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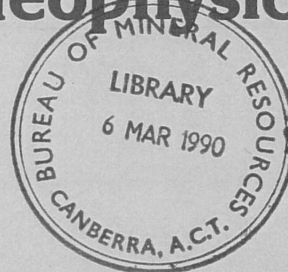


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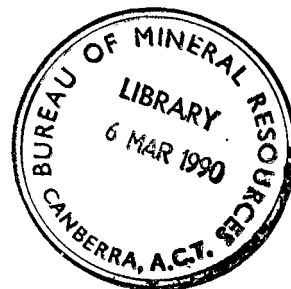
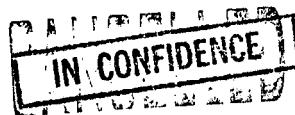
Record 1990/10

DIRECT HYDROCARBON DETECTION IN THE WATER COLUMN OF THE TORQUAY
SUB-BASIN, VICTORIA, AUSTRALIA

Principal Investigators: G.W. O'Brien & D.T. Heggie

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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
Division of Marine Geosciences and Petroleum Geology

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SUB-BASIN, VICTORIA, AUSTRALIA

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EXECUTIVE SUMMARY

DIRECT HYDROCARBON DETECTION IN THE WATER COLUMN OF THE TORQUAY SUB-BASIN, VICTORIA, AUSTRALIA

BMR Record 1990/10

By G.W. O'Brien & D.T. Heggie

Division of Marine Geosciences and Petroleum Geology

During February 1989, the Bureau of Mineral Resources, in conjunction with Transglobal Exploration and Geoscience (TEG) of Leucadia, USA, conducted a limited direct hydrocarbon detection (DHD) program for Shell Development Australia Pty Ltd in the Torquay Sub-Basin, southeastern Australia. The survey was of limited extent and was principally sited along two previously collected seismic lines:- BMR Line 48/004 (a SW-NE strike line) and Shell Line OS88A-15 (a NW-SE dip line). The program was designed to test for the presence of thermogenic hydrocarbons in this rank wildcat area. The total program consisted of approximately 220 line km of DHD (comprising 3 separate lines :-89/070, 89/072 and 89/073), 39 km of high resolution seismic reflection profiling and 42 km of side scan sonar profiling. Anomalous concentrations of hydrocarbons were detected on all three survey lines. These anomalies varied in intensity from "moderate" to "very weak".

The strongest anomaly was located on Line 89/070 (BMR Line 48/004). Ethane (C_2) concentrations increased by an order of magnitude at the northeastern end of this line, whereas propane (C_3) increased four-fold; methane (C_1) only increased from approximately 6.1 to 7.6 ppm, a 25% increase. This anomaly was not reproducible approximately 18-24 hours after it was first sampled, which coupled with the fact that the anomaly increased progressively towards Port Phillip Bay, may suggest that the anomaly is anthropogenic in origin and sourced from Port Phillip Bay.

A subtle, but perhaps very significant anomaly was found on Line 89/072 (Shell Line OS88A-15), just south of the intersection with Line 89/070 (BMR Line 48/004) (latitude $38^{\circ}40.328'S$; longitude $144^{\circ}07.333'E$). This anomaly was sharp and only about 2 km wide. Total hydrocarbons and methane increased from background levels of approximately 19 and 7 ppm to maximum values of 23.5 and 10.5 respectively. Ethane also increased very slightly from background values of 0.049 ppm to a maximum of 0.057 ppm. Normally such subtle variations would be discarded as insignificant. However, this anomaly coincided with a depression on the seafloor:- such depressions or "pockmarks" are commonly associated with hydrocarbon seepage in other parts of the world. A combined side scan sonar and high resolution seismic reflection study was carried out over the depression to better define its morphology and its relationship to the subsurface geology. This study showed two things:-

1.)The seafloor in the vicinity of the anomaly/depression has more relief than the surrounding seafloor.

2.)The anomaly/depression corresponds with the crest of a large anticlinal structure. The seismic reflections become incoherent along the axial region of the structure and there is complete "white-out" which extends all the way to the seafloor. The seismic character is consistent with the presence of shallow gas along the axis of the structure.

The integration of DHD, side scan and seismic data suggests that this subtle hydrocarbon anomaly may well be the result of the microseepage of hydrocarbons to the seafloor from the anticlinal structure. The concentrations of hydrocarbons are too low to determine whether the hydrocarbons are of thermogenic or biogenic origin. However, the very slight increase in the ethane concentration may indicate that the anomaly could be thermogenic in origin. While the detected hydrocarbon microseepage was very limited during the survey, it is not possible to discount the presence of significant hydrocarbon accumulations on the basis of available data.

A very small anomaly was detected on Line 89/073 (latitude $38^{\circ}33.100'S$; longitude $144^{\circ}15.584'E$) with methane rising to a maximum of 8.78 ppm. No significance is placed on this anomaly.

In conclusion, no evidence was found of large scale thermogenic hydrocarbon seepage in the Torquay Sub-Basin. The subtle hydrocarbon anomalies that were found were all restricted to the northern part of the study area, where the general concentrations of C_2 to C_4 hydrocarbons were about two-fold higher than those measured in the southeastern part of the area. These higher concentrations may be related either to proximity to Port Phillip Bay or hydrocarbon generation within a mature Torquay Sub-Basin sedimentary sequence. Additional DHD work would be required to confirm which is more likely. Seafloor sampling of the sediments around the anomaly on Line 89/072, combined with a more detailed DHD program run very close to the seafloor over the depression, might help characterize the thermogenic/biogenic nature of this anomaly.

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INTRODUCTION

During February 1989, the Bureau of Mineral Resources, in conjunction with Transglobal Exploration and Geoscience (TEG) of Leucadia, USA, conducted a direct hydrocarbon detection (DHD) program with the Shell Company of Australia Limited in the Torquay Sub-Basin, southeastern Australia. The geochemical survey originally agreed to by Shell and BMR consisted of two survey lines, both over previously collected seismic lines (BMR Line 48/004 and Shell Line OS88A-15 line). The program was designed to test for the presence of thermogenic hydrocarbons in this rank wildcat area. The actual survey (see Figures 1 & 2) consisted of three lines. Survey lines 89/070 and 89/072 were sited along seismic lines 48/004 (a SW-NE strike line) and OS88A-15 (a NW-SE dip line) respectively. Line 89/073 had no seismic control and was collected to provide additional data for the interpretation of lines 89/070 and /072. Similarly, side scan sonar and high resolution seismic reflection data were also acquired to aid in the interpretation of the geochemical data. The total program consisted of approximately 220 line km of DHD, 42 km of side scan sonar profiling and 39 km of high resolution seismic reflection profiling.

OBJECTIVES

The objective of the program was to obtain measurements of the light hydrocarbon concentrations in the water column (within 10-15 m of the seafloor) in the Torquay Sub-Basin, southeastern Australia. The Torquay Sub-Basin is a rank wildcat area in which only 2 exploration wells, Snail#1 and Nerita#1, have been drilled. The sedimentary sequence in the Torquay Sub-Basin consists of Early Cretaceous syn-rift sediments which are unconformably overlain by a thick sequence of latest Cretaceous and Tertiary sediments. In excess of 3000 m of latest Cretaceous-Paleocene fluviio-deltaic sediments (the Eastern View Coal Measures) may be present within the Torquay Sub-Basin. Potential hydrocarbon source rocks may exist within Early Cretaceous lacustrine sediments near the base of the sedimentary sequence, and within the Eastern View Coal Measures (EVCM). The maturity of the EVCM may be marginal, however. If thermogenic hydrocarbons were detected in the water column during the geochemical survey, it could significantly upgrade the prospectivity of the region, and provide new information on source rock maturity and type.

SHIP'S PROGRAM

Geochemical surveying began on the south-western end of Line 89/070 (BMR Line 48/004) on February 21, 1989 (see Figure 1). The fish was pulled at the end of Line 89/070 and repairs were made to the DHD cable and fish. While repairs were being made, a high resolution seismic source and cable were deployed, and a seismic line run along Shell Line OS88A-15 (DHD Line 89/072). This was done to try to determine whether shallow gas was present

and characterize the nature of the sub-seafloor geology. After the seismic line was shot, the side scan sonar was deployed and a "Figure 8" survey was carried out over the intersection of BMR Line 48/004 (Line 89/070) and Shell Line OS88A-15 (DHD Line 89/072) (see Figure 2).

The ship then steamed south to the beginning of Line OS88A-15 and the DHD cable and fish were deployed. The first attempt at data acquisition (Line 89/071) was aborted because of equipment problems, and the line was restarted as Line 89/072. Surveying continued to the end of Line 89/072 without problems (Figure 2). At the end of Line 89/072 it was decided to run another line to follow up a hydrocarbon anomaly detected at the end of Line 89/070. This line (Line 89/073) ran from the intersection of Shell Lines OS88A-15 (i.e. Line 89/072) and Shell Line OS88A-14A northeast to the intersection of Lines OS88A-14A and OS88A-23. It then proceeded southeast along Line OS88A-23 to its intersection with Line OS88A-12A, west-southwest along OS88A-12A then northwest along Line OS88A-19 to its intersection with BMR Line 48/004 (DHD Line 89/070). Surveying then continued along a projected extension of Line 48/004 to its intersection with Line OS88A-14, then east-northeast along this line to its intersection with Line OS88A-31.

DHD RESULTS:- TORQUAY SUB-BASIN

Tables 1, 2, 3 contain all relevant water column data collected during the survey. Data included are C_1 - C_4 , total hydrocarbons (THC), carbon dioxide (CO_2), salinity, temperature, fish depth, latitude, longitude, and hydrocarbon wetness. Units are:-

Hydrocarbon data:-ppm in the gas phase.

Salinity:-ppt.

Temperature:- $^{\circ}C$.

Fish Depth:-m.

Latitude ($^{\circ}S$) & longitude ($^{\circ}E$):-degrees, minutes, seconds.

Hydrocarbon wetness:- $\{(C_2-C_4)/(C_1-C_4)\} \times 100$

The data are graphically presented on both an "all data" and line-by-line basis, and are presented in relation to shotpoint and as X-Y cross plots.

General Trends:- Torquay Sub-Basin

The majority of the data collected in the Torquay Sub-Basin was characteristically of background concentration and composition. The following statements refer only to trends observed in these background data.

- i.) There is generally a positive relationship between the total hydrocarbon (THC) and methane concentrations (Figure 3).
- ii.) There is a positive covariance between the methane and the ethane-propane concentrations (Figures 4 & 5).
- iii.) The methane concentration generally decreases with increasing water depth (Figure 6), probably because of decreased biological production at depth.
- iv.) The biologically-produced hydrocarbons, i.e. ethylene and propylene, are positively correlated with the ethane and propane concentrations

respectively (Figures 7 & 8). Moreover, the concentration of both ethylene and propylene decrease significantly with increasing water depth (Figure 9), presumably because of decreased biological production. v.) The concentrations of methane, ethane and propane are generally relatively constant in the water depth range 0 to 45-50 m (Figures 6, 10-11). Limited water temperature and salinity data suggest that the water column is fairly well mixed to about 50 m.

Line 89/070

THC and, to a greater extent methane, show slight increases in concentration along Line 89/070 (Figure 14), with methane showing its most rapid increase from approximately shotpoint#150 onwards (to the northeast):- methane (C_1) increased from approximately 6.1 to 7.6 ppm, a 25% increase. In contrast, ethane (C_2) concentrations increased by an order of magnitude at the northeastern end of this line; propane (C_3) concentrations increased four-fold. Butane (C_4) reached detectable concentrations towards the end of this line (Figure 15). The water depth along this line shallowed progressively to the northeast. Consequently, fish depth decreased whereas water temperature and salinity increased (Figure 16). The biologically-produced hydrocarbons (ethylene and propylene) also increased significantly in concentration to the northeast (Figures 17 & 18).

In order to test the reproducibility of this anomaly, we relocated on the end of Line 89/070 (as part of Line 89/073, approximately 55 km to the southwest of Port Phillip Bay) 18-24 hours after the anomaly was detected. No significant anomaly was detected on Line 89/073, however. This observation suggests that this anomaly may be due to anthropogenic hydrocarbons (which have emanated from Port Phillip Bay and been dissipated by tides and currents) rather than to thermogenic hydrocarbons advected into the water column from a "point source" on the seafloor. The observation that the "background" concentrations of ethane and propane are higher in the northern part of the study area (0.04-0.05 ppm) compared with the southern part of the study area (0.01-0.02 ppm) does indicate that a hydrocarbon "source" is present in the northern part of the area. That source may be pollution from Port Phillip Bay, hydrocarbons generated within the sedimentary pile, or both.

Line 89/072

The water depth decreases progressively to the northwest along Line 89/072. The ethane, propane, ethylene and propylene concentrations also increase slightly (Figure 19). Neither THC nor methane show any strong, systematic trends along the line, though a small but significant THC/methane "kick" is present between shotpoints 120 to 128 (Figures 20 & 21). This subtle, but perhaps very significant anomaly was found just south of the intersection of Line 89/070 with Line 89/072 (latitude $38^{\circ}40.328'S$, longitude $144^{\circ}07.333'E$, approximately 65 km southwest of the entrance to Port Phillip Bay). This anomaly is sharp, being only about 2 km wide (8 shotpoints). Total hydrocarbons and methane increase from background levels of approximately 19 and 7 ppm to maximum values of 23.5 and 10.5 respectively (Figures 22 & 23). Ethane also increases very slightly from background values of 0.049 ppm to a maximum of 0.057 ppm (Figure 24). Generally such subtle variations in concentration would not be considered significant. However, this anomaly coincides with a depression on the seafloor. Depressions or "pockmarks" are commonly associated with hydrocarbon seepage in other parts of the world. Combined side scan sonar,

high resolution seismic reflection and echo sounder data were used to better define the depression's morphology and its relationship to the subsurface geology.

This data showed two things:-

- 1.) The 12 KHz echo sounder showed that a slight depression was present on the seafloor in the vicinity of the hydrocarbon anomaly. Moreover, side-scan data showed that the seafloor around the anomaly had more relief than the surrounding area (Figures 25 & 26).
- 2.) The anomaly/depression corresponds with the crest of a large anticlinal structure (Figures 27 & 28). The seismic reflections become incoherent along the axial region of the structure and there is complete "white-out" which extends all the way to the seafloor. The seismic character is consistent with the presence of shallow gas along the axis of the structure.

The integration of DHD, side scan and seismic data suggests that this subtle hydrocarbon anomaly may be the result of the microseepage of hydrocarbons to the seafloor from the anticlinal structure. The concentrations of hydrocarbons are too low to determine whether the hydrocarbons are of thermogenic or biogenic origin. However, the very slight increase in the ethane concentration may indicate that the anomaly could be thermogenic in origin. While the detected hydrocarbon microseepage was very limited during the survey, it is not possible to discount the presence of significant gas accumulations on the basis of available data.

Line 89/073

Two very small anomalies were detected on Line 89/073. The first was at about shotpoint number 40 while the second was at shotpoint 170 (Figure 29). In the first anomaly, THC and methane rose to maxima of 21.04 and 8.78 ppm respectively. The heavier hydrocarbons show no obvious correlation with the THC or methane concentrations in the vicinity of either anomaly (Figure 30 & 31) and this, combined with their very subtle nature, means that no significance can be placed either on these anomalies. No side scan or seismic data is available for this line.

Line 89/073 did link the end of Line 89/070 to follow up the anomaly detected at the end of Line 89/070. Unfortunately the ethane-rich anomaly found at the end of Line 89/070 was not reproduced on Line 89/073, even though the two data sets were acquired only 18-24 hours apart. This lack of duplication may be due to the actions of strong currents in the area and/or the cyclicity of tidal discharge from Port Phillip Bay.

3-Dimensional and Contour Plots

The methane, ethane and propane data set from the Torquay Sub-Basin has been gridded, contoured and plotted as 2- and 3-dimensional surface plots. The limited nature of the survey makes such an approach of limited use, though they have been included for completeness (Figures 32-40).

ACKNOWLEDGMENTS

We wish to thank the Master (Henry Foreman) and crew of the R.V. Rig Seismic and all BMR technical and scientific staff for their contribution to the success of this study. We also thank all TEG staff members involved with the survey, in particular Dr Blayne Hartman.

APPENDIX 1

Non-Geochemical Acquisition Systems

The following section describes the performance and characteristics of the non-geochemical data acquisition systems for Survey 89 in toto, including the work in the Torquay Sub-Basin.

The non-seismic data acquisition system (DAS) ran for the duration of the cruise with 9 breaks in data collection. These 9 breaks, caused by computer hardware failure and power surges, resulted in a total of 134 minutes of data not being recorded over the scientific cruise length of 30 days. Fortunately the system failures occurred mainly during transits to specific sites, and, for the critical parts of the survey there was less than 15 minutes of data lost.

Navigation

Positioning of the ship is derived from three largely independent systems; Global Positioning System (GPS), dead reckoning with updates from the Transit Satellite System and radio navigation using Hifix. All on-board navigation is done within the WGS72 coordinate system, as this is the system used by the Transit Satellites. The GPS has been using WGS84 since January 1987 but as the difference from WGS72 is only of the order of a metre, no conversion of the GPS positions is warranted.

Global Positioning System

A Magnavox T-Set receiver gives continuous absolute positioning within about 20 metres r.m.s. under optimum conditions. However, the system is in the experimental stage with only 7 of the proposed 24 satellites in orbit. Positioning is possible for some 8 hours a day but this can be extended to 12 hours in the two-satellite mode by using an atomic frequency standard. Success depends entirely upon an acceptable frequency bias between the satellite transmissions and the standard being determined during the previous period of three to four satellite visibility. Considerable uncertainty is involved with the use of two satellites. Experimentation with the system in port has shown that the two-satellite system is unreliable, giving position errors which compound the longer the system operates on two satellites.

By using the GPS receiver without an external atomic standard, coverage during the cruise was limited to approximately 7 hours per day. During this period the GPS worked well. Problems encountered with the receiver during previous surveys appear to have been fixed by the replacement of the

receivers internal oscillator.

Dead Reckoning System

Two independent systems incorporating gyro compass, dual-axis sonar-doppler log and Transit Satnav receiver provides the best available positioning of this type. A lower grade system of Robertson gyro, Raytheon DSN450 sonar-doppler and MX1142 Satnav receiver is used as the backup.

Both systems have problems in rough weather or when heading into the sea due to air being trapped under the hull and blanking the transmission of all sonar systems. A smaller paddle wheel log has proven to be useful in bad weather as it is not affected by the under-bottom turbulence to the same extent as the sonar-dopplers. This is due to the paddle log being lowered further beneath the hull than the sonar-dopplers.

The shallowness of the survey areas during the cruise were suitable for high accuracy sonar doppler velocity determination. The sonar dopplers operated well for all areas except in the eastern Gippsland. In this section of the Gippsland the ship operated in depths of 260 metres. At this depth the sonar dopplers toggled between bottom lock and water lock and their performance diminished.

The paddle log was not used during the survey due to the failure of a gate valve through which the paddle log is lowered.

Hifix

A Decca Hifix radio navigation system was operated for the entire cruise with varying results. BMR Marine has been experimenting for some time to extend the effective range of the Hifix system by operating it in circular mode with all stations slaved to their own rubidium standards. During this cruise, four shore transmitters as well as the shipboard receiver were slaved to their own atomic standard. Such a system is affected by the individual drift of the rubidium standards.

The quality of positions derived from the Hifix chain during the Bass Basin segment varied. The position quality was influenced by shore station geometry, atmospheric conditions, and atomic standard drift. The drift of the atomic standards was low, but variable in direction. Due to the unpredictability in the atomic standard drift, the Hifix position was adjusted to Transit satellite positions. Atmospheric interference was a problem in the initial part of the Bass Basin work, but diminished as the range to shore stations decreased and the weather became less severe.

No Hifix was received during the Stansbury and Otway Basin segments. Although the Phillip Island and Cape Liptrap stations were visible during the Torquay Sub Basin work, poor geometry precluded their use. Upon arrival in the Gippsland Basin, the Hifix station at Lake Tyers failed. The transmitter unit from Phillip Island was transferred to Lake Tyers and Hifix was available for all but the first day of operations in the Gippsland. Comparison of Hifix positions obtained in the Gippsland with Transit satellite fixes showed differences rarely exceeding 180 metres.

Bathymetry

Bathymetric data was derived from a Raytheon 12KHz echo sounder. This echo sounder produced excellent results for the duration of the cruise, with continuous soundings along all lines.

Sub-bottom profiling was attempted using a Raytheon 3.5 KHz echo sounder. Basic problems with hull design and transducer placement on the ship resulted in little or no penetration. The system was of use in obtaining a second independent water depth.

Side Scan Sonar

Side scan sonar data was obtained using an EG&G side scan sonar system. Side scan profiles were performed in the Bass, Otway and Torquay Basins. The profiles recorded did not have the clarity expected, and there appears to be offset and calibration problems with the digital to analogue converter used to output the side scan record on the electrostatic plotter display system. Even with this problem the side scan profiles obtained did contain interpretable sea floor structure.

Seismic Reflection Profiling

High resolution seismic data was recorded for 12 hours in the Torquay and Otway Basins. A record length of 1.5 seconds with a sample rate of 1m sec was used. The data was recorded using an 8 channel streamer having a group interval of 12.5 metres. A 15 cubic inch water gun shooting every 12.5 metres resulted in 8 fold recording. Near trace gather plots indicate that the high resolution seismic data had good signal levels, with penetration beyond 1 second.

A list of channel allocations for non-seismic data in the South East Australia Geochemical Cruise (#89) is given in an appendix.

APPENDIX 2:- DHD METHODOLOGY

A bottom water exploration survey searches for evidence of hydrocarbon seepage from the sediments into the near-bottom seawater. A submersible unit containing sensors and a water pump was towed at speeds ranging from 5 to 6.5 knots. Near-bottom seawater was continuously pumped up to the ship by the submersible unit. The unit was generally kept within 10 meters of the bottom in the survey area to maximum water depths of 70 meters.

On board ship, the seawater was continuously degassed under vacuum in a closed chamber. Approximately 12 litres of water per minute were degassed, yielding approximately 200 ml of dissolved gas per minute. The stripped gases were passed through a series of analytical instruments for measurement of hydrocarbon compounds of interest. The following data were collected throughout the survey :

- . Light hydrocarbons (C1-C4) every 2 minutes.
- . Total hydrocarbons every 30 seconds.
- . Salinity, temperature, and depth every 30 seconds.
- . Gasoline-range hydrocarbons (C5-C8) every 10 minutes.
- . Carbon dioxide every 2 minutes.

Calibration standards and system blanks with zero nitrogen were performed once each day. Calibrations were within 10% for the entire program and system blanks were less than 2 ppm for methane and 5 ppb for the C2+ compounds. Minimum detection limits were approximately 10 parts per billion in the stripped gas (equivalent to 0.02 nl/l). All measured parameters were recorded by a shipboard computer and displayed immediately after the conclusion of each analysis to ensure data quality and to allow immediate recognition of anomalies.

APPENDIX 3:- INTERPRETATIVE METHODOLOGY

Sources and Characteristics of Light Hydrocarbons

Three primary sources of hydrocarbon seepage exist in the marine environment :

1. Biological activity in the shallow sediments and water column.
2. Deep sediments in which hydrocarbons have been produced by the thermal degradation of organic matter (source rocks).
3. Reservoired petroleum (oil and gas).

Each source produces hydrocarbons with different geochemical signatures. Biologically derived hydrocarbons are predominantly composed of methane. Traces of the higher carbon number compounds (C2+) are produced, but the unsaturated hydrocarbon compounds (ethylene and propylene) are thought to be produced in greater quantities than their saturated homologs (ethane and propane). The ratio of the C2+ compounds to methane, termed the hydrocarbon wetness, generally is less than 0.1%.

Thermal processes produce larger quantities of the C2+ hydrocarbons (higher hydrocarbon wetnesses) and none of the unsaturated compounds. The relative amounts of the C2+ compounds, branched to straight chain compounds and the isotopic composition of hydrocarbons produced by thermal mechanisms vary depending upon the type of organic matter and thermal maturity.

Hydrocarbon seepage from thermally produced gas generally lacks significant quantities of compounds greater than propane (C3) and tends to have hydrocarbon wetnesses less than 1.0%. Ethane is significantly more abundant than propane with ethane to propane ratios generally exceeding 5. Dry thermogenic gas may be quite similar in hydrocarbon composition to biogenically produced gas, but generally contains larger quantities of ethane and at least a trace of propane.

Hydrocarbon seepage from reservoired oil tends to have the entire suite of light hydrocarbons (C1 through C4) and, depending upon the seepage rate, may contain significant quantities of the gasoline range (C5-C8), longer straight-chained hydrocarbons (C15+ alkanes), and 2-ring and 3-ring

aromatic hydrocarbons. Hydrocarbon wetnesses tend to be greater than 1%, the ratio of ethane to propane is less than 5.

Seepage from condensates is likely to have a geochemical signature intermediate between thermal gases and oils, i.e., presence of methane, ethane, propane, and possibly butane; wetnesses in the range of 0.5% to 1.0%, and ethane to propane ratios of approximately 5.

The signature of hydrocarbons leaking from near-surface or outcropping source rocks may differ from the typical thermogenic signatures described previously because of the differing mobility of the hydrocarbon compounds. Although the entire suite of light hydrocarbons may be present, hydrocarbon wetnesses may be extremely high due to the preferential loss of methane. Because natural variations exist in light hydrocarbons produced by the different mechanisms and secondary processes (oxidation, differential migration, etc.) may alter hydrocarbon compositions, it is important to realize that the above criteria are not rigid. Nevertheless, they allow a geochemical interpretation which can be refined by integration with the subsurface geology and local oceanography.

The Mixing Model Interpretation Method

Interpretation of the source of hydrocarbon anomalies is based upon the differences in the hydrocarbon signatures from the various hydrocarbon sources. It is important to realize that these characteristic hydrocarbon signatures are applicable only to hydrocarbons from petroleum seepage. In the natural environment, both marine and terrestrial, low quantities of natural hydrocarbons exist which are unrelated to petroleum seepage from depth (commonly referred to as the "background"). The processes creating and controlling the hydrocarbon background population are not well known, but include biological production and fractionation, photosynthetic production and destruction reactions, and chemical oxidation. Because the relative importance of these processes varies in different areas, the background population has extremely variable characteristics from one location to another, but is always characterized by low concentrations.

In areas where petroleum seepage from depth does occur, the seeping hydrocarbons mix with the natural hydrocarbons in the near-surface sediments and seawater. When hydrocarbon anomalies are measured in the shallow sediments or water column, the anomalies represent a mixture of the pure seepage with this hydrocarbon background. For this reason, it is necessary to consider the effects that the background hydrocarbons may have on the characteristic ratios before attempting to apply the ratios for source determination of anomalies.

One approach to account for the hydrocarbon background is to define a background concentration (either statistically or graphically) and subtract the defined value from the measured data. This approach is problematic because the background population generally varies throughout the survey area and subtraction of a constant background level leads to erroneous conclusions.

A second and more powerful approach is to construct cross plots of key hydrocarbon parameters and to search for trends in the data indicative of a mixture of seeping hydrocarbons with the background hydrocarbons. The hydrocarbons are added to the background population (as from seepage, for

example), a mixture of the two sources results and this appears on the plot as a trend of data extending away from the background (i.e., a mixing line). As the quantity of the hydrocarbons added to the background increases, higher and higher hydrocarbon values result, and the mixing line trends toward the composition of the pure hydrocarbon source. The model described here is identical to the mixing model used by geologists when working with mineral and rock formation from melts and to the model used by oceanographers when determining the relative inputs of fresh and salt water in estuaries,.

A cross plot of two compounds (e.g., ethane vs. methane) indicates whether the compounds are being added to the natural hydrocarbons in an area. Positive trends on plots of one compound versus another indicate that both compounds are being added concurrently and thus, the source of the anomaly contains both compounds. Because a mixing trend is created by one hydrocarbon source supplying hydrocarbons to the background, all data on the same trend reflect the same source regardless of the absolute concentrations or absolute ratios. For example, an anomaly with ethane at 0.1 ppm would reflect the same hydrocarbon source as a second anomaly with ethane values at 1.0 ppm if the data from the two anomalies lie on the same mixing trend. Similarly, an anomaly with a wetness of 2% (oil-like) may actually represent a dry gas source if it falls on a mixing trend that has low wetnesses at higher concentrations.

The interpretation approach adopted here is to construct cross plots for all compounds and diagnostic ratios and determine the characteristics of the hydrocarbon sources by extrapolating observed trends to the pure end-member.

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq70	1	02/21/89	08:39:42	14.37	6.44	0.012	0.069	0.011	0.017	0.000	0.000	3697.0	31.57	15.83	55.2	39 2.974	143 26.695	0.36
torq70	2	02/21/89	08:42:39	13.87	6.07	0.010	0.068	0.013	0.016	0.000	0.000	3879.2	31.57	15.43	55.2	39 2.919	143 26.788	0.38
torq70	3	02/21/89	08:43:46	14.14	6.44	0.011	0.070	0.010	0.017	0.000	0.000	3879.2	31.64	15.49	55.4	39 2.757	143 27.067	0.32
torq70	4	02/21/89	08:46:42	14.24	5.97	0.011	0.063	0.014	0.015	0.000	0.000	3935.4	31.50	15.38	55.4	39 2.695	143 27.175	0.42
torq70	5	02/21/89	08:47:49	14.13	6.34	0.010	0.065	0.010	0.014	0.000	0.000	3935.4	31.50	15.37	55.2	39 2.540	143 27.460	0.31
torq70	6	02/21/89	08:50:46	13.97	5.99	0.011	0.062	0.013	0.008	0.000	0.000	3920.1	31.50	15.38	58.1	39 2.489	143 27.556	0.40
torq70	7	02/21/89	08:51:52	14.07	6.34	0.013	0.063	0.011	0.013	0.000	0.000	3920.1	31.57	15.44	59.0	39 2.336	143 27.845	0.38
torq70	8	02/21/89	08:54:50	13.64	5.99	0.010	0.062	0.015	0.012	0.000	0.000	4059.0	31.64	15.53	59.3	39 2.237	143 28.017	0.42
torq70	9	02/21/89	08:56:41	13.63	6.32	0.012	0.060	0.010	0.014	0.000	0.000	4098.6	31.71	15.60	58.6	39 2.130	143 28.211	0.35
torq70	10	02/21/89	08:58:53	14.01	5.92	0.010	0.063	0.013	0.009	0.000	0.000	3971.6	31.43	15.28	58.7	39 2.024	143 28.406	0.39
torq70	11	02/21/89	09:00:45	14.06	6.35	0.011	0.063	0.010	0.012	0.000	0.000	3942.7	31.43	15.26	59.0	39 1.917	143 28.600	0.33
torq70	12	02/21/89	09:02:57	13.99	6.04	0.011	0.063	0.012	0.012	0.000	0.000	3892.6	31.43	15.30	58.3	39 1.811	143 28.794	0.38
torq70	13	02/21/89	09:04:48	13.84	6.41	0.010	0.067	0.010	0.013	0.000	0.000	4029.7	31.50	15.34	59.0	39 1.704	143 28.988	0.31
torq70	14	02/21/89	09:07:02	13.63	6.00	0.010	0.063	0.011	0.012	0.000	0.000	4133.0	31.57	15.41	58.4	39 1.597	143 29.182	0.35
torq70	15	02/21/89	09:08:53	13.68	6.29	0.011	0.063	0.010	0.012	0.000	0.000	4151.3	31.57	15.44	58.8	39 1.491	143 29.377	0.33
torq70	16	02/21/89	09:11:06	13.55	5.90	0.009	0.059	0.011	0.013	0.000	0.000	4003.4	31.57	15.45	58.6	39 1.384	143 29.571	0.34
torq70	17	02/21/89	09:12:53	13.17	6.25	0.012	0.063	0.012	0.013	0.000	0.000	3941.9	31.57	15.46	58.8	39 1.278	143 29.765	0.38
torq70	18	02/21/89	09:15:09	13.34	5.84	0.010	0.061	0.012	0.014	0.000	0.000	3751.2	31.64	15.47	59.2	39 1.171	143 29.960	0.38
torq70	19	02/21/89	09:16:57	13.33	6.24	0.009	0.060	0.013	0.012	0.000	0.000	3698.7	31.64	15.47	59.2	39 1.064	143 30.154	0.35
torq70	20	02/21/89	09:19:13	13.10	5.87	0.012	0.061	0.010	0.013	0.000	0.000	3621.8	31.71	15.49	59.2	39 .971	143 30.328	0.37
torq70	21	02/21/89	09:21:01	13.05	6.21	0.011	0.061	0.011	0.012	0.000	0.000	3573.1	31.78	15.63	59.0	39 .798	143 30.515	0.35
torq70	22	02/21/89	09:23:17	13.19	5.80	0.011	0.060	0.009	0.011	0.000	0.000	3546.5	31.71	15.62	59.4	39 .686	143 30.716	0.34
torq70	23	02/21/89	09:25:04	13.41	6.24	0.012	0.072	0.010	0.011	0.000	0.000	3538.8	31.78	15.63	59.6	39 .568	143 30.938	0.35
torq70	24	02/21/89	09:27:21	13.46	5.88	0.011	0.062	0.013	0.013	0.000	0.000	3543.5	31.85	15.73	58.5	39 .486	143 31.099	0.41
torq70	25	02/21/89	09:29:05	13.34	6.25	0.012	0.065	0.012	0.012	0.000	0.000	3483.6	31.78	15.68	59.4	39 .370	143 31.318	0.38
torq70	26	02/21/89	09:31:24	13.56	5.89	0.012	0.062	0.013	0.011	0.000	0.000	3545.8	31.92	15.79	58.6	39 .286	143 31.476	0.42
torq70	27	02/21/89	09:33:04	13.74	6.29	0.012	0.063	0.012	0.012	0.000	0.000	3545.8	31.85	15.70	59.2	39 .168	143 31.697	0.38
torq70	28	02/21/89	09:35:26	13.78	5.93	0.011	0.064	0.011	0.013	0.000	0.000	3659.2	31.99	15.82	59.6	39 .083	143 31.855	0.37
torq70	29	02/21/89	09:37:04	13.52	6.32	0.011	0.068	0.011	0.011	0.000	0.000	3659.2	31.92	15.82	58.8	38 59.956	143 32.095	0.35
torq70	30	02/21/89	09:39:28	13.56	5.96	0.011	0.066	0.010	0.010	0.000	0.000	3671.9	31.92	15.75	58.8	38 59.878	143 32.238	0.35
torq70	31	02/21/89	09:41:05	13.68	6.32	0.012	0.066	0.011	0.012	0.000	0.000	3671.9	31.85	15.75	59.6	38 59.749	143 32.477	0.36
torq70	32	02/21/89	09:43:33	13.88	5.97	0.011	0.067	0.012	0.014	0.000	0.000	3602.1	31.92	15.79	58.5	38 59.606	143 32.241	0.38
torq70	33	02/21/89	09:47:37	13.94	5.99	0.010	0.067	0.014	0.017	0.000	0.000	3673.9	31.85	15.74	58.6	38 59.464	143 33.005	0.40
torq70	34	02/21/89	09:49:00	13.71	6.32	0.011	0.069	0.012	0.015	0.000	0.000	3673.9	31.85	15.75	59.2	38 59.323	143 33.267	0.36
torq70	35	02/21/89	09:51:39	13.83	5.98	0.011	0.069	0.013	0.013	0.000	0.000	3756.9	31.85	15.75	59.1	38 59.252	143 33.395	0.40
torq70	36	02/21/89	09:53:04	13.85	6.35	0.012	0.074	0.011	0.014	0.000	0.000	3711.0	31.85	15.76	59.3	38 59.109	143 33.655	0.36
torq70	37	02/21/89	09:55:44	13.98	5.97	0.011	0.067	0.010	0.016	0.000	0.000	3736.4	31.92	15.75	58.3	38 59.038	143 33.781	0.35
torq70	38	02/21/89	09:57:07	13.64	6.32	0.012	0.069	0.010	0.015	0.000	0.000	3769.8	31.92	15.76	59.7	38 58.900	143 34.036	0.35
torq70	39	02/21/89	09:59:47	13.90	5.97	0.011	0.068	0.010	0.015	0.000	0.000	3735.6	31.92	15.77	59.3	38 58.825	143 34.178	0.35
torq70	40	02/21/89	10:01:11	13.87	6.32	0.013	0.072	0.012	0.013	0.000	0.000	3794.1	31.92	15.78	59.2	38 58.691	143 34.429	0.39
torq70	41	02/21/89	10:03:51	13.71	5.98	0.012	0.069	0.012	0.012	0.000	0.000	3790.5	31.92	15.79	60.3	38 58.623	143 34.554	0.40
torq70	42	02/21/89	10:05:14	13.94	6.33	0.012	0.073	0.013	0.014	0.000	0.000	3819.0	31.92	15.82	60.2	38 58.487	143 34.799	0.39
torq70	43	02/21/89	10:07:55	13.95	5.98	0.013	0.069	0.012	0.012	0.000	0.000	3817.7	31.99	15.85	60.1	38 58.418	143 34.922	0.42
torq70	44	02/21/89	10:09:18	13.90	6.33	0.012	0.072	0.011	0.015	0.000	0.000	3826.7	31.99	15.84	59.2	38 58.274	143 35.178	0.36
torq70	45	02/21/89	10:11:58	13.97	5.94	0.012	0.070	0.013	0.015	0.000	0.000	3831.5	31.99	15.84	59.4	38 58.206	143 35.303	0.42
torq70	46	02/21/89	10:13:22	13.90	6.35	0.014	0.073	0.012	0.013	0.000	0.000	3810.5	31.99	15.85	60.0	38 58.071	143 35.555	0.41
torq70	47	02/21/89	10:16:02	13.80	6.01	0.012	0.071	0.009	0.014	0.000	0.000	3863.9	31.99	15.85	59.1	38 58.004	143 35.684	0.35
torq70	48	02/21/89	10:17:25	13.87	6.37	0.015	0.077	0.011	0.014	0.000	0.000	3799.9	31.99	15.84	59.0	38 57.862	143 35.934	0.41
torq70	49	02/21/89	10:20:06	13.77	6.01	0.011	0.071	0.014	0.014	0.000	0.000	3767.9	32.06	15.94	56.9	38 57.782	143 36.075	0.41
torq70	50	02/21/89	10:21:29	13.82	6.39	0.011	0.072	0.015	0.017	0.000	0.000	3781.7	32.13	15.98	52.9	38 57.644	143 36.334	0.41
torq70	51	02/21/89	10:24:10	13.61	6.06	0.012	0.073	0.013	0.018	0.000	0.000	3757.5	32.20	16.05	49.0	38 57.575	143 36.460	0.41
torq70	52	02/21/89	10:25:33	13.73	6.42	0.013	0.076	0.012	0.017	0.000	0.000	3801.9	32.20	16.05	47.9	38 57.433	143 36.713	0.39
torq70	53	02/21/89	10:28:14	13.77	6.13	0.014	0.075	0.011	0.017	0.000	0.000	3779.8	32.27	16.11	49.0	38 57.361	143 36.846	0.41
torq70	54	02/21/89	10:29:37	13.57	6.52	0.013	0.078	0.013	0.017	0.000	0.000	3758.7	32.20	16.07	48.9	38 57.218	143 37.106	0.40

Table 1. Direct hydrocarbon detection data collected along survey line 89/070, Torquay Sub-Basin, southeastern Australia.

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq70	55	02/21/89	10:32:15	13.65	6.21	0.012	0.076	0.012	0.017	0.000	0.000	3756.7	32.20	16.07	49.3	38 57.139	143 37.244	0.39
torq70	56	02/21/89	10:33:41	13.72	6.57	0.011	0.077	0.008	0.018	0.000	0.000	3756.7	32.27	16.13	49.7	38 57.013	143 37.473	0.29
torq70	57	02/21/89	10:36:18	13.72	6.27	0.011	0.078	0.010	0.022	0.000	0.000	3667.0	32.27	16.13	49.7	38 56.922	143 37.645	0.33
torq70	58	02/21/89	10:38:09	13.21	6.60	0.014	0.080	0.013	0.018	0.000	0.000	3711.4	32.13	16.01	55.0	38 56.805	143 37.861	0.41
torq70	59	02/21/89	10:40:22	13.45	6.27	0.013	0.078	0.009	0.017	0.000	0.000	3601.8	32.20	16.02	55.0	38 56.710	143 38.036	0.35
torq70	60	02/21/89	10:42:13	13.45	6.62	0.011	0.081	0.013	0.017	0.000	0.000	3673.3	32.13	16.02	55.0	38 56.448	143 38.302	0.36
torq70	61	02/21/89	10:44:27	13.53	6.28	0.012	0.091	0.012	0.020	0.000	0.000	3731.4	32.13	16.01	60.3	38 56.351	143 38.489	0.38
torq70	62	02/21/89	10:46:16	13.53	6.62	0.013	0.080	0.013	0.018	0.000	0.000	3762.6	32.13	16.01	60.9	38 56.228	143 38.723	0.39
torq70	63	02/21/89	10:48:29	13.78	6.28	0.012	0.079	0.016	0.017	0.000	0.000	3789.0	32.13	16.01	61.9	38 56.135	143 38.901	0.44
torq70	64	02/21/89	10:50:21	13.62	6.64	0.012	0.084	0.015	0.021	0.000	0.000	3771.8	32.13	16.00	61.4	38 56.028	143 39.106	0.41
torq70	65	02/21/89	10:52:33	13.53	6.32	0.012	0.079	0.011	0.019	0.000	0.000	3792.1	32.13	16.01	60.6	38 55.936	143 39.280	0.36
torq70	66	02/21/89	10:54:25	13.39	6.67	0.012	0.085	0.013	0.018	0.000	0.000	3812.9	32.13	16.07	58.6	38 55.827	143 39.483	0.37
torq70	67	02/21/89	10:56:37	13.26	6.33	0.014	0.087	0.013	0.022	0.000	0.000	3705.8	32.20	16.01	58.6	38 55.737	143 39.657	0.42
torq70	68	02/21/89	10:58:28	13.22	6.68	0.016	0.086	0.014	0.020	0.000	0.000	3729.5	32.20	16.07	55.0	38 55.628	143 39.860	0.45
torq70	69	02/21/89	11:00:41	12.68	6.34	0.013	0.080	0.013	0.019	0.000	0.000	3705.0	32.20	16.07	55.4	38 55.528	143 40.049	0.41
torq70	70	02/21/89	11:02:32	12.84	6.68	0.011	0.083	0.015	0.015	0.000	0.000	3571.6	32.20	16.04	55.5	38 55.419	143 40.254	0.39
torq70	71	02/21/89	11:04:44	13.08	6.34	0.012	0.080	0.012	0.018	0.000	0.000	3531.0	32.20	16.06	55.1	38 55.326	143 40.428	0.38
torq70	72	02/21/89	11:06:36	13.16	6.70	0.012	0.083	0.016	0.019	0.000	0.000	3624.0	32.20	16.09	55.2	38 55.216	143 40.633	0.42
torq70	73	02/21/89	11:08:48	13.11	6.37	0.012	0.081	0.015	0.019	0.000	0.000	3763.4	32.27	16.11	55.3	38 55.123	143 40.805	0.42
torq70	74	02/21/89	11:10:40	13.14	6.76	0.013	0.087	0.013	0.020	0.000	0.000	3779.2	32.27	16.10	55.9	38 55.007	143 41.025	0.38
torq70	75	02/21/89	11:12:51	13.28	6.38	0.012	0.082	0.014	0.022	0.000	0.000	3745.8	32.27	16.12	55.9	38 54.912	143 41.193	0.41
torq70	76	02/21/89	11:14:43	13.30	6.74	0.013	0.083	0.012	0.019	0.000	0.000	3733.2	32.27	16.15	55.4	38 54.869	143 41.270	0.37
torq70	77	02/21/89	11:16:55	13.39	6.41	0.012	0.082	0.015	0.022	0.000	0.000	3769.1	32.27	16.14	55.4	38 54.709	143 41.561	0.42
torq70	78	02/21/89	11:18:47	13.30	6.73	0.013	0.085	0.011	0.024	0.000	0.000	3747.9	32.27	16.14	54.4	38 54.601	143 41.766	0.36
torq70	79	02/21/89	11:20:59	13.35	6.43	0.012	0.084	0.011	0.022	0.000	0.000	3721.3	32.27	16.17	54.6	38 54.499	143 41.951	0.36
torq70	80	02/21/89	11:22:51	13.36	6.76	0.013	0.085	0.012	0.020	0.000	0.000	3724.5	32.34	16.17	55.0	38 54.390	143 42.153	0.37
torq70	81	02/21/89	11:25:02	13.55	6.45	0.013	0.084	0.011	0.023	0.000	0.000	3746.2	32.34	16.17	54.0	38 54.293	143 42.323	0.37
torq70	82	02/21/89	11:26:55	13.55	6.82	0.014	0.086	0.009	0.020	0.000	0.000	3711.3	32.34	16.19	55.0	38 54.182	143 42.526	0.34
torq70	83	02/21/89	11:29:07	13.82	6.48	0.014	0.083	0.014	0.021	0.000	0.000	3747.3	32.34	16.20	55.4	38 54.090	143 42.697	0.43
torq70	84	02/21/89	11:30:59	13.90	6.82	0.014	0.086	0.013	0.017	0.000	0.000	3819.1	32.34	16.20	54.0	38 53.972	143 42.914	0.39
torq70	85	02/21/89	11:33:11	14.30	6.49	0.013	0.084	0.014	0.025	0.000	0.000	3946.0	32.34	16.19	55.7	38 53.878	143 43.087	0.41
torq70	86	02/21/89	11:35:03	14.31	6.87	0.014	0.088	0.013	0.022	0.000	0.000	3918.4	32.27	16.17	55.0	38 53.771	143 43.286	0.39
torq70	87	02/21/89	11:37:15	13.98	6.54	0.013	0.085	0.014	0.017	0.007	0.009	3948.8	32.27	16.14	54.6	38 53.680	143 43.456	0.65
torq70	88	02/21/89	11:39:07	14.11	6.92	0.013	0.087	0.015	0.018	0.000	0.000	3777.3	32.27	16.11	56.2	38 53.565	143 43.672	0.40
torq70	89	02/21/89	11:41:23	13.92	6.52	0.014	0.085	0.013	0.025	0.000	0.006	3774.2	32.27	16.09	55.5	38 53.484	143 43.826	0.50
torq70	90	02/21/89	11:43:11	13.88	6.86	0.018	0.089	0.016	0.024	0.000	0.000	3820.5	32.20	16.08	55.5	38 53.357	143 44.057	0.49
torq70	91	02/21/89	11:45:31	13.72	6.50	0.013	0.085	0.013	0.022	0.000	0.000	3833.5	32.20	16.05	54.4	38 53.275	143 44.213	0.40
torq70	92	02/21/89	11:47:15	13.53	6.81	0.011	0.085	0.014	0.023	0.000	0.000	3868.1	32.20	16.04	54.6	38 53.156	143 44.432	0.37
torq70	93	02/21/89	11:49:35	13.45	6.48	0.014	0.084	0.015	0.023	0.000	0.000	3874.0	32.20	16.04	55.2	38 53.071	143 44.586	0.45
torq70	94	02/21/89	11:51:16	13.40	6.82	0.015	0.090	0.014	0.021	0.000	0.000	3835.7	32.20	16.02	55.2	38 52.951	143 44.802	0.42
torq70	95	02/21/89	11:53:39	13.49	6.48	0.014	0.085	0.015	0.020	0.000	0.000	3838.3	32.13	16.01	55.4	38 52.867	143 44.958	0.45
torq70	96	02/21/89	11:55:19	13.49	6.83	0.013	0.085	0.014	0.016	0.000	0.000	3813.3	32.13	16.01	54.4	38 52.742	143 45.194	0.39
torq70	97	02/21/89	11:57:42	13.35	6.48	0.014	0.084	0.017	0.018	0.000	0.000	3760.6	32.13	16.01	55.2	38 52.604	143 45.395	0.48
torq70	98	02/21/89	11:59:23	13.64	6.84	0.012	0.084	0.014	0.020	0.000	0.000	3748.9	32.13	16.01	54.8	38 52.466	143 45.596	0.38
torq70	99	02/21/89	12:01:43	13.49	6.48	0.013	0.083	0.014	0.019	0.000	0.000	3763.3	32.13	16.01	54.6	38 52.328	143 45.796	0.42
torq70	100	02/21/89	12:03:27	13.41	6.84	0.014	0.084	0.010	0.020	0.000	0.000	3768.2	32.13	16.01	55.4	38 52.189	143 45.997	0.35
torq70	101	02/21/89	12:05:46	13.58	6.50	0.014	0.082	0.015	0.019	0.000	0.000	3804.0	32.13	16.01	54.8	38 52.051	143 46.198	0.44
torq70	102	02/21/89	12:07:30	13.51	6.83	0.015	0.086	0.012	0.020	0.000	0.000	3802.9	32.20	16.01	54.6	38 51.913	143 46.399	0.39
torq70	103	02/21/89	12:09:50	13.53	6.43	0.014	0.083	0.009	0.021	0.000	0.000	3847.0	32.13	16.01	55.1	38 51.823	143 46.567	0.36
torq70	104	02/21/89	12:11:34	13.55	6.85	0.014	0.085	0.013	0.020	0.000	0.000	3881.8	32.20	16.01	55.6	38 51.705	143 46.783	0.39
torq70	105	02/21/89	12:13:54	13.59	6.51	0.014	0.084	0.015	0.019	0.000	0.000	3872.9	32.13	16.02	55.2	38 51.622	143 46.935	0.44
torq70	106	02/21/89	12:15:38	13.57	6.87	0.016	0.088	0.011	0.020	0.000	0.000	3879.0	32.20	16.02	54.8	38 51.507	143 47.155	0.39
torq70	107	02/21/89	12:17:58	13.59	6.52	0.015	0.083	0.012	0.019	0.000	0.000	3886.8	32.20	16.02	55.7	38 51.416	143 47.324	0.41
torq70	108	02/21/89	12:19:42	13.62	6.87	0.014	0.087	0.011	0.021	0.000	0.000	3886.8	32.20	16.02	55.0	38 51.319	143 47.615	0.36

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq70	109	02/21/89	12:22:02	13.58	6.52	0.014	0.084	0.010	0.013	0.000	0.000	3941.5	32.13	16.02	54.8	38 51.237	143 47.770	0.37
torq70	110	02/21/89	12:23:46	13.57	6.86	0.015	0.086	0.013	0.020	0.000	0.000	3941.5	32.13	16.02	54.7	38 51.123	143 47.983	0.41
torq70	111	02/21/89	12:26:07	13.57	6.50	0.013	0.085	0.014	0.021	0.000	0.000	3854.0	32.13	16.02	59.3	38 51.040	143 48.137	0.41
torq70	112	02/21/89	12:27:49	13.54	6.84	0.014	0.085	0.012	0.023	0.000	0.000	3915.7	32.20	16.02	57.6	38 50.928	143 48.353	0.38
torq70	113	02/21/89	12:30:11	13.52	6.51	0.014	0.085	0.012	0.021	0.000	0.000	3900.5	32.20	16.02	57.7	38 50.838	143 48.521	0.40
torq70	114	02/21/89	12:31:53	13.53	6.85	0.014	0.086	0.012	0.019	0.000	0.000	3849.2	32.20	16.01	58.1	38 50.724	143 48.735	0.38
torq70	115	02/21/89	12:34:13	13.55	6.51	0.015	0.085	0.015	0.018	0.000	0.000	3886.7	32.20	16.02	58.1	38 50.575	143 48.843	0.46
torq70	116	02/21/89	12:35:57	13.55	6.86	0.013	0.083	0.013	0.017	0.000	0.000	3890.3	32.20	16.03	58.8	38 50.468	143 49.059	0.38
torq70	117	02/21/89	12:38:17	13.58	6.51	0.015	0.086	0.016	0.022	0.000	0.000	3920.6	32.20	16.03	58.6	38 50.390	143 49.213	0.47
torq70	118	02/21/89	12:40:01	13.56	6.87	0.016	0.086	0.012	0.019	0.000	0.000	3892.0	32.20	16.03	57.8	38 50.283	143 49.427	0.41
torq70	119	02/21/89	12:42:20	13.61	6.53	0.015	0.084	0.015	0.024	0.000	0.000	3957.2	32.20	16.03	58.5	38 50.197	143 49.596	0.46
torq70	120	02/21/89	12:44:04	13.44	6.87	0.013	0.087	0.013	0.021	0.000	0.000	3931.8	32.20	16.04	57.6	38 50.089	143 49.810	0.38
torq70	121	02/21/89	12:46:25	13.51	6.52	0.014	0.084	0.013	0.021	0.000	0.000	3919.8	32.20	16.04	57.7	38 50.013	143 49.964	0.41
torq70	122	02/21/89	12:48:08	13.52	6.87	0.015	0.085	0.013	0.019	0.000	0.000	3875.1	32.20	16.04	59.0	38 49.904	143 50.173	0.41
torq70	123	02/21/89	12:50:27	13.47	6.45	0.015	0.083	0.014	0.020	0.000	0.000	3947.6	32.20	16.05	57.3	38 49.828	143 50.328	0.45
torq70	124	02/21/89	12:52:12	13.56	6.85	0.014	0.087	0.016	0.019	0.000	0.000	3861.2	32.20	16.05	56.9	38 49.719	143 50.546	0.44
torq70	125	02/21/89	12:54:32	13.51	6.50	0.015	0.084	0.015	0.022	0.000	0.000	3928.4	32.20	16.05	57.7	38 49.633	143 50.717	0.46
torq70	126	02/21/89	12:56:16	13.44	6.86	0.016	0.086	0.013	0.021	0.000	0.000	3923.5	32.20	16.05	57.6	38 49.520	143 50.938	0.42
torq70	127	02/21/89	12:58:36	13.57	6.51	0.015	0.084	0.014	0.019	0.000	0.000	3884.2	32.20	16.07	57.9	38 49.440	143 51.097	0.44
torq70	128	02/21/89	13:00:20	13.75	6.87	0.015	0.087	0.013	0.017	0.000	0.000	3943.3	32.20	16.07	58.4	38 49.329	143 51.321	0.41
torq70	129	02/21/89	13:02:39	13.71	6.54	0.015	0.087	0.013	0.019	0.000	0.000	3991.3	32.20	16.07	57.4	38 49.241	143 51.493	0.43
torq70	130	02/21/89	13:04:23	13.71	6.90	0.014	0.089	0.012	0.022	0.000	0.000	3951.7	32.20	16.06	57.4	38 49.131	143 51.713	0.38
torq70	131	02/21/89	13:06:44	13.71	6.57	0.015	0.087	0.015	0.024	0.000	0.000	3944.9	32.20	16.07	58.5	38 49.053	143 51.868	0.45
torq70	132	02/21/89	13:08:26	13.72	6.94	0.016	0.088	0.014	0.024	0.000	0.000	3924.0	32.20	16.05	57.1	38 48.940	143 52.088	0.43
torq70	133	02/21/89	13:10:47	13.70	6.60	0.017	0.088	0.016	0.024	0.000	0.000	3952.2	32.20	16.06	57.4	38 48.861	143 52.247	0.50
torq70	134	02/21/89	13:12:30	13.63	6.96	0.018	0.084	0.013	0.024	0.000	0.000	4020.3	32.20	16.06	57.3	38 48.748	143 52.474	0.44
torq70	135	02/21/89	13:14:52	13.59	6.60	0.017	0.087	0.012	0.022	0.000	0.000	3966.0	32.20	16.05	57.3	38 48.658	143 52.646	0.44
torq70	136	02/21/89	13:16:34	13.58	6.95	0.018	0.092	0.015	0.023	0.000	0.000	3950.7	32.20	16.05	58.1	38 48.539	143 52.863	0.47
torq70	137	02/21/89	13:18:56	13.72	6.61	0.017	0.087	0.011	0.022	0.000	0.000	4040.1	32.20	16.04	57.8	38 48.455	143 53.016	0.42
torq70	138	02/21/89	13:20:38	13.64	6.96	0.017	0.087	0.016	0.021	0.000	0.000	4040.1	32.20	16.05	57.9	38 48.335	143 53.229	0.47
torq70	139	02/21/89	13:23:00	13.68	6.62	0.017	0.088	0.015	0.020	0.000	0.000	4038.4	32.20	16.07	57.9	38 48.252	143 53.381	0.48
torq70	140	02/21/89	13:24:43	13.53	6.97	0.016	0.087	0.013	0.024	0.000	0.000	4038.4	32.20	16.07	57.9	38 48.126	143 53.608	0.41
torq70	141	02/21/89	13:27:03	13.47	6.61	0.017	0.087	0.016	0.023	0.000	0.000	3979.4	32.20	16.07	57.4	38 48.042	143 53.758	0.50
torq70	142	02/21/89	13:28:51	13.44	6.98	0.018	0.089	0.015	0.023	0.000	0.000	4016.7	32.27	16.08	57.7	38 47.922	143 53.970	0.47
torq70	143	02/21/89	13:31:07	13.33	6.51	0.018	0.086	0.014	0.022	0.000	0.000	4006.5	32.27	16.09	57.8	38 47.829	143 54.137	0.49
torq70	144	02/21/89	13:32:55	13.32	6.95	0.017	0.086	0.014	0.019	0.000	0.000	4026.6	32.20	16.10	57.8	38 47.715	143 54.333	0.44
torq70	145	02/21/89	13:35:10	13.31	6.56	0.019	0.083	0.013	0.019	0.000	0.000	4044.5	32.27	16.10	57.9	38 47.621	143 54.498	0.49
torq70	146	02/21/89	13:36:58	13.48	6.90	0.018	0.084	0.009	0.014	0.000	0.000	4086.5	32.27	16.11	58.3	38 47.502	143 54.708	0.39
torq70	147	02/21/89	13:39:15	13.35	6.54	0.018	0.082	0.010	0.017	0.000	0.000	4153.5	32.27	16.11	58.1	38 47.417	143 54.858	0.43
torq70	148	02/21/89	13:41:01	13.30	6.92	0.022	0.087	0.011	0.016	0.000	0.000	4114.9	32.27	16.12	58.4	38 47.296	143 55.067	0.47
torq70	149	02/21/89	13:43:18	13.29	6.55	0.019	0.084	0.015	0.016	0.000	0.000	4143.6	32.27	16.10	57.7	38 47.205	143 55.232	0.52
torq70	150	02/21/89	13:45:05	13.31	6.93	0.018	0.085	0.016	0.015	0.000	0.000	4108.4	32.27	16.11	57.8	38 47.099	143 55.430	0.49
torq70	151	02/21/89	13:47:22	13.57	6.47	0.020	0.084	0.013	0.015	0.000	0.000	4122.2	32.27	16.10	57.0	38 47.007	143 55.593	0.51
torq70	152	02/21/89	13:49:09	13.69	6.92	0.018	0.084	0.015	0.012	0.000	0.000	4067.1	32.27	16.09	57.1	38 46.888	143 55.803	0.47
torq70	153	02/21/89	13:51:26	13.19	6.30	0.018	0.074	0.013	0.014	0.000	0.000	3086.6	32.27	16.09	57.2	38 46.802	143 55.955	0.49
torq70	154	02/21/89	13:53:12	13.72	6.77	0.022	0.078	0.016	0.016	0.000	0.000	3695.3	32.20	16.08	57.0	38 46.682	143 56.169	0.56
torq70	155	02/21/89	13:55:29	13.55	6.50	0.022	0.080	0.015	0.016	0.000	0.000	4130.1	32.27	16.10	57.0	38 46.587	143 56.336	0.57
torq70	156	02/21/89	13:57:17	13.50	6.95	0.021	0.086	0.014	0.018	0.000	0.000	4264.9	32.27	16.12	57.3	38 46.474	143 56.532	0.50
torq70	157	02/21/89	13:59:33	13.59	6.60	0.021	0.082	0.013	0.019	0.000	0.000	4246.7	32.27	16.16	57.2	38 46.380	143 56.700	0.51
torq70	158	02/21/89	14:01:20	13.65	6.97	0.021	0.085	0.013	0.017	0.000	0.000	4232.4	32.34	16.18	57.3	38 46.262	143 56.913	0.49
torq70	159	02/21/89	14:03:37	13.64	6.64	0.021	0.084	0.015	0.017	0.000	0.000	4227.2	32.34	16.20	56.4	38 46.180	143 57.070	0.54
torq70	160	02/21/89	14:05:24	13.69	7.05	0.023	0.087	0.014	0.015	0.000	0.000	4234.2	32.34	16.19	56.7	38 46.057	143 57.292	0.52
torq70	161	02/21/89	14:07:41	13.51	6.68	0.022	0.084	0.014	0.018	0.000	0.005	4258.6	32.34	16.17	56.8	38 45.962	143 57.468	0.61
torq70	162	02/21/89	14:09:27	13.67	7.09	0.026	0.092	0.016	0.018	0.000	0.000	4286.4	32.34	16.18	56.8	38 45.841	143 57.687	0.59

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq70	163	02/21/89	14:11:46	13.61	6.59	0.023	0.088	0.015	0.016	0.000	0.000	4225.1	32.34	16.18	56.9	38 45.755	143 57.845	0.57
torq70	164	02/21/89	14:13:32	13.69	7.10	0.023	0.090	0.015	0.020	0.000	0.000	4275.9	32.34	16.18	57.0	38 45.645	143 58.048	0.53
torq70	165	02/21/89	14:15:49	13.41	6.73	0.024	0.086	0.014	0.012	0.000	0.000	4204.6	32.34	16.18	55.9	38 45.544	143 58.239	0.56
torq70	166	02/21/89	14:17:36	13.41	7.10	0.026	0.090	0.015	0.016	0.000	0.000	4185.4	32.34	16.18	56.6	38 45.430	143 58.445	0.57
torq70	167	02/21/89	14:19:53	13.29	6.68	0.026	0.085	0.015	0.015	0.000	0.000	4107.5	32.34	16.17	56.7	38 45.336	143 58.619	0.61
torq70	168	02/21/89	14:21:39	13.45	7.06	0.026	0.088	0.017	0.016	0.000	0.000	4107.5	32.34	16.17	57.1	38 45.213	143 58.837	0.61
torq70	169	02/21/89	14:23:58	13.83	6.56	0.027	0.086	0.016	0.016	0.000	0.000	3917.9	32.34	16.17	56.5	38 45.127	143 58.993	0.65
torq70	170	02/21/89	14:25:43	14.09	6.99	0.026	0.084	0.017	0.018	0.000	0.000	3978.0	32.27	16.17	56.8	38 45.006	143 59.209	0.61
torq70	171	02/21/89	14:28:01	14.04	6.63	0.029	0.086	0.017	0.015	0.000	0.000	3989.7	32.27	16.16	56.9	38 44.911	143 59.381	0.69
torq70	172	02/21/89	14:29:47	14.01	6.99	0.030	0.088	0.016	0.014	0.000	0.000	3938.3	32.27	16.15	57.1	38 44.799	143 59.584	0.65
torq70	173	02/21/89	14:32:05	14.01	6.60	0.028	0.084	0.018	0.017	0.000	0.000	3908.2	32.27	16.14	56.9	38 44.704	143 59.755	0.69
torq70	174	02/21/89	14:33:51	13.96	6.96	0.031	0.087	0.016	0.019	0.000	0.000	3869.3	32.27	16.15	56.6	38 44.585	143 59.971	0.67
torq70	175	02/21/89	14:36:08	13.39	6.59	0.031	0.083	0.019	0.018	0.000	0.000	3865.7	32.27	16.14	56.5	38 44.493	144 .139	0.75
torq70	176	02/21/89	14:37:55	13.45	6.95	0.031	0.087	0.015	0.015	0.000	0.000	3670.5	32.27	16.13	56.3	38 44.381	144 .341	0.66
torq70	177	02/21/89	14:40:12	13.57	6.55	0.028	0.082	0.017	0.017	0.000	0.000	3592.0	32.27	16.14	56.7	38 44.285	144 .511	0.68
torq70	178	02/21/89	14:41:58	13.50	6.91	0.031	0.081	0.019	0.017	0.000	0.000	3721.7	32.27	16.13	56.3	38 44.161	144 .729	0.72
torq70	179	02/21/89	14:44:17	13.36	6.57	0.031	0.083	0.018	0.015	0.000	0.000	3710.1	32.27	16.12	55.8	38 44.073	144 .883	0.74
torq70	180	02/21/89	14:46:01	13.43	6.94	0.035	0.082	0.018	0.011	0.000	0.000	3757.3	32.27	16.12	57.0	38 43.949	144 1.102	0.76
torq70	181	02/21/89	14:48:20	13.35	6.58	0.033	0.083	0.022	0.017	0.000	0.000	3759.9	32.27	16.13	56.6	38 43.852	144 1.273	0.83
torq70	182	02/21/89	14:50:05	13.35	6.95	0.034	0.085	0.018	0.016	0.000	0.000	3770.6	32.27	16.15	56.3	38 43.740	144 1.476	0.74
torq70	183	02/21/89	14:52:23	13.34	6.56	0.033	0.085	0.019	0.014	0.000	0.000	3763.5	32.27	16.17	56.3	38 43.648	144 1.650	0.79
torq70	184	02/21/89	14:54:09	13.31	6.99	0.036	0.085	0.018	0.009	0.000	0.000	3804.5	32.34	16.20	56.3	38 43.531	144 1.868	0.77
torq70	185	02/21/89	14:56:28	13.49	6.60	0.036	0.085	0.018	0.015	0.000	0.000	3866.6	32.34	16.18	55.8	38 43.445	144 2.023	0.81
torq70	186	02/21/89	14:58:13	13.50	7.04	0.036	0.087	0.020	0.011	0.000	0.000	3891.1	32.34	16.22	56.8	38 43.325	144 2.241	0.79
torq70	187	02/21/89	15:00:33	13.55	6.75	0.038	0.087	0.021	0.014	0.000	0.000	3909.2	32.34	16.18	56.2	38 43.232	144 2.415	0.87
torq70	188	02/21/89	15:02:16	13.29	7.16	0.039	0.089	0.019	0.016	0.000	0.000	3959.3	32.34	16.17	55.8	38 43.109	144 2.637	0.80
torq70	189	02/21/89	15:04:38	13.46	6.77	0.040	0.088	0.020	0.015	0.000	0.000	3989.4	32.34	16.22	56.0	38 43.024	144 2.794	0.88
torq70	190	02/21/89	15:06:20	13.47	7.19	0.042	0.095	0.020	0.017	0.000	0.000	3825.1	32.34	16.23	55.7	38 42.902	144 3.012	0.85
torq70	191	02/21/89	15:08:42	13.33	6.76	0.039	0.088	0.019	0.015	0.000	0.009	3984.7	32.41	16.23	56.0	38 42.815	144 3.168	0.98
torq70	192	02/21/89	15:10:24	13.21	7.17	0.043	0.092	0.020	0.016	0.000	0.000	3963.2	32.41	16.23	55.9	38 42.684	144 3.400	0.87
torq70	193	02/21/89	15:12:48	13.62	6.84	0.043	0.089	0.024	0.013	0.000	0.005	3870.8	32.41	16.26	55.5	38 42.597	144 3.556	1.04
torq70	194	02/21/89	15:14:28	13.36	7.28	0.044	0.091	0.020	0.016	0.000	0.000	3870.8	32.41	16.26	55.2	38 42.466	144 3.792	0.87
torq70	195	02/21/89	15:16:55	13.50	6.94	0.044	0.089	0.024	0.018	0.000	0.000	3859.3	32.48	16.29	54.8	38 42.384	144 3.929	0.97
torq70	196	02/21/89	15:18:32	13.53	7.34	0.047	0.092	0.022	0.015	0.000	0.000	3859.3	32.41	16.26	55.2	38 42.252	144 4.162	0.93
torq70	197	02/21/89	15:20:58	13.54	6.98	0.046	0.089	0.019	0.018	0.000	0.000	3957.3	32.41	16.23	54.7	38 42.164	144 4.318	0.92
torq70	198	02/21/89	15:22:36	13.66	7.36	0.041	0.084	0.020	0.020	0.000	0.000	3928.6	32.48	16.33	55.4	38 42.040	144 4.532	0.82
torq70	199	02/21/89	15:25:02	13.83	7.05	0.049	0.091	0.025	0.018	0.000	0.000	3926.4	32.34	16.19	54.8	38 41.951	144 4.689	1.04
torq70	200	02/21/89	15:26:40	13.86	7.41	0.048	0.093	0.024	0.016	0.000	0.000	3967.9	32.34	16.20	54.8	38 41.786	144 4.888	0.96
torq70	201	02/21/89	15:29:06	13.80	7.09	0.051	0.093	0.023	0.019	0.000	0.000	4005.8	32.34	16.21	55.4	38 41.621	144 5.087	1.03
torq70	202	02/21/89	15:30:43	13.69	7.48	0.054	0.097	0.025	0.017	0.000	0.000	4007.6	32.48	16.29	55.4	38 41.457	144 5.286	1.05
torq70	203	02/21/89	15:33:10	13.76	7.12	0.054	0.094	0.027	0.016	0.000	0.000	3943.1	32.48	16.29	54.8	38 41.292	144 5.485	1.13
torq70	204	02/21/89	15:34:44	13.77	7.50	0.056	0.096	0.026	0.014	0.000	0.000	3998.1	32.48	16.35	54.8	38 41.127	144 5.684	1.08
torq70	205	02/21/89	15:37:14	13.91	7.06	0.055	0.094	0.024	0.016	0.000	0.000	3991.0	32.55	16.42	55.0	38 40.963	144 5.883	1.11
torq70	206	02/21/89	15:38:47	13.92	7.51	0.054	0.095	0.026	0.015	0.000	0.000	4001.4	32.55	16.45	55.2	38 40.839	144 6.119	1.05
torq70	207	02/21/89	15:41:17	13.89	7.12	0.057	0.095	0.028	0.016	0.000	0.000	4003.8	32.62	16.49	53.7	38 40.764	144 6.262	1.18
torq70	208	02/21/89	15:42:51	13.90	7.53	0.060	0.099	0.026	0.017	0.000	0.000	4022.3	32.69	16.55	54.6	38 40.638	144 6.502	1.13
torq70	209	02/21/89	15:45:21	13.89	7.15	0.059	0.094	0.029	0.015	0.000	0.000	3962.6	32.90	16.75	55.0	38 40.564	144 6.645	1.22
torq70	210	02/21/89	15:46:55	13.90	7.54	0.061	0.100	0.025	0.018	0.000	0.000	3995.7	33.18	17.13	55.2	38 40.380	144 6.956	1.13
torq70	211	02/21/89	15:49:25	13.98	7.16	0.060	0.096	0.028	0.017	0.000	0.005	4037.8	33.18	17.05	54.1	38 40.298	144 7.115	1.28
torq70	212	02/21/89	15:50:58	13.83	7.56	0.061	0.099	0.028	0.017	0.000	0.000	3903.1	33.60	17.43	54.8	38 40.176	144 7.355	1.16
torq70	213	02/21/89	15:53:30	13.91	7.20	0.064	0.099	0.029	0.021	0.000	0.000	3867.4	33.60	17.43	55.2	38 40.102	144 7.496	1.27
torq70	214	02/21/89	15:55:02	13.91	7.49	0.064	0.101	0.028	0.021	0.000	0.000	3927.1	33.53	17.41	55.2	38 39.980	144 7.738	1.21
torq70	215	02/21/89	15:57:33	13.85	7.16	0.064	0.099	0.029	0.023	0.000	0.008	3889.6	33.67	17.54	54.8	38 39.897	144 7.897	1.39
torq70	216	02/21/89	15:59:06	13.79	7.35	0.065	0.102	0.025	0.024	0.000	0.000	3881.1	33.67	17.54	55.2	38 39.776	144 8.134	1.21

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq70	217	02/21/89	16:01:39	13.90	6.99	0.065	0.101	0.025	0.030	0.000	0.000	3894.9	33.67	17.58	55.1	38 39.704	144 8.280	1.27
torq70	218	02/21/89	16:03:09	13.81	7.24	0.067	0.110	0.026	0.030	0.000	0.000	3880.6	33.60	17.46	55.2	38 39.582	144 8.520	1.27
torq70	219	02/21/89	16:05:42	13.91	7.02	0.070	0.102	0.029	0.024	0.000	0.000	3860.9	33.67	17.48	55.5	38 39.509	144 8.665	1.39
torq70	220	02/21/89	16:07:13	13.87	7.26	0.069	0.104	0.027	0.026	0.000	0.000	3860.9	33.53	17.38	54.6	38 39.386	144 8.906	1.30
torq70	221	02/21/89	16:09:46	14.06	7.00	0.068	0.101	0.027	0.020	0.000	0.000	3838.8	33.39	17.22	54.9	38 39.311	144 9.047	1.34
torq70	222	02/21/89	16:11:16	14.06	7.26	0.070	0.101	0.029	0.029	0.000	0.000	3838.8	33.46	17.38	55.3	38 39.179	144 9.300	1.35
torq70	223	02/21/89	16:13:50	14.11	7.03	0.071	0.103	0.031	0.031	0.000	0.000	3867.8	33.46	17.42	54.4	38 39.106	144 9.445	1.43
torq70	224	02/21/89	16:15:21	13.96	7.30	0.066	0.102	0.027	0.031	0.000	0.000	3867.8	33.32	17.22	55.5	38 38.983	144 9.683	1.26
torq70	225	02/21/89	16:17:53	13.56	7.11	0.073	0.099	0.026	0.026	0.000	0.000	3916.0	33.18	17.03	54.8	38 38.908	144 9.827	1.37
torq70	226	02/21/89	16:19:25	13.80	7.39	0.074	0.102	0.031	0.024	0.000	0.000	3773.3	33.18	17.03	55.2	38 38.775	144 10.084	1.40
torq70	227	02/21/89	16:21:57	13.60	7.11	0.072	0.096	0.029	0.023	0.000	0.000	3720.3	32.97	16.85	55.0	38 38.698	144 10.228	1.40
torq70	228	02/21/89	16:23:29	13.62	7.39	0.076	0.102	0.029	0.024	0.000	0.000	3720.3	33.25	17.08	55.3	38 38.575	144 10.468	1.40
torq70	229	02/21/89	16:26:01	13.83	7.11	0.073	0.093	0.028	0.022	0.000	0.000	3720.3	33.11	16.97	54.7	38 38.499	144 10.609	1.40
torq70	230	02/21/89	16:27:33	13.98	7.44	0.080	0.106	0.029	0.022	0.000	0.000	3720.3	33.18	16.99	54.9	38 38.375	144 10.847	1.44
torq70	231	02/21/89	16:30:05	13.76	7.12	0.077	0.093	0.032	0.016	0.000	0.006	3720.3	33.46	17.31	54.8	38 38.293	144 11.006	1.59
torq70	232	02/21/89	16:31:37	13.77	7.41	0.077	0.095	0.031	0.018	0.000	0.000	3720.3	33.46	17.31	55.2	38 38.073	144 11.281	1.44
torq70	233	02/21/89	16:34:12	13.79	7.08	0.078	0.092	0.032	0.019	0.000	0.000	3720.3	33.53	17.45	54.8	38 37.997	144 11.426	1.53
torq70	234	02/21/89	16:35:41	13.74	7.38	0.078	0.096	0.028	0.020	0.000	0.000	3797.1	33.53	17.39	55.0	38 37.870	144 11.666	1.42
torq70	235	02/21/89	16:38:14	13.75	7.09	0.079	0.095	0.035	0.019	0.000	0.009	3787.2	33.11	16.93	55.4	38 37.794	144 11.808	1.71
torq70	236	02/21/89	16:39:45	14.02	7.40	0.086	0.097	0.032	0.021	0.000	0.000	3772.7	33.11	17.02	55.2	38 37.661	144 12.063	1.57
torq70	237	02/21/89	16:42:23	13.90	7.11	0.081	0.095	0.033	0.025	0.000	0.000	3765.5	33.11	16.97	55.4	38 37.587	144 12.204	1.58
torq70	238	02/21/89	16:43:48	13.83	7.40	0.086	0.100	0.033	0.025	0.000	0.000	3784.9	33.11	16.95	55.2	38 37.466	144 12.438	1.58
torq70	239	02/21/89	16:46:27	13.79	7.15	0.080	0.093	0.037	0.021	0.000	0.005	3855.7	33.18	17.08	54.6	38 37.330	144 12.698	1.68
torq70	240	02/21/89	16:50:34	13.69	7.20	0.086	0.095	0.036	0.020	0.000	0.011	3851.6	33.11	17.03	54.8	38 37.194	144 12.958	1.81
torq70	241	02/21/89	16:51:54	13.60	7.51	0.090	0.098	0.037	0.018	0.000	0.000	3867.4	33.04	17.03	55.2	38 37.052	144 13.226	1.66
torq70	242	02/21/89	16:54:43	13.61	7.13	0.088	0.091	0.034	0.019	0.000	0.008	3872.5	32.97	16.85	54.6	38 36.988	144 13.354	1.79
torq70	243	02/21/89	16:55:58	13.56	7.41	0.101	0.097	0.034	0.019	0.000	0.000	3872.5	32.76	16.57	54.8	38 36.845	144 13.627	1.79
torq70	244	02/21/89	16:58:51	13.53	7.08	0.087	0.088	0.035	0.020	0.000	0.008	3809.5	32.62	16.44	54.4	38 36.788	144 13.738	1.80
torq70	245	02/21/89	17:00:02	13.42	7.40	0.093	0.095	0.034	0.019	0.000	0.000	3809.5	32.69	16.55	55.0	38 36.647	144 14.013	1.69
torq70	246	02/21/89	17:02:56	13.72	7.10	0.091	0.087	0.038	0.021	0.000	0.007	3821.3	32.69	16.55	55.2	38 36.589	144 14.125	1.88
torq70	247	02/21/89	17:04:06	13.82	7.45	0.112	0.104	0.036	0.018	0.000	0.000	3821.3	32.90	16.71	55.0	38 36.440	144 14.414	1.95
torq70	248	02/21/89	17:07:03	14.29	7.25	0.093	0.090	0.040	0.019	0.000	0.005	3901.3	32.83	16.71	55.1	38 36.382	144 14.526	1.87
torq70	249	02/21/89	17:08:10	14.24	7.79	0.101	0.093	0.038	0.017	0.000	0.000	3901.3	32.83	16.67	54.3	38 36.231	144 14.815	1.75
torq70	250	02/21/89	17:11:12	14.22	7.27	0.094	0.089	0.038	0.016	0.000	0.010	3911.0	32.83	16.83	51.7	38 36.161	144 14.888	1.92

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq72b	1	02/23/89	04:23:21	23.97	6.82	0.042	0.127	0.025	0.037	0.000	0.013	4266.1	33.32	17.41	21.1	39 .778	144 12.561	1.16
torq72b	2	02/23/89	04:25:08	23.87	7.04	0.049	0.131	0.023	0.029	0.000	0.007	4147.5	33.39	17.38	20.6	39 .780	144 12.660	1.11
torq72b	3	02/23/89	04:27:29	23.69	6.84	0.042	0.129	0.027	0.034	0.004	0.011	4174.0	33.32	17.40	19.9	39 .780	144 12.731	1.21
torq72b	4	02/23/89	04:29:14	23.54	7.34	0.039	0.126	0.022	0.026	0.000	0.010	4174.0	33.39	17.35	33.1	39 .782	144 12.821	0.96
torq72b	5	02/23/89	04:31:38	23.56	6.87	0.041	0.129	0.026	0.029	0.000	0.010	4156.7	33.11	17.18	52.6	39 .783	144 12.892	1.11
torq72b	6	02/23/89	04:33:17	23.86	7.00	0.047	0.126	0.024	0.024	0.000	0.010	4156.7	33.11	17.16	51.6	39 .726	144 13.010	1.14
torq72b	7	02/23/89	04:35:46	23.92	6.86	0.043	0.123	0.026	0.030	0.000	0.010	4228.0	32.62	16.60	54.4	39 .642	144 13.030	1.14
torq72b	8	02/23/89	04:37:21	24.13	6.99	0.045	0.120	0.025	0.025	0.000	0.000	4227.0	32.48	16.36	53.4	39 .431	144 12.982	0.99
torq72b	9	02/23/89	04:39:52	23.21	6.85	0.042	0.114	0.024	0.024	0.000	0.000	4204.0	31.99	15.89	61.1	39 .296	144 12.946	0.95
torq72b	10	02/23/89	04:41:26	23.68	7.00	0.045	0.111	0.020	0.022	0.000	0.000	4363.6	31.99	15.88	62.1	39 .081	144 12.891	0.92
torq72b	11	02/23/89	04:43:55	23.91	6.59	0.042	0.109	0.024	0.018	0.000	0.010	4191.4	31.99	15.88	62.6	38 59.957	144 12.854	1.14
torq72b	12	02/23/89	04:45:30	22.99	6.91	0.044	0.110	0.025	0.019	0.000	0.011	4270.8	31.99	15.88	61.0	38 59.742	144 12.788	1.14
torq72b	13	02/23/89	04:48:03	23.74	6.64	0.043	0.107	0.025	0.018	0.000	0.011	4325.9	31.99	15.87	62.1	38 59.619	144 12.751	1.18
torq72b	14	02/23/89	04:49:33	23.51	6.85	0.044	0.103	0.026	0.018	0.000	0.012	4532.9	31.99	15.86	61.1	38 59.413	144 12.689	1.18
torq72b	15	02/23/89	04:52:12	22.56	6.38	0.042	0.099	0.022	0.016	0.000	0.013	4438.6	31.99	15.86	61.7	38 59.283	144 12.654	1.19
torq72b	16	02/23/89	04:53:37	22.40	6.74	0.044	0.099	0.024	0.015	0.000	0.010	4554.6	31.92	15.86	60.8	38 59.059	144 12.598	1.14
torq72b	17	02/23/89	04:56:17	21.23	6.33	0.044	0.097	0.027	0.015	0.000	0.007	4506.2	31.99	15.87	60.7	38 58.945	144 12.576	1.22
torq72b	18	02/23/89	04:57:41	22.29	6.69	0.047	0.096	0.026	0.013	0.000	0.007	4240.5	31.99	15.88	60.8	38 58.706	144 12.515	1.18
torq72b	19	02/23/89	05:00:25	22.08	6.32	0.044	0.091	0.027	0.015	0.000	0.007	4445.7	31.99	15.89	60.3	38 58.591	144 12.486	1.22
torq72b	20	02/23/89	05:01:45	22.03	6.70	0.041	0.093	0.025	0.014	0.000	0.008	4571.6	31.99	15.87	60.1	38 58.347	144 12.420	1.09

Table 2. Direct hydrocarbon detection data collected along survey line
89/072, Torquay Sub-Basin, southeastern Australia.

line	shot	data	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq72b	21	02/23/89	05:04:33	21.75	6.35	0.043	0.092	0.026	0.012	0.000	0.009	4447.8	31.92	15.86	60.6	38 58.247	144 12.387	1.21
torq72b	22	02/23/89	05:05:46	21.91	6.74	0.044	0.094	0.024	0.018	0.000	0.000	4593.0	31.99	15.87	60.6	38 57.988	144 12.307	1.00
torq72b	23	02/23/89	05:08:43	20.79	6.38	0.041	0.096	0.024	0.014	0.000	0.000	4474.7	31.99	15.87	60.1	38 57.902	144 12.285	1.01
torq72b	24	02/23/89	05:09:49	20.66	6.76	0.044	0.098	0.026	0.015	0.000	0.000	4474.7	31.99	15.88	59.9	38 57.642	144 12.202	1.02
torq72b	25	02/23/89	05:12:47	21.37	6.38	0.044	0.093	0.029	0.014	0.000	0.000	4530.8	31.99	15.89	60.5	38 57.543	144 12.171	1.13
torq72b	26	02/23/89	05:13:53	21.28	6.77	0.042	0.093	0.025	0.015	0.000	0.000	4530.8	31.99	15.87	59.9	38 57.296	144 12.100	0.98
torq72b	27	02/23/89	05:16:51	21.08	6.38	0.042	0.093	0.028	0.014	0.000	0.010	4582.1	31.99	15.89	60.1	38 57.197	144 12.068	1.24
torq72b	28	02/23/89	05:17:57	21.26	6.78	0.039	0.096	0.024	0.013	0.000	0.000	4582.1	31.99	15.89	60.3	38 56.939	144 11.995	0.92
torq72b	29	02/23/89	05:20:57	21.01	6.39	0.040	0.096	0.026	0.013	0.000	0.006	4586.0	31.99	15.90	60.3	38 56.853	144 11.971	1.11
torq72b	30	02/23/89	05:22:01	20.97	6.78	0.043	0.093	0.026	0.013	0.000	0.000	4586.0	31.99	15.88	60.6	38 56.572	144 11.796	1.01
torq72b	31	02/23/89	05:25:01	20.87	6.42	0.041	0.095	0.027	0.014	0.000	0.008	4614.3	31.99	15.90	59.7	38 56.472	144 11.770	1.17
torq72b	32	02/23/89	05:26:06	20.97	6.80	0.043	0.094	0.025	0.011	0.000	0.000	4614.3	31.99	15.89	59.9	38 56.216	144 11.702	0.99
torq72b	33	02/23/89	05:29:08	20.88	6.43	0.044	0.096	0.027	0.014	0.000	0.000	4684.2	31.99	15.91	59.4	38 56.146	144 11.684	1.09
torq72b	34	02/23/89	05:30:10	20.88	6.81	0.044	0.098	0.025	0.013	0.000	0.000	4684.2	31.99	15.91	60.6	38 55.873	144 11.611	1.00
torq72b	35	02/23/89	05:33:12	20.90	6.44	0.044	0.096	0.026	0.013	0.000	0.000	4703.0	31.99	15.91	59.7	38 55.773	144 11.583	1.07
torq72b	36	02/23/89	05:34:15	20.92	6.83	0.045	0.100	0.027	0.012	0.000	0.000	4653.3	31.99	15.91	59.6	38 55.513	144 11.519	1.04
torq72b	37	02/23/89	05:37:16	20.86	6.43	0.042	0.095	0.028	0.010	0.000	0.000	4642.0	31.99	15.90	59.8	38 55.427	144 11.497	1.08
torq72b	38	02/23/89	05:38:19	20.91	6.83	0.045	0.096	0.027	0.016	0.000	0.000	4716.0	31.99	15.90	60.3	38 55.155	144 11.424	1.04
torq72b	39	02/23/89	05:41:23	20.87	6.45	0.043	0.097	0.026	0.014	0.000	0.009	4686.2	31.99	15.90	60.6	38 55.083	144 11.407	1.19
torq72b	40	02/23/89	05:42:22	20.70	6.82	0.042	0.100	0.026	0.015	0.000	0.000	4724.6	31.99	15.89	59.3	38 54.811	144 11.334	0.99
torq72b	41	02/23/89	05:45:32	20.78	6.46	0.041	0.097	0.028	0.013	0.000	0.000	4731.6	31.99	15.90	60.5	38 54.724	144 11.312	1.06
torq72b	42	02/23/89	05:46:26	20.70	6.85	0.044	0.101	0.029	0.013	0.000	0.000	4760.8	31.99	15.91	59.9	38 54.383	144 11.182	1.05
torq72b	43	02/23/89	05:49:36	20.61	6.45	0.042	0.096	0.027	0.013	0.000	0.000	4786.9	31.99	15.91	59.7	38 54.311	144 11.164	1.06
torq72b	44	02/23/89	05:50:30	20.57	6.85	0.044	0.095	0.024	0.015	0.000	0.000	4834.1	31.99	15.91	59.4	38 54.039	144 11.094	0.98
torq72b	45	02/23/89	05:53:41	20.51	6.46	0.043	0.098	0.028	0.014	0.000	0.000	4759.0	31.99	15.93	59.9	38 53.953	144 11.072	1.09
torq72b	46	02/23/89	05:54:35	20.63	6.85	0.045	0.097	0.024	0.017	0.000	0.000	4818.8	32.06	15.93	59.6	38 53.679	144 11.005	1.00
torq72b	47	02/23/89	05:57:46	21.00	6.49	0.041	0.099	0.026	0.016	0.000	0.000	4795.8	32.06	15.94	60.5	38 53.608	144 10.986	1.02
torq72b	48	02/23/89	05:58:38	20.79	6.89	0.043	0.102	0.024	0.016	0.000	0.000	4795.8	32.06	15.94	60.3	38 53.340	144 10.909	0.96
torq72b	49	02/23/89	06:01:51	20.22	6.50	0.042	0.096	0.029	0.014	0.000	0.000	4836.7	32.06	15.95	59.9	38 53.270	144 10.889	1.08
torq72b	50	02/23/89	06:02:42	20.16	6.89	0.039	0.098	0.025	0.018	0.000	0.000	4836.7	32.06	15.95	59.9	38 52.988	144 10.805	0.92
torq72b	51	02/23/89	06:05:55	20.25	6.51	0.042	0.097	0.027	0.015	0.000	0.007	4757.0	32.06	15.96	60.6	38 52.916	144 10.789	1.15
torq72b	52	02/23/89	06:06:46	20.09	6.90	0.044	0.104	0.026	0.013	0.000	0.000	4757.0	32.06	15.96	60.3	38 52.643	144 10.717	1.00
torq72b	53	02/23/89	06:09:58	19.42	6.49	0.041	0.097	0.027	0.014	0.000	0.000	4711.1	32.06	15.99	60.3	38 52.571	144 10.703	1.04
torq72b	54	02/23/89	06:10:51	18.57	6.88	0.042	0.100	0.025	0.013	0.000	0.000	4711.1	32.06	16.00	60.4	38 52.300	144 10.644	0.96
torq72b	55	02/23/89	06:14:02	18.41	6.48	0.040	0.096	0.026	0.012	0.000	0.000	4218.5	32.13	16.01	59.7	38 52.214	144 10.626	1.01
torq72b	56	02/23/89	06:14:54	18.52	6.82	0.044	0.096	0.028	0.013	0.000	0.000	4218.5	32.13	16.02	60.9	38 51.942	144 10.567	1.05
torq72b	57	02/23/89	06:18:07	19.02	6.44	0.045	0.093	0.029	0.015	0.000	0.000	4205.6	32.13	16.05	60.2	38 51.872	144 10.552	1.14
torq72b	58	02/23/89	06:18:55	19.06	6.84	0.044	0.098	0.028	0.012	0.000	0.000	4205.6	32.13	16.06	60.7	38 51.604	144 10.488	1.04
torq72b	59	02/23/89	06:22:11	18.70	6.46	0.047	0.095	0.028	0.014	0.000	0.000	4342.6	32.13	16.07	60.6	38 51.533	144 10.468	1.15
torq72b	60	02/23/89	06:23:03	18.76	6.89	0.046	0.095	0.029	0.017	0.000	0.000	4342.6	32.20	16.07	59.7	38 51.247	144 10.391	1.08
torq72b	61	02/23/89	06:26:14	18.95	6.50	0.047	0.095	0.032	0.014	0.000	0.000	4267.2	32.20	16.07	60.2	38 51.176	144 10.373	1.20
torq72b	62	02/23/89	06:27:09	18.98	6.89	0.046	0.094	0.026	0.014	0.000	0.000	4321.1	32.20	16.07	60.3	38 50.934	144 10.311	1.03
torq72b	63	02/23/89	06:30:18	19.10	6.54	0.046	0.097	0.027	0.013	0.000	0.000	4235.4	32.13	16.07	60.3	38 50.834	144 10.283	1.10
torq72b	64	02/23/89	06:31:13	19.10	6.93	0.049	0.099	0.027	0.014	0.000	0.000	4325.8	32.20	16.07	60.6	38 50.567	144 10.210	1.09
torq72b	65	02/23/89	06:34:22	19.02	6.55	0.048	0.096	0.032	0.016	0.000	0.000	4309.9	32.20	16.08	59.9	38 50.484	144 10.186	1.21
torq72b	66	02/23/89	06:35:16	19.01	6.96	0.047	0.107	0.033	0.015	0.000	0.000	4325.2	32.20	16.08	60.8	38 50.215	144 10.115	1.14
torq72b	67	02/23/89	06:38:26	19.02	6.58	0.046	0.098	0.031	0.017	0.000	0.000	4316.5	32.20	16.08	60.1	38 50.143	144 10.098	1.16
torq72b	68	02/23/89	06:39:21	19.16	6.98	0.051	0.103	0.029	0.014	0.000	0.000	4255.8	32.20	16.08	60.1	38 49.874	144 10.025	1.13
torq72b	69	02/23/89	06:42:30	19.10	6.60	0.046	0.098	0.029	0.014	0.000	0.000	4267.3	32.20	16.08	60.9	38 49.789	144 9.999	1.12
torq72b	70	02/23/89	06:43:25	19.00	6.99	0.048	0.104	0.027	0.012	0.000	0.000	4257.6	32.20	16.08	60.8	38 49.532	144 9.928	1.06
torq72b	71	02/23/89	06:46:35	19.03	6.61	0.046	0.097	0.033	0.015	0.000	0.000	4239.6	32.20	16.09	60.6	38 49.446	144 9.904	1.18
torq72b	72	02/23/89	06:47:29	19.26	6.99	0.046	0.097	0.027	0.014	0.000	0.000	4321.4	32.20	16.09	60.1	38 49.178	144 9.822	1.03
torq72b	73	02/23/89	06:50:39	19.12	6.62	0.046	0.097	0.030	0.013	0.000	0.000	4278.5	32.20	16.10	60.4	38 49.106	144 9.800	1.13
torq72b	74	02/23/89	06:51:33	18.94	6.99	0.047	0.105	0.027	0.015	0.000	0.000	4278.5	32.20	16.10	60.1	38 48.839	144 9.723	1.05

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq72b	75	02/23/89	06:54:43	18.95	6.62	0.047	0.097	0.032	0.018	0.000	0.000	4300.5	32.20	16.11	58.9	38 48.682	144 9.677	1.18
torq72b	76	02/23/89	06:56:35	18.97	6.83	0.047	0.102	0.029	0.016	0.000	0.000	4291.0	32.27	16.12	58.1	38 48.482	144 9.619	1.10
torq72b	77	02/23/89	06:58:47	19.06	6.62	0.049	0.099	0.031	0.012	0.000	0.000	4292.4	32.27	16.15	59.0	38 48.380	144 9.591	1.19
torq72b	78	02/23/89	07:00:40	18.85	7.00	0.049	0.102	0.029	0.016	0.000	0.000	4231.8	32.27	16.16	59.3	38 48.130	144 9.525	1.10
torq72b	79	02/23/89	07:02:51	18.98	6.63	0.047	0.097	0.028	0.018	0.000	0.000	4289.7	32.27	16.17	58.6	38 47.931	144 9.404	1.12
torq72b	80	02/23/89	07:04:43	19.20	7.04	0.046	0.101	0.026	0.015	0.000	0.000	4409.7	32.27	16.19	58.6	38 47.731	144 9.284	1.01
torq72b	81	02/23/89	07:06:55	19.22	6.67	0.048	0.099	0.027	0.015	0.000	0.000	4374.1	32.27	16.19	58.4	38 47.532	144 9.163	1.11
torq72b	82	02/23/89	07:08:47	19.08	7.10	0.047	0.103	0.026	0.018	0.000	0.000	4424.5	32.27	16.20	57.9	38 47.333	144 9.043	1.02
torq72b	83	02/23/89	07:10:59	19.17	6.73	0.048	0.101	0.027	0.013	0.000	0.000	4343.4	32.27	16.20	58.3	38 47.134	144 8.922	1.10
torq72b	84	02/23/89	07:12:51	19.23	7.13	0.050	0.104	0.029	0.013	0.000	0.000	4345.2	32.27	16.20	59.0	38 46.935	144 8.802	1.10
torq72b	85	02/23/89	07:15:04	19.24	6.76	0.048	0.100	0.029	0.014	0.000	0.000	4309.5	32.27	16.19	58.6	38 46.772	144 8.752	1.13
torq72b	86	02/23/89	07:16:55	19.20	7.18	0.049	0.110	0.029	0.013	0.000	0.000	4293.3	32.27	16.18	58.0	38 46.561	144 8.707	1.08
torq72b	87	02/23/89	07:19:08	19.19	6.79	0.050	0.099	0.030	0.013	0.000	0.000	4382.5	32.27	16.18	58.2	38 46.388	144 8.668	1.16
torq72b	88	02/23/89	07:20:59	19.16	7.19	0.048	0.105	0.026	0.014	0.000	0.000	4364.1	32.27	16.17	58.9	38 46.189	144 8.624	1.02
torq72b	89	02/23/89	07:23:12	19.28	6.79	0.047	0.100	0.029	0.015	0.000	0.000	4262.3	32.27	16.17	58.4	38 46.019	144 8.586	1.11
torq72b	90	02/23/89	07:25:03	19.15	7.18	0.049	0.105	0.029	0.016	0.000	0.000	4357.4	32.27	16.17	58.4	38 45.810	144 8.542	1.08
torq72b	91	02/23/89	07:27:16	19.22	6.79	0.049	0.100	0.030	0.014	0.000	0.000	4344.3	32.27	16.17	59.0	38 45.641	144 8.507	1.15
torq72b	92	02/23/89	07:29:07	19.21	7.18	0.049	0.104	0.028	0.014	0.000	0.000	4279.6	32.27	16.17	59.0	38 45.439	144 8.469	1.06
torq72b	93	02/23/89	07:31:20	19.18	6.79	0.048	0.099	0.028	0.016	0.000	0.000	4478.1	32.27	16.16	58.6	38 45.267	144 8.436	1.11
torq72b	94	02/23/89	07:33:11	19.20	7.19	0.051	0.101	0.029	0.017	0.000	0.000	4402.0	32.27	16.15	59.2	38 45.075	144 8.395	1.10
torq72b	95	02/23/89	07:35:24	19.13	6.80	0.048	0.100	0.031	0.014	0.000	0.000	4368.0	32.27	16.15	59.0	38 44.906	144 8.362	1.15
torq72b	96	02/23/89	07:37:15	19.14	7.17	0.050	0.106	0.028	0.019	0.000	0.000	4393.0	32.27	16.15	58.8	38 44.687	144 8.318	1.08
torq72b	97	02/23/89	07:39:28	19.04	6.79	0.048	0.100	0.024	0.013	0.000	0.000	4304.2	32.27	16.15	58.6	38 44.525	144 8.286	1.05
torq72b	98	02/23/89	07:41:20	19.09	7.17	0.049	0.099	0.027	0.014	0.000	0.000	4304.2	32.27	16.14	59.4	38 44.326	144 8.245	1.05
torq72b	99	02/23/89	07:43:33	19.02	6.78	0.048	0.101	0.028	0.016	0.000	0.000	4453.8	32.27	16.13	59.2	38 44.161	144 8.210	1.11
torq72b	100	02/23/89	07:45:24	19.07	7.20	0.047	0.107	0.024	0.018	0.000	0.000	4302.9	32.27	16.14	59.0	38 43.968	144 8.170	0.98
torq72b	101	02/23/89	07:47:37	19.11	6.79	0.049	0.101	0.026	0.015	0.000	0.000	4411.2	32.27	16.14	58.9	38 43.787	144 8.132	1.09
torq72b	102	02/23/89	07:49:28	19.14	7.21	0.052	0.110	0.032	0.015	0.000	0.000	4387.6	32.27	16.15	59.1	38 43.591	144 8.090	1.15
torq72b	103	02/23/89	07:51:40	19.00	6.81	0.049	0.101	0.029	0.015	0.000	0.000	4429.3	32.27	16.14	59.4	38 43.423	144 8.055	1.13
torq72b	104	02/23/89	07:53:32	18.98	7.19	0.050	0.103	0.026	0.017	0.000	0.000	4394.5	32.27	16.15	58.6	38 43.224	144 8.015	1.05
torq72b	105	02/23/89	07:55:45	19.00	6.78	0.049	0.100	0.030	0.016	0.000	0.000	4371.7	32.27	16.14	59.2	38 43.065	144 7.980	1.15
torq72b	106	02/23/89	07:57:36	18.98	7.17	0.048	0.100	0.029	0.017	0.000	0.000	4445.2	32.20	16.13	58.7	38 42.855	144 7.934	1.06
torq72b	107	02/23/89	07:59:49	19.12	6.80	0.048	0.099	0.029	0.015	0.000	0.000	4359.4	32.27	16.16	58.7	38 42.687	144 7.901	1.12
torq72b	108	02/23/89	08:01:40	19.02	7.21	0.050	0.102	0.030	0.016	0.000	0.000	4361.0	32.27	16.14	58.8	38 42.494	144 7.859	1.10
torq72b	109	02/23/89	08:03:52	19.04	6.82	0.048	0.100	0.030	0.016	0.000	0.000	4403.0	32.27	16.16	58.3	38 42.330	144 7.826	1.13
torq72b	110	02/23/89	08:05:44	19.12	7.22	0.050	0.100	0.028	0.014	0.000	0.000	4523.0	32.27	16.16	58.5	38 42.126	144 7.780	1.07
torq72b	111	02/23/89	08:07:56	19.08	6.84	0.049	0.102	0.033	0.016	0.000	0.000	4477.0	32.27	16.17	58.8	38 41.957	144 7.747	1.18
torq72b	112	02/23/89	08:09:48	19.17	7.27	0.052	0.105	0.031	0.018	0.000	0.000	4362.1	32.27	16.19	59.2	38 41.765	144 7.709	1.13
torq72b	113	02/23/89	08:12:00	19.24	6.89	0.047	0.101	0.027	0.018	0.000	0.000	4335.9	32.27	16.17	59.6	38 41.600	144 7.672	1.06
torq72b	114	02/23/89	08:13:51	19.22	7.33	0.049	0.105	0.030	0.014	0.000	0.000	4362.5	32.27	16.17	56.8	38 41.407	144 7.630	1.07
torq72b	115	02/23/89	08:16:04	19.29	6.96	0.048	0.102	0.030	0.013	0.000	0.000	4352.7	32.27	16.17	57.1	38 41.245	144 7.588	1.11
torq72b	116	02/23/89	08:17:56	19.77	7.38	0.052	0.109	0.029	0.012	0.000	0.000	4295.5	32.27	16.17	57.4	38 41.044	144 7.529	1.09
torq72b	117	02/23/89	08:20:08	20.44	7.13	0.050	0.101	0.033	0.016	0.000	0.000	4270.1	32.27	16.17	57.7	38 40.877	144 7.487	1.15
torq72b	118	02/23/89	08:22:00	21.49	7.83	0.051	0.103	0.030	0.016	0.000	0.000	4318.7	32.27	16.17	57.3	38 40.686	144 7.432	1.02
torq72b	119	02/23/89	08:24:12	23.57	8.14	0.052	0.101	0.031	0.011	0.000	0.000	4385.9	32.27	16.17	57.4	38 40.529	144 7.388	1.01
torq72b	120	02/23/89	08:26:05	23.45	9.66	0.055	0.104	0.032	0.016	0.000	0.000	4474.5	32.27	16.17	57.4	38 40.328	144 7.333	0.89
torq72b	121	02/23/89	08:28:18	20.41	10.47	0.057	0.102	0.033	0.017	0.000	0.000	4556.2	32.27	16.18	57.1	38 40.179	144 7.293	0.85
torq72b	122	02/23/89	08:30:09	19.26	9.33	0.051	0.100	0.029	0.017	0.000	0.000	4444.5	32.34	16.20	57.2	38 39.976	144 7.238	0.85
torq72b	123	02/23/89	08:32:23	19.22	7.25	0.051	0.101	0.031	0.015	0.000	0.000	4336.1	32.34	16.24	57.2	38 39.816	144 7.194	1.12
torq72b	124	02/23/89	08:34:13	19.22	7.41	0.052	0.107	0.027	0.014	0.000	0.000	4336.1	32.55	16.43	57.3	38 39.626	144 7.145	1.06
torq72b	125	02/23/89	08:36:27	19.29	6.95	0.051	0.102	0.031	0.014	0.000	0.000	4300.0	32.55	16.44	56.7	38 39.449	144 7.033	1.17
torq72b	126	02/23/89	08:38:18	19.57	7.38	0.051	0.107	0.030	0.014	0.000	0.000	4281.0	32.55	16.45	56.8	38 39.254	144 6.989	1.09
torq72b	127	02/23/89	08:40:31	19.61	7.04	0.051	0.105	0.032	0.019	0.000	0.000	4175.2	32.55	16.48	57.2	38 39.093	144 6.951	1.16
torq72b	128	02/23/89	08:42:23	19.49	7.51	0.049	0.110	0.030	0.021	0.000	0.000	4278.6	32.62	16.52	57.3	38 38.902	144 6.907	1.04

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	1butane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq72b	129	02/23/89	08:44:34	19.36	7.11	0.049	0.107	0.030	0.018	0.000	0.006	4077.8	32.62	16.54	57.1	38 38.739	144 6.868	1.18
torq72b	130	02/23/89	08:46:26	19.39	7.50	0.048	0.104	0.034	0.023	0.000	0.000	3975.2	32.62	16.53	57.4	38 38.525	144 6.817	1.08
torq72b	131	02/23/89	08:48:43	19.53	7.13	0.046	0.105	0.030	0.021	0.000	0.000	3998.6	32.48	16.39	57.7	38 38.365	144 6.775	1.06
torq72b	132	02/23/89	08:50:30	19.60	7.55	0.049	0.105	0.030	0.021	0.000	0.000	3962.9	32.48	16.37	56.3	38 38.154	144 6.718	1.04
torq72b	133	02/23/89	08:52:48	19.54	7.24	0.048	0.107	0.030	0.023	0.000	0.000	4020.8	32.55	16.44	57.6	38 38.001	144 6.678	1.07
torq72b	134	02/23/89	08:54:33	19.45	7.59	0.050	0.106	0.031	0.022	0.000	0.000	4175.7	32.69	16.65	57.5	38 37.795	144 6.623	1.06
torq72b	135	02/23/89	08:56:51	19.57	7.13	0.050	0.106	0.033	0.021	0.000	0.000	4167.9	32.69	16.59	57.7	38 37.641	144 6.584	1.15
torq72b	136	02/23/89	08:58:37	19.76	7.55	0.053	0.113	0.032	0.016	0.000	0.000	4233.8	32.69	16.56	58.0	38 37.430	144 6.528	1.11
torq72b	137	02/23/89	09:00:56	19.72	7.20	0.050	0.108	0.031	0.019	0.000	0.006	4287.5	32.83	16.73	57.3	38 37.262	144 6.482	1.19
torq72b	138	02/23/89	09:02:42	19.70	7.62	0.046	0.112	0.030	0.030	0.000	0.000	4140.1	32.90	16.78	57.0	38 37.050	144 6.425	0.99
torq72b	139	02/23/89	09:05:01	20.00	7.28	0.049	0.110	0.029	0.027	0.000	0.000	4107.9	32.69	16.56	57.0	38 36.884	144 6.427	1.06
torq72b	140	02/23/89	09:06:45	20.07	7.66	0.054	0.116	0.032	0.023	0.000	0.000	4067.5	32.48	16.39	57.1	38 36.667	144 6.359	1.11
torq72b	141	02/23/89	09:09:05	20.07	7.38	0.047	0.111	0.033	0.026	0.000	0.008	4047.6	32.41	16.34	57.0	38 36.504	144 6.308	1.18
torq72b	142	02/23/89	09:10:50	19.78	7.75	0.048	0.116	0.032	0.025	0.000	0.000	4118.9	32.90	16.84	55.2	38 36.286	144 6.240	1.02
torq72b	143	02/23/89	09:13:13	19.54	7.29	0.051	0.111	0.030	0.023	0.000	0.000	4134.5	33.25	17.15	52.5	38 36.137	144 6.187	1.10
torq72b	144	02/23/89	09:14:53	19.13	7.56	0.050	0.106	0.033	0.018	0.000	0.000	4227.3	33.18	17.08	51.8	38 35.918	144 6.116	1.09
torq72b	145	02/23/89	09:17:18	19.07	7.02	0.052	0.104	0.028	0.016	0.000	0.006	4243.9	33.67	17.61	47.0	38 35.771	144 6.064	1.21
torq72b	146	02/23/89	09:18:58	19.57	7.36	0.051	0.100	0.033	0.018	0.000	0.000	4315.4	33.67	17.63	40.8	38 35.540	144 5.995	1.13
torq72b	147	02/23/89	09:21:26	19.25	7.04	0.051	0.111	0.031	0.025	0.000	0.004	4103.7	33.67	17.61	40.8	38 35.388	144 5.955	1.21
torq72b	148	02/23/89	09:23:02	19.18	7.42	0.053	0.116	0.033	0.035	0.000	0.000	4103.7	33.67	17.61	40.8	38 35.164	144 5.891	1.15
torq72b	149	02/23/89	09:25:34	19.32	6.76	0.048	0.113	0.026	0.031	0.000	0.000	4036.7	33.67	17.61	40.8	38 35.029	144 5.848	1.08
torq72b	150	02/23/89	09:27:06	19.22	6.95	0.049	0.115	0.027	0.032	0.000	0.000	4070.0	33.67	17.61	41.0	38 34.799	144 5.782	1.08
torq72b	151	02/23/89	09:29:39	19.18	6.69	0.047	0.112	0.029	0.030	0.000	0.006	4012.3	33.67	17.61	40.8	38 34.643	144 5.739	1.21
torq72b	152	02/23/89	09:31:10	18.93	6.92	0.047	0.111	0.027	0.033	0.000	0.000	4007.2	33.60	17.61	41.2	38 34.416	144 5.671	1.06
torq72b	153	02/23/89	09:33:46	19.05	6.64	0.048	0.108	0.027	0.031	0.000	0.000	4026.7	33.60	17.61	41.4	38 34.277	144 5.634	1.12
torq72b	154	02/23/89	09:35:15	19.10	6.92	0.050	0.111	0.024	0.033	0.000	0.000	4030.0	33.60	17.60	40.9	38 34.034	144 5.570	1.06
torq72b	155	02/23/89	09:37:51	19.12	6.63	0.048	0.108	0.029	0.028	0.000	0.000	4038.2	33.60	17.60	41.0	38 33.897	144 5.533	1.15
torq72b	156	02/23/89	09:39:19	19.14	6.71	0.049	0.112	0.026	0.028	0.000	0.000	3996.5	33.60	17.60	40.9	38 33.703	144 5.480	1.10
torq72b	157	02/23/89	09:41:56	19.08	6.63	0.047	0.107	0.025	0.029	0.000	0.000	4022.6	33.60	17.59	41.1	38 33.703	144 5.480	1.07
torq72b	158	02/23/89	09:43:23	19.06	6.87	0.047	0.107	0.024	0.025	0.000	0.000	4011.4	33.60	17.59	41.2	38 33.287	144 5.374	1.02
torq72b	159	02/23/89	09:46:00	19.05	6.61	0.047	0.107	0.027	0.027	0.000	0.000	3976.8	33.60	17.59	40.6	38 33.164	144 5.341	1.11
torq72b	160	02/23/89	09:47:26	18.99	6.84	0.048	0.110	0.026	0.026	0.000	0.000	3928.0	33.60	17.59	41.1	38 32.918	144 5.268	1.07
torq72b	161	02/23/89	09:50:04	19.08	6.60	0.046	0.106	0.026	0.030	0.000	0.000	3905.8	33.67	17.68	33.6	38 32.779	144 5.224	1.08
torq72b	162	02/23/89	09:51:31	19.07	6.85	0.047	0.107	0.025	0.029	0.000	0.000	4047.3	33.74	17.71	34.1	38 32.552	144 5.151	1.04
torq72b	163	02/23/89	09:54:08	19.52	6.60	0.047	0.106	0.031	0.030	0.000	0.000	3980.1	33.81	17.76	25.5	38 32.455	144 5.123	1.17
torq72b	164	02/23/89	09:55:35	19.34	6.85	0.048	0.105	0.027	0.032	0.000	0.000	4009.0	33.81	17.77	25.5	38 32.184	144 5.002	1.08
torq72b	165	02/23/89	09:58:12	19.65	6.67	0.048	0.112	0.030	0.032	0.000	0.008	4052.1	33.81	17.81	19.3	38 32.064	144 4.971	1.27
torq72b	166	02/23/89	09:59:38	19.94	6.93	0.050	0.116	0.027	0.032	0.000	0.000	4162.0	33.88	17.84	19.3	38 31.848	144 4.808	1.10
torq72b	167	02/23/89	10:02:21	20.41	6.76	0.053	0.115	0.028	0.034	0.000	0.000	3963.6	33.88	17.87	19.0	38 31.806	144 4.655	1.18
torq72b	168	02/23/89	10:03:42	20.14	6.99	0.051	0.116	0.029	0.032	0.000	0.000	3963.6	33.88	17.85	19.2	38 31.956	144 4.429	1.13
torq72b	169	02/23/89	10:06:26	19.82	6.78	0.054	0.120	0.033	0.033	0.000	0.000	3949.3	33.88	17.84	19.4	38 32.086	144 4.424	1.27
torq72b	170	02/23/89	10:07:46	19.86	7.01	0.054	0.123	0.030	0.035	0.000	0.000	3949.3	33.88	17.83	19.3	38 32.341	144 4.422	1.18
torq72b	171	02/23/89	10:10:30	19.91	6.75	0.053	0.123	0.033	0.037	0.000	0.000	3968.0	33.81	17.83	19.4	38 32.468	144 4.422	1.26
torq72b	172	02/23/89	10:11:51	19.84	7.03	0.055	0.125	0.037	0.040	0.000	0.000	3968.0	33.81	17.83	19.1	38 32.713	144 4.426	1.29
torq72b	173	02/23/89	10:14:33	19.80	6.75	0.052	0.121	0.035	0.035	0.000	0.007	4090.0	33.88	17.79	28.6	38 32.835	144 4.429	1.37
torq72b	174	02/23/89	10:15:56	19.71	7.04	0.053	0.124	0.031	0.032	0.000	0.000	4090.0	33.81	17.81	29.2	38 33.071	144 4.468	1.18
torq72b	175	02/23/89	10:18:39	19.69	6.73	0.051	0.118	0.032	0.033	0.000	0.007	3862.9	33.81	17.77	27.9	38 33.205	144 4.506	1.32
torq72b	176	02/23/89	10:19:59	19.68	6.97	0.050	0.121	0.030	0.031	0.000	0.000	4018.7	33.74	17.75	28.6	38 33.440	144 4.579	1.14
torq72b	177	02/23/89	10:22:46	19.99	6.73	0.050	0.114	0.029	0.034	0.000	0.008	4050.5	33.74	17.71	27.2	38 33.497	144 4.611	1.28
torq72b	178	02/23/89	10:24:04	19.59	7.00	0.052	0.116	0.030	0.031	0.000	0.000	4066.4	33.74	17.70	28.3	38 33.763	144 4.697	1.16
torq72b	179	02/23/89	10:26:52	19.58	6.75	0.048	0.113	0.031	0.032	0.000	0.000	4093.7	33.67	17.68	27.7	38 33.880	144 4.733	1.16
torq72b	180	02/23/89	10:28:08	19.57	6.97	0.051	0.120	0.030	0.026	0.000	0.000	4103.8	33.67	17.67	27.7	38 34.145	144 4.819	1.15
torq72b	181	02/23/89	10:30:55	19.49	6.72	0.048	0.114	0.026	0.031	0.000	0.000	4095.4	33.74	17.61	27.2	38 34.279	144 4.861	1.09
torq72b	182	02/23/89	10:32:13	19.53	6.95	0.048	0.120	0.029	0.035	0.000	0.000	4222.4	33.67	17.63	27.5	38 34.539	144 4.940	1.10

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq73	1	02/23/89	10:43:11	19.58	6.68	0.046	0.113	0.025	0.037	0.000	0.000	4147.7	33.67	17.62	41.8	38 34.882	144 5.742	1.05
torq73	2	02/23/89	10:44:34	19.20	6.92	0.049	0.115	0.027	0.032	0.000	0.000	3963.4	33.67	17.62	41.6	38 34.824	144 6.048	1.09
torq73	3	02/23/89	10:47:16	19.17	6.65	0.051	0.107	0.027	0.031	0.000	0.009	3790.5	33.60	17.62	50.3	38 34.797	144 6.200	1.29
torq73	4	02/23/89	10:48:37	19.24	6.89	0.049	0.107	0.026	0.033	0.000	0.000	3886.6	33.60	17.61	49.9	38 34.739	144 6.530	1.08
torq73	5	02/23/89	10:51:24	19.11	6.65	0.050	0.105	0.032	0.026	0.000	0.007	3955.9	33.67	17.61	50.4	38 34.711	144 6.685	1.32
torq73	6	02/23/89	10:52:41	19.07	6.88	0.048	0.106	0.019	0.031	0.000	0.000	3955.9	33.60	17.61	50.1	38 34.655	144 7.011	0.96
torq73	7	02/23/89	10:55:30	18.95	6.63	0.044	0.105	0.026	0.027	0.000	0.007	3909.6	33.60	17.51	53.8	38 34.632	144 7.147	1.15
torq73	8	02/23/89	10:56:45	19.00	6.66	0.043	0.103	0.027	0.029	0.000	0.000	3909.6	33.53	17.52	53.7	38 34.571	144 7.474	1.04
torq73	9	02/23/89	10:59:38	18.98	6.62	0.047	0.104	0.026	0.028	0.000	0.006	3951.1	33.53	17.47	54.1	38 34.548	144 7.612	1.18
torq73	10	02/23/89	11:00:50	18.97	6.87	0.047	0.102	0.025	0.027	0.000	0.000	3951.1	33.53	17.48	54.1	38 34.477	144 7.958	1.04
torq73	11	02/23/89	11:03:44	19.15	6.65	0.047	0.102	0.031	0.027	0.000	0.000	3904.6	33.53	17.35	53.8	38 34.454	144 8.091	1.16
torq73	12	02/23/89	11:04:54	19.05	6.91	0.047	0.108	0.028	0.028	0.000	0.000	3904.6	33.32	17.09	53.8	38 34.395	144 8.423	1.07
torq73	13	02/23/89	11:07:48	18.95	6.64	0.043	0.103	0.030	0.025	0.000	0.009	3903.5	33.32	17.29	54.1	38 34.369	144 8.553	1.22
torq73	14	02/23/89	11:08:58	18.90	6.93	0.044	0.106	0.029	0.025	0.000	0.000	3930.8	33.25	17.24	53.7	38 34.303	144 8.901	1.04
torq73	15	02/23/89	11:11:55	19.10	6.67	0.045	0.104	0.027	0.026	0.000	0.000	3975.1	33.25	17.18	53.7	38 34.277	144 9.036	1.07
torq73	16	02/23/89	11:13:02	18.95	6.95	0.045	0.103	0.026	0.025	0.000	0.000	3998.9	33.18	17.17	53.7	38 34.216	144 9.370	1.01
torq73	17	02/23/89	11:15:59	18.78	6.74	0.044	0.101	0.028	0.021	0.000	0.005	3960.0	33.46	17.42	53.6	38 34.191	144 9.507	1.13
torq73	18	02/23/89	11:17:06	19.16	7.02	0.044	0.104	0.026	0.020	0.000	0.000	3853.8	33.11	17.07	53.8	38 34.126	144 9.862	0.99
torq73	19	02/23/89	11:20:08	18.91	6.67	0.043	0.101	0.027	0.020	0.000	0.000	3882.3	32.83	16.76	58.5	38 34.103	144 9.979	1.04
torq73	20	02/23/89	11:21:10	18.84	6.97	0.044	0.099	0.022	0.020	0.000	0.000	3868.0	32.76	16.69	58.3	38 34.043	144 10.336	0.94
torq73	21	02/23/89	11:24:12	19.34	6.70	0.043	0.100	0.023	0.022	0.000	0.000	3925.9	32.62	16.51	58.7	38 34.005	144 10.551	0.98
torq73	22	02/23/89	11:25:14	19.80	7.00	0.045	0.099	0.024	0.019	0.000	0.000	3920.7	32.83	16.80	54.5	38 33.939	144 10.906	0.98
torq73	23	02/23/89	11:28:16	20.09	7.13	0.046	0.098	0.028	0.016	0.000	0.000	3973.8	32.83	16.81	54.3	38 33.918	144 11.025	1.03
torq73	24	02/23/89	11:29:18	19.58	7.56	0.049	0.097	0.028	0.010	0.000	0.000	4067.4	32.76	16.71	55.3	38 33.853	144 11.380	1.01
torq73	25	02/23/89	11:32:21	18.73	7.38	0.048	0.096	0.031	0.016	0.000	0.000	4024.5	32.76	16.67	55.9	38 33.823	144 11.512	1.06
torq73	26	02/23/89	11:33:22	18.67	7.41	0.050	0.103	0.029	0.018	0.000	0.000	4024.5	32.62	16.57	55.8	38 33.766	144 11.852	1.05
torq73	27	02/23/89	11:36:25	18.92	6.82	0.045	0.100	0.029	0.021	0.000	0.000	4034.8	32.62	16.54	55.7	38 33.743	144 11.966	1.07
torq73	28	02/23/89	11:37:26	18.95	7.13	0.049	0.107	0.032	0.017	0.000	0.000	4034.8	32.55	16.49	55.8	38 33.690	144 12.308	1.12
torq73	29	02/23/89	11:40:29	19.05	6.99	0.046	0.098	0.028	0.016	0.000	0.005	4064.2	32.48	16.39	56.3	38 33.655	144 12.519	1.12
torq73	30	02/23/89	11:42:20	19.28	7.41	0.043	0.099	0.026	0.015	0.000	0.000	4070.6	32.34	16.33	56.2	38 33.613	144 12.783	0.92
torq73	31	02/23/89	11:44:37	20.05	7.16	0.045	0.098	0.026	0.016	0.000	0.000	4056.8	32.41	16.34	56.4	38 33.576	144 12.995	0.98
torq73	32	02/23/89	11:46:24	20.42	7.73	0.047	0.099	0.020	0.019	0.000	0.000	4138.9	32.34	16.32	55.7	38 33.530	144 13.242	0.86
torq73	33	02/23/89	11:48:41	20.55	7.86	0.047	0.098	0.020	0.018	0.000	0.018	4106.3	32.48	16.39	55.9	38 33.495	144 13.453	1.07
torq73	34	02/23/89	11:50:28	21.22	8.43	0.048	0.096	0.026	0.017	0.000	0.000	4196.3	32.48	16.42	55.2	38 33.444	144 13.722	0.87
torq73	35	02/23/89	11:52:46	20.59	8.37	0.049	0.097	0.029	0.015	0.000	0.000	4157.2	32.48	16.39	55.7	38 33.404	144 13.931	0.92
torq73	36	02/23/89	11:54:33	20.18	8.81	0.045	0.099	0.029	0.015	0.000	0.000	4136.7	32.55	16.43	56.3	38 33.354	144 14.185	0.83
torq73	37	02/23/89	11:56:49	21.15	8.09	0.046	0.098	0.024	0.014	0.000	0.006	4157.0	32.62	16.47	56.3	38 33.311	144 14.394	0.93
torq73	38	02/23/89	11:58:37	20.43	8.32	0.047	0.102	0.022	0.014	0.000	0.000	4108.9	32.55	16.48	56.5	38 33.279	144 14.568	0.82
torq73	39	02/23/89	12:00:57	20.72	8.05	0.045	0.101	0.029	0.016	0.000	0.000	4153.7	32.48	16.43	56.7	38 33.227	144 14.855	0.91
torq73	40	02/23/89	12:02:41	20.93	8.59	0.048	0.102	0.025	0.015	0.000	0.000	4175.1	32.48	16.43	56.4	38 33.178	144 15.117	0.84
torq73	41	02/23/89	12:05:01	20.94	7.88	0.047	0.097	0.030	0.017	0.004	0.009	4191.0	32.41	16.38	56.1	38 33.143	144 15.330	1.13
torq73	42	02/23/89	12:06:45	21.04	8.78	0.048	0.100	0.027	0.017	0.000	0.000	4164.7	32.41	16.34	55.9	38 33.100	144 15.584	0.85
torq73	43	02/23/89	12:09:11	20.57	8.35	0.047	0.099	0.028	0.015	0.000	0.005	4217.9	32.41	16.34	56.6	38 33.072	144 15.776	0.95
torq73	44	02/23/89	12:10:50	20.59	8.75	0.048	0.102	0.030	0.014	0.000	0.000	4188.1	32.55	16.50	55.9	38 33.021	144 16.057	0.88
torq73	45	02/23/89	12:13:17	20.28	8.18	0.047	0.097	0.030	0.015	0.000	0.000	4286.3	32.62	16.60	56.3	38 32.992	144 16.240	0.93
torq73	46	02/23/89	12:14:54	20.27	8.57	0.049	0.098	0.026	0.011	0.000	0.000	4129.5	32.69	16.65	55.9	38 32.940	144 16.507	0.87
torq73	47	02/23/89	12:17:21	19.90	7.99	0.044	0.098	0.030	0.015	0.000	0.004	4187.8	32.90	16.79	56.5	38 32.912	144 16.696	0.97
torq73	48	02/23/89	12:18:57	19.77	8.19	0.048	0.102	0.030	0.015	0.000	0.000	4187.8	32.90	16.84	56.0	38 32.863	144 16.979	0.94
torq73	49	02/23/89	12:21:29	19.92	7.53	0.044	0.099	0.027	0.015	0.000	0.000	4159.2	32.97	16.97	55.7	38 32.829	144 17.153	0.93
torq73	50	02/23/89	12:23:01	19.84	8.11	0.045	0.099	0.029	0.012	0.000	0.000	4159.2	33.04	17.02	55.7	38 32.771	144 17.466	0.90

Table 3. Direct hydrocarbon detection data collected along survey line
89/073, Torquay Sub-Basin, southeastern Australia.

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq73	51	02/23/89	12:25:33	19.39	7.59	0.044	0.097	0.029	0.016	0.000	0.007	4124.9	33.04	17.01	55.5	38 32.737	144 17.642	1.04
torq73	52	02/23/89	12:27:06	19.21	7.81	0.043	0.104	0.027	0.013	0.000	0.000	4124.9	33.25	17.17	55.6	38 32.680	144 17.932	0.89
torq73	53	02/23/89	12:29:38	18.90	7.22	0.044	0.097	0.027	0.019	0.000	0.000	4053.6	33.25	17.18	55.9	38 32.650	144 18.107	0.97
torq73	54	02/23/89	12:31:10	18.72	7.33	0.043	0.104	0.030	0.016	0.000	0.000	4081.7	33.25	17.18	55.9	38 32.599	144 18.397	0.99
torq73	55	02/23/89	12:33:42	18.42	6.98	0.042	0.098	0.027	0.020	0.000	0.007	4040.7	33.18	17.15	55.9	38 32.559	144 18.591	1.08
torq73	56	02/23/89	12:35:14	18.47	7.04	0.046	0.103	0.027	0.021	0.000	0.000	4028.4	33.18	17.12	56.3	38 32.503	144 18.876	1.03
torq73	57	02/23/89	12:37:50	18.74	6.70	0.042	0.101	0.027	0.020	0.000	0.000	3984.5	33.04	16.99	55.4	38 32.470	144 19.048	1.02
torq73	58	02/23/89	12:39:18	18.66	6.97	0.042	0.096	0.026	0.019	0.000	0.000	4046.6	33.18	16.99	56.1	38 32.419	144 19.354	0.97
torq73	59	02/23/89	12:41:54	18.60	6.69	0.040	0.100	0.026	0.021	0.000	0.000	3962.9	33.11	17.20	55.4	38 32.387	144 19.530	0.98
torq73	60	02/23/89	12:43:23	18.69	6.97	0.043	0.105	0.025	0.021	0.000	0.000	4112.2	33.53	17.56	55.9	38 32.333	144 19.821	0.97
torq73	61	02/23/89	12:45:58	18.78	6.71	0.041	0.098	0.026	0.017	0.000	0.000	4089.4	33.60	17.59	55.8	38 32.301	144 19.997	0.99
torq73	62	02/23/89	12:47:26	18.81	6.98	0.042	0.101	0.025	0.015	0.000	0.000	4025.5	33.74	17.66	55.3	38 32.255	144 20.286	0.95
torq73	63	02/23/89	12:50:02	18.95	6.77	0.043	0.099	0.026	0.014	0.000	0.000	4043.4	33.74	17.70	55.7	38 32.221	144 20.462	1.01
torq73	64	02/23/89	12:51:30	18.77	7.03	0.045	0.107	0.026	0.026	0.000	0.000	4046.2	33.74	17.72	55.1	38 32.170	144 20.773	1.00
torq73	65	02/23/89	12:54:06	19.71	6.63	0.041	0.102	0.029	0.028	0.000	0.006	3971.8	33.74	17.70	55.2	38 32.141	144 20.945	1.13
torq73	66	02/23/89	12:55:34	20.04	6.83	0.038	0.103	0.027	0.033	0.000	0.000	4022.5	33.74	17.72	56.1	38 32.080	144 21.259	0.94
torq73	67	02/23/89	12:58:14	19.19	6.57	0.041	0.104	0.024	0.030	0.000	0.000	3991.6	33.67	17.68	55.3	38 32.052	144 21.409	0.98
torq73	68	02/23/89	12:59:38	19.31	6.82	0.040	0.106	0.017	0.029	0.000	0.000	3977.6	33.67	17.67	55.6	38 31.993	144 21.718	0.83
torq73	69	02/23/89	13:02:18	18.97	6.56	0.038	0.103	0.022	0.029	0.000	0.005	4038.9	33.67	17.68	55.1	38 31.966	144 21.868	0.98
torq73	70	02/23/89	13:03:42	18.96	6.83	0.041	0.106	0.025	0.030	0.000	0.000	4038.9	33.74	17.69	55.2	38 31.904	144 22.196	0.96
torq73	71	02/23/89	13:06:24	18.87	6.59	0.041	0.104	0.026	0.023	0.000	0.000	3918.6	33.74	17.68	55.2	38 31.875	144 22.352	1.01
torq73	72	02/23/89	13:07:46	18.89	6.83	0.040	0.100	0.016	0.029	0.000	0.000	3918.6	33.53	17.56	56.3	38 31.809	144 22.652	0.81
torq73	73	02/23/89	13:10:29	18.90	6.57	0.041	0.104	0.027	0.029	0.000	0.000	4034.9	33.11	17.01	56.9	38 31.825	144 22.797	1.02
torq73	74	02/23/89	13:11:50	18.87	6.83	0.043	0.109	0.027	0.027	0.000	0.000	4034.9	33.53	17.39	56.5	38 32.006	144 22.833	1.01
torq73	75	02/23/89	13:14:32	19.30	6.24	0.041	0.103	0.027	0.022	0.000	0.000	4089.3	33.60	17.56	56.8	38 32.122	144 22.863	1.08
torq73	76	02/23/89	13:15:55	19.02	7.01	0.042	0.107	0.026	0.030	0.000	0.000	4089.3	33.60	17.57	56.1	38 32.319	144 22.930	0.96
torq73	77	02/23/89	13:18:36	18.77	6.83	0.042	0.102	0.029	0.027	0.000	0.000	3979.1	33.39	17.40	56.6	38 32.435	144 22.961	1.03
torq73	78	02/23/89	13:19:59	18.98	7.01	0.042	0.105	0.019	0.030	0.000	0.000	4013.2	33.53	17.52	55.4	38 32.657	144 23.026	0.86
torq73	79	02/23/89	13:22:40	19.04	6.70	0.040	0.102	0.028	0.029	0.000	0.000	4002.2	33.53	17.49	55.4	38 32.769	144 23.055	1.01
torq73	80	02/23/89	13:24:03	19.00	7.00	0.043	0.104	0.019	0.029	0.000	0.000	4004.9	33.53	17.47	55.7	38 32.996	144 23.121	0.88
torq73	81	02/23/89	13:26:44	18.82	6.78	0.042	0.103	0.027	0.026	0.000	0.000	4041.5	33.46	17.41	54.2	38 33.120	144 23.156	1.01
torq73	82	02/23/89	13:28:07	18.71	6.99	0.041	0.103	0.024	0.028	0.000	0.000	3983.1	33.46	17.37	55.9	38 33.350	144 23.218	0.92
torq73	83	02/23/89	13:30:48	18.64	6.64	0.041	0.102	0.027	0.026	0.000	0.000	3987.6	33.39	17.34	55.3	38 33.461	144 23.243	1.01
torq73	84	02/23/89	13:32:11	18.84	6.90	0.044	0.103	0.025	0.025	0.000	0.000	4049.9	33.39	17.35	55.2	38 33.705	144 23.271	0.99
torq73	85	02/23/89	13:34:52	18.70	6.62	0.040	0.103	0.029	0.025	0.000	0.000	3906.2	33.32	17.28	55.7	38 33.832	144 23.306	1.03
torq73	86	02/23/89	13:36:15	18.49	6.89	0.037	0.103	0.026	0.028	0.000	0.000	4042.8	33.32	17.34	55.0	38 34.053	144 23.370	0.91
torq73	87	02/23/89	13:38:56	18.53	6.63	0.040	0.103	0.024	0.019	0.000	0.000	4047.6	33.39	17.35	55.7	38 34.174	144 23.403	0.96
torq73	88	02/23/89	13:40:19	18.50	6.92	0.042	0.106	0.028	0.022	0.000	0.000	4001.0	33.32	17.27	56.7	38 34.403	144 23.465	1.00
torq73	89	02/23/89	13:43:00	18.78	6.63	0.041	0.101	0.025	0.023	0.000	0.000	4039.2	33.32	17.26	55.4	38 34.514	144 23.500	0.99
torq73	90	02/23/89	13:44:23	18.50	6.92	0.042	0.106	0.019	0.023	0.000	0.000	4012.6	33.32	17.28	56.0	38 34.738	144 23.568	0.87
torq73	91	02/23/89	13:47:04	18.89	6.66	0.039	0.103	0.025	0.020	0.000	0.000	3995.3	33.32	17.35	56.6	38 34.867	144 23.604	0.95
torq73	92	02/23/89	13:48:26	18.78	6.92	0.039	0.100	0.024	0.026	0.000	0.000	3998.1	33.39	17.36	55.8	38 35.097	144 23.672	0.90
torq73	93	02/23/89	13:51:08	18.49	6.64	0.039	0.099	0.027	0.021	0.000	0.000	4016.2	33.39	17.36	55.6	38 35.208	144 23.705	0.98
torq73	94	02/23/89	13:52:31	18.63	6.92	0.041	0.099	0.028	0.022	0.000	0.000	3946.4	33.39	17.35	55.5	38 35.443	144 23.765	0.99
torq73	95	02/23/89	13:55:12	18.63	6.62	0.041	0.100	0.028	0.019	0.000	0.000	4005.1	33.32	17.27	55.9	38 35.566	144 23.800	1.03
torq73	96	02/23/89	13:56:35	18.53	6.91	0.041	0.103	0.027	0.020	0.000	0.000	4005.1	33.32	17.33	55.5	38 35.796	144 23.859	0.97
torq73	97	02/23/89	13:59:17	18.53	6.60	0.040	0.102	0.026	0.022	0.000	0.004	4018.6	33.32	17.31	55.5	38 35.910	144 23.886	1.05
torq73	98	02/23/89	14:00:38	18.45	6.89	0.042	0.104	0.027	0.026	0.000	0.000	4018.6	33.39	17.35	55.5	38 36.159	144 23.945	0.99
torq73	99	02/23/89	14:03:25	18.39	6.60	0.040	0.102	0.025	0.024	0.000	0.000	3889.7	33.25	17.24	57.0	38 36.260	144 23.967	0.98
torq73	100	02/23/89	14:04:43	18.41	6.92	0.062	0.123	0.030	0.027	0.000	0.000	3889.7	33.25	17.24	56.6	38 36.498	144 24.022	1.31
torq73	101	02/23/89	14:07:30	18.42	6.58	0.041	0.100	0.028	0.020	0.000	0.000	3945.9	33.25	17.23	56.6	38 36.620	144 24.047	1.04
torq73	102	02/23/89	14:08:47	18.37	6.88	0.043	0.105	0.028	0.026	0.000	0.000	3945.9	33.25	17.23	55.7	38 36.856	144 24.102	1.02
torq73	103	02/23/89	14:11:33	18.33	6.59	0.040	0.100	0.026	0.020	0.000	0.000	4054.4	33.32	17.30	54.7	38 36.972	144 24.130	0.99
torq73	104	02/23/89	14:12:52	18.38	6.90	0.045	0.108	0.024	0.022	0.000	0.000	4024.9	33.32	17.32	55.0	38 37.218	144 24.185	0.99

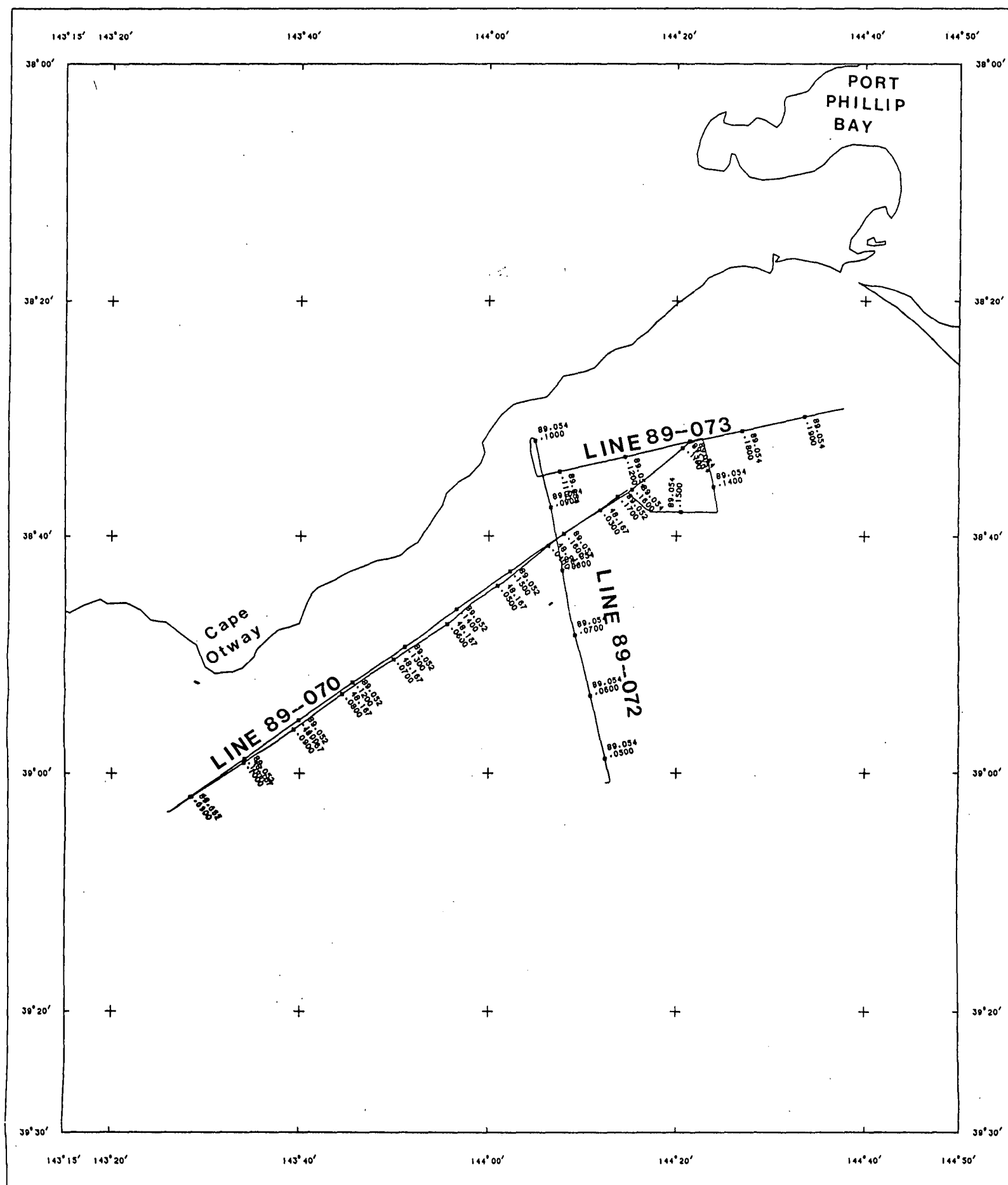
line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq73	105	02/23/89	14:15:38	18.22	6.59	0.039	0.099	0.026	0.016	0.000	0.008	4056.1	33.25	17.18	55.4	38 37.348	144 24.214	1.09
torq73	106	02/23/89	14:16:56	18.28	6.92	0.060	0.111	0.026	0.025	0.000	0.000	4025.8	33.32	17.30	55.2	38 37.592	144 24.272	1.23
torq73	107	02/23/89	14:19:46	18.28	6.60	0.040	0.099	0.024	0.025	0.000	0.000	3914.2	33.18	17.17	55.5	38 37.698	144 24.298	0.96
torq73	108	02/23/89	14:21:00	18.34	6.89	0.041	0.099	0.018	0.025	0.000	0.000	3921.8	33.04	17.00	56.3	38 37.932	144 24.327	0.85
torq73	109	02/23/89	14:23:50	18.29	6.62	0.040	0.098	0.024	0.018	0.000	0.000	3952.0	33.11	17.11	56.3	38 37.993	144 24.256	0.96
torq73	110	02/23/89	14:25:04	18.23	6.91	0.041	0.101	0.019	0.021	0.000	0.000	4018.9	33.11	17.09	55.9	38 37.994	144 23.974	0.86
torq73	111	02/23/89	14:27:54	18.18	6.61	0.040	0.096	0.023	0.020	0.000	0.000	4079.2	33.11	17.11	55.0	38 37.995	144 23.833	0.94
torq73	112	02/23/89	14:29:08	18.13	6.93	0.041	0.097	0.025	0.019	0.000	0.000	3965.3	33.18	17.11	55.0	38 38.005	144 23.525	0.94
torq73	113	02/23/89	14:31:58	18.21	6.63	0.040	0.096	0.024	0.020	0.000	0.000	4005.7	33.11	17.08	56.1	38 38.004	144 23.395	0.96
torq73	114	02/23/89	14:33:11	18.18	6.91	0.040	0.100	0.024	0.019	0.000	0.000	4045.9	33.18	17.18	55.3	38 37.993	144 23.090	0.92
torq73	115	02/23/89	14:36:03	18.13	6.60	0.039	0.096	0.021	0.021	0.000	0.000	4058.8	33.11	17.10	54.8	38 38.002	144 22.963	0.90
torq73	116	02/23/89	14:37:15	18.20	6.90	0.040	0.104	0.019	0.021	0.000	0.000	4052.5	33.11	17.10	55.2	38 38.001	144 22.632	0.85
torq73	117	02/23/89	14:40:07	18.17	6.63	0.039	0.095	0.017	0.019	0.000	0.007	4012.0	33.11	17.10	56.2	38 38.001	144 22.496	0.94
torq73	118	02/23/89	14:41:20	18.09	6.94	0.038	0.106	0.024	0.021	0.000	0.000	4028.5	33.11	17.11	55.4	38 38.003	144 22.185	0.89
torq73	119	02/23/89	14:44:13	18.35	6.65	0.039	0.095	0.024	0.019	0.000	0.000	4053.6	33.11	17.06	55.5	38 38.001	144 22.073	0.94
torq73	120	02/23/89	14:45:24	18.32	6.94	0.040	0.100	0.027	0.019	0.000	0.000	4053.6	33.11	17.08	55.0	38 38.000	144 21.738	0.96
torq73	121	02/23/89	14:48:16	18.03	6.62	0.041	0.095	0.024	0.018	0.000	0.000	4022.0	33.11	17.11	55.5	38 38.009	144 21.592	0.97
torq73	122	02/23/89	14:49:27	17.98	6.95	0.055	0.103	0.024	0.019	0.000	0.000	4022.0	33.11	17.12	55.3	38 38.001	144 21.281	1.12
torq73	123	02/23/89	14:52:20	18.06	6.61	0.037	0.089	0.023	0.019	0.000	0.000	4052.0	33.11	17.08	55.6	38 38.001	144 21.149	0.90
torq73	124	02/23/89	14:53:31	18.01	6.91	0.039	0.092	0.018	0.017	0.000	0.000	4052.0	33.18	17.06	55.5	38 38.005	144 20.834	0.82
torq73	125	02/23/89	14:56:23	18.14	6.59	0.039	0.091	0.019	0.018	0.000	0.000	3949.0	33.11	17.07	56.2	38 38.002	144 20.704	0.87
torq73	126	02/23/89	14:57:35	18.04	6.88	0.041	0.096	0.025	0.020	0.000	0.000	3949.0	33.32	17.07	55.9	38 38.008	144 20.414	0.95
torq73	127	02/23/89	15:00:27	18.03	6.59	0.038	0.090	0.020	0.018	0.000	0.000	3988.9	33.11	17.07	54.7	38 37.995	144 20.244	0.87
torq73	128	02/23/89	15:01:40	18.44	6.90	0.038	0.093	0.014	0.014	0.000	0.000	3988.9	33.18	17.07	54.6	38 37.994	144 19.926	0.75
torq73	129	02/23/89	15:04:31	18.05	6.60	0.038	0.092	0.026	0.017	0.000	0.007	3986.0	33.18	17.12	55.4	38 38.001	144 19.796	1.06
torq73	130	02/23/89	15:05:44	18.10	6.93	0.041	0.101	0.023	0.019	0.000	0.000	4008.1	33.11	17.07	55.6	38 38.000	144 19.462	0.92
torq73	131	02/23/89	15:08:40	18.19	6.58	0.039	0.093	0.024	0.018	0.000	0.000	4000.9	33.11	17.07	54.9	38 37.995	144 19.336	0.95
torq73	132	02/23/89	15:09:48	18.14	6.93	0.059	0.112	0.025	0.019	0.000	0.000	3965.7	33.11	17.08	55.2	38 37.986	144 19.030	1.20
torq73	133	02/23/89	15:12:44	18.23	6.59	0.038	0.093	0.025	0.019	0.000	0.000	4009.4	33.11	17.08	56.1	38 37.988	144 18.902	0.95
torq73	134	02/23/89	15:13:52	18.20	6.90	0.040	0.099	0.026	0.019	0.000	0.000	4038.2	33.11	17.06	56.0	38 37.977	144 18.567	0.95
torq73	135	02/23/89	15:16:48	18.14	6.60	0.038	0.094	0.022	0.014	0.000	0.000	4044.9	33.11	17.02	54.4	38 37.977	144 18.441	0.90
torq73	136	02/23/89	15:17:56	18.10	6.90	0.038	0.095	0.025	0.021	0.000	0.000	4037.1	33.11	17.02	54.6	38 37.967	144 18.118	0.90
torq73	137	02/23/89	15:20:52	17.92	6.59	0.038	0.093	0.020	0.017	0.000	0.000	3981.4	33.04	17.04	54.6	38 37.971	144 17.986	0.87
torq73	138	02/23/89	15:22:00	17.96	6.90	0.039	0.100	0.024	0.021	0.000	0.000	3987.6	32.97	16.98	54.8	38 37.970	144 17.631	0.90
torq73	139	02/23/89	15:24:56	18.04	6.57	0.037	0.090	0.021	0.017	0.000	0.000	3998.6	32.97	16.95	53.9	38 37.965	144 17.514	0.87
torq73	140	02/23/89	15:26:04	18.03	6.84	0.039	0.097	0.024	0.017	0.000	0.000	3979.5	32.76	16.75	56.6	38 37.954	144 17.159	0.91
torq73	141	02/23/89	15:29:02	17.99	6.56	0.038	0.090	0.027	0.017	0.000	0.000	3988.1	32.90	16.76	55.9	38 37.888	144 17.060	0.98
torq73	142	02/23/89	15:30:08	18.67	6.86	0.039	0.096	0.027	0.016	0.000	0.000	3998.4	32.97	16.91	54.6	38 37.749	144 16.776	0.95
torq73	143	02/23/89	15:33:05	17.90	6.59	0.039	0.096	0.027	0.014	0.000	0.000	4072.5	32.90	16.87	53.6	38 37.689	144 16.655	0.99
torq73	144	02/23/89	15:34:12	17.90	6.91	0.042	0.102	0.021	0.018	0.000	0.000	3966.0	32.97	16.97	54.4	38 37.491	144 16.379	0.90
torq73	145	02/23/89	15:37:09	17.87	6.58	0.038	0.095	0.027	0.015	0.000	0.000	4004.5	32.76	16.78	55.2	38 37.425	144 16.285	0.98
torq73	146	02/23/89	15:38:16	18.04	6.91	0.040	0.100	0.023	0.015	0.000	0.000	4004.5	32.83	16.82	56.0	38 37.226	144 16.036	0.90
torq73	147	02/23/89	15:41:13	18.02	6.58	0.039	0.095	0.025	0.017	0.000	0.000	4019.1	32.62	16.56	55.8	38 37.143	144 15.938	0.96
torq73	148	02/23/89	15:42:20	18.14	6.89	0.037	0.094	0.024	0.015	0.000	0.000	4019.1	32.62	16.62	56.4	38 36.947	144 15.703	0.88
torq73	149	02/23/89	15:45:18	19.22	6.59	0.039	0.097	0.022	0.014	0.000	0.000	4020.3	32.48	16.41	55.4	38 36.895	144 15.608	0.92
torq73	150	02/23/89	15:46:23	18.59	6.93	0.058	0.124	0.027	0.013	0.000	0.000	4020.3	32.69	16.65	55.9	38 36.711	144 15.357	1.21
torq73	151	02/23/89	15:49:21	17.98	6.58	0.040	0.098	0.026	0.015	0.000	0.000	3953.5	32.76	16.72	56.4	38 36.633	144 15.260	0.99
torq73	152	02/23/89	15:50:27	17.97	6.92	0.040	0.099	0.026	0.018	0.000	0.000	3953.5	32.62	16.60	55.9	38 36.464	144 15.022	0.94
torq73	153	02/23/89	15:53:25	17.95	6.58	0.040	0.097	0.026	0.014	0.000	0.000	3960.2	32.06	16.00	58.2	38 36.390	144 14.927	0.99
torq73	154	02/23/89	15:54:32	17.93	6.91	0.041	0.099	0.025	0.015	0.000	0.000	3960.2	32.13	16.10	56.7	38 36.187	144 15.013	0.95
torq73	155	02/23/89	15:57:29	18.13	6.59	0.040	0.095	0.027	0.014	0.000	0.000	4105.2	32.48	16.46	55.0	38 36.159	144 15.112	1.01
torq73	156	02/23/89	15:58:36	18.28	6.95	0.042	0.106	0.024	0.015	0.000	0.000	4096.2	32.48	16.46	55.9	38 35.979	144 15.374	0.94
torq73	157	02/23/89	16:01:33	17.81	6.99	0.042	0.096	0.029	0.013	0.000	0.000	4075.8	32.48	16.50	55.9	38 35.905	144 15.474	1.00
torq73	158	02/23/89	16:02:40	17.70	7.33	0.043	0.101	0.025	0.013	0.000	0.000	3966.4	32.76	16.64	55.2	38 35.710	144 15.758	0.92

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	ibutane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq73	159	02/23/89	16:05:37	17.72	6.65	0.041	0.099	0.026	0.014	0.000	0.005	4007.5	32.41	16.33	55.7	38 35.638	144 15.853	1.07
torq73	160	02/23/89	16:06:44	17.72	6.97	0.040	0.095	0.021	0.016	0.000	0.000	3986.3	32.48	16.49	54.0	38 35.470	144 16.130	0.87
torq73	161	02/23/89	16:09:46	17.74	6.62	0.039	0.095	0.025	0.014	0.000	0.000	3988.2	32.48	16.49	53.8	38 35.419	144 16.241	0.96
torq73	162	02/23/89	16:10:48	17.77	7.20	0.044	0.097	0.026	0.015	0.000	0.000	4059.1	32.48	16.39	55.9	38 35.242	144 16.516	0.96
torq73	163	02/23/89	16:13:50	17.83	6.70	0.040	0.096	0.028	0.013	0.000	0.000	4088.6	32.41	16.35	55.6	38 35.206	144 16.604	1.01
torq73	164	02/23/89	16:14:52	17.86	7.05	0.040	0.098	0.029	0.014	0.000	0.000	4039.1	32.27	16.23	55.0	38 35.013	144 16.868	0.97
torq73	165	02/23/89	16:17:54	17.95	6.72	0.041	0.095	0.026	0.012	0.000	0.000	4105.7	32.27	16.23	56.3	38 34.963	144 16.954	0.99
torq73	166	02/23/89	16:18:56	18.05	7.10	0.039	0.096	0.025	0.013	0.000	0.000	4105.2	32.27	16.19	55.7	38 34.784	144 17.236	0.89
torq73	167	02/23/89	16:21:59	17.99	6.79	0.040	0.096	0.023	0.013	0.000	0.000	4155.4	32.27	16.25	56.6	38 34.716	144 17.322	0.92
torq73	168	02/23/89	16:23:01	18.00	7.18	0.040	0.095	0.026	0.011	0.000	0.000	4130.5	32.20	16.25	56.6	38 34.555	144 17.587	0.91
torq73	169	02/23/89	16:26:03	18.10	6.83	0.040	0.095	0.023	0.012	0.000	0.000	4110.7	32.27	16.23	56.6	38 34.492	144 17.675	0.91
torq73	170	02/23/89	16:27:05	18.19	7.25	0.059	0.117	0.026	0.012	0.000	0.000	4110.7	32.55	16.53	55.4	38 34.328	144 17.944	1.16
torq73	171	02/23/89	16:30:07	18.35	6.96	0.041	0.096	0.030	0.013	0.000	0.000	4144.0	32.62	16.60	55.3	38 34.264	144 18.045	1.01
torq73	172	02/23/89	16:31:09	18.30	7.37	0.041	0.098	0.025	0.012	0.000	0.000	4144.0	32.76	16.75	56.1	38 34.095	144 18.316	0.89
torq73	173	02/23/89	16:34:11	18.14	7.02	0.042	0.096	0.025	0.014	0.000	0.000	4068.3	32.83	16.84	55.5	38 34.033	144 18.406	0.94
torq73	174	02/23/89	16:35:13	18.14	7.39	0.044	0.101	0.025	0.015	0.000	0.000	4068.3	32.90	16.84	56.6	38 33.878	144 18.673	0.93
torq73	175	02/23/89	16:38:16	18.08	6.90	0.040	0.094	0.027	0.015	0.000	0.000	4085.8	33.11	17.09	55.9	38 33.815	144 18.765	0.96
torq73	176	02/23/89	16:39:17	18.05	7.24	0.042	0.098	0.025	0.018	0.000	0.000	4085.8	33.04	17.02	56.1	38 33.628	144 19.050	0.92
torq73	177	02/23/89	16:42:20	17.83	6.80	0.040	0.094	0.027	0.016	0.000	0.000	4017.3	33.04	17.09	55.9	38 33.578	144 19.136	0.98
torq73	178	02/23/89	16:43:21	17.92	7.12	0.034	0.091	0.024	0.016	0.000	0.000	4017.3	33.25	17.24	56.1	38 33.415	144 19.404	0.81
torq73	179	02/23/89	16:46:24	18.05	6.72	0.039	0.097	0.025	0.017	0.000	0.000	4029.5	33.25	17.19	55.7	38 33.353	144 19.490	0.94
torq73	180	02/23/89	16:47:25	17.89	7.02	0.036	0.096	0.024	0.016	0.000	0.000	4029.5	33.25	17.21	55.1	38 33.186	144 19.750	0.85
torq73	181	02/23/89	16:50:28	17.99	6.67	0.037	0.099	0.025	0.018	0.000	0.000	4013.7	33.25	17.22	55.5	38 33.116	144 19.847	0.92
torq73	182	02/23/89	16:51:30	18.03	6.97	0.039	0.100	0.025	0.016	0.000	0.000	3969.8	33.25	17.20	55.0	38 32.941	144 20.099	0.91
torq73	183	02/23/89	16:54:32	17.87	6.67	0.038	0.099	0.024	0.013	0.000	0.000	4001.3	33.18	17.18	55.9	38 32.872	144 20.184	0.92
torq73	184	02/23/89	16:55:34	17.90	6.97	0.038	0.103	0.024	0.017	0.000	0.000	4038.4	33.18	17.09	55.9	38 32.697	144 20.435	0.88
torq73	185	02/23/89	16:58:35	18.08	6.65	0.038	0.096	0.025	0.018	0.000	0.000	4024.1	33.04	17.05	56.1	38 32.637	144 20.519	0.94
torq73	186	02/23/89	16:59:38	18.01	6.98	0.039	0.095	0.024	0.018	0.000	0.000	4034.6	33.04	17.03	55.2	38 32.451	144 20.788	0.89
torq73	187	02/23/89	17:02:40	17.88	6.61	0.038	0.094	0.025	0.020	0.000	0.008	3965.9	33.39	17.38	55.7	38 32.389	144 20.870	1.06
torq73	188	02/23/89	17:03:43	17.79	6.93	0.040	0.101	0.024	0.017	0.000	0.000	3956.1	33.39	17.40	56.7	38 32.215	144 21.119	0.92
torq73	189	02/23/89	17:06:45	18.24	6.60	0.039	0.095	0.025	0.018	0.004	0.007	3975.3	33.32	17.21	56.1	38 32.180	144 21.215	1.12
torq73	190	02/23/89	17:07:46	18.35	6.94	0.040	0.097	0.027	0.020	0.000	0.000	4025.7	33.32	17.36	56.3	38 32.111	144 21.555	0.96
torq73	191	02/23/89	17:10:54	18.52	6.75	0.038	0.099	0.017	0.024	0.000	0.000	3996.2	33.60	17.59	56.3	38 32.099	144 21.645	0.81
torq73	192	02/23/89	17:11:49	18.61	7.17	0.039	0.103	0.025	0.017	0.000	0.000	3973.0	33.74	17.68	55.7	38 32.021	144 21.993	0.89
torq73	193	02/23/89	17:14:58	18.60	6.85	0.038	0.101	0.026	0.013	0.000	0.000	3967.8	33.74	17.70	55.8	38 32.003	144 22.103	0.93
torq73	194	02/23/89	17:15:54	18.65	7.06	0.037	0.101	0.023	0.029	0.000	0.000	3987.9	33.74	17.71	55.9	38 31.938	144 22.451	0.84
torq73	195	02/23/89	17:19:02	18.36	6.58	0.038	0.100	0.025	0.030	0.000	0.005	3948.1	33.60	17.62	56.1	38 31.930	144 22.544	1.02
torq73	196	02/23/89	17:19:58	18.29	6.86	0.036	0.104	0.025	0.027	0.000	0.000	3948.1	33.67	17.64	55.9	38 31.860	144 22.890	0.88
torq73	197	02/23/89	17:23:08	18.78	6.52	0.036	0.100	0.021	0.028	0.000	0.006	4020.7	33.60	17.61	56.4	38 31.848	144 23.002	0.96
torq73	198	02/23/89	17:24:02	18.64	6.84	0.049	0.108	0.023	0.025	0.000	0.000	4020.7	33.67	17.64	55.5	38 31.795	144 23.364	1.04
torq73	199	02/23/89	17:27:16	18.43	6.58	0.036	0.100	0.025	0.029	0.000	0.000	4004.5	33.60	17.61	56.1	38 31.778	144 23.434	0.92
torq73	200	02/23/89	17:28:06	18.37	6.87	0.038	0.103	0.023	0.023	0.000	0.000	4004.5	33.60	25.09	56.6	38 31.719	144 23.796	0.88
torq73	201	02/23/89	17:31:20	18.31	6.58	0.037	0.101	0.024	0.027	0.000	0.005	3941.8	33.67	17.65	55.7	38 31.704	144 23.884	0.99
torq73	202	02/23/89	17:32:11	18.45	6.87	0.036	0.101	0.024	0.025	0.000	0.000	3941.8	33.67	17.66	55.7	38 31.642	144 24.230	0.87
torq73	203	02/23/89	17:35:28	18.34	6.59	0.036	0.100	0.026	0.030	0.000	0.000	3926.4	33.67	17.66	55.7	38 31.628	144 24.318	0.93
torq73	204	02/23/89	17:36:14	18.40	6.87	0.038	0.102	0.025	0.027	0.000	0.000	3926.4	33.67	17.69	56.5	38 31.527	144 24.752	0.91
torq73	205	02/23/89	17:39:32	18.31	6.53	0.036	0.098	0.025	0.027	0.000	0.000	3977.6	33.74	17.69	56.3	38 31.514	144 24.825	0.93
torq73	206	02/23/89	17:40:19	18.33	6.85	0.039	0.102	0.027	0.028	0.000	0.000	3977.6	33.74	17.69	55.2	38 31.451	144 25.192	0.95
torq73	207	02/23/89	17:43:36	18.36	6.53	0.035	0.101	0.023	0.029	0.000	0.000	3962.3	33.74	17.69	55.2	38 31.431	144 25.283	0.88
torq73	208	02/23/89	17:44:23	18.28	6.85	0.039	0.102	0.023	0.027	0.000	0.000	3933.8	33.74	17.70	56.3	38 31.382	144 25.648	0.90
torq73	209	02/23/89	17:47:40	18.26	6.54	0.037	0.103	0.018	0.028	0.000	0.005	4027.6	33.67	17.67	56.3	38 31.376	144 25.723	0.91
torq73	210	02/23/89	17:48:27	18.26	6.82	0.035	0.103	0.023	0.026	0.000	0.000	3951.8	33.74	17.67	55.9	38 31.319	144 26.085	0.84
torq73	211	02/23/89	17:51:45	18.22	6.52	0.035	0.099	0.024	0.029	0.000	0.000	3955.8	33.74	17.68	55.4	38 31.295	144 26.179	0.90
torq73	212	02/23/89	17:52:31	18.15	6.80	0.039	0.104	0.024	0.030	0.000	0.000	4020.0	33.74	17.70	55.4	38 31.241	144 26.526	0.92

line	shot	date	time	thc	methane	ethane	ethylene	propane	propylene	1butane	nbutane	CO2	salinity	temp(C)	depth(m)	latitude	longitude	% wetness
torq73	213	02/23/89	17:55:50	18.17	6.54	0.037	0.099	0.022	0.031	0.000	0.000	3955.2	33.74	17.72	55.9	38 31.220	144 26.622	0.89
torq73	214	02/23/89	17:56:35	18.19	6.82	0.036	0.098	0.022	0.026	0.000	0.000	3938.5	33.74	17.72	55.2	38 31.157	144 26.990	0.84
torq73	215	02/23/89	17:59:54	18.12	6.54	0.035	0.101	0.023	0.029	0.004	0.008	3900.5	33.74	17.68	55.5	38 31.156	144 27.025	1.06
torq73	216	02/23/89	18:00:39	18.05	6.83	0.034	0.099	0.023	0.024	0.000	0.000	3900.5	33.74	18.44	55.9	38 31.094	144 27.341	0.83
torq73	217	02/23/89	18:04:03	18.23	6.49	0.033	0.101	0.021	0.027	0.000	0.007	3956.3	33.67	17.65	54.8	38 31.068	144 27.526	0.93
torq73	218	02/23/89	18:04:43	18.39	6.77	0.036	0.101	0.024	0.029	0.000	0.000	3956.3	33.74	17.67	56.3	38 30.991	144 27.914	0.88
torq73	219	02/23/89	18:08:10	18.39	6.52	0.036	0.101	0.024	0.027	0.000	0.000	3980.4	33.74	17.72	55.7	38 30.995	144 27.971	0.91
torq73	220	02/23/89	18:08:48	18.64	6.73	0.032	0.098	0.021	0.024	0.000	0.000	3980.4	33.74	17.71	54.9	38 30.920	144 28.361	0.91
torq73	221	02/23/89	18:12:14	18.09	6.52	0.035	0.100	0.024	0.027	0.000	0.000	3927.8	33.74	18.10	55.2	38 30.902	144 28.440	0.90
torq73	222	02/23/89	18:12:51	18.16	6.74	0.026	0.071	0.010	0.019	0.000	0.000	3927.8	33.67	17.62	55.4	38 30.838	144 28.808	0.89
torq73	223	02/23/89	18:16:18	18.06	6.47	0.035	0.100	0.026	0.030	0.000	0.000	3905.8	33.53	17.47	55.4	38 30.824	144 28.885	0.93
torq73	224	02/23/89	18:16:55	18.14	6.75	0.025	0.070	0.017	0.020	0.000	0.000	3905.8	33.53	17.47	55.3	38 30.754	144 29.271	1.17
torq73	225	02/23/89	18:20:21	18.24	6.49	0.035	0.097	0.027	0.026	0.000	0.008	3949.9	33.53	17.51	55.2	38 30.742	144 29.326	1.07
torq73	226	02/23/89	18:20:59	18.12	6.70	0.033	0.083	0.015	0.029	0.000	0.000	3949.9	33.53	17.45	55.0	38 30.671	144 29.716	0.90
torq73	227	02/23/89	18:24:27	18.12	6.49	0.035	0.098	0.024	0.024	0.000	0.009	3940.0	33.39	17.39	55.0	38 30.657	144 29.791	1.04
torq73	228	02/23/89	18:25:03	18.10	6.78	0.025	0.077	0.020	0.017	0.000	0.000	3940.0	33.39	17.30	55.2	38 30.589	144 30.179	1.26
torq73	229	02/23/89	18:28:34	17.96	6.53	0.034	0.094	0.023	0.020	0.000	0.000	3931.1	33.39	17.40	55.0	38 30.579	144 30.240	0.87
torq73	230	02/23/89	18:29:07	17.96	6.82	0.039	0.099	0.027	0.021	0.000	0.000	3931.1	33.46	17.41	55.8	38 30.514	144 30.623	0.96
torq73	231	02/23/89	18:32:38	18.01	6.54	0.033	0.092	0.023	0.020	0.000	0.000	3945.6	33.46	17.39	55.9	38 30.500	144 30.698	0.85
torq73	232	02/23/89	18:33:12	18.01	6.80	0.032	0.078	0.020	0.018	0.000	0.000	3945.6	33.46	17.39	55.9	38 30.433	144 31.080	0.93
torq73	233	02/23/89	18:36:43	18.02	6.54	0.036	0.094	0.023	0.018	0.000	0.006	4003.0	33.53	17.42	55.4	38 30.424	144 31.137	0.98
torq73	234	02/23/89	18:37:16	17.97	6.82	0.033	0.083	0.020	0.017	0.000	0.000	3985.8	33.46	17.39	55.0	38 30.359	144 31.542	1.02
torq73	235	02/23/89	18:40:52	17.89	6.52	0.033	0.095	0.023	0.021	0.000	0.000	3928.4	33.46	17.43	55.2	38 30.353	144 31.578	0.85
torq73	236	02/23/89	18:41:21	17.89	6.81	0.037	0.098	0.023	0.024	0.000	0.000	3964.9	33.46	17.45	54.9	38 30.283	144 31.981	0.87
torq73	237	02/23/89	18:44:56	19.03	6.48	0.036	0.092	0.020	0.019	0.000	0.000	3978.5	33.46	17.40	55.7	38 30.276	144 32.016	0.86
torq73	238	02/23/89	18:45:24	18.84	6.78	0.035	0.095	0.024	0.017	0.000	0.000	3956.5	33.53	17.51	55.9	38 30.202	144 32.421	0.86
torq73	239	02/23/89	18:49:01	18.40	6.46	0.036	0.095	0.024	0.022	0.000	0.005	4042.8	33.60	17.61	55.7	38 30.191	144 32.476	1.00
torq73	240	02/23/89	18:49:28	18.51	6.74	0.035	0.094	0.023	0.019	0.000	0.000	4042.8	33.60	17.56	55.9	38 30.130	144 32.873	0.85
torq73	241	02/23/89	18:53:09	18.39	6.38	0.038	0.100	0.022	0.023	0.000	0.000	4047.9	33.74	17.71	55.4	38 30.122	144 32.928	0.93
torq73	242	02/23/89	18:53:32	18.47	6.71	0.038	0.102	0.023	0.020	0.000	0.000	4047.9	33.60	17.70	55.9	38 30.047	144 33.325	0.90
torq73	243	02/23/89	18:57:13	18.44	6.43	0.038	0.100	0.028	0.025	0.000	0.000	4101.9	33.74	17.69	55.3	38 30.042	144 33.360	1.02
torq73	244	02/23/89	18:57:36	18.49	6.76	0.040	0.110	0.026	0.021	0.000	0.000	4101.9	33.74	17.70	55.7	38 29.969	144 33.708	0.97
torq73	245	02/23/89	19:01:17	18.16	6.47	0.038	0.103	0.024	0.023	0.000	0.000	4031.5	33.60	17.68	55.9	38 29.962	144 33.745	0.95
torq73	246	02/23/89	19:01:40	18.16	6.77	0.036	0.105	0.022	0.025	0.000	0.000	4031.5	33.60	17.63	55.7	38 29.890	144 34.160	0.85
torq73	247	02/23/89	19:05:22	18.17	6.47	0.037	0.101	0.025	0.025	0.000	0.000	4003.8	33.60	17.57	55.8	38 29.886	144 34.199	0.95
torq73	248	02/23/89	19:05:44	18.19	6.80	0.040	0.113	0.027	0.027	0.000	0.000	4003.8	33.60	17.51	55.9	38 29.821	144 34.601	0.98
torq73	249	02/23/89	19:09:26	18.18	6.47	0.038	0.101	0.019	0.023	0.000	0.000	4048.4	33.53	17.53	55.4	38 29.816	144 34.636	0.87
torq73	250	02/23/89	19:09:48	18.24	6.79	0.038	0.104	0.025	0.027	0.000	0.000	4048.4	33.32	17.33	55.1	38 29.747	144 35.035	0.92
torq73	251	02/23/89	19:13:30	18.08	6.51	0.038	0.102	0.029	0.019	0.000	0.000	3978.4	33.32	17.35	55.2	38 29.742	144 35.072	1.02
torq73	252	02/23/89	19:13:52	18.08	6.84	0.040	0.107	0.025	0.014	0.000	0.000	3978.4	33.46	17.48	55.3	38 29.669	144 35.488	0.94
torq73	253	02/23/89	19:17:34	18.05	6.49	0.036	0.102	0.016	0.020	0.000	0.006	4020.4	33.25	17.24	55.4	38 29.662	144 35.528	0.89
torq73	254	02/23/89	19:17:56	18.05	6.82	0.038	0.103	0.018	0.018	0.000	0.000	4020.4	33.18	17.17	55.6	38 29.598	144 35.925	0.81
torq73	255	02/23/89	19:21:40	17.99	6.46	0.038	0.102	0.025	0.018	0.000	0.009	4029.4	33.18	17.01	55.2	38 29.587	144 35.964	1.10
torq73	256	02/23/89	19:22:00	17.99	6.81	0.038	0.102	0.023	0.018	0.000	0.000	4029.4	32.76	16.68	55.2	38 29.587	144 35.964	0.89
torq73	257	02/23/89	19:25:48	18.01	6.53	0.039	0.102	0.028	0.016	0.000	0.005	4143.7	33.11	17.10	55.6	38 29.480	144 36.414	1.09
torq73	258	02/23/89	19:26:04	18.01	6.89	0.038	0.100	0.018	0.016	0.000	0.000	4143.7	32.90	16.76	55.4	38 29.480	144 36.414	0.81
torq73	259	02/23/89	19:29:54	18.35	6.64	0.040	0.098	0.027	0.015	0.000	0.005	4063.2	32.20	16.11	55.3	38 29.410	144 36.859	1.07
torq73	260	02/23/89	19:30:09	18.05	7.02	0.040	0.099	0.024	0.015	0.000	0.000	4121.9	32.34	16.17	55.4	38 29.410	144 36.859	0.90
torq73	261	02/23/89	19:34:01	18.23	6.64	0.040	0.101	0.027	0.016	0.000	0.000	4194.8	32.27	16.18	54.8	38 29.348	144 37.328	1.00
torq73	262	02/23/89	19:34:12	18.23	7.02	0.041	0.103	0.026	0.016	0.000	0.000	4194.8	32.20	16.17	55.2	38 29.348	144 37.328	0.95
torq73	263	02/23/89	19:38:06	18.23	6.73	0.040	0.101	0.029	0.014	0.000	0.008	4174.2	31.92	15.83	54.9	38 29.274	144 37.778	1.13
torq73	264	02/23/89	19:38:17	18.30	7.16	0.059	0.113	0.025	0.014	0.000	0.000	4174.2	31.92	15.77	55.0	38 29.274	144 37.778	1.16

TORQUAY SUBBASIN

EDITION OF 1990/02/08



AUSTRALIAN NATIONAL SPHEROID
UNIVERSAL MERCATOR (SPHERE)
WITH NATURAL SCALE CORRECT
AT LATITUDE 33 00

COMPUTER DRAWN AT THE DIVISION OF
MARINE GEOSCIENCES & PETROLEUM GEOLOGY



TORQUAY SUBBASIN

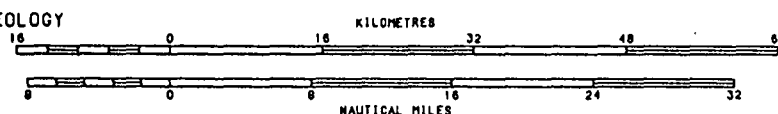
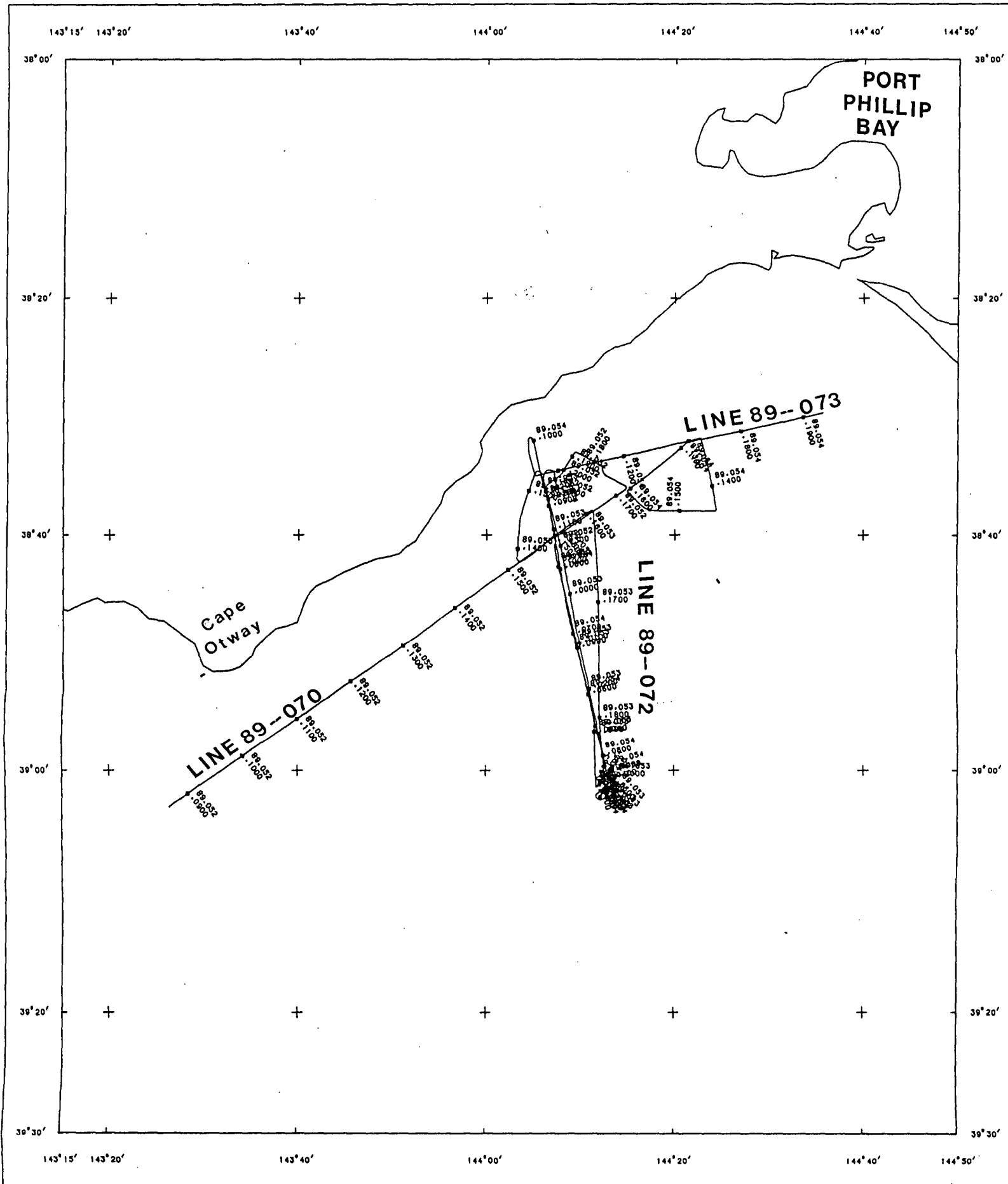


Figure 2. Map showing the ship's track during all types of data collection within the Torquay Sub-Basin. Times are GMT.

TORQUAY SUBBASIN

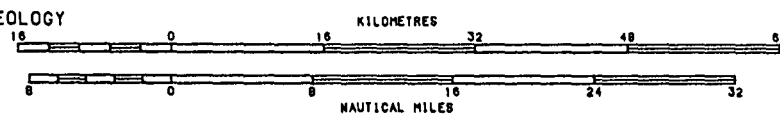
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EDITION OF 1990/02/08



AUSTRALIAN NATIONAL SPHEROID
UNIVERSAL MERCATOR (SPHERE)
WITH NATURAL SCALE CORRECT
AT LATITUDE 33 00

COMPUTER DRAWN AT THE DIVISION OF
MARINE GEOSCIENCES & PETROLEUM GEOLOGY



TORQUAY SUBBASIN

TORQUAY SUB-BASIN:- ALL DATA

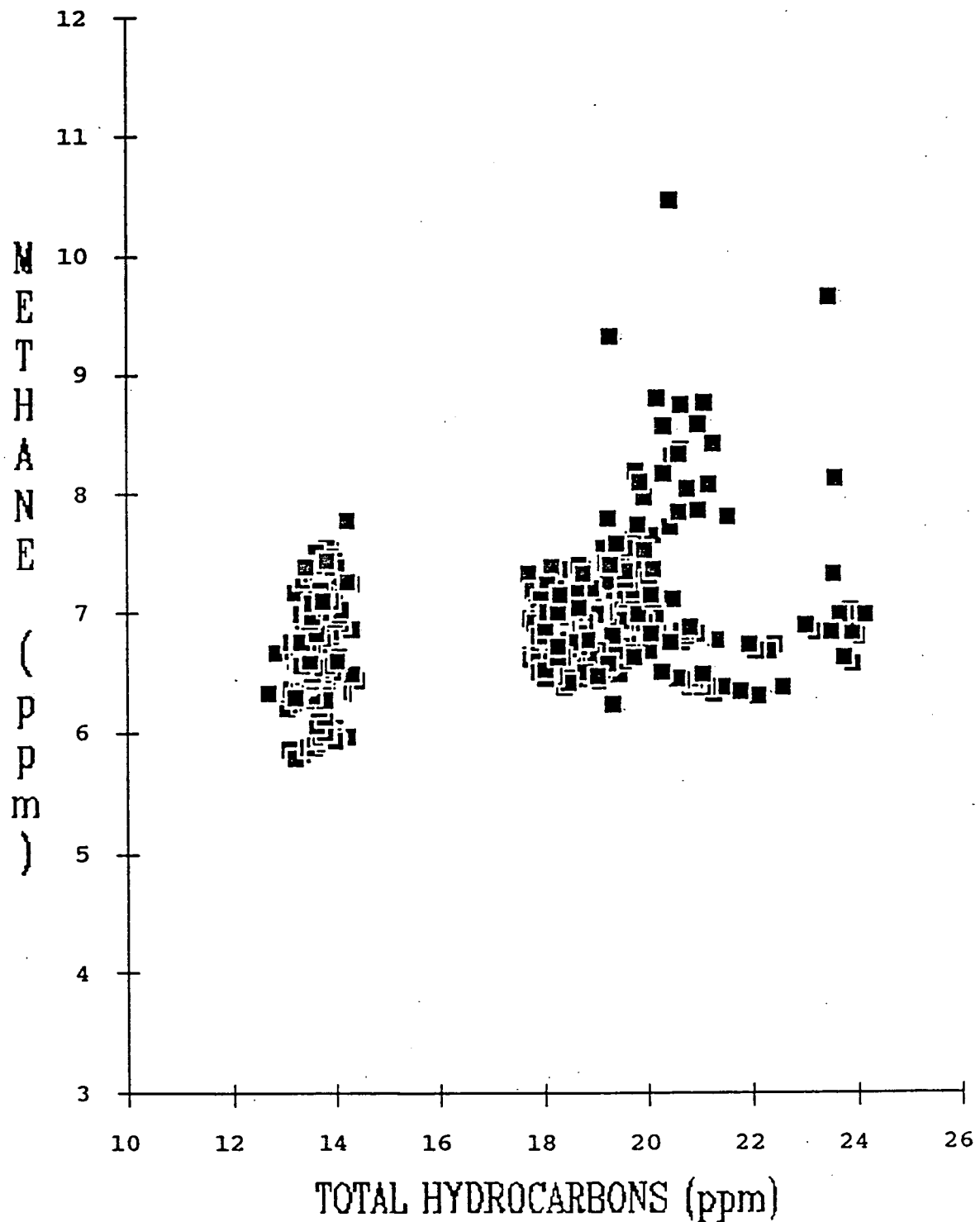


Figure 3. Cross-plot between the total hydrocarbon (THC) and methane concentrations for all DHD data collected in the Torquay Sub-Basin. Plot shows the positive relationship between the two variables.

TORQUAY SUB-BASIN:- ALL DATA

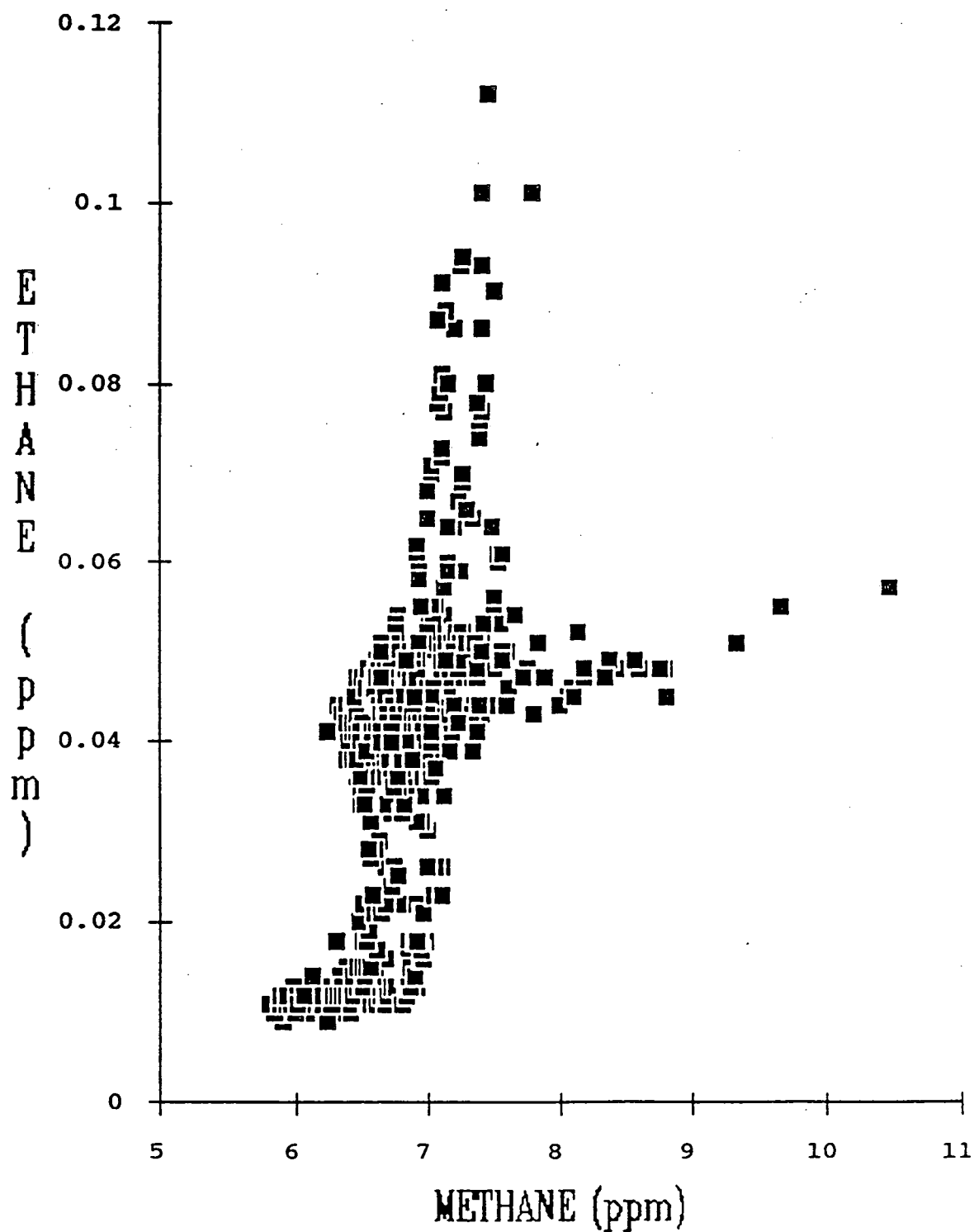


Figure 4. Cross-plot between the methane and ethane concentrations for all data collected in the Torquay Sub-Basin. Plot shows the positive relationship between the two variables.

TORQUAY SUB-BASIN:- ALL DATA

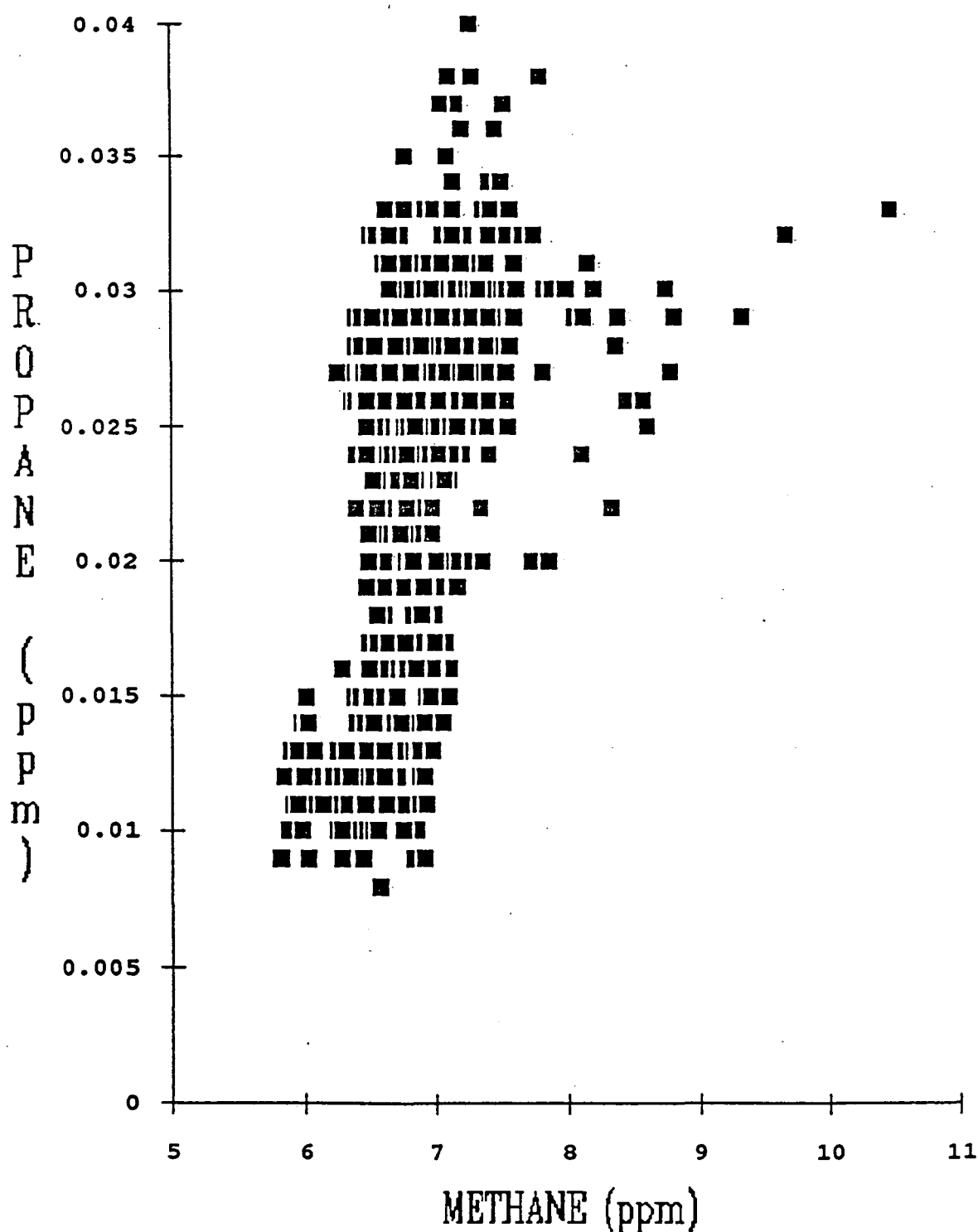


Figure 5. Cross-plot between the methane and propane concentrations for all data collected in the Torquay Sub-Basin. Plot shows the positive relationship between the two variables.

TORQUAY SUB-BASIN:- ALL DATA

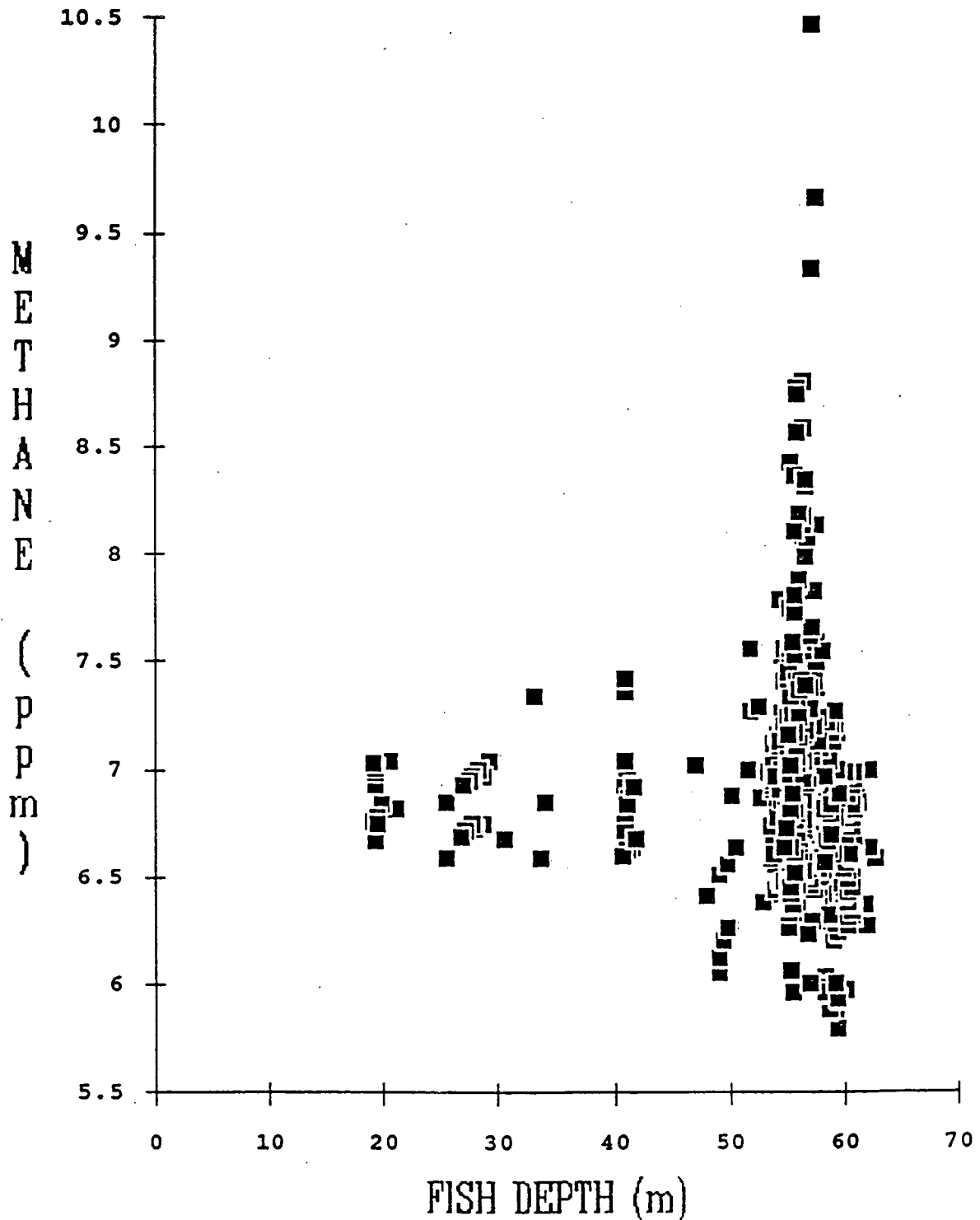


Figure 6. Methane concentration versus fish depth for all DHD data in the Torquay Sub-Basin. The methane concentrations are relatively constant over the depth range 20 to 50 m, indicating that the water column is relatively well mixed to that depth.

TORQUAY SUB-BASIN:- ALL DATA

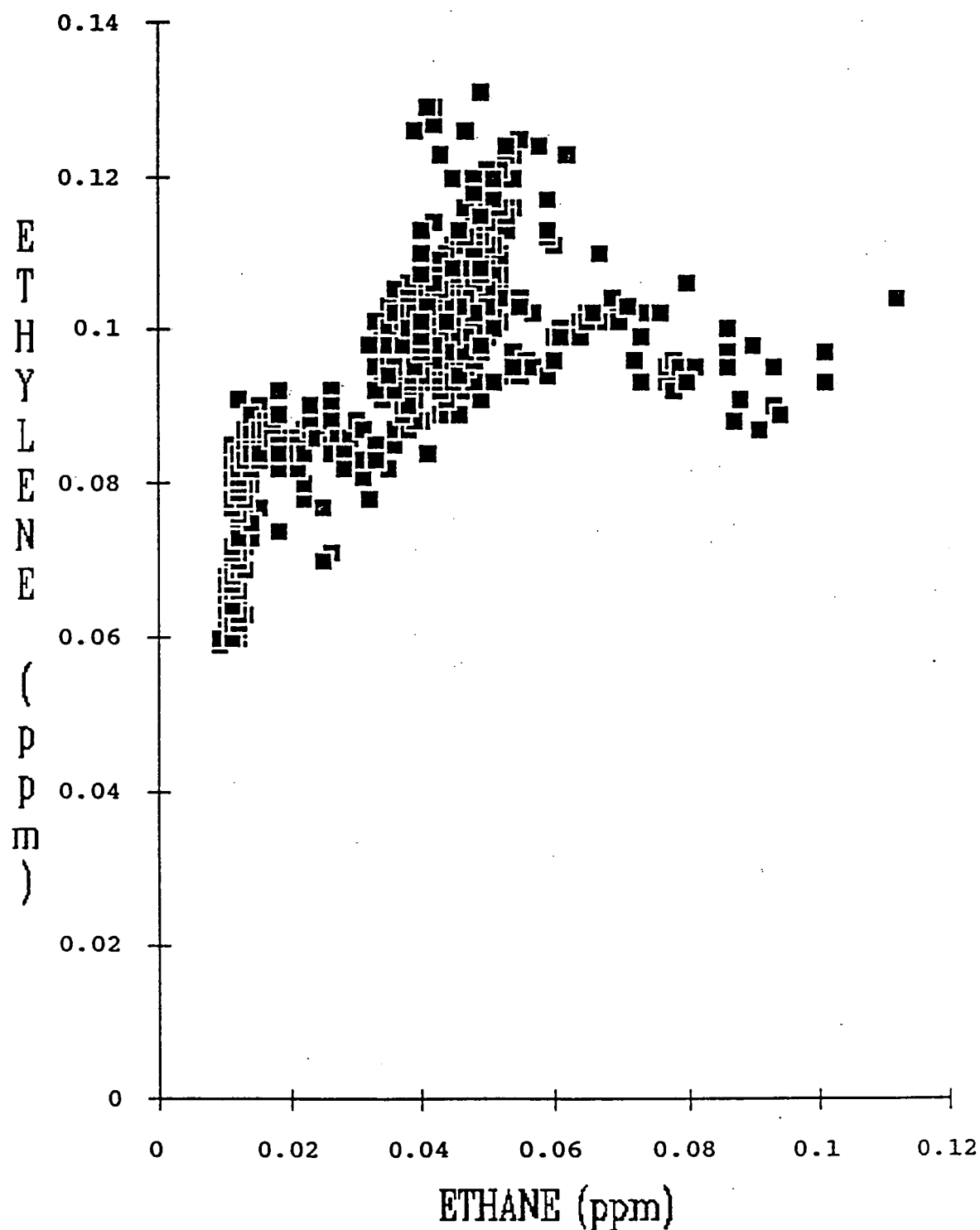


Figure 7. Ethane versus ethylene cross-plot for all DHD data from the Torquay Sub-Basin, showing a strong positive relationship between the two variables.

TORQUAY SUB-BASIN:- ALL DATA

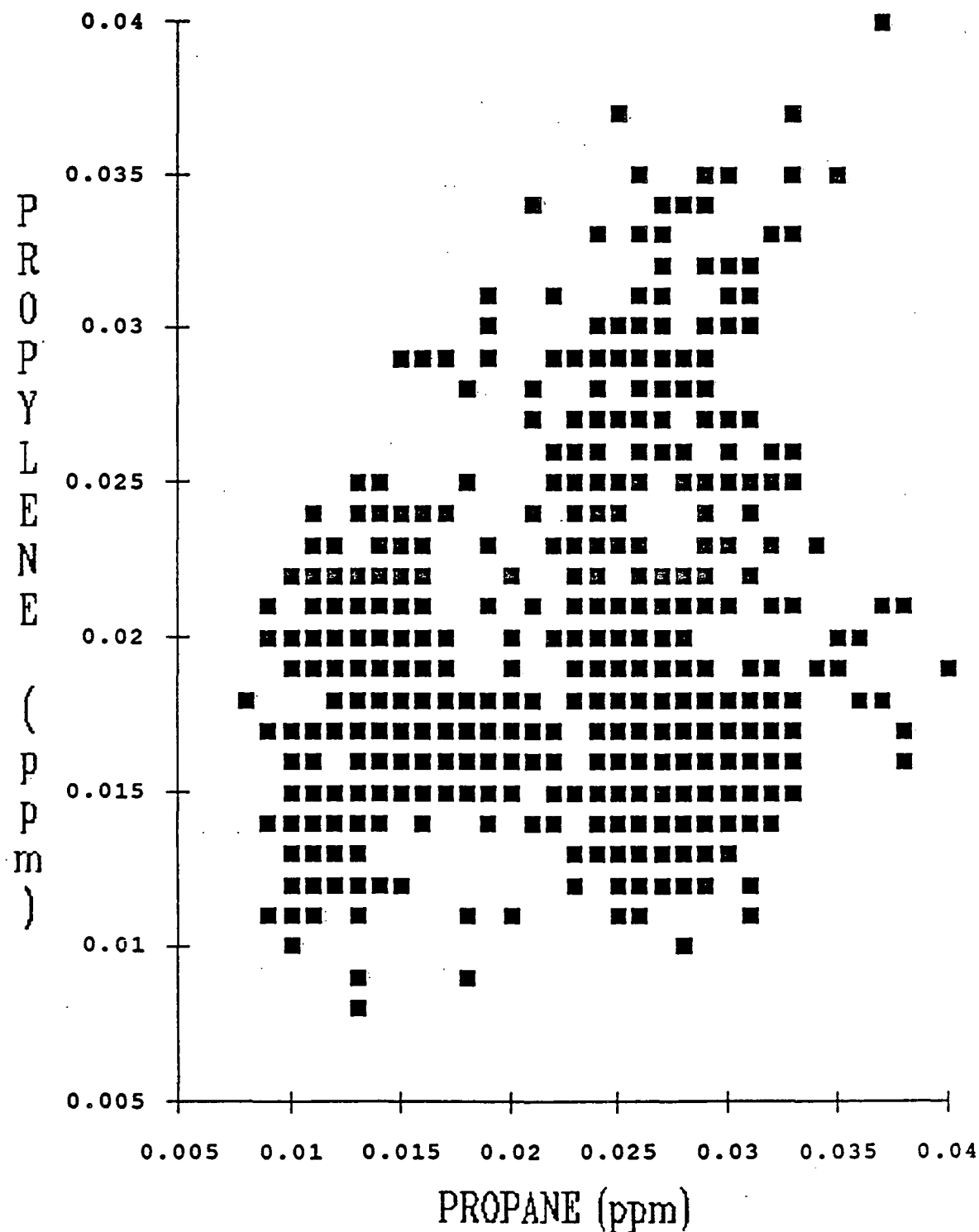


Figure 8. Propane versus propylene cross-plot for all DHD data from the Torquay Sub-Basin, showing a strong positive relationship between the two variables.

TORQUAY SUB-BASIN:- ALL DATA

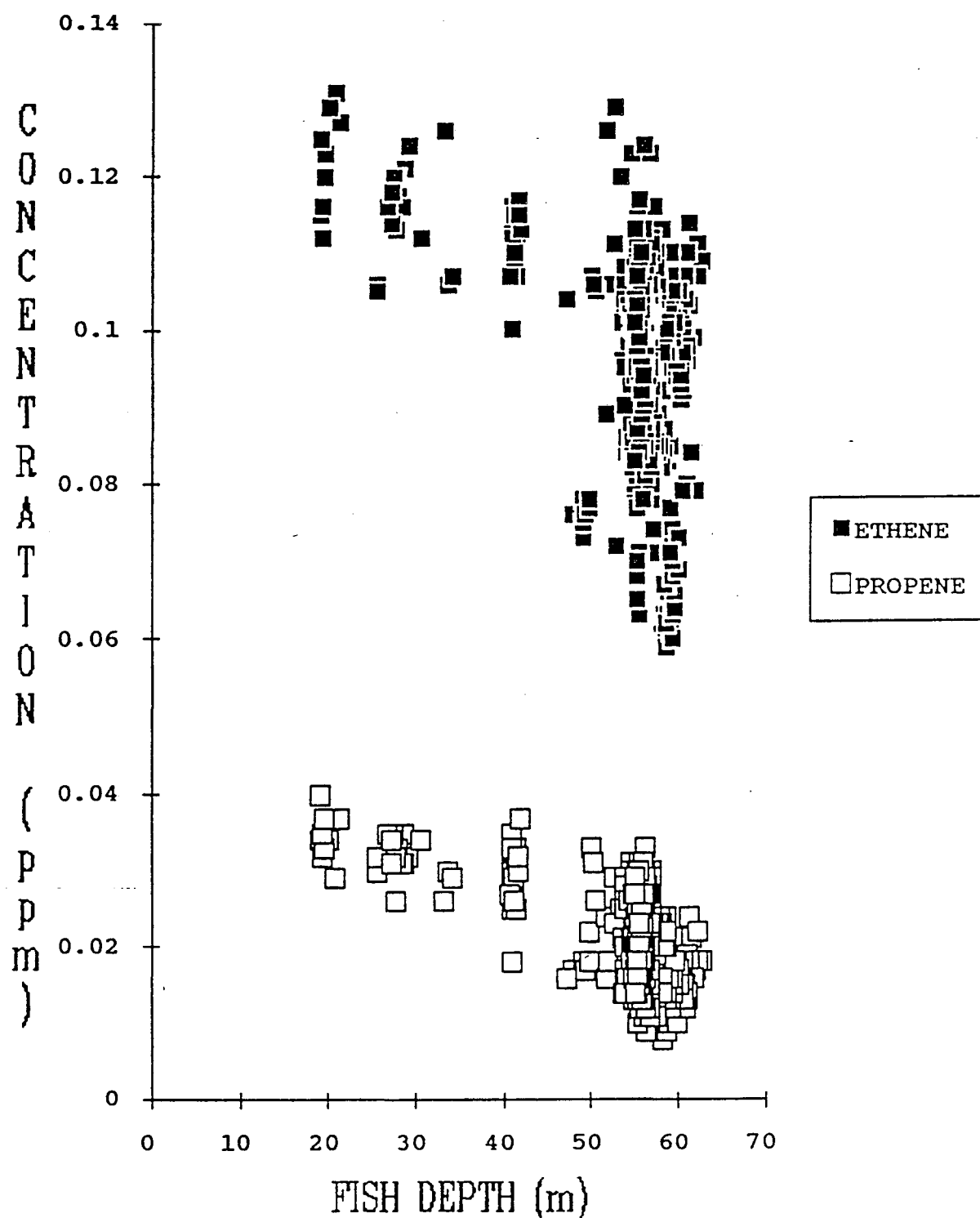


Figure 9. Ethylene and propylene concentrations plotted against fish depth for all DHD data in the Torquay Sub-Basin. Both decrease with increasing water depth, indicating that both are principally produced by photosynthetic organisms in the photic zone.

TORQUAY SUB-BASIN:- ALL DATA

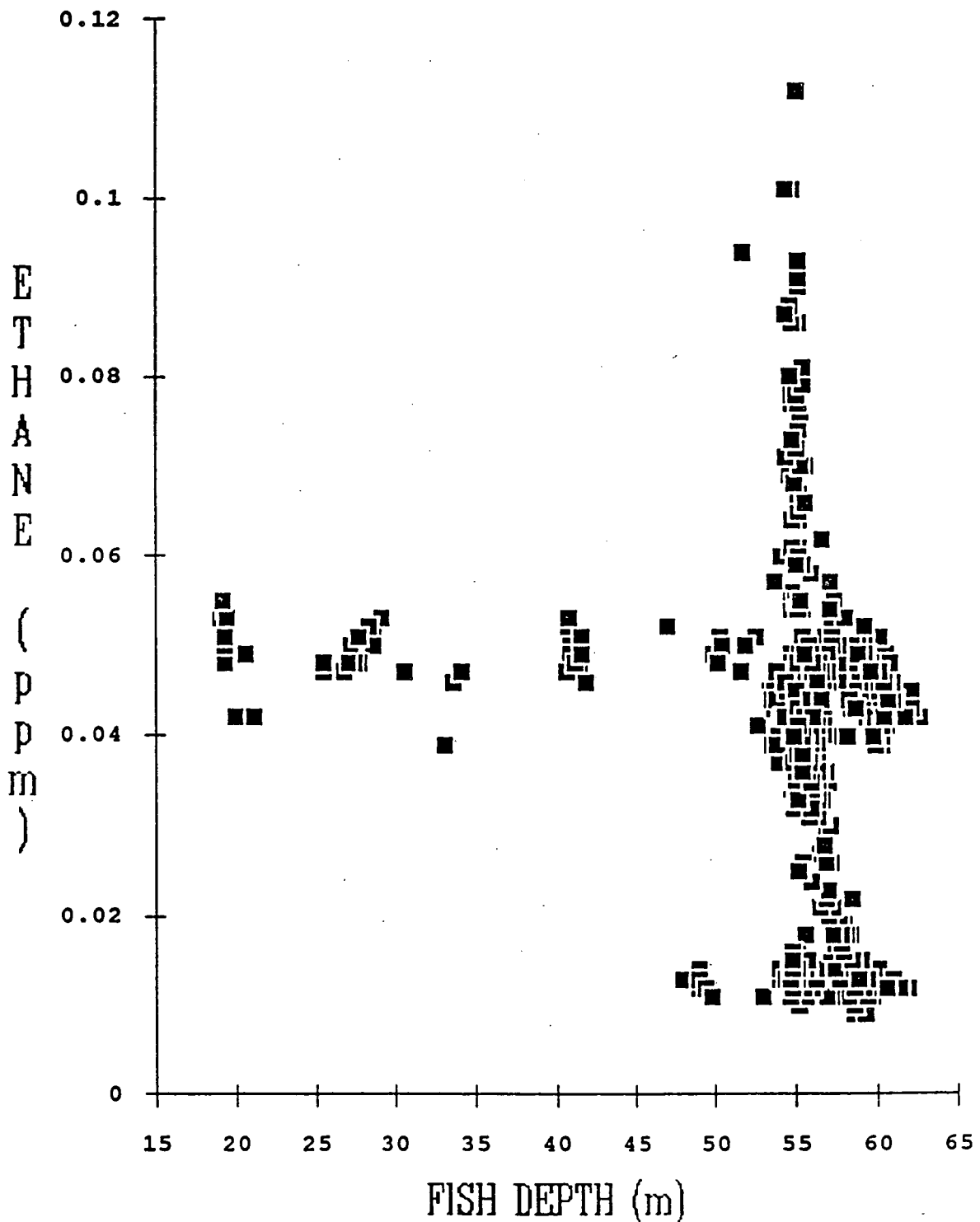


Figure 10. Ethane concentration versus fish depth for all DHD data in the Torquay Sub-Basin. The ethane concentrations are relatively constant over the depth range 20 to 50 m, indicating that the water column is relatively well mixed to that depth.

TORQUAY SUB-BASIN:- ALL DATA

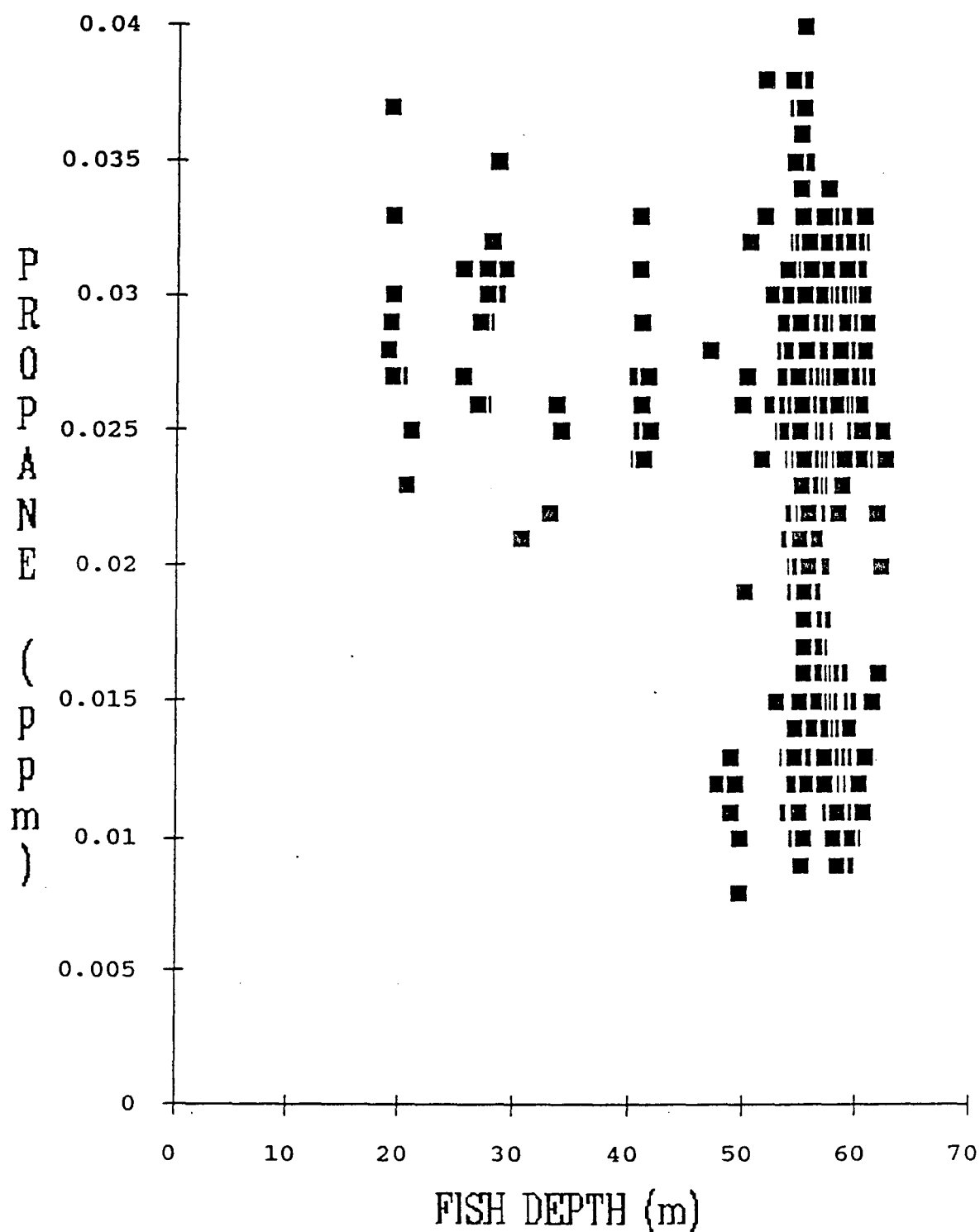


Figure 11. Propane concentration versus fish depth for all DHD data in the Torquay Sub-Basin. The propane concentrations are relatively constant over the depth range 20 to 50 m, indicating that the water column is relatively well mixed to that depth.

TORQUAY SUB-BASIN:- ALL DATA

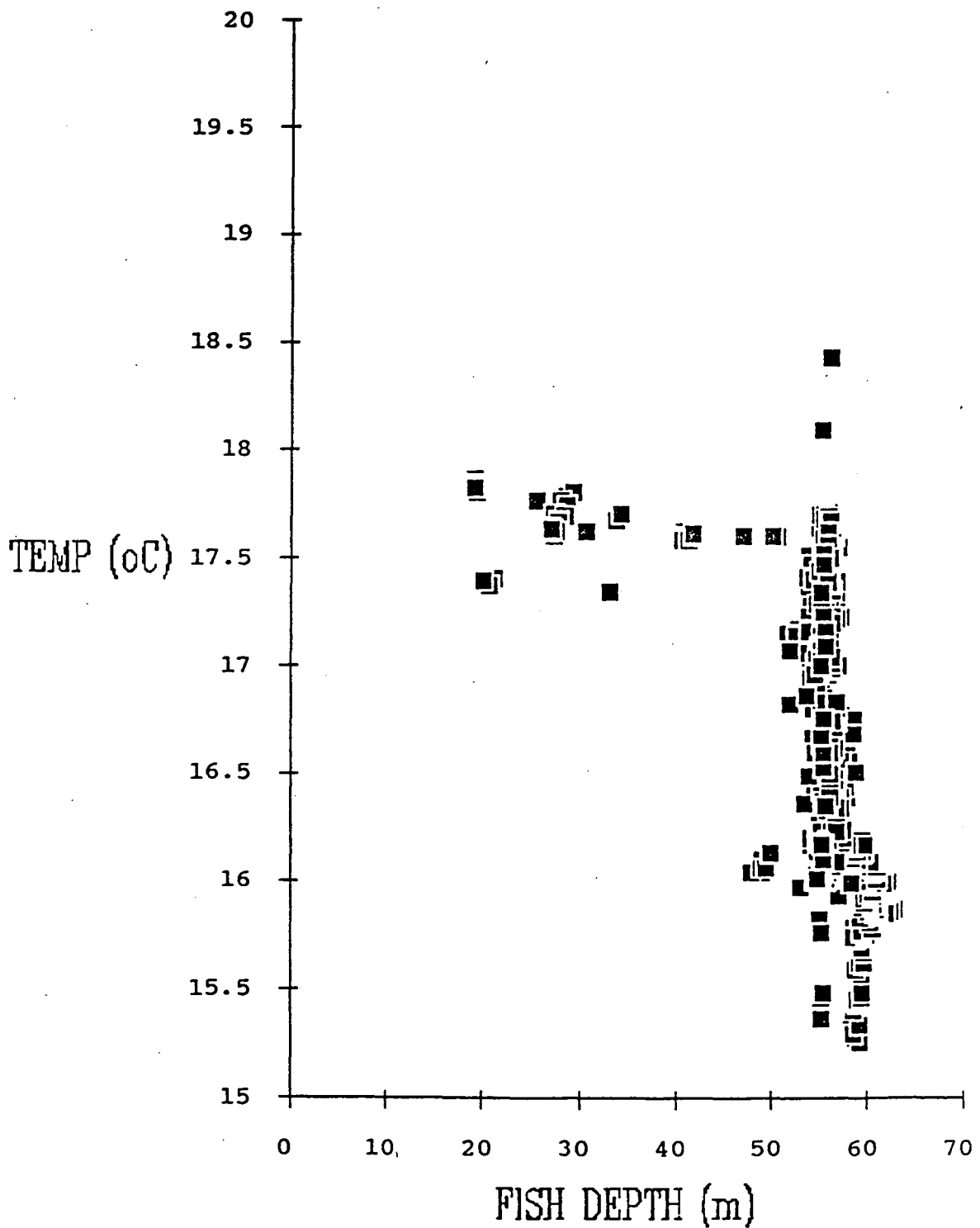


Figure 12. Water temperature versus fish depth for all DHD data in the Torquay Sub-Basin. The temperature is relatively constant over the depth range 20 to 50 m, indicating that the water column is relatively well mixed to that depth.

TORQUAY SUB-BASIN:- ALL DATA

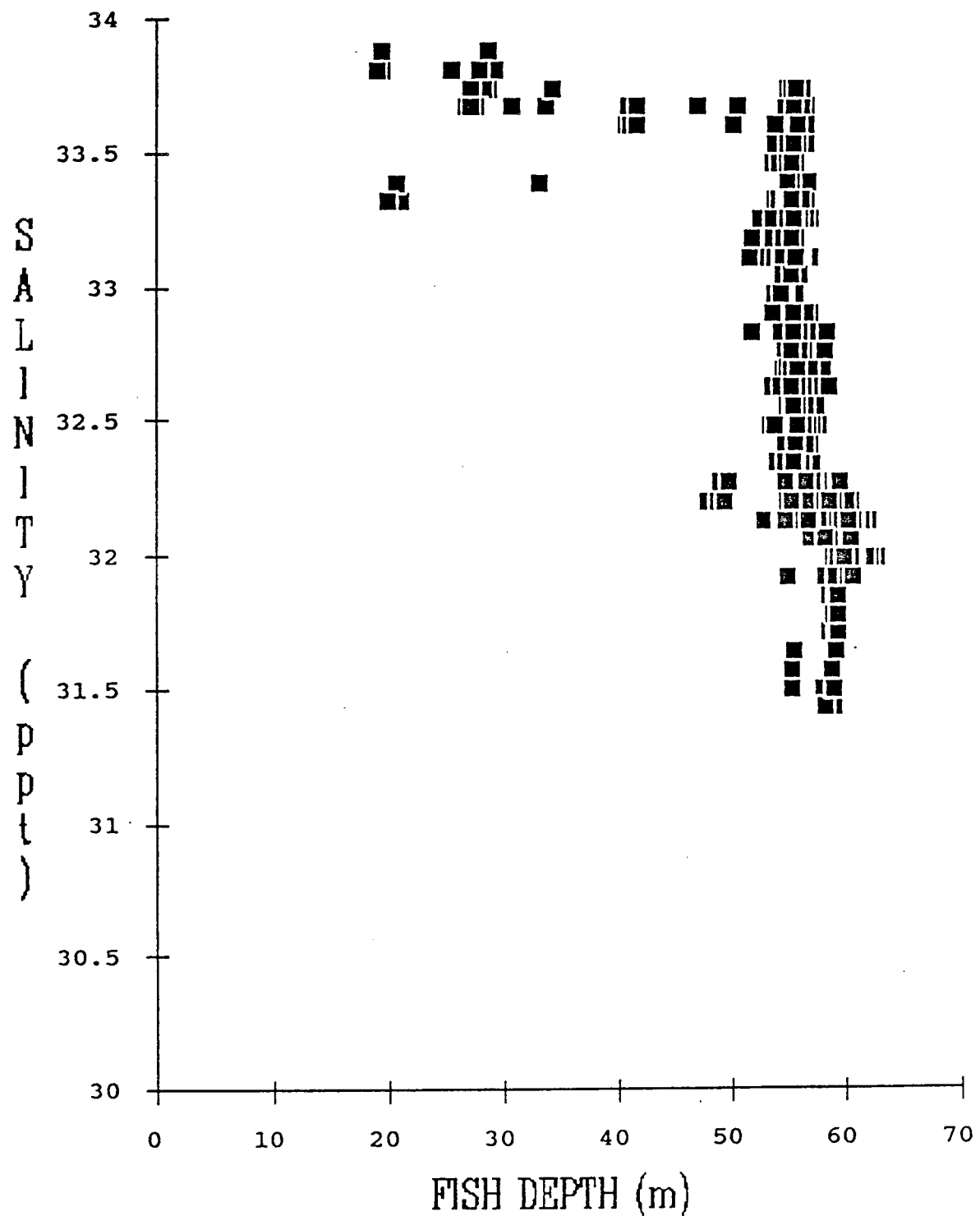


Figure 13. Salinity versus fish depth for all DHD data in the Torquay Sub-Basin. The salinity is relatively constant over the depth range 20 to 50 m, indicating that the water column is relatively well mixed to that depth.

TORQUAY SUB-BASIN:- LINE 70

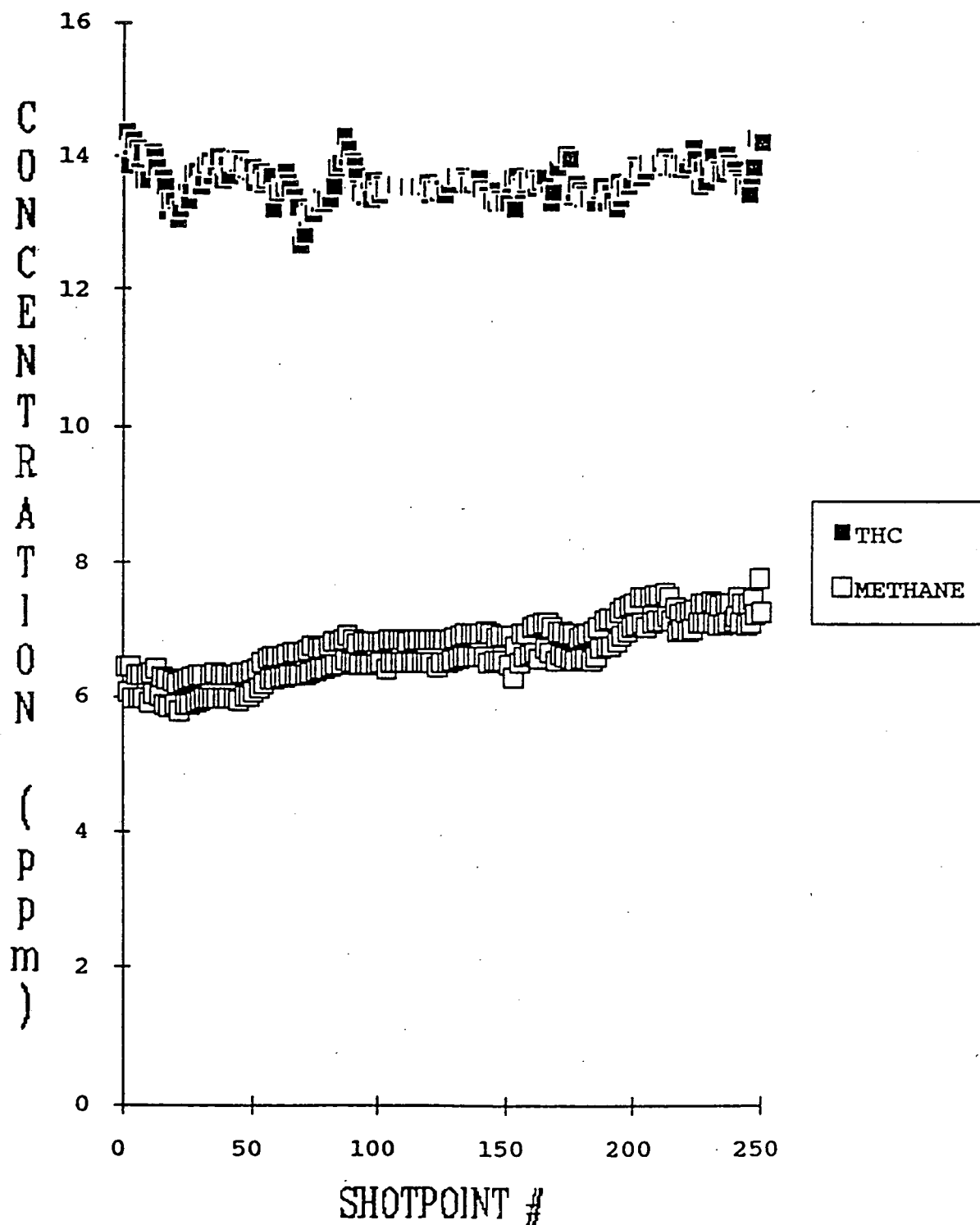


Figure 14. THC and methane DHD data versus shotpoint number along survey line 89/070, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 70

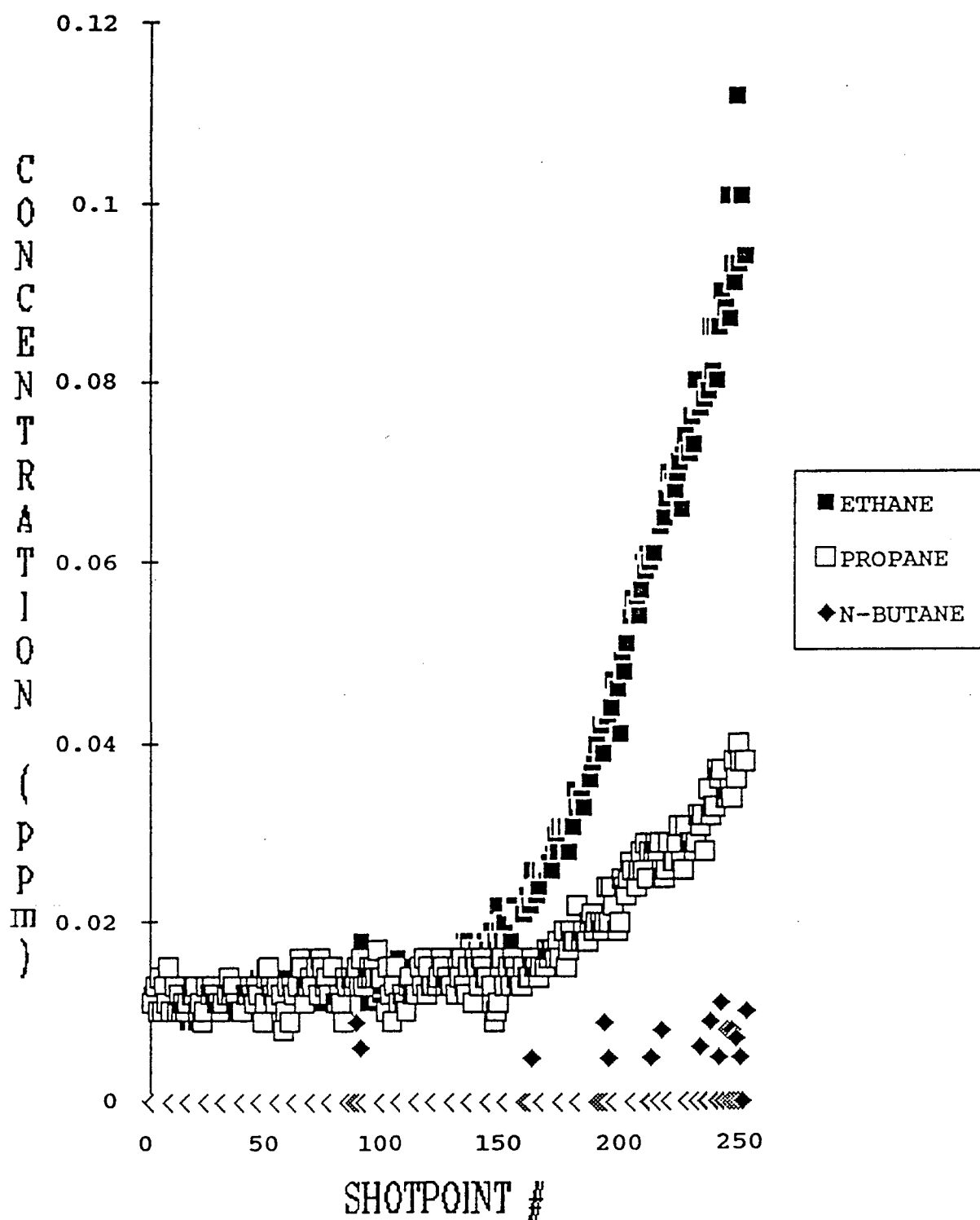


Figure 15. Ethane, propane and n-butane DHD concentrations versus shotpoint number along survey line 89/070, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 70

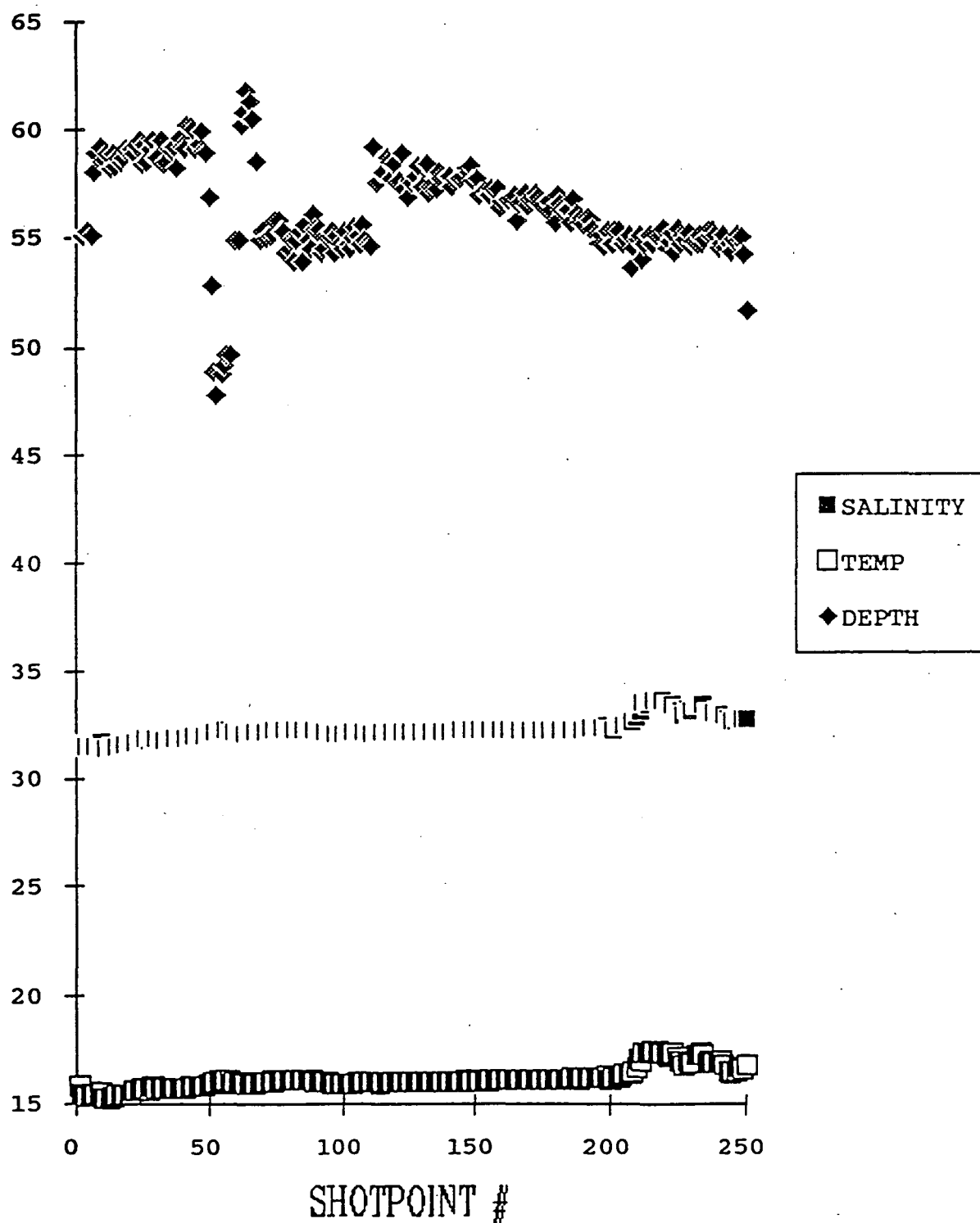


Figure 16. Salinity, water temperature and fish depth DHD data versus shotpoint number along survey line 89/070, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 70

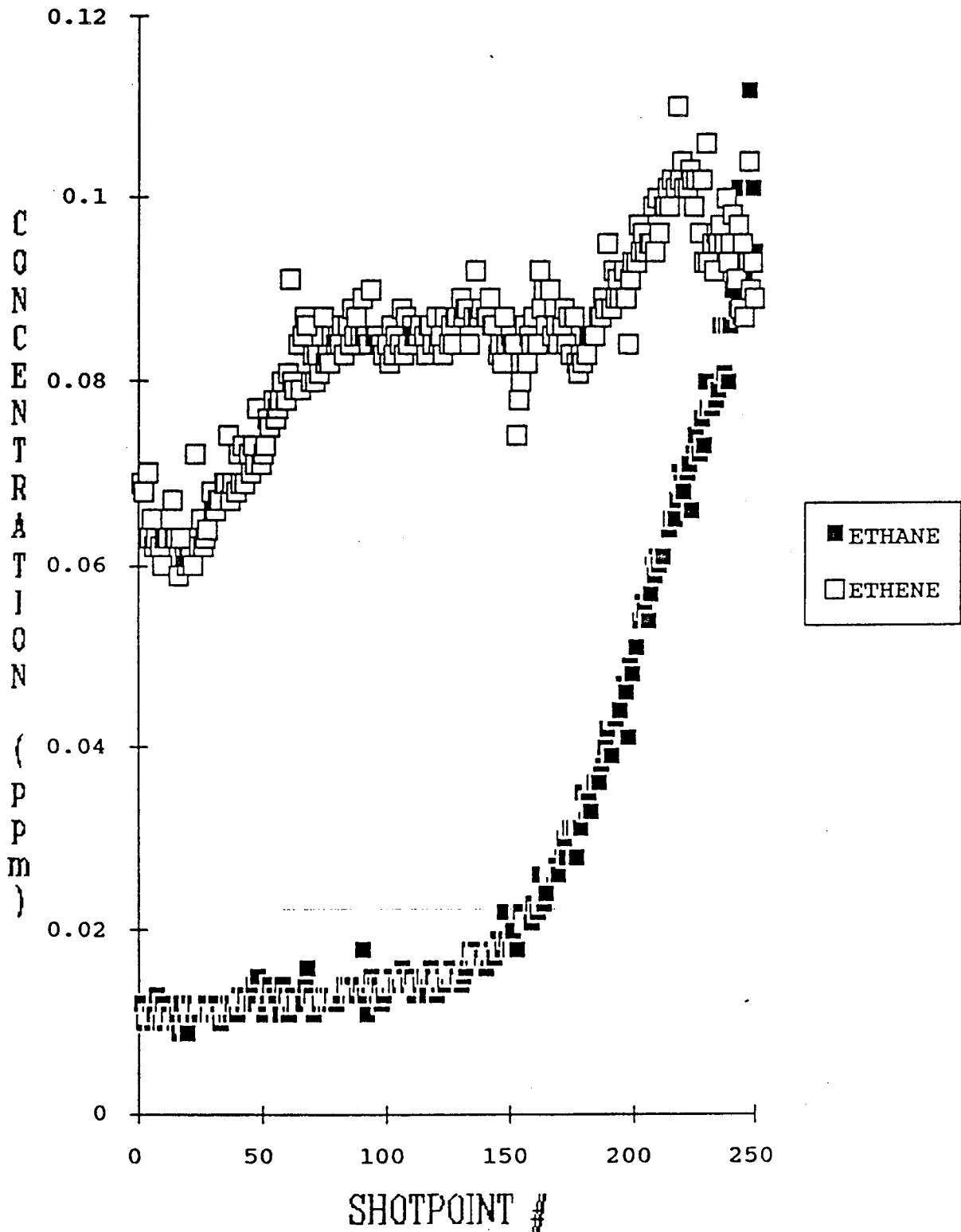


Figure 17. Ethane and ethylene DHD data versus shotpoint number along survey line 89/070, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 70

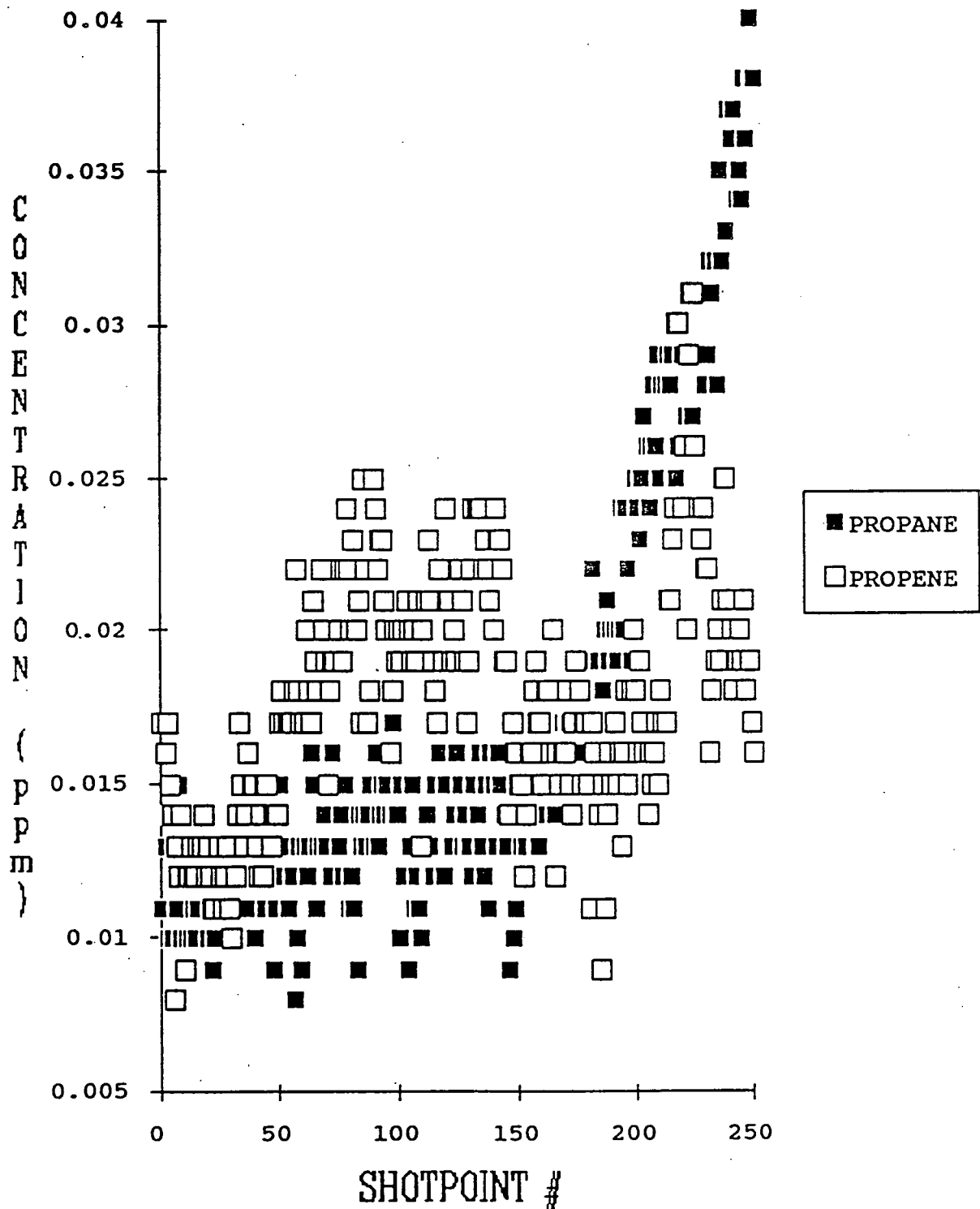


Figure 18. Propane and propylene DHD data versus shotpoint number along survey line 89/070, Torquay Sub-Basin.

LINE 72

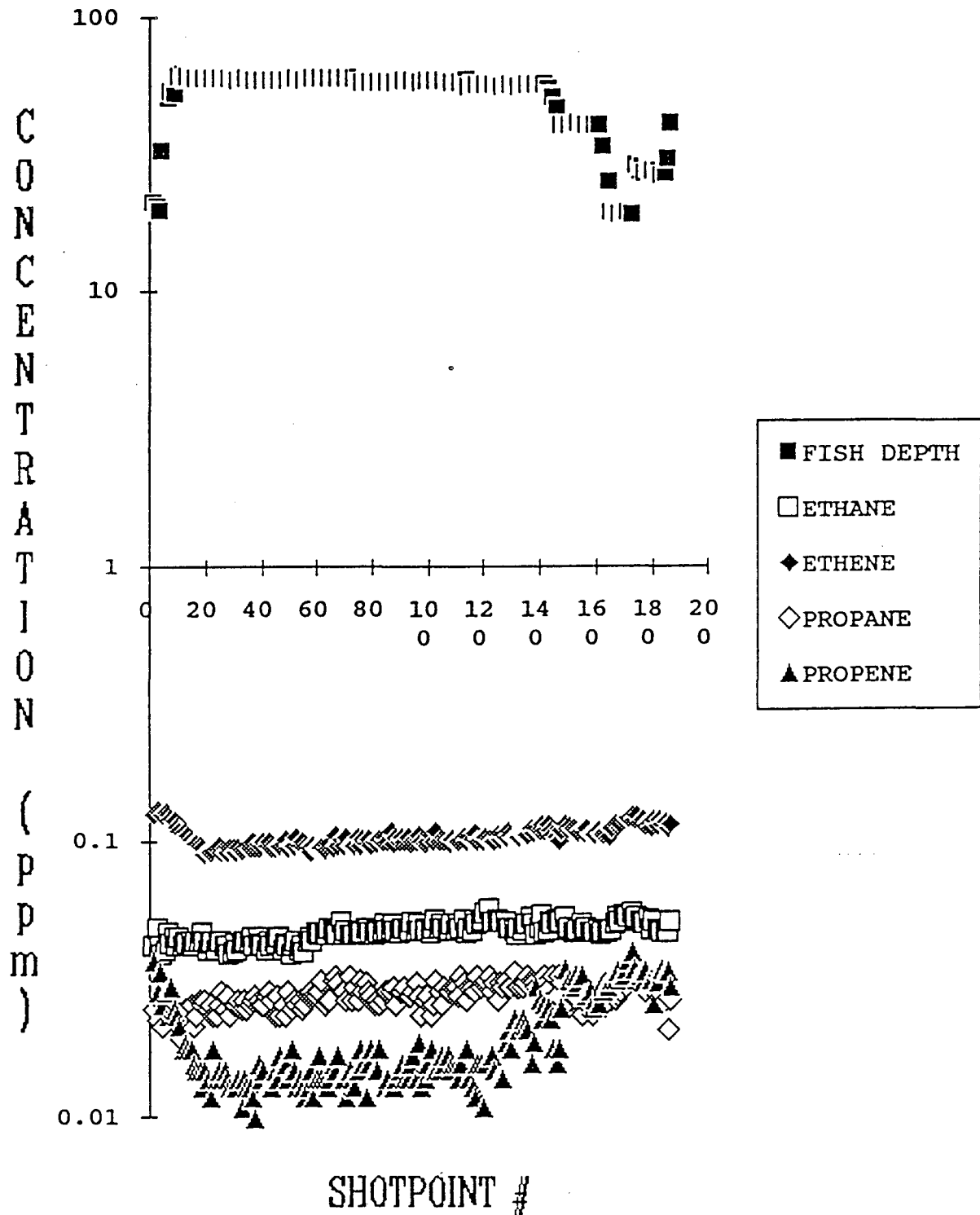


Figure 19. Fish depth and ethane-ethylene and propane-propylene concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin.

Seafloor Depression

LINE 72

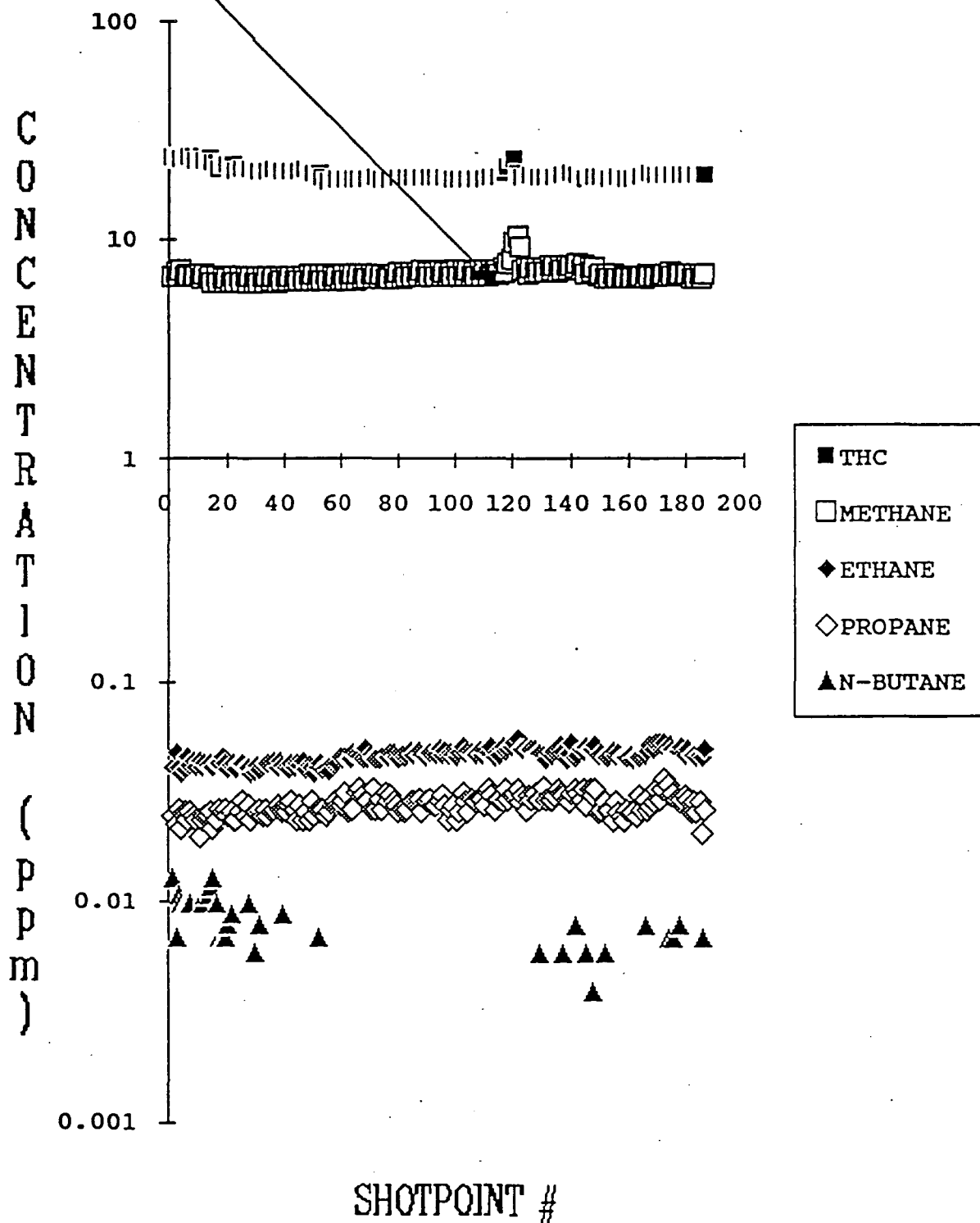


Figure 20. THC, methane, ethane, propane, and n-butane concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 72

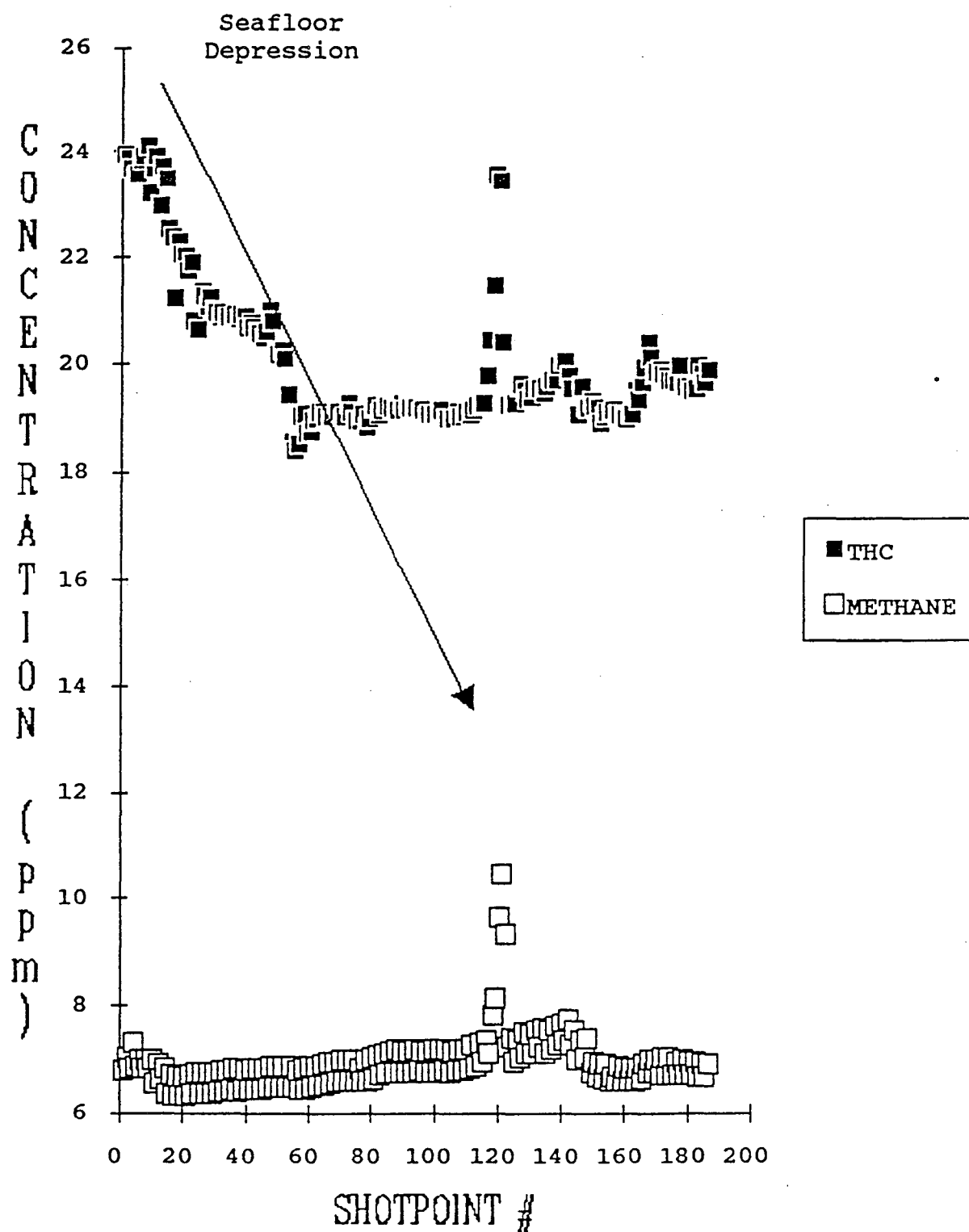


Figure 21. THC and methane concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin.

LINE 72:- SHOTPOINTS 110 TO 130

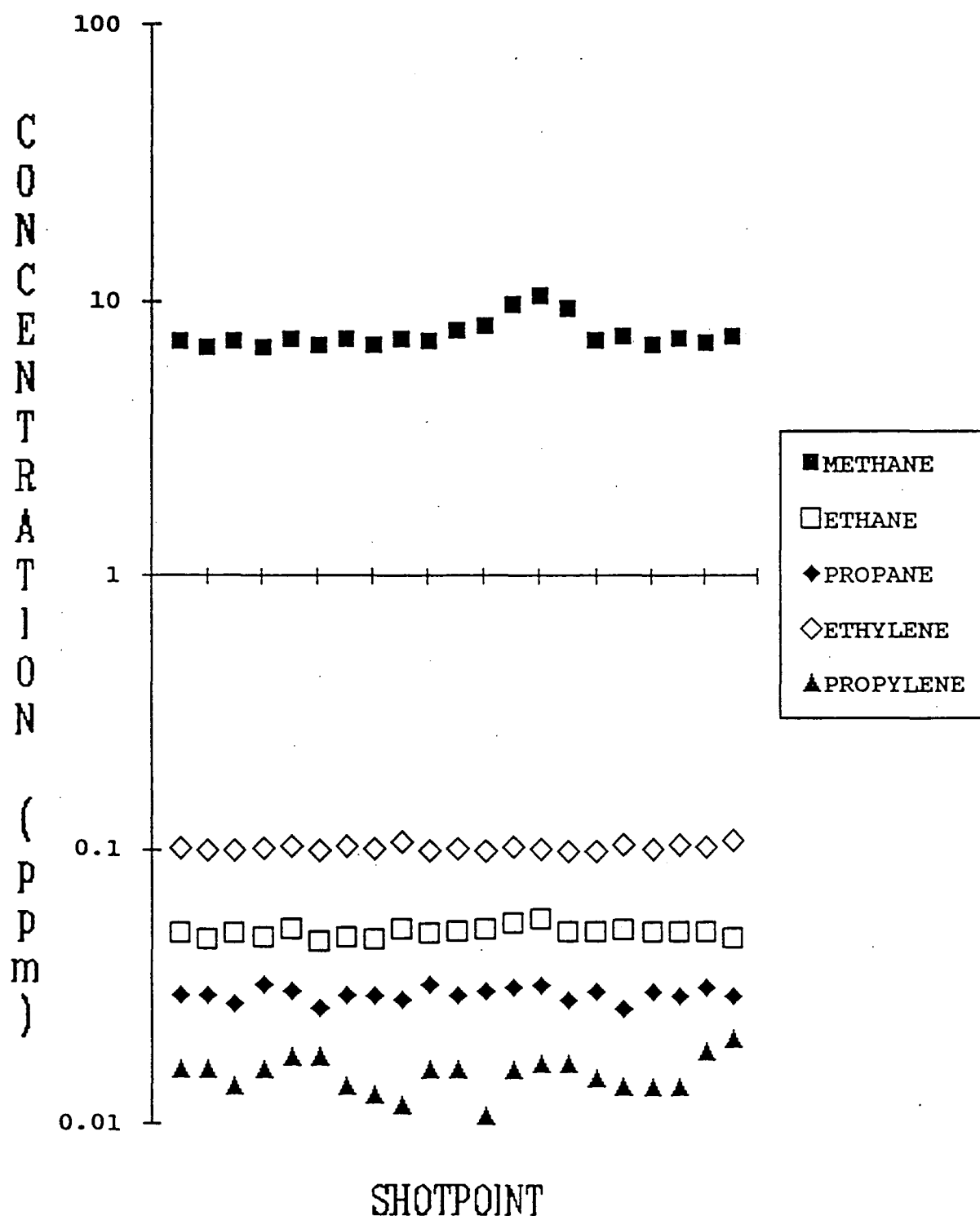


Figure 22. Methane, ethane, propane, ethylene, and propylene concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin. Only data from shotpoints 110 to 130 are included.

LINE 72:- SHOTPOINTS 110 TO 130

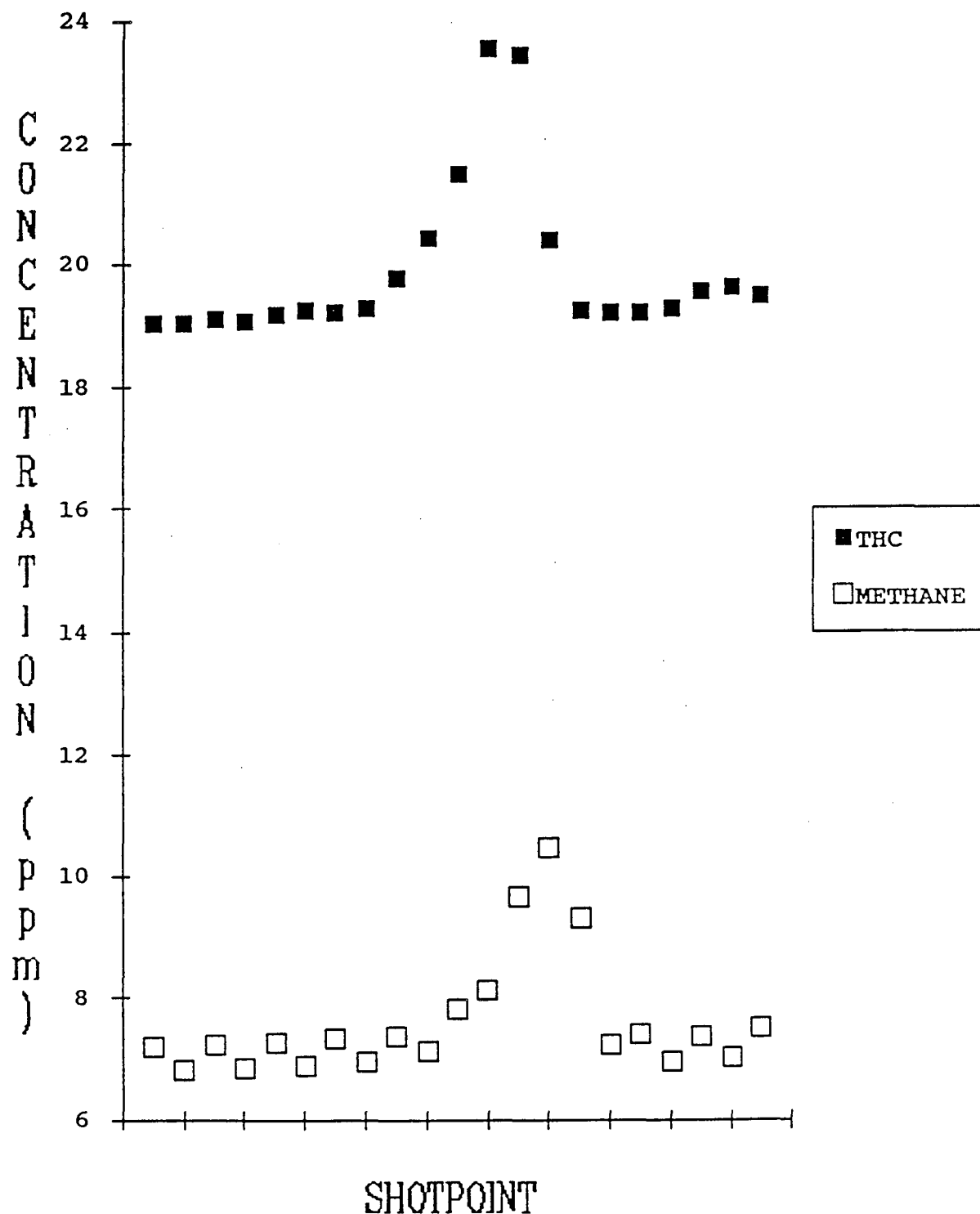


Figure 23. THC and methane concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin. Only data from shotpoints 110 to 130 are included.

LINE 72:- SHOTPOINTS 110 TO 130

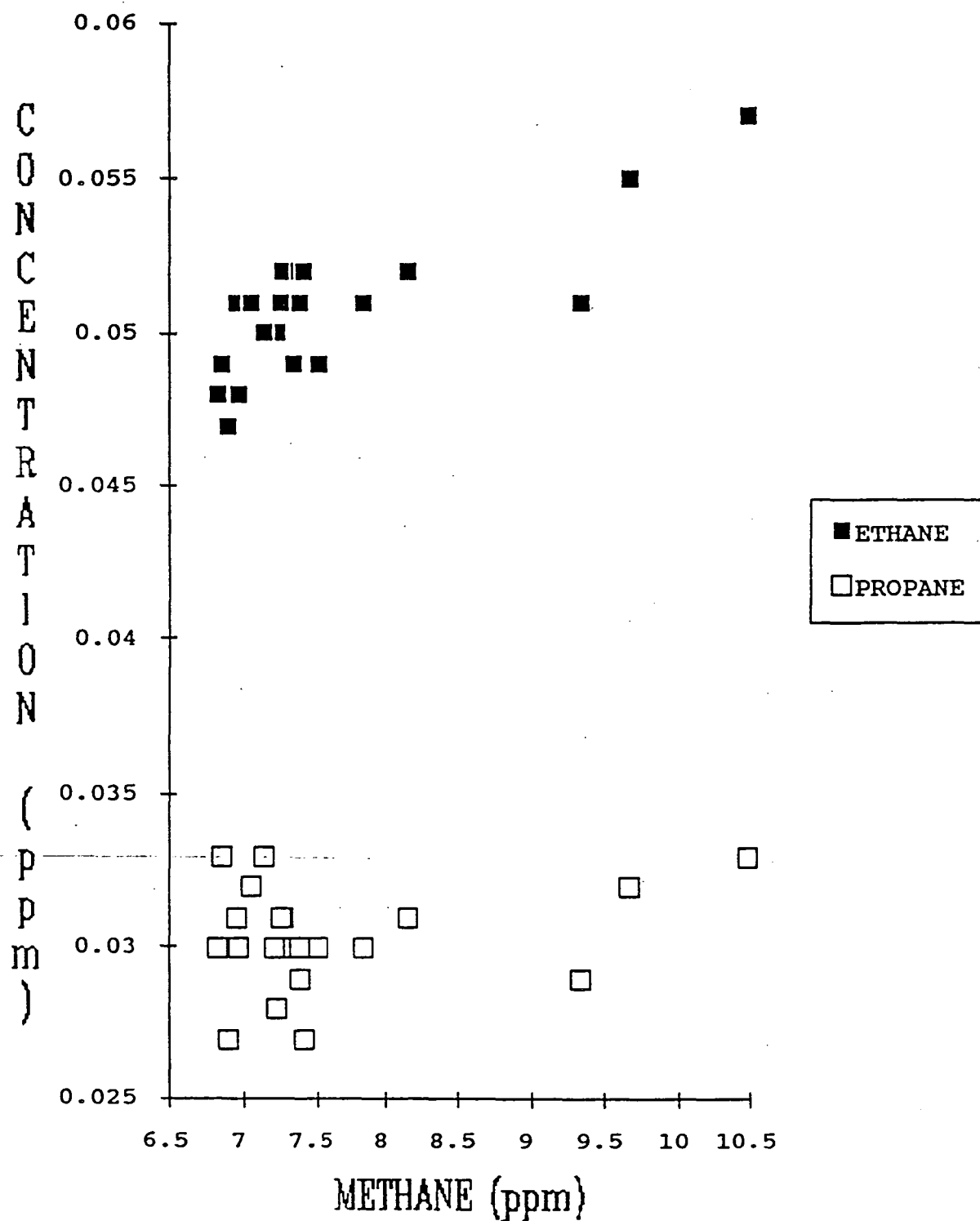


Figure 24. Ethane and propane concentrations versus shotpoint number along survey line 89/072, Torquay Sub-Basin. Only data from shotpoints 110 to 130 are included.

NE

SW

FOCUS
OF
SEEP

Figure 25. 12 KHz echo sounder record over anomaly on Line 89/072, showing a 2-3 m depression on the seafloor.

NE

SW

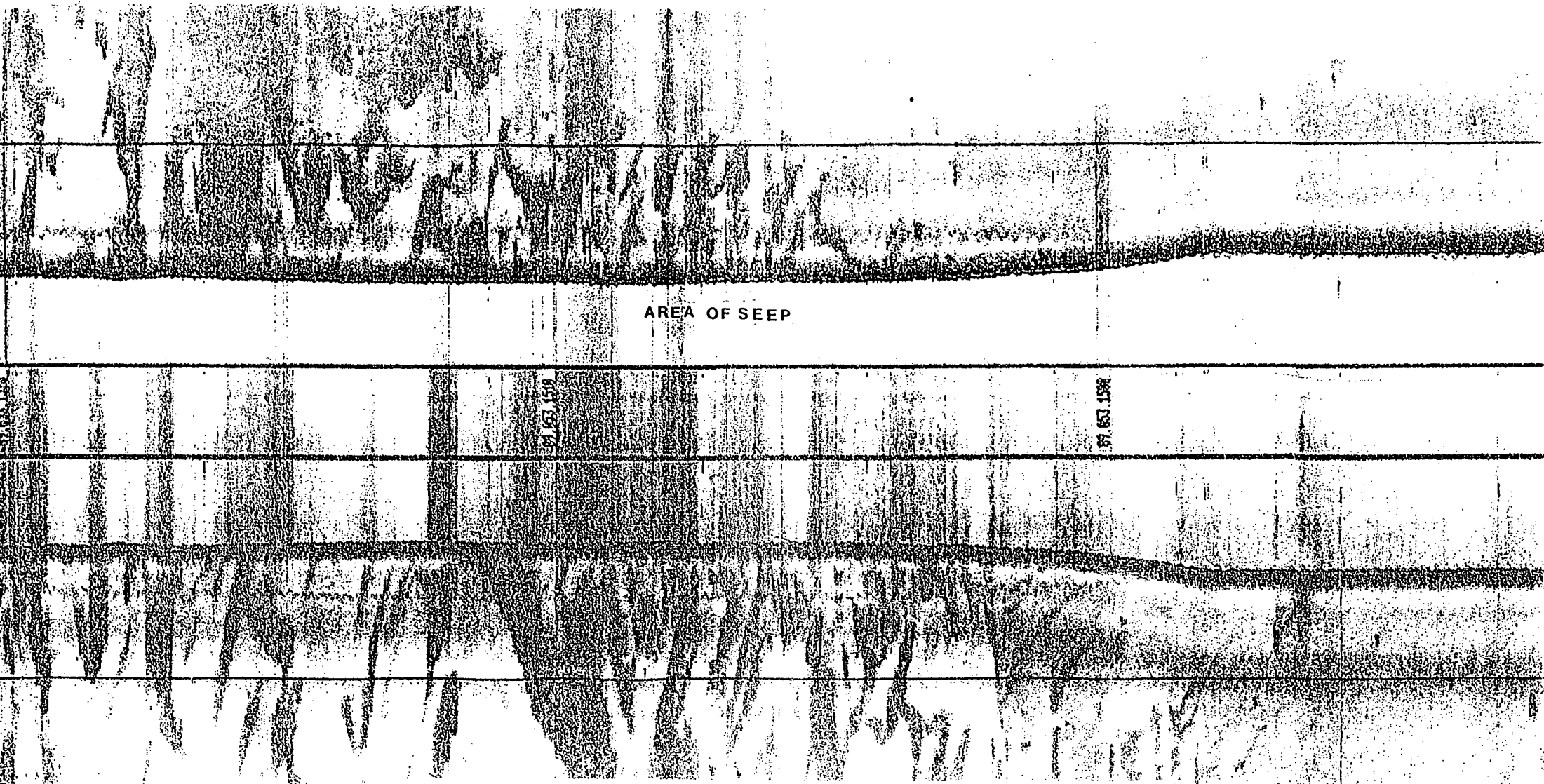
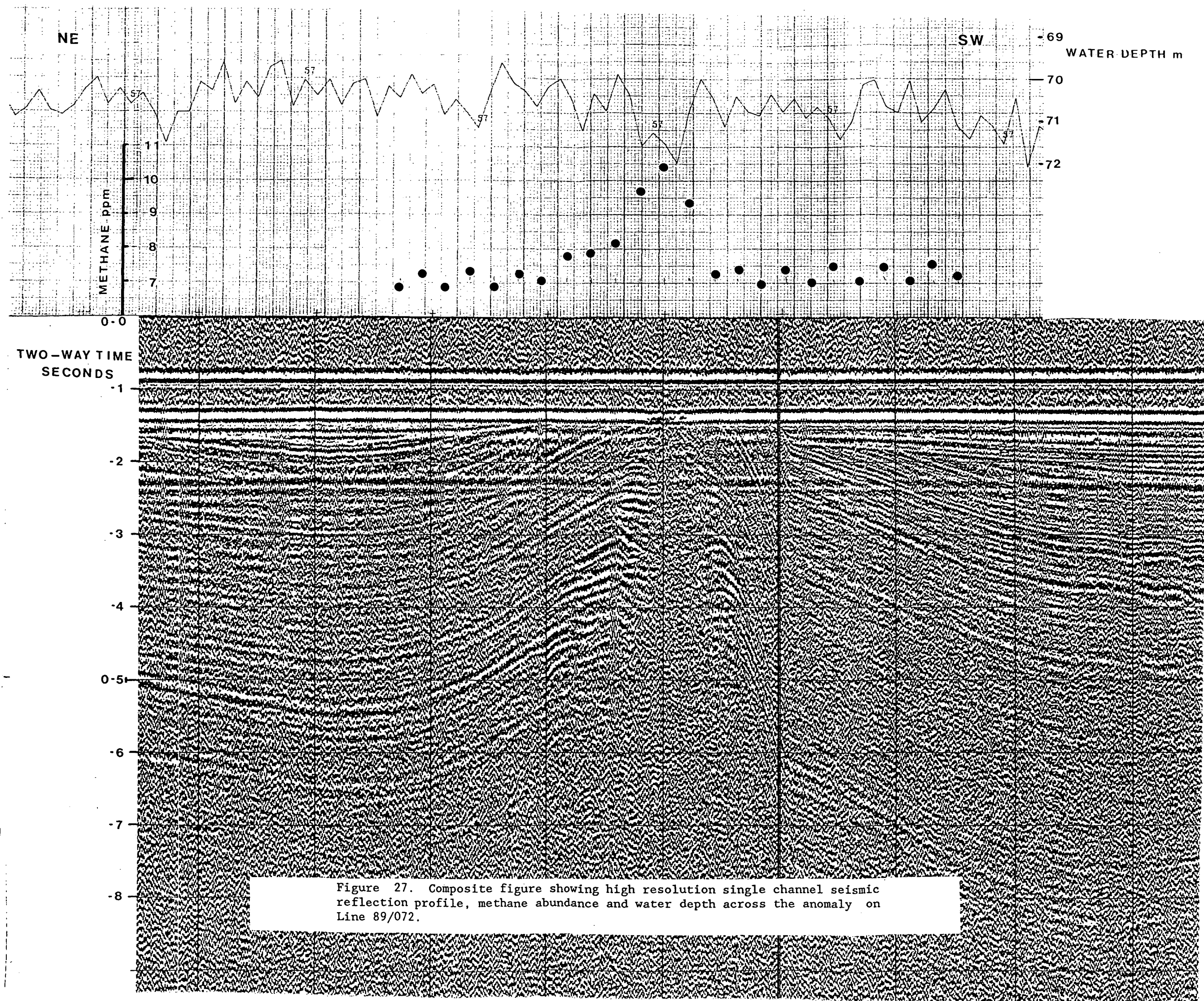


Figure 26. Side scan record of seafloor over hydrocarbon anomaly on Line 89/072. Seafloor has more relief in the vicinity of the hydrocarbon anomaly than away from it.



NE

89-082-210

SEEP

89-082-210

89-082-210

SW

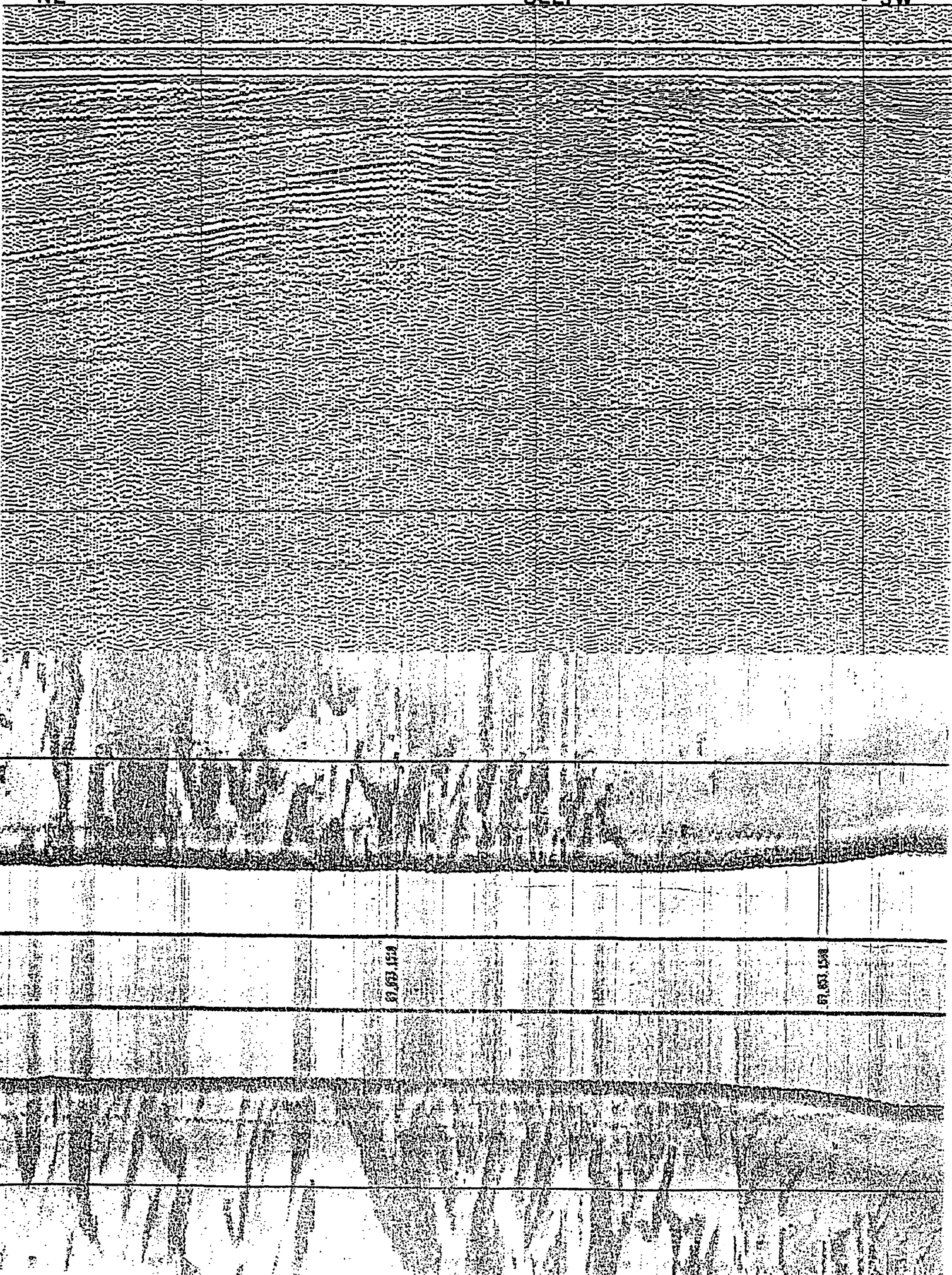


Figure 28. High resolution seismic profile and side scan sonar record across the anomaly on Line 89/072.

LINE 73

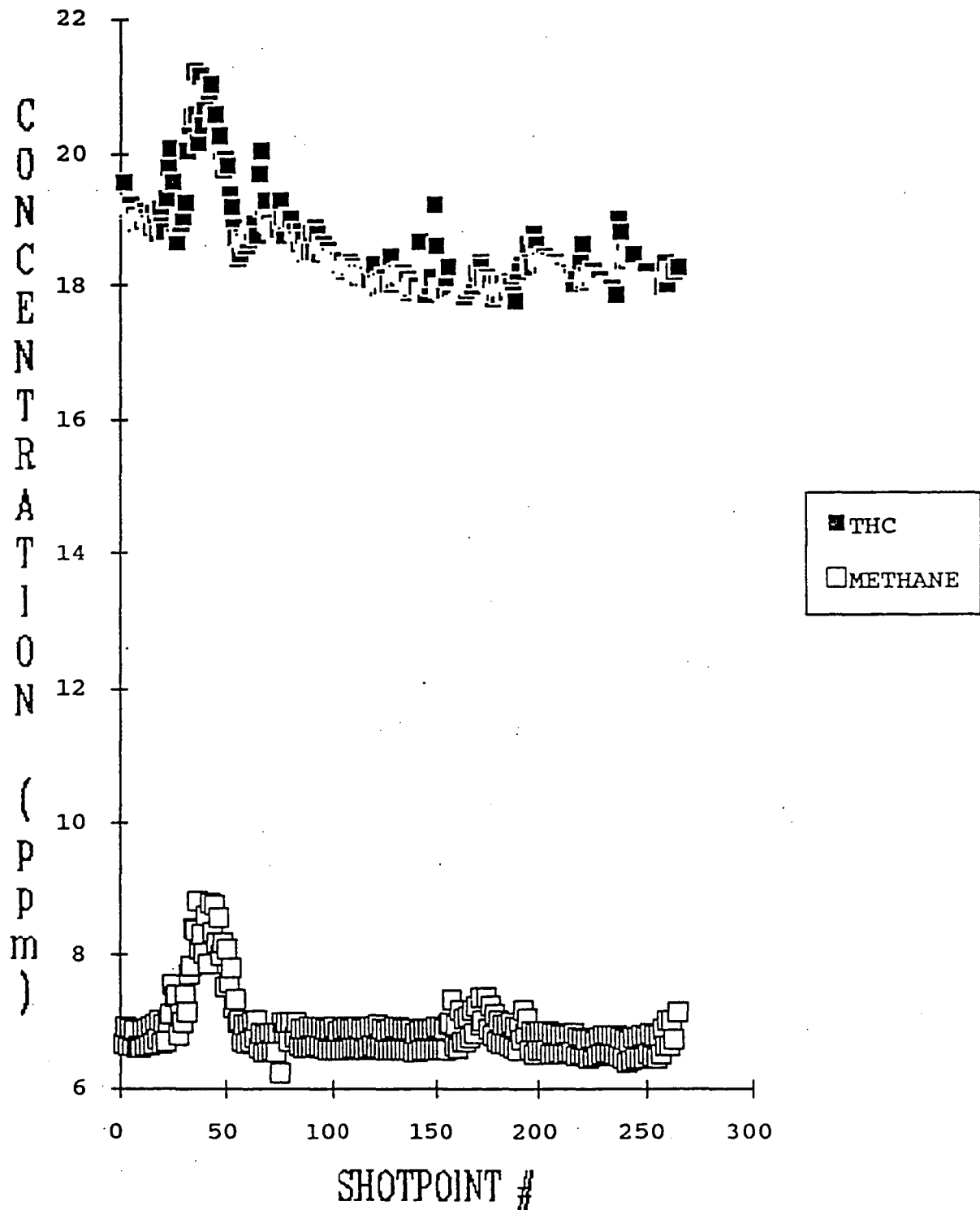


Figure 29. THC and methane concentrations versus shotpoint number for survey line 89/073, Torquay Sub-Basin.

TORQUAY SUB-BASIN:- LINE 73

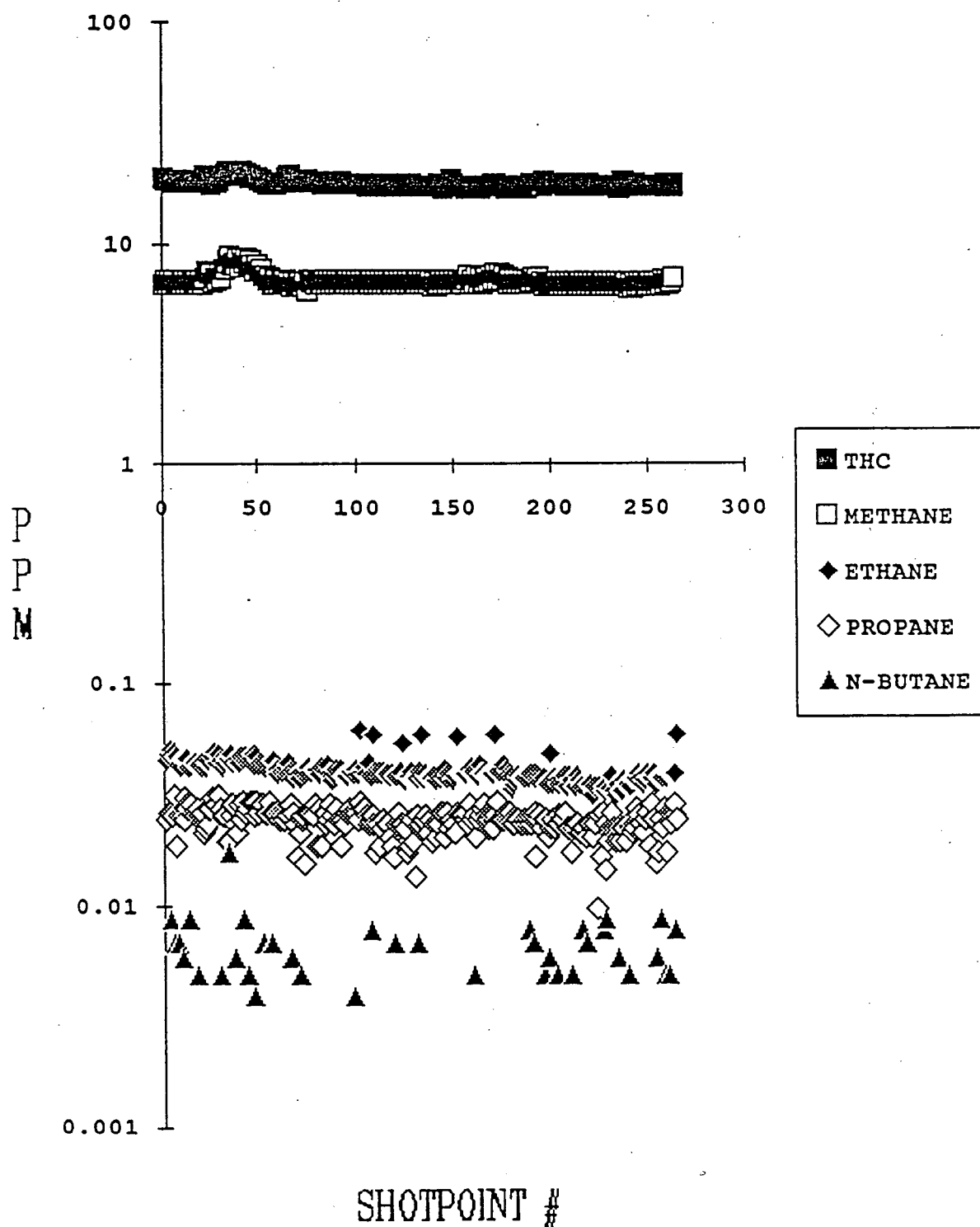


Figure 30. THC, methane, ethane, propane and n-butane concentrations versus shotpoint number for survey line 89/073, Torquay Sub-Basin.

LINE 73

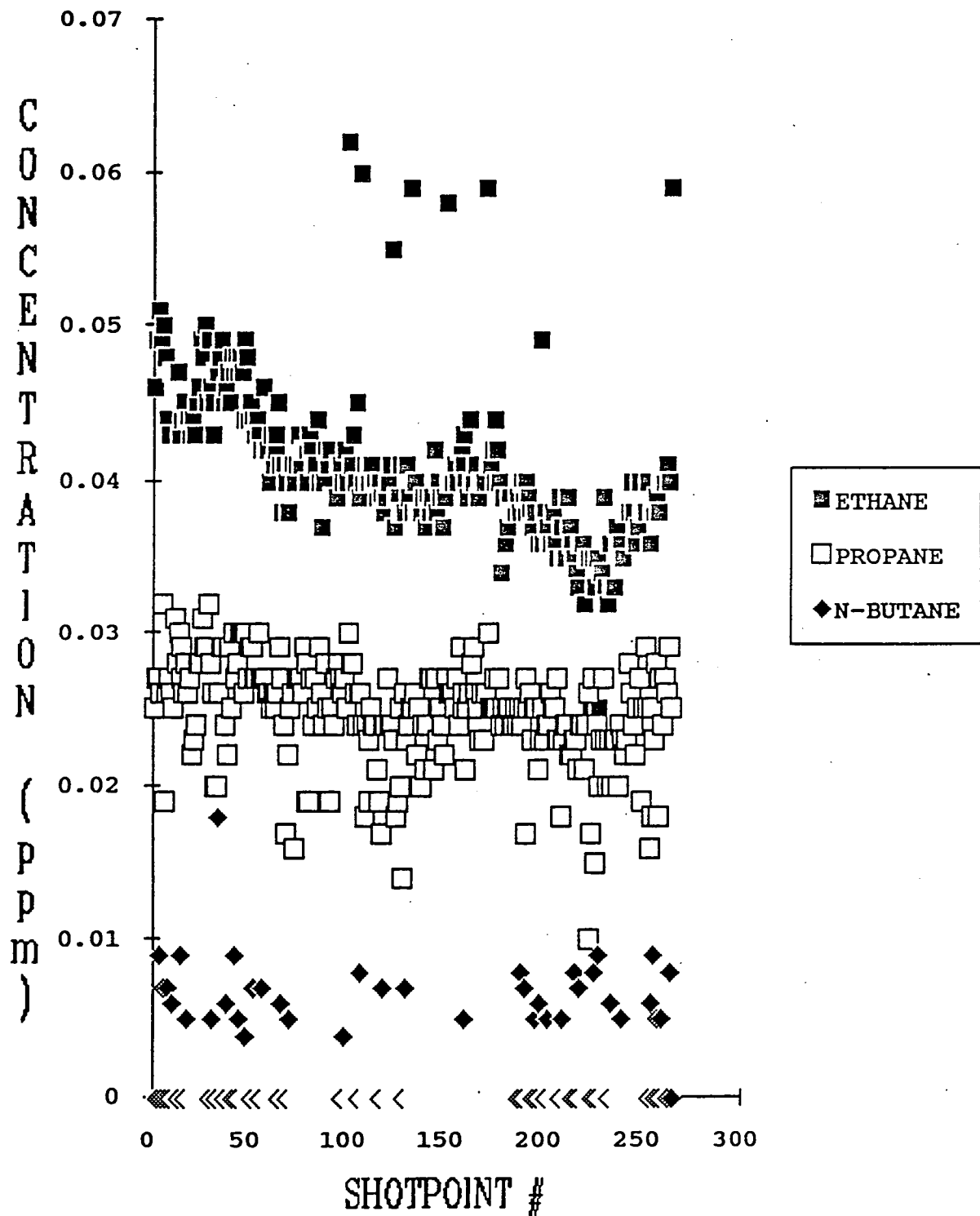


Figure 31. Ethane, propane and n-butane concentrations versus shotpoint number for survey line 89/073, Torquay Sub-Basin.

Figure 32. Methane contours, Torquay Sub-Basin.

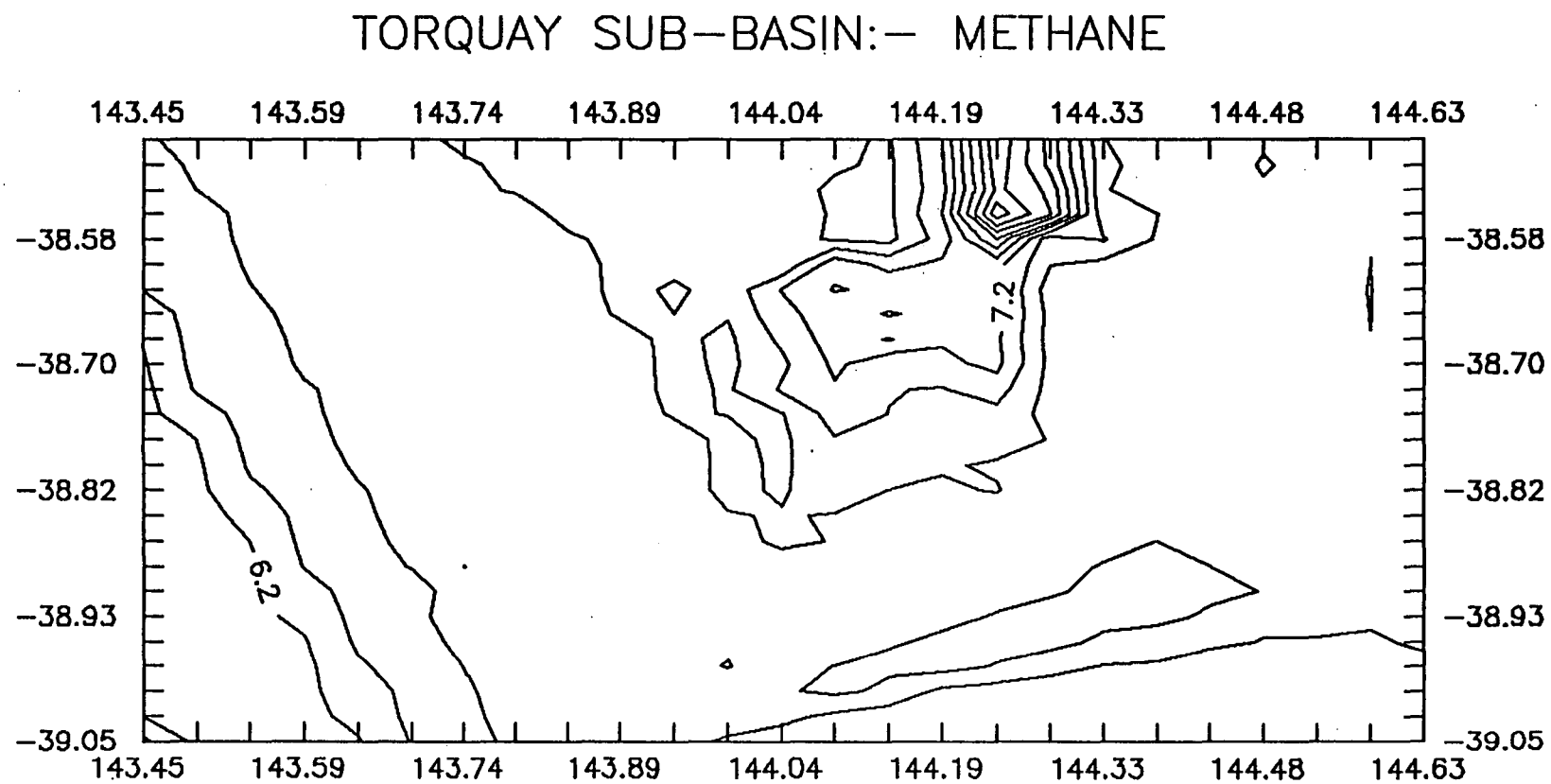


Figure 33. Methane contours and ship's track, Torquay Sub-Basin.

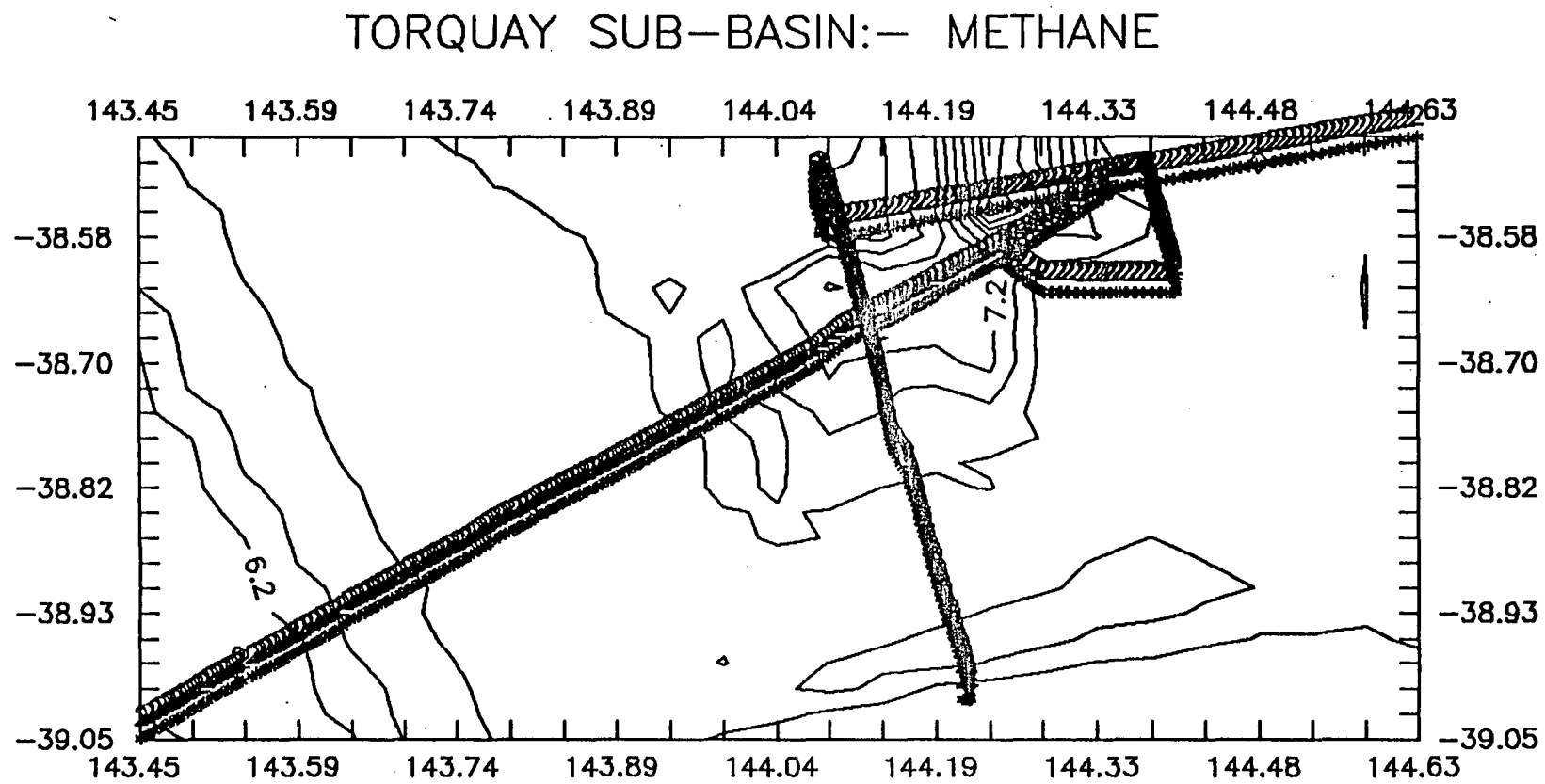
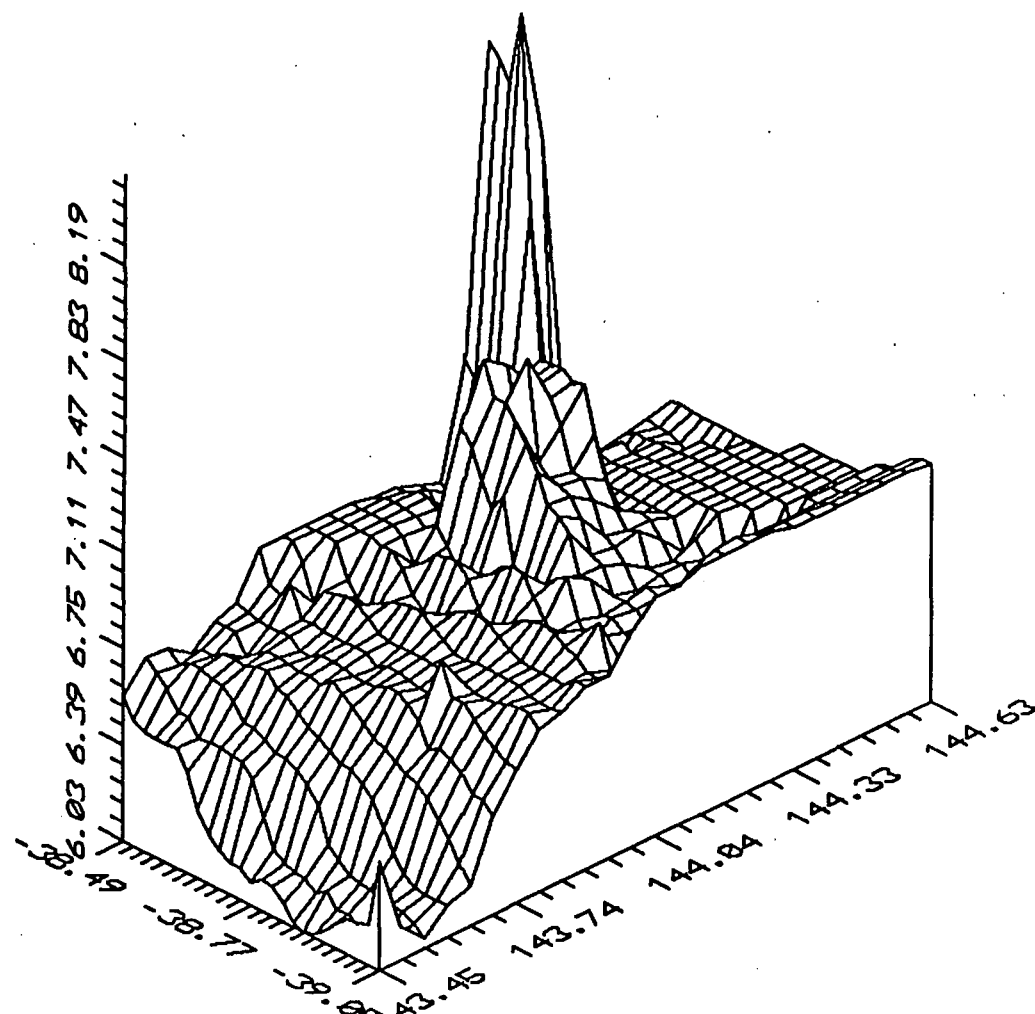


Figure 34. 3-dimensional plot of the methane concentration, Torquay Sub-Basin.



TORQUAY SUB-BASIN:- METHANE

Figure 35. Ethane contours, Torquay Sub-Basin.

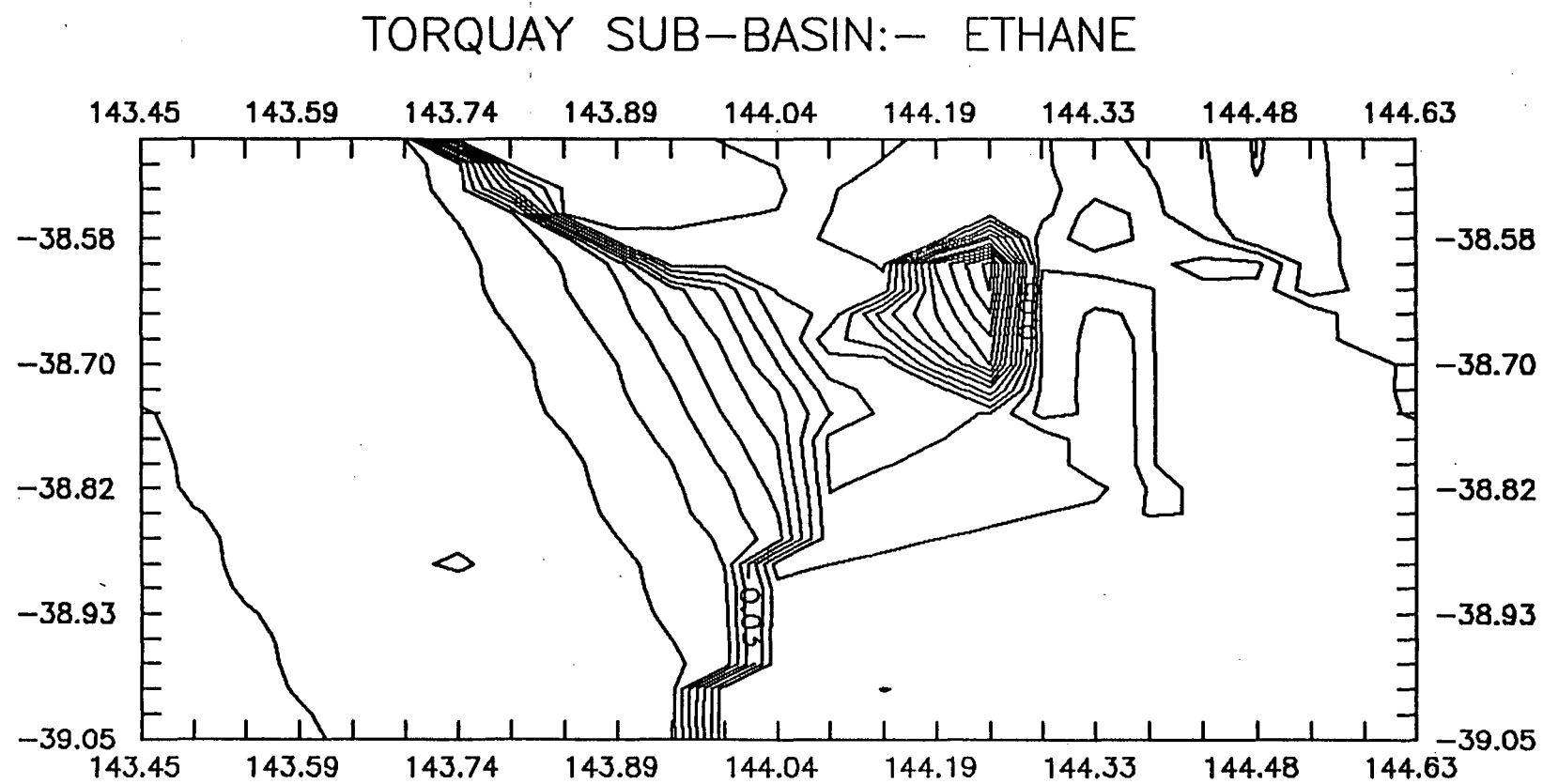


Figure 36. Ethane contours and ship's track, Torquay Sub-Basin.

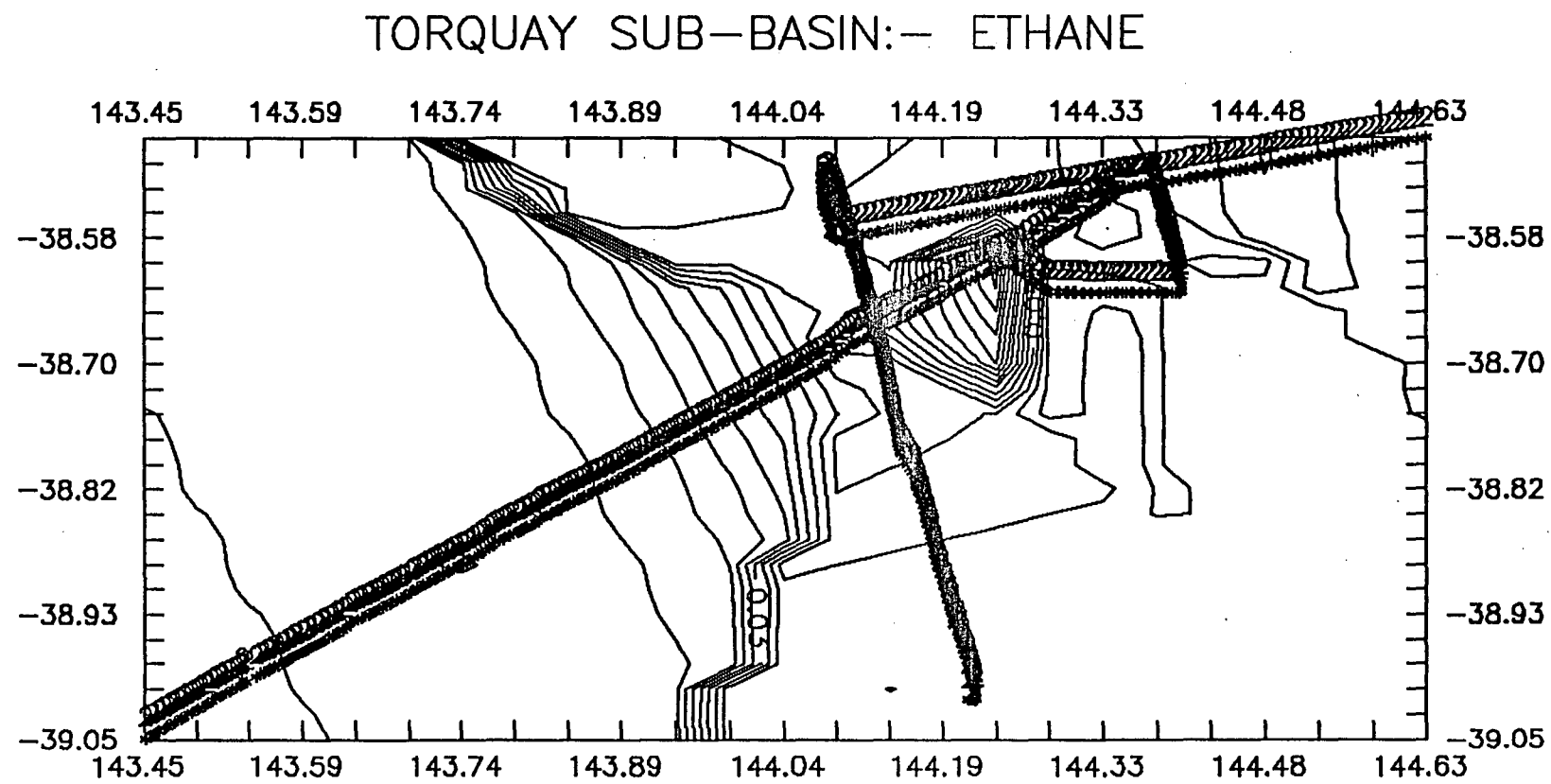
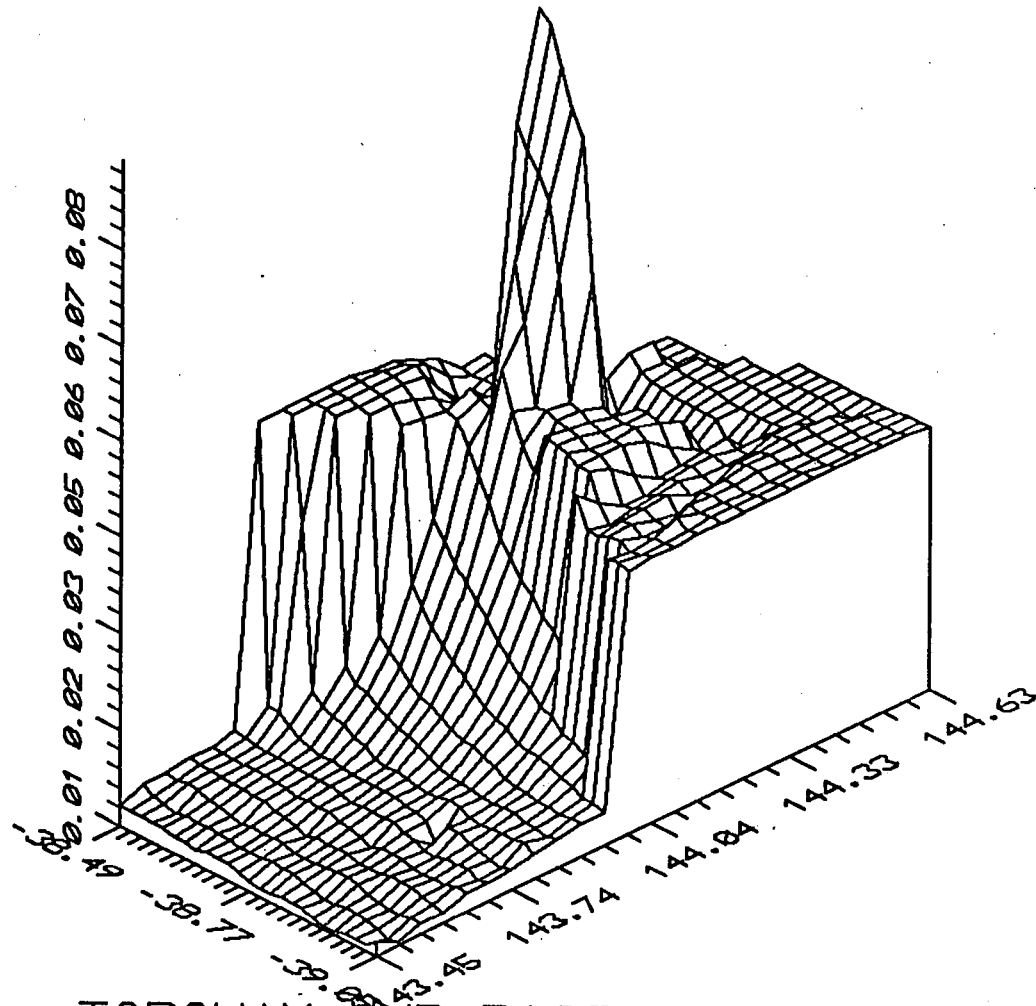


Figure 37. 3-dimensional plot of the ethane concentration, Torquay Sub-Basin.



TORQUAY SUB-BASIN:- ETHANE

Figure 38. Propane contours, Torquay Sub-Basin.

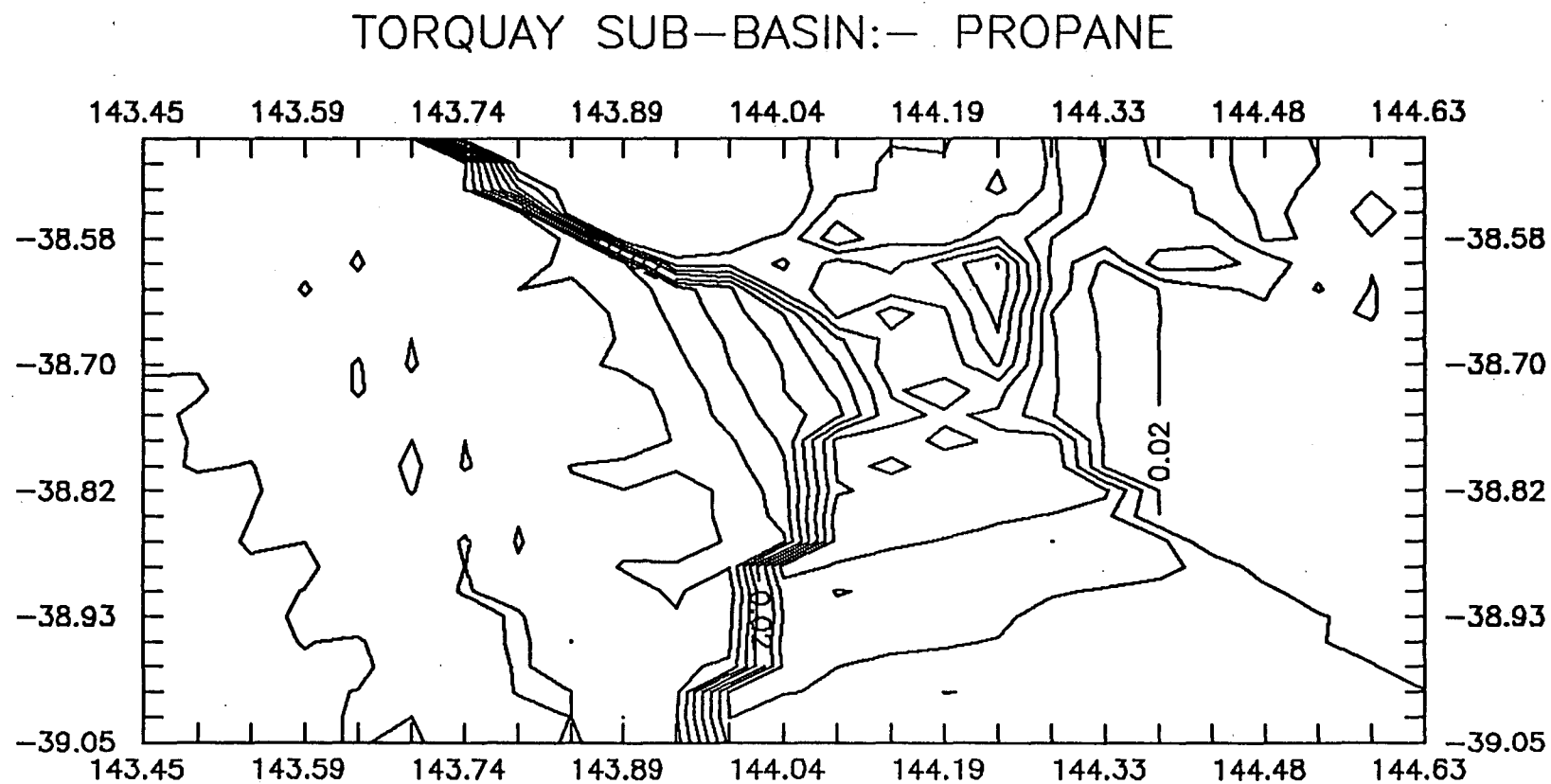


Figure 39. Propane contours and ship's track, Torquay Sub-Basin.

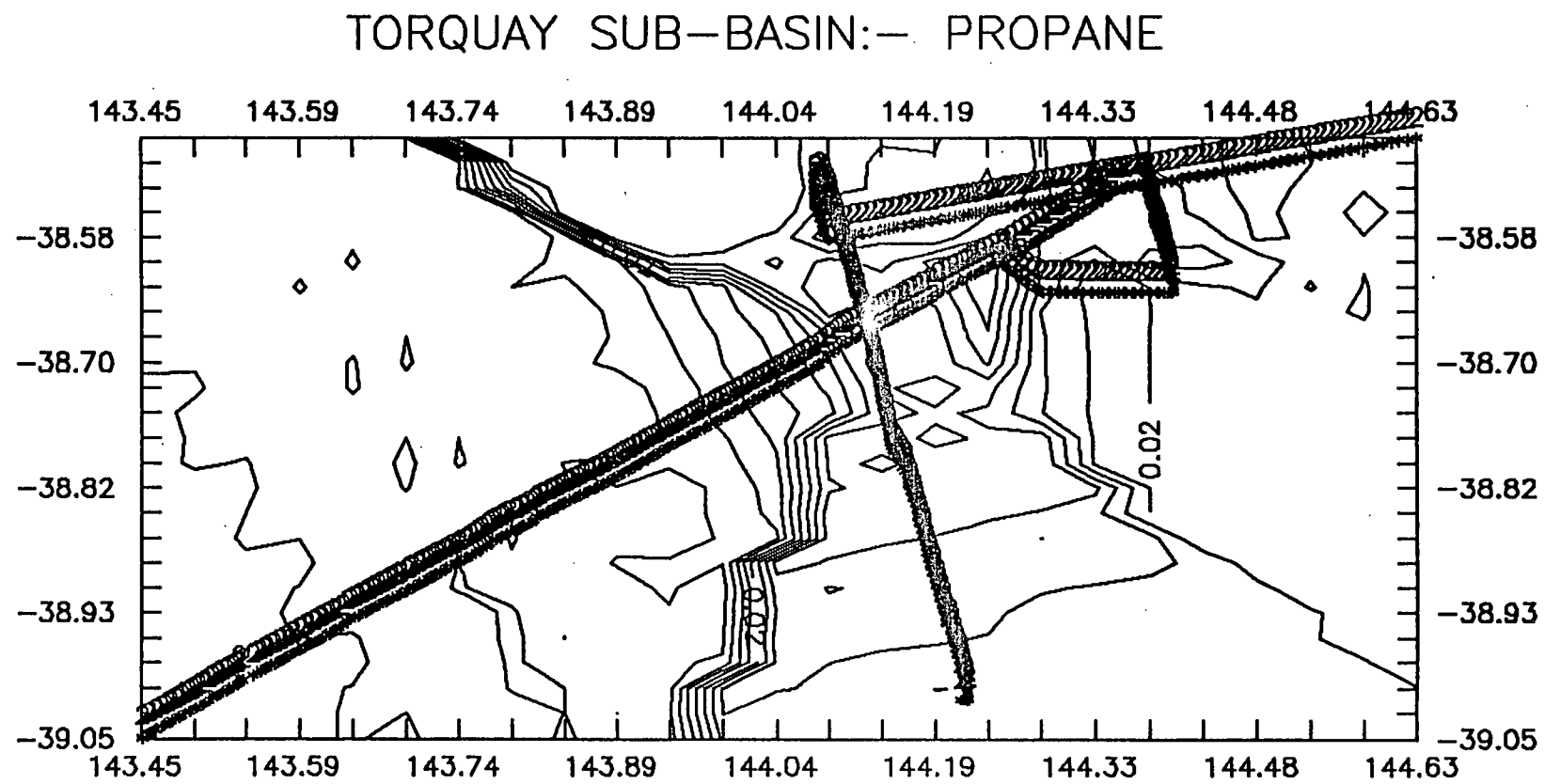


Figure 40. 3-dimensional plot of the propane concentration, Torquay Sub-Basin.

