

PROJECT NO.12989

REPORT TO

SABLE OFFSHORE ENERGY INC.

ON

1999 ANNUAL REPORT
OFFSHORE ENVIRONMENTAL EFFECTS MONITORING PROGRAM
VOLUME 1:REPORT

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clumping behaviour of the drill waste suggesting that perhaps a smaller amount of drill muds may be available for flocculation than modelled. Modifications to the bblt model have been undertaken at the

Bedford Institute of Oceanography since the 1997 EIS report was prepared and revised model predictions may reflect these changes.

The drill waste piles were considerably smaller than modelled. The lower volumes of drill cuttings discharged from Venture may contribute to this finding, however, Thebaud cuttings discharges were relatively close to predicted, yet the drill cuttings pile was approximately half the radius. Drill cuttings piles were visible within 70 m of the discharge pipe at Venture and Thebaud. Elevated levels of total petroleum hydrocarbons (TPH) and barium were generally found at 250 and 500 m from the drilling platforms and were short-lived. Dispersion or burial appeared to occur within a six month period and is likely attributed to sediment transport. These EEM surveys demonstrate the dynamic nature of the seabed; a well documented feature of Sable Island Bank. A single storm event has the capacity to transport sediment equivalent to the annual rate.

Sediment toxicity was observed in amphipod mortality testing and in echinoid fertilization testing at stations throughout Venture, Thebaud and North Triumph fields for the baseline surveys. Amphipod mortality toxicity effects and elevated TPH and barium concentrations in sediment were correlated and found along the predicted prevailing currents. The echinoid fertilization toxicity test does not provide reliable results that correlate with other observations. Continued use of this test must be addressed in further SOEI EEM surveys. Microtox testing on sediment samples from all fields during baseline and drilling phase surveys showed no toxicity. There did not appear to be any significant effects that could be attributed to drilling activity for inorganic or organic contaminants other than barium and TPH.

The abundance of epifaunal macroinvertebrates is very patchy and highly variable both spatially and temporally. The dominant epibenthic organism at Venture and Thebaud are sand dollars. Brittlestars are common as well at North Triumph, but are relatively rare at Venture and Thebaud. The active nature and megaripple features of the seafloor at the shallower Thebaud and Venture sides precludes stable colonisation of many epifaunal organisms and accurate sampling by remote means. The siltier sediment at North Triumph is a more suitable habitat for brittlestars. No obvious effects beyond the drill waste pile on benthic fauna or habitat are evident.

For mussels moored at Venture, sensory evaluation and body burden determination of hydrocarbons revealed that no obvious flavour or odours were detected differently from the controls or any other mooring site. Hydrocarbons are detected in tissues but appear not to be causing taint. Scallops collected from natural beds in the project area, showed low levels of aliphatic hydrocarbons in baseline and drilling phase surveys. No taint was detected in sensory evaluations.

The data generated from observations of marine mammals and seabirds made by trained observers provided no evidence of avoidance or attraction to the project area by these animals. Observers have recorded sightings of groups of baleen and toothed whales, and seals within the immediate vicinity of the RGII and Santa Fe Galaxy platforms. The cetacean species are seen feeding and/or with young. It is realistic to assume that any marine mammal observed from these fixed platforms is also within the acoustic range of the sound spectra radiating from the drilling activities.

Bird migration trends by the platforms mirror Sable Island area patterns. All common species were observed both far and in close proximity to the platform and did not generally appear to avoid the platform area. Low incidence of dead birds and the high frequency of the surveys suggest there was likely no large scale bird fatalities in the vicinity of the platforms.

For the ongoing offshore EEM program, the practicality, logistics and analytical limitations of some parameters should be reviewed, as well as consideration for modifications of sampling locations and effort.

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
1.1 Environmental Management Plan	1
1.2 EEM Design	2
1.3 Current Stage of Offshore Development	2
1.4 Objectives	3
1.5 Scope	3
1.6 Report Organization	4
2.0 CHRONOLOGY OF OFFSHORE DRILLING OPERATIONS	5
2.1 Venture	6
2.2 Thebaud	7
2.3 North Triumph	9
3.0 MONITORING RESULTS	10
3.1 Sampling Design	10
3.2 Water Column Monitoring	11
3.2.1 Objective and Analysis	11
3.2.2 Venture Results	12
3.2.3 Thebaud Results	14
3.2.4 North Triumph Results	15
3.3 Benthic Boundary Layer	16
3.3.1 Objectives	16
3.3.2 Data Analysis	17
3.3.3 Near-Field vs. Far-Field	18
3.3.3.1 Venture	18
3.3.3.2 Thebaud	19
3.3.3.3 North Triumph	19
3.3.4 Within the Near-Field Area	19
3.3.4.1 Venture	20
3.3.4.2 Thebaud	20
3.3.4.3 North Triumph	21
3.3.5 Particle Size Analysis	21
3.3.6 Summary of Effects	21



3.4	Sediment Chemistry	21
3.4.1	Objectives	21
3.4.2	Statistical Approach	22
3.4.3	Data Screening	23
3.4.4	Sediment Chemistry at the Gully	28
3.4.5	Sediment Chemistry at Venture	29
3.4.5.1	Near-Field vs. Far-Field	29
3.4.5.2	Within the Near-Field Area	29
3.4.5.3	Summary of Observed Effects at Venture	33
3.4.6	Sediment Chemistry at Thebaud	33
3.4.6.1	Near-Field vs. Far-Field	34
3.4.6.2	Within the Near-Field Area	34
3.4.6.3	Summary of Effects at Thebaud	37
3.4.7	Sediment Chemistry at North Triumph	38
3.4.7.1	Near-Field vs. Far-Field	38
3.4.7.2	Within the Near-Field Area	40
3.4.7.3	Summary of Effects at North Triumph	42
3.4.8	Overall Effects of Drilling Platforms on Sediment Quality	42
3.4.9	Summary of Sediment Chemistry Results	47
3.5	Sediment Toxicity	47
3.5.1	Objectives and Analysis	47
3.5.2	Sediment Toxicity at Venture	48
3.5.3	Sediment Toxicity at Thebaud	49
3.5.4	Sediment Toxicity at North Triumph	50
3.6	Benthic Habitat and Community	52
3.6.1	Objective and Analysis	52
3.6.2	Epibenthic Community	52
3.6.2.1	Venture	53
3.6.2.2	Thebaud	54
3.6.2.3	North Triumph	54
3.6.3	Summary of Benthic Epifauna Results	54
3.6.4	Cuttings Pile Surveys	55
3.6.4.1	Venture	55
3.6.4.2	Thebaud	56
3.7	Taint and Body Burden	56
3.7.1	Objective and Analysis	56
3.7.2	Caged Mussel Quality at Venture	56
3.7.3	Summary of Moored Mussel Effects at Venture	58
3.7.4	Scallops	59

3.8	Marine Mammals	61
3.8.1	Objective	61
3.8.2	Observations From Venture	62
3.8.3	Observations From Thebaud	62
3.8.4	Whales	62
3.8.5	Seals	63
3.9	Marine Birds	64
3.9.1	Offshore Seabird Monitoring	64
3.9.2	Thebaud	66
3.9.3	Population Trends	67
3.9.4	Summary of Seabird Observations	70
3.10	Sable Island EEM Studies	70
3.10.1	Oiled-Seabird Beach Surveys	70
3.10.2	Flare Emissions	72
3.10.3	Passive Collectors	72
4.0	DISCUSSION	75
4.1	Model Predictions	75
4.1.1	Plume Dispersion	75
4.1.2	Drill Waste Deposition	77
4.1.3	Benthic Boundary Layer Transport	77
4.1.4	Taint	78
4.2	Drill Waste Effects at Venture	78
4.3	Drill Wastes Effects at Thebaud	79
4.4	Drill Waste Effects at North Triumph	81
5.0	CONCLUSIONS	83
6.0	REFERENCES	85
6.1	Literature Cited	85
6.2	Personal Communications	87

LIST OF TABLES

	On Page
Table 2.1	Volume of Mud and Cuttings Discharged From Each Well 5
Table 3.1	Summer and Fall Hydrographic Data 13
Table 3.2	Total Suspended Solids (TSS) and Chlorophyll <i>a</i> Concentration in the Water Column at Venture Field 14
Table 3.3	Total Suspended Solids (TSS) and Chlorophyll <i>a</i> Concentration in the Water Column at Thebaud Field 15
Table 3.4	Total Suspended Solids (TSS) and Chlorophyll <i>a</i> Concentration in the Water Column at North Triumph Field 16
Table 3.5	Results of Nested ANOVA, with Coding for Field (Near vs. Far), Time (Date of Survey), and Field×Time Interactions at Venture, Thebaud and North Triumph 19
Table 3.6	Results of Nested ANOVA, with Coding for Distance (250, 500, 1,000 and 3,000 m), Time (Date of Survey), and Distance×Time Interactions at Venture, Thebaud and North Triumph 20
Table 3.7	CCME Guidelines for Selected Metals in Marine Sediments (mg/kg) 24
Table 3.8	Analysis of Quality Assurance Data for Transformed Parameters, Sable Offshore Energy EEM Program, 1998–1999. 26
Table 3.9	Comparison of Near-Field and Far-Field Samples at Venture, using Nested ANOVA. 30
Table 3.10	Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at Venture, using Nested ANOVA. 31
Table 3.11	Comparison of Near-Field and Far-Field Samples at Thebaud, using Nested ANOVA. 35
Table 3.12	Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at Thebaud, using Nested ANOVA. 36
Table 3.13	Comparison of Near-Field and Far-Field Samples at North Triumph, using Nested ANOVA. 39
Table 3.14	Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at North Triumph, using Nested ANOVA. 41
Table 3.15	Comparison of Main Effects for All Drilling Platforms, Using Nested ANOVA. 44
Table 3.16	Comparison of Survey and Distance Effects for All Drilling Platforms, Using Nested ANOVA. 45
Table 3.17	Tests for Significant Differences Due to Time, Axis, Distance, Time×Axis, Time×Distance or Time×Axis at the Venture Stations 48
Table 3.18	Tests for Significant Differences Due to Time, Axis, Distance, Time×Axis, Time×Distance or Time×Axis at the Thebaud Stations 50

Table 3.19	Tests for Significant Differences Due to Time, Axis, Distance, Time×Axis, Time×Distance or Time×Axis at the North Triumph Stations	51
Table 3.20	Abundance of Sand Dollar and Brittle Star at Venture, North Triumph, and Thebaud.	53
Table 3.21	Dimensions of the Drill Waste Pile at Venture	55
Table 3.22	Dimensions of the Drill Waste Pile at Thebaud	56
Table 3.23	Aliphatic Hydrocarbon Concentration in Blue Mussel Tissues Following Three Months Exposure (August 1998 to October 1998)	57
Table 3.24	Aliphatic Hydrocarbon Concentrations in Blue Mussel Tissues After Six Months Exposure (October 1998 to April 1999)	58
Table 3.25	Results From Sensory Triangle Tests in Sea Scallops	59
Table 3.26	Concentration of Aliphatic Hydrocarbons in Scallop Tissues	60
Table 3.27	Oil and Gas Observer Program: Observer Coverage 1999	61
Table 3.28	Results of Beached Seabird Surveys For 1999	71
Table 3.29	Hydrocarbons Analysis from Oiled Seabird Carcasses Collected During January and February 1999	72
Table 3.30	NO ₂ , VOC and Deposition Trap Data	73
Table 3.31	Airborne Particulate Deposition Trap Data	74
Table 4.1	Comparison of Predicted and Measured Drill Cutting Volumes (m ³) From Each Platform	76
Table 4.2	Predicted Concentrations, Layer Thickness and Biological Effects From Drill Wastes at Venture, Thebaud and North Triumph	77

LIST OF FIGURES

After Page

Figure 1.1	Site Location	1
Figure 2.1	Well Depths as of December 31, 1999	5
Figure 2.2	Drilling Chronology	5
Figure 2.3	Venture 1 and Venture 3 Cuttings Discharges	6
Figure 2.4	Venture 4 and Venture 5 Cuttings Discharges	6
Figure 2.5	Thebaud 1 and Thebaud 2 Cuttings Discharges	7
Figure 2.6	Thebaud 3 and Thebaud 5 Cuttings Discharge	7
Figure 2.7	North Triumph Cuttings Discharges	9
Figure 3.1	Sampling Locations	10
Figure 3.2	Venture Benthic Boundary Layer- Suspended Particulate Matter	18
Figure 3.3	Venture Benthic Boundary Layer- Barium	18
Figure 3.4	Thebaud Benthic Boundary Layer- Suspended Particulate Matter	19
Figure 3.5	Thebaud Benthic Boundary Layer- Barium	19

Figure 3.6	North Triumph Benthic Boundary Layer- Suspended Particulate Matter	19
Figure 3.7	North Triumph Benthic Boundary Layer- Barium	19
Figure 3.8	Original vs. Replicate Samples	on page 27
Figure 3.9	Venture Sediment Barium	32
Figure 3.10	Venture Sediment Chemistry Boxplots	32
Figure 3.11	Venture Sediment Total Petroleum Hydrocarbons	32
Figure 3.12	Thebaud Sediment Barium	34
Figure 3.13	Thebaud Sediment Total Petroleum Hydrocarbons	34
Figure 3.14	Thebaud Sediment Chemistry Boxplots	37
Figure 3.15	Hydrocarbon "Fingerprint" from Thebaud Sediment	37
Figure 3.16	North Triumph Sediment Barium	38
Figure 3.17	North Triumph Sediment Total Petroleum Hydrocarbon	38
Figure 3.18	North Triumph Sediment Chemistry Boxplots	40
Figure 3.19	Gully Amphipod Mortality	48
Figure 3.20	Venture Amphipod Mortality	48
Figure 3.21	Venture Echinoid Fertilization	49
Figure 3.22	Gully Echinoid Fertilization	49
Figure 3.23	Thebaud Amphipod Mortality	49
Figure 3.24	Thebaud Echinoid Fertilization	50
Figure 3.25	North Triumph Amphipod Mortality	50
Figure 3.26	North Triumph Echinoid Fertilization	51
Figure 3.27	Mussel Mooring Locations	56
Figure 3.28	Scallop Tow Locations	59
Figure 3.29	Comparative Hydrocarbon Chromatograms	60
Figure 3.30	Comparative Hydrocarbon Chromatograms	60
Figure 3.31	Comparative Hydrocarbon Chromatograms	60
Figure 3.32	Whaling Activity 1966 - 1971	63
Figure 3.33	Seabird Species Composition by Field	65
Figure 3.34	Number of Seabirds per Survey by Field	65
Figure 3.35	Shearwater Spp. Occurrence by Field	67
Figure 3.36	Northern Gannet Occurrence by Field	68
Figure 3.37	Herring Gull Occurrence by Field	68
Figure 3.38	Great Black-backed Gull Occurrence by Field	68
Figure 3.39	Black-legged Kittiwake Occurrence by Field	68
Figure 3.40	Common Tern Occurrence by Field	69
Figure 3.41	Air Quality Study Area	72
Figure 4.1	Venture Cuttings Pile	78
Figure 4.2	Thebaud Cuttings Pile	80



LIST OF PHOTOS

After Page

Photo 1	Drill waste pile under the RGII at Venture	55
Photo 2	Drill waste pile under the RGII at Venture	55
Photo 3	Drill waste pile under the RGII at Venture	55
Photo 4	Edge of the drill waste pile at Venture	55

}



LIST OF APPENDICES

Appendix A Material Safety Data Sheet for NovaPlus™

Appendix B Particle Size Analysis Results

Appendix B-1 Particle Size Analysis Results for Fall 1998

Appendix B-2 Particle Size Analysis Results for June 1999

Appendix C Laboratory Analytical Data for Sediment from "The Gully" and Venture Field

Appendix C-1 June 1998 Gully Data

Appendix C-2 Fall 1998 Gully Data

Appendix C-3 June 1999 Gully Data

Appendix C-4 Fall 1999 Gully Data

Appendix C-5 June 1998 Venture Data

Appendix C-6 Fall 1998 Venture Data

Appendix C-7 June 1999 Venture Data

Appendix C-8 Fall 1999 Venture Data

Appendix D Laboratory Analytical Results for Sediment from Thebaud Field

Appendix D-1 June 1998 Data

Appendix D-2 June 1999 Data

Appendix D-3 Fall 1999 Data

Appendix E Laboratory Analytical Results for Sediment from North Triumph Field

Appendix E-1 Fall 1998 Data

Appendix E-2 June 1999 Data

Appendix E-3 Fall 1999 Data

Appendix F Location of Rigs to its Respective Jacket/Platform

Appendix F-1 Location of Santa Fe Galaxy II in Relation to Thebaud Wellhead Platform

Appendix F-2 Location of Rowan Gorilla II in Relation to Venture Jacket

Appendix G Results of Sensory Evaluations and Hydrocarbon Body Burden in Shellfish

Appendix G-1 Evaluation of Mussels for Tainting Hydrocarbons December 23, 1998

Appendix G-2 Supplementary Report (to December 23, 1998) on Evaluation of Mussels for Tainting Hydrocarbons January 18, 1999

Appendix G-3 Evaluation of Mussels for Tainting Hydrocarbons June 15, 1999

Appendix G-4 Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons November 19, 1998



Appendix G-5 Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons
December 2, 1999

Appendix H Information on Recovery of Injured Raptor

Appendix H-1 Halifax Chronicle Herald Article from October 23, 1999

Appendix H-2 Letter from Atlantic Raptor Rehabilitation Centre



1.0 INTRODUCTION

In 1997, Sable Offshore Energy Incorporated (SOEI) obtained a Development Plan Approval from the Canada–Nova Scotia Offshore Petroleum Board (CNSOPB) to develop the Sable offshore natural gas fields located 160 to 200 km off the south coast of Nova Scotia, Canada (Figure 1.1). Under the Development Plan Approval, the Environmental Effects Monitoring (EEM) MacLaren is necessary to test the predictions made in the Environmental Impact Statement (SOEI 1996, MacLaren Plansearch 1997 a,b), to assess the impact of various discharges, and to collect data that will be useful for environmental management decisions. This document presents the results of the EEM work to date as of December 31, 1999 and includes baseline and multiple EEM sampling events during drilling, depending upon the stage of development at each field. At the Venture field, one baseline and three drilling surveys were conducted. At Thebaud, one baseline and two drilling survey were conducted, and at North Triumph two baseline and one drilling surveys were conducted.

This EEM document is part of the environmental approval processes required by CNSOPB; it also demonstrates SOEI's commitment to sound environmental practices. The EIS described what was known about the project as of October 1996, the environment at the Sable Island Bank sites, and the potential for interaction between the environment and the project. The EEM program has shed considerable light on the modeling predictions of the EIS and has broadened the understanding of the dynamic nature of the receiving environment at some fields relative to drilling activity undertaken to date. As the project continues, more information of the short- and long-term fate and effects of drill wastes will be obtained for use in management decision making for the offshore oil and gas industry on the Scotian Shelf.

1.1 Environmental Management Plan

The offshore EEM program is an integral component of SOEI's Environmental Management Plan (EMP) (SOEI 1999). The objectives of the EMP are to:

- ensure that operations activities are undertaken in an appropriate manner and that any impacts on the environment associated with operations activities are minimised and monitored; and
- anticipate and minimize the risk of potential effects from unexpected incidents, such as hydrocarbons or other chemical spills, and ensure that appropriate contingency plans are in such place in the event of such incidents.

The EMP outlines the study design of the drilling phase EEM program. The EEM program incorporates the SOEI fisheries observer program, established through the Offshore Fisheries Liaison Committee, which contributes significantly to the database of offshore environmental features.

The Sable Offshore Energy Inc. Environmental Effects Monitoring Advisory Group (SEEMAG), as a part of the EMP, serves an important role in setting standards and providing review for the EEM program. Since, its inception in January 1998, SEEMAG has met four times in 1998 and three times in 1999. The group continues to evaluate progress of the EEM and to provide feedback on the design and relevance of individual monitoring activities.

The EEM program also embodies the Health, Safety and Environmental Policy in the philosophy of continuous improvements, and the conduct and adherence of employees during the offshore surveys. In respecting the Code of Practice for Sable Island, SOEI supports environmental studies including bird surveys and air quality monitoring.

1.2 EEM Design

The objective of the EEM program is to test whether the effects of discharging drill wastes into the marine environment occur within the zones of influence predicted by the EIS. The goal of the EEM program is to assist decision making by providing feedback to SOEI, CNSOPB, stakeholders, and the public.

Environmental measurements are concentrated within the area of the platforms where meaningful changes are expected to occur and where the point source discharge is located. However, concerns for the Gully and the potential transport of drill wastes to that area indicated that monitoring on a regional basis is required. This regional monitoring also addresses specific questions about cumulative effects from other sources on the Sable Bank, including the SOEI gas fields and the Cohasset-Panuke development.

Selected attributes considered for inclusion into the drilling phase EEM program are: water quality in the water column and benthic boundary layer; sediment quality; benthic habitat; shellfish taint and body burden; marine mammals; and seabirds.

The basic strategy of this monitoring design is to take environmental measurements at sufficient spatial coverage over the course of the drilling and production phases to determine drilling material deposition, movement, and fate/impact of discharged waste. The sampling program was based on a standard gradient to background grid design commonly used to monitor effects from offshore oil and gas developments. This sampling grid consists of major and minor axes with sampling conducted at specific points on these axes. The major axes align with the mean current and most probable storm path directions of drilling and production waste discharges, as predicted by modelling (MacLaren Plansearch Limited 1997a,b).

1.3 Current Stage of Offshore Development

Initial Tier I development planning included five wells to be drilled at Venture, four wells at Thebaud and three wells at North Triumph. As of December 31, 1999 five wells at Venture had been drilled to

completion or partially, four wells at Thebaud are virtually completed and one well at North Triumph was completed.

Water based muds were batch drilled in the upper portion of each well at each field before proceeding with drilling using the synthetic-based mud, NovaPlus™. This product is composed of silica, gypsum, diethylenetriamine, methyl alcohol, sodium chloride, calcium hydroxide, calcium chloride and synthetic hydrocarbon (oligomer). Hydrocarbons extracted by gas-liquid chromatography from a sample sent to DalTech's Canadian Institute of Fisheries Technology, occur in cluster of six peaks coinciding with C₁₄-C₁₉ aliphatic hydrocarbons. The Material Safety Data Sheet for NovaPlus™ is provided in Appendix A. There was no acute aquatic toxicity in mysid shrimp toxicity tests.

The cuttings material ranges from shale to coarse grain sands. The type of drill bit, solids removal in the mud system, and the formation type dictates the ultimate size of the material discharged.

1.4 Objectives

This EEM program involves the collection of repeated measurements of environmental variables to detect changes that are directly or indirectly attributable to drill waste discharges. The EEM program is undertaken with the following primary objectives:

- to verify whether the effects of discharging drill wastes into the marine environment occur within the zones of influence predicted by the EIS;
- to evaluate the effectiveness of mitigation and identify the need for improved or altered mitigation;
- to provide an early warning of undesirable change in the environment;
- to provide results to the Canada-Nova Scotia Offshore Petroleum Board, other regulatory authorities, stakeholders and public so that there can be informed decision making; and
- to contribute to the knowledge base of the Scotian Shelf and improve environmental understanding of cause-and-effect relationships related to offshore oil and gas developments.

1.5 Scope

This report focuses on the Tier I development up to December 31, 1999 and includes the natural gas well sites at Venture, Thebaud and North Triumph. This date is significant as the CNSOPB stipulated in Condition 21 of the Development Plan Decision Report that after December 31, 1999, discharges of low

toxicity mineral oil on cuttings shall not exceed 1% LTMO by weight on cuttings, unless authorized. The synthetic-based muds used for drilling fall into this category of LTMO's.

Drilling at Venture commenced June 20, 1998, followed by commencement of development drilling at Thebaud on November 22, 1998. Drilling at the North Triumph gas field commenced in November 1999 to complete one well before the December 31 deadline, and is currently suspended.

1.6 Report Organization

Section 2 provides a chronology of drilling in Tier I up to December 31, 1999. Information on the volume of drill cuttings, muds, and percent oil on cuttings released are provided for each well.

Section 3 presents the results for the baseline and drilling surveys conducted from June 1998 to November 1999. Development drilling at each field was staggered, hence the number of drilling surveys varies.

Section 4 compares the predicted model results for the distribution and dispersion of drill waste with measured values at each gas field.

Section 5 summarizes the report findings, Section 6 provides recommendations for consideration in the ongoing SOEI EEM surveys. References are provided in Section 7.

Appendices are presented under separate cover in Volume 2.

2.0 CHRONOLOGY OF OFFSHORE DRILLING OPERATIONS

This section describes the drilling progress, and the amount of drill cuttings and mud discharged at each of the three fields in the Tier I phase of the SOEI EEM Program as of December 31, 1999. This information is provided by SOEI drilling engineers and M-1 Drilling Fluids Canada Ltd. Figure 2.1 illustrates the well depth and development status up to December 31, 1999.

All wells were initially batch drilled with water-based mud followed by continued use of water-based mud and eventually switching to synthetic-based mud, when required. Figure 2.2 illustrates the drilling dates and associated drill mud type for all wells. Table 2.1 shows the total volumes of cuttings and mud by type and the percentage of oil on cuttings discharged.

Table 2.1 Volume of Mud and Cuttings Discharged From Each Well

Well	Vol. Of WBM Cuttings (m ³)	Vol. Of WBM (m ³)	Vol. Of SBM Cuttings (m ³)	Vol. Of SBM (m ³)	% Oil on Cuttings Discharged		
					Average	Min-Max Range	
Venture 1	1600.7	nr	369.9	151.2	9.43	5.44	15.91
Venture 2	nr	nr	0	0	0	0	0
Venture 3	279.6	1530.7	286.1	573.3	9.25	5.66	13.68
Venture 4	98.7	nr	497.8	568.3	9.98	6.13	13.87
Venture 5	213.8	567+	501.7	528.6	9.43	3.48	15.24
Thebaud 1	165.5	nr	330.6	536.7	11.57	8.43	13.78
Thebaud 2	361.2	nr	244.6	536.7	11.55	6.85	26.61
Thebaud 3	360.6	288+	391.5	446.4	10.73	5.84	21.76
Thebaud 4	166.2	310	0	0	0	0	0
Thebaud 5	369.0	362	315.7	313.0	10.81	9.08	13.23
North Triumph 1	286.1	nr	194.1	194.5	12.52	9.50	24.19

nr=not reported

+ = not all volumes reported

The mean percentage of oil discharged with the drill cuttings is below the Offshore Waste Treatment Guidelines (NEB *et al.* 1996) limit of 15 %.

Figure 2.1

Well Depths/Status - Dec 31, 1999

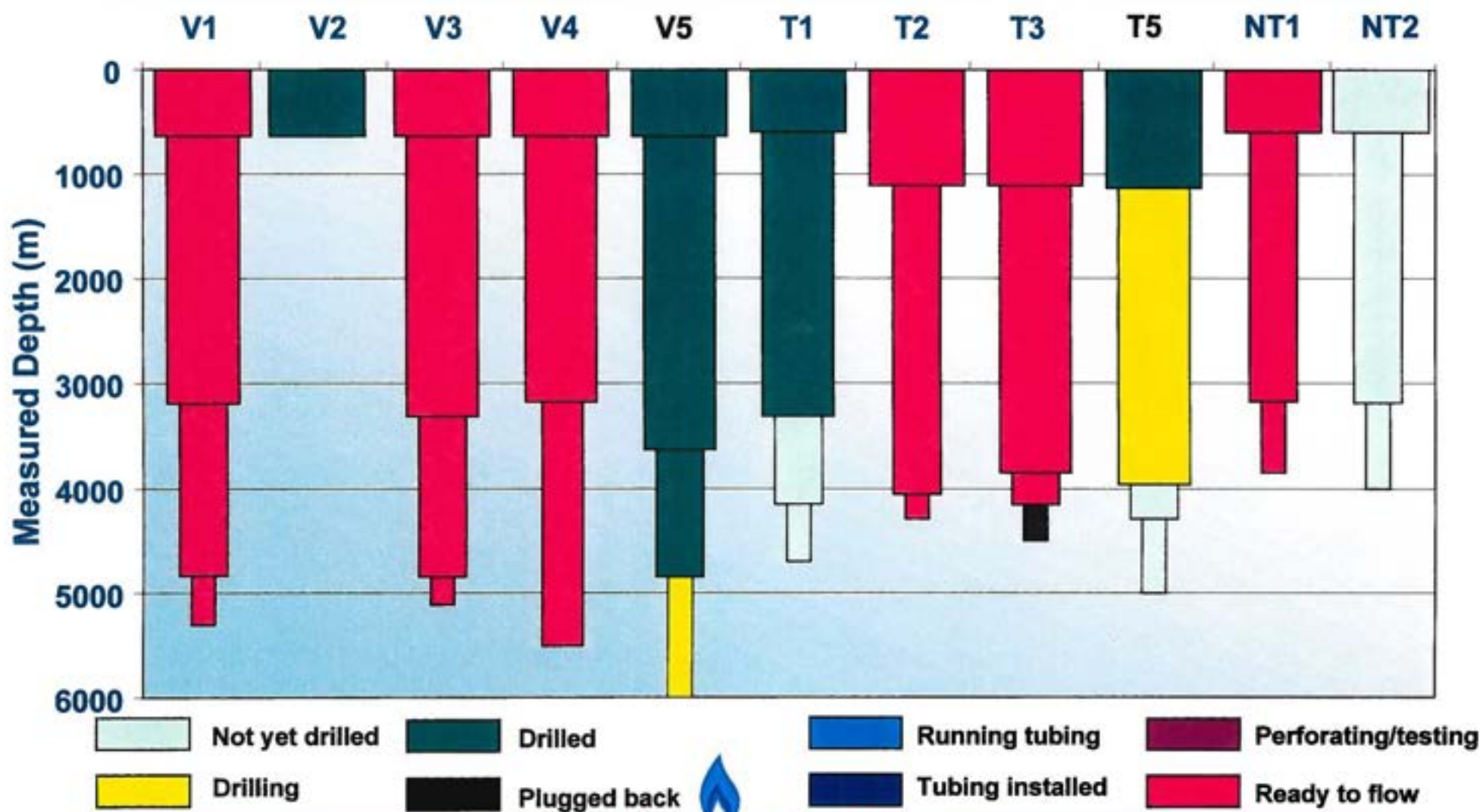
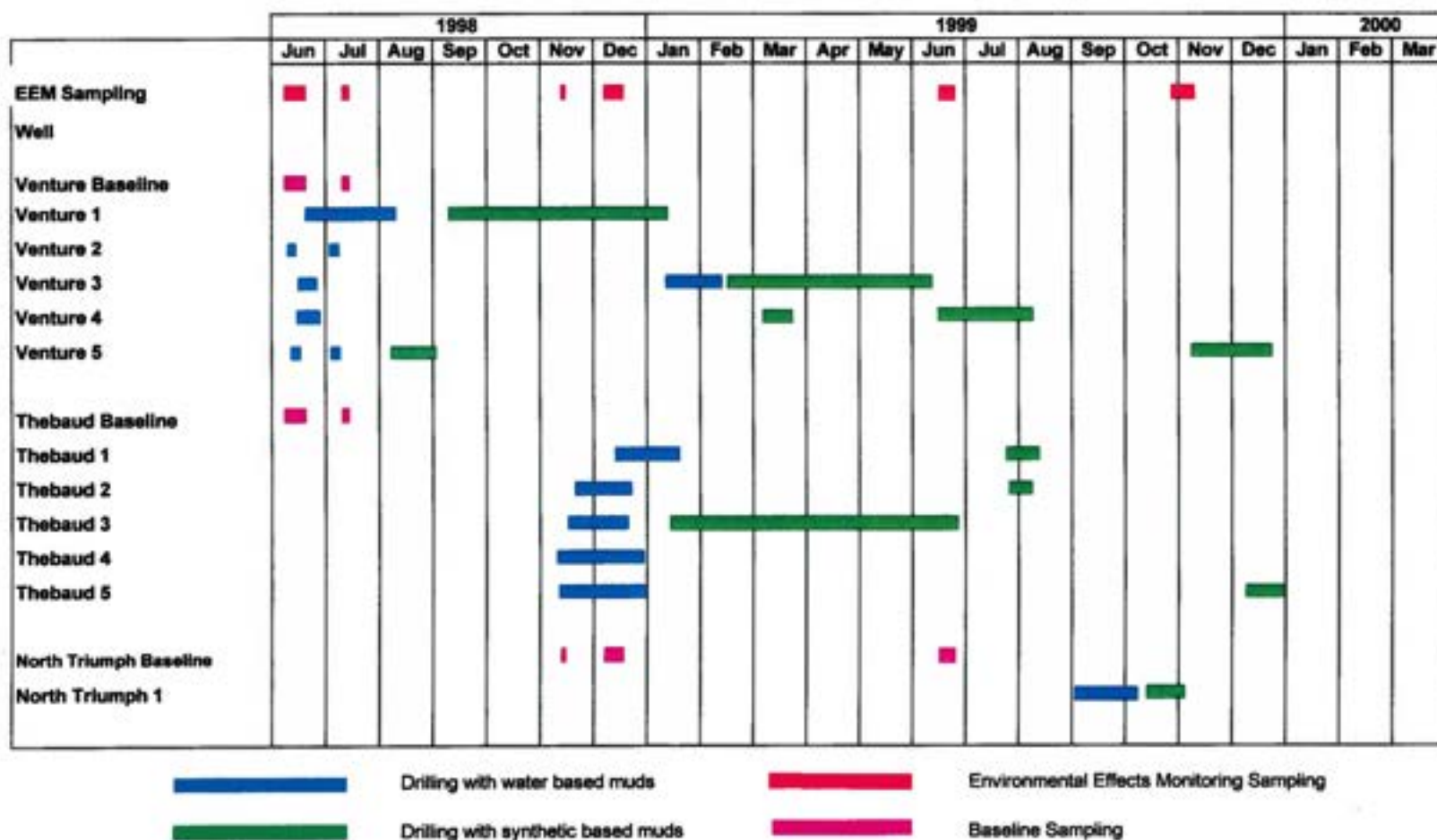


Figure 2.2

Drilling Schedule and Mud Types



2.1 Venture

In the original project description (SOEI 1996), five wells were planned for the Venture field. Five wells had undergone drilling activity at the Venture field by the end of 1999 (Figure 2.1). Three of these wells were considered to be "ready to flow". No new wells will be drilled at this field unless there is a change in gas demand or project scope in the future (I. Pettit, SOEI, pers.comm.). Figures 2.3 and 2.4 illustrate the EEM survey schedule relative to the discharge of drill cuttings.

Venture 1

Drilling operations commenced at the Venture 1 well site on June 20, 1998 with the use of water-based mud (WBM) (Figure 2.2). The use of WBM for drilling continued until July 31, 1998 with completion of the upper portion of the well. Over this period 1,600.7 m³ of WBM cuttings were discharged. The volume of WBM discharged was not recorded.

Drilling recommenced with the use of synthetic-based mud (SBM) on September 6, 1998 and continued until December 22, 1998. The final discharge of SBM cuttings occurred on December 22, 1998 and total SBM totaled 369.9 m³. The final discharge of SBM occurred on December 28, 1998. A total of 151.2 m³ of SBM was discharged.

Two EEM sampling surveys coincided with the drilling activity at this well. The coinciding dates were July 10–14, 1998 and again on November 13 and 14, 1998 in conjunction with December 9–14, 1998.

Venture 2

Drilling with WBM occurred at the Venture 2 well on June 12, 1998 and July 4 and 5, 1999. The volumes of WBM cuttings or mud released were not recorded.

Venture 3

Initial WBM drill activities were carried out between June 18, 1998 and June 24, 1998. Drilling with WBM recommenced on January 18, 1999 and continued until February 3, 1999. The final discharge of WBM cuttings occurred on February 3, 1999 but the final discharge of WBM did not occur until Feb 8, 1999. A total of 279.6 m³ of WBM cuttings and 1,530.7 m³ of WBM were discharged.

Drilling with SBM began on February 9, 1999 and continued until March 7, 1999. This drilling was completed between March 23, 1999 and June 2, 1999 when the final discharge of SBM cuttings occurred. However, the final discharge of SBM occurred on June 10, 1999. A total of 286.1 m³ of SBM cuttings and 573.3 m³ of SBM were discharged over this drilling period.

Figure 2.3 Venture Cuttings Discharges

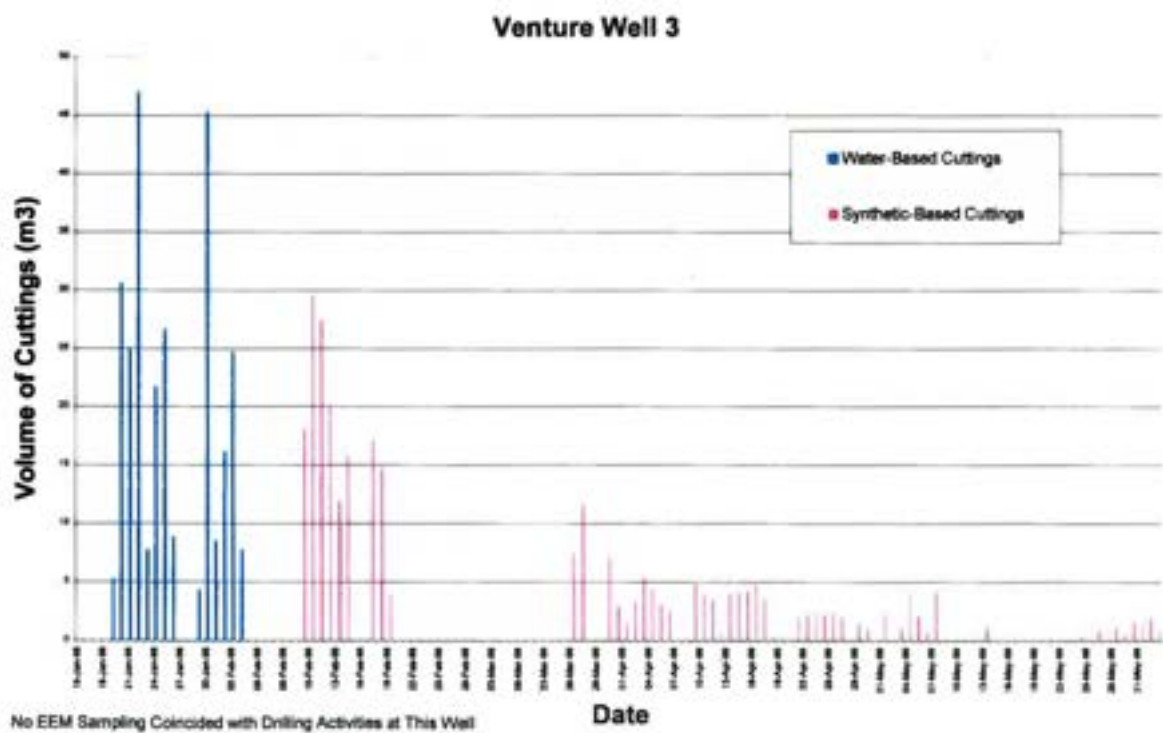
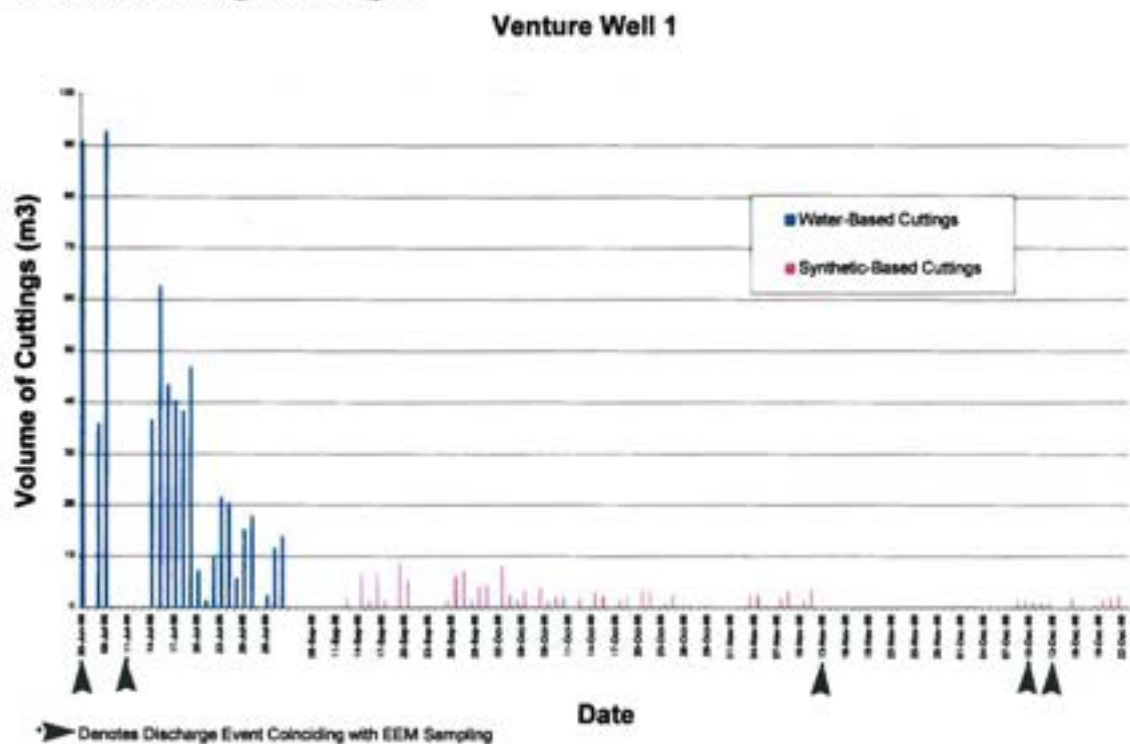
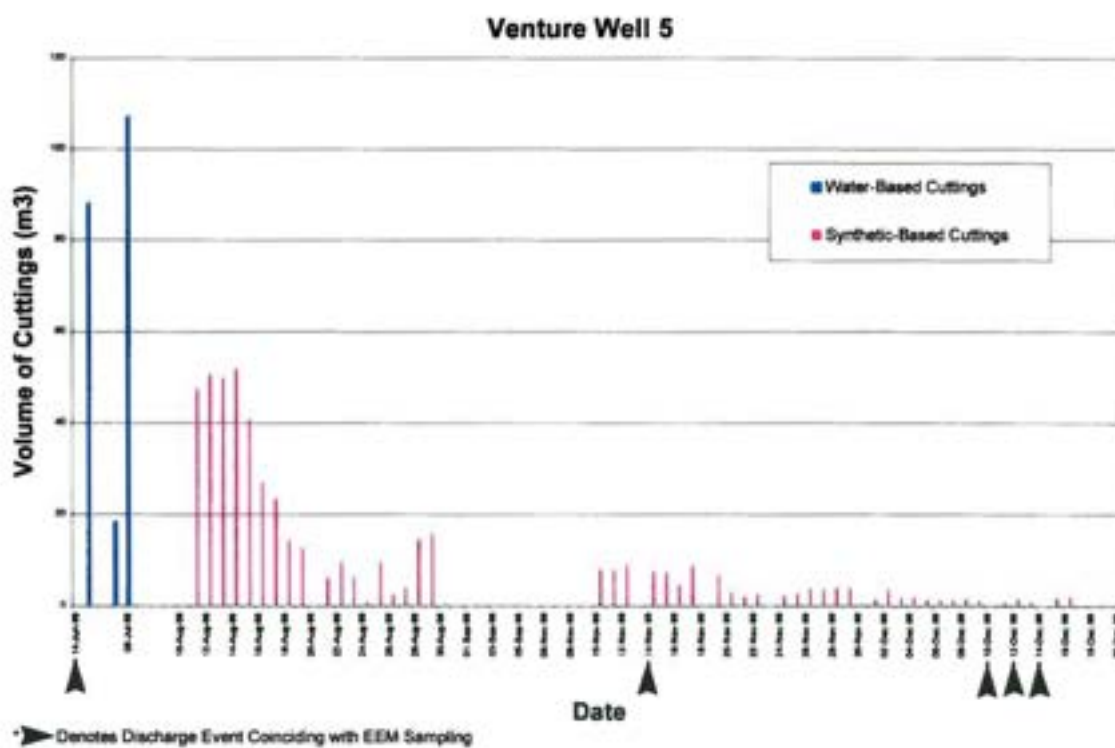
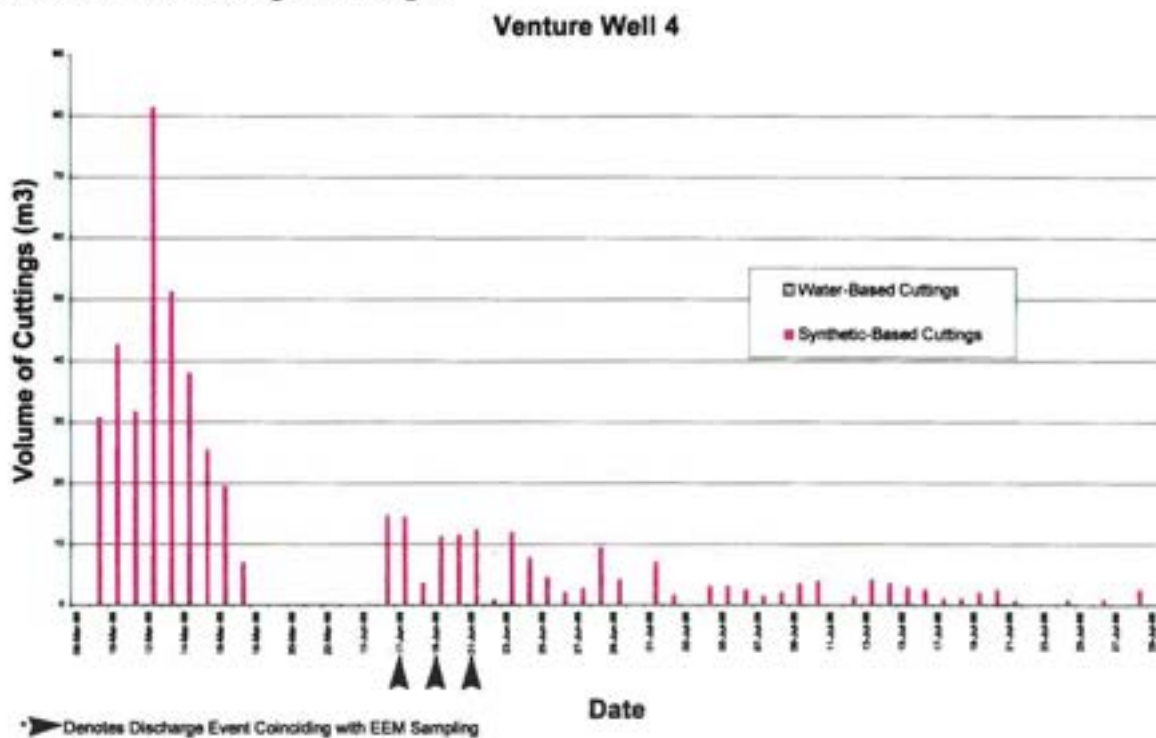


Figure 2.4 Venture Cuttings Discharges



No EEM surveys coincided with WBM or SBM drilling at the Venture 3 well.

Venture 4

Drilling with WBM occurred between June 16, 1998 and June 29, 1998 at the Venture 4 well. A total of 98.7 m³ of WBM cuttings were discharged to the marine environment over this period. The volume of mud discharged was not recorded.

Drilling with SBM began on March 9, 1999 and paused on March 17, 1999. Drilling recommenced on June 16, 1999 and continued until July 29, 1999 when the final total depth was attained and the final discharge of SBM cuttings occurred. The final discharge of SBM did not occur until August 9, 1999 when all activities to finalize preparation for production were completed. This drilling generated 497.8 m³ of SBM cuttings and 568.3 m³ of SBM discharged.

The drilling activities at the Venture 4 well coincided with the EEM survey which took place between June 16, 1999 and June 21, 1999.

Venture 5

The WBM drilling of the upper portion of the Venture 5 well proceeded on June 14 and 15, 1998 and July 7-9, 1998. A total of 213.8 m³ of WBM cuttings were discharged during this period. All WBM cuttings were released over three days. One 567 m³ dump of WBM was recorded at the end of the WBM section; however, no other volumes of WMB use was recorded.

SBM drilling of the lower portion of the Venture 5 well began on Aug 9, 1998 and was suspended on August 30, 1998. This drilling recommenced on November 9, 1999 and was ongoing at year end of 1999. To that date, 501.7 m³ of SBM cuttings and 528.6 m³ of SBM had been discharged.

The drilling activity at the Venture 5 well coincided with an EEM survey between Nov 6, 1999 and Nov 10, 1999.

2.2 Thebaud

A total of five wells were drilled at the Thebaud field to the end of 1999. By year end, the Thebaud 2 and Thebaud 3 wells were considered to be ready to produce gas. Thebaud 4 was surface drilled; casing problems rendered this well inoperable. Figures 2.5 and 2.6 show the EEM survey schedule relative to the discharge of cuttings.

Figure 2.5 Thebaud Cuttings Discharges

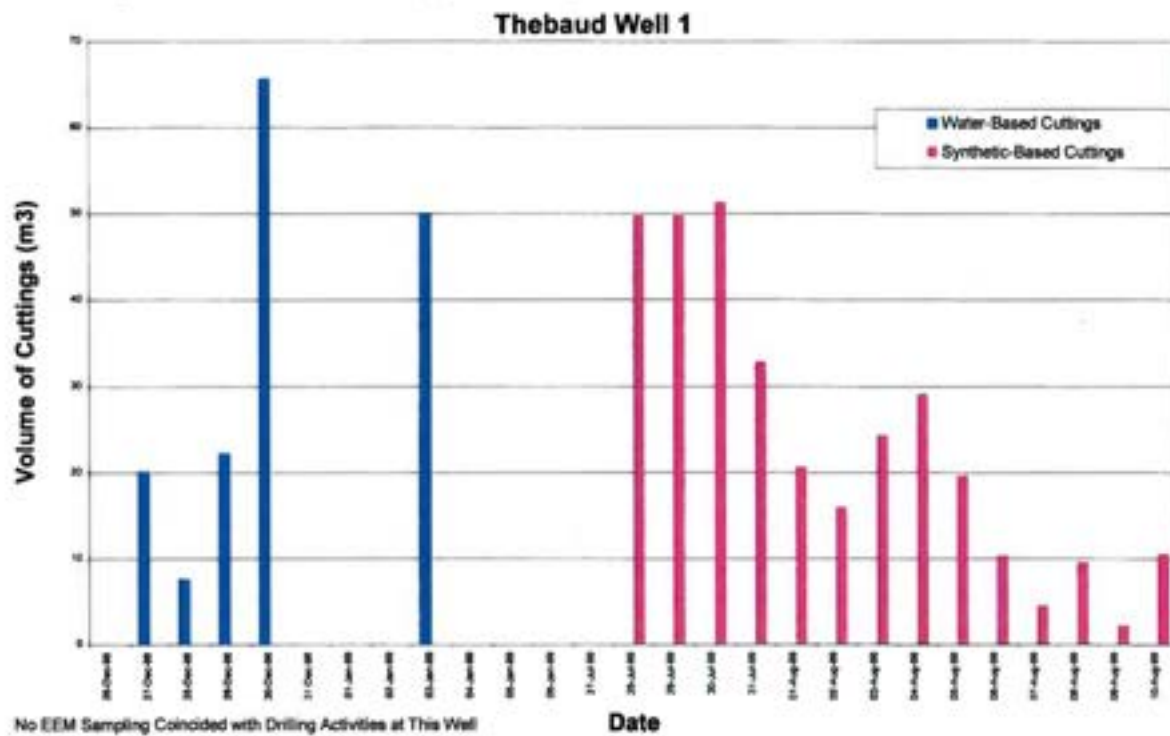
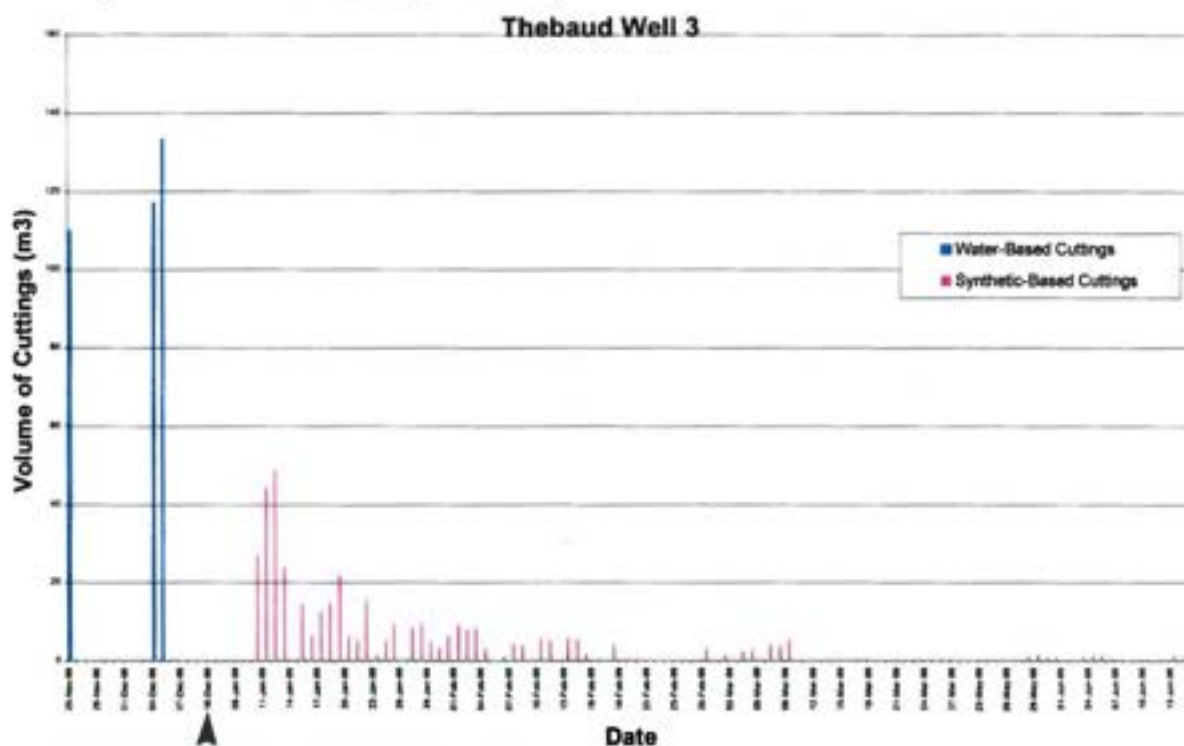


Figure 2.6 Thebaud Cuttings Discharges



Thebaud 1

Drilling with WBM at the Thebaud 1 well began on December 26, 1998 and was completed on January 3, 1999. A total of 165.5 m³ of WBM cuttings were discharged over the course of WBM drilling. The volume of WBM used was not recorded.

SBM drilling began on July 28, 1999 and was suspended on August 10, 1999. It had not recommenced by year end 1999. A total of 330.6 m³ of SBM cuttings and 536.7 m³ of SBM were discharged.

No EEM surveys coincided with WBM or SBM drilling of the Thebaud 1 well.

Thebaud 2

Drilling with the use of WBM commenced on Nov 18, 1998 and was completed between December 22–25, 1998. This drilling generated 361.2 m³ of WBM discharged cuttings. The volume of WBM discharged was not recorded.

SBM drilling began on March 29, 1999 and was completed on May 6, 1999 when a pipe became stuck in the well. Though drilling ceased on this date, the final discharge of SBM occurred on May 23, 1999. A total of 244.6 m³ of SBM cuttings and 536.7 m³ of SBM were discharged over the course of drilling the Thebaud 2 well.

No EEM surveys coincided with the drilling of Thebaud 2.

Thebaud 3

The upper portion of the Thebaud 3 well was drilled with WBM commencing on November 25, 1998 and was completed on Dec 5, 1998. A total of 360.6 m³ of WBM drill cuttings were released throughout the WBM drilling phase of Thebaud 3 with the majority of these discharges occurring on the final two days of WBM drilling. Three records of WBM discharge were reported; a minimum volume of 288 m³ was discharged.

SBM drilling began on Jan 9, 1999 and was temporarily suspended on March 9, 1999 for moving the drilling apparatus to the Thebaud 2 well. SBM drilling recommenced on May 27, 1999 and continued until completion on June 15, 1999 when final total well depth was attained. Preparation work on Thebaud 3 continued to June 28, 1999, when the final discharge of SBM occurred. Discharges of SBM cuttings totaled 391.5 m³ and 446.4 m³ of SBM.

Drill-related activities coincided with an EEM survey between June 16, 1999 and June 21, 1999.

Thebaud 4

Initial drilling of Thebaud 4 began on November 19, 1998 and was completed on December 11, 1998. Drilling relied completely on the use of WBM and a total of 166.2 m³ of WBM drill cuttings and 310 m³ of mud were discharged to the marine environment. Drilling was suspended at Thebaud 4 and no future drilling at this site is planned.

The drilling activity at Thebaud 4 did not coincide with any EEM surveys.

Thebaud 5

The upper portion of the Thebaud 5 well was drilled using of WBM between November 24, 1999 and December 18, 1999. A total of 369.0 m³ of WBM cuttings were discharged with the majority of the cuttings being discharged during the final three days of WBM drilling. The records show that at least 362 m³ of WBM were bulk dumped.

Drilling recommenced with the use of SBM on Dec 14, 1999 and was ongoing at year end 1999. To this date, 315.7 m³ of SBM cuttings and 313.0 m³ of SBM had been discharged.

None of the drilling activity at the Thebaud 5 well coincided with EEM surveys.

2.3 North Triumph

At year end 1999 only the North Triumph 1 well had been drilled. This one well was considered to be ready to produce natural gas at this time. Figure 2.7 shows the EEM survey schedule relative to the volume of cuttings discharged.

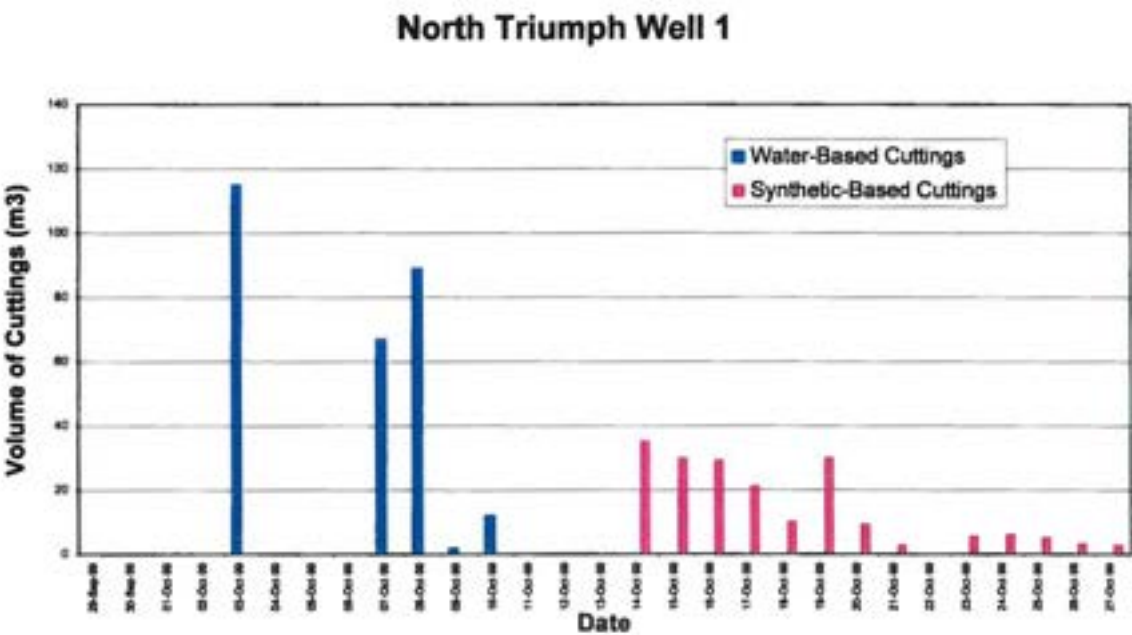
North Triumph 1

Drilling with WBM commenced on October 3, 1999 and was completed on October 10, 1999. In total, 286.1 m³ of WBM drill cuttings, 484 m³ of WBM were bulk dumped and at least 32 m³ of WBM from the solids removal equipment were discharged over the course of the WBM drilling at North Triumph 1.

Drilling with SBM began on October 14, 1999 and was completed on October 27, 1999 when the final discharge of SBM occurred. Activities to ready well for production continued until November 5, 1999. A total of 194.1 m³ of SBM drill cuttings were discharged along with 194.5 m³ of SBM. The majority of the SBM cuttings and SBM were discharged over the initial six days of SBM drilling at North Triumph 1.

The drill-related activities at the North Triumph 1 well coincided with an EEM survey between October 28, 1999 and November 5, 1999.

Figure 2.7 North Triumph Cuttings Discharges



No EEM Sampling Coincided with Drilling Activities at This Well

3.0 MONITORING RESULTS

The drilling phase sampling design focuses upon the seabed because sediments are the ultimate destination for persistent chemicals in the marine environment from the release of drill fluids and cuttings. The two most common chemical contaminants associated with offshore oil and gas platforms are hydrocarbons and metals. Particulates from drill wastes in the benthic boundary layer are also considered in the program because there may be potential effects on scallops on the Bank. This section presents the results of the drilling surveys undertaken from November 1998 through to November 1999 and compares the findings with the baseline surveys.

3.1 Sampling Design

The sampling design and methodologies for sampling are described in detail in the baseline and drilling design report (JWEL 1998). The monitoring program for the drilling areas was based on a radial design, with samples located at regular distances along axes extending away from the drill site, like spokes in a wheel. (Figure 3.1) Axes 3 and 7 were aligned with the expected prevailing current direction (MacLaren Plansearch, 1997a,b). Axes 1 and 5 were placed at right angles to that direction. The methodologies or sampling regime have not been significantly revised from the original program design.

Water Column Quality

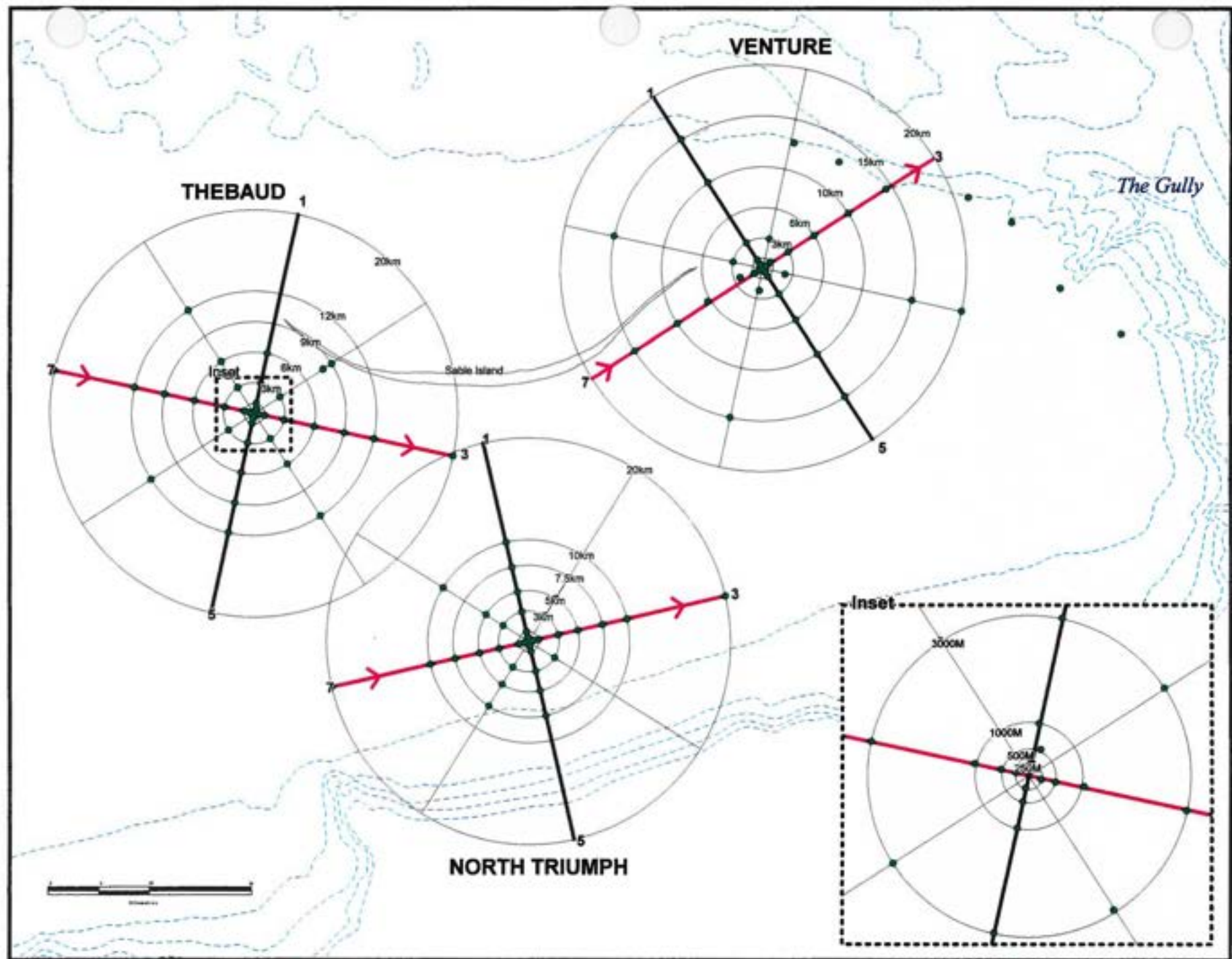
During the drilling phase, water samples are collected from the water column in the winter and summer season along the predicted prevailing current direction, from the platforms to verify plume modelling predictions of drill wastes in the water column. Samples have been analyzed for particle size and hydrocarbons. A CTD profile is taken at each station to support the physical oceanographic program.

Benthic Boundary Layer (BBL)

Water from the benthic boundary layer (BBL) is sampled using similar equipment to the CABLE (eg. Niskin bottles) developed by the Bedford Institute of Oceanography (BIO) specifically for this task. Water samples are analysed for suspended particulate matter and barium on a bi-annual basis over the drilling phase. Inorganic particle size spectrum analysis for bentonite signature is provided by BIO on a limited number of samples.

Sediment Quality

To monitor drill waste distribution, sediment is collected by a grab sampler and analysed for a suite of metals, hydrocarbons and toxicity. Sediment samples are collected bi-annually over the drilling phase at all stations for each platform.



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Figure 3.1
Environmental Effects Monitoring Sample Locations

Benthic Habitat

Benthic habitat and epifaunal species are recorded at each sampling site using underwater still photography and video cameras to provide qualitative and quantitative assessments of changes to this environmental component. These surveys are undertaken to verify model predictions of areal extent of drill waste on the seabed. Infaunal macroinvertebrate samples are collected in the North Triumph field. Post-storm seabed scour surveys conducted by SOEI are used to assess the dimensions of drill waste piles.

Taint and Body Burden of Fish and Shellfish

Taint and hydrocarbon shellfish analysis have been assessed in caged mussels and in scallops from natural occurring scallop beds near the gas fields. The drilling EEM program includes using caged mussels to monitor for taint and body burden of contaminants along a transect from each platform in the direction of prevailing current. The caged shellfish are retrieved and analysed quarterly. Scallops are collected annually from wild stocks.

Marine Mammals and Seabirds

Year-round offshore monitoring of marine mammals and seabirds are conducted by trained offshore observers on platforms and vessels.

3.2 Water Column Monitoring

3.2.1 Objective and Analysis

The objective of collecting physical oceanographic data is to provide supporting information to the EEM program. The data characterizes the water column within the projected zone of influence providing spatial and temporal characteristics of stratification.

Hydrographic parameters, especially density, may potentially influence EEM results through their direct and indirect relationship to current patterns. Summer stratification can lead to variations in the vertical tidal current patterns and will affect the ocean response to wind events. The nature and importance of this influence near Sable Island is presently an area of active research. It has been recently noted (COA, 1997), that variations in tidal flows can be related to minor variations in stratification resulting from a few days of settled sunny summer weather. High currents due to spring tides and storms will tend to reduce stratification and hence the Sable area features tidal patterns which may vary on meteorological time scales. The hydrographic component of the 1999 EEM program was primarily the summer and fall surveys supplemented by CTD casts conducted during field trips to deploy or recovery environmental equipment.

The data provide an overall view of the seasonal hydrographic regime, showing slight stratification in summer and little stratification in winter, but do not provide enough detail to characterise minor temporal variations in stratification. Plans to acquire continuous hydrographic profiles are an important part of the existing EEM program, however, a number of operational challenges must be overcome. Acquisition strategies associated with collecting hydrographic data on meaningful temporal and spatial scales are currently under development, funded by SOEI's R&D program.

Overall hydrographic results during the summer and fall surveys are shown in Table 3.1.

A transect line from the jacket along the axis of predicted prevailing current was completed at distances 250, 500, 800, 1000, and 2000 m from the drilling platform. As depicted in Tables 3.2 to 3.4, samples were collected from the surface, mid-water and near bottom at Venture, Thebaud and North Triumph.

3.2.2 Venture Results

Total petroleum hydrocarbons were below the estimated quantitation limit (EQL) of the laboratory for all stations sampled during the drilling surveys except at mid-water depth 250 m from the Venture platform in the June 1999 survey, and 2000 m mid-water depth in the Fall 1999 survey. The concentrations were 0.001 mg/l (the EQL) and 0.002 mg/L, respectively.

Relative to further sampling stations, total suspended solids (TSS) concentrations were elevated in the mid-water samples collected 250 and 500 m from the Venture platform during the first drilling survey (Table 3.2), suggesting the presence of a plume. Chlorophyll *a* showed no change relative to the change in TSS suggesting that the elevated TSS levels did not affect light attenuation and primary production. Based on the information presented in Section 2.0, well drilling at Venture 4 was ongoing at the time of the June 1999 EEM survey. However, no plume was visible at that time. The possible plume from the first drilling survey at Venture cannot knowingly be attributed to bulk dumps of water-based mud as date specific discharge information was not recorded at the platform.

No other elevated TSS concentrations were observed during subsequent surveys at Venture, even though well drilling at Venture 1 coincided with the Fall 1998 EEM water quality sampling.

Table 3.1 Summer and Fall Hydrographic Data

Depth	Temperature (C)	Salinity (psu)	Sigma (kg/m3) (Density=Sigma+1000)
Mean Summer Hydrography at Shallow Sites (<27m)			
surface	12.01	31.57	23.92
mid-depth	11.34	31.70	24.15
bottom	10.91	31.76	24.27
Mean Summer Hydrography at Intermediate Depth Sites (27m< Z <70m)			
surface	11.92	31.71	24.05
mid-depth	9.32	31.94	24.65
bottom	7.85	32.17	25.03
Mean Summer Hydrography at Deep Sites (70m<)			
surface	11.78	31.52	23.93
mid-depth	4.86	32.17	25.44
bottom	3.89	32.62	25.91
Mean Fall Hydrography at Shallow Sites (<27m)			
surface	11.27	30.76	23.43
mid-depth	11.28	31.11	23.70
bottom	11.27	31.12	23.70
Mean Fall Hydrography at Intermediate Depth Sites (27m< Z <70m)			
surface	10.91	30.85	23.56
mid-depth	10.90	31.18	23.82
bottom	9.14	31.59	24.40
Mean Fall Hydrography at Deep Sites (70m<)			
surface	11.04	31.02	23.67
mid-depth	10.50	31.11	23.83
bottom	4.72	32.53	25.74

Table 3.2 Total Suspended Solids (TSS) and Chlorophyll *a* Concentration in the Water Column at Venture Field

Station	Depth	TSS (mg/L)			Chlorophyll <i>a</i> (mg/m ³)		
		Nov/Dec 1998	June 1999	Oct/Nov. 1999	June 1999	Nov/Dec 1998	Oct/Nov. 1999
V-250-3	surface	<0.5	2.8	2.3	0.3	0.8	1.8
	middle	13.2	3.0	1.6	0.3	0.9	1.5
	bottom	1.0	2.1	1.1	0.3	0.8	1.6
V-500-3	surface	2.0	2.6	1.4	0.5	0.7	1.4
	middle	13.2	4.1	1.8	0.4	0.8	1.8
	bottom	2.1	3.2	1.3	0.5	0.6	1.7
V-800-3	surface	1.2	2.8	1.4	0.4	1.0	1.2
	middle	1.7	2.7	1.4	0.5	0.8	1.6
	bottom	1.2	2.7	1.7	0.8	0.9	1.7
V-1000-3	surface	1.1	4.8	1.8	0.5	0.7	1.6
	middle	<0.5	3.0	2.2	0.5	0.9	1.0
	bottom	1.0	2.6	1.9	0.6	0.9	0.8
V-2000-3	surface	1.5	2.1	1.3	0.3	0.8	1.2
	middle	1.4	2.3	1.7	0.6	1.0	1.1
	bottom	1.1	2.1	2.1	0.6	0.7	1.4

3.2.3 Thebaud Results

Drilling at Thebaud 4 coincided with water quality sampling of the June 1999 EEM survey, and no elevated concentrations of TSS nor suppression of primary production were observed (Table 3.3). Total petroleum hydrocarbons were less than the analytical EQL for all stations sampled during the drilling surveys.

Table 3.3 Total Suspended Solids (TSS) and Chlorophyll *a* Concentration in the Water Column at Thebaud Field

Station	Depth	TSS (mg/L)		Chlorophyll <i>a</i> (mg/m ³)	
		June 1999	Oct/Nov. 1999	June 1999	Oct/Nov. 1999
T-250-3	surface	3.0	2.3	0.3	2.2
	middle	4.0	1.5	0.4	2.0
	bottom	4.2	3.6	0.8	2.4
T-500-3	surface	4	2.4	0.3	2.3
	middle	3.9	3.1	0.4	2.4
	bottom	4.4	3.4	0.5	2.4
T-800-3	surface	3.5	1.8	0.3	2.5
	middle	3.0	1.7	0.4	2.5
	bottom	3.2	3.8	0.8	2.4
T-1000-3	surface	2.7	2.3	0.3	2.5
	middle	3.0	1.9	0.4	1.8
	bottom	2.8	4.2	0.5	2.4
T-2000-3	surface	1.6	2.5	0.4	3.0
	middle	2.1	1.6	0.5	2.7
	bottom	2.3	2.1	0.8	2.7

3.2.4 North Triumph Results

Water quality samples were collected for the first time at North Triumph just after drilling activity at North Triumph 1 had ceased and no elevations in TSS were detected (Table 3.4). Total petroleum hydrocarbons were below the EQL of the laboratory for all stations sampled during the drilling surveys.

Table 3.4 Total Suspended Solids (TSS) and Chlorophyll *a* Concentration in the Water Column at the North Triumph Field

Station	Depth	TSS (mg/L)	Chlorophyll <i>a</i> (mg/m ³)
		November 1999	November 1999
NT-250-7	surface	1.9	1.1
	middle	1.9	1.1
	bottom	1.6	<1.0
NT-500-7	surface	<1.0	1.1
	middle	1.3	0.8
	bottom	2.0	0.1
NT-800-7	surface	<1	1.1
	middle	1.3	1.1
	bottom	1.8	<1.0
NT-2000-7	surface	<1.0	1.1
	middle	<1.0	1.1
	bottom	2.0	0.1

3.3 Benthic Boundary Layer

3.3.1 Objectives

Monitoring for suspended particulate matter (SPM) and barium in the BBL was undertaken in a spatial and temporal context at each gas field. These results were used to evaluate whether drill waste flocculant was present at concentrations predicted by the modeling to adversely affect commercially important shellfish species. Research studies on developing predictive models and sampling technology for flocculation in the benthic boundary layer are ongoing (Muschenheim *et al.* 1995, Muschenheim and Milligan 1996, Milligan *et al.* 1997).

The BBL study is designed to address specific questions from which the following null hypothesis is derived for statistical analysis:

- Does benthic boundary layer flocculent occur in pre-drill conditions? What are its characteristics in terms of specific tracers of particle size and the presence of petroleum hydrocarbons and barium?

- Can benthic boundary layer flocculent be consistently identified and sampled with existing available technology by a gradient-to-background approach?

H_0 : The concentration of barium and suspended particulate matter in water samples from the benthic boundary layer are not significantly higher during drilling operations.

3.3.2 Data Analysis

Conceptually, if drilling activities were to increase benthic boundary layer SPM concentrations, and if this SPM were enriched with barium (from drilling muds), then there should be a strong and positive relationship between benthic boundary layer SPM and barium concentrations. For each drilling platform, the relationship between benthic boundary layer SPM concentration and total barium concentrations in the SPM (all measurements from all stations) was first examined by linear regression. Both variables were first log-transformed in order to improve the heterogeneity of the variance. There was no significant relationship ($p < 0.05$) between benthic boundary layer SPM and barium concentrations at Venture or Thebaud. There was a significant regression relationship ($p = 0.008$) at North Triumph, however, the relationship was very weak ($r^2 = 0.082$).

To further evaluate the potential environmental effects of drilling activities, the benthic boundary layer SPM concentrations ($\mu\text{g/L}$) and barium concentrations ($\mu\text{g/g}$ in the SPM) were compared between near-field ($\leq 3,000$ m from the drilling platform) and far-field ($> 3,000$ m from the drilling platform) areas, to determine whether there are major effects within the near-field area. The data were tested using nested Analysis of Variance (ANOVA), with Field (near-field or far-field) and Time (baseline, or after up to 6, 12 or 18 months of drilling activity) as main effects. As no significant differences were expected at the time of the baseline survey, the Field $\times$ Time interaction term is of particular interest in assessing differences that may be attributable to the drilling activities.

Subsequently, effects within the near-field area were assessed, again using nested ANOVA, with Distance (250, 500, 1,000 and 3,000 m from the drilling platform) and Time (as before) being main effects, and the Distance $\times$ Time interaction again being of particular importance with respect to detecting effects that may be attributable to the drilling activities.

In any statistical testing program where a large number of tests are carried out, there is a risk that random factors will occasionally lead to the conclusion that a statistically significant effect exists, where in fact there is no real difference. Using the conventional statistical probability level (p) of $\alpha = 0.05$, this will occur in about one test in twenty. In order to aid in interpreting the importance of statistically significant differences where doubt may exist as to whether they are true effects of the project, four principles were identified during the study design phase. These were the principles of:

- proximity (differences are more likely to be attributable to the project if they are observed in close proximity to the source of the disturbance);
- adjacency (differences are more likely to be attributable to the project if two or more adjacent locations are affected);
- multiplicity (differences are more likely to be attributable to the project if two or more parameters are affected simultaneously); and
- duration (differences are more likely to be attributable to the project if they persist over time).

Although each of these principles is evaluated independently, they can be taken cumulatively to establish a weight of evidence suggesting that observed statistically significant differences either are, or are not, true effects of the project.

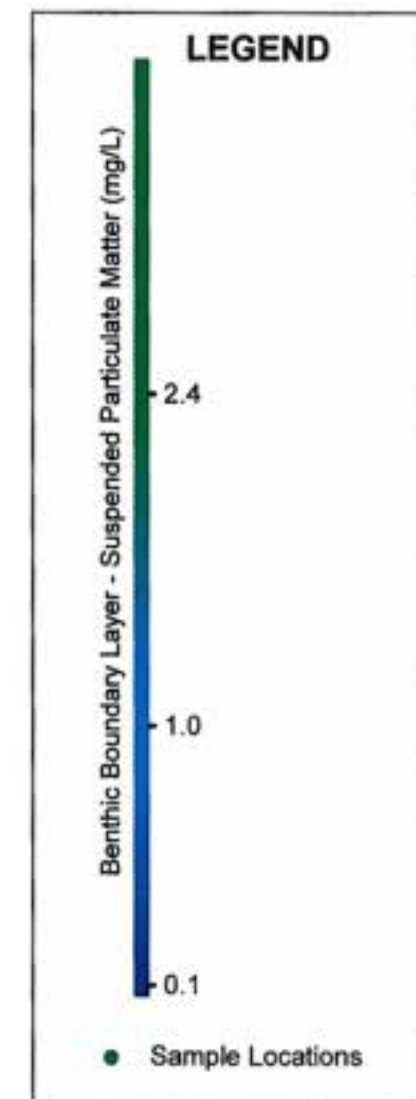
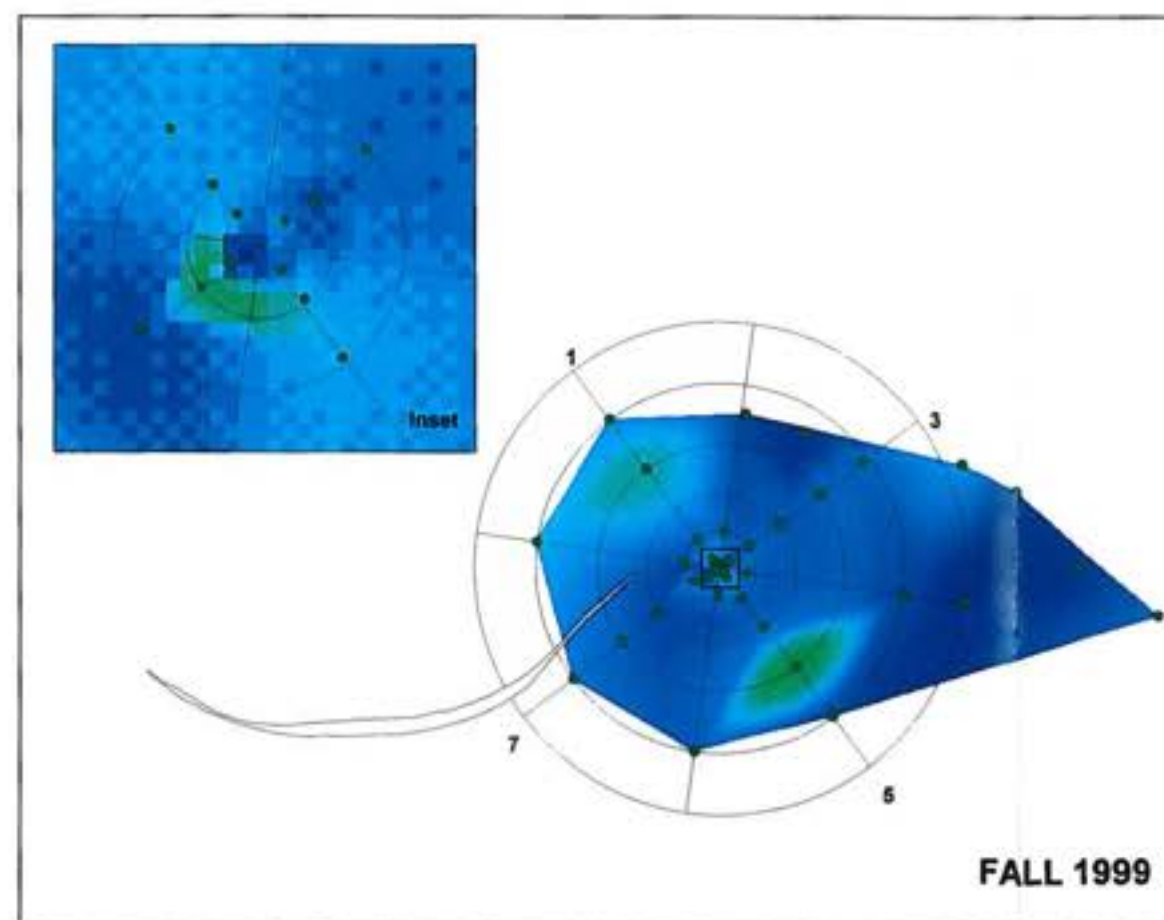
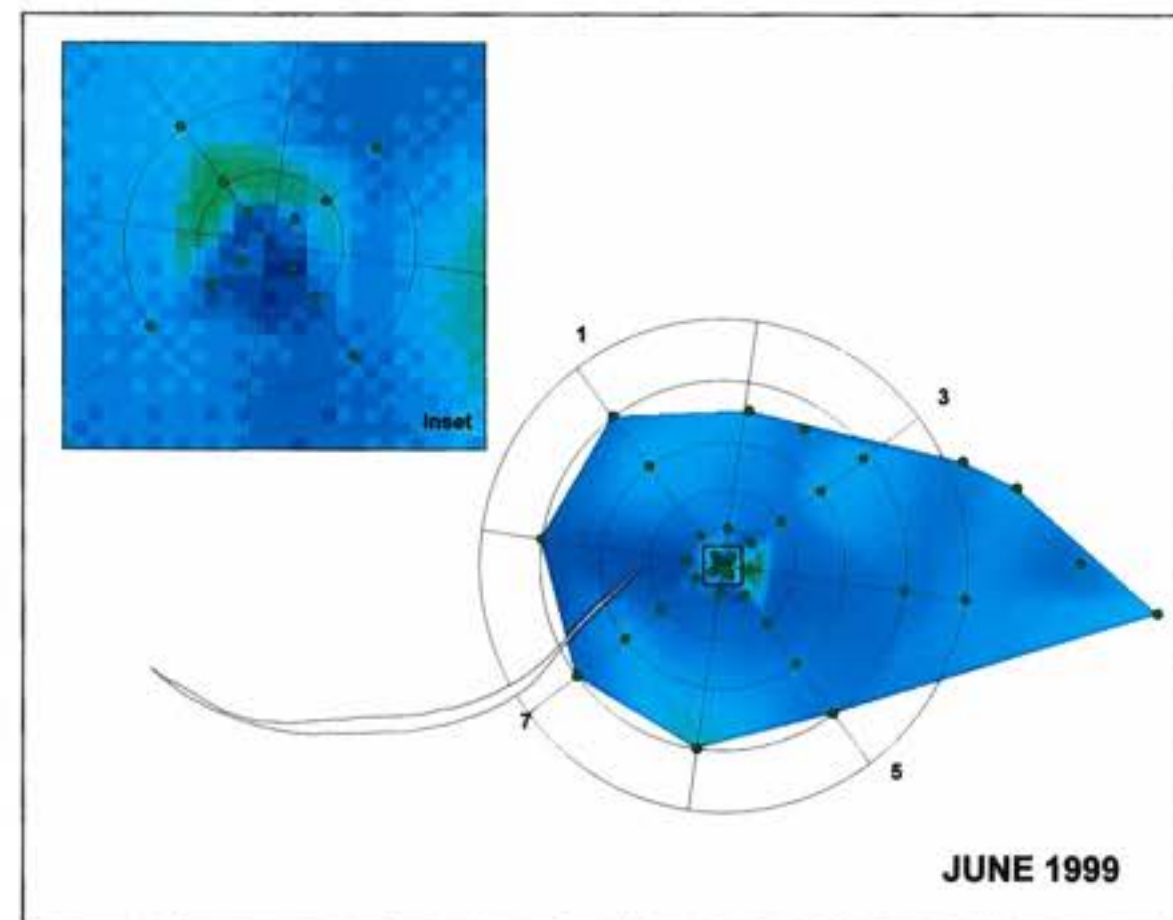
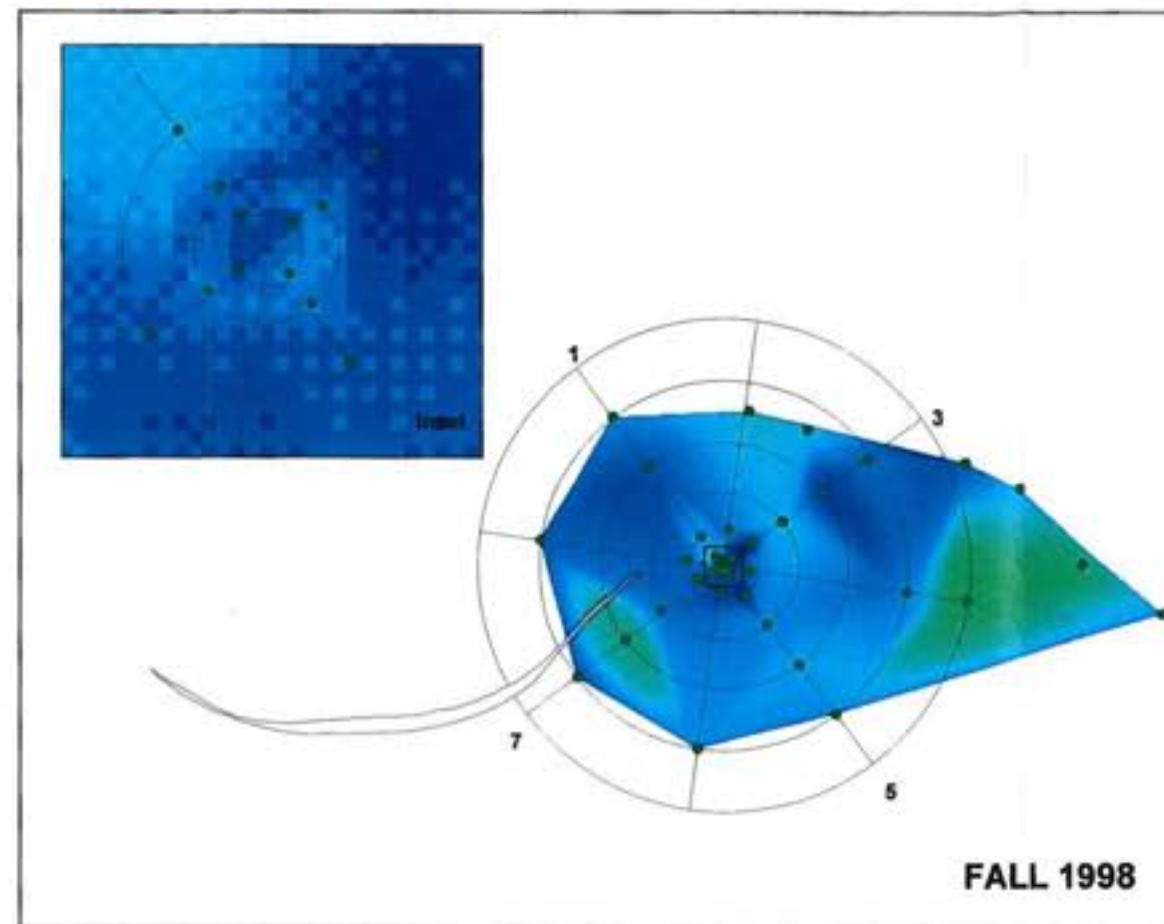
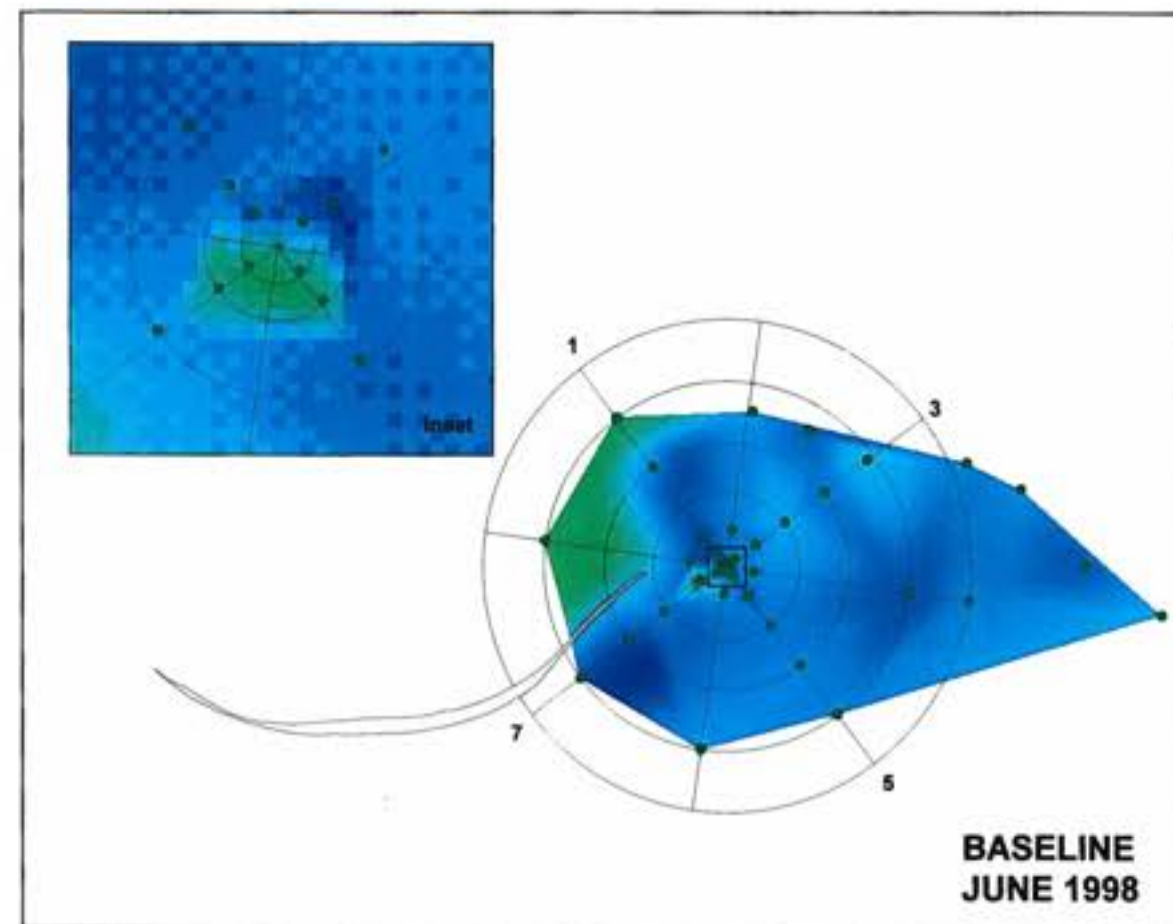
3.3.3 Near-Field vs. Far-Field

Differences between the near-field and the far-field were evaluated for each of the three drilling areas separately, using nested ANOVA (testing for effects due to Field, Time, and Field×Time). As noted above, the data for the dependent variables benthic boundary layer SPM concentration ($\mu\text{g/L}$) and barium concentration in the SPM ($\mu\text{g/g}$) were first log-transformed to improve the heterogeneity of the variance. At Venture, the baseline survey was conducted in June 1998 (Time 1), with drilling surveys in November 1998, June 1999 and November 1999 (Times 2, 3 and 4). At Thebaud, the baseline survey was also conducted in June 1998 (Time 1), with drilling surveys carried out in June 1999 and November 1999 (Times 3 and 4). At North Triumph, the baseline surveys were conducted in November 1998 and June 1999 (Times 2 and 3) with a drilling survey in November 1999 (Time 4).

The results of the statistical testing are summarized in Table 3.5. In general, these results show that there were a number of significant differences, overall, between the near-field and the far-field. The predicted differences that would indicate an effect attributable to drilling activity would include higher SPM and barium concentrations in the near-field than in the far-field. Likewise, SPM and barium concentrations would be predicted to increase after the baseline survey if there were an effect attributable to drilling.

3.3.3.1 Venture

At Venture, the benthic boundary layer SPM concentration did not differ significantly between near-field and far-field, or over time (Figure 3.2). The barium concentration in SPM, however, showed a significant Field×Time interaction ($p=0.044$) and to Time ($p=0.004$). These differences reflected higher barium concentrations overall in November 1998 (drilling) than in November 1999 (drilling) (Figure 3.3). In addition, the barium concentration was lower in the near-field than in the far-field in November 1998, but higher in the near-field than in the far-field in November 1999. None of these differences appear to be attributable to drilling activities.



**FIGURE 3.2
BENTHIC BOUNDARY
LAYER SUSPENDED
PARTICULATE MATTER**

Venture Well & Gully Sites

Table 3.5 Results of Nested ANOVA, with Coding for Field (Near vs. Far), Time (Date of Survey), and Field×Time Interactions at Venture, Thebaud and North Triumph

Variable	Probability (p) of Difference Being Significant		
	Field	Time	Field×Time
Venture-SPM	0.183	0.611	0.673
Venture-Barium	0.616	0.004	0.043
Thebaud-SPM	0.467	0.001	0.349
Thebaud-Barium	0.014	0.053	0.044
North Triumph-SPM	0.810	0.514	0.044
North Triumph-Barium	0.193	<0.001	0.384

3.3.3.2 Thebaud

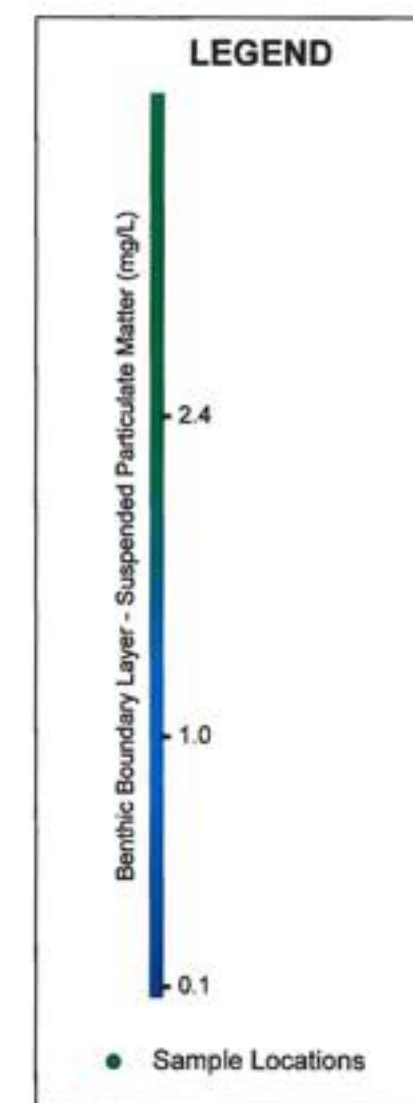
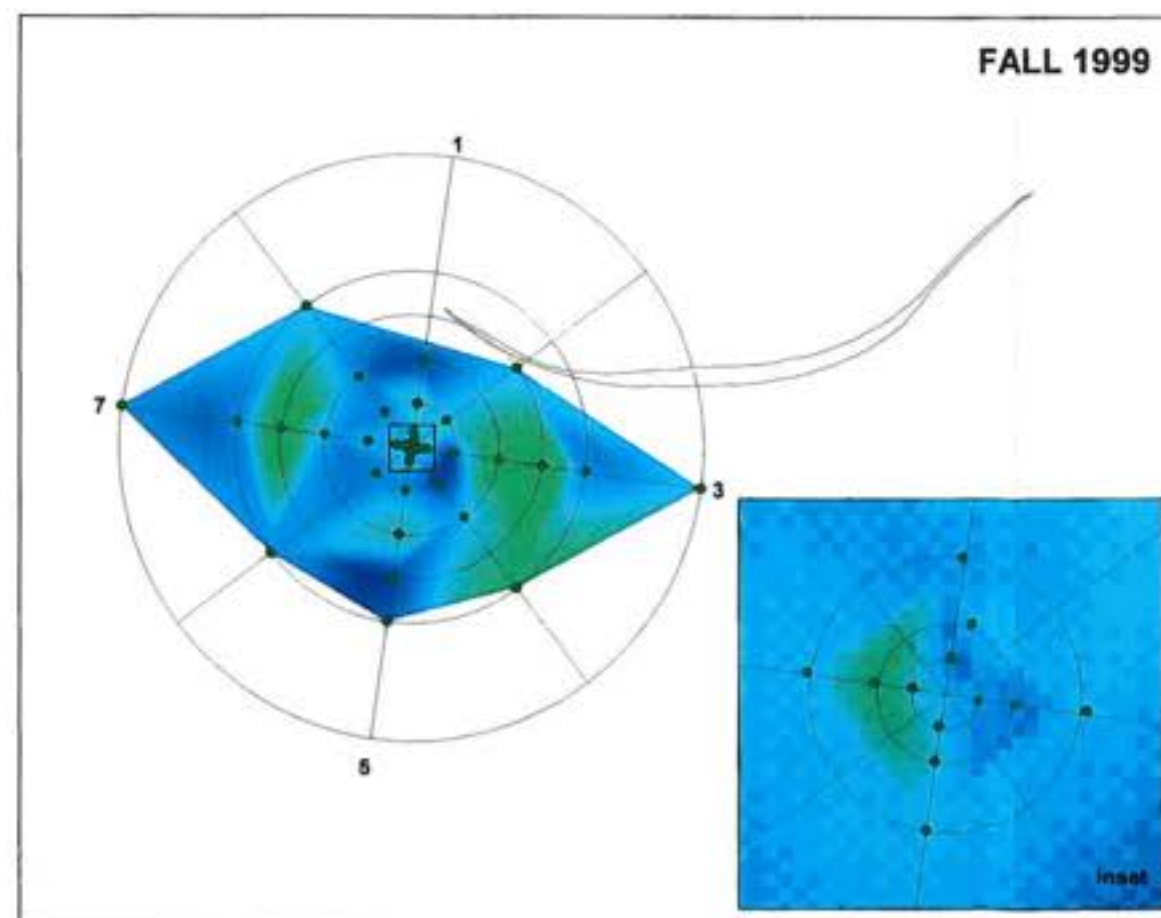
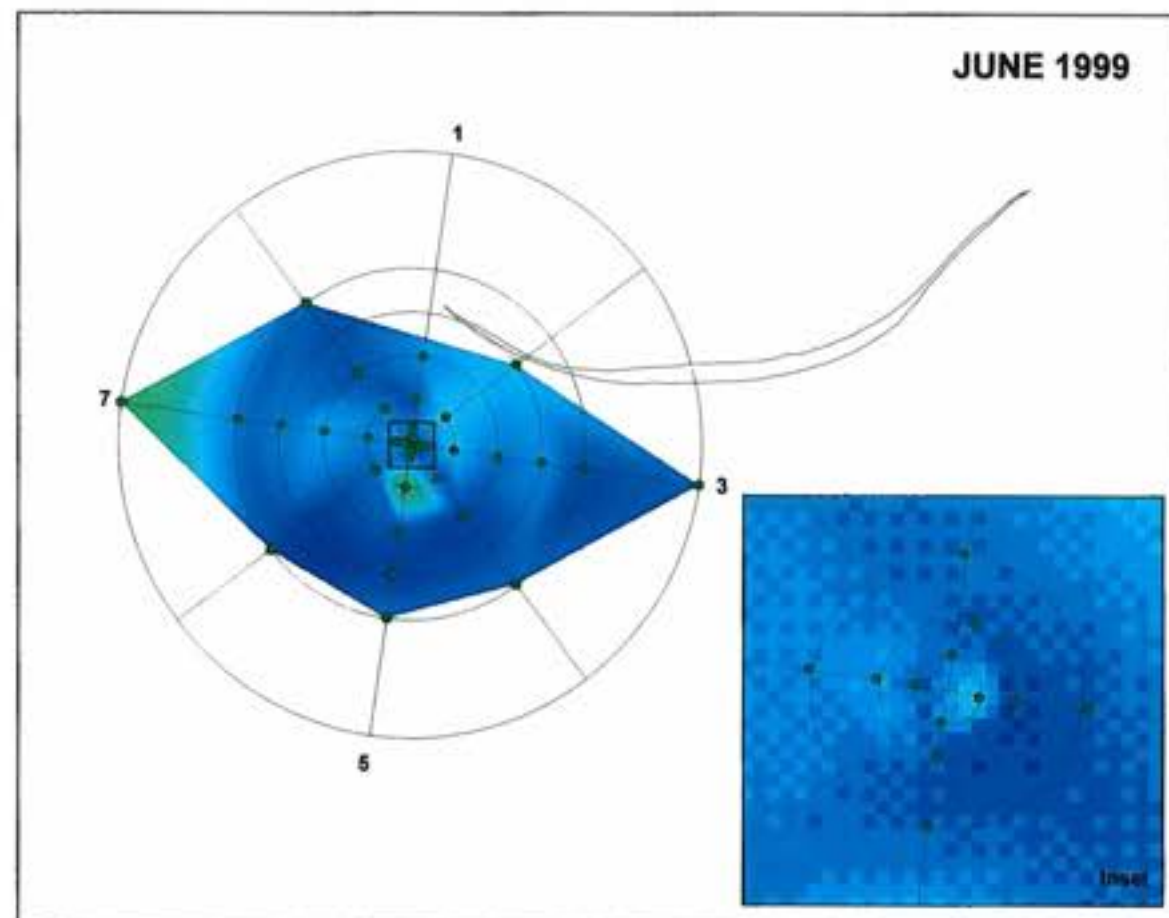
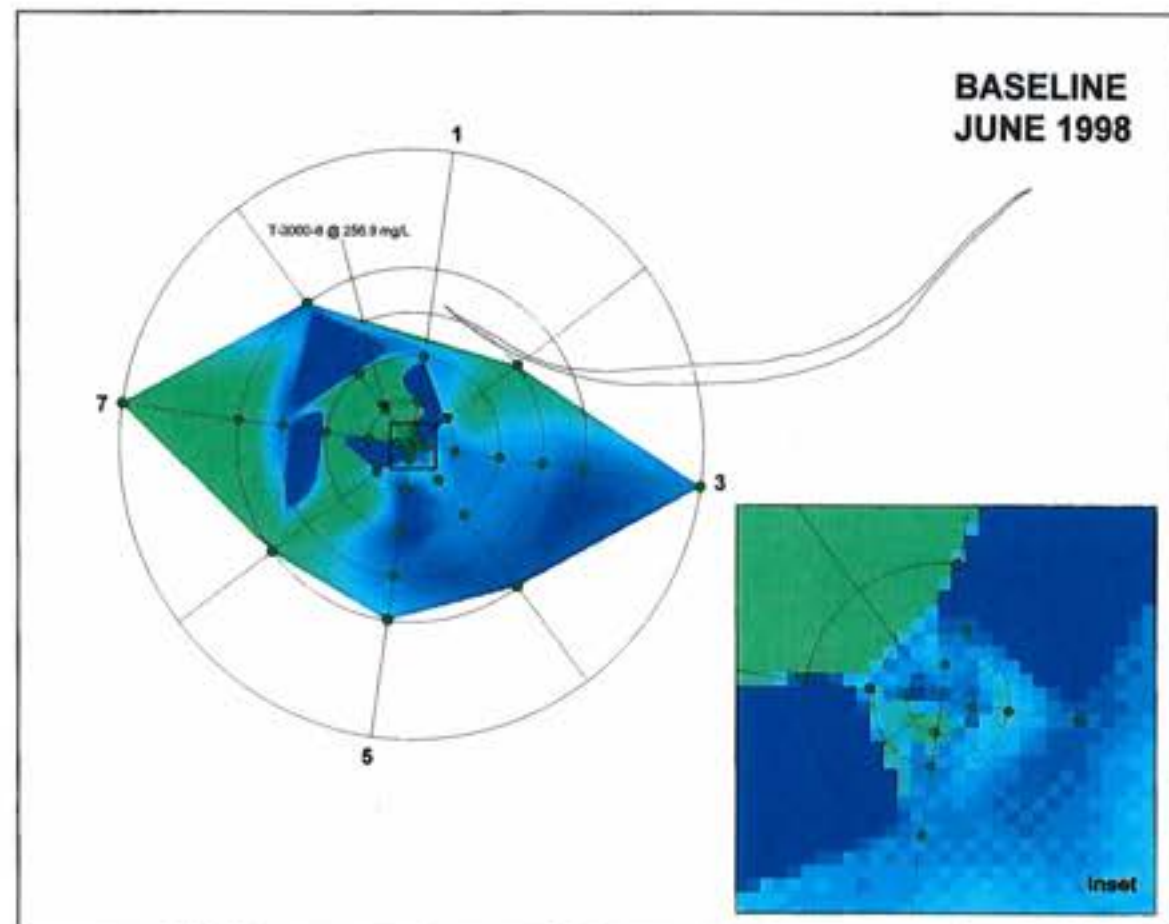
At Thebaud, the benthic boundary layer SPM concentration showed no significant Field×Time interaction, however, there was a significant Time effects ($p=0.001$). The SPM concentration was higher overall in November 1999 than in June 1998 or June 1999 (Figure 3.4). The barium concentration in SPM did show a significant Field×Time interaction. Barium level was lower overall in the near-field than in the far-field. In addition, the barium concentration was greater in the far-field than in the near-field during the baseline survey (June 1998) and in November 1999 (Figure 3.5). None of these differences appear to be attributable to drilling activities.

3.3.3.3 North Triumph

At North Triumph, the benthic boundary layer SPM concentration did not differ significantly between near-field and far-field, or over time (Figure 3.6). The barium concentration, however, showed significant differences attributable to Time (Figure 3.7). This effect was caused by higher barium concentrations reported during the first baseline survey (November 1998) than second baseline in June 1999 or the drilling survey in November 1999. This difference does not appear to be attributable to drilling activities.

3.3.4 Within the Near-Field Area

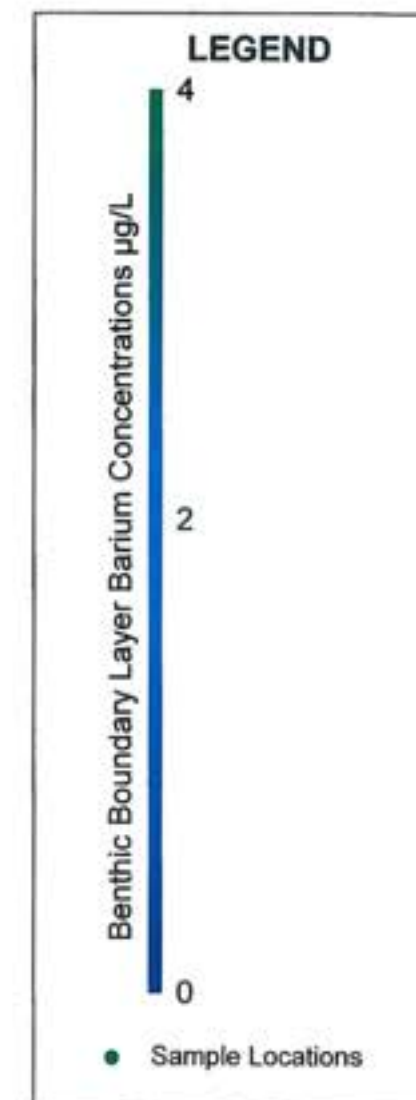
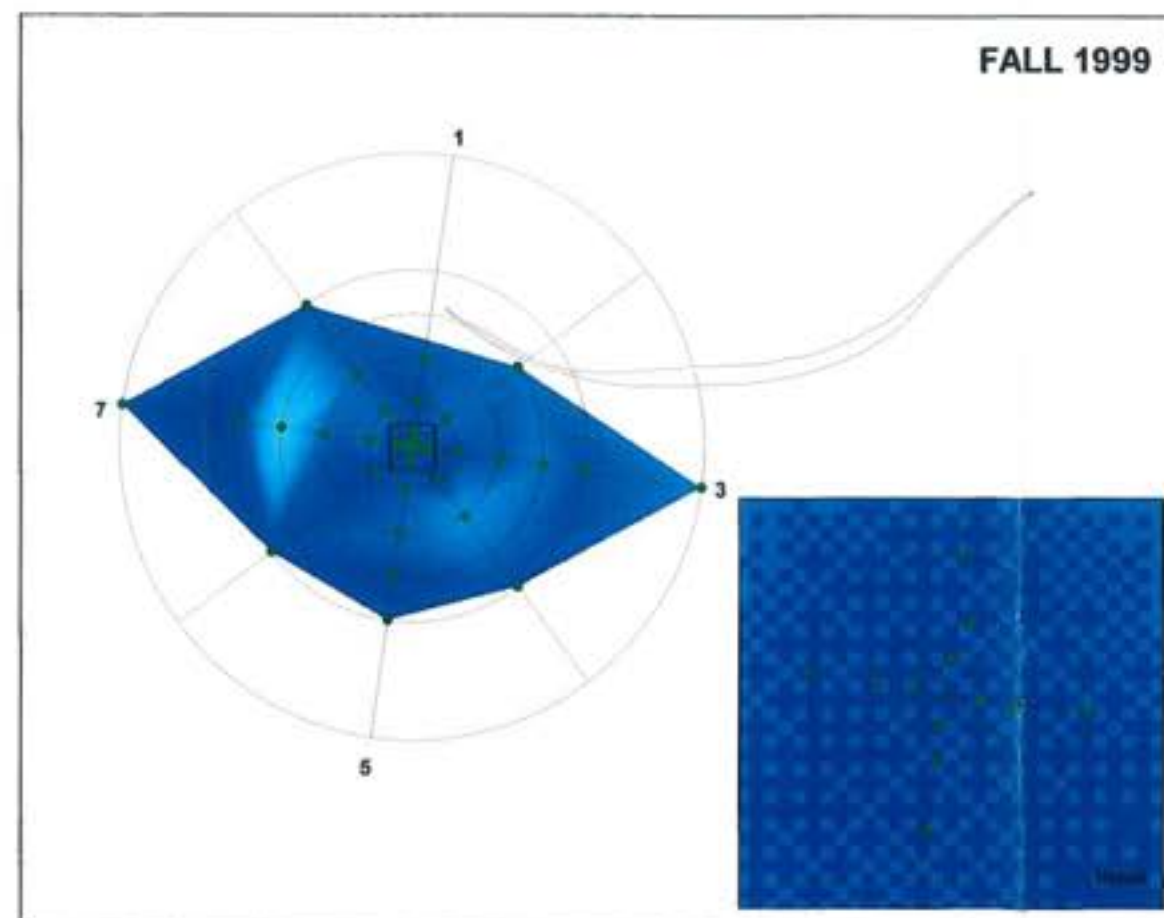
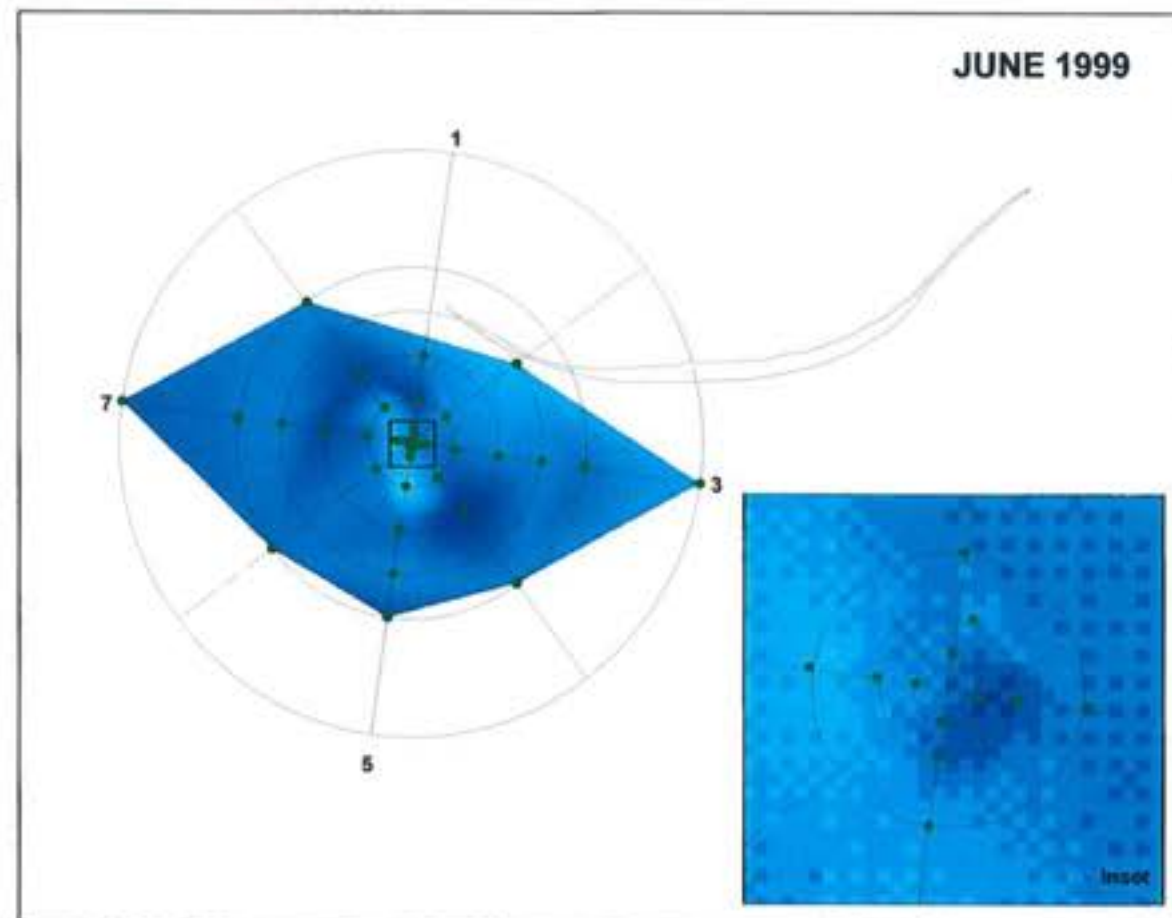
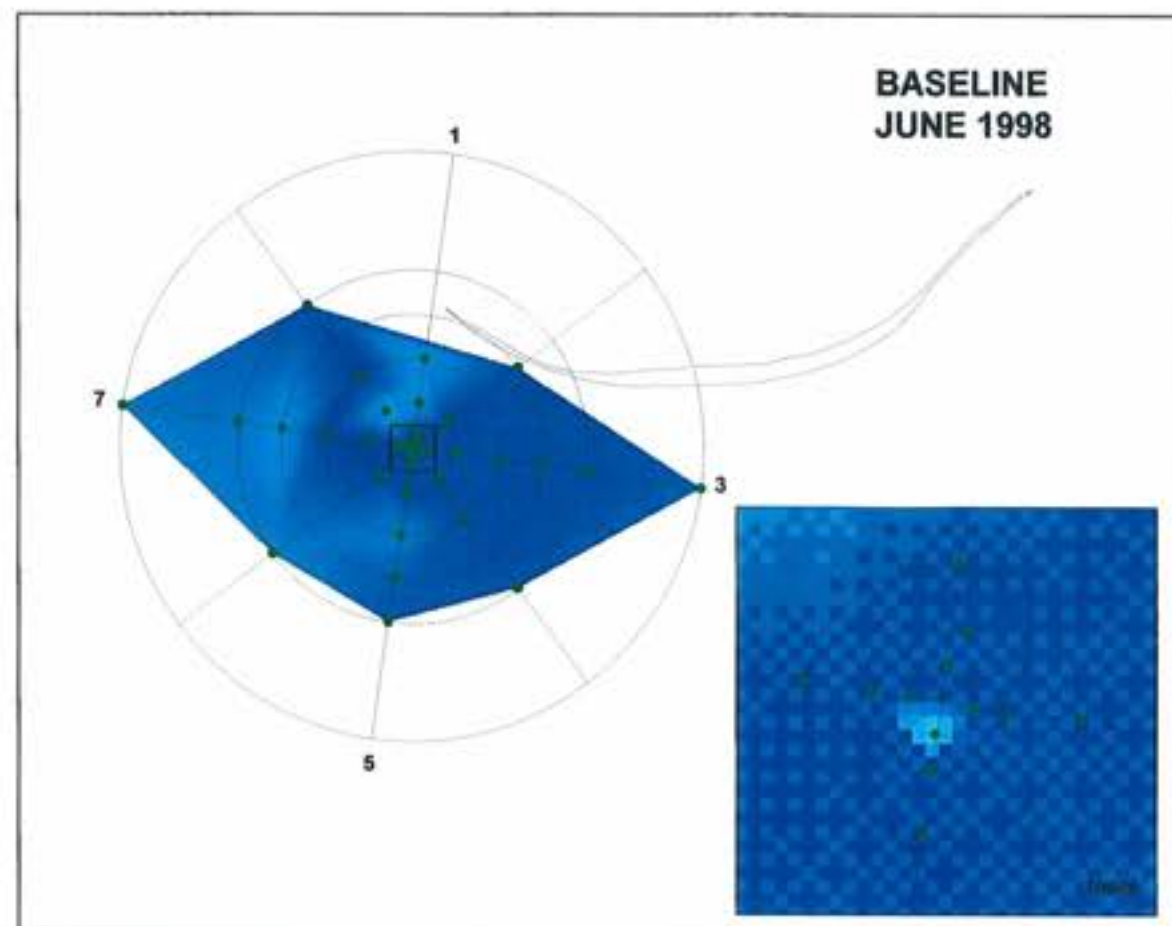
Within the near-field area at each drilling site, effects on the benthic boundary layer SPM and barium concentrations due to Distance, Time, and the Distance×Time interaction were tested using nested ANOVA. The results of these analyses are summarized in Table 3.6.



**FIGURE 3.4
BENTHIC BOUNDARY
LAYER SUSPENDED
PARTICULATE MATTER**

Thebaud Well

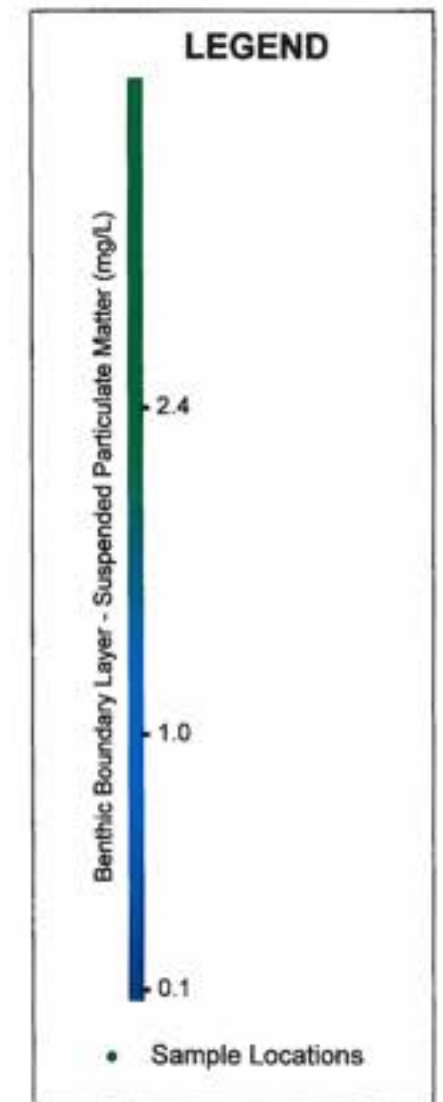
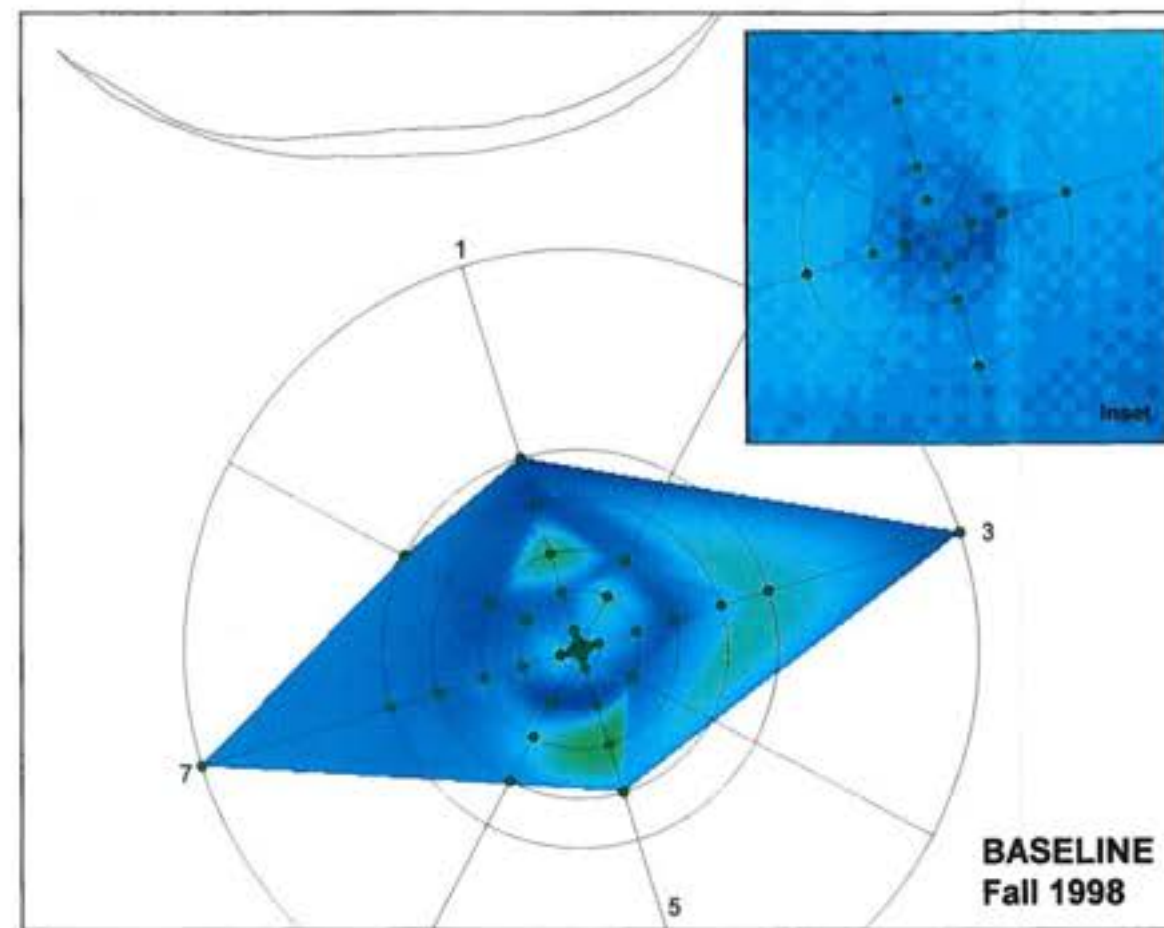




**FIGURE 3.5
BENTHIC BOUNDARY
LAYER BARIUM
CONCENTRATIONS**

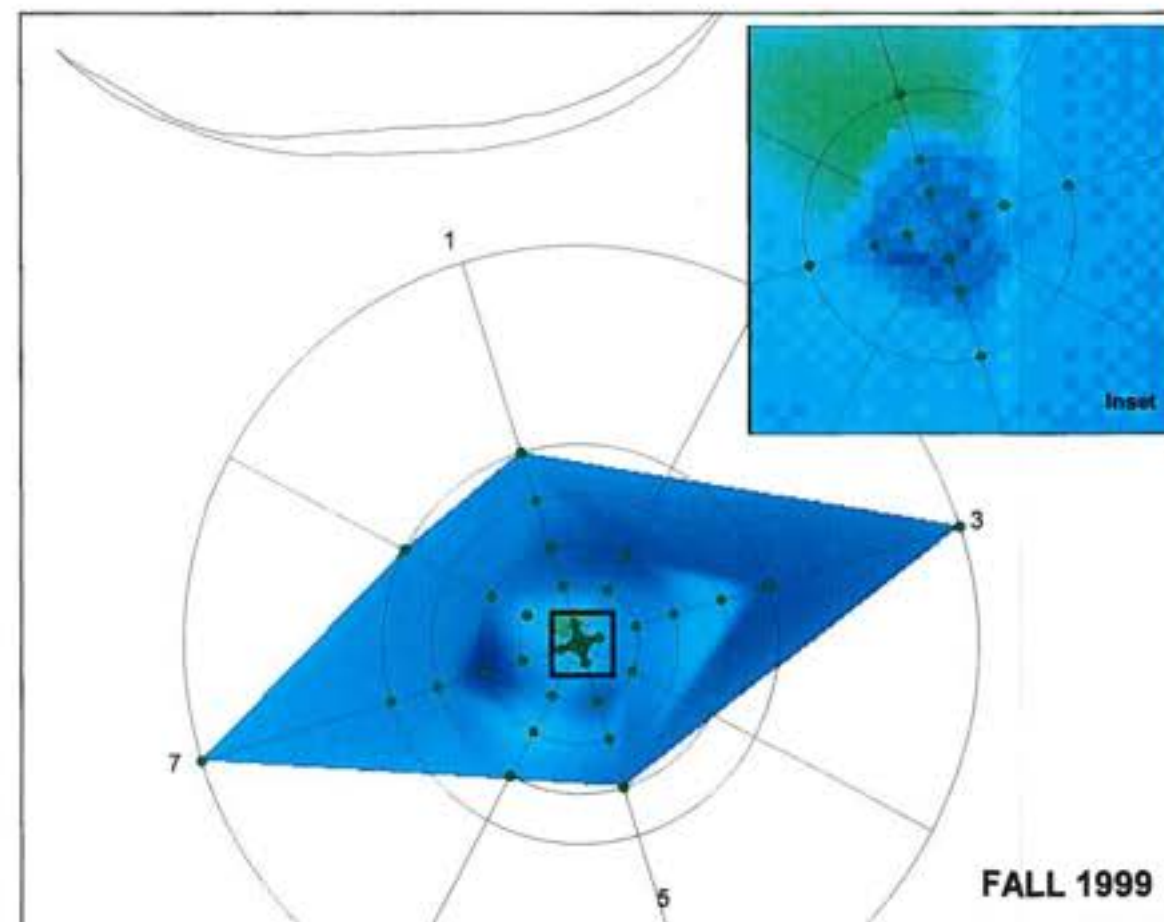
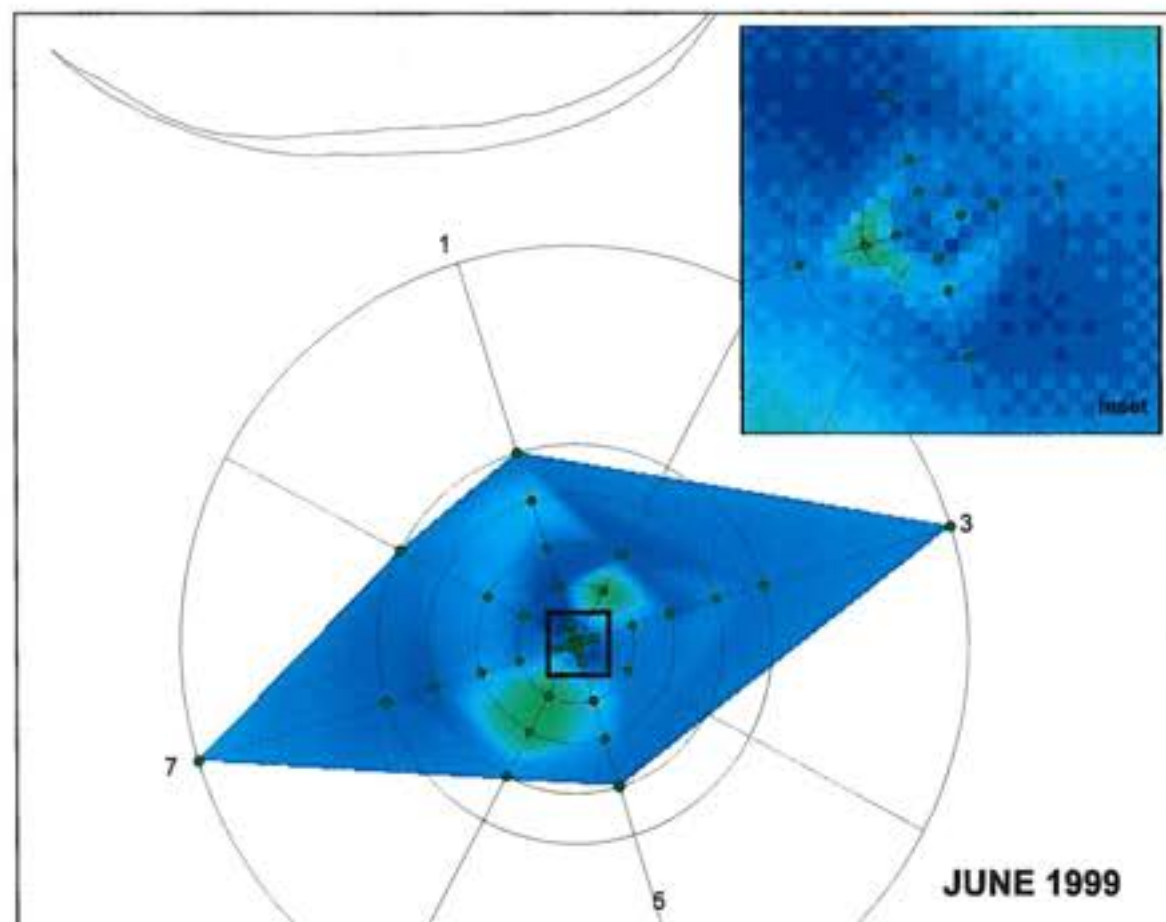
Thebaud Well

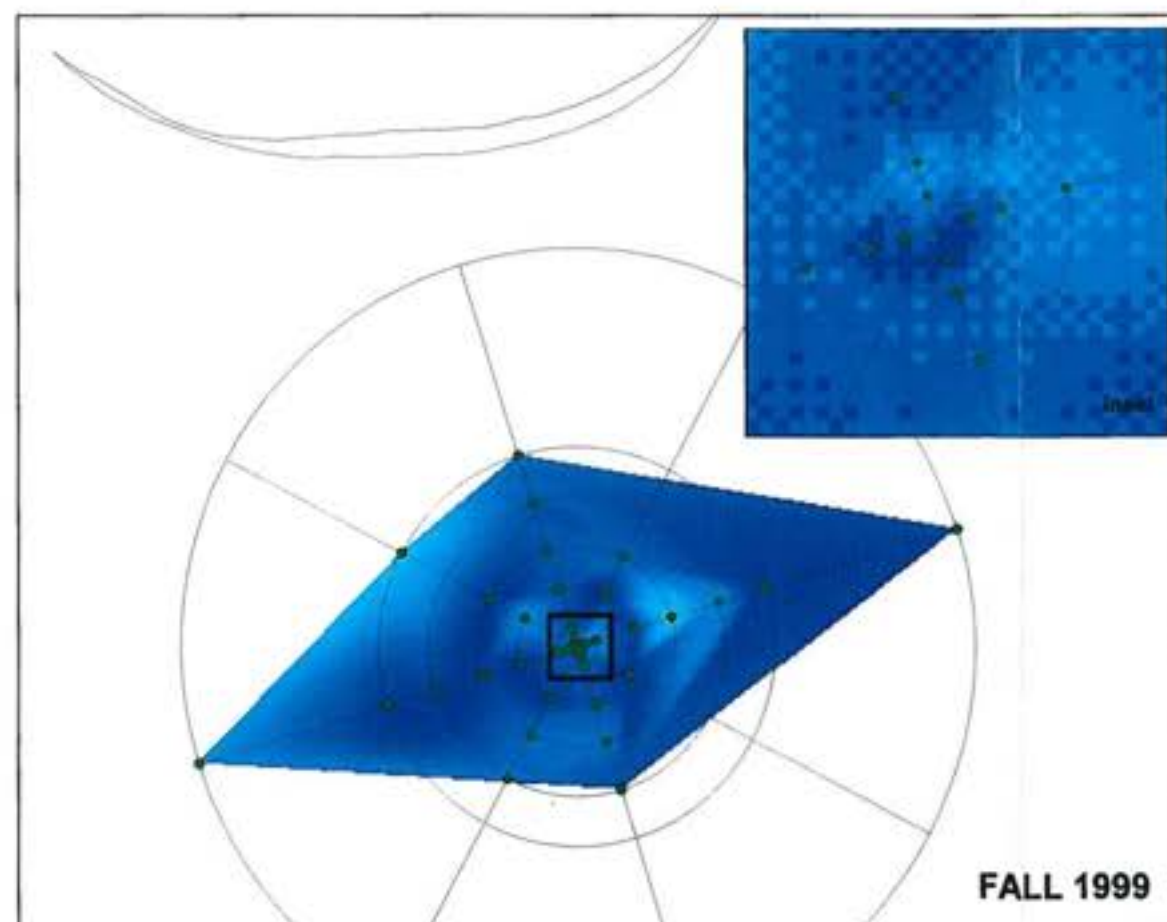
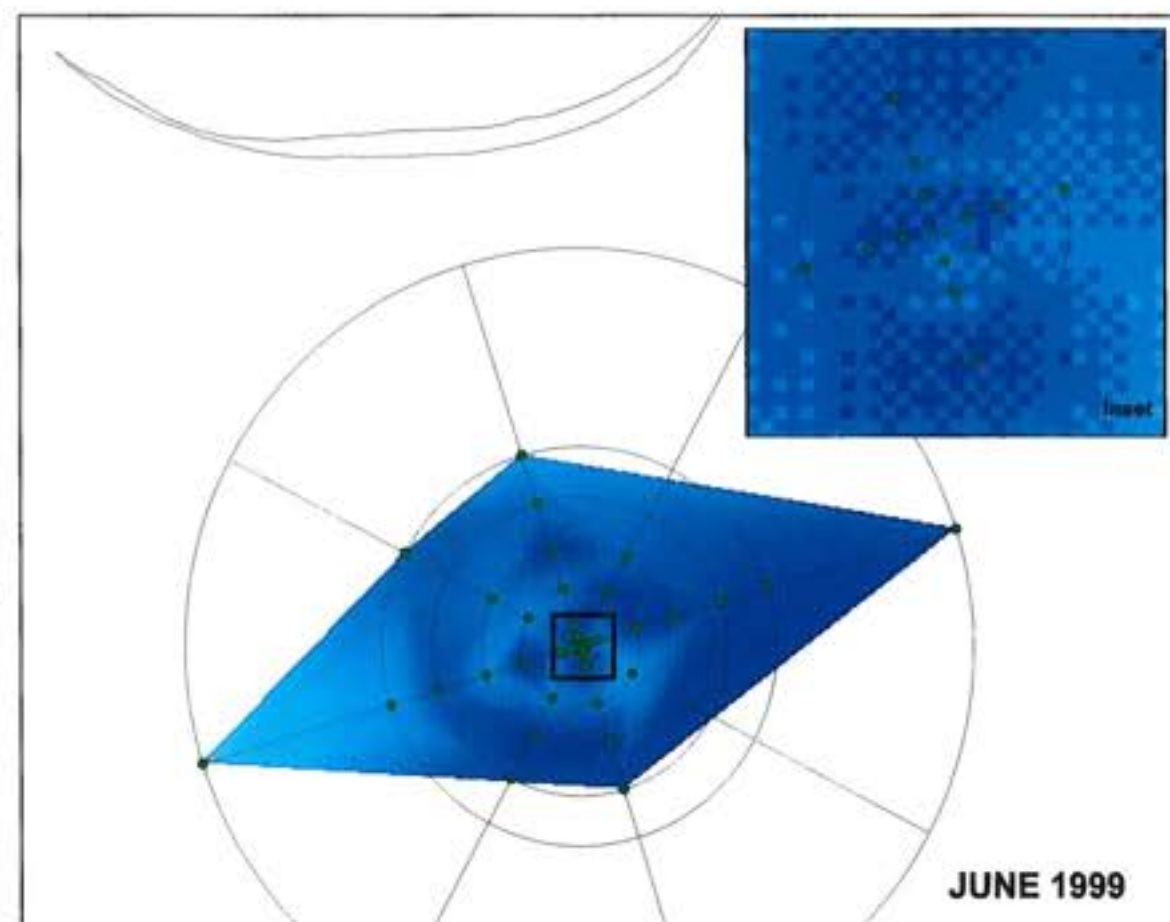
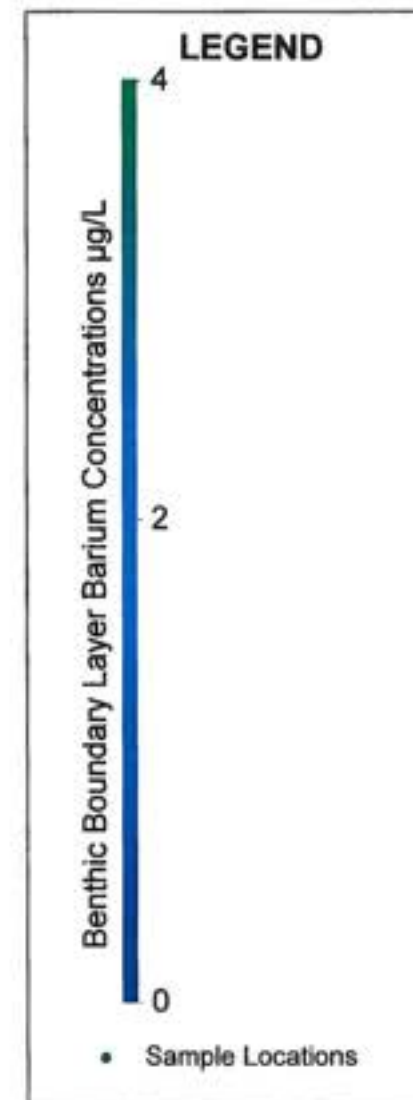
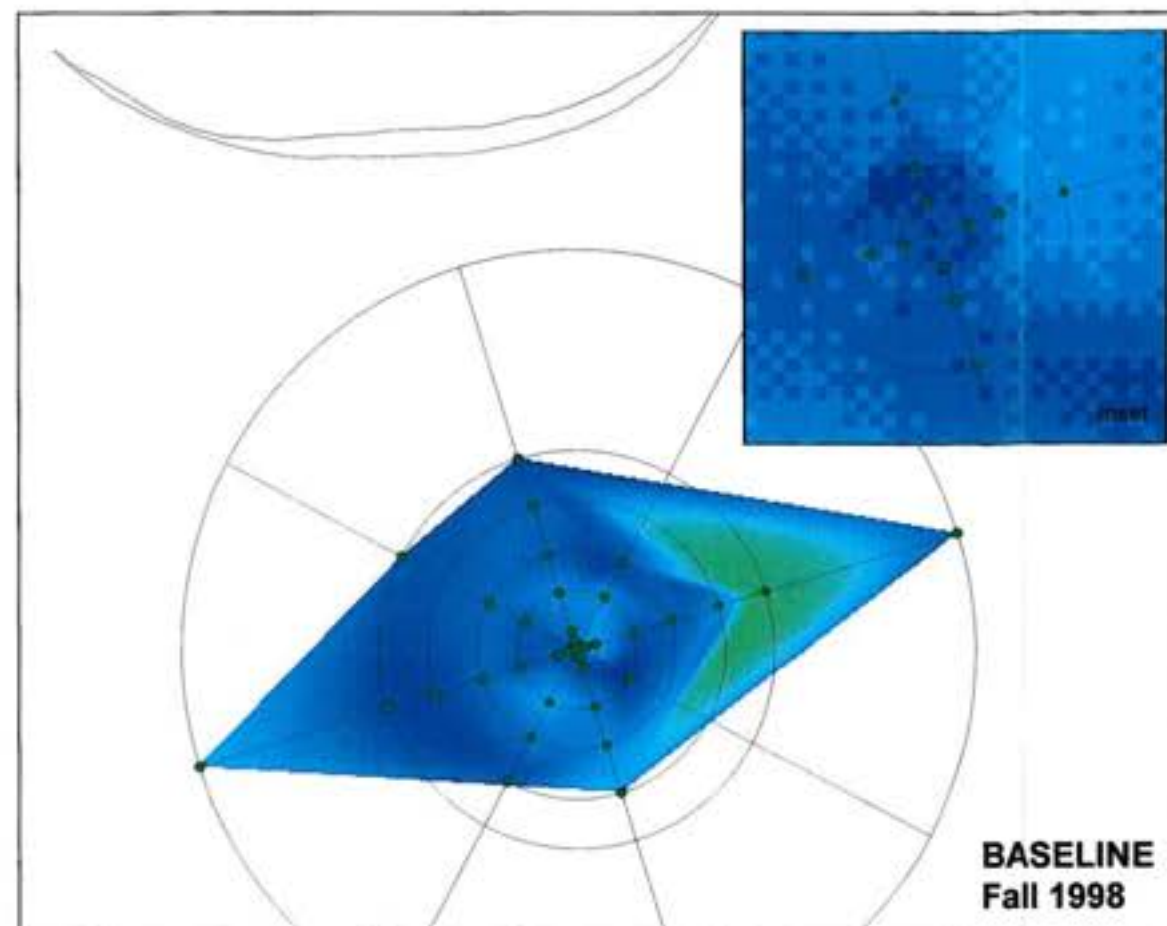




**FIGURE 3.6
BENTHIC BOUNDARY
LAYER SUSPENDED
PARTICULATE MATTER**

North Triumph Well





**FIGURE 3.7
BENTHIC BOUNDARY
LAYER BARIUM
CONCENTRATIONS**

North Triumph Well



Table 3.6 Results of Nested ANOVA, with Coding for Distance (250, 500, 1,000 and 3,000 m), Time (Date of Survey), and Distance×Time Interactions at Venture, Thebaud and North Triumph

Variable	Probability (p) of Difference Being Significant		
	Distance	Time	Distance×Time
Venture-SPM	0.057	0.098	0.921
Venture-Barium	0.017	0.093	0.778
Thebaud-SPM	0.481	0.002	0.276
Thebaud-Barium	0.791	0.002	0.583
North Triumph-SPM	0.226	0.154	0.011
North Triumph-Barium	0.233	<0.001	0.547

3.3.4.1 Venture

At Venture, there were no significant differences for benthic boundary layer SPM concentrations, attributable to the Distance×Time interaction, Distance or Time effects. Barium concentrations in the SPM did vary significantly as a function of Distance from the drilling platform. However, further testing of this main effect using Tukey's HSD test found that the barium concentration at 1,000 m was higher overall than concentrations at 250, 500 or 3,000 m. This difference does not appear to be related to the drilling activities.

3.3.4.2 Thebaud

At Thebaud, there was a significant difference for the benthic boundary layer SPM concentration, attributable to Time ($p=0.002$). Benthic boundary layer SPM concentrations were found to be higher overall in June 1999 than in November 1999, however, neither of these surveys was significantly different from the baseline survey. Analysis of barium concentrations in the SPM likewise found an effect attributable to Time ($p=0.002$), and as for the SPM concentration, further analysis showed that the barium concentration was higher overall in June 1999 than in November 1999. Again, the overall barium concentrations recorded during these surveys did not differ significantly from barium concentrations recorded during the baseline survey. Both SPM and barium concentrations were extremely low (generally lower than the values recorded during the baseline survey) in samples collected at Thebaud during November 1999. These differences do not appear to be related to the drilling activities.

3.3.4.3 North Triumph

At North Triumph, there was a significant Distance×Time interaction for the benthic boundary layer SPM concentrations (Table 3.6). This difference was caused by SPM concentrations at a distance of 1,000 m during the June 1999 survey, than were recorded at other times. Analysis of barium concentrations found a significant effect due to Time ($p < 0.001$). Further investigation showed that barium concentrations were significantly higher overall at North Triumph during the first baseline survey (November 1998) than in June or November 1999 surveys. These differences do not appear to be related to the drilling activities.

3.3.5 Particle Size Analysis

Eight filtered samples from each survey period were submitted for Inorganic Particle Size Spectra (IPSS) analysis at the Bedford Institute of Oceanography for the detection of particulate drill waste by looking for the particle size of bentonite ($< 4\mu$). The selection criterium for choosing the candidate samples was those BBL samples with the highest barium concentrations. The low sample number permitted for analysis is limited by the availability of technical assistance of the BIO lab.

The first eight samples included the four 250 m Venture stations collected during the baseline and the Fall 1998 survey for comparison with drilling operations. Results of the analysis showed that there were no drilling waste-sized particles in the collected samples (Appendix B).

Eight filtered samples from the June 1999 survey include: from Venture stations V-500 on axis 3, V-1000 on axis 1, and Gully station G3; from Thebaud stations T-1000 on axis 7, T-3000 on axes 5 and 6; from North Triumph stations NT-5000 on axis 5 and NT-20000 on axis 7. Results of the IPSS shows that bentonite-size particles were not present (Appendix B).

3.3.6 Summary of Effects

Overall, this analysis shows little evidence for the detection of flocculated drill waste in benthic boundary layer SPM. There were no significant differences in either SPM or barium concentrations in the benthic boundary layer around the Venture, Thebaud or North Triumph drilling platforms, that can be attributed to drilling activities and bentonite is not present as a component in the SPM.

3.4 Sediment Chemistry

3.4.1 Objectives

The study design was intended to address specific questions, and to allow the testing of specific null hypotheses, regarding the potential effects of drilling on the marine environment. Operational monitoring

of sediment quality is intended to answer the following question with respect to the effects of drilling on sediment quality.

- Have the concentrations of contaminants in sediment changed? If so, can these changes be correlated with sediment toxicity or changes in benthic habitat along a gradient from the platforms?

This question is formulated into a null hypothesis that can be tested statistically.

H_0 : Drilling operations have not significantly changed the concentration of trace metals, petroleum hydrocarbons, or sediment grain size distribution.

Rejection of this null hypothesis (at the probability level $p < 0.05$) will lead to the acceptance of the alternative hypothesis that drilling activity has caused significant change in the marine environment. A statistically significant change may or may not have ecologically significant implications. Therefore, acceptance of the alternative hypothesis must be accompanied by an evaluation of the ecological relevance of the magnitude of the change that has been detected.

3.4.2 Statistical Approach

The statistical approach to evaluating the monitoring data has been structured to consider three levels of scale.

- 1) Testing for overall differences between near-field stations (3,000 m or less from the drilling platform) and far-field stations (more than 5,000 m from the drilling platform) at each specific platform. This testing will be used to assess whether there are "gross" effects attributable to drilling activities, that cause an overall change within 3 km of the platform. This testing is carried out using a nested Analysis of Variance design, incorporating coding for near-field or far-field stations, and the date of the survey (1, 2, 3, or 4). Of greatest interest are effects due to "Field" (which may identify overall natural differences between near-field and far-field areas. Effects due to "Time" can identify changes over time that occur in both the near-field and the far-field. A significant "Field×Time" interaction term would identify a difference between the near-field and the far-field that does not exist at all times.
- 2) Testing for local effects as a function of Time or Distance, within 3,000 m of each specific platform. These tests are carried out using a nested ANOVA, and consider time (up to four sequential surveys over a two-year period), distance from the drilling platform (250, 500, 1,000 and 3,000 m), and the Time×Distance interaction (potentially significant differences that may not exist at all times or distances from the platform). It is the interaction term that is most likely to identify genuine effects of drilling, as the data sets include the baseline surveys that were carried out prior to significant drilling operations.

- 3) Testing for the effects of drilling near platforms in general. This test is carried out by pooling the results obtained so far from all four platforms, and using the nested ANOVA design to look for general effects attributable to the presence and activities of drilling platforms on the Scotian Shelf.

In contrast to other work on the effects of offshore drilling platforms in the marine environment (Kennicutt *et al.* 1996), the present study design treats all effects (Distance, Axis, and the Distance $\times$ Axis interaction) as fixed effects. As a consequence, the results of the analysis are specific to each platform and time.

In any statistical testing program where a large number of tests are carried out, there is a risk that random factors will occasionally lead to the conclusion that a statistically significant effect exists, where in fact there is no real difference. Using the conventional statistical probability level (p) of $\alpha=0.05$, this will occur in about one test in twenty. In order to aid in interpreting the importance of statistically significant differences where doubt may exist as to whether they are true effects of the project, four principles were identified during the study design phase. These were the principles of:

- proximity (differences are more likely to be real if they are observed in close proximity to the source of the disturbance);
- adjacency (differences are more likely to be real if two or more adjacent locations are affected);
- multiplicity (differences are more likely to be real if two or more parameters are affected simultaneously); and duration (differences are more likely to be real if they persist over time).

Although each of these principles is evaluated independently, they can be taken cumulatively to establish a weight of evidence suggesting that observed statistically significant differences either are, or are not, true effects of the project.

3.4.3 Data Screening

Overall, the analysis of sediments has shown non-detectable results for all or virtually all samples submitted for the PAH (polycyclic aromatic hydrocarbon) and BTEX (benzene, toluene, ethyl benzene and xylenes) compounds. Likewise, concentrations of the low molecular weight (C_6 – C_{11}) in the total TPH (total petroleum hydrocarbon) compounds have also been uniformly non-detectable. Therefore, the discussion of potential organic contaminants will be limited to the heavier (C_{11} – C_{20} and C_{21} – C_{32}) hydrocarbons, as represented by TPH (the sum of C_6 to C_{32} hydrocarbons).

Among the inorganic analytes, concentrations of antimony, arsenic, beryllium, boron, cadmium, cobalt, copper, lithium, molybdenum, mercury, nickel, selenium and tin have been less than or at the analytical detection limits in virtually all samples submitted. Therefore, the discussion will be limited to total inorganic carbon (TIC), total organic carbon (TOC), aluminum, barium, chromium, iron, lead, manganese,

strontium, thallium, uranium, vanadium and zinc. Of these, barium is considered to be a key element for monitoring purposes because it is a constituent of barite, a clay-like mineral used in drilling muds.

The Canadian Council of Ministers of the Environment has developed marine sediment quality guidelines for a number of inorganic and organic substances (CCME 1999). These guidelines are expressed as "interim sediment quality guidelines" (ISQG) and "probable effect levels" (PEL). The ISQG guidelines represent the lowest concentration of a substance at which an adverse effect on marine biota may be expressed, whereas the PEL guidelines represent the concentration at which an adverse effect is likely to be observed. Table 3.7 shows the ISQG and PEL values for selected heavy metals monitored in this EEM program.

Concentrations of all of these elements were below the relevant ISQG levels in all samples. Appendices B to D provide the lab analytical data on sediments for each of the fields. Canadian sediment quality guidelines are also available for a variety of PAH compounds. As noted above, these compounds were uniformly non-detectable in the study area ($<50 \mu\text{g/kg}$). In some cases, the ISQG concentration for PAH compounds is less than $50 \mu\text{g/kg}$, although the PEL concentration is always higher. There is no evidence that drilling activities have changed the baseline concentrations of PAH compounds at any of the drilling sites.

Table 3.7 CCME Guidelines for Selected Metals in Marine Sediments (mg/kg)

Metal	ISQG Value	PEL Value
Arsenic	7.24	41.6
Cadmium	0.7	4.2
Chromium	52.3	160.0
Copper	18.7	108.0
Lead	30.2	112.0
Mercury	0.13	0.70
Zinc	124.0	271.0

As part of the overall quality assurance and quality control plan for the monitoring program, field duplicate samples were collected at selected sampling stations. In addition, laboratory duplicate samples were also processed. The field duplicate samples incorporate at least three sources of variation (field variation between samples; sub-sampling variation in the laboratory, and analytical uncertainty), whereas the laboratory duplicate samples incorporate sub-sampling variation and analytical uncertainty.

By comparing the analytical results for the field and laboratory duplicate samples with the results for the "original" sample collected at that location, the reliability and reproducibility of the field sampling and analytical processes can be assessed. Table 3.8 provides Pearson correlation coefficients (R values) for both field and laboratory quality assurance samples. For three representative variables (barium, iron and lead), the "original" and "duplicate" data have been plotted to provide a graphical illustration of the data quality (Figure 3.8).

There are three general patterns observed in the data, as outlined below.

- For sediment grain size, correlation coefficients for both the laboratory and the field replicate data are similar. This indicates that the main factor influencing data quality for the sediment grain size variables (gravel, sand, silt, clay) is the laboratory sub-sampling and analytical process (*i.e.*, imperfect homogeneity in laboratory sub-samples, and/or uncertainty associated with laboratory measurements).
- For some elemental components of the sediment (*e.g.*, barium), field and laboratory variability are also of similar magnitude, indicating that laboratory sub-sampling and analytical uncertainty are the

major sources of uncertainty. However, the data for both field and laboratory QA data sets have very low variability (R values of 0.979 and 0.958, respectively). These findings support the selection of barium as an indicator of drilling effects, as it exhibits low natural variability in the field, and is reliably measured in the laboratory.

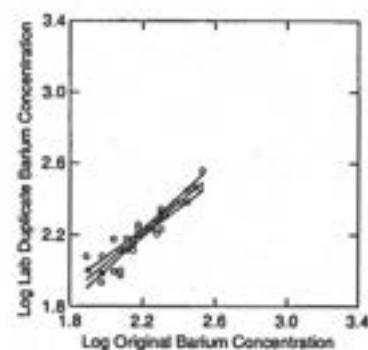
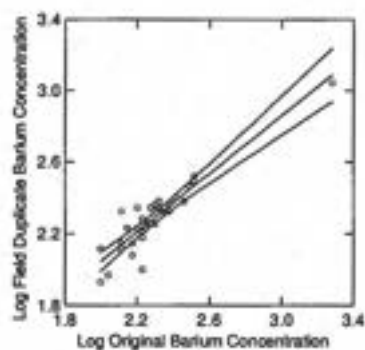
- For other elements (*e.g.*, iron, lead), variation associated with the field duplicates is the main source of uncertainty, while the laboratory replicates have low uncertainty. This indicates that natural variability between samples collected in the field is a larger source of uncertainty than the analytical process.

Overall, the laboratory QA samples indicate that the data are of high quality. For some variables (including TIC, chromium, cobalt, copper, iron, lead, manganese, nickel and zinc), the field QA data indicate that there may be high natural variability in the offshore environment. Most of the variables retained in the data set as being routinely present at detectable concentrations (TIC, TOC, Al, Ba, Cr, Fe, Pb, Mn, Sr, Tl, U, V, Zn) were log-transformed prior to analysis, to improve the homogeneity of the variance. In the case of TPH, where it was necessary to code "non-detectable" values as 0, rather than one-half of the detection limit, the $Z = \log(X+1)$ transformation was used. Sediment particle size data (gravel, sand, silt and clay), normally expressed as percentages or proportions, were corrected using the arcsin square root transformation ($Z = \arcsin\sqrt{X}$), which is particularly relevant for values outside the range of 0.3 to 0.7 (Steel and Torrie 1960). All statistical analysis was carried out using SYSTAT™ Version 6.0 for Windows.

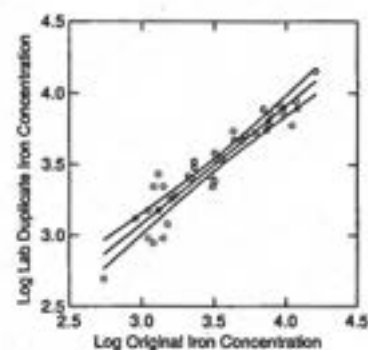
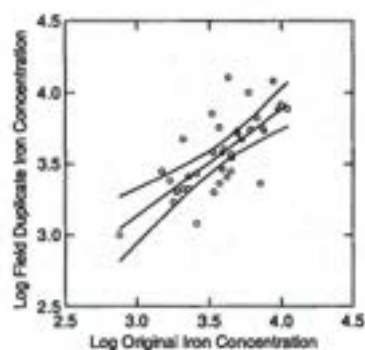
Table 3.8 Analysis of Quality Assurance Data for Transformed Parameters, Sable Offshore Energy EEM Program, 1998–1999.

Parameter	Field Duplicates		Laboratory Duplicates		
	Pearson "r"	n	Pearson "r"	n	Comment
Total Inorganic Carbon	0.767	38	0.967	24	limited range of values
Total Organic Carbon	0.506	38	0.797	24	
Aluminum	0.857	38	0.973	41	
Arsenic	0.738	38	0.565	41	
Barium	0.922	38	0.942	41	
Chromium	0.707	38	0.926	41	
Cobalt	0.550	38	0.786	41	
Copper	0.294	38	0.896	41	
Iron	0.679	38	0.936	41	
Lead	0.745	38	0.942	41	
Manganese	0.688	38	0.793	41	
Nickel	0.659	38	0.972	41	
Strontium	0.832	38	0.952	41	
Thallium	0.892	38	0.845	41	limited range of values
Uranium	0.447	38	0.834	41	limited range of values
Vanadium	0.698	38	0.934	41	
Zinc	0.663	38	0.889	41	
TPH	0.931	38	0.950	40	often non-detectable
Gravel	0.720	38	0.712	41	often non-detectable
Sand	0.831	38	0.900	41	
Silt	0.894	38	0.616	41	often non-detectable
Clay	0.787	38	0.812	41	

a)



b)



c)

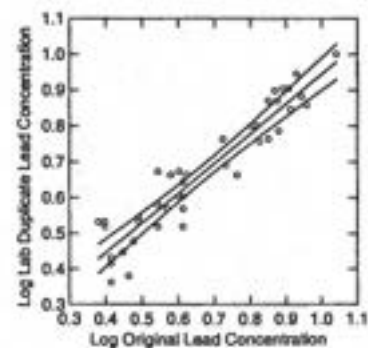
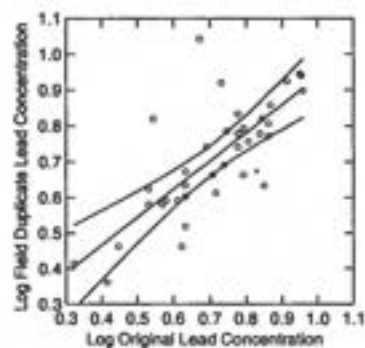


Figure 3.8 Comparisons of log-transformed field replicate and laboratory replicate data (mg/kg) with "original" data for (a) barium, (b) iron and (c) lead. Samples selected as field replicates are not the same as those selected as laboratory replicates.

3.4.4 Sediment Chemistry at the Gully

The data set for the Gully consists of five sampling stations, that have been sampled on each of the four consecutive surveys. As a result, it is possible to test for differences over Time (with the five sampling stations as replicates). It would also be possible to test for differences between stations at the Gully. However, as there were no exploration or drilling activities at the Gully, and these samples were collected to provide assurance that activities near Sable Island were not affecting this area, detecting differences between stations at the Gully is of considerably less interest than detecting differences over time.

Using ANOVA, differences between the four sequential surveys were tested, using Time as a treatment, and the five stations as replicates. Time was coded as 1 (June 1998), 2 (November 1998), 3 (June 1999), or 4 (November 1999). In performing this analysis, we disregard the fact that by repeatedly sampling the same stations, they become technically pseudoreplicated over Time. Three statistically significant differences (*i.e.*, $p \leq 0.05$) were detected among the variables examined (*i.e.*, the transformed "retained variables", as above). Differences were detected for:

- total inorganic carbon (TIC, $p=0.0031$), with TIC at Time 1 > Time 3, and TIC at Time 2 > Times 3 and 4;
- total petroleum hydrocarbon (TPH, $p<0.0001$), with TPH at Time 3 > Times 1, 2 or 4; and
- barium concentration in the benthic boundary layer floc ($p=0.0036$), with barium at Time 2 > Times 1 and 4.

These differences, although statistically significant, do not appear to be related to drilling activities. There is no plausible reason why TIC in sediments at the Gully should decrease over time as a result of drilling activities elsewhere. Interpretation of the TPH results is complicated by the fact that the sensitivity of the analysis improved over time, and detection limits varied from 15 mg/kg to <3 mg/kg. As a result, it was decided to code "less than" values for TPH as zero, rather than one-half the detection limit value. With improved analytical sensitivity, TPH was generally detected at all sampling stations during the June 1999 survey (Time 3). The TPH concentrations measured at sites in the Gully area ranged from 2.65 mg/kg to 5.45 mg/kg. These TPH concentrations are consistent with background TPH concentrations measured at far-field stations around the drilling platforms at that time, and would not have been detectable during the baseline survey. Therefore, the TPH results do not appear to indicate an effect attributable to drilling activity.

3.4.5 Sediment Chemistry at Venture

3.4.5.1 Near-Field vs. Far-Field

Differences between the near-field and the far-field were evaluated for the four survey dates, using nested ANOVA (testing for effects due to Field, Time, and Field×Time), and data that were either log-transformed or arcsine square root transformed, as appropriate, to improve the homogeneity of the variance. The results of the statistical testing are summarized in Table 3.9. There were no significant differences in the Field×Time interactions. In general, these results show that most of the significant differences occur in the Field effect, which indicates that the lower concentrations of analytes (TIC, TOC, thallium, gravel, silt and clay) are in the near-field than in the far-field. In contrast, (but inevitably as the sediment grain size fractions must sum to unity) there tended to be more sand present in near-field samples than in far-field samples. The 1998 annual report found this result to be a function of water depth; the deeper more quiescent water experiences less resuspension of fine particles (JWEL 1999).

Temporal changes ($p < 0.0001$) observed at both the near-field and the far-field included a tendency for TIC to increase over time (with an Field×Time interaction term that approached significance); and a tendency for TOC to decrease over time. The TPH concentrations exhibit a Time effect ($p < 0.0001$); concentrations were highest in June 1999, and were also higher in November 1998 than in June 1998. The clay content of sediments was higher overall in November 1999 than in June 1999.

Overall, these changes are probably indicative of natural variability (differences attributable to "Field" or minor calibration shifts at the analytical laboratory (TIC, TOC, gravel, silt and clay are all near to, or often less than the analytical detection limits). This conclusion is supported by the fact that the most of the variables for which significant difference were detected are either not expected to be affected significantly by drilling activities (e.g., TIC, thallium, gravel, sand), or the direction of the difference runs counter to the trend that would be expected for an effect of drilling (e.g., silt, clay, TOC). For TPH, the significant effect at Time 3 (June 1999) may be an artifact of the low detection limits achieved by the laboratory for these samples. At other times, detection limits of < 3 mg/kg were coded as 0 mg/kg.

As there were no large-scale differences between near-field and far-field that were indicative of an effect of drilling that affected the entire near-field area, it was considered appropriate to examine possible effects within the near-field area (250 to 3,000 m).

3.4.5.2 Within the Near-Field Area

Potentially significant differences within the near-field were evaluated using a nested ANOVA model with four Distances (250, 500, 1,000 and 3,000 m) and four Times (June 1998, November 1998, June 1999 and November 1999). The results of the ANOVAs are presented in Table 3.10. Of particular interest in this



Table 3.9 Comparison of Near-Field and Far-Field Samples at Venture, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Field (Near/Far)	Time (1, 2, 3, 4)	Field × Time	Comment
TIC	p<0.0001**	p<0.0001**	p=0.0517 (approaching significance)	Near-field < far-field, both increasing over time (although the far-field may tend to increase more than the near-field).
TOC	p<0.0001**	p<0.0001**	p=0.4641	Near-field < far-field, both decreasing over time.
Thallium	p<0.0001**	p=0.9830	p=0.9830	Near-field < far-field overall.
TPH	p=0.6706	p<0.0001**	p=0.4143	TPH higher overall in June 1999 than at other times; TPH higher in November 1998 than in June 1998.
Gravel	p=0.0192*	p=0.6534	p=0.9724	Near-field < far-field overall.
Sand	p<0.0001**	p=0.5944	p=0.9952	Near-field > far-field overall.
Silt	p<0.0001**	p=0.9711	p=0.6499	Near-field < far-field overall.
Clay	p<0.0001**	p=0.0216*	p=0.5107	Near-field < far-field overall; clay somewhat higher overall in November 1999 than in June 1999.

¹ Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.





Table 3.10 Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at Venture, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Distance	Time	Distance × Time	Comment
TIC	0.6257	<0.0001**	0.0712	TIC increases over Time, 1<2<3<4
TOC	0.0259*	<0.0001**	0.5632	Distance 3000 > 250, 500, 1000 Times 1, 2 > Times 3, 4
Aluminum	0.0002**	0.1447	0.5487	Distance 250 < 1000
Barium	0.0143*	0.1359	0.2870	Distance 3000 < 250, 1000
Chromium	0.0005**	0.7330	0.6718	Distance 250 < 500, 1000, 3000
Iron	0.0008**	0.3346	0.8093	Distance 250 < 500, 1000, 3000
Lead	0.0003**	0.3814	0.6967	Distance 250 < 500, 1000, 3000
Manganese	0.0008**	0.1329	0.8753	Distance 250 < 500, 1000, 3000
Strontium	0.0008**	0.3325	0.5920	Distance 1000 > 250, 3000
Vanadium	0.0003**	0.5825	0.7715	Distance 250 < 500, 1000, 3000
Zinc	0.0103*	0.7375	0.6244	Distance 250 < 1000
TPH	0.0003**	<0.0001**	0.4020	Distance 250 > 500, 3000 Time 3 > Times 1, 2, 4
Silt	0.7350	0.0263*	0.5738	Times 2, 3 < Times 1, 4

¹ Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.



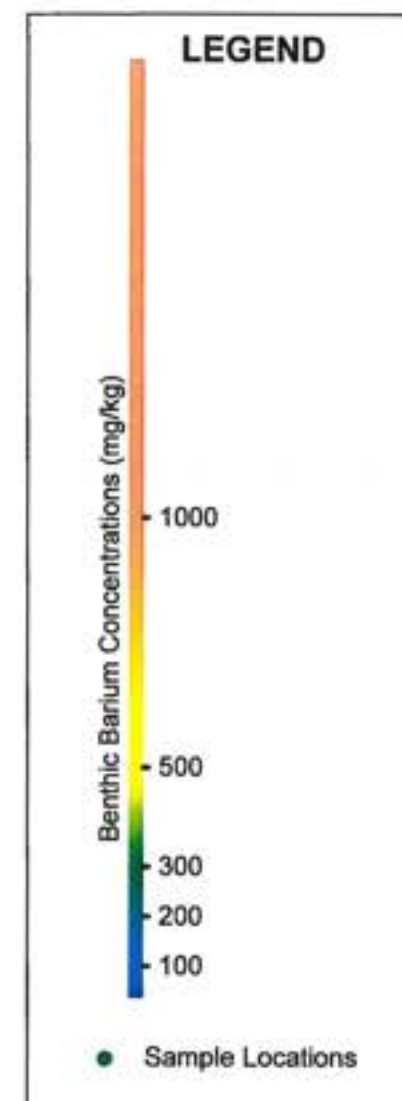
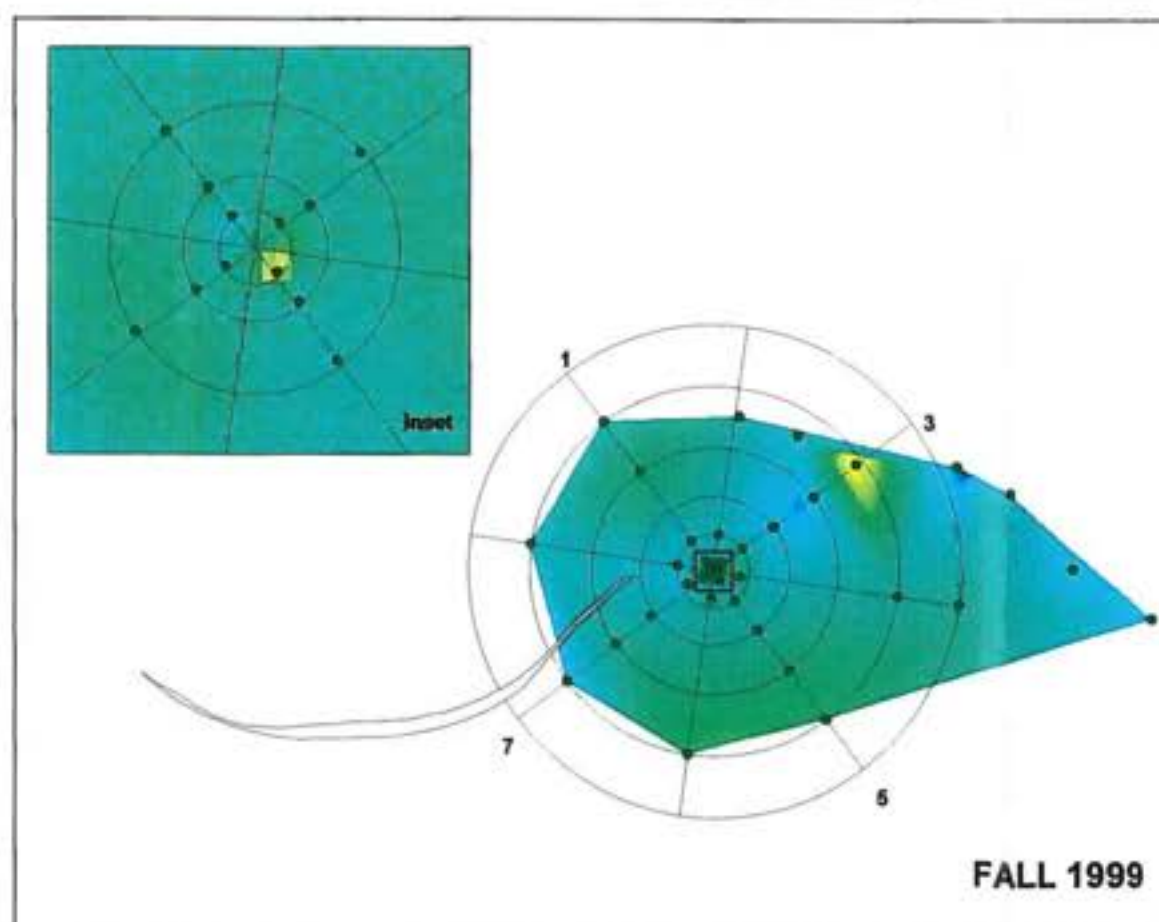
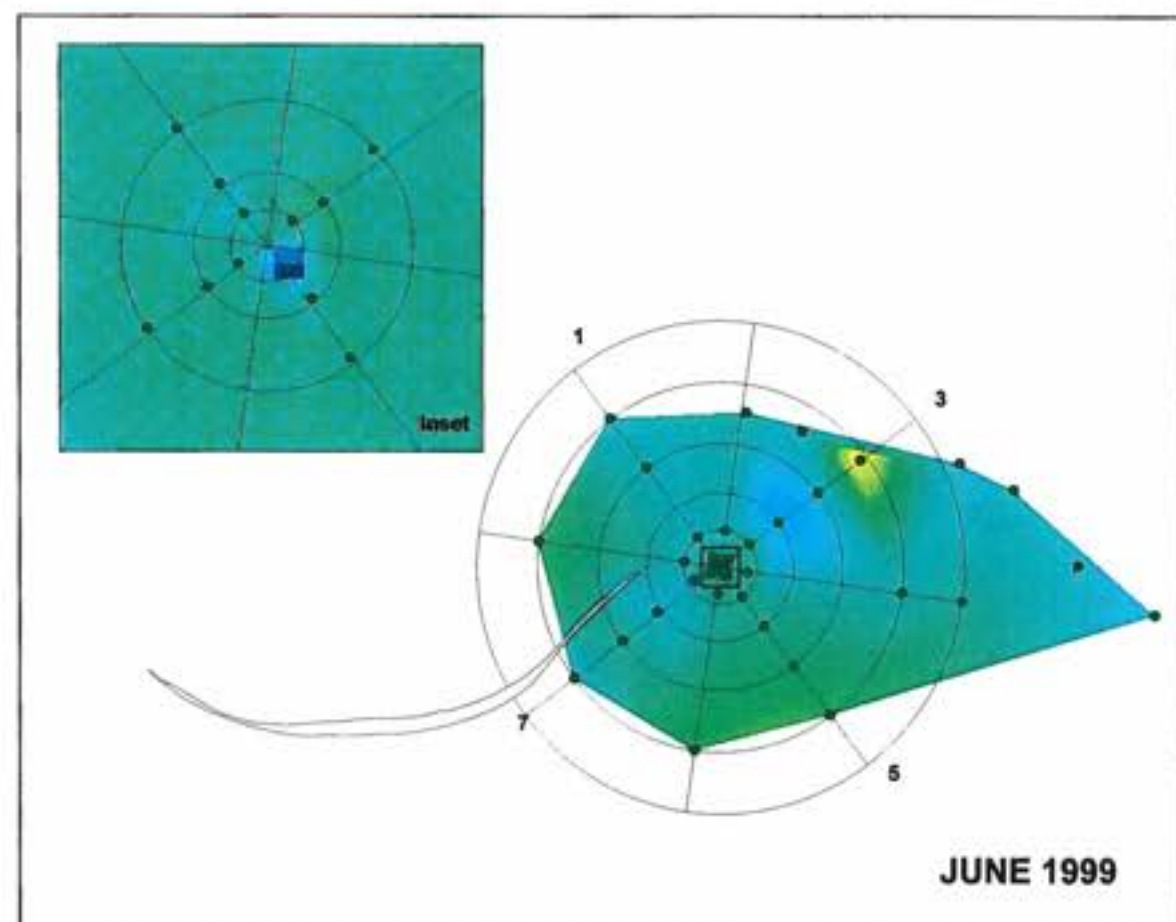
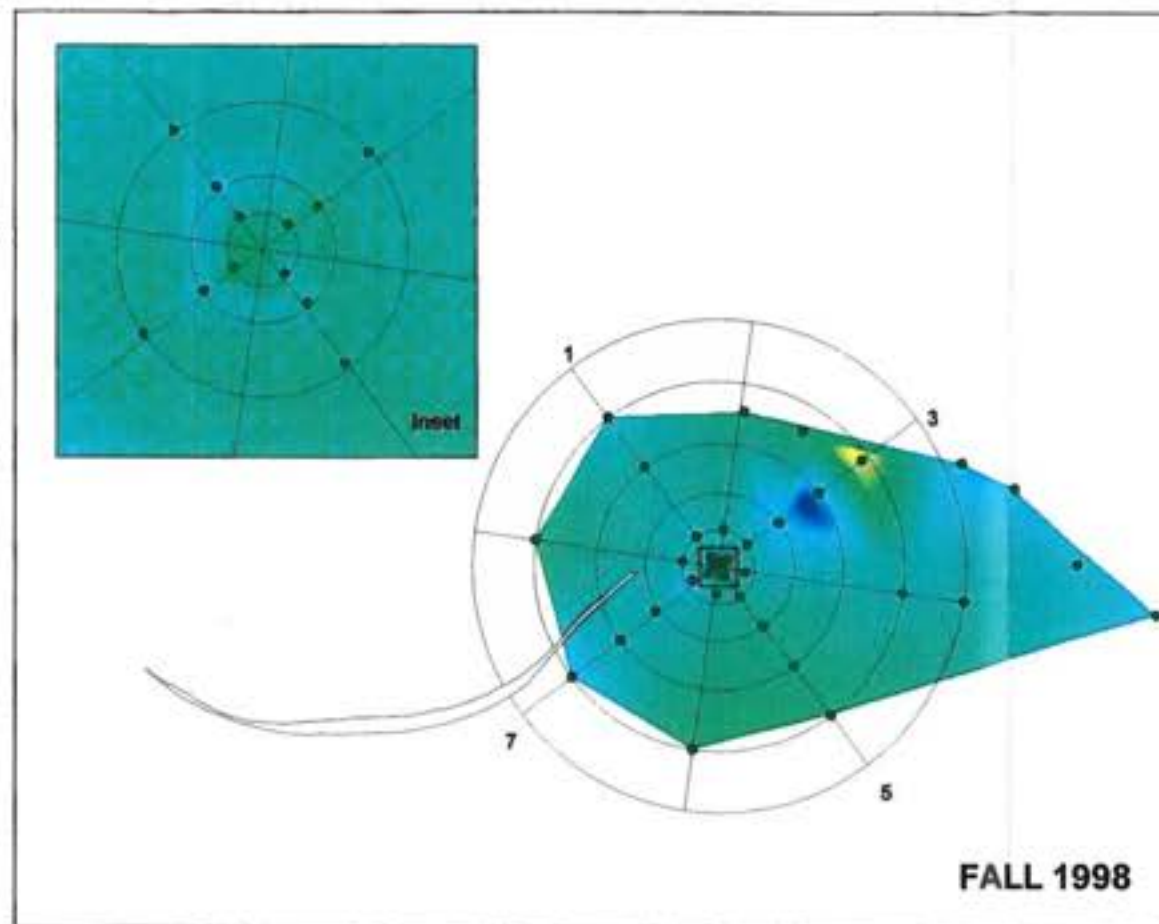
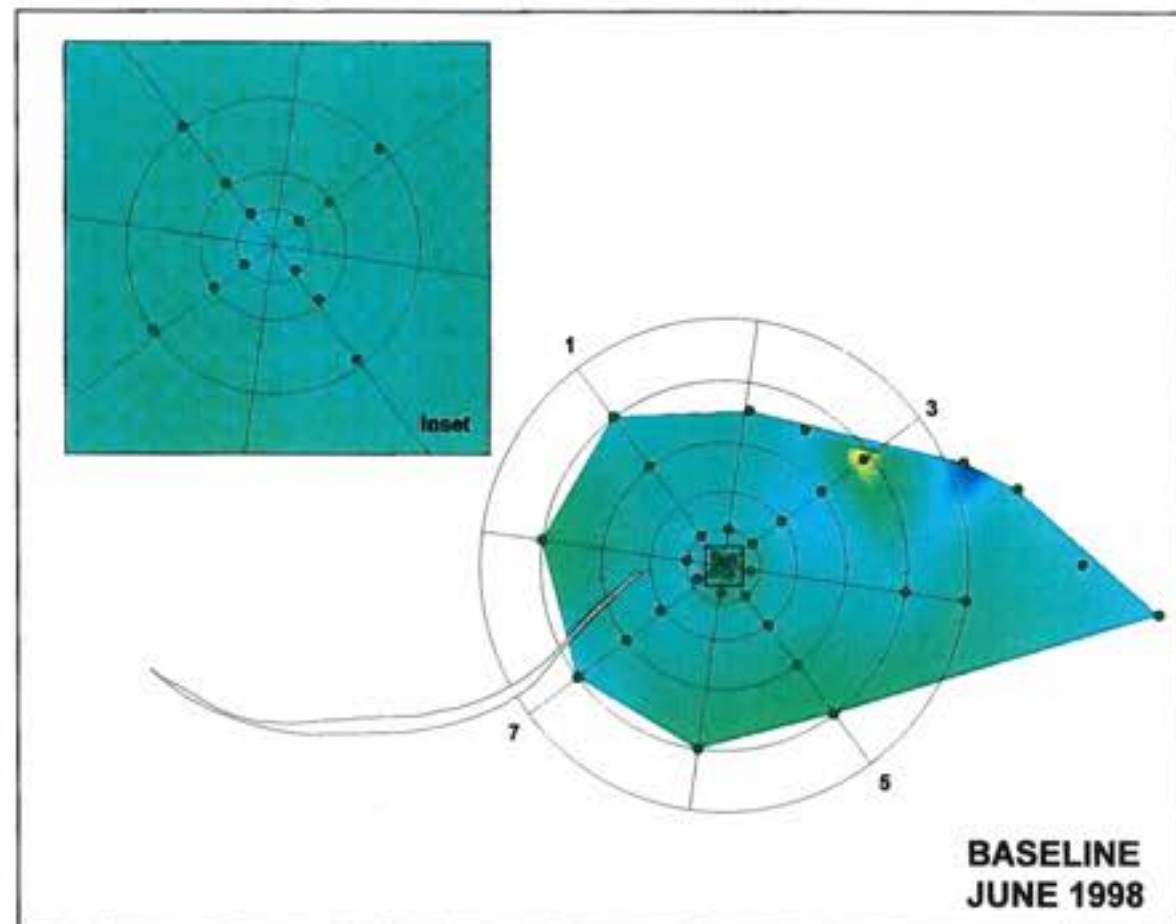
analysis is the Distance $\times$ Time interaction term, which would indicate the presence of a significant difference at one or more distances, that was not present at all times. This would be the expected condition for effects due to the drilling platform, that could not exist at the time of the baseline survey (June 1998).

Significant differences of various kinds were detected using the nested ANOVA for the transformed values of TIC, TOC, aluminum, barium, chromium, iron, lead, manganese, strontium, vanadium, zinc and TPH. In addition, a significant difference was also observed in the silt content of sediments near the Venture drilling platform. Overall, these results indicate that there were no significant Distance $\times$ Time interactions that would identify an effect that occurred only after the baseline survey.

There were a number of clearly inter-correlated differences that were attributable to Distance, and indicate that the natural sediment quality is not completely uniform across the near-field area. In particular, concentrations of chromium, iron, lead, manganese and vanadium were lower overall at the 250 m distance than at other distances, and concentrations of aluminum and zinc were lower overall at the 250 m distance than at 1,000 m. Concentrations of TIC increased over time at all distances, however, concentrations of TOC were higher during the two 1998 surveys than in 1999, and higher overall at the 3,000 m distance than at distances closer to the drilling platform.

For barium and TPH, there are some indications of effects that are attributable to the drilling activities. The barium concentration in sediment was higher overall at the 250 and 1,000 m distances than at the 3,000 m distance (Figure 3.9). A boxplot of barium concentration in sediment over the entire sampling grid is presented in Figure 3.10. This plot is useful for comparing the distribution of values between sampling surveys with respect to the variability on observations and displays summary statistics for the distribution. Identification of outliers is also facilitated by the plots. Barium levels appear to have increased slightly over time as the median value of both 1999 surveys are higher than the 1998 surveys. An elevated barium level is observed at 250 m from the drill centre on axis 5 in the November 1999 survey. The V-15000-3 site shows consistently elevated barium levels for all surveys which may indicate a source of barium contamination in the vicinity of this site. The closest abandoned drilled well is 5 km northeast along the same axis.

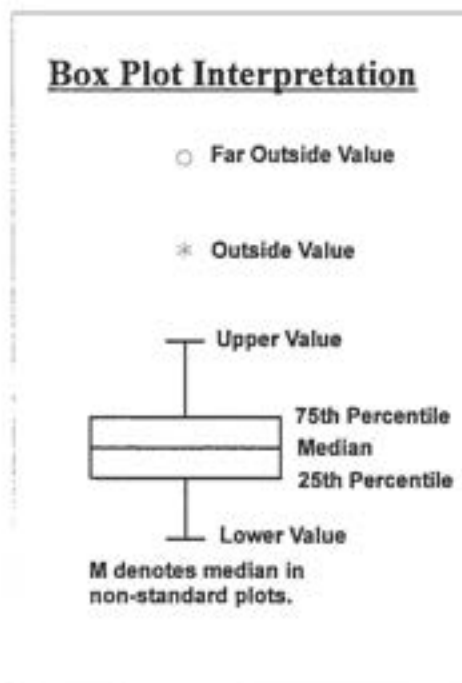
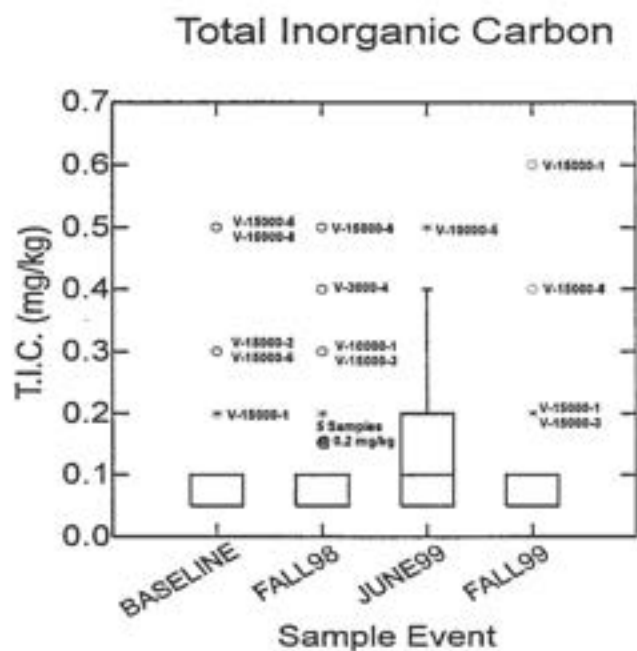
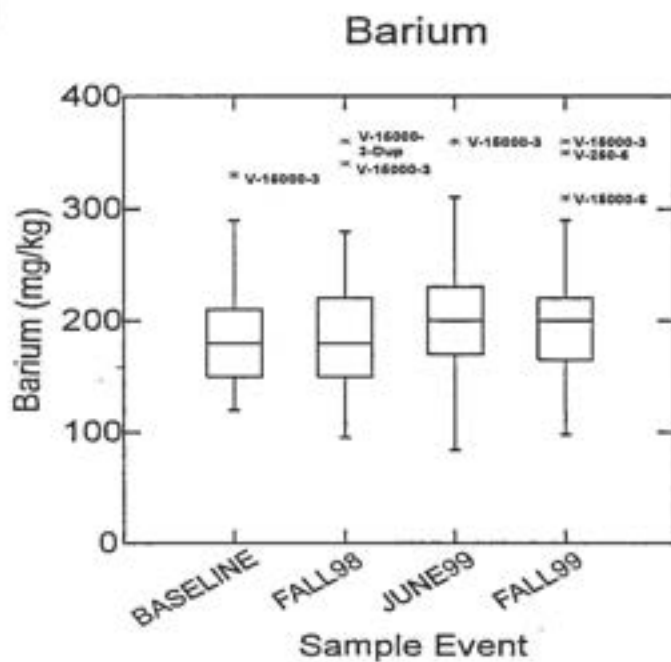
TPH was higher overall at the 250 m distance than at 500 or 3,000 m, and was also higher overall during the June 1999 survey than during the other three surveys (Figure 3.11). There was, however, no significant interaction between Distance and Time. As noted above, the analysis of the TPH data is made somewhat more complicated by the variable detection limits. However, inspection of the raw data indicates that it is reasonable to conclude that concentrations of TPH were measurably increased near the drilling platform at the time of the June 1999 survey. Concentrations appear to have declined again by the time of the November 1999 survey.

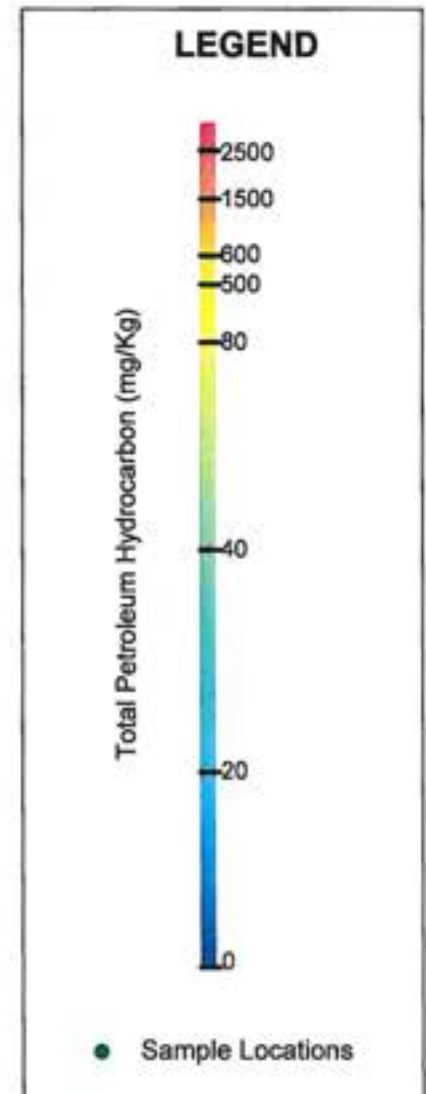
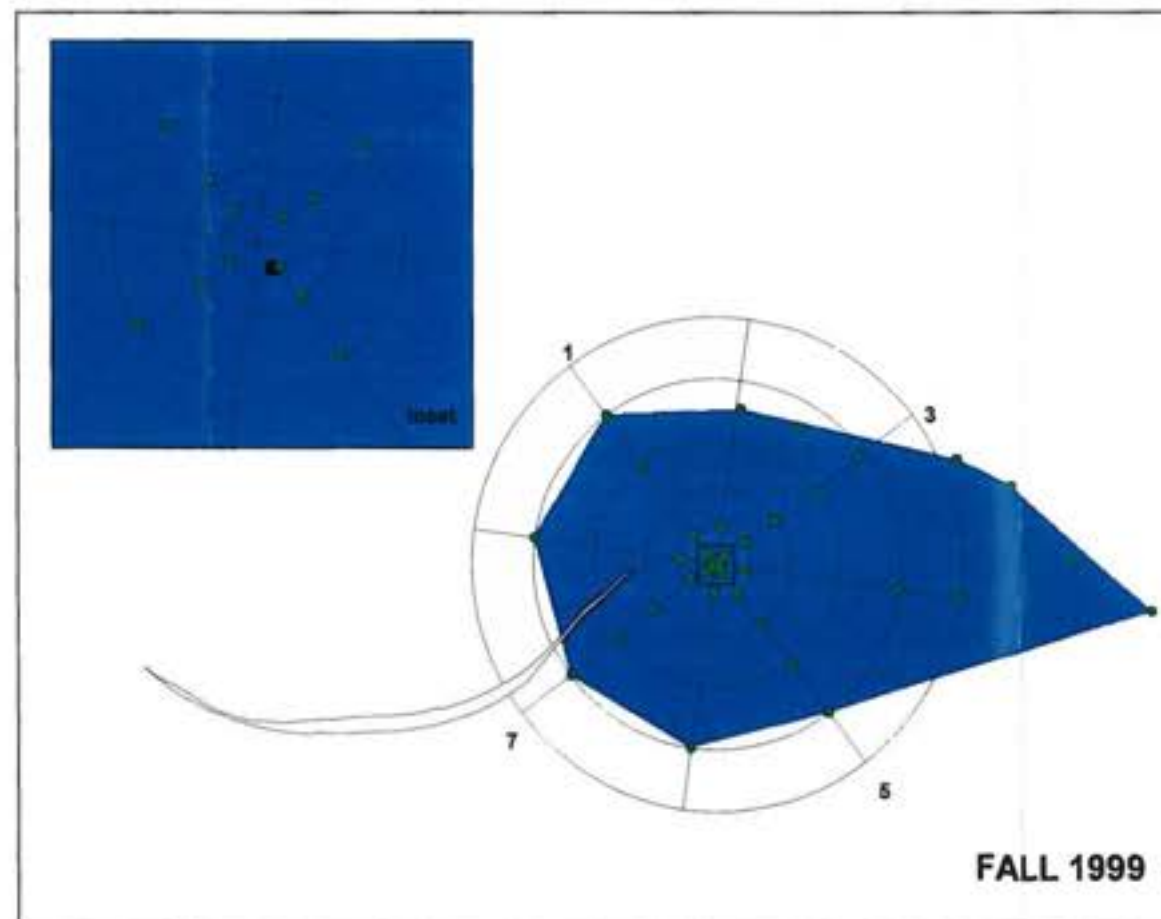
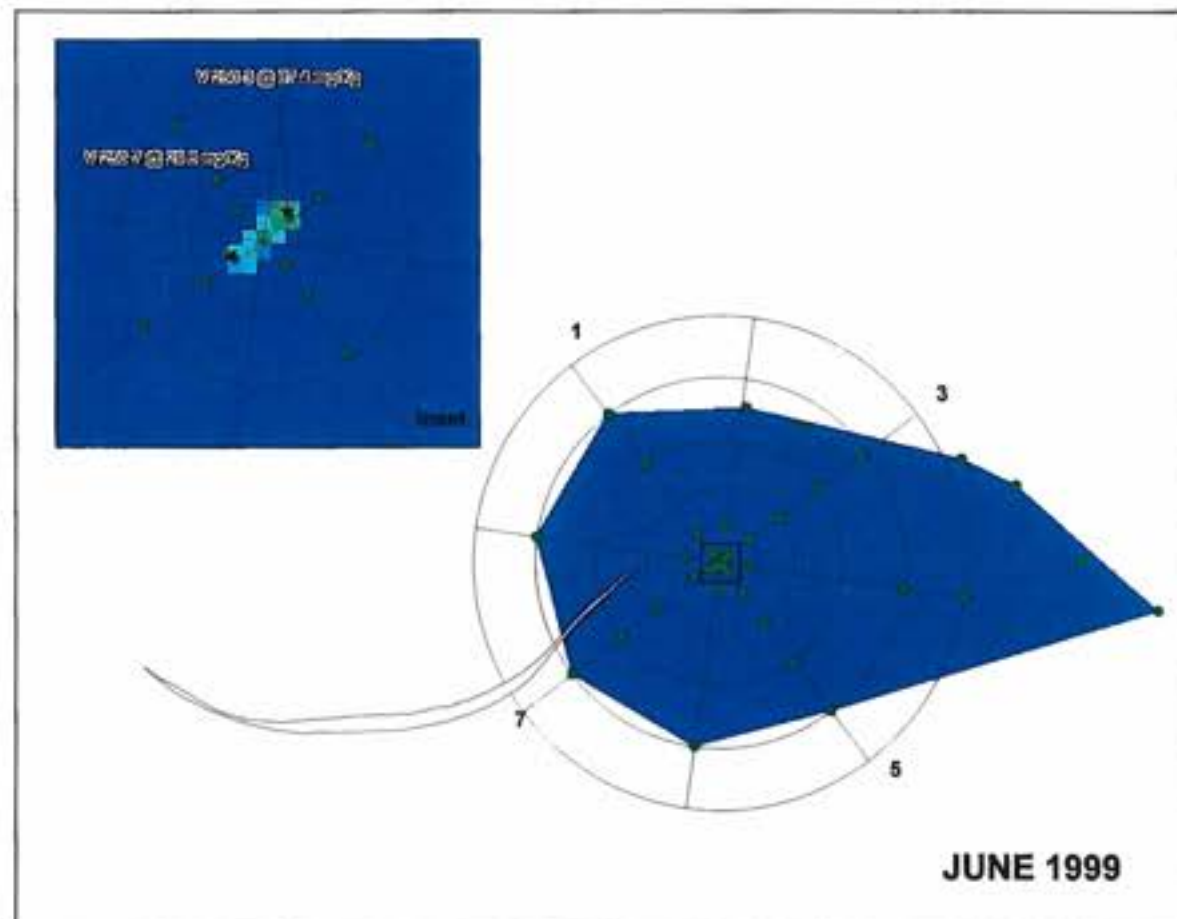
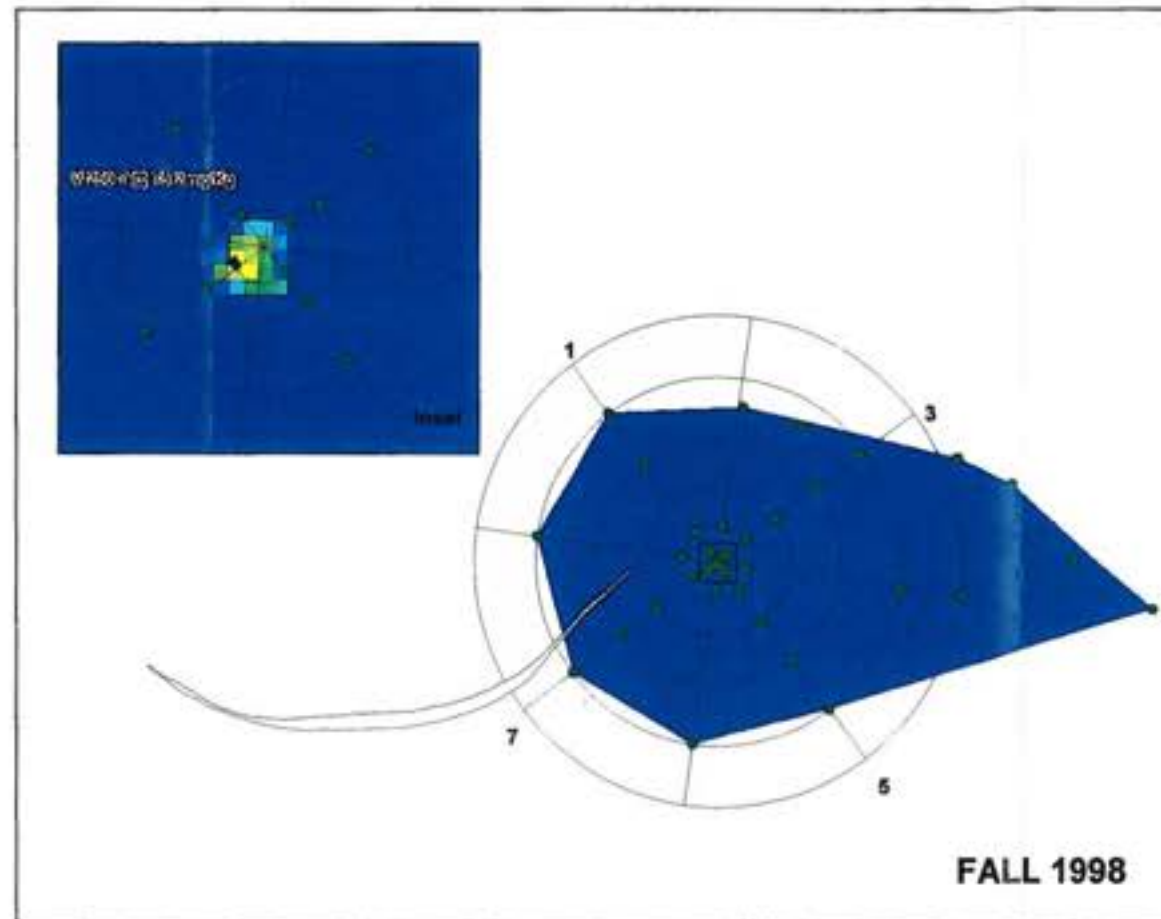
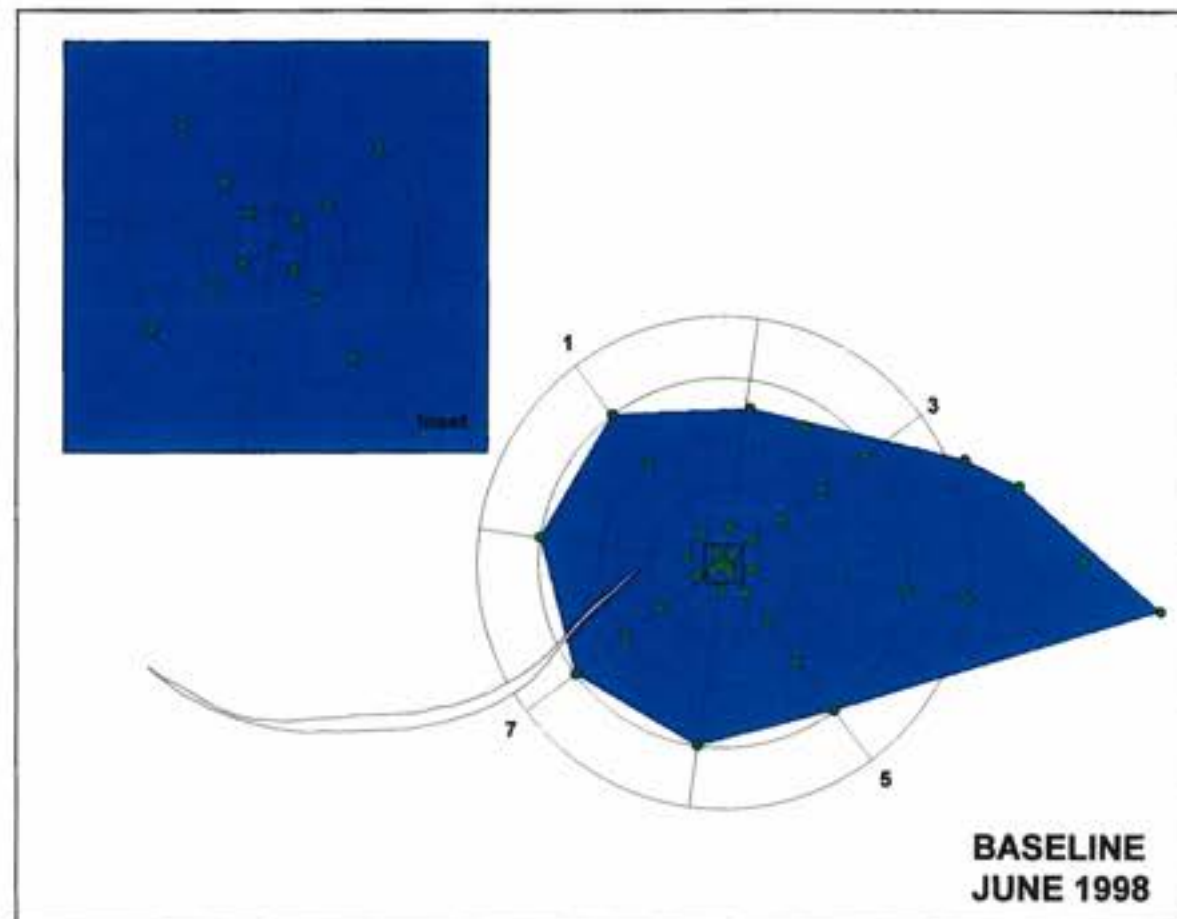


**FIGURE 3.9
SEDIMENT BARIUM
CONCENTRATIONS**

Venture Well & Gully Sites

Figure 3.10 Venture Sediment Chemistry





**FIGURE 3.11
TOTAL PETROLEUM
HYDROCARBONS IN
SEDIMENT**

Venture Well & Gully Sites



For the sediment grain size analysis, the only significant differences detected in the near-field were recorded for silt content. The silt content was significantly lower at times 2 and 3 than at times 1 and 4. This does not appear to be an effect that could be attributable to the presence of the platform.

3.4.5.3 Summary of Observed Effects at Venture

There were no large-scale differences between near-field and far-field that were indicative of an effect attributable to drilling activities at the Venture platform. Within the near-field, there was some evidence suggesting an increase over time in barium concentrations near the platform, although this effect was not statistically significant and concentrations remained within the range of natural variability observed during the baseline surveys. Similarly, there was some indication that the TPH concentration at some stations 250 m from the platform may have increased over baseline concentrations after drilling began, although this effect appeared statistically as a Distance effect, and not as the Distance $\times$ Time interaction which would have provided definitive statistical evidence. In this regard, a TPH concentration of 75.2 mg/kg was detected at the 250 m distance on Axis 7 during the November 1998 survey, and concentrations of 37.4 and 29.3 mg/kg were detected at the same distance on Axes 3 and 7 during the June 1999 survey. By November 1999, the highest concentration was 15.2 mg/kg, recorded at the 250 m distance on Axis 5.

3.4.6 Sediment Chemistry at Thebaud

Copper levels in sediment collected around the Thebaud field show near identical ranges and median values over the course of these surveys. The fact that the November 1999 survey displays the highest percentage of detectable copper levels indicates that drilling activity may be causing an increase in the copper levels in sediment over the course of time. An outlier at 500 m along Axis 7 during this survey indicates a potential effect from drilling waste discharges. Sediment nickel levels show a similar increasing trend over time indicating that this parameter may also be affected by drilling activity. This is further supported by the fact that the November 1999 survey results have a higher median value as well as a larger range.

Neither lead nor zinc levels display any trend over the course of time. This suggests that these parameters have not been affected by the drilling activities performed at the Thebaud site. Cadmium levels remain undetectable for all sample stations.

Total organic carbon (TOC) levels in sediment from Thebaud do not show an increase in median values in either of the drilling surveys as compared to the baseline median TOC value. The box plots of both drilling surveys show outlier values yet of elevated TOC levels that occur at a minimum of 9,000 metres from the jacket; drilling activity is not believed to be the source of this carbon.

3.4.6.1 Near-Field vs. Far-Field

Differences between the near-field and the far-field were evaluated for the three survey dates, using nested ANOVA (testing for effects due to Field, Date, and Field×Date), and data that were either log-transformed or arcsine square root transformed, as appropriate, to improve the homogeneity of the variance. At Thebaud, the baseline survey (Time 1) was carried out in June 1998, with two drilling surveys (Time 3, June 1999 and Time 4, November 1999). There was no survey carried out at Thebaud at Time 2 (November 1998). The results of the statistical testing are summarized in Table 3.11. In general, these results show that there were no significant Field Time interactions, though marginally for TPH. There are a few significant differences, overall, between the near-field and the far-field. The concentration of TIC was found to be lower in the near-field than in the far-field. The concentration of TOC in sediments was higher overall in June 1998 than in later surveys. There were minor (offsetting) differences in the silt and clay content of sediments between June 1998 and November 1999.

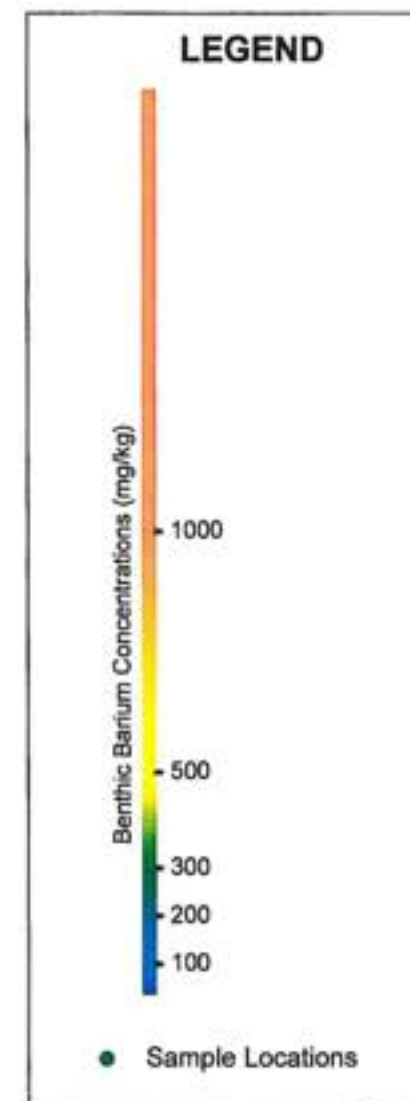
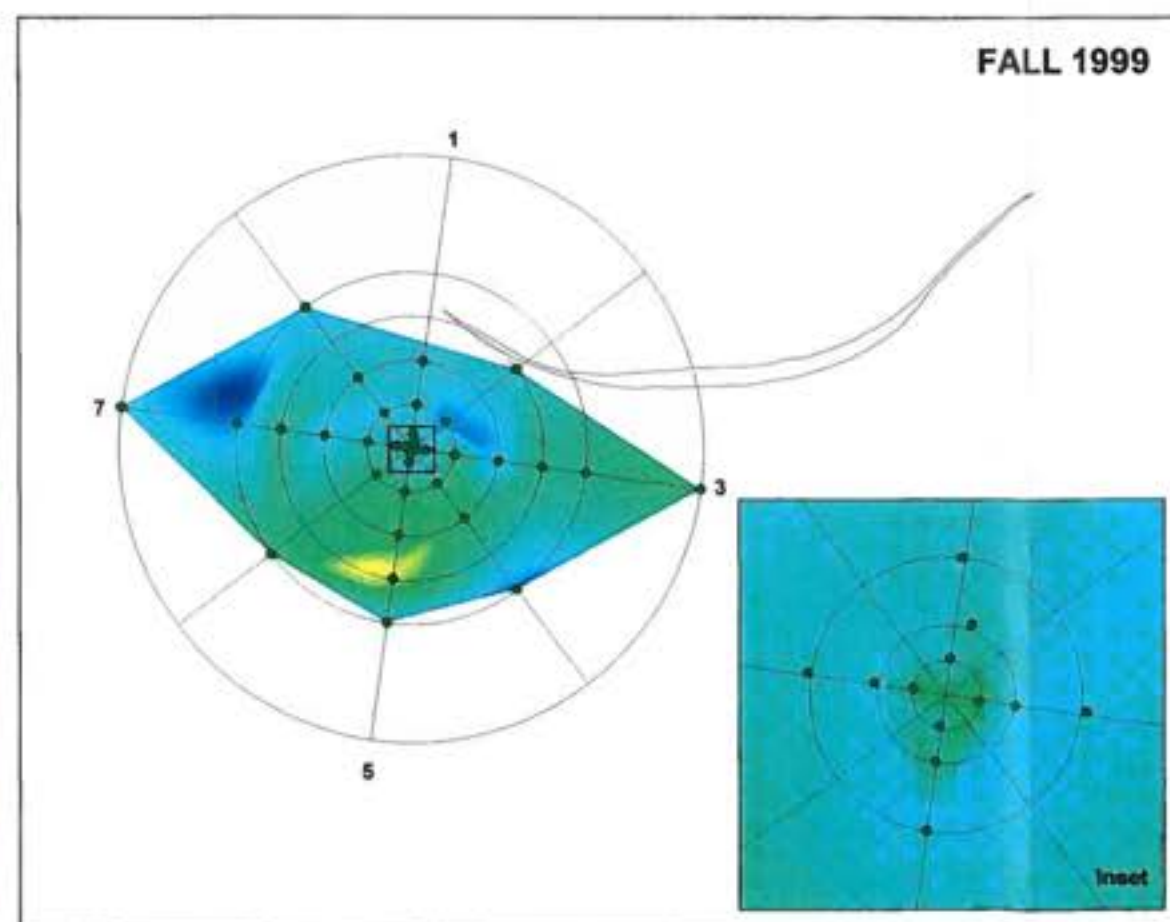
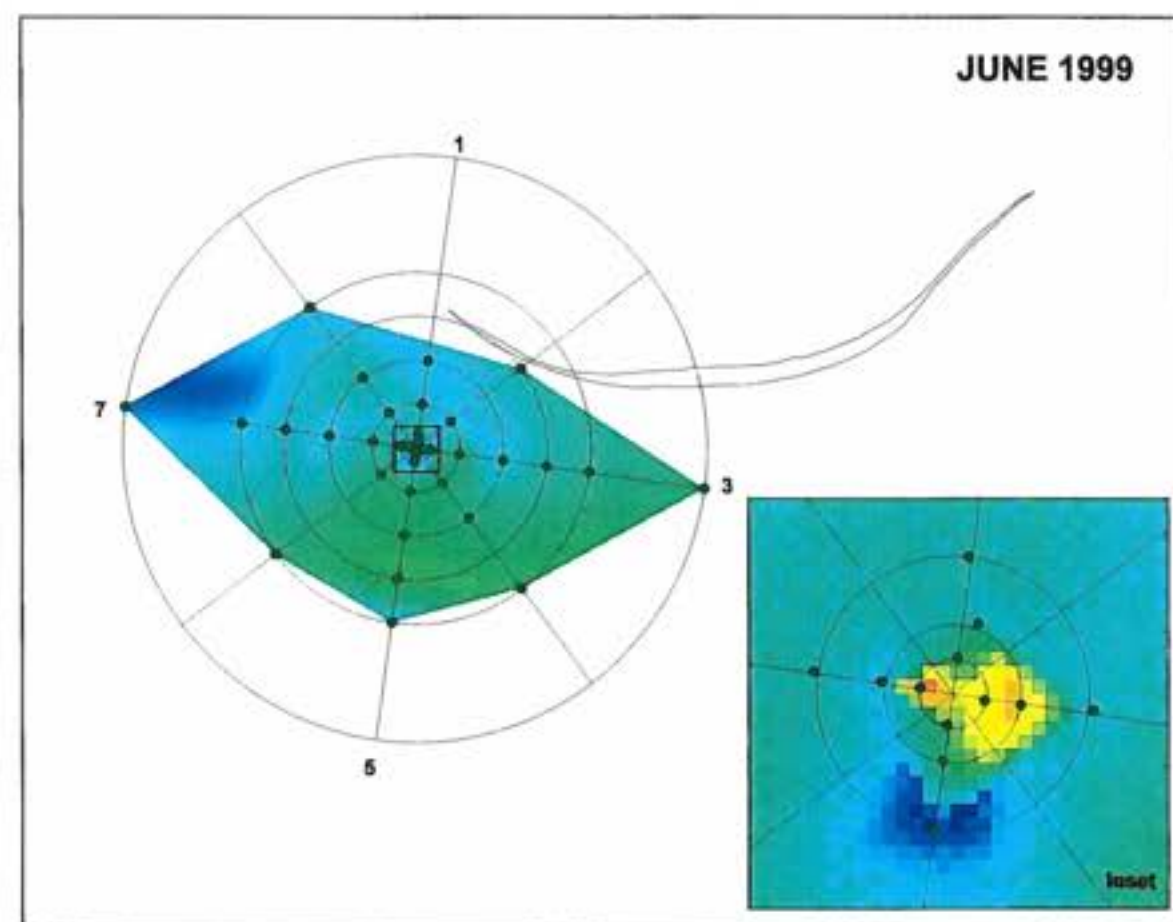
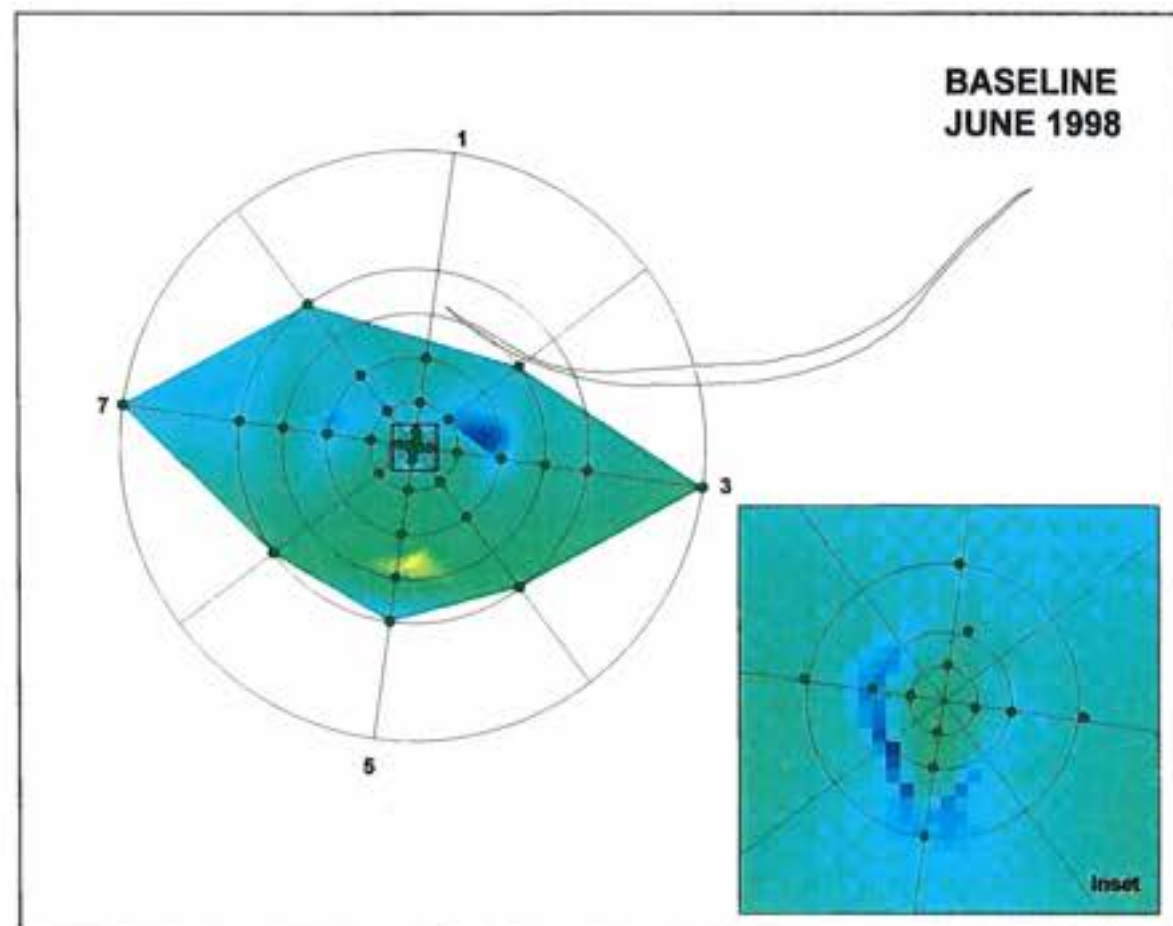
For barium, there were statistically significant effects attributable to Field (near-field was higher overall than far-field) (Figure 3.12). For TPH there were significant effects attributable to Field and Time. These results reflected higher TPH concentrations overall in the near-field than in the far-field, and higher TPH concentrations at the time of the June 1999 survey than during the surveys of June 1998 or November 1999 (Figure 3.13).

Overall, the differences associated with barium and TPH appear to be indicative of effects attributable to drilling. These effects are explored in more detail below, by examining the significance of variation within the near-field zone. The differences observed for other variables appear to reflect large-scale environmental or temporal variability.

3.4.6.2 Within the Near-Field Area

Within the near-field area at Thebaud, effects due to Distance, Time, and the Distance×Time interaction were tested using nested ANOVA (Table 3.12). TPH exhibited the only significant effect due to the Distance×Time interaction ($p < 0.009$). This difference reflected higher overall TPH concentrations in sediments at Thebaud during the June 1999 survey than during the June 1998 (baseline) or November 1999 surveys. The significant Distance effect indicated higher overall TPH concentrations at 250 m during the June 1999 survey than at other times or distances (Figure 3.13).

There were no significant differences for TIC or TOC. A suite of metals were generally found to exhibit low concentrations at the 1,000 m distance, when compared to the 250 m, 500, and 3,000 m. Associated with this tendency was a higher gravel content and lower silt content at the 1,000 m distance. Therefore, the results for the metals were assumed to be caused by natural variability in sediment quality, with low element concentrations being associated with higher gravel and lower "fines" content in the sediment.



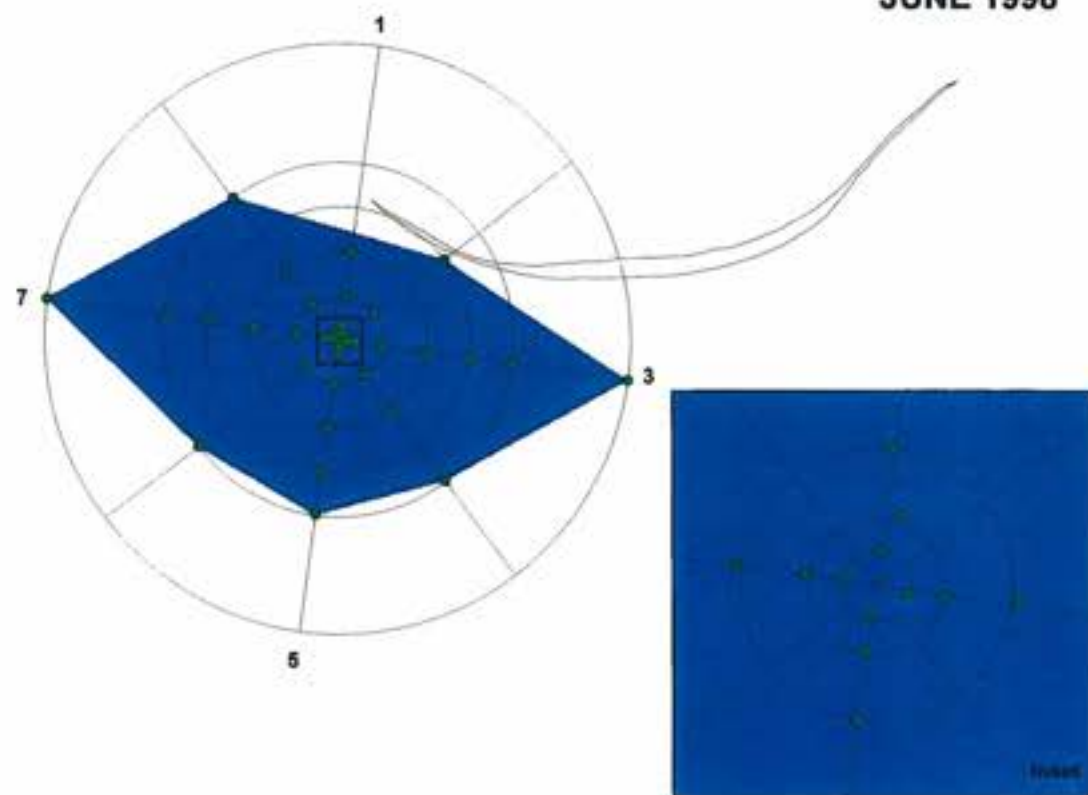
**FIGURE 3.12
SEDIMENT BARIUM
CONCENTRATIONS**

Thebaud Well

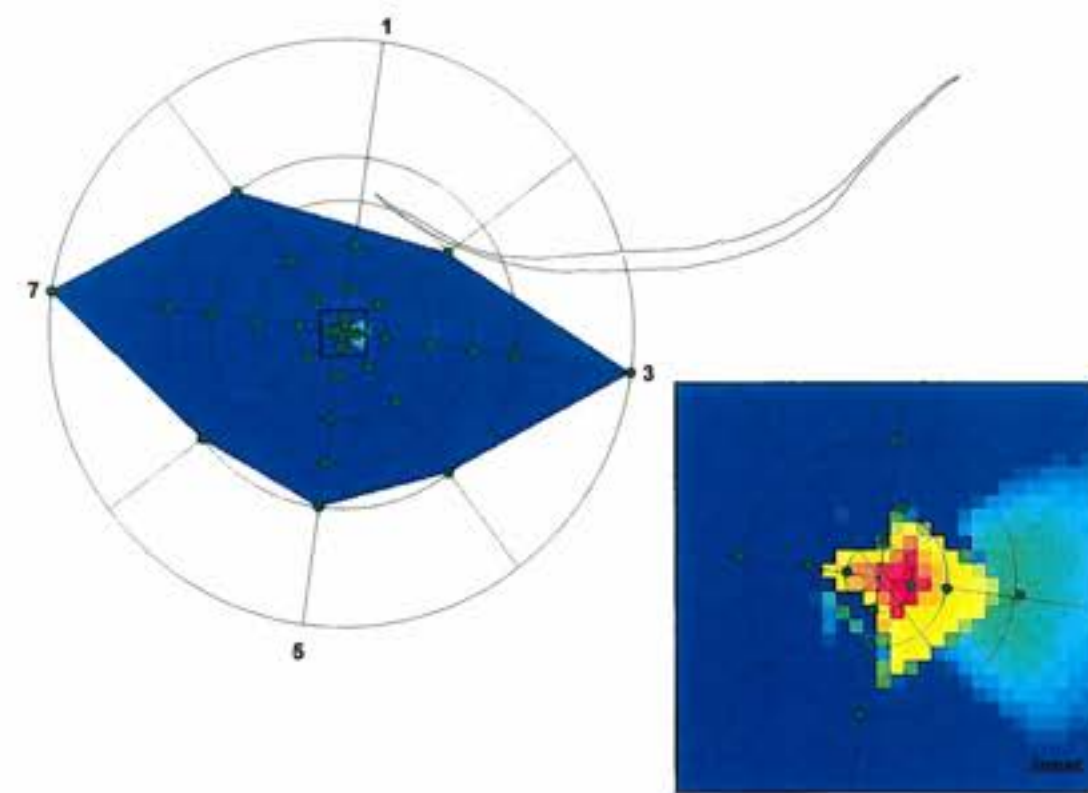


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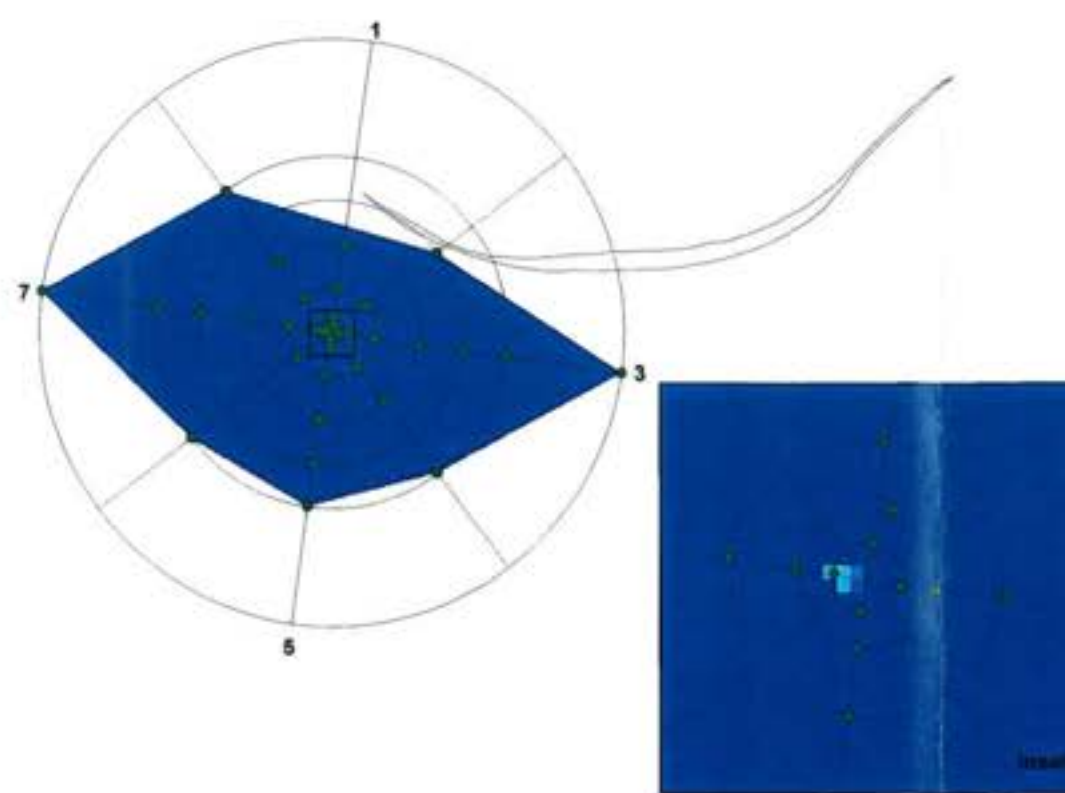
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JUNE 1998**



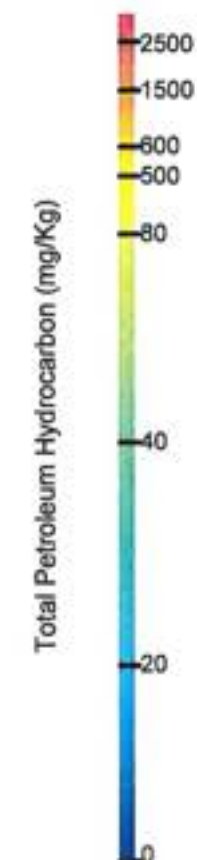
JUNE 1999



FALL 1999



LEGEND



● Sample Locations

**FIGURE 3.13
TOTAL PETROLEUM
HYDROCARBONS IN
SEDIMENT**

Thebaud Well



**Jacques Whitford
Environment Limited**



Table 3.11 Comparison of Near-Field and Far-Field Samples at Thebaud, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Field (Near/Far)	Time (1, 2, 3)	Field × Time	Comment
TIC	p=0.0195*	p<0.0001**	p=0.0905	near-field < far-field; Time 1 < 3, 4
TOC	p<0.1180	p<0.0001**	p=0.4960	Time 1 > 3, 4
Barium	p=0.0387*	p=0.4373	p=0.1972	near-field > far-field
TPH	p=0.0010**	p<0.0001**	p<0.0544	near-field > far-field; Time 3 > 1, 4
Silt	p=0.0578*	p=0.0488*	p=0.2593	Time 4 > 1
Clay	p=0.5691	p=0.0020*	p=0.9888	Time 1 > 4

¹ Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.





Table 3.12 Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at Thebaud, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Distance	Time	Distance × Time	Comment
TIC	p=0.2538	p<0.0001**	p=0.7847	Time 1 < 3, 4
TOC	p<0.9913	p<0.0001**	p=0.5431	Time 1 > 3, 4
Aluminum	p=0.0027*	p=0.0599*	p=0.9695	1000 m < 250 m, 3000 m
Barium	p=0.0006**	p=0.0336*	p=0.3966	Time 3 > 1, 4; 1000 m < 250 m
Chromium	p=0.0021*	p=0.9718	p=0.9142	1000 m < 250 m, 3000 m
Iron	p=0.0032*	p=0.9325	p=0.8533	1000 m < 250 m, 3000 m
Lead	p=0.0007**	p=0.3643	p=0.8615	1000 m < 250 m, 500 m, 3000 m
Manganese	p=0.0016*	p=0.7923	p=0.9158	1000 m < 250 m, 500 m, 3000 m
Strontium	p=0.0022*	p=0.5948	p=0.9403	1000 m < 250 m, 3000 m
Uranium	p=0.0276*	p=0.5689	p=0.3090	1000 m < 250 m
Vanadium	p=0.0037*	p=0.9509	p=0.8858	1000 m < 250 m, 3000 m
Zinc	p=0.0042*	p=0.8018	p=0.6213	1000 m < 250 m, 500 m
TPH	p<0.0001**	p<0.0001**	p<0.0099*	Time 3 > 1, 4; 250 m > 1000 m, 3000 m; TPH elevated at 250 m Distance at Time 3
Gravel	p=0.0389*	p=0.7824	p=0.3743	1000 m > 250 m, 3000 m
Silt	p=0.0004**	p=0.1942	p=0.2904	1000 m < 250 m, 3000 m
Clay	p=0.0918	p=0.0060*	p=0.8206	Time 4 < 1

Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.



For barium there were significant effects attributable to Time and Distance. These differences reflected higher barium concentrations overall in June 1999 than during the June 1998 (baseline) or November 1999 surveys; and higher barium concentrations overall at the 250 m distance than at 1,000 m. This Distance effect mirrors the effect due to Distance that was noted above for many other elements, and may be in part a result of natural variation near the drilling platform. A boxplot of barium concentration in sediment over the entire Thebaud sampling field is presented in Figure 3.14. Median barium levels and ranges are similar for baseline and drilling surveys. The exception are the three outliers at 250 m and 500 m observed in the June 99 survey.

This observation is supported by the fact that these same sites displayed higher toxicity levels and black oily globules were found in sediment samples (Section 3.5). These globules produced a "carbon fingerprint" nearly identical to NovaPlus™ drill mud (Figure 3.15).

3.4.6.3 Summary of Effects at Thebaud

Overall, this analysis shows that there were few significant differences between the near-field and far-field at Thebaud, and that these are mainly attributable to natural variation. However, higher overall concentrations of barium and TPH were detected within the near-field. When effects within the near-field area are examined in detail, there appears to be significant natural variation at the 1,000 m distance, where slightly coarser sediments display lower concentrations of many elements than were observed at other distances. Concentrations of barium and TPH were significantly higher during the June 1999 survey than at other times, and were higher overall at the 250 m distance than at other distances.

Barium concentrations of up to 760 mg/kg (two to three times the background concentration) were detected at the 250 m distance near Thebaud in June 1999. Also in June 1999, a barium concentration of 650 mg/kg was detected at the 500 m distance on Axis 3. However, the barium concentrations returned to the background range (100 to 300 mg/kg) by November 1999, likely through sediment transport.

During the June 1999 survey, a TPH concentration of 1,546 mg/kg was detected at a distance of 250 m on Axis 3. TPH concentrations at 250 m on other Axes were lower, ranging from 24.7 to 586 mg/kg. TPH concentrations were also elevated, although without causing a statistically significant response, at some of the 500 m and 1,000 m distances. A TPH concentration of 324 mg/kg was detected at 500 m on Axis 3 (the concentrations on other Axes at that distance were all less than 20 mg/kg). A TPH concentration of 35.5 mg/kg was detected at 1,000 m, also on Axis 3 (the concentrations on other Axes at 1,000 m were all less than 5 mg/kg). The significant Distance $\times$ Time interaction term for TPH, caused by high TPH concentrations at the 250 m distance during June 1999, clearly signals an effect of the drilling platform. TPH levels returned to background levels by the November 1999 survey.

Figure 3.14 Thebaud Sediment Chemistry

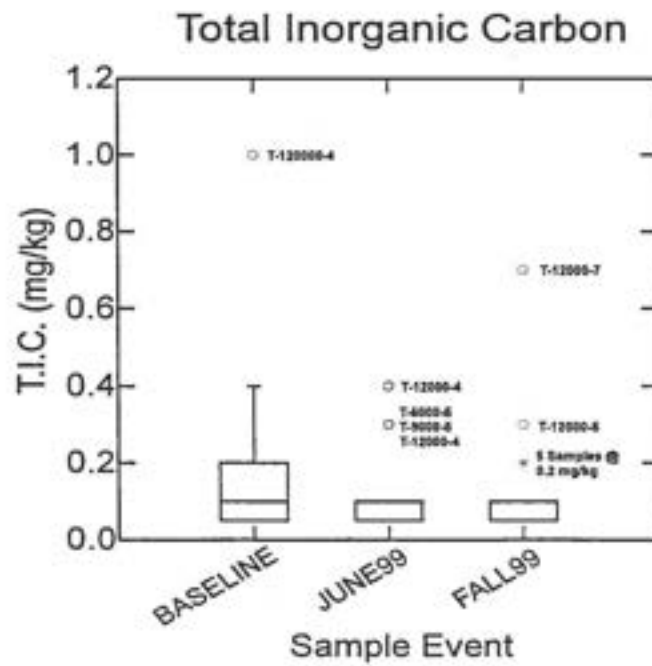
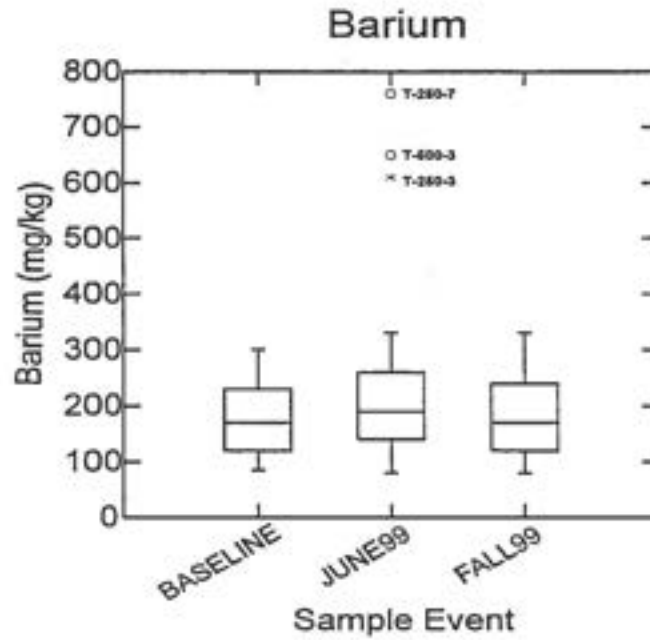
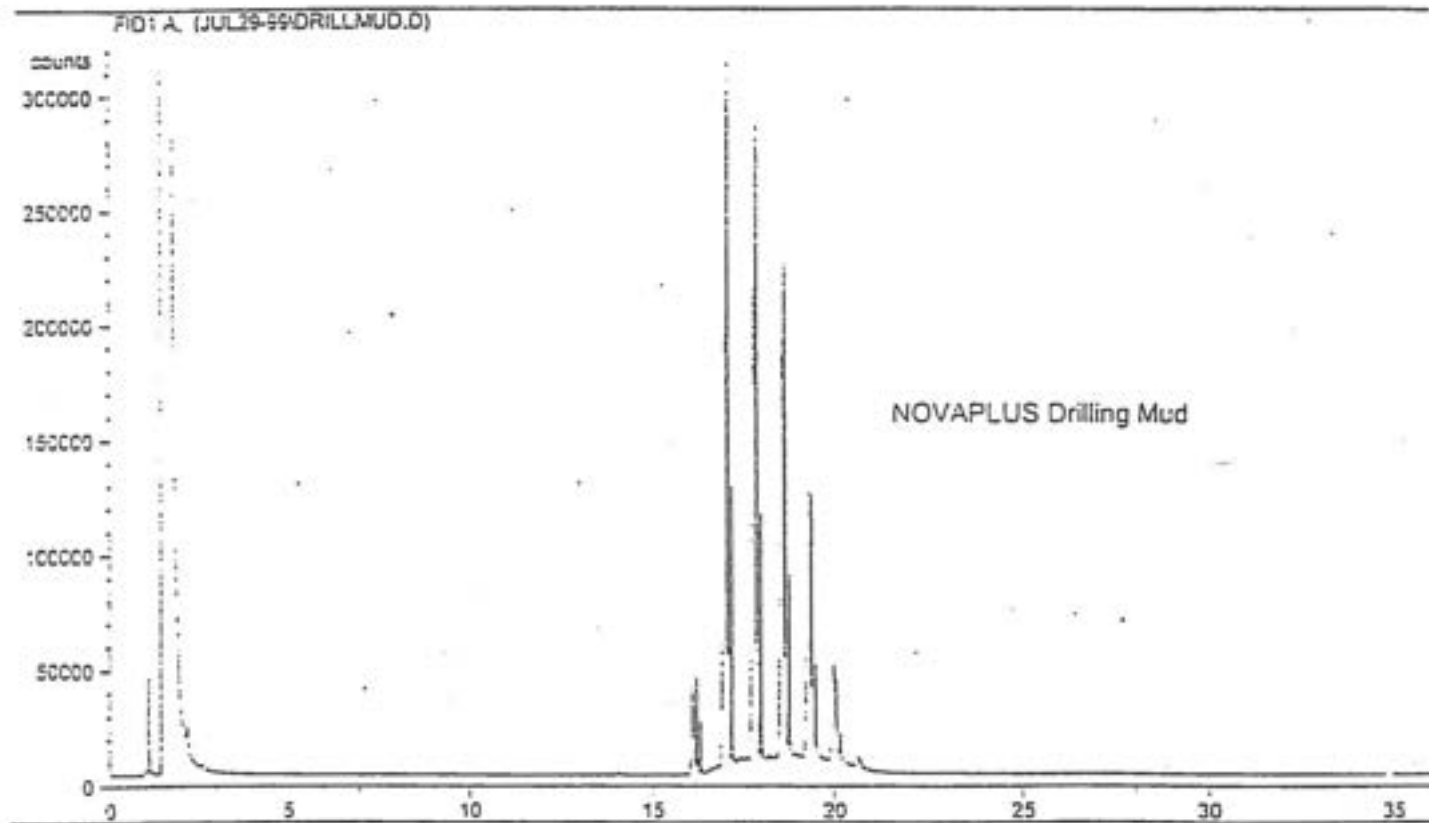
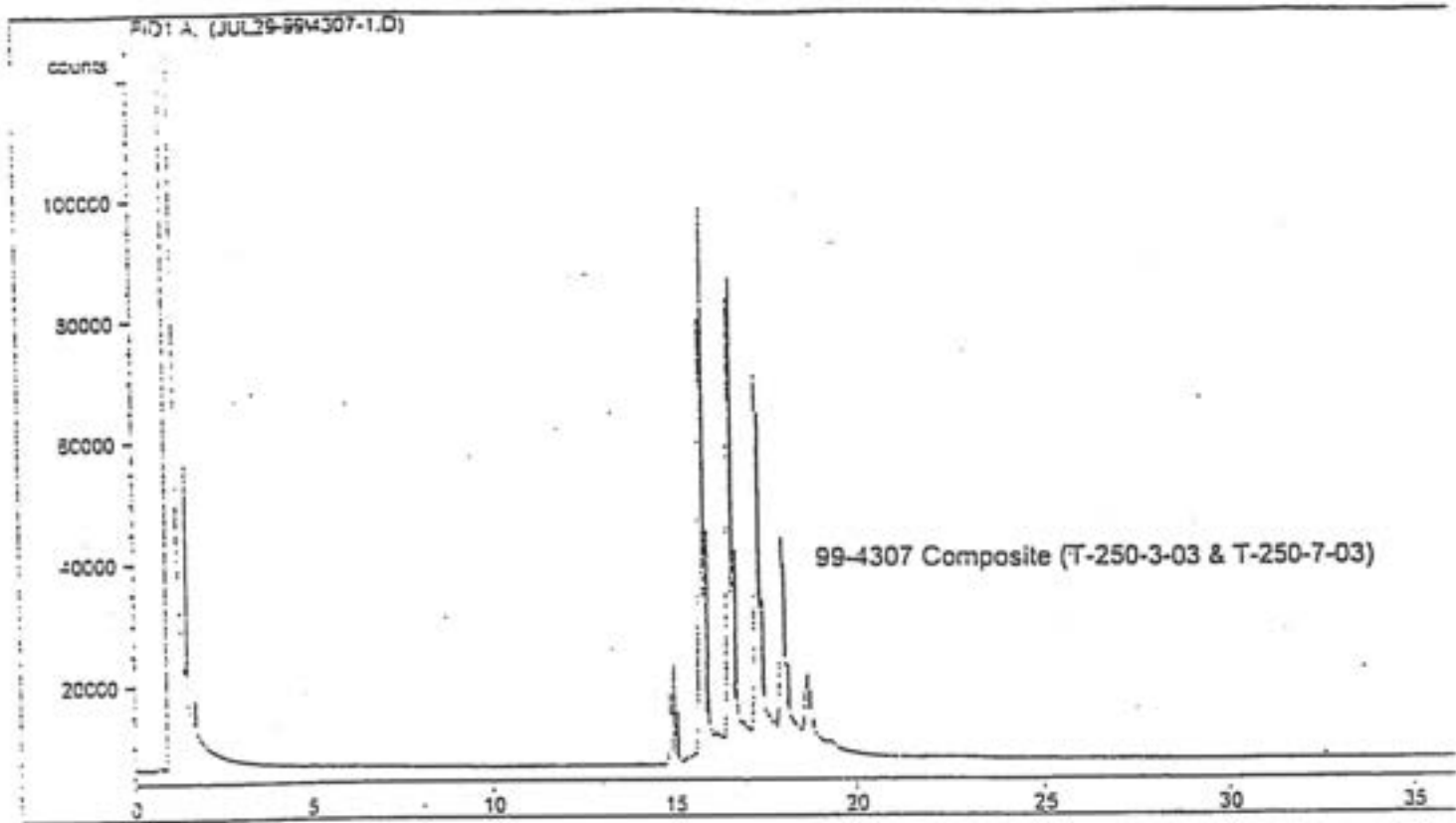


Figure 3.15



3.4.7 Sediment Chemistry at North Triumph

Copper and nickel levels in sediment collected from the North Triumph site show no effects from drilling activity. A consistent median value and range are observed between the drill survey and the two baseline surveys as well as similar percentages of samples with detectable levels of both these parameters. Levels of lead found in this sediment did not change between the baseline surveys and the drilling survey. Cadmium levels remain undetectable for all sample stations.

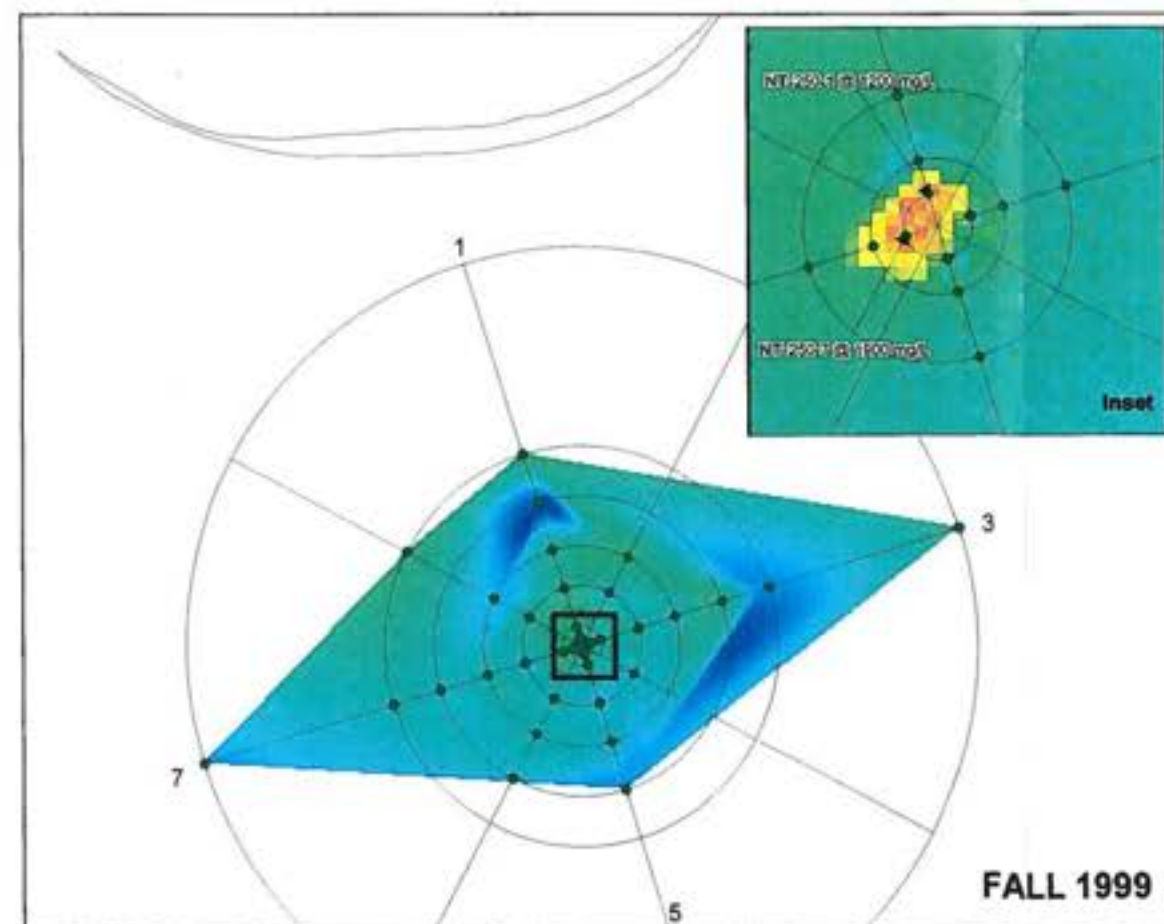
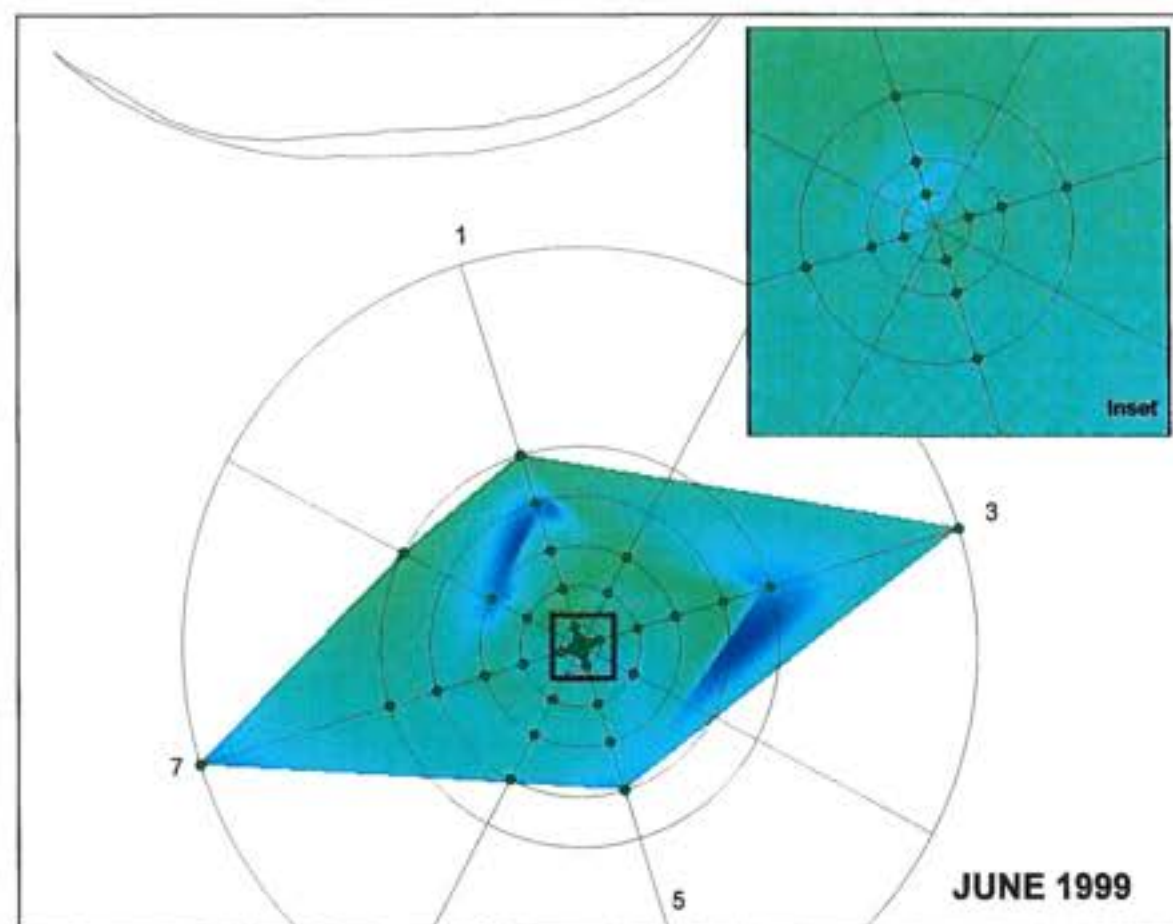
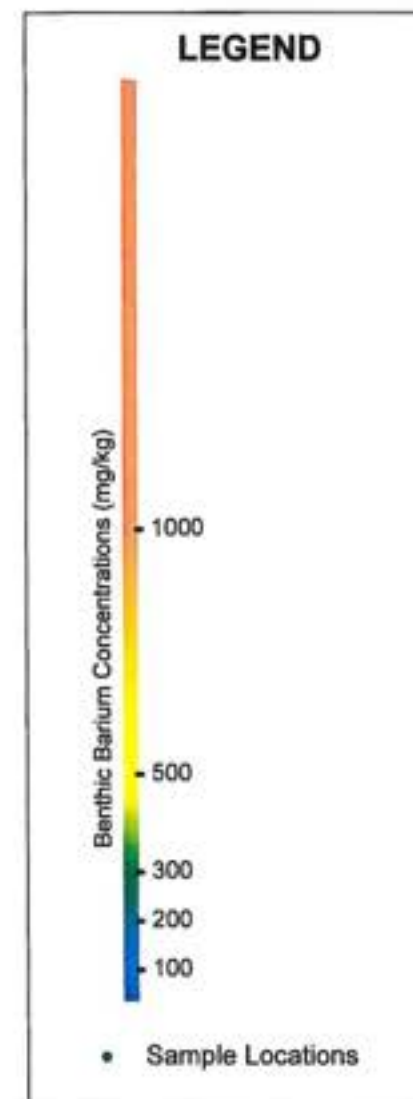
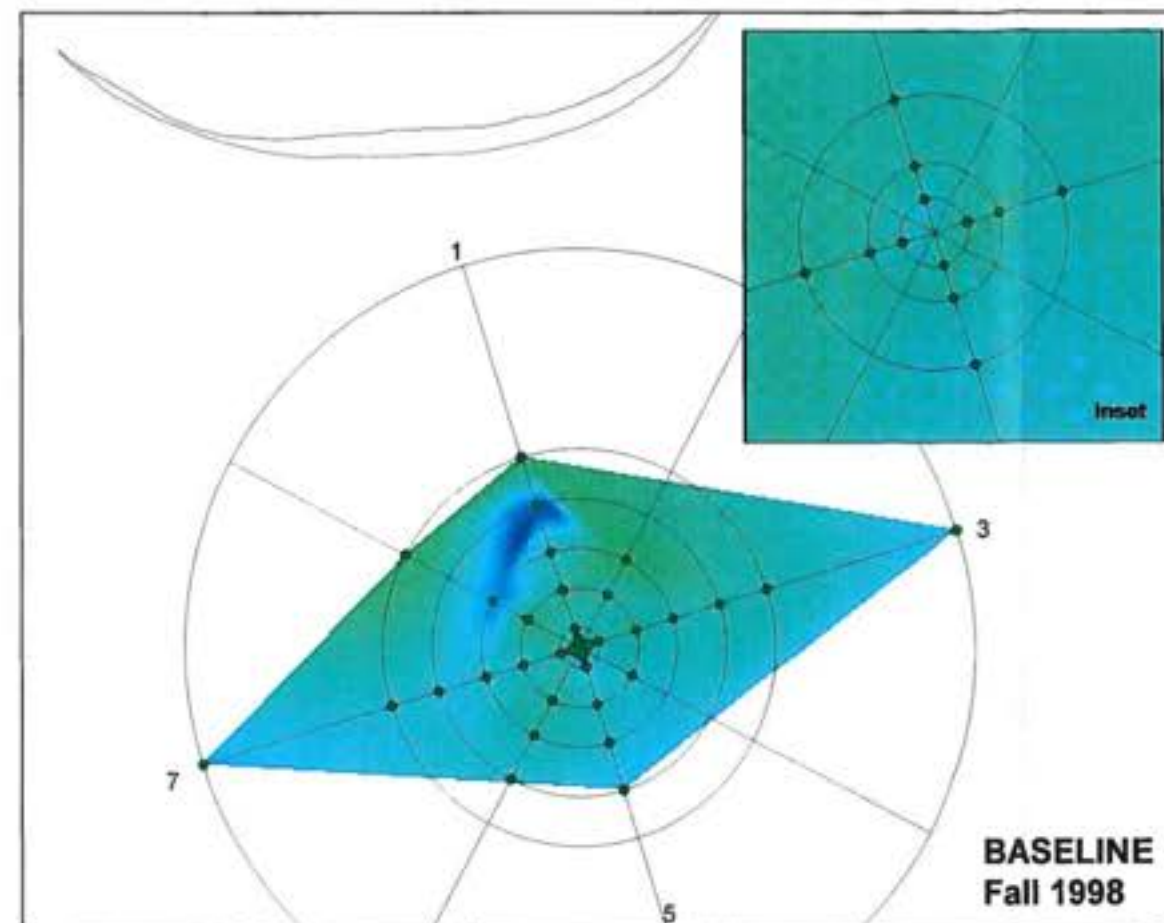
Zinc levels in the sediment surrounding the North Triumph site were somewhat variable over time with a number of sample stations producing values outside the normal range in all surveys. No drill-related effects are suspected to have occurred as the survey associated with drilling events in fact shows the lowest median zinc levels with the smallest range of values. Two of the three stations which show values outside the normal range for this drilling survey in fact show higher levels in the baseline surveys.

Analysis of total organic carbon (TOC) levels found in the sediment surrounding the North Triumph site do show an increase in median values and range in the drilling survey for the November 1999 data as compared to the baseline surveys. An outlier is shown at 500 m along Axis 7, as well as at a control distance of 20 km.

3.4.7.1 Near-Field vs. Far-Field

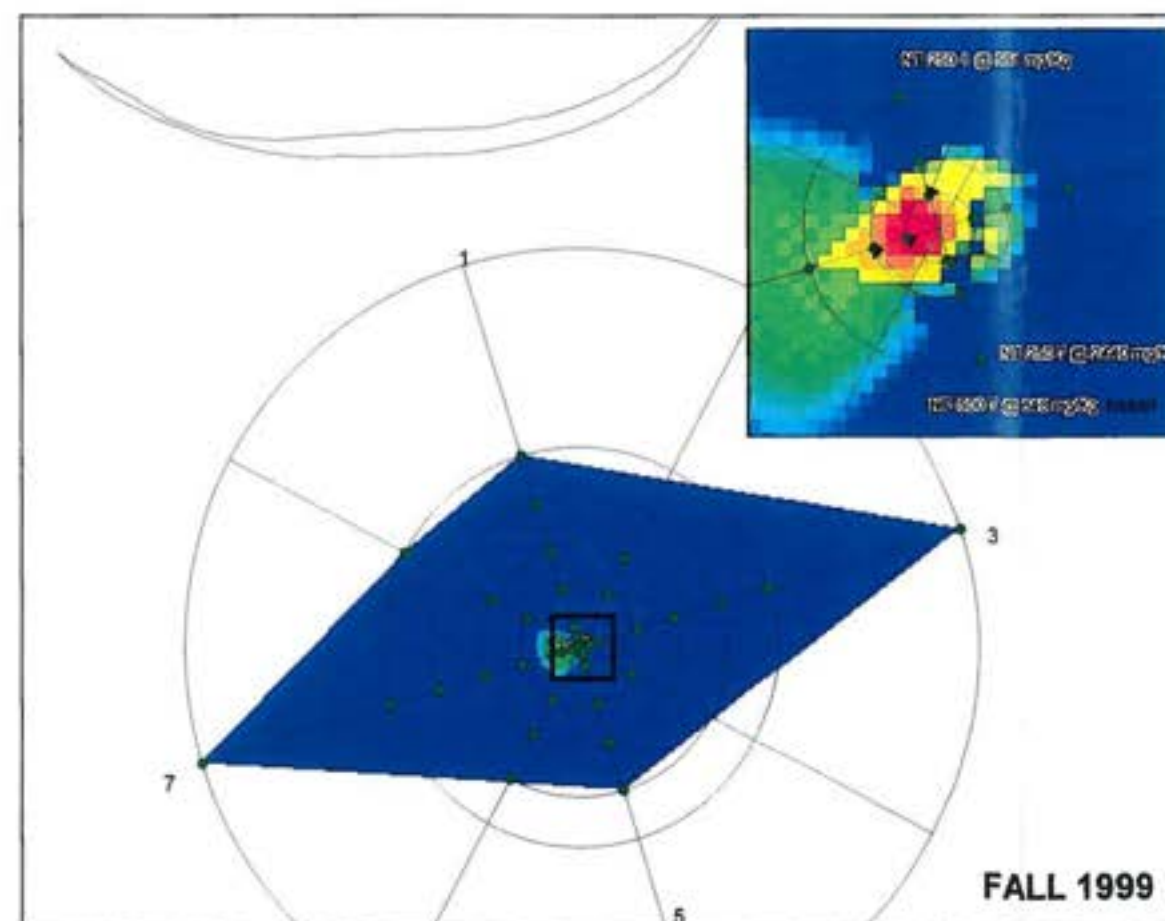
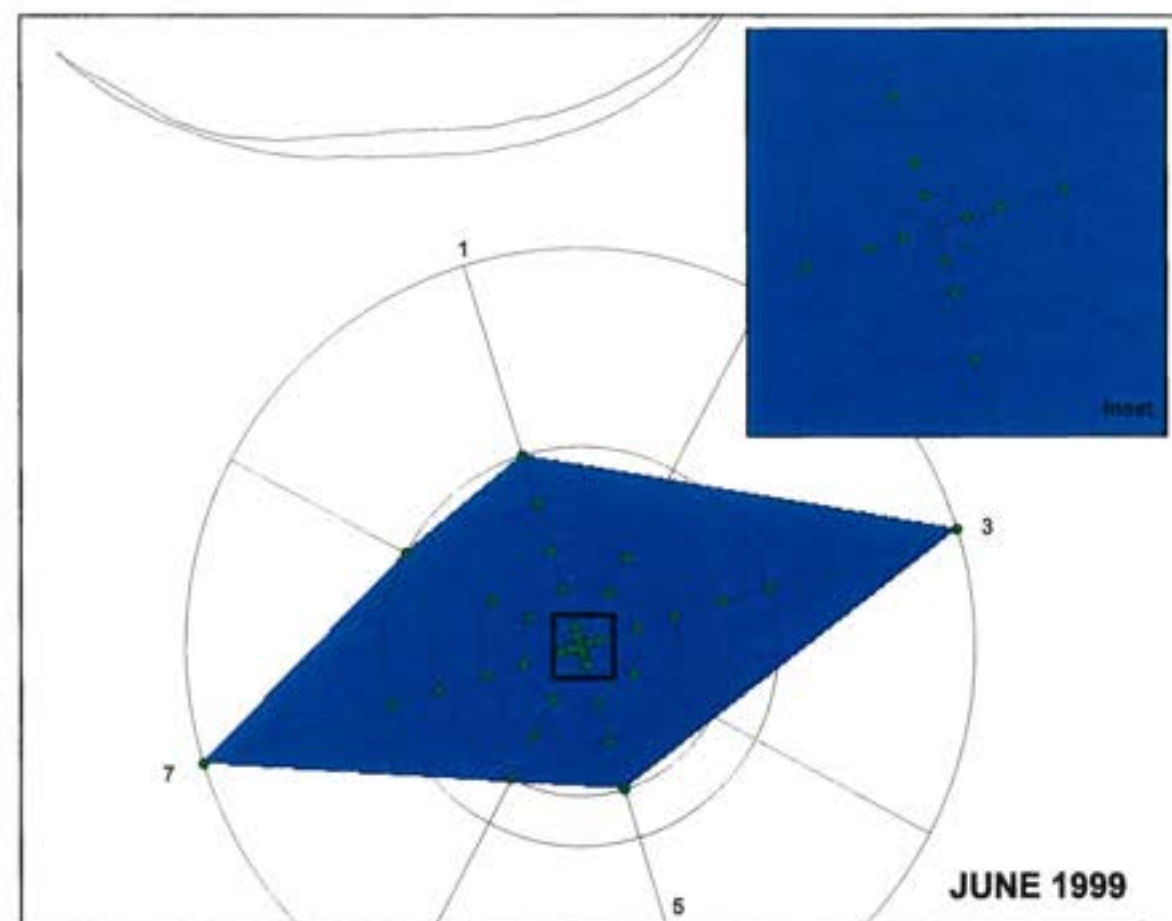
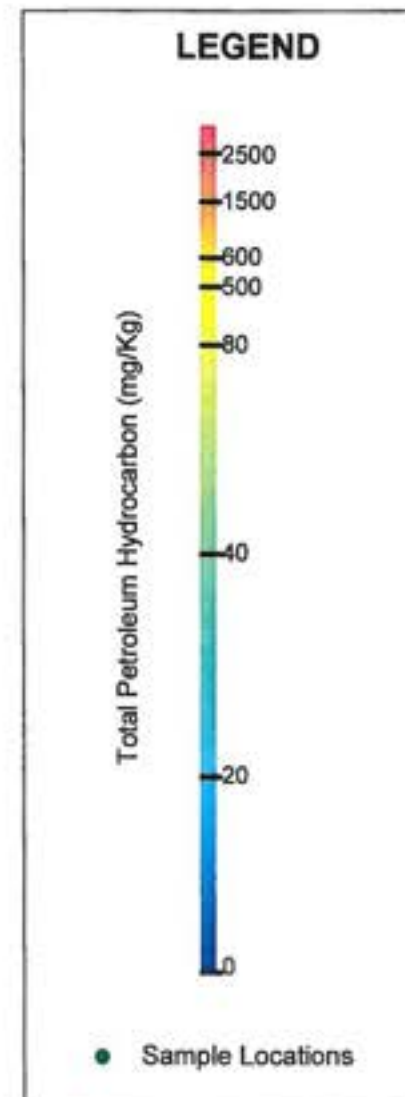
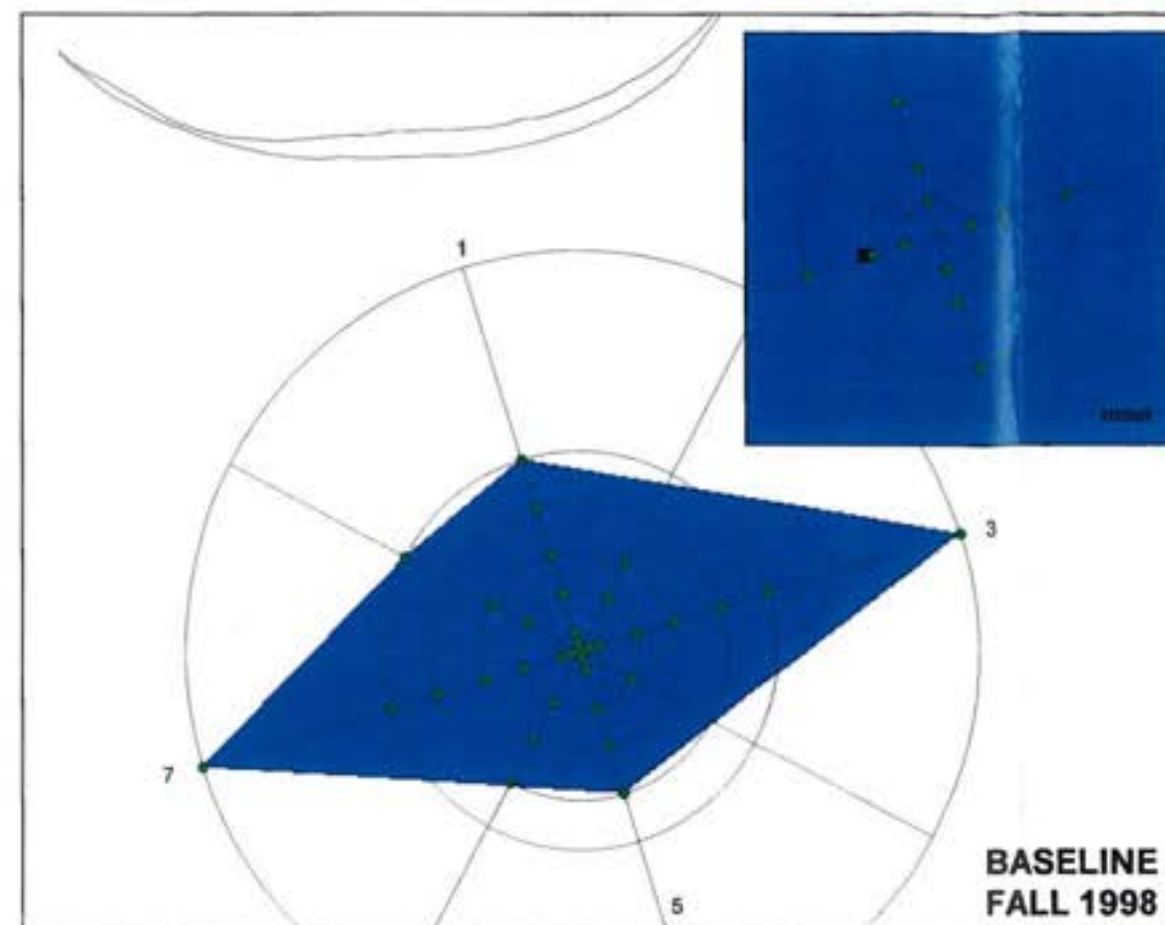
Differences between the near-field and the far-field were evaluated for the three survey dates, using nested ANOVA (testing for effects due to Field, Date, and Field×Date), and data that were either log-transformed or arcsine square root transformed, as appropriate, to improve the homogeneity of the variance. At North Triumph, two baseline surveys were carried out, in November 1998 and June 1999, with one drilling survey (November 1999). The results of the statistical testing are summarized in Table 3.13.

For TOC, barium and TPH, there were significant Field×Time interactions. For TOC, the concentration recorded after drilling began was higher than concentrations measured during the two baseline surveys. For barium, the interaction term reflected the fact that barium concentrations were higher in the near-field than in the far-field during the third survey after drilling began, but not during the two baseline surveys (Figure 3.16). For TPH there were effects attributable to the Field×Time interaction, as well as main effects attributable to Field and Time. These results reflected higher concentrations in the near-field than in the far field during the November 1999 survey, or during other surveys, as well as higher TPH concentrations overall in the near-field than in the far-field, and higher TPH concentrations during the third (November 1999) survey than during the baseline surveys (Figure 3.17).



**FIGURE 3.16
SEDIMENT BARIUM
CONCENTRATIONS**

North Triumph Well



**FIGURE 3.17
TOTAL PETROLEUM
HYDROCARBONS IN
SEDIMENT**

North Triumph Well



Table 3.13 Comparison of Near-Field and Far-Field Samples at North Triumph, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Field (Near/Far)	Time (1, 2, 3)	Field × Time	Comment
TIC	p=0.0295*	p<0.0001**	p=0.9465	near-field > far-field; time 1<2<3
TOC	p=0.0323*	p<0.0001**	p=0.0222*	near-field > far-field; time 1>2,3; near-field > far-field at time 3
Aluminum	p=0.0013*	p=0.0010**	p=0.7898	near-field > far-field; time 1>2>3
Barium	p=0.0001**	p=0.1617	p=0.0217*	near-field > far-field; near-field > far-field at time 3
Chromium	p=0.0161*	p=0.8197	p=0.3694	near-field > far-field
Iron	p=0.0172*	p=0.9489	p=0.4588	near-field > far-field
Lead	p=0.0007**	p=0.5517	p=0.8789	near-field > far-field
Manganese	p=0.0205*	p=0.7464	p=0.4470	near-field > far-field
Strontium	p=0.0003**	p=0.9271	p=0.3047	near-field > far-field
Thallium	p=0.0011*	p=0.2568	p=0.7365	near-field > far-field
Uranium	p=0.0191*	p=0.7172	p=0.9860	near-field > far-field
Vanadium	p=0.0151*	p=0.9036	p=0.3650	near-field > far-field
Zinc	p=0.0173*	p=0.0001**	p=0.5463	near-field > far-field; time 1>2, 3
TPH	p<0.0001**	p=0.0248*	p<0.0001**	near-field > far-field; time 3>1; near-field > far-field at time 3
Gravel	p=0.0029*	p=0.5969	p=0.3992	near-field < far-field
Silt	p=0.0051*	p=0.0235*	p=0.9203	near-field > far-field; time 3>2
Clay	p=0.0090*	p=0.4588	p=0.0937	near-field > far-field

Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.



In general, the ANOVA results show that most of the significant differences indicated higher concentrations of analytes (TIC, aluminum, chromium, iron, lead, manganese, strontium, thallium, uranium vanadium) in the near-field than in the far-field. There tended to be less gravel present in near-field sediments, with correspondingly more fines (silt and clay) present. This difference between the near-field and the far-field at North Triumph may account for many of the significant differences noted above, as most trace elements are preferentially concentrated onto fine particles. Significant differences over time were noted for aluminum, zinc, and silt. The concentration of aluminum tended to increase steadily over time, and the concentration of zinc was higher during the June and November 1999 surveys than during the November 1998 survey.

Overall, many of these changes (*i.e.*, the majority of the differences associated with inorganic variables) are indicative of natural variability or large-scale gradients between near-field and far-field areas. For barium and TPH, the differences that are seen are indicative of effects attributable to drilling. These effects are explored in more detail below, by examining the significance of variation within the near-field zone.

3.4.7.2 Within the Near-Field Area

Within the near-field area, effects due to Distance, Time, and the Distance $\times$ Time interaction were tested using nested ANOVA (Table 3.14). There was a significant Distance $\times$ Time interaction for TIC, barium, zinc and TPH. TIC concentration was lower at the 3,000 m distance during the November 1999 survey than at other times. Concentrations of TIC present in the near-field at North Triumph were significantly higher during the first baseline survey (November 1998) than during the second baseline survey (June 1999). The TIC concentration was also higher overall at distances of 250 and 1,000 m from the drilling platform than at a distance of 3,000 m from the platform. The TIC concentration at North Triumph was higher overall during the November 1999 survey than during the two baseline surveys, although there were no significant distance effects or interactions.

For barium concentration in sediments at North Triumph, there was also a significant main effect attributable to Time. The interaction indicated higher barium concentrations at a distance of 250 m from the platform in November 1999 than during the baseline surveys, although barium concentrations at other distances did not appear to be significantly changed. The main effect (Time) reflected higher barium concentrations overall within the near-field November 1999 than at other times. A boxplot of barium concentration in sediment from North Triumph is presented in Figures 3.18. The drilling survey has a median barium level and range nearly identical to both baseline surveys. Possibly drill-related effects were observed at three sites at 250 m and 500 m of the jacket where values exist well outside the range of other barium levels from this site. This possibility of drill-related effects is further supported by higher toxicity levels being observed at these same sites with elevated barium levels (Section 3.5).



Figure 3.18 North Triumph Sediment Chemistry

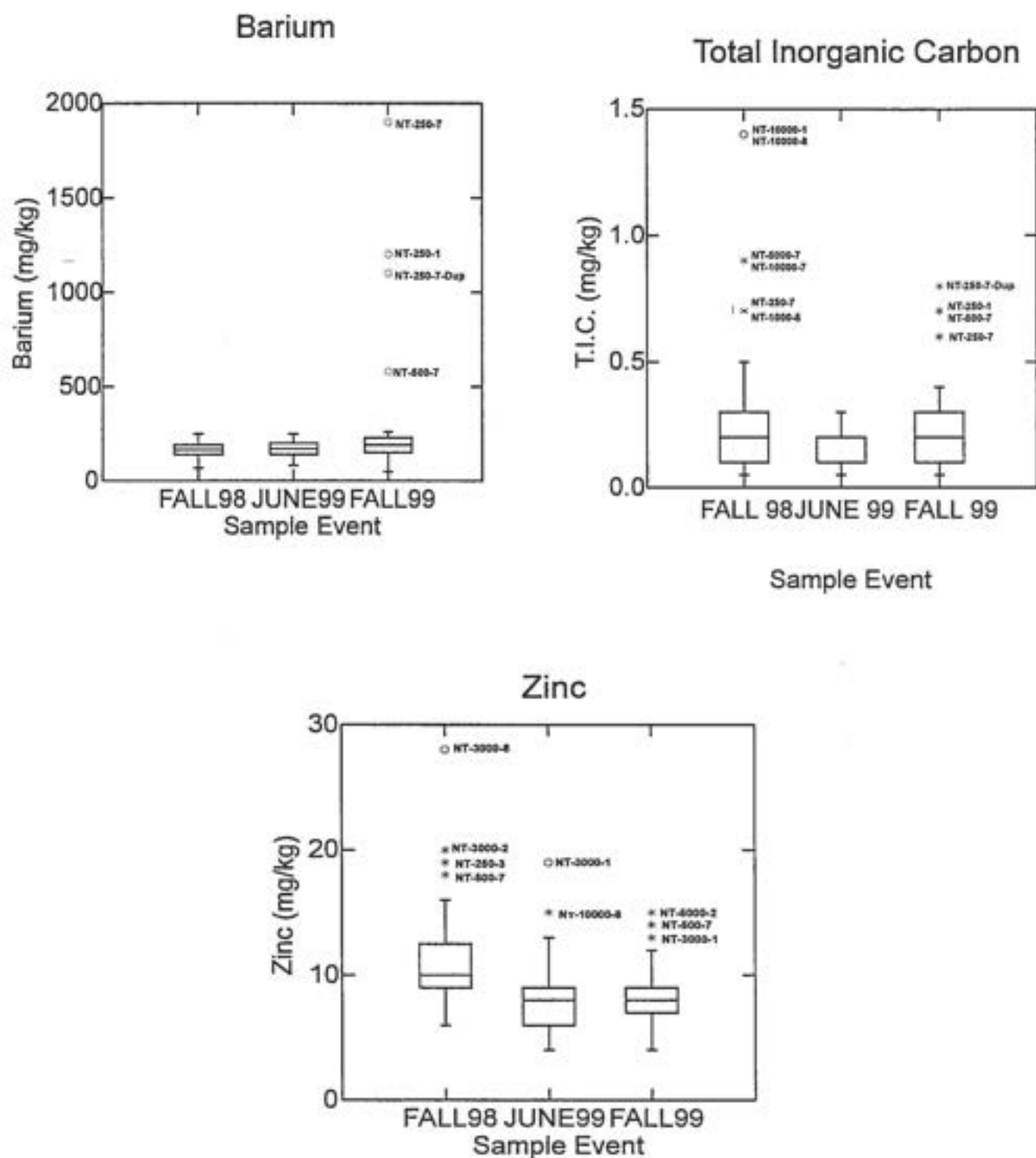




Table 3.14 Tests for Significant Differences Due to Distance, Time, or the Distance×Time Interaction at North Triumph, using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Distance	Time	Distance × Time	Comment
TIC	p=0.0057*	p<0.0297*	p=0.0208*	Time 2 (baseline) > 3 (baseline); Distance 4<1, 3; TIC lower at Distance 4, Time 4 than at other times.
TOC	p<0.4883	p<0.0001**	p=0.8062	Time 4> 2, 3
Aluminum	p=0.7655	p=0.0071*	p=0.9854	Time 4 < 2
Barium	p=0.1577	p=0.0013*	p=0.0180*	Time 4 > 2, 3; barium is elevated at a Distance of 250 m at time 4 (November 1999)
Zinc	p=0.9952	p=0.0004**	p=0.0433	Time 2 > 3, 4; zinc is elevated at a Distance of 250 m at Time 2 (baseline)
TPH	p=0.0191*	p<0.0002**	p<0.0033**	Time 4 > 3, 2; Distance 1 > 4; TPH is elevated at a Distance of 250 m at Time 4 (November 1999)

¹ Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.



For TPH, there was also a significant effects due to Distance and Time. The significant interaction term was caused by higher TPH concentrations measured at a distance of 250 m during November 1999 than at other times and distances. The significant Time effect reflected higher overall TPH concentrations in sediments at North Triumph during the November 1999 survey than during the two previous (baseline) surveys. The significant Distance effect indicated higher overall TPH concentrations at 250 m than at 3,000 m.

The zinc concentration was higher overall during the baseline survey, and was elevated at a distance of 250 m during the first baseline survey, although not during the following surveys. The boxplot shows a consistent outlier of elevated zinc at 500 m on axis 7 and at 3000 m on axes 1 and 2 during the November surveys.

3.4.7.3 Summary of Effects at North Triumph

Overall, this analysis shows significant differences between the near-field and far-field at North Triumph that are attributable to natural variation for many inorganic variables. However, higher concentrations of barium and TPH within the near-field, and in particular at a distance of 250 m from the drilling platform, during November 1999, are indicators that drilling activities have influenced sediment quality.

Barium concentrations at the 250 m distance reached 1,900 mg/kg on Axis 7 and 1,200 mg/kg on Axis 1 during the November 1999 survey. Concentrations of barium found at the same distance on Axes 3 and 5 did not exceed 250 mg/kg (within the normal background range). During the same survey, a barium concentration of 580 mg/kg was recorded at the 500 m distance on Axis 7, although barium concentrations on the other Axes at that distance likewise did not exceed 250 mg/kg.

Concentrations of TPH at North Triumph were observed to be as high as 2,440 mg/kg (5,620 mg/kg in a field duplicate sample) on Axis 7 at the 250 m distance in November 1999, and elevated concentrations were also noted at that distance on Axes 1 and 5. TPH concentrations of 613 mg/kg and 52.7 mg/kg were observed at the 500 m and 1,000 m distances on Axis 7. Concentrations of TPH on the other Axes were much closer to the background range.

3.4.8 Overall Effects of Drilling Platforms on Sediment Quality

The overall effects of the three drilling platforms in sediment quality were assessed by combining all of the near-field survey data sets for the individual platforms and survey dates. Prior to combining the data sets, it was confirmed by an analysis of Field, Distance and Field×Distance that there were generally no significant differences between platforms at the time of the baseline surveys. Coding of the overall data set included the following categories:

- Survey (baseline, or after up to 6, 12, or 18 months of drilling activity);
- Distance from the platform (250, 500, 1,000 or 3,000 m)
- Axis (only axes 1, 3, 5 and 7 were represented at all distances); and
- Season (summer or fall).

In the present study design, the axes were aligned with the expected major tidal excursion and water currents directions, such that axes 3 and 7 were aligned with the expected directions of sediment transport, and axes 1 and 5 were at right angles to this expected direction. Therefore, in each case, the axis numbers are inherently meaningful, and most sediment or contaminant deposition would be predicted to occur on axes 3 and 7.

The available data represented five baseline surveys (one each at Venture, South Venture and Thebaud, and two at North Triumph), three surveys following up to six months of drilling (Venture, Thebaud and North Triumph); two surveys following up to one year of drilling (Venture and Thebaud); and one survey (Venture) following up to eighteen months of drilling activity.

Using the available data, the following ANOVA models were constructed.

- A nested ANOVA coding for Distance, Axis, Season, Distance $\times$ Axis, Season $\times$ Axis, Distance $\times$ Season, and Distance $\times$ Axis $\times$ Season. This ANOVA was used to confirm that there were no significant differences attributable to Axis, and to evaluate the importance of Season as a factor affecting contaminant concentrations near the drilling platforms.
- A nested ANOVA coding for Survey, Distance and Distance $\times$ Survey. In this ANOVA, the axes were treated as replicates (having confirmed that there were no significant Axis effects), and the effects of Distance from the platform, and time elapsed since the first drilling were evaluated.

In comparing the main effects for all the drilling platforms, there were few significant main effects (Distance, Axis or Season) associated with the inorganic parameters (Table 3.15). The concentration of TIC and TOC in sediments were found to be significantly higher in fall than in summer. The percentage of sand in sediment was slightly lower, while the silt and clay sized fractions were slightly higher in fall than in summer. For TIC and TOC, significant effects attributable to Survey were found (Table 3.16), with lower overall TIC and TOC concentrations recorded in November 1998 and June 1999, than in June 1998 or November 1999.





Table 3.15 Comparison of Main Effects for All Drilling Platforms, Using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Distance	Axis	Season	Comment
TIC	p=0.5370	p=0.6560	p=0.0010**	TIC in fall > TIC in summer.
TOC	p=0.9381	p=0.1450	p=0.0046*	TOC in fall > TOC in summer.
Aluminum				
Barium	p=0.0003**	p=0.5337	p=0.0007**	Ba at 250 m > 500, 1,000 and 3,000 m. Ba in fall > Ba in summer. Significant Distance×Season interaction present (p=0.0040).
Strontium	p=0.2649	p=0.1833	p=0.0349*	Sr in fall > Sr in summer.
Thallium				
Uranium	p=0.6671	p=0.9442	p=0.0429*	U in fall > U in summer.
TPH	p=0.0003**	p=0.2546	p<0.0001**	TPH at 250 m > 500, 1,000 and 3,000 m. TPH in fall > TPH in summer.
Sand	p=0.8960	p=0.2650	p=0.0086*	Sand in fall < Sand in summer.
Silt	p=0.9504	p=0.5429	p=0.0010**	Silt in fall > Silt in summer.
Clay	p=0.3651	p=0.7277	p=0.0028	Clay in fall > Clay in summer.

- 1 Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.
- 2 Significant Distance×Axis interactions were present for Al, Cr, Fe, Pb, Mn, Sr, V and Zn. This interaction term indicates differences in concentrations of these metals on some axes, at some distances. These differences are attributable to natural variation in the environment.





Table 3.16 Comparison of Survey and Distance Effects for All Drilling Platforms, Using Nested ANOVA.

Variable ¹	Probability (p) of Difference Being Significant (*) or Highly Significant (**)			
	Survey	Distance	Survey × Distance	Comment
TIC	p=0.0006**	p=0.9153	p=0.1815	Surveys P1 and P2 < B and P3.
TOC	p<0.0001**	p=0.8796	p=0.9152	Surveys P1 and P2 < B and P3.
Barium	p<0.0001**	p=0.0010**	p=0.0008**	Survey P1 > P2, B. Distance 250 > 500, 1,000, 3,000 m. No differences during survey B, but significant difference present during survey P1.
Lead	p=0.0241	p=0.2233	p=0.4262	Survey P3 > P2.
TPH	p<0.0001**	p<0.0001**	p=0.0023*	Survey P1 > P2, P3, B; Survey P2 > B. Distance 250 > 500, 1,000, 3,000 m. No differences during survey B, but significant differences present during survey P1.

¹ Only those variables where a significant difference was present in the ANOVA model are presented here. All other variables examined showed no significant differences. A p value of more than 0.05 is considered to be statistically non-significant.



There was commonly in the case of metals (aluminum, chromium, iron, lead, manganese, strontium, vanadium and zinc) a significant Distance $\times$ Axis interaction term. In no case was the variability that led to the significance of this interaction term associated with the 250 m distance, and in general it appeared to be caused by variation on Axis 7 at the farther distances. Some metals had marginal or highly significant effect due Season, as well as a Season $\times$ Distance interaction. All of these differences appear to be due entirely to natural background variation, and may be disregarded.

Using the second model (Table 3.16) There is a significant Survey $\times$ Distance interaction for barium and TPH. In the case of barium, effects due to Distance ($p=0.0003$) and Season ($p<0.0001$) were highly significant, while all other terms in the nested model were non-significant. The Distance effect was found to indicate that the barium concentration was higher overall at 250 m than at all other distances. The Season effect was found to show that barium concentrations were generally higher in the fall than in the spring.

The second model tested for barium (Table 3.16) found a significant Survey $\times$ Distance interaction ($p=0.0023$), as well as highly significant main effects ($p<0.0001$). The Survey $\times$ Distance interaction captured significantly higher barium concentrations at the 250 m distance after six months of drilling activity, than at other times or distances. Barium concentrations were highest overall after six months of drilling, and declined such that they were no longer significantly different from the baseline concentrations after 12 and 18 months of drilling.

For TPH, effects due to Distance ($p=0.0003$) and Season ($p<0.0001$) were also highly significant, while all other terms in the nested model were non-significant (Table 3.15). The Distance effect was found to indicate that the TPH concentration was higher overall at 250 m than at other distances. The season effect showed that TPH concentrations were higher overall in the fall than in the spring.

The second model tested for TPH (Table 3.16) likewise found a significant Survey $\times$ Distance interaction ($p=0.0023$), as well as highly significant main effects ($p<0.0001$). The interaction captured significantly higher TPH concentrations at the 250 m distance after six months of drilling activity, than at other times or distances such that they were no longer significantly different from the baseline concentrations after 12 and 18 months of drilling.

Overall, the results obtained to date suggest that the effects of drilling on sediment quality are greatest during the first six months after the platforms are established; both barium and TPH concentrations declined after 12 and 18 months of drilling activity. The effects of drilling were most pronounced at a distance of 250 m from the platform. Effects were rarely significant at 500 m although trend lines suggested slight but statistically insignificant effects may have extended to a distance of up to 1 km after six months of drilling. The significant seasonal effects suggest that winter weather may aid in dispersing (or burying) contaminants released by drilling activity. There did not appear to be any significant effects that could be attributed to drilling activity for inorganic or organic contaminants other than barium and TPH.

3.4.9 Summary of Sediment Chemistry Results

The marine sediments near Sable Island are predominantly sandy, with small amounts of clay present. No significant differences have been observed in sediment grain size composition near the drilling platforms (at distances of 250 m or greater) that can be attributed to the drilling activities.

In general, concentrations of the PAH compounds, the BTEX compounds, and many trace metals have been consistently non-detectable in the vicinity of the drilling platforms near Sable Island.

For those trace elements that are routinely detected (with the exception of barium), no significant changes have been observed that do not appear to be attributable to natural variation (temporal or spatial) in the environment.

For barium, there have been statistically significant increases in concentrations observed at the 250 m distance, and individual observations of elevated barium concentrations extend in some cases to a distance of 1,000 m from the drilling platforms (although these individual observations are not sufficient to cause a statistically significant response).

Observations for TPH are similar to those for barium, with statistically significant responses detected at the 250 m distance, and individual observations extending to a distance of 1,000 m (although again, these individual observations are not sufficient to cause a statistically significant response).

To date, concentrations of barium and TPH around the drilling platforms have not been observed to increase over time; rather they have been highest following the first period of drilling, and declined thereafter.

3.5 Sediment Toxicity

3.5.1 Objectives and Analysis

A battery of three toxicity assays, two assays with sensitive organisms are used in standardised testing of marine sediments. These assays test the inhibition of echinoid fertilization (using *Litichinus pictus*) and amphipod mortality (using *Rhepoxinius abronius*). The third test, Microtox™, used a strain of luminescent marine bacteria (*Vibrio fischeri*). Sediment toxicity testing was conducted to detect and measure if chemical contaminants associated with drill waste discharges are responsible for significant changes in sediment toxicity. As with the sediment chemistry attribute, the study of sediment toxicity was designed to address questions regarding drill waste effects, such as:

- Has sediment toxicity changed during the drilling phase? If so, does this occur along a gradient from the platform?

This question is formulated in a null hypothesis for statistical analysis.

H_0 : The drilling operation has not significantly changed the toxicity of the sediment.

Amphipod survival and echinoid fertilization results were compared between stations using ANOVA to evaluate variation attributable to Time, Direction and Distance, as well as Time $\times$ Direction, Time $\times$ Distance and Direction $\times$ Distance interactions. The data were log-transformed (Log X+1) to improve the homogeneity of the variance. The SAS Statistical package was used for the ANOVA.

3.5.2 Sediment Toxicity at Venture

Amphipod Survival

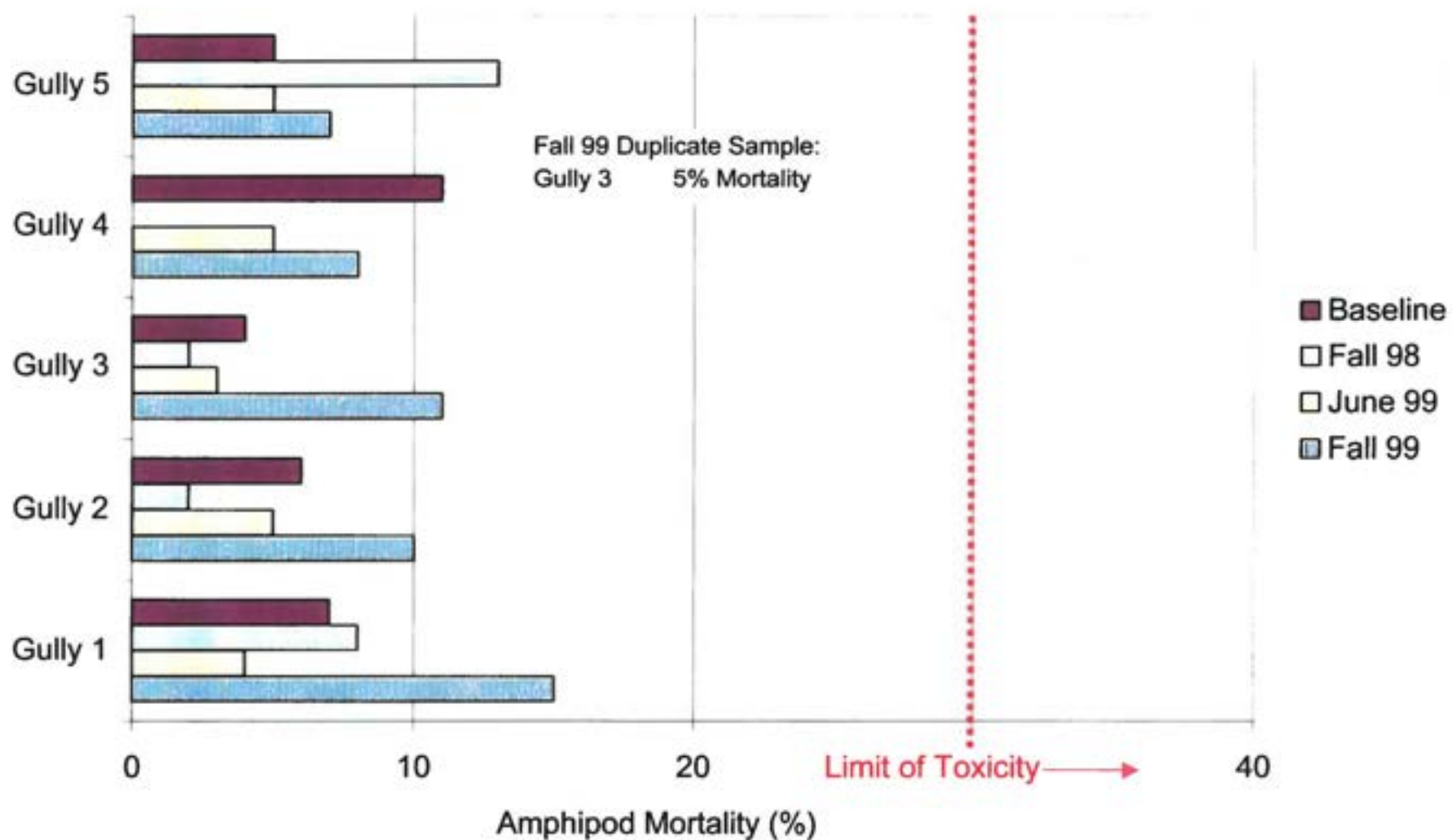
Very low toxicity is observed for all rounds of baseline and drilling testing for the amphipod mortality test using the marine amphipod *Rhepoxinius abronius*. A sample is considered to exhibit a toxic effect if the sample mortality is greater than 30% more than that of the control sample in accordance with Environment Canada's interpretation guidelines (Aquatic Toxicological Section). Both the Gully (Figure 3.19) and Venture (Figure 3.20) sites have not shown any toxic effects in any of the four rounds of environmental effects monitoring. Table 3.17 provides the statistical results of toxicity testing at Venture. Statistically examining the % mortality, there was a significant difference between stations in the Time $\times$ Axis interaction ($p=0.0284$); however, this difference is mainly between difference stations on differences axis at difference times. There is a significant between the overall baseline result with those from the November 1998 data along axis 1 ($p=0.0133$), but this trend does not persist, nor is there any distance associated with this observation. Also there is a significant difference along axis 3 from the November 1998 compared to the June 1999 data ($p=0.0117$), however there is no clear trend with specific stations.

Table 3.17 Tests for Significant Differences Due to Time, Axis, Distance, Time $\times$ Axis, Time $\times$ Distance or Time $\times$ Axis at the Venture Stations

Variable	Probability (p) of Difference Being Significant					
	Time	Axis	Distance	Time $\times$ Axis	Time $\times$ Distance	Axis $\times$ Distance
Amphipod	0	0.05	0.2638	0.0284	0.2976	0.0812
Echinoid	0.589	0.236	0.2159	0.6944	0.5465	0.5296

Figure 3.19

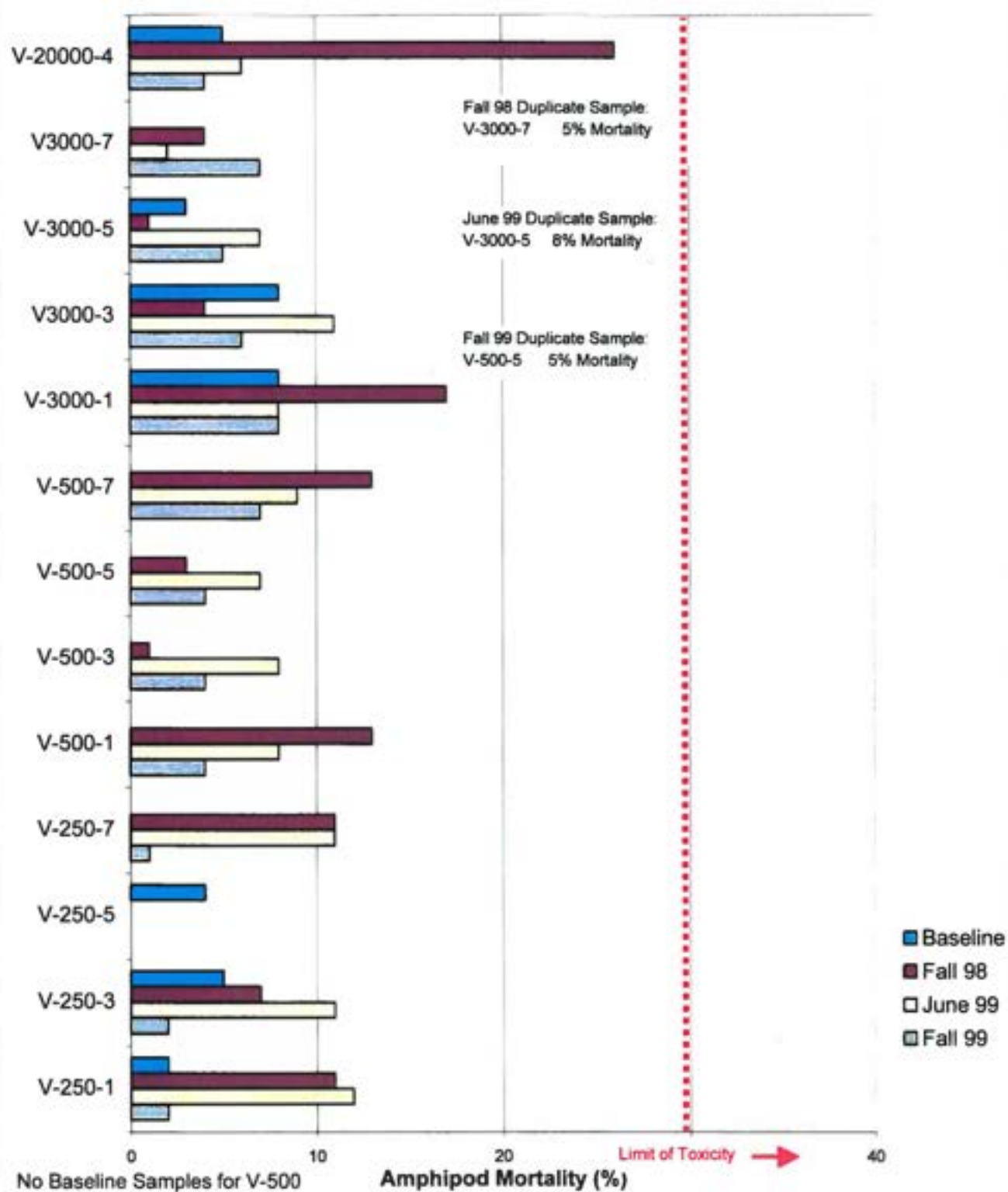
Gully Amphipod Mortality



* Toxic Effect is considered to be a mortality $\geq 30\%$ (30% difference from control)

Figure 3.20

Venture Amphipod Mortality



* Toxic Effect is considered to be a mortality $\geq 30\%$ (30% difference from control)

Echinoid Fertilization

Over the course of four rounds of EEM monitoring, 45 echinoid fertilization tests have been performed from the pore water from Venture sediment samples. Of these 45 samples, eight were found to exhibit a sub-lethal toxic effect (a difference of more than 25% from a control sample) (Figure 3.21). These samples were evenly distributed over the first three rounds of sampling including the baseline. There were no significant differences with the interactions nor effects (Table 3.17). These effects do not appear to be associated with drilling activity. ANOVA of the echinoid fertilization data shows no significant difference between any interaction or variable.

A total of 20 echinoid fertilization assays have been completed over four rounds of EEM sampling at the Gully. A toxic effect existed in 45% of all samples (Figure 3.22). As these toxic effects were evenly distributed over the four sample events including baseline, these sub-lethal toxic effects are not considered to be drilling activity related.

Microtox™

All rounds of sampling related to drilling activity have produced Microtox™ results of >98684 mg/L for all sample locations. These results represent an IC50 endpoint of >100%, as calculated by Microbics Software and graphical validation. These results indicate no toxic effect being observed in *Vibrio fischeri*.

3.5.3 Sediment Toxicity at Thebaud

Amphipod Survival

Marine sediments from the Thebaud field have shown a toxic effect in the marine amphipod *Rhepoxinus abronius* in one of the three rounds of EEM monitoring (Figure 3.23). Both the T-250-3 and T-250-7 samples displayed amphipod mortality rates above 80% and were considered to be highly toxic. These samples both contained small globules of an oily material that were sent to Seatech Ltd. for identification. These globules were subsequently found to have gas chromatograph "fingerprints" nearly identical to those of a sample of Nova Plus drill mud (Figure 3.15). This evidence correlates these toxic results with drilling activity at the Thebaud site. ANOVA of the data shows no clear patterns of significant difference between the stations with time, distance or axis (Table 3.18).



Figure 3.21

Venture Echinoid Fertilization

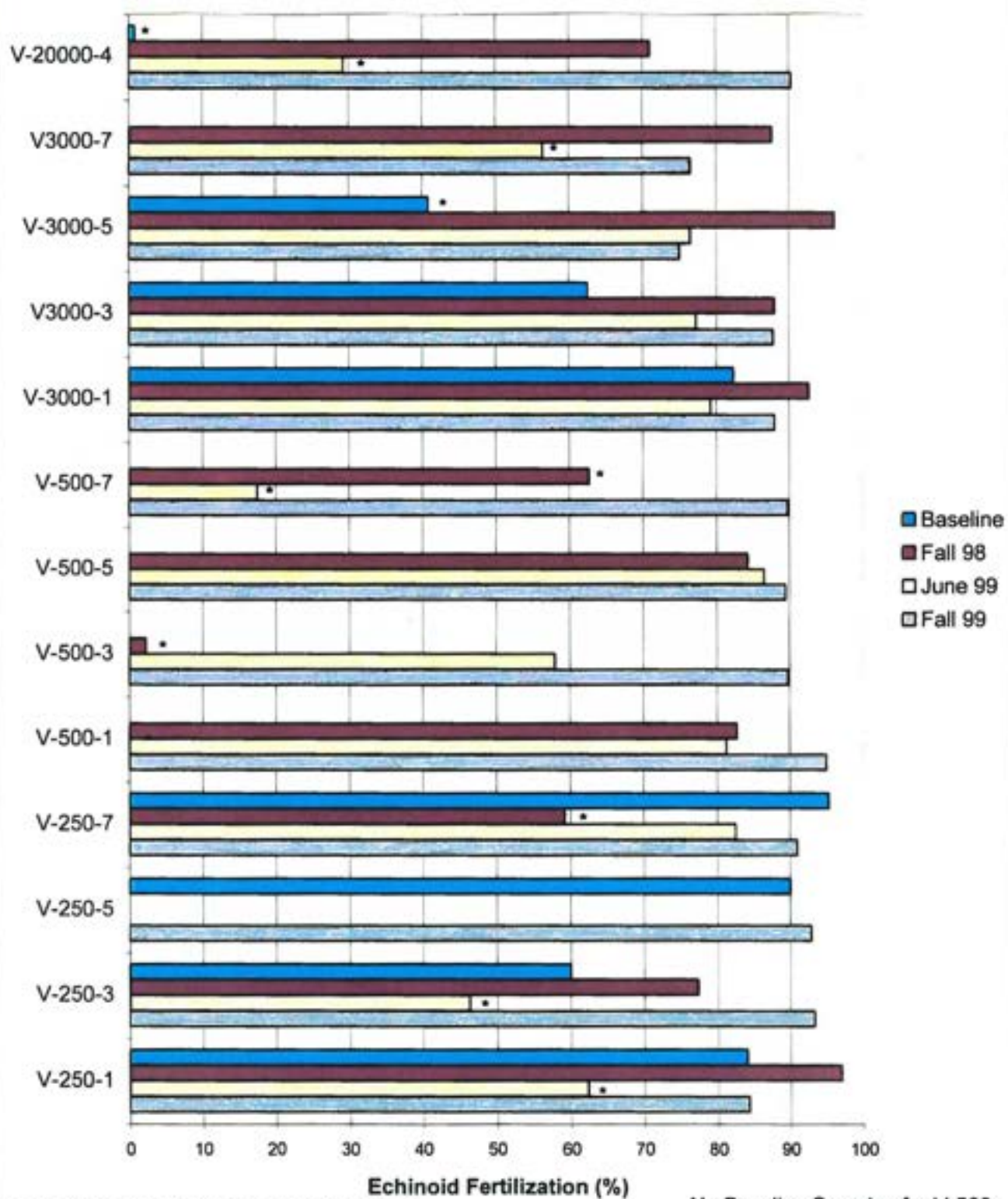


Figure 3.22

Gully Echinoid Fertilization

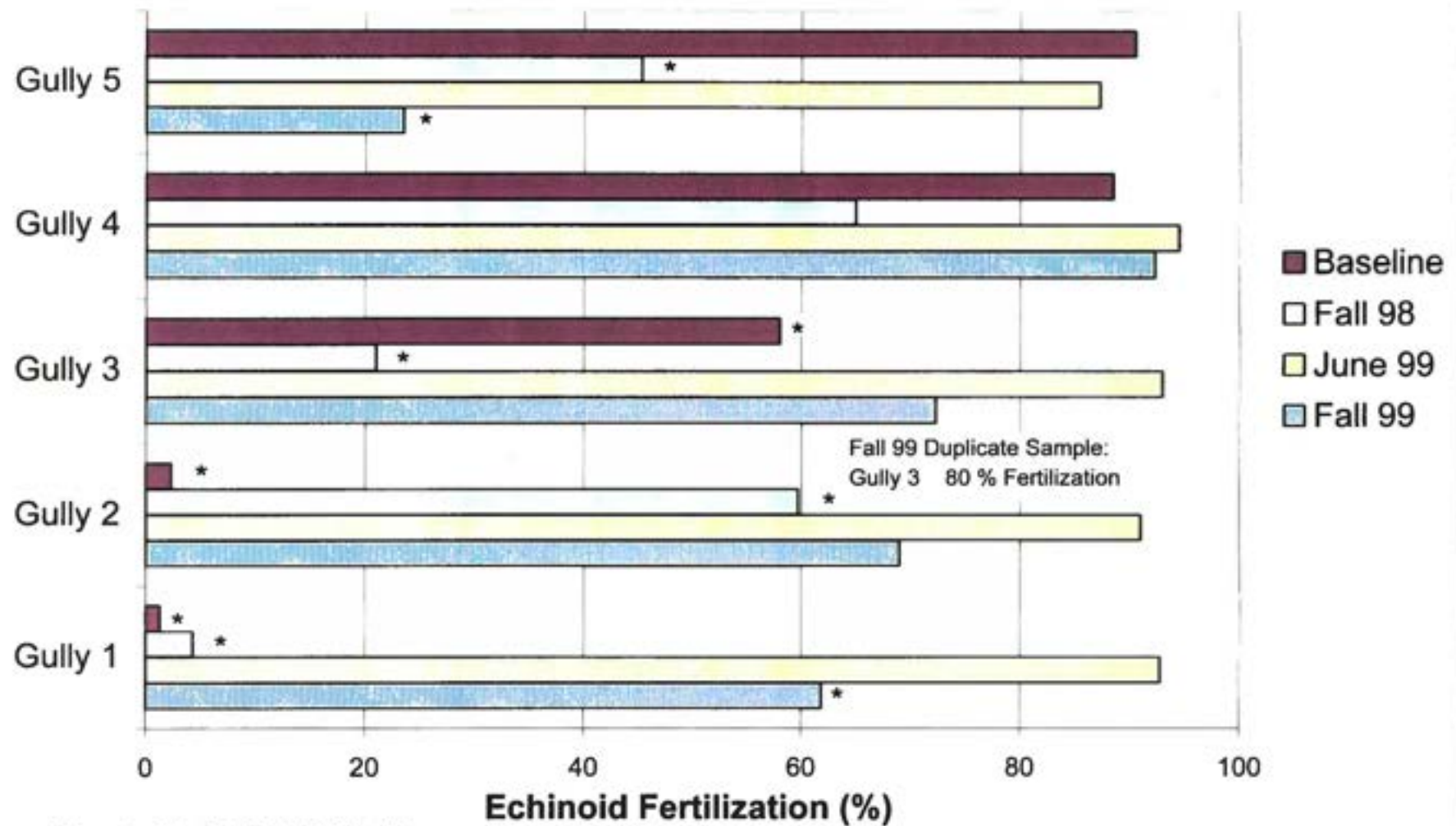


Figure 3.23

Thebaud Amphipod Mortality

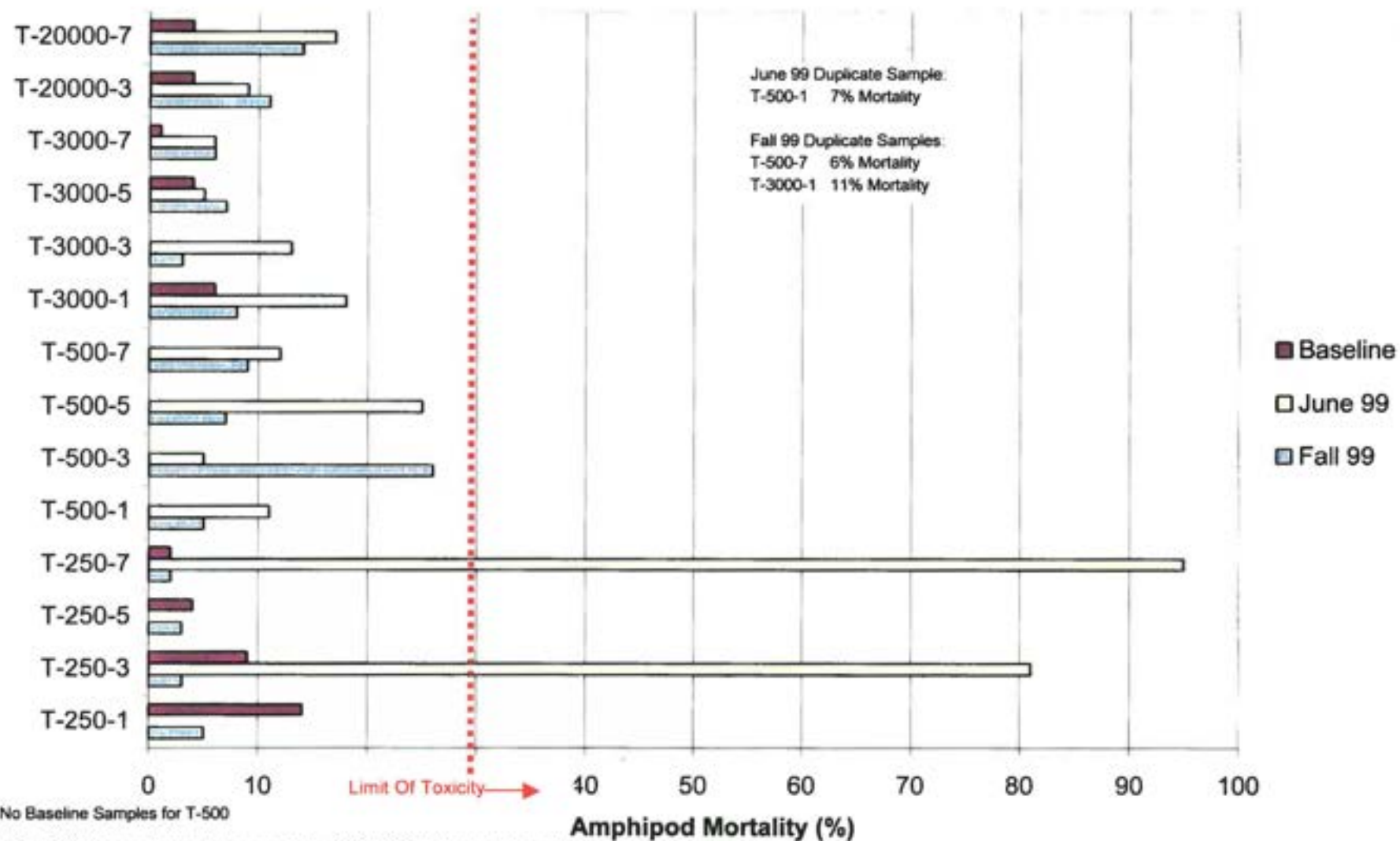


Table 3.18 Tests for Significant Differences Due to Time, Axis, Distance, Time×Axis, Time×Distance or Time×Axis at the Thebaud Stations

Variable	Probability (p) of Difference Being Significant					
	Time	Axis	Distance	Time×Axis	Time×Distance	Axis×Distance
Amphipod	0.717	0.988	0.6762	0.5059	0.7542	0.5784
Echinoid	0.07	0.177	0.2904	0.1292	0.1565	0.5162

Echinoid Fertilization

A total of 16 samples exhibiting a toxic effect in the echinoid fertilization test were observed for the 38 assays spanning three rounds of EEM sampling (Figure 3.24). These effects were not considered to be related to drilling activity as the baseline sampling in fact yielded the highest percentage of toxic effects.

ANOVA of the echinoid fertilization tests show no trends with respect to a gradient effect as there are no significant differences at the 5% level between stations (Table 3.18).

Microtox™

All rounds of sampling related to drilling activity have produced Microtox™ results of >98684 mg/L for all sample locations. These results represent an endpoint (IC50) of >100%, as calculated by Microbics Software and graphical validation. These results indicate no toxic effect being observed in *Vibrio fischeri*.

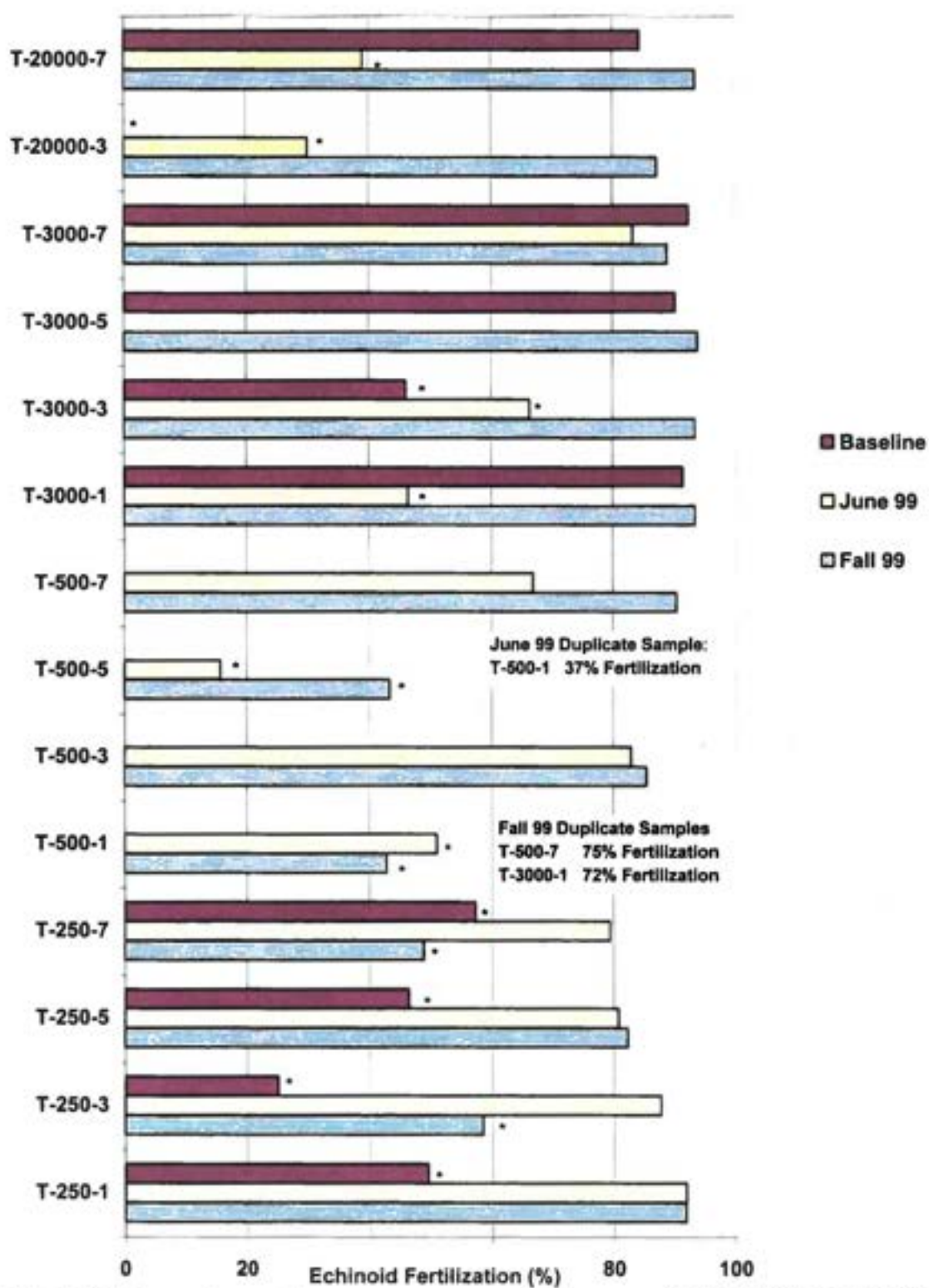
3.5.4 Sediment Toxicity at North Triumph

Amphipod Survival

Sediments from the North Triumph field exhibited toxic effects to *Rhepoxinius abronius* in two rounds of testing (Figure 3.25). Significant differences occur in the Time×Distance and Time×Axis interactions and in the Time effect (Table 3.19). The NT-20000-3 station showed an amphipod mortality of 32% during the EEM study in November 1998. As this survey was a baseline for the North Triumph field, this toxic effect is not considered to represent a drill activity-related effect. The November 1999 sampling found three samples showing a toxic effect. All three sites are within the 250 metre radius of North Triumph (NT-250-1, NT-250-5 and NT-250-7) and displayed mortality rates between 30% and 56%. These results are assumed to be due to drill waste effects. This finding is supported by high sediment barium (an indicator of drilling mud presence) levels at two of the three sites (NT-250-1 and NT-250-7). Statistically, there is a significant difference in the November 1999 250 m stations compared with the first and second baseline surveys at 250 m ($p=0.002$ and 0.012 , respectively) and 500 m ($p=0.027$ and 0.009 , respectively) from the platform.

Figure 3.24

Thebaud Echinoid Fertilization

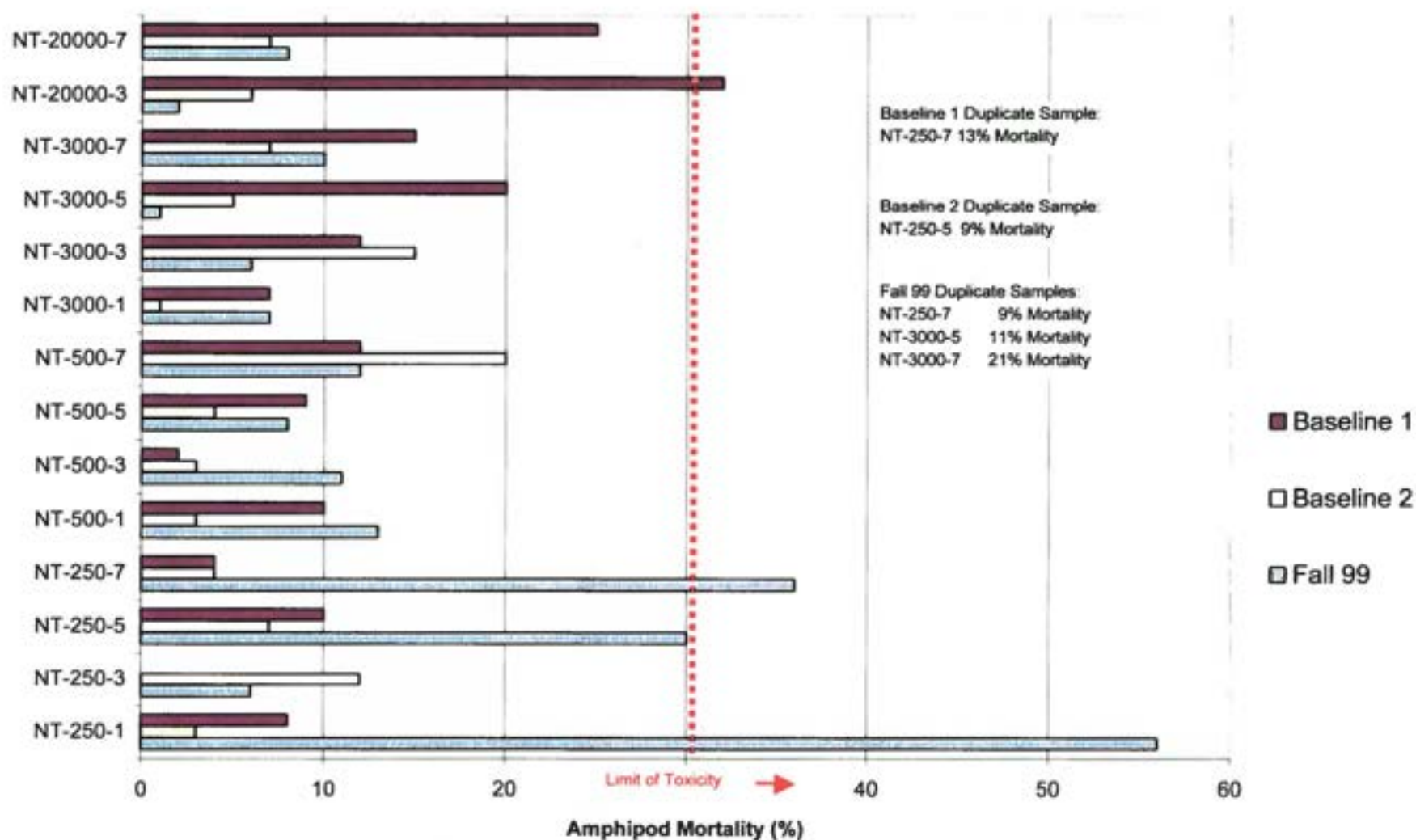


* Denotes Toxic Effect (>25% difference from control)

No Baseline Samples for T-500

Figure 3.25

North Triumph Amphipod Mortality



* Toxic Effect is considered to be a mortality $\geq 30\%$ (30% difference from control)

Table 3.19 Tests for Significant Differences Due to Time, Axis, Distance, Time×Axis, Time×Distance or Time×Axis at the North Triumph Stations

Variable	Probability (p) of Difference Being Significant					
	Time	Axis	Distance	Time×Axis	Time×Distance	Axis×Distance
Amphipod	0.02	0.148	0.7836	0.0335	0.0017	0.124
Echinoid	0	0.279	0.0698	0.4883	0.2814	0.4171

Echinoid Fertilization

A total of 42 echinoid fertilization assays were performed over the course of two baseline and one drilling survey at the North Triumph field. Toxic effects were evident in 71% of the samples from the drilling survey and 57% of baseline samples (Figure 3.26). ANOVA of the echinoid fertilization data shows highly variable data. There are no significant differences in the interaction terms, however, there was a highly significant Time effect (Table 3.19). The two baseline surveys significantly differ ($p=0.0001$), therefore there is a time effect, and therefore the first baseline survey significantly differs from the November 1999 drilling survey ($p=0.0001$). The November 1999 survey does not differ significantly from the second baseline survey. ($p=0.18$).

Microtox™

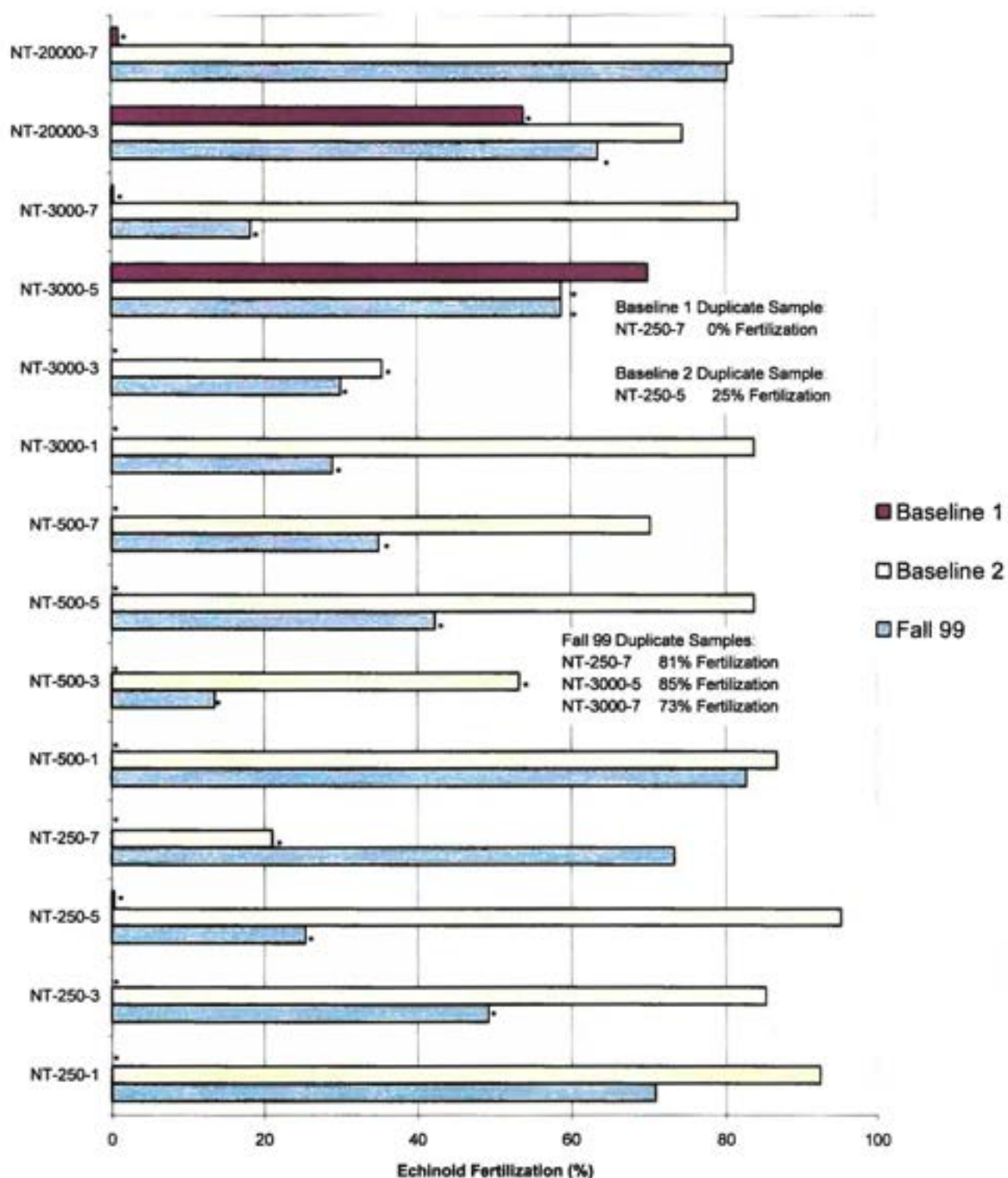
All rounds of sampling related to drilling activity have produced Microtox™ results of >98684 mg/L for all sample locations. These results represent an IC50 endpoint of $>100\%$, as calculated by Microbics Software and graphical validation. These results indicate no toxic effect being observed in *Vibrio fischeri*.

Summary of Sediment Toxicity

The amphipod survival test using *Rhepoxinius abronius* has proven itself to be an accurate indicator of drill-related toxic effects as samples showing high toxicity in this test correlated with high levels of barium and TPH. The echinoid fertilization test using *Litichinus pictus* has shown little to no correlation with results of sediment chemistry sampling and as such does not appear to be an effective sub-lethal toxicity test for the Sable Offshore Energy EEM Program. The Microtox™ test using *Vibrio fischeri* does not appear to be sensitive to possible drill-related effects as no test result has shown any toxic effect for any sample from any round of sampling.

Figure 3.26

North Triumph Echinoid Fertilization



* Denotes Toxic Effect (>25% difference from control)

3.6 Benthic Habitat and Community

3.6.1 Objective and Analysis

The distribution and abundance of mega-epifaunal species will be used in conjunction with sediment chemistry and toxicity results to provide a holistic assessment of sediment quality and assess whether a correlation exists among the triad of parameters. The study design was intended to address specific questions, and to allow the testing of specific null hypotheses, regarding the potential effects of drilling on the marine environment. Monitoring of benthic habitat and epibenthic megafauna is intended to answer the following questions.

- Has the benthic habitat in the nearfield or farfield changed from the observed baseline or reference?
- Has benthic habitat and epifaunal species relative abundance changed with distance from each drilling site? If so, can these changes be correlated with sediment chemistry and toxicity?
- Are changes in benthic habitat consistent or prolonged with time along a gradient?
- Is benthic habitat and epifaunal species abundance useful as an EEM candidate attribute?

The key null hypothesis with respect to the effects of drilling activity on the benthic epifauna was:

H_0 : the population density of observed epifaunal organisms has not been changed by the drilling operation.

Rejection of this null hypothesis at the $\alpha = 0.05$ level would lead to acceptance of the alternative hypothesis, that drilling activities have resulted in changes in the population density of the observed epibenthic organisms.

3.6.2 Epibenthic Community

Epibenthic macroinvertebrates species were surveyed at each sampling site using still photography in an underwater frame and housing, and underwater video camera. Counts of species observed in each frame provide a value for density of benthic organisms over a much larger area than would be sampled by traditional grabs or corers (Table 3.20). The abundance data were transformed ($\log X+1$) prior to regression analysis, to improve the homogeneity of variance.

The predominant organisms observed during the baseline surveys included sand dollars and brittle stars, although small numbers of crabs, gastropods, sea stars, and sea anemones were also observed. DFO has recently conducted various benthic habitat evaluations using their underwater videographs and CAMPOD along a transect from the Gully to Venture (D. Gordon, pers. comm).

3.6.2.1 Venture

The abundance of sand dollars and brittlestars was scored at Venture during the baseline (June 1998) survey, and in three subsequent surveys (November 1998, June 1999 and November 1999). Summary statistics for the abundance of these organisms at each distance from the Venture field are provided in Table 3.20. The abundance of sand dollars at Venture was highly variable (ranging from 0 to 140/m²), however, the median abundance was generally low (0 to 2.6/m²).

Regression analysis for the baseline survey (June 1998) found that the abundance of sand dollars increased significantly with distance away from the drilling platform ($p = 0.003$). There was no significant change with distance for the abundance of brittlestars, which were not observed in the Venture survey area during any of the four surveys.

Table 3.20 Abundance of Sand Dollar and Brittle Star at Venture, North Triumph, and Thebaud.

Drill Platform	Sand Dollar (#/m ²)		Brittle Star (#/m ²)	
	Range	Median	Range	Median
Venture				
June 1998 (baseline)	0 – 46	2.6	0	
November 1998	0 – 48	0		
June 1999	0 – 140	2.5		
November 1999	0 – 43	1.8		
North Triumph				
November 1998 (baseline)	0 – 33	7.1	0 – 128	9.5
June 1999 (baseline)	0 – 83	10.6	0 – 59	0.9
November 1999	0 – 38	0	0 – 66	0
Thebaud				
June 1998 (baseline)	0 – 163	3.6	0	0
June 1999	0 – 57	0.26		
November 1999	0 – 107	2.5		

The abundance of sand dollars also increased significantly ($p=0.006$) with distance from the Venture platform during the November 1998 survey. In June 1999, the abundance of sand dollars was again observed to increase significantly with distance away from the platform ($p = 0.005$). In November 1999, the abundance of sand dollars was not related to distance from the platform.

Overall, these results indicate that the abundance of sand dollars is patchy at Venture and that some suitable habitat appears to be located in the far-field. The consistent increase in the abundance of sand dollars with distance from the platform existed prior to drilling and can not be considered an effect of drilling.

3.6.2.2 Thebaud

At Thebaud, the abundance of sand dollars (Table 3.20) was also variable, ranging from 0 to 163/m². No brittlestars were present at the sampling stations.

Regression analysis for the baseline survey (June 1998) found that the abundance of sand dollars did not change significantly with distance away from the drilling platform. In June 1999, the abundance of sand dollars was again observed to be independent from the distance away from the platform. In November 1999, the abundance of sand dollars was again unrelated to distance from the platform.

Overall, these results indicate that the abundance of sand dollars is patchy at Thebaud, and brittlestars are extremely scarce, or absent. There was no relationship between the abundance of sand dollars and distance from the platform that could be attributed to drilling activities.

3.6.2.3 North Triumph

At North Triumph, the abundance of sand dollars (Table 3.20) was also variable, ranging from 0 to 83/m². Brittlestars were more frequently present at North Triumph than at Venture and ranged in abundance from 0 to 128/m².

Regression analysis for the two baseline survey (November 1998 and June 1999) found that the abundance of sand dollars did not change significantly with distance away from the drilling platform. The abundance of brittlestars did not change with distance from the platform during the November 1998 survey, however, brittlestar abundance decreased significantly with distance from the drilling platform during the June 1999 baseline survey ($p = 0.008$).

In November 1999 (the first drilling survey at North Triumph), the abundance of sand dollars was observed to increase significantly ($p = 0.004$) with distance from the platform, whereas the abundance of brittlestars decreased ($p = 0.02$) with distance from the platform.

Overall, these results indicate that the abundance of sand dollars and brittlestars is patchy and highly variable at North Triumph. There was generally no relationship between abundance and distance from the platform that could reasonably be attributed to drilling activities.

3.6.3 Summary of Benthic Epifauna Results

The use of video and still photography to record the abundance of benthic epifauna is a practical tool for monitoring purposes. However, the abundance of these organisms tends to be patchy and may be highly variable both spatially and over time. Hence, although these organisms are readily identified and counted

in photographic images, the statistical power to detect change in the environment is inherently low. Sand dollars are common and ubiquitous on Sable Island Bank. Brittle stars were common at North Triumph, but not at Venture or Thebaud. Other organisms were observed too rarely to be considered useful for monitoring purposes.

3.6.4 Cuttings Pile Surveys

As part of the post-storm scour survey around the drill rigs and jacket legs using a remotely-operated vehicle (ROV), a quantitative assessment of cuttings pile was possible at Venture and Thebaud. There is no survey data for North Triumph at this time. The position of each rig to its respective jacket/platform is provided in E.

3.6.4.1 Venture

A total of four ROV survey showing the extent of the cuttings pile were provided by SOEI's Subsea Coordinator (S. Hart, pers. comm) for the Venture field. The survey dates were September 20, October 17, October 20 and December 6, 1999.

The highest point of the pile appears to be centred around the east drive rack on the starboard leg of the RG II (Photos 1 to 3). This pile has formed below the drill cuttings discharge pipe. The pile comes up over the top of the spud can at this point (Photo 2). Based upon the height of the spud can, the cuttings pile height is estimated to be approximately three metres. From the peak of the pile, the side slopes decline down the NE and SE faces. The edge of the drilling returns around the starboard leg were measured by sonar. Table 3.21 provides the dimensions of the drill waste pile over each of the four surveys.

Table 3.21 Dimensions of the Drill Waste Pile at Venture

Date	Pile Height (m)	West (m)	South (m)	East (m)	North (m)
Sept. 20, 1999	3	22	25	70	n/a
Oct. 17, 1999	3	22	26	66	60 (NE)
Oct. 20, 1999	3	22	25	66	58 (NE)
Dec. 6, 1999	3	23	22	57.3	60 (NE)

NE refers to Northeast direction from discharge point.

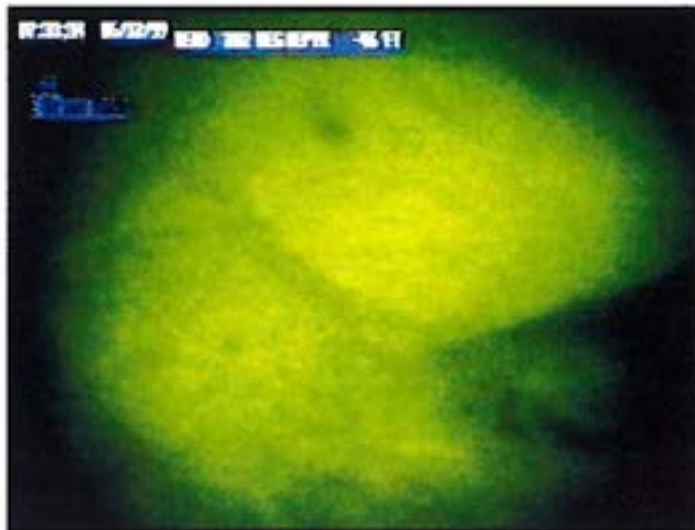


Photo 2: Drill waste pile under the RGII at Venture



Photo 1: Drill waste pile under the RGII at Venture



Photo 3: Drill waste pile under the RGII at Venture

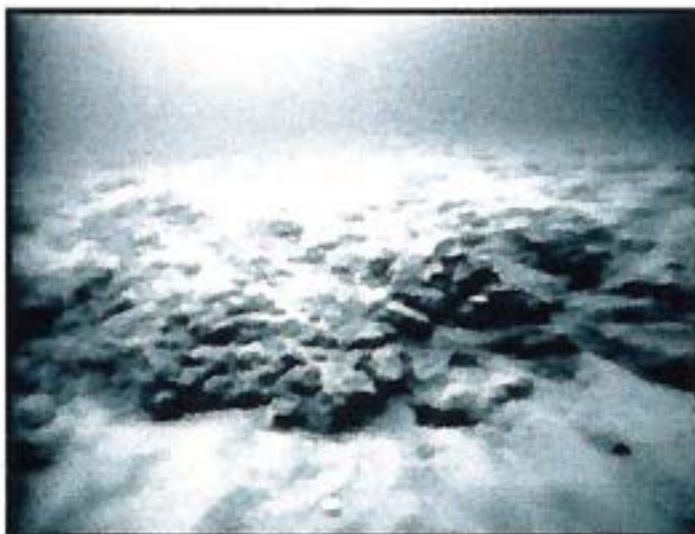


Photo 4: Edge of the drill waste pile at Venture



3.6.4.2 Thebaud

Two ROV post-storm scour surveys were conducted at the Thebaud field on November 5 and 25, 1999. The entire wellhead platform for Thebaud appears to be encompassed by the cuttings from information provided by the operator of the ROV. At leg A2 of the wellhead platform, the cuttings pile appears to be one metre in height. Table 3.22 provides the dimensions of the drill waste pile over the two surveys.

Table 3.22 Dimensions of the Drill Waste Pile at Thebaud

Date	Pile Height (m)	West (m)	South (m)	East (m)	North (m)
Nov. 5, 1999	1	43	29	32	22
Nov. 25, 1999	1	34	29	46	15

3.7 Taint and Body Burden

3.7.1 Objective and Analysis

This program component establishes levels of tissue chemical contaminants and organoleptic quality using taint testing evaluations for mussels and scallops and determines if the sublethal effects of petroleum hydrocarbon uptake are observed in higher trophic levels; and whether there are demonstrable effects harmful to the marketing of fish products. Sublethal effects, such as growth reduction or impairment of reproduction are currently being analysed at the Bedford Institute of Oceanography through toxicity testing of NovaPlus™, the synthetic oil-based mud used for the EEM Program. Published information on these studies are not available.

A null hypothesis was formulated to statistically test the effects of discharging drill wastes into the water column on commercially important shellfish species.

H_0 : The drilling operation has not significantly changed taint determination and/or petroleum hydrocarbon in shellfish in the project area.

3.7.2 Caged Mussel Quality at Venture

The first set of moored mussels at Venture were set in August 1998 and retrieved in October 1998. Only three of seven sets (from 500 m, 4 km and 30 km sites) were retrieved due to loss of gear from vessel and seismic activities. The 30 km site is the reference set and is located south of Sable Island between the Venture and Thebaud jacket locations. Figure 3.27 shows the locations of moored mussels used in taint testing for the SOEI EEM.

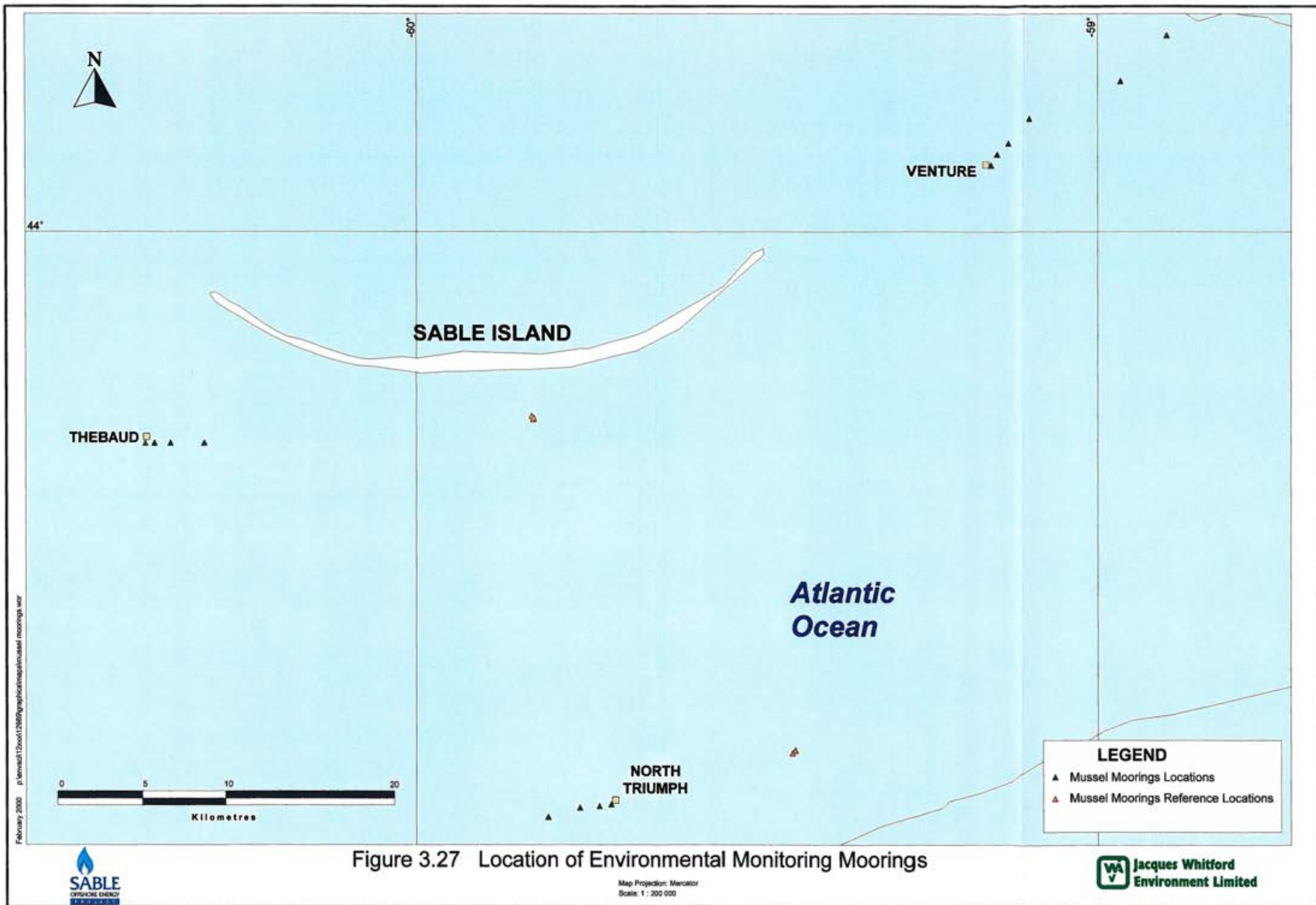


Figure 3.27 Location of Environmental Monitoring Moorings

Appendix G provides the sensory evaluations and hydrocarbon analysis data for mussel tissues. The results of sensory (taste and smell) evaluation showed a significant difference at the 5% level in the odour of mussels located at the 4 km site (bottom set) compared to the 30 km reference bottom set. There was no significant difference found in the odours among the other samples and no significant differences found among the flavours of any samples compared.

The body burden analysis for hydrocarbons are presented in Table 3.23. The analysis showed that the bottom samples from the 30 km site are similar to the 4 km bottom samples except for a longer chain length hydrocarbons from C₂₃ onwards. This result indicates a different phytoplankton was available to mussels at this site as shown in previous studies for this type of hydrocarbon (Zhou *et al.* 1996). At the 500 m site, the gas-liquid chromatograms differ from the 4 km and 30 km sites in having a baseline bulge in the oil-base mud region (C₁₇ to C₂₀). The high peaks of pristane indicates that the mussels were healthy and feeding. These chromatograms are displayed in Appendix G.

Table 3.23 Aliphatic Hydrocarbon Concentration in Blue Mussel Tissues Following Three Months Exposure (August 1998 to October 1998)

Sample	Aliphatic Hydrocarbons (ppm, wet tissue)	
	Total from C ₁₀ to C ₂₄	Oil Base Mud Region
500 m bottom net	4.1	0.5
500 m top net	4.1	0.4
4 km bottom net	1.7	0.3
4 km top net	2.5	0.4
30 km bottom net	1.9	0.4
30 km top net	2.3	0.5
30 km top lab duplicate	1.9	0.4

The second set of moored mussels from Venture were retrieved in April 1999, six months after deployment. Seven partial sets were retrieved from 500 m (top only), 1000 m (top only), 2000 m (top only), 4 km (top and bottom), 10 km (top only), 13 km (top and bottom) and 30 km reference (tops and bottoms). A sample of the mussels from the source aquaculture farm (Indian Point Marine Farms, Mahone Bay) were also assessed. It is believed that sediment transport removed the bottom nets; other bottom founded gear was also lost at the same time.

The results of the sensory evaluation showed no significant difference between the source mussels and samples obtained from a Sobey's grocery store. Sensory evaluation of the mussels placed offshore showed no significant differences among any of the sites.

The chromatograms of the hydrocarbon analysis showed small amounts of hydrocarbons in the source, reference and 13 km samples (Appendix G). The top samples from the 500 m site showed the highest amount of total hydrocarbons, particularly in the base mud oil region (3.04 mg/L) (Table 3.24). The 1000 m (top), 2000 m (top) and 4 km (top and bottom) and the 10 km sites showed a moderate amount of hydrocarbons present with a small baseline base mud oil envelope present (1.98 – 0.12 mg/L).

A third set of mooring were placed at Venture and Thebaud in April 1999, but were removed within a few days as they were an obstacle to seismic exploration and SOEI pipeline construction activities occurring at that time. A fourth set of moorings were set during the November 1999 survey and were retrieved in February 2000. Appropriate analysis had not been completed on these samples in time for inclusion in this report.

Table 3.24 Aliphatic Hydrocarbon Concentrations in Blue Mussel Tissues After Six Months Exposure (October 1998 to April 1999)

Samples	Aliphatic Hydrocarbons (ppm, wet tissue)	
	Total from C ₁₀ to C ₂₄	Oil Base Mud Region
Indian Pt. Source Mussels	2.24	0.12
500 m top net	7.54	3.04
1000 m top net	5.25	0.71
2000 m top net	5.49	0.62
4 km top net	5.47	1.98
4 km bottom net	3.45	0.42
9.5 km top net	5.48	1.34
13 km top net	2.22	0.34
13 km bottom net	1.71	0.31
30 km reference top net	2.24	0.24
30 km reference bottom net	2.24	0.52

3.7.3 Summary of Moored Mussel Effects at Venture

The highest concentration of aliphatic hydrocarbons detected in mussel tissues in the base mud oil region was at 3.04 mg/L at the 500 m site where despite chemical presence no flavour or odours were detected differently from the references or any other site. The high peaks of pristane are evidence of healthy feeding mussels. Monitoring with moored mussels at Cohasset-Panuke found aliphatic hydrocarbons at 44.5 mg/L at 500 m from the platform (Zhou *et al.* 1996)

3.7.4 Scallops

In September 1999, a second round of scallop (*Placopecten magellanicus*) collections from natural beds was undertaken through a charter from Scotia Trawlers Ltd. of Lunenburg, N.S., from three test areas (north of Venture, south of Thebaud and west of North Triumph) and a reference area located between the mainland and Sable Island (Figure 3.28). For the study, 150 scallops were obtained from each of the test sites and 200 scallops were collected from the reference site. The shellfish were kept frozen onboard the vessel and delivered frozen to the Canadian Institute of Fisheries Technology (CIFT) in Halifax, for analysis.

Taint Testing

In the sensory evaluation, the panelists compared scallops purchased at the Atlantic Superstore to the reference scallops. A significant difference at the 1% level in flavour of the scallops was detected, but no significant difference was found in odour. There was no significant difference in this comparison in the 1998 baseline evaluation.

There was no significant differences detected between reference scallops and those from the Venture or Thebaud sites in either flavour or odour. The baseline analysis of the Thebaud sample detected a 5% level difference in odour, but not in flavour from the reference scallops. In 1999, the scallop from North Triumph (pre-drilling) showed a significant difference at the 5% level in flavour from the references but there was no significant difference in odour. Table 3.25 shows the sensory evaluation data.

Table 3.25 Results From Sensory Triangle Tests in Sea Scallops

Test Sample	Reference Sample	Odour Result		Flavour Result	
		Level of Significance	Correct Judgements	Level of Significance	Correct Judgements
Atlantic Superstore	Reference	NS	8/18	1%	11/18
Venture	Reference	NS	4/18	NS	4/18
Thebaud	Reference	NS	6/18	NS	5/18
North Triumph	Reference	NS	9/18	5%	10/18

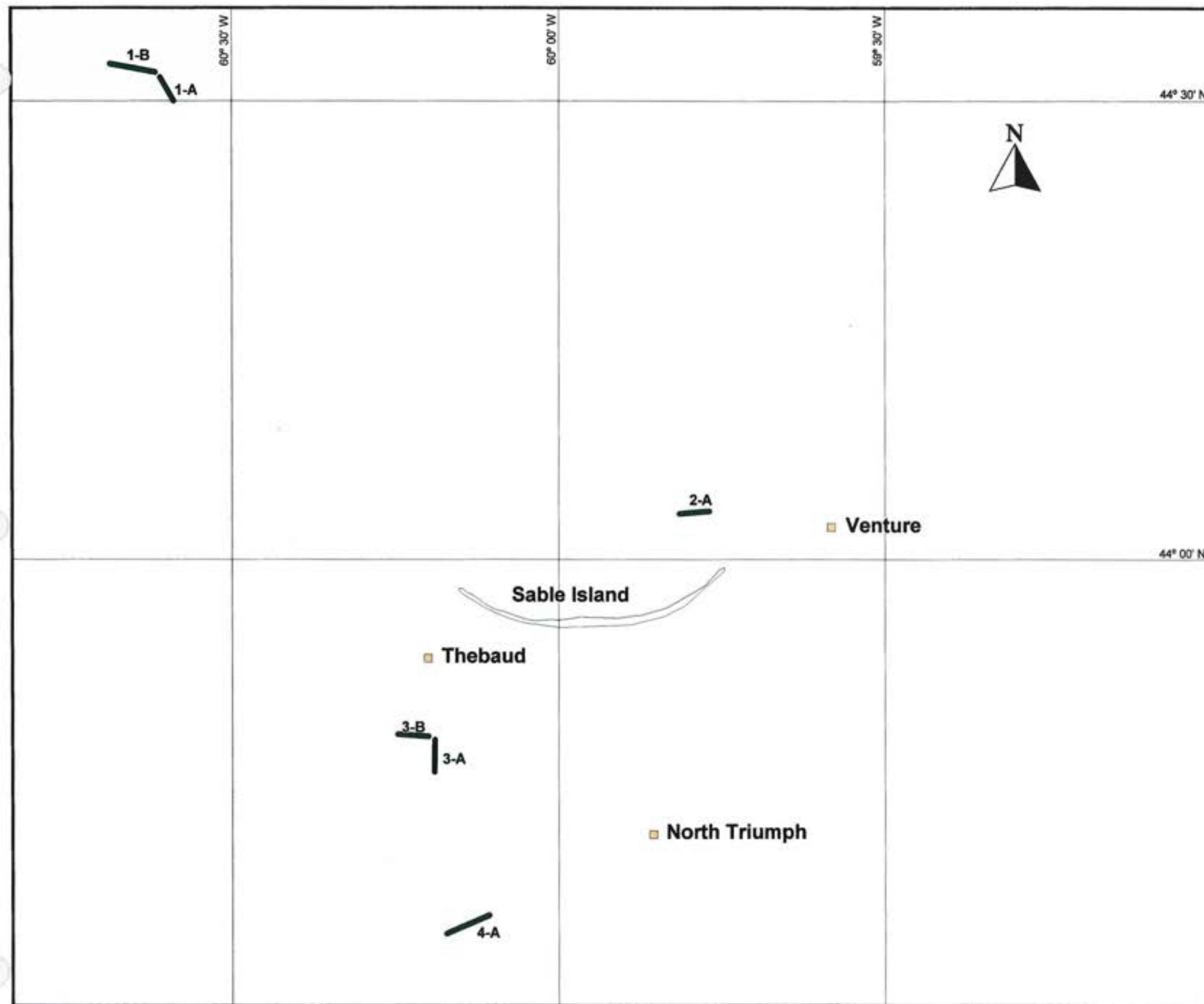
Body Burden

Table 3.26 provides the level of aliphatic hydrocarbons present in the C₁₀ to C₂₄ region. Chemical analysis for hydrocarbons in adductor and rings/roe tissues showed slight and low molecular weight hydrocarbon contamination of the adductor muscles from Thebaud samples.

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Environmental Effects Monitoring Project**



**Figure 3.28
Scallop Tow Locations**

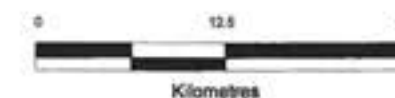


Legend

-  Well Site
-  Scallop Tow

Map Parameters

Map Projection: Mercator
Horizontal Datum: NAD 83
Map Scale: 1 : 500 000



The rings/roes of the Reference, Venture and North Triumph sites were relatively free of obvious and unexpected hydrocarbons. Ring/roe tissues from Thebaud were heavily contaminated with numerous volatile hydrocarbon emerging in the C₈ to C₁₂ region of the gas-liquid chromatographic analysis. The hydrocarbons are clearly of a petroleum origin. To match these hydrocarbons with other possible sources of contamination, such as onboard the ship during collection, automotive grade diesel and gasoline fuels were subjected to gas-liquid chromatography. There was no match with these products (Appendix G). It is believed that the water-soluble fraction of a parent mixture of hydrocarbons that is rich in hydrocarbons between the alkanes C₈ and C₁₀ is the source. Gas condensate exhibits this characteristic suggesting that condensate was in the water column at or near the Thebaud scallop collection site.

Table 3.26 Concentration of Aliphatic Hydrocarbons in Scallop Tissues

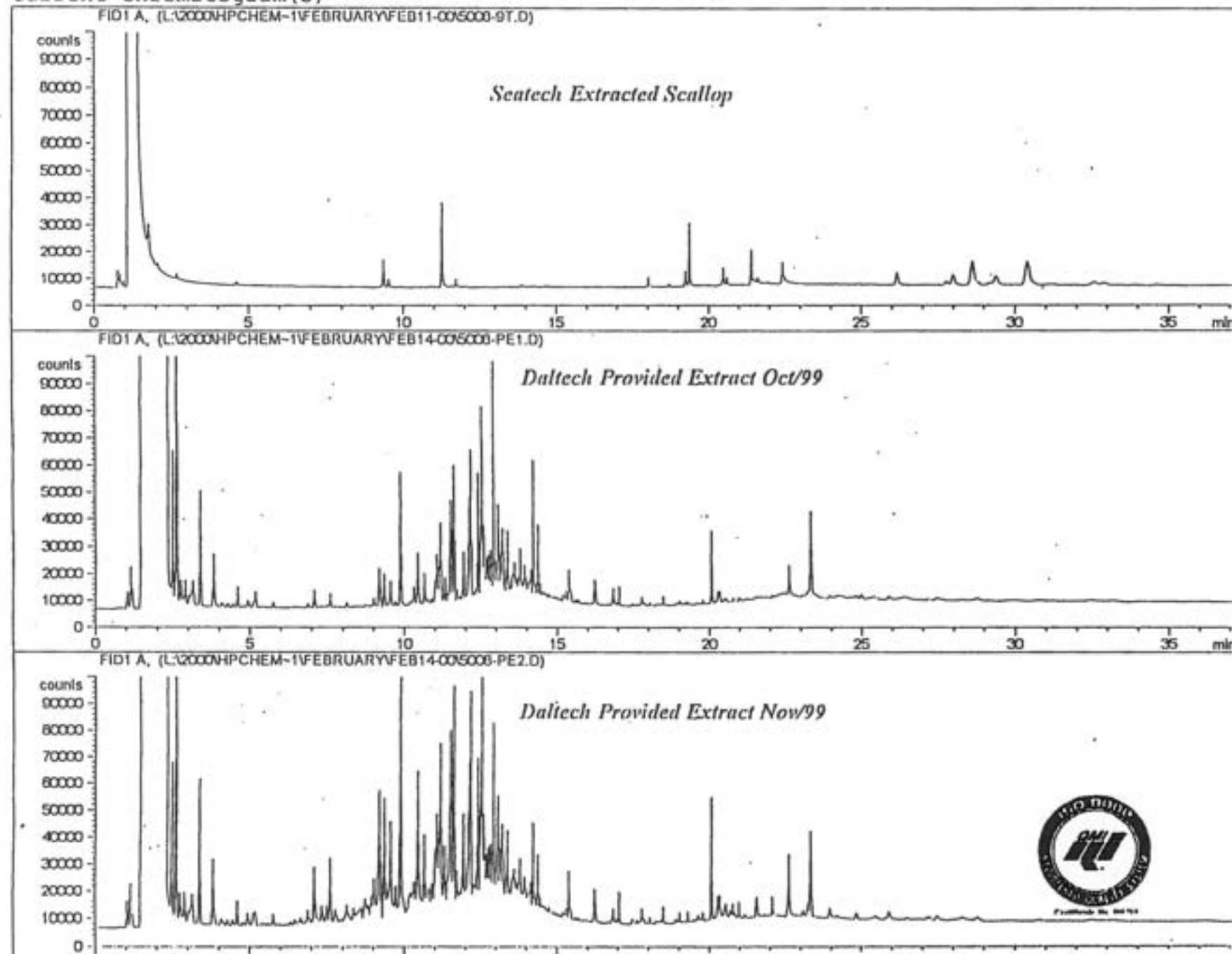
Sample	Aliphatic Hydrocarbons (ppm, wet tissue)			
	Total From C10 to C24		Base Mud Oil Region	
Sampling Period	1998 Baseline	1999	1998 Baseline	1999
Reference adductor muscle	1.6	3.45	0.4	1.52
Reference rings and roes	3.7	3.03	0.6	0.63
Venture adductor muscle	1.5	5.06	0.3	3.49
Venture rings and roes	1.6	3.07	0.3	0.5
Venture rings and roes, dup.		4.46		0.32
Thebaud adductor muscle	2.7	4.84	0.3	1.83
Thebaud rings and roes	2.7	27.21	0.3	19.01
North Triumph adductor muscle*		1.43		0.87
North Triumph rings and roes*		3.61		0.3

* – denotes baseline samples

To verify the condensate source, samples of the tissues and extracts were sent from DalTech to Seatech Ltd. for comparison with samples of drilling mud standards from COPAN and SOEI. These samples were analyzed for oil identification by cold solvent extraction followed by gas chromatography with flame ionization detection (GC/FID). The chromatograms generated from this procedure were compared (fingerprinted) with oil standards from Thebaud condensate, NovaPlus™, diesel fuel and COPAN condensate (Figures 3.29 to 3.31). The oil components found in the scallops exist in the same boiling range as the condensate, however, the distribution of these components is not identical and there is no match with the other hydrocarbon sources. Metabolism of petrogenic hydrocarbons by the scallops may modify the hydrocarbon signature. The source of hydrocarbon may be from natural seepage.

Figure 3.29

Current Chromatogram(s)



Current Chromatogram(s)

Figure 3.30

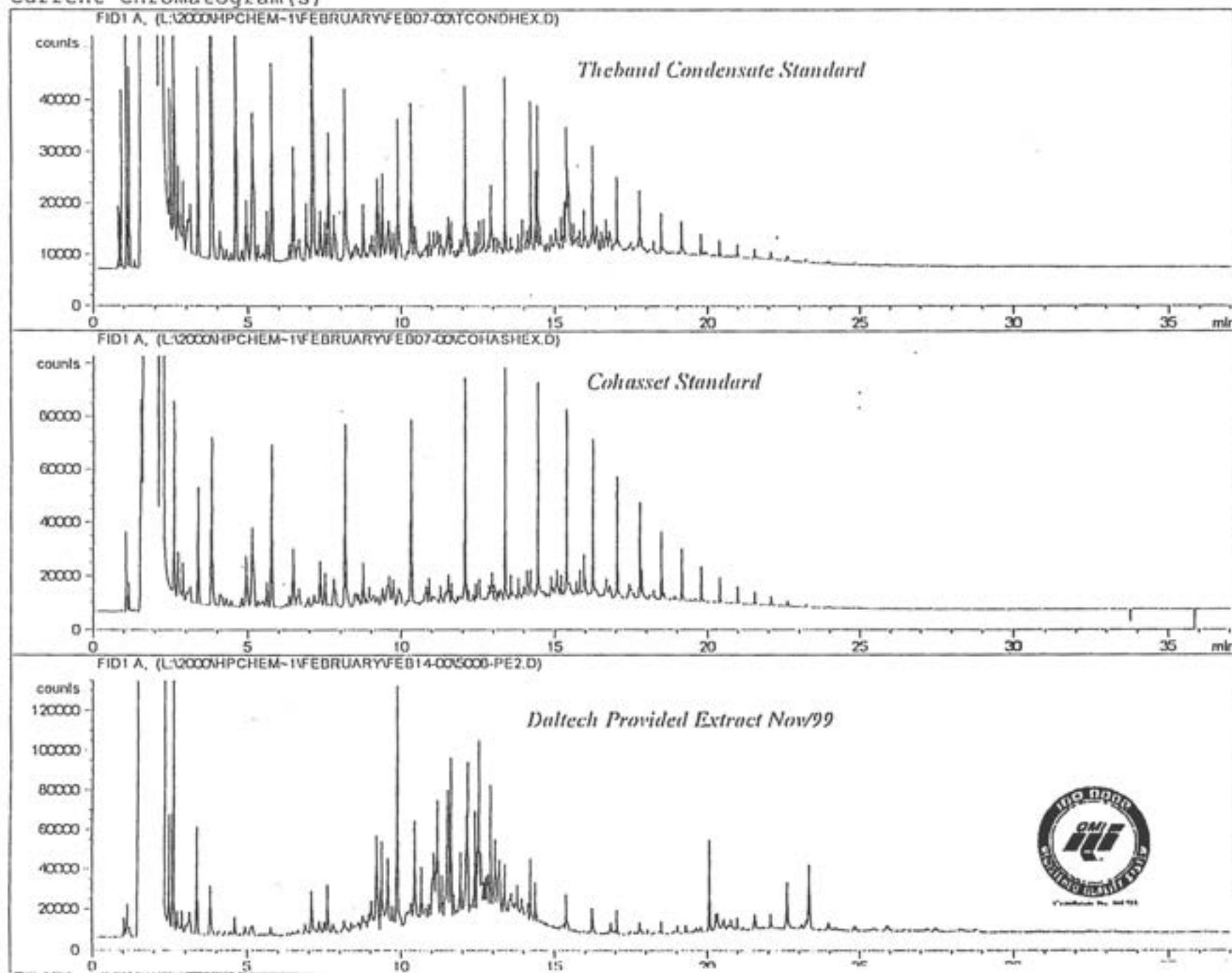
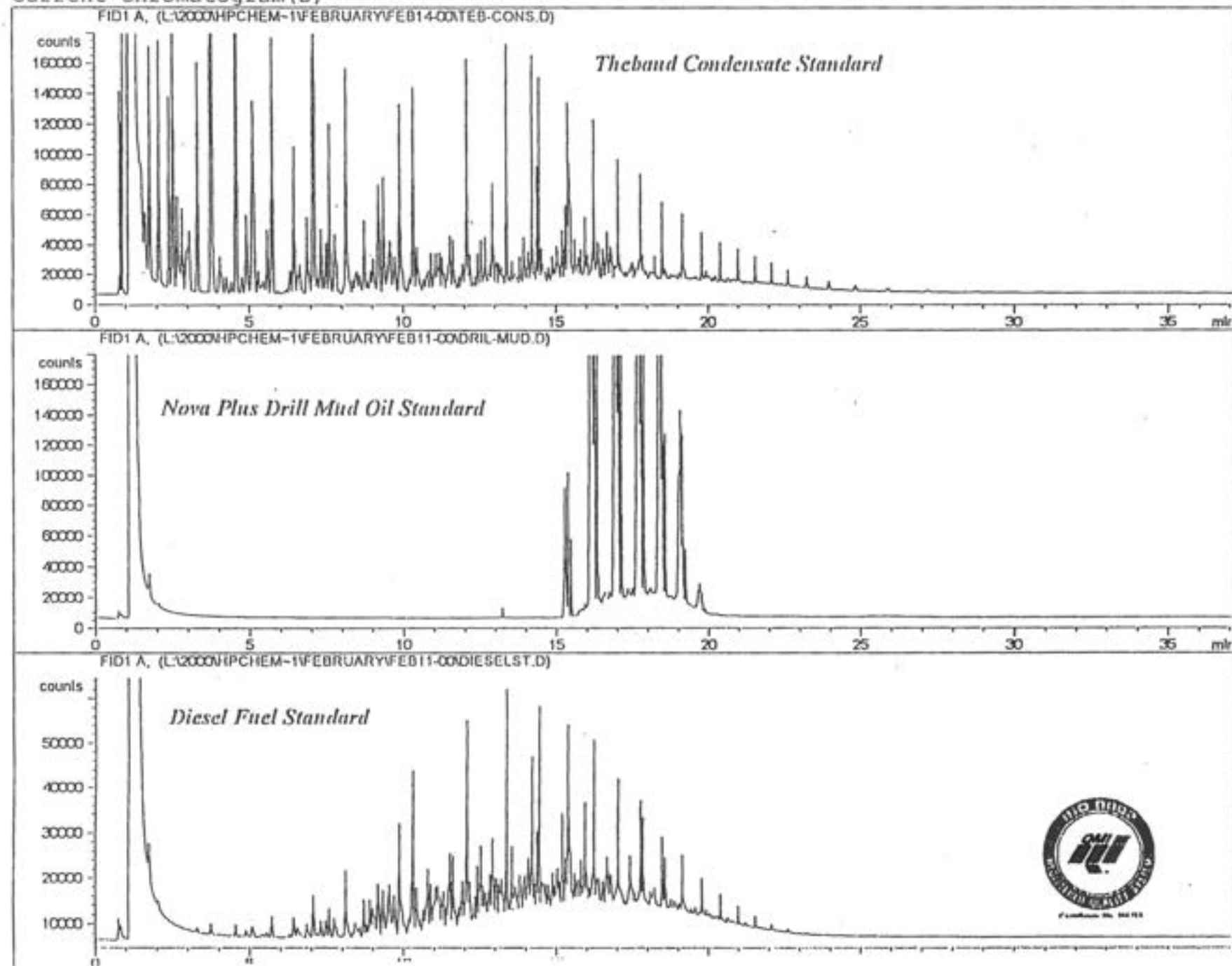


Figure 3.31

Current Chromatogram(s)



3.8 Marine Mammals

3.8.1 Objective

The purpose of this component is to evaluate if the noise levels from SOEI EEM Program activities on the Sable Island Bank alter the behaviour of marine mammals relative to the platforms. This is assessed through the use of trained observers on offshore platforms. This study component is not suitable for statistical analysis however, valuable information can be obtained in the trends of marine mammals observed.

The opportunity for observation of marine mammals in the SOEI offshore gas fields is unique to the Scotian Shelf with stable platforms, circa 30–35 m above sea level. As experience is gained through the employment of dedicated observers, as well as increasing input from the interested workforce on the platform, the observational data can be refined. As with any survey or marine wildlife, observations can be restricted by sea-state and visibility, less so from a fixed platform. However, since the platforms of observation are either fixed or are holding positions for extended period (eg. Saipem 7000 heavy lift crane) the data are not directly comparable to surveys from moving vessels and aircraft. Dive time and surface exposure factors, of specific marine mammals, must be included in the equation, as well as their possible attraction or repulsion to the structure or onboard activity. Table 3.27 provides a schedule of observers and observation periods for 1999 at each field.

Table 3.27 Oil and Gas Observer Program: Observer Coverage 1999

Observer	Dates	Comments
Venture		
Gordon Stewart	Jan.1-8; Mar.12- Apr.2	
William Lloyd	Feb.19- Mar.12; Apr.2-23; May 14- Jun.4; June 25- 30; Aug.6-27; Sept.10-Oct.5	
Mike Corporon	Jan.8-29, Dec.7-22	Down-manned rig on Dec 22
Eric Strowbridge	Apr.23-May 14; Jun.4-25; Jul.19- Aug. 6; Aug. 27-Sept.10	
Alvin Titus	Oct.12- Nov.2; Nov.19-Dec.7	
Thebaud		
Mike Mattatall	Jan.1-7; Jan.28-Feb.9; Feb.23-Mar.8; Mar.23-Apr.6; Apr.20-May 4;	
Scot Burton	Jan.6-28; Feb.9-23; Mar.8-23; Apr.6-20; Jun.1-22; Jul.13-27; Sept.14-Oct.5;	
Mike Corporon	May 17-31; Jun.22-Jul.13; Jul.27-Aug.10; Sept.3-14	Down-manned rig on Aug. 10
William Lloyd	Oct.5-19; Dec.13-27	Down-manned platform on Oct. 19
Eric Strowbridge	Nov.29-Dec.13; Dec.27-31	

3.8.2 Observations From Venture

To year end of 1999, a total of 542 marine mammal observation surveys were performed from the deck of the Rowan Gorilla II stationed at the Venture field. A typical marine mammal survey represents a 60 minute period three times a day in which a trained observer surveys the marine environment surrounding the rig generally from an elevated point such as a helideck scanning for any sign of marine mammal activity ranging from actual mammal sighting to tell-tale signs such as "blows" from whales. These observations include nine whale and two seal species. Of these 542 surveys, visibility of less than one kilometer was encountered in 19 surveys as a result of poor weather. No marine mammals were observed in 83% of these surveys. A total of 19 baleen whales, 184 toothed whales and 154 seals were observed from June 1998 to the end of December 1999.

3.8.3 Observations From Thebaud

A total of 214 marine mammal observation surveys were performed on the deck of the Santa Fe Galaxy II stationed at the Thebaud gas field from November 1998 to the end of December 1999. These observations included five whale and two seal species. Of these 214 surveys, visibility of less than 1 kilometre (due to weather) was encountered in 23 surveys. No marine mammals were observed in 58% of all marine mammal surveys at this location. A total of 62 baleen whales, 304 toothed whales and 59 seals were observed over the course of these surveys at Thebaud. Minke whales accounted for 94% of all baleen whales observed from this location.

It is realistic to assume that any marine mammal detected visually from these fixed platforms, is also within the acoustic envelope of most, if not all, of the sound effects spectra radiating from the site.

To date, the year-round observations of marine mammals from the fixed structures and ships represent the most continuous observational effort ever in this region of the Scotian Shelf. There are no comparable data available for comparison with this time series of sightings off Sable Island, except to relate the numbers of whales observed from platforms to data from commercial whaler log data of 1966–1972 (Sutcliffe and Brodie 1977).

3.8.4 Whales

Both baleen whales, toothed whales and seals frequent the area, sometimes feeding and/or with young within the immediate vicinity of the platform. Fixed structures, as well as those moored for extended periods, typically become a focus for marine production (eg. reef effect) which further attracts marine life. What is not known is whether the degree of marine mammal activity is more or less than that prior to petroleum-related industrial activity. Based on the distribution of large whales from 1966–1972, as observed by skilled commercial whalers (Sutcliffe and Brodie 1977), the present areas of SOEI activity immediate to Sable Island, was not sufficiently attractive, even though this area was within their vessel range and between two

sites of hunting activity in the Gully and slopes of Western Bank, as well as other feeding grounds to the southwest. Figure 3.32 shows the whaling effort between 1966 and 1971 (Sutcliffe and Brodie 1977).

Present densities of large whales within the site are not high, nor were they in the 1960s–1970s. Had there been reliable concentrations of large whales in these areas: fin, sei, bottlenose and sperm whale, the whalers would have exploited them. There is another factor here: that the bottom topography and ocean dynamics are not conducive to plankton concentration sufficient for large numbers of baleen whales (Sutcliffe and Brodie 1977).

Observers are sighting juveniles within groups of toothed and baleen whales. Whales care for their young for extended periods (one to three years), therefore the presence of young cetaceans within groups that approach the site may imply some conditioning of the adults to the offshore activity. By contrast, the presence of solitary juvenile seals may simply reflect their curiosity (or naivety). Parental investment by seals ranges several days to several weeks.

3.8.5 Seals

The population of grey seals on Sable Island continues to expand, having increased more than 100-fold since the early 1960s and placing increasing feeding requirements on the prey resources immediate to the island. The latest estimates of grey seal pup production for Sable Island exceed 30,000 and may be as high as 35,000 (D. Bowen, pers. comm.). Estimating a ratio of 5:1 (1 year+:pups) the seasonal population attributed to Sable Island ranges 150,000 – 175,000.

The grey seal, because of its larger numbers is observed most frequently within the immediate vicinity of the platform structure, sometimes between the support legs, feeding on fish. The grey seal is one of the more wary seals, compared to the harbour seal, for example. The observations of feeding seals imply some behavioural conditioning to the presence of the structure. The continued expansion of this grey seal population suggests that the present level of industrial activity is not inhibiting access to feeding areas.

It is important to note here that there are now several generations of grey seals (assuming 4–5 years to sexual maturity in females) that have been born on Sable Island, in the presence of off-island structures and related industrial activity. This behaviour is in marked contrast to the recent shifts of breeding colonies along the Nova Scotia coast, apparently in response to past bounty hunting and culling programs (pers. obs. P. Brodie).

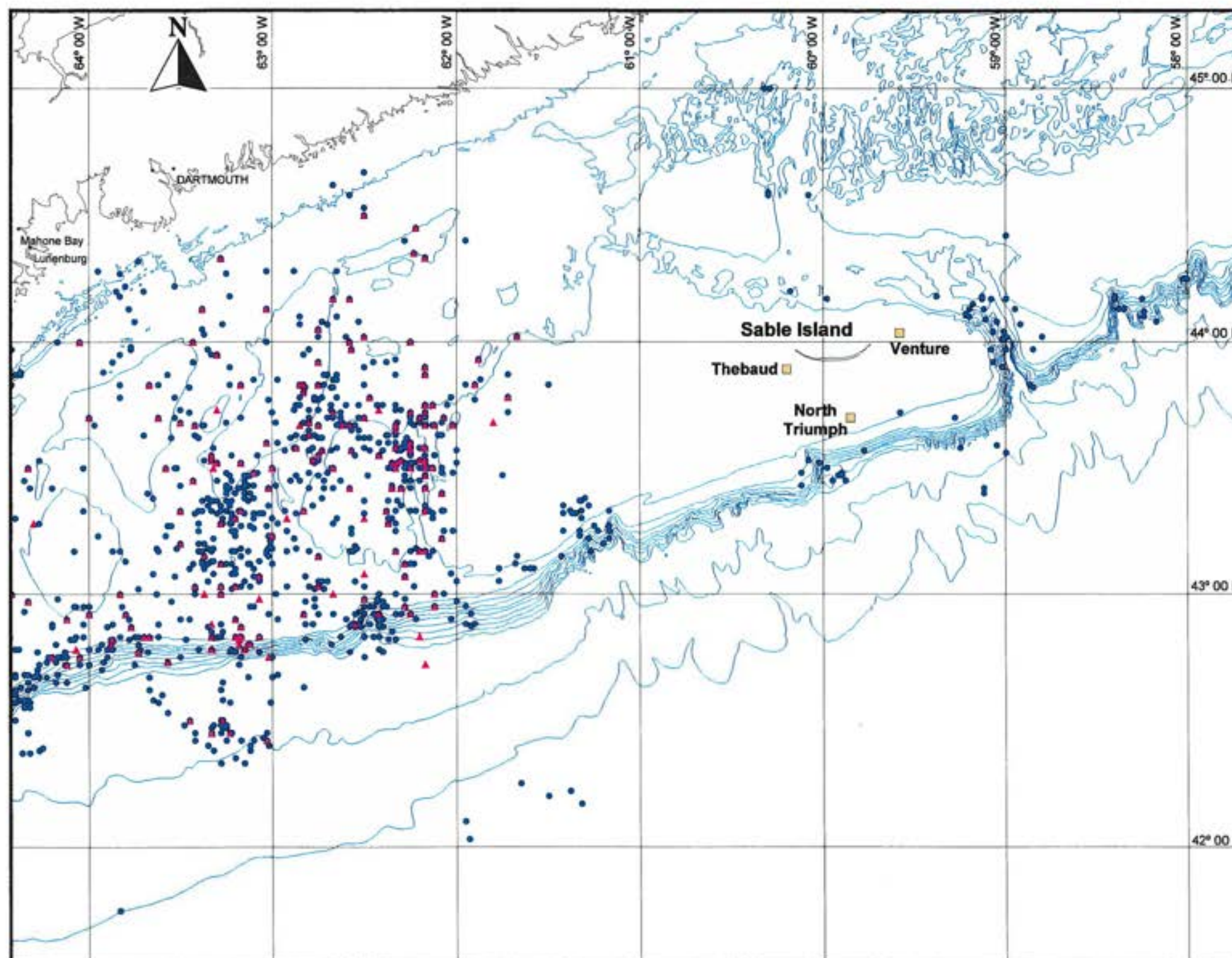
The relative isolation of Sable Island may be its greatest attraction to grey seals, rather than the availability of food. Adults haul out on the beaches after they have exploited resources, stored as fat reserves, from other areas of the NW Atlantic.

The greatest demographic change in this area over the past 35 years has been the continued expansion of the grey seal, in terms of numbers, biomass and more importantly, aggregate surface area. Aggregate surface area of a warm bodied marine mammal is a useful relative index of energy requirement: in terms of thermal

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**Figure 3.32
Whaling Activity 1966 - 1971**



Legend

- Well Site
- ▲ Whale Sightings During Hunting (exclusive of kills)
- Whale Kills

Map Parameters

Map Projection: Mercator
Horizontal Datum: NAD 83
Map Scale: 1 : 2 000 000



maintenance and propulsive costs (Brodie and Pásche 1983, Brodie 1984). This index has implications on the food reserves required to support this population expansion.

The grey seal has continued to expand to unprecedented numbers during the exploration and production activities of Sable Island. If prey abundance or distribution of feeding effort were negatively affected by these activities, it should be manifested in the present status of this species.

Grey seal increase have been attributed to an overall decline in large predatory sharks, a consequence of the change in technology and incidental catch of sharks by the swordfishing industry (Brodie and Beck 1983).

The dramatic increase in grey seals and their expanding use of the Sable Island beaches in turn, has placed increasing pressure on the harbour seal colony on Sable Island. The harbour seals, as well, were considered to be the more vulnerable to shark predation in the immediate vicinity of Sable Island due to their smaller body size and their May–June pupping season, which may be coincident with increasing numbers of predatory sharks as the ocean temperature rises in summer (Brodie and Beck 1983). In addition to possible social pressure on Sable Island harbour seals, the expansion of grey seals could be at the expense of other marine mammals, however, this is difficult to quantify.

3.9 Marine Birds

3.9.1 Offshore Seabird Monitoring

Observers were trained to observe birds both from the offshore platforms and ships associated with the Sable Offshore Energy EEM Program. However, since there are consistent data for Venture and Thebaud, and suitable controls are unavailable, statistical analysis of the data will be limited. There were no observations made from North Triumph. Seabird abundance and activity is related to the drilling platforms by considering trends. The presence of trained observers permits the year-round study of seabird activity near the platforms and in the waters surrounding the platforms, a unique opportunity.

Observers attended a three day training session in 1998 and a refresher course in 1999, both conducted by JWEL, which instructed them how to identify seabirds and conduct seabird surveys. Two new observers were trained in 1999. The training session and refresher course involved two days of classroom instruction and one day in the field.

Three types of surveys that observers are conducting while in the vicinity of the platforms include:

- Ten Minute Platform-based Surveys;
- Platform Dead/Exhausted Bird Surveys; and
- Ten Minute Ship-based Surveys.

Details on the survey methodologies are provided in the baseline and drilling design report (JWEL 1998).



Venture

Platform-based Surveys

Platform-based surveys have been conducted on the Rowan Gorilla II (Venture) since June 13, 1998. Results of 1998 surveys are discussed in the 1998 annual report (JWEL 1999). Three observers conducted surveys (in rotation) on the platform in 1998 and two additional observers were added to the rotation in 1999. Several gaps exist in the data when observers were not on board the platform. A total of 605 surveys were conducted over 237 days between January 1 and December 23, 1999. There is no record of any surveys conducted after dark (*i.e.*, under the platform lights) in 1999. An average of 2.6 surveys were conducted per day in both 1998 and 1999.

In 1999, 12,500 birds were recorded over the year. The five most numerous species encountered were Herring Gull, Great Black-backed Gull, undetermined shearwater species, Greater Shearwater and Northern Gannet (Figure 3.33). If it is assumed that the undetermined shearwater species was the more common Greater Shearwater, this species would be the second most numerous species recorded. No birds were sighted in 19% of the surveys. Figure 3.34 shows the number of seabirds per survey at each platform. A total of 18 marine bird species were identified, and 8 land bird or inland waterfowl species were identified. The 8 land birds species included various sparrows, hawks and warblers. Relatively few (22 in total) land-based birds were recorded on the Rowan Gorilla II in 1999, suggesting that the platform lights did not attract large numbers of land-based birds.

All of the common species were observed both far from and in close proximity to the platform, and did not generally appear to be avoiding the platform area. More gulls were counted within 300 m of the platform than beyond 300 m. However, shearwater numbers were generally greater beyond 300 m, mostly due to large flocks observed at a distance in June and July. This is not likely evidence of avoidance of the platform, as most shearwaters were observed within 300 m of the platform in November, 1999. Twice as many gannets were counted beyond 300 m of the platform as within 300 m, however due to the difference in areas within each zone, this cannot be considered as evidence of avoidance of the platform.

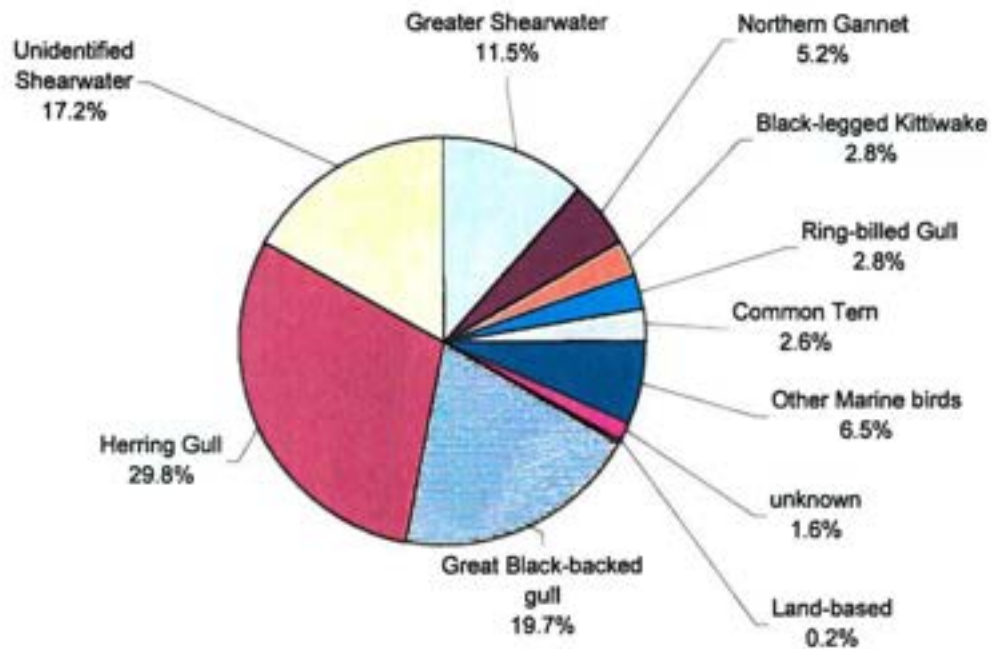
Flaring activity was recorded during 11 surveys conducted over five days between October 19 and November 11, 1999. The only reaction recorded was that birds (mostly gulls) moved away from the flare boom, however, they remained in the vicinity of the platform. No fatalities were observed to occur as a direct result of flaring. As flaring was recorded in less than 2% of the surveys, flaring was likely a rare event in 1999.

Platform Dead/Exhausted Bird Surveys

In 1999, 301 walkabouts were conducted over 229 days; a total of 13 birds in 10 surveys were recorded. Most of these were land-based birds, and most were found dead or died shortly after being discovered. An immature Herring Gull was the only dead marine bird recorded. Most of the birds were small, warbler- or

Figure 3.33 Seabird Species Composition by Field (1999)

Venture: RGII Platform



Thebaud: Santa Fe Galaxy II

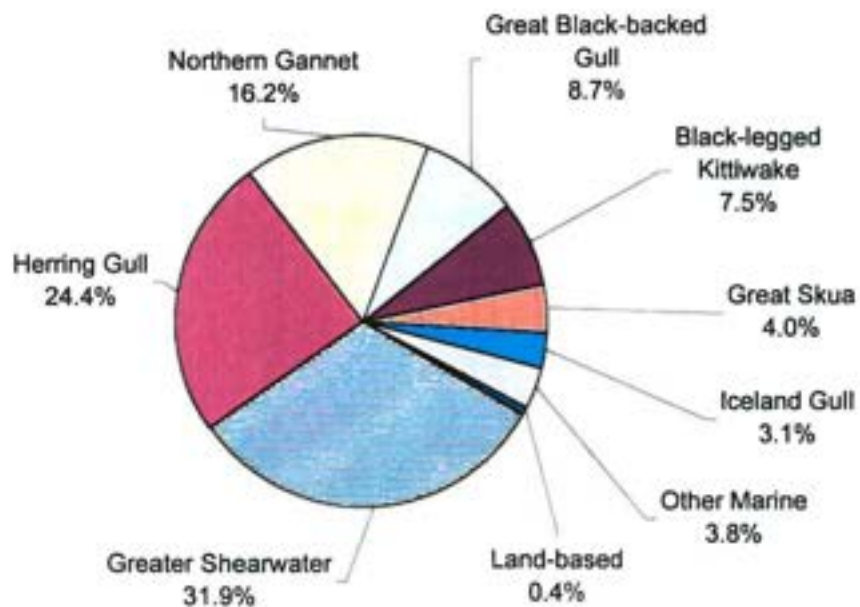
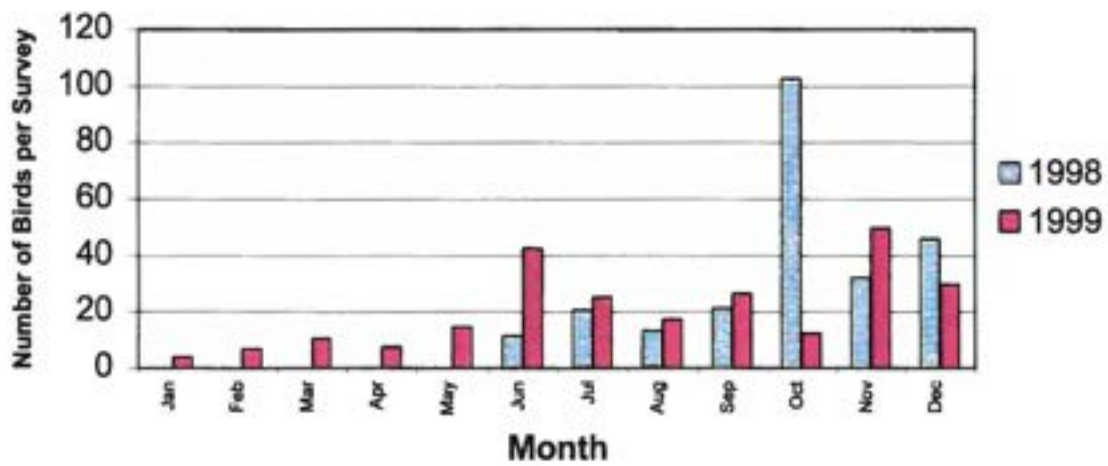
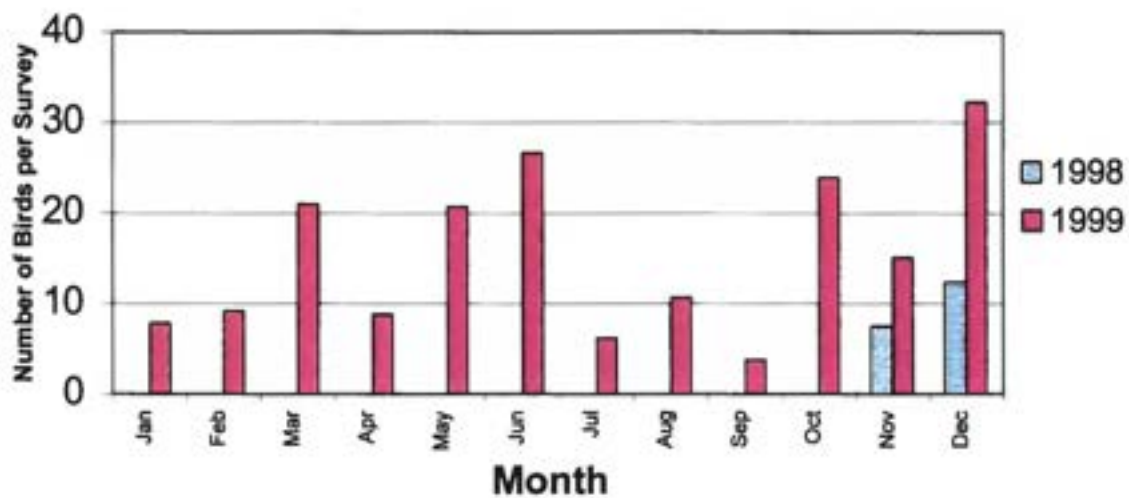


Figure 3.34 Number of Seabirds per Survey by Field

Venture : Rowan Gorilla II



Thebaud: Santa Fe Galaxy II



sparrow-sized birds, however, the wing of an American Kestrel was discovered during one of the walkabouts, and a Peregrine Falcon, which was unable to fly, was air-lifted to the mainland for treatment. This falcon was later returned to the environment to continue its migration south after a short stay at the Atlantic Raptor Rehabilitation Centre in St. Margaret's Bay, N.S. (Appendix H). The low incidence of dead birds and the high frequency of the surveys suggest there was likely no large scale fatalities in the vicinity of the Venture platform.

3.9.2 Thebaud

Platform-based Surveys - Santa Fe Galaxy II and Thebaud Production Platform

In 1998, one of two observers conducted platform-based surveys on the Santa Fe Galaxy II starting on November 20. The surveys conducted from the Santa Fe Galaxy II were the first for both observers. One more observer joined the rotation in 1999, and another only conducted surveys in January. Surveys continued in 1999 on the Santa Fe Galaxy II until September 13, and surveys resumed at the Thebaud site on a production platform October 6. Only one survey was conducted in November 1999.

In 1999, 644 surveys were conducted over 257 days at the Thebaud well, an average of 2.5 per day. The numbers of surveys conducted each day dropped to only one or two on the production platform, from an average of three per day on the Santa Fe Galaxy II. When the observers were on the platform, they tended to complete surveys nearly every day, weather permitting.

More than 9,000 birds were recorded at the Thebaud well in 1999. The five most numerous species encountered Greater Shearwater, Herring Gull, Northern Gannet, Great Black-backed Gull and Black-legged Kittiwake (Figure 3.33). No birds were recorded in nearly 22% of the surveys. Figure 3.34 shows the number of seabirds per survey at each platform. The number of birds per unit effort in 1999 was comparable at Thebaud to that from the Rowan Gorilla II at Venture for the same period, as was the distribution of species. A total of 17 marine bird species were identified, and 10 land bird or inland waterfowl species were identified. Relatively few (43 in total) land-based birds were recorded at Thebaud in 1999, suggesting that the platform lights did not attract large numbers of land-based birds.

All of the common species were observed both far from and in close proximity to the platform, and did not generally appear to be avoiding the platform area. More gulls were counted within 300 m of the platform than beyond 300 m, and there was little difference in shearwater numbers within and beyond 300 m. Gannets were just as likely to be flying within 300 m of the platform as beyond 300 m, however they were more likely to rest on the water at a distance from the platforms.



There was no record of any night-time surveys conducted on board the Santa Fe Galaxy II in 1998, however, of 14 surveys conducted under the platform lights between January 12 and April 16, 1999, birds were seen on only one occasion (30 Great Black-backed Gulls resting within 7 m of the platform). It is not known, however, whether or not this is a seasonal trend, as night time surveys were not recorded for the rest of the year.

Platform Dead/Exhausted Bird Surveys

In 1999, 218 walkabouts were performed over 200 days, which is 84% of the days between the first and last survey conducted in 1999. Five birds in five different surveys were found dead, including three land-based birds (Northern Junco, a juvenile Gray Jay, and a Northern Parula Warbler), a shore bird (Black-bellied Plover) and a marine bird (Thick-billed Murre). The low incidence of dead birds and the high frequency of the surveys suggest there was likely no large scale fatalities in the vicinity of the Thebaud well.

3.9.3 Population Trends

Procellariidae

In decreasing abundance, Greater Shearwater, Northern Fulmar and Sooty Shearwater occur regularly in the vicinity of Sable Island (Brown, 1986). Shearwater abundance is lowest during the winter months after they have migrated to the southern hemisphere. Greater Shearwaters are most abundant during the period from July to September while Sooty Shearwaters are most abundant between April and June (Brown, 1986). Northern Fulmars are present in the vicinity of Sable Island throughout the year, but are most abundant between October and December, and are least abundant between January and April.

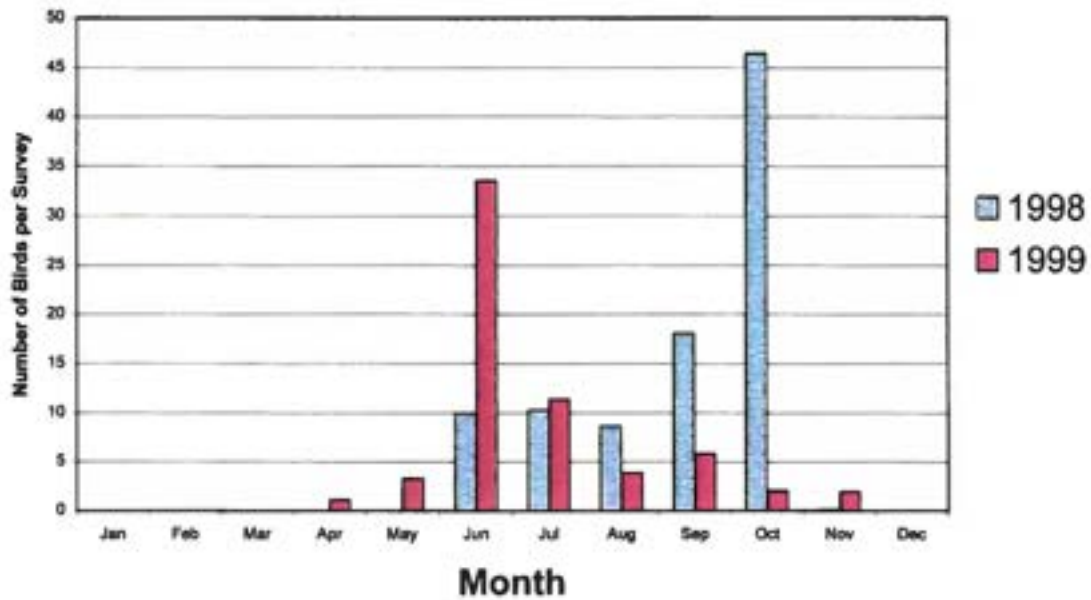
At Venture, Greater Shearwaters were most common in September and October in 1998, presumably en route to the southern hemisphere (Figure 3.35), which mirrors the trend for the Sable Island area (Brown 1986) was similar in 1999, however, the peak shifted to June. As expected, Sooty Shearwater observations were few in 1999. Of note is that no Northern Fulmars were observed in any of the 1998 surveys, however, up to five Northern Fulmars at a time were recorded over 18 surveys in October, 1999.

At Thebaud, shearwaters were also most common in June in 1999, presumably returning from breeding in the southern hemisphere (Figure 3.35). Their distribution loosely mirrors the trend for the Sable Island area (Brown, 1986). In 1999, 71 Sooty Shearwaters were recorded over the spring/summer. Northern Fulmars encounters were infrequent; four were recorded in January 1999, and up to seven birds were recorded over 12 surveys in seven days in October, 1999.

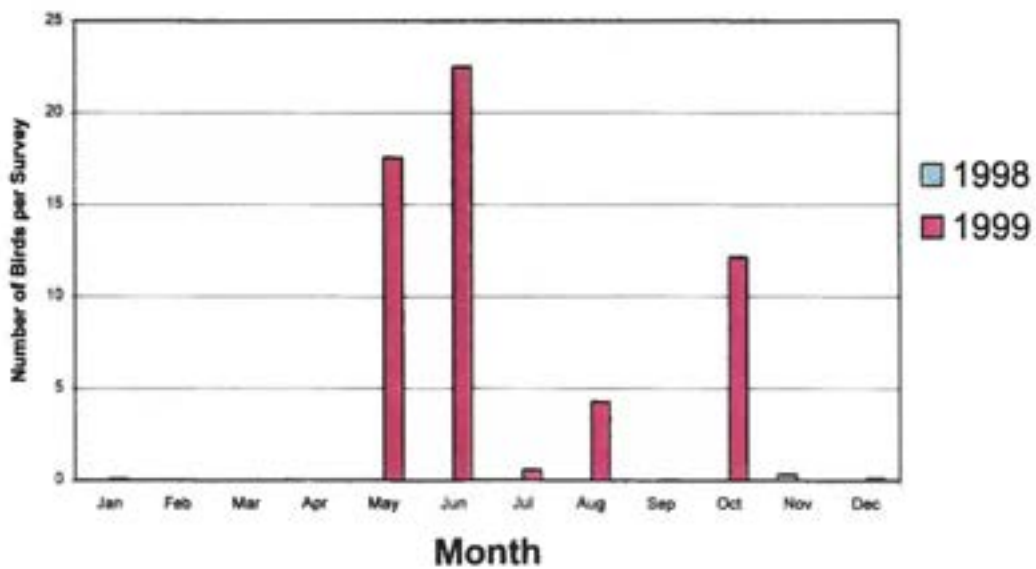
The area around Sable Island supports high densities of Greater Shearwaters in comparison to other areas in Atlantic Canadian waters. Densities of Sooty Shearwater and Northern Fulmar in the Sable Island area are moderate in comparison to densities in other areas of Atlantic Canada.

Figure 3.35 Shearwater Spp. Occurrence by Field

Venture: Rowan Gorilla II



Thebaud: Santa Fe Galaxy II



Greater Shearwaters have generally been one of the most abundant and frequent species recorded during the platform-based surveys. Other shearwaters have been relatively rare, as have Northern Fulmars. Therefore, there is no obvious change in the distribution of procellariids in the vicinity of Sable Island.

Storm-petrels

Two species of Storm-petrel, Leach's Storm-petrel and Wilson's Storm-petrel are regularly reported in Atlantic Canadian waters (Brown, 1986). Relatively high numbers of Leach's and Wilson's Storm-petrels are found the waters around Sable Island as compared to other areas of Atlantic Canada. Large numbers of Leach's Storm-petrels arrive in Canadian waters in May. They remain plentiful off Sable Island until early autumn when they migrate south following the end of the breeding season. Wilson's Storm-petrels spend the austral winter in the northern hemisphere. Migrating birds begin to appear in large numbers in the vicinity of Sable Island in May and remain abundant until August when they begin to migrate south. Wilson's Storm-petrel is the most abundant of the two species.

Both species have been recorded near the platforms in spring and summer, and have been found resting or dead on the platforms during the daily walkabouts, in all seasons, however, their numbers have been small. Due to their small size, they are likely being missed during platform-based surveys.

Northern Gannets

Northern Gannets are most abundant in the vicinity of Sable Island during the months of June and July. The birds present in the vicinity of Sable Island at this time may be subadults or failed breeders. Northern Gannet numbers are typically very low during the fall and winter months when they migrate to the southeastern coast of the United States and the Gulf of Mexico. The concentrations of Northern Gannets found around Sable Island are similar to those found in most areas of Atlantic Canada except for the vicinity of breeding colonies where concentrations are very high.

At Venture, Northern Gannets had very low numbers in 1998 until October to December, when flocks were on their south bound migration (Figure 3.36). In 1999, Northern Gannets only peaked in November. This differed from the Thebaud well, where Northern Gannet numbers peaked in March, 1999, likely migrating to breeding colonies in the Gulf of St. Lawrence (Figure 3.36). Most Northern Gannets recorded from the platforms were migrating through the area, however there was no evidence of avoidance of the platforms.

Larids

At least 13 species of laridae (gulls, terns, jaegers and skuas) have been recorded in the PIROP data for the region (Brown, 1986). Herring Gull, Great Black-backed Gull and Black-legged Kittiwake account for most of the larid species observed within the region, and this same trend was found at the Venture and Thebaud wells in both 1998 and 1999 (Figures 3.37 to 3.39). All of these species display the same seasonal abundance patterns. The lowest numbers of larids are present during the period from April to June. At this time gulls and kittiwakes are gathered at their coastal breeding colonies and tend to forage in close proximity

Figure 3.36 Northern Gannet Occurrence by Field

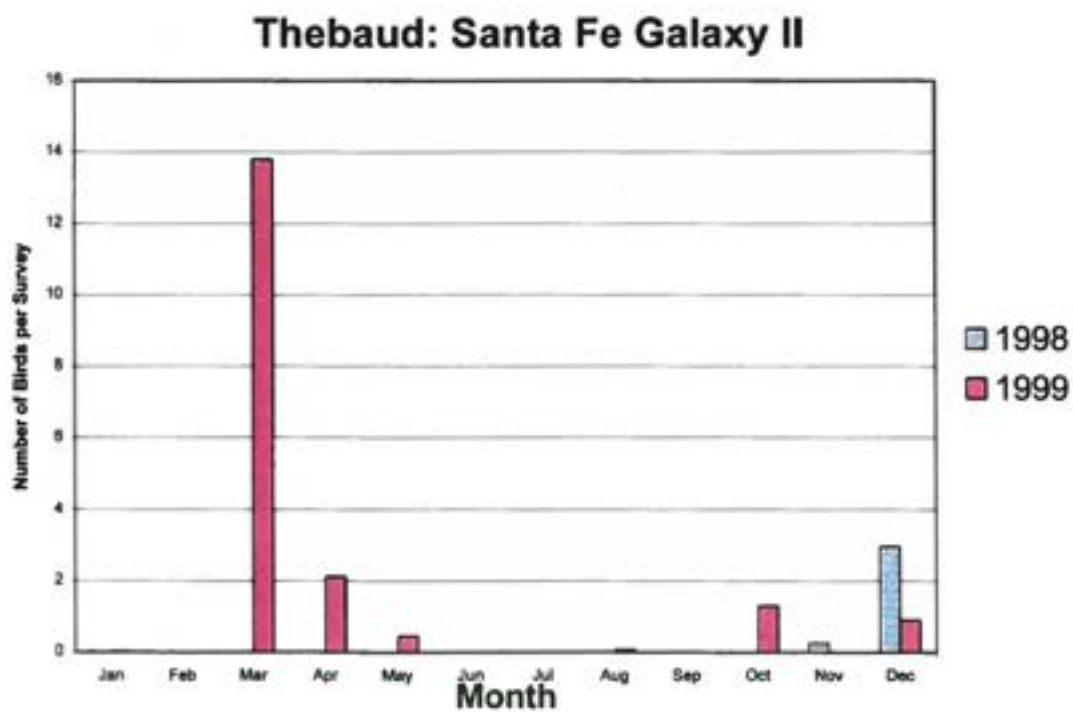
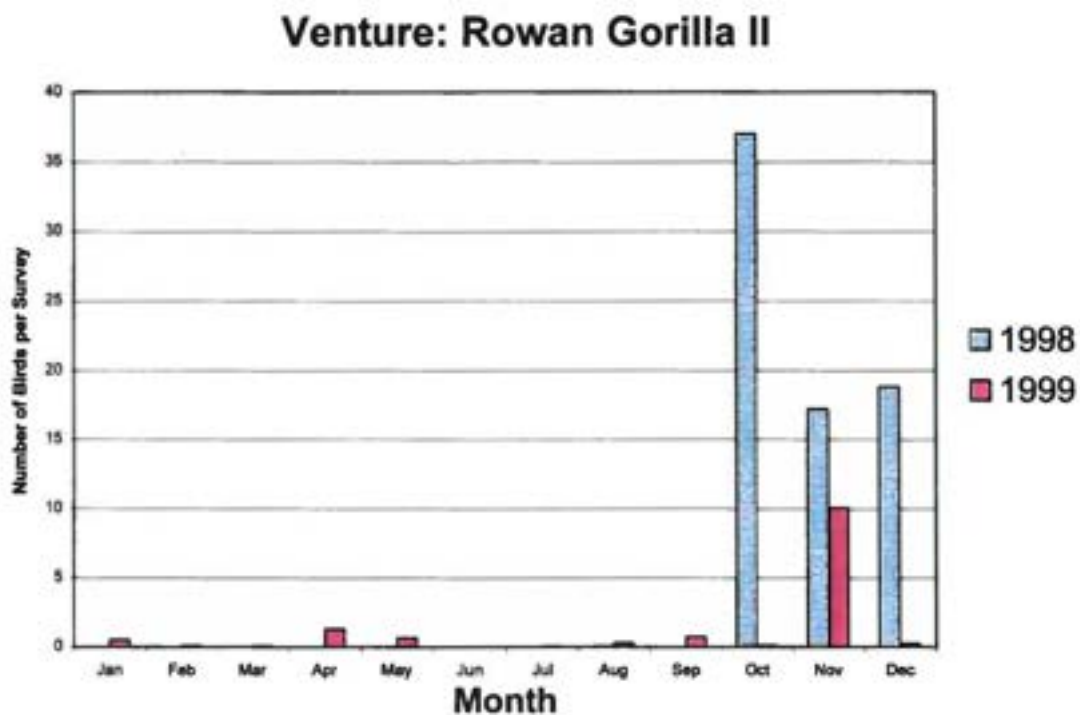
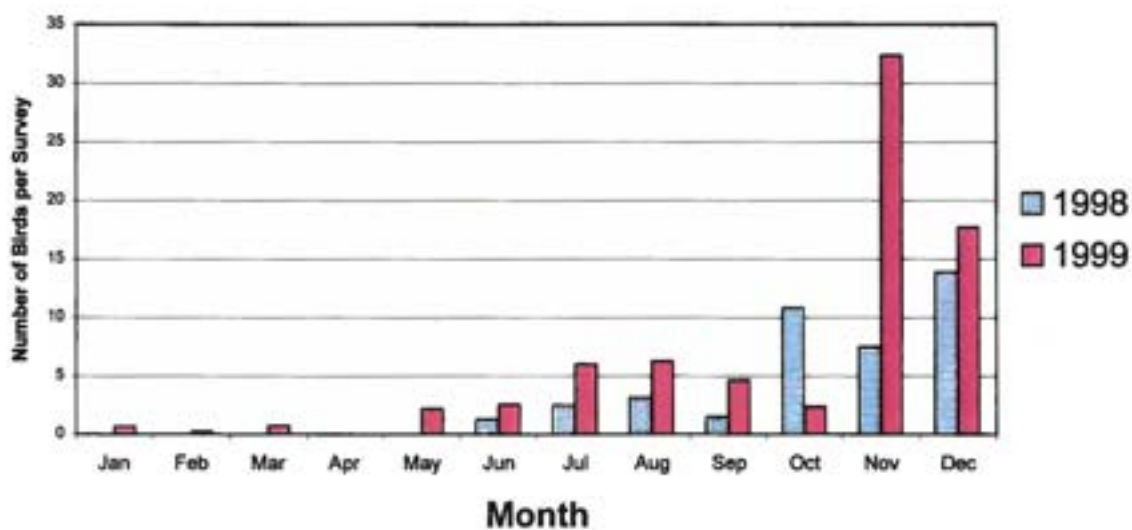


Figure 3.37 Herring Gull Occurrence by Field

Venture: Rowan Gorilla II



Thebaud: Santa Fe Galaxy II

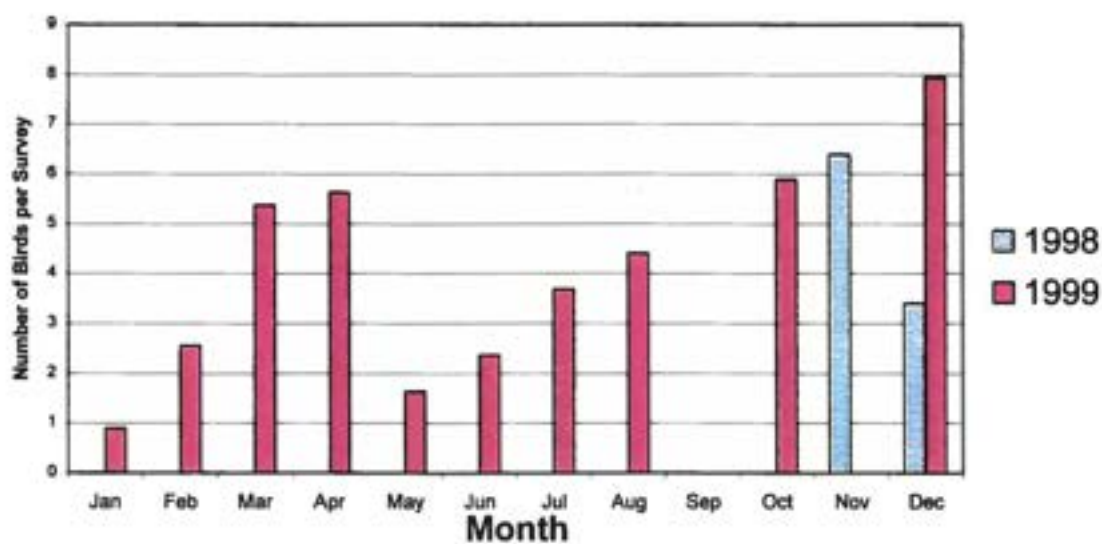
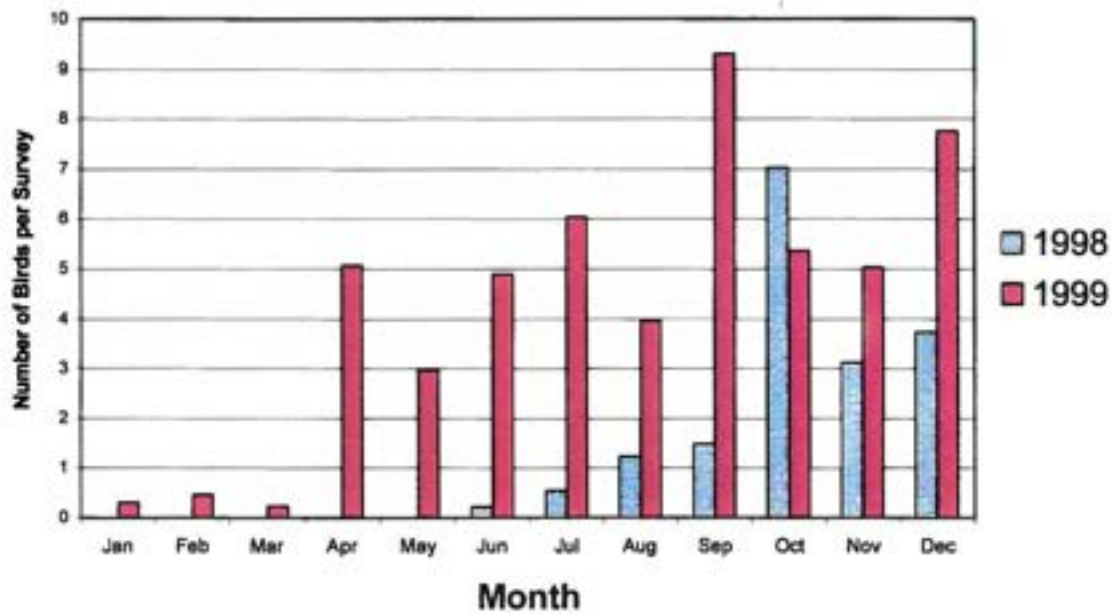


Figure 3.38 Great Black-backed Gull Occurrence by Field

Venture: Rowan Gorilla II



Thebaud: Santa Fe Galaxy II

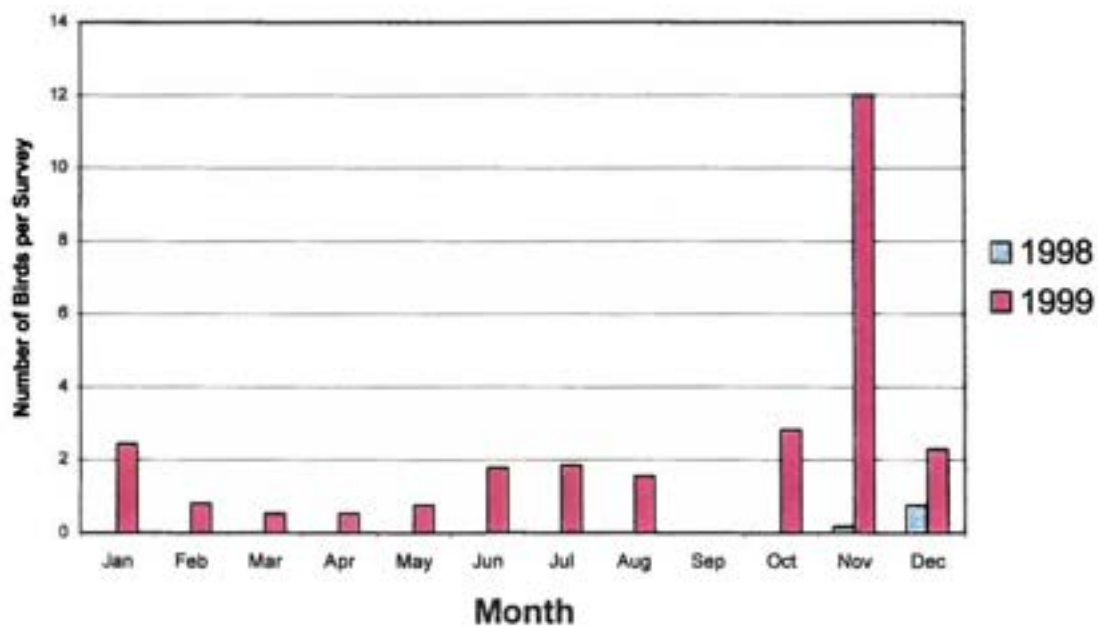
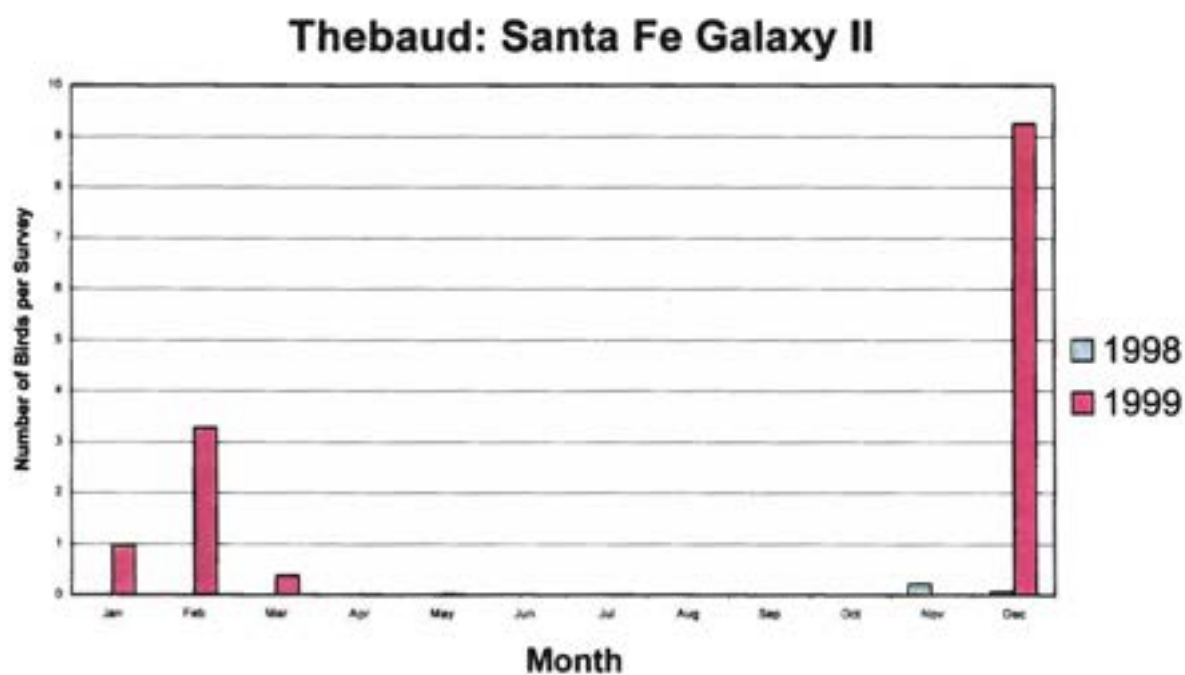
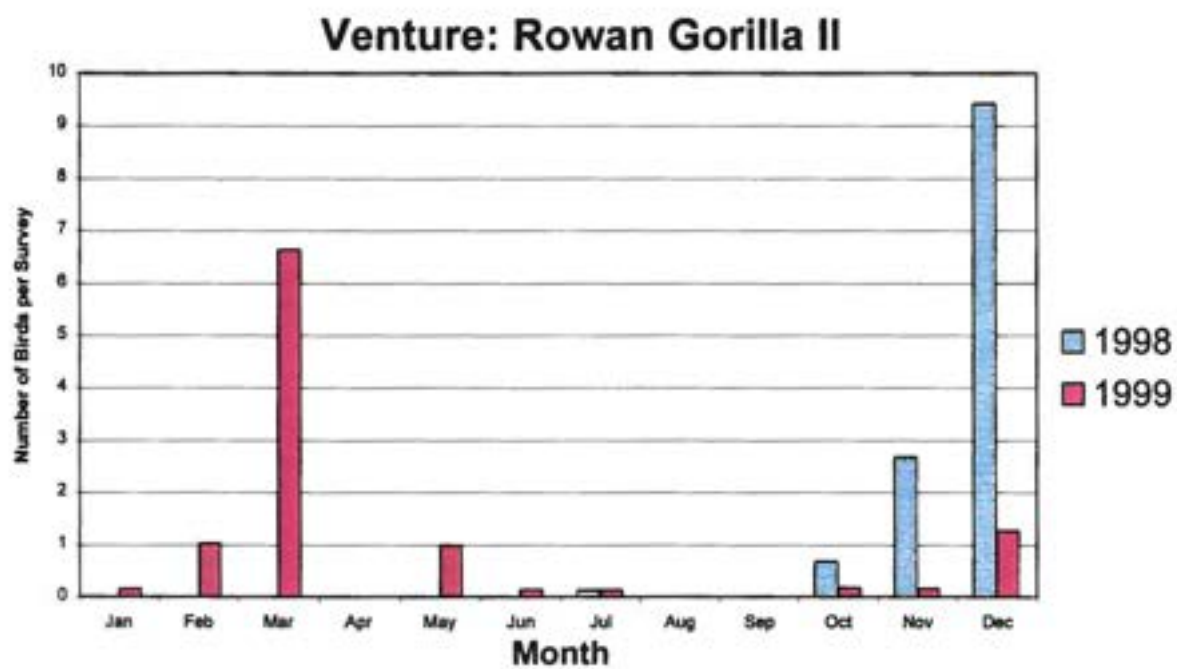


Figure 3.39 Black-legged Kittiwake Occurrence by Field



to the colonies. Both Herring Gull and Great Black-backed Gull breed on Sable Island. Larid numbers increase through the summer and peak during the period between October and December. At this time adult and juvenile larids have dispersed from their breeding colonies and are foraging at sea. Larid numbers decrease between January and March, probably as a result of a combination of mortality and movement of birds to their colony sites.

The waters around Sable Island support relatively high concentrations of Herring Gulls and Great Black-backed Gulls in comparison to other areas of Atlantic Canada. This may reflect the presence of large colonies of both species on Sable Island. Herring and Black-backed Gulls have generally been two of the most abundant and frequent species recorded during the platform-based surveys, and of the other larids, Black-legged Kittiwake were the most abundant. Population densities of Black-legged Kittiwakes are generally lower in the waters around Sable Island than in other areas of Atlantic Canada. The data at both Venture and Thebaud supports the trend of peak abundance of all three species in the fall (Figure 3.37-3.39).

A single Long-tailed Jaeger was recorded at Venture in February, 1999, and Great Skuas were recorded at Venture in October/November over 4 surveys. At Thebaud, up to three Great Skuas were recorded over five days in July, August and September, and an estimated 350 were recorded resting within 300 metres of the Thebaud production platform in December, however the latter observation is suspect and has not been confirmed. The rarity of these species is not unexpected, so cannot be attributed to the platforms.

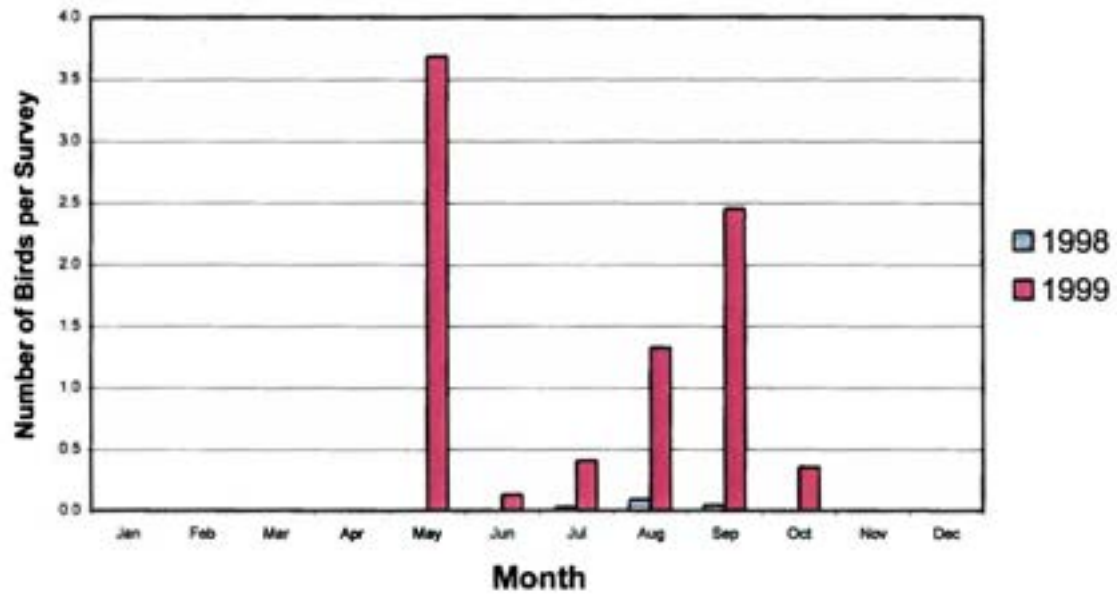
Terns were generally observed at a distance from the platform at Venture, and likely are associated with Sable Island (the Venture well is approximately 14 km from Sable Island (Figure 3.40). About 20 times the number of terns were recorded in 1999 than were recorded in 1998, and they were recorded almost three times more often. At Thebaud, Common Terns were only recorded in January by the observer that conducted surveys in January and at no other time at the Thebaud well (Figure 3.40). This suggests that there was likely observer bias introduced in the results.

Alcids

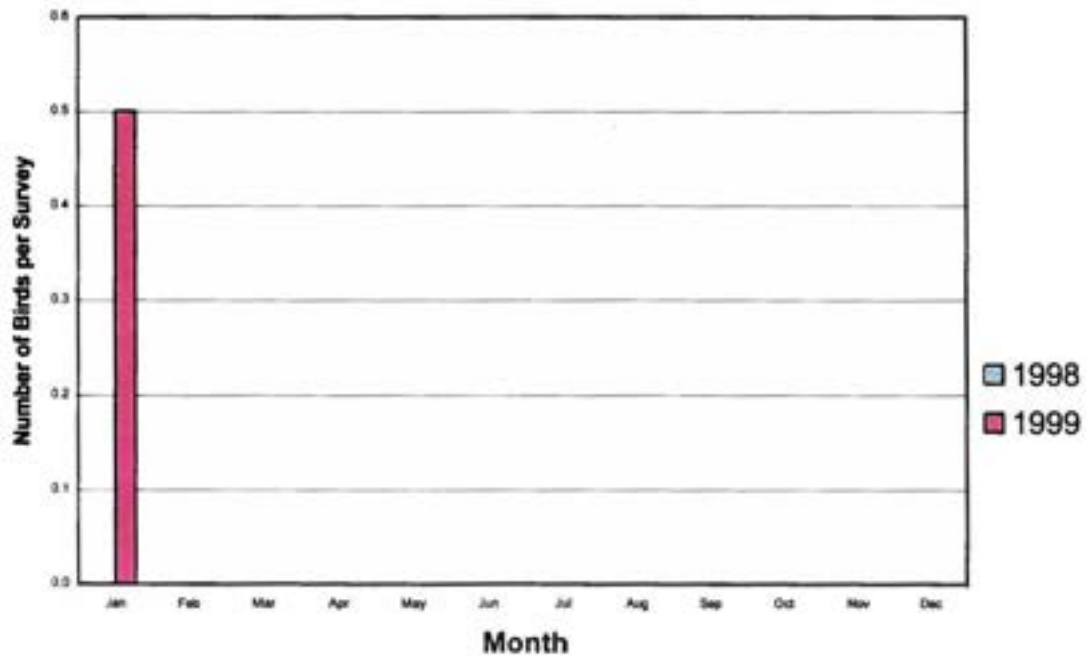
Five alcid species can be expected to occur in the region including Dovekie, Common Murre, Thick-billed Murre, Razorbill, and Atlantic Puffin. All of these species are pelagic species that typically stay away from land except for their breeding colonies. In general, these species are most abundant in the waters around Sable Island during the winter months, particularly during the months of January and February (Brown, 1986). Numbers decline during the spring as these birds congregate at their breeding colonies. Alcids disperse from these colony sites in the autumn and reach the Sable Island area in early winter. This pattern is similar for all of these species although there are some differences in the time they are present in the Sable Island area (Brown, 1986). The area around Sable Island generally supports a relatively low population density of all of the alcid species in comparison to other areas of Atlantic Canada. The highest densities are typically found in the waters around Newfoundland

Figure 3.40 Common Tern Occurrence by Field

Venture: Rowan Gorilla II



Thebaud: Santa Fe Galaxy II



Alcid sightings by observers have been quite rare, however, this is not surprising given their coloration and size. Dovekies have only been seen within 300 m of the platforms (likely due to their small size). Murres have been recorded on 25 occasions at Thebaud but only once at Venture. The only dead alcids recorded during walkabouts was a Razorbill in December, 1998, discovered following a major storm, and a Thick-billed Murre discovered in March, 1999, all on the Santa Fe Galaxy II.

3.9.4 Summary of Seabird Observations

Bird migration trends by the platforms mirror Sable Island area patterns. All common species were observed both far and in close proximity to the platform and did not generally appear to avoid the platform area. Low incidence of dead birds and the high frequency of the surveys suggest there was likely no large scale fatalities in the vicinity of the platforms. No fatalities were observed to occur as a direct result of flaring. As flaring was recorded in less than 2% of the surveys at Venture, flaring is likely a rare event during drilling of the wells.

3.10 Sable Island EEM Studies

This section provides summaries of the oiled seabird beach surveys and the air quality monitoring for detection of flare emissions from Venture. Both surveys monitor for effects originating from the offshore platforms that may affect Sable Island or can be monitored from the island. Sable Island provides a unique platform upon which to augment the offshore EEM program.

3.10.1 Oiled-Seabird Beach Surveys

Through the use of beach surveys, possible interactions between the seabird population and hydrocarbons produced by gas production activities offshore were examined. With the exception of the sandy plain area (on south side of island), the beach was examined from tideline to the base of the vegetated dunes. Along the sandy plain the area of beach surveyed extends from tideline to roughly 50 metres inland. Seabird carcasses were collected; examined for oiling, entanglement and experimental markings such as legbands; and were removed from the beach. Protocol provided by John Chardine of the Canadian Wildlife Service, was used for recording numbers and rates of oiling. Selected oiled specimens were sent to Seatech Ltd., Halifax, for oil identification.

A total of 11 beached seabird surveys of the north and south sides of Sable Island were carried out by Zoe Lucas in 1999. One survey was performed each month with the exception of August. Table 3.28 shows number of seabirds and the respective percent oiled for the main groups of seabirds found as carcasses. For 1999, the numbers of oiled seabirds found and species composition were consistent with patterns observed on Sable Island in previous years by this same observer.

Oil samples from selected oiled seabirds were sent Seatech Ltd, Halifax for oil identification. Table 3.29 shows results from the analysis of samples from January and February 1999. Oil specimens collected during the latter part of 1999 have not yet been analyzed.





Table 3.28 Results of Beached Seabird Surveys For 1999

Species		January	February	March	April	May	June	July	September	October	November	December	Total
Tubenose Spp.	# found	0	2	11	5	3	108	11	13	22	8	7	190
	% oiled	0	0	0	20.0	0	2.7	14.3	0	5.6	0	33.6	4.6
Northern Gannet	# found	0	1	0	1	2	0	0	2	7	21	8	42
	% oiled	0	0	0	0	0	0	0	50.0	0	0	0	2.6
Gull Spp.	# found	9	7	8	4	7	6	7	1	6	19	11	85
	% oiled	0	14.3	0	0	50.0	0	0	0	0	0	0	2.9
Murre Spp.	# found	6	189	79	42	8	2	0	1	0	0	14	341
	% oiled	20.0	49.0	75.0	52.9	0	0	0	0	0	0	100.0	52.5
Dovekie	# found	5	100	23	12	2	0	0	0	0	10	48	200
	% oiled	25.0	89.8	87.5	100.0	50.0	0	0	0	0	0	72.2	79.6
Atlantic Puffin	# found	6	33	7	1	0	0	0	0	0	1	10	58
	% oiled	25.0	31.6	0	0	0	0	0	0	0	0	50.0	28.6



Table 3.29 Hydrocarbons Analysis from Oiled Seabird Carcasses Collected During January and February 1999

Date Collected	Major Component	Minor Component
Jan. 15	weathered bunker	lube oil
Jan. 20	weathered bunker	lube oil
Jan. 25	lube oil, bunker	weathered Cohasset
Feb. 11	weathered bunker	lube oil
Feb. 12	lube oil	weathered bunker
Feb. 16	weathered bunker	lube oil
Feb. 18	unknown mid-range oil	lube oil
Feb. 18	weathered distillate	lube oil

All oiled carcasses were contaminated with very dark, thick oil; the oil usually having a crusty, hardened outer layer. Of the eight oiled specimens analyzed, one was found to be partially contaminated with weathered Cohasset condensate. It would appear that this bird encountered lube/bunker in more massive quantities and then may have encountered a slick of Cohasset condensate before arriving on Sable Island. No other analyzed samples displayed contamination from oil traceable to the drilling activity offshore of Sable Island.

3.10.2 Flare Emissions

Sable Offshore Energy Incorporated contracted Seatech Ltd to conduct a study of flare emissions from offshore operations at the Venture field and other fields during facility start up. During start up, well contents, primarily gas, but also some condensate, water and drilling fluids are managed by flaring at the test well. Due to this uncontrolled mixture, soot, Volatile Organic Compounds (VOCs), and nitrogen dioxide (NO₂ among other NO_x) could be released.

Passive monitoring systems (NO₂ passive samplers, VOC dosimeters, and particle deposition collectors) were installed on October 28, 1999. Figure 3.41 displays the location of samplers. The samplers were retrieved on November 28 and 29, 1999, and new dosimeters/filters installed.

3.10.3 Passive Collectors

The results for nitrogen dioxide dosimeters, VOC dosimeter and particulate deposition collectors are reported in Table 3.30.

The Sable Island stations had very low levels of NO₂ and VOCs. The Halifax reference station also displayed low levels of these contaminants.

Figure 3.41: Air Quality Study Area

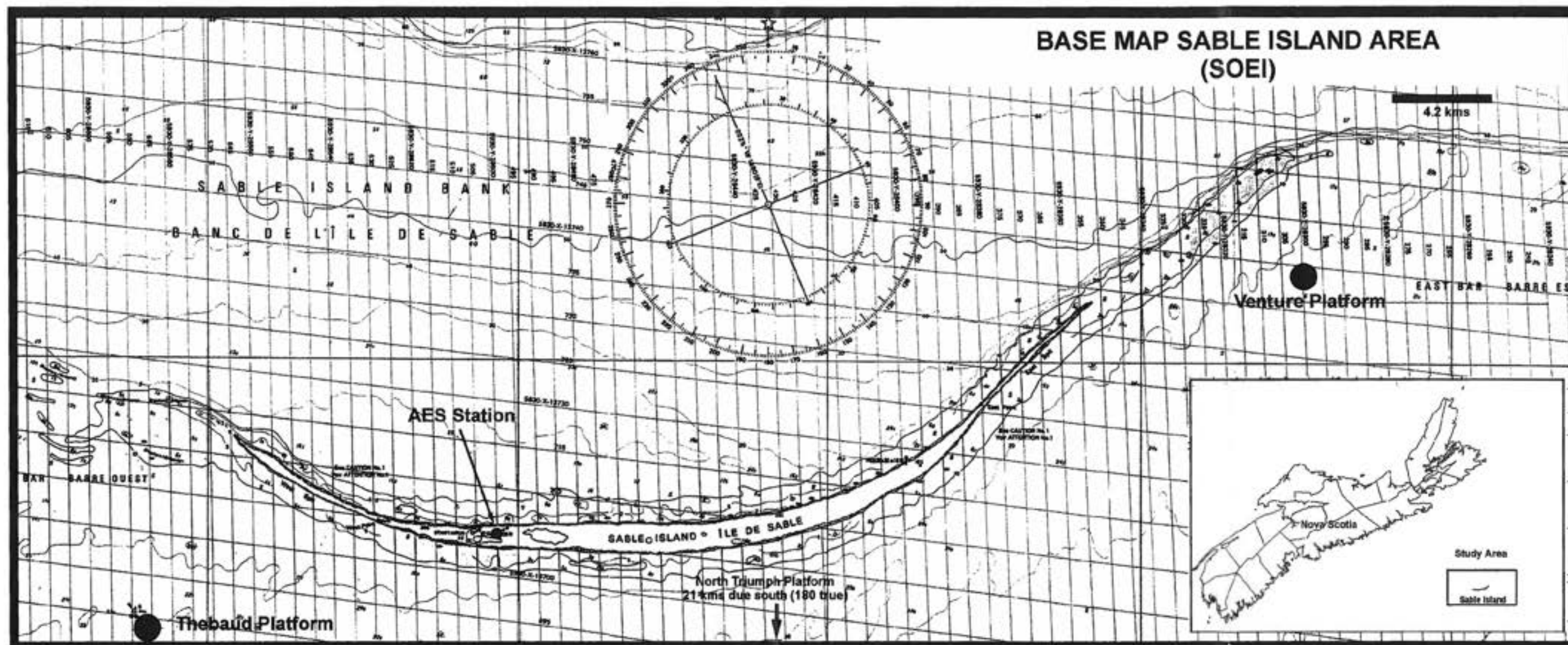


Table 3.31 Airborne Particulate Deposition Trap Data

Station ID	Mass Retained By Trap (g)	Deposition (g/m ² /day)	Number of Days Sampled
#1	0.0050	0.002	32
#2	0.0258	0.011	32
#3	0.0440	0.019	32
#4 (Halifax Control)	Destroyed	n/a	32

Summary

For the one month survey, the levels of NO₂ and VOCs both on Sable Island and in Halifax were typical of levels found for these contaminants in other similar urban and isolated areas (Seatech Ltd. 2000). The particle deposition collectors showed no evidence of soot to justify further analyses (i.e. for PAHs).

The mass of particles retained by the particle deposition collectors ranged from 5.0 mg at station #1 to 44.0 mg at station #3 (Table 3.30). The Halifax reference sample was partially destroyed and unable to be analysed for particulate mass. Microscopic examination of the Sable Island filters revealed the particulate to consist primarily of a fine grained brown sand. The Halifax reference station also displayed some fine grained sand, and some loose organic material. No further analyses (i.e. PAHs) were performed as no evidence of soot was found on any of the four filters. Deposition rates for the four stations are calculated in Table 3.31.

Table 3.30 NO₂, VOC and Deposition Trap Data

Station ID	NO ₂ ($\mu\text{g}/\text{m}^3$)	VOC ($\mu\text{g}/\text{m}^3$)					Mass Retained By Collector (mg)	Micro Exam
		benzene	toluene	ethylbenzene	xylenes	n-hexane		
#1 (Sable)	1.4	ND	ND	ND	ND	ND	5.0	Fine brown particulate; quartz grains; fine sand and loose organic material.
#2 (Sable)	1.1	ND	ND	ND	ND	ND	25.8	Fine brown particulate and very fine grained sand.
#3 (Sable)	1.6	ND	ND	ND	ND	ND	44.0	Dark brown fine particulate; organic material and mostly fine grained sand.
#4 (Halifax Reference)	12.8	0.6	1.1	ND	0.5	ND	partially destroyed	Very dirty; large pieces of organic material and fine grained sand.

* All results corrected for badge and/or solvent blanks.

Notes:

- Area of particle deposition collector = 0.07 m²
- Traps, VOC and NO₂ badges were deployed for 32 days; Oct 28 - Nov 29, 1999.
- ND_{VOC} = <0.2 $\mu\text{g}/\text{m}^3$
- ND_{NO₂} = <0.2 $\mu\text{g}/\text{m}^3$



4.0 DISCUSSION

This section provides a comparison of data results from the various EEM study components obtained from monitoring surveys conducted at the Venture, Thebaud and North Triumph gas fields with the EIS model predictions (MacLaren Plansearch 1997 a,b). The objective of the EEM program is to test whether the effects of discharging drill wastes into the marine environment occur within the zones of influence predicted by the EIS.

4.1 Model Predictions

One of the main data inputs into the models are the volumes of drill muds and cuttings predicted to be discharged for each well based on depth of well drilled. Table 4.1 shows the comparison between the predicted volumes of drill cuttings discharged with the measured volumes as of December 31, 1999. The actual volumes of discharged cuttings is a minimum of half the predicted values, except for Thebaud where the volumes of predicted and measured volumes of SBM cuttings are accurate.

The long-term and short-term fate of drill cuttings and mud in the benthic boundary layer and on the seafloor were predicted using existing knowledge and modeling techniques at that time (MacLaren Plansearch 1997). Four models were used to predict the dispersion and transport of drill waste discharges including:

- a near-field (short-term) plume dispersion and particle settling model (Koh-Chang type model);
- a model for predicting the drill cuttings and mud solids deposition based on grain size distribution and settling velocity (Stokes Law)
- the FATE model on long-term fate of the drill cuttings, through sediment transport processes under normal and storm conditions
- the BBLT (benthic boundary layer transport) model which predicts the transport of suspended flocculated material and fine particles

Model simulations were run considering the discharge of drill waste from a single well and total wells drilled at each field for the Tier I phase.

4.1.1 Plume Dispersion

From the discharge of drill fluids, oceanographic modelling predicted that a visible plume may exist for several kilometres from the discharge point (MacLaren Plansearch 1997b). The plume was predicted to narrow and cover less than 2% of the surface area and last only a few hours. At Venture and Thebaud, settling of synthetic-based mud and cuttings was predicted to occur rapidly and within 800 m of the platform.



Table 4.1 Comparison of Predicted and Measured Drill Cutting Volumes (m³) From Each Platform

Platform	Predicted No. of Wells	No. of Wells as of 12/99	Vol. of Discharged WBM Cuttings (m ³)		Vol. of Discharged SBM Cuttings (m ³)		Predicted Total Vol. of Cuttings (m ³)	Total Vol. of Cuttings (m ³) as of 12/99
			Predicted	Measured as of 12/99	Predicted	Measured as of 12/99		
Venture	5	5	2433	1195	3179	1427	5612	2622
Thebaud	4	5	2519	1423	1253	1282	3785	2705
North Triumph	3	1	1456	287	1163	194	2627	481



4.1.2 Drill Waste Deposition

Modelled distribution of drill muds and cuttings on the seafloor were presented as areal spread and thickness of deposit based on drilling waste quantities (MacLaren Plansearch 1997b). Table 4.2 shows the predicted radii of hydrocarbon concentrations from the discharge of drill wastes at Venture, Thebaud and North Triumph.

Table 4.2 Predicted Concentrations, Layer Thickness and Biological Effects From Drill Wastes at Venture, Thebaud and North Triumph

Drill Waste Layer Thickness	Hydrocarbon Concentration	Biological Effect	Radius From Platform		
			Venture	Thebaud	N.Triumph
1 cm	10,000 ppm	smothering with pronounced toxicity and tainting	150–300 m	100 m	40–80 m
1 mm	1,000 ppm	50% reduction in abundance and diversity	300–400 m	400–600 m	100–200 m
0.1 mm	100 ppm	diversity and abundance at background, only sensitive species lost	600–700 m	600–800 m	500–1000 m
0.01 mm	10 ppm	no noticeable effect	>700 m	>800 m	>1000 m

Through modelling, the cutting mounds were predicted to be a maximum height of 3.5 m at Venture, with an initial spread to 1 mm thickness out to 400–500 m radius. At Thebaud, the estimated maximum mound height is 1.0 m with an initial spread to 1 mm thickness out to 500–600 m. Because of the dynamic nature of the ocean in these shallow sites, it was predicted that 80–90% of the deposited cuttings will be dispersed to below detectable levels within one year. Sediment transport modelling predicted that the spread of fine grained materials will be to the east, north, and west–southwest directions from North Triumph, and to the north and east from Venture and Thebaud (MacLaren Plansearch 1997b)

4.1.3 Benthic Boundary Layer Transport

Benthic boundary layer transport (bbt) modelling was applied at the three gas fields, as well as at Cohasset–Panuke for comparison and model verification with an active drilling site. An OBM concentration of 83 ppm was found at 250 m following completion of drilling at COPAN.

For the SOEI EEM Program, the bblt model predicted that drilling mud fines under the conditions of a continuous daily release model scenario with a release rate of 3,000 kg/day for 30–40 days would generate, an OBM concentration of 0.1 mg/L within 5 to 15 km from the discharge (MacLaren Plansearch 1997b). The seasonal dispersion pattern of OBM in the BBL was modelled to occur in a north and east direction from Venture; in a northwest and southeast direction from Thebaud; and southwest and southeast directions from North Triumph.

4.1.4 Taint

The zone of influence upon scallops is the distance, as predicted by modelling (MacLaren Plansearch 1997a,b), to be the extent of drill mud transport. From the results of lab experiments conducted at the Bedford Institute of Oceanography, an OBM concentration of 1–2 mg/L in the BBL is considered toxic to scallops (Cranford in press, MacLaren Plansearch 1997a,b). This concentration is predicted to extend 10–15 km from Venture and 10–12 km from Thebaud.

A dissolved hydrocarbon concentration of 1 mg/L is considered the level required to induce taint over a limited duration of exposure (MacLaren Plansearch 1997b). A distance of 15 km is the predicted outer range where scallops may accumulate some body burden of hydrocarbons. Fish exposed to drilling muds do not readily accumulate hydrocarbons and only fish feeding in the zone of severe benthic community effects (where the hydrocarbon concentrations are >1,000 ppm) may develop taint (MacLaren Plansearch 1997b). Distances of 300–400 m and 400–600 m from Venture and Thebaud, respectively, includes these predicted zones of influences.

4.2 Drill Waste Effects at Venture

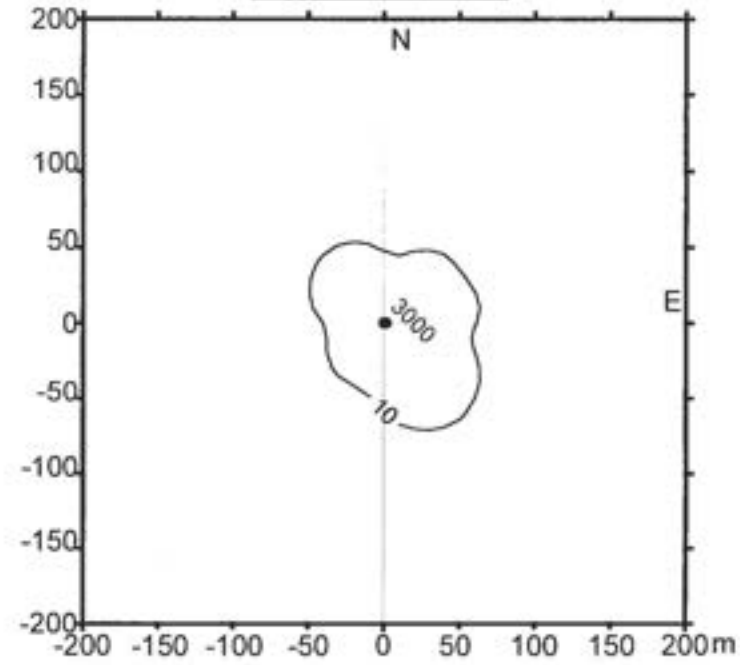
Three ROV surveys surrounding the Venture jacket and the RGII rig provide information on the dimensions of the cuttings pile boundary. The boundary of the cuttings pile visible to the ROV operator was assumed to represent a 1.0 cm cuttings depth as heights less than 1 cm may not be accurately discernable through the use of an ROV. This boundary was compared to the predicted 1.0 cm cuttings pile contour in Figure 4.1. These model predictions were based on an assumed volume of 5,612 m³ of cuttings being discharged at the Venture field whereas only 2,622 m³ of cuttings were actually discharged. At 150–300 m from the cuttings discharge point, this drill waste layer thickness was predicted to:

- contain hydrocarbon concentration at the 10,000 ppm range,
- smother all benthos, and
- have pronounced toxicity and tainting effects.

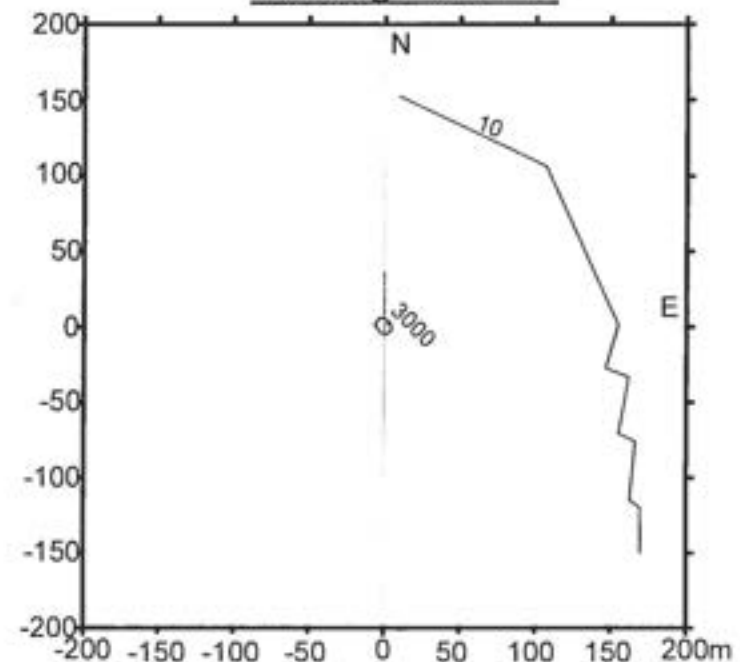
The ROV survey shows that the maximum observable radius of the cuttings pile for any of the three ROV surveys was approximately 66 m in the October 17, 1999 survey. The October 20, 1999 survey showed a maximum radius of the cuttings pile of 63 m and 60 m in the December 6, 1999 survey. These values

planned: 2001-2009/05/03/multiple models/venture,ref

October 20, 1999



Modeling Prediction



suggest that the cuttings pile may have reduced from the October 20 survey to the December 6 survey. The benthos is smothered under the thick drill waste layer to the edge of the pile. The pile edge is abrupt (measured by ROV at 20–30 cm high) as shown in Photo 4 with little evidence of smothering beyond.

Elevated levels of total petroleum hydrocarbons in sediments were detected in the second drilling survey (June 1999), at the 250 m distance along the northeast and southwest directions (axes 3, 5 and 7) at concentrations between 20–30 ppm, well below the 10,000 ppm predicted. Hydrocarbon concentrations at 500 m and beyond were within background levels and below the predicted 10 ppm where biological effects are expected.

Sediment metal concentrations were not modelled in the Environmental Impact Assessment Report (SOEI 1996, MacLaren Plansearch 1997). However, barium has proven to be a reasonable indicator of drill wastes (Hartley 1996, Kennicutt *et al.* 1996). There were no significant increases in barium in the Venture field samples; however barium concentration at the 250 m station on axis 5 in the November 1999 survey shows a slight increase indicating a potential for an effect in this area. TPH at this station is not particularly elevated, but this is an area to observe for potential change.

No toxic effects upon amphipod survival were found at any of the Venture or Gully stations during any of the surveys. Echinoid fertilizations showed random toxic effects throughout the field in baseline and drilling surveys, and were not correlated to TPH concentration. No toxic effect in the Microtox™ tests resulted at any station in any survey. Pronounced toxic effects were predicted to result where hydrocarbon concentrations were in the 10,000 ppm range such high levels have not been detected to date as discussed above.

Sensory evaluations and body burden testing for hydrocarbons at Venture have shown low levels of hydrocarbon in the oil base mud region in blue mussels and scallops tissues. A significant odour difference in bottom moored mussels 4 km away was the result of a phytoplankton species in the first moored set; no taint in flavours were detected. Subsequently, tainting has not been detected in the scallop or mussels tested over the past 18 months of offshore drilling at any of the moored stations. Analysis of suspended particulate matter for flocculated drill wastes has shown no evidence of drill waste in the benthic boundary layer.

4.3 Drill Wastes Effects at Thebaud

Two ROV surveys undertaken at the Thebaud jackets and Santa Fe Galaxy rig provide information on dimensions of the cuttings pile boundary. The model predictions were based on an assumed volume of 3,785 m³ of cuttings being discharged at the Thebaud field whereas 2,705 m³ of cuttings were actually discharged from the Santa Fe Galaxy II at Thebaud. For Thebaud, at 100 m from the cuttings discharge point, this drill waste layer thickness was predicted to:

- be 1.0 cm thick;
- contain hydrocarbon concentration at the 10,000 ppm range;
- smother all benthos, and
- have pronounced toxicity and tainting effects.

The ROV survey showed that the maximum radius of the cuttings pile was observed to occur at approximately 45 m in the November 5, 1999 survey and 47 m in the November 25, 1999 survey. This indicates that modeling overestimated the areal extent of the cuttings pile boundary. Smothering of benthic fauna would result within the 47 m radius which is half the distance predicted (Figure 4.2).

The closest sampling distance is 250 m from the platform. Between 400–600 m, the drill waste layer thickness was predicted to :

- be 1.0 mm thick;
- contain hydrocarbon concentrations of 1,000 ppm; and
- cause a 50% reduction in abundance and diversity.

The 1.0 mm thickness in drill waste layer is virtually impossible to measure as this would represent a dusting over the surface of the sandy seafloor of the thickness equivalent to the grain size of sand.

Elevated petroleum hydrocarbons were detected at 250 and 500 m sampling radii in the first drilling survey (June 1999). Axes 3 and 7, located along the direction of predicted prevailing current exhibited the highest concentrations. The highest TPH level was at the 250 m station (1550 ppm), which falls within the prediction concentration for the 400–600 m range. The other stations at 250 and 500 m had levels <590 ppm, which is approximately half of the predicted concentration for that distance range. At distances >800 m, there was a slight elevation along axis 3 at 1000 m (35.5 ppm) which is within the order of predicted order of magnitude. Attenuation of drill waste from source appears to occur along axis 3 in an easterly direction as predicted. The high concentrations at the 250 and 500 m distance are not evident in the following November 1999 survey indicating that sediment transport is burying surficial sediments or biodegradation of these synthetic-based muds is occurring. In aerobic conditions, NovaPlus™ drill mud is biodegraded by 72% in 28 days where it is biodegraded by 38+% in 128 days in anaerobic conditions (Darryl Cullum, pers. comm.).

Elevated barium concentration in sediments correlates exactly with elevated TPH values at the 250 m stations on axes 3 and 7, and with the 500 m station on axis 7 in the June 99 survey. Barium levels at all stations are similar to background for all other remaining surveys.

No reduction to the magnitude of 50% in abundance or diversity was evident in the dominant epifauna species. The diversity of epibenthic species is naturally very low.

Amphipod mortalities occurred in the June 99 drilling survey at the two 250 m stations where high levels of hydrocarbon (1550 and 586 ppm) were detected. Low levels of toxicity were present during that survey at two other stations, however, TPH was <10 ppm. These mortalities were not evident in the following November 1999 survey, as well the TPH levels had decreased significantly (<25 ppm). The echinoid fertilization test showed random toxic effects at 4–5 stations for every survey including the two baseline surveys. No correlation with TPH exists. The two 250 m stations with the elevated TPH noted above, had percent fertilizations >79%. No toxic effect in the Microtox™ tests resulted at any station in any survey.

Sensory evaluations of mussels for Thebaud are currently undergoing analysis and the results are not available for this report. No obvious taint was detected in wild scallops collected downstream from the field area. Adductor muscle in some Thebaud scallop were lightly contaminated with volatile hydrocarbons. Fingerprinting of these scallop tissues with known sources from SOEI, COPAN and diesel fuel did not find a match. Analysis for barium and bentonite sized particles in SPM for flocculated drill waste in the BBL showed that drill wastes were not detected during the surveys.

4.4 Drill Waste Effects at North Triumph

No ROV survey data are available for the North Triumph cuttings pile to allow comparison between the actual data and modeling predictions.

Assuming that the 1 cm boundary limit is suitable to delineate the drill waste pile for reasons previously discussed above, the modelling predicted an areal extent of 40–80 m. The closest sampling distance is 250 m from the platform. Between 100–200 m, the drill waste layer thickness was predicted to :

- be 1.0 mm thick;
- contain hydrocarbon concentrations of 1,000 ppm; and
- cause a 50% reduction in abundance and diversity.

During the first drilling survey for this field in the November 1999, three of the four 250 m stations (on axes 1, 5 and 7) had elevated TPH between 53.4 and 2440 ppm. Axis 7 had the highest level and is the axis of predicted prevailing current. TPH attenuates to 500 m at 613.0 ppm and to 1000 m at 52.7 ppm, beyond which TPH is at background levels. These concentrations with distance approximate that which was modelled for North Triumph.

Barium concentrations are elevated by an order of magnitude at the same 250 m and 500 m stations with elevated hydrocarbons noted above.

No reduction in the magnitude of 50% in abundance or diversity was evident in the dominant epifauna species. The diversity of epibenthic species is naturally low, but somewhat higher than Venture and Thebaud where considerable scouring of the seafloor occurs.

Amphipod mortality tests shows toxic effects at the 250 m stations along axes 1 and 7. The station on axis 7 had the highest overall TPH and barium levels and also the lowest amphipod survival. Sieved sediment from axes 1 and 7 had visible black oil globules. A baseline sample at 20,000 m had a toxic effect on amphipods; this result is not related to this project. The echinoid fertilization test shows no toxic effect on the two 250 m stations (>70% fertilization) that correlate with the elevated TPH, barium or high amphipod mortality results. For the November 1999 drilling survey, 9 of 14 stations had toxic results to fertilization. For the baseline surveys 13 of 14 and 4 of 14 stations had toxic effects on echinoid fertilization.

Sensory evaluations with moored mussels from North Triumph are currently undergoing analysis and the results are not available for this report. No obvious taint was detected in wild scallops collected downcurrent from the field area. Analysis for barium and bentonite sized particles in SPM for flocculated drill waste in the BBL showed that drill wastes were not detected during the surveys.

5.0 CONCLUSIONS

The main conclusion that can be drawn from these 1999 offshore EEM program results is that the models used in the EIS predictions overestimated the extent of impact from the discharge of drilling wastes. The Joint Public Review Panel Report concluded that the SOE Project was not likely to cause significant adverse environmental effects, provided that appropriate mitigation was applied. Therefore, the effects observed in the field to date validate the conclusions of the EIS and in fact, are far less of an impact than anticipated. Specific project conclusions for EEM Program components are as follows.

- The appearance and disappearance of detectable drill waste within 250 m and 500 m at Venture and Thebaud between drilling surveys demonstrates the dynamic nature of the seabed in Sable Island Bank shallow waters (Amos *et al.* 1988). Photo 4 depicts a buried ADCP deployed at Venture, which occurred sometime over a three month recording period provides a visual reference to the significance of sediment transport in the area.
- There did not appear to be any significant effects that could be attributed to drilling activity for inorganic or organic contaminants other than barium and TPH.
- All amphipod mortality toxicity effects and elevated TPH and barium concentrations in sediment were found along the prevailing currents as established in the sampling design, but at concentrations far less than predicted.
- The drill waste piles were considerably smaller than modelled.
- The active nature and megaripple features of the seafloor at the shallower Thebaud and Venture sides precludes stable colonisation of many epifaunal organisms and accurate sampling by remote means. The siltier sediment at North Triumph is a more suitable habitat for brittlestars, and the more quiescent nature of sediment transport at the deeper depths permits a more diverse benthic community to develop.
- Reasons for not detecting flocculated drill wastes could include: that the periodic sampling does not coincide when floc is present; or that floc is not generated from the discharge of the NovaPlus synthetic-based drill mud in the quantities anticipated through modelling. The longterm fate modelling assumed "the estimated drill cuttings sediment distribution contained a large fraction of non-cohesive characteristics, it is likely that a large percentage of the cuttings mound distribution will erode under similar conditions as the natural bottom material" (MacLaren Plansearch 1997 a,b). The drill waste has been described by SOEI personnel as sticky, perhaps the cohesive factor was originally underestimated. The underwater post-scour storm video shows clumping of the drill waste suggesting that perhaps a smaller amount of drill muds may be available for flocculation than modelled.

- Hydrocarbons are detected in shellfish tissues but appear not to be causing taint.
- It is realistic to assume that the marine mammals observed from the fixed platforms is also within the acoustic range of the sound spectra radiating from the drilling activities.
- Low incidence of dead birds and the high frequency of the surveys suggest there was likely no large scale bird fatalities in the vicinity of the platforms. None of the oiled seabirds found on Sable Island beaches contained hydrocarbons traceable to the SOEI EEM Program.
- Over a one month monitoring period, October - November, 1999, Sable Island air quality was not affected by flare emissions from SOEI Operations.
- The experience gained to date warrants the consideration of modifications of the sampling program which is an inherent feature of the feedback system of EEM programs and a SOEI commitment in the continuous improvement process of the EMP.

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6.2 Personal Communications

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PROJECT NO.12989

REPORT TO

SABLE OFFSHORE ENERGY INC.

ON

**1999 ANNUAL REPORT
OFFSHORE ENVIRONMENTAL EFFECTS MONITORING PROGRAM
VOLUME 2:APPENDICES**

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19	Thebaud OIM	Thebaud Offshore Installation Manager	Thebaud Platform
20	Gas Plant Lead	Control Room Gas Plant	Goldboro
21	Frac Plant Lead	Fractionation Plant Office	Point Tupper
22	Charles Rogers	Well Construction Manager	6 th Floor Founders

LIST OF APPENDICES

Appendix A Material Safety Data Sheet for NovaPlus™

Appendix B Particle Size Analysis Results

- Appendix B-1 Particle Size Analysis Results for Fall 1998
- Appendix B-2 Particle Size Analysis Results for June 1999

Appendix C Laboratory Analytical Data for Sediment from "The Gully" and Venture Field

- Appendix C-1 June 1998 Gully Data
- Appendix C-2 Fall 1998 Gully Data
- Appendix C-3 June 1999 Gully Data
- Appendix C-4 Fall 1999 Gully Data
- Appendix C-5 June 1998 Venture Data
- Appendix C-6 Fall 1998 Venture Data
- Appendix C-7 June 1999 Venture Data
- Appendix C-8 Fall 1999 Venture Data

Appendix D Laboratory Analytical Results for Sediment from Thebaud Field

- Appendix D-1 June 1998 Data
- Appendix D-2 June 1999 Data
- Appendix D-3 Fall 1999 Data

Appendix E Laboratory Analytical Results for Sediment from North Triumph Field

- Appendix E-1 Fall 1998 Data
- Appendix E-2 June 1999 Data
- Appendix E-3 Fall 1999 Data

Appendix F Location of Rigs to its Respective Jacket/Platform

- Appendix F-1 Location of Santa Fe Galaxy II in Relation to Thebaud Wellhead Platform
- Appendix F-2 Location of Rowan Gorilla II in Relation to Venture Jacket

Appendix G Results of Sensory Evaluations and Hydrocarbon Body Burden in Shellfish

- Appendix G-1 Evaluation of Mussels for Tainting Hydrocarbons December 23, 1998
- Appendix G-2 Supplementary Report (to December 23, 1998) on Evaluation of Mussels for Tainting Hydrocarbons January 18, 1999
- Appendix G-3 Evaluation of Mussels for Tainting Hydrocarbons June 15, 1999
- Appendix G-4 Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons November 19, 1998
- Appendix G-5 Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons December 2, 1999



Appendix H Information on Recovery of Injured Raptor

Appendix H-1 Halifax Chronicle Herald Article from October 23, 1999

Appendix H-2 Letter from Atlantic Raptor Rehabilitation Centre



Appendix A
Material Safety Data Sheet for NovaPlus™

HI 61
June 24, 2001
Sept 9-10

MATERIAL SAFETY DATA SHEET

NOVAPLUS

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: NOVAPLUS

APPLICATIONS: Synthetic-based drilling fluid.

EMERGENCY TELEPHONE: 281-561-1600

SUPPLIER: Supplied by a Business Unit of
M-I L.L.C.
P.O. Box 42842, Houston, Texas 77242-2842
See cover sheet for local supplier.

TELEPHONE: 281-561-1509

FAX: 281-561-7240

CONTACT PERSON: Sam Hoskin

2. COMPOSITION, INFORMATION ON INGREDIENTS

INGREDIENT NAME:	CAS No.:	CONTENTS :	EPA RC:	TPQ:
Silica, crystalline, quartz	14808-60-7			
Silica, crystalline, Cristobalite	14464-46-1			
Silica, crystalline, Tridymite	15468-32-3			
Gypsum	13397-24-5			
Diethylenetriamine	111-40-0			
Methyl alcohol	67-56-1		5 000 lbs	
Sodium chloride	7647-14-5			
Calcium hydroxide	1305-62-0			
Calcium chloride	10043-52-4			
Synthetic hydrocarbon				

COMPOSITION COMMENTS:

This MSDS is designed to give general information about M-I's NOVAPLUS drilling fluid.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore a complete disclosure of a particular fluid's composition is impractical.

The ingredients listed above are constituents of the various products which may be present in a NOVAPLUS fluid.

Synthetic hydrocarbon is a synthetic oligomer which is the liquid fraction of the fluid, typically 60-80% by volume.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

CAUTION! MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

This product is a/an to tan brown liquid Dike and contain spills. Keep out of sewers and waterways.
light

ACUTE EFFECTS:

INHALATION: Irritating to the respiratory tract if inhaled.

INGESTION: May cause gastric distress, nausea and vomiting if ingested.

SKIN: Irritating to the skin.

EYES: Irritating to the eyes.

CHRONIC EFFECTS:**CARCINOGENICITY:**

IARC: Not listed. OSHA: Not regulated. NTP: Not listed.

ROUTE OF ENTRY:

Inhalation. Skin and/or eye contact.

TARGET ORGANS:

Respiratory system, lungs. Skin. Eyes.

4. FIRST AID MEASURES

INHALATION: Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Get medical attention.

INGESTION: Drink a couple of glasses water or milk. Do not give victim anything to drink if he is unconscious. Get medical attention.

SKIN: Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYES: Promptly wash eyes with lots of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

AUTO IGNITION TEMP. (°F): N/D

FLAMMABILITY LIMIT - LOWER(%): N/D

FLAMMABILITY LIMIT - UPPER(%): N/D

EXTINGUISHING MEDIA:

Carbon dioxide (CO2). Dry chemicals. Foam. Water spray, fog or mist.

SPECIAL FIRE FIGHTING PROCEDURES:

Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire fighting clothing (including fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

UNUSUAL FIRE & EXPLOSION HAZARDS:

No unusual fire or explosion hazards noted.

HAZARDOUS COMBUSTION PRODUCTS:

Irritating gases/vapors/fumes. Oxides of Carbon.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Wear proper personal protective equipment (see MSDS Section 8).

SPILL CLEAN-UP PROCEDURES:

Absorb in vermiculite, dry sand or earth and place into containers. Rinse area with water. Dike far ahead of larger spills for later disposal. Do not contaminate drainage or waterways.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:

Ventilate well, avoid breathing vapors. Use approved respirator if air contamination is above accepted level. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed.

STORAGE PRECAUTIONS:

No special precaution for storing.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

INGREDIENT NAME:	CAS No.:	OSHA PEL:		ACGIH TLV:		OTHER:		UNITS:
		TWA:	STEL:	TWA:	STEL:	TWA:	STEL:	
Silica, crystalline, quartz	14808-60-7	*		0.1				mg/m3 resp.dust
Silica, crystalline, Cristobalite	14464-46-1	*		0.05				mg/m3 resp.dust
Silica, crystalline, Tridymite	15468-32-3	*		0.05				mg/m3 resp.dust
Gypsum	13397-24-5	15						mg/m3 total dust
Diethylenetriamine	111-40-0			4.2 Sk				mg/m3
Methyl alcohol	67-56-1	260 Sk		262 Sk	328			mg/m3
Sodium chloride	7647-14-5	5		3				mg/m3 resp.dust
Calcium hydroxide	1305-62-0	15		5				mg/m3 total dust
Calcium chloride	10043-52-4	5		3				mg/m3 resp.dust
Synthetic hydrocarbon		5 *		5 *	10 *			mg/m3

INGREDIENT COMMENTS:

* OSHA PELs for Mineral Dusts containing crystalline silica are 10 mg/m3 / (%SiO2+2) for quartz and 1/2 the calculated quartz value for cristobalite and tridymite. * Exposure limits are for Oil mist, mineral. Exposure limits for Particulates Not Otherwise Classified (PNOC) are applicable to mists/aerosols of IO 1618.

PROTECTIVE EQUIPMENT:



ENGINEERING CONTROLS:

Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to reduce air contamination and keep worker exposure below the applicable limits.

- VENTILATION:** Supply natural or mechanical ventilation adequate to exhaust airborne product and keep exposures below the applicable limits.
- RESPIRATORS:** If exposed to particulates/aerosols:
Use at least a NIOSH-approved N95 half-mask disposable or reusable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reusable particulate respirator.
If exposed to organic vapors:
Use a NIOSH/MSHA-approved organic vapor respirator.
- PROTECTIVE GLOVES:**
Chemical resistant gloves required for prolonged or repeated contact. Use protective gloves made of impermeable material. Such as, Nitrile, or Neoprene.
- EYE PROTECTION:**
Wear chemical safety goggles where eye exposure is reasonably probable.
- PROTECTIVE CLOTHING:**
Wear appropriate clothing to prevent repeated or prolonged skin contact. Use rubber boots. Wear long-sleeve impermeable coveralls for torso and limb protection whenever heavy exposure is anticipated. Nitrile- or neoprene-coated nylon or equivalent material is recommended. Tyvek coveralls may be substituted during hot weather. If Tyvek coveralls become torn or saturated change them immediately.
- HYGIENIC WORK PRACTICES:**
Use a barrier cream designed to protect against oil-based hazards on areas not covered by protective clothing. Follow manufacturer's recommendations.
- Promptly remove non-impervious clothing that becomes wet or contaminated.
- Wash promptly with soap & water if skin becomes contaminated. Do not wash skin with diesel oil, gasoline or strong detergents, such as rag wash. Change work clothing daily if there is any possibility of contamination. Wash entire body with soap and water at end of each exposure period. Use appropriate hand lotion to prevent defatting and cracking of skin.
- Isolate contaminated clothing and wash before reuse. Ensure that contaminated clothing is thoroughly cleaned before wearing. This may require washing several times in hot water.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE:	Liquid.	
COLOR:	Grey, to Brown.	
ODOR:	Hydrocarbon.	
SOLUBILITY DESCRIPTION:	Insoluble in water.	
BOILING POINT (°F, interval):	-545	PRESSURE: 760mmHg
DENSITY/SPECIFIC GRAVITY (g/ml):	1.0 - 2.4	TEMPERATURE (°F): 68
VAPOR DENSITY (air=1):	N/D	
VAPOR PRESSURE:	N/D	TEMPERATURE (°F):
EVAPORATION RATE:	N/D	REFERENCE:
pH-VALUE, DILUTED SOLUTION:	N/A	CONCENTRATION (%M):
PARTITION COEFF. (log Pow):	8.57 (Base fluid - IO 1618)	

10. STABILITY AND REACTIVITY

- STABILITY:** Normally stable.
- CONDITIONS TO AVOID:**
N/A.
- HAZARDOUS POLYMERIZATION:**
Will not polymerize.

POLYMERIZATION DESCRIPTION:
Not relevant.**MATERIALS TO AVOID:**
Strong oxidizing agents.**HAZARDOUS DECOMPOSITION PRODUCTS:**
No specific hazardous decomposition products noted.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

Corrosive effects.	4 hours.	Skin.	Rat.	Slightly - moderately irritating
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TOXICOLOGICAL INFORMATION:

Toxicological data for major component(s):

Component: Diethylenetriamine

TOXICOLOGICAL DATA:

Corrosive effects.	Eye irritation test.			Rabbit.	750 ug - Severe Irritation
Corrosive effects.		24 hours.	Skin.	Rabbit.	10 mg - Severe Irritation

TOXIC DOSE - LD 50: 1080 mg/kg (oral rat)

TOXIC DOSE - LD 50: 1090 mg/kg (skin-rbt)

Component: Methyl alcohol

TOXICOLOGICAL DATA:

Corrosive effects.		24 hours.	Eye.	Rabbit.	100 mg - Moderate Irritation
Corrosive effects.		24 hours.	Skin.	Rabbit.	20mg - Moderate Irritation
Acute toxicity.	LDLo.		Oral.	Human.	143 mg/kg

TOXIC DOSE - LD 50: 5628 mg/kg (oral rat)

TOXIC CONC. - LC 50: 64000 ppm/4h (inh-rat)

Component: Sodium chloride

TOXIC DOSE - LD 50: 3000 mg/kg (oral rat)

Component: Calcium hydroxide

TOXIC DOSE - LD 50: 7340 mg/kg (oral rat)

Component: Calcium chloride

TOXIC DOSE - LD 50: 1000 mg/kg (oral rat)

12. ECOLOGICAL INFORMATION

IC 50, 72 HRS, ALGAE, mg/l: 2,046

BIOACCUMULATION:

No bioaccumulation is expected due to the high molecular weight.

BIODEGRADABILITY:

Readily biodegradable under aerobic conditions, 72% in 28 days, by OECD Method 306.

ACUTE AQUATIC TOXICITY:

Passes mysid shrimp toxicity test required by Gulf of Mexico NPDES permit. LC50 values are typically >200,000 ppm.

13. DISPOSAL CONSIDERATIONS

WASTE MANAGEMENT:

Contact M-I's Environmental Affairs Department for waste management assistance.

DISPOSAL METHODS:

Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that containers are empty by RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

GENERAL:

RQ = N/A

U.S. DOT:

U.S. DOT CLASS:

Not regulated.

CANADIAN TRANSPORT:

TDGR CLASS:

Not regulated.

SEA TRANSPORT:

IMDG CLASS:

Not regulated.

AIR TRANSPORT:

ICAO CLASS:

Not regulated.

15. REGULATORY INFORMATION

REGULATORY STATUS OF INGREDIENTS:

NAME:	CAS No:	TSCA:	CERCLA:	SARA 302:	SARA 313:	DSL(CAN):
Silica, crystalline, quartz	14808-60-7	Yes	No	No	No	Yes
Silica, crystalline, Cristobalite	14464-46-1	Yes	No	No	No	Yes
Silica, crystalline, Tridymite	15468-32-3	Yes	No	No	No	Yes
Gypsum	13397-24-5	Yes	No	No	No	Yes
Diethylenetriamine	111-40-0	Yes	No	No	No	Yes
Methyl alcohol	67-56-1	Yes	Yes	No	Yes	Yes
Sodium chloride	7647-14-5	Yes	No	No	No	Yes
Calcium hydroxide	1305-62-0	Yes	No	No	No	Yes
Calcium chloride	10043-52-4	Yes	No	No	No	Yes
Synthetic hydrocarbon		Yes	No	No	No	Yes

US FEDERAL REGULATIONS:

WASTE CLASSIFICATION:

Drilling fluids used in oil and gas well drilling are classified as Non-hazardous Oilfield Waste (NOW).

REGULATORY STATUS:

This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

SARA 311 Categories:

1. Immediate (Acute) Health Effects.
2. Delayed (Chronic) Health Effects.

TSCA: The ingredients of this product are on the TSCA Inventory.

STATE REGULATIONS:

STATE REGULATORY STATUS:

This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):
See appropriate State regulations for oil and gas E&P wastes.

CANADIAN REGULATIONS:
LABELS FOR SUPPLY:

REGULATORY STATUS:

This Material Safety Data Sheet has been prepared in compliance with the Controlled Product Regulations. D2A - Other Toxic Effects: Very Toxic Material

16. OTHER INFORMATION

NPCA HMIS HAZARD INDEX:

* 2 Moderate Hazard

FLAMMABILITY:

1 Slight Hazard

REACTIVITY:

0 Minimal Hazard

NPCA HMIS PERS. PROTECT. INDEX:

X Ask your supervisor for guidance

USER NOTES:

NA = Not applicable ND = Not determined

INFORMATION SOURCES:

OSHA Permissible Exposure Limits, 29 CFR 1910, Subpart Z, Section 1910.1000, Air Contaminants.

ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (latest edition).

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Silica, Some Silicates, Coal Dust, and para-Aramid Fibers, Vol. 68, World Health Organization, Lyon, France, 1997.

Sax's Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed.), VNR, New York, New York, (1997).

PREPARED BY:

Semi Hoskin

REVISION No.:

0

MSDS STATUS:

Approved.

DATE: June 24, 1998

DISCLAIMER:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources

each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be
herein is made or incurred hereunder.

Appendix B: Particle Size Analysis Results

- Appendix B-1: Particle Size Analysis Results for Fall 1998
- Appendix B-2: Particle Size Analysis Results for June 1999

Appendix B-1
Particle Size Analysis Results for Fall 1998

Particle Size Analysis Results Fall 1998

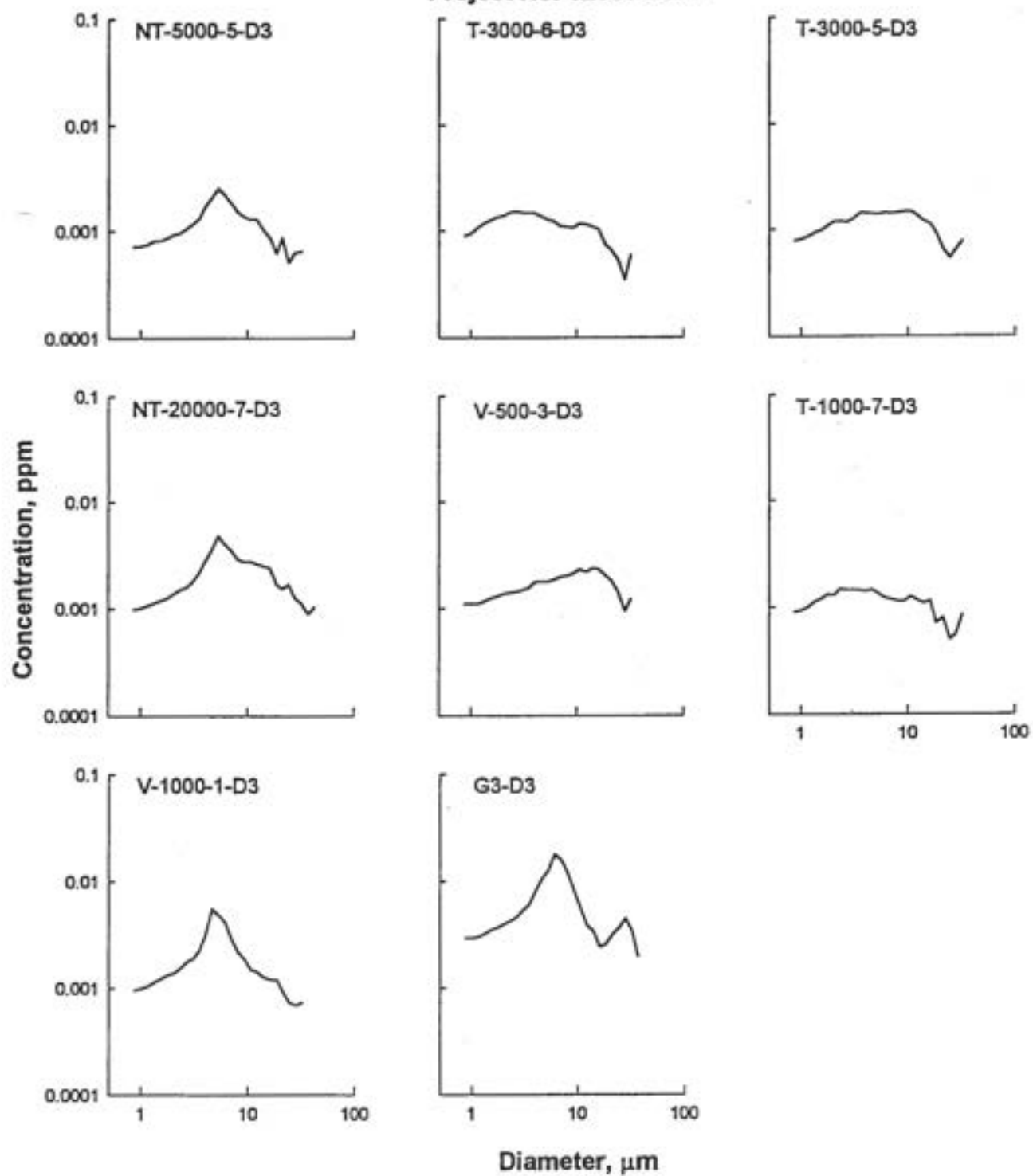
ID#	990622001	990622002	990622003	990622004
Filter	6	17	104	110
-W ID	V-250-7B	V-250-5B	V-250-3B	V-250-1B
Total ppm	0.047378304	0.069452902	0.013786791	0.019881799
Diameter				
0.87	0.001571201	0.002113061	0.000436291	0.000487468
1.00	0.001801029	0.002367190	0.000450972	0.000518476
1.15	0.002018077	0.002755010	0.000485102	0.000561096
1.32	0.002248400	0.003050133	0.000510907	0.000613519
1.52	0.002445581	0.003313265	0.000565487	0.000703395
1.74	0.002581052	0.003466090	0.000603560	0.000725695
2.00	0.002675224	0.003618592	0.000634237	0.000752052
2.30	0.002694001	0.003750452	0.000652470	0.000830678
2.64	0.002752859	0.003873085	0.000663797	0.000890935
3.03	0.002856746	0.003949878	0.000698490	0.000900606
3.48	0.003021245	0.004283213	0.000783844	0.000908855
4.00	0.003022264	0.004693994	0.000840594	0.001057662
4.59	0.002864497	0.004491421	0.000771574	0.001026254
5.28	0.002497532	0.004076685	0.000780912	0.001049140
6.06	0.002281165	0.003672432	0.000882317	0.001090625
6.96	0.002019368	0.003292793	0.000810415	0.001110817
8.00	0.001679529	0.002775009	0.000646913	0.001032739
9.19	0.001315136	0.002339895	0.000564277	0.000987952
10.56	0.001151952	0.001838546	0.000505362	0.000955123
12.13	0.001054817	0.001536248	0.000402235	0.000887270
13.93	0.000856243	0.001453327	0.000360697	0.000764428
16.00	0.000646278	0.000979120	0.000303949	0.000594034
18.38	0.000481143	0.000801231	0.000141865	0.000568423
21.11	0.000321104	0.000579447	0.000148930	0.000449047
24.25	0.000289710	0.000382783	0.000141591	0.000207884
27.86	0.000232153			0.000207626
32.00				
36.76				

Particle Size Analysis Results Fall 1998

ID#	990622005	990622006	990622007	990622008
Filter	5	29	37	43
V-W ID	V-250-5-D1	V-250-7-D1	V-250-3-D1	V-250-1-D1
Total ppm	0.028347509	0.031607239	0.028309516	0.027799959
Diameter				
0.87	0.000700872	0.000950890	0.000673715	0.000682814
1.00	0.000754416	0.001024934	0.000729760	0.000746603
1.15	0.000800017	0.001071338	0.000776718	0.000819603
1.32	0.000876990	0.001143642	0.000849880	0.000902593
1.52	0.000971027	0.001204277	0.000917571	0.001002344
1.74	0.001014200	0.001266020	0.001013029	0.001019091
2.00	0.001061613	0.001276380	0.001087202	0.001031243
2.30	0.001061088	0.001282237	0.001162061	0.001048877
2.64	0.001151018	0.001320155	0.001102304	0.001089838
3.03	0.001059606	0.001338913	0.001243850	0.001191671
3.48	0.001253226	0.001277455	0.001332736	0.001210437
4.00	0.001235166	0.001316908	0.001355657	0.001347577
4.59	0.001211711	0.001263667	0.001328045	0.001329309
5.28	0.001307495	0.001266108	0.001360513	0.001417695
6.06	0.001391552	0.001348182	0.001418371	0.001518524
6.96	0.001451487	0.001333189	0.001490805	0.001541190
8.00	0.001477145	0.001331937	0.001489965	0.001594543
9.19	0.001327277	0.001178284	0.001361660	0.001468358
10.56	0.001265962	0.001190066	0.001293501	0.001377831
12.13	0.001599224	0.001499999	0.001274371	0.001480558
13.93	0.001637887	0.001390345	0.001331367	0.001339677
16.00	0.001285838	0.001269737	0.001215265	0.000815542
18.38	0.000783085	0.000845195	0.000824929	0.000675908
21.11	0.000565993	0.000644088	0.000558344	0.000568444
24.25	0.000416328	0.000504691	0.000276789	0.000339672
27.86	0.000346450	0.000402852	0.000340752	0.000240017
32.00	0.000340837	0.000414856	0.000500358	
36.76		0.000451917		

Appendix B-2
Particle Size Analysis Results for June 1999

Jacques Whitford Environment Limited
Project No. 12989-8903



Jacques Whitford Project # 12989-8903 BBL samples

FILTER #	[Ba] ug	Our ID NUMBER	VOLUME (ml)	ASH WT	sample+	beaker
NT-5000-5-D3	10.1	000208001	4000	0.00017	8.2419	8.24173
T-3000-6-D3	6.7	000208002	4000	0.0006	9.0909	9.0903
T-3000-5-D3	4.9	000208003	4000	0.0006	8.025	8.0244
NT-20000-7-D3	4.9	000208004	4000	0.0021	8.1299	8.1278
V-500-3-D3	4.8	000208005	4000	0.00098	8.1488	8.14782
T-1000-7-D3	4	000208006	4000	0.00028	8.1176	8.11732
V-1000-1-D3	3.9	000208007	4000	0.00038	7.9548	7.95442
G3-D3	3.8	000208008	4000	0.00071	8.2856	8.28489

Particle Size Analysis Results for June 1999

OUR ID	000208001	000208002	000208003	000208004	000208005	000208006
Sample ID	NT-5000-5-D3	T-3000-6-D3	T-3000-5-D3	NT-20000-7-D3	V-500-3-D3	T-1000-7-D3
Total ppm	0.031434624	0.030168789	0.030512157	0.059806167	0.044802908	0.030852068
5	0.000719458	0.000906809	0.000784997	0.000991748	0.001118793	0.000906431
6	0.000728123	0.000957668	0.000816879	0.001030039	0.001132925	0.000944111
7	0.000763573	0.001081612	0.000870129	0.001081069	0.00112279	0.00101081
8	0.00082226	0.001175834	0.000934793	0.001145431	0.001188724	0.001130793
9	0.000820176	0.001270664	0.000989146	0.001204667	0.001263319	0.001203831
10	0.000877879	0.001354004	0.001091715	0.00127337	0.001325103	0.001334271
11	0.000934931	0.00140262	0.001190407	0.001368194	0.001367604	0.001311225
12	0.000968302	0.001503613	0.001205501	0.001525326	0.001426092	0.001502607
13	0.001071621	0.001537562	0.001162201	0.001606475	0.001451632	0.001462731
14	0.001172416	0.0015008	0.001277119	0.001804269	0.001504546	0.001465316
15	0.001324997	0.001476481	0.001432694	0.002175032	0.001570191	0.001451774
16	0.00172984	0.001486519	0.001432094	0.002805788	0.001795441	0.001428765
17	0.002079095	0.001393259	0.001414022	0.003562011	0.001800113	0.001478462
18	0.002561867	0.001287582	0.001386588	0.004674932	0.001786406	0.001355953
19	0.002240367	0.00122873	0.001450569	0.004136821	0.001896817	0.001239105
20	0.001866468	0.001119963	0.001414868	0.003563649	0.002001953	0.001191989
21	0.001526427	0.001088799	0.001455096	0.002988106	0.00204022	0.001155801
22	0.001387373	0.001061757	0.001476197	0.002791702	0.002130954	0.001147345
23	0.001293946	0.001186073	0.001478923	0.00290799	0.002362924	0.001275515
24	0.001311253	0.0011501	0.001357807	0.002670218	0.002220245	0.001179941
25	0.001055454	0.001091675	0.001204491	0.002549775	0.002412414	0.001089611
26	0.000882407	0.00103311	0.00113047	0.002452438	0.002353455	0.001173974
27	0.000623917	0.000739495	0.000923542	0.001721699	0.002050698	0.000707305
28	0.000873837	0.000662391	0.000659095	0.001551344	0.001833013	0.000808935
29	0.000514216	0.000532364	0.000543827	0.001725187	0.001435089	0.000498909
30	0.000634228	0.000347838	0.000653219	0.001294397	0.000951394	0.00055362
31	0.000648194	0.000591444	0.000775771	0.001136392	0.001240053	0.000846938
32				0.000894632		
33				0.001053465		

Particle Size Analysis Results for June 1999

OUR ID	000208007	000208008
Sample ID	V-1000-1-D3	G3-D3
Total ppm	0.050330651	0.164837378
5	0.000970676	0.002955782
6	0.00099449	0.002958115
7	0.001057125	0.003039164
8	0.001147747	0.003236702
9	0.001239306	0.003560437
10	0.001338397	0.003710273
11	0.001401642	0.004012899
12	0.001552751	0.004285647
13	0.001773629	0.004614711
14	0.001933469	0.005371284
15	0.002257296	0.006048241
16	0.003209489	0.008298135
17	0.005592222	0.010733729
18	0.004903189	0.012754318
19	0.004170301	0.018112496
20	0.002988873	0.015918156
21	0.002215653	0.011958933
22	0.001904271	0.008225056
23	0.001509205	0.005718087
24	0.00142532	0.003936197
25	0.001274963	0.003440548
26	0.001208072	0.002456113
27	0.001195245	0.002620627
28	0.000916667	0.003215657
29	0.000730134	0.003686609
30	0.000687523	0.004477498
31	0.000732995	0.003490489
32		0.002001275
33		

**Appendix C: Laboratory Analytical Data for Sediment
from "The Gully" and Venture Field**

- Appendix C-1: June 1998 Gully Data
- Appendix C-2: Fall 1998 Gully Data
- Appendix C-3: June 1999 Gully Data
- Appendix C-4: Fall 1999 Gully Data
- Appendix C-5: June 1998 Venture Data
- Appendix C-6: Fall 1998 Venture Data
- Appendix C-7: June 1999 Venture Data
- Appendix C-8: Fall 1999 Venture Data

**Appendix C-1: Laboratory Analytical Data for Sediment
from "The Gully", June 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1a: Trace Elements at Gully Stations - June 1998

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
Gully 1		7420	<2	<2	120	<5	<5	<0.3	3	<1	<2
Gully 2		4700	<2	<2	78	<5	<5	<0.3	<2	<1	<2
Gully 3		6970	<2	<2	120	<5	<5	<0.3	3	<1	<2
Gully 4		7960	<2	<2	130	<5	<5	<0.3	2	<1	<2
Gully 4	Lab Dup.	7910	<2	<2	150	<5	<5	<0.3	2	<1	<2
Gully 5		6240	<2	<2	110	<5	<5	<0.3	2	<1	<2

Unique_station_id	Replicate_id	Iron mg/kg	Lead mg/kg	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg
Gully 1		1400	2.8	<5	24	<2	0.01	<2	<2	34	0.1
Gully 2		610	2.00	<5	6	<2	<0.01	<2	<2	19	0.10
Gully 3		1300	3.00	<5	17	<2	<0.01	<2	<2	28	0.10
Gully 4		1100	3.70	<5	19	<2	<0.01	<2	<2	32	0.10
Gully 4	Lab Dup.	950	3.70	<5	19	<2	<0.01	<2	<2	34	0.10
Gully 5		630	2.80	<5	11	<2	<0.01	<2	<2	26	0.10

Unique_station_id	Replicate_id	Ti mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
Gully 1		<2	0.2	5	7
Gully 2		<2	0.20	2	5
Gully 3		<2	0.20	4	6
Gully 4		<2	0.20	3	6
Gully 4	Lab Dup.	<2	0.20	3	6
Gully 5		<2	0.10	2	5

TABLE 2a: Petroleum Hydrocarbons at Gully Stations - June 1998

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₇ -C ₉ mg/kg	C ₁₀ -C ₁₁ mg/kg	C ₁₂ -C ₁₄ mg/kg	TEH (C ₁₁ -C ₁₄) mg/kg	TPH mg/kg
Gully 1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
Gully 2		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
Gully 3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
Gully 4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
Gully 4	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
Gully 5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5

TABLE 3a: Polycyclic Aromatic Hydrocarbons at Gully Stations - June 1998

Unique_station_id	Replicate_id	Naphthalene mg/kg	2-Methylnaphthalene mg/kg	1-Methylnaphthalene mg/kg	Acenaphthylene mg/kg	Acenaphthene mg/kg
Gully 1		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 2		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 3		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4	Lab Dup.	<0.05	<0.05	<0.05	<0.05	<0.05
Gully 5		<0.05	<0.05	<0.05	<0.05	<0.05

Unique_station_id	Replicate_id	Fluorene mg/kg	Phenanthrene mg/kg	Anthracene mg/kg	Fluoranthene mg/kg	Pyrene mg/kg
Gully 1		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 2		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 3		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4	Lab Dup.	<0.05	<0.05	<0.05	<0.05	<0.05
Gully 5		<0.05	<0.05	<0.05	<0.05	<0.05

Unique_station_id	Replicate_id	Benzo(a)anthracene mg/kg	Chrysene mg/kg	Benzo(b)fluoranthene mg/kg	Benzo(k)fluoranthene mg/kg	Benzo(a)pyrene mg/kg
Gully 1		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 2		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 3		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4		<0.05	<0.05	<0.05	<0.05	<0.05
Gully 4	Lab Dup.	<0.05	<0.05	<0.05	<0.05	<0.05
Gully 5		<0.05	<0.05	<0.05	<0.05	<0.05

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
Gully 1		<0.05	<0.05	<0.05	<0.05
Gully 2		<0.05	<0.05	<0.05	<0.05
Gully 3		<0.05	<0.05	<0.05	<0.05
Gully 4		<0.05	<0.05	<0.05	<0.05
Gully 4	Lab Dup.	<0.05	<0.05	<0.05	<0.05
Gully 5		<0.05	<0.05	<0.05	<0.05

TABLE 4a: Sediment Quality at Gully Stations - June 1998

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
Gully 1		<0.10	0.30	0.8	98.3	0.1	0.8	0.0002	<0.3
Gully 2		0.10	0.20	0.9	98.3	<0.1	0.8	0.0004	<0.3
Gully 3		0.10	0.20	<0.1	99.2	<0.1	0.8	0.0005	<0.3
Gully 4		0.10	0.20	<0.1	99.2	<0.1	0.8	0.0002	<0.3
Gully 4	Lab Dup.	0.10	0.20	<0.1	99.2	<0.1	0.8		
Gully 5		0.20	0.20	<0.1	99.1	<0.1	0.9	0.0008	<0.3

TABLE 5a: Toxicity at Gully Stations - June 1998

Unique station id	Replicate id	Amphipod Mortality %	Survival Control Mortality %	Echinoid Fertilization % Fertilization	Microtox EC50
Gully 1		7	1	1.3	>100%
Gully 2		6	1	2.3	>100%
Gully 3		4	1	58	>100%
Gully 4		11	1	88.5	>100%
Gully 4	Lab Dup.				
Gully 5		5	1	90.5	>100%

**Appendix C-2: Laboratory Analytical Data for Sediment
from "The Gully", Fall 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1b: Trace Elements at Gully Stations - November 1998

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
Gully 1		15000	< 2	2	260	< 5	< 5	< 0.3	8	1	2
Gully 2		6200	< 2	2	97	< 5	< 5	< 0.3	2	< 1	< 2
Gully 2	Lab Dup.										
Gully 3		6290	< 2	< 2	100	< 5	< 5	< 0.3	2	< 1	< 2
Gully 4		8180	< 2	< 2	130	< 5	< 5	< 0.3	2	< 1	< 2
Gully 5		6360	< 2	< 2	110	< 5	< 5	< 0.3	< 2	< 1	< 2
Gully 5	Lab Dup.	6200	< 2	< 2	99	< 5	< 5	< 0.3	< 2	< 1	< 2

Unique_station_id	Replicate_id	Iron mg/kg	Lead mg/kg	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg
Gully 1		5000	6.6	< 5	100	< 2	< 0.01	2	< 2	61	0.2
Gully 2		1800	2.5	< 5	12	< 2	< 0.01	< 2	< 2	24	0.1
Gully 2	Lab Dup.										
Gully 3		831	2.5	< 5	8	< 2	< 0.01	< 2	< 2	31	0.1
Gully 4		1190	3.3	< 5	22	< 2	< 0.01	< 2	< 2	34	0.1
Gully 5		550	2.8	< 5	8	< 2	< 0.01	< 2	< 2	28	0.1
Gully 5	Lab Dup.	490	2.8	< 5	7	< 2	< 0.01	< 2	< 2	26	0.1

Unique_station_id	Replicate_id	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
Gully 1		< 2	0.3	13	11
Gully 2		< 2	0.2	5	6
Gully 2	Lab Dup.				
Gully 3		< 2	0.2	3	7
Gully 4		< 2	0.1	4	7
Gully 5		< 2	0.1	2	8
Gully 5	Lab Dup.	< 2	0.1	2	8

[illegible][illegible]

TABLE 3b: Polycyclic Aromatic Hydrocarbons at Gully Stations - November 1998

Unique_station_id	Replicate_id	Naphthalene mg/kg	2-Methylnaphthalene mg/kg	1-Methylnaphthalene mg/kg	Acenaphthylene mg/kg	Acenaphthene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2	Lab Dup.					
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Fluorene mg/kg	Phenanthrene mg/kg	Anthracene mg/kg	Fluoranthene mg/kg	Pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2	Lab Dup.					
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Benzo(a)anthracene mg/kg	Chrysene mg/kg	Benzo(b)fluoranthene mg/kg	Benzo(k)fluoranthene mg/kg	Benzo(a)pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2	Lab Dup.					
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenzo(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05
Gully 2	Lab Dup.				
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05
Gully 5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4b: Sediment Quality at Gully Stations - November 1998

Unique_station_id	Replicate_id	Total Inorg. Carbon p/kg	Total Org. Carbon p/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc p/L	Bs Content
Gully 1		0.1	0.4	0.1	98.7	0.1	1.1	0.0010	<0.3
Gully 2		0.2	0.2	0.8	98.4	< 0.1	0.7	0.0003	0.53
Gully 2	Lab Dup.								
Gully 3		0.1	0.2	0.1	99.1	< 0.1	0.8	0.0008	1.40
Gully 4		0.1	0.2	0.5	98.6	< 0.1	0.8	0.0020	0.48
Gully 5		0.2	0.2	0.8	98.4	< 0.1	0.8	0.0007	1.00
Gully 5	Lab Dup.			2.7	96.4	0.1	0.8		

TABLE 5b: Toxicity at Gully Stations - November 1998

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid Fertilization		Microtox EC50
				Mortality %	Control Mortality %	% Fertilization	IC 50	
Gully 1				8	2	4.30		>100%
Gully 2		1.63	<.05	2	2	59.70		>100%
Gully 2	Lab Dup.			1	2	60.30		
Gully 3		0.1	<0.05	2	2	21.00		>100%
Gully 4		<0.05	<0.05	0	2	65.00		>100%
Gully 5		0.06	<0.05	13	2	45.30		>100%
Gully 5	Lab Dup.							

**Appendix C-3: Laboratory Analytical Data for Sediment
from "The Gully", June 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1c: Trace Elements at Gully Stations - June 1999

Unique_station_id	Replicate_id	Aluminium mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
Gully 1		7800	< 2	< 2	150	< 5	< 5	< 0.3	3	< 1	< 2
Gully 2		5900	< 2	2	130	< 5	< 5	< 0.3	2	< 1	< 2
Gully 3		6500	< 2	2	140	< 5	< 5	< 0.3	2	< 1	< 2
Gully 4		8200	< 2	< 2	140	< 5	< 5	< 0.3	2	< 1	< 2
Gully 5		6200	< 2	< 2	110	< 5	< 5	< 0.3	< 2	< 1	< 2

Unique_station_id	Replicate_id	Iron mg/kg	Lead mg/kg	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg
Gully 1		1500	3.7	< 5	18	< 2	< 0.01	< 2	< 2	< 0.5	35
Gully 2		1100	2.3	< 5	14	< 2	< 0.01	< 2	< 2	< 0.5	28
Gully 3		1200	3.2	< 5	13	< 2	< 0.01	< 2	< 2	< 0.5	29
Gully 4		1100	3.4	< 5	16	< 2	< 0.01	< 2	< 2	< 0.5	36
Gully 5		480	2.4	< 5	11	< 2	< 0.01	< 2	< 2	< 0.5	28

Unique_station_id	Replicate_id	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
Gully 1		0.1	< 2	0.2	5	5
Gully 2		0.1	< 2	0.1	4	18
Gully 3		0.1	< 2	0.1	4	6
Gully 4		0.1	< 2	0.1	4	4
Gully 5		0.1	< 2	0.1	2	4

TABLE 2c: Petroleum Hydrocarbons at Gully Stations - June 1999

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₁₁ -C ₃₀) mg/kg	TPH mg/kg
Gully 1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.851	1.8	2.65	2.65
Gully 2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.62	3.82	5.44	5.45
Gully 3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.55	3.44	4.99	4.99
Gully 4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.75	3.38	5.13	5.13
Gully 5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.92	3.29	5.21	5.21

TABLE 3c: Polycyclic Aromatic Hydrocarbons at Gully Stations - June 1999

Unique_station_id	Replicate_id	Naphthalene mg/kg	2-Methylnaphthalene mg/kg	1-Methylnaphthalene mg/kg	Acenaphthylene mg/kg	Acenaphthene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Fluorene mg/kg	Phenanthrene mg/kg	Anthracene mg/kg	Fluoranthene mg/kg	Pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Benzo(a)anthracene mg/kg	Chrysene mg/kg	Benzo(b)fluoranthene mg/kg	Benzo(k)fluoranthene mg/kg	Benzo(a)pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4c: Sediment Quality at Gully Stations - June 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
Gully 1		0.2	< 0.1	6.8	92.5	< 0.1	0.8	0.0005	0.22
Gully 2		0.2	< 0.1	0.3	98.8	0.1	0.8	0.0005	<0.20
Gully 3		0.2	< 0.1	0.1	98.9	0.2	0.9	0.0007	0.63
Gully 4		0.2	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0004	0.20
Gully 5		0.3	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0010	<0.20

TABLE 5c: Toxicity at Gully Stations - June 1999

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Microtox EC50
				Mortality	Control Mortality %			
Gully 1		4.27	<20	4	3	92.8	>100%	>100%
Gully 2		13.20	<20	5	3	91.0	>100%	>100%
Gully 3		8.38	<20	3	3	93.0	>100%	>100%
Gully 4		7.79	<20	5	3	94.5	>100%	>100%
Gully 5		7.20	<20	5	3	87.3	>100%	>100%

**Appendix C-4: Laboratory Analytical Data for Sediment
from "The Gully", Fall 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1d: Trace Elements at Gully Stations - November 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
Gully 1		6100	<2	<2	130	<5	<5	<0.3	3	<1	<2
Gully 2		4800	<2	<2	93	<5	<5	<0.3	2	<1	<2
Gully 3		5700	<2	<2	150	<5	<5	<0.3	<2	<1	<2
Gully 3	Field Dup.	6000	<2	<2	120	<5	<5	<0.3	2	<1	<2
Gully 4		4900	<2	<2	110	<5	<5	<0.3	<2	<1	<2
Gully 5		5500	<2	<2	110	<5	<5	<0.3	<2	<1	<2

Unique_station_id	Replicate_id	Iron mg/kg	Lead mg/kg	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg
Gully 1		1700	3.1	<5	29	<2	<0.01	<2	<2	<0.5	36
Gully 2		940	2.5	<5	8	<2	<0.01	<2	<2	<0.5	24
Gully 3		760	2.8	<5	7	<2	<0.01	<2	<2	<0.5	32
Gully 3	Field Dup.	1000	2.9	<5	12	<2	<0.01	<2	<2	<0.5	26
Gully 4		850	2.4	<5	16	<2	<0.01	<2	<2	<0.5	27
Gully 5		540	2.3	<5	10	2	<0.01	<2	<2	<0.5	28

Unique_station_id	Replicate_id	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
Gully 1		0.1	<2	0.3	5	5
Gully 2		0.1	<2	0.2	3	4
Gully 3		0.1	<2	0.2	2	4
Gully 3	Field Dup.	0.1	<2	0.2	3	4
Gully 4		0.1	<2	0.2	2	4
Gully 5		0.1	<2	0.1	2	4

TABLE 2d: Petroleum Hydrocarbons at Gully Stations - November 1999

Unique station id	Replicate id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₁₁ -C ₂₀) mg/kg	TPH mg/kg
Gully 1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
Gully 2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
Gully 3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
Gully 3	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
Gully 4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
Gully 5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3

TABLE 3d: Polycyclic Aromatic Hydrocarbons at Gully Stations - November 1999

Unique_station_id	Replicate_id	Naphthalene mg/kg	2-Methylnaphthalene mg/kg	1-Methylnaphthalene mg/kg	Acenaphthylene mg/kg	Acenaphthene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Fluorene mg/kg	Phenanthrene mg/kg	Anthracene mg/kg	Fluoranthene mg/kg	Pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Benzo(a)anthracene mg/kg	Chrysene mg/kg	Benzo(b)fluoranthene mg/kg	Benzo(k)fluoranthene mg/kg	Benzo(a)pyrene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
Gully 1		< 0.05	< 0.05	< 0.05	< 0.05
Gully 2		< 0.05	< 0.05	< 0.05	< 0.05
Gully 3		< 0.05	< 0.05	< 0.05	< 0.05
Gully 3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
Gully 4		< 0.05	< 0.05	< 0.05	< 0.05
Gully 5		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4d: Sediment Quality at Gully Stations - November 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Bs Content
Gully 1		0.5	< 0.1	1.9	97.2	< 0.1	0.9	0.0002	<0.20
Gully 2		0.2	0.1	0.1	99.2	0.1	0.7	0.0007	<0.20
Gully 3		0.3	0.1	< 0.1	99.2	< 0.1	0.8	0.0003	<0.20
Gully 3	Field Dup.	0.3	< 0.1	< 0.1	99	< 0.1	0.9	0.0003	0.22
Gully 4		0.3	< 0.1	0.1	99.2	0.1	0.6	0.0003	<0.20
Gully 5		0.4	< 0.1	0.3	98.9	< 0.1	0.7	0.0005	0.20

TABLE Sd: Toxicity at Gully Stations - November 1999

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Microtox EC50
				Mortality %	Control Mortality %			
Gully 1		28.10	<10	15	0	61.8	>100%	>100%
Gully 2		<0.50	<10	10	0	69.0	>100%	>100%
Gully 3		<0.50	<10	11	0	72.3	>100%	>100%
Gully 3	Field Dup.	<0.50	<10	5	0	80.0	>100%	>100%
Gully 4		<0.50	<10	8	0	92.3	>100%	>100%
Gully 5		7.79	<10	7	0	23.5	45.30%	>100%

**Appendix C-5: Laboratory Analytical Data for Sediment
from Venture Field, June 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1a: Trace Elements at Venture Drill Site - June 1998

Unique station id	Replicate id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
V-250-1		8940	<2	<2	150	<5	<5	<0.3	3	<1	<2	1800	3.60	<5
V-250-3		10400	<2	2	170	<5	<5	<0.3	4	1	<2	2200	4.10	<5
V-250-3	Lab Dup.	10300	<2	<2	170	<5	<5	<0.3	4	<1	<2	2500	4.40	<5
V-250-5		9240	<2	<2	160	<5	<5	<0.3	3	<1	<2	1800	3.70	<5
V-250-5	Field Dup.	8860	<2	2	170	<5	<5	<0.3	3	<1	<2	1700	3.80	<5
V-250-7		7960	<2	<2	140	<5	<5	<0.3	3	<1	<2	1400	3.30	<5
V-500-1		10800	<2	2	190	<5	<5	<0.3	6	1	<2	2700	4.40	<5
V-500-3		11800	<2	2	210	<5	<5	<0.3	4	1	<2	3000	5.70	<5
V-500-5		9760	<2	2	180	<5	<5	<0.3	5	1	<2	2100	4.30	<5
V-500-5	Field Dup.	10700	<2	2	180	<5	<5	<0.3	5	1	<2	2900	4.90	<5
V-500-7		12800	<2	3	190	<5	<5	<0.3	17	3	5	16200	11.00	<5
V-500-7	Lab Dup.	12200	<2	2	190	<5	<5	<0.3	17	3	4	14200	10.00	<5
V-1000-1		12200	<2	2	190	<5	<5	<0.3	8	1	2	6310	6.40	<5
V-1000-3		12400	<2	2	190	<5	<5	<0.3	7	1	<2	4100	5.70	<5
V-1000-5		10800	<2	2	170	<5	<5	<0.3	6	1	<2	3700	5.70	<5
V-1000-7		13300	<2	3	200	<5	<5	<0.3	28	3	4	18000	12.00	<5
V-3000-1		8630	<2	2	140	<5	<5	<0.3	4	1	<2	3100	4.10	<5
V-3000-2		9230	<2	<2	150	<5	<5	<0.3	3	<1	<2	1800	3.70	<5
V-3000-3		12800	<2	3	200	<5	<5	<0.3	13	2	2	10200	8.20	<5
V-3000-4		12600	<2	<2	220	<5	<5	<0.3	5	1	<2	2400	5.30	<5
V-3000-5		13900	<2	2	220	<5	<5	<0.3	9	1	2	6960	7.10	<5
V-3000-5	Lab Dup.	13400	<2	2	220	<5	<5	<0.3	10	2	2	7690	7.40	<5
V-3000-6		15100	<2	2	240	<5	<5	<0.3	16	2	2	11500	8.90	<5
V-3000-7		8990	<2	2	140	<5	<5	<0.3	5	1	<2	3100	4.60	<5
V-3000-8		8910	<2	<2	140	<5	<5	<0.3	4	1	<2	2100	3.70	<5
V-6000-3		6540	<2	<2	120	<5	<5	<0.3	2	<1	<2	1000	2.80	<5
V-6000-5		14000	<2	2	180	<5	<5	<0.3	16	2	2	9620	7.90	<5
V-6000-7		9130	<2	2	150	<5	<5	<0.3	5	1	<2	3300	4.00	<5
V-10000-1		11400	<2	2	180	<5	<5	<0.3	5	1	<2	2600	5.70	<5
V-10000-3		6830	<2	<2	120	<5	<5	<0.3	2	<1	<2	1100	3.10	<5
V-10000-5		15800	<2	2	240	<5	<5	<0.3	9	1	2	6880	7.80	<5
V-10000-7		12000	<2	2	190	<5	<5	<0.3	8	1	<2	4500	6.30	<5
V-15000-1		8660	<2	2	140	<5	<5	<0.3	5	1	<2	3000	6.80	<5
V-15000-2		12300	<2	3	180	<5	<5	<0.3	8	1	<2	4200	6.80	<5
V-15000-3		21100	<2	4	330	<5	<5	<0.3	12	1	2	8180	9.00	<5
V-15000-4		8750	<2	<2	140	<5	<5	<0.3	3	1	<2	1600	3.70	<5
V-15000-5		17900	<2	2	290	<5	<5	<0.3	9	1	2	4800	8.40	<5
V-15000-5		18000	<2	2	280	<5	<5	<0.3	8	1	2	4100	7.00	<5
V-15000-6		19400	<2	2	280	<5	<5	<0.3	15	2	3	10600	8.20	<5
V-15000-7		6240	<2	2	120	<5	<5	<0.3	2	<1	<2	2200	3.00	<5
V-15000-8		18000	<2	2	280	<5	<5	<0.3	8	1	2	4100	7	<5
V-20000-4		11200	<2	2	200	<5	<5	<0.3	3	<1	2	1800	4.60	<5

TABLE 1a: Trace Elements at Venture Drill Site - June 1998 (Continued)

Unique station id	Replicate id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
V-250-1		31	<2	<0.01	<2	<2	37	0.10	<2	0.20	4	6
V-250-3		44	<2	<0.01	<2	<2	45	0.10	<2	0.30	5	6
V-250-3	Lab Dup.	<2	<2	<0.01	<2	<2	43	0.10	<2	0.20	6	7
V-250-5		27	<2	<0.01	<2	<2	39	0.10	<2	0.20	5	8
V-250-5	Field Dup.	22	<2	<0.01	<2	<2	37	0.10	<2	0.20	5	8
V-250-7		19	<2	<0.01	<2	<2	31	0.10	<2	0.20	4	6
V-500-1		45	<2	<0.01	<2	<2	41	0.10	<2	0.20	7	8
V-500-3		79	<2	<0.01	<2	<2	48	0.10	<2	0.20	7	7
V-500-5		33	<2	<0.01	2.00	<2	43	0.10	<2	0.20	7	8
V-500-5	Field Dup.	55	<2	<0.01	<2	<2	43	0.10	<2	0.20	8	9
V-500-7		620	<2	<0.01	3.00	<2	52	0.10	<2	0.60	36	25
V-500-7	Lab Dup.	510	<2	<0.01	3.00	<2	52	0.10	<2	0.50	33	23
V-1000-1		160	<2	<0.01	2.00	<2	45	0.10	<2	0.30	14	10
V-1000-3		110	<2	<0.01	2.00	<2	50	0.10	<2	0.20	11	10
V-1000-5		120	<2	<0.01	<2	<2	42	0.10	<2	0.30	10	10
V-1000-7		630	<2	<0.01	3.00	<2	54	0.10	<2	0.60	40	32
V-3000-1		71	<2	<0.01	<2	<2	36	0.10	<2	0.20	7	7
V-3000-2		24	<2	<0.01	<2	<2	33	0.10	<2	0.20	4	5
V-3000-3		310	<2	<0.01	3.00	<2	54	0.10	<2	0.40	24	17
V-3000-4		48	<2	<0.01	<2	<2	53	0.10	<2	0.20	6	7
V-3000-5		220	<2	0.01	2.00	<2	58	0.10	<2	0.40	14	12
V-3000-5	Lab Dup.	240	<2	<0.01	2.00	<2	57	0.10	<2	0.30	16	14
V-3000-6		350	<2	0.02	3.00	<2	60	0.10	<2	0.50	26	19
V-3000-7		55	<2	<0.01	<2	<2	37	0.10	<2	0.20	8	7
V-3000-8		55	<2	<0.01	<2	<2	37	0.10	<2	0.20	5	7
V-6000-3		15	<2	<0.01	<2	<2	23	0.10	<2	0.10	3	5
V-6000-5		300	<2	<0.01	3.00	<2	56	0.10	<2	0.40	21	16
V-6000-7		69	<2	0.01	<2	<2	40	0.10	<2	0.20	7	7
V-10000-1		53	<2	<0.01	<2	<2	47	0.10	<2	0.30	7	7
V-10000-3		19	<2	<0.01	<2	<2	27	0.10	<2	0.20	3	4
V-10000-5		200	<2	0.01	2.00	<2	60	0.20	<2	0.30	15	12
V-10000-7		100	<2	<0.01	2.00	<2	50	0.10	<2	0.30	11	10
V-15000-1		70	<2	<0.01	<2	<2	38	0.10	<2	0.30	9	7
V-15000-2		74	<2	<0.01	2.00	<2	47	0.10	<2	0.30	11	8
V-15000-3		140	<2	<0.01	3.00	<2	78	0.20	<2	0.40	16	12
V-15000-4		30	<2	0.01	<2	<2	37	0.10	<2	<2	5	6
V-15000-5		150	<2	<0.01	2.00	<2	72	0.20	<2	0.30	12	11
V-15000-5		88	3.00	<0.01	2.00	<2	71	0.20	<2	0.30	10	9
V-15000-6		340	<2	<0.01	3.00	<2	73	0.20	<2	0.50	23	19
V-15000-7		13	<2	0.01	<2	<2	27	0.10	<2	0.10	5	11
V-15000-8		88	3	<0.01	2	<2	71	0.2	<2	0.3	10	9
V-20000-4		19	<2	0.01	<2	<2	47	0.10	<2	0.10	4	11

TABLE 2a: Petroleum Hydrocarbons at Venture Drill Site - June 1998

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₁₈ mg/kg	C ₁₉ -C ₂₁ mg/kg	TEH (C ₁₀ -C ₂₁) mg/kg	TPH mg/kg
V-250-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-250-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-250-3	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-250-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-250-5	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-250-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-5	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-500-7	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-1000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-1000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-1000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-1000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-2		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-5	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-6		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-3000-8		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-6000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-6000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-6000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-10000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-10000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-10000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-10000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-2		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-6		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-15000-8		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
V-20000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5

TABLE 3a: Polycyclic Aromatic Hydrocarbons at Venture Drill Site - June 1998 (Continued)

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenzo(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
V-250-1		<0.05	<0.05	<0.05	<0.05
V-250-3		<0.05	<0.05	<0.05	<0.05
V-250-3	Lab Dup.	<0.05	<0.05	<0.05	<0.05
V-250-5		<0.05	<0.05	<0.05	<0.05
V-250-5	Field Dup.	<0.05	<0.05	<0.05	<0.05
V-250-7		<0.05	<0.05	<0.05	<0.05
V-500-1		<0.05	<0.05	<0.05	<0.05
V-500-3		<0.05	<0.05	<0.05	<0.05
V-500-5		<0.05	<0.05	<0.05	<0.05
V-500-5	Field Dup.	<0.05	<0.05	<0.05	<0.05
V-500-7		<0.05	<0.05	<0.05	<0.05
V-500-7	Lab Dup.	<0.05	<0.05	<0.05	<0.05
V-1000-1		<0.05	<0.05	<0.05	<0.05
V-1000-3		<0.05	<0.05	<0.05	<0.05
V-1000-5		<0.05	<0.05	<0.05	<0.05
V-1000-7		<0.05	<0.05	<0.05	<0.05
V-3000-1		<0.05	<0.05	<0.05	<0.05
V-3000-2		<0.05	<0.05	<0.05	<0.05
V-3000-3		<0.05	<0.05	<0.05	<0.05
V-3000-4		<0.05	<0.05	<0.05	<0.05
V-3000-5		<0.05	<0.05	<0.05	<0.05
V-3000-5	Lab Dup.	<0.05	<0.05	<0.05	<0.05
V-3000-6		<0.05	<0.05	<0.05	<0.05
V-3000-7		<0.05	<0.05	<0.05	<0.05
V-3000-8		<0.05	<0.05	<0.05	<0.05
V-6000-3		<0.05	<0.05	<0.05	<0.05
V-6000-5		<0.05	<0.05	<0.05	<0.05
V-6000-7		<0.05	<0.05	<0.05	<0.05
V-10000-1		<0.05	<0.05	<0.05	<0.05
V-10000-3		<0.05	<0.05	<0.05	<0.05
V-10000-5		<0.05	<0.05	<0.05	<0.05
V-10000-7		<0.05	<0.05	<0.05	<0.05
V-15000-1		<0.05	<0.05	<0.05	<0.05
V-15000-2		<0.05	<0.05	<0.05	<0.05
V-15000-3		<0.05	<0.05	<0.05	<0.05
V-15000-4		<0.05	<0.05	<0.05	<0.05
V-15000-5		<0.05	<0.05	<0.05	<0.05
V-15000-5		<0.05	<0.05	<0.05	<0.05
V-15000-6		<0.05	<0.05	<0.05	<0.05
V-15000-7		<0.05	<0.05	<0.05	<0.05
V-15000-8		<0.05	<0.05	<0.05	<0.05
V-20000-4		<0.05	<0.05	<0.05	<0.05

TABLE 4a: Sediment Quality at Venture Drill Site - June 1998

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Bs Content
V-250-1		<0.10	0.20	<0.1	99.2	<0.1	0.9	0.0002	<0.3
V-250-3		<0.10	0.20	<0.1	99.1	<0.1	1	0.0003	<0.3
V-250-3	Lab Dup.	<0.10	0.20	0.1	99	<0.1	0.9		
V-250-5		<0.10	0.20	<0.1	99.1	<0.1	0.8	0.0019	1.10
V-250-5	Field Dup.	0.10	0.20	<0.1	99.3	<0.1	0.9		
V-250-7		0.10	0.20	<0.1	99.1	0.1	0.8	0.0022	<0.3
V-500-1		<0.10	0.20	2.6	97	0.1	0.4	0.0004	<0.3
V-500-3		0.10	0.30	0.1	99.1	<0.1	0.8	lost	<0.3
V-500-5		0.10	0.20	<0.1	99.1	<0.1	1	0.0018	<0.3
V-500-5	Field Dup.	0.10	0.20	<0.1	99.2	<0.1	0.8		
V-500-7		0.10	0.20	<0.1	99.3	<0.1	0.8	0.0017	<0.3
V-500-7	Lab Dup.	0.10	0.20	<0.1	99.2	1.6	0.8		
V-1000-1		<0.10	0.20	<0.1	99.2	<0.1	1	0.0002	<0.3
V-1000-3		<0.10	0.20	<0.1	99.1	0.1	0.8	0.0005	0.28
V-1000-5		<0.10	0.30	<0.1	99.2	<0.1	0.8	0.0003	1.00
V-1000-7		<0.10	0.30	<0.1	99	0.1	0.9	0.0007	0.56
V-3000-1		<0.10	0.20	0.1	98.9	<0.1	0.9	0.0001	<0.3
V-3000-2		<0.10	0.20	<0.1	99.2	<0.1	0.8	0.0004	<0.3
V-3000-3		<0.10	0.30	4.1	94.4	0.3	1.2	0.0004	0.24
V-3000-4		<0.10	0.30	<0.1	99.1	<0.1	0.9	0.0005	<0.3
V-3000-5		0.10	0.30	<0.1	99.2	<0.1	0.8	0.0002	<0.3
V-3000-5	Lab Dup.	0.10	0.30	<0.1	99.1	<0.1	0.9		
V-3000-6		0.10	0.30	<0.1	99	1.6	1	0.0006	<0.3
V-3000-7		<0.10	0.20	<0.1	99.2	0.1	0.8	0.0016	<0.3
V-3000-8		<0.10	0.20	<0.1	99.1	<0.1	0.9	0.0002	0.80
V-6000-3		<0.10	0.20	<0.1	99.1	<0.1	0.9	0.0008	<0.3
V-6000-5		<0.10	0.30	<0.1	99.6	<0.1	0.4	0.0004	<0.3
V-6000-7		<0.10	0.20	<0.1	99.2	<0.1	0.8	0.0004	<0.3
V-10000-1		<0.10	0.50	<0.1	99.1	0.1	0.8	0.0005	<0.3
V-10000-3		0.10	0.20	0.5	98.4	0.1	1.1	0.0004	<0.3
V-10000-5		0.10	0.50	<0.1	99	<0.1	1	0.0005	<0.3
V-10000-7		0.10	0.30	<0.1	99	<0.1	1	0.0001	0.35
V-15000-1		0.20	0.50	7	91.6	0.3	1.2	0.0026	<0.3
V-15000-2		0.30	0.40	<0.1	99.2	<0.1	0.8	0.0007	<0.3
V-15000-3		0.20	0.90	<0.1	97.7	0.5	1.8	0.001	<0.3
V-15000-4		<0.10	0.30	<0.1	99.2	1.5	0.8	0.0001	<0.3
V-15000-5		0.10	0.40	0.1	97.4	0.5	2	0.0005	<0.3
V-15000-5		0.50	0.90	<0.1	99	1.7	1		
V-15000-6		0.30	0.50	5.8	92.9	0.1	1.2	0.0006	1.51
V-15000-7		0.10	0.20	<0.1	99.1	<0.1	0.9	0.0001	0.56
V-15000-8		0.50	0.90	0.1	97.4	0.5	2	0.0038	1.42
V-20000-4		0.10	0.40	<0.1	99	<0.1	1	0.0004	<0.3

TABLE 5a: Toxicity at Venture Drill Site - June 1998

Unique_station_id	Replicate_id	Amphipod Mortality %	Survival Control Mortality %	Echinoid Fertilization % Fertilization	Microtox EC50
V-250-1		2	1	84	>100%
V-250-3		5	1	60	>100%
V-250-3	Lab Dup.				
V-250-5		4	2	90	>100%
V-250-5	Field Dup.				
V-250-7		0	2	95.3	>100%
V-500-1					
V-500-3					
V-500-5					
V-500-5	Field Dup.				
V-500-7					
V-500-7	Lab Dup.				
V-1000-1					
V-1000-3					
V-1000-5					
V-1000-7					
V-3000-1		8	1	82.3	>100%
V-3000-2					
V-3000-3		8	1	62.5	>100%
V-3000-4					
V-3000-5		3	1	40.8	>100%
V-3000-5	Lab Dup.				
V-3000-6					>100%
V-3000-7					
V-3000-8					
V-6000-3					
V-6000-5					
V-6000-7					
V-10000-1					
V-10000-3					
V-10000-5					
V-10000-7					
V-15000-1					
V-15000-2					
V-15000-3					
V-15000-4					
V-15000-5					
V-15000-5					
V-15000-6					
V-15000-7					
V-15000-8					
V-20000-4		5	1	0.75	>100%

**Appendix C-6: Laboratory Analytical Data for Sediment
from Venture Field, Fall 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1b: Trace Elements at Venture Drill Site - November 1998

Unique station id	Replicate id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
V-250-1		9800	<2	2	220	<5	<5	<0.3	5	1	<2	2800	4.3	<5
V-250-3		11000	<2	2	220	<5	<5	<0.3	5	1	<2	3200	4.8	<5
V-250-5		9900	<2	2	190	<5	<5	<0.3	4	1	<2	2200	4.4	<5
V-250-7		8600	<2	2	280	<5	<5	<0.3	4	1	<2	2600	4	<5
V-500-1		7900	<2	2	140	<5	<5	<0.3	3	1	<2	2100	3.6	<5
V-500-3		12000	<2	2	220	<5	<5	<0.3	6	1	<2	3200	5.2	<5
V-500-5		10000	<2	2	190	<5	<5	<0.3	5	1	<2	2900	4.7	<5
V-500-5	Lab Dup.													
V-500-7		8200	<2	2	150	<5	<5	<0.3	8	1	<2	6400	4.8	<5
V-1000-1		12900	<2	2	180	<5	<5	<0.3	17	2	3	12000	9.5	<5
V-1000-3		12700	<2	2	190	<5	<5	<0.3	10	2	2	7130	7.1	<5
V-1000-3	Field Dup.													
V-1000-5		14000	<2	2	220	<5	<5	<0.3	9	1	2	5000	6.2	<5
V-1000-5	Field Dup.	13000	<2	2	210	<5	<5	<0.3	9	1	<2	5200	6.2	<5
V-1000-7		13900	<2	2	210	<5	<5	<0.3	11	2	2	8090	8.4	<5
V-3000-1		8300	<2	<2	150	<5	<5	<0.3	4	1	<2	2200	3.5	<5
V-3000-2		10000	<2	2	180	<5	<5	<0.3	4	1	<2	2100	4.1	<5
V-3000-2	Lab Dup.	9800	<2	2	170	<5	<5	<0.3	4	1	<2	2600	4	<5
V-3000-3		12000	<2	2	170	<5	<5	<0.3	10	2	2	7400	6.3	<5
V-3000-3	Lab Dup.													
V-3000-4		12400	<2	2	170	<5	<5	<0.3	12	2	2	7830	7.8	<5
V-3000-5		13000	<2	2	230	<5	<5	<0.3	7	1	<2	3400	5.4	<5
V-3000-6		12900	<2	3	180	<5	<5	<0.3	28	3	4	13700	13	<5
V-3000-6	Field Dup.	14600	<2	3	220	<5	<5	<0.3	22	3	3	12700	11	<5
V-3000-7		7330	<2	2	100	<5	<5	<0.3	4	1	<2	2600	3.4	<5
V-3000-7	Field Dup.	8120	<2	<2	130	<5	<5	<0.3	4	1	<2	2700	3.8	<5
V-3000-8		9600	<2	2	160	<5	<5	<0.3	6	1	2	4300	4.7	<5
V-3000-8		9800	<2	2	180	<5	<5	<0.3	8	1	<2	4700	4.7	<5
V-6000-3		6090	<2	<2	100	<5	<5	<0.3	2	<1	<2	944	2.4	<5
V-6000-5		13000	<2	3	220	<5	<5	<0.3	11	2	2	6500	6.4	<5
V-6000-7		11100	<2	2	160	<5	<5	<0.3	9	1	<2	6890	6.5	<5
V-6000-7	Lab Dup.													
V-10000-1		9600	<2	2	180	<5	<5	<0.3	5	1	<2	2100	4.9	<5
V-10000-3		6050	<2	<2	95	<5	<5	<0.3	2	<1	<2	898	2.5	<5
V-10000-3	Lab Dup.	7820	<2	<2	120	<5	<5	<0.3	2	<1	<2	1310	3.3	<5
V-10000-5		15900	<2	2	230	<5	<5	<0.3	13	2	2	9690	9	<5
V-10000-7		12000	<2	3	160	<5	<5	<0.3	25	3	4	15500	12	<5
V-15000-1		8100	<2	2	130	<5	<5	<0.3	4	<1	<2	2300	5.5	<5
V-15000-2		13000	<2	4	230	<5	<5	<0.3	9	1	2	4300	7.4	<5
V-15000-2	Lab Dup.	14000	3	5	230	<5	<5	<0.3	9	1	2	5400	7.9	<5
V-15000-3		21000	<2	4	340	<5	<5	<0.3	14	2	2	7800	8.5	<5
V-15000-3	Lab Dup.	21000	<2	4	360	<5	<5	<0.3	13	1	2	7200	8.8	<5
V-15000-4		10100	<2	<2	170	<5	<5	<0.3	3	1	<2	2100	4.3	<5
V-15000-4	Field Dup.	9740	<2	2	150	<5	<5	<0.3	3	1	<2	2100	4.3	<5
V-15000-5		18100	<2	2	260	<5	<5	<0.3	9	1	3	5910	7.5	<5
V-15000-6		19500	<2	2	270	<5	<5	<0.3	14	2	3	9210	8.8	<5
V-15000-7		5890	<2	2	95	<5	<5	<0.3	4	<1	<2	3200	2.6	<5
V-15000-7	Lab Dup.	6200	<2	<2	96	<5	<5	<0.3	4	<1	<2	2400	2.7	<5
V-15000-8		13000	<2	2	230	<5	<5	<0.3	8	1	2	3400	6.1	<5
V-20000-4		11300	<2	2	180	<5	<5	<0.3	3	1	<2	2400	4.8	<5

TABLE 1b: Trace Elements at Venture Drill Site - November 1998(Continued)

Unique_station_id	Replicate_id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
V-250-1		55	<2	<0.01	<2	<2	42	0.1	<2	0.2	7	7
V-250-3		67	<2	<0.01	<2	<2	48	0.1	<2	0.2	8	8
V-250-5		34	<2	<0.01	<2	<2	41	0.1	<2	0.2	6	7
V-250-7		72	<2	<0.01	<2	<2	38	0.1	<2	0.3	6	7
V-500-1		40	<2	0.02	<2	<2	33	0.1	<2	0.2	6	6
V-500-3		69	<2	<0.01	2	<2	48	0.2	<2	0.3	9	7
V-500-5		72	<2	0.05	<2	<2	43	0.1	<2	0.2	7	8
V-500-5	Lab Dup.											
V-500-7		170	<2	<0.01	<2	<2	34	0.1	<2	0.3	14	12
V-1000-1		430	<2	<0.01	3	<2	54	0.1	<2	0.5	28	23
V-1000-3		210	<2	<0.01	2	<2	54	0.1	<2	0.4	18	16
V-1000-3	Field Dup.											
V-1000-5		100	<2	<0.01	2	<2	56	0.1	<2	0.3	12	10
V-1000-5	Field Dup.	150	<2	<0.01	2	<2	52	0.1	<2	0.3	13	11
V-1000-7		250	<2	<0.01	2	<2	57	0.1	<2	0.4	20	17
V-3000-1		43	<2	<0.01	<2	<2	35	0.1	<2	0.2	6	7
V-3000-2		32	<2	<0.01	<2	<2	41	0.1	<2	0.2	6	6
V-3000-2	Lab Dup.	53	<2	<0.01	<2	<2	43	0.1	<2	0.2	7	7
V-3000-3		230	<2	<0.01	2	<2	48	0.1	<2	0.3	17	15
V-3000-3	Lab Dup.											
V-3000-4		290	<2	<0.01	2	<2	50	0.1	<2	0.4	19	18
V-3000-5		88	<2	<0.01	2	<2	54	0.1	<2	0.2	10	9
V-3000-6		560	<2	<0.01	3	<2	54	0.1	<2	0.7	32	28
V-3000-6	Field Dup.	430	<2	<0.01	3	<2	58	0.1	<2	0.6	27	24
V-3000-7		48	<2	<0.01	2	<2	31	0.1	<2	0.2	7	9
V-3000-7	Field Dup.	65	<2	<0.01	<2	<2	33	0.1	<2	0.2	7	9
V-3000-8		130	<2	<0.01	<2	<2	36	0.1	<2	0.2	11	10
V-3000-8		130	<2	<0.01	2	<2	40	0.1	<2	0.2	12	10
V-6000-3		8	<2	<0.01	<2	<2	25	0.1	<2	0.1	3	6
V-6000-5		200	<2	<0.01	2	<2	56	0.1	<2	0.3	16	17
V-6000-7		180	<2	<0.01	2	<2	49	0.1	<2	0.3	15	14
V-6000-7	Lab Dup.											
V-10000-1		43	<2	<0.01	<2	<2	40	0.1	<2	0.2	6	7
V-10000-3		11	<2	<0.01	<2	<2	27	0.1	<2	0.1	3	7
V-10000-3	Lab Dup.	20	<2	<0.01	<2	<2	37	0.1	<2	0.2	4	8
V-10000-5		320	<2	<0.01	3	<2	62	0.2	<2	0.5	24	22
V-10000-7		540	<2	<0.01	3	<2	52	0.1	<2	0.7	35	29
V-15000-1		44	<2	0.05	<2	<2	39	0.1	<2	0.2	8	7
V-15000-2		55	<2	<0.01	2	<2	55	0.1	<2	0.3	13	9
V-15000-2	Lab Dup.	66	2	<0.01	2	3	55	0.2	<2	0.4	13	10
V-15000-3		92	<2	<0.01	3	<2	74	0.2	<2	0.4	17	12
V-15000-3	Lab Dup.	92	<2	<0.01	3	<2	78	0.2	<2	0.4	16	11
V-15000-4		43	<2	<0.01	<2	<2	45	0.1	<2	0.2	5	10
V-15000-4	Field Dup.	41	<2	<0.01	<2	<2	42	0.1	<2	0.2	5	10
V-15000-5		170	<2	<0.01	2	<2	70	0.2	<2	0.3	14	15
V-15000-6		300	<2	<0.01	3	<2	77	0.2	<2	0.6	22	20
V-15000-7		18	<2	<0.01	<2	<2	26	0.1	<2	0.1	7	8
V-15000-7	Lab Dup.	26	<2	<0.01	<2	<2	26	0.1	<2	0.1	5	9
V-15000-8		84	<2	<0.01	2	<2	54	0.2	<2	0.4	10	9
V-20000-4		40	<2	<0.01	2	<2	47	0.1	<2	0.2	6	11

TABLE 2b: Petroleum Hydrocarbons at Venture Drill Site - November 1998

Unique station id	Replicate id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₁₅ mg/kg	C ₁₆ -C ₂₀ mg/kg	TEH (C ₁₁ -C ₂₀) mg/kg	TPH mg/kg
V-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	75.2	< 15	75.2	75.2
V-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-500-5	Lab Dup.									
V-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.714	< 0.25	102	0.71
V-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1	< 0.25	94	1.00
V-1000-3	Field Dup.									
V-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-1000-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.894	0.409	100	1.30
V-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-3000-2	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 2	< 3	105	0.00
V-3000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1.5	< 2	114	0.00
V-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.359	1.44	86	1.80
V-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.382	1.37	99	1.75
V-3000-6	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	81	0.00
V-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1.5	< 2.5	118	0.00
V-3000-7	Field Dup.	< 0.025	0.049	< 0.025	0.1	< 2.5	0.392	1.42	79	1.81
V-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-3000-8	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-6000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.905	3.05	91	3.96
V-6000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-6000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.4	< 1.5	114	0.00
V-6000-7	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.6	< 1.5	125	0.00
V-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.01	2.6	97	3.61
V-10000-3	Lab Dup.									
V-10000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.622	0.647	102	1.27
V-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.437	1.04	103	1.48
V-15000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-15000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-15000-2	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-15000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-15000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-15000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.386	0.821	93	0.00
V-15000-4	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.11	1.51	98	2.62
V-15000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.19	1.5	136	2.69
V-15000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.53	4.09	135	5.62
V-15000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.44	1.73	120	2.17
V-15000-7	Lab Dup.									
V-15000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 15	< 15	< 30	< 32.5
V-20000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.41	2.11	109	3.52

TABLE 3b: Polycyclic Aromatic Hydrocarbons at Venture Drill Site - November 1998 (Continued)

Unique_station_id	Replicate_id	Fluoranthene mg/kg	Pyrene mg/kg	Benz(a)anthracene mg/kg	Chrysene mg/kg	Benz(b)fluoranthene mg/kg	Benz(k)fluoranthene mg/kg	Benz(a)pyrene mg/kg
V-250-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-250-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-250-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-250-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-500-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-500-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-500-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-500-5	Lab Dup							
V-500-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-1000-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3	Field Dup.							
V-1000-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-1000-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-1000-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3	Lab Dup.							
V-3000-4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-7	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-8		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-8	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-6000-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-6000-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7	Lab Dup.							
V-10000-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-1		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-3	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-4	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-5		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-6		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-8		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V-20000-4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

TABLE 3b: Polycyclic Aromatic Hydrocarbons at Venture Drill Site - November 1998 (Continued)

Unique_station_id	Replicate_id	Pyrene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo[ghi]perylene mg/kg
V-250-1		< 0.05	< 0.05	< 0.05	< 0.05
V-250-3		< 0.05	< 0.05	< 0.05	< 0.05
V-250-5		< 0.05	< 0.05	< 0.05	< 0.05
V-250-7		< 0.05	< 0.05	< 0.05	< 0.05
V-500-1		< 0.05	< 0.05	< 0.05	< 0.05
V-500-3		< 0.05	< 0.05	< 0.05	< 0.05
V-500-5		< 0.05	< 0.05	< 0.05	< 0.05
V-500-5	Lab Dup.				
V-500-7		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3	Field Dup.				
V-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-5	Field Dup.				
V-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2	Lab Dup.				
V-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3	Lab Dup.				
V-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6	Field Dup.				
V-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-7	Field Dup.				
V-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-8	Field Dup.				
V-6000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7	Lab Dup.				
V-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3	Lab Dup.				
V-10000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2	Lab Dup.				
V-15000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-3	Lab Dup.				
V-15000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-4	Field Dup.				
V-15000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7	Lab Dup.				
V-15000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-20000-4		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4b: Sediment Quality at Venture Drill Site - November 1998

Unique station id	Replicate id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
V-250-1		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0003	<0.30
V-250-3		0.1	0.2	< 0.1	99.1	< 0.1	0.8	0.0003	0.30
V-250-5		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0006	<0.30
V-250-7		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0003	<0.30
V-500-1		< 0.1	0.2	< 0.1	99.2	< 0.1	0.7	0.0004	<0.30
V-500-3		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0005	<0.30
V-500-5		0.1	0.2	< 0.1	98.9	< 0.1	1	0.0005	<0.30
V-500-5	Lab Dup.								
V-500-7		< 0.1	0.2	0.1	99.2	< 0.1	0.7	0.0005	<0.30
V-1000-1		0.1	0.2	< 0.1	99	0.1	0.9	0.0009	0.85
V-1000-3		0.1	0.2	< 0.1	99.1	< 0.1	0.9	0.0001	0.53
V-1000-3	Field Dup.							0.0013	0.88
V-1000-5		0.1	0.2	< 0.1	99	< 0.1	0.9	0.0003	<0.30
V-1000-5	Field Dup.	< 0.1	0.2	< 0.1	99.2	< 0.1	0.7	0.0002	<0.30
V-1000-7		0.1	0.2	< 0.1	99.1	< 0.1	0.8	0.0003	0.45
V-3000-1		< 0.1	0.2	< 0.1	99.2	< 0.1	0.7	0.0007	0.35
V-3000-2		< 0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0005	<0.30
V-3000-2	Lab Dup.	< 0.1	0.2	< 0.1	99.2	< 0.1	0.8		
V-3000-3		< 0.1	0.4	< 0.1	99.2	< 0.1	0.9	0.0002	<0.30
V-3000-3	Lab Dup.								
V-3000-4		0.4	0.2	< 0.1	99.2	0.1	0.8	0.0004	0.33
V-3000-5		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0001	<0.30
V-3000-6		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0002	<0.30
V-3000-6	Field Dup.	0.2	0.2	< 0.1	99.2	< 0.1	0.8	0.0007	0.53
V-3000-7		0.1	0.2	< 0.1	99.3	< 0.1	0.7	0.0004	0.78
V-3000-7	Field Dup.	0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0010	0.65
V-3000-8		< 0.1	0.2	< 0.1	99.2	< 0.1	0.7	0.0004	<0.30
V-3000-8	Field Dup.	< 0.1	0.2	< 0.1	99.2	0.1	0.7	0.0005	<0.30
V-6000-3		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0009	0.95
V-6000-5		< 0.1	0.3	< 0.1	99.2	< 0.1	0.8	0.0006	0.35
V-6000-7		0.1	0.2	< 0.1	99.2	3	0.8	0.0005	0.45
V-6000-7	Lab Dup.								
V-10000-1		0.3	0.4	0.6	98.2	0.2	1	0.0003	0.40
V-10000-3		0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0002	0.85
V-10000-3	Lab Dup.			< 0.1	99.3	0.1	0.7		
V-10000-5		< 0.1	0.4	< 0.1	99	< 0.1	1	0.0008	1.18
V-10000-7		< 0.1	0.3	< 0.1	99	0.1	0.8	0.0018	0.63
V-15000-1		0.1	0.3	4.5	93.9	0.5	1.1	0.0006	<0.30
V-15000-2		0.2	0.6	1.6	97.2	0.2	0.9	0.0012	<0.30
V-15000-2	Lab Dup.			1.4	97.6	0.1	0.9		
V-15000-3		0.3	0.9	< 0.1	97.6	0.8	1.6	0.0004	<0.30
V-15000-3	Lab Dup.			< 0.1	97.7	0.8	1.5		
V-15000-4		0.2	0.2	< 0.1	99.1	< 0.1	0.9	0.0006	0.80
V-15000-4	Field Dup.	0.1	0.2	< 0.1	99.2	< 0.1	0.8	0.0005	0.38
V-15000-5		0.2	0.4	< 0.1	99.1	< 0.1	0.9	0.0006	0.33
V-15000-6		0.1	0.7	0.4	98.4	0.2	1	0.0006	0.65
V-15000-7		0.1	0.2	< 0.1	99.2	0.1	0.7	0.0002	0.35
V-15000-7	Lab Dup.			0.1	99.2	< 0.1	0.7		
V-15000-8		0.5	1.4	< 0.1	96.8	1.2	1.9	0.0003	<0.30
V-20000-4		0.2	0.2	< 0.1	99.2	< 0.1	0.9	0.0023	0.93

TABLE 5b: Toxicity at Venture Drill Site - November 1998

Unique station id	Replicate id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid Fertilization		Microtox EC50
				Mortality %	Control Mortality %	% Fertilization	IC 50	
V-250-1				11	2	97.00		>100%
V-250-3				7	2	77.30	91.1	>100%
V-250-5								>100%
V-250-7				11	2	59.30	>100%	>100%
V-500-1				13	2	82.70		>100%
V-500-3				1	2	2.30	22.6	>100%
V-500-5				3	2	84.30		>100%
V-500-5	Lab Dup.							
V-500-7				13	2	62.70	68.2	>100%
V-1000-1								
V-1000-3								
V-1000-3	Field Dup.							
V-1000-5								
V-1000-5	Field Dup.							
V-1000-7								
V-3000-1				17	2	92.70		>100%
V-3000-2								
V-3000-2	Lab Dup.							
V-3000-3		<0.05	<0.05	4	2	88.00		>100%
V-3000-3	Lab Dup.							
V-3000-4								
V-3000-5				1	2	96.30		>100%
V-3000-6								
V-3000-6	Field Dup.							
V-3000-7		<0.05	<0.05	4	2	87.70		>100%
V-3000-7	Field Dup.	<0.05	<0.05	5	2	90.00		>100%
V-3000-8								
V-3000-8	Field Dup.							
V-6000-3								
V-6000-5								
V-6000-7								
V-6000-7	Lab Dup.							
V-10000-1								
V-10000-3								
V-10000-3	Lab Dup.							
V-10000-5								
V-10000-7								
V-15000-1								
V-15000-2								
V-15000-2	Lab Dup.							
V-15000-3								
V-15000-3	Lab Dup.							
V-15000-4								
V-15000-4	Field Dup.							
V-15000-5								
V-15000-6								
V-15000-7								
V-15000-7	Lab Dup.							
V-15000-8								
V-20000-4		<0.05	<0.05	26	2	71.00	62.0	>100%

**Appendix C-7: Laboratory Analytical Data for Sediment
from Venture Field, June 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1c: Trace Elements at Venture Drill Site - June 1999

Unique station id	Replicate id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
V-250-1		8100	<2	2	170	<5	<5	<0.3	5	1	<2	3000	4	<5
V-250-1	Lab Dup.	8800	<2	2	170	<5	<5	<0.3	4	<1	<2	2600	4	<5
V-250-3		8700	<2	2	240	<5	<5	<0.3	4	1	<2	2300	3.9	<5
V-250-7		6700	<2	2	200	<5	<5	<0.3	4	1	<2	1900	3.4	<5
V-500-1		7900	<2	2	170	<5	<5	<0.3	4	1	4	1900	3.8	<5
V-500-3		11000	<2	2	240	<5	<5	<0.3	6	1	<2	3100	5	<5
V-500-5		8700	<2	2	180	<5	<5	<0.3	5	1	<2	2400	4.2	<5
V-500-7		12000	<2	3	220	<5	<5	<0.3	18	3	4	13000	8.6	<5
V-1000-1		12000	<2	2	210	<5	<5	<0.3	11	2	2	7900	6.6	<5
V-1000-3		9500	<2	2	200	<5	<5	<0.3	5	1	<2	2600	4.4	<5
V-1000-5		9800	<2	2	210	<5	<5	<0.3	5	1	<2	2300	4.6	<5
V-1000-7		11000	<2	2	210	<5	<5	<0.3	8	1	2	6000	6.2	<5
V-3000-1		8600	<2	2	150	<5	<5	<0.3	4	1	<2	2100	3.4	<5
V-3000-2		8600	<2	<2	160	<5	<5	<0.3	3	<1	<2	1600	3.5	<5
V-3000-3		13000	<2	2	210	<5	<5	<0.3	11	2	2	7600	6.7	<5
V-3000-4		13000	<2	2	210	<5	<5	<0.3	8	1	<2	4100	5.3	<5
V-3000-5		13000	<2	3	200	<5	<5	<0.3	15	2	3	9600	8.2	<5
V-3000-5	Lab Dup.	13000	<2	2	220	<5	<5	<0.3	13	2	3	7900	7	<5
V-3000-5	Field Dup.	13000	<2	3	230	<5	<5	<0.3	19	2	2	7600	8.4	<5
V-3000-6		13000	<2	2	210	<5	<5	<0.3	11	2	2	7400	7.1	<5
V-3000-7		8200	<2	2	140	<5	<5	<0.3	4	<1	<2	2200	3.3	<5
V-3000-8		8700	<2	2	160	<5	<5	<0.3	5	1	2	2800	4	<5
V-6000-3		6000	<2	<2	84	<5	<5	<0.3	2	<1	<2	1500	2.4	<5
V-6000-5		14000	<2	2	220	<5	<5	<0.3	12	2	2	7200	7	<5
V-6000-7		8400	<2	2	140	<5	<5	<0.3	8	1	2	5800	4.5	<5
V-10000-1		9400	<2	2	160	<5	<5	<0.3	5	1	<2	2700	4.5	<5
V-10000-3		7400	<2	<2	130	<5	<5	<0.3	2	<1	<2	1000	2.9	<5
V-10000-5		15000	<2	2	260	<5	<5	<0.3	12	2	2	7600	7.4	<5
V-10000-7		13000	<2	2	200	<5	<5	<0.3	11	1	2	5900	5.4	<5
V-10000-7	Field Dup.	13000	<2	2	230	<5	<5	<0.3	22	2	2	10000	8.3	<5
V-15000-1		8100	<2	3	150	<5	<5	<0.3	4	<1	<2	2400	5.1	<5
V-15000-2		10000	<2	4	170	<5	<5	<0.3	7	1	<2	3900	5.6	<5
V-15000-2	Field Dup.	10000	<2	4	190	<5	<5	<0.3	7	1	<2	3800	6.1	<5
V-15000-3		21000	<2	5	360	<5	<5	<0.3	14	2	2	7800	8.9	5
V-15000-4		9400	<2	2	170	<5	<5	<0.3	2	<1	<2	1400	4.1	<5
V-15000-5		17000	<2	2	310	<5	<5	<0.3	8	1	2	5200	7.5	<5
V-15000-5	Lab Dup.	17000	<2	2	290	<5	<5	<0.3	10	<1	2	5100	7.4	<5
V-15000-6		19000	<2	2	310	<5	<5	<0.3	14	2	2	8800	8.2	<5
V-15000-7		7800	<2	2	150	<5	<5	<0.3	5	1	<2	3500	3.8	<5
V-15000-8		16000	<2	2	290	<5	<5	<0.3	10	1	3	4600	7.3	<5
V-15000-8	Field Dup.	14000	<2	2	240	<5	<5	<0.3	7	1	<2	3500	5.9	<5
V-20000-4		11000	<2	2	190	<5	<5	<0.3	3	<1	<2	2000	4.8	<5

TABLE 1c: Trace Elements at Venture Drill Site - June 1999 (Continued)

Unique_station_id	Replicate_id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
V-250-1		84	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	9	10
V-250-1	Lab Dup.	66	<2	<0.01	<2	<2	<0.5	42	0.1	<2	0.2	8	7
V-250-3		40	<2	<0.01	<2	<2	<0.5	45	0.1	<2	0.2	7	13
V-250-7		30	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.1	6	8
V-500-1		33	<2	<0.01	<2	<2	<0.5	40	0.1	<2	0.1	6	8
V-500-3		59	<2	<0.01	2	<2	<0.5	53	0.1	<2	0.2	9	9
V-500-5		39	<2	<0.01	<2	<2	<0.5	43	0.1	<2	0.2	7	9
V-500-7		430	<2	<0.01	3	<2	<0.5	58	0.2	<2	0.6	34	28
V-1000-1		250	<2	<0.01	2	<2	<0.5	55	0.1	<2	0.4	20	17
V-1000-3		55	<2	<0.01	<2	<2	<0.5	48	0.1	<2	0.2	7	7
V-1000-5		38	<2	<0.01	2	<2	<0.5	52	0.1	<2	0.2	7	7
V-1000-7		150	<2	<0.01	2	<2	<0.5	52	0.1	<2	0.3	15	13
V-3000-1		44	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.2	6	8
V-3000-2		23	<2	<0.01	<2	<2	<0.5	40	0.1	<2	0.2	4	8
V-3000-3		220	<2	<0.01	2	<2	<0.5	58	0.1	<2	0.3	19	16
V-3000-4		100	<2	<0.01	2	<2	<0.5	55	0.1	<2	0.2	12	11
V-3000-5		300	<2	<0.01	3	<2	<0.5	55	0.1	<2	0.4	25	22
V-3000-5	Lab Dup.	250	<2	<0.01	2	<2	<0.5	57	0.1	<2	0.3	21	18
V-3000-5	Field Dup.	270	<2	<0.01	3	<2	<0.5	56	0.1	<2	0.4	20	15
V-3000-6		210	<2	<0.01	3	<2	<0.5	57	0.1	<2	0.4	19	16
V-3000-7		24	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	6	7
V-3000-8		65	<2	<0.01	<2	<2	<0.5	41	0.1	<2	0.2	8	10
V-6000-3		17	<2	<0.01	<2	<2	<0.5	27	0.1	<2	0.1	5	6
V-6000-5		220	<2	<0.01	3	<2	<0.5	60	0.2	<2	0.5	19	16
V-6000-7		140	<2	<0.01	2	<2	<0.5	40	0.1	<2	0.2	14	12
V-10000-1		51	<2	<0.01	<2	<2	<0.5	46	0.1	<2	0.2	7	9
V-10000-3		10	<2	<0.01	<2	<2	<0.5	32	0.1	<2	0.1	3	6
V-10000-5		210	<2	<0.01	2	<2	<0.5	66	0.2	<2	0.8	19	15
V-10000-7		120	<2	<0.01	2	<2	<0.5	58	0.1	<2	0.3	15	12
V-10000-7	Field Dup.	290	<2	<0.01	3	<2	<0.5	56	0.1	<2	0.5	23	18
V-15000-1		38	<2	<0.01	<2	<2	<0.5	40	0.1	<2	0.3	9	10
V-15000-2		55	<2	<0.01	2	<2	<0.5	50	0.1	<2	0.3	12	10
V-15000-2	Field Dup.	49	<2	<0.01	2	<2	<0.5	45	0.1	<2	0.2	12	8
V-15000-3		100	<2	<0.01	4	<2	<0.5	86	0.2	<2	0.4	19	15
V-15000-4		21	<2	<0.01	<2	<2	<0.5	43	0.1	<2	0.2	4	7
V-15000-5		150	<2	<0.01	2	<2	<0.5	66	0.2	<2	0.4	12	11
V-15000-5	Lab Dup.	140	<2	<0.01	2	<2	<0.5	65	0.2	<2	0.3	12	12
V-15000-6		280	<2	<0.01	3	<2	<0.5	76	0.2	<2	0.5	21	19
V-15000-7		49	<2	<0.01	2	<2	<0.5	35	0.1	<2	0.2	8	8
V-15000-8		130	<2	<0.01	3	<2	<0.5	63	0.2	<2	0.4	13	13
V-15000-8	Field Dup.	83	<2	<0.01	2	<2	<0.5	57	0.2	<2	0.3	9	10
V-20000-4		28	<2	<0.01	<2	<2	<0.5	47	0.1	<2	0.2	5	7

TABLE 2c: Petroleum Hydrocarbons at Venture Drill Site - June 1999

Unique station id	Replicate id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₁₀ -C ₃₀) mg/kg	TPH mg/kg
V-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.26	0.999	2.26	2.26
V-250-1	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.27	0.992	3.26	3.26
V-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	34.8	2.6	37.40	37.4
V-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	26.8	2.52	29.32	29.3
V-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.23	1.5	2.73	2.73
V-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.38	1.46	5.84	5.85
V-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.37	1.58	2.95	2.95
V-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.06	1.78	3.84	3.84
V-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.657	1.33	1.99	1.99
V-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.68	1.63	6.31	6.31
V-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.963	1.69	2.65	2.66
V-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.2	1.85	4.05	4.05
V-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.798	1.66	2.46	2.46
V-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1	1.51	2.51	2.51
V-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.27	2.16	3.43	3.43
V-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.26	2.19	3.45	3.46
V-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.834	1.78	2.61	2.61
V-3000-5	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.725	1.47	2.20	2.2
V-3000-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.6	2.74	4.34	4.34
V-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.03	2	3.03	3.03
V-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.839	1.82	2.66	2.66
V-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1	1.38	2.38	2.38
V-6000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.695	1.13	1.83	1.83
V-6000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.744	1.32	2.06	2.07
V-6000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.625	1.1	1.73	1.73
V-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.79	3.76	5.55	5.54
V-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.24	2.4	3.64	3.65
V-10000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.68	2.22	3.90	3.89
V-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.79	2.83	4.62	4.62
V-10000-7	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.1	2.11	3.21	3.21
V-15000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.34	3.53	5.87	5.87
V-15000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.828	1.82	2.65	2.65
V-15000-2	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.72	4.37	6.09	6.09
V-15000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.41	2.92	4.33	4.32
V-15000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.32	2.96	5.28	5.28
V-15000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.33	1.62	2.95	2.95
V-15000-5	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.43	2.68	4.11	4.11
V-15000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.68	6.03	10.71	10.7
V-15000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.786	1.19	1.98	1.98
V-15000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.96	5.54	8.50	8.49
V-15000-8	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.06	4.68	6.74	6.74
V-20000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.817	1.7	2.52	2.51

TABLE 3c: Polycyclic Aromatic Hydrocarbons at Venture Drill Site - June 1999 (Continued)

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
V-250-1		< 0.05	< 0.05	< 0.05	< 0.05
V-250-1	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-250-3		< 0.05	< 0.05	< 0.05	< 0.05
V-250-7		< 0.05	< 0.05	< 0.05	< 0.05
V-500-1		< 0.05	< 0.05	< 0.05	< 0.05
V-500-3		< 0.05	< 0.05	< 0.05	< 0.05
V-500-5		< 0.05	< 0.05	< 0.05	< 0.05
V-500-7		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-7	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-8	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-20000-4		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4c: Sediment Quality at Venture Drill Site - June 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
V-250-1		0.1	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0003	<0.20
V-250-1	Lab Dup.			< 0.1	99.3	< 0.1	0.8		
V-250-3		0.1	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0006	0.22
V-250-7		0.1	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0004	0.40
V-500-1		0.1	0.1	< 0.1	99.2	< 0.1	0.8	0.0018	<0.20
V-500-3		0.1	< 0.1	< 0.1	99.1	< 0.1	0.8	0.0012	0.80
V-500-5		0.1	0.1	< 0.1	99.1	< 0.1	0.9	0.0003	0.33
V-500-7		0.2	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0004	0.35
V-1000-1		0.1	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0009	0.65
V-1000-3		0.1	< 0.1	< 0.1	99.2	< 0.1	0.7	0.0005	0.30
V-1000-5		0.1	0.1	< 0.1	99.2	< 0.1	0.8	0.0005	0.32
V-1000-7		0.2	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0007	0.23
V-3000-1		0.1	0.3	< 0.1	99.1	< 0.1	0.8	0.0005	0.38
V-3000-2		0.1	0.1	< 0.1	99	< 0.1	0.9	0.0006	<0.20
V-3000-3		0.2	< 0.1	0.1	99	< 0.1	0.9	0.0004	0.27
V-3000-4		0.1	< 0.1	0.1	98.9	< 0.1	1	0.0018	<0.20
V-3000-5		0.2	< 0.1	0.3	98.8	0.1	0.9	0.0004	0.27
V-3000-5	Lab Dup.			< 0.1	99.2	0.1	0.7		
V-3000-5	Field Dup.	0.2	< 0.1	0.1	99	< 0.1	0.9	0.0004	0.30
V-3000-6		0.1	< 0.1	< 0.1	99.2	< 0.1	0.7	0.0004	<0.20
V-3000-7		0.1	0.3	< 0.1	99.3	< 0.1	0.7	0.0005	<0.20
V-3000-8		0.1	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0003	<0.20
V-6000-3		0.1	0.4	< 0.1	99.3	< 0.1	0.7	0.0005	0.42
V-6000-5		0.2	0.3	< 0.1	99.1	< 0.1	0.9	0.0004	<0.20
V-6000-7		0.1	< 0.1	< 0.1	99.2	0.1	0.8	0.0004	0.57
V-10000-1		0.4	0.1	0.2	97.9	0.6	1.4	0.0009	<0.20
V-10000-3		0.2	0.4	< 0.1	99.3	0.1	0.7	0.0008	<0.20
V-10000-5		0.3	0.5	< 0.1	99.1	0.1	0.9	0.0006	0.45
V-10000-7		0.2	0.2	< 0.1	99	0.1	0.9	0.0008	<0.20
V-10000-7	Field Dup.	0.2	< 0.1	< 0.1	99	< 0.1	1	0.0016	<0.20
V-15000-1		0.4	0.2	4.8	93.3	0.6	1.3	0.0004	<0.20
V-15000-2		0.4	0.1	2.2	96.7	0.2	0.9	0.0007	0.48
V-15000-2	Field Dup.	0.3	0.2	1.4	96.9	0.5	1.2	0.0005	<0.20
V-15000-3		0.7	0.3	< 0.1	98	0.5	1.5	0.0008	<0.20
V-15000-4		0.2	< 0.1	< 0.1	99.2	0.1	0.7	0.0005	<0.20
V-15000-5		0.4	< 0.1	< 0.1	98.8	< 0.1	1.1	0.0005	0.25
V-15000-5	Lab Dup.			< 0.1	98.7	0.1	1.2		
V-15000-6		0.6	0.1	< 0.1	98.9	0.1	1	0.0012	<0.20
V-15000-7		0.1	0.1	< 0.1	99.3	< 0.1	0.6	0.0004	0.22
V-15000-8		1.2	0.2	< 0.1	97.1	1.1	1.8	0.0002	<0.20
V-15000-8	Field Dup.	1.1	0.1	< 0.1	97.7	0.8	1.5	0.0009	0.73
V-20000-4		0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0007	0.30

TABLE 5c: Toxicity at Venture Drill Site - June 1999

Unique station id	Replicate id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Microtox EC50
				Mortality	Control Mortality %			
V-250-1		1.94	<20	12	3	62.3	>100%	>100%
V-250-1	Lab Dup.							
V-250-3		1.35	<20	11	3	46.3	98.10%	>100%
V-250-7		1.59	<20	11	3	82.5	>100%	>100%
V-500-1		2.19	<20	8	3	81.3	>100%	>100%
V-500-3		1.08	<20	8	3	58.0	>100%	>100%
V-500-5		1.87	<20	7	3	86.5	>100%	>100%
V-500-7		2.32	<20	9	3	17.5	62.30%	>100%
V-1000-1								
V-1000-3								
V-1000-5								
V-1000-7								
V-3000-1		1.14	<20	8	3	79.3	>100%	>100%
V-3000-2								
V-3000-3		1.96	<20	11	3	77.3	>100%	>100%
V-3000-4								
V-3000-5		2.95	<20	7	3	76.5	>100%	>100%
V-3000-5	Lab Dup.							
V-3000-5	Field Dup.	3.38	<20	8	3	80.8	>100%	>100%
V-3000-6								
V-3000-7		0.54	<20	2	3	56.5	>100%	>100%
V-3000-8								
V-6000-3								
V-6000-5								
V-6000-7								
V-10000-1								
V-10000-3								
V-10000-5								
V-10000-7								
V-10000-7	Field Dup.							
V-15000-1								
V-15000-2								
V-15000-2	Field Dup.							
V-15000-3								
V-15000-4								
V-15000-5								
V-15000-5	Lab Dup.							
V-15000-6								
V-15000-7								
V-15000-8								
V-15000-8	Field Dup.							
V-20000-4		2.47	<20	6	3	29.3	82.00%	>100%

**Appendix C-8: Laboratory Analytical Data for Sediment
from Venture Field, Fall 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1d: Trace Elements at Venture Drill Site - November 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
V-250-1		7600	< 2	2	160	< 5	< 5	< 0.3	4	1	< 2	3100	4	< 5
V-250-3		10000	< 2	2	260	< 5	< 5	< 0.3	5	1	< 2	4100	5.5	< 5
V-250-5		8500	< 2	< 2	350	< 5	< 5	< 0.3	3	1	< 2	2300	4.1	< 5
V-250-7		7300	< 2	2	210	< 5	< 5	< 0.3	3	1	< 2	2800	3.5	< 5
V-500-1		11000	< 2	2	210	< 5	< 5	< 0.3	19	2	3	9700	7.6	< 5
V-500-1	Lab Dup.	10000	< 2	2	200	< 5	< 5	< 0.3	17	2	2	7000	6.1	< 5
V-500-3		10000	< 2	2	220	< 5	< 5	< 0.3	5	1	< 2	3300	4.8	< 5
V-500-5		9900	< 2	2	190	< 5	< 5	< 0.3	6	1	2	3900	5.5	< 5
V-500-5	Field Dup.	9100	< 2	2	180	< 5	< 5	< 0.3	4	1	< 2	2300	4.3	< 5
V-500-7		11000	< 2	2	220	< 5	< 5	< 0.3	31	3	3	14000	9.7	< 5
V-500-7	Lab Dup.													
V-1000-1		11000	< 2	2	210	< 5	< 5	< 0.3	5	1	< 2	3600	5.1	< 5
V-1000-3		10000	< 2	2	210	< 5	< 5	< 0.3	7	1	2	5000	5.5	< 5
V-1000-5		10000	< 2	2	180	< 5	< 5	< 0.3	14	2	2	7900	7.7	< 5
V-1000-7		12000	< 2	2	240	< 5	< 5	< 0.3	14	2	3	9600	8.7	< 5
V-3000-1		7900	< 2	< 2	150	< 5	< 5	< 0.3	3	1	< 2	2300	3.6	< 5
V-3000-2		8100	< 2	2	160	< 5	< 5	< 0.3	3	1	< 2	2700	4	< 5
V-3000-3		12000	< 2	2	200	< 5	< 5	< 0.3	18	2	3	9000	8.1	< 5
V-3000-3	Lab Dup.	12000	< 2	2	210	< 5	< 5	< 0.3	17	2	2	8200	8	< 5
V-3000-4		12000	< 2	2	230	< 5	< 5	< 0.3	22	3	4	14000	9.4	< 5
V-3000-5		12000	< 2	2	200	< 5	< 5	< 0.3	18	3	3	14000	9.9	< 5
V-3000-6		11000	< 2	2	200	< 5	< 5	< 0.3	13	2	2	8200	7.3	< 5
V-3000-7		7400	< 2	2	130	< 5	< 5	< 0.3	4	1	< 2	3800	3.8	< 5
V-3000-8		7200	< 2	< 2	140	< 5	< 5	< 0.3	3	1	< 2	2600	3.8	< 5
V-6000-3		5900	< 2	< 2	120	< 5	< 5	< 0.3	< 2	< 1	< 2	1100	3.1	< 5
V-6000-5		12000	< 2	3	200	< 5	< 5	< 0.3	38	5	6	25000	13	< 5
V-6000-7		8800	< 2	2	170	< 5	< 5	< 0.3	13	2	3	9500	6.5	< 5
V-10000-1		12000	< 2	2	240	< 5	< 5	< 0.3	9	1	2	4500	6.9	< 5
V-10000-1	Field Dup.	9900	< 2	2	210	< 5	< 5	< 0.3	7	1	2	3700	6	< 5
V-10000-3		5700	< 2	< 2	120	< 5	< 5	< 0.3	2	< 1	< 2	1200	2.6	< 5
V-10000-3	Lab Dup.	5000	< 2	< 2	100	< 5	< 5	< 0.3	< 2	< 1	< 2	880	2.3	< 5
V-10000-5		15000	< 2	2	260	< 5	< 5	< 0.3	15	4	3	10000	9.5	< 5
V-10000-7		11000	< 2	3	200	< 5	< 5	< 0.3	16	2	3	11000	7.8	< 5
V-15000-1		7700	< 2	3	170	< 5	< 5	< 0.3	6	1	2	3400	6.2	< 5
V-15000-1	Field Dup.	5200	< 2	3	100	< 5	< 5	< 0.3	4	< 1	2	2000	4.6	< 5
V-15000-2		8500	< 2	4	180	< 5	< 5	< 0.3	7	1	2	4000	6.3	< 5
V-15000-3		19000	< 2	5	360	< 5	< 5	< 0.3	15	2	2	7900	9	5
V-15000-4		8900	< 2	2	190	< 5	< 5	< 0.3	3	1	< 2	2300	4.7	< 5
V-15000-5		16000	< 2	2	280	< 5	< 5	< 0.3	13	2	3	6900	8.4	< 5
V-15000-6		18000	< 2	2	310	< 5	< 5	< 0.3	16	2	3	8800	8.9	< 5
V-15000-6	Field Dup.	17000	< 2	3	290	< 5	< 5	< 0.3	19	3	4	12000	8.8	< 5
V-15000-7		5100	< 2	2	98	< 5	< 5	< 0.3	3	< 1	< 2	3300	2.4	< 5
V-15000-8		8300	< 2	< 2	150	< 5	< 5	< 0.3	4	< 1	< 2	1400	3.5	< 5
V-15000-8	Lab Dup.	8000	< 2	2	180	< 5	< 5	< 0.3	6	1	< 2	2200	4.7	< 5
V-20000-4		10000	< 2	2	200	< 5	< 5	< 0.3	4	1	< 2	2600	5	< 5

TABLE 1d: Trace Elements at Venture Drill Site - November 1999 (Continued)

Unique station id	Replicate id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
V-250-1		74	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	7	7
V-250-3		100	<2	<0.01	2	<2	<0.5	50	0.1	<2	0.3	10	10
V-250-5		37	<2	<0.01	<2	<2	<0.5	46	0.1	<2	0.2	5	6
V-250-7		78	<2	<0.01	<2	<2	<0.5	36	0.1	<2	0.2	6	6
V-500-1		370	<2	<0.01	2	<2	<0.5	51	0.1	<2	0.4	22	20
V-500-1	Lab Dup.	250	<2	<0.01	2	<2	<0.5	46	0.1	<2	0.3	16	15
V-500-3		63	<2	<0.01	2	<2	<0.5	50	0.1	<2	0.2	8	8
V-500-5		110	<2	<0.01	2	<2	<0.5	47	0.1	<2	0.2	10	8
V-500-5	Field Dup.	43	<2	<0.01	2	<2	<0.5	44	0.1	<2	0.2	6	7
V-500-7		570	<2	<0.01	3	<2	<0.5	52	0.1	<2	0.8	32	25
V-500-7	Lab Dup.												
V-1000-1		96	<2	<0.01	2	<2	<0.5	52	0.1	<2	0.2	9	9
V-1000-3		160	<2	<0.01	2	<2	<0.5	52	0.1	<2	0.2	13	11
V-1000-5		320	<2	<0.01	2	<2	<0.5	49	0.1	<2	0.5	20	16
V-1000-7		350	<2	<0.01	2	<2	<0.5	60	0.1	<2	0.4	24	18
V-3000-1		62	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.2	6	7
V-3000-2		53	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.2	6	7
V-3000-3		350	<2	<0.01	3	<2	<0.5	56	0.1	<2	0.4	25	18
V-3000-3	Lab Dup.	300	<2	<0.01	2	<2	<0.5	59	0.1	<2	0.4	21	33
V-3000-4		570	<2	<0.01	3	<2	<0.5	57	0.2	<2	0.5	29	23
V-3000-5		500	<2	<0.01	3	<2	<0.5	54	0.1	<2	0.7	28	22
V-3000-6		260	<2	<0.01	2	<2	<0.5	53	0.1	<2	0.4	20	16
V-3000-7		76	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	9	7
V-3000-8		46	<2	<0.01	<2	<2	<0.5	35	0.1	<2	0.2	6	6
V-6000-3		9	<2	<0.01	<2	<2	<0.5	30	0.1	<2	0.1	3	4
V-6000-5		1000	<2	<0.01	4	<2	<0.5	54	0.1	2	1.1	52	41
V-6000-7		280	<2	<0.01	2	<2	<0.5	42	0.1	<2	0.4	24	15
V-10000-1		94	<2	<0.01	2	<2	<0.5	58	0.2	<2	0.3	12	12
V-10000-1	Field Dup.	86	<2	<0.01	2	<2	<0.5	50	0.1	<2	0.2	10	8
V-10000-3		10	<2	<0.01	<2	<2	<0.5	30	0.1	<2	0.2	3	5
V-10000-3	Lab Dup.	9	<2	<0.01	<2	<2	<0.5	26	0.1	<2	0.2	2	5
V-10000-5		340	<2	<0.01	3	<2	<0.5	65	0.2	<2	0.6	26	18
V-10000-7		310	<2	<0.01	3	<2	<0.5	52	0.1	<2	0.5	25	18
V-15000-1		56	<2	<0.01	2	<2	<0.5	44	0.1	<2	0.3	10	7
V-15000-1	Field Dup.	36	<2	<0.01	<2	<2	<0.5	29	0.1	<2	0.2	7	6
V-15000-2		53	<2	<0.01	2	<2	<0.5	44	0.1	<2	0.3	11	7
V-15000-3		100	<2	<0.01	3	<2	<0.5	82	0.2	<2	0.4	19	13
V-15000-4		45	<2	<0.01	<2	<2	<0.5	45	0.1	<2	0.2	6	6
V-15000-5		270	<2	<0.01	3	<2	<0.5	72	0.2	<2	0.4	19	17
V-15000-6		340	<2	<0.01	3	<2	<0.5	77	0.2	<2	0.6	23	18
V-15000-6	Field Dup.	490	<2	<0.01	4	<2	<0.5	76	0.2	<2	0.8	29	22
V-15000-7		22	<2	<0.01	<2	<2	<0.5	26	<0.1	<2	0.2	7	7
V-15000-8		26	<2	<0.01	<2	<2	<0.5	33	0.1	<2	0.2	5	6
V-15000-8	Lab Dup.	48	<2	<0.01	<2	<2	<0.5	45	0.1	<2	0.2	6	8
V-20000-4		45	<2	<0.01	<2	<2	<0.5	48	0.1	<2	0.2	7	6

TABLE 2d: Petroleum Hydrocarbons at Venture Drill Site - November 1999

Unique station id	Replicate id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₉ -C ₁₀ mg/kg	C ₁₁ -C ₁₂ mg/kg	C ₁₃ -C ₁₄ mg/kg	TEH (C ₁₁ -C ₁₄) mg/kg	TPH mg/kg
V-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.584	1.2	< 3	< 3
V-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.61	0.932	3.54	3.54
V-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	14.3	0.885	15.2	15.2
V-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.42	0.882	3.3	3.3
V-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.395	0.683	< 3	< 3
V-500-1	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.436	0.756	< 3	< 3
V-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.53	1.19	< 3	< 3
V-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.527	1.33	< 3	< 3
V-500-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.641	0.865	< 3	< 3
V-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.721	0.999	< 3	< 3
V-500-7	Lab Dup.									
V-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.37	1.1	< 3	< 3
V-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.423	0.77	< 3	< 3
V-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-6000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-6000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-6000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-1	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-1	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-6	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-15000-8	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
V-20000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3

TABLE 3d: Polycyclic Aromatic Hydrocarbons at Venture Drill Site - November 1999 (Continued)

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
V-250-1		< 0.05	< 0.05	< 0.05	< 0.05
V-250-3		< 0.05	< 0.05	< 0.05	< 0.05
V-250-5		< 0.05	< 0.05	< 0.05	< 0.05
V-250-7		< 0.05	< 0.05	< 0.05	< 0.05
V-500-1		< 0.05	< 0.05	< 0.05	< 0.05
V-500-1	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-500-3		< 0.05	< 0.05	< 0.05	< 0.05
V-500-5		< 0.05	< 0.05	< 0.05	< 0.05
V-500-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-500-7		< 0.05	< 0.05	< 0.05	< 0.05
V-500-7	Lab Dup.				
V-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-3	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-6000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-1	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-3	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-10000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-1		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-1	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-2		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-3		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-4		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-5		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-6		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-6	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-15000-7		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-8		< 0.05	< 0.05	< 0.05	< 0.05
V-15000-8	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
V-20000-4		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4d: Sediment Quality at Venture Drill Site - November 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
V-250-1		0.2	< 0.1	< 0.1	99.2	< 0.1	0.7	0.0007	0.22
V-250-3		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0006	<0.30
V-250-5		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0005	<0.20
V-250-7		0.1	0.1	< 0.1	99.2	< 0.1	0.7	0.0003	<0.20
V-500-1		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0008	<0.20
V-500-1	Lab Dup.	0.2	< 0.1	< 0.1	99	0.1	0.8		
V-500-3		0.2	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0004	<0.3
V-500-5		0.2	< 0.1	< 0.1	99.1	0.1	0.9	0.0011	0.22
V-500-5	Field Dup.	0.2	< 0.1	< 0.1	99	0.1	0.9	0.0012	0.58
V-500-7		0.2	< 0.1	< 0.1	99.3	0.1	0.7	0.0015	<0.30
V-500-7	Lab Dup.								
V-1000-1		0.2	< 0.1	< 0.1	99	0.1	1	0.0008	0.33
V-1000-3		0.2	< 0.1	< 0.1	99	0.1	0.9	0.0005	<0.20
V-1000-5		0.2	< 0.1	< 0.1	99.1	< 0.1	1.1	0.0009	0.83
V-1000-7		0.2	< 0.1	< 0.1	98.9	< 0.1	1.1	0.0004	<0.20
V-3000-1		0.1	0.1	< 0.1	99.1	< 0.1	1	0.0005	<0.20
V-3000-2		0.1	0.1	0.1	99.1	< 0.1	0.8	0.0005	0.25
V-3000-3		0.2	0.1	< 0.1	99	< 0.1	1	0.0005	<0.20
V-3000-3	Lab Dup.	0.2	0.1	< 0.1	98.9	< 0.1	1.1		
V-3000-4		0.2	< 0.1	< 0.1	99	< 0.1	1	0.0005	0.20
V-3000-5		0.2	< 0.1	< 0.1	98.9	0.1	1	0.0004	<0.33
V-3000-6		0.2	< 0.1	< 0.1	99	< 0.1	1	0.0005	0.22
V-3000-7		0.1	< 0.1	< 0.1	99	< 0.1	1	0.0006	<0.3
V-3000-8		0.1	< 0.1	< 0.1	99	< 0.1	1	0.0004	<0.20
V-6000-3		0.2	< 0.1	0.1	98.9	0.1	1	0.0005	<0.20
V-6000-5		0.3	< 0.1	< 0.1	99	< 0.1	1.1	0.0005	0.80
V-6000-7		0.2	< 0.1	< 0.1	98.9	< 0.1	1.1	0.0004	<0.20
V-10000-1		0.8	< 0.1	0.1	98.3	0.3	1.3	0.0012	<0.20
V-10000-1	Field Dup.	0.9	0.1	0.2	98.6	0.2	1	0.0002	<0.20
V-10000-3		0.2	0.1	< 0.1	98.9	< 0.1	1.3	0.0005	<0.20
V-10000-3	Lab Dup.	0.2	0.1	< 0.1	98.9	< 0.1	1.1		
V-10000-5		0.4	0.1	< 0.1	98.7	0.1	1.2	0.0016	<0.20
V-10000-7		0.3	< 0.1	< 0.1	99	< 0.1	1	0.0005	0.22
V-15000-1		1.2	0.6	4.8	92.8	0.6	1.8	0.0006	0.40
V-15000-1	Field Dup.	1	0.2	1.8	96.4	0.4	1.4	0.0005	<0.20
V-15000-2		1.1	< 0.1	4.6	93.9	0.2	1.3	0.0003	<0.20
V-15000-3		1.2	0.2	< 0.1	97.7	0.4	2	0.0005	<0.20
V-15000-4		0.2	< 0.1	0.1	99	< 0.1	0.9	0.0004	<0.20
V-15000-5		0.7	< 0.1	< 0.1	98.8	0.1	1.1	0.0003	<0.20
V-15000-6		1	0.1	0.4	97.9	0.2	1.5	0.0005	<0.20
V-15000-6	Field Dup.	1	0.1	1.2	97.3	0.1	1.4	0.0006	<0.20
V-15000-7		0.2	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0006	0.20
V-15000-8		1	0.4	0.1	98.2	0.4	1.3	0.0009	0.25
V-15000-8	Lab Dup.	0.9	0.2	0.5	97.8	0.4	1.2		
V-20000-4		0.3	< 0.1	< 0.1	99	< 0.1	1	0.0003	<0.20

TABLE 5d: Toxicity at Venture Drill Site - November 1999

Unique_station_M	Replicate_M	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Micronas EC50
				Mortality %	Control Mortality %			
V-250-1		<0.50	<10	2	0	84.3	>100%	>100%
V-250-3		<0.50	<10	2	0	93.3	>100%	>100%
V-250-5		<0.50	<10	0	0	92.8	>100%	>100%
V-250-7		<0.50	<10	1	0	91.0	>100%	>100%
V-500-1		<0.50	<10	4	0	95.0	>100%	>100%
V-500-1	Lab Dup.							
V-500-3		<0.50	<10	4	0	89.8	>100%	>100%
V-500-5		<0.50	<10	4	0	89.5	>100%	>100%
V-500-5	Field Dup.	<0.50	<10	5	0	82.0	>100%	>100%
V-500-7		<0.50	<10	7	0	89.8	>100%	>100%
V-500-7	Lab Dup.	<0.50						
V-1000-1								
V-1000-3								
V-1000-5								
V-1000-7								
V-3000-1		<0.50	<10	8	0	88.0	>100%	>100%
V-3000-2								
V-3000-3		<0.50	<10	6	0	87.8	>100%	>100%
V-3000-3	Lab Dup.							
V-3000-4								
V-3000-5		<0.50	<10	5	0	75.0	>100%	>100%
V-3000-6								
V-3000-7		<0.50	<10	7	0	76.5	>100%	>100%
V-3000-8								
V-6000-3								
V-6000-5								
V-6000-7								
V-10000-1								
V-10000-1	Field Dup.							
V-10000-3								
V-10000-3	Lab Dup.							
V-10000-5								
V-10000-7								
V-15000-1								
V-15000-1	Field Dup.							
V-15000-2								
V-15000-3								
V-15000-4								
V-15000-5								
V-15000-6								
V-15000-6	Field Dup.							
V-15000-7								
V-15000-8								
V-15000-8	Lab Dup.							
V-20000-4		<0.50	<10	4	0	90.3	>100%	>100%

**Appendix D: Laboratory Analytical Results for
Sediment from Thebaud Field**

- Appendix D-1 June 1998 Data
- Appendix D-2 June 1999 Data
- Appendix D-3 Fall 1999 Data

**Appendix D-1: Laboratory Analytical Results
for Sediment from Thebaud Field, June 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1a: Trace Elements at Thebaud Drill Site - June 1998

Unique station id	Replicate id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg
T-250-1		12900	<2	2	210	<5	<5	<0.3	20	2	3	13200	8.30
T-250-3		12700	<2	2	200	<5	<5	<0.3	8	1	<2	6360	5.60
T-250-5		15500	<2	2	270	<5	<5	<0.3	11	1	<2	6300	6.80
T-250-7		13800	<2	2	230	<5	<5	<0.3	10	1	2	5200	6.10
T-500-1		12000	<2	2	180	<5	<5	<0.3	16	2	2	11100	8.80
T-500-3		7000	<2	<2	120	<5	<5	<0.3	2	<1	<2	1200	3.00
T-500-3	Lab Dup.	6110	<2	<2	94	<5	<5	<0.3	3	1	<2	2200	3.00
T-500-5		14700	<2	2	230	<5	<5	<0.3	10	1	2	6530	6.40
T-500-7		6320	<2	<2	89	<5	<5	<0.3	3	<1	<2	2000	2.50
T-1000-1		6110	<2	<2	120	<5	<5	<0.3	2	<1	<2	1300	2.50
T-1000-1	Lab Dup.	7070	<2	2	130	<5	<5	<0.3	4	<1	<2	2700	3.40
T-1000-3		8980	<2	2	170	<5	<5	<0.3	5	1	<2	3200	3.80
T-1000-5		6350	<2	<2	95	<5	<5	<0.3	4	<1	<2	2300	2.50
T-1000-7		11100	<2	<2	200	<5	<5	<0.3	7	1	<2	3600	4.90
T-3000-1		8180	<2	<2	150	<5	<5	<0.3	5	1	<2	2800	3.80
T-3000-2		5930	<2	<2	92	<5	<5	<0.3	3	<1	<2	1600	2.30
T-3000-3		14800	<2	2	220	<5	<5	<0.3	9	1	<2	6290	6.30
T-3000-4		15900	<2	2	230	<5	<5	<0.3	21	3	3	16700	8.50
T-3000-5		17100	<2	3	260	<5	<5	<0.3	8	1	<2	5440	6.50
T-3000-6		15700	<2	3	240	<5	<5	<0.3	11	1	<2	6610	7.00
T-3000-7		8500	<2	<2	160	<5	<5	<0.3	5	1	<2	2800	4.00
T-3000-8		6790	<2	<2	120	<5	<5	<0.3	3	<1	<2	1700	2.70
T-6000-1		9610	<2	<2	190	<5	<5	<0.3	7	1	<2	4100	5.30
T-6000-3		5900	<2	<2	95	<5	<5	<0.3	2	<1	<2	1300	2.20
T-6000-4		18000	<2	3	250	<5	<5	<0.3	13	2	3	7610	7.30
T-6000-5		18500	<2	3	280	<5	<5	<0.3	11	1	2	6610	7.60
T-6000-7		6080	<2	<2	100	<5	<5	<0.3	2	1	<2	1900	2.60
T-6000-7	Field Dup.	5000	<2	2	85	<5	<5	<0.3	3	1	<2	2000	2.30
T-6000-8		8170	<2	2	130	<5	<5	<0.3	6	1	<2	3100	3.60
T-9000-2		6890	<2	<2	140	<5	<5	<0.3	3	<1	<2	1700	3.10
T-9000-2	Lab Dup.	7570	<2	<2	140	<5	<5	<0.3	3	<1	<2	1900	3.50
T-9000-3		13000	<2	<2	210	<5	<5	<0.3	6	1	<2	2900	4.80
T-9000-5		21200	<2	3	300	<5	<5	<0.3	13	2	2	8340	8.20
T-9000-7		10100	<2	3	170	<5	<5	<0.3	6	1	<2	4000	4.30
T-9000-7	Field Dup.	10000	<2	3	160	<5	<5	<0.3	5	1	<2	4000	4.00
T-12000-3		13600	<2	2	200	<5	<5	<0.3	12	2	2	7570	6.60
T-12000-3	Lab Dup.	13400	<2	<2	200	<5	<5	<0.3	11	1	2	6380	6.30
T-12000-4		22900	<2	3	300	<5	<5	<0.3	15	2	2	10000	8.80
T-12000-5		7020	<2	<2	100	<5	<5	<0.3	2	<1	<2	1000	3.00
T-12000-6		17300	<2	3	260	<5	<5	<0.3	11	1	2	6730	7.40
T-12000-6	Field Dup.	16800	<2	3	250	<5	<5	<0.3	10	1	2	6640	7.20
T-12000-7		6980	<2	3	110	<5	<5	<0.3	6	1	<2	4300	3.30
T-12000-8		5880	<2	<2	130	<5	<5	<0.3	2	<1	<2	1600	4.10
T-12000-8	Lab Dup.	6610	<2	<2	130	<5	<5	<0.3	2	<1	<2	1800	3.30
T-20000-3		18600	<2	2	260	<5	<5	<0.3	14	2	2	8720	7.30
T-20000-7		3500	<2	<2	110	<5	<5	<0.3	3	<1	<2	1500	2.10
T-20000-7	Field Dup.	5840	<2	2	93	<5	<5	<0.3	4	<1	<2	2800	2.60

TABLE 1a: Trace Elements at Thebaud Drill Site - June 1998 (Continued)

Unique_station_id	Replicate_id	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg	Ti mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
T-250-1		<5	400	<2	<0.01	3.00	<2	51	0.10	<2	0.70	27	20
T-250-3		<5	130	<2	<0.01	2.00	<2	46	0.20	<2	0.30	13	10
T-250-5		<5	120	<2	<0.01	3.00	<2	60	0.10	<2	0.40	15	12
T-250-7		<5	120	<2	0.01	<2	<2	57	0.10	<2	0.4	14	12
T-500-1		<5	350	<2	0.01	3.00	<2	51	0.10	<2	0.60	25	18
T-500-3		<5	12	<2	<0.01	<2	<2	28	0.10	<2	0.20	3	7
T-500-3	Lab Dup.	<5	17	<2	<0.01	<2	<2	24	0.10	<2	0.20	5	7
T-500-5		<5	130	<2	0.01	2.00	<2	58	0.10	<2	0.30	15	12
T-500-7		<5	21	<2	<0.01	<2	<2	25	0.10	<2	0.10	4	5
T-1000-1		<5	11	<2	<0.01	<2	<2	26	0.10	<2	0.10	3	5
T-1000-1	Lab Dup.	<5	27	<2	<0.01	<2	<2	28	0.10	<2	0.20	6	7
T-1000-3		<5	28	<2	<0.01	2.00	<2	36	0.10	<2	0.20	7	8
T-1000-5		<5	26	<2	<0.01	<2	<2	30	0.10	<2	0.10	5	7
T-1000-7		<5	58	<2	0.01	2.00	<2	47	0.10	<2	0.20	9	8
T-3000-1		<5	52	<2	<0.01	<2	<2	32	0.10	<2	0.20	7	8
T-3000-2		<5	12	<2	<0.01	<2	<2	22	0.10	<2	0.10	4	7
T-3000-3		<5	140	<2	<0.01	2.00	<2	60	0.20	<2	0.40	13	11
T-3000-4		<5	520	<2	<0.01	4.00	<2	61	0.10	<2	0.80	37	26
T-3000-5		<5	66	<2	<0.01	2.00	<2	65	0.20	<2	0.30	11	10
T-3000-6		<5	120	<2	<0.01	2.00	<2	63	0.20	<2	0.40	15	12
T-3000-7		<5	50	<2	<0.01	<2	<2	35	0.10	<2	0.20	7	8
T-3000-8		<5	16	<2	<0.01	<2	<2	28	0.10	<2	0.10	4	7
T-6000-1		<5	110	<2	<0.01	2.00	<2	41	0.10	<2	0.30	10	11
T-6000-3		<5	14	<2	<0.01	<2	<2	28	0.10	<2	0.10	3	5
T-6000-4		<5	170	<2	<0.01	3.00	<2	71	0.20	<2	0.50	16	13
T-6000-5		<5	120	<2	<0.01	3.00	<2	75	0.20	<2	0.40	15	13
T-6000-7		<5	16	<2	<0.01	<2	<2	23	0.10	<2	0.10	4	6
T-6000-7	Field Dup.	<5	17	<2	<0.01	<2	<2	22	0.10	<2	0.40	6	6
T-6000-8		<5	35	<2	<0.01	2.00	<2	37	0.10	<2	0.20	8	9
T-9000-2		<5	26	<2	<0.01	<2	<2	31	0.10	<2	0.10	4	6
T-9000-2	Lab Dup.	<5	43	<2	<0.01	<2	<2	34	0.10	<2	0.20	5	7
T-9000-3		<5	33	<2	<0.01	2.00	<2	52	0.20	<2	0.20	6	6
T-9000-5		<5	220	<2	<0.01	3.00	<2	79	0.30	<2	0.60	18	16
T-9000-7		<5	47	<2	<0.01	2.00	<2	39	0.10	<2	0.30	9	9
T-9000-7	Field Dup.	<5	36	<2	<0.01	2.00	<2	39	0.10	<2	0.20	9	9
T-12000-3		<5	230	<2	<0.01	2.00	<2	58	0.10	<2	0.40	16	13
T-12000-3	Lab Dup.	<5	170	<2	<0.01	2.00	<2	54	0.10	<2	0.40	13	12
T-12000-4		<5	280	<2	<0.01	4.00	<2	80	0.30	<2	0.80	19	17
T-12000-5		<5	36	<2	<0.01	<2	<2	28	0.10	<2	0.20	3	6
T-12000-6		<5	150	<2	<0.01	3.00	<2	71	0.20	<2	0.50	15	13
T-12000-6	Field Dup.	<5	150	<2	<0.01	3.00	<2	68	0.20	<2	0.40	14	12
T-12000-7		<5	52	<2	<0.01	2.00	<2	35	0.10	<2	0.20	11	7
T-12000-8		<5	16	<2	<0.01	<2	<2	29	0.10	<2	0.20	4	7
T-12000-8	Lab Dup.	<5	25	<2	<0.01	<2	<2	32	0.10	<2	0.20	4	7
T-20000-3		<5	250	<2	<0.01	3.00	<2	71	0.20	<2	0.50	18	15
T-20000-7		<5	12	<2	<0.01	<2	<2	21	0.10	<2	0.10	4	6
T-20000-7	Field Dup.	<5	20	<2	<0.01	<2	<2	27	0.10	<2	0.40	6	7

TABLE 2a: Petroleum Hydrocarbons at Thebaud Drill Site - June 1998

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₁₅ mg/kg	C ₁₆ -C ₂₀ mg/kg	TEH (C ₁₁ -C ₂₀) mg/kg	TPH mg/kg
T-250-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-250-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-250-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-250-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-500-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-500-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-500-5	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-500-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-1000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-1000-1	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-1000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-1000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-1000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-2		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-6		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-3000-8		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-1		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-7	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-6000-8		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-2		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-2	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-9000-7	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-3	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-4		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-5		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-6		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-6	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-8		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-12000-8	Lab Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-20000-3		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-20000-7		<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5
T-20000-7	Field Dup.	<0.025	<0.025	<0.025	<0.05	<2.5	<15.0	<15.0	<30.0	<32.5

TABLE 3a: Polycyclic Aromatic Hydrocarbons at Thebaud Drill Site - June 1998

[illegible]

TABLE 3a: Polycyclic Aromatic Hydrocarbons at Thebaud Drill Site - June 1998 (Continued)

Unique station id	Replicate id	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
T-250-1		<0.05	<0.05	<0.05
T-250-3		<0.05	<0.05	<0.05
T-250-5		<0.05	<0.05	<0.05
T-250-7		<0.05	<0.05	<0.05
T-500-1		<0.05	<0.05	<0.05
T-500-3		<0.05	<0.05	<0.05
T-500-5	Lab Dup.	<0.05	<0.05	<0.05
T-500-7		<0.05	<0.05	<0.05
T-1000-1		<0.05	<0.05	<0.05
T-1000-3	Lab Dup.	<0.05	<0.05	<0.05
T-1000-5		<0.05	<0.05	<0.05
T-1000-7		<0.05	<0.05	<0.05
T-3000-1		<0.05	<0.05	<0.05
T-3000-2		<0.05	<0.05	<0.05
T-3000-3		<0.05	<0.05	<0.05
T-3000-4		<0.05	<0.05	<0.05
T-3000-5		<0.05	<0.05	<0.05
T-3000-6		<0.05	<0.05	<0.05
T-3000-7		<0.05	<0.05	<0.05
T-3000-8		<0.05	<0.05	<0.05
T-6000-1		<0.05	<0.05	<0.05
T-6000-3		<0.05	<0.05	<0.05
T-6000-4		<0.05	<0.05	<0.05
T-6000-5		<0.05	<0.05	<0.05
T-6000-7		<0.05	<0.05	<0.05
T-6000-8	Field Dup.	<0.05	<0.05	<0.05
T-9000-2		<0.05	<0.05	<0.05
T-9000-3	Lab Dup.	<0.05	<0.05	<0.05
T-9000-5		<0.05	<0.05	<0.05
T-9000-7		<0.05	<0.05	<0.05
T-9000-8	Field Dup.	<0.05	<0.05	<0.05
T-12000-3		<0.05	<0.05	<0.05
T-12000-4	Lab Dup.	<0.05	<0.05	<0.05
T-12000-5		<0.05	<0.05	<0.05
T-12000-6		<0.05	<0.05	<0.05
T-12000-7	Field Dup.	<0.05	<0.05	<0.05
T-12000-8		<0.05	<0.05	<0.05
T-12000-9	Lab Dup.	<0.05	<0.05	<0.05
T-20000-3		<0.05	<0.05	<0.05
T-20000-7		<0.05	<0.05	<0.05
T-20000-8	Field Dup.	<0.05	<0.05	<0.05

TABLE 4a: Sediment Quality at Thebaud Drill Site - June 1998

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Fluc g/L	Ba Content
T-250-1		<0.10	0.40	<0.1	98.9	<0.1	1	0.0005273	<0.3
T-250-3		<0.10	0.30	<0.1	98.9	0.1	1	0.0002	<0.3
T-250-5		<0.10	0.40	<0.1	98.8	0.1	1.1	0.0022	1.72
T-250-7		0.30	<0.1	<0.1	98.9	0.1	0.9	lost	<0.3
T-500-1		<0.10	0.40	<0.1	99	<0.1	1	0.0001667	<0.3
T-500-3		0.10	0.40	<0.1	99.1	<0.1	0.8	0.0010105	<0.3
T-500-3	Lab Dup.	0.10	0.40	<0.1	99.1	<0.1	0.8		
T-500-5		<0.10	0.40	<0.1	98.8	0.2	1	0.0003	<0.3
T-500-7		<0.10	0.20	0.7	98.5	<0.1	0.7	0.0007	<0.3
T-1000-1		<0.10	0.20	0.2	99	<0.1	0.8	0.0005	<0.3
T-1000-1	Lab Dup.	<0.10	0.20	0.2	99	<0.1	0.8		
T-1000-3		<0.10	0.30	<0.1	99	<0.1	1	0.0001	<0.3
T-1000-5		<0.10	0.20	2.3	97	<0.1	0.7	0.0004	<0.3
T-1000-7		0.10	0.50	<0.1	99	<0.1	1	0.0003	<0.3
T-3000-1		0.10	0.20	<0.1	99.1	<0.1	1.2	0.0004	0.83
T-3000-2		0.10	0.20	0.1	99	<0.1	1.3	0.0009	<0.3
T-3000-3		<0.10	0.30	<0.1	98.8	0.1	1.1	0.0004	<0.3
T-3000-4		<0.10	0.40	<0.1	98.9	0.1	1	0.0007	<0.3
T-3000-5		0.10	0.40	<0.1	98.4	0.1	1.8	lost	<0.3
T-3000-6		<0.10	0.40	<0.1	98.9	0.1	0.9	0.0012	<0.3
T-3000-7		<0.10	0.20	<0.1	99.2	0.1	0.7	0.0003	<0.3
T-3000-8		0.10	0.10	0.2	98.9	<0.1	0.9	0.2569	0.89
T-6000-1		0.10	0.20	<0.1	99.1	<0.1	0.9	0.0006	0.81
T-6000-3		<0.10	0.30	<0.1	99	0.1	0.9	0.0005	<0.3
T-6000-4		0.40	0.40	<0.1	98.6	0.3	1.2	0.0004	<0.3
T-6000-5		0.30	0.50	<0.1	98.2	0.2	1.6		0.59
T-6000-7		0.10	0.20	0.2	99.1	<0.1	0.7	0.0019	<0.3
T-6000-7	Field Dup.	0.10	0.10	0.2	99.2	<0.1	0.7		
T-6000-8		0.20	0.20	<0.1	99.1	<0.1	1	0.0024	<0.3
T-9000-2		0.10	0.20	<0.1	99.4	<0.1	0.7	0.0023	<0.3
T-9000-2	Lab Dup.	0.10	0.20	0.1	99.3	0.1	0.6		
T-9000-3		0.10	0.30	<0.1	98.9	<0.1	1.1	0.0004	<0.3
T-9000-5		0.30	0.50	<0.1	98.5	0.1	1.5	0.0003	0.36
T-9000-7		0.10	0.20	<0.1	99.3	<0.1	0.7	0.0004	0.85
T-9000-7	Field Dup.	0.20	0.20	<0.1	99.3	<0.1	0.7		
T-12000-3		0.10	0.40	<0.1	98.9	0.1	1	0.0001	<0.3
T-12000-3	Lab Dup.	0.1	0.40	<0.1	98.9	0.1	1		
T-12000-4		1.00	0.70	<0.1	97.1	1.1	1.8		<0.3
T-12000-5		0.20	0.30	<0.1	99	0.1	0.9	0.0009	<0.3
T-12000-6		0.30	0.40	<0.1	98.3	0.1	1.6	0.0023	0.61
T-12000-6	Field Dup.	0.20	0.40	<0.1	98.6	<0.1	1.5		
T-12000-7		0.30	0.20	<0.1	99.1	<0.1	1.1	0.0029	0.61
T-12000-8		0.10	0.20	0.1	98.8	<0.1	1.1	0.0002	<0.3
T-12000-8	Lab Dup.	0.10	0.20	<0.1	99.1	<0.1	1.2	0.0032	2.40
T-20000-3		0.40	0.60	<0.1	98.4	0.2	1.4	0.0004	<0.3
T-20000-7		0.10	0.20	3.4	95.7	<0.1	0.9	0.0024	0.50
T-20000-7	Field Dup.	0.30	0.30	0.8	97.9	0.2	1		

TABLE 5a: Toxicity at Thebaud Drill Site - June 1998

Unique station id	Replicate id	Amphipod Mortality %	Survival Control Mortality %	Echinoid Fertilization % Fertilization	Microtox EC50
T-250-1		14	1	49.5	>100%
T-250-3		9	1	25	>100%
T-250-5		4	1	46.3	>100%
T-250-7		2	1	57.3	>100%
T-500-1					
T-500-3					
T-500-3	Lab Dup.				
T-500-5					
T-500-7					
T-1000-1					
T-1000-1	Lab Dup.				
T-1000-3					
T-1000-5					
T-1000-7					
T-3000-1		6	2	91.5	>100%
T-3000-2					
T-3000-3		0	1	46	>100%
T-3000-4					
T-3000-5		4	2	90.3	>100%
T-3000-6					
T-3000-7		1	2	92.5	>100%
T-3000-8					
T-6000-1					
T-6000-3					
T-6000-4					
T-6000-5					
T-6000-7					
T-6000-7	Field Dup.				
T-6000-8					
T-9000-2					
T-9000-2	Lab Dup.				
T-9000-3					
T-9000-5					
T-9000-7					
T-9000-7	Field Dup.				
T-12000-3					
T-12000-3	Lab Dup.				
T-12000-4					
T-12000-5					
T-12000-6					
T-12000-6	Field Dup.				
T-12000-7					
T-12000-8					
T-12000-8	Lab Dup.				
T-20000-3		4	1	0	>100%
T-20000-7		4	2	84.5	>100%
T-20000-7	Field Dup.				

Appendix D-2: Laboratory Analytical Results for Sediment from Thebaud Field, June 1999

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1b: Trace Elements at Thebaud Drill Site - June 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg
T-250-1		11000	< 2	< 2	260	< 5	< 5	< 0.3	17	2	3	12000	7.1
T-250-1	Lab Dup.	11000	< 2	2	240	< 5	< 5	< 0.3	14	2	2	7800	5.8
T-250-3		13000	< 2	2	610	< 5	< 5	< 0.3	8	1	< 2	3900	5.6
T-250-5		14000	< 2	2	300	< 5	< 5	< 0.3	12	2	< 2	7200	6.6
T-250-7		10000	< 2	< 2	760	< 5	< 5	< 0.3	6	1	< 2	2800	4.4
T-500-1		9900	< 2	2	190	< 5	< 5	< 0.3	10	1	< 2	4500	5.1
T-500-1	Field Dup.	11000	< 2	2	220	< 5	< 5	< 0.3	7	1	< 2	3500	4.6
T-500-3		5100	< 2	< 2	650	< 5	< 5	< 0.3	3	< 1	< 2	2300	2.7
T-500-5		15000	< 2	3	260	< 5	< 5	< 0.3	14	2	2	9500	7.2
T-500-7		6600	< 2	2	120	< 5	< 5	< 0.3	4	< 1	< 2	2200	2.9
T-1000-1		7300	< 2	< 2	180	< 5	< 5	< 0.3	4	< 1	< 2	2000	3.1
T-1000-3		7200	< 2	2	150	< 5	< 5	< 0.3	4	< 1	< 2	2200	3.1
T-1000-5		4900	< 2	< 2	80	< 5	< 5	< 0.3	2	< 1	< 2	1500	2.2
T-1000-7		9300	< 2	2	180	< 5	< 5	< 0.3	6	1	< 2	3700	4.3
T-1000-7	Field Dup.	7900	< 2	2	170	< 5	< 5	< 0.3	4	< 1	< 2	2300	3.3
T-3000-1		7500	< 2	2	140	< 5	< 5	< 0.3	9	1	< 2	4200	4.3
T-3000-2		5600	< 2	< 2	110	< 5	< 5	< 0.3	4	< 1	< 2	2400	2.5
T-3000-3		14000	< 2	2	240	< 5	< 5	< 0.3	9	1	< 2	4600	5.7
T-3000-4		16000	< 2	3	280	< 5	< 5	< 0.3	13	2	< 2	6800	7
T-3000-5		15000	< 2	3	270	< 5	< 5	< 0.3	10	1	< 2	5200	6.2
T-3000-6		15000	< 2	3	240	< 5	< 5	< 0.3	11	2	2	7600	6.4
T-3000-6	Lab Dup.	15000	< 2	3	240	< 5	< 5	< 0.3	11	1	< 2	6100	6.3
T-3000-6	Field Dup.	14000	< 2	3	230	< 5	< 5	< 0.3	10	1	< 2	5400	5.7
T-3000-7		8800	< 2	2	180	< 5	< 5	< 0.3	5	1	< 2	2900	3.6
T-3000-8		6600	< 2	2	140	< 5	< 5	< 0.3	4	< 1	< 2	2500	2.6
T-6000-1		4600	< 2	< 2	100	< 5	< 5	< 0.3	2	< 1	< 2	1400	2.1
T-6000-3		6200	< 2	< 2	120	< 5	< 5	< 0.3	4	< 1	< 2	1700	2.6
T-6000-4		16000	< 2	3	250	< 5	< 5	< 0.3	11	2	< 2	6200	6.1
T-6000-5		18000	< 2	4	300	< 5	< 5	< 0.3	12	1	< 2	5800	6.7
T-6000-7		6400	< 2	3	120	< 5	< 5	< 0.3	5	1	< 2	3500	2.8
T-6000-8		9100	< 2	2	170	< 5	< 5	< 0.3	4	1	< 2	2800	3.6
T-9000-2		9100	< 2	< 2	170	< 5	< 5	< 0.3	4	1	< 2	2500	4.2
T-9000-3		9800	< 2	< 2	180	< 5	< 5	< 0.3	5	1	< 2	2400	3.8
T-9000-5		20000	< 2	3	320	< 5	< 5	< 0.3	12	2	2	6700	7.8
T-9000-7		8100	< 2	3	140	< 5	< 5	< 0.3	5	1	< 2	3200	3.5
T-9000-7	Lab Dup.	7800	< 2	3	150	< 5	< 5	< 0.3	5	1	< 2	3800	3.3
T-12000-3		13000	< 2	2	210	< 5	< 5	< 0.3	10	1	< 2	5100	5.7
T-12000-4		23000	< 2	4	330	< 5	< 5	< 0.3	17	2	2	10000	9
T-12000-4	Field Dup.	22000	< 2	4	330	< 5	< 5	< 0.3	15	2	2	8200	8.7
T-12000-5		6100	< 2	< 2	110	< 5	< 5	< 0.3	2	< 1	< 2	800	2.8
T-12000-6		15000	< 2	3	240	< 5	< 5	< 0.3	8	1	< 2	4200	6
T-12000-7		5300	< 2	4	97	< 5	< 5	< 0.3	8	1	< 2	5900	2
T-12000-8		6000	< 2	2	110	< 5	< 5	< 0.3	4	1	< 2	2100	3
T-20000-3		17000	< 2	2	260	< 5	< 5	< 0.3	14	2	2	7500	6.9
T-20000-7		4500	< 2	2	84	< 5	< 5	< 0.3	3	< 1	< 2	2400	1.9

TABLE 1b: Trace Elements at Thebaud Drill Site - June 1999 (Continued)

Unique_station_id	Replicate_id	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Ti mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
T-250-1		< 5	390	< 2	< 0.01	2	< 2	< 0.5	49	0.1	< 2	0.5	21	21
T-250-1	Lab Dup.	< 5	230	< 2	< 0.01	2	< 2	< 0.5	48	0.1	< 2	0.3	16	16
T-250-3		< 5	49	< 2	< 0.01	2	< 2	< 0.5	65	0.1	< 2	0.2	9	9
T-250-5		< 5	160	< 2	< 0.01	3	< 2	< 0.5	62	0.2	< 2	0.4	17	15
T-250-7		< 5	35	< 2	< 0.01	2	< 2	< 0.5	60	0.1	< 2	0.2	7	8
T-500-1		< 5	120	< 2	< 0.01	2	< 2	< 0.5	45	0.1	< 2	0.3	12	11
T-500-1	Field Dup.	< 5	58	< 2	< 0.01	2	< 2	< 0.5	50	0.1	< 2	0.2	10	9
T-500-3		< 5	18	< 2	< 0.01	6	< 2	< 0.5	40	0.1	< 2	0.2	4	6
T-500-5		< 5	250	< 2	< 0.01	3	< 2	< 0.5	63	0.2	< 2	0.5	22	18
T-500-7		< 5	25	< 2	< 0.01	< 2	< 2	< 0.5	29	0.1	< 2	0.2	6	6
T-1000-1		< 5	16	< 2	< 0.01	< 2	< 2	< 0.5	32	0.1	< 2	0.3	5	6
T-1000-3		< 5	14	< 2	< 0.01	2	< 2	< 0.5	32	0.1	< 2	0.2	5	7
T-1000-5		< 5	10	< 2	< 0.01	< 2	< 2	< 0.5	22	0.1	< 2	0.4	4	5
T-1000-7		< 5	70	< 2	< 0.01	2	< 2	< 0.5	43	0.1	< 2	0.3	10	8
T-1000-7	Field Dup.	< 5	21	< 2	< 0.01	< 2	< 2	< 0.5	36	0.2	< 2	0.2	5	6
T-3000-1		< 5	100	< 2	< 0.01	2	< 2	< 0.5	34	0.1	< 2	0.2	11	10
T-3000-2		< 5	13	< 2	< 0.01	< 2	< 2	< 0.5	23	0.1	< 2	0.1	6	7
T-3000-3		< 5	88	< 2	< 0.01	2	< 2	< 0.5	62	0.2	< 2	0.3	12	10
T-3000-4		< 5	150	< 2	< 0.01	3	< 2	< 0.5	69	0.2	< 2	0.4	17	14
T-3000-5		< 5	68	< 2	< 0.01	2	< 2	< 0.5	68	0.2	< 2	0.3	12	10
T-3000-6		< 5	170	< 2	< 0.01	2	< 2	< 0.5	59	0.2	< 2	0.4	17	15
T-3000-6	Lab Dup.	< 5	120	< 2	< 0.01	2	< 2	< 0.5	65	0.2	< 2	0.4	15	13
T-3000-6	Field Dup.	< 5	88	< 2	< 0.01	2	< 2	< 0.5	54	0.2	< 2	0.3	13	12
T-3000-7		< 5	21	< 2	< 0.01	< 2	< 2	< 0.5	38	0.1	< 2	0.2	7	7
T-3000-8		< 5	15	< 2	< 0.01	< 2	< 2	< 0.5	27	0.1	< 2	0.1	6	6
T-6000-1		< 5	15	< 2	< 0.01	< 2	< 2	< 0.5	24	0.1	< 2	0.1	4	4
T-6000-3		< 5	21	< 2	< 0.01	< 2	< 2	< 0.5	28	0.1	< 2	0.1	4	5
T-6000-4		< 5	160	< 2	< 0.01	3	< 2	< 0.5	68	0.2	< 2	0.4	16	14
T-6000-5		< 5	95	< 2	< 0.01	3	< 2	< 0.5	79	0.2	< 2	0.4	14	12
T-6000-7		< 5	20	< 2	< 0.01	2	< 2	< 0.5	30	0.1	< 2	0.3	10	7
T-6000-8		< 5	17	< 2	< 0.01	< 2	< 2	< 0.5	43	0.1	< 2	0.1	7	6
T-9000-2		< 5	54	< 2	< 0.01	< 2	< 2	< 0.5	40	0.1	< 2	0.1	7	7
T-9000-3		< 5	22	< 2	< 0.01	< 2	< 2	< 0.5	39	0.1	< 2	0.2	6	7
T-9000-5		< 5	150	< 2	< 0.01	3	< 2	< 0.5	80	0.2	< 2	0.4	17	14
T-9000-7		< 5	44	< 2	< 0.01	< 2	< 2	< 0.5	35	0.1	< 2	0.2	8	7
T-9000-7	Lab Dup.	< 5	39	< 2	< 0.01	< 2	< 2	< 0.5	36	0.1	< 2	0.2	10	8
T-12000-3		< 5	140	< 2	< 0.01	2	< 2	< 0.5	58	0.1	< 2	0.5	14	13
T-12000-4		5	310	< 2	< 0.01	4	< 2	< 0.5	88	0.3	< 2	0.8	24	20
T-12000-4	Field Dup.	< 5	190	< 2	< 0.01	4	< 2	< 0.5	84	0.3	< 2	0.6	19	16
T-12000-5		< 5	17	< 2	< 0.01	< 2	< 2	< 0.5	28	0.1	< 2	0.2	3	5
T-12000-6		< 5	80	< 2	< 0.01	2	< 2	< 0.5	60	0.2	< 2	0.4	11	11
T-12000-7		< 5	40	< 2	< 0.01	2	< 2	< 0.5	31	0.1	< 2	0.3	16	8
T-12000-8		< 5	27	< 2	< 0.01	< 2	< 2	< 0.5	24	0.1	< 2	0.1	6	5
T-20000-3		< 5	220	< 2	< 0.01	3	< 2	< 0.5	69	0.2	< 2	0.6	20	16
T-20000-7		< 5	16	< 2	< 0.01	< 2	< 2	< 0.5	22	< 0.1	< 2	0.1	6	5

TABLE 2b: Petroleum Hydrocarbons at Thebaud Drill Site - June 1999

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₂₇ -C ₃₁) mg/kg	TPH mg/kg
T-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	21.7	3	24.70	24.7
T-250-1	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	29.7	3.4	33.10	33.1
T-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1510	35.9	1545.90	1550
T-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	22.8	6.29	29.09	29.1
T-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	560	25.5	585.50	586
T-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.18	3.15	5.33	5.32
T-500-1	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	13.2	6.41	19.60	19.6
T-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	315	8.62	323.62	324
T-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	5.69	3.52	9.21	9.21
T-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	6.7	3.32	10.02	10
T-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.51	1.86	3.37	3.37
T-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	30.9	4.6	35.50	35.5
T-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.44	2.38	3.82	3.83
T-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.54	2.06	3.60	3.6
T-1000-7	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.71	2.8	4.51	4.51
T-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.23	1.87	3.10	3.1
T-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.51	2.6	4.11	4.12
T-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.4	2.56	3.96	3.96
T-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.49	3.58	6.07	6.07
T-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.63	4.8	7.43	7.43
T-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.47	2.61	4.08	4.09
T-3000-6	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.55	2.72	4.27	4.27
T-3000-6	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.7	3.09	4.80	4.8
T-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.25	2.42	3.67	3.67
T-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.47	2.2	3.67	3.67
T-6000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.978	2.19	3.17	3.17
T-6000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.04	2.3	3.34	3.34
T-6000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.54	6.2	9.74	9.74
T-6000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.58	6.12	9.70	9.7
T-6000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.13	3.57	5.70	5.7
T-6000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.864	1.88	2.74	2.75
T-9000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.04	2.13	3.17	3.16
T-9000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.14	3.43	5.57	5.57
T-9000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.73	5.54	8.27	8.28
T-9000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.636	1.45	2.09	2.08
T-9000-7	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.876	1.59	2.47	2.46
T-12000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.82	3.38	5.40	5.4
T-12000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.07	7.99	12.06	12.1
T-12000-4	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.84	7.45	11.30	11.3
T-12000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.47	3.4	4.87	4.87
T-12000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.95	4.16	6.11	6.11
T-12000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.14	2.41	3.55	3.54
T-12000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.63	2.12	4.75	4.74
T-20000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.61	7.89	12.50	12.5
T-20000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.37	2.67	4.04	4.05

TABLE 3b: Polycyclic Aromatic Hydrocarbons at Thebaud Drill Site - June 1999 (Continued)

Unique_station_id	Replicate_id	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
T-250-1		< 0.05	< 0.05	< 0.05
T-250-1	Lab Dup.	< 0.05	< 0.05	< 0.05
T-250-3		< 0.05	< 0.05	< 0.05
T-250-5		< 0.05	< 0.05	< 0.05
T-250-7		< 0.05	< 0.05	< 0.05
T-500-1		< 0.05	< 0.05	< 0.05
T-500-1	Field Dup.	< 0.05	< 0.05	< 0.05
T-500-3		< 0.05	< 0.05	< 0.05
T-500-5		< 0.05	< 0.05	< 0.05
T-500-7		< 0.05	< 0.05	< 0.05
T-1000-1		< 0.05	< 0.05	< 0.05
T-1000-3		< 0.05	< 0.05	< 0.05
T-1000-5		< 0.05	< 0.05	< 0.05
T-1000-7		< 0.05	< 0.05	< 0.05
T-1000-7	Field Dup.	< 0.05	< 0.05	< 0.05
T-3000-1		< 0.05	< 0.05	< 0.05
T-3000-2		< 0.05	< 0.05	< 0.05
T-3000-3		< 0.05	< 0.05	< 0.05
T-3000-4		< 0.05	< 0.05	< 0.05
T-3000-5		< 0.05	< 0.05	< 0.05
T-3000-6		< 0.05	< 0.05	< 0.05
T-3000-6	Lab Dup.	< 0.05	< 0.05	< 0.05
T-3000-6	Field Dup.	< 0.05	< 0.05	< 0.05
T-3000-7		< 0.05	< 0.05	< 0.05
T-3000-8		< 0.05	< 0.05	< 0.05
T-6000-1		< 0.05	< 0.05	< 0.05
T-6000-3		< 0.05	< 0.05	< 0.05
T-6000-4		< 0.05	< 0.05	< 0.05
T-6000-5		< 0.05	< 0.05	< 0.05
T-6000-7		< 0.05	< 0.05	< 0.05
T-6000-8		< 0.05	< 0.05	< 0.05
T-9000-2		< 0.05	< 0.05	< 0.05
T-9000-3		< 0.05	< 0.05	< 0.05
T-9000-5		< 0.05	< 0.05	< 0.05
T-9000-7		< 0.05	< 0.05	< 0.05
T-9000-7	Lab Dup.	< 0.05	< 0.05	< 0.05
T-12000-3		< 0.05	< 0.05	< 0.05
T-12000-4		< 0.05	< 0.05	< 0.05
T-12000-4	Field Dup.	< 0.05	< 0.05	< 0.05
T-12000-5		< 0.05	< 0.05	< 0.05
T-12000-6		< 0.05	< 0.05	< 0.05
T-12000-7		< 0.05	< 0.05	< 0.05
T-12000-8		< 0.05	< 0.05	< 0.05
T-20000-3		< 0.05	< 0.05	< 0.05
T-20000-7		< 0.05	< 0.05	< 0.05

TABLE 4b: Sediment Quality at Thebaud Drill Site - June 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
T-250-1		0.1	0.1	< 0.1	99.1	0.1	0.8	0.0004	0.35
T-250-1	Lab Dup.			< 0.1	99.1	0.1	0.8		
T-250-3		0.3	0.1	< 0.1	98.8	0.2	1.1	0.0010	<0.20
T-250-5		0.2	< 0.1	< 0.1	98.8	0.1	1.1	0.0005	0.25
T-250-7		0.3	0.1	< 0.1	99	0.2	0.8	0.0004	0.50
T-500-1		0.1	< 0.1	< 0.1	99.2	< 0.1	0.7	0.0003	0.45
T-500-1	Field Dup.	0.2	< 0.1	0.6	98.4	0.1	0.8	0.0005	<0.20
T-500-3		0.3	0.1	0.8	98.4	0.1	0.7	0.0002	<0.20
T-500-5		0.3	< 0.1	< 0.1	98.9	0.1	1.1	0.0003	0.28
T-500-7		0.1	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0007	0.52
T-1000-1		0.1	< 0.1	0.3	98.9	< 0.1	0.8	0.0004	0.32
T-1000-3		0.3	< 0.1	0.5	98.4	< 0.1	1	0.0003	0.30
T-1000-5		0.1	0.1	1.9	97.6	< 0.1	0.6	0.0004	0.50
T-1000-7		0.1	< 0.1	< 0.1	99.2	< 0.1	0.9	0.0006	0.67
T-1000-7	Field Dup.	0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0010	0.40
T-3000-1		0.1	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0003	<0.20
T-3000-2		0.1	0.1	< 0.1	99.1	< 0.1	0.8	0.0010	0.38
T-3000-3		0.3	0.1	< 0.1	99	0.1	1	0.0009	0.28
T-3000-4		0.3	< 0.1	< 0.1	98.7	0.3	1	0.0004	0.28
T-3000-5		0.4	< 0.1	< 0.1	98.7	0.1	1.2	0.0018	0.82
T-3000-6		0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0004	0.35
T-3000-6	Lab Dup.			< 0.1	99	< 0.1	1		
T-3000-6	Field Dup.	0.2	< 0.1	< 0.1	99	< 0.1	1	0.0002	1.12
T-3000-7		0.1	< 0.1	< 0.1	99.1	0.1	0.8	0.0005	0.27
T-3000-8		0.1	0.1	< 0.1	99.2	< 0.1	0.7	0.0004	0.43
T-6000-1		0.1	< 0.1	0.1	99.2	0.1	0.6	0.0006	0.37
T-6000-3		0.1	< 0.1	0.2	99	< 0.1	0.8	0.0005	0.33
T-6000-4		0.4	0.1	< 0.1	98.7	0.3	1	0.0002	0.00
T-6000-5		0.5	0.3	< 0.1	98.4	0.3	1.3	0.0003	0.25
T-6000-7		0.2	< 0.1	0.2	99	0.1	0.8	0.0007	<0.20
T-6000-8		0.1	0.1	< 0.1	99.2	0.1	0.7	0.0003	<0.20
T-9000-2		0.1	< 0.1	< 0.1	99.1	< 0.1	0.9	0.0009	0.70
T-9000-3		0.2	0.1	< 0.1	99	0.1	0.9	0.0006	0.37
T-9000-5		0.6	0.3	< 0.1	97.8	0.7	1.5	0.0002	0.35
T-9000-7		0.1	< 0.1	< 0.1	99	< 0.1	1	0.0005	0.32
T-9000-7	Lab Dup.			< 0.1	99	< 0.1	1		
T-12000-3		0.2	0.1	< 0.1	98.9	0.1	1	0.0003	0.30
T-12000-4		1.1	0.3	< 0.1	96.5	1.2	2.3	0.0003	0.35
T-12000-4	Field Dup.	1.3	0.1	< 0.1	96.8	1.4	1.9	0.0005	<0.20
T-12000-5		0.2	0.1	0.5	98.4	0.1	1	0.0004	<0.20
T-12000-6		0.4	< 0.1	< 0.1	98.5	0.3	1.2	0.0002	0.25
T-12000-7		0.1	< 0.1	1.2	98.3	< 0.1	0.5	0.0005	0.30
T-12000-8		0.1	< 0.1	0.2	99	0.1	0.7	0.0003	0.35
T-20000-3		0.6	< 0.1	< 0.1	98.4	0.3	1.3	0.0003	0.55
T-20000-7		0.2	0.4	0.5	98.8	0.1	0.6	0.0020	<24

TABLE 5b: Toxicity at Thebaud Drill Site - June 1999

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid Fertilization		Microtox
				Mortality %	Control Mortality %	% Fertilization	IC 50	EC50
T-250-1		0.33	<20	0	3	92.0	>100%	>100%
T-250-1	Lab Dup.							
T-250-3		<0.25	<20	81	3	87.8	>100%	>100%
T-250-5		18.50	<20	0	3	80.8	>100%	>100%
T-250-7		<0.25	<20	95	3	79.5	>100%	>100%
T-500-1		1.21	<20	11	3	51.0	>100%	>100%
T-500-1	Field Dup.	9.07	<20	7	3	36.5	91.00%	>100%
T-500-3		3.13	<20	5	3	83.0	>100%	>100%
T-500-5		3.21	<20	25	3	15.8	69.10%	>100%
T-500-7		2.91	<20	12	3	66.8	>100%	>100%
T-1000-1								
T-1000-3								
T-1000-5								
T-1000-7								
T-1000-7	Field Dup.							
T-3000-1		0.78	<20	18	3	46.3	>100%	>100%
T-3000-2								
T-3000-3		7.26	<20	13	3	66.3	>100%	>100%
T-3000-4								
T-3000-5		10.20	<20	5	3	0.0	66.40%	>100%
T-3000-6								
T-3000-6	Lab Dup.							
T-3000-6	Field Dup.							
T-3000-7		2.33	<20	6	3	83.3	>100%	>100%
T-3000-8								
T-6000-1								
T-6000-3								
T-6000-4								
T-6000-5								
T-6000-7								
T-6000-8								
T-9000-2								
T-9000-3								
T-9000-5								
T-9000-7								
T-9000-7	Lab Dup.							
T-12000-3								
T-12000-4								
T-12000-4	Field Dup.							
T-12000-5								
T-12000-6								
T-12000-7								
T-12000-8								
T-20000-3		14.80	<20	9	3	30.0	61.90%	>100%
T-20000-7		8.93	<20	17	3	39.0	87.20%	>100%

Appendix D-3: Laboratory Analytical Results for Sediment from Thebaud Field, Fall 1999

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1c: Trace Elements at Thebaud Drill Site - November 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg
T-250-1		7900	< 2	2	170	< 5	< 5	< 0.3	8	1	< 2	4200	3.9
T-250-3		11000	< 2	2	280	< 5	< 5	< 0.3	15	2	2	6100	5.8
T-250-3	Lab Dup.	8800	< 2	2	240	< 5	< 5	< 0.3	11	1	2	5300	4.6
T-250-5		7400	< 2	2	180	< 5	< 5	< 0.3	6	1	< 2	3200	3.5
T-250-7		8100	< 2	< 2	260	< 5	< 5	< 0.3	7	1	< 2	3900	4.1
T-500-1		8800	< 2	2	180	< 5	7	< 0.3	9	1	2	5300	5
T-500-3		4500	< 2	< 2	120	< 5	< 5	< 0.3	4	1	< 2	2300	3
T-500-5		13000	< 2	2	230	< 5	< 5	< 0.3	20	2	2	9300	7
T-500-7		6500	< 2	2	130	< 5	< 5	< 0.3	6	1	< 2	3300	3.5
T-500-7	Field Dup.	11000	< 2	2	210	< 5	< 5	< 0.3	21	2	15	7100	6.6
T-500-7	Lab Dup.												
T-1000-1		6400	< 2	< 2	150	< 5	< 5	< 0.3	4	1	< 2	2400	3.1
T-1000-3		5600	< 2	< 2	120	< 5	< 5	< 0.3	4	< 1	< 2	2400	2.5
T-1000-5		5200	< 2	< 2	120	< 5	< 5	< 0.3	3	< 1	< 2	1800	2.3
T-1000-7		7200	< 2	2	150	< 5	< 5	< 0.3	6	1	2	3500	3.5
T-1000-7	Lab Dup.	7200	< 2	2	160	< 5	< 5	< 0.3	8	1	< 2	3600	3.8
T-3000-1		6700	< 2	< 2	140	< 5	< 5	< 0.3	7	1	< 2	4500	4.1
T-3000-1	Field Dup.	7100	< 2	< 2	170	< 5	< 5	< 0.3	4	1	2	2800	3.9
T-3000-2		5000	< 2	< 2	84	< 5	< 5	< 0.3	3	< 1	< 2	1600	1.8
T-3000-3		11000	< 2	2	220	< 5	< 5	< 0.3	10	1	2	5700	5.5
T-3000-4		13000	< 2	3	230	< 5	< 5	< 0.3	14	2	2	7800	6.3
T-3000-5		16000	< 2	3	260	< 5	< 5	< 0.3	10	1	2	6700	6.6
T-3000-6		13000	< 2	3	240	< 5	< 5	< 0.3	11	1	< 2	6400	5.9
T-3000-7		7900	< 2	2	170	< 5	< 5	< 0.3	4	1	< 2	3200	3.7
T-3000-7	Lab Dup.												
T-3000-8		5600	< 2	< 2	110	< 5	< 5	< 0.3	4	1	< 2	2400	3
T-6000-1		7100	< 2	2	140	< 5	< 5	< 0.3	8	1	< 2	4500	4
T-6000-3		6200	< 2	< 2	110	< 5	< 5	< 0.3	3	1	< 2	2200	2.8
T-6000-4		17000	< 2	3	270	< 5	< 5	< 0.3	15	2	2	7200	6.9
T-6000-5		18000	< 2	3	280	< 5	< 5	< 0.3	14	2	2	8600	7.6
T-6000-7		6600	< 2	4	120	< 5	< 5	< 0.3	6	1	< 2	5200	3.3
T-6000-8		8200	< 2	2	150	< 5	< 5	< 0.3	6	1	< 2	3800	3.9
T-9000-2		8600	< 2	< 2	160	< 5	< 5	< 0.3	8	1	2	5000	4.8
T-9000-3		12000	< 2	2	220	< 5	< 5	< 0.3	10	1	2	5100	5.6
T-9000-5		20000	< 2	3	330	< 5	< 5	< 0.3	21	3	3	11000	9.1
T-9000-5	Field Dup.	19000	< 2	3	310	< 5	< 5	< 0.3	14	2	2	7700	7.9
T-9000-5	Lab Dup.	18000	< 2	3	290	< 5	< 5	< 0.3	11	2	3	5900	7.2
T-9000-7		9900	< 2	3	200	< 5	< 5	< 0.3	5	1	< 2	5000	5
T-12000-3		12000	< 2	2	220	< 5	< 5	< 0.3	15	2	2	7500	6.5
T-12000-4		5400	< 2	2	80	< 5	< 5	< 0.3	3	1	< 2	1400	2.6
T-12000-4	Lab Dup.	5800	< 2	< 2	100	< 5	< 5	< 0.3	2	< 1	< 2	950	2.6
T-12000-5		7400	< 2	< 2	140	< 5	< 5	< 0.3	2	1	< 2	1400	3.5
T-12000-6		15000	< 2	3	260	< 5	< 5	< 0.3	9	1	2	5500	6.8
T-12000-7		4800	< 2	2	87	< 5	< 5	< 0.3	3	1	< 2	3100	2.2
T-12000-8		5400	< 2	2	110	< 5	< 5	< 0.3	2	< 1	< 2	1900	3
T-20000-3		15000	< 2	2	270	< 5	< 5	< 0.3	16	2	2	9600	7.2
T-20000-7		4800	< 2	< 2	110	< 5	< 5	< 0.3	2	< 1	< 2	1700	2.6

TABLE 1c: Trace Elements at Thebaud Drill Site - November 1999 (Continued)

Unique_station_id	Replicate_id	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
T-250-1		< 5	80	< 2	< 0.01	2	< 2	< 0.5	43	0.1	< 2	0.2	11	11
T-250-3		< 5	170	< 2	< 0.01	3	< 2	< 0.5	55	0.1	< 2	0.5	19	15
T-250-3	Lab Dup.	< 5	120	< 2	< 0.01	2	< 2	< 0.5	48	0.1	< 2	0.3	15	12
T-250-5		< 5	30	< 2	< 0.01	2	< 2	< 0.5	37	0.1	< 2	0.2	8	7
T-250-7		< 5	76	< 2	< 0.01	2	< 2	< 0.5	41	0.1	< 2	0.3	9	8
T-500-1		< 5	130	< 2	< 0.01	2	< 2	< 0.5	46	0.1	< 2	0.4	15	13
T-500-3		< 5	19	< 2	< 0.01	< 2	< 2	< 0.5	25	< 0.1	< 2	0.1	6	6
T-500-5		< 5	300	< 2	< 0.01	3	< 2	< 0.5	62	0.2	< 2	0.6	25	20
T-500-7		< 5	49	< 2	< 0.01	2	< 2	< 0.5	30	0.1	< 2	0.2	8	24
T-500-7	Field Dup.	< 5	220	< 2	< 0.01	3	< 2	< 0.5	49	0.1	< 2	0.7	20	16
T-500-7	Lab Dup.													
T-1000-1		< 5	26	< 2	< 0.01	< 2	< 2	< 0.5	32	0.1	< 2	0.1	5	6
T-1000-3		< 5	20	< 2	< 0.01	< 2	< 2	< 0.5	30	0.1	< 2	0.2	6	7
T-1000-5		< 5	15	< 2	< 0.01	< 2	< 2	< 0.5	27	0.1	< 2	0.1	4	6
T-1000-7		< 5	37	< 2	< 0.01	2	< 2	< 0.5	37	0.1	< 2	0.2	9	8
T-1000-7	Lab Dup.	< 5	41	< 2	< 0.01	2	< 2	< 0.5	36	0.1	< 2	0.2	10	8
T-3000-1		< 5	120	< 2	< 0.01	< 2	< 2	< 0.5	32	0.1	< 2	0.2	10	10
T-3000-1	Field Dup.	< 5	55	< 2	< 0.01	2	< 2	< 0.5	36	0.1	< 2	0.2	8	9
T-3000-2		< 5	7	< 2	< 0.01	< 2	< 2	< 0.5	20	0.1	< 2	0.2	3	5
T-3000-3		< 5	140	< 2	< 0.01	2	< 2	< 0.5	56	0.1	< 2	0.4	14	13
T-3000-4		< 5	190	< 2	< 0.01	3	< 2	< 0.5	60	0.2	< 2	0.4	18	14
T-3000-5		< 5	140	< 2	< 0.01	3	< 2	< 0.5	72	0.2	< 2	0.4	14	12
T-3000-6		< 5	140	< 2	< 0.01	2	< 2	< 0.5	60	0.2	< 2	0.5	15	12
T-3000-7		< 5	34	< 2	< 0.01	2	< 2	< 0.5	39	0.1	< 2	0.2	7	7
T-3000-7	Lab Dup.													
T-3000-8		< 5	42	< 2	< 0.01	< 2	< 2	< 0.5	29	0.1	< 2	0.2	5	8
T-6000-1		< 5	110	< 2	< 0.01	2	< 2	< 0.5	35	0.1	< 2	0.2	10	9
T-6000-3		< 5	43	< 2	< 0.01	< 2	< 2	< 0.5	31	0.1	< 2	0.2	5	6
T-6000-4		< 5	170	< 2	< 0.01	3	< 2	< 0.5	77	0.2	< 2	0.6	18	15
T-6000-5		< 5	260	< 2	< 0.01	3	< 2	< 0.5	80	0.2	< 2	0.5	19	15
T-6000-7		< 5	37	< 2	< 0.01	3	< 2	< 0.5	29	0.1	< 2	0.3	14	9
T-6000-8		< 5	43	< 2	< 0.01	2	< 2	< 0.5	40	0.1	< 2	0.2	9	7
T-9000-2		< 5	140	< 2	< 0.01	2	< 2	< 0.5	42	0.1	< 2	0.3	12	11
T-9000-3		< 5	120	< 2	< 0.01	2	< 2	< 0.5	53	0.1	< 2	0.3	12	11
T-9000-5		< 5	380	< 2	< 0.01	4	< 2	< 0.5	83	0.2	< 2	0.9	26	20
T-9000-5	Field Dup.	< 5	220	< 2	< 0.01	3	< 2	< 0.5	82	0.2	< 2	0.6	20	14
T-9000-5	Lab Dup.	< 5	150	< 2	< 0.01	3	< 2	< 0.5	76	0.2	6	0.4	16	12
T-9000-7		< 5	64	< 2	< 0.01	2	< 2	< 0.5	49	0.1	< 2	0.3	11	9
T-12000-3		< 5	250	< 2	< 0.01	3	< 2	< 0.5	62	0.1	< 2	0.5	19	20
T-12000-4		< 5	26	< 2	< 0.01	< 2	< 2	< 0.5	29	0.1	< 2	0.3	4	5
T-12000-4	Lab Dup.	< 5	20	< 2	< 0.01	< 2	< 2	< 0.5	30	0.1	< 2	0.2	3	8
T-12000-5		< 5	32	< 2	< 0.01	< 2	< 2	< 0.5	36	0.1	< 2	0.2	4	6
T-12000-6		< 5	120	< 2	< 0.01	2	< 2	< 0.5	68	0.2	< 2	0.4	13	11
T-12000-7		< 5	23	< 2	< 0.01	< 2	< 2	< 0.5	28	< 0.1	< 2	0.3	7	6
T-12000-8		< 5	29	< 2	< 0.01	< 2	< 2	< 0.5	34	0.1	< 2	0.5	4	6
T-20000-3		< 5	340	< 2	< 0.01	3	< 2	< 0.5	66	0.2	< 2	0.6	22	18
T-20000-7		< 5	12	< 2	< 0.01	< 2	< 2	< 0.5	21	0.1	< 2	0.1	3	4

TABLE 2c: Petroleum Hydrocarbons at Thebaud Drill Site - November 1999

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₁₁ -C ₃₀) mg/kg	TPH mg/kg
T-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.1	1.43	4.52	4.52
T-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	12.1	2.11	14.2	14.2
T-250-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	18.9	2.41	21.3	21.3
T-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	8.95	2.32	11.3	11.3
T-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	21.4	2.04	23.4	23.4
T-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	7	2.13	9.13	9.13
T-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.9	1.64	3.54	3.54
T-500-7	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-500-7	Lab Dup.									
T-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-1000-7	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-1	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.931	1.25	< 3	< 3
T-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-3000-7	Lab Dup.									
T-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-6000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-5	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-9000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-4	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-12000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-20000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
T-20000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3

TABLE 3c: Polycyclic Aromatic Hydrocarbons at Thebaud Drill Site - November 1999 (Continued)

Unique_station_id	Replicate_id	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
T-250-1		< 0.05	< 0.05	< 0.05
T-250-3		< 0.05	< 0.05	< 0.05
T-250-3	Lab Dup.	< 0.05	< 0.05	< 0.05
T-250-5		< 0.05	< 0.05	< 0.05
T-250-7		< 0.05	< 0.05	< 0.05
T-500-1		< 0.05	< 0.05	< 0.05
T-500-3		< 0.05	< 0.05	< 0.05
T-500-5		< 0.05	< 0.05	< 0.05
T-500-7		< 0.05	< 0.05	< 0.05
T-500-7	Field Dup.	< 0.05	< 0.05	< 0.05
T-500-7	Lab Dup.			
T-1000-1		< 0.05	< 0.05	< 0.05
T-1000-3		< 0.05	< 0.05	< 0.05
T-1000-5		< 0.05	< 0.05	< 0.05
T-1000-7		< 0.05	< 0.05	< 0.05
T-1000-7	Lab Dup.	< 0.05	< 0.05	< 0.05
T-3000-1		< 0.05	< 0.05	< 0.05
T-3000-1	Field Dup.	< 0.05	< 0.05	< 0.05
T-3000-2		< 0.05	< 0.05	< 0.05
T-3000-3		< 0.05	< 0.05	< 0.05
T-3000-4		< 0.05	< 0.05	< 0.05
T-3000-5		< 0.05	< 0.05	< 0.05
T-3000-6		< 0.05	< 0.05	< 0.05
T-3000-7		< 0.05	< 0.05	< 0.05
T-3000-7	Lab Dup.			
T-3000-8		< 0.05	< 0.05	< 0.05
T-6000-1		< 0.05	< 0.05	< 0.05
T-6000-3		< 0.05	< 0.05	< 0.05
T-6000-4		< 0.05	< 0.05	< 0.05
T-6000-5		< 0.05	< 0.05	< 0.05
T-6000-7		< 0.05	< 0.05	< 0.05
T-6000-8		< 0.05	< 0.05	< 0.05
T-9000-2		< 0.05	< 0.05	< 0.05
T-9000-3		< 0.05	< 0.05	< 0.05
T-9000-5		< 0.05	< 0.05	< 0.05
T-9000-5	Field Dup.	< 0.05	< 0.05	< 0.05
T-9000-5	Lab Dup.	< 0.05	< 0.05	< 0.05
T-9000-7		< 0.05	< 0.05	< 0.05
T-12000-3		< 0.05	< 0.05	< 0.05
T-12000-4		< 0.05	< 0.05	< 0.05
T-12000-4	Lab Dup.	< 0.05	< 0.05	< 0.05
T-12000-5		< 0.05	< 0.05	< 0.05
T-12000-6		< 0.05	< 0.05	< 0.05
T-12000-7		< 0.05	< 0.05	< 0.05
T-12000-8		< 0.05	< 0.05	< 0.05
T-20000-3		< 0.05	< 0.05	< 0.05
T-20000-7		< 0.05	< 0.05	< 0.05

TABLE 4c: Sediment Quality at Thebaud Drill Site - November 1999

Unique station id	Replicate id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
T-250-1		0.2	< 0.1	< 0.1	99.2	0.1	0.7	0.0006	<0.20
T-250-3		0.3	0.1	< 0.1	99.1	0.1	0.8	0.0008	<0.25
T-250-3	Lab Dup.	0.3	0.1	< 0.1	99	0.2	0.8		
T-250-5		0.3	< 0.1	< 0.1	99.1	0.1	0.8	0.0009	<0.27
T-250-7		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0013	<0.20
T-500-1		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0009	<0.31
T-500-3		0.5	< 0.1	0.4	98.8	0.1	0.7	0.0006	<0.20
T-500-5		0.3	0.1	< 0.1	99.1	0.1	0.8	0.0011	<0.30
T-500-7		0.3	< 0.1	1.6	97.5	0.1	0.8	0.0020	<0.20
T-500-7	Field Dup.	0.1	0.1	< 0.1	98.9	0.1	1	0.0006	<0.20
T-500-7	Lab Dup.								
T-1000-1		0.1	0.1	< 0.1	99.2	0.1	0.7	0.0008	<0.20
T-1000-3		0.2	< 0.1	< 0.1	99.3	< 0.1	0.7	0.0009	<0.25
T-1000-5		0.1	0.1	< 0.1	99.3	< 0.1	0.7	0.0009	<0.25
T-1000-7		0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0009	<0.20
T-1000-7	Lab Dup.	0.1	0.1	< 0.1	99.2	< 0.1	0.8		
T-3000-1		0.1	0.1	< 0.1	99.1	0.1	0.8	0.0012	<0.20
T-3000-1	Field Dup.	0.1	< 0.1	< 0.1	99	0.1	0.9	0.0009	<0.20
T-3000-2		0.2	< 0.1	0.1	99.1	< 0.1	0.7	0.0011	0.35
T-3000-3		0.2	< 0.1	< 0.1	99.1	0.1	0.8	0.0004	<0.20
T-3000-4		0.4	< 0.1	< 0.1	99	0.2	0.8	0.0003	<0.20
T-3000-5		0.4	0.1	< 0.1	98.9	0.2	0.9	0.0006	0.25
T-3000-6		0.4	0.1	0.1	98.6	0.2	1.1	0.0005	<0.20
T-3000-7		0.1	0.1	< 0.1	99.2	0.1	0.7	0.0008	0.38
T-3000-7	Lab Dup.								
T-3000-8		0.2	< 0.1	0.1	99.2	< 0.1	0.7	0.0006	0.33
T-6000-1		0.2	< 0.1	< 0.1	99	0.3	0.7	0.0003	0.23
T-6000-3		0.2	< 0.1	< 0.1	99.2	0.1	0.7	0.0025	0.28
T-6000-4		0.6	0.2	< 0.1	98.9	0.2	0.9	0.0009	0.74
T-6000-5		0.8	0.1	< 0.1	98.7	0.2	1.1	0.0013	0.38
T-6000-7		0.1	0.1	< 0.1	99.3	0.1	0.6	0.0009	0.42
T-6000-8		0.2	0.1	< 0.1	99.2	< 0.1	0.7	0.0006	0.33
T-9000-2		0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0009	0.42
T-9000-3		0.3	< 0.1	< 0.1	99.1	0.1	0.8	0.0027	0.48
T-9000-5		1.2	0.2	< 0.1	98.4	0.4	1.1	0.0003	<0.20
T-9000-5	Field Dup.	1.4	0.1	0.2	97.6	0.5	1.6	0.0004	<0.20
T-9000-5	Lab Dup.	1.4	< 0.1	0.1	97.6	0.6	1.7		
T-9000-7		0.2	< 0.1	< 0.1	99.2	< 0.1	0.8	0.0027	1.60
T-12000-3		0.3	< 0.1	< 0.1	99	0.2	0.8	0.0006	0.23
T-12000-4		0.8	0.2	0.4	98.3	0.3	0.9	0.0023	0.20
T-12000-4	Lab Dup.	0.5	0.2	0.3	98.5	0.2	0.9		
T-12000-5		0.6	0.3	9.4	87.6	1.9	1	0.0004	0.20
T-12000-6		0.6	0.1	< 0.1	98.9	< 0.1	1.1	0.0006	<0.20
T-12000-7		0.2	0.7	1.8	97.5	< 0.1	0.6	0.0006	<0.20
T-12000-8		0.1	0.1	1.5	97.8	< 0.1	0.7	0.0009	0.22
T-20000-3		0.9	0.2	< 0.1	98.3	0.5	1.3	0.0011	0.62
T-20000-7		0.5	< 0.1	3.2	96.3	< 0.1	0.5	0.0006	<0.25

TABLE 5c: Toxicity at Therbaud Stations - November 1999

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilisation	Fertilisation IC50	Microtox EC50
				Mortality %	Control Mortality %			
T-250-1		<0.50	<10	5	0	91.9	>100%	>100%
T-250-3		<0.50	<10	3	0	58.5	>100%	>100%
T-250-3	Lab Dup.	<0.50						
T-250-5		<0.50	<10	3	0	82.3	>100%	>100%
T-250-7		<0.50	<10	2	0	48.8	>100%	>100%
T-500-1		<0.50	<10	5	0	42.8	94.00%	>100%
T-500-3		<0.50	<10	26	0	85.5	>100%	>100%
T-500-5		<0.50	<10	7	0	43.3	89.90%	>100%
T-500-7		<0.50	<10	9	0	90.5	>100%	>100%
T-500-7	Field Dup.	<0.50	<10	6	0	75.0	>100%	>100%
T-500-7	Lab Dup.	<0.50						
T-1000-1								
T-1000-3								
T-1000-5								
T-1000-7								
T-1000-7	Lab Dup.							
T-3000-1		<0.50	<10	8	0	93.5	>100%	>100%
T-3000-1	Field Dup.	<0.50	<10	11	0	71.8	>100%	>100%
T-3000-2								
T-3000-3		<0.50	<10	3	0	93.5	>100%	>100%
T-3000-4								
T-3000-5		0.59	<10	7	0	94.0	>100%	>100%
T-3000-6								
T-3000-7		<0.50	<10	6	0	89.0	>100%	>100%
T-3000-7	Lab Dup.	<0.50						
T-3000-8								
T-6000-1								
T-6000-3								
T-6000-4								
T-6000-5								
T-6000-7								
T-6000-8								
T-9000-2								
T-9000-3								
T-9000-5								
T-9000-5	Field Dup.							
T-9000-5	Lab Dup.							
T-9000-7								
T-12000-3								
T-12000-4								
T-12000-4	Lab Dup.							
T-12000-5								
T-12000-6								
T-12000-7								
T-12000-8								
T-20000-3		8.10	<10	11	0	87.3	>100%	>100%
T-20000-7		<0.50	<10	14	0	93.5	>100%	>100%

**Appendix E: Laboratory Analytical Results
for Sediment from North Triumph Field**

- Appendix E-1 Fall 1998 Data
- Appendix E-2 June 1999 Data
- Appendix E-3 Fall 1999 Data

**Appendix E-1: Laboratory Analytical Results
for Sediment from North Triumph Field, Fall 1998**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1a: Trace Elements at North Triumph Drill Site - November 1998

Unique station id	Replicate id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
NT-250-1		9360	<2	<2	140	<5	<5	<0.3	4	1	<2	2200	4.1	<5
NT-250-3		14200	<2	2	200	<5	<5	<0.3	8	1	2	4210	6.5	<5
NT-250-5		13500	<2	2	190	<5	<5	<0.3	7	1	2	4060	6.6	<5
NT-250-7		9610	<2	<2	150	<5	<5	<0.3	4	1	<2	2300	4.3	<5
NT-250-7	Field Dup.	9440	<2	<2	140	<5	<5	<0.3	5	1	<2	2570	4.7	<5
NT-500-1		10700	<2	<2	180	<5	<5	<0.3	6	1	4	3300	5	<5
NT-500-3		13400	<2	2	200	<5	<5	<0.3	8	1	2	4200	6.5	<5
NT-500-3	Lab Dup.													
NT-500-5		11300	<2	<2	170	<5	<5	<0.3	5	1	<2	3000	5.1	<5
NT-500-7		12200	<2	<2	180	<5	<5	<0.3	5	1	<2	2800	5.3	<5
NT-1000-1		12100	<2	2	180	<5	<5	<0.3	6	1	<2	3370	4.9	<5
NT-1000-1	Field Dup.	12400	<2	2	180	<5	<5	<0.3	7	1	2	3800	5.5	<5
NT-1000-3		10800	<2	2	170	<5	<5	<0.3	5	1	2	2600	4.5	<5
NT-1000-3	Lab Dup.													
NT-1000-5		9360	<2	<2	140	<5	<5	<0.3	5	1	<2	2400	4.8	<5
NT-1000-7		13200	<2	2	200	<5	<5	<0.3	7	1	2	3900	5.6	<5
NT-3000-1		15400	<2	<2	200	<5	<5	<0.3	7	1	2	4100	5.6	<5
NT-3000-1	Lab Dup.													
NT-3000-2		14400	<2	2	190	<5	<5	<0.3	10	2	2	7340	6.7	<5
NT-3000-2	Lab Dup.	12700	<2	<2	160	<5	<5	<0.3	8	1	2	5500	5.7	<5
NT-3000-3		15100	<2	2	200	<5	<5	<0.3	8	1	3	4720	6.2	<5
NT-3000-4		9630	<2	<2	150	<5	<5	<0.3	3	1	<2	1860	3.9	<5
NT-3000-5		9550	<2	<2	150	<5	<5	<0.3	4	1	<2	2300	4.2	<5
NT-3000-5	Lab Dup.	10800	<2	<2	160	<5	<5	<0.3	5	<1	<2	3000	4.6	<5
NT-3000-6		12800	<2	<2	200	<5	<5	<0.3	6	1	3	3610	5.5	<5
NT-3000-7		11100	<2	<2	150	<5	<5	<0.3	5	1	<2	3160	4.7	<5
NT-3000-8		14900	<2	2	210	<5	<5	<0.3	8	1	2	4500	6.2	<5
NT-5000-1		9890	<2	<2	150	<5	<5	<0.3	4	1	<2	2300	4	<5
NT-5000-2		17200	<2	<2	240	<5	<5	<0.3	8	1	2	5000	6.4	<5
NT-5000-3		12900	<2	2	170	<5	<5	<0.3	7	1	2	4210	5.2	<5
NT-5000-3	Field Dup.	9810	<2	<2	150	<5	<5	<0.3	5	1	<2	2540	4.1	<5
NT-5000-5		10100	<2	<2	140	<5	<5	<0.3	5	1	<2	3080	4.1	<5
NT-5000-5	Lab Dup.	8320	<2	<2	130	<5	<5	<0.3	4	<1	<2	2200	3.7	<5
NT-5000-6		11500	<2	<2	180	<5	<5	<0.3	5	1	<2	2920	5	<5
NT-5000-7		9720	<2	<2	140	<5	<5	<0.3	4	1	2	1800	4.3	<5
NT-5000-8		4340	<2	<2	79	<5	<5	<0.3	2	<1	<2	830	2.1	<5
NT-7500-1		5000	<2	<2	68	<5	<5	<0.3	<2	<1	<2	650	1.9	<5
NT-7500-3		12400	<2	2	180	<5	<5	<0.3	6	1	2	3610	5.1	<5
NT-7500-5		6230	<2	<2	100	<5	<5	<0.3	2	<1	<2	1400	2.7	<5
NT-7500-6		9270	<2	<2	140	<5	<5	<0.3	5	1	<2	2390	4.4	<5
NT-7500-7		9080	<2	<2	130	<5	<5	<0.3	3	1	<2	2000	5.2	<5
NT-10000-1		17600	<2	2	250	<5	<5	<0.3	8	1	2	6070	6.8	<5
NT-10000-3		10500	<2	<2	170	<5	<5	<0.3	4	1	<2	2500	4.4	<5
NT-10000-7		9270	<2	<2	140	<5	<5	<0.3	5	1	<2	2300	4.4	<5
NT-10000-8		17600	<2	2	250	<5	<5	<0.3	10	2	2	6360	7.7	<5
NT-20000-3		7940	<2	<2	100	<5	<5	<0.3	4	1	<2	2500	3.6	<5
NT-20000-7		5890	<2	<2	91	<5	<5	<0.3	2	<1	<2	900	2.9	<5

TABLE 1a: Trace Elements at North Triumph Drill Site - November 1998(Continued)

Unique station id	Replicate id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Strontium mg/kg	Thallium mg/kg	Ti mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
NT-250-1		69	<2	<0.01	<2	<2	44	0.1	<2	0.3	6	11
NT-250-3		160	<2	<0.01	2	<2	58	0.2	<2	0.4	11	19
NT-250-5		130	<2	<0.01	2	<2	54	0.2	<2	0.4	11	14
NT-250-7		76	<2	<0.01	<2	<2	45	0.1	<2	0.3	7	11
NT-250-7	Field Dup.	90	<2	<0.01	<2	<2	44	0.1	<2	0.3	7	10
NT-500-1		120	<2	<0.01	2	<2	44	0.1	<2	0.3	9	14
NT-500-3		150	<2	<0.01	2	<2	58	0.2	<2	0.5	11	14
NT-500-3	Lab Dup.											
NT-500-5		91	<2	<0.01	2	<2	50	0.1	<2	0.3	8	12
NT-500-7		77	<2	<0.01	<2	<2	51	0.2	<2	0.3	8	18
NT-1000-1		120	<2	<0.01	2	<2	50	0.1	<2	0.3	9	10
NT-1000-1	Field Dup.	160	<2	<0.01	2	<2	49	0.1	<2	0.4	10	10
NT-1000-3		79	<2	<0.01	2	<2	43	0.1	<2	0.3	8	9
NT-1000-3	Lab Dup.											
NT-1000-5		78	<2	<0.01	<2	<2	41	0.1	<2	0.4	7	11
NT-1000-7		150	<2	<0.01	2	<2	52	0.2	<2	0.3	11	10
NT-3000-1		150	<2	<0.01	2	<2	55	0.2	<2	0.4	11	11
NT-3000-1	Lab Dup.											
NT-3000-2		320	<2	<0.01	3	<2	56	0.2	<2	0.6	17	20
NT-3000-2	Lab Dup.	230	<2	<0.01	2	<2	52	0.2	<2	0.5	13	15
NT-3000-3		150	<2	<0.01	3	<2	58	0.2	<2	0.4	12	10
NT-3000-4		53	<2	<0.01	<2	<2	41	0.1	<2	0.2	6	10
NT-3000-5		81	<2	<0.01	<2	<2	40	0.1	<2	0.2	7	8
NT-3000-5	Lab Dup.	120	<2	<0.01	<2	<2	45	0.1	<2	0.2	8	8
NT-3000-6		120	<2	<0.01	3	<2	53	0.1	<2	0.3	10	10
NT-3000-7		130	<2	<0.01	2	<2	45	0.1	<2	0.3	8	8
NT-3000-8		160	<2	<0.01	2	<2	59	0.2	<2	0.4	13	28
NT-5000-1		97	<2	<0.01	<2	<2	40	0.1	<2	0.2	6	10
NT-5000-2		180	<2	<0.01	3	<2	62	0.2	<2	0.5	14	12
NT-5000-3		170	<2	<0.01	2	<2	51	0.1	<2	0.3	11	11
NT-5000-3	Field Dup.	88	<2	<0.01	<2	<2	41	0.1	<2	0.3	7	8
NT-5000-5		140	<2	<0.01	<2	<2	41	0.1	<2	0.3	8	8
NT-5000-5	Lab Dup.	80	<2	<0.01	<2	<2	35	0.1	<2	0.2	7	9
NT-5000-6		94	<2	<0.01	2	<2	48	0.1	<2	0.2	8	9
NT-5000-7		47	<2	<0.01	<2	<2	43	0.1	<2	0.2	5	10
NT-5000-8		20	<2	<0.01	<2	<2	24	0.1	<2	0.1	3	6
NT-7500-1		16	<2	<0.01	<2	<2	21	0.1	<2	0.2	2	6
NT-7500-3		110	<2	<0.01	2	<2	49	0.1	<2	0.4	10	10
NT-7500-5		36	<2	<0.01	<2	<2	28	0.1	<2	0.2	4	6
NT-7500-6		78	<2	<0.01	2	<2	38	0.1	<2	0.2	7	8
NT-7500-7		69	<2	<0.01	<2	<2	40	0.1	<2	0.2	6	16
NT-10000-1		170	<2	<0.01	3	<2	61	0.2	<2	0.5	13	13
NT-10000-3		69	<2	<0.01	<2	<2	42	0.1	<2	0.2	7	8
NT-10000-7		84	<2	<0.01	<2	<2	40	0.1	<2	0.3	7	11
NT-10000-8		260	<2	<0.01	3	<2	71	0.2	<2	0.6	15	20
NT-20000-3		65	<2	<0.01	<2	<2	33	0.1	<2	0.2	6	10
NT-20000-7		26	<2	<0.01	<2	<2	26	0.1	<2	0.2	3	10

TABLE 2a: Petroleum Hydrocarbons at North Triumph Drill Site - November 1998

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₉ -C ₁₀ mg/kg	C ₁₁ -C ₁₂ mg/kg	C ₁₃ -C ₁₄ mg/kg	TEH (C ₁₁ -C ₁₄) mg/kg	TPH mg/kg
NT-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.3	2.76	103	4.06
NT-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.329	1.44	87	1.77
NT-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.371	1.75	100	2.12
NT-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.746	1.04	91	1.79
NT-250-7	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1.5	< 2	84	0
NT-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.868	2.38	114	3.24
NT-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 2.5	< 3.5	108	0
NT-500-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.372	1.28	95	1.66
NT-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.23	2.44	96	3.67
NT-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.53	4.06	124	5.59
NT-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	3.21	78	3.21
NT-1000-1	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.556	2.08	121	2.63
NT-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	1.08	108	1.08
NT-1000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	1.11	84	1.11
NT-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.35	3.46	127	4.81
NT-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1.5	< 3.5	99	0
NT-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.81	2.16	103	2.97
NT-3000-1	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.8	< 2	112	0
NT-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 2.5	< 3.5	88	0
NT-3000-2	Lab Dup.									
NT-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.777	2.62	103	3.39
NT-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.339	1.15	92	1.49
NT-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.434	1.89	120	2.32
NT-3000-5	Lab Dup.									
NT-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.4	< 0.25	111	0
NT-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	1.03	109	1.03
NT-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.61	2.95	121	3.56
NT-5000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.8	< 1.5	118	0
NT-5000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.782	2.2	70	2.98
NT-5000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	0.858	102	0.86
NT-5000-3	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	0.615	96	0.62
NT-5000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	1.1	94	1.1
NT-5000-5	Lab Dup.									
NT-5000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1	< 1.5	102	0
NT-5000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	1.26	96	1.26
NT-5000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.347	0.748	86	1.1
NT-7500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.344	< 0.25	77	0.34
NT-7500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.817	2.61	86	3.43
NT-7500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	83	0
NT-7500-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 1.5	< 1.75	120	0
NT-7500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.449	1.74	95	2.19
NT-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.718	1.76	85	2.48
NT-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.337	< 0.25	80	0.34
NT-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.376	1.31	107	1.68
NT-10000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 2.5	< 4.5	103	0
NT-20000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.363	1.2	98	1.57
NT-20000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.18	2.05	94	3.24

TABLE 3a: Polycyclic Aromatic Hydrocarbons at North Triumph Drill Site - November 1998 (Continued)

Unique_station_id	Replicate_id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
NT-250-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-7	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-3	Lab Dup.				
NT-500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-1	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-3	Lab Dup.				
NT-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-1	Lab Dup.				
NT-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-2	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-7		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4a: Sediment Quality at North Triumph Drill Site - November 1998

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
NT-250-1		0.3	0.3	0.1	98.4	0.5	0.9	0.0006	<0.3
NT-250-3		0.4	0.7	< 0.1	97.9	0.9	1.2	0.0004	0.40
NT-250-5		0.3	0.5	< 0.1	97.5	1.1	1.4	0.0004	<0.3
NT-250-7		0.7	0.3	< 0.1	98.7	0.4	1	0.0003	0.40
NT-250-7	Field Dup.	0.2	0.4	< 0.1	98.3	0.4	1.2	0.0004	0.30
NT-500-1		0.1	0.5	< 0.1	98.6	0.4	0.9	0.0005	<0.3
NT-500-3		0.1	0.6	0.1	97.8	1.1	1	0.0003	0.58
NT-500-3	Lab Dup.								
NT-500-5		0.2	0.4	0.3	97.6	1.2	0.9	0.0005	0.45
NT-500-7		0.2	0.5	< 0.1	98.5	0.5	1	0.0006	0.60
NT-1000-1		0.2	0.6	< 0.1	97.8	0.7	1.5	0.0006	0.75
NT-1000-1	Field Dup.	0.3	0.5	0.7	97.4	0.7	1.2	0.0010	0.95
NT-1000-3		0.2	0.6	< 0.1	97.8	1.1	1.2	0.0008	1.23
NT-1000-3	Lab Dup.								
NT-1000-5		0.7	0.4	< 0.1	98.4	0.5	1.1	0.0006	0.33
NT-1000-7		0.2	0.8	0.4	97.3	0.9	1.5	0.0010	0.45
NT-3000-1		0.3	0.8	< 0.1	97.9	0.9	1.2	0.0004	0.98
NT-3000-1	Lab Dup.								
NT-3000-2		0.2	0.5	< 0.1	97.9	1.2	1	0.0011	0.98
NT-3000-2	Lab Dup.			< 0.1	98.5	0.6	0.9		
NT-3000-3		0.3	1.1	< 0.1	95	3.4	1.6	0.0003	0.48
NT-3000-4		0.2	0.4	0.2	98	0.7	1	0.0003	<0.3
NT-3000-5		0.2	0.4	0.2	98.2	0.5	1.1	0.0003	0.83
NT-3000-5	Lab Dup.			0.3	97.9	0.7	1		
NT-3000-6		0.2	0.5	0.4	97.4	0.9	1.2	0.0001	1.28
NT-3000-7		0.1	0.4	< 0.1	98.5	0.7	0.8	0.0004	0.48
NT-3000-8		0.1	0.7	< 0.1	97.7	0.8	1.4	0.0003	0.53
NT-5000-1		< 0.1	0.6	< 0.1	98.3	0.6	1.1	0.0017	0.50
NT-5000-2		0.4	0.8	< 0.1	96.8	1.7	1.4	0.0003	0.38
NT-5000-3		0.5	0.5	< 0.1	98.1	0.7	1.2	0.0002	0.45
NT-5000-3	Field Dup.	< 0.1	0.7	< 0.1	97.6	1.3	1.1	0.0001	0.40
NT-5000-5		0.1	0.4	< 0.1	97.8	1.1	1.1	0.0026	0.95
NT-5000-5	Lab Dup.			< 0.1	98	0.9	1.1		
NT-5000-6		0.3	0.7	< 0.1	97.9	0.9	1.3	0.0009	0.70
NT-5000-7		0.9	0.4	< 0.1	98.5	0.6	0.9	0.0004	0.55
NT-5000-8		0.4	0.2	0.5	98.7	0.1	0.7	0.0002	0.58
NT-7500-1		0.1	0.3	2.9	96	0.2	0.8	0.0001	0.50
NT-7500-3		0.2	0.8	< 0.1	97.4	1.2	1.3	0.0008	0.98
NT-7500-5		0.1	0.4	< 0.1	98.3	0.5	1.1	0.0007	1.38
NT-7500-6		0.2	0.4	0.1	98.5	0.5	0.9	0.0005	0.38
NT-7500-7		< 0.1	0.5	< 0.1	98.8	0.3	0.9	0.0003	<0.3
NT-10000-1		0.3	1	5.6	91.8	1.2	1.4		
NT-10000-3		0.1	0.4	< 0.1	99	0.2	0.8	0.0013	3.50
NT-10000-7		0.9	0.5	< 0.1	98.6	0.4	1	0.0004	<0.3
NT-10000-8		1.4	0.8	< 0.1	98	0.8	1.2	0.0004	0.35
NT-20000-3		0.2	0.2	< 0.1	95.5	3.7	0.8	0.0001	0.48
NT-20000-7		0.2	0.3	1.6	97.6	0.1	0.8	0.0005	1.50

TABLE 5a: Toxicity at North Triumph Drill Site - November 1998

Unique station id	Replicate id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid Fertilization		Microtox EC50
				Mortality %	Control Mortality %	% Fertilization	IC 50	
NT-250-1		<0.05	<0.05	8	2	0.00	10.8	>100%
NT-250-3		0.28	<0.05	0	2	0.00	6.1	>100%
NT-250-5		0.14	<0.05	10	2	0.33	14.3	>100%
NT-250-7		<0.05	<0.05	4	2	0.00	5.1	>100%
NT-250-7	Field Dup.	<0.05	<0.05	13	2	0.00	5.1	>100%
NT-500-1		<0.05	<0.05	10	2	0.00	5.3	>100%
NT-500-3		0.25	<0.05	2	2	0.00	8.6	>100%
NT-500-3	Lab Dup.							
NT-500-5		<0.05	<0.05	9	2	0.00	37.9	>100%
NT-500-7		1.41	<0.05	12	2	0.00	14.8	>100%
NT-1000-1								
NT-1000-1	Field Dup.							
NT-1000-3								
NT-1000-3	Lab Dup.							
NT-1000-5								
NT-1000-7								
NT-3000-1		0.28	<0.05	7	2	0.00	30.1	>100%
NT-3000-1	Lab Dup.							
NT-3000-2								
NT-3000-2	Lab Dup.							
NT-3000-3		<0.05	<0.05	12	2	0.00	17.5	>100%
NT-3000-4								
NT-3000-5		<0.05	<0.05	20	2	70.00		>100%
NT-3000-5	Lab Dup.							
NT-3000-6								
NT-3000-7		<0.05	No result	15	2	0.33	6.0	>100%
NT-3000-8								
NT-5000-1								
NT-5000-2								
NT-5000-3								
NT-5000-3	Field Dup.							
NT-5000-5								
NT-5000-5	Lab Dup.							
NT-5000-6								
NT-5000-7								
NT-5000-8								
NT-7500-1								
NT-7500-3								
NT-7500-5								
NT-7500-6								
NT-7500-7								
NT-10000-1								
NT-10000-3								
NT-10000-7								
NT-10000-8								
NT-20000-3		<0.05	<0.05	32	2	54.00	80.4	>100%
NT-20000-7		<0.05	<0.05	25	2	1.00	<10	>100%

**Appendix E-2: Laboratory Analytical Results
for Sediment from North Triumph Field, June 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1b: Trace Elements at North Triumph Drill Site - June 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
NT-250-1		6600	<2	<2	110	<5	<5	<0.3	3	<1	<2	1300	3.1	<5
NT-250-1	Lab Dup.	7600	<2	<2	150	<5	<5	<0.3	3	<1	<2	1500	3.4	<5
NT-250-3		13000	<2	<2	210	<5	<5	<0.3	6	1	<2	3000	5.8	<5
NT-250-5		13000	<2	2	210	<5	<5	<0.3	7	1	2	3700	6	<5
NT-250-5	Field Dup.	15000	<2	2	240	<5	<5	<0.3	9	1	2	5700	6.8	<5
NT-250-7		9100	<2	<2	150	<5	<5	<0.3	4	<1	<2	1900	4.2	<5
NT-500-1		7200	<2	<2	140	<5	<5	<0.3	3	<1	2	1300	3.3	<5
NT-500-3		12000	<2	2	200	<5	<5	<0.3	6	1	2	3300	5.4	<5
NT-500-5		11000	<2	<2	180	<5	<5	<0.3	6	1	<2	3000	5.4	<5
NT-500-7		10000	<2	<2	170	<5	<5	<0.3	4	1	<2	2500	4.6	<5
NT-1000-1		13000	<2	2	230	<5	<5	<0.3	7	1	2	4000	6.2	<5
NT-1000-3		11000	<2	<2	200	<5	<5	<0.3	6	1	<2	3200	5.7	<5
NT-1000-5		9400	<2	<2	160	<5	<5	<0.3	4	1	<2	2400	4.9	<5
NT-1000-7		11000	<2	2	180	<5	<5	<0.3	5	1	<2	3000	5.4	<5
NT-3000-1		15000	<2	2	240	<5	<5	<0.3	9	2	2	6100	7.3	<5
NT-3000-2		12000	<2	2	200	<5	<5	<0.3	7	1	2	5000	6	<5
NT-3000-2	Field Dup.	12000	<2	2	180	<5	<5	<0.3	8	1	2	5400	5.5	<5
NT-3000-3		12000	<2	2	200	<5	<5	<0.3	5	1	<2	3100	6	<5
NT-3000-4		8100	<2	<2	130	<5	<5	<0.3	4	1	<2	2300	3.8	<5
NT-3000-4	Lab Dup.	9600	<2	<2	150	<5	<5	<0.3	6	1	<2	3300	4.6	<5
NT-3000-5		9900	<2	<2	170	<5	<5	<0.3	6	1	<2	2800	5	<5
NT-3000-6		11000	<2	<2	180	<5	<5	<0.3	6	1	2	3000	5.4	<5
NT-3000-7		9100	<2	<2	160	<5	<5	<0.3	6	1	<2	2800	4.7	<5
NT-3000-8		14000	<2	2	210	<5	<5	<0.3	10	1	2	5700	6.4	<5
NT-5000-1		10000	<2	<2	170	<5	<5	<0.3	5	1	<2	2700	4.2	<5
NT-5000-2		14000	<2	2	240	<5	<5	<0.3	9	1	2	5500	6.7	<5
NT-5000-3		13000	<2	2	200	<5	<5	<0.3	9	1	2	5300	6.1	<5
NT-5000-5		7300	<2	<2	130	<5	<5	<0.3	4	<1	<2	1700	3.4	<5
NT-5000-5	Field Dup.	8600	<2	<2	140	<5	<5	<0.3	5	1	<2	2400	4.2	<5
NT-5000-6		8800	<2	<2	150	<5	<5	<0.3	5	1	<2	2500	4.4	<5
NT-5000-7		12000	<2	<2	200	<5	<5	<0.3	7	1	2	3800	5.7	<5
NT-5000-8		4600	<2	<2	82	<5	<5	<0.3	2	<1	<2	970	2.4	<5
NT-7500-1		5200	<2	<2	84	<5	<5	<0.3	2	<1	<2	1200	2.6	<5
NT-7500-3		14000	<2	2	230	<5	<5	<0.3	10	1	2	5600	6.4	<5
NT-7500-5		5600	<2	<2	94	<5	<5	<0.3	3	<1	<2	1500	2.9	<5
NT-7500-5	Lab Dup.	6600	<2	<2	120	<5	<5	<0.3	4	<1	<2	1500	3.4	<5
NT-7500-6		8000	<2	<2	140	<5	<5	<0.3	4	1	<2	1900	4.1	<5
NT-7500-7		10000	<2	<2	160	<5	<5	<0.3	6	1	<2	3000	5.1	<5
NT-10000-1		16000	<2	2	240	<5	<5	<0.3	11	2	2	6200	6.7	<5
NT-10000-3		4600	<2	<2	84	<5	<5	<0.3	2	<1	<2	950	2.2	<5
NT-10000-7		10000	<2	<2	170	<5	<5	<0.3	6	1	<2	2900	4.7	<5
NT-10000-8		17000	<2	2	250	<5	<5	<0.3	13	2	2	7400	7.3	<5
NT-10000-8	Field Dup.	16000	<2	2	240	<5	<5	<0.3	9	2	2	5700	6.4	<5
NT-20000-3		10000	<2	2	170	<5	<5	<0.3	6	1	<2	2800	4.5	<5
NT-20000-7		4700	<2	<2	83	<5	<5	<0.3	2	<1	<2	850	2.4	<5

TABLE 1b: Trace Elements at North Triumph Drill Site - June 1999 (Continued)

Unique_station_id	Replicate_id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Tin mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
NT-250-1		37	<2	<0.01	<2	<2	<0.5	28	0.1	<2	0.2	4	5
NT-250-1	Lab Dup.	45	<2	<0.01	<2	<2	<0.5	34	0.1	<2	0.2	5	5
NT-250-3		82	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.3	8	8
NT-250-5		130	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.4	10	9
NT-250-5	Field Dup.	190	<2	<0.01	2	<2	<0.5	63	0.2	<2	0.5	13	12
NT-250-7		55	<2	<0.01	<2	<2	<0.5	40	0.1	<2	0.2	5	6
NT-500-1		30	<2	<0.01	<2	<2	<0.5	33	0.1	<2	0.2	4	5
NT-500-3		100	<2	<0.01	2	<2	<0.5	50	0.2	<2	0.3	9	8
NT-500-5		96	<2	<0.01	2	<2	<0.5	47	0.2	<2	0.3	8	7
NT-500-7		72	<2	<0.01	<2	<2	<0.5	43	0.2	<2	0.3	7	7
NT-1000-1		140	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.4	10	9
NT-1000-3		98	<2	<0.01	2	<2	<0.5	50	0.2	<2	0.3	9	8
NT-1000-5		78	<2	<0.01	<2	<2	<0.5	41	0.1	<2	0.3	6	7
NT-1000-7		87	<2	<0.01	2	<2	<0.5	46	0.2	<2	0.3	8	8
NT-3000-1		220	<2	<0.01	2	<2	<0.5	62	0.2	<2	0.5	14	19
NT-3000-2		170	<2	<0.01	2	<2	<0.5	52	0.2	<2	0.5	12	10
NT-3000-2	Field Dup.	210	<2	<0.01	2	<2	<0.5	52	0.2	<2	0.4	12	12
NT-3000-3		84	<2	<0.01	2	<2	<0.5	49	0.2	<2	0.3	8	8
NT-3000-4		85	<2	<0.01	<2	<2	<0.5	37	0.1	<2	0.2	6	7
NT-3000-4	Lab Dup.	130	<2	<0.01	<2	<2	<0.5	44	0.1	<2	0.3	9	8
NT-3000-5		94	<2	<0.01	2	<2	<0.5	45	0.1	<2	0.3	8	8
NT-3000-6		89	<2	<0.01	2	<2	<0.5	49	0.1	<2	0.3	9	9
NT-3000-7		110	<2	<0.01	<2	<2	<0.5	45	0.1	<2	0.3	8	8
NT-3000-8		210	<2	<0.01	2	<2	<0.5	60	0.2	<2	0.4	14	12
NT-5000-1		100	<2	<0.01	2	<2	<0.5	46	0.1	<2	0.3	7	8
NT-5000-2		190	<2	<0.01	2	<2	<0.5	62	0.2	<2	0.6	14	12
NT-5000-3		190	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.4	12	11
NT-5000-5		59	<2	<0.01	<2	<2	<0.5	35	0.1	<2	0.2	5	6
NT-5000-5	Field Dup.	73	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.3	7	8
NT-5000-6		88	<2	<0.01	<2	<2	<0.5	41	0.1	<2	0.2	7	7
NT-5000-7		160	<2	<0.01	2	<2	<0.5	54	0.2	<2	0.4	10	9
NT-5000-8		30	<2	<0.01	<2	<2	<0.5	25	0.1	<2	0.2	4	5
NT-7500-1		20	<2	<0.01	<2	<2	<0.5	25	0.1	<2	0.4	4	5
NT-7500-3		170	<2	<0.01	2	<2	<0.5	61	0.2	<2	0.4	14	11
NT-7500-5		38	<2	<0.01	<2	<2	<0.5	27	0.1	<2	0.2	5	5
NT-7500-5	Lab Dup.	45	<2	<0.01	<2	<2	<0.5	33	0.1	<2	0.2	4	6
NT-7500-6		53	<2	<0.01	<2	<2	<0.5	37	0.1	<2	0.2	5	6
NT-7500-7		110	<2	<0.01	<2	<2	<0.5	45	0.1	<2	0.3	9	8
NT-10000-1		200	<2	<0.01	4	<2	<0.5	62	0.2	<2	0.6	14	12
NT-10000-3		15	<2	<0.01	<2	<2	<0.5	22	0.1	<2	0.1	3	4
NT-10000-7		110	<2	<0.01	2	<2	<0.5	46	0.1	<2	0.3	8	8
NT-10000-8		290	<2	<0.01	3	<2	<0.5	68	0.2	<2	0.6	17	15
NT-10000-8	Field Dup.	230	<2	<0.01	3	<2	<0.5	65	0.2	<2	0.6	14	13
NT-20000-3		64	<2	<0.01	2	<2	<0.5	43	0.2	<2	0.3	7	8
NT-20000-7		22	<2	<0.01	<2	<2	<0.5	21	0.1	<2	0.2	3	5

TABLE 2b: Petroleum Hydrocarbons at North Triumph Drill Site - June 1999

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₂₀ mg/kg	C ₂₁ -C ₃₀ mg/kg	TEH (C ₁₁ -C ₃₀) mg/kg	TPH mg/kg
NT-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.905	1.45	2.36	2.36
NT-250-1	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.14	1.86	3.01	3.01
NT-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.41	2.42	3.83	3.84
NT-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.87	3.11	4.98	4.99
NT-250-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.72	4.53	7.25	7.25
NT-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.64	2.88	4.52	4.53
NT-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.07	1.67	2.74	2.75
NT-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.49	3.79	6.28	6.28
NT-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.45	4.5	6.95	6.95
NT-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.49	2.85	4.34	4.34
NT-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.68	3.39	5.07	5.06
NT-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.65	3.42	5.07	5.08
NT-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.45	2.96	4.41	4.41
NT-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.38	4.58	6.96	6.96
NT-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.97	5.36	8.33	8.33
NT-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	2.65	2.65	2.65
NT-3000-2	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.36	2.58	3.94	3.94
NT-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2	3.99	5.99	5.99
NT-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.906	1.54	2.45	2.44
NT-3000-4	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.3	2.16	3.46	3.46
NT-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.46	2.7	4.16	4.16
NT-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.16	2.42	3.58	3.59
NT-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.12	2.14	3.26	3.26
NT-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.61	3.39	5.00	5
NT-5000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.74	5.08	7.82	7.82
NT-5000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.96	4.43	6.39	6.39
NT-5000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.25	2.98	4.23	4.22
NT-5000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.25	2.7	3.95	3.94
NT-5000-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.696	1.27	1.96	1.96
NT-5000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.45	3.47	4.92	4.92
NT-5000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.04	2.44	3.48	3.48
NT-5000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.12	2.08	3.20	3.19
NT-7500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.12	2.45	3.57	3.57
NT-7500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.73	2.89	4.62	4.62
NT-7500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.914	1.67	2.58	2.58
NT-7500-5	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.35	2.72	4.07	4.06
NT-7500-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.07	2.02	3.09	3.1
NT-7500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.11	1.88	2.99	2.98
NT-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.79	3.36	5.15	5.15
NT-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.817	1.95	2.77	2.77
NT-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.739	2.12	2.86	2.86
NT-10000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.3	3.16	4.46	4.45
NT-10000-8	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.24	4.43	6.68	6.68
NT-20000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.913	2.38	3.29	3.29
NT-20000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.719	1.78	2.50	2.49

TABLE 3b: Polycyclic Aromatic Hydrocarbons at North Triumph Drill Site - June 1999 (Continued)

Unique station id	Replicate id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
NT-250-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-1	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-250-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-250-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-2	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-4	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-8	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-7		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4b: Sediment Quality at North Triumph Drill Site - June 1999

Unique station id	Replicate id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
NT-250-1		0.2	0.1	< 0.1	98.8	0.3	0.8	0.0004	<0.20
NT-250-1	Lab Dup.			< 0.1	98.8	0.3	0.9		
NT-250-3		0.5	0.2	< 0.1	97.7	1.1	1.2	0.0006	0.20
NT-250-5		0.5	0.2	< 0.1	97.9	0.8	1.3	0.0004	0.28
NT-250-5	Field Dup.	0.5	0.2	< 0.1	97.9	1	1.1	0.0001	<0.20
NT-250-7		0.3	0.1	< 0.1	98.7	0.4	0.9	0.0005	<0.20
NT-500-1		0.3	< 0.1	0.8	98.1	0.3	0.7	0.0004	0.22
NT-500-3		0.6	0.1	< 0.1	97.9	0.9	1.2	0.0004	<0.20
NT-500-5		0.5	0.2	0.1	97.6	0.9	1.4	0.0007	0.25
NT-500-7		0.3	0.3	0.1	98.1	0.7	1.1	0.0018	<0.20
NT-1000-1		0.5	0.3	< 0.1	98	0.8	1.2	0.0001	<0.20
NT-1000-3		0.5	0.2	< 0.1	97.9	0.9	1.2	0.0004	0.30
NT-1000-5		0.4	0.1	< 0.1	98.4	0.7	1	0.0003	<0.20
NT-1000-7		0.6	0.2	< 0.1	97.9	0.8	1.3	0.0005	0.22
NT-3000-1		0.7	0.2	< 0.1	97.8	0.7	1.4	0.0002	0.28
NT-3000-2		0.5	< 0.1	< 0.1	97.7	1.2	1.1	0.0018	<0.20
NT-3000-2	Field Dup.	0.4	0.1	< 0.1	98.3	0.6	1.1	0.0002	0.22
NT-3000-3		0.5	0.1	0.1	96.8	1.8	1.3	0.0006	<0.20
NT-3000-4		0.4	0.1	0.6	97.7	0.7	1	0.0005	0.45
NT-3000-4	Lab Dup.			0.8	97	1.2	1		
NT-3000-5		0.4	0.1	< 0.1	98.1	0.8	1.1	0.0011	0.33
NT-3000-6		0.5	0.1	< 0.1	98	0.7	1.3	0.0020	0.33
NT-3000-7		0.3	0.1	0.1	98.6	0.4	1	0.0006	<0.20
NT-3000-8		0.5	0.1	< 0.1	95	3.7	1.2	0.0004	0.38
NT-5000-1		0.6	0.2	< 0.1	98.2	0.5	1.3	0.0004	<0.20
NT-5000-2		0.6	0.3	< 0.1	97.3	1.1	1.6	0.0003	0.23
NT-5000-3		0.4	0.2	0.1	97.6	1.1	1.2	0.0004	<0.20
NT-5000-5		0.2	0.2	0.2	98.2	0.4	1.2	0.0006	<0.20
NT-5000-5	Field Dup.	0.4	< 0.1	0.1	98.4	0.5	1.1	0.0004	<0.20
NT-5000-6		0.4	< 0.1	< 0.1	98.6	0.3	1.1	0.0019	<0.20
NT-5000-7		0.3	0.2	< 0.1	98.3	0.6	1.1	0.0007	0.38
NT-5000-8		0.1	0.2	< 0.1	99	0.1	0.9	0.0006	0.30
NT-7500-1		0.2	0.1	2	96.8	0.3	0.9	0.0009	0.30
NT-7500-3		0.5	0.2	< 0.1	97	1.6	1.4	0.0005	<0.20
NT-7500-5		0.3	0.1	< 0.1	98.3	0.6	1.1	0.0004	<0.20
NT-7500-5	Lab Dup.			1.5	96.9	0.6	1		
NT-7500-6		0.3	0.1	< 0.1	98.2	0.5	1.3	0.0005	<0.20
NT-7500-7		0.2	0.2	< 0.1	98.5	0.6	0.9	0.0003	0.22
NT-10000-1		0.5	0.3	< 0.1	98.3	0.5	1.2	0.0004	0.48
NT-10000-3		0.2	< 0.1	1.1	98	0.1	0.8	0.0004	<0.20
NT-10000-7		0.3	0.1	< 0.1	98.8	0.2	1	0.0004	0.52
NT-10000-8		0.6	0.3	< 0.1	98.1	0.5	1.4	0.0004	0.23
NT-10000-8	Field Dup.	0.8	0.1	0.2	98	0.5	1.3	0.0006	<0.20
NT-20000-3		0.4	0.1	< 0.1	97.6	1.3	1.1	0.0005	<0.20
NT-20000-7		0.2	0.2	0.1	99.1	0.1	0.7	0.0006	0.82

TABLE 5b: Toxicity at North Triumph Drill Site - June 1999

Unique station id	Replicate id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Microtox EC50
				Mortality	Control Mortality %			
NT-250-1		3.65	<20	3	3	92.5	>100%	>100%
NT-250-1	Lab Dup.							
NT-250-3		6.87	<20	12	3	85.3	>100%	>100%
NT-250-5		6.31	<20	7	3	95.3	>100%	>100%
NT-250-5	Field Dup.	4.45	<20	9	3	24.5	51.80%	>100%
NT-250-7		7.76	<20	4	3	21.0	72.60%	>100%
NT-500-1		5.21	<20	3	3	86.8	>100%	>100%
NT-500-3		3.35	<20	3	3	53.3	>100%	>100%
NT-500-5		5.54	<20	4	3	83.8	>100%	>100%
NT-500-7		5.64	<20	20	3	70.3	>100%	>100%
NT-1000-1								
NT-1000-3								
NT-1000-5								
NT-1000-7								
NT-3000-1		6.92	<20	1		83.8	>100%	>100%
NT-3000-2								
NT-3000-2	Field Dup.							
NT-3000-3		3.16	<20	15		35.5	78.20%	>100%
NT-3000-4								
NT-3000-4	Lab Dup.							
NT-3000-5		8.00	<20	5		58.8	>100%	>100%
NT-3000-6								
NT-3000-7		3.46	<20	7		81.7	>100%	>100%
NT-3000-8								
NT-5000-1								
NT-5000-2								
NT-5000-3								
NT-5000-5								
NT-5000-5	Field Dup.							
NT-5000-6								
NT-5000-7								
NT-5000-8								
NT-7500-1								
NT-7500-3								
NT-7500-5								
NT-7500-5	Lab Dup.							
NT-7500-6								
NT-7500-7								
NT-10000-1								
NT-10000-3								
NT-10000-7								
NT-10000-8								
NT-10000-8	Field Dup.							
NT-20000-3		4.94	<20	6	3	74.5	>100%	>100%
NT-20000-7		4.48	<20	7	3	81.0	>100%	>100%

**Appendix E-3: Laboratory Analytical Results
for Sediment from North Triumph Field, Fall 1999**

- Table 1: Trace Elements
- Table 2: Petroleum Hydrocarbons
- Table 3: Polycyclic Aromatic Hydrocarbons
- Table 4: Sediment Quality
- Table 5: Toxicity

TABLE 1c: Trace Elements at North Triumph Drill Site - November 1999

Unique_station_id	Replicate_id	Aluminum mg/kg	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Lithium mg/kg
NT-250-1		8600	< 2	< 2	1200	< 5	< 5	< 0.3	5	1	2	2900	4.5	< 5
NT-250-3		11000	< 2	< 2	220	< 5	< 5	< 0.3	7	1	2	3900	5.6	< 5
NT-250-5		9100	< 2	< 2	250	< 5	< 5	< 0.3	5	1	< 2	2900	4.6	< 5
NT-250-7		7100	< 2	< 2	1900	< 5	< 5	< 0.3	4	1	< 2	2600	4.2	< 5
NT-250-7	Field Dup.	4900	< 2	< 2	1100	< 5	< 5	< 0.3	2	< 1	< 2	1200	2.9	< 5
NT-500-1		5300	< 2	< 2	180	< 5	< 5	< 0.3	2	< 1	< 2	940	2.8	< 5
NT-500-3		10000	< 2	< 2	250	< 5	< 5	< 0.3	5	1	2	3400	6.1	< 5
NT-500-3	Lab Dup.													
NT-500-5		9600	< 2	< 2	230	< 5	< 5	< 0.3	7	1	2	3700	5.4	< 5
NT-500-7		11000	< 2	2	580	< 5	< 5	< 0.3	8	1	2	4200	6.3	< 5
NT-1000-1		11000	< 2	< 2	260	< 5	< 5	< 0.3	8	1	2	4300	5.9	< 5
NT-1000-3		9400	< 2	< 2	200	< 5	< 5	< 0.3	6	1	2	3600	5.4	< 5
NT-1000-3	Lab Dup.	9000	< 2	< 2	170	< 5	< 5	< 0.3	6	1	< 2	3400	4.9	< 5
NT-1000-5		8500	< 2	< 2	190	< 5	< 5	< 0.3	5	1	< 2	2900	4.4	< 5
NT-1000-7		9700	< 2	< 2	260	< 5	< 5	< 0.3	8	1	2	4000	5.4	< 5
NT-3000-1		13000	< 2	2	220	< 5	< 5	< 0.3	10	2	2	5600	6.2	< 5
NT-3000-2		9300	< 2	< 2	170	< 5	< 5	< 0.3	7	1	2	4100	5.1	< 5
NT-3000-3		10000	< 2	< 2	190	< 5	< 5	< 0.3	7	1	2	3900	5.4	< 5
NT-3000-4		7900	< 2	< 2	150	< 5	< 5	< 0.3	4	1	< 2	2500	4.2	< 5
NT-3000-5		7100	< 2	< 2	130	< 5	< 5	< 0.3	4	1	< 2	2300	3.8	< 5
NT-3000-5	Field Dup.	7200	< 2	< 2	130	< 5	< 5	< 0.3	4	< 1	< 2	2100	3.9	< 5
NT-3000-6		8400	< 2	< 2	160	< 5	< 5	< 0.3	6	1	< 2	3300	4.7	< 5
NT-3000-7		7400	< 2	< 2	160	< 5	< 5	< 0.3	5	1	< 2	2600	4.2	< 5
NT-3000-8		11000	< 2	2	200	< 5	< 5	< 0.3	10	1	2	4900	5.3	< 5
NT-3000-8	Lab Dup.	11000	< 2	< 2	210	< 5	< 5	< 0.3	8	1	2	4600	5.8	< 5
NT-5000-1		9600	< 2	< 2	190	< 5	< 5	< 0.3	6	1	< 2	3500	4.5	< 5
NT-5000-2		13000	< 2	2	240	< 5	< 5	< 0.3	12	2	2	6100	7	< 5
NT-5000-2	Field Dup.	13000	< 2	2	230	< 5	< 5	< 0.3	10	1	2	5500	6.6	< 5
NT-5000-3		8200	< 2	< 2	170	< 5	< 5	< 0.3	6	1	< 2	3200	4.5	< 5
NT-5000-5		7100	< 2	< 2	150	< 5	< 5	< 0.3	6	1	< 2	2700	4.8	< 5
NT-5000-6		9000	< 2	< 2	170	< 5	< 5	< 0.3	6	1	2	3300	4.9	< 5
NT-5000-7		8200	< 2	< 2	170	< 5	< 5	< 0.3	5	1	< 2	2800	4.4	< 5
NT-5000-8		4400	< 2	< 2	91	< 5	< 5	< 0.3	< 2	< 1	< 2	860	2	< 5
NT-7500-1		3400	< 2	< 2	49	< 5	< 5	< 0.3	< 2	< 1	< 2	750	1.4	< 5
NT-7500-3		10000	< 2	2	210	< 5	< 5	< 0.3	8	1	2	3900	6.1	< 5
NT-7500-5		4200	< 2	< 2	78	< 5	< 5	< 0.3	2	< 1	< 2	1100	2.4	< 5
NT-7500-5	Lab Dup.	4900	< 2	< 2	86	< 5	< 5	< 0.3	2	< 1	< 2	1200	2.4	< 5
NT-7500-6		6200	< 2	< 2	130	< 5	< 5	< 0.3	3	< 1	< 2	1800	3.8	< 5
NT-7500-7		7400	< 2	< 2	150	< 5	< 5	< 0.3	5	1	< 2	2400	4.4	< 5
NT-10000-1		13000	< 2	2	240	< 5	< 5	< 0.3	9	1	2	5000	6.4	< 5
NT-10000-3		3800	< 2	< 2	69	< 5	< 5	< 0.3	2	< 1	< 2	780	2.1	< 5
NT-10000-7		8100	< 2	< 2	160	< 5	< 5	< 0.3	5	1	< 2	2700	4.6	< 5
NT-10000-8		14000	< 2	2	250	< 5	< 5	< 0.3	9	1	2	4600	6.5	< 5
NT-20000-3		11000	< 2	2	210	< 5	< 5	< 0.3	11	1	4	5300	6	< 5
NT-20000-3	Field Dup.	12000	< 2	2	220	< 5	< 5	< 0.3	8	1	2	4700	6	< 5
NT-20000-7		3700	< 2	< 2	77	< 5	< 5	< 0.3	2	< 1	< 2	630	1.9	< 5

TABLE 1c: Trace Elements at North Triumph Drill Site - November 1999 (Continued)

Unique_station_id	Replicate_id	Manganese mg/kg	Molybdenum mg/kg	Mercury mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Strontium mg/kg	Thallium mg/kg	Ti mg/kg	Uranium mg/kg	Vanadium mg/kg	Zinc mg/kg
NT-250-1		99	<2	<0.01	2	<2	<0.5	71	0.1	<2	0.2	7	8
NT-250-3		150	<2	<0.01	2	<2	<0.5	56	0.2	<2	0.4	10	9
NT-250-5		89	<2	<0.01	2	<2	<0.5	52	0.1	<2	0.3	8	8
NT-250-7		100	<2	<0.01	<2	<2	<0.5	77	0.1	<2	0.2	6	8
NT-250-7	Field Dup.	23	<2	<0.01	<2	<2	<0.5	46	0.1	<2	0.2	3	4
NT-500-1		18	<2	<0.01	<2	<2	<0.5	29	0.1	<2	0.2	3	4
NT-500-3		100	<2	<0.01	2	<2	<0.5	54	0.2	<2	0.3	9	9
NT-500-3	Lab Dup.												
NT-500-5		130	<2	<0.01	2	<2	<0.5	51	0.2	<2	0.4	10	9
NT-500-7		120	<2	<0.01	2	<2	<0.5	66	0.2	<2	0.4	11	14
NT-1000-1		150	<2	<0.01	2	<2	<0.5	57	0.2	<2	0.4	12	10
NT-1000-3		130	<2	<0.01	2	<2	<0.5	51	0.2	<2	0.4	9	9
NT-1000-3	Lab Dup.	150	<2	<0.01	2	<2	<0.5	44	0.1	<2	0.3	9	8
NT-1000-5		98	<2	<0.01	2	<2	<0.5	49	0.1	<2	0.3	8	8
NT-1000-7		130	<2	<0.01	2	<2	<0.5	50	0.2	<2	0.4	11	10
NT-3000-1		230	<2	<0.01	3	<2	<0.5	60	0.2	2	0.6	16	13
NT-3000-2		170	<2	<0.01	2	<2	<0.5	49	0.2	<2	0.4	11	9
NT-3000-3		130	<2	<0.01	2	<2	<0.5	51	0.2	<2	0.4	10	9
NT-3000-4		84	<2	<0.01	<2	<2	<0.5	42	0.1	<2	0.3	7	7
NT-3000-5		72	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	6	6
NT-3000-5	Field Dup.	55	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.2	6	5
NT-3000-6		110	<2	<0.01	2	<2	<0.5	43	0.1	<2	0.3	9	8
NT-3000-7		92	<2	<0.01	<2	<2	<0.5	38	0.1	<2	0.3	7	8
NT-3000-8		210	<2	<0.01	2	<2	<0.5	57	0.2	<2	0.4	14	11
NT-3000-8	Lab Dup.	190	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.4	13	11
NT-5000-1		150	<2	<0.01	2	<2	<0.5	48	0.2	<2	0.3	9	9
NT-5000-2		270	<2	<0.01	3	<2	<0.5	62	0.2	<2	0.6	17	15
NT-5000-2	Field Dup.	260	<2	<0.01	2	<2	<0.5	63	0.2	<2	0.6	14	11
NT-5000-3		120	<2	<0.01	2	<2	<0.5	40	0.1	<2	0.3	9	9
NT-5000-5		88	<2	<0.01	<2	<2	<0.5	39	0.1	<2	0.3	8	8
NT-5000-6		99	<2	<0.01	2	<2	<0.5	48	0.1	<2	0.3	9	7
NT-5000-7		95	<2	<0.01	<2	<2	<0.5	47	0.1	<2	0.3	7	7
NT-5000-8		16	<2	<0.01	<2	<2	<0.5	22	<0.1	<2	0.2	3	4
NT-7500-1		11	<2	<0.01	<2	<2	<0.5	17	<0.1	<2	0.2	2	4
NT-7500-3		110	<2	<0.01	2	<2	<0.5	58	0.2	<2	0.3	11	9
NT-7500-5		22	<2	<0.01	<2	<2	<0.5	21	<0.1	<2	0.2	3	5
NT-7500-5	Lab Dup.	26	<2	<0.01	<2	<2	<0.5	26	0.1	<2	0.2	3	5
NT-7500-6		53	<2	<0.01	<2	<2	<0.5	36	0.1	<2	0.2	5	6
NT-7500-7		75	<2	<0.01	<2	<2	<0.5	42	0.1	<2	0.3	7	8
NT-10000-1		160	<2	<0.01	2	<2	<0.5	61	0.2	<2	0.5	13	11
NT-10000-3		11	<2	<0.01	<2	<2	<0.5	22	0.1	<2	0.1	3	4
NT-10000-7		99	<2	<0.01	<2	<2	<0.5	44	0.1	<2	0.3	7	7
NT-10000-8		160	<2	<0.01	3	<2	<0.5	70	0.2	<2	0.5	12	12
NT-20000-3		94	<2	<0.01	3	<2	<0.5	55	0.2	<2	0.4	15	12
NT-20000-3	Field Dup.	130	<2	<0.01	2	<2	<0.5	55	0.2	<2	0.5	12	9
NT-20000-7		12	<2	<0.01	<2	<2	<0.5	15	<0.1	<2	0.1	2	4

TABLE 2c: Petroleum Hydrocarbons at North Triumph Drill Site - November 1999

Unique_station_id	Replicate_id	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	C ₆ -C ₁₀ mg/kg	C ₁₁ -C ₁₅ mg/kg	C ₁₆ -C ₂₂ mg/kg	TEH (C ₁₁ -C ₂₂) mg/kg	TPH mg/kg
NT-250-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	547	13.9	561	561
NT-250-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.98	2.94	7.91	7.91
NT-250-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	46.5	6.9	53.4	53.4
NT-250-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2340	101	2440	2440
NT-250-7	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	5580	42.2	5620	5620
NT-500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	13.2	3.58	16.8	16.8
NT-500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	30.1	6.96	37.1	37.1
NT-500-3	Lab Dup.									
NT-500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	8.58	5.55	14.1	14.1
NT-500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	592	21	613	613
NT-1000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	6.49	6.45	12.9	12.9
NT-1000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.1	2.68	5.78	5.78
NT-1000-3	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.07	3.28	6.36	6.36
NT-1000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	7.3	6	13.3	13.3
NT-1000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	46.3	6.46	52.7	52.7
NT-3000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-3000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.49	3.14	5.64	5.64
NT-3000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	4.13	4.77	8.9	8.9
NT-3000-4		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.44	2.72	5.16	5.16
NT-3000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-3000-5	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	0.824	2.38	3.2	3.2
NT-3000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-3000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.01	2.6	5.62	5.62
NT-3000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.65	3.11	6.76	6.76
NT-3000-8	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	3.14	3.34	6.48	6.48
NT-5000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-2		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-2	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-5000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	2.75	2.95	5.7	5.7
NT-5000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-5		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-5	Lab Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-6		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-7500-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.84	1.98	3.82	3.82
NT-10000-1		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-10000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-10000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.62	2.56	4.18	4.18
NT-10000-8		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	1.02	1.61	< 3	< 3
NT-20000-3		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-20000-3	Field Dup.	< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3
NT-20000-7		< 0.025	< 0.025	< 0.025	< 0.05	< 2.5	< 0.25	< 0.25	< 3	< 3

TABLE 3c: Polycyclic Aromatic Hydrocarbons at North Triumph Drill Site - November 1999 (Continued)

Unique station id	Replicate id	Perylene mg/kg	Indeno(1,2,3-cd)pyrene mg/kg	Dibenz(a,h)anthracene mg/kg	Benzo(ghi)perylene mg/kg
NT-250-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-250-7	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-3	Lab Dup.				
NT-500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-3	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-1000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-4		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-5	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-3000-8	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-2		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-2	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-5000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-5		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-5	Lab Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-6		< 0.05	< 0.05	< 0.05	< 0.05
NT-7500-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-1		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-7		< 0.05	< 0.05	< 0.05	< 0.05
NT-10000-8		< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-3		< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-3	Field Dup.	< 0.05	< 0.05	< 0.05	< 0.05
NT-20000-7		< 0.05	< 0.05	< 0.05	< 0.05

TABLE 4c: Sediment Quality at North Triumph Drill Site - November 1999

Unique_station_id	Replicate_id	Total Inorg. Carbon g/kg	Total Org. Carbon g/kg	Gravel_%	Sand_%	Silt_%	Clay_%	Floc g/L	Ba Content
NT-250-1		1.2	0.7	0.1	96.4	1.7	1.8	0.0005	0.40
NT-250-3		1.1	0.2	< 0.1	97.3	1.5	1.2	0.0005	<0.20
NT-250-5		1.1	0.2	< 0.1	97.3	1.4	1.3	0.0004	<0.20
NT-250-7		0.9	0.6	< 0.1	97.5	1.1	1.4	0.0006	0.25
NT-250-7	Field Dup.	0.7	0.8	< 0.1	97.4	0.9	1.7	0.0006	1.55
NT-500-1		0.5	0.2	< 0.1	99	0.2	0.8	0.0007	0.47
NT-500-3		1.2	0.3	< 0.1	96.5	2	1.4	0.0007	0.30
NT-500-3	Lab Dup.								
NT-500-5		1.1	0.4	0.2	97.1	1.4	1.3	0.0005	0.25
NT-500-7		2.2	0.7	< 0.1	94.9	2.6	2.5	0.0005	<0.20
NT-1000-1		1.2	0.3	< 0.1	96.9	1.6	1.5	0.0012	<0.32
NT-1000-3		0.8	0.1	< 0.1	97.9	1	1.1	0.0008	0.47
NT-1000-3	Lab Dup.	0.7	0.2	< 0.1	98.4	0.5	1.1		
NT-1000-5		1.1	0.4	0.1	97.3	1.1	1.5	0.0009	0.24
NT-1000-7		1.1	0.3	< 0.1	97.4	1.1	1.6	0.0010	0.27
NT-3000-1		1.1	< 0.1	0.1	97.7	0.7	1.5	0.0005	0.23
NT-3000-2		0.7	0.2	< 0.1	98.5	0.4	1.2	0.0005	<0.20
NT-3000-3		1	0.2	< 0.1	97.5	1.1	1.4	0.0006	0.22
NT-3000-4		0.8	0.2	0.3	97.7	0.8	1.2	0.0006	<0.20
NT-3000-5		1	< 0.1	< 0.1	98.3	1	0.7	0.0004	0.23
NT-3000-5	Field Dup.	0.7	0.3	< 0.1	97.9	0.8	1.3	0.0018	<0.20
NT-3000-6		0.8	< 0.1	2.3	95.6	0.8	1.3	0.0006	<0.21
NT-3000-7		0.7	< 0.1	< 0.1	98.6	0.4	1	0.0005	<0.20
NT-3000-8		1	0.1	0.2	98	0.6	1.2	0.0008	0.48
NT-3000-8	Lab Dup.	1.1	< 0.1	0.2	98	0.7	1.1		
NT-5000-1		0.8	0.1	0.2	98.2	0.6	1	0.0004	0.23
NT-5000-2		1.3	< 0.1	0.2	97.6	0.9	1.3	0.0003	0.30
NT-5000-2	Field Dup.	0.9	0.4	< 0.1	98.1	0.6	1.4	0.0006	0.60
NT-5000-3		0.9	< 0.1	0.1	97.8	1	1.1	0.0007	0.90
NT-5000-5		0.8	0.1	< 0.1	98	0.9	1.2	0.0007	0.35
NT-5000-6		0.9	0.1	< 0.1	98.1	0.9	1.2	0.0010	0.33
NT-5000-7		1	< 0.1	0.2	98	0.6	1.2	0.0001	<0.20
NT-5000-8		0.3	0.1	0.4	98.8	0.1	0.7	0.0005	<0.20
NT-7500-1		0.5	< 0.1	0.1	99.2	0.2	0.5	0.0006	0.27
NT-7500-3		1.5	0.2	< 0.1	95.4	3.1	1.4	0.0008	0.44
NT-7500-5		0.7	0.1	< 0.1	98.5	0.7	0.8	0.0005	0.20
NT-7500-5	Lab Dup.	0.8	0.1	< 0.1	98.3	0.7	1		
NT-7500-6		0.8	0.2	0.7	97.2	0.9	1.2	0.0007	0.35
NT-7500-7		0.6	0.1	< 0.1	98.5	0.6	0.9	0.0005	<0.20
NT-10000-1		1.6	< 0.1	0.6	96.5	1.4	1.5	0.0006	0.30
NT-10000-3		0.5	< 0.1	3.9	95	0.4	0.7	0.0003	<0.20
NT-10000-7		0.7	0.1	< 0.1	98.3	0.5	1.1	0.0006	<0.20
NT-10000-8		1.5	0.3	1.5	87.6	9.1	1.8	0.0006	0.77
NT-20000-3		2.5	0.3	< 0.1	91.7	6	2.3	0.0005	<0.20
NT-20000-3	Field Dup.	0.9	0.3	< 0.1	96.6	2	1.5	0.0004	<0.20
NT-20000-7		0.2	0.1	0.6	98.6	0.1	0.7	0.0007	0.50

TABLE 5c: Toxicity at North Triumph Drill Site - November 1999

Unique_station_id	Replicate_id	Ammonia mg/kg	Sulphide mg/kg	Amphipod Survival		Echinoid % Fertilization	Fertilization IC50	Microtox EC50
				Mortality %	Control Mortality %			
NT-250-1		<0.50	<10	56	0	70.8	>100%	>100%
NT-250-3		6.32	<10	6	0	49.3	>100%	>100%
NT-250-5		9.41	<10	30	0	25.3	63.60%	>100%
NT-250-7		<0.50	<10	36	0	73.3	>100%	>100%
NT-250-7	Field Dup.	<0.50	<10	9	0	81.2	>100%	>100%
NT-500-1		<0.50	<10	13	0	82.8	>100%	>100%
NT-500-3		1.27	<10	11	0	13.5	43.70%	>100%
NT-500-3	Lab Dup.	3.74						
NT-500-5		6.57	<10	8	0	42.3	87.10%	>100%
NT-500-7		1.22	<10	12	0	35.0	77.30%	>100%
NT-1000-1								
NT-1000-3								
NT-1000-3	Lab Dup.							
NT-1000-5								
NT-1000-7								
NT-3000-1		1.38	<10	7	0	29.0	74.30%	>100%
NT-3000-2								
NT-3000-3		<0.50	<10	6	0	30.0	73.90%	>100%
NT-3000-4								
NT-3000-5		<0.50	<10	1	0	58.8	>100%	>100%
NT-3000-5	Field Dup.	<0.50	<10	11	0	84.5	>100%	>100%
NT-3000-6								
NT-3000-7		<0.50	<10	10	0	18.3	37.80%	>100%
NT-3000-8								
NT-3000-8	Lab Dup.							
NT-5000-1								
NT-5000-2								
NT-5000-2	Field Dup.							
NT-5000-3								
NT-5000-5								
NT-5000-6								
NT-5000-7								
NT-5000-8								
NT-7500-1								
NT-7500-3								
NT-7500-5								
NT-7500-5	Lab Dup.							
NT-7500-6								
NT-7500-7								
NT-10000-1								
NT-10000-3								
NT-10000-7								
NT-10000-8								
NT-20000-3		5.61	<10	2	0	63.5	>100%	>100%
NT-20000-3	Field Dup.	1.92	<10	21	0	73.2	>100%	>100%
NT-20000-7		<0.50	<10	8	0	80.3	>100%	>100%

Appendix F: Location of Rigs to its Respective Jacket/ Platform

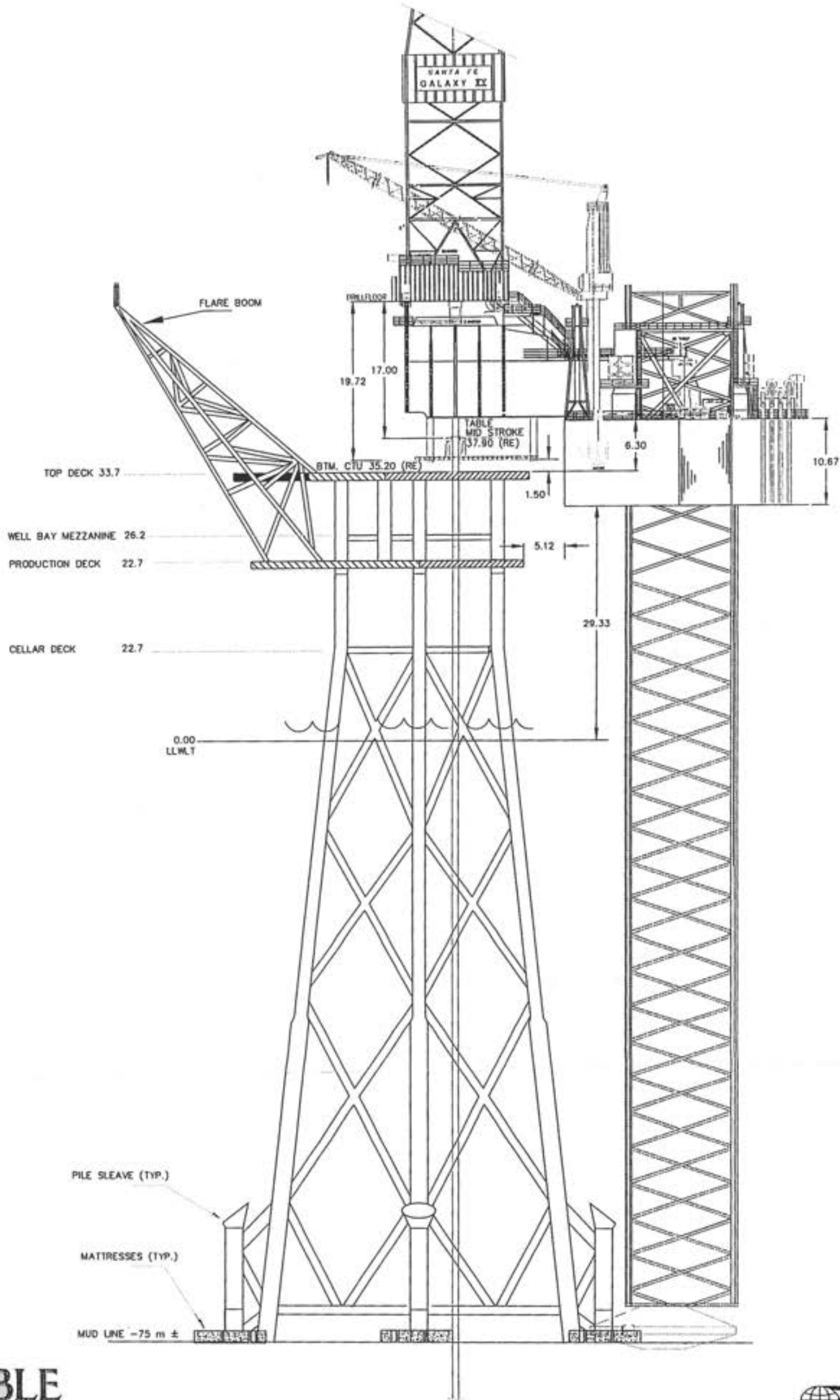
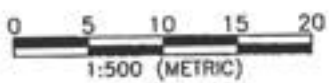
- Appendix F-1: Location of Santa Fe Galaxy II in Relation to Thebaud Wellhead Platform
- Appendix F-2: Location of Rowan Gorilla II in Relation to Venture Jacket

Appendix F-1
Location of Santa Fe Galaxy II in Relation
to Thebaud Wellhead Platform

ATTACHMENT NO. 9

GALAXY II AT THEBAUD WELL JACKET PLATFORM

ELEVATION VIEW



Appendix F-2
Location of Rowan Gorilla II in Relation
to Venture Jacket

1. ALL DIMENSIONS ARE GIVEN IN MM.
2. CLEARANCE BETWEEN VENTURE AND GORILLA II IS TAKEN FROM LEVELLING TRUNNION RING PLATE (AS ADVISED BY DRILLERS).
3. VENTURE GUIDE PINS (2) OFF AT LEGS A2 & A3

1. ALL DIMENSIONS ARE GIVEN IN MM.
2. CLEARANCE BETWEEN VENTURE AND GORILLA II IS TAKEN FROM LEVELLING TRUNNION RING PLATE (AS ADVISED BY DRILLERS).
3. VENTURE GUIDE PWS (2) OFF AT LEGS A2 & A3

1. LOCATION OF 57000

- ### 1. LOCATION OF 57000

MEMO (FILE 3075-01-15) ROMAN GORILLA II AS BUILT LOCATION AT VENTURE JACKET

MEMO (FILE 3075-01-15)

ROMAN GORILLA II AS BUILT LOCATION AT VENTURE JACKET



PLAN VIEW

A2	ISSUED FOR COMMENT	CXB	16/09/88				
A1	ISSUED FOR I.D.C.	NML	16/09/88				
NML				946200			
1:750							
SABLE (REMARKS)	Saipem UK Limited						
SABLE OFFSHORE ENERGY PROJECT							
ROWAN GORILLA II INTERFACE WITH VENTURE JACKET – PLAN VIEW							
			946200/DRC/SK6110.01			A2	

Appendix G: Results of Sensory Evaluations and Hydrocarbon Body Burden in Shellfish

- Appendix G-1: Evaluation of Mussels for Tainting Hydrocarbons December 23, 1998
- Appendix G-2: Supplementary Report (to December 23, 1998) on Evaluation of mussels for Tainting Hydrocarbons January 18, 1999
- Appendix G-3: Evaluation of Mussels for Tainting Hydrocarbons June 15, 1999
- Appendix G-4: Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons November 19, 1998
- Appendix G-5: Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons December 2, 1999

Appendix G-1
Evaluation of Mussels for Tainting Hydrocarbons
December 23, 1998

Table 1

Average Weight of Mussels, Mussel Shells and the Mussel Animals

Sample	Weight of Intact Mussel (gm)	Weight of Shell (gm)	Weight of Water and Meat (gm)
500 m, #1, bottom	18.54	8.47	10.07
500 m, #1, top	16.33	8.74	7.89
4 km, #4, bottom	15.82	8.03	7.79
4 km, #4, top	13.88	7.26	6.62
30 km, #6, bottom	15.69	8.60	7.09
30 km, #6, top	17.83	8.47	9.37

Table 2

Amount of Aliphatic Hydrocarbons in the Mussels (ppm, wet tissue basis)

Sample	Aliphatics Hydrocarbons	
	Total from C ₁₀ to C ₂₄ ^a	BMO ^b Region
500 m, #1, bottom	4.1	0.5
500 m, #1, top	4.1	0.4
4 km, #4, bottom	1.7	0.3
4 km, #4, top	2.5	0.4
30 km, #6, bottom	1.9	0.4
30 km, #6, top	2.3	0.5
	1.9	0.4

^a The specific alkane pattern suggests a possible biogenic origin for the Aliphatics hydrocarbons

^b Base Mud Oil

Table 3

% Lipid in Mussels

Sample	% Lipid
500 m, #1, bottom	0.69
500 m, 31, top	0.84
4 km, 34, bottom	0.82
4 km, 34, top	0.88
30 km, 36, bottom	0.51
30 km, #6, top	0.78

Table 4

Level of Significance in differentiating Between the Off-Shore Control and Test Samples by Sensory Evaluation as Determined by the Triangle Test

Test Sample	Control Sample	Odour Result		Flavour Results	
		Level of Significance	Correct ^a Judgement	Level of Significance	Correct ^a Judgements
500 m, #1, bottom	30 km, #6, bottom	NS ^b	5/18	NS	7/18
500 m, #1, top	30 km, #6, top	NS	5/18	NS	7/18
4 km, #4, bottom	30 km, #6, bottom	5%	10/18	NS	7/18
4 km, #4, top	30 km, #4, top	NS	6/18	NS	9/18

^a Number of panelists correctly identifying the odd sample/total judgements.

^b NS = not significant

Figure A

Triangle Test -Mussels

Name: _____

Date: _____

Please evaluate these samples for any abnormal or undesirable odours or flavours. Two of these samples are identical, the third is different.

A. ODOUR: Test the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

B. FLAVOUR: Test the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

Comments:

Appendix A

Statistical Chart Triangle Test^a

Number of Sensory Panelists	Number of Correct Answers Necessary to Establish Level of Significance		
	5%	1%	0.1%
7	5	6	7
8	6	7	8
9	6	7	8
10	7	8	9
11	7	8	9
12	8	9	10
13	8	9	10
14	9	10	11
15	9	10	12
16	10	11	12
17	10	11	13
18	10	12	13
19	11	12	14
20	11	13	14

^a From Larmond, 1977

PERKIN ELMER CORP. PART NO. N625-1026

PERKIN ELMER CORP. PART NO. N625-1026

Figure 1: 30 km top #1

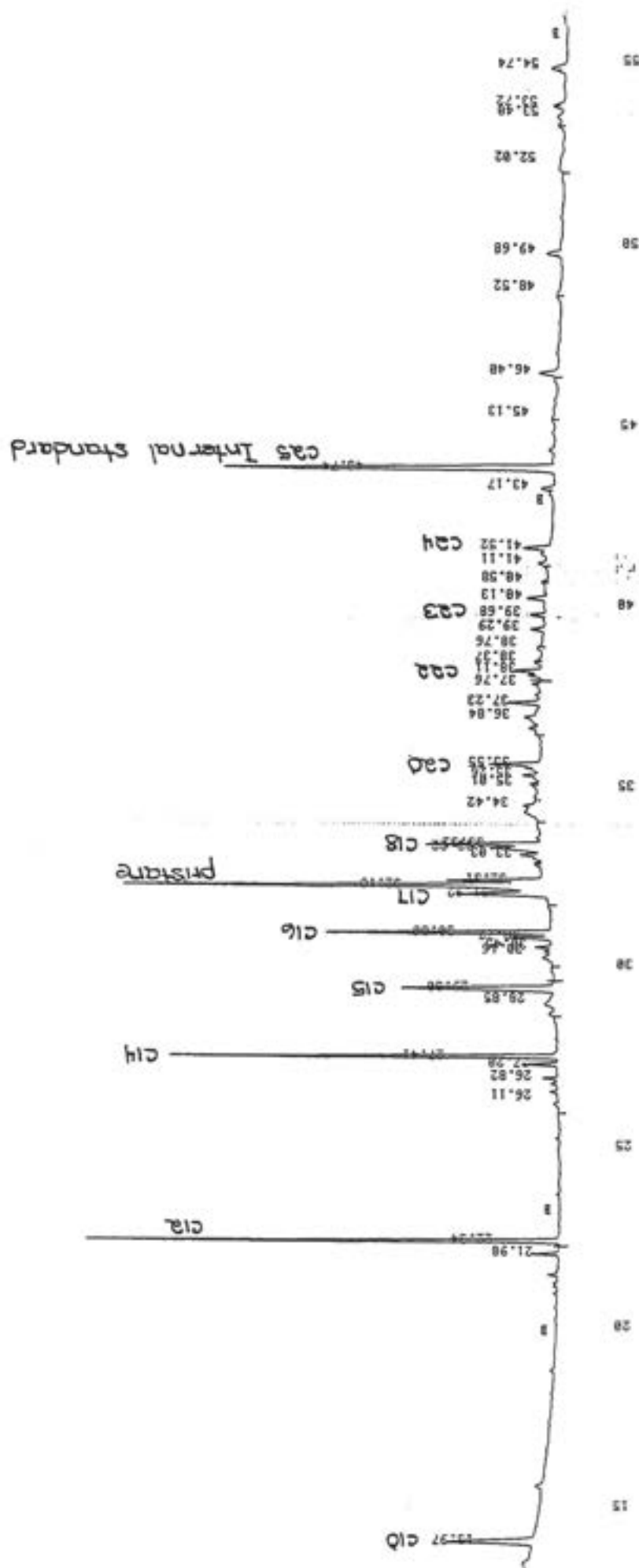


Figure 2: 30 km top #2 (duplicate)



Figure 3: 30 km bottom

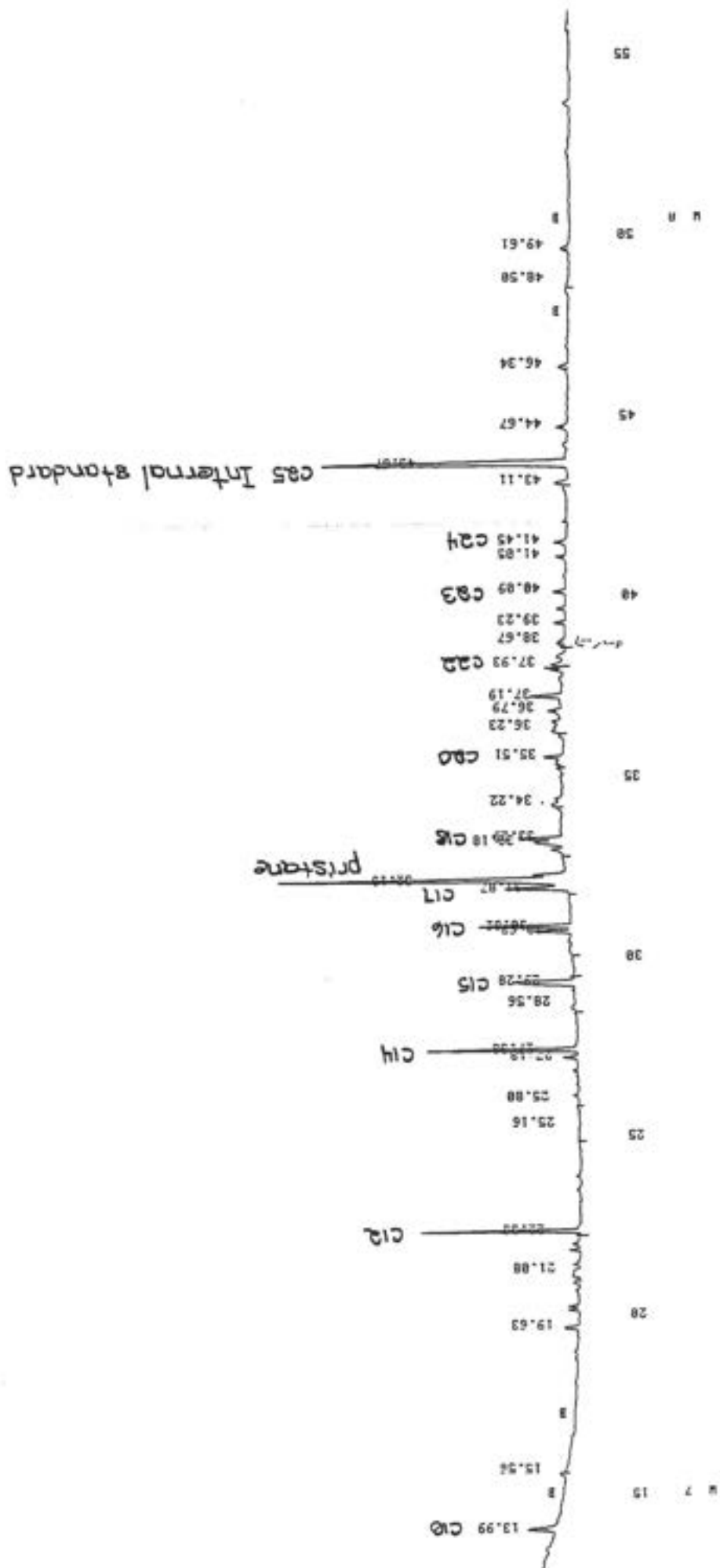


Figure 4: 4 km top

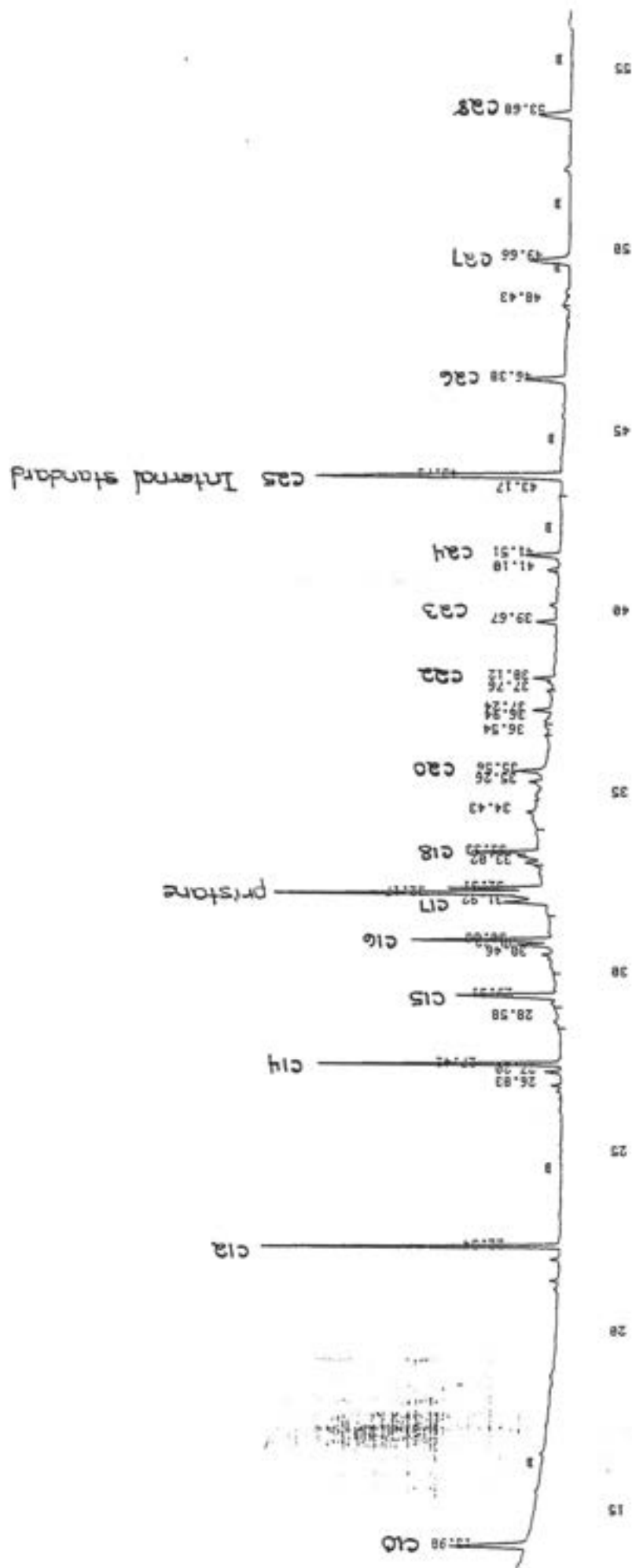


Figure 5: 4 Km bottom

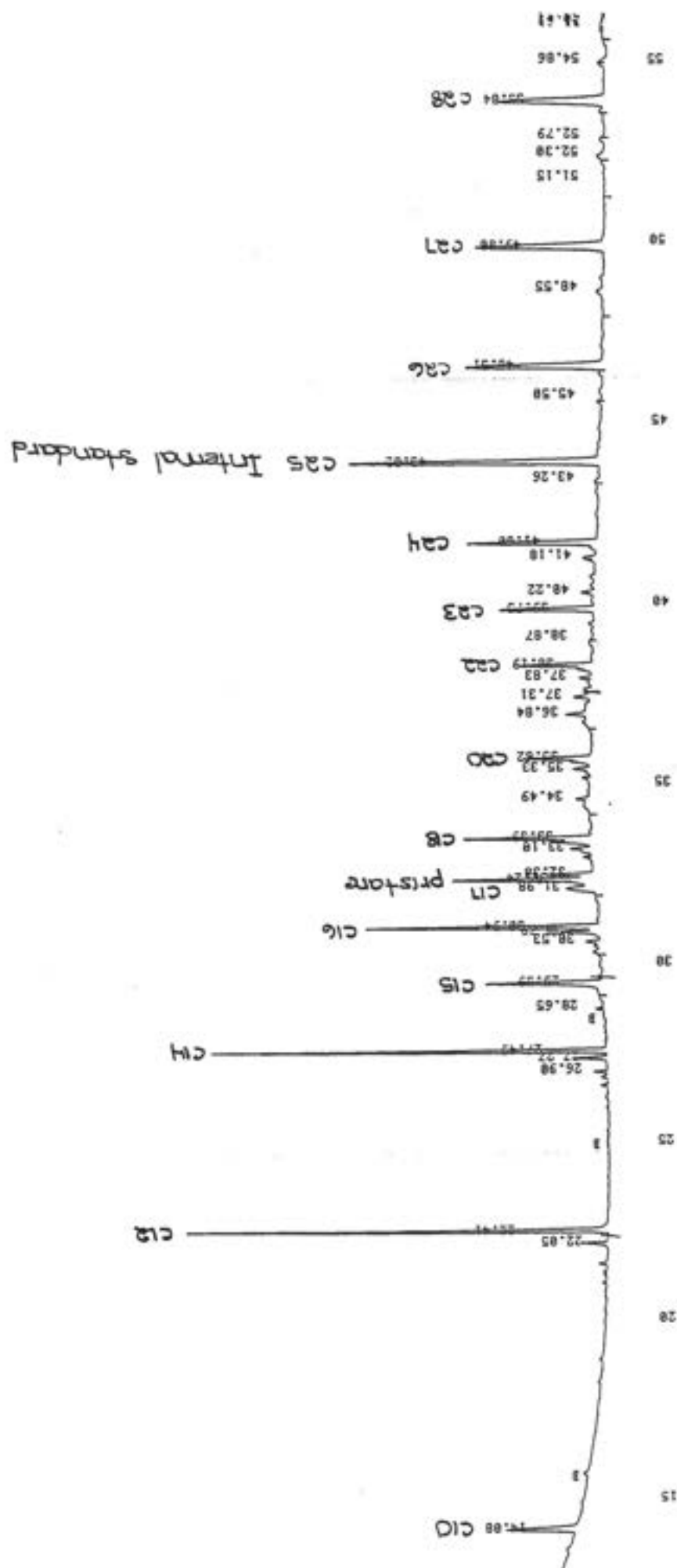


Figure 6: 500m top

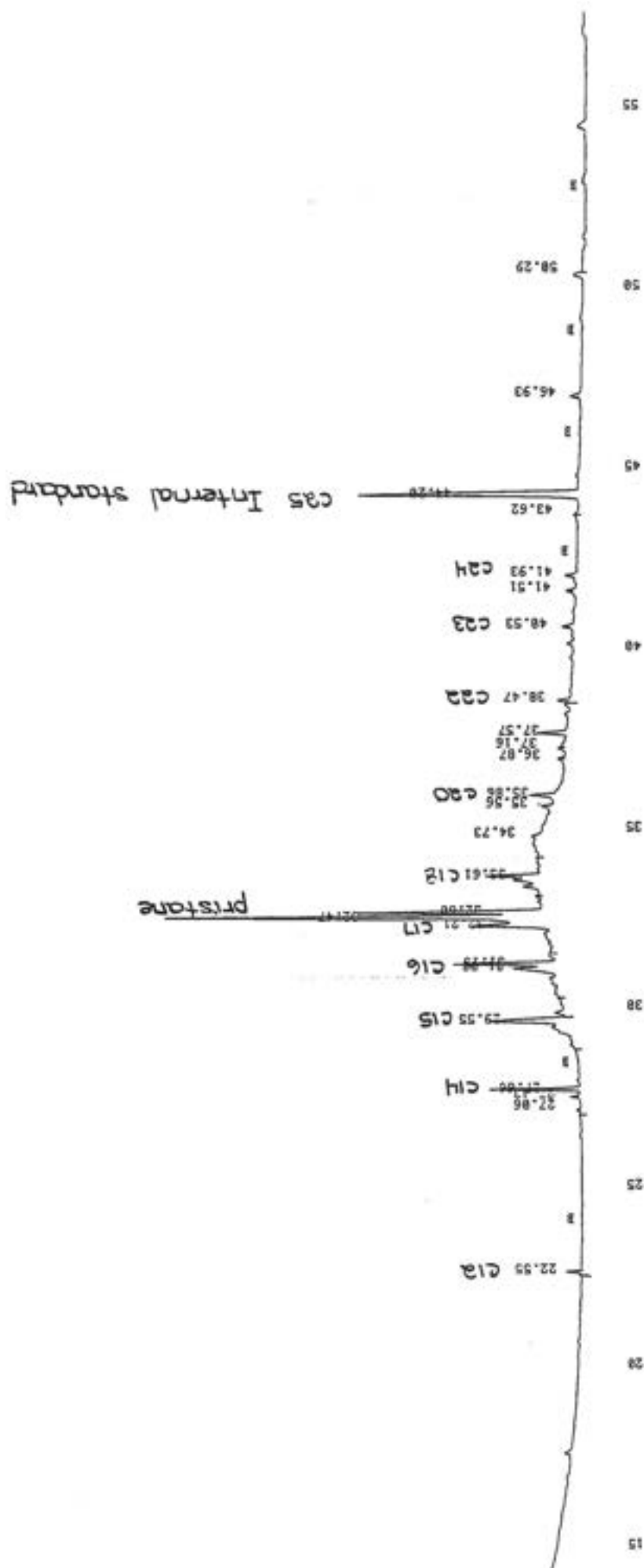
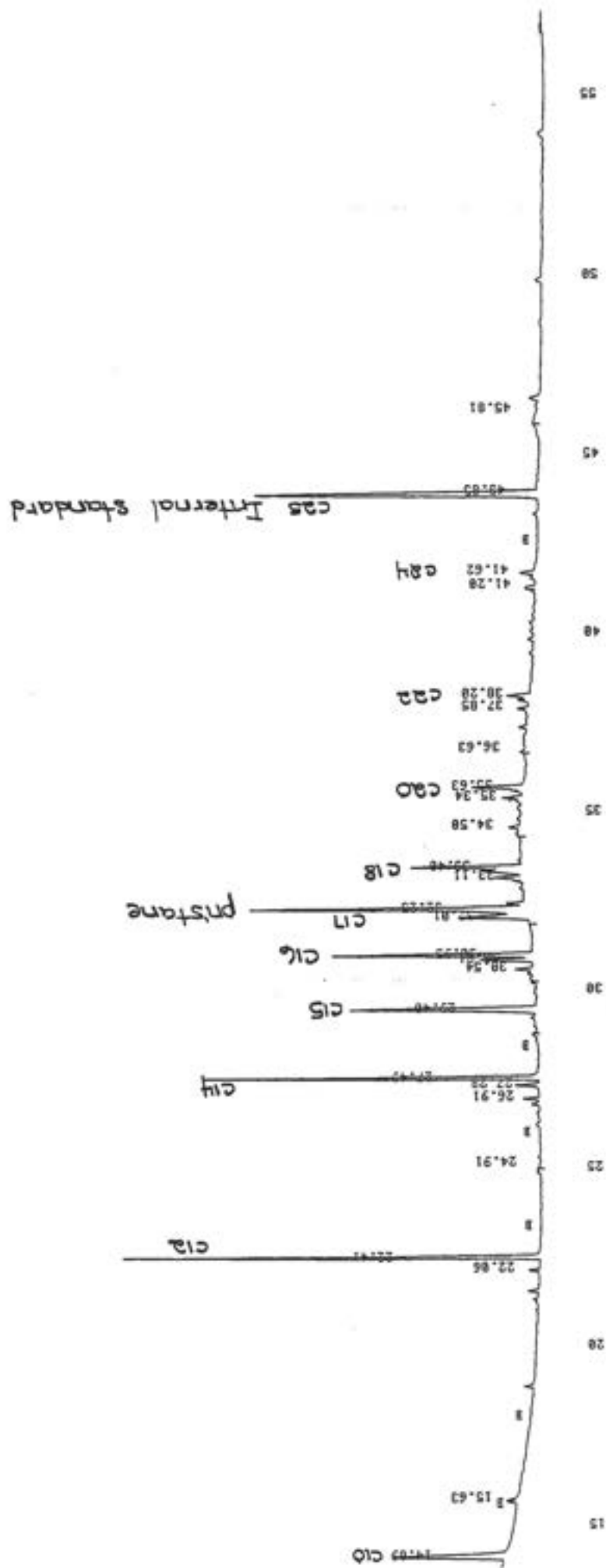


Figure 7: 500m bottom



Appendix G-2
Supplementary Report (to December 23, 1998) on Evaluation of Mussels
for Tainting Hydrocarbons
January 18, 1999

Table 1

Iatroscan Lipid Composition of Whole Mussel Soft Tissues (area%; average of 5 analyses each)

	Triacylglyceride (%)	Free Fatty Acid (%)	Alcohol (%)	Total Sterol (%)	Diacylglyceride (%)	Monoacylglyceride (%)	Polar Lipids (%)
500 m, #1, bottom	17.6±1.1	3.5±0.5	ND	4.5±0.3	ND	ND	74.3±9.2
500 m, #1, top	17.6±1.2	4.0±0.4	ND	4.4±0.2	ND	ND	74.0±4.4
4 km, #4, bottom	17.0±0.6	3.4±0.3	ND	5.2±0.2	ND	ND	74.5±5.9
4 km, #4, top	15.2±1.3	1.3±0.1	ND	4.4±0.4	ND	ND	79.1±7.0
30 km, #6, bottom	10.0±0.5	1.4±0.8	ND	4.5±0.2	ND	ND	84.1±6.8
30 km, #6, top	17.6±1.2	3.8±0.4	ND	4.6±0.3	ND	ND	74.0±9.8

ND = None Detected

Report of December 23, 1998

Table 2 - Revised

Amount of Aliphatic Hydrocarbons in the Mussels (ppm, wet tissue basis)

Sample	Aliphatics Hydrocarbons	
	Total from C ₁₀ to C ₂₄ ^a	BMO ^b Region
500 m, #1, bottom	4.1	0.5
500 m, #1, top	4.1	0.4
4 km, #4, bottom	1.7	0.3
4 km, #4, top	2.5	0.4
30 km, #6, bottom	1.9	0.4
30 km, #6, top	2.3	0.5
30 km, #6, top, lab duplicate	1.9	0.4

^a The specific alkane pattern suggests a possible biogenic origin for the long-chain aliphatic hydrocarbons

^b Base Mud Oil

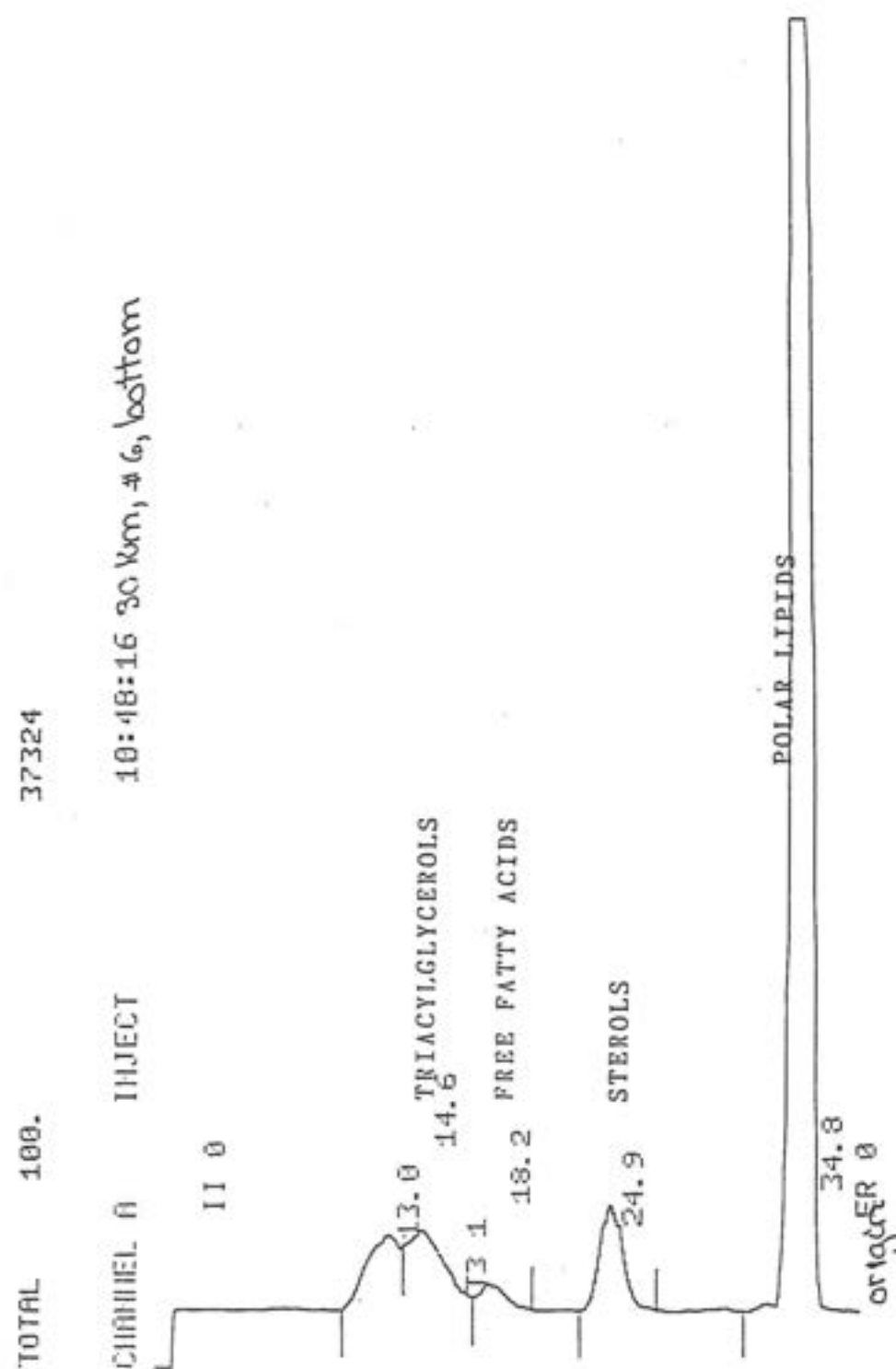


Figure 1. Typical chromatographic record of mussel lipid classes separated on a silica gel Chromarod. For details see text.

Appendix G-3
Evaluation of Mussels for Tainting Hydrocarbons
June 15, 1999

Table 1

Level of Significance in Differentiating Between the Off-Shore Control and Test Samples by Sensory Evaluation as determined by the Triangle Test.

Test Sample	Control Sample	Odour Results		Flavour Results	
		Level of Significance	Correct ^a Judgement	Level of Significance	Correct ^a Significance
13 km Gully, #8, top	Control, #10, top	NS ^b	8/18	NS	9/18
13 km Gully, #8, bottom	Control, #10, bottom	NS	4/18	NS	4/18
9.5 km, Gully, #7, top	Control, #10, top	NS	7/18	NS	7/18
4 km, Venture, #6, top	Control, #10, top	NS	7/18	NS	7/18
4 km, Venture, #6, bottom	Control, #10, bottom	NS	5/18	NS	7/18
2 km, Venture, #5, top	Control, #9, top	NS	6/18	NS	7/18
1 km, Venture, #4, top	Control, #10, top	NS	4/18	NS	5/18
500 m, Venture, #3, top	Control, #9, top	NS	9/18	NS	9/18
Sobey's commercial mussel	Indian Point mussel Farms	NS	10/20	NS	9/20

^a Number of panelists correctly identifying the odd sample/total judgements.

^b NS = not significant

Table 2

Amount of Aliphatic Hydrocarbons in the Mussels (ppm, wet tissue basis)

Sample	Aliphatics Hydrocarbons ^a	
	Total from C ₁₀ to C ₂₄	BMO ^b Region
Indian Pt Reference Mussels	2.24	0.12
Control - top #10	2.24	0.24
Control - bottom #10	2.11	0.52
13 km Gully - top #8	2.22	0.34
13 km Gully - bottom #8	1.71	0.31
9.5 km Gully - top #7	5.48	1.34
4 km Venture - top #6	5.47	1.98
4 km Venture - bottom #6	3.45	0.42
2 km Venture - top #5	5.49	0.62
1 km Venture - top #4	5.25	0.71
500 m Venture - top #3	7.54	3.04

^a Blank values not subtracted.^b Base Mud Oil

Figure A

Triangle Test -Mussels

Name: _____

Date: _____

Please evaluate these samples for any abnormal or undesirable odours or flavours. Two of these samples are identical, the third is different.

A. ODOUR: Test the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

B. FLAVOUR: Test the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

Comments:

Appendix A

Statistical Chart Triangle Test^a

Number of Sensory Panelists	Number of Correct Answers Necessary to Establish Level of Significance		
	5%	1%	0.1%
7	5	6	7
8	6	7	8
9	6	7	8
10	7	8	9
11	7	8	9
12	8	9	10
13	8	9	10
14	9	10	11
15	9	10	12
16	10	11	12
17	10	11	13
18	10	12	13
19	11	12	14
20	11	13	14

^a From Larmond, 1977

Figure 1 : Indian Point reference musse/s

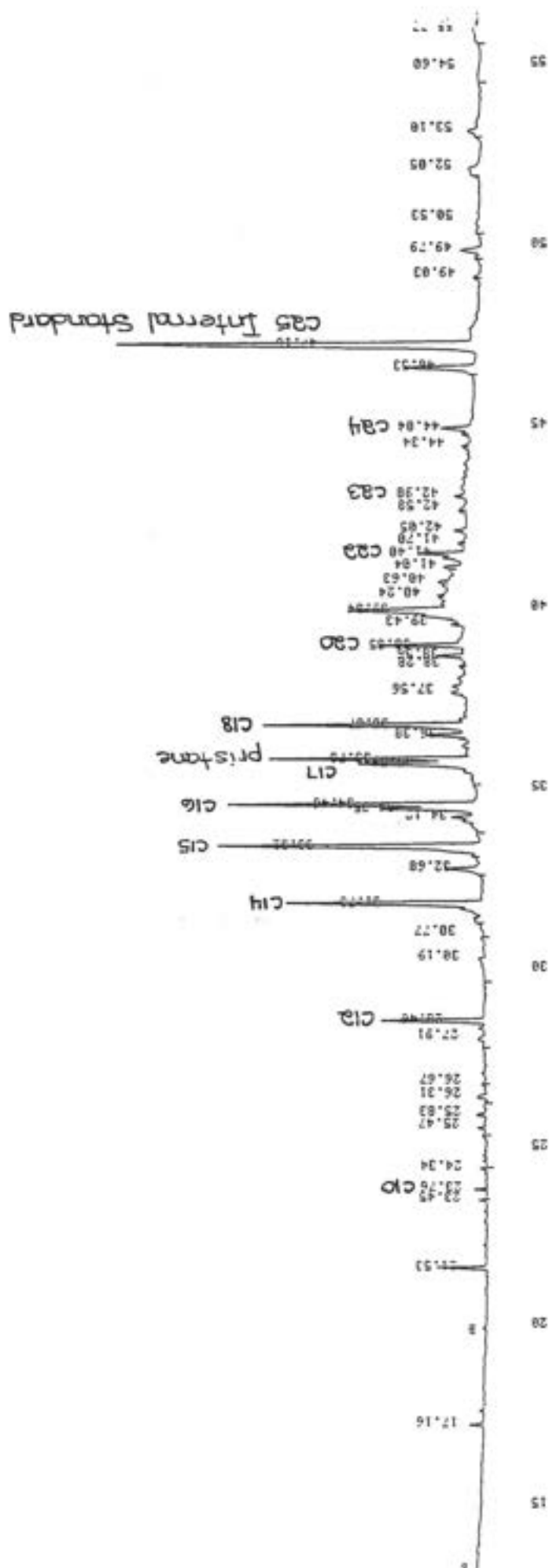


Figure 2: top, control

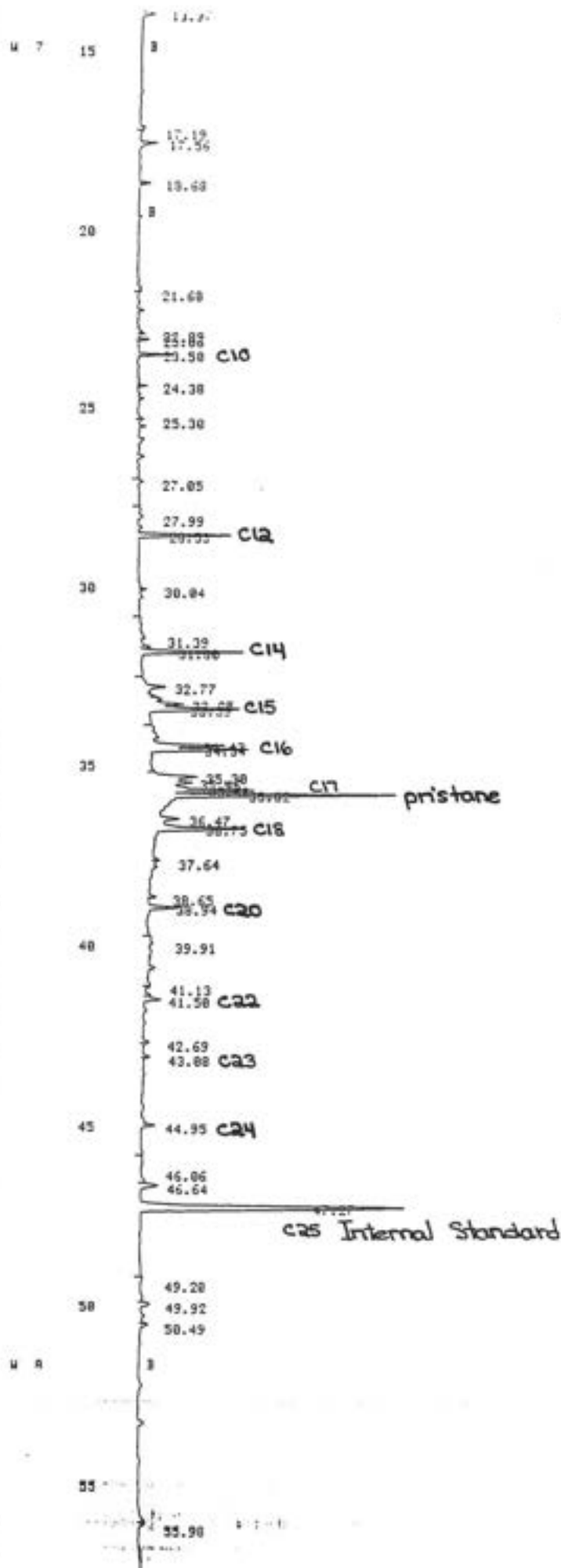


Figure 3: bottom, control

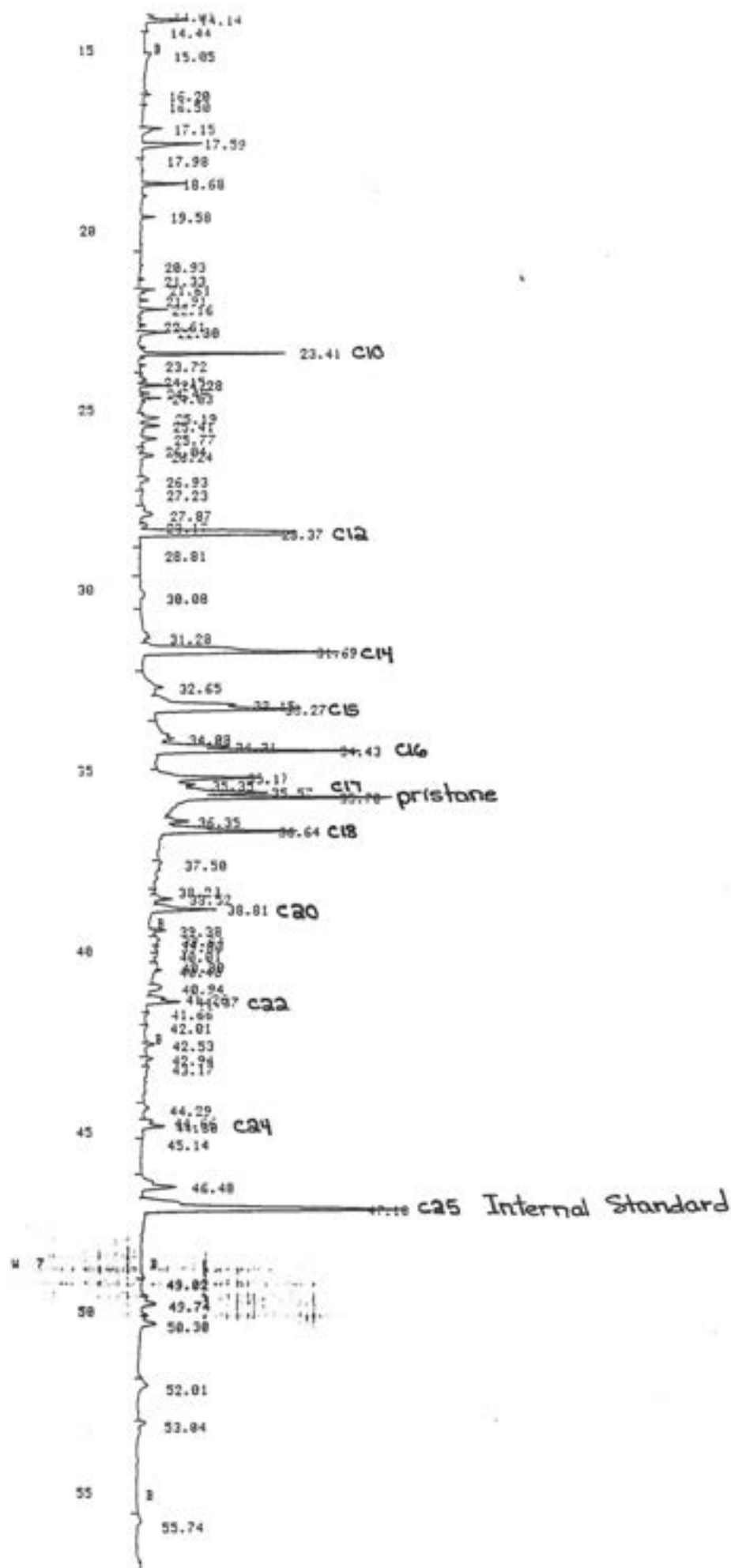
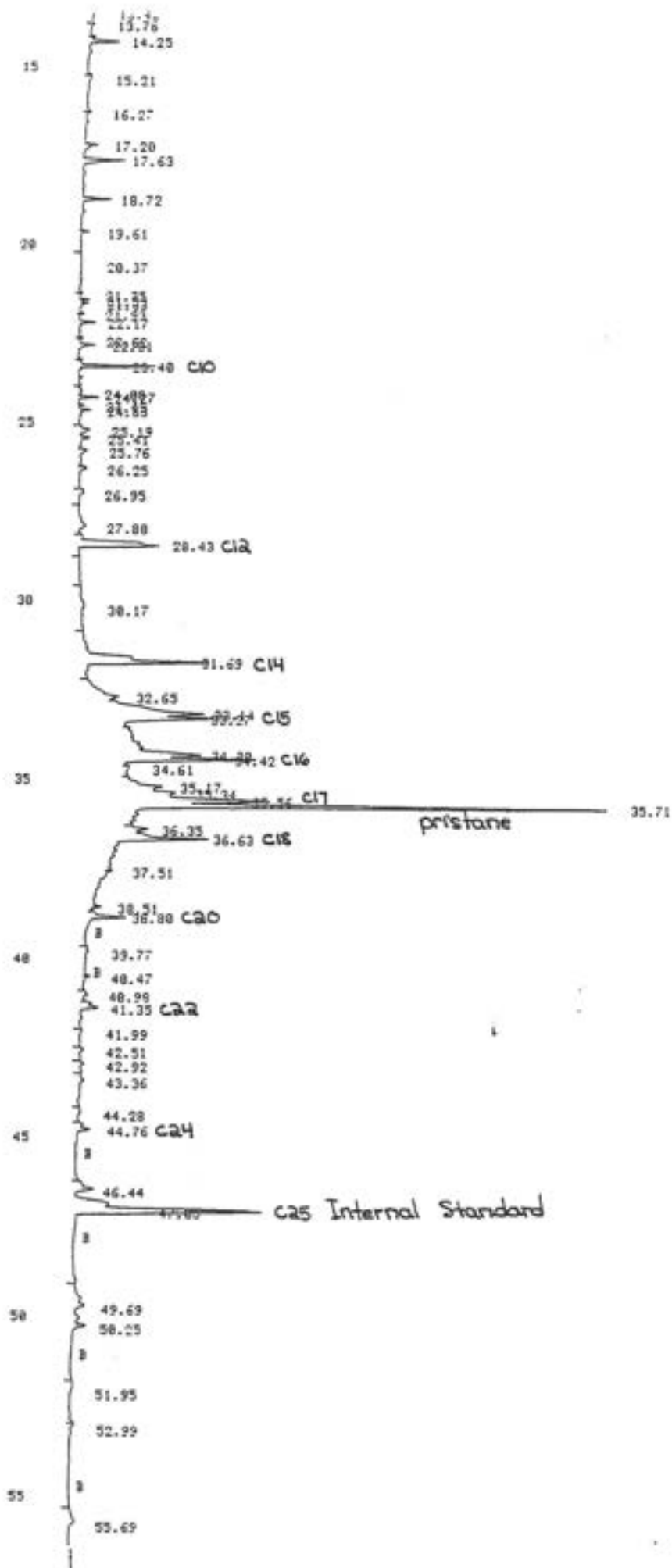


Figure 4 : top, 500m Venture



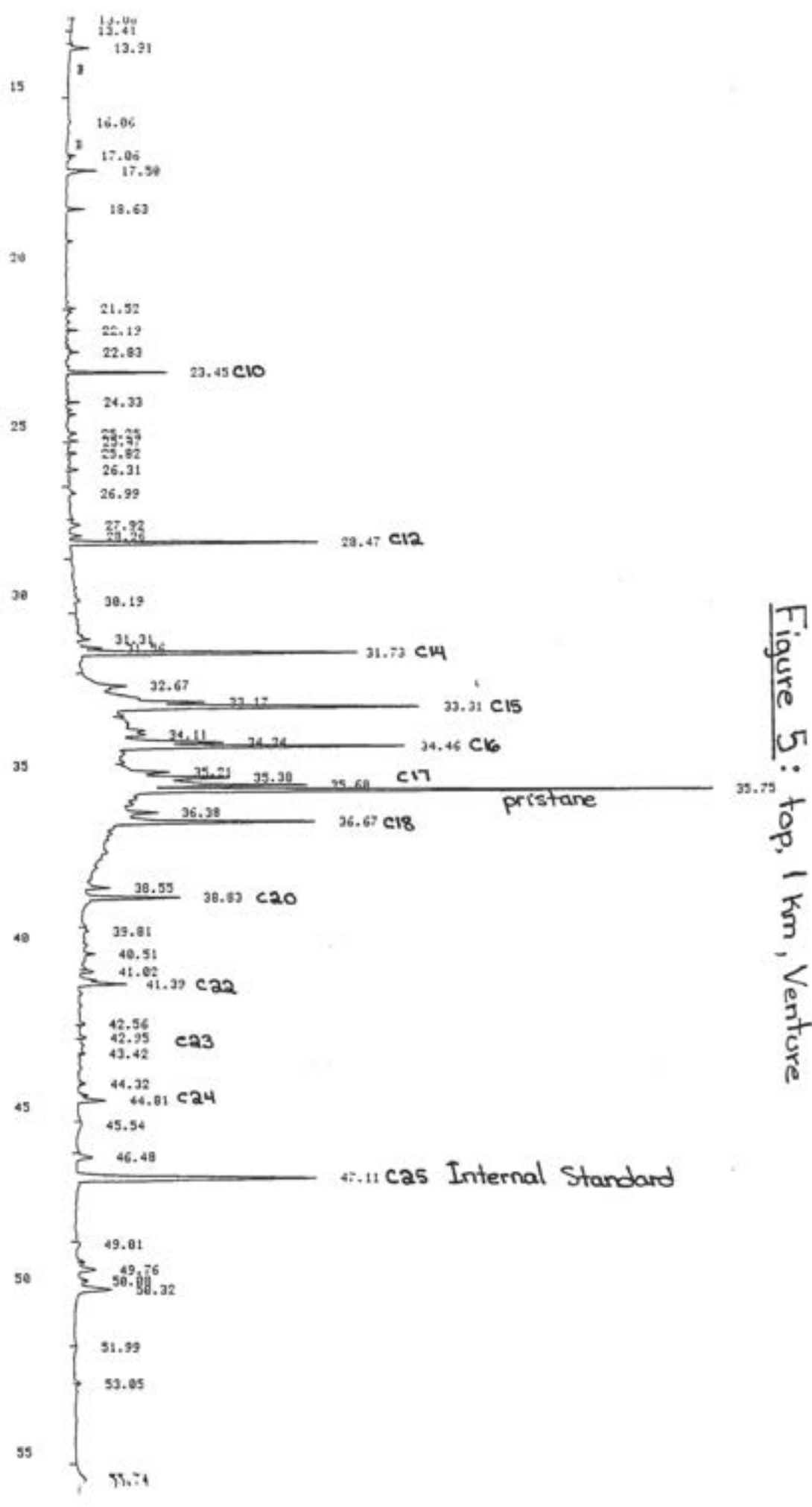


Figure 1: top, 2 km, Venture

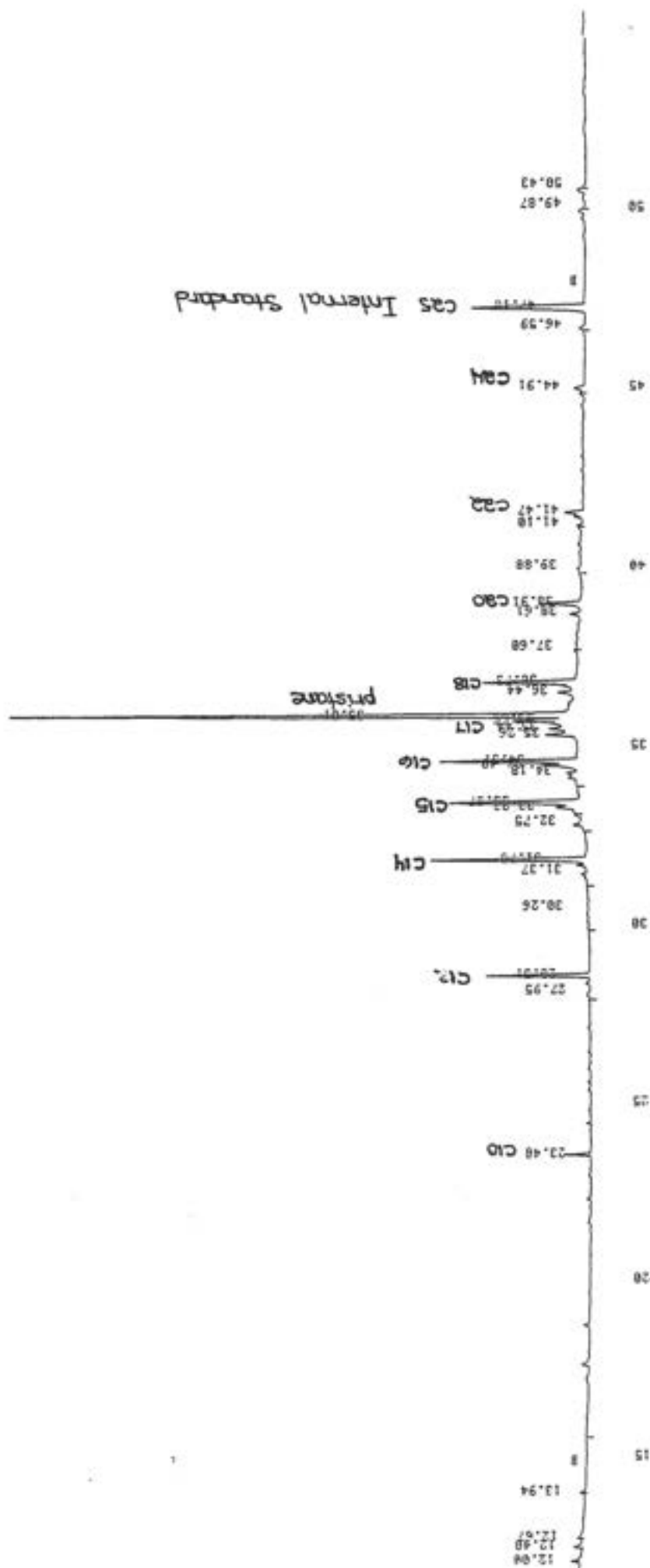


Figure 7: top, 4 km, Venture

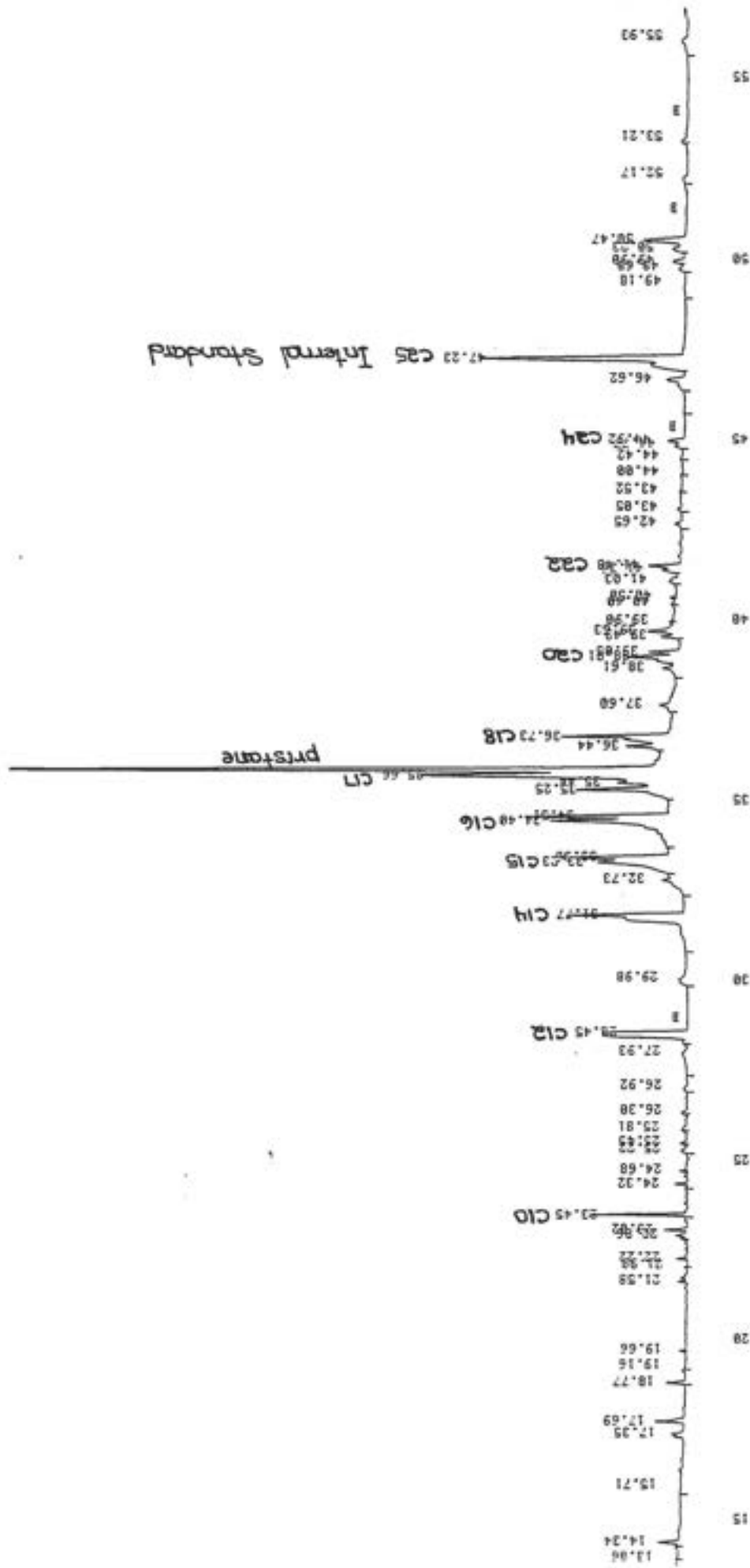


Figure 8: bottom, Venture, 4 km

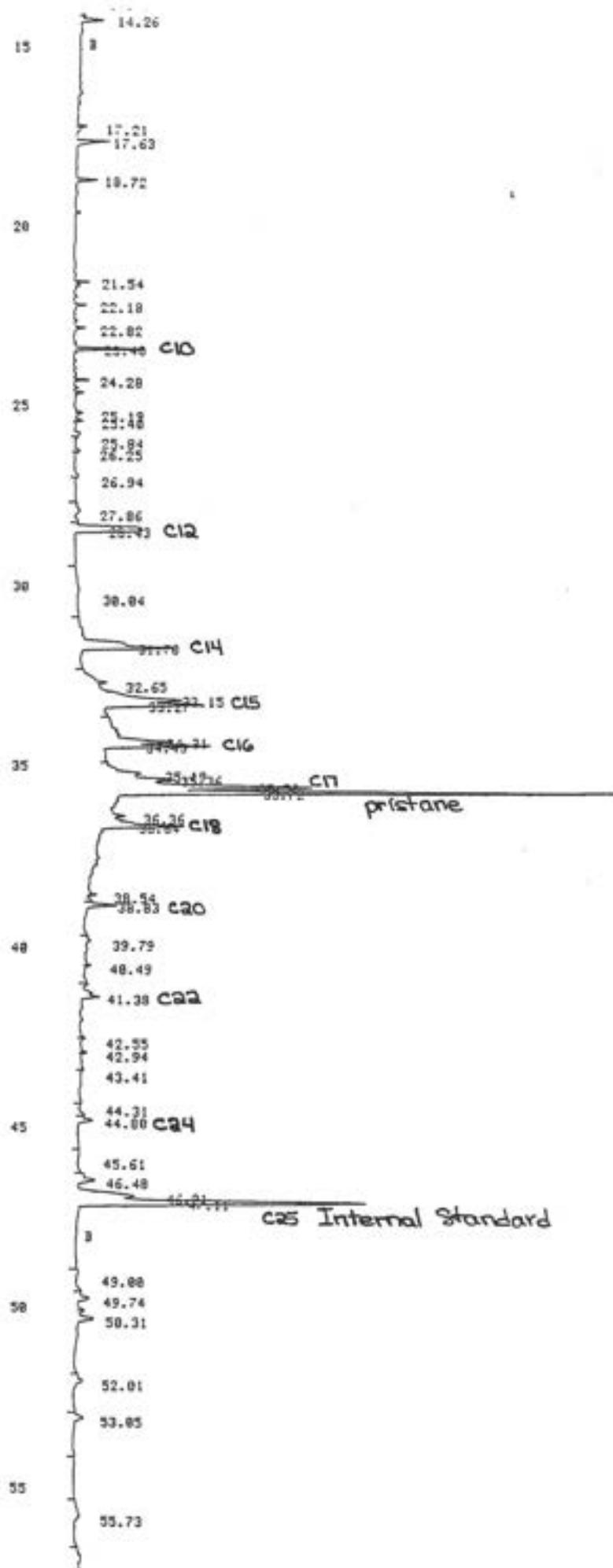


Figure 9: top, 9.5 km Gully

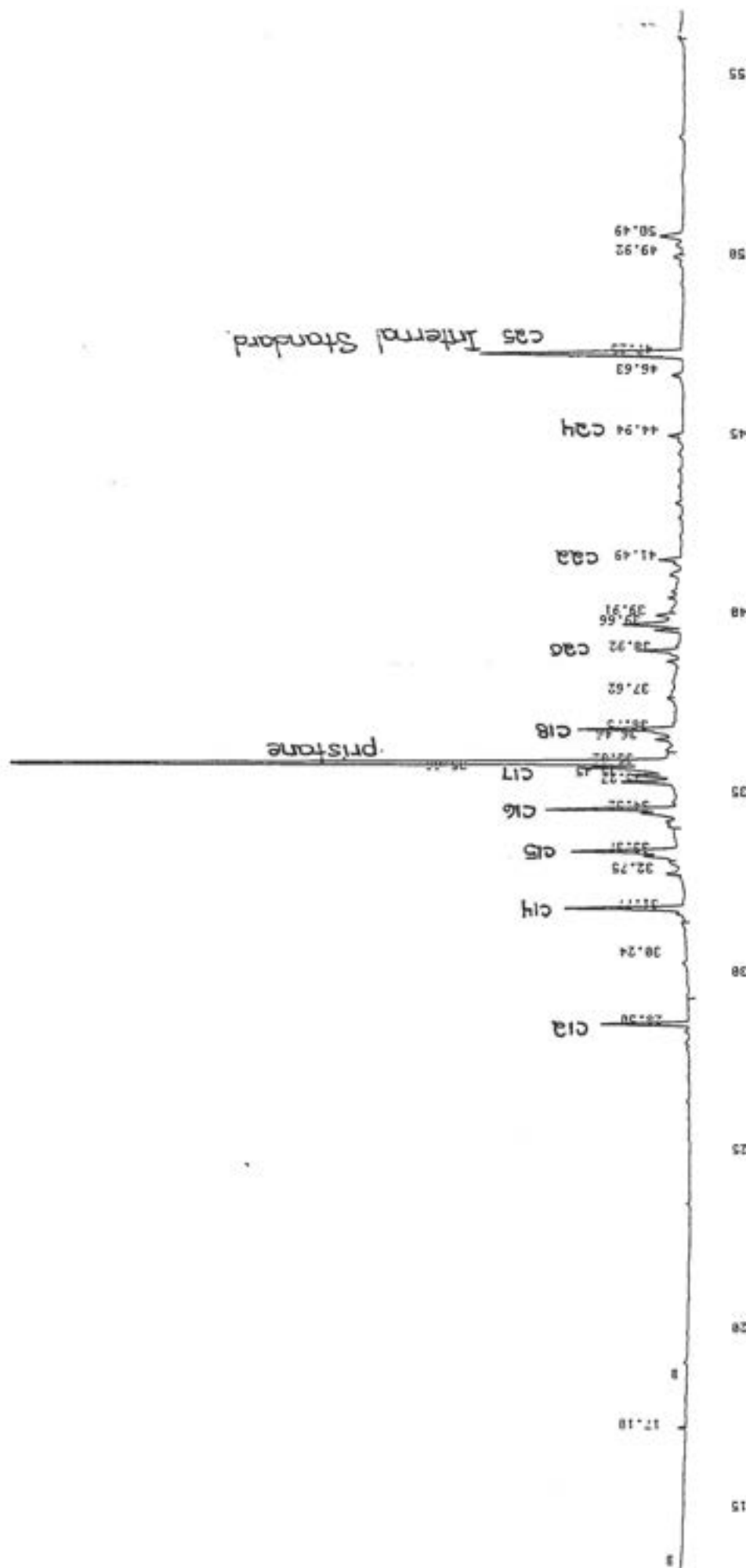


Figure 10: top, 13 km, Gully

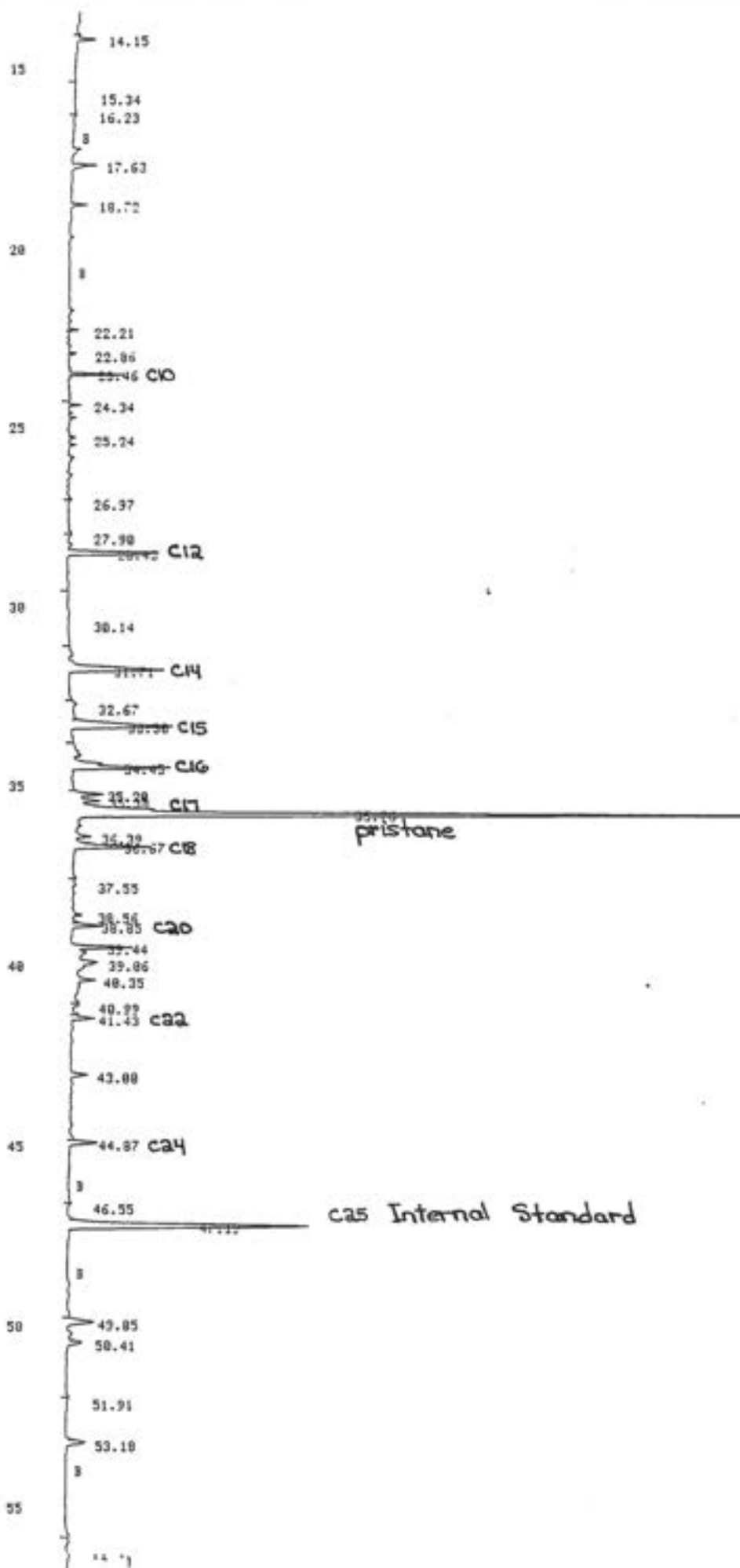
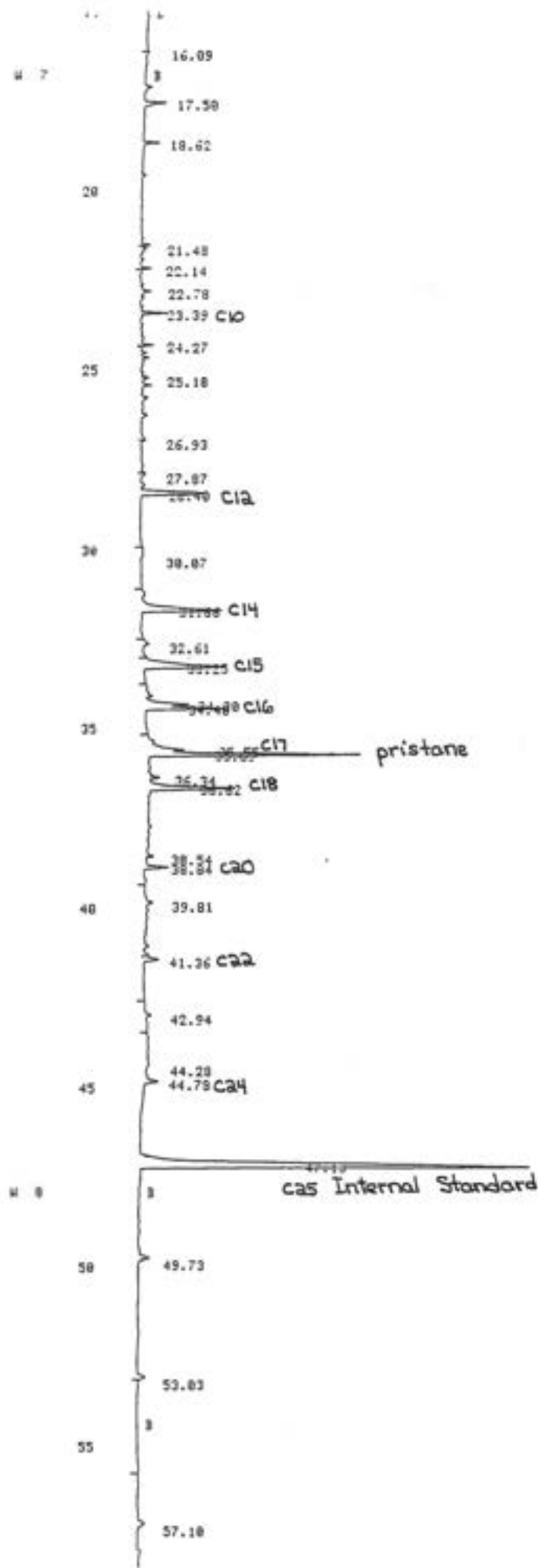


Figure 11: bottom, Gully



MP

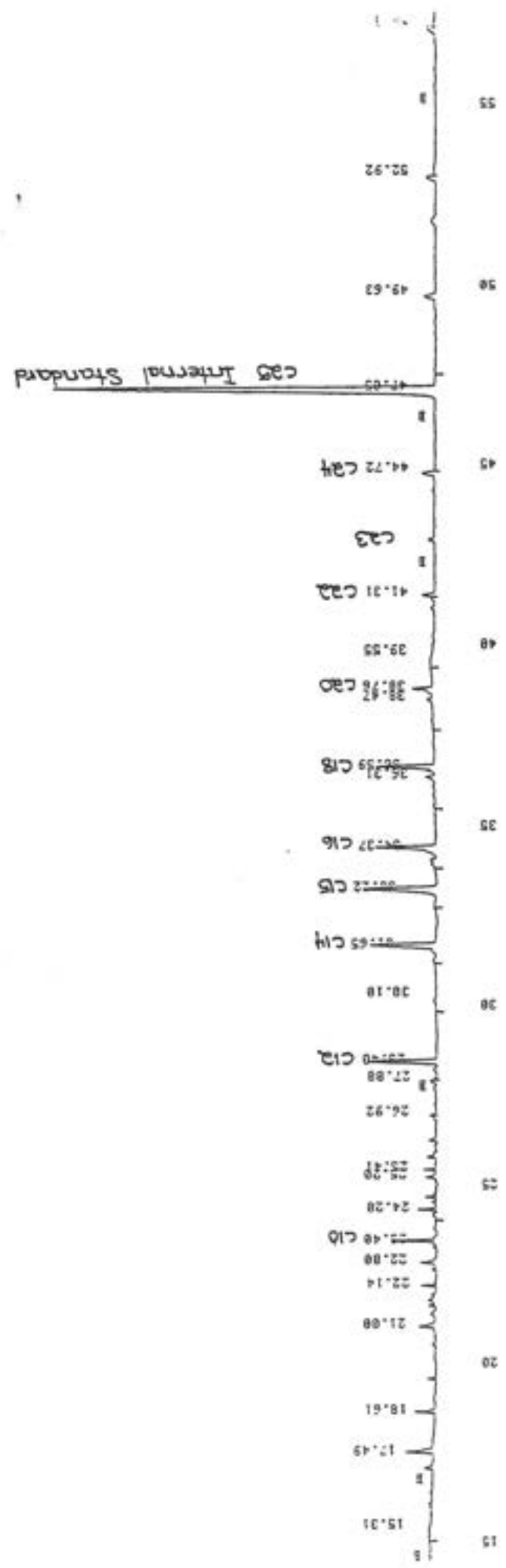
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PERKIN ELMER CORP. PART NO. N625-1026

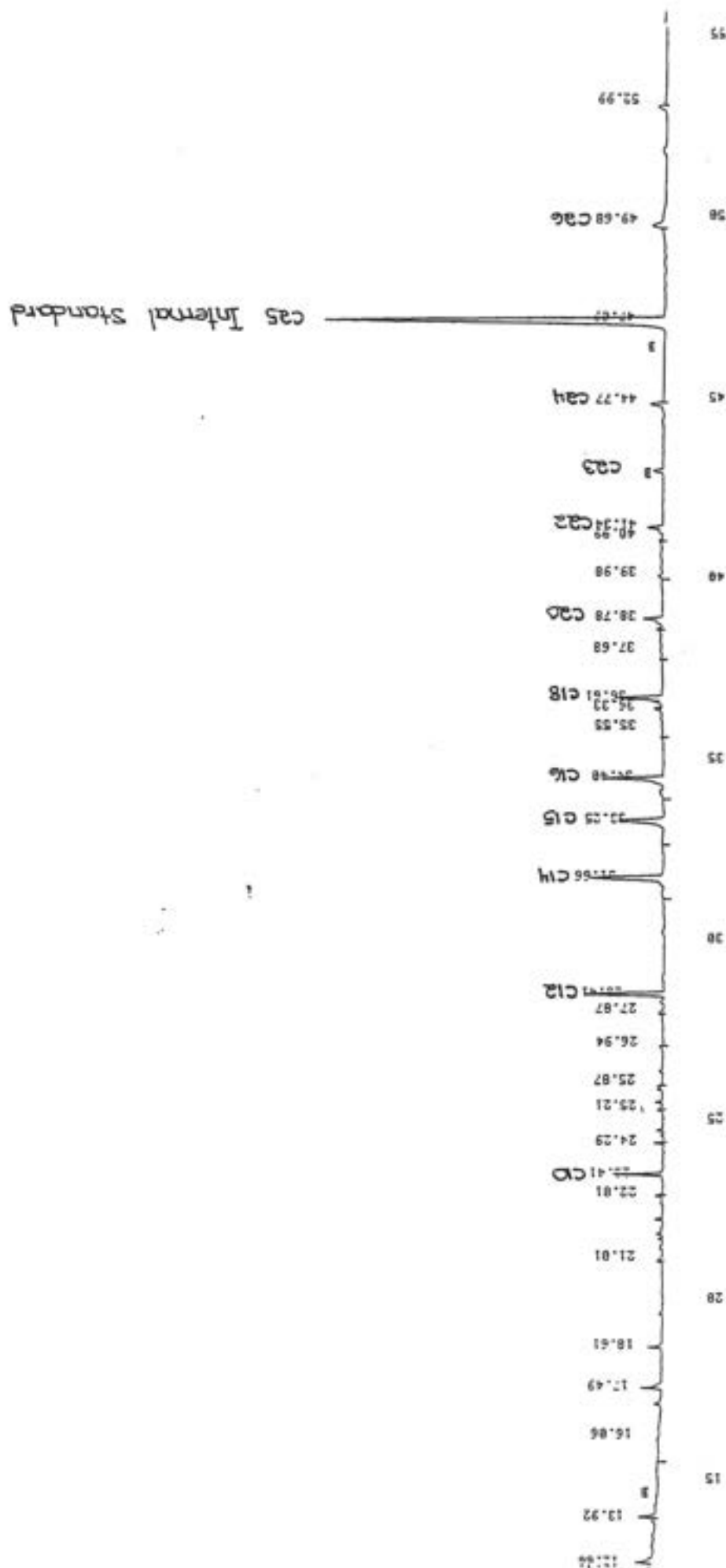
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Procedural Blank No. 2



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1312

PERKIN ELMER CORP. PART NO. N625-1026

083

Appendix G-4
Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons
November 19, 1998

Table 2 - Revised

Amount of Aliphatic Hydrocarbons in the Scallop Adductor Muscles and Rings
and Roes (ppm, wet tissue basis)

Sample		<u>Aliphatics Hydrocarbons</u>	
		Total from C ₁₀ to C ₂₄ ^a	BMO* Region ^b
JW-I-C	adductor muscle	1.6	0.4
	rings and roes	3.7	0.6
JW-I-T	adductor muscles	2.7	0.3
	rings and roes	2.7	0.3
JW-I-V	adductor muscles	1.5	0.3
	rings and roes	1.6	0.3

^a The specific alkane pattern suggests a possible biogenic origin for the aliphatic hydrocarbons.

^b Base Mud Oil

Table 6

Level of significance in differentiating between the off-shore control and test samples as determined by the Triangle Test

Test Sample	Control Sample	Odour Result		Flavour Result	
		Level of Significance	Correct ^a Judgements	Level of Significance	Correct ^a Judgements
Atlantic Superstore	JW-I-C	NS ^b	4/9	NS	4/9
JW-I-T	JW-I-C	5%	11/18	NS	8/18
JW-I-V	JW-I-C	NS	8/18	NS	5/18

^aNumber of panelists correctly identifying the odd sample/total judgements

^bNS = not significant

Appendix A

Statistical Chart Triangle Test*

Number of Sensory Panelists	Number of Correct Answers Necessary to Establish Level of Significance		
	5%	1%	0.1%
7	5	6	7
8	6	7	8
9	6	7	8
10	7	8	9
11	7	8	9
12	8	9	10
13	8	9	10
14	9	10	11
15	9	10	12
16	10	11	12
17	10	11	13
18	10	12	13
19	11	12	14
20	11	13	14

* From Larmond, 1977

Appendix B

Aromatic Hydrocarbons

Naphthalene
1-Methylnaphthalene
Biphenyl
2,6-Dimethylnaphthalene
Acenaphthylene
Acenaphthene
2,3,5-Trimethylnaphthalene
Fluorene
Phenanthrene
Anthracene
1-Methylphenanthrene
Fluoranthene
Pyrene
Benzo[a]anthracene
Chrysene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[e]pyrene
Benzo[a]pyrene
Perylene

Appendix G-5
Evaluation of Naturally Occurring Scallops for Tainting Hydrocarbons
December 2, 1999

Table 1

Average Height and Weight of Scallops and Average Weight of the Scallop Shells,
Adductor Muscles and Rings and Roes

Sample	Height of Shell (cm)	Weight of Scallop (gm)	Scallop Shell Weight (gm)	Adductor Muscle Weight (gm)	Rings and Roes Weight (gm)
JW-II-C	15.0±0.7	376.3±58.7	191.1±31.6	46.1±2.8	136.6±32.4
JW-II-V	13.8±0.5	313.7±75.3	177.9±35.2	32.6±5.9	97.5±52.9
JW-II-T	14.5±0.5	332.9±24.5	172.1±18.3	41.2±3.6	114.4±12.9
JW-II-N	12.3±0.8	197.6±49.0	96.6±36.7	20.8±2.9	74.9±24.3

Table 2

Amount of Aliphatic Hydrocarbons in the Scallop Adductor Muscles and Rings
and Roes (ppm, wet tissue basis)

Sample	<u>Aliphatics Hydrocarbons</u>	
	Total from C ₁₀ to C ₂₄ ^a	BMO ^b Region
JW-II-C	adductor muscle	3.45
	rings and roes	3.03
JW-II-V	adductor muscles	5.06
	rings and roes random	3.07
	rings and roes, random duplicate	4.46
JW-II-T	adductor muscles	4.84
	rings and roes	27.21 ^c
JW-II-N	adductor muscles	1.43
	rings and roes	3.61

a The specific alkane pattern suggests a possible biogenic origin for the aliphatic hydrocarbons.

b Base Mud Oil

c Includes volatile hydrocarbon contamination.

Table 3

% Lipid of Adductor Muscles and Rings and Roes of Scallops

Sample		% Lipid
JW-II-C	adductor muscles	0.79
	rings and roes	1.17
JW-II-V	adductor muscles	0.82
	rings and roes	0.80
JW-II-T	adductor muscles	1.21
	rings and roes	1.21
JW-II-N	adductor muscles	0.77
	rings and roes	0.72

Table 4

Lipid Class Composition of Scallop Adductor Muscles and Scallop Rings and Roes (area %*)

Sample	Hydrocarbon	Triacylglycerol	Free Fatty Acid	Sterol	Monoacylglycerol	Polar Lipid
JW-II-C Adductor Muscles	ND	ND	ND	5.5	ND	94.5
JW-II-V Adductor Muscles	ND	ND	ND	6.4	ND	93.6
JW-II-T Adductor Muscles	ND	ND	ND	5.5	ND	94.5
JW-II-N Adductor Muscles	ND	ND	ND	6.5	ND	93.5
JW-II-C Rings and Roes	ND	39.2	1.3	1.5	0.4	57.6
JW-II-V Rings and Roes	ND	12.1	1.1	1.8	TR	85.0
JW-II-T Rings and Roes	ND	31.9	1.0	1.1	ND	66.0
JW-II-N Rings and Roes	0.8	13.0	0.5	2.2	TR	83.5

* uncorrected for detector response

ND: not detected

TR: trace

Table 5

Level of Significance in Differentiating Between the Off-shore Control and Test Samples as Determined by the Triangle Test.

Test Sample	Control Sample	Odour Result		Flavour Result	
		Level of Significance	Correct ^a Judgements	Level of Significance ^b	Correct Judgements
Atlantic Superstore	JW-II-C	NS	8/18	1%	11/18
JW-II-V	JW-II-C	NS	4/18	NS	4/18
JW-II-T	JW-II-C	NS	6/18	NS	5/18
JW-II-N	JW-II-C	NS	9/18	5%	10/18

a Number of panelists correctly identifying the odd sample/total judgements

b NS = not significant

Figure 1: JW-II-C adductor muscle

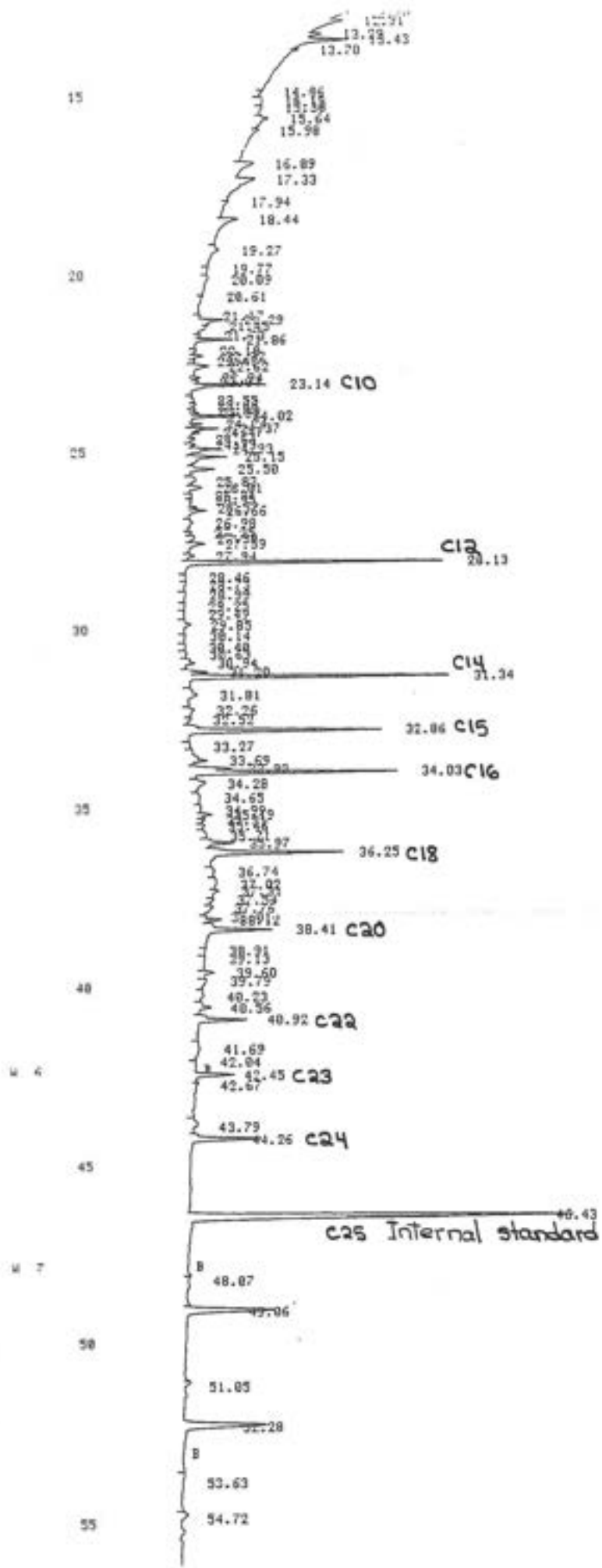


Figure 2: JW-II-C rings and roes

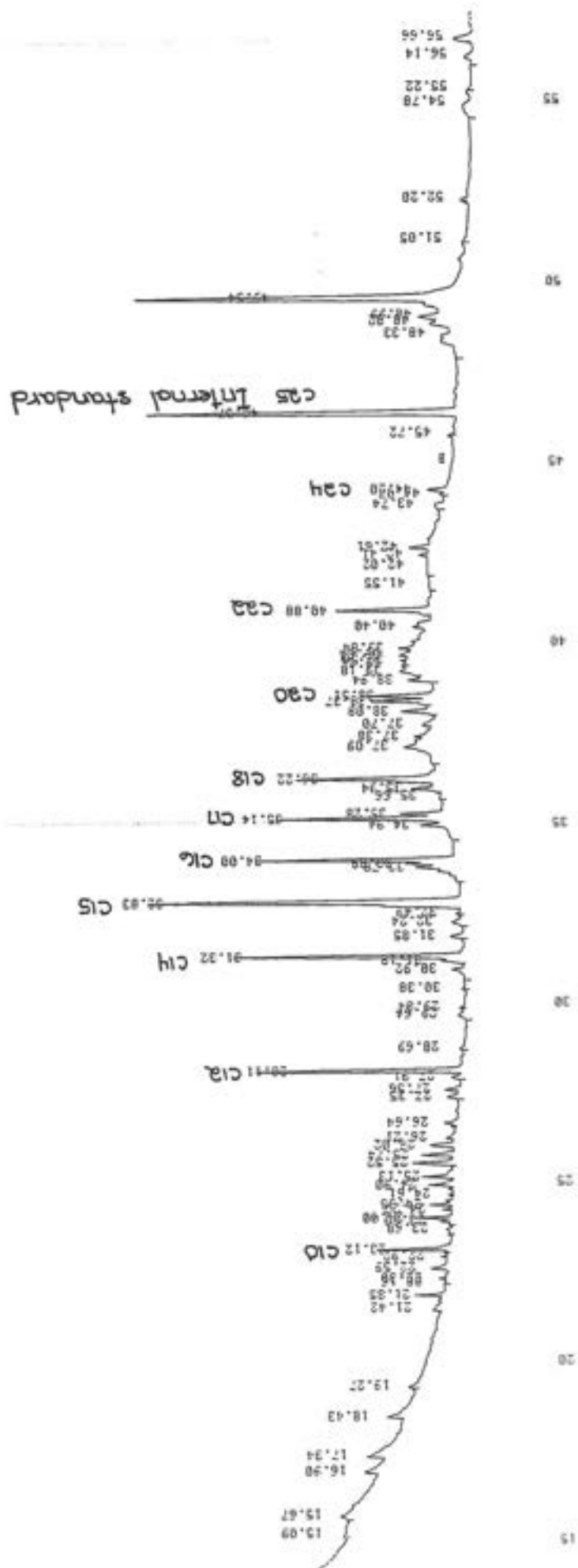


Figure 3: JW-II-V adductor muscles



Figure 4: JW-II-V rings and roes

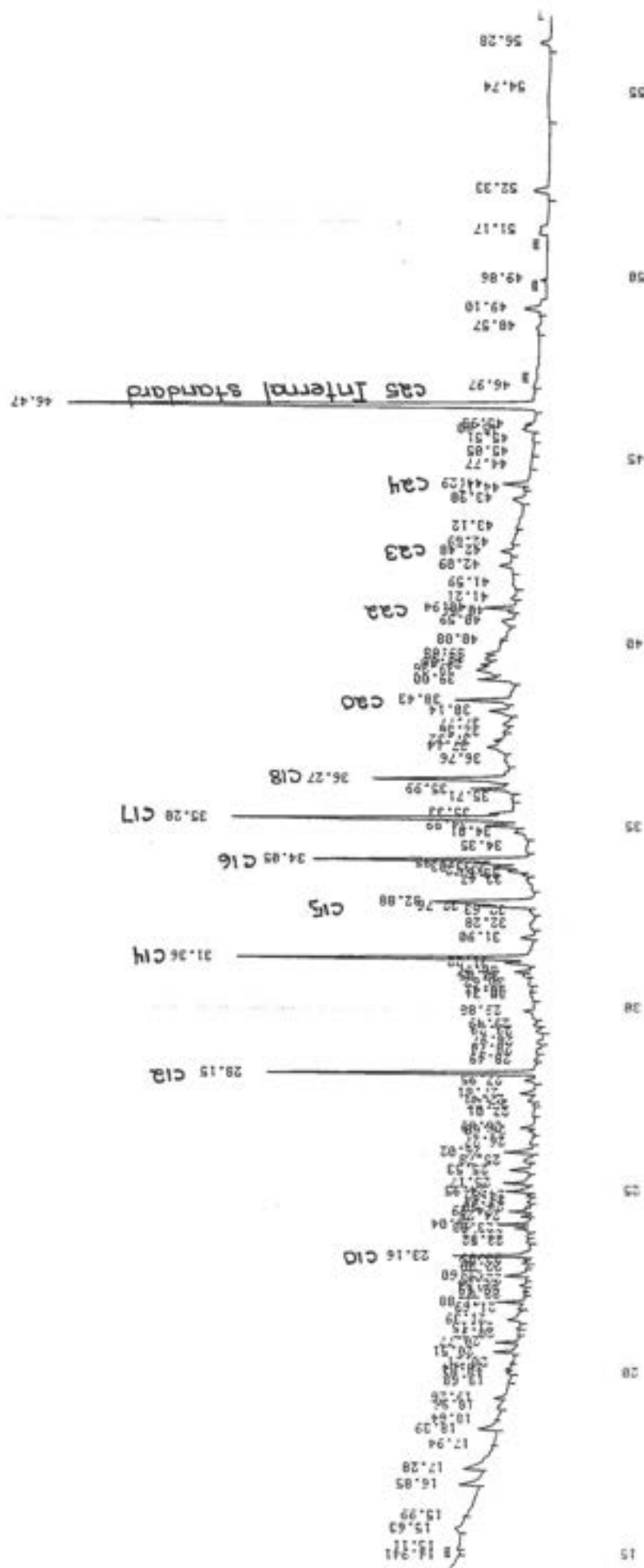
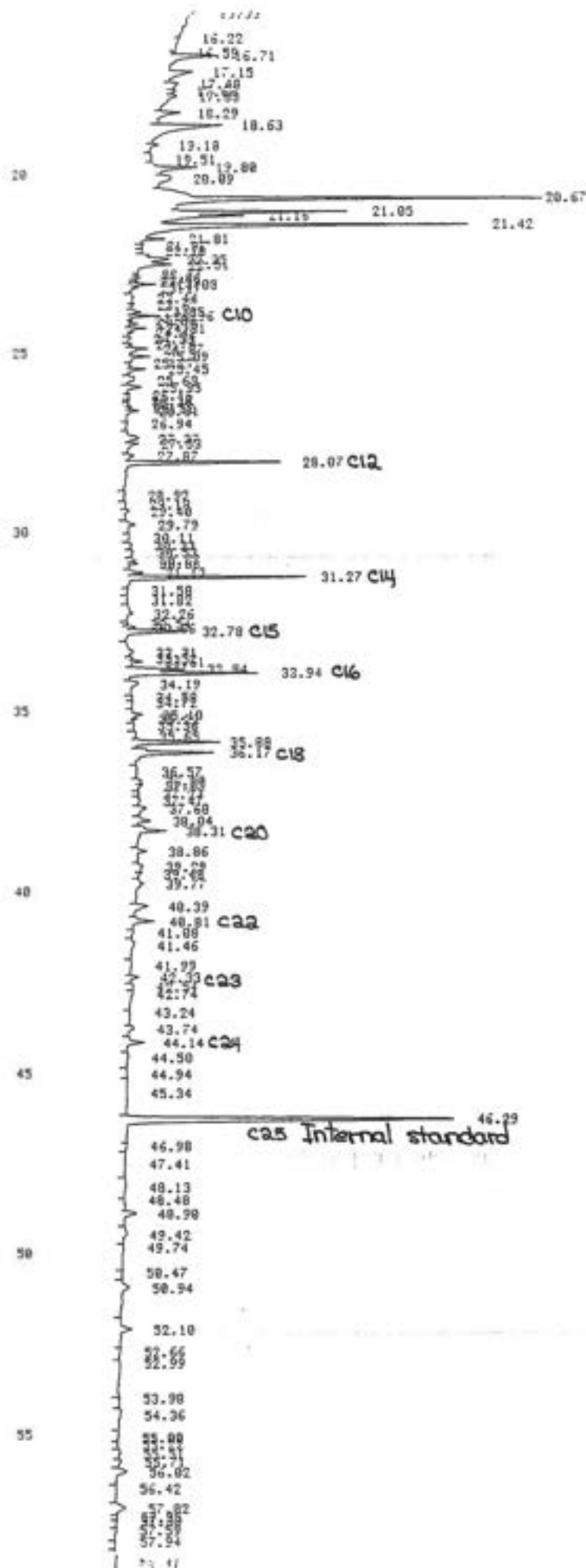


Figure 5: JW-II-T adductor muscle



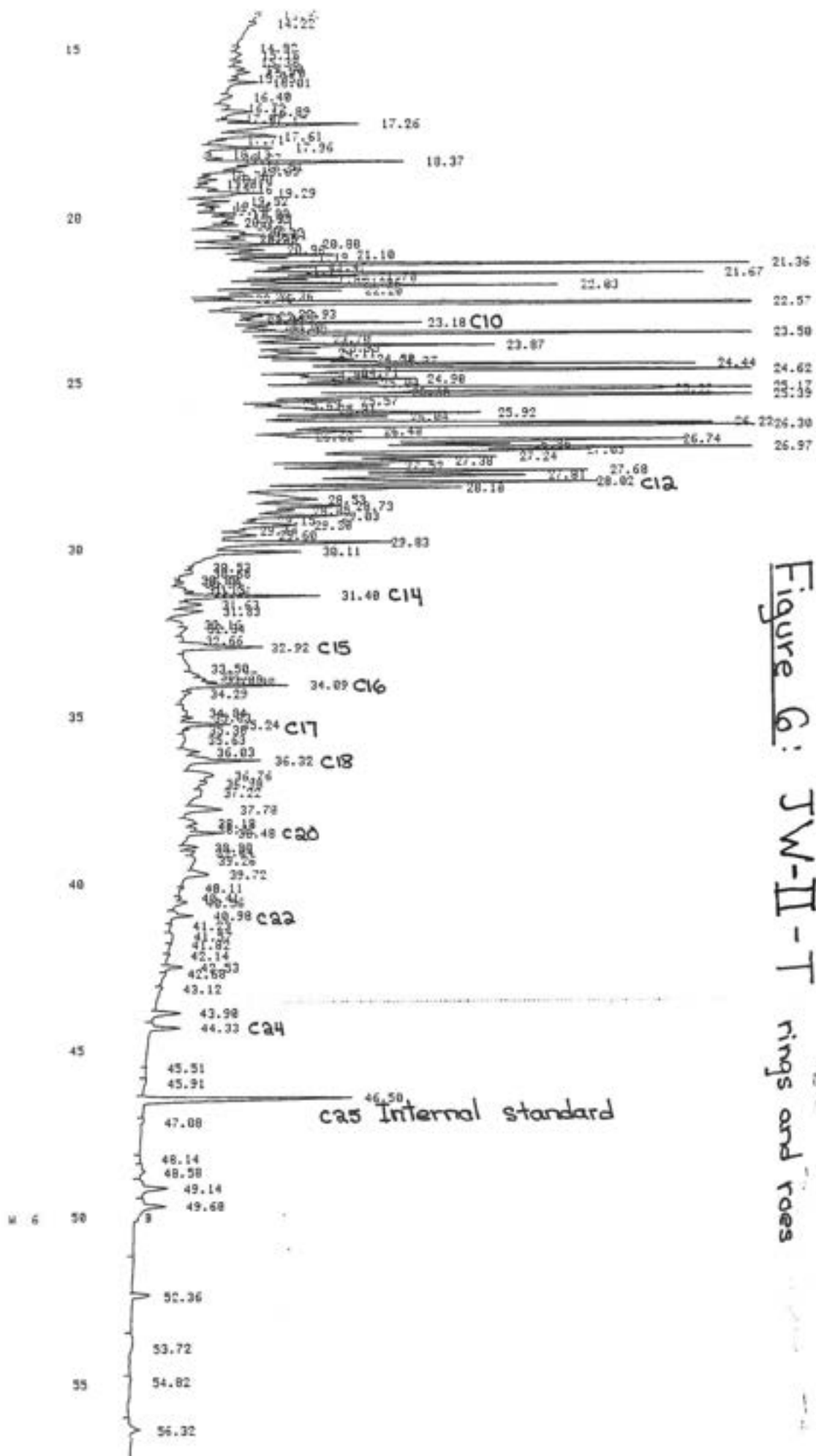


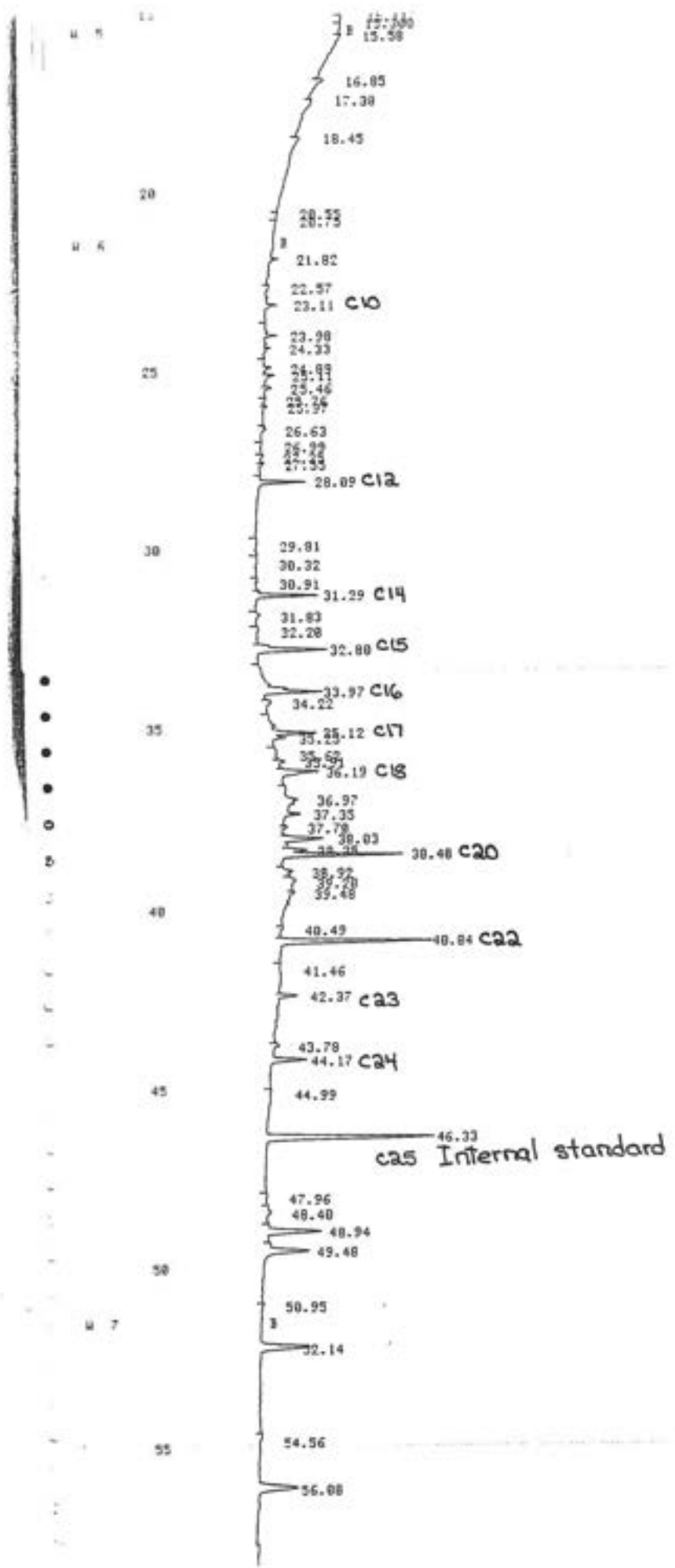
Figure 6: JW-II-T rings and roes

PERKIN ELMER CORP. PART NO. N625-1026

PERKIN ELMER CORP. PART NO. N625-1026

0.32

Figure 8: JW-II-N rings and roes



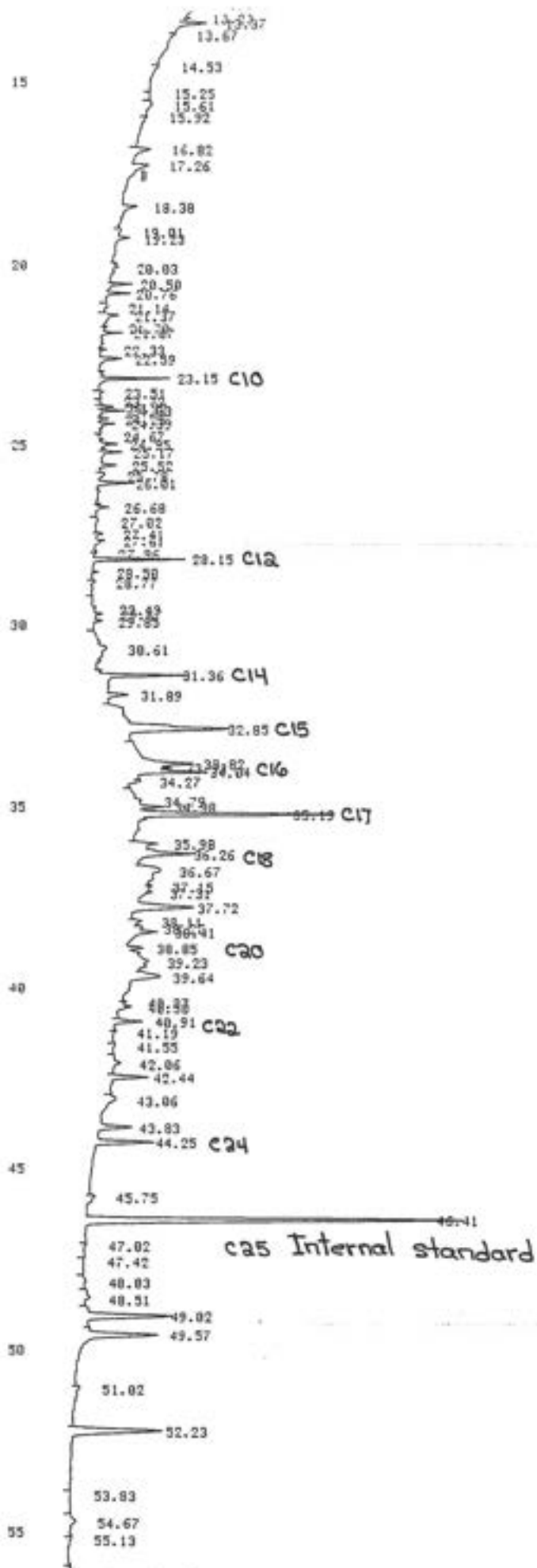
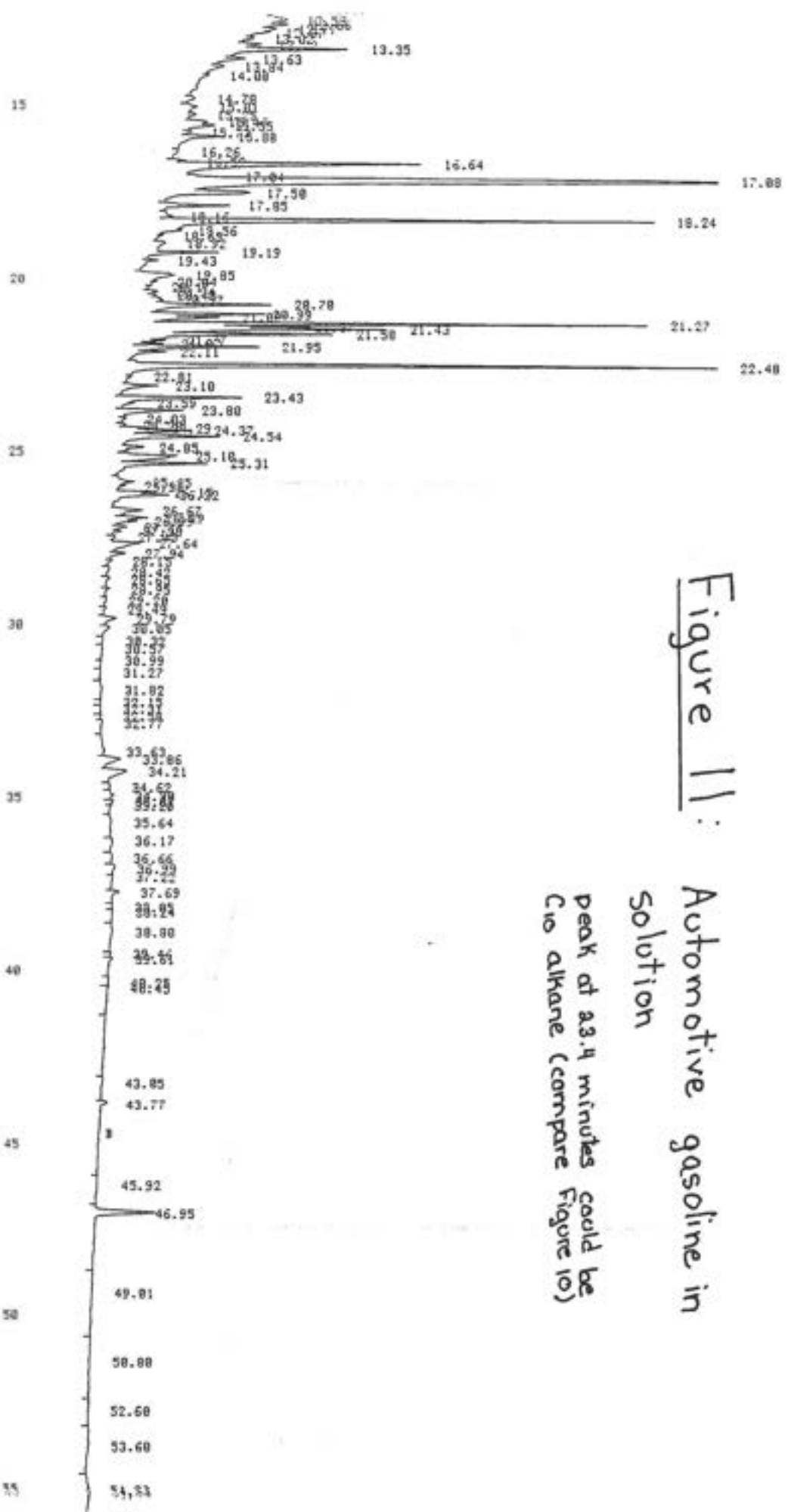
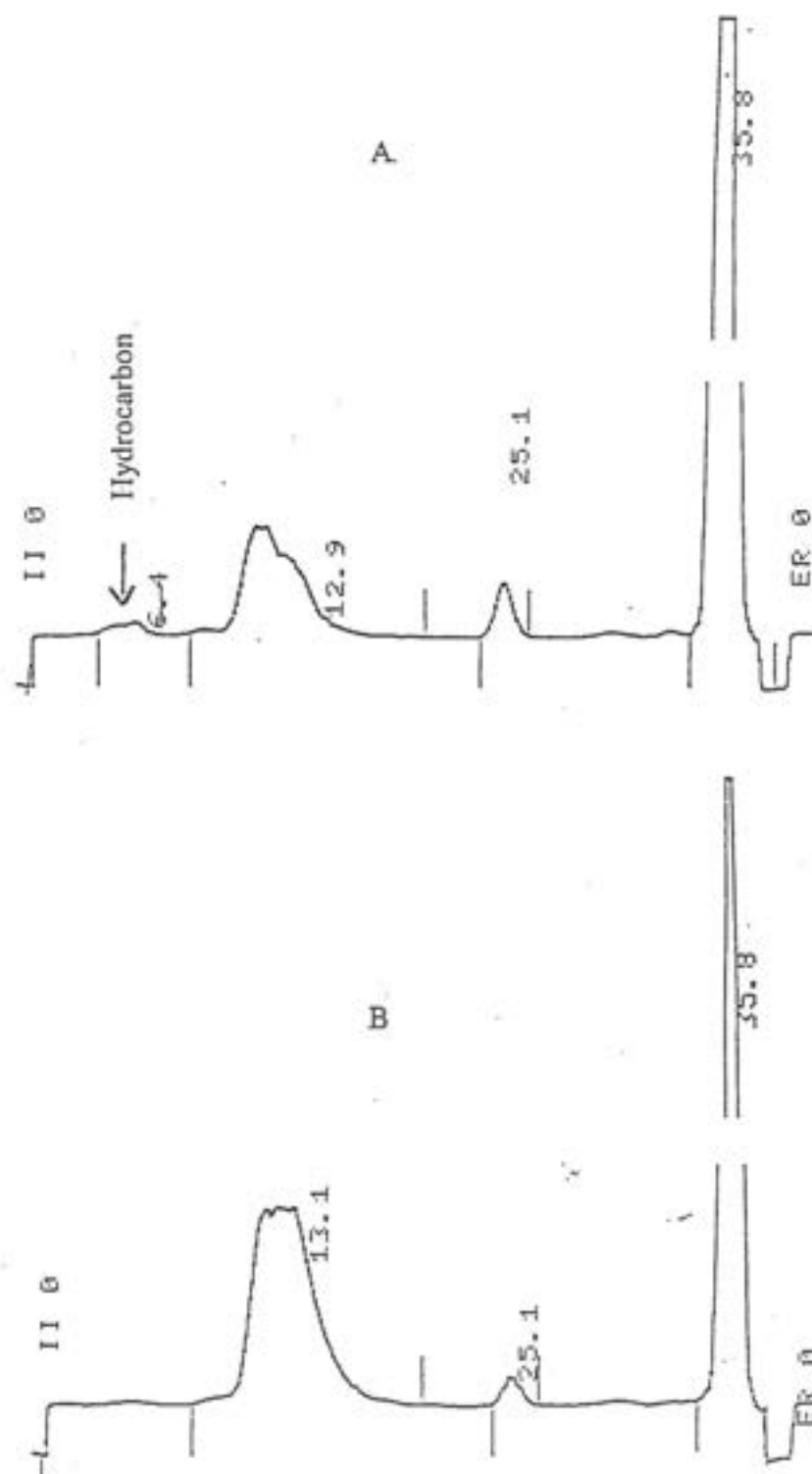


Figure 9: JW-II-V
rings and roses
(duplicate)



Appendix A



Iatroscan chromatogram of analysis of scallop ring and roe lipid. Figure A (JW-II-N) showing hydrocarbon, Figure B (JW-II-T) showing almost no hydrocarbon.

Appendix B

Aromatic Hydrocarbons

Naphthalene
1-Methylnaphthalene
Biphenyl
2,6-Dimethylnaphthalene
Acenaphthylene
Acenaphthene
2,3,5-Trimethylnaphthalene
Fluorene
Phenanthrene
Anthracene
1-Methylphenanthrene
Fluoranthene
Pyrene
Benzo[a]anthracene
Chrysene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[e]pyrene
Benzo[a]pyrene
Perylene

Appendix C

Triangle Test - Scallops

Name: _____

Date: _____

Please evaluate these samples for any abnormal or undesirable odours or flavours. Two of these samples are identical, the third is different.

A. ODOUR: Smell the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

B. FLAVOUR: Taste the samples in the order indicated and identify the odd sample.

Code	Check Odd Sample
_____	_____
_____	_____
_____	_____

Comments:

Appendix D

Statistical Chart Triangle Test^a

Number of Sensory Panelists	Number of Correct Answers Necessary to Establish Level of Significance		
	5%	1%	0.1%
7	5	6	7
8	6	7	8
9	6	7	8
10	7	8	9
11	7	8	9
12	8	9	10
13	8	9	10
14	9	10	11
15	9	10	12
16	10	11	12
17	10	11	13
18	10	12	13
19	11	12	14
20	11	13	14

^a From Larmond, 1977

Appendix E

Preparation of Water-Soluble Crude Oil Fraction

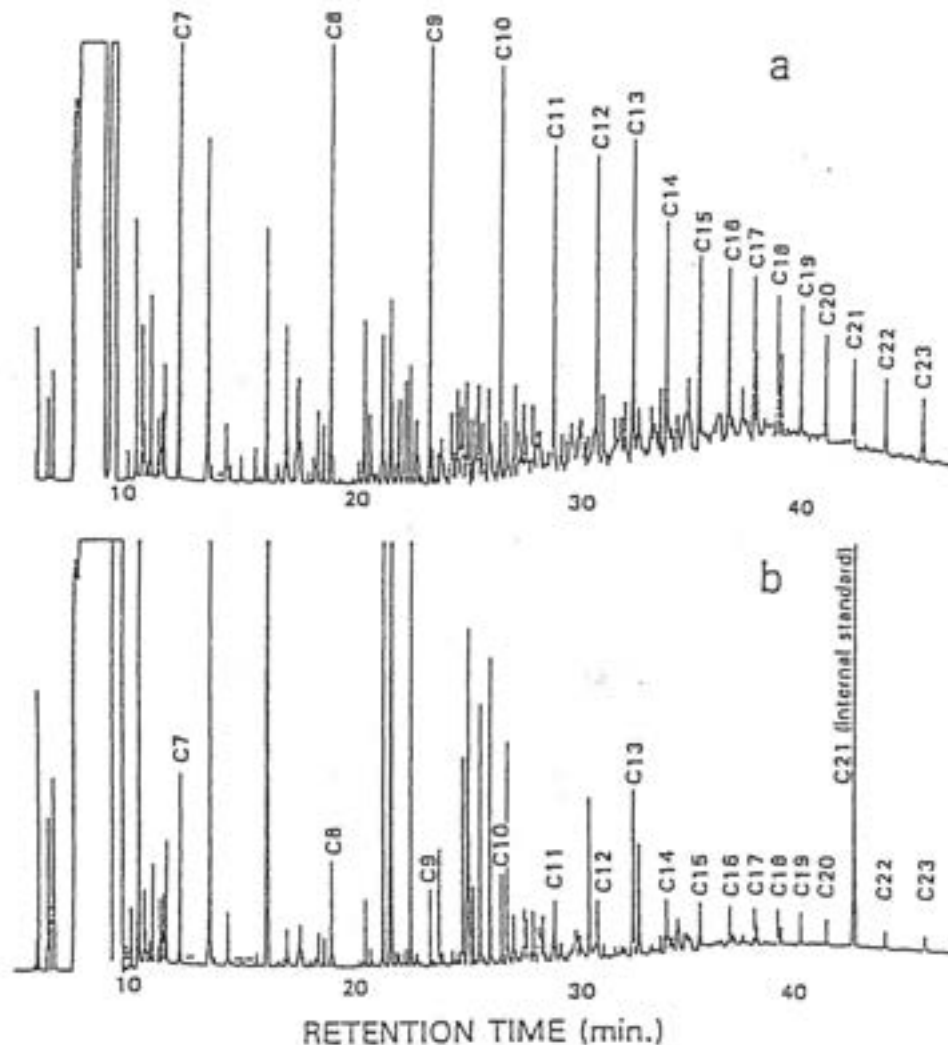


Fig. 4. (a) GLC chromatogram of Flotta North Sea crude oil; (b) GLC chromatogram of water-soluble fraction extracted from the same crude oil by reciprocating plate extraction column under conditions of an excessive reciprocation speed (260 strokes/min) at a flow rate of seawater of 220 ml/min and a flow rate of crude oil of 2.9 ml/min; settling time, 5 h at 5°C

Enrichment of shorter- chain volatile petroleum hydrocarbons highly soluble in seawater. From Zhou *et al.*, 1994.

Appendix F

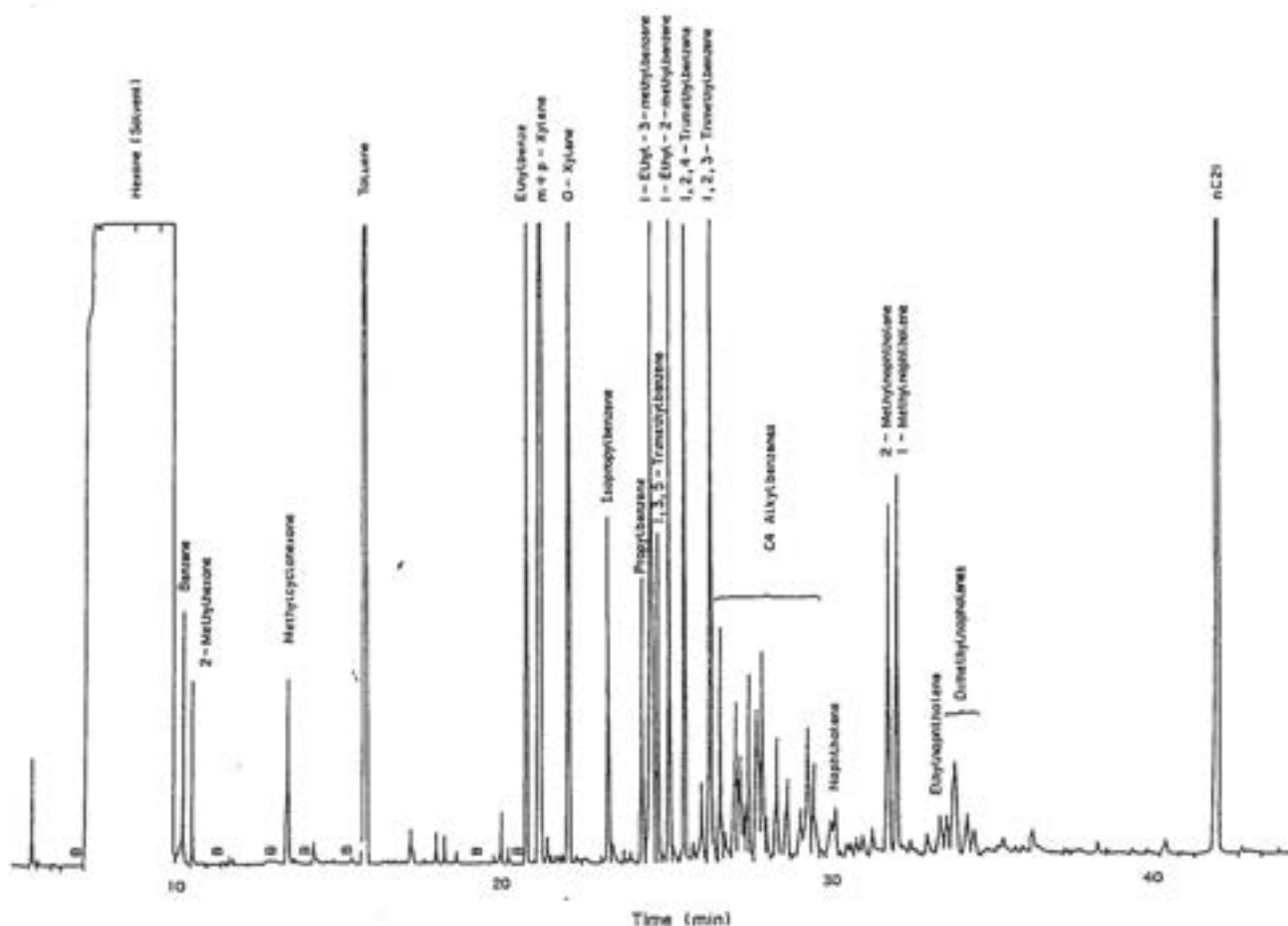


Fig. 1 Typical gas chromatogram of the WSF of Flotta crude oil used in exposure studies with salmon. Hencicosane (C21) was used as an internal standard. Note that benzene and 2-methylhexane are recorded with an attenuation 2-fold less than the rest of the chromatogram. C4 Alkylbenzenes = several tetramethyl- and propyl-methyl-benzenes.

Details of shorter-chain hydrocarbons, especially aromatics, soluble in seawater. From Heras *et al.*, 1992.

Appendix G

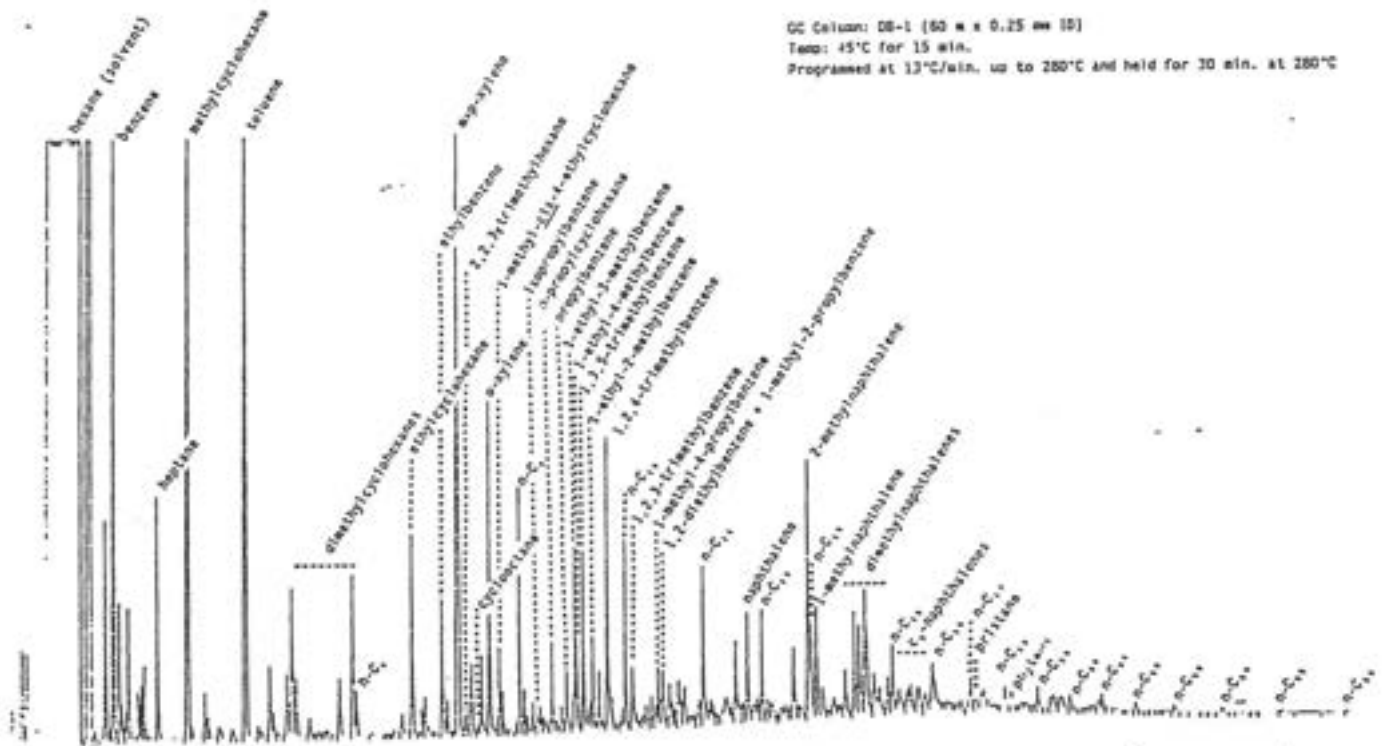
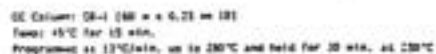


Figure 3.1. GLC hydrocarbon profile of the blended condensate.

Blended natural gas well condensate used for former scallop tainting studies. From Ernst *et al.*, 1989.



Water soluble fraction (WSF) of natural gas condensate used for former scallop tainting studies. From Ernst *et al.*, 1989.

Appendix H: Information on Recovery of Injured Raptor

- Appendix H-1: Halifax Chronicle Herald Article from October 23, 1999
- Appendix H-2: Letter from Atlantic Raptor Rehabilitation Centre

Appendix H-1
Halifax Chronicle Herald Article from October 23, 1999

Oil rig crew saves falcon

By Brian Haves / Staff Reporter

Some birds have all the luck, especially a migrating peregrine falcon that crash-landed last week onto the deck of an offshore drilling rig.

Oil workers aboard Rowan Gorilla II were going about their business when they noticed the troubled and disoriented bird winging by with no place to go.

When the falcon hit the deck, the oilmen's off-duty daily routine changed as they became involved in a rescue mission many will not soon forget.

Jim MacDonald, lead building supervisor for the Sable Offshore Energy Inc.-leased rig, said the falcon was first spotted flying around the platform the day before and became trapped in an enclosed area from which the bird couldn't fly.

"It was a different kind of bird from the seagulls and sparrows we normally see out here," he said.

Mr. MacDonald said the bird sparked a lot of interest among the crew, who were able to corral it inside an old television box.

"We gave it fish and chicken to eat and made a perch for him to stand on. He was pretty well docile when we caught him. He was pretty well beat."

Mr. MacDonald speculated that a strong westerly wind that day may have blown the bird farther out to sea than normal.

"They were able to identify the raptor from a bird book and wanted to know what to feed the peregrine and how to prepare it for transport by helicopter to Halifax," Elaine Kew, director of the Atlantic Raptor Rehabilitation Centre in Mares Point, said of the phone call she got Monday from Alvin Titus, a fisheries observer aboard the rig who also tracks bird species in the area.

Ms. Kew said the bird was slated to be transported the next day by helicopter, but weather conditions forced cancellation of the flight.

But a crew with Canadian Helicopters International had the falcon under its wing when she arrived at Halifax International Airport on Wednesday afternoon.

The lively, young peregrine was secured in a large cardboard box with a sign that read "keep fingers out of the holes," she added.

Informed the falcon may have damaged its wing, Ms. Kew took the bird directly to the Dartmouth Veterinary Hospital for a thorough examination.

The wing was in good shape, but the falcon had a very low body weight and oil on its upper feathers from taking up a defensive position against some machinery on the rig, she said.

After the examination and a good washing, the peregrine was taken to the centre - a not-for-profit, all-volunteer facility that cares for birds of prey.

The falcon was fed road-killed deer meat, vitamin drops, and placed in a box by a fireplace to dry off, Ms. Kew said.

The bird is now housed in the facility's flight unit for hawks and falcons, and although still unable to fly, staff are confident the falcon will regain its strength.

Hopefully the peregrine, taken off the endangered species list last year, can be released in a month or so to continue its journey to warmer climes in the Southern Hemisphere, she said. She praised the rig's crew for giving the young falcon a second chance and changing the course of its fragile life.

"Without the intervention of the crew . . . this young peregrine falcon, making its first migration south, would have died of starvation," she said.

Appendix H-2
Letter from Atlantic Raptor Rehabilitation Centre

November 17, 1999

To: The Crew of the Rowan Gorilla 11

From: The Atlantic Raptor Rehabilitation Centre

This afternoon at 3:30 the Peregrine Falcon took flight and continued her journey migrating south. Over the past few weeks, she exercised in one of our flight units and dined on pheasant, grouse, ducks and rodents. During the Peregrine's recovery she remained undisturbed and isolated. The keel bone (breast bone) was protruding indicating that she had been unsuccessful hunting. Your subsequent intervention and her stay at the ARRC has provided the necessary care and build up of muscle tissue required for flight. US Fish and Wildlife Band No. 180715714 was placed on her left leg, she weighed 1311 grams. This was a first year hatched Peregrine Falcon. We are situated on a peninsula in St. Margaret's Bay, an ideal release site for this young Peregrine. Our next door neighbour has a large field sloping down into Schooner Cove. Over the years this has become our runway strip for many of the large raptors. With strong wingbeats she flew low following the slope then gained altitude and crossed the cove to the next Peninsula.

Even though the Peregrine Falcon was taken off the endangered species list, this Falcon remains threatened. Canada remains cautious about their survival and maintains records on all Peregrines that have made contact with humans.

During the Peregrine's stay and on it's release we have taken photos for our files. When the release photos are developed, I will send them to you. Thank you for your compassion and concern for this fragile wildlife. Watch the skies for us.

Mike and Elaine Kew