MICROPALEO CONSULTANTS, INC.

SHELL WESTERN E & P

BURGER NO. 1 (OCS-Y-1413)

API #55-352-00001

QUAD NR03-02 BLOCK 718

CHUKCHI SEA, ALASKA

Prepared by:

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BIOSTRATIGRAPHY REPORT

Job No. 22-113 **May, 2003**

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FORAMINIFERA REPORT

Interpreted by

Michael B. Mickey

FORAMINIFERA SUMMARY

580-2380'

Age.	Early Cretaceous Aptian to Early Albian
Zone.	F-9
Environment.	Nonmarine to Inner Neritic (Alluvial Plain to Inner Shelf)

2380-5030'SW

Age.	Early Cretaceous Probable Aptian
Zones.	Probable F-9 to F-11
Environment.	Middle Neritic to Bathyal (Middle Shelf to Slope)

5030SW-5290'

Age.	Early Cretaceous Barremian
Zone.	F-12
Environment.	Bathyal - Distal (Lower Slope & Base of Slope - Starved Basin)

5290-5410'

Age. Early Cretaceous
Hauterivian

Zone. F-13a

Environment. Middle Neritic
(Middle Shelf)

5410-6550'

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. 5410-5800': Middle Neritic
(Middle Shelf)
5800-6550': Outer Neritic
(Outer Shelf)

6550-6560' SAMPLE GAP

6560-7090'

Age. Late Jurassic
Kimmeridgian to Volgian?

Zones. F-15? to F-16a

Environment. Outer Neritic to Upper Bathyal
(Outer Shelf to Upper Slope)

7090-7450'

Age.	Late Jurassic Kimmeridgian
Zone.	F-16a
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)

7450-8200'T.D.

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)

INTRODUCTION

Scope

Data from 326 Foraminifera samples from the Shell Western E & P Burger No. 1 (OCS-Y-1413) well were incorporated into this report. These consisted of 252 ditch and 74 sidewall core samples covering the interval 580 to 8200 feet total depth. This work was done as part of M.C.I. Job Number 22-113.

Procedures

Standard techniques were used to process the material. All samples were boiled in Quaternary-O and washed over 20 and 200 mesh screens. Frequency symbols correspond to the following numerical values: very rare (1), rare (2 - 4), frequent (5 -25), common (26 - 100), abundant (101 - 999) and prolific (1000+). The picked foram slides and residues are reposited at the State of Alaska Geological Materials Center in Eagle River, Alaska.

Certain factors such as shelf widths, basin configuration and overall basin depths associated with Arctic Mesozoic basins are not completely understood at present. The paleoenvironments presented in this report reflect relative basinal position only and should not be tied to specific water depths. Generally, neritic corresponds to shelf or deltaic environments, while bathyal corresponds to slope or prodelta environments and bathyal (starved basin) corresponds to distal (far from the source) deposition. As an example, prodelta deposits could represent deposition as shallow as middle neritic or as deep as bathyal (slope) depending on the delta type and shelf width. With a narrow shelf, a river-dominated deltaic system could build across the shelf and the prodelta deposits would be in a bathyal (slope) depth. A tide-dominated deltaic system associated with a wide shelf could result in middle neritic prodelta deposition.

Format

A listing of the age, environment, fauna and occasional lithology comments for each biostratigraphic interval follows. A generalized summary of the well is presented in the Conclusions section at the end of the Foraminifera Report. Foraminifera Distribution Charts (Figures F-1 & F-2) and a High Resolution Biostratigraphy Plot (Figure B-1) containing foram diversity/abundance plots, a cumulative faunal plot and paleoenvironmental plot(s) are in pockets at the back of this report.

RESULTS

580-2380'

Age.	Early Cretaceous Aptian to Early Albian
Zone.	F-9
Environment.	Nonmarine to Inner Neritic (Alluvial Plain to Inner Shelf)
Fauna.	*Haplophragmoides kirki, H. excavatus, H. linki, H. topagorukensis, Ammodiscus rotalarius, Gavelinella awunensis, Bathysiphon vitta*, megaspores, fish debris, pyrite, and common to abundant coal above 1420 feet.

2380-5030'SW

Age.	Early Cretaceous Probable Aptian
Zones.	Probable F-9 to F-11
Environment.	Middle Neritic to Bathyal (Middle Shelf to Slope)
Fauna.	*Haplophragmoides excavatus, H. topagorukensis, H. linki, H. gigas, Bathysiphon vitta, Ammobaculites wenonahae, A. fragmentarius, Glomospira corona, Verneuilinoides borealis, Hippocrepina barksdalei, Trochammina mcmurrayensis, Lenticulina macrodisca, Miliammina awunensis, M. manitobensis, M. ischnia, Gaudryina nanushukensis, Conorboides umiatensis, Eurycheilostoma grandstandensis, Pseudobolivina rayi, Gaudryinella irregularis, Inoceramus* prisms, pyrite, megaspores, and frequent to common pyritized radiolaria below 3730 feet.

5030SW-5290'

Age. Early Cretaceous
Barremian

Zone. F-12

Environment. Bathyal - Distal
(Lower Slope & Base of Slope - Starved Basin)

Fauna. *Ammobaculites reophacoides, Bathysiphon scintillata, Haplophragmoides duoflatis, H. coronis, Trochamminoides* sp. (small, thin), megaspores, pyrite, rare to common pyritized radiolaria, frequent to common scattered paper shale and frequent to abundant rounded frosted quartz floating sand grains.

5290-5410'

Age. Early Cretaceous
Hauterivian

Zone. F-13a

Environment. Middle Neritic
(Middle Shelf)

Fauna. Arenaceous spp. (large, coarse), *Gaudryina tailleuri, Haplophragmoides coronis, H. duoflatis, Globulina prisca, Ammobaculites erectus, Saracenaria projectura, Trochammina squamata, Bathysiphon scintillata, Ammodiscus* sp. (small, thin), pyrite and frequent to abundant rounded frosted quartz floating sand grains.

5410-6550'

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. 5410-5800': Middle Neritic
(Middle Shelf)
5800-6550': Outer Neritic
(Outer Shelf)

Fauna. *Bathysiphon granulocoelia, B. scintillata,* arenaceous spp. (large, coarse), *Haplophragmoides duoflatis, H. coronis, H. goodenoughensis, H. inflatigrandis, Lenticulina muensteri, L.* sp. (raised sutures), *Quinqueloculina* sp. 2, *Praebulimina* sp. 1, *Trochamminoides* sp. (small, thin), *Ammobaculites erectus, A. reophacoides, Saracenaria projectura, S. valanginiana, Glomospirella* sp. S, *G. arctica, Gaudryina tailleuri, G. milleri, Quadrimorphina ruckerae, Thuramminoides* sp., *Globulina prisca, Oolina apiculata, Glomospira subarctica, Gyroidinoides nitidus, Trochammina squamata, T. rosacea, T. conicominuta, Uvigerinammina* sp. 1 (of Wall), *Epistomina* cf. *caracolla, Marginulinopsis collinsi, M. cephalotes, Gravellina* sp. (large), *Rectoglandulina humilis,* ostracods, gastropods (pyrite casts), *Inoceramus* prisms, shell fragments, pelmatozoan fragments, rounded frosted quartz floating sand grains, pyrite, pyrite sticks and rare scattered glauconite.

6550-6560' SAMPLE GAP

6560-7090'

Age.	Late Jurassic Kimmeridgian to Volgian?
Zones.	F-15? to F-16a
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)
Fauna.	*Trochammina misinovi, T. rostovzevi, T. taboryensis, Marginulinopsis robusta, Gaudryina milleri, Haplophragmoides canui, Oolina apiculata, Lenticulina audax, L. subalata, Astacolus pediacus, Lagena aphela, Ammodiscus cheradospirus, Epistomina* cf. *uhligi, E.* aff. *anterior, Orientalia* sp. 2 (of Wall), *Tristix* cf. *triangularis, Saracenaria triangularis, S. oxfordiana, Ammobaculites alaskensis, A. cobbani, Dentalina ectadia, Spirillina amphelicta, Frondicularia franconica, Eoguttulina liassica, Inoceramus* prisms, shell fragments, gastropods (casts), pelmatozoan fragments, pyrite, pyrite sticks and rare to frequent ostracods.

7090-7450'

Age.	Late Jurassic Kimmeridgian
Zone.	F-16a
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)
Fauna.	*Trochammina taboryensis, T. kosyrevae, T. misinovi, T. kumaensis, T.* sp. (small, high spired), *T. rostovzevi, Saracenaria oxfordiana, S. triangularis, Globulina topagorukensis, Glomospira pattoni, Conorboides hofkeri, Gaudryina tailleuri, G. milleri, G. leffingwelli, Haplophragmoides canui, H.* spp., *Lenticulina audax, L. quenstedti, Ammobaculites barrowensis, A. alaskensis, Epistomina* cf. *uhligi, Recurvoides turbinatus, Marginulina costata, Orientalia* sp. 2 (of Wall), *Dentalina* spp., *Vaginulinopsis thomasi, Lingulina polita,* pyrite and rare to frequent scattered ostracods.

7450-8200'T.D.

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)
Fauna.	*Trochammina rostovzevi, T. kosyrevae, T. misinovi, T. taboryensis, T. kumaensis, T. canningensis, Gaudryina leffingwelli, G. milleri, G. dyscrita, Bathysiphon anomalocoelia,* arenaceous spp. (large, coarse), *Ammobaculites alaskensis, A. barrowensis, Haplophragmoides canui, H.* spp., *Lenticulina audax, L. quenstedti, Glomospira pattoni, Recurvoides turbinatus, Lituotuba irregularis, Dentalina* spp., *Thuramminoides* sp., *Reophax suevica, Ammomarginulina baryntica, Ammodiscus orbis, Vaginulina sherborni, Flabellammina chapmani,* pyrite, pyrite sticks, rare scattered glauconite and rare to common scattered tar (common in the basal sample).

CONCLUSIONS

The Shell Western E & P Burger No. 1 (OCS-Y-1413) well penetrated the following biostratigraphic sequence based on foraminiferal analysis:

- 4830+ feet (580-5410') of Hauterivian to Early Albian age (Early Brookian & Beaufortian - Rift Sequence) alluvial plain to outer shelf topsets, slope foresets and base of slope bottomsets.

- 2790+ feet (5410-8200'T.D.) of Oxfordian to Valanginian age (Beaufortian - Incipient Rift Sequence) middle shelf to slope sedimentation.

PALYNOLOGY REPORT

Interpreted by:

Hideyo Haga

PALYNOLOGY SUMMARY

580-5020'

Age.	Early Cretaceous Aptian - Early Albian
Zone.	P-M18
Environment.	Nonmarine - Marginal Marine

5020-5248'SW

Age.	Early Cretaceous Barremian - Aptian
Zone.	P-M18a
Environment.	Marine

5248SW-5673'SW

Age.	Early Cretaceous Hauterivian
Zone.	P-M19
Environment.	Marine

5673SW-6586'SW

Age.	Early Cretaceous Valanginian
Zone.	P-M20
Environment.	Marine

6586SW-8200'T.D.

Age.	Late Jurassic Oxfordian? - Kimmeridgian
Zones.	P-M22? to P-M21
Environment.	Marine
Remarks.	The bottom sample (8130-8200') has a marked decrease in recovery. The forms recorded may not be indigenous.

INTRODUCTION

Purpose and Scope

Micropaleo Consultants, Inc. conducted palynological analyses on 197 samples from the Shell Western E & P Burger No. 1 (OCS-Y-1413) well. This total consisted of 112 ditch-cutting composites and 85 sidewall core samples taken between 580 feet and the total depth of 8,200 feet. This report includes 27 ditch samples from a later project in which much of the well was reprocessed at 30-foot intervals.

This report provides an updated format for the palynomorph data and new interpretations of these data.

Procedures

The ditch sample material was processed by M.C.I. with standard palynologic techniques using hydrochloric, hydrofluoric and nitric acid treatments. A heavy liquid separation and a sieving/panning technique further concentrated the resultant kerogen residues. Permanent palynology slide mounts were made for each sample with sufficient organic recoveries.

The kerogen maturation samples were processed without the nitric acid treatment. These were analyzed at greater spacing than the palynology samples. Permanent slide mounts were made for the Thermal Alteration Index (T.A.I.) samples. Kerogen "plugs" were made with polyester resin and polished for Vitrinite Reflectance (V.R.) measurements.

As each palynology slide was examined, an estimate of abundance for each palynomorph taxon was recorded in a microcomputer. These data form the basic elements of the species distribution chart.

Based on the palynomorph assemblages observed, an age and environment of deposition are interpreted for the palynostratigraphic subdivisions. The

environment, as interpreted from the palynological preparations, is merely categorized as nonmarine, marginal marine or marine. These categories are based on the absence or presence and diversity of microplankton.

Report Format

The following Results section gives the age, environment of deposition and significant palynomorphs. This is an expansion of the brief Summary at the beginning of this report. Following the Results are general comments in the Conclusion section. The last section of the report consists of the Kerogen Maturation Analyses.

The Palynomorph Distribution Chart (Figure P-1) lists the occurrence and abundance of recorded taxa in each sample. Included on this chart are the diversity and abundance curves for the spore-pollen and the microplankton cysts.

High Resolution Biostratigraphy Plots - Foraminifera/Palynomorphs (Figure B-1) are also provided. This chart includes additional palynology parameters in the form of a cumulative plot that illustrates the relative abundance of the nonmarine, marine and miscellaneous palynomorph components.

RESULTS

580-5020'

Age. Early Cretaceous
Aptian to Early Albian

Zone. P-M18

Environment. Nonmarine to Marginal Marine

Palynomorphs. The Aptian to Early Albian interval consists of strata that produce poor marine palynomorph recoveries and many reworked Paleozoic and Mesozoic spore-pollen and dinocysts.

The indigenous spore assemblage includes *Aequitriradites spinulosus*, *Gleicheniidites senonicus*, *Osmundacidites* spp., *Rouseisporites reticulatus* and *Trilobosporites*. Numerous occurrences of reworked *Densosporites* and *Taeniaesporites* were also recorded through this section.

The dinocyst assemblage includes *Cyclonephelium distinctum*, *Gardodinium trabeculosum*, *Imbatodinium jaegeri*, *Odontochitina operculata*, *Oligosphaeridium complex* and *Palaeoperidinium cretaceum*. Occurring in this section are reworked specimens of Jurassic and Neocomian dinocysts.

Discussion. The overall palynomorph assemblage, with the presence of numerous reworked forms and the absence of restrictive Albian markers, indicates an Aptian - Early Albian age sequence. This assemblage is typical of the Nanushuk/Torok units seen in the western North Slope of Alaska.

5020-5248'SW

Age.	Early Cretaceous Barremian to Aptian
Zone.	P-M18a
Environment.	Marine
Palynomorphs.	The section of Barremian - Aptian age represents an interval with rich and diverse microplankton recoveries. As typical, the assemblage consists of the same species as seen above, but in greater abundance. The abundant forms include *Cyclonephelium distinctum*, *Odontochitina operculata* and *Oligosphaeridium complex*. Also important to this unit is the appearance of *Micrhystridium* sp. A.
Discussion.	The kerogen consists largely of amorphous and herbaceous material.

5248SW-5673'SW

Age. Early Cretaceous
Hauterivian

Zone. P-M19

Environment. Marine

Palynomorphs. The Hauterivian zone is marked by the appearance of a number of diagnostic dinocyst species. The assemblage includes *Gardodinium trabeculosum*, *Herendeenia alaskaensis*, *Lunatadinium dissolutum*, *Muderongia* sp. N, *Muderongia* cf. *M. simplex* and *Oligosphaeridium complex* (thick-wall). Reworked Late Jurassic dinocysts occur in the sidewall core at 5557 feet.

Discussion. The base of the Hauterivian section is placed at the highest and consistent appearance of Valanginian dinocysts. This interpretation must assume that the Valanginian forms are not reworked.

An alternate interpretation would place the lower boundary at 6010 feet. This interpretation requires reworking of the higher Valanginian occurrences, and uses the lowest occurrence of Hauterivian dinocysts in sidewall core samples as evidence for the base of the Hauterivian. This presumes that the sidewall core samples lack any mud-invasion contaminants.

A decrease in amorphous organic recoveries begins in this interval.

5673SW-6586'SW

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. The Valanginian section is characterized by an increase in spore-pollen recoveries. This assemblage includes *Classopollis classoides*, *Exesipollenites tumulus*, species of *Pilosisporites* and *Trilobosporites*, and *Vitreisporites pallidus*. Reworked Paleozoic spores occur below 6010 feet.

The dinocyst assemblage is marked by the consistent occurrences of *Apteodinium spongiosum*, *Gochteodinia villosa*, *Gonyaulacysta* sp. G (granular), *Nelchinopsis kostromiensis*, *Sirmiodinium grossi* and *Tubotuberella apatela*. Numerous reworked Late Jurassic dinocyst species occur sporadically through this interval.

Discussion. The appearance of reworked Paleozoic spores would be consistent with a Valanginian age. This reworked assemblage begins below 6010 feet.

6586SW-8200'T.D.

Age. Late Jurassic
Oxfordian? to Kimmeridgian

Zones. P-M22? to P-M21

Environment. Marine

Palynomorphs. This interval of Late Jurassic strata carries most of the same palynomorphs as recorded above. Many of the forms are sloughed from the overlying units. Significant, however, are the fairly consistent occurrences of the Jurassic forms *Pareodinia osmingtonensis*, *Gonyaulacysta ambigua*? and *G. cladophora*. Single specimens of *Chytroeisphaeridia pericompsa* and *Nannoceratopsis pellucida* were also recorded.

Discussion. The Jurassic dinocyst species essentially range in age from Oxfordian to Kimmeridgian. Absent a more consistent and diverse Oxfordian assemblage, an age ranging from Oxfordian? to Kimmeridgian is assigned.

The bottom ditch sample (8130-8200') is included in the interval, but a marked decrease in total palynomorph recovery is obvious. Previously, this sample was designated as indeterminate in age.

CONCLUSIONS

Palynological analysis of the Shell Western E & P Burger No. 1 (OCS-Y-1413) well provides the following palynostratigraphic subdivisions:

- Nonmarine to marginal marine strata of Aptian - Early Albian age occur from 580 feet to 5020 feet. This age assignment is based largely on the absence of restrictive Albian age markers.

- Marine strata of Barremian - Aptian age occur between 5020 feet and 5248SW feet.

- Marine strata of Hauterivian age are identified from 5248SW feet to 5673SW feet. This requires that some of the Hauterivian dinocysts recovered in the sidewall core samples below this interval to be present as mud contaminants.

- Marine strata of Valanginian age are placed between 5673SW feet and 6586SW feet. It is possible that the occurrences of Valanginian dinocysts above 6010 feet are reworked.

- An alternative interpretation for the top of Valanginian would be at 6010 feet. This would require that the Valanginian species be reworked above 6010 feet. The appearance of reworked Paleozoic spores would be consistent with this lower pick.

- Late Jurassic, marine strata occur from 6586SW feet to the total depth of 8200 feet. This section is assigned a range of Oxfordian? to Kimmeridgian age.

- The bottommost sample had a decrease in palynomorph recovery. If the recorded forms are not indigenous, an indeterminate age would be appropriate.

KEROGEN MATURATION REPORT

Interpreted by:

Hideyo Haga

KEROGEN MATURATION
(T.A.I. - VITRINITE REFLECTANCE)

Maturation levels of the kerogen residues from the Shell Western E & P Burger No. 1 (OCS-Y-1413) well were determined by the visual methods Thermal Alteration Index (T.A.I.) and by Vitrinite Reflectance (V.R.) measurements. A chart correlating the two measurement techniques and their relationship to hydrocarbon generation is given in Figure 1.

Thermal Alteration Index

Sixteen (16) T.A.I. samples were prepared and analyzed. The sample spacing is generally at 270 feet and the analyzed sample composite intervals are also 270 feet.

The T.A.I. and percentage estimates for the major organic constituents are presented in Table I. A generalized organic classification scheme is used, but the terminology employed may be equated to the following categories:

■	Amorphous	=	Alginite	= Type I
■	Herbaceous	=	Exinite	= Type II
■	Woody	=	Vitrinite	= Type III
■	Fusinitic	=	Inertnite	= Type IV

The T.A.I. estimates suggest that the mature organic facies is reached at about 2500 feet and continues within the mature range to the total depth.

The organic constituents are dominated by the oil-prone amorphous/ herbaceous material between 5200 feet and 7700 feet in the T.A.I. composites. However, the palynomorph slides did suggest that the amorphous recoveries probably decreased significantly below 5300 feet.

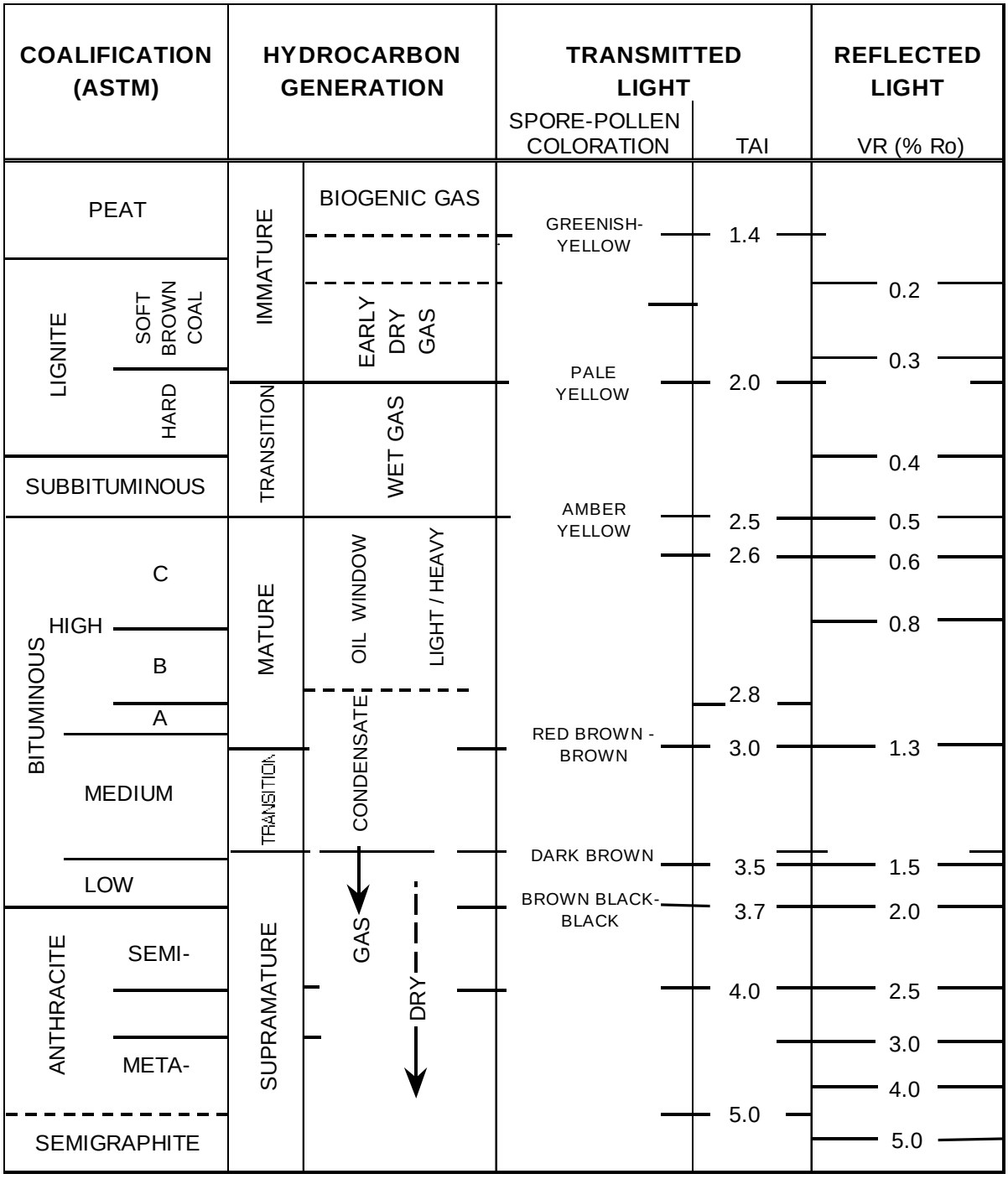


Figure 1. Correlation of Thermal Alteration Index (TAI) and Vitrinite Reflectance (VR) values to hydrocarbon generation. Modified from Heroux, Y., Chagnou, A. and Bertrand, R., (1979).

Shell OCS Y-1413 #1 (Burger)

	SAMPLE	TAI	KEROGEN TYPES (%)			VR	REMARKS
	(Feet)		A	H	W-F	(Avg Ro)	
1	670-940	2.0-2.3	-	10	90	-	
2	1210-1480	2.0-2.3	-	10	90	0.32	
3	1750-2020	2.0-2.3	-	20	80	-	
4	2290-2560	2.3-2.5	10	20	70	0.50	
5	2830-3100	2.3-2.5	-	10	90	-	
6	3370-3640	2.5-3.0	T	10	90	0.52	
7	3910-4180	2.3-2.8	10	20	70	-	
8	4450-4720	2.5	-	20	80	0.51	
9	4990-5080	2.3-2.5	10	15	75	-	
10	5260-5350	2.3-2.5	70	10	20	0.56?	Sparse vitrinite
11	5530-5620	2.3-2.5	80	10	10	-	
12	5830-6100	2.5	60	30	10	0.53?	Sparse vitrinite
13	6370-6640	2.5	30	40	30	-	
14	6910-7180	2.5	80	10	10	?	Insufficient vitrinite
15	7450-7720	2.5	40	40	20	-	
16	7990-8200	2.5	30	20	50	0.70	

A = amorphous, H = herbaceous (includes palynomorphs), W-F = woody-fusinitic, T = trace

TABLE 1 Thermal Alteration Index (TAI), percent of kerogen types, and Vitrinite Reflectanc

Vitrinite Reflectance

A Leitz MPV-II photometer system and Leitz Orthoplan microscope were used to make the V.R. measurements. This equipment was integrated with a desktop computer for data recording and manipulation.

Eight samples were prepared for V.R. (R_o) measurements. Of this total, measurements were conducted on seven samples. Two of the measured samples have questionable results due to their sparse vitrinite recoveries.

The individual V.R. measurements, histogram plots and calculated averages are given in the Appendix. The average V.R. values of the measured samples are also included in Table I. Figure 2 is a graphic display of the average V.R. for each sample in a semi-log plot.

The V.R. averages agree with the T.A.I. estimates for the depth at which a mature level of thermal alteration was reached.

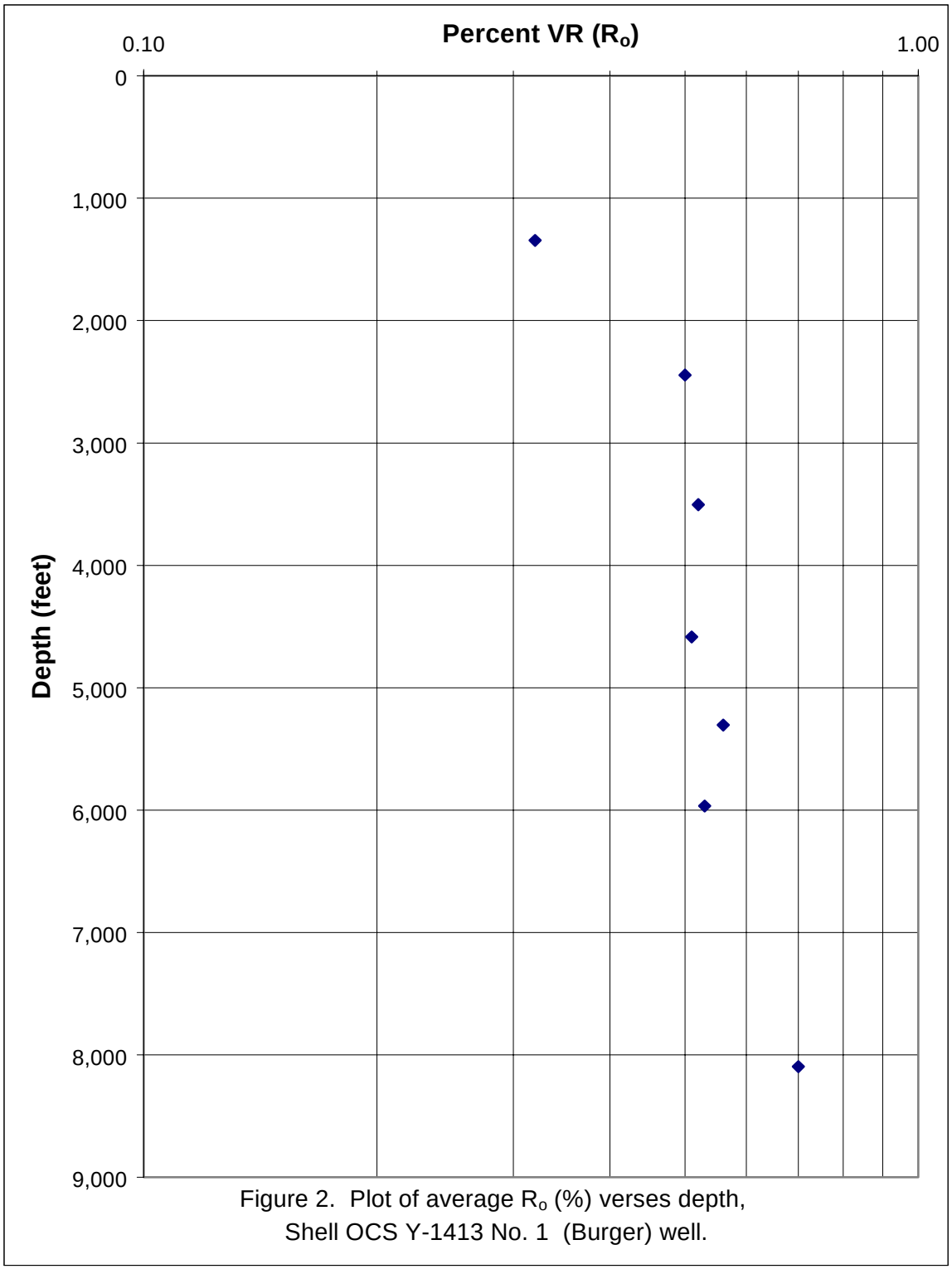


Figure 2. Plot of average R_o (%) verses depth,
Shell OCS Y-1413 No. 1 (Burger) well.

REFERENCE

Heroux, Y., Chagnou, A. and Bertrand, R., 1979. Compilation and correlation of major thermal maturation indicators: Bull. Am. Assoc. Petr. Geol., 63: pp. 2128-2144.

APPENDIX

VITRINITE REFLECTANCE DATA

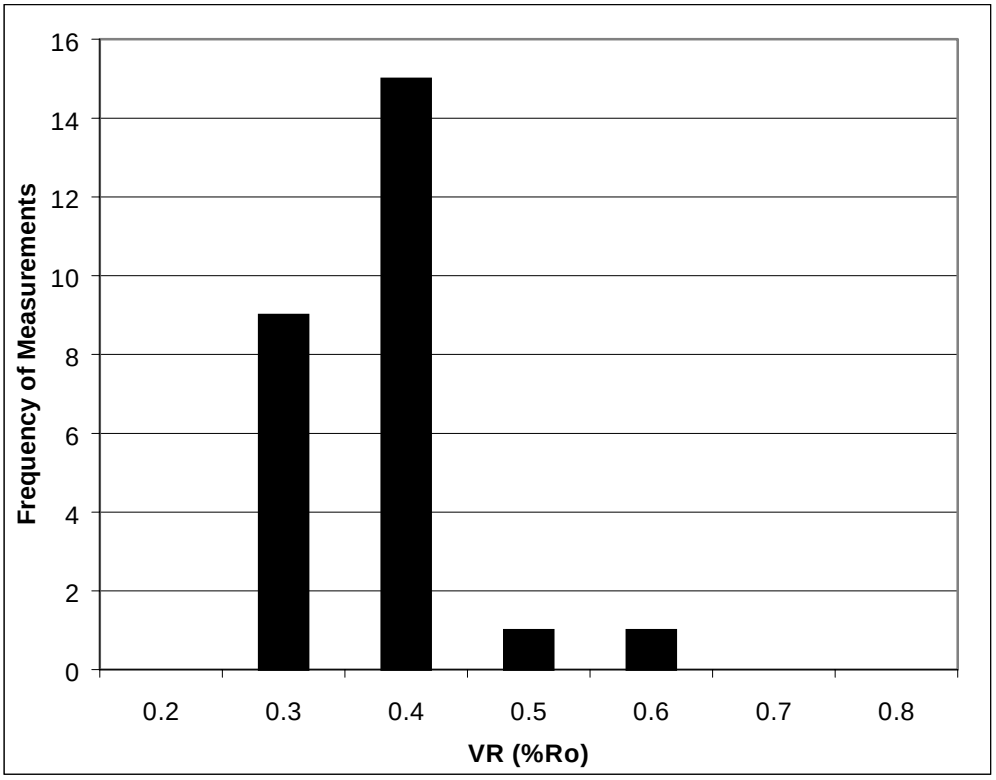
Shell OCS Y-1413 #1 (Burger)

Sample Depth: 1210-1480'

VR Measurements:

0.21	0.30	0.35			
0.24	0.31	0.36			
0.25	0.32	0.37			
0.25	0.32	0.38			
0.26	0.32	0.48			
0.27	0.33	0.52			
0.27	0.33				
0.28	0.34				
0.28	0.34				
0.30	0.35				

Number of meas: 26 **Median:** 0.32
Average: 0.32 **Stand. Dev:** 0.07



Shell OCS Y-1413 #1 (Burger)

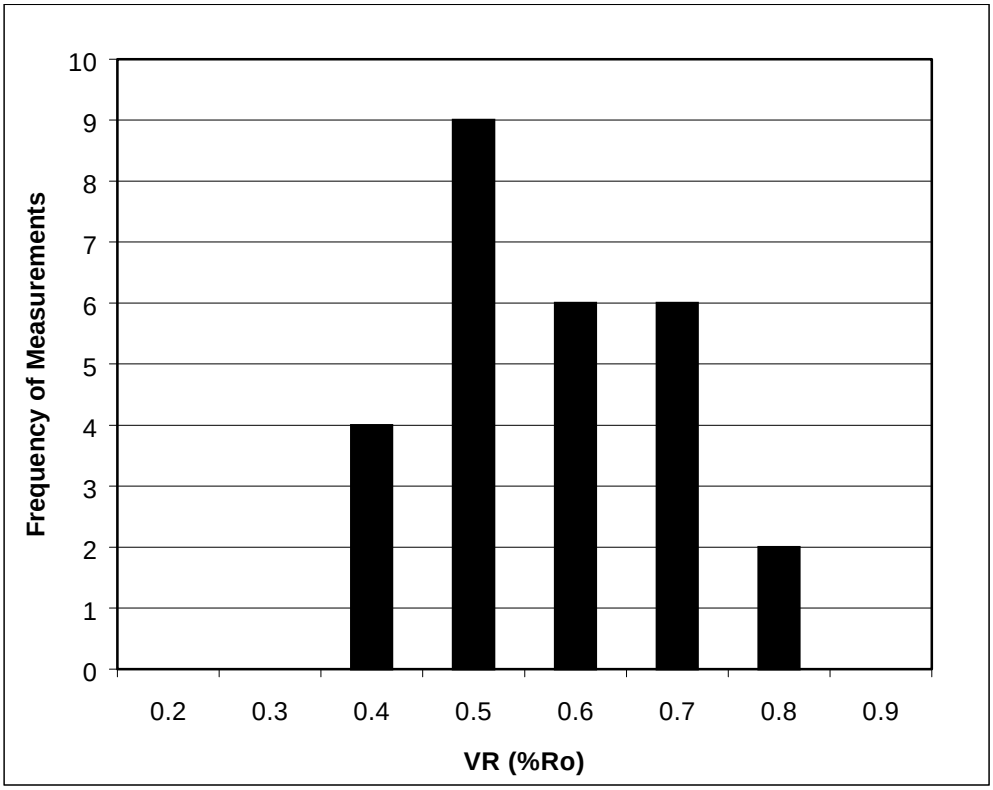
Sample Depth: 2290-2560'

VR Measurements:

0.32	0.45	0.61			
0.32	0.45	0.61			
0.37	0.45	0.62			
0.39	0.50	0.62			
0.40	0.51	0.66			
0.40	0.53	0.70			
0.40	0.55	0.70			
0.43	0.56				
0.44	0.58				
0.44	0.61				

Number of meas: 27 **Median:** 0.50

Average: 0.50 **Stand. Dev:** 0.11



Shell OCS Y-1413 #1 (Burger)

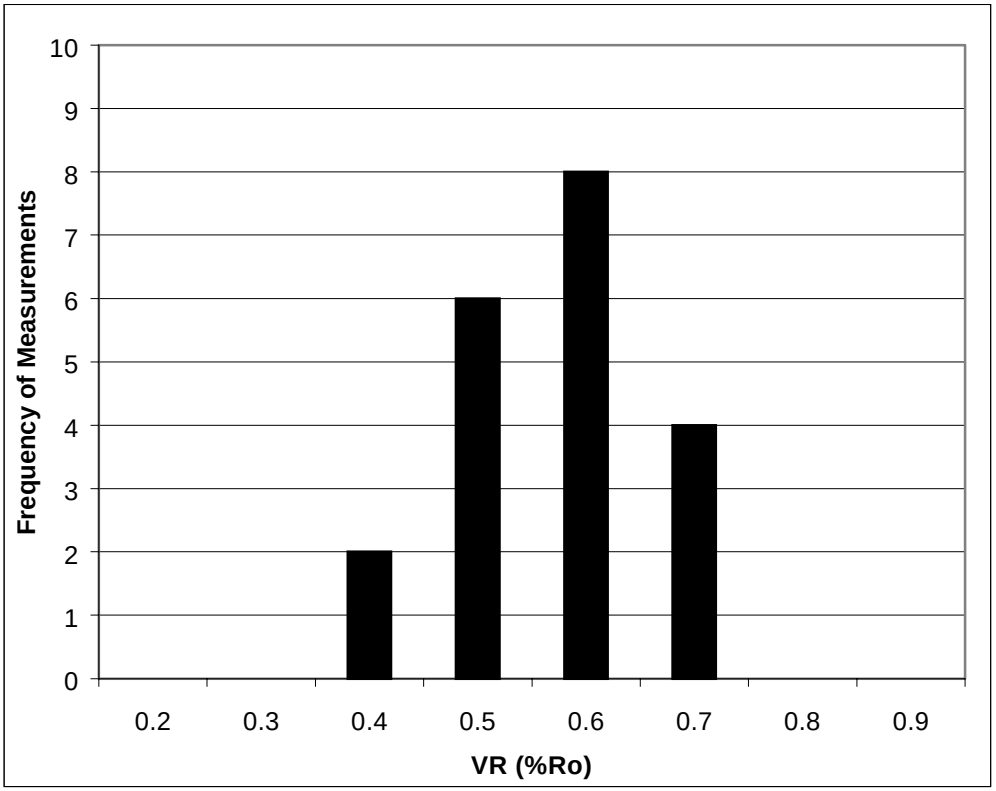
Sample Depth: 3370-3640'

VR Measurements:

0.37	0.54				
0.37	0.56				
0.41	0.57				
0.41	0.58				
0.41	0.59				
0.42	0.59				
0.46	0.61				
0.49	0.67				
0.51	0.68				
0.51	0.68				

Number of meas: 20 **Median:** 0.53

Average: 0.52 **Stand. Dev:** 0.10



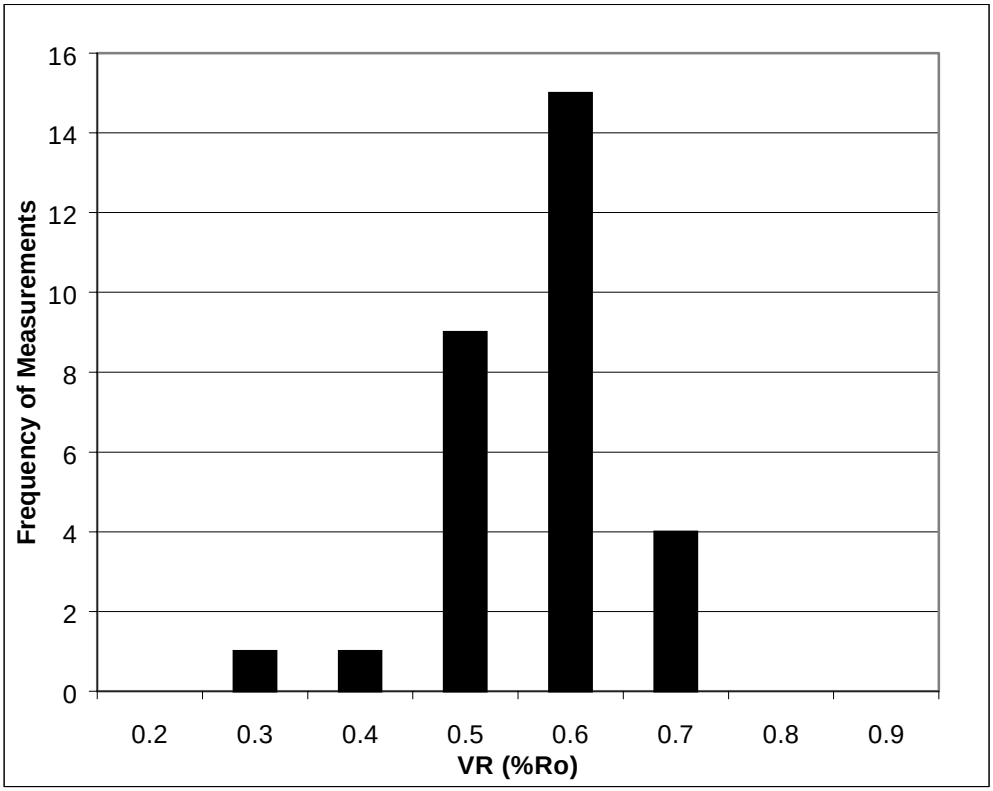
Shell OCS Y-1413 #1 (Burger)

Sample Depth: 4450-4720'

VR Measurements:

0.28	0.49	0.53			
0.39	0.50	0.53			
0.41	0.50	0.54			
0.42	0.50	0.55			
0.42	0.51	0.56			
0.44	0.52	0.59			
0.45	0.52	0.60			
0.47	0.52	0.61			
0.47	0.52	0.61			
0.49	0.53	0.69			

Number of meas:	30	**Median:**	0.52
Average:	0.51	**Stand. Dev:**	0.08



Shell OCS Y-1413 #1 (Burger)

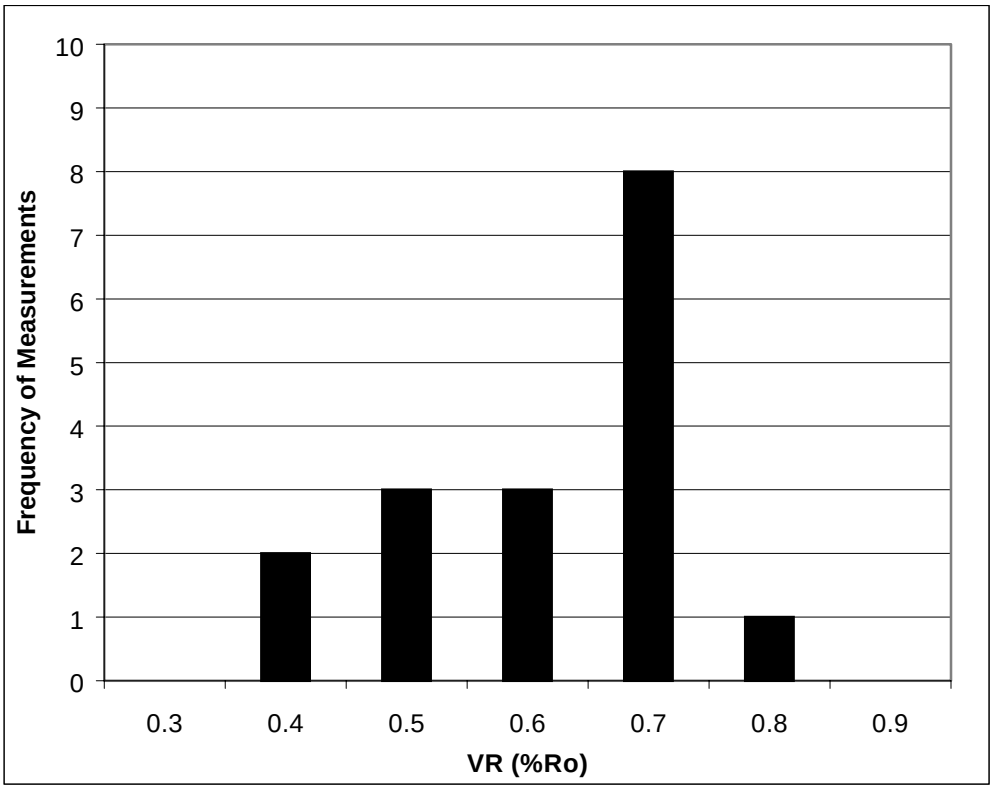
Sample Depth: 5260-5350'

VR Measurements:

0.38	0.62				
0.39	0.63				
0.41	0.65				
0.43	0.65				
0.44	0.65				
0.55	0.66				
0.55	0.76				
0.56					
0.60					
0.62					

Number of meas: 17 **Median:** 0.60

Average: 0.56 **Stand. Dev:** 0.11



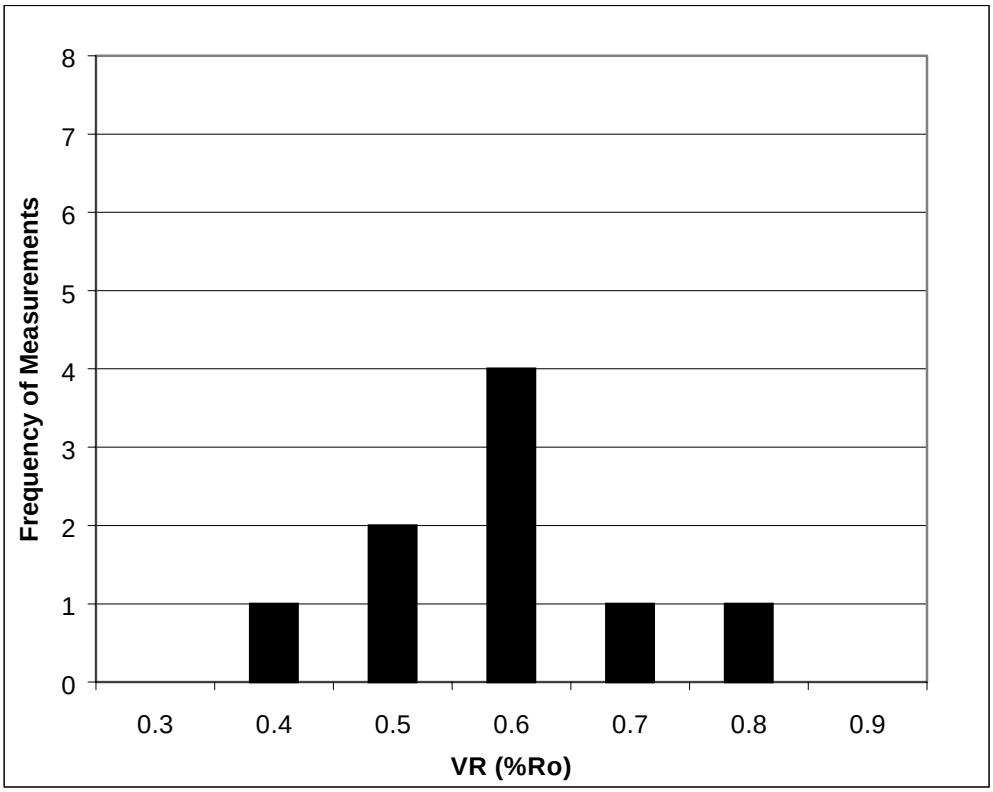
Shell OCS Y-1413 #1 (Burger)

Sample Depth: 5830-6100'

VR Measurements:

0.35					
0.46					
0.47					
0.50					
0.52					
0.54					
0.54					
0.63					
0.75					

Number of meas:	9	**Median:**	0.52
Average:	0.53	**Stand. Dev:**	0.11



Shell OCS Y-1413 #1 (Burger)

Sample Depth: 7990-8200'

VR Measurements:

0.44	0.68	0.83			
0.51	0.69	0.84			
0.57	0.70	0.84			
0.57	0.74	0.86			
0.59	0.74	0.88			
0.61	0.76				
0.62	0.76				
0.67	0.77				
0.68	0.79				
0.68	0.79				

Number of meas:	25	**Median:**	0.70
Average:	0.70	**Stand. Dev:**	0.11