MICROPALEO CONSULTANTS, INC.

CHEVRON USA

AKULIK NO. 1

API #50-207-20001

SEC. 23, T5S/R49W UM

NORTH SLOPE, ALASKA

Prepared by:

Michael B. Mickey - Foraminifera

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BIOSTRATIGRAPHY REPORT

Job No. 21-106 **June, 2002**

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Hauterivian
KE_{H}

Discussion. Steeply dipping, folded and/or faulted flysch deposition?

FORAMINIFERA REPORT

Interpreted by

Michael B. Mickey

FORAMINIFERA SUMMARY

60-7400'

Age.	Early Cretaceous Aptian	
Zones.	F-10 to F-11	
Environment.	60-2140':	Upper to Middle Bathyal (Upper to Middle Slope)
	2140-7400':	Bathyal (Slope)
Discussion.	Steeply dipping, folded and/or faulted flysch deposition?	

7400-9380'

Age.	Early Cretaceous Barremian
Zone.	F-12
Environment.	Bathyal (Slope)
Discussion.	Steeply dipping, folded and/or faulted flysch deposition?

9380-17,038'T.D.

Age.	Early Cretaceous Hauterivian
Zone.	F-13a
Environment.	Bathyal (Slope)
Discussion.	Steeply dipping, folded and/or faulted flysch deposition?

INTRODUCTION

Scope

Micropaleo Consultants, Inc. processed, picked and analyzed for Foraminifera 195 ditch samples from the Chevron USA Akulik No. 1 well. These samples covered the interval 60 to 17,038 feet total depth. This work was done as part of M.C.I. Job Number 21-106.

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. A Foraminifera Distribution Chart (Figure F-1) 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

60-7400'

Age.	Early Cretaceous Aptian	
Zones.	F-10 to F-11	
Environment.	60-2140':	Upper to Middle Bathyal (Upper to Middle Slope)
	2140-7400':	Bathyal (Slope)
Fauna.	*Verneuilinoides borealis, Trochamminoides* sp. (small, thin), *Bathysiphon vitta, Saccammina lathrami, Gaudryina* cf. *tailleuri, Ammodiscus* sp. (small, thin), *Haplophragmoides excavatus, H.* cf. *linki, Ammobaculites fragmentarius, Miliammina* cf. *ischnia, Psamminopelta bowsheri, Gaudryinella irregularis, Thuramminoides septagonalis*, charophytes, paper shale, pyrite and rare to common scattered detrital? coal.	
Discussion.	Steeply dipping, folded and/or faulted flysch deposition?	

7400-9380'

Age. Early Cretaceous
Barremian

Zone. F-12

Environment. Bathyal
(Slope)

Fauna. *Ammobaculites erectus, Haplophragmoides coronis,* pyrite, and frequent rounded frosted quartz floating sand grains at 8120-8210 feet.

Discussion. Steeply dipping, folded and/or faulted flysch deposition?

9380-17,038'T.D.

Age. Early Cretaceous
Hauterivian

Zone. F-13a

Environment. Bathyal
(Slope)

Fauna. *Haplophragmoides coronis, H. duoflatis, Ammobaculites reophacoides, Gaudryina tailleuri, Glomospira subarctica, Oolina apiculata,* pyrite, and rare rounded frosted quartz floating sand grains at 13,200-13,290 feet.

Discussion. Steeply dipping, folded and/or faulted flysch deposition?

CONCLUSIONS

The Chevron USA Akulik No. 1 well penetrated the following biostratigraphic sequence based on foraminiferal analysis:

- 16,978+ feet (60-17,038'T.D.) of Hauterivian to Aptian age (Early Brookian) probably steeply dipping, folded and/or faulted slope flysch deposition.

PALYNOLOGY REPORT

Interpreted by:

Hideyo Haga

PALYNOLOGY SUMMARY

60-4140'

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

4140-10,190'

Age.	Probable Early Cretaceous Probable Aptian - Early Albian
Zone.	Probably continues in P-M18
Environment.	Marginal Marine
Remarks.	Poor palynomorph recoveries.

10,190-15,900'

Age.	Early Cretaceous Neocomian (Probable Hauterivian)
Zone.	Probable P-M19
Environment.	Marginal Marine
Remarks.	Limited palynomorph assemblage.

15,900-17,038'T.D.

Age.	Indeterminate
Zone.	Indeterminate
Environment.	No evidence of marine.

INTRODUCTION

Purpose and Scope

Micropaleo Consultants, Inc. conducted palynological analyses on 196 ditch and 11 conventional core samples from the Chevron USA Akulik No. 1 well. The samples were taken between 60 feet and the total depth of 17,038 feet.

This report provides an updated format from the palynomorph data.

Procedures

The sample material was obtained from the State of Alaska, Department of Natural Resources, Geological Materials Center in Eagle Creek, Alaska. All processed material is on reposit at that facility.

The samples were processed with standard palynologic techniques using hydrochloric, hydrofluoric and nitric acid treatments. Sonification, 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 nitric acid.

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 subdivision. The environment, as interpreted from the palynological preparations, is merely categorized as marginal marine. This is based on the presence and relatively low diversity and abundance 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

60-4140'

Age.	Early Cretaceous Aptian to Early Albian
Zone.	P-M18
Environment.	Marginal Marine
Palynomorphs.	This interval is characterized by a limited diversity of Cretaceous palynomorphs. The assemblage includes sporadic occurrences of the dinocyst species *Cyclonephelium distinctum*, *Gardodinium trabeculosum*, *Odontochitina operculata* and *Oligosphaeridium complex*. These forms suggest an Early Cretaceous age. Several recorded species of spore-pollen and dinocysts are obviously reworked from Neocomian and older strata.
Discussion.	This assemblage, although not highly age diagnostic, is characteristic of the Torok Formation. The age assignment is based largely on the absence of Middle - Late Albian markers.

4140-10,190'

Age.	Probable Early Cretaceous Probable Aptian to Early Albian
Zone.	Probably continues in P-M18
Environment.	Marginal Marine
Palynomorphs.	A sharp decline in palynomorph recoveries in noted for this interval. The spore-pollen assemblage consists of *Deltoidospora*, reworked *Densosporites*, *Lycopodiumsporites* and undifferentiated bisaccates. The dinocysts are essentially absent.
Discussion.	This interval is probably a continuation of the overlying section and represents a very poorly fossiliferous Torok Formation facies.

10,190-15,900'

Age.	Early Cretaceous Neocomian (Probable Hauterivian)
Zone.	Probable P-M19
Environment.	Marginal Marine
Palynomorphs.	The single important species that defines this interval is the dinocyst *Oligosphaeridium complex* (thick-wall). Other species recorded are *Cyclonephelium distinctum* and *Odontochitina operculata*.
Discussion.	The most common species *Oligosphaeridium complex* (thick-wall) occurs through the Neocomian, but with the presence of *Odontochitina operculata* and the absence of other definitive species a tentative Hauterivian age is assigned.

15,900-17,038'T.D.

Age.	Indeterminate
Zone.	Indeterminate
Environment.	No evidence of marine.
Palynomorphs.	The palynomorph recoveries are very sparse and sporadic. The recorded forms may all be derived from up-hole.

CONCLUSIONS

Palynological analysis of the Chevron USA Akulik No. 1 well provides the following palynostratigraphic subdivisions:

- Marginal marine strata of Aptian - Early Albian age occur from 60 feet to 4140 feet.

- It appears that the Aptian - Early Albian section probably continues down to 10,190 feet.

- Marginal marine strata of probable Hauterivian age are present from 10,190 feet to 15,900 feet.

- The bottom interval from 15,900 feet to the total depth of 17,038 feet is of indeterminate age.

KEROGEN MATURATION REPORT

Interpreted by:

Hideyo Haga

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

Maturation levels of the kerogen residues from the Chevron USA Akulik No. 1 well were determined by visual, Thermal Alteration Index (T.A.I.) estimates, and by vitrinite reflectance (V.R.) measurements. A chart correlating the two methods with hydrocarbon generation is given in Figure 1.

Unoxidized fractions of selected kerogen samples were used to make T.A.I. slides and V.R. resin mounts. The V.R. resin "plugs" were cut and polished in preparation for the reflectance measurements.

Thermal Alteration Index

Sixty-one (61) T.A.I. samples were prepared and analyzed. The sample composite intervals used are essentially all at 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 and 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 attained at about 2500 feet and continues to about 10,000 feet. Below 10,000 feet the strata are in the supramature facies.

The organic quality indicates a dominance of gas-prone kerogen material in the entire well.

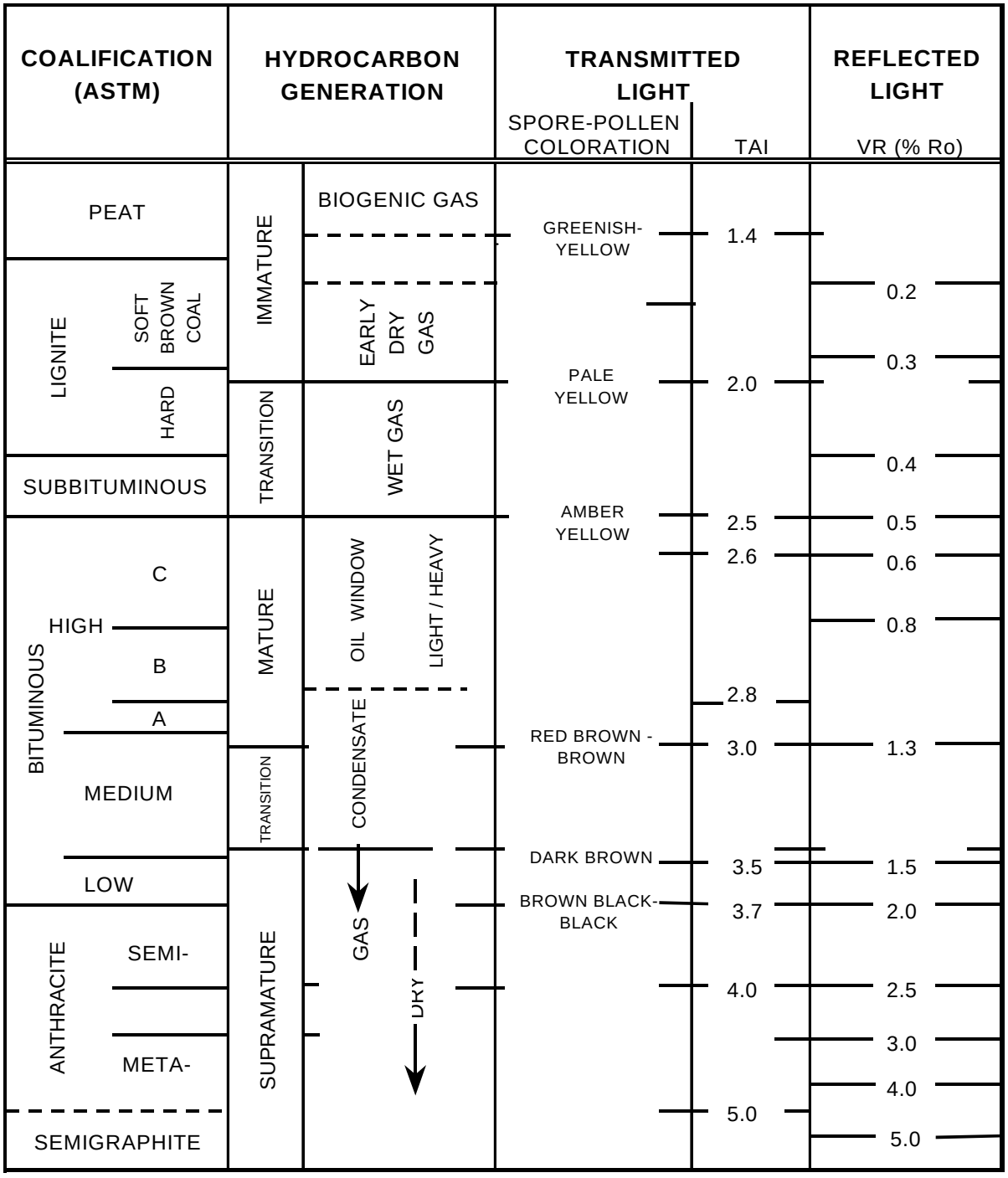


Figure 1. Correlation of Thermal Alteration Index (TAI) and Vitrinite Reflectance (VR) values to hydrocarbon generation. Modified from Heroux, Y., Chagnou, A. and Bertrand, R., (1979).

Chevron Akulik No.1

	SAMPLE (Feet)	TAI	KEROGEN TYPES (%) A	H	W-F	VR Avg Ro	REMARKS
1	60-380	2.0-2.3	10?	20	70		
2	380-700	2.3		20	80	0.55	
3	700-1020	2.3		20	80		
4	1020-1340	2.0-2.3	T	20	80	0.54	
5	1340-1660	2.3	T	20	80		
6	1660-1980	2.3	20	20	60	0.64	
7	1980-2300	2.3	T	20	80		
8	2300-2620	2.3		10	90	0.71	
9	2620-2940	2.3-2.5	T	20	80	0.83	
10	2940-3260	2.3-2.5		10	90	0.80	
11	3260-3580	2.5-3.0	10	20	70	1.02	
12	3580-3900	2.5-3.0	10	10	80	0.90	
13	3900-4220	2.5-3.0	10	20	70	1.04	
14	4220-4540	2.5-3.0	10	20	70	0.87	Poor VR spl
15	4540-4880	2.5-3.0	10	10	80	1.34	
16	4880-5150	2.5-3.0		20	80	1.17	
17	5150-5420	2.5-3.0	10	10	80	1.42	
18	5420-5690	3.0	T	10	90	1.36	
19	5690-5960	2.5-3.0+		10	90		
20	5960-6230	2.5-3.0+	T	20	80	1.36	
21	6230-6500	2.5-3.0+	10	10	80	1.46	
22	6500-6770	2.5-3.0+	T	10	90	1.46	
23	6770-7040	2.7-3.0+	T	10	90		
24	7040-7310	2.7-3.0+		10	90	1.50	
25	7310-7580	2.7-3.0+	T	10	90		
26	7580-7850	2.7-3.0+		10	90	1.39	
27	7850-8210	2.7-3.0+	T	15	85		
28	8210-8480	2.7-3.0+	10	10	80	1.25	
29	8480-8750	3.0+	10	10	80		
30	8750-9020	2.5-3.0+	10	20	70	1.62	
31	9020-9290	2.7-3.0+		10	90		
32	9290-9560	2.7-3.0+		10	90	1.78	
33	9560-9880	2.7-3.0+	10	20	70		
34	9880-10100	3.5	T	10	90	2.01	
35	10100-10370	3.5		10	90		

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

TABLE 1 Thermal Alteration Index (TAI), Kerogen Types, and Vitrinite Reflectance (VR).

Chevron Akulik No.1

	SAMPLE (Feet)	TAI	KEROGEN TYPES (%) A	H	W-F	VR Avg Ro	REMARKS
36	10370-10640	3.5		20	80	2.17	
37	10640-10910	3.5		10	90		
38	10910-11180	3.5		20	80	2.24	
39	11180-11450	3.5		20	80		
40	11450-11670	3.5		30	70	2.23	Begin redrill spls. Small VR spl
41	11670-11940	3.5		10	90		
42	11940-12210	3.5		20	80		Organics v. corroded or pulveri
43	12210-12480	3.5	?	30?	70?	2.21	As above
44	12480-12750	3.5		20?	80?		As above
45	12750-13020	3.0		20?	80?	2.19	As above
46	13020-13290	3.0		20?	80?		As above
47	13340-13430	3.2		30	70		Original hole spl.
48	13700-13790	3.2		40	60		Original hole spl.
49	13880-13970	3.2		30	70		Original hole spl.
50	14240-14330	3.2		40	60		Original hole spl.
51	14370-14640					2.23	
52	14510-14600	3.2		60	40		Original hole spl.
53	14690-14770	3.2		50	50		Original hole spl.
54	14910-15180	3.0-3.5		30?	70?	2.36	Organics = corroded?
55	15180-15450	3.5	10?	30?	60?		As above
56	15450-15720	3.5		30	70	2.65 **?**	As above. Poor VR spl.
57	15720-15990	3.5	10?	30?	60?		As above.
58	15990-16260	3.0-3.5		40?	60		As above.
59	16260-16530	3.5		30	70	2.89 **?**	As above. V. poor VR spl.
60	16530-16800	3.5		30	70		As above.
61	16800-17038TD	3.5	10?	30?	60?	2.94 **?**	As above. V. poor VR spl.

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

TABLE 1 Continued

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.

Thirty-three (33) samples were used for V.R. (R_o) measurements. 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 indicate that the well is within the mature range for hydrocarbon generation from 60 feet down to about 10,000 feet. Below 10,000 feet the section is in the supramature range where only dry gas would be expected.

The maturity of the section at the top of the well suggests that a significant volume of overburden has been removed at this location.

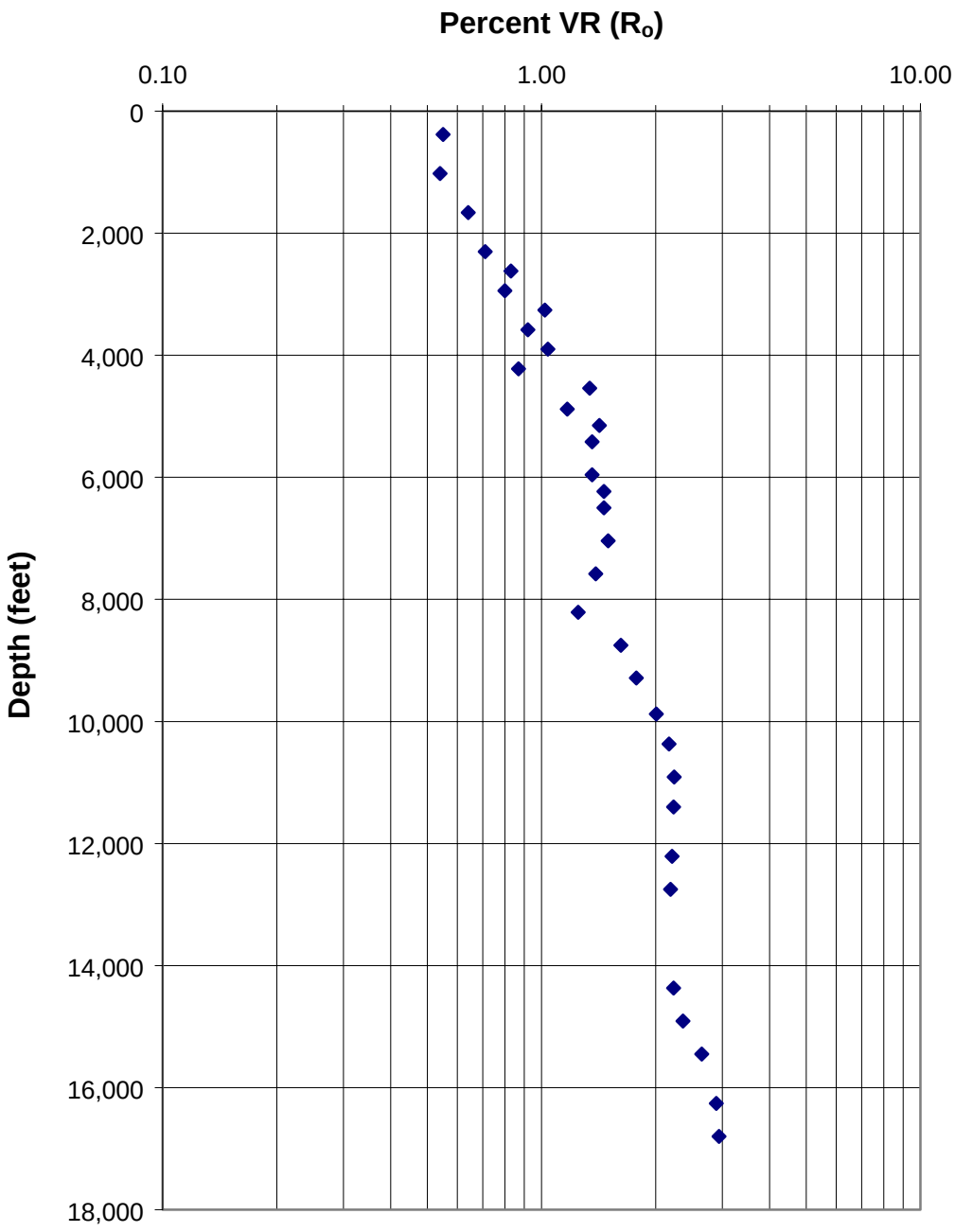


Figure 2. Plot of average R_o (%) verses depth,
Chevron Akulik No. 1

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

Chevron Akulik No.1

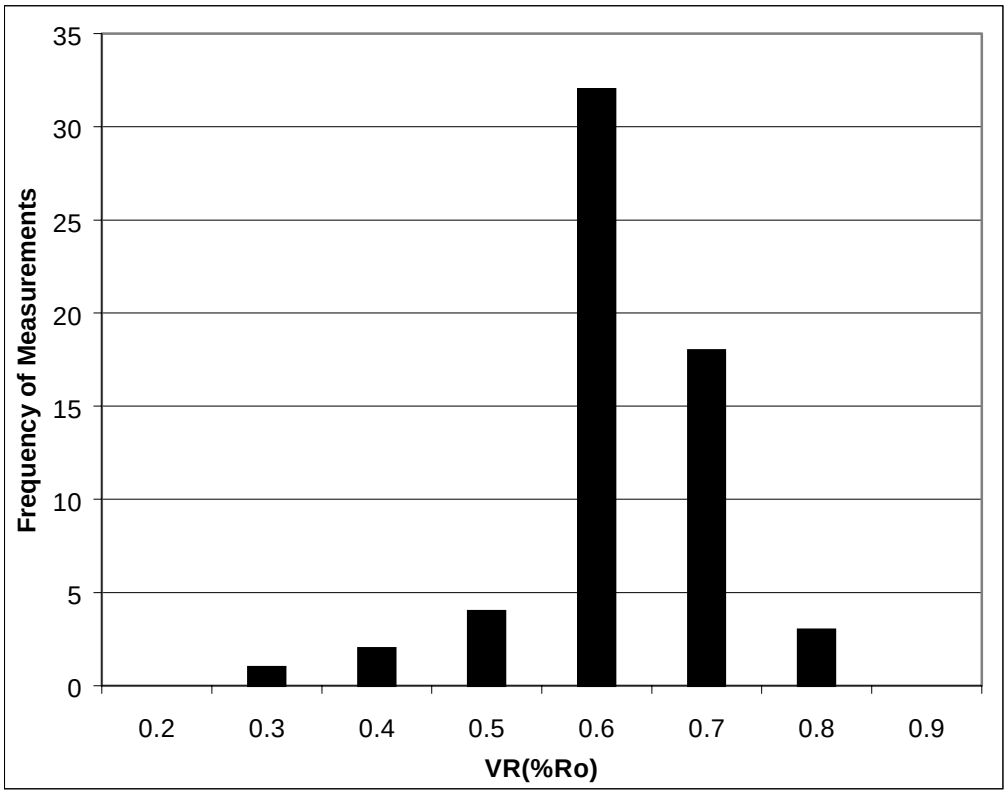
Sample Depth: 380-700' Ditch

VR Measurements:

0.33	0.25	0.52	0.38	0.49	0.54	
0.44	0.47	0.52	0.51	0.50	0.55	
0.50	0.48	0.53	0.53	0.52	0.59	
0.52	0.52	0.56	0.53	0.52	0.60	
0.52	0.52	0.59	0.53	0.54	0.60	
0.53	0.58	0.61	0.53	0.63	0.60	
0.55	0.62	0.62	0.54	0.63	0.61	
0.56	0.63	0.63	0.54	0.64	0.62	
0.56	0.69	0.69	0.55	0.66	0.62	
0.57	0.71	0.71	0.59	0.73	0.64	

Number of meas: 60 **Median:** 0.55

Average: 0.56 **Stand. Dev:** 0.08



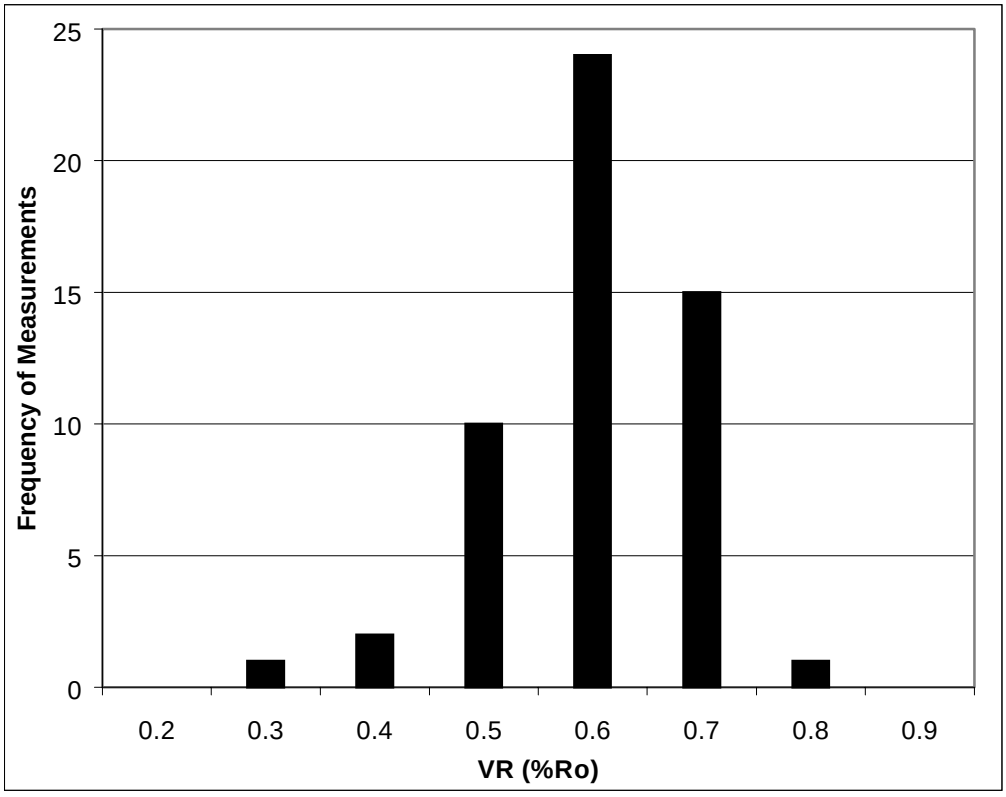
Chevron Akulik No.1

Sample Depth: 1020-1340' Ditch

VR Measurements:

0.50	0.46	0.30	0.38	0.22	0.46
0.51	0.50	0.44	0.42	0.41	0.56
0.51	0.51	0.48	0.44	0.44	0.58
0.51	0.52	0.50	0.46	0.47	
0.60	0.56	0.52	0.51	0.52	
0.62	0.57	0.55	0.52	0.54	
0.64	0.59	0.57	0.52	0.57	
0.65	0.62	0.65	0.57	0.58	
0.66	0.66	0.66	0.60	0.61	
0.68	0.68	0.75	0.68	0.64	

Number of meas:	53	**Median:**	0.54
Average:	0.54	**Stand. Dev:**	0.10



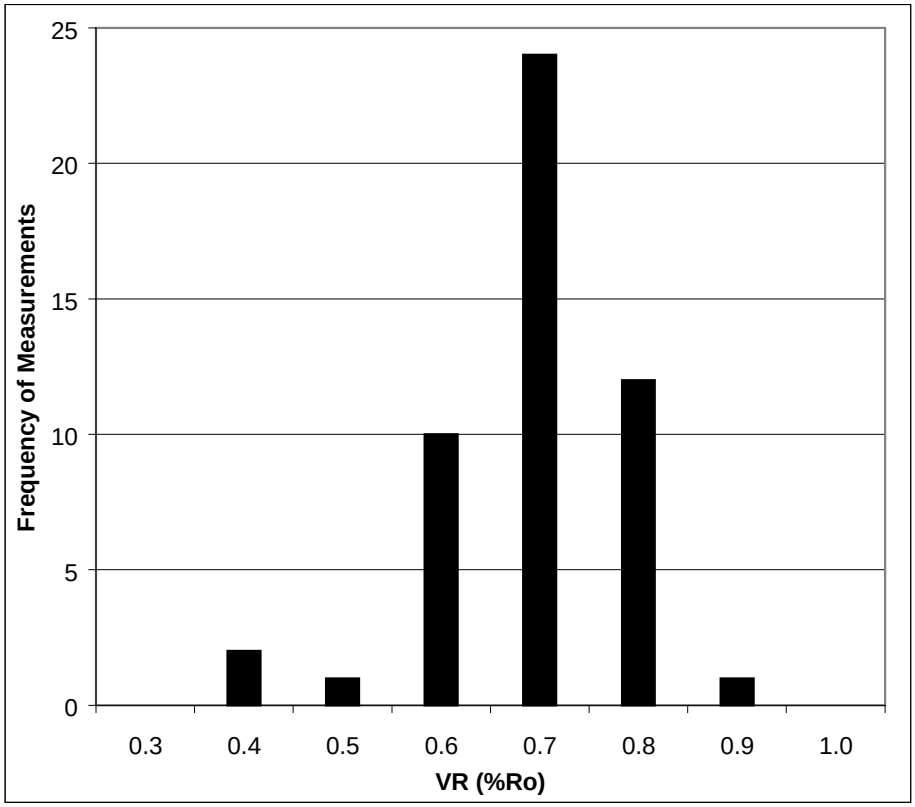
Chevron Akulik No.1

Sample Depth: 1660-1980' Ditch

VR Measurements:

0.34	0.59	0.33	0.59	0.59	
0.44	0.60	0.54	0.59	0.59	
0.58	0.61	0.59	0.60	0.59	
0.58	0.64	0.60	0.64	0.61	
0.62	0.65	0.60	0.65	0.62	
0.64	0.69	0.61	0.67	0.67	
0.71	0.69	0.63	0.68	0.69	
0.75	0.70	0.63	0.68	0.70	
0.78	0.72	0.68	0.71	0.76	
0.79	0.77	0.72	0.80	0.77	

Number of meas:	50	**Median:**	0.64
Average:	0.64	**Stand. Dev:**	0.10



Chevron Akulik No.1

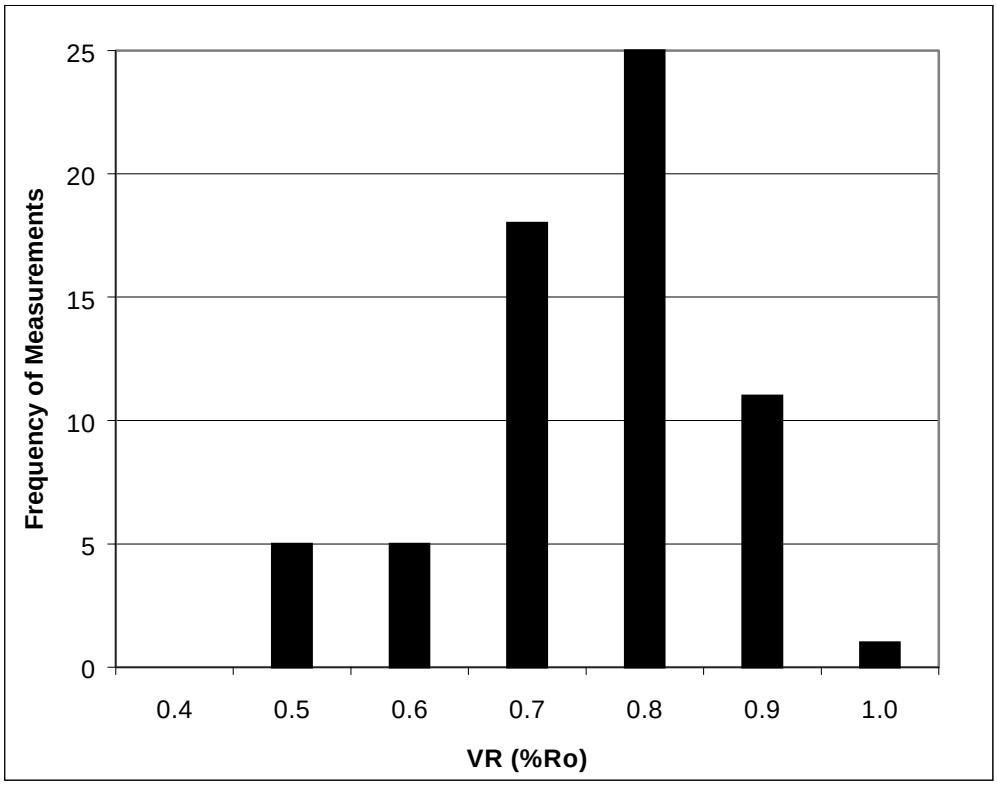
Sample Depth: 2300-2620' Ditch

VR Measurements:

0.51	0.47	0.48	0.66	0.49	0.42	0.60
0.54	0.62	0.59	0.66	0.70	0.47	0.61
0.59	0.68	0.65	0.72	0.73	0.54	0.67
0.66	0.69	0.67	0.79	0.74	0.65	0.73
0.66	0.72	0.69	0.79	0.75	0.66	0.78
0.67	0.74	0.73	0.81	0.78	0.66	
0.77	0.76	0.74	0.81	0.78	0.69	
0.80	0.78	0.76	0.85	0.78	0.76	
0.81	0.82	0.77	0.86	0.79	0.77	
0.82	0.89	0.85	0.90	0.80	0.79	

Number of meas: 65 **Median:** 0.73

Average: 0.71 **Stand. Dev:** 0.11



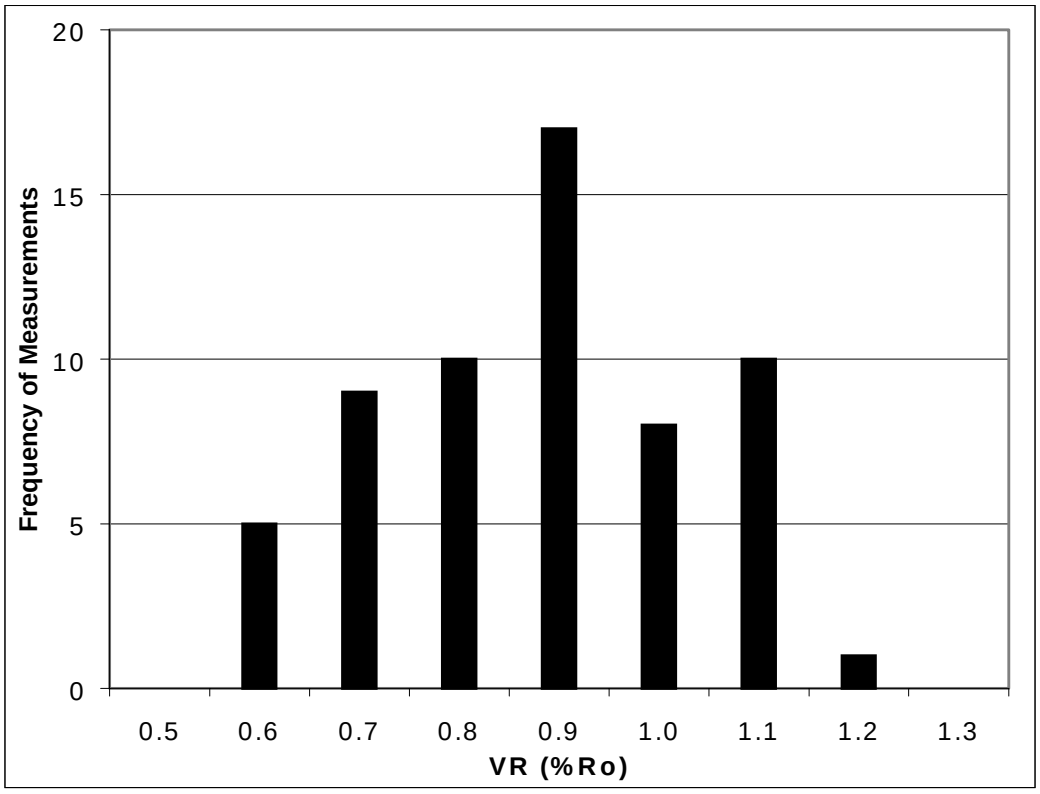
Chevron Akulik No.1

Sample Depth: 2620-2940' Ditch

VR Measurements:

0.62	0.67	0.64	0.53	0.55	0.59
0.64	0.72	0.64	0.54	0.56	0.65
0.80	0.76	0.64	0.71	0.64	0.76
0.82	0.82	0.73	0.77	0.65	0.79
0.83	0.84	0.77	0.80	0.75	0.83
0.88	0.87	0.80	0.81	0.79	0.85
1.00	0.96	0.81	0.83	0.82	0.85
1.02	1.02	0.86	0.96	1.01	0.96
1.02	1.06	0.97	0.99	1.07	0.99
1.05	1.07	0.98	1.06	1.17	0.99

Number of meas	60	**Median:**	0.82
Average:	0.83	**Stand. Dev:**	0.16



Chevron Akulik No.1

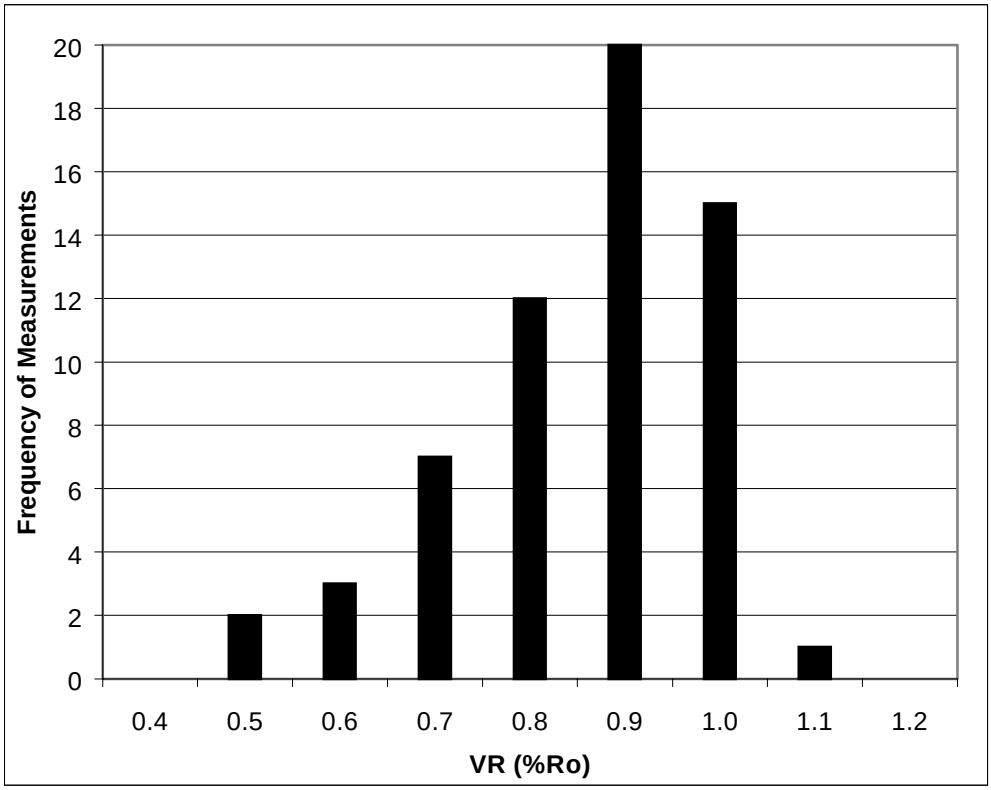
Sample Depth: 2940-3260' Ditch

VR Measurements:

0.66	0.68	0.49	0.54	0.67	0.48
0.74	0.69	0.67	0.56	0.76	0.63
0.75	0.71	0.80	0.58	0.78	0.75
0.84	0.72	0.80	0.69	0.80	0.78
0.87	0.74	0.81	0.72	0.85	0.81
0.87	0.87	0.85	0.77	0.86	0.81
0.89	0.87	0.87	0.79	0.88	0.89
0.90	0.89	0.88	0.90	0.92	0.90
0.90	0.90	0.95	0.93	0.94	0.91
0.92	0.91	0.98	0.96	0.95	1.05

Number of meas: 60 **Median:** 0.83

Average: 0.80 **Stand. Dev:** 0.12



Chevron Akulik No.1

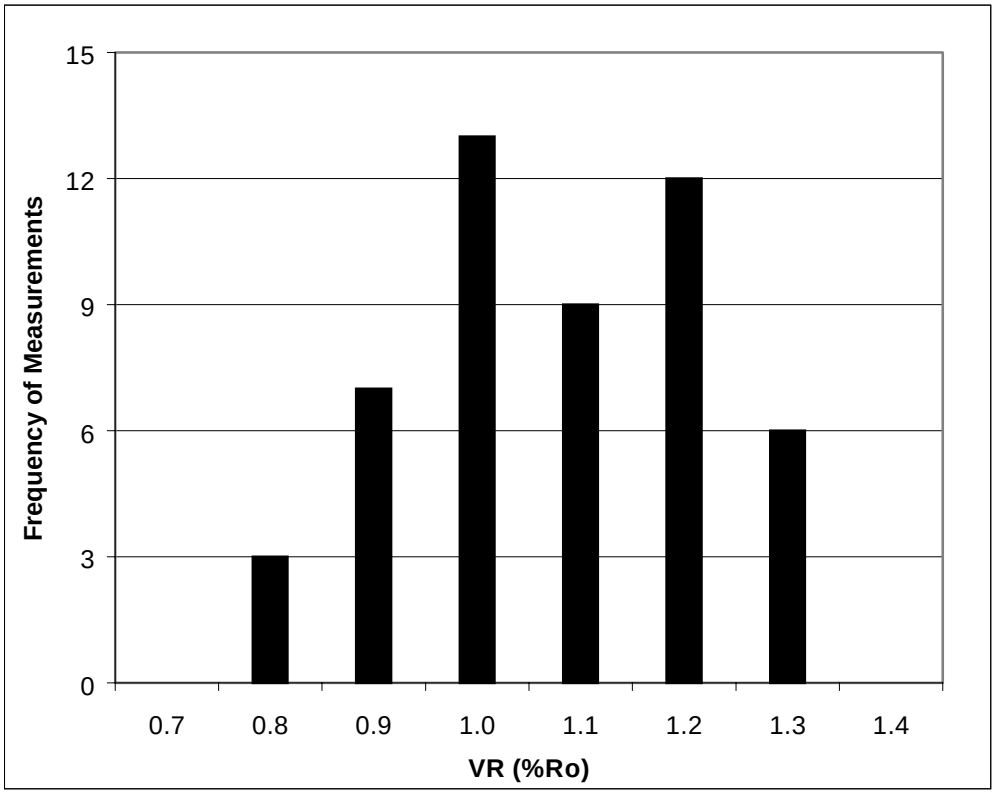
Sample Depth: 3260-3580' Ditch

VR Measurements:

0.72	0.78	0.90	0.73	0.81	
0.90	0.85	0.96	0.82	0.82	
0.94	0.91	0.98	0.86	0.85	
0.99	0.94	1.06	0.89	0.95	
1.05	0.98	1.07	0.91	0.95	
1.06	1.00	1.10	0.94	1.05	
1.09	1.03	1.15	1.10	1.09	
1.11	1.11	1.16	1.17	1.12	
1.11	1.15	1.20	1.18	1.21	
1.16	1.26	1.24	1.21	1.23	

Number of meas: 50 **Median:** 1.04

Average: 1.02 **Stand. Dev:** 0.14



Chevron Akulik No.1

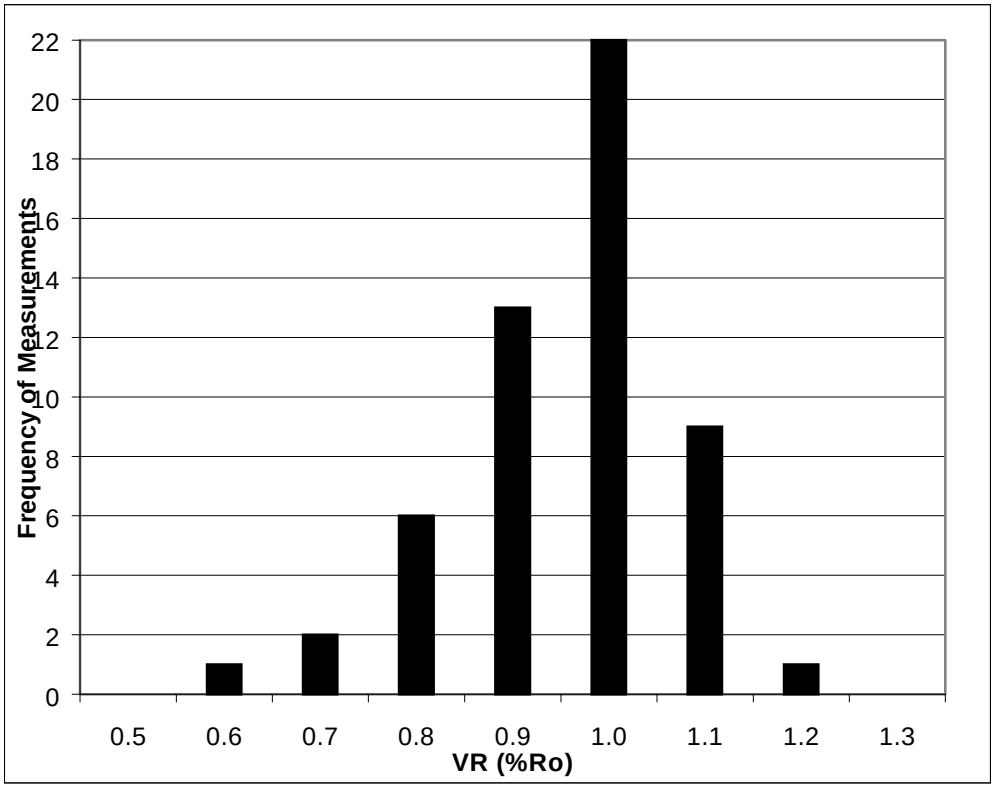
Sample Depth: 3580-3900' Ditch

VR Measurements:

0.54	0.78	0.70	0.66	0.80	0.86
0.77	0.81	0.79	0.67	0.91	0.90
0.77	0.86	0.83	0.74	0.92	0.91
0.86	0.86	0.84	0.85	0.94	0.95
0.88	0.90	0.89	0.88	0.95	
0.94	0.90	0.97	0.89	1.01	
0.95	0.93	0.98	0.93	1.01	
0.95	0.98	0.99	0.93	1.01	
0.99	0.99	1.01	0.96	1.01	
1.00	1.01	1.03	1.13	1.08	

Number of meas: 54 **Median:** 0.92

Average: 0.90 **Stand. Dev:** 0.11



Chevron Akulik No.1

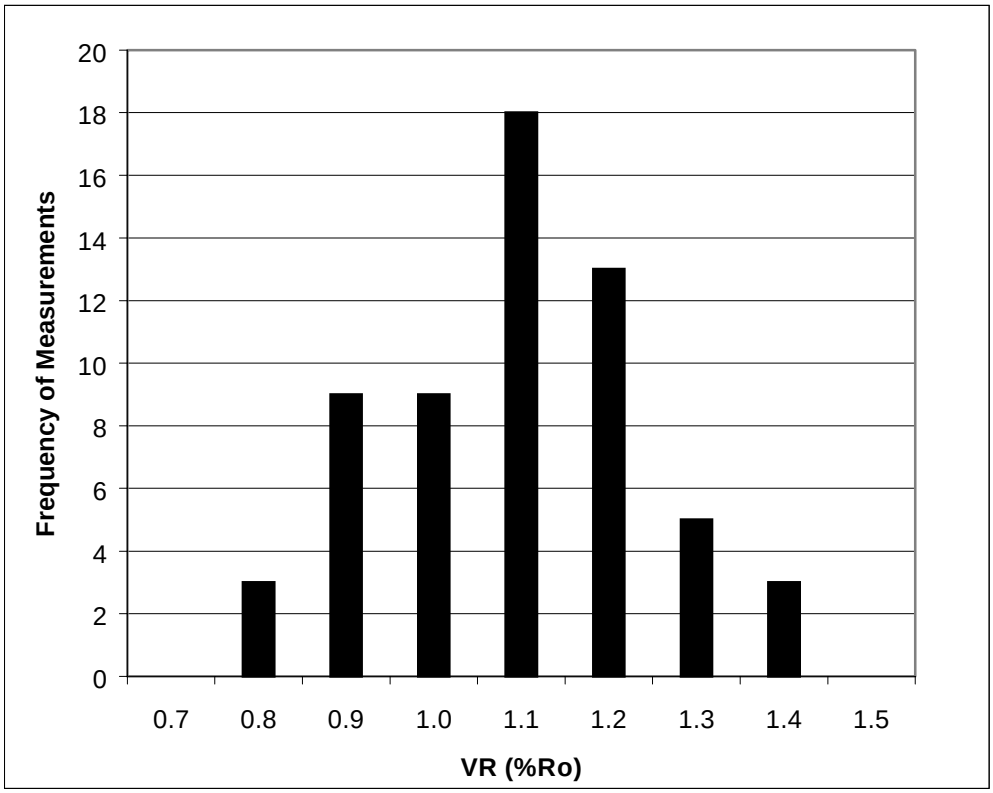
Sample Depth: 3900-4220' Ditch

VR Measurements:

0.76	0.87	0.87	0.74	0.84	0.95
0.79	0.93	0.88	0.83	0.85	0.96
0.88	0.94	0.97	0.88	0.88	0.96
0.99	1.00	1.01	0.92	0.95	1.01
1.05	1.05	1.02	1.01	1.01	1.02
1.07	1.11	1.02	1.07	1.05	1.02
1.07	1.19	1.08	1.11	1.05	1.12
1.07	1.20	1.13	1.11	1.19	1.13
1.17	1.21	1.19	1.12	1.27	1.15
1.22	1.23	1.36	1.30	1.32	1.16

Number of meas: 60 **Median:** 1.04

Average: 1.04 **Stand. Dev:** 0.14



Chevron Akulik No.1

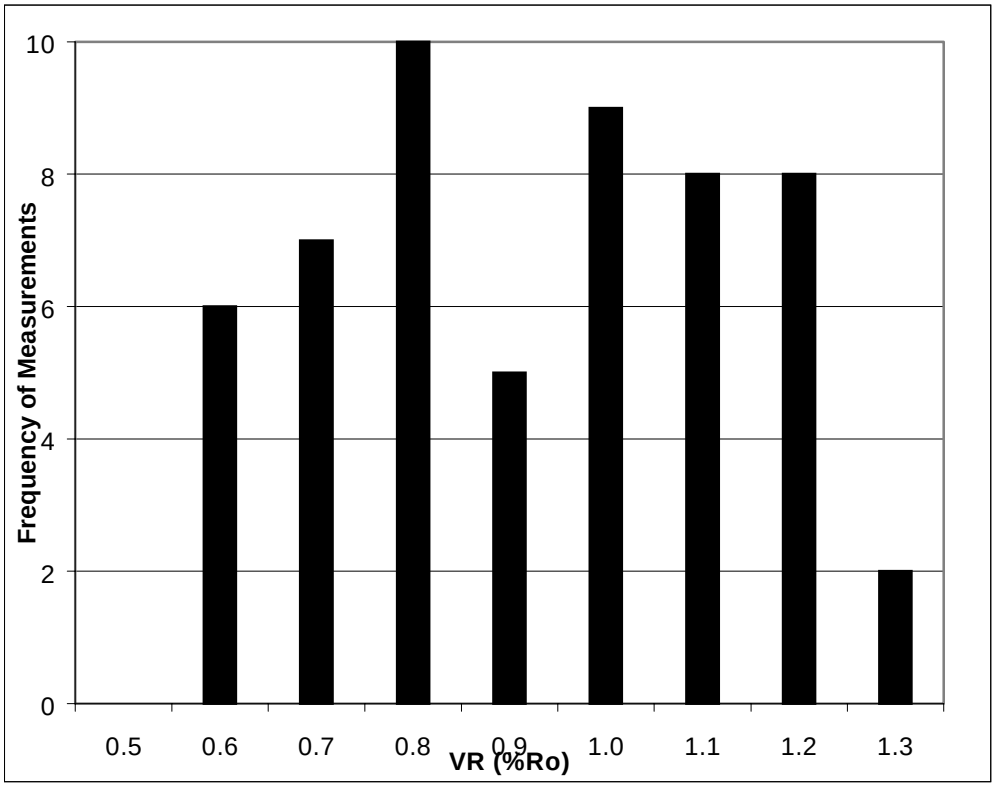
Sample Depth: 4220-4540' Ditch

VR Measurements:

0.55	0.57	0.57	0.51	0.61	0.53
0.61	0.84	0.63	0.64	0.69	0.59
0.65	0.88	0.70	0.69	0.71	0.77
0.71	0.94	0.87	0.72	0.81	0.89
0.72	0.95	0.97	0.73	0.90	1.12
0.73	1.08	0.98	0.76	1.02	
0.90	1.09	1.03	0.77	1.04	
0.92	1.10	1.04	1.06	1.04	
0.93	1.10	1.14	1.15	1.10	
0.95	1.23	1.16	1.27	1.15	

Number of meas: 55 **Median:** 0.89

Average: 0.87 **Stand. Dev:** 0.21

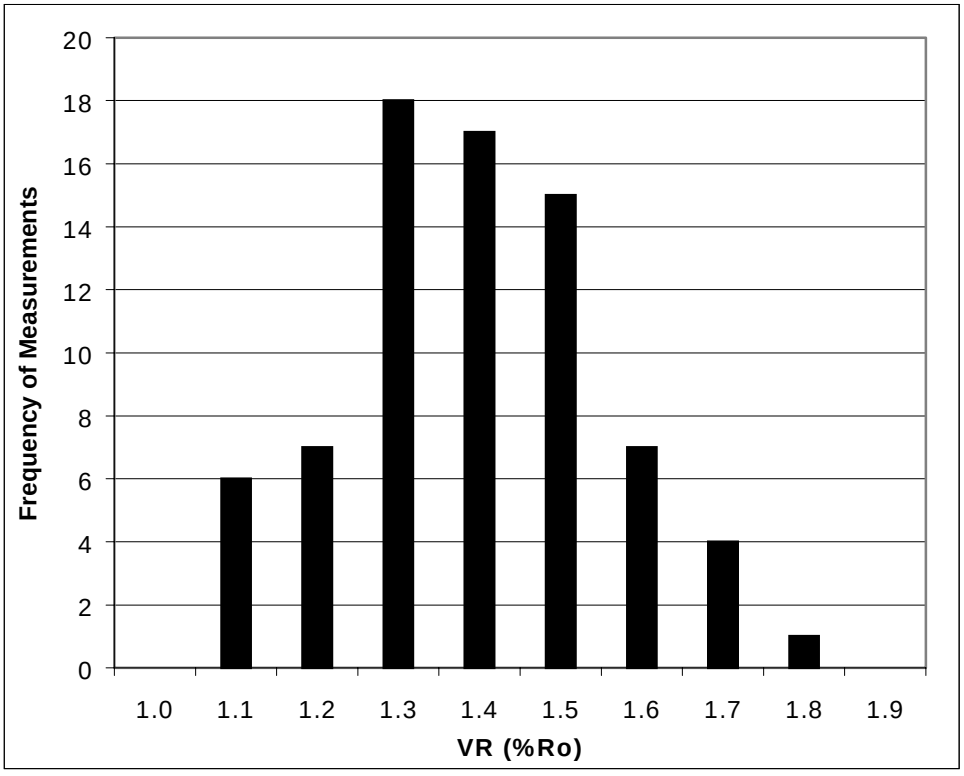


Chevron Akulik No.1

Sample Dep 4540-4880' Ditch
VR Measurements:

1.07	1.07	1.02	1.28	1.08	1.01	1.09	1.18
1.26	1.21	1.14	1.29	1.11	1.11	1.21	1.20
1.29	1.26	1.14	1.40	1.14	1.19	1.25	1.22
1.32	1.32	1.21	1.41	1.22	1.21	1.29	1.22
1.44	1.36	1.28	1.43	1.25	1.30	1.30	1.24
1.47	1.44	1.31	1.43	1.30	1.30	1.32	
1.50	1.45	1.34	1.46	1.33	1.37	1.42	
1.51	1.47	1.35	1.53	1.33	1.42	1.48	
1.69	1.57	1.38	1.58	1.39	1.49	1.49	
1.74	1.68	1.39	1.69	1.60	1.50	1.53	

Number of n 75 **Median:** 1.32
Average: 1.34 **Stand. Dev:** 0.16



Chevron Akulik No.1

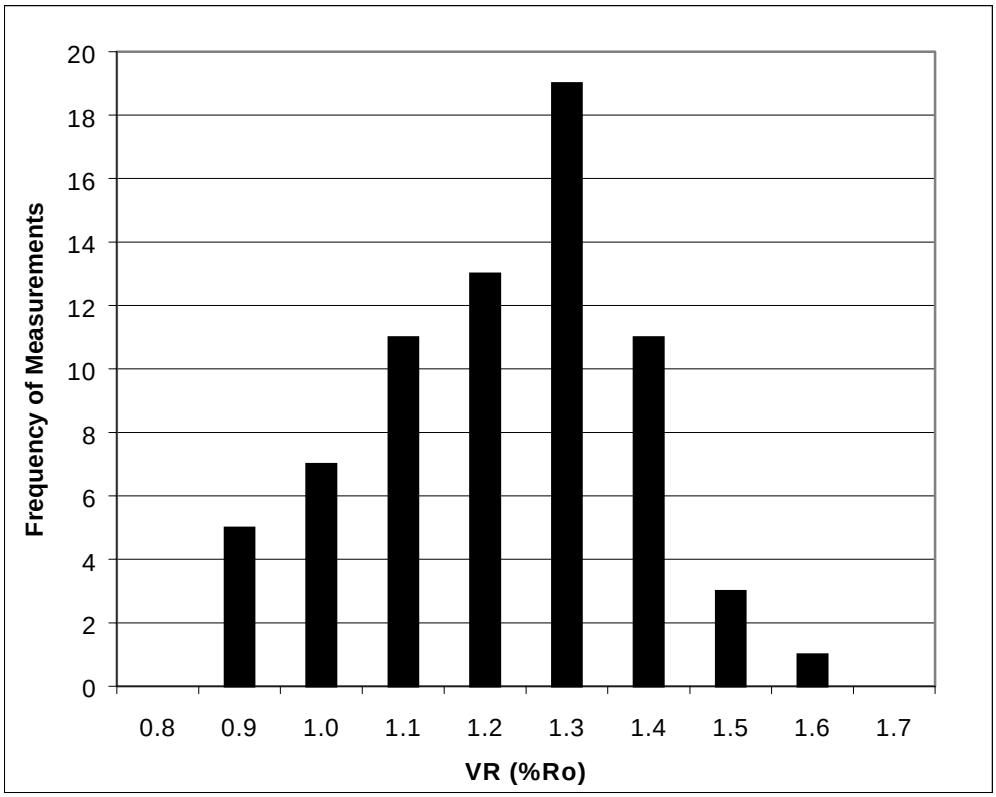
Sample Depth: 4880-5150' Ditch

VR Measurements:

1.06	0.93	0.86	0.86	0.86	0.89	0.85
1.06	0.98	0.95	0.97	0.94	0.99	0.99
1.12	1.15	1.04	1.06	1.07	1.04	1.09
1.23	1.16	1.09	1.15	1.08	1.19	1.16
1.24	1.19	1.09	1.16	1.09	1.23	1.16
1.27	1.21	1.12	1.22	1.12	1.25	1.21
1.30	1.24	1.17	1.30	1.23	1.26	1.22
1.41	1.26	1.19	1.32	1.23	1.29	1.25
1.41	1.39	1.21	1.36	1.35	1.31	1.26
1.57	1.47	1.27	1.36	1.39	1.39	1.30

Number of meas: 70 **Median:** 1.19

Average: 1.17 **Stand. Dev:** 0.16



Chevron Akulik No.1

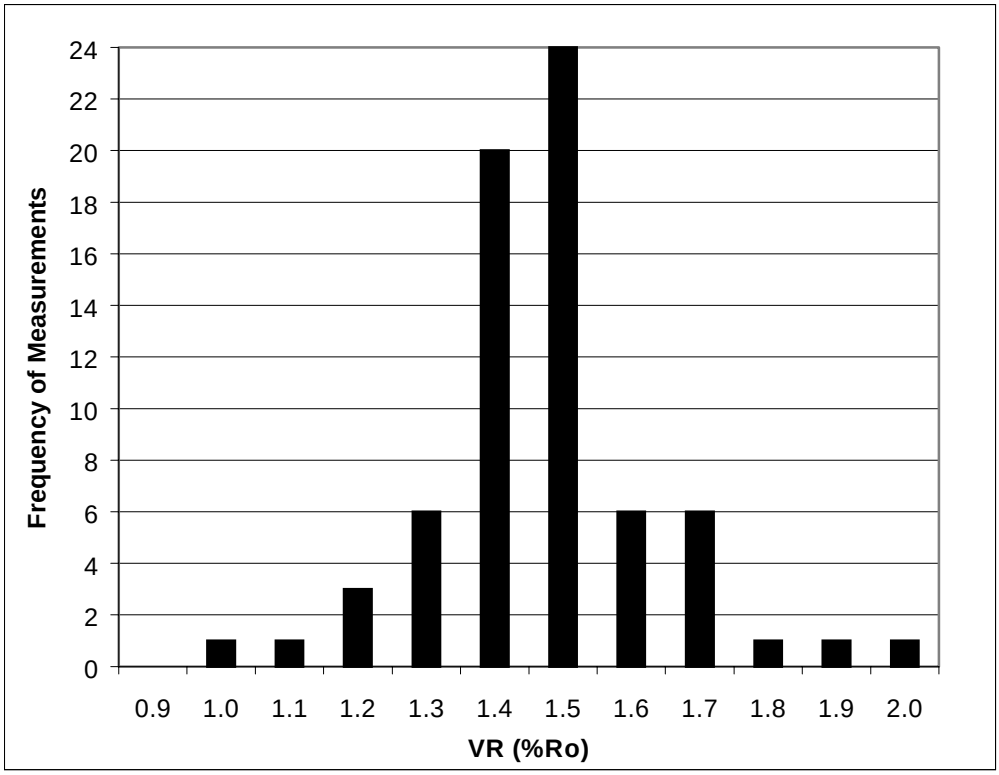
Sample Depth: 5150-5420' Ditch

VR Measurements:

1.27	1.08	1.31	1.30	0.97	1.26	1.19
1.27	1.12	1.34	1.32	1.18	1.34	1.27
1.31	1.30	1.37	1.32	1.39	1.35	1.27
1.40	1.35	1.38	1.37	1.40	1.38	1.27
1.40	1.36	1.39	1.40	1.42	1.40	1.41
1.40	1.38	1.39	1.41	1.44	1.47	1.44
1.49	1.39	1.42	1.41	1.47	1.51	1.44
1.57	1.40	1.47	1.57	1.61	1.60	1.45
1.70	1.43	1.50	1.58	1.69	1.61	1.46
1.83	1.45	1.62	1.58	1.95	1.62	1.49

Number of meas: 70 **Median:** 1.40

Average: 1.42 **Stand. Dev:** 0.16



Chevron Akulik No.1

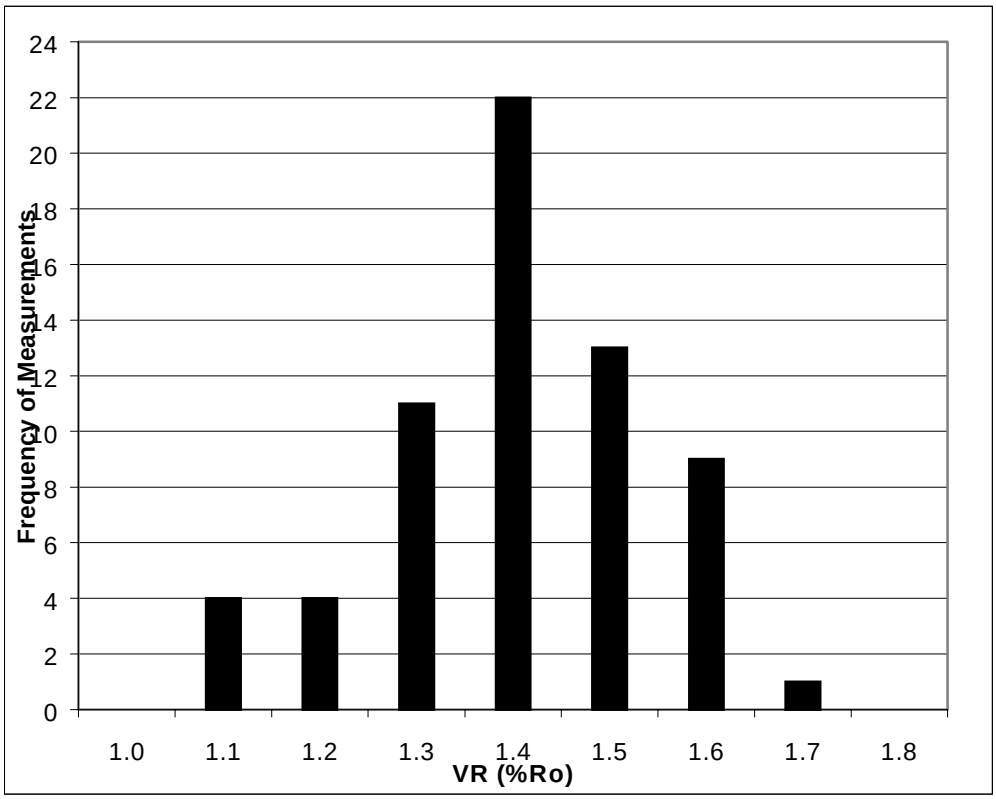
Sample Depth: 5420-5690' Ditch

VR Measurements:

1.17	1.01	1.09	1.03	1.26	1.22	1.08
1.19	1.16	1.15	1.26	1.32	1.28	1.24
1.27	1.26	1.29	1.29	1.33	1.36	1.29
1.34	1.29	1.31	1.30	1.36	1.37	1.46
1.38	1.33	1.33	1.30	1.37	1.40	
1.43	1.36	1.34	1.31	1.38	1.42	
1.46	1.49	1.39	1.34	1.39	1.45	
1.48	1.50	1.45	1.34	1.39	1.51	
1.56	1.52	1.49	1.41	1.47	1.51	
1.57	1.59	1.59	1.48	1.58	1.63	

Number of meas: 64 **Median:** 1.36

Average: 1.36 **Stand. Dev:** 0.14



Chevron Akulik No.1

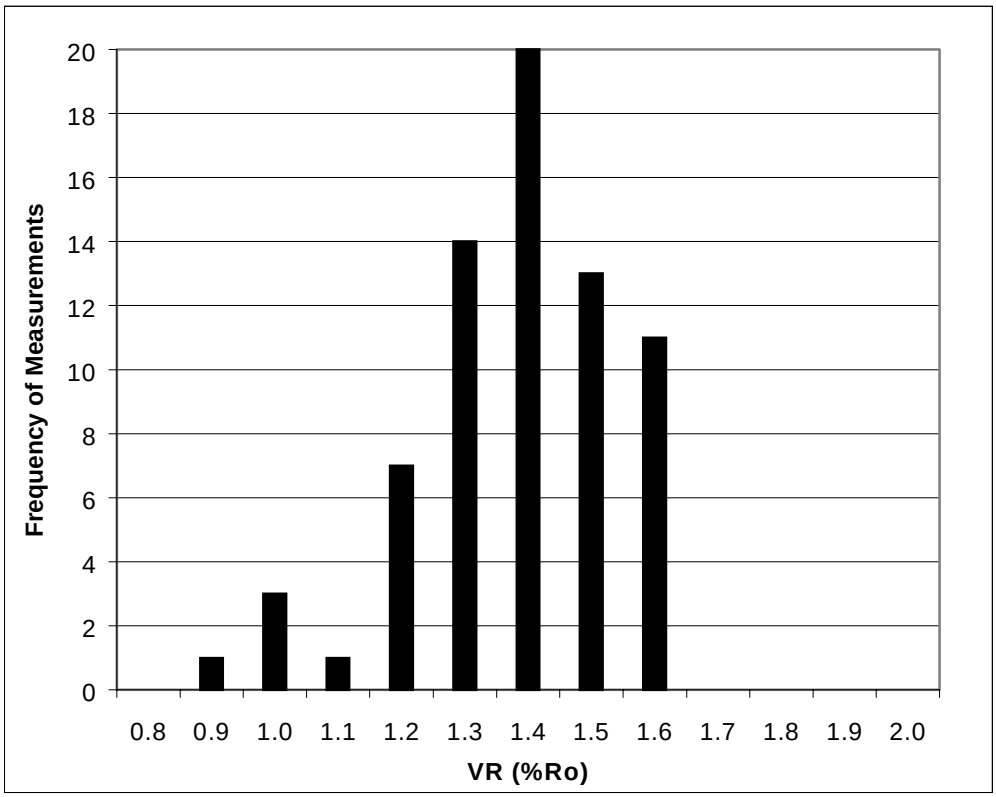
Sample Depth: 5960-6230' Ditch

VR Measurements:

0.85	0.90	0.90	1.11	1.23	1.16	1.07
1.24	1.16	0.99	1.19	1.28	1.29	1.17
1.24	1.24	1.14	1.30	1.33	1.32	1.18
1.24	1.25	1.27	1.32	1.34	1.35	1.27
1.29	1.26	1.29	1.35	1.35	1.36	1.28
1.31	1.36	1.38	1.41	1.37	1.36	1.32
1.32	1.39	1.44	1.43	1.39	1.40	1.36
1.51	1.40	1.44	1.47	1.44	1.41	1.39
1.53	1.47	1.52	1.51	1.46	1.55	1.43
1.57	1.48	1.54	1.54	1.54	1.58	1.55

Number of meas: 70 **Median:** 1.35

Average: 1.33 **Stand. Dev:** 0.16



Chevron Akulik No.1

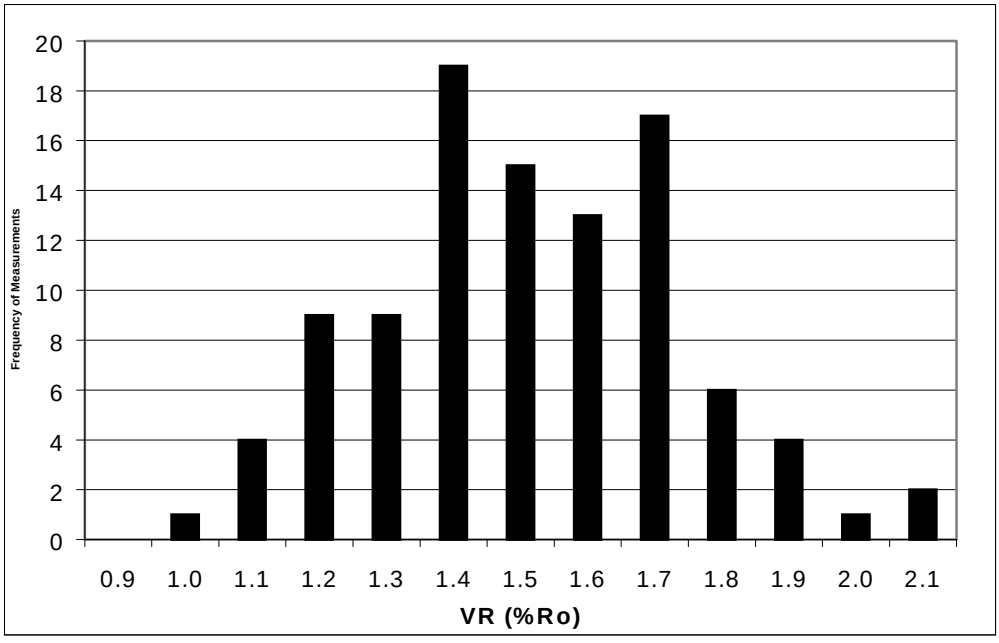
Sample Depth: 6230-6500' Ditch

VR Measurements:

1.23	0.99	1.01	1.06	1.19	1.05	1.17
1.31	1.12	1.09	1.15	1.22	1.18	1.22
1.33	1.17	1.15	1.16	1.30	1.20	1.33
1.36	1.18	1.20	1.30	1.47	1.20	1.35
1.45	1.28	1.26	1.34	1.48	1.31	1.39
1.46	1.34	1.29	1.36	1.48	1.37	1.41
1.53	1.36	1.31	1.37	1.49	1.39	1.44
1.53	1.45	1.31	1.40	1.50	1.48	1.46
1.54	1.47	1.32	1.41	1.56	1.60	1.50
1.56	1.54	1.46	1.57	1.62	1.61	1.63
1.62	1.55	1.51	1.59	1.65	1.64	
1.62	1.61	1.57	1.63	1.68	1.64	
1.63	1.64	1.65	1.79	1.77	1.71	
1.69	1.68	1.80	1.81	1.90	1.73	
1.81	1.75	1.87	2.03	2.03	1.77	

Number of meas: 100 **Median:** 1.46

Average: 1.46 **Stand. Dev:** 0.22



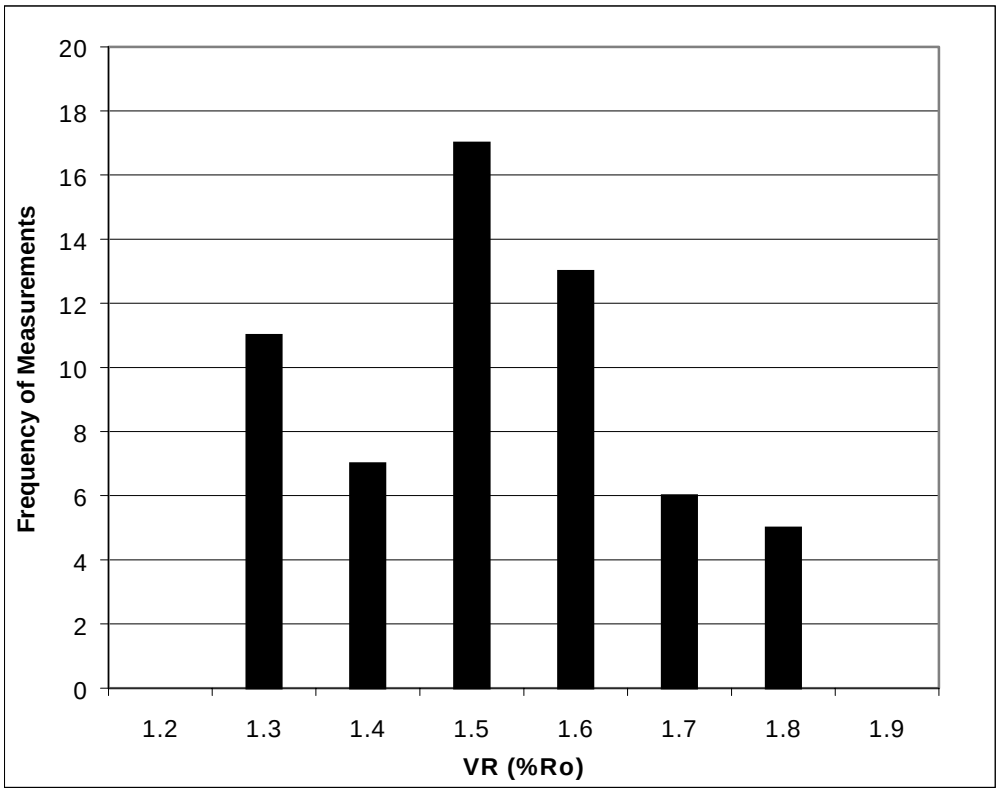
Chevron Akulik No.1

Sample Depth: 6500-6770' Ditch

VR Measurements:

1.22	1.25	1.31	1.26	1.24	1.21	
1.24	1.29	1.33	1.43	1.25	1.23	
1.28	1.38	1.47	1.43	1.36	1.23	
1.30	1.40	1.53	1.49	1.39	1.36	
1.41	1.42	1.53	1.51	1.44	1.42	
1.44	1.43	1.57	1.56	1.45	1.44	
1.48	1.49	1.58	1.58	1.48	1.47	
1.50	1.51	1.60	1.61	1.50	1.53	
1.59	1.77	1.67	1.67	1.51	1.63	
1.66	1.78	1.73	1.77	1.71		

Number of meas:	59	**Median:**	1.47
Average:	1.46	**Stand. Dev:**	0.15



Chevron Akulik No.1

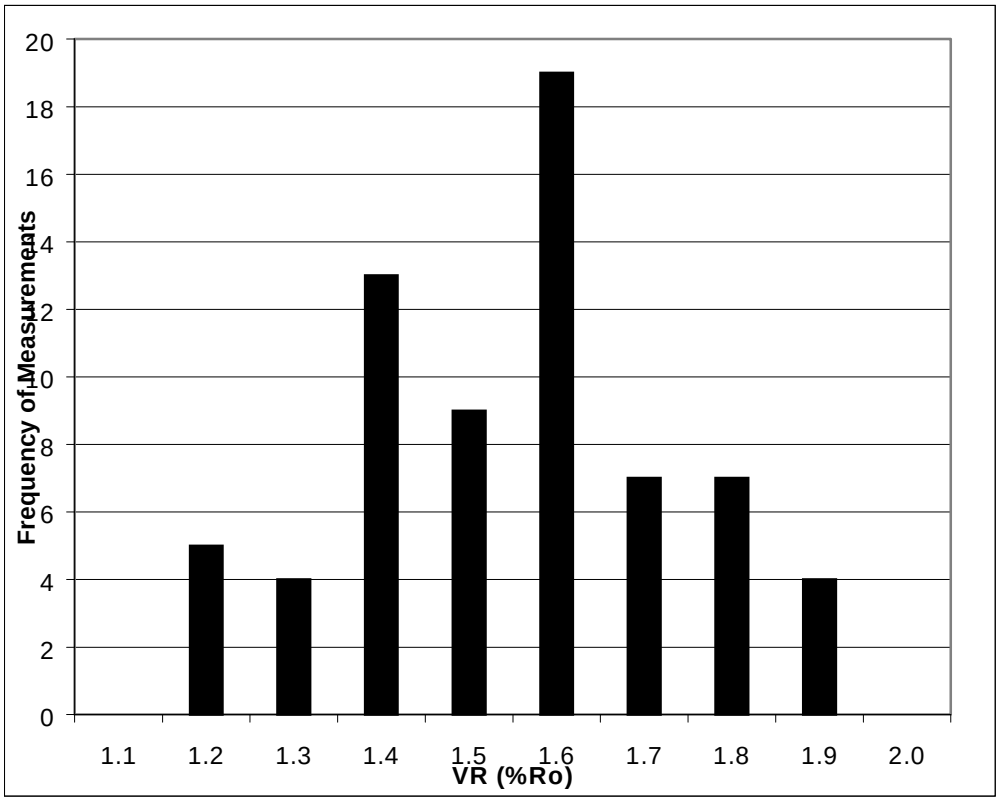
Sample Depth: 7040-7310' Ditch

VR Measurements:

1.19	1.33	1.18	1.25	1.19	1.12	1.15
1.25	1.34	1.24	1.30	1.21	1.31	1.30
1.44	1.39	1.33	1.35	1.39	1.33	1.46
1.47	1.42	1.33	1.48	1.41	1.50	1.53
1.55	1.50	1.37	1.49	1.53	1.51	1.55
1.62	1.54	1.39	1.56	1.53	1.53	1.58
1.75	1.68	1.41	1.59	1.57	1.53	1.66
1.76	1.69	1.47	1.60	1.74	1.53	1.68
1.81	1.72	1.58	1.64	1.76	1.55	
1.83	1.82	1.82	1.73	1.78	1.56	

Number of meas: 68 **Median:** 1.52

Average: 1.50 **Stand. Dev:** 0.18



Chevron Akulik No.1

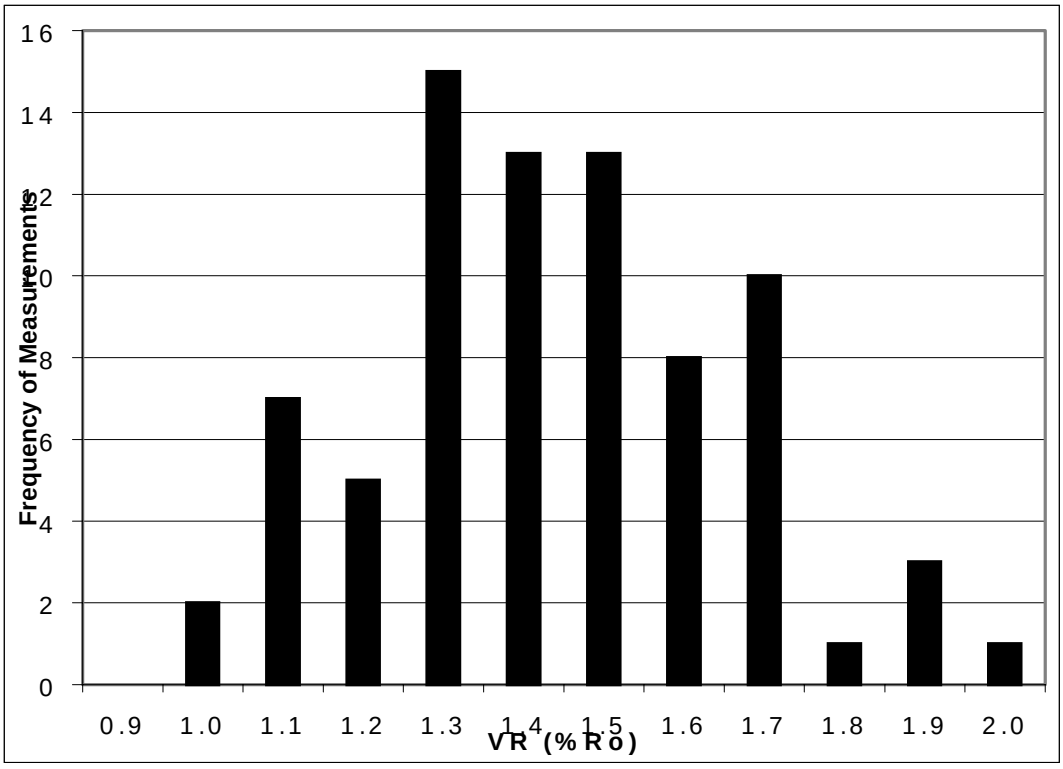
Sample Depth: 7580-7850' Ditch

VR Measurements:

1.01	1.18	1.07	1.22	0.93	1.07	1.06	1.23
1.06	1.18	1.09	1.27	0.99	1.21	1.09	1.27
1.17	1.21	1.17	1.31	1.33	1.23	1.15	1.35
1.24	1.24	1.22	1.37	1.38	1.25	1.24	1.39
1.36	1.37	1.28	1.37	1.42	1.28	1.28	1.47
1.43	1.44	1.35	1.51	1.48	1.32	1.41	1.48
1.57	1.47	1.37	1.58	1.49	1.38	1.47	1.55
1.58	1.61	1.45	1.59	1.65	1.43	1.62	1.69
1.67	1.61	1.52	1.60	1.66	1.44	1.72	
1.89	1.64	1.82	1.61	1.86	1.57	1.99	

Number of meas: 78 **Median:** 1.38

Average: 1.39 **Stand. Dev** 0.22



Chevron Akulik No.1

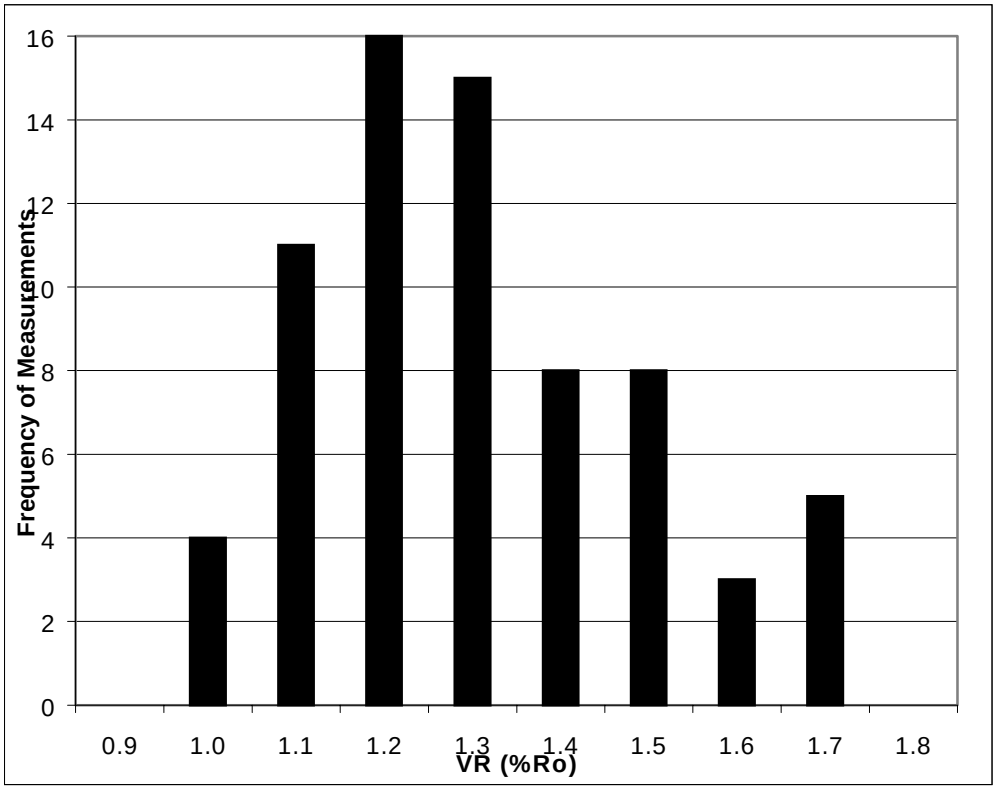
Sample Depth: 8210-8480' Ditch

VR Measurements:

1.07	0.92	1.03	1.01	1.11	0.94	0.94
1.09	0.94	1.05	1.02	1.13	1.07	1.04
1.13	1.03	1.08	1.14	1.13	1.10	1.08
1.15	1.11	1.17	1.15	1.19	1.15	1.10
1.15	1.20	1.21	1.24	1.25	1.15	1.23
1.31	1.23	1.28	1.26	1.28	1.16	1.24
1.35	1.24	1.36	1.30	1.28	1.28	1.28
1.39	1.31	1.37	1.48	1.36	1.40	1.28
1.42	1.41	1.47	1.58	1.55	1.60	1.42
1.46	1.43	1.69	1.67	1.65	1.63	1.50

Number of meas: 70 **Median:** 1.24

Average: 1.25 **Stand. Dev:** 0.19



Chevron Akulik No.1

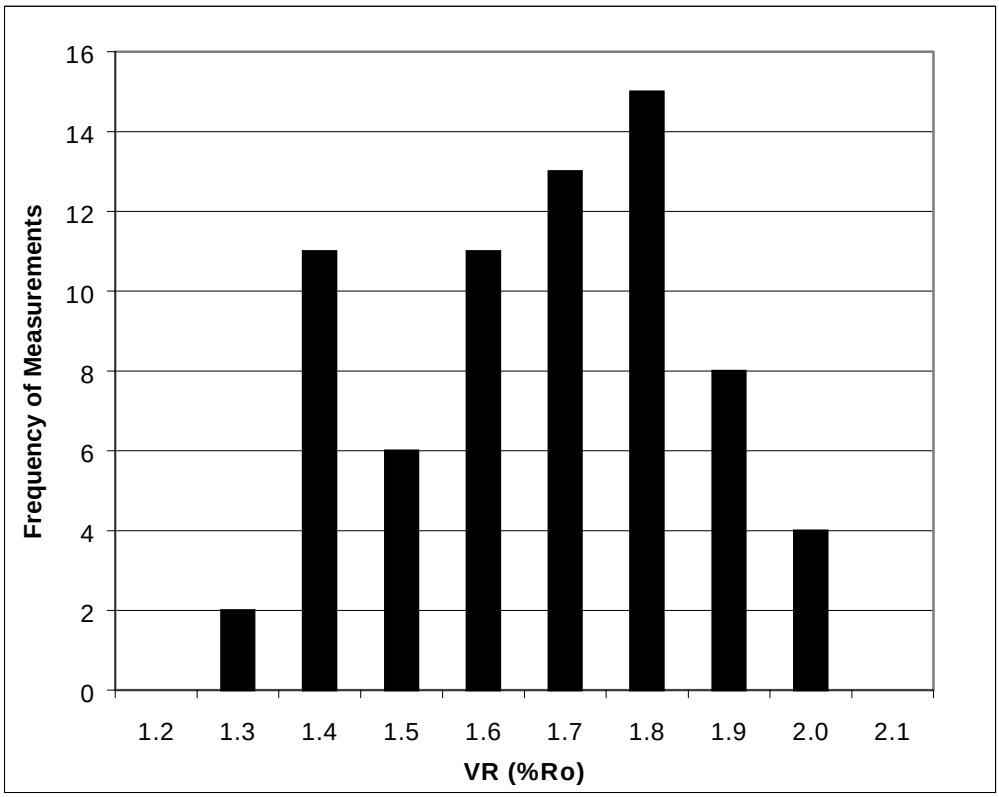
Sample Depth: 8750-9020' Ditch

VR Measurements:

1.33	1.31	1.23	1.33	1.30	1.53	1.27
1.35	1.38	1.45	1.37	1.46	1.54	1.32
1.36	1.40	1.64	1.48	1.47	1.61	1.33
1.52	1.45	1.64	1.56	1.56	1.63	1.35
1.56	1.57	1.66	1.56	1.58	1.70	1.55
1.65	1.71	1.71	1.59	1.61	1.71	1.62
1.68	1.72	1.72	1.72	1.65	1.74	1.65
1.77	1.74	1.83	1.78	1.65	1.78	1.72
1.85	1.77	1.89	1.80	1.67	1.85	1.75
1.86	1.94	1.94	1.87	1.96	1.88	1.92

Number of meas: 70 **Median:** 1.64

Average: 1.62 **Stand. Dev:** 0.19



Chevron Akulik No.1

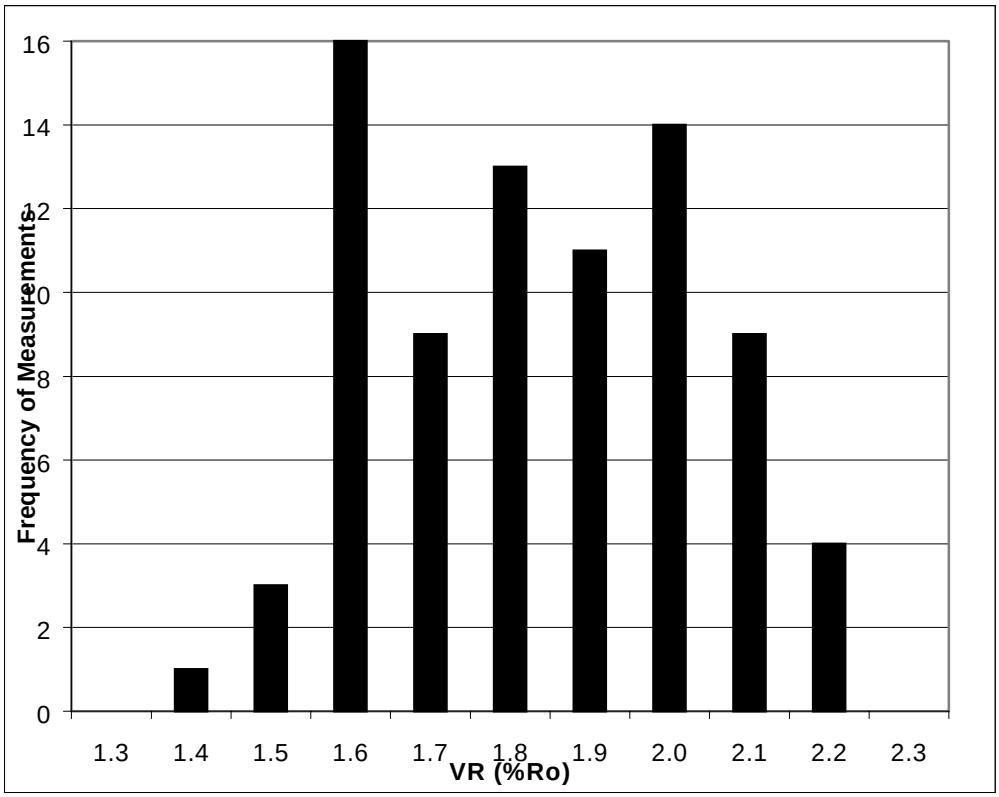
Sample Depth: 9290-9560' Ditch

VR Measurements:

1.56	1.37	1.49	1.50	1.40	1.59	1.47	1.53
1.65	1.56	1.55	1.50	1.50	1.63	1.54	1.55
1.71	1.57	1.56	1.74	1.53	1.73	1.63	1.56
1.74	1.57	1.80	1.76	1.62	1.76	1.67	1.76
1.81	1.58	1.82	1.78	1.65	1.78	1.70	1.78
1.95	1.62	1.95	1.84	1.66	1.86	1.79	1.81
1.96	1.64	1.96	1.86	1.79	1.94	1.80	1.82
2.01	2.02	1.96	1.88	1.84	1.98	1.91	1.9
2.02	2.02	1.98	2.11	2.00	1.99	1.92	1.93
2.17	2.13	2.05	2.19	2.04	2.02	2.04	1.97

Number of meas: 80 **Median:** 1.79

Average: 1.78 **Stand. Dev:** 0.20



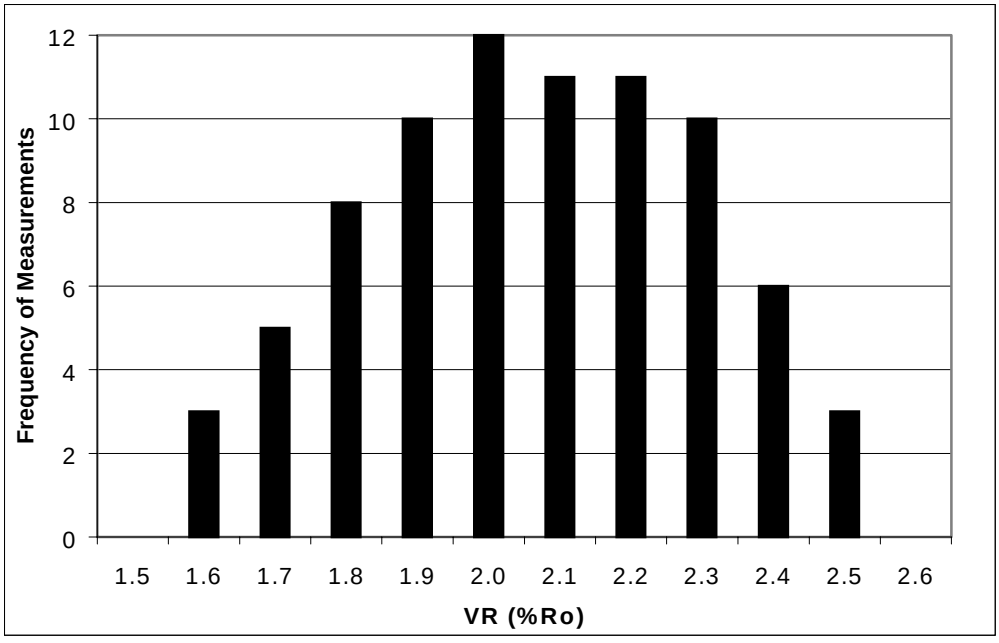
Chevron Akulik No.1

Sample Depth: 9880-10100' Ditch

VR Measurements:

1.68	1.59	1.71	1.66	1.59	1.64
1.70	1.72	1.82	1.73	1.59	1.75
1.76	1.79	1.85	1.75	1.66	1.83
1.84	1.81	1.87	1.80	1.66	2.08
1.85	1.84	1.93	1.93	1.81	
1.93	1.92	1.99	1.96	1.97	
1.95	1.97	1.99	2.00	2.01	
1.95	2.09	2.05	2.03	2.03	
1.99	2.10	2.09	2.13	2.09	
2.05	2.12	2.10	2.16	2.12	
2.05	2.20	2.16	2.18	2.18	
2.10	2.28	2.21	2.22	2.21	
2.16	2.28	2.24	2.26	2.25	
2.31	2.30	2.37	2.32	2.28	
2.38	2.41	2.45	2.40	2.30	

Number of meas:	79	**Median:**	2.01
Average:	2.01	**Stand. Dev:**	0.23



Chevron Akulik No.1

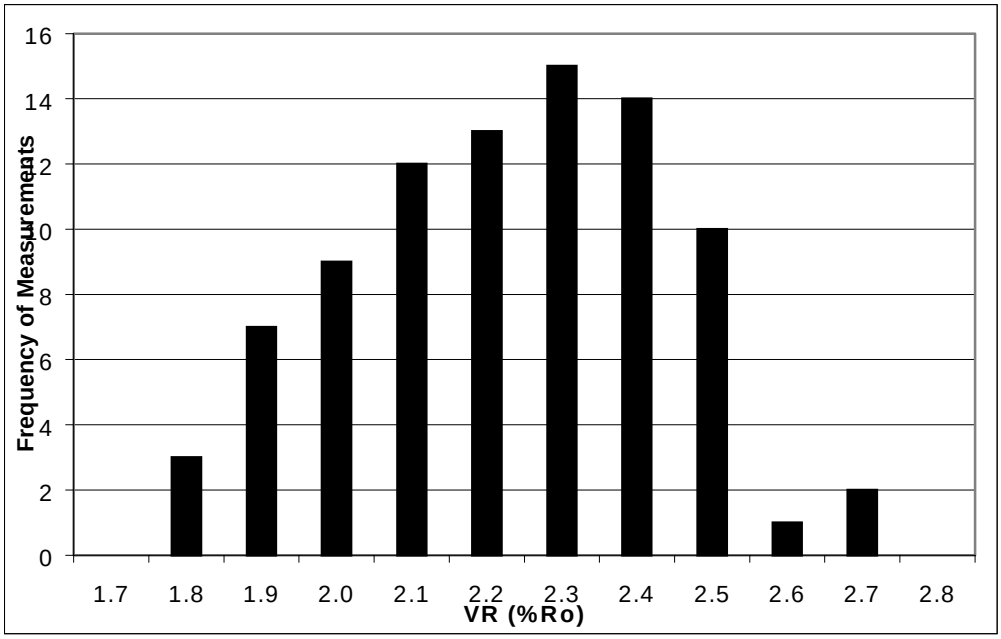
Sample Depth: 10370-10640'Ditch

VR Measurements:

1.73	1.88	1.79	1.93	1.71	1.94
2.09	1.90	1.81	1.94	1.88	2.00
2.12	1.94	2.00	1.85	1.91	2.03
2.17	1.95	2.03	1.87	2.00	2.05
2.20	1.95	2.08	1.88	2.10	2.11
2.27	1.99	2.08	1.88	2.13	2.18
2.29	2.05	2.20	2.08	2.23	2.30
2.30	2.07	2.23	2.11	2.24	2.30
2.32	2.13	2.25	2.14	2.24	2.31
2.40	2.14	2.26	2.19	2.28	2.37
2.42	2.16	2.36	2.24	2.31	2.47
2.45	2.18	2.38	2.25	2.32	
2.46	2.25	2.45	2.29	2.35	
2.47	2.30	2.48	2.35	2.41	
2.65	2.67	2.52	2.36	2.46	

Number of meas: 86 **Median:** 2.19

Average: 2.17 **Stand. Dev:** 0.21



Chevron Akulik No.1

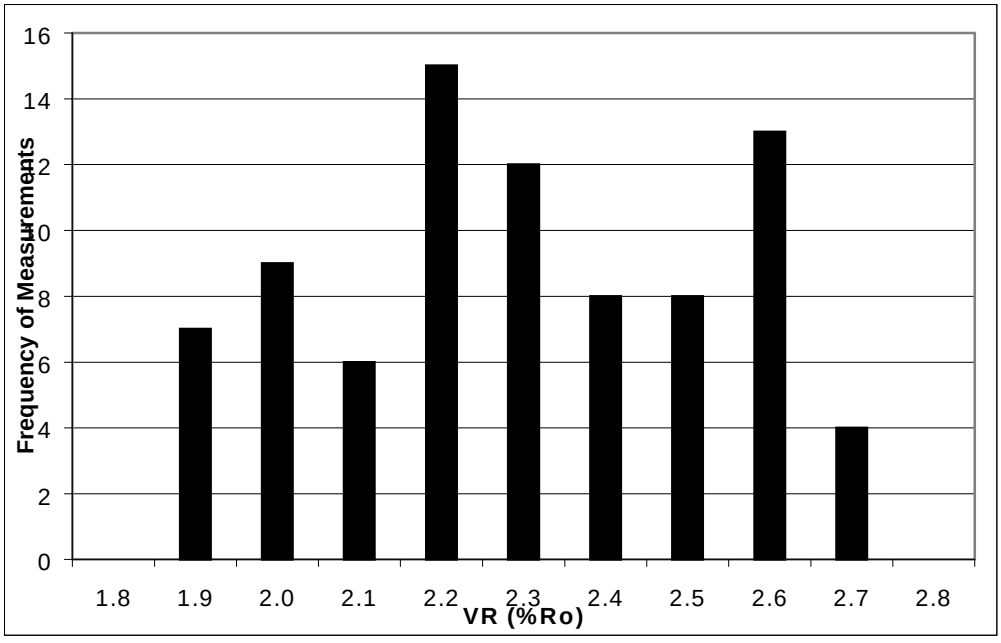
Sample Depth: 10910-11180' Ditch

VR Measurements:

1.96	1.88	1.87	1.83	1.91	1.81
1.99	1.94	1.89	1.84	2.01	1.84
2.09	1.99	1.91	1.95	2.06	1.97
2.10	2.02	2.10	1.96	2.10	2.12
2.10	2.04	2.22	2.08	2.11	2.18
2.26	2.12	2.23	2.13	2.12	2.46
2.29	2.14	2.24	2.14	2.13	2.48
2.30	2.16	2.27	2.21	2.18	
2.39	2.20	2.35	2.28	2.24	
2.49	2.42	2.37	2.29	2.26	
2.50	2.50	2.38	2.41	2.36	
2.51	2.52	2.39	2.53	2.37	
2.54	2.57	2.40	2.59	2.43	
2.57	2.59	2.42	2.59	2.54	
2.61	2.67	2.52	2.62	2.60	

Number of meas: 82 **Median:** 2.24

Average: 2.24 **Stand. Dev:** 0.24



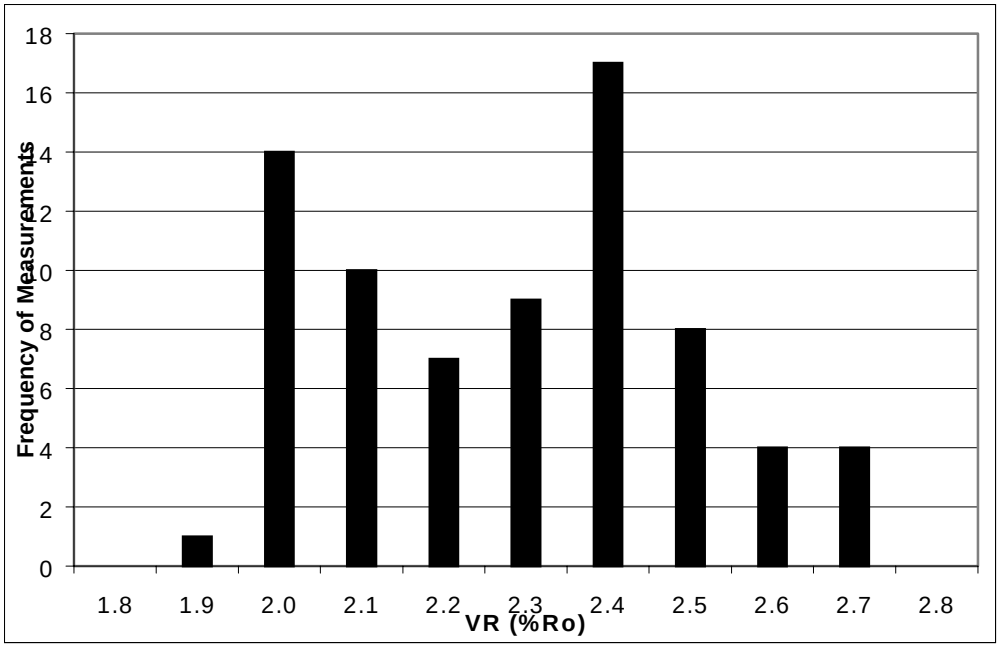
Chevron Akulik No.1

Sample Depth: 11400-11670' Ditch

VR Measurements:

1.85	1.94	1.92	2.01	1.92	
1.95	1.96	1.94	2.07	1.92	
1.95	1.97	2.06	2.08	1.93	
1.96	2.02	2.07	2.08	1.95	
2.07	2.05	2.12	2.22	1.96	
2.15	2.16	2.19	2.26	1.98	
2.19	2.24	2.22	2.27	2.03	
2.21	2.25	2.32	2.32	2.11	
2.26	2.37	2.32	2.33	2.15	
2.30	2.46	2.34	2.34	2.27	
2.31	2.49	2.35	2.39	2.35	
2.33	2.53	2.39	2.44	2.36	
2.36	2.62	2.41	2.49	2.43	
2.36	2.63	2.43	2.54	2.44	
2.51	2.65	2.58	2.67		

Number of meas:	74	**Median:**	2.26
Average:	2.23	**Stand. Dev:**	0.21



Chevron Akulik No.1

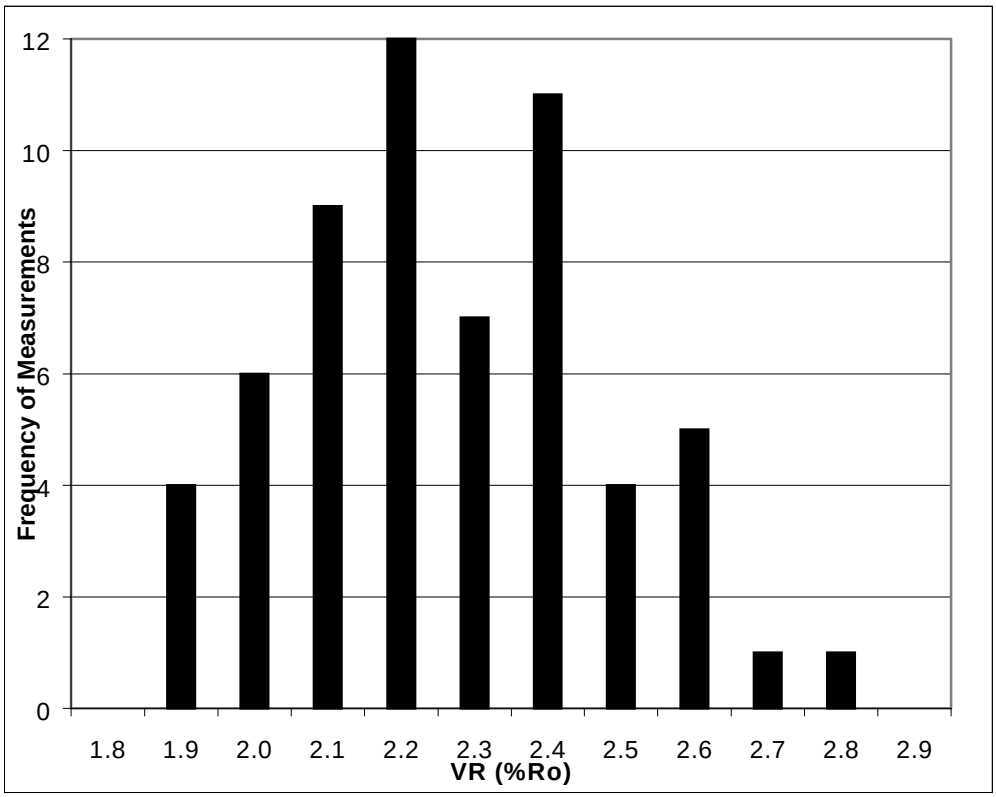
Sample Depth: 12210-12480' Ditch

VR Measurements:

1.89	1.90	1.84	1.91	1.86	2.03	
1.93	1.96	1.89	2.01	1.92	2.07	
2.14	2.11	1.93	2.14	2.01	2.17	
2.23	2.16	2.04	2.18	2.01	2.17	
2.32	2.17	2.06	2.25	2.07	2.29	
2.35	2.19	2.09	2.34	2.13	2.29	
2.38	2.19	2.25	2.39	2.19	2.30	
2.42	2.20	2.34	2.50	2.26	2.38	
2.51	2.35	2.39	2.64	2.39	2.40	
2.56	2.41	2.40	2.74	2.52	2.57	

Number of meas: 60 **Median:** 2.19

Average: 2.21 **Stand. Dev:** 0.21



Chevron Akulik No.1

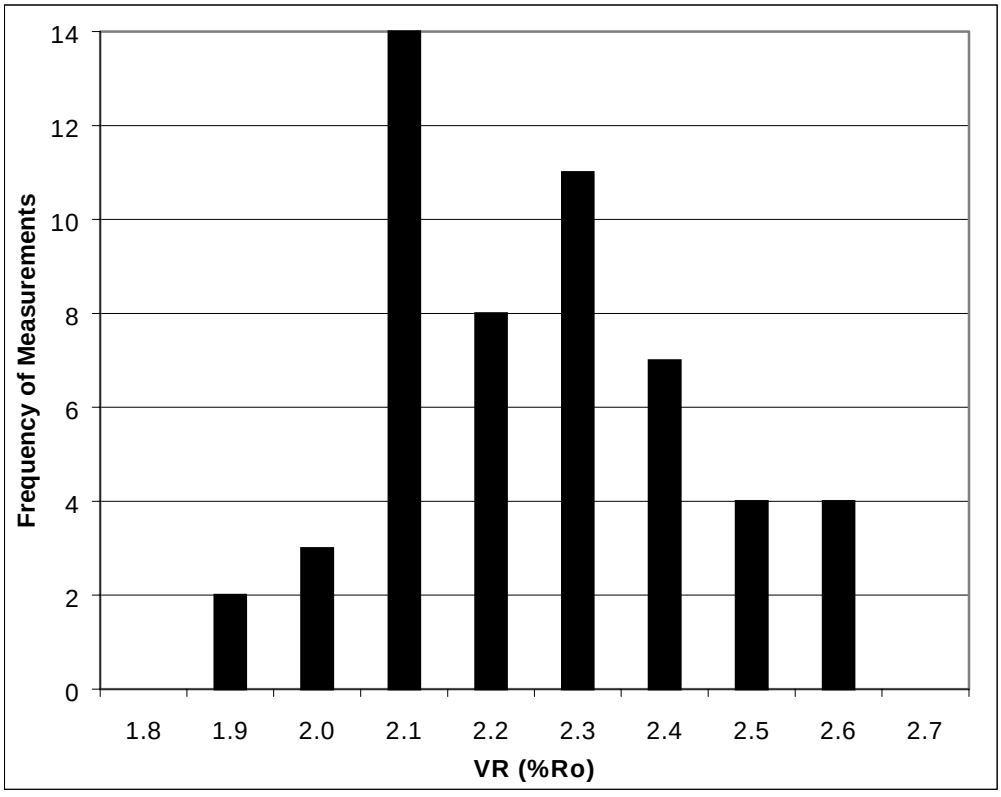
Sample Depth: 12750-13020' Ditch

VR Measurements:

1.97	1.91	1.86	1.87	2.06	2.02	
2.00	2.01	1.98	2.02	2.09	2.15	
2.06	2.04	2.02	2.06	2.13	2.23	
2.21	2.06	2.04	2.06	2.25		
2.24	2.16	2.11	2.07	2.27		
2.33	2.19	2.13	2.18	2.27		
2.42	2.20	2.13	2.20	2.30		
2.47	2.25	2.34	2.20	2.32		
2.57	2.31	2.39	2.22	2.41		
2.59	2.41	2.51	2.35	2.54		

Number of meas: 53 **Median:** 2.19

Average: 2.19 **Stand. Dev:** 0.18



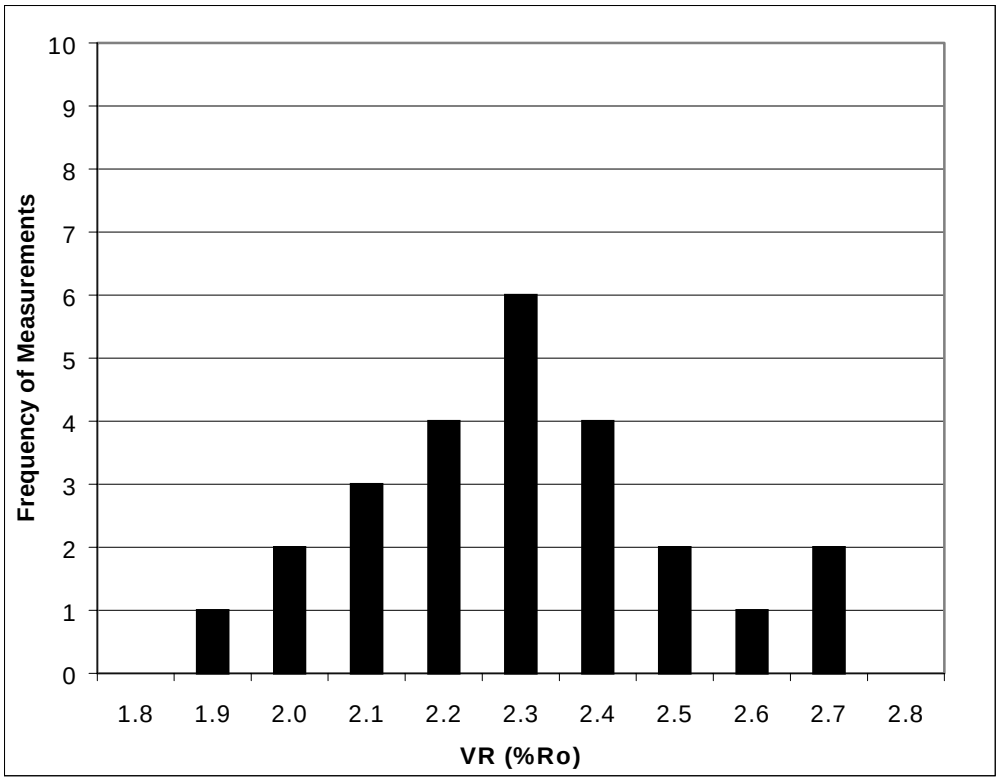
Chevron Akulik No.1

Sample Depth: 14370-14640' Ditch

VR Measurements:

1.81	2.03	1.99				
1.91	2.11	2.15				
2.05	2.20	2.20				
2.07	2.20	2.32				
2.11	2.23	2.39				
2.13	2.25					
2.24	2.30					
2.31	2.41					
2.50	2.45					
2.64	2.64					

Number of meas:	25	**Median:**	2.20
Average:	2.23	**Stand. Dev:**	0.21



Chevron Akulik No.1

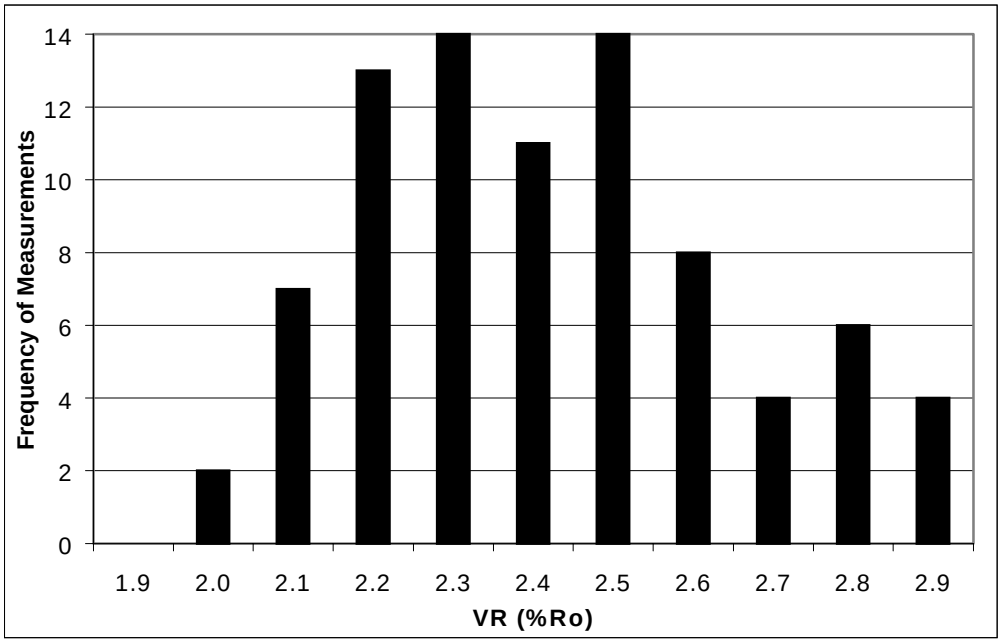
Sample Depth: 14910-15180' Ditch

VR Measurements:

2.07	2.09	1.99	2.04	1.91	2.12	
2.11	2.14	2.14	2.04	2.00	2.21	
2.16	2.15	2.14	2.07	2.14	2.24	
2.16	2.36	2.22	2.09	2.18	2.29	
2.25	2.37	2.23	2.10	2.21	2.44	
2.31	2.39	2.24	2.18	2.23	2.49	
2.34	2.41	2.26	2.18	2.23	2.54	
2.42	2.45	2.31	2.29	2.29	2.78	
2.43	2.51	2.39	2.29	2.31		
2.44	2.54	2.43	2.35	2.33		
2.49	2.61	2.45	2.36	2.41		
2.53	2.68	2.49	2.49	2.51		
2.55	2.71	2.49	2.78	2.55		
2.70	2.85	2.50	2.81	2.60		
2.70	2.85	2.61	2.82	2.71		

Number of meas: 83 **Median:** 2.35

Average: 2.36 **Stand. Dev:** 0.23



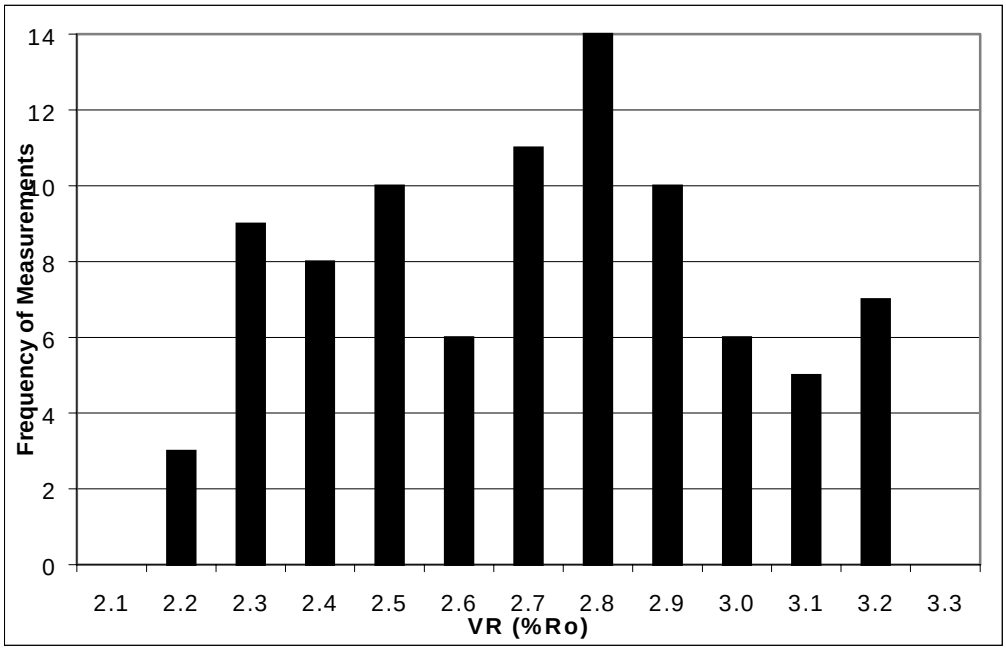
Chevron Akulik No.1

Sample Depth: 15450-15720' Ditch

VR Measurements:

2.26	2.18	2.28	2.23	2.19	2.16	
2.34	2.21	2.38	2.25	2.25	2.26	
2.35	2.34	2.46	2.26	2.32	2.28	
2.37	2.45	2.49	2.36	2.44	2.40	
2.40	2.55	2.58	2.38	2.46	2.42	
2.45	2.55	2.74	2.52	2.62	2.44	
2.50	2.69	2.78	2.61	2.64	2.59	
2.67	2.69	2.78	2.68	2.64	2.60	
2.71	2.72	2.83	2.70	2.71	2.63	
2.77	2.78	2.84	2.77	2.74	2.69	
2.78	2.85	2.93	2.80	2.75	2.80	
2.81	2.90	3.00	2.84	2.77	2.81	
2.85	3.00	3.06	2.96	2.81	2.96	
2.99	3.00	3.10	3.02	3.14	3.10	
2.99	3.11	3.15	3.12	3.18		

Number of meas:	89	**Median:**	2.69
Average:	2.65	**Stand. Dev:**	0.27



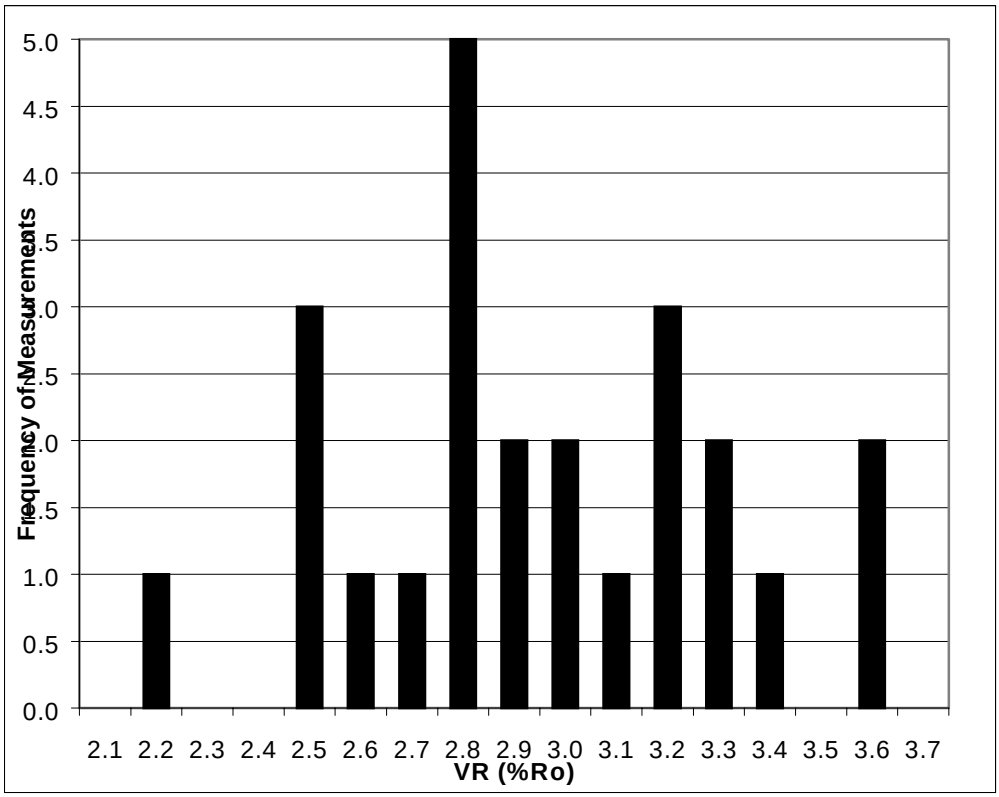
Chevron Akulik No.1

Sample Depth: 16260-16530' Ditch

VR Measurements:

2.42	2.17	2.41		
2.51	2.47	2.79		
2.68	2.73	2.89		
2.71	2.75	3.29		
2.79	2.90			
2.82	2.92			
3.10	3.03			
3.10	3.10			
3.29	3.50			
3.33	3.56			

Number of meas:	24	**Median:**	2.86
Average:	2.89	**Stand. Dev:**	0.36



Chevron Akulik No.1

Sample Depth: 16800-17038' Ditch T.D.

VR Measurements:

2.71	2.46	2.45	2.61	2.56	2.45	2.64
2.72	2.46	2.53	2.71	2.57	2.57	2.75
2.74	2.48	2.53	2.86	2.59	2.81	2.77
2.85	2.48	2.66	3.05	2.81	2.81	2.90
3.11	2.52	2.69	3.08	2.83	2.89	2.97
3.25	2.53	2.92	3.18	2.93	3.14	
3.32	2.56	3.28	3.33	2.94	3.16	
3.51	2.75	3.35	3.37	3.02	3.16	
3.55	2.85	3.42	3.38	3.50	3.25	
3.56	3.36	3.44	3.54	3.55	3.25	

Number of meas: 65 **Median:** 2.86

Average: 2.94 **Stand. Dev:** 0.35