KEPLINGER LABORATORIES, INC.

A Keplinger Company

February 18, 1986

Helmrich and Payne, Inc.
Utica at 21st Street
Tulsa, Oklahoma 74114

Attention: Mr. Jack Keeling

Re: Routine Core Analysis
Well Carmichael No. 10
Ellis County, Kansas
Job Number 86-1045-00

Gentlemen:

This report presents the final results of the routine core analyses performed on plug and full diameter core samples from the subject well. Upon receipt of the core, a surface core gamma ray scan was performed. Next, one- and two-inch-diameter core plugs were drilled from the preserved core material. These samples were then placed in "Dean-Stark" type distillation equipment to obtain oil and water saturations. After drying, air permeabilities and porosities were measured for each sample. The full diameter samples were cleaned using a toluene/CO_2 pressurized core cleaner. The samples were dried and air permeabilities (horizontal and vertical) and porosities were measured for each sample.

The conditions under which this report is presented are described immediately following this report. Please contact us if you have any questions concerning these data, or if we may be of further service.

Respectfully submitted,

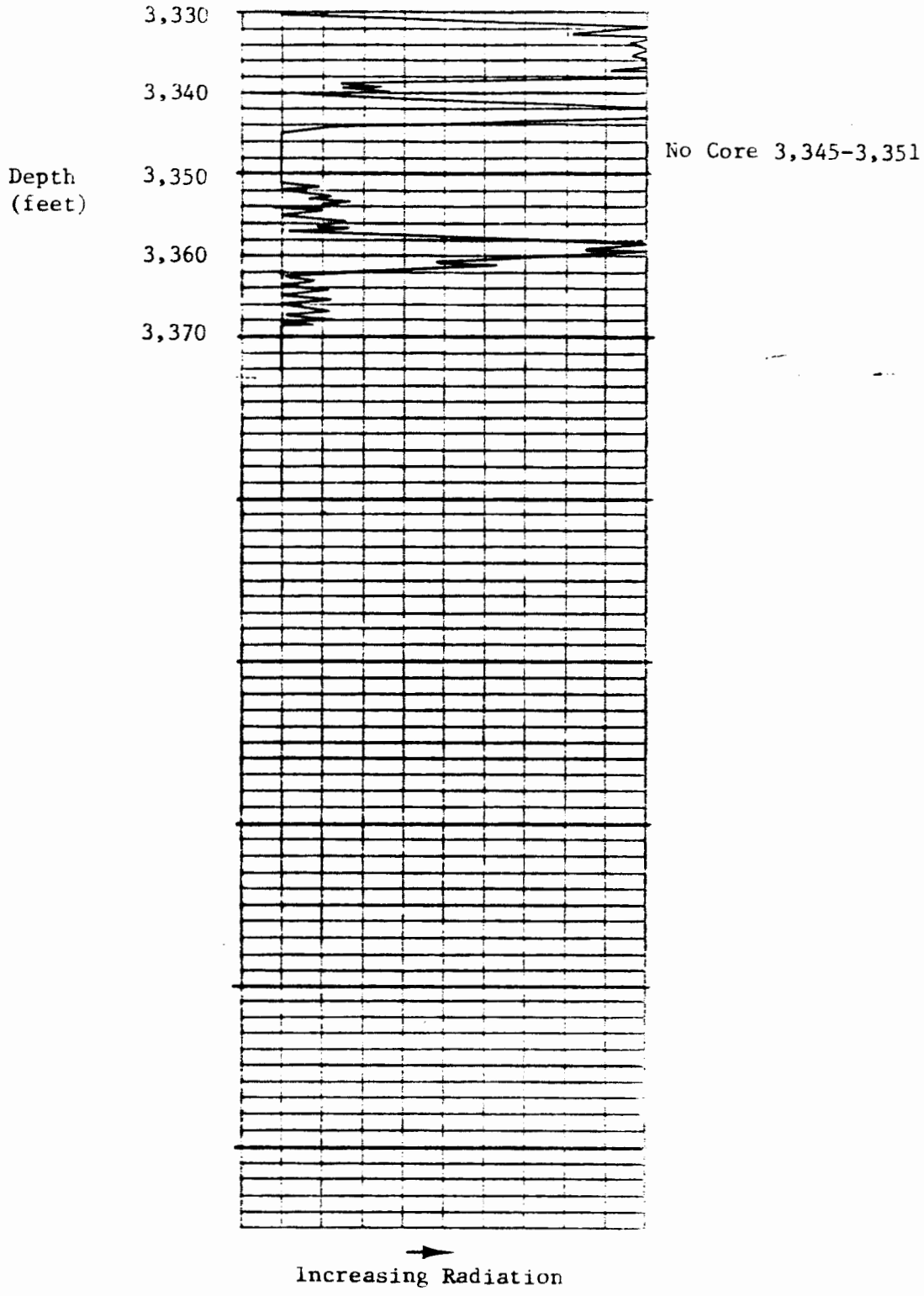
KEPLINGER LABORATORIES, INC.

Keplinger Laboratories, Inc.

JML:dsc

CORE GAMMA LOG

HELMRICH AND PAYNE
WELL CARMICHAEL NO. 10
ELLIS COUNTY, KANSAS



KEPLINGER LABORATORIES, INC.

ROUTINE CORE ANALYSIS TEST RESULTS

HELMRICH AND PAYNE, INC.
WELL CARMICHAEL NO. 10
ELLIS COUNTY, KANSAS

Coring Fluid: Water Based Mud

Sample Number	Depth, Feet	Air Permeability, md	Porosity, Percent	Saturation, Percent Pore Volume Oil	Water	Grain Density, gm/cc	Lithologic Description
1R	3,337.2	3.83	11.0	15.8	85.0	2.69	Sst: gry, med-crs qtz sd w/mnr cht pbl, mnr calc cmt, qtz cmt.
2R	3,338.2	203.	12.9	10.2	88.3	2.68	Sst: gry, med-crs qtz sd, calc cmt, qtz cmt.
3R	3,339.3	30.9	13.8	27.8	71.9	2.69	Sst: gry, med-crs qtz sd, mnr cht, qtz cmt.
4R	3,340.0	2.88	11.7	15.5	84.5	2.67	a.a.
7R	3,353.5	32.6	11.1	19.9	77.5	2.62	Congl: yel-bu, med-pbl qtz and cht, mnr pyr, calc cmt, qtz cmt.
9R	3,356.5	68.4*	17.4	9.9	73.4	2.65	a.a.

* Fractured

FULL DIAMETER ROUTINE CORE ANALYSIS TEST RESULTS

HELMRICH AND PAYNE, INC.
WELL CARMICHAEL NO. 10
ELLIS COUNTY, KANSAS

Coring Fluid: Water Based Mud

Sample Number	Depth, Feet	Air Permeability, Horizontal	Air Permeability, Horizontal-90°	Air Permeability, Vertical	Porosity, Percent	Grain Density, gm/cc	Lithologic Description
5FD	3,343.5-44.0	7.63	6.22	3.80	12.0	2.59	Congl: yel-bu, med-pbl qtz and cht, calc cmt, qtz cmt.
6FD	3,352.0-52.5	9.77	7.71	3.88	9.3	2.62	a.a.
8FD	3,355.0-55.5	24.9	22.6	16.5	15.4	2.61	a.a.
10FD	3,363.5-64.0	16.5	12.0	100.*	11.1	2.65	a.a.
11FD	3,365.6-66.0	1.87	1.72	0.98	8.9	2.63	a.a.
12FD	3,367.0-67.5	0.87	0.86	3.57	10.0	2.67	a.a.

* Fractured

CONDITIONS AND QUALIFICATIONS

Keplinger Laboratories, Inc. will endeavor to provide accurate and reliable laboratory measurements of the cores provided by the client. The results of any core analysis are necessarily affected by the condition in which the core is received and the selection of the samples to be analyzed. In the absence of direction by the client, Keplinger Laboratories, Inc. will utilize their best geological and engineering judgment in selecting the samples to be analyzed. It should be recognized that most cores do not have uniform properties and that selection of truly representative samples is rarely possible. Unless otherwise directed, the samples will normally be selected from the highest quality segments. Thus, use of the properties measured in this report in reservoir calculations could result in an overestimation in reservoir volume and/or deliverability. Keplinger Laboratories, Inc. assumes no responsibility nor offers any guarantee of the productivity or performance of any oil or gas well or hydrocarbon recovery process based upon the data presented in this report.

This report has been prepared for the exclusive use of Helmrich and Payne, Inc. The report shall not be distributed, reproduced, or made available to any other company or person without the prior knowledge and written consent of Keplinger Laboratories, Inc.

STANDARD ABBREVIATIONS FOR LITHOLOGIC DESCRIPTIONS

WORD	ABBREVIATION	WORD	ABBREVIATION	WORD	ABBREVIATION	WORD	ABBREVIATION
abundant	abd	claystone	Clst	equivalent	Equiv	halite (-iferous)	Hal, hal
altered	alt	clean	cln	euhedral	euhd	hard	hd
alternating	altg	coal	C	evaporite (-itic)	Evap, evap	hematite (-ic)	Hem, hem
amount	Amt	coarse	crs	excellent	ex	heterogeneous	hetr
and	&	cobble	Cbl	extremely	extr	homogeneous	hom
Angular	ang	common	com			horizontal	hor
anhydrite (-ic)	Anhy, anhy	compact	cpct	faint	fnt	inclusion (-ded)	Incl, incl
approximate	apprx	conchoidal	conch	fair	fr	indistinct	indst
arenaceous	aren	concretion (-ary)	Conc, conc	feldspar (-athic)	Fspr, fspr	indurated	ind
argillaceous	arg	conglomerate (-ic)	Cgl, cgl	ferruginous	ferr	insoluble	insl
as above	a.a.	consolidated	consol	fibrous	fibr	interbedded	intbd
asphalt (ic)	Asph, asph	contorted	cntrt	fine (-ly)	f, fnly	intercrystalline	intxln
at	@	coral, coralline	Cor, corln	fissile	fis	intergranular	intgran
authigenic	authg	cream	crm	flake, flaky	Flk, flk	intergrown	intgn
average	Av, av	crenulated	cren	foliated	fol	interlaminated	intrlam
		cross	x	formation	Fm	increasing	incr
band (-ed)	Bnd, bnd	cross-bedded	x-bd	fossil (-iferous)	Foss, foss	interparticle	intpar
bed (-ed)	Bd, bd	cross-laminted	x-lam	fracture (-d)	Frac, frac	irregular (-ly)	irr
bedding	Bdg	cryptocrystalline	crpxln	fragment (-al)	Frag, frag		
black (-ish)	blk, blksh	crystal (-line)	Xl, xln	frequent (-al)	freq	lamina (-tions, -ated)	Lam, lam
blocky	blky	cube, cubic	Cub, cub	friable	fri	large	lge
blue (-ish)	bl, blsh					layer	Lyr
breccia (-ted)	Brec, brec	dark (-er)	dk, dkr	generally	gen	lens, lenticular	Len, lent
brittle	brit	dead	dd	glauconite (-itic)	Glauc, glauc	light	lt
brown	brn	debris	Deb	good	gd	lignite (-itic)	Lig, lig
buff	bu	decrease (-ing)	Decr, decr	grain (-s, -ed)	Gr, gr	limestone	Ls
burrow (-ed)	Bur, bur	dense	dns	grainstone	Grst	limy	lmy
		diagenesis (-etic)	Diagn, diagn	granite	Grt		
calcite (-ic)	Calc, calctc	disseminated	dissem	granite wash	G.W.		
calcareous	calc	ditto	" or do	granule (-ar)	Gran, gran	magnetite, magnetic	Mag, mag
carbonaceous	carb	dolomite (-ic)	Dol, dol	gravel	Grv	marl (-y)	Mrl, mrl
cement (-ed, ing)	Cmt, cmt	dominant (-ly)	dom	gray, grey (-ish)	gry, grysh	marlstone	Mrlst
chalk (-y)	Chk, chky	drilling	drlg	green (-ish)	gn, gnsh	massive	mass
chert (-y)	Cht, cht			grit (-ty)	Gt, gt	matrix	Mtrx
chlorite (-ic)	Chlor, chlor	earthy	ea	gypsum (iferous)	Gyp, gyp	maximum	max
clay (-ey)	Cl, cl	equant	eqnt			medium	m or med
						mica (-ceous)	Mic, mic
						milky	mky

STANDARD ABBREVIATIONS FOR LITHOLOGIC DESCRIPTIONS

WORD	ABBREVIATION	WORD	ABBREVIATION	WORD	ABBREVIATION
minor	mnr	rare	r	tabular (-ate)	tab
moderate	mod	red (-ish)	rd, rdsh	tan	tn
mold (-ic)	Mol, mol	replaced (-ment)	rep, Repl	texture (-d)	Tex, tex
mottled	mott	residue (-ual)	Res, res	thick	thk
mud (-dy)	md, mdy	ripple	Rpl	thin	thn
mudstone	Mdst	round (-ed)	rnd, rndd	thin-bedded	t.b.
		rubble (-bly)	Rbl, rbl	throughout	thru
				trace	Tr
nodules (ar)	Nod, nod			translucent	trnsl
no sample	n.s.	salt (-y)	Sa, sa	transparent	trnsp
no visible porosity	n.v.p.	same as above	s.a.		
numerous	num	sand (-y)	Sd, sdy	unconsolidated	uncons
		sandstone	Sst	uniform	uni
occasional	occ	scarce	scs		
oil	O	scattered	scat	variegated	vgt
olive	olv	secondary	sec	varicolored	varic
oolite (-itic)	Ool, ool	shale (-ly)	Sh, sh	vein (-ing, -ed)	Vn, vn
orange (-ish)	or, orsh	shell	Shl	vertical	vert
				very	v
organic	org	siderite (-itic)	Sid, sid	vesicular	ves
orthoclase	Orth	silica (-iceous)	Sil, sil	violet	vi
oxidized	ox	silt (-y)	Slt, slty	visible	vis
		siltstone	Sltst	vug (-gy)	Vug, vug
packstone	Pkst	similar	sim		
part (-ly)	Pt, pt	skeletal	skel	wavy	wvy
particle	Par, par	slickenside (-d)	Slick, slick	weak	wk
parting	Ptg	slight (-ly)	Sli, slily	weathered	wthd
patch (-y)	Pch, pch	small	sml	well	Wl, wl
pebble (-ly)	Pbl, pbl	smooth	sm	white	wh
pink	pk	soft	sft	with	w/
pinkish	pkish	somewhat	smwt	without	w/o
pin-point (porosity)	p.p.	sorted (-ing)	srt, srtg		
possible (-ly)	poss	sparse (-ly)	sps, spsly	yellow (-ish)	yel, yelsh
predominant (-ly)	pred	speck (-led)	Spk, spkld		
primary	prim	spotted (-y)	sptd, spty		
prominent	prom	stain (-ed, ing)	Stn, stn		
purple	purp	stringer	strgr		
pyrite (-itized, -itic)	Pyr, pyr	stylolite (-itic)	Styl, styl		
		subangular	sbang		
quartz	Qtz, qtz	sulphur, sulphurous	Su, su		

HP-3

Memo

HELMERICH & PAYNE, Inc.

Date 6-2-86

To Lynn Watney / Dave Newell

From Renée Davis Subject Carmichael 10

Enclosed are the logs and core analyses on our Carmichael #10 to accompany the core we are supplying for your library. The core will be shipped from Keplinger Labs in Tulsa. Unfortunately, the core was broken up quite a bit in the slabbing process but we trust that it will survive shipment and that it will be of interest to you.

Sincerely,

Renée Davis

Operations Consultant

P.S. Logs have been released, and none of the other information is being held confidential.

CORE #1

3330' - 51': Rec 14'; lost 7'

6": Ls, wht, f xln, sli ool, sl st of oil at contact w/sh below.
84": Sh. btm 1' had several 1" sd stringers. Coarse immature sd w/good show bldg oil. Sh was gry-grn yellow, top 2' was red sh, v clayey.
44": Ss, very immature, poorly sorted, angular, well cmtd, very good show free oil thruout, some bldg.
16": Sh, gry
21": Cgl cht & sd. Cht wht to varicolored yellow gry, much interbdd ss, coarse grn immature, poorly std, good SO throughout sd, almost totally saturated.

Core #2 (3351' - 58') 7'

7': Cht, cngl, wht to varicolored yellow gray, much interbdd ss, coarse grnd, immature, angular, poorly sorted, good intergranular porosity, oil saturated throughout.

Core #3 (3358' - 69') Rec 11'

4": Cngl as in core #2.
3': Gry-blk laminated sh.
8': V. chty, v. dirty cngl ~~cmtd w/silica and pyrite~~ calc. cmt, no vis porosity. NSO.

CHEMICAL RESEARCH AND DEVELOPMENT DEPARTMENT

HALLIBURTON SERVICES
DUNCAN, OKLAHOMA

LABORATORY REPORT

No. T11-A033-86

To Mr. John Songer

Halliburton Services

Tulsa, OK

Date February 24, 1986

We give below results of our examination of three cores.

Submitted by Helmerich & Payne

Marked Well: Carmichael No. 10
Location: Sec. 4-11S-17W, Ellis Co., KS
Formation: Conglomerate
Depth: 3,364 feet, 3,354.5 feet and 3,338 feet
Received: February 5, 1986

Purpose

The cores were received for analysis by x-ray diffraction, scanning electron microscope, acid solubilities, Young's Modulus, regained permeability and petrographic thin section.

Conclusions

The requested data are included in this report. The samples received are a poorly cemented conglomerate, with a matrix of large pebbles surrounded by a matrix of sand size and smaller material. Calcite is the cementing material. There is a small quantity of clay in pores. The fragile nature of the cores prevented us from getting a sample from Young's Modulus measurement.

Based on the regained permeability test results, and the other data, we think an aqueous base fluid is acceptable and suggest adding CLA-STA FS to the prepad.

Data

Core Description

We received three cores, all of coarse conglomerate. The larger pebbles are mostly grey to blue chert some rounded, others angular, with many microfractures, and some showing signs of alteration on their surface. The matrix is sand size and smaller clear and amber quartz grains and a lot of white, powdery calcite. The cores are not well cemented and break up when plugged.

Qualitative X-ray Diffraction and Acid Solubility Analyses

Purpose: To identify the types and relative quantities of minerals in the formation sample.

Procedure: A pulverized one gram sample is placed in an x-ray beam and rotated through an arc. The x-ray beam is diffracted by the sample and the diffraction patterns are recorded.

Results: The diffraction patterns are used to identify the types of minerals present and their relative quantities. The relative quantities for the submitted samples are as follows:

Sample No.	1	2	3
Depth (feet)	3,338	3,354.5	3,364
HCl Solubility*	4.0%	2.0%	19.2%
Quartz	80-100%	80-100%	65-80%
Feldspar	0	0	0
Calcite	2-5%	2-5%	15-20%
Dolomite	0	0	0
Kaolinite	2-5%	0.5-2%	2-5%
Illite	0.5-2%	0.5-2%	0.5-2%
Mixed Layer	0	0	0
Chlorite	2-5%	0.5-2%	2-5%
Pyrite	0.5-2%	0.5-2%	0.5-2%
Siderite	0.5-2%	0	0
Salt	0.5-2%	0.5-2%	0.5-2%

*One gram of sample is added to 0.5N HCl. After reaction, the excess acid is titrated with 0.2N NaOH. The results are calculated and reported as calcium carbonate. (Note: a pure dolomite will be reported as 108%).

Data Cont'd

Regained Permeability Tests (N_2 Gas)

Sample No.	Depth (feet)	Test Pressure (psig)
3A,B,D	3,364	200

Purpose: To measure the effect of fluids on the permeability of samples.

Procedure: The core test plugs (15/16 inches in diameter by 1 inch in length) are oven dried and the sides are sealed with epoxy to insure linear flow through the test plugs. Initial nitrogen permeability measurements are then obtained in one direction. The core plugs are then saturated and a measured volume of fluid is flowed through the core plug in the opposite direction. Fluid flow temperature was 75°F. Regained permeability measurements are obtained in the original direction. Gas flow measurements are at 73°F.

Results: The data are reported as a percent of the initial permeability recovered.

Sample No.	Initial Perm. Gas (N_2) (md)	Saturation Fluid
3A	0.529	2% KCl
3B	0.912	2% KCl with 2 gallons/1,000 gallons CLA-STA FS
3D	1.42	Diesel

Percent Regained Permeability (N_2) vs Time

Sample No.	Time (hrs)	Percent	Time (hrs)	Percent	Time (hrs)	Percent	Time (hrs)	Percent	Time (hrs)	Percent
3A	0.5	22	1.0	28	3.0	60	6.0	68	24	68
3B	0.5	35	1.0	86	3.0	<100	-	-	-	-
3D	0.5	37	1.0	55	3.0	22	6.0	19	24	19

Data Cont'd

Scanning Electron Microscope (SEM) Examination and Petrographic Examination

For SEM:

Purpose: To provide a greatly magnified view of a core sample. Minerals present in the sample can be identified and their location observed.

Procedure: A core chip with a freshly broken surface is required for this examination. The sample is coated with a gold palladium alloy and placed in the vacuum chamber of the SEM. The core chip is viewed at a high magnification and a photomicrograph is taken. An associated energy dispersive x-ray (EDX) is used to help identify the mineral content of the sample.

Results: The framework grains can be identified and their size approximated. The location of the clay minerals within the sample can be observed. The SEM can produce, in effect, a pseudo three-dimensional view of formation pore spaces. The area of the sample viewed is very small and may not clearly characterize the entire formation.

For Petrographic:

Purpose: To describe the framework grains, the matrix or the cementing material, and the pore spaces.

Procedure: Core chips are glued to glass slides and then ground to a thin section through which light can be transmitted. The slide is placed under a microscope and viewed using polarized light at high magnification.

Results: The result of this examination is a descriptive and systematic classification of the rock and materials present in the sample. This analysis is a visual observation, thus is somewhat subjective.

Data Cont'd

Scanning Electron Microscope Examination Cont'd

Sample No: 1
Depth: 3,338 feet

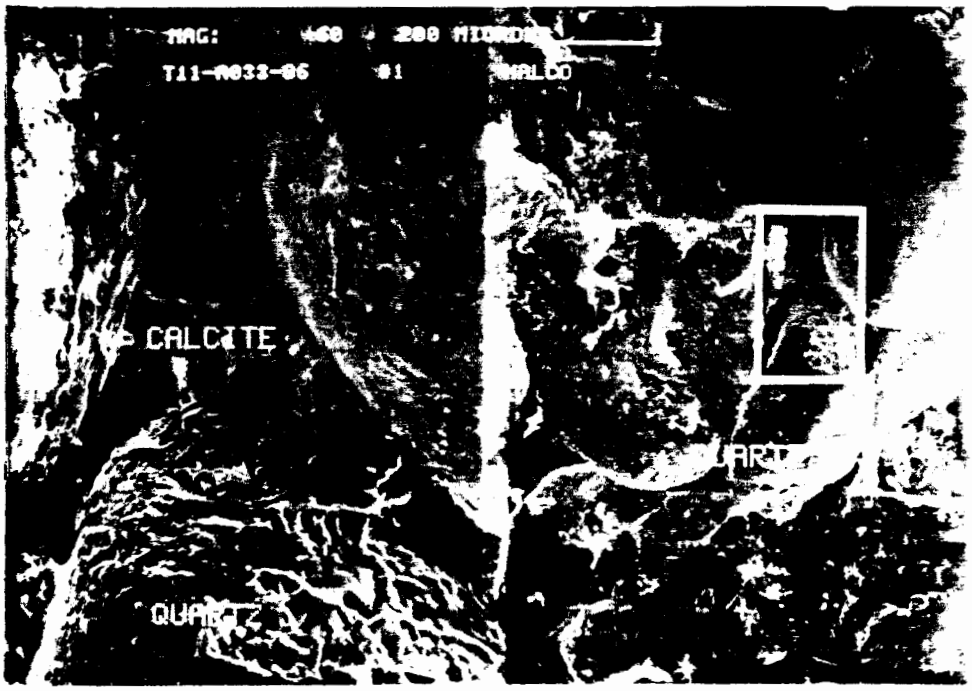


Figure No. 1; Negative No. 21805-9308; Magnification 60X, 300X

Sample No. 1 has a framework of medium sand size grains of quartz with calcite infilling between the grains. Trace of chlorite. Poor visible porosity. One grain noted of florencite - Ce(Al)3[P(O)4]2(OH)6. (Upper right portion of close-up.)

Petrographic Examination Cont'd

CALCAREOUS CEMENTED SANDSTONE - Framework of poorly sorted, subangular to rounded, granule to very fine sand size grains of quartz, chert, rock fragments, mica, with a small amount of calcite pore fill. Microcrystalline calcite and clay lines and infills many pores. Good to fair visible porosity.

Data Cont'd

Scanning Electron Microscope Examination Cont'd

Sample No: 2
Depth: 3,354 feet

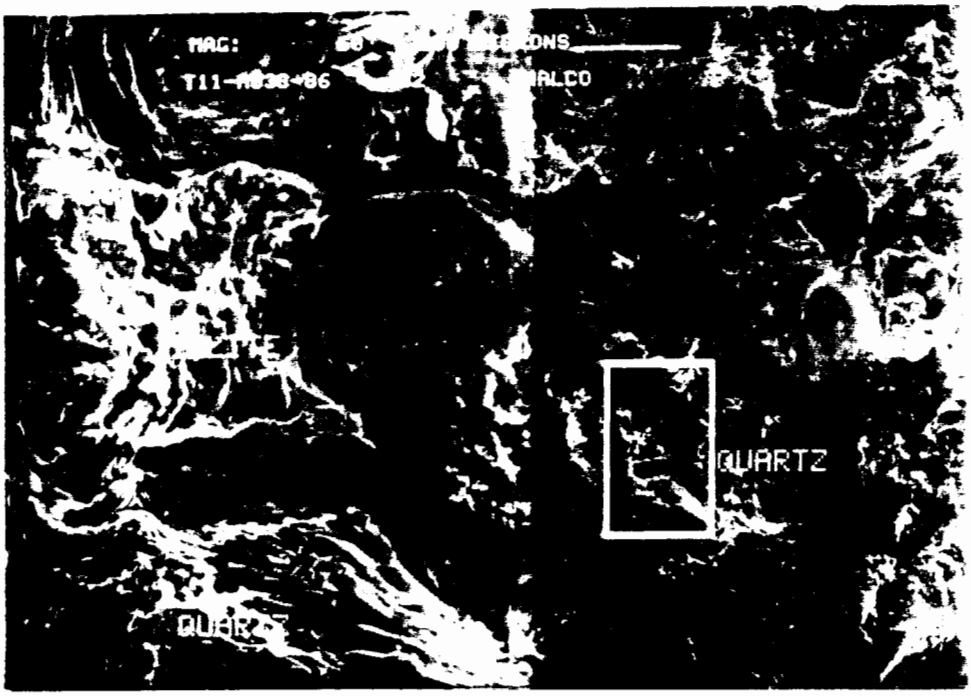


Figure No. 2; Negative No. 21805-9307; Magnification 60X, 300X

Sample No. 2 has a framework of medium to fine sand size grains of quartz with a trace of calcite cement. Trace of illite clay. Poor visible porosity.

Petrographic Examination Cont'd

SANDSTONE - Framework of poorly sorted, subangular to rounded, granule to very fine sand size grains of quartz, chert, rock fragments, with a very small amount of calcite and clays infilling some pore spaces. Good to fair visible porosity.

Data Cont'd

Scanning Electron Microscope Examination Cont'd

Sample No: 3
Depth: 3,364 feet

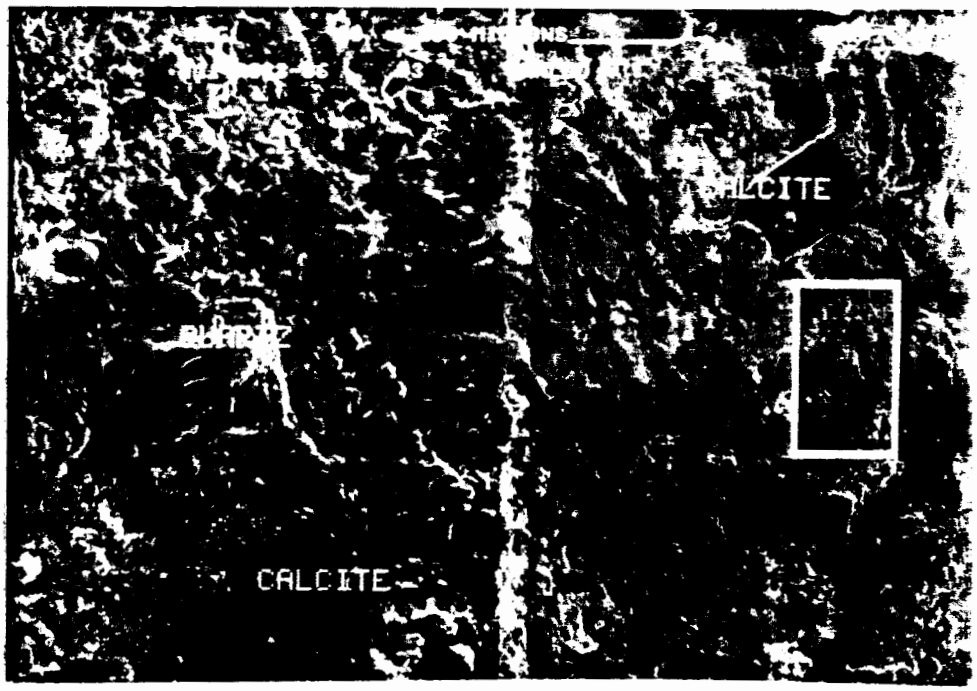


Figure No. 3; Negative No. 21805-9306; Magnification 60X, 300X

Sample No. 3 consists of calcite crystals ranging from 200 microns to less than 2 microns. Small amount of silt size quartz grains scattered throughout the calcite. Trace of salt and chlorite clay. No visible porosity.

Petrographic Examination Cont'd

CALCAREOUS CEMENTED SANDSTONE - Framework of poorly sorted, subangular to rounded, pebble to very fine sand size grains of quartz, chert, rock fragments, with a moderate to large amount of carbonate cement. Trace of clay in intergranular pores. Good to fair visible porosity.

Core Sample Disposition

The core samples will be held in storage for 60 days following mailing of the report. At the end of this time, we will select representative core pieces for storage in the Core Library and discard the remainder unless we are requested to ship the cores to another location.

The selected core pieces will be in the Core Library for two years and will be considered the property of the customer. These core pieces will not be released without the permission of the customer, the originating Halliburton Engineer, or a Stimulation Engineering and Design Section Supervisor. After two years, the selected core pieces will be kept for another eight years, during this time the pieces may be used for a variety of projects.

Data Book Reference

The data presented in this report are recorded in Stimulation Engineering and Design Book No. 5899, page 34; Analytical Book No. 5895, page 43 and 44; Analytical Book No. 5914, page 22; and Analytical Book No. 5921, page 15.

cc: Mr. B. A. Matthews
Mr. K. W. McKown
Mr. C. E. Kirby
Mr. R. M. Lasater
Dr. L. E. Harris

Respectfully submitted,

HALLIBURTON SERVICES

Laboratory Analyst
Arrington-Pyeatt-Simon
Loghry-Gray-Black

By Martin Halterman

Martin Halterman

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