

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

February 27, 1973

REPLY TO
S. N. W. 42ND ST.
OKLAHOMA CITY, OKLA.
73118

Galaxy Oil Company
918 Lamar
Wichita Falls, Texas 76301

SE SE NW
Sec. 15 - 21s - 38w

Attn: Mr. Gerald Jackson

Subject: Core Analysis Data
Harshbarger No. 1 Well
Hugoton Field
Kearny County, Kansas
CLI File No. CP-1-7717

Gentlemen:

Diamond cores were taken in the Chase group in the Harshbarger No. 1 Well between 2543 and 2638 feet. The core was preserved at the well-site and shipped to the Oklahoma City laboratory for whole-core analysis in the intervals requested. The resulting data are presented on page one of this report.

Poor permeability and porosity development is encountered in the interval 2577 to 2586 feet. Low measured total water saturations suggest some gas space exists.

A Core-Gamma Surface Log was recorded and is presented on the accompanying Coregraph.

We appreciate this opportunity of serving you and remain ready to serve your needs in formation or reservoir analysis.

Very truly yours,

CORE LABORATORIES, INC.



Dale E. Boyle
Oklahoma City Laboratory Manager

DEB:es

5 cc - Addressee

4 cc - Northern Natural Gas Company

Attn: Mr. Chet Jamison

The Park Suite 100

5155 E. 51st

Tulsa, Oklahoma 74135

2 cc - Natomas Company

Attn: Mr. C. E. Englehart

12th Floor - International Building

St. Mary's Square

San Francisco, California 94108

CORE ANALYSIS RESULTS

Company GALAXY OIL COMPANY Formation KRIDER File CP-1-7717
 Well HARSHBARGER NO. 1 Core Type DIAMOND 3 1/2" Date Report 12-11-72
 Field HUGOTON Drilling Fluid WATER BASE MUD Analysts BOYLE
 County KEARNY State KANSAS Elev. 3363' KB Location SE SE NW SEC. 15-21S-38W

Lithological Abbreviations

SAND - SD SHALE - SH LIME - LM	DOLomite - DOL CHERT - CH GYPSUM - GYP	ANHYDRITE - ANHY CONGLOMERATE - CONG FOSSILIFEROUS - FOSS	SANDY - SDY SHALY - SHY LIMY - LMV	FINE - FV MEDIUM - MED COARSE - CSE	CRYSTALLINE - XLN GRAIN - GRN GRANULAR - GRNL	BROWN - BRN GRAY - GRV VUGGY - VGY	FRACTURED - FRAC LAMINATION - LAM STYLOLITIC - STY	SLIGHTLY - S VERY - V/ WITH - W/
SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS		POROSITY PER CENT	RESIDUAL SATURATION PER CENT PORE		SAMPLE DESCRIPTION AND REMARKS	
		PERM. MAX.	PERM. 90°		OIL	TOTAL WATER		

WHOLE-CORE ANALYSIS

	2543-50						Anhy, w/few sh stks
	50-60						Siltstone, shy (red)
	60-77						Sh, silty (red)
1	2577-78	0.1	0.1	7.7	0.0	88.6	Dol, silty, anhy
2	78-79	<0.1	<0.1	6.0	0.0	56.3	Dol, silty, anhy
3	79-80	0.1	0.1	5.0	0.0	34.6	Dol, anhy
4	80-81	0.1	<0.1	5.9	0.0	29.6	Dol, anhy
5	81-82	0.4	<0.1	5.4	0.0	38.6	Dol, anhy, vert frac
6	82-83		<0.1*	4.6	0.0	29.0	Dol, anhy
7	83-84	0.5	0.1	6.8	0.0	46.0	Dol, anhy, vert frac
8	84-85	0.1	0.1	10.5	0.0	75.4	Dol, silty, anhy
9	85-86	<0.1	<0.1	8.1	0.0	68.0	Dol, silty, anhy
	86-91						Dol, w/sh stks & anhy incl
	91-2608						Siltstone, shy (red)
	2608-17						Sh (red)
	17-19						Dol, sdy
	19-31						Siltstone (red) (dol - 2621-22)
	2631-38						Sh, silty (red)

* DENOTES PLUG PERMEABILITY

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

CORE LABORATORIES, INC.



Petroleum Reservoir Engineering

COMPANY GALAXY OIL COMPANY FIELD HUGOTON FILE CP-1-7717
 WELL HARSHBARGER NO. 1 COUNTY KEARNY DATE 2-15-73
 LOCATION SE SE NW SEC. 15-21S-38W STATE KANSAS ELEV. 3363' KB

CORE-GAMMA CORRELATION

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VERTICAL SCALE: 5" = 100'

CORE-GAMMA SURFACE LOG

(PATENT APPLIED FOR)

GAMMA RAY

RADIATION INCREASE →

COREGRAPH

TOTAL WATER

PERCENT TOTAL WATER

80 60 40 20

PERMEABILITY

MILLIDARCS

100 50 10 5 1

POROSITY

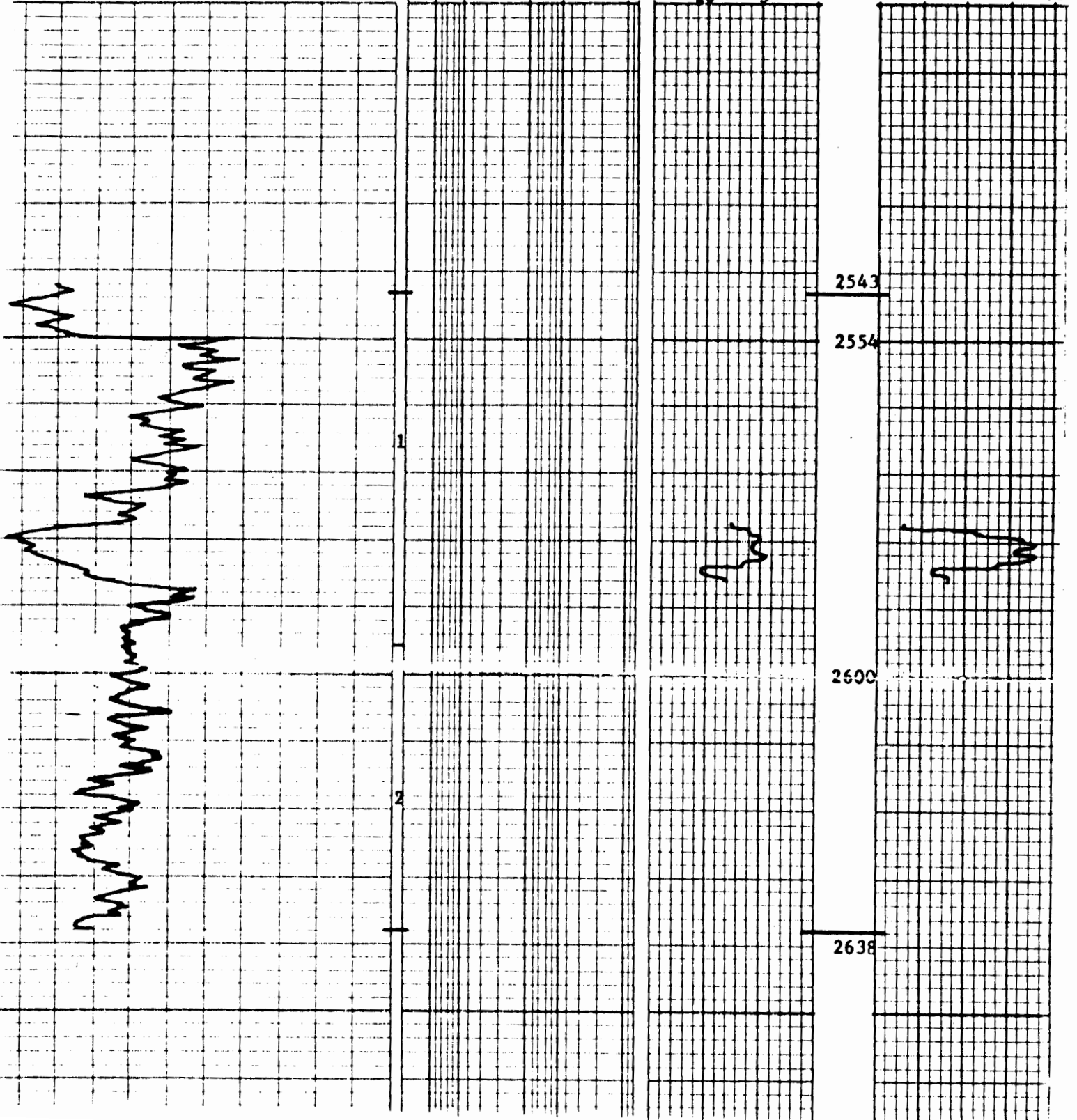
PERCENT

10 5

OIL SATURATION

PERCENT PORE SPACE

0 20 40 60 80



Galaxy Oil Co.--Harshbarger #1
Sec. 15, T21S-R38W
Kearny County, Kansas

Cone Description
by:

Doug Marden
Liberal, Kansas

Diamond Core #1 2543-2596' Recovered 53'

- 2543.0-2545.0' Shale, dark gray, mottled maroon, slightly calcareous, fine textured.
- 2545.0-2550.0' Sandstone, gray, some tan, very fine-grained, quartzitic, dense, no visible porosity--some medium-grained.
- 2550.0-2554.0' Shale, dark red, conchoidal, non-calcareous w/few thin interbeds of sandstone, light-medium gray, very fine-grained, no visible porosity, non-calcareous--some of red shale is silty.
- 2554.0-2561.5' Shale, dark red, silty, occasional small round quartz pebbles ($\frac{1}{8}$ " non-calcareous to very slightly calcareous; breaks like a mud-stone; finely micaceous (muscovite) in part, few very thin ($\frac{1}{16}$ ") light gray, very fine-grained sandstone beds from 2559-2560'--very slightly calcareous.
- 2561.5-2563.5' Shale, dark red, fine textured, crumbly, rotten, breaks in conchoidal fractures.
- 2563.5-2566.3' Shale, as from 2561.5-2563.5, few $\frac{1}{8}$ " round quartz pebbles--not rotten--some mottled medium gray--silty in bottom foot
- 2566.3-2568.0' Shale, dark red, mottled green and dark gray, fine-textured, rotten.
- 2568.0-2572.0' Shale, dark red, slightly silty, conchoidal fractures, probable small red shale pebbles.
- 2572.0-2575.0' Shale, dark red, fine-textured, breaks like a mud stone.
- 2575.0-2577.4' Shale, dark red, fine-textured, with large ($\frac{3}{4}$ ") gray quartzitic sandstone pebbles--almost a quartz conglomerate in a shale matrix--many very small pebbles. Sandstone conglomerate from 2576.0-2577.4'.
- 2577.4-2585.0' Sandstone, brown mottled light green, fine-grained, slightly shaly in top $\frac{1}{2}$ foot, then is a very fine-grained greenish, non-calcareous sandstone, some intergranular porosity; becoming tan and buff at 2579'; still very fine-grained; cream colored below 2580' and very slightly calcareous; more tan & medium gray, quartzitic below 2581'--fine-grained, dense appearing, but must have intergranular porosity--few very small pebbles or coarse grains of sand becoming cream and tan again at 2583', some white, crystalline white anhydrite inclusions in bottom one foot. Entire interval bleeding gas.

Core #1 (Cont'd.)

- 2585.0-2586.0' Sandstone, buff, mottled medium gray, very fine-grained, even-grained, slightly calcareous.
- 2586.0-2590.0' Shale, medium gray, silty, non-calcareous breaks in concoidal fractures--streaks of buff siltstone, very slightly calcareous in fractures. Some cross-bedding in the shale of these siltstones or very fine-grained sandstones.
- 2590.0-2591.0' Shale and siltstone, as above--no cross-bedding.
- 2591.0-2596.0' Shale, dark red, mottled greenish gray, fine-textured, non-calcareous.

Diamond Core #2 2596-2640' Recovered 41'

- 2596.0-2600' Siltstone, red, "chunky" & shale, red, silty, very slightly calcareous.
- 2600.0-2601' Siltstone, dark grayish red, very shaly.
- 2601.0-2608' Siltstone, dark red, shaly, not calcareous, concoidal fractures, some mottled dark gray below 2605'--almost a silty shale--red siltstone 2606-2608'.
- 2608-2615' Shale, dark red brown, silty in part, few $\frac{1}{2}$ " quartz pebbles 2609-2610'--mostly a dark red, fine-textured shale--some mottled gray green--slickensides 2611-2612'--quite silty 2613-2615'.
- 2615.0-2617.5' Shale, dark gray green, fine-textured, breaks "blocky", some white "clayey" shale 2616-2617.5'.
- 2617.5-2621.2' Sandstone, light gray buff, to buff, very fine-grained, no visible porosity, no shows, dense. One greenish shale laminae-sandstone appears fine sugary--is hard--non-calcareous.
- 2621.2-2621.3' Shale, dark gray, silty.
- 2621.3-2623.0' Siltstone, medium brown, shaly--non-calcareous.
- 2623.0-2624.5' Sandstone, light gray, very fine-grained, non-calcareous, no visible porosity, no shows, hard--some thin dark red siltstone beds.
- 2624.5-2631.5' Siltstone, dark red, shaly, no visible porosity, no shows; could be a sandstone, dark red, silty & shaly, some very fine-grained, buff gray, silty, mottled red sandstone in bottom foot.
- 2631.5-2637.0' Shale, dark red, mottled dark gray, silty, concoidal fractures, non-calcareous--some red siltstone, shaly from 2634-2635', shale, dark red mottled gray green in bottom 2 feet--scattered $\frac{1}{2}$ " quartz pebbles in matrix.
- 2637.0-2640.0' Lost core.

Note: Three feet of core may have been lost when a connection was made at 2602'. It is believed that the top of sandstone above should be at 2620.5' instead of 2617.5'.

Galaxy Oil Co.--Harshbarger #1

Sec. 15, T21S-R38W

Kearny County, Kansas

Diamond Core #1 2543-2596'

Coring Time:

2543-2550'	52	56	59	56	45	40	33			
2550-2560'	22	20	23	22	16	16	25	13	15	18
2560-2570'	22	24	26	21	17	26	27	27	22	24
2570-2580'	24	25	25	25	23	37	39	38	40	35
2580-2590'	33	22	23	22	23	19	35	19	16	16
2590-2596'	17	16	17	16	13	14				

Diamond Core #2 2596-2640'

Coring Time:

2596-2600'	28	19	17	16						
2600-2610'	18	17	14	15	17	15	14	16	23	21
2610-2620'	19	18	18	17	21	28	24	34	26	31
2620-2630'	14	11	13	12	12	14	16	11	11	9
2630-2640'	10	11	17	16	11	17	18	19	17	21

CORE #1 & CORE #2 ANALYSIS BY CORE LAB

Sample No.	Depth	Perm: Max	Perm 90°	Poros.	Oil	Total Water	Sample Disco.
	2543-50						See sample description above
	2550-60						
	2560-77						
1	2577-78	0.1	0.1	7.7	0	88.6	
2	2578-79	Less than	0.1	6.0	0	56.3	
3	2579-80	0.1	0.1	5.0	0	34.6	
4	2580-81	0.1	0.1	5.9	0	29.6	
5	2581-82	0.4	0.1	5.4	0	38.6	<u>1</u>
6	2582-83	*	0.1	4.6	0	29.0	
7	2583-84	0.5	0.1	6.8	0	46.0	<u>1</u>
8	2584-85	0.1	0.1	10.5	0	75.4	
9	2585-86	0.1	0.1	8.1	0	68.0	
	2586-91						
	2591-2608						
	2608-17						
	2617-19						
	2619-31						
	2631-38						

* Denotes Plug Permeability

CORE DESCRIPTIONS
GALAXY NO.1 HARSHBARGER

- 2619-19½ Mottled dol, sh & anhy as 2616-16½ w/ some dol. as above.
- 2619½-20 Sh, maroon, silt textured, dolomitic w/ few scat. lge anhy incls.
- 2620-21 Dol., Salmon pink & lt. gray mottled, silty, very argil, no vis por.
- 2621-22 Dol., lt. brn w/ pink mottling, v.f. xtln, argil, no vis por. w/ lt. & med. gray dolomitic laminated sh. strk (2") @ 2621.
- 2622-23 Dol., pink and maroon mottled, v.f. granular, very argil., no vis por.
- 2623-24 Dol., lt. brn, fine xtln., slightly argil, trcs. pin-point porosity.
- 2624-24½ Sh., maroon, amorphous, dolomitic.
- 2624½-25 Dol., lt. gray, v.f. xtln, argil, no vis por.
- 2625-25½ Dol., brown, v.f. granular, no vis por, very argil (could be called dolomitic sh).
- 2625½-29 Dol., A.A. color varies from orange to maroon depending on amount of argil. content.
- 2629-31 Dol., as above but becoming extremely argil, and more towards red dolomitic sh. side.
- 2631-31½ Sh, brownish maroon, amorphous, dolomitic.
- 2631½-34½ Dol. as above.
- 2634½-36 Sh., gray, pink & maroon mottled, dolomitic, silt textured.
- 2636-37 Sh, med gray, hd, amorphous, dolomitic.
- 2637-38 Sh., rust, silt textured, dolomitic w/ strk of lt. grayish-green sh. at base w/ inclusions of glassy gray & pink anhy.

SIX FEET OF CORE MISSING.

CORE DESCRIPTIONS

GALAXY NO.1 HARSHBARGER

SE SE NW Sec. 15-T21S-R38W
Kearny County, Kansas

Core #1: 2543-96
Core #2: 2596-2644

By: Bill Little
Geologist for
Northern Natural Gas
Tulsa

- 2543-44 Anhy & sh; anhy is lt.glassy gray, xtln; sh is med gray, dolomitic, trcs. brn & red mottling.
- 2544-44½ Sh, pred brnish red w/ med gray mottling, dolomitic.
- 2544½-45 Anhy & sh, as 43-44 - Trc. of laminae of lt. gray v.f.g. chalky dol.
- 2545-47 Anhy, lt. glassy gray, xtln. w/ laminae of lt. gray v.f.g. chalky dol. at base.
- 2547-48½ Anhy as above w/ strks lt. & dk. gray laminated v.f.g. chalky shaly dol.
- 2548½-50 Anhy, wh., med. & dk. gray mottled, xtln.
- 2550-50½ Sh, med. gray grading to maroon, amorphous, dolomitic.
- 2550½-53 Siltstone, lt. gray & lt. orange, shaly, dolomitic, very finely micaceous.
- 2553-54 Sh, rust, parts amorphous, parts silt textured. Very finely micaceous, dolomitic.
- 2554-59 AA w/ brnish-red waxy nodules & anhy. incls., very finely micaceous, less anhydritic & fewer nodules towards base - closed vert. x 58½-59½.
- 2559-60 Dol, lt. gray v.f. xtln, chalky & v. slightly argil. no vis por.
- 2560-66 Sh, rust w/ some grayish-green mottling, both silt textured & amorphous, dolomitic, w/ strks of anhy @ 62-63. Vert x's @ 60½ to 63. Some amorphous sh nodule incls. in silt textured sh.

CORE DESCRIPTIONS
GALAXY NO.1 HARSHBARGER

- 2566-67 Sh, med greenish-gray amorphous, dolomitic.
- 2567-77½ Sh, rust, amorphous, dolomitic, trcs. greenish-gray mottling w/ strk of lt. glassy gray anhy w/ red sh mottling from 68½ - 69, vert frac. @ 67-68 & 71½ - 73. Anhy incls. 75-76 & becoming very anhydritic @ base.
- 2577½-78 Dol, greenish-gray, v.f.g., silty, argil. No vis. por. abnd. anhy blobs @ top. No vis por.
- 2578-79 A.A. becoming lt. buff in color, less silty, not argil, w/ abund. anhy incls. no vis por.
- 2579-80 A.A. more anhydritic, approx. 40-50% anhy. no vis por.
- 2580-81 A.A. less anhydritic than 79-80 & anhy incls. smaller but still of c.g. size. No vis por.
- 2581-82 A.A. more anhydritic, at least 50% anhy, no vis por.
- 2582-83 A.A., like 80-81, no vis por.
- 2583-84 A.A. ½ foot, very little anhy, 10-20% & ½ foot very anhydritic 50% (whole core shows ½ foot of anhy laminae) closed hair-line x.
- 2584-84½ A.A., no anhy.
- 2584½-85 A.A. no anhy, becoming darker in color and argil.
- 2585-86 Footages off, no core for this interval, possibly one foot off here.
- 2586-86½ Dol, dk, grayish brn, micro xtln, very argil.
- 2586½-87 A.A. except lt. brn in color, less argil & trc anhy incls.
- 2587-89 Sh, very dark gray, amorphous, dolomitic (source rock?), parts mottled & laminated w/ lighter gray shale.
- 2589-91 Dol, dk brn dense, mottled w/ smoky blue xtln anhy & w/ strks. of lt. & med gray dolomitic shale.

CORE DESCRIPTIONS
GALAXY NO.1 HARSHBARGER

- 2591-92 Dol, med. gray w/ yellow limonitic mottling, dense, very argil.
- 2592-96 Dol, rust & med. gray mottled, dense, very argil. Could be called dolomitic shale, texture more on dolomite side. Grades into red shale below.
- 2596-96½ Sh, rust, silt textured, dolomitic.
- 2596½-97 As above w/ large blobs lt. glassy gray anhy incls.
- 2597-98½ As 96-96½.
- 2598½-99 As 96½-97.
- 2599-2602½ Red dolomitic sh. as above, no anhy. incls.
- 2602½-03 Sh., med. gray, amorphous, dolomitic, few scat. anhy. incls.
- 2603-07 Red dolomitic sh. A.A. No anhy. incls. w/ strk gray sh @ 2605½-06.
- 2607-08 A.A. becoming lighter in color (lt. orange & salmon).
- 2608-08½ Sh, A.A. becoming rust colored again and w/ large anhy blob incl.
- 2608½-09 Rust red shale as above.
- 2609-14½ Rust red sh as above mottled w/ much anhy & mottled w/ some lighter colored sh. Percentage of anhy grades down toward base.
- 2614½-16 Shale as above interbedded w/ med greenish-gray dolomitic sh.
- 2616-16½ Mottled dol, sh. & anhy. Dol. is very lt. gray, amorphous, chalky; anhy is glassy gray, wh. & pink, xtln; sh is greenish gray, amorphous, dolomitic.
- 2616½-17 Sh, maroon & med. grayish-green mottled, amorphous, dolomitic.
- 2617-19 Dol., lt. buff, v.f. granular, very silty, no vis por; w/ strk (3") of mottled dol. sh & anhy as at 2616-16½ @ 2618.