

BIOSTRATIGRAPHY OF EXPLORATORY WELLS, NORTHERN WILLAMETTE BASIN, OREGON

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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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OIL AND GAS INVESTIGATION 12

**BIOSTRATIGRAPHY OF EXPLORATORY WELLS,
NORTHERN WILLAMETTE BASIN, OREGON**

By
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1984

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SECTION I. OVERVIEW

INTRODUCTION

Since Oregon's 1979 Mist Field discovery, there has been increased interest in the nearby northern Willamette Basin. Four recent wells, all included in this report, were drilled from fall, 1980 to fall, 1982. They average slightly greater than 5500 ft in depth.

Five older wells also are included in this study. Four of them were previously reported on by this writer in Oregon Department of Geology and Mineral Industries (D.O.G.A.M.I.) Open File Report O-80-1. The fifth, the Humble Wicks No. 1, was drilled farthest east in the study area.

This report provides detailed biostratigraphy of strata nearby but in a basin separate from that which contains Mist Field. It is the aim of this investigation to present fossil sequences for contrast and comparison to those in the east Nehalem Basin (see McKeel, 1983).

Section II includes individual foraminiferal reports for the nine wells. Each well report contains an introductory summary, followed by interval listings of fossil and key lithologic highest occurrences. Primarily only highest occurrences are used here because of extensive downhole contamination in ditch samples. The well reports are concluded by interpretations of age (benthic foraminiferal Stage) and paleobathymetry for each distinctive well interval.

Concluding this report (back cover) is a subsurface illustration which contains a surface location map and selected correlations for all but one of the wells in the form of a generally north-south cross section.

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SAMPLE COVERAGE AND PROCESSING

Interpretations in this study are based on 918 samples (582 wet ditch, 295 dry ditch, and 41 cores). Sample coverage varies from one ditch sample analyzed for each 30 ft of section to only widely spaced cores. In this study, best sample coverage, and hence the most reliable data, were obtained from the Reichhold Bagdanoff, Quintana Gath, and Oregon Natural Gas Independence wells. The Texaco Cooper Mountain well has the poorest sample coverage. Therefore, the interpretations for this well section are more tentative.

Raw material from each sample was boiled for 20 minutes in a 32 to 1 water to Quaternary "0" (Zingula, 1968) solution. Fossils were not concentrated by flotation, thereby eliminating the possibility of losing replaced, infilled, or arenaceous specimens in the tailings.

FOSSIL CORRELATIONS

California benthic foraminiferal Stages of Kleinpell (1938), Schenck and Kleinpell (1936), and Mallory (1959) are used in this study. Based on rare but distinctive planktic foraminiferal occurrences, strata recognized herein as Refugian, Narizian, and upper Ulatisian, represent the following regional ages:

uppermost Refugian = early Oligocene
rest of Refugian = late Eocene
upper Narizian = late Eocene
lower Narizian = late middle Eocene
upper Ulatisian = early middle Eocene

Boundaries between four benthic foraminiferal Stages are recognized in various well sections of this study. The Zemorrian-Refugian boundary is present in the northernmost and southernmost well sections (see Plate 1). The Refugian-Narizian boundary is most easily recognized, but only in wells south of Township 5 South, and west of Range 1 West. Highest Narizian sediments are marked by highest *Cibicides natlandi* and/or *Bulimina microcostata* - the same as for the east Nehalem Basin (McKeel, 1983). Only one well, the Reichhold Finn No. 1, penetrated fossiliferous section which is certainly as old as Ulatisian. In this well, the Narizian-Ulatisian boundary is tentatively recognized at a possible hiatus defined by a shallow shelf tropical fauna of large foraminifers at 3670 ft.

Highest occurrences of species at 20 different horizons were selected for illustration on Plate 1. Benthic species were found to be more useful as a whole for correlation of post-Ulatisian strata, whereas planktic fossils are more reliable in the Ulatisian, when sediments were deposited farther from shore.

Most benthic species chosen for correlation in this study lived on the upper to upper middle slope. Highest occurrences of species outside this depth range are too facies controlled for reliable correlations in this basin. In the upper Narizian, maximum numbers of deep bathyal hispid *Uvigerina*, however, do seem to correlate from well to well, but their highest occurrences do not.

In several wells, a sand stratigraphically equivalent to the producing Clark and Wilson sand (= upper Cowlitz sand of McKeel, 1983) is below or bracketed by key benthic Foraminifera. In the two

wells of this study drilled farthest west, Lenticulina chirana and maximum numbers of hispid Uvigerina occur above, and Amphimorphina jenkinsi is present below the sand (see Plate 1). The three most southerly well sections illustrated on Plate 1 do not contain A. jenkinsi below the sand, but the same species (Lenticulina chirana and maximum hispid Uvigerina) occur above it.

A few planktic fossil occurrences were chosen for correlation. Turborotalia insolita's highest occurrence is within the Refugian Stage just below the top of the Eocene. In the "Narizian, undifferentiated" part of the section, the highest occurrence of Subbotina sp. var. (large) and a horizon of common large spherical radiolaria are recognizable in the Finn and Bruer wells. Another burst of large spherical radiolaria occurs in upper Ulatisian-lower Narizian, undifferentiated strata. This horizon is recognizable in all but one of the wells north of Township 6 South (see Plate 1). In the Ulatisian, highest occurrences of Planorotalites cf. P. planoconica and Truncorotaloides cf. T. pseudotopilensis, may prove to be useful species for future Willamette Basin correlations.

LITHOLOGIC CORRELATIONS

Lithologies noted throughout this study are from biased sample residues after boiling in Quaternary "0" and washing through a 200 mesh screen. Although quantitatively incorrect, they are qualitatively useful, especially for correlation.

A few distinctive lithologies aided in correlation of poorly fossiliferous or barren Narizian sections. Correlations mentioned below are illustrated on Plate 1.

In the northern part of the study area, the Texaco Cooper Mountain No. 1 is connected to the Nahama and Weagant Klohs No. 1 using restricted ranges of rutile(?) crystals. A lower part of the Klohs well is tentatively correlated to the Reichhold Bagdanoff No. 23-28 by nearly adjacent horizons of rounded coarse sand and gilsonite in both wells. These occurrences probably are stratigraphically equivalent, as the two wells are aligned parallel to the trend of the basin.

In the southern third of the study area, sandy horizons are useful for correlation. In both the Reichhold Merrill No. 1 and Oregon Natural Gas Independence No. 12-25, rounded coarse sand represents a hiatus slightly below highest Narizian fossils. The same two wells contain a horizon of highest abundant mica, which marks the top of sands stratigraphically equivalent to Mist Field's producer (Clark and Wilson sand). Also in the Merrill and Independence wells, the top of a sandstone, increasingly resistant (going down section) to disaggregation in Quaternary "0", occurs 400 to 500 ft below the highest abundant mica. This same "well-consolidated" sandstone is present in the Quintana Gath No. 1 to the east, and to the north in the Reichhold Finn No. 1 and Reserve Oil and Gas Bruer No. 1.

PALEOENVIRONMENTAL TRENDS

A paleobathymetric curve for a composite section in the study area is illustrated in Figure 1. Interpretations of water depth throughout this study are based on Ingle's (1980) southern California framework. Maximum depths for his Paleogene biofacies

are: inner neritic 150 ft; outer neritic 470 ft; upper bathyal 1560 ft; upper middle bathyal 4700 ft; lower middle bathyal 6250 ft.

Essentially all strata penetrated by the wells of this study, with the exception of the bottom half of the Reichhold Finn No. 1, were deposited close to shore. An increase in fossil plankton below 3070 ft and another below 4660 ft in the Finn, indicate a generally offshore depositional regime during the Ulatisian and basal Narizian.

Wells in the southwest quarter of the study area contain the most complete sedimentary Cowlitz sections. They are very similar paleobathymetrically to those in the east Nehalem Basin, Columbia County. Going down section from highest Narizian, bathyal depths reached a maximum a short distance above a non-marine to shallow shelf sand. The sand's base appears to lie unconformably upon lower middle bathyal deposits. Continuing down section, water depth shoals somewhat abruptly to outer neritic-upper bathyal depths in the lower Cowlitz (= upper Yamhill?).

It is noteworthy that three widely spaced wells in the northern Willamette Basin have very similar Refugian paleobathymetric histories documented in their sections. They are the Klohs No. 1 to the north and the Merrill and Independence wells in the extreme south. In each of the three Refugian well sections, shallow shelf fossils are bracketed by upper bathyal faunas.

Interestingly, a similar sequence of Refugian paleobathymetry exists in part of the east Nehalem Basin. In the western half of Township 6 North, Range 4 West, apparently the same Refugian shoaling, even more pronounced, is evident in all six well sections studied (see McKeel, 1983, Plate 1, cross section two).

In both basins mentioned above, the Refugian shoaling occurred slightly before the extinction of the planktic marker species, Turborotalia insolita, in each well section where T. insolita is present.

In summary, foraminiferal distributions indicate that major changes in Refugian and upper Narizian paleobathymetry were concurrent in the east Nehalem (McKeel, 1983) and northern Willamette Basins. Therefore, it is this writer's opinion that these major changes in water depth in the two basins were caused by the same set of events.

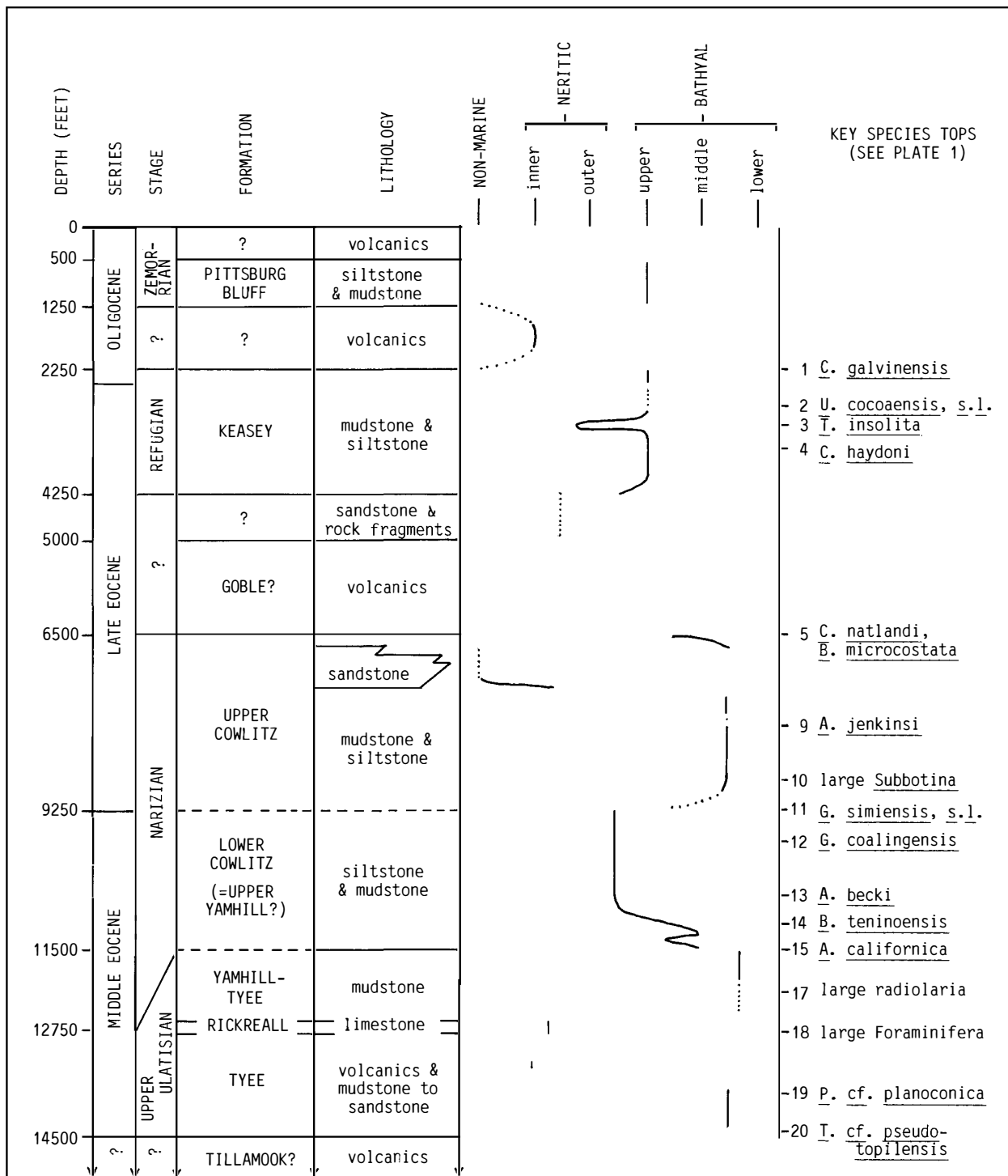


Figure 1. Composite subsurface stratigraphy and paleobathymetric curve for northern Willamette Basin. The following well sections, considered to be most complete, are primary sources for this composite: 0-2250 ft = Klohs No. 1 from 0-2380 ft; 2250-4450 ft = Independence No. 12-25 from 310-2290 ft; 4250-6500 ft = Klohs No. 1 from 3740-5870 ft; 6500-9250 ft = Bruer No. 1 from 600-3430 ft; 9250-11500 ft = Bagdanoff No. 23-28 from 3150-5460 ft; 11500-14500 ft = Finn No. 1 from 2410-5320 ft.

SECTION II. FORAMINIFERAL REPORTS

Note that each ditch sample depth mentioned in the following reports, whether singly or in depth intervals containing more than one sample, represents the bottom of the interval, which generally is 30 ft.

TEXACO, INC.
COOPER MOUNTAIN NO. 1
SE¼ SEC. 25, T1S, R2W
WASHINGTON COUNTY, OREGON

Summary

The well penetrated strata of Refugian, Narizian, and possibly upper Ulatisian age. Refugian sediments were deposited in a nearshore environment, where circulation with the open sea was cut off or restricted. Open marine conditions existed during the Narizian, and deposits were also generally nearshore.

Sparse sample coverage for this deep well did not allow precise fossil correlations to other wells of this study. However, general correlations between the lower half of the Cooper Mountain to that of the Reichhold Bagdanoff No. 1, to the south, are attempted (see Plate 1, back cover).

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 58 previously unprocessed samples (16 dry ditch and 42 cores) borrowed from the Oregon Department of Geology and Mineral Industries (D.O.G.A.M.I.) collection. Depth intervals of ditch samples are uncertain. It is believed that ditch sample depths mentioned below are bottoms of their respective intervals.

1096-1594' (cores)

Globobulimina spp. (crushed) R*, diatoms (pyritized, centrate) R (1096 ft only). Also, glass shards flood (1096 and 1102 ft).

1982-2208' (cores)

Globobulimina oregonensis R, *Eponides* cf. *kleinpelli* R, *Lenticulina* "cf. *welchi*" (of Rau, 1948, pl. 28, figs. 16, 17, = post-Narizian expression) R, *Nonionellina* *aplini* R, *Uvigerina* *cocoaensis*, s.l. R, *Cibicides* *evolutus* R, *Cancris* sp. var. (small) R, *Guttulina* *irregularis* R, *Cassidulina* cf. *galvinensis* R, *Nonion* *halkyardi* R, *Caucasina* *schencki* C, *Gaudryina* *alazanensis* R, *Uvigerina* *beccarii* R.

2437-2455'

Lenticulina spp. (fragments) R (2455 ft only).

* R=1-10 specimens per sample; c=11-32; A=33-100; VA=100+.

3150' (core)

Barren of fossils. Black metallic tetragonal (rutile?) crystals abundant.

3316' (core)

Barren of fossils.

3625-3634' (core)

Barren of fossils. Rutile? crystals (as at 3150 ft) common.

4273-4924' (cores)

Cibicides *natlandi* R, *C. natlandi*/haydoni (intermediate form) R, *Gyroidina* *simiensis*, s.l. R, *Spumellaria* (spheres) R-VA, ostracod var. (deep median sulcus) R, *Gyroidina* *octocamerata* R, *Cibicides* *cushmani* R, *Cassidulina* *globosa* R-C, *C. globosa* var. (uncoiling) R, *Discorbis* *coalingensis*? (of Mallory, 1959) R, *Alabamina* *kernensis* R, *Gaudryina* *coalingensis* R, *Globigerina* cf. *wilsoni* R, *Amphimorphina* *becki* R, *Baggina* *teninoensis* R, *Pseudohastigerina* *micra* R, *P. lillisi* R, *Gyroidina* "scalata" (of Cushman, et. al., 1949, pl. 15, fig. 13), *Truncorotaloides* *aspensis* R.

4936-4944' (core)

Cyclamina sp. var. (large) C, *Ammodiscus* cf. *incertus* R, *Nodosaria* *latejugata*, s.s. R, *Anomalina* cf. *crassisepta* R, *Bathysiphon* *eocenica* R, *Subbotina* spp. C, *Trifarina* *californica* R, plus species listed above.

5105'; 5275' (cores)

Barren of fossils.

5285'; 5306' (cores)

Arenaceous spp. (indeterminate) R, *Haplophragmoides* sp. R.

5759-5797' (cores)

Spongodiscidae R. No new foraminiferal species. *Gyroidina* *simiensis*, s.l. R-C.

6519-6799' (ditch cuttings)

Amphimorphina *californica* R, *Quadriformina* sp. R, shell fragments R, *Bulimina* *sculptilis* R, *Cibicides* cf. *mcmastersi* R, *Spumellaria* var. (large spheres) VA, *Vaginulinopsis* *mexicana* var. R, *Alabamina* *scitula* R, *Valvulineria* *welcomensis* R, *Marginulina* *subbullata* R, *Eponides* *minima* R, ostracod variety ("winged") R, plus species listed above.

<u>6879'</u> (ditch cuttings)	2437-2455	Indeterminate	Marine, undifferentiated
No new species. Spumellaria (some replaced) C, replaced Foraminifera (indeterminate) R.	3150	Indeterminate	Indeterminate
<u>6959-7247'</u> (ditch cuttings)	3316	Indeterminate	Indeterminate
Bulimina cf. jacksonensis? C, Chilostomella sp. var. (obese) R, Oridorsalis umbonatus R, Bulimina alaz-anensis? R, B. corrugata R, Nassellaria R, Spumel-laria (many "pinkish") VA, Cibicidoides coalingensis (of Mallory, 1959) R, Lenticulina welchi R, Vaginu-linopsis sp. R, Uvigerina sp. var. (small, lightly costate) R, Bulimina whitei? R, plus species listed above.	4273-4290	Lower Narizian	Outer Neritic to Upper Bathyal
<u>7275'</u> ; <u>7365'</u> (ditch cuttings)	4492-4732	Lower Narizian	Upper Bathyal
No new species. Spumellaria C-VA.	4742-4944	Lower Narizian	Upper to Upper Middle Bathyal
<u>7445'</u> (ditch cuttings)	5105; 5275	Indeterminate	Indeterminate
Barren of indigenous fossils. Bentonite flood.	5285; 5306	Indeterminate	Marine, undifferentiated
<u>7525'</u> ; <u>7605'</u> (ditch cuttings)	5759; 5797	Lower Narizian	Upper to Upper Middle Bathyal
Gyroidina cf. soldanii C, Lenticulina spp. A, Troch-ammina cf. globigeriniformis R.	6519-6799	Upper Ulatisian	Middle Bathyal, undif-ferentiated
<u>7695'</u> (ditch cuttings)	6879	Indeterminate	Open Marine, undiffer-entiated
Probably barren of indigenous Foraminifera.	6959-7247	Upper Ulatisian	Middle Bathyal, undif-ferentiated
<u>7775'</u> (ditch cuttings)	7275; 7365	Indeterminate	Open Marine, undiffer-entiated
No new species. Spumellaria C.	7445	Indeterminate	Indeterminate
<u>7804-7816'</u> (core)	7525; 7605	Upper Ulatisian	Bathyal, undifferen-tiated
Barren of fossils.	7695	Indeterminate	Indeterminate
<u>7812-8100'</u> (cores and ditch cuttings)	7775	Indeterminate	Open Marine, undiffer-entiated
Sterrasters R, Pseudoglandulina inflata R, P. conica R, Dentalina dusenburyi R, Bulimina macilenta R, plus species listed above.	7804-7816	Indeterminate	Indeterminate
<u>8596'</u> (core)	7812-8100	Upper Ulatisian	Bathyal, undifferen-tiated
Barren of Foraminifera. No new species. Spumel-laria A, pyrite VA.	8596	Indeterminate	Open Marine, undiffer-entiated
<u>8598'</u> (core)	8598	Upper Ulatisian	Bathyal, undifferen-tiated
Bolivina basiscurta R. Also, species listed above R, and Spumellaria VA.	8812-8832; 8896	Indeterminate	Indeterminate
<u>8812-8832'</u> ; <u>8896'</u> (cores)			
Barren of fossils.			

NAHAMA & WEAGENT, INC.
KLOHS NO. 1
NE¼ SEC. 6, T3S, R2W
YAMHILL COUNTY, OREGON

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
1096	Indeterminate	Marine, undifferentiated
1102-1594	Indeterminate	Indeterminate
1982-2208	Refugian	Upper Bathyal

Summary

The upper portion of this well penetrated marine strata representing the Zemorrian and Refugian California benthic foraminiferal Stages of Kleinpell (1938) and Schenck and Kleinpell (1936), respectively. The interval from 3740 (possibly as high as 3620) ft to the deepest sample examined at

5360 ft is barren of indigenous marine fossils. However, a marine environment is indicated by indigenous glauconite from 5060 to 5120 ft.

Ocean depths were relatively shallow, never being greater than upper bathyal. The presence of radiolaria indicate open marine conditions during deposition from 580 to 970 ft (Zemorian) and 2380 to 3200 ft (Refugian).

A distinctive feature of this well is the absence of marine upper Narizian sediments. Other wells in the northernmost Willamette Basin (north of Township 6 South) are similarly lacking this part of the marine fossiliferous section. In contrast, wells in Columbia County's Mist Field area contain well developed upper Narizian faunas above the producing (Clark and Wilson) sand. Most central and southern Willamette Basin wells also have marine fossiliferous sections of upper Narizian age.

Rutile(?) crystals at 4340 ft in this well may be correlative to those found at 3150 and 3625 to 3634 ft in the Texaco Cooper Mountain No. 1 to the north.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 93 previously unprocessed wet ditch samples.

100-550'

Barren of marine fossils. Primarily volcanics. Rare bentonite (430 ft). Rare to common lignitic mudstone and very abundant glass shards (490-550 ft).

580-1210'

Quinqueloculina imperialis VR-R*, Q. weaveri VR-R, Gyroidina planata VR-R, Buccella oregonensis VR-R, Cassidulina crassipunctata R-C, Cibicides elmaensis var. "A" R-C, Globorotaloides suteri VR, Pseudoglandulina inflata VR, Gaudryina sp. VR, Globigerina praebulloides (of McKeel and Lipps, 1975) VR, Uvigerina? obesa? R, Anomalina sp. VR, Cassidulina margareta? R, Fissurina sp. VR, Alabamina kernensis? (fragment) VR, diatoms (pyritized, centrate) R-VA, Cassidulina cf. galvinensis VR-R, Bolivina sp. var. (small) VR-R, Eggerella sp. var. (large, crushed) VR, Pseudoglandulina sp. var. (thin, elliptical) VR-R, Virgulina zetina VR, Cibicides aff. olequaensis VR, Nonionellina? sp. VR, Pseudoglandulina nallpeensis? (crushed) VR, Pyrgo sp. VR.

1270-1540'

Barren of indigenous marine fossils. Pyritized wood fragments A (1330 ft), bentonite R (1480 ft), sub-rounded rock fragments A (1540 ft).

1600-2080'

Elphidium sp. VR, Elphidiella sp. VR-R, Cibicides sp. var. (large, coarse wall, umbilical plug, both sides, subrounded periphery) VR, plus very rare occurrences of upper bathyal species listed above, considered to be caved. Glauconite VR (1900 ft), R (1960 ft), and C (2080 ft).

* VR=1-2 specimens per sample; R=2-10; C=11-32; A=33-100; VA=101-320; VVA= 321-1000; FL=1000+.

2140-2350'

Barren of indigenous fossils. Quartz-pyrite clusters VVA (2260 ft).

2380-3260'

Eponides kleinpelli VR-R, Uvigerina atwilli R-C, U. cocoaensis, s.l. R-VA, Guttulina cf. hantkeni R, G. irregularis VR-R, Bolivina basiscurta VR, B. oregonensis VR, Plectofrondicularia spp. VR-R, Cassidulina cf. globosa VR, Quinqueloculina porterensis VR-R, Ceratobulimina washburnei VR-R, Alabamina kernensis VR, Gaudryina alazanensis VR, Spumellaria R, Caucasina schencki VR-R, Sigmomorphina schencki VR, Cassidulina galvinensis, s.l. R-C, Gyroidina condoni VR (2410-2560 ft), Nonionellina cf. applini VR-R, Plectofrondicularia packardii VR, Lenticulina inornatus R, Eponides gaviotaensis R, Melonis pompilioides VR-R (2680-2860 ft), Plectofrondicularia robusta VR, Uvigerina cocoaensis, s.s. R, Nonionellina cf. labradoricus VR, N. applini VR-R, Trifarina cooperensis VR, Turborotalia insolita VR-R (2740-3170 ft), Cassidulina galvinensis R (2800 ft), Plectofrondicularia multilineata VR, Uvigerina sp. var. ("medium" costae) VR-R, Chiloguembelina cubensis VR, Eponides mexicana VR, Cibicides cf. olequaensis VR, Cibicides mcmastersi VR (3140 ft), Valvulineria willapaensis VR (3200 ft), plus species listed in intervals above, including Elphidiella sp. VR-R (3170-3260 ft).

3320-3620'

Cribronion? cf. roemeri? VR, Nonionellina applini var. (large) R (3350 and 3380 ft), Valvulineria menloensis VR, Caucasina schencki var. (elongate) R, Lagenella costata R, Dentalina dusenburyi VR, plus species listed above, including Cibicides mcmastersi VR-R. Upper bathyal species occur in reduced numbers in this interval, and are considered to be caved.

3680-3740'

Uvigerina cf. blakeleyensis VR, plus species listed in intervals above, including Uvigerina cf. atwilli R, Turborotalia insolita VR-R. Although upper bathyal Refugian species increase in numbers as compared to the interval above, they probably represent an increase in cavings. Essentially no "new" species, plus a re-appearance of the short-ranging *I. insolita* support the cavings interpretation.

3800-5000'

Barren of indigenous marine fossils. Sub-rounded coarse sand C (4040 ft), gilsonite VVA (4160 ft), rutile? (tetragonal, black metallic) crystals C (4340 ft), bentonite VVA (4400 ft), major increase in volcanics at 4760 ft, "red grains" VA (5000 ft).

5060-5120'

Barren of marine fossils, but glauconite C-VA. Volcanic rock fragments VA-VVA.

5180-5360'

Volcanics. Barren of indigenous fossils.

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
100-550	Indeterminate	Indeterminate
580-1210	Zemorrian	Upper Bathyal
1270-1540	Indeterminate	Indeterminate
1600-2080	Indeterminate	Inner Neritic
2140-2350	Indeterminate	Indeterminate
2380-3110	Refugian	Upper Bathyal
3170-3260	Refugian	Mixed Inner Neritic to Upper Bathyal
3320-3620	Basal Refugian	Middle to Outer Neritic
3680-3740	Refugian?	Upper Bathyal?
3800-5000	Indeterminate	Indeterminate
5060-5120	Indeterminate	Marine, undifferentiated
5180-5360	Indeterminate	Indeterminate
5390-5869	T.D. No samples received.	

REICHHOLD ENERGY CORPORATION
BAGDANOFF NO. 23-28
SW¼ SEC. 28, T5S, R2W
MARION COUNTY, OREGON

Summary

The well section from 1680 to 3120 ft is indeterminate in age due to very shallow shelf to non-marine facies.

The lower half of the well section is lower Narizian from 3150 to 5430 ft, and possibly as old as upper Ulatisian from 5460 to 6000 ft T.D.

There is a major hiatus between 3120 and 3150 ft, which separates marginal marine to shallow neritic sediments above, from outer neritic to deep bathyal ones below.

Plankton distribution indicates a nearshore, intermittently open marine environment of deposition throughout the marine parts of the section studied.

A steady, gradual marine regression during deposition of the bottom half of the well section is indicated by benthic Foraminifera.

Rounded coarse sand and lignite in the Bagdanoff at 2100 and 2310 ft, respectively are tentatively correlated to similar occurrences in the Nahama & Weagant Klohs No. 1, at 4040 and 4160 ft (see Plate 1). If this proposal is correct, then at least part, and possibly all, of the Bagdanoff section from 1680 to 3120 ft represents a very shallow water Refugian facies.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 145 previously unprocessed wet ditch samples.

1680-3120'

Nonionellina applini? VR*, partially opalized lignite/coal R (1800 ft), Elphidium sp. VR-R, shell fragments VR-VA, Spumellaria VR, tar VR (intermittent from 1890 to 2190 ft, and at 2620 ft), Bathysiphon eocenica VR, Quinqueloculina sp. VR, diatoms VR, Globigerina cf. bulloides VR, G. angiporoides VR, volcanic glass shards A (1980 ft), well rounded coarse sand C (2100 ft), Pseudoglandulina inflata VR-R, Nonionellina cf. labradoricus VR, Lenticulina spp. VR, Globobulimina spp. R, Uvigerina sp. VR, Eponides kleinpelli VR, gilsonite R-FL (intermittent from 2310 to 2730 ft), bentonitic shale C (intermittent from 2370 to 2940 ft), coal A-FL (2310 to 3120 ft), limestone? A (2730 ft), arenaceous spp. (indeterminate) VR, diatomaceous mudstone R (2850 ft).

3150-4110'

Cibicides baileyi VR-R, Gyroidina simiensis, s.l. R-C, Nonionellina applini VR-R, Cibicides cf. haydoni VR, ostracod var. (deep median sulcus) VR, Quinqueloculina imperialis VR, Ceratobulimina washburnei VR-R, Bolivina oregonensis VR, Lenticulina spp. (large) VR-R, Cibicides haydoni VR-C, Dentalina dusenburyi VR, Plectofrondicularia multilinea VR, Eponides cf. mexicana VR-R, Lenticulina cowlitzensis VR, Cibicides natlandi, s.l. VR, Cassidulina globosa VR-R, Marginulina cf. sp. c (of Beck, 1943) VR, Boldia hodgei VR-R, Alabamina cf. scitula VR, Saracenaria sp. VR-R, Cibicides olequaensis VR-R, Karreriella contorta VR, Spumellaria var. (large) C (3450 ft; 3480 ft), Uvigerina sp. var. (small, costate) VR-R, Gyroidina condoni R, Gaudryina coalingsensis VR-R, Caucasina schencki VR, Spongodiscidae R, Lenticulina cf. terryi VR, Globigerina cf. wilsoni R.

4140-4470'

Gyroidina octocamerata VR-R, Allomorphina sp. VR, Trifarina hannai R, Dyocibicides perforata VR, Truncorotaloides cf. topilensis VR, T. cf. bullbrookii (juvenile) VR, Trochammina cf. globigeriniformis VR, Cassidulina cf. globosa var. (uncoiling) VR, plus species listed above.

4500-6000'

Nodosaria latejugata var. VR-R, Amphimorphina becki VR-R, Ammodiscus sp. VR-R, Gyroidina "scalata" (of Cushman, et. al., 1949) VR-R, G. soldanii R, Cibicides aff. granulosus VR, Pseudohastigerina micra VR-R, Plectofrondicularia aff. californica VR, Gyroidina rotundiformis VR, Globigerina wilsoni R, Plectofrondicularia gracilis VR, Subbotina frontosa, s.s. VR, Uvigerina garzaensis var. (small) VR, Pseudohastigerina danvillensis VR-R, Truncorotaloides cf. collectus VR, Amphimorphina sp. (of Mallory, 1959, pl. 29) VR, Subbotina senni VR, Uvigerina alabamensis (of Mallory, 1959) VR, Sigmolima tenuis VR, Subbotina eocaena R, Pseudohastigerina cf. wilcoxensis VR, Ellipsonodosaria sp. VR-R, Uvigerina churchi VR, Bulimina cf. lacrima VR, Truncorotaloides pentacameratus R, Uvigerina demicostata VR, Baggina teninensis VR-R, Trifarina californica VR, Amphimorphina ignota? VR, Truncorotaloides topilensis VR, Oridorsalis umbonatus VR, Bulimina corrugata VR-R, Amphimorphina californica (weakly costate) VR-R, Bulimina

* VR=1-2 specimens per sample; R=2-10; C=11-32; A=33-100; VA=101-320; VVA=320-1000; FL=1000+.

cf. *jacksonensis*? VR-C, *Subbotina linaperta* VR, *Cibicides* cf. *praecursorius* (of Mallory, 1959) VR, *Lenticulina welchi* VR-R, *Bulimina alazanensis* R, *Valvulineria welcomensis* VR-R, *Bulimina curtissima* VR, *Spumellaria* var. ("spiny") R, *Bulimina* cf. *whitei* R, *Bolivina* "*pisciformis*" (not *basiscurta*) (of Mallory, 1959) VR, *Bulimina garzaensis* R, *Anomalina?* *aragonensis*? (poorly preserved) VR, *Pseudohastigerina sharkriverensis* VR, plus species listed above.

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
1680;1710	Indeterminate	Indeterminate
1740-2040	Indeterminate	Inner Neritic
2070	Indeterminate	Indeterminate
2100;2130	Indeterminate	Inner to Middle Neritic
2160-2280	Indeterminate	Indeterminate
2310-3120	Indeterminate	Marginal Marine to Non-marine
3150-4770	Lower Narizian	Outer Neritic to Upper Bathyal
4800;4830	Lower Narizian	Upper to Middle Bathyal
4860-5070	Lower Narizian	Middle Bathyal, undifferentiated
5100-5190	Lower Narizian	Upper to Upper Middle Bathyal
5220-5310	Lower Narizian	Bathyal, undifferentiated
5340-5430	Lower Narizian	Middle Bathyal, undifferentiated
5460-5640	Upper Ulatisian to Lower Narizian	Upper to Middle Bathyal, undifferentiated
5670;5700	Upper Ulatisian to Lower Narizian	Lower Middle Bathyal
5730-5880	Upper Ulatisian to Lower Narizian	Upper to Middle Bathyal, undifferentiated
5910-6000	Upper Ulatisian to Lower Narizian	Lower Middle Bathyal

REICHOLD ENERGY CORPORATION
FINN NO. 1
SW¼ SEC. 17, T6S, R4W
POLK COUNTY, OREGON

Summary

The well penetrated strata of Refugian, Narizian, and Ulatisian age. The stage boundaries indicate significant depositional and/or paleoceanographic changes. An absence of fossil plankton in Refugian sediments suggests little or no open sea circulation during that time, even though water

depths were bathyal. A large faunal change across the Refugian-Narizian boundary (between 490 and 550 ft) is perhaps the result of this downhole change from restricted to open sea circulation. The exact depth of the Narizian-Ulatisian boundary is clouded by sparse faunas in sediments containing limestone. Although open ocean circulation continued across this boundary, paleobathymetry changed drastically from deep bathyal in the lower Narizian (2170 to 3370 ft) to warm, very shallow (inner neritic) seas in the highest upper Ulatisian fauna in the well at 3670 ft, and then back to deep bathyal below 4690 ft.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 81 previously unprocessed dry ditch samples borrowed from the D.O.G.A.M.I. collection.

70-490'

Eponides kleinpelli R*, *Cassidulina galvinensis* R, *Cibicides evolutus* R, *Melonis pompilioides* R, *Cassidulina* cf. *margareta* R-A, *Quinqueloculina imperialis* R, *Uvigerina atwilli* R, *Nonionellina aplini* R, *Caucasina schencki* R, *Uvigerina cocoaensis* R, U. cf. *gallowayi* R, *Ceratobulimina washburnei* R, *Pseudoglandulina inflata* R, *Gyroidina* cf. *condoni* R, *Cibicides haydoni* R, *Nonion halkyardi* R, *Guttulina irregularis* R, *Uvigerina* cf. *atwilli* R-A, *Guttulina frankei* R, *Uvigerina* cf. *cocoaensis* R-C, *Plectofrondicularia packardi* R, *Cibicides natlandi/haydoni* (intermediate form) R, *Robertina washingtonensis* R, *Bolivina basiscurta* R, *B. striatella* R, *Uvigerinella?* *impolita?* R.

550-1630'

Lenticulina chirana R, *Valvulineria "churchi"*** R-C, *Boldia hodgei* R, *Spumellaria* (spheres) R-VA, *Subbotina* spp. R, *Valvulineria tumeyensis* R, *Spongodiscidae* R-A, *Plectofrondicularia searsi* R, *P. minuta* R, *Saccamina?* sp. R, *Uvigerina nudorobusta* R, *Valvulineria "churchi"* var. (highly trochospiral) R, *Bulimina microcostata* R-C, *Nassellaria* R, *Subbotina linaperta* R, *Pseudohastigerina micra* R, very fine-grained sandstone (790 ft), *Trifarina cooperensis?* R-C, *Plectofrondicularia oregonensis* R, *Gyroidina "scalata"* (of Cushman, et. al., 1949) R, *Lenticulina welchi*, s.l. R, ostracod var. (deep median sulcus) R, *Spumellaria* var. ("spiny"), R, *Dentalina dusenburyi* R, *Amphimorphina jenkinsi* R, *Bulimina* sp. var. (large, smooth) R, plus species listed above.

2110'

Species listed above, including *Spumellaria* C, arenaceous sp. indeterminate (large, crushed) R.

2170-3070'

Gyroidina simiensis, s.l. R, *Alabamina scitula* R, *Gyroidina octocamerata* R, *Bulimina corrugata* R, very fine-grained glauconitic sandstone (2230 ft),

* R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+.

** This informally named species resembles *Valvulineria chirana*, but has distinctly raised sutures on the spiral side.

Uvigerina sp. var. (hispidocostate) R, Darbyella? sp. R, Eponides gaviotaensis R, Baggina teninoensis R, Nodosaria latejugata? (fragment) R, Cassidulina globosa var. (uncoiling) R, Uvigerina alabamensis (of Mallory, 1959) R, Amphimorphina californica R, Bulimina lirata R, Eponides dorfi (of Mallory, 1959) R, Discorbis coalingensis (of Mallory, 1959) R, Trochammina cf. globigeriniformis R, Eggerella elongata R, Bulimina whitei? R, Bulimina alazanensis? R, Pseudoglandulina conica R, Truncorotaloides collacteus R, plus species listed above, including Spumellaria var. (large) C (at 3070 ft).

3130'

No new species. Mudstone more resistant to Quaternary "0" than in samples above.

3190-3310'

Species listed above, including Spumellaria R-C, Nodosaria? sp. (broken) R-C.

3370'

Species listed above, including Eggerella elongata R, Spumellaria A.

3490-3610'

Probably barren of indigenous Foraminifera. Spumellaria C-A. Highest primarily limestone lithology at 3490 ft.

3670-3730'

Operculina cushmani? (of Mallory, 1959) R, Amphistegina sp. R, Vaginulinopsis nudicostata R, Cibicides spp. R-A, Discorbis baintoni R, Cibicides spiropunctatus R, Elphidium spp. R, Cibicides spp. (attached forms) R, Truncorotaloides bullbrookii R, Nodosaria latejugata R, gastropods R, plus species listed above. Highest volcanic? lithology at 3730 ft.

4060'

Probably barren of indigenous fossils. Inorganic spheres VA.

4330'

Elphidium californicum R.

4630'

Barren of indigenous fossils.

4690-4870'

Bulimina cf. carlsoni R, Subbotina frontosa R, Cibicoides venezuelanus R, Truncorotaloides wartsteinensis R, "Globorotaloides" sp. (of McKeel and Lipps, 1975) R, Bifarina nuttalli R, Bulimina whitei, s.s. R, Planorotalites cf. planoconica R, "Parrella" midwayana (of Mallory, 1959) R, Gyroidina childsi R, Anomalina aragonensis R, Uvigerina miriamae R, Truncorotaloides densus R, plus species listed above.

4990-5320'

Lenticulina turbinatus R, Dorothisa principiensis R, Bolivina lodoensis R, Truncorotaloides spinulosus?

R, Subbotina aff. soldadoensis R, Truncorotaloides cf. pseudotopilensis R, Plectofrondicularia kerni? (crushed) R, plus species listed above.

5770'

Barren of indigenous fossils.

6580'

Barren of indigenous fossils.

7240-7252'

Barren of indigenous fossils.

CONCLUSIONS

<u>DEPTH (FEET)</u>	<u>STAGE</u>	<u>PALEOENVIRONMENT</u>
70-490	Refugian	Upper to Upper Middle Bathyal
550-670	Upper Narizian	Lower Middle Bathyal
730-850	Indeterminate	Indeterminate
910-1630	Narizian, undifferentiated	Middle Bathyal, undifferentiated
1690-1990	Narizian, undifferentiated	Lower Middle to Lower Bathyal
2050-2110	Indeterminate	Open Marine, undifferentiated
2170-3070	Lower Narizian	Lower Middle to Lower Bathyal
3130-3310	Indeterminate	Open Marine, undifferentiated
3370	Lower Narizian	Lower Middle to Lower Bathyal
3430-3610	Indeterminate	Open Marine, undifferentiated
3670	Upper Ulatisian	Tropical Inner to Middle Neritic
3730	Upper Ulatisian	Open Marine, undifferentiated
4060	Indeterminate	Indeterminate
4330	Ulatisian, undifferentiated	Inner Neritic
4630;4660	Indeterminate	Indeterminate
4690;5320	Ulatisian, undifferentiated	Lower Middle Bathyal
5770	Indeterminate	Indeterminate
6580	Indeterminate	Indeterminate
7240-7252	Indeterminate	Indeterminate

RESERVE OIL AND GAS COMPANY
BRUER NO. 1
NE¼ SEC. 31, T6S, R4W
POLK COUNTY, OREGON

Summary

The well penetrated strata of Refugian and Narizian age.

Fossil plankton are absent in the Refugian, but radiolaria and a few planktic foraminifers are present throughout the Narizian portion of the well. Therefore, open ocean circulation was restricted or absent in Refugian time, but during the Narizian there was open sea circulation.

All sediments in this well were deposited close to shore, with water depths being primarily either shallow shelf (neritic) or middle bathyal. A sandy interval, from 880 to 1460 ft, is possibly of inner to middle neritic origin.

The Bruer well section is similar, and correlates reasonably well, to the upper half of the Reichhold Finn No. 1. The Finn was drilled about two and one half miles north of the Bruer. The Bruer section, however, appears to be expanded in thickness to approximately 150 per cent of age equivalent Finn strata (see Plate 1).

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 51 previously unprocessed dry ditch samples borrowed from the D.O.G.A.M.I. collection. Ditch sample intervals are 30 ft down to 510 ft, but change to 20 ft from 560 to 4800 ft.

30'

Globobulimina sp. R*, *Anomalina* sp. (etched) R.

150-510'

Uvigerina cf. *cocoaensis* R, *Cassidulina galvinensis* R, *Uvigerina beccarii* var. (obese) R, *Robertina washingtonensis* R, *Guttulina frankei* R, *Cibicides evolutus* R, *Nonion planatum* R, *Guttulina irregularis* R, *Cibicides haydoni* R, *Uvigerina cocoaensis*, s. s. R, *U. cf. atwilli* R, *Plectofrondicularia packardi* R, *Eponides kleinpellii* R, *Uvigerina atwilli*, s.s. R, *Caucasina schencki* R, *Nonion halkyardi* R, *Pseudoglandulina inflata* R, *Boldia hodgei* R, *Cibicides olequaensis* R, *Plectofrondicularia robusta* R, *Nonionellina applini* R, *Bolivina striatella* R, shell fragments A, *Caucasina schencki* var. (very elongate) A, *Uvigerina* cf. *mexicana* R.

560'

Plectofrondicularia oregonensis R, *Elphidiella* sp. R, sponge spicules C, sterrasters C, echinoid spines R, plus species listed above.

580'

Haplophragmoides sp. (crushed) R, *Spongodiscidae* R, *Cyclammina* sp. R, *Nassellaria* R, *Spumellaria* (spheres) R. Highest glauconitic mudstone.

* R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+.

600'; 620'

Cibicides natlandi R, *Bulimina microcostata* R, *Valvulineria "churchi"* R, *Anomalina garzaensis* R, arenaceous spp. (indeterminate) R, *Subbotina* sp. R, plus species listed above.

740'

Uvigerina nudorobusta R, *Lenticulina chirana* R, *Elipsonodosaria* sp. R, *Spumellaria* var. ("spiny") R, *Bolivina kleinpellii* var. (large) R, *B. oregonensis* R, *Lenticulina welchi*, s.l. R, *Cassidulina globosa* var. (uncoiling) R, *Bolivina kleinpellii* C, plus species listed above.

880-1320'

Probably barren of indigenous Foraminifera. Very fine-grained sandstone tops at 880 ft.

1460'

Elphidium sp. (worn) R.

1600-1880'

Trochammina cf. *globigeriniformis* R, *Eponides gaviot-aensis* R, *Plectofrondicularia vokesi* R, *Valvulineria tumeyensis*? R, *Nodosaria deliciae* R, *Bulimina alazanensis*? R, *Truncorotaloides pentacameratus*? R, *Subbotina* cf. *frontosa* R, *Gyroidina* cf. *simiensis*?? R, *Bulimina* cf. *whitei* R, *Plectofrondicularia packardi* var. (keeled) R, *ostracod* var. (deep median sulcus) R, *Bolivina basiscorta* R, *Bulimina corrugata/whitei* (intermediate form) R, *B. corrugata* R, *Virgulina* sp. var. (small, slender, finely costate) C, *V. sp.* var. (small, slender, smooth) C, plus species listed above.

2020-3000'

Gyroidina "scalata" (of Cushman, et. al., 1949) R, *Uvigerina garzaensis* var. (large) R, *Amphimorphina jenkinsi* R, *Trifarina californica*? (small) R, *Margulinolopsis* sp. R, *Valvulineria tumeyensis*? var. (obese, large) R, *Pseudohastigerina micra* R, *Clavigerinella*? *eocenica*? (juvenile) R, *Valvulineria tumeyensis* var. (large, highly trochospiral) R, *Subbotina minima* R, *Pseudohastigerina lillisi* R, *Gyroidina octocamerata* R, *Subbotina* sp. var. (large) R, *Bulimina lacrima* R, *Subbotina eocaena* R, *Uvigerina elongata*, s.s. R, plus species listed above.

3140-3280'

Lenticulina pseudovortex? R, *Globorotaloides* sp. (of McKeel and Lipps, 1975) R, *Bulimina corrugata*, s.s. R, *Lenticulina welchi* var. (sutures very wide and depressed) R, *Alabamina scitula* R, plus species listed above.

3420-3800'

Oridorsalis umbonatus R, *Gyroidina simiensis*, s.l. R, *Nodosaria longiscata* R, *Cibicides pachyderma* (of Mallory, 1959) R, *Valvulineria welcomensis* R, plus species listed above.

3940'

No new species. *Spongodiscidae* C, *Spumellaria* R.

4040-4540'

Lenticulina midwayensis? (of Mallory, 1959, pl. 7) R, Cibicides cushmani R, Gaudryina coalingensis R, Amphimorphina californica R, Trifarina californica R, Cibicides sandiegensis R, Discorbis coalingensis (of Mallory, 1959) R, Pseudoglandulina conica R, Bulimina macilenta R, plus species listed above, including Bulimina microcostata R, Bulimina corrugata/alazanensis (intermediate forms) R, Valvulinaria welcomensis R, and Spumellaria var. (large) C (at 4540 ft).

4580'

Bathysiphon eocenica R. Also, Spumellaria VA.

4600-4740'

Barren of indigenous fossils. Primarily volcanics.

4800'

Bulimina lirata R, plus species listed above.

4840'

Rare Foraminifera, probably caved. Also, Spumellaria C.

4900'

Bulimina whitei, s.s. R (one specimen), plus species listed above.

4920-5520'

Barren of indigenous Foraminifera. Primarily volcanics.

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
30	Indeterminate	Marine, undifferentiated
150-510	Refugian	Upper Bathyal
560	Refugian	Mixed Inner Neritic to Bathyal
580	Indeterminate	Marine, undifferentiated
600;620	Upper Narizian	Upper Middle Bathyal
740	Upper Narizian	Lower Middle Bathyal
880-1320	Indeterminate	Indeterminate
1460	Indeterminate	Probably Inner to Middle Neritic
1600-1880	Narizian, undifferentiated	Lower Middle Bathyal
2020-3000	Narizian, undifferentiated	Lower Middle Bathyal
3140-3280	Narizian, undifferentiated	Middle Bathyal, undifferentiated

3420-3800	Lower Narizian	Middle Bathyal, undifferentiated
3940	Indeterminate	Marine, undifferentiated
4040-4540	Lower Narizian	Mixed Upper Bathyal to Lower Middle Bathyal
4580	Indeterminate	Marine, undifferentiated
4600-4740	Indeterminate	Indeterminate
4800	Lower Narizian	Middle Bathyal, undifferentiated
4840	Indeterminate	Marine?
4900	Probably Lower Narizian	Lower Middle Bathyal
4920-5520	Indeterminate	Indeterminate

QUINTANA PETROLEUM CORPORATION
GATH NO. 1
SE¼ SEC. 16, T8S, R2W
MARION COUNTY, OREGON

Summary

The well section contains three distinctive fossiliferous intervals representing parts of the Refugian and Narizian benthic foraminiferal Stages of Schenck and Kleinpell (1936) and Mallory (1959), respectively. The shallowest interval (60 to 810 ft) has intermittent, sparse faunas of probable Refugian age. The middle interval (3390 to 4350 ft) contains Narizian faunas, also intermittent. The deepest interval (4710 to 5010 ft) has lower diversity faunas which are also Narizian in age. This deepest interval lacks Cibicides natlandi. The bottom 1000 ft of the well section probably are barren of indigenous Foraminifera.

Sparse plankton indicate deposition nearshore throughout the well section. Conditions were intermittently open marine during the Refugian and upper Narizian. The older of the two Narizian fossiliferous intervals contains no plankton, indicating deposition restricted from open sea circulation.

Although the Gath No. 1 is ten miles east of the Reichhold Merrill No. 1, there appears to be a fair upper Narizian correlation from 3390 to 3930 ft in the Gath to 2560 to 3280 ft in the Merrill (see Plate 1).

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 188 previously unprocessed wet ditch samples.

60'

Caucasina schencki R*, Nonionellina cf. applini VR, Spumellaria VR.

90-180'

Barren of indigenous fossils. Serpentine VR (120 ft), *VR=1-2 specimens per sample; R=2-10; C=11-32; A=33-100; VA=101-320; VVA=321-1000; FL=1000+.

bentonitic mudstone VA (180 ft).

210'

Alabamina kernensis, s.l. VR.

240-780'

Essentially barren of fossils. Volcanic glass shards C at 510 ft.

810'

Elphidiella sp. R, *Globobulimina* spp. R, *Valvulineria menloensis* (juvenile) VR.

840'

Barren of marine microfossils. Lignite partially replaced by translucent rock material FL.

870-1260'

Barren of marine microfossils. Bentonitic (and some opaline) rock fragments VA (960 ft; 990 ft); top of common volcanic "red" grains (1020 ft); bentonite C (1170 ft).

1290-1590'

Samples not examined or processed (solid volcanics).

1620-2820'

Barren of marine microfossils. Hard bentonite VA (1650 ft); "red" grains with opaline?? inclusions VVA (1860 ft); major increase in "red" grains (2040 ft); serpentine VR (2100 ft); bentonite? (hard) A (2370 ft); major increase in "red" and "green" grains (2790 ft).

2850'

Barren of marine microfossils. Glauconite? VVA.

2880-3360'

Barren of marine microfossils. Near-white non-calcareous rock fragments A-VA (3360 ft).

3390-3450'

Grayish brown siltstone. *Bathysiphon eocenica* VR-R, *Vaginulinopsis saundersi* R, *Lenticulina* spp. VR-C, *Guttulina irregularis* R, *Boldia hodgei* VR-R, *Eponides mexicana* R, *Alabamina* cf. *scitula* VR, *Cibicides natlandi* R, *Bulimina sculptilis* var. (poorly preserved) VR-R, *Cassidulina globosa* R, *Bulimina* sp. var. (small, fat, costate) VR, *Cyclamina* sp. VR, plus *Spumellaria* (listed above) VR.

3480-3750'

Discorbis? sp. (attached? form, worn) VR (3630 ft). Otherwise barren of marine microfossils.

3780-3840'

Lenticulina sp. var. (large) VR, *Bulimina laciniata* VR-R, *Valvulineria welcomensis* VR, *Lenticulina chirana* VR, *Gyroidina* sp. VR, *Plectofrondicularia* sp. VR, plus species listed above, including

Spumellaria R.

3870'; 3900'

Barren of indigenous Foraminifera. Lignite FL.

3930'

Nonion inflatum VR-R, *Saracenaria* sp. VR, *Karrerella contorta* R, *Uvigerina* cf. *beccarii* R, *Cibicides haydoni/natlandi* (intermediate form) VR, *Uvigerina nudorobusta* R, *Truncorotaloides* cf. *pentacameratus* VR, *Globigerina* sp. var. (large) VR, *Pullenia* cf. *quinqueloba* VR, *Bolivina oregonensis* VR, plus species listed above, including *Boldia hodgei* C, *Cibicides natlandi* R, *Spumellaria* R.

3960'; 3990'

Subbotina linaperta VR, *Valvulineria involuta* VR, *Globigerinatheka*? sp. VR, *Subbotina angiporoides* VR, *Quinqueloculina imperialis* R, *Globigerina prasaepis* VR, *Trifarina cooperensis* VR, *Globigerinatheka tropicalis* VR, *Krythe*? sp. (ostracod) VR, *Uvigerina* sp. var. (small, costate) VR, *Globigerinatheka barri*? (poorly preserved) VR, plus species listed above, including *Cibicides natlandi* R, *Bulimina laciniata* R. Also, *Spumellaria* C (3990 ft).

4020'

Species listed above, including *Uvigerina* cf. *nudorobusta* VR, *Spumellaria* R.

4050'

Eponides mexicana var. (highly convex spiral side, flat involute side) VR, plus species listed above.

4080-4320'

Very rare occurrences of species listed above. Probably barren of indigenous Foraminifera.

4350'

Epistomina sp. VR, *Gyroidina planata* VR, plus species listed above, including *Cibicides natlandi* R, *Bulimina laciniata* R, *Eponides mexicana* var. VR, *Saracenaria* sp. VR, *Uvigerina nudorobusta* VR, *Spumellaria* VR.

4380-4680'

Barren of indigenous fossils.

4710'

Species listed above, including *Lenticulina* spp. R, *Boldia*? *hodgei*? (poorly preserved) VR.

4740-4980'

Gyroidina "scalata" (of Cushman, et. al., 1949) VR-R, *G. cf. condoni* R, *Lenticulina welchi*, s.l. VR, *arenaceus* spp. (indeterminate) R-VA, *Elphidium* sp. R, *Trochammina* sp. VR, plus species listed above, including *Caucasina schencki* VR-VA, *Plectofrondicularia* sp. var. (costate) R, *Lenticulina* spp. R-C.

5010'

Species listed above, including Lenticulina spp. C.

5040-5670'

Barren of indigenous marine microfossils. Fine to medium-grained quartz sandstone C-VA; gilsonite C (5250 ft); shell fragments R (5640 ft; 5670 ft).

5700'

Rare occurrences of species listed above, including Lenticulina spp. R, Quinqueloculina sp. VR, arenaceous sp. (indeterminate) VR. Possibly barren of indigenous Foraminifera.

5730-6000'

Barren of indigenous Foraminifera. Lignitic sandstone and mudstone R (5820 ft); intermittent gilsonite R-FL (5850 to 5970 ft).

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
60	Probably Refugian	Middle Neritic or deeper
90-180	Indeterminate	Indeterminate
210	Probably Refugian	Marine, undifferentiated
240-780	Indeterminate	Indeterminate
810	Probably Refugian	Inner to Middle Neritic
840	Indeterminate	Possibly Non-marine to Marginal Marine
870-1260	Indeterminate	Indeterminate
1620-2820	Indeterminate	Indeterminate
2850	Indeterminate	Possibly Marine
2880-3360	Indeterminate	Indeterminate
3390-3450	Upper Narizian	Outer Neritic to Upper Bathyal
3480-3600	Indeterminate	Indeterminate
3630	Indeterminate	Marine, undifferentiated
3660-3750	Indeterminate	Indeterminate
3780-3840	Upper Narizian	Upper to Upper Middle Bathyal
3870;3900	Indeterminate	Indeterminate
3930	Upper Narizian	Middle Bathyal, undifferentiated
3960;3990	Upper Narizian	Upper to Upper Middle Bathyal
4020	Upper Narizian	Upper to Middle Bathyal, undifferentiated

4050	Narizian, undifferentiated	Marine, undifferentiated
4080-4320	Indeterminate	Indeterminate
4350	Narizian, undifferentiated	Bathyal, undifferentiated
4380-4470	Indeterminate	Indeterminate
4500	Indeterminate	Marine, undifferentiated
4530-4680	Indeterminate	Indeterminate
4710	Narizian, undifferentiated	Marine, undifferentiated
4740-4980	Narizian, undifferentiated	Upper to Upper Middle Bathyal
5010	Narizian, undifferentiated	Probably Neritic
5040-5610	Indeterminate	Indeterminate
5640;5670	Indeterminate	Probably Marginal Marine to Inner Neritic
5700	Indeterminate	Probably Neritic
5730-5790	Indeterminate	Indeterminate
5820	Indeterminate	Probably Marginal Marine to Non-marine
5850-6000	Indeterminate	Indeterminate

REICHHOLD ENERGY CORPORATION
MERRILL NO. 1
SW¼ SEC. 24, T8S, R4W
MARION COUNTY, OREGON

Summary

Two distinctively different fossiliferous intervals occur in this well. The shallower one (670 to 2470 ft) is Refugian in age. The deeper interval (2560 to 4480 ft) contains intermittent Narizian faunas.

Benthic Foraminifera indicate two nearshore transgressive sequences, separated by a regression. In upper Narizian time, bathymetry changed from neritic to open marine, middle bathyal depths, and back to neritic. In the Refugian, water depth was primarily upper bathyal, but occasionally fluctuated to neritic.

A correlation of the Merrill No. 1 to the nearby (less than one mile south) Oregon Natural Gas Independence No. 12-25 is provided on Plate 1. The upper third (Refugian) portions of the two well sections are quite similar. However, the Merrill No. 1 appears to contain approximately 1500 ft of upper Narizian section which is largely missing in the Independence No. 12-25.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 53 previously unprocessed dry ditch samples which were borrowed from the D.O.G.A.M.I. collection.

30-640'

No samples available.

670-2200'

Cibicides evolutus R*, *Guttulina* sp. a (of Beck, 1943) R, *Anomalina californiensis* R, *Nonionellina applini* R, *Spumellaria* (spheres) R, *Pseudoglandulina inflata* R-C, *Cassidulina galvinensis* R, *Elphidium* sp. R, *Uvigerina cocoaensis* R-C, U. cf. *atwilli* R-C, U. cf. *gallowayi* R, *Plectofrondicularia packardi* R, *Eponides kleinpelli* R, *Melonis pompilioides* R, *Uvigerina atwilli* R-C, *Caucasina schencki* R, *Bolivina* cf. *astoriensis* R, B. *kleinpelli* R, *Uvigerinella*? cf. *impolita*? R, *Cibicides* cf. *evolutus* var. (thickened sutures and peripheral rim) R, *Cassidulina globosa* R, *Guttulina irregularis* R, *Ceratobulimina washburnei* R, *Cassidulina* cf. *margareta* R, *Elphidiella* sp. R, *Uvigerina vicksburgensis*? R, U. *cocoaensis/gallowayi* (intermediate form) R, *Cibicides haydoni* R, C. *olequaensis*? R, *Plectofrondicularia robusta*? R, *Nonion halkyardi* (crushed) R.

2290-2380'

Reduced fauna with no new species. Probably barren of indigenous Foraminifera.

2470'

Cibicides aff. *natlandi* (surface of involute side not roughened) R, plus species listed above.

2560'

Caucasina schencki var. (large) R, *Bulimina sculptilis* R, *Cibicides natlandi* R, *Lenticulina inornata* R, plus caved Refugian species listed above.

2650-2920'

Probably barren of indigenous fossils except for *Elphidiella* sp. R, and *Lenticulina* spp. (2920 ft only) C. Clean white sand through 20 mesh screen (2650 ft); well-rounded coarse sand (2740 ft).

3010-3370'

Gyroidina "scalata"/condoni (intermediate form) R, *Subbotina* spp. R, *Lenticulina chirana* R, *Boldia hodgei* R, *Bulimina microcostata* R-A, *Bolivina basis-curta* R-C, *Frondicularia*? sp. R, *Trifarina cooperensis* R, *Valvulineria tumeyensis* R, V. "churchi" R, *Textularia*? sp. R, *Uvigerina nudorobusta* R, *Subbotina yeguaensis* R, *Epistomina* sp. R, *Sigmoilina* sp. R, *Spongodiscidae* (discs) R, *Cibicides* cf. *cushmani* R, *Karrerella contorta* R, *Uvigerina garzaensis* R, *Alabamina* sp. R, *Pseudohastigerina micra* R, *Bulimina laciniata* R, B. sp. var. (spinose lower half of test) R, *Lenticulina welchi/chirana* (intermediate form) R, *Stilostomella* aff. *lepidula* R, plus species listed above, including *Spumellaria* (spheres) R-C.

* R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+.

3460-4090'

Probably barren of indigenous fossils. Highest fine-grained micaceous sandstone at 3460 ft; highest medium-grained sandstone at 3730 ft.

4180-4270'

Valvulineria welcomensis R, *Bolivina oregonensis* R, *Haplophragmoides*? sp. (crushed) R, *Gyroidina "scalata"* (of Cushman, et. al., 1949) R-C, arenaceous spp. (indeterminate) R, *Haplophragmoides obliquicameratus*? R, *Nonion* aff. *cushmani*? R, *Lenticulina* cf. *terryi* R, L. *welchi*, s.l. R, *Gyroidina* cf. *soldanii* R, *Cibicides cushmani* R.

4360'

Barren of indigenous Foraminifera. Ostracod (possibly "deep median sulcus" variety) R.

4480'

Elphidium cf. *minutum*? R, plus species listed above, including *Lenticulina* spp. C, *Elphidium*? (*Elphidiella*?) sp. (sucrosic preservation) R, *Caucasina schencki* C.

4540-5283'

Essentially barren of indigenous fossils. Common coal (?) at 4720 ft; arenaceous sp. (indeterminate), possibly indigenous, one specimen only, at 4810 ft.

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
670-1300	Refugian	Upper Bathyal
1390-1570	Refugian	Mixed Inner Neritic to Upper Bathyal
1660-2200	Refugian	Upper Bathyal
2290-2380	Indeterminate	Indeterminate
2470	Probably lower-most Refugian	Probably Outer Neritic to Upper Bathyal
2560	Upper Narizian	Mixed Outer Neritic to Upper Middle Bathyal
2740	Indeterminate	Possible Beach
2920	Indeterminate	Inner to Middle Neritic
3010-3100	Upper Narizian	Mixed Inner Neritic to Upper Middle Bathyal
3190-3280	Upper Narizian	Lower Middle Bathyal
3370	Upper Narizian	Upper Middle Bathyal
3430-4090	Indeterminate	Indeterminate
4180-4270	Narizian, undifferentiated	Middle Bathyal, undifferentiated
4360-4480	Narizian, undifferentiated	Neritic, undifferentiated

4540-4630	Indeterminate	Indeterminate
4720-4810	Indeterminate	Non-marine to Marginal Marine
4900-5283	Indeterminate	Indeterminate

OREGON NATURAL GAS DEVELOPMENT CORPORATION
INDEPENDENCE NO. 12-25
NW¼ SEC. 25, T8S, R4W
MARION COUNTY, OREGON

Summary

The well penetrated marine strata representing parts of the Refugian and Narizian Stages. The upper half (Refugian and uppermost Narizian) of the well section is separated from the lower half (Narizian) by a hiatus at 2410 ft. The lower (Narizian) half of the well section is also divided by a probable hiatus at 4175 ft. Extremely rare lower Narizian foraminiferal species, namely *Pseudoglandulina* cf. *conica*, *Cibicides blandeidi*? (crushed), *Eponides* cf. *minima*, and *Truncorotaloides interpositus*, indicate the bottom 450 ft of the well penetrated Yamhill or older sediments. However, it is possible that such rare occurrences are the result of reworking.

Benthic foraminiferal distribution in the well section indicates several transgressive-regressive cycles. The maximum marine transgression is in the upper Narizian, at 2980 ft. In this sample, rare offshore plankton (*Nassellaria*) and the greatest number of the deep bathyal species, *Uvigerina nudorobusta* were found. Another distinctive deep water interval occurs at 3810 ft, where abundant specimens of *Gyroidina "scalata"* (of Cushman, et. al., 1949) occur with little else. The Refugian paleobathymetric fluctuations were more subtle in general than the above mentioned Narizian ones, but they too should be locally useful for correlation.

Deposition was generally nearshore. There was frequent restriction from open sea circulation, more so in the Refugian than in the Narizian.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from 156 previously unprocessed wet ditch samples from 220 to 4820 ft.

220'; 250'

Calcareous species (indeterminate, crushed) R*, echinoid spines VR.

280'

Sub-rounded to sub-angular coarse sand VVA. Barren of fossils.

310-580'

Pseudoglandulina inflata VR-R, *Lenticulina* sp. VR, *Globobulimina* sp. (crushed) VR-R, shell fragments VR, *Gyroidina* sp. (crushed) VR, *Cassidulina galvinensis*, s.s. R, *Anomalina californiensis* VR-C,

* VR=1-2 specimens per sample; R=2-10; C=11-32; A=33-100; VA=101-320; VVA=320-1000; FL=1000+.

Quinqueloculina imperialis VR, *Cibicides evolutus* R, *Quinqueloculina* spp. R, *Nonion* sp. (crushed) VR, *Plectofrondicularia multilineata* VR, *Pullenia* sp. VR, *Nonionella pauciloba* VR, diatoms (pyritized, centrate) VR, *Bolivina* sp. (small) VR, *Spumellaria* (spheres) VR, *Epistominella* sp. (small) VR, *Lagena striatella* VR, *Ceratobulimina washburnei* VR, *Plectofrondicularia gracilis* VR, *Cibicides* aff. *olequaensis* VR, C. "fortunatus" (of McDougall, 1980, pl. 24) VR, lost circulation material FL (580 ft), *sterrasters* VR-R, *Cibicides elmaensis* (of McDougall, 1980, pls. 23 and 24) VR, *Guttulina* cf. *hantkeni* VR, *Quinqueloculina weaveri* VR, *Nonionellina applini* VR, *Cassidulina galvinensis/globosa* (intermediate form, inflated chambers) R, *Haplophragmoides* sp. var. (small, crushed) VR, *Lagena costata* VR, *Cibicides* aff. *mcmastersi* VR.

610-790'

Lost circulation material FL (610 ft), upper Narizian bathyal Foraminifera R (700 ft), interpreted to be reworked, *Elphidium*? (*Cribrononion*?) sp. VR (730 ft), Refugian upper bathyal Foraminifera VR, poorly preserved (760; 790 ft), interpreted to be reworked, plus rare occurrences of species listed above - probably contamination from above. Possibly barren of indigenous Foraminifera.

850-2260'

Eponides kleinpelli VR-R, *Uvigerina cocoaensis* R-VA, U. cf. *atwilli* VR-C, U. *atwilli* VR-R, *Caucasina schencki* VR-C, *Cassidulina* cf. *galvinensis* VR-R, *Globigerina* sp. VR, *Plectofrondicularia packardii* VR-R, *Melonis* cf. *pompilioides* VR-R, *Eponides mexicana* R, *Bolivina kleinpelli* R, *Robertina washingtonensis* VR, *Turborotalia insolita* VR, *Cassidulina* cf. *globosa* VR, *Bulimina microcostata* (1240 ft, reworked) VR, *Uvigerina* sp. var. (fine, continuous costae) R, *Valvulineria menloensis* VR, V. *willapaensis* R, *Gyroidina planata* R, *Cassidulina* cf. *galvinensis* var. (inflated chambers) R, *Nonionellina applini* var. (large, subrounded periphery, inflated chambers) R, *Cibicides haydoni* VR, *Cassidulina galvinensis*, s.l. R, *Bolivina striatella* VR, *Nonion halkyardi* var. (large) R, *Plectofrondicularia vokesi* VR, *Cornuspira lewisensis* VR, *Cibicides olequaensis*, s.s. VR, *Caucasina schencki* var. (large, on 80 mesh screen) R, *Haplophragmoides* sp. var. (large, coarse wall) VR, *Lenticulina*? (*Saracenaria*?) sp. var. VR, *Cibicides haydoni/natlandi* (intermediate form) VR, *Virgulina* sp. var. (thin) VR, plus species listed above, including *Globobulimina* sp. (crushed) C (from 1090 to 2260 ft), shell fragments C (1210 ft), *Cassidulina* cf. *galvinensis* R-C (from 1300 to 2260 ft), *Spumellaria* R, and *Pseudoglandulina inflata* C (1840 ft).

2290-2560'

Lignite C-A (2290;2320 ft), *Dentalina dusenburyi* (fragment) VR, *Cibicides* cf. *natlandi* VR, rounded to sub-rounded coarse sand C-VVA (2410 to 2560 ft), volcanic? sand and rock fragments R-VVA (2500; 2530 ft), plus shallow water species listed above, including *Valvulineria willapaensis* VR, ostracods VR, *Lenticulina* spp. VR-R, *Cibicides haydoni* VR, and *Elphidium* sp. R. Rare upper bathyal Refugian Foraminifera in this interval are considered to be contamination from above.

2590'; 2620'

Vaginulinopsis saundersi? (worn) VR, Karreriella contorta VR, Plectofrondicularia searsii? VR, Cibicides aff. mcmasteri (thin, with plug) R, Trilaculina gilboei VR, Quinqueloculina sp. var. (small, thin) VR, plus species listed above, including Cibicides haydoni VR, Lenticulina spp. R, Quinqueloculina imperialis R, Globobulimina spp. R, and Melonis cf. pompilioides VR. Also, Elphidiella sp. var. (acute periphery) R.

2650'

Boldia hodgei R, Lenticulina chirana VR, Cibicides natlandi VR, C. cf. mcmasteri VR, Trifarina cooperensis R, plus species listed above, including Lenticulina spp. C, Elphidiella sp. var. R, Elphidium sp. R, and Bolivina striatella VR.

2680-2800'

Bulimina microcostata R-A, Pseudohastigerina lillisi VR, Bolivina basiscurta VR, Valvulinaria "churchi" R, Lenticulina welchi, s.l. VR, plus species listed above, including Lenticulina spp. C-A, Elphidiella sp. var. R-C, Trifarina cooperensis C (at 2680 ft), Cassidulina globosa/galvinensis (intermediate form) VR-R, Cibicides natlandi R, Boldia hodgei R, and Spumellaria VR-C.

2830-3010'

Valvulinaria tumeyensis VR-R, Cassidulina globosa R, Valvulinaria "churchi"/tumeyensis (intermediate form) R-C, Gyroidina "scalata" (of Cushman, et. al., 1949) VR-R, Uvigerina nudorobusta R-C, Lenticulina chirana/welchi (intermediate form, thin) R, Nonion planatum VR, Lenticulina welchi, s.s. R, Allomorphina sp. (pyritized) VR, Globobulimina oregonensis VR, Valvulinaria cf. rotundiformis VR, Alabamina kernensis (small) VR, Bolivina klempelli? var. (wide test, on 100 mesh screen) R, Spongodiscidae VR, Bathysiphon eocenica R, Epistomina sp. R, Subbotina angiporoides VR, volcanics C-VA (2980 and 3010 ft), Eponides sp. (of Tipton, et. al., 1973) VR, Cassidulina globosa cf. var. (uncoiling) VR, Oridorsalis umbonatus VR, Nassellaria R, Cassidulina cf. globosa var. (large test, inflated chambers) VR, plus species listed above, including Spumellaria C-A, Bulimina microcostata C-A, and Lenticulina chirana R.

3040-3090'

Fecal pellets (replaced by glauconite) A-VVA, distinctive "sucrosic" fossil preservation (3040 ft), Bulimina lacinata VR-R, B. sculptilis VR, Uvigerina sp. var. (costate) VR, Valvulinaria welcomensis VR, Uvigerina elongata? VR, Bulimina sp. var. (smooth, pointed proloculus) VR, Subbotina prasaepis? VR, Nodosaria delicatae VR, Vaginulinopsis lewisensis VR, Trochammina sp. var. (small) VR, Anomalina garzaensis (small) R, plus species listed above, including Uvigerina nudorobusta R, U. cf. churchi? R, Boldia hodgei VR, Bolivina basiscurta R (3040 ft), Eponides sp. (of Tipton, et. al., 1973) VR, and Bolivina striatella R (3090 ft).

3120-3240'

Vaginulinopsis saundersi VR, Globigerinatheka

index VR, mica VA (3180; 3210 ft), lignite C (3240 ft), plus rare occurrences of species listed above. Probably barren of indigenous Foraminifera.

3270-3570'

Ostracod var. (large, deep median sulcus) VR, Dentalina communis VR, Trochammina cf. globigeriniformis VR, Spumellaria var. ("spiny") VR, plus species listed above, including Cyclamina sp. VR, arenaceous spp. (crushed) VR-R, Haplophragmoides sp. var. (evolute) VR, and shell fragments C (3540 ft). Rare Refugian and bathyal upper Narizian contaminants are present in the interval.

3600-3780'

The following shallow water species, all listed in intervals above, are considered indigenous: shell fragments VR-R, Elphidium sp. VR-R, Cibicides sp. VR, Lenticulina spp. R, Elphidiella sp. R, E. sp. var. R, Robertina washingtonensis VR, Quinqueloculina sp. VR, arenaceous sp. (Dorothia?) (crushed) VR, and Guttulina irregularis VR. Rare Refugian and bathyal upper Narizian Foraminifera in this interval are probably contaminants from above.

3810-3870'

Plectofrondicularia oregonensis VR, plus species listed above, including Lenticulina spp. C, Gyroidina "scalata" (of Cushman, et. al., 1949) R-A, Ellipsodinosaria? (fragments) R, Alabamina sp. (small) R, Plectofrondicularia sp. (fragments) VR-R, and Spumellaria var. ("spiny") VR.

3900-4010'

Species listed above, including Elphidium sp. VR, pyrite A (3950 ft), Lenticulina spp. R, Elphidium?/ (Elphidiella?) sp. VR-R, Elphidiella sp. var. (3980 ft), Eponides gaviotaensis? VR, ostracods VR, Nonionellina applini VR, Caucasina schencki VR-R. Rare bathyal Narizian Foraminifera in this interval are considered to be contamination from above.

4040-4160'

Barren of indigenous Foraminifera. Rare bathyal Refugian and Narizian contaminants.

4175'

Coarse-grained sub-rounded sand VA. Barren of Foraminifera.

4200-4370'

Barren of indigenous Foraminifera. Rare bathyal Narizian Foraminifera in this interval are considered to be contamination from above.

4400-4500'

Volcanics VVA (4440; 4470 ft), Uvigerina garzaensis, s.s. (worn) VR, Eponides cf. minima R, Pseudoglandulina cf. conica VR, Cibicides blanpeidi? (crushed) VR, plus species listed above, including Elphidiella sp. R, Spumellaria VR-R, Caucasina schencki VR-R, and Trifarina spp. VR.

4530-4650'

Species listed above, including gastropods VR, Globobulimina sp. VR-R, Lenticulina spp. VR-R, Elphidiella sp. R-C, Spumellaria VR-R, Elphidiella sp. var. R. Rare upper Refugian to Narizian bathyal Foraminifera present are interpreted to be contamination from above.

4680-4820'

Truncorotaloides interpositus VR, plus species listed above, including Caucasina schencki R, Lenticulina spp. C-A, Elphidiella sp. VR-R, ostracod var. (deep median sulcus) VR-R, ostracod varieties VR-R, Nonionellina applini VR-R, Haplophragmoides sp. (crushed) VR, and Spumellaria VR-R. Rare Refugian and Narizian bathyal Foraminiferal are probably contaminants from above.

CONCLUSIONS

DEPTH (FEET)	STAGE	PALEOENVIRONMENT
220; 250	Indeterminate	Marine, undifferentiated
280	Indeterminate	Beach?
310-580	Upper Refugian	Upper Bathyal
610-790	Indeterminate	Indeterminate
820	Indeterminate	Neritic?
850-1030	Refugian	Upper Bathyal
1060-1180	Refugian	Outer Neritic to Upper Bathyal
1210	Refugian	Middle to Outer Neritic
1240-1360	Refugian	Outer Neritic to Upper Bathyal
1390-2260	Refugian	Upper Bathyal
2290-2380	Probably Upper Narizian	Outer Neritic to Upper Bathyal
2410-2560	Indeterminate	Beach? to Inner Neritic
2590; 2620	Probably Upper Narizian	Neritic
2650	Upper Narizian	Middle to Outer Neritic
2680-2800	Upper Narizian	Mixed Inner and Middle Neritic to Upper Bathyal
2830-3010	Upper Narizian	Lower Middle Bathyal
3040-3090	Upper Narizian	Mixed Upper and Middle Bathyal
3120-3240	Indeterminate	Indeterminate
3270-3570	Narizian, undifferentiated	Probably Inner to Middle Neritic
3600-3660	Indeterminate	Probably Inner Neritic

3690-3780	Indeterminate	Probably Inner to Middle Neritic
3810-3870	Narizian, undifferentiated	Upper Middle Bathyal
3900-4010	Indeterminate	Inner Neritic
4040-4160	Indeterminate	Indeterminate
4175	Indeterminate	Beach?
4200-4370	Indeterminate	Indeterminate
4400-4500	Narizian, possibly Lower	Mixed Neritic and rare Bathyal
4530-4650	Indeterminate	Inner to Middle Neritic?
4680-4820	Narizian, possibly Lower	Probably Neritic

HUMBLE OIL AND REFINING COMPANY
WICKS NO. 1
NE¼ SEC. 11, T7S, R1E*
MARION COUNTY, OREGON

Summary

Only one sample examined, at 1670 ft, contains marine microfossils. Unfortunately, they are of too shallow water (inner neritic) origin to be age diagnostic.

Common lignite was found locked in lithology in sedimentary intervals between 350 and 2000 ft. Lignite was also found in abundance in what appears to be a volcanic interval from 2030 to 2150 ft. Therefore, the section from 350 to 2150 ft possibly is non-marine, with the one exception at 1670 ft. Both Foraminifera and lignite are absent below 2150 ft.

BIOSTRATIGRAPHIC RESULTS

The following data were derived from analysis of 94 previously unprocessed dry ditch samples borrowed from the D.O.G.A.M.I. collection.

80-320'

Barren of Foraminifera.

350-740'

Barren of Foraminifera. Lignite R**.

770-950'

Barren of Foraminifera.

980'; 1010'

Barren of Foraminifera. Lignite R-C.

1040-1640'

Barren of Foraminifera.

* Well location is shown incorrectly on Plate 1. Well is actually located 6 mi to the east in R1E, instead of R1W as shown on the location map.

** R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+.

1670'

Elphidiella sp. R.

1700-2150'

Barren of Foraminifera. Lignite C-VA.

2180'

Barren of Foraminifera.

2210-3290'

Interval not examined for microfossils. No sediments reported within volcanics (see Newton, 1969).

3320-7760'

Barren of Foraminifera. Major increase in "red" grains at 4310 ft; inorganic spheres top at 6020 ft; asphalt? VA at 6080 ft, A at 6440 ft, and R at 6860 ft.

CONCLUSIONS

<u>DEPTH (FEET)</u>	<u>STAGE</u>	<u>PALEOENVIRONMENT</u>
80-320	Indeterminate	Indeterminate
350-740	Indeterminate	Possibly Non-marine
770-950	Indeterminate	Indeterminate
980; 1010	Indeterminate	Possibly Non-marine
1040-1640	Indeterminate	Indeterminate
1670	Indeterminate	Inner Neritic
1700-2150	Indeterminate	Possibly Non-marine
2180	Indeterminate	Indeterminate
3320-7760	Indeterminate	Indeterminate

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