USGS 1076

a

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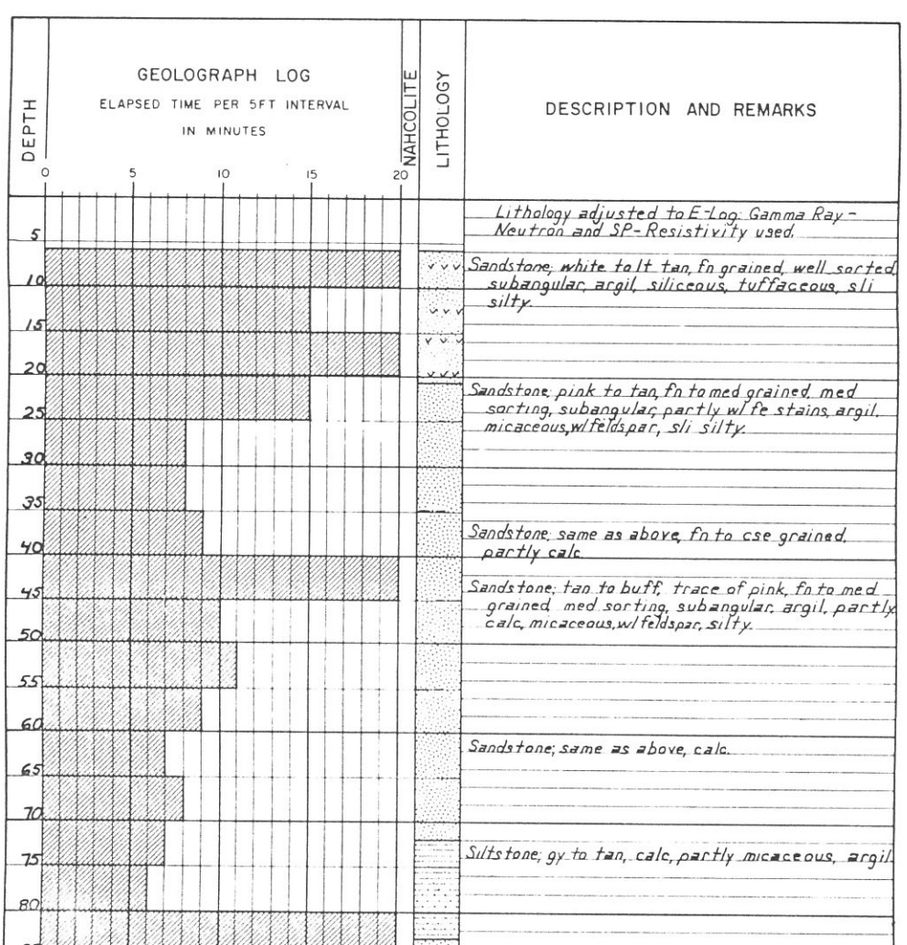
LITHOLOGIC AND GEOLOGRAPH LOG
Prepared by
AMUEDO AND IVEY
Denver, Colorado

COMPANY:	RIO BLANCO OIL SHALE PROJECT
DRILL HOLE:	M-1
LOCATION:	NE SW, SEC. 29, T.1S., R.99W. 3980' S/NL, 2345 W/EL
DATE:	Spudded 11/9/74; Completed 11/15/74
TOTAL DEPTH:	1887.0'
HOLE SIZE:	11" 0'-145' 6.75" 145'-1887.0'
ELEVATION:	Gr. 7452'; KB 7459'
SAMPLING:	J.A. Hartley D.G. Malotte M.A. Scanniello
LOGGING:	D.L. Peterson D.C. Reffert

MARKER BEDS	Depth	Datum
TOP "A" GROOVE	734	+6725
BASE "A" GROOVE	746	+6713
MAHOGANY ZONE	746-870	+6713-6589
TOP "B" GROOVE	870	+6589
BASE "B" GROOVE	888	+6571
BARREN ZONE	1000-1111	+6459-6348
TOP GARDEN GULCH	1616	+5843



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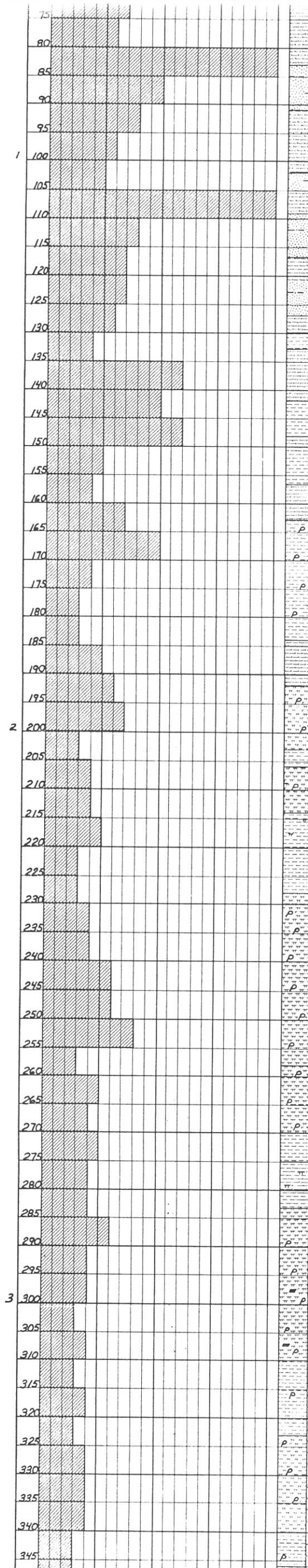


75 Siltstone; gy to tan, calc, partly micaceous, argil.

80

85 Sandstone; tan, salt and pepper, fn to med grained, med sorting, subangular, micaceous, silty, calc, argil, partly w/ feldspar.

90

95 Siltstone; gy to tan, calc, argil, partly micaceous.

1 100

105 Sandstone; same as above

110 Siltstone; gy v argil, calc.

Sandstone; tan, salt and pepper.

115

120 Siltstone; gy, v argil, calc.

125 Sandstone; tan, salt and pepper, trace of pink, fn to med grained, med sorting, subangular, partly micaceous, calc, silty, argil, partly w/ feldspar.

130 Siltstone; same as above.

Mudstone; gy, silty, calc.

135 ←Bottom of casing @ 136'

140 Siltstone; gy, v argil, calc.

145 Mudstone; gy, silty, calc.

150 Siltstone; same as above.

155 Mudstone; same as above.

160 Siltstone; gy, sli sandy, calc, argil, partly micaceous.

165 P

170 Mudstone; gy to lt brn, calc, partly silty, w/ pyr scattered throughout.

175 P

180 P

185

190 Siltstone; gy to lt gy, calc, argil.

195 Marlstone; dk gy to brn, partly laminated, calc, micro-micaceous in part, trace of pyr.

2 200 P

205 Mudstone; dk gy, micro-micaceous.

210 P Marlstone; same as above.

215

220

Mudstone; same as above, partly marly.

225

230

235 P

240 Marlstone; dk brn to buff, v calc, w/ laminated limy streaks, sli silty.

245 P

250 P

255 Marlstone; same as above, v calc, w/ limy streaks.

260 P

265 Marlstone; tan to dk brn, laminated, argil, calc, w/ pyr scattered throughout.

270 P

Mudstone; dk gy, micro-micaceous.

275

280 Siltstone; buff to lt gy, calc, partly marly.

285

290 P

295 Marlstone; buff to gy brn, v calc, partly laminated, limy streaks, w/ pyr scattered throughout, trace of calc xls.

3 300 P

305 P

310 P

315

320 P Mudstone; dk gy, partly marly, calc, w/ trace pyr.

325 P

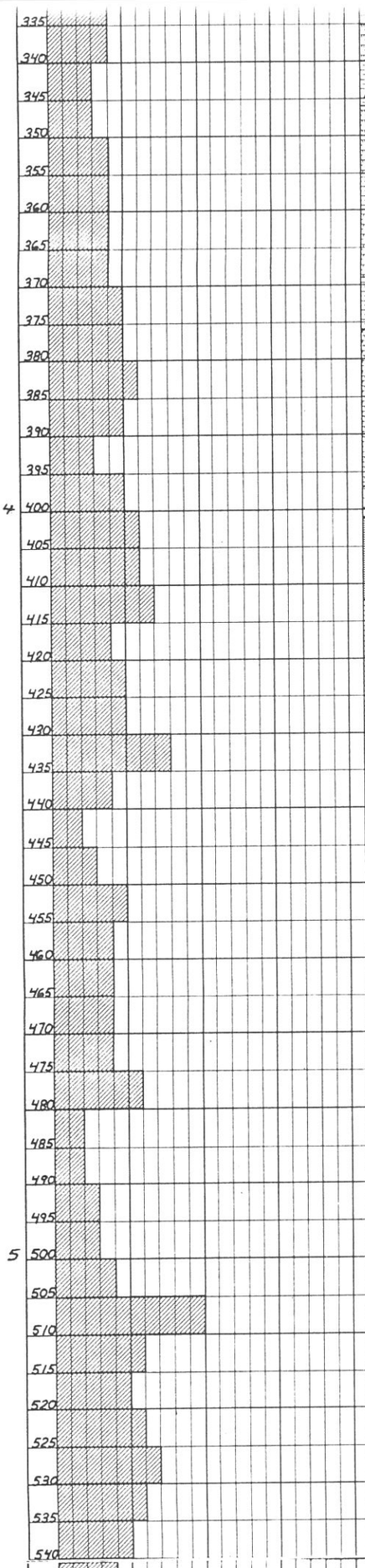
330 Marlstone; brn to gy brn, laminated, v argil, w/ calc, pyr, petroliferous traces.

335 P

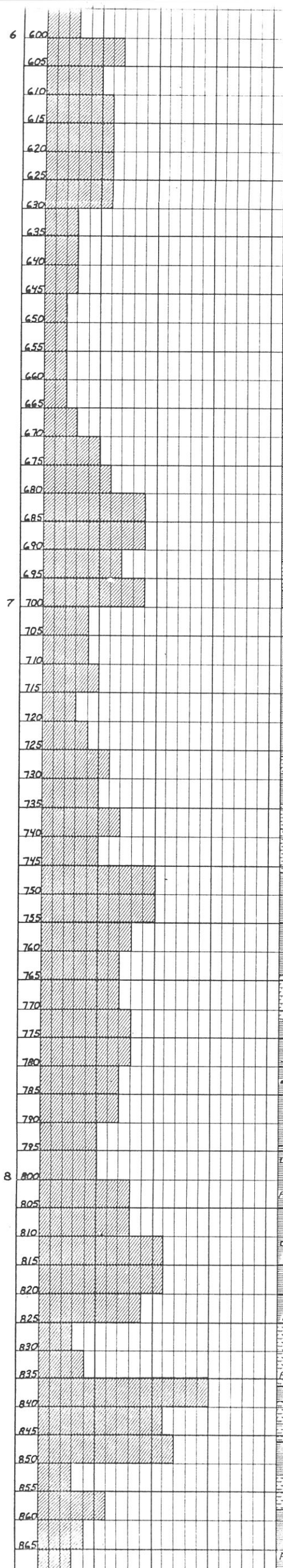
340 Marlstone; buff to lt tan, v calc, limy streaks.

345 P Mudstone; dk gy, micro-micaceous, sli calc, trace of pyr.

C



335 Marlstone; buff to lt tan, v calc, limy streaks.
340 Mudstone; dk gy, micro-micaceous, sli calc, trace of pyr.
345
350 Marlstone; tan to gy brn, v argil, calc, partly micaceous, w/ trace of pyr.
355
Mudstone; dk gy, micro-micaceous.
360
365 Marlstone; same as above.
370 Mudstone; dk gy, micro-micaceous, sli calc.
375
380
385 Marlstone; lt tan to dk gy brn, v calc, pyr scattered throughout, petroliferous traces.
390
395
4 400 Mudstone; dk gy, micro-micaceous, marly.
405 Oil Shale; brn to dk gy brn, partly petroliferous, laminated calc, low to v low grade, trace of pyr
410
415
420
425 Marlstone; brn to dk gy brn, v argil, streaks, pyr scattered throughout, petroliferous traces, calc.
430
435
440
445 Mudstone; dk gy, micro-micaceous, marly
450
455 Marlstone; buff to lt tan, partly laminated, calc xls scattered throughout, traces of pyr.
460
465
470 Siltstone; lt gy to buff, w/ pyr and calc xls scattered throughout.
475
480
485 Siltstone; lt gy to buff, partly sandy, sli calc, traces of pyr.
490
495
5 500 Marlstone; brn to gy brn, partly laminated, w/ calc xls scattered throughout.
505
510
515 Mudstone; lt brn to buff, sli calc, w/ traces of pyr and calc.
520
525 Marlstone; brn to gy brn, laminated, w/ pyr and calc xls.
530 Mudstone; same as above.
535 Marlstone; same as above.
540
545 Oil Shale; brn to dk brn, calc, low grade, w/ calc xls.
550
555 Oil Shale; brn to dk gy brn, calc, low grade, pyr scattered throughout.
560
565 Siltstone; lt gy to buff, sli calc, w/ pyr scattered throughout.
570
575 Marlstone; brn to gy brn.
580 Mudstone; brn to buff, partly marly and silty, w/ traces of pyr.
585
590 Siltstone; same as above.
Mudstone; lt brn to buff, sli calc, sli silty.
595
6 600 Siltstone; lt gy to buff, sli calc, argil, traces of carbonaceous streaks.
605 Mudstone; lt gy to buff, sli silty.
Siltstone; same as above.



Siltstone; lt gy to buff, sli calc, argil, traces of carbonaceous streaks.

Mudstone; lt gy to buff, sli silty.

Siltstone; same as above.

Marlstone; brn, dense, calc, petroliferous traces.

Oil Shale; brn to dk gy brn laminated dense, low to med grade, partly marly, w/ traces of calc veins.

Marlstone; brn, laminated, calc.

Mudstone; lt brn to buff, sli calc, partly silty.

Oil Shale; brn to dk gy brn, laminated, low to med grade, traces of pyr.

Mudstone; buff to brn, marly.

Oil Shale; dk brn to dk gy brn, dense laminated, med grade, partly marly.

Marlstone; brn, dense, w/ calc xls.

Oil Shale; dk brn to blk, dense, laminated, med to high grade partly micro-micaceous, w/ brn to blk oil strains sli calc.

Marlstone; brn to dk brn, dense, laminated, petroliferous traces.

Oil Shale; same as above.

TOP "A" GROOVE @ 734' (from E log)

Mudstone; buff to lt gy, sli calc, partly marly.

BASE "A" GROOVE @ 746' (from E log)

Oil Shale; brn to dk gy brn, dense, laminated, low to med grade, marly.

Marlstone; brn to lt brn, dense, partly laminated petroliferous traces.

Oil Shale; brn to dk gy brn dense laminated, low to med grade, w/ p-p calc scattered throughout, partly vuggy.

Oil Shale; brn to dk gy brn, laminated, low grade, sli vuggy, marly, pyr scattered throughout.

Marlstone; brn to gy brn, laminated, pyr scattered throughout, w/ petroliferous traces.

Oil Shale; dk brn to blk, dense, med grade, w/ blk oil stains.

Marlstone; same as above.

Mudstone; buff to gy, marly.

Oil Shale; same as above, med to high grade.

Marlstone; brn, partly laminated w/ trace of pyr.

Oil Shale; dk brn to blk, dense, laminated, med to high grade, partly marly, trace of pyr, w/ blk oil stains.

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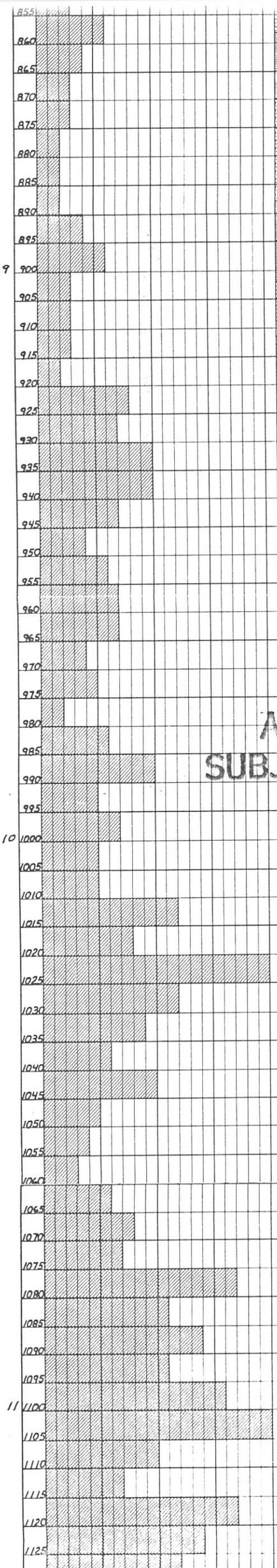

855 Marlstone; brn, partly laminated, w/ trace of pyr.

860

865 Oil Shale; dk brn to blk, dense, laminated, med to high grade, partly marly, trace of pyr, w/ blk oil strains.

870 TOP "B" GROOVE @ 870' (from E Log)

875 Marlstone; brn dense, partly, laminated.

880

885 BOTTOM "B" GROOVE @ 888' (from E Log)

890

895 Oil Shale; dk brn to blk, dense, med to high grade, partly micro-micaceous, w/ blk oil strains.

9 900

905 Marlstone; brn, dense, sli vuggy, petroliferous traces.

910

915 Oil Shale; brn to dk brn, laminated, low to med grade.

920 Marlstone; brn, partly dense, laminated.

925 Oil Shale; same as above.
Marlstone; same as above.

930 Oil Shale; same as above.
Marlstone; same as above.

935 Oil Shale; brn to dk brn, dense, laminated, low to med grade, partly marly, w/ brn oil stains.

940 Marlstone; brn, laminated, petroliferous traces.

945 Oil Shale; same as above.

950 Mudstone; brn to buff, marly.

955

960 Oil Shale; brn to dk brn, dense, laminated, low to med grade, sli marly, trace of pyr and vugs.

965

970

975 Marlstone; brn to buff, partly laminated, w/ trace of pyr.

980

985

990 Oil Shale; dk brn to blk, laminated, med grade marly streaks, partly micro-micaceous, w/ blk oil strains.

995

10 1000 TOP BARREN ZONE @ 1000' (from E Log)

1005 Marlstone; brn, partly laminated.
Oil Shale; dk brn to blk, med grade, partly micro-micaceous.

1010

1015 Marlstone; brn to gy brn, laminated, w/ petroliferous traces.

1020

1025 Oil Shale; dk brn to blk, med to high grade, micro-micaceous.

1030 Marlstone; brn to lt brn, laminated, petroliferous traces.

1035 Mudstone; lt gy to gy brn, sli laminated.

1040

1045 Marlstone; same as above.

1050 Oil Shale; dk brn to blk, dense, med to high grade.

1055 Mudstone; lt gy to gy brn.

1060 Marlstone; gy brn to brn, laminated.

1065

1070

1075 Mudstone; lt gy to gy brn.

1080 Oil Shale; dk brn to blk, high grade, partly micro-micaceous.

1085 Mudstone; lt gy to gy brn.
Marlstone; same as above.

1090 Oil Shale; same as above, med grade.

1095 Mudstone; lt gy to gy brn, partly laminated.

11 1100 Oil Shale; dk brn to blk, dense, med grade.

1105 BASE BARREN ZONE @ 1111' (from E Log)

1110

1115

1120 Oil Shale; brn to dk gy brn, dense, laminated, low to med grade, partly marly and vuggy, w/ trace of pyr.

1125

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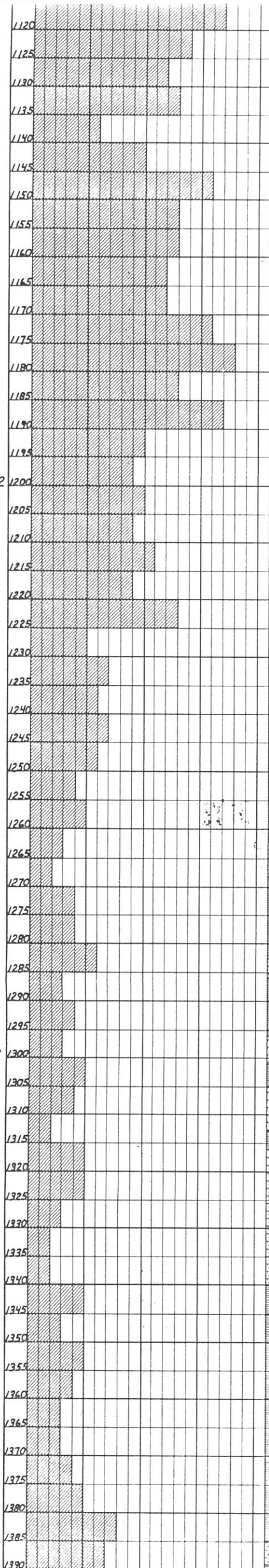


1120 Oil Shale; brn to dk gy brn, dense, laminated, low to med grade, partly marly and vuggy, wl trace of pyr.

1125

1130

1135 Oil Shale; same as above.

1140

1145 Marlstone; brn to gy brn, dense, laminated.

1150

1155

1160 Oil Shale; blk to dk brn, dense, med to high grade, wl brn to blk oil stains, wl trace of pyr.

1165

1170

1175 Marlstone; brn to gy brn, laminated, wl trace of pyr.

1180 Oil Shale; dk brn, dense, med grade.

1185 Marlstone; same as above.
Mudstone; lt gy to gy brn, wl trace of pyr.

1190 Oil Shale; dk brn to blk, high grade, sli vuggy.
Marlstone; brn to gy brn, laminated.

1195 Oil Shale; dk brn to blk, med to high grade, wl vugs partly filled wl white calc xls.

12 1200 Marlstone; brn to gy brn, laminated, partly wl pyr.

1205

1210

1215

1220 Oil Shale; blk to dk brn, dense, med grade, wl blk oil stains, partly marly, wl pyr scattered throughout.

1225

1230

1235

1240 Oil Shale; blk to dk brn, med to high grade, wl pp calc, vuggy, wl pyr scattered throughout.

1245 Marlstone; brn to gy brn, trace of pyr, sli vuggy.

1250

1255 Oil Shale; dk brn, low grade, sli vuggy, wl trace of pyr.

1260 Marlstone; lt brn to gy brn, vuggy, wl pyr.
Oil Shale; same as above, med grade, trace of calc xls.

1265 Marlstone; same as above.

1270

1275 Oil Shale; dk brn, dense, low to med grade, partly vuggy, wl trace of pyr.

1280

1285 Marlstone; gy brn to brn, sli vuggy.

1290 Oil Shale; brn to dk brn, dense, low grade, sli vuggy, partly wl brn oil stains.

1295

13 1300 Marlstone; partly laminated, vuggy.

1305 Oil Shale; dk brn, dense, med grade.

1310 Marlstone; brn, sli vuggy, wl white specks scattered throughout.

1315 Oil Shale; same as above.

1320

1325

1330 Marlstone; brn to dk gy brn, partly micro-micaceous, partly wl white specks.

1335

1340

1345

1350 Oil Shale; brn to dk gy brn, dense, laminated, med grade, partly marly, wl brn oil stains.

1355

1360

1365

1370

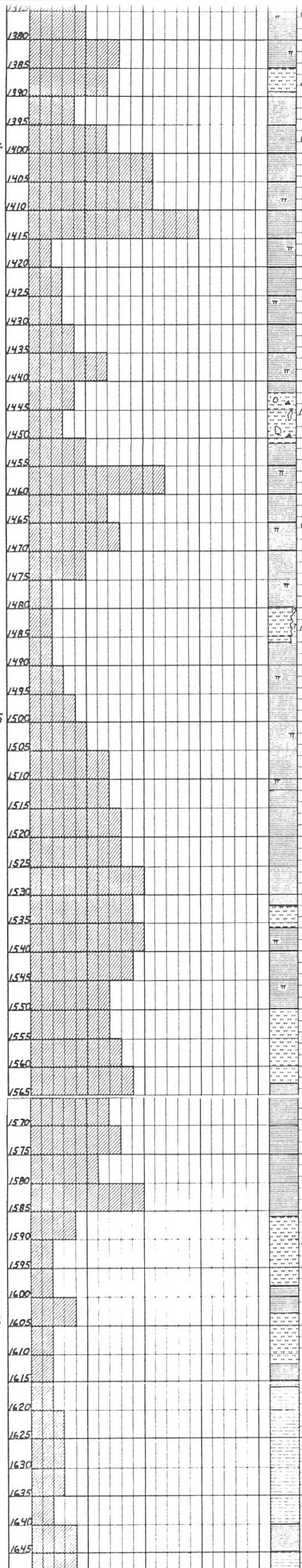
1375 Oil Shale; same as above.

1380

1385

1390 Marlstone; brn to gy brn, dense, partly laminated.

8



1380 Oil Shale; same as above.

1385

1390 Marlstone; brn to gy brn, dense, partly laminated.

1395

14 1400 Oil Shale; dk brn to blk, dense, med to high grade, wl brn to blk oil stains.

1405

1410

1415

1420

1425 Oil Shale; brn to dk brn, dense, partly laminated, low grade, partly marly, wl brn oil stains.

1430

1435

1440

1445 Marlstone; brn, vuggy, partly wl white chert.

1450

1455

1460

1465 Oil Shale; lt brn, dense, med grade, partly marly.

1470

1475

1480

1485 Marlstone; brn to gy brn, abundant cavings, v poor samples.

1490

1495

15 1500 Oil Shale; dk brn, dense, med grade, sli marly.

1505

1510

1515

1520 Oil Shale; blk to dk brn, dense, med to high grade, partly micro-micaceous.

1525

1530

1535 Marlstone; brn to dk brn, dense, laminated, petroliferous traces.

1540

1545 Oil Shale; dk brn to blk, dense, partly laminated, med grade, partly marly.

1550

1555 Marlstone; brn to gy brn, partly laminated.

1560

1565

1570 Oil Shale; dk brn, to blk brn, dense, partly laminated, med grade, partly micro-micaceous.

1575

1580

1585

1590 Marlstone; gy brn to brn, abundant cavings, poor samples.

1595

1600 Oil Shale; brn to dk brn, laminated, low grade, abundant caving.

16 1605 Marlstone; gy brn to brn, abundant cavings, poor sampling.

1610 Oil Shale; same as above, abundant cavings.

1615 TOP GARDEN GULCH @ 1616' (from E Log)

1620

1625 Shale; argil, gy to gy brn, laminated, sli calc, partly micro-micaceous, trace of petroliferous streaks.

1630

1635

1640 Oil Shale; blk to dk gy brn, low grade, micro-micaceous, abundant cavings, poor samples

1645

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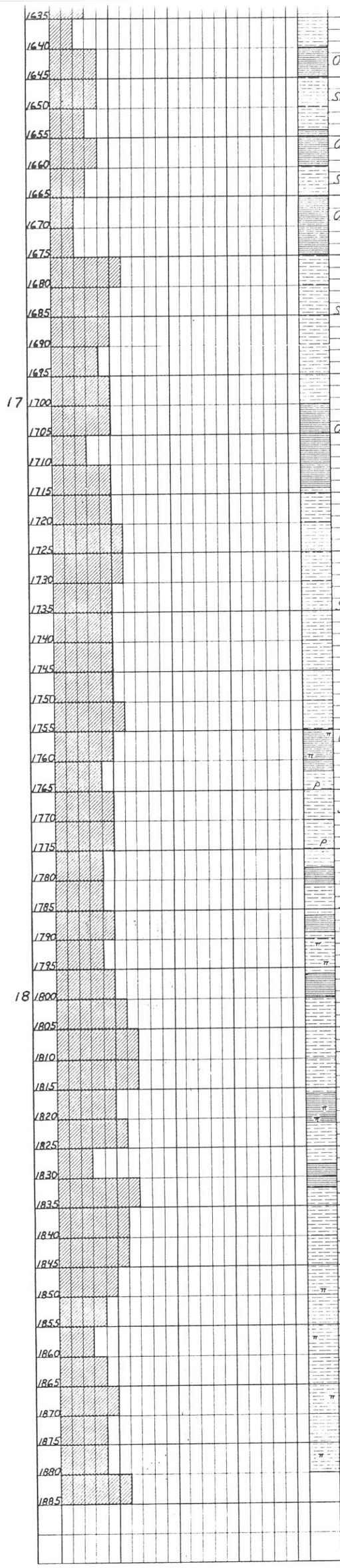

Oil Shale; blk to dk gy brn, low grade, micro-micaceous, abundant cavings poor samples

Shale; argil, gy to gy brn, laminated, sli calc, partly micro-micaceous, partly w/ petroliferous streaks, abundant caving, poor samples.

Oil Shale; brn, laminated, low grade, marly streaks

Shale; argil, gy to gy brn, laminated, marly streaks.

Oil Shale; blk to dk brn, laminated, low grade, micro-micaceous w/ blk oil stains.

Shale; argil, dk gy to gy, partly marly, micro-micaceous, abundant caving, poor sample

Oil Shale; dk brn to dk gy, partly laminated, low grade, partly micro-micaceous, partly w/ blk oil stains, poor samples.

Shale; argil gy to gy brn laminated, partly marly, abundant cavings, poor samples.

Oil Shale; dk brn to dk gy, partly laminated, low grade, partly micro-micaceous, partly marly, abundant cavings.

Shale; argil, gy to gy brn, laminated, partly micro-micaceous, trace of pyr, abundant cavings.

Oil Shale; same as above.

Shale; argil, same as above.

Oil Shale; same as above.

Shale; argil, gy to gy brn, laminated, marly streaks.

Oil Shale; dk gy to blk, partly laminated, low grade, micro-micaceous, abundant cavings.

Shale; argil, gy to gy brn, laminated, partly micro-micaceous, abundant cavings.

Oil Shale; dk brn to dk gy, partly laminated, low grade, partly micro-micaceous, marly.

Shale; argil, same as above.

Oil Shale; same as above.

Shale; argil, gy to gy brn, laminated, partly micro-micaceous, marly streaks, abundant cavings, poor samples.

TD for E-Log = 1880.0'
TD for samples = 1870.0'
TD for driller = 1887.0'

"Note": The lithology in this well has been adjusted to E-logs. In general the various logs were used as follows. Gamma Ray-Neutron log was used from surface to 730.0, SP-resistivity log was used from 730.0' to 1616.0'. In very general, Gamma Ray-FDL log was used from 1616.0' to TD.

The samples were fair quality from surface to 1590.0' and from 1590.0' to TD were poor quality.

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