Mudlog descriptions up hole.

Claystone, moderate orange brown to dark orange brown in part, firm to moderately hard, subfissile in part, silty in part grading to argillaceous, siltstone, moderately calcareous or dolomitic in part

Limestone, white to light grey, trace variably green, friable to moderately hard, calcisiltite to fine calcarenite, commonly microcrystalline and dolomitic, hard to very hard, trace very fine to fine quartz sand

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Lindsay Description: 2502 – 2505 100% SST, translucent to clear, very pale brown, patchy translucent/brown aggregates, friable (loose) to hard, very fine to very coarse, generally fine to medium, poorly sorted, sub angular to rounded, silty ip, com kaolin mtrx, strong to moderately strong siliceous cement (overgrowths), clean aggregates to occasional interstitial bituminous carb mat, common micxln and crsly xln pyrite, occasional shale clasts in labile aggregates, commonly silicified quartzitic aggregates, poor to inferred good porosity, no show. Min fluor in carbonates only.

2505 – 2508m 100% SST a/a

2508- 2511m 90% SST 10% CLYST

2511 – 2514m 30% SST, medium grey, hard, very fine to fine grained, predom very fine, dolomitic and siliceous cement, very poor visual porosity

70% CLYST medium to dark grey, medium greenish grey, occasional trace light greenish grey, moderately hard, irregular cuttings angular rarely splintery in part, subfissile in part, grades to argillaceous siltstone in part, non calcareous

2514-2517m CLYST 95% SST 5%

2517-2520m CLYST 95% SST 5%

2517-2523m CLYST 95% SST 5%

2523-2526m CLYST 80% SST 20% very fine to fine grained as above, locally minor loose medium grained round sand, trace garnet, pr por.

2526-2529m CLYST 95% SST 5%

2529-2541m CLYST 100%

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2562-2571m logged after trip at 2564m.

CLYST 100%; predominantly dark grey, lesser medium grey, hard, blocky to subfissile, minor irregular, rare splintery, non calcareous; trace to 10% medium to dark orange brown, probable cavings from above 2450m, note dispersed clay turned mud (brine) orange red while drilling fill just above 2564m

2571-2574m

CLYST 90%; dark grey as above

SST 10%; as below

2577m grab sample 100% SST: light grey, loose, fine to coarse, predominantly medium, well sorted, angular to subangular, rare subround and rounded, quartz overgrowth and silica dissolution common, minor broken grains, rare silica shards, grains predominantly clear

Show: faint yellow white fluorescence pervasive, immediate but slow blooming faint blue white fluorescent cut. Oil in Mud: pervasive dull yellow fluorescence coalesces at surface with time to give moderately bright yellow white fluorescence in part. Brown droplets of oil are seen to break out of the mud.

2574-2577m

SST 50%; as 2577m grab sample but predominantly coarse

CLYST 50% predominantly cavings

2577-2580m

SST 90% predominantly medium to coarse loose grains, rare hard tight siliceous aggregates

CLYST 10% Cavings

Note 23/1/12 no description in book for 2580-2583m and 2583-2586m, shift change. Increasing percentage of broken grains indicating greater silica cementation was noted by MRH with depth

2595m-2610m SST, 100% Sandstone, light grey, loose, fine to coarse, predominantly medium, well sorted, subangular to subround, rare rounded grains with common angular fractured grains, grains translucent to clear.

Pervasive dull yellow fluorescence (cream) in samples with instant but slow blooming pale bluish white fluorescence. Oil in mud minor droplets, more correctly aggregates of fine droplets of oil emulsion that coagulate in patches at surface. Note description of returns from circulation of trip a 2593m.

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2643-2649m SST, 100% light grey brown, light brown, loose, very fine to fine, predominantly fine well sorted, subround to subangular, common angular broken grains, good trace to common aggregates increasing to common with depth, hard, siliceous cement, very rare with kaolin matrix, rare to poor trace medium and coarse grains. Fluorescence: pervasive dull yellow white, slow blooming faint blue white fluorescent cut, strong white residual ring, variable light brown oil stain (?).

Note MRH 23-1-12: whether this is oil stain or stain occurring subsequent to deposition is unclear. In core the very fine grained “arkosic” unit (per G Ambrose) with poor reservoir quality and high gamma ray has a sharp contact with the more porous sandstone, “the sweet spot sand”. A disconformity is indicated with sub-aerial exposure suggested, Kaolin in trace quantities initially noted by Cullen and modest iron oxide forming on grains?

2649-2652m SST, 100% a/a

2652-2655m SST, 100% a/a

Sweep pumped; 30% cavings in sample rounded cuttings of hard dark grey claystone, reddish and greenish claystone from way up hole, also common larger fragments of hard very fine sandstone, coarser quartz present; likely cavings.

Additional Note (post drill 23-1-12): More correctly the cuttings described as cavings are in fact larger cuttings and cavings that were not being lifted by the KCl brine, the rounding of the hard claystone grains suggest they were in the hole for some time, not unexpected as low weight brine was used as a drilling fluid.

2658 to 2670m SST, 100% loose predominantly loose very fine to fine as above; common larger fragments of hard aggregates, decreasing with depth

60% cavings declining to 20% or less

2670 – 2679m SST, very fine to fine grained, predominantly fine, loose with occasional aggregates, rare medium.

Cavings (more correctly returns from sweep) decline to zero

Good oil show associated with 1139 unit gas peak and minor drilling break from 2676m. Note made 23-1-12 : high readings were recorded between 2674.5m to 2677.5m, coincident with faster drilling.

Good continuous stream of oil on surface of possum belly 2-3cm wide, mud discoloured pale brown over shakers, black oil on shakers after drilling break at 2676m. Formation change more clay in samples below 2679m indicates fault displacement or perhaps an open fracture or fracture zone. Note MRH 23-1-12

Mudlog Description: A slug of oil came to the surface as a solid stream of oil 2-3cm wide in possum belly from break at 2676m, minor fault more clayey sands past 2679m

2679-2682m Poor sample logged after slow pumping while repairing wash pipe. Cavings 50%

2682-2685m SST 80% light grey, loose, very fine to fine, angular to round, minor siliceous aggregates, trace aggregates with white kaolin matrix, poor oil show, very dull fluorescence, faint blue white fluorescent cut

CLYST 20% dark grey, red in part, moderately hard, very small cuttings making general sample dark grey

Sample fluorescence 20%

2685-2688m 5% fluor. Logged 50% SST/50% CLYST

2688-2691m 5% fluor. Logged 50% SST/50% CLYST

Note: MRH 23-1-12 The concern here was that the clays in the sample were cavings, because of the colouration and composition. More subtle oil show was due to claystone in sample. Considered with Lindsay, he considered they looked like cuttings. True , however there was a problem with a leak in the wash pipe at Kelly Down about 2679m, it took some time repair this and during this time very low circulation was achieved using a circulating head, it may be that claystone cavings accumulated about the bend in the hole above where horizontal was reached, on resuming drilling such cavings would be ground up on the bend of the hole and circulated to the surface, this grinding aided by the prescence of coarser sand material settling in the hole.

It was a curious thing that when I woke up on the day we were due to fly out, they were circulating, cleaning the hole above the sweet spot sandstone I think. The sand returns circulated to the surface at the time I looked at the shakers were noteworthy consisting of very well coarse sand grains in a fairly substantial pile, these presumably had been down hole for a long period ending up very spherical as a result. These we seen as traces in the returns from sweaps.

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2739m to 2757m

SST: 100% light grey, light brownish in part, loose, very fine to fine, predominantly fine well sorted, angular to rarely rounded, very common broken grains, rare siliceous aggregates and shards, trace carbonaceous material

Trace firm fragments kaolin or rock flour

Show: faint yellow white fluorescence pervasive, immediate but slow blooming faint blue white fluorescent cut. Oil in Mud; faintly fluorescent

2760m: 100% SST a/a very fine to fine medium, increase of oil in mud

Show: 100% dull yellow white fluorescence, pale blue white cut fluorescence, instant when dry, bright blue white residual ring, good number of fluorescent blotches on mud surface

Note MRH 23-1-12

2763m a/a

Trip at 2764m

2763-2766m logged after trip (claystone cavings in sample), Sandstone fine to medium

2766-2769m Sandstone mainly fine grained

2769-2772m Sandstone mainly fine grained medium in part

Pervasive dull yellow white fluorescence throughout samples

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2808- 2838m

SST: 100% light grey, loose, fine to medium, predominantly medium, well sorted, common angular mainly broken grains, clear to translucent, lesser fraction subangular to rounded translucent, occasionally with quartz overgrowth, trace shards of silica, nil to occasional trace kaolin fragments, no aggregates,

Show: pervasive dull yellow white, faint blue white cut fluorescence, blue white to white residual ring, oil in mud with dull yellow white fluorescence 20-80% oil on surface (this for mudlog)

Show: pervasive dull yellow white, faint blue white cut fluorescence, blue white to white residual ring, oil in mud 50-80% on surface of samples commonly fine droplets occasionally larger droplets, with faster drilling, lesser amount when slow drilling while sliding

2838-2847m

SST: 100% light grey, loose, fine to medium, predominantly fine, subangular to rounded, common broken grains, well sorted, dispersed kaolin. Shows generally as above, intensity diminished.

**Specific notes individual samples from notebook:**

2808-2817m Sandstone, fine to medium grained, predominantly medium, well sorted, subangular to rounded, predominantly angular broken grains

2817m-2823m Sandstone, fine to medium (finer medium),

2823m-2838m Sandstone, loose, fine to medium, predominantly medium (coarser medium), clear to milky quartz, translucent to transparent, trace quartz with quartz overgrowth, strong pervasive dull yellow white fluorescence, common fine droplets (emulsion) of oil in mud, occasional popping out of larger droplets. Translucent grains indicative of better porosity.

2838m-2844m Sandstone, fine to medium, predominantly fine, kaolin in samples soft and dispersed lesser intensity of shows. DROPPED AGAIN.

Directional driller also reached this conclusion.

2847m grab, fine to medium, predominantly medium (fine medium)

2848.5m grab sample finer again !