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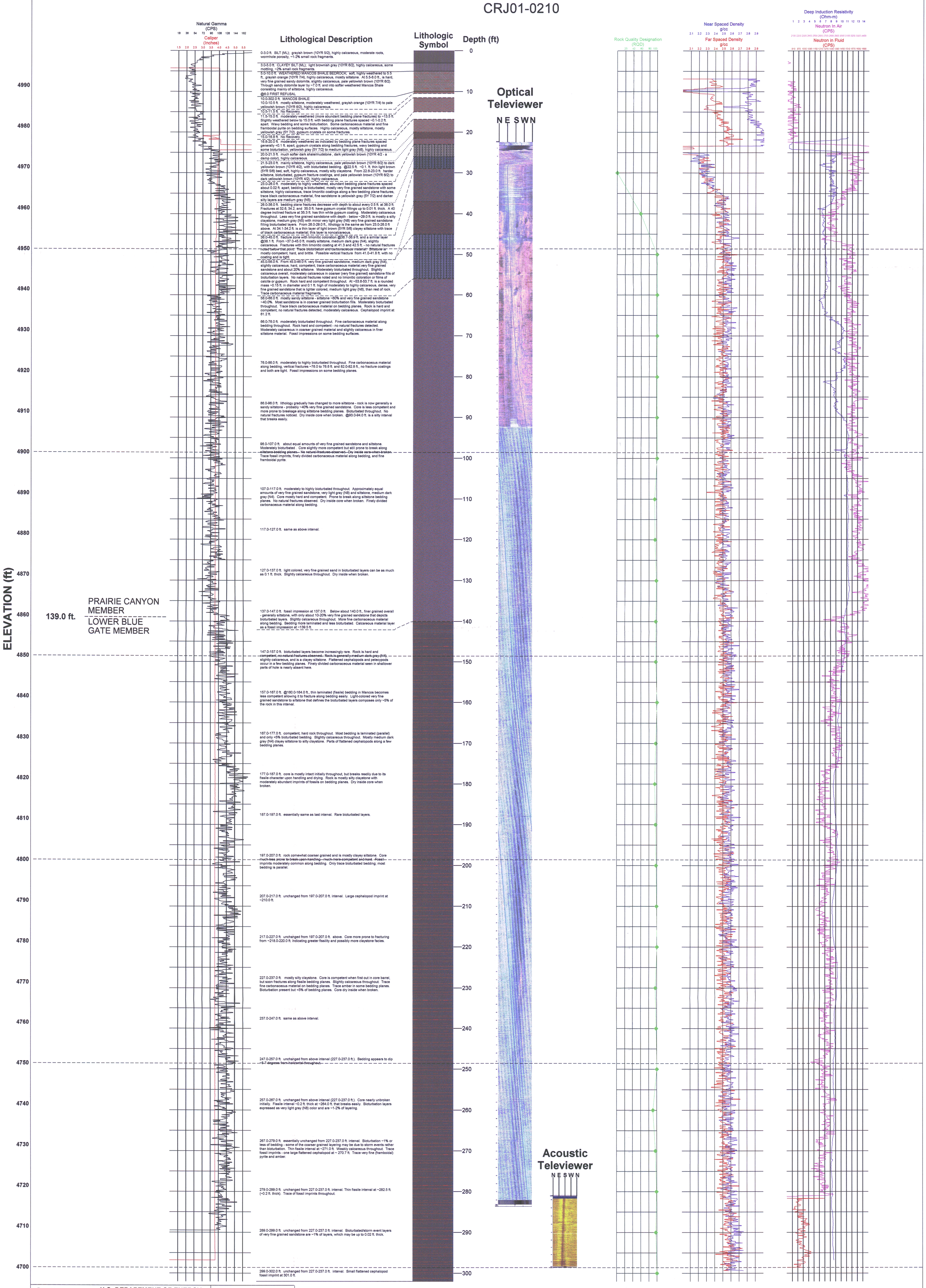

0-3.0 ft. SILT (ML); grayish brown (10YR 5/2), highly calcareous, moderate roots, wormhole porosity, ~1-2% small rock fragments.

3.0-5.0 ft. CLAYEY SILT (ML); light brownish gray (10YR 6/2), highly calcareous, some mottling, ~2% small rock fragments.

5.0-10.0 ft. WEATHERED MANCOS SHALE BEDROCK: soft, highly weathered to 5.5 ft., grayish orange (10YR 7/4), highly calcareous, mostly siltstone. At 5.5-8.0 ft., is hard, very fine grained sandy dolomite, slightly calcareous, pale yellowish brown (10YR 6/2). Through sandy dolomite layer by ~7.0 ft. and into softer weathered Mancos Shale consisting mainly of siltstone, highly calcareous.
@8.0 FIRST REFUSAL.

10.0-302.0 ft. MANCOS SHALE:
10.0-10.5 ft. mostly siltstone, moderately weathered, grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2), highly calcareous.

10.5-11.5 ft. No Recovery.

11.5-15.0 ft. moderately weathered (more abundant bedding plane fractures) to ~13.5 ft. Slightly weathered below to 15.0 ft. with bedding plane fractures spaced ~0.1-0.2 ft. apart. Wavy bedding and some bioturbation. Some carbonaceous material and fine framboidal pyrite on bedding surfaces. Highly calcareous, mostly siltstone, mostly yellowish gray (5Y 7/2), gypsum crystals on some fractures.

15.0-16.8 ft. No Recovery.

16.8-20.0 ft. moderately weathered as indicated by bedding plane fractures spaced generally <0.1 ft. apart, gypsum crystals along bedding fractures, wavy bedding and some bioturbation, yellowish gray (5Y 7/2) to medium light gray (N6), highly calcareous.

20.0-21.5 ft. much softer dark shale/mudstone , dark yellowish brown (10YR 4/2 - a damp color), highly calcareous.

21.5-23.0 ft. mainly siltstone, highly calcareous, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), with bioturbated bedding. @22.5 ft. ~0.1. ft. thin light brown (5YR 5/6) bed, soft, highly calcareous, mostly silty claystone. From 22.8-23.0 ft. harder siltstone, bioturbated, gypsum fracture coatings, and pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), highly calcareous.

23.0-26.0 ft. moderately to highly weathered, abundant bedding plane fractures spaced about 0.02 ft. apart, bedding is bioturbated, mostly very fine grained sandstone with some siltstone, highly calcareous, trace limonitic coatings along a few bedding plane fractures, trace black carbonaceous material, fine sandstone is yellowish gray (5Y 7/2) and darker silty layers are medium gray (N5).

26.0-36.0 ft. bedding plane fractures decrease with depth to about every 0.5 ft. at 36.0 ft. Fractures at 32.6, 34.2, and 35.0 ft. have gypsum crystal fillings up to 0.01 ft. thick. A 40 degree inclined fracture at 35.3 ft. has thin white gypsum coating. Moderately calcareous throughout. Less very fine grained sandstone with depth - below ~29.0 ft. is mostly a silty claystone, medium gray (N5) with minor very light gray (N8) very fine grained sandstone filling bioturbated layers. From 26.0-29.0 ft., lithology is the same as from 23.0-26.0 ft above. At 34.1-34.2 ft. is a thin layer of light brown (5YR 5/6) clayey siltstone with trace of black carbonaceous material; this layer is noncalcareous.

36.0-45.0 ft. fracture zone with limonitic coloration @36.7-36.9 ft. and a similar layer @38.1 ft. From ~37.0-45.0 ft. mostly siltstone, medium dark gray (N4), slightly calcareous. Fractures with thin limonitic coating at 41.3 and 42.5 ft. - no natural fractures noted below that point. Trace bioturbation and carbonaceous material. Siltstone is mostly competent, hard, and brittle. Possible vertical fracture from 41.0-41.8 ft. with no coating and is tight.

45.0-56.0 ft. From 45.0-46.0 ft. very fine grained sandstone, medium dark gray (N4), slightly calcareous, hard, competent, trace carbonaceous material.very fine grained sandstone and about 20% siltstone. Moderately bioturbated throughout. Slightly calcareous overall, moderately calcareous in coarser (very fine grained) sandstone fills of bioturbation layers. No natural fractures noted and no limonitic coloration or films of calcite or gypsum. Rock hard and competent throughout. At ~53.6-53.7 ft. is a rounded mass ~0.15 ft. in diameter and 0.1 ft. high of moderately to highly calcareous, dense, very fine grained sandstone that is lighter colored, medium light gray (N6), than rest of rock. Trace carbonaceous material fragments.

56.0-66.0 ft. mostly sandy siltstone - siltstone ~60% and very fine grained sandstone ~40.0%. Most sandstone is in coarser grained bioturbation fills. Moderately bioturbated throughout. Trace black carbonaceous material on bedding planes. Rock is hard and competent, no natural fractures detected, moderately calcareous. Cephalopod imprint at 61.2 ft.

66.0-76.0 ft. moderately bioturbated throughout. Fine carbonaceous material along bedding throughout. Rock hard and competent - no natural fractures detected. Moderately calcareous in coarser grained material and slightly calcareous in finer siltstone material. Fossil impressions on some bedding surfaces.

76.0-86.0 ft. moderately to highly bioturbated throughout. Fine carbonaceous material along bedding, vertical fractures ~76.0 to 76.6 ft. and 82.0-82.8 ft., no fracture coatings and both are tight. Fossil impressions on some bedding planes.

86.0-96.0 ft. lithology gradually has changed to more siltstone - rock is now generally a sandy siltstone - probably ~40% very fine grained sandstone. Core is less competent and more prone to breakage along siltstone bedding planes. Bioturbated throughout. No natural fractures noticed. Dry inside core when broken. @93.0-94.0 ft. is a silty interval that breaks easily.

96.0-107.0 ft. about equal amounts of very fine grained sandstone and siltstone. Moderately bioturbated . Core slightly more competent but still prone to break along siltstone bedding planes. No natural fractures observed. Dry inside core when broken. Trace fossil imprints, finely divided carbonaceous material along bedding, and fine framboidal pyrite.

107.0-117.0 ft. moderately to highly bioturbated throughout. Approximately equal amounts of very fine grained sandstone, very light gray (N8) and siltstone, medium dark gray (N4). Core mostly hard and competent. Prone to break along siltstone bedding planes. No natural fractures observed. Dry inside core when broken. Finely divided carbonaceous material along bedding.

117.0-127.0 ft. same as above interval.

127.0-137.0 ft. light colored, very fine grained sand in bioturbated layers can be as much as 0.1 ft. thick. Slightly calcareous throughout. Dry inside when broken.

137.0-147.0 ft. fossil impression at 137.0 ft. Below about 140.0 ft., finer grained overall - generally siltstone, with only about 10-20% very fine grained sandstone that depicts bioturbated layers. Slightly calcareous throughout. More fine carbonaceous material along bedding. Bedding more laminated and less bioturbated. Calcareous material layer as a fossil impression at ~139.5 ft.

147.0-157.0 ft. bioturbated layers become increasingly rare. Rock is hard and competent, no natural fractures observed. Rock is generally medium dark gray (N4), slightly calcareous, and is a clayey siltstone. Flattened cephalopods and pelecypods occur in a few bedding planes. Finely divided carbonaceous material seen in shallower parts of hole is nearly absent here.

157.0-167.0 ft. @160.0-164.0 ft., thin laminated (fissile) bedding in Mancos becomes less competent allowing it to fracture along bedding easily. Light-colored very fine grained sandstone to siltstone that defines the bioturbated layers composes only ~5% of the rock in this interval.

167.0-177.0 ft. competent, hard rock throughout. Most bedding is laminated (parallel) and only <5% bioturbated bedding. Slightly calcareous throughout. Mostly medium dark gray (N4) clayey siltstone to silty claystone. Parts of flattened cephalopods along a few bedding planes.

177.0-187.0 ft. core is mostly intact initially throughout, but breaks readily due to its fissile character upon handling and drying. Rock is mostly silty claystone with moderately abundant imprints of fossils on bedding planes. Dry inside core when broken.

187.0-197.0 ft. essentially same as last interval. Rare bioturbated layers.

197.0-207.0 ft. rock comewhat coarser grained and is mostly clayey siltstone. Core much less prone to break upon handling—much more competent and hard. Fossil imprints moderately common along bedding. Only trace bioturbated bedding; most bedding is parallel.

207.0-217.0 ft. unchanged from 197.0-207.0 ft. interval. Large cephalopod imprint at ~210.0 ft.

217.0-227.0 ft. unchanged from 197.0-207.0 ft. above. Core more prone to fracturing from ~218.0-220.0 ft. indicating greater fissility and possibly more claystone facies.

227.0-237.0 ft. mostly silty claystone. Core is competent when first out in core barrel, but soon fractures along fissile bedding planes. Slightly calcareous throughout. Trace fine carbonaceous material on bedding planes. Trace amber in some bedding planes. Bioturbation present but <5% of bedding planes. Core dry inside when broken.

237.0-247.0 ft. same as above interval.

247.0-257.0 ft. unchanged from above interval (227.0-237.0 ft.). Bedding appears to dip ~5-7 degrees from horizontal throughout.

257.0-267.0 ft. unchanged from above interval (227.0-237.0 ft.). Core nearly unbroken initially. Fissile interval ~0.2 ft. thick at ~264.0 ft. that breaks easily. Bioturbation layers expressed as very light gray (N8) color and are ~1-2% of layering.

267.0-279.0 ft. essentially unchanged from 227.0-237.0 ft. interval. Bioturbation ~1% or less of bedding - some of the coarser grained layering may be due to storm events rather than bioturbation. Thin fissile interval at ~271.0 ft. Weakly calcareous throughout. Trace fossil imprints - one large flattened cephalopod at ~ 270.7 ft. Trace very fine (framboidal) pyrite and amber.

279.0-289.0 ft. unchanged from 227.0-237.0 ft. interval. Thin fissile interval at ~282.5 ft. (~0.2 ft. thick). Trace of fossil imprints throughout.

289.0-299.0 ft. unchanged from 227.0-237.0 ft. interval. Bioturbated/storm event layers of very fine grained sandstone are ~1% of layers, which may be up to 0.02 ft. thick.

299.0-302.0 ft. unchanged from 227.0-237.0 ft. interval. Small flattened cephalopod fossil imprint at 301.0 ft.

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