Appendix 1 - Drillers log of the Mylan Park, Monongalia County, West Virginia coal bed gas core. Abbreviations: LITH = Lithology; SURF = surface; SH = shale; SLST = siltstone; SS = sandstone; MDST = mudstone; LS = limestone; CLST = claystone; NR = no record; BN = bone; PYR = pyrite; LITH MOD = lithology modifiers; MAT = material; SDY = sandy; STR = stringer; CALC = calcareous; NODAR = nodules; ARG = argillaceous; CALC INCL = calcareous inclusions; SDY = sandy; KAOL = kaolinite; CARB = carbonaceous; SS STR = sandstone stringers; BLK = black; SLTY = silty; BREC = brecciated; SH STR = shale stringer; SH INBD = shale interbedded; IMP = impure; CLRN = clarain; FS = fusain; IMP = impure; MOT = mottled; CLST INBD = claystone interbedded; FOSS = fossils; NP = not present; XBD = cross-bedded; QTZ PBL = quartz pebbles; BRW = burrows; CANL = cannel; COAL CLS = coal clasts; SH CLS = shale clasts; CGL = conglomerate; SS INBD = sandstone interbedded; FEST INCL = ironstone inclusions; SLST INBD = siltstone interbedded; XLN = cross laminate.

POINT ID: 306-061

QUAD: OSAGE (7.5')
COUNTY: MONONGALIA COMMENT: MYLAN PARK CORE

ST PLANE E: 1846876.7 UTME: 582050.02 LATITUDE: 39.64378
ST PLANE N: 417051.5 UTMN: 4388448.50 LONGITUDE: -80.04376

ELEVATION: 1200.00 TOTAL DEPTH: 2525.00 DATE: 11/14/2002

NOTES:
Geologists log of Mylan Park Core located within Mylan Park on a tributary of Dents Run between Higgins Knob and Chisler Knob, 2800 ft west of Chisler Knob, 3400 ft east of Sugar Grove Church and 5200 ft north northwest of Zoar Church, Osage 7.5' quad, Grant district, Monongalia County, West Virginia. Drilled by L. J. Hughes & Sons. Driller was Howard 'Fuzzy' Salisbury. Drilling dates 9/23/02 - 11/13/02. Location surveyed by Triad Engineering (state plane). Described by Nick Fedorko and Jim Britton. Coal Bed Methane desorption by Peter Warwick, Jingle Ruppert and Rob Crangle of USGS, Mud logged by Jay Mallow of Hydrocarbon Well Logging Services, geophysical logging by Phil Mitchem of Marshall Miller 11/14/02. Drilled in cooperation with U.S. Department of Energy, National Energy Technology Laboratory, Morgantown, West Virginia, Project Manager, Bill Schuller, EG&G Corp.

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF	MAT	Waynesburg surface mine, spoil and weathered bed rock. 60.00' cased, an additional 3.30' drilled by tri-cone bit (not cored).	63.30	63.30
SH		Light medium gray, poorly bedded, broken 66.00' - 67.00', sharp lower contact, poorly developed slickensides to base, occasional small roots.	4.21	67.51
SLST		Light gray, occasional roots, base sharp.	0.60	68.11
SH		Light medium gray, clayey upper .15', micaceous and slightly silty to base, base sharp on increasing sand.	2.31	70.42
SLST		Light gray, sandy to base, ripple laminated, base sharp on grain size change.	0.66	71.08
SS		Light gray, fine grained, thinly bedded, base sharp.	0.20	71.28
SH	SDY	Medium gray with sandy and silty streaks which are light gray, base gradational on grain size.	0.63	71.91
SS		Light gray, fine grained, micaceous, ripple laminated, iron stained concretion at 71.90' approximately 0.12', sharp flat lower contact, slightly calcareous to base.	4.87	76.78
SH		Light to medium gray, uniform, fissile, no plants observed, one weakly calcareous band, gradational lower contact on loss of bedding.	2.22	79.00

MDST		Medium gray, slightly bedded, soft with occasional slickensides, black carbonaceous streaks in bottom 0.60', sharp lower contact on color.	1.41	80.41
SH	COAL STR	Dark gray to black, soft, thin coal streaks especially in basal 0.02', carbonaceous, base sharp.	0.19	80.60
		LITTLE WAYNESBURG COAL HORIZON		
SH	CALC	Medium dark gray, 1 ostracod observed, base sharp on color.	0.11	80.71
LS		Light gray, hard, finely nodular, micritic, ostracods, base sharp.	2.59	83.30
LS		Medium gray, ostracods, slightly argillaceous, base gradational on color and composition.	0.65	83.95
LS		Light gray, hard, micritic, abundant ostracods, becomes argillaceous in basal 0.50', base sharp.	1.88	85.83
LS		Light gray to brown, very fine grained, very hard, nodular and fractured in upper 0.02', sparry calcite fracture fill, slightly argillaceous to base, base sharp.	0.82	86.65
LS		Light gray to brown, very fine grained and very hard, finely nodular, occasional medium gray clasts, sparry calcite fill, base sharp and irregular.	0.26	86.91
LS		Medium gray, hard, slightly silty, base sharp.	1.37	88.28
LS		Mudstone calcareous partings at top, fine to coarse, hard, calcareous nodules in base 0.60', very calcareous, base sharp.	1.34	89.62
LS	NODAR	Medium green with gray green matrix and abundant fine to coarse light gray to brown calcite nodules, base gradational on loss of nodules.	0.73	90.35
LS		Light gray, hard, micritic, slightly nodular to base, irregular top with vertical fractures, base sharp.	0.79	91.14
LS	ARG	Medium gray, hard, faint hard nodules, base sharp, ostracods.	1.18	92.32
LS	NODAR	Light gray, micritic, fine to medium nodules, top surface irregular with vertical fractures extending 0.40' from top, base sharp and irregular with some mixing on lower unit.	2.38	94.70
SH	CALC	Bright light gray green, base sharp.	0.33	95.03

LS		Light gray, micritic, slightly bedded, base sharp.	0.29	95.32
LS		Medium gray, few ostracods, mud cracks to top of unit, base sharp.	0.32	95.64
LS		Light gray, hard, micritic, vertical fractures throughout, base sharp.	0.34	95.98
LS	ARG	Medium gray, broken, clayey, base sharp and irregular.	0.67	96.65
LS	NODAR	Light gray, micritic, vertical fractures, especially nodular top 0.10'and basal 0.20', slumping features, base sharp and irregular.	1.55	98.20
LS		Medium gray, slightly argillaceous, few hard, lighter nodules, abundant ostracods, base sharp.	2.61	100.81
LS		Light gray, hard, thinly bedded, base sharp.	0.37	101.18
MDST	CALC INCL	Medium green gray, few fine to coarse nodules, shaly lower half of unit, slickensides upper 0.40', possible algal banding in basal 1.00'.	1.86	103.04
SH	CALC INCL	Medium gray, few large, light gray calcareous nodules, shale is non-calcareous, increasingly weakly calcareous to base, base sharp.	1.28	104.32
SH	SDY	Light to medium gray, sandy and silty, base sharp.	0.22	104.54
SS		Light gray, fine grained, planar ripple laminations, occasional dark gray to medium gray shaly streaks, calcareous shale rip-ups to base, base gradational on increased shale streaks.	1.86	106.40
SLST	SDY	Medium to light gray, shaly, light gray to medium gray, fine grained sandstone streaks, base sharp.	6.90	113.30
SS		Light gray, fine grained, planar cross laminations, small shale rip-ups (medium gray), base sharp and slightly inclined.	0.95	114.25
SH		Medium gray, slightly calcareous in lower 0.10', calcareous nodules approximately 0.08' at top, approximately 0.20' loss in unit, base sharp.	1.26	115.51
LS		Light gray, hard, broken in barrel, base sharp, approximately 0.10 core loss.	0.53	116.04
CLST	KAOL	Medium dark gray with medium to light green gray clasts throughout, hard, non-calcareous, appears brecciated, base sharp.	0.40	116.44
LS		Medium gray, hard, broken in barrel, abundant fine	0.31	116.75

		pyrite, pyritized fecal matter (?), approximately 0.20' core loss at base.		
MDST		Medium gray with dark gray to black streaks, slightly bedded, base sharp.	2.26	119.01
SH		Light to medium gray, occasional poorly developed slickensides, base sharp and irregular on color and lithology.	3.19	122.20
SH	CARB	Black, abundant pyrite lenses, less carbonaceous to base, sharp irregular lower contact on color. **UNIONTOWN COAL HORIZON**	0.15	122.35
SH		Light to medium gray, broken in barrel, soft clayey zones, base sharp on lithology, Annularia, Neuropteris at 126.00', abundant plant material and debris.	4.61	126.96
SH	SS STR	Medium gray with light gray sandy streaks and lenses, slightly slumped, soft sediment deformation, dark streaks less than 0.01' to top, base sharp.	0.80	127.76
SS		Light gray, very fine grained, planar cross laminations, occasional thin organic streaks, dark shale laminations, gradational base with loss of sandstone, increasing shale to center.	2.10	129.86
SH	SS STR	Medium gray with very sparse thin very fine grained sandstone streaks, light gray, scattered plant material and debris, pyrite blebs.	2.06	131.92
SH		Medium gray, siderite bands at 133.00', base sharp, slightly calcareous to base, occasional ostracods scattered at basal 0.50'.	2.70	134.62
LS		Dark gray to black, abundant ostracods, pyritized ostracod hash, base sharp.	0.16	134.78
LS	ARG	Medium gray at top to light green gray to base, occasional fine to coarse, light gray, hard, limestone nodules, occasional ostracods to top, gradational lower contact with increasing bedding to base.	3.82	138.60
SH		Medium gray, poorly bedded, slightly silty, base gradational.	2.73	141.33
MDST	CALC INCL	Medium gray, non-calcareous matrix, occasional fine to coarse, faint, weakly to very calcareous nodules < 0.10', gradational lower contact on increased bedding.	3.85	145.18

SH		Medium gray, non-calcareous, occasional fine, faint, calcite nodules, gradational lower contact.	2.10	147.28
CLST		Medium gray, occasional fine to coarse calcite nodules less than 0.05', broken in barrel, base sharp.	1.52	148.80
SH		Light to medium gray, sharp lower contact.	0.37	149.17
CLST	CALC INCL	Medium gray, occasional fine to coarse, weakly calcareous nodules, weakly bedded, gradational lower contact on bedding.	2.88	152.05
SH		Medium gray, poorly bedded.	1.45	153.50
NR		CORE LOSS	0.40	153.90
SH		Medium gray, clayey, calcareous nodules < 0.01' at 155.30', and occasional coarse nodules below 160.00', lycopod stems, Neuropteris at 160.00', very abundant, faint iron stained band at 162.00' - 163.00', occasional slickensides, plant debris to 168.06'.	14.16	168.06
SS	COAL STR	Medium dark gray to black, shale, coaly streaks, interlaminated, base sharp.	1.04	169.10
SH		Medium gray, hard, sharp lower contact.	2.69	171.79
SH	CALC	Medium dark gray, soft clayey upper 0.30', large vertical calcite filled fractures up to 10 cm, light gray nodules and thin bands, sharp lower contact.	2.46	174.25
LS		Medium gray, vertical fractures, abundant ostracods, sharp lower contact on color.	0.58	174.83
LS		Light gray, hard, abundant, angular fractures from 175.50' to base, micritic, hard.	2.24	177.07
CLST	CALC	Soft, slickensides.	0.20	177.27
LS		Light gray, hard, dense, micritic, upper 0.40' is broken, slickensides and soft streaks.	1.73	179.00
SS	CALC	Light gray, fine to medium grained, nonbedded, green and very fine grained in basal 0.30', calcareous nodules to base.	2.55	181.55
LS	ARG	Medium gray, broken in barrel.	1.48	183.03
NR		CORE LOSS	0.50	183.53
MDST	CALC	Medium gray green, abundant fine to coarse nodules, abundant large slickensides, very soft	4.85	188.38

		zones below 185.00', light to medium gray green in basal 2.00', sharp lower contact.		
SS		Light gray green, very fine grained, weakly calcareous, faint planar laminations to planar cross laminations, slightly silty to base, thin shale break at 192.00' and 193.00', slightly angular lower contact.	5.79	194.17
SH		Light gray, one 4.00 mm calcareous band at top, non-calcareous shale, no plants seen, sharp lower contact.	1.74	195.91
SS		Light gray, very fine grained, ripple laminated, one 1 mm thick calcareous band, gradational lower contact with loss of sand.	0.36	196.27
SH	CALC INCL	Light gray, uniform, few faint weakly calcareous to calcareous bands, nodular calcareous fracture fill (roots?) 202.00' - 204.00', sharp lower contact on color change.	8.13	204.40
SH		Banded medium dark gray and black zones, sharp lower contact on color change, pressure buttons, barren.	2.23	206.63
SH	BLK	Black, sharp lower contact.	0.22	206.85
LS		Light gray, micritic, sharp lower contact.	0.32	207.17
LS		Medium gray, abundant ostracods, pyrite, massive, sharp lower contact.	0.35	207.52
MDST	CALC	Weakly calcareous, variegated light gray green, medium gray and dark gray, small clasts, harder and darker at base, less clay, sharp lower contact on calcareous, increasing calcite to base.	0.42	207.94
LS	NODAR	Light gray, fine to coarse, hard nodules, with medium to dark gray matrix, sharp lower contact.	1.13	209.07
CLST	CALC INCL	Medium gray green, occasional fine to coarse faint calcite nodules, some in vertical fractures or root traces, slightly shaly to base, gradational lower contact.	2.10	211.17
SH		Medium gray green, occasional small fine calcite nodules, dark gray green to base, sharp lower contact on increasing calcite.	0.74	211.91
LS		Light gray brown, very fine grained, hard, brittle, ostracods, broken in barrel, possible core loss of approximately 0.20', sharp, irregular lower contact, dark banded at 212.50'.	1.84	213.75

LS		Light gray, micritic, angled, inclined laminations, nodular in lower 0.10', gradational lower contact on color change.	0.36	214.11
LS		Ostracods, very fine, dark gray nodules (millimeter scale), light gray angular clasts, lighter gray with more abundant light gray clasts in lower 0.20', sharp lower contact.	0.79	214.90
LS		Light gray brown, hard, brittle, scattered ostracods, locally small sparry cement, under hand lens there are many angular clasts with sparry cement observed, sharp lower contact.	2.11	217.01
LS		Light gray to top, medium gray to base, slightly nodular, sharp, irregular lower contact.	0.45	217.46
LS		Light gray, hard, micritic, nodular below 218.00', occasional sparry calcite filled fractures, sharp, irregular lower contact.	1.44	218.90
SH	CALC		0.10	219.00
CLST		Medium gray green, very fine, smooth, slickensides, broken, sharp lower contact on color and lithology.	0.65	219.65
SH		Medium gray, poorly bedded to top, barren, sharp lower contact, slightly angled on color and lithology.	0.48	220.13
LS		Light gray, hard, dense, uniform, gradational lower contact, nodular to base, weakly reactive to HCL, dolomitic (?), micritic.	1.91	222.04
LS	NODAR	Light gray with medium gray zones, mostly fine nodules, scattered ostracods, sharp lower contact on loss of nodules.	1.47	223.51
LS		Light gray, hard, dense, micritic, finely nodular below 224.70', spar filled voids, occasional ostracods, sharp lower contact.	4.81	228.32
SH		Light green, sharp lower contact, non-calcareous.	0.08	228.40
LS		Medium gray, nodular in upper 0.15', light gray and dense to base.	0.52	228.92
SH		Medium gray green, non-calcareous, sharp lower contact.	0.28	229.20
LS		Light gray with medium gray bands, thin laminae in upper ½ of unit, very scattered small pyrite, cross laminations, sharp lower contact.	0.73	229.93

LS		Medium gray, sharp, angular lower contact.	0.55	230.48	
LS		Light gray, hard, micritic, sharp lower contact.	0.34	230.82	
LS	ARG	Medium gray, sharp lower contact on color.	0.46	231.28	
SH	CALC	Medium gray green, poorly bedded to base, weakly calcareous in lower 0.40', sharp lower contact on color and carbonate.	1.40	232.68	
SH		Light gray green with dark reddish streaks 233.35' - 233.43' and 233.75' - 234.00', non-calcareous, becomes mottled and streaked, predominately red with light gray green and light gray mottles below 234.35', large calcareous nodules and thin streaks 234.25' - 234.90', poorly bedded to base, sharp lower contact on color change and increased sand.	2.79	235.47	
SH	SLTY	Medium gray, with red in lower 0.20', thin silty laminations, sharp lower contact.	0.46	235.93	
CLST		Medium gray with abundant faint gray, red and light gray and olive mottling especially in lower half, sharp lower contact.	1.34		237.27
CLST	KAOL	Medium gray green, fine dark gray clasts, sharp lower contact.	0.47	237.74	
LS		Medium dark gray, fine nodules to 238.45', fine mosaic pattern to base, sharp lower contact.	1.06	238.80	
LS		Light gray, hard, micritic, locally thinly laminated, nodular at base, sharp, irregular lower contact, dark streaks.	2.45	241.25	
LS		Medium gray, small, sub-millimeter scale phosphatic (?) material, sharp lower contact on color and texture.	0.53	241.78	
MDST	CALC INCL	Light medium gray green, especially to base, medium gray at top, abundant fine to coarse calcite nodules, one with concentric growth rings, silty, gradational lower contact on base of nodules.	1.25	243.03	
SS		Light gray green, very fine to fine grained at base, micaceous, massive, sharp lower contact, angular.	3.63	246.66	
SH	CALC INCL	Light medium gray green with abundant fine to coarse, distinct calcite nodules, non-calcareous matrix, poorly bedded, calcite nodules decrease to base, concentrated in bands up to 0.20', weakly calcareous, occasional pyrite 'balls', tiny pyritized rootlets at 250.80', sharp lower contact	9.06	255.72	

		on color change.		
SH		Medium dark gray, very fissile, sharp lower contact on color.	0.16	255.88
SH		Medium gray, sharp lower contact.	0.10	255.98
LS		Light gray, thin black bands and laminations to top, spar filled ostracods, sharp lower contact.	0.40	256.38
LS		Medium gray, abundant ostracods, sharp lower contact.	0.45	256.83
LS		Light gray, hard, dense, micritic, abundant ostracods in upper 0.10', sharp, irregular lower contact.	1.57	258.40
LS		Medium gray to gray green at base, faint light gray green clasts, slightly angular, sharp lower contact.	0.84	259.24
LS		Light gray, nodular, hard, micritic, vertical fractures filled with material from above bed, gradational lower contact on increasing clay.	0.36	259.60
MDST	CALC	Light to medium gray green, calcareous, coarse, distinct calcite nodules, silty, very gradational lower contact on decreasing calcite.	2.77	262.37
SLST		Light to medium gray green, with few coarse, distinct calcite nodules, occasional clayey to shaly bands, occasional silty streaks to base.	1.75	264.12
SH	SLTY	Light green gray, with few fine to coarse, distinct calcite and dolomitic (?) nodules, sharp lower contact.	2.80	266.92
SS	SH STR	Light gray, very fine to fine grained, planar ripple laminations, medium gray green shale laminations and streaks, small vertical dolomite filled root (?) traces, sharp lower contact.	1.26	268.18
SH	CALC INCL	Light medium green gray, irregular carbonate masses to top with vertical fracture fill, small < 1 mm continuous tube shaped feeding traces (?) at 268.33', sharp lower contact.	0.61	268.79
SS		Light gray, very fine grained, planar ripple laminations, calcite, shale mud drapes, sharp lower contact.	2.24	271.03
SH		Light medium gray, banded, limestone nodules at 273.00', occasional thin silty streaks below 274.00', sharp lower contact.	6.36	277.39

LS		Medium gray, very fine dark gray clasts, highly irregular, sharp lower contact.	0.41	277.80
LS		Light gray, brecciated, highly irregular sharp lower contact.	0.45	278.25
LS		Medium gray, abundant ostracods to base, sharp lower contact on color.	0.91	279.16
LS		Light gray, hard, dense, micritic, sharp lower contact.	0.21	279.37
LS	BREC	Light gray with dark gray fine clasts, sharp lower contact.	0.33	279.70
LS		Light gray, hard, dense, sharp lower contact.	0.72	280.42
LS		Medium gray, hard, dense, sharp lower contact.	0.68	281.10
LS	NODAR	Light gray with medium gray matrix, especially nodular in basal 0.80' and upper 0.70', sharp lower contact.	1.86	282.96
LS		Light gray, hard, dense, laminated basal 0.30', sharp lower contact.	0.60	283.56
LS		Medium gray, hard dense, sharp lower contact.	0.67	284.23
LS		Light gray, hard dense, nodular and fracture filled with dark material in upper 0.30', featureless below, sharp lower contact.	1.77	286.00
LS	NODAR	Light gray, faintly nodular, hard, dense, sharp lower contact.	0.88	286.88
LS	SDY	Light gray, hard, dense, sharp lower contact.	0.87	287.75
SH	SDY	Light green gray non-calcareous with small calcite nodules, very gradational lower contact with increasing sand to base.	1.37	289.12
SS		Light gray, fine grained, locally faint cross bedding and calcareous zones, locally micaceous, unknown dark pellet shaped features associated with calcite throughout, possibly small burrows (?), dark, round masses 3.0 - 7.0 mm diameter, medium gray with dark gray to black outsides, confined to a single 0.70' unit, planar laminations 295.00' to base, sharp, slightly angular lower contact.	6.73	295.85
SH	SDY	Light medium gray, occasional calcite streaks and nodules in upper 0.30' (possibly burrows), decreasing sand to base, gradational lower contact on loss of sand.	2.00	297.85

SH		Medium gray, slightly silty 302.50' to base, pyrite masses approximately 0.03' throughout, fish scale at 300.20', sandy 305.00' - 305.20', shale clasts 305.20' - 306.00', sharp lower contact.	8.17	306.02
SH		Medium gray, sharp lower contact.	0.61	306.63
SH	SLTY	Medium gray with light gray bands, micaceous, lycopod stems, sharp, angular lower contact.	5.04	311.67
SS		Light gray, very fine grained, ripple cross laminated, gradational lower contact on increased shale.	1.08	312.75
SH	SS STR	Medium dark gray shale from 0.01' to 0.10' thick, sandy streaks are very fine grained, ripple laminated.	1.00	313.75
SS		Light gray, very fine grained, ripple cross laminated, sharp lower contact.	0.25	314.00
SS	COAL STR	Light to medium gray, very fine grained, ripple cross laminated, very thin coal and dark gray to black shale laminations, sharp lower contact at base of coal streaks, horizontal pyrite filled burrows (?), in top 0.40'.	1.33	315.33
SS	SH STR	Light gray, very fine grained, ripple cross laminated and planar cross laminated, dark gray to black shale streaks from 316.00' to base, erosive sharp lower contact.	1.65	316.98
SS		Light gray, fine to medium grained at base, fines upward, faint planar laminations to 320.00', low angle cross laminations with mica and few coal streaks from 320.20' to 320.88' and from 321.40' to base, sharp, angular lower contact.	6.93	323.91
SS		Light gray, fine grained, nonbedded to 324.70', approximately 20 degree planar cross laminations 324.70' to base, occasional thin coaly streaks < 0.01', low angle planar cross beds in basal 0.50', sharp lower contact on streaks, slightly coarser and greener to base.	2.27	326.18
SS	SH STR	Light gray, fine grained with medium grained zones, thin dark gray to black coaly and mica rich streaks all mm scale, low angle planar cross beds, sharp lower contact on loss of streaks.	1.55	327.73
SS		Light gray, very fine to fine grained, massive, occasional very thin carbonate streaks, sharp lower contact.	2.89	330.62

SS		Light gray, fine grained, coaly streaks < 0.01', dark organic rich and mica rich streaks in upper 0.15', low angle planar bedding, sharp lower contact.	1.31	331.93
SH	SS STR	Dark gray, sand is light gray, fine grained, occasional thin coaly streaks, faint ripples in sand, abundant sandstone streaks 332.43' - 332.65', sharp lower contact.	1.06	332.99
SS	SH STR	Light gray, fine grained, low angle planar cross beds with ripple laminations in upper 0.60', locally abundant mica and thin coaly streaks, weakly calcareous, sharp lower contact.	1.31	334.30
SS	SH INBD	Light gray, very fine grained, flat planar beds, shale is dark gray, very thin streaks, gradational lower contact.	0.94	335.24
SH	SS STR	Dark gray, sand is fine grained, light gray, pyrite streaks < 0.01' at 305.68' - 305.80', carbonaceous stems and pyritized plant material, sharp lower contact.	2.01	337.25
SH		Dark gray, occasional pyrite streaks, plant fossils and debris, occasional thin light gray silty streaks, sharp lower contact.	1.70	338.95
SH	SS STR	Medium dark gray, sand is light gray, very fine grained, especially sandy 340.10' - 340.95', scattered stems and plant material, well to poorly preserved, sharp lower contact on color.	4.17	343.12
SH		Very dark gray, very well preserved calamite stem, sharp lower contact.	2.81	345.93
SH		Dark gray, abundant pyrite, sharp lower contact.	0.28	346.21
SH	BLK	Black; bony; common pyrite lenses; common thin vitrain streaks; becomes canneloid in upper 0.08'; sharp lower contact (described by Bill Grady in lab).	0.22	346.43
COAL	IMP	**<u>TOP OF SEWICKLEY COAL</u>** Thin banded. NOT SAMPLED FOR METHANE.	0.03	346.46
SH	BLK	Black; bony; few vitrain lenses; medium density; minor bedding plane marcasite; barren of fossils; large pyritized fusains at top; sharp lower contact on coal (described by Bill Grady in lab). NOT SAMPLED FOR METHANE.	0.34	346.80
COAL	CLRN	Clarain, dull; very abundant (25%) 1-5mm fusain bands mineralized with clays and pyrite; sharp base (described by Bill Grady in lab). SAMPLED BY	0.49	347.29

		USGS FOR METHANE TESTING.		
COAL	CLRN	Clarain, bright; >75% 1-5mm vitrain bands; occasional large pyritized fusain with associated cleat pyrite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.46	347.75
COAL	IMP	Bony to bone; thinly laminated; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	347.79
BN		Shaly; high density; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.09	347.88
COAL	CLRN	Clarain, bright; >75% 1-5mm vitrain bands; minor thick fusains; minor peacock stains (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	1.44	349.32
COAL	FS	Fusain pyritized with occasional cleat pyrite in coal above and below (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.03	349.35
COAL	CLRN	Clarain, bright; >75% 1-3mm vitrain bands; common, thick, soft fusain bands; heavy peacock stains on cleat; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.51	349.86
COAL	CLRN	Clarain, dull; hard; occasional 1-3mm vitrain bands; minor cleat calcite; minor peacock stains (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.64	350.50
COAL	CLRN	Clarain, bright; coal to jumbled in core for accurate description (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	1.13	351.63
SH	BLK	Black; soft; bony; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.07	351.70
COAL	CLRN	Clarain, bright; common pyritized fusains (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.40	352.10
PYR		Pyrite; sulfur ball; lenticular; irregular base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	352.15
COAL	IMP	Bony to bone; highly irregular thickness; few pyritized fusain lenses; bedding plane pyrite on base; base sharp (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF SEWICKLEY COAL**	0.05	352.20

MDST	ROOT	Dark gray; rooted; 50% 1mm rounded, medium gray lithic fragments; common bedding pyrite on top, minor pyrite within; gradational base on shale.	0.10	352.30
SH	ROOT	Dark gray, poorly bedded, at least one root seen, slickensides with calcite coatings, pyrite nodules, one calcite nodule, sharp lower contact on texture change.	0.94	353.24
SLST		Medium gray, large pyrite nodules, sharp lower contact.	0.43	353.67
SH		Medium gray, grades to dark gray to black at base, lighter medium gray streaks, sharp lower contact on lithology.	2.66	356.33
LS		Dark gray, slightly bedded, hard, dense, Spirorbis, fecal pellets (?), ostracods, rounded light gray material, sharp lower contact on color.	2.46	358.79
LS		Light gray, hard, micritic, dense, finely nodular or burrowed in upper 0.60', nodular zone 359.80' - 359.85', dark streaks, 1 vertical fracture near base, sharp lower contact on shale bands.	2.63	361.42
LS		Light gray with dark gray, limestone, micritic streaks, dark streaks increasing to base, hard, dense, sharp lower contact.	2.14	363.56
LS		Light gray, hard, dense, abundant ostracods at 364.00', sharp, angular lower contact.	1.99	365.55
LS		Medium dark gray, fine grained, micritic, sharp lower contact.	0.21	365.76
LS		Light gray, abundant spar filling, ostracods, sharp lower contact.	0.34	366.10
LS		Light gray, with medium dark gray and dark gray bands, ostracod rich, sharp, angular lower contact.	0.65	366.75
LS		Light gray, hard, dense, ostracods, upper 0.10' contains nodules and ostracods, calcite filled streaks, base nodular with 1 vertical calcite filled burrow, sharp lower contact.	1.25	368.00
LS		Medium gray, hard, dense, sharp lower contact.	0.36	368.36
LS	NODAR	Light gray with medium dark gray matrix, calcite filled streaks, ostracods, sharp lower contact.	1.16	369.52
LS		Medium gray, slightly argillaceous, ostracods, 1	1.68	371.20

		slickenside break, nodular in basal 0.20' with light gray, hard nodules, sharp, highly irregular lower contact.		
CLST		Medium gray, non-calcareous, sharp lower contact.	0.14	371.34
LS		Medium gray, nodular, sharp, irregular lower contact.	0.44	371.78
CLST		Medium gray, non-calcareous, slightly brecciated in lower 0.10', sharp lower contact.	0.32	372.10
SH	COAL STR	Dark gray to black with very thin < 1 mm vitrain streaks, sharp lower contact.	0.04	372.14
SH		Medium gray, non-calcareous, poorly bedded in upper 1.00', occasional slickenside breaks, sharp lower contact.	2.86	375.00
LS		Light gray, hard, dense, sharp lower contact.	0.27	375.27
SH	CARB	Dark gray to black, calcareous, abundant carbonaceous coaly streaks (stems), sharp lower contact.	0.33	375.60
LS		Light gray to light green gray brown, hard, brittle from 376.00' - 377.00', slightly nodular in upper 0.20', sharp lower contact.	2.15	377.75
CLST		Medium gray matrix with light green gray poorly formed clasts, brecciated, slightly kaolinitic. sharp lower contact.	0.15	377.90
SH	CALC	Medium dark gray, sharp, irregular lower contact.	0.32	378.22
LS		Light gray, hard, dense in 0.20', vertical fractures and nodules, sharp lower contact.	0.44	378.66
SH		Medium gray, weakly calcareous, thin banded, sharp lower contact.	0.04	378.70
LS		Light gray, hard, dense, ostracods, finer grained shaly break 371.00' - 371.25', sharp, irregular lower contact.	2.11	380.81
LS	NODAR	Medium gray matrix, light gray, medium to coarse nodules especially to top, slightly argillaceous, ostracods, sharp lower contact.	0.94	381.75
SH	CALC INCL	Light medium gray, poorly bedded with fine to coarse faint calcite nodules, gradational lower contact.	1.17	382.92
MDST		Light medium gray, slight green cast, non-calcareous, calcite banded 383.30', sharp	0.93	383.85

		lower contact.		
LS	NODAR	Medium dark gray, slightly argillaceous, light gray, fine to coarse nodules and bands, sharp lower contact.	1.10	384.95
LS		Light gray, hard, dense, burrows, ostracods, sharp lower contact.	2.58	387.53
LS		Medium gray, ostracods, few darker nodules, sharp lower contact.	0.33	387.86
LS	NODAR	Light gray, with many fine to coarse distinct, round to subangular nodules, sharp, very irregular lower contact.	1.24	389.10
CLST	SOFT	Light medium gray, broken in barrel, sharp lower contact.	0.16	389.26
MDST	SLTY	Light gray, locally weakly calcareous to 391.50', non-calcareous to base, weakly bedded, sharp lower contact.	4.92	394.18
SH		Medium gray, poorly developed slickensides, mudcracks (?), pyrite, sharp lower contact.	3.94	398.12
LS		Medium gray, shaly, sharp lower contact.	0.31	398.43
LS		Light gray, hard, dense, sharp lower contact.	0.89	399.32
SH		Light medium gray, slightly silty, few calcite nodules in upper 0.40', hard, sharp lower contact.	1.20	400.52
LS		Light to medium gray, hard, dense, fine grained, micritic, sharp, wavy lower contact.	0.26	400.78
MDST		Medium gray, non-calcareous, sharp, irregular, highly angular lower contact.	0.75	401.53
MDST	CALC	Light medium gray, gradational, angular lower contact.	2.08	403.61
MDST		Light medium gray, non-calcareous, slightly bedded at base.	1.53	405.14
SH	PYR	Dark gray to black, abundant bedding plane pyrite and small pyrite blebs; thin coaly streaks, sharp lower contact on coal (described by Bill Grady in lab).	0.16	405.30
COAL	CLRN	Clarain, bright; thinly laminated; >75% 1-3mm vitrain bands; rare 1mm fusains; rare cleat calcite; coal too jumbled in core for accurate description (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	2.70	408.00

		REDSTONE COAL		
SH	CARB	Dark gray, roots, coalified plant debris, sharp lower contact.	0.55	408.55
LS		Light medium gray, fissile, laminated, sharp lower contact.	0.79	409.34
LS		Light gray, hard, dense, occasional medium dark streaks from 411.00' to base, sharp lower contact.	3.33	412.67
LS		Medium gray, dense, hard, occasional ostracods, sharp lower contact on nodules.	6.42	419.09
MDST	CALC	Light medium gray, nodular, weakly calcareous, common medium to coarse limestone nodules especially to top, sharp lower contact.	4.36	423.45
LS		Light gray, hard, dense, spar filled fractures, sharp, irregular lower contact.	0.97	424.42
SH		Medium dark gray, poorly bedded, sharp lower contact on color.	1.14	425.56
SH		Black; bony; common large fusain fragments on bedding; minor bedding pyrite; occasional large mica flake; very small plant trash; basal 0.08' contains large pyrite lenses; base sharp (described by Bill Grady in lab).	0.62	426.18
COAL	IMP	**TOP OF PITTSBURGH COAL ROOF SEQUENCE** Bony to bone; very fine attrital; medium density; rare vitrain lenses; common siderite lenses; pyrite lenses common and more abundant upward (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.48	426.66
COAL	IMP	Bony; occasional thin vitrain streaks; medium density; common small pyrite lenses; minor sideritized fusains; sharp base (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.30	426.96
SH	BLK	Black; bony (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	427.01
BN	COAL STR	Large irregular coal stringers (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.08	427.09
COAL	CLRN	Clarain, dull; minor thin pyrite lenses; gradational top, sharp and irregular (+-0.04') base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.12	427.21

BN	PYR	Common pyrite lenses and vitrain stringers; lower density and more coaly upward (described by Bill Grady in lab). ALL BUT BASAL 0.02' SAMPLED BY USGS FOR METHANE TESTING.	0.77	427.98
COAL	IMP	Bony to bone; few vitrain stringers; common pyrite lenses; medium density; sharp top and bottom (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.08	428.06
SH	COAL STR	Black; bony; coal stringers; pyrite nodules and lenses; small fracture-filling calcite (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.84	428.90
SH	BLK	Black; coalified plant trash and stems, thin coaly streaks, minor small pyrite lenses; sharp lower contact (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	2.22	431.12
COAL	CLRN	Clarain, dull; abundant thin fusains (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.14	431.26
SH		Dark gray to black with light gray inclined laminations, slightly rooted, coalified plant material, fine organic streaks, pyrite. (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	1.09	432.35
COAL	IMP	Bony to bone; thinly laminated; medium density; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	432.45
COAL	CLRN	Clarain, dull; hard; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.38	432.83
COAL	CLRN	Clarain, bright; 75% 1mm vitrain bands (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.35	433.18
SH	BLK	Black; minor plant fragments; sharp top and bottom (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	433.23
COAL	CLRN	Clarain, dull; abundant pyrite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	433.25
MDST	ROOT	Medium-to-dark gray; rooted; large slickensides; large stem fragments and thin vitrain bands in upper 0.05' (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.51	433.76

MDST	SLTY	Medium gray; silty; highly rooted; abundant pyrite in roots and disseminated; slickensided; occasional coaly lenses; sharp base (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING. **BASE OF PITTSBURGH COAL ROOF SEQUENCE**	0.09	433.85
COAL	CLRN	**T0P OF PITTSBURGH MAIN BENCH** Clarain, dull; thinly laminated; few 1mm vitrain bands; broken in core (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.30	434.15
COAL	FS	Fusain mineralized with calcite, pyrite, siderite(?), and 1mm globules of unknown mineral; parting was rounded off during drilling and represents less than original amount of this material (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	434.25
COAL	CLRN	Clarain, bright; attrital; <15% 1-3mm vitrain bands; more abundant and thicker vitrain bands upward; minor cleat calcite; rare cleat dolomite; gradational base; top 0.10' broken (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	1.50	435.75
COAL	CLRN	Clarain, dull; thinly laminated; <15% 1mm vitrain bands; common cleat dolomite; minor sideritized fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.45	436.20
COAL	IMP	Bony to bone; thinly laminated; gradational top and bottom (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	436.24
COAL	CLRN	Clarain, dull; thinly laminated (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	436.28
COAL	IMP	Bony to bone; thinly laminated with very thin inclined vitrain lenses, absent in base and more common upward; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	436.32
COAL	CLRN	Clarain, dull; common thin fusain lenses; common cleat dolomite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.18	436.50
COAL	CLRN	Clarain, bright; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.35	436.85
COAL	CLRN	Clarain, dull; thinly laminated; <5% vitrain	0.50	437.35

		bands; minor cleat calcite and dolomite; minor thin pyritized fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.		
COAL	FS	Fusain, soft; non-mineralized; irregular (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	437.37
COAL	CLRN	Clarain, dull; thin cleat dolomite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.11	437.48
BN		Canneloid; few thin lenticular vitrains; small irregular pyritized fusain fragments; no fauna; sharp top and bottom (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.08	437.56
COAL	CLRN	Clarain, dull; hard; thinly laminated; common cleat dolomite; minor cleat calcite; minor small pyritized fusains; sharp base (bearing-in bench) (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.35	437.91
COAL	IMP	Bony to bone; thinly laminated; gradational from bottom to top with more thin vitrain bands toward top; common cleat dolomite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	437.95
BN		Minor small pyritized fusain fragments, especially at base; no fauna; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	438.00
COAL	CLRN	Clarain dull; hard; small cleat dolomite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.35	438.35
COAL	CLRN	Clarain, dull; common small pyritized fusain lenses; common cleat dolomite(?) (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.07	438.42
COAL	FS	Fusain; irregular; mineralized with clays (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	438.44
COAL	CLRN	Clarain, bright; minor small fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.18	438.62
COAL	CLRN	Clarain, dull; common small pyritized fusain lenses; common cleat dolomite(?) and minor cleat calcite (described by Bill Grady in lab). SAMPLED	0.16	438.78

		BY USGS FOR METHANE TESTING.		
PYR		Abundant very fine grained pyrite mixed with very fine, <1mm granular vitrain fragments; base sharp and inclined on coal below; and top sharp and horizontal (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.09	438.87
COAL	CLRN	Clarain, bright; granular; >95% 1-3mm vitrain bands; occasional very thin non-mineralized fusain lenses; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.50	439.37
COAL	CLRN	Clarain, bright; occasional large pyritized fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	1.43	440.80
COAL	CLRN	Clarain, bright; occasional large cleat pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.33	441.13
COAL	CLRN	Clarain, dull (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.22	441.35
COAL	CLRN	Clarain, bright (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	441.45
COAL	CLRN	Clarain, dull; hard; numerous thin fusains mineralized with clays and pyrite; lower 0.05' bony (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.47	441.92
COAL	CLRN	Clarain, bright; common 1-3mm vitrain bands (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.15	442.07
COAL		Vitrain; sharp top and bottom (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	442.11
COAL	CLRN	Clarain, dull; thinly laminated with bone lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.08	442.19
COAL		Vitrain; sharp top and bottom (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	442.24
COAL	CLRN	Clarain, dull; thinly laminated; soft; minor pyrite lenses; occasional thin bone coal lenses; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF PITTSBURGH COAL MAIN BENCH**	0.11	442.35
SH	BLK	Black; silty; abundant thin lenses of pyrite;	0.07	442.42

		occasional vitrain stringer containing fracture fill calcite; sharp base (described by Bill Grady in lab).			
LS		Medium gray, upper 0.20' is black, light gray to base, sharp lower contact on color, abundant pyritized ostracods and bivalves, sampled top 0.65 for USGS, sharp lower contact on color.		1.07	443.49
SLST		Light medium gray, shaly.	0.51	444.00	
SH		Medium gray, calcite nodules with pyrite, calcite nodules 445.75' - 446.00', sharp lower contact.		6.30	450.30
SS		Light gray, fine grained, ripple cross laminations, micaceous.		0.70	451.00
LS	SH INBD	Light gray, hard, dense, thin beds of medium gray, non-calcareous streaks to 0.09', thick, sharp lower contact.		0.58	451.58
SH	CALC INCL	Medium gray, non-calcareous, large calcite nodules and streaks, no fossils seen, sharp lower contact.		1.34	452.92
SS		Light gray, very fine grained, ripple laminated, micaceous, shale break 453.00' - 453.10', gradational lower contact on loss of sand.		1.01	453.93
SH	SLTY	Medium gray, 1 calcite nodule, sharp lower contact.		0.91	454.84
SH	CALC INCL	Medium gray, weakly calcareous and sideritic nodules, dark gray, soft clay zone 455.37' - 455.41', sharp lower contact.		0.76	455.60
SH		Medium dark gray, soft zones, black in lower 0.03', sharp lower contact.		0.27	455.87
SH	CALC INCL	Medium gray, light gray bands, light gray limestone nodules and bands, occasional spar fill in fractures, broken in drilling, soft clay bands, sharp lower contact.		1.82	457.69
SH		Light gray with dark gray to black carbonaceous streaks, fine slickensides, sharp lower contact on color change.		0.24	457.93
SH		Medium gray, very fine, thin very soft clayey partings, no fossils seen, very fissile, slickensides, sharp lower contact.		1.07	459.00
SS		Light gray, very fine grained, silty, sharp lower contact.		0.27	459.27
SH	SLTY	Medium gray, sandstone streaks in lower 0.15',		0.70	459.97

		sharp lower contact.		
SH		Medium dark gray, thin < 1 mm soft streaks, pyrite, slightly calcareous in lower 0.10', sharp lower contact, large pyrite masses.	4.83	464.80
LS	NODAR	Medium gray, slightly argillaceous, zones of light gray, hard, nodular limestone, zone of dark and light gray streaks 467.30' - 467.45', sharp lower contact on color.	3.00	467.80
SH	BLK	Thin banded, non-calcareous, sharp lower contact.	0.08	467.88
SH		Light medium gray, with thin black bands, soft, sharp lower contact on color change.	0.44	468.32
SH	COAL STR	Black; bony; thin coal streaks; irregular brown shale lenses; gradational base (described by Bill Grady in lab).	0.09	468.41
BN		Abundant 1mm megaspores and pyrite on bedding; sharp base (described by Bill Grady in lab).	0.02	468.43
COAL	IMP	**TOP OF UPPER LITTLE PITTSBURGH COAL** Bony to bone; thinly laminated; minor cleat calcite (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.07	468.50
COAL	CLRN	Clarain, dull; occasional 1-3mm vitrain bands; irregular lenses and bands of bone coal and black shale; minor cleat calcite; sharp base (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.52	469.02
SH	BLK	Black. (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.01	469.03
COAL	CLRN	Clarain, dull; thinly laminated; 0.03' vitrain at base; contains bands and lenses of bone coal with highly contorted laminae; common cleat calcite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.22	469.25
SH		Light gray with medium gray mottling; contains irregular cm size clasts of light gray shale; minor large plant trash; common marcasite in fractures (roots?); gradational base (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.11	469.36
SH		Light-to-medium gray, thin clay streaks to base, diffuse small pyrite crystals, sharp lower contact. NOT SAMPLED BY USGS FOR METHANE TESTING.	0.29	469.65
COAL		Clarain, dull; thinly laminated; occasional 1-3mm	0.65	470.30

		vitrain bands; thin cleat calcite and pyritized fusains in upper half; base sharp (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING. **BASE UPPER LITTLE PITTSBURGH COAL**		
SH	CARB	Black; carbonaceous; bony; common small pyrite lenses; sharp base (described by Bill Grady in lab).	0.03	470.33
LS		Medium gray, shaly, sharp lower contact.	0.07	470.40
LS		Light gray, hard, dense, faint nodules, dark and broken in center at 470.90', (exposure surface), possibly 2 cycles, sharp, angular lower contact on color, darker to base.	1.10	471.50
SH		Medium dark gray, very small root traces, finely disseminated pyrite, sharp, angular lower contact.	0.65	472.15
LS		Medium dark gray, hard, dense, scattered dark gray nodules, sharp, angular, irregular lower contact.	2.00	474.15
CLST		Light to medium green gray, with light gray and medium and dark gray streaks and small clasts, slightly kaolinitic, fine, scattered pyrite, poorly developed slickensides, sharp, angular lower contact on color and lithology.	2.27	476.42
LS		Medium gray, shaly at top, sharp lower contact.	1.02	477.44
SH		Light gray, very fine grained, poorly bedded, locally soft and clayey zones, no fossils seen, sharp lower contact.	1.14	478.58
SH	BLK	Black; devoid of coaly materials; top and bottom sharp (described by Bill Grady in lab).	0.05	478.63
SH	BLK	Dark gray; bony; highly disseminated coaly material; poorly bedded; high density; common pyrite lenses; common marcasite near base; small (1mm) siderite blebs near top; gradational base (described by Bill Grady in lab).	0.22	478.85
COAL	IMP	**TOP LOWER LITTLE PITTSBURGH COAL** Thinly laminated dull clarains interbedded with thin black shales and lenses of bone coal containing common large (5X15mm) pyrite lenses; sharp base (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.18	479.03
COAL	CLRN	Clarain, dull; very thinly laminated; common thin cleat calcite and thin black shale bands; base sharp (described by Bill Grady in lab). NOT SAMPLED BY USGS FOR METHANE TESTING.	0.17	479.20

BASE LOWER LITTLE PITTSBURGH COAL

SH	BLK	Black; minor small pyrite lenses; rare ostracods; small coal flecks (described by Bill Grady in lab).	0.03	479.23
LS		Medium gray, upper 0.20' is light gray, hard, dense, occasional spar filled streaks and globules, occasional dark and medium gray streaks, few light gray faint nodules, sharp, angular lower contact.	5.53	484.76
SH		Light to medium gray green, poorly bedded, silty, vertical, dark gray, root traces (?), clayey in upper 0.30', gradational lower contact on color.	2.07	486.83
SH		Dark gray with light gray bands, gradational lower contact on bedding change.	1.49	488.32
CLST		Light gray with medium and dark gray streaks, abundant finely disseminated small pyrite crystals, slickensides, sharp lower contact.	0.93	489.25
LS		Light gray, hard, dense, occasional spar filled streaks, faintly nodular (light gray) with light gray green matrix, sharp lower contact.	2.77	492.02
CLST		Medium gray green, few small faint light gray calcite nodules in lower 0.03', very irregular and sharp lower contact.	1.00	493.02
LS		Light gray, hard, dense, abundant scattered spar fill in upper 1.10', nodular with abundant vertical fracture fills, with medium gray calcite material, sharp, highly irregular lower contact.	2.25	495.27
CLST		Light gray green, fine grained, non-calcareous, becomes weakly bedded from 496.00' to base, few fine, distinct red mottles in basal 0.35', sharp lower contact on color change, soft and clayey zone in lower 0.20'.	1.68	496.95
SH	MOT	Light gray green and gray red, poorly bedded, sharp lower contact on color change.	0.56	497.51
CLST		Light gray green with distinct, medium to coarse, gray red mottles from 497.80' - 498.00', gradational lower contact on color change.	0.69	498.20
CLST		Light gray to light gray green to base, with medium gray zones and light gray to black streaks or root traces, scattered fine organic matter, darker gray in upper 0.30', gradational lower contact on color change.	2.02	500.22

SLST		Light gray green, vertical dark gray to black streaks in upper 0.50' (root traces?), slightly bedded to base, sharp lower contact.	2.52	502.74
SH		Light to medium gray green, abundant weakly calcareous nodules and streaks from top to 503.65', few faint dark streaks in lower 0.10', sharp lower contact, slickensides in lower 0.10'.	5.83	508.57
CLST		Medium gray with dark gray bands, sharp lower contact on color change, occasional slickensides.	0.32	508.89
CLST		Light medium gray green, abundant poorly developed slickensides, sharp lower contact on color change.	0.56	509.45
CLST	MOT	Light medium gray green with fine to medium, distinct red mottles and streaks, sharp lower contact on color change.	1.27	510.72
CLST	RED	Predominately red with light gray to green distinct, fine to coarse mottling, slickensides, dark gray to black mottling, sharp lower contact on color change.	2.03	512.75
MDST	CALC INCL	Light medium gray green with few fine to coarse faint calcareous nodules, abundant slickensides, gradational lower contact on increased bedding.	1.75	514.50
SH	SLTY	Light gray green with very fine mica throughout, gradational lower contact on increasing sandstone.	1.50	516.00
SS	SLTY	Light gray green, very fine grained, flat planar laminae, sharp, angular lower contact.	0.68	516.68
SH	CALC INCL	Light gray green, with common fine to coarse, distinct, light gray to white calcite streaks and irregular masses (roots?), mostly vertically arranged, sharp lower contact on lithology.	6.12	522.80
LS		Light gray, hard, dense, thin, indistinct boundaries.	0.32	523.12
SH	SLTY	Light medium gray green, sharp lower contact.	1.05	524.17
LS		Light gray, hard, dense, sharp lower contact.	0.18	524.35
SS		Light gray, fine grained with medium gray, very fine grained and silty streaks, low angle planar ripple cross beds and slight green tint at 527.40', massive to 527.40', sharp lower contact.	4.93	529.28
SS		Light gray, fine grained grading to coarse grained at base, low angle ripple cross laminae at approximately 15 degrees, occasional silty streaks from 537.00' to base, coarse grained below	13.57	542.85

		540.10', sharp lower contact on increasing bedding angle.		
SH		Medium gray, slickensides, sharp, angular lower contact.	0.15	543.00
CLST		Light gray, very soft.	0.15	543.15
SH	SLTY	Light gray, becoming sandy and micaceous to base, finely laminated, arbitrary gradational lower contact at obvious sandstone laminations.	2.47	545.62
SS		Light gray, very fine grained, planar ripple laminations, micaceous, flat, arbitrary lower contact.	0.61	546.23
SH		Light to medium gray green, few very thin light gray very fine grained sandy and silty streaks in top 0.50', gradational lower contact on loss of streaks and color change.	1.25	547.48
SH		Medium gray green, few fine to medium dark gray, faint to distinct sideritic/pyritic nodules and streaks, arbitrary lower contact on color change, no fossils seen.	0.86	548.34
SH		Medium dark gray, with black vertical bone and scale material on base, sharp lower contact.	0.24	548.58
LS		Medium dark gray with black streaks, very abundant pyrite streaks, gradational lower contact on color and composition change.	0.55	549.13
LS		Light gray, hard, dense, nodular in top 0.25' with vertical fractures, high angle, sharp, lower contact.	0.47	549.60
CLST		Light gray green, non-calcareous, angular sharp lower contact.	0.14	549.74
CLST		Medium gray, abundant slickensides, few faint, fine calcite nodules, sharp lower contact at color change.	1.19	550.93
SH	BLK	Some carbonaceous streaks, sharp lower contact.	0.10	551.03
CLST	KAOL	Light gray to brown with few, medium to medium gray green rounded clasts and dark gray streaks, sharp lower contact.	0.15	551.18
SH		Medium dark gray with some tan to black streaks in top 0.05', mixed with claystone above, poorly bedded, gradational lower contact on color change and bedding.	0.42	551.60

SH	CALC INCL	Medium gray, thin vertical to sub vertical thin, faint, calcite streaks, probable root traces, gradational lower contact at base of calcite.	0.70	552.30
SH		Medium gray, slightly silty streaks from top to 553.44', gradational lower contact at color change and bedding.	2.16	554.46
SH		Medium gray with abundant dark gray streaks and blebs, soft and hard laminations, poorly bedded to base with fine slickensides, sharp lower contact.	2.50	556.96
SLST		Medium gray green, micaceous, few black streaks, sandy, sharp lower contact.	1.10	558.06
CLST		Medium gray green, faint coarse weakly calcareous nodules at top, slickensides, sharp lower contact at calcareous material.	1.31	559.37
CLST	CALC	Medium gray green, with few coarse, faint, light gray calcite nodules, gradational lower contact on color.	3.80	563.17
CLST		Light gray green, streaks to 564.00', sharp lower contact on calcareous material.	0.96	564.13
SH	CALC INCL	Light medium gray green, poorly bedded to 1.50', fissile below, abundant light gray distinct, vertical to sub vertical wavy calcite streaks (roots?), less common to base, gradational lower contact on color, abundant poorly developed slickensides, no fossils seen.	4.94	569.07
SH		Light medium gray, with light gray green, coarse, distinct, large, sub angular to sub rounded clasts, streaks of iron stained fine grained quartz in lower 0.20', sharp lower contact.	1.17	570.24
SH		Medium gray green, few black streaks, possible root traces, no fossils seen, slightly silty, 1 slickensided fracture, gradational lower contact on increased sandstone and silt.	1.64	571.88
SH	SLTY	Medium gray green, slightly sandy from top to 573.00', light gray 572.50' to 573.50', pyritic, sharp lower contact.	1.87	573.75
SH	SS STR	Medium gray green, with thin laminae, fine to very fine grained, light gray green 1 to 3 mm thick sandy zones, sharp lower contact.	1.80	575.55
SS		Light gray green, fine grained, thin bedded, sharp, angular lower contact.	0.21	575.76

SH		Medium gray green, dark gray vertical streaks dissecting the core, slightly silty to top, sharp lower contact.	0.90	576.66
SLST		Medium gray green, slightly sandy, very fine grained, sharp lower contact.	2.59	579.25
LS		Light gray green with white calcite throughout, locally sandy and silty, sharp lower contact.	0.12	579.37
SH	SLTY	Medium gray green, silty, sharp lower contact.	0.69	580.06
LS		Light gray green, silty with medium gray green matrix, accumulation of calcite streaks and nodules, sharp lower contact.	0.10	580.16
SH	SS STR	Medium gray green, silty, faint, very fine grained to fine grained, ripple laminated sandstone streaks, very locally calcareous streaks and nodules, sharp lower contact.	2.88	583.04
SH		Medium gray, sharp lower contact.	0.35	583.39
CLST		Medium gray green, brecciated, slickensides, fine, faint to distinct, light gray green to medium gray clasts, sharp lower contact.	0.16	583.55
SH	CALC	Medium gray, sharp lower contact.	0.45	584.00
LS		Light gray, hard, dense, light gray to brown 584.70' to 585.60', abundant spar filled streaks, shaly streaks 584.35', sharp lower contact.	1.86	585.86
SH	CALC	Medium gray green, poorly bedded, gradational lower contact on color change.	1.14	587.00
MDST	MOT	Light to medium gray green with few faint to coarse faint to distinct red mottles and olive streaks, weakly bedded, calcareous, few fine to distinct light gray to white calcite nodules, gradational lower contact on color.	1.15	588.15
MDST	RED	Red with faint to distinct, light gray green, light gray and occasional olive mottles, common slickensides, calcareous, few fine to coarse light gray to white calcite nodules, gradational lower contact on loss of calcite.	4.94	593.09
MDST	RED	Red with faint to distinct light gray green and olive mottles and streaks, abundant slickensides, non-calcareous, gradational lower contact on increasing silt.	4.81	597.90
SLST	CALC INCL	Light gray green with red mottling in upper 0.10', slightly sandy with sandy streaks, weakly	12.90	610.80

		calcareous inclusions, light gray nodules and streaks, increasingly nodular to nodular limestone bed 608.00' - 610.00', sharp lower contact.		
SLST	SDY	Light gray green, thin light gray, very fine grained sandstone streaks, few and thin medium gray shale streaks, possible burrows or other bioturbation 613.00' - 614.00', sharp, angular lower contact.	3.79	614.59
SS		Light gray green, fine grained grading to coarse grained at base, faint, slightly inclined planar cross laminations, sharp lower contact, 0.70' at base is medium gray green.	11.03	625.62
SH		Medium gray green, poorly bedded, abundant slickensides with calcite on slick faces, pyrite, common faint, fine to coarse clayey nodules, sharp lower contact.	1.00	626.62
LS		Light gray green, hard, dense, occasional fine to medium grained iron stained sand, sharp lower contact.	0.49	627.11
SH		Medium gray green, scattered pyrite throughout, occasional calcite nodules in upper 1.50', soft and clayey at base, sharp lower contact.	0.43	627.54
SH		Dark gray, inter-bedded with soft clayey streaks up to 0.02', sharp lower contact.	0.25	627.79
SH		Medium dark gray green, very well developed slickensides at base, soft and clayey at basal 0.10', occasional dark gray to black, small root traces or other organic material, sharp lower contact.	0.34	628.13
SH		Medium gray green, poorly bedded, very well developed slickensides, hard, gradational lower contact.	0.38	628.51
CLST	CALC	Light gray green, large fracture slickensides, slightly silty at base, scattered pyrite, gradational lower contact on color.	1.90	630.41
CLST		Light green gray, mottled red, calcareous, abundant slickensides, decreasing calcite to base, gradational lower contact.	5.69	636.10
CLST	RED	Red with green mottling, olive mottles to base, abundant slickensides, scattered calcite rims around mottles 636.67' - 636.93', sharp lower contact.	1.13	637.23
CLST	SOFT	Red with green to base, gradational lower contact.	0.70	637.93

CLST		Medium gray green, abundant slickensides, scattered pyrite throughout, faint vertical calcite filled root traces, sharp lower contact on color.	1.14	639.07
CLST		Red mottled green, abundant slickensides, gradational lower contact.	0.58	639.65
CLST		Medium gray green, abundant slickensides, occasional red mottling, sharp angular, lower contact on color.	0.38	640.03
CLST		Medium gray green, purple streaks, sharp angular lower contact.	0.09	640.12
CLST		Medium gray green, mottled red with dark gray to black vertical streaks (possible roots), slickensides, broken in barrel basal 0.50', locally calcareous streaks and nodules 647.00' to base, sharp lower contact on color.	7.61	647.73
LS		Very light gray, hard, dense, micritic, upper 0.40' mixed with above unit, faint, coarse to fine, nodular zone 649.60' thin shale streaks < 0.01' throughout, sharp lower contact.	3.27	651.00
SH	CALC	Medium gray green, slickensides, sharp lower contact.	0.14	651.14
CLST	CALC INCL	Medium gray green, faint medium to coarse, calcite nodules, slightly silty, gradational lower contact.	0.86	652.00
CLST	CALC INCL	Medium gray green with abundant fine to coarse, distinct, vertical and horizontal calcite nodules and slickensides, soft to base, broken, gradational lower contact on lithology.	1.27	653.27
LS	NODAR	Nodular at top grades to micrite at base, hard, dense, nodules are faint, fine to coarse with green gray matrix, sharp lower contact.	1.31	654.58
SH	CALC	Medium gray, slickensides, pyrite, sharp lower contact.	0.57	655.15
CLST	SOFT	Gray brown, sharp lower contact.	0.24	655.39
LS	NODAR	Light to medium gray, with dark gray to black streaks, hard, sharp lower contact.	0.10	655.49
CLST		Medium gray with dark gray streaks, soft, sharp lower contact.	0.19	655.68
LS	NODAR	Light gray, with medium gray matrix, nodules are	0.40	656.08

		faint and fine, sharp lower contact on lithology.		
SH		Medium dark gray, poorly bedded, slickensides, base sharp on lithology.	0.16	656.24
CLST	SOFT	Medium gray, sharp lower contact.	0.39	656.63
SH		Medium gray, abundant well developed slickensides, sharp lower contact, slightly calcareous at base on slickenside faces.	0.57	657.20
CLST	SOFT	Gray to medium gray, plastic consistency with slightly more competent shale streaks 657.24' - 657.31' and 658.45' to base, sharp lower contact on color.	1.35	658.55
CLST	SOFT	Brown gray with dark gray to black streaks, mottles, sharp lower contact.	0.09	658.64
CLST		Dark gray to black, soft, sharp lower contact.	0.10	658.74
SH	CARB	Very dark gray, pyrite blebs and streaks, abundant coaly plant material, sharp lower contact.	0.33	659.07
CLST	SOFT	Brown gray, sharp lower contact.	0.10	659.17
SH		Medium gray, sharp lower contact.	0.08	659.25
SH	CLST INBD	Shale is dark gray, claystone is dark brown gray and soft, sharp lower contact.	0.56	659.81
SH		Dark gray.	0.12	659.93
SH	CARB	Black; highly carbonaceous; rooted with small plant trash; pyrite in root traces; slickensided; sharp inclined (about 15 degrees) base on coal below (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.09	660.02
COAL	CLRN	**TOP OF ELK LICK COAL** Clarain, dull; hard; common large pyrite lenses; common thin cleat calcite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.20	660.22
COAL	CLRN	Clarain, bright; common cm length (1-5mm height) pyrite lenses throughout; thin cleat calcite throughout (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF ELK LICK COAL**	0.38	660.60
CLST		Dark gray, slickensides, abundant pyrite streaks, very thin coaly streaks at 660.90', becomes shaly at base, gradational lower contact.	1.33	661.93

CLST		Medium gray, calcite nodules, very clayey at top 2.50', weakly bedded, common coarse, distinct light gray, calcareous nodules, matrix is calcareous, gradational lower contact on color, fine pyrite throughout.	9.07	671.00
CLST	MOT	Light gray to gray and red, slickensides, broken from drilling, very soft at bottom 0.60', sharp lower contact.	3.80	674.80
CLST	MOT	Light gray green with many fine to coarse, distinct red mottles, slickensides, very soft 676.10' - 676.60', gradational lower contact on color change.	2.14	676.94
SH		Light gray, hard, poorly bedded, gradational lower contact on color change.	0.76	677.70
SLST		Light to medium gray green bands, shaly, gradational lower contact on lower silty zone to base.	3.35	681.05
SH		Medium gray green, mudcracks throughout, finer grained to base (clayey), gradational lower contact on color.	4.18	685.23
SH	RED	Light to medium gray green bands and indistinct mottles to 688.00', nearly solid red, slickensides, somewhat broken with soft streaks 689.00' - 693.00', fissile throughout, grayer to base, gradational lower contact on color change.	8.77	694.00
SH		Medium gray, few faint fine to coarse red mottles, gradational lower contact, slickensides, very fine mica flakes.	2.71	696.71
SH		Medium gray, occasional dark gray to black nodules, bands and vertical fracture fills, indeterminate composition, slickensides, gradational lower contact on color.	3.07	699.78
SH		Dark gray to black, abundant large slickensides, sharp lower contact on color, very thin coaly streaks and pyrite at base, light gray bands approximately 0.03' at base, sharp lower contact.	1.12	700.90
SH	CARB	Sharp lower contact.	0.05	700.95
CLST		Medium gray green, grayer to base, slickensides, sharp lower contact on increasing calcite.	1.20	702.15
SH	CALC INCL	Medium gray, calcite, light gray, fine to coarse, distinct calcite nodules, weakly to poorly bedded to base, slickensides, few calcite nodules to base, gradational lower contact.	5.75	707.90

CLST		Medium gray green, calcareous, slickensides, sharp lower contact on color.	1.10	709.00
MDST	MOT	Equal areas of distinct gray, red, olive and light gray and medium gray green, slickensides, non-calcareous, gradational lower contact on color.	1.88	710.88
CLST	SOFT	Equal mottles of medium gray green, light gray green, and olive, soft clayey zones, non-calcareous, gradational lower contact on bedding, slickensides.	1.88	712.76
SH		Finely mottled and banded medium gray green, olive and gray to base, slightly calcareous in basal 0.10'.	0.64	713.40
SH	FOSS	**TOP AMES MARINE ZONE** Light gray green with light gray limestone nodules. Brachiopod parts and other debris, nodular, pyritic, slickensides, gradational lower contact.	0.60	714.00
SH	FOSS	Medium gray green, calcareous, abundant fine to coarse, prominent light gray limestone nodules, fossils, brachiopod spines and shell fragments in upper portion, sharp lower contact.	5.22	719.22
SH	FOSS	Medium gray, pyritic, slickensides, occasional light gray nodules or bands of limestone, pelecypod, more abundant fossils in basal 0.10', vertical fractures, sharp lower contact.	9.98	729.20
LS	FOSS	Medium gray, with light gray limestone nodules and light gray fossil brachiopods, upper 1.20' is somewhat clayey and shaly, abundant fossils, neochonetes, gastropods, etc, sharp lower contact.	3.07	732.27
LS	FOSS	Medium dark gray, brachiopods, less abundant than above unit.	0.62	732.89
LS	FOSS	Abundant fossil hash, pyrite and fossil fragments, brachiopods, occasional slickensides, sharp lower contact. **BASE OF AMES MARINE ZONE**	1.27	734.16
SH		Medium gray, very soft, no fossils seen, sharp lower contact.	0.26	734.42
SH	CARB	Black, thin coaly streaks and coalified plant material, pyrite lenses.	0.34	734.76
COAL	NP	**HARLEM COAL HORIZON**	0.00	734.76

CLST		Dark gray to black, darker to top, slickensides, gradational lower contact.	0.69	735.45
CLST	CALC	Medium gray, few faint coarse calcite nodules, sharp lower contact on calcite content and hardness.	1.50	736.95
LS	ARG	Fine grained, very fine grained pyrite crystals, small root traces, few common, fine to medium, distinct, light gray calcareous nodules, slickensides, gradational lower contact on increasing clay.	3.21	740.16
MDST	CALC	Light to medium gray, very well developed slickensides, many fine to coarse, distinct, light gray calcareous nodules, gradational lower contact on color.	3.30	743.46
MDST	MOT	Light medium gray green, many red to gray distinct, fine to coarse mottles, calcareous throughout, many fine to coarse, distinct, light gray calcareous nodules, abundant slickensides, gradational lower contact on color.	2.64	746.10
MDST		Red with light gray green, coarse mottles, abundant slickensides, common fine to coarse, distinct, light gray calcareous nodules, non-calcareous matrix, gradational lower contact on color.	6.10	752.20
MDST	MOT	Light to medium gray green with few coarse, distinct red mottles, common fine to coarse, light gray calcareous nodules, slickensides, non-calcareous matrix.	1.80	754.00
MDST	MOT	Red with abundant fine to coarse, medium gray green mottles, red and purple streaks, calcareous, common fine to coarse, distinct, light gray calcareous nodules, common slickensides, sharp lower contact on color.	1.95	755.95
MDST	RED	Red, fine to coarse, distinct, olive and gray green mottles, abundant slickensides, soft, broken, 1 calcareous streak, sharp lower contact on color.	5.49	761.44
MDST	MOT	Light to medium gray green, coarse, distinct, red mottles, locally slightly calcareous, few fine to coarse, light gray calcareous nodules, broken at base, gradational lower contact.	1.60	763.04
MDST		Medium green gray, abundant slickensides, occasional mottled red, medium dark gray fine mottles at base, gradational lower contact on roots.	2.30	765.34

MDST		Dark gray green, abundant fine to coarse distinct light gray vertical calcite filled roots, occasional mineral filled, weakly calcareous vertical fractures below 768.00', sharp lower contact on color.	3.94	769.28
SH		Medium dark gray, lighter to top, small poorly developed slickensides, sharp lower contact.	0.17	769.45
CLST	SOFT	Light gray to gray green, sharp lower contact.	0.47	769.92
SH		Medium gray green, sharp lower contact.	0.12	770.04
CLST	SOFT	Gray, sharp lower contact.	0.13	770.17
SH		Light medium gray, poorly bedded, small scattered pyrite, hard, soft and clayey 771.30' - 771.41', slightly silty to base, very fine scattered sand grains at base, gradational lower contact.	2.35	772.52
SLST	SDY	Light gray to gray green, sharp lower contact.	0.75	773.27
SS	SLTY	Light gray to gray green, very fine grained, silt is light to medium gray green, planar laminations with ripple laminations at base.	1.36	774.63
SLST		Gray, hard, sharp lower contact.	0.37	775.00
SS		Light gray green, very fine to fine grained, grades to siltstone at base, silt is medium gray green, low angle or planar cross beds, sharp lower contact on increasing grain size.	1.75	776.75
SS		Gray to light gray green, fine grained, flat low angle laminations and bedding, silty streaks to top, flat bedded at base, 771.10' light gray green to dark gray green, very weakly calcareous at base, slightly lithic, sharp lower contact on lithology.	3.69	780.44
SLST		Light gray green, soft claystone streaks 0.01' thick at 781.13', sharp lower contact on lithology.	0.78	781.22
SS		Light gray with medium to light gray streaks, low angle planar cross beds less than 10 degrees, medium gray to 784.00', low angle sharp lower contact.	2.78	784.00
SH		Light to medium gray green, uniform, no fossils seen, sharp lower contact on color change.	1.46	785.46
SH		Medium to dark gray at base, no fossils seen, few pressure buttons with fine slickensides, sharp	0.58	786.04

		lower contact.		
SH		Medium gray, very soft, broken, fissile, sharp lower contact, possible pelecypod observed, very questionable.	0.24	786.28
SH		Medium gray, uniform, fine, no fossils seen, pressure button, sharp lower contact on slight color change.	0.85	787.13
SH		Medium dark gray, very fine, uniform with very soft interlaminated bands, slickensides, small thin pyritized rootlets, sharp lower contact, very questionable pelecypod shell.	2.24	789.37
COAL	IMP	Durain, bony, impure, very abundant pyrite blebs and streaks, cleat, coaly streaks, very dull, small calcite blebs, sharp lower contact. NOT SAMPLED FOR METHANE TESTING. **UPPER BAKERSTOWN COAL**	0.38	789.75
MDST	CALC INCL	Medium gray, large slickensides, calcareous, few fine to coarse, faint to distinct calcareous nodules, small root traces, pyrite, occasional small < 1 mm pebbles, sharp lower contact on increasing calcareous material.	3.48	793.23
LS	NODAR	Light gray with medium dark gray clayey matrix, slickensides, sharp lower contact on base of nodules.	1.09	794.32
MDST	CALC	Medium gray, slickensides, few faint to coarse, light gray calcareous nodules, gradational lower contact on loss of calcite.	1.78	796.10
CLST		Light green gray, non-calcareous, yellow brown vertical root fill, slickensides.	1.45	797.55
SH		Light medium gray green, soft clayey zones 810.00' and 803.00', locally dark gray to black streaks, slickensides, sharp lower contact.	6.62	804.17
SH	CARB	Dark gray to black, very thin coaly streaks, sharp lower contact.	0.05	804.22
LS	FOSS	**TOP PORTERSVILEE MARINE ZONE** Light gray brown, hard, dense, medium dark gray shaly streaks at base, fossils, sharp lower contact.	0.18	804.40
LS	FOSS	Medium gray, hard dense, dark gray at base, slickensides, pyrite, sharp lower contact on color.	0.50	804.90
LS	FOSS	Light gray brown, hard, dense, pyrite, concentric	0.32	805.22

		shaly deformed clasts, dark gray, sharp lower wavy contact on color, not as fossiliferous as above.		
LS		Medium gray, very small olive green clasts < 1mm, phosphatic material, hard, dense, micritic, ostracods, sharp lower contact on color.	0.67	805.89
LS	NODAR	Medium dark gray with faint to distinct, fine to coarse, rounded to subrounded, light gray to brown nodules increasing to base, gradational lower contact, slickensides, olive green clasts, small vertical to subvertical calcite filled fractures.	1.52	807.41
LS		Light to medium gray, distinct vertical dark calcite filled fractures, occasional fine to medium distinct to prominent calcite filled light gray fills, spar filled fractures, very faint possible shell fragments, sharp lower contact, light gray at base with thin silty or shaly medium gray streaks. **BASE PORTERSVILLE MARINE ZONE**	0.92	808.33
CLST	KAOL	Mixed light gray, medium and dark gray, and green kaolinitic 'interfingered' streaks horizontal micro-brecciation in upper 0.10', medium to dark gray streaks in center, darker green gray at base, sharp lower contact.	0.21	808.54
MDST		Medium gray, upper 0.15' is clay, lighter gray, distinct calcareous nodules, brittle, locally broken, abundant slickensides, weakly calcareous with very small calcite nodules, sharp lower contact.	1.71	810.25
SH		Medium to medium dark gray, weakly calcareous, soft clayey streaks throughout, slickensides, faint yellow brown mottling below 811.50', sharp lower contact.	2.78	813.03
LS		Medium to medium dark gray, faint, coarse nodules, ostracods, small green clasts, gradational lower contact.	1.30	814.33
LS	NODAR	Medium gray with lighter gray, brown gray, light green and gray, faint to distinct nodules, gradational lower contact.	0.52	814.85
SH		Medium to dark gray with soft medium gray claystone streaks, slickensides, upper 0.50' appears rooted, some yellow mottling 818.25' - 818.60', lower 0.55' is soft, gradational lower contact on color and lithology.	4.35	819.20
SH	CARB	Dark gray to black, slickensides, pyritic, sharp	0.81	820.01

		lower contact.		
COAL	IMP	Shaly, pyritic, sharp lower contact. NOT SAMPLED FOR METHANE TESTING. **BAKERSTOWN COAL**	0.09	820.10
CLST		Medium dark gray, abundant slickensides, sharp lower contact.	0.23	820.33
CLST	SOFT	Medium dark gray.	0.37	820.70
NR		CORE LOSS	0.90	821.60
CLST		Light to medium gray green, non-calcareous, slickensides, sharp lower contact on increasing calcite.	1.74	823.34
CLST	CALC INCL	Light to medium gray green, common fine to coarse, very faint, calcareous nodules, matrix is calcareous, slickensides, sharp lower contact on change in bedding and loss of calcareous material.	1.79	825.13
CLST	SOFT	Light gray green, non-calcareous, slickensides, sharp lower contact on bedding change.	0.96	826.09
SH		Medium gray to medium gray green, non-calcareous, soft, laminated, soft throughout, sharp lower contact on calcite below, few organic fragments, sharp lower contact on nodules.	2.03	828.12
SH	CALC INCL	Medium gray to medium gray green, coarse, faint calcareous nodules, non calcareous matrix, sharp lower contact on color.	0.47	828.59
SH		Medium gray, interbedded with siltstone, pyritic, occasional slickensides, predominately shale with lighter gray silty bands up to 0.02', dark gray to base, less silt at base, sharp lower contact on color.	13.34	841.93
SH	RED	Red with faint light gray green bands, becomes grayer to base, base sharp on color.	1.93	843.86
SH		Medium gray with olive streaks at top, darker gray in basal 0.90', very soft, fissile, slickensides, slightly banded, few black streaks, very fragile, sharp lower contact.	1.19	845.05
CLST		Light gray, purplish red and black bands, prominently mottled, slickensides, broken by drilling, possible loss (1.14'), gradational lower contact on color change.	2.25	847.30
CLST	RED	Red with distinct thin olive and light gray streaks, slickensides.	0.40	847.70

NR		CORE LOSS	0.78	848.48
CLST	MOT	Equal light gray, red and light gray red, very soft, slickensides, gradational lower contact on bedding.	2.87	851.35
SH	RED	Red with few light gray streaks and mottles, some poorly bedded zones, occasional slickensides, sharp lower contact on color.	9.11	860.46
SH		Medium gray green, non calcareous, no fossils seen, sharp lower contact.	0.41	860.87
LS	FOSS	Light gray, slightly sandy with medium gray streaks, medium gray green to base, abundant fossils and fossil pieces, brachiopods, gastropods, crinoid stems, sharp lower contact on calcite at base. **PINE CREEK MARINE ZONE**	2.38	863.25
SH		Medium gray green with few red mottles, sharp lower contact.	0.20	863.45
MDST	RED	Red, calcareous, few faint, distinct, light gray green streaks, few fine to coarse, distinct light gray calcareous nodules, abundant streaks, gradational lower contact on color change.	4.69	868.14
MDST	MOT	Red with fine, distinct, light gray green mottles and clasts, slickensides, calcite on slick faces, sharp lower contact.	1.41	869.55
CLST		Medium gray green, brecciated, with dark gray angular to sub rounded clasts, dark gray to black streaks in upper 0.15' and lower 0.10', sharp lower contact.	1.62	871.17
SLST		Light green gray, abundant calcite streaks in upper 0.25', shaly to base, mica, sharp lower contact.	0.90	872.07
SH	SS STR	Medium gray green with light gray, very fine grained micaceous sandy streaks, gradational lower contact.	0.45	872.52
SH		Medium gray green grades to gray at base, sandy and silty to top, clayey to 874.00', calcareous streaks and nodules, light gray at 874.00', gradational lower contact on sands below, silty to base.	3.61	876.13
SH	SS STR	Medium gray with light gray, very fine grained, faint ripple laminated sandstone streaks, small organic fragments, sharp lower contact.	1.09	877.22

SS	CALC	Light gray, very fine grained, nonbedded to top, flat planar laminations to base, sharp lower contact.	0.85	878.07
SH		Medium gray, irregular vertical fracture fill, gray brown, finely micaceous, slightly silty, occasional sandy or silty zones and streaks, darker gray laminations 891.00' - 893.00', occasional 0.10' siderite bands, darker to base, gradational lower contact at 1st fossil.	19.43	897.50
SH	FOSS	**TOP BRUSH CREEK MARINE ZONE** Medium gray to medium dark gray at basal 0.50', thin sandy bed 898.20' - 898.23', brachiopod well preserved at 901.30', sharp lower contact.	4.45	901.95
LS	FOSS	Light gray, dark gray to black streaks, abundant marine fossils, brachiopods, crinoids, pyrite, sharp lower contact.	0.85	902.80
SLST	FOSS	Medium gray, few small crinoid columns with calcite, sharp lower contact. **BASE BRUSH CREEK MARINE ZONE**	0.24	903.04
SS	BRW	Bi-directional crossbeds in upper 0.30', burrowed below, light gray, very fine grained, sharp lower contact, burrows diminish to base.	3.50	906.54
SS		Light gray, fine grained, ripple laminated to ripple cross laminated, shale streaks, 1 dark gray filled burrow 907.25', 1 shale clast, mica, sharp lower contact.	1.28	907.82
SH	SS STR	Medium dark gray with very thin light gray, very fine grained sandy streaks with ripple laminations, pyrite, poorly preserved plant material, scattered thin small coaly fragments to base, sharp lower contact on lowest sandy streaks.	8.92	916.74
SH		Medium dark gray, pyrite streaks, scattered carbonaceous plant fragments, sharp lower contact on coal, more abundant coaly fragments in basal 0.15'.	3.66	920.40
COAL	IMP	**TOP OF BRUSH CREEK COAL** Bony to bone; very thinly laminated with black shale bands, thicker toward top (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	920.45
COAL	CLRN	Clarain, dull; very thinly laminated; few 1-3mm vitrain bands; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.23	920.68

COAL	IMP	Bony to bone; few thin vitrain bands; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.12	920.80
SH	BLK	Black; highly carbonaceous near base with common resin rodlets on bedding; top half rooted; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.30	921.10
COAL	CLRN	Clarain, dull; common, thin fusain lenses throughout; thin cleat calcite near base; base sharp (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE BRUSH CREEK COAL**	0.70	921.80
SH	ROOT	Medium dark gray, arbitrary lower contact.	2.05	923.85
CLST		Medium dark gray, very well developed slickensides, sharp lower contact on calcite fill below.	1.77	925.62
CLST	CALC INCL	Medium gray with fine to coarse, light gray, distinct calcareous nodules, very well developed slickensides, gradational lower contact on loss of calcareous material.	5.38	931.00
CLST		Light to medium gray, slickensides, dark gray to black streaks and few coarse distinct, light gray calcite nodules in basal 0.20', gradational lower contact on color and composition.	4.90	935.90
SH		Medium gray green, faint, very fine, light green gray sandy and silty streaks, brown siderite streaks, sharp lower contact on decreasing silt and sand.	6.38	942.28
SH		Medium gray green, slickensides, rooted, sharp lower contact on color change.	1.55	943.83
SH		Dark gray to black, slickensides, fine organic streaks, sharp lower contact on color change.	0.39	944.22
SH		Medium gray green, very fine clayey, pyritized plant material, few slickensides, sharp lower contact on color change.	1.98	946.20
SH		Dark gray, soft streaks, weakly bedded, locally very soft, crumbly, sharp lower contact on color change.	0.38	946.58
CLST		Medium gray, very soft, plastic consistency, crumbly, with few hard lenses, slickensides, thin shaly zones throughout, more competent below 950.30', 1 irregular light gray calcareous mass at 952.40', few light gray, rounded clasts 954.00' -	9.38	955.96

		955.00', gradational lower contact with few clasts from lower unit in boundary area and color change.		
MDST		Light gray green, distinct, dark gray streaks and thin fracture fills (root traces?), slightly silty, very coarse, light gray, distinct calcareous nodules 958.00' to base, slickensides, olive rinds on some calcareous nodules, sharp lower contact on base of calcareous material and color change.	4.24	960.20
CLST		Medium gray green, with abundant dark gray to black streaks, slickensides, soft at top, sharp lower contact on color change.	0.67	960.87
SH		Medium gray, poorly bedded, slightly silty, gradational lower contact on increasing sand.	1.33	962.20
SS	SH INBD	**TOP OF MAHONING SANDSTONE** Fining upward sequence, light gray green, sand is very fine grained, planar laminated to planar cross laminations, slightly inclined to base, medium gray green shale and silt bands and streaks, sharp lower contact on grain size.	7.46	969.66
SS	XBD	Fine to medium grained, lithic, low angle planar cross laminations, micaceous, shale streaks 979.00' - 981.30', locally abundant mica streaks, sharp lower contact on grain size change.	15.67	985.33
SS		Medium grained, light gray, massive to low angle planar bedding, sharp lower contact.	3.55	988.88
SS		Fine to medium grained, sub ripple laminations, multidirectional, shale clasts and streaks in upper 0.10', 990.15' -990.40' and 993.65' - 994.00', gas show, lithic, occasional shale pebbles (angular), abundant angular elongate shale streaks and rip-ups 997.75' - 999.20', and 1003.00' to base, sharp lower contact.	15.08	1003.96
SS		Medium grained, locally coarse grained, low angle planar bedding 1003.96 ' - 1004.80', flat bedded 1004.80' 1004.90', 20 degree angled cross bedding 1004.90' - 1006.00', nonbedded 1006.00' - 1007.34', low angle planar cross bedding 1007.34' - 1008.20', mixed channel lag, and high energy with angular shale rip-ups 1009.40', faint high angle cross bedding 1009.40' - 1014.00', well cemented, slightly lithic, locally quartz arenite, sharp lower contact.	27.00	1030.96
SS	COAL STR	Light gray, fine to medium grained, locally abundant mica, few very thin < 1 mm coal streaks, pyrite, lithic, sharp lower contact at lowest coal	1.49	1032.45

		streak. **BASE OF MAHONING SANDSTONE**		
COAL	NP	**UPPER FREEPORT COAL POSITION (ABSENT)**	0.00	1032.45
SS		**TOP OF UPPER FREEPORT SANDSTONE** Light gray, medium to coarse grained, low angle planar cross laminations, medium gray silty streaks approximately 1 mm thick.	1.55	1034.00
SS		Light gray, medium grained with medium gray and darker streaks, about 20 degree planar cross laminations, occasional mica rich streaks, faint or nonbedded 1039.00' - 1042.80', coal streak 0.01' at 1042.95', sharp lower contact.	9.27	1043.27
BN		Coal bony, rafted material, sharp lower contact.	0.07	1043.34
SS		Light gray, coarse grained, nonbedded, occasional coaly clasts < 0.02', pyrite, sharp lower contact on bedding.	3.81	1047.15
SS		Light gray, medium to coarse grained, low angle planar cross laminations, thin mica rich streaks, coaly streaks and fragments 1048.30' - 1049.50', faintly bedded 1049.50' - 1051.00', shaly parting 1051.94' - 1052.00', coarse grained 1052.65', basal portion exhibits 20 degree cross beds to 1054.00', 1054.00' - 1054.85' coarse grained, non bedded, coal streaks, angular shale clasts and pebbles, angular sharp lower contact.	7.70	1054.85
SS	QTZ PBL	Light gray to light medium gray, coaly streaks up to 3 mm thick, angled, coarse to very coarse grained pebbles up to 1 cm diameter, angular shale pebbles to 1 cm long, very light gray to white in upper 0.20', faint planar cross laminations, steeply bedded throughout, flatter bedded to base, locally fine to medium grained streaks with quartz pebbles, angular sharp lower contact.	2.58	1057.43
SS	XBD	Light gray, fine to coarse grained at base (fining upward sequence), silty or mica streaks, sub-millimeter coal fragments, planar cross laminations, abundant rock fragments and grains, lithic, gradational lower contact on coal streaks.	7.07	1064.50
SS		Light gray to gray, coarse grained, occasional coal streaks up to 3 mm thick, few coal clasts up to 3 mm by 3 cm, dark gray, rounded and angular shale clasts, locally micaceous, very lithic, shale pebble lag from 1070.15' - 1070.26', abundant shale streaks and clasts and mica rich streaks below 1071.00', large medium gray pebble bed, 1072.58' - 1072.70', occasional pyrite coaly	10.00	1074.50

		streaks, few pebbles to 1070.00', sharp lower contact on bedding change.		
SS	XBD	Light gray, fine grained, planar cross laminations, sharp lower contact.	1.58	1076.08
SS		Light gray, medium grained, massive, abundant lithic rock fragments, occasional shale clasts and coal streaks in basal 0.20', sharp lower contact.	3.14	1079.22
SS	XBD	Light gray, medium grained, planar cross laminated, bi-directional in upper 0.20', lithic fragments, sharp lower contact.	1.28	1080.50
SS		Light gray to gray, fine to medium grained, micaceous, abundant rock fragments, sharp lower contact.	0.69	1081.19
SS		Light gray, fine to medium grained, cross bedded and massive zones, coal streaks to 5 mm thick, medium to coarse at base, low angle planar laminations 1084.00' - base, abundant light gray shale clasts and pebbles 1086.40' - base, 1 large medium gray shale clast at base, sharp lower contact. **BASE OF UPPER FREEPORT SANDSTONE**	7.03	1088.22
SH		Medium gray green, few root traces and dark streaks, poorly bedded at top, occasional slickensides, micaceous, few light gray, distinct streaks and blebs, more medium gray 1094.00' - base, sharp lower contact on color change and carbonate.	8.78	1097.00
SH	CALC INCL	Medium gray green, dark gray streaks at top and at 1099.15', non calcareous matrix, light medium gray, fine to coarse, distinct, vertical to sub vertical and irregular masses of calcareous material especially concentrated from top to 1098.10', sparse pyrite blebs, sharp lower contact at silt.	2.19	1099.19
SH	SLTY	Medium gray with sub millimeter, light gray streaks, micaceous, silty, no fossils seen, sharp lower contact at sand streaks.	1.15	1100.34
SS	SH STR	Medium gray shale streaks and thin beds up to 0.03', thick with light gray, very fine grained planar laminated sandstone streaks and beds up to 0.35' thick, sharp lower contact.	4.01	1104.35
SS		Light gray, very fine grained, mostly planar laminated especially at base with flat planar laminations at top, very micaceous and abundant rock fragments, gradational lower contact on increasing shale laminations.	1.35	1105.70

SH	SS STR	Medium gray, very thin light gray, very fine grained sandy and silty streaks in top to 1107.00', thin light gray, very fine grained, planar laminated sandstone beds with few thin coal streaks from 1107.67' - 1107.82', coalified and pyritized plant material throughout, sharp lower contact on sandstone and color change.	2.42	1108.12
SH		Dark gray to black, 0.03' thick coal bands and 1108.75', moderately abundant root traces, some pyritized coalified plant material, sharp lower contact.	2.64	1110.76
SS	COAL STR	Light gray, very fine grained, planar laminated, abundant coal streaks 1110.93' - 1111.16', sparse in rest of unit, sharp lower contact.	1.38	1112.14
SH		Medium dark gray with distinct dark gray to black bands, coalified and pyritized plant material, locally mica rich, dark gray to black in lower 0.40', soft clay 1120.65' - 1120.75' and 1120.90' - 1121.00', sharp lower contact, coaly streaks to base, plant debris, organic material, finely disseminated pyrite.	9.56	1121.70
COAL	CLRN	**TOP OF UPPER KITTANNING COAL** Clarain, dull; occasional 1-3mm vitrain bands; minor fusains (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.83	1122.53
COAL	FS	Fusain, soft (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.03	1122.56
COAL	CLRN	Clarain, dull; occasional 2-10mm vitrain bands; common 1-3mm fusain lenses mineralized with clays and pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF UPPER KITTANNING COAL**	0.84	1123.40
SH	ROOT	Medium gray, abundant black root traces, disrupted bedding, occasional coarse, faint siderite nodules, few slickensides, gradational lower contact on base of roots.	3.08	1126.48
SH		Medium gray, dark gray to black streaks, few coarse siderite nodules, few slickensides, coalified plant debris, pyritized plant fragments, very well preserved plant leafs at 1130.00', branching venation, sharp lower contact.	5.27	1131.75
SH	BLK	Thin banded, sharp lower contact, finely dispersed organic material.	0.05	1131.80
MDST		Medium gray, coaly streaks and material in top	2.20	1134.00

		0.30', finely brecciated in upper 0.03', light gray to brown material in brecciated zone, occasional roots and slickensides, weakly bedded, silty, hard, sharp lower contact.		
LS		**TOP JOHNSTOWN CEMENT LIMESTONE** Medium gray with light gray nodules in upper 0.10', hard, no fossils seen, gradational lower contact mixed with unit below.	0.54	1134.54
LS		Light gray, hard, dense, very nodular mixed with upper unit in upper 0.50', vertical fractures filled with darker material above, the rest is faintly nodular, sharp lower contact on color and composition change.	1.51	1136.05
LS	NODAR	Medium gray matrix with abundant fine to coarse, distinct, light gray nodules and streaks, angular, sharp lower contact. **BASE JOHNSTOWN CEMENT LIMESTONE**	4.95	1141.00
CLST	CALC INCL	Medium gray with medium gray green zones, abundant fine to medium, light gray, distinct calcareous nodules, non calcareous matrix, slickensides, sharp lower contact.	1.22	1142.22
CLST	KAOL	Light gray, brown, fine to medium gray green streaks and gray clasts, thin black streaks at base, sharp lower contact.	0.28	1142.50
SH	CALC INCL	Medium gray green, slightly silty to top with faint, fine to coarse calcareous filled vertical fractures throughout and nodules, gradational lower contact on loss of calcareous nodules, sharp lower contact on color.	6.12	1148.62
SH		Medium gray green, with very thin wispy black streaks, sharp lower contact.	0.46	1149.08
SH		Medium gray green, hard, silty, sharp lower contact on color change.	2.25	1151.33
SH		Dark gray, with black streaks, sharp lower contact.	0.10	1151.43
SH		Medium gray with few medium gray green streaks, slightly sandy in basal 0.10', dark gray small fracture fills, no fossils seen, sharp lower contact.	1.26	1152.69
SS		Light gray green, medium to coarse grained, with medium gray green streaks, high angle planar cross laminations, micaceous, lithic fragments, ripple cross laminae sets approximately 0.20', fine grained streaks 1154.78' - 1154.91', angular sharp	2.22	1154.91

		lower contact.		
SS	XBD	Medium grained, light gray to gray, high angle planar cross beds, lithic, very scattered coaly fragments < 1 mm, locally micaceous with mica streaks, sharp, erosional lower contact.	2.07	1156.98
SS	XBD	Fine grained at top, medium and coarse grained streaks throughout, light gray green with medium gray green streaks, locally micaceous, lithic, shaly silty streaks, light gray 1158.80' - 1159.00', very occasional small coaly fragments with small pyrite, angular sharp lower contact on grain size.	4.36	1161.34
SS		Fine grained, gray green, faint high angle cross beds with medium grained streaks, light gray, angular, sharp lower contact, lithic.	1.01	1162.35
SS	XBD	Light gray green with medium gray green streaks, fine grained to top, medium and coarse grained to base, bi-directional cross beds, locally micaceous, very occasional thin coaly streaks, lithic, angular, sharp lower contact.	3.17	1165.52
SS		Fine grained to top, grades to medium grained in center and fine grained at base, light gray to light gray green, various low angle planar cross beds with occasional high angle cross beds, very lithic, sharp lower contact on grain size.	1.27	1166.79
SS		Medium grained, light to medium gray green, scattered small thin coaly fragments, lithic, locally micaceous, becomes very faint to nonbedded at base, sharp lower contact.	3.17	1169.96
SS		Light medium gray green, medium grained with very thin small coaly fragments, lithic, micaceous, low angle planar cross beds, sharp lower contact on color.	1.56	1171.52
SS		Light gray, medium grained, coaly fragments, very small shale pebbles, lithic, poorly bedded, sharp lower contact on grain size.	0.46	1171.98
SS		Very fine grained, light gray, flat planar bedding, sharp lower contact.	0.12	1172.10
SS		Light gray, medium to coarse grained, locally micaceous, faint ripple bedding, sharp, angular lower contact.	0.96	1173.06
SS	SLTY	Light gray with medium dark gray streaks top and bottom, flat bedded, sharp lower contact.	0.17	1173.23

SS		Light gray with darker gray streaks, medium to coarse grained, low angle planar bedding, increasingly silty and shale streaks to base, sharp lower contact.	1.77	1175.00
SS		Fine grained, light gray, mostly planar cross laminations in various directions, lithic, rounded shale pebbles at 1176.92.	3.50	1178.50
SS	SH INBD	Very fine grained, light gray, faint, planar cross laminations and rock fragments, with medium gray shale laminations, increasing shale in lower 0.13', sharp lower contact.	0.61	1179.11
SS		Very fine grained, light gray with rounded light gray brown shale pebbles and shaly streaks, medium gray, lithic, micaceous streaks, ripple laminae, ripple cross laminations, sharp lower contact.	1.34	1180.45
SH	SS STR	Medium gray to gray brown,1 dark coaly streak less than 0.01' at base, light gray, very fine grained, rippled sandstone streaks, especially to top, sharp lower contact.	0.67	1181.12
SS		Light gray, very fine grained, ripple laminated, abundant rock fragments, sharp lower contact.	0.68	1181.80
SH		Medium gray with abundant dark gray streaks, plant trash, sharp lower contact.	0.29	1182.09
SS		Light gray, very fine grained, ripples with planar laminations and planar cross laminations, few dark gray shale and dark gray coaly streaks, sharp lower contact on lithology.	2.01	1184.10
COAL	CLRN	**TOP MIDDLE KITTANNING COAL UPPER SPLIT** Clarain, dull; attrital; very thinly laminated; occasional thin vitrain bands; occasional pyritized fusain bands; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	1.23	1185.33
COAL	CLRN	Clarain, dull; very thinly laminated; common, very thin carbonaceous shales (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE MIDDLE KITTANNING COAL UPPER SPLIT**	0.07	1185.40
SH		Dark gray to top, medium gray to base, faint roots mixing with lower unit at base, gradational lower contact, coalified plant material in upper 0.30'.	1.75	1187.15
SS	BRW	Weakly calcareous, very fine grained, light medium gray, bioturbated, dark gray to black coaly streaks, ripple laminated, sharp lower contact.	0.47	1187.62

SH	BRW	Dark gray to black, horizontal and sub vertical burrows approximately 5 mm wide filled with sand, coalified plant stems to base, sharp lower contact.	0.38	1188.00
SH	COAL STR	Dark gray; abundant (50%) coal stringers; sharp lower contact (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.15	1188.15
COAL	CLRN	**TOP MIDDLE KITTANNING COAL MAIN SPLIT** Clarain, dull; thinly laminated; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.40	1188.55
COAL	SPLINT	Splint; hard; attrital with few small vitrain fragments; low density; conchoidal fracture; sharp, inclined, erosional base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.08	1188.63
COAL	CANL	Cannel matrix with common, very thin vitrain bands; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.19	1188.82
COAL	CANL	Cannel; very few, thin vitrain bands and angular fragments; low density; conchoidal fracture; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	1188.92
BN		Rare 1mm megaspores; sharp, irregular base on pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	1188.94
COAL	FS	Fusain; pyritized; 1-3cm pyrite lenses in clarain; irregular base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.06	1189.00
COAL	CLRN	Clarain, dull; hard; occasional 1-3mm vitrain bands; few large vitrains with abundant small cleat pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.45	1189.45
COAL	CLRN	Clarain, bright; soft; >95% 1-10mm vitrain bands; common, small, pyritized fusain lenses; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.55	1190.00
COAL	CLRN	Clarain, dull; minor, small pyrite lenses; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.17	1190.17
BN		Sand-size (quartz?) grains in upper half; high density; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	1190.27

COAL		Vitrain; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	1190.31
COAL	CLRN	Clarain, bright; >95% 1-3mm vitrain bands; common pyritized fusain lenses; minor cleat calcite and pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE MIDDLE KITTANNING COAL MAIN SPLIT**	0.14	1190.45
CLST	ROOT	Light medium gray, alternating hard and soft crumbly zones, thin white layer of non reactive mineral at 1192.00' (gypsum?), sharp lower contact.	2.83	1193.28
SLST	ROOT	Light gray, slightly sandy to base, gradational lower contact.	2.37	1195.65
SS	ROOT	Light gray, fine grained, abundant mica, faint planar cross laminations, sharp lower contact.	0.45	1196.10
SH	SLTY	Medium gray with light to dark gray bands, 2 mm band of white soft, non water soluble mineral at top (gypsum?), 1 silty sandy vertical fracture, silty top 0.10', possible bioturbation, darker in basal 0.10', sharp lower contact.	1.98	1198.08
SS		Light gray, fine grained, abundant lithic grains, mica, possible burrow 1198.75', planar laminated to base, planar cross laminated center, ripple laminated to top, gradational lower contact on shale streaks.	3.52	1201.60
SH		Medium dark gray, silty laminations, occasional roots, coalified plant trash, sharp lower contact on base of silty streaks.	1.70	1203.30
SH		Medium gray, plant debris and trash, siderite rich streaks and nodules below 1205.00', sharp lower contact on color.	2.76	1206.06
COAL	CANL	Black, very smooth, hard, uniform, small flecks of pyrite, impure, bony, semi conchoidal break, will not burn, black streak, sharp lower contact, more likely a cannel shale.	0.45	1206.51
CLST	ROOT	Medium dark gray, with dark gray and black streaks, abundant black coalified root traces, siderite nodules below 1208.70', gradational lower contact on base of roots.	3.37	1209.88
SH		Medium gray to dark gray with few light gray silty bands, possible burrows at 1211.60', occasional slickensides, coalified plant debris, roots, sharp lower contact on color.	2.54	1212.42

SH		Medium gray, possible sideritized burrows and nodules from 3 mm to 1 cm in diameter, arbitrary lower contact on silty streaks, roots, coalified root material.	1.14	1213.56
SH	SLTY	Medium gray with gray to medium gray silty streaks up to 6 mm thick, regularly spaced at approximately 1.5 cm, roots, becomes fine grained, gray, ripple laminated (1 mm to 1.5 cm) sandy streaks below 1215.00', ripples, burrows at 1215.80', siderite nodules approximately 0.04' at 1216.95', microslumping 1216.84' - 1216.95' filled with sandy material 1216.17' - 1216.34', burrowing to base, sharp lower contact.	3.63	1217.19
SS		Light gray, very fine grained with dark gray shale streaks, discontinuous disrupted shale streaks 1217.40', abundant shale streaks 1217.82' - 1218.15', sharp lower contact.	1.16	1218.35
SH	SS INBD	Medium gray beds up to 1.70' thick to 0.10' thick with light gray, very fine grained, planar to ripple laminated sandstone beds (from 0.10' thick) up to 0.40', abundant plant debris, well preserved plant fossil at 1222.68', sharp lower contact on basal sandstone.	4.86	1223.21
SH		Medium to dark gray to black, fissile, some soft streaks, coaly plant material, locally conchoidal breaks, lycopod stems, calamite stem, slightly silty below 1228.00', sharp lower contact on change in color and composition.	6.20	1229.41
COAL	NP	**POSITION OF LOWER KITTANNING COAL (ABSENT).**	0.00	1229.41
SLST	ROOT	Medium gray, few dark gray root streaks, gradational lower contact at thin sandy streaks.	3.30	1232.71
SLST	SDY	Medium gray with thin light gray, very fine grained, abundantly micaceous, rippled sandstone streaks, and wispy discontinuous lenses, one angular coal streak at 1237.26', gradational lower contact on color and composition.	5.49	1238.20
SH	SS INBD	Medium dark gray, silty sandy shale beds from 0.10' to 1.00' thick with light gray, very fine grained, faint, ripple laminated sandstone streaks within them and interbedded light gray, very fine grained ripple laminated sandstone beds from 0.05' to 0.20' thick, sharp lower contact.	5.14	1243.34
SS	SH INBD	Sand is light gray, very fine grained at top 0.70' with inclined, slump laminations with dark gray shale laminations, beds below are mainly ripple	6.36	1249.70

		laminated with some planar cross lamination zones, sand beds are 0.10' to 1.50', predominately sandstone in basal 2.70', shale beds are medium gray with silty/sandy streaks from 0.10' - 0.50' thick, sharp lower contact on color and composition change.		
SS	COAL CLS	Light gray with white quartz-rich streaks, medium grained, faintly planar laminated, moderately abundant coal clasts, one 0.30' coal band at 1250.00', sharp lower contact on grain size and composition.	1.41	1251.11
SS	XBD	Light gray, very fine grained, planar cross laminated, very micaceous, lithic, abundant rock grains, sharp lower contact.	9.85	1260.96
SS		Light gray, medium to coarse grained, very micaceous in zones, abundant rock grains and minerals, some zones of ripple laminations but highly disrupted into brecciated pattern 1268.20' to base, burrowed/bioturbated/gas escape?, darker gray with few coarse grains up to 2 mm in bottom 1.00', angular sharp lower contact.	9.44	1270.40
SH		Dark gray.	0.10	1270.50
SH BLK		Carbonaceous. SAMPLED BY USGS FOR METHANE TESTING.	0.15	1270.65
COAL	IMP	**TOP OF CLARION COAL ZONE** Bony; inclined (45 degrees) disrupted band (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	1270.75
SH	CARB	Black; bony; highly carbonaceous; occasional thin vitrain stringers; inclined bedding (30-45 degrees); slickensided; (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.30	1271.05
SH	BLK	Black; occasional thick vitrain stringers representing stems?; slickensided, inclined (15-30 degrees), irregular bedding; large pyrite lens at top; top horizontal; inclined, sharp base; (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.15	1271.20
COAL	CLRN	Clarain, dull; common thick vitrain lenses; sharp, inclined base; (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	1271.30
COAL		Durain, dull; sharp inclined base; (described by Bill Grady in lab). SAMPLED BY USGS	0.05	1271.35

	FOR METHANE TESTING.		
COAL IMP	Bony to bone; nonbanded; canneloid; medium density; (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.15	1271.50
COAL CLRN	Clarain, dull; hard; numerous isolated 1 cm pyrite lenses throughout; (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.85	1272.35
SH	Dark gray to black, coalified stems, few slickensides, gradational lower contact on loss of bedding.	0.45	1272.80
CLST ROOT	Light medium gray, abundant root traces, 1 soft zone at 1274.00' for 0.15', sharp lower contact.	2.40	1275.20
MDST	Medium dark gray, internally massive, top and bottom contacts are arbitrary on grain size, silty throughout, roots.	0.24	1275.44
CLST ROOT	Medium dark gray, slightly silty below 1276.55', internally massive, poorly developed slickensides, poorly preserved stem fragments to base, base sharp on grain size increase.	1.48	1276.92
SLST	Light medium gray grades to base to dark gray shale, laminations to 0.13' thick, rooted, sharp lower contact.	0.31	1277.23
SLST	Medium gray, nonbedded, carbonized root traces.	0.12	1277.35
MDST SLTY	Medium gray with light medium gray, very fine grained sandstone streaks to 0.02', sharp lower contact on grain size, poorly bedded, rooted.	0.61	1277.96
SS	Very fine grained, medium light gray, thin bedded, rooted, ripples, very dark gray root traces, sharp lower contact.	0.18	1278.14
SH	Medium to medium dark gray, grades to claystone in lower half of unit, fissile, occasional carbonaceous stems, roots, sharp lower contact.	0.56	1278.70
COAL IMP	Bony to bone; thin carbonaceous shale bands; occasional vitrain bands; common disseminated pyrite throughout; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.10	1278.80
COAL CLRN	Clarain, bright; >75% 1mm vitrain bands; common very thin pyritized fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE	0.26	1279.06

		TESTING.		
COAL	CLRN	Clarain, dull; very thinly laminated; splinty; lenticular in core (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.03	1279.09
COAL	CLRN	Clarain, bright; >95% 1-3mm vitrain bands; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	1279.14
COAL	CLRN	Clarain, dull; very thinly laminated; minor pyritized fusain lenses, more frequent near base; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.34	1279.48
COAL	CLRN	Clarain, bright; very abundant cleat pyrite in cleats 1-5mm apart and minor but 1mm thick cleat calcite; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.09	1279.57
COAL	CLRN	Clarain, dull; very thinly laminated; few small pyrite blebs and lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.25	1279.82
COAL	CLRN	Clarain, dull; hard; thinly laminated; common pyrite lenses; thin cleat calcite in top half; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.20	1280.02
COAL	CLRN	Clarain, dull; thinly laminated; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.18	1280.20
COAL	IMP	Bony to bone; thinly laminated; abundant <1mm megaspores; pyrite lenses at top; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.06	1280.26
COAL		Vitrain (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.01	1280.27
COAL	CLRN	Clarain, dull; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.08	1280.35
COAL	CLRN	Clarain, bright; >95% 1-3mm vitrain bands; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.04	1280.39
COAL	CLRN	Clarain, dull; hard; occasional 1-3mm vitrain bands (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.14	1280.53
COAL		Durain; dull; hard with conchoidal fracture; several 1mm isolated vitrain bands; sharp base	0.05	1280.58

		(described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.		
COAL		Vitrain; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	1280.60
COAL		Durain; dull; hard; minor, very thin, irregular banding; medium-high density; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.07	1280.67
COAL	CLRN	Clarain, dull; hard; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	1280.72
COAL	CLRN	Clarain, bright; abundant 4X20mm pyritized fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE CLARION COAL ZONE**	0.08	1280.80
SH		Very dark gray, carbonaceous, poorly bedded, large carbonized plant debris, roots, sharp lower contact.	0.20	1281.00
CLST		Medium gray, carbonized material throughout, eluviated down, soft, broken in barrel.	0.30	1281.30
CLST		Brown gray, kaolinitic, locally semi-flint, poorly developed slickensides, locally very soft, broken in core barrel, medium dark gray streaks throughout, sharp lower contact on color and lithology.	3.10	1284.40
CLST		Dark gray to black, abundant poorly developed slickensides, coaly plant material.	0.15	1284.55
CLST	KAOL	Brown gray, with abundant sub vertical, distinct dark gray to black root traces, basal 0.15' is very soft, slickensides.	0.85	1285.40
SLST	SDY	Medium brown gray, mica flakes, coarse grained to base, abundant clay matrix, sharp lower contact on grain size increase.	0.30	1285.70
SLST	SDY	Sandy streaks to fine grained sandstone at base, light gray to gray with very faint, flat, planar laminations to base, locally micaceous, internally massive at top, sharp lower contact on grain size.	2.60	1288.30
SS		Light gray, nonbedded, lithic, locally micaceous, fine to fine - medium grained at base, very faint flat planar bands, sharp lower contact on grain size.	2.89	1291.19
SLST	SDY	Light gray with light medium gray sandy streaks,	2.58	1293.77

		micaceous, small poorly preserved plant debris, sharp lower contact on grain size.		
SH	SLTY	Medium gray, siderite streaks up to 0.08' below 1295.80', sharp lower contact on color, occasional poorly developed slickenside below 1299.00'.	5.63	1299.40
SH	BLK	Conchoidal fracture, sharp lower contact.	0.20	1299.60
CLST	KAOL	Dark gray and medium brown gray, soft, broken, crumbly, sharp lower contact, abundant poorly developed slickensides.	0.20	1299.80
SH	CARB	Black, abundant thin coaly streaks, sharp lower contact.	0.11	1299.91
CLST	SOFT	Kaolinitic, brown gray, soft, crumbly, sharp lower contact.	0.23	1300.14
MDST	ROOT	Medium gray, rooted, sharp lower contact.	0.25	1300.39
CLST		Brown gray, hard, silty streaks, featureless.	4.63	1305.02
CLST		Brown gray, hard, with abundant, small ½ mm scale pyritic 'bb's', vertical roots extending through next unit with dark gray to black mineral fill, occasional small poorly developed slickensides, sharp lower contact on color.	2.31	1307.33
SH	ROOT	Dark gray, poorly bedded, rooted, occasional very small, very thin subvertical fractures, sharp lower contact.	1.53	1308.86
SLST		Light gray, with medium gray streaks, sandy to base, gradational lower contact on increasing sand.	1.50	1310.36
SS		Very fine to fine grained, light gray, bioturbated or rooted top to 1311.00', faint low angle planar to nonbedded at base, micaceous, lithic, silty/ shaly wisps, increasing dark gray shaly streaks to base, gradational lower contact, locally mica rich streaks.	6.86	1317.22
SH	SLTY	Gray, ripple laminated with darker gray streaks, locally mica rich streaks, darker shaly streaks in basal 0.20', gradational lower contact.	0.76	1317.98
SLST	SH STR	Light gray with dark gray streaks, ripple laminated, slightly sandy to base, sandy streaks below 1323.00', poorly preserved plant matter, locally micaceous, occasional very small coalified plant material, gradational lower contact on loss of sandstone and silt.	5.66	1323.64

SH	SLTY	Medium gray, hard, poorly bedded, siderite, slickensides, 0.10' thick sandy streaks at 1324.30', slightly sandy at base, very occasional scattered coaly plant fragments, sharp lower contact.	0.76	1324.40
COAL	IMP	**TOP UPPER MERCER COAL** Bony to bone; thinly laminated with very thin carbonaceous shales; common very fine pyrite on bedding; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.05	1324.45
COAL	CLRN	Clarain, dull; thinly laminated; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.20	1324.65
COAL	CLRN	Clarain, bright; >75% 1-3mm vitrain bands (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.33	1324.98
COAL	FS	Fusain, soft and lenticular (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	1325.00
COAL	CLRN	Clarain, dull; common thin fusain lenses (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE UPPER MERCER COAL**	0.15	1325.15
CLST	ROOT	Dark gray, abundant roots, small slickensides, coalified plant material, sharp lower contact, locally soft, crumbly.	0.32	1325.47
CLST	ROOT	Medium gray grading to light medium gray to base, locally poorly developed slickensides, abundant roots, soft, crumbly 1325.70' - 1326.10', harder below 1326.20', fine sand sized brown grains suspended in matrix from 1327.15' - 1328.75', abundant dark gray to black root traces, decreasing with depth, sharp lower contact on color, gradational lower contact on bedding.	4.88	1330.35
SH		Medium to medium dark gray, roots and coalified plant material, lycopod stems, poorly preserved plant fossils, weakly bedded, silt filled roots, occasional mica, very fine, light gray silty streaks < 0.02' thick, inclined at approximately 10 degrees, sharp lower contact on color and lithology.	2.30	1332.65
SH		Dark gray, well preserved plant fossils, siderite nodules below 1332.94' and throughout, size and amount decreasing to base, coalified plant material, lycopods stems, sharp angular lower contact on color and lithology.	2.17	1334.82

SH		Dark gray to black with abundant plant trash, coalified plant material, thin coal streaks, sharp lower contact.	0.18	1335.00
COAL	CLRN	Sharp lower contact. NOT SAMPLED FOR METHANE, LEFT IN CORE BOX	0.33	1335.33
CLST	ROOT	Very dark gray, rooted, sharp lower contact.	0.16	1335.49
CLST	ROOT	Medium dark gray, rooted, abundant stem and root debris, soft and crumbly 1336.28' - 1336.75', occasional poorly developed slickensides, sharp lower contact.	2.33	1337.82
CLST	ROOT	Medium gray, rooted, darker gray discontinuous shaly streaks at 1337.70' to base, locally micaceous at base, gradational lower contact on shale streaks below.	1.46	1339.28
SLST	SH STR	Gray to medium gray, dark gray planar laminated shale streaks up to 0.03' thick, abundant micaceous streaks, coalified plant material, gradational lower contact on loss of streaks.	4.15	1343.43
SLST	SH STR	Light gray, with medium to dark gray planar laminated shale streaks, very micaceous throughout, sharp lower contact.	1.43	1344.86
SH	SLTY	Medium gray with light gray, planar ripple laminations, coalified plant material, occasional siderite nodules, very poorly preserved plant fragments, very scattered mica, coaly plant material, lycopod stems, preservation is better to base, occasional slickensides to base, arbitrary lower contact.	10.14	1355.00
SH		Dark gray, abundant siderite nodules to 0.05', coalified plant material to base, sharp lower contact on coal, thin, dark gray to black shaly and coaly streaks to base.	2.50	1357.50
COAL	CLRN	**TOP OF LOWER MERCER COAL.** Clarain, dull; hard, common small black shale lenses and small pyritized fusain lenses; gradational base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.13	1357.63
COAL		Durain; bony; nonbanded; conchoidal fracture; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.28	1357.91
COAL		Durain; splinty; nonbanded; conchoidal fracture; medium density; few 1cm pyrite nodules (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE	0.21	1358.12

		TESTING.		
COAL	FS	Fusain; mineralized with clays and pyrite (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.03	1358.15
COAL	CLRN	Clarain, dull; soft; conchoidal fracture; common fusain lenses, most pyritized (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF LOWER MERCER COAL**	0.35	1358.50
CLST		Dark gray, very well developed slickensides, sharp lower contact.	0.15	1358.65
CLST	KAOL	Medium gray with medium brown gray, soft clayey kaolinitic zones up to 1.60' thick, rooted, plugged off here in core barrel resulting in early barrel pull at 1365'.	2.17	1360.82
CLST	ROOT	Dark gray, locally broken in core barrel, rooted, slickensides, gradational lower contact on bedding.	2.18	1363.00
SH		Medium gray, slightly micaceous, root traces, small coalified plant fragments, occasional silty zones 1369.00' - base, poorly preserved plant debris, sharp lower contact on sand.	8.85	1371.85
SH	SS STR	Medium dark gray shale in beds from 0.20' to 1.00' thick, sand is light gray, very fine grained, ripple laminated sandstone streaks from 0.10' to 0.75' thick, possible sand filled slump fractures at 1372.00' and 1375.00 - 1376.00', sharp lower contact on top of cleaner sand, scattered plant trash, occasional roots.	10.23	1382.08
SS	SH CLS	**TOP OF 2ND SALT SAND** Light gray, very fine grained, ripple laminated, with few, very, very coarse, medium gray shale clasts, especially from 1382.70' - 1383.24', angular sharp lower contact.	1.17	1383.25
SS		Light gray, fine grained with medium grained zones, lithic planar ripple laminated and planar cross laminated, occasional shale clasts and streaks 1382.20' - 1383.53', micaceous, thin coaly streaks 1387.15' - 1387.30' and 1391.50' - 1391.65', locally abundant mica, possible weak stylolites, occasional small shale clasts 1388.00', 1309.00', 1391.50', 1401.00', sharp lower contact on grain size change.	18.60	1401.85
SS	XBD	Light gray, fine to medium grained coarsens upward, few quartz pebbles to 2 mm diameter, mica	1.07	1402.92

		concentrated on cross beds, high angle planar, sharp lower contact.		
SS	QTZ PBL	Light gray, coarse grained with pebbles to 6 mm diameter, high angle coal clasts, medium gray slickensided shale clasts at base, sharp, wavy, angular lower contact.	0.50	1403.42
SS		Fine grained, light gray, lithic arenite, micaceous, dark minerals, rock fragments, cleaner than above sands, faint planar cross laminations, few light gray shale clasts in upper 0.25', sharp lower contact at grain size and composition change.	2.44	1405.86
SS	CGL	Light gray, coarse grained matrix, > 95% quartz, abundant quartz pebbles up to 1 cm diameter, very occasional shale pebbles, "poker chip" breaks at 1411.00', very porous, high angle coal streaks, clasts in basal 0.70', sharp lower contact on grain size change.	7.67	1413.53
SS		Light gray brown, very fine grained, fairly quartz rich, dark cement, siderite and siderite cemented sandstone pebbles, few shale pebbles, sharp lower contact on composition and bedding.	0.39	1413.92
SS	XBD	Light gray, fine to medium grained, abundant mica on cross bed surfaces, some lithic fragments, high quartz content, truncated ripple cross laminations, sharp lower contact on grain size and composition.	6.11	1420.03
SS	CGL	Light gray, medium to coarse grained, > 95% quartz, scattered quartz pebbles up to 1 cm in diameter, abundant in basal 0.50', few siderite pebbles, sharp lower contact.	4.47	1424.50
SS		Light gray, fine to medium grained, 1 coaly streak, fairly clean, few stylolites below 1426.00', quartzose to base, sharp lower contact at grain size change.	3.88	1428.38
SS	QTZ PBL	Light gray, coarse grained, with abundant quartz pebbles a few of which are up to 1 cm in diameter, few dark gray shale and medium gray siderite pebbles, large (0.20') siderite pebbles at base, high angle coal streaks with slickensides 1428.60' - 1428.70', sharp lower contact on grain size and composition change.	0.95	1429.33
SS		Light gray, fine grained, abundant mica, lithic, massive, sharp lower contact.	0.52	1429.85
SS	XBD	Light gray, fine grained, planar cross to ripple	0.81	1430.66

		cross laminated, large (up to 0.10' diameter) siderite nodules in base, sharp lower contact. **BASE OF 2ND SALT SAND**		
SH	SS INBD	Shale is medium gray, finely micaceous, silty, calamite stems, occasional carbonized plant fragments, occasional lycopod leaves, light gray, very fine grained, rippled sandstone streaks and beds/zones up to 0.60' thick with shale streaks, some bioturbation and or slumping. sharp lower contact.	10.64	1441.30
SS	QTZ	Light gray, fine to medium grained, > 95% quartz, mostly planar cross laminated, large, medium gray shale clasts near top, "poker chip" wafers approximately 1 cm thick from 1442.00' - 1444.00', 1446.38' - 1452.90', abundant stylolites (coaly and micaceous) extending up to 3 mm at 1445.95', quartz arenite, rounded to subrounded, quartz cement, sharp lower contact on grain size.	11.45	1452.75
SS		Light gray, very fine grained at top to fine grained at base, occasional coaly clasts 0.01' x 0.02', and thin coaly wisps, "poker chip wafers" 1453.00' - 1453.40', occasional dark gray silty clasts, low angle planar cross beds, minor stylotization, 0.01' coal streak at 1454.50', locally mica rich streaks, very thin coaly and silty/shaly streaks 1459.50' - 1459.93', sharp lower contact on lithology.	7.66	1460.41
SS	SH CLS	Fine grained, white to light gray, with very abundant, angular to subrounded shale clasts and silty clasts ranging from gray to medium gray, tan and brown, up to 0.06', coaly streaks approximately 0.01' to 0.02' thick at 1461.00' - 1461.12', occasional medium grained sand grains and flat tabular, dark gray shale rip-ups to base, sharp lower contact with slight 0.03' thick zone of mixing.	0.81	1461.22
CLST		Brown gray, abundant very well developed slickensides, slightly sandy and silty, dark gray to black organic remnants - roots, darker gray to base, pyrite lenses at base, sharp lower contact on coal.	3.63	1464.85
COAL	IMP	**TOP QUAKERSTOWN COAL ZONE** Clarain, dull and bright; coal fractured and highly contorted in core with offset (faulted); pyrite lenses and shales; slickensides; pyrite extremely abundant in upper half; sharp angular base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.75	1465.60

CLST		Very dark gray; bony; very thin coaly streaks; abundant very small plant debris; intact roots?; very small disseminated pyrite lenses; pyrite band at top; slickensided; angular sharp lower contact (described in lab by Bill Grady).	0.12		1465.72
CLST		Dark gray, abundant slickensides, sharp, slightly angular lower contact.	0.76		1466.48
SH	BLK	Sharp lower contact.	0.02		1466.50
MDST		Dark gray, very well developed slickensides, slightly softer to base, sharp lower contact on color.	1.53		1468.03
SH		Very dark gray, poorly bedded, abundant very well developed low angle slickensides, sharp lower contact on color.	2.16		1470.19
SH	CARB	Black, coal streaks, very thin, sub-mm COAL streaks, sharp lower contact.		0.09	1470.28
MDST	ROOT	Very dark gray grades to dark gray at base, small mica flakes, gradational lower contact.	0.39		1470.67
SLST		Dark gray in upper 0.20' grades to light gray at base, micaceous, occasional very fine grained sandy grains, carbonaceous plant material, sharp lower contact on color.	2.75		1473.42
SLST		Gray to medium gray, mixed with dark gray to black shaly streaks, zone of mixing especially in basal 0.20', impure coal streaks to base, sharp, angular lower contact on lithology.	0.64		1474.06
COAL	CLRN	Bright banded, pyritic in upper 0.12', sharp lower contact.	0.12		1474.18
SH	BLK	Sharp lower contact.	0.02		1474.20
CLST	ROOT	Dark gray, coal streak at 1474.42', abundant very well developed slickensides, roots, pyritized rootlets, coalified plant stems, occasional very well preserved plant fragments, sharp lower contact.	1.40		1475.60
COAL	CLRN	Clarain, dull; few 1mm vitrain bands in top; lower half grades into bone (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.06		1475.66
BN		Thinly laminated; sharp base (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.02		1475.68
BN	PYR	Abundant pyrite lenses (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.03		1475.71

COAL	CLRN	Clarain, dull; thinly laminated; sharp base (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.02	1475.73
BN	PYR	Thinly laminated with common pyrite lenses and abundant 0.25 mm spherical pyrite nodules throughout (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.07	1475.80
COAL	CLRN	Clarain, dull; occasional 1mm vitrain bands; sharp base (described in lab by Bill Grady). SAMPLED BY USGS FOR METHANE TESTING.	0.09	1475.89
BN	PYR	Thinly laminated with abundant 0.25mm spherical pyrite nodules throughout (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.02	1475.91
COAL	CLRN	Clarain, dull; thin pyrite layer at top (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.07	1475.98
COAL	CLRN	Clarain, bright; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING.	0.42	1476.40
COAL		Clarain, dull; thinly laminated; sharp base (described by Bill Grady in lab). SAMPLED BY USGS FOR METHANE TESTING. **BASE OF QUAKERSTOWN COAL ZONE**	0.03	1476.43
SH	ROOT	Dark gray, pyritic material, coalified plant material, sharp lower contact on color.	0.30	1476.73
CLST	ROOT	Medium gray, poorly bedded, rooted, abundant slickensides, locally thin soft clayey zones, vertical to sub vertical fracture slickensides, sharp lower contact on lithology.	3.31	1480.04
CLST	ROOT	Light to medium gray, poorly bedded, slickensides, rooted, slightly silty 1480.62' - 1481.00', medium gray to base, sharp lower contact mixed with lower unit over 0.03'.	1.64	1481.68
CLST	ROOT	Medium gray, silty, grades to dark gray at base, slickensides, rooted, sharp lower contact on lithology.	0.73	1482.41
SH	CARB	Black, sub millimeter coal streaks, pyrite streaks, sharp lower contact.	0.09	1482.50
SH	ROOT	Medium gray, poorly bedded, rooted, slickensides, pyrite streaks, pyritized rootlets, gradational lower contact on color.	0.33	1482.83

SH	ROOT	Medium gray, abundant slickensides, small pyritized rootlets, sharp lower contact on lithology.	0.58	1483.41
SLST		**PENNSYLVANIAN - MISSISSIPPIAN BOUNDARY** Light medium green gray, occasional roots and small slickensides at top, some coalified plant debris, gradational lower contact, locally micaceous.	4.94	1488.35
CLST		Medium gray green, weakly bedded, few slickensides, few non calcareous, irregular streaks in basal 0.70', gradational lower contact on composition, sharp lower contact on color.	2.83	1491.18
CLST		Medium dark gray green with few, faint, dark gray streaks (root traces?) and bands, weakly bedded, few weak slickensides, sharp lower contact on composition and color change, few thin very soft zones.	2.33	1493.51
MDST		Medium gray green, slightly silty, few, distinct, fine to medium, slightly sideritic nodules in top 1.20', few weak slickensides, gradational lower contact on color change.	1.99	1495.50
MDST		Light to medium gray green with many, very coarse, gray red mottles, slightly silty, weakly bedded, large weakly calcareous, light gray brown irregular masses from 1498.00' - 1498.40', few fine nodules above 1498.00', arbitrary sharp lower contact at color change.	3.65	1499.15
MDST	MOT	Predominantly red with fine to coarse, distinct, light gray green mottles and streaks, weakly bedded, few bands and zones of light gray brown weakly calcareous material at 1499.60' and 1500.70', sharp lower contact at color change.	2.28	1501.43
SH	SLTY	Light gray green, weakly bedded, silty with very faint, sandy streaks from 1503.00' to 1503.50', sharp lower contact at color and composition change.	2.76	1504.19
SH	MOT	Predominately red with coarse, faint to distinct, light to medium gray green mottles, poorly bedded, hard, sharp lower contact on color change.	0.81	1505.00
MDST	MOT	Predominately medium gray green with coarse red mottles, dark gray to black streaks from 1505.55' - 1505.85', gradational lower contact on color.	1.33	1506.33
SLST		Light to medium gray green, hard, gradational lower contact on composition change.	2.59	1508.92

MDST	MOT	Medium gray green with many coarse, faint, red mottles, few slickensides, gradational lower contact on color.	2.08	1511.00
MDST	RED	Nearly solid red with few to common, faint, medium, gray green mottles and streaks, abundant slickensides, few faint to coarse, calcareous nodules, gradational lower contact on color.	10.36	1521.36
SLST	CALC INCL	Light gray green, weakly bedded with common, distinct, fine to coarse calcareous nodules and streaks, 1 - 2 mm thick calcareous laminations below 1523.35', sharp lower contact on grain size.	2.31	1523.67
SH		Light gray green, micaceous, few, fine to medium, distinct, calcareous nodules 1526.20' - 1526.35', slightly silty in zones, sharp lower contact on color change.	3.08	1526.75
CLST	RED	Red with few coarse, faint, medium gray green mottles and streaks especially in the upper 0.20', abundant well developed slickensides, few, fine to medium, distinct, light gray red calcareous nodules, particularly abundant in basal 0.35', sharp lower contact on color.	4.69	1531.44
SH		Interbedded light gray green and red, few, fine, streaks, distinct light gray calcareous material, sharp lower contact on color change.	1.38	1532.82
SH	RED	Red, weakly to poorly bedded, occasional medium gray green bands or streaks, non-calcareous, few slickensides, very gradational lower contact on bedding change.	6.18	1539.00
CLST	RED	Solid red, abundant slickensides, few, faint, harder, lighter gray red calcareous bands, 1 nodule at 1545.50', basal 1.00' is mottled with lighter gray red and medium gray green transition zone to next unit, gradational lower contact at base of red.	7.55	1546.55
SLST	CALC INCL	Medium gray green with abundant light gray to red, fine to coarse, distinct calcareous nodules and streaks, light gray to red matrix is calcareous in upper 2.50', micaceous, very calcareous 1549.00' - 1549.70', gradational lower contact on grain size increase and base of calcite.	3.70	1550.25
SLST		Medium gray green, slightly sandy, hard, sharp lower contact on sandstone.	1.25	1551.50
SS		Light gray green, very fine grained, grades down to siltstone, ripple cross laminated to planar ripple laminated, nonbedded at base, very gradational	2.06	1553.56

		lower contact on loss of sandstone.		
SH	SLTY	Medium gray green, hard, gradational lower contact on increasing sandstone.	0.40	1553.96
SS		Light gray green, very fine grained, planar laminated to 1554.62', planar cross laminated 1554.62' - 1554.68', flat planar laminated 1554.68' - base, grades to siltstone at base, gradational lower contact, few coarse, distinct, light gray, calcareous nodules 1556.30' - base.	3.34	1557.30
SH	CALC INCL	Medium gray green with light gray, fine to coarse, distinct, calcareous nodules, especially nodular 1558.75' - 1559.70', sharp lower contact on composition change.	3.05	1560.35
SS		Very fine grained, light gray green, few shale streaks and bands, medium gray up to 0.03' thick from top to 1563.47', ripple laminated and ripple cross laminated 1562.00' - 1567.00', flat laminated 1567.00' - 1568.00', massive 1568.00' - 1569.85', few very fine, dark gray shale clasts 1569.45' - 1569.85', faint, ripple laminations and planar cross laminations 1569.80' - 1571.35', zones of planar laminations, massive 1571.35' - base, sharp, slightly angular lower contact, especially massive in basal 4.50'.	21.17	1581.52
SH	SDY	Medium gray green, micaceous, with faint, very fine grained sandstone streaks, gradational lower contact on increasing sandstone.	0.68	1582.20
SS		Light gray green, fine grained, ripple laminated to slightly increasing ripple laminations, very micaceous, sharp lower contact.	6.75	1588.95
SS		Light gray green, very fine grained, very faint low angle ripple and planar laminations, few dark gray shale clasts at 1589.30' and 1590.45', distinct ripple cross laminations 1591.35' - 1591.99', sharp lower contact, thin pyrite streaks at 1590.50', very weakly calcareous.	4.03	1592.98
SH		Medium gray green, sharp lower contact.	0.14	1593.12
SS		Light gray green, very fine grained, ripple laminated, locally very micaceous, occasional organic matter, sharp lower contact.	0.61	1593.73
SLST	CALC INCL	Light gray green with abundant fine to coarse, light gray and black and tan calcareous nodules and streaks, sharp lower contact.	0.14	1593.87
SS	CALC	Light gray green, very fine grained, with large	0.76	1594.63

		medium gray shale clasts and coalified and pyritized plant stem 1594.30' - 1594.42', few fine to medium, light gray calcareous nodules at 1594.25', occasional thin, fine, dark gray streaks in basal 0.10', sharp lower contact on calcareous nodules.		
LS	NODAR	Light to medium gray green, light gray to dark gray streaks in matrix, very abundant faint to prominent, fine to coarse, white, light brown, light gray green, light gray, and dark gray calcareous nodules and streaks, probably fossils of bone or tooth fragments, sharp lower contact.	3.81	1598.44
SH		Medium gray green, occasional silty streaks, fine mica, sharp lower contact at sandstone, non-calcareous.	1.71	1600.15
SS		Very fine grained, light to medium gray green, silty, lithic, micaceous, sharp lower contact, weakly calcareous.	0.61	1600.76
SH		Medium gray green, hard, slightly silty to base, sharp lower contact on lithology.	2.17	1602.93
SS		Light gray green, fine to very fine grained, micaceous, silty, faint planar laminations, sharp lower contact.	1.48	1604.41
SH		Medium gray green, sharp lower contact.	0.82	1605.23
SS	SH INBD	Light gray green, very fine grained, sandstone beds to 0.90' with medium gray green shale bands 0.50' - 0.30', zone of mixing at 1608.90', shale is silty, micaceous, non-calcareous, sharp lower contact.	5.71	1610.94
SS		Light gray green, very fine grained, very faint flat planar cross beds with occasional high angle cross beds at top, micaceous, ripple cross laminations, 1621.00' - 1622.00', shale zone 1615.10' - 1615.35' and 1618.70' - 1619.25', sharp irregular lower contact.	9.26	1620.20
SLST	SDY	Medium gray green, faint planar cross laminations, sandy streaks, possible stem impression 1620.90', microfaulting at 1621.30', gradational lower contact on color change and composition, very well preserved plant fossils and stems 1623.00', pyritized and other roots.	2.83	1623.03
SH		Medium gray, root impressions to top, fossil pinnule at 1624.10', black coaly (?) streak 1624.08', dark gray to black, organic streak, sharp lower contact.	1.20	1624.23

SLST		Medium gray, micaceous, sandy, with light gray sandy streaks in thin zones, sharp lower contact.	4.57	1628.80
SS	SH CLS	Light gray, very fine grained, micaceous with abundant medium grained, rounded and angular shale clasts, especially in basal 0.75', sharp lower contact.	1.10	1629.90
SS		Light gray, very fine grained, micaceous, thin planar laminations, occasional black organic streaks on bedding plane, sharp lower contact.	2.21	1632.11
SS	CALC INCL	Light gray, very fine grained, with abundant, distinct, light gray, calcareous nodules, few pyrite nodules, sub mm organic streaks in top 0.05' and basal 0.10', sharp lower contact.	0.40	1632.51
SS	CALC	Calamite stems approximately 1.0 cm diameter, light gray, pyrite nodules, few light gray calcareous nodules to 0.20', organic streaks in basal 0.25', sharp lower contact.	0.64	1633.15
SS		Light gray, very fine grained, ripple laminated, fine organic/coaly matter on ripples from 1633.70' - 1634.00', with pyrite in same zone, sharp lower contact.	1.50	1634.65
SH	CALC INCL	Medium gray green with common light gray nodules, sharp lower contact.	0.41	1635.06
SS	CALC	Light gray green, very fine grained, micaceous, faintly ripple laminated, sharp lower contact.	0.78	1635.84
LS	NODAR	Light to medium gray green matrix, sandy, calcareous with abundant closely packed, light gray green to medium gray green and medium gray limestone nodules, sharp lower contact.	2.66	1638.50
SS	CALC	Light gray, very fine grained, faintly ripple cross laminated, mica, sharp lower contact.	0.57	1639.07
LS	NODAR	Light to medium (see nodular limestone unit above), basal 1.00' has non-calcareous shale matrix, calcite filled fracture at base, sharp lower contact.	3.43	1642.50
SH		Medium gray green with 1 red mottle, slickensides, sharp lower contact on color.	0.30	1642.80
SH	RED	Red with faint medium gray green mottles and streaks, common slickensides, light gray to white calcite streaks in top 0.45', mostly solid red below 1645.00' poorly bedded, sharp lower contact on color change.	4.00	1646.80

SH	SLTY	Medium gray green, silty, poorly bedded, gradational lower contact on composition and color.	1.10	1647.90
SH	CALC	Light gray with streaks of medium gray green in top 0.25' and basal 0.55', faintly ripple laminated throughout, calcareous throughout, gradational lower contact on base of calcareous content.	1.27	1649.17
SH		Medium to dark gray green with faint gray red bands in top half, non-calcareous with sub mm calcite coats on 2 fractures, 1 poorly preserved pelecypod (?) at 1650.37', poorly bedded, very slightly silty, fairly sharp lower contact on color.	2.22	1651.39
SH		Medium gray, very fine, very fissile, very fragile, but breaks mostly on low angle planes, soft, clayey zone from 1656.60' - 1656.80', very broken and fragile with slickensides from 1656.00' - base, possible pelecypod fragments and other fragments seen, sharp lower contact at fossils, calcareous.	8.39	1659.78
SH	FOSS	**TOP OF LITTLE LIME** Medium dark gray, very fine, abundant pelecypod, brachiopods, gastropods in calcite bands and scattered throughout, phosphatic tooth, sharp lower contact at limestone.	2.87	1662.65
LS	FOSS	Light gray with medium gray zones and matrix around nodular zones, abundant brachiopods, pelecypods, crinoids, mostly medium gray from 1645.00' to base with some hard, light gray beds from 1672.80 to base, sharp lower contact at lithology change.	9.05	1671.70
LS	FOSS	Light gray, abundant marine fossils, ostracods, trace fossils, bioturbated, shale rip-ups, scour surfaces, light gray sand sized ooids, burrow mottling.	2.15	1673.85
LS	FOSS	Light gray with medium gray zones and matrix around nodular zones, abundant brachiopods, pelecypods, crinoids.	1.55	1675.40
SH	FOSS	Medium dark gray, pelecypods, brachiopods, calcite on slickenside faces, very fissile, very thin sub mm bands of calcite, sharp lower contact.	5.75	1681.15
LS	FOSS	Medium gray with abundant marine fossils, brachiopods, pelecypods, crinoids, H2S smell with acid reaction, less fossiliferous and medium gray	1.10	1682.25

		green in basal half, sharp lower contact on color and composition. **BASE OF LITTLE LIME**		
MDST	MOT	Predominately dark red with faint, fine to medium, dark gray green mottles, weakly bedded, diffuse reaction to acid on grains, matrix is non-calcareous, gradational lower contact on bedding and color.	0.83	1683.08
SH		Banded predominately medium gray with diffuse, faint red bands, non-calcareous, lingula at 1683.90', sharp lower contact on texture.	2.12	1685.20
SLST		Medium gray green with faint red mottling, hard, micaceous, sharp lower contact.	1.01	1686.21
MDST	RED	Red with medium gray green top to 0.30', slickensides, slightly silty, one calcareous nodule below 1687.75', gradational lower contact on color.	2.72	1688.93
MDST		Medium gray green with faint, fine red mottles and streaks, gradational lower contact on bedding change.	0.97	1689.90
SH		Medium gray green and banded red, light gray green and medium gray, predominately medium gray in basal 0.12', soft clay zone, very fissile, very fine grained, sharp lower contact.	3.07	1692.97
LS		**TOP OF GREENBRIER LIMESTONE** Light gray, fine grained, hard, very fine, crenulated fractures, nodular with medium gray green matrix in basal 1.00' abundant fossils in basal 0.50', sharp lower contact.	5.70	1698.67
SH		Medium gray green, non-calcareous, soft zone in middle, sharp lower contact on color, 1 brachiopod piece.	0.32	1698.99
SH	RED	Red, non calcareous, sharp lower contact on color.	0.13	1699.12
SH		Medium gray green, non calcareous with thin calcite bands, no fossils seen, gradational lower contact on color.	0.19	1699.31
SH		Medium dark gray, mostly non-calcareous with very thin calcite bands, brachiopod and pelecypods, lingula, gastropod, gradational lower contact on increasing calcite cement.	2.04	1701.35
LS	ARG	Medium gray, silty, very fine, light gray, ripple streaks, pelecypod, basal 0.30' finely nodular to brecciated, sharp lower contact.	2.42	1703.77

SLST		Light gray green, hard, non-calcareous, sparse pyrite, weakly calcareous in basal 0.50', sharp lower contact.	1.76	1705.53
LS		Light gray, hard, cyclically interbedded, light medium and dark gray beds, some light gray beds are nodular, some vertical fractures, few calcite filled streaks, crinoids gastropods, brachiopods seen at various intervals, coral at 1739.30', more fossiliferous below 1725.00', thinner beds 0.50' and less thick from 1745.00' to base, gradational lower contact at basal light gray bed.	49.77	1755.30
LS	FOSS	Medium gray, hard, abundant gastropods, crinoids, and fossil fragments throughout, sharp lower contact at light gray bed.	3.60	1758.90
LS	FOSS	Interbedded light gray, mostly nodular limestone in beds approximately 0.60' down to 0.20' with medium gray beds, more argillaceous than above, becoming slightly fissile (shaly) to 1765.04', less fossiliferous than above, orbiculoid at 1764.30', sharp lower contact at color and composition change.	6.31	1765.21
LS	FOSS	Predominately light gray to white, very fine grained, moderately abundant ostracods visible on acid etched surfaces, hard, very thin (< 1 mm) crenulated vertical fractures filled with dark material, some sub horizontal fractures filled with white calcite, few medium gray beds with more abundant fossils - crinoids - from 0.05' - 0.20' thick, light gray beds from 0.20' to 1.10' thick, arbitrary sharp lower contact at top of thicker medium gray beds.	7.19	1772.40
LS	FOSS	Predominately medium gray beds from 0.40' to 0.70' thick, abundant crinoids, occasional pelecypods, occasional pyrite nodules, interbedded light gray beds from 0.15' - 0.40' thick, arbitrary sharp lower contact at top of thicker light gray limestone bed.	3.15	1775.55
LS	FOSS	Light gray, hard, very fine grained, abundant white calcite in sub-horizontal and vertical fracture fills, sharp lower contact at bedding change.	1.30	1776.85
LS		Medium gray, faintly laminated, somewhat crystalline, abundant fine, rounded grains on etched surface, probably quartz grains, no fossils evident, sharp lower contact on color and composition change. **BASE OF GREENBRIER LIMESTONE**	1.80	1778.65

SH		Medium gray green, non-calcareous with abundant light gray to white ripple laminated to ripple cross laminated fine grained lime sand streaks, few calcareous nodules to base, faint, coarse, red mottles and streaks from 1780.80' to base, gradational lower contact with mixing of color.	2.95	1781.60
CLST	RED	Red with common, fine to coarse, faint to distinct, light and medium gray green mottles and streaks, few faint, coarse calcareous nodules, 1 large nodule at 1785.00', abundant slickensides, becoming bedded to base, sharp lower contact on color.	5.18	1786.78
SH	CALC	Medium gray green, weakly calcareous to calcareous, spirorbis (?), some ostracods visible on acid etched surfaces, pelecypods, sharp lower contact.	2.06	1788.84
LS		Light gray, hard, white calcareous streaks in top, ostracods (?), sharp lower contact.	0.36	1789.20
SS	CALC	**TOP OF BIG INJUN SANDSTONE** Light gray green with light gray streaks, ripple laminations, possibly bioturbated or soft sediment deformation, fine to medium grained strongly calcareous sandy zones are quartz rich, sharp lower contact.	9.24	1798.44
SS	CALC	Light gray, zones of planar laminations and planar ripple laminations, calcareous to strongly calcareous, fine to medium grained, breakage in wafers 2 cm thick at 1801.00' - 1802.00', with rounded grains, fairly fine grained at base, sharp lower contact on color.	11.09	1809.53
SS	CALC	Light gray, fine grained, fairly clean, ripple laminations with abundant light gray green shaly streaks and laminations, finer grained at base, sharp lower contact.	7.00	1816.53
SS		Light gray green, very fine grained, weakly calcareous, bioturbated (?), light gray green disrupted shale laminations, sharp lower contact.	7.13	1823.66
SS	CALC	Light gray, fine to medium grained, with medium to dark gray mica rich zones especially and at top at bottom, sharp lower contact.	0.80	1824.46
SS		Light gray to white, slightly calcareous, very fine grained, fairly clean, abundant cement, sharp lower contact on composition.	0.62	1825.08
SS	CALC	Light gray, fairly clean with some mica zones,	1.48	1826.56

		faint planar laminations and planar cross laminations, sharp lower contact.		
SS	XBD	Light gray, planar cross laminated, alternating medium gray and light gray to white laminations, white laminations have more calcite cement, fine grained, gas show 1827.40' to base, sharp lower contact.	8.40	1834.96
SS		Light gray, fine to medium grained, weakly calcareous, zones of floating coarse grains in fine to medium grained matrix, sharp lower contact on color and grain size.	1.00	1835.96
SS		Light gray, very fine grained, massive, silty, slightly calcareous, sharp lower contact.	0.32	1836.28
SLST		Medium gray green, non-calcareous, sharp lower contact.	0.13	1836.41
SS		Medium gray green, non-calcareous, few floating coarse sand grains, sharp lower contact.	0.37	1836.78
SS		Light gray, fine to medium grained, scattered coarse grains floating in matrix, few pyrite nodules, sharp lower contact.	1.95	1838.73
SS		Light gray with light gray green streaks, fine to medium grained, sharp, irregular lower contact.	0.63	1839.36
SS	QTZ	Light gray, fine grained, quartzose, with dark gray mica laminations especially 1840.30' - base, sharp lower contact.	1.58	1840.94
SS		Light gray, medium grained, mostly quartz with moderately abundant black pyrite organic grains up to 1 mm diameter, odor of oil, sharp lower contact.	1.93	1842.87
SS		Light gray, very fine grained, mica, planar cross laminated, sharp lower contact.	0.30	1843.17
SS		Light gray, medium grained, mostly quartz, moderately abundant pyritic organic grains up to 1 mm, planar cross laminations, show of gas, sharp lower contact.	2.53	1845.70
SS		Light gray, fine grained, some mica, massive, light oil smell, show of gas, sharp lower contact.	1.42	1847.12
SS	XBD	Light gray, fine grained, occasional mica, non-calcareous, planar cross laminated, mica on surfaces, occasional shale clasts, show of gas, some change in lamination direction, sharp lower contact.	4.19	1851.31

SS	SH CLS	Light gray, fine to medium grained, abundant light to medium gray shale clasts, sharp lower contact.	0.99	1852.30
SS		Light gray, planar cross laminated similar to unit 2 above this one, sharp lower contact.	1.95	1854.25
SS		Light gray, fine grained, mostly quartz, massive to 1.00', planar ripple laminated from below top 1.00' to base, large medium gray shale clasts at top and at 1855.25', finer shale streaks and clasts 1856.20' - 1856.50', sharp lower contact.	2.90	1857.15
SS		Light gray, fine grained, ripple laminated, fine mica, occasional medium gray shale streaks, gradational lower contact with bedding change.	4.35	1861.50
SS	QTZ	Light gray, fine grained, faintly planar cross laminated, mica in top 0.50', massive below, sharp lower contact on gas show.	1.79	1863.29
SS	XBD	Fine grained, planar laminated to planar ripple laminated, slightly inclined, abundant mica, oil odor, gas show, sharp lower contact.	1.02	1864.31
SS	QTZ	Light gray, fine grained, massive, gas show, occasional medium gray shale clasts particularly abundant in basal 1.20', sharp, lower contact, gas show and oil shows 1867.50' - base, large vertical fractures 1867.00' - 1867.50'.	6.34	1870.65
SH	SS STR	Medium gray with light gray, very fine sandstone streaks in basal 0.30', irregular sandstone masses in top 0.30' (part of slump?), sharp lower contact.	1.05	1871.70
SS		Light gray, fine grained, mostly quartz, moderately abundant, medium gray shale clasts 5 mm long, shale streaks in basal 0.10', sharp lower contact.	1.02	1872.72
SH		Medium gray, fine mica, pyrite, sharp, angular lower contact.	0.26	1872.98
SS		Fine grained, light gray, dark mica streaks, ripple laminated, abundant mica, medium gray shale bands at 1876.70' - base, sharp lower contact.	3.74	1876.72
SS		Light gray, fine grained, some mica, fairly clean, gas show/oil odor, abundant organic rich streaks, medium gray shale layer 1880.08' -1880.13', sharp lower contact on grain size.	3.84	1880.56
SS	SH CLS	Light gray, fine grained, abundant medium gray shale clasts and pebbles, light green, shale	1.04	1881.60

		streaks, abundant black organic rich streaks, large medium gray shale clasts 1881.42' - 1881.45', sharp lower contact.		
SH		Medium gray, silty, sharp lower contact on grain size change.	2.33	1883.93
SH		Medium gray, slightly silty, few slickensides, light gray and red clasts, shale zone 1884.00' - 1884.20' with gas show, no fossils seen, gradational lower contact on color and composition.	3.45	1887.38
SH		Medium dark gray, fine with fine mica, slickensides, zone of faint, fine to coarse, light and medium gray shale clasts from 1887.60' - 1887.80', lenses of very fine grained sandstone with medium gray brown shale clasts within lower 0.40', no fossils seen, wavy sharp lower contact.	1.79	1889.17
SS		Light gray green, fine grained, low angle planar laminations and ripple laminations, abundant dark minerals and ripple laminations, abundant dark minerals and rock grains, mica, dark mica rich streaks in basal 0.20', sharp lower contact on color and composition, gas show (73 units).	2.37	1891.54
SS	SH CLS	Light gray, medium grained, dark minerals, rock grains, mica, mostly multi-directional ripple cross laminations from top to 1895.00', massive from 1895.00' - base, few medium gray shale clasts and occasional streaks across core from top to 1895.30', irregular dark gray shale clasts from 0.03' to 0.30' across at 1895.35', moderately abundant dark gray shale clasts from 3 mm to 3 cm long from 1895.00' to base, gas show (93 units) high angle sharp lower contact. **BASE BIG INJUN SANDSTONE**	6.31	1897.85
SH		Dark gray, slickensides, few organic rich fragments, may be very large clast at top of lag deposit, sharp lower contact.	0.35	1898.20
SS	SH CLS	Light gray, fine grained, very abundant, closely packed medium gray shale clasts from 5 mm to 2 cm thick and extending across core, channel lag deposit, sharp lower contact.	1.87	1900.07
SH		Medium gray with occasional light to medium gray bands, fine, occasional fine mica, fissile, occasional possible sand filled burrows below 1902.00', light gray, very sandy/silty bands from 1902.44' - 1902.60', 1903.53' - 1903.69', no fossils seen, arbitrary, gradational lower contact.	4.93	1905.00

SH	SS INBD	Shale is medium gray, fine, fissile beds from 0.05' to approximately 1.00' thick, some light to medium gray silty zones especially at 1909.00', no fossils seen, occasional gray brown sideritic bands up to 0.10' thick throughout, interbedded with light gray, very fine grained silty, sandstone beds and irregular lenses from 0.03' - 0.90' thick, occasional burrows evident throughout, some pyritized, some soft sediment deformation or general bioturbation in sandstone, very fine fragments of organic material in shales, arbitrary lower contact on sandstone beds over shale.	47.67	1952.67
SS	SH INBD	Sandstone beds are light gray, very fine grained, very micaceous, silty, predominantly planar with some low angle planar cross laminations and few zones of slight ripple laminations, more discrete beds with much less soft sediment deformations than unit above, beds vary from 0.05' - 1.40' thick, occasional horizontal and vertical burrows, especially from 1962.00' 1963.00', shale beds are medium gray from 0.05' to 0.30' thick, some fine organic fragments, some pyritized, fissile, fine, sharp lower contact at basal sandstone bed.	12.11	1964.78
SH		Medium dark gray, slightly silty, fine mica, no fossils seen, sharp lower contact.	1.19	1965.97
SS		**TOP OF SQUAW SANDSTONE** Light gray, fine grained, moderately abundant rock grains, mica, zones of rippled mica streaks, zones of ripple cross laminations, flat ripple laminations, massive and planar cross laminations, thin shale laminations at 1973.35', dark gray, fine shale clasts from 1973.95' to 1974.07', large shale clasts at 1975.15', strong gas show throughout, gradational lower contact on composition change.	13.03	1979.00
SS		Light gray, fine grained, 'cleaner' but still many dark grains, occasional organic grains, occasional mica, faint planar laminations in top 0.50', massive to base, gas show, sharp lower contact.	2.55	1981.55
PYR		Abundant rounded and long streaks of pyrite in a matrix of fine sand, mica and abundant coalified organic material, sharp lower contact, gas show.	0.19	1981.74
SS		Light gray, fine grained, 'cleaner' but still dark grains, occasional organic grains, weakly developed stylolites, breaks in “poker chips” from 1982.70' to 1983.00', light medium gray shale clasts from 1984.35' to 1984.80', gas show	3.36	1985.10

		throughout, faintly planar cross to ripple cross laminated, sharp lower contact with shale.		
SH		Medium gray, thin bed or large clasts, sharp lower contact.	0.05	1985.15
SS		Light gray, fine grained, ripple laminated to ripple cross laminated, bright coalified organic material, pyrite nodules, streaks, gas show, gradational lower contact.	0.22	1985.37
SH		Medium dark gray, few faint, thin, very fine grained sandstone streaks in transitional zones at top and bottom of unit, carbonaceous or coaly plant fragments, gradational lower contact.	0.83	1986.20
SS		Light gray, very fine grained, mica and rock grains, carbonaceous or coaly organic material, ripple laminated to ripple cross laminated, high angle sharp lower contact, gas show.	0.47	1986.67
SH		Medium gray with dark gray to black clasts, probably large clasts, high angle sharp lower contact.	0.08	1986.75
SS		Light gray, fine grained, dark mineral and few rock grains, few coarse organic grains or small clasts, minor mica, massive, sharp lower contact on bedding change.	2.59	1989.34
SS		Light gray, very fine to fine grained, mostly flat ripple laminated with some ripple cross laminations to base, abundant mica rich laminations, gas show, angular, sharp lower contact.	1.05	1990.39
SS		Light gray, fine grained, minor mica, moderately abundant very fine grained, dark (organic?) grains with few coarse, organic grains, planar laminated to low angle planar cross laminations, few dark gray, thin shale streaks in basal 0.60', gas show, sharp lower contact.	2.24	1992.63
SS	SH CLS	Light gray, fine grained, 1 large, irregular, black shale clast from 1992.68' - 1992.76', other fine to coarse medium gray to dark gray shale clasts, pyrite nodules, sharp lower contact, gas show.	0.35	1992.98
SS		Light gray, fine to medium grained, quartz with minor dark minerals, mica and organic grains in top 1.00' moderately abundant rock grains, organic grains, mica in rest of unit, massive in top 1.00', rest shows zones of planar laminations to planar cross laminations with changing directions,	5.52	1998.50

		some minor planar laminated zones, mica rich zone from 1995.75' to 1996.00', gas show, sharp lower contact.		
SS	FEST INCL	Light gray, fine grained, with light gray brown, rounded and elongated siderite pebbles, gas show, high angle sharp lower contact.	0.18	1998.68
SS	QTZ	Light gray, medium grained, quartz with minor accessory minerals, faint planar cross laminations, 'poker chip' fractures in basal 0.30', sharp lower contact. Gas show.	0.65	1999.33
SS	FEST INCL	Light gray, fine grained matrix with abundant rounded to lenticular siderite pebbles up to 13 mm diameter and 5 cm long, few dark gray shale pebbles, high angle sharp lower contact. Gas show.	0.31	1999.64
SS		Light gray, fine grained, moderately abundant mica, dark mineral grains, rock bands, faint flat ripple laminations, gas show, sharp lower contact. **BASE OF SQUAW SANDSTONE**	1.60	2001.24
SS	SH INBD	Light gray, very fine grained, mostly ripple laminated in laminations from 0.02' and beds to 0.30' thick with medium gray shale laminations from 0.01' to beds 0.25' thick, gradational lower contact.	1.42	2002.66
SH		Light to medium gray, silty and sandy, poorly bedded, possible plant or bivalve at 2002.80', vertical fracture from 2003.10' to 2003.50', angular, sharp lower contact.	2.90	2005.56
SS		Light to medium gray, very fine grained, planar laminated to flat ripple laminated, bioturbated (burrowed?) or soft sediment deformation at 2005.90' and in basal 0.15', few light gray to brown siderite pebbles in top 0.15', dark gray shale break from 2006.16' - 2006.20', sharp lower contact.	1.24	2006.80
SH	SLTY	Medium gray, silty, micaceous, hard, siderite pebbles in base, sharp lower contact.	0.60	2007.40
SH	BRW	Medium to dark gray laminations and thin beds from 1 - 2 mm to 2 cm thick, interlaminated/ interbedded with light to medium gray very fine grained to silty ripple laminations and beds, from 1 - 2 mm to 2 - 3 cm thick, common, mostly horizontal sand filled burrows, pelecypods (?) at 2007.50', no others seen, sharp lower contact at increasing sand and gas show.	6.18	2013.58
SS	SH INBD	Light gray, very fine grained, ripple laminated	1.61	2015.19

		sandstone beds 0.03' to 0.40' thick with medium gray shale beds 0.05' to 0.30' thick, Gas detected but not visible, sharp lower contact.		
SS	FEST INCL	Light gray, very fine grained with moderately abundant light gray and light gray brown mostly elongate siderite pebbles up to 6 cm long and 1.75 cm thick, possible bivalves in basal 0.07', sharp lower contact.	1.06	2016.25
SH		Medium gray, very fine, fissile, featureless but for an occasional fine pyritic nodule, no fossils seen, gradational lower contact at increasing sandstone with depth.	1.35	2017.60
SH	SS STR	Medium gray with a few light to medium gray, very fine grained, faint sandy laminations less than 5 mm thick, no fossils seen, sharp lower contact at color and texture change.	1.30	2018.90
SH	SLTY	Light to medium gray, hard, fine mica, sharp lower contact.	1.00	2019.90
SH		Medium gray, fissile, fine, few light gray, very fine grained, rippled sandstone streaks approximately 5 mm to 1 cm thick, increasing to base, very nicely preserved orbiculoids showing relief at 2024.68, no other fossils seen, zone of medium grained white sand in shale from 2024.85' - 2024.97', 1 sandstone streak with sharp/angular top and bottom contacts, fine grained, light gray, 0.14' thick at 2025.35, occasional faint silty streaks 2025.23' - base, sharp, angular lower contact with mixing of lower unit over 0.20', pyritized and other plant debris at basal 0.40'.	6.12	2026.02
SS		**TOP OF WEIR SANDSTONE** Fine grained, light gray to white, very clean with very faint low angle to flat planar cross laminations, occasional darker silty streaks, dark gray shale streaks 0.02' thick at 2029.70', occasional angular shale rip-ups, very fine grained to 0.04' long 2030.18' to base, sharp lower contact on color and lithology.	4.36	2030.38
SS	SH STR	Light gray, fine to very fine grained, with dark gray shale streaks and thin beds to 0.20', faint planar to ripple remnant bedding at top, 20 degree planar cross bedding below 2033.00', shale contains some pyritized and coaly plant fragments, gassy smell at 2031.10' - 2031.35', very hard and crystalline sandstone 2032.10' - 2032.38', more gray than other sand with 'poker chip' fractures, very clean quartz arenite (?), sharp lower contact on color and start of gas show, locally small	3.37	2033.75

		weakly calcareous zones.		
SS		Fine grained, light gray, gas show, flat planar laminations top to 2034.90', nonbedded 2034.90' - 2036.25' with 2 low angle planar cross laminations at 2035.33', flat planar cross laminations 2036.25' - 2036.54', low angle, approximately 15 degree planar laminations grading to nonbedded at base 2036.54' - 2037.45', slightly silty, light medium gray to gray with flat planar laminations 2037.45' - 2038.65', nonbedded 2038.65' - 2038.80', thin shaly medium gray streaks with pyritized plant debris and mica, 2038.80' - 2038.85', low angle planar cross laminations with very thin darker gray streaks less than or equal 1 mm, nonbedded locally with either poorly preserved vertical burrows or dewatering structures scattered throughout, sharp lower contact on color.	10.67	2044.42
SLST	SDY	Gas show, light medium gray, flat bedded, hard, sharp lower contact on color and lithology.	0.10	2044.52
SS		Light gray, fine grained, nonbedded, very clean, possibly quartz arenite at top, very well cemented, sharp lower contact on lithology, gas show.	0.48	2045.00
SS		Light gray, fine grained, lithic arenite, rounded grains, low angle planar laminations and flat planar laminations, locally nonbedded, occasional thin mm scale silty/shaly and/or mica rich streaks, low angle planar cross beds 2045.00' 2046.62', flat planar ripple laminations 2046.62' - 2047.89', possible dewatering feature at 2046.65', silty streaks 2047.89' - 2047.90', sharp lower contact at base of silty streaks.	2.90	2047.90
SS		Fine grained, light gray to white, very hard, well cemented, nearly a quartz arenite, darker mineral streaks 2049.00' - 2050.07', nonbedded 2050.07' - 2050.84', sharp lower contact on increase of streaks.	2.96	2050.86
SS		Fine grained, light gray, hard, clean with few scattered dark mineral streaks less than 1 mm, low angle planar cross beds, very weakly calcareous below 2049.00', locally mica rich streaks, sharp lower contact on lithology.	2.25	2053.11
SH	SLTY	Medium gray with lighter gray sandy/silty streaks, abundant plant debris, mica, very weakly calcareous in silt-rich zones, pyrite blebs, thin and elongate to 0.07' x 1 mm to base, sharp, wavy lower contact on lithology.	0.46	2053.57

SS		Fine grained, light gray, dark thin mineral rich streaks throughout, flat planar laminations in top 0.50', low angle planar cross laminations to base, base sharp on bedding.	0.68	2054.25
SS		Fine grained, nonbedded, weakly calcareous to 2056.23', well cemented with few rock fragments, well rounded grains, sharp, angular lower contact on lithology and color, pyritized shale fragment at 2056.16'.	2.19	2056.44
SLST	SDY	Medium gray, with light gray sandy streaks, low angle to flat planar bedding, sharp lower contact on lithology.	0.14	2056.58
SS		Very fine grained, locally very weakly calcareous, low angle to flat planar laminations, sharp lower contact on lithology.	0.97	2057.55
SS		Light medium gray, very fine grained, locally silty, very weakly calcareous, dirty sand, silty streaks 0.02' thick, medium gray at 2058.16', low angle planar laminations to massive throughout, very faint bedding, occasional coarse sandstone pebbles to base, base sharp on lithology.	1.60	2059.15
SH		Medium gray, abundant fossil plant trash, lower 0.07' is channel lag with coarse light gray, sandstone pebbles, medium gray shale pebbles and rock fragments up to 0.04' x 0.10', whole unit may be channel lag, sharp lower contact on lithology.	0.17	2059.32
SS	CALC	Light gray, very fine grained grades to siltstone, gray at base, low angle planar cross laminations, mica, calcareous zone ends at 2059.55', sharp lower contact on lithology and color.	0.39	2059.71
SS	SH STR	Light gray, fine grained, slightly silty, dirty sandstone with medium gray shale streaks to 0.05' thick, sharp lower contact on lithology.	0.21	2059.92
SS		Very fine grained, light gray to gray, very faint low angle planar laminations to nonbedded locally weakly calcareous, gas show 2045.00' - 2063.80', very occasional carbonized plant fragments, thin fossil hash approximately 0.01' at 2061.90', with crinoid columnals, brachiopod fragments, some of the crinoid parts appear to be more 5 sided than round, possible pelecypod in lower 0.10' has few very thin shale rip-ups less than 1 mm x 5 mm, sharp lower contact on lithology. **BASE OF WEIR SANDSTONE**	3.90	2063.82
SH		Medium gray with silty streaks, light medium gray to gray, micaceous, occasional scattered plant	0.88	2064.70

		material, sharp, wavy lower contact on lithology.		
SH	SS STR	Medium gray, with dark gray shale with medium dark gray silty streaks, occasional thin very fine grained sandy streaks at top, silty streaks to base, occasional irregular pyritized masses < 0.02' scattered below 2066.50', horizontal burrows 2067.75', very occasional, very small coaly plant trash, sand streaks have ripples, sharp lower contact on color and lithology.	3.14	2067.84
SLST		Gray to light medium gray, flat planar laminations, very fine grained sandy grains scattered throughout, sharp lower contact on color and lithology.	1.51	2069.35
SH	SLST INBD	Dark gray, with medium to dark gray siltstone streaks less than or equal to 1 mm, flat bedded, horizontal and vertical burrows, occasional very fine grained, light gray sandy streaks, possible micro fault at 2073.40', rounded irregular pyrite blebs at 2075.50', heavily bioturbated 2075.50' - 2076.50', locally micaceous, scattered plant trash, few medium to coarse, distinct irregular to rounded, siderite nodules below 2085.00', very fine mica on some bedding planes, burrows diminish to base, base sharp on lithology.	19.27	2088.62
SLST	CALC	Light gray, very hard, weakly to non-calcareous top to 2088.72', moderately to strong 2088.72' - 2089.89', non-calcareous to base, slightly darker gray top and bottom, fairly nonbedded except for 1 visible flat planar lamination to base, sharp lower contact on color and lithology.	1.61	2090.23
SH		Medium dark gray, very occasional scattered plant debris, sharp lower contact on lithology and color.	0.17	2090.40
SLST		Gray with occasional dark gray shale streak in upper 0.20', slightly sandy (very fine grained) to base, flat bedded, occasional mica, very weakly calcareous in zones, either thin dark gray shale wisps or very poorly preserved shells at 2091.81', dense, sharp lower contact.	3.28	2093.68
SLST		Light gray, slightly darker top to 2094.00', possibly bioturbated, occasional medium gray shaly clasts in upper ½, mica, sharp lower contact on lithology and color.	1.32	2095.00
SH	SLST INBD	Medium dark gray with light gray siltstone streaks up to 0.08', abundant horizontal burrows, occasional vertical burrows, nonbedded siltstone bed 2098.77' - 2099.30', increasingly silty to	13.01	2108.01

		1205.00', grades to siltstone with shale streaks at base, bioturbated 2105.00' to base, very occasional poorly preserved plant trash (some pyritized).		
SH	SLST INBD	Medium to dark gray with light gray silty streaks, slightly bioturbated with horizontal burrows, otherwise flat bedded, occasional scattered partially pyritized plant debris, 1 shell fragment, possibly on orbiculoid at 2110.59', increasingly silty to base with scattered mica, sharp lower contact on lithology.	4.92	2112.93
SLST		Light gray with medium gray shale streaks, locally very burrowed, especially to top, mica, 1 shell fragment at 2114.50' increasing bioturbated to base, calcareous band at 2112.52' - 2112.54', 2113.04' - 2113.07', very hard 2113.50' to 2125.00', sharp lower contact on color, large J shaped burrow approximately 0.15' at base on unit into next unit.	12.27	2125.20
SLST		Medium gray, nearly a shale, flat bedded with occasional light gray, very, very fine grained sandy or silty streaks, scattered fine mica, truncated ripples or movement created feature that appears similar to a lepidodendron impression at 2125.82', well bedded, purer silt to base with ripple laminations, sharp lower contact on lithology and color, very hard in basal 0.40'.	6.43	2131.63
SH	FOSS	Dark gray with light gray silty streaks, abundant burrowing, pelecypod at 2133.10', 2133.78', pelecypods and other scattered fragments, very bioturbated 2135.00' to base, sharp lower contact on color.	4.02	2135.65
SLST	SH STR	Light gray to gray with medium gray shale streaks, nonbedded to 2136.11', bioturbated 2136.11' to base, occasional small shale pebbles 2136.24', mica, sharp lower contact on color and lithology.	3.00	2138.65
SH	SLTY	Medium gray, with light gray to gray silty streaks, bioturbated, orbiculoid at 2139.24', sharp lower contact on increasing silt.	1.95	2140.60
SLST	SH STR	Light gray with dark gray shale streaks below 2141.85', very bioturbated top to 2141.00', non bedded with weakly calcareous 2141.00' - 2141.85', sharp lower contact.	4.55	2145.15
SH	FOSS	Medium gray to dark gray with light gray to gray silty streaks and zones up to 0.40', bioturbated throughout, locally very heavily, especially at 2150.90' - 2151.50', 2154.05' - 2154.50', and	21.53	2166.68

		2156.00' - 2157.00', 2164.00' - 2165.00', occasional scattered plant debris, 2 brachiopods and 1 pelecypod at 2145.62', small branched crinoid arm at 2146.11', locally micaceous, pelecypod at 2148.90' to eor 2165.00', increasingly shaly to base, medium dark gray with thin silty streaks, sharp lower contact. *NOTE* Driller was stuck at 2165 for about two weeks. Description commences from redrill where it overlaps the original. Redrill commenced at 1925.00'.		
SLST		Light gray to gray, faint very low angle planar beds, sharp lower contact on lithology and color.	0.66	2167.34
SH	SLST INBD	Medium gray with light gray to gray siltstone streaks and thin beds, hard, occasional vertical burrows, flat planar to ripple laminations, poorly preserved plant debris, bivalve fragments at 2172.20', pelecypod fragments at 2172.88', sharp lower contact on lithology.	6.69	2174.03
SLST	FOSS	Gray with dark gray streaks, burrowed, abundant pelecypods 2176.80' - 2177.10', increasing burrows below 2180.00', pelecypods 2181.83' - 2185.00', coalified and partially pyritized plant stem at 2184.46', scattered pelecypods 2185.00' - 2192.50', very bioturbated 2185.00 to base, increasingly shaly to base, arbitrary lower contact.	20.86	2194.89
SH	SLTY	Medium gray, flat bedded, silty streaks throughout, light gray, hard, flat planar laminations with occasional silty ripple laminations below 2202.30', occasional thin pyritized plant debris below 2204.00', occasional very dark gray thin < 0.01' shale streaks, sharp lower contact on lithology.	10.11	2205.00
SLST	BRW	Gray, abundant burrows throughout increasing to base, shaly wisps throughout, sharp lower contact with thin zone on mixing.	1.15	2206.15
SLST	FOSS	Light gray to gray with dark gray shaly zones, hard, occasional small pelecypods throughout below 2207.60', orbiculoid 2208.05', burrowed to base, arbitrary lower contact on increasing burrows.	3.27	2209.42
SLST	BRW	**TOP OF MURRAYSVILLE SANDSTONE** Gray to light gray, gas show 2209.63' - 2209.71', faint planar laminations, horizontal and vertical burrows, sharp lower contact on lithology.	2.91	2212.33
SLST	CALC	Light gray, weakly calcareous, faint planar beds, sharp lower contact on lithology.	0.45	2212.78

SLST	BRW	Light gray, gray and medium gray mixed, horizontal and vertical burrows, gas show 2213.50' - 2215.20' in quartz pebble conglomerate lag, 2217.17' - 2220.78', occasional very thin dark gray mixed shale streaks, pyritized shale or siderite pebbles at 2216.50', 2217.30', locally micaceous, silty shale streaks, dark gray 2220.77' - 2220.96', sharp lower contact on lithology.	8.72	2221.50
SS		Very fine grained with coarse grained quartz pebble conglomerate at base, gray, medium gray mixed with abundant dark silty matrix, gas show 2222.07' - 2223.08', rounded shale pebbles to 0.06'diameter, silty or shaly streaks throughout, sharp lower contact. **BASE OF MURRAYVILLE SANDSTONE** **MISSISSIPPIAN - DEVONIAN BOUNDARY**	1.58	2223.08
SH		Dark gray, occasional very fine mica concentrations, pelecypod fragments at 2228.48', very small carbonaceous and pyritized plant fragments, occasional thin concentrations of fine grained sandstone in wisps, unidentified shell fragment at 2233.35', possible tooth fragment at 2233.98', slightly silty to base, gradational lower contact on increasing silty streaks.	13.18	2236.26
SH	FOSS	Dark gray with light gray to gray silty streaks and zones, increasing to base, bioturbated, 2 very well preserved pelecypods at 2236.44', increasingly bioturbated to base, grades to siltstone burrowed at base, micaceous, small plant fragments, very fine grained, Light gray sandy wisps, sharp lower contact.	4.65	2240.91
SLST		Light gray to gray, shaly and sandy streaks, fairly flat bedded with rounded sandy slugs, coarse grained sandy streaks, 2241.68' - 2241.81', with some mixing of coarse grains below, possible burrows, pyritized plant fragments, sharp lower contact on burrows below.	1.67	2242.58
SLST	BRW	Light gray to gray with vertical and horizontal burrows, sharp lower contact.	4.16	2246.74
SH	FOSS	Medium gray to dark gray, occasional pyrite, occasional siderite nodules at 2247.30', brachiopod at 2248.50', sharp lower contact.	2.86	2249.60
SLST	SH STR	Burrowed, gray with medium to dark gray shale streaks, slightly increasing shale to base, pyrite bleb at 2250.75', mica, pyritized plant fragments, sharp lower contact on lithology.	5.24	2254.84

SLST		Gray, burrowed at top 0.10', low angle planar cross laminations, sharp lower contact.	0.52	2255.36
SLST	BRW	Gray, slightly angular sharp lower contact.	0.28	2255.64
SH		Dark gray, sharp lower contact.	0.10	2255.74
SLST	SH STR	Gray with medium gray shale streaks, gas show 2256.00' - 2257.00', locally micaceous, pyritized plant fragments, cleaner silt to base, high angle fractures at 2259.40' and 2260.25', sharp lower contact on lithology.	4.83	2260.57
SLST	SH STR	Gray with dark gray to medium gray shale streaks, slightly rippled, occasional burrows, locally small mica, grades to darker gray at base, rare scattered plant debris, some pyritized.	6.91	2267.48
SH	SLTY	Sand streaks, dark gray with Light gray to gray silty and sandy streaks, possible tooth fragment at 2267.53', slightly burrowed sharp lower contact on lithology.	0.62	2268.10
SLST		Gray with finely disseminated pyrite in fan shape, plant fragments, sharp lower contact on lithology.	0.12	2268.22
SLST	SH STR	With sandy streaks, medium green gray, very thin conglomerate lag at 2268.40' with large white quartz pebbles and siderite and shale pebbles ranging from black to red brown, burrowed below 2268.46', sharp lower contact.	6.85	2275.07
SLST	SH INBD	Interbedded with shale and sandstone, burrowed, Light gray with Light gray, and gray sandy streaks and dark gray shale streaks and zones, occasional siderite rich streaks, horizontal and vertical burrows, some faint ripples, sharp lower contact on lithology.	3.99	2279.06
SS	BRW	Very fine grained with dark gray shale streaks and thin beds, faint planar laminations to 2279.40', burrowed to base, some shale rip-ups, quartz pebbles abundant to base mixed in fine grained matrix, sharp lower contact on lithology.	2.98	2282.04
SS	QTZ PBL	Gray with white pebbles and fine grained matrix, 'poker chip' fractures, sharp lower contact on lithology.	0.21	2282.25
SLST	SDY	Medium gray with light gray sandy streaks, rippled, sandy streaks up to 0.15' thick, similar to flaser bedding, sharp lower contact on lithology.	2.65	2284.90
SS	CGL	Quartz pebble bed with grains up to 0.03', light	0.10	2285.00

		gray to gray with white pebbles, base sharp on lithology.		
SH	SS STR	Medium gray with very fine grained, gray sandstone streaks, slightly burrowed, sharp lower contact on lithology.	1.10	2286.10
SS	SH INBD	Light gray, very fine grained with medium to dark gray shale streaks and thin beds, many sands are discontinuous ripples (flaser bedding), decreasing sandstone to base, sharp lower contact on lithology.	0.83	2286.93
SH	SLTY	With thin sandy streaks, burrowed, medium gray with light gray to gray silty and very fine grained sandy streaks, abundant horizontal burrows < 1 mm (sand filled) at top to 2287.30', sandstone streaks at 2287.70' - 2287.82', abundant burrows throughout, many branching out, increasing silty to base with sandstone streaks, occasional rounded pyrite pebbles 2298.62', sandstone streaks at 2301.00', sharp lower contact on lithology.	14.19	2301.12
SS	QTZ PBL	**TOP OF GANTZ SANDSTONE** Conglomerate, white to light gray with pyrite pebbles and other siltstone rounded pebbles to 0.08' in fine grained matrix.	0.09	2301.21
SLST	SDY	Gray to medium gray with light gray fine grained sandy streaks, burrowed, ripples, locally micaceous, sandy to base with ripples and shale streaks, dark gray, sharp lower contact on lithology.	1.89	2303.10
SS	QTZ PBL	Quartz pebble conglomerate, light gray to white rounded pebbles to 0.03', grains touch one another with gray matrix of silt, occasional rock fragments, sharp lower contact on lithology, gas show.	0.50	2303.60
SH		Dark gray, angular sharp lower contact top and bottom.	0.10	2303.70
SS		Very fine grained, low angle planar cross laminations with pebble lag in lower 0.21', white quartz pebbles to 0.02' and rock and shale fragments (dark gray) mixed, sandstone quartz pebble lag at base, sharp lower contact on lithology.	0.55	2304.25
SS		Very fine grained, gray, flat planar laminations, sharp lower contact.	0.94	2305.19
SLST		Light gray green, with sandy streaks and quartz pebbles below 2307.00', low angle planar cross	2.78	2307.97

		laminations, light gray to white pebbles to 0.04' ends at quartz pebble conglomerate at base, gas show, sharp lower contact.		
SLST		Green gray with sandy streaks, shaly upper 0.01', occasional sandstone pebbles 2309.17' to base, locally micaceous, flat planar laminations, sharp lower contact on lithology.	1.35	2309.32
SS		Fine grained, light gray with quartz pebbles in upper 0.04' dark gray shaly streaks, rock fragments, occasional faint burrows, planar cross laminations to top, disturbed to base, sharp lower contact on lithology.	3.06	2312.38
SH	FOSS	Dark gray, silty, locally micaceous, sharp lower contact.	0.45	2312.83
SS	BRW	Gray, very fine grained with coarse grains and pebbles scattered throughout, burrows, gas show, medium dark gray 2315.16' - 2317.00', very bioturbated throughout, gas show, occasional shale streaks, conglomerate base, sharp lower contact on lithology.	6.12	2318.95
SS	XLN	Fine grained, gray, hard, flat planar laminations, occasional dark mineral streaks < 0.01', very thin shaly streaks, thin shale streaks, dark gray 0.01' thick at 2325.83, mostly quartz arenite with occasional rock fragments, flat bedded on slightly inclined bedding, occasional small shale rip-ups (angular), very hard and tight, occasional fine grained streaks 2331.60' - base, increasingly dirty to base, sharp lower contact on lithology, local micaceous streaks.	14.77	2333.72
SS	BRW	Gray, light gray, medium gray, fine grained with dark gray shale streaks to base, below 2336.50' very bioturbated, visible burrows to base, sharp lower contact on lithology.	2.88	2336.60
SH	FOSS	Silty, medium gray with gray or medium gray silty streaks, pelecypods, possible fish(?) bone fragments, brachiopod fragments, occasional very fine grained white sandy streaks below 2238.25', shale pebbles, increasing sandy and bioturbated to base, pyritized plant fragments to base, grades to a very dirty fine grained sandstone at base, slightly wavy lower contact on lithology.	3.95	2340.55
SS	XLN	Very fine grained, gray, hard, low angle cross laminations to flat planar laminations, occasional dark mineral streaks throughout, occasional coarse grained pebbles scattered below 2343.00, grades to green gray, 0.05' dark gray shale streak at	5.24	2345.79

		2345.19', sharp lower contact on lithology and color. **BASE OF GANTZ SANDSTONE**		
SH	SS INBD	Gray green with dark gray, green and dark gray shale beds approximately 0.10' thick, occasional sandstone pebbles < 0.01' in sands, occasional ripples, crinoid crown pinnules at 2339.90', sandstone is very fine grained, gray to light green gray, occasional pyrite plant material, burrows, increasingly sandy to base, sharp lower contact on lithology.	1.36	2347.15
SH	SS STR	Dark gray with light gray, white and gray, fine grained, sandy streaks, vertical and horizontal burrowed, locally micaceous, pelecypods, sharp lower contact.	7.88	2355.03
SS	SH STR	**TOP OF 50 FOOT SANDSTONE** Fine grained, gray, with dark gray shale streaks, bi-directional cross laminations 2356.00' - 2356.20', irregular shale streaks < 0.01', occasional shale rip-ups, gas show throughout, burrows, quartz pebble conglomerate 2356.42' - 2356.47', shale rip-ups, large 0.05' white quartz pebbles at 2352.50', 0.04' black shale streak at 2364.39', sharp lower contact.	9.41	2364.44
SS	QTZ PBL	Conglomerate, occasional large pebbles to 0.08', rock fragments, 'poker chip' fractures, occasional red shale pebbles, sharp lower contact.	0.91	2365.35
SH		Dark gray, sharp lower contact on lithology.	0.49	2365.84
SS		Very fine grained, gray, hard with white and tan quartz pebbles and shale streaks, especially concentrated at 2367.40' - 2367.60', occasional dark gray shale rip-ups, dark mineral and shale streaks < 0.01', gas show, sharp lower contact on grain size and color.	8.51	2374.35
SS		Fine grained, light gray, very dirty 2374.63' - 2374.70', abundant pyritized streaks and fragments with dark gray shale in this zone, occasional pyrite and shale to 2375.00, occasional gray and brown shale, clasts and pebbles, cleaner sand to base sharp lower contact, vertical fracture, gas show.	1.32	2375.67
SS	SH STR	Fine grained, gray, hard with very dark gray shale streaks and gray, dark gray and very dark gray shale pebbles, locally micaceous, occasional burrows (especially horizontal), silty to base, sharp lower contact on color, gas show, increasing shale streaks to base, sharp lower contact.	10.78	2386.45

SH	SDY	Medium gray with light gray, fine grained sandstone streaks and intermixed grains, possible burrows, sharp lower contact.	0.65	2387.10
SS		Fine grained, gray to medium gray with occasional shale streaks, burrows, dirty, increasingly shaly to base, flat bedded to top, very thin green flint-like clay at 2390.15', occasional pyrite crystals, sharp lower contact on lithology. **BASE OF 50 FOOT SANDSTONE**	4.46	2391.56
SH	SDY	Dark gray, burrowed, very occasional plant fragments, sharp lower contact on lithology.	1.39	2392.95
SLST	SDY	Gray to medium gray with gray sandy streaks, flat bedded, occasional shale rip-ups, slightly bioturbated, locally micaceous, some soft sediment deformation, fish scale (?) at 2395.56', sharp lower contact on lithology.	4.20	2397.15
SLST	SH STR	Medium gray green, occasional plant fragments, sharp lower contact.	0.57	2397.72
SLST		Medium green gray, occasional slickensides, sandy streaks, light gray, fine grained, locally micaceous, burrowed at base, sharp lower contact on lithology.	5.61	2403.33
SS	BRW	Light and dark gray mixed, fine grained, occasional plant fragments, dark silty streaks to base, some ripple laminations, sharp lower contact.	3.35	2406.68
SH	SDY	Dark gray with light gray, very fine grained sandy streaks increasing to base, occasional horizontal and vertical burrows, sharp lower contact.	0.63	2407.31
SLST	FOSS	Medium dark gray, flat planar laminations, brachiopods, sharp lower contact on lithology and color.	0.79	2408.10
SH	FOSS	Dark gray with light gray sandy streaks, pelecypods.	1.58	2409.68
SLST	FOSS	Dark gray, light gray mixed, hard, pelecypods, horizontal and vertical burrows, sharp lower contact.	1.53	2411.21
SH	SLTY	Dark gray, vertical burrows and occasional horizontal burrows, gradational lower contact.	4.79	2416.00
SLST	SDY	With shale streaks, horizontal and vertical burrows, otherwise flat bedded, occasional plant debris, orbiculoid at 2415.50', more shaly to top	5.02	2421.02

		and silty to base, very bioturbated at base, sharp lower contact.		
SH	BRW	Dark gray with medium gray sandy horizontal and vertical burrows, sharp lower contact.	0.83	2421.85
SS	BRW	Very fine grained, abundant horizontal and vertical burrows, light gray, gray, medium gray mixed occasional dark gray sandy streaks to base, few scattered pelecypods, sharp lower contact.	5.86	2427.71
SH	FOSS	Medium dark gray, burrowed, occasional organic fragments, pelecypods, sharp lower contact on color.	2.89	2430.60
SLST	BRW	Very bioturbated, medium gray with lighter streaks, locally micaceous, sharp lower contact.	0.48	2431.08
SH		Medium gray, fossil fragments, horizontal and vertical burrows, sharp lower contact.	1.90	2432.98
SS	BRW	Gray, light gray, with a faint green hue, very fine grained, very bioturbated, green rock fragments, occasional thin shale streaks, sharp lower contact.	4.90	2437.88
SH	SLTY	Dark gray, with horizontal silty streaks to base and top, occasional organic fragments, locally micaceous, sharp lower contact on lithology.	1.52	2439.40
SLST	BRW	Light gray, gray, medium gray and dark gray mixed, occasional shale streaks, less burrowed to base, organic fragments, locally micaceous, sharp lower contact.	1.94	2441.34
SH	FOSS	Dark gray with slight greenish tint, small pelecypods, lingula, many various fossils, occasional slickensides to base, fossil zone ends at 2443.00', increasing slickensides to base, non-fossiliferous to base, burrowed below 2445.00', gradational lower contact.	4.81	2446.15
SLST	BRW	Medium gray, brachiopod fragments at 2446.45', darker gray to base with very fine grained sandy or light gray silty streaks, sharp lower contact on lithology.	1.25	2447.40
SH	FOSS	Very dark gray, vertical burrows, brachiopod fragments, lingula, occasional slickensides, locally green shale, partially pyritized plant debris, sharp lower contact.	2.62	2450.02
SLST	BRW	Shaly to base, medium dark gray with lighter gray silty streaks, sharp lower contact.	1.25	2451.27

SS	BRW	Fine grained, mixed, light, medium and dark gray vertical and horizontal burrows, slickensides, fossils below 2454.00', unknown fossil at 2454.52', sharp lower contact.		3.43	2454.70
SS	SLTY	With shale streaks, light gray, gray green and light gray, and white to base, sharp lower contact on color.		0.54	2455.24
SH	FOSS	Red with green mottles and streaks, upper 0.60' is silty, lower 0.10' is slightly sandy, slickensides, brachiopods and pelecypods, sharp lower contact on lithology.		3.00	2458.24
SS		**TOP OF 30 FOOT SANDSTONE** Fine to very fine grained, light gray green, burrows to top, nonbedded massive to base, sharp lower contact on color and lithology.		1.46	2459.70
SLST	SH STR	Medium gray with dark gray shale streaks especially to base, sharp lower contact.		0.26	2459.96
SS		Very fine grained, burrowed with shaly dark streaks mixed by bioturbation, locally 'poker chip' fracture, cleaner sand to base, very clean 2461.40' - 2461.56', grades to slightly reddish to base, occasional green fragments.	4.54	2464.50	
SH	RED	Red with dark gray streaks, small, horizontal burrows, gradational lower contact on color.		3.68	2468.18
SH	FOSS	Dark gray with occasional red streaks in upper 0.30', pelecypods, sharp lower contact.		1.28	2469.46
SS	BRW	Light and dark gray mixed, visible burrows to base, very bioturbated to top, gradational lower contact with some burrows extending to the shale unit below.		0.52	2469.98
SH	FOSS	Dark gray, occasional plant fragments, fish scale (?), 2470.36', very small brachiopods, pyrite fragments of organic matter, vertical burrows, pelecypods, possible ostracods, sharp lower contact.		2.20	2472.18
SS	BRW	Light and dark gray mixed, abundant burrows extending into shale below, gradational lower contact.		0.47	2472.65
SH	BRW	Medium dark gray, occasional fossils, sharp lower contact.		1.14	2473.79
SS	SLTY	Silty with shale streaks, gray with light gray silty streaks and dark gray shale streaks, burrows, some dark green 'halos' around burrows,		4.71	2478.50

		green tint throughout unit, occasional red and green mottles and streaks below 2476.00', increasingly green to base, sharp lower contact on color and lithology.		
SH	RED	Red with dark gray streaks especially to base, silty, possible very poorly preserved shell molds, occasional burrows, locally abundant mica, sharp lower contact on color.	2.40	2480.90
SH		Dark gray green, occasional poorly preserved organic material, shell fragments below 2482.00', sharp lower contact on lithology and color.	1.25	2482.15
SS		Very fine grained, light gray, slightly mixed with shale above to 2482.30', burrows to 2483.10', gas show 2483.05' to base, hard, crystalline and clean below 2483.00', occasional shale rip-ups below 2483.60', slight green hue to 2485.00', occasional green shale rip-ups at 2486.00', clean below 2486.65', nonbedded or very faint flat planar bedding, occasional dark gray shale streaks 2492.55' - base, sharp lower contact. **BASE OF 30 FOOT SANDSTONE**	11.46	2493.61
SH	SLTY	Silty and sandy streaks, dark gray with very fine grained white to light gray silty and sandy streaks, occasional pyrite plant fragments, occasional slickensides, burrows, very occasional fossil fragments, sharp lower contact.	1.50	2495.11
SLST	FOSS	Gray green, fossil fragments, occasional slickensides, pelecypods, sharp lower contact.	2.20	2497.31
SH	FOSS	Gray green, silty, horizontal and vertical burrows, calamite (?) stem, occasional red and black mottles and streaks, lingula at 2500.00 and below with other pelecypods, slightly silty to base, increasingly silty to base, grades to siltstone at base, base sharp on lithology.	6.34	2503.65
SH	FOSS	Green gray, sand filled burrows to 2504.66, bioturbated, abundant small (<5 mm) pelecypod brachiopod fragments, lingula (very nicely preserved one at 2506.55'), sharp lower contact at sandstone streaks.	3.86	2507.51
SH	SS STR	Medium gray in top 0.20', rest is light medium gray green, light gray to white, fine grained burrowed and bioturbated, siltstone streaks and bands, very calcareous, sharp lower contact on color and composition.	0.69	2508.20
CLST	RED	Predominately red with fine, distinct, light gray green streaks and mottles, weakly bedded, fine	2.71	2510.91

		slickensides, finely micaceous, sharp lower contact on color and composition.		
SS	SLTY	Light gray green, fine grained with abundant silt, mud supported grains, very dirty, few small (<3 mm) pelecypods, red shale intermixed in basal 0.20', sharp lower contact at color and composition change.	0.61	2511.52
SH	RED	Red with light gray green bands, few small sand filled burrows, sharp lower contact on color and composition change.	2.00	2513.52
MDST		Light gray green, very sandy, silty in top 0.40', clayey to base, some red streaks and irregular mottles, gradational lower contact on color and bedding.	1.08	2514.60
SH	RED	Few light gray green streaks, gradational lower contact on color change.	1.10	2515.70
SH		Medium gray green with few faint red bands in top 0.60', black, some carbonized root or stem impressions especially abundant from 2516.50' to base, gradational lower contact at sand streaks.	2.16	2517.86
SS	SLTY	Light gray, very fine grained, silty, ripple laminated, pyritized horizontal burrows, carbonized streaks, abundant mica, slightly coarser to fine grained at base, sharp lower contact.	6.39	2524.25
SH		Light medium gray, slightly silty, few carbonaceous pinnules (?) or stems at 2524.42', poorly bedded to TD 2525.00. TD at 11:00 a.m. November 14, 2002.	0.75	2525.00