

Appendix I

Core photos, log files, Strater, and first round sampling report.

Earth MRI round 1 samples were collected from individual state surveys. From the West Virginia Geological and Economic Survey there are core photos, logger reports of lithology, stratigraphic logs, and a sampling report.

Key for Strater:

SH-shale

SLST-siltstone

SLTY-silty

SS-sandstone

XBD-crossbedded

MDST-mudstone

CALC-

INBD-interbedded

FTCY-flintclay

BREC-brecciated

CLST-claystone

SDY-sandy

PYR-pyrite

CARB-

QTZ-quartz

BITRB-bioturbated

STR-stringers

NODAR-nodular

LS-limestone

FEST-

CLRN-clarion

ARG-aragonite or argillaceous?

ROOT-root structures

SLMP

STR

FOSS-fossils

KAOL-kaolinite

MOT-mottled

PBL-pebble

BRW-brown

IMP-impure

SKS-slickenlines



282-026 box45 451.83'-461.59'



282-026 box47 471.32'-481.34'



282-026 box50 500.41'-510.00'



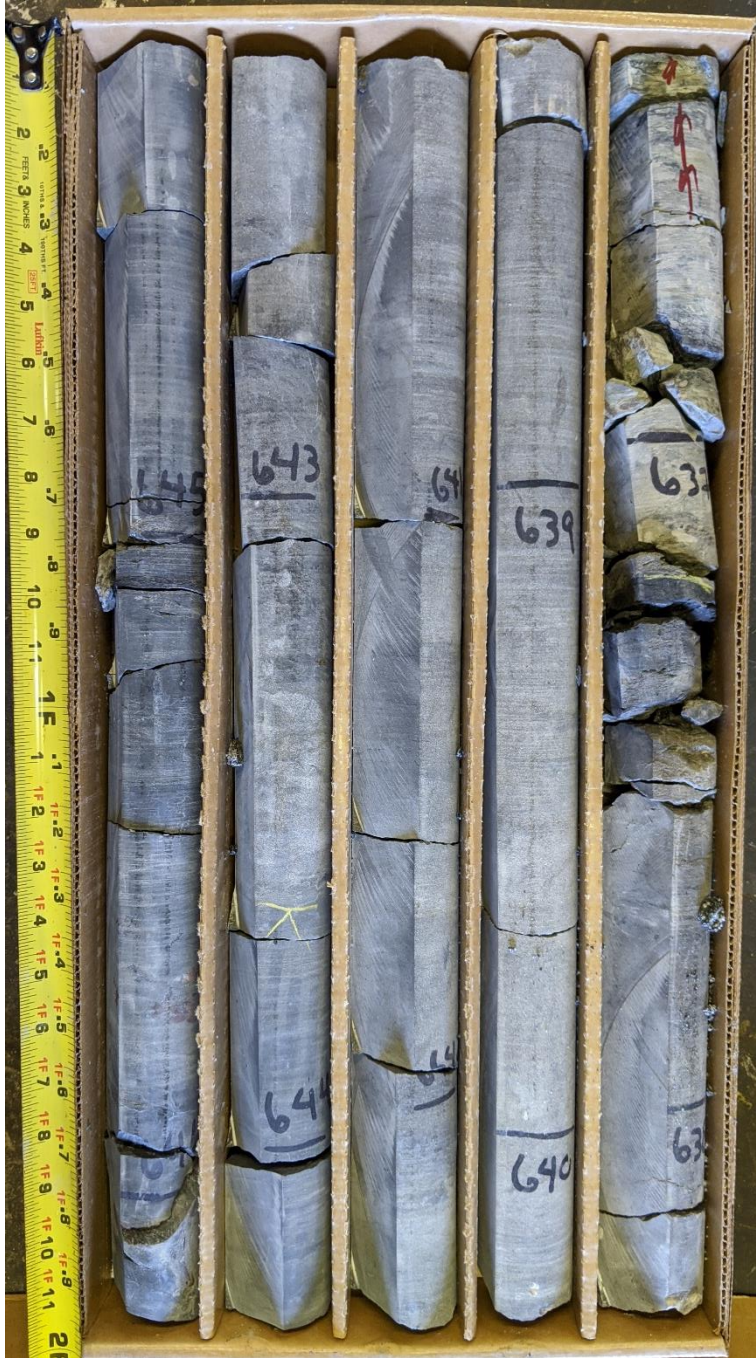
282-026 box51 510.00'-519.51'



282-026 box62 617.15'-626.85'



282-026 box63 626.85'-636.42'



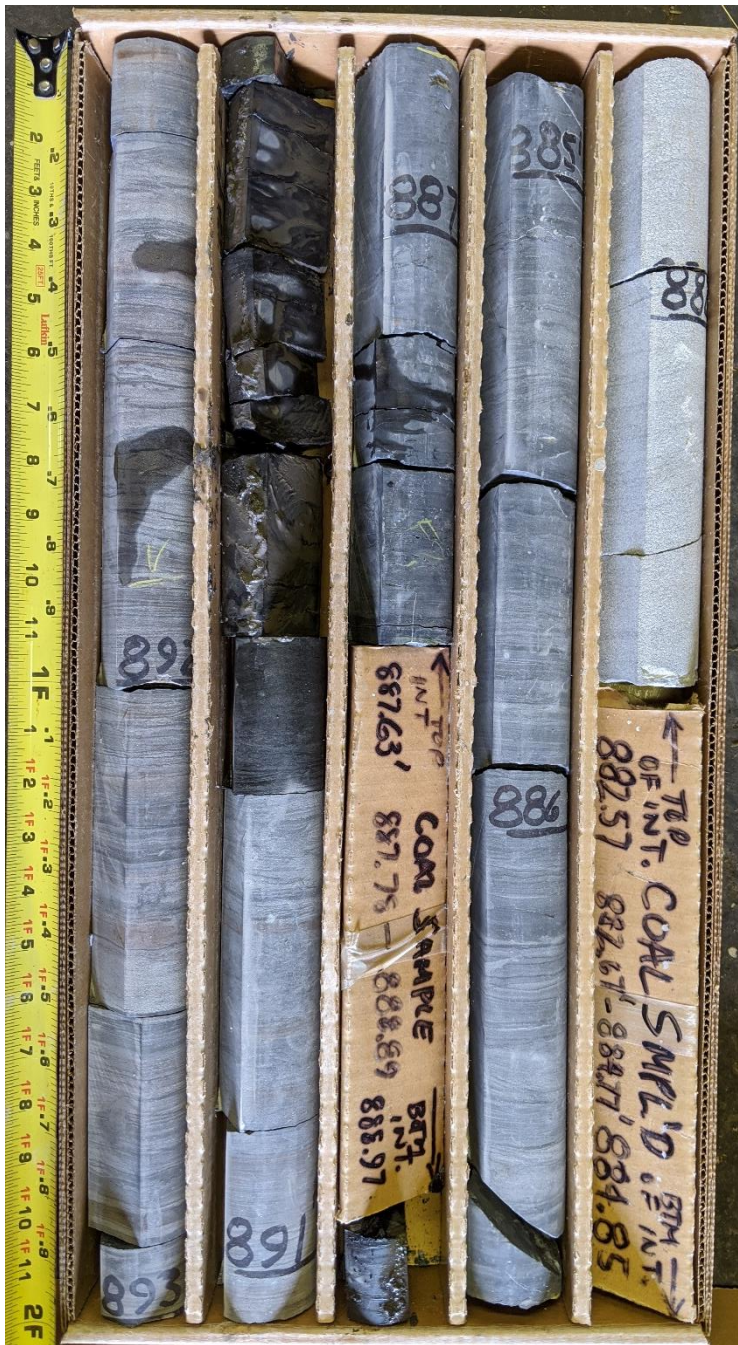
282-026 box64 636.42'-646.15'



282-026 box72 715.54'-725.21'



282-026 box86 852.10'-862.09'



282-026 box89 881.62'-893.00'



282-026 box92 912.46'-924.46'



285-073 box12 135.58'-145.42'



285-073 box19 205.21'-215.17'



285-073 box20 215.17'-225.00'



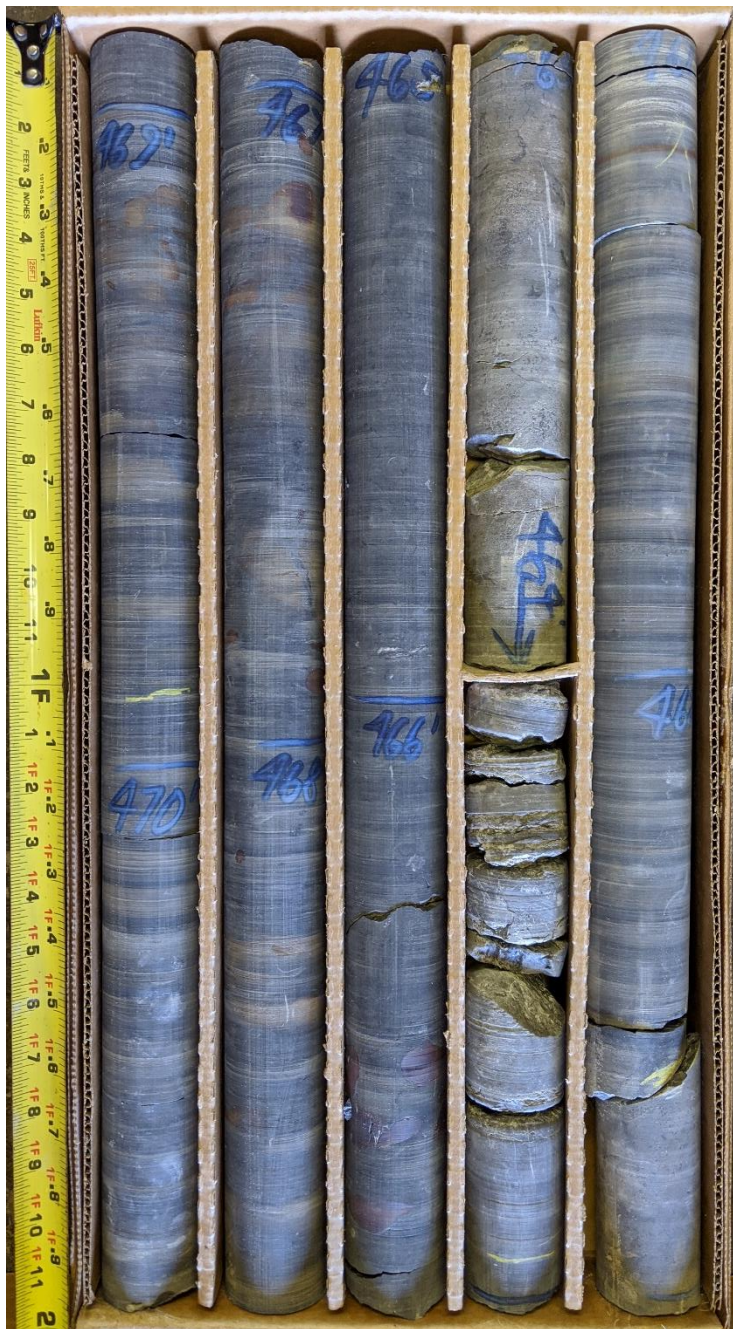
285-073 box21 225.00'-237.91'



285-073 box25 267.34'-277.23'



285-073 box27 287.21'-302.90'



285-073 box44 461.02'-470.87'



285-073 box45 470.87'-481.75'



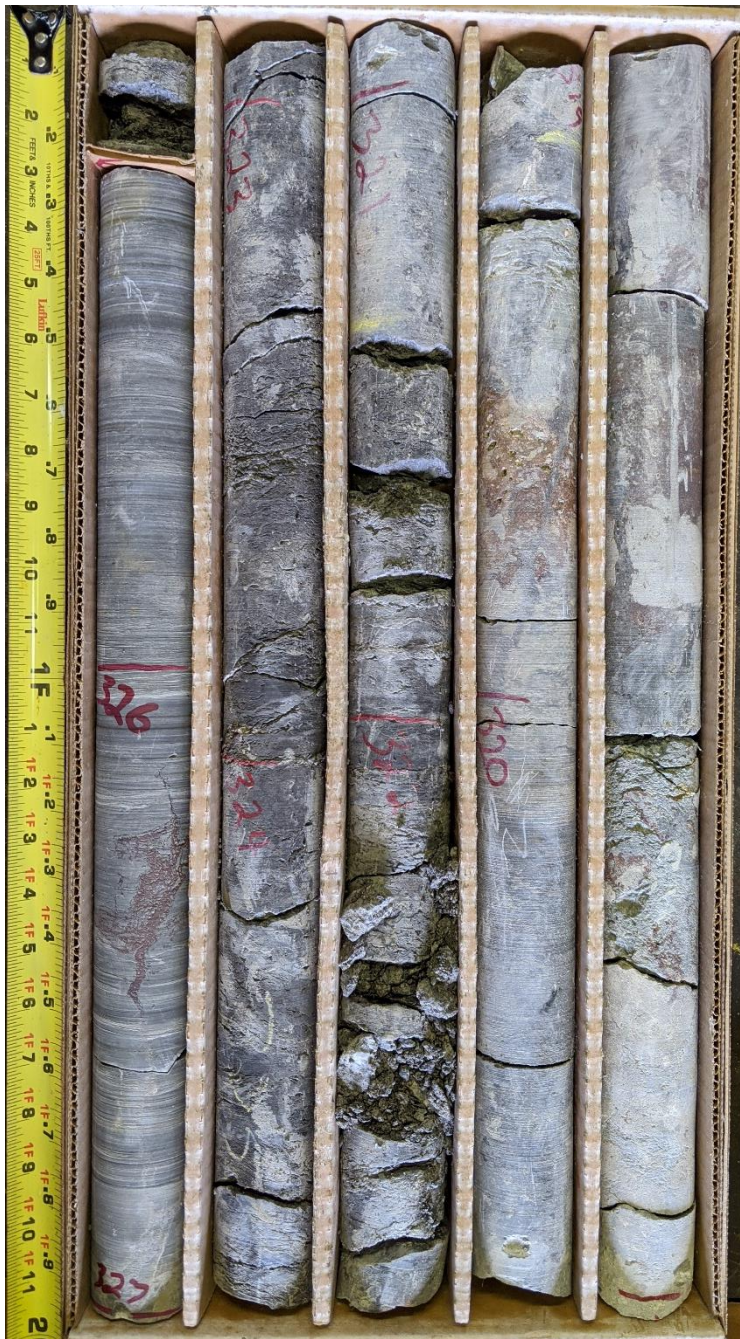
285-073 box46 481.75'-491.57'



285-073 box48 501.61'-511.44'



285-073 box49 511.44'-521.24'



302-072 box32 316.97'-327.01'



302-072 box33 327.01'-336.14'



302-072 box37 364.57'-373.91'



302-072 box38 373.91'-384.11''



302-072 box39 384.11'-393.71''



302-072 box40 393.71'-403.23''



302-072 box43 422.75'-433.05'



302-072 box44 443.05'-443.71'



302-072 box45 443.71'-453.76'



302-072 box51 501.64'-511.36'



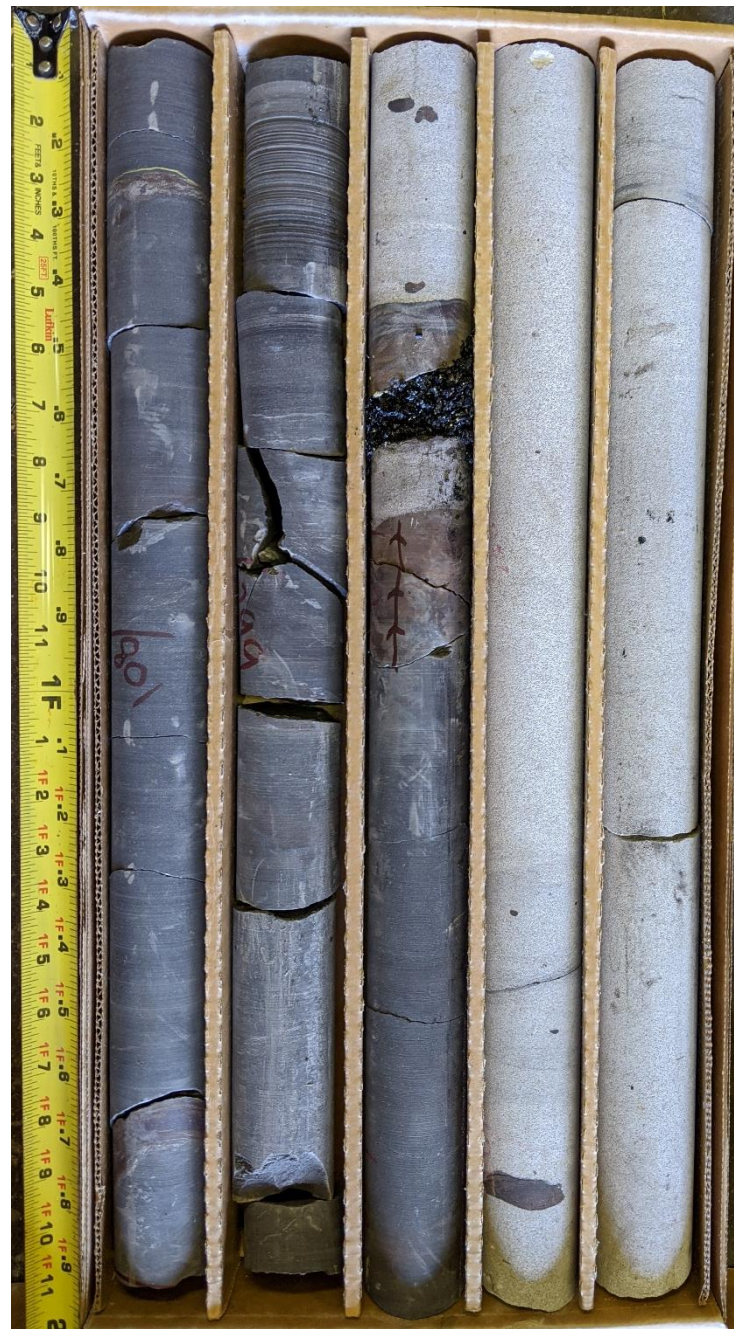
302-072 box52 511.36'-520.88'



302-072 box53 520.88'-532.38'



302-072 box59 580.76'-589.84'



302-072 box81 792.33-802.01



306-061 box107 1113.48'-1124.09'



306-061 box109 1133.60'-1143.30'



306-061 box114 1182.46'-1194.60'



306-061 box122 1263.21'-1274.26'



306-061 box123 1274.26'-1284.50'



306-061 box124 1284.50'-1294.17'



306-061 box125 1294.17'-1303.78'



306-061 box128 1323.53'-1332.77'



306-061 box129 1332.77'-1342.47'



306-061 box131 1352.32'-1364.07'



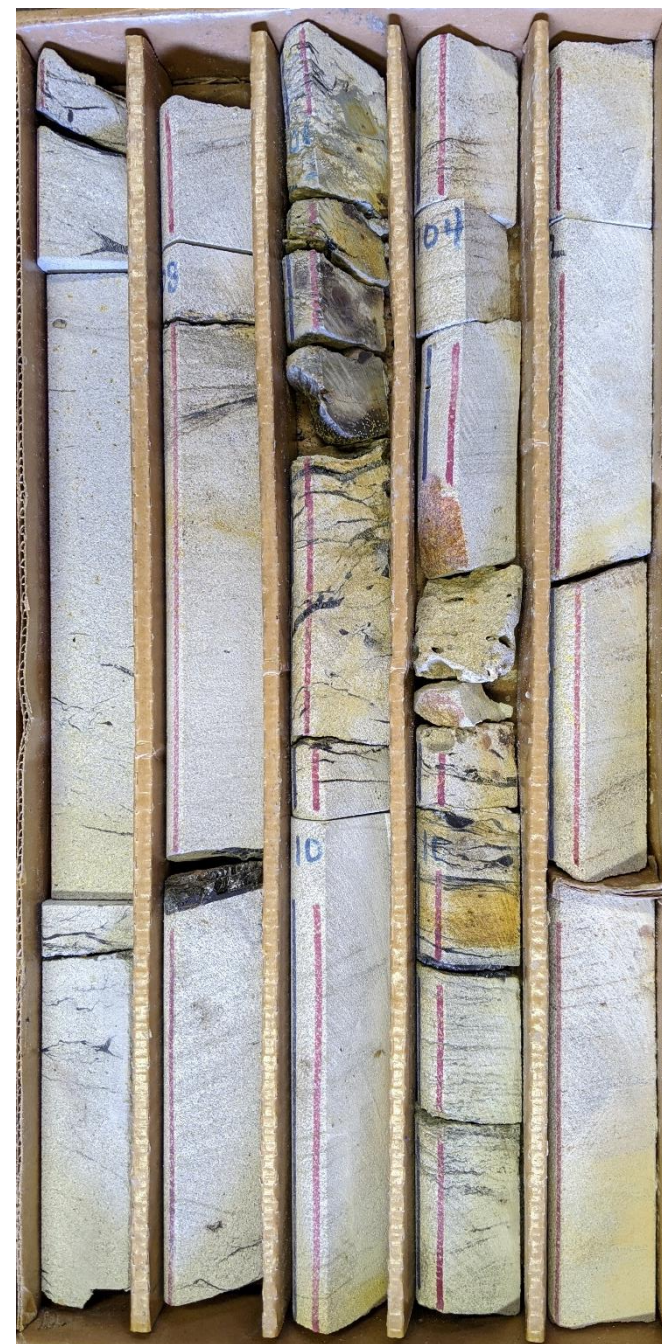
306-061 box132 1364.07'-1371.85'



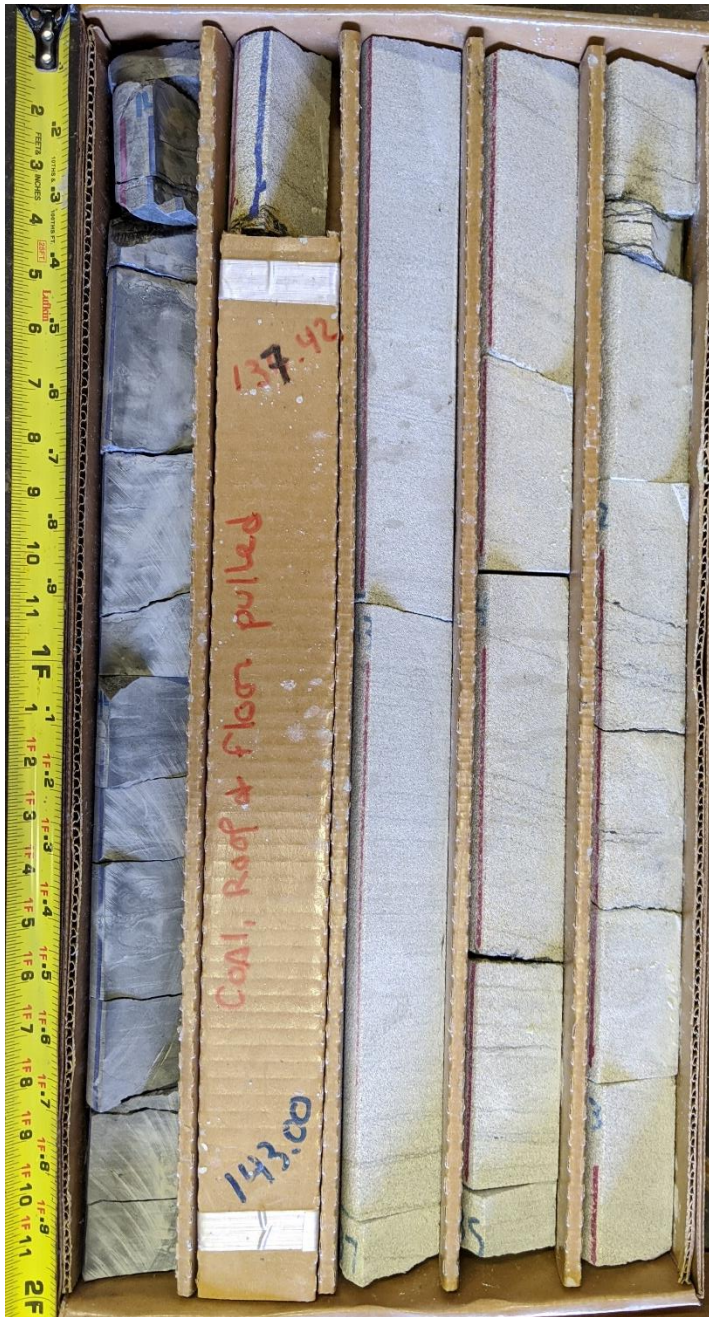
307-098 box1 23.00'-32.40'



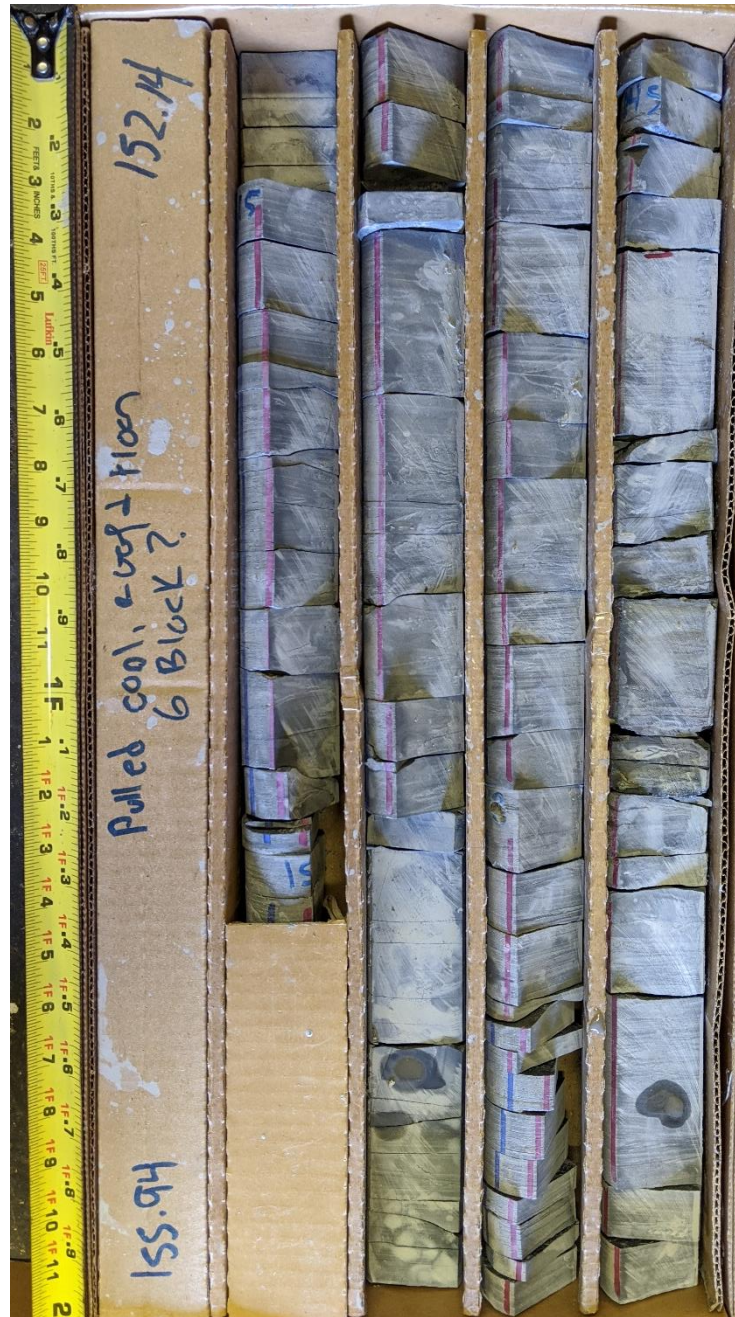
307-098 box2 32.40'-42.11'



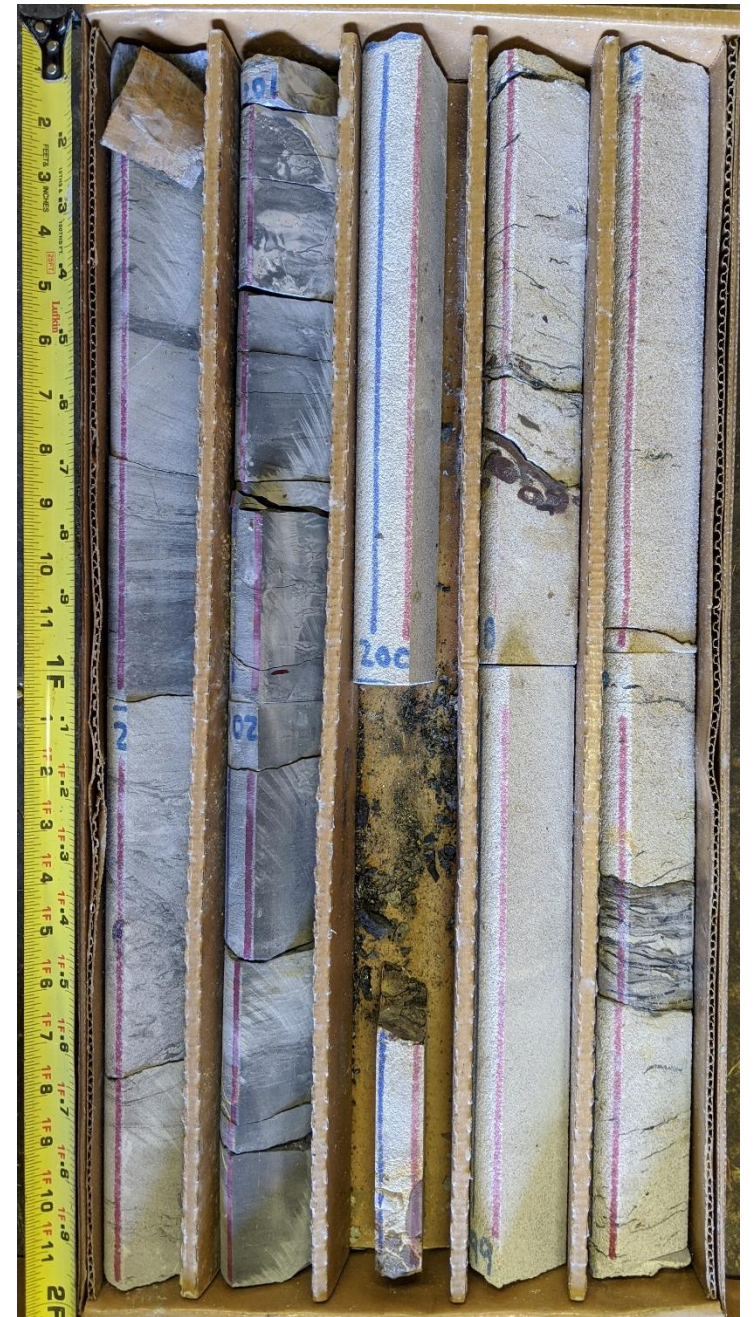
307-098 box9 101.73-111.64'



307-098 box12 131.31'-144.93'



307-098 box13 144.93'-155.94'



307-098 box18 195.05'-204.93'



307-098 box19 204.93'-214.50'



307-098 box25 266.45'-276.41'



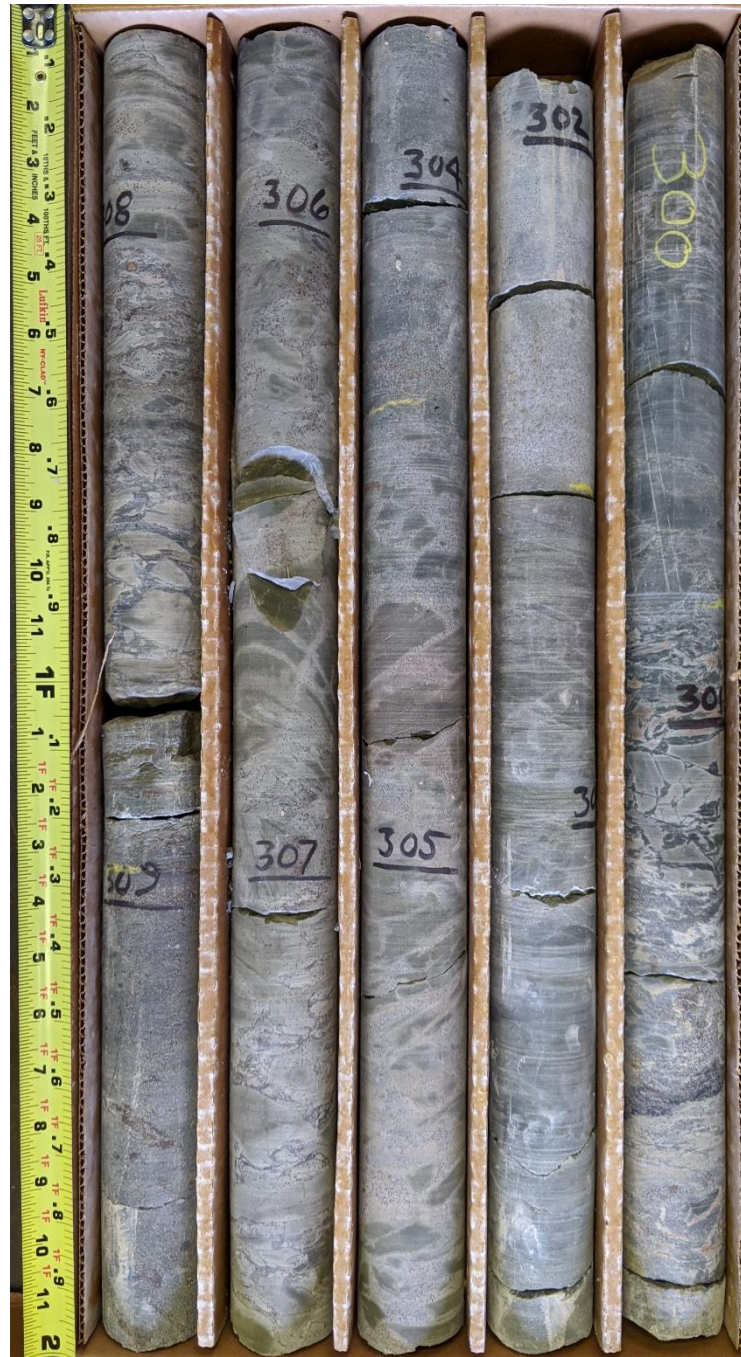
307-098 box26 276.41'-286.19'



307-098 box30 316.50'-331.93'



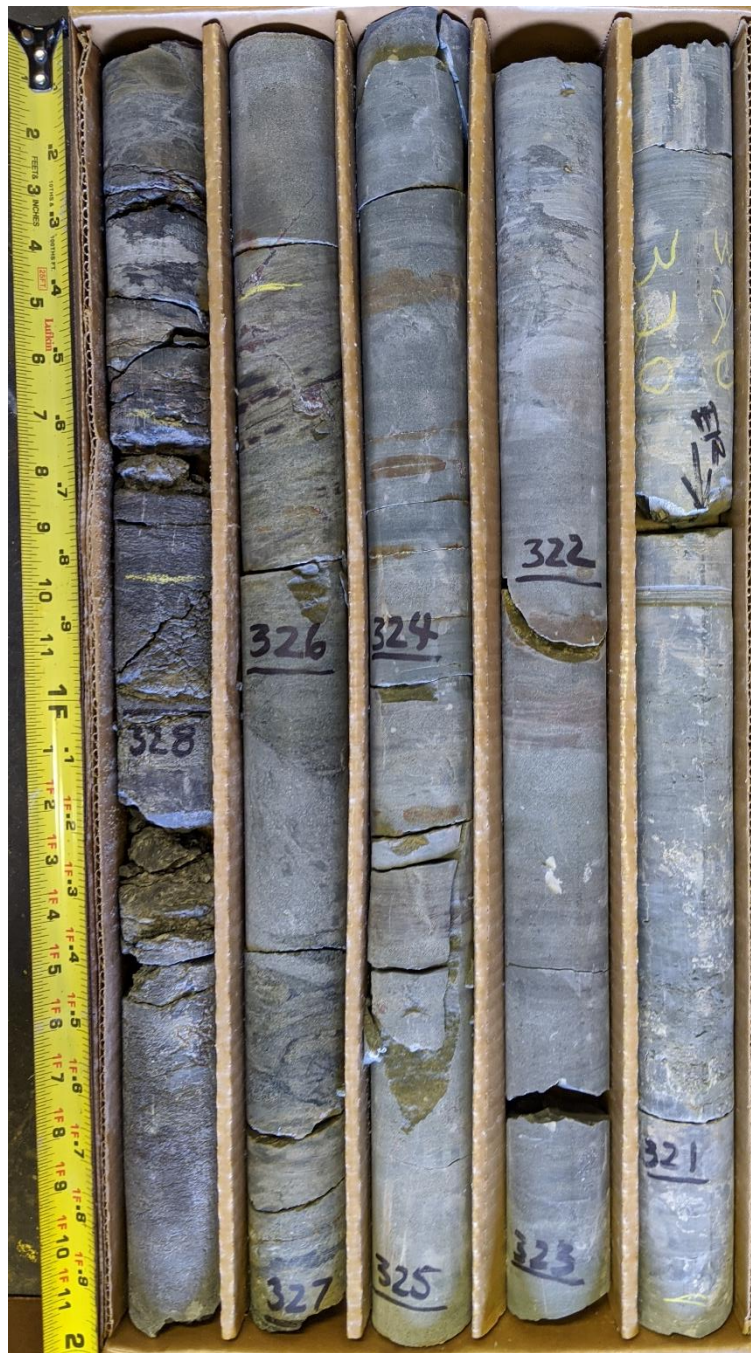
308-007 box28 290.37'-300.00'



308-007 box29 300.00'-309.67'



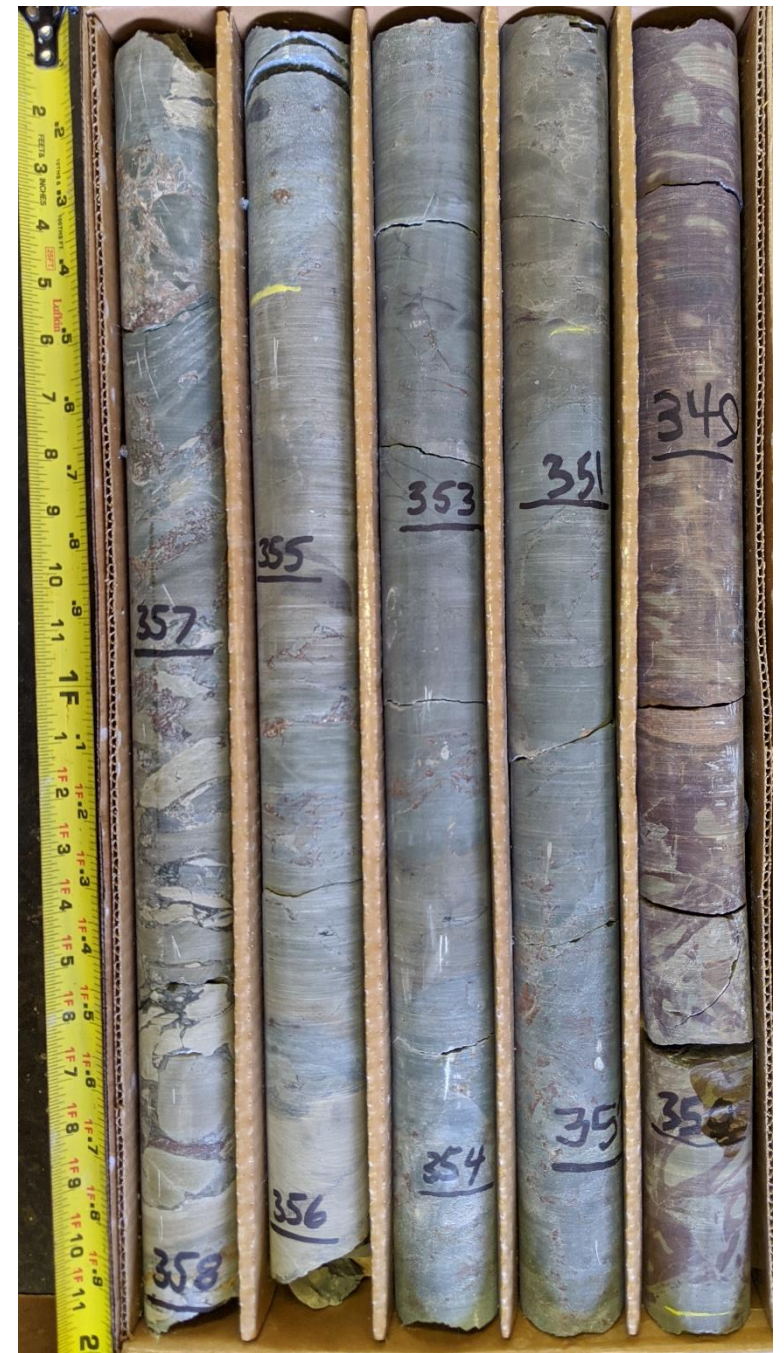
308-007 box30 308.67'-319.31'



308-007 box31 319.31'-328.96''



308-007 box32 328.96'-338.75''



308-007 box34 348.36'-258.05''



308-007 box35 358.05'-367.62'



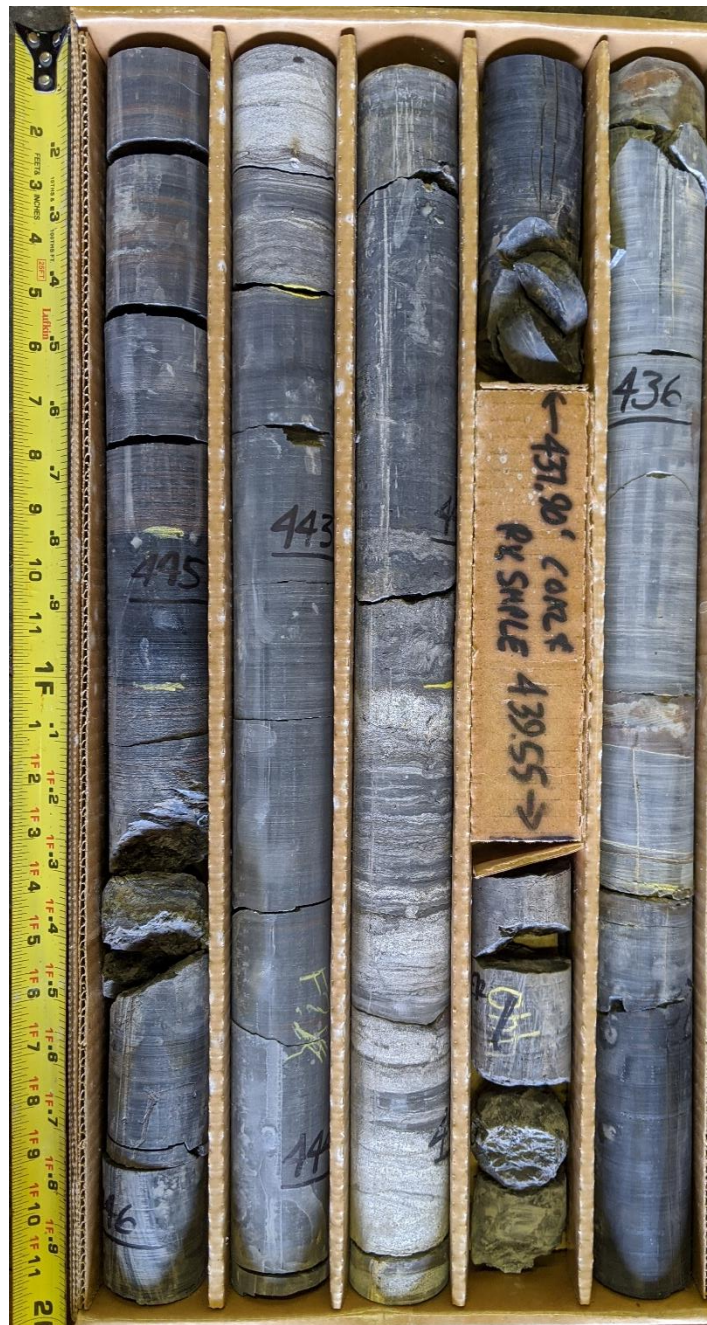
308-007 box39 396.73'-406.28'



308-007 box40 406.28'-415.85'



308-007 box41 415.85'-425.76'



308-007 box43 435.45'-446.10'



308-007 box44 446.10'-458.68'



308-007 box50 507.58'-517.38'



309-055 box130 1269.09'-1278.80'



309-055 box149 1455.63'-1465.58'



309-055 box150 1465.58'-1475.09'



309-055 box150 1465.58'-1475.09'



309-055 box161 1572.49'-1582.78'

POINT ID: 285-073

QUAD: BUCKHANNON (7.5')

COUNTY: UPSHUR

COMMENT: WVGES A.B. CARTER CORE HOLE

ST PLANE E: 2227146.3

UTME: 569207.60

LATITUDE: 38.90776

ST PLANE N: 695675.8

UTMN: 4306635.85

LONGITUDE: -80.20182

ELEVATION: 1875.92

TOTAL DEPTH: 1114.00

DATE: 11/13/20

GEOLOGIST: WVGES

NOTES: Record of A.B.Carter core drilled by WVGES on the A.B.Carter farm on the top of a small ridge about 525 feet south of county route 22 (or 9/5), 3,475 feet southeast of Mt. Carmel Church, and 2,850 feet northeast of the mouth of Grassy Run on Buckhannon River, Washington District, Upshur County, WV. Drilling contractor: L.J.Hughes and Sons. Driller: Howard (Fuzzy) Salisbury. Drilling dates: November 14 to December 1, 2000. Geophysical logging: Geological Logging Systems (Marshall Miller), December 4, 2000. Survey: Triad Engineering, 12/11/2000. Core logged by: Nick Fedorko and Dave Jones, 0-504'; Nick Fedorko, 504-1114'(TD).

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		Cased surface material, later extended to 27.5'.	21.50	21.50
NR	CORE LOSS		4.50	26.00
CLST	CALC INCL	Light-to-medium gray-green; few, light gray, calcareous streaks; weathered; broken; very soft from 29.50 to 30.20'; abrupt lower contact.	4.20	30.20
CLST	CALC INCL	Medium gray; light-to-medium gray calcareous streaks; less weathered than above; gradual lower contact.	1.05	31.25
SH	CALC INCL	Light gray; poorly bedded; light gray calcareous streaks; gradual lower contact.	0.90	32.15
SH	SLTY	Medium gray; slightly sandy; few, faint, fine, light gray calcareous streaks and nodules.	1.85	34.00
NR	CORE LOSS		0.92	34.92
SH	SLTY	Medium gray; slightly sandy; few, faint, fine, light gray calcareous streaks and nodules; gradual lower contact.	1.03	35.95
SS		Light-to-medium gray; fining upward from fine to very fine grained; two thin medium gray shale	4.55	40.50

streaks from 37.30 to 37.50'; light gray calcareous nodules at 37.50'; calcareous from 37.50 to 39.00'; medium gray shale pebbles and rip-ups from 40.15' to base; clear lower contact.

SH	CALC INCL	Medium gray; common, distinct, coarse, light gray calcareous nodules; becoming sandy to base; gradual lower contact.	1.62	42.12
SS	CALC INCL	Light gray; fine grained; cross laminated; common, faint, coarse, light gray, calcareous nodules; clear lower contact.	3.08	45.20
SS	XBD	Light gray; fine grained; planar and ripple cross laminated; abrupt lower contact.	12.22	57.42
COAL	NP	Position of the Brush Creek coal (absent).	0.00	57.42
CLST	ROOT	Medium gray; very fine; dark gray-to-black, carbonaceous root traces; broken by drilling.	2.68	60.10
NR	CORE LOSS		1.41	61.51
CLST	ROOT	Medium gray; very fine; dark gray-to-black, carbonaceous root traces; broken by drilling; clear lower contact.	0.82	62.33
SH		Light gray; poorly bedded; silty to base; abrupt lower contact.	0.97	63.30
SS		Light gray; fine grained at top with zones of medium-to-coarse grained; interbedded zones of planar and ripple cross laminations; medium gray shale streaks from 89.00-89.50'; abrupt lower contact.	48.47	111.77
SS	SH STR	Light gray; fine grained; micaceous; ripple cross laminated; dark gray shale streaks with pyrite; some streaks organic rich; clear lower contact.	2.53	114.30
SS		Light gray; fine grained; planar laminated; few dark shale and mineral streaks; abrupt lower contact.	1.20	115.50
SS	COAL STR	Light gray; fine grained; thin, rippled coal streaks; some medium-to-dark gray shale streaks; abrupt lower contact.	0.43	115.93
SS		Light gray; fine grained.	0.14	116.07
SS	COAL STR	Light gray; fine grained; thin coal streaks and spars.	0.11	116.18
SS		Light gray; fine grained; ripple cross laminated; few thin coal and shale streaks.	0.87	117.05

SS	COAL STR	Light gray; fine grained; abundant thin coal streaks and spars; one streak 0.03' thick at 118.25'; abrupt lower contact.	1.35	118.40
SS	SH STR	Light gray; fine grained; medium gray shale streaks; abrupt lower contact.	0.55	118.95
SS	SH CLS	Light gray; fine-to-medium grained; mostly ripple laminated; common medium gray shale clasts and streaks.	2.17	121.12
SS		Light gray; fine-to-medium grained; massive; one shale streak at 130.50'; coaly streaks from 135.55-135.68'; abrupt lower contact.	14.95	136.07
COAL	NP	Position of the Upper Freeport coal (absent).	0.00	136.07
FTCY	NODAR	Light gray; crudely nodular; medium gray matrix; slightly pyritic; clear lower contact.	1.10	137.17
SH		Light-to-medium gray; weakly bedded at top; few siderite masses; clear lower contact.	4.53	141.70
CLST		Medium gray; dark streaks; possibly kaolinitic.	0.60	142.30
NR	CORE LOSS		0.50	142.80
CLST		Medium gray; broken by drilling; gradual lower contact.	1.05	143.85
SH		Medium gray; some sandy and silty zones; abrupt lower contact.	9.69	153.54
SS		Light gray; very fine grained; mostly ripple laminated; abrupt lower contact.	1.08	154.62
SH		Medium gray; very uniform; abrupt lower contact.	4.03	158.65
LS	NODAR	Top of Upper Freeport Limestone zone. Light gray; weakly calcareous with light gray to white, thin calcareous streaks; clear lower contact.	0.44	159.09
SH	FEST INCL	Medium gray; few, faint, coarse, siderite nodules throughout; clear lower contact.	14.94	174.03
SH	SS STR	Medium gray; light gray, fine grained, rippled sandstone streaks; clear lower contact.	0.74	174.77
SH	CALC INCL	Medium gray; few, distinct, calcareous nodules; abrupt lower contact.	2.48	177.25
SS	CALC	Light gray; very fine grained; mostly ripple laminated; calcareous throughout; few medium gray shale streaks; abrupt lower contact.	2.31	179.56
SH	CALC INCL	Medium gray; few, distinct, coarse, light gray,	1.94	181.50

calcareous nodules; clear lower contact.

SH	SS STR	Medium gray; zones of light gray, very fine grained, rippled sandstone streaks; one or two faint, medium calcareous nodules; abrupt lower contact.	7.50	189.00
LS		Light gray; hard; some zones not as calcareous as others; thin, light gray, strongly calcareous streaks and fracture fills; abrupt lower contact.	0.93	189.93
Base of Upper Freeport Limestone				
SH		Medium gray; abrupt lower contact.	0.79	190.72
SS	CALC	Light gray; very fine grained; rippled; abrupt lower contact.	0.43	191.15
SH		Medium gray; very few, faint, fine, light gray calcareous nodules; abrupt lower contact.	2.20	193.35
SH	SDY	Medium-to-light gray; calcareous, clear lower contact.	0.38	193.73
SH		Medium gray; very few, very fine, faint, calcareous streaks and nodules; clear lower contact at large nodule.	9.42	203.15
SH	FEST INCL	Medium gray; few, distinct, large siderite nodules up to 2" in diameter, some with light gray calcite-filled fractures within them; abrupt lower contact.	3.75	206.90
FTCY	BREC	Medium gray; light gray-brown angular clasts; some dark gray-to-black streaks at base; abrupt lower contact.	0.39	207.29
SS	QTZ	Light gray-to-white; fine grained; intermixed with Flint clay; abrupt lower contact.	0.22	207.51
FTCY	BREC	Medium gray; very fine, light gray-brown clasts; some dark gray streaks; abrupt lower contact.	0.52	208.03
CLST		Light gray; badly broken with about 0.25' of loss in this unit; abrupt, wavy lower contact.	2.20	210.23
SS	QTZ	Light gray; fine-to-medium grained; some dark minerals; few, distinct, medium, medium gray-brown flint clay clasts and irregular lenses; abrupt, high angle lower contact.	0.71	210.94
CLST		Medium gray to medium gray-brown; some slickensides; abrupt, wavy lower contact.	3.06	214.00
SS	QTZ	Gray; very fine grained; some medium gray shale rip ups from 215.50-215.75'; abrupt lower contact.	2.27	216.27

FTCY		Banded light gray and medium gray with some small, dark gray streaks; abrupt lower contact.	0.55	216.82
SS	QTZ	Light gray; fine-to-medium grained; faint planar bedding; iron oxide stained fractures from top to 219.90'; abrupt, angular lower contact.	2.73	219.55
SS	QTZ	Light gray; medium-to-coarse grained; massive; abundant iron oxide staining on fractures and between grains; medium gray shale rip ups from 222.65-222.90'; abrupt lower contact.	7.43	226.98
SH		Medium-to-dark gray; abrupt lower contact.	0.12	227.10
SS	BITRB	Light gray; fine grained; ripple laminated; probably rooted; clear lower contact.	1.72	228.82
SS		Light gray; very fine grained; medium gray shale streak at base; abrupt lower contact.	1.18	230.00
SH		Medium gray; abrupt, angular lower contact.	0.38	230.38
SS	SH STR	Sandstone, light gray; quartzose. Shale, medium gray; abrupt lower contact with coal; coal stringers and abundant pyrite on bedding in basal 0.05' (sampled basal 0.05' with coal).	0.62	231.00
SS	COAL STR	Very fine grained; coal stringers with abundant pyrite (sampled) (described by Bill Grady in lab).	0.06	231.06
COAL	CLRN	Top of Upper Kittanning coal. Bright clarain; abundant pyritized fusains; sharp top (sampled) (described by Bill Grady in lab).	0.41	231.47
COAL	CLRN	Dull clarain; common pyritized fusains; interfingered very thin carbonaceous shale bands (sampled) (described by Bill Grady in lab).	0.06	231.53
BN		Abundant pyrite; top and bottom gradational over 0.01' (sampled) (described by Bill Grady in lab).	0.01	231.54
COAL	CLRN	Dull (sampled) (described by Bill Grady in lab).	0.08	231.62
COAL	CLRN	Bright clarain; soft; broken in core; common pyritized fusain bands (sampled) (described by Bill Grady in lab).	0.44	232.06
COAL	CLRN	Dull clarain (sampled) (described by Bill Grady in lab).	0.13	232.19
SH	BLK	Black; bony/canneloid; medium density; conchoidal fracture; pyrite on bedding; fractures in top part (sampled) (described by Bill Grady in lab).	0.09	232.28
COAL	CLRN	Dull clarain; common pyritized fusain lenses; minor cleat pyrite (sampled) (described by Bill Grady in lab).	0.34	232.62

SH	BLK	Black; soft; coal stringers; gradational lower contact (sampled) (described by Bill Grady in lab).	0.07	232.69
BN		Sharp base; gradational top (sampled) (described by Bill Grady in lab).	0.01	232.70
COAL	CLRN	Dull clarain; thinly laminated vitrain bands; common 0.01-0.02' pyrite lenses and bands (sampled) (described by Bill Grady in lab).	0.31	233.01
COAL	CLRN	Bright clarain; >75% 1-5mm thick vitrain bands; abundant pyritized fusain lenses throughout (sampled) (described by Bill Grady in lab).	1.41	234.42
Base of Upper Kittanning coal				
SH	BLK	Black; common pinnules; broken by drilling (sampled).	0.09	234.51
CLST		Medium gray; slickensided; abrupt lower contact (sampled top 0.09' with coal)	0.66	235.17
SH		Medium gray; few, dark gray root traces; poorly bedded; abrupt lower contact.	1.14	236.31
SS	SLTY	Light gray; very fine grained; micaceous; silty; rooted; clear lower contact.	1.73	238.04
SH		Medium gray with light gray bands; clear lower contact.	1.99	240.03
SS	SLTY	Light-to-medium gray; very fine grained; micaceous; abrupt lower contact.	1.32	241.35
SH		Medium gray; abrupt, angular lower contact.	0.52	241.87
SS		Light gray; fine grained; ripple to ripple cross laminated; clear lower contact.	3.08	244.95
SH		Medium gray; clear lower contact.	1.97	246.92
SS	SH STR	Light gray; very fine grained; ripple laminated; light-to-medium gray shale streaks; clear lower contact.	1.77	248.69
SH		Medium gray; abrupt lower contact.	1.77	250.46
SS		Light gray; fine grained; ripple to planar laminated; micaceous; abrupt lower contact.	4.13	254.59
SH		Light-to-medium gray; abrupt lower contact.	2.33	256.92
LS		Light gray; thin bed; abrupt lower contact.	0.08	257.00
SH		Medium-to-light gray band; clear lower contact.	1.75	258.75

SS		Light gray; fine grained; ripple laminated; some medium gray shale streaks at base; abrupt lower contact.	1.17	259.92
SH		Medium and light gray bands; abrupt lower contact.	2.13	262.05
SS		Light gray; very fine grained; ripple laminated; abrupt lower contact.	0.16	262.21
SH		Medium and light gray bands; abrupt, angular lower contact.	2.97	265.18
LS		Top of Johnstown Cement Limestone. Light gray; hard; nodular; abrupt lower contact.	0.28	265.46
LS	ARG	Medium gray; argillaceous; shaly; slightly fissile; abrupt lower contact.	1.34	266.80
LS	NODAR	Light gray; nodular; hard; abrupt lower contact.	0.32	267.12
LS	ARG	Medium gray; argillaceous; many, distinct, fine-to-medium, light gray nodules; abrupt lower contact.	2.82	269.94
Base of Johnstown Cement Limestone				
FTCY	BREC	Light gray-green clasts in medium gray matrix; clear lower contact.	1.81	271.75
CLST		Medium gray; dark gray streak near base; abrupt lower contact.	1.20	272.95
COAL		Abrupt lower contact (not sampled). Unnamed coal	0.07	273.02
SH		Medium gray; poorly bedded; clear lower contact.	1.95	274.97
SH	SS STR	Medium gray; light gray, very fine grained, rippled sandstone streaks; possible burrows; abrupt lower contact.	2.21	277.18
SH		Medium gray; clear lower contact.	1.86	279.04
SH	SS STR	Medium gray; Light gray, very fine grained, rippled sandstone streaks; sandstone streaks more abundant in basal half; abrupt lower contact.	6.31	285.35
SS		Light gray-to-white; very fine grained; rippled to ripple cross laminated; fairly clean; few medium gray shale clasts; abrupt lower contact.	0.35	285.70
SH		Medium gray; abrupt lower contact.	0.15	285.85
SS		Light gray-white; very fine grained; medium gray shale streak in the middle; abrupt, angular lower	0.37	286.22

		contact.		
SH		Medium gray; clear lower contact.	0.89	287.11
SS	SH STR	Light gray; very fine grained; ripple laminated; fairly clean; medium gray shale streaks; abrupt lower contact.	0.89	288.00
SH		Dark gray; very uniform; abrupt lower contact.	2.10	290.10
SH	SS STR	Medium-to-dark gray; four evenly spaced, light gray, very fine grained, rippled sandstone streaks; abrupt lower contact.	0.43	290.53
SH		Medium gray at top, dark gray-to-black at base; abrupt lower contact (sampled basal 0.16' with coal).	1.07	291.60
SH	BLK	Black; highly carbonaceous; bony; medium density; gradational base (sampled) (described by Bill Grady in lab).	0.23	291.83
BN		Top of Middle Kittanning coal. Very thinly laminated with carbonaceous shale lenses; very thin vitrain stringers and minor large pyrite lenses; sharp erosional base (sampled) (described by Bill Grady in lab).	0.30	292.13
COAL	CLRN	Dull clarain; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.08	292.21
COAL	FS	Fusain; soft; mineralized with clays (sampled) (described by Bill Grady in lab).	0.05	292.26
COAL	CLRN	Dull clarain; common 1mm vitrain bands; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.07	292.33
PYR		Pyrite parting (sampled) (described by Bill Grady in lab).	0.01	292.34
COAL		Dull durain; canneloid; non-banded; conchoidal fracture; very fine grained groundmass; medium density; rare, very thin, vitrain fragments; extremely small, dispersed pyrite throughout evidenced by small iron stains; larger pyrite lenses present and common cleat pyrite (sampled) (described by Bill Grady in lab).	0.74	293.08
COAL	CLRN	Bright clarain; interbanded dull clarain and 1-3mm vitrain bands (sampled) (described by Bill Grady in lab).	0.22	293.30
COAL	CLRN	Dull clarain; rare, very thin vitrain streaks; sharp top (sampled) (described by Bill Grady in lab).	0.14	293.44

COAL		Durain; attrital; dull, non-banded, granular groundmass; minor small pyrite lenses; sharp top; some vitrain-rich coal at base (sampled) (described by Bill Grady in lab).	0.08	293.52
COAL	NR	Not recovered; part of 0.28' core loss between runs; lithology and thickness from e-log (no sample).	0.10	293.62
BN		Not recovered; part of 0.28' core loss between runs; lithology and thickness from e-log (no sample).	0.12	293.74
COAL	NR	Not recovered; part of 0.28' core loss between runs; lithology and thickness from e-log (no sample).	0.06	293.80
COAL	CLRN	Dull clarain; rare, thin vitrain bands; 0.01' fusain at top (sampled) (described by Bill Grady in lab).	0.17	293.97
COAL	CLRN	Bright clarain; abundant 1-3mm vitrain bands; common, thin fusains, few pyritized; rare cleat calcite (sampled) (described by Bill Grady in lab).	0.33	294.30
COAL	CLRN	Bright clarain; common pyritized fusains (sampled) (described by Bill Grady in lab).	0.16	294.46
COAL	FS	Fusain; soft (sampled) (described by Bill Grady in lab).	0.01	294.47
COAL	CLRN	Bright clarain (sampled) (described by Bill Grady in lab).	0.09	294.56
COAL	CLRN	Dull clarain; common fusain lenses; common 1-3mm vitrain bands (sampled) (described by Bill Grady in lab).	0.30	294.86
COAL		Vitrain; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.04	294.90
COAL	IMP	Bony to bone; thinly laminated; thin vitrain bands at base; lenticular cannel layers up to 0.01' thick; small fusain lenses; common, very thin, carbonaceous shales in middle; small cleat pyrite (sampled) (described by Bill Grady in lab).	0.09	294.99
COAL	IMP	Interlaminated bone coal and 1-3mm vitrain bands and thin fusain lenses (sampled) (described by Bill Grady in lab).	0.09	295.08
COAL	CLRN	Dull clarain (sampled) (described by Bill Grady in lab).	0.08	295.16
COAL	IMP	Bony to bone; medium density; contains thin vitrain streaks in lower half with thin	0.14	295.30

		carbonaceous shale lenses in upper half (sampled) (described by Bill Grady in lab).		
COAL	IMP	Interlaminated bone coal and 1-3mm vitrain bands and thin fusain lenses (sampled) (described by Bill Grady in lab).	0.11	295.41
COAL	IMP	Bony to bone; very thinly laminated with discontinuous black shale parting at top (sampled) (described by Bill Grady in lab).	0.09	295.50
BN		Very thinly laminated; contains lenticular (0.00-0.02') black shale; pyrite lens near base; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.05	295.55
COAL		Vitrain (sampled) (described by Bill Grady in lab).	0.01	295.56
COAL	IMP	Bony to bone; very thinly laminated with vitrain streaks; minor small pyrite lenses; sharp top, gradational bottom (sampled) (described by Bill Grady in lab).	0.10	295.66
COAL	CLRN	Dull clarain; common cleat pyrite (sampled) (described by Bill Grady in lab).	0.03	295.69
SH	BLK	Black; varied thickness (sampled) (described by Bill Grady in lab).	0.02	295.71
COAL	CLRN	Dull clarain; minor, thin, pyritized fusains; rare cleat pyrite (sampled) (described by Bill Grady in lab).	0.16	295.87
COAL	CLRN	Dull clarain; fine grained, granular, attrital groundmass with occasional <1mm vitrain bands; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.08	295.95
COAL	IMP	Bony to bone; extremely fine grained groundmass; non-banded; moderate density; rare, small, angular and lenticular clasts of cannel coal and very small shale clasts or lenses; irregular (erosional?) base; sharp top (sampled) (described by Bill Grady in lab).	0.14	296.09
COAL	CANL	Dull; greasy luster; conchoidal fracture; very fine grained groundmass with rare, small vitrain fragments; sharp top (sampled) (described by Bill Grady in lab).	0.15	296.24
COAL	IMP	Bony to bone; canneloid; extremely fine groundmass with very few, small, angular vitrain fragments and rare, very thin vitrain bands; low density; minor pyritized fusains at base; sharp top (sampled) (described by Bill Grady in lab).	0.12	296.36

COAL	CLRN	Dull clarain; very fine attrital groundmass; minor 1mm vitrain bands; gradational base, sharp top (sampled) (described by Bill Grady in lab).	0.11	296.47
COAL	IMP	Bony to bone; attrital; very thinly laminated with small, angular vitrain fragments and very fine groundmass; top and bottom gradational (sampled) (described by Bill Grady in lab).	0.10	296.57
COAL	IMP	Bony to bone; canneloid; extremely fine groundmass with very few, small, angular vitrain fragments and rare, very thin vitrain bands; low density; sharp base (sampled) (described by Bill Grady in lab).	0.19	296.76
COAL	CLRN	Bright clarain; common, 1-3mm vitrain bands; common, 1mm, lenticular, pyritized fusain lenses at 0.10' intervals; fusains more abundant and coal highly fragmented above 297.13' (sampled) (described by Bill Grady in lab).	1.22	297.98
COAL	IMP	Bony to bone; high density; laminated with few, thin vitrain lenses; large, lenticular, pyritized fusain at top (sampled) (described by Bill Grady in lab).	0.05	298.03
COAL	IMP	Bony to bone; high density; laminated with few, thin vitrain lenses; extremely abundant, very fine pyrite dispersed throughout; sharp bottom and top (sampled) (described by Bill Grady in lab).	0.11	298.14
Base of Middle Kittanning coal				
CLST	ROOT	Medium gray; dark gray streaks; black root traces; slightly fissile; abundant pyrite in upper 0.03' (Bill Grady); gradual lower contact (top 0.11' sampled with coal).	1.26	299.40
SH		Dark gray; abrupt lower contact.	0.87	300.27
SH	SS STR	Shale, dark gray; sandstone, light gray, very fine grained, rippled streaks; some slumping; some soft sediment deformation; abrupt lower contact (not sampled).	0.43	300.70
SH	BLK	Black; abrupt lower contact (not sampled).	0.41	301.11
SS		Light-to-dark gray; fine grained; fairly clean; angular coal streaks; soft sediment deformation; abrupt lower contact (sampled with coal, 6/19/01).	0.25	301.36
COAL	IMP	Impure; dull clarain containing small and large sandstone lenses, common fusain lenses, and thin black shale at base; bedding contorted and top was sharp and erosional (sampled 6/19/01) (described by Bill Grady in lab).	0.09	301.45

COAL		Vitrain bands dominate, ranging in thickness from 1mm to 1cm; interbedded with abundant, pyritized fusain lenses; thin carbonaceous shale at top (sampled 6/19/01) (described by Bill Grady in lab).	0.10	301.55
SS		Light gray-to-black, mixed with organic matter; light gray zones are fairly clean; soft sediment deformation; cola streaks; abrupt, angular lower contact (sampled 6/19/01) (description from field).	0.19	301.74
COAL	CLRN	Dull clarain, thinly laminated with common, thin vitrain bands; minor pyrite lenses; sharp, erosional top (sampled 6/19/01) (described by Bill Grady in lab).	0.14	301.88
COAL	CLRN	Dull clarain, thinly laminated with minor, thin vitrain bands; abundant pyrite in vitrain at top (sampled 6/19/01) (described by Bill Grady in lab).	0.09	301.97
SH	BLK	Black; bony; lenticular (sampled 6/19/01) (described by Bill Grady in lab).	0.02	301.99
COAL	CLRN	Clarain, dull attrital matrix containing 1mm vitrain bands; common 1mm, lenticular, soft fusain lenses (sampled 6/19/01) (described by Bill Grady in lab).	0.06	302.05
COAL	IMP	Vitrain bands interbedded with thin, carbonaceous shales containing abundant pyrite (sampled 6/19/01) (described by Bill Grady in lab).	0.03	302.08
BN		High density; interbedded with thin, white sandstone lenses; contains abundant, very fine pyrite dispersed throughout and abundant sulfides on core; abrupt, angular, wavy lower contact (sampled 6/19/01) (described by Bill Grady in lab).	0.04	302.12
MDST	ROOT	Medium gray; sandy; silty; carbonaceous root traces; abrupt, angular lower contact (sampled w/ coal, 6/19/01).	0.14	302.26
MDST		Dark gray-to-black; coal streak at top and bottom; abrupt lower contact (sampled top 0.09' w/ coal, 6/19/01).	1.31	303.57
MDST	ROOT	Medium-to-dark gray; some coaly streaks; irregular nodule of very fine clean sand mixed with organic matter from 303.58 to 303.67'.	0.43	304.00
SS	ROOT	Light gray; very fine grained; highly bioturbated; medium gray shale streaks; clear lower contact.	1.12	305.12

SH	SS STR	Medium gray; light gray, very fine grained sandstone streaks; bioturbated; couple of thin coal streaks near top; clear lower contact.	2.11	307.23
SH		Medium gray; few light gray, very fine grained sandy zones; abrupt, angular lower contact.	2.93	310.16
SS	QTZ	Light gray; fine grained; fairly clean with some dark minerals; coal spar at 311.10'; few stylolites; some medium gray shale clasts at 313.15'; abrupt lower contact.	6.26	316.42
SS	BITRB	Light gray; very fine grained; possibly rooted; abundant medium gray shale streaks; abrupt, angular lower contact.	4.78	321.20
SS	BITRB	Light gray; very fine grained; some minor, medium gray shale streaks; abrupt, angular lower contact.	1.00	322.20
SS	BITRB	Light gray; very fine grained; probably rooted; medium gray shale streaks; clear lower contact.	1.14	323.34
SS	SH STR	Light gray; fine grained; fairly clean; more abundant shale clasts in basal foot; abrupt lower contact.	2.65	325.99
SS		Light gray; fine grained; few, fine, medium gray shale clasts and streaks; clear lower contact.	2.23	328.22
SS	BRW	Light gray; fine grained; some dark gray shale streaks; possible horizontal and vertical burrows; abrupt lower contact.	0.39	328.61
SS	SH STR	Light gray; fine grained; thin, medium gray shale streaks; abrupt lower contact.	0.35	328.96
SH	SS STR	Medium gray; light gray, thin sandstone streaks; clear lower contact.	0.70	329.66
SS	BRW	Light gray; very fine grained; medium gray shale streaks; indistinct burrows; clear lower contact.	0.34	330.00
SS	SLMP	Light gray; fine grained; mixed with medium gray shale; abrupt lower contact.	0.52	330.52
SS	SLMP	Light gray; fine grained; high angle laminations; medium gray shale streaks; coal streak at base; abrupt, high angle lower contact.	0.48	331.00
SS	SH STR	Light gray; fine grained; rippled laminations; bioturbated from top to 331.90', probably rooting; medium gray, thin shale streaks.	2.10	333.10
SS		Light gray; very fine grained; few shale clasts in top 0.20'; abrupt lower contact.	1.07	334.17

SH	SS STR	Medium gray; light gray, very fine grained; rippled sandstone streaks; abrupt lower contact.	0.26	334.43
SS	SH STR	Light gray; very fine grained; medium-to-dark gray shale streaks; abrupt lower contact.	0.75	335.18
SS		Light gray; very fine grained; planar cross laminated; abrupt lower contact.	0.47	335.65
SS	SH STR	Light gray; very fine grained; ripple cross laminated; medium-to-dark gray shale streaks; abrupt lower contact.	0.59	336.24
SS		Light gray; very fine grained; few, fine, medium gray shale clasts; abrupt, angular lower contact.	0.75	336.99
SH		Medium gray; abrupt, angular, irregular lower contact.	0.33	337.32
SS	SH CLS	Light gray; very fine grained; massive; abundant shale clasts and streaks; clear lower contact.	1.43	338.75
SS	SH CLS	Light gray; very fine grained; mostly very fine, medium gray shale clasts; some larger shale clasts from 343.25-343.40'; abrupt lower contact.	4.68	343.43
SH	SS STR	Medium gray; very thin sandstone streaks; abrupt lower contact.	0.09	343.52
SS		Light gray; very fine grained; few medium gray shale clasts; clear lower contact.	1.62	345.14
SS	SH STR	Light gray; very fine grained; dark, sandy shale streaks; abrupt lower contact.	0.34	345.48
SS		Light gray; fine grained; massive; clear lower contact.	0.67	346.15
SS	SH STR	Light gray; very fine grained; dark, sandy shale streaks, mostly thin, but up to 0.03' thick; clear lower contact.	1.28	347.43
SS		Light gray; fairly clean; few scattered medium gray shale streaks and clasts; few stylolites; clear lower contact.	5.17	352.60
SS	SH CLS	Light gray; fine grained; medium gray shale clasts and streaks; clear lower contact.	0.47	353.07
SS	QTZ	Fine-to-medium grained; some dark minerals; mostly planar cross laminated; occasional stylolites; coal streaks at 354.00', 354.10', 354.92', 355.10', 356.00', and 362.40'.	10.93	364.00
SS	QTZ PBL	Light gray; massive; quartz pebbles up to 0.01' diameter; clear lower contact at basal pebble.	0.88	364.88

SS	QTZ	Fine-to-medium grained; some dark minerals; massive; clear lower contact.	3.73	368.61
SS	QTZ PBL	Light gray; fine-to-medium grained matrix; zones of quartz pebbles up to 0.02' diameter; few stylolites; abrupt, angular lower contact.	2.19	370.80
COAL	IMP	Rafted; badly broken; abrupt, angular lower contact (not sampled).	0.32	371.12
SS	QTZ	Light gray; fine-to-medium grained; abrupt lower contact with coal streaks.	0.28	371.40
SS	QTZ PBL	Light gray; fine grained matrix; quartz pebbles up to 0.02' diameter; abrupt, angular lower contact.	0.80	372.20
SH	SS STR	Medium gray; light gray, very fine grained, rippled sandstone streaks; clear lower contact.	0.90	373.10
SS		Light gray; very fine-to-fine grained; ripple cross laminated; micaceous; few, small, medium gray shale clasts from 377.40-378.00' and at 378.80'; abrupt, angular lower contact.	6.38	379.48
SH		Thin, medium gray bed.	0.09	379.57
SS	SH CLS	Light gray; fine grained; micaceous; medium gray shale clasts and streaks; clear lower contact.	0.33	379.90
SS		Light gray; fine-to-medium grained; planar cross laminated; large medium gray shale clast at 384.75'; few shale clasts from 386.23-386.35'; few shale streaks from 386.97-388.20'; shale clasts at 388.70' and 389.90'; abrupt, angular lower contact.	10.65	390.55
SH		Medium gray with dark gray-to-black streaks; abundant, <1mm size spheres of clay-filled pyrite; abrupt lower contact.	0.43	390.98
SH	SS STR	Light-to-medium gray; zones up to 0.50' thick of very fine grained, light gray, thin rippled sandstone streaks; clear lower contact.	3.85	394.83
SH		Dark gray-to-black; very uniform; occasional bands of pyrite; abrupt lower contact (sampled basal 0.12' with units below, 6/19/01).	12.19	407.02
BN		Top of No. 5 Block coal. High density; gradational top and bottom (sampled 6/19/01) (described by Bill Grady in lab).	0.15	407.17
COAL	IMP	Bony; granular groundmass; common, thin, black shale lenses and thin siltstone lenses near top; gradational top and bottom (sampled 6/19/01) (described by Bill Grady in lab).	0.08	407.25

COAL	CLRN	Dull clarain, thinly laminated with common, thin, black shale lenses (sampled 6/19/01) (described by Bill Grady in lab).	0.07	407.32
COAL	IMP	Interbedded, lenticular bone coal, dull clarain, light gray siltstone, and black shales with contorted bedding; gradational base and top (sampled 6/19/01) (described by Bill Grady in lab).	0.22	407.54
BN		Canneloid; medium density; numerous small vitrain fragments (sampled 6/19/01) (described by Bill Grady in lab).	0.27	407.81
BN		Shaly; medium density; few small vitrain fragments; several large siltstone and gray shale lenses or clasts; common pyrite in siltstone and bone (sampled 6/19/01) (described by Bill Grady in lab).	0.05	407.86
BN		Shaly; medium density; few small vitrain fragments; small siltstone lenses in lower part; small pyrite lenses throughout; larger, angular pyrite (pyritized fusain fragments in upper 0.10' (sampled 6/19/01) (described by Bill Grady in lab).	0.28	408.14
COAL	IMP	Bony; medium density; granular matrix with few, angular vitrain fragments and common, small pyrite lenses throughout (sampled 6/19/01) (described by Bill Grady in lab).	0.07	408.21
COAL	CLRN	Bright clarain; sharp top and bottom (sampled 6/19/01) (described by Bill Grady in lab).	0.04	408.25
COAL	IMP	Bony; medium density; granular matrix with few, angular vitrain fragments and common, small pyrite lenses throughout (sampled 6/19/01) (described by Bill Grady in lab).	0.05	408.30
SS		Light gray; very fine grained; rippled; dark gray shale streaks; coal stringers consisting of 1cm vitrain fragments and thin, pyritized fusain lenses in lower part (sampled 6/19/01) (described by Bill Grady in lab).	0.12	408.42
COAL	CLRN	Dull clarain; thinly laminated; common, soft fusain lenses; common cleat pyrite; sharp top and bottom contacts (sampled 6/19/01) (described by Bill Grady in lab).	0.05	408.47
SLST		Several medium gray lenses and black shale lenses; contains large, angular vitrain fragments; sharp top and bottom (sampled 6/19/01) (described by Bill Grady in lab).	0.05	408.52
COAL	CLRN	Dull clarain; thinly laminated with occasional 1mm	0.07	408.59

		vitrain bands and thin, mineralized fusains (sampled 6/19/01) (described by Bill Grady in lab).		
BN		Silty; high density; few angular vitrain fragments; thin, gray siltstone at top; sharp base (sampled 6/19/01) (described by Bill Grady in lab).	0.05	408.64
SH		Light-to-medium gray; dark gray-to-black root traces in top 1.50'; few sandstone streaks from 411.05 to 411.18'; abrupt lower contact (sampled top 0.41' (included 0.05' overlying bn) with coal above, 6/29/01).	6.11	414.75
COAL		Moderately bright (not sampled).	0.04	414.79
		Base of No. 5 Block coal		
SH	ROOT	Medium gray; few indistinct root traces; abrupt lower contact (not sampled).	0.38	415.17
SH	ROOT	Light gray; soft zones; common indistinct root traces; gradual lower contact.	1.83	417.00
SH	ROOT	Medium gray; very uniform; abundant, dark gray-to-black root traces; abrupt lower contact.	7.92	424.92
SH	SS STR	medium-to-dark gray; light gray, very fine grained, thin, rippled sandstone streaks; few, very thin coal streaks, especially in lower 0.40'; abrupt lower contact.	1.70	426.62
SS	COAL STR	Light gray; very fine grained; coal streaks abundant in basal 0.40'; medium gray shale streaks; abrupt lower contact.	0.78	427.40
SH		Medium gray with light gray banding; very uniform; few sandstone streaks in top 0.45'; abrupt, high angle lower contact.	14.08	441.48
SS	QTZ	Light-to-medium gray; coal streaks and spars, mostly from top to 442.20'; abrupt lower contact.	2.12	443.60
SS	COAL STR	Light gray; fine grained; micaceous; no coal streaks from 444.75-445.65', very sparse from 445.72-448.00'; abrupt lower contact.	5.93	449.53
SH	FEST INCL	Medium-to-dark gray; common, distinct, coarse, somewhat rounded siderite nodules; abrupt lower contact.	1.64	451.17
SH	FEST INCL	Light-to-medium gray; few, distinct, medium-to-coarse, rounded siderite nodules; abrupt lower contact.	2.15	453.32
SH	SS STR	Light-to-medium gray; light gray, very fine	4.37	457.69

grained, rippled sandstone streaks; sandstone beds up to 0.3' thick; clear lower contact.

SH		Medium gray; a few, faint ironstone bands; zone of light gray, fine grained sandstone streaks from 461.00-461.16'; abrupt, high angle lower contact.	4.99	462.68
CLST	ROOT	Light gray; many, thin, dark gray-to-black root traces.	2.25	464.93
SH	FEST INCL	Medium gray; few, distinct, coarse, rounded ironstone nodules; few ironstone bands; clear lower contact.	4.95	469.88
SH	SS STR	Medium gray; few, fine grained, light gray sandstone streaks and lenses; clear lower contact.	1.74	471.62
SH		Dark gray-to-black; abrupt lower contact; (basal 0.03' sampled with coal).	1.08	472.70
COAL	IMP	Top of Little No. 5 Block. Interbedded 1mm vitrain, bone, and carbonaceous shale bands (sampled) (described by Bill Grady in lab).	0.12	472.82
SH	BLK	Black; canneloid; heavily rooted; conchoidal fracture; extremely slickensided; base gradational; top 0.03' grades into bone (sampled) (described by Bill Grady in lab).	0.12	472.94
SH		Medium gray; highly rooted and slickensided (sampled) (described by Bill Grady in lab).	0.30	473.24
SH	BLK	Black; contains small clasts of bone and vitrain (sampled) (described by Bill Grady in lab).	0.16	473.40
BN		Bone with interbedded black shale; lenticular and slickensided (sampled) (described by Bill Grady in lab).	0.03	473.43
COAL	IMP	Bony or bone; occasional 1mm vitrain bands (sampled) (described by Bill Grady in lab).	0.04	473.47
BN		Black; dull; thinly laminated; common, small pyrite lenses throughout; no vitrains; gradational top (sampled) (described by Bill Grady in lab).	0.10	473.57
COAL	CLRN	Dull clarain; thinly laminated; rare vitrain bands; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.15	473.72
COAL	CLRN	Dull clarain; attrital groundmass with minor 1mm vitrain bands and common pyrite lenses and carbonaceous shale bands throughout; large pyrite bands near top (sampled) (described by Bill Grady	0.18	473.90

		in lab).		
COAL		Durain; fine granular attritus; rare vitrain fragments; medium density; sharp top (sampled) (described by Bill Grady in lab).	0.07	473.97
COAL	IMP	Bone/bony; lenticular; sharp angular top and bottom; slickensided (sampled) (described by Bill Grady in lab).	0.03	474.00
SH		Medium gray; rooted; large leaf (Neuropteris?) imprints (sampled) (described by Bill Grady in lab).	0.13	474.13
BN		Gradational top (sampled) (described by Bill Grady in lab).	0.04	474.17
COAL	CLRN	Dull clarain; rare thin vitrain bands and lenses; minor small pyrite lenses; sharp top (sampled) (described by Bill Grady in lab).	0.32	474.49
BN		Few thin vitrain stringers; interfingers with coal below; sharp top (sampled) (described by Bill Grady in lab).	0.04	474.53
COAL	CLRN	Dull clarain; attrital; minor 1mm vitrain bands; minor small pyritized fusain lenses throughout (sampled) (described by Bill Grady in lab).	0.16	474.69
		Base of Little No. 5 Block coal		
CLST		Medium gray; common plant leaf fragments; irregular, abrupt lower contact; (top 0.08' sampled with coal).	1.20	475.89
SS	SH INBD	Sandstone, light gray, very fine grained, ripple laminated in thin beds up to 0.10' thick; shale, medium gray in beds up to 0.07' thick; rhythmically bedded; possible sand-filled burrows; clear lower contact.	3.83	479.72
SH		Medium-to-dark gray; zone of possible small pelecypods from 480.55-480.64'; few ironstone nodules in bottom 0.10'; abrupt lower contact.	0.32	480.04
CLST	ROOT	Light gray; abundant dark gray-to-black root traces.	3.96	484.00
SS	ROOT	Light gray; very fine grained; ripple laminated; disrupted by rooting; clear lower contact.	1.75	485.75
SH		Light gray; abrupt lower contact.	0.13	485.88
SS	XBD	Light gray; very fine-to-fine grained; shale band from 487.42-487.46'; micaceous; abrupt lower contact.	9.37	495.25

SH	SS STR	Medium gray with light gray bands; light gray, very fine grained, rippled sandstone streaks; few minor coal streaks; abrupt lower contact.	2.55	497.80
SH		Light-to-medium gray; uniform; micaceous; clear lower contact (unit re-described at Survey, 6/28/2001).	1.80	499.60
SH	FOSS	Medium-to-dark gray; sparse, partially exposed pelecypods, one small (2mm) gastropod(?), pyritized burrows(?); gradual lower contact at loss of fossils (unit re-described at Survey, 6/28/2001).	0.75	500.35
		Kanawha Black flint marine zone		
SH		Light to medium gray; uniform; one ironstone nodule; gradual lower contact on appearance of root traces, loss of bedding (unit re-described at Survey, 6/28/2001).	2.90	503.25
SH	ROOT	Medium gray at top to dark gray at base; poorly bedded; common root traces; abrupt lower contact.	1.45	504.70
CLST		Light gray; abundant, round, shot-size siderite pellets or grains in a claystone matrix; abrupt lower contact (unit re-described at Survey, 6/28/2001).	1.02	505.72
SH	ROOT	Medium gray; abundant root traces; few slickensides; clear lower contact on color change (unit re-described at Survey, 6/28/2001).	1.60	507.32
SH	ROOT	Medium and dark gray-to-black zones; abundant root traces; becoming poorly bedded to base; gradual lower contact (unit re-described at Survey, 6/28/2001).	2.06	509.38
CLST	ROOT	Light gray-brown; very fine; common dark gray-to-black root traces; large ironstone nodules at 512.00'; diffuse lower contact with increased bedding.	3.44	512.82
SH		Medium gray; very few, faint, coarse ironstone nodules; rooted in top 1.00'; few plant fossils and stems; clear lower contact at sandstone streaks (unit re-described at Survey, 6/28/2001).	7.05	519.87
SH	SS STR	Medium gray; light gray, very fine grained, slumped sandstone streaks with soft sediment deformation and micro-faults; clear lower contact.	1.16	521.03
SH		Light-to-medium gray; ironstone bands; few sandstone streaks in base; clear lower contact.	0.81	521.84

SS	SH STR	Light gray; very fine grained; mostly ripple laminated; some micro-faulting; few plant fossils; clear lower contact.	2.16	524.00
SH	SS STR	Medium gray; light gray, very fine grained, ripple laminated sandstone streaks; clear lower contact.	3.66	527.66
SH		Medium-to-dark gray; silty to sandy, increasing to base; micaceous; very few zones of light gray, very fine grained, ripple cross laminated sandstone streaks, some show slumping and soft sediment deformation; few, faint, coarse, round ironstone nodules and bands; common plant pinnules and stems, small root traces; large ironstone nodules from 547.62-547.88'; abrupt, angular lower contact (unit re-described at Survey, 6/26/2001).	20.65	548.31
SS	SH STR	Light gray; fine grained; bi-directional planar cross laminations; medium gray shale streaks and small clasts; clear lower contact at first coal streak.	2.24	550.55
SS	COAL STR	Light gray; fine grained; planar to planar cross laminated; thin coal streaks and a few coal clasts; few, distinct, coarse, round ironstone nodules; clear lower contact at lowest coal streak.	3.66	554.21
SS	XBD	Light gray; fine grained; zone of fine-to-medium ironstone pebbles from 554.58-558.65'; abrupt lower contact.	0.75	554.96
SH	SS STR	Medium gray with very thin, light gray, very fine grained sandstone streaks; a thin bed; abrupt lower contact.	0.11	555.07
SS	SH STR	Light gray; very fine grained; mostly planar cross laminated; medium gray shale streaks showing soft sediment deformation from top to 555.50'; only 3 shale streaks from 555.50' to base; abrupt lower contact.	3.84	558.91
CLST		Round to sub-round clasts of light gray flint clay(?); shale clasts; sandy zones; few ironstone nodules; abrupt lower contact.	2.21	561.12
SS	XBD	Light gray; fine grained; planar cross laminated; zone of shale or mica streaks from 564.05-564.23'; few, fine, shale pebbles in basal 0.20'; abrupt, angular lower contact.	4.78	565.90
SS	COAL STR	Light gray; fine grained; few, thin-to-thick coal streaks; also light gray shale streaks and clasts;	1.69	567.59

		clear lower contact.		
SS	XBD	Light gray; fine grained; abrupt, angular lower contact at coal spar.	0.62	568.21
SS	COAL STR	Light gray; fine grained; abundant coal streaks and spars, clear lower contact.	0.72	568.93
SS	XBD	Light gray; fine grained; planar cross laminated; clear lower contact.	0.59	569.52
SS	COAL STR	Light gray; fine grained; abundant coal spars and streaks; few light gray shale clasts and pebbles; abrupt lower contact.	0.51	570.03
SS	SH STR	Light gray; fine grained; mostly sandstone interlaminated with medium gray shale streaks; also mica streaks; abrupt lower contact.	2.41	572.44
SS	XBD	Light gray; fine grained; ripple-to-ripple cross laminated; minor zones of shale streaks; abrupt lower contact at shale streak.	5.90	578.34
SS	SH STR	Light gray; fine grained; four zones of medium-to-dark gray shale streaks; abrupt lower contact at basal shale streak.	1.16	579.50
SS		Light gray; fine grained; ripple laminated; abrupt lower contact.	1.14	580.64
SS	SH STR	Light gray; fine grained; medium gray shale streaks and sandstone about 50/50; abrupt lower contact.	1.34	581.98
SS		Light gray; fine grained; abrupt lower contact.	0.40	582.38
SS	SH STR	Light gray; fine grained; ripple laminated; medium gray shale streaks and beds up to 0.25' thick; abrupt lower contact.	3.52	585.90
SS	COAL STR	Light gray; fine grained; many coal streaks and spars; abrupt lower contact.	0.51	586.41
SS	FEST INCL	Light gray; fine grained; planar cross laminated to 587.72', massive to base; many, round-to-sub-round, fine-to-coarse, distinct, ironstone pebbles, especially from 587.10' to base; also shale pebbles and clasts; medium gray shale bed or large pebble from 587.71-587.82'; abrupt lower contact.	2.55	588.96
SH	SLTY	Medium gray; light gray, slightly sandy bands; few, faint, coarse, ironstone nodules; few poorly preserved plant fossils and few stems; gradual lower contact.	12.77	601.73
SH	SS STR	Medium gray; few, very fine grained, light gray	5.82	607.55

		sandstone streaks; some slump planes; few, faint, coarse, ironstone nodules; coalified plant stems; clear lower contact.		
SH		medium gray; few, faint, coarse, ironstone nodules; clear lower contact.	2.25	609.80
SH	SS STR	Medium gray; few, light gray, fine grained, irregular, sandstone streaks and lenses; some soft sediment deformation evident; few, faint, coarse, ironstone nodules; abrupt lower contact.	7.67	617.47
SS	SH CLS	Light gray; fine grained; light gray, fine-to-medium shale clasts and a few, thin coal streaks; methane emissions evident; clear lower contact.	0.33	617.80
SS		Light gray; fine grained; fairly clean, but still significant accessory minerals; mostly planar cross laminated; thin coal streaks from 618.80-618.85', 621.62-621.97', at 622.50', from 622.97-623.20', and 625.05-625.18'; few, fine-to-medium ironstone pebbles at 622.53'; abrupt, angular lower contact.	7.62	625.42
SH		Medium gray with light gray bands; good plant pinnules; abrupt, wavy lower contact.	8.98	634.40
SS	FEST INCL	Light gray; fine grained; many, distinct, coarse, rounded ironstone pebbles, especially from top to 635.05', fewer below; also coal streaks and spars; abrupt, angular lower contact.	1.75	636.15
SH	SDY	Medium gray; sandy; silty; few, light gray, very fine grained sandstone streaks; few, faint, coarse, ironstone nodules; no sandstone streaks below 643.00'; few dark gray-to-black root traces from around 644.00' to base; abrupt lower contact.	10.15	646.30
SH	SDY	Medium-to-dark gray; possibly burrowed; clear lower contact.	0.54	646.84
SS	BRW	Light gray; very fine grained; ripple laminated with interlaminated medium gray shale in laminations about 0.02' thick; common horizontal burrows; clear lower contact.	1.68	648.52
SS	SH INBD	Light gray; very fine grained; ripple laminated with interlaminated medium gray shale; few burrows from 650.10 to 650.25'; abrupt lower contact.	1.96	650.48
SH		Medium-to-dark gray with some light gray banding; very uniform; pyrite bands from 661.19 to 661.26'; non-marine bivalve at 658.88'; abrupt lower contact.	16.39	666.87
SH	BLK	Dark gray-to-black; pyrite lenses; abrupt lower	0.10	666.97

		contact.		
SH		Medium gray with some light gray bands; root traces in top 0.30'; clear lower contact.	2.94	669.91
SH	BLK	Black.	0.09	670.00
CLST	ROOT	Light-to-medium gray; slightly bedded; black root traces; increasing bedding to base, transitional to shale; some sandstone streaks in basal 1.0'; clear lower contact.	4.08	674.08
SS		Light gray; fine grained; micaceous; zones of ripple laminated, ripple cross laminated, planar laminated, and planar cross laminated; shows of black crude oil starting at 677.20', especially strong from 681.50-682.00', 683.10-683.75', and 684.00-688.60'; less oil from 688.60-692.65'; yellow crude oil with methane emissions from 692.65 to about 694.00'; especially oily and gassy from 697.15' to base; becoming less micaceous, slightly cleaner, and medium grained to base;	28.46	702.54
COAL		Rafted, abrupt lower contact (not sampled).	0.10	702.64
SS		Light gray; abrupt lower contact.	0.04	702.68
FEST		Medium gray; thin white calcareous streaks; coaly streaks and coalified stems; show of oil; abrupt lower contact.	0.29	702.97
SS	COAL CLS	Light gray; fine-to-medium grained; many coal spars and streaks; clear lower contact.	1.07	704.04
SS	COAL STR	Light gray; fine grained; planar cross laminated; thin coal streaks and spars; few, distinct, coarse ironstone pebbles to base; clear lower contact.	2.41	706.45
SS	XBD	Light gray; fine grained; micaceous; mostly planar cross laminated; abrupt lower contact.	12.05	718.50
SS	COAL STR	Light gray; fine grained; micaceous; common thin coal streaks and spars; abrupt lower contact at basal coal streak.	1.72	720.22
SS		Light gray; fine grained; few thin coal streaks; abrupt lower contact.	1.93	722.15
SS	COAL STR	Light gray; fine grained; common thin coal streaks and spars; abrupt lower contact.	1.00	723.15
SS	FEST INCL	Light gray; fine grained; many, distinct, coarse ironstone nodules; abrupt lower contact.	0.13	723.28
SH		Medium gray; silty to siltstone; few sandstone streaks in basal 0.10'; clear lower contact.	3.62	726.90

SS		Light gray; fine grained; few shale clasts; few mica streaks in middle; abrupt lower contact.	0.77	727.67
SH	SS STR	Medium gray; very thin, light gray, very fine grained sandstone streaks; abrupt lower contact.	0.51	728.18
SS	FEST INCL	Light gray; fine grained; subrounded ironstone clasts and pebbles; also shale clasts; abrupt lower contact.	0.40	728.58
SS		Light gray; fine grained; slumped?; abrupt lower contact.	1.06	729.64
SH		Thin medium gray bed; inclusions of sandstone; soft sediment deformation; abrupt lower contact.	0.14	729.78
SS		Light gray; fine grained; planar to ripple laminated; abrupt lower contact.	0.50	730.28
SH	SS STR	Medium gray; very thin, very fine grained, rippled sandstone streaks; abrupt lower contact.	0.43	730.71
SS	XBD	Light gray; fine grained; few minor shale streaks and ironstone nodules; abrupt lower contact at coal streak.	5.15	735.86
SS		Light gray; fine-to-medium grained; few thin coal streaks; cleaner than sandstone above; abrupt, angular lower contact.	1.69	737.55
SH		Medium gray; inclusions of sandstone in base; abrupt, angular lower contact.	0.38	737.93
SS	SH CLS	Light gray; medium grained; cleaner, approaching quartzose; few medium gray shale clasts and pebbles; clear lower contact at large ironstone pebble.	1.89	739.82
SS		Light gray; fine-to-medium grained; little mica, but considerable accessory minerals; less clean than above sandstone; clear lower contact at coal streak.	2.55	742.37
SS	COAL STR	Light gray; fine-to-medium grained; like above unit; clear lower contact.	1.09	743.46
SS		Light gray; fine grained; clear lower contact at coal streak.	0.79	744.25
SS	COAL STR	Light gray; fine grained; few thin coal streaks; fairly clean; abrupt lower contact.	1.55	745.80
SS	QTZ	Light gray; fining up from medium to fine grained; still some accessory mineral; few stylolites; few very minor coal streaks, one at base; abrupt, angular lower contact.	15.40	761.20

SH		Medium gray; clear lower contact on color change.	3.85	765.05
SH	BLK	Black; coal streaks near base; abrupt lower contact.	0.63	765.68
SH	SLTY	Medium-to-dark gray; abrupt, angular lower contact.	1.32	767.00
SS	ROOT	Light gray; fine grained; highly bioturbated, rooted; few coal streaks and spars; few medium gray shale streaks; abrupt lower contact.	3.92	770.92
SH	SS STR	Medium gray; very thin, very fine grained, light gray sandstone streaks; clear lower contact at sandstone.	0.66	771.58
SS	SH INBD	Light gray; very fine grained; ripple cross laminations up to 0.07' thick with interlaminated, distinct, wavy, medium gray shale laminations up to 0.03' thick; abrupt lower contact.	2.03	773.61
SH	SLMP	Medium gray; contorted lenses of light gray, very fine grained sandstone; clear lower contact.	1.92	775.53
SS	SH INBD	Light gray; very fine grained, thin ripple laminated to ripple cross laminated, wavy beds or laminations up to 0.05' thick; interlaminated medium gray, wavy shale up to 0.03' thick; clear lower contact.	6.02	781.55
SH	SS STR	Medium gray; very thin, light gray, very fine grained, discontinuous sandstone streaks and lenses; some streaks are ripple cross laminated; many lenses deformed by soft sediment deformation; also possible burrows(?), especially from about 789' to base; common slickensides; few coal streaks in basal 0.03'; abrupt lower contact with coal; (basal 0.13' sampled with coal).	14.62	796.17
COAL	IMP	Top of No. 2 Gas coal. Interbedded large vitrain bands and irregular black shale lenses. (sampled) (described by Bill Grady in lab).	0.13	796.30
COAL	CLRN	Dull clarain; common, 1mm vitrain bands; abundant, thin fusain lenses throughout (sampled) (described by Bill Grady in lab).	0.37	796.67
COAL	CLRN	Bright clarain; >90% 1-10mm vitrain bands (sampled) (described by Bill Grady in lab).	0.14	796.81
SH		Dark gray; lenticular; slickensided; contains 1-3mm vitrain bands and fragments (sampled) (described by Bill Grady in lab).	0.02	796.83
COAL	CLRN	Bright clarain; very thin carbonaceous shales (sampled) (described by Bill Grady in lab).	0.16	796.99

SH	BLK	Black; slickensided (sampled) (described by Bill Grady in lab).	0.01	797.00
COAL	CLRN	Bright clarain; very thin carbonaceous shales (sampled) (described by Bill Grady in lab).	0.04	797.04
COAL	CLRN	Bright clarain; >75% 1-3mm vitrain bands; minor, thin fusain lenses (sampled) (described by Bill Grady in lab).	0.21	797.25
COAL	CLRN	Dull clarain; attrital groundmass; 15% 1-2mm vitrain bands; common, pyritized fusain lenses; minor cleat calcite; gradational top and bottom (sampled) (described by Bill Grady in lab).	0.35	797.60
COAL	CLRN	Bright clarain; common 1-3mm vitrain bands; common, thin fusain lenses (sampled) (described by Bill Grady in lab).	0.15	797.75
COAL	CLRN	Bright clarain; >90% 1-5mm vitrain bands; common fusain lenses; common 0.5mm thick cleat calcite (sampled) (described by Bill Grady in lab).	0.09	797.84
COAL	FS	Fusain; soft (sampled) (described by Bill Grady in lab).	0.01	797.85
COAL	CLRN	Bright clarain; >90% 1-5mm vitrain bands; common fusain lenses (sampled) (described by Bill Grady in lab).	0.65	798.50
COAL	FS	Fusain; soft (sampled) (described by Bill Grady in lab).	0.01	798.51
COAL	CLRN	Bright clarain; >90% 1-5mm vitrain bands; common fusain lenses (sampled) (described by Bill Grady in lab).	0.72	799.23
COAL	CLRN	Bright clarain; >75% 1-3mm vitrain bands; minor fusain lenses (sampled) (described by Bill Grady in lab).	0.23	799.46
COAL	CLRN	Dull clarain; attrital (sampled) (described by Bill Grady in lab).	0.03	799.49
SH	BLK	Black; bony; plant trash; rooted (sampled) (described by Bill Grady in lab).	0.03	799.52
COAL	CLRN	Dull clarain; common <1mm vitrain bands; minor cleat calcite; minor pyrite at top; sharp, erosional top; sharp base (sampled) (described by Bill Grady in lab).	0.21	799.73
SH		Dark gray; bony; very carbonaceous (sampled) (described by Bill Grady in lab).	0.04	799.77
COAL		Thin band or stringer (sampled) (described by Bill	0.02	799.79

Grady in lab).

Base of No. 2 Gas coal

SH	ROOT	Light-to-medium gray; few coal streaks to base; abrupt lower contact (top 0.07' sampled with coal).	2.58	802.37
SH	COAL STR	Light-to-medium gray; thin coal streaks; abrupt lower contact (not sampled).	0.20	802.57
COAL	IMP	Some bright streaks (not sampled).	0.07	802.64
SH	BLK	Black; few coal streaks; light gray bands; abrupt lower contact.	0.29	802.93
SH		Light gray; abrupt lower contact.	0.04	802.97
SH	BLK	Black; abrupt lower contact.	0.05	803.02
SH	SDY	Light gray; silty; black root traces; abrupt, angular lower contact.	3.21	806.23
SS	QTZ	Light-to-medium gray; coarse grained; some quartz pebbles up to 0.01i diameter; some light gray quartzose streaks and bands up to 0.05' thick; light yellow oil on surface; abrupt lower contact.	1.03	807.26
SLST		Light gray; abrupt lower contact.	0.19	807.45
SS	QTZ	Light gray; medium-to-coarse grained; abrupt, irregular, wavy lower contact.	0.15	807.60
SLST		Light gray; light gray shale bands to base; abrupt lower contact.	1.99	809.59
SS	XBD	Light gray; medium grained; ripple cross laminated; shale band at base; abrupt lower contact.	0.27	809.86
SS	QTZ PBL	Medium gray; micaceous; coarse grained; scattered quartz pebbles up to 0.01' diameter; abundant light yellow oil on surface; clear lower contact at grain size change.	4.99	814.85
SS	XBD	Light gray; fine-to-medium grained; micaceous; very few, scattered quartz pebbles up to 0.01' diameter; little or no oil showing; abrupt lower contact at grain size change.	8.62	823.47
SS		Medium gray; light gray quartzose zones; coarse grained; abundant light yellow oil; abrupt lower contact.	1.48	824.95
SS	QTZ PBL	Light gray-to-white; medium-to-coarse grained; fairly clean; scattered quartz pebbles up to 0.02' diameter; abrupt lower contact.	5.15	830.10

CGL	QTZ PBL	Light-to-medium gray; micaceous; very coarse grained; abundant quartz pebbles up to 0.02' diameter; dark yellow oil with gas showing, especially from top to 831.00', and from 831.70 to 831.80'; abrupt lower contact at grain size change.	1.85	831.95
SS	XBD	Light gray; medium grained; micaceous; few zones of quartz pebbles up to 0.02' diameter; abrupt lower contact.	2.77	834.72
SS	QTZ PBL	Medium gray; medium grained; many quartz pebbles up to 0.02' diameter; abrupt lower contact.	1.06	835.78
CGL	QTZ PBL	Light gray-to-white; many quartz pebbles up to 0.03' diameter; abrupt lower contact.	1.22	837.00
SH		Medium gray clasts; abrupt lower contact.	0.07	837.07
SS	QTZ PBL	Light gray; coarse grained; fairly clean, almost quartzose; quartz pebbles up to 0.03' diameter; zones almost conglomeratic; oil show throughout, especially from top to 839.00'; abrupt lower contact.	5.64	842.71
CGL		Abundant quartz pebbles up to 0.03' diameter; few stylolites; minor oil show; abrupt lower contact.	1.79	844.50
SS		Light gray; fine-to-medium grained; shale streaks; abrupt lower contact.	0.40	844.90
CGL	QTZ PBL	Light gray; very coarse grained; quartz pebbles up to 0.03' diameter; show of dark oil and gas from 846.00' to base; abrupt lower contact.	2.58	847.48
SS		Light gray; medium grained; fairly clean; abrupt lower contact.	0.52	848.00
CGL	QTZ PBL	Light gray; quartz pebbles up to 0.03' diameter; abrupt lower contact.	1.74	849.74
SS	QTZ	Light gray; medium grained; occasional stylolites; still some accessory minerals; dark oil and gas shows throughout; abrupt lower contact.	9.82	859.56
CGL	QTZ PBL	Light gray; quartz pebbles up to 0.02' diameter; some medium-to-coarse grained sand matrix; pyrite between grains at 861.35' with shale clasts; coal spar at 861.85'; abrupt, wavy, compactional lower contact.	2.98	862.54
SH		Dark gray; very uniform; many slickensides; common, distinct, fine-to-medium siderite nodules or sideritized burrows from 864.65 to 865.70' and from 868.80' to base; abrupt lower contact with compactional mixing of mud and sand.	10.16	872.70

SS	BITRB	Medium gray; very fine grained; homogenized, probably from rooting; clear lower contact at upward increase in sand.	1.20	873.90
SH	SS STR	Dark gray; thin streaks, lenses, and large pockets of sandstone; possible soft sediment deformation; possible burrows at 874.50'; few, distinct, coarse ironstone nodules; very few sandstone streaks to base; diffuse lower contact.	5.12	879.02
SH		Medium gray; very uniform; abrupt lower contact (sampled basal 0.07' with coal).	13.71	892.73
SH	BLK	Black; canneloid; highly carbonaceous; very finely laminated; very hard and dense-high density; cubic fracture; contains small pyrite nodules; no fossils; angular top (sampled) (described by Bill Grady in lab).	0.17	892.90
BN		Medium density; gradational top (sampled) (described by Bill Grady in lab).	0.03	892.93
COAL	IMP	Bony to bone; gradational top (sampled) (described by Bill Grady in lab).	0.02	892.95
COAL	CLRN	Dull clarain; sharp top (sampled) (described by Bill Grady in lab).	0.03	892.98
COAL		Durain; granular; silvery; minor, small pyritized fusains (sampled) (described by Bill Grady in lab).	0.06	893.04
COAL	CLRN	Bright clarain; vitrains with 1mm pyritized fusain in middle (sampled) (described by Bill Grady in lab).	0.04	893.08
COAL		Durain; attrital; silvery; sharp top and bottom (sampled) (described by Bill Grady in lab).	0.03	893.11
COAL	CLRN	Bright clarain; common, thin fusain lenses; sharp base (sampled) (described by Bill Grady in lab).	0.29	893.40
		Unnamed coal		
CLST	ROOT	Light gray; abrupt, angular lower contact (sampled top 0.06' with coal).	0.78	894.18
SH	ROOT	Dark gray; light gray, very fine grained sandstone streaks; all heavily rooted, homogenized with overall dark gray appearance; common, distinct, coarse ironstone nodules and lenses; gradual lower contact with loss of rooting with depth.	3.28	897.46
SH	SS STR	Medium-to-dark gray; light gray, very fine grained; rippled sandstone streaks, increasing upward; very few streaks from 904.70' to base;	10.26	907.72

		clear lower contact.		
SH		Dark gray; very uniform; some well preserved plant pinnules at 914' and throughout; abrupt lower contact (sampled basal 0.05' with coal).	7.45	915.17
SH	BLK	Black; thin, wavy band at top of coal; abrupt lower contact (sampled).	0.01	915.18
COAL	FS	Fusain; soft; partially mineralized with clays; contains petroleum (sampled) (described by Bill Grady in lab).	0.07	915.25
COAL	CLRN	Dull clarain; common 1mm vitrain bands; fusain bands at top and bottom (sampled) (described by Bill Grady in lab).	0.07	915.32
COAL	CLRN	Bright clarain; common, thin fusain lenses; sharp base (sampled) (described by Bill Grady in lab).	0.61	915.93
		Unnamed coal		
CLST	ROOT	Light-to-medium gray; abundant dark gray-to-black root traces; clear lower contact (sampled top 0.04' with coal).	6.57	922.50
SH		Medium gray; some light gray bands; very few ironstone bands; no plant fossils seen; large ironstone nodules/bands from 935.80 to 937.15', some with white, weakly calcareous veins in them; abrupt lower contact.	17.90	940.40
CLST	ROOT	Light gray-brown; slightly bedded from top to 941.15'; many dark gray-black pyritized(?) root traces from 941.25 to 941.60'.	3.90	944.30
NR	CORE LOSS	Core loss.	0.30	944.60
CLST	ROOT	See description above.	0.65	945.25
SH		Medium gray.	3.37	948.62
CLST	ROOT	medium gray; slickensided.	2.39	951.01
SH	BLK	Black; abrupt lower contact [paleosol A horizon].	0.22	951.23
SH		Medium gray; rooted; poorly bedded at top; some plant fossils; clear lower contact.	2.10	953.33
SH	SLTY	Light-to-medium gray.	0.27	953.60
SH		Medium gray; abrupt lower contact.	1.48	955.08
SS	SH INBD	Light gray; fine grained; ripple laminated; medium gray shale interbeds.	1.26	956.34
SH		Medium gray; abrupt, angular lower contact.	1.74	958.08

SS	COAL STR	Light gray; fine grained; ripple laminated; many coal streaks and spars; one large ironstone nodule at base; slight show of yellow oil; abrupt lower contact.	1.64	959.72
SS		Light gray; fine grained; strong show of light yellow oil and gas; clear lower contact.	2.15	961.87
SS	COAL STR	Light gray; fine grained; many coal streaks and spars; abrupt, angular lower contact.	1.79	963.66
SH		Medium gray, black at base; many slickensides; very uniform; abrupt lower contact with coal (sampled basal 0.06' with coal).	6.17	969.83
COAL	CLRN	Top of Sewell coal. Dull clarain; attrital with common, 1-3mm vitrain bands and common, 0.01' soft fusain bands and lenses (sampled) (described by Bill Grady in lab).	0.11	969.94
COAL	FS	Fusain; soft (sampled) (described by Bill Grady in lab).	0.01	969.95
COAL	CLRN	Dull clarain; mainly 1cm bands of attrital groundmass interbedded with 1-5mm vitrain bands and minor, small fusain lenses (sampled) (described by Bill Grady in lab).	0.23	970.18
COAL	DULL	Dull; attrital groundmass composed of very abundant and large, soft fusain fragments, small (<<1mm) vitrain fragments, 1cm, rounded vitrain fragments, and single, 1cm vitrain band at 45 degree angle to bedding with groundmass (sampled) (described by Bill Grady in lab).	0.14	970.32
COAL	CLRN	Dull clarain; attrital; medium density; zones of 1-3mm vitrain bands (sampled) (described by Bill Grady in lab).	0.15	970.47
COAL	CLRN	Bright clarain; abundant 1-3mm vitrain bands (sampled) (described by Bill Grady in lab).	0.15	970.62
COAL	FS	Fusain; soft (sampled) (described by Bill Grady in lab).	0.02	970.64
COAL	CLRN	Dull clarain; few 1mm vitrain bands; abundant 0.01' soft fusain bands (sampled) (described by Bill Grady in lab).	0.21	970.85
COAL	FS	Fusain; mineralized with clays (sampled) (described by Bill Grady in lab).	0.01	970.86
COAL	CLRN	Dull clarain; few 1mm vitrain bands (sampled) (described by Bill Grady in lab).	0.14	971.00
COAL		Semisplint; dull; attrital; common, small fusains;	0.21	971.21

		rare, thin vitrains (sampled) (described by Bill Grady in lab).		
COAL	CLRN	Bright clarain; attrital, bright groundmass; rare, small, vitrain lenses; common, small, fusain lenses (sampled) (described by Bill Grady in lab).	0.34	971.55
COAL	CLRN	Bright clarain; >50% 1-3mm vitrain bands; minor cleat calcite (sampled) (described by Bill Grady in lab).	0.43	971.98
COAL	CLRN	Dull clarain (sampled) (described by Bill Grady in lab).	0.03	972.01
COAL	IMP	Bony or bone; laminated; very thin vitrain fragments; occasional black shale lenses and minor vitrain bands, thicker and more abundant upward (sampled) (described by Bill Grady in lab).	0.12	972.13
SH	BLK	Black, parting (sampled) (described by Bill Grady in lab).	0.04	972.17
COAL	IMP	Bony or bone (sampled) (described by Bill Grady in lab).	0.01	972.18
COAL	CLRN	Dull clarain; common 1mm vitrain bands (sampled) (described by Bill Grady in lab).	0.12	972.30
COAL	CLRN	Dull clarain; very thinly laminated; occasional large vitrain fragments; gradational base (sampled) (described by Bill Grady in lab).	0.05	972.35
BN	SH INTLAM	Bone interbedded with black shale (sampled) (described by Bill Grady in lab).	0.04	972.39
COAL	FS	Fusain, mineralized with clays (sampled) (described by Bill Grady in lab).	0.03	972.42
COAL	CLRN	Dull clarain; occasional 1mm vitrains with vitrain bands more abundant and thicker toward top (sampled) (described by Bill Grady in lab).	0.38	972.80
SH	COAL STR	Black; common coal stringers (sampled) (described by Bill Grady in lab).	0.19	972.99
COAL	IMP	Bony or bone; common, thin vitrain bands; common cleat calcite; sharp top (sampled) (described by Bill Grady in lab).	0.04	973.03
BN		Thinly laminated; gradational top (sampled) (described by Bill Grady in lab).	0.03	973.06
COAL		Vitrain (sampled) (described by Bill Grady in lab).	0.01	973.07
SH	COAL STR	Black with thin coal stringers (sampled) (described by Bill Grady in lab).	0.02	973.09

COAL	IMP	Bony or bone; very thinly laminated; high density; minor cleat calcite (sampled) (described by Bill Grady in lab).	0.05	973.14
		Base of Sewell coal		
SH		Light gray; clear lower contact (sampled top 0.06' with coal).	1.96	975.10
SH	SS STR	Light-to-medium gray; light gray, very fine grained sandstone streaks; clear lower contact.	1.55	976.65
SH		Light-to-medium gray; very uniform; abrupt lower contact.	4.75	981.40
SS	SH CLS	Light gray; very fine grained; many, fine-to-medium shale clasts; abrupt lower contact.	0.45	981.85
SH		Medium-to-light gray bands; abrupt lower contact.	1.38	983.23
SS	SH STR	Light gray; very fine grained; ripple laminated; thin, medium gray shale streaks; abrupt lower contact.	0.51	983.74
SH		Medium gray; very uniform; high angle, irregular, soft sediment deformation lower contact.	1.96	985.70
SS		Light gray; very fine grained; ripple laminated; zone of fine shale clasts from 986.40 to 986.52'; abrupt lower contact.	1.77	987.47
SH		Medium gray; very uniform; abrupt lower contact.	0.97	988.44
SS		Light gray; fine grained; planar to ripple laminated; wavy black mica streaks; clear lower contact.	1.98	990.42
SS		Light gray; fine grained; highly contorted black mica streaks and bands; abrupt lower contact.	2.08	992.50
SS		Light gray; fine grained; ripple laminated to ripple cross laminated.	1.50	994.00
SS	COAL STR	Light gray; fine grained; many coal streaks; abrupt, angular lower contact.	0.27	994.27
SS	XBD	Light gray; fine grained; planar cross laminated; abrupt, angular lower contact.	0.98	995.25
SS	SH CLS	Light gray; fine grained; shale streaks to 995.53'; fine shale clasts from 995.53 to 996.80'; very coarse shale clasts from 997.12 to 997.45'; shale streaks and clasts from 997.45' to base; clear lower contact.	2.84	998.09
SS	XBD	Light gray; mostly planar cross laminated with some ripple cross laminations; fining up from	9.50	1007.59

		medium to fine grained; clear lower contact.		
SS	SH STR	Light gray; fine grained; shale streaks and fine clasts; abrupt lower contact.	1.21	1008.80
SS	XBD	Light gray; both planar and ripple cross laminations; fining up medium to fine grained; abrupt lower contact.	7.20	1016.00
SS	COAL STR	Light gray; medium grained; thin coal streaks; abrupt lower contact.	0.51	1016.51
SS		Light gray; fine grained; clear lower contact.	0.93	1017.44
SS	QTZ PBL	Light gray; fine grained; scattered quartz pebbles up to 0.04' diameter; medium gray shale clasts in basal 0.30'; clear lower contact.	0.74	1018.18
SS		Light gray; fine-to-medium grained; mostly planar cross laminated; clear lower contact.	1.32	1019.50
SS	QTZ PBL	Light gray; fine-to-medium grained; scattered quartz pebbles up to 0.03' diameter; medium gray shale streaks in top 0.30'; 0.02' thick coal clast at 1019.86'; abrupt lower contact.	1.17	1020.67
SS		Light gray; medium grained; planar cross laminated; abrupt lower contact.	2.45	1023.12
SH		Medium gray clast; abrupt lower contact.	0.11	1023.23
CGL	QTZ PBL	Pebbles up to 0.03' diameter; abrupt lower contact.	0.27	1023.50
SS		Light gray; medium grained; clear lower contact.	0.32	1023.82
CGL	QTZ PBL	Light gray; large coal clasts; abrupt lower contact.	0.48	1024.30
SS		Light gray; medium grained; abrupt lower contact.	0.70	1025.00
SH		Medium gray clast; abrupt, angular lower contact.	0.12	1025.12
SS	XBD	Light gray; very fine grained; planar cross laminated; abrupt lower contact.	0.44	1025.56
SH		Medium gray; thin bed; abrupt lower contact.	0.11	1025.67
SS	XBD	Light gray; very fine grained; planar cross laminated; few fine shale clasts; clear lower contact.	0.99	1026.66
SS	SH CLS	Light gray; fine grained; many. coarse, medium gray shale clasts; abrupt lower contact.	0.52	1027.18
SS		Light gray; medium grained; approaching quartzose;	3.94	1031.12

		few scattered quartz pebbles up to 0.04' diameter; abrupt lower contact.		
CGL	QTZ PBL	Quartz pebbles up to 0.05' diameter; coal clasts 0.04' thick at high angle at 1031.65'; abrupt, high angle lower contact.	3.49	1034.61
SS		Light gray to 1035.35', medium gray to base; fine grained; mostly ripple laminated; medium gray shale clast 0.06' thick at top; very fine grained, shaly sandstone/sandy shale mix from 1035.75' to base; abrupt, low angle lower contact.	1.30	1035.91
SS	QTZ PBL	Light gray; medium-to-coarse grained at base with quartz pebbles 0.01 to 0.02' diameter; increasing quartz pebbles to top, almost conglomeratic; abrupt, angular lower contact.	2.20	1038.11
SS	SH CLS	Light gray; medium grained; very coarse, medium-to-dark gray shale clasts, lenses, or bands; also some quartz pebbles up to 0.04' diameter; clear lower contact.	0.75	1038.86
SS	XBD	Light gray; medium grained; mostly planar cross laminated; abrupt lower contact.	1.41	1040.27
SS	FEST INCL	Light gray; medium grained; many large ironstone nodules and clasts; very coarse (0.04' diameter) quartz pebbles; few shale clasts; abrupt, angular lower contact.	1.19	1041.46
SS		Light gray; very fine grained; ripple laminated to low angle ripple cross laminated; gradual lower contact, part of fining up sequence.	6.54	1048.00
SS		Light gray; medium grained; little cleaner than sandstone above; planar laminated; abrupt lower contact.	4.68	1052.68
SH	SDY	Thin bed or clast; abrupt lower contact.	0.14	1052.82
SS	XBD	Light gray; medium grained; mostly planar cross laminated; clear lower contact.	2.43	1055.25
SS	COAL STR	Light gray; medium grained; few thin coal streaks; few thin shale streaks; clear lower contact.	0.38	1055.63
SS	XBD	Light gray; fine grained; mostly planar cross laminated with some ripple cross laminations, especially toward base; abrupt lower contact.	4.54	1060.17
SH		Medium gray; thin bed; abrupt lower contact.	0.17	1060.34
SS		Light gray; fining up from medium to fine grained; lots of accessory minerals; abrupt lower contact.	3.81	1064.15
SH		Medium gray; thin bed; abrupt lower contact.	0.11	1064.26

SS		Light gray; fine-to-medium grained; zones of planar cross laminated and massive; zone of few shale streaks and few quartz pebbles from 1070.32 to 1070.71'; large dark gray shale clast from 1074.00 to 1074.30'; abrupt lower contact. Bottom of unit is Mississippian-Pennsylvanian contact.	10.45	1074.71
SH		Top of Mauch Chunk. Medium gray-green slightly silty in places; clear lower contact.	5.45	1080.16
MDST		Medium-to-dark gray-green; few, faint, coarse, light-to-medium gray-green mottles; slickensided; clear lower contact on red mottles.	2.44	1082.60
MDST	RED	Mottled red and light gray-green to 1083.50', mostly solid red with few, coarse, light gray-green mottles to base; many slickensides; clear lower contact.	4.42	1087.02
SH		Light gray-green; clear lower contact.	1.08	1088.10
MDST	RED	Red; few, fine-to-coarse, light gray-green mottles and streaks; calcareous, with some very fine, white, prominent calcareous grains at about 1089.65'; clear lower contact at slight color change.	1.83	1089.93
MDST	RED	Red; common; distinct, fine-to-coarse, olive mottles from top to 1090.25'; few, distinct, medium, calcareous nodules from 1090.90 to 1091.25'; calcareous throughout unit; increasing bedding to base; clear lower contact at color change.	2.30	1092.23
SH	MOT	Light gray-green; one large red mottle; weakly calcareous; few, distinct, coarse, calcareous nodules; abrupt lower contact.	0.90	1093.13
SS		Light gray-green; very fine grained; rippled; abrupt lower contact.	0.19	1093.32
SH		Light-to-medium gray green; slightly silty; abrupt lower contact.	1.42	1094.74
SH	RED	Red; abrupt lower contact.	1.44	1096.18
SH		Light gray-green; one thin calcareous streak; abrupt lower contact.	0.79	1096.97
SH	RED	Red; some light gray-green mottles, bands, and streaks; calcareous from 1098.10 to 1098.55'; abrupt lower contact.	1.70	1098.67
SH		Light gray-green; some red bands below 1099.65';	1.69	1100.36

		calcareous below 1099.25'; abrupt lower contact.		
MDST		Medium-to-dark gray-green; some black streaks (root traces?); clear lower contact at color change [paleosol A horizon].	0.42	1100.78
MDST	MOT	Light gray-green; many, distinct, coarse, red mottles; few, faint, medium-to-coarse, calcareous nodules; clear lower contact on color change [paleosol B horizon].	0.92	1101.70
MDST	RED	Red; some medium gray-green mottles; few, faint-to-distinct, fine-to-very coarse, strongly calcareous nodules, mostly from top to 1103.85'; mostly solid red from 1103.85' to base; many slickensides; gradual lower contact on color and bedding change [paleosol B horizon].	4.77	1106.47
SH	CALC	Light gray-green; weakly calcareous; many, prominent, fine-to-medium, strongly calcareous nodules; clear lower contact.	3.13	1109.60
SH	SS STR	Light gray-green; light gray, very fine grained, calcareous, rippled sandstone streaks; abrupt lower contact at basal sandstone streak.	2.80	1112.40
SH		Medium gray-green; abrupt lower contact at color change.	0.37	1112.77
SH	RED	Red; few minor light gray-green bands and mottles; to bottom of hole, total depth 1114.00'.	1.23	1114.00

POINT ID: 302-072

QUAD: NESTORVILLE (7.5')

COUNTY: Barbour COMMENT:

ST PLANE E: 1888911.2 UTME: 595629.00 LATITUDE: 39.22670
ST PLANE N: 264919.8 UTMN: 4342310.00 LONGITUDE: -79.89213

ELEVATION: 1656.00 TOTAL DEPTH: 1015.00 DATE: 02/14/20
GEOLOGIST: WVGS

NOTES: Log of core hole drilled on the Virginia Edge farm on a ridge about 3,300 feet west-southwest of the old Kasson school, about 4,700 feet north-northeast of Souls Harbor church, and about 575 feet east of County Route 2/2, Cove District, Barbour County, West Virginia. Drilling contractor: L.J. Hughes and Sons, Inc. Driller: George Ritchie. Helper: Jim Ritchie. Drilling Dates: 2/5/02 to 2/14/02. Geophysical logging: Geological Logging Systems and Allegheny Wireline Services, Inc., 2/18/02. On-site coal bed methane desorption: Dave Uhrin. Core logged by: Chris Volk and Nick Fedorko. Also on-site: Bill Kohl, geologist, Shiloh Development Corp., and Dave Bajek, geologist, Belden & Blake

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		Roller bit through soil.	10.00	10.00
SS		Light gray; fine-to-medium grained; some ripple cross lamination from 12.0 to 14.0' and at 15.0'; fairly 'clean' with some rock fragments and dark minerals.	5.22	15.22
NR	CORE LOSS	Probably weathered sandstone.	3.71	18.93
SS		Light gray; medium grained; heavily oxidized zone from 19.1-19.6'; sharp lower contact at grain size change.	1.58	20.51
SS		Light gray; coarse grained with grains up to 3mm; sharp lower contact.	0.90	21.41
SLST		Light-to-medium gray; sandy to base; carbonaceous angular fragments in basal 0.1'; sharp lower contact.	0.58	21.99
SS		Light gray; medium grained; highly oxidized joint faces; rock fragments; sharp lower contact.	1.32	23.31
CLST		Medium gray; slightly bedded at top; soft zones; sharp lower contact.	2.73	26.04

SLST		Light gray; abundant pyrite streaks and lenses; Sharp lower contact.	0.45	26.49
CLST		Light-to-medium gray; soft; sandy.	1.32	27.81
SLST		Medium gray; sandy; few calcareous inclusions from 27.82-28.10'.	0.69	28.50
MDST	CALC INCL	Medium gray-green; many, fine-to-medium, calcareous streaks and nodules; sharp lower contact.	0.25	28.75
SS		Light gray-green; fine grained.	2.40	31.15
CLST		Light gray-green; weakly bedded; some soft zones; gradational lower contact.	1.31	32.46
MDST		Light gray-green; some sand close to top; gradational lower contact.	1.33	33.79
MDST		Medium gray; soft; weakly bedded; sharp lower contact.	0.64	34.43
CLST		Light gray; weakly bedded at base; soft; gradational lower contact.	2.06	36.49
SLST		Light gray-green; soft zones; gradational lower contact.	1.71	38.20
MDST		Light gray; soft; weakly bedded; sharp lower contact.	2.90	41.10
SH	SDY	Light gray-green; sandy at base; gradational lower contact.	0.78	41.88
MDST		Light gray-green; sandy; some silty cross bedded zones.	1.35	43.23
SLST		Light gray-green; some sand from 44.55-45.25'; calcareous inclusions from 46.50' to base; gradational lower contact.	4.02	47.25
SLST		Light gray-green; sandy zones; sharp lower contact.	1.35	48.60
SLST		Light gray-green; sharp lower contact.	0.72	49.32
CLST		Light gray-green; soft; weakly bedded.	0.85	50.17
CLST		Light gray; weakly bedded; color darker to base; gradational lower contact.	5.64	55.81
CLST		Dark gray; some soft zones; weakly calcareous; sharp lower contact.	0.67	56.48
LS	FOSS	Top of Ames marine zone. Light gray; nodular with medium gray, argillaceous	1.27	57.75

matrix in top 0.60'; basal part light gray, hard; marine fossils including brachiopods, possible ostracodes and crinoid columns in limestone; sharp lower contact.

SH	FOSS	Medium-to-dark gray; strongly calcareous; sparse to moderately abundant marine fossils including brachiopods, pelecypods (one 4cm across); few burrows; gradational lower contact on color change.	2.80	60.55
SH	FOSS	Dark gray; strongly calcareous; sparse marine fossils, mostly brachiopods; common pyrite blebs; sharp lower contact.	1.28	61.83
LS		Light gray; hard; abundant spar-filled fractures; pyritic; no fossils seen; sharp lower contact.	0.34	62.17
SH	FOSS	Dark gray; calcareous; occasional marine fossils including brachiopods and gastropods; one large brachiopod 4cm across; gradational lower contact with increasing fossils with depth.	6.32	68.49
SH	FOSS	Dark gray; very strongly calcareous; abundant marine fossils including gastropods and brachiopods; argillaceous limestone in basal half with very abundant gastropods and brachiopods, some pyritized; sharp lower contact. (basal 0.16' sampled with coal below).	3.43	71.92
Base of Ames marine zone				
BN		Disrupted bedding; common small angular vitrain fragments; minor shell fragments observed; small pyrite lenses throughout; gradational base; (sampled with coal below); (described by Bill Grady in lab).	0.10	72.02
COAL	CLRN	Top of Harlem coal. Dull clarain; abundant large irregular pyrite lenses; sharp base; (described by Bill Grady in lab).	0.08	72.10
COAL		Vitrain; (described by Bill Grady in lab).	0.08	72.18
COAL	CLRN	Dull clarain; <15% 1mm vitrain bands; common disseminated pyrite (yellow sulfates on core) and minor small pyritized fusain lenses; (described by Bill Grady in lab). Base of Harlem coal.	0.97	73.15
CLST		Dark gray; slickensided; gradational lower contact; (not sampled).	0.40	73.55
MDST	CALC	Medium gray; calcareous; slickensided; some clay partings.	6.05	79.60

CLST	CALC	Light gray-green; calcareous; some calcareous nodules; slickensided; gradational lower contact.	4.60	84.20
CLST	RED	Light gray-green and red; calcareous; slickensided.	6.80	91.00
NR	CORE LOSS		1.10	92.10
CLST	RED	Red with some green streaks; few small calcareous nodules; sharp lower contact.	1.20	93.30
CLST	RED	Red; green streaks; weakly calcareous; some calcareous inclusions; slickensided; gradational lower contact.	3.26	96.56
CLST	RED	Red and green mottling; weakly calcareous; few calcareous inclusions.	3.14	99.70
NR	CORE LOSS		0.10	99.80
CLST	RED	Red with few green lenses; slickensided; gradational lower contact.	1.60	101.40
CLST	RED	Red; green lenses from 104.15' to 105.85'; soft.	4.60	106.00
NR	CORE LOSS		0.20	106.20
CLST	RED	Red; calcareous; slickensided; sharp lower contact.	1.05	107.25
MDST	CALC	Green; calcareous; sharp lower contact.	0.80	108.05
CLST	RED	Mottled red-green; few calcareous inclusions; some soft zones; gradational lower contact.	4.35	112.40
CLST	RED	Red; some weakly calcareous zones; sharp lower contact.	2.58	114.98
CLST	CALC INCL	Green, calcareous inclusions.	1.02	116.00
NR	CORE LOSS		0.56	116.56
MDST	CALC INCL	Green; calcareous inclusions; gradational lower contact.	0.77	117.33
CLST	RED	Red; few gray-green mottles; sharp lower contact on color change.	2.02	119.35
CLST		Green; few red mottles; gradational lower contact on color change.	0.91	120.26
MDST	RED	Red; few small green-gray mottles; few small calcareous inclusions.	4.04	124.30
NR	CORE LOSS		1.63	125.93
CLST	RED	Red; about 20% green mottles; slickensided;	1.09	127.02

		gradational lower contact on loss of green.		
CLST	RED	Red, with green mottling below 131.0'; few slickensides; gradational lower contact on red to green.	4.72	131.74
CLST		Green; red mottling to 132.30'; slickensided.	2.86	134.60
NR	CORE LOSS		0.25	134.85
CLST	CALC INCL	Light gray-green; common, faint calcareous streaks and nodules; gradational lower contact with increased bedding with depth.	0.70	135.55
SH		Light-to-medium gray-green; very fine; sharp lower contact at calcareous nodules.	2.16	137.71
SH	CALC INCL	Light-to-medium gray-green; many, strongly calcareous, light gray-to-white nodules and streaks; sharp lower contact at base of calcareous material.	0.75	138.46
SH		Light-to-medium gray-green; sharp lower contact at top of calcareous material.	0.46	138.92
SH	CALC INCL	Light-to-medium gray-green; many, distinct, light gray-to-white calcareous nodules and streaks, mainly in top half; slightly silty; sharp lower contact at base of calcareous material.	1.26	140.18
SH	SS STR	Light-to-medium gray-green; thin beds up to 0.05' thick; light gray-green, very fine grained sandstone streaks; thin laminations; gradational lower contact with sandstone below.	5.18	145.36
SS	SH INBD	Light gray-green; very fine grained; silty; micaceous; beds up to 0.30' thick; thinner light-to-medium gray-green, silty shale beds; sharp, irregular lower contact.	3.06	148.42
SS		Light gray; very fine grained; ripple laminated; micaceous; silty; sharp, planar lower contact.	0.70	149.12
SH	SS INBD	Light gray-green.	0.88	150.00
SH		Light-to-medium gray-green; uniform; few sandy streaks; one banded siderite nodule at 151.00'; few silty zones; sandy streak at base; sharp lower contact.	4.40	154.40
SH	SLTY	Medium gray-green; slightly silty; sharp lower contact.	0.91	155.31
SH		Medium gray-green; sharp lower contact.	0.54	155.85
SS	SH STR	Light gray-green with thin medium gray streaks; very fine grained; ripple laminated; 0.10' at top	1.22	157.07

		with possible siderite grains; sharp lower contact.		
SS	XBD	Light gray-green; some faint cross bedding; micaceous; abundant rock fragments; sharp lower contact.	12.13	169.20
NR	CORE LOSS	Driller reported bit drop and loss of water circulation in this interval. Originally placed on top of coal, but e-log indicates the loss belongs above the shale units recovered from above the coal. The caliper log also shows a 'cave' in this section.	0.70	169.90
SH	CARB	Dark gray-to-black; few thin light gray streaks; broken; sharp lower contact.	0.38	170.28
SH		Light-to-medium gray; thin black shale streaks; soft; poorly bedded; sharp lower contact.	0.21	170.49
SH	CARB	Black.	0.11	170.60
COAL	PYR	Very broken; no detailed description possible; most of coal is dull clarain with attrital groundmass and abundant pyritized fusain lenses oxidized to white sulfates on core; top of core is bone coal, high density, with contorted bedding; bright soft clarain near base; pyrite lenses (sampled by WVGES on-site) at 170.70, 170.87, and from 170.90-171.00' were included in sample; (described in lab by Bill Grady); (sampled for methane desorption).	1.20	171.80
SH	CARB	Black; carbonaceous; coaly; abundant pyrite; sharp lower contact.	0.26	172.06
MDST		Medium gray; weakly calcareous to base; few weakly bedded zones; sharp lower contact at increased calcareous material.	1.04	173.10
LS	NODAR	Medium gray with light gray nodules of varying size; sharp lower contact.	2.72	175.82
LS		Light gray; hard; minor vertical fracturing at top; sharp lower contact.	1.01	176.83
MDST	CALC INCL	Light-to-medium gray with light gray, weakly calcareous inclusions; soft; broken zones; calcareous nodules more abundant in top; sharp lower contact on soft claystone.	1.93	178.76
CLST		Light-to-medium gray; some soft zones; weakly bedded; sharp lower contact at black streaks.	0.39	179.15
CLST		Medium-to-dark gray streaks; soft zones; sharp lower contact at color change.	0.24	179.39

MDST		Light-to-medium gray; slickensided; broken by drilling.	0.61	180.00
SS		Light gray; very fine grained; silty; gradational lower contact with upward increase in silt and sand.	2.00	182.00
MDST		Medium gray; soft zones; broken at base; increased bedding to base; becoming silty at 186.70' to base; sharp lower contact at sand.	9.41	191.41
SS		Medium gray; very fine grained; silty; indistinct bedding; sharp lower contact at calcareous nodules.	1.83	193.24
MDST	CALC INCL	Medium gray with light-to-medium gray calcareous nodules; sharp lower contact.	1.35	194.59
SS	XBD	Light gray with some white streaks; fine-to-medium grained; cross bedded; micaceous; less cross bedding to base.	5.41	200.00
SS		Light gray; fine grained; micaceous; sharp lower contact with shale.	10.81	210.81
SH		Medium-to-dark gray; slickensided; few small pyrite zones at top; small sandstone clasts at base; sharp lower contact.	0.34	211.15
SS		Light gray; few dark gray streaks; fine grained; micaceous; rock fragments; sharp lower contact on shale.	1.80	212.95
SH		Medium-to-dark gray; some sandy zones; slickensided; few calcareous nodules at about 213.60'; sharp lower contact on sandstone.	1.61	214.56
SS		Medium gray; fine grained; abundant rock clasts; some black shale clasts; becomes shaly in base; sharp lower contact with sandstone below.	1.12	215.68
SS		Light gray with medium gray shaly zones; fine grained; some rock fragments; micaceous; silty shale at base; sharp lower contact with cross bedded sandstone.	1.51	217.19
SS	XBD	Light and medium gray beds, mostly medium gray at base; becomes more silty to base; fine grained; sharp lower contact with shale.	0.93	218.12
SH		Dark gray; carbonaceous plant fossils; sharp lower contact with sandstone.	0.79	218.91
SS		Light gray; fine grained; some rock clasts; shaly to base, gradational lower contact with shale.	0.69	219.60
SH		Dark gray; sandy in top; sharp lower contact with	0.53	220.13

		sandstone.		
SS		Light gray; fine-to-medium grained; micaceous; few shale clasts; rock fragments; sharp lower contact.	1.20	221.33
SS	SH STR	Medium gray; dark gray shale streaks; ripple laminated; some soft sediment deformation; gradational lower contact with increase in shale.	1.17	222.50
SH		Dark gray; sandy at top; broken, plant fossils; sharp lower contact at broken zone.	1.45	223.95
SH	BLK	Black; carbonaceous; broken; pyritic; plant fossils; sharp lower contact at coal streaks.	0.14	224.09
SH		Dark gray with some black streaks; black carbonaceous zones; coal streaks; pyrite; slickensides; plant fossils; sharp lower contact with sandstone.	3.73	227.82
SS		Light gray; fine grained; shale clasts at top and a few close to base; some rock fragments; micaceous; sharp lower contact with increase of black streaks.	2.15	229.97
SS	SH CLS	Light gray and black beds; dark gray shale rip ups; fine grained; sharp lower contact with loss of shale clasts.	6.05	236.02
SS	COAL STR	Light gray; medium grained; coal streaks; rock fragments.	4.08	240.10
SS	SH CLS	Light gray; fine grained; shale rip ups; coal streaks; shale streaks; gradational lower contact on grain size.	2.32	242.42
SS		Light gray; medium grained; shale streaks; few small shale clasts; micaceous; sharp lower contact with shale.	4.21	246.63
SH		Medium and dark gray bands; some thin silty and sandy zones; possible pyritic burrows at 250.0'; siderite nodules; no marine fossils seen.	8.29	254.92
SH	BRW	Dark gray; pyrite-filled burrows; no marine fossils seen.	3.42	258.34
SH	CARB	Black; carbonaceous; thin coal and bone streaks.	0.06	258.40
COAL	IMP	Top of Brush Creek coal. Impure; bony to bone; thinly laminated; abundant disseminated pyrite oxidized to yellow sulfates on core and common pyritized fusain lenses oxidized to white sulfates on core; (described in lab by Bill Grady); (sampled for methane desorption).	0.20	258.60
SH		Medium gray; plant stems (boxed with core).	0.77	259.37

SH	BLK	Black; plant stems; few thin coal streaks; (boxed with core).	0.18	259.55
COAL	CLRN	Dull clarain; few pyritized fusain lenses; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.30	259.85
COAL	CLRN	Dull clarain; common small pyritized fusain lenses; abundant disseminated pyrite throughout oxidized to white sulfates; occasional large vitrain lenses; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.35	260.20
COAL	CLRN	Dull clarain; occasional large vitrain lenses; (described in lab by Bill Grady); (sampled for methane desorption). Base of Brush Creek coal	0.20	260.40
SH		Light to medium gray; some light gray bands; very few, fine, calcareous nodules; gradational lower contact with increasingly poor bedding.	4.74	265.14
CLST	ROOT	Light-to-medium gray; black root traces; some soft zones; sharp lower contact.	2.26	267.40
SLST		Light gray; dolomitic cement, reacts when powdered; hard; sharp, irregular lower contact.	1.27	268.67
CLST		Light-to-medium gray; extremely friable; soft zones up to 0.2' thick; harder zones with kaolinite fragments.	0.93	269.60
NR	CORE LOSS		1.20	270.80
CLST		Medium gray; broken; soft zones; few harder zones; siderite zone from 276.32' to base; sharp lower contact at basal siderite.	7.17	277.97
CLST	SKS	Light gray-green; slickensided; sharp lower contact at siderite.	6.36	284.33
CLST	SKS	Light gray-green; slickensided; vertical fractures filled with siderite grains; sharp lower contact.	0.92	285.25
SH		Light gray-green; silty at base; sharp lower contact with siderite nodules.	1.76	287.01
SH		Light gray-green; approximately 50% large siderite inclusions; sharp lower contact with loss of siderite.	0.49	287.50
SH	SLTY	Medium gray-green; silty; sharp lower contact with appearance of sand.	1.07	288.57

SS	XBD	Light gray-green; very fine grained; micaceous; ripple cross-laminated; sharp lower contact with loss of sand.	0.35	288.92
SH		Medium gray-green; silty.	1.08	290.00
SH		Medium gray-green shale with some light gray-green, fine grained sand from 200.37 to 200.78'; some siderite bands and fracture fills; sharp lower contact.	2.60	292.60
SS		Light gray-green; very fine grained; planar to ripple laminated; few medium gray shale beds; sharp lower contact.	2.55	295.15
SH		Medium gray-green with dark gray-green bands; siderite bands in basal half; sharp lower contact at base of siderite.	1.08	296.23
CLST	KAOL	Medium gray-green with abundant dark gray-black streaks and nodules; silty/sandy zone from 296.60 to 297.00'; sharp lower contact at color change.	0.93	297.16
SH	BLK	Black; slickensided; slightly kaolinitic; no plants or stems; few light gray-green lenses and bands; sharp, irregular lower contact.	0.42	297.58
LS		Light gray; slightly nodular in top 0.50'; few, thin, vertical fractures; irregular, sharp lower contact.	1.36	298.94
LS		Medium gray; argillaceous in top 0.70'; rest light gray and hard; irregular, sharp lower contact with differential compaction.	2.00	300.94
LS	NODAR	Light gray nodules in a medium gray matrix; sharp lower contact.	1.74	302.68
LS	ARG	Medium gray; argillaceous; somewhat nodular; irregular, sharp lower contact.	1.52	304.20
LS		Light gray; hard; vertical fractures with nodules in the top; sharp lower contact.	0.38	304.58
LS	ARG	Medium gray; argillaceous; strongly calcareous; sharp lower contact.	0.27	304.85
LS		Light-to-medium gray; slightly nodular; gradational lower contact with decrease in calcareous material.	0.55	305.40
CLST		Medium gray; calcareous in top 0.30', weakly calcareous in spots below; soft crumbly zones with hard bands; sharp lower contact.	2.00	307.40
CLST		Brecciated with many, fine-to-coarse, faint-to-distinct, light gray-green, light gray,	1.50	308.90

		dark gray, medium gray, rounded-to-subangular, slightly kaolinitic clasts; sharp, irregular lower contact with differential compaction features.		
SH		Light-to-medium gray-green; sharp lower contact at calcareous material.	2.59	311.49
SH	CALC INCL	Medium gray-green; white calcareous nodules; green color lessens to base; irregular, sharp lower contact with differential compaction.	6.48	317.97
MDST		Medium gray-green matrix with white, brown-red, and dark gray streaks and nodules; calcareous nodules; siderite nodules; some kaolinitic nodules; gradational lower contact with harder material.	1.17	319.14
FTCY	BREC	Light-to-medium gray matrix with light gray, light gray-brown, dark gray, and brown rounded-to-subangular clasts and streaks; occasional calcareous nodules at top; sharp lower contact.	2.22	321.36
CLST		Medium gray; alternating hard and soft zones.	4.02	325.38
SH		Medium gray; few light-to-medium gray, very fine grained, thin sandy layers; vertical fractures filled with siderite; sharp lower contact at broken zone.	2.69	328.07
SH		Dark gray; hard and soft, friable zones; some pyrite-filled lenses at base; sharp lower contact with black shale.	1.07	329.14
SH	BLK	Black and dark gray with some dark gray-brown layers at base; some pyrite layers; few thin calcareous streaks at 329.55' and at base; sharp lower contact at loss of calcareous material.	0.78	329.92
SH	BLK	Black; some pyrite lenses; bony (boxed with core).	0.48	330.40
COAL	CLRN	Top of Upper Freeport coal Bright clarain; common small pyritized fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.40	330.80
SH		Medium gray; bony; minor pyrite on bedding; sharp top and bottom; (described in lab by Bill Grady); (sampled for methane desorption).	0.02	330.82
COAL	CLRN	Dull clarain; common 1cm pyritized fusain lenses throughout; common thick cleat calcite; (described in lab by Bill Grady); (sampled for methane desorption).	0.42	331.24
COAL	IMP	Impure; bony to bone; gradational top and bottom; (described in lab by Bill Grady); (sampled for	0.03	331.27

methane desorption).

SH		Dark-to-medium gray; minor pyrite on bedding; stigmaraia; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	331.32
COAL	CLRN	Bright clarain; abundant large pyritized fusain lenses and disseminated pyrite; common cleat calcite; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.12	331.44
COAL	CLRN	Bright clarain; soft; few pyrite lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.10	331.54
SH	BLK	Black; (described in lab by Bill Grady); (sampled for methane desorption).	0.01	331.55
COAL	IMP	Interbedded clarain and black shale; abundant pyrite throughout oxidized to yellow sulfates; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	331.60
SH		Not present in coal sample, removed prior to desorption? Noted in driller's log.	0.22	331.82
COAL	CLRN	Dull clarain; extremely fractured; (described in lab by Bill Grady); (sampled for methane desorption). Base of Upper Freeport coal.	0.08	331.90
SH	BLK	Black and dark gray bands; soft and friable; sharp lower contact with soft broken clay.	0.49	332.39
CLST		Medium-to-dark gray; soft, crumbly; sharp lower contact with harder shale.	0.59	332.98
SH		Dark gray; soft clayey intervals; sharp lower contact.	0.53	333.51
CLST		Medium gray; soft with few hard layers; sharp lower contact.	1.79	335.30
SH	ROOT	Medium gray; few black root traces at top; siderite nodules at 337.00'; gradational lower contact at calcareous material.	3.35	338.65
LS	ARG	Argillaceous; medium gray; weakly calcareous at top, more strongly calcareous to base; some strongly calcareous nodules; sharp lower contact at soft zones. . Upper Freeport Limestone	5.64	344.29
MDST	CALC	Medium gray; some argillaceous limestone beds; soft zones; calcareous throughout; sharp lower contact at base of calcareous material.	0.40	344.69

SH		Medium gray; slickensided; some siderite nodules; few dark gray streaks; silty, sandy zones beginning at 349.60'; few clayey partings.	10.87	355.56
SH		Medium gray with light gray streaks; sandy/silty beds increasing to base; sharp lower contact with appearance of siderite nodules.	4.19	359.75
SH	SS INBD	Light and dark gray bands; siderite nodules and layers; very fine grained sand and silt; sandstone layers more abundant at base; gradational lower contact with increase in sandstone.	5.24	364.99
SS	XBD	Light and dark gray bands and gray-brown siderite zones; fine grained; cross bedded; sharp lower contact with black shale.	1.57	366.56
SH		Dark gray and black; carbonaceous; coaly streaks; few pyrite lenses; sharp lower contact with soft zone.	0.37	366.93
MDST		Dark gray; few shaley beds; color darker to base; broken and soft; sharp lower contact with black shale.	1.42	368.35
SH	BLK	Black; slickensides; pyrite lenses.	0.15	368.50
COAL	IMP	Top of upper split of Lower Freeport coal. Impure; bony to bone; thinly laminated; irregular vitrain fragments; common small pyrite lenses; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.09	368.59
COAL	CLRN	Bright clarain; abundant large pyrite lenses; abundant cleat calcite; (described in lab by Bill Grady); (sampled for methane desorption).	0.21	368.80
SH	BLK	Black; slickensides; few coal streaks; pyritic (boxed with core).	0.80	369.60
COAL	CLRN	Dull clarain; extremely abundant fusains, some pyritized; abundant iron-stained cleat calcite; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.15	369.75
COAL	IMP	Impure; bony to bone; highly disrupted bedding; irregular black shale bands interfingering with bone containing large angular vitrain fragments; large and small pyrite nodules and disseminated pyrite throughout; common thin cleat calcite, also probably allocthonous; gradational base; (described in lab by Bill Grady); (sampled for methane desorption). Base of upper split of Lower Freeport coal.	0.25	370.00
SH	BLK	Black; pyrite lenses; bone and black shale	0.06	370.06

		interfingering; stigmara on base; sharp lower contact with soft clay (boxed with core).		
CLST		Medium gray; soft; broken; sharp lower contact.	0.29	370.35
SS		Medium gray; siderite; few dark gray shale streaks; burrows at base.	0.65	371.00
SS	BRW	Medium gray; interbedded dark gray shale; burrowed and bioturbated.	0.33	371.33
SS		Light-to-medium gray; few black shale streaks; some cross bedded; sharp lower contact with shale.	1.06	372.39
SH		Dark gray; light gray, fine grained sandstone layer at base; sharp lower contact.	0.32	372.71
SH		Dark gray-to-black; few sandstone layers at base; possible burrows; sharp lower contact.	0.88	373.59
SS	XBD	Light gray; few black shale streaks at top; cross bedded; sharp lower contact.	0.90	374.49
SH	BLK	Black; pyritic; few soft layers.	0.71	375.20
COAL	PYR	Durain; extremely thinly laminated; highly disrupted banding; irregular bone coal lenses; small rounded shale clasts and angular vitrain fragments interfingering with durain; irregular and inclined vitrain bands with some vertical common 1cm pyrite nodules; very likely allocthonous coal; (described in lab by Bill Grady); (sampled for methane desorption). Lower Freeport coal.	1.38	376.58
SH	COAL STR	Dark gray; coal streaks; pyritic; few soft zones; sharp lower contact.	1.71	378.29
CLST		Medium gray; soft; broken; some shale interbeds.	0.51	378.80
SH		Dark gray; broken; few clayey partings; gradational lower contact with increasing silt content to base.	4.70	383.50
SH	SLTY	Medium gray; silty; micaceous; fairly hard; light gray flint clay clasts in bottom 2.00'; sharp lower contact.	3.32	386.82
FTCY	BREC	Medium gray; light gray angular to subangular clasts; sharp lower contact.	0.32	387.14
SLST		Medium gray; hard; micaceous; scattered flint clay clasts starting at about 390.50' to base; gradational lower contact with increasing flint clay.	4.86	392.00
FTCY	BREC	Medium-to-dark gray, silty matrix; brecciated with	10.62	402.62

		light gray, brown-gray, and occasional black, angular-to-subangular clasts; less silty in basal half of unit; larger, better developed clasts from 400.00' to base; silty in basal 0.30'; irregular, sharp lower contact.		
SH	ROOT	Mostly medium gray with dark gray-to-black zones; poorly bedded; occasional slickensides; clayey; common black root traces; gradational lower contact with sandstone streaks and increased bedding.	7.85	410.47
SH	SS STR	Medium gray; abundant light gray, very fine grained, rippled sandstone streaks; possible flaser bedding; possible burrowing from 410.77 to 410.82'; one sandstone bed from 413.13 to 413.38'; sharp lower contact at basal sandstone streak.	4.82	415.29
SH		Medium-to-dark gray; few very thin, very fine grained, light gray sandstone streaks; sharp lower contact.	1.34	416.63
SS	SH INBD	Light gray, very fine grained, micaceous, sandstone beds up to 0.50' thick; interbedded medium-to-dark gray shale beds and streaks; burrowing from 420.07 to 420.18'; sharp, angular lower contact.	5.64	422.27
SS		Light-to-medium gray; medium grained; ripple bedded; shale band at 422.75'; thin coal and shale streaks and clasts from 423.0' to base; sharp, high angle, erosional lower contact; (sampled basal 0.13' with coal below).	2.12	424.39
COAL	CLRN	Top of upper split of Upper Kittanning coal. Bright clarain; soft; 50% 1-3mm vitrain bands inclined 30 degrees; abundant soft irregular partially pyritized fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.37	424.76
COAL	FS	Fusain; soft; (described in lab by Bill Grady); (sampled for methane desorption).	0.09	424.85
COAL	CLRN	Dull clarain; abundant cleat calcite; 1mm bedding plane calcite at base; (described in lab by Bill Grady); (sampled for methane desorption). Base of upper split of Upper Kittanning coal.	0.08	424.93
SH	BLK	Black with medium gray streaks; pyrite lenses; black, bony, highly carbonaceous with calcite and pyrite on root impressions in top 0.15'; sharp lower contact; sampled top 0.15' with coal above).	0.55	425.48
SH	ROOT	Light gray-brown from top to 425.85', rest medium-to-dark gray; bedding disrupted by common black root traces; pyrite nodules; very fine	8.14	433.62

		grained, thin, light gray sandy streaks starting at 426.90' to base; sharp lower contact at loss of sand streaks.		
SH	ROOT	Medium gray; some root traces; some sandy streaks; sharp lower contact.	4.61	438.23
SH	BLK	Black; sharp lower contact.	0.48	438.71
SH	COAL STR	Coal streaks, broken.	0.09	438.80
COAL	CLRN	Top of main split of Upper Kittanning coal. Dull clarain; thinly laminated; interfingers with durain below; (described in lab by Bill Grady); (sampled for methane desorption).	0.22	439.02
COAL		Durain; matte fracture surface; medium density; few large pyrite lenses; few interfingering 2mm vitrain bands at base; (described in lab by Bill Grady); (sampled for methane desorption).	0.12	439.14
COAL		Vitrain; (described in lab by Bill Grady); (sampled for methane desorption).	0.03	439.17
COAL	CLRN	Bright clarain; soft; few fusain lenses; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.24	439.41
SH		Dark gray; thin coal stringers; highly rooted with stigmara in top 0.05'; slickensided; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.22	439.63
BN		Thinly laminated; common 1mm megaspores; gradational contact with coal below; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	439.68
COAL	CLRN	Dull clarain; (described in lab by Bill Grady); (sampled for methane desorption).	0.06	439.74
COAL	IMP	Impure; bony to bone; abundant disseminated oxidized pyrite; gradational top and bottom; (described in lab by Bill Grady); (sampled for methane desorption).	0.03	439.77
COAL	CLRN	Dull clarain; common 1-3mm vitrain bands; abundant disseminated pyrite and abundant pyritized fusains oxidized to sulfates; (described in lab by Bill Grady); (sampled for methane desorption).	0.32	440.09
COAL	CLRN	Dull clarain; numerous thin black shale lenses; minor cleat calcite; (described in lab by Bill Grady); (sampled for methane desorption).	0.10	440.19
COAL	CLRN	Dull clarain; thinly laminated; abundant pyritized fusains oxidized to sulfates on core; minor cleat	0.27	440.46

		calcite; (described in lab by Bill Grady); (sampled for methane desorption).		
BN		Thinly laminated; contorted laminae; moderate disseminated pyrite throughout with abundant pyrite (sulfates on core) on top and bottom surfaces; (described in lab by Bill Grady); (sampled for methane desorption).	0.03	440.49
COAL	CLRN	Dull clarain; thinly laminated; occasional 0.02' vitrain lenses; abundant thin cleat calcite; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.12	440.61
SH	BLK	Black; highly carbonaceous; few stem and large stigmara imprints; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.13	440.74
COAL	IMP	Impure; bony to bone; thinly laminated; medium density; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.06	440.80
SH	BLK	Black; bony; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	440.85
COAL		Vitrain; (described in lab by Bill Grady); (sampled for methane desorption).	0.01	440.86
BN		With thin black shale bands and large stigmara on base; (described in lab by Bill Grady); (sampled for methane desorption).	0.06	440.92
COAL	IMP	Impure; bony to bone; thinly laminated; (described in lab by Bill Grady); (sampled for methane desorption). Base of main split of Upper Kittanning coal.	0.04	440.96
SH		Medium gray; not sampled for methane desorption.	0.06	441.02
SH	COAL STR	Black; coal streaks; not sampled for methane desorption.	0.27	441.29
SH		Light-to-dark gray bands; not sampled for methane desorption.	0.77	442.06
COAL	CLRN	Dull clarain; very broken; (described in lab by Bill Grady); (sampled for methane desorption). Lower split of Upper Kittanning coal.	0.23	442.29
SH		Medium gray; sharp lower contact with calcareous material.	2.91	445.20
LS	ARG	Medium-to-dark gray; argillaceous; calcareous nodules; few dark gray shale clasts; sharp lower contact with loss of calcareous material.	1.53	446.73

Johnstown Cement Limestone

CLST		Medium gray; weakly calcareous; some light gray kaolinitc clasts; sharp lower contact.	1.20	447.93
CLST	KAOL	Medium gray; brecciated with light gray and light gray-green clasts; irregular, sharp lower contact.	1.26	449.19
CLST	KAOL	Light gray with dark gray streaks; weakly bedded; gradational lower contact with increasing silt.	1.43	450.62
SH	SLTY	Light-to-medium gray; silty; micaceous; gradational lower contact with calcareous inclusions below.	2.83	453.45
SH		Slightly silty; weakly calcareous, irregular masses and vertical fracture fills-possible root traces; some sandy streaks at 455.00' to base.	2.33	455.78
SH	SDY	Medium gray; sandy; light gray sandy streaks; weakly calcareous material between 458.00 and 459.00'; gradational lower contact with increasing sand.	5.95	461.73
SS	SH INBD	Light gray, very fine grained, ripple laminated sandstone streaks and thin beds; interbedded medium gray shale streaks and thin beds; sharp lower contact at basal sand bed.	5.85	467.58
SH	SS STR	Medium gray shale; light gray, very fine grained, ripple laminated sandstone streaks and thin beds up to 0.50' thick; occasional siderite nodule; sharp lower contact.	7.70	475.28
SS		Light gray; very fine grained; ripple laminated; sharp lower contact.	2.27	477.55
SH		Medium-to-dark gray; plant fossils; sharp lower contact.	1.92	479.47
SS		Light gray; very fine grained; ripple laminated; sharp lower contact with shale.	1.23	480.70
SH	SS STR	Dark gray; light gray, very fine grained sandstone streaks; sharp lower contact with sandstone.	0.26	480.96
SS	SH STR	Light gray; very fine grained; planar cross laminated at top, ripple cross laminated beginning at about 484.50' to base; abundant rock fragments; few medium gray shale streaks; sharp lower contact at grain-size change.	8.52	489.48
SS		Light gray; coarse grained; coal spars at 492.04'; abundant coal and pyrite streaks from 493.61' to 494.20'; some rock fragments but "cleaner" with about 5-10% dark minerals and occasional stylolites.	10.52	500.00

SS	COAL STR	Light gray; fine-to-medium grained; abundant coal streaks; few dark shale partings; some pyrite with coal streaks; sharp lower contact.	3.26	503.26
SH	COAL STR	Dark gray; few coal streaks; plant fossils; pyrite associated with plant fossils; sharp lower contact.	0.46	503.72
SS	COAL STR	Light gray; fine grained; coal streaks; few pyrite lenses; sharp lower contact.	0.81	504.53
SH	SS STR	Dark gray shale with light gray, very fine grained sandstone streaks; few black shale streaks at the base; few plant stems; sharp lower contact with loss of sand.	1.34	505.87
SH		Dark gray-to-black; few pyrite lenses between 506.11 to 506.42'; sharp lower contact.	1.59	507.46
SH	CARB	Black; carbonaceous; some pyrite lenses.	0.45	507.91
COAL		Top of Middle Kittanning coal. Vittrains with thin pyritized fusain in middle; (described in lab by Bill Grady); (sampled for methane desorption).	0.09	508.00
SH	BLK	Black; sharp top and bottom; (described in lab by Bill Grady); (sampled for methane desorption).	0.01	508.01
COAL	CLRN	Bright clarain; soft; >95% 2-10mm vitrain bands; common 0.01' and smaller fusain lenses, some pyritized; (described in lab by Bill Grady); (sampled for methane desorption).	0.40	508.41
COAL	FS	Pyritized fusain; (described in lab by Bill Grady); (sampled for methane desorption).	0.02	508.43
COAL	CLRN	Bright clarain; soft; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.03	508.46
COAL	CLRN	Dull clarain; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	508.51
COAL	CLRN	Bright clarain; soft; common pyritized fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption). Base of Middle Kittanning coal.	0.30	508.81
SH		Dark gray; top 0.12' dark gray-to-black; slickensided; very fine pyrite streaks on slickenside faces; some root streaks; gradational lower contact.	2.81	511.62
CLST	ROOT	Medium-to-dark gray; slickensided;; some root traces; weakly bedded; few soft partings; sharp lower contact with color change.	3.72	515.34

CLST		Dark gray-to-black; few black streaks; soft; sharp lower contact.	0.41	515.75
SH		Medium gray; some light and dark gray streaks; soft, clayey parting at 515.95'; sharp lower contact.	0.37	516.12
SS		Light gray with some dark gray mineral fragments; fine grained; some medium gray shale streaks and clasts; some cross laminations at top.	7.88	524.00
COAL	CLRN	Top of Lower Kittanning coal. Bright clarain; soft; common small pyritized fusain lenses; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.46	524.46
COAL	CLRN	Bright clarain; soft; sharp base; (described in lab by Bill Grady); (sampled for methane desorption).	0.04	524.50
COAL	CLRN	Bright clarain; abundant soft fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.12	524.62
COAL	CLRN	Bright clarain; soft; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.34	524.96
COAL	CLRN	Bright clarain; soft; common small pyritized fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.34	525.30
COAL	CLRN	Bright clarain; few soft fusain lenses; (described in lab by Bill Grady); (sampled for methane desorption).	0.68	525.98
COAL	FS	Fusain; pyritized; partly oxidized to hematite; sharp top and bottom; (described in lab by Bill Grady); (sampled for methane desorption).	0.05	526.03
COAL	CLRN	Bright clarain; soft; gradational base; (described in lab by Bill Grady); (sampled for methane desorption).	0.55	526.58
COAL	IMP	Impure; very abundant oxidized pyrite; (described in lab by Bill Grady); (sampled for methane desorption).	0.08	526.66
SH	BLK	Black; bony; vitrain band in middle; (described in lab by Bill Grady); (sampled for methane desorption).	0.04	526.70
SH	ROOT	Medium gray with black root traces; sharp lower contact; not sampled for analysis; not sampled for methane desorption.	0.40	527.10

COAL	IMP	Bright streaks laminated with dull shale streaks; bony in bottom 0.10'; sharp lower contact; not sampled for analysis; not sampled for methane desorption; left in cardboard core box.	0.27	527.37
		Base of Lower Kittanning coal.		
MDST	ROOT	Light-to-medium gray; silty; sandy; abundant dark gray-to-black root streaks; gradational lower contact.	2.03	529.40
SS	ROOT	Light gray; very fine grained, abundant black root traces; sharp lower contact.	0.38	529.78
SH	SS STR	Medium gray shale with light gray, very fine grained sandstone streaks and zones up to 0.25' thick; common rooting; gradational lower contact with loss of sand.	3.26	533.04
SH		Medium gray; plant stems; rooted; sharp lower contact.	1.01	534.05
SS	SH STR	Light gray; very fine grained; ripple laminated; medium gray shale streaks and laminations; sharp lower contact with loss of shale.	0.81	534.86
SS		Light gray; very fine grained; few thin shale streaks and mica streaks; ripple laminated; sharp lower contact at grain size change.	1.84	536.70
SS		Light gray; medium grained; cleaner below 538.00'; poorly formed stylolites; few black shale clasts; sharp lower contact at quartz pebbles.	7.42	544.12
SS	QTZ PBL	Light gray; fairly clean; some dark subangular rock fragments; coarse grained; most quartz pebbles <4mm with few at top 5-7mm; also carbonaceous-to-coaly plant remains; sharp lower contact at base of quartz pebbles.	2.18	546.30
SS		Light gray; medium-to-coarse grained; 5-10% dark mineral grains; few 2-3mm quartz pebbles; black carbonaceous shale and pyrite streaks from 547.69 to 548.06'; poorly formed stylolite at 548.19'; gradational lower contact with addition of more quartz pebbles.	8.46	554.76
SS	QTZ PBL	Light gray; coarse grained matrix; few dark mineral fragments; light gray-to-white, 3-7mm quartz pebbles; sharp lower contact at base of quartz pebbles.	0.66	555.42
SS		Light gray; medium grained; few dark gray shale streaks; light gray-to-white fine grained sandstone streak at 556.52'; some dark minerals; few quartz pebbles; sharp lower contact.	1.85	557.27

SS	QTZ PBL	Light gray; medium grained matrix with 3-7mm, subrounded to subangular, light gray-to-white quartz pebbles; few dark minerals; sharp lower contact with loss of quartz pebbles.	0.70	557.97
SS		Light-to-medium gray; fine grained; few dark minerals; faint cross beds; sharp lower contact with quartz pebbles.	0.66	558.63
SS	QTZ PBL	Light gray, medium grained matrix; light gray-to-white, 3-5mm quartz pebbles; few black shale streaks; few non-quartz pebbles; sharp lower contact.	0.80	559.43
SS	SH STR	Light gray, medium grained sandstone; black coaly and carbonaceous shale streaks and zones up to 0.05' thick; sharp lower contact with loss of shale.	0.32	559.75
SS		Light gray; medium grained; few dark minerals; cross bedded in basal 0.60'; sharp lower contact.	1.28	561.03
SH	BRW	Medium gray; few burrows; black root traces; sandy streaks increasing in bottom 3.0'; gradational lower contact with increase in sand.	5.65	566.68
SH	SS STR	Medium gray shale with light gray, fine grained sandstone streaks; some root traces; cross bedded; sharp lower contact at base of sand.	3.70	570.38
SH		Dark gray; few plant stem fossils; sharp lower contact with sand.	1.01	571.39
SS	SH STR	Light gray sandstone with medium-to-dark gray shale streaks and zones up to 0.05' thick; ripple laminated; sharp lower contact.	1.60	572.99
SH	SS STR	Medium-to-dark gray shale with light gray, ripple laminated sandstone streaks and zones up to 0.07' thick; sharp lower contact.	3.66	576.65
SS		Light gray; fine grained; ripple laminated; few shale clasts, black shale and coaly streaks from 578.93 to 579.37'; dark gray shale zones at 579.90 and 580.40'; sharp lower contact.	4.07	580.72
SH	SDY	Medium gray; sandy; few light gray sandstone lenses; sharp lower contact with sand and coal streaks.	0.40	581.12
SS	COAL STR	Light gray; very fine grained; planar-to-ripple laminated; sharp lower contact.	0.45	581.57
SH	SS STR	Medium-to-dark gray shale with light gray, ripple laminated sandstone streaks; sand increases in bottom 2.0'; sharp lower contact.	4.26	585.83

SH	BLK	Black; slickensided; small sand lens at 585.98'; sharp lower contact.	0.21	586.04
SS		Light gray; fine-to-medium grained; few dark minerals; sharp lower contact.	0.48	586.52
SH	BLK	Black; carbonaceous; bony; abundant pyrite on base; lenticular; interfingers with sandstone in top; top surface inclined; sharp lower contact; (described in lab by Bill Grady); (not sampled for methane desorption).	0.12	586.64
COAL	CLRN	Dull clarain; abundant small pyritized fusains oxidized to white sulfates; sharp base; (described in lab by Bill Grady); (not sampled for methane desorption). Upper Mercer(?) or No. 5 Block(?) coal	0.41	587.05
SH	BITRB	Dark gray; light gray, small plant trash; micaceous; very fine grained sandstone streaks and zones; bioturbated, possibly burrowing; sandy; sharp lower contact with increased bioturbation.	3.45	590.50
SH	BITRB	Medium-to-dark gray; light gray fine grained sandstone (streaks?); heavily bioturbated with possible burrowing and some coalified root traces; sharp lower contact.	3.12	593.62
SS		Light gray-to-white; fine-to-medium grained; few mica streaks; ripple laminated in top 0.60'; some dark minerals; few shale clast from 595.20 to 595.33'; dark gray shale streaks from 595.43 to 595.83'; sharp lower contact.	3.43	597.05
SS	SH STR	Light gray; fine grained; medium-to-dark gray shale streaks; bioturbated with possible burrows; sharp lower contact.	0.54	597.59
SS		Light gray; fine-to-medium grained; dark minerals; few shale streaks in top 0.70'; few thin coal streaks; sharp lower contact.	2.52	600.11
SS		Light gray; fine-to-medium grained; micaceous; coal streaks; dark gray shale streaks; sharp lower contact at base of coal and shale streaks.	1.02	601.13
SS		Light gray; fine-to-medium grained; micaceous; some dark minerals; light gray-to-white sandstone streaks and shale streaks from 605.54 to 605.74'; white crystals on fracture face at about 612.00', gypsum?; sharp lower contact at grain size change.	19.74	620.87
SS		Light gray; fine grained; quartz with abundant dark minerals; micaceous; abundant thin black shale streaks; sharp lower contact at grain size change.	0.50	621.37

SS	QTZ	Light gray; quartzose with 5-10% dark minerals and mica; medium grained; coal streaks, most from 622.25 to 622.90'; sharp lower contact at basal coal streaks.	1.64	623.01
SS	QTZ	Light gray; quartzose with few dark minerals; few thin coal streaks at 623.35' and 624.55'; sharp lower contact.	2.48	625.49
SH		Medium gray; siderite nodules - possible burrow fills?; few light gray, very fine grained sandy streaks; occasional slickensides and poorly bedded zones.	4.51	630.00
SH		Dark gray; slickensides; black carbonaceous zone from 630.20 to 630.28'; sharp lower contact.	0.28	630.28
SH	SS STR	Medium gray; very fine grained, ripple laminated sandstone streaks; sharp lower contact.	2.10	632.38
SS		Light gray; ripple laminated; fine grained, micaceous; coal streaks from 633.0 to 634.0'.	1.74	634.12
SH	SS STR	Medium gray with some dark gray shale clasts; some ripple laminated, very fine grained sandstone streaks; sharp lower contact.	1.73	635.85
SS		Light gray; fine grained; some medium gray shale streaks; micaceous; dark minerals; sharp lower contact at coal and shale streaks.	5.82	641.67
SS	COAL STR	Light gray; coal streaks; black shale streaks; fine grained; some mica; sharp lower contact at base of coal streaks.	1.30	642.97
SS		Light gray; fine-to-medium grained; few thin shale streaks; dark gray shale streak at 644.38'; micaceous; sharp lower contact at quartz pebbles.	7.40	650.37
SS	QTZ PBL	Light gray; coarse grained; quartz pebbles range from 2-5mm; sharp lower contact with pebble size change.	3.71	654.08
SS	QTZ PBL	Light-to-medium gray; medium-to-coarse grained matrix; quartz pebbles from 2-3mm in size; dark gray shale lens at base; sharp, angular lower contact.	0.30	654.38
SS		Light gray; fine grained; dark gray shale streaks; micaceous; sharp lower contact.	1.59	655.97
SS	XBD	Light gray; fine grained; micaceous; cross bedded; fairly clean; stylolites.	14.03	670.00
SS	QTZ	Light gray; fine grained; stylolites; cross bedded; sharp lower contact with thin shale streaks.	14.67	684.67

SS		Light gray; abundant dark minerals; fine grained; few small coal streaks at base; sharp lower contact at quartz pebbles.	0.66	685.33
SS	QTZ PBL	Light-to-medium gray; fine-to-medium grained; coal streaks; abundant dark minerals; quartz pebbles from 1-7mm; sharp lower contact.	0.84	686.17
SH		Dark gray; plant stems; some root traces; few fine grained sandstone streaks; occasional quartz pebbles; sharp lower contact.	2.72	688.89
SS		Light gray; micaceous; fine grained; cross bedded; abundant dark minerals; sharp lower contact at grain size change and quartz pebbles.	2.06	690.95
SS	QTZ PBL	Light gray; medium grained; micaceous; common, but not abundant 2-5mm quartz pebbles; sharp lower contact at more abundant quartz pebbles.	1.02	691.97
SS	QTZ PBL	Light gray; coarse grained; abundant quartz pebbles from 2-7mm; few shale pebbles; sharp lower contact at base of abundant quartz pebbles.	2.14	694.11
SS	QTZ PBL	Light gray; micaceous; stylolites; coarse grained; dark minerals; quartz pebbles from 2-6mm; coal streak at 695.82'; sharp lower contact at grain size change and base of quartz pebbles.	2.72	696.83
SS		Light gray; fine-to-medium grained; dark minerals; very few quartz pebbles; sharp lower contact with grain size change.	2.99	699.82
SS		Light gray; coarse grained; some quartz pebbles from 2-4mm; dark minerals; few dark shale clasts; sharp lower contact.	1.62	701.44
SH		Dark gray; slickensides; sharp lower contact.	0.30	701.74
SS		Light gray; some 1-4mm quartz pebbles; dark minerals; coarse grained; few dark shale clasts; sharp lower contact at grain size change.	0.36	702.10
SS	QTZ	Light gray; fine grained; quartzose with about 5-10% dark minerals; few small stylolites; few cross beds; sharp lower contact at grain size change.	6.82	708.92
SS		Medium grained; micaceous; few small shale streaks; abundant dark minerals; sharp lower contact.	0.42	709.34
SH		Medium gray; sandstone streaks; slickensides.	0.66	710.00
SH		Medium gray; plant stems; some root traces; slickensides; sharp lower contact with color change.	7.24	717.24

SH		Dark gray; slickensides; examined closely for marine fossils in field and office, none found; sharp lower contact.	0.33	717.57
SH	BLK	Black; coal streaks; coaly material throughout; few plant stems; examined closely for marine fossils in field and office, none found.	0.13	717.70
COAL	SPLINT	Top of Little No. 5 Block(?) or Stockton A(?) coal. Splint coal; low density; conchoidal fracture; probably at top of coal; (described in lab by Bill Grady); (sampled for methane desorption).	0.18	717.88
COAL	CLRN	Dull clarain; highly fractured in core with slickensides, probably corresponding to the slickensided 0.07' ironstone lens excluded from coal for methane desorption and sampled separately; ironstone lens contains small disseminated pyrite; (described in lab by Bill Grady); (sampled for methane desorption). Base of Little No. 5 Block(?) or Stockton A(?) coal.	0.72	718.60
SS	QTZ	Light gray; fine-to-medium grained; quartzose with less than 5% dark minerals; medium-to-coarse grained at the base; few quartz pebbles in base; sharp, high angle lower contact.	6.61	725.21
SS	XBD	Light gray; fine grained to very fine grained at base; ripple cross laminated; micaceous (dirty); sharp, irregular lower contact.	1.27	726.48
SS	SH STR	Light gray; micaceous; ripple laminated to ripple cross laminated; very fine grained; shale and mica streaks in top 0.32'; more abundant thin shale and mica streaks in basal 0.35'; sharp, high angle lower contact.	0.89	727.37
SS		Light gray; fine grained; "cleaner"; some mica; sharp, angular lower contact on coal spar.	0.85	728.22
COAL		Thin, bright, angular spar across the entire core; sharp lower contact; (not sampled).	0.02	728.24
SS	SH CLS	Highly disrupted, light gray fine grained sand with medium-to-dark gray subangular-to-rounded shale clasts and pebbles and rounded light gray-to-brown siderite pebbles; zone of medium-to-dark gray shale or very large clast in top 0.20' of unit; sharp irregular lower contact.	1.04	729.28
SS		Light gray; fining upward from coarse to fine grained in top 0.40'; mostly planar laminated; few scattered coal clasts, shale clasts, and abundant siderite pebbles up to 3cm in basal 0.20'; sharp	4.92	734.20

lower contact at base of siderite pebble zone.

SS	SH CLS	Light gray; medium grained; ripple laminated; very fine, medium gray shale clasts scattered throughout; few shale clasts up to 13mm; medium gray shale band or large clast and large siderite pebbles in basal 0.10'; sharp lower contact at base of siderite pebbles.	1.19	735.39
SS	XBD	Light gray; fine grained; ripple cross laminated; micaceous; abundant dark minerals; dark gray mica streaks; medium gray shale streaks starting at 736.35' to base.	3.96	739.35
SS	XBD	Light gray; fine grained; micaceous; cross bedded; gray shale streaks and small shale clasts; sharp lower contact at loss of shale.	2.28	741.63
SS	XBD	Light gray; fine grained; ripple cross laminated; micaceous; abundant dark minerals; sharp lower contact with differential compaction on shale.	6.56	748.19
SH	ROOT	Dark gray; abundant plant stems and root traces; sharp lower contact.	0.60	748.79
SS	XBD	Light gray; fine grained; ripple cross laminated; micaceous; dark gray mica streaks; few shale clasts from 749.40 to 749.75'; abundant mica and shale streaks at base; sharp lower contact with loss of shale streaks.	2.39	751.18
SS		Light gray; fine grained; ripple laminated; abundant dark minerals; sharp lower contact at shale streaks.	0.41	751.59
SS	SH STR	Light gray with medium gray shale streaks; micaceous; abundant dark minerals; sharp lower contact at base of shale streaks.	0.80	752.39
SS		Light gray; fine grained; massive; micaceous; abundant dark minerals; few plant stems; plant stems more abundant from 762' to base; sharp lower contact.	11.96	764.35
SS	XBD	Light gray; fine grained; abundant mica streaks; cross bedded; abundant dark minerals; sharp lower contact at top of bioturbation.	1.34	765.69
SS	SH STR	Light gray; dark gray shale streaks; pyrite nodules; possible bioturbation; sharp lower contact.	0.36	766.05
SS		Light gray; fine-to-medium grained; abundant dark minerals; few mica streaks; mass of dark gray shale clasts from 767.58 to 767.66'; sharp lower contact at grain size change.	2.17	768.22

SS		Light gray; fine grained(?); ripple laminated; micaceous; abundant dark minerals; sharp lower contact.	0.26	768.48
SH		Dark gray; plant stems; sharp lower contact.	0.47	768.95
SS		Light gray; fine grained; ripple laminated; abundant dark minerals; sharp lower contact.	0.64	769.59
SH		Dark gray; plant stems; sharp lower contact.	1.44	771.03
SS	XBD	Light gray with dark gray mica streaks; fine-to-medium grained; abundant dark minerals; cross bedded; sharp lower contact at top of shale streaks.	2.92	773.95
SS	SH STR	Light gray with dark gray-to-black shale streaks; micaceous; fine-to-medium grained; sharp lower contact at base of shale streaks.	0.93	774.88
SS	XBD	Light gray; fine-to-medium grained; cross bedded; some dark minerals; although fairly clean; occasional shale streak.	4.59	779.47
SS	XBD	Light gray; fine grained; dark gray mica streaks; cross bedded; few dark gray shale streaks at base; sharp lower contact at base of shale streaks.	3.28	782.75
SS		Light gray; fine grained; few plant stems; coal streak at 783.19'; abundant dark minerals; sharp lower contact with addition of shale streaks.	1.87	784.62
SS	SH STR	Light gray; fine grained; some dark minerals; dark gray-to-black shale streaks; few shale clasts at base; few coal streaks; sharp lower contact at base of shale streaks.	1.13	785.75
SS	XBD	Light gray; fine grained; cross bedded; few shale pebbles in top up to 10mm diameter; abundant dark minerals; more micaceous to base in streaks; sharp lower contact with loss of cross bedding.	2.82	788.57
SS		Light gray; fine grained; micaceous; few cross beds; few shale pebbles at base up to 12mm diameter; sharp lower contact at shale streaks.	8.10	796.67
SS	SH STR	Light gray; fine grained; dark gray shale streaks; few small shale clasts; sharp lower contact at base of shale streaks.	0.06	796.73
SS		Light gray-brown; fine grained; few gray shale streaks; sharp lower contact.	0.07	796.80
COAL		Bright; probably rafted; (not sampled, in core box).	0.06	796.86
SS		Light gray; fine grained; some rock fragments;	0.14	797.00

		sharp lower contact.		
CLST		Light gray-brown; possibly rooted; sharp lower contact.	0.22	797.22
SH		Dark gray; few plant stems; some root traces; sharp lower contact at sandy streaks.	3.09	800.31
SH	SLTY	Dark gray; abundant plant stems; silty, sandy; 2 siderite streaks; high angle slump features; sharp lower contact at base of silt.	5.71	806.02
SH		Medium-to-dark gray; occasional rounded siderite nodules; few root traces; large siderite zone with calcite filled fractures from 807.25 to 807.75'; some nodules show compaction around them; silty toward base; few plant stems; sharp lower contact.	3.33	809.35
SS	BRW	Medium-to-dark gray with some light gray, very fine grained sand; shaley; highly disrupted by burrowing; sharp lower contact with color and lithology change.	1.32	810.67
MDST	BRW	Light gray-brown; silty; dark gray burrows in top 0.30'; slickensided; sharp lower contact.	0.90	811.57
SH	BITRB	Dark gray; possible burrows; sharp lower contact.	0.36	811.93
SH	ROOT	Medium gray; plant stems and very abundant root traces, especially above 814.00'; few very thin, very fine grained sandstone streaks; sharp lower contact at sandstone streaks.	6.01	817.94
SH	SS STR	Medium gray; abundant, light gray, rippled sandstone streaks; rooted; sharp lower contact.	1.22	819.16
SS	SH STR	Light gray; very fine grained; medium gray shale laminations; sharp lower contact.	0.96	820.12
FEST		Light gray-brown siderite zone with some shale streaks at base; sharp lower contact.	0.43	820.55
SH		Dark gray; occasional roots; very uniform; sharp lower contact.	5.00	825.55
SH		Light gray; poorly bedded; very few root traces; gradational lower contact with color change.	1.77	827.32
SH	ROOT	Medium-to-dark gray; pyrite nodules as possible root fillings; abundant root traces; very uniform; some sandy lenses in basal 0.70'; sharp lower contact.	3.29	830.61
SS	BRW	Light gray; fine grained; light-to-medium gray shale interlaminated and bioturbated; siderite filled burrows at top; large siderite nodule from 831.00 to 831.45' and large nodules from 840.58 to	12.43	843.04

		840.77' and from 842.52 to 842.95'; sharp lower contact.		
SH		Light gray-brown; few root traces; few burrows; sharp lower contact.	1.70	844.74
SS	BRW	Light-to-medium gray; fine grained; possible burrows; medium-to-dark gray shale streaks; sharp lower contact.	0.28	845.02
SH	BRW	Laminated medium-to-dark gray shale and light gray, very fine grained sandstone disrupted by burrows; few burrows from 850.00' to base; sharp lower contact.	6.32	851.34
SS	SH STR	Light gray; fine grained; medium and dark gray shale streaks and some small shale clasts; sharp lower contact; (sampled basal 0.41' with coal below).	0.94	852.28
COAL	CLRN	Dull clarain; common 1mm vitrain bands; abundant small pyritized fusain lenses; minor cleat calcite; sharp lower contact; (described in lab by Bill Grady); (not sampled for methane desorption). Winifrede(?) coal.	0.21	852.49
MDST	CARB	Black; very highly carbonaceous; abundant small fusain and vitrain fragments; minor small irregular pyrite nodules; slickensided in top part; plant trash; sharp, angular lower contact; (sampled with coal above); (described in lab by Bill Grady).	0.24	852.73
MDST	ROOT	Medium gray; abundant root traces; sharp, irregular lower contact; (sampled top 0.37' with coal above).	0.57	853.30
CLST	ROOT	Black; thin coaly streaks; sharp, irregular lower contact on color change.	0.05	853.35
CLST	ROOT	Light-to-medium gray; abundant root traces; silty and sandy in basal half; siderite nodules; sharp lower contact.	2.28	855.63
SS	ROOT	Light-to-medium gray; very fine grained; abundant root traces to 857.00'; some dark gray shale streaks; sharp lower contact at base of shale streaks.	2.47	858.10
SS	XBD	Light gray; very fine grained; ripple cross laminated to ripple laminated; micaceous; sharp lower contact at shale streaks.	2.21	860.31
SS	SH STR	Light gray; fine grained; ripple laminated; micaceous; medium-to-dark gray shale streaks; few siderite layers; sharp lower contact.	10.27	870.58

SS	SLMP	Medium gray; very fine grained; slumped; few dark shale streaks; sharp lower contact.	2.02	872.60
SH	SS STR	Medium gray shale with light gray, fine grained, ripple laminated sandstone; sand increases in bottom half; sharp lower contact.	2.56	875.16
SS	SH STR	Light gray; fine grained; medium gray shale streaks; micaceous; planar laminated with some ripple laminations; sharp lower contact.	0.81	875.97
SH		Medium-to-dark gray; occasional root trace.	4.03	880.00
SH		Medium-to-dark gray; very uniform; plant stems, more common in bottom 7.0'; possible <i>Annularia</i> sp. at 883.60'; calcareous filled fracture from 893.15 to 895.50'; sharp lower contact at sandstone streaks.	20.01	900.01
SH	SS STR	Medium gray shale with light gray, very fine grained, ripple laminated, micaceous sandstone streaks; common plant stems; few root traces; sharp lower contact.	3.40	903.41
SH		Medium-to-dark gray; uniform; sharp lower contact at color change.	0.60	904.01
SH		Dark gray; plant stems; sharp lower contact at color change.	0.31	904.32
SH		Dark gray-to-black; coaly plant material; sharp lower contact.	0.07	904.39
COAL	SH STR	Impure; black; some pyrite; sharp lower contact with claystone; (left in core box).	0.16	904.55
		Chilton Rider(?) coal.		
CLST		Dark gray; slickensides; some black streaks; possible root streaks; sharp lower contact.	1.23	905.78
SH	ROOT	Medium gray; common root traces; few plant stems; few light gray sandstone streaks; few slickensides; sharp lower contact at silt.	2.98	908.76
SH	SLTY	Medium gray with few medium-to-dark gray streaks; abundant plant stems; few sandstone streaks; occasional small siderite nodules; sharp lower contact at increased sand content.	5.18	913.94
SH	SS STR	Medium gray shale with light gray, very fine grained sandstone streaks; few plant fossils, small leaf at 913.58'; few dark shale streaks; sharp lower contact with color change and loss of sand.	1.14	915.08

SH	BLK	Black; some coalified plant stems; sharp lower contact.	1.15	916.23
MDST	ROOT	Medium gray; common roots; few plant stems; weakly bedded; sharp lower contact with increase in sand.	1.40	917.63
SS	ROOT	Light-to-medium gray; very fine grained; very dirty with abundant dark minerals; root traces most abundant at top; few plant stems; sharp lower contact.	11.64	929.27
SH	SS STR	Medium-to-dark gray shale with light gray, very fine grained sandstone streaks; common plant stems; few root traces; sharp lower contact.	1.75	931.02
SS		Light gray; fine grained; ripple laminated; few dark gray shale streaks at base; mica streaks; >10% dark minerals; sharp lower contact on grain size change.	1.89	932.91
SS	XBD	Light gray; medium grained; cleaner with about 10% dark minerals; micaceous; sharp lower contact.	10.88	943.79
COAL		Bright; bright streaks; sharp lower contact with sandstone; rafted?; (left in core box).	0.06	943.85
SS	XBD	Light gray; fine-to-medium grained; about 10% dark minerals; micaceous; ripple laminated; coal streak at 945.10'; few small coal streaks between 948.47 and 948.83'; sharp lower contact.	5.25	949.10
SS	COAL STR	Light gray-to-white; fine grained; abundant dark minerals; coal streaks abundant in top 0.15'; sharp lower contact on grain size change.	0.41	949.51
SS	COAL STR	Light gray-to-white; medium grained; micaceous; abundant dark minerals; coal streaks; shale pebbles in basal 0.23'; sharp lower contact at base of coal streaks.	1.65	951.16
SS		Light gray; fine grained; micaceous; about 10% dark minerals; few dark gray shale streaks from 951.90 to 952.15'; sharp lower contact.	1.95	953.11
SH	SS STR	Dark gray shale with light gray, fine grained, ripple laminated sandstone streaks; few plant stems; few small, 2-5mm shale pebbles at 954.82'; sharp lower contact with shale loss. Base of Pennsylvanian.	1.02	954.13
SS	XBD	Top of Mississippian. Light-to-medium gray-green; ripple cross laminated; some mica; 0.04' dark shale band at base; slightly calcareous; sharp lower contact with shale.	1.15	955.28
SH		Light-to-medium gray with slight greenish color	3.42	958.70

when wet; few thin poorly bedded zones around 958.40'; loss in run.

NR	CORE LOSS	Loss probably from unit below.	0.70	959.40
CLST		Light gray; few green streaks in basal 0.50'; soft, broken zones; few slickensides; sharp lower contact.	2.93	962.33
MDST		Light gray-green; slickensides; few light gray-brown shale clasts; few clayey partings; sharp lower contact on color change.	1.74	964.07
MDST	RED	Red with green mottles and streaks; few soft, broken zones; sharp lower contact on color change.	2.33	966.40
MDST	SKS	Light-to-medium gray; slickensided; broken; sharp lower contact on color change.	2.02	968.42
MDST	RED	Red with a few light gray-green streaks and zones; slickensided; broken; few soft zones; few light gray streaks in bottom 0.30'; sharp lower contact on color change.	8.37	976.79
SH		Light gray-green; slickensided; few red and green streaks in bottom 0.50'; sharp lower contact on color change.	4.04	980.83
MDST	RED	Red with few medium gray streaks; slickensided; bedded in top 0.90'; soft and broken zones from 981.80' to base; sharp lower contact on color change.	1.92	982.75
CLST	SKS	Medium gray-green and dark gray streaks; soft partings from 982.89' to base; sharp lower contact on red color.	0.55	983.30
CLST	RED	Red with some medium gray-green and dark gray streaks and zones in top 0.50'; soft, broken zones around 984.30' and from 985.00' to base; sharp lower contact on color change.	3.95	987.25
SH		Medium gray-green; few red mottles in top 0.60'; some medium-to-dark gray streaks and red and green mottles in basal 0.50'; sharp lower contact at base of red and green.	4.23	991.48
CLST	SKS	Medium gray; few green streaks in bottom 0.40'; slickensided; sharp lower contact on red color.	2.66	994.14
MDST	RED	Red; few, fine-to-coarse, distinct, light gray-green mottles; few fine-to-coarse, distinct, light gray-to-white calcareous nodules; also very fine calcareous material in matrix in places; slickensided; mostly soft, broken with a few harder zones; sharp lower contact on color change.	7.60	1001.74

SH	CALC INCL	Light gray-green; few, fine, faint, calcareous nodules; sharp lower contact on color change.	1.31	1003.05
SH	CALC INCL	Light-to-medium gray-green with reddish tint in top 0.50'; few, medium, distinct, light gray-white calcareous nodules; sharp lower contact on color change.	1.25	1004.30
SH	RED	Medium red-gray, redder to base; few, fine-to-medium, faint-to-distinct, calcareous nodules to 1004.75'; few, fine, distinct, light gray-green mottles from 1004.75' to base; sharp lower contact at color change.	0.98	1005.28
SH		Light-to-medium gray-green; few, fine, faint calcareous nodules; becoming silty and sandy to base; gradational lower contact with increasing sand content.	2.02	1007.30
SS	CALC	Light gray with medium gray-green streaks; very fine grained; micaceous; dark minerals; ripple laminated; slightly calcareous from top to about 1010.00'; few, medium-to-coarse, distinct, calcareous nodules from about 1010.00' to base; gradational lower contact with transition from shale.	3.65	1010.95
SH		Light-to-medium gray-green; faint reddish color at base; silty, sandy to top; sharp lower contact with color change.	1.49	1012.44
SH	RED	Red; very fine, uniform; sharp lower contact on color change.	0.28	1012.72
SH		Light-to-medium gray-green and dull red banding; fine; sharp lower contact.	0.44	1013.16
SH	SLTY	Light gray-green; silty; faint, very fine grained sandy streaks; hard; one calcareous nodule in base; sharp lower contact.	0.97	1014.13
SH		Light-to-medium gray-green; fine; one calcareous nodule at upper contact; probably to TD, loss in last run.	0.35	1014.48
NR	CORE LOSS	Drilled to TD 1015.00'; lost in hole.	0.52	1015.00

POINT ID: 306-061

QUAD: OSAGE (7.5')

COUNTY: MONONGALIA COMMENT: CHAPLIN HILL/MYLAN PARK CORE

ST PLANE E: 1846876.7 UTME: 453342.72 LATITUDE: 38.14414
ST PLANE N: 417051.5 UTMN: 4221735.91 LONGITUDE: -81.53245

ELEVATION: 1200.00 TOTAL DEPTH: 2525.00 DATE: 11/14/19
GEOLOGIST: WVGS

NOTES: Geologists core 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 north west 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. Described by Nick Fedorko and Jim Britton. Coal Bed Methane desorption by Peter Warrick, Jingle Ruppert and Rob Crangle of USGS, Mud logged by Jay Mallow of Hydrocarbon Well Logging Services, geophysical logging by Phil

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. LITTLE WAYNESBURG COAL HORIZON	0.19	80.60
SH	CALC	Medium dark gray, 1 ostracod observed, base sharp	0.11	80.71

		on color.		
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, mudcracks 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, shaley 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	1.28	104.32

		weakly calcareous to base, base sharp.		
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 shaley streaks, calcareous shale rip ups to base, base gradational on increased shale streaks.	1.86	106.40
SLST	SDY	Medium to light gray, shaley, 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 pyrite, pyritized fecal matter (?), approximately 0.20' core loss at base.	0.31	116.75
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 sparce 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,	3.82	138.60

		gradational lower contact with increasing bedding to base.		
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, non-bedded, 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 zones below 185.00', light to medium gray green in basal 2.00', sharp lower contact.	4.85	188.38
SS		Light gray green, very fine grained, weakly calcareous, faint planar laminations to planar	5.79	194.17

		cross laminations, slightly silty to base, thin shale break at 192.00' and 193.00', slightly angular lower contact.		
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 shaley 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 lense 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 1/2 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, wealy 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	0.53	241.78

		phosphatic (?) material, sharp lower contact on color and texture.		
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 on color change.	9.06	255.72
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 shaley 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, non bedded 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	CARB	Dark gray to black, pyrite streaks at top, coaly streaks in bottom 0.05', sharp lower contact.	0.22	346.43
COAL	IMP	TOP OF SEWICKLEY COAL Thin banded. NOT SAMPLED FOR METHANE.	0.03	346.46
SH	CARB	Black, coaly streaks, dense, sharp lower contact on coal. NOT SAMPLED FOR METHANE.	0.34	346.80
COAL	BRT	SAMPLED BY USGS FOR METHANE TESTING.	5.30	352.10
SH		Gray or pyrite band. SAMPLED BY USGS FOR METHANE TESTING.	0.05	352.15
COAL		Thin band. SAMPLED BY USGS FOR METHANE TESTING. BASE OF SEWICKLEY COAL	0.05	352.20
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.	1.04	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, densed, 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	1.25	368.00

		filled burrow, sharp lower contact.		
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 slickenside break, nodular in basal 0.20' with light gray, hard nodules, sharp, highly irregular lower contact.	1.68	371.20
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 shaley 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 lower contact.	0.93	383.85
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, shaley, 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 pyrite, thin coaly streaks, abundant pyrite blebs, sharp lower contact on coal.	0.16	405.30
COAL		Pyrite streaks. SAMPLED BY USGS FOR METHANE TESTING. REDSTONE COAL	2.70	408.00
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		Very dark gray to black, abundant plant trash, pyrite nodules and plant trash, sharp lower contact.	0.62	426.18

SH		Very dark gray to black, coal streaks, abundant pyrite streaks, pyritized plant trash.	0.78	426.96
COAL	IMP	TOP OF PITTSBURG COAL ROOF SAMPLED BY USGS FOR METHANE TESTING	0.60	427.56
BN	COAL STR	Pyrite nodules and lenses. TOP 0.40' SAMPLED FOR METHANA TESTING.	1.34	428.90
SH	BLK	Coalified plant trash and stems, thin coaly streaks, sharp lower contact. NOT SAMPLED FOR METHANE.	2.22	431.12
COAL		NOT SAMPLED FOR METHANE.	0.14	431.26
SH		Dark gray to black with light gray inclined laminations, slightly rooted, coalified plant material, fine organic streaks, pyrite. NOT SAMPLED FOR METHANE.	1.09	432.35
COAL		SAMPLED BY USGS FOR METHANE TESTING.	0.90	433.25
MDST		Medium gray, very slickensided, sharp lower contact. NOT SAMPLED FOR METHANE. BASE OF PITTSBURGH COAL ROOF	0.60	433.85
COAL		TOP OF PITTSBURGH MAIN BENCH SAMPLED BY USGS FOR METHANE TESTING.	0.30	434.15
PYR		SAMPLED BY USGS FOR METHANE TESTING.	0.10	434.25
COAL		SAMPLED BY USGS FOR METHAN TESTING. BASE OF PITTSBURGH COAL MAIN BENCH	8.10	442.35
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.	1.14	443.49
SLST		Light medium gray, shaley.	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	1.82	457.69

		in fractures, broken in drilling, soft clay bands, sharp lower contact.		
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', sharp lower contact.	0.70	459.97
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	CARB	Dark gray to black, coaly streaks, sharp lower contact on coal.	0.18	468.50
COAL		TOP OF UPPER LITTLE PITTSBURGH COAL SAMPLED BY USGS FOR METHANE TESTING.	0.75	469.25
SH		Light medium gray, thin clay streaks to base, diffuse small pyrite crystals, sharp lower contact. NOT SAMPLED FOR METHANE.	0.40	469.65
COAL		Bright banded clarain, common thick vitrains, thin bone and dull clarain streaks at top, sharp lower contact. NOT SAMPLED FOR METHANE, PULLED FROM BOX FOR ANALYSIS. BASE UPPER LITTLE PITTSBURGH COAL	0.65	470.30
SH	CARB	Black, coal streaks, sharp lower contact.	0.03	470.33
LS		Medium gray, shaley, 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, shaley 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	Pyrite streaks, finely disseminated coaly material, sharp lower contact.	0.27	478.85
COAL	IMP	Abundant pyrite streaks and blebs, dull clarain with small bright clarains, gradational lower contact. NOT SAMPLED FOR METHANE. LOWER LITTLE PITTSBURGH COAL	0.35	479.20
SH	BLK	Non-calcareous, sharp lower contact.	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',	5.83	508.57

		sharp lower contact, slickensides in lower 0.10'.		
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 boundries.	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 crossbeds 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 540.10', sharp lower contact on increasing bedding angle.	13.57	542.85
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	0.86	548.34

		streaks, arbitrary lower contact on color change, no fossils seen.		
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, shaley 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 faint and fine, sharp lower contact on lithology.	0.40	656.08
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

COAL	IMP	SAMPLED BY USGS FOR METHANE TESTING. ELK LICK COAL	0.67	660.60
CLST		Dark gray, slickensides, abundant pyrite streaks, very thin coaly streaks at 660.90', becomes shaley 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, shaley, 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, pelecypods, 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 shaley, 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	3.69	780.44

		lithology.		
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 lower contact.	0.58	786.04
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, boney, 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 PORTERSVILLE MARINE ZONE Light gray brown, hard, dense, medium dark gray shaley 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

		shaley 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 shaley 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 lower contact.	0.81	820.01
COAL	IMP	Shaley, pyritic, sharp lower contact. NOT SAMPLED FOR METHANE. 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', shaley 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, non-bedded 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 BRUSH CREEK COAL Bony.	0.40	920.80

		SAMPLED BY USGS FOR METHANE TESTING.		
SH		Dark gray. SAMPLED BY USGS FOR METHANE TESTING.	0.30	921.10
COAL		Sharp lower contact. 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 shaley zones throughout, more competent below 950.30', 1 irregular light gray calcareous mass at 952.40', few light gray, rounded clasts 954.00' - 955.00', gradational lower contact with few clasts from lower unit in boundary area and color change.	9.38	955.96
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,	7.46	969.66

		medium gray green shale and silt bands and streaks, sharp lower contact on grainsize.		
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 grainsize 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', non bedded 1006.00' - 1007.34', low angle planar crossbedding 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 streak. BASE OF MAHONING SANDSTONE	1.49	1032.45
COAL	NP		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 non bedded 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, non bedded, 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', shaley 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,	2.58	1057.43

		locally fine to medium grained streaks with quartz pebbles, angular sharp lower contact.		
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 streaks, few pebbles to 1070.00', sharp lower contact on bedding change.	10.00	1074.50
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	1.35	1105.70

		increasing shale laminations.		
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	SAMPLED BY USGS FOR METHANE TESTING. UPPER KITTANNING COAL	1.70	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 veination, 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 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.	2.20	1134.00
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 lower contact.	2.22	1154.91
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, shaley silty streaks, light gray 1158.80' - 1159.00', very occasional small coaly fragments with small pyrite, angular sharp lower contact on grainsize.	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 crossbeds, 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 crossbeds, very lithic, sharp lower contact on grainsize.	1.27	1166.79
SS		Medium grained, light to medium gray green, scattered small thin coaly fragments, lithic, locally micaceous, becomes very faint to non-bedded 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 grainsize.	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 shaley 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	IMP	TOP MIDDLE KITTANNING COAL SAMPLED BY USGS FOR METHANE TESTING.	1.30	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, sharp lower contact.	0.15	1188.15
COAL	IMP	SAMPLED BY USGS FOR METHANE TESTING. BASE MIDDLE KITTANNING COAL	2.30	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 bioturbations, 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. LOWER KITTANNING COAL	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)	4.86	1223.21

		up to 0.40', abundant plant debris, well preserved plant fossil at 1222.68', sharp lower contact on basal sandstone.		
SH		Medium to dark gray to black, fissile, some soft streaks, coaly plant material, locally concoidal breaks, lycopod stems, calamite stem, slightly silty below 1228.00', sharp lower contact on change in color and composition.	6.20	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 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.	6.36	1249.70
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.	0.70	1271.20
COAL	IMP	TOP LOWER KITTANNING COAL ZONE Bony, pyrite. SAMPLED BY USGS FOR METHANE TESTING.	0.15	1271.35
SH	BLK	SAMPLED BY USGS FOR METHANE TESTING.	0.15	1271.50
COAL		Pyritic. 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, non bedded, 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		SAMPLED BY USGS FOR METHANE TESTING. BASE LOWER KITTANNING COAL ZONE	2.10	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, alluviated 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, non bedded, 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, micaceous, small poorly preserved plant debris, sharp lower contact on grain size.	2.58	1293.77

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	Concoidal 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
COAL	NP	CLARION COAL HORIZON	0.00	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 1/2 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 non bedded at base, micaceous, lithic, silty / shaley wisps, increasing dark gray shaley 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 shaley 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		TOP UPPER MERCER COAL Bony, impure. SAMPLED BY USGS FOR METHANE TESTING.	0.05	1324.45
COAL		SAMPLE BY USGS FOR METHANE TESTING. BASE UPPER MERCER COAL	0.70	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.	1.33	1336.82
CLST	ROOT	Medium gray, rooted, darker gray discontinuous shaley 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 shaley and coaly streaks to base.	2.50	1357.50
COAL		Upper 1/2 of unit is bony, lower 1/2 is clarain, abundant pyrite. SAMPLED BY USGS FOR METHANE TESTING. LOWER MERCER COAL	1.00	1358.50
CLST		Dark gray, very well developed slickensides, sharp	0.15	1358.65

		lower contact.		
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 concentrated on crossbeds, high angle planar, sharp lower contact.	1.07	1402.92
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	6.11	1420.03

		on cross bed surfaces, some lithic fragments, high quartz content, truncated ripple cross laminations, sharp lower contact on grain size and composition.		
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 grainsize 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 grainsize 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 cross laminated, large (up to 0.10' diameter) siderite nodules in base, sharp lower contact. BASE OF 2ND SALT SAND	0.81	1430.66
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 grainsize.	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 / shaley 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 (root?) remnants, darker gray to	3.63	1464.85

		base, sharp lower contact on coal.		
COAL	IMP	TOP QUAKERSTOWN COAL ZONE Very abundant pyrite, sharp, angular lower contact. SAMPLED BY USGS FOR METHANE TESTING.	0.75	1465.60
CLST		Very dark gray, very thin coaly streaks, abundant plant debris, roots ?, angular sharp lower contact.	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 shaley 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
SH	COAL STR	Dark gray. SAMPLED BY USGS FOR METHANE TESTING.	0.20	1475.80
COAL		Dull banded in bottom 0.03'. SAMPLED BY USGS FOR METHANE TESTING. BASE OF QUAKERSTOWN COAL ZONE	0.63	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,	0.73	1482.41

		slickensides, rooted, sharp lower contact on lithology.		
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		PENNSYLVANNIAN - 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	10.36	1521.36

		slickensides, few faint to coarse, calcareous nodules, gradational lower contact on color.		
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, non bedded at base, very gradational lower contact on loss of sandstone.	2.06	1553.56
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' -	21.17	1581.52

		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,		
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 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.	0.76	1594.63
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	9.26	1620.20

		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.		
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 lowr 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 wiht sub mm calcite coats on 2 fractures, 1 poorly preserved pelecepod (?) 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 pelecepod 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 pelecepods, 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 sith 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 amd medium gray green in basal half, sharp lower contact on color and composition. BASE OF LITTLE LIME	1.10	1682.25
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 pelecypds, 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, sparce 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, crynoids 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 (shaley) 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	7.19	1772.40

		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.		
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 SANSTONE 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 shaley 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, faint planar laminations and planar cross laminations, sharp lower contact.	1.48	1826.56

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 grainsize.	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,	4.35	1861.50

		gradational lower contact with bedding change.		
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 streaks, abundant black organic rich streaks, large medium gray shale clasts 1881.42' - 1881.45', sharp lower contact.	1.04	1881.60
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	6.31	1897.85

		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.		
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,	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,	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	3.36	1985.10

		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 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, some minor planar laminated zones, mica rich zone from 1995.75' to 1996.00', gas show, sharp lower contact.	5.52	1998.50
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 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.	1.61	2015.19
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	6.12	2026.02

		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		
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
SS		Fine grained, light gray, gas show, flat planar laminations top to 2034.90', non bedded 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 non bedded at base 2036.54' - 2037.45', slightly silty, light medium gray to gray with flat planar laminations 2037.45' - 2038.65', non bedded 2038.65' - 2038.80', thin shaley medium gray streaks with	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, non-bedded, 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 non bedded, occasional thin mm scale silty / shaley 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', non bedded 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	0.46	2053.57

		and elongate to 0.07' x 1 mm to base, sharp, wavy lower contact on lithology.		
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, non bedded, 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 non bedded 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 pelecypods in lower 0.10' has few very thin shale rip ups less than 1 mm x 5 mm, sharp lower contact on lithology.	3.90	2063.82
SH		Medium gray with silty streaks, light medium gray to gray, micaceous, occasional scattered plant material, sharp, wavy lower contact on lithology.	0.88	2064.70
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	1.51	2069.35

and lithology.

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	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 non-bedded 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 shaley clasts in upper 1/2, 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, non-bedded siltstone bed 2098.77' - 2099.30', increasingly silty to 1205.00', grades to siltstone with shale streaks at base, bioturbated 2105.00' to base, very occasional poorly preserved plant trash (some pyritized).	13.01	2108.01
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, non bedded 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 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 shaley to base, medium dark gray with	21.53	2166.68
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 shaley to base, arbitrary lower contact.	20.86	2194.89
SH	SLTY	Medium gray, flat bedded, silty streaks throughout, light gray, hard, flat planar lamintaion with occasional silty ripple laminatins 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, shaley wisps throughout, sharp lower contact with thin zone on mixing.	1.15	2206.15
SLST	FOSS	Light gray to gray with dark gray shaley 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	2.91	2212.33

		burrows, sharp lower contact on lithology.		
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 shaley 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, shaley 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 gray to gray with white pebbles, base sharp on lithology.	0.10	2285.00
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 laminations, light gray to white pebbles to 0.04' ends at quartz pebble conglomerate at base, gas show, sharp lower contact.	2.78	2307.97
SLST		Green gray with sandy streaks, shaley 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 shaley 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 shaley 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	3.95	2340.55

		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.		
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 2345.19', sharp lower contact on lithology and color. BASE OF GANTZ SANDSTONE	5.24	2345.79
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 grainsize 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 shaley 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 shaley to top and silty to base, very bioturbated at base, sharp lower contact.	5.02	2421.02
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	Shaley 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, non bedded 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 shaley 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	0.52	2469.98

		contact with some burrows extending to the shale unit below.		
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, 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.	4.71	2478.50
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', non-bedded 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 slickensides, finely micaceous, sharp lower contact on color and composition.	2.71	2510.91
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

POINT ID: 309-055

QUAD: MACFARLAN (7.5')

COUNTY: Ritchie

COMMENT: Also identified as 06-RV-10

ST PLANE E: 485043.0 UTME: 46278.51 LATITUDE: 48.67722
ST PLANE N: 4328384.0 UTMN: 5409720.66 LONGITUDE: -87.16485

ELEVATION: 1094.00 TOTAL DEPTH: 1982.00 DATE: 06/07/2006

NOTES: Log of core hole drilled on the Ritchie County Mines Property, Ritchie County, West Virginia. Drilling contractor: L.J. Hughes and Sons, Inc. Driller: Bobby Stewart. Drilling Dates: 5/11/06 to 6/07/06. Geophysical logging: Marshall Miller and Assoc. and Appalachian Geophysical Surveys, 6/07/06. On-site coal bed methane desorption: Dave Uhrin. Core logged by: Gary Daft, Misty Cawthern, and Nick Fedorko. Also on-site: Bill Kohl, geologist, Penn Virginia Oil and Gas Corp. Hole also identified as 06-RV-10.

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		20 feet cased; 2 feet chipped	22.00	22.00
SH	SLTY	Weathered green-brown; slightly silty; sharp lower contact.	1.16	23.16
SS	XBD	Light gray; fine grained; micaceous; weathered yellowish-brownish in top 0.5'; ripple laminated with some planar laminations and low angle planar cross laminated zones; sharp lower contact at grain size change.	7.96	31.12
SS	XBD	Light gray-green; abundant mica; lithic; fine-medium grained; faint planar cross laminations; sharp lower contact at grain size change.	1.93	33.05
SS		Light gray-green; very fine grained; lithic; planar laminations; flat sharp lower contact.	1.05	34.10
SS		Light gray with green tint; lithic; medium-coarse grained in base; fining upward to medium grained; massive bedding in top 1.5 feet; planar laminations to base; flat sharp lower contact.	5.15	39.25
CLST		Light gray-green; thinly bedded; gradual lower contact on color change.	0.10	39.35
MDST	RED	Solid red; soft; clayey- weathered; fine angular blocky structure.	2.65	42.00
NR	CORE LOSS	Core loss in end of run.	0.30	42.30
MDST	RED	Red as above; few olive mottles in base; clear lower contact on color and bedding.	0.90	43.20
SH	CALC INCL	Medium gray-green; subfissile; common fine to coarse light gray and red calcareous nodules; few coarse distinct red mottles; sharp lower contact.	4.25	47.45
SLST	CALC INCL	Light gray-green; slightly sandy; noncalcareous with common light gray fine grained calcareous streaks especially before 49 feet.	4.11	51.56
SS	SLTY	Silty; weathered gray-green with hematite on fractures; sharp lower contact.	0.76	52.32
SH		Medium gray-green; sharp lower contact	0.58	52.90
SS	XBD	Light gray-green; medium grained; lithic; ripple cross laminations and ripple laminations; sharp lower contact.	3.50	56.40

SH	RED	Red; many coarse prominent red and light gray-green mottles; slightly silty; subfissile; clear lower contact on color change.	1.70	58.10
SH	RED	Solid red; subfissile; noncalcareous; occasional slickensides; sharp lower contact.	3.53	61.63
SH	HD	Hard; dull red-gray; slightly silty; sharp lower contact.	3.74	65.37
SLST	SDY	Med gray-green; sandy; massive bedding; clear lower contact on	2.13	67.50
SS	BITRB	Light gray-green; very fine grained; very micaceous; planar laminations with minor bioturbation in top to 69.50'; planar laminations below; clear lower contact at color change.	7.29	74.79
SS	CALC	Light gray weathered brownish; fine grained; abundant micas; lithic; clear lower contact at calcareous.	4.31	79.10
SS	CALC INCL	Light gray with brownish weathering; medium grained; lithic; calcareous streaks; clear lower contact at grain size change.	2.16	81.26
SS	CALC INCL	Light gray; fine grained; silty; light gray calcareous streaks; sharp lower contact.	0.74	82.00
SS	XBD	Light gray weathered brown; very fine grained; micaceous; massive bedding to 85.00 feet; faint ripple cross laminations to base; sharp lower contact at grain size change.	4.63	86.63
SS	XBD	Light gray weathered brown to 89.00 feet; fine grained; lithic; ripple laminations to 90.30'; massive bedding 90.30 to 92.50 feet; mostly planar cross laminations from 92.50 to base. sharp lower contact.	12.47	99.10
SS	CALC	Light gray-green; medium grained; calcareous streaks; micaceous; common light gray-green calcareous clasts in basal 1.3 feet; sharp lower contact.	2.62	101.72
SLST		Medium gray-green.	0.28	102.00
SS		Light green-gray; medium grained; very micaceous; lithic; clay matrix; massive bedding; clasts of light gray-green shale in base; irregular sharp lower contact with soft sediment deformation.	0.60	102.60
SH	RED	Red; clayey; interbedded dull red and med gray-green; broken; subfissile; sharp lower contact.	2.50	105.10
SH	HD	Medium gray-green; subfissile; hard; slightly silty; finely micaceous; sharp lower contact on color change.	2.72	107.82
SH	RED	Interbedded bands of dark red and faint light gray-green; noncalcareous; subfissile; sharp lower contact.	0.60	108.42
CLST	RED	Red; mottled with common coarse really prominent dell red and light gray-green; sharp lower contact at color.	0.81	109.23
CLST	RED	Red; solid; clayey; soft; common coarse slickensides; fine angular blocky structure;	3.30	112.53

		noncalcareous; clear lower contact on color.		
CLST	RED	Red; many fine faint red, dark gray-green and occasional yellow-brown mottles; common coarse slickensides; fine angular blocky structure.	3.72	116.25
NR	CORE LOSS	Core loss.	0.45	116.70
CLST	RED	Red; mottled with many fine to coarse distinct red and medium gray-green mottles to 119.00'; more red with fine dark gray-green mottles and streaks; slightly calcareous to calcareous; clear lower contact on nodules.	3.02	119.72
CLST	RED	Predominantly red with few faint fine dark gray-green mottles; highly calcareous with few coarse faint reddish calcareous nodules; clear lower contact on color.	1.73	121.45
MDST	MOT	Medium gray-green with common faint fine red and olive yellow mottles and streaks; silty; few calcareous zones; clear lower contact on color.	0.40	121.85
SLST	CALC INCL	Light gray-green with few red streaks and bands; finely micaceous; common light gray calcareous streaks; few fine to coarse calcareous nodules; clear lower contact at base of calcareous nodules.	4.44	126.29
SLST	SDY	Light-medium gray-green; sandy; finely micaceous; hard; noncalcareous; sharp lower contact at color.	0.49	126.78
SH	RED	Red; coarse distinct red mottles with medium gray-green mottles; silty; weakly bedded to base; sharp lower contact.	0.84	127.62
SH	CALC INCL	Light gray-green; silty; subfissile; hard; common coarse light gray calcareous nodules in a noncalcareous matrix; clear lower contact on color.	5.38	133.00
SH	RED	Red; mottled with many coarse distinct red and light gray-green mottles; subfissile; finely micaceous; one possible dark gray-black root fragment; slightly calcareous with zone of light gray-green calcareous nodules from 134.2-134.60'; clear lower contact on color and bedding.	2.00	135.00
MDST	RED	Predominantly red with faint dark gray-green mottles and streaks becoming common below 142.00 feet; calcareous throughout with many faint to distinct, fine to coarse calcareous nodules; common slickensides; fine angular blocky structure; silty laminations; sharp lower contact on color.	11.47	146.47
SH	CALC INCL	Mottled with many coarse prominent red and light gray-green mottles; slightly silty in top; subfissile; common fine to coarse prominent light gray calcareous nodules throughout in noncalcareous matrix; sharp lower contact.	2.86	149.33
SH	RED	Nearly solid red; subfissile; few calcareous nodules; sharp lower contact.	2.32	151.65
SS		Light to medium gray-green; fine grained; finely micaceous; lithic; massive bedding; sharp lower contact.	2.75	154.40
SH	CALC INCL	Predominantly red with common, distinct, coarse light gray-green mottles; light gray-green in basal 1.0 feet; many faint to distinct fine to	2.81	157.21

		very coarse light gray and red calcareous nodules; sharp lower contact.		
SLST	SDY	Light gray-green; sandy; finely micaceous; massive bedding; sharp lower contact.	1.11	158.32
SS	CALC	Light gray-green; fine to medium grained; massive bedding; lithic; calcareous throughout; minor shale clasts in base; sharp lower contact.	0.98	159.30
SH	SS STR	Medium Gray-green; irregular calcareous sandstone streaks; occasional calcareous nodules; sharp lower contact.	0.90	160.20
SH	CALC INCL	Banded medium gray-green and red; many distinct fine to coarse calcareous nodules and streaks; no calcareous nodules in basal 0.50'; sharp lower contact.	2.29	162.49
SS	XBD	Light gray-green; ripple laminations; ripple cross laminations; micaceous; lithic; fine to medium grained; sharp lower contact.	2.03	164.52
SH	RED	Interbedded red and medium gray-green; sharp lower contact.	4.38	168.90
SH	MOT	Predominantly medium gray-green with few coarse distinct red mottles; Pecopteris Sp. around 169.00'; Slightly silty in top 0.40'; degrading bedding to base becoming a mudstone; few very thin subvert light gray-green with calcareous streaks; clear lower contact.	3.23	172.13
SH	RED	Predominantly red in top becoming light gray-green at base; subfissile with interbedded zones transitioning to claystone; clear lower contact.	4.78	176.91
CLST	RED	Predominantly red with few to common, faint, fine to medium, dark gray-green mottles and streaks; many slickensides; fine angular blocky structure; occasional calcareous streaks; few more coarse light gray-green mottles to base; clear lower contact.	11.86	188.77
SH		Medium gray-green; silty in top; no fossils seen; sharp lower contact.	8.13	196.90
SS		Light gray-green; fine grained; ripple laminations; 2 minor shale laminations; sharp lower contact.	0.40	197.30
SH		Medium gray; thinly bedded; sharp lower contact.	0.45	197.75
SS	XBD	Light gray-green, gray to base; micaceous; fine to medium grained; lithic; interbedded zones of ripple laminations, low angle ripple cross laminations and low angle planar cross laminations; laminations few zones of massive bedding; medium to coarse grained in base fining upward; mostly massive bedding from 222' to base; sharp lower contact.	37.99	235.74
SH		Medium gray; thinly bedded probably a large clast; low angle sharp lower contact.	0.06	235.80
SS		Light gray; coarse grained; lithic; some mica; low angle sharp lower contact.	2.28	238.08
SS	COAL STR	Light gray; coarse grained; micaceous; lithic; common, distinct, wispy coal streaks and irregular clasts; sharp lower contact.	1.17	239.25

COAL	IMP	Dull; hard; common, fine blobs and streaks of pyrite; probably transported; sharp lower contact.	0.06	239.31
SS		Light gray; very fine grained; ripple laminations; sharp lower contact.	0.20	239.51
SS	COAL STR	Light gray; fine to medium grained; common coal streaks and clasts; common shale pebbles; sharp lower contact.	0.77	240.28
COAL	IMP	Dull; hard; transported; impure.	0.06	240.34
SS	SH CLS	Light gray; lithic; coarse in top; fine to medium grained with depth; some mica; zones of coarse grains and shale pebbles from (242.65- 242.80')	2.67	243.01
MDST	MOT	Predominantly gray with abundant, coarse, faint, black mottles and streaks; clear lower contact.	1.54	244.55
CLST		Dark gray-green; solid; clayey; soft; common, coarse slickensides; fine angular blocky structure; noncalcareous; gradual lower contact.	5.37	249.92
MDST		Medium gray-green; noncalcareous; hard; slightly silty; clear lower contact.	1.15	251.07
CLST		Medium to dark gray-green; soft; common, coarse slickensides; fine angular blocky structure; noncalcareous; gradual lower contact.	1.75	252.82
SH		Dark gray-green; slightly silty; gradually becomes clayey and poorly bedded toward base; noncalcareous; clear lower contact.	4.18	257.00
SH	CALC	Dark gray-green; common coarse calcareous irregular masses throughout; clear lower contact.	3.71	260.71
SH		Dark gray-green; slightly silty; noncalcareous; hard; gradual lower contact.	0.92	261.63
SS	XBD	Medium gray; fining upward; coarse grained at base; lithic; ripple laminations to 265.30'; mostly planar cross laminations; few medium gray-green fine shale clasts starting below 274'; From 281.4' planar laminations; ripple laminations from (292.49-292.91'); very coarse grained from 297' to base with ripple laminations; sharp lower contact.	37.34	298.97
SS		Medium to light gray; coarse grained; lithic; some mica; sharp lower contact.	2.21	301.18
SS	SH CLS	Gray; lithic; fine to medium grained; micaceous; planar laminations and planar cross laminations; (317.40-318.00') sandstone becomes coarse grained; (317.70-318.50') few, fine shale clasts; Starting 320.80' large shale clasts and few, fine shale clasts; starting at 322.36' sandstone becomes coarse grained; common fine shale clasts; sharp lower contact at grain size change.	22.89	324.07
SS	COAL STR	Gray; Fine to medium grained; lithic; micaceous; mostly planar laminations; few ripple laminations; (328.00-328.70') few, fine shale and coal streaks; sharp lower contact at color and grain size change.	6.48	330.55
SS		Medium to dark gray; fine grained; micaceous; lithic; ripple laminations toward top; planar laminations; sharp lower contact at color and	0.63	331.18

		grain size.		
SS	SH CLS	Light gray; fine to medium grained; micaceous; lithic; few, fine shale clasts; few calcareous clasts; few ripple laminations; sharp lower contact at color.	0.63	331.81
SS	CALC	Medium gray; slightly calcareous becoming highly calcareous; fine to medium grained; lithic; micaceous; clear lower contact at grain size.	0.75	332.56
SS	SH CLS	Medium to dark gray; fine grained; abundant, medium to coarse, shale clasts; Clasts becoming coarse at bottom; sharp lower contact at lithology.	1.20	333.76
SH	CALC INCL	Dark gray; silty; few fine calcareous clasts; sharp lower contact.	1.92	335.68
SH	CALC INCL	Dark gray; clayey; abundant highly calcareous bands; gradual lower contact at color change.	4.22	339.90
SH	CALC INCL	Clayey; dark gray; soft red bands becoming larger and more abundant at (341.00-341.50'); Few highly calcareous bands; Highly fissile; from 341.70', shale becomes predominately gray; sharp lower contact.	2.56	342.46
CLST	MOT	Soft; predominantly green-gray; common to many coarse distinct red mottles; clear lower contact.	1.24	343.70
SH	MOT	Medium gray; abundant red bands; poorly bedded.	0.72	344.42
MDST	RED	Predominantly red with few fine faint gray-green mottles; common slickensides; fine angular blocky structures; clear lower contact.	1.67	346.09
CLST	RED	Red; soft; few fine faint gray-green mottles; fine angular blocky structure; clear lower contact.	0.71	346.80
MDST	RED	Predominantly red with common fine faint gray-green mottles; common slickensides; fine angular blocky structure; few fine calcareous clasts.	4.78	351.58
NR	CORE LOSS	Core loss	0.52	352.10
MDST	RED	Predominantly red with few fine faint gray mottles; common slickensides; fine angular blocky structure; clear lower contact	0.84	352.94
SH	CALC INCL	Hard; gray-green; few fine faint calcareous clasts; clear lower contact.	0.47	353.41
CLST	RED	Predominantly red with many medium to coarse distinct gray-green mottles; clear lower contact.	1.85	355.26
SLST	SS INBD	Sandstone interbedded; sandstone is calcareous and very fine grained; lithic with some mica; medium gray-green; siltstone is slightly sandy; medium gray-green; some mica; clear lower contact.	2.00	357.26
SLST	CALC INCL	Medium gray-green; sandy; very fine grained sandstone laminations; zone of calcareous clasts from 358.27-359.5'; clear lower contact at color change.	4.44	361.70
CLST	RED	Red; few fine distinct gray-green mottles; soft; fine angular blocky structure; crumbles.	1.13	362.83

MDST	MOT	Gray-green; few fine faint red mottles; few medium slickensides; fine angular blocky structure; hard; clear lower contact.	0.71	363.54
SLST		Medium gray-green; hard; few mica; clear lower contact.	0.99	364.53
SH	MOT	Silty; predominantly gray-green with few fine faint red mottles; clear lower contact.	0.40	364.93
SS	CALC INCL	Medium gray-green; very fine grained; common fine distinct calcareous clasts; some mica; lithic; clear lower contact.	1.69	366.62
SH	CALC INCL	Medium gray-green; interbedded siltstone; few medium slickensides; few fine calcareous clast; clear lower contact.	5.06	371.68
SS	CALC	Medium gray-green; very fine to fine grained; calcareous; ripple laminations; lithic; micaceous; clear lower contact at end of calcareous zone.	0.90	372.58
SS	CALC INCL	Medium gray-green; very fine grained sandstone; ripple laminations; noncalcareous; lithic, micaceous; few fine calcareous clasts becoming abundant at base; clear lower contact.	4.57	377.15
SS		Medium gray-green; fine to medium grained; lithic; abundant mica; noncalcareous; ripple laminations; clear lower contact.	0.88	378.03
SS	CALC INCL	Medium gray-green; fine grained; lithic; abundant mica; ripple laminations; common fine calcareous clasts; gradual lower contact.	0.41	378.44
SH	MOT	Predominantly gray-green with coarse distinct red bands increasing in abundance towards base; noncalcareous matrix with few fine faint calcareous clasts; clear lower contact at color change.	1.94	380.38
SH	MOT	Medium to dark gray-green; noncalcareous; silty; few mica; few fine faint calcareous clasts; few fine distinct red bands increasing in abundance towards base; gradual lower contact at color change.	1.62	382.00
MDST	RED	Hard with two clay zones from 382.80-383.00'; predominantly red with common fine faint gray-green mottles; noncalcareous; clear lower contact.	1.26	383.26
SH	MOT	Silty; predominantly gray-green with few fine red bands at top; hard; common fine distinct calcareous clasts and streaks; some mica; starting at about 387.50 feet, few fine distinct red bands; clear lower contact.	5.92	389.18
SS	CALC	Very fine grained; lithic; few micas; medium gray-green; faint planar laminations; common fine to medium distinct calcareous zones; clear lower contact.	0.94	390.12
SH	MOT	Predominantly gray-green with common fine distinct red bands throughout; common fine calcareous bands; clear lower contact.	3.97	394.09
MDST	RED	Predominantly red with common medium distinct gray-green mottles, increasing into abundant and coarse from 395.00-396.00'; gradual lower contact with lithology	3.13	397.22

SLST	CALC INCL	Gray-green; increasingly sandy toward base; common fine and coarse distinct calcareous clasts; micaceous.	9.00	406.22
MDST	RED	Predominantly red with common fine faint gray-green mottles; slightly calcareous; common coarse slickensides; fine angular blocky structure; gradually gets harder toward base; sharp lower contact at color change.	9.05	415.27
SLST	CALC INCL	Medium gray-green; micaceous; few fine faint red mottles; common fine to medium calcareous clasts; gradual lower contact with lithology.	2.26	417.53
SH	MOT	Silty; medium gray-green; micaceous; few to common fine red bands; common fine to medium calcareous clasts.	6.32	423.85
SLST	CALC INCL	Medium gray-green; many fine to medium calcareous clasts; hard; some mica; sharp lower contact at lithology.	7.59	431.44
MDST	MOT	Medium gray-green; common coarse distinct red mottles; possible fossils; few to common fine to medium calcareous clasts; common medium to coarse distinct slickensides; possible fracture filling; gradual lower contact at lithology.	0.82	432.26
SH	MOT	Predominantly medium gray-green with many medium to coarse red bands; many fine distinct calcareous clasts; sharp lower contact at color change.	4.46	436.72
SLST	SH STR	Medium gray-green; micaceous; few fine shale bands; few medium to coarse distinct slickensides; few fine distinct sandy zones from 342.80-343.50'; gradual lower contact at lithology.	7.83	444.55
SH	SLTY	Silty; light gray-green; hard; few coarse distinct slickensides; clear lower contact at lithology.	0.49	445.04
SS	SH STR	Very fine to fine grained; medium gray-green; few medium shale clasts at top of unit; lithic; micaceous; planar laminations; some ripple laminations; some planar cross laminations; zones of shale with few medium to coarse slickensides (449.12-449.51') and (450.10-450.30'); Thin shale layer at 451.45'; common coarse distinct shale streaks from 456.60-456.70'; Few coarse distinct shale clasts at 458.45'; sharp lower contact at lithology.	15.17	460.21
SH	SLTY	Silty; light gray-green; Hard; Sharp lower contact at lithology.	0.61	460.82
SS	SH STR	Medium gray-green; very fine to fine grained; micaceous; lithic; abundant coarse distinct shale clasts.	1.50	462.32
SH	COAL STR	Coal streaks; dark gray-green; plant fossils; common coarse slickensides; few fine clay and silty layers throughout; clear lower contact.	5.12	467.44
COAL	IMP	Black; shiny; slightly impure at top; clear lower contact. <u>Uniontown Coal.</u>	0.46	467.90
SH	PYR	Pyrite clasts; medium gray; clay lens about 0.1 feet below upper contact; clear lower contact.	1.40	469.30
SH	CALC INCL	Medium gray; silty; common fine calcareous clasts;	2.57	471.87

		clear lower contact.		
SLST	CALC INCL	Medium gray; few fine faint calcareous clasts; some mica; slightly sandy; clear lower contact.	1.06	472.93
SH	BLK	Silty; medium gray; few fine faint calcareous clasts; few fine faint black clasts; Some mica; increasingly silty towards base; gradual lower contact.	5.26	478.19
SS	CALC INCL	Medium gray; fine to medium grained; abundant mica; lithic; planar and ripple laminations; shale interbedded from 478.83 to 478.94 feet; planar cross laminations from 487.79 to 483.03 feet; common fine calcareous clasts; sharp lower contact.	8.15	486.34
SH	MOT	Dark gray; few fine distinct clay lenses throughout; fine red bands increasing in abundance towards base; few fine calcareous at base; sharp lower contact.	2.79	489.13
CLST	RED	Red; abundant coarse distinct gray-green mottles; soft; noncalcareous; clear lower contact.	0.49	489.62
MDST	RED	Red; abundant coarse distinct gray-green mottles; fine angular blocky structure; hard; noncalcareous; sharp lower contact.	0.23	489.85
CLST	RED	Red; abundant medium distinct mottles; soft; noncalcareous; sharp lower contact.	0.29	490.14
MDST	CALC INCL	Medium gray-green; common medium slickensides; fine angular blocky structure; abundant fine to medium distinct calcareous clasts; clear lower contact at color change.	0.81	490.95
MDST	RED	Red; common fine distinct gray-green mottles; common coarse slickensides; fine angular blocky structure; common fine faint highly calcareous clasts;	4.39	495.34
SH	MOT	Predominantly gray-green with abundant medium distinct red and olive brown mottles; few fine calcareous clasts; sharp lower contact.	0.81	496.15
MDST	MOT	Predominantly gray-green with abundant medium to coarse distinct red mottles; few coarse slickensides; noncalcareous; sharp lower contact.	0.56	496.71
CLST	RED	Red; soft; common fine faint gray-green mottles; noncalcareous; fine angular blocky structure; clear lower contact.	1.33	498.04
MDST	MOT	Predominantly gray-green with abundant coarse distinct red mottles; few medium to coarse slickensides; fine angular blocky structure; noncalcareous; sharp lower contact.	0.64	498.68
CLST	RED	Predominantly red with common fine distinct gray-green mottles; fine angular blocky structure; noncalcareous; sharp lower contact.	0.77	499.45
MDST	MOT	Predominantly gray-green with abundant coarse distinct red mottles; common coarse distinct slickensides; fine angular blocky structure; highly calcareous; clear lower contact.	21.05	520.50
SLST	MDST INBD	Predominantly gray-green with few coarse distinct red mottles in top 0.5 feet; one large mudstone clast at 520.47 feet; noncalcareous.	1.64	522.14

SS	CALC INCL	Very fine grained; medium gray-green; lithic; some mica; few fine faint highly calcareous clasts; clear lower contact.	0.97	523.11
SLST	SDY	Gray-green; slightly sandy; some mica; noncalcareous; clear lower contact at lithology and color;	0.35	523.46
SH		Predominantly gray-green with common coarse distinct mottles; noncalcareous; hard; clear lower contact.	0.37	523.83
SH	RED	Predominantly red with few fine faint mottles at top; becomes very fissile at bottom 0.2 feet; noncalcareous; clear lower contact.	0.45	524.28
SH	HD	Silty; medium gray-green; some mica; noncalcareous; hard; clear lower contact.	0.42	524.70
SLST	SDY	Sandy; medium gray-green; some mica; noncalcareous; clear lower contact.	0.68	525.38
SS	CALC INCL	Medium gray-green; fine grained; lithic; abundant mica; common fine faint highly calcareous clasts; planar laminations; clear lower contact.	0.77	526.15
SH	MOT	Medium gray-green; few fine distinct red mottles (size and abundance increase with depth); common fine distinct highly calcareous clasts; clear lower contact at color change.	3.97	530.12
SH	RED	Red; few fine faint gray-green silty mottles; very few flecks of mica; few fine faint highly calcareous clasts; clear lower contact at color change.	1.11	531.23
SH	MOT	Predominantly gray-green with common coarse distinct red mottles in top 0.4'; mottles decrease in abundance with depth; few fine distinct highly calcareous clasts; two clay bands from 532.79 to 532.84 feet; becomes highly fissile within this interval; clear lower contact with color change.	1.91	533.14
SH	RED	Red; few fine faint gray-green mottles; few fine faint calcareous clasts; clear lower contact	1.36	534.50
CLST	RED	Red; common fine distinct gray-green mottles; fine angular blocky structure; noncalcareous; clear lower contact.	0.40	534.90
SH	RED	Red; few fine faint gray-green mottles; few fine faint calcareous clasts at top; clear lower contact.	2.38	537.28
MDST	RED	Red; few fine faint gray-green mottles; few fine distinct calcareous clasts; common coarse distinct slickensides; fine angular blocky structure; clear lower contact.	3.01	540.29
SH	RED	Silty; gray-green; few fine distinct red mottles; common fine distinct highly calcareous clasts and streaks; clear lower contact.	3.80	544.09
SS	CALC INCL	Very fine grained; medium gray-green; lithic; some mica; common fine distinct highly calcareous clasts and streaks; clear lower contact.	1.43	545.52
SLST	CALC INCL	Sandy; medium gray-green; some mica; common fine faint calcareous clasts and streaks; clear lower contact.	1.65	547.17

MDST	MOT	Predominantly gray-green with common medium distinct red mottles; few medium slickensides; fine angular blocky structure; common fine distinct highly calcareous clasts; gradual lower contact.	2.89	550.06
CLST	RED	Red; few fine faint gray-green and olive mottles; common fine faint highly calcareous clasts; clear lower contact.	1.10	551.16
MDST	RED	Red; few fine distinct gray-green mottles; many fine faint calcareous clasts; clear lower contact.	1.35	552.51
CLST	RED	Red; few fine faint gray-green and olive mottles; calcareous; clear lower contact.	0.32	552.83
MDST	RED	Red; few fine faint gray-green mottles; noncalcareous; fine angular blocky structure; clear lower contact.	0.49	553.32
CLST	RED	Red; few fine faint gray-green mottles; calcareous; fine angular blocky structure; soft; clear lower contact.	1.30	554.62
MDST	RED	Red; few fine faint gray-green mottles; common coarse distinct slickensides; fine angular blocky structure; calcareous; clear lower contact.	0.48	555.10
CLST	RED	Red; common fine distinct gray-green mottles; calcareous; fine angular blocky structure; clear lower contact.	0.40	555.50
MDST	RED	Red; few fine faint gray-green mottles; common coarse distinct slickensides; fine angular blocky structure; calcareous; clear lower contact.	0.22	555.72
CLST	RED	Red; common fine distinct gray-green mottles; calcareous; fine angular blocky structure; clear lower contact.	0.76	556.48
MDST	RED	Red; few fine distinct gray-green mottles; calcareous; common medium to coarse slickensides; fine angular blocky structure; clay interval from 579.30 to 579.84 feet; clear lower contact.	24.67	581.15
SH	RED	Red; hard; few fine distinct gray-green mottles; calcareous.	2.58	583.73
CLST	CARB	Medium gray; slightly shaly; top 0.10 feet is olive-yellow brown color; dark gray to black carbonaceous streaks; noncalcareous; clear lower contact.	1.25	584.98
MDST		Dark gray; few fine distinct pyrite clasts; clear lower contact.	0.24	585.22
CLST	CARB	Medium gray; slightly shaly; soft; dark gray to black carbonaceous streaks increasing in abundance at base; clear lower contact.	1.40	586.62
SH	BLK	Black; flecks of mica; noncalcareous; sharp lower contact.	0.97	587.59
SH		Dark gray; flecks of mica; noncalcareous; few fine faint slickensides; sharp lower contact.	0.71	588.30
CLST	CARB	Dark gray; micaceous; few fine black streaks; slightly shaly; noncalcareous; soft; sharp lower contact.	0.60	588.90

SH	COAL STR	Dark gray; abundant coal streaks; micaceous; noncalcareous; sharp lower contact.	0.93	589.83
SS	COAL STR	Medium gray; abundant coal streaks; fine grained; common fine faint calcareous streaks; sharp lower contact.	0.75	590.58
SH	COAL STR	Black; few coal streaks; flecks of mica; noncalcareous; sharp lower contact. <u>Sewickley Coal Position.</u>	0.78	591.36
SH	SLTY	Dark gray; silty; some mica; noncalcareous; clear lower contact.	2.74	594.10
SH	PYR	Medium dark gray; some mica; slightly silty; few medium to coarse distinct calcareous clasts; few fine faint flecks of pyrite; clear lower contact.	5.30	599.40
SH		Medium to dark gray; subfissile; noncalcareous; clear lower contact.	5.01	604.41
SH	SLTY	Medium gray; some mica; silty; ripple laminations; noncalcareous; clear lower contact.	0.45	604.86
SS		Medium gray; fine to medium grained; lithic; some mica; ripple laminations; noncalcareous; clear lower contact.	1.51	606.37
SS	SH CLS	Medium gray; lithic; some mica; ripple laminations; grain size fining upward; noncalcareous; from 620.00 to 620.10 feet, coarse shale clasts; 621.00 to ER 622, coarse abundant shale clasts; clear lower contact.	15.33	621.70
SH		Medium gray; clayey; few fine distinct black streaks; noncalcareous; clear lower contact.	1.21	622.91
CLST	RED	Brownish red; soft; shaly fragments; noncalcareous; clear lower contact at color change.	0.37	623.28
CLST	MOT	Green-gray; soft; common fine distinct red mottles; noncalcareous; clear lower contact.	0.25	623.53
SH	MOT	Medium gray-green; silty; few coarse distinct slickensides and red mottles near top; common medium distinct calcareous clasts throughout; clear lower contact.	1.74	625.27
SLST	CALC INCL	Medium gray-green; ripple interlaminated fine grained lithic sandstone; abundant mica; common medium distinct highly calcareous clasts; gradual lower contact.	3.58	628.85
SH	CALC INCL	Medium gray-green; silty; some mica; common fine to medium distinct calcareous clasts; clear lower contact.	1.36	630.21
SH	MOT	Gray-green; few medium faint red mottles; few fine faint slickensides; noncalcareous; clear lower contact.	1.47	631.68
CLST	MOT	Gray-green; shaly; fine angular blocky structure; common fine to medium distinct red mottles; slightly calcareous at base; clear lower contact.	0.63	632.31
MDST	MOT	Gray-green; fine to medium distinct red mottles at top and decreasing to few at base; common medium distinct slickensides; fine angular blocky structure; clear lower contact.	1.31	633.62

SH	CALC INCL	Silty; gray-green; many medium to coarse highly calcareous clasts; poorly bedded; clear lower contact.	2.13	635.75
SLST	CALC INCL	Gray-green; mica; sandy; common fine to medium distinct calcareous clasts; gradual lower contact.	3.29	639.04
SH	CALC INCL	Slightly silty; medium gray-green; common fine to medium distinct calcareous clasts; sharp lower contact at color change.	0.86	639.90
SH	RED	Predominantly red with few medium to coarse distinct gray-green mottles and bands; few coarse distinct slickensides; noncalcareous; clear lower contact.	0.39	640.29
CLST	RED	Predominantly red with common fine distinct gray-green mottles; shaly; fine angular blocky structure; soft at top increasing hardness toward base; noncalcareous; clear lower contact.	0.98	641.27
SH	RED	Red; few fine distinct gray-green mottles; few coarse distinct slickensides; poorly bedded; noncalcareous; clear lower contact.	0.51	641.78
SH	MOT	Predominantly gray-green with common medium faint red mottles; poorly bedded; noncalcareous; clear lower contact.	0.74	642.52
SH	CALC INCL	Gray-green; silty; few fine distinct calcareous clasts; clear lower contact.	4.07	646.59
SS		Medium gray-green; very fine to fine grained; Lithic; abundant mica; noncalcareous; ripple laminations to 652.73 feet; planar laminations to around 658.20 feet; then planar and ripple laminations to base; clear lower contact	14.73	661.32
SS	CALC	Gray-green (slightly more green); medium grained; very slightly calcareous; ripple laminations; laminations of finer sandstone; clear lower contact.	1.40	662.72
SS		Light gray-green; lithic; abundant mica; medium to coarse grained; ripple laminations; noncalcareous; clear lower contact.	5.33	668.05
SS	SH CLS	Light gray-green; medium to coarse grained; common fine to medium distinct shale clasts; micaceous; lithic; calcareous matrix; clear lower contact.	2.08	670.13
SS	SH CLS	Light gray-green; medium to coarse grained; few fine distinct shale clasts in top 0.5 feet; lithic; planar and ripple laminations; micaceous; noncalcareous; sharp lower contact.	5.53	675.66
SH		Medium gray; silty; some mica; noncalcareous; clear lower contact.	2.25	677.91
SH	RED	Red; few fine faint gray and olive brown mottles; noncalcareous; clear lower contact.	1.43	679.34
SH	SKS	Medium to dark gray; clayey; few coarse distinct slickensides; noncalcareous; clear lower contact.	0.96	680.30
CLST		Dark gray to black; soft; fine angular blocky structure in top 0.5 feet then fireclay to base; sharp lower contact.	1.59	681.89
SH	MOT	Predominantly gray-green with common medium to	3.09	684.98

		coarse distinct red mottles and bands; some mica; few coarse distinct and irregular highly calcareous clasts; clasts ending around 683.00 feet; clear lower contact.		
SH	RED	Predominantly red with common medium to coarse distinct gray mottles and bands; some mica; one coarse highly calcareous red band from 685.65 to 685.68 feet; noncalcareous; clear lower contact.	1.55	686.53
SH	MOT	Predominantly gray-green with common medium to coarse distinct red mottles and bands; few medium slickensides; noncalcareous; clear lower contact.	1.47	688.00
SH	RED	Predominantly red; common fine to medium distinct gray-green bands and mottles; few mica; noncalcareous; clear lower contact.	4.20	692.20
SH	CALC INCL	Gray-green; micaceous; ripple laminations; few fine distinct calcareous laminations in upper 1.0 feet of unit then noncalcareous; gradual lower contact.	2.41	694.61
SH	CALC INCL	Medium gray-green; silty; some mica; noncalcareous with few fine faint calcareous clasts scattered throughout; from 696.83 to 697.10 feet few medium red shale bands; clear lower contact.	4.49	699.10
SH	RED	Red; few fine faint gray-green and olive/ yellow brown mottles; noncalcareous.	0.72	699.82
CLST	MOT	Gray-green; shaly; fine angular blocky structure; common fine to coarse gray-green and yellow brown mottles; soft; noncalcareous; clear lower contact.	0.56	700.38
SH	RED	Red; common fine distinct gray-green and olive/ yellow brown mottles; few medium to coarse slickensides.	1.82	702.20
CLST	RED	Red; soft; shaly; common fine distinct gray-green and olive yellow brown mottles; noncalcareous; clear lower contact.	0.42	702.62
SH	RED	Red; few fine faint distinct gray-green and olive yellow brown mottles; few fine distinct slickensides; soft clayey shale at bottom 0.2 feet; noncalcareous; sharp lower contact.	1.74	704.36
SH	CALC INCL	Gray-green; silty; some mica; common fine to medium distinct calcareous clasts; gradual lower contact.	1.17	705.53
SS	CALC INCL	Gray-green; very fine grained; lithic; abundant mica; ripple laminations; common fine highly calcareous clasts; clear lower contact.	1.09	706.62
SH	CALC INCL	Gray-green; silty; micaceous; abundant fine distinct highly calcareous clasts; clear lower contact.	3.08	709.70
SH	CALC INCL	Gray-green; silty; micaceous; very few fine faint calcareous clasts; clear lower contact.	2.93	712.63
SH	RED	Red; common fine distinct gray-green and olive yellow brown mottles; noncalcareous; clear lower contact.	0.66	713.29
SH		Gray-green; silty; few mica; noncalcareous; clear lower contact.	0.38	713.67
SH	RED	Red; common fine distinct gray-green and olive	0.39	714.06

		yellow brown mottles; noncalcareous; clear lower contact.		
SH	MOT	Gray-green; silty; few fine faint red mottles at top; few mica; noncalcareous; clear lower contact.	2.22	716.28
SH	RED	Red; common fine distinct gray-green and olive yellow brown mottles; noncalcareous; clear lower contact.	0.41	716.69
SH	MOT	Gray-green; common fine to medium distinct red mottles; few fine faint olive yellow brown mottles at top; noncalcareous; gradual lower contact.	2.12	718.81
SH	MOT	Gray-green; silty; Few fine to medium distinct red and olive yellow brown mottles; highly calcareous; Poorly bedded; few medium to coarse distinct slickensides; from 722.50 to 723.00' red mottles are coarse and abundant; clear lower contact.	4.82	723.63
MDST	RED	Red; common medium to coarse slickensides; few fine faint gray-green mottles; calcareous; clear lower contact.	0.59	724.22
SH	MOT	Gray-green; few medium to coarse slickensides at top 0.5 feet; few fine to medium distinct red mottles in top 1.0 feet; silty; few mica; many fine to medium highly calcareous clasts; clear lower contact. <u>Pittsburgh Coal Position.</u>	4.83	729.05
FTCY	MOT	Common coarse and fine distinct orange-red, red, olive yellow-brown and dark red clasts scattered throughout but increasing in abundance around 736.00 feet; common fine to medium highly calcareous clasts; few fine angular blocky structure and soft in small intervals scattered throughout; Intervals range from 0.1 to 0.2 feet thick; clear lower contact.	10.60	739.65
CLST	MOT	Medium dark gray and olive yellow-brown; common fine distinct olive mottles; few fine faint black mottles; few fine faint red mottles; clear lower contact.	1.26	740.91
MDST	MOT	Medium to dark gray/ olive; common fine distinct red and olive mottles; noncalcareous; gradual lower contact.	2.05	742.96
SH	MOT	Gray-green; silty; few fine faint red mottles at top; noncalcareous; clear lower contact.	5.14	748.10
SH	RED	Red; common fine to medium distinct gray-green mottles and bands; noncalcareous; clear lower contact at olive mottles and clayey texture.	3.22	751.32
SH	RED	Red; common fine gray-green and olive/ yellow brown mottles; clayey; noncalcareous; clear lower contact; extra 0.5 feet in core.	1.45	752.77
SH	RED	Dark red / olive; common fine to medium distinct olive yellow brown and dark gray mottles; noncalcareous; sharp lower contact.	0.98	753.75
CLST	MOT	Predominantly dark gray-green with common fine to medium olive yellow brown and dark red mottles; soft; fine angular blocky structure; noncalcareous; clear lower contact.	1.50	755.25
SH	MOT	Predominantly dark gray-green and olive with many medium to coarse olive yellow brown and red	3.09	758.34

		mottles; few fine olive with red and gray-green mottled clayey soft shale intervals ranging from 0.1 to 0.3 feet thick; noncalcareous except bottom 0.4 feet; clear lower contact.		
CLST	RED	Predominantly red with common fine to medium distinct olive, dark red and dark gray-green mottles; fine angular blocky structure; calcareous; clear lower contact.	0.86	759.20
SH	MOT	Silty; gray-green; few fine to medium distinct red mottles; common fine distinct highly calcareous clasts; siltstone lens lithic and micaceous from 762.05 to 762.12 feet; At 764.94 feet shale becomes interlaminated with silty zone; silty zone common to many fine distinct calcareous clasts; Mottling becomes less pronounced; clear lower contact at color.	7.91	767.11
SH	RED	Red; few fine to medium faint green mottles; few fine faint calcareous clasts; from 768.40 to 769.00 feet pronounced red clayey zone; clear lower contact.	2.76	769.87
SLST	CALC INCL	Light to medium gray-green; few mica; Lithic; few fine distinct calcareous clasts; from 772.58 to 773.14 feet sandstone, fine grained, micaceous, lithic and ripple laminations; at 773.14 feet siltstone becomes noncalcareous; clear lower contact.	5.23	775.10
SH	RED	Red; few fine faint green mottles at top; becomes clayey at bottom; noncalcareous; clear lower contact.	0.55	775.65
SLST	SDY	Light gray-green; sandy; micaceous; lithic; few fine faint slightly calcareous clasts.	2.23	777.88
SH	SLTY	Light gray-green; silty; micaceous; lithic; noncalcareous; gradual lower contact.	3.07	780.95
SLST	SDY	Light gray-green; noncalcareous; sandy laminations; micaceous; lithic; gradual lower contact.	1.69	782.64
SS	CALC INCL	Light gray-green; very fine grained; micaceous; lithic; few medium to coarse distinct calcareous clasts; ripple laminations; clear lower contact.	4.30	786.94
SH		Medium gray-green; silty; micaceous; noncalcareous; clear lower contact.	0.45	787.39
SH	MOT	Medium to dark gray-green; few fine to medium red mottles; noncalcareous; at 787.88 feet 0.1 feet thick light green clay zone; at 788.38 feet claystone zone; light gray-green; few fine faint mottles; fine angular blocky structure; clear lower contact.	1.23	788.62
SH	RED	Red; common fine to medium green mottles; noncalcareous; gradual lower contact.	1.03	789.65
SH	MOT	Light gray-green; common fine to medium red mottles; noncalcareous; clear lower contact.	0.67	790.32
SLST		Light to medium gray-green; micaceous; lithic; noncalcareous; gradual lower contact.	0.93	791.25
SLST	SH STR	Light to medium gray-green; micaceous; lithic; noncalcareous; from 791.25 to 791.75 shale zone; silty; medium gray-green; micaceous; clear lower	0.98	792.23

		contact.		
SS	CALC INCL	Light to medium gray-green; very fine to fine grained; micaceous; lithic; planar laminations; few fine faint calcareous clasts; clear lower contact.	1.75	793.98
SH	MOT	Medium gray-green; slightly silty; few fine faint red mottles; gradual lower contact; becoming more red at base.	1.31	795.29
SH	RED	Red; few fine distinct calcareous clasts; from 795.67 to 795.74 feet, red claystone; noncalcareous; fine angular blocky structure; few fine medium to coarse distinct slickensides; clear lower contact.	1.45	796.74
SH	MOT	Dark gray; silty; few fine faint calcareous clasts; plant and stem fossils; few fine sandy streaks; at 800.43 feet, common medium to coarse red mottles; clear lower contact.	4.85	801.59
SH	RED	Red; noncalcareous; few fine faint green mottles; few fine distinct slickensides; from 804.30 feet to base, green shale with few medium to coarse red mottles; silty at bottom; clear lower contact.	3.22	804.81
SS	SH STR	Medium gray-green; fine to medium grained; lithic; micaceous; shale laminations; noncalcareous; ripple and planar laminations; clear lower contact.	5.71	810.52
SH	MOT	Dark gray-green; slightly silty; few medium to coarse slickensides; common medium to coarse red mottles; noncalcareous; clear lower contact.	2.65	813.17
SH		Dark gray-green; slightly silty; noncalcareous; clear lower contact.	1.69	814.86
SH	RED	Red; subfissile; few fine faint gray mottles; few fine faint calcareous clasts; few fine faint slickensides; clear lower contact.	3.90	818.76
SH	MOT	Dark gray; common fine to medium red mottles; fissile; plant fossils; dark gray to black streaks from 821.15 to 821.40 feet;	2.90	821.66
SH	BLK	Black; silty; hard.	0.44	822.10
SH	BLK	Black; common medium to coarse gray silty lenses.	0.45	822.55
CLST	MOT	Dark gray; abundant fine to medium distinct olive-brown, dark red, and gray-green mottles; few fine to medium distinct calcareous clasts; fine angular blocky structure; clear lower contact.	4.00	826.55
SH	RED	Predominantly red; many medium to coarse gray-green and olive-brown mottles; subfissile; common fine to medium calcareous clasts; clear lower contact.	5.45	832.00
SH	CALC INCL	Medium gray-green; silty; common very fine to fine sandstone streaks; sandstone streaks are calcareous; clear lower contact.	5.76	837.76
SH	RED	Red; few medium to coarse gray-green mottles; noncalcareous; green color becomes more dominant at bottom; gradual lower contact.	0.78	838.54
SH	SS STR	Light to medium gray-green; silty; common very	3.06	841.60

		fine to fine grained sandstone streaks; sandstone streaks calcareous; clear lower contact.		
SH	MOT	Medium gray-green; slightly silty at top; abundant medium to coarse distinct red mottles.	1.50	843.10
SH	RED	Red; few to common fine medium distinct gray-green mottles; sharp lower contact.	1.58	844.68
CLST	RED	Red; few fine distinct gray-green mottles; fine angular blocky structure; inter laminations of shale; gradual lower contact.	4.84	849.52
MDST	MOT	Medium to dark gray-green; first 0.4 feet of section gray-green shale; few fine faint red mottles; few fine to medium olive-brown becoming coarse and more pronounced near bottom; poorly bedded; abundant fine to medium calcareous clasts.	5.64	855.16
MDST	RED	Predominantly red; common fine to medium gray-green mottles; common medium to coarse olive-brown mottles; abundant fine to medium highly calcareous clasts; from 856.75 to 857.25 feet unit becomes claystone; red with common fine gray-green and olive-brown mottles; highly calcareous; clear lower contact.	2.09	857.25
MDST	RED	Reddish gray; common fine to medium distinct gray-green, olive-brown, and gray mottles; noncalcareous; from 862.35 to 864.40 feet common medium to coarse distinct calcareous clasts; clear lower contact.	8.50	865.75
CLST	RED	Red; common fine to medium distinct gray-green and gray mottles; zones of shale toward bottom of unit; few fine faint olive-brown mottles; sharp lower contact.	4.84	870.59
SH	MOT	Light gray-green; silty; few fine faint calcareous clasts; silty zones calcareous; few fine distinct red and olive-brown mottles toward top of unit; mottles become medium to coarse lower in the unit; sharp lower contact.	4.63	875.22
SLST	CALC INCL	Light to medium gray-green; Sandy; very fine to fine grained; lithic; micaceous; few fine faint calcareous clasts; gradual lower contact.	2.61	877.83
SH	MOT	Medium gray-green; common fine to medium distinct red mottles; from 878.40 to 879.00 feet zone of red shale with few fine to medium green mottles; few fine distinct calcareous clasts; clear lower contact.	1.17	879.00
SH	CALC INCL	Light gray-green; silty; lithic; micaceous; few fine faint pyrite crystals; few fine distinct calcareous clasts; sandy lenses; clear lower contact.	2.75	881.75
SH	RED	Red; common fine to medium gray-green and gray mottles; few fine to medium distinct calcareous clasts; from 882.60 to 883.40 feet gray-green mottles become coarse; soft areas throughout unit; gradual lower contact.	10.25	892.00
SH	CALC INCL	Light to medium gray-green; few fine faint red mottles; abundant fine distinct calcareous clasts; sharp lower contact.	2.26	894.26
MDST	RED	Red; many fine to medium distinct gray-green mottles; abundant fine distinct calcareous clasts;	11.84	906.10

		few fine distinct olive-brown mottles; from 901.48 to 901.79 feet, shale zone; red; few fine to medium distinct gray-green mottles.		
SH	RED	Red; common fine to medium distinct gray-green mottles; noncalcareous; subfissile; poorly bedded.	3.82	909.92
MDST	MOT	Dark gray green; abundant fine to coarse distinct red mottles; common fine to medium olive brown mottles; few fine to medium distinct light gray mottles; few coarse distinct slickensides; noncalcareous; at 910 feet becomes predominantly red; common fine to medium gray green mottles; sharp lower contact.	3.08	913.00
MDST	RED	Red; common fine to medium distinct gray green mottles; common fine distinct olive brown mottles; common fine to medium distinct highly calcareous nodules; sharp lower contact.	6.51	919.51
CLST	RED	Red; abundant fine gray-green distinct mottles; common fine distinct olive-brown mottles; common fine distinct highly calcareous nodules; fine angular blocky structure; clear lower contact.	1.55	921.06
SH	RED	Red; abundant fine distinct gray-green mottles; common fine distinct olive-brown mottles; few fine faint slightly calcareous clasts; becomes soft and subfissile at bottom of unit; clear lower contact.	3.09	924.15
MDST	MOT	Medium gray; few fine faint red and black mottles; common coarse distinct slickensides; fine angular blocky structure; noncalcareous; clear lower contact.	0.53	924.68
CLST	RED	Red; top 0.54 feet red mudstone; few fine to medium distinct gray-green mottles; few fine distinct olive-brown mottles; from 926 feet to bottom of unit becomes calcareous and more intense toward bottom; clear lower contact.	2.43	927.11
MDST	RED	Red; common fine distinct gray-green and olive-brown mottles; calcareous; dark gray streak at base of unit.	1.70	928.81
MDST	RED	Red; abundant medium distinct olive-brown mottles; few fine to medium distinct gray-green mottles; at 929 feet unit becomes calcareous; common coarse distinct slickensides; clear lower contact.	3.03	931.84
MDST	RED	Red; few fine faint olive-brown mottles; calcareous; common coarse distinct slickensides; few fine faint gray-green mottles; many medium distinct highly calcareous clasts; becomes more shaly at bottom of unit; clear lower contact at color change.	2.66	934.50
SLST	CALC INCL	Light to medium gray-green; common medium to coarse distinct highly calcareous clasts; micaceous; lithic; clear lower contact.	3.41	937.91
MDST	RED	Red; few fine faint gray-green mottles; noncalcareous; common coarse distinct slickensides; clear lower contact.	1.35	939.26
SH	RED	Red; few fine faint gray-green mottles; common fine to medium distinct highly calcareous clasts; poorly bedded.	6.39	945.65
SH	MOT	Light to medium gray-green; common fine to coarse red mottles; common medium to coarse red bands;	3.73	949.38

		few fine distinct calcareous clasts; clear lower contact.		
SH	RED	Red; common fine to coarse distinct gray-green mottles; common medium to coarse gray-green bands; few fine distinct calcareous clasts; clear lower contact.	4.42	953.80
SH	MOT	Gray; common fine to medium black streaks; common fine distinct olive-brown mottles; noncalcareous.	2.26	956.06
MDST	RED	Red; common fine to medium distinct olive-brown mottles; common fine to medium distinct gray-green mottles; common fine to coarse distinct highly calcareous clasts; common coarse distinct slickensides.	7.38	963.44
MDST	RED	Red; many fine to medium olive-brown mottles; common fine to medium distinct gray-green mottles; common fine to medium distinct highly calcareous	4.84	968.28
		clasts; clear lower contact		
SH	MOT	Medium gray-green; few fine faint distinct mottles in upper 1.5 feet; top 1.5 feet soft with many medium to coarse distinct red mottles; some pyrite crystals.	3.72	972.00
SH	PYR	Light to medium gray-green; silty; some pyrite crystals; micas; from 974.40 to 974.75 feet very fine grained sandy zone; gradual lower contact.	3.23	975.23
SS	CALC INCL	Light gray-green; fine grained; few shale streaks at top of unit; at 975.70 feet a mini fault or soft sediment deformation present; grain size gradually coarsens to medium; lithic; micaceous; common fine faint calcareous clasts; planar, ripple, and planar cross laminations; becomes noncalcareous until last 0.5 feet with few fine faint calcareous clasts starting at 983.00 feet; common fine noncalcareous dark gray rounded pyritic shale clasts to base; starting at 984.00	18.89	994.12
SH	PYR	Dark gray; common fine distinct pyrite clasts; noncalcareous; slightly silty; clear lower contact.	0.63	994.75
MDST	RED	Predominantly red with common medium to coarse distinct gray-green and common fine to medium distinct olive-brown mottles; common medium to coarse distinct highly calcareous clasts; soft clay-rich layer from 1001.43 to 1001.59 feet.	8.06	1002.81
SH	MOT	Silty; medium gray; Few fine to medium distinct dark gray streaks and mottles; few medium to coarse slickensides; noncalcareous; clear lower contact.	1.34	1004.15
SH	RED	Red with common fine to medium distinct gray-green mottles; top 0.8 feet is soft and clayey; few coarse distinct slickensides; noncalcareous; clear lower contact at start of calcareous clasts.	3.80	1007.95
SH	RED	Red with common fine to medium distinct gray-green mottles; common fine to medium distinct calcareous clasts; few fine to medium slickensides; clayey interval from 1010.10 to 1010.25 feet; clear lower contact at color change.	5.38	1013.33
SH	FOSS	Silty; medium gray-green; some mica; few medium to coarse distinct calcareous clasts starting at	16.56	1029.89

about 1018.45 to 1021.00 feet; calcareous clasts contain some fossils- appear to be ostracods; marine fossiliferous zone from 1028.85 to 1029.75 feet with gastropods, brachiopods and crinoid stems; sharp lower contact.

Ames Marine Zone.

SH	MOT	Medium gray with common fine to medium distinct red mottles; clayey in top 0.5 feet; subfissile; common fine to medium slickensides; clayey interval from 1030.87 to 1034.34 feet; noncalcareous; clear lower contact.	1.76	1031.65
SH	COAL STR	Dark gray; clayey in top 0.5 feet; common fine to medium distinct carbonaceous dark gray to black streaks throughout; few fine to medium slickensides ending around 1033.00 feet; slightly silty; noncalcareous; plant fossils; black shale and coal streaks from 1036.00 to 1037.50 feet (Harlem coal); some pyrite; silty zone from 1038.42 to 1038.74; clear lower contact at start of calcareous clasts.	11.07	1042.72
		<u>Harlem Coal Position.</u>		
SH	CALC INCL	Medium gray; silty; some mica; common fine to medium distinct calcareous clasts; few medium to coarse slickensides; few fine faint black streaks; hard; clear lower contact.	6.09	1048.81
SH	MOT	Medium gray; silty; common fine to medium faint red and olive/ yellow-brown mottles; hard; few medium to coarse slickensides; few fine to medium distinct calcareous clasts; highly calcareous matrix; gradual lower contact with color change.	3.19	1052.00
SH	RED	Red; hard; common fine to medium distinct gray-green and olive/ yellow-brown mottles; subfissile; few medium to coarse slickensides; abundant fine to medium distinct highly calcareous clasts; matrix is highly calcareous; sharp lower contact.	7.09	1059.09
CLST	RED	Red; shaly; many fine distinct gray-green and olive-brown mottles; slightly calcareous; poorly bedded; few fine faint slickensides; from 1062.00 to 1062.85 feet mudstone becomes primary lithology; red; common fine distinct gray-green mottles; few coarse distinct slickensides; (From 1066.45 to 1067.10), (From 1067.48 to 1067.60), and (From 1068.15 to 1068.85) mudstone intervals with the same description as the mudstone above; clear lower contact.	11.22	1070.31
MDST	RED	Red; common fine to medium distinct gray-green mottles; common fine distinct olive-brown mottles; calcareous; common fine to medium distinct calcareous clasts; from 1072.69 to 1073.88 feet primary lithology becomes claystone; red; common fine distinct gray-green mottles; few fine distinct olive-brown mottles; from 1074.10 to 1074.63 feet claystone interval with the same description as above; clear lower contact.	5.00	1075.31
MDST	RED	Red; common fine to medium distinct gray-green mottles; common fine distinct olive-brown mottles; common fine to medium distinct highly calcareous clasts; matrix slightly calcareous; common coarse distinct slickensides; clear lower contact	17.05	1092.36
CLST	RED	Dark red; common fine distinct gray-green and olive-brown mottles; common fine faint calcareous	2.99	1095.35

		clasts; soft; fine angular blocky structure; clear lower contact.		
MDST	MOT	Light gray-green; abundant medium to coarse distinct red mottles; common fine to medium distinct olive-brown mottles; common coarse distinct calcareous clasts; few coarse distinct slickensides; clear lower contact.	0.32	1095.67
CLST	MOT	Light gray-green; common fine distinct light gray and olive-brown mottles; few fine faint red mottles; few fine faint calcareous clasts; clear lower contact.	0.87	1096.54
SH	FOSS	Light gray-green; micaceous; lithic; silty; silty zones have common fine distinct calcareous clasts; from 1105.72 to 1106.29 feet fossiliferous zone, ostracods?; gradual lower contact.	12.25	1108.79
SH	MOT	Light gray-green; common medium to coarse distinct red mottles; few fine to medium distinct calcareous clasts; at 1110.00 feet shifts to red shale with common medium to coarse distinct gray-green mottles; gradual lower contact.	2.78	1111.57
SH	FOSS	Medium gray-green; slightly silty; few fine to medium distinct red and olive-brown mottles; marine fossils, gastropods and brachiopods present; sharp lower contact. <u>Portersville Marine Zone.</u>	0.56	1112.13
SH	PYR	Light gray-green; silty; pyrite crystals; few fine faint calcareous clasts; from 1115.10 to 1116.35 feet, calcareous sandy zone; at 1121.35 feet red shale band; clear lower contact.	9.75	1121.88
SH	BLK	Light gray; clayey; noncalcareous; common fine distinct black streaks; few fine red mottles.	0.75	1122.63
MDST	MOT	Light to medium gray-green; abundant fine to medium distinct red mottles; common fine to medium distinct olive-brown mottles; common fine to medium calcareous clasts; common coarse distinct slickensides; clear lower contact.	4.99	1127.62
CLST	RED	Red; common fine distinct gray-green and olive-brown mottles; noncalcareous; clear lower contact.	1.05	1128.67
SH	MOT	Dark gray; clayey; few fine faint black and olive-brown mottles; few medium to coarse slickensides; clear lower contact.	0.48	1129.15
CLST	RED	Red; common fine distinct gray-green mottles; few fine distinct olive-brown mottles; noncalcareous; From 1130.35 to 1130.50 feet shale zone; gray with abundant red fine to medium distinct mottles; noncalcareous; few coarse distinct slickensides; claystone below shale layer has same description as above; clear lower contact.	1.85	1131.00
MDST	RED	Red; common fine to medium gray-green mottles; common fine distinct olive-brown mottles; noncalcareous; few coarse distinct slickensides; gradual lower contact becoming predominantly light gray-green.	2.17	1133.17
MDST	MOT	Light to medium gray-green; weakly bedded; common fine distinct red and olive-brown mottles; noncalcareous; clear lower contact.	3.37	1136.54

CLST	MOT	Light gray-green; few fine distinct red mottles; few fine faint light gray-green mottles; common fine to medium distinct olive-brown mottles; noncalcareous; clear lower contact.	1.28	1137.82
SH	MOT	Light gray-green; common medium to coarse olive-brown mottles; common fine distinct black streaks; noncalcareous; clear lower contact.	0.31	1138.13
SH	CALC INCL	Medium gray-green; few dark gray-green bands; few fine to medium distinct calcareous clasts; silty.	8.67	1146.80
SH	MOT	Dark gray-green; slightly silty; noncalcareous; few fine distinct black mottles; sharp lower contact.	2.51	1149.31
SS	XBD	Medium gray-green; very fine to fine grained; micaceous; lithic; noncalcareous; cross planar laminations; clear lower contact.	0.80	1150.11
SH	SLST INBD	Light gray-green; sandy; micaceous; lithic; noncalcareous; few fine distinct shale clasts; many fine distinct siltstone laminations; clear lower contact.	3.31	1153.42
SS	SH CLS	Light gray-green; fine to medium grained; common fine to medium shale clasts and streaks; many fine faint slightly calcareous streaks; micaceous; Lithic; gradual lower contact.	5.71	1159.13
SH	CALC INCL	Medium gray-green; silty; many fine to medium sandy streaks; micaceous; lithic; many fine distinct calcareous clasts and streaks; clear lower contact.	3.49	1162.62
SS	SH CLS	Medium gray-green; fine to medium grained; lithic; some mica; ripple laminations; noncalcareous; common fine to medium distinct shale clasts from 1165 feet to base; sharp lower contact.	2.66	1165.28
SH	SS STR	Medium gray; silty; some mica; few fine distinct sandstone streaks; noncalcareous; sharp lower contact.	0.31	1165.59
SS	SH STR	Medium gray-green; medium grained; few fine to medium gray shale clasts and streaks; lithic; micaceous; ripple laminations; few fine faint calcareous clasts; Grain size starting to coarsen towards base; black streaks from 1172.71 to 1174.83 feet; sharp lower contact.	10.68	1176.27
SH	SLTY	Medium gray; silty; some mica; noncalcareous; at 1177.16 feet no longer silty with few coarse slickensides; sharp lower contact.	1.33	1177.60
SS	CALC INCL	Medium gray; fine to medium grained; common fine distinct shale clasts and streaks; lithic; some mica; many fine faint calcareous clasts and streaks; sharp lower contact.	1.01	1178.61
SH	SLTY	Medium gray; silty laminations; silty zone from 1179.11 to 1179.37 feet; clear lower contact at color change.	1.14	1179.75
SH	BITRB	Dark gray; worm burrows oriented horizontally with cavities replaced by pyrite and fine sand; noncalcareous; plant debris; few fine sandy laminations and lenses; common fine to medium distinct siderite bands; few burrows oriented vertically; few fine to medium sandy bands from 1190.85 feet to base; sandy bands; calcareous;	12.07	1191.82

		clear lower contact.		
		<u>Pine Creek Marine Zone.</u>		
SH	COAL STR	Dark gray; many medium to coarse siderite clasts and bands; few fine distinct calcareous clasts; slightly coalified plant material; slightly silty; coal streaks starting at 1202.47 feet; clear lower contact.	10.93	1202.75
COAL	BRT BND	Black; bright banded; clear lower contact.	0.52	1203.27
BN	COAL STR	Black; pyrite streaks and clasts; coal streaks; clear lower contact.	0.67	1203.94
SH	CLST INBD	Dark gray; silty; plant debris; noncalcareous; common fine to medium slickensides; few thin (0.1 to 0.2 feet) clayey soft intervals; clear lower contact.	6.71	1210.65
LS	FOSS	Medium to dark gray; silty; marine fossils; calcareous; argillaceous; gradual lower contact.	1.06	1211.71
		<u>Brush Creek Marine Zone.</u>		
SH	CLST INBD	Medium gray; top of unit is silty and gradually becomes clear within first 0.7 feet of the unit; clay-rich; soft clay intervals throughout; plant debris; poorly bedded; many fine to medium slickensides; gradually becomes silty toward base; clear lower contact.	7.87	1219.58
SH	BLK	Dark gray; clayey; common fine to medium distinct black streaks; common medium to coarse slickensides; clear lower contact.	1.72	1221.30
SH	COAL STR	Dark gray; clayey; common medium to coarse coal clasts; noncalcareous; white mineral crystallized in cracks.	0.70	1222.00
COAL	BRT BND	Black; bright banded; clear lower contact.	0.21	1222.21
		<u>Brush Creek Coal.</u>		
SS	COAL STR	Light to medium gray; few fine distinct coal streaks; micaceous; lithic; few fine faint calcareous clasts; clear lower contact.	0.78	1222.99
SH	COAL STR	Dark gray; few fine distinct coal streaks; few fine distinct shale streaks; noncalcareous.	1.00	1223.99
SH	SLTY	Dark gray; silty laminations; clayey; noncalcareous; clear lower contact.	3.87	1227.86
SH	CALC INCL	Light gray; Silty; common fine distinct calcareous clasts; few coarse distinct slickensides.	6.72	1234.58
SH	MOT	Medium gray-green; silty; abundant fine to medium distinct red mottles; few fine distinct olive-brown mottles; occurrence of mottles lessens at bottom of unit; from 1239.14 to 1239.26 feet few fine to medium calcareous clasts; clear lower contact.	6.51	1241.09
SH	MOT	Medium to dark gray-green; abundant medium to coarse distinct red mottles; noncalcareous; poorly bedded; at 1245 red mottles lessen in abundance; gradual lower contact.	5.38	1246.47
MDST	RED	Red; many medium to coarse distinct gray-green mottles; few fine distinct olive-brown mottles; weakly bedded; noncalcareous; sharp lower contact.	3.43	1249.90

SH	MOT	Medium gray-green; silty; micaceous; plant debris; few fine faint red mottles; few coarse distinct slickensides; gradual lower contact.	3.18	1253.08
MDST	MOT	Medium gray-green; abundant medium to coarse distinct red mottles; common fine to medium distinct olive-brown mottles; few fine distinct gray and red clasts; clear lower contact.	1.36	1254.44
SH	FEST INCL	Medium gray-green; silty; abundant very fine distinct siderite nodules; from 1256.10 to 1257.10 feet, shale becomes less silty; common fine faint red mottles and bands; from 1257.10 feet to base, poorly bedded; few coarse distinct slickensides; clear lower contact.	4.30	1258.74
MDST	CALC INCL	Light gray-green; silty; abundant fine to medium distinct highly calcareous clasts; weakly bedded; gradual lower contact.	3.26	1262.00
SS	CALC INCL	Medium gray-green; fine to medium grained; lithic; some mica; common fine to medium shale clasts; many fine to medium distinct calcareous clasts; sharp lower contact.	1.58	1263.58
SS	SH CLS	Medium gray-green; very fine to fine grained; lithic; micaceous; common medium to coarse shale clasts; noncalcareous; clear lower contact.	4.08	1267.66
SH	SLTY	Medium gray-green; silty; silty laminations; noncalcareous; some mica; few fine to medium slickensides; clear lower contact.	2.81	1270.47
SH	FEST INCL	Medium gray-green; silty; siderite bb's; noncalcareous; few fine to medium faint red mottles; clear lower contact.	0.58	1271.05
SH	MOT	Predominantly gray-green with common medium to coarse bright red mottles and bands; silty zones; noncalcareous; sharp lower contact.	1.53	1272.58
SLST	SH STR	Medium gray-green; common medium shale clasts; noncalcareous; clear lower contact.	0.82	1273.40
FTCY	MOT	Gray-green; abundant fine to medium dark red, black, and purple mottles and clasts; clasts are subrounded and subangular; slightly silty matrix.	1.31	1274.71
FTCY	BREC	Light gray-green; abundant fine to medium bright red, black, and gray-green mottles and clasts; lighter overall color; subrounded to subangular clasts; silty matrix; at 1277.59 zones of brecciated clasts; clear lower contact.	2.88	1277.59
SH	BLK	Dark gray to black; organically enriched; irregular shape; sharp lower contact.	0.04	1277.63
SH	SLST INBD	Medium gray-green; silty; silty laminations; noncalcareous; clear lower contact.	3.22	1280.85
SH	MOT	Medium gray-green; silty; silty laminations; few fine to medium faint red and olive-brown mottles; common fine to medium distinct calcareous clasts and streaks; mottles disappear after 1282.00 feet ; calcareous clasts decreases from common to few.	4.10	1284.95
SH	CALC INCL	Medium gray-green; slightly silty; few fine faint calcareous clasts; few fine to medium distinct slickensides.	4.27	1289.22
SH	SLTY	Medium gray-green; silty at top of unit and	3.58	1292.80

becomes slightly silty at bottom of unit.

SH	MOT	Medium gray-green; few fine faint red mottles; few fine distinct slickensides; many medium to coarse highly calcareous clasts.	1.80	1294.60
SH	CALC INCL	Medium gray-green; silty; common fine distinct sandy laminations with common fine distinct calcareous clasts; few plant debris.	4.50	1299.10
SS	CALC INCL	Light gray; fine grained; micaceous; lithic; common fine to medium distinct calcareous clasts; mainly ripple laminations with cross planar laminations from 1301.00 to 1301.20 feet.	3.35	1302.45
SH	SLTY	Light gray; silty; noncalcareous; few micas; clear lower contact.	2.51	1304.96
SH	LS STR	Medium gray; silty laminations; few coarse distinct slickensides; becomes slightly silty toward base; plant debris; few fine to coarse distinct limestone nodules; from 1308.60 to 1309.24 feet, many coarse distinct iron rich limestone nodules; sharp lower contact.	4.60	1309.56
SH	BLK	Black; abundant fine faint calcareous clasts; few fine faint coal streaks; sharp lower contact.	0.07	1309.63
SH	CALC INCL	Medium gray; silty until 1310.40 feet; micaceous; thin soft clay-rich layers; plant debris in clay intervals; from 1311.45 to base, silty laminations; around 1312.70 feet, few fine to medium distinct calcareous clasts; from 1314.09 to base, dark gray bands; clear lower contact.	6.46	1316.09
SH	MOT	Dark gray; clayey; abundant fine distinct black streaks; common fine distinct black mottles; clear lower contact.	0.32	1316.41
SH	MOT	Medium gray; silty; common fine distinct dark gray streaks and mottles; few fine distinct slickensides; micaceous; silty zones throughout; noncalcareous; sharp lower contact.	5.09	1321.50
SS	XBD	Light to medium gray; very fine to fine grained; micaceous; lithic; ripple laminations; noncalcareous.	2.20	1323.70
SS	XBD	Light to medium gray; medium grained; micaceous; lithic; ripple, planar, and cross planar laminations; noncalcareous.	10.37	1334.07
SS	CALC INCL	Light gray; medium grained; lithic; micaceous; ripple laminations; common fine to medium distinct calcareous clasts; top 0.1 feet of unit dark gray with black shale streaks; common fine to coarse distinct shale and possibly fireclay clasts; sharp lower contact.	3.22	1337.29
SH	SDY	Medium gray; silty; common fine distinct dark gray bands and streaks; noncalcareous; very fine grained, ripple laminated sandy zones.	4.71	1342.00
SS	CALC	Medium gray; lithic; micaceous; fine to medium grained ripple laminations to 1343 then planar cross laminations; calcareous; gradual lower contact.	2.30	1344.30
SH	SLTY	Medium gray; silty; very fine lithic sandy zones; some mica; calcareous in top 0.2 feet sandy zone;	1.39	1345.69

		few fine to medium distinct brown bands; sharp lower contact.		
SS	XBD	Medium gray; fine to medium grained; lithic; abundant mica; ripple, planar, and cross planar laminations; noncalcareous; sharp lower contact.	1.85	1347.54
SH	ROOT	Dark gray; silty; pyritic; root traces; noncalcareous; light gray shale bands; sharp lower contact.	1.69	1349.23
SH	BLK	Black; cannel; break slightly conchoidal; very fine grained; noncalcareous; sharp lower contact.	0.34	1349.57
		<u>Top of Lower Freeport Coal.</u>		
COAL	IMP	Impure; sample taken for coal bed methane test; pyrite streaks;	1.92	1351.49
COAL	IMP	Impure; sharp lower contact.	0.13	1351.62
SH		Dark gray; irregular lens; sharp lower contact.	0.02	1351.64
COAL	IMP	Impure; dull; sharp lower contact. <u>Base of Lower Freeport Coal.</u>	0.07	1351.71
SH	BLK	Dark gray to black; irregular sharp wavy contact.	0.15	1351.86
SH	ROOT	Dark gray; silty; root traces ending around 1354.00 feet; few fine to medium slickensides ending after root traces; few pyrite streaks near top; noncalcareous; clear lower contact.	3.14	1355.00
SH	CALC INCL	Dark gray; silty; common fine distinct calcareous clasts and bands; from 1355.85 to 1357.06' common medium to coarse brown noncalcareous clasts; starting around 1357.00' common fine to medium dark gray and black streaks; few brown streaks starting around 1361.00 feet; few fine to medium slickensides; sandy zone from 1362.10 to 1362.50'; several sandy zones with ripple and planar cross laminations; calcareous clasts become more abundant towards base; few distinct black streaks	17.68	1372.68
SS	CALC	Medium gray; fine grained; few fine distinct shale streaks; highly calcareous; sharp lower contact.	0.29	1372.97
SH	CALC	Medium gray; slightly silty; some plant debris; calcareous; sharp lower contact.	1.95	1374.92
SS	CALC	Medium gray; fine grained; lithic; some mica; ripple laminations; calcareous; gradual lower contact.	1.47	1376.39
SH	CALC INCL	Medium gray; silty; many fine faint calcareous clasts and streaks; few very fine sandy zones.	10.01	1386.40
LS	SH STR	Light to medium gray; many fine distinct shale clasts; massive texture at top of unit and becomes nodular at base; gradual lower contact.	2.00	1388.40
LS	SH STR	Dark gray; nodular texture; noncalcareous muddy matrix; clear lower contact.	0.70	1389.10
MDST	MOT	Medium gray; many fine to medium distinct dark and light gray angular clasts; noncalcareous.	1.06	1390.16
SH	BLK	Dark gray to black; coalified plant material; clear lower contact.	0.08	1390.24
SH	ROOT	Medium gray; silty; root traces; noncalcareous; becomes dark gray at base; gradual lower contact.	1.13	1391.37

SH	CARB	Dark gray to black; organically enriched; few coal streaks; silty; clear lower contact.	1.35	1392.72
SH	FEST INCL	Medium to dark gray; silty; plant debris; from 1395.37 to 1395.63 feet, common fine to medium distinct siderite nodules; clear lower contact.	2.91	1395.63
SH	FEST INCL	Light gray-green; slightly silty; few medium distinct siderite nodules at top of unit; noncalcareous; clear lower contact.	1.41	1397.04
MDST	COAL STR	Medium gray-green; common coarse distinct medium to dark gray mottles; many fine to medium distinct siderite nodules; at 1392.88 feet, unit becomes dark gray to black; plant debris; coal streaks; clear lower contact.	0.84	1397.88
SH	SLTY	Light gray-green; silty; noncalcareous.	1.82	1399.70
SS		Light gray-green; very fine grained; ripple and planar laminations; lithic; micaceous; noncalcareous.	2.40	1402.10
SH	FEST INCL	Light gray; silty; few fine to medium distinct siderite nodules; at 1403.00 feet unit becomes medium to dark gray; noncalcareous; gradual lower contact becoming more muddy at base of unit.	1.21	1403.31
MDST	CALC INCL	Light gray-green; slightly silty; common medium to coarse calcareous clasts and streaks; gradual lower contact becoming shaly at bottom of unit.	1.42	1404.73
SH	SDY	Light gray-green; silty; poorly bedded; at 1407.79 feet, sandy zone; ripple laminations; clear lower contact.	3.36	1408.09
SH	FEST INCL	Medium gray-green; silty; common very fine sandy zones; common fine to medium siderite nodules; clear lower contact.	0.71	1408.80
SH	ROOT	Medium to dark gray-green; silty; few fine distinct black streaks; root traces; plan material; sharp lower contact.	7.24	1416.04
SH	SS INBD	Medium gray-green; silty; interlaminated with sandy zones; very fine grained; noncalcareous; cross planar and planar laminations; lithic; micaceous; few fine distinct black streaks; gradual lower contact.	5.13	1421.17
SS	SH STR	Light gray; very fine grained; lithic; micaceous; planar cross and ripple laminations; interlaminated with medium to dark gray silty shale.	0.86	1422.03
SH	SLTY	Dark gray; silty zones; common fine distinct light gray bands and streaks; plant debris.	1.32	1423.35
SS	CALC	Primarily light gray; very fine grained; dark gray shale zone first 0.5 feet; micaceous; lithic; many fine distinct dark gray streaks; cross planar and ripple laminations; soft sediment features; from 1425.00 to 1426.00 feet, calcareous zone; clear lower contact.	5.49	1428.84
SH	PYR	Dark gray; silty; pyrite crystals; sandy zones throughout; very fine grained; micaceous; lithic; planar cross laminations.	10.96	1439.80
SH	COAL STR	Light to medium gray-green; silty; from 1431.04 to	2.35	1442.15

		1431.29 feet, very fine sandy zone; few fine distinct coal streaks in sandy zone; few coarse distinct slickensides; clear lower contact.		
SLST		Medium gray-green; micaceous; lithic; noncalcareous.	0.27	1442.42
SH	FEST INCL	Medium gray; silty; noncalcareous; few medium distinct siderite nodules; interbedded sandstone in units roughly 1 feet thick; very fine grained; planar and ripple laminations; few calcareous zones throughout; micaceous; lithic; gradual lower contact.	4.34	1446.76
SH	FEST INCL	Medium gray; silty; many fine distinct very fine grained sandstone streaks; lithic, micaceous, ripple laminated sandstone streaks; noncalcareous; common fine to medium distinct dark gray bands starting about 1449.00 feet; few fine distinct siderite clasts; gradual lower contact.	3.20	1449.96
SH	COAL STR	Dark gray; common fine distinct sandstone laminations; sandstone very fine grained, lithic, micaceous, ripple laminated, and calcareous; from 1452.42 to 1452.98 feet, few fine faint distinct coal streaks; Starting at 1452.42 feet, plant material and root traces; clear lower contact.	7.85	1457.81
SH	BLK	Black; abundant coarse distinct coal streaks; carbonaceous.	0.51	1458.32
		<u>Top of Middle Kittanning Coal.</u>		
COAL	IMP	Impure; abundant fine shale streaks; dull	0.58	1458.90
SH	COAL STR	Black; common fine distinct coal streaks; carbonaceous; pyrite crystals.	0.66	1459.56
SH	COAL STR	Dark gray; plant debris; few fine distinct coal streaks near base.	0.62	1460.18
BN	COAL STR	Common fine coal streaks; pyrite.	0.15	1460.33
COAL	IMP	Impure; dark gray shale streaks.	0.27	1460.60
COAL	FS	Black; carbonaceous; sooty; oil smell; coal parting; fusain.	0.12	1460.72
COAL	IMP	Impure; dark gray shale streaks.	0.27	1460.99
COAL	FS	Black; carbonaceous; sooty; oil smell; coal parting; fusain.	0.20	1461.19
COAL	BRT	Hard; bright; showed no cleats. <u>Base of Middle Kittanning Coal.</u>	0.46	1461.65
MDST	MOT	Dark gray; common fine to medium light gray mottles; few plant debris; gradual lower contact.	0.42	1462.07
FTCY	MOT	Medium gray; abundant light gray and black subangular fine to medium clasts; few fine root traces and plant debris; few fine to medium black shale streaks; clear lower contact.	1.63	1463.70
MDST	ROOT	Light to medium gray; weakly bedded; root traces and plant debris; common fine black and light gray clasts; clear lower contact.	2.54	1466.24
FTCY		Medium gray; abundant fine to medium subangular and subrounded light gray, dark gray, and black clasts; few coarse black streaks; few root traces at top of unit; clear lower contact.	1.29	1467.53

SH	FEST INCL	Medium gray; silty; few fine to medium dark gray mottles; common fine light gray, dark gray, and black subangular clasts; siderite bb's throughout and concentrated from 1469.42 to 1469.77 feet; gradual lower contact.	2.87	1470.40
FTCY		Medium gray; silty matrix; abundant fine to medium light gray, dark gray, and black subangular to subrounded clasts; few black streaks; few plant debris; clear lower contact.	1.48	1471.88
CLST	MOT	Light to medium gray; soft; common fine distinct light gray mottles; few fine faint black and dark gray mottles; fine angular blocky structure; noncalcareous; sharp lower contact.	1.75	1473.63
FTCY	BREC	Brecciated; matrix is medium gray and silty; clasts are light gray, coarse, abundant, subangular to angular; root traces; common fine light gray and dark gray subrounded clasts at base; gradual lower contact.	2.35	1475.98
SH	FEST INCL	Medium gray; silty; few zones of common fine subangular to subrounded light gray and dark gray clasts; common black streaks near top; abundant siderite bb's, but start to disappear at 1478.00 feet; clear lower contact.	3.63	1479.61
SH	FEST INCL	Medium gray; silty; few fine distinct dark gray bands; common siderite bb's; noncalcareous; few small zones with light gray and dark gray fine clasts scattered throughout; root traces; frequency of dark bands increases towards base; gradual lower contact.	5.45	1485.06
SH	FEST INCL	Dark gray; plant debris; abundant siderite bb's from 1486.50 to 1486.90 feet; few medium to coarse black streaks; soft clay-rich interval-dark gray, mainly black streaks from 1487.80 to 1488.28 feet; slightly silty towards base; root traces; clear lower contact.	4.93	1489.99
SS	FEST INCL	Light to medium gray; very fine grained; lithic; micaceous; few fine siderite nodules; clear lower contact.	0.99	1490.98
SH	SLTY	Medium gray; silty laminations; common fine dark gray bands; few plant debris; few fine to medium slickensides; clear lower contact.	3.62	1494.60
SH	ROOT	Medium gray-brown; silty; plant debris; few siderite bb's; few sandy lenses towards base; root traces; gradual lower contact.	2.16	1496.76
SS	SH STR	Light gray-brown; very fine to fine grained; lithic; micaceous; few fine black streaks; few fine shale streaks; planar laminations starting at 1502.00 feet; fining upward sequence sandstone becomes fine to medium grained below 1502.00 feet; from 1519.35 to 1520.10 feet, common medium distinct brown streaks; noncalcareous; fining upward sequence continues, sandstone becomes medium to coarse grained; Planar cross laminations starting at 1523.00 feet; Ripple laminations	44.70	1541.46
SH	BLK	Dark gray to black; carbonaceous; plant debris; few medium distinct medium gray bands; clear lower contact.	0.34	1541.80
SH	SS STR	Medium gray; silty; common fine to medium distinct	0.30	1542.10

		very fine grained sandstone lenses.		
SS	SH STR	Light gray; very fine to fine grained; lithic; few micas; many medium to coarse distinct medium gray shale clasts; two large shale bands at base; sharp lower contact.	1.06	1543.16
SS	COAL STR	Light gray; fine to medium grained; lithic; some micas; ripple and planar cross laminations starting at 1547.00 feet; few to common fine distinct coal streaks increasing in frequency towards base; interval of dark gray fine grained sandstone from 1550.72 to 1550.88 feet; hint of oil odor; few fine black shale streaks at base; clear lower contact.	15.42	1558.58
SH	COAL STR	Black; silty; coalified plant debris; common fine to medium coal streaks; few coarse slickensides; clear lower contact.	1.22	1559.80
SS	COAL STR	Dark gray; very fine grained; abundant fine to medium dark gray to black shale streaks; common fine to medium distinct coal streaks; dark gray shale streaks and coal streaks increasing in abundance at bottom of unit; clear lower contact.	3.20	1563.00
SS	COAL STR	Medium gray; very fine to fine grained; Lithic; micaceous; many fine distinct coal streaks; many fine distinct dark gray shale streaks; sharp lower contact.	1.71	1564.71
SH	FEST INCL	Medium to dark gray; silty; micaceous; abundant medium to coarse distinct very fine grained sandstone lenses; few fine distinct siderite bands; clear lower contact.	1.97	1566.68
SH	COAL STR	Medium gray; silty; few fine to medium siderite bands; becomes dark gray shale at 1568.70 feet; at 1570.50 feet, begin to have few coalified plant debris; few fine distinct coal streaks and pyrite at bottom of unit; sharp lower contact.	5.26	1571.94
		<u>Top of Stockton A Coal.</u>		
COAL	BRT	Bright; included in samples.	0.03	1571.97
SH	COAL STR	Black; carbonaceous; coal streaks.	0.08	1572.05
COAL	PYR	Pyrite lenses; coal bed methane present.	0.03	1572.08
COAL	BRT	Bright; little cleat fractures; coal bed methane present; included in sample.	0.41	1572.49
SH	CARB	Black; carbonaceous.	0.24	1572.73
COAL	BN STR	Bone streaks; included in sample.	0.13	1572.86
COAL	BRT	Bright; cleated; coal bed methane present; included in sample.	0.51	1573.37
		<u>Base of Stockton A Coal.</u>		
SH	COAL STR	Black; carbonaceous; few fine distinct coal streaks; sharp lower contact.	0.56	1573.93
SH	ROOT	Medium gray; silty; few fine to medium slickensides; root traces; plant debris.	2.43	1576.36
CLST	CARB	Dark gray to black; soft; Shaly; fine angular blocky structures; sharp lower contact.	0.49	1576.85

SH	CARB	Dark gray to black; carbonaceous; sharp lower contact.	0.43	1577.28
COAL	BRT	Bright; little cleat fractures; coal bed methane present; included in sample. <u>Stockton Coal.</u>	0.88	1578.16
SH	SS STR	Dark gray; silty; plant debris; common fine distinct very fine grained sandstone lenses and streaks.	1.59	1579.75
SS	COAL STR	Medium gray; very fine to fine grained; lithic; micaceous; few fine distinct coal streaks; abundant fine to medium distinct dark gray and black shale bands and lenses; ripple laminations; soft sediment deformation; shale bands and lenses increase at base; gradual lower contact.	5.17	1584.92
SH	PYR	Dark gray to black; Slightly silty; few fine distinct pyrite streaks; plant debris; few fine distinct very fine to fine grained sandstone lenses and streaks at top of unit; clear lower contact.	2.62	1587.54
COAL	BRT	Bright; little coal bed methane show; taken for sample; (in canister with coal below, broken to fit along side).	0.33	1587.87
SH	BLK	Dark gray to black; few coarse distinct slickensides; plant debris.	0.80	1588.67
COAL	BRT	<u>Top of Coalburg Coal.</u> Bright; cleated; coal bed methane show; taken for sample. <u>Base of Coalburg Coal.</u>	1.84	1590.51
SLST	ROOT	Medium gray; abundant root traces; micaceous; lithic.	3.01	1593.52
SLST	SDY	Medium gray; common fine distinct dark gray bands; plant debris; from 1595.03 to 1597.40 feet, abundant medium to coarse distinct very fine grained sandstone lenses; sandstone has ripple and planar laminations; Few fine distinct very fine sandstone lenses below 1597.40 feet; clear lower contact.	6.01	1599.53
SH	SLTY	Medium gray; silty; clear lower contact.	1.28	1600.81
SH	BLK	Black; plant debris.	0.12	1600.93
MDST	ROOT	Brownish-gray; Silty; few fine distinct root traces; plant debris; few fine to coarse distinct slickensides; Clear lower contact.	1.32	1602.25
SS	CALC	Light to medium gray; micaceous; lithic; common fine distinct clean sandstone lenses with calcareous cement; very fine to fine grained; root traces; plant debris; planar cross laminations; clear lower contact.	1.45	1603.70
SS	CALC INCL	Light to medium gray; very fine to fine grained; abundant micas; lithic; few fine distinct clean sandstone with calcareous sandstone lenses; clear lower contact.	0.37	1604.07
SH	SS STR	Light to medium gray; silty laminations; common fine distinct sandstone lenses; micaceous; clear lower contact.	3.88	1607.95
SH	FEST INCL	Dark gray; slightly silty; few fine to medium	6.38	1614.33

		distinct siderite nodules; few fine distinct slickensides; silty laminations starting at 1613.00; few fine distinct black shale streaks at bottom of unit.		
COAL	BRT BND	Common bright banded; impure; bone streaks; pyrite streaks; clear lower contact.	0.63	1614.96
MDST	COAL STR	Dark gray; common fine distinct coal streaks; few coarse distinct slickensides; clear lower contact.	0.34	1615.30
MDST	ROOT	Medium gray; silty; root traces; plant debris; common coarse distinct slickensides; clear lower contact.	3.51	1618.81
SLST	ROOT	Medium gray; root traces; common fine distinct sandstone lenses; clear lower contact.	0.47	1619.28
SS	SLST INBD	Light to medium gray; very fine grained; lithic; micaceous; siltstone laminations; ripple laminations; clear lower contact.	0.35	1619.63
SS	SH STR	Light to medium gray; very fine grained; micaceous; lithic; abundant fine distinct dark gray and black shale streaks.	1.04	1620.67
SS	COAL STR	Light to medium gray; very fine grained; micaceous; lithic; many fine distinct coal streaks; common fine distinct medium to dark gray shale streaks; sharp lower contact.	1.00	1621.67
SS	COAL STR	Brownish gray; very fine to fine grained; micaceous; lithic; oil smell; oil present; common fine distinct dark gray shale and coal streaks; clear lower contact.	3.02	1624.69
SS	SH STR	Light gray; very fine grained; many fine to medium distinct dark gray shale streaks; micaceous; lithic; ripple laminations; clear lower contact.	0.53	1625.22
SH	SDY	Silty; medium gray; coalified plant debris; common fine sandstone lenses; sandy zone from 1628 to 1629 and from 1634.50 to 1635.30; micaceous; clear lower contact.	13.58	1638.80
SH	FEST INCL	Slightly silty; medium to dark gray; common fine to medium distinct siderite bands; clear lower contact.	7.98	1646.78
SH	BLK	Black; silty; plant debris; few fine distinct coal streaks; few fine distinct slickensides; clear lower contact.	0.99	1647.77
COAL	IMP	Impure; bright bands; few fine distinct pyrite streaks; clear lower contact.	0.26	1648.03
SH	ROOT	Medium to dark gray; slightly silty; plant debris; root traces; few fine black streaks at bottom of unit; few fine distinct dark gray soft clay intervals; sharp lower contact.	2.06	1650.09
COAL	BRT	Bright; cleated; coal bed methane present; sample taken.	1.11	1651.20
SH	ROOT	Medium to dark gray; silty; root traces; plant debris; few micas.	2.98	1654.18
CLST	SOFT	Medium to dark gray; fine angular blocky structure; soft.	0.17	1654.35
COAL	PYR	Bright; cleated; thin pyrite streaks; coal bed	0.91	1655.26

methane present; sample taken.

Winifrede Coal.

SH	BLK	Dark gray to black; silty; coalified plant debris; few fine distinct black streaks; clear lower contact.	0.46	1655.72
SH	ROOT	Brownish-gray; silty; root traces; few fine distinct slickensides; clear lower contact.	3.71	1659.43
SH	BITRB	Dark gray; silty; root traces; common fine distinct siltstone laminations; few medium to coarse distinct siderite nodules; from 1660.56 to 1660.77 unit becomes brownish-gray with root traces; common burrows oriented horizontally; bioturbated sand lenses near bottom; clear lower contact at color change.	6.32	1665.75
SH	BLK	Very dark gray to black; slightly silty; micaceous; clear lower contact at color change.	0.32	1666.07
SH	ROOT	Dark gray; black streaks at top of unit; rooted; coalified plant debris; silty; sharp lower contact.	1.13	1667.20
COAL	IMP	Impure; dull with few shiny areas; hard; sharp lower contact.	0.20	1667.40
MDST	ROOT	Dark gray; root traces; few fine distinct black streaks at base; common coarse slickensides; sharp lower contact.	0.39	1667.79
COAL	BRT BND	Bright banded; pyrite streaks; few bone streaks; coal bed methane present; cleated; sharp lower contact.	0.66	1668.45
SLST	ROOT	Rooted; medium gray with hint of brown; micaceous; plant debris; few fine to medium black streaks; clear lower contact.	2.94	1671.39
SH	SLTY	Silty; medium gray; many fine dark gray siltstone laminations; few medium distinct silt clasts at top; common fine to medium carbonaceous shale laminations; coalified plant debris; clear lower contact.	3.25	1674.64
SH	CALC	Silty; medium gray; many fine dark gray siltstone and shale laminations; ripple laminations; calcareous; plant debris; coalified plant debris; clear lower contact.	0.91	1675.55
SH	FEST INCL	Silty; medium gray; many dark gray fine siltstone and shale laminations; few fine to medium siderite clasts; rooted; coalified plant debris; clear lower contact.	1.83	1677.38
SLST	CALC	Medium gray; calcareous; many fine dark gray shale clasts and laminations; root traces; coalified plant debris; clear lower contact.	0.56	1677.94
SH	FEST INCL	Medium gray; slightly silty; common fine to medium silty laminations; few fine to medium siderite bands and clasts; coalified plant debris; few fine shale clasts; clear lower contact with color change.	10.67	1688.61
SH	FOSS	Winifrede Shale; black; few marine fossils scattered throughout (lingula); noncalcareous; sharp lower contact. <u>Winifrede Shale Marine Zone.</u>	2.84	1691.45

SH	PYR	Medium gray; common fine distinct siltstone laminations; plant debris; pyrite; common fine to medium siderite bands; noncalcareous; clear lower contact.	3.99	1695.44
SH	FEST INCL	Dark gray with common fine to medium, medium gray shale bands; few fine to medium siderite bands; plant debris; fissile; clear lower contact.	0.46	1695.90
SH	CARB	Dark gray to black; carbonaceous; plant debris; pyrite streaks; clear lower contact.	0.68	1696.58
BN	COAL STR	Black; coal streaks; pyrite streaks; plant fossils; clear lower contact.	0.40	1696.98
SH	COAL STR	Black; common fine distinct coal and pyrite streaks; plant debris; clear lower contact. <u>Cedar Grove Coal Position.</u>	0.56	1697.54
MDST	ROOT	Brownish gray; silty; rooted; plant debris; few fine to medium slickensides; weakly bedded; clear lower contact.	2.86	1700.40
SS	ROOT	Medium gray; very fine grained; micaceous; lithic; few root traces at top of unit; ripple laminations; common fine distinct dark gray silty laminations; clear lower contact.	0.43	1700.83
SLST	ROOT	Dark gray; root traces; plant debris; some micas; few fine faint black shale streaks; clear lower contact	0.50	1701.33
SS	ROOT	Medium gray; very fine grained; lithic; micaceous; rooted; ripple laminations; common fine distinct silty laminations; clear lower contact.	0.82	1702.15
SLST	ROOT	Dark gray; rooted; plant debris; some mica; few fine faint dark gray and black shale streaks; clear lower contact.	0.43	1702.58
FTCY		Brownish-gray; rooted; few fine slickensides; siderite bb's; pyrite; clear lower contact.	1.13	1703.71
SH	ROOT	Silty; medium gray; top 0.2 feet very silty with roots and siderite bb's' plant debris; color gradually darkens towards base; clear lower contact.	0.42	1704.13
MDST		Silty; dark gray; coalified plant material at top; few fine slickensides; plant debris; clear lower contact.	0.71	1704.84
SH	BLK	Black; silty; rooted; plant debris with some coalified plant debris; clear lower contact.	2.06	1706.90
SH	BLK	Black; common medium to coarse distinct siderite clasts; plant debris; coalified plant debris; few fine slickensides; clear lower contact.	0.58	1707.48
SH	ROOT	Brownish gray; silty; rooted; poorly bedded; few medium to coarse siderite clasts; clear lower contact.	0.78	1708.26
CLST	ROOT	Brownish gray; hard; rooted; few fine slickensides; dark shale band at top; few soft intervals from 1709 to 1710; common medium to coarse black mottles; siderite bb's starting around 1711.50; gradual lower contact.	4.31	1712.57
SH	ROOT	Medium gray; plant debris; root traces; plant fossils; silty; clear lower contact.	2.43	1715.00

SH	ROOT	Medium gray to gray-brown; plant debris; roots; common medium to coarse siderite bands and clasts; clear lower contact at start of fossils.	2.25	1717.25
SH	FOSS	Dark gray to black; lingula fossils; common medium to coarse siderite bands to 1718.63; clear lower contact. <u>Dingess Shale Marine Zone.</u>	3.94	1721.19
SLST	BITRB	Medium to dark gray; rooted; pyrite; burrows oriented horizontally; common fine to medium siderite clasts.	5.11	1722.30
SH	ROOT	Dark gray; light gray shale band for 0.42 feet at top of unit; root traces; few fine to medium distinct siderite bands and clasts; plant debris; common fine distinct black streaks; gradual lower contact to black shale.	3.14	1729.44
SH	BLK	Black; few micas; few fine faint plant debris; few coarse distinct slickensides; common fine to medium distinct siderite bands.	6.10	1735.54
SH	BITRB	Brownish gray; many fine distinct silty laminations; plant debris; horizontally oriented burrows; clear lower contact.	3.21	1738.75
SH	CALC	Medium gray; silty; hard; slightly calcareous matrix; few micas; clear lower contact.	0.49	1739.24
SH	BITRB	Black; silty; horizontally oriented burrows; few micas; few coarse distinct siderite clasts; many fine distinct silty laminations; siderite clasts disappear after 1743; clear lower contact.	4.98	1744.22
SH	BLK	Dark gray to black; slightly silty; few micas; hard; clear lower contact.	8.78	1753.00
SS	BITRB	Medium brownish-gray; very fine grained; abundant fine distinct silty shale laminations; coalified plant debris; very fine pyrite; horizontally oriented burrows; sharp lower contact.	3.46	1756.46
SH	COAL STR	Black; coalified plant debris; root traces; few fine distinct coal streaks; coal streaks have coal bed methane present; common fine to medium gray shale bands; pyrite; few coarse distinct siderite clasts; from 1758.50 to 1758.75 bright coal band; clear lower contact.	2.29	1758.75
CLST	SOFT	Dark gray; soft; fine angular blocky structure.	0.48	1759.23
SH	COAL STR	Medium gray; silty; common fine distinct black shale streaks; few fine distinct coal streaks; root traces; coalified plant debris; pyrite; gradual lower contact.	2.18	1761.41
SH	ROOT	Medium gray; silty; root traces; few fine distinct very fine sandy lenses; plant debris.	2.72	1764.13
SH	ROOT	Medium gray; silty; root traces; few fine distinct slickensides; plant debris; at 1766 shale becomes poorly bedded; few medium distinct siderite clasts; few coarse distinct dark gray shale clasts; clear lower contact.	4.93	1769.06
SS		Medium gray; very fine grained; lithic; micaceous; gradual lower contact.	0.48	1769.54
SH	SLTY	Medium gray; silty; many fine to coarse distinct	6.48	1776.02

		siltstone laminations; coalified plant debris; noncoalified plant debris; few fine distinct sandstone lenses beginning at 1775.60; gradual lower contact.		
SH	FEST INCL	Medium to dark gray; silty; common coarse distinct very fine grained ripple laminated sandstone interbeds; plant debris; soft sediment deformation; few medium to coarse distinct siderite clasts starting at 1779.30; clear lower contact.	10.13	1786.15
SH	BITRB	Medium to dark gray; silty; common coarse distinct very fine grained ripple laminated sandstone interbeds; horizontally oriented burrows; few fine to medium distinct siderite clasts; plant debris; coalified plant debris; sharp lower contact.	7.34	1793.49
SS	SH STR	Light gray; fine to medium grained; lithic; micaceous; ripple and planar cross laminations; few fine distinct black streaks; common fine distinct medium gray shale streaks; plant debris; gas present; common fine distinct stylolites; clear lower contact	11.39	1804.88
SS	COAL STR	Light to medium gray with slight brown tint; medium grained; micaceous; lithic; common fine distinct stylolites; gas present; few medium to coarse distinct gray shale clasts and few fine distinct coal streaks from 1809.62 to 1811.05; from 1816.95 to bottom of unit, few fine distinct coal streaks; coalified plant debris; sharp lower contact.	13.21	1818.09
SS	CALC	Light to medium gray with slight brown tint; medium grained; sandstone cleaner than above; calcareous matrix; sharp lower contact.	0.92	1819.01
COAL	BRT BND	Bright; banded; pyrite.	0.03	1819.04
SS	COAL STR	Light to medium gray; medium to coarse grained; lithic; micaceous; few fine to medium distinct shale clasts; few fine distinct coal streaks; few fine distinct stylolites; calcareous; sandstone becoming cleaner; gas present.	2.84	1821.88
SS	SH CLS	Medium gray; micaceous; lithic; few fine distinct gray shale streaks and clasts.	0.12	1822.00
SS	COAL STR	Medium gray; medium grained; lithic; micaceous; from 1822.66 to 1822.93 feet few fine distinct black shale streaks; few fine to medium distinct gray shale streaks and clasts; few fine to medium distinct siderite clasts; ripple and planar cross laminations; few fine distinct coal streaks; clear lower contact.	5.52	1827.52
SH	SDY	Dark gray; silty; common fine to coarse distinct very fine grained sandy zones; sandy zones have ripple and planar cross laminations; sharp lower contact.	1.35	1828.87
SS	XBD	Light to medium gray; fine to medium grained; lithic; ripple and planar cross laminations; sharp lower contact.	1.82	1830.69
SH	SDY	Dark gray; silty; common fine to medium distinct fine grained sandy zones; sandy zones have planar cross laminations.	0.28	1830.97
SS	XBD	Light to medium gray; medium grained; lithic;	3.11	1834.08

		planar cross laminations; clear lower contact.		
SS	CALC	Light to medium gray; medium grained; planar cross laminations to 1834.50; planar and ripple laminations; calcareous; lithic; clear lower contact.	2.29	1836.37
SS	COAL STR	Light to medium gray; lithic; micaceous; ripple and planar cross laminations; few fine distinct coal streaks starting at 1843.90; few fine to medium distinct medium gray clasts starting at 1844.17; clear lower contact.	8.49	1844.86
SS	COAL STR	Light gray; very fine grained; lithic; micaceous; abundant fine to coarse coal bands; sharp lower contact.	0.26	1845.12
SS	COAL STR	Light to medium gray; medium grained; lithic; micaceous; few fine distinct stylolites starting at 1846.50; few fine distinct coal streaks; few fine to medium distinct siderite nodules; planar cross laminations starting at 1851.25; clear lower contact.	7.67	1852.79
SS	COAL STR	medium gray; medium grained; lithic; micaceous; common very fine distinct coal streaks.	2.02	1854.81
SS	CALC	Light to medium gray; lithic; micaceous; planar cross laminations; slightly calcareous matrix; few fine distinct coal streaks; few fine distinct organic clasts; sharp lower contact.	1.29	1856.10
SS	COAL STR	Medium to dark gray; fine to medium grained; lithic; micaceous; few fine distinct coal streaks; from 1856.55 to 1856.62 bands of coarse grained sandstone; planar laminations; clear lower contact.	0.66	1856.76
SS	COAL STR	Light to medium gray; medium grained; lithic; micaceous; common fine distinct coal streaks; massive bedding; sharp lower contact.	3.33	1860.09
SS	COAL STR	Medium gray; very fine grained; many fine distinct coal streaks; pyrite; sharp lower contact.	0.03	1860.12
SLST	COAL STR	Medium to dark gray; common fine distinct very fine grained sandy lenses; few fine distinct coal streaks at top of unit; clear lower contact.	0.36	1860.48
SS	COAL STR	Light to medium gray; fine to medium grained; few fine distinct gray shale clasts and streaks; few fine distinct coal streaks; ripple and planar cross laminations; from 1865.20 to 1865.28 coarse sandy zone; clear lower contact.	6.67	1867.15
SS	COAL STR	Light to medium gray; lithic; micaceous; few medium to coarse siderite nodules; few fine dark gray shale clasts; few faint planar cross laminations; few fine distinct coal streaks at bottom of unit; clear lower contact.	1.32	1868.47
SS	COAL STR	Light to medium gray; very fine to fine grained; few micas; abundant fine to medium coal streaks; clear lower contact.	0.24	1868.71
SS	COAL STR	Light to medium gray; medium grained; lithic; micaceous; few fine to coarse distinct coal streaks; ripple and planar cross laminations; few coarse distinct siderite nodules; gradual lower contact.	5.94	1874.65

SH	COAL STR	Medium to dark gray; very silty; hard; common fine distinct very fine grained sandstone laminations; few fine distinct coal streaks; sharp lower contact.	0.34	1874.99
SS	COAL CLS	Light to medium gray; medium to coarse grained; few fine to medium distinct coal streaks; common fine to medium distinct gray shale clasts; common medium distinct siderite nodules; Channel lag; few very coarse distinct coal clasts; clear lower contact.	1.19	1876.18
SS	FEST INCL	Medium gray; medium grained; micaceous; lithic; few medium to coarse medium gray shale clasts; few medium to coarse distinct siderite nodules.	0.99	1877.17
SS	COAL STR	Light to medium gray; coarse grained; 85 percent quartz; few fine distinct coal streaks; planar cross lamination; few coarse distinct gray shale clasts; gradual lower contact.	1.16	1878.33
SH	FEST INCL	Black; silty; pyritized plant stem; common medium distinct shale clasts; few medium distinct siderite clasts; clear lower contact.	0.25	1878.58
SS	COAL STR	Medium gray; medium to coarse grained; lithic; micaceous; few fine distinct coal streaks; planar cross laminations; sharp lower contact.	1.48	1880.06
SH	COAL STR	Dark gray; few fine distinct coal streaks.	0.14	1880.20
SS	COAL STR	Medium gray; medium grained; few micas; few fine distinct shale streaks; common fine to medium distinct coal streaks; clear lower contact.	0.85	1881.05
SS	COAL STR	Light gray with brownish tint; oil and gas present; few fine to medium distinct coal streaks; common fine distinct gray shale streaks; 90 percent quartz.	2.88	1883.93
SS	QTZ	Light to medium gray; medium grained; 85 to 90 percent quartz; planar cross laminations until 1884.80; some oil present; clear lower contact.	1.26	1885.19
SS	FEST INCL	Medium gray; fine to medium grained; micaceous; lithic; common fine to medium distinct siderite bands; coalified plant debris; planar and planar cross laminations; some oil present.	4.70	1889.89
SS	QTZ	Medium to dark gray; very fine to fine grained; lithic; micaceous; common fine distinct clean coarse sandstone laminations and lenses; coalified plant debris; planar cross laminations.	0.80	1890.69
SS	QTZ	Light to medium gray; medium to coarse grained; common fine distinct very fine grained sandstone lenses; coalified plant debris; common medium to coarse shale clasts; 90 percent quartz; clear lower contact.	0.83	1891.52
SS	QTZ	Light to medium gray; coarse grained; 90 percent quartz; few fine distinct coal streaks; few fine to coarse distinct shale clasts at bottom of unit; clear lower contact.	1.33	1892.85
SS	FEST INCL	Medium to dark gray; medium to coarse grained; lithic; micaceous; few coarse distinct siderite clasts; few medium distinct shale clasts; planar cross laminations; sharp lower contact	0.90	1893.75

SH	CARB	Black; carbonaceous.	0.05	1893.80
SH		Medium gray with brownish tint; plant debris; few fine distinct slickensides; gradual lower contact.	1.94	1895.74
SS	BITRB	Medium gray; very fine grained; lithic; micaceous; abundant fine to medium distinct very fine grained light sandstone wavy laminations and lenses; few horizontally oriented burrows towards bottom of unit; sharp lower contact.	6.75	1902.49
SS	COAL STR	Light gray; medium to coarse grained; 95 percent quartz; quartzose sandstone; planar cross laminations; few planar laminations; from 1913.94 to 1913.98 few fine distinct coal streaks; after 1915 some oil present; clear lower contact.	13.61	1916.10
SS	QTZ	Medium gray; medium to coarse grained; 85 to 90 percent quartz; few fine distinct stylolites; few fine distinct coal streaks; 1916.58 many medium distinct quartz pebbles; clear lower contact.	0.94	1917.04
SS	QTZ	Light to medium gray; medium to coarse; 95 percent quartz; quartzose sandstone; few fine distinct stylolites; few fine distinct coal streaks; oil present; clear lower contact.	2.58	1919.62
SS	QTZ	Light to medium gray; coarse grained; 95 percent quartz; quartzose sandstone; abundant medium to coarse distinct quartz grains; few fine distinct coal streaks and clasts; some oil present; sharp lower contact.	0.43	1920.05
SS	QTZ	Light gray; coarse grained; 95 percent quartz; quartzose sandstone; common medium distinct quartz pebbles; some oil present; clear lower contact.	0.58	1920.63
SS	QTZ	Light gray; medium to coarse grained; 95 percent quartz, quartzose sandstone; Common fine distinct stylolites; common fine to medium distinct quartz pebbles throughout; few fine distinct shale clasts; few fine distinct coal streaks; 1921.26 abundant medium to coarse distinct quartz pebbles; clear lower contact.	0.91	1921.54
SS	QTZ	Light gray; medium to coarse grained; 95 percent quartz, quartzose sandstone; few fine distinct stylolites; some oil and gas present; few fine distinct coal streaks and clasts; planar cross laminations; clear lower contact.	5.53	1927.07
SS	QTZ	Light gray; medium to coarse grained; 95 percent quartz, quartzose sandstone; common fine to medium distinct quartz pebbles at top of unit; few fine to medium distinct shale streaks; thinly bedded "poker chip"; few fine distinct stylolites.	1.61	1928.68
SS	QTZ PBL	Light gray; fining upward sequence; coarse grained; few fine distinct stylolites; few fine distinct coal streaks; common fine to medium distinct quartz and shale pebbles.	0.80	1929.48
SS	QTZ PBL	Light to medium gray; fine to medium grained; 80 to 85 percent quartz; few fine distinct stylolites; planar and planar cross laminations; from 1936.51-1936.68' thinly bedded; from 1936.72-1936.82' common medium distinct quartz pebbles; from 1938.91' to bottom of unit common	9.55	1939.03

		fine to medium quartz pebbles; clear lower contact.		
SS	QTZ PBL	Light to medium gray; medium to coarse grained; 85 percent quartz; few medium distinct quartz pebbles and shale clasts; oil and gas present.	4.36	1943.39
SS	FEST INCL	Light gray; fine to medium grained; 80 percent quartz; many fine to coarse distinct quartz pebbles; few medium to coarse siderite clasts; few coarse clasts composed of coarse sandstone; sharp lower contact.	1.51	1944.90
SS		Medium gray; very fine grained; 80 to 85 percent quartz; abundant fine distinct "dendritic" stylolites; sharp lower contact.	0.41	1945.31
SH	FEST INCL	Dark gray; many fine to medium distinct sandstone bands and lenses; few fine distinct siderite nodules; from 1945.51-1945.75' primarily very fine grained sandstone with many fine distinct dark gray shale streaks; gradual lower contact.	2.40	1947.71
CGL	COAL STR	Fine to medium; subrounded to rounded; very fine grained sandstone matrix; few fine distinct stylolites; few medium to coarse distinct shale and siderite clasts; gradual lower contact.	0.54	1948.25
SS	QTZ PBL	Light to medium gray; very fine to fine grained; 75 percent clean; few fine quartz pebbles; gradual lower contact.	0.45	1948.70
CGL	SH CLS	Medium to coarse grained clean sandstone matrix; subrounded to rounded fine to medium pebbles; green, pink, and yellow pebbles; few fine-medium distinct gray shale clasts; gradual lower contact.	1.25	1949.95
SS	QTZ PBL	Light gray; medium-coarse grained; 75 percent quartz; few fine to medium quartz pebbles; few fine to medium shale clasts; gradual lower contact.	0.74	1950.69
CGL	QTZ PBL	Coarse grained clean sandstone matrix; abundant fine and common medium distinct pebbles; green, pink and yellow pebbles; gradual lower contact.	0.49	1951.18
SS	QTZ	Light to medium gray; medium to coarse grained; 90 percent quartz; few planar cross laminations at top of unit.	0.80	1951.98
SH	FEST INCL	Dark gray to black; few medium distinct green shale clasts; few medium to coarse distinct very fine grained brecciated sandstone clasts; few fine distinct siderite bands; clear lower contact.	0.28	1952.26
SH	FEST INCL	Dark gray-green; few fine distinct very fine grained sandstone lenses; few fine distinct siderite lenses; few fine distinct pyrite streaks at base; noncalcareous; clear lower contact.	0.35	1952.61
SLST	CALC	Light brownish gray; calcareous; starting at 1955' dark brown noncalcareous inclusions; possible fossils; gradual lower contact.	4.64	1957.25
LS		Light brownish gray; highly calcareous; few fine distinct vertically oriented stylolites.	1.04	1958.29
SH	CALC	Medium green-gray; silty; calcareous.	3.59	1961.88
SLST	CALC	Medium green-gray; calcareous; gradual lower contact.	0.17	1962.05

<u>Top of Greenbrier Limestone.</u>				
LS	SLTY	Medium gray; fine grained; slightly silty; few scattered medium to dark gray clasts; sharp lower contact.	0.56	1962.61
LS	NODAR	Light gray; hard; medium to coarse grained; pelioidal; common calcite crystals; few medium nodular zones; sharp lower contact.	1.50	1964.11
LS	FOSS	Light gray; oolitic; calcite cemented; bioclastic fragments become more abundant deeper in unit.	6.29	1970.40
LS	FOSS	Light gray; hard; oolitic; bioclastic grains; occasional intact pelociopod shells; few fine distinct stylolites; few fine zones of larger shell fragments; sharp lower contact.	9.80	1980.20
LS	FOSS	Light gray; fossils; crinoid fossils; gastropods; shell fragments; sharp lower contact.	1.08	1981.28
LS	FOSS	Light gray; hard; oolitic; bioclastic shell fragments; few fine distinct stylolites.	0.72	1982.00

POINT ID: 308-007

QUAD: NEWBURG (7.5')

COUNTY: Preston COMMENT: WVGES Roy Sapp core

ST PLANE E: 1900400.0 UTME: 598720.85 LATITUDE: 39.44834
ST PLANE N: 345600.0 UTMN: 4366950.29 LONGITUDE: -79.85270

ELEVATION: 1831.00 TOTAL DEPTH: 950.00 DATE: 05/27/20

GEOLOGIST:

NOTES: Log of the Roy Sapp core drilled on a ridge on his farm about 4,000 feet north-northwest of Threefork Bridge, 12,300 feet south-southwest of Gordon Church, and 6,500 feet southeast of a bench mark with elevation 1873 along the Gladesville-Independence Road, Lyon District, Preston County, WV. Drilling contractor: LJ Hughes and Sons, Inc. Driller: Jerry Browning. Helper: Brian Fitzwater. Drilling dates: May 14 to 27, 2003. Geophysical logging: Geological Logging Systems (Marshall Miller), Pete Mitchem, May 28, 2003. Core logged by: Nick Fedorko. Coals described in detail in lab by Bill Grady.

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		No core, 22 feet of casing set.	22.00	22.00
MDST	CALC	Medium gray; calcareous; badly braken in top 2.0'; iron stains on bedding planes; zone of light gray calcareous nodules in base; gradational lower contact on loss of calcareous material.	4.04	26.04
SH	CALC INCL	Medium gray-green; sub-fissile; moderately abundant light gray calcareous nodules 5-10 mm diameter and thin calcareous streaks in a noncalcareous matrix; fine brecciated pattern with dark gray-green from 28.75 to 28.95'.	3.96	30.00
NR	CORE LOSS	Probably in first run but put here for convenience.	1.36	31.36
SH		Medium gray; no calcareous material; 0.07' thick zone at base is thinly laminated and contains orange iron oxide staining; sharp lower contact.	1.09	32.45
SS	SH INBD	Light gray; very fine grained; silty; medium gray shale bands up to 0.10' thick; sharp lower contact at calcareous material.	2.05	34.50
SH	CALC INCL	Medium gray; silty; common, fine-to-coarse, distinct, light gray calcareous streaks and	1.41	35.91

irregular masses; sharp lower contact.

SH		Medium gray; slightly silty in top 4.0'; uniform; no plant or invertebrate fossils seen; sharp lower contact on color change.	17.29	53.20
SH	FOSS	Dark gray-black; becoming calcareous at about 55.0'; moderately abundant gastropods, pelecypods, brachiopods; bands and nodules of hard, light gray limestone up to 0.15' thick from 62.40 to 70.35'; abundantly fossiliferous in basal 1.0', some fossils are pyritized; abundant bedding plane calcite 0.1-1.0 mm thick in lower 0.05 ft; sharp lower contact on coal, (sampled basal 0.20' with coal). Ames Marine Zone	19.34	72.54
COAL	IMP	Top of Harlem coal. Impure; thinly interbedded dull clarains, bone coal layers, black shales, and fusains; minor iron-stained cleat calcite; (described by Bill Grady in lab).	0.13	72.67
SH	BLK	Black; bony; sharp base; (described by Bill Grady in lab).	0.03	72.70
COAL	CLRN	Dull clarain; thin banded with common 0.01-0.02 ft vitrain bands; few 0.01 ft soft fusain bands and occasional 1-3mm bone coal bands and partings with disseminated pyrite; minor cleat calcite in upper part; sharp base; (described by Bill Grady in lab).	0.76	73.46
COAL	FS	Fusain; soft; (described by Bill Grady in lab).	0.02	73.48
COAL	CLRN	Dull clarain; few 1-3mm vitrain bands; sharp base; (described by Bill Grady in lab).	0.20	73.68
COAL	CLRN	Bright clarain; few thin dull clarain bands; (described by Bill Grady in lab).	0.09	73.77
BN		Abundant disseminated pyrite; gradational top and bottom; (described by Bill Grady in lab).	0.02	73.79
COAL	CLRN	Dull clarain; thinly laminated; sharp base; (described by Bill Grady in lab).	0.12	73.91
COAL	FS	Fusain; soft; (described by Bill Grady in lab).	0.09	74.00
COAL	IMP	Impure; interbedded dull clarain and black shale; (described by Bill Grady in lab). Base of Harlem coal	0.07	74.07
MDST	ROOT	Medium gray; few black root traces at top; few large coalified stem fragments with associated fine pyrite and minor disseminated pyrite in top part; gradational lower contact on change to	1.42	75.49

calcareous; (sampled top 0.24' with coal).

LS	ARG	Light-to-medium gray; argillaceous; strongly calcareous; sharp lower contact.	1.69	77.18
MDST	CALC	Light gray-green; argillaceous; few medium-to-dark gray strongly calcareous nodules; common slickensides; sharp lower contact at base of calcareous material.	2.49	79.67
LS	ARG	Light-to-medium gray, slightly green at top; weakly bedded (shaly); light gray, fine-to-medium, distinct nodules; sharp lower contact.	1.98	81.65
LS		Light gray; hard; dense; vertical fractures in top 0.10' in-filled with material from above; becoming nodular to base; gradational lower contact on increasing clay material.	1.50	83.15
LS		Medium gray with fine light gray streaks; hard; gradational lower contact.	1.16	84.31
LS	NODAR	Medium gray with many light gray, hard, dense, coarse nodules; sharp lower contact.	2.94	87.25
MDST	CALC INCL	Light-to-medium gray-green; matrix is weakly calcareous in top, strongly calcareous to base; many fine-to-coarse, distinct, light gray calcareous nodules; common slickensides; arbitrary gradational lower contact on color and clay content changes.	7.90	95.15
CLST	CALC INCL	Light-to-medium gray-green; many, distinct, fine-to-coarse, calcareous nodules; mostly noncalcareous matrix; occasional slickensides, especially in top; becoming weakly bedded below 97'; sharp lower contact.	8.07	103.22
LS		Light gray; hard; dense; thin vertical fractures in top about 0.10' long.	1.58	104.80
SH	CALC INCL	Light gray-green; weakly calcareous; poorly bedded; common, distinct, light gray calcareous streaks and thin nodular beds up to 0.40' thick; sharp lower contact at base of nodular limestone bed.	5.10	109.90
SH		Light gray-green; poorly bedded; few, faint, fine, light gray, weakly calcareous streaks; some medium gray, fine, faint, dark gray mottles in basal 1.0'; gradational lower contact on color change.	3.90	113.80
CLST	MOT	Equally mottled light gray-green, light gray, and gray-red; few slickensides; one large weakly calcareous nodule at 115.00-115.35'; gradational lower contact on basal red.	2.78	116.58

CLST		Light gray-green; weakly bedded, transitional to shale; few slickensides; sharp lower contact on color change.	4.09	120.67
SH	RED	Thin bands of red alternating with light gray-green; light gray-green in basal 0.10'; weakly bedded.	0.73	121.40
SH		Dark gray-black with 0.05' thick light gray-green band in the middle; slightly carbonaceous in base; sharp lower contact.	0.23	121.63
CLST	ROOT	Light gray-green; few black carbonaceous root streaks; fine pyrite streaks; few slickensides; sharp lower contact on color, composition change.	1.37	123.00
MDST	RED	Mottled predominately red with many, faint-to-distinct, coarse, light gray-green mottles to 128.20'; also many prominent, fine-to-coarse olive mottles and streaks from 128.20' to base; becoming more light gray-green in basal 2.0'; common, fine-to-coarse, distinct, light gray and some red strongly calcareous nodules throughout, although decreasing to the base; gradational lower contact on color and bedding change.	9.37	132.37
SH		Banded light gray-green and olive with a few minor red bands; gradational lower contact on color change.	3.01	135.38
SH	RED	Thinly banded red, olive, and light gray-green; some vertical olive streaks; gradational lower contact on loss of bedding.	3.92	139.30
CLST	RED	Mottled red, light gray-green, olive; becoming sub-fissile to base; sharp lower contact on color and bedding changes.	1.45	140.75
SH		Light gray-green with olive streaks in top; sharp lower contact on color change.	0.57	141.32
CLST		Medium gray with dark gray-black streaks; very fine; sharp lower contact. Bakerstown coal position(?)	0.34	141.66
COAL	NP	Bakerstown coal (absent)	0.00	141.66
LS		Light-to-medium gray; hard; dense; very abundant, white, calcite-filled ostracodes throughout; pyrite common, sharp lower contact.	2.26	143.92
CLST	KAOL	Brecciated to nodular; matrix is predominately light-to-medium gray to gray-green with many, distinct-to-prominent, angular-to-subangular,	3.78	147.70

		light gray-brown semi-flint clay clasts; smooth; semi-hard; angular, sharp lower contact.		
CLST		Mostly light gray-green nodules; sharp lower contact.	0.50	148.20
MDST	SKS	Medium gray; many slickensides; high angle, sharp lower contact.	1.40	149.60
MDST	ROOT	Light gray; slightly silty; black organic streaks, probably root traces to 150', none to base, gradational lower contact on silt content.	2.18	151.78
SLST		Light-to-medium gray-green; micaceous; sandy; gradational to sandstone.	2.77	154.55
SS		Light gray; very fine grained; low angle ripple cross laminations; shaly streaks and bands; sharp lower contact on grain size change.	8.71	163.26
SS		Light gray; fine-to-medium grained zones; multi-directional ripple cross laminations and some planar cross laminated zones; some shaly/silty streaks and zones; high angle sharp lower contact.	7.42	170.68
SS	XBD	Light gray; medium grained; ripple cross laminated; abundant matrix, dark minerals, and rock fragments; sharp lower contact.	3.67	174.35
SS	SH STR	Fine-to-medium grained with shaly/silty streaks; sharp lower contact.	0.62	174.97
SS		Light gray; coarse grained; abundant mud matrix, dark minerals; planar to planar cross laminated; sharp lower contact on grain size change.	0.95	175.92
SS	XBD	Light gray; fine grained, medium-to-coarse grained in basal 2.0'; planar cross laminated; micaceous; dark minerals; lost drill water in bedding plane at 178.75'; sharp lower contact.	16.77	192.69
SS	SH STR	Light gray; coarse grained in top 0.50', rest fine grained; medium gray shale zones and streaks; sharp lower contact.	1.36	194.05
CLST	SKS	Medium gray; abundant slickensides; badly broken by drilling.	4.45	198.50
NR	CORE LOSS	Core loss in claystone unit between runs.	0.50	199.00
CLST	SKS	Medium gray; abundant slickensides; badly broken by drilling.	1.30	200.30
CLST	CALC INCL	Light gray-green; very fine; abundant slickensides; very large (max 0.30' long) faint calcareous nodules; gradational lower contact on	3.57	203.87

color change and base of nodules.

CLST		Light-to-medium gray-green; black subvertical and horizontal streaks; weakly bedded; few slickensides; gradational lower contact on bedding change.	2.23	206.10
SH	CALC INCL	Medium gray; common, faint, coarse, weakly calcareous nodules (when scratched); poorly bedded; no nodules in basal 1.0'; micaceous; sharp lower contact.	4.40	210.50
SS	SH STR	Light gray; very fine grained; silty; ripple laminated beds/zones up to 0.20' thick; medium gray shale streaks and laminations up to 0.10' thick; sharp lower contact.	2.46	212.96
SS		Light gray; fine grained; ripple laminated; mud drapes; pyritic burrows from 214.08 to 214.14'; flat, sharp lower contact.	2.91	215.87
SH		Dark gray, thin bed; sharp lower contact.	0.25	216.12
SS		Light gray; fine grained; ripple cross laminated with mud drapes; gradational lower contact on grain size change.	1.42	217.54
SS		Light gray; fine-to-medium grained; ripple-to-planar cross laminated; micaceous; common dark minerals, rock grains, and few organic grains; sharp lower contact.	2.88	220.42
SH	SLTY	Medium gray; silty, sandy; sharp lower contact.	0.25	220.67
SS		Light gray; fine-to-medium grained, coarsening upward; few coaly streaks and small clasts from 226.55 to 226.90'; mostly ripple laminated to ripple cross laminated; irregular, angular sharp lower contact.	7.98	228.65
SH	ROOT	Medium gray; broken; few black root traces; sharp lower contact at sand.	1.60	230.25
SH	ROOT	Medium gray; sand-filled root traces? or burrows?; also black root traces; sharp lower contact at base of sand.	0.75	231.00
SLST		Medium gray; increasingly silty, sandy to base; few black organic streaks (roots?) ; pyrite streaks; sharp lower contact.	4.63	235.63
SS	COAL STR	Light gray; fine grained; abundant thin (1mm) coal streaks; pyrite blebs and streaks; sharp lower contact.	0.25	235.88
SS		Light gray; mostly fine grained; coal streaks from 236.15 to 236.55'; few small quartz pebbles;	12.88	248.76

coarse grains, and dark gray shale clasts up to 0.08' long from 237.40 to 238.00'; fine grained and mostly planar to low angle planar cross laminated from 240' to base; sharp lower contact.

SH		Medium gray; uniform; light gray silt-and very fine grained sand-filled, mostly horizontal burrows in scattered zones up to 0.10' thick starting at 252'; common carbonaceous root traces, stems, and plant trash, some pyritized; no marine body fossils; barren of all fossil material from 264.45' to base; sharp lower contact at marine fossils.	21.02	269.78
SH	FOSS	Medium-to-dark gray; abundant marine fossils including pelycypods (Pecten and others), gastropods, brachiopods, all calcite-filled; especially abundant in top 0.30', scattered below; pyritic nodules and abundant fossils from 271 to 272'; sharp lower contact; (sampled basal 0.02' with coal). Brush Creek marine zone	3.06	272.84
COAL	CLRN	Top of Brush Creek coal. Dull clarain; very thinly laminated; minor iron stained cleat calcite; (described by Bill Grady in lab).	0.14	272.98
COAL		Vitrain with thin cleat calcite; sharp base; (described by Bill Grady in lab).	0.02	273.00
COAL	CLRN	Dull clarain; common vitrain lenses; minor iron-stained cleat calcite; sharp base; (described by Bill Grady in lab).	0.05	273.05
SH	CARB	Black; highly carbonaceous; few large coalified stem imprints; bone lenses; minor pyrite on bedding; less carbonaceous upward; sharp base; (described by Bill Grady in lab).	0.39	273.44
COAL	CLRN	Bright clarain; very broken; probably vitrain; sharp base; (described by Bill Grady in lab).	0.10	273.54
SH	BLK	Black; bony; lenticular; sharp base; (described by Bill Grady in lab).	0.03	273.57
COAL	CLRN	Dull clarain; sharp base; (described by Bill Grady in lab).	0.05	273.62
COAL	CLRN	Bright clarain; bright attritus with few 1-2mm vitrain bands; common small cleat pyrite, mostly oxidized to hematite and sulfates; weathered; gradational lower base; (described by Bill Grady in lab).	0.68	274.30
COAL	CLRN	Dull clarain; weathered; frequent fusain lenses, some pyritized; sharp base; (described by Bill	0.42	274.72

Grady in lab).

COAL		Durain; medium density; minor pyrite lenses; gradational base; (described by Bill Grady in lab).	0.07	274.79
COAL	IMP	Impure; interbedded dull clarain, black shale; and pyrite lenses; weathered; sharp base; (described by Bill Grady in lab). Base of Brush Creek coal.	0.18	274.97
SH		Black in top 0.04', rest medium-to-dark gray; abundant pyritized roots in upper part; sharp lower contact; (sampled top 0.20' with coal).	0.37	275.34
LS		Light gray with light gray-green clasts; slightly argillaceous; sharp lower contact.	0.55	275.89
MDST	CALC	Light-to-medium gray-green; strongly calcareous with many, fine-to-coarse, distinct, mostly round, very strongly calcareous nodules; few slickensides.	4.11	280.00
NR	CORE LOSS		0.74	280.74
MDST	CALC	Light-to-medium gray-green; strongly calcareous with many, fine-to-coarse, distinct, mostly round, very strongly calcareous nodules; few slickensides; gradational lower contact on loss of calcareous material.	1.44	282.18
MDST	SKS	Medium gray; noncalcareous; common slickensides; gradational lower contact on color and bedding change.	4.88	287.06
SH		Light gray-green; sub-fissile; slightly silty; minor calcite streaks at 291'; gradational lower contact on increasing sand.	5.69	292.75
SS	SLTY	Light gray to light gray-green; very fine grained; slumped - mixed sand, silt, and clay; gradational lower contact.	1.69	294.44
SH		Light gray-green; sub-fissile; streaks (roots?) of calcite from 295 to 295.50'; sharp lower contact.	2.46	296.90
FTCY		Predominately green-blue; banded with light gray, dark gray, medium green in top 0.90'; brecciated to nodular from 297.75 to 298.90' with light gray-green-blue, light gray, and some dark gray-green clasts, nodules, and matrix; banded from 298.90' to base; common streaks and zones of round siderite grains or pellets (BB size) throughout; sharp lower contact.	2.70	299.60
SH		Light gray-green; sharp lower contact.	0.40	300.00

FTCY		Faint medium gray-green, gray-brown, and light gray inclined banding, sharp lower contact.	0.82	300.82
FTCY	BREC	Light gray-red, light gray, light gray-brown angular clasts in a medium gray-green matrix; few black streaks; abundant sub-millimeter siderite grains or pellets; sharp lower contact.	1.00	301.82
SS		Light gray; fine grained; faint light gray-green and reddish flint clay clasts; abundant sub-millimeter siderite grains; sharp lower contact.	0.70	302.52
FTCY		Medium gray-green; faintly brecciated in top half; lower half is banded to massive; sub-millimeter siderite grains or pellets to base; sharp lower contact.	1.80	304.32
FTCY	BREC	Predominately medium gray-green angular clasts with few gray-brown clasts; matrix is more gray with some black streaks and abundant sub-millimeter siderite pellets in matrix; sharp lower contact.	4.63	308.95
SH	CALC INCL	Medium gray-green; sub-fissile; calcite-filled vertical fractures from top to base; noncalcareous matrix; gradational lower contact on bedding change.	1.05	310.00
CLST		Medium gray with a hint of green; weakly bedded; few slickensides; nearly a shale in places; gradational lower contact on color change.	4.87	314.87
CLST	MOT	Medium gray-green with common, very faint, fine-to-coarse, red mottles and streaks; weakly bedded to shale; gradational lower contact.	1.33	316.20
SH		Medium gray; poorly bedded; sharp lower contact.	0.55	316.75
LS	NODAR	Light gray; very nodular; vertical fractures in top of unit; sharp lower contact.	0.67	317.42
SH	CALC INCL	Light-to-medium gray-green with light gray-white, fine, common, distinct calcareous streaks in a brecciated pattern, especially to 318.50'; less calcareous from 319' to base; gradational lower contact on loss of calcareous material.	3.77	321.19
SH		Predominately medium gray-green with clasts and bands of light gray-green and red flint clay or kaolinitic claystone; light gray, fine grained sandy zones and streaks; abundant pyrite streaks; sharp lower contact.	4.26	325.45
FTCY		Brecciated to nodular; predominately light and medium gray-green with gray; banded in top 0.50'	2.10	327.55

with rest brecciated to nodular; black streaks in basal 0.50'; medium, prominent, red nodules in basal 0.10'; abundant pyrite streaks; sharp lower contact.

SH		Dark gray-to-black; soft; poorly bedded; clayey; gradational lower contact on color change. [Paleosol A horizon].	0.25	327.80
COAL	NP	Mahoning coal position (absent).	0.00	327.80
CLST		Medium gray with light gray-green streaks; pyrite; few slickensides. [Paleosol B horizon].	1.36	329.16
CLST		Light gray-green; fine angular to subangular paleosol structure; clayey or illitic (surface 'plucked' by drilling); few slickensides; more competent to base; gradational lower contact on clay content and bedding change. [Paleosol B or BC horizon].	5.49	334.65
SH		Light-to-medium gray-green; sub-fissile; some slickensides; becoming harder and finer (kaolinitic?), more flint clay-like to base; gradational lower contact on color change.	7.57	342.22
SH	MOT	Light gray-green with many, prominent, red mottles with very sharply defined edges; sub-fissile, hard, transitional to flint clay; gradational lower contact on color change.	5.40	347.62
SH	MOT	Predominately red with many, coarse, prominent light gray-green mottles with light gray-red halos on the edges; gradational lower contact.	2.64	350.26
SH		Medium gray-green with light gray-brown clasts; occasional fine calcareous nodules; some pyrite; zones of sub-millimeter siderite pellets; gradational lower contact on increasing amount of clasts.	4.31	354.57
CLST		Brecciated claystone or flint clay; medium-to-dark gray-green, sandy matrix with many, coarse, distinct, angular, light gray-green and gray-brown clasts throughout; sharp lower contact.	3.57	358.14
MDST		Light gray; micaceous; silty; few slickensides; sharp lower contact.	2.72	360.86
CLST	KAOL	Brecciated to nodular; light gray-brown and light gray clasts or nodules in a dark gray matrix; thin sideritic red streaks in top and near base; sharp lower contact.	0.97	361.83
SH		Medium gray; poorly bedded; occasional faint root traces; occasional pyrite streaks; no fossils seen; sharp lower contact.	6.64	368.47

SH	CARB	Dark gray-black; carbonaceous to coaly; coaly streaks; thin inclined bed; sharp lower contact. Upper Freeport coal horizon	0.03	368.50
COAL	NP	Upper Freeport coal (absent).	0.00	368.50
SH	SLTY	Medium gray; micaceous; faint root traces in top 0.20'; gradational lower contact on grain size change.	0.75	369.25
SS		Light gray; very fine grained; micaceous; ripple laminated with silty/shaly zones; root traces; gradational lower contact.	3.27	372.52
SH		Medium gray; occasional faint root trace; no other fossils; occasional compactional slickensides; gradational lower contact.	1.98	374.50
SS	SH STR	Light gray; fine grained; ripple laminations with interlaminated medium gray shale; sharp lower contact.	2.08	376.58
SH	CALC INCL	Medium gray; fine; micaceous, no fossils, 1 large calcareous nodule 0.30' long at top with few, distinct, fine, calcareous nodules below; gradational lower contact at base of nodules.	3.42	380.00
SH		Medium gray; uniform; no plant or invertebrate fossils see; sharp lower contact at calcareous material.	3.27	383.27
LS		Top of Upper Freeport Limestone. Medium gray; slightly argillaceous; sharp lower contact on color change.	0.57	383.84
LS		Light gray; hard; nodular; thin bed; sharp lower contact.	0.87	384.71
SH	CALC INCL	Medium gray; poorly bedded; few, fine, distinct, calcareous nodules; gradational lower contact at sand streaks.	3.23	387.94
SH	SS STR	Medium gray; light gray, very fine grained, rippled sandstone streaks, gradational lower contact at base of sandstone streaks.	1.33	389.27
SH		Medium gray; uniform; sub-fissile; sharp lower contact.	0.99	390.26
LS		Light gray; hard; dense; broken at base.	1.39	391.65
NR	CORE LOSS	Run was 0.35'; placed in broken zone.	0.35	392.00
LS		Light gray; hard; dense; micritic; light-to-medium gray vertical in-filled burrows or roots; sharp lower contact at color change.	1.13	393.13

LS		Medium gray; hard; slightly argillaceous; sharp lower contact on color change.	0.87	394.00
LS		Light gray; hard; dense; vertical fractures; sharp lower contact.	0.32	394.32
LS	ARG	Medium-to-dark gray; clayey-argillaceous; 1 slickenside; sharp lower contact.	0.60	394.92
LS	SH INBD	Light gray, hard, dense beds interbedded with medium gray, slightly argillaceous units 0.30 to 0.50' thick; sharp lower contact.	1.63	396.55
CLST	CALC INCL	Medium-to-dark gray; vertical, calcite filled burrows; sharp lower contact.	0.39	396.94
LS	SDY	Light-to-medium gray; weakly calcareous with sand and organic grains throughout; angular, sharp lower contact.	0.61	397.55
LS		Light gray; hard; dense; micritic; few spar streaks; irregular, sharp lower contact.	0.91	398.46
		Base of Upper Freeport Limestone.		
CLST		Medium gray; faintly nodular in top 0.50'; dark streaks in basal 0.50'; sharp lower contact.	2.56	401.02
SH	CARB	Black; carbonaceous; very fine coaly fragments; sharp lower contact. Lower Freeport coal horizon.	0.19	401.21
COAL	NP	Lower Freeport coal (absent)	0.00	401.21
CLST	ROOT	Medium gray; black root traces; sharp lower contact.	1.05	402.26
SH	SS STR	Light-to-medium gray; few, light gray, very fine grained, ripple laminated sandstone streaks and laminations up to 0.10' thick, most less than 0.02' thick; occasional root traces in top half; gradational lower contact at basal sand streak.	4.21	406.47
SH		Medium gray; uniform; fissile; sharp lower contact.	0.87	407.34
SH		Brecciated with medium gray clasts in a finely fragmented matrix; poorly bedded; sharp lower contact.	1.13	408.47
SH		Medium gray with a few, fine, prominent brick red clasts from 409.00 to 409.10' and from 409.45 to 409.60'; sub-fissile; gradational lower contact on bedding change.	2.99	411.46
CLST		Light gray with common, faint, fine, medium gray,	4.56	416.02

medium gray-green and prominent brick red mottles or clasts; red clasts from 412.40 to 413.40'; occasional slickensides; occasional soft zones; sharp lower contact on color change.

CLST		Light gray-green; dark gray patches in top half; becoming light-to-medium gray to base; sharp lower contact.	2.62	418.64
SLST		Light gray-green; micaceous; massive; sandy streaks from 420' to base; sharp lower contact.	3.66	422.30
SS		Light gray; fine grained; faint planar laminations; medium gray shaly/silty zone from 422.90 to 423.28'; abundant mica and dark minerals; flat, sharp lower contact.	2.64	424.94
SH		Medium gray; few, distinct, coarse, sideritic nodules up to 0.40' long with light gray-white very strongly calcareous streaks within them; no fossils seen; some vertical fractures filled with medium gray material; gradational lower contact with sand streaks.	5.16	430.10
SH	SS STR	Medium gray; light gray, very fine grained, rippled sandstone streaks and one bed from 431.50 to 432.02'; gradational lower contact at basal sandstone streaks.	4.05	434.15
SH	CALC INCL	Medium gray; faint calcareous bands up to 0.10' thick; possible fine feeding traces at 434.26'; occasional pyrite streak; sharp lower contact on color change.	2.59	436.74
SH	CANL	Black and black when scratched; heavy; low to high density; uniform; broken in base by drilling; canneloid; laminar-to-conchoidal fracture; common large irregular pyrite nodules; sharp lower contact; (basal 1.12 sampled with coal below).	2.28	439.02
COAL	CLRN	Dull clarain; common pyritized fusain lenses; (described by Bill Grady in lab). upper split of Upper Kittanning coal.	0.28	439.30
SH	ROOT	Medium gray; abundant root traces; sub-fissile; sharp lower contact; (sampled top 0.25' with coal above).	1.94	441.24
SS	ROOT	Light gray-to-white; fine grained; rippled; highly rooted; sharp lower contact.	1.36	442.60
SH		Medium gray; fissile; uniform; possible fossil invertebrate at 443.77'; sharp lower contact.	2.30	444.90
SH	BLK	Black; sharp lower contact.	0.23	445.13
SH	ROOT	Dark gray-to-black; rooted; sub-fissile in top;	3.27	448.40

		becoming darker gray and more fissile to base; thin soft bands near middle; sharp lower contact; (sampled basal 0.31' with coal below).		
FEST		Large nodule; (sampled with coal below).	0.16	448.56
SH		Dark gray-to-black; sharp lower contact on coal; (sampled with coal below).	0.03	448.59
COAL	CLRN	Top of Upper Kittanning coal. Dull clarain; occasional 1-3mm vitrain bands; minor iron-stained cleat calcite; few partially pyritized fusain lenses; sharp base; (described by Bill Grady in lab).	0.72	449.31
COAL		Vitrain; thick cleat calcite; (described by Bill Grady in lab).	0.04	449.35
COAL	CLRN	Dull clarain; thin bone lenses and pyritized fusain lenses; gradational base; (described by Bill Grady in lab).	0.13	449.48
COAL	IMP	Impure; bony to bone; gradational base; (described by Bill Grady in lab).	0.01	449.49
COAL	CLRN	Bright clarain; common 1mm pyritized fusain bands; gradational base; (described by Bill Grady in lab).	0.35	449.84
COAL	IMP	Impure; bony to bone; with disseminated pyrite; sharp base; (described by Bill Grady in lab).	0.06	449.90
FTCY		Dark gray; rooted; few small 1mm rounded clasts of gray shale; conchoidal fracture; sharp base; (described by Bill Grady in lab).	0.10	450.00
COAL	CLRN	Bright clarain; common pyritized fusains; calcite and iron stains on cleat; sharp base; (described by Bill Grady in lab).	0.76	450.76
SH		Medium gray; few bony lenses; rooted; few stem imprints; sharp base; (described by Bill Grady in lab).	0.26	451.02
COAL	CLRN	Dull clarain; common pyrite lenses; gradational base; (described by Bill Grady in lab).	0.06	451.08
COAL	IMP	Impure; bony to bone; abundant disseminated pyrite; gradational top and bottom; (described by Bill Grady in lab).	0.08	451.16
COAL	CLRN	Bright clarain; thin cleat calcite; gradational base; (described by Bill Grady in lab).	0.07	451.23
COAL	IMP	Impure; bony to bone; common resin rodlets; common bedding pyrite and calcite; sharp base; (described by Bill Grady in lab).	0.04	451.27

Base of Upper Kittanning coal.

SH		Dark gray; bone and clarain; abundant 1-2mm thick calcite streaks; sharp lower contact; (sampled with coal above).	0.03	451.30
CLST	ROOT	Medium gray; abundant dark gray-to-black root traces; few large stem imprints near top; abundant small pyrite on top surface; thin calcite band around 451.45'; gradational lower contact on color change; (sampled top 0.30' with coal above).	1.17	452.47
CLST	ROOT	Medium gray-green; abundant root traces; sharp lower contact on color change.	2.18	454.65
SH	ROOT	Light gray-green to about 457', more gray to base; most rooting evident in top 2.0'; sub-fissile; gradational lower contact on loss of roots and increased fissility.	7.35	462.00
SH	SLTY	Medium gray; silty, sandy in zones; few, distinct, fine-to-medium, sideritic nodules (calcareous only upon scratching); possible burrow in sandstone streak at 466.40; angular, sharp lower contact.	4.85	466.85
SS	BRW	Light gray; fine grained; ripple laminated in top 1.50', mostly planar cross laminated to base; few horizontal, sideritized or clay-filled 2-3mm wide burrows throughout; 2 shale breaks less than 0.10' thick in base; sharp lower contact.	4.39	471.24
SS		Light gray-to-white; medium grained; mostly planar cross laminated with directional changes; much cleaner--about 85-95% quartz to 480', 'dirty' below 480'; 0.10' thick shale bed in base; sharp lower contact.	14.63	485.87
SS		Light gray; fine grained at top to coarse grained in base (fining upward); increasing quartz content with crude stylolites beginning at about 490'; mostly planar cross laminated; quartzose (about 90% quartz) from 500' to base; irregular, sharp lower contact exhibiting soft sediment deformation of unit below.	21.90	507.77
SH	ROOT	Dark gray-to-black with light gray, fine grained sandstone streaks; all highly rooted; sharp lower contact.	2.75	510.52
COAL	IMP	Shaly; pyritic; (not sampled). Middle Kittanning coal.	0.06	510.58
CLST	ROOT	Light gray and streaked black to dark gray, especially dark in top 0.08'; 2 nodules or blebs of very fine grained, clean sand with organic streaks; sharp lower contact.	1.22	511.80

MDST	ROOT	Light gray; abundant black root traces; silty to base; arbitrary, gradational lower contact on increasing silt and sand content.	2.05	513.85
SLST	ROOT	Medium gray; highly rooted, decreasing to base; becoming sandy to base; sharp lower contact.	4.75	518.60
SS		Light gray; fine grained; abundant dark minerals, rock grains; micaceous; mud matrix; ripple laminated; sharp lower contact at first shale bed.	5.18	523.78
SS	SH INBD	Light gray, very fine grained, ripple cross laminated sandstone beds from 0.10 to 1.0' thick with interbedded, medium gray shale beds from 0.05 to 0.20' thick, many with sandstone streaks; arbitrary sharp lower contact at thicker sandstone bed.	8.79	532.57
SS		Light gray; very fine grained; low angle ripple cross laminations; very thin (<1mm) dark gray shale streaks; sharp lower contact.	1.34	533.91
SH	SS STR	Medium-to-dark gray with very fine grained, light gray, rippled sandstone streaks; sharp lower contact.	0.80	534.71
SS	SH STR	Light gray; very fine grained; ripple cross laminated with common, very thin (about 1mm) rippled, dark gray shale or mica streaks; sharp lower contact.	5.48	540.19
SS		Light gray; very fine grained; common, very thin, 2-10mm long, dark gray shale clasts, especially from 540.80 to 542.45'; faintly planar laminated; sharp lower contact.	3.18	543.37
SH	SS STR	Medium-to-dark gray shale laminations with light gray, very fine grained, rippled sandstone laminations; possible burrow at 545.40'; sharp lower contact.	2.40	545.77
SS	SH STR	Light gray, very fine grained, rippled sandstone laminations with interlaminated medium gray shale; few coaly streaks; gradational lower contact on increasing shale.	1.95	547.72
SH	SS STR	Medium gray shale with interlaminated light gray, very fine grained, rippled sandstone laminations and streaks; few possible burrows; arbitrary contact at increasing sand.	4.85	552.57
SS	SH STR	Light gray, very fine grained, ripple laminated sandstone with dark gray shale laminations and streaks and mica streaks; occasional coaly streaks; sharp lower contact.	6.69	559.26

SS		Light gray; fine grained; 'cleaner', about 80-85% quartz; mostly ripple cross laminated; fine coal clasts and streaks from 560.50 to 561.52'; 0.01' thick coal bands at 562.60' and 564.37'; medium gray shale bed from 566.39 to 566.48'; concentrated pyritic coal and shale streaks from 568.64 to 568.70' and from 570.87 to 570.00'; few scattered quartz pebbles up to 5mm diameter from 567.60' to base; coarse grained to base; medium gray shale clasts in basal 0.14'; angular, sharp	12.24	571.50
SS	QTZ PBL	Light gray; fine-to-medium grained matrix, about 85-90% quartz, few dark minerals; scattered quartz pebbles up to 10mm long and a few shale pebbles up to 10mm long, especially from top to 573', less to base; sharp lower contact.	4.50	576.00
SS	COAL STR	Light gray; medium-to-coarse grained; about 90-95% quartz; common coal clasts up to 0.05' thick and thin coal streaks and lenses, many inclined; sharp lower contact.	5.28	581.28
SS		Light gray; medium grained; few very fine grained dark gray shale or organic clasts; abundant dark minerals; some mica; massive; sharp lower contact.	2.99	584.27
SLST	SDY	Medium gray; zones of light gray, ripple cross laminated sandstone streaks from 585.08 to 585.25'; few root traces; zone of coarse sand lenses and clasts of siltstone from 588.38 to 588.73'; sharp lower contact.	5.16	589.43
SS	QTZ PBL	Light gray, fine grained matrix with many quartz pebbles up to 5mm long; shale clasts; sharp lower contact.	0.27	589.70
SS		Light gray; medium grained; few very fine grained dark gray shale or organic clasts; abundant dark minerals; some mica; massive; sharp lower contact.	1.60	591.30
SS		Light gray; fine-to-coarse grained; band of siderite lenses and quartz pebbles up to 10mm diameter at 591.60'; thin coaly streaks and clasts from top to 591.88'; large coal clast across whole core from 592.20 to 592.37'; sharp lower contact.	1.52	592.82
CGL	QTZ PBL	Light gray; fine-to-coarse grained matrix; abundant quartz pebbles up to 8mm long; few rock clasts; one large, 30mm siderite clast; few 1-3mm brick red grains; zones of coal streaks from 593.00 to 593.06', 594.17 to 594.22'; coal spar at 593.20 and 593.82'; sharp lower contact.	1.61	594.43
SS	QTZ	Light gray; fine grained; smooth; high angle planar cross laminations; occasional mica or organic grains; high angle, sharp lower contact.	1.27	595.70

SS	COAL STR	Light gray-to-white; coarse grained to pebbly; coaly lenses up to 0.02' thick; sharp lower contact.	0.23	595.93
SS		Light gray; medium grained; 'dirty' with abundant mica and dark minerals; ripple cross laminated; sharp lower contact.	1.63	597.56
SS		Light gray; coarse-to-very coarse grained; 85-90% quartz; some organic grains, dark minerals; frosty cement; coal streaks and clasts from 598.72 to 598.78'; and from 600' to base; gradational lower contact on increasing grain size.	3.92	601.48
CGL	QTZ PBL	Light gray; closely packed quartz pebbles up to 10mm diameter; few coal streaks; sharp lower contact.	1.99	603.47
COAL		Large, rafted clast; sharp lower contact.	0.17	603.64
CGL	QTZ PBL	Light gray; closely packed, rounded to subangular quartz pebbles up to 8mm diameter; abundant pyrite at top below coal; coal clasts and streaks in bottom half; sharp lower contact.	0.91	604.55
SH	CANL	Or dull coal; black; large clast with inter-fingered sandstone streaks; sharp lower contact.	0.28	604.83
SS		Light gray; bands of quartz pebble conglomerate, fine grained dirty sandstone, and rafted coal lenses up to 0.08' thick; few 1-2mm, brick red grains in the conglomeratic zones; sharp lower contact.	0.99	605.82
SH	BLK	Black; canneloid; sharp lower contact.	0.35	606.17
CLST		Black; slickensided; faint root traces; sharp base; (described by Bill Grady in lab).	0.15	606.32
BN		Very thin carbonaceous shale lenses; large decorticated lycopod stem imprints; gradational base; (described by Bill Grady in lab).	0.11	606.43
COAL	IMP	Top of Upper Mercer coal. Impure; bony to bone; gradational base; (described by Bill Grady in lab).	0.02	606.45
COAL	CLRN	Dull clarain; common large pyrite lenses; (described by Bill Grady in lab).	0.08	606.53
PYR		Partly oxidized to white sulfates; (described by Bill Grady in lab).	0.02	606.55
COAL	CLRN	Dull clarain; several 1mm pyrite layers; sharp base; (described by Bill Grady in lab).	0.19	606.74

PYR		Partly oxidized to white sulfates; sharp base; (described by Bill Grady in lab).	0.02	606.76
COAL	CLRN	Bright clarain; sharp base; (described by Bill Grady in lab).	0.06	606.82
COAL	IMP	Impure; bony to bone; thinly laminated; gradational base; (described by Bill Grady in lab).	0.02	606.84
FTCY		Dark gray; conchoidal fracture; stigmata and large stem imprints; sharp base; (described by Bill Grady in lab).	0.06	606.90
COAL	IMP	Impure; bony to bone; gradational base; (described by Bill Grady in lab).	0.02	606.92
COAL	CLRN	Dull clarain; several small pyrite lenses; sharp base; (described by Bill Grady in lab). Base of Upper Mercer coal	0.39	607.31
SH	CARB	Black; very bony; abundant angular vitrain fragments throughout; rare vitrain bands; thin coaly streaks; few ostracodes in upper 0.05'; sharp lower contact; (sampled top 0.28' with coal above).	0.74	608.05
SH	COAL STR	Black; carbonaceous; common coal streaks and spars; gradational lower contact.	0.87	608.92
SS	COAL STR	Light-to-medium gray; fine grained; highly rooted; coal streaks and spars; sharp lower contact at basal coal streak.	0.71	609.63
SS	ROOT	Light gray; fine grained; dirty; rooted throughout; gradational lower contact.	3.32	612.95
SS		Light gray; fine grained; planar to planar cross laminated; micaceous; dark minerals; gradational lower contact.	1.21	614.16
SH	SS STR	Medium gray; silty, sandy with light gray-to-white, fine grained, rippled sandstone streaks; some bioturbation (roots?); sandstone bed from 617.60 to 618.00' and from 618.90 to 619.35'; few siderite nodules around 620.50'; high angle, sharp lower contact.	9.22	623.38
SS		Light gray; fine grained; dirty; dark gray shale clasts and streaks from top to around 628', sparse from 628' to base; gradational lower contact at basal clasts.	9.08	632.46
SS		Light gray; fine grained; 'cleaner' than above; ripple-to-planar cross laminated; weak stylolites to base, approaching quartzose to base; sharp lower contact.	17.56	650.02

SS	QTZ PBL	Light gray; fairly clean; quartz pebbles up to 15mm, especially in top 0.20'; sharp lower contact at grain size change.	0.52	650.54
SS	COAL STR	Light gray; very coarse grained; 2 coal clasts across core 0.03' thick; sharp lower contact.	0.63	651.17
CGL	QTZ PBL	Light gray; closely packed quartz pebbles all about 5mm diameter; sharp lower contact.	0.56	651.73
SS	QTZ	Fine-to-medium grained at base, coarsening up to coarse-to-very coarse at top; common stylolites; common pyrite grains; few dark minerals; vertical fractures from 652 to 656' with a silvery mineral on the fracture faces; few small fractures and vugs filled with fine, soft white material; sharp lower contact.	7.81	659.54
SH		Medium gray; few sandstone streaks; sandy, silty to base; gradational lower contact, mixing with unit below.	2.01	661.55
SS		Light gray; fine grained; fairly clean but some mica and dark minerals; coaly streaks in top 0.50'; fine shale clasts to base; faint planar laminations; sharp lower contact.	3.73	665.28
SS	COAL STR	Light gray; fine grained with a few very coarse grained to pebbly zones; two high angle coal clasts at top up to 0.03' thick; thin wispy coal streaks and a few clasts from 666' to base; sharp lower contact at basal coal streak.	2.07	667.35
SS		Light gray; fine grained; fairly clean but has mica and dark grains; predominately planar cross laminated; sharp lower contact.	5.83	673.18
SS	SH CLS	Light gray with abundant medium gray shale clasts; sharp lower contact at basal shale clasts.	0.54	673.72
SS		Light gray; fine-to-medium grained; about 85-90% quartz grains; crude stylolites; few coaly streaks from 674 to 675.50'; few minor pebbly zones; sharp lower contact.	3.58	677.30
SS	COAL STR	Light gray; medium grained; possibly slumped; thin coal streaks; sharp lower contact.	0.90	678.20
SS	QTZ	Light gray; fine grained to 678.95', coarse below; becoming quartzose at about 679'; rhythmically planar cross laminated in fine-to-coarse grained couplets; high angle, sharp lower contact.	9.40	687.60
SS	COAL CLS	Light gray; coarse-to-very coarse grained; two high angle coal clasts in top 0.50', one is 0.10' thick (channel lag?); sharp lower contact.	1.10	688.70

SH		Medium-to-dark gray; occasional, large siderite nodule or band; few, faint, sandy streaks; pyrite streaks; very uniform; occasional fragments of organic material but no plant or invertebrate fossils seen; hard; sharp lower contact; (sampled basal 0.16' of unit with coal below).	6.74	695.44
COAL	IMP	Top of Quakertown coal zone. Impure; bony to bone; sharp base; (described by Bill Grady in lab).	0.01	695.45
COAL	CLRN	Dull clarain; thinly laminated with common 1 mm vitrain bands; pyritized fusains common near top and base; (described by Bill Grady in lab).	0.45	695.90
CLST	ROOT	Dark gray-to-black in top 0.04'; medium gray below, becoming lighter with depth; occasional slickensides; soft crumbly zone from 697 to 697.30'; gradational lower contact with increased bedding; (sampled top 0.31' with coal above).	2.85	698.75
SH	ROOT	Medium gray; sub-fissile; many root traces, decreasing to base of unit; fissility increasing to base; sharp lower contact; (sampled basal 0.23' with units below).	4.94	703.69
CLST		Black; bony; gradational base; (described by Bill Grady in lab).	0.10	703.79
COAL	IMP	Impure; bony to bone; thinly laminated; medium density; sharp base; (described by Bill Grady in lab).	0.12	703.91
COAL	CLRN	Bright clarain; soft; few pyritized fusains; (described by Bill Grady in lab).	0.50	704.41
COAL	CLRN	Dull clarain; thinly laminated; (described by Bill Grady in lab).	0.06	704.47
COAL	IMP	Impure; bony to bone; abundant 1mm megaspores; gradational top and bottom; (described by Bill Grady in lab).	0.05	704.52
COAL	CLRN	Dull clarain; sharp base; (described by Bill Grady in lab). Base of Quakertown coal zone.	0.08	704.60
CLST	ROOT	Dark gray-to-black in top 0.50', dark gray-brown below; bony in top 0.04'; rooted in top 0.29'; black band at 705.65'; badly broken in base; (sampled top 0.29' with coal above).	1.45	706.05
NR	CORE LOSS	Core loss in soft zone of claystone.	0.50	706.55
SH	ROOT	Dark gray-to-black; slickensides; sharp lower contact.	0.33	706.88

COAL	IMP	Dull; shaly; sharp lower contact; (not sampled).	0.12	707.00
CLST	ROOT	Medium gray-brown; abundant root traces; gradational lower contact.	2.63	709.63
SH	ROOT	Medium-to-dark gray; sub-fissile; common root traces; silty to base; sharp lower contact.	1.72	711.35
SS	SH INBD	Light gray, very fine grained, ripple laminated with interlaminated gray shale; sharp lower contact.	2.54	713.89
SS	QTZ	Light gray-to-white; very coarse grained; clean; irregular lower contact.	0.19	714.08
SH	SS STR	Medium gray with thin, very fine grained, rippled sandstone laminations and streaks; some roots; angular, sharp lower contact.	0.68	714.76
SS		Light gray-to-white; interlaminated fine grained, dirty sandstone from 0.01 to 0.06' thick and fine-to-medium grained quartzose sandstone of similar thickness; few minor dark gray shale laminations; sharp lower contact.	2.06	716.82
SS	SH INBD	Light gray, fine grained, dirty sandstone with 4 medium gray shale laminations up to 0.03' thick; sharp lower contact.	0.43	717.25
SS	QTZ	Light gray; coarse-to-very coarse grained; mostly quartz grains with occasional rock grain, dark mineral, or organic grain; sharp lower contact.	3.32	720.57
SH		Medium gray; a thin band; sharp lower contact.	0.06	720.63
SS		Light gray; fine grained; sharp lower contact.	0.26	720.89
SH	SS STR	Medium gray with light gray, fine grained, rippled sandstone streaks; sharp lower contact.	0.20	721.09
SS	QTZ	Light gray; coarse-to-very coarse grained; planar-to-planar cross laminated; medium gray shale clasts from 721.77 to 722.15'; sharp lower contact.	1.97	723.06
SH		Medium gray; sharp lower contact.	0.10	723.16
SS	QTZ	Light gray; mostly fining up planar cross laminations from coarse-to-very coarse to fine-to-medium grained; laminations are 0.01 to 0.10' thick; especially regular form 735 to 742'; occasional stylolite; very coarse grained to conglomeratic from 744.07 to 745.07'; sharp lower contact.	23.24	746.40

CGL	QTZ PBL	Light gray; close packed sub-round quartz pebbles up to 10mm long; some rock grains, shale clasts; quite clean; sharp lower contact.	2.40	748.80
SS	QTZ	Light gray; medium grained at base fining up to fine grained; few dark minerals; some brownish stain or cement; few stylolites; angular, sharp lower contact.	2.15	750.95
SH	SS STR	Medium gray; light gray, very fine grained, rippled sandstone streaks, decreasing to base; gradational lower contact at basal sandstone streak.	1.31	752.26
SH	SLTY	Medium gray; no fossils found; irregular, high angle, sharp lower contact.	1.55	753.81
SH	SS INBD	Medium gray; silty; sandy; irregular streaks and lenses of light gray, very fine grained, rippled sandstone; sharp lower contact.	2.38	756.19
SS	SH CLS	Light gray; fine grained; common, fine, medium gray shale clasts; sharp lower contact.	0.11	756.30
SH		Dark gray-to-black; sharp lower contact.	0.05	756.35
SH		Medium gray; one sandstone streak at top; sharp lower contact.	0.18	756.53
SS	SH CLS	Light gray; very fine grained; abundant, fine-to-coarse, subangular, medium gray shale clasts; sharp lower contact.	0.43	756.96
SS	QTZ	Light gray; fine-to-medium grained; few rock grains; mostly quartz; large coal clast at 761.30'; sharp lower contact.	4.92	761.88
SS		Light gray; fine grained; about 85-90% quartz; some mica and dark minerals; sharp lower contact.	1.64	763.52
SS	QTZ	Light gray, borderline quartzose; few stylolites; mostly planar cross laminated; fine-to-medium grained; high angle, sharp lower contact.	6.65	770.17
SS	COAL STR	Light gray; medium grained; fairly clean; abundant coal streaks; irregular, sharp lower contact.	0.91	771.08
SH		Medium gray; poorly bedded; some slickensides; broken by drilling; coal clast at 771.30'; irregular, high angle, sharp lower contact.	2.09	773.17
SH	SS STR	Medium gray; silty; faint, very fine grained, rippled sandstone streaks, some showing micro-slumping; sharp lower contact.	2.10	775.27
SS	SH CLS	Light gray-to-white; clean quartz sand with abundant, medium gray shale clasts and streaks;	0.38	775.65

		few coal streaks; high angle, sharp lower contact.		
SH	SS STR	Medium gray with one sandstone lens; part of two overlying units; sharp lower contact.	0.22	775.87
SS	FEST INCL	Light gray; fine-to-medium grained; coal spars and streaks and rounded siderite nodules in base; high angle, sharp lower contact.	0.53	776.40
SS		Light gray; planar cross inter laminations of fine grained, dirty sandstone and medium grained, cleaner quartzose sandstone; sharp lower contact.	1.18	777.58
SH	SS STR	Medium gray; very fine grained, rippled sandstone/siltstone streaks; sharp lower contact.	0.14	777.72
SS	XBD	Light gray; fine grained; common dark minerals; occasional mica; few cleaner laminae from 781.15 to 782.00'; few coaly streaks from 781.80 to 782.20'; sharp lower contact.	5.51	783.23
SS	XBD	Light gray; distinct planar cross laminations of fine grained, cleaner sand at base, grading up to very fine grained, dirty sand and capped by mica, varying in thickness from 0.02 to 0.10' thick; flat, sharp lower contact.	4.67	787.90
SH	SDY	Medium gray.	0.13	788.03
SS	XBD	Like unit at 787.90 only overall cleaner; abundant mica in basal 0.15'; angular, sharp lower contact.	4.84	792.87
SS	QTZ	Light gray, medium grained; frosty cement; few dark minerals; few stylolites; coaly streaks from 795.27' to base; sharp lower contact.	3.58	796.45
SS	FEST INCL	Light gray; fine-to-medium grained; abundant, medium gray shale clasts and streaks; common siderite pebbles in basal 0.55' (channel lag); sharp lower contact.	0.93	797.38
SH		Medium gray; poorly bedded; large, faint siderite nodules from 798.50 to 799.30'; siderite nodules and shale clasts mixed with sand from 799.15 to 799.35'; highly irregular (slumped?), sharp lower contact.	3.89	801.27
SS		Light gray; fine grained; micaceous; dark minerals; faint ripple laminations; high angle, sharp lower contact.	1.10	802.37
SS		Light gray; medium grained; ripple laminated; moderately clean with abundant, wispy mica streaks; sharp lower contact.	3.54	805.91
SS		Light gray; fine grained; micaceous; dark minerals; planar cross laminated; irregular, sharp	0.71	806.62

lower contact.

SS		Light gray-to-white; fine-to-medium grained; coaly streaks in top 0.15'; shaly streaks and clasts throughout; fine-to-medium siderite nodules/pebbles in basal 0.15'; sharp lower contact.	0.73	807.35
SS		Light gray; medium grained at base fining up to fine grained; more quartzose to base, dirty in the top; planar-to-ripple laminated; sharp lower contact.	2.45	809.80
SH		Medium gray; uniform; thin, very fine grained, light gray sandstone streaks and wisps, decreasing below 816'; few 2-3 mm horizontal burrows(?); micaceous; no plant or invertebrate fossils seen; large, light gray siderite nodular zone from 817.00 to 817.70'; common pyrite streaks and 1mm to 1cm pyrite nodules that appear to fill vertical burrows or roots in basal 0.20'; abundant pyrite nodules in base; silty to base; sharp lower contact; (sampled basal 0.20' with coal below).	10.40	820.20
COAL	CLRN	Top of Coalburg(?) coal. Bright clarain; soft; (described by Bill Grady in lab).	0.06	820.26
COAL	FS	Fusain; soft; partly pyritized; lenticular; (described by Bill Grady in lab).	0.06	820.32
COAL	IMP	Impure; bony; interlaminated durain and vitrain bands; gradational base; (described by Bill Grady in lab).	0.15	820.47
COAL		Durain; splinty; hard; non-banded; high density; conchoidal fracture; disseminated pyrite (yellow sulfates on core) in lower 0.03'; sharp base; (described by Bill Grady in lab).	0.12	820.59
COAL	CLRN	Bright clarain; soft; minor pyritized fusains; (described by Bill Grady in lab).	1.16	821.75
COAL	FS	Fusain; pyritized; thickness variable (0.02-0.04'); top and bottom very irregular; (described by Bill Grady in lab).	0.02	821.77
COAL	CLRN	Bright clarain; common pyritized fusain bands; common disseminated pyrite; (sulfates on core) (described by Bill Grady in lab).	0.19	821.96
COAL	FS	Fusain; partly pyritized; (described by Bill Grady in lab).	0.03	821.99
COAL	CLRN	Bright clarain; common thin pyritized fusains; (described by Bill Grady in lab).	0.13	822.12

COAL		Durain; fine attrital matrix; very small angular vitrain fragments; medium density; conchoidal fracture; sharp base; (described by Bill Grady in lab).	0.55	822.67
COAL	IMP	Dull clarain; bony; very thinly laminated; (described by Bill Grady in lab).	0.14	822.81
COAL	CLRN	Bright clarain; abundant pyritized fusains; (described by Bill Grady in lab).	0.03	822.84
COAL		Durain; fine attrital matrix; common very small vitrain fragments; minor 1mm vitrain bands; medium density; common pyrite lenses at top; sharp base; (described by Bill Grady in lab).	0.23	823.07
COAL	CLRN	Bright clarain; many small pyritized fusains; (described by Bill Grady in lab).	0.11	823.18
PYR		Pyrite and pyritized fusains; irregular top and bottom; (described by Bill Grady in lab).	0.03	823.21
COAL	CLRN	Dull clarain; abundant disseminated pyrite; (described by Bill Grady in lab).	0.08	823.29
COAL	CLRN	Dull clarain; very thinly laminated; sharp irregular base; (described by Bill Grady in lab).	0.12	823.41
SH	BLK	Black; top part fusain mineralized with clays; lenticular; sharp base; (described by Bill Grady in lab).	0.05	823.46
COAL	CLRN	Bright clarain; minor small pyritized fusain lenses; sharp base; (described by Bill Grady in lab).	0.10	823.56
COAL	CLRN	Dull clarain; very thinly laminated; pyrite lenses in calamite imprint on base; (described by Bill Grady in lab).	0.09	823.65
SH		Dark gray; lenticular; large calamite imprints; sharp base; (described by Bill Grady in lab).	0.01	823.66
COAL	CLRN	Dull clarain; thinly laminated; sharp base; (described by Bill Grady in lab).	0.05	823.71
BN		Stem imprints; sharp base; (described by Bill Grady in lab).	0.03	823.74
COAL	CLRN	Dull clarain; bony; very thinly laminated; base sharp but irregular on large stigmara; (described by Bill Grady in lab). Base of Coalburg(?) coal.	0.02	823.76
SH		Medium gray-to-black; lightly rooted; very soft; 20-30% irregular bony coal bands in top 0.10'; broken from 823.80 to 824.00'; sharp lower	0.97	824.73

contact; (sampled top 0.10' with coal above).

SS		Light gray; coarse grained at base fining upward to fine grained; dirty; micaceous; faintly ripple laminated in top, ripple-to-planar cross laminated in base; sharp lower contact on grain size.	10.72	835.45
SS		Light gray; fine grained; abundant mica; dark minerals; ripple-to-ripple cross laminated; few medium gray shale clasts from 843.50 to 844.00'; becoming quartzose from 845.77' to base; sharp lower contact on composition.	16.27	851.72
SS	QTZ	Light gray; medium grained; massive from top to 854.55'; distinct planar cross laminations bounded by mica or dark minerals from 854.55' to base; laminations vary from 0.01' to 0.06' thick; low angle, sharp lower contact.	5.62	857.34
SS	COAL CLS	Light gray; fine-to-medium grained; few coal clasts and streaks; minor, medium gray shale streaks; micaceous; dark minerals; some quartz-rich zones; sharp lower contact.	1.13	858.47
SS		Light gray; fine grained; micaceous; coal streaks from 859.16 to 860.00'.	1.53	860.00
SS		Light gray; fine grained; micaceous; faint, low angle ripple cross laminations; few minor shale clasts and coal streaks below 862.50'; low angle, sharp lower contact on composition and grain size.	4.61	864.61
SS	COAL STR	Light gray; fine-to-medium grained; less micaceous; coal streaks from 865 to 865.26' and from 866.23' to base; sharp lower contact at basal coal streak.	2.99	867.60
SS		Light gray; fine-to-medium grained; ripple cross laminated in top; faint ripple laminations to base; few minor, fine, medium gray shale clasts from 872.70' to base and more concentrated with one large clast from 873.70 to 873.88'; sharp lower contact.	8.37	875.97
SH	SS STR	Medium-to-dark gray; abundant, inclined, light gray, very fine grained, thin (most <3 mm), rippled sandstone streaks; few burrows(?) at about 877.35'; micro-faulting from around 879 to 879.40'; micaceous; occasional organic streaks; high angle, sharp lower contact.	8.97	884.94
SH		Medium gray; breaks on an angle; occasional slickensides; no fossils seen; sharp lower contact.	3.96	888.90
CLST	ROOT	Dark gray from top to 891'; light to medium gray-brown below 891'; badly broken by drilling in	5.50	894.40

		zones; abundant slickensides; common roots; (plugged off in this interval, pulled run short).		
SH	SS STR	Medium gray; inclined, light gray, very fine grained, thin (max 0.03'), rippled sandstone streaks; some micro-faulting; some burrows; sharp lower contact.	7.60	902.00
SH		Dark gray-to-black; broken; slickensides; few sandstone lenses.	0.65	902.65
SS	SH INBD	Light gray; fine grained; clean, approaching quartzose; thin beds up to 0.50' thick and streaks with interlaminated medium-to-dark gray shale streaks to beds up to 0.20'; zones are bioturbated, possibly burrowed; gas shows in all sandstone zones; zone of wedging lens of shale/siderite pebbles from 908.20 to 908.30'; high angle, irregular, sharp lower contact. Base of Pennsylvanian.	6.01	908.66
MDST		Top of Mississippian. Medium gray with slight greenish tint; badly broken; loss in base.	0.69	909.35
NR	CORE LOSS	Loss at end of run in unit above.	0.15	909.50
NR	CORE LOSS	Loss at top of run.	0.40	909.90
MDST		Medium green-gray; faint dark streaks (roots?); few slickensides; gradational lower contact on color change.	1.80	911.70
SH		Light gray-green; poorly bedded; sideritic nodules and masses from 913.00 to 913.90'; sandy streaks around 915'; light gray-brown mottles and bands (not siderite) from 915.65 to 917.80'; siderite band at 918.25'; few dark gray-to-black streaks from 918.73 to 919.20'; gradational lower contact on color change.	7.51	919.21
MDST		Medium gray-green; slickensides; silty; gradational lower contact on color, bedding change.	1.07	920.28
SH	RED	Red with light gray-green mottles and zones of light gray-green; poorly bedded, especially in top 1.50'; gradational lower contact.	7.22	927.50
SLST		Light gray-green; shaly; sandy in top 0.80'; gradational lower contact.	2.73	930.23
SH	RED	Predominately red with light gray-green streaks and bands; large gray-brown sideritic mass from 933.05 to 933.36'; sharp lower contact.	3.77	934.00

SS		Light gray to light gray-green; very fine grained; silty; ripple laminated; abundant accessory minerals; fine pyrite; sharp lower contact.	1.93	935.93
MDST		Medium gray-green; few slickensides; few, faint, coarse, red mottles in basal 0.20'; gradational lower contact on color change.	1.07	937.00
MDST	RED	Nearly solid red with few, faint, very fine, light gray-green fragments and streaks; calcareous nodules starting at 939'; gradational lower contact on color change.	2.46	939.46
SLST	CALC INCL	Light gray-green; many, fine, distinct, light gray, calcareous nodules and streaks, especially in top half; sandy; gradational lower contact on color and lithology change.	1.34	940.80
SH	MOT	Equal areas of red and light gray-green mottles; common light gray and red calcareous nodules; poorly bedded; gradational lower contact on color change.	2.81	943.61
SH		Light gray-green; few silty streaks; poorly bedded; gradational lower contact on color and lithology change.	2.51	946.12
SH	CALC INCL	Predominately light gray-green; coarse, distinct, red mottles near top and base; common, medium, distinct, light gray-red calcareous nodules throughout; sharp lower contact on color change.	2.49	948.61
SH	RED	Solid red; poorly bedded; few, faint, medium, gray-red calcareous nodules to end-of-run.	0.61	949.22
NR	CORE LOSS	Reportedly slipped from barrel on last run, to TD = 950'.	0.78	950.00

POINT ID: 307-098
 QUAD: MUD (7.5')
 COUNTY: BOONE

COMMENT: HOBET #21 MINE

ST PLANE E: 1747400.0 UTME: 423030.62 LATITUDE: 38.11900
 ST PLANE N: 408650.0 UTMN: 4219175.58 LONGITUDE: -81.87806

ELEVATION: 1440.00 TOTAL DEPTH: 753.00 DATE: 08/04/2003
 GEOLOGIST: JAMES BRITTON

NOTES: Geologist core drilled on Arch Mineral's Hobet Mining Inc. surface mine on a ridge approximately 1500 feet north of the Hobet 21 main office between Bragg Fork and right fork of Long Branch, Scott district, Mud (7.5') quad, Boone County, West Virginia.

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		Rotary drilled to 23.00', cased to 21.00'.	23.00	23.00
SS		Medium grained, gray, very occasional very thin coal streaks, locally orange iron stained, 15 degree planar cross beds, sharp lower contact on grain size.	2.46	25.46
SS		Fine grained, gray with abundant dark gray to black mineral streaks, very low angle bedding to flat planar bedding, sharp lower contact on color.	2.29	27.75
SS		Fine grained, orange, very iron stained, bedding obscured by stains, sharp lower contact on color.	1.15	28.90
SS		Fine grained, gray, flat planar bedding, abundant dark mineral streaks, sharp lower contact on color.	3.77	32.67
SS		Fine grained, orange, as above but very iron stained.	0.11	32.78
CLST		Brown gray and orange, very soft, broken, locally slightly silty, this interval is very broken and appears to be much more than the measured thickness, sharp lower contact on lithology.	3.02	35.80
SS		Fine to medium grained, gray, stained orange, poorly bedded, sharp lower contact on color.	0.46	36.26

SS	Medium grained, gray, 15 degree planar cross beds, lithic, occasional thin dark mineral streaks, sharp lower contact on color.	1.14	37.40
SS	Medium to coarse grained, orange, very poorly cemented, very lithic, bedding obscured by iron stains, coarse grained to base, angular sharp lower contact on grain size and color.	2.50	39.90
SS	Medium grained, gray brown with orange staining, occasional mineral streaks, fractured at 41.20' - 43.00', sharp lower contact on color.	3.41	43.31
SS	Fine grained top grades to medium and coarse grained at base, very iron stained orange, very poorly cemented, bedding obscured by stains, gradational lower contact mixed with lower unit at base.	7.96	51.27
SS	Medium coarse grained, gray stained slightly orange in upper 1.50', large high angle fracture at 52.00', coal streak at 52.50', occasional very coarse grained pebbles to 0.01', faint planar bedding, sharp lower contact on lithology and color.	7.52	58.79
SS	Very coarse grained, gray with abundant coal streaks to 0.03' and quartz pebbles, nonbedded, sharp lower contact on lithology.	1.10	59.89
SS	Medium grained, gray, nonbedded, occasional coarse grained or larger quartz pebbles below 62.00', faintly bedded 63.75' to base, dark mineral streaks especially 64.07' - 65.75', abundant coal rip-ups 67.58' to base, sharp lower contact on lithology.	9.14	69.03
COAL		0.12	69.15
SS	Fine grained, gray, grades to very fine grained at base, low angle planar bedding, sharp lower contact on lithology and grain size.	3.32	72.47
SS	Fine to medium grained, gray, various sequences of fine - medium - fine - medium grained throughout about 1.00' thick, faintly low angle bedded, occasional dark mineral streaks especially 81.20' - 83.40', sharp lower contact on lithology.	10.93	83.40
SS	Fine to medium grained, gray with faint low angle cross beds, very occasional very thin coaly wisps, occasional mica rich streaks especially to base, sharp lower contact on lithology.	9.36	92.76
SS	Medium grained, gray, lithic coal streaks, abundant tan and brown slightly angular to rounded	2.27	95.03

shale pebbles, sharp lower contact.

SS		Fine to medium grained, gray with abundant coal streaks to 0.02' and less, coal wisps throughout, very faint low angle bedding, occasional shale pebbles 99.60' - 100.00', sharp lower contact on lithology.	6.33	101.36
SS		Fine grained, gray, very occasional small coal clasts, nonbedded, arbitrary lower contact.	1.64	103.00
SS		Fine grained, gray, low angle bedding, occasional very thin coal streaks, fractured 104.45' with iron staining on fracture surface, abundant soft shale clasts 104.60' - 105.00' some of which are washed out during drilling, also remnant tan very soft pebbles, increasingly coaly streaks 104.90' - 105.25', mineral rich streaks to base, sharp lower contact on lithology.	2.80	105.80
CLST		Gray, slickensides, with sandy top and base, occasional coal streaks, soft, mixed with fine grained sandstone above, sharp lower contact on lithology.	0.66	106.46
SS	COAL STR	Fine grained, light gray, more mixed than bedded, lithic, sharp lower contact on lithology.	0.51	106.97
SS		Fine to medium grained, gray to light gray, planar cross laminations to about 15 degrees, occasional coal streaks at about 112.50', locally abundant mineral rich streaks, very abundant angular shale rip-ups, light green and tan 112.60' - 112.90', angular and sharp lower contact.	6.18	113.15
SS		Fine grained, gray, low angle bedding at about 10 degrees, locally abundant mineral rich streaks, sharp lower contact on grain size.	2.15	115.30
SS		Very fine grained, gray, grades to fine - medium grained at base, low angle planar cross beds throughout, sharp and angular lower contact on color.	3.31	118.61
SS		Very fine grained, gray, stained orange, sharp lower contact on color.	1.51	120.12
SS		Fine to medium grained, gray, low angle bedding throughout, coaly and mineral rich streaks 124.80' - 128.20', very faintly bedded to base, sharp lower contact on lithology.	17.38	137.50
COAL		7 BLOCK MAIN SEAM	5.02	142.52
CLST		Dark gray to black, rooted, very well developed slickensides, coalified plant fragments, sharp lower contact on lithology.	2.71	145.23

SLST		Medium gray, with very fine coaly streaks, sharp lower contact on lithology.	0.16	145.39
SH		Very dark gray, slightly silty streaks, occasional poorly preserved plant debris, sharp lower contact on lithology.	0.68	146.07
SH	SLTY	Medium dark gray, very occasional poorly preserved plant debris, sharp lower contact on lithology.	6.18	152.25
SH	BLK		0.11	152.36
COAL			0.21	152.57
MDST	ROOT	Medium dark gray.	1.18	153.75
SH	CARB	Black	0.08	153.83
COAL			0.09	153.92
SH		Dark gray.	0.25	154.17
SH	BLK		0.18	154.35
COAL		6 BLOCK MAIN SEAM	1.16	155.51
CLST		Black, coal streaks.	0.07	155.58
SS		Fine grained grades to very fine grained sand at top, abundant coal streaks at top, sharp lower contact on lithology.	0.30	155.88
SH	CARB	Black with coal streaks.	0.05	155.93
SS		Fine grained, very dirty with abundant organic rich streaks to top, sharp lower contact on lithology.	0.07	156.00
SS		Fine to medium grained, gray, poorly bedded, shale wisps, lithic grains, locally micaceous, low angle bedding to base, base sharp on grain size.	5.08	161.08
SS		Fine grained, gray with abundant mica rich streaks throughout, occasional coaly streaks, sharp lower contact on grain size.	0.52	161.60
SS		Medium grained, gray, nonbedded top to 163.00', low angle planar bedding to base, abundant thin mineral rich streaks throughout, locally abundant mica, occasional thin coaly wisps and streaks, sharp lower contact on lithology.	8.52	170.12
SH		Dark gray, with abundant softer clayey streaks, slightly silty in top 0.20', tan clayey blebs 172.20' - 172.80', slightly rooted, occasional	3.15	173.27

poorly preserved plant debris.

SS		Medium grained, light gray, upper 0.50' is very lithic with shale pebbles, coal streaks and wisps, also mixed with shale above, coal streaks at 173.72' - 174.15', small coal clasts throughout from 174.00' to base, sharp and angular lower contact on lithology.	3.28	176.55
COAL			0.18	176.73
SS	SH INBD	Gray to medium gray, fine grained, all is mixed, also coal streaks, sharp lower contact on grain size and lithology.	0.27	177.00
SS		Medium grained, gray to light gray, very faintly bedded, coal streaks below 178.85' to base, up to 0.02' thick, few elongate shale clasts in lower 0.40', sharp lower contact on grain size.	2.97	179.97
SS		Fine grained, gray, largely nonbedded, occasional mineral wisps, sharp lower contact on lithology.	4.83	184.80
SS		Fine to medium grained, gray, 15 degree bedding with abundant shale rip-ups, mineral rich streaks, sharp lower contact on lithology.	0.34	185.14
SS		Fine to medium grained, gray with locally abundant scattered mineral rich streaks, coaly wisps, large 0.06' x 0.15' dark gray, angular shale rip-ups in basal 0.40', sharp lower contact on lithology.	3.47	188.61
SS		Fine to medium grained, gray with abundant scattered thin coal streaks, wisps, and clasts throughout, very poorly bedded, very occasional rounded shale pebbles, basal 0.50' is very lithic, sharp lower contact on lithology and grain size, calcareous 190.45' - 193.00'.	4.82	193.43
SS		Coarse grained, gray, nonbedded, few scattered fine coal clasts throughout, sharp lower contact on lithology.	2.59	196.02
SS		Medium to coarse grained with abundant scattered coal streaks less than 0.01', and wisps, nonbedded with tan-brown rounded to subangular 0.03' x 0.05' shale lag at base, sharp on lithology.	1.70	197.72
SS		Medium to coarse grained, gray, nonbedded, sharp lower contact on lithology.	2.38	200.10
COAL			0.20	200.30
SS	SH PBL	Shale pebble conglomerate, sand is very fine to fine grained gray with abundant large rounded to subangular brown, tan and gray shale pebbles throughout, also coal streaks, sharp lower contact	0.68	200.98

		on lithology.		
CLST		Medium gray.	0.96	201.94
CLST		Slightly silty, medium gray, occasional light gray ripple beds, gradational lower contact, occasional plant fragments, occasional slickensides to base.	1.06	203.00
SLST	SDY	Medium gray to gray with gray streaks, occasional dark mineral streaks, low angle to 20 degree bedding, increasing shale to base, sharp lower contact on lithology.	1.00	204.00
SS		Fine grained, gray with abundant mixing of silt and shale of above unit, perhaps exhibits soft sediment deformation, 1 brown subrounded shale pebble in center, sharp lower contact on lithology.	0.60	204.60
SS		Fine to medium grained, gray with very faint cross beds, occasional mica concentrated in streaks, few, angular, scattered dark gray shale pebbles in upper 0.40', sharp lower contact on lithology.	1.18	205.78
SS	CALC	Light gray, fine grained, planar cross laminations at about 25 degrees, very few scattered mineral streaks and shaley wisps, sharp lower contact on lithology.	3.77	209.55
SS	COAL STR	Fine grained, gray with abundant coal streaks to 0.02', faint low angle bedding, sharp lower contact on lithology.	2.36	211.91
COAL			0.24	212.15
CLST	ROOT	Black, coal streaks, sharp lower contact on color.	0.06	212.21
CLST		Very dark gray, slickensides, 1 very thin coal streaks, sharp lower contact on lithology.	0.32	212.53
CLST		Medium gray with scattered siderite nodules to 0.10', rooted at top, slickensides, sharp lower contact on lithology.	1.84	214.37
SH		Medium gray, siderite nodules and streaks to 0.10', abundant poorly preserved plant fragments, few very well preserved fossils, 1 siderite nodule with an interesting fossil like 'ornamentation', sharp lower contact on lithology.	9.03	223.40
SS		Fine grained, light gray with abundant shaley and silty streaks top and bottom, ripples to center, gradational lower contact on lithology.	1.58	224.98
SS	SH STR	Medium grained with light gray to gray, very fine grained sandstone streaks, ripples to base, sharp lower contact on lithology.	2.40	227.38

SH		Dark gray.	1.02	228.40
SH	BLK		0.08	228.48
COAL		5 BLOCK MAIN SEAM	3.88	232.36
CLST	ROOT	Dark gray, slickensides.	0.91	233.27
SH		Medium gray, siderite nodules throughout, slickensides, roots, pyritized plant debris, coalified plant fragments, well preserved plant fossils around 238.00'.	7.68	240.95
SH	COAL STR	Black.	0.90	241.85
SH		Dark gray to black, scattered plant debris, gradational lower contact.	1.25	243.10
SLST		Dark gray, sharp lower contact on lithology.	1.78	244.88
SS	SH INBD	Sand is fine grained gray, lithic with locally abundant thin coaly streaks, shale rip-ups and streaks, and mineral rich streaks, shale is medium gray with silty streaks, gradational lower contact.	2.80	247.68
SS	SH STR	Sandstone is fine grained, gray, very lithic with abundant coal clasts, very abundant elongate, angular shale rip-ups, possible vertical burrows or sediment fluid flow at 249.50', sharp lower contact on lithology, rippled locally.	11.23	258.91
SH		Medium gray with occasional silty and sandy streaks, scattered poorly preserved plant material, sharp lower contact on lithology.	0.69	259.60
SS		Medium grained, gray with few small, scattered coal and shale clasts and coaly wisps, faint low angle bedding to nonbedded, sharp lower contact on lithology.	2.14	261.74
SH		Dark gray, sharp lower contact on lithology, very few scattered pieces of plant material.	0.30	262.04
SS		Fine to medium grained, gray, nonbedded top to 263.00', very lithic with abundant very dark shale streaks 263.00' - 264.00', low angle planar bedding 265.30', sharp lower contact on grain size.	3.36	265.40
SS		Medium grained, gray, faint planar bedding, mineral rich streaks 268.60' - 270.00', fine grained below 269.00', coal clasts 273.20' to base, basal shale pebble lag of brown, rounded pebbles up to 0.06' x 0.03', occasional well preserved plant fossils at top, sharp lower	9.67	275.07

		contact on lithology.		
SH		Dark gray, locally soft, slickensides, slightly rooted, occasional plant debris, increasingly silty and harder to base, base sharp on lithology.	7.06	282.13
SH	FOSS	Dark gray, very few fossils observed but the first one seen at 282.13, slightly silty with bioturbation, grades to siltstone at base, siderite blebs at 286.00' sharp lower contact on lithology.	7.50	289.63
SS	CALC	Gray with abundant lithic material, siderite nodules, high angle bedding, angular sharp lower contact on lithology, roots.	1.22	290.85
SH		Medium dark gray, siderite nodules, slickensides, abundant plant material, increasingly clayey below 307.00' and slightly darker, gradational lower contact on color.	23.01	313.86
SH		Very dark gray, occasional small siderite nodules, sharp lower contact on color.	0.12	313.98
SH	BLK	Sharp lower contact on lithology.	1.02	315.00
COAL			1.32	316.32
CLST		Dark gray to black, slickensides, roots, sharp lower contact on color.	0.28	316.60
SH	ROOT	Medium dark gray, slickensides, some fossil plant fragments to base which increase in quality to base, some coaly plant material, sharp lower contact on lithology.	3.44	320.04
SH	BLK	Coal streaks, sharp lower contact on lithology.	0.12	320.16
CLST	ROOT	Slickensides, medium gray, sharp lower contact on color and lithology.	1.00	321.16
COAL		STOCKTON MAIN SEAM	5.94	327.10
CLST		Dark gray, slightly rooted, slickensides, very broken 328.00' to 329.50', plant root traces, gradational lower contact on lithology.	2.63	329.73
SLST	SH STR	Gray to light gray with medium gray shale streaks, low angle bedding, possible occasional burrows, slickensides, sharp lower contact on lithology.	1.20	330.93
SH		Dark gray, sharp lower contact.	1.01	331.94
SS		Gray, fine grained, few thin scattered, flat and elongate shale rip ups, very fine 5 degree bedding, sharp lower contact on lithology.	0.79	332.73

SLST		Medium gray, flat bedding, sharp lower contact on lithology.	0.35	333.08
SS		Fine grained, gray, scattered thin mineral rich streaks, organic (coaly) streaks, bedding ranges from nearly flat at top to 25 degree base, sharp lower contact on lithology.	7.89	340.97
COAL		COALBURG MAIN SEAM	3.39	344.36
CLST		Black, sharp lower contact.	0.12	344.48
CLST		Dark gray, rooted, some well preserved plant debris.	0.82	345.30
SH	COAL STR	Black, sharp lower contact.	0.60	345.90
COAL			0.50	346.40
CLST		Dark grey, sharp lower contact.	0.10	346.50
COAL			0.15	346.65
CLST		Dark gray, rooted, sharp lower contact.	0.35	347.00
SH		Dark gray, abundant plant material throughout, well preserved leaves. 348.10, sharp lower contact.	3.37	350.37
SH		Very dark gray.	0.19	350.56
COAL		COALBURG LOWER SPLIT 1	3.72	354.28
CLST		Black, rooted, slickensides.	0.20	354.48
CLST	SKS	Dark gray.	0.34	354.82
SH		Medium gray, slightly rooted, sharp lower contact.	1.63	356.45
SS		Fine grained, gray, very lithic, abundant dark gray shale rip-ups.	0.25	356.70
SH		Slightly silty, medium gray, sharp lower contact on lithology.	0.15	356.85
SS		Gray, medium grained, lithic, nonbedded top to 360.30', planar cross beds to 361.50', nonbedded to 363.60', sharp lower contact on lithology.	6.75	363.60
SS		Medium grained, gray, occasional thin coal streaks, locally abundant thin mineral streaks, nonbedded top to faint cross beds to base, gradational lower contact.	4.58	368.18
SS		Medium grained, gray with abundant coal fragments and mica concentrated in a concentric 'roll', soft	0.35	368.53

sediment deformation (?), sharp lower contact on lithology.

SS		Medium grained, gray, largely nonbedded, occasional thin coal streaks especially to top, mica rich streaks to base, gradational lower contact.	7.80	376.33
SS		Medium grained, gray with light gray fine grained streaks to base up to 0.20', thin scattered coal streaks throughout, occasional shale rip-up clasts, poorly bedded at top, cross bedded to base, sharp lower contact on color and grain size, slightly calcareous 381.00' - base.	5.82	382.15
SS		Fine grained, light gray, abundant coal streaks and dark mineral streaks throughout, less coal streaks to base but much thicker (up to 0.04'), large rounded brown shale clast (0.20') at 384.80', increasing shale pebbles and rip-ups to base, faint 20 degree planar bedding to base, base sharp.	3.97	386.12
SS		Medium grained grades to fine grained at base, gray, faint 20 - 30 degree planar cross beds to top, very few, very thin coaly streaks and wisps 387.50' - base, lithic, sharp lower contact on lithology.	3.95	390.07
SH		Medium gray, siderite streaks, occasional well preserved plant fragments and fossils, sharp lower contact on color.	5.18	395.25
SH		Very dark gray to black, abundant coalified plant fragments, sharp lower contact.	0.70	395.95
COAL			0.02	395.97
CLST		Very dark gray.	0.03	396.00
SH		Coal streaks, black.	0.12	396.12
SH		Dark gray.	0.22	396.34
COAL		WINIFREDE MAIN SEAM	0.78	397.12
SH		Dark gray.	0.78	397.90
SH	COAL STR	Very dark gray.	0.27	398.17
COAL			0.80	398.97
COAL	SH STR		0.09	399.06
SH		Dark gray.	0.22	399.28
COAL			0.67	399.95

SH	COAL STR	Claystone, pyrite, mixed.	1.01	400.96
COAL			0.58	401.54
MDST	ROOT	Dark gray with light gray mixed silt, hard, sharp lower contact on lithology.	2.34	403.88
SS		Medium grained, gray, lithic, faint troughs at top to 405.00', soft sediment deformation 408.00 - 410.00' with occasional shale rip-up clasts, low angle cross beds 411.00' - base, base sharp on grain size.	8.99	412.87
SS		Fine grained, gray, lithic, abundant thin mica rich streaks and dark mineral streaks, flat bedded, sharp lower contact on lithology.	4.60	417.47
SS		Fine to medium grained, gray, lithic, with abundant very dark gray mineral and mica streaks from top to 418.00', low angle bedding to base, sharp and angular lower contact on grain size.	3.13	420.60
SS		Medium to coarse grained, light gray, nonbedded, occasional shale rip-ups 423.00', low angle planar beds 423.65' - base, organic rich streaks 424.55' - 424.69', sharp lower contact on lithology.	5.88	426.48
SS		Very fine grained, light gray, hard, 5 degree planar beds, occasional brown mineral streaks throughout, sharp lower contact on lithology.	1.47	427.95
SS	CALC	Very fine grained, light gray, low angle planar beds at about 5 degrees, occasional dark mineral streaks, sharp lower contact on lithology.	0.65	428.60
SS		Medium grained, gray, largely nonbedded with occasional faint cross beds, few, thin, scattered, brown mineral streaks, occasional thin shale streaks 435.20' to end of run, sharp lower contact on lithology.	7.30	435.90
SS		Medium grained, nonbedded, very small, scattered coal wisps and thin mica streaks, sharp lower contact on grain size.	4.96	440.86
SS		Fine to medium grained, gray, abundant mica streaks and dark mineral streaks especially to top and base, planar bedding at around 5 to 10 degrees, occasional shale rip-ups to base, very thin coal streaks 446.50' to base, with increasing shale rip-ups, sharp lower contact on grain size.	6.14	447.00
SS		Fine grained, with abundant brown and dark mineral streaks throughout, low angle to flat planar bedding, sharp lower contact on lithology.	11.13	458.13

SS	COAL STR	Medium grained, gray, with abundant coal streaks throughout and shale rip-ups, basal 0.90' is a coarse grained lag with shale, coal streaks and larger quartz grains, sharp lower contact on lithology.	3.82	461.95
SS		Fine grained, gray with few, small elongate scattered shale clasts, sharp lower contact on lithology.	0.60	462.55
COAL	IMP		0.10	462.65
SS		Medium grained, gray with large 0.04' rounded tan and gray shale pebbles, and occasional coal streaks to base, gradational lower contact on loss of coal streaks.	1.56	464.21
SS		Fine grained, gray, faint low angle bedding at about 10 degrees, occasional scattered brown mineral streaks to base, base sharp on lithology.	2.98	467.19
SS		Fine to medium grained, largely nonbedded, with occasional thin coal streaks and shale pebbles, coal streaks are thinner but more abundant to base, base sharp on lithology.	3.64	470.83
SS		Fine grained, gray with abundant dark gray, angular shale rip-ups decreasing to base, gradational lower contact on loss of shale.	1.15	471.98
SS		Fine grained, gray with faint 10 to 15 degree dark gray and angular shale rip-ups and occasional coal streaks, especially to top, dark mineral streaks to top, gradational lower contact.	3.36	475.34
SS		Fine grained, gray, slightly calcareous to base, low angle planar cross beds, brown mineral stains, sharp lower contact.	2.03	477.37
SS		Fine grained, gray with abundant thin coal streaks and dark mineral streaks throughout, flat bedded, very abundant coal streaks 481.00' - base, sharp lower contact on lithology.	3.96	481.33
SS		Very fine grained, gray with very abundant, angular, dark gray shale rip-ups, nonbedded, sharp lower contact on lithology.	0.74	482.07
SS		Fine grained, gray with dark gray to black mineral streaks and coal streaks, mostly nonbedded, gradational lower contact.	2.85	484.92
SS		Fine grained, gray with abundant dark gray, thin shale streaks, grades to dark gray shale at base with occasional tan shale pebbles, sharp lower contact on lithology.	0.71	485.63

SS	COAL STR	Fine to medium grained, gray, nonbedded, sharp lower contact on lithology.	1.70	487.33
SH		Dark gray, with siderite nodules, sharp lower contact on lithology, slickensides.	0.47	487.80
SS		Fine to medium grained, gray with shale pebbles and thin coal streaks, low angle planar bedding, sharp lower contact on lithology.	4.72	492.52
COAL		CHILTON A MAIN SEAM	0.53	493.05
CLST		Dark gray, rooted, sharp lower contact.	0.10	493.15
SH		Medium dark gray, scattered well preserved plant fossils, roots and slickensides, occasional siderite nodules, increasingly silty to base, base sharp on lithology.	6.10	499.25
SS		Very fine grained, gray, lithic with dark gray shale streaks and very thin coaly wisps, abundant brown mineral streaks to base, base sharp on lithology.	2.19	501.44
SH		Medium gray, occasional siderite nodules and plant fossils, slightly silty to base, gradational lower contact.	6.14	507.58
SH	HD	Dark gray, siderite streaks, sharp lower contact on lithology.	3.18	510.76
SH	BLK	Very clayey, slickensides, sharp lower contact on lithology.	1.97	512.73
SH	FOSS	Black, abundant marine fossils, sharp lower contact on color and lithology.	0.55	513.28
CLST		Medium gray, slickensides, occasional plant fossils, slightly silty and hard to base, gradational lower contact.	3.46	516.74
SH		Dark gray, silty, hard, occasional plant fossils, increasingly silty to base, locally micaceous, sharp lower contact on lithology.	3.63	520.37
SLST		Medium gray to gray with dark gray shale streaks, flat bedding, sharp lower contact on lithology.	0.79	521.16
SS		Very fine to fine grained, low angle 10 degree bedding, abundant dark mineral and shale streaks 522.50' to 523.40', less streaks 523.40' - 525.00', increasingly shaley to base, sharp lower contact on lithology.	5.09	526.25
SS		Fine grained, gray, occasional, few, scattered small elongate shale wisps, especially to base,	2.05	528.30

base sharp on lithology.

SS	SH STR	Fine to medium grained, gray, very lithic, shale streaks are medium gray to dark gray, very few scattered coal streaks, sharp lower contact on lithology.	3.26	531.56
SH	SLTY	Mixed gray, medium gray and dark gray, occasional slickensides, sharp lower contact on lithology.	1.42	532.98
SS		Very fine grained, gray, 10 to 15 degree bedding top to 534.00', fracture filled with calcite at 533.15', sharp lower contact on lithology.	0.90	533.88
SLST	CALC	Gray with a slightly brown tint, very fine grained, bi-directional bedding, sharp lower contact.	3.49	537.37
SS		Very fine grained grades to fine grained at base, gray with abundant dark gray mineral streaks, low angle to flat bedded, slightly rippled, occasional thin coaly streaks, sharp lower contact on grain size.	9.89	547.26
SS		Fine to medium grained, gray with scattered dark mineral streaks, occasional thin coal fragments and shale rip-ups, nonbedded from top to 549.70', low angled planar bedding 549.70' - 550.90', abundant dark gray shale rip-ups 550.90' - 551.06', nonbedded 552.00' - 557.00', flat bedded to very low angle bedding 557.00' - 569.48', non bedded 569.48' - 576.96', brown and gray rounded shale pebble conglomerate channel lag at base, pebbles to 0.15' thick, sharp lower contact on	32.49	579.75
COAL		CHILTON MAIN SEAM	1.93	581.68
CLST		Black, slightly broken at top, grades to brown gray at base, gradational lower contact.	0.05	581.73
CLST		Brown gray, rooted, hard, grades to gray at base, gradational lower contact, occasional siderite nodules, occasional poorly developed slickensides below 584.00'.	2.09	583.82
SH		Medium dark gray, abundant siderite streaks and nodules, occasional poorly preserved plant and fossil fragments and occasional roots, sharp lower contact.	5.33	589.15
SH	BLK	Occasional plant fossils, sharp lower contact.	0.18	589.33
COAL			0.07	589.40
SH		Dark gray, siderite streaks, silty streaks, coaly streaks, occasional plant fossils, locally soft and crumbly, sharp lower contact.	1.24	590.64

SH	BLK	Occasional slickensides, very occasional plant fragments, sharp lower contact on lithology.	0.47	591.11
COAL		LITTLE CHILTON MAIN SEAM	1.65	592.76
CLST		Black, rooted, small slickensides, gradational lower contact.	0.41	593.17
SH		Dark gray, occasional plant fragments, sharp lower contact.	1.81	594.98
SS		Gray with abundant dark gray shale streaks, slightly rippled, possible faint trough bedding, gradational lower contact, locally micaceous, some poorly preserved coalified plant material, sharp lower contact on lithology.	3.96	598.94
SH	SS STR	Dark gray with gray sandy streaks, burrows at 601.30' to base, occasional siderite blebs, some of the burrows are carbonaceous.	8.76	607.70
SH		Very dark gray grades to black at base, sharp lower contact.	2.74	610.44
COAL		FIRE CLAY RIDER MAIN SEAM	0.54	610.98
CLST		Medium gray grades to light medium gray at base, rooted, slickensides.	1.32	612.30
SS	SH INBD	Sand is fine grained, gray with dark mineral streaks and ripples, occasional siderite nodules, shale is dark gray, locally mixed with sand top and base but in units up to 1.50' thick, sharp lower contact on lithology.	5.88	618.18
SS		Fine grained, gray with abundant dark mineral streaks and shale streaks, low angle ripple beds, locally carbonaceous streaks, sharp lower contact.	4.82	623.00
CLST		Medium to medium dark gray with silty streaks to top, siderite streaks, very thin organic rich streaks, coalified plant fragments, increasingly darker to base, top 0.50' is silty enough to be classified as a siltstone, grades to very fine claystone at base, base sharp on color.	1.27	624.27
CLST		Very dark gray, slickensides, sharp lower contact on color.	0.23	624.50
CLST		Medium brown gray, slickensides, sharp lower contact.	0.16	624.66
COAL		FIRE CLAY MAIN SEAM	0.33	624.99
CLST		Medium dark gray, locally silty, especially at top, rooted, sharp lower contact on color.	0.73	625.72

CLST		Dark gray with medium dark gray claystone mixed, sharp lower contact on lithology and color.	0.68	626.40
MDST		Medium dark gray grades to dark gray claystone at base, rooted, nonbedded, slickensides, sharp lower contact on lithology.	0.84	627.24
SLST	BRW	Burrowed, gray with medium dark gray silty and clayey streaks, vertical and horizontal burrows, low angle bedding, sharp lower contact on lithology.	4.51	631.75
SS		Fine to medium grained, gray, upper 1.25' has shale rip-up clasts varying in size from < 0.01' to about 0.08' which are very angular, low angle bedding 633.75' - 636.00' with dark mineral streaks and mica rich zones, nonbedded 636.00' - base, sharp lower contact on lithology.	5.45	637.20
SS	COAL STR	Fine grained, gray with abundant thin coal streaks and occasional small shale clasts, low angle to poorly bedded, sharp lower contact on color.	1.05	638.25
SS		Fine to medium grained, gray with light gray zones and dark mineral streaks, low angle bedding top to 644.00', coal streaks 644.60' - 646.35', dark mineral streaks 646.50' - 649.00', occasional shale rip ups up to 0.10' at 651.60' and 653.00', locally very mica rich, sharp lower contact on lithology.	16.75	655.00
COAL		CEDAR GROVE MAIN SEAM	0.95	655.95
CLST		Medium gray, rooted, slightly silty to base, sharp lower contact on lithology.	0.22	656.17
SLST		Gray at base to medium gray at top, rooted or burrowed, very dirty at top, sharp lower contact on grain size.	2.89	659.06
SS		Fine grained, gray with abundant shale wisps and dark mineral streaks throughout, ripples below 661.00', low angle bedding throughout, burrows 664.00', abundant dark mineral streaks concentrated 667.35' - 670.00', sharp lower contact on grain size.	10.94	670.00
SS		Medium grained, gray, low angle bedding, dark mineral streaks, very dirty 674.67' - 676.40' with occasional angular shale rip-ups, locally very micaceous, calcareous 673.00' - 674.00'.	13.02	683.02
SS		Coarse grained, gray with abundant black mineral streaks, mica rich, low angle bedding, sharp lower contact on lithology.	0.90	683.92

SS		Fine grained, gray, low angle bedding, scattered dark gray and occasional brown mineral streaks, few coaly wisps, sharp lower contact on lithology.	9.23	693.15
SS		Fine to medium grained gray with abundant angular dark gray shale rip-ups up to 0.15', siderite nodules and coal streaks up to 0.06', very dirty, sharp lower contact on lithology.	5.04	698.19
SS		Fine to medium grained, gray, dark gray and brown mineral streaks, coaly streaks, low angle planar bedding, few small angular dark gray shale rip-ups, sharp lower contact on lithology.	2.79	700.98
SS		Fine to medium grained, light gray to gray, low angle planar bedding, occasional small coal spars, coaly wisps, shale rip-ups decreasing to base, sharp lower contact on lithology.	5.32	706.30
SH		Dark gray to black, siderite blebs 706.30' - 706.60', burrows below 726.00', sharp lower contact on lithology.	22.40	728.70
LS	FOSS	Light brown gray, abundant fossils, sharp lower contact on lithology.	0.91	729.61
COAL		WILLIAMSON RIDER MAIN SEAM	0.79	730.40
SH	COAL STR	Black, sharp lower contact on color.	0.26	730.66
SH		Dark gray, occasional plant fragments, sharp lower contact on lithology.	2.50	733.16
COAL		WILLIAMSON MAIN SEAM	0.34	733.50
SH	BLK	Sharp lower contact on color.	0.10	733.60
SLST		Gray with abundant dark gray organic rich streaks, sharp lower contact on lithology.	0.47	734.07
COAL			2.02	736.09
SH	BLK		0.13	736.22
COAL			0.27	736.49
CLST		Medium gray.	0.38	736.87
SLST		Medium gray grades to fine grained, gray sandstone at base, roots or burrows, sharp lower contact.	1.62	738.49
SS	SH INBD	Sand is fine grained, gray, rippled, shale is dark gray, sharp lower contact on lithology.	0.51	739.00
SS		Fine grained, gray, low angle to 30 degree bedding, occasional dark mineral streaks, with increasing dark streaks to base, base sharp on	4.04	743.04

lithology.

SLST	SH STR	Siltstone is medium gray to dark gray with light gray to gray fine grained sandstone streaks, low angle bedding, ripples, decreasing sandstone to base.	9.96	753.00
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POINT ID: 282-026
 QUAD: HEROLD (7.5')
 COUNTY: Braxton

COMMENT: Designated as USGS-8

ST PLANE E: 2070053.0 UTME: 521344.67 LATITUDE: 38.61921
 ST PLANE N: 589701.0 UTMN: 4274342.37 LONGITUDE: -80.75482

ELEVATION: 1524.00 TOTAL DEPTH: 1861.00 DATE: 05/05/2000

NOTES:

Record of WVGES core hole drilled on a ridgetop at the junction of I-79 and US Rt 19 (I-79 exit 57) approximately 850 feet northeast of the centerline of I-79 at the Rt. 19 overpass and approximately 7550 feet east-northeast of the triangulation station (1818 feet) on Coon Knob, Otter District, Braxton County. Drilling contractor: J&S Drilling. Driller: Jim Williams, 0-701', 1381.45-1861'; Steve Rhodes 701-1381.45'. Drilling dates: April 3 to May 5, 2000. Geophysical logging: Marshall Miller, May 8, 2000; Schlumberger, May 9, 2000. Core logged by: Nick Fedorko and Jim Britton, 0-861', 1021-1081'. Jim Britton: 1081-1091', 1640.86-1819'. Nick Fedorko: 861-1021', 1091-1640.86', and 1819-1861'(TD).

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SURF MAT		Rotary drilled and cased to 21'. Later cased to 99'.	21.00	21.00
MDST	RED	Dark gray-red with common, distinct, fine-to-coarse, very strongly calcareous glaebules in a noncalcareous matrix; broken at top; coarse subangular fragments; clear lower contact with color change (paleosol B horizon).	3.90	24.90
MDST	MOT	Light gray-green with many, distinct, coarse, red-gray mottles; many, coarse, very strongly calcareous glaebules; clear lower contact with loss of red mottles (paleosol B horizon).	0.63	25.53
MDST	CALC INCL	Light gray-green with many, distinct, fine-to-coarse, very strongly calcareous glaebules in a noncalcareous matrix; slightly bedded; iron stains on joint faces; gradual lower contact with increasing silt and sand (paleosol B and BC horizons).	4.02	29.55
SLST		Light gray-green; broken by drilling; abundant iron stains and calcite crystals on near-vertical joints; sandy streaks from 33.30' to 33.80'; few, medium-to-coarse, strongly calcareous glaebules from 31.60' to 34.65'; many strongly calcareous glaebules from 34.65' to base; abrupt lower contact.	6.60	36.15
SH	MOT	Interbedded gray-red and light gray-green; few, faint, coarse, light gray-green mottles in the red zones; few, faint, coarse, red mottles in the light gray-green zones; few, faint, very thin, calcareous streaks down to 38.00'; clear lower contact.	4.08	40.23
SLST		Light gray-green; clear lower contact.	1.07	41.30
SH	RED	Interbedded red and light gray; poorly bedded; clear lower contact.	3.38	44.68
MDST	RED	Medium gray-red to 47.00'; red with common,	13.42	58.10

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		distinct, fine-to-coarse, light gray and olive mottles from 47.00' to base; light gray-green mottles in basal 1.0'; common slickensides throughout; few, faint, medium, calcareous glaebules in basal 2.00'; abrupt lower contact (paleosol B horizon).		
SLST	SDY	Light gray-green; few, faint, coarse, calcareous glaebules in top 0.20'.	2.90	61.00
NR	CORE LOSS		2.00	63.00
MDST	RED	Core loss in top of this unit; badly broken by drilling to 64.90'; common, distinct, coarse, light gray-green mottles in broken pieces to 64.90'; common slickensides; mostly solid red with few, faint, fine, light gray streaks below 64.90'; few, faint, fine-to-medium, calcareous glaebules below 64.90'; badly broken at end-of-run with core loss.	7.30	70.30
NR	CORE LOSS		0.65	70.95
MDST	RED	Same as unit above core loss below 64.90'; clear lower contact on color change (paleosol B horizon).	3.12	74.07
MDST	MOT	Equal areas of many, distinct, coarse, red, medium gray-green, and olive mottles; gradual lower contact to shale below [paleosol BC horizon].	1.38	75.45
SH		Light gray-green; clayey, with sandy zone from 76.65' to 77.35'; few, faint, coarse, calcareous glaebules in basal 0.60'; common, coarse, red mottles in basal 0.60'; gradual lower contact with color change.	2.50	77.95
SH	RED	Poorly bedded; few, faint, medium, calcareous glaebules; clear lower contact with color change.	5.17	83.12
SH	SS STR	Light gray-green, with fine grained, light gray, sandstone streaks; clear lower contact with loss of sandstone streaks.	1.98	85.10
SH	CALC INCL	Few, distinct, fine-to-coarse, strongly calcareous glaebules; abrupt lower contact on color change.	1.90	87.00
SH	RED	Few, faint, fine, calcareous glaebules in top 0.50'; clear lower contact with loss of bedding.	4.10	91.10
SH		Light gray-green with common, distinct, coarse, red mottles; poorly bedded; few, distinct, coarse, red, calcareous nodules; abrupt lower contact on color change.	3.50	94.60
MDST	RED	Red with common, distinct, thin, light gray streaks (root traces?) and mottles, many from 98 to 100'; many slickensides; lighter red in basal 1.50'; diffuse lower contact with color change [paleosol B horizon].	11.06	105.66
SLST	SS INBD	Medium gray-green; light gray-green sandstone	10.27	115.93

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		streaks, very fine grained; occasional thin shale zones; abrupt lower contact.		
SS		Very fine grained; light-to-medium gray-green; ripple bedding; abrupt, angular lower contact on bedding change.	1.28	117.21
SS		As above with cross bedding at 15 degrees increasing to base; occasional dark mineral streaks throughout; abrupt lower contact on grain size and color change.	1.35	118.56
SS	XBD	Light gray-green; cross beds at 15 degrees; fine grained; slightly dirty; clear lower contact on color change.	4.47	123.03
SS	XBD	Light-to-medium gray-green; fine grained; occasional, very thin shale streaks; occasional, dark mineral streaks less than 0.01' thick; abrupt lower contact on color and grain size change.	3.02	126.05
SS	SLTY	Grades to a very fine grained sandstone at base; medium gray-green; low angle bedding; clear lower contact on bedding and grain size change.	1.50	127.55
SS	XBD	Ripple cross laminated; light gray-green; fine-to-medium grained at base; thin shale streak from 129.30 to 129.50'; occasional mica; clear lower contact on color and grain size change.	3.82	131.37
SS	XBD	Fine grained in top (fining upward); occasional dark minerals; some ripple cross lamination; changes in cross bed direction throughout; 0.01' thick shale parting at 140.27'; slumped from 140.27 to 141.00'; cross bedded to 142.20'; medium-to-coarse grained to base; medium gray-green streaks in base.	11.53	142.90
SS	SLST INBD	Sandstone fine grained, medium gray-green; siltstone medium-to-dark gray-green; very low angle to planar bedding; occasional dark streaks; increasing siltstone to base; abrupt lower contact.	5.45	148.35
SS		Fine-to-medium grained; light gray-green; occasional pebbles up to 0.03' across in top of unit; pebble lag from 151.48 to 151.70'; clear lower contact.	3.35	151.70
SS		Fine-to-medium grained; occasional mica; light gray-green to medium gray-green in base; occasional dark mineral streaks; planar to low angle cross bedding; abrupt lower contact.	5.85	157.55
CLST		Slightly kaolinitic; hard; light-to-medium gray; abrupt lower contact; [paleosol AB horizon?]	0.27	157.82
CLST		Medium gray; common slickensides; soft; core surface pitted from drilling; diffuse lower contact on mottles; [paleosol B horizon].	4.23	162.05
MDST	MOT	Medium gray with many, faint, coarse, gray-red	6.42	168.47

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		mottles; few, faint, fine-to-coarse, calcareous glaebules; common slickensides; clear lower contact on increasing glaebules [paleosol B horizon].		
MDST	CALC INCL	Medium gray with many, distinct, fine-to-coarse, calcareous glaebules; clayey; common, faint, coarse, gray-red mottles; common slickensides; clear lower contact on color change [paleosol Bk horizon].	3.10	171.57
MDST	RED	Like unit above except for color; gray-red with many, distinct, fine-to-coarse, calcareous glaebules; few, faint, coarse, light gray mottles; clear lower contact on loss of glaebules [paleosol Bk horizon].	2.25	173.82
MDST	RED	Few, faint, fine-to-coarse, calcareous glaebules; clayey; few, distinct, coarse, light gray mottles; clear lower contact on color change [paleosol B horizon].	2.45	176.27
CLST		Light gray with few, faint, coarse, red mottles and 2 distinct, black to dark gray streaks in top and basal 0.15'; clear lower contact at base of black streak [paleosol A horizon].	0.33	176.60
MDST		Predominately olive; some medium gray and red zones; 0.03' thick strongly calcareous band at base; abrupt lower contact [paleosol B horizon].	0.59	177.19
MDST	RED	Common, distinct, fine-to-coarse, olive mottles; badly broken at end of run; probable loss [paleosol B horizon].	2.81	180.00
NR	CORE LOSS	At base of run to 181.00'.	1.00	181.00
NR	CORE LOSS	At top of run.	0.25	181.25
MDST	RED	Many, distinct, coarse, olive and light gray-green mottles; becoming bedded in base; abrupt lower contact on color change but diffuse lower contact on bedding [paleosol BC horizon].	0.95	182.20
SH	RED	Interbedded gray-red and light gray-green; abrupt lower contact on loss of bedding [paleosol C horizon].	5.12	187.32
MDST	RED	Common, distinct, medium-to-coarse, light gray-green and olive mottles; few, distinct, very fine, vertical, calcareous streaks (root traces?) more abundant and thicker in base; gradual lower contact with increasing sand and silt in base.	2.51	189.83
SH	SS INBD	Shale medium gray-green, silty; sandstone zones are fine-grained, ripple cross-laminated, light-to-medium gray-green, lighter zones with strongly calcareous streaks and cement; few, distinct, fine-to-coarse, strongly calcareous glaebules throughout; strongly calcareous vertical streaks from 195 to 196.50'; many, distinct, coarse, strongly calcareous glaebules from 200.35	23.17	213.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		to 200.55'; few, faint, fine, strongly calcareous glaebules from 200.55 to base; less sandstone,		
SH		Light gray-green with few, faint-to-distinct, coarse, calcareous glaebules; poorly bedded; abrupt lower contact.	1.68	214.68
CLST		Medium gray with many, distinct, thin-to-thick, dark gray-black bands or layers; also some light-to-medium gray-green and olive bands; slightly kaolinitic; clear lower contact on base of dark streaks and mineralogy change [paleosol A horizon].	1.19	215.87
CLST		Light-to-medium gray-green; slightly bedded; abrupt lower contact on bedding change [paleosol BC horizon]	0.60	216.47
SH	RED	Red with many, distinct, fine-to-coarse, light gray-green mottles; abrupt lower contact on color change [paleosol C horizon].	2.36	218.83
SH		Light gray-green; diffuse lower contact on change to red color.	3.97	222.80
SH	RED	Poorly bedded; olive, medium gray, and medium gray-green bands; diffuse lower contact with loss of bedding and color change.	3.92	226.72
MDST	SKS	Many slickensides; coarse olive iron glaebule from 226.90 to 227.25'; medium olive-gray color overall; abrupt, angular lower contact on color change [paleosol B horizon].	1.88	228.60
MDST	CALC INCL	Medium gray-green; clayey; calcareous with common, distinct, fine-to-coarse, strongly calcareous glaebules; common slickensides; gradual lower contact on color change [paleosol B horizon].	3.57	232.17
MDST	CALC INCL	Light-to-medium gray-green with common-to-many, distinct, fine-to-coarse, strongly calcareous glaebules; many slickensides; abrupt lower contact on amount of glaebules.	2.83	235.00
LS	NODAR	Many, prominent, coarse, very strongly calcareous limestone nodules in a medium gray-green matrix.	0.72	235.72
SH	CALC INCL	Many, distinct, coarse, red mottles in top 0.70'; common, distinct, coarse, strongly calcareous glaebules throughout with zone of many glaebules from 237.0 to 237.75'; mostly medium gray-green with another zone of red mottles from 241.0 to 242.20'; becoming poorly bedded to base; clear lower contact on color change and loss of bedding.	8.66	244.38
MDST	MOT	Medium gray-green with common, faint, gray-red mottles; few, distinct, coarse, calcareous glaebules and streaks; common slickensides; gradual lower contact with bedding development [paleosol B horizon].	3.18	247.56
SH	CALC INCL	Medium gray-green; poorly bedded; common, faint,	5.44	253.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		coarse, calcareous glaebules; few slickensides in top; gradual lower contact with loss of glaebules.		
SH		Medium gray-green; very occasional fossil plant stems; diffuse lower contact with increase in sand.	3.60	256.60
SS	SLTY	Fine grained; medium gray-green; planar bedding; clear lower contact with grain size change.	1.95	258.55
SS		Fine grained; medium gray-green; low angle (15 degrees) planar cross bedding; occasional dark streak; few, distinct, calcareous nodules in bottom 0.50'; gradual lower contact on increasing calcareous material.	11.71	270.26
SS	CALC INCL	Light green; fine grained to medium grained in base; faint, planar bedding becoming less distinct to base; many, coarse, calcareous pebbles and angular clasts in bottom 2.0'; angular abrupt lower contact.	2.79	273.05
MDST	SKS	Medium gray; clayey; many slickensides; common, distinct, coarse, olive mottles starting at 273.80'; large, calcareous glaebule from 274.0 to 274.20'; gradual lower contact on color change [paleosol B horizon].	1.60	274.65
MDST	MOT	Medium gray-green with many, distinct, coarse, gray-red and olive mottles; few, distinct, fine, calcareous glaebules; many slickensides; some loss in this unit [paleosol B horizon].	0.70	275.35
NR	CORE LOSS	From the unit above?	0.15	275.50
MDST	RED	Dark gray-red with many, distinct, fine-to-coarse, olive mottles and streaks and a few, light gray-green mottles; common, faint, fine-to-coarse, calcareous glaebules; few slickensides; diffuse lower contact on loss of olive mottles and fewer calcareous glaebules [paleosol B horizon].	3.50	279.00
MDST	RED	Dark gray-red; few, distinct, coarse, light gray-green mottles; few slickensides; core loss, plugged off in this unit [paleosol B horizon].	4.45	283.45
NR	CORE LOSS	Core loss in unit above.	0.95	284.40
MDST	MOT	Mostly gray-red with light gray-green zones and common, distinct, fine-to-coarse, mottles to 285.30' and from 288.50 to base; few weak slickensides; clear lower contact [paleosol B and BC horizons].	5.35	289.75
SH		Stained olive; poorly bedded; clear lower contact with sandiness [paleosol C horizon].	0.29	290.04
SS		Medium gray-green; bedding destroyed; many, distinct, fine-to-coarse, olive mottles and streaks to 290.75'; common, prominent, vertical, calcareous streaks; clear lower contact on bedding development [paleosol C horizon].	0.96	291.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Fine grained; light gray-green; planar bedding; some calcareous cement; occasional green shale streak; abrupt, flat lower contact.	1.98	292.98
SH		Green; one very strongly calcareous nodule near the top; poorly developed slickensides near top; abrupt lower contact at sandstone streak.	1.80	294.78
SH	SS INBD	Shale medium gray-green; sandstone light gray-green; fine grained; some bi-directional ripple cross laminations from 299.0 to 299.35'; beds 0.5 to 1.0' thick; few, distinct, coarse, calcareous nodules.	6.22	301.00
SH	RED	Red with light gray-green zones and bands.	1.33	302.33
NR	CORE LOSS		0.22	302.55
SH	RED	Zone of many, faint, fine-to-medium, calcareous nodules from 303.90 to 303.95'; few olive streaks and bands; abrupt lower contact.	3.82	306.37
SS		Very fine grained; light gray-green; ripple bedded; shale wisps on ripples; calcareous cement; abrupt lower contact.	0.63	307.00
SH		Interbedded red and light gray-green; abrupt lower contact on color change.	5.35	312.35
SH	RED	Clayey; few slickensides; dark gray streaks at 314.10' and 314.50'; soft zone at 315.45'; abrupt lower contact.	3.55	315.90
SS		Fine grained; silty in top; light gray-green; ripple bedded; calcareous cemented zone from 319.90 to 320.40'; occasional, strongly calcareous nodules throughout; diffuse lower contact with decreasing grain size and siltiness.	5.46	321.36
SH		Light gray-green; silty in the top; abrupt lower contact on color change.	1.22	322.58
SH	RED	Red with a few, distinct, coarse, light gray-green mottles; few, thin olive bands; one slickenside near the top; soft, clayey zone from 328.05 to 328.13'; interlaminated dark gray-to-black and light gray-green streaks in basal 0.10'; abrupt lower contact.	5.75	328.33
LS		Light gray with dark gray streaks and thin bands; abrupt lower contact.	0.06	328.39
SH	RED	Red with a light gray-green band 0.02' thick at top; few, thin (0.02'), olive bands; abrupt lower contact on color change.	1.41	329.80
SH		Medium gray-green with thin limestone band (0.02' thick) in middle; few dark gray-to-black streaks; abrupt, angular lower contact.	0.13	329.93
LS		Light gray; hard; very strongly calcareous; calcite on fracture faces; no fossils; abrupt lower contact.	0.82	330.75

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
MDST	CALC	Strongly calcareous; light gray-green; transition into limestone bed above [paleosol B horizon].	0.35	331.10
MDST	MOT	Equally mottled, distinct, fine-to-coarse, gray-red, olive, and light-to-medium gray-green; strongly calcareous; clayey matrix; many, distinct-to-prominent, fine-to-coarse, very strongly calcareous glaebules; common slickensides; diffuse lower contact on loss of calcium carbonate and color change [paleosol B horizon].	3.90	335.00
MDST	MOT	Mostly dark red with many, distinct, fine-to-coarse, olive mottles and streaks; few, prominent, thin, strongly calcareous streaks; soft clayey zones from 337.00 to 337.60', 338.60 to 338.88'; darker gray-red matrix from 337.00' to base; abrupt lower contact at very light gray flintclay fragments [paleosol B horizon].	3.90	338.90
FTCY		Light gray; fine-to-coarse, round-to-angular, fragments in a red mudstone matrix; abrupt lower contact [paleosol A or B horizon?].	0.71	339.61
MDST	RED		0.36	339.97
CLST		Light gray with very thin, dark gray-to-black streaks; abrupt lower contact [paleosol A horizon].	0.09	340.06
MDST	RED	Red with few, faint, fine-to-coarse, light gray and olive mottles and streaks; common slickensides; abrupt lower contact with color and grain size change [paleosol B horizon].	4.41	344.47
SS		Fine grained; light gray to light gray-green; very fine grained at the base (coarsening upward); massive from top to 346.37', ripple cross-laminated to base; occasional very thin mica-rich streaks; occasional strongly calcareous cemented zones from 346.70 to 347.78'; abrupt lower contact.	4.00	348.47
SH	CALC INCL	Medium gray-green with many, faint, coarse, strongly calcareous glaebules; clear lower contact with loss of bedding.	0.76	349.23
MDST	RED	Red with many distinct-to-prominent fine-to-coarse very strongly calcareous glaebules; common-to-many faint fine-to-coarse medium gray-green mottles and streaks; few slickensides; few faint fine-to-coarse olive mottles in basal 0.30'; abrupt lower contact [paleosol B horizon].	5.83	355.06
MDST		Medium-to-dark gray with dark gray-to-black streaks; abrupt lower contact [paleosol A horizon].	0.17	355.23
MDST	MOT	Predominately red matrix with many, faint-to-distinct, fine-to-coarse, olive, light gray, and medium gray-green mottles; many slickensides; abrupt lower contact with color change [paleosol B horizon].	3.02	358.25

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
CLST		Light gray-green; abrupt, angular lower contact with limestone below.	0.08	358.33
LS	NODAR	Two hard micritic nodules with mudstone in between; abrupt lower contact.	0.29	358.62
SLST		Light gray-green with many, distinct, fine-to-coarse, calcareous glauabules and streaks; clear lower contact with increasing grain size.	1.51	360.13
SH	SS INBD	Medium gray-green shale with few, thin (<0.5'), fine grained, medium gray sandstone beds; very few, distinct, very fine, calcareous streaks; diffuse lower contact with increasing sand.	7.81	367.94
SS		Fine grained; light gray-green; faint, planar, ripple laminations to low angle, ripple, cross laminations; occasional, thin, mineral bands; abrupt lower contact.	2.92	370.86
SS		Fine grained-to-medium grained at base (fining up); planar-to-low angle cross beds; occasional, dark mineral streaks; locally mica-rich; abrupt lower contact.	2.31	373.17
SS		Very fine grained-to-medium grained at base (fining up); massive to low angle cross bedding, angle increasing to base; occasional, small, elongate, shale clasts <0.01' thick; abrupt lower contact on grain size change.	0.77	373.94
SS		Medium grained-to-fine grained in the base (coarsening up); abundant, light-to-dark gray-green, shale clasts; abundant, thin (<0.01'), shaly partings; abrupt lower contact.	1.02	374.96
SS		Light gray-green; fine grained with medium grained streaks; occasional, medium gray-green, elongate, shale clasts; abrupt, angular erosive lower contact.	0.44	375.40
CLST		Light gray-green with few, distinct, red mottles; slickensides; broken; core loss in this unit [paleosol B horizon].	0.40	375.80
NR	CORE LOSS	Core loss in unit above.	0.34	376.14
MDST	MOT	Mostly medium gray-green with common, distinct, red mottles and olive mottles below 379.0'; clayey, many slickensides; basal 0.45' strongly calcareous; abrupt lower contact [paleosol B horizon].	5.69	381.83
SH		Medium gray-green; abrupt lower contact [paleosol C horizon].	0.45	382.28
MDST	CALC	Medium gray-green; strongly calcareous; sand-sized, strongly calcareous grains; abrupt lower contact at presence/absence of calcareous material [paleosol B horizon].	0.42	382.70
CLST		Light gray-green to gray-brown; kaolinitic; soft, clayey zone from 383.12 to 383.21'; abrupt lower	0.51	383.21

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		contact [paleosol B horizon].		
FTCY		Light gray-brown bands with dark gray streaks; abrupt lower contact [paleosol B horizon].	0.08	383.29
SH	SS STR	Medium gray-green shale with zones of very fine grained, light gray, rippled, sandstone streaks; one planar laminated zone; light gray, very fine grained, sandstone bed from 387.38' to base; diffuse lower contact with loss of sand.	4.64	387.93
SH	CALC INCL	Medium gray-green; few sandstone streaks in top 0.30'; zones of light gray, sand-sized, strongly calcareous grains from 389.25 to 389.40', 389.78 to 390.00', and 391.85 to 391.97'; abrupt lower contact at basal calcareous zone.	4.04	391.97
SH		Medium gray-green; abrupt lower contact.	3.78	395.75
CLST		Dark gray with dark gray-to-black bands; abrupt lower contact [paleosol A horizon].	0.25	396.00
MDST		Dark gray-green with many, distinct, fine-to-coarse, olive mottles and vertical streaks; common slickensides; clayey; abrupt lower contact with color and texture change [paleosol B horizon].	2.00	398.00
MDST	SKS	Light gray-green; many slickensides; clayey; few, distinct, fine-to-coarse, strongly calcareous glaebules; few, faint, fine, olive mottles; probable loss in this unit [paleosol B horizon].	2.60	400.60
NR	CORE LOSS	From unit above.	0.40	401.00
MDST		Medium gray-green with many, distinct, coarse, olive mottles; few, distinct, coarse, strongly calcareous glaebules; abrupt lower contact on color change [paleosol B horizon].	1.23	402.23
MDST	RED	Red with few, distinct, medium gray-green streaks; very clayey; soft; few slickensides; gradual lower contact on color change [paleosol B horizon].	2.77	405.00
MDST		Medium gray; very soft; clayey; few slickensides; diffuse lower contact on color change [paleosol B horizon].	2.93	407.93
MDST	MOT	Medium gray with common, faint, fine-to-coarse, gray-red mottles; becoming increasingly red below 410.00'; few, distinct, fine-to-coarse, olive mottles in basal 0.80'; very soft; clayey; many slickensides; few, faint, coarse, calcareous glaebules below 412.40'; clear lower contact on color change [paleosol B horizon].	5.07	413.00
CLST		Medium gray; very clayey; common, distinct, fine-to-coarse, olive mottles; slightly bedded; gradual lower contact on color and bedding change [paleosol B horizon].	1.30	414.30
MDST	RED	Clayey; dark gray-red matrix with many, faint,	4.30	418.60

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		fine-to-medium, medium gray-red mottles; few, faint, medium-to-coarse, medium gray mottles; few, distinct, very fine, dark gray soil fragments or grains below 417.50'; (deepest well-developed red bed); [paleosol B horizon].		
NR	CORE LOSS	Cut 8.20' in this run; loss could be from many places in the run (411.00' to 419.20'), put at end of run for convenience.	0.60	419.20
MDST		Medium gray with faint, fine-to-medium, red mottles and fragments; few, faint, fine-to-coarse, olive mottles from 420.60' to base; common slickensides; clear lower contact on color change [paleosol B horizon].	2.10	421.30
MDST		Medium gray with some dark gray streaks - root traces?; few slickensides; abrupt lower contact [paleosol B horizon].	2.25	423.55
CLST		Dark gray; organic appearance; slickensides; abrupt lower contact on color change [paleosol A? horizon].	0.35	423.90
CLST		Medium gray; abrupt lower contact on color change [paleosol B horizon].	0.18	424.08
Coal	NP	Position of the Brush Creek coal.	0.00	424.08
SH	CARB	Dark gray-black; poorly bedded in top; increasingly bedded with increasing organic matter content to base; plant stems; abrupt lower contact [paleosol A or O horizon]. . Brush Creek coal horizon	0.50	424.58
SH		Medium gray; plant trash; abrupt lower contact [paleosol C horizon].	0.17	424.75
SLST	SS INBD	Light gray; increasing sand content to base; <0.10' thick, medium gray-green shale bands in basal 0.70'; abrupt lower contact.	4.95	429.70
SH		Medium gray-green; red streak at 430.20' with faint red streaks from 431.55 to 432.00' (deepest occurrence of red); abrupt lower contact;	3.80	433.50
SLST		Medium gray-green; few, faint, sand grains; abrupt lower contact;	0.45	433.95
SH		Medium gray-green; abrupt lower contact.	0.37	434.32
SLST		Light gray-green; planar bedded; abrupt lower contact.	1.31	435.63
SH	SLTY	Medium gray-green, abrupt lower contact.	3.54	439.17
SLST	CALC	Light gray; weakly calcareous; very hard; abrupt lower contact.	0.24	439.41
SH		Medium gray-green; slightly sandy in base; clear lower contact.	1.30	440.71

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS	SLTY	Medium gray-green; occasional mica; massive; abrupt lower contact.	0.31	441.02
SS	XBD	Light gray; planar cross-laminated; dark mineral streaks on laminations; fine grained; locally abundant mica on lamination planes; low angle abrupt lower contact.	7.53	448.55
SS		Light gray; fine grained; planar ripple laminated; abrupt lower contact.	0.91	449.46
SS		Light gray; fine grained; planar laminated in top; planar ripple-laminated from 453.00' to base; increasing mica streaks to base; abrupt, erosional lower contact.	3.82	453.28
SH		Medium gray-green; silty streaks in top 0.40'; abrupt lower contact.	3.95	457.23
MDST	CALC	Medium gray; noncalcareous from top to 457.53'; calcareous from 457.53' to strongly calcareous in base; few slickensides; clear, angular lower contact [paleosol B horizon].	1.92	459.15
LS		Light gray; hard; micritic; many, distinct, fine, light gray-green clasts (?); no fossils seen; abrupt lower contact.	0.96	460.11
FTCY		Light-to-medium gray-brown with black streaks; bedded; nondescript, uniform to 460.25'; brecciated, angular-to-subround fragments with black matrix to base; abrupt lower contact.	0.37	460.48
SS	SH INBD	Sandstone: very fine grained; light gray; mostly ripple laminated; shale: medium gray-green; silty in top of unit; very strongly calcareous fracture-fills and nodules to 463.8'; one large nodule 466.2 to 466.35'; abrupt lower contact.	8.50	468.98
SS		Light gray to light gray-green; very fine grained; low angle cross laminations; occasional ripple cross laminations; possible slump and soft sediment deformation at 470.50'; mica-rich partings; increasing mica to base; abrupt lower contact.	3.08	472.06
SH		Light gray-green; silty streaks in top 1.20'; very few, distinct, very thin, calcareous streaks; few slickensides; clear lower contact.	5.05	477.11
SH		Dark gray.	0.43	477.54
FTCY	BREC	Predominately medium gray with light gray, medium gray and dark gray clasts and dark gray streaks; abrupt lower contact.	0.85	478.39
CLST		Medium gray; very soft; many, faint, fine-to-coarse, harder clasts in very soft matrix.	0.64	479.03
NR	CORE LOSS		0.29	479.32
MDST	SLTY	Medium gray; silt starts around 481.0'; becoming	6.42	485.74

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		siltier and sandy to base; root traces; clear lower contact on first sandstone [paleosol B horizon].		
SS		Light gray; very fine grained; ripple cross laminated; abrupt lower contact.	3.58	489.32
SLST	SDY	Medium gray; light gray sandstone streaks; abrupt lower contact.	0.71	490.03
SS		Light gray; very fine grained; ripple cross laminated; abrupt lower contact at shale bed.	1.31	491.34
SS	SH INBD	Sandstone: light gray; very fine grained; trough cross stratification; some ripple laminations; distinct contacts; shale: medium-to-dark gray; occasional sandy streaks; possible soft sediment deformation at 493.48'; abrupt lower contact.	3.04	494.38
SS	XBD	Light gray; fine-to-medium grained; fining upwards; well cemented with calcareous cement; locally abundant mica; planar cross laminations; abrupt lower contact.	4.23	498.61
SS	CALC	Light gray; very fine to fine grained; massive; micaceous; abrupt lower contact.	0.52	499.13
SS	XBD	Light gray; fine grained; dark mica streaks; planar cross laminations; very weakly calcareous cement; clear lower contact at shale clasts.	5.09	504.22
SS	SH CLS	Light gray; fine grained; many, medium gray, fine-to-coarse, shale clasts throughout; abrupt lower contact.	0.45	504.67
SH	SS INBD	Medium gray with two light gray, fine grained, ripple cross laminated sandstone beds; gradual lower contact on loss of sandstone.	2.63	507.30
COAL	NP	Position of the Upper Freeport coal.	0.00	507.30
CLST		Medium gray with dark gray, and medium gray-green bands, darker to base; few slickensides; slightly bedded at top; rooted; light gray-green, noncalcareous glaebules from 512.20' to base; clear lower contact with color and texture change [paleosol B horizon].	7.37	514.67
CLST	SDY	Silty; light gray; rooted; diffuse lower contact on base of roots and increased bedding [paleosol B horizon].	2.54	517.21
SH	SS STR	Medium gray with few, light gray, very fine grained, rippled-to-planar, sandstone streaks; abrupt lower contact [paleosol C horizon].	11.91	529.12
SS		Fine grained; light gray; low angle, planar cross laminations; coarsening up; abrupt lower contact.	0.71	529.83
SS		Light gray; medium grained; well cemented; low angle, planar bedding; mica-rich bedding planes; shale rip-up clasts up to 0.20' from 550.00 to	21.17	551.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		551.00'.		
SS		Very fine grained; medium gray; planar laminated; abrupt, angular lower contact.	0.30	551.30
SS		Light gray; medium grained; very few, very thin, shale clasts; micaceous; massive; abrupt angular lower contact.	2.78	554.08
SS		Light gray; fine grained; low angle planar cross laminations; locally abundant mica streaks at base; abrupt, angular lower contact.	1.42	555.50
SS		Light gray; medium grained; scattered mica-rich streaks; occasional, very small, organic matter streaks; low angle, planar cross laminations to massive.	5.10	560.60
SLST	SDY	Medium gray; sandstone: light gray; inclined, planar laminations about 30 degrees, probably slumped, chevrons on inclined beds; abrupt lower contact.	1.69	562.29
SS		Light gray; massive; occasional, medium gray, shale pebbles up to 0.15' across; abrupt lower contact on bedding and grain size change.	5.44	567.73
SS	COAL STR	Light gray; fine grained; low angle, cross laminations; coal and mica streaks; coal streaks most abundant from 570 to 570.33'; abrupt lower contact on grain size change.	2.73	570.46
SS		Light gray; medium grained; massive; abrupt lower contact.	0.25	570.71
SS		Light gray; very fine grained; planar laminations; occasional medium grained zone <0.10' thick; abrupt lower contact.	1.29	572.00
SS		Light gray; fine grained; distorted bedding with coal clasts and streaks and shale clasts; abrupt lower contact.	0.16	572.16
SS		Light gray; fine grained to 578.10', medium grained to 588.10', interbedded fine and medium grained to 591.00', medium grained to base; occasional, low angle, planar cross laminations with mica-rich streaks to 593.00'; abrupt lower contact.	26.26	598.42
SS		Light gray; fine grained; low angle, planar cross laminations; prominent, vertical, calcite-filled fractures from top to 599.75'; locally micaceous; abrupt lower contact on grain size change.	2.58	601.00
SS		Medium grained; light gray; green minerals yield a green tint; massive at top to low angle, cross laminations to base; fine grained bed from 606.92 to 607.00'; calcareous nodules at base; very thin shale rip-ups and mica streaks; very few, very small, organic streaks from 601.20 to 603.10'; abrupt lower contact on grain size change.	7.29	608.29

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light gray; fine grained; occasional, very thin (<0.01'), medium gray streaks; locally abundant mica; low angle, planar cross laminations; abrupt lower contact.	0.39	608.68
SS	XBD	Light gray; fine-to-medium grained; cross laminated at about 15 degrees, better developed to base; locally abundant mica on bedding planes.	1.97	610.65
NR	CORE LOSS		0.35	611.00
SS	XBD	Light gray; fine grained; low angle, planar cross laminations; locally abundant mica; abrupt lower contact on grain size and bedding change.	5.52	616.52
SS		Medium grained; light gray; massive; abrupt lower contact.	4.49	621.01
CLST		Dark gray; many slickensides; rooted; pyrite on slickensides; one large, very weakly calcareous, pyritic nodule from 622.0 to 622.22'; pyritized plant trash; abrupt, wavy lower contact.	2.18	623.19
COAL	NP	Position of the Upper Kittanning coal.	0.00	623.19
SH	CARB	Dark gray to black; very thin coal streaks; abundant pyrite blebs and lenses; abrupt lower contact [not sampled]. . Upper Kittanning coal horizon	0.19	623.38
CLST		Medium gray; root traces; many slickensides; light gray, faint-to-distinct, coarse, very weakly calcareous nodules with thin calcareous streaks from 614.00' to base; abrupt lower contact [paleosol B horizon].	2.45	625.83
SS		Light gray; fine grained; bedding disrupted by rooting; abrupt, very angular, compactional lower contact [paleosol BC or C horizon].	0.98	626.81
SS	SH STR	Very fine grained; light gray; rippled and ripple trough cross laminations ; medium gray shale streaks; abrupt lower contact.	7.98	634.79
SH		Medium gray; some plant pinnules (neuropteris sp?), stems, plant trash; occasional pyrite on bedding planes; abrupt lower contact.	1.21	636.00
SH	COAL STR	Dark gray to black; abundant organic streaks; abrupt lower contact.	0.24	636.24
FTCY	BREC	Medium gray with many, distinct, fine-to-coarse, light gray-brown clasts, especially abundant from 636.80' to base; few slickensides; abrupt lower contact.	0.98	637.22
MDST	SLTY	Silty; sandy; medium gray; highly rooted; massive; sandstone streaks; abrupt lower contact at basal sandstone streak, diffuse lower contact on loss of roots [paleosol B horizon].	6.40	643.62

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH		Dark gray; very weakly calcareous nodules at 645.70'; slump? with silt fill at 646'; abrupt lower contact at first sandstone streak.	3.38	647.00
SH	SS STR	Shale: medium gray; occasional slickensides; some coalified plant material; very fine grained, light gray, ripple bedded sandstone streaks in zones up to 0.50' thick; micro-faulting in zone from 652.15 to 654.57'; abrupt lower contact at last sandstone streak.	9.60	656.60
SH		Dark gray; abrupt lower contact [sampled basal 0.15' with coal].	2.65	659.25
COAL	CLRN	Clarain, dull; minor cleat calcite; very irregular, erosional top with 0.05' relief [sampled] [described by Bill Grady in lab].	0.16	659.41
SH		Dark gray; lenticular [sampled] [described by Bill Grady in lab].	0.01	659.42
COAL	CLRN	Clarain, bright; minor fusains mineralized with clays and calcite [sampled] [described by Bill Grady in lab].	0.33	659.75
COAL	CLRN	Clarain, bright; abundant, large, pyritized fusain layers [sampled] [described by Bill Grady in lab].	0.06	659.81
COAL	CLRN	Clarain, dull; gradational base and top [sampled] [described by Bill Grady in lab].	0.04	659.85
COAL	CLRN	Clarain, bright; minor, very thin, pyritized fusain lenses; minor cleat calcite [sampled] [described by Bill Grady in lab].	0.17	660.02
COAL	CLRN	Clarain, dull; very common, thin, pyritized fusain lenses up to 0.01' thick [sampled] [described by Bill Grady in lab].	0.09	660.11
SS		Light gray; lenses in vitrain [sampled] [described by Bill Grady in lab].	0.02	660.13
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.10	660.23
PYR		Pyrite or marcasite bands in vitrain [sampled] [described by Bill Grady in lab].	0.01	660.24
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.06	660.30
SH		Medium gray; lenticular [sampled] [described by Bill Grady in lab].	0.02	660.32
COAL	CLRN	Clarain, bright; common, soft fusain lenses [sampled] [described by Bill Grady in lab].	0.13	660.45
COAL	CLRN	Clarain, bright; thin, medium gray shale parting at top [sampled] [described by Bill Grady in lab].	0.08	660.53
COAL	FS	Fusain; mineralized with clays and pyrite [sampled] [described by Bill Grady in lab].	0.01	660.54

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.04	660.58
SH		Dark gray; minor, very thin, light gray, very fine grained sandstone lenses; plant trash on top; top and bottom sharp [sampled] [described by Bill Grady in lab].	0.03	660.61
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.08	660.69
SH		Medium gray with lenses of light gray, very fine sandstone' sharp top and bottom [sampled] [described by Bill Grady in lab].	0.03	660.72
COAL	CLRN	Clarain, bright; very thin sandstone parting in upper 0.01' [sampled] [described by Bill Grady in lab].	0.06	660.78
SS		Light gray; very fine grained; minor coal fragments; sharp top and bottom [sampled] [described by Bill Grady in lab].	0.02	660.80
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.05	660.85
SS		Light gray; very fine grained; lenses of medium gray shale; top and bottom sharp [sampled] [described by Bill Grady in lab].	0.01	660.86
COAL	CLRN	Clarain, dull; common, very thin sandstone layers; minor pyrite lenses [sampled] [described by Bill Grady in lab].	0.05	660.91
		Middle Kittanning coal		
SS		Light gray; medium grained; highly rooted; large, shale clast in base; abrupt lower contact [not sampled].	0.79	661.70
SS		Light-to-medium gray; fine-to-medium grained; low angle, planar cross laminations; occasional coal streaks; concentrated coal and mica streaks from 679.11' to base; occasional shale streaks; locally mica-rich; abrupt lower contact.	17.95	679.65
SS		Light gray; medium grained; abundant coal streaks from 682.90 to 685.90'; low angle, planar cross laminations; occasional shale rip-up; locally abundant mica on bedding planes; becoming coarser to base; abrupt lower contact on color and grain size change.	12.14	691.79
SS		Light-to-medium gray; medium grained with occasional, coarse pebbles at base; fining upward to fine grained at the top; low angle, planar cross laminations; medium gray shale rip-ups in basal 0.20'; abrupt wavy lower contact.	1.41	693.20
SS		Light gray; fine grained; massive; clear lower contact on bedding change.	4.10	697.30

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light-to-medium gray; dark gray mica streaks; fine grained; occasional, rippled, shale streaks at top; locally abundant mica; bidirectional, planar cross laminations; few crenulations on bedding from 699.60 to 700.60'; light gray-to-white, fine grained streaks in zones from 705.20 to 705.85 and 709.05 to 709.30'; very fine shale rip-ups from 710.65 to 711.15'; very thin, dark, coal and shale streaks from 711.14 to 712.00'; few, coarse, quartz pebbles from 714.20' to base; abrupt, angular Lower contact with coal [not sampled].	17.41	714.71
COAL	CLRN	Clarain, bright; banding disrupted by abundant fusains mineralized with clays and minor pyrite; common cleat pyrite; erosional, angular top [sampled] [described by Bill Grady in lab].	0.12	714.83
COAL	FS	Fusain; hard; irregular thickness; heavily mineralized with pyrite and clays [sampled] [described by Bill Grady in lab].	0.07	714.90
COAL	CLRN	Clarain, bright; few, very thin pyritized fusain bands; entire coal unit may be rafted(?); abrupt, angular lower contact [sampled w/out top or bottom rock included] [described by Bill Grady in lab]. . No. 6 Block/Lower Kittanning? coal	0.20	715.10
SS		Fine-to-medium grained with coarse pebbles; medium gray; coal spars at 715.47', 0.06' thick at 716.55', at 716.98', and 717.10'; faint, ripple cross laminations; abundant shale and quartz pebbles [channel lag] from 716.50 to 717.30'; abrupt, angular, erosional lower contact [not sampled].	2.32	717.42
SH	ROOT	Medium gray; silty; root traces; poorly bedded; clear lower contact.	1.53	718.95
FTCY		Shaly; medium gray with thin, dark gray streaks; weakly bedded; clear lower contact at color change.	0.54	719.49
SH		Dark gray; kaolinitic, abrupt lower contact.	0.21	719.70
SH		Medium gray; kaolinitic; abrupt lower contact.	0.08	719.78
SS	QTZ	Light gray; very fine grained; quartzose; planar cross laminations; clear lower contact.	0.84	720.62
FTCY		Medium gray-brown with dark gray streaks; conchoidal fracture; hard; some near-vertical black streaks (roots?).	0.48	721.10
SH	BLK	Black to dark gray; poorly bedded; clear lower contact.	0.92	722.02
CLST		Medium gray; silty in top 0.28'; rooted; slickensides; abrupt lower contact.	1.23	723.25

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Fine grained; light gray; low angle, planar and ripple cross laminations; slight rooting in top 1.15'; occasional mica-rich zones; silty from 725.57 to 725.64'; locally hard quartz-rich streaks from 731.50 to 733.00'; planar laminations from 739.50 to 741.50'; low angle, planar cross laminations from 741.50 to 742.85'; massive from 742.85 to 743.00'; slumped(?) from 743.00' to base; abrupt, angular lower contact.	20.41	743.66
SS		Light gray; fine grained; white (clean?) fine grained sandstone streaks; planar laminations; abrupt lower contact.	0.72	744.38
SS		Light gray; fine grained; occasional, white sandstone streaks; slightly coarser to base; abrupt lower contact.	0.62	745.00
SS	COAL STR	Light gray; fine grained; abundant coal streaks; white, quartz-rich, sandstone streaks, increasing in abundance and thickness to base; clear lower contact.	2.12	747.12
SS		Light gray; fine grained; low angle, ripple and planar cross laminations at top, grading to massive at base; clear lower contact.	2.29	749.41
SS	COAL STR	Light gray; medium grained; low angle, planar cross laminations; locally abundant mica; few coal streaks below 754.35'; zone of clean sandstone streaks from 754.16' to base; clear lower contact.	5.43	754.84
SS		Light gray; predominately medium grained with coarse, and fine grained zones; abundant coal streaks up to 0.02' thick; abundant, clean sandstone streaks, clear lower contact.	4.16	759.00
SS		Fine-to-medium grained; light-to-medium gray; occasional coal streaks throughout; planar laminations; massive from 761.60 to 762.50'; fine grained, ripple cross laminated, with occasional, very small coal streaks and dark heavy mineral streaks from 762.50 to 762.77'; medium grained to 762.97', fine grained to base; coarsening up; occasional coaly streaks to base; abrupt lower contact.	4.25	763.25
SS		Light-to-medium gray; low angle, planar cross laminations; medium grained; abrupt lower contact.	0.50	763.75
SS		Light gray; fine grained to medium grained in base (fining-up); faint, planar cross laminations; locally abundant mica streaks; abrupt lower contact at grain size change.	6.47	770.22
SLST	SS INBD	Light gray; fine grained, grading to medium grained at base (fining-up); occasional, small, coaly spars; locally abundant mica; low angle, planar cross laminations; abrupt lower contact.	6.02	776.24
SS		Medium gray; sandstone: light gray, very fine grained, ripple cross laminated streaks; abrupt	2.99	779.23

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		lower contact.		
SS	SH CLS	Light gray; fine grained; abundant, very fine, shale clasts; low angle, planar cross laminations; clear lower contact.	1.17	780.40
SS	XBD	Light gray; fine grained; clasts medium gray, silty; lag of shale pebbles up to 0.20' diameter from 782.70' to base; abrupt lower contact.	2.87	783.27
SS		Light gray; fine grained; low angle, planar cross laminations; locally abundant mica on bedding; occasional, very thin, coaly streaks; abrupt lower contact on bedding change.	7.50	790.77
SS		Light gray; fine grained; massive; clear lower contact.	6.55	797.32
SS		Light gray; fine grained; low angle, planar cross laminations; locally abundant mica; occasional, very small, coal clasts; abrupt lower contact on grain size change.	0.28	797.60
SS	COAL CLS	Light gray grading to white at the base; fine grained; occasional shale clasts; abrupt lower contact.	0.37	797.97
SS		Light gray; fine grained; low angle, planar cross laminations; abrupt lower contact at coal streaks.	7.20	805.17
SS	COAL STR	Light gray, fine grained; coal streaks; low angle, planar cross laminations; abrupt lower contact.	0.29	805.46
SS		Light gray; fine grained; low angle, planar cross laminations; coal streaks from 808.31 to 808.60', 815.23 to 816.53', 821.45 to 821.51' and at 823.76; abundant coal streaks from 825.00 to 829.63'; locally abundant mica on some bedding planes; abrupt lower contact.	24.17	829.63
SS		Light gray; fining up from medium to fine grained; low angle, planar cross laminations; occasional, dark, heavy mineral streaks; abrupt lower contact.	6.02	835.65
SS		Light gray; fine-to-medium grained at base, fining up to fine grained; occasional, very thin, coal streaks at top; low angle, planar cross laminations; occasional shale rip-ups to base <0.01' thick; abrupt high angle lower contact.	1.92	837.57
SH		Dark gray; light gray-brown flintclay bands from 838.05 to 838.21'; occasional slickensides; sandstone streaks from 838.30' to base; abrupt lower contact at sandstone.	1.83	839.40
SS	COAL STR	Light gray; fine grained; massive; few coal clasts up to 0.02' thick; locally abundant mica; occasional shale rip-ups; abrupt lower contact on grain size change.	5.72	845.12
SS		Light gray; fining up from medium to fine grained at top; low angle, planar cross laminations;	4.31	849.43

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		abundant mica streaks at top, slightly crenulated; abrupt, angular lower contact.		
SS		Light gray; fine grained; planar cross laminations; abrupt lower contact.	3.22	852.65
SS		Light gray; fine grained; abundant mica streaks; clear lower contact.	0.31	852.96
SS		Light gray; fine grained; massive; dark mineral patch from 853.58 to 853.80'; abrupt, angular lower contact [sampled basal 0.05' with coal].	0.96	853.92
COAL	IMP	Bone; attrital; very fine grained; low density; sharp, erosional top contact with sandstone, bottom gradational into clarain [sampled] [described by Bill Grady in lab].	0.05	853.97
COAL	CLRN	Clarain, dull; attrital; very fine grained with minor 1mm vitrain bands; gradational base [sampled] [described by Bill Grady in lab].	0.21	854.18
SH	BLK	Black; very carbonaceous; bony gradational top [sampled] [described by Bill Grady in lab].	0.05	854.23
COAL	IMP	Bone; attrital; medium density; contains lenses of carbonaceous shale in lower part; gradational upward with thin fusain lenses and vitrain bands in upper part; angular sharp base on claystone [sampled] [described by Bill Grady in lab].	0.09	854.32
		Little No. 5 Block coal		
CLST	ROOT	Medium gray-brown; abundant root traces; occasional slickensides; coal streak at 854.41'; clear lower contact with development of bedding [paleosol B horizon, not sampled with coal].	2.39	856.71
SH		Medium gray; plant fragments; roots; abrupt lower contact.	2.58	859.29
SLST		Light gray; clear lower contact at sandstone streaks.	2.37	861.66
SS	SH STR	Light gray; mostly fine grained with some medium grained zones; unit part of fining-up sequence; medium gray shale streaks and thin beds up to 0.25' thick; sandstone is mostly rippled laminated; abrupt lower contact at last shale streak.	2.23	863.89
SS	XBD	Light gray; fine grained with few medium grained zones, fining-up overall; mostly planar cross laminated, low to high angle; clear lower contact at grain size change.	10.33	874.22
SS		Light gray; medium grained at base, to fine grained in top 0.50'; mostly planar laminations with few, planar cross laminations; clear lower contact.	3.03	877.25
SS	BITRB	Light gray; fine grained; slightly contorted	1.09	878.34

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		bedding with few medium gray, shale clasts and drapes; clear lower contact.		
SS		Light gray; fine-to-medium grained; planar, to low angle, planar cross laminations, some bi-directional; planar cross laminations from 881.25' to base; abrupt lower contact [sampled basal 0.10' with coal].	4.33	882.67
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.01	882.68
SS		Light gray, parting [sampled] [described by Bill Grady in lab].	0.01	882.69
COAL	IMP	Bone; occasional 1mm vitrains [sampled] [described by Bill Grady in lab].	0.03	882.72
COAL	CLRN	Clarain, bright; minor cleat calcite [sampled] [described by Bill Grady in lab].	0.12	882.84
COAL	CLRN	Clarain, dull; gradational base containing lenses of cannel coal [sampled] [described by Bill Grady in lab].	0.15	882.99
COAL	CANL	Cannel; nonbanded; low density; conchoidal fracture; minor vitrain fragments [sampled] [described by Bill Grady in lab].	0.12	883.11
BN		Minor vitrain fragments and 1mm vitrain bands near top [sampled] [described by Bill Grady in lab].	0.10	883.21
SH	BLK	Black; canneloid; bony; rare, very small vitrain fragments; medium density; conchoidal fracture [sampled] [described by Bill Grady in lab].	0.03	883.24
BN		Canneloid; minor vitrain fragments; medium density; conchoidal fracture [sampled] [described by Bill Grady in lab].	0.09	883.33
SH	BLK	Black; canneloid; bony; rare, very small vitrain fragments; high density; conchoidal fracture [sampled] [described by Bill Grady in lab].	0.22	883.55
COAL	IMP	Bone; canneloid; few small vitrain fragments; sharp base [sampled] [described by Bill Grady in lab].	0.04	883.59
SH	BLK	Black; bony; minor, very thin vitrain stringers [sampled] [described by Bill Grady in lab].	0.06	883.65
BN		Poorly bedded; minor small and large vitrain fragments; medium density; common cleat calcite and pyrite and pyritized fusain lenses; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.12	883.77
COAL	CLRN	Clarain, bright; common 1-2mm vitrains [sampled] [described by Bill Grady in lab].	0.62	884.39
COAL	CLRN	Clarain, dull; thinly laminated; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.06	884.45

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		lab].		
SH	BLK	Black; minor sulfate lenses [sampled] [described by Bill Grady in lab].	0.04	884.49
BN		Thinly laminated with common vitrain bands and stringers; high density [sampled] [described by Bill Grady in lab].	0.07	884.56
COAL	CLRN	Clarain, dull; very thinly laminated; sharp top and bottom [sampled] [described by Bill Grady in lab].	0.06	884.62
SLST		Black; bony, with gray streaks [sampled] [described by Bill Grady in lab].	0.05	884.67
COAL	CLRN	Clarain, dull; thinly laminated; common 1mm vitrain bands near top; base gradational [sampled] [described by Bill Grady in lab].	0.10	884.77
COAL	IMP	Bone; lenticular; gradational bottom [sampled] [described by Bill Grady in lab].	0.02	884.79
SH	ROOT	Black, bony, with thin bone coal stringers in top 0.08'; rest medium gray; rooted; with very fine grained, light gray, rooted, sandstone streaks; clear lower contact at loss of sandstone streaks [sampled top 0.08' with coal].	1.94	886.73
SH		Medium gray [not sampled].	0.90	887.63
SH	BLK	Black; rooted with stigmaria; slickensided [sampled with coal below] [described by Bill Grady in lab].	0.15	887.78
COAL	CLRN	Clarain, dull; sharp base and top [sampled] [described by Bill Grady in lab].	0.04	887.82
BN		Non-banded; conchoidal fracture; very fine attrital matrix; rare, very small vitrain fragments and very thin, very fine grained sand lenses [sampled] [described by Bill Grady in lab].	0.09	887.91
COAL		Vitrain; lenticular [sampled] [described by Bill Grady in lab].	0.03	887.94
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.07	888.01
BN		Non-banded; high density; attrital; minor small vitrain fragments; gradational base, sharp top [sampled] [described by Bill Grady in lab].	0.03	888.04
COAL	IMP	Bone; abundant carbonaceous shales and fusain fragments [sampled] [described by Bill Grady in lab].	0.02	888.06
COAL	CLRN	Clarain, dull; common 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.04	888.10
COAL	IMP	Bone; with very thin carbonaceous shales and very small vitrain fragments [sampled] [described by	0.03	888.13

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		Bill Grady in lab].		
COAL	CLRN	Clarain, dull; common 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.08	888.21
COAL	IMP	Bone; with very thin carbonaceous shales and very small vitrain fragments [sampled] [described by Bill Grady in lab].	0.06	888.27
COAL	CLRN	Clarain, dull; common 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.05	888.32
COAL	CLRN	Clarain, dull; minor very thin vitrain bands; gradational base [sampled] [described by Bill Grady in lab].	0.16	888.48
COAL	CLRN	Clarain, dull; common 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.30	888.78
COAL	CLRN	Clarain, bright; common 1-3mm vitrain bands; common cleat calcite [sampled] [described by Bill Grady in lab].	0.10	888.88
COAL	IMP	Bone; sharp top and base [sampled] [described by Bill Grady in lab].	0.01	888.89
		Stockton A Coal		
SH		Dark gray; poorly bedded; root traces; gradual lower contact with increasing sand content [sampled top 0.08' with coal].	1.11	890.00
SS	SH STR	Light gray; fine grained; rooted; distorted bedding to 891.83'; mostly ripple laminated; medium gray shale streaks throughout; abrupt lower contact.	4.47	894.47
SH	FEST INCL	Medium gray; occasional, thin (<0.02'), ironstone bands and lenticular nodules; noncalcareous; few, very thin, light gray, very fine grained, sandstone streaks; clear lower contact.	3.74	898.21
SH	SS STR	Medium gray, with light-to-medium gray, fine-to-very fine grained, sandstone streaks, mostly planar and planar cross laminated with some ripple cross laminated; burrows? at 900.42 and 902.15'; abrupt lower contact.	5.05	903.26
SH	COAL STR	Medium gray; abundant coal streaks, especially from top to 904.00'; also light gray, very fine grained, sandstone streaks, mostly planar cross laminated; abrupt lower contact.	2.81	906.07
SH		Medium gray; occasional, thin, light gray, very fine grained, sandstone streaks; possible planar burrows; sandstone streaks mainly planar laminated, ripple laminated from 912.00 to 912.20'; few, faint, coarse, ironstone streaks and lenses throughout; gradual lower contact at appearance of sandstone streaks.	7.31	913.38
SH		Medium gray with light gray zone from 914.20 to	2.20	915.58

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		915.00'; few, faint, coarse, ironstone streaks and irregular nodules throughout; abrupt lower contact [sampled basal 0.08' with coal].		
COAL	CLRN	Clarain, bright; sharp top [sampled] [described by Bill Grady in lab].	0.03	915.61
COAL	FS	Fusain; hard; mineralized with clays [sampled] [described by Bill Grady in lab].	0.02	915.63
COAL	CLRN	Clarain, bright; minor cleat calcite; sharp base [sampled] [described by Bill Grady in lab].	0.07	915.70
COAL	SPLINT	Splint; steel-gray; conchoidal fracture; very fine vitrain fragments [sampled] [described by Bill Grady in lab].	0.06	915.76
COAL	CANL	Canneloid; black; splinty; non-banded; very fine attrital groundmass; conchoidal fracture; minor cleat calcite; gradational base [sampled] [described by Bill Grady in lab].	0.15	915.91
COAL	SPLINT	Splint; steel-gray; conchoidal fracture; very fine vitrain fragments; low density [sampled] [described by Bill Grady in lab].	0.78	916.69
COAL	CLRN	Clarain, bright; thin vitrain bands [sampled] [described by Bill Grady in lab].	0.02	916.71
COAL	SPLINT	Splint; steel-gray; conchoidal fracture; very fine vitrain fragments; low density; small pyrite lenses; minor cleat calcite [sampled] [described by Bill Grady in lab].	0.25	916.96
COAL		Durain; attrital; sharp top, gradational base [sampled] [described by Bill Grady in lab].	0.04	917.00
COAL	CLRN	Clarain, bright; interbanded 0.01' vitrain bands and thin, lenticular attrital bands [sampled] [described by Bill Grady in lab].	0.45	917.45
COAL		Vitrain; two equal thickness bands separated by an attrital layer [sampled] [described by Bill Grady in lab].	0.09	917.54
COAL	CLRN	Clarain, bright; common 0.01' vitrain bands [sampled] [described by Bill Grady in lab].	0.13	917.67
COAL		Durain; attrital; very fine groundmass and small vitrain fragments; medium density [sampled] [described by Bill Grady in lab].	0.10	917.77
COAL	CLRN	Clarain, dull; small pyrite lenses; sharp base [sampled] [described by Bill Grady in lab].	0.23	918.00
CLST	ROOT	Medium-to-dark gray; slickensides; gradual lower contact with development of bedding [sampled top 0.10' with coal].	1.17	919.17
SH		Medium-to-dark gray; abrupt lower contact [not sampled].	1.83	921.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL	CLRN	Clarain, dull; minor, thin, vitrain bands [sampled] [described by Bill Grady in lab].	0.19	921.19
COAL	CLRN	Clarain; interbanded 0.03' dull clarain, attrital bands, and thin vitrain bands [sampled] [described by Bill Grady in lab].	0.24	921.43
COAL		Vitrain [sampled] [described by Bill Grady in lab].	0.06	921.49
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.03	921.52
COAL		Vitrain, lenticular [sampled] [described by Bill Grady in lab].	0.02	921.54
COAL	CLRN	Clarain; interbanded 0.03' dull clarain, attrital bands, and 0.01' vitrain bands [sampled] [described by Bill Grady in lab].	0.36	921.90
COAL		Vitrain; lenticular [sampled] [described by Bill Grady in lab].	0.04	921.94
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab]; abrupt lower contact [field description].	0.15	922.09
		Stockton coal		
SH		Medium gray; poorly bedded; abrupt lower contact at sandstone streaks [sampled top 0.10' with coal].	1.96	924.05
SH	SS STR	Medium gray; light gray, very fine grained, planar cross laminated, and planar laminated sandstone streaks; some rippled streaks from 926.00 to 926.30'; distorted bedding from 925.75 to 926.00'; coal streaks at 925.13'; clear lower contact.	2.69	926.74
SS		Light gray; fine grained; rippled laminated from top to 928.05' with minor dark mineral or mica streaks; rest mainly planar cross laminated to ripple cross laminated; coal streaks and clasts from 929.45 to 929.93'; fine shale clasts from 929.93' to base; abrupt, high angle lower contact.	3.36	930.10
SS	SLMP	High angle slump; planar-to-ripple cross laminated; light gray; fine grained with dark shale or mica streaks; abrupt angular lower contact.	0.65	930.75
SH		Medium gray; slumped sandstone streaks from 931' to base; 0.05' diameter shale and ironstone? pebbles in base; abrupt, high angle lower contact.	0.75	931.50
SS	SH STR	Light gray, fine grained, ripple cross laminated; medium gray shale streaks; abrupt, high angle lower contact.	1.09	932.59
SS	XBD	Light gray; fining upward from fine to medium grained; mostly ripple-to-planar cross laminated; few, very thin, coal streaks from 933.15 to 933.50'; abrupt lower contact on grain size	1.26	933.85

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		change.		
SS	XBD	Light gray; fining up from medium to fine grained; slight change in angle and direction of planar cross laminations; abrupt lower contact.	1.97	935.82
SS	COAL STR	Light gray; fine grained; mostly ripple laminated with very thin coal streaks and medium gray shale streaks; clear lower contact at basal coal streak.	0.83	936.65
SS	SH STR	Light gray; fine grained; ripple laminated; medium gray shale bands and streaks; abrupt lower contact.	1.25	937.90
SH	SLTY	Medium gray with faint, light gray, very fine streaks; clear lower contact.	1.29	939.19
SH		Medium gray to dark gray in base; very uniform; abrupt lower contact.	3.89	943.08
SH	COAL STR	Dark gray; occasional coal streaks; clear lower contact [sampled basal 0.10' with coal].	0.71	943.79
BN		Bone; occasional small vitrain fragments; gradational base [sampled] [described by Bill Grady in lab].	0.04	943.83
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.09	943.92
SH	BLK	Black; non-banded with 1-3mm vitrain bands at 0.04' intervals [sampled] [described by Bill Grady in lab].	0.09	944.01
SH	BLK	Black; non-banded; very abundant 1mm megaspores; minor small vitrain fragments [sampled] [described by Bill Grady in lab].	0.11	944.12
SH	BLK	Black; abundant coal stringers; 1mm megaspores; stigmara and ostracods common [sampled] [described by Bill Grady in lab].	0.13	944.25
COAL	IMP	Impure; interlaminated very thin vitrains and black shales; sharp base [sampled] [described by Bill Grady in lab].	0.13	944.38
SH	BLK	Black; common coal stringers and 1mm megaspores [sampled] [described by Bill Grady in lab].	0.22	944.60
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.03	944.63
SH	BLK	Black; interlaminated 0.01' shale, dull clarain, and vitrain bands [sampled] [described by Bill Grady in lab].	0.14	944.77
COAL	CLRN		0.20	944.97
BN		Bone; very fine grained; non-banded; hard; lenticular [sampled] [described by Bill Grady in lab].	0.01	944.98

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL		Semisplint; medium density; conchoidal fracture [sampled] [described by Bill Grady in lab].	0.03	945.01
COAL	IMP	Bone; very fine grained; non-banded; lenticular; sharp top, gradational bottom [sampled] [described by Bill Grady in lab].	0.06	945.07
COAL	CLRN	Clarain, dull; common 3mm X 10mm fusain lenses mineralized with marcasite in lower part; minor cleat calcite and 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.16	945.23
COAL	FS	Fusain; mineralized with marcasite [sampled] [described by Bill Grady in lab].	0.01	945.24
COAL		Semisplint; bright attritus; conchoidal fracture; occasional 1-3mm vitrain bands [sampled] [described by Bill Grady in lab].	0.08	945.32
COAL		Semisplint; bright attritus; hard; low density; occasional 1mm vitrain bands; minor, thin, fusain lenses and larger, marcasite-filled fusains [sampled] [described by Bill Grady in lab].	0.66	945.98
COAL	SPLINT	Splint; steel gray; conchoidal fracture; low density; gradational top [sampled] [described by Bill Grady in lab].	0.03	946.01
COAL	IMP	Bone; hard; conchoidal fracture; occasional, thin vitrain bands; common 1mm megaspores; top and bottom sharp [sampled] [described by Bill Grady in lab].	0.04	946.05
COAL	CLRN	Clarain, bright; thin vitrain bands; common cleat and bedding calcite; common pyritized fusain lenses; 1mm marcasite band at top [sampled] [described by Bill Grady in lab].	0.06	946.11
COAL	CLRN	Clarain, dull; thinly laminated with thin vitrains and common 1mm megaspores; gradational base [sampled] [described by Bill Grady in lab].	0.17	946.28
BN		High density; middle 0.07' canneloid with rare, small vitrain fragments and abundant 1mm megaspores; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.11	946.39
COAL	CLRN	Clarain, dull; very thinly laminated; gradational upward to bone [sampled] [described by Bill Grady in lab].	0.03	946.42
BN		Bone; canneloid; non-banded; minor, very thin vitrain bands containing pyrite; high density; conchoidal fracture [sampled] [described by Bill Grady in lab].	0.06	946.48
COAL	IMP	Bone; medium density; occasional vitrain fragments and canneloid shale lenses [sampled] [described by Bill Grady in lab].	0.11	946.59
COAL	IMP	Bone, canneloid; very fine grained [sampled] [described by Bill Grady in lab].	0.03	946.62

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL	CLRN	Clarain, dull; gradational base over 0.10' [sampled] [described by Bill Grady in lab].	0.30	946.92
COAL	CLRN	Clarain, bright [sampled] [described by Bill Grady in lab].	0.49	947.41
COAL	CLRN	Clarain, bright; soft; abundant fusain lenses [sampled] [described by Bill Grady in lab].	0.06	947.47
COAL	FS	Fusain; mineralized with calcite [sampled] [described by Bill Grady in lab].	0.02	947.49
COAL	CLRN	Clarain, bright, soft [sampled] [described by Bill Grady in lab].	0.02	947.51
COAL		Vitrain with abundant calcite on bedding and vertical fractures [sampled] [described by Bill Grady in lab].	0.02	947.53
COAL	CLRN	Clarain, bright; soft, abundant fusain bands and lenses; abundant 1-4mm vitrain bands [sampled] [described by Bill Grady in lab].	0.33	947.86
COAL	FS	Fusain; soft; non-mineralized [sampled] [described by Bill Grady in lab].	0.03	947.89
COAL	CLRN	Clarain, bright; soft; abundant fusain bands and lenses; abundant 1-4mm vitrain bands [sampled] [described by Bill Grady in lab].	0.18	948.07
COAL	CLRN	Clarain, bright; common 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.44	948.51
COAL	CLRN	Clarain, dull; thinly laminated; medium density; common, very thin carbonaceous shales [sampled] [described by Bill Grady in lab].	0.10	948.61
COAL	IMP	Bone; irregular thickness; gradational base [sampled] [described by Bill Grady in lab].	0.01	948.62
SH		Medium gray; few, light gray, very fine grained, sandstone streaks from 949.77' to base; clear lower contact on basal sandstone streak [sampled top 0.05' with coal above].	5.04	953.66
SH		Medium-to-dark gray; very finely fissile; abrupt lower contact [sampled basal 0.09' with coal below].	2.90	956.56
COAL	CLRN	Clarain, dull; common bone layers increasing in thickness upward; sharp top contact [sampled] [described by Bill Grady in lab].	0.04	956.60
COAL	CLRN	Clarain, bright; abundant, thin fusain lenses; abundant, cleat calcite up to 1mm thick; sharp base [sampled] [described by Bill Grady in lab].	0.13	956.73
BN		Bone; sandy; irregular thickness; gradational base [sampled] [described by Bill Grady in lab].	0.01	956.74
SS	COAL CLS	Black to dark gray; very fine grained; very hard; slightly micaceous; bedded with abundant, very	0.22	956.96

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		fine coal fragments (<<1mm); irregular bands and lenses of medium gray and light gray sandstone; minor, small stem or root fragments [sampled] [described by Bill Grady in lab].		
SH	BLK	Black; canneloid; extremely fine grained; high density; barren of fossils or vitrain fragments; very finely laminated in top 0.03'; top sharp but irregular [sampled] [described by Bill Grady in lab].	0.60	957.56
BN		Bone; silty; non-bedded; very hard; discontinuous 0.03' black shale at top; irregular, erosional lower contact [sampled] [described by Bill Grady in lab].	0.20	957.76
BN		Black; very fine grained; medium density; contains small vitrain fragments and irregular 0.01' cannel coal layers [sampled] [described by Bill Grady in lab]; abrupt lower contact [field description].	0.04	957.80
COAL	IMP	Bone; gradational base [sampled] [described by Bill Grady in lab].	0.03	957.83
COAL	CLRN	Clarain, dull; gradational base [sampled] [described by Bill Grady in lab].	0.05	957.88
COAL	CLRN	Clarain, bright; common 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.05	957.93
COAL	IMP	Bone; replaced laterally by 0.03' pyrite lens [sampled] [described by Bill Grady in lab].	0.01	957.94
COAL	CLRN	Clarain, bright; medium density; common 1-3mm vitrain bands [sampled] [described by Bill Grady in lab]; abrupt lower contact [field description].	0.44	958.38
BN		Medium density; shaly [sampled] [described by Bill Grady in lab].	0.21	958.59
COAL	CLRN	Clarain, dull; medium density; thinly laminated; occasional 1-3mm vitrain laminae [sampled] [described by Bill Grady in lab].	0.16	958.75
COAL	IMP	Bone; very fine grained; minor, very thin vitrain fragments; stigmaria on base [sampled] [described by Bill Grady in lab].	0.06	958.81
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.04	958.85
COAL	FS	Fusain; mineralized with clays; irregular thickness [sampled] [described by Bill Grady in lab].	0.02	958.87
COAL	CLRN	Clarain, dull; grades from thinly laminated in basal 0.05' to dull clarain [sampled] [described by Bill Grady in lab].	0.22	959.09
COAL	CLRN	Clarain, dull; thinly laminated with common, thin bone coal lenses; gradational base [sampled] [described by Bill Grady in lab].	0.07	959.16

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL	IMP	Bone; attrital; common, very fine (<<1mm) vitrain fragments [sampled] [described by Bill Grady in lab].	0.06	959.22
COAL	IMP	Bone; very fine grained; rare, very small vitrain fragments [sampled] [described by Bill Grady in lab].	0.02	959.24
COAL	CLRN	Clarain, bright; common 1-3mm vitrain bands and common, thin fusain lenses [sampled] [described by Bill Grady in lab].	0.68	959.92
COAL	FS	Fusain; soft; non-mineralized [sampled] [described by Bill Grady in lab].	0.01	959.93
COAL	CLRN	Clarain, bright; common 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.24	960.17
COAL	CLRN	Clarain, dull; minor 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.20	960.37
COAL	CLRN	Clarain, bright; common, thin fusain lenses [sampled] [described by Bill Grady in lab].	0.11	960.48
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.08	960.56
COAL	CLRN	Clarain, bright; common 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.17	960.73
COAL	IMP	Bone with dull clarain stringers; sharp base [sampled] [described by Bill Grady in lab].	0.03	960.76
Coalburg coal				
CLST	ROOT	Medium gray with dark gray-to-black root traces; gradual lower contact with loss of roots and increasing development of bedding [sampled top 0.10' with above coal].	4.42	965.18
SH		Medium gray; clear lower contact on silt content.	1.14	966.32
SH	SLTY	Medium gray; very fine grained, medium gray, sandstone streaks, rippled from 967.77 to 968.77'; abrupt, angular lower contact.	4.48	970.80
SS		Light gray; very fine grained; ripple cross laminated; few, dark gray, shale streaks; clear lower contact.	0.55	971.35
SH	SDY	Medium gray; micaceous; sandy; abrupt lower contact.	1.03	972.38
SS		Light gray; fine-to-very fine grained; ripple laminations; abrupt lower contact with grain size and bedding change.	0.85	973.23
SS	XBD	Light gray; fine grained; high angle (about 15 degrees), planar cross laminations with some zones showing laminations bounded by dark streaks about 0.02-0.03' thick; medium gray shale bands and clasts from 976.24 to 976.27'; abrupt lower	5.17	978.40

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		contact with bedding change.		
SS		Light gray; fine-to-very fine grained; planar ripple laminations; abrupt lower contact.	1.87	980.27
SH	SS STR	Medium gray; light gray, very fine grained, ripple laminations; abrupt lower contact.	0.21	980.48
SS		Light gray; fine grained; mostly planar cross laminations but with some change in direction; abrupt lower contact at coal streak.	9.47	989.95
SS	COAL STR	Light gray; fine grained; mostly planar cross laminations; few zones of thin coal streaks with mica; some very fine grained zones; abrupt lower contact at basal coal streak.	3.03	992.98
SS	XBD	Light gray; fine grained; planar cross laminations; abrupt lower contact at grain size change.	2.75	995.73
SS	XBD	Light gray; medium grained; few, medium gray, shale streaks and clasts from top to 997.90'; abrupt lower contact at coal streaks.	11.09	1006.82
SS	COAL STR	Light gray; medium grained; planar ripple to ripple cross laminated; thin coal streaks and small clasts throughout, especially abundant from 1009.90 to 1010.40'; few, medium gray, fine, shale clasts in basal 0.15'; abrupt lower contact.	4.68	1011.50
SS		Light gray; fine grained; mostly planar laminated with some planar cross laminations; coal streaks from 1014.00 to 1014.60' and from 1016.05 to 1016.30'; abrupt, angular lower contact on coal [not sampled].	4.93	1016.43
COAL	CLRN	Clarain, bright; abrupt lower contact [sampled] [described by Bill Grady in lab].	0.21	1016.64
		Winifrede coal		
CLST	ROOT	Dark gray-to-black; clear lower contact at sandstone [sampled top 0.07' with coal above].	0.55	1017.19
SH	ROOT	Dark gray; light gray, very fine grained, rooted, sandstone streaks; few, distinct, coarse, ironstone nodules and bands from 1018.45 to 1018.70'; abrupt lower contact at sandstone streak.	1.93	1019.12
SH	SDY	Dark gray; abrupt lower contact.	0.63	1019.75
SS		Light gray; fine grained; abrupt lower contact at shale bands.	2.25	1022.00
SS	SH STR	Light-to-medium gray; fine grained; locally abundant mica; planar laminations; medium-to-dark gray shale streaks and bands up to 0.02' thick; high angle fracture at 1023'; abrupt lower contact.	2.62	1024.62

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH	SS STR	Medium-to-dark gray; sandstone streaks are light gray, very fine grained, becoming finer and less distinct to base; clear lower contact.	3.10	1027.72
SH	FEST INCL	Medium-to-dark gray; very uniform; few, faint, coarse, ironstone nodules and bands; clear lower contact at sandstone streak.	5.49	1033.21
SH	SS STR	Medium gray; very occasional, very thin, light gray, very fine grained, sandstone streaks; clear lower contact at basal sandstone streak.	3.99	1037.20
SH	FOSS	Dark gray; few, faint, bands of ironstone <0.02' thick; few marine fossils in basal 1.0 to 2.0'; abrupt lower contact.	7.85	1045.05
SH	FOSS	Medium gray with abundant marine fossils including brachiopods, pelecypods; fossils are strongly calcareous; abrupt lower contact [not sampled].	0.76	1045.81
Winifrede Shale				
COAL		Durain; very fine grained; canneloid; conchoidal fracture; medium density; minor cleat calcite and numerous 0.01' H. X >0.01' W. black siltstone lenses; siltstone more abundant toward top [sampled] [described by Bill Grady in lab].	0.04	1045.85
COAL		Durain; very fine grained; canneloid; conchoidal fracture; medium density [sampled] [described by Bill Grady in lab].	0.08	1045.93
COAL	CLRN	Clarain, bright; 1-2mm vitrain bands common; bright attritus; sharp base [sampled] [described by Bill Grady in lab].	0.09	1046.02
COAL	IMP	Bone; occasional, very thin, vitrain lenses and fragments and carbonaceous shale layers with resin rodlets on bedding; gradational bottom [sampled] [described by Bill Grady in lab].	0.07	1046.09
COAL	CLRN	Clarain, dull; attrital; very finely laminated [sampled] [described by Bill Grady in lab].	0.07	1046.16
COAL	IMP	Bone; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.03	1046.19
COAL	CLRN	Clarain, dull; hard [sampled] [described by Bill Grady in lab].	0.21	1046.40
Chilton Rider coal				
CLST	ROOT	Medium gray; clear lower contact at basal roots [not sampled].	2.12	1048.52
SH	SS STR	Medium gray; occasional, light gray, very fine grained, sandstone streaks and laminations; occasional ironstone bands up to 0.02' thick.	6.35	1054.87
SS		Medium gray; very fine grained; rippled and bi-directional planar cross laminations; abrupt lower contact.	2.85	1057.72

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH	SS STR	Medium gray; light gray, fine grained, sandstone streaks; about 50/50 shale and sandstone streaks; clear lower contact.	3.36	1061.08
SH	FEST INCL	Medium gray; few, faint, coarse, ironstone bands up to 0.02' thick; abrupt lower contact [not sampled].	2.83	1063.91
SH	BLK	Black; contains interfingering 1mm bone and clarain lenses in lower 0.02'; contains 1-3mm vitrain in middle; slickensided [sampled] [described by Bill Grady in lab].	0.04	1063.95
COAL	CLRN	Clarain, dull; abrupt lower contact [sampled] [described by Bill Grady in lab].	0.29	1064.24
SH		Medium gray; abrupt lower contact [not sampled].	2.78	1067.02
COAL	CLRN	Clarain [not sampled].	0.17	1067.19
SH	CARB	Black [not sampled].	0.30	1067.49
CLST	ROOT	Medium gray with abundant, dark gray-to-black, root traces; abrupt lower contact [not sampled].	1.55	1069.04
COAL	SH INTLAM	[not sampled]. Chilton coal	0.29	1069.33
SH	ROOT	Dark gray; poorly bedded at top; few, faint, coarse, ironstone nodules in basal 0.20'; abrupt lower contact at sandstone streaks [not sampled].	1.96	1071.29
SS	SH STR	Light gray; very fine grained; ripple laminated; rooted; dark gray shale streaks increasing to base; few, faint, coarse, ironstone nodules and bands; abrupt lower contact.	4.31	1075.60
SH	FEST INCL	Dark gray; many, faint, coarse, ironstone nodules and bands; clear lower contact.	1.60	1077.20
SH		Dark gray; few, thin, sandstone streaks starting at 1078.70'; few, faint, coarse, ironstone nodules below 1079.00'; compaction around nodules evident; less ironstone nodules in base; abrupt lower contact [not sampled].	8.63	1085.83
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.15	1085.98
COAL	CLRN	Clarain, bright; soft; common cleat calcite [sampled] [described by Bill Grady in lab].	0.38	1086.36
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.17	1086.53
COAL		Durain, attrital; occasional 1mm vitrain bands and angular fragments; medium density [sampled] [described by Bill Grady in lab].	0.18	1086.71
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.07	1086.78

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
COAL		Vitrain [sampled] [described by Bill Grady in lab].	0.05	1086.83
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.08	1086.91
COAL	CLRN	Clarain, bright; interbanded 1-4mm attrital layers and vitrain bands [sampled] [described by Bill Grady in lab].	0.10	1087.01
COAL	CLRN	Clarain, dull [sampled] [described by Bill Grady in lab].	0.07	1087.08
COAL	IMP	Bone; canneloid; very fine grained [sampled] [described by Bill Grady in lab].	0.04	1087.12
COAL	IMP	Bone; attrital; common 1-3mm vitrains [sampled] [described by Bill Grady in lab].	0.07	1087.19
COAL	CLRN	Clarain, bright; minor cleat calcite [sampled] [described by Bill Grady in lab].	0.04	1087.23
COAL	IMP	Bone; common 1mm vitrain bands [sampled] [described by Bill Grady in lab].	0.08	1087.31
COAL	IMP	Bone; attrital; abundant pyrite; lenticular [sampled] [described by Bill Grady in lab].	0.05	1087.36
CLST	ROOT	Dark gray; disturbed bedding; rooted with stigmaraia; 0.01' pyrite layer at top [sampled] [described by Bill Grady in lab].	0.20	1087.56
CLST	ROOT	Black; heavily rooted; bedding disturbed; abundant stigmaraia imprints throughout [sampled] [described by Bill Grady in lab].	0.08	1087.64
COAL	IMP	Bone; granular; high density; reworked fusain fragments with abundant dispersed pyrite; 0.01' thick pyrite band at 1087.71' [sampled] [described by Bill Grady in lab].	0.09	1087.73
COAL	IMP	Bone; common thin vitrains; less vitrains upward [sampled] [described by Bill Grady in lab].	0.10	1087.83
COAL	CLRN	Clarain, dull; abundant fusain lenses [sampled] [described by Bill Grady in lab].	0.53	1088.36
COAL	CLRN	Clarain, dull; minor thin fusains [sampled] [described by Bill Grady in lab].	0.17	1088.53
COAL	CLRN	Clarain, dull, attrital; rare, thin vitrain lenses [sampled] [described by Bill Grady in lab].	0.19	1088.72
COAL		Durain; abundant fusains; irregular thickness [sampled] [described by Bill Grady in lab].	0.04	1088.76
COAL	CLRN	Clarain, dull; abundant 1-3mm fusain bands and lenses; soft; non-mineralized [sampled] [described by Bill Grady in lab].	0.15	1088.91
COAL		Durain, attrital; minor, very thin vitrain lenses; medium density [sampled] [described by Bill Grady	0.09	1089.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		in lab].		
COAL	CLRN	Clarain, dull; common fusain lenses [sampled] [described by Bill Grady in lab].	0.21	1089.21
COAL	CLRN	Clarain, bright; slickensided, angular base [sampled] [described by Bill Grady in lab].	0.20	1089.41
CLST	ROOT	Black; abundant slickensides; broken; abrupt lower contact [not sampled].	0.17	1089.58
SH		Dark gray; very occasional, very thin, very fine grained, sandstone streaks; clear lower contact with coal [basal 0.05' sampled with coal below is coaly with common cleat calcite and pyrite lenses].	1.89	1091.47
COAL		Durain, attrital; medium density; very thin vitrain bands and fragments; minor cleat calcite; common pyrite lenses in top; gradational base over 0.04'; broken by drilling [sampled] [described by Bill Grady in lab].	0.44	1091.91
SH	CARB	Black; very carbonaceous; very rooted and slickensided; minor calcite and pyrite on slickensides; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.10	1092.01
COAL	IMP	Bone, attrital; medium density; contains abundant, 1-3mm fusain and vitrain fragments in upper part; gradational base; thin pyrite lenses near top [sampled] [described by Bill Grady in lab].	0.10	1092.11
COAL	CLRN	Clarain, dull; common cleat calcite [sampled] [described by Bill Grady in lab].	0.09	1092.20
COAL		Semisplint, attrital; very thin vitrain lenses; conchoidal fracture; low density; common cleat calcite [sampled] [described by Bill Grady in lab].	0.10	1092.30
COAL	CLRN	Clarain, dull; common semisplint layers; common cleat calcite [sampled] [described by Bill Grady in lab].	0.24	1092.54
COAL	IMP	Impure; dull clarains interbedded with abundant carbonaceous shale layers; very slickensided with calcite; 0.01' thick pyrite layer at base [sampled] [described by Bill Grady in lab]. Units from 1092.01 to 1092.66 broken by drilling [field description].	0.12	1092.66
CLST	ROOT	Dark-to-medium gray; badly broken by drilling; clear lower contact at color change [top 0.14' sampled with coal above very carbonaceous; very abundant coalified roots; common slickensides with calcite and minor pyrite on surfaces [described by Bill Grady in lab]].	0.81	1093.47
CLST	ROOT	Light gray; clayey; crumbly in top 0.21'; abundant pyrite from 1094.90 to 1095.20'; diffuse lower contact with increasing bedding development [not	2.22	1095.69

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		sampled].		
SH	CARB	Black, pyrite streaks, clear lower contact [not sampled].	0.92	1096.61
SH	CARB	Black with occasional, very thin, coal streaks; common, faint, fine, medium gray, streaks and small clasts of clayey material; abrupt lower contact at coal [basal 0.06' sampled with coal below, silty, common pyrite lenses and thin sandstone lenses as described by Bill Grady in lab].	1.20	1097.81
COAL		Fusains; mostly pyritized; some clay-filled; interbedded with 1mm vitrain bands; sharp top and bottom [sampled] [described by Bill Grady in lab].	0.05	1097.86
COAL	CLRN	Clarain, dull; common fusain lenses and cleat calcite [sampled] [described by Bill Grady in lab].	0.14	1098.00
SH	CARB	Black; carbonaceous; bony; stigmara; sharp top and bottom [sampled] [described by Bill Grady in lab].	0.02	1098.02
COAL	CLRN	Clarain, dull; abundant 1mm fusain lenses and minor cleat calcite; base gradational [sampled] [described by Bill Grady in lab].	0.05	1098.07
COAL	CLRN	Clarain, bright; sharp base [sampled] [described by Bill Grady in lab].	0.04	1098.11
COAL	CLRN	Clarain, dull; gradational base [sampled] [described by Bill Grady in lab].	0.05	1098.16
COAL	IMP	Bone; dull; black; medium density; some fine clarain and fusain lenses; common, very thin, carbonaceous shale lenses; sharp and irregular lower contact [sampled] [described by Bill Grady in lab]. Somewhat broken by drilling from 1097.81 to 1098.51 [field description].	0.35	1098.51
		Fireclay coal		
MDST	ROOT	Medium-to-dark gray with abundant, light gray, very fine grained, bioturbated (rooted?), sandstone streaks; clear lower contact at bedding change [top 0.10' sampled with coal above contains abundant coal fragments and roots as described by Bill Grady in lab].	3.36	1101.87
SH	BITRB	Dark gray; abundant, light gray, very fine grained, bioturbated, sandstone streaks; possible burrowing; abrupt lower contact at basal sandstone streak.	4.33	1106.20
SH		Medium gray; badly broken by drilling; vertical fractures?; abrupt lower contact at sandstone streaks.	2.96	1109.16
SH	BRW	Dark gray; abundant, light gray, very fine grained, sandstone streaks; highly burrowed;	0.59	1109.75

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		abrupt lower contact.		
SH		Dark gray; few, faint, coarse, ironstone nodules; abrupt lower contact.	1.99	1111.74
SH	BRW	Dark gray; highly burrowed; abundant, light gray, very fine grained, sandstone streaks; ironstone nodules in top 0.15'; abrupt lower contact.	0.74	1112.48
SH	SDY	Dark gray; sandy; abrupt lower contact on coal [sampled basal 0.14' with coal below].	1.02	1113.50
COAL	CLRN	Clarain, dull; sharp upper contact; irregular lower contact on sandstone lenses [sampled] [described by Bill Grady in lab].	0.01	1113.51
COAL	CLRN	Clarain, dull; contorted; contains several large (0.03'H X 0.10'W) and small rounded lenses of very fine grained sandstone with abundant interstitial pyrite [sampled] [described by Bill Grady in lab].	0.09	1113.60
COAL	CLRN	Clarain, dull; common fusain lenses and common cleat calcite [sampled] [described by Bill Grady in lab].	0.28	1113.88
COAL		Durain; impure; medium density with interbedded, very thin, carbonaceous shale lenses and vitrain bands [sampled] [described by Bill Grady in lab].	0.03	1113.91
SH	CARB	Black; carbonaceous; bony; sharp top and gradational base [sampled] [described by Bill Grady in lab].	0.04	1113.95
COAL	IMP	Bone; low density; common vitrain bands and fragments; occasional fusain lenses; abundant 1mm megaspores on bedding; sharp base [sampled] [described by Bill Grady in lab].	0.08	1114.03
COAL	CLRN	Clarain, dull; irregular bone layers and vitrain bands; minor fusain lenses; minor cleat calcite; sharp base [sampled] [described by Bill Grady in lab].	0.22	1114.25
		Cedar Grove coal		
SH	ROOT	Silty; medium gray; abrupt lower contact [top 0.10' sampled with coal above, very carbonaceous; poorly bedded; slickensided; abundant pyrite filling vertical voids and fractures (roots?) up to 1mm in size; common roots].	1.35	1115.60
SH		Light gray; becoming sandy to base; abrupt lower contact.	1.57	1117.17
SH	BRW	Dark gray; abundant, light gray, very fine grained, sandstone streaks, all burrowed; abrupt lower contact at basal burrowing.	4.05	1121.22
SH		Medium gray; very occasional, very thin, light gray, very fine grained, sandstone streaks, mostly	10.29	1131.51

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		absent below 1127.00'; abrupt lower contact at color change.		
SH	FEST INCL	Light gray; some clasts of overlying unit in top 0.15'; common, faint, coarse, ironstone nodules and bands; coal streak at 1135.04'; abundant plant pinnules; gradual lower contact, sandy in contact zone.	4.73	1136.24
SS	BITRB	Light gray; bioturbated; very fine grained; massive; abrupt lower contact.	0.17	1136.41
SS	QTZ	Very fine grained; medium gray sand with thin streaks and distorted bands of very fine grained, light gray, quartz sand; abrupt high angle lower contact.	0.24	1136.65
SS	BITRB	Light gray; very fine grained; massive; irregular lower contact with mixing of sand and shale.	1.03	1137.68
SH	BITRB	Medium gray; break between sandstone; clear lower contact.	0.32	1138.00
SS	BITRB	Light gray; very fine grained; massive; churned; clear lower contact.	1.16	1139.16
SH	BITRB	Medium gray shale streaks with light gray, very fine grained, mostly ripple laminated, sandstone streaks; probably rooted throughout; clear lower contact at ironstone band and decreasing sandstone streaks.	5.49	1144.65
SH		Medium gray; few, thin, light gray, very fine grained, sandstone streaks increasing upwards; few, faint, coarse, ironstone nodules and bands; clear lower contact at basal sandstone streak.	4.70	1149.35
SH	FEST INCL	Medium gray; very uniform; few, faint, coarse, nodules and bands of ironstone, very weakly calcareous when scratched; less ironstone to base; abrupt lower contact.	13.69	1163.04
SH	FOSS	Light-to-medium gray; calcareous marine fossils including brachiopods; also bioturbated; sandy; abrupt lower contact on coal [basal 0.12' sampled with coal below, carbonaceous, micaceous, thin vitrain bands and abundant pyrite on inclined bedding, very abundant interstitial pyrite in basal 0.01']. . Dingess Shale	1.29	1164.33
COAL	CLRN	Clarain, dull; thicker and more abundant vitrain bands upward; gradational lower contact [sampled] [described by Bill Grady in lab].	0.42	1164.75
COAL	IMP	Bone; medium density; very fine attrital vitrain fragments and large vitrain bands from stems and calamites on bedding; large stigmara at base [sampled] [described by Bill Grady in lab]. . Williamson Coal	0.20	1164.95

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH		Medium gray with coal streak at 1165.59'; gradual lower contact with increasing sand [sampled top 0.08' with coal above].	1.12	1166.07
SH	SS STR	Medium gray; very thin, light gray, very fine grained, planar, ripple laminated sandstone streaks; clear lower contact at basal sandstone streak.	6.93	1173.00
SH		Medium gray; few, very thin, light gray, very fine grained, sandstone streaks; clear lower contact.	6.25	1179.25
SH	BRW	Medium gray; abundant, light gray, very fine grained, rippled, sandstone streaks; sand-filled planar round burrows up to 0.01' diameter; clear lower contact with increasing sand.	7.67	1186.92
SS	BRW	Light gray; fine grained; mostly rippled but distorted; horizontal and vertical burrows; some ironstone nodules showing compaction around them; abrupt lower contact.	2.95	1189.87
SH		Medium gray; few, very thin, very fine grained, sandstone streaks; burrows from 1194.00' to base; clear lower contact.	5.13	1195.00
SH	BRW	Medium gray; light gray, fine grained, rippled, sandstone streaks; many sand-filled burrows; bedding still somewhat intact; clear lower contact with increasing sand.	1.90	1196.90
SS	BRW	Light gray; very fine grained; rippled laminations; medium gray shale streaks; bedding mostly intact with abundant sand-filled burrows and general bioturbation; abrupt lower contact.	8.67	1205.57
SS	CALC	Light gray; hard; dense; fine-to-medium grained with strongly calcareous cement; massive in top 0.30' with distorted cross laminations to base; also sand-sized coal fragments; very thin mica and coal streaks; clear lower contact at appearance of calcareous cement.	1.03	1206.60
		Campbell Creek marine zone		
SS		Light gray; fine grained; ripple-to-ripple cross laminated; abundant mica streaks and coaly streaks; few, medium gray, shale clasts; abrupt lower contact.	4.70	1211.30
SH		Medium gray; few, very thin, very fine grained, sandstone streaks; abrupt lower contact.	1.68	1212.98
SS	SH STR	Light-to-medium gray; fine-to-very fine grained; planar cross laminations; occasional, medium gray, shale bands and streaks up to 0.02' thick; clear lower contact with increasing sand.	1.22	1214.20
SH		Dark gray; abrupt lower contact [not sampled].	0.28	1214.48
COAL	IMP	[not sampled].	0.07	1214.55

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
PYR		Nodule with coal streaks; clayey; abrupt lower contact [not sampled].	0.17	1214.72
COAL	IMP	[not sampled].	0.08	1214.80
CLST	ROOT	Light gray-brown; abundant root traces; gradual lower contact on color and bedding change [not sampled].	1.75	1216.55
SH		Medium gray; rooted in top; light gray, very fine grained, rippled, sandstone streaks from 1217.45 to 1218.35'; abrupt lower contact with coal [sampled basal 0.02' with coal below].	2.43	1218.98
COAL	IMP	Bone; nonbanded, with 1mm megaspores; gradational base [sampled] [described by Bill Grady in lab].	0.02	1219.00
COAL	CLRN	Clarain, bright; common fusain lenses; 4mm vitrain band near top [sampled] [described by Bill Grady in lab].	0.21	1219.21
COAL	IMP	Bone; medium density; nonbanded; gradational top and bottom [sampled] [described by Bill Grady in lab].	0.05	1219.26
BN		Nonbanded; high density; very fine groundmass; common, 1mm, angular vitrain fragments; small pyrite blebs and ostracods [sampled] [described by Bill Grady in lab].	0.10	1219.36
COAL	CLRN	Clarain, dull; sharp base [sampled] [described by Bill Grady in lab].	0.02	1219.38
COAL	CLRN	Clarain, bright; soft; common fusain lenses; bottom sharp [sampled] [described by Bill Grady in lab].	0.80	1220.18
COAL	IMP	Bone; very fine grained groundmass with very fine grained vitrain fragments on disrupted bedding; medium density; bottom angular on claystone beneath with stigmara at base [sampled] [described by Bill Grady in lab].	0.08	1220.26
CLST	ROOT	Black in top 0.03', rest medium gray; slickensides; clear lower contact with increasing bedding development [sampled top 0.18' with coal above].	1.77	1222.03
SH		Medium gray; poorly bedded in top; abrupt lower contact [sampled basal 0.06' with coal below].	0.97	1223.00
COAL		Durain; very thinly laminated vitrains, carbonaceous shales, and common 1X5mm pyrite lenses [sampled] [described by Bill Grady in lab].	0.07	1223.07
COAL	CLRN	Clarain, dull; common fusain lenses; minor cleat calcite [sampled] [described by Bill Grady in lab].	0.15	1223.22
COAL	IMP	Bone; very finely banded with thin vitrains, thin black shales with large stigmara, and distinct fusain bands within and marking top and bottom	0.06	1223.28

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		surfaces [sampled] [described by Bill Grady in lab].		
COAL	CLRN	Clarain, dull; common 1mm vitrain bands at top; sharp base [sampled] [described by Bill Grady in lab].	0.18	1223.46
SH		Dark gray; black; carbonaceous in top by coal; abrupt lower contact [sampled top 0.17' with coal above, containing carbonized stem fragments at angles to bedding].	0.21	1223.67
SS	SH INBD	Sandstone; light gray; fine grained; top 0.40' massive, rest planar ripple laminated; medium gray shale zones/beds up to 0.10' thick; clear lower contact [not sampled].	2.70	1226.37
SH		Medium gray [not sampled].	2.44	1228.81
COAL		[not sampled].	0.25	1229.06
		No. 2 Gas coal		
CLST	ROOT	Light gray; becoming sandy at 1230.00'; clear lower contact at bedding change [not sampled].	2.67	1231.73
SS	SH STR	Light gray; very fine grained; ripple laminated; medium gray shale streaks; vertical fractures; abrupt lower contact.	3.79	1235.52
SH		Medium gray; vertical fractures; abrupt lower contact.	0.41	1235.93
SS	SH STR	Light gray; very fine grained; mostly ripple laminated; medium gray shale streaks and thin beds up to 0.02' thick; few root traces and burrows(?); abrupt lower contact.	7.92	1243.85
SH		Medium gray; broken slickensided pieces from 1246.10 to 1247.15'.	4.05	1247.90
SS	BITRB	Light gray; fine grained; bedding greatly distorted, probably from rooting; medium gray shale streaks throughout; few, distinct, medium-to-coarse, ironstone nodules throughout; possible burrows also; gradual lower contact.	3.63	1251.53
SH	BITRB	Medium gray; sandy, vertical fractures; gradual lower contact.	1.75	1253.28
SS	BITRB	Light-to-medium gray; fine grained; abundant, medium gray, shale streaks; highly bioturbated, probably burrows; increasing shale to base; clear lower contact.	1.50	1254.78
SH	SS STR	Medium gray; light gray, very fine grained, rippled, sandstone streaks increasing in amount to top; clear lower contact.	1.60	1256.38
SH		Medium gray to dark gray-black in basal 1.0'; vertical fractures and broken from 1261.00 to base; abrupt lower contact.	6.79	1263.17

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light-to-medium gray; very fine grained; slightly ripple laminated [not sampled].	0.14	1263.31
COAL	IMP	[not sampled]. Powellton coal	0.14	1263.45
CLST	ROOT	Light gray in top 0.20' grading to medium gray; few, faint, medium-to-coarse, ironstone nodules from 1265.00' to base; abrupt lower contact [not sampled].	2.11	1265.56
SS	SH STR	Light gray; fine grained; ripple laminated; medium gray shale streaks up to 0.02' thick and one 0.15' bed; abrupt lower contact.	2.56	1268.12
SH		Medium gray; clear lower contact.	0.53	1268.65
CLST	ROOT	Light-to-medium gray; clear lower contact.	0.35	1269.00
SH		Medium gray; clear lower contact.	1.10	1270.10
SS		Medium gray; massive; very fine grained; abrupt, angular lower contact.	0.37	1270.47
SH		Medium gray; abrupt lower contact.	3.63	1274.10
SS	XBD	Light gray; fine grained; ripple cross laminated; clear lower contact.	0.83	1274.93
SH	SS STR	Medium gray; few, light gray, very fine grained, ripple cross laminated, sandstone streaks, especially abundant from 1275.90 to 1276.30'; abrupt lower contact.	3.97	1278.90
SS	XBD	Light gray; fine grained; ripple cross laminated; zone of planar cross laminations from 1279.40 to 1280.00'; abrupt lower contact.	1.37	1280.27
SH	SS STR	Medium gray; light gray, very fine grained, ripple cross laminated sandstone streaks; vertical fracture from 1280.80' to base; clear lower contact with increase in sand below.	2.33	1282.60
SS	SH INBD	Light gray; fine grained; ripple cross laminations with interlaminated shale beds up to 0.03' thick and shale streaks; abrupt lower contact at lowermost shale band.	2.50	1285.10
SS	XBD	Light gray; very fine grained; ripple cross laminated; shale clasts in basal 0.50'; clear lower contact.	1.55	1286.65
SS	XBD	Light gray; fine grained; ripple laminated; coaly, mica streaks in top 0.25'; abrupt lower contact at calcareous cement.	1.70	1288.35
SS	CALC	Light gray-brown; fine grained; massive; calcareous cement with calcite on vertical fractures; abrupt lower contact.	1.28	1289.63
SS	XBD	Light gray; fine grained; ripple laminated; clear	4.33	1293.96

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		lower contact.		
SS	SLMP	Light gray; fine grained; very high angle cross bedding and some distorted bedding; medium gray shale clasts in base; abrupt lower contact.	0.88	1294.84
SH	FEST INCL	Medium gray; few, faint, coarse, ironstone nodules; few, thin, sandstone streaks; plant pinnules.	5.52	1300.36
NR	CORE LOSS		0.27	1300.63
SH		Medium gray; broken in drilling [sampled basal 0.10' with coal below].	0.21	1300.84
COAL	IMP	Impure; contains large (0.00 - 0.07') lens of black shale containing common ostracods and 1-5mm angular fusain fragments; sharp top and angular base in coal below [sampled] [described by Bill Grady in lab].	0.08	1300.92
COAL	CLRN	Clarain; dull; attrital; common 1mm vitrain bands and thin fusains [sampled] [described in lab by Bill Grady].	0.44	1301.36
COAL	IMP	Bone, with occasional large carbonized stem imprints as 1mm vitrain bands in upper part; medium density; gradational top and bottom [sampled] [described by Bill Grady in lab]. Broken by drilling; possible loss [field description].	0.07	1301.43
		Eagle coal		
CLST	ROOT	Medium gray; abrupt lower contact [sample top 0.10' with coal above].	0.89	1302.32
SS	ROOT	Light gray; fine grained; planar laminations and ripple laminations; bedding distorted by rooting, decreasing to base; gradual lower contact with decreased distortion to bedding.	6.53	1308.85
SS	XBD	Light gray; fine-to-medium grained; planar cross laminations; abrupt lower contact.	4.61	1313.46
SH	SS STR	Medium gray; few, light gray, very fine grained, very thin, sandstone streaks, increasing upward; clear lower contact at basal sandstone streak.	5.19	1318.65
SH		Medium gray; sandy; hard, especially to base; clear lower contact at sandstone streaks.	7.29	1325.94
SH	SS STR	Medium gray shale; light gray, fine grained; ripple and ripple cross laminated, sandstone streaks; part of fining upward sequence; abrupt lower contact.	0.61	1326.55
SS	XBD	Light gray; medium grained; abrupt lower contact at grain size change.	2.97	1329.52
SS	COAL STR	Light gray; fine grained; mostly ripple cross laminated; few, very thin, micaceous, coal streaks; abrupt, high angle, lower contact.	3.55	1333.07

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH	COAL STR	Dark gray; clayey; poorly bedded; few, thin, coal streaks, especially at base; abrupt, irregular, lower contact.	0.40	1333.47
SS		Light gray; very fine grained; a thin lense; abrupt lower contact.	0.15	1333.62
SH		Dark gray; poorly bedded; slickensided; slumped; irregular lenses of light gray, medium grained sandstone; abrupt lower contact.	1.16	1334.78
SH	SS STR	Medium gray; silty; light gray, fine grained, sandstone streaks; high angle, planar, cross laminations to 1335.33', low angle to base; abrupt lower contact.	1.80	1336.58
SH	SLMP	Medium gray; silty; sandy; very high angle (45 degrees), light gray, fine grained, sandstone streaks, especially distorted in basal half; abrupt, angular, lower contact.	1.42	1338.00
SS		Light gray; medium grained; massive; fining upward; abrupt lower contact on grain size change.	6.36	1344.36
SS		Light gray; medium-to-coarse grained; bi-directional, planar, cross laminations to massive; abrupt lower contact on grain size change.	0.74	1345.10
SS		Light gray; fine-to-medium grained; planar laminations to planar cross laminations; abrupt lower contact on grain size change.	0.60	1345.70
SS		Light gray; medium-to-coarse grained; interbedded, planar cross laminations and massive; medium gray shale and ironstone clasts from 1352.15 to 1352.52'; abrupt, angular, lower contact.	7.22	1352.92
SH		Medium gray; slickensided; few, faint, medium-to-coarse, ironstone nodules; clear lower contact at sandstone streaks.	7.05	1359.97
SS	SLMP	Overall, homogenized medium gray; light gray, fine grained, planar cross laminations; medium gray shale streaks; all distorted, slumped with common micro-faulting; increasing shale to base; abrupt lower contact at basal sandstone streak.	4.03	1364.00
SH		Medium-to-dark gray; abundant slickensides; very broken into small fragments, especially at base; abrupt lower contact.	0.95	1364.95
COAL	NP	Position of the Middle War Eagle coal (absent)	0.00	1364.95
CLST	ROOT	Light gray-brown; abundant root traces; clear lower contact at sandstone streak.	0.75	1365.70
SS	SH STR	Light gray; very fine grained; planar ripple laminations with streaks of claystone (above unit) in top; shale streaks in basal 0.30'; clear lower contact.	1.13	1366.83

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH	SS STR	Medium gray; few, very thin, very fine grained, light gray, sandstone streaks; clear lower contact.	1.85	1368.68
SS	SH INBD	Light gray; very fine grained; ripple laminations; medium gray shale streaks and laminations - "tiger striped"; some zones of soft sediment deformation; clear lower contact with upward increasing sand and decreasing shale.	9.81	1378.49
SH	SS STR	Medium-to-dark gray; few, light gray, fine grained, rippled sandstone streaks; abrupt lower contact.	2.81	1381.30
SS	BRW	Light gray; fine grained; ripple laminations; interlaminated medium gray shale; some round, mostly planar burrows, especially from 1383.80' to base; abrupt lower contact.	4.06	1385.36
SH		Medium gray; very uniform; occasional, light gray, very fine grained, very thin, discontinuous sandstone streaks; few, faint, ironstone bands up to 0.07' thick; silty to base; some burrows evident in sandstone streaks below 1402.00'; badly broken around vertical fractures from 1412.80' to base; abrupt lower contact.	29.59	1414.95
SS	BRW	Light gray; very fine grained; rippled laminations; medium gray shale laminations and streaks; common sand-filled burrows, especially below 1416.00'; increased bioturbation below 1416.00'; abrupt lower contact.	4.28	1419.23
SH		Medium gray; occasional, light gray, very fine grained, very thin, discontinuous, rippled, sandstone streaks; clear lower contact at burrows.	2.90	1422.13
SH	BRW	Medium gray; few, light gray, very fine grained, sand-filled burrows and discontinuous streaks; large ironstone nodules from 1427.32 to 1427.45'; abrupt lower contact with sandstone band at base.	5.38	1427.51
SH		Medium gray; very uniform; plant stems; becoming silty, sandy to base; clear lower contact at sandstone streaks.	5.09	1432.60
SH	SS STR	Medium gray; sandy; faint, medium gray, very fine grained, rippled, sandstone streaks; abrupt lower contact.	1.18	1433.78
SS		Light gray; fine grained; mostly ripple laminated; few, medium-to-dark gray, shale bands up to 0.02' thick, from top to 1435.67'; common mica streaks; clear lower contact at bedding and mineralogy change.	3.60	1437.38
SS	XBD	Light gray; fine grained; mica streaks; mostly ripple cross laminated; increasing quartz content to base; abrupt lower contact at basal 0.03' thick shale band.	1.84	1439.22
SS	QTZ	Light gray-to-white; fine-to-medium grained; still	0.12	1439.34

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		some accessory minerals; abrupt lower contact.		
SS		Light gray; fine grained; ripple to ripple cross laminations; mica streaks; moderately clean with minor accessory minerals; cleaner with stylolites from 1442.50' to base; abrupt lower contact.	4.19	1443.53
SS		Light-to-medium gray; fine-to-very fine grained; medium-to-dark gray shale streaks; abrupt lower contact at basal shale streak.	0.78	1444.31
SS	QTZ	Light gray; fine grained; mostly massive to rippled; common stylolites; thin coaly streaks from 1451.00' to base; abrupt lower contact.	7.12	1451.43
SS	SH CLS	Light gray; fine grained; quartzose; medium gray shale clasts and streaks; one large, angular, shale clast from 1451.60 to 1451.70'; clear lower contact at basal shale streak.	0.47	1451.90
SS		Light gray; medium grained; fairly quartzose; minor accessory minerals; cleaner to base; few, thin, coal streaks throughout; abrupt, irregular lower contact.	4.04	1455.94
SS	SH STR	Light gray; fine grained; ripple laminated; common, medium gray, shale laminations up to 0.02' thick and rippled shale streaks; abundant, small shale clasts in top 0.25' and from 1490.05 to 1459.25', from 1476.90 to 1477.31', from 1477.82 to 1477.90', from 1480.32 to 1480.44', from 1480.72 to 1480.88', from 1482.16 to 1482.50', from 1483.33 to 1483.37', and in basal 0.07'; abrupt lower contact.	29.70	1485.64
SS		Light gray; medium grained; few, fine, ironstone pebbles; slightly clean; abrupt lower contact on grain size change.	0.76	1486.40
SS		Light gray; fine grained; slightly inclined, planar laminations; abrupt lower contact.	0.40	1486.80
SS	CGL	Light gray; medium grained; abundant, ironstone pebbles and clasts; some fine grained, medium gray, sandstone pebbles and clasts; one coal streak; one zone with gas emissions; clear lower contact.	1.25	1488.05
SS	SH CLS	Light gray; fine grained; abundant, medium gray, shale clasts; clear lower contact.	1.12	1489.17
SS		Light gray; fine grained; massive; zones of fine, ironstone pebbles and clasts from 1489.40 to 1489.60', and from 1490.23' to base; clear lower contact.	1.28	1490.45
SS	CGL	Light gray; medium grained; abundant, ironstone pebbles, shale clasts and pebbles; few, fine grained, sandstone clasts; abrupt lower contact.	0.69	1491.14
SS		Light gray; very fine grained; planar cross laminations; abrupt, angular lower contact.	0.44	1491.58

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS	SH CLS	Light gray; medium grained; medium gray, shale clasts; few ironstone clasts; abrupt lower contact.	0.79	1492.37
SS		Light gray; fine grained; large shale pebble from 1493.30 to 1493.58', discontinuous across core; few shale and ironstone clasts and pebbles in basal 0.20'; abrupt lower contact.	1.63	1494.00
SS	XBD	Light gray; fine grained; planar cross laminations; abrupt lower contact.	1.11	1495.11
SS	CGL	Light gray; medium grained; abundant shale pebbles and clasts; abrupt lower contact.	0.39	1495.50
SH		Dark gray; abrupt lower contact.	2.40	1497.90
SH	SDY	Medium gray; few, very thin, light gray, very fine grained, rippled, slightly inclined, sandstone streaks; clear lower contact at basal sandstone streak.	3.63	1501.53
SH	FEST INCL	Medium gray; few, faint, bands of ironstone up to 0.18' thick; few plant stems; abrupt, angular lower contact.	5.12	1506.65
SS		Medium gray; very fine grained; rooted in top; abrupt lower contact.	1.68	1508.33
SS	QTZ	Light gray-to-white; hard; fine grained; abrupt lower contact.	0.41	1508.74
SS		Light-to-medium gray; very fine grained; streaks of clean sandstone; soft sediment deformation(?) from 1509.12 to 1509.55'; abrupt, angular lower contact.	1.16	1509.90
SS	QTZ	Light gray-to-white; fine grained; ripple and ripple cross laminations; mostly quartz grains with minor dark mineral grains and mica; hard; slump planes, micro-faulting in basal 0.40'; abrupt, angular lower contact.	2.43	1512.33
SS	SH STR	Light gray; very fine grained; rippled sandstone streaks, some quartzose; medium gray and light gray-brown shale streaks; clear lower contact.	0.84	1513.17
SS	SH STR	Light gray; very fine grained; ripple laminations with interlaminated, medium gray shale; some sandstone laminations are very discontinuous; possible planar burrows from 1516.00' to base; clear lower contact at basal sandstone streak.	5.31	1518.48
SH		Dark gray; very uniform; no plants seen; abrupt lower contact at sandstone streak.	3.15	1521.63
SH	SS STR	Medium gray; few, light-to-medium gray, very fine grained, sandstone streaks; bioturbated - rooted?, burrowed?; abrupt lower contact at basal sandstone streak.	1.20	1522.83
SH	FEST INCL	Medium gray; common ironstone bands up to 0.03'	2.98	1525.81

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		thick, few nodules; abrupt lower contact.		
SS	BITRB	Medium gray; very fine grained; rooted?; abrupt lower contact.	0.25	1526.06
SH		Medium-to-dark gray; few, faint, thin (<0.02'), ironstone bands; clear lower contact.	0.94	1527.00
SH		Medium gray; few, faint, ironstone bands; small pelecypods and possible gastropods, possibly extending into shale above and below; clear lower contact to last fossil observed.	2.37	1529.37
SH		Medium gray with light gray streaks; ironstone bands; no fossils seen; very thin, very fine grained, sandstone streaks from 1532.80 to 1534.00'; clear lower contact.	5.48	1534.85
SH	SLTY	Light-to-medium gray; zones of 1-2 mm sized siderite pellets; sandy streak zone from 1536.60 to 1536.70'; abrupt lower contact.	2.21	1537.06
SS	ROOT	Light gray; very fine grained; silty; rooted to about 1540.00', less so below; some white, cleaner streaks; diffuse lower contact with loss of rooting and increasing shaliness.	4.11	1541.17
SH	SDY	Light-to-medium gray; sandy and silty; diffuse lower contact at discernible sandstone streak.	3.08	1544.25
SH	SS STR	Light-to-medium gray; sandy; light gray-to-white, very fine grained, rippled and ripple cross laminated, sandstone streaks, some slightly clean; very high angle, possibly slumped laminations from 1550.00 to 1550.85'; rooted from 1551.00' to base; highly rooted from 1556.00' to base; clear lower contact.	13.00	1557.25
SS	SH STR	Light gray; very fine grained; rippled, bioturbated; medium gray, shale bands and streaks; clear lower contact.	0.75	1558.00
SH	SS STR	Medium gray; sandy; light gray-to-white, very fine grained, sandstone streaks; white zones are clean quartz; soft sediment deformation or bioturbation below 1559.00'; abundant coal streaks and clasts from 1561.63 to 1562.52'; increasing sand to base; abrupt lower contact.	4.73	1562.73
SS	SH STR	Thin, light gray, very fine grained, ripple laminated sandstone with interlaminated, dark gray shale; bioturbated, probably rooted; sandstone streaks not as evident in basal 0.30'; abrupt lower contact [sampled basal 0.10' with coal below].	1.43	1564.16
COAL	CLRN	Clarain, dull; common 1-3mm vitrain bands [sampled] [described by Bill Grady in lab].	0.14	1564.30
COAL	CLRN	Clarain; dull; common fusain lenses; base of coal irregular and gradational into top 0.01' of sandstone below [sampled] [described in lab by	1.30	1565.60

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		Bill Grady] Gas bubbles from cleat and bedding; broken along cleat [from field description]. . Sewell coal		
SS	ROOT	Light gray; very fine grained; fining-up; laminations destroyed from top to about 1568.00'; ripple laminations evident from 1568.00' to base, but still rooted; abrupt lower contact [sampled top 0.06 with coal above].	4.22	1569.82
SH		Medium-to-dark gray; very few, very thin, light gray, very fine grained, sandstone streaks; few, faint, coarse, ironstone nodules in top to 1571.02'; clear lower contact at sandstone streaks.	6.80	1576.62
SH	SS STR	Medium-to-dark gray; light gray, very fine grained, slightly ripple laminated, sandstone streaks; some burrowing(?) evident in sandstone streaks; abrupt lower contact.	2.21	1578.83
SS	SLTY	Light-to-medium gray; massive; burrowed in top 0.10'; rooted.	2.17	1581.00
SH	SLTY	Medium gray; few sandstone streaks; roots, plant pinnules; clear lower contact.	2.08	1583.08
SH	SS STR	Medium gray; light gray, very fine grained, high angle, rippled, sandstone streaks, slumped to 1585.20'; mostly low angle, ripple cross laminations from 1585.20' to base; abrupt lower contact at basal sandstone streak.	5.75	1588.83
SH	FEST INCL	Medium gray; few, faint, coarse, ironstone nodules and bands; abrupt lower contact.	2.03	1590.86
SS	SLTY	Medium gray; very fine grained; mostly ripple laminated; clear lower contact.	2.06	1592.92
SH		Medium gray; abrupt lower contact [sampled basal 0.10' with coal below].	1.42	1594.34
COAL	CLRN	Clarain, dull; lenticular [sampled] [described by Bill Grady in lab].	0.00	1594.34
COAL	FS	Fusain; mineralized with clays and pyrite; composed of >5mm fusain fragments; lenticular [sampled] [described by Bill Grady in lab].	0.08	1594.42
COAL	CLRN	Clarain, dull; common 1mm vitrain bands and carbonaceous shale layers [sampled] [described by Bill Grady in lab]. Core badly broken when removed from core barrel with water; stratigraphy uncertain from top of coal to base of this unit (1594.89') [field description].	0.47	1594.89
SS		Black; lenticular; sharp top and bottom; contains thin vitrain bands and small vitrain fragments in base [sampled] [described by Bill Grady in lab].	0.04	1594.93
COAL	CLRN	Clarain, dull; occasional 1mm vitrain bands	0.07	1595.00

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		[sampled] [described by Bill Grady in lab]. Partially lost; bottom broken, uncertain [field description].		
SH		Medium-to-dark gray; badly broken at top by drilling, contact with coal uncertain; abrupt lower contact [not sampled].	0.97	1595.97
COAL	CLRN	Clarain, bright; with 1-3mm vitrain bands; angular contact with shale above [sampled] [described by Bill Grady in lab].	0.08	1596.05
COAL	CLRN	Clarain; attrital matrix bright; common 1mm vitrain bands; common, thin, carbonaceous shale lenses; medium density [sampled] [described by Bill Grady in lab].	0.10	1596.15
SH	BLK	Black; bony; carbonaceous; interbedded 0.02' bone layers and thin vitrain in upper 0.06'; sharp top and bottom [sampled] [described by Bill Grady in lab].	0.16	1596.31
COAL	CLRN	Clarain, bright; 1-3mm vitrain bands; minor cleat calcite; top 0.02' interfingers with shale above [sampled] [described by Bill Grady in lab].	0.15	1596.46
BN		Common, thin, vitrain fragments; angular basal contact; thickness varied in core from 0.02 to 0.07' [not sampled] [described by Bill Grady in lab].	0.05	1596.51
SH		Dark gray; few thin coal streaks, clear lower contact [not sampled].	0.79	1597.30
SH	SS STR	Medium gray; sandy, silty; few ironstone nodules; light gray, very thin, very fine grained, bioturbated, sandstone streaks, becoming ripple cross laminated below 1600.00'; coal streak at 1598.25'; clear lower contact at basal sandstone streak.	3.87	1601.17
SH	COAL STR	Medium-to-dark gray; moderately abundant coal streaks and spars up to 0.02' thick; clear lower contact with upward decrease in coal streaks.	6.01	1607.18
SH	COAL STR	Dark gray; abundant coal streaks and clasts, more so than above, especially abundant from 1610.00 to 1611.40'; large pyrite nodule at 1608.60'; plant material throughout; unit badly broken by drilling; vertical fracturing and broken from 1617.80 to 1619.30'; very few coal streaks below 1619.50'; abrupt lower contact.	18.19	1625.37
SLST	ROOT	Light-to-medium gray; sandy; massive; fine grained to base; clear lower contact.	4.63	1630.00
SH		Light-to-medium gray; dark gray-to-black streaks and bands; abrupt lower contact [paleosol A horizon].	0.13	1630.13
CLST	ROOT	Light gray-to-brown; slightly bedded in top 0.20', rest massive; slickensided; diffuse lower contact	3.05	1633.18

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		with increasing sand and bedding [paleosol B horizon].		
SH	SLTY	Light-to-medium gray; sandy, silty; poorly bedded; zones of mm-sized siderite(?) pellets; abrupt lower contact.	2.02	1635.20
SS		Light gray; very fine grained; ripple and ripple cross laminations; shale bed from 1637.25 to 1637.45'; abrupt lower contact.	2.34	1637.54
SH		Medium gray at top to dark gray at base; bands of very fine, ironstone(?) pellets to 1637.93'; abrupt lower contact.	1.20	1638.74
CLST	ROOT	Medium gray-brown; abundant root traces; broken; abundant, small slickensides; plant trash; clear lower contact with increasing bedding.	3.86	1642.60
SH		Medium-to-dark gray; increasing fissility to base; occasional, small, poorly developed slickensides; occasional plant fragments; sideritic zone from 1643.23 to 1643.47' and 1544.25 to 1644.50'; occasional, dark clay streak; clear lower contact.	2.82	1645.42
SH	SS STR	Medium-to-dark gray; light gray, very fine grained, rippled, sandstone streaks; possible, occasional bioturbation; sand decreases to base; occasional lycopod stems on bedding planes; clear lower contact.	1.33	1646.75
SH		Medium-to-dark gray; abundant plant trash and fragments, not easily identifiable; abrupt lower contact.	0.62	1647.37
CLST	ROOT	Dark gray; abundant, well developed, slickensides; very broken from drilling from 1648.50 to 1649.90'; abrupt lower contact.	3.80	1651.17
SLST	SS INBD	Light-to-medium gray; planar laminated sandstone streaks; very occasional, poorly preserved, plant fragments; well preserved calamite stems on bedding planes to base; angled to vertical fractures at 1662.70 and 1665.50'; less sandy to base.	15.13	1666.30
SLST	SS INBD	Medium gray; sandstone, light-to-medium gray, very fine grained, beds < 0.5' thick; occasional zones of soft sediment deformation; increasing sand to base; abrupt lower contact.	8.83	1675.13
SS		Light gray; fine grained; low angle, planar cross laminations; occasional shale rip-ups < 0.07' thick; abrupt, angular, lower contact, about 45 degrees.	1.27	1676.40
SS		Light gray; very fine grained; mixed with dark gray siltstone, possibly slumped; shale rip-ups; low angle, ripple cross laminations and planar cross laminations to base; abrupt, angular lower contact.	1.10	1677.50

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light gray; fine grained; abundant, small trough beds; abrupt lower contact.	2.29	1679.79
SLST	SS INBD	Medium-to-dark gray; more a zone of mixing than distinct lithologies; sandstone occurs as <0.07' round blebs within the siltstone matrix; possibly soft sediment deformation; abrupt lower contact.	0.35	1680.14
SS		Light gray; fine grained; trough cross laminations changing to low angle, planar, cross laminations to base; organic-rich, thin (<0.01' thick) streaks; locally abundant mica.	0.76	1680.90
SS		Light gray; fine grained; bi-directional, planar cross laminations; occasional, very thin, shale wisps; abrupt lower contact on color change.	2.46	1683.36
SS		Medium-to-dark gray; low angle, planar cross laminations; dark minerals on laminations; abrupt lower contact on color change.	0.25	1683.61
SS		Light gray; fine grained; low angle, planar, cross laminations; abundant, very thin, shale wisps on bedding to top; abrupt lower contact.	0.56	1684.17
SS	HD	Light gray; fine grained; massive to 1684.98'; low angle, planar, cross laminations to 1686.10'; occasional, dark, shale wisps on laminations from 1686.10 to 1686.30'; shale streaks from 1686.56 to 1686.58'; planar, cross laminations at 20 degrees with occasional shale wisps to 1688.40'; planar laminations from 1688.40 to 1688.73'; planar, cross laminations to base; mica-rich partings less than 0.01' thick from 1691.30 to 1690.45'; rounded and flat shale pebbles averaging 0.05' X <0.01'	16.88	1701.05
SS	HD	Light gray; fine grained; planar, to low angle, planar, cross laminations; locally abundant mica; abrupt lower contact on color change.	3.45	1704.50
SS	HD	Very light gray; fine grained; abundant mica partings less than 0.01' thick; clear lower contact.	0.33	1704.83
SS	HD	Light gray; fine grained; massive to top; abundant mica streaks below 1706.20'; planar laminations to base; occasional, angular-to-subrounded pebbles about 0.08' diameter from 1709.70 to 1710.15'; abrupt lower contact.	6.57	1711.40
SS	HD	Fine grained; abundant mica and dark streaks; low angle (about 15 degrees); clear, angular lower contact.	1.35	1712.75
SS	HD	Light gray; fine grained; massive; very hard; clear lower contact.	0.35	1713.10
SS	COAL STR	Hard; fine grained; light gray; coal streaks are thin at top, up to 0.01' thick at base; also occasional, 0.02' thick, medium grained, sandstone streaks to base; appears that sand becomes even harder to base; clear lower contact.	6.85	1719.95

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS	HD	Fine grained; gray; massive [not sampled].	0.80	1720.75
COAL	CLRN	Broken; methane emissions evident [not sampled].	0.11	1720.86
SS		Fine grained; light gray; soft sediment deformation; occasional, dark mineral streaks; coaly streak <0.01' thick at 1721.62'; abundant shale pebbles at base; clear lower contact [not sampled].	0.89	1721.75
SH	SS STR	Medium-to-dark gray; sandstone: fine grained; light gray; ripple laminated; slickensides; planar laminations to base; abrupt lower contact [not sampled].	0.80	1722.55
COAL	IMP	Bone; contains abundant 1mm megaspores; sharp top and bottom contacts [Sampled at Survey, described by Bill Grady in lab].	0.02	1722.57
COAL	CLRN	Clarain, dull; impure; hard; numerous, very thin, carbonaceous shale layers [sampled at Survey, described by Bill Grady in lab]. Methane emissions evident in field.	0.11	1722.68
SH	BLK	Black; bony; carbonaceous; minor vitrain flakes; sharp top and bottom contacts [sampled at Survey, described by Bill Grady in lab].	0.09	1722.77
COAL	CLRN	Clarain, dull; minor thin fusains; sharp base [sampled at Survey, described by Bill Grady in lab].	0.10	1722.87
SH	BLK	Black; bony; rooted; sharp top and bottom [sampled at office, described by Bill Grady].	0.08	1722.95
CLST	ROOT	Black; roots; slickensides [not sampled].	0.15	1723.10
SH		Dark gray; slightly silty; occasional slickensides to top; increasingly silty to base.	1.15	1724.25
SLST	SDY	Dark gray; sandy; massive to top; mixed with sand to base.	5.65	1729.90
SS		Medium-to-dark gray; fine grained; occasional, thin, plant material wisps; low angle, planar, cross laminations; some very small, coaly fragments; coarser to base; occasional, shale pebbles below 1732.00'; abrupt lower contact.	2.60	1732.50
SH		Very dark gray; coaly streaks; slickensides; poorly preserved plant fossils; slightly silty to base; clear lower contact.	3.50	1736.00
SS	SLST INBD	Siltstone: dark gray; sandstone: light gray; fine grained; low angle, planar, cross laminations; some mixing, possibly soft sediment deformation; very thin, coaly wisps; increasing sand to base; abrupt lower contact.	1.80	1737.80
SS		Light gray; fine grained; soft sediment deformation; occasional shale pebbles; abrupt lower contact on oil show.	0.45	1738.25

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light gray; fine grained; massive to mixed; abundant oil and gas coming from pores; abrupt lower contact.	1.76	1740.01
SLST		Medium gray; occasional, sandy streaks to base; locally abundant siderite-rich blebs less than 0.10' diameter below 1744.00'; occasional, poorly developed slickensides; increasingly sandy to base; rooted in places; observed zones of mixing and micro-faulting in sandy streaks (slumping?); occasional, well-preserved calamite stem; abrupt lower contact on color change.	10.38	1750.39
SLST		Light gray; occasional, sandy streak; occasional slickensides; possible slump below 1751.00'; abrupt lower contact.	1.18	1751.57
SH	BLK	Black; very slickensided; interesting plant fossil at 1753.64'; poorly preserved plant fragments.	2.41	1753.98
SS	SLST INBD	Siltstone: medium gray; sandstone: light gray; low angle, planar, cross laminations; very small ripples; occasional plant fragments; clear lower contact.	1.10	1755.08
SS		Light gray; fine grained; soft sediment deformation; occasional shaly streak; abrupt lower color.	1.32	1756.40
SS		Light gray; fine grained; slumped.	0.73	1757.13
SS	COAL STR	Light gray; fine grained; hard; abundant, dark mineral streaks; occasional, thin shale streaks; gas showing at 1759.00'; sand darkens to base; occasional shale clast; some poorly preserved plant material; abrupt lower contact.	5.95	1763.08
SLST		Medium-to-dark gray; some clay zones; well developed slickensides locally; clear lower contact.	0.78	1763.86
SS		Light gray with white streaks; fine grained; occasional shale clasts mixed with silt; coal streak at 1763.98'; abrupt lower contact.	0.84	1764.70
SLST		Medium gray; occasional clayey streak; locally slightly sandy; occasional slickensides; abrupt lower contact.	3.70	1768.40
SS	SLST INBD	Light gray; very fine grained; siltstone is dark gray; low angle, planar, cross laminations to flat, planar laminations; beds less than 0.40' thick; increasing siltstone to base and beds becoming thinner, about 0.10' thick; clear lower contact.	7.34	1775.74
SS	SLST INBD	Sandstone: light gray; very fine grained. Siltstone: dark gray. Possibly rippled; definitely rhythmically bedded; beds are 0.10' or less thick, relatively flat; occasional clayey streak up to 0.02' thick to base; abrupt lower contact.	5.08	1780.82

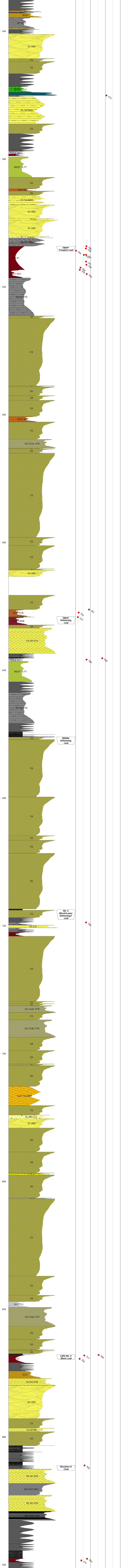
LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SS		Light gray; fine grained; rippled and micro-faulted; horizontal fractures; slightly silty, increasing to base; abrupt lower contact.	3.90	1784.72
SS		Light gray; fine grained; rippled; dark streaks; occasional plant stems; abrupt lower contact.	0.28	1785.00
SLST	SDY	Medium-to-dark gray; sand occurs in very fine grained wisps and laminations; flat, planar bedding; occasional ripples in sandy zones; abundant, well preserved calamites(?); abrupt lower contact.	7.18	1792.18
SS		Light gray; fine grained; abundant trough ripples and low angle, rippled, cross laminations; occasional silty streaks; clear lower contact.	2.82	1795.00
SLST	SDY	Dark gray; fine grained; light gray, fine grained sand; rippled; vertical fracture at 1795.50'; abrupt lower contact.	1.15	1796.15
SS		Light gray; very fine grained; abundant, dark mineral streaks; rippled; sand becomes cleaner to base; shale rip-ups at base; abrupt, wavy lower contact.	1.38	1797.53
SS		Light gray; very fine grained; abundant dark streaks; ripples; becomes cleaner sand to base; fewer dark streaks to base; possible burrows; vertical fracture at 1804.10'; abrupt, angular lower contact.	8.68	1806.21
SLST	SS INBD	Siltstone: dark gray. Sandstone: light gray-to-gray; fine grained. Beds about 0.40' thick; some small ripples; mostly flat, planar laminations; abrupt lower contact.	2.44	1808.65
SS		Light gray-to-gray; fine grained; occasional dark mineral streaks; low angle, planar, cross laminations to flat, planar laminations; occasional shale rip-ups and pebbles to base, elongate, less than 0.10' by 0.03'; abrupt, erosional lower contact.	6.40	1815.05
CLST	ROOT	Medium gray; clayey; slickensided; clear lower contact.	0.81	1815.86
CLST	ROOT	Medium-to-dark gray; slickensides; slightly silty; clear lower contact [paleosol B horizon]. . Base of unit is Mississippian-Pennsylvanian boundary.	0.64	1816.50
SS		Very fine grained; gray to gray-green; massive to mixed bedding types; clear lower contact.	2.10	1818.60
MDST		Light-to-medium gray-green; very poorly bedded at top; silty in top to 1819.00'; slickensided; badly broken; clear lower contact at color change [paleosol B horizon].	2.06	1820.66
CLST	RED	Red; few, distinct, fine-to-coarse, light	1.69	1822.35

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
		gray-green mottles; common slickensides; abrupt lower contact at color change [paleosol B,BC horizons].		
SH		Medium gray-green; slickensides; abrupt lower contact.	0.28	1822.63
SS	SH STR	Light gray-green; very fine grained; rippled laminations and streaks; medium gray-green shale streaks; clear lower contact with increasing shale.	0.37	1823.00
CLST	SKS	Medium gray-green; many slickensides; badly broken in top half; abrupt lower contact [paleosol B horizon].	0.52	1823.52
SS	SH INBD	Light gray-green; very fine grained; massive; some soft sediment deformation evident; interbeds of medium gray-green shale; abrupt lower contact.	0.48	1824.00
SH		Medium gray-green; clear lower contact at color and bedding change.	0.17	1824.17
CLST	RED	Red with common, light-to-medium gray-green, distinct, fine-to-coarse mottles; zone of medium gray-green from 1826.65 to 1826.80'; zone of light gray-to-white, calcareous-to-strongly calcareous streaks and fracture fills from 1827.50 to 1827.70'; clear lower contact at color change [paleosol B horizon].	3.98	1828.15
SH		Medium gray-green; poorly bedded; few slickensides; few, distinct, light gray, calcareous nodules; large nodule from 1828.53 to 1828.65'; abrupt lower contact.	0.55	1828.70
SS	SLMP	Light-to-medium gray-green; very fine grained; planar rippled to ripple cross laminated; high angle slump planes and some soft sediment deformation; common, distinct, light gray, medium-to-coarse, calcareous nodules; medium gray-green shale streaks and bands from 1831.55' to base; clear lower contact.	4.30	1833.00
SH		Medium gray-green; sandy in top; few slickensides; abrupt lower contact at color change.	1.52	1834.52
MDST	RED	Gray-red; few, light gray-green, prominent, coarse mottles; common slickensides; few, distinct, fine, calcareous nodules; clear, angular, lower contact at calcareous/non-calcareous break [paleosol B horizon].	1.58	1836.10
SH	CALC	Red; light gray-green streaks and laminations; calcareous throughout; few, distinct, medium-to-coarse, calcareous nodules; few slickensides; abrupt lower contact at color change.	2.07	1838.17
SH		Light gray-green; weakly calcareous; few, distinct, medium-to-coarse, light gray, calcareous nodules; abrupt lower contact at color change.	0.70	1838.87

LITH	LITH MOD	DESCRIPTION	THICKNESS	DEPTH
SH	RED	Solid red; poorly bedded; few-to-common slickensides; badly broken from 1841.45' to base.	3.43	1842.30
MDST	SLTY	Medium gray-green; some light gray-green clasts; abrupt, angular, lower contact [paleosol B horizon].	0.20	1842.50
CLST	SKS	Medium gray-green; black streaks and patches; many slickensides; sandy lenses and streaks throughout; nodular appearance; abrupt, angular, lower contact [paleosol B horizon].	0.60	1843.10
CLST	MOT	Medium gray-green; many, distinct, coarse, red mottles and streaks; many slickensides; very broken; abrupt lower contact [paleosol B horizon].	1.87	1844.97
SH	RED	Red, with streaks and bands of light gray-green; abrupt lower contact at color change.	1.66	1846.63
SH		Medium gray; very uniform; abrupt lower contact.	0.74	1847.37
SS		Light-to-medium gray; very fine grained; ripple laminated; medium gray shale break from 1848.25 to 1848.39'; shaly in bottom 0.07'; abrupt lower contact.	2.14	1849.51
SH		Medium gray-green; calcareous; small, calcite-filled ostracodes(?); possible pieces of bivalves; pyrite grains; clear lower contact at color change and decreasing fossils.	0.72	1850.23
CLST	RED	Solid red; few, faint, fine-to-coarse, medium gray-green mottles in basal 0.50'; common slickensides; calcareous throughout; few, very thin, calcareous streaks from 1852.16' to base; clear lower contact at basal red color [paleosol B horizon].	2.77	1853.00
CLST	CALC	Medium gray-green; calcareous; few, thin, light gray-to-white calcareous streaks; common slickensides; diffuse lower contact with nodules [paleosol B horizon].	3.20	1856.20
CLST	CALC	Medium gray-green; faint, light-to-medium gray, fine, smooth, calcareous nodules; very weakly calcareous from 1857.17' to base; clear lower contact [paleosol B horizon].	1.25	1857.45
SH	SLTY	Medium gray-green; sandy in basal half; abrupt lower contact.	1.36	1858.81
SS	SH STR	Light gray; very fine grained; ripple laminated; medium gray shale streaks and beds; abrupt lower contact.	1.15	1859.96
SS	QTZ	Light gray; ripple laminations; dark gray streaks; very fine grained; smooth; hard; to TD 1861'.	1.04	1861.00

Borehole 282-026

REE Total (La-Lu) + Y
ppm



Borehole 285-073

REE Total (La-Lu) + Y
ppm

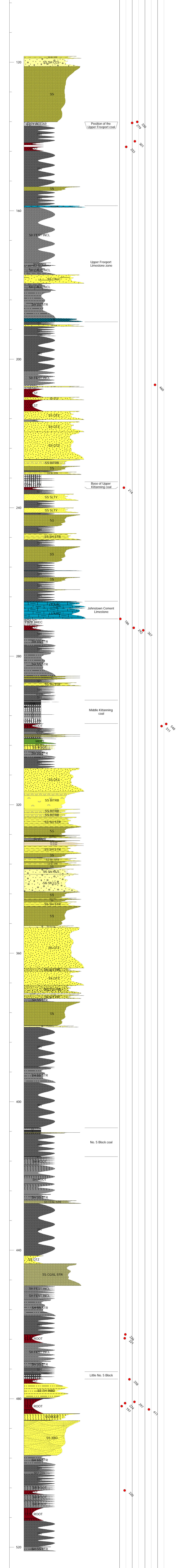
Feet

180

280

380

480



Position of the Upper Freeport coal

Upper Freeport Limestone zone

Base of Upper Kittanning coal

Johnstown Cement Limestone

Middle Kittanning coal

No. 5 Block coal

Little No. 5 Block

120

160

200

240

280

320

360

400

440

480

480

480

480

480

480

480

520

300

307

460

274

186

292

309

548

511

226

274

298

297

411

220

191

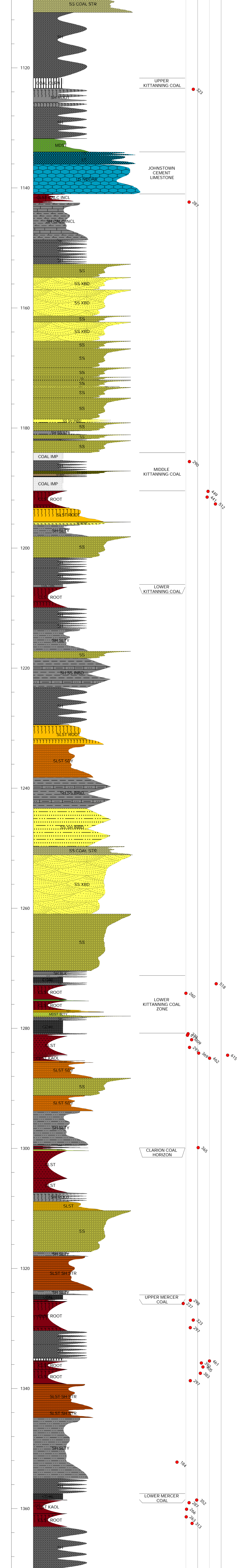
224

Borehole 306-061

REE Total (La-Lu) + Y

300 ppm 500

Feet

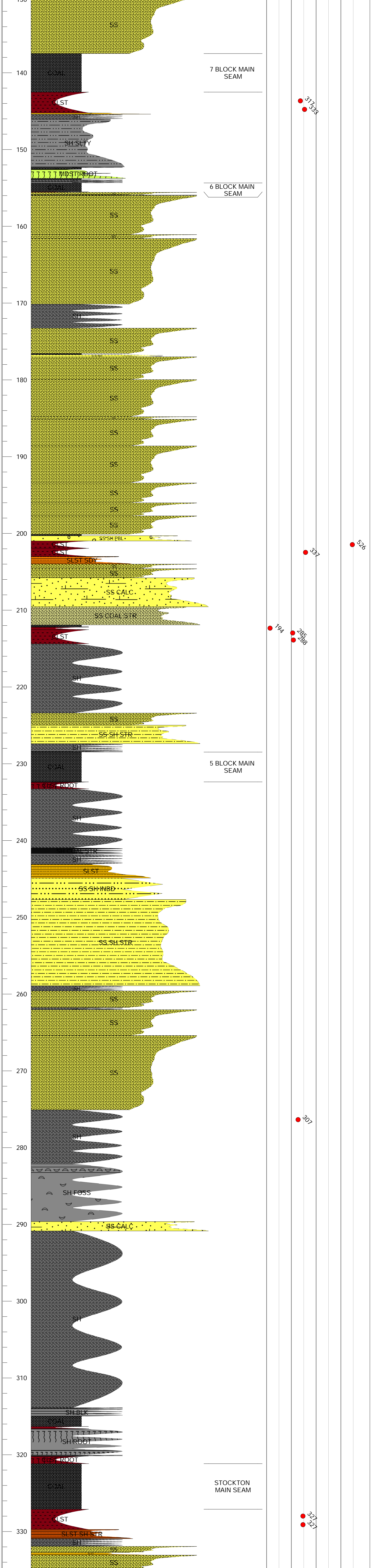


Borehole 307-098

REE Total (La-Lu) + Y
ppm

180 280 380 480

Feet

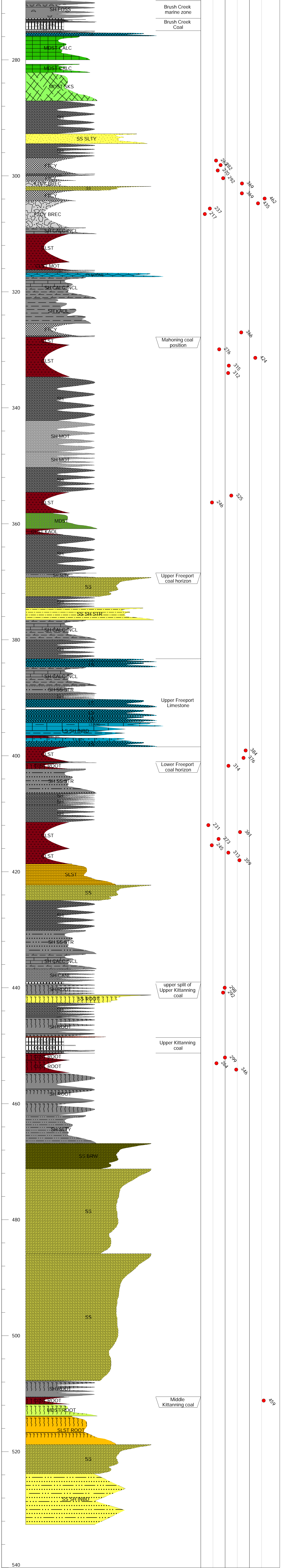


Borehole 308-007

REE Total (La-Lu) + Y

200 300 400 ppm

Feet



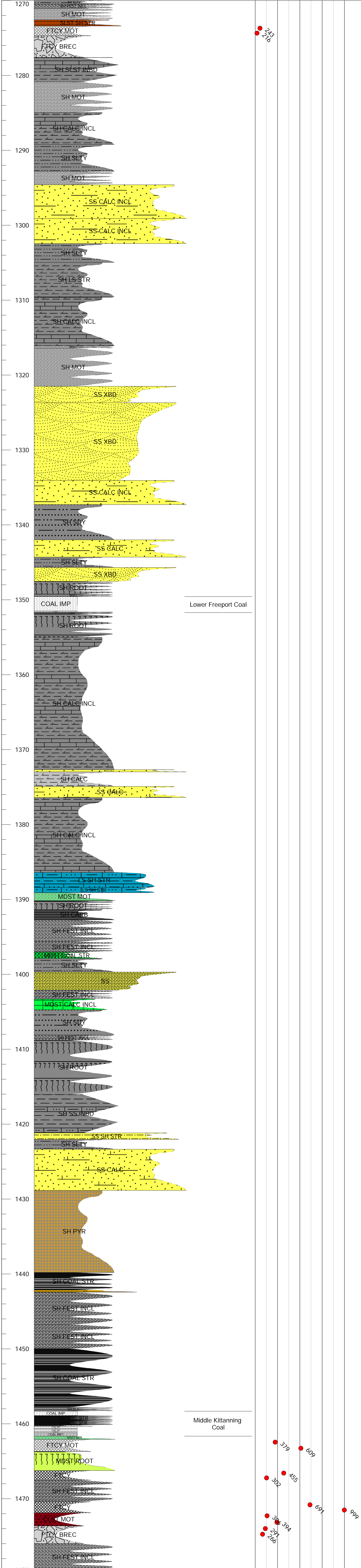
540

Borehole 309-055

REE Total (La-Lu) + Y
ppm

200 400 600 800 1000

Feet



Regional Trends and Stratigraphic Observations for the EMRI First Round of REE Sampling

Sampling Methodology

The purpose of the 2020 West Virginia Geological and Economics Survey's (WVGES) Earth MRI project funded by the United States Geological Survey (USGS) was to assess the rare earth element (REE) concentrations in claystones, underclays, and other fine grained siliciclastic rock units deposited adjacent to coal seams. Samples for this project were collected from claystones, kaolinitic claystones, flintclays, and shale units that had soft, clayey intervals mainly from the Pennsylvanian Allegheny Formation. Although the Pennsylvanian Allegheny Formation was the main target for the sampling of this project, samples were also collected from the Pennsylvanian Kanawha Formation and the Pennsylvanian Conemaugh Group where a claystone or flintclay unit was close to the lower or upper boundary of the Allegheny Formation. Lithologic units of interest (e.g. claystone, kaolinitic claystone, and flintclay) and stratigraphic intervals were identified using the geologist's log and coal database for each of the cores that were sampled. The geologists log for each of the cores were described by the WVGES's staff geologists at the drill site or when the core was received at the office.

Samples were collected from the coal cores with a masonry saw to vertically slab the core. All of the coal cores sampled were two inches in diameter and the sample slab that was removed from the core was 0.625 inches in thickness, roughly one third the diameter of the core. Lithologic units of interest were subdivided and sampled as a homogenous unit. Any change in lithology, color, sedimentary structure, or a texture change would result in a single unit to be split, and multiple samples were collected from a single lithologic unit. All lithologic units that were greater than two feet in thickness were split into samples of 1.5 feet or less and units thicker than six feet were split into samples of two feet or less. All collected samples were weighed to ensure that a minimum of 50 grams of rock was collected for each sample. A second slab was cut and a second sample collected from all units of interest that had less than 50 grams of material in the first sample. This cut was made perpendicular or 90 degrees to the first cut of the rock unit. Three samples were collected that contain rock from more than one lithologic unit. This occurred due to the lithologic units being too thin to be collected by themselves and provide 50 grams of material while leaving a portion of the core in the collection. WV-EMRI-016 had three lithologic units combined into a sample while WV-EMRI-054 and WV-EMRI-080 had two separate units combined into a single sample.

Sample Locations

The 2020 travel restrictions prevented field work and travel across the state to collect new samples from outcrop for the early portion of the first round of sampling for the Earth MRI Project. During the first round of sampling for the project, 217 samples were collected from eight coal research cores from the WVGES core repository (Figure 1.). Of these samples 166 were submitted to the USGS lab and 47 were submitted to the National Energy Technology Lab (NETL) and were analyzed for REE concentrations. In addition to the samples collected from the coal research core, ten grab samples were collected from outcrop in two counties after some travel restrictions were removed (Figure 2.). Of these nine of the samples were submitted to the USGS for analysis.

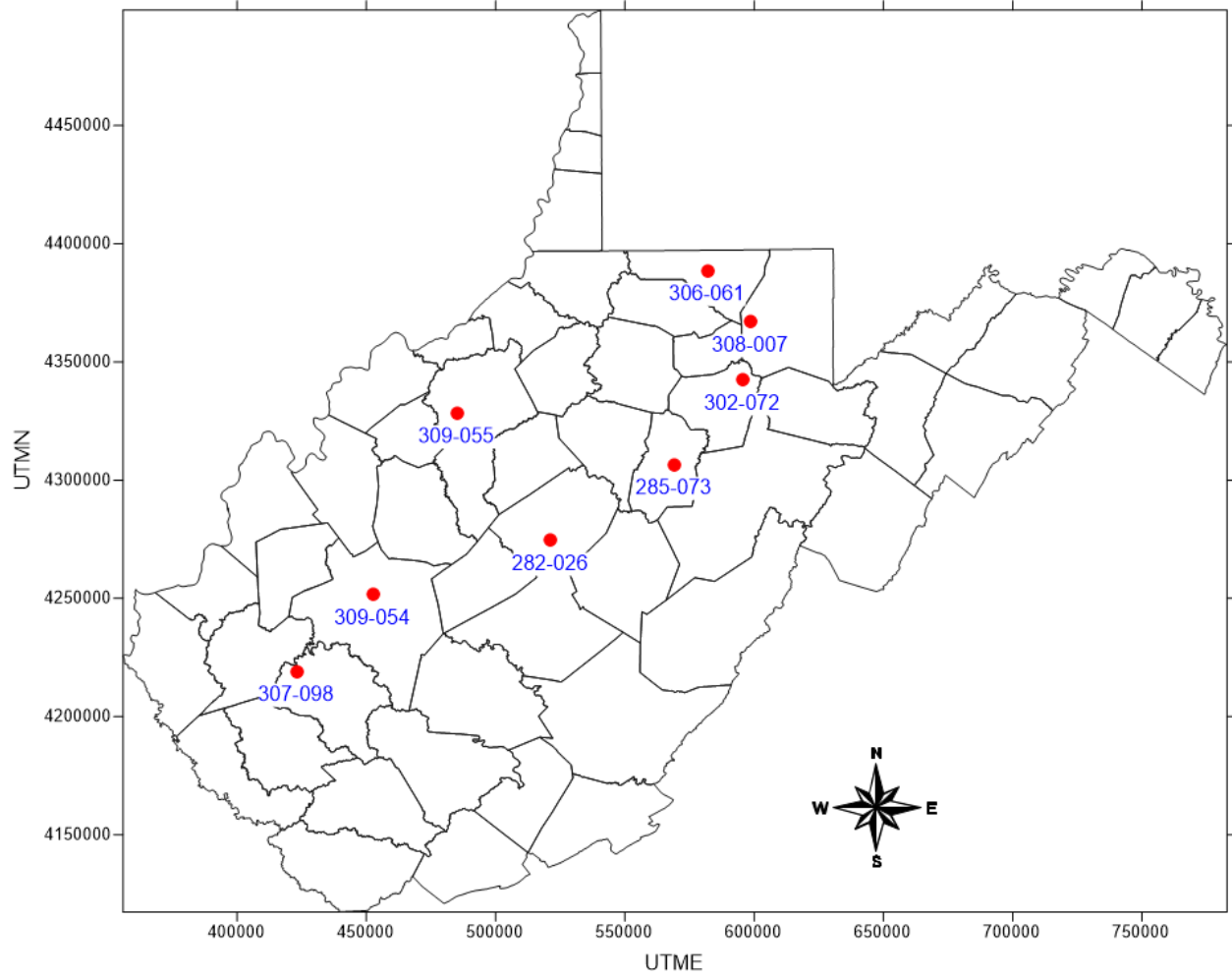


Figure 1. Location of the eight coal research cores sampled for the Earth MRI project.

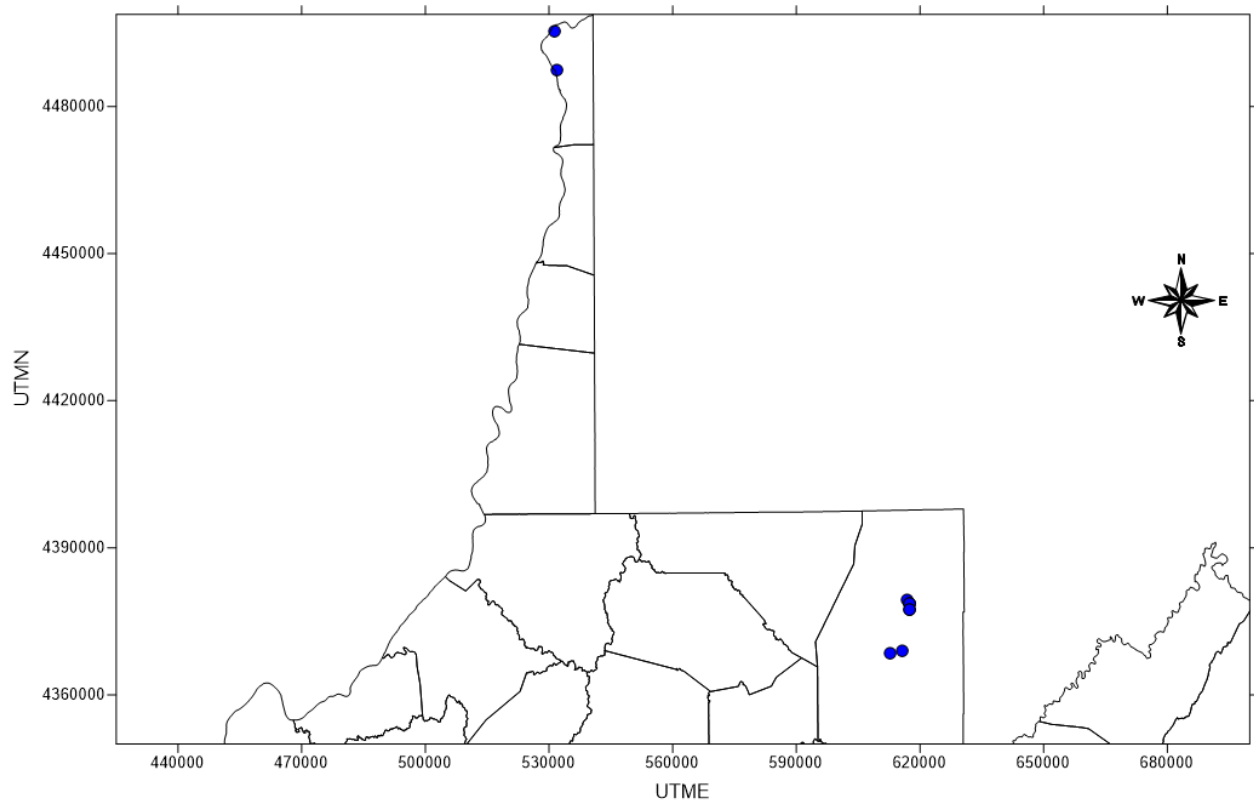


Figure 2. Location of the ten outcrop grab samples taken for the Earth MRI project.

Regional Stratigraphic Observations

The following section provides a regional stratigraphic overview on which coal seams / coal intervals have an enrichment in rare earth elements (REEs) and where regionally these enriched coal seams / intervals are present. The results for total concentration of REEs ((La-Lu)+Y) from both the USGS and NETL labs for samples collected from the coal research cores were plotted on a graphic log that displays the lithology of the sampled intervals and the correlated coal stratigraphy (figures 3 through figure 10 below). The data points in red were the results from the USGS lab while the green data points were the results from the NETL lab. All of the data points displayed on the log were rounded to three significant digits. The correlations for the coal seams / intervals are from the coal database which are more current than the coal names that were listed on the geologist's log. Some of the coal seams and intervals have a tag "unnamed in coal database" followed by a named in parenthesis. This is the correlation given to the particular interval from the geologist's log or an interpretation of the coal seam/ interval that is currently not listed as such in the current active coal database. The coal not present designation in the coal database and on the geologists' log signifies that a particular coal is present in the region and is expected to be present but, is absent in this core at this location. The coal not present is used for mapping purposes and helps to constrain the thickness and extent of the mapped coal seam.

The results from the USGS and NETL labs for the first round of sampling by the WVGES for rare earth elements provided concentration values that were within a similar range of values. The results from the sampling showed that across the region where samples were able to be collected the interval

surrounding the Middle Kittanning Coal Seam to have the highest concentration of total REEs ((La-Lu)+Y) for any of the coal intervals that were sampled. The following intervals were ranked based upon the REE concentration for each given coal seam / interval from highest to lowest.

(1). REE concentrations in the Middle Kittanning interval ranged from 999 ppm to 266 ppm. The cutoff between background concentration and enrichment for REEs for this project is 300ppm. The data shows that regionally the Middle Kittanning interval has the highest REE concentration in Ritchie County (309-055) with a range of 999ppm to 266 ppm, followed by Upshur (285-073) 548ppm-511ppm, then Barbour (302-072) 520ppm-306ppm, and finally Monongalia (306-061) 512ppm-290ppm, The 6 Block coal interval of the southern coal basin is stratigraphically equivalent to the Middle Kittanning of the northern coal basin. Boone County (307-098) has samples from the 6 Block Coal interval that have REE concentrations of 333ppm and 317ppm. The sample for Preston County (308-007) was collected in the interval above the Middle Kittanning, just below the Middle Kittanning Rider and was enriched with a concentration of 459ppm. The Middle Kittanning Coal is not present in the Preston county core.

Samples collected from the Middle Kittanning interval in core 309-055 from Ritchie County West Virginia had some of the highest concentration of REEs. Eight out the ten samples collected for this core in the Middle Kittanning interval had total REE concentration above the minimum enrichment value of 300 parts per million (ppm). These samples ranged in value between 999ppm to 266ppm. Of the enriched samples in this interval two were collected from a claystone unit, while the other eight were from a flint clay, mottled flint clay, or brecciated flint clay.

(2). The interval below the Lower Kittanning Coal seam had the second highest concentration of REEs present of all of the intervals sampled. The new data indicates the interval below the Lower Coal Kittanning Coal was enriched with REEs in the cores from Braxton (282-026), Monongalia (306-061), and Barbour (302-072) counties. Grab samples collected from outcrop directly above the Lower Kittanning Coal in Hancock County also had elevated concentrations of REES. The Braxton core (282-026) had the highest with a sample range of 615ppm-302ppm, then Monongalia (306-061) 615ppm-279ppm, and Barbour (302-072) with 479ppm-223ppm. Two grab samples; WVMRI10a (440ppm) and WVMRI9a (410ppm) were sampled from two separate locations in Hancock County directly above the Lower Kittanning Coal seam and were also enriched in REEs. The 5 Block of the southern coal basin is thought to be the stratigraphic equivalent to the Lower Kittanning of the northern coal basin. An interval ten feet above the Upper 5 Block Coal in the Boone County core (307-098) is also enriched with samples of 528ppm and 337ppm. The interval below the Upper 5 Block Coal in Boone County was not enriched with a range of 288ppm-194ppm. The Upper 5 Block Coal would possibly be equivalent to the Upper Split of the Lower Kittanning Coal. The sample below the 5 Block Coal from the Kanawha County core 309-054 was not enriched with a value of 238ppm.

(3). Near the base of the Conemaugh Group close to the upper contact with the Allegheny Formation there are a few kaolinitic claystone, claystone and flintclay units that were enriched in REES in many of the cores sampled across the study area. These claystone and flintclay units of the lower Conemaugh Group / upper Allegheny Formation interval were enriched in Braxton, Ritchie, Preston, Barbour, and Boone counties. The contact between the Conemaugh Group and Allegheny Formation is the top of the Upper Freeport Coal when present. However the Upper Freeport Coal is not always present across the study area and the exact boundary between the Conemaugh Group and Allegheny

Formation is not always clear. These samples were collected from the various cores due to the presence of kaolinitic claystones and flintclays occurring near the top of the Allegheny Formation. Also these samples were collected from an interval that is not associated with major coal seams or near any coal seams of importance.

- Braxton (282-026)
Approximately 35 feet below Brush Creek Coal horizon 3 units were sampled, a flintclay (613ppm), brecciated flint clay (243ppm), and a claystone (214ppm).
- Ritchie (309-055)
Fifty feet below Brush Creek Coal five samples were collected from a mottled flintclay and a brecciated flint clay (491ppm-216ppm).
- Preston (308-007)
Collected from approximately 20-35 feet below Brush Creek Coal, 23 samples were collected from eight units (435ppm-202ppm).
Approximately five feet above the position of the Mahoning Coal not present three samples were collected, two from a brecciated flintclay and one from a claystone unit (366ppm-221ppm).
Approximately five feet below the position of the Mahoning Coal not present 4 samples were collected from a claystone unit (424ppm-276ppm).
- Barbour (302-072)
Approximately 55 feet below the Brush Creek Coal two samples were collected from a brecciated flintclay and two samples were collected from a claystone (402ppm-259ppm).
- Boone (307-098)
Approximately 100 feet above the 6 Block Coal 3 samples were collected from a claystone unit (400ppm-367ppm).
Approximately 40 feet above the 6 Block Coal a sample was collected from a claystone unit with coal streaks (288ppm).

(4). A few of the cores sampled had an enriched zones of REEs in the interval above and below the Upper Kittanning Coal. The sample data indicated there was enrichment in Braxton, Upshur, Preston, and Monongalia counties. The samples collected from the Upper Kittanning interval from Barbour County was not enriched.

- Braxton (282-026)
Approximately 15 feet below the Upper Kittanning Coal not present (558ppm and 348 ppm).
Above Upper Kittanning Coal not present (381ppm-231ppm).
- Upshur (285-073)
Approximately 15-30 feet above the Upper Kittanning Coal (460ppm-205ppm).
Base of Upper Kittanning Coal 214ppm.
- Preston (308-007)
Below Upper Kittanning Coal (346ppm-264ppm).
Below Upper Kittanning Upper Split (298 ppm & 292ppm).
- Monongalia (306-061)
Below Upper Kittanning Coal 323ppm.
- Barbour (302-073)

Below Upper Kittanning Lower Split 1 (290ppm-118ppm).
Below Upper Kittanning Upper Split 1 (277ppm).
Approximately five feet below Upper Kittanning Coal (234ppm).

(5). The Interval directly below the Johnston Cement Limestone had samples that were enriched in REEs. The Johnstown Cement was picked in the descriptions of the geologist's log for Upshur (285-073), Barbour (282-026) and Monongalia County (306-061) cores, but is only not in the coal database for the Monongalia County core. The Johnstown cement limestone is a marine limestone that is present in the northern parts of West Virginia and extends as far south as Upshur and Barbour counties. The interval below the Johnstone Cement Limestone was enriched in REEs in Upshur and Barbour counties, but not in Monongalia County.

- Upshur (285-073)
Below Johnstone Cement Limestone (546ppm-186ppm).
- Barbour (282-026)
Below Johnstown Cement Limestone (457ppm-185ppm).
- Monongalia (306-061)
Below Johnstown Cement Limestone (287ppm).

(6). The Interval of the Upper Freeport Coal is enriched in REE concentration in Barbour and Preston counties and only slightly enriched in Braxton and Upshur counties.

- Barbour (302-072)
Directly below Upper Freeport Coal (535ppm-231ppm).
Approximately ten feet above Upper Freeport Coal (402ppm-259ppm).
- Preston (308-007)
Approximately 15 feet above Upper Freeport Coal not present (463ppm-240ppm).
- Braxton (282-026)
Below Upper Freeport Coal not present (350ppm-206ppm).
- Upshur (285-073)
Below Upper Freeport Coal not present (320ppm-279ppm).
Approximately five feet below Upper Freeport Coal not present (301ppm & 233ppm).

(7). The Little 5 Block Coal interval and equivalents had a few enriched samples, but most were only slightly enriched. The Braxton County core (282-026) had the highest followed by Upshur County (285-073), then Monongalia County (306-061). The Clarion Coal interval of the Monongalia County core is the northern coal basin stratigraphic equivalent of the Little 5 Block of the southern coal basin. The samples from the Upshur County core were collected above and below a coal seam that is unnamed in the coal database, but called Little 5 Block on the geologist's log.

- Braxton (282-026)
Directly below Little 5 Block Coal (509ppm-225ppm).
- Upshur (285-073)
Approximately eight feet below unnamed coal in database (Little 5 Block Coal?)(411ppm-197ppm).

Directly below unnamed coal (Little 5 Block Coal?) (258ppm).

Approximately ten feet above unnamed coal (Little 5 Block Coal?) (226ppm & 221ppm).

- Monongalia (306-061)
Below unnamed in coal database Clarion Coal not present (365ppm).

(8). The interval below the Stockton A near the Bottom of the Allegheny Formation had samples collected with moderate amounts of enrichment in Monongalia, Braxton, and Boone counties. The Upper Mercer Coal which is present in the Monongalia County core is the northern coal basin equivalent of the Stockton A Coal of the southern coal basin. The samples from the Monongalia County were from below a coal that was unnamed in the coal database, but was correlated as Upper Mercer on the geologist's log.

- Monongalia (306-061)
Approximately 10 feet below unnamed in coal database Upper Mercer Coal (461ppm-297ppm).
Five feet below Upper Mercer Coal (323ppm-184ppm).
- Braxton (282-026)
Below Stockton A Coal (320ppm).
- Boone (307-098)
Above the Kanawha Black Flint, possibly in Stockton A Coal interval if present. No coal is associated with the shale unit these samples were taken from 45 feet below the 5 Block Coal (387ppm & 354ppm).

(9). The Lower Freeport Coal interval also had some slight to moderate enrichment of REEs in the samples collected from the Preston, and Barbour County cores. Two outcrop grab samples (MRIWV4a and MRIWV4b) collected from a single location in Preston County also had a slight enrichment of REEs. The Lower Freeport Coal was missing in the Preston County core and a coal not present was placed both on the geologist's log and in the coal database above a carbonaceous shale. This coal not present represents the stratigraphic position of the Lower Freeport Coal.

- Preston (308-007)
Approximately 25 above Lower Freeport Coal not present (384ppm-314ppm).
Approximately 10 above Lower Freeport Coal not present (361ppm-231ppm).
- Barbour (302-072)
Approximately 10 feet above Lower Freeport Coal and directly beneath the Lower Freeport Upper Split (352ppm-315ppm).
Directly below the Lower Freeport Coal (264ppm-238ppm).
Approximately 12 feet below the Lower Freeport Coal (375ppm).
Approximately 20 feet below the Lower Freeport Coal (341ppm-224ppm).
- Preston County outcrop grab samples
MRIWV4a: Directly above the Lower Freeport Coal (333ppm).
MRIWV4b: Four feet above the Lower Freeport Coal (314ppm).

(10). The Stockton / Lower Mercer interval varies in amount of enrichment across the cores sampled. The samples collected in Braxton, Monongalia, Boone, Kanawha, and Upshur cores were

slightly to moderately enriched in REES, while the sample from the Barbour core was not enriched. The Lower Mercer of the northern coal basin is the stratigraphic equivalent of the Stockton coal of the southern coal basin. The samples from the Upshur County core (285-073) were collected from an interval in which no coal was present and a coal not present was added to the coal database (near core depth of 500.00 feet). This interval roughly / possibly correlates to the Stockton coal interval in the vicinity of the boundary between the Allegheny and Kanawha formations. The sample from the Barbour County core (302-072) was taken below an unnamed coal (at a depth of 796.86) in the coal database and is possibly in the Stockton interval?

- Braxton (282-026)
Below Stockton Coal Lower Split 1 (369ppm & 342ppm).
Below above Stockton Coal (354ppm & 277ppm).
- Monongalia (306-061)
Below unnamed in coal database Lower Mercer Coal on the geologist's log (352ppm-263ppm).
- Boone (307-098)
Below the Stockton Coal (327ppm).
- Kanawha (309-054)
Below the Stockton Coal (319ppm).
- Upshur (285-073)
Possible Stockton interval, no coal present near the boundary between the Allegheny and Kanawha formations (363ppm-220ppm).
- Barbour (302-072)
Below unnamed coal in coal database possibly Stockton Coal? (119ppm).

Stratigraphy and Lithology of Enriched Intervals

The following section provides a detailed description of the stratigraphy and lithology for the intervals that had enriched REE concentrations for each of the coal research cores sampled. Some additional information on coal stratigraphy and sample collection is also provided throughout the section. The graphic logs in this section displays the stratigraphic position of the REE samples collected in relation to the coal seams and sampled intervals of importance. A detailed description of the stratigraphy and lithology for the outcrop grab samples that had enriched REE concentrations is also provided.

Boone (307-098)

The Boone County Core (307-098) (Figure 4) had five intervals in which samples collected were enriched in REEs. Those intervals are near the top of the Allegheny formation, below the 6 Block Coal, above the Upper 5 Block Coal, above the Kanawha Black Flint, and below the Stockton Coal of the Kanawha Formation.

Near top of Allegheny Formation

The results for these three samples are from the NETL lab only. WV-EMRI-072 (400.44ppm), WV-EMRI-073 (354.36ppm), and WV-EMRI-074 (367.35ppm) were collected from the same claystone unit that was not associated with any coal seams. This claystone unit was brown gray and orange, very soft, broken, and locally silty.

Below the 6 Block Coal

Two samples were collected from the interval of less than a foot below the 6 Block Coal main seam. WV-EMRI-076 (316.51ppm) and WV-EMRI-077 (333.34ppm) were both from a dark gray to black rooted claystone that contained coalified plant fragments and both samples were slightly enriched in REEs. The second sample; WV-EMR-077 also had fine siltstone laminations present.

Above Upper 5 Block Coal

These two samples were collected directly below an unnamed coal seam and roughly 10 feet above the Upper 5 Block Coal seam. WV-EMRI-078 (526.31ppm) and WV-EMRI-079 (337.26ppm) were from two different claystone units below the unnamed coal seam. WV-EMRI-078 had the highest concentration of REEs for all of the samples taken from the Boone County core.

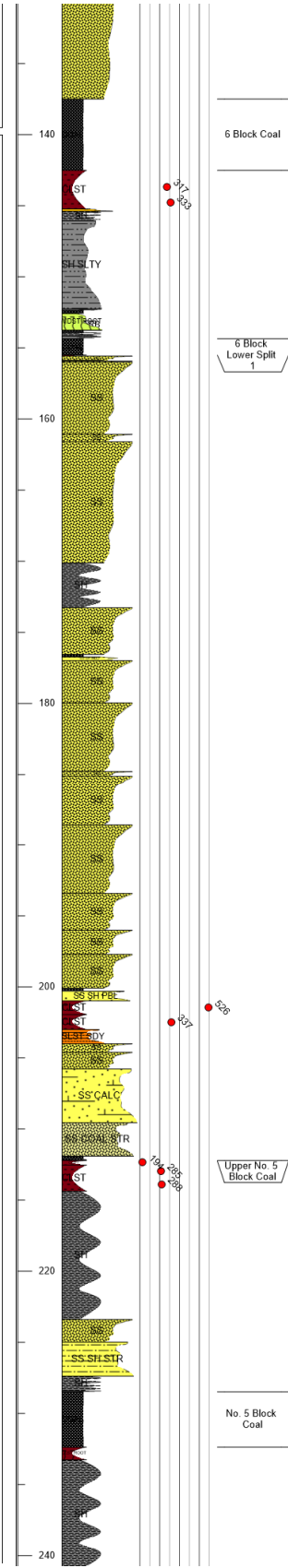
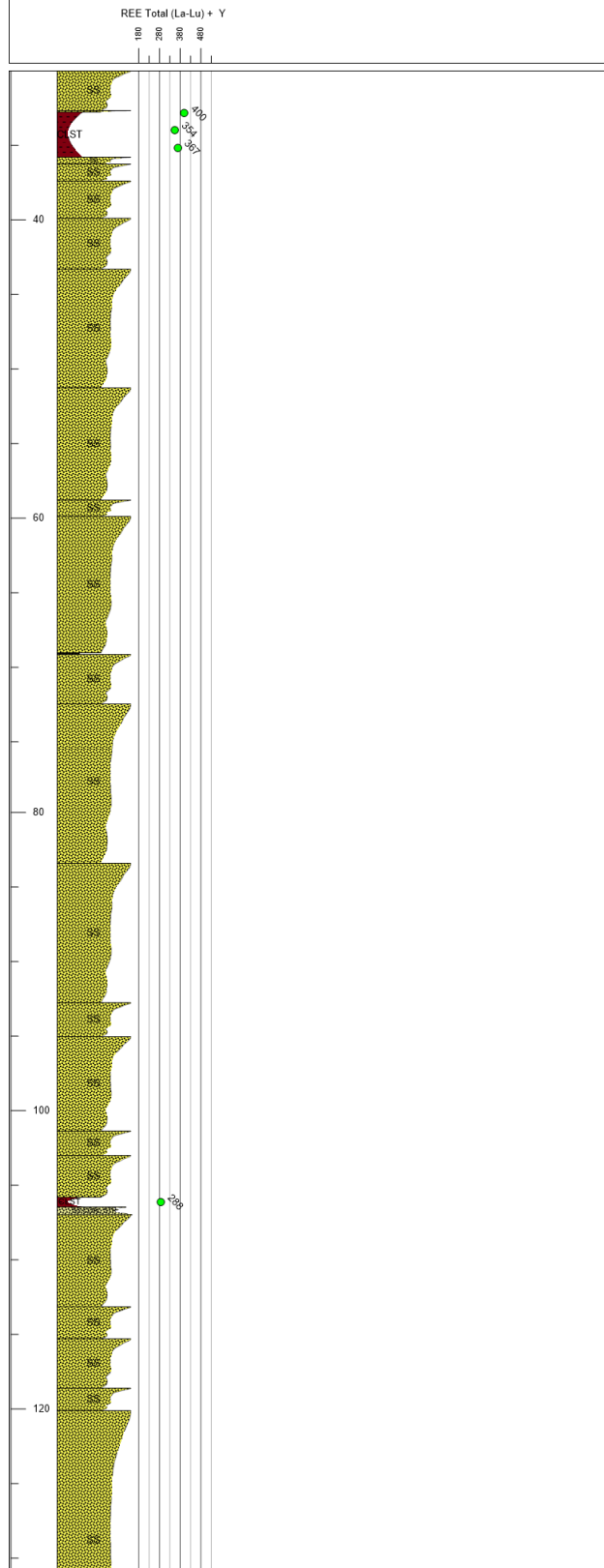
Above the Kanawha Black Flint

Above Kanawha Black Flint and roughly 45 feet below the 5 Block Coal; WV-EMRI-083 (307.19ppm) & WV-EMRI-084 (354.45ppm) were collected from the same shale / claystone unit. Results for WV-EMRI-083 from the USGS lab while WV-EMRI-084 came from the NETL lab. The unit was called a shale on the original geologist log, but was clayey, broken, and became harder and siltier towards base.

Below Stockton Coal

Two samples were collected below the Stockton Coal; WV-EMRI-085 (326.84ppm) & WV-EMRI-086 (326.98ppm). The Stockton Coal stratigraphic position is near the top of the Kanawha Formation and is commonly the first major coal present beneath the Kanawha Black Flint, the boundary between the Allegheny and Kanawha formations in the southern coal basin. These two samples were from the same claystone unit.

307-098
Boone Co.



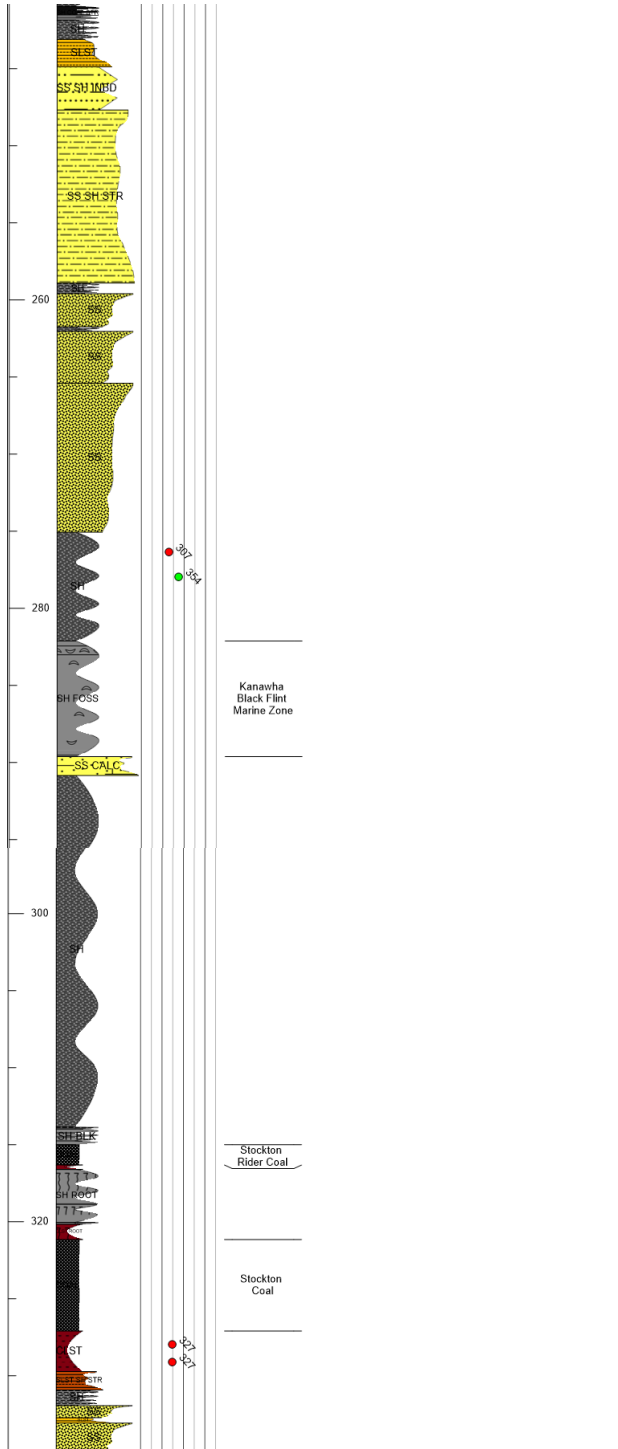


Figure 3. Graphic log for the Boone County core 307-098.

Kanawha (309-054)

The Kanawha County core (309-054) had two intervals in which the samples were enriched in REEs. All samples collected for Kanawha 309-054 were submitted to the NETL lab for analysis. The intervals that had enriched samples were the intervals near the base of the Conemaugh Group / top of the Allegheny Formation and beneath the Stockton Coal of the Kanawha Formation.

Near base of Conemaugh Group/ Top of Allegheny Formation

Five samples were taken from two claystone units near the base of the Conemaugh Group / top of the Allegheny Formation. WV-EMRI-211 (301.22ppm), WV-EMRI-212 (242.06ppm), and WV-EMRI-213 (224.62ppm) were collected from a red claystone that was slightly kaolinitic. Only WV-EMRI-211 which was sampled from near the top of the red claystone unit was slightly enriched in REEs. WV-EMRI-214 (211.14ppm) and WV-EMRI-215 (233.91ppm) were from another claystone directly below the unit described above and both samples were not enriched in REEs.

Below Stockton Coal

Only one sample WV-EMRI-217 (319.18ppm) was taken from a shale unit beneath the Stockton Coal and it was enriched in REEs. This shale unit had soft clayey zones and fine coal streaks near the top of the unit.

309-054
Kanawha Co.

REE Total (La-Lu) + Y
200 300 400

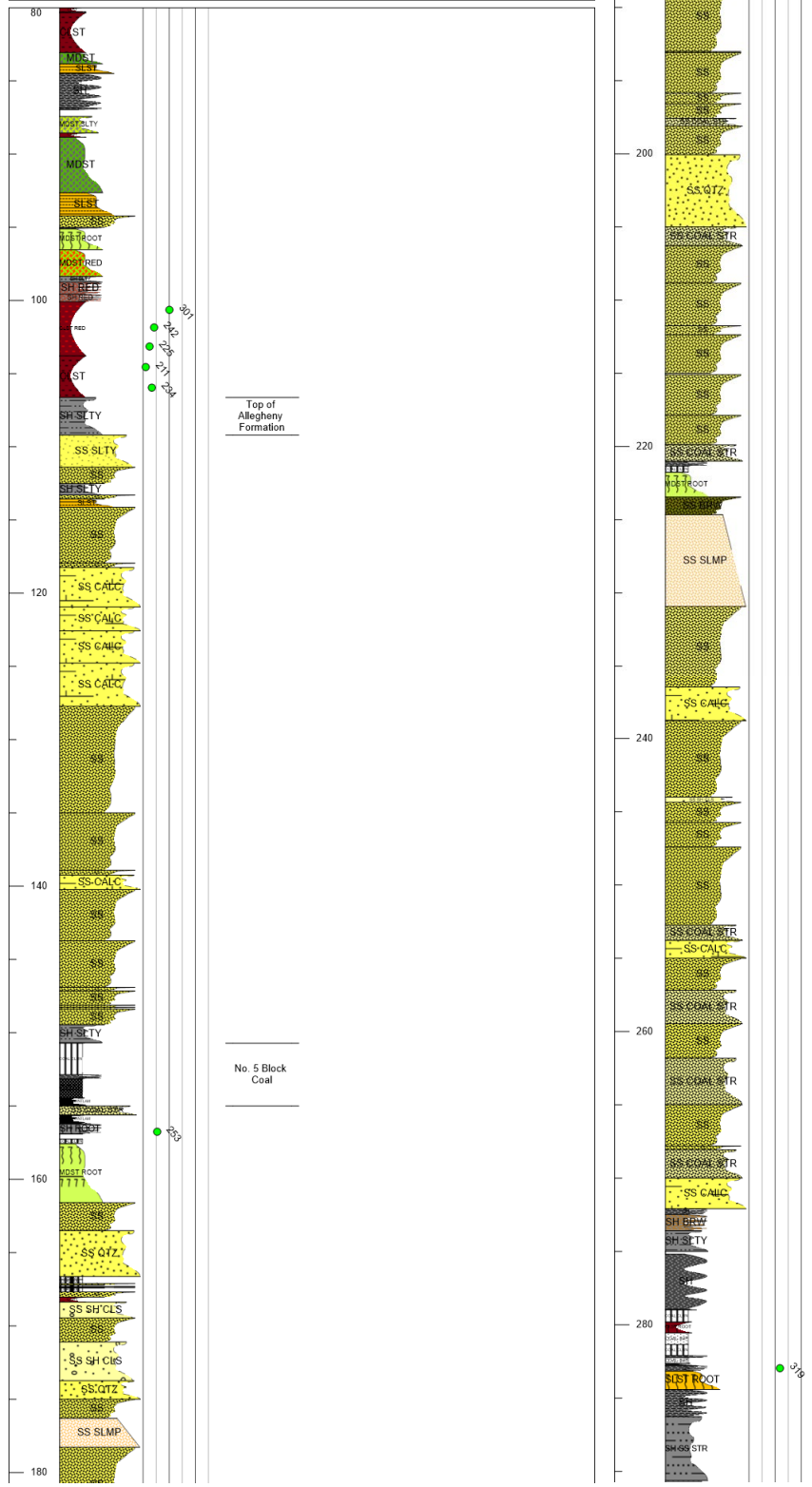




Figure 4. Graphic log for the Kanawha County core 309-054.

Ritchie (309-055)

The Ritchie County core (309-055) (Figure 5) had three intervals in which the analysis of the samples showed to be enriched in REEs. The intervals that had enriched samples were the interval near the base of the Conemaugh Group / top of the Allegheny Formation, directly beneath the Middle Kittanning Coal, and roughly ten feet below the Middle Kittanning Coal. The samples collected in the interval roughly ten feet below the Middle Kittanning Coal had some of the highest concentrations of REEs from any of the samples collected for the Earth MRI project or submitted to the NETL for analysis.

Near base of Conemaugh Group/ top of Allegheny Formation roughly 50 feet below the Brush Creek Coal of the Conemaugh Group.

Five samples were collected from two different flintclay units, but only one of the samples was enriched in REEs. WV-EMRI-194 (242.56ppm) and WV-EMRI-195 (216.08) were from the same mottled flintclay unit near the top of the Allegheny formation, however neither sample was enriched. Three additional samples were collected in the brecciated flintclay unit below; WV-EMRI-196 (277.04ppm), WV-EMRI-197 (215.76ppm), and WV-EMRI-198 (491.29ppm). Only the sample from the lower most part of the brecciated flintclay unit was enriched in REEs. The analysis for WV-EMRI-196, WV-EMRI-197, and WV-EMRI-198 was completed by the NETL lab.

Below Middle Kittanning Coal

Four samples were collected in two different flintclay units less than five feet below the Middle Kittanning Coal seam. WV-EMRI-199 (378.78ppm) and WV-EMRI-200 (555.83) were from a mottled flintclay unit directly beneath the Middle Kittanning Coal seam. WV-EMRI-201 (455.38ppm) and WV-EMRI-202 (301.62) were sampled from a flintclay unit roughly 2.5 feet below the mottled flintclay discussed above.

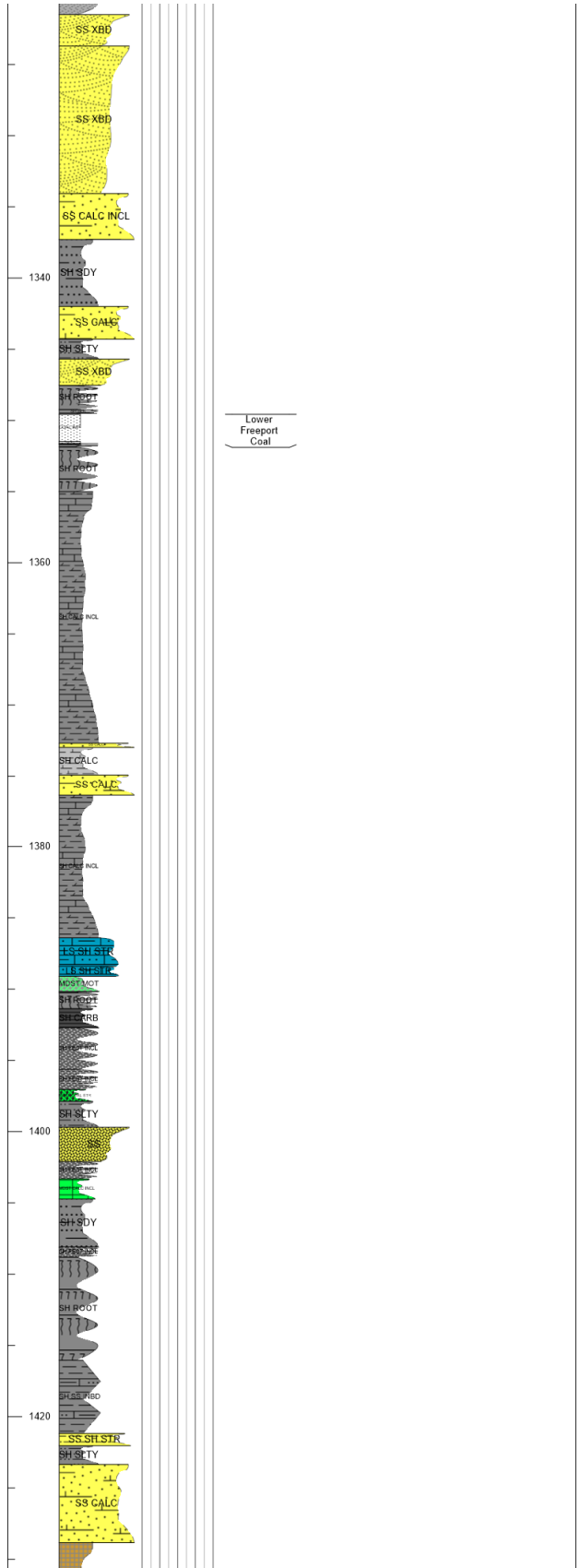
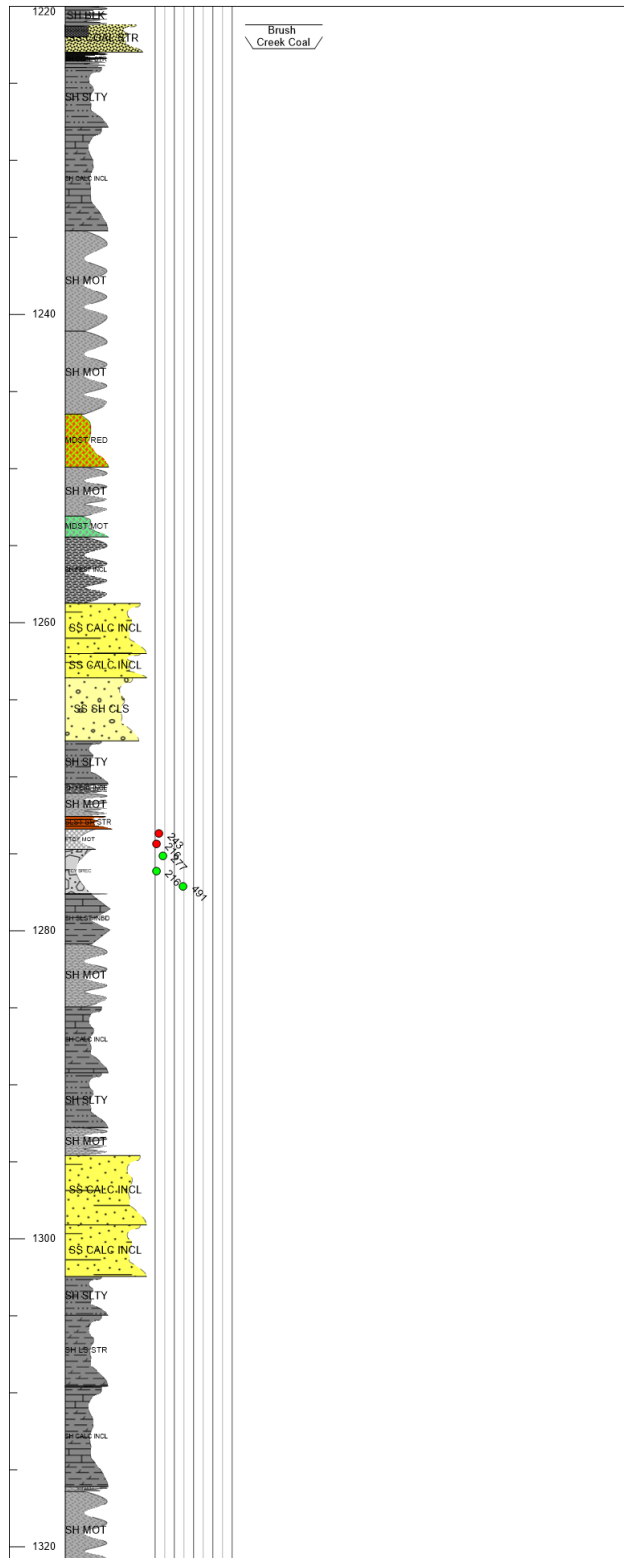
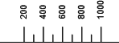
Ten Feet below the Middle Kittanning Coal

In the interval starting roughly eight to ten feet below the Middle Kittanning Coal six samples were collected from three different units, a flintclay, mottled claystone, and brecciated flintclay. Samples WV-EMRI-203 (690.89ppm) and WV-EMRI-204 (998.84ppm) were taken from a flintclay unit and the results show this unit to have some of the highest concentrations of REEs for all of the samples collected. The description of this unit seem typical of an Allegheny Formation flintclay, however there were some fine calcite streaks noted for WV-EMRI-204. Samples WV-EMRI-205 (306.26ppm) and WV-EMRI-206 (394.46ppm) were from a claystone unit directed below the highly enriched flintclay discussed above. While these samples were enriched in REEs, they were not highly enriched as the unit above.

WV-EMR-207 (290.70ppm) and WV-EMRI-208 (265.67ppm) were taken from a brecciated flintclay directed beneath the claystone unit discussed above, however neither sample from this unit was enriched in REEs.

309-055
Ritchie Co.

REE Total (La-Lu) + Y



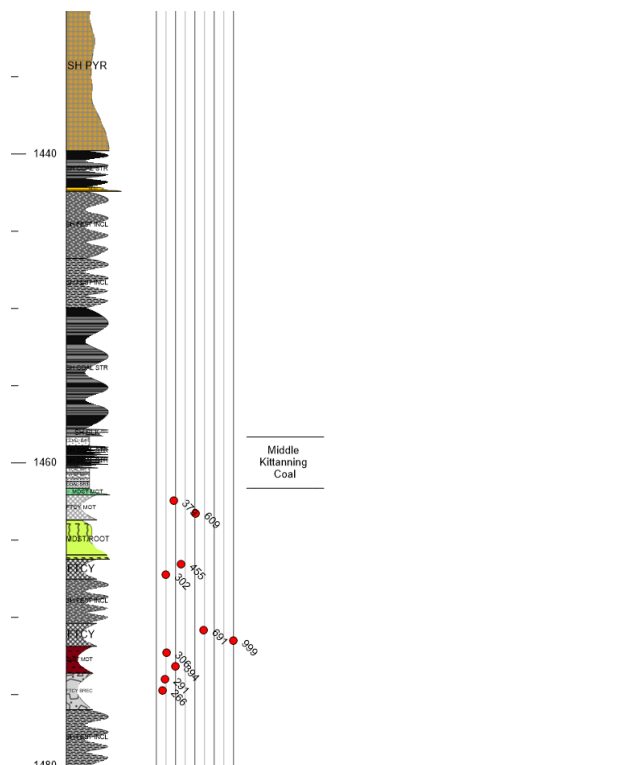


Figure 5. Graphic log for the Ritchie County core 309-055.

Braxton (282-026)

The Braxton County core (282-026) (Figure 6) had samples that were collected from seven different intervals that were enriched in REEs. These seven intervals include; near the base of the Conemaugh Group / top of Allegheny Formation, below the position of the Upper Freeport Coal, Upper Kittanning Coal not present interval, below Lower Kittanning Coal, below the Little 5 Block Coal, below the Stockton A Coal, and in the interval above and below the Stockton Coal of the Kanawha Formation. The samples with the highest concentrations of REEs for this core were from the interval below the Lower Kittanning Coal seam.

Near base of Conemaugh Group/ top of Allegheny Formation roughly 35 feet below the Brush Creek Coal of the Conemaugh Group as picked on the geologist's log.

The Brush Creek Coal was not present in this core and a coal not present was picked on the geologist's log that is not currently correlated in the coal database. Three samples were collected in this lower Conemaugh Group / upper Allegheny Formation interval, and two of the three samples were enriched in REEs. WV-EMRI-87 (613.40ppm) was from a brecciated flintclay unit that was light to medium gray in color and darkened to black towards its base. WV-EMRI-088 (343.18ppm) was taken roughly 20 feet below WV-EMRI-087 from a brecciated flintclay. Directly below this brecciated flintclay WV-EMRI-089 (214.18ppm) was from a claystone unit and was not enriched in REES. The results for WV-EMRI-088 and WV-EMRI-089 was processed by the NETL lab.

Below the position of the Upper Freeport Coal

The coal not present for the Upper Freeport Coal was placed above claystone unit that roughly represents the position the Upper Freeport Coal on the geologist's log, but has not been correlated in the coal database. In this interval ten samples were collected from two units within the interval of ten feet below the top of the claystone unit. Eight samples were from the upper claystone and two samples were taken from a sandy claystone unit below. Eight samples; WV-EMRI-090 (345.51ppm), WV-EMRI-091 (338.07ppm), WV-EMRI-092 (205.78ppm), WV-EMRI-093 (311.91ppm), WV-EMRI-094 (341.74ppm), WV-EMRI-095 (340.94ppm), WV-EMRI-096 (345.93ppm), and WV EMRI-097 (266.22ppm) were collected from a medium to dark gray claystone unit that darkens in colors towards base, and also contained slickensides and plant roots. There were non-calcareous globules that were present in the interval the final three samples were collected, but they did not seem to effect the REE concentrations. This claystone unit was enriched in REEs throughout the unit and does not seem to have a pattern. WV-EMRI-098 (256.32ppm) and WV-EMRI-099 (349.95ppm) were from a sandy claystone directly below the claystone unit described above. This unit was sandy, rooted and light gray in color. Only one of the samples collected from this unit was enriched in REEs.

Upper Kittanning Coal not present interval

The coal not present for the Upper Kittanning Coal was placed above a carbonaceous shale unit that represents the position of the Upper Kittanning Coal seam on the geologist log, but has not been correlated in the coal database. Three samples were collected from this interval with two above the carbonaceous shale in a claystone unit and one sample from below in a separate claystone unit. WV-EMRI-100 (380.92) and WV-EMRI-101 (241.54) were from the claystone unit above the Upper Kittanning not present horizon. WV-EMRI-100 was taken near the top of the unit and is slightly enriched in REEs, while WV-EMRI-101 collected in the bottom part of the unit was not enriched. In the lower part of this claystone unit there was a calcareous nodule which was not present in the upper parts of the claystone unit. WV-EMRI-102 (231.37ppm) was from a claystone unit below the Upper Kittanning Coal not present horizon and is not enriched in REEs. Ironstone and calcareous clasts were present in this lower claystone unit.

Roughly 15 feet below the Upper Kittanning Coal not present two samples; WV-EMRI-103 (557.58ppm) and WV-EMRI-104 (347.6ppm) were from a brecciated flintclay unit. Both samples were enriched in REEs with the upper most sample having a much higher concentration.

Below Lower Kittanning

In the interval beneath the Lower Kittanning Coal, six samples were collected from five different rock units with all of the samples having some enrichment of REEs. WV-EMRI-105 (340.18ppm) was collected from a shaley flintclay unit 2.3' below the base of the Lower Kittanning Coal directly under a rooted shale unit. Of all of the samples collected below the Lower Kittanning Coal, WV-EMRI-105 was the only sample that was sent to the USGS lab for analysis, while the other 5 samples were sent to the NETL lab. WV-EMRI-106 (614.56ppm) was from a kaolinitic shale directly below the flintclay unit above. WV-EMRI-107 (506.80ppm) was collected from a hard shaley flintclay. WV-EMRI-108 (606.67ppm) was taken from a poorly bedded dark gray to black shale directly below the shaley flintclay described above.

The Final two samples WV-EMRI-109 (345.10ppm) and WV-EMRI-110 (301.67ppm) were collected from a medium gray, rooted, and silty claystone. There tends to be a general trend in the sampled units below the Lower Kittanning that the concentration of REEs decrease in abundance with depth.

Below Little 5 Block Coal

Three samples were collected from a rooted claystone unit directly beneath the Little 5 Block Coal and two of the three samples were enriched in REEs. A single rooted claystone unit was sampled as three separate samples unit dues to changes in both lithology and color. WV-EMRI-111 (509.25ppm) had the highest concentration of REEs from the samples taken from beneath the Little 5 Block. This upper most sample was taken separately due to the presence of coal streaks in the upper most parts of the claystone unit. WV-EMRI-112 (316.93ppm) was taken in the interval beneath the coal streaks, and was sampled separately from the WV-EMRI-113 (254.69ppm) due to a gradational color change from medium brown gray to light brown gray and the unit becoming harder to base. Within the rooted claystone unit beneath the Little 5 Block, the concentration of REES in the samples decreases with depth.

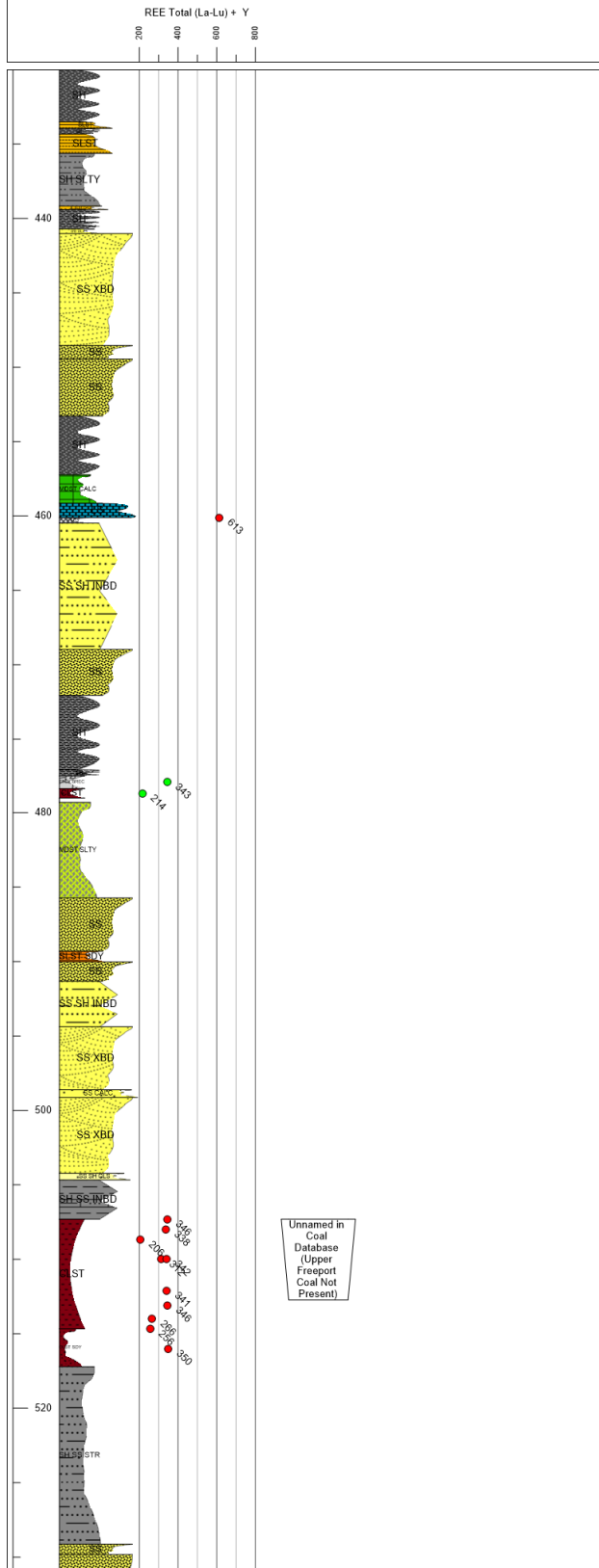
Below Stockton A Coal

Only one sample; WV-EMRI-114 (319.89) was taken from a poorly bedded shale with root traces directly beneath the Stockton A Coal seam.

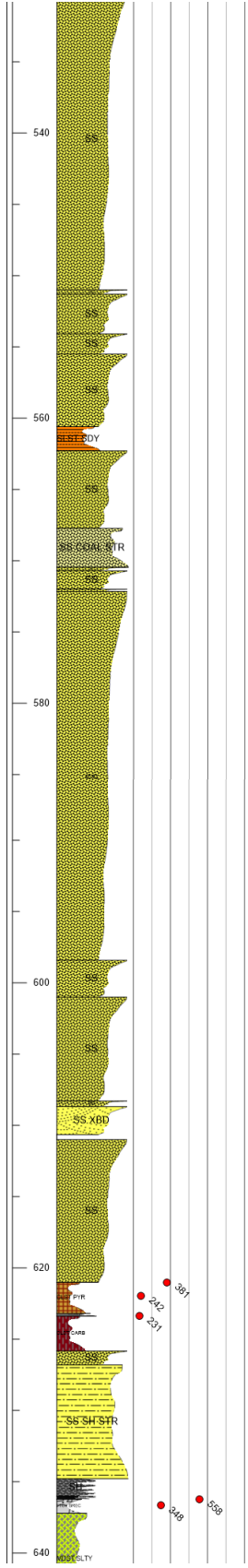
Below the Stockton Coal of the Kanawha Formation

In this interval two samples were collected from a claystone unit below the Stockton Coal main seam and two sample were from a shale directly below the Stockton Coal Lower Split. WV-EMRI-115 (354.19ppm) and WV-EMRI-116 (277.11ppm) were from a rooted claystone directly beneath the main seam of the Stockton Coal, only one of which was enriched in REEs. WV-EMRI-117 (341.87ppm) and WV-EMRI-118 (369ppm) were taken directly below the Stockton Lower Split about 5 feet below the base of Stockton Coal main seam. Three of the four samples from the Stockton Coal interval were slightly enriched with REEs.

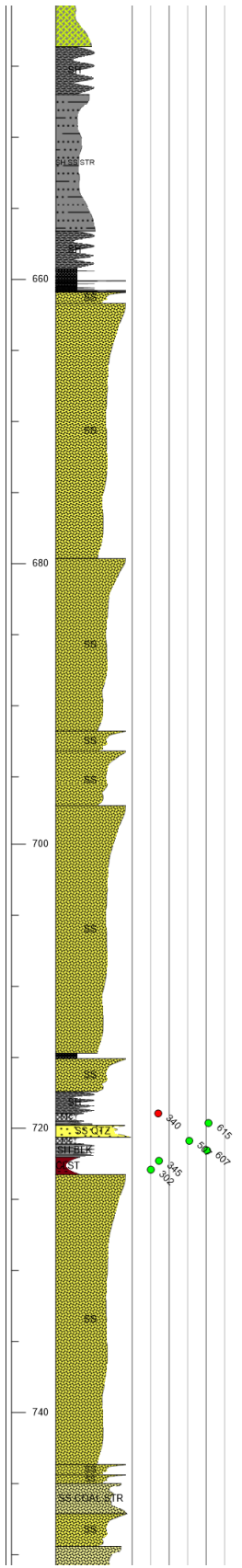
282-026
Braxton Co.



Unnamed in Coal Database (Upper Freeport Coal Not Present)

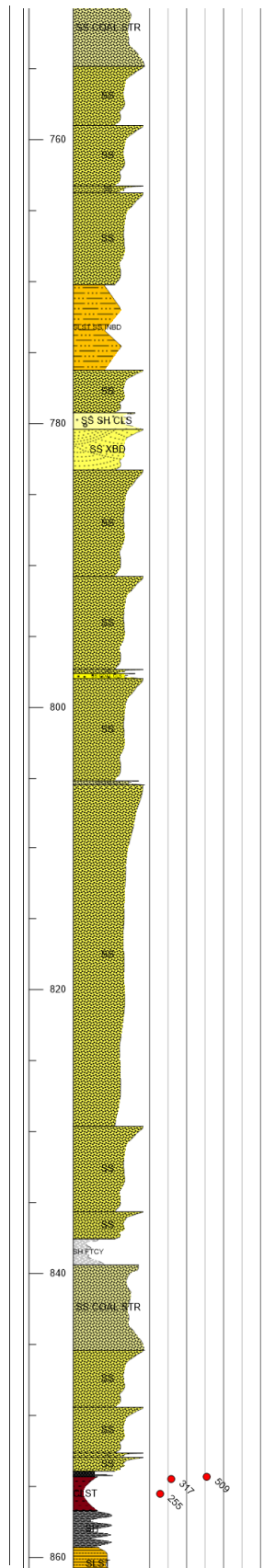


Unnamed in Coal Database (Upper Kittanning Coal Not Present)



Middle
Kittanning
Coal

Lower
Kittanning
Coal



No. 5 Block
Coal Not
Present

Little No. 5
Block Coal

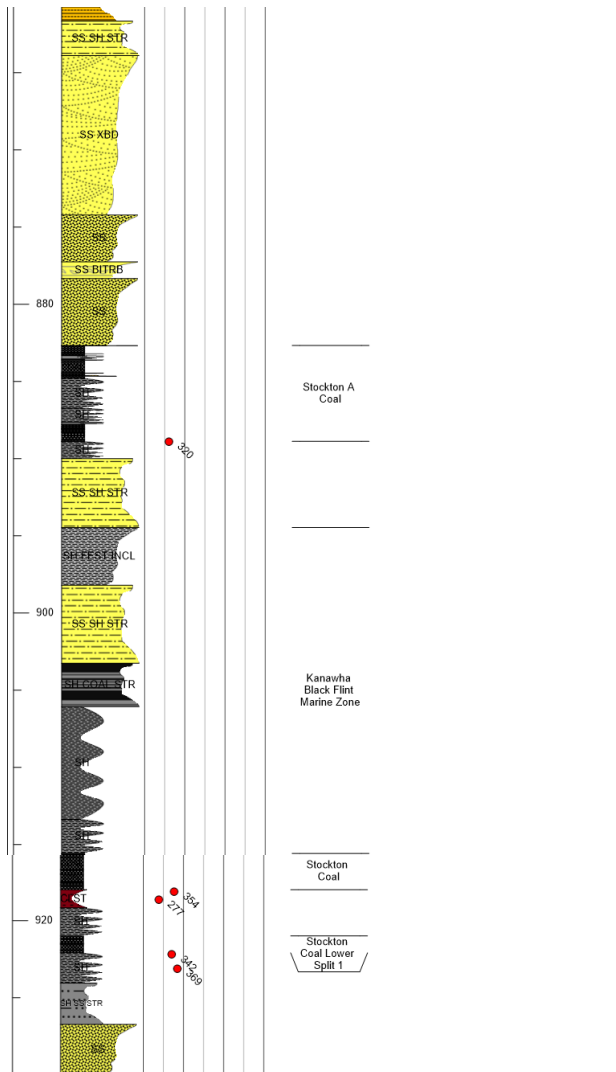


Figure 6. Graphic log for the Braxton County core 282-026.

Upshur (285-073)

The Upshur County core (285-073) (Figure 7) had six intervals in which the samples were enriched with REEs. These six intervals that had enriched samples include; below the Upper Freeport Coal not present, above the Upper Kittanning Coal, below the Johnstown Cement Limestone, below an unnamed coal possibly the Middle Kittanning Upper Split, below the Middle Kittanning Coal, below the Little 5 Block / unnamed coal, and below the Kanawha Black Flint. The interval below the Middle Kittanning Coal had the highest concentrations for this core.

Below the Upper Freeport Coal not present

The coal not present for the Upper Freeport was placed above a nodular flintclay unit that represents the position of the Upper Freeport Coal seam on the geologist's log, but has not been correlated in the coal database. Four samples were collected from an interval of less than six feet below

the Upper Freeport Coal not present. Two samples WV-EMRI-119 (319.56ppm) and WV-EMRI-120 (279.20ppm) were from a nodular flintclay unit and only one of the samples was slightly enriched in REEs. One sample WV-EMRI-121 (300.69ppm); was taken from a claystone unit along with the bottom 0.40' of the poorly bedded shale above. The Poorly bedded shale was described on the geologist's log as shale but appeared to actually be claystone. These samples were combined due to the unit above not having enough material to be sampled alone. The final sample taken from this interval, WV-EMRI-122 (232.57ppm) was from a claystone unit directly below a section of drilling core loss and was not enriched in REEs.

Above the Upper Kittanning Coal

In the interval between the base of the Upper Freeport Limestone and above the Upper Kittanning Coal, eight samples were collected from two flintclay and two claystone units with four of the samples having enriched REE concentrations. These samples were collected roughly 18 feet below the base of the Upper Freeport Limestone and 25 Feet above the top of the Upper Kittanning Coal. WV-EMRI-123 (459.52) was from a brecciated flintclay and had the highest concentration of REEs of the samples collected in this interval. WV-EMRI-124 (205.37ppm) was taken from a separate brecciated flintclay, but was not enriched in REEs. Directly below the flintclay described above, two samples; WV-EMRI-125 (308.19ppm) and WV-EMRI-126 (305.00ppm) were both from a rooted claystone unit and were slightly enriched. Three samples; WV-EMRI-127 (281.04ppm), WV-EMRI-128 (283.39ppm), and WV-EMRI-129 (287.40) were collected from a separate claystone than the one above and none of the samples from this unit were enriched. The final sample in this interval; WV-EMRI-130 (319.33) was from a flintclay with fine plant roots and was slightly enriched in REEs. All of the samples taken from above the Upper Kittanning Coal with the exception of WV-EMRI-123, were submitted to the NETL lab for analysis.

Below the Johnstown Cement Limestone

Four samples were collected from two different units below the Johnstown Cement Limestone, with two samples from a brecciated flintclay and two samples were from a claystone. Two samples; WV-EMRI-132 (186.13) and WV-EMRI-133 (546.34ppm) were from a brecciated flintclay. WV-EMRI-134(297.84) and WV-EMRI-135 (291.74ppm) were taken from a rooted claystone and neither sample was enriched. WV-EMRI-133 was the only sample taken below the Johnstown Cement Limestone that was enriched in REEs. Samples WV-EMRI-132 and WV-EMRI-135 were analyzed by the USGS lab and WV-EMRI-133 and WV-EMRI-134 were analyzed at the NETL lab.

Below an unnamed coal possibly the Middle Kittanning Upper Split (?)

Roughly three feet below the Johnston Cement Limestone there is a thin coal that is unnamed on both the geologist's log and in the coal database that may possibly correlate to the Middle Kittanning Upper Split (?). One sample, WV-EMRI-136 (366.94ppm) was taken from a poorly bedded shale below this unnamed coal and was enriched in REEs.

Below the Middle Kittanning Coal

Two samples were taken from the base of the Middle Kittanning Coal, which had the highest concentration of REEs of all of the sampled taken from the Upshur County core. WV-EMRI-137 (547.87ppm) and WV-EMRI-138 (511.23ppm) were from a rooted claystone unit that had pyrite.

Below the Little 5 Block / unnamed coal

Five samples were collected from an interval below a coal that was tagged Little 5 Block on the geologist's log but remains unnamed in the coal database. The one sample taken directly below the coal; WV-EMRI-141 (257.85ppm) was not enriched in REEs. Four more samples were collected roughly five feet below the coal, but only one of these samples had some enrichment. WV-EMRI-142 (297.36ppm) was taken from the upper part of a rooted claystone unit and was not enriched in REES. Three samples; WV-EMRI-143 (223.66ppm), WV-EMRI-144 (196.80ppm), and WV-EMRI-145 (411.45ppm) were from the lower part of the rooted claystone unit that was lighter in color than the unit above.

Below the Kanawha Black Flint

Five samples were collected from two separate units in the interval below the Kanawha Black Flint marine zone. The interval on the geologist's log was picked as the Kanawha Black Flint, but was not correlated as such in the coal database. The Kanawha black flint is the unit that marks the boundary between the underlying Kanawha Formation from the Allegheny Formation above. Below the Kanawha Black Flint, the Stockton Coal is the first major coal of the Kanawha Formation that is present in this interval, but is missing from the Upshur County Core. WV-EMRI-146 (220.12ppm) was taken from a claystone unit approximately five feet below the Kanawha Black Flint and was not enriched in REEs. Four samples; WV-EMRI-147 (362.74ppm), WV-EMRI-148 (333.96), WV-EMRI-149 (308.74ppm), and WV-EMRI-150 (311.94ppm) were collected from a rooted claystone approximately 10 feet below the Kanawha Black Flint and all of these samples were slightly enriched with REEs. Sample WV-EMRI-146 was analyzed by the USGS lab while WV-EMRI-147, WV-EMRI-148, WV-EMRI-149, and WV-EMRI-150 were processed and analyzed by the NETL lab.

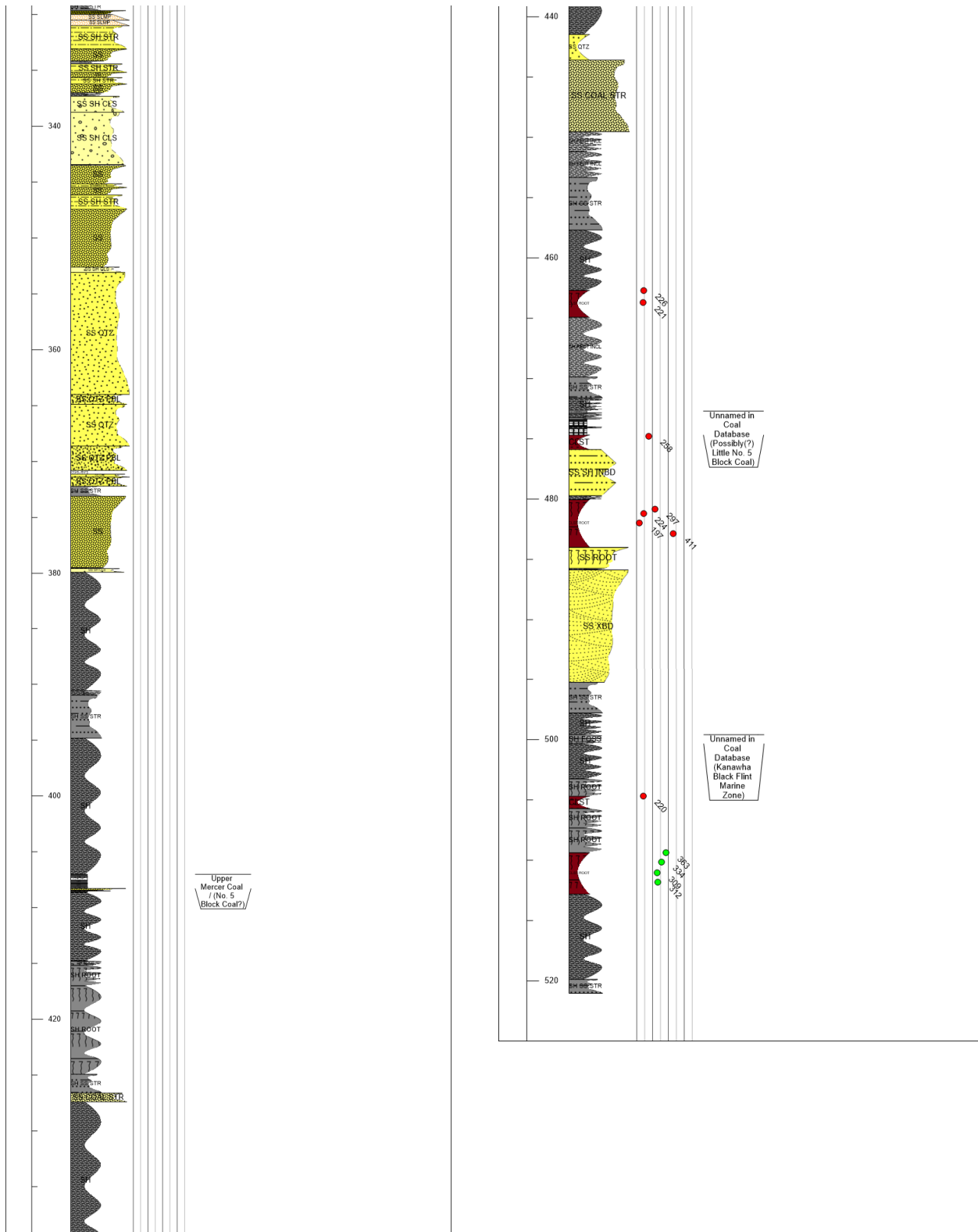


Figure 7. Graphic log for the Upshur County core 285-073

Barbour (302-072)

The Barbour County core (302-072) (Figure 8) had eight intervals in which the samples collected were enriched with REEs, and the interval below the Upper Freeport Coal had the highest concentrations for this core. The eight intervals that had enriched samples include; near the base of the Conemaugh Group, below Upper Freeport Coal, below the Lower Freeport Upper Split, ten feet below the Lower Freeport Coal, twenty five feet below the Lower Freeport Coal, below the Johnstown Cement Limestone, below the Middle Kittanning Coal, and within and below the Lower Kittanning Coal.

Near the base of the Conemaugh Group / top of the Allegheny Formation

Near the Base of the Conemaugh Group, roughly ten feet above the top of the Upper Freeport Coal that marks the top of the Allegheny Formation, four samples were collected from two different rock units, and three of the samples had enriched concentrations of REEs. Two samples; WV-EMRI-032 (258.73ppm) and WV-EMRI-033 (356.48ppm) were collected from a brecciated flintclay unit that had occasional calcareous nodules present. Two additional samples WV-EMRI-034 (384.69ppm) and WV-EMRI-035 (402.30ppm) were taken from a claystone directly beneath the flintclay unit above. Samples WV-EMRI-033 and WV-EMRI-034 were submitted to the NETL for analysis and all the other samples taken from the Barbour County (302-072) core were analyzed by the USGS lab.

Below Upper Freeport Coal

Below the Upper Freeport Coal five samples were collected from three different rock units, but only one of the samples showed an enrichment in REEs. WV-EMRI-036 (295.37ppm) was taken from a black shale that contained soft clayey zones. Directly below the Black shale, WV-EMRI-037 (284.92ppm) was from a soft medium gray claystone. WV-EMRI-038 (535.39ppm) was collected from a gray shale with soft clayey zones and is enriched in REEs. Under this shale with soft clayey zones, WV-EMRI-39 (273.28ppm) and WV-EMRI-40 (230.93ppm) were from a gray claystone with hard and soft layers and neither of these samples were enriched.

Below the Lower Freeport Upper Split

Two samples were collected beneath a coal seam that was correlated as the Lower Freeport Upper Split on the geologist's log, but is only correlated as the Lower Freeport interval in the coal database. WV-EMRI-041 (315.83ppm) was taken from a black shale that had some pyrite and was inter-fingered with bone. Directly below this unit, WV-EMRI-042 (351.76ppm) was from a soft claystone unit. Both of the samples from this interval were slightly enriched in REEs.

Ten feet below the Lower Freeport Coal

The three samples collected directly beneath the Lower Freeport Coal were not enriched in REEs but a sample from roughly ten feet below the coal seam did have some enrichment. WV-EMRI-046 (376.21ppm) was from a medium gray claystone.

Twenty five feet below the Lower Freeport Coal

A second interval, approximately twenty five feet below the Lower Freeport Coal had six samples taken from a single brecciated flintclay unit, and two of the samples showed enriched concentrations of REEs. WV-EMRI-047(310.45ppm), WV-EMRI-048 (295.78ppm), WV-EMRI-049 (257.78ppm), WV-EMRI-050 (255.45), WV-EMRI-051 (340.76ppm), and WV-EMRI-052 (223.71ppm) were all taken from a silty brecciated flintclay. WV-EMRI-051 was from an interval that had larger flintclay clasts and also had an increase in the red staining and oxidation on the outside of the core. Only two samples, WV-EMRI-047 taken at the top of the flintclay and WV-EMRI-051 taken near the bottom had enriched REE concentrations.

Below the Johnstown Cement Limestone

Three samples were collected from three separate claystone units in the interval of less than five feet below the Johnstown Cement Limestone, but only one of the samples / claystone units had an enriched concentration of REEs. WV-EMRI-057 (165.22ppm) was taken from a claystone that was weakly calcareous and had kaolinitic claystone clasts. WV-EMRI-058 (456.90ppm) was sampled from a kaolinitic claystone with brecciated clasts and was enriched in REEs. The final sample collected in this interval, WV-EMRI-059 (269.28ppm) was from a weakly bedded kaolinitic claystone and was not enriched with REEs.

Below the Middle Kittanning Coal

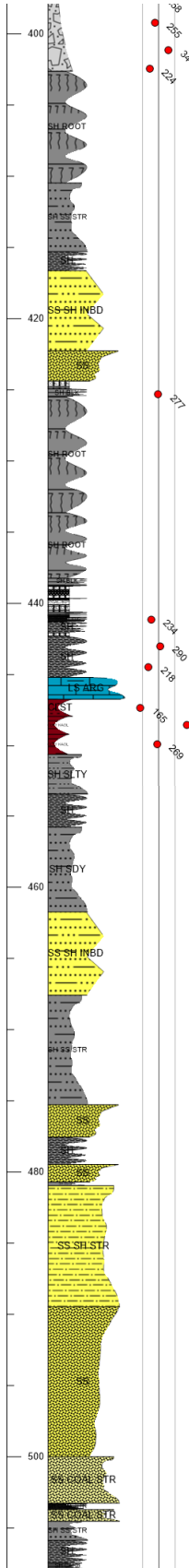
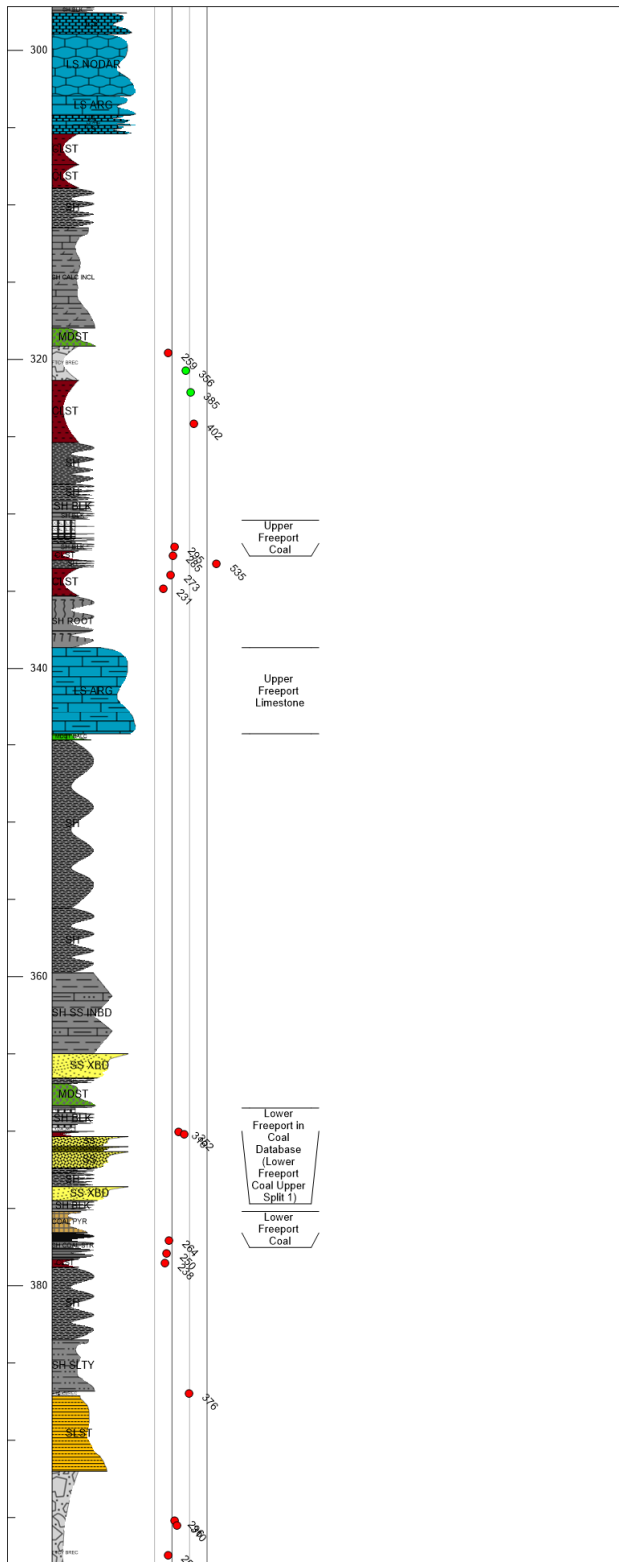
Below the Middle Kittanning Coal, eight samples were collected from four different rock units. All of the samples collected from this interval of less than seven feet below the base of the Middle Kittanning Coal were enriched in REEs. Three samples; WV-EMRI-060 (344.74ppm), WV-EMRI-061 (377.08ppm), and WV-EMRI-062 (324.72ppm) were taken from a dark gray shale with pyrite streaks. Three samples; WV-EMRI-063 (389.73ppm), WV-EMRI-064 (374.14ppm), WV-EMRI-065 (349.77ppm) were from a medium to dark gray rooted claystone unit directly beneath the dark gray shale described above. WV-EMRI-064 and WV-EMRI-065 were taken as separate samples from the rest of the rooted claystone unit above due to the presence of light gray claystone clasts. One sample; WV-EMRI-066 (306.13ppm) was collected from a dark gray to black claystone that was soft. The final sample from this interval, WV-EMRI-067 (520.03ppm) was from a soft, medium gray shale with light and dark gray shale streaks and had a clayey parting. WV-EMRI-067 had the highest concentration of REEs for any of the samples collected below the Middle Kittanning Coal.

Within and below the Lower Kittanning Coal

Two samples were taken from the interval around the Lower Kittanning Coal, one from the parting of the main coal seam and one directly below the main coal seam. WV-EMRI-068 (479.22) was collected from a rooted shale unit that is a parting within the main seam of the Lower Kittanning Coal. Directly beneath the Lower Kittanning Coal Main Seam, WV-EMRI-069 (222.82ppm) was from a rooted claystone with coal streaks. Of these two samples only the sample taken from the parting within the Lower Kittanning Coal Main Seam was enriched in REEs.

302-072
Barbour Co.

REE Total (La-Lu) + Y



Unnamed in Coal Database (Upper Kittanning Coal Upper Split 1)

Upper Kittanning Coal

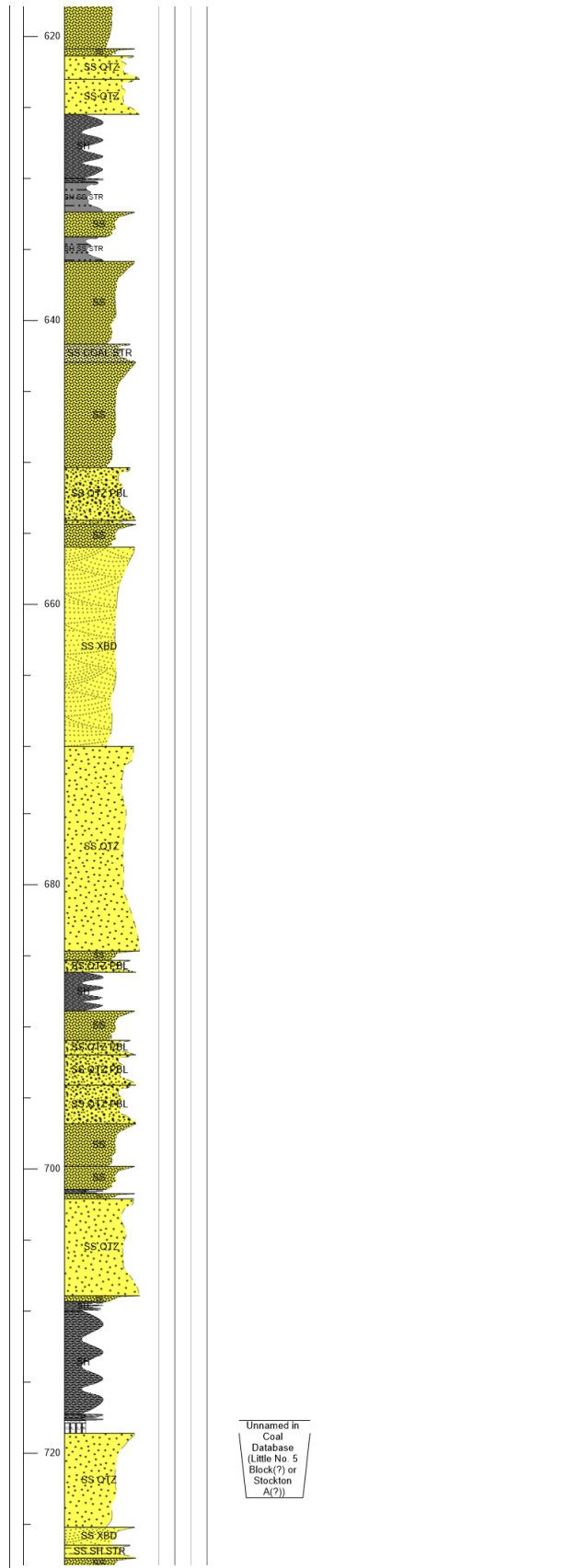
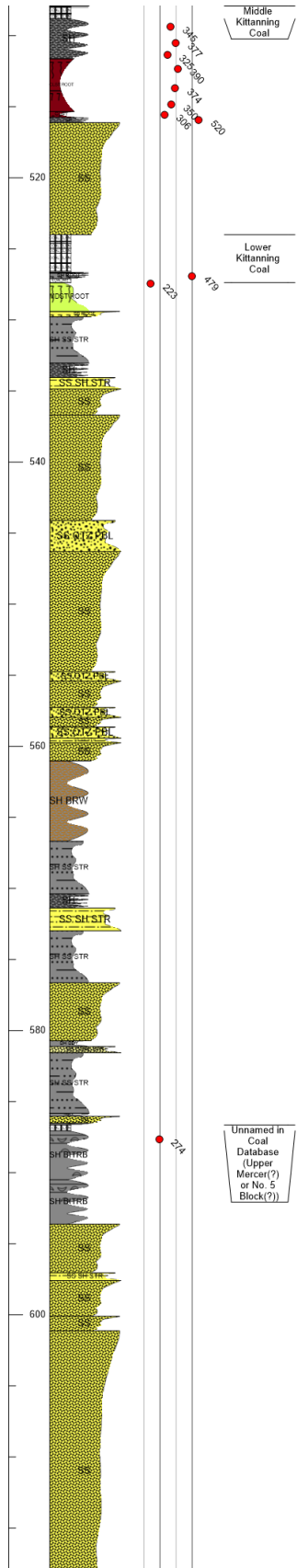
Upper Kittanning Coal Lower Split 1
Johnstown Cement Limestone

Upper Freeport Coal

Upper Freeport Limestone

Lower Freeport in Coal Database (Lower Freeport Coal Upper Split 1)

Lower Freeport Coal



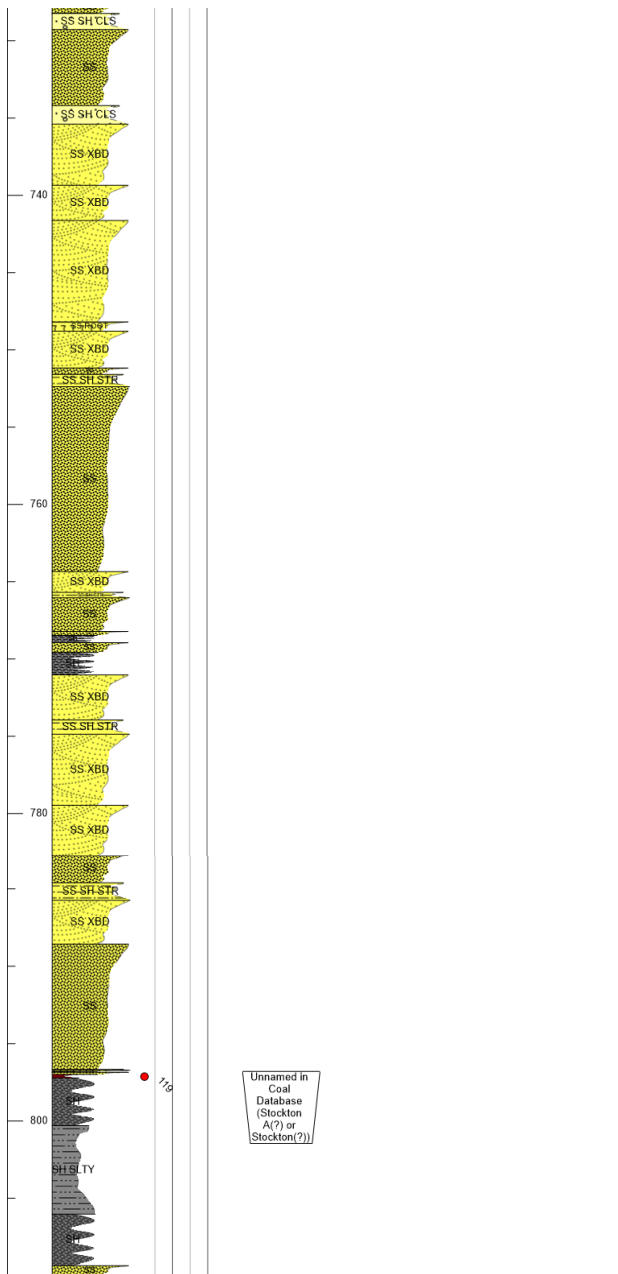


Figure 8. Graphic log for the Barbour County core 302-072.

Preston (308-007)

The Preston County core (308-007) (Figure 9) had ten intervals in which the samples were enriched in REEs. A sample taken from the interval roughly twenty feet below the Brush Creek coal in the Conemaugh Group had the highest concentrations of REEs for this core. The ten intervals that had enriched samples include; 20 to 35 feet below the Brush Creek Coal, 35 to 40 feet below the Brush Creek Coal, above the Mahoning Coal not present, below the Mahoning Coal not present, above the Upper Freeport Coal, below the Upper Freeport Limestone, below the Lower Freeport Coal not present, ten feet below the Lower Freeport Coal not present, below Upper Kittanning Coal, and below the Middle Kittanning Rider Coal.

Near the base of the Conemaugh Group 20 to 35 feet below the Brush Creek Coal

Twelve samples were collected from five separate rock units in the interval 20 to 35 feet below the Brush Creek Coal near the base of the Conemaugh Group / top of the Allegheny Formation. Of these 12 samples, four had enriched REE concentrations from three of rock units sampled. Samples WV-EMRI-151 (262.77ppm), WV-EMRI-152 (281.52ppm), and WV-EMRI-153 (269.66ppm) were from a flintclay unit and did not have any enrichment. WV-EMRI-152 and WV-EMRI-153 were from an interval of the flintclay that was brecciated. A single sample; WV-EMRI-154 (291.89ppm) was from a medium gray green flintclay with inclined gray-brown and light gray bands. WV-EMRI-155 (369.29ppm) was sampled from a brecciated flintclay and was enriched in REEs. Two samples; WV-EMRI-156 (368.88ppm) and WV-EMRI-157 (462.34ppm) were taken from a flint clay that was faintly brecciated near the top of the unit, becoming banded towards the base with submillimeter siderite clasts or pellets. Five samples; WV-EMRI-158 (435.12ppm), WV-EMRI-159 (237.36ppm), WV-EMRI-160 (216.58ppm), WV-EMRI-161 (247.52ppm), and WV-EMRI-162 (334.71ppm) were collected from a brecciated flintclay that had abundant submillimeter siderite pellets in the flintclay matrix. Samples WV-EMRI-161 and WV-EMRI-162 were analyzed by the NETL lab while the other samples from this interval were analyzed by the USGS lab.

Near the base of the Conemaugh Group 35 to 40 feet below the Brush Creek Coal

Five samples were collected from two rock units in the interval 35 to 40 feet below the Brush Creek Coal, but only one of the samples had an enriched concentration of REEs. Four samples, WV-EMRI-163 (331.41ppm), WV-EMRI-164 (298.77ppm), WV-EMRI-165 (203.01ppm), and WV-EMRI-166 (236.99ppm) were collected from a medium gray claystone that was weakly bedded throughout. WV-EMRI-163 was from the uppermost portion of the claystone unit where dark gray and black mottles and bands were present. WV-EMRI-167 (243.40ppm) was sampled from a gray-green mottled claystone directly beneath the claystone above unit and was not enriched in REEs. All of the samples from the interval of 35 to 40 feet below the Brush Creek Coal were sent to the NETL lab for analysis.

Above the Mahoning Coal not present

The coal not present for the Mahoning Coal was placed below a soft, dark gray to black shale unit that represents the position of the Mahoning Coal seam both on the geologist log and correlated as such in the coal database. Two samples, WV-EMRI-168 (220.79) and WV-EMRI-169 (341.35) were collected from a brecciated flintclay above the dark gray to black shale horizon of the Mahoning Coal position. Only one of these samples WV-EMRI-169 was slightly enriched in REEs. Both of these samples were analyzed by the NETL lab.

Below the Mahoning Coal not present

Five samples were collected from two different claystone units beneath the Mahoning Coal not present horizon. WV-EMRI-170 (366.18ppm) was from a medium gray claystone with light gray-green streaks and pyrite. WV-EMRI-170 was sampled directly below the Mahoning Coal not present horizon and was enriched in REEs. Four samples; WV-EMRI-171 (275.69ppm), WV-EMRI-172 (423.92ppm), WV-EMRI-173 (315.24ppm), and WV-EMRI-174 (312.37ppm) were from a light gray-green, illitic or clayey claystone unit. The upper most sample WV-EMRI-171 was not enriched in REEs, but the three other samples taken from the lower portions of the unit were enriched.

Above the Upper Freeport Coal not present

The coal not present for the Upper Freeport Coal was placed below a black, carbonaceous shale with coal streaks that represents the position of the Upper Freeport Coal seam on the geologist's log and in the coal database. Four samples were taken from two separate claystone and kaolinitic claystone rock units roughly 15 feet above the Upper Freeport Coal position. Three samples; WV-EMRI-175 (325.31ppm), WV-EMRI-176 (246.12ppm), and WV-EMRI-177 (240.33ppm) were collected from a medium to dark gray-green brecciated claystone / flintclay that had a sandy matrix. Only the uppermost sample (WV-EMRI-175) from this claystone was enriched in REEs. WV-EMRI-178 (463.09ppm) was taken from a light brown-gray, kaolinitic claystone roughly ten feet above the Upper Freeport Coal not present position and was also enriched in REEs. Samples WV-EMRI-175 and WV-EMRI-176 were analyzed by the USGS lab and samples WV-EMRI-177 and WV-EMRI-178 were analyzed by the NETL lab.

Below the Upper Freeport Limestone

Three samples were collected from two different claystone units below the Upper Freeport Limestone. Two samples were collected from a medium gray claystone directly below the base of the Upper Freeport Limestone and 20 feet above the position of the Lower Freeport Coal not present. WV-EMRI-179 (384.29ppm) and WV-EMRI-180 (375.69ppm) both had enriched concentrations of REEs. The coal not present for the Lower Freeport Coal was placed below a black, carbonaceous shale with fine coaly fragments and represents the position of the Lower Freeport Coal seam on the geologist's log and in the coal database. The coal not present for the Lower Freeport Coal seam in the coal database was later moved from a depth of 401.21' to 422.30' and differs from the original correlation in the geologist's log. One sample, WV-EMRI-181 (313.70ppm) was collected directly below the carbonaceous shale unit and five feet below the Upper Freeport Limestone in a rooted claystone and was slightly enriched in REEs. All three of these samples were analyzed by the USGS lab along with the remainder of samples collected from Preston County core (308-007).

Ten feet above the Lower Freeport Coal not present

Six samples were collected from two different claystone units in the interval of five to ten feet above the Lower Freeport Coal horizon. Of these six samples, only three had elevated concentrations of REEs. Four samples; WV-EMRI-182 (231.04ppm), WV-EMRI-183 (361.30ppm), WV-EMRI-184 (273.16ppm), and WV-EMRI-185 (245.18ppm) were taken from a light gray claystone with red and gray mottles. Two samples, WV-EMRI-186 (313.19ppm) and WV-EMRI-186 (358.92ppm) were from a second

claystone that was light gray, mottled, and darkens towards base. Both of the samples from second claystone unit were enriched in REEs.

Below Upper Kittanning Coal

Three samples were collected from two different rooted claystone units below the base of the Upper Kittanning Coal, but only one of these samples was enriched in REEs. WV-EMRI-190 (299.34ppm) was taken from a medium gray rooted claystone with pyrite and a thin calcite band. Two samples; WV-EMRI-191 (264.41ppm) and WV-EMRI-192 (345.65ppm) were from a medium gray-green claystone with abundant root traces below the claystone unit mentioned above. Only WV-EMRI-192 taken from the bottom section of the second claystone unit was enriched in REEs.

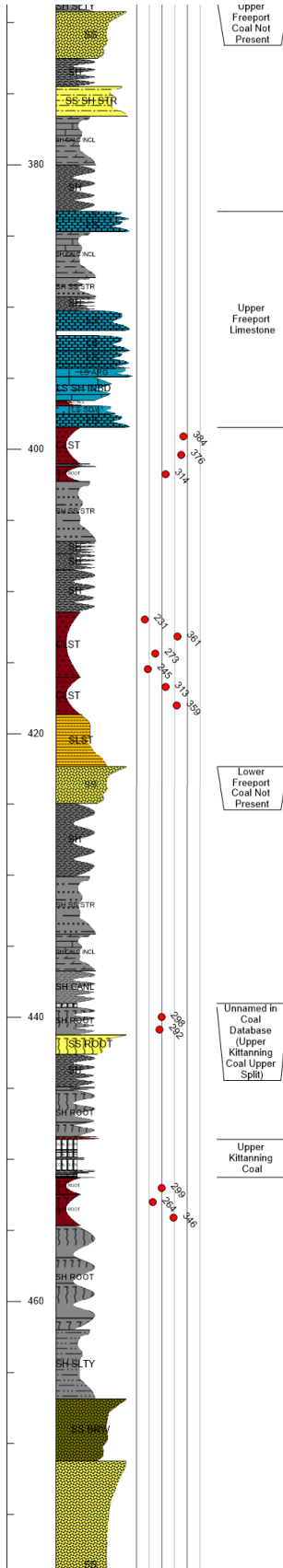
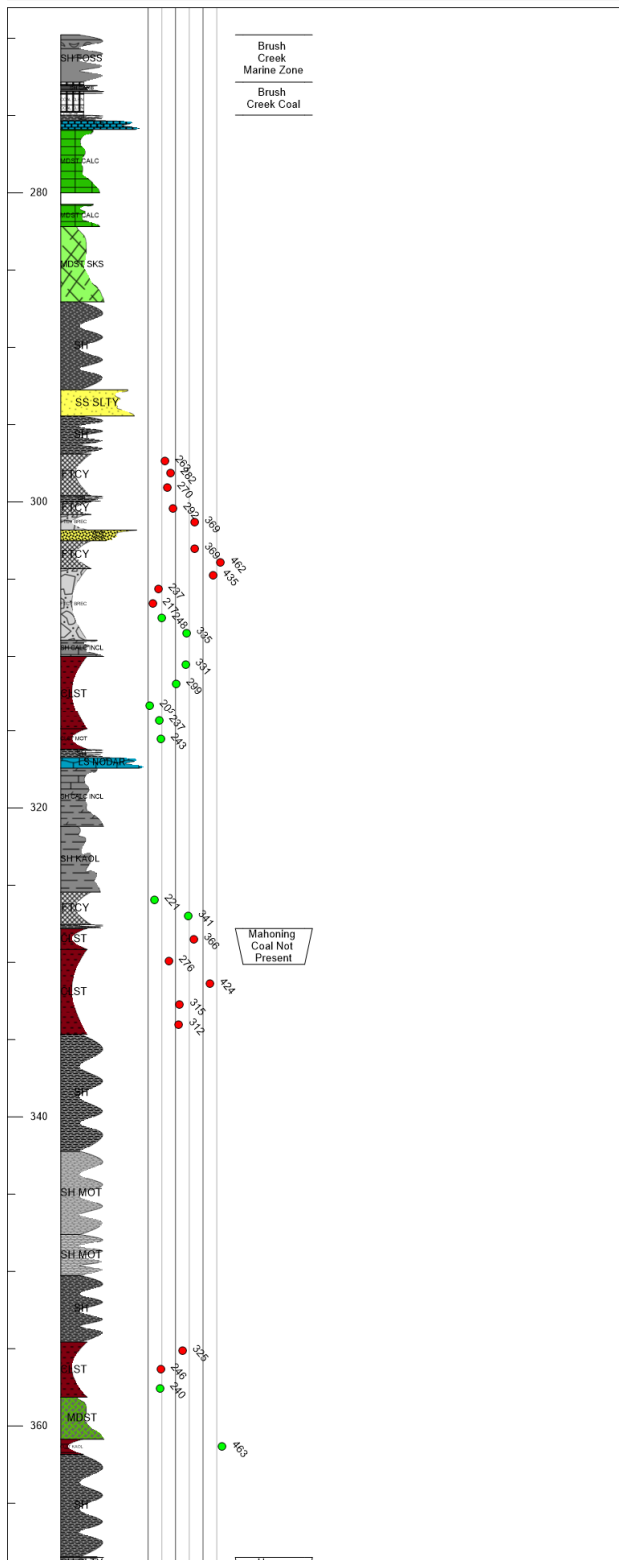
Below Middle Kittanning Rider Coal

One sample was taken from a rooted claystone directly beneath the Middle Kittanning Rider Coal that was enriched in REEs. The geologist's log correlated this coal as the Middle Kittanning Coal, but has been re-correlated in the coal database as the Middle Kittanning Rider. WV-EMRI-193 (458.59ppm) was from a light gray rooted claystone that had dark gray and black streaks in the top of the unit.

308-007
Preston Co.

REE Total (La-Lu) + Y

200 300 400



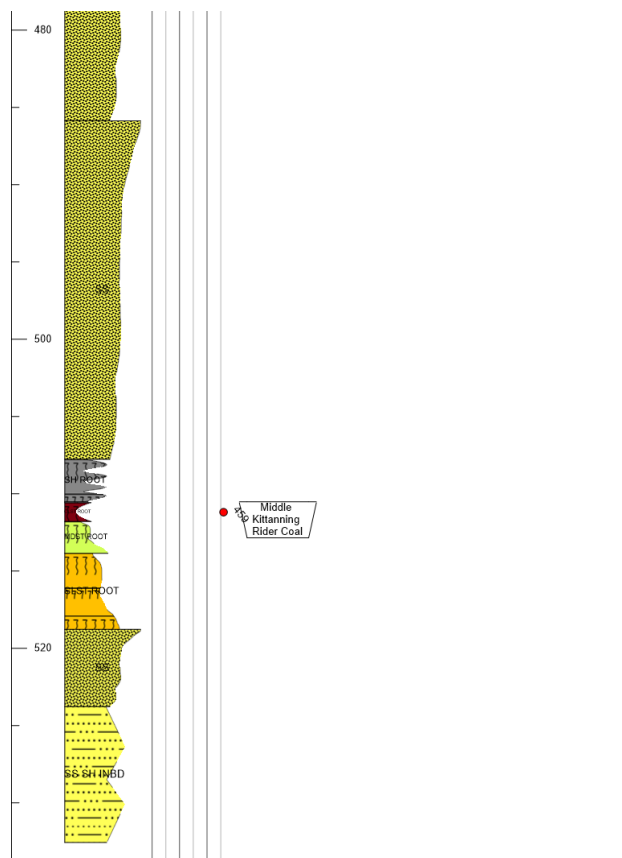


Figure 9. Graphic log for the Preston County core 308-007.

Monongalia (306-061)

The Monongalia County core (308-007) (Figure 10) had eight intervals in which the samples were enriched in REEs. A sample collected from the interval below the Lower Kittanning Coal had the highest concentrations of REEs for this core. The eight intervals that had enriched samples include; below the Upper Kittanning Coal, below Middle Kittanning Coal, below the Lower Kittanning Upper Split, below the Lower Kittanning Coal, above Clarion Coal not present, below the Upper Mercer Coal, below an unnamed coal ten feet beneath Upper Mercer Coal, and below the Lower Mercer Coal.

Below Upper Kittanning Coal

Directly beneath the base of the Upper Kittanning Coal one enriched sample; WV-EMRI-001 (323.15ppm) was collected from a rooted shale with faint siderite nodules.

Below the Middle Kittanning Coal

Three samples; WV-EMRI-004 (448.61), WV-EMRI-005 (440.87ppm), and WV-EMRI-006 (440.87ppm) were taken from a light gray rooted claystone directly beneath the Middle Kittanning Coal. This claystone had alternating intervals of hard and soft clayey intervals. WV-EMRI-006 was from the interval (1190.00'-1193.30') that had a thin white mineralized streak that did not react to HCL, which was possibly gypsum? The coal seam was correlated as Middle Kittanning Main Split on the geologist's log, but is not correlated in the coal database.

Below Lower Kittanning Upper Split

Two samples were taken from directly below the Lower Kittanning Upper Split, one from a black shale and the other from a claystone. WV-EMRI-007 (518.08ppm) was from a black shale unit that had coalified plant stems and was enriched in REEs. The second sample WV-EMRI-008 (259.95ppm) was collected from a light gray rooted claystone and was not enriched.

Below Lower Kittanning Coal

Seven samples were collected from five separate rock units beneath the Lower Kittanning Coal and four of the samples were enriched in REEs. The coal was tagged as the Lower Kittanning Main Split on the geologist's log, but has been correlated only as Lower Kittanning in the coal database. WV-EMRI-009 (278.53ppm) was taken from a dark gray, poorly bedded, carbonaceous shale directly beneath the Lower Kittanning Coal. Under the carbonaceous shale, WV-EMRI-010 (273.08ppm) was from a soft, medium gray claystone that had carbonaceous material throughout. Three samples; WV-EMRI-011 (308.72ppm), WV-EMRI-012 (290.75ppm), and WV-EMRI-013 (368.57ppm) were collected from a brown gray, locally soft, kaolinitic claystone that had dark gray streaks. WV-EMRI-014 (615.42ppm) was from a dark gray to black claystone with coaly plant material. This sample had the highest concentration of REEs for all of the samples taken from the Monongalia County Core (360-061). The final sample from this interval; WV-EMRI-015 (461.71ppm) was from a brown gray, kaolinitic claystone with abundant root traces and was also enriched in REEs.

Above the Clarion Coal not present

The coal not present for the Clarion Coal was placed below a black, carbonaceous shale with abundant thin coaly streaks. This coal not present represents the position of the Clarion Coal seam on the geologist's log, but is not correlated in the coal database. One sample, WV-EMRI-016 (364.54ppm) was taken 0.5' above the position of the Clarion Coal not present from a kaolinitic claystone and the black shale that is directly above the Clarion Coal horizon. The kaolinitic claystone and the black shale units were combined into one sample due to both the shale and claystone being too thin to sample alone and still maintain the minimum of 50 grams of rock for each sample. The claystone sampled in WV-EMRI-016 was kaolinitic, medium to dark brown gray, and was soft, broken, and crumbly. The shale unit sampled in WV-EMRI-016 was black, carbonaceous and had thin coaly streaks.

Below the Upper Mercer Coal

Four samples were collected from two separate rooted claystone units in the interval of less than five feet below the Upper Mercer Coal, but only one of the samples was enriched in REEs. The geologist's log correlated this coal as the Upper Mercer Coal, but is unnamed in the coal database. WV-EMRI-017 (294.97ppm) was taken from a dark gray rooted claystone with coalified plant material and slickensides directly below the Upper Mercer Coal seam. Four samples; WV-EMRI-018 (237.08ppm), WV-EMRI-019 (184.02ppm), WV-EMRI-020 (322.59ppm), and WV-EMRI-021 (297.14ppm) were collected from a medium gray claystone with plant roots. The claystone becomes more competent towards the base and the brown grains in a sandy matrix increases in abundance towards base.

Below an unnamed coal ten feet below the Upper Mercer Coal

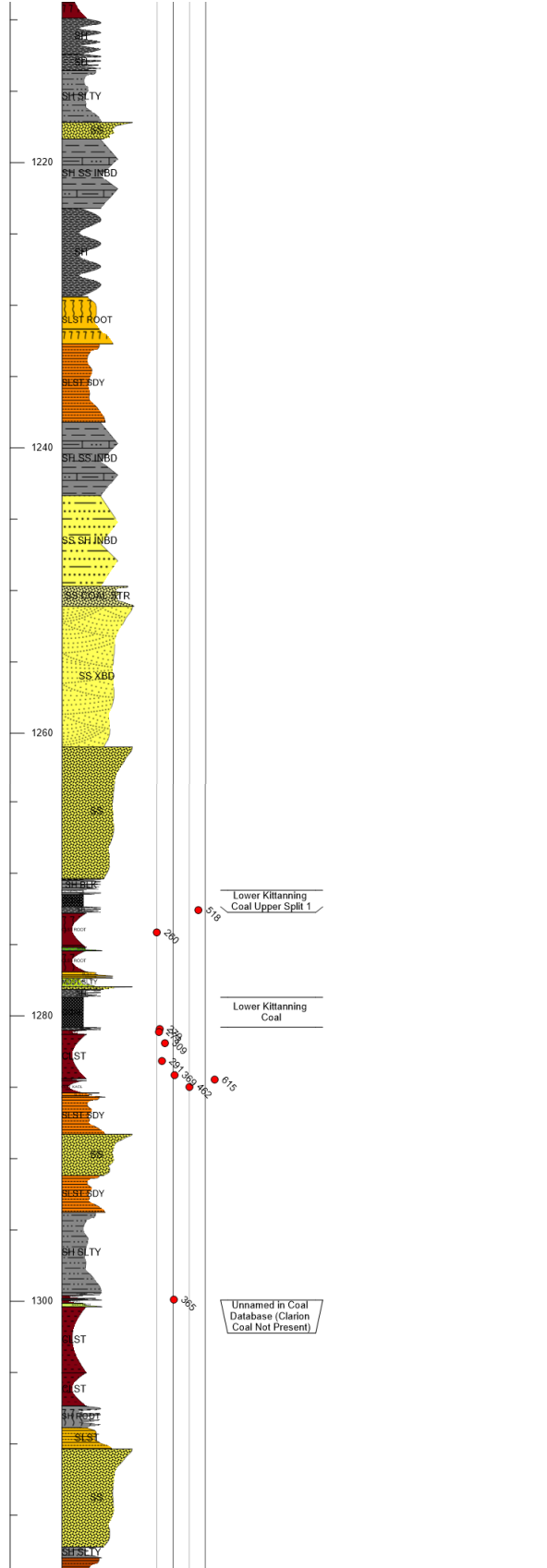
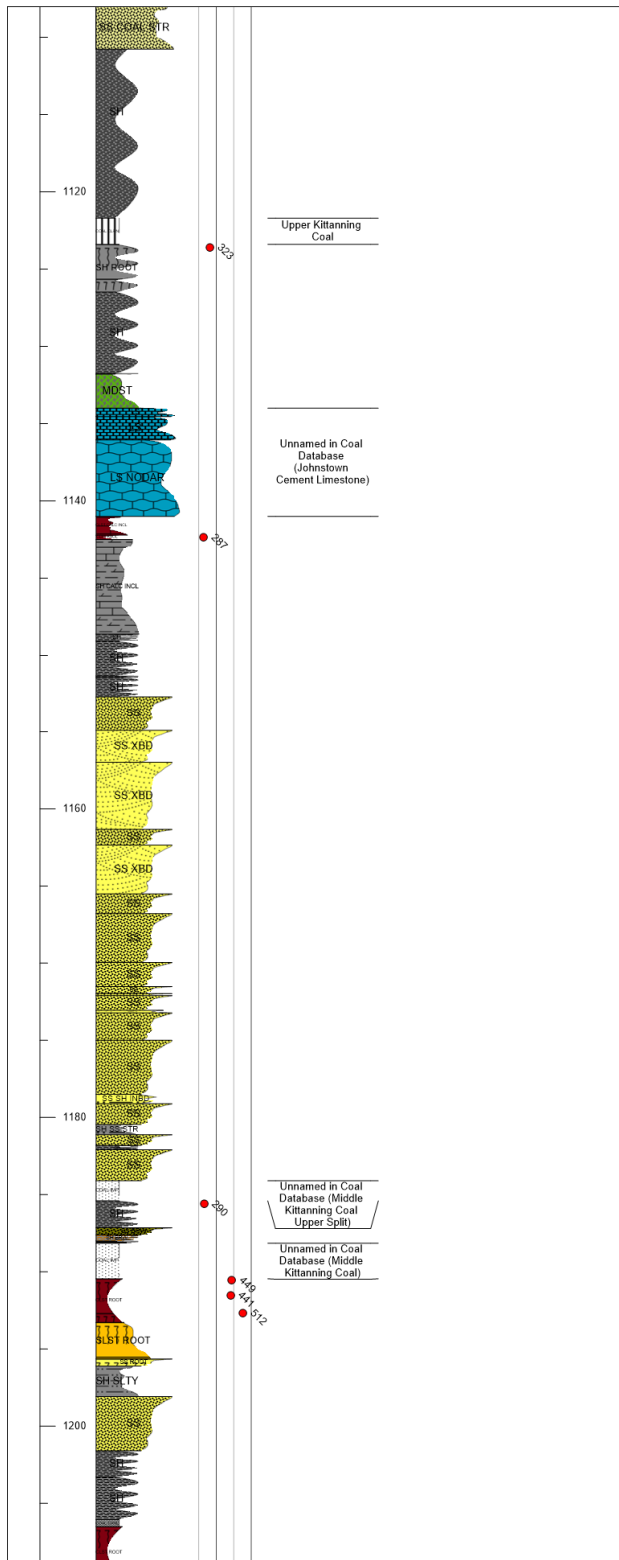
Five samples were collected from three different rooted claystone units from below an unnamed coal at an interval of ten to 15 feet below the Upper Mercer Coal of the geologist's log. This coal is unnamed both on the geologist's log and in the coal database, but may possibly correlate to the Upper Mercer lower split coal? Four of the five samples taken from this interval had enriched REE concentrations. WV-EMRI-022 (460.71ppm) was from a dark gray rooted claystone and had the highest concentration of REEs for any of the samples taken from this interval. Two samples; WV-EMRI-023 (391.54ppm) and WV-EMRI-024 (405.08ppm) were collected from a medium gray rooted claystone with abundant plant stems and roots and had slickensides. WV-EMRI-025 (383.07ppm) and WV-EMRI-026 (297.38ppm) were taken from a third claystone unit in this interval that was medium gray and rooted. WV-EMRI-026 was from an interval of the claystone unit that had dark grey shale streaks and was micaceous at the base.

Below the Lower Mercer Coal

Five samples were collected from three different claystone units from the interval below the Lower Mercer Coal, but only two of the samples were enriched in REES. The geologist's log correlated this coal as the Lower Mercer Coal, but it remains unnamed in the coal database. WV-EMRI-027 (351.88ppm) was taken from a dark grey claystone with well-developed slickensides and the sample was enriched in REEs. Two samples; WV-EMRI-028 (286.90ppm) and WV-EMRI-029 (265.51ppm) were from a medium gray claystone that had soft kaolinitic zones throughout. WV-EMRI-030 (262.64ppm) and WV-EMRI-031 (312.57ppm) were taken from a dark gray rooted claystone with slickensides, but only the lower most sample of WV-EMRI-031 was enriched in REEs.

306-061
Monongalia Co.

REE Total (La-Lu) + Y
306 309



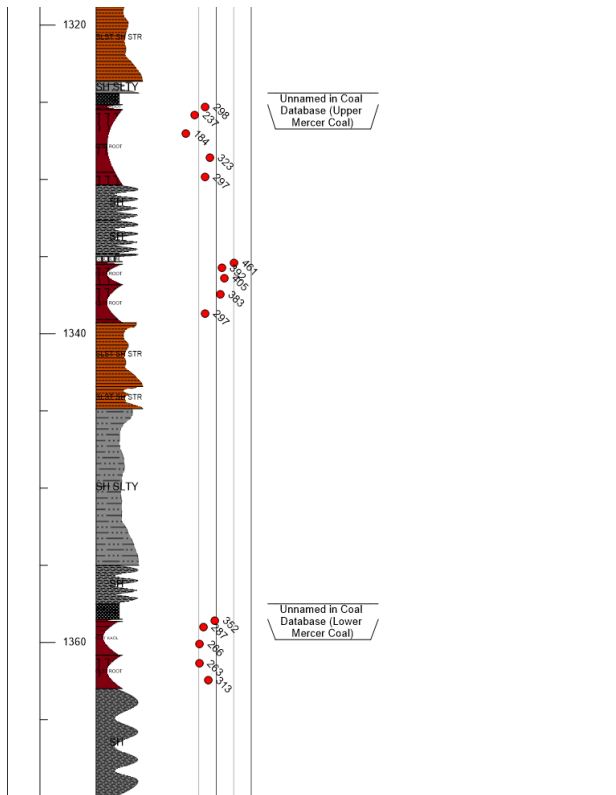


Figure 10. Graphic log for the Monongalia County core 306-061.

Outcrop Samples

Ten outcrop grab samples were collected for the first round of sampling and only nine of those samples were submitted to the USGS for analysis. Eight of these samples were from Preston County and two were from Hancock County. Of the nine samples submitted for analysis only four had enriched concentration of REE.

Hancock County

Two outcrop grab samples were taken from two different locations in Hancock County below the Lower Kittanning Coal. WVMRI9a (409.70ppm) was sampled from a dark grey soft claystone unit from the same location as Tallon & Hunter (1959) Hancock samples eight & nine. WVMRI10a (439.83ppm) was sampled from a soft claystone with coal residue in a mined cold audit. This sample was collected from the same location as Tallon & Hunter (1959) Hancock samples six & seven. Both of the samples taken from claystone units below the Lower Kittanning in Hancock County were enriched in REEs.

Preston County

Three samples were collected from a single location in Preston County from a nine foot thick flintclay unit above the Lower Freeport Coal. The Preston county Report has correlated the flintclay at this location to be the Mount Savage Fireclay (Hennen & Reger 1914). MRIWV4a (332.94ppm) was from the bottom part of the flintclay which had some micas and sandstone lenses. Two more samples; MRIWV4b (314.07ppm) was collected 4.5 feet from the bottom and MRIWV4c (253.94ppm) nine feet from the bottom of the flintclay unit. At this sample location the concentration of REEs increases in abundance towards the base of the flintclay.

References

Hennen, R. V., and Reger, D. B., 1914. Preston County: West Virginia Geological and Economic Survey County Report.

Tallon, W. A., and Hunter, R. G., 1959. High-aluminum clays of West Virginia: West Virginia Geological and Economic Survey Report of Investigations 17, 25 & 26 p.

Appendix II Orange

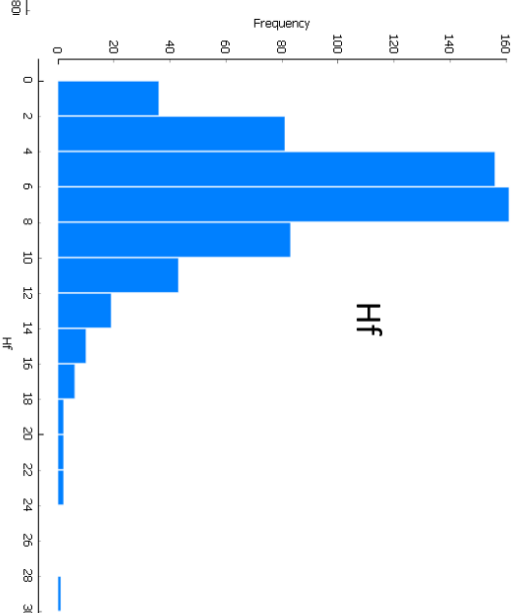
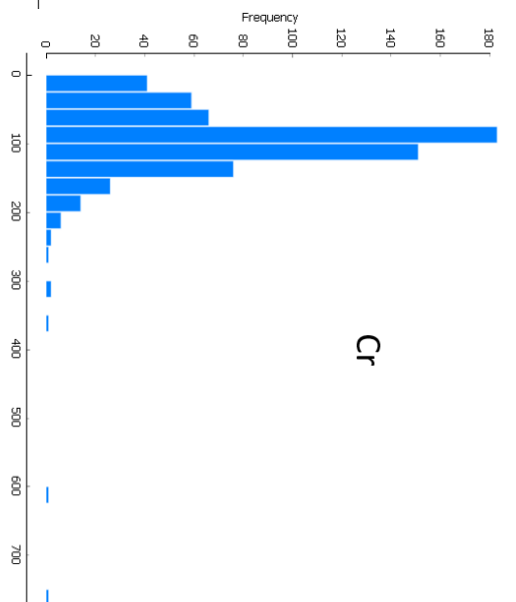
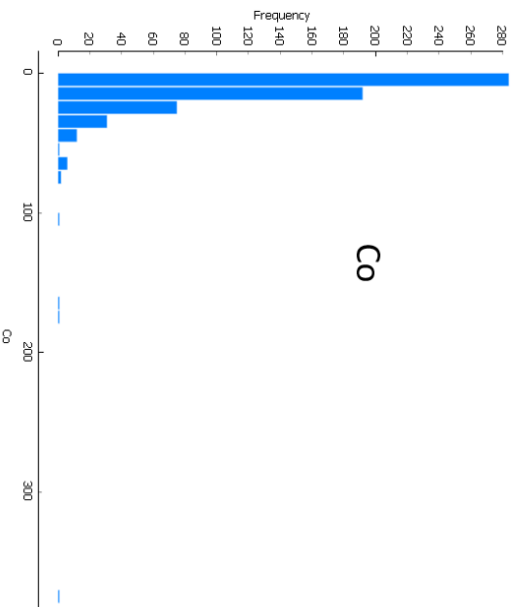
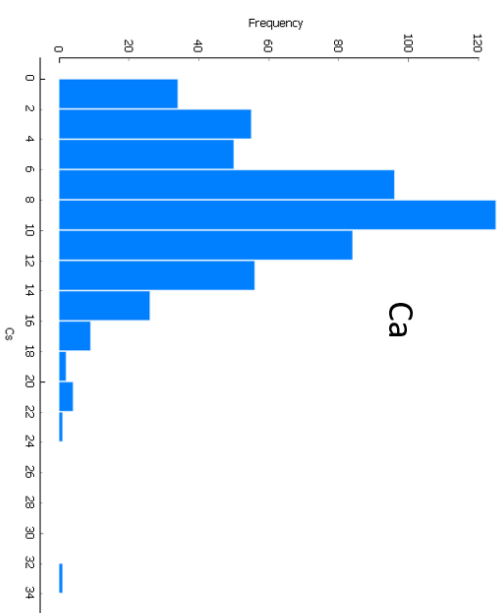
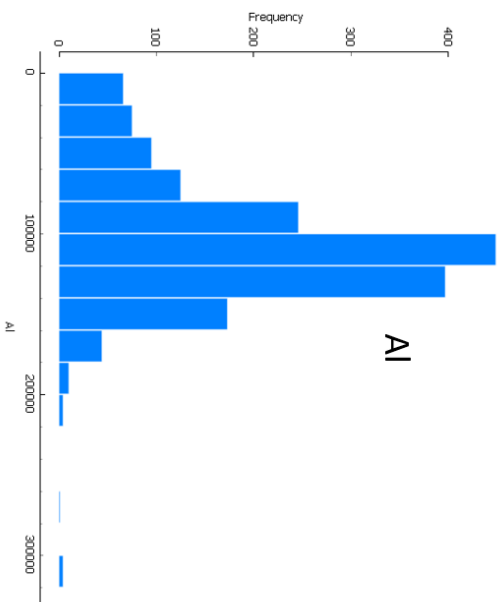
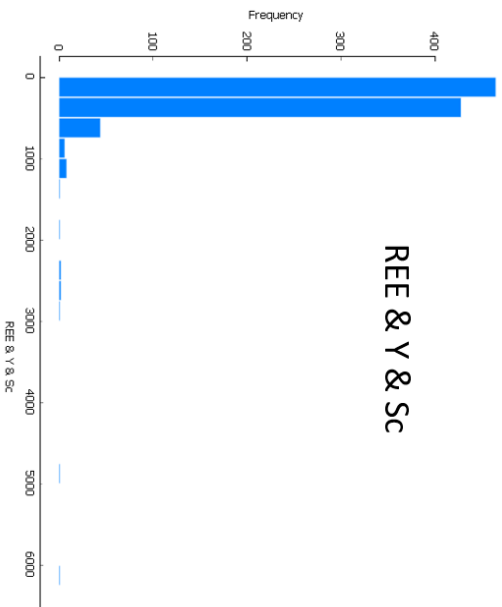
Data Analytics – Orange

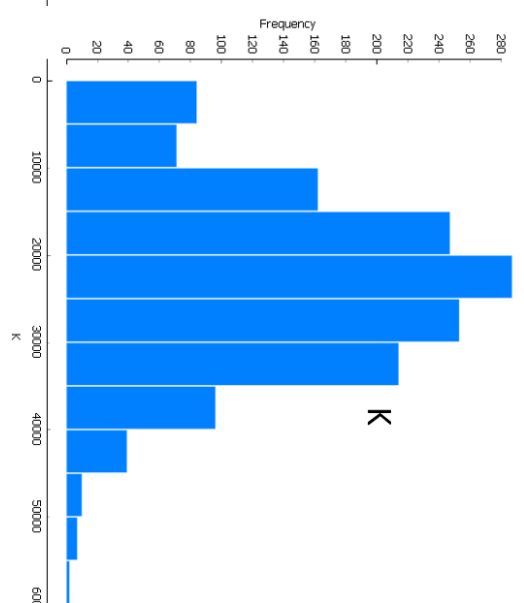
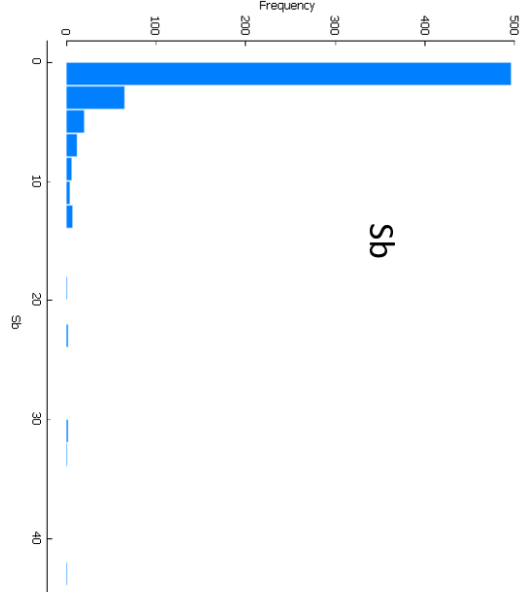
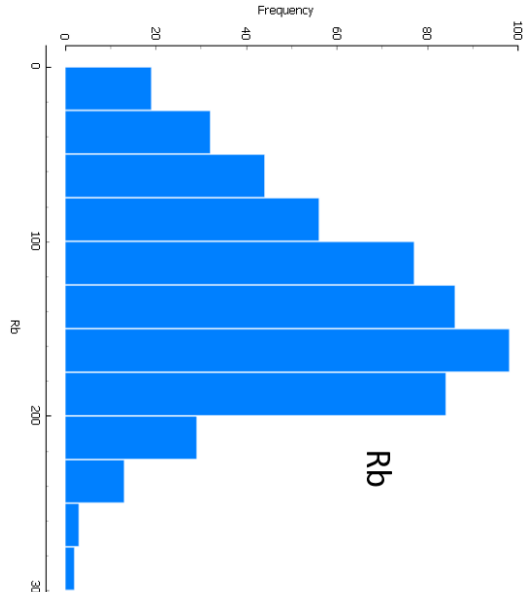
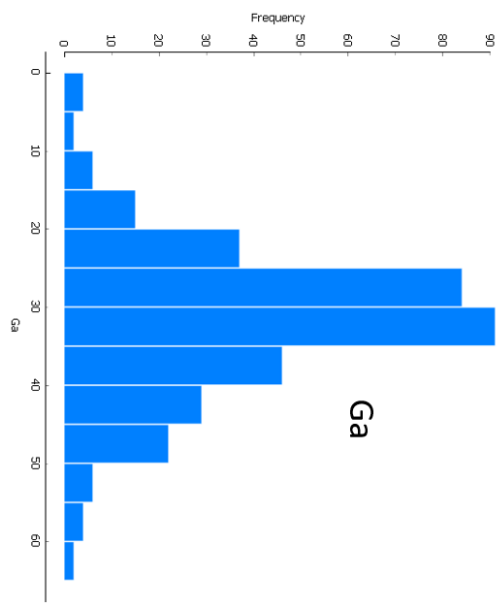
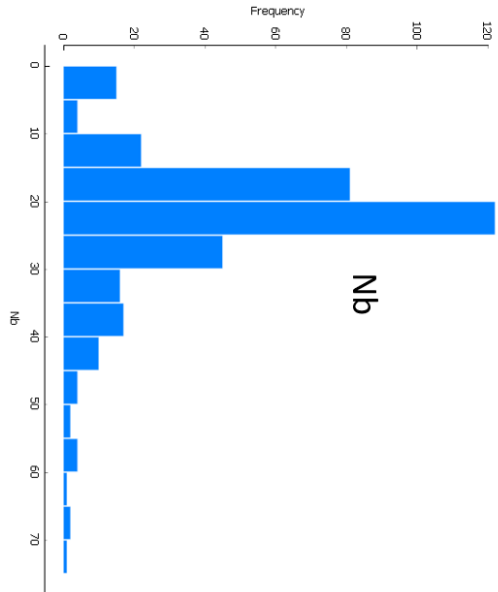
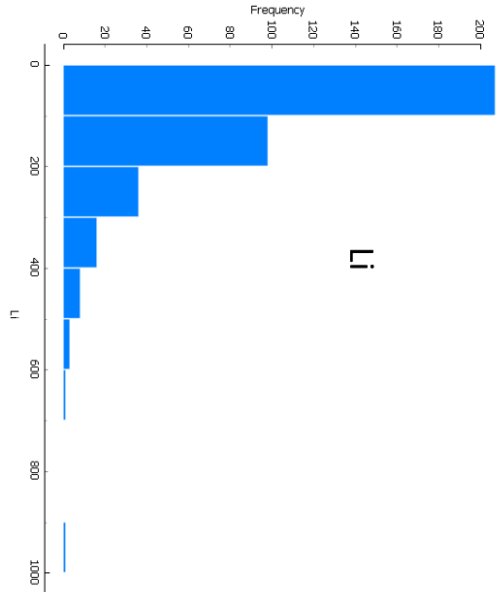
With the size and variable nature of the geochemical data gathered for this project (new and legacy data), the use of data analytics was advantageous to identify trends and connections between multiple variables. This study used the ability of the program Orange to take voluminous datasets with free parameters and multiple inputs and train the algorithms to map features and targets (data filtering, probability assessment, feature scoring) by optimizing as many of the free parameters as possible. The program uses unsupervised learning to identify patterns, clusters, and structures within the data. Geochemical data (the newest WV values, new data from PA and eastern KY, recent analyses from other studies in WV and historical datasets) were analyzed using multiple statistical and machine-learning features in Orange (Demsar et al., 2013), including Principle Component Analyses (PCA), cluster, k-means, and t-SNE determinations and plots. Orange was also used to create visualizations such as XY crossplots using data analyses workflows and data mining using a combination of components.

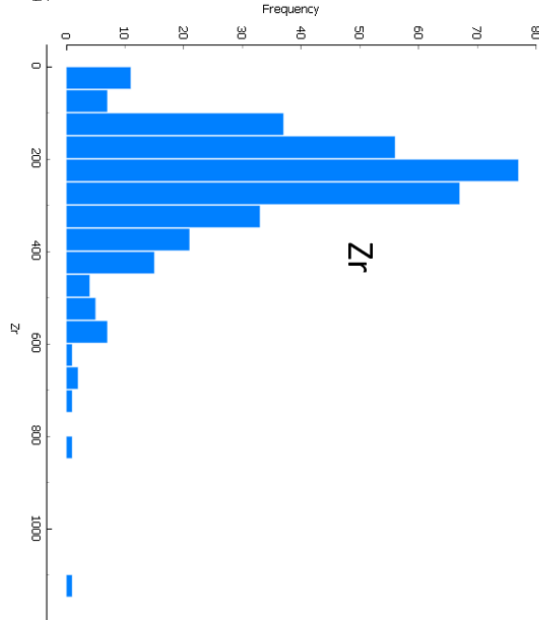
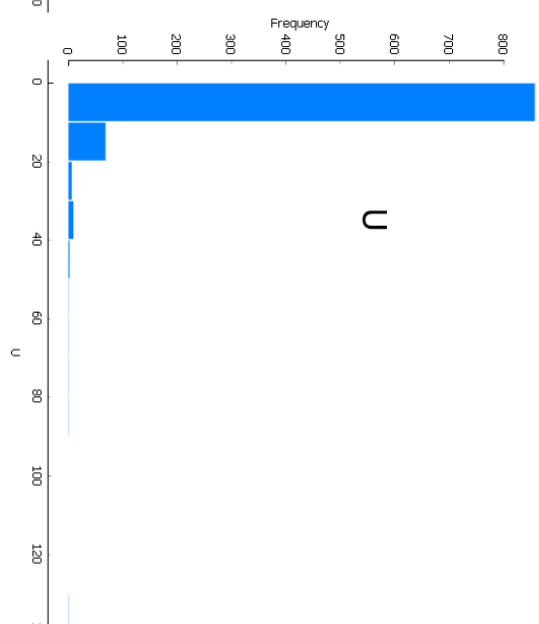
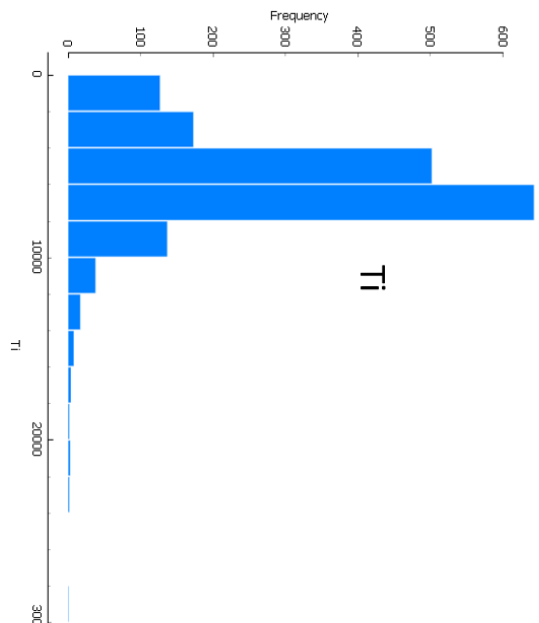
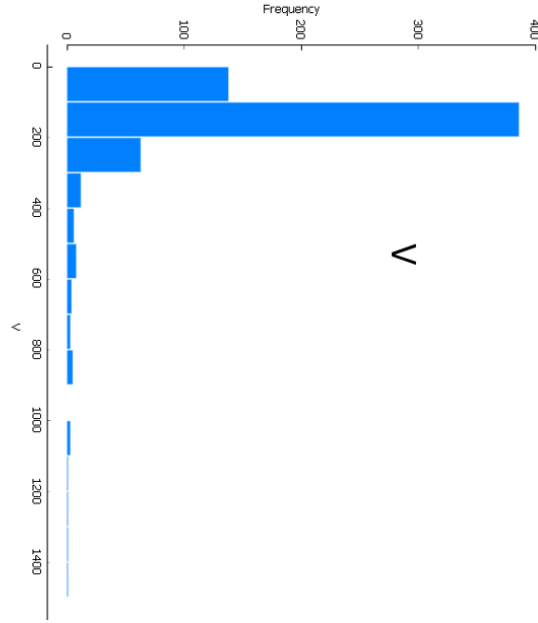
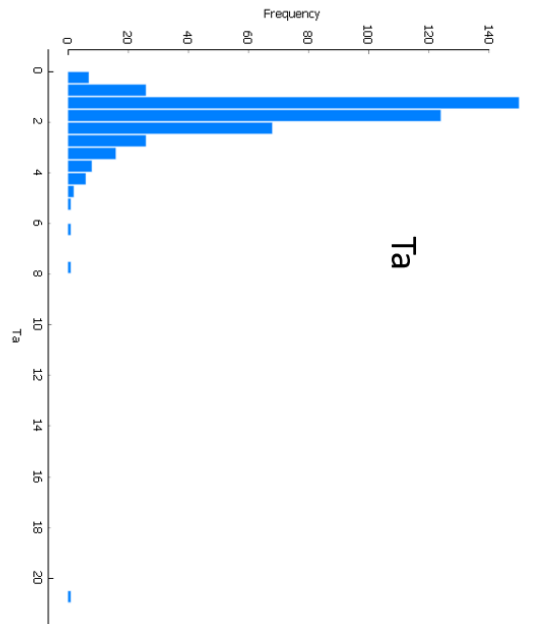
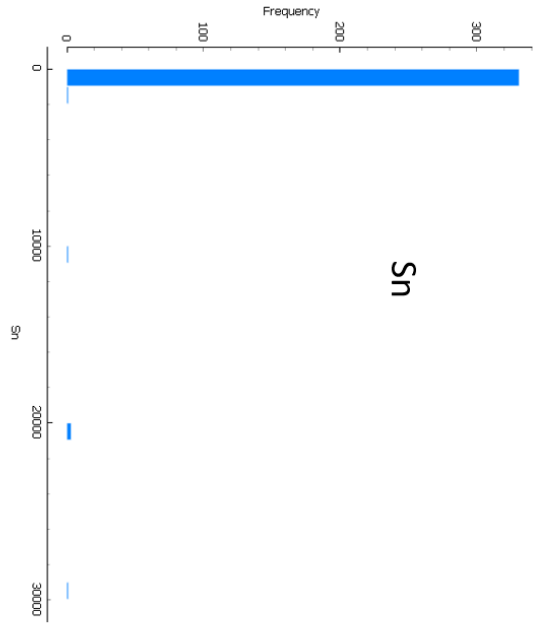
Multiple datasets were used at various stages of data analyses in Orange depending on the elements measured. These datasets include: new WV MRI stage 1 clays (n=166), new eastern KY MRI clays (n=32), new PA MRI stage 1 clays (n=64), underclays from the WVGES Coal Program database (n=6), Marcellus tonsteins from Parrish (2013, n=15), WV historical database of shales and clays (n=1057, majors only), underclays REE data from WVGES Coal Program database (n= 73, REEs only), coal-related samples from TetraTek (2018, n=255, REEs only, PA and WV), sub-coal clays from latest NETL collaboration (S. Montross, personal comm?, n=48) and miscellaneous samples from WVGES (McDowell, 2018 and 2019, RI-34 and RI-34 Supplemental, n=301). Several different formats were used here to analyze and display distributions including histograms and scatter plots. Sieve charts are simple color displays of correlation strengths between two variables with divisions based on natural breaks in data (darker colors equal stronger correlation, grey = not correlated, red = negative, blue = positive). Statistics involved included principle component analyses (PCA) which indicate elements co-variance with each other and multidimensional space (MDS) analyses.

Histograms

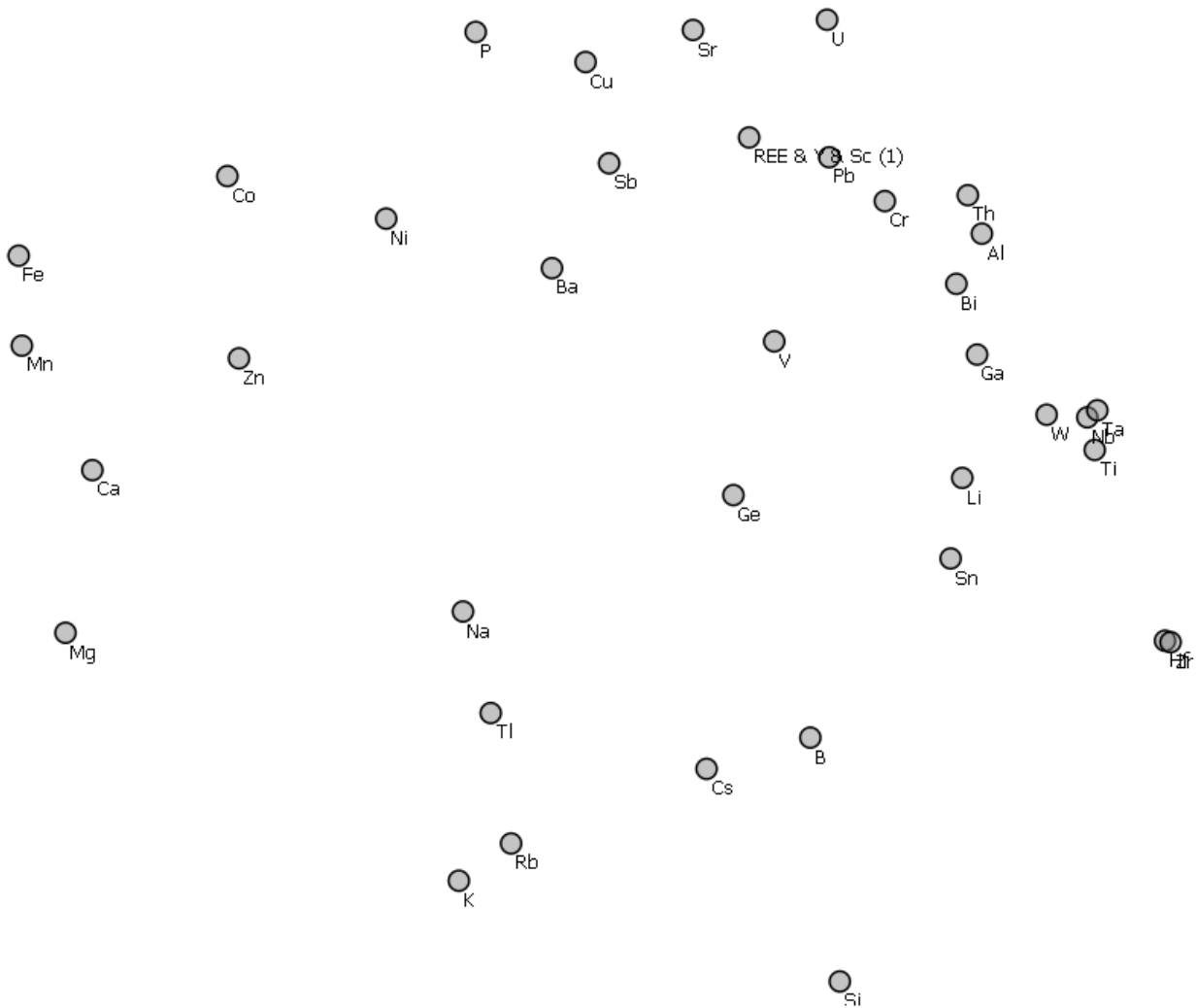
Basic histograms of REEs and other critical mineral abundances in the data used in Orange; shows the variable range of values and frequency of common values.







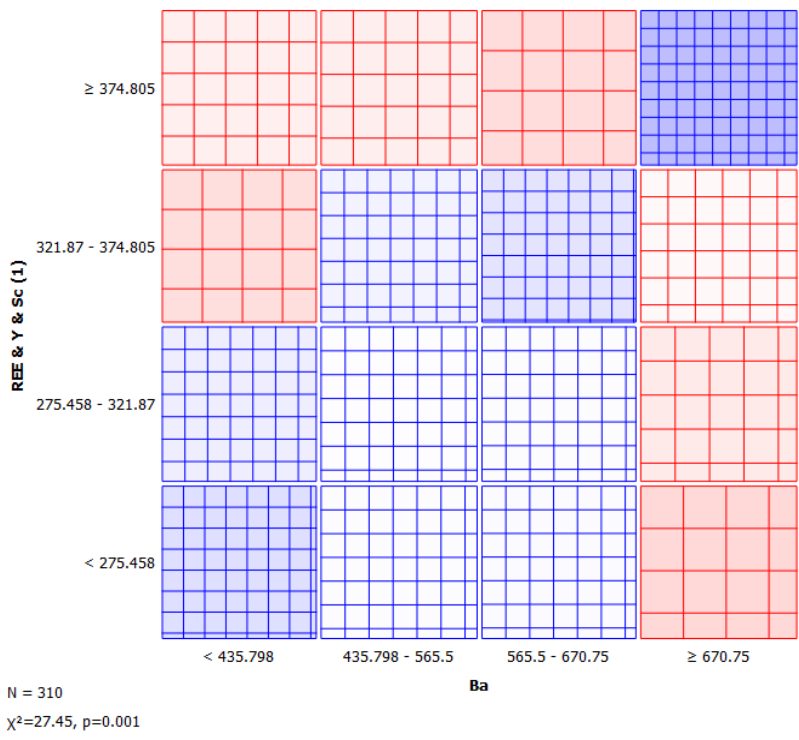
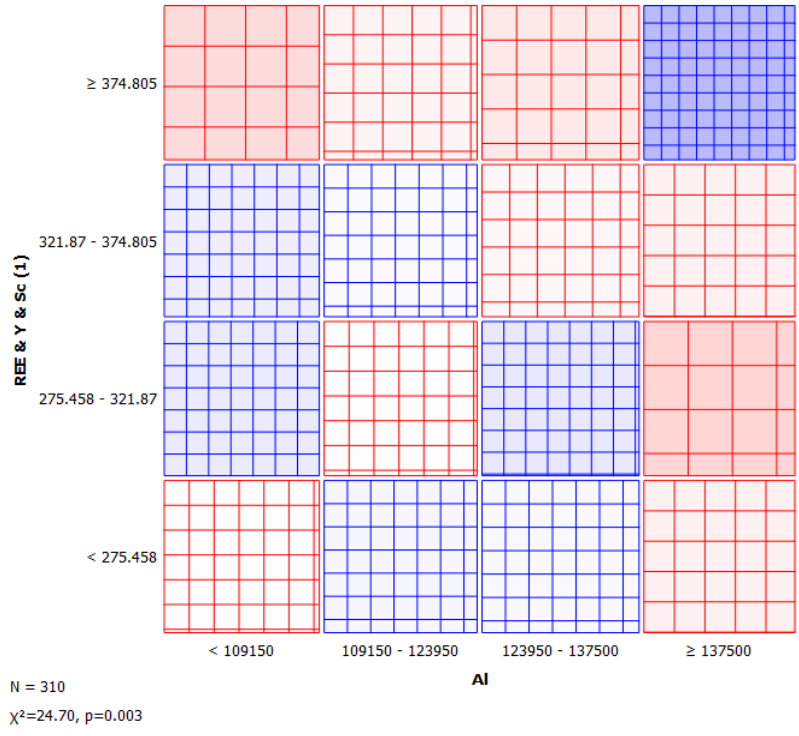
MDS

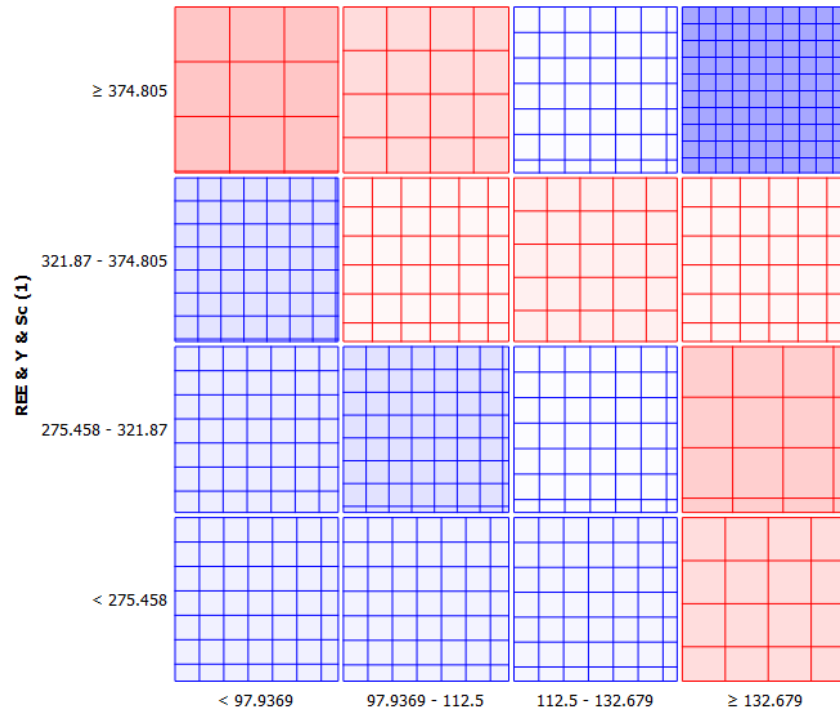


“Closeness” of elements indicates similarity of behavior. This two-dimensional data projection is a multidimensional scaling constructed by a distance matrix.

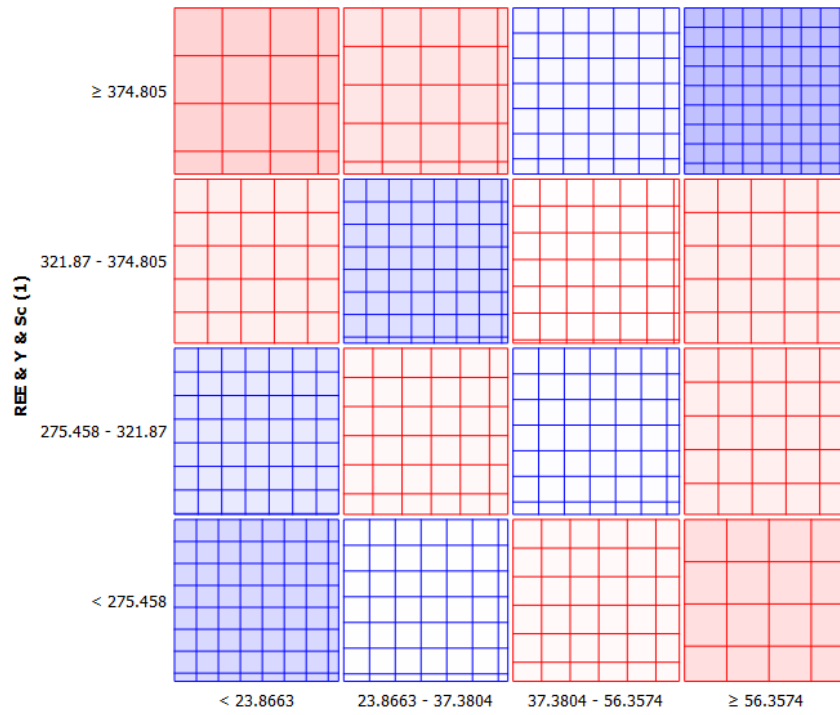
Sieve

Sieve diagrams allow the visualization of observed and expected correlations for a pair of variables; in the following cases, amount of REEs compared to amounts of a given element. The elements chosen for comparison here showed behavior that was covariant with REEs in cross-plots and MDS space. It is a test of probability of two variables being correlated where the null hypothesis is that there is zero correlation (grey). The strength of a correlation (i.e. the over or under prediction of two variables correlating in a given pair of ranges) is displayed as color intensity. Positive correlations are blue and negative correlations are red.

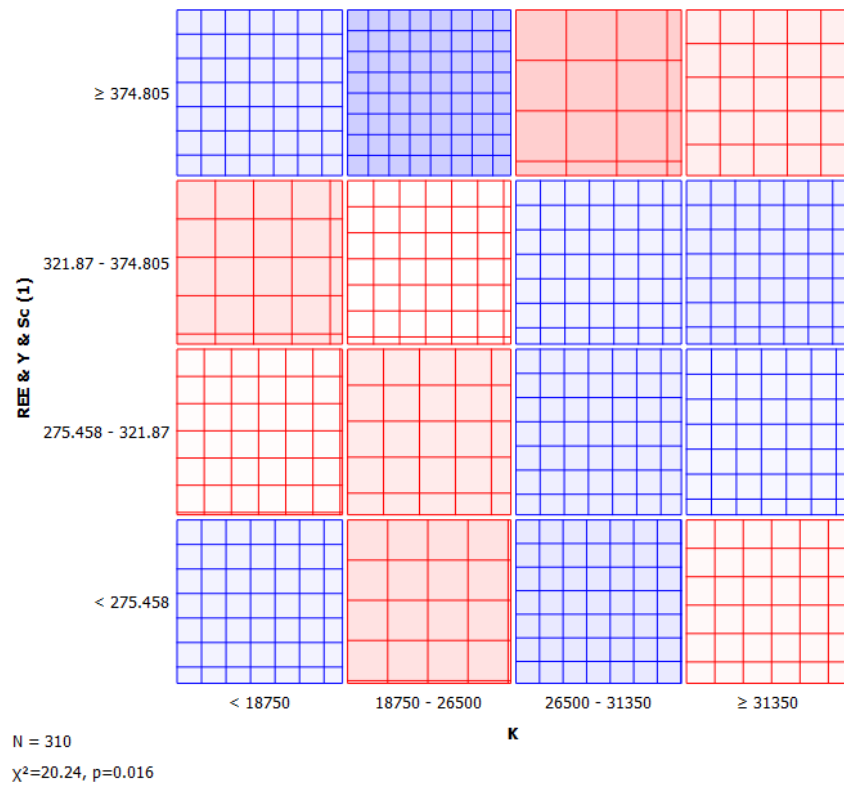
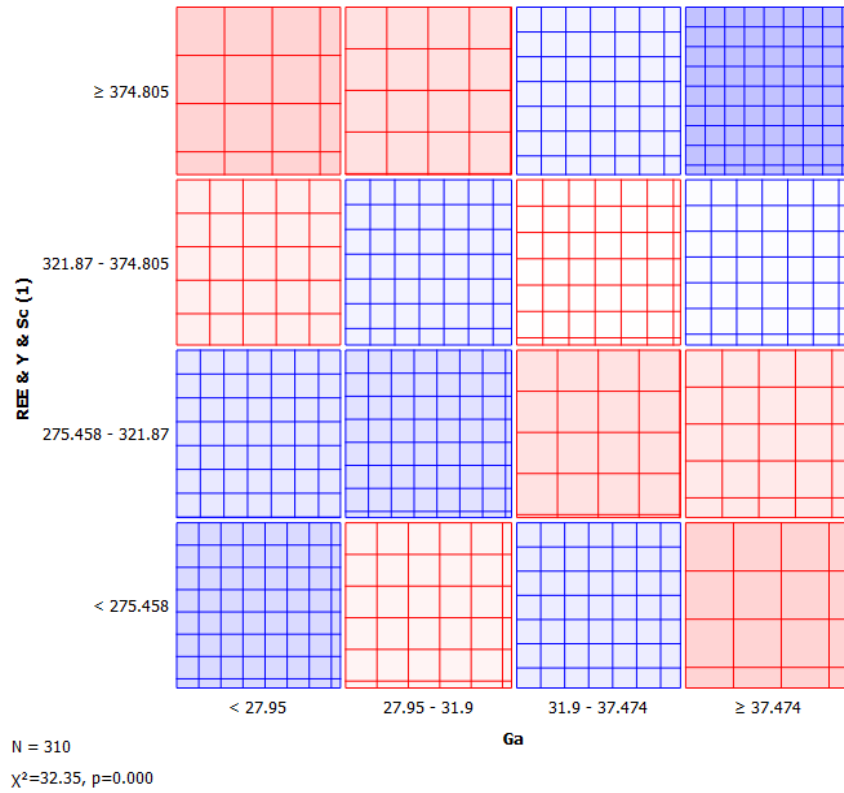


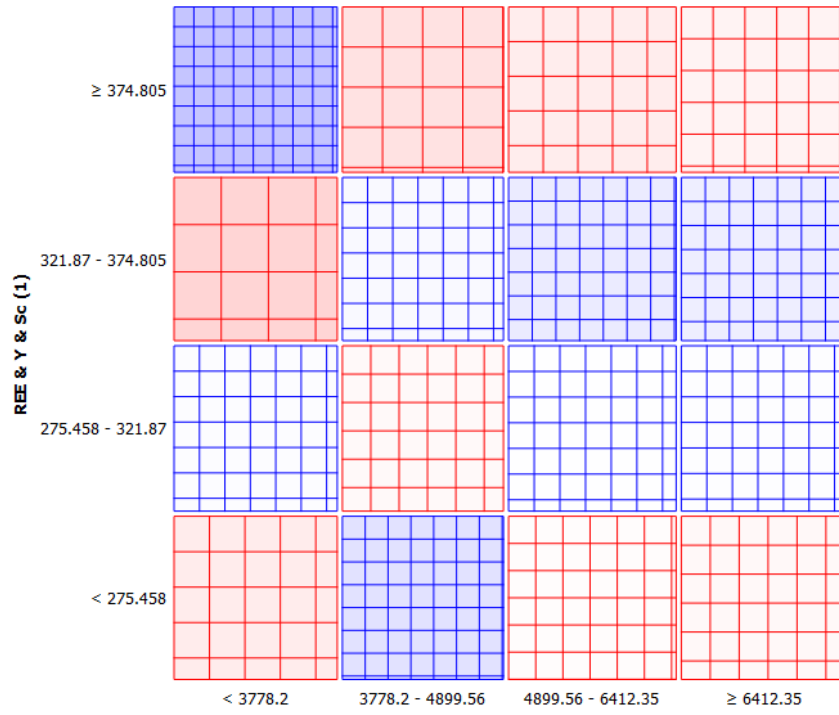


N = 310
 $\chi^2=44.82$, $p=0.000$



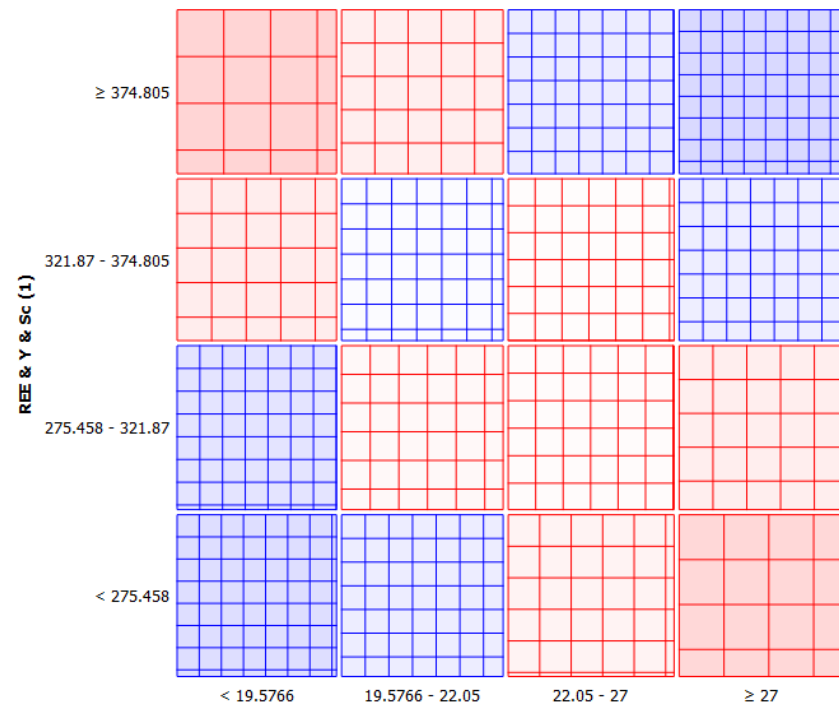
N = 309
 $\chi^2=26.98$, $p=0.001$





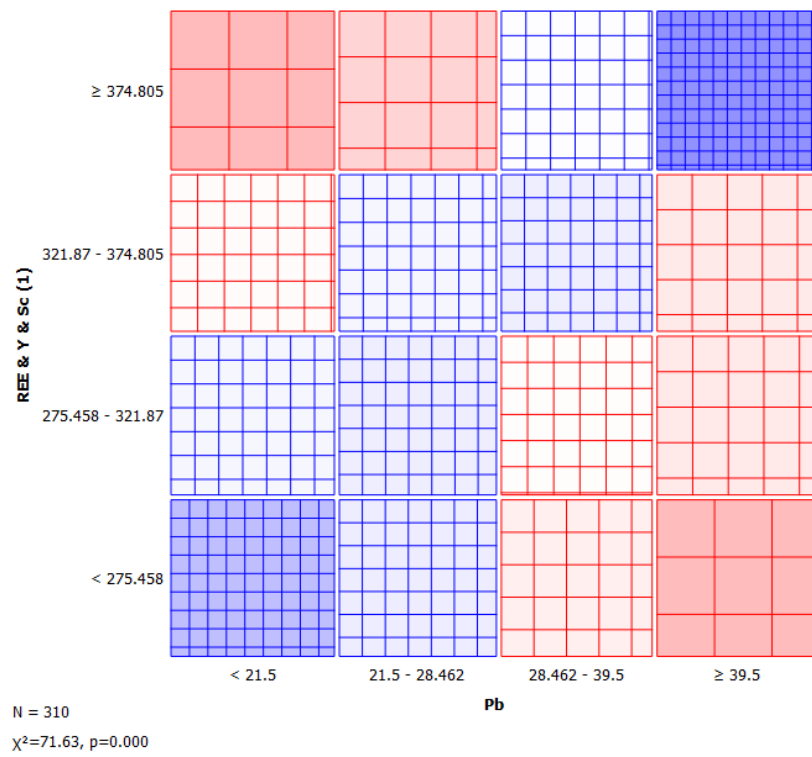
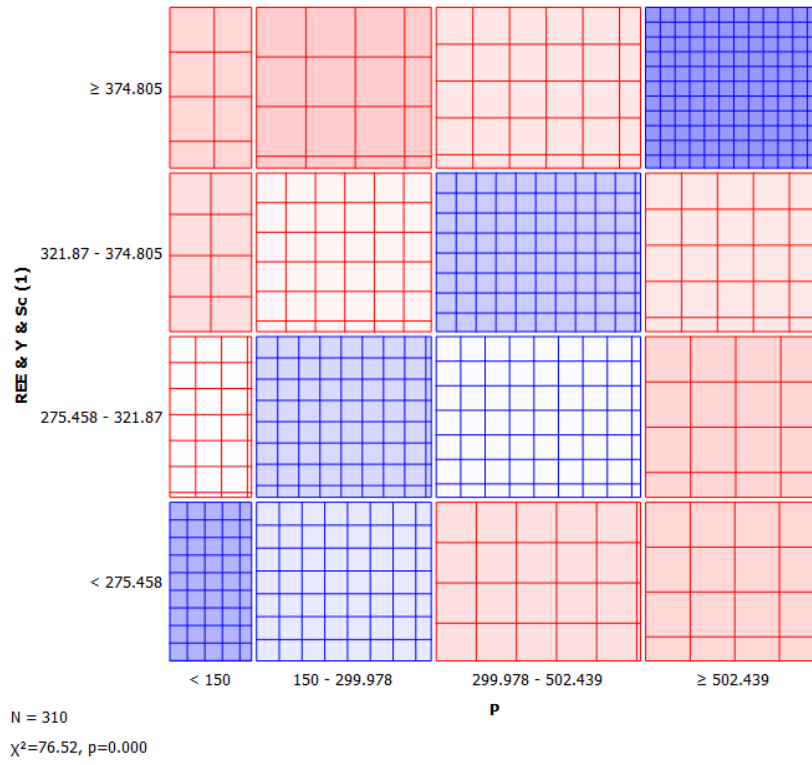
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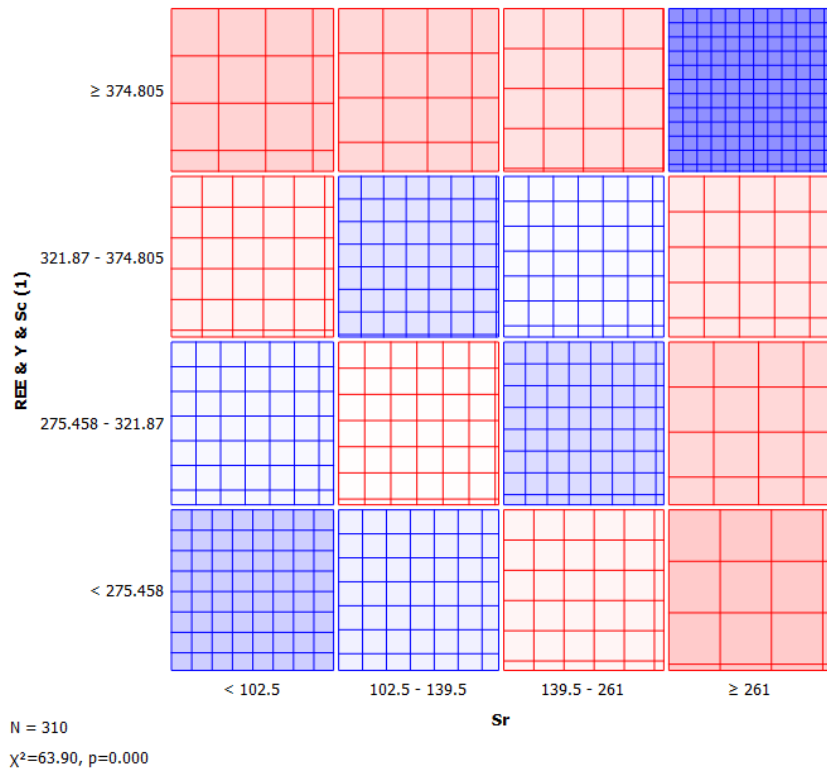
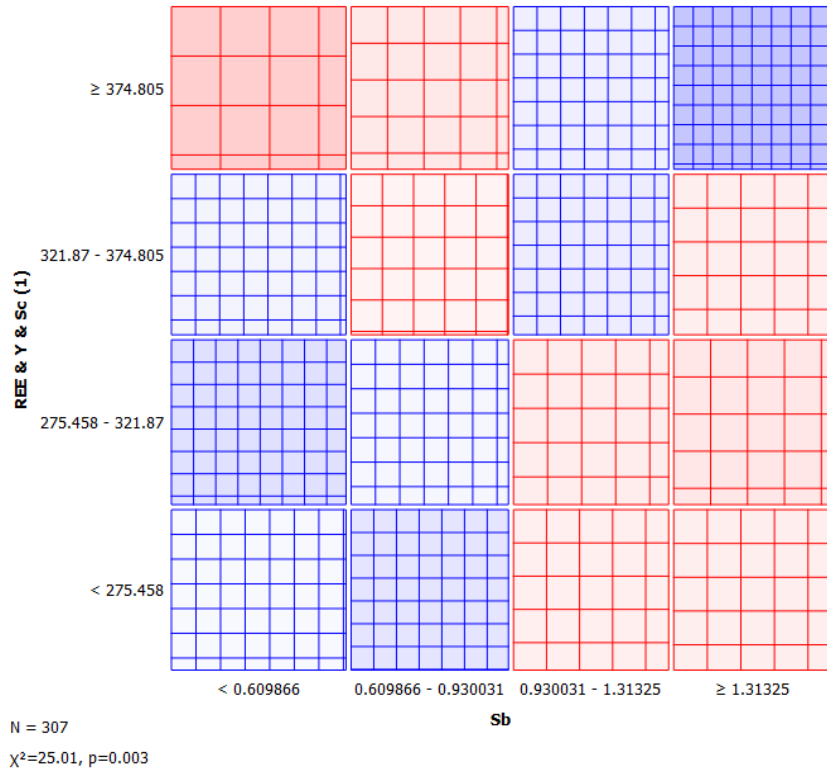
$\chi^2=20.46$, $p=0.015$

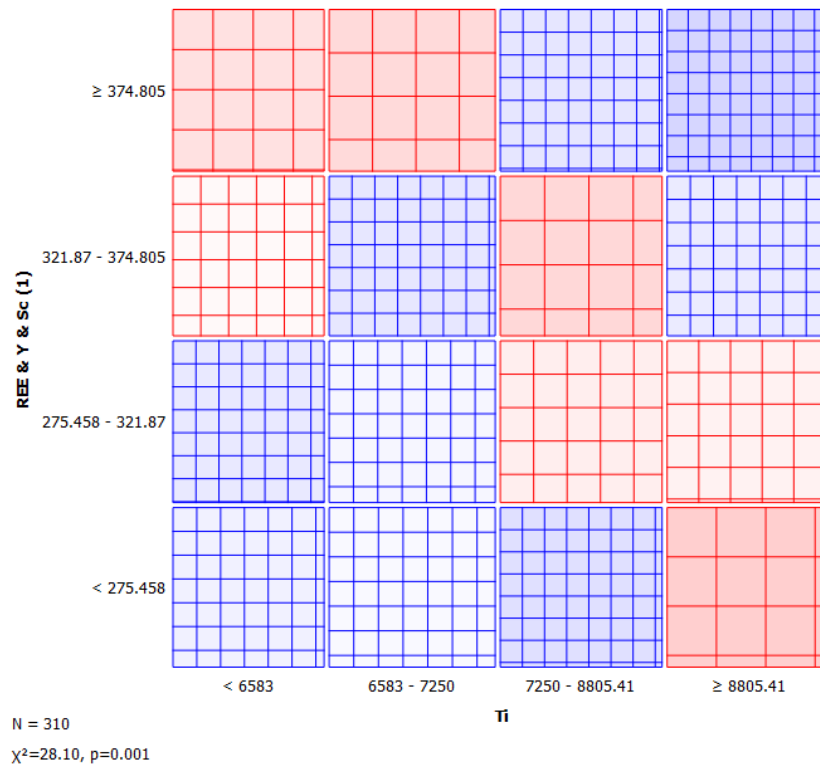
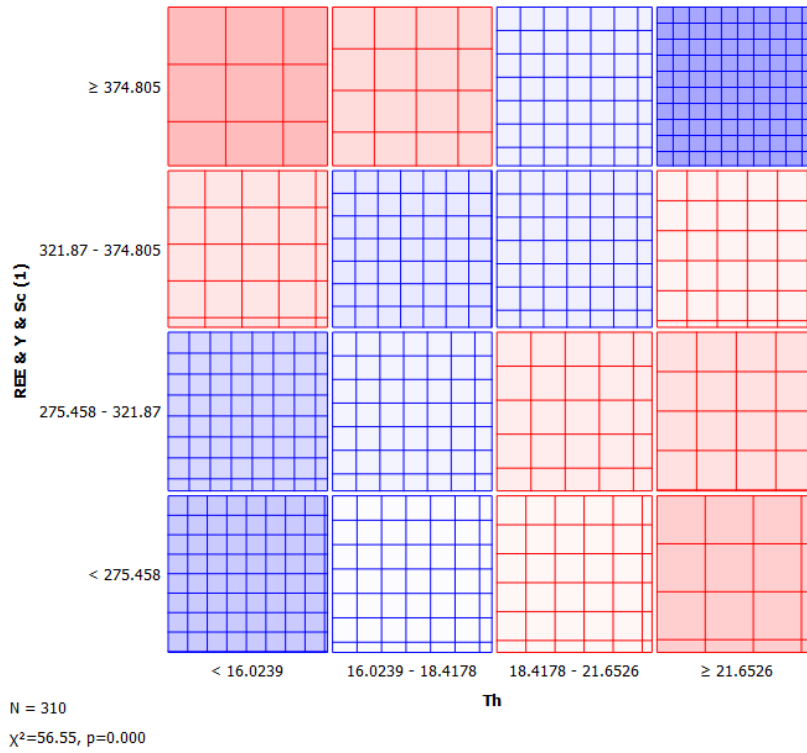


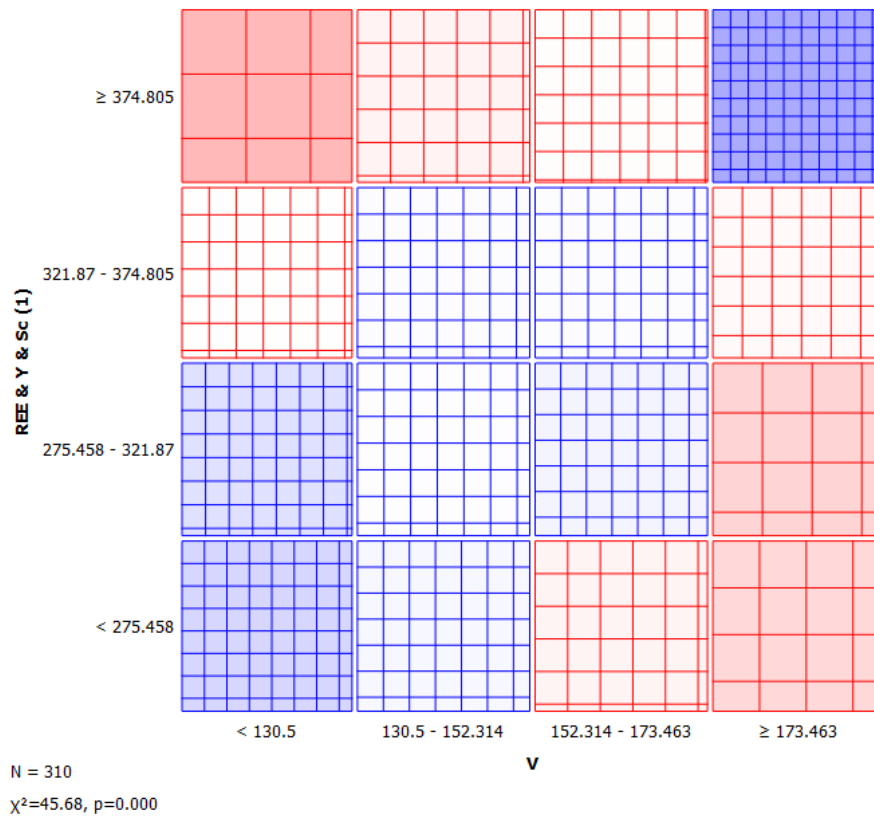
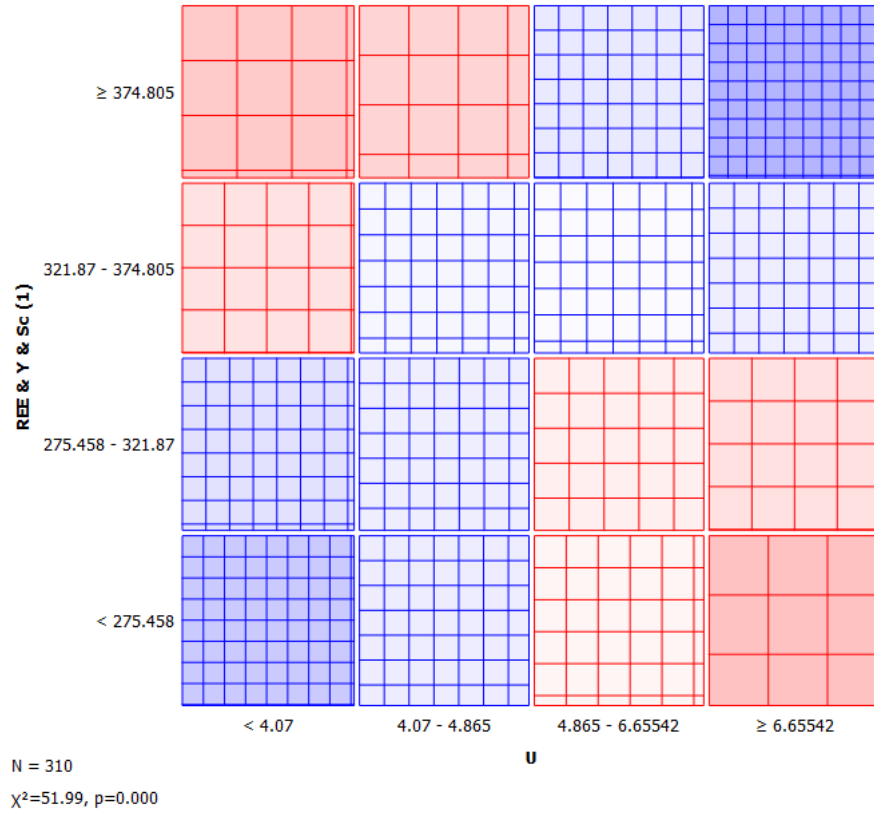
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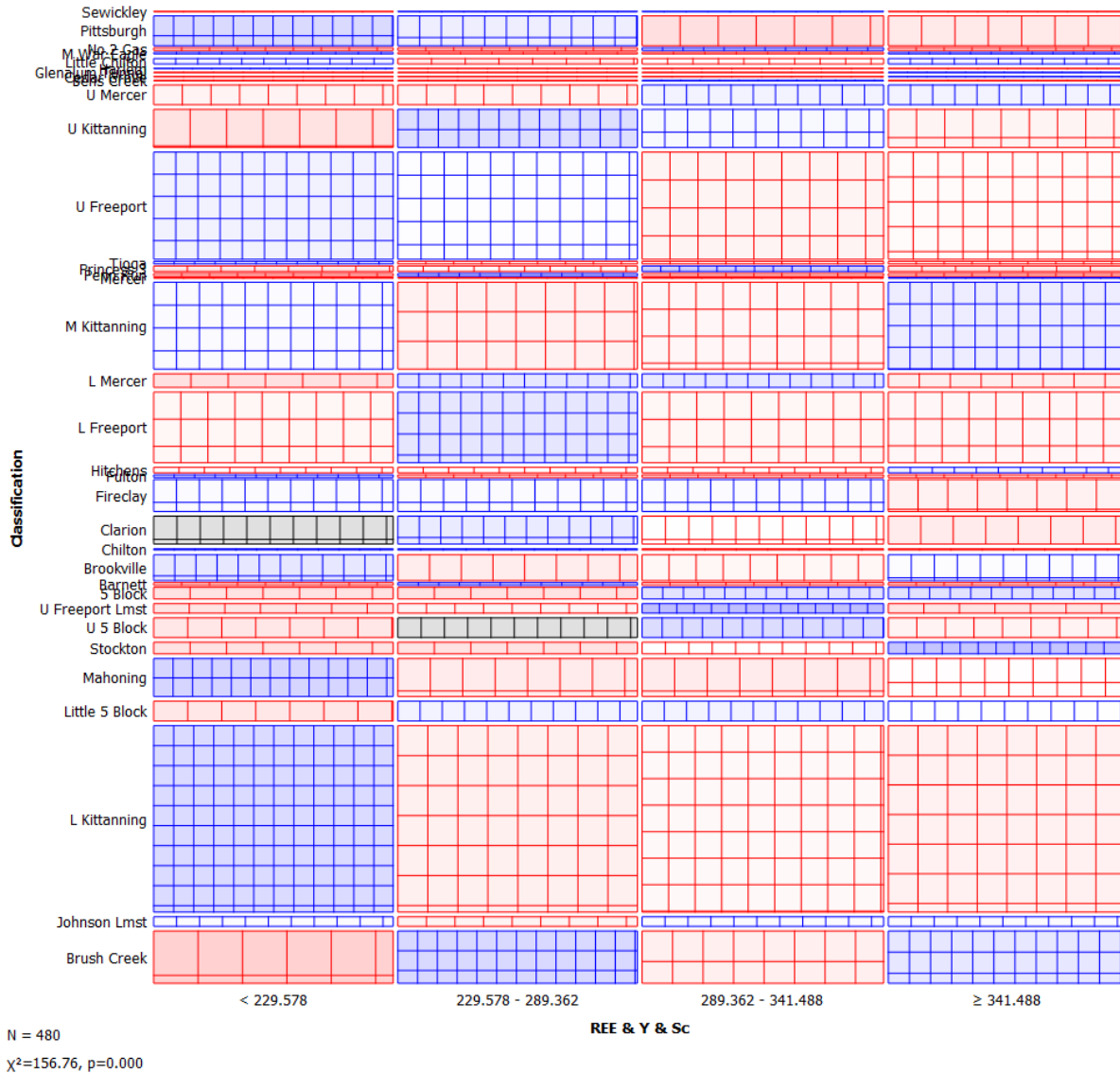
$\chi^2=20.96$, $p=0.013$





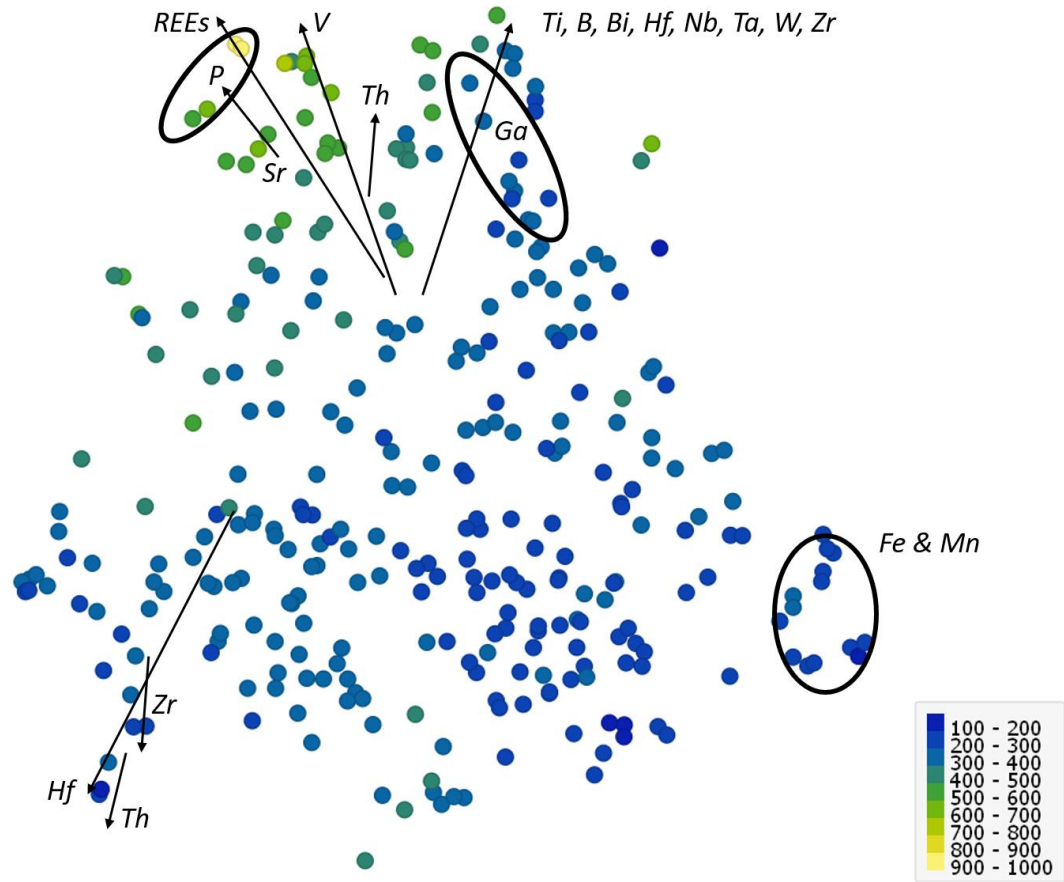






t-SNE

t-Distributed Stochastic Neighbor Embedding (t-SNE) is a non-linear dimensionality reduction algorithm used for exploring high-dimensional data. It maps multi-dimensional data to two or more dimensions in order to help understand how data is arranged in a high-dimensional space. We can use the pattern and location of data to derive simple correlations and similar behaviors.

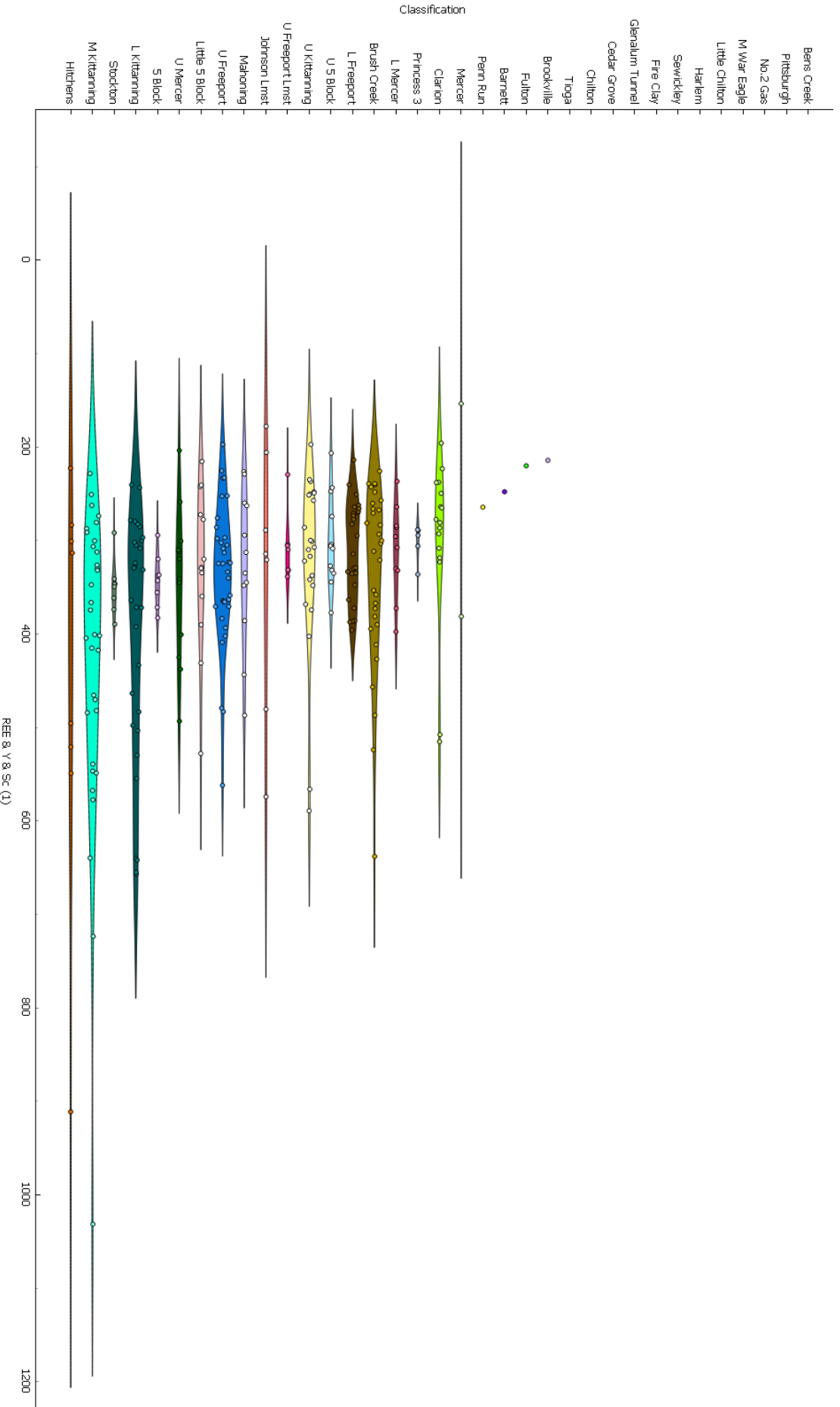


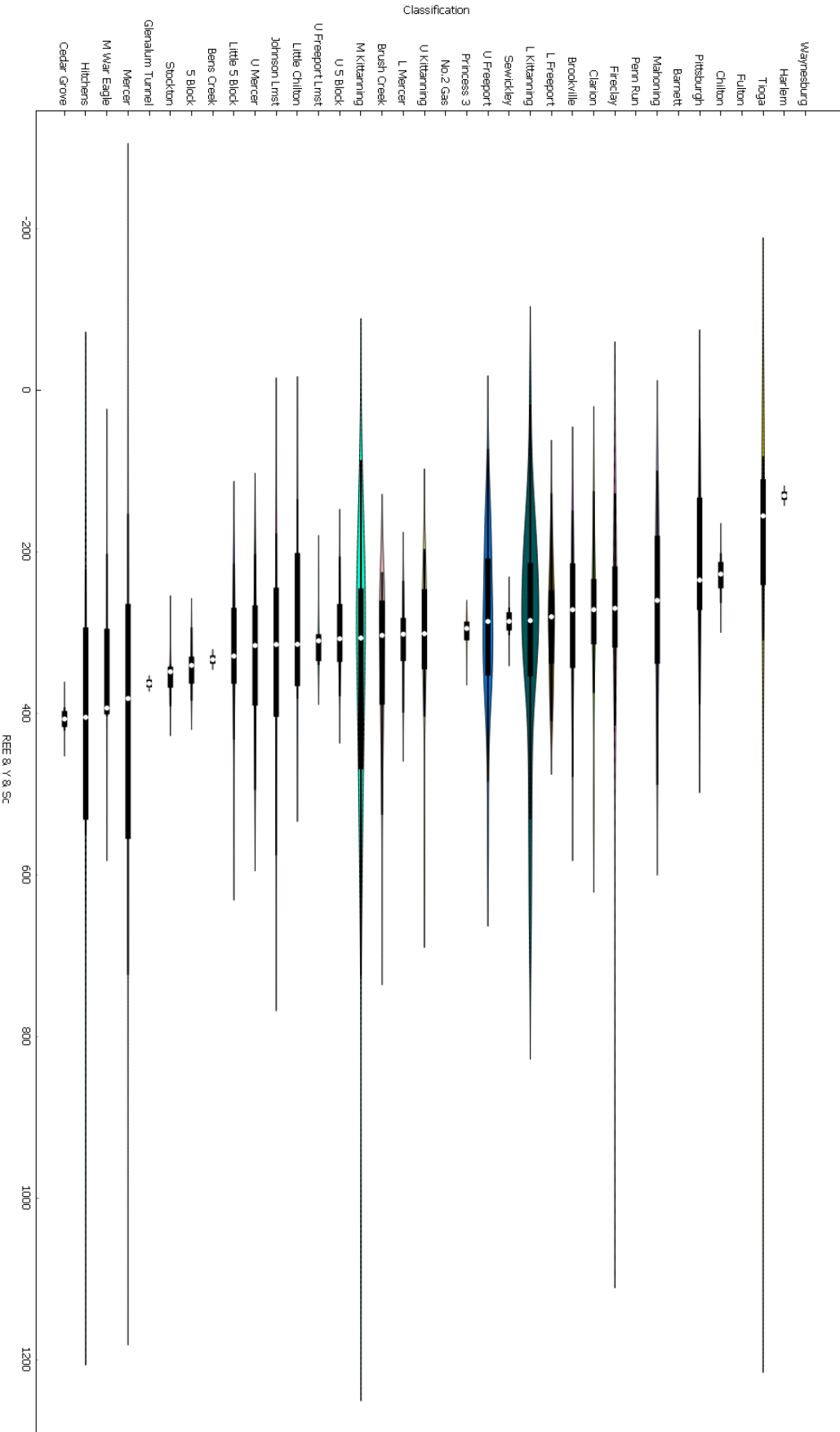
Violin Plots for Different Coal Beds

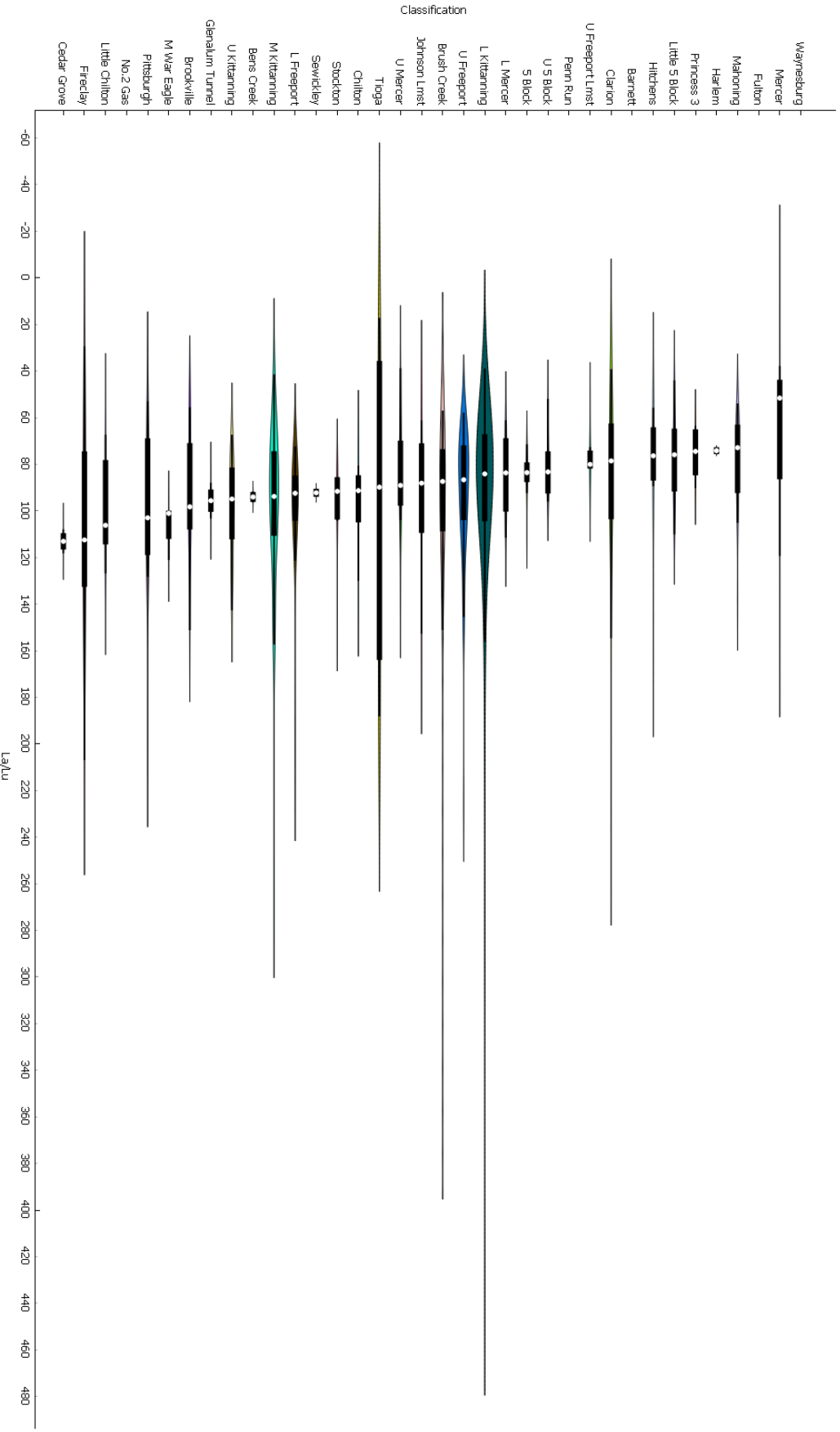
Violin plots of the distribution of total REEs and La/Lu ratio associated with different coal beds.

Claystones associated with the Mercer, Middle Kittanning, and Lower Kittanning coals have statistically significant higher total REEs amounts. All claystones are significantly richer in LREEs than HREEs, with the Mercer claystones being richest in relative HREEs.

First plot shows the results for the 1st set of MRI samples and the Montross data. Second plot – first plot data as well as Tioga ash and TetraTek. Third – second plot data plus Grady database samples.







Orange Discussion and Results

After running Orange through several iterations, some important trends that indicate higher REE totals (> 375 ppm) were found, including:

- Strong positive correlation: Al>137,500 ppm and P>500 ppm
- 26,500 ppm >K> 18,750 ppm
- Th > 21.5 ppm, Sr > 260 ppm
- Higher total REEs inversely correlated with Mg (Mg<3800 ppm)
- Ti>7,250 ppm, V> 170 ppm weakly positively correlated
- Nb > 22 ppm weakly positively correlated
- Strong positive correlation Cu >56 ppm, Cr>130 ppm, Pb>39.5 ppm, Ba>670 ppm
- Weakly positive U>6.5 ppm, Sb>1.3 ppm, Bi>0.7 ppm, Ga>37.5 ppm

Multidimensional space (MDS) plots show correlations and general similar behavior of REES with Cu, Cr, Pb, U, Sb, V, Bi, Ga, and Ba.

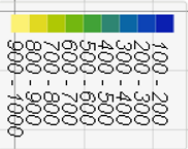
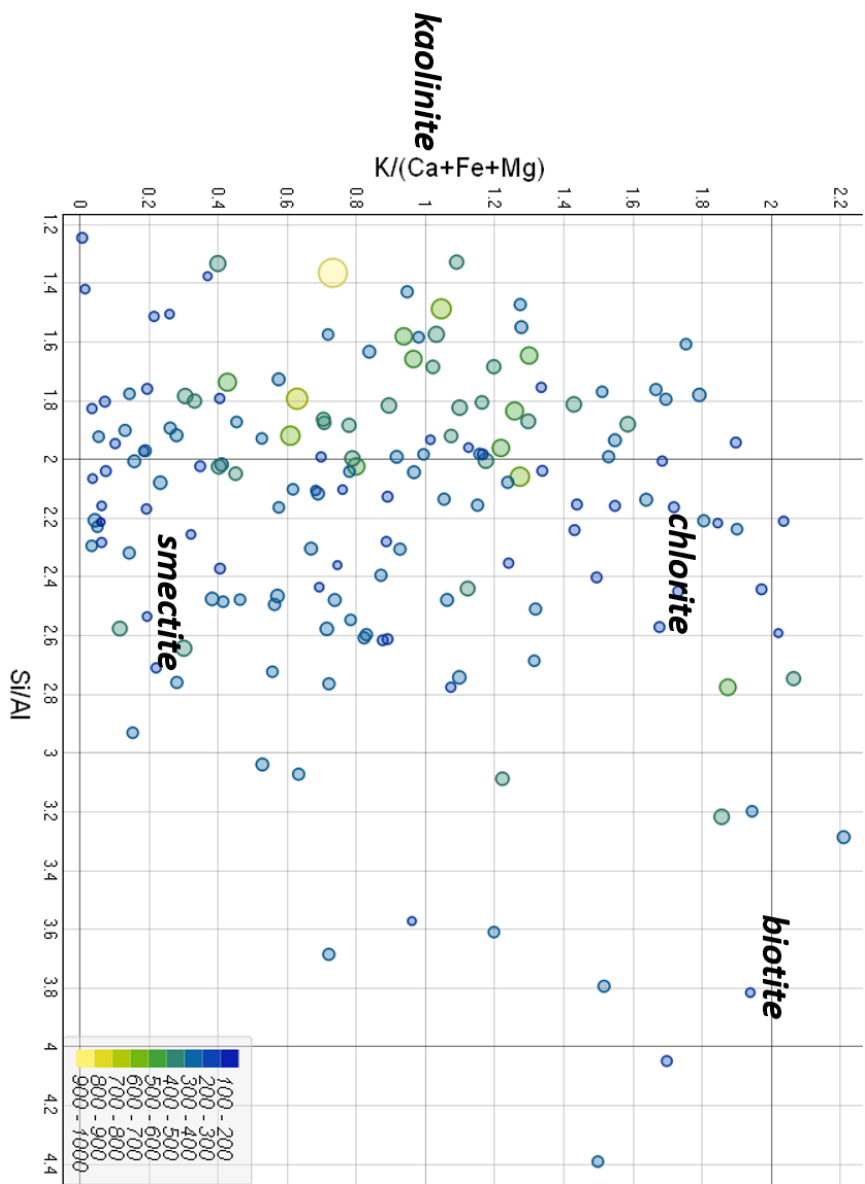
Cu does not act like other ²⁺ transitional metals (from where it plots on MDS) which may indicate that it is oxidized; V and Cr behave in a similar manner.

Plots indicate that the REEs are mainly in kaolinite instead of illite; they appear to be in a mix of kaolinite, chlorite and smectite. They do not have Al and K rich enough to have illite dominate.

muscovite

illite

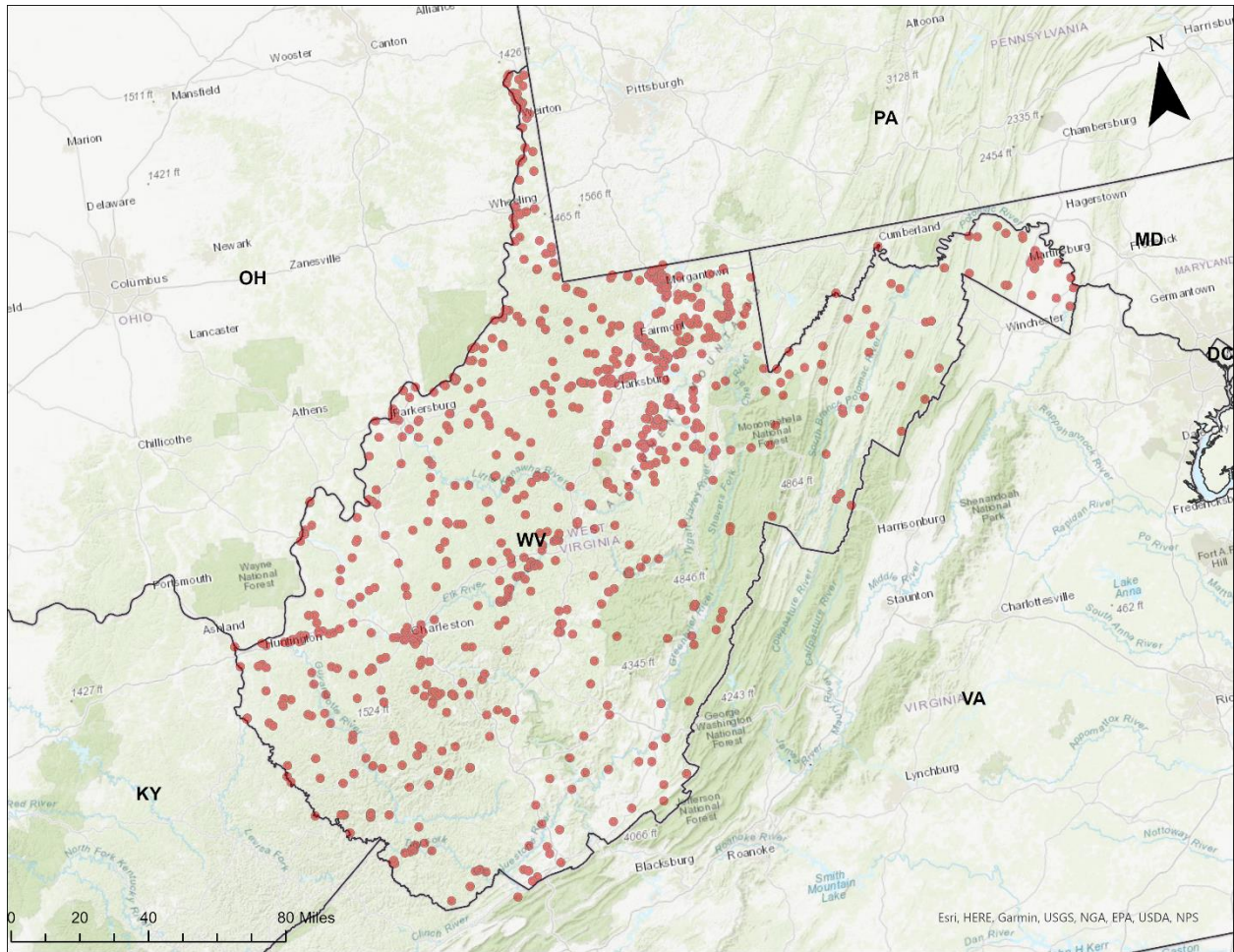
kaolinite



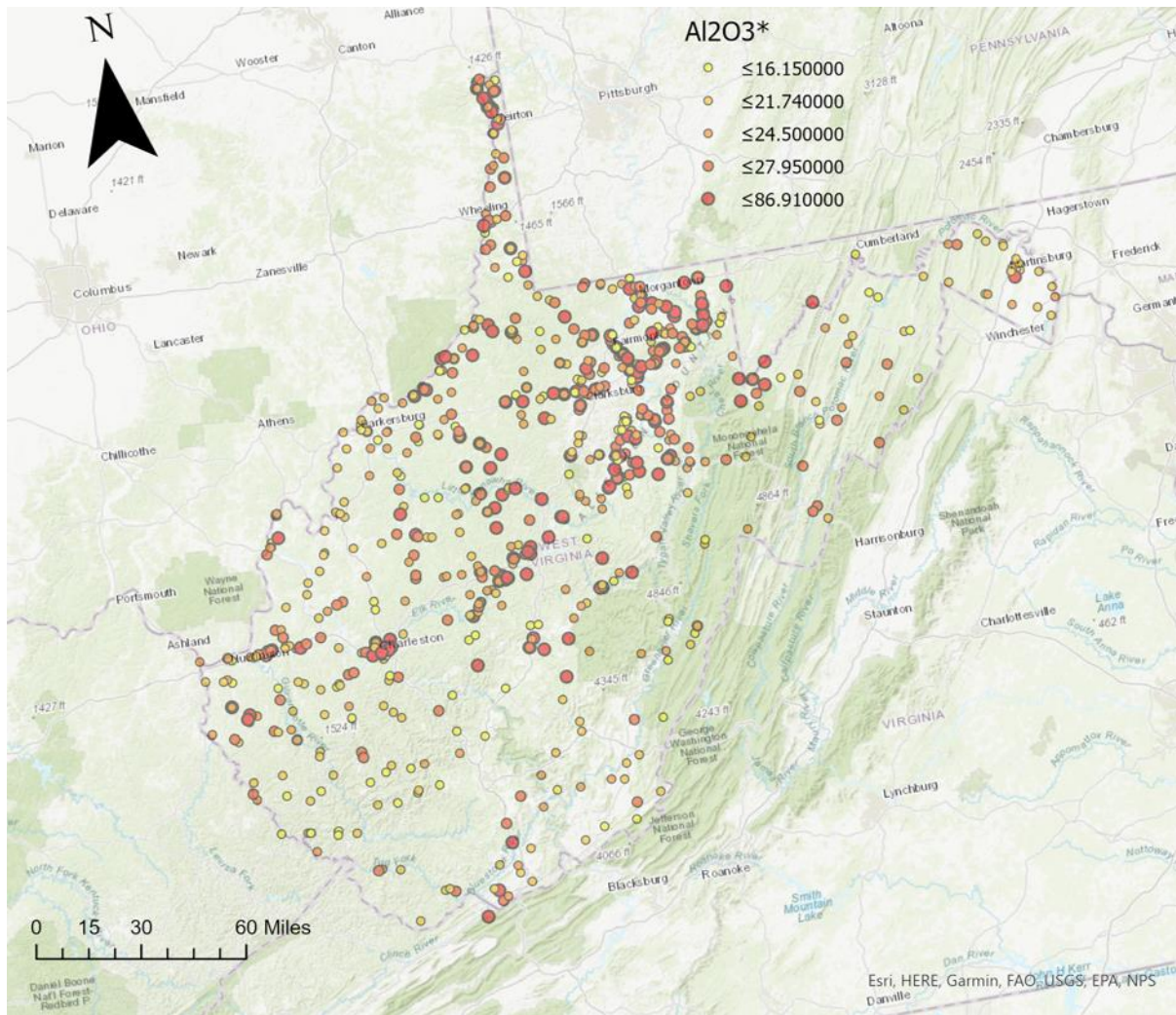
Plot of Si/Al versus $\text{K}(\text{Ca}+\text{Fe}+\text{Mg})$ in order to see how the analyses plot in the clay fields. Colors correspond to the total REE amounts. Kaolinite = $\text{Si}/\text{Al} = 1$, $\text{K,Na,Ca,Fe,Mg} = 0$, $\text{K}/(\text{Ca,Fe,Mg}) = 1$,
 Smectite = $\text{Si}/\text{Al} > 1$ $\text{K,Na,Ca,Fe,Mg} > 0$ $\text{K}/(\text{Ca,Fe,Mg}) < 1$, Chlorite = $\text{Si}/\text{Al} > 1$
 $\text{K,Na,Ca,Fe,Mg} > 0$ $\text{K}/(\text{Ca,Fe,Mg}) \geq 1$, Illite = $\text{Si}/\text{Al} < 1$ $\text{K,Na,Ca,Fe,Mg} \gg 0$ $\text{K}/(\text{Ca,Fe,Mg}) > 1$)

Predominance of kaolinite indicates heavy weathering and saprolite production, with less input of erosional detrital allogenic minerals as source of REEs. The cyclical occurrence of clays within and under coals (cyclothems tied with Gondwana glaciation) indicates weather related deposition of clays (as well as coals) instead of tectonic controls (uplift and erosion in eastern Laurentia). Coals follow global glacial climate cycle (and clay deposition appears to follow them) as transgressions and regressions flood and dry swamps and peatlands (become shallow marine environments with carbonaceous shales as deltaic floodplain deposits co-occurring with coals, in possible peat swamps) – not depocenters from mountain granitoid detritus. REE bearing minerals do not seem prevalent, there is not very high P or Th concentrations together with REE, indicating monazite and/or xenotime are not present. There are not many samples with high Z and Hf concentrations, which indicates there is not abundant zircon. There are some hints of Sr with P in a few samples which may indicate Sr-phosphates (phosphoalunites) such as florencite, goyazite, belovite.

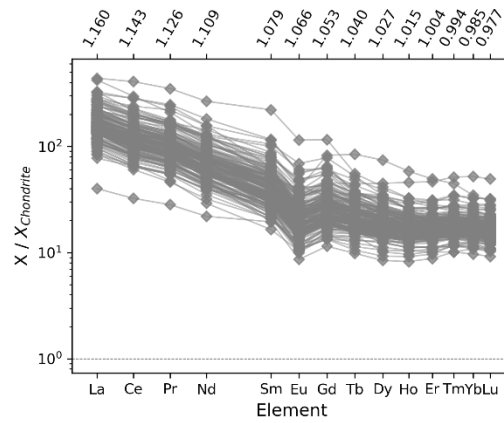
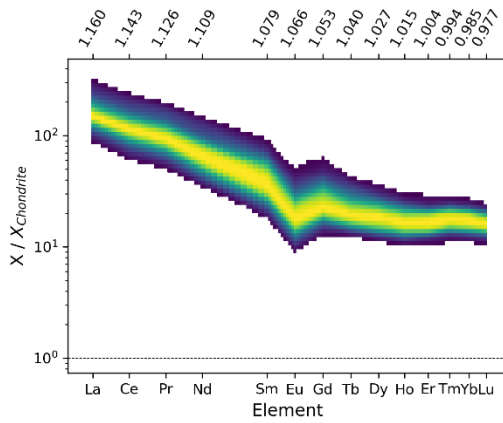
The abnormal association of total REEs with transition metals such as Pb, Cu, Sb, Cr, V, Bi is atypical of common REE minerals like monazite, xenotime, basinites and allow for the predominance of ion absorption clays to be the main host. The Al content is extremely high due to very high weathering amounts, as other elements are stripped out, immobile Al remains and indicates longer and higher amounts of weathering. This places the REEs and additional critical minerals mentioned here in the Appalachian Basin within the Chemical Weathering System of the USGS defined mineral system approach (Hofstra and Kreiner, 2020).

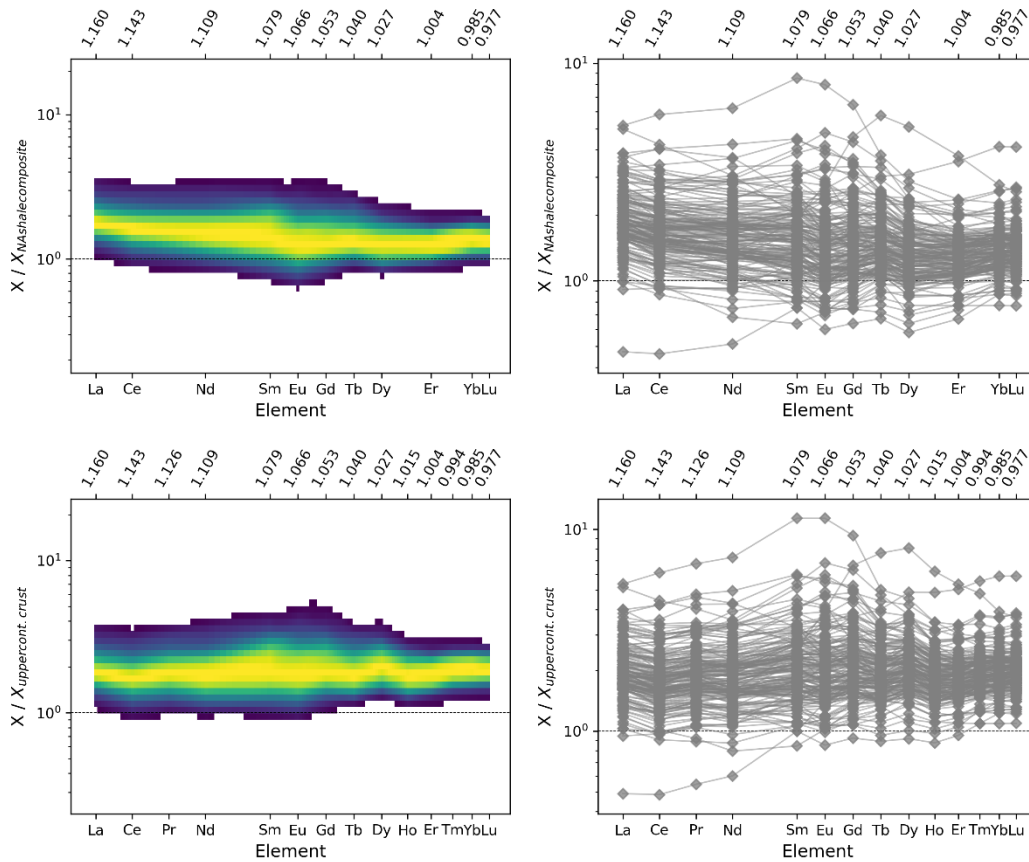


Historical WV data

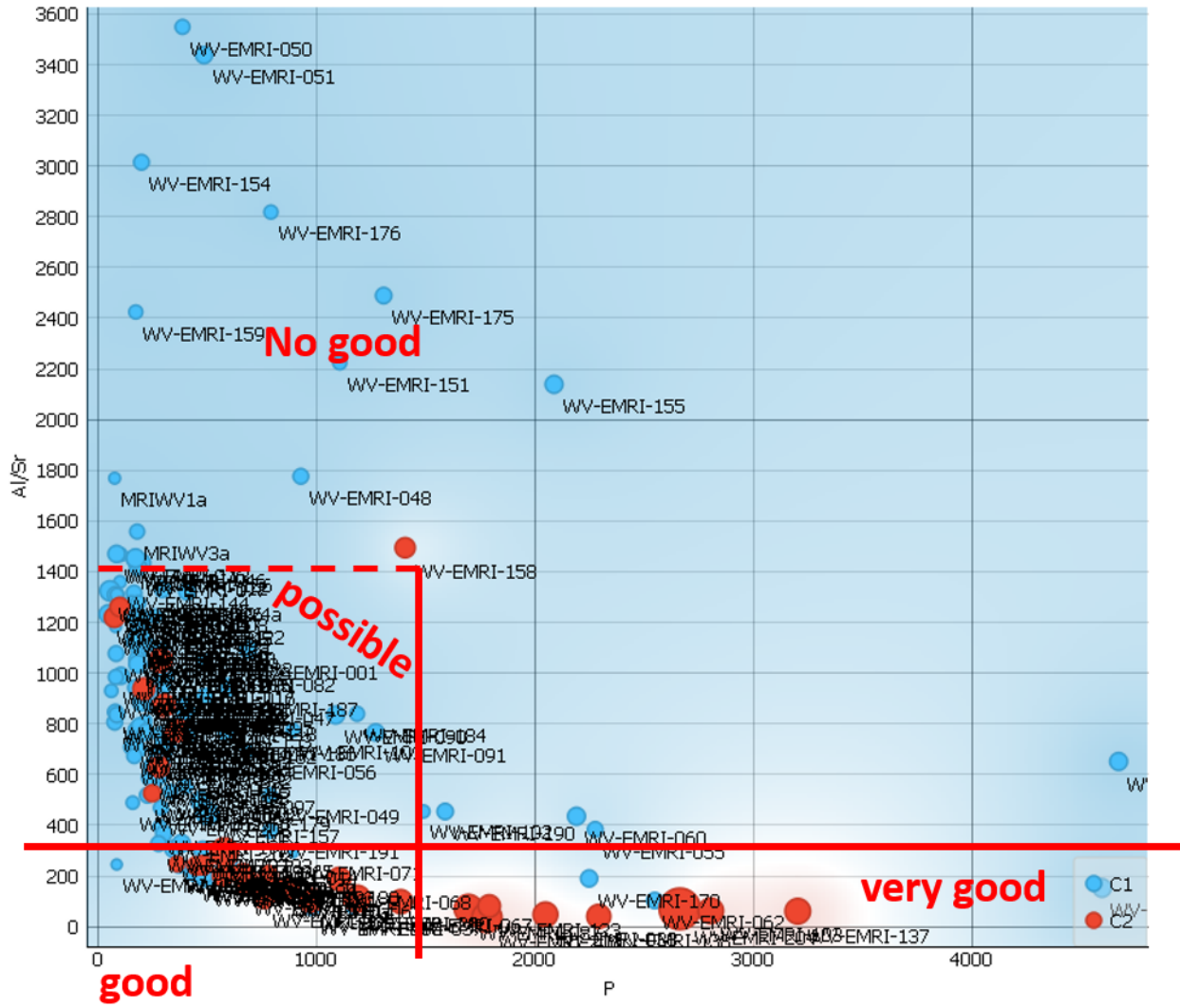


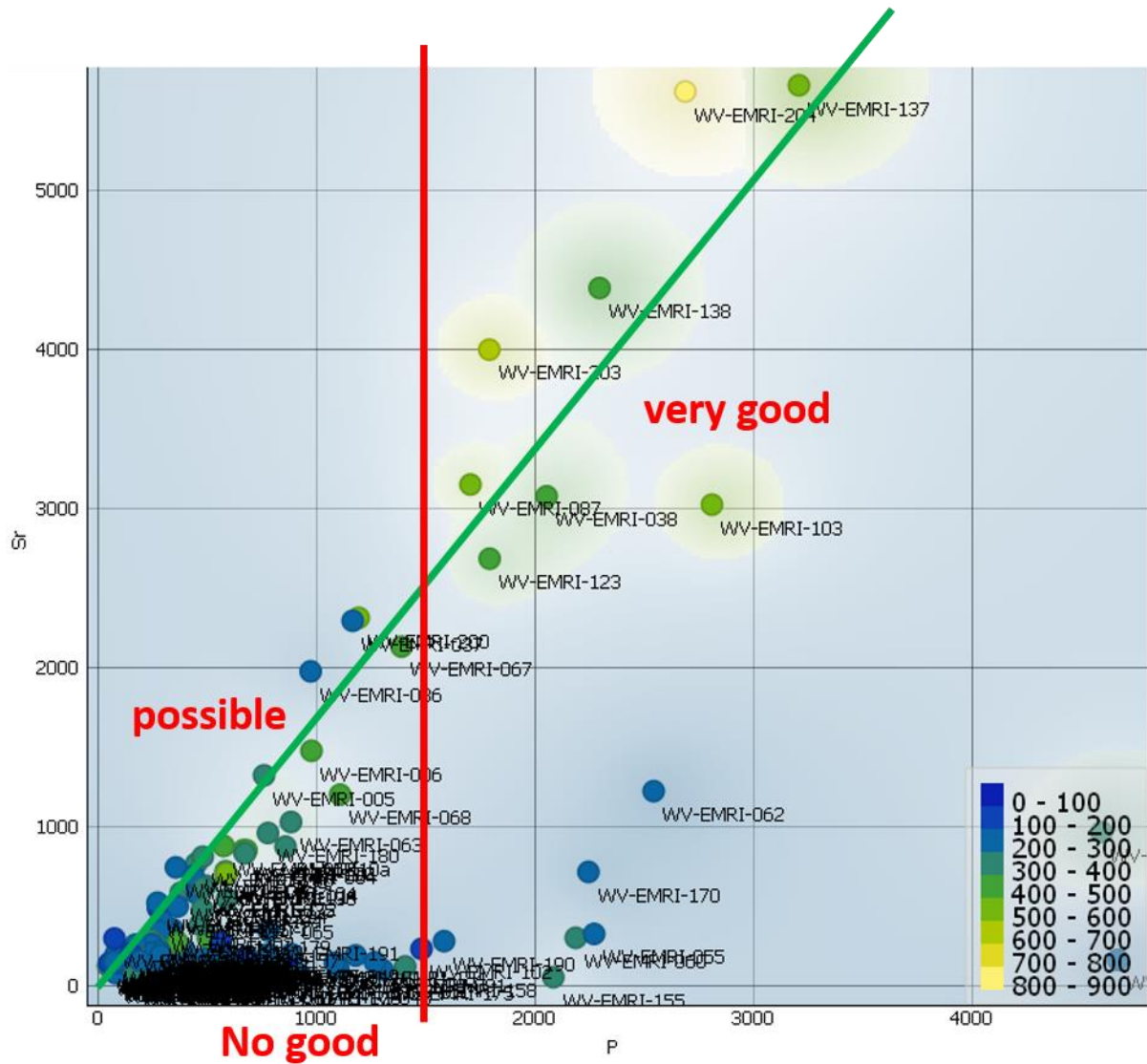
Historical WV data plotted by Al_2O_3 wt. %

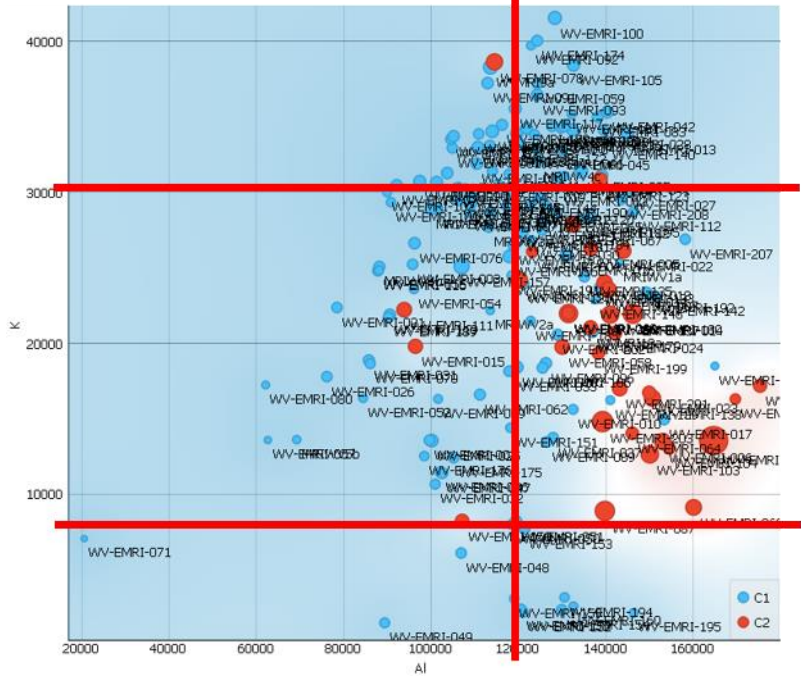
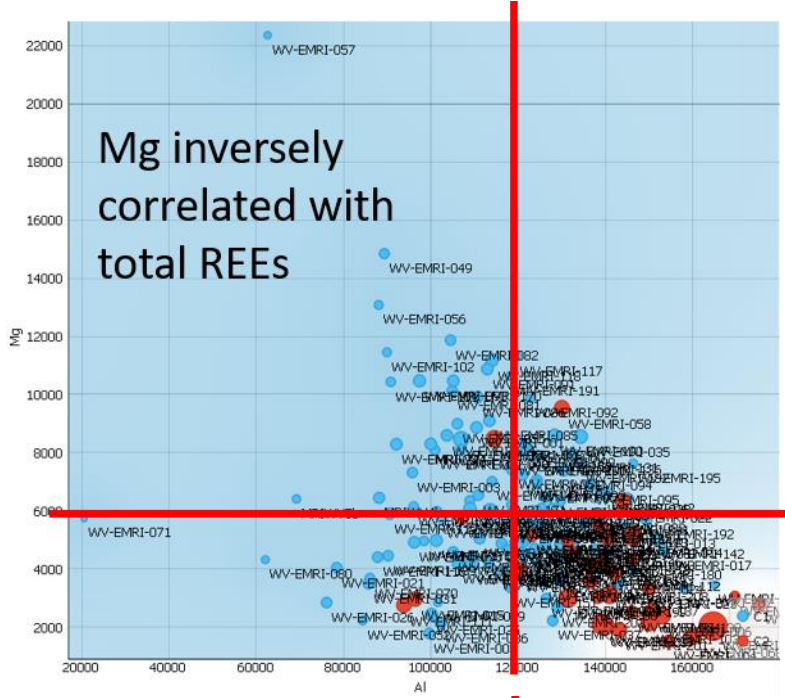


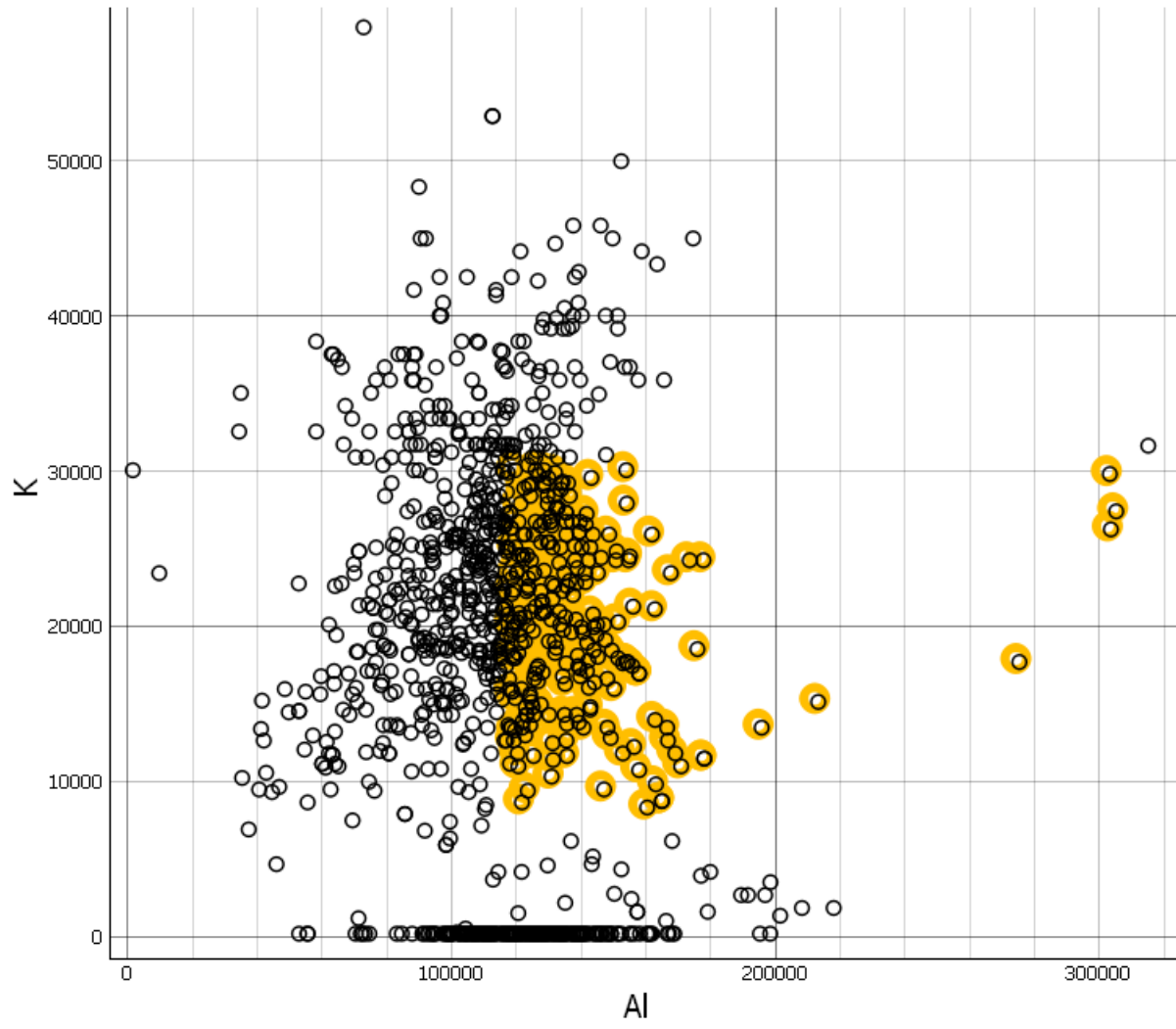


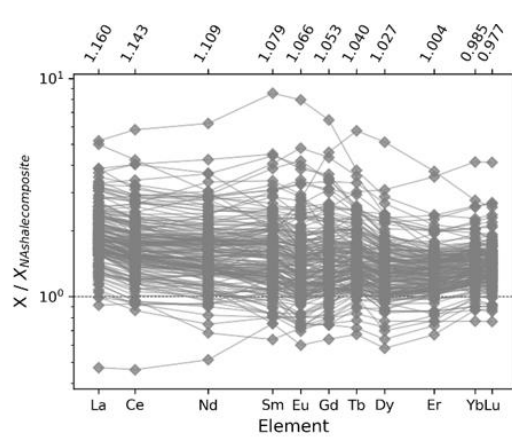
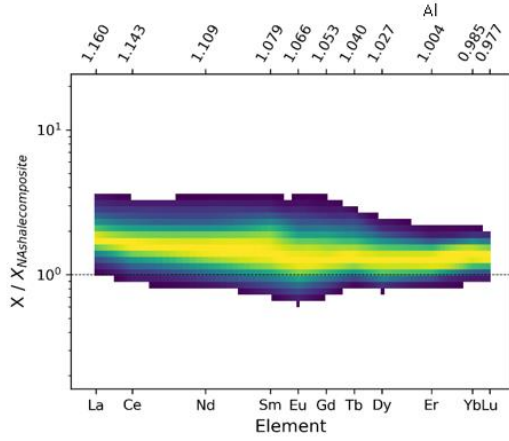
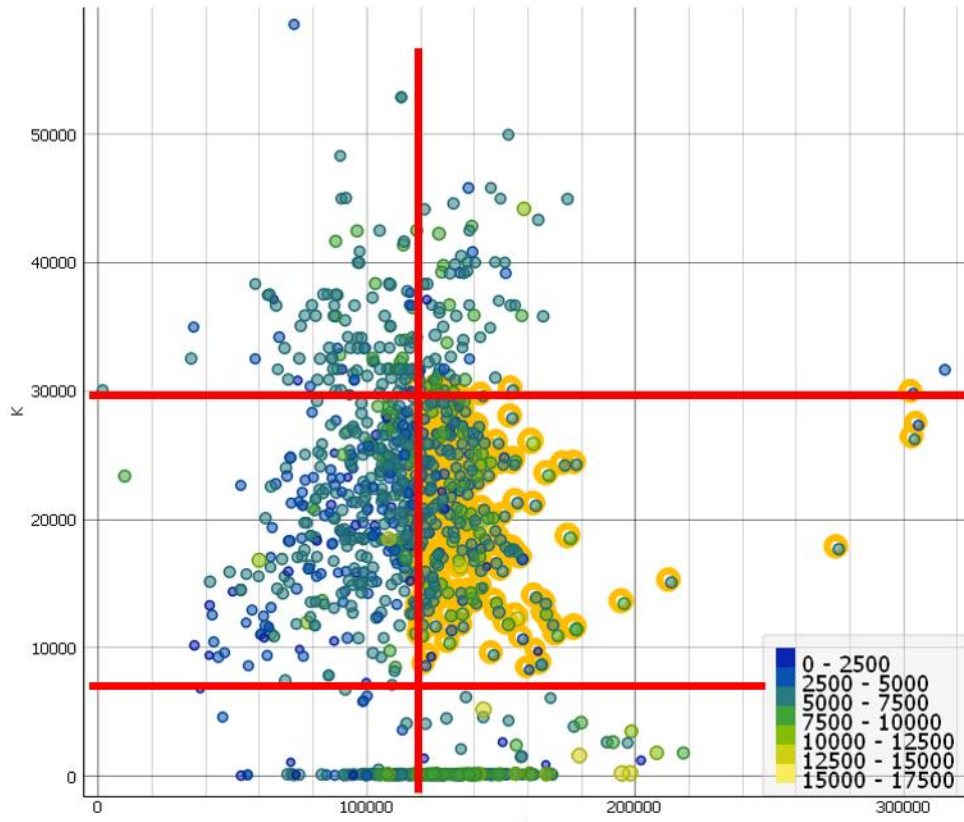
REE spidergrams for the new Appalachian Basin samples vs chondrite (top), the North American Shale Composite (middle) and Average Upper Continental Crust (bottom). The negative Eu anomaly is characteristic of a differentiated igneous source that fractionated an evolved, Eu-depleted magma (e.g., alkali granitoids) while accumulating Eu²⁺-enriched plagioclase (e.g., gabbro, anorthosite).

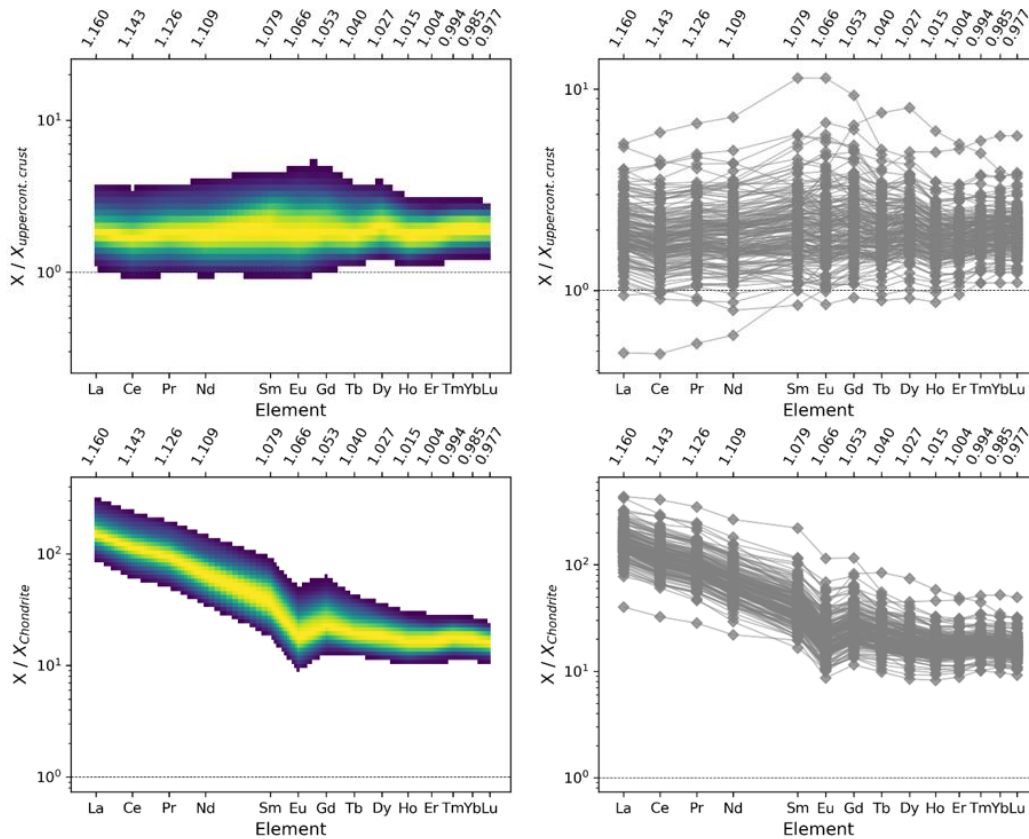












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McDowell, R. R. (compiler), 2017 (last revision, 2022), *Stratigraphic Geochemical Database for Portions of Pendleton County, West Virginia, and Adjacent Virginia Counties - Supplement: West Virginia Geological and Economic Survey Report of Investigations, RI-34-Supplement, digital files.*

Montross, S.N., Verba, C.A., Collins, K., 2017. *Characterization of Rare Earth Element minerals in coal utilization byproducts; NETL-TRS-10-2017; NETL Technical Report Series; U.S. Department of Energy, National Energy Technology Laboratory: Morgantown, WV, 2017; p 52. DOI: 10.18141/1432615.*

TetraTech, Inc., 2018. *Identification and characterization of coal and coal by-products containing high Rare Earth Element concentrations. Final Report, U.S. Department of Energy contract # DE-FE-00266478. URL: https://edx.netl.doe.gov/ree/?page_id=2169*

Appendix III

Sample location and lithology, ICPMS, and WDXRF data followed by chondrite ratios.

Sample details including locations and lithology provided by state surveys. ICPMS, WDXRF, and chondrite ratio data provided by USGS via AGAT Labs.

Field Number (no more than 16 characters)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Datum	Country	State	Location Description	Collection Date MM/DD/YYYY
231-036-B1	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	8/26/2021
231-036-B2	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	8/26/2021
231-036-B3	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	8/26/2021
230-092D-UC	38.42451	-80.7866	NAD83	United Stat	WV	230-092D e	8/26/2021
230-092D-LC	38.42451	-80.7866	NAD83	United Stat	WV	230-092D e	8/26/2021
230-092B-UC	38.44225	-80.7863	NAD83	United Stat	WV	230-092B c	8/26/2021
230-092B-LC	38.44225	-80.7863	NAD83	United Stat	WV	230-092B c	8/26/2021
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214-093A-B1	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	8/25/2021
214-093A-B2	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	8/25/2021
214-093A-B3	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	8/25/2021
MD-14-B1	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	8/25/2021
MD-14-B2	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	8/25/2021
MD-14-B3	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	8/25/2021
MD-14-B4	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	8/25/2021
MD-15-B1	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	8/25/2021
MD-15-B2	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	8/25/2021
MD-15-B3	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	8/25/2021
MD-15-B4	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	8/25/2021
MD-15-B5	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	8/25/2021

MD-15-B7	39.65572	-79.7707	NAD83	United Stat WV	MD-15 alor 8/25/2021
MD-15-B8	39.65572	-79.7707	NAD83	United Stat WV	MD-15 alor 8/25/2021
230-092A-B1	38.42026	-80.7872	NAD83	United Stat WV	230-092A s 8/25/2021
230-092A-B2	38.42026	-80.7872	NAD83	United Stat WV	230-092A s 8/25/2021
230-092G	38.42817	-80.7874	NAD83	United Stat WV	230-092G s 8/17/2021
50-092B-B1	38.58468	-80.7385	NAD83	United Stat WV	50-092 aloi 8/27/2021
50-092B-B2	38.58468	-80.7385	NAD83	United Stat WV	50-092 aloi 8/27/2021
50-092B-B3	38.58468	-80.7385	NAD83	United Stat WV	50-092 aloi 8/27/2021
50-080-B1	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B2	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B3	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B4	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B5	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B6	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B7	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B8	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
50-080-B9	38.59372	-80.7336	NAD83	United Stat WV	50-080 aloi 8/27/2021
272-095-B1	39.65644	-79.7735	NAD83	United Stat WV	Near truck 8/25/2021
272-095-B2	39.65644	-79.7735	NAD83	United Stat WV	Near truck 8/25/2021
272-095-B3	39.65644	-79.7735	NAD83	United Stat WV	Near truck 8/25/2021
272-095-B4	39.65644	-79.7735	NAD83	United Stat WV	Near truck 8/25/2021
230-092D-B1	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B2	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B3	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B4	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B5	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B6	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
230-092D-B7	38.42447	-80.7863	NAD83	United Stat WV	230-092D s 8/17/2021
90-037	39.66099	-79.851	NAD83	United Stat WV	90-037 loc: 8/25/2021
230-092F-B1	38.42698	-80.7864	NAD83	United Stat WV	230-092F a 8/17/2021
230-092F-B2	38.42698	-80.7864	NAD83	United Stat WV	230-092F a 8/17/2021
230-092F-B3	38.42698	-80.7864	NAD83	United Stat WV	230-092F a 8/17/2021
230-092F-B4	38.42698	-80.7864	NAD83	United Stat WV	230-092F a 8/17/2021
50-092B-US	38.58468	-80.7385	NAD83	United Stat WV	50-092 aloi 8/27/2021
WV-EMRI-209	39.07819	-81.1938	NAD83	United Stat WV	Log of core hole drilled
WV-EMRI-210	39.07819	-81.1938	NAD83	United Stat WV	Log of core hole drilled
MD-9-A	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US 6/1/2021
MD-9-B	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US 6/1/2021
MD-9-C	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US 6/1/2021
MD-9-D	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US 6/1/2021
MD-14-A	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We 6/23/2021
MD-14-B	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We 6/23/2021
MD-14-C	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We 6/23/2021
MD-14-D	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We 6/23/2021
MD-15-A	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che 6/23/2021

MD-15-B	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	6/23/2021
MD-15-C	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	6/23/2021
MD-15-D	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	6/23/2021
MD-15-E	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	6/23/2021
MD-15-F	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	6/23/2021
OGS-CSH0001A	39.46806	-82.3128	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0001B	39.46806	-82.3128	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0002	39.46806	-82.3128	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003A	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003B	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003C	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003D	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003E	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0003F	39.47257	-82.249	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0004A	39.472	-82.2497	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0004B	39.472	-82.2497	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0004C	39.472	-82.2497	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0005	39.46784	-82.2501	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0006	39.3283	-82.0857	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0007	39.32831	-82.0857	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0008A	39.43432	-82.1987	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0008B	39.43432	-82.1987	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0008C	39.43432	-82.1987	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0009A	39.43595	-82.1996	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0009B	39.43595	-82.1996	WGS84	United Stat OH	road outcro	1/13/2021
OGS-CSH0010	39.87326	-82.1167	WGS84	United Stat OH	road outcro	1/21/2021
OGS-CSH0011	39.86459	-82.1216	WGS84	United Stat OH	Maysville N	1/21/2021
OGS-CSH0012	39.86486	-82.1224	WGS84	United Stat OH	Maysville N	1/21/2021
OGS-CSH0013	39.78689	-82.6408	WGS84	United Stat OH	Private hor	3/10/2021
OGS-CSH0014A	39.52574	-82.3598	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0014B	39.52574	-82.3598	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0015A	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0015B	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0015C	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0016A	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0016B	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0016C	39.52597	-82.3595	WGS84	United Stat OH	former pos	3/10/2021
OGS-CSH0017A	39.47272	-82.2407	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0017B	39.47272	-82.2407	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0017C	39.47272	-82.2407	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0017D	39.47272	-82.2407	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0017E	39.47272	-82.2407	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0018A	39.47278	-82.2416	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0018B	39.47278	-82.2416	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0018C	39.47278	-82.2416	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0019A	39.1461	-82.0221	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0019B	39.1461	-82.0221	WGS84	United Stat OH	road outcro	3/10/2021

OGS-CSH0020A	39.14648	-82.0222	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0020B	39.14648	-82.0222	WGS84	United Stat OH	road outcro	3/10/2021
OGS-CSH0021A	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021B	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021C	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021D	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021E	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021F	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0021G	40.0092	-81.5594	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0022A	40.07834	-81.5643	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0022B	40.07834	-81.5643	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0022C	40.07834	-81.5643	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0023A	40.07907	-81.5639	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0023B	40.07907	-81.5639	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0023C	40.07907	-81.5639	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0023D	40.07907	-81.5639	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0024A	40.14748	-81.5486	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0024B	40.14748	-81.5486	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0024C	40.14748	-81.5486	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0024D	40.14748	-81.5486	WGS84	United Stat OH	road outcro	3/11/2021
OGS-CSH0025	40.09065	-81.5581	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0026	40.14458	-81.5498	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027A	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027B	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027C	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027D	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027E	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027F	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0027G	40.29346	-81.5496	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0028A	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028B	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028C	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028D	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028E	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028F	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0028G	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	3/23/2021
OGS-CSH0029A	40.30853	-81.5672	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0029B	40.30853	-81.5672	WGS84	United Stat OH	road outcro	3/23/2021
PAGS-MRI-WeiserSF-1	40.82045	-76.4414	NAD83	United Stat Pennsylvan	Wesier Stat	5/6/2021
PAGS-MRI-WeiserSF-2	40.82021	-76.4478	NAD83	United Stat Pennsylvan	Wesier Stat	5/6/2021
IND063_2361_103.0FT	40.42231	-79.1576	NAD83	United Stat Pennsylvan	State Game	4/26/2021
IND063_2361_99.0FT	40.42231	-79.1576	NAD83	United Stat Pennsylvan	State Game	4/26/2021
IND063_2361_92.5FT	40.42231	-79.1576	NAD83	United Stat Pennsylvan	State Game	4/26/2021
IND063_2361_91.7FT	40.42231	-79.1576	NAD83	United Stat Pennsylvan	State Game	4/26/2021
IND063_2361_83.1FT	40.42231	-79.1576	NAD83	United Stat Pennsylvan	State Game	4/26/2021
IND063_2362_123.2FT	40.42519	-79.1583	NAD83	United Stat Pennsylvan	State Game	4/27/2021
IND063_2363_187.2FT	40.42425	-79.1535	NAD83	United Stat Pennsylvan	State Game	4/27/2021

IND063_2363_65.5FT	40.42425	-79.1535	NAD83	United Stat Pennsylvan State Game	4/27/2021
IND063_2363_60.4FT	40.42425	-79.1535	NAD83	United Stat Pennsylvan State Game	4/27/2021
IND063_2363_49.2FT	40.42425	-79.1535	NAD83	United Stat Pennsylvan State Game	4/27/2021
IND063_2363_57.46FT	40.42425	-79.1535	NAD83	United Stat Pennsylvan State Game	4/27/2021
IND063_2364_192FT	40.42752	-79.1551	NAD83	United Stat Pennsylvan State Game	4/27/2021
PAGS-HW21-002_432FT	40.64755	-78.9187	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-HW21-002_578 Ft	40.64755	-78.9187	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-HW21-002_595FT	40.64755	-78.9187	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-HW21-002_725 Ft	40.64755	-78.9187	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-HW21-002_729Ft	40.64755	-78.9187	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-BRU21-001_403FT	40.50886	-79.0519	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-KJ21-002_300FT	41.29497	-78.7545	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-MB-1901	39.85027	-80.416	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-MB-1904	39.8523	-80.4317	NAD83	United Stat Pennsylvan NA	?/?/2021
PAGS-NV-1905	39.96185	-80.2758	NAD83	United Stat Pennsylvan NA	?/?/2021
MRI-23_Top	40.96754	-80.3583	NAD83	United Stat Pennsylvan West-boun	6/23/2021
MRI-23_Base	40.96754	-80.3583	NAD83	United Stat Pennsylvan West-boun	6/23/2021
MRI-24	40.96779	-80.3591	NAD83	United Stat Pennsylvan West-boun	6/23/2021
MRI-25	40.96771	-80.3611	NAD83	United Stat Pennsylvan West-boun	6/23/2021
MRI-26D	40.90445	-80.2247	NAD83	United Stat Pennsylvan Armstrong	6/23/2021
MRI-26E	40.90445	-80.2247	NAD83	United Stat Pennsylvan Armstrong	6/23/2021
MRI-27	40.96097	-80.1334	NAD83	United Stat Pennsylvan Northboun	6/24/2021
MRI-28C	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-28D_Top	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-28D_Base	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-28M	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-28Q	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-28X	40.96762	-80.3642	NAD83	United Stat Pennsylvan Eastbound	6/24/2021
MRI-29_Top	40.96975	-80.3421	NAD83	United Stat Pennsylvan Exposure a	6/24/2021
MRI-29_Base	40.96975	-80.3421	NAD83	United Stat Pennsylvan Exposure a	6/24/2021
MRI-30E_Top	40.99851	-80.3927	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-30E_Base	40.99851	-80.3927	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-30K	40.99851	-80.3927	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-30LK	40.99851	-80.3927	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-31_Top	41.00131	-80.3928	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-31_Mid1	41.00131	-80.3928	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-31_Mid2	41.00131	-80.3928	NAD83	United Stat Pennsylvan State Route	6/24/2021
MRI-31_Base	41.00131	-80.3928	NAD83	United Stat Pennsylvan State Route	6/24/2021
TGS872DH5_31_5	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_54_5	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_119_8	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_166_0	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_171_25	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_227_1	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH5_250_0	41.00145	-78.1306	NAD83	United Stat PA	12/04/1987
TGS872DH4_378_7	41.14117	-78.0747	NAD83	United Stat PA	11/16/1987
MRI-22-C	40.9429	-78.558	NAD83	United Stat PA	Abandonec 8/5/2020

MRI-22-E	40.9429	-78.558	NAD83	United Stat PA	Abandonec	8/5/2020
MRI-22-D	40.9429	-78.558	NAD83	United Stat PA	Abandonec	8/5/2020
MD-6-A	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-6-B	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-6-C	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-6-D	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-6-E	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-6-F	39.86294	-79.0567	WGS84	United Stat PA	Route 219	5/6/2021
MD-1-A	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-B	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-C	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-D	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-E	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-F	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-G	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-1-H	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	3/15/2021
MD-2-A	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-B	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-C	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-D	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-E	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-F	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-2-G	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	3/30/2021
MD-3-A	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-B	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-C	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-D	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-E	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-F	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-G	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-H	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-I	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-3-J	39.48727	-79.0888	WGS84	United Stat MD	Savage Riv	4/15/2021
MD-4-A	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-B	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-C	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-D	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-E	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-F	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-G	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-H	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-4-I	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	4/15/2021
MD-5-A	39.41965	-79.1407	WGS84	United Stat MD	railroad on	4/26/2021
MD-5-B	39.41965	-79.1407	WGS84	United Stat MD	railroad on	4/26/2021
MD-5-C	39.41965	-79.1407	WGS84	United Stat MD	railroad on	4/26/2021
MD-5-D	39.41965	-79.1407	WGS84	United Stat MD	railroad on	4/26/2021
MD-7-A	39.66807	-78.961	WGS84	United Stat MD	MD-7, Pa, E	5/27/2021

MD-12-J	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-K	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-L	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-M	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-N	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-O	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-P	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-12-Q	39.67093	-78.9627	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-A	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-B	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-C	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-D	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-E	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
MD-13-F	39.66982	-78.9624	WGS84	United Stat MD	US 68 - Big	6/17/2021
OGS-CSH0029C	40.30853	-81.5672	WGS84	United Stat OH	road outcro	3/23/2021
OGS-CSH0030	40.0365	-81.4799	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0031	40.11245	-81.5252	WGS84	United Stat OH	Salt Fork St	3/30/2021
OGS-CSH0032A	40.30873	-81.5671	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0032B	40.30873	-81.5671	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033A	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033B	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033C	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033D	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033E	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033F	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033G	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033H	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033I	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0033J	40.42912	-81.5344	WGS84	United Stat OH	road outcro	3/30/2021
OGS-CSH0034A	40.22785	-81.5543	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0034B	40.22785	-81.5543	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0034C	40.22785	-81.5543	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0034D	40.22785	-81.5543	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0034E	40.22785	-81.5543	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0035A	40.41373	-81.5463	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0035B	40.41373	-81.5463	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0035C	40.41373	-81.5463	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0036A	40.41268	-81.5469	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0036B	40.41268	-81.5469	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0036C	40.41268	-81.5469	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0036D	40.41268	-81.5469	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0037A	40.28947	-81.7213	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0037B	40.28947	-81.7213	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0037C	40.28947	-81.7213	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0037D	40.28947	-81.7213	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0038A	40.28947	-81.7208	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0038B	40.28947	-81.7208	WGS84	United Stat OH	road outcro	4/27/2021

OGS-CSH0038C	40.28947	-81.7208	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0038D	40.28947	-81.7208	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0039	40.28946	-81.7207	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0040	40.28945	-81.7206	WGS84	United Stat OH	road outcro	4/27/2021
OGS-CSH0041A	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041B	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041C	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041D	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041E	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041F	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041G	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0041H	39.096	-82.658	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042A	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042B	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042C	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042D	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042E	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042F	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0042G	39.09587	-82.6579	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0043A	39.09572	-82.6578	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0043B	39.09572	-82.6578	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0043C	39.09572	-82.6578	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0044A	39.09522	-82.6585	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0044B	39.09522	-82.6585	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0044C	39.09522	-82.6585	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0045	39.05025	-82.6147	WGS84	United Stat OH	outcrop at	5/5/2021
OGS-CSH0046A	39.05625	-82.6188	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0046B	39.05625	-82.6188	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0046C	39.05625	-82.6188	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0046D	39.05625	-82.6188	WGS84	United Stat OH	road outcro	5/5/2021
OGS-CSH0047	39.10831	-82.6771	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0048A	39.05024	-82.6147	WGS84	United Stat OH	outcrop at	5/14/2021
OGS-CSH0048B	39.05024	-82.6147	WGS84	United Stat OH	outcrop at	5/14/2021
OGS-CSH0048C	39.05024	-82.6147	WGS84	United Stat OH	outcrop at	5/14/2021
OGS-CSH0049A	39.05025	-82.6147	WGS84	United Stat OH	outcrop at	5/14/2021
OGS-CSH0049B	39.05025	-82.6147	WGS84	United Stat OH	outcrop at	5/14/2021
OGS-CSH0050A	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0050B	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0050C	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0050D	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0050E	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0050F	38.96815	-82.5021	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0051A	38.97798	-82.5229	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0051B	38.97798	-82.5229	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0051C	38.97798	-82.5229	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0051D	38.97798	-82.5229	WGS84	United Stat OH	road outcro	5/14/2021
OGS-CSH0052A	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021

OGS-CSH0052B	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0052C	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0052D	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0052E	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0053	38.80854	-82.864	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0054	38.53788	-82.6752	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0055	38.5532	-82.7002	WGS84	United Stat OH	outcrop alc	6/8/2021
OGS-CSH0056A	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0056B	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0056C	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0056D	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0057A	38.51859	-82.651	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0057B	38.51859	-82.651	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0057C	38.51859	-82.651	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0057D	38.51859	-82.651	WGS84	United Stat OH	outcrop at	6/8/2021
OGS-CSH0058A	38.44697	-82.3886	WGS84	United Stat OH	Proctorville	6/16/2021
OGS-CSH0058B	38.44697	-82.3886	WGS84	United Stat OH	Proctorville	6/16/2021
OGS-CSH0059A	38.41107	-82.5565	WGS84	United Stat OH	US-52 S ne	6/16/2021
OGS-CSH0059B	38.41107	-82.5565	WGS84	United Stat OH	US-52 S ne	6/16/2021
OGS-CSH0060A	38.47886	-82.6174	WGS84	United Stat OH	ODOT site	6/16/2021
OGS-CSH0060B	38.47886	-82.6174	WGS84	United Stat OH	ODOT site	6/16/2021
OGS-CSH0061A	38.47994	-82.6203	WGS84	United Stat OH	ODOT site	6/16/2021
OGS-CSH0061B	38.47994	-82.6203	WGS84	United Stat OH	ODOT site	6/16/2021
OGS-CSH0061C	38.47994	-82.6203	WGS84	United Stat OH	ODOT site	6/16/2021
OGS-CSH0062A	38.4854	-82.6358	WGS84	United Stat OH	road outcro	6/17/2021
OGS-CSH0062B	38.4854	-82.6358	WGS84	United Stat OH	road outcro	6/17/2021
OGS-CSH0062C	38.4854	-82.6358	WGS84	United Stat OH	road outcro	6/17/2021
OGS-CSH0062D	38.4854	-82.6358	WGS84	United Stat OH	road outcro	6/17/2021
OGS-CSH0063A	38.4905	-82.6403	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0063B	38.4905	-82.6403	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0063C	38.4905	-82.6403	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0063D	38.4905	-82.6403	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064A	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064B	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064D	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064E	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064F	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064G	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064H	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0064I	38.49128	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0065	38.49065	-82.6419	WGS84	United Stat OH	old mine si	6/17/2021
OGS-CSH0066A	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	6/17/2021
OGS-CSH0066B	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	6/17/2021
OGS-CSH0066C	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	6/17/2021
OGS-CSH0066D	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	6/17/2021
SDH-217-1	39.17441	-87.1312	WGS84	Clay IN	Drill hole SI	7/15/2020

SDH-259a-17	38.65571	-87.5205	WGS84	Knox	IN	Drill hole SI 7/22/2020
SDH-259a-18	38.65571	-87.5205	WGS84	Knox	IN	Drill hole SI 7/22/2020
SDH-259a-19	38.65571	-87.5205	WGS84	Knox	IN	Drill hole SI 7/22/2020
SDH-259a-20	38.65571	-87.5205	WGS84	Knox	IN	Drill hole SI 7/22/2020
SDH-366-1	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-2	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-3	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-4	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-5	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-6	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-7	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-8	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-9	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-10	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-11	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
SDH-366-12	38.06214	-87.5261	WGS84	Vanderburç	IN	Drill hole SI 7/29/2020
KGS546-103.9	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-105	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-107.7	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-108.5	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-169.3	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-169.8	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-169.8Q	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-170.6	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-171.3	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-171.3Q	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-356.2	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-366	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-366Q	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-367	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-367Q	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-368	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-441.6	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-442.5	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-443.5	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-492.8	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-493.5	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
KGS546-493.5Q	37.75455	-87.8475	NAD83	United Stat	KY	KGS core 5 7/23/2020
WH20-1	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-2	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-3	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-4	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-5	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-6	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-7	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-8	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020
WH20-9	41.4343	-90.9409	NAD83		IA	Wyoming f 7/27/2020

WP20-1	40.7254	-91.5476	NAD83	IA	5 miles we	7/27/2020
SC20-1	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
SC20-2	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
SC20-3	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
SC20-4	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
SC20-5	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
SC20-6	40.8665	-92.2626	NAD83	IA	Salt Creek -	7/28/2020
RR20-1	41.376	-93.1084	NAD83	IA	Red Rock L	7/28/2020
Car20-1	41.1545	-93.1441	NAD83	IA	Carruthers	7/29/2020
Car20-2	41.1545	-93.1441	NAD83	IA	Carruthers	7/29/2020
Car20-3	41.1545	-93.1441	NAD83	IA	Carruthers	7/29/2020
330Ave20-1	41.1597	-93.1183	NAD83	IA	330th Ave	7/29/2020
330Ave20-2	41.1597	-93.1183	NAD83	IA	330th Ave	7/29/2020
330Ave20-3	41.1597	-93.1183	NAD83	IA	330th Ave	7/29/2020
330Ave20-4	41.1597	-93.1183	NAD83	IA	330th Ave	7/29/2020
WPD20-1	41.327	-94.0018	NAD83	IA	Winterset	7/30/2020
WPD20-2	41.327	-94.0018	NAD83	IA	Winterset	7/30/2020
WPD20-3	41.327	-94.0018	NAD83	IA	Winterset	7/30/2020
WPD20-4	41.327	-94.0018	NAD83	IA	Winterset	7/30/2020
NBS20-1	41.327	-94.0018	NAD83	IA	Middle Riv	7/30/2020
NBS20-2	41.327	-94.0018	NAD83	IA	Middle Riv	7/30/2020
NBS20-3	41.327	-94.0018	NAD83	IA	Middle Riv	7/30/2020
NBS20-4	41.327	-94.0018	NAD83	IA	Middle Riv	7/30/2020
MC20-1	41.057	-93.4087	NAD83	IA	510th Stre	7/30/2020
MC20-2	41.057	-93.4087	NAD83	IA	510th Stre	7/30/2020
MC20-3	41.057	-93.4087	NAD83	IA	510th Stre	7/30/2020
MC20-4	41.057	-93.4087	NAD83	IA	510th Stre	7/30/2020
MC20-5	41.057	-93.4087	NAD83	IA	510th Stre	7/30/2020
CP10-1	40.7111	-92.8657	NAD83	IA	Coal Projec	8/3/2020
CP10-2	40.7111	-92.8657	NAD83	IA	Coal Projec	8/3/2020
CP37-1	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-2	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-3	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-4	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-5	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-6	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-7	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-8	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-9	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-10	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-11	41.069	-93.809	NAD83	IA	Coal Projec	8/3/2020
CP37-12	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-13	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-14	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-15	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-16	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-17	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020

CP37-18	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-19	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-20	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-21	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-22	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-23	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
CP37-24	41.069	-93.809	NAD83	IA	Coal Projec	8/4/2020
W27556-1	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-2	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-3	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-4	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-5	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-6	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
W27556-7	40.6001	-95.5745	NAD83	IA	SW-4 River	8/4/2020
2466700_689.8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_690	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_690.3	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_691.2	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_691.8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_798.1	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_798.3	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_798.9	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_799.3	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_799.6	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_800.5	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1019	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1019.6	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1019.9	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1020.5	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1021.5	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1021.7	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1022.4	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1023	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1023.3	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1024	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1024.2	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1025	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1025.4	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1026	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1026.9	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1071.3	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1071.4	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1078.9	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1079.7	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1080.4	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1080.6	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1081	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020

2466700_1081.6	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1082.6	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1083.5	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_1084.8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_857	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_855.8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_854.8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_855.2	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_857.9	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
2466700_856.4	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	7/7/2020
14Q13-1	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-2	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-3	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-4	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-5	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-6	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-7	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-8	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-9	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-10	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-11	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-12	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-13	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-14	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-15	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-16	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-17	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
14Q13-18	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.9/4/2020	
SDH-317-1	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-2	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-3	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-4	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-5	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-6	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-7	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-317-8	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI9/4/2020	
SDH-377-1	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-2	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-3	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-4	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-5	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-6	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-7	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-8	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-9	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-10	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	
SDH-377-11	38.59692	-87.1601	WGS84	Daviess IN	Drill hole SI9/22/2020	

SDH-377-12	38.59692	-87.1601	WGS84	Daviess	IN	Drill hole SI9/22/2020
SDH-377-13	38.59692	-87.1601	WGS84	Daviess	IN	Drill hole SI9/22/2020
SDH-377-14	38.59692	-87.1601	WGS84	Daviess	IN	Drill hole SI9/22/2020
SDH-379-1	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-2	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-3	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-4	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-5	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-6	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-7	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-8	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-9	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-10	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-11	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-12	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-13	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-14	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-15	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-16	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-17	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-18	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-379-19	38.33701	-87.215	WGS84	Pike	IN	Drill hole SI8/25/2020
SDH-347-1	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-2	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-3	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-4	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-5	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-6	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-7	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-8	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-9	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-10	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-11	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-12	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-347-13	38.85156	-87.3113	WGS84	Knox	IN	Drill hole SI8/25/2020
SDH-300-1	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-2	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-3	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-4	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-5	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-6	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-7	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-8	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-9	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-10	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-11	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-12	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020

SDH-300-13	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-14	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-15	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-16	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-17	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020
SDH-300-18	39.02537	-87.4131	WGS84	Sullivan	IN	Drill hole SI9/22/2020

Method Collected	Sample Source	Depth	TREE	Y	REE+Y	Sc	REE+Y+Sc	Li
channel	artificial ex	0.0-1.0	393.75	38.1	431.85	21	452.85	66
channel	artificial ex	1.0-2.0	289.88	37.8	327.68	20	347.68	59
channel	artificial ex	2.0-2.55	306.34	37.4	343.74	20	363.74	60
channel	artificial ex	0.0-0.15	271.84	30.2	302.04	16	318.04	67
channel	artificial ex	0.0-1.0	262.29	35.6	297.89	16	313.89	65
channel	artificial ex	0.0-0.45	298.33	45.6	343.93	17	360.93	90
channel	artificial ex	0.0-0.5	247.58	33.4	280.98	15	295.98	73
channel	artificial ex	0.0-0.5	403.33	58.4	461.73	17	478.73	131
channel	artificial ex	0.5-1.0	279.39	39.8	319.19	19	338.19	104
channel	artificial ex	1.0-2.0	342.06	49.9	391.96	19	410.96	102
channel	artificial ex	2.0-3.0	354.05	53.1	407.15	18	425.15	86
channel	artificial ex	3.0-4.0	300.32	42.1	342.42	18	360.42	97
channel	artificial ex	4.0-4.9	396.67	40.1	436.77	18	454.77	121
channel	artificial ex	0.0-0.5	595.59	42.6	638.19	11	649.19	159
channel	artificial ex	0.5-1.0	214.6	25	239.6	17	256.6	92
channel	artificial ex	1.0-2.0	247.33	32.1	279.43	18	297.43	83
channel	artificial ex	2.0-3.0	262.26	35.4	297.66	17	314.66	76
channel	artificial ex	0.0-0.5	318.28	36.9	355.18	21	376.18	192
channel	artificial ex	0.5-1.0	356.41	37.3	393.71	23	416.71	164
channel	artificial ex	1.0-2.0	471.76	43	514.76	23	537.76	143
channel	artificial ex	2.0-3.0	389.8	42.8	432.6	20	452.6	123
channel	artificial ex	3.0-4.0	360.16	53.1	413.26	20	433.26	109
channel	artificial ex	0.0-0.5	262.58	34.3	296.88	20	316.88	583
channel	artificial ex	0.5-1.0	253.82	35.8	289.62	15	304.62	550
channel	artificial ex	1.0-2.0	226.88	42	268.88	11	279.88	230
channel	artificial ex	2.0-3.0	238.52	41.4	279.92	13	292.92	280
channel	artificial ex	3.0-4.0	254.38	37	291.38	15	306.38	351
channel	artificial ex	3.9-4.4	261.18	36	297.18	17	314.18	426
channel	artificial ex	0.0-0.5	328.43	44.4	372.83	16	388.83	248
channel	artificial ex	0.5-1.0	315.01	43.3	358.31	17	375.31	249
channel	artificial ex	1.0-1.7	317.86	40.7	358.56	19	377.56	250
channel	artificial ex	0.0-0.5	242.86	22.9	265.76	16	281.76	274
channel	artificial ex	0.5-1.0	238.68	27.8	266.48	13	279.48	97
channel	artificial ex	1.0-2.0	342.55	19.2	361.75	19	380.75	109
channel	artificial ex	2.0-2.35	342.89	20.6	363.49	20	383.49	75
channel	artificial ex	0.0-0.5	289.2	46.9	336.1	19	355.1	1000
channel	artificial ex	0.5-1.0	279.57	30.9	310.47	19	329.47	434
channel	artificial ex	1.0-2.0	212.35	37.2	249.55	18	267.55	356
channel	artificial ex	2.0-3.0	198.35	34.4	232.75	19	251.75	232
channel	artificial ex	3.0-4.0	180.96	22.4	203.36	19	222.36	128

channel	artificial ex 5.0-6.0	193.59	29.9	223.49	14	237.49	66
channel	artificial ex 6.0-7.0	197.26	28.7	225.96	16	241.96	74
channel	artificial ex 0.0-0.5	283.37	36.8	320.17	20	340.17	66
channel	artificial ex 1.0-2.0	276.06	37.2	313.26	20	333.26	64
channel	artificial ex 0.0-0.7	350.05	45.9	395.95	17	412.95	67
channel	artificial ex 0.0-0.5	261.03	27	288.03	18	306.03	48
channel	artificial ex 0.5-1.0	287.1	37.5	324.6	18	342.6	49
channel	artificial ex 1.0-1.8	230.18	34.2	264.38	12	276.38	27
channel	artificial ex 0.0-0.5	219.18	26.1	245.28	19	264.28	243
channel	artificial ex 0.5-1.0	273.79	24.8	298.59	16	314.59	179
channel	artificial ex 1.0-2.0	192.52	29.6	222.12	21	243.12	107
channel	artificial ex 2.0-3.0	273.9	35.3	309.2	17	326.2	178
channel	artificial ex 3.0-4.0	271.9	35	306.9	17	323.9	175
channel	artificial ex 4.0-5.0	222.94	34.3	257.24	15	272.24	313
channel	artificial ex 5.0-6.0	272.43	32.2	304.63	20	324.63	174
channel	artificial ex 6.0-7.0	405.93	31.7	437.63	18	455.63	140
channel	artificial ex 8.0-9.0	252.39	31.4	283.79	19	302.79	144
channel	artificial ex 0.0-0.5	218.77	32.8	251.57	13	264.57	213
channel	artificial ex 0.5-1.0	190.17	31.7	221.87	18	239.87	240
channel	artificial ex 1.0-2.0	317.8	35.1	352.9	30	382.9	254
channel	artificial ex 2.0-3.0	440.19	37.1	477.29	28	505.29	174
channel	artificial ex 0.0-0.5	313.75	63.4	377.15	11	388.15	37
channel	artificial ex 0.5-1.0	262.82	37.9	300.72	6	306.72	39
channel	artificial ex 1.0-2.0	264.62	39.7	304.32	8	312.32	54
channel	artificial ex 2.0-3.0	241.73	38	279.73	8	287.73	53
channel	artificial ex 3.0-4.0	240.53	37.3	277.83	10	287.83	64
channel	artificial ex 4.0-5.0	247.05	34.6	281.65	10	291.65	70
channel	artificial ex 5.0-6.35	249.16	31.3	280.46	11	291.46	78
channel	artificial ex 0.0-0.5	171.37	21.6	192.97	9	201.97	78
channel	artificial ex 0.0-0.9	225.1	29.1	254.2	15	269.2	274
channel	artificial ex 0.9-1.9	233.1	29	262.1	16	278.1	97
channel	artificial ex 1.9-2.9	310.53	39.2	349.73	17	366.73	68
channel	artificial ex 2.9-3.85	326.41	44.5	370.91	17	387.91	57
channel	artificial ex 0.0-1.0	116.1	15.1	131.2			12
Core 309-0 WVGES	1475.13'-1'	268.09	33.7	301.79	22	323.79	110
Core 309-0 WVGES	1576.36'-1'	534.24	44.7	578.94	28	606.94	205
single/grab natural exp	3	231.68	32	263.68	19	282.68	54
single/grab natural exp	2	145.5	31.6	177.1	20	197.1	74
single/grab natural exp	1	123.18	28.8	151.98	17	168.98	82
single/grab natural exp	0	175.78	34.9	210.68	17	227.68	149
single/grab natural exp	3	201.98	31.9	233.88	19	252.88	40
single/grab natural exp	2	317.74	16.2	333.94	24	357.94	63
single/grab natural exp	1	306.44	20.7	327.14	21	348.14	81
single/grab natural exp	0	247.49	21.1	268.59	20	288.59	185
single/grab natural exp	5	205.06	32.9	237.96	17	254.96	59

single/grab natural exp	4	201.38	26.4	227.78	19.2	246.98	81.9
single/grab natural exp	3	183.4	26.2	209.6	20	229.6	106
single/grab natural exp	2	192.26	29.2	221.46	20	241.46	167
single/grab natural exp	1	190.85	33.8	224.65	16	240.65	286
single/grab natural exp	0	200.39	31	231.39	19	250.39	271
channel artificial ex Surface col		276.18	34.8	310.98	27	337.98	268
channel artificial ex Surface col		237.59	48.9	286.49	27	313.49	492
channel artificial ex Surface col		226.74	42	268.74	15	283.74	99
channel artificial ex Surface col		324.94	32.7	357.64	17	374.64	85
channel artificial ex Surface col		284.85	25.7	310.55	24	334.55	99
channel artificial ex Surface col		158.99	32.1	191.09	17	208.09	60
channel artificial ex Surface col		196	34	230	18	248	38
channel artificial ex Surface col		161.32	33.4	194.72	18	212.72	66
channel artificial ex Surface col		226.22	34.8	261.02	19	280.02	51
channel artificial ex Surface col		260.32	32.8	293.12	21	314.12	42
channel artificial ex Surface col		260.68	33.7	294.38	21	315.38	42
channel artificial ex Surface col		301.77	37.4	339.17	23	362.17	55
channel artificial ex Surface col		198.4	32.3	230.7	18	248.7	45
channel artificial ex Surface col		187.52	23.8	211.32	19	230.32	37
channel artificial ex Surface col		234.9	45.2	280.1	17	297.1	24
channel artificial ex Surface col		214.69	21.6	236.29	20	256.29	94
channel artificial ex Surface col		214.94	23.9	238.84	20	258.84	96
channel artificial ex Surface col		242.27	27.5	269.77	20	289.77	79
channel artificial ex Surface col		209.58	26.6	236.18	20	256.18	55
channel artificial ex Surface col		247.72	28	275.72	17	292.72	53
channel float/collu Surface col		183.89	30	213.89	14	227.89	56
channel mine/quari Surface col		137.84	16.6	154.44	20	174.44	23
channel mine/quari Surface col		225.46	36	261.46	17	278.46	90
single/grab natural exp Surface col		199.76	38	237.76	12	249.76	24
channel mine/quari Surface col		264.42	36	300.42	23	323.42	177
channel mine/quari Surface col		266.05	36.4	302.45	22	324.45	162
channel mine/quari Surface col		199.83	40.4	240.23	20	260.23	348
channel mine/quari Surface col		175.06	31.8	206.86	26	232.86	398
channel mine/quari Surface col		181.32	31.1	212.42	26	238.42	369
channel mine/quari Surface col		197.61	30.2	227.81	19	246.81	83
channel mine/quari Surface col		207.25	36.8	244.05	18	262.05	55
channel mine/quari Surface col		268.13	39.5	307.63	21	328.63	63
channel artificial ex Surface col		412.89	29.5	442.39	37	479.39	163
channel artificial ex Surface col		351.01	24.2	375.21	35	410.21	170
channel artificial ex Surface col		331.09	39.3	370.39	18	388.39	116
channel artificial ex Surface col		242.16	26	268.16	28	296.16	95
channel artificial ex Surface col		199.02	29.2	228.22	22	250.22	54
channel artificial ex Surface col		296.48	34.7	331.18	20	351.18	77
channel artificial ex Surface col		287.81	36	323.81	20	343.81	72
channel artificial ex Surface col		319.85	42.7	362.55	20	382.55	63
channel artificial ex Surface col		155.89	17.6	173.49	16	189.49	15
channel artificial ex Surface col		241.59	17.4	258.99	16	274.99	16

channel	artificial ex Surface col	244.17	37.2	281.37	15	296.37	26	
channel	artificial ex Surface col	120.21	19	139.21	12	151.21	18	
channel	artificial ex Surface col	235.97	33	268.97	18	286.97	70	
channel	artificial ex Surface col	203.77	29.8	233.57	19	252.57	69	
channel	artificial ex Surface col	356.59	46.3	402.89	20	422.89	80	
channel	artificial ex Surface col	209.92	32.8	242.72	21	263.72	164	
channel	artificial ex Surface col	222.59	37	259.59	18	277.59	64	
channel	artificial ex Surface col	280.04	43.4	323.44	16	339.44	59	
channel	artificial ex Surface col	300.83	45.6	346.43	17	363.43	56	
channel	artificial ex Surface col	230.09	32.9	262.99	14	276.99	67	
channel	artificial ex Surface col	364.95	42.5	407.45	21	428.45	96	
channel	artificial ex Surface col	263.05	33.8	296.85	16	312.85	49	
channel	artificial ex Surface col	206.8	27.6	234.4	16	250.4	152	
channel	artificial ex Surface col	196.74	28.3	225.04	19	244.04	86	
channel	artificial ex Surface col	351.26	29.7	380.96	22	402.96	86	
channel	artificial ex Surface col	212.42	27.2	239.62	21	260.62	67	
channel	artificial ex Surface col	199.45	25	224.45	17	241.45	344	
channel	artificial ex Surface col	121.93	19.7	141.63	21	162.63	118	
channel	artificial ex Surface col	223.16	20.4	243.56	19	262.56	98	
channel	artificial ex Surface col	225.26	41.1	266.36	17	283.36	31	
channel	artificial ex Surface col	277.16	32.6	309.76	12	321.76	120	
channel	artificial ex Surface col	512.73	38.3	551.03	24	575.03	171	
channel	artificial ex Surface col	240.45	40.4	280.85	19	299.85	297	
channel	artificial ex Surface col	216.82	38.3	255.12	20	275.12	284	
channel	artificial ex Surface col	268.97	35.6	304.57	22	326.57	205	
channel	artificial ex Surface col	338.66	32.4	371.06	21	392.06	142	
channel	artificial ex Surface col	277.06	34.9	311.96	18	329.96	114	
channel	artificial ex Surface col	244.82	32.9	277.72	17	294.72	105	
channel	artificial ex Surface col	262.96	36.8	299.76	16	315.76	81	
channel	artificial ex Surface col	255.52	45.1	300.62	25	325.62	274	
channel	artificial ex Surface col	211.21	31.3	242.51	20	262.51	194	
channel	artificial ex Surface col	333.62	34.6	368.22	20	388.22	131	
channel	artificial ex Surface col	272.68	38.4	311.08	20	331.08	114	
channel	artificial ex Surface col	248.5	36	284.5	18	302.5	49	
channel	artificial ex Surface col	263.74	37.9	301.64	22	323.64	43	
channel	artificial ex Surface col	261.51	37.4	298.91	22	320.91	46	
channel	artificial ex Surface col	272.44	35.1	307.54	17	324.54	56	
channel	artificial ex Surface col	304.4	42.4	346.8	17	363.8	55	
single/grab	Pennsylvan	0	260.59	38.4	298.99	22	320.99	76
single/grab	Pennsylvan	0	286.34	29.6	315.94	24	339.94	42
Core	Pennsylvan	103	226.54	38	264.54	18	282.54	67
Core	Pennsylvan	99	668.01	82.4	750.41	22	772.41	77
Core	Pennsylvan	92.5	227.84	31.2	259.04	23	282.04	79
Core	Pennsylvan	91.7	185.93	35	220.93	24	244.93	387
Core	Pennsylvan	83.1	297.8	38	335.8	24	359.8	125
Core	Pennsylvan	123.2	290	40.6	330.6	28	358.6	807
Core	Pennsylvan	187.2	392.78	55.5	448.28	20	468.28	156

Core	Pennsylvan	65.5	220.21	34.8	255.01	19	274.01	138
Core	Pennsylvan	60.4	227.06	37.2	264.26	18	282.26	136
Core	Pennsylvan	49.2	342.35	61.1	403.45	26	429.45	1010
Core	Pennsylvan	57.46	620.75	56.8	677.55	40	717.55	194
Core	Pennsylvan	192	371.66	37.1	408.76	24	432.76	222
Core	Pennsylvan	432	237.86	36.3	274.16	23	297.16	73
Core	Pennsylvan	578	282.16	35	317.16	21	338.16	342
Core	Pennsylvan	595	180.56	31.2	211.76	21	232.76	261
Core	Pennsylvan	725	260.66	38.4	299.06	22	321.06	144
Core	Pennsylvan	729	209	35	244	21	265	230
Core	Pennsylvan	403	214.94	33.7	248.64	20	268.64	60
Core	Pennsylvan	300	156.7	28.1	184.8	26	210.8	71
Core	Pennsylvan	162.2	229.01	26.8	255.81	16	271.81	33
Core	Pennsylvan	27.4	343.79	11.5	355.29	17	372.29	73
Core	Pennsylvan	59.65	214.61	22.7	237.31	23	260.31	62
single/grab	Pennsylvan	0	285.48	42.9	328.38	26	354.38	315
single/grab	Pennsylvan	0	231.611	34.6	266.211	20	286.211	89
single/grab	Pennsylvan	0	262.26	39.7	301.96	10	311.96	39
single/grab	Pennsylvan	0	188.2	35.3	223.5	18	241.5	94
single/grab	Pennsylvan	0	205.67	49.4	255.07	25	280.07	1100
single/grab	Pennsylvan	0	146.65	29.6	176.25	18	194.25	219
single/grab	Pennsylvan	0	222.33	35.8	258.13	20	278.13	157
single/grab	Pennsylvan	0	143.41	20.6	164.01	12	176.01	59
single/grab	Pennsylvan	0	236.32	39.1	275.42	18	293.42	236
single/grab	Pennsylvan	0	303.65	38	341.65	30	371.65	255
single/grab	Pennsylvan	0	541.73	45.2	586.93	33	619.93	283
single/grab	Pennsylvan	0	362.91	66.1	429.01	21	450.01	117
single/grab	Pennsylvan	0	259.9	31.5	291.4	19	310.4	66
single/grab	Pennsylvan	0	243.44	37.5	280.94	19	299.94	73
single/grab	Pennsylvan	0	155.79	24.8	180.59	13	193.59	34
single/grab	Pennsylvan	0	282.6	33.4	316	16	332	71
single/grab	Pennsylvan	0	223.75	34.2	257.95	15	272.95	62
single/grab	Pennsylvan	0	198.98	25.4	224.38	18	242.38	31
single/grab	Pennsylvan	0	212.45	30.7	243.15	16	259.15	44
single/grab	Pennsylvan	0	411.15	47.6	458.75	22	480.75	370
single/grab	Pennsylvan	0	257.15	54.2	311.35	20	331.35	635
single/grab	Pennsylvan	0	293.89	62.8	356.69	18	374.69	240
single/grab	Pennsylvan	0	272.43	50.7	323.13	23	346.13	253
single/grab	Pennsylvan 31.5'-31.6'		119.29	20.9	140.19	20	160.19	28
single/grab	Pennsylvan 54.5'-54.6'		250.18	37.1	287.28	20	307.28	96
single/grab	Pennsylvan 119.8'-119.		229.62	41.2	270.82	15	285.82	85
single/grab	Pennsylvan 166.0-166.		222.11	33.8	255.91	18	273.91	142
single/grab	Pennsylvan 171.25'-17.		129.63	31.9	161.53	26	187.53	311
single/grab	Pennsylvan 227.1'-227.		351.9	82.4	434.3	41	475.3	149
single/grab	Pennsylvan 250.0'-250.		156.99	36.4	193.39	27	220.39	250
single/grab	Pennsylvan 378.7'-378.		242.96	39	281.96	20	301.96	281
single/grab	Pennsylvan NA		602.31	27.1	629.41	13	642.41	181

single/grab Pennsylvan NA		69.04	36	105.04	24	129.04	734
single/grab Pennsylvan NA		144.28	28.1	172.38	15	187.38	279
single/grab natural exp	5	205.64	33.3	238.94	14	252.94	60
single/grab natural exp	4	187.12	38.8	225.92	22	247.92	60
single/grab natural exp	3	203.83	44.2	248.03	28	276.03	244
single/grab natural exp	2	265.6	43.5	309.1	25	334.1	221
single/grab natural exp	1	217.93	25.9	243.83	33	276.83	297
single/grab natural exp	0	53.33	31.2	84.53	31	115.53	260
single/grab mine/quari	7	221.51	28.2	249.71	18	267.71	15
single/grab mine/quari	6	339.91	59.5	399.41	20	419.41	26
single/grab mine/quari	5	170.7	44.6	215.3	15	230.3	27
single/grab mine/quari	4	322.65	47	369.65	14	383.65	74
single/grab mine/quari	3	278.75	45	323.75	18	341.75	121
single/grab mine/quari	2	120.1	26.2	146.3	22	168.3	26
single/grab mine/quari	1	130.56	32.5	163.06	29	192.06	23
single/grab mine/quari	0	146.05	30	176.05	22	198.05	50
single/grab natural exp	6	178.29	28.7	206.99	14	220.99	24
single/grab natural exp	5	173.73	29	202.73	17	219.73	32
single/grab natural exp	4	260.29	35.6	295.89	19	314.89	42
single/grab natural exp	3	262.02	33.1	295.12	17	312.12	35
single/grab natural exp	2	213.73	34.1	247.83	18	265.83	40
single/grab natural exp	1	167.52	30.6	198.12	17	215.12	46
single/grab natural exp	0	181.55	35.7	217.25	19	236.25	118
single/grab natural exp	9	420.3	47.3	467.6	23	490.6	61
single/grab natural exp	8	142.15	27	169.15	23	192.15	76
single/grab natural exp	7	162.14	29.1	191.24	22	213.24	98
single/grab natural exp	6	188.73	30.2	218.93	23	241.93	210
single/grab natural exp	5	219.65	36	255.65	17	272.65	74
single/grab natural exp	4	193.07	31.8	224.87	15	239.87	66
single/grab natural exp	3	221.7	34.8	256.5	18	274.5	74
single/grab natural exp	2	227.58	35.6	263.18	18	281.18	68
single/grab natural exp	1	216.91	34.6	251.51	16	267.51	67
single/grab natural exp	0	245.49	36.5	281.99	19	300.99	93
single/grab natural exp	8	255.35	35	290.35	20	310.35	141
single/grab natural exp	7	286.52	39.5	326.02	22	348.02	133
single/grab natural exp	6	311.04	42.7	353.74	23	376.74	125
single/grab natural exp	5	295.5	43.4	338.9	22	360.9	133
single/grab natural exp	4	309.57	45.8	355.37	22	377.37	133
single/grab natural exp	3	248.54	38.7	287.24	23	310.24	150
single/grab natural exp	2	239.39	38.2	277.59	24	301.59	144
single/grab natural exp	1	248.33	38.2	286.53	24	310.53	145
single/grab natural exp	0	763.66	27.4	791.06	35	826.06	226
single/grab natural exp	3	204.02	25.4	229.42	25	254.42	223
single/grab natural exp	2	247.66	37.2	284.86	25	309.86	119
single/grab natural exp	1	243.99	36	279.99	23	302.99	115
single/grab natural exp	0	217.78	34.5	252.28	26	278.28	91
single/grab natural exp	6	288.16	28.3	316.46	26	342.46	258

single/grab natural exp	5	411.33	39.1	450.43	28	478.43	124
single/grab natural exp	4	377.83	40.2	418.03	23	441.03	55
single/grab natural exp	3	312.48	37.8	350.28	21	371.28	40
single/grab natural exp	2	320.79	36.5	357.29	21	378.29	53
single/grab natural exp	1	266.7	32	298.7	24	322.7	43
single/grab natural exp	0	232.2	28.5	260.7	25	285.7	37
single/grab natural exp	0	224.18	29.4	253.58	24	277.58	36
single/grab natural exp	13	198.11	30.2	228.31	16	244.31	32
single/grab natural exp	12	214.67	33	247.67	20	267.67	84
single/grab natural exp	11	211.9	29.9	241.8	18	259.8	108
single/grab natural exp	10	214.32	32.9	247.22	18	265.22	108
single/grab natural exp	9	243.04	30.3	273.34	18	291.34	106
single/grab natural exp	8	246.41	37.1	283.51	18	301.51	86
single/grab natural exp	7	252.09	39.9	291.99	19	310.99	90
single/grab natural exp	6	273.51	42.6	316.11	17	333.11	81
single/grab natural exp	5	264.77	36.8	301.57	17	318.57	88
single/grab natural exp	4	247.92	35.7	283.62	18	301.62	91
single/grab natural exp	3	279.26	33.3	312.56	19	331.56	107
single/grab natural exp	2	245.28	31.3	276.58	18	294.58	102
single/grab natural exp	1	233.54	29.3	262.84	18	280.84	106
single/grab natural exp	0	227.1	28.1	255.2	18	273.2	105
single/grab natural exp	0	227.96	30.5	258.46	17	275.46	104
single/grab natural exp	6	222.33	33	255.33	21	276.33	87
single/grab natural exp	5	251.41	36.9	288.31	21	309.31	77
single/grab natural exp	4	249.62	36.6	286.22	21	307.22	75
single/grab natural exp	3	262.1	39.3	301.4	21	322.4	73
single/grab natural exp	2	277.4	41.1	318.5	21	339.5	70
single/grab natural exp	1	277.77	37.2	314.97	22	336.97	118
single/grab natural exp	0	219.76	31.2	250.96	24	274.96	411
single/grab natural exp	8	222.08	36.1	258.18	17	275.18	116
single/grab natural exp	7	183.05	30.4	213.45	14	227.45	103
single/grab natural exp	6	216.36	33.6	249.96	18	267.96	230
single/grab natural exp	5	279.25	26.4	305.65	25	330.65	493
single/grab natural exp	4	257.95	29.9	287.85	55	342.85	289
single/grab natural exp	3	276.89	27.5	304.39	24	328.39	160
single/grab natural exp	2	236.29	31.9	268.19	19	287.19	115
single/grab natural exp	1	268.68	35.1	303.78	20	323.78	116
single/grab natural exp	0	319.53	47.6	367.13	24	391.13	187
single/grab natural exp	16	259.82	46.2	306.02	22	328.02	72
single/grab natural exp	15	257.51	41.8	299.31	20	319.31	79
single/grab natural exp	14	263.09	39.8	302.89	20	322.89	97
single/grab natural exp	13	253.93	43.5	297.43	17	314.43	79
single/grab natural exp	12	293	51.5	344.5	18	362.5	82
single/grab natural exp	11	260.45	48.6	309.05	19	328.05	84
single/grab natural exp	10	265.22	48.4	313.62	19	332.62	89
single/grab natural exp	9	251.1	42.5	293.6	18	311.6	93
single/grab natural exp	8	263.48	49.3	312.78	21	333.78	93

single/grab natural exp	7	226.19	38.9	265.09	14	279.09	47
single/grab natural exp	6	241.67	39.8	281.47	15	296.47	57
single/grab natural exp	5	470.1	33.7	503.8	18	521.8	144
single/grab natural exp	4	260.34	31.6	291.94	21	312.94	137
single/grab natural exp	3	232.34	27.1	259.44	20	279.44	122
single/grab natural exp	2	253.73	31.9	285.63	19	304.63	118
single/grab natural exp	1	262.33	29.2	291.53	21	312.53	134
single/grab natural exp	0	273.27	31.6	304.87	22	326.87	128
single/grab natural exp	4	458.03	54.9	512.93	24	536.93	55
single/grab natural exp	3	305.03	37.9	342.93	19	361.93	53
single/grab natural exp	2	252.52	38.7	291.22	21	312.22	74
single/grab natural exp	1	223.08	34.8	257.88	21	278.88	98
single/grab natural exp	0	201.67	34.9	236.57	22	258.57	158
single/grab natural exp	0	190.1	38	228.1	18	246.1	327
channel artificial ex Surface col		227.27	42.9	270.17	12	282.17	42
channel artificial ex Surface col		154.51	20.6	175.11	14	189.11	92
channel natural exp Surface col		203.53	26.8	230.33	18	248.33	194
channel artificial ex Surface col		197.08	29.2	226.28	15	241.28	244
channel artificial ex Surface col		211.77	28.4	240.17	14	254.17	177
channel artificial ex Surface col		177.05	34.4	211.45	15	226.45	71
channel artificial ex Surface col		186.66	31	217.66	17	234.66	71
channel artificial ex Surface col		318.19	49.4	367.59	17	384.59	42
channel artificial ex Surface col		218.79	31.2	249.99	19	268.99	72
channel artificial ex Surface col		439.8	51	490.8	19	509.8	65
channel artificial ex Surface col		228.18	33.1	261.28	19	280.28	26
channel artificial ex Surface col		259.04	35.9	294.94	18	312.94	64
channel artificial ex Surface col		276.73	35.6	312.33	18	330.33	67
channel artificial ex Surface col		277.38	39.4	316.78	19	335.78	57
channel artificial ex Surface col		217.03	34.2	251.23	18	269.23	44
channel artificial ex Surface col		239.85	36.8	276.65	13	289.65	184
channel artificial ex Surface col		150.76	28.1	178.86	12	190.86	158
channel artificial ex Surface col		190.54	31.4	221.94	12	233.94	134
channel artificial ex Surface col		185.22	31.2	216.42	12	228.42	79
channel artificial ex Surface col		208.1	37.6	245.7	13	258.7	88
channel artificial ex Surface col		280.45	37.2	317.65	15	332.65	111
channel artificial ex Surface col		382.39	51.4	433.79	16	449.79	105
channel artificial ex Surface col		310.74	41.4	352.14	17	369.14	131
channel artificial ex Surface col		159.18	20.5	179.68	11	190.68	153
channel artificial ex Surface col		191.85	28.8	220.65	16	236.65	258
channel artificial ex Surface col		210.31	28.2	238.51	15	253.51	128
channel artificial ex Surface col		200.62	24.9	225.52	10	235.52	71
channel artificial ex Surface col		239.96	46.4	286.36	13	299.36	48
channel artificial ex Surface col		202.98	36.2	239.18	14	253.18	56
channel artificial ex Surface col		197.02	31.6	228.62	16	244.62	36
channel artificial ex Surface col		352.41	40.9	393.31	14	407.31	33
channel artificial ex Surface col		202.46	31.5	233.96	13	246.96	60
channel artificial ex Surface col		212.55	41.1	253.65	17	270.65	299

channel	artificial ex Surface col	210.11	29.8	239.91	19	258.91	93
channel	artificial ex Surface col	197.34	39.5	236.84	21	257.84	223
channel	artificial ex Surface col	266.34	36.9	303.24	21	324.24	297
channel	artificial ex Surface col	205.41	34.8	240.21	18	258.21	88
channel	artificial ex Surface col	197.15	34.4	231.55	23	254.55	265
channel	artificial ex Surface col	164.98	29.2	194.18	18	212.18	160
channel	artificial ex Surface col	230.96	33.4	264.36	19	283.36	137
channel	artificial ex Surface col	182.26	30.8	213.06	18	231.06	113
channel	artificial ex Surface col	163.38	29.9	193.28	15	208.28	81
channel	artificial ex Surface col	177.28	27.7	204.98	16	220.98	80
channel	artificial ex Surface col	193.94	32.4	226.34	18	244.34	85
channel	artificial ex Surface col	215.11	33.4	248.51	18	266.51	95
channel	artificial ex Surface col	139.47	33.5	172.97	14	186.97	131
channel	artificial ex Surface col	130.12	26.8	156.92	16	172.92	103
channel	artificial ex Surface col	155.76	28.1	183.86	20	203.86	126
channel	artificial ex Surface col	499.36	51	550.36	25	575.36	134
channel	artificial ex Surface col	351.94	39.6	391.54	21	412.54	118
channel	artificial ex Surface col	284.13	39.5	323.63	21	344.63	110
channel	artificial ex Surface col	251.44	32.7	284.14	21	305.14	116
channel	artificial ex Surface col	194.92	33.7	228.62	10	238.62	90
channel	artificial ex Surface col	150.74	31.1	181.84	12	193.84	84
channel	artificial ex Surface col	284.04	30.7	314.74	21	335.74	119
channel	artificial ex Surface col	170.34	31.3	201.64	10	211.64	175
channel	artificial ex Surface col	133.58	33	166.58	8	174.58	159
channel	artificial ex Surface col	155.48	25.1	180.58	7	187.58	142
channel	artificial ex Surface col	238.94	35.6	274.54	21	295.54	73
channel	artificial ex Surface col	223.7	41.1	264.8	17	281.8	224
channel	artificial ex Surface col	201.2	33.2	234.4	15	249.4	144
channel	artificial ex Surface col	187.34	33.1	220.44	12	232.44	128
channel	artificial ex Surface col	194.33	29	223.33	21	244.33	128
channel	artificial ex Surface col	289.15	44.5	333.65	17	350.65	232
channel	artificial ex Surface col	234.14	39.1	273.24	16	289.24	363
channel	artificial ex Surface col	178.33	36.9	215.23	10	225.23	130
channel	artificial ex Surface col	192.5	31.4	223.9	8	231.9	43
channel	artificial ex Surface col	241.38	29.3	270.68	20	290.68	88
channel	artificial ex Surface col	239.73	28.8	268.53	21	289.53	101
channel	artificial ex Surface col	265.2	19.9	285.1	19	304.1	150
channel	artificial ex Surface col	198.09	19	217.09	20	237.09	115
channel	artificial ex Surface col	167.46	24.1	191.56	21	212.56	61
channel	artificial ex Surface col	320.88	51.4	372.28	21	393.28	50
channel	artificial ex Surface col	199.27	24.3	223.57	20	243.57	76
channel	artificial ex Surface col	225.13	28.9	254.03	19	273.03	69
channel	artificial ex Surface col	207.97	32.4	240.37	18	258.37	47
channel	artificial ex Surface col	208.02	31.8	239.82	17	256.82	48
channel	artificial ex Surface col	188.98	29.5	218.48	19	237.48	56
channel	artificial ex Surface col	243.69	30.3	273.99	13	286.99	53
channel	artificial ex Surface col	246.02	29.4	275.42	17	292.42	282

channel	artificial ex Surface col	254.82	33.6	288.42	18	306.42	278
channel	artificial ex Surface col	283.88	38.7	322.58	16	338.58	180
channel	artificial ex Surface col	178.62	30.6	209.22	14	223.22	106
channel	artificial ex Surface col	283.3	36.1	319.4	18	337.4	251
channel	artificial ex Surface col	223.42	36.8	260.22	16	276.22	68
channel	artificial ex Surface col	165.97	28	193.97	8	201.97	47
channel	artificial ex Surface col	247.66	35.5	283.16	10	293.16	89
channel	mine/quar Surface col	266.59	40.8	307.39	19	326.39	90
channel	mine/quar Surface col	207.24	34.6	241.84	15	256.84	140
channel	mine/quar Surface col	191.08	32.9	223.98	16	239.98	164
channel	mine/quar Surface col	201.22	35.2	236.42	14	250.42	105
channel	mine/quar Surface col	237.87	22	259.87	16	275.87	72
channel	mine/quar Surface col	325.8	38.1	363.9	12	375.9	59
channel	mine/quar Surface col	228.5	32.2	260.7	13	273.7	71
channel	mine/quar Surface col	231.41	33.9	265.31	11	276.31	49
channel	artificial ex Surface col	348.28	48.9	397.18	18	415.18	89
channel	artificial ex Surface col	271.08	41.6	312.68	19	331.68	80
channel	artificial ex Surface col	280.49	35.9	316.39	19	335.39	171
channel	artificial ex Surface col	232.15	32.7	264.85	20	284.85	249
channel	artificial ex Surface col	243.96	26.8	270.76	18	288.76	103
channel	artificial ex Surface col	228.51	24.8	253.31	18	271.31	56
channel	artificial ex Surface col	236.81	36.3	273.11	17	290.11	236
channel	artificial ex Surface col	238.62	30.8	269.42	20	289.42	110
channel	artificial ex Surface col	211.56	28	239.56	22	261.56	72
channel	artificial ex Surface col	123.75	19.1	142.85	26	168.85	59
channel	artificial ex Surface col	580.56	40	620.56	22	642.56	113
channel	artificial ex Surface col	1292.86	28	1320.86	12	1332.86	186
channel	artificial ex Surface col	370.84	31.4	402.24	22	424.24	114
channel	mine/quar Surface col	233.3	28.1	261.4	18	279.4	67
channel	mine/quar Surface col	266.61	28.5	295.11	18	313.11	68
channel	mine/quar Surface col	264.75	41.6	306.35	21	327.35	76
channel	mine/quar Surface col	229.31	36.5	265.81	20	285.81	77
channel	mine/quar Surface col	355.13	43.2	398.33	23	421.33	96
channel	mine/quar Surface col	337.33	42.3	379.63	25	404.63	95
channel	mine/quar Surface col	328.36	42.2	370.56	23	393.56	91
channel	mine/quar Surface col	351.32	43.3	394.62	24	418.62	107
channel	mine/quar Surface col	346.44	53.3	399.74	24	423.74	143
channel	mine/quar Surface col	296.24	30.3	326.54	24	350.54	183
channel	mine/quar Surface col	245.91	32.1	278.01	23	301.01	107
channel	mine/quar Surface col	273.49	40.4	313.89	22	335.89	91
channel	mine/quar Surface col	325.42	51.2	376.62	21	397.62	69
channel	mine/quar Surface col	214.94	35.4	250.34	12	262.34	51
channel	mine/quar Surface col	179.49	21.4	200.89	23	223.89	36
channel	mine/quar Surface col	558.98	38.5	597.48	34	631.48	140
channel	mine/quar Surface col	314.62	32.4	347.02	19	366.02	112
channel	mine/quar Surface col	213.64	42.2	255.84	18	273.84	74
single/grab drill core	126	18.55	4.5	23.05		23.05	

single/grab drill core	128.5	60.37	15.2	75.57	7	82.57	17
single/grab drill core	130.5	247.26	40.5	287.76	16	303.76	119
single/grab drill core	135	234.97	38	272.97	12	284.97	44
single/grab drill core	140	215.94	40.8	256.74	11	267.74	40
single/grab drill core	140.2	110.11	9.6	119.71		119.71	
single/grab drill core	141.3	233.02	41.2	274.22	20	294.22	215
single/grab drill core	143.5	268.37	45	313.37	19	332.37	61
single/grab drill core	161	254.66	33.8	288.46	20	308.46	98
single/grab drill core	163.5	98.2	8.7	106.9		106.9	
single/grab drill core	167	272.08	43.5	315.58	20	335.58	204
single/grab drill core	171	272.51	43.7	316.21	17	333.21	151
single/grab drill core	178	179.57	34.7	214.27	10	224.27	34
single/grab drill core	224	225.93	31.5	257.43	22	279.43	67
single/grab drill core	230	190.72	33.6	224.32	13	237.32	46
single/grab drill core	309.5	196.22	28.5	224.72	17	241.72	58
single/grab drill core	310.5	11.91	2.8	14.71		14.71	
single/grab drill core	313	276.8	31.5	308.3	23	331.3	215
single/grab drill core	317.5	1205.93	74.2	1280.13	22	1302.13	47
single/grab drill core	237	209.23	26.5	235.73	21	256.73	50
single/grab drill core	239.2	354.67	30.1	384.77	21	405.77	40
single/grab drill core	338	193.61	31.1	224.71	17	241.71	48
single/grab drill core	341	21.13	4.2	25.33		25.33	
single/grab drill core	342.5	133.32	24.3	157.62	22	179.62	258
single/grab drill core	345.2	690.05	38.5	728.55	20	748.55	89
single/grab drill core	350	222.11	26.3	248.41	15	263.41	61
single/grab drill core	352.5	208.71	25.8	234.51	19	253.51	48
single/grab drill core	363.1	13.12	3.7	16.82		16.82	
single/grab drill core	366	183.86	28.3	212.16	17	229.16	34
single/grab drill core	366.5	8.63	4.6	13.23		13.23	
single/grab drill core	369.2	153.09	26.7	179.79	21	200.79	129
single/grab drill core	371.2	308.19	35.8	343.99	22	365.99	48
single/grab drill core	430	271.36	54.2	325.56	17	342.56	40
single/grab drill core	433	36.35	8.5	44.85		44.85	28
single/grab drill core	436	175.37	30	205.37	18	223.37	48
single/grab drill core	532.7	84.79	8.6	93.39	14	107.39	40
single/grab drill core	533.7	18.12	5.5	23.62	5	28.62	
single/grab drill core	534.5	108.84	20.7	129.54	11	140.54	21
single/grab drill core	538.7	180.79	35.5	216.29	14	230.29	83
single/grab drill core	542.7	173.37	27.6	200.97	14	214.97	125
single/grab drill core	649.5	166.67	29.6	196.27	15	211.27	38
single/grab drill core	651.5	241.67	44.8	286.47	16	302.47	67
single/grab drill core	675.6	188.43	30.4	218.83	20	238.83	45
single/grab drill core	680.2	19.05	6.7	25.75		25.75	
single/grab drill core	683.2	222.28	29.5	251.78	18	269.78	55
single/grab drill core	685.4	232.89	28.7	261.59	15	276.59	45
single/grab drill core	696.5	214.09	31	245.09	19	264.09	58
single/grab drill core	701.9	184.32	33.2	217.52	18	235.52	40

single/grab drill core	703.6	279.3	31.4	310.7	20	330.7	45
single/grab drill core	724.6	234.77	52.4	287.17	18	305.17	50
single/grab drill core	725.6	27.91	4.5	32.41	5	37.41	20
single/grab drill core	727.3	128.09	37.4	165.49	14	179.49	252
single/grab drill core	203	16.8	5.4	22.2	6	28.2	
single/grab drill core	204	211.6	29.7	241.3	21	262.3	76
single/grab drill core	207	468.46	38.3	506.76	22	528.76	72
single/grab drill core	213.5	401.44	36.5	437.94	21	458.94	117
single/grab drill core	239	61.06	13.4	74.46		74.46	
single/grab drill core	244	237.35	30.4	267.75	21	288.75	114
single/grab drill core	347.5	46.26	7.9	54.16		54.16	13
single/grab drill core	348.6	197.33	27.4	224.73	18	242.73	39
single/grab drill core	352.6	201.39	35.1	236.49	12	248.49	30
single/grab drill core	442.7	109.01	17.6	126.61	16	142.61	32
single/grab drill core	445	29.61	7.5	37.11		37.11	
single/grab drill core	448	181.37	29.9	211.27	15	226.27	28
single/grab drill core	103.9	71.92	17.7	89.62	9	98.62	20
single/grab drill core	105	281.32	35.3	316.62	20	336.62	128
single/grab drill core	107.7	286.4	35.7	322.1	19	341.1	122
single/grab drill core	108.5	294.17	39.3	333.47	19	352.47	111
single/grab drill core	169.3	277.36	45.4	322.76	19	341.76	142
single/grab drill core	169.8	197.04	31.5	228.54	21	249.54	111
single/grab drill core	169.8	206.64	32	238.64	20	258.64	115
single/grab drill core	170.6	342.88	49.9	392.78	18	410.78	80
single/grab drill core	171.3	305.67	38.5	344.17	14	358.17	53
single/grab drill core	171.3	266.1	36.2	302.3	14	316.3	56
single/grab drill core	365.2	106.61	23.2	129.81	14	143.81	34
single/grab drill core	366	254.41	36.7	291.11	19	310.11	55
single/grab drill core	366	231.31	33.7	265.01	19	284.01	57
single/grab drill core	367	202.17	34.3	236.47	19	255.47	57
single/grab drill core	367	205.41	36	241.41	19	260.41	62
single/grab drill core	368	185.71	26	211.71	10	221.71	47
single/grab drill core	441.6	86.67	14.3	100.97	5	105.97	12
single/grab drill core	442.5	184.73	25.4	210.13	16	226.13	28
single/grab drill core	443.5	193.86	32.4	226.26	16	242.26	32
single/grab drill core	492.8	197.1	24.9	222	14	236	218
single/grab drill core	493.5	288.06	40.6	328.66	18	346.66	169
single/grab drill core	493.5	276.17	40.4	316.57	19	335.57	178
single/grab artificial ex 3' below lo		254.2	34.1	288.3	13	301.3	109
single/grab artificial ex 2' below lo		290.7	42.7	333.4	20	353.4	190
single/grab artificial ex 1' below lo		311.43	43.4	354.83	18	372.83	176
single/grab artificial ex 3' below m		137.17	26.6	163.77	18	181.77	169
single/grab artificial ex 2' below m		159.36	27.7	187.06	17	204.06	156
single/grab artificial ex 1' below m		171.7	32.8	204.5	19	223.5	269
single/grab artificial ex 3' below uq		119.34	22.8	142.14	5	147.14	13
single/grab artificial ex 2' below uq		110.99	20.8	131.79		131.79	14
single/grab artificial ex 1' below uq		142.32	23.5	165.82	7	172.82	19

single/grab natural exposure/outc	234.38	37.2	271.58	19	290.58	200
single/grab natural exp v.lt.gr sh ~2	175.89	32.4	208.29	18	226.29	65
single/grab natural exp gr-bn sh ~1	171.69	27.1	198.79	13	211.79	104
single/grab natural exp ~3' below l	456.76	40	496.76	17	513.76	123
single/grab natural exp ~1' below l	189.98	27.6	217.58	17	234.58	256
single/grab natural exp below upper	287.72	55.9	343.62	18	361.62	87
composite natural exp above upper	177.9	25.9	203.8	18	221.8	39
single/grab natural exp just below	148.04	34.1	182.14	18	200.14	446
single/grab artificial ex ~5' below c	149.63	28.7	178.33	13	191.33	97
single/grab artificial ex ~3' below c	154.04	23.3	177.34	23	200.34	61
single/grab artificial ex just below	123.31	19.4	142.71	11	153.71	21
single/grab artificial ex ~6' below c	261.6	32.1	293.7	21	314.7	76
single/grab artificial ex ~4' below c	250.12	28.2	278.32	26	304.32	70
single/grab artificial ex ~2' below c	113.76	32	145.76	15	160.76	74
single/grab artificial ex just below	79.99	24.9	104.89	12	116.89	331
single/grab mine/quar just below	232.51	38	270.51	12	282.51	33
single/grab mine/quar 1' below St	150.45	22.7	173.15	13	186.15	41
single/grab mine/quar 2' below St	143.58	22.1	165.68	14	179.68	42
single/grab mine/quar 3' below St	252.02	26.1	278.12	16	294.12	32
single/grab natural exp upper cont	218.28	35.4	253.68	15	268.68	45
single/grab natural exp 2' below cc	140	21.2	161.2	14	175.2	38
single/grab natural exp 3' below cc	234.16	22.5	256.66	14	270.66	37
single/grab natural exp 4' below cc	135.69	19.5	155.19	14	169.19	37
single/grab natural exp just under l	217.85	32	249.85	17	266.85	83
single/grab natural exp ~1' below N	237.6	39.4	277	15	292	72
single/grab natural exp ~2' below N	159.17	23.6	182.77	13	195.77	50
single/grab natural exp ~3' below N	188.72	31	219.72	18	237.72	52
single/grab natural exp ~4' below N	183.18	28.1	211.28	16	227.28	65
composite drill core 426-427'	122.8	25.5	148.3	17	165.3	662
composite drill core 427-248'	179.54	26	205.54	20	225.54	183
single/grab drill core 487.4-487.7'	196.55	29.2	225.75	24	249.75	145
single/grab drill core 486.3-486.6'	255.91	29.9	285.81	23	308.81	153
single/grab drill core 306.3-306.6'	196.13	28.9	225.03	20	245.03	49
single/grab drill core 304.4-304.7'	145.41	24.2	169.61	18	187.61	78
single/grab drill core 303-303.4'	127.72	19.7	147.42	19	166.42	126
single/grab drill core 167.2-167.5'	157.17	19.6	176.77	16	192.77	63
single/grab drill core 128.2-128.5'	157.43	30	187.43	16	203.43	39
single/grab drill core 124.4-124.7'	361.25	29.5	390.75	18	408.75	44
single/grab drill core 121.8-122.1'	131.67	20.1	151.77	19	170.77	61
single/grab drill core 119.0-119.3'	175.19	28	203.19	19	222.19	59
single/grab drill core 117.35-117.6'	219.66	28.8	248.46	20	268.46	78
single/grab drill core 114.3-114.6'	166.08	25.9	191.98	19	210.98	51
single/grab drill core 112.8-113.1'	154.38	21.6	175.98	17	192.98	35
single/grab drill core 111.7-112.0'	450.11	23.9	474.01	15	489.01	39
single/grab drill core 97.7-97.9'	125.09	19.2	144.29	11	155.29	20
single/grab drill core 96.1-96.2'	113.36	19.3	132.66	15	147.66	29
single/grab drill core 91.1-91.2'	265.57	23.8	289.37	18	307.37	41

single/grab drill core	88.9-89.1'	196.33	28.7	225.03	18	243.03	42
single/grab drill core	87.1-87.3'	206.7	25.3	232	19	251	36
single/grab drill core	84.6-84.7'	315.92	60.3	376.22	14	390.22	15
single/grab drill core	82.3-82.4'	111.95	20.1	132.05	20	152.05	97
composite drill core	81.0-81.7'	138.21	23	161.21	19	180.21	101
single/grab drill core	58.7-58.7	134.82	23.9	158.72	14	172.72	29
single/grab drill core	57.4-57.5'	431.74	13.4	445.14	19	464.14	57
single/grab drill core	193.2-193.4	160.87	16.2	177.07	23	200.07	144
single/grab drill core	222.6-222.7	138.64	24.1	162.74	17	179.74	50
composite drill core	255.5-256.1	138.77	23.8	162.57	13	175.57	37
single/grab drill core	291.4-291.5	168.77	31.8	200.57	16	216.57	63
single/grab drill core	473.5-473.7	115.66	11.4	127.06	20	147.06	108
composite drill core	513-514'	204.95	18.2	223.15	19	242.15	96
single/grab drill core	642.8-642.9	112.48	18.1	130.58	14	144.58	64
single/grab drill core	689.8	208.46	31	239.46	18	257.46	122
single/grab drill core	690	248.65	32.4	281.05	14	295.05	130
single/grab drill core	690.3	228	33.4	261.4	13	274.4	75
single/grab drill core	691.2	257.26	42.3	299.56	15	314.56	74
single/grab drill core	691.8	408.23	94.8	503.03	17	520.03	67
single/grab drill core	798.1	202.87	16.6	219.47	12	231.47	65
single/grab drill core	798.3	251.46	29.6	281.06	16	297.06	107
single/grab drill core	798.9	244.03	34.6	278.63	16	294.63	121
single/grab drill core	799.3	257.13	33.9	291.03	16	307.03	94
single/grab drill core	799.6	286.99	36.9	323.89	18	341.89	100
single/grab drill core	800.5	308.18	36.7	344.88	15	359.88	85
single/grab drill core	1019	262.63	31	293.63	19	312.63	64
single/grab drill core	1019.6	249.67	29.3	278.97	21	299.97	80
single/grab drill core	1019.9	270.85	32	302.85	22	324.85	72
single/grab drill core	1020.5	201.77	27.9	229.67	21	250.67	79
single/grab drill core	1021.5	330.27	39.4	369.67	17	386.67	98
single/grab drill core	1021.7	244.85	44.9	289.75	19	308.75	60
single/grab drill core	1022.4	232.55	46.8	279.35	16	295.35	38
single/grab drill core	1023	225.7	51.3	277	17	294	60
single/grab drill core	1023.3	218.18	42.1	260.28	15	275.28	68
single/grab drill core	1024	283.48	50	333.48	17	350.48	56
single/grab drill core	1024.2	475.01	42.2	517.21	15	532.21	61
single/grab drill core	1025	265.98	37.3	303.28	14	317.28	54
single/grab drill core	1025.4	231.49	42.9	274.39	15	289.39	38
single/grab drill core	1026	257.89	45.8	303.69	16	319.69	61
single/grab drill core	1026.9	189.36	64.6	253.96	18	271.96	31
single/grab drill core	1071.3	140.08	14.6	154.68		154.68	11
single/grab drill core	1071.4	141.41	30.5	171.91	13	184.91	17
single/grab drill core	1078.9	230.62	35.6	266.22	21	287.22	178
single/grab drill core	1079.7	220.36	32	252.36	19	271.36	144
single/grab drill core	1080.4	278.63	46.9	325.53	22	347.53	131
single/grab drill core	1080.6	427.29	99	526.29	22	548.29	129
single/grab drill core	1081	401.47	51.5	452.97	20	472.97	157

single/grab drill core	1081.6	257.58	58.8	316.38	17	333.38	96
single/grab drill core	1082.6	197.43	32.3	229.73	10	239.73	40
single/grab drill core	1083.5	196.38	36.7	233.08	15	248.08	97
single/grab drill core	1084.8	227.98	66	293.98	15	308.98	37
single/grab drill core	857	233.15	39.9	273.05	17	290.05	57
single/grab drill core	855.8	282.2	55	337.2	32	369.2	98
single/grab drill core	854.8	162.2	32.5	194.7	20	214.7	212
single/grab drill core	855.2	151.3	30.5	181.8	19	200.8	190
single/grab drill core	857.9	219.64	36.9	256.54	17	273.54	67
single/grab drill core	856.4	227.18	36.3	263.48	15	278.48	103
single/grab drill core	41.4	200.98	78	278.98	13	291.98	26
single/grab drill core	42.4	12.73	8	20.73		20.73	
single/grab drill core	45	342.4	266	608.4	8	616.4	61
single/grab drill core	46	266.49	27.7	294.19	23	317.19	185
single/grab drill core	49	249.92	39.9	289.82	14	303.82	77
single/grab drill core	57	9.43	6.6	16.03		16.03	
single/grab drill core	57.5	178.19	26.2	204.39	14	218.39	61
single/grab drill core	58.5	157.17	31.1	188.27	13	201.27	39
single/grab drill core	93.5	189.52	31	220.52	14	234.52	45
single/grab drill core	94.8	20.36	3.7	24.06	14	38.06	
single/grab drill core	96.5	224.34	37.9	262.24	23	285.24	219
single/grab drill core	97.8	192.7	33.9	226.6	25	251.6	89
single/grab drill core	148.9	93.88	7.6	101.48	10	111.48	14
single/grab drill core	150.6	335.19	35.8	370.99	25	395.99	328
single/grab drill core	154	185.24	28.6	213.84	24	237.84	61
single/grab drill core	215	19.99	9.6	29.59		29.59	
single/grab drill core	216.5	533.04	102	635.04	26	661.04	182
single/grab drill core	218.5	231.19	46.7	277.89	16	293.89	52
single/grab drill core	66.8	201.43	74.1	275.53	14	289.53	30
single/grab drill core	71	140.18	21.6	161.78	18	179.78	56
single/grab drill core	79	218.22	39	257.22	17	274.22	47
single/grab drill core	89.7	207.49	53.2	260.69	19	279.69	32
single/grab drill core	93.5	235.86	38.9	274.76	16	290.76	31
single/grab drill core	105.7	291.76	119	410.76	18	428.76	43
single/grab drill core	109.2	580.5	26	606.5	33	639.5	294
single/grab drill core	111	147.57	31.9	179.47	23	202.47	530
single/grab drill core	60.3	148.47	21.1	169.57	14	183.57	31
single/grab drill core	62.3	267.46	30.3	297.76	18	315.76	57
single/grab drill core	64.5	276.74	42	318.74	16	334.74	55
single/grab drill core	118.5	182.12	39.2	221.32	14	235.32	32
single/grab drill core	162.4	202.94	19.1	222.04	19	241.04	32
single/grab drill core	164.1	193.24	37.1	230.34	15	245.34	50
single/grab drill core	166.4	316.19	32.9	349.09	20	369.09	141
single/grab drill core	195.3	210.8	55.6	266.4	12	278.4	33
single/grab drill core	198.2	266.39	38.5	304.89	24	328.89	197
single/grab drill core	208.2	202.1	46.3	248.4	21	269.4	164
single/grab drill core	238	156.6	31	187.6	22	209.6	276

single/grab drill core	240.8	223.92	35.1	259.02	23	282.02	58
single/grab drill core	312.5	259.65	33.5	293.15	23	316.15	222
single/grab drill core	314.7	232.17	31.8	263.97	25	288.97	119
single/grab drill core	114.5	126.72	27.2	153.92	10	163.92	24
single/grab drill core	118.4	194.09	55	249.09	13	262.09	28
single/grab drill core	119.4	11.97	5.6	17.57		17.57	
single/grab drill core	121.2	192.81	28.3	221.11	19	240.11	70
single/grab drill core	124.4	246.84	33.3	280.14	19	299.14	128
single/grab drill core	130.9	267.55	40.7	308.25	26	334.25	205
single/grab drill core	210.2	245.34	37.5	282.84	19	301.84	44
single/grab drill core	212.3	115.91	30.6	146.51	10	156.51	26
single/grab drill core	214.4	11.46	5.5	16.96		16.96	
single/grab drill core	215.8	108.77	30	138.77	18	156.77	106
single/grab drill core	218.1	147.27	34.1	181.37	17	198.37	73
single/grab drill core	221.2	248.4	24.8	273.2	20	293.2	118
single/grab drill core	253.6	493.75	208	701.75	18	719.75	60
single/grab drill core	257.1	263.74	27.9	291.64	20	311.64	124
single/grab drill core	259.1	373.29	31.2	404.49	16	420.49	86
single/grab drill core	287.4	233.53	44.7	278.23	17	295.23	33
single/grab drill core	289.3	187.52	26.7	214.22	15	229.22	43
single/grab drill core	291.5	285.12	32.1	317.22	32	349.22	196
single/grab drill core	294.4	189.87	32.2	222.07	16	238.07	49
single/grab drill core	69	217.29	33.7	250.99	15	265.99	51
single/grab drill core	71	48.38	7.3	55.68	6	61.68	30
single/grab drill core	74	127.32	28.6	155.92	24	179.92	215
single/grab drill core	76.2	235.28	43.5	278.78	19	297.78	46
single/grab drill core	101.7	274.56	40.8	315.36	18	333.36	45
single/grab drill core	105.2	24.61	4.6	29.21		29.21	
single/grab drill core	109.1	256.17	66.3	322.47	16	338.47	37
single/grab drill core	114.7	185.13	26.2	211.33	22	233.33	128
single/grab drill core	118.6	289.24	55.2	344.44	17	361.44	50
single/grab drill core	169.3	281.96	28.6	310.56	19	329.56	138
single/grab drill core	173.9	42.4	7.1	49.5		49.5	19
single/grab drill core	176.4	194.85	29.6	224.45	21	245.45	118
single/grab drill core	178.2	204.37	35.2	239.57	20	259.57	76
single/grab drill core	148	327.46	33.3	360.76	20	380.76	145
single/grab drill core	149.8	257.45	40.5	297.95	18	315.95	45
single/grab drill core	180.8	43.33	5	48.33	6	54.33	14
single/grab drill core	183.5	206.15	71.3	277.45	15	292.45	39
single/grab drill core	185.1	186.59	20.9	207.49	19	226.49	44
single/grab drill core	190.8	115.69	25.7	141.39	8	149.39	25
single/grab drill core	255.8	201.68	32	233.68	15	248.68	32
single/grab drill core	261.7	13.53	2.4	15.93		15.93	
single/grab drill core	262	270.14	38.7	308.84	17	325.84	37
single/grab drill core	267.3	193.79	31.5	225.29	15	240.29	32
single/grab drill core	273.3	147.57	28.2	175.77	12	187.77	29
single/grab drill core	350.3	164.23	32.8	197.03	14	211.03	30

single/grab drill core	352	10.1	5.7	15.8		15.8	
single/grab drill core	354.8	218.22	23.3	241.52	19	260.52	73
single/grab drill core	357.5	224.82	27.1	251.92	17	268.92	76
single/grab drill core	403	262.59	41.9	304.49	19	323.49	49
single/grab drill core	435	168.71	10.6	179.31	10	189.31	79
single/grab drill core	436.2	200.32	36.7	237.02	15	252.02	205

sedimentar	claystone	Monongah pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Monongah pennsylvan	not minera	not altered	6"	sample ~2'	below A transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample below A	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample ~1'	below B transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~1'	below C transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~1'	below D transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, 1'	below E transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~1'	below F transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	6"	sample, ~1'	below A transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	6"	sample ~1'	below B transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	6"	sample below A	transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	~6"	sample, below B	transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	~6"	sample, below C	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample below A	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	~6"	sample, below B	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	~6"	sample, below C	transitional
sedimentar	claystone	Conemaugl pennsylvan	not minera	not altered	12"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	12"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample ~2'	below A transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample ~2'	below B transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~2'	below C transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~2'	below D transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~2'	below E transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample, ~2'	below F transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample ~2'	below A transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample ~2'	below B transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample, ~2'	below C transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample, ~2'	below D transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample, ~2'	below E transitional
sedimentar	claystone	Pottsville - pennsylvan	not minera	not altered	6"	sample, ~2'	below F transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	uppermost, 6"	sample	transitional
sedimentar	claystone	Allegheny - pennsylvan	not minera	not altered	6"	sample ~2'	below A transitional
sedimentar	Shale	Llewellyn F pennsylvanian					Sampled on highwall of abandone
sedimentar	Shale	Pottsville F pennsylvanian					Sampled on highwall of abandone
sedimentar	Silty Clayst	Pottsville F pennsylvanian					Sample taken 103.0 ft to 103.4 ft b
sedimentar	Claystone	Pottsville F pennsylvanian					Sample taken 99.0 ft to 99.2 ft bel
sedimentar	Claystone	Pottsville F pennsylvanian					Sample taken 92.5 ft to 92.8 ft bel
sedimentar	Claystone	Pottsville F pennsylvanian					Sample taken 91.7 ft to 92.0 ft bel
sedimentar	Claystone	Pottsville F pennsylvanian					Sample taken 83.1 ft to 83.8 ft bel
sedimentar	Silty Clayst	Pottsville F pennsylvanian					Sample taken 123.2 ft to 123.4 ft b
sedimentar	Siltstone	Pottsville F pennsylvanian					Sample taken 187.2 ft to 187.5 ft b

sedimentar coal	Minshall Cc pennsylvan disseminat not altered	Bended dull coal, vitrai continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Massive grey siltstone continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Massive light grey silts continental
sedimentar shale	shale abov pennsylvan disseminat not altered	Horizontal to rippled la marine
sedimentar coal	Upper Bloc pennsylvan disseminat not altered	Bended coal, vitrain la continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Claystone, intense roo continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Massive greenish-grey continental
sedimentar shale	shale abov pennsylvan disseminat not altered	Massive black shale. marine
sedimentar coal	Lower Bloc pennsylvan disseminat not altered	Bended coal. continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Massive mudstone, pla continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Massive mudstone, roa continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Grey medium grain sar continental
sedimentar paleosol	Maria Cree pennsylvan disseminat argillitic	Bluish-grey mudstone, continental
sedimentar paleosol	Maria Cree pennsylvan disseminat argillitic	Light grey fined graine continental
sedimentar shale	shale abov pennsylvan disseminat not altered	Light grey massive sha marine
sedimentar coal	Danville Co pennsylvan disseminat not altered	Bended bright coal. continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Grey mudstone to clay continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Grey mudstone, slicker continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Grey massive mudston continental
sedimentar paleosol	paleosol be pennsylvan disseminat argillitic	Greenish-grey claystor continental
sedimentar shale	shale abov pennsylvan disseminat not altered	Grey, horizontally lami marine
sedimentar coal	Danville Co pennsylvan disseminat not altered	Bended coal, vitrain la continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, slicken continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, rootin continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, slicken continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, slicken continental
sedimentar coal	Hymera Co pennsylvan disseminat not altered	Bended coal, calcite or continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone, rootin continental
sedimentar coal	Herrin Coal pennsylvan disseminat not altered	Bended coal. continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, plant f continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone to clay continental
sedimentar shale	Turner Min pennsylvan disseminat not altered	Black massive shale. marine
sedimentar coal	Springfield pennsylvan disseminat not altered	Bended coal, vitrain la continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone with c continental
sedimentar shale	Excello Sha pennsylvan disseminat not altered	Black massive shale. marine
sedimentar coal	Houchin Cr pennsylvan disseminat not altered	Bended coal, calcite or continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey massive mudston continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Massive light grey silts continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Massive light grey silts continental
sedimentar shale	Mecca Qua pennsylvan disseminat not altered	Black massive shale. marine
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Massive light grey silts continental
sedimentar shale	shale abov pennsylvan disseminat not altered	Dark grey massive sha marine
sedimentar coal	Upper Seel pennsylvan disseminat not altered	Bended coal, calcite or continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone, rootin continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Light grey massive silts continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Light grey claystone, sl continental
sedimentar shale	Carrier Mill pennsylvan disseminat not altered	Black massive shale. marine

sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey massive siltstone	continental
sedimentar shale	Veale Sha pennsylvan disseminat not altered	Black massive shale.	marine
sedimentar coal	Wise Ridge pennsylvan disseminat not altered	Bended coal, highly ox	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey massive mudston	continental
sedimentar coal	Danville Co pennsylvan disseminat not altered	Bended coal.	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey massive mudston	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Dark grey claystone, sl	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, somet	continental
sedimentar coal	Hymera Co pennsylvan disseminat not altered	Bended coal, vitrain la	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone, aband	continental
sedimentar coal	Springfield pennsylvan disseminat not altered	Bended coal.	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone, rootin	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Light grey siltstone to l	continental
sedimentar shale	Excello Sha pennsylvan disseminat not altered	Black, organic rich shal	marine
sedimentar coal	Houchin Cr pennsylvan disseminat not altered	Bended to bended brig	continental
sedimentar paleosol	paleosol ur pennsylvan disseminat argillitic	Grey massive mudston	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Dark grey shale with ir	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Dark grey shale with ir	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Dark grey shale	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Dark grey shale	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey green firecla	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey green firecla	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey green firecla	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey green firecla	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey sandy shale	continental
sedimentar claystone	Shelburn F1 pennsylvan not minera not altered	Light grey sandy shale	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Black shale with phosp	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green sandy	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green sandy	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Dark grey shaley mudf	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Dark grey shaley mudf	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green sandy	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Coal	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Dark grey shale with c	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green silty sl	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Black shale with coal st	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green massi	continental
sedimentar claystone	Carbondale pennsylvan not minera not altered	Light grey green massi	continental
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional
sedimentar mudstone	Caseyville f pennsylvan not minera not altered		transitional
sedimentar mudstone	Caseyville f pennsylvan not minera not altered		transitional
sedimentar mudstone	Caseyville f pennsylvan not minera not altered		transitional
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional
sedimentar shale	Caseyville f pennsylvan not minera not altered		transitional

sedimentar mudstone	Davis	pennsylvan not minera	argillitic	
sedimentar mudstone	Davis	pennsylvan not minera	argillitic	
sedimentar mudstone	Davis	pennsylvan not minera	argillitic	
sedimentar mudstone	Davis	pennsylvan not minera	argillitic	
sedimentar mudstone	Springfield	pennsylvan not minera	argillitic	
sedimentar mudstone	springfield	pennsylvan not minera	argillitic	
sedimentar mudstone	springfield	pennsylvan not minera	argillitic	
sedimentar mudstone	springfield	pennsylvan not minera	argillitic	
sedimentar mudstone	springfield	pennsylvan not minera	argillitic	
sedimentar shale	Mecca Qua	pennsylvan disseminat	not altered	Dark grey to black mas marine
sedimentar coal	Colchester	pennsylvan disseminat	not altered	Bended coal, vitrain la continental
sedimentar coal	Upper Seel	pennsylvan disseminat	not altered	Bended coal with kaoli continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey crumbled claysto continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Light grey crumbled ck continental
sedimentar coal	Lower Seel	pennsylvan disseminat	not altered	Bended coal continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey claystone, plant f continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Light grey to yellowish continental
sedimentar shale	Veale Shale	pennsylvan disseminat	not altered	Dark grey to black mas marine
sedimentar coal	Wise Ridge	pennsylvan disseminat	not altered	Bended coal, thin vitra continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey claystone, rootinç continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey claystone, rootinç continental
sedimentar coal	Viking B Co	pennsylvan disseminat	not altered	Bended coal, calcite in continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey claystone, plant f continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Dark grey claystone, pl continental
sedimentar coal	Upper Bloc	pennsylvan disseminat	not altered	Bended coal, fusain on continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Dark grey mudstone, p continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey mudstone, rootin continental
sedimentar shale	Mecca Qua	pennsylvan disseminat	not altered	Dark grey to black mas marine
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Light grey claystone, pl continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Light grey claystone, pl continental
sedimentar shale	Carrier Mill	pennsylvan disseminat	not altered	Dark grey to black mas marine
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey mudstone, rootin continental
sedimentar shale	Veale Shale	pennsylvan disseminat	not altered	Dark grey to black mas marine
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Dark grey mudstone, p continental
sedimentar paleosol	paleosol ur	pennsylvan disseminat	argillitic	Grey-yellowish mudstc continental
sedimentar shale	Excello Sha	pennsylvan disseminat	not altered	Grey shale, very fissile. marine
sedimentar paleosol	Houchin Cr	pennsylvan disseminat	argillitic	Light grey to greenish continental
sedimentar paleosol	Houchin Cr	pennsylvan disseminat	argillitic	Black massive shale continental
sedimentar shale	Mecca Qua	pennsylvan disseminat	not altered	Bended to banded-brig marine
sedimentar shale	Carrier Mill	pennsylvan disseminat	not altered	Grey-brownish massiv marine
sedimentar paleosol	Carrier Mill	pennsylvan disseminat	argillitic	Greenish-brown massi continental
sedimentar paleosol	Carrier Mill	pennsylvan disseminat	argillitic	Grey massive limeston continental
sedimentar shale	Veale Shale	pennsylvan disseminat	not altered	Black massive shale marine
sedimentar paleosol	Wise Ridge	pennsylvan disseminat	argillitic	Bended to branded-bri continental
sedimentar paleosol	Wise Ridge	pennsylvan disseminat	argillitic	Grey mudstone, comr continental
sedimentar paleosol	Viking B Co	pennsylvan disseminat	argillitic	Light gray to yellow-gr continental

sedimentary paleosol	Viking B Co pennsylvan disseminat argillitic	Black massive organic continental
sedimentary paleosol	Upper Bloc pennsylvan disseminat argillitic	Dark grey to black shal continental
sedimentary paleosol	Upper Bloc pennsylvan disseminat argillitic	Grey mudstone with a continental
sedimentary shale	Excello Sha pennsylvan disseminat not altered	Black massive shale marine
sedimentary shale	Excello Sha pennsylvan disseminat not altered	Black massive shale marine
sedimentary coal	Houchin Cr pennsylvan disseminat not altered	Bended coal, vitrain be continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Light gray claystone, rc continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Grey mudstone, massi continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Gray mudstone, slicker continental
sedimentary shale	Mecca Qua pennsylvan disseminat not altered	Black massive shale, marine
sedimentary shale	Mecca Qua pennsylvan disseminat not altered	Black massive shale, br marine
sedimentary coal	Colchester pennsylvan disseminat not altered	Bended coal with fusai continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Brownish grey claystor continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Light gray claystone, sl continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Gray massive clayston continental
sedimentary shale	Carrier Mill pennsylvan disseminat not altered	Black massive shale, h marine
sedimentary shale	Carrier Mill pennsylvan disseminat not altered	Grey shale, horizontal marine
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Grey claystone, slicken continental
sedimentary shale	Veale Shale pennsylvan disseminat not altered	Dark grey to black ma marine
sedimentary shale	Veale Shale pennsylvan disseminat not altered	Dark grey massive shal marine
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Brownish-gray claystor continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Light gray claystone, sl continental
sedimentary shale	shale above pennsylvan disseminat not altered	Gray massive shale wit marine
sedimentary coal	Danville Co pennsylvan disseminat not altered	Bended bright coal wit continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Massive light gray clay continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Massive light gray-bro continental
sedimentary shale	shale above pennsylvan disseminat not altered	Dark gray shale with h marine
sedimentary coal	Hymera Co pennsylvan disseminat not altered	Bended coal with calci continental
sedimentary shale	Anna Shale pennsylvan disseminat not altered	Black shale with horizc marine
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Light gray claystone, rc continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Massive, light gray mu continental
sedimentary shale	shale above pennsylvan disseminat not altered	Gray to dark gray mass marine
sedimentary coal	Springfield pennsylvan disseminat not altered	Bended coal continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Light gray massive clay continental
sedimentary paleosol	paleosol ur pennsylvan disseminat argillitic	Massive, very hard gre continental
sedimentary paleosol	Danville Co pennsylvan disseminat argillitic	Dark grey massive shal continental
sedimentary paleosol	Danville Co pennsylvan disseminat argillitic	Light grey mudstone, r continental
sedimentary coal	Hymera Co pennsylvan disseminat not altered	Grey-yellowish massiv continental
sedimentary shale	Anna Shale pennsylvan disseminat not altered	Grey massive shale marine
sedimentary shale	Energy Sha pennsylvan disseminat not altered	Grey massive shale, ge marine
sedimentary paleosol	Herrin Coal pennsylvan disseminat argillitic	Grey massive mudston continental
sedimentary shale	Turner Min pennsylvan disseminat not altered	Light grey massive mu marine
sedimentary coal	Springfield pennsylvan disseminat not altered	Black massive to horizc continental
sedimentary paleosol	Springfield pennsylvan disseminat argillitic	Grey massive mudston continental
sedimentary paleosol	Springfield pennsylvan disseminat argillitic	Grey massive mudston continental
sedimentary paleosol	Springfield pennsylvan disseminat argillitic	Grey to brownish grey continental
sedimentary shale	Excello Sha pennsylvan disseminat not altered	Light grey massive mu marine

sedimentar coal	Houchin Cr pennsylvan disseminat not altered	Grey massive mudston	continental
sedimentar paleosol	Houchin Cr pennsylvan disseminat argillitic	Grey mudstone, slicken	continental
sedimentar paleosol	Houchin Cr pennsylvan disseminat argillitic	Grey claystone, slicken	continental
sedimentar shale	Mecca Qua pennsylvan disseminat not altered	Light grey with browni	marine
sedimentar shale	Coaly shale pennsylvan disseminat not altered	Bended coal with com	marine
sedimentar paleosol	Seelyville C pennsylvan disseminat argillitic	Black massive to horiz	continental

SOURCE_ ROCK (Metamorphic rocks only)	METAMORPHISM (Metamorphic rocks only)	FACIES_GRADE (Metamorphic rocks only)	Job No.	Lab No.	Field No.	Sample Description	Rep	Test Comments
			MRP-1956:	C-534866	231-036-B1			1
			MRP-1956:	C-534867	231-036-B2			1
			MRP-1956:	C-534868	231-036-B3			1
			MRP-1956:	C-534869	230-092D-UC			1
			MRP-1956:	C-534872	230-092D-LC			1
			MRP-1956:	C-534873	230-092B-UC			1
			MRP-1956:	C-534874	230-092B-LC			1
			MRP-1956:	C-534875	231-093-B1			1
			MRP-1956:	C-534876	231-093-B2			1
			MRP-1956:	C-534877	231-093-B3			1
			MRP-1956:	C-534878	231-093-B4			1
			MRP-1956:	C-534879	231-093-B5			1
			MRP-1956:	C-534880	231-093-B6			1
			MRP-1956:	C-534883	50-092A-B1			1
			MRP-1956:	C-534884	50-092A-B2			1
			MRP-1956:	C-534885	50-092A-B3			1
			MRP-1956:	C-534886	50-092A-B4			1
			MRP-1956:	C-534887	214-093C-B1			1
			MRP-1956:	C-534888	214-093C-B2			1
			MRP-1956:	C-534889	214-093C-B3			1
			MRP-1956:	C-534890	214-093C-B4			1
			MRP-1956:	C-534891	214-093C-B5			1
			MRP-1956:	C-534892	214-093B-B1			1
			MRP-1956:	C-534894	214-093B-B2			1
			MRP-1956:	C-534895	214-093B-B3			1
			MRP-1956:	C-534897	214-093B-B4			1
			MRP-1956:	C-534898	214-093B-B5			1
			MRP-1956:	C-534899	214-093B-B6			1
			MRP-1956:	C-534900	214-093A-B1			1
			MRP-1956:	C-534901	214-093A-B2			1
			MRP-1956:	C-534902	214-093A-B3			1
			MRP-1956:	C-534903	MD-14-B1			1
			MRP-1956:	C-534904	MD-14-B2			1
			MRP-1956:	C-534905	MD-14-B3			1
			MRP-1956:	C-534906	MD-14-B4			1
			MRP-1956:	C-534907	MD-15-B1			1
			MRP-1956:	C-534909	MD-15-B2			1
			MRP-1956:	C-534910	MD-15-B3			1
			MRP-1956:	C-534911	MD-15-B4			1
			MRP-1956:	C-534912	MD-15-B5			1

MRP-1956; C-534914	MD-15-B7	1
MRP-1956; C-534915	MD-15-B8	1
MRP-1956; C-534917	230-092A-B1	1
MRP-1956; C-534918	230-092A-B2	1
MRP-1956; C-534952	230-092G	1
MRP-1956; C-534920	50-092B-B1	1
MRP-1956; C-534921	50-092B-B2	1
MRP-1956; C-534922	50-092B-B3	1
MRP-1956; C-534923	50-080-B1	1
MRP-1956; C-534924	50-080-B2	1
MRP-1956; C-534925	50-080-B3	1
MRP-1956; C-534926	50-080-B4	1
MRP-1956; C-534927	50-080-B5	1
MRP-1956; C-534928	50-080-B6	1
MRP-1956; C-534929	50-080-B7	1
MRP-1956; C-534931	50-080-B8	1
MRP-1956; C-534933	50-080-B9	1
MRP-1956; C-534934	272-095-B1	1
MRP-1956; C-534935	272-095-B2	1
MRP-1956; C-534936	272-095-B3	1
MRP-1956; C-534937	272-095-B4	1
MRP-1956; C-534938	230-092D-B1	1
MRP-1956; C-534939	230-092D-B2	1
MRP-1956; C-534940	230-092D-B3	1
MRP-1956; C-534941	230-092D-B4	1
MRP-1956; C-534942	230-092D-B5	1
MRP-1956; C-534943	230-092D-B6	1
MRP-1956; C-534944	230-092D-B7	1
MRP-1956; C-534945	90-037	1
MRP-1956; C-534946	230-092F-B1	1
MRP-1956; C-534947	230-092F-B2	1
MRP-1956; C-534948	230-092F-B3	1
MRP-1956; C-534950	230-092F-B4	1
MRP-1956; C-534951	50-092B-US	1

MRP-1934; C-528341	WV-EMRI-209	Brecciated; matrix is medium gray
MRP-1934; C-528342	WV-EMRI-210	Dark gray to black; soft; shaly; fine
MRP-1934; C-528324	MD-9-A	4 samples total, depth is measure
MRP-1934; C-528325	MD-9-B	
MRP-1934; C-528326	MD-9-C	
MRP-1934; C-528328	MD-9-D	
MRP-1934; C-528330	MD-14-A	4 samples total, depth is measure
MRP-1934; C-528331	MD-14-B	
MRP-1934; C-528332	MD-14-C	
MRP-1934; C-528333	MD-14-D	
MRP-1934; C-528334	MD-15-A	6 samples total, depth is measure

	MRP-1934 C-528335	MD-15-B		
	MRP-1934 C-528337	MD-15-C		
	MRP-1934 C-528338	MD-15-D		
	MRP-1934 C-528339	MD-15-E		
	MRP-1934 C-528340	MD-15-F		
	MRP-1955 C-534507	OGS-CSH0001A	uppermost	1
	MRP-1955 C-534508	OGS-CSH0001B	6" sample	1
	MRP-1955 C-534510	OGS-CSH0002	6" sample	1
	MRP-1955 C-534511	OGS-CSH0003A	uppermost	1
	MRP-1955 C-534513	OGS-CSH0003B	6" sample	1
	MRP-1955 C-534514	OGS-CSH0003C	6" sample	1
	MRP-1955 C-534515	OGS-CSH0003D	6" sample	1
	MRP-1955 C-534516	OGS-CSH0003E	6" sample	1
	MRP-1955 C-534517	OGS-CSH0003F	6" sample	1
	MRP-1955 C-534518	OGS-CSH0004A	uppermost	1
	MRP-1955 C-534520	OGS-CSH0004B	6" sample	1
	MRP-1955 C-534521	OGS-CSH0004C	6" sample	1
	MRP-1955 C-534522	OGS-CSH0005	6" sample	1
	MRP-1955 C-534524	OGS-CSH0006	6" sample	1
	MRP-1955 C-534525	OGS-CSH0007	6" sample	1
	MRP-1955 C-534526	OGS-CSH0008A	uppermost	1
	MRP-1955 C-534527	OGS-CSH0008B	6" sample	1
	MRP-1955 C-534528	OGS-CSH0008C	6" sample	1
	MRP-1955 C-534529	OGS-CSH0009A	uppermost	1
	MRP-1955 C-534530	OGS-CSH0009B	6" sample	1
	MRP-1955 C-534531	OGS-CSH0010	~1.5' samp	1
	MRP-1955 C-534532	OGS-CSH0011	~1.2' samp	1
	MRP-1955 C-534533	OGS-CSH0012	~2.5-3' sam	1
	MRP-1955 C-534535	OGS-CSH0013	~12" sampl	1
	MRP-1955 C-534537	OGS-CSH0014A	uppermost	1
	MRP-1955 C-534538	OGS-CSH0014B	~1.5' samp	1
	MRP-1955 C-534539	OGS-CSH0015A	uppermost	1
	MRP-1955 C-534540	OGS-CSH0015B	6" sample	1
	MRP-1955 C-534541	OGS-CSH0015C	6" sample	1
	MRP-1955 C-534542	OGS-CSH0016A	uppermost	1
	MRP-1955 C-534543	OGS-CSH0016B	6" sample	1
	MRP-1955 C-534544	OGS-CSH0016C	6" sample	1
	MRP-1955 C-534545	OGS-CSH0017A	uppermost	1
	MRP-1955 C-534546	OGS-CSH0017B	6" sample	1
	MRP-1955 C-534548	OGS-CSH0017C	6" sample	1
	MRP-1955 C-534549	OGS-CSH0017D	6" sample	1
	MRP-1955 C-534550	OGS-CSH0017E	6" sample	1
	MRP-1955 C-534551	OGS-CSH0018A	uppermost	1
	MRP-1955 C-534552	OGS-CSH0018B	6" sample	1
	MRP-1955 C-534553	OGS-CSH0018C	6" sample	1
	MRP-1955 C-534555	OGS-CSH0019A	uppermost	1
	MRP-1955 C-534556	OGS-CSH0019B	6" sample	1

	MRP-1955: C-534558	OGS-CSH0020A	uppermost	1
	MRP-1955: C-534559	OGS-CSH0020B	6" sample	1
	MRP-1955: C-534561	OGS-CSH0021A	uppermost	1
	MRP-1955: C-534562	OGS-CSH0021B	6" sample	1
	MRP-1955: C-534563	OGS-CSH0021C	6" sample	1
	MRP-1955: C-534564	OGS-CSH0021D	6" sample	1
	MRP-1955: C-534565	OGS-CSH0021E	6" sample	1
	MRP-1955: C-534567	OGS-CSH0021F	6" sample	1
	MRP-1955: C-534568	OGS-CSH0021G	6" sample	1
	MRP-1955: C-534569	OGS-CSH0022A	uppermost	1
	MRP-1955: C-534570	OGS-CSH0022B	6" sample	1
	MRP-1955: C-534572	OGS-CSH0022C	6" sample	1
	MRP-1955: C-534573	OGS-CSH0023A	uppermost	1
	MRP-1955: C-534574	OGS-CSH0023B	6" sample	1
	MRP-1955: C-534575	OGS-CSH0023C	~6" sample	1
	MRP-1955: C-534576	OGS-CSH0023D	~6" sample	1
	MRP-1955: C-534577	OGS-CSH0024A	uppermost	1
	MRP-1955: C-534578	OGS-CSH0024B	6" sample	1
	MRP-1955: C-534579	OGS-CSH0024C	~6" sample	1
	MRP-1955: C-534580	OGS-CSH0024D	~6" sample	1
	MRP-1955: C-534581	OGS-CSH0025	12" sample	1
	MRP-1955: C-534583	OGS-CSH0026	12" sample	1
	MRP-1955: C-534585	OGS-CSH0027A	uppermost	1
	MRP-1955: C-534586	OGS-CSH0027B	6" sample	1
	MRP-1955: C-534587	OGS-CSH0027C	6" sample	1
	MRP-1955: C-534588	OGS-CSH0027D	6" sample	1
	MRP-1955: C-534589	OGS-CSH0027E	6" sample	1
	MRP-1955: C-534590	OGS-CSH0027F	6" sample	1
	MRP-1955: C-534591	OGS-CSH0027G	6" sample	1
	MRP-1955: C-534592	OGS-CSH0028A	uppermost	1
	MRP-1955: C-534593	OGS-CSH0028B	6" sample	1
	MRP-1955: C-534594	OGS-CSH0028C	6" sample	1
	MRP-1955: C-534595	OGS-CSH0028D	6" sample	1
	MRP-1955: C-534596	OGS-CSH0028E	6" sample	1
	MRP-1955: C-534598	OGS-CSH0028F	6" sample	1
	MRP-1955: C-534599	OGS-CSH0028G	6" sample	1
	MRP-1955: C-534600	OGS-CSH0029A	uppermost	1
	MRP-1955: C-534601	OGS-CSH0029B	6" sample	1
	MRP-1956: C-534954	PAGS-WeiserSF-	Sampled or	1
	MRP-1956: C-534955	PAGS-WeiserSF-	Sampled or	1
	MRP-1956: C-534957	IND063_2361_1	Sample tak	1
	MRP-1956: C-534958	IND063_2361_9	Sample tak	1
	MRP-1956: C-534960	IND063_2361_9	Sample tak	1
	MRP-1956: C-534961	IND063_2361_9	Sample tak	1
	MRP-1956: C-534962	IND063_2361_8	Taken 83.1	1
	MRP-1956: C-534963	IND063_2362_1	Sample tak	1
	MRP-1956: C-534964	IND063_2363_1	Sample tak	1

ow ground surface. Sample taken	MRP-1956: C-534965	IND063_2363_6	Sample tak	1
ow ground surface. Sample taken	MRP-1956: C-534966	IND063_2363_6	Sample tak	1
ow ground surface. Sampled by A.	MRP-1956: C-534968	IND063_2363_4	Sample tak	1
below ground surface. Sample take	MRP-1956: C-534969	IND0632363_57	Sample tak	1
ft below ground surfacace. Sample t	MRP-1956: C-534971	IND063_2364_1	Sample tak	1
of coal.	MRP-1956: C-534972	HW21-002_432	Sampled 1.	1
of coal.	MRP-1956: C-534973	HW21-002_578	Sample tak	1
il.	MRP-1956: C-534974	HW21-002_595	Sampled 1.	1
coal.	MRP-1956: C-534975	HW21-002_725	Sampled 0.	1
al.	MRP-1956: C-534976	HW21-002_729	Sampled 0.	1
	MRP-1956: C-534977	BRU21-001_403		1
	MRP-1956: C-534979	KJ21-002_300		1
	MRP-1956: C-534980	PAGS-MB-1901		1
	MRP-1956: C-534981	PAGS-MB-1904		1
	MRP-1956: C-534982	PAGS-NV-1905		1
of coal. Sampled by A.D.Bierly (Per	MRP-1956: C-534984	MRI-23_Top	Sample tak	1
of coal. Sampled by A.D.Bierly (Per	MRP-1956: C-534985	MRI-23_Base	Sample tak	1
of coal. Sampled by A.D.Bierly (Per	MRP-1956: C-534986	MRI-24	Sample tak	1
3 ft-thick carbonaceous shale bind	MRP-1956: C-534988	MRI-25	1.05 ft thic	1
with 0.1 ft coal (locally cut out) und	MRP-1956: C-534989	MRI-26D	Exposure d	1
with 0.1 ft coal (locally cut out) und	MRP-1956: C-534990	MRI-26E	Exposure d	1
ed within the first 1.5 feet below b	MRP-1956: C-534991	MRI-27	0.3 ft-thick	1
of coal. Sampled by A.D.Bierly (P	MRP-1956: C-534992	MRI-28C	Sampled 0.	1
of coal. Sampled by A.D.Bierly (P	MRP-1956: C-534993	MRI-28D_Top	Sampled 0.	1
ase of coal. Sampled by A.D.Bierly	MRP-1956: C-534995	MRI-28D_Base	Sampled 1.	1
of coal. Sampled by A.D.Bierly (P	MRP-1956: C-534996	MRI-28M	Sampled 0.	1
of coal. Sampled by A.D.Bierly (P	MRP-1956: C-534997	MRI-28Q	Sampled 0.	1
of coal. Sampled by A.D.Bierly (P	MRP-1956: C-534998	MRI-28X	Sampled 0.	1
of coal. From 0.0 ft to 2.0 ft below	MRP-1956: C-534999	MRI-29_Top	Sampled 2.	1
se of coal. From 0.0 ft to 2.0 ft bel	MRP-1956: C-535000	MRI-29_Base	Sampled 2.	1
ase of coal. Sampled by A.D.Bierly	MRP-1956: C-535001	MRI-30E_Top	Sampled 0.	1
ase of coal. Sampled by A.D.Bierly	MRP-1956: C-535002	MRI-30E_Base	Sampled 1.	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535003	MRI-30K	Sample tak	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535004	MRI-30LK	Sample tak	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535006	MRI-31_Top	Sample tak	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535007	MRI-31_Mid1	Sample tak	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535008	MRI-31_Mid2	Sample tak	1
/ base of coal. Sampled by A.D.Bier	MRP-1956: C-535009	MRI-31_Base	Sample tak	1
	MRP-1934: C-528313	TGS872DH5_31_Core		
	MRP-1934: C-528319	TGS872DH5_54_Core		
	MRP-1934: C-528311	TGS872DH5_115_Core		
	MRP-1934: C-528316	TGS872DH5_166_Core		
	MRP-1934: C-528318	TGS872DH5_171_Core		
	MRP-1934: C-528314	TGS872DH5_227_Core		
	MRP-1934: C-528317	TGS872DH5_25C_Core		
	MRP-1934: C-528312	TGS872DH4_378_Core		
nsylvania boundary	MRP-1934: C-528320	MRI-22-C	Flint clay on the Mississippian-Pen	

nsylvania boundary
nsylvania boundary

MRP-1934; C-528321 MRI-22-E
MRP-1934; C-528322 MRI-22-D
MRP-1934; C-528303 MD-6-A
MRP-1934; C-528304 MD-6-B
MRP-1934; C-528305 MD-6-C
MRP-1934; C-528307 MD-6-D
MRP-1934; C-528309 MD-6-E
MRP-1934; C-528310 MD-6-F
MRP-1934; C-528344 MD-1-A
MRP-1934; C-528345 MD-1-B
MRP-1934; C-528346 MD-1-C
MRP-1934; C-528347 MD-1-D
MRP-1934; C-528348 MD-1-E
MRP-1934; C-528350 MD-1-F
MRP-1934; C-528351 MD-1-G
MRP-1934; C-528352 MD-1-H
MRP-1934; C-528354 MD-2-A
MRP-1934; C-528355 MD-2-B
MRP-1934; C-528356 MD-2-C
MRP-1934; C-528357 MD-2-D
MRP-1934; C-528358 MD-2-E
MRP-1934; C-528359 MD-2-F
MRP-1934; C-528360 MD-2-G
MRP-1934; C-528361 MD-3-A
MRP-1934; C-528362 MD-3-B
MRP-1934; C-528364 MD-3-C
MRP-1934; C-528366 MD-3-D
MRP-1934; C-528367 MD-3-E
MRP-1934; C-528368 MD-3-F
MRP-1934; C-528369 MD-3-G
MRP-1934; C-528370 MD-3-H
MRP-1934; C-528371 MD-3-I
MRP-1934; C-528372 MD-3-J
MRP-1934; C-528373 MD-4-A
MRP-1934; C-528375 MD-4-B
MRP-1934; C-528376 MD-4-C
MRP-1934; C-528377 MD-4-D
MRP-1934; C-528378 MD-4-E
MRP-1934; C-528379 MD-4-F
MRP-1934; C-528380 MD-4-G
MRP-1934; C-528381 MD-4-H
MRP-1934; C-528382 MD-4-I
MRP-1935; C-528384 MD-5-A 4
MRP-1935; C-528385 MD-5-B
MRP-1935; C-528386 MD-5-C
MRP-1935; C-528387 MD-5-D
MRP-1935; C-528388 MD-7-A 8

Flint clay on the Mississippian-Pen
Flint clay on the Mississippian-Pen
6 samples total, depth is measure

8 samples total, depth is measure

7 samples total, depth is measure

10 samples total, depth is measure

9 samples total, depth is measure

4 samples total, depth is measure

8 samples total, depth is measure

MRP-1935(C-528390	MD-7-B	
MRP-1935(C-528391	MD-7-C	
MRP-1935(C-528393	MD-7-D	
MRP-1935(C-528394	MD-7-E	
MRP-1935(C-528395	MD-7-F	
MRP-1935(C-528396	MD-7-G	
MRP-1935(C-528397	MD-7-H	
MRP-1935(C-528398	MD-8-A	15 samples total, depth is measur
MRP-1935(C-528399	MD-8-B	
MRP-1935(C-528401	MD-8-C	
MRP-1935(C-528402	MD-8-D	
MRP-1935(C-528403	MD-8-E	
MRP-1935(C-528404	MD-8-F	
MRP-1935(C-528406	MD-8-G	
MRP-1935(C-528407	MD-8-H	
MRP-1935(C-528408	MD-8-I	
MRP-1935(C-528409	MD-8-J	
MRP-1935(C-528411	MD-8-K	
MRP-1935(C-528412	MD-8-L	
MRP-1935(C-528413	MD-8-M	
MRP-1935(C-528414	MD-8-N	
MRP-1935(C-528415	MD-8-O	
MRP-1935(C-528416	MD-10-A	7 samples total, depth is measure
MRP-1935(C-528417	MD-10-B	
MRP-1935(C-528418	MD-10-C	
MRP-1935(C-528419	MD-10-D	
MRP-1935(C-528420	MD-10-E	
MRP-1935(C-528421	MD-10-F	
MRP-1935(C-528423	MD-10-G	
MRP-1935(C-528424	MD-11-A	9 samples total, depth is measure
MRP-1935(C-528425	MD-11-B	
MRP-1935(C-528426	MD-11-C	
MRP-1935(C-528427	MD-11-D	
MRP-1935(C-528429	MD-11-E	
MRP-1935(C-528431	MD-11-F	
MRP-1935(C-528432	MD-11-G	
MRP-1935(C-528433	MD-11-H	
MRP-1935(C-528434	MD-11-I	
MRP-1935(C-528435	MD-12-A	17 samples total, depth is measur
MRP-1935(C-528436	MD-12-B	
MRP-1935(C-528437	MD-12-C	
MRP-1935(C-528438	MD-12-D	
MRP-1935(C-528439	MD-12-E	
MRP-1935(C-528440	MD-12-F	
MRP-1935(C-528442	MD-12-G	
MRP-1935(C-528443	MD-12-H	
MRP-1935(C-528445	MD-12-I	

MRP-1935: C-528446 MD-12-J
 MRP-1935: C-528447 MD-12-K
 MRP-1935: C-528448 MD-12-L
 MRP-1935: C-528449 MD-12-M
 MRP-1935: C-528450 MD-12-N
 MRP-1935: C-528451 MD-12-O
 MRP-1935: C-528452 MD-12-P
 MRP-1935: C-528453 MD-12-Q
 MRP-1935: C-528455 MD-13-A 6 samples total, depth is measure
 MRP-1935: C-528456 MD-13-B
 MRP-1935: C-528457 MD-13-C
 MRP-1935: C-528458 MD-13-D
 MRP-1935: C-528459 MD-13-E
 MRP-1935: C-528460 MD-13-F

	MRP-1955: C-534603	OGS-CSH0029C	6" sample	1
	MRP-1955: C-534604	OGS-CSH0030	6-9" sample	1
	MRP-1955: C-534606	OGS-CSH0031	1.5' sample	1
	MRP-1955: C-534607	OGS-CSH0032A	uppermost	1
	MRP-1955: C-534609	OGS-CSH0032B	6" sample	1
	MRP-1955: C-534610	OGS-CSH0033A	uppermost	1
	MRP-1955: C-534611	OGS-CSH0033B	6" sample	1
	MRP-1955: C-534612	OGS-CSH0033C	6" sample	1
	MRP-1955: C-534613	OGS-CSH0033D	6" sample	1
	MRP-1955: C-534614	OGS-CSH0033E	6" sample	1
	MRP-1955: C-534616	OGS-CSH0033F	6" sample	1
	MRP-1955: C-534617	OGS-CSH0033G	6" sample	1
	MRP-1955: C-534618	OGS-CSH0033H	6" sample	1
	MRP-1955: C-534620	OGS-CSH0033I	6" sample	1
	MRP-1955: C-534621	OGS-CSH0033J	6" sample	1
	MRP-1955: C-534622	OGS-CSH0034A	uppermost	1
	MRP-1955: C-534623	OGS-CSH0034B	6" sample	1
	MRP-1955: C-534624	OGS-CSH0034C	6" sample	1
	MRP-1955: C-534625	OGS-CSH0034D	6" sample	1
	MRP-1955: C-534626	OGS-CSH0034E	6" sample	1
	MRP-1955: C-534627	OGS-CSH0035A	uppermost	1
	MRP-1955: C-534628	OGS-CSH0035B	6" sample	1
	MRP-1955: C-534631	OGS-CSH0035C	6" sample	1
	MRP-1955: C-534632	OGS-CSH0036A	uppermost	1
	MRP-1955: C-534633	OGS-CSH0036B	6" sample	1
	MRP-1955: C-534634	OGS-CSH0036C	6" sample	1
	MRP-1955: C-534635	OGS-CSH0036D	6" sample	1
	MRP-1955: C-534637	OGS-CSH0037A	uppermost	1
	MRP-1955: C-534638	OGS-CSH0037B	6" sample	1
	MRP-1955: C-534639	OGS-CSH0037C	6" sample	1
	MRP-1955: C-534640	OGS-CSH0037D	6" sample	1
	MRP-1955: C-534641	OGS-CSH0038A	uppermost	1
	MRP-1955: C-534642	OGS-CSH0038B	6" sample	1

	MRP-1955: C-534643	OGS-CSH0038C	6" sample	1
	MRP-1955: C-534644	OGS-CSH0038D	6" sample	1
	MRP-1955: C-534646	OGS-CSH0039	~6" sample	1
	MRP-1955: C-534647	OGS-CSH0040	~6" sample	1
	MRP-1955: C-534648	OGS-CSH0041A	uppermost	1
	MRP-1955: C-534649	OGS-CSH0041B	6" sample	1
	MRP-1955: C-534651	OGS-CSH0041C	6" sample	1
	MRP-1955: C-534652	OGS-CSH0041D	6" sample	1
	MRP-1955: C-534654	OGS-CSH0041E	6" sample	1
	MRP-1955: C-534655	OGS-CSH0041F	6" sample	1
	MRP-1955: C-534657	OGS-CSH0041G	6" sample	1
	MRP-1955: C-534658	OGS-CSH0041H	6" sample	1
	MRP-1955: C-534659	OGS-CSH0042A	uppermost	1
	MRP-1955: C-534660	OGS-CSH0042B	6" sample	1
	MRP-1955: C-534661	OGS-CSH0042C	6" sample	1
	MRP-1955: C-534662	OGS-CSH0042D	6" sample	1
	MRP-1955: C-534664	OGS-CSH0042E	6" sample	1
	MRP-1955: C-534665	OGS-CSH0042F	6" sample	1
	MRP-1955: C-534666	OGS-CSH0042G	6" sample	1
	MRP-1955: C-534668	OGS-CSH0043A	uppermost	1
	MRP-1955: C-534669	OGS-CSH0043B	6" sample	1
	MRP-1955: C-534670	OGS-CSH0043C	6" sample	1
	MRP-1955: C-534671	OGS-CSH0044A	uppermost	1
	MRP-1955: C-534672	OGS-CSH0044B	6" sample	1
	MRP-1955: C-534673	OGS-CSH0044C	6" sample	1
	MRP-1955: C-534674	OGS-CSH0045	2.5' compo	1
	MRP-1955: C-534675	OGS-CSH0046A	uppermost	1
	MRP-1955: C-534676	OGS-CSH0046B	6" sample	1
	MRP-1955: C-534679	OGS-CSH0046C	6" sample	1
	MRP-1955: C-534680	OGS-CSH0046D	6" sample	1
	MRP-1955: C-534681	OGS-CSH0047	6" sample	1
	MRP-1955: C-534682	OGS-CSH0048A	uppermost	1
	MRP-1955: C-534683	OGS-CSH0048B	6" sample	1
	MRP-1955: C-534684	OGS-CSH0048C	6" sample	1
	MRP-1955: C-534685	OGS-CSH0049A	uppermost	1
	MRP-1955: C-534686	OGS-CSH0049B	6" sample	1
	MRP-1955: C-534688	OGS-CSH0050A	uppermost	1
	MRP-1955: C-534689	OGS-CSH0050B	6" sample	1
	MRP-1955: C-534690	OGS-CSH0050C	6" sample	1
	MRP-1955: C-534691	OGS-CSH0050D	6" sample	1
	MRP-1955: C-534692	OGS-CSH0050E	6" sample	1
	MRP-1955: C-534694	OGS-CSH0050F	6" sample	1
	MRP-1955: C-534695	OGS-CSH0051A	uppermost	1
	MRP-1955: C-534696	OGS-CSH0051B	6" sample	1
	MRP-1955: C-534698	OGS-CSH0051C	6" sample	1
	MRP-1955: C-534699	OGS-CSH0051D	6" sample	1
	MRP-1955: C-534700	OGS-CSH0052A	uppermost	1

	MRP-1955 C-534701	OGS-CSH0052B	6" sample	1
	MRP-1955 C-534703	OGS-CSH0052C	6" sample	1
	MRP-1955 C-534705	OGS-CSH0052D	6" sample	1
	MRP-1955 C-534706	OGS-CSH0052E	6" sample	1
	MRP-1955 C-534707	OGS-CSH0053	2" sample	1
	MRP-1955 C-534708	OGS-CSH0054	12" sample	1
	MRP-1955 C-534709	OGS-CSH0055	12" sample	1
	MRP-1955 C-534710	OGS-CSH0056A	uppermost	1
	MRP-1955 C-534711	OGS-CSH0056B	6" sample	1
	MRP-1955 C-534712	OGS-CSH0056C	6" sample	1
	MRP-1955 C-534714	OGS-CSH0056D	6" sample	1
	MRP-1955 C-534717	OGS-CSH0057A	uppermost	1
	MRP-1955 C-534718	OGS-CSH0057B	6" sample	1
	MRP-1955 C-534719	OGS-CSH0057C	6" sample	1
	MRP-1955 C-534720	OGS-CSH0057D	6" sample	1
	MRP-1955 C-534721	OGS-CSH0058A	uppermost	1
	MRP-1955 C-534722	OGS-CSH0058B	6" sample	1
	MRP-1955 C-534723	OGS-CSH0059A	uppermost	1
	MRP-1955 C-534724	OGS-CSH0059B	6" sample	1
	MRP-1955 C-534725	OGS-CSH0060A	uppermost	1
	MRP-1955 C-534726	OGS-CSH0060B	6" sample	1
	MRP-1955 C-534727	OGS-CSH0061A	uppermost	1
	MRP-1955 C-534729	OGS-CSH0061B	6" sample	1
	MRP-1955 C-534730	OGS-CSH0061C	6" sample	1
	MRP-1955 C-534732	OGS-CSH0062A	uppermost	1
	MRP-1955 C-534733	OGS-CSH0062B	6" sample	1
	MRP-1955 C-534735	OGS-CSH0062C	6" sample	1
	MRP-1955 C-534736	OGS-CSH0062D	6" sample	1
	MRP-1955 C-534738	OGS-CSH0063A	uppermost	1
	MRP-1955 C-534739	OGS-CSH0063B	6" sample	1
	MRP-1955 C-534740	OGS-CSH0063C	6" sample	1
	MRP-1955 C-534741	OGS-CSH0063D	6" sample	1
	MRP-1955 C-534742	OGS-CSH0064A	uppermost	1
	MRP-1955 C-534743	OGS-CSH0064B	6" sample	1
	MRP-1955 C-534744	OGS-CSH0064C	6" sample	1
	MRP-1955 C-534745	OGS-CSH0064D	6" sample	1
	MRP-1955 C-534746	OGS-CSH0064E	6" sample	1
	MRP-1955 C-534747	OGS-CSH0064F	6" sample	1
	MRP-1955 C-534749	OGS-CSH0064G	6" sample	1
	MRP-1955 C-534750	OGS-CSH0064H	6" sample	1
	MRP-1955 C-534751	OGS-CSH0064I	6" sample	1
	MRP-1955 C-534752	OGS-CSH0065	12" sample	1
	MRP-1955 C-534753	OGS-CSH0066A	uppermost	1
	MRP-1955 C-534755	OGS-CSH0066B	6" sample	1
	MRP-1955 C-534756	OGS-CSH0066C	6" sample	1
	MRP-1955 C-534757	OGS-CSH0066D	6" sample	1
	MRP-1894 C-515082	SDH-217-1	Back shale	1

	MRP-1894 C-515083	SDH-217-2	Bended dul	1
	MRP-1894 C-515084	SDH-217-3	Massive gr	1
	MRP-1894 C-515086	SDH-217-4	Massive lig	1
	MRP-1894 C-515087	SDH-217-5	Horizontal	1
	MRP-1894 C-515089	SDH-217-6	Bended coa	1
	MRP-1894 C-515090	SDH-217-7	Claystone	1
	MRP-1894 C-515091	SDH-217-8	Massive gr	1
	MRP-1894 C-515092	SDH-217-9	Massive blk	1
	MRP-1894 C-515093	SDH-217-10	Bended coa	1
	MRP-1894 C-515094	SDH-217-11	Massive mi	1
	MRP-1894 C-515095	SDH-217-12	Massive mi	1
	MRP-1894 C-515096	SDH-217-13	Grey mediu	1
	MRP-1894 C-515098	SDH-4-1	Bluish-grey	1
	MRP-1894 C-515099	SDH-4-2	Light grey f	1
	MRP-1894 C-515100	SDH-4-3	Light grey r	1
	MRP-1894 C-515101	SDH-4-4	Bended bri	1
	MRP-1894 C-515102	SDH-4-5	Grey muds	1
	MRP-1894 C-515103	SDH-4-6	Grey muds	1
	MRP-1894 C-515104	SDH-259-1	Grey massi	1
	MRP-1894 C-515106	SDH-259-2	Greenish-g	1
	MRP-1894 C-515107	SDH-259-3	Grey horiz	1
	MRP-1894 C-515108	SDH-259-4	Bended coa	1
	MRP-1894 C-515109	SDH-259-5	Grey clayst	1
	MRP-1894 C-515110	SDH-259-6	Grey clayst	1
	MRP-1894 C-515111	SDH-259-7	Grey clayst	1
	MRP-1894 C-515112	SDH-259-8	Grey clayst	1
	MRP-1894 C-515114	SDH-259-9	Bended coa	1
	MRP-1894 C-515115	SDH-259-10	Grey muds	1
	MRP-1894 C-515116	SDH-259-11	Bended coa	1
	MRP-1894 C-515117	SDH-259-12	Grey clayst	1
	MRP-1894 C-515118	SDH-259-13	Grey muds	1
	MRP-1894 C-515120	SDH-259a-1	Black mass	1
	MRP-1894 C-515121	SDH-259a-2	Bended coa	1
	MRP-1894 C-515122	SDH-259a-3	Grey muds	1
	MRP-1894 C-515124	SDH-259a-4	Black mass	1
	MRP-1894 C-515125	SDH-259a-5	Bended coa	1
	MRP-1894 C-515127	SDH-259a-6	Grey massi	1
	MRP-1894 C-515128	SDH-259a-7	Massive lig	1
	MRP-1894 C-515129	SDH-259a-8	Massive lig	1
	MRP-1894 C-515130	SDH-259a-9	Black mass	1
	MRP-1894 C-515131	SDH-259a-10	Massive lig	1
	MRP-1894 C-515132	SDH-259a-11	Dark grey r	1
	MRP-1894 C-515133	SDH-259a-12	Bended coa	1
	MRP-1894 C-515134	SDH-259a-13	Grey muds	1
	MRP-1894 C-515136	SDH-259a-14	Light grey r	1
	MRP-1894 C-515137	SDH-259a-15	Light grey c	1
	MRP-1894 C-515138	SDH-259a-16	Black mass	1

MRP-1894; C-515139	SDH-259a-17	Grey massi	1
MRP-1894; C-515140	SDH-259a-18	Black mass	1
MRP-1894; C-515141	SDH-259a-19	Bended coa	1
MRP-1894; C-515142	SDH-259a-20	Grey massi	1
MRP-1894; C-515144	SDH-366-1	Bended coa	1
MRP-1894; C-515145	SDH-366-2	Grey massi	1
MRP-1894; C-515146	SDH-366-3	Dark grey c	1
MRP-1894; C-515147	SDH-366-4	Grey clayst	1
MRP-1894; C-515148	SDH-366-5	Bended coa	1
MRP-1894; C-515149	SDH-366-6	Grey muds	1
MRP-1894; C-515150	SDH-366-7	Bended coa	1
MRP-1894; C-515152	SDH-366-8	Grey muds	1
MRP-1894; C-515153	SDH-366-9	Light grey s	1
MRP-1894; C-515154	SDH-366-10	Black orga	1
MRP-1894; C-515155	SDH-366-11	Bended to	1
MRP-1894; C-515156	SDH-366-12	Grey massi	1
MRP-1895(C-515231	KGS546-103.9	Dark grey shale with iron vein	
MRP-1895(C-515232	KGS546-105	Dark grey shale with iron banding	
MRP-1895(C-515233	KGS546-107.7	Dark grey shale	
MRP-1895(C-515234	KGS546-108.5	Dark grey shale	
MRP-1895(C-515235	KGS546-169.3	Light grey green fireclay	
MRP-1895(C-515237	KGS546-169.8	Light grey green fireclay	
MRP-1895(C-515238	KGS546-169.8Q	Light grey green fireclay	
MRP-1895(C-515239	KGS546-170.6	Light grey green fireclay	
MRP-1895(C-515240	KGS546-171.3	Light grey sandy shale	
MRP-1895(C-515241	KGS546-171.3Q	Light grey sandy shale	
MRP-1895(C-515243	KGS546-356.2	Black shale with phospahte nodule	
MRP-1895(C-515244	KGS546-366	Light grey green sandy shale	
MRP-1895(C-515245	KGS546-366Q	Light grey green sandy shale	
MRP-1895(C-515246	KGS546-367	Dark grey shaley mudflow	
MRP-1895(C-515247	KGS546-367Q	Dark grey shaley mudflow	
MRP-1895(C-515248	KGS546-368	Light grey green sandy shale	
MRP-1895(C-515249	KGS546-441.6	Coal	
MRP-1895(C-515250	KGS546-442.5	Dark grey shale with coal inclusior	
MRP-1895(C-515252	KGS546-443.5	Light grey green silty shale	
MRP-1895(C-515253	KGS546-492.8	Black shale with coal streaks	
MRP-1895(C-515254	KGS546-493.5	Light grey green massive churned	
MRP-1895(C-515255	KGS546-493.5Q	Light grey green massive churned	
MRP-1895; C-515295	WH20-1		1
MRP-1895; C-515296	WH20-2		1
MRP-1895; C-515297	WH20-3		1
MRP-1895; C-515298	WH20-4		1
MRP-1895; C-515299	WH20-5		1
MRP-1895; C-515301	WH20-6		1
MRP-1895; C-515302	WH20-7		1
MRP-1895; C-515303	WH20-8		1
MRP-1895; C-515304	WH20-9		1

	MRP-1895; C-515305	WP20-1	1
	MRP-1895; C-515307	SC20-1	1
	MRP-1895; C-515308	SC20-2	1
	MRP-1895; C-515309	SC20-3	1
	MRP-1895; C-515310	SC20-4	1
	MRP-1895; C-515311	SC20-5	1
	MRP-1895; C-515313	SC20-6	1
	MRP-1895; C-515314	RR20-1	1
	MRP-1895; C-515315	Car20-1	1
	MRP-1895; C-515316	Car20-2	1
	MRP-1895; C-515317	Car20-3	1
	MRP-1895; C-515319	330Ave20-1	1
	MRP-1895; C-515320	330Ave20-2	1
	MRP-1895; C-515321	330Ave20-3	1
	MRP-1895; C-515322	330Ave20-4	1
	MRP-1895; C-515323	WPD20-1	1
	MRP-1895; C-515324	WPD20-2	1
	MRP-1895; C-515325	WPD20-3	1
	MRP-1895; C-515326	WPD20-4	1
	MRP-1895; C-515327	NBS20-1	1
	MRP-1895; C-515328	NBS20-2	1
	MRP-1895; C-515330	NBS20-3	1
	MRP-1895; C-515331	NBS20-4	1
	MRP-1895; C-515332	MC20-1	1
	MRP-1895; C-515333	MC20-2	1
	MRP-1895; C-515334	MC20-3	1
	MRP-1895; C-515336	MC20-4	1
	MRP-1895; C-515338	MC20-5	1
	MRP-1895; C-515339	CP10-1	1
	MRP-1895; C-515340	CP10-2	1
	MRP-1895; C-515341	CP37-1	1
	MRP-1895; C-515343	CP37-2	1
	MRP-1895; C-515344	CP37-3	1
	MRP-1895; C-515345	CP37-4	1
	MRP-1895; C-515346	CP37-5	1
	MRP-1895; C-515347	CP37-6	1
	MRP-1895; C-515349	CP37-7	1
	MRP-1895; C-515350	CP37-8	1
	MRP-1895; C-515351	CP37-9	1
	MRP-1895; C-515352	CP37-10	1
	MRP-1895; C-515353	CP37-11	1
	MRP-1895; C-515354	CP37-12	1
	MRP-1895; C-515355	CP37-13	1
	MRP-1895; C-515356	CP37-14	1
	MRP-1895; C-515357	CP37-15	1
	MRP-1895; C-515358	CP37-16	1
	MRP-1895; C-515360	CP37-17	1

	MRP-1895(C-515361	CP37-18	1
	MRP-1895(C-515362	CP37-19	1
	MRP-1895(C-515363	CP37-20	1
	MRP-1895(C-515364	CP37-21	1
	MRP-1895(C-515366	CP37-22	1
	MRP-1895(C-515367	CP37-23	1
	MRP-1895(C-515368	CP37-24	1
	MRP-1895(C-515369	W27556-1	1
	MRP-1895(C-515370	W27556-2	1
	MRP-1895(C-515371	W27556-3	1
	MRP-1895(C-515372	W27556-4	1
	MRP-1895(C-515373	W27556-5	1
	MRP-1895(C-515374	W27556-6	1
	MRP-1895(C-515375	W27556-7	1
	MRP-1895(C-515438	2466700_689.8	1
	MRP-1895(C-515439	2466700_690	1
	MRP-1895(C-515441	2466700_690.3	1
	MRP-1895(C-515442	2466700_691.2	1
	MRP-1895(C-515443	2466700_691.8	1
	MRP-1895(C-515445	2466700_798.1 anthracitic	1
	MRP-1895(C-515446	2466700_798.3	1
	MRP-1895(C-515447	2466700_798.9	1
	MRP-1895(C-515448	2466700_799.3	1
	MRP-1895(C-515449	2466700_799.6	1
	MRP-1895(C-515451	2466700_800.5	1
	MRP-1895(C-515452	2466700_1019 partly anth	1
	MRP-1895(C-515453	2466700_1019.6	1
	MRP-1895(C-515454	2466700_1019.9 anthracitic	1
	MRP-1895(C-515455	2466700_1020.5	1
	MRP-1895(C-515456	2466700_1021.5	1
	MRP-1895(C-515457	2466700_1021.7	1
	MRP-1895(C-515458	2466700_1022.4	1
	MRP-1895(C-515459	2466700_1023	1
	MRP-1895(C-515460	2466700_1023.3	1
	MRP-1895(C-515462	2466700_1024	1
	MRP-1895(C-515463	2466700_1024.2	1
	MRP-1895(C-515464	2466700_1025	1
	MRP-1895(C-515465	2466700_1025.4	1
	MRP-1895(C-515466	2466700_1026	1
	MRP-1895(C-515467	2466700_1026.9	1
	MRP-1895(C-515468	2466700_1071.3 partly anth	1
	MRP-1895(C-515470	2466700_1071.4	1
	MRP-1895(C-515471	2466700_1078.9	1
	MRP-1895(C-515472	2466700_1079.7	1
	MRP-1895(C-515474	2466700_1080.4	1
	MRP-1895(C-515475	2466700_1080.6	1
	MRP-1895(C-515476	2466700_1081	1

	MRP-1895	C-515477	2466700_1081.6		1
	MRP-1895	C-515478	2466700_1082.6		1
	MRP-1895	C-515479	2466700_1083.5		1
	MRP-1895	C-515480	2466700_1084.8		1
	MRP-1895	C-515481	2466700_857		1
	MRP-1895	C-515482	2466700_855.8		1
	MRP-1895	C-515483	2466700_854.8		1
	MRP-1895	C-515484	2466700_855.2		1
	MRP-1895	C-515485	2466700_857.9		1
	MRP-1895	C-515486	2466700_856.4		1
	MRP-1909	C-520100	14Q13-1	Dark grey t	1
	MRP-1909	C-520101	14Q13-2	Bended co	1
	MRP-1909	C-520102	14Q13-3	Bended co	1
	MRP-1909	C-520104	14Q13-4	Grey crumt	1
	MRP-1909	C-520105	14Q13-5	Light grey c	1
	MRP-1909	C-520107	14Q13-6	Bended co	1
	MRP-1909	C-520108	14Q13-7	Grey clayst	1
	MRP-1909	C-520109	14Q13-8	Light grey t	1
	MRP-1909	C-520110	14Q13-9	Dark grey t	1
	MRP-1909	C-520111	14Q13-10	Bended co	1
	MRP-1909	C-520112	14Q13-11	Grey clayst	1
	MRP-1909	C-520113	14Q13-12	Grey clayst	1
	MRP-1909	C-520115	14Q13-13	Bended co	1
	MRP-1909	C-520116	14Q13-14	Grey clayst	1
	MRP-1909	C-520117	14Q13-15	Dark grey c	1
	MRP-1909	C-520118	14Q13-16	Bended co	1
	MRP-1909	C-520119	14Q13-17	Dark grey r	1
	MRP-1909	C-520120	14Q13-18	Grey muds	1
	MRP-1909	C-520122	SDH-317-1	Dark grey t	1
	MRP-1909	C-520123	SDH-317-2	Light grey c	1
	MRP-1909	C-520124	SDH-317-3	Light grey c	1
	MRP-1909	C-520125	SDH-317-4	Dark grey t	1
	MRP-1909	C-520126	SDH-317-5	Grey muds	1
	MRP-1909	C-520128	SDH-317-6	Dark grey t	1
	MRP-1909	C-520129	SDH-317-7	Dark grey r	1
	MRP-1909	C-520130	SDH-317-8	Grey-yellow	1
	MRP-1909	C-520132	SDH-377-1	Grey shale	1
	MRP-1909	C-520133	SDH-377-2	Light grey t	1
	MRP-1909	C-520134	SDH-377-3	Black mass	1
	MRP-1909	C-520136	SDH-377-4	Bended to	1
	MRP-1909	C-520137	SDH-377-5	Grey-brown	1
	MRP-1909	C-520139	SDH-377-6	Greenish-b	1
	MRP-1909	C-520140	SDH-377-7	Grey massi	1
	MRP-1909	C-520141	SDH-377-8	Black mass	1
	MRP-1909	C-520142	SDH-377-9	Bended to	1
	MRP-1909	C-520143	SDH-377-10	Grey muds	1
	MRP-1909	C-520145	SDH-377-11	Light gray t	1

	MRP-1909: C-520146	SDH-377-12	Black mass	1
	MRP-1909: C-520147	SDH-377-13	Dark grey t	1
	MRP-1909: C-520148	SDH-377-14	Grey muds	1
	MRP-1910: C-520150	SDH-379-1	Black massive shale	
	MRP-1910: C-520151	SDH-379-2	Black massive shale	
	MRP-1910: C-520152	SDH-379-3	Bended coal, vitrain bends, calcite	
	MRP-1910: C-520154	SDH-379-4	Light gray claystone, rooting spora	
	MRP-1910: C-520155	SDH-379-5	Grey mudstone, massive, rooting s	
	MRP-1910: C-520157	SDH-379-6	Gray mudstone, slickensides, rooti	
	MRP-1910: C-520158	SDH-379-7	Black massive shale,	
	MRP-1910: C-520159	SDH-379-8	Black massive shale, brachiopods	
	MRP-1910: C-520160	SDH-379-9	Bended coal with fusain on bedding	
	MRP-1910: C-520161	SDH-379-10	Brownish grey claystone, abandon	
	MRP-1910: C-520162	SDH-379-11	Light gray claystone, slickensides,	
	MRP-1910: C-520163	SDH-379-12	Gray massive claystone , rooting s	
	MRP-1910: C-520165	SDH-379-13	Black massive shale, horizontal lar	
	MRP-1910: C-520166	SDH-379-14	Grey shale, horizontal lamination	
	MRP-1910: C-520167	SDH-379-15	Grey claystone, slickensides, plant	
	MRP-1910: C-520168	SDH-379-16	Dark grey to black massive shale	
	MRP-1910: C-520169	SDH-379-17	Dark grey massive shale	
	MRP-1910: C-520170	SDH-379-18	Brownish-gray claystone, abounde	
	MRP-1910: C-520171	SDH-379-19	Light gray claystone, slickensides p	
	MRP-1910: C-520173	SDH-347-1	Gray massive shale with plant frag	
	MRP-1910: C-520174	SDH-347-2	Bended bright coal with lots of fus	
	MRP-1910: C-520175	SDH-347-3	Massive light gray claystone, spora	
	MRP-1910: C-520176	SDH-347-4	Massive light gray-brown mudstor	
	MRP-1910: C-520177	SDH-347-5	Dark gray shale with horizontal lar	
	MRP-1910: C-520179	SDH-347-6	Bended coal with calcite in clits	
	MRP-1910: C-520180	SDH-347-7	Black shale with horizontal lamina	
	MRP-1910: C-520181	SDH-347-8	Light gray claystone, roots very co	
	MRP-1910: C-520182	SDH-347-9	Massive, light gray mudstone to si	
	MRP-1910: C-520183	SDH-347-10	Gray to dark gray massive shale w	
	MRP-1910: C-520184	SDH-347-11	Bended coal	
	MRP-1910: C-520185	SDH-347-12	Light gray massive claystone, root	
	MRP-1910: C-520186	SDH-347-13	Massive, very hard greenish-grey i	
	MRP-1910: C-520188	SDH-300-1	Dark grey massive shale	
	MRP-1910: C-520189	SDH-300-2	Light grey mudstone, massive, roc	
	MRP-1910: C-520190	SDH-300-3	Grey-yellowish massive mudstone	
	MRP-1910: C-520192	SDH-300-4	Grey massive shale	
	MRP-1910: C-520193	SDH-300-5	Grey massive shale, gentle horizo	
	MRP-1910: C-520195	SDH-300-6	Grey massive mudstone, plant frag	
	MRP-1910: C-520196	SDH-300-7	Light grey massive mudstone, slick	
	MRP-1910: C-520197	SDH-300-8	Black massive to horizontally lamia	
	MRP-1910: C-520198	SDH-300-9	Grey massive mudstone, slickensic	
	MRP-1910: C-520199	SDH-300-10	Grey massive mudstone, rooting s	
	MRP-1910: C-520200	SDH-300-11	11 Grey to brownish grey massive	
	MRP-1910: C-520201	SDH-300-12	12 Light grey massive mudstone, r	

	MRP-1910: C-520203	SDH-300-13	Grey massive mudstone, slickensid
	MRP-1910: C-520204	SDH-300-14	Grey mudstone, slickensides, mas:
	MRP-1910: C-520205	SDH-300-15	Grey claystone, slickensides, rooti
	MRP-1910: C-520206	SDH-300-16	Light grey with brownish irregular
	MRP-1910: C-520207	SDH-300-17	Bended coal with common calcite
	MRP-1910: C-520208	SDH-300-18	Black massive to horizontally lami

Al %	Ca %	Fe %	K %	Mg %	P %	S %	Si %	Ti %
12.5	0.1	2.07	4.03	0.74	0.02	0.2	26.3	0.73
11.8	0.09	1.51	3.56	0.54	0.02	0.1	29	0.75
12	0.06	1.7	3.72	0.62	0.02	<0.1	28.5	0.69
12	0.09	3.54	3.63	0.89	0.02	0.5	24	0.55
10.8	0.13	3.72	3.18	1.01	0.03	0.3	28.7	0.56
11.1	0.12	1.4	2.53	0.5	0.02	0.1	24.2	1.31
11.7	0.14	1.67	3.37	0.59	0.02	<0.1	27.4	0.72
14	0.12	1.45	2	0.3	0.22	0.3	23.2	0.87
13.5	0.09	1.53	3.2	0.58	0.02	<0.1	26.8	0.74
13	0.09	2.648	3.1	0.75	0.02	<0.1	26.5	0.74
12.8	0.09	2.91	3.08	0.71	0.02	0.1	26.6	0.67
13.5	0.08	3.22	3.12	0.79	0.02	0.1	26.1	0.66
13.6	0.09	2.87	3.17	0.68	0.08	0.3	24.9	0.62
12.3	0.09	1.95	1.52	0.2	0.18	0.5	25.9	1.06
14.1	0.08	2.18	3.21	0.46	0.03	0.3	25.4	0.7
14	0.03	1.76	3.36	0.48	0.02	0.1	26.7	0.68
11.9	0.03	5.22	3.27	0.59	0.03	0.6	25.1	0.63
14.5	0.06	1.61	2.56	0.5	0.04	0.3	24.2	0.69
14.6	0.12	1.67	2.57	0.5	0.04	0.5	25.2	0.69
14.2	0.13	2.12	2.71	0.51	0.05	1.1	25.1	0.7
13	0.09	1.53	2.61	0.47	0.05	0.5	27.1	0.73
12.8	0.16	3.57	2.66	0.52	0.06	0.5	25.8	0.69
13.2	0.02	2.12	1.64	0.36	0.04	0.4	19.4	0.89
11.9	0.03	1.55	1.63	0.36	0.03	0.2	26.3	0.8
8.73	0.02	0.88	1.68	0.29	0.02	<0.1	32.8	0.77
10.3	0.04	1.19	1.99	0.35	0.02	0.1	30.5	0.76
11.6	0.04	1.72	2.2	0.4	0.02	0.6	27.6	0.74
13.3	0.05	1.47	2.45	0.45	0.03	<0.1	27	0.77
12.6	0.03	1.66	2.73	0.49	0.03	<0.1	25.2	0.64
12.3	0.03	2.16	2.69	0.49	0.04	<0.1	26.1	0.65
12.1	0.04	2.24	2.81	0.62	0.03	<0.1	26.9	0.55
12	0.04	3.09	2.72	0.51	0.08	0.3	25.2	0.65
10.1	0.02	1.87	2.37	0.38	0.07	0.2	29.3	0.62
13.4	0.04	3.69	3.09	0.53	0.12	0.6	24.4	0.57
12.5	0.06	2.86	2.8	0.54	0.11	0.2	24.1	0.6
15.6	0.1	2.52	0.78	0.39	0.03	0.8	20.6	1.54
16.3	0.08	2.4	1.95	0.43	0.03	0.3	21.7	1.06
16.3	0.09	1.51	1.5	0.34	0.02	0.2	23	1.08
14.3	0.08	1.46	2.42	0.43	0.02	0.1	26.2	0.92
13.7	0.08	1.32	2.86	0.44	0.02	<0.1	25.4	0.76

9.41	0.06	0.86	1.92	0.3	0.01 <0.1		29.2	0.75
10.1	0.06	1.07	2.11	0.34	0.02 <0.1		28.2	0.76
11.5	0.09	2.5	3.12	0.9	0.02 <0.1		27.2	0.66
11.2	0.09	2.7	3.17	0.93	0.02 <0.1		26.3	0.58
12.9	0.06	4.36	3.62	0.88	0.03	0.1	27	0.69
11.5	0.05	5.76	3.61	0.6	0.03	1	21.8	0.57
11.1	0.06	5.02	3.45	0.73	0.04	0.5	25.4	0.65
8.3	0.06	4.77	2.72	0.37	0.06	0.5	26.8	0.55
12.8	0.09	3.34	3.08	0.58	0.03	0.2	25.4	0.55
11.5	0.1	3.05	2.34	0.37	0.06	0.9	22.7	0.62
12.8	0.05	2.58	3.39	0.64	0.02	0.2	24.6	0.69
13.2	0.1	2.9	3.66	0.85	0.03	0.1	26.1	0.71
13.9	0.12	4.2	3.72	0.81	0.05 <0.1		26	0.64
11.9	0.12	9.28	2.09	0.42	0.06 <0.1		23.4	0.71
14.4	0.1	5.26	1.38	0.24	0.06	0.1	22.6	0.95
14.8	0.07	2.75	1.12	0.24	0.07 <0.1		20.6	0.91
14.8	0.09	4.57	1.25	0.22	0.05 <0.1		22.2	0.97
13.9	0.14	1.53	1.35	0.33	0.03	0.2	25	1.22
14	0.12	1.28	1.24	0.33	0.03 <0.1		23.8	1.16
14.9	0.1	1.31	1.21	0.31	0.05	0.1	22.7	1.5
13.5	0.11	1.66	1.63	0.32	0.07	0.1	23.4	1.26
8.01	0.04	11.8	2.5	0.34	0.03	0.2	13	0.38
8.05	0.1	1.76	2.78	0.47	0.02 <0.1		29.1	0.66
8.21	0.08	3.22	2.66	0.83	0.03 <0.1		28.2	0.66
7.68	0.12	4.52	2.62	0.85	0.03 <0.1		28.2	0.63
9.15	0.12	4.28	3.14	0.99	0.04 <0.1		27.5	0.64
9.86	0.13	3.96	3.43	1.08	0.04	0.1	27.1	0.61
9.98	0.11	3.67	3.45	1.05	0.03 <0.1		25	0.58
7.57	0.4	5.39	1.95	0.38	0.02	0.2	17.8	0.46
11.9	0.03	2.75	2.24	0.47	0.02	0.3	24.7	0.76
12.3	0.03	1.48	2.9	0.42	0.01	0.1	28.2	0.62
12.1	0.06	1.63	3.08	0.48	0.01 <0.1		29.6	0.72
11.6	0.04	1.91	2.87	0.49	0.02 <0.1		27.6	0.7
5.01	0.02	2.16	1.84	0.12	0.03 <0.1		36.6	0.19
13.4	0.045	1.05	2.78	0.33	0.03	<0.1	26.9	0.78
16.1	0.07	1.2	2.34	0.38	0.03	0.2	23.8	0.85
10.4	0.048	0.73	2.06	0.28	0.01 <0.1		30	0.63
11.1	0.05	0.93	2.28	0.32	0.01 <0.1		31	0.72
9.89	0.06	0.7	1.81	0.26	0.01 <0.1		32.1	0.71
10.7	0.057	0.95	1.84	0.3	0.01 <0.1		29.4	0.84
8.78	0.16	3.17	2.3	0.66	0.06	0.3	30.4	0.61
15.1	0.06	2.77	3.76	0.48	0.11	0.2	23.8	0.58
13.3	0.06	2.87	3.44	0.54	0.11	0.3	24.8	0.64
12.3	0.03	3.82	3.26	0.48	0.07	0.2	24.7	0.75
10.6	0.013	0.89	2.47	0.32	0.01 <0.1		29.9	0.78

12.4	0.01	0.98	3.17	0.4	0.01 <0.1		29.5	0.77
13.6	0.02	1.17	3.24	0.42	0.02 <0.1		27.3	0.78
14.8	0.034	1.42	3.14	0.43	0.02 <0.1		27.7	0.86
15.7	0.04	1.1	1.23	0.23	0.02	0.1	22	1.03
16.8	0.024	1.22	2.16	0.35	0.02 <0.1		23.6	0.97
17.3	0.11	1.67	2.72	0.44	0.02	0.2	20.9	1
17.2	0.12	1.99	1.9	0.39	0.02	0.3	21.4	1.52
8.55	0.1	0.8	2.27	0.27	0.01	0.3	22.8	0.64
13.6	0.12	2.63	1.64	0.29	0.02	1.8	22.8	0.58
14.9	0.12	1.51	3.46	0.54	0.03	0.1	27.2	0.65
12.4	0.1	1.26	2.31	0.31	0.01 <0.1		28.1	0.72
10.4	0.12	1.14	1.91	0.26	0.01 <0.1		30.3	0.66
13.3	0.1	1.31	2.26	0.34	0.01 <0.1		30.3	0.78
11.4	0.12	1.51	2.12	0.31	0.02 <0.1		30.6	0.72
11.4	0.28	4.54	3.78	0.7	0.03 <0.1		28.9	0.61
11.5	0.22	3.97	3.87	0.68	0.03 <0.1		30.2	0.59
13.8	0.18	4.62	3.35	0.84	0.06 <0.1		30.3	0.79
12	0.15	0.81	2.66	0.34	0.01 <0.1		28.8	0.73
9.46	0.4	9.83	3.47	1.67	0.07 <0.1		24.8	0.41
8.15	5.52	3.03	2.98	1.17	0.13 <0.1		25.4	0.46
12.6	0.06	2.93	3.15	0.71	0.05	0.4	26.3	0.62
12.2	0.15	3.15	3.18	0.78	0.02	0.3	26.4	0.62
11.6	0.2	3.31	3.12	0.8	0.03	0.4	26.3	0.6
12.1	0.13	1.94	3.36	0.56	0.03	0.5	26.2	0.64
10.4	0.11	3.25	3.05	0.66	0.02	1.2	27.4	0.59
7.72	4.45	2.9	2.62	2.21	0.04 <0.1		26.8	0.48
11.3	0.51	2.77	4.02	0.94 <0.01		0.3	27.7	0.44
10.8	0.22	1.45	2.86	0.57	0.01 <0.1		28.1	0.64
6.31	0.35	3.85	2.44	0.6	0.04 <0.1		29.6	0.46
11.9	0.07	3.55	2.66	0.87	0.02	0.2	29.7	0.73
11.4	0.12	3.91	3.47	1.04	0.02	0.1	27.5	0.67
11	0.14	2.01	1.71	0.39	0.02 <0.1		32	0.81
13.5	0.17	1.71	2.65	0.51	0.01 <0.1		28.5	0.77
12.9	0.16	2.11	2.63	0.51	0.02 <0.1		27.3	0.69
10	0.11	1.59	2.29	0.39	0.01 <0.1		32.4	0.72
9.94	0.12	1.4	2.52	0.39	0.01 <0.1		32.2	0.69
10.9	0.11	2.85	2.49	0.44	0.02 <0.1		33.7	0.74
14.2	0.15	2.25	2.42	0.61	0.11	0.3	28.2	0.68
13.8	0.13	2.02	2.29	0.62	0.1	0.2	25.6	0.59
12.3	0.15	3.86	2.09	0.39	0.05	0.2	26.1	1.04
15.2	0.14	1.39	2.68	0.49	0.03 <0.1		25.4	0.72
12.4	0.11	1.37	3.22	0.5	0.02 <0.1		26.7	0.58
11.3	0.12	3.18	3.63	1.04	0.03 <0.1		26.3	0.61
10.9	0.14	4.29	3.43	1.11	0.03 <0.1		25.3	0.59
10.9	0.12	4.33	3.52	1.06	0.05	0.2	26.2	0.62
9.29	0.12	3.6	3.03	1	0.09	0.3	26.1	0.54
9.37	0.11	3.73	2.88	1.02	0.19	0.3	25.5	0.5

7.58	5.66	7.24	2.07	0.54	0.65	4.8	17.5	0.34
8.58	1.2	6.21	2.61	0.74	0.14	1.7	24.6	0.45
10.2	0.15	3.6	2.99	0.59	0.02	0.5	24.6	0.61
11	0.11	2.95	3.08	0.67	0.01	0.3	26.2	0.62
9.68	0.1	7.59	2.42	0.4	0.06	0.3	25.7	0.73
12.4	0.1	3.04	2.32	0.5	0.04	0.4	26.1	0.73
10.2	0.1	4.53	2.93	0.54	0.02	0.2	28.1	0.63
9.63	0.12	2.26	2.65	0.66	0.01 <0.1		30.4	0.66
9.44	0.77	3.13	2.83	1.01	0.02 <0.1		29	0.62
7.68	0.1	3.75	2.11	0.32	0.01	2.3	29.3	0.61
10.7	0.15	2.71	2.57	0.65	0.02	0.2	26.8	0.65
7.98	0.12	2.81	2	0.43	0.01	0.4	30.6	0.56
8.71	0.15	3.41	2.32	0.49	0.02	2	29.2	0.58
9.43	0.12	7.03	2.71	0.63	0.02	3.6	24.1	0.51
11	0.17	4.67	3.17	0.77	0.03	0.8	25.4	0.55
11.2	0.13	4.25	3.48	0.7	0.02	0.6	26.1	0.57
10.4	0.3	3.41	1.97	0.72	0.03	0.5	27.5	0.63
10.6	0.33	3.27	3.27	0.98	0.01	0.4	28.3	0.59
10.1	0.37	3.16	3.18	0.94	0.02	0.3	27.1	0.55
8.01	0.9	11.8	2.89	1.14	0.17	0.2	22.4	0.44
7.33	0.12	2.3	1.85	0.3	0.02	0.2	31.3	0.67
12.1	0.14	2.2	3.16	0.56	0.13	0.1	27	0.72
11.9	0.16	2.37	1.66	0.4	0.02	0.2	25.7	0.89
11.9	0.13	1.49	1.69	0.4	0.02	0.2	26.9	0.89
13.9	0.12	1.55	1.93	0.4	0.03	0.2	26.1	0.87
13.4	0.11	2	2.11	0.4	0.04	0.7	25.9	0.79
11.4	0.1	1.37	2.42	0.43	0.03	0.1	27.6	0.71
10.7	0.09	1.27	2.51	0.43	0.02 <0.1		28.6	0.7
9.49	0.1	4.66	2.28	0.38	0.02	0.2	27.8	0.62
15.7	0.15	2.01	1.98	0.47	0.02	0.2	21.9	1.63
19	0.14	1.33	1.16	0.24	0.02	0.1	21.7	1.21
15.1	0.1	1.23	1.97	0.28	0.02 <0.1		25.5	1.07
13.8	0.1	1.57	2.54	0.34	0.02 <0.1		26.5	0.88
11.5	0.08	0.95	2.39	0.31	0.01 <0.1		28.5	0.7
12	0.1	1	3.05	0.38	0.01 <0.1		28.2	0.7
11.8	0.11	0.98	2.91	0.38	0.01 <0.1		28.8	0.69
10.2	0.13	2.96	2.77	0.68	0.04	0.2	24.4	0.55
10	0.14	3.55	2.89	0.93	0.06	0.2	26.8	0.61
13.9	0.05	1.14	3.89	0.47	0.02 <0.1		26.8	0.79
14.3	0.06	0.88	4.03	0.45	0.02 <0.1		25.8	0.67
9.46	0.51	8.75	3.16	1.25	0.11 <0.1		25.1	0.56
11.8	0.14	3.88	4.32	0.99	0.06	0.1	26.3	0.63
11.9	0.11	2.17	3.78	0.52	0.02 <0.1		27.3	0.7
13.4	0.1	1.28	3.48	0.47	0.02 <0.1		26.9	0.88
12.9	0.08	1.07	3.5	0.39	0.02	0.1	27.7	0.83
15.3	0.1	1.66	2.45	0.44	0.03 <0.1		25.7	0.98
10.3	0.08	1.04	2.47	0.35	0.02 <0.1		28.9	0.72

10.3	0.24	10.8	3.01	0.77	0.02	0.3	23.7	0.63
9.97	0.07	1.09	2.73	0.39	0.02	0.2	28.7	0.79
15	0.1	1.69	2.11	0.49	0.03 <0.1		24.4	1.82
14.7	0.1	1.61	2.15	0.3	0.17	1	25	1.79
17.2	0.18	4.58	2.96	0.4	0.04 <0.1		21	0.93
12.7	0.31	2.2	3.13	0.78	0.09 <0.1		26.1	0.76
13.7	0.15	2.38	3.47	0.75	0.06	0.4	24.5	0.7
12.5	0.07	1.37	2.99	0.43	0.01	0.2	27.9	0.8
12	0.34	5.82	3.21	0.98	0.08	0.6	23.6	0.63
11.8	0.06	1.16	3.2	0.49	0.02	0.2	28	0.79
10.1	0.14	3.48	3.1	0.53	0.01 <0.1		27.7	0.67
13.4	0.12	1.85	3.57	0.43	0.01 <0.1		26.8	0.68
9.65	10.7	2.26	1.85	0.51	0.55	1.3	21.1	0.54
13.7	0.12	1.65	2.03	0.4	0.05	0.8	25.8	0.8
12.9	2.97	3.29	3.41	0.69	0.02	2.2	23.1	0.54
15.3	0.23	0.91	1.55	0.37	0.02 <0.1		25.1	1.12
11.4	0.1	0.79	2.18	0.33	0.02 <0.1		28	0.8
3.73	0.09	0.31	0.7	0.11	0.01 <0.1		37.9	0.73
11.4	0.15	2.2	2.92	0.46	0.01	1.3	26.3	0.86
14.1	0.19	6.01	1.52	0.47	0.02	4.3	22.5	1.45
11.2	0.16	5.69	2.51	0.42	0.01	0.9	26	0.8
12.7	0.05	2.11	3.27	0.49	0.04 <0.1		26.5	0.75
8.68	0.18	3.17	1.98	0.31	0.02	2.8	22.9	0.72
13.3	0.2	1.73	2.65	0.52	0.02	0.6	26.7	0.93
15.9	0.22	1.53	3.24	0.62	0.02	0.2	24.1	0.82
13.3	0.1	0.94	1.31	0.27	0.05	0.2	17.1	1.51
10.3	0.13	0.59	1.25	0.2	0.02 <0.1		27.1	1.53
10.8	0.04	2.82	3.25	0.73	0.01	0.1	27.5	0.63
10.7	0.03	1.01	2.66	0.38	0.02 <0.1		28.6	1.06
9.64	0.04	0.89	2.53	0.37	0.01 <0.1		29.4	0.64
9.46	0.06	2.44	3.07	0.63	0.05	0.3	27.7	0.66
8.32	0.06	4.36	2.83	0.57	0.07	0.7	28.6	0.66
10.9	0.04	2.65	3.54	0.53	0.01	0.6	27.6	0.64
9.44	0.04	1.76	2.29	0.35	0.01	0.3	28.6	0.81
15.4	0.22	1.16	2.11	0.45	0.04 <0.1		24.6	1.03
16.4	0.22	1.42	1.93	0.51	0.02 <0.1		23.3	1.24
15	0.15	1.24	3.39	0.51	0.02 <0.1		25.3	0.78
16.2	0.16	1.31	3.85	0.57	0.02 <0.1		24.4	0.73
10.3	0.09	2.32	3.51	0.92	0.01	0.8	26.6	0.58
10.6	0.06	2.71	3.24	1.08	0.01 <0.1		26.5	0.68
7.92	0.09	0.71	2.85	0.4	0.01 <0.1		30	1
11.1	0.1	1.57	3.19	0.62	0.02	0.5	28.4	0.7
14.3	0.13	0.99	1.99	0.47 <0.01	<0.1		25	1.11
10.2	0.07	0.97	2.18	0.34	0.02	0.5	20.4	2.64
14.8	0.16	1.35	2.07	0.49	0.01 <0.1		24.7	0.99
12.6	0.07	1.15	3.56	0.52	0.01 <0.1		27.1	0.94
18.3	0.01	1.46	0.66	0.09	0.04 <0.1		18.8	0.86

20.7	<0.01	1.39	0.39	0.09	0.03	0.5	17.4	1.38
18.3	<0.01	5.35	0.19	0.19	0.03	0.1	17.8	1.02
8.95	0.09	0.88	2.42	0.44	0.02	<0.1	29.4	0.69
8.6	0.11	12.7	2.38	0.49	0.05	<0.1	23.7	0.57
16.8	0.1	0.34	0.1	0.05	0.01	<0.1	23.1	1.11
15.3	0.07	0.29	0.094	0.05	0.02	<0.1	25.1	1.03
19.2	0.09	0.46	0.2	0.04	0.01	<0.1	20.5	1.09
16.8	0.08	0.4	0.21	0.04	<0.01	<0.1	23.3	1.17
9.28	0.02	0.91	1.88	0.3	0.01	<0.1	30.4	0.65
10.7	0.05	0.27	0.56	0.04	0.04	<0.1	28.1	2.29
9.06	0.05	0.38	1.13	0.06	0.01	<0.1	29.8	1.11
10.2	0.05	0.33	0.22	0.02	0.01	<0.1	29.8	0.76
12.3	0.07	0.25	0.22	0.03	0.02	<0.1	27.7	0.68
12.4	<0.01	0.8	2.61	0.39	<0.01	<0.1	26.5	0.64
11.6	0.03	0.75	2.55	0.37	<0.01	<0.1	27.1	0.7
13.8	0.02	0.61	1.94	0.1	<0.01	<0.1	25.9	0.64
7.2	0.05	1.3	1.89	0.33	<0.01	<0.1	32.6	0.59
8.41	0.06	0.95	2.24	0.39	<0.01	<0.1	29.7	0.62
9.82	0.03	1.43	2.42	0.47	0.01	<0.1	30.1	0.7
8.63	0.03	0.7	2.1	0.39	0.01	<0.1	30.9	0.64
9.43	0.05	0.82	2.33	0.43	0.01	<0.1	29.8	0.68
9.76	0.02	1.03	2.21	0.42	<0.01	<0.1	29.5	0.7
13.2	0.06	1.28	2.67	0.43	0.02	<0.1	28.9	1
11	0.03	1.09	2.81	0.5	0.02	<0.1	27.7	0.67
10.4	0.04	4.36	2.61	0.43	0.01	0.2	27.1	0.6
11.1	<0.01	1.11	2.65	0.44	<0.01	0.1	28.2	0.67
12	0.04	1.24	3.01	0.54	0.01	<0.1	27.4	0.75
8.26	0.04	1.57	1.97	0.53	0.03	<0.1	31.2	0.59
7.65	0.02	1.54	1.8	0.46	0.03	<0.1	31.6	0.58
8.69	0.06	1.53	2.2	0.47	0.05	<0.1	30.6	0.62
8.53	0.02	1.54	2.07	0.51	0.04	<0.1	30.5	0.61
8.21	0.04	1.49	2.01	0.46	0.02	<0.1	31	0.6
9.58	0.03	1.56	2.37	0.52	0.02	<0.1	29.8	0.63
11.3	0.08	2.17	2.72	0.92	0.02	<0.1	28	0.69
11.4	0.12	2.04	3.01	0.88	0.03	<0.1	27.9	0.7
11.1	0.13	1.96	2.93	0.9	0.03	<0.1	27.1	0.68
11.2	0.09	2.1	2.81	0.93	0.02	<0.1	27.4	0.69
11.1	0.11	2.06	2.85	0.94	0.02	<0.1	25.8	0.68
11.6	0.13	2.1	2.94	0.84	0.02	<0.1	26.2	0.67
11.7	0.18	1.83	3.13	0.7	0.02	<0.1	26.5	0.68
11.4	0.04	2.09	2.81	0.38	0.02	<0.1	24.1	0.66
14	0.08	0.87	2.42	0.38	0.32	0.4	22.8	0.73
13.7	0.18	3.06	2.54	0.7	0.02	<0.1	24.7	0.67
12.5	0.29	2.18	2.54	0.55	0.07	<0.1	26.3	0.76
11.8	0.18	1.83	2.33	0.5	0.03	<0.1	27.8	0.8
11	0.6	5.3	2.4	0.66	0.02	<0.1	26.5	0.72
15.8	0.02	1.31	2.8	0.45	0.04	<0.1	26.8	0.89

15	0.03	1.18	2.57	0.38	0.09 <0.1		27.1	0.82
14	0.04	1.46	3.05	0.45	0.1	0.1	27	0.73
13.5	0.03	1.64	3.19	0.49	0.11	0.1	28.2	0.75
12.9	0.03	1.4	2.76	0.44	0.11	0.2	29	0.76
13.3	0.04	1.35	2.9	0.44	0.04 <0.1		28.7	0.75
13.5	0.03	1.31	2.95	0.43	0.03 <0.1		30.1	0.82
12.9 <0.01		1.26	2.94	0.41	0.03 <0.1		29.6	0.87
8.6	0.02	0.93	2.51	0.36	0.01 <0.1		33.9	0.75
10.5	0.02	1	3.08	0.47	0.02 <0.1		31.3	0.74
9.48 <0.01		1.41	2.72	0.54	0.02 <0.1		30.1	0.7
9.47 <0.01		1.46	2.67	0.55	0.02 <0.1		31.3	0.71
9.72	0.02	1.56	2.71	0.53	0.02 <0.1		31.8	0.72
9.39	0.04	3.16	2.6	0.46	0.02 <0.1		30.4	0.7
9.61 <0.01		4.06	2.67	0.45	0.02 <0.1		30	0.7
8.71	0.02	1.19	2.53	0.38	0.02 <0.1		31.9	0.67
9.69	0.03	1.13	2.66	0.41	0.02 <0.1		31.2	0.72
9.83	0.02	1.06	2.71	0.42	0.02 <0.1		31.3	0.73
11 <0.01		1.07	3	0.46	0.02 <0.1		31.2	0.75
10.3 <0.01		0.95	2.68	0.41	0.02 <0.1		31.1	0.73
10.2	0.02	0.96	2.66	0.41	0.02 <0.1		30.8	0.73
10.6 <0.01		0.98	2.84	0.42	0.02 <0.1		30.1	0.74
10.3	0.02	0.95	2.63	0.39	0.02 <0.1		30.9	0.77
10.9	0.21	3.63	2.97	0.72	0.03 <0.1		29.3	0.69
10.8	0.16	2.64	2.92	0.76	0.04 <0.1		29.4	0.71
10.9	0.16	2.85	3.01	0.77	0.03 <0.1		29.2	0.71
10.8	0.2	3.47	2.87	0.75	0.03 <0.1		29.2	0.7
10.7	0.18	4.09	2.84	0.8	0.02 <0.1		28.8	0.72
11.5	0.15	4.14	2.92	0.65	0.02 <0.1		27.7	0.7
13	0.15	4.3	2.45	0.76	0.02 <0.1		27.2	0.74
10.1	0.02	0.87	2.24	0.35	0.02 <0.1		32.6	0.77
9.24	0.01	0.75	1.94	0.3	0.01 <0.1		33.6	0.71
12.6 <0.01		1.04	2.25	0.4	0.02 <0.1		29.7	0.82
17.5 <0.01		1.58	2.44	0.52	0.03 <0.1		23.5	0.93
16.7	0.01	1.17	1.78	0.33	0.03	0.1	21.1	1.24
15.6	0.02	1.24	3.09	0.52	0.03 <0.1		24.8	0.78
13.2	0.04	1.02	3.05	0.44	0.02 <0.1		27.5	0.81
14.3	0.01	1.18	3.05	0.47	0.02 <0.1		26.9	0.99
16.2 <0.01		1.2	2.87	0.47	0.03 <0.1		25.4	1.36
11.2 <0.01		2.6	3.06	0.46	0.03 <0.1		30.2	0.7
10.7	0.03	1.37	2.81	0.49	0.02 <0.1		30.8	0.71
11.3	0.01	2.33	2.99	0.75	0.02 <0.1		30	0.7
9.48 <0.01		2.37	2.55	0.65	0.03 <0.1		31.2	0.69
10	0.02	2.85	2.65	0.67	0.03 <0.1		31.6	0.72
10.2 <0.01		3.9	2.65	0.63	0.04 <0.1		29.4	0.69
10.3 <0.01		4.83	2.71	0.62	0.04 <0.1		28.4	0.68
10.6	0.02	2.81	2.83	0.7	0.03 <0.1		29.7	0.7
11.1	0.02	2.97	2.93	0.66	0.03 <0.1		29.2	0.72

7.71	0.02	0.79	2	0.29	0.01 <0.1		33.3	0.65
8.54	<0.01	0.83	2.16	0.33	0.02 <0.1		32.9	0.69
10.3	0.04	0.93	1.63	0.25	0.07 <0.1		31.8	0.82
12.7	0.05	1.06	2.96	0.46	0.02 <0.1		29.3	0.72
12.1	0.02	1.09	2.77	0.45	0.02 <0.1		29.4	0.71
11.9	0.01	1.03	2.7	0.44	0.02 <0.1		29.9	0.72
13.1	<0.01	1.12	2.94	0.49	0.02 <0.1		29.6	0.72
12.7	0.02	1.12	3.12	0.51	0.02 <0.1		28.8	0.71
11.8	0.01	2.62	3.02	0.53	0.03 <0.1		31.5	0.81
9.74	0.02	1.03	2.3	0.36	0.02 <0.1		32.1	0.74
10.5	<0.01	0.97	2.49	0.36	0.02 <0.1		31.7	0.77
10.8	0.03	0.93	2.35	0.36	0.02 <0.1		32.1	0.78
12.2	<0.01	1.11	2.65	0.42	0.02 <0.1		30	0.82
11.1	<0.01	1.02	1.62	0.33	0.02 <0.1		30.6	0.93
8.23	0.21	7.29	2	0.81	0.09 <0.1		27.4	0.48
8.9	0.27	3	1.77	0.81	0.09	0.8	17.4	0.38
11.9	0.31	4.14	2.32	0.92	0.02	1.2	25.3	0.61
11.1	0.07	3.44	1.88	0.44	0.03	0.1	24.3	0.55
10.7	0.03	3.29	1.93	0.45	0.04	0.2	24.8	0.56
11.4	<0.01	1.51	2.59	0.42	0.01 <0.1		28	0.63
11.9	<0.01	1.39	2.78	0.45	0.01 <0.1		27.4	0.61
8.11	0.03	19.8	1.99	0.37 <0.01	<0.1		18.9	0.33
12.3	0.05	2.31	2.92	0.54	0.02 <0.1		27.2	0.58
11.6	0.07	4.97	2.98	0.57	0.02 <0.1		26.6	0.54
10.6	0.18	2.89	3.07	0.65	0.02 <0.1		27.8	0.52
11.6	0.09	2.87	2.78	0.5	0.02 <0.1		27.7	0.58
11.2	0.14	4.26	2.85	0.58	0.02 <0.1		26.5	0.55
11.2	0.12	3.88	2.76	0.55	0.02 <0.1		26.9	0.55
11.1	0.19	3.04	2.84	0.56	0.02 <0.1		27.4	0.56
10.9	0.07	3.3	1.87	0.31	0.12	0.9	27.2	0.65
11.3	0.06	3.18	1.8	0.33	0.02	0.2	27.7	0.71
10.2	0.08	2.47	1.96	0.32	0.04	0.2	28.9	0.68
9.8	0.08	2.41	2.16	0.35	0.02 <0.1		29	0.65
9.76	0.05	2.18	2.26	0.38	0.03 <0.1		27.1	0.64
12.1	0.18	1.97	0.89	0.27	0.08	0.3	26.5	0.79
12.3	0.15	2.36	0.95	0.27	0.11	0.4	26	0.79
12	0.12	2.42	0.9	0.24	0.06	0.3	27.8	0.84
8.62	0.03	5.26	1.84	0.42	0.08	1.1	18.7	0.58
13.4	0.03	2.4	1.65	0.38	0.04	0.3	25	0.9
12.5	0.02	2	2.13	0.42	0.03	0.3	25.9	0.82
9.16	<0.01	2.03	1.84	0.35	0.03	0.3	29.1	0.61
11.2	0.31	1.92	2.34	0.56	0.02	0.4	26.8	1.25
11.5	0.18	1.35	2.18	0.5	0.01	0.2	27.7	1.01
10.3	0.05	0.99	2.34	0.37	0.01 <0.1		29.5	0.71
9.61	0.04	1.45	2.49	0.45	0.01 <0.1		29.5	0.68
9.82	0.04	3.14	2.49	0.56	0.03	0.6	28.5	0.62
11.9	0.03	1.71	1.93	0.36	0.02	0.3	26.9	0.85

12.6	0.12	2.44	2.81	0.64	0.05	0.6	27.6	0.65
12.2	0.04	3.47	2.05	0.36	0.02	0.4	28.5	0.79
12.2	0.06	1.66	1.96	0.38	0.03 <0.1		32.8	0.84
9.46	0.13	4.93	2.27	0.83	0.03 <0.1		33.3	0.66
15.3	0.08	1.49	2.21	0.53	0.01 <0.1		29.1	0.87
12.4	0.05	1.42	1.91	0.42	0.01	0.1	29.8	0.73
12.8	0.03	1.55	2.13	0.44	0.02	0.1	30.3	0.71
11.9	0.03	1.57	1.98	0.42	0.02	0.3	27.6	0.63
9.36	0.02	4.5	1.63	0.36	0.02	0.2	33.3	0.6
9.39	0.03	4.77	1.66	0.42	0.03 <0.1		32.7	0.61
9.84	0.01	5.76	1.71	0.45	0.03	0.1	30.7	0.61
10.6	<0.01	5.29	1.8	0.45	0.04 <0.1		31.4	0.65
9.78	0.02	0.88	1.54	0.3	0.01 <0.1		35	0.86
10.5	0.04	12.9	1.64	0.36	0.02	0.2	27.3	0.65
12.7	0.02	4.81	1.88	0.44	0.02 <0.1		28.5	0.76
15.1	0.09	1.78	2.26	0.56	0.02 <0.1		29.8	0.75
12.5	0.04	2.53	2.2	0.54	0.02 <0.1		27.6	0.66
11	0.04	4.24	2.09	0.56	0.03 <0.1		29.5	0.61
11.3	0.05	3.24	2.1	0.59	0.03 <0.1		28.5	0.63
6.06	0.04	2.77	1.03	0.21 <0.01		0.6	34.8	0.66
7.34	0.06	4.86	1.47	0.29 <0.01		0.4	31.7	0.64
11.9	0.16	5.65	2.01	0.53	0.02 <0.1		26.3	0.61
6.86	0.03	1.07	0.72	0.17	0.02 <0.1		33.5	0.6
6.19	0.01	0.54	0.64	0.15 <0.01	<0.1		34	0.62
5.03	0.02	0.43	0.4	0.1	0.01 <0.1		38	0.53
10.2	0.22	7.16	3.15	1.19	0.07 <0.1		26.2	0.54
10.3	0.03	2.77	2.07	0.4	0.02	0.4	25.3	0.62
8.49	0.03	4.94	2.17	0.39	0.02	0.5	31	0.62
6.88	0.02	9.51	1.58	0.27	0.02	0.7	28.8	0.52
10.7	0.01	6.01	2.9	0.63	0.02	0.2	26.7	0.6
9.17	0.06	1.34	1.66	0.45	0.02 <0.1		31.7	0.7
9.88	0.06	2.74	1.88	0.53	0.02	0.2	29.5	0.76
7.47	0.01	1.03	1.2	0.23 <0.01	<0.1		33.8	0.75
6.84	0.01	0.86	1.27	0.17 <0.01	<0.1		35.5	0.6
10.9	0.09	5.24	3.28	1.13	0.11	0.2	26.9	0.57
11.3	0.05	5.19	3.36	1.17	0.08	0.1	26.2	0.54
12.4	0.04	2.29	2.87	0.6	0.04	0.2	26.6	0.55
11.6	0.04	3.16	2.92	0.67	0.03	0.2	26.3	0.53
11	0.04	3.41	2.85	1.03	0.01	0.5	28.2	0.58
10.8	0.58	4.41	2.92	1.22	0.24	1	27.5	0.57
10.8	0.07	6.24	3.17	1.17	0.07	1	25.4	0.53
10.4	0.1	5.82	3.1	1.17	0.13	1.7	25.7	0.52
11.3	0.05	1.41	2.5	0.41	0.01 <0.1		29.7	0.65
10.8	0.05	1.44	2.33	0.36	0.02 <0.1		30.2	0.62
12.4	0.08	1.47	2.5	0.45	0.01 <0.1		29.2	0.68
9.68	0.06	2.23	2.14	0.34	0.03	0.1	27.4	0.58
12.8	0.09	2.26	2.19	0.58	0.02	0.2	24.8	0.6

12.5	0.1	3.11	2.12	0.64	0.02 <0.1		25.7	0.58
10.8	0.12	5.04	2.13	0.69	0.02	0.1	26.1	0.53
7.66	0.24	16.9	1.54	0.71	0.07	0.1	20	0.35
12.5	0.13	2.62	2.29	0.71	0.02 <0.1		26.5	0.6
10.5	0.09	1.69	2.3	0.51	0.01 <0.1		27	0.65
8.07	0.06	1.73	1.96	0.28	0.01	0.2	30.1	0.62
8.76	0.04	2.03	1.81	0.43	0.01 <0.1		28.9	0.59
11.4	0.29	5.6	3.31	0.92	0.05 <0.1		25.7	0.53
10.2	0.31	3.19	2.03	0.34	0.01	0.2	27.3	0.6
10.5	0.31	2.3	2.08	0.41	0.01	0.2	27.7	0.63
10.5	0.11	1.72	2.21	0.45	0.01 <0.1		29.3	0.64
12.8	0.21	1.62	3	0.59	0.02 <0.1		25.1	0.48
10.1	0.12	1.18	2.03	0.37	0.02 <0.1		30.8	0.62
10.3	0.15	1.29	2.08	0.39	0.02	0.1	28.3	0.62
8.28	0.07	1.42	2.31	0.4	0.01 <0.1		30.5	0.67
10.9	1.12	8.64	3.29	1.37	0.12 <0.1		24.4	0.6
10.4	2.53	7.01	3.09	1.56	0.08	0.2	23.6	0.59
11.1	0.22	4.28	3.18	1.16	0.03 <0.1		26.5	0.59
11.7	0.19	3.42	3.29	1.07	0.02 <0.1		27.6	0.62
10.1	0.36	2.92	2.34	0.83 <0.01		0.4	27.9	0.59
10.3	0.34	4.94	2.39	0.75	0.01 <0.1		27.4	0.61
12.3	0.2	1.09	1.33	0.43	0.02	0.2	27.7	0.87
12.5	0.15	1.21	2.24	0.47 <0.01		0.1	27.3	0.74
12.9	0.15	1.25	2.96	0.5 <0.01	<0.1		29.5	0.69
12	0.16	1.87	3.01	0.67	0.01	0.1	27.8	0.69
16.3	0.19	1.01	1.5	0.26	0.23	0.3	23.1	1.42
17.9	0.19	0.73	0.85	0.18	0.63	0.8	19.4	0.77
13.6	0.19	1.13	1.65	0.31	0.16	0.2	25.7	0.77
11.2	0.08	2.88	2.54	0.63	0.06	0.3	24.9	0.64
11.3	0.06	3.33	2.37	0.79	0.03	0.5	27	0.65
11.8	1.65	5.76	1.75	0.98	0.03	1.1	21.8	0.57
11.8	4.64	4.37	1.87	0.94	0.03	0.7	23.5	0.57
14.5	1.15	1.89	1.89	0.64	0.03	0.7	23.9	0.69
14.2	0.42	1.75	2.08	0.68	0.03	0.3	24.5	0.68
13.5	0.39	1.69	1.95	0.66	0.03	0.3	24.3	0.65
13.6	1.1	2.33	1.8	0.66	0.07	0.7	23.9	0.64
14.8	0.23	1.84	1.83	0.65	0.04	0.2	24.8	0.72
15.4	0.26	1.72	2.03	0.65	0.03	0.2	25	0.67
14.8	0.32	2.52	2.75	0.74	0.02	0.2	25.6	0.59
13.8	0.48	4.07	2.71	0.72	0.03	0.3	25.8	0.65
12.9	0.07	3.67	3.24	0.93	0.02 <0.1		26.6	0.69
9.34	0.03	1.33	1.96	0.33	0.01 <0.1		29	0.64
12.4	0.33	3.34	2.8	0.87	0.03	0.1	24.8	0.51
18.8	0.34	0.98	1.46	0.25	0.11	0.2	22.3	1.79
14.8	0.25	1.79	1.69	0.34	0.03 <0.1		25.4	1.13
12.7	0.23	1.51	1.58	0.34	0.02 <0.1		29.5	1.13
0.9	0.04	0.2	0.09	0.02 <0.01				0.04

1.69	0.13	0.17	0.23	0.05	0.04	0.07
8.46	0.05	2.05	2.06	0.34	0.02	0.64
6.13	0.03	1.22	1.59	0.26	0.02	0.52
5.82	0.05	1.61	1.48	0.26	0.03	0.48
0.25	0.05	0.03	0.02	0.01	0.02	0.01
10.7	0.06	1	2.38	0.35	0.02	0.67
9.15	0.07	6.23	2.46	0.52	0.02	0.56
11.7	0.2	4.86	2.97	0.85	0.06	0.54
0.84	0.11	0.09	0.07	0.02	0.05	0.03
10.8	0.06	1.21	2.42	0.39	0.02	0.71
9.1	0.04	1.45	2.04	0.32	0.02	0.68
5.96	0.21	7.96	1.38	0.21	0.04	0.46
11.7	0.09	2.78	3.71	0.73	0.03	0.64
6.62	4.88	4.55	1.92	1.11	0.02	0.47
9.75	0.24	4.32	3.07	1.29	0.06	0.52
0.74	0.03	0.08	0.14	0.04	<0.01	0.04
13.4	0.07	0.92	0.89	0.28	<0.01	0.74
10.4	0.31	5.93	3.58	1.27	0.06	0.58
11.1	0.26	4.35	2.74	0.69	0.06	0.63
11.9	0.12	2.13	2.75	0.67	0.06	0.65
8.46	0.41	5.8	2.48	1.16	0.07	0.54
0.81	0.13	0.47	0.21	0.08	<0.01	0.05
12.8	0.08	1.19	1.65	0.44	<0.01	0.74
11.2	0.1	2.74	2.94	0.92	0.02	0.6
10.7	1.6	3.22	3.75	0.98	0.07	0.51
10.9	1.41	2.03	3.56	0.69	0.02	0.59
0.56	0.25	0.55	0.13	0.03	<0.01	0.03
9.09	0.71	3.85	3.03	0.69	0.3	0.51
0.58	0.12	0.55	0.07	0.02	<0.01	0.03
11.7	0.1	1.64	2.39	0.65	<0.01	0.68
10.5	3.4	2.55	2.53	0.83	0.03	0.6
7.66	0.85	3.76	2.64	0.93	0.24	0.44
1.48	0.26	0.33	0.28	0.05	<0.01	0.11
8.88	1.04	2.62	2.63	0.9	0.05	0.6
7.05	0.68	4.45	2.51	1.11	0.07	0.34
0.9	0.11	0.66	0.18	0.05	<0.01	0.05
6.93	0.05	0.65	1.05	0.22	<0.01	0.52
5.69	4.52	2.4	1.12	1.75	0.02	0.53
8.8	1.93	2.05	1.92	1.07	0.02	0.63
7.02	0.59	4.08	2.57	0.96	0.09	0.34
9.34	1.59	4.14	2.22	0.65	0.02	0.58
9.52	4.68	2.87	2.49	0.68	0.05	0.51
0.75	0.06	0.45	0.13	0.03	<0.01	0.04
10.5	0.04	3.95	2.54	0.38	0.02	0.63
10	0.05	1.36	2.35	0.32	0.02	0.66
10.9	1.02	2.59	2.79	0.52	0.02	0.62
8.63	0.73	4.56	2.97	1.04	0.15	0.47

11.4	0.2	2.18	2.47	0.43	0.09			0.7
8.32	0.8	4.55	2.89	1.01	0.32			0.41
1.63	0.61	3.66	0.49	0.13	<0.01			0.09
13.7	0.06	1	0.35	0.16	<0.01			1.11
1.13	0.06	1.58	0.25	0.06	<0.01			0.06
11.2	0.24	3.83	3.66	1.32	0.07			0.53
12.1	0.1	3.12	3.14	0.72	0.02			0.62
12.5	0.1	4.01	3.24	0.72	0.02			0.51
0.96	0.08	1.3	0.18	0.07	0.02			0.04
12.7	0.09	2.92	3.62	0.96	0.04			0.55
1.52	0.09	0.65	0.34	0.07	<0.01			0.1
9.03	0.1	2.06	2.77	0.72	0.01			0.62
5.22	4.66	3.54	1.5	0.65	0.03			0.43
6.59	2.05	3.97	2.63	1.22	0.08			0.3
1.52	0.55	0.87	0.47	0.13	<0.01			0.09
7.96	0.15	1.92	2.72	0.69	0.04			0.6
2.01	2.92	28.7	0.61	4	0.11	<0.1	3.61	0.08
12.3	0.46	2.8	3.56	0.97	0.03	<0.1	25.8	0.6
12.3	0.54	2.84	3.49	0.92	0.04	0.2	25.9	0.61
11.4	0.68	3.32	3.29	0.95	0.04	<0.1	26.1	0.63
10.3	0.03	1.25	2.35	0.42	0.01	0.3	30.5	0.83
12.1	0.04	2.77	2.73	0.52	0.01	0.8	25.8	0.66
12.1	0.03	1.89	2.73	0.5	<0.01	0.5	26.3	0.68
10	0.2	12.1	2.3	0.48	0.01	1.9	20.7	0.49
8.93	0.04	3.28	1.99	0.4	<0.01	2	30.4	0.61
9.03	0.03	3.22	2.03	0.42	<0.01	1.8	30.8	0.61
3.43	2.98	25.6	0.86	4.13	0.18	0.1	7.73	0.14
10.1	0.15	2.47	2.92	0.99	0.06	0.5	27.9	0.63
10.2	0.18	2.64	2.94	0.99	0.06	0.7	28.3	0.63
9.67	2.33	3.17	2.68	1	0.05	1.5	26.2	0.59
9.71	2.38	3.32	2.68	1.02	0.04	1.6	26.2	0.59
6.86	0.6	2.09	1.75	0.67	<0.01	0.5	34	0.49
3.23	0.09	12.4	1.18	0.3	0.02	11.3	15.1	0.23
8.47	0.07	2	2.95	0.69	0.02	0.3	30.8	0.6
8.51	0.18	2.46	2.82	0.69	0.05	0.9	30.7	0.59
6.56	0.12	2.27	1.24	0.31	0.03	2.3	13.4	0.37
10.9	0.04	2.49	2.82	0.78	0.02	0.2	28.7	0.63
11.2	0.05	2.77	2.88	0.8	0.02	0.3	28.6	0.64
6.01	0.03	0.78	1.56	0.3	0.01	<0.1	37.6	0.58
9.14	0.04	1.2	2.35	0.44	0.02	0.1	32	0.82
8.64	0.03	1.2	2.14	0.39	0.02	<0.1	33.2	0.78
10.2	0.04	3.64	2.54	0.46	0.01	0.3	29.3	0.69
10.2	0.04	2.3	2.42	0.45	0.02	0.3	30.5	0.7
10.1	0.07	1.93	2.35	0.46	0.02	0.3	30.2	0.86
2.54	0.02	0.84	1.14	0.12	<0.01	<0.1	42.1	0.46
2.36	<0.01	0.71	1.06	0.1	<0.01	0.1	42	0.42
3.3	0.11	0.59	1.36	0.2	0.01	0.5	39.4	0.51

10.4	0.11	1.14	1.78	0.37	0.03	0.3	30.8	0.75
9.41	0.37	1.2	2.64	0.35	0.02	0.4	31.9	0.73
6.39	0.18	5.14	1.42	0.2	0.05	0.2	33.6	0.64
9.28	0.03	2.93	2.27	0.34	0.04	2.1	30.4	0.66
9.29	0.09	1.12	1.47	0.27	0.01	0.3	32.7	0.7
11.5	0.16	8.08	2.41	0.52	0.33 <0.1		23.2	0.57
9.22	0.1	5.35	2.38	0.4	0.02	0.2	29.4	0.66
10.6	0.06	1.21	0.6	0.25	0.01	0.6	31.3	0.9
6.26	0.12	0.65	1.27	0.26	0.01 <0.1		37	0.69
11	0.25	3.11	2.81	0.63	0.02 <0.1		27.9	0.69
6.84	0.15	1.41	1.67	0.45	0.02 <0.1		33.6	0.57
13.1	0.07	5.2	2.56	0.49	0.04 <0.1		24.1	0.62
13.3	0.02	4.15	2.33	0.41	0.04 <0.1		25.1	0.67
7.43	0.01	1.88	0.89	0.16	0.02 <0.1		34.4	0.8
10.4	0.05	1.09	0.51	0.16	0.01	0.1	29.7	0.93
4.66	9.74	6.09	1.41	1.05	0.21	6.1	21	0.31
6.26	4.19	3.5	1.47	1.19	0.03	2.5	26.9	0.45
6.89	3.59	2.55	1.79	1.35	0.04	1	28.4	0.48
5.57	7.75	2.66	1.65	1.75	0.04	1.1	23.4	0.39
7.06	3.88	2.91	2.13	1.25	0.19	0.8	27.5	0.45
6.8	2.77	3.16	1.96	1.15	0.04	1.3	28.4	0.47
6.73	3.97	2.86	2.03	1.19	0.04	0.9	27.4	0.46
7.22	2.25	2.93	2.24	1.21	0.04	0.8	28.8	0.48
9.65	0.57	4.65	2.73	1.3	0.11 <0.1		27.7	0.66
8.63	1.4	4.32	2.27	1.1	0.19 <0.1		28.6	0.55
7.02	0.91	2.98	1.75	0.86	0.05 <0.1		32.6	0.58
7.41	0.52	7.37	1.91	0.99	0.08 <0.1		28.2	0.59
8.76	0.29	3.17	2.33	1.11	0.08 <0.1		31	0.62
11.5	0.1	1.49	0.83	0.36	0.01	0.6	28.5	0.8
11	0.09	1.41	2.06	0.4	0.02	0.2	29.8	0.66
11.8	0.09	2.37	2.65	0.46	0.02	1.2	26.3	0.68
11.5	0.1	1.89	2	0.39	0.02	1.2	27.1	0.74
7.04	12.9	4.32	2.18	1.5	0.04	1.6	17.2	0.27
8.82	2.23	2.36	1.92	0.86	0.03	0.7	28.3	0.6
9.2	0.16	2.5	1.72	0.63 <0.01		1.4	28.7	0.61
8.76	0.9	3.74	2.42	1.48	0.04	1.3	26.6	0.55
7.66	5.06	5.82	2.53	2.29	0.06 <0.1		23.3	0.5
8.72	0.26	5.86	2.85	1.18	0.07 <0.1		28	0.58
9.36	1.89	6.03	3.12	1.59	0.07 <0.1		25.2	0.52
9.14	3.45	6.13	3.02	1.56	0.08 <0.1		24.8	0.51
10.3	0.39	7.67	3.37	1.73	0.07 <0.1		25.3	0.51
8.62	2.23	5.35	2.88	1.43	0.04 <0.1		26.1	0.52
8.09	0.13	5.4	2.91	1.03	0.01 <0.1		28.8	0.52
7.62	0.11	3.54	2.6	0.81	0.04 <0.1		31.8	0.57
4.66	14	3.35	1.63	1.88	0.03	0.3	19.7	0.3
7.22	3.13	4.42	2.4	1.27	0.03 <0.1		27.8	0.47
8.13	0.21	6.82	2.84	1.31	0.05 <0.1		28.1	0.51

8.28	0.83	6.8	2.84	1.37	0.07 <0.1		27.5	0.51
8.48	0.65	5.1	2.52	1.15	0.04 <0.1		27.7	0.51
3.23	25.6	2.33	0.87	0.73 <0.01		0.4	10.4	0.19
9.38	0.27	5.04	2.02	0.99	0.02 <0.1		28.4	0.58
9.43	1.32	2.55	1.85	0.97	0.02	0.2	28.5	0.6
6.21	8.03	4.76	2.21	1.14	0.13	3.6	23.4	0.44
9.83	0.22	4.03	3.3	1.15	0.06	2.3	25.3	0.52
11.5	0.29	4.3	3.33	1.26	0.03	1.4	25.1	0.58
8.84	2.37	3.91	2.95	1.54	0.1 <0.1		26.6	0.55
6.08	5.31	3.46	1.89	3.33	0.03	0.4	24.2	0.45
6.48	8.02	4.38	1.89	4.4 <0.01		0.1	19	0.37
10.5	0.13	4.16	3.17	1.38	0.01	1.5	25.4	0.49
10.3	0.26	3.49	3.47	1.37	0.08	0.1	27.5	0.47
8.08	1.09	3.27	2.93	1.69	0.09	1.3	27.1	0.53
10.2	0.03	1.94	2.83	0.48	0.02	0.8	29	0.62
9.32	0.04	1.69	2.36	0.42	0.02	0.5	32.1	0.63
7.66	0.11	5.47	1.97	0.47	0.02	2.7	28.3	0.56
8.76	0.08	3.77	2.36	0.71	0.03	1.5	28.5	0.61
8.33	0.69	5.98	2.26	0.64	0.27	2.1	27	0.58
4.9	0.09	6.72	1.24	0.29	0.06	7.2	9.9	0.24
9.88	0.07	2.51	2.7	0.56	0.03	1.4	26.4	0.56
10.4	0.03	2	2.78	0.65	0.04	0.2	29	0.64
10.1	0.06	2.12	2.7	0.66	0.04	0.1	29	0.62
11.2	0.05	2.11	3.03	0.71	0.05 <0.1		29.2	0.65
9.85	0.04	1.72	2.64	0.58	0.05 <0.1		30.4	0.63
12.4	0.08	1.98	2.56	0.53	0.02	0.9	25	0.61
13	0.09	1.59	2.66	0.56	0.02	0.4	26.5	0.65
12.5	0.08	1.54	2.57	0.55	0.02	0.4	25.2	0.62
12.8	0.08	1.65	2.71	0.56	0.03	0.4	26.2	0.65
12.6	0.1	1.53	2.54	0.44	0.06	0.4	28.1	0.73
8.52	9.51	1.56	1.98	0.45	0.04	0.7	23.2	0.52
5.68	13.6	7.02	1.45	1.31	0.02	6	15.5	0.31
9.33	0.9	8.06	2.6	1.29	0.03	0.7	24.1	0.51
10	0.17	3.5	2.82	0.74	0.03	0.9	28.4	0.6
9.33	0.41	5.43	2.61	1.04	0.03 <0.1		27.5	0.59
9.66	0.24	3.47	2.67	0.83	0.05 <0.1		28.8	0.62
8.73	0.99	4.6	2.32	0.92	0.05 <0.1		27.8	0.54
6.85	1.26	11.5	1.9	1.53	0.04 <0.1		22.2	0.45
9.78	0.28	4.7	2.84	0.94	0.03 <0.1		27.1	0.6
5.82	1.4	20.1	1.76	2.12	0.07 <0.1		14.5	0.33
1.97	1.25	18.3	0.31	0.1	0.03	21.2	7.52	0.1
4.68	0.42	19.9	1.34	0.54	0.04	14	16.7	0.25
11.9	0.05	2.55	2.59	0.53 <0.01		1.5	26.2	0.65
10.7	0.05	5.53	2.34	0.46	0.02	5	22.8	0.54
12	0.05	2.99	2.79	0.54	0.03	1.9	25.7	0.58
12.2	0.04	2.96	2.8	0.53	0.03	1.8	26	0.58
12.1	0.04	2.94	2.73	0.49	0.03	2	25.1	0.54

9.63	0.02	4.43	2.29	0.47	0.02	3.5	27.6	0.57
6.78	0.13	3.15	1.41	0.23	0.04	2.7	30.8	0.44
10.2	0.02	1.09	2.29	0.35	0.02	0.2	31	0.67
8.17	0.88	4.77	2.13	0.63	0.27 <0.1		30.2	0.61
7.84	0.46	7.17	2.12	1.03	0.02	0.4	28.7	0.6
6.91	1.32	14.4	1.74	1.66	0.01	0.5	20.2	0.44
10.7	0.08	1.95	3.16	0.68	0.01	0.2	30.5	0.71
10.6	0.07	1.99	3.21	0.67 <0.01		0.2	30	0.7
8.89	0.38	5.72	2.46	1.04	0.04	0.5	29.3	0.61
9.46	0.19	3.71	2.45	0.75 <0.01		0.5	29.5	0.64
4.94	0.75	3.13	1.69	0.63	0.23	1	13	0.21
0.75	0.07	0.81	0.25	0.06 <0.01		0.5	1.71	0.04
3.69	0.08	2.76	0.22	0.03	0.05	0.6	3.87	0.04
13.6	0.14	2.02	2.58	0.56	0.02	0.7	26.2	0.63
8.8	0.11	3.44	2.33	0.49	0.05	1.6	28.5	0.6
0.51	0.04	3.12	0.08 <0.01	<0.01		0.8	0.77	0.02
10.1	0.12	1.81	1.94	0.31	0.02	0.6	30.4	0.65
8.37	0.04	3.03	2.01	0.27	0.01	1.7	30.2	0.61
7.89	0.49	3.79	2.57	0.97	0.1	0.9	20	0.41
1.2	0.05	2.2	0.33	0.08 <0.01		0.6	2.44	0.07
14.9	0.03	1.21	0.41	0.14	0.01	0.3	26.9	0.98
12.6	0.05	0.87	1.22	0.21 <0.01	<0.1		30.1	0.82
0.89	0.46	4.09	0.09	0.01 <0.01		0.6	1.46	0.06
13.5	0.03	2.24	1.64	0.31	0.02	0.5	25.5	0.76
13.3	0.02	2.22	3.48	0.49	0.02	0.2	27.6	0.6
0.32	1.09	0.9	0.07 <0.01	<0.01		0.3	0.5	0.02
12.9	0.25	1.14	2.37	0.4	0.23	0.2	27.1	0.83
7.94	0.02	2.28	1.97	0.39	0.02	0.1	34.3	0.69
5.61	1.22	2.94	1.97	0.78	0.36	1	15.3	0.28
11.3	0.13	4.18	3.08	0.55	0.01	2.2	23.8	0.42
9.93	0.08	1.85	2.64	0.38	0.01	0.8	29.5	0.63
7.33	7.92	7.19	2.51	0.91	0.07	2.1	18	0.37
6.11	14.1	7.48	1.01	0.41	0.11	3.5	11.5	0.31
6.89	2.85	4.2	2.35	0.81	1.14	1.3	17.8	0.37
15.9	0.08	1.35	1.01	0.2	0.08	0.6	23.6	0.89
17.6	0.07	1.39	1.28	0.28	0.02	0.5	20.5	0.91
7.67	0.36	4.01	2.7	1	0.07	1.2	28	0.41
10.2	0.15	2.28	2.92	0.67	0.02	0.2	29.6	0.61
9.47	0.11	6.17	3.04	0.79	0.02	0.8	27	0.59
6.65	0.49	3.54	2.44	0.86	0.1	0.6	16.9	0.32
9.82	0.04	2.26	3.5	0.87	0.02	0.4	27.6	0.56
7.72	0.03	1.65	1.4	0.3 <0.01		0.6	32.2	0.76
12	0.03	1.44	1.84	0.34	0.02	0.3	28.6	0.7
5.2	1.06	3.34	1.83	0.77	0.2	0.7	13	0.29
14.5	0.02	1	0.7	0.19	0.02	0.2	25.1	0.85
12.7	0.03	1.14	0.72	0.18	0.01 <0.1		28.8	0.79
13.3	0.05	1.03	0.78	0.23	0.01	0.1	29.6	0.87

13	0.07	2.08	1.28	0.27	<0.01	0.3	28	0.72
14.9	0.04	1.24	2.59	0.44	0.02	0.1	23.6	0.8
13.1	0.06	6.05	2.85	0.51	0.02	0.2	22.2	0.6
4.92	3.49	3.53	1.86	1.01	1.01		23.2	0.22
4.62	2.64	3.63	1.95	1.09	0.27		15.4	0.23
0.44	2.31	1.5	0.12	0.05	<0.01		1.42	0.02
10.2	0.13	1.11	1.29	0.31	0.02		30.4	0.66
9.59	0.11	1.36	1.21	0.33	0.01		30	0.66
13.7	0.15	2.92	1.77	0.41	0.02		23.6	0.65
8.4	2.5	4.36	2.8	1.15	0.13		21.8	0.36
4.33	0.75	2.93	1.49	0.63	0.14		11.8	0.21
0.47	0.22	0.66	0.13	0.04	<0.01		0.96	0.02
12.8	0.09	3.1	1.51	0.21	0.03		22.6	0.68
11.1	0.07	3.55	2.76	0.7	0.02		27.5	0.48
12.7	0.08	2.92	3.23	0.8	0.03		26.6	0.53
8.38	1.54	4.45	2.53	0.87	0.66		22.4	0.45
11.9	0.17	3.95	3.17	0.92	0.07		24.4	0.51
10.7	0.07	1.5	1.69	0.31	0.05		29.7	0.69
7.44	5.05	9.05	2.33	0.95	0.3		19.9	0.4
9.41	0.83	4.56	2.86	0.97	0.07		25.4	0.53
16.7	0.08	0.98	0.85	0.2	0.04		23.2	0.93
9.97	0.05	1.29	1.37	0.23	0.02		31.1	0.68
8.36	0.34	4.99	2.4	1.08	0.07		29.2	0.61
1.81	0.2	0.47	0.42	0.13	<0.01		4.19	0.11
12.6	0.13	2.62	1.48	0.38	0.02		27.3	0.77
7.5	8.82	5.36	1.97	2.48	0.13		16.2	0.41
8.42	0.73	6.83	2.17	0.87	0.09		18.3	0.39
1.17	0.1	0.57	0.26	0.05	<0.01		2.82	0.07
6.84	2.48	3.56	2.47	0.87	0.77		17.1	0.33
12	0.1	2.26	2.81	0.8	0.01		28.8	0.69
6.24	7.76	6.59	1.69	1.47	0.03		20.8	0.42
11.8	0.17	3.34	3.35	0.96	0.06		25.7	0.53
1.13	0.04	0.89	0.18	0.04	<0.01		1.85	0.06
11.4	0.07	1.9	2.59	0.66	0.01		27.2	0.69
10.9	0.29	3.43	2.71	0.93	0.07		26.2	0.67
11.5	0.19	2.66	2.27	0.54	0.05		26.3	0.68
8.96	6.19	3.28	2.68	0.98	0.05		22.2	0.53
2.78	0.09	1.46	0.83	0.24	0.01		7.91	0.16
5.85	3.54	3.27	2.18	0.91	1.3		13.6	0.25
9.64	0.12	5.87	3.47	1.02	0.05		22.2	0.36
3.25	17.3	5.98	0.94	3.98	<0.01		7.37	0.17
7.33	1.08	3.41	2.59	0.82	0.36		20.7	0.33
1.03	0.05	0.7	0.32	0.08	<0.01		2.75	0.06
9.18	0.42	2.38	2.74	0.57	0.18		28.6	0.57
5.39	6.03	3.98	1.58	2.34	0.04		23.2	0.43
3.85	13.2	4.36	1.12	5.1	0.02		11.9	0.28
6.23	1.27	3.52	2.38	0.94	0.09		18.7	0.33

0.44	0.08	0.71	0.13	0.03	<0.01	0.73	0.02
11.1	0.07	2.84	3.19	0.76	0.03	25.8	0.49
10.3	0.16	4.33	2.99	0.73	0.06	25.1	0.5
8.81	1.54	4.89	2.45	1.11	0.32	22	0.47
3.63	0.07	1.34	0.43	0.09	0.02	4.64	0.17
9.19	0.06	2.24	2.04	0.35	0.02	28.4	0.67

Ag ppm	As ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Cd ppm	Ce ppm	Co ppm
<1	<5	71	829	7	0.5	<0.2	173	8.4
<1	<5	72	736	5	0.5	<0.2	123	6
<1	<5	69	760	6	0.5	0.5	131	6.1
<1	8	77	759	<5	0.6	<0.2	112	10.2
<1	7	55	716	<5	0.4	<0.2	107	14.3
<1	<5	58	569	<5	0.9	<0.2	126	6.9
<1	<5	63	762	<5	0.4	<0.2	103	5.3
<1	23	42	1120	<5	1.1	<0.2	147	8.1
<1	<5	65	746	<5	0.7	<0.2	115	6.2
<1	7	48	741	<5	0.7	<0.2	142	13.3
<1	15	73	709	<5	0.5	<0.2	148	9.5
<1	16	43	724	<5	0.6	<0.2	124	10.6
<1	27	64	821	<5	0.9	<0.2	163	8
<1	84	39	1500	<5	1.2	<0.2	265	3.9
<1	53	50	825	<5	0.6	<0.2	93.5	2.7
<1	23	55	656	<5	0.7	<0.2	107	2.7
<1	28	60	7890	9	0.6	<0.2	112	4.9
<1	7	74	639	8	0.8	<0.2	135	11.1
<1	12	69	508	10	0.9	0.7	150	24
<1	21	72	505	10	0.8	0.9	209	44.3
<1	19	82	557	8	0.6	0.6	165	35.1
<1	21	68	538	10	0.5	0.9	147	35.3
<1	13	45	371	6	0.8	<0.2	112	3.3
<1	6	39	415	5	0.4	<0.2	109	3.7
<1	<5	54	355	<5	0.2	<0.2	92.7	3.6
<1	<5	50	428	5	0.3	<0.2	98.5	6
<1	8	59	472	6	0.3	<0.2	107	8.9
<1	<5	65	533	8	0.4	<0.2	111	6
<1	11	67	511	8	0.5	<0.2	137	5.4
<1	15	57	532	8	0.5	<0.2	131	6.2
<1	8	76	531	9	0.5	<0.2	133	9.2
<1	99	55	607	7	0.4	<0.2	109	2.7
<1	27	61	514	6	0.4	<0.2	103	2
<1	52	75	635	10	0.8	<0.2	155	3.5
<1	26	62	660	<5	0.6	<0.2	157	4.9
<1	12	26	229	<5	1.5	<0.2	124	17.9
<1	10	29	457	<5	0.9	<0.2	122	7.7
<1	<5	24	345	<5	0.9	<0.2	89.2	11.4
<1	<5	50	546	<5	0.4	<0.2	82.4	7.8
<1	<5	35	615	<5	0.3	<0.2	79.4	5.1

<1	<5	35	428 <5		0.2 <0.2		82.2	2.3	
<1	<5	43	465 <5		0.3 <0.2		84.9	2.5	
<1	5	48	689 <5		0.3	0.2	125	12.4	
<1	6	32	686 <5		0.3 <0.2		121	12.4	
<1	8	63	625	10	0.5 <0.2		147	19.1	
<1	49	51	598	6	0.6 <0.2		117	4.7	
<1	19	43	681 <5		0.3 <0.2		125	5.8	
<1	21	23	518 <5		0.2 <0.2		99.3	2.3	
<1	83	28	671 <5		0.7 <0.2		98.6	4.8	
<1	186	28	644 <5		0.7 <0.2		120	4.8	
<1	38	27	708 <5		0.4 <0.2		84.6	3.8	
<1	13	47	643	7	0.5 <0.2		120	7.9	
<1	49	34	728	8	0.8 <0.2		119	30	
<1	22	24	480	7	0.5 <0.2		98.1	26.5	
<1	32 <10		556	7	0.4 <0.2		124	17.5	
<1	33 <10		300	7	0.5 <0.2		188	4.7	
<1	15 <10		566	7	0.5 <0.2		117	43	
<1	9	18	318	7	1 <0.2		98.9	9.2	
<1	6	28	270	7	1.1 <0.2		80.6	8.9	
<1	7	34	303	8	1.8 <0.2		141	7.2	
<1	8	22	461	8	1.2 <0.2		197	11.5	
<1	18	27	401	12	0.6	0.5	122	7	
<1	<5	58	461	6	0.2	0.3	115	5.2	
<1	<5	55	438	8	0.2	0.6	113	22.2	
<1	<5	36	422	8	0.2 <0.2		103	18.5	
<1	<5	62	486	8	0.2 <0.2		103	16.8	
<1	<5	63	529	7	0.2 <0.2		107	17.8	
<1	<5	57	522	7	0.3 <0.2		110	16.7	
<1	36	28	412 <5		0.2 <0.2		76.5	8.4	
<1	37	31	367	6	0.5 <0.2		100	3.9	
<1	11	49	582 <5		0.5 <0.2		100	7	
<1	8	65	622	5	0.5 <0.2		134	4.4	
<1	10	52	613	5	0.5 <0.2		138	9.1	
<1	12 <10		267 <5		0.1 <0.2		49.3	1.2	
	<1	<5	50.2	494	<5	0.6	<0.2	118	14.6
	<1	<5	78.3	318	<5	0.8	0.3	238	8.93
<1	<5		39.7	370 <5		0.4 <0.2		101	3.96
<1	<5		69.2	418 <5		0.4 <0.2		60.4	4.36
<1	<5		52.3	329 <5		0.3 <0.2		50.3	3.56
<1	6	63.5	350 <5		0.4 <0.2		73.4	3.82	
<1	26	33.6	399 <5		0.2 <0.2		82.4	9.85	
<1	26	98.3	615 <5		0.8 <0.2		149	4.98	
<1	23	77.4	647 <5		1.3	0.2	143	5.26	
<1	52	56.2	610 <5		0.4 <0.2		115	4.07	
<1	<5	55.3	471 <5		0.2 <0.2		88	3.29	

<1	<5	59.1	551 <5		0.3 <0.2	86.3	3.76	
<1	<5	60.1	583 <5		0.3 <0.2	79.3	4.14	
<1	<5	77.9	578 <5		0.4 <0.2	83	4.76	
<1	<5	36.1	250 <5		1 <0.2	80.3	6.85	
<1	<5	61.3	410 <5		0.8 <0.2	86.5	7.36	
<1		8	83	590 <5	1.1 <0.2	119	5	
<1		7	95	422 <5	1.4 <0.2	98.3	5.3	
<1	<5		82	379	5	0.4 <0.2	94.1	1.8
<1		28	56	929 <5	0.9 <0.2	148	14.9	
<1		9	45	575 <5	0.5 <0.2	125	4	
<1		15	42	371 <5	0.4 <0.2	63.5	2.6	
<1	<5		49	316 <5	0.3 <0.2	80.2	3.2	
<1		15	33	403 <5	0.5 <0.2	65.1	2.5	
<1	<5		41	482 <5	0.4 <0.2	95.1	4.2	
<1	<5		45	642 <5	0.4 <0.2	113	15	
<1	<5		53	674 <5	0.4 <0.2	111	13.3	
<1	<5		76	726	5	0.4 <0.2	128	22.6
<1	<5		45	477 <5	0.3 <0.2	85.2	2.6	
<1		14	46	457 <5	0.5 <0.2	79.1	25.1	
<1	<5		63	450 <5	0.5	0.4	97.4	10.5
<1		26	48	407 <5	0.5 <0.2	96.3	6.1	
<1		20	45	471 <5	0.4 <0.2	94.7	11.1	
<1		17	48	490 <5	0.4 <0.2	107	7.6	
<1		23	59	625 <5	0.5 <0.2	88.7	3.2	
<1		30	30	582 <5	0.3 <0.2	109	5	
<1		8	44	459 <5	0.3	0.2	76.5	13.3
<1	<5		57	629 <5	0.3 <0.2	59.9	5.1	
<1	<5		35	539 <5	0.4 <0.2	93.6	5	
<1		23	58	456 <5	0.2	0.3	81.5	13.5
<1		9	49	688 <5	0.4 <0.2	113	11.7	
<1		9	52	711 <5	0.3 <0.2	114	22	
<1		19	48	446 <5	0.4 <0.2	82.6	5.4	
<1		8	52	506 <5	0.5 <0.2	72.7	7.8	
<1		7	50	484 <5	0.6 <0.2	75.5	8.2	
<1		8	51	448 <5	0.7 <0.2	84.3	8.9	
<1	<5		49	438 <5	0.4 <0.2	86.7	4.5	
<1	<5		50	605 <5	0.4 <0.2	113	5.1	
<1		23	62	884 <5	0.5 <0.2	178	14.7	
<1		18	58	799 <5	0.6 <0.2	154	9	
<1		18	78	426 <5	0.6 <0.2	151	13.6	
<1	<5		73	425 <5	1 <0.2	104	3.7	
<1	<5		75	545 <5	0.5 <0.2	83.6	3.5	
<1		5	74	619 <5	0.5 <0.2	129	13.6	
<1		7	58	1110 <5	0.5	0.3	124	38.1
<1		11	60	600 <5	0.5 <0.2	135	16.2	
<1		41	30	1520 <5	0.5 <0.2	72.4	4.2	
<1		44	25	652 <5	0.5 <0.2	116	5	

<1	80	23	359 <5	0.5 <0.2		101	15.3
<1	144	35	297 <5	0.5 <0.2		50.5 <0.5	
<1	151	62	595 <5	0.5 <0.2		103	4.3
<1	51	72	359 <5	0.5 <0.2		88.1	4.6
<1	6	50	508 <5	0.4 <0.2		150	22.4
<1	7	63	459 <5	0.6 <0.2		90.5	9.5
<1	<5	49	507 <5	0.3 <0.2		93	14.2
<1	<5	41	466 <5	0.3 <0.2		118	9.7
<1	<5	40	471 <5	0.3 <0.2		125	16.8
<1	31	44	341 <5	0.3 <0.2		95.3	4.1
<1	6	46	421 <5	0.3 <0.2		165	49.5
<1	6	25	322 <5	0.3	0.8	112	30
<1	44	39	403 <5	0.3	0.4	90.3	9.7
<1	49	55	442 <5	0.5	0.3	83.7	8.8
<1	30	56	518 <5	0.5	0.3	158	20.1
<1	37	62	564 <5	0.5 <0.2		93.8	12.4
<1	13	41	657 <5	0.4 <0.2		88.5	13.7
<1	<5	64	502 <5	0.4 <0.2		51.4	7.3
<1	<5	74	857 <5	0.4 <0.2		100	7.4
<1	5	58	387 <5	0.3	0.7	90.6	37
<1	27	35	326 <5	0.2 <0.2		121	4.7
<1	38	65	971 <5	0.6 <0.2		231	6.1
<1	32	69	294 <5	0.7 <0.2		102	4.8
<1	22	64	282 <5	0.7 <0.2		91.9	4.5
<1	19	68	307 <5	0.8 <0.2		119	4.4
<1	20	60	384 <5	0.7 <0.2		152	5.8
<1	6	58	402 <5	0.4 <0.2		122	4.5
<1	<5	62	390 <5	0.3 <0.2		110	5
<1	6	58	422 <5	0.3 <0.2		112	11.1
<1	9	106	364 <5	1.7 <0.2		107	4.1
<1	6	61	472 <5	1.1 <0.2		91.1	7.8
<1	<5	58	428 <5	0.8 <0.2		156	3.7
<1	<5	50	545 <5	0.6 <0.2		120	3.3
<1	<5	50	502 <5	0.3 <0.2		106	2.4
<1	<5	61	630 <5	0.3 <0.2		109	2.1
<1	<5	58	604 <5	0.3 <0.2		109	2.7
<1	32	43	658 <5	0.5 <0.2		118	5.5
<1	6	44	603 <5	0.3 <0.2		129	9.3
<1	<5	41	814 <5	0.2 <0.2		111	3.5
<1	<5	28	902 <5	0.4 <0.2		126	2.8
<1	<5	63	745 <5	0.3 <0.2		93.3	19.1
<1	26	53	614 <5	0.3 <0.2		287	55.5
<1	5	70	486 <5	0.3 <0.2		101	8.7
<1	9	67	1120 <5	0.4	0.9	76.1	9.8
<1	<5	68	583 <5	0.2	0.3	132	58.3
<1	9	65	489 <5	0.7 <0.2		128	10.1
<1	<5	40	424 <5	0.2 <0.2		168	4.2

<1		10	38	483 <5		0.2	0.2	92.7	29.5
<1		6	54	436 <5		0.2	0.2	99.3	18.9
<1	<5		60	430 <5		1 <0.2		144	11.2
<1		18	50	753 <5		1.5	0.3	277	18
<1		5	76	578 <5		0.5 <0.2		175	2.6
<1	<5		62	474 <5		0.4 <0.2		99.1	18.7
<1		14	64	678 <5		0.5 <0.2		122	54.5
<1		10	46	588 <5		0.3 <0.2		74.3	79.6
<1		29	66	683 <5		0.3 <0.2		110	16
<1	<5		57	735 <5		0.3 <0.2		89	2.7
<1	<5		52	535 <5		0.2 <0.2		91.3	14
<1	<5		43	691 <5		0.6 <0.2		64.1	14
<1		19	55	385 <5		0.4 <0.2		98.5	12.5
<1		17	56	499 <5		1.2 <0.2		168	9.3
<1		36	70	455 <5		0.7 <0.2		92	13.9
<1		7	52	310 <5		0.7 <0.2		124	11
<1	<5		56	423 <5		0.3 <0.2		101	6.3
<1	<5		21	180 <5	<0.1	<0.2		113	0.8
<1		5	67	510 <5		0.2 <0.2		80.1	7.3
<1		64	67	314 <5		1.1 <0.2		85.6	13.7
<1		7	55	457 <5		0.2 <0.2		62	4.1
<1		16	60	711 <5		0.2 <0.2		96	4.9
<1		25	42	336 <5		0.3	0.2	65	5
<1	<5		68	498 <5		0.3 <0.2		102	8.8
<1	<5		72	453 <5		0.7 <0.2		130	14.2
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<1	<5		83	208 <5		1 <0.2		153	4.5
<1	<5		69	564 <5		0.3 <0.2		110	6.6
<1	<5		78	429 <5		0.7 <0.2		104	2.1
<1	<5		67	364 <5		0.4 <0.2		66.2	1.5
<1		7	77	568 <5		0.3 <0.2		122	7.2
<1	<5		65	674 <5		0.2 <0.2		95.2	6.5
<1	<5		87	981 <5		0.5 <0.2		87.7	3.9
<1		33	92	500 <5		0.7 <0.2		90.3	4
<1	<5		81	373 <5		1.2 <0.2		170	18
<1	<5		71	411 <5		1.6 <0.2		99.7	15.4
<1	<5		80	599 <5		0.5 <0.2		111	6.4
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<1	<5		48.1	436 <5		0.4	0.2	52.5	12.2
<1	<5		53.9	661 <5		0.4 <0.2		109	21.5
<1	<5		40.4	541 <5		0.2 <0.2		98.5	1.59
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<1	<5		39.1	339 <5		0.9 <0.2		51.6	7.07
<1		6	79.5	707 <5		1.9 <0.2		145	3.13
<1		6	30.2	513 <5		0.8 <0.2		63.6	11.3
<1	<5		69	673 <5		0.5 <0.2		105	4.03
<1	<5		133	141 <5		0.8 <0.2		300	2.52

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<1		7 40.3	418 <5			0.3 <0.2	88.4	5.04
<1		8 30.7	430 <5			0.3 0.6	76.7	21.1
<1	<5	<10.0	68 <5	<0.1	<0.2		82.1	5.9
<1	<5	<10.0	48.5 <5	<0.1	<0.2		114	7.7
<1	<5	<10.0	59.4 <5			0.3 <0.2	86.1	8.93
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<1	<5	63.3	229 <5			1.7 0.3	150	1.15
<1	<5	54.2	266 <5			0.5 <0.2	69	0.76
<1		7 <10.0	122 <5	<0.1	<0.2		134	4.25
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<1	<5	82.7	375 <5			0.2 <0.2	73.1	2.06
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<1	<5	83.7	621 <5			0.4 <0.2	82.2	4.07
<1	<5	55.8	673 <5			0.2 <0.2	94.2	5.9
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<1	<5	69.3	1010 <5			0.2 <0.2	95.7	4.85
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<1	<5	25.7	356 <5			0.5 0.2	93.7	11.2
<1		25 47.8	487 <5			0.6 <0.2	134	6.7

<1		40	45.5	746 <5	0.7 <0.2		183	4.87
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<1		36	41.4	1360 <5	0.5 <0.2		134	3.34
<1		18	47	1560 <5	0.5 <0.2		141	3.14
<1		18	43.4	502 <5	0.5 <0.2		120	3.62
<1	<5		47.1	442 <5	0.5 <0.2		108	3.05
<1	<5		44.3	460 <5	0.5 <0.2		102	2.26
<1		10	53.3	384 <5	0.2 <0.2		88.1	2.31
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<1	<5		48.7	841 <5	0.3 <0.2		97.1	13
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<1		5	37.8	496 <5	0.3 <0.2		85.4	5.81
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<1		19	60	233 <5	0.6 <0.2		137	7.2
<1		50	72	1410 <5	0.4 <0.2		70.8	4.3
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<1	<5		58	1170 <5	0.2 <0.2		82.6	2.2
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<1		18	100	372 <5	0.5 <0.2		89.3	4

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<1	<5		33	310 <5	0.3 <0.2		79	1.8
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<1	<5		56	598 <5	0.5 <0.2		78.7	3.5
<1		14	42	564 <5	0.4 <0.2		104	11.3
<1		9	88	466 <5	0.5 <0.2		104	11.8

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<1		14	49	603 <5		0.4 <0.2		148	24.1
<1	<5		31	500 <5		0.4	0.3	113	24.6
<1		6	52	534 <5		0.4 <0.2		118	14.6
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<1	<5		45	377	5	0.6 <0.2		101	10.8
<1	<5		48	462 <5		0.4 <0.2		89.1	4.9
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<1		19	50	373 <5		0.4 <0.2		114	15.8
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<1		9	68	411	5	0.7 <0.2		144	15.3
<1		8	68	401 <5		0.7 <0.2		138	13.8
<1		14	57	407	6	0.6	0.3	146	12.8
<1		6	69	364	8	0.8 <0.2		139	12.4
<1	<5		52	423	7	0.7 <0.2		128	11.8
<1	<5		77	476	7	0.7	0.3	101	15.3
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<1	<5		84	565 <5		0.4	0.2	140	26.7
<1		19	66	431 <5		0.3 <0.2		90.7	3.5
<1		17	79	3570 <5		0.4	0.5	77.5	18.2
<1		6	129	530 <5		1.6	0.4	255	7.7
<1		7	53	571 <5		1 <0.2		141	9.6
<1	<5		115	389 <5		0.6 <0.2		90.7	8.6
	1	13	132	96.4 <5		0.1 <0.2		7.3	15.8

	1	11	137	54.4 <5		0.1	0.3	19.6	14.9
<1		7	89	500 <5		0.3 <0.2		99.2	5.8
<1		7	70	362 <5		0.2 <0.2		94.7	6.2
<1		19	61	340 <5		0.2 <0.2		85.1	59.1
<1	<5		89	36.1 <5	<0.1	<0.2		47.4	9.4
<1		12	92	625 <5		0.4 <0.2		96.7	8.3
<1		7	90	531 <5		0.3 <0.2		110	23.1
<1		10	114	564 <5		0.4 <0.2		106	18.8
<1	<5		145	68.7 <5	<0.1	<0.2		40.6	10.7
	1	12	110	534 <5		0.3 <0.2		113	14
<1		10	102	446 <5		0.3 <0.2		113	5.9
<1		10	72	301 <5		0.3 <0.2		73.7	21.3
<1	<5		127	532	5	0.5 <0.2		96.4	8.9
<1		9	59	377 <5		0.2 <0.2		77.9	11.3
<1		9	90	516 <5		0.3 <0.2		82.1	20.1
	1 <5		176	27.5 <5	<0.1	<0.2		4.7	7.4
	1	7	104	240 <5		0.4 <0.2		119	4.3
<1		13	130	400	7	0.3 <0.2		510	49.3
<1		11	117	394 <5		0.5 <0.2		90.1	9.3
<1		9	140	459 <5		0.5 <0.2		160	67
<1		9	76	464 <5		0.3 <0.2		79.4	14.1
<1		5	133	41.2 <5	<0.1	<0.2		8.8	3.8
<1		14	89	423 <5		0.6 <0.2		55.7	10.2
<1		17	101	474 <5		0.4 <0.2		302	34.3
<1		7	109	550 <5		0.4 <0.2		94.4	13.5
<1		6	104	573 <5		0.5 <0.2		90.4	3.3
<1		6	135	25 <5	<0.1	<0.2		4.7	1.6
<1		27	111	470 <5		0.4	8.4	72.4	22.7
<1		6	103	16.2 <5	<0.1	<0.2		2.6	2.9
<1		10	109	327 <5		0.3 <0.2		62.6	10.4
<1		20	103	331 <5		0.3 <0.2		129	17.5
	3	19	99	373 <5		0.4	134	88	15.2
<1		6	107	49.2 <5		0.1 <0.2		13.9	1.5
<1		13	103	298 <5		0.3 <0.2		70.5	14.7
	5	44	97	291 <5		0.6	106	35.9	21.2
<1	<5		109	31.3 <5		0.1	4.3	6.3	10.1
<1		8	64	181 <5		0.3	1.1	44.6	5.7
<1		12	50	227 <5		0.3 <0.2		72.9	8.4
<1		13	76	338 <5		0.3 <0.2		71.9	11.4
	3	28	96	251 <5		0.4	47.2	65.6	20.8
<1		14	75	349 <5		0.4 <0.2		96.4	14.3
<1		8	90	356 <5		0.5	0.7	78.8	15
<1	<5		92	21.5 <5		0.1 <0.2		6.2	2.7
<1		13	90	366 <5		0.4 <0.2		93	7.7
<1		9	80	408 <5		0.2 <0.2		98.4	2.7
<1		14	88	412 <5		0.4 <0.2		88.5	9.9
<1		31	109	317 <5		0.4	13.7	74.7	19.9

<1		18	93	420 <5		0.5	0.2	121	23
<1		33	102	301 <5		0.4	53.5	80.8	23.1
<1		23	86	49.8 <5		0.1	0.5	11.4	5.4
	1	10	93	79.8 <5		0.8 <0.2		47.7	6
<1		64	175	41.3 <5		0.1 <0.2		6.2	10.5
<1		14	97	563 <5		0.4 <0.2		88.3	15.2
<1		12	90	585 <5		0.4 <0.2		207	8.9
	2	17	89	589	5	0.6 <0.2		168	38.8
<1		6	160	57.6 <5		0.2	0.3	20.7	1.7
	1	5	100	665 <5		0.5 <0.2		101	25.1
<1	<5		140	54.9 <5		0.1 <0.2		19.3	4.4
	1	6	111	317 <5		0.3	0.2	83.4	13
	1	12	46	261 <5		0.2	0.3	78.9	17.2
	6	51	103	346 <5		0.5	113	41.6	19.1
<1		9	141	74.8 <5		0.1 <0.2		11.3	12.5
	2	5	102	463 <5		0.3 <0.2		73.5	11.6
<1	<5		15	257 <5	<0.1	<0.2		27.1	13.5
	1	7	125	608 <5		0.5 <0.2		117	16.5
	2	11	123	562 <5		0.4 <0.2		122	16
<1		18	120	573 <5		0.4	0.3	124	15.1
<1		5	106	532 <5		0.4 <0.2		114	7.7
<1		10	103	577 <5		0.4 <0.2		81.4	14
	1 <5		102	575 <5		0.4 <0.2		85.7	10.6
<1		17	77	470 <5		0.4	7.5	143	28.1
<1		11	70	409 <5		0.2 <0.2		128	18.6
<1		11	71	407 <5		0.3 <0.2		111	18.2
	1	9	39	176 <5		0.2 <0.2		40.5	7.1
<1		7	142	256 <5		0.3 <0.2		104	13.6
<1	<5		139	256 <5		0.3 <0.2		94.5	13.2
<1		9	126	268 <5		0.3 <0.2		80.4	25.2
<1		11	126	278 <5		0.3 <0.2		82.1	27.3
<1	<5		57	370 <5		0.1 <0.2		77.6	14.9
<1		99	45	141 <5		0.2	0.3	33.1	63.5
<1		7	120	335 <5		0.3 <0.2		76.9	7.6
	1	12	113	360 <5		0.2 <0.2		76.7	13.6
<1		20	94	281 <5		0.7	0.4	80.3	26.7
<1		8	95	533 <5		0.4 <0.2		116	15.5
<1		10	94	543 <5		0.3 <0.2		111	15.8
<1	<5		99	256 <5		0.2 <0.2		110	10.4
<1		8	133	346 <5		0.3 <0.2		127	83.6
<1		6	128	312 <5		0.3 <0.2		137	8
<1		9	121	358 <5		0.3 <0.2		55.2	4.4
<1		28	121	354 <5		0.3 <0.2		65.1	3.6
<1		46	129	374 <5		0.4 <0.2		70	3.3
<1		8	68	205 <5		0.1 <0.2		48.5	1.6
<1		11	64	198 <5	<0.1	<0.2		45.3	1.4
<1		8	92	256 <5	<0.1	<0.2		59.5	1.8

<1	<5	88	369 <5	0.3 <0.2		97.3	14	
<1		12	103	535 <5	0.2 <0.2	72.2	3.1	
<1	<5	81	332 <5	0.2 <0.2		72.3	4	
<1	<5	90	423 <5	0.2 <0.2		206	9	
<1	<5	86	311 <5	0.4 <0.2		80.3	5.8	
<1		14	101	462 <5	0.4	0.3	101	125
<1	<5	98	521 <5	0.3 <0.2		74.3	3.7	
<1		8	107	291 <5	0.3	0.6	57.8	15.5
<1	<5	81	292 <5	0.2 <0.2		59.1	3.9	
<1	<5	98	377 <5	0.4 <0.2		62.6	6.7	
<1		8	85	227 <5	0.2	4.5	50.7	32.1
<1	<5	91	412 <5	0.3	0.5	110	45.9	
<1		6	89	382 <5	0.4	0.2	106	3.3
<1		10	78	215 <5	0.3 <0.2		44.5	2
	1	75	127	324 <5	0.4 <0.2		29.7	3.5
<1		84	58	146 <5	0.2	0.3	89.6	17.3
<1		23	70	171 <5	0.2 <0.2		62.7	21.3
<1		8	75	193 <5	0.2 <0.2		58.9	15.5
<1		12	66	176 <5	0.2 <0.2		112	15.6
<1		27	88	232 <5	0.2	2.2	85.2	15.9
<1		21	81	220 <5	0.2 <0.2		57.6	15.7
<1		18	79	229 <5	0.2 <0.2		105	12.3
<1		20	87	255 <5	0.2 <0.2		56.6	13.9
<1	<5	82	467 <5	0.3 <0.2		88.9	19.8	
<1		7	81	435 <5	0.2 <0.2		92	18.3
<1	<5	57	1240 <5	0.2 <0.2		67.2	13.4	
<1	<5	69	360 <5	0.2 <0.2		76.2	14	
<1	<5	78	395 <5	0.2 <0.2		75.4	15.1	
<1		14	109	164 <5	0.5 <0.2		49.4	13.3
<1	<5	98	358 <5	0.4 <0.2		76.6	4.8	
<1		14	115	448 <5	0.5 <0.2		83.4	15.9
<1		19	113	390 <5	0.5 <0.2		113	33.1
<1		9	71	253 <5	0.3 <0.2		80.5	14.3
<1		7	101	164 <5	0.3 <0.2		58.5	11.9
<1		7	106	142 <5	0.2 <0.2		54.1	13.1
<1		12	102	270 <5	0.3	0.4	67.4	17
<1		5	112	214 <5	0.2	0.2	60.3	13
<1		9	102	235 <5	0.2 <0.2		164	13.4
<1		9	107	309 <5	0.2 <0.2		52.8	13.5
<1		7	110	309 <5	0.3 <0.2		69.9	17.4
<1		5	112	409 <5	0.3 <0.2		92.1	22
<1		11	86	313 <5	0.5 <0.2		67.3	16.5
<1		14	98	274 <5	0.3 <0.2		65.4	11
	1	11	97	307 <5	0.2 <0.2		214	7.7
<1		5	65	142 <5	0.3	0.3	50.5	30.4
<1	<5	89	187 <5	0.2 <0.2		44	11.2	
<1		9	106	281 <5	0.4 <0.2		121	15.5

<1		6	107	284 <5		1.1 <0.2		82.3	17.2
<1		7	97	148 <5		0.3 <0.2		92.4	8.7
<1		8	37	61.6 <5		0.2	0.8	84.4	4.2
<1	<5		108	140 <5		0.3 <0.2		43.6	6.3
<1		11	113	122 <5		0.4 <0.2		53.7	88.7
<1		103	106	249 <5		0.2	0.3	52.6	25
<1		32	143	339 <5		0.3	0.2	217	13.9
<1		10	145	463 <5		0.4 <0.2		70.9	14
<1		9	137	380 <5		0.2 <0.2		55.2	12.4
<1		5	97	236 <5		0.2 <0.2		55.3	11
<1	<5		67	326 <5		0.1	0.5	61.7	8.3
<1		7	145	447 <5		0.4 <0.2		49	16.1
<1		6	141	479 <5		0.4 <0.2		91.7	12.5
<1	<5		147	341 <5		0.2 <0.2		45.2	15.5
<1		9	96	559 <5		0.4 <0.2		86.1	11.5
<1	<5		79	446 <5		0.4 <0.2		103	11.2
<1		18	67	379 <5		0.3 <0.2		93.3	37.1
<1		11	76	452 <5		0.4 <0.2		104	28
<1		21	75	435 <5		0.3 <0.2		123	24.2
<1		139	69	209 <5		0.4 <0.2		86	46.6
<1		17	102	473 <5		0.4 <0.2		106	33.1
<1		11	98	520 <5		0.3 <0.2		99.9	22.2
	2	8	97	507 <5		0.3 <0.2		106	32
<1		12	107	556 <5		0.4 <0.2		119	51.5
<1		6	93	503 <5		0.4 <0.2		130	12.8
	1	9	161	283	6	0.5 <0.2		114	17.2
	1	7	163	293	6	0.6 <0.2		107	13.8
	1	5	170	301	7	0.6 <0.2		116	13.5
	1	8	162	292	6	0.6 <0.2		85.2	13.4
<1		11	119	408	5	0.6 <0.2		137	8.7
<1		23	76	364 <5		0.3	0.4	94.7	15.6
<1		66	52	280 <5		0.2	0.9	86.2	56.7
<1		31	88	444 <5		0.4	0.2	83.1	23.9
	1	19	96	498 <5		0.4 <0.2		84.2	24.3
<1	<5		82	477 <5		0.3	0.2	112	10.5
<1		6	88	523 <5		0.4 <0.2		207	11
<1		7	85	443 <5		0.4 <0.2		110	28.4
<1	<5		70	373 <5		0.3 <0.2		93	28
<1		5	89	496 <5		0.4 <0.2		104	24.7
<1		7	78	785 <5		0.3 <0.2		69.2	66.8
<1		56	23	78.1 <5		0.1	0.5	58.5	14.5
<1		31	57	176 <5		0.5	1.6	51.6	5.3
	1	15	117	313 <5		0.5	1.3	93.8	32.4
	1	19	100	310 <5		0.5	7.6	91.3	51.7
<1		30	111	375	5	0.6	1.6	112	113
<1		15	106	426	6	0.6	1.5	160	64.1
<1		16	100	454 <5		0.7	2.4	170	60.2

<1		12	81	413 <5		0.4	1.3	95.7	40.1
<1		9	62	670 <5		0.2	0.4	68.9	13.3
<1		12	84	424 <5		0.3 <0.2		76.2	16.8
<1		6	85	414 <5		0.2 <0.2		63.9	3.4
<1		10	83	354 <5		0.2 <0.2		97.3	16.5
<1		17	70	285 <5		0.2 <0.2		116	29.6
<1		6	165	323	6	0.3 <0.2		64.9	17.6
	1	7	164	308	6	0.3 <0.2		61	12.1
<1		13	90	412 <5		0.2 <0.2		90.6	17.4
	1	18	94	379 <5		0.3 <0.2		93.2	24.1
	7	57	65	318 <5		0.6	139	65.8	27.2
<1		7	150	35.7 <5	<0.1		0.2	3.6	2.1
<1		9	120	73.3	5	0.2	0.7	99.3	27.2
<1		5	99	485 <5		0.5 <0.2		121	19.6
<1		13	78	450 <5		0.3 <0.2		104	10.5
<1	<5		113	15.5 <5	<0.1		0.2	2	2.4
	1	14	79	401 <5		0.3	1.1	75.3	13.2
	1	20	70	420 <5		0.2	0.2	62.9	16.2
	4	23	104	357 <5		0.3	40.9	68.9	15.3
<1		6	144	43.7 <5	<0.1		0.2	8	11
<1		6	94	179 <5		0.7	0.2	87.6	14.2
<1	<5		85	355 <5		0.6 <0.2		78.2	4.8
<1	<5		126	19.1 <5	<0.1	<0.2		35.6	4.9
	1	7	96	441 <5		0.6 <0.2		136	14.3
	1 <5		105	723	5	0.4 <0.2		74.1	6.1
<1	<5		172	9.4 <5	<0.1	<0.2		7	4.2
<1		6	128	834	6	0.6 <0.2		201	10.5
<1	<5		82	423 <5		0.2 <0.2		92.2	14.5
	7	28	98	365 <5		0.4	102	69.9	14.8
<1		13	102	694 <5		0.4 <0.2		57.4	20.4
<1		15	86	624 <5		0.3 <0.2		88.7	28.3
	1	80	116	437 <5		0.5	1.2	77.4	35.8
	1	21	56	426 <5		0.3	0.7	93.2	46.5
	5	39	107	482	6	0.4	76.1	87.3	20.1
<1		24	142	354 <5		1.1 <0.2		272	26.6
<1		19	145	469 <5		0.9 <0.2		59.6	26.9
<1		30	93	424 <5		0.3	10.8	62	15.9
<1	<5		85	521 <5		0.3 <0.2		117	10.6
<1	<5		79	538 <5		0.3 <0.2		113	16.9
	2	25	97	559 <5		0.4	84.2	66.6	21.9
<1		17	131	542	6	0.4	4	88.9	13.3
	1	10	102	327 <5		0.4 <0.2		76.5	20
<1		9	86	463 <5		0.4 <0.2		138	8.4
	6	29	79	317 <5		0.4	119	68	16.7
<1		7	90	277 <5		0.7 <0.2		110	14.5
<1	<5		74	280 <5		0.5 <0.2		79.3	6.8
	1 <5		86	303 <5		0.6 <0.2		61.7	4.1

<1		10	77	290	<5		0.6	<0.2	92.5	20.4
<1		5	115	517	<5		0.7	<0.2	108	10.7
<1	<5		106	520		6	0.5	<0.2	95.5	21.9
	4	21	81	321	<5		0.3	91.9	49.3	13.9
	2	17	90	283	<5		0.4	93.1	71.3	17.4
<1	<5		132	17.7	<5		<0.1	<0.2	4.1	1.9
<1	6	79	202		<5		0.3	<0.2	78.4	15.3
<1	7	78	206		<5		0.3	<0.2	102	11.6
<1	22	98	330		<5		0.5	<0.2	105	16
1	33	114	405		<5		0.8	1.2	100	15.4
7	29	77	27800		<5		0.3	144	40.6	14.5
2	<5	146	27.8		<5		<0.1	0.8	3.6	2.4
1	48	122	460		6		0.7	<0.2	42.3	18
<1	11	82	521		<5		0.5	<0.2	58.8	17.4
1	<5	105	561		<5		0.7	<0.2	111	12.2
2	46	117	344		5		0.3	23.6	131	52.3
2	15	109	524		<5		0.7	0.2	114	16.1
2	9	92	384		<5		0.5	<0.2	173	9.3
3	213	122	278		6		0.3	0.3	89.4	29.8
3	33	126	325		<5		0.4	5.4	76.1	20.6
1	13	88	265		<5		1	<0.2	122	17.8
2	17	68	298		<5		0.4	0.5	78.7	34.1
2	17	91	431	<5			0.3	<0.2	90.2	21.4
<1	<5		156	73.2	<5		0.1	<0.2	20.4	7
<1		9	104	307	<5		0.5	<0.2	51.8	7.4
<1	<5		97	325		5	0.3	<0.2	87.2	10.2
<1		67	125	362	<5		0.5	<0.2	114	36.5
<1	<5		139	39.1	<5		<0.1	<0.2	10.2	3
	3	20	109	358	<5		0.5	15.4	96.3	17.1
	1	6	135	386	<5		0.4	<0.2	78.5	9.2
<1		14	71	342	<5		0.2	0.4	116	16.6
<1		20	117	623	<5		0.6	<0.2	126	15.4
<1	<5		106	31.2	<5		<0.1	<0.2	17.6	5.1
<1	<5		140	400	<5		0.3	<0.2	82.1	11.3
	2	10	135	433		7	0.3	<0.2	82.2	16
	2	9	116	525	<5		0.4	<0.2	143	16.1
	1	<5	116	444	<5		0.3	<0.2	105	18.4
	2	<5	126	142	<5		<0.1	<0.2	19.2	5.2
	5	28	99	361	<5		0.6	256	73.1	15.1
	1	12	120	522	<5		0.6	<0.2	81.8	20
<1		9	47	242	<5		0.1	<0.2	46	16.2
<1		20	129	361	<5		0.5	1.9	83.5	22.9
	1	<5	103	44.1	<5		<0.1	0.3	5.6	2.9
	2	8	112	477	<5		0.3	<0.2	105	11.9
<1	<5		62	313	<5		0.2	<0.2	80.7	13.8
	1	<5	46	250	<5		0.1	<0.2	59.7	8.9
	4	22	118	342	<5		0.4	41.9	63.9	17.3

<1	<5	110	13.4 <5	<0.1	<0.2	2.6	2	
<1		7	105	589 <5	0.4 <0.2	95	17.4	
<1		10	105	574 <5	0.5 <0.2	97	21.5	
<1		32	123	419 <5	0.6	1.8	108	24.4
	1	5	82	98.4 <5	0.3	0.4	72.4	6.8
	1	11	90	498 <5	0.2	0.2	81.2	23.2

Cr ppm	Cs ppm	Cu ppm	Dy ppm	Er ppm	Eu ppm	Ga ppm	Gd ppm	Ge ppm
104	13.6	27	7.98	4.29	2.09	41.4	9.14	3
89	13.3	16	7.18	4.33	1.55	38.7	6.97	3
97	11.6	33	7.27	4.31	1.67	36.7	7.8	3
97	14.2	18	6.38	3.52	1.92	34.4	7.78	3
90	9.5	12	7.06	4.13	1.72	31.3	7.93	3
125	14.4 <5		7.2	4.96	1.65	48	7.48	2
82	13.3	5	6.03	3.78	1.43	35.3	6.77	3
139	9.5	14	13.9	6.03	5.96	39.5	25.2	3
100	9.7 <5		7.68	4.55	1.62	35.5	7.79	2
113	9.6	23	9.79	5.7	2.22	36	10.6	3
104	10.1	13	10.3	5.46	2.24	34.9	10.8	3
115	9.8	22	8.64	4.73	2.03	38.4	9.41	3
121	11.7	22	8.58	4.52	4.09	43.2	15.1	3
177	9.6 <5		8.62	4.65	3.4	49.3	14	3
102	15 <5		5	3	0.89	39.1	4.23	2
108	14.5 <5		6.17	3.47	1.11	40.1	5.53	2
110	10.7	21	6.9	3.81	1.38	36.1	6.45	2
119	12	80	7.35	4.4	1.97	43.7	8.21	4
143	11	65	7.29	4.37	2.25	41.5	9.32	3
148	11.6	92	8.62	5.13	2.31	42.8	9.48	3
122	12	60	8.38	5.16	2.49	38.2	9.94	3
118	12.5	37	10.4	5.63	2.78	38.4	12.8	3
123	9.6	14	6.08	3.98	1.36	47.4	5.95	3
97	8.7	12	6.53	4	1.33	36.6	5.85	3
74	6.4	6	7.41	4.61	1.28	25.8	6.42	2
82	8.8	9	7.19	4.62	1.28	30.7	6.58	2
86	10	13	6.83	4.26	1.44	35	6.49	3
98	11.1	18	6.47	4.06	1.53	38.6	6.66	2
103	9.5	12	8.57	4.77	2.31	33.7	9.72	4
117	9.1	21	8.39	4.7	2.19	34	9.71	3
102	9.8	38	8.17	4.56	2.27	33.4	9.57	3
105	16.6	13	4.12	2.69	1.12	37.3	4.44	4
85	10.6 <5		4.99	3.25	1.26	27.4	5.17	3
137	14.3	17	3.73	2.52	1.61	38	4.9	3
135	11.8	40	4.17	2.85	1.6	32.2	5.32	4
162	3.6	145	8.28	5.67	1.57	50.5	8.18	3
152	7.7	35	5.72	3.68	1.41	44.6	6.33	3
166	6.7	68	6.26	3.98	1.31	42.5	6.32	2
121	9.5	43	5.8	3.69	1.23	35.5	5.64	2
110	11.4	36	4.4	2.85	0.82	31.5	3.84	2

119	5.9	6	5.32	3.42	1.12	22.1	5.18	2
109	6.3	7	5.11	3.23	1.15	24	5.08	2
115	11	31	7.14	4.1	1.75	28.2	7.84	2
95	10.5	30	7.51	4.18	1.75	28.2	8.12	2
115	10.3	31	8.99	5.16	2.32	36.1	10.5	2
97	14	13	5.33	3.22	1.39	31.3	5.6	3
95	9.7	15	7.64	4.28	1.93	29.2	8.1	2
64	5.1 <5		6.61	3.86	1.37	20.1	6.79	2
108	10.4	23	4.94	2.86	1.13	29.4	4.91	3
114	11.1	13	4.76	2.83	1.88	25.7	6.89	6
119	11.4	15	5.51	3.22	1.2	30.3	5.56	3
160	11.3	17	6.76	3.87	1.61	33.8	7.4	3
144	11.9	34	6.97	4.1	1.65	35.5	7.48	3
154	10.2	33	6.27	3.83	1.36	30	6.27	3
209	5.2	25	6.43	3.87	1.57	32.8	6.28	3
181	4.5	11	6.57	3.86	2.23	34.6	8.13	2
190	6	47	6.06	3.96	1.33	34.8	5.57	2
170	6.1	27	6.19	4.09	1.05	40	5.43	3
174	5.1	15	5.92	3.9	1	43.9	4.98	3
231	4.8	18	7.18	4.61	1.66	51.4	6.97	3
218	7.3	44	8.18	4.66	2.25	40.5	9.12	3
91	10.8	73	11.4	7.07	2.67	32.1	12	6
107	10.2	5	7.17	4.26	1.57	22.7	7.27	3
94	10	7	7.82	4.49	1.83	22.4	8.53	2
104	8.3	7	7.45	4.34	1.64	21.4	7.88	3
102	10.3	9	6.76	4.2	1.63	24.2	7.66	2
111	11.4	11	6.63	3.94	1.66	26.6	7.9	2
107	13.1	10	6.19	3.43	1.6	27.1	7	3
170	6.1	28	3.9	2.52	0.86	22.7	4.03	2
129	10.5 <5		4.9	3.16	1.25	31.3	5.35	3
96	10.7	11	5.4	3.14	1.2	33	5.24	2
126	9	8	7.61	4.44	2.02	31.1	8.57	2
109	8.7	26	8.62	5.09	2.19	31	10	3
27	2.9 <5		2.77	1.74	0.76	10.2	3.1	2
97	9.5	21	6.29	4.2	1.15	34.2	5.48	2
112	6.4	30	10.7	4.81	4.06	39.2	17.8	2
93	7	7	6.13	3.73	1.24	22.8	6.38	2
124	9	8	5.45	3.61	0.9	23.9	4.6	2
94	6.6 <5		4.47	3.26	0.82	19	4	2
91	6.9 <5		5.61	3.98	1.1	24.8	5.3	2
71	5.7	23	6.59	3.47	1.7	20.5	8.61	1
127	11.3	28	2.77	2.2	1.26	36	3.75	2
132	13.5	19	3.67	2.62	1.21	32.4	4.28	3
100	18.6	32	3.56	2.67	0.89	33	3.63	3
99	7.3	8	5.64	3.55	1.11	25.2	5.08	2

89.8	10.3	8.05	4.73	3.16	0.96	29.4	4.58	2
92	11.3	13	4.63	2.92	0.9	32	4.11	2
110	10.5	16	5.31	3.32	0.99	31.3	4.78	2
134	6.3	20	5.64	3.63	1.1	40.2	5.94	2
137	7.3	20	5.23	3.31	1.06	40.5	5.14	2
141	12.4	46	6.77	3.91	1.78	48.8	7.57	2
181	8.4	39	8.31	5.49	1.28	57.8	6.57	2
64	11	23	6.99	4.34	1.22	24.2	6.79	2
106	11.2	66	6.67	4.01	1.25	37.7	7.04	6
119	12.4	24	4.9	2.94	1.29	41.3	5.51	2
90	13.4	18	5.55	3.66	1	32.2	5.65	2
77	8.8	12	6.3	3.95	1.16	26.5	6.12	2
104	12.9	11	5.55	3.63	1.01	31.6	5.52	1
98	8.7	18	6.61	3.93	1.23	27.4	6.68	1
90	7.8	50	6.3	4.04	1.43	27.8	6.16	2
104	7.1	31	6.52	3.98	1.46	26.9	5.87	2
115	7.5	35	6.51	4.19	1.53	33.6	7.01	2
91	5.2 <5		5.51	3.77	0.94	28.8	4.8	2
87	11.9	30	5.05	2.95	1.31	23.6	5.68	2
119	12.4	53	7.56	4.37	1.71	19.5	8.16	2
118	10.2	12	4.09	2.54	1.16	30.2	4.71	2
121	9.2	50	4.72	2.89	1.22	29.2	5.07	1
112	9	18	5.56	3.21	1.36	29.4	5.92	2
115	11.1	8	4.42	3.25	0.99	30	4.27	2
78	6.4	7	5.13	3.2	1.14	25.6	4.93	2
70	6	19	5.48	3.29	1.24	17.6	5.85	2
104	19.5	6	2.96	2.07	0.7	26.3	2.57	1
83	9.8	18	6.48	3.99	1.32	28.4	6.63	2
55	5.2	30	6.62	4	1.53	16.1	6.91	2
107	8.4	22	7.06	4.16	1.7	24.5	7.81	2
104	9.2	22	7.09	4.25	1.82	26.4	7.83	3
90	7.5	15	7.09	4.4	1.23	25.7	6.08	2
118	9.2	13	5.35	3.49	0.97	31	4.82	2
117	9.5	15	5.3	3.35	1.04	31.5	4.9	2
118	9.9	24	5.23	3.26	1.08	32.4	5.04	2
88	9.9	22	6.2	4	1.1	23.2	5.89	2
95	9.9	22	7.28	4.41	1.63	23.6	7.44	2
145	12	109	6.21	3.66	2.52	33.6	8.54	2
165	12.8	113	5.02	3.06	2.11	36.2	6.55	2
141	14.8	13	7.1	4.49	1.44	37.5	6.11	2
156	16.7	16	4.84	3.13	1.23	39.1	5.03	2
98	15.6	9	5.21	3.07	1.1	35.2	5	2
89	9.3	63	6.43	3.76	1.65	30.4	7.28	2
88	8.6	58	6.65	3.96	1.63	30	7.41	2
93	8	50	8.28	4.87	2.1	31	9.24	2
100	11.6	28	3.02	2.15	0.63	26.8	2.62	3
100	11.5	30	3.21	2.19	0.9	26.6	3.44	2

84	7.3	53	7.65	3.8	2	19.7	9.11	1
92	7.8 <5		3.35	2.31	0.64	25.7	3.09	2
107	12.5	29	6.14	3.32	1.63	27.8	6.76	4
111	12.7	33	5.84	3.15	1.42	30	6.24	2
93	8.5	46	8.42	5.36	2.2	28.4	8.51	2
132	12.9	20	6.15	3.77	1.26	32.8	5.66	2
72	8.4	25	6.71	4.23	1.27	28.8	6.51	2
68	6.5	18	8.27	4.68	1.86	24.8	8.76	2
70	6.2	23	8.38	4.76	2	24.6	9.49	2
106	6.8	7	5.91	3.25	1.7	18.5	7.63	2
94	8.8	12	8.23	4.74	2.52	28.3	10.6	2
73	5.5	12	6.6	3.84	1.61	19.8	6.94	2
95	7.7	25	5.03	3.16	1.13	21	5.18	2
92	10.2	28	5.31	3.01	1.2	25.6	5.24	2
108	11	46	5.59	3.46	1.85	28.3	6.98	2
122	11.6	34	5.01	3.11	1.14	29.6	5.2	2
114	9.2	52	4.72	2.98	0.94	23.8	4.22	2
118	10.7	29	3.75	2.74	0.66	26.5	2.87	1
110	11	26	3.73	2.62	0.74	25.6	3.28	3
83	10	40	7.75	3.96	2.01	20.1	9.28	2
64	5.5 <5		6.58	3.74	1.65	17.7	7.54	2
119	13.2	60	8.61	4.68	3.08	33.9	11.5	3
123	12.5	12	7.5	4.63	1.4	32.7	6.86	2
127	12.1	7	6.8	4.16	1.28	34	6.08	2
171	12	5	6.61	4.17	1.29	35.5	6.28	2
143	13.3	10	6.03	3.73	1.69	34.2	6.08	2
125	12.3	7	6.45	3.75	1.42	27.9	6.11	2
103	9.6	19	5.48	3.6	1.1	25.3	4.95	2
103	7.7	34	7.17	4.23	1.55	22.3	7.33	2
182	10.5	24	7.58	5.13	1.38	58.3	6.73	3
180	6.9	15	5.17	3.54	0.93	51.1	4.3	2
151	7.5	13	5.61	3.81	1.06	44.1	4.92	2
127	10.6	16	6.84	4.17	1.33	39.4	6.31	2
90	7.2	8	6.35	3.98	1.34	27.3	6.31	2
96	8	5	7.13	4.3	1.47	29.4	7.23	2
98	6.9	7	6.83	4.28	1.4	28.8	6.75	2
89	6.1	9	6.64	3.91	1.62	24.6	7.16	6
82	5.1	12	7.88	4.53	1.91	24.7	8.79	2
133	6.8	7	7.03	4.16	1.64	30.4	8.02	2
113	10.3	16	5.87	3.39	1.52	32.3	7.3	2
99	7.9	33	7.33	4.02	1.8	21.7	8.54	2
125	10.5	36	15.7	8.1	3.66	29.3	16.9	3
123	8.9	25	5.74	3.62	1.19	28.6	5.48	2
157	9.6	21	6.07	3.9	1.45	32.2	6.19	2
127	15.2	21	7.6	4.57	1.81	27.6	8.15	2
140	12.2	36	7.71	4.54	1.53	36.7	7.53	3
106	10.2	19	11.1	5.7	2.46	22.4	13.1	2

123	9.8	19	6.32	3.69	1.69	24.4	7.24	2
96	10.6	19	6.26	3.97	1.1	23.4	5.72	2
140	10.7	29	10.2	7	1.7	54.5	8.71	3
256	7.3	122	11.3	6.14	4.55	45.2	17	4
171	10.3	11	6.35	4.02	1.6	33.4	6.89	2
152	13	44	6.85	3.81	1.8	31.5	8.55	2
135	11.9	48	6.69	3.84	1.86	34.1	8	3
135	14.8	28	6.25	3.84	1.11	33.8	5.74	3
135	7.8	29	7.44	4.24	2.02	27.5	8.89	2
133	9.9	5	5.87	3.76	1.34	30.1	6.28	2
117	6.9	23	6.02	3.7	1.41	23.3	6.63	2
127	11.1	12	4.92	3.26	1.05	31.3	4.72	2
113	7.7	49	5.99	3.05	1.59	21.3	6.96	1
132	13.8	30	1.48	1.86	0.33	26.9	1.08	3
138	10.8	77	4.58	2.94	1.03	32.7	4.47	2
157	7.7	44	8.03	4.8	1.74	42.6	8.11	2
118	10.5	15	6.22	3.78	1.21	27.4	5.571	1
74	2 <5		7.38	4.28	1.75	12.5	8.49	2
116	15.7	12	6.18	3.87	0.96	28.5	5.03	2
173	9.7	57	8.23	5.39	1.3	43	6.7	2
107	9.5 <5		4.98	3.23	0.82	27.3	4.12	1
106	9.3 <5		6.43	3.75	1.2	31.6	6.31	2
96	7.2	15	3.28	2.39	0.59	22.9	2.63	3
117	13.8	25	6.8	4.3	1.28	33.2	5.79	2
159	16.3	36	7.91	4.54	1.79	40.9	7.43	3
156	5.4	19	8.14	4.8	1.94	57.7	8.07	3
107	7.5	12	11.6	7.37	2.17	43.8	10.5	2
102	12	16	5.97	3.62	1.6	29	6.72	2
108	17.3	6	6.6	4.21	1.36	39.1	6.12	2
81	13.3 <5		4.49	2.93	0.83	26.3	3.72	1
112	13.4	11	6.68	3.88	1.79	24.2	8.11	2
93	9.7	9	6.1	3.76	1.32	21.3	5.79	2
120	20.4	8	4.37	3.08	0.9	28.2	4.07	1
122	22.6	5	5.55	3.66	1.12	24.7	5.28	2
158	11.4	47	9.72	5.77	2.43	46.9	10	3
168	9.5	46	10.2	5.6	2.41	52.9	11.6	2
114	14.1	8	12.2	5.71	3.07	39.9	15.9	2
121	16.9	9	9.59	5.3	1.88	48.2	9.19	2
117	11.4	33	3.41	2.48	0.57	26.3	2.97	3
101	8.8	41	6.45	3.97	1.32	28.4	6.49	3
74	17.1 <5		6.47	4.4	1.19	28.2	6.06	3
96	13.6	8	5.64	3.58	1.19	28.6	5.5	3
173	8	47	5.53	3.75	0.83	44.7	4.45	3
274	10.7	180	13.2	9.18	2.39	44	10.4	3
171	7.7	128	5.99	3.9	1.2	41.1	6.01	3
98	16.1	14	6.37	4.33	1.27	36.7	6.07	3
113	1.7 <5		4.88	2.98	1.85	35.6	6.6	2

217	2.2	10	6.04	3.95	0.75	58.9	4.35	2
160	0.7 <5		4.05	3.28	0.44	52.8	2.48	2
82	8.1	15	5.99	3.7	1.08	25.2	5.21	2
81	7.9	17	6.96	4.14	1.4	22.9	6.77	2
171	0.3	33	8.25	4.55	1.8	39	9.54	3
133	0.3	20	7.7	4.46	1.64	39.5	8.72	2
175	0.3	31	6.35	2.87	2.27	47	10.9	2
158	0.3	19	5.51	3.46	0.46	43.7	3.42	2
89	6.3	11	4.95	3.1	1.2	23.9	5	2
142	1 <5		9.19	6.53	1.38	41.3	7.06	4
94	1 <5		7.3	4.96	0.99	31.2	5.67	3
112	0.2	6	9.56	5.17	2.37	22.7	11.1	3
134	0.3	19	8.9	4.62	2.03	31.5	9.54	3
107	9.4 <5		4.15	2.89	0.72	30.5	3.25	2
165	9.8 <5		5.33	3.49	1	28.5	4.46	2
123	1.3 <5		5.47	3.28	1.07	35.5	5.3	2
86	6.2	6	4.86	3.18	1.11	19.4	4.88	2
84	7.7	9	5.25	3.31	1.44	21.2	4.98	2
100	9.7	8	6.83	4.01	1.4	29.9	6.74	2
84	8.1 <5		6.66	3.71	1.68	24	7.93	2
103	9.7 <5		5.9	3.69	1.08	26.5	5.72	3
92	10.3	5	5.06	3.47	0.86	25.6	3.96	2
113	13.1	14	5.9	4.08	1.17	36.9	4.73	2
122	9.2	8	9.85	5.18	2.53	29.4	12.5	3
111	10.2	48	4.62	2.91	1.13	25.2	4.49	2
111	11.1 <5		4.85	3.1	1.14	27.6	4.6	2
120	15.1 <5		4.84	3.33	1.04	33.6	4.63	2
133	6.6	6	6.52	3.91	1.54	21.8	7.03	2
83	5.8 <5		5.58	3.33	1.35	19.5	6.31	2
98	7.5	7	6.46	3.63	1.52	24	6.96	3
89	6.9	6	6.35	3.84	1.54	21.2	6.95	2
239	7 <5		6.21	3.62	1.48	21.8	6.94	2
91	9.1	6	6.79	3.7	1.6	25	7.71	3
123	8.9	34	6.13	3.83	1.44	29.6	6.74	3
123	9.3	37	7.21	4.22	1.7	31.9	7.88	2
158	9.4	32	7.89	4.56	2.03	32.3	9.41	3
122	9.4	46	7.87	4.53	1.92	31.6	8.56	3
141	9.4	32	8.6	4.8	2.18	29.7	10.1	2
166	9.9	36	7.55	4.4	1.85	30	7.82	2
137	10.1	38	7.12	4.17	1.55	33.3	7.15	3
136	12	50	7.43	4.17	1.37	34.5	6.97	3
207	14.1	29	6.48	3.45	3.52	44.1	12.6	4
107	12.2	33	4.95	2.94	1.14	29.5	5.57	2
108	14.2	66	6.79	3.87	1.84	31.4	8.07	2
109	12.5	60	6.53	3.96	1.42	29.8	6.8	2
102	10.9	47	6.78	3.96	1.47	27.3	6.76	1
138	15.3	34	5.31	3.4	1.15	37.2	5.72	2

141	11.1	20	7.98	4.35	2.89	36.5	11.5	2
130	11.6	21	8.47	4.48	3.07	33.8	11.6	2
127	11.3	16	7.95	4.07	2.69	33	10.7	2
121	9.4	13	7.92	3.98	2.52	28.5	10.4	2
125	10.5	32	5.65	3.67	1.44	27.1	5.73	1
147	10.6	23	4.65	3.27	0.76	28.7	4.21	2
118	11.6	22	5.01	3.41	0.88	27.2	4.76	2
64	8.4 <5		5.28	3.32	1.06	23.7	5.14	2
78	8.8	18	5.8	3.7	1.19	23.4	5.68	2
68	7.4	26	5.39	3.58	1.05	22.5	5.21	1
68	7.3	25	5.87	3.82	1.1	21.1	5.56	1
68	7.6	23	5.69	3.7	1.23	22.1	5.68 <1	
74	7.4	57	6.85	4.2	1.55	21.2	7.3	1
78	8.6	45	7.56	4.52	1.6	23.2	7.7	1
72	6.5	7	7.97	4.67	1.68	21.2	8.42 <1	
79	8.2	5	6.54	4.13	1.52	21.8	7.28	2
80	8.4 <5		6.44	3.86	1.4	25.3	6.73	1
89	10.1 <5		6.15	3.75	1.36	25.8	6.53	1
85	8.8 <5		5.59	3.54	1.24	24.1	5.58	1
97	9.2 <5		5.38	3.4	1.19	22.7	5.39	1
89	9.4 <5		5.13	3.2	1.07	22.7	4.96	1
82	9.8 <5		5.21	3.43	1.25	23.3	5.37	1
96	8	34	6.2	3.67	1.38	24.2	6.66	1
97	7.4	33	6.89	3.84	1.6	24.9	7.57	2
100	6.9	35	6.85	4.17	1.63	25.4	7.55	2
94	7.5	34	7.46	4.36	1.81	25.4	8.47	2
96	6.8	36	7.64	4.51	1.75	25.9	8.77	2
100	8.1	29	7.14	4.02	1.73	25.8	8.67	2
108	7.5	37	6.09	3.56	1.42	28.2	6.75	2
81	8.1	6	6.69	4.24	1.23	24.8	6.51	2
69	7.6 <5		5.2	3.29	1.21	20.2	5.11	1
87	8.8	7	5.88	3.76	1.19	28.2	5.71	2
137	10.8	10	4.76	3.14	1.23	45	5.03	2
281	6	30	5.95	3.88	1.29	46.2	5.57	3
118	12.8	7	5.18	3.24	1.47	39.2	5.89	2
104	11.7 <5		5.42	3.57	1.31	33.2	5.89	2
102	14.2 <5		6.04	3.95	1.36	41.1	6.21	2
132	13.7 <5		7.99	5.15	1.73	47.4	8.35	2
89	7.4	48	8.53	5.04	1.95	26.9	9	2
91	7.8	16	7.32	4.52	1.65	23.5	8.28	2
115	7.6	27	7.26	4.49	1.75	24.8	8.36	2
86	6.4	20	7.93	4.82	1.72	22.1	8.7	2
92	7.3	33	9.52	5.88	2.15	23.5	10.9	2
92	6.8	37	8.93	5.49	1.86	24.7	9.45	1
80	7.2	51	8.62	5.42	1.81	24	9.33	2
93	7.5	35	7.64	4.68	1.55	23.3	8.23	1
98	8	39	8.07	4.83	1.64	29.5	8.25	4

63	4.6	8	6.54	3.93	1.24	18.2	6.7	4
67	5.5	6	7.42	4.36	1.44	20.5	7.39	4
97	5.7	28	6.41	3.7	3.68	28.1	8.77	4
100	10.4	9	5.82	3.55	1.78	28.8	6.4	2
97	9.9	10	4.91	3.06	1.27	28.1	5.13	2
92	9.7	10	5.57	3.39	1.53	31.1	6.2	3
100	11.8	12	4.89	3.07	1.23	33.4	5.3	4
110	12.1	10	5.49	3.48	1.27	34.3	5.76	3
116	13.5	55	11.1	5.83	2.98	36.7	13.3	3
97	10.4	16	7.35	4.32	1.68	27.8	8.26	3
104	10.6	15	6.85	4.22	1.53	28.3	6.99	3
103	9.9	12	6.16	3.88	1.26	27.3	6.08	3
111	11.3	15	5.79	3.74	1.15	28.9	5.31	3
102	9.4	18	6.05	3.99	1	31.4	5.4	3
56	3.2	23	7.55	4.35	1.67	19.8	8.51	2
81	6.6	40	3.93	2.29	1.09	20.8	4.87	4
128	9.5	49	5.11	3.2	1.2	26.5	5.2	2
85	7.5	16	5.19	3.09	1.26	26.8	5.94	7
84	7.6	16	5.24	3.2	1.24	28.1	5.6	4
77	6.4	6	5.66	3.66	1	28	4.91	3
78	6.5 <5		5.26	3.43	0.97	28.4	5.04	2
54	4.7	25	10.5	5.48	2.85	18.7	12.4	2
85	7.2	23	5.85	3.55	1.11	29.5	5.58	2
89	7.3	33	10.9	5.58	3.66	28.2	15.5	3
86	20.9	12	5.9	3.56	1.48	24.3	7.1	2
83	9.1	18	6.64	3.89	1.79	27	7.99	2
76	7.6	28	7.29	4.11	2.03	28.7	8.9	3
92	12.2	26	7.36	4.3	1.88	27.3	8.96	2
103	17.1	25	6.35	3.87	1.49	25.3	6.8	2
90	7.8	12	6.4	3.85	1.61	24.7	8.21	2
91	9.1	15	4.66	2.81	0.83	28.1	4.52	2
85	7.9	16	5.1	3.31	1.08	24.9	5.46	2
80	7.8	21	5.33	3.2	1.06	25	5.56	2
77	6.8	24	6.44	4.13	1.32	27.2	6.71	2
120	8.1 <5		7.19	4.09	1.62	32.4	8.28	2
124	8.1	6	9.75	5.37	2.51	34.2	12.7	2
130	6.9	12	7.65	4.53	1.44	32.4	7.5	2
77	5.8	11	3.46	2.4	0.76	24.1	3.43	11
114	9.4	6	4.71	3.25	0.9	33.4	4.57	3
104	9.9 <5		4.52	3.16	1.03	32.2	4.64	2
88	6.4 <5		4.37	2.86	0.88	23	4.5	2
82	13.3	14	7.52	5.08	1.38	39.6	7.35	2
87	12.4 <5		6.37	4.1	1.08	37.2	6.07	2
74	6.4	12	5.8	3.8	1.03	24.9	5.98	2
66	6.1	25	8.07	4.54	2.37	22.9	10.4	2
68	10.6	10	5.29	3.31	1.18	24.5	5.4	2
106	10.6	8	6.93	4.31	1.49	34.3	7.01	2

92	12.7	9	4.98	3.17	1.12	29.2	5.42	2
97	10.2	12	7.08	4.29	1.27	31.9	6.66	2
95	7.1	16	6.89	4.29	1.3	28.4	6.28	2
85	5.1	26	6.08	3.73	1.46	19.7	6.89	2
123	9	13	5.77	3.79	1.13	33.3	5.45	2
122	6.9 <5		4.97	3.07	0.96	25.9	4.49	2
119	8.1 <5		6.09	3.57	1.43	27.1	6.71	3
111	8.2	6	5.41	3.36	1.1	26.9	5.01	4
112	6.6	14	5.02	3.15	1.01	19.8	4.42	2
106	5.9	23	5.02	3.13	1.18	19.8	5.5	2
109	6.5	26	5.59	3.41	1.4	21.4	6.17	3
115	6.7	19	6.29	3.76	1.48	22.3	6.84	3
104	6.2	12	5.52	3.77	0.89	20.1	4.65	2
112	6.6	12	4.57	2.87	0.84	20.7	4.34	2
122	8.7	14	4.69	2.93	0.94	26.3	4.34	2
137	11.1	29	10.7	5.18	3.64	31	16	3
193	10.7	25	8	4.39	2.46	30.2	10.4	2
123	8.4	27	6.99	4.32	1.87	26.9	8.77	2
135	8.2	21	6.11	3.56	1.64	27.1	7.04	3
107	4.5	16	5.77	3.57	1.24	15.5	5.87	2
114	5.6	6	5.33	3.3	0.85	17.8	4.64	2
119	9	18	6.04	3.23	1.83	26.7	7.89	2
146	3.6	9	4.91	3.26	0.92	14.9	5.11	2
165	3.2	10	5.6	3.42	0.89	14.3	5.02	2
136	2.3	8	4.04	2.68	0.98	10.3	4.78	1
72	5	37	6.92	4.08	1.64	25.7	7.91	3
65	7.3	13	7.02	4.24	1.47	24.2	7.7	4
72	5.9	10	5.9	3.78	1.14	21.5	5.99	2
56	4.1	18	6.19	3.53	1.24	16.2	6.49	2
85	7.4	25	5.22	3.12	1.14	28	5.31	2
97	7.1	20	8.06	4.82	1.96	21.7	9.37	2
70	6.4	24	6.86	4.17	1.45	29.3	7.29	3
50	3.5 <5		6.13	4.18	0.97	19	5.81	2
41	3.1 <5		5.58	3.64	1.15	15.4	5.61	1
81	7.5	30	5.39	3.4	1.34	30.6	5.69	2
83	8.3	35	5.24	3.45	1.33	31	5.81	2
111	12.9	11	3.91	2.35	1.32	33.3	4.98	2
110	12.6	25	3.6	2.36	0.93	29.6	3.78	3
119	11.1	37	4.33	3.06	1.08	28.5	4.28	1
141	9.8	43	10.2	5.03	2.71	27.6	12.5	2
93	9.1	34	4.29	3	1.02	28.7	4.53	2
88	8.4	37	5.39	3.32	1.29	28.3	5.86	2
97	11.5 <5		6.14	3.68	1.09	31.5	5.85	2
79	10.3	6	5.69	3.45	1.1	29.8	5.48	4
94	15 <5		5.47	3.31	1	36.1	5.2	2
95	8.5	15	6.13	3.68	1.3	27.9	6.02	3
151	11.5	24	5.91	3.39	1.6	31	6.43	4

150	11.2	21	6.88	4.01	1.79	29.4	7.43	2
144	11.6	17	7.71	4.31	2.14	28.7	8.92	2
90	7.2 <5		5.58	3.44	1.43	17.8	6.01	2
150	11.9	21	7.32	4.17	2.07	30.6	8.39	3
155	14.4	14	6.69	4.09	1.37	28.6	5.91	2
69	9 <5		4.87	3.19	0.96	20.3	4.7	2
71	5.3	22	7	3.84	1.62	23.1	7.74	2
119	8.7	32	7.48	4.38	1.86	31.2	8.48	2
95	8.1	17	6.16	3.71	1.31	27.9	6.33	6
101	8.4	9	5.61	3.62	1.17	27	5.86	2
96	8.2	5	6.22	3.93	1.21	27.2	5.95	2
115	10.8	35	4.4	2.45	1.28	31.6	5.01	2
93	12.7	18	7.94	4.31	1.93	26.9	9.76	3
93	13.4	8	6.01	3.93	1.24	28.4	6.17	2
85	7.1	7	6.11	3.87	1.3	24	6.24	1
95	9.1	19	9.84	5.25	2.5	30.9	11.4	3
77	7.6	35	7.41	4.67	1.79	28.9	8.1	2
102	9.4	28	7.25	3.91	1.98	30.1	8.63	2
106	8.6	27	6.38	3.7	1.53	31.1	6.71	2
115	15.3	47	5.45	3.11	1.72	27	6.83	2
121	13.1	35	5.11	2.8	1.58	27.8	6.51	2
128	12.3	44	6.91	3.97	1.64	31.6	7.26	2
118	20.3	24	6.39	3.48	1.55	36.3	6.38	2
101	21.6	16	5.47	3.17	1.26	35.2	5.04	2
95	17.9	33	3.74	2.61	0.58	35.5	2.39	1
172	8.7	33	8.48	5.26	2.77	50.3	9.01	3
219	4.9	35	8.15	3.8	5.56	44.6	20.1	3
135	9.5	118	7.09	3.8	2.09	37.9	8.24	3
118	14.2	38	5.39	3.18	1.38	30.2	5.88	2
127	14	30	5.77	3.41	1.76	32	6.98	2
105	12.9	39	7.63	4.41	2.01	29.9	8.75	2
113	11	33	6.75	3.82	1.61	28	7.43	2
126	12.1	47	9.22	4.42	2.73	32.6	12.1	3
129	12.6	56	8.62	4.5	2.69	35.1	10.9	3
135	12.2	54	8.54	4.4	2.52	34.8	10.9	2
119	12.3	105	9.34	4.83	2.94	35.8	12.6	3
122	12.3	77	10	5.53	2.97	36.7	12.6	3
127	13.1	56	5.99	3.66	1.42	35.8	6.06	2
100	15.9	42	6.67	3.83	1.49	37	6.48	2
88	12.2	71	7.39	4.34	1.8	32.5	7.92	2
86	9.7	36	9.96	5.65	2.23	33.6	10.2	3
60	8.5 <5		6.1	3.81	1.05	25.4	5.9	9
119	11.7	67	3.92	2.62	0.97	36	3.99	2
173	6.8	100	6.79	5.32	1.72	62.3	5.4	4
127	11.2	27	5.86	4.26	0.95	50	4.29	2
89	8.9	27	6.89	4.98	1.09	35.4	5.11	2
14	0.3	8	0.67	0.44	0.16	2.19	0.69 <1	

	25	2.1	22	3.04	1.19	0.94	5.67	4.78 <1
	85	6.6	20	7.65	4.51	1.91	21.6	8.99 <1
	77	4.4	18	7.18	4.17	1.8	15.7	8.81 <1
	81	3.8	15	7.57	4.12	1.86	14.7	9.41 <1
<10	<0.1		27	1.65	0.89	0.81	2.57	3.02 <1
	98	8.6	27	7.66	4.35	1.6	27.5	8.03 <1
	94	6.7	21	8.6	5.03	2.04	24.4	9.53 <1
	129	9.1	30	6.62	3.72	1.78	28.8	7.94 <1
	11	0.2	20	1.71	0.81	0.69	3.82	2.96 <1
	91	8	27	8.3	4.91	1.76	27.3	8.34 <1
	80	6.9	34	7.89	4.64	1.93	23.1	9.32 <1
	134	4.5	20	6.21	3.61	1.3	15.8	6.48 <1
	115	15.9	17	6.15	3.57	1.47	28.8	6.57 <1
	55	3.4	12	6.17	3.53	1.38	16.4	6.89 <1
	89	8.2	30	5.22	3.13	1.37	26	6.23 <1
	12	0.8	7	0.52	0.32	0.09	4.88	0.44 <1
	142	10.7	80	7.58	3.62	2.02	30.4	8.5 <1
	109	16.8	38	20.4	8	9.94	32.1	41.1 <1
	107	15.6	35	5.06	2.92	1.34	28.2	5.96 <1
	94	16.9	30	5.65	3.49	1.77	30.6	7.24 <1
	85	5.9	35	5.83	3.36	1.52	20.7	6.8 <1
	15	1.2	6	0.73	0.46	0.17	4.03	0.73 <1
	111	11.3	38	4.16	2.93	0.68	32.2	3.29 <1
	105	12.3	44	10.5	4.53	5.28	30.1	20.2 <1
	111	16.2	76	5.04	2.84	1.44	26.5	6.34 <1
	121	17.7	6	4.9	3.16	1.17	26.9	5.01 <1
	13	0.6	10	0.74	0.41	0.16	3.06	0.71 <1
	324	9.7	65	5.17	2.89	1.43	22.5	6.59 <1
	19	0.4	6	0.7	0.5	0.11	3.37	0.5 <1
	107	13.2	30	5.07	3.3	0.94	28.9	4.66 <1
	77	11.7	36	7.32	3.83	2.36	27.3	10.6 <1
	298	7.8	80	12.7	5	4.37	26.5	20 <1
	21	1.8	6	1.33	0.78	0.25	3.88	3.14 <1
	93	9.2	30	5.82	3.52	1.46	24.1	6.67 <1
	515	7.2	169	1.51	0.99	0.48	18.4	1.91 <1
	15	1.5	49	1.13	0.75	0.17	5.96	0.75 <1
	85	6.4	49	3.74	2.63	0.67	15	3.49 <1
	58	4.8	11	6.32	3.64	1.42	14.8	6.69 <1
	57	7.2	10	5.1	3.07	1.13	23.9	5.29 <1
	254	7.3	137	4.79	2.82	1.28	18	5.62 <1
	66	8.5	15	8.15	4.84	1.47	25.3	8.56 <1
	118	8.7	48	5.74	3.5	1.21	28.7	5.98 <1
	13	0.9	13	1.27	0.72	0.27	4.55	1.3 <1
	100	8.3	23	5.69	3.4	1.33	29.2	6.27 <1
	61	5.7	13	5.3	3.35	1.28	23.6	6 <1
	86	9.1	22	5.71	3.51	1.38	29.9	6.56 <1
	178	8.7	69	4.78	3.26	1.23	21	5.24 <1

109	7.8	75	6.59	3.74	1.77	28.8	8.41	<1
333	7.4	139	7.39	4.29	2.14	20.3	9.67	<1
18	2.4	11	0.78	0.44	0.26	12.8	0.9	<1
149	3.3	52	7.24	4.07	0.95	37.5	4.75	<1
14	1.5	11	0.91	0.61	0.17	5.72	0.68	<1
105	10.1	34	5.51	3.24	1.65	28.9	6.83	<1
95	12.6	30	8.9	4.18	3.58	34.1	14.8	<1
96	13.2	44	8.2	4.07	3.58	34.4	14.4	<1
15	1	75	2.36	1.38	0.82	4.49	3.28	<1
113	11.7	41	6.02	3.34	1.74	32.9	7.64	<1
22	1.5	9	1.41	0.86	0.38	4.43	1.41	<1
96	10.5	25	5.13	3.16	1.34	21.8	5.93	<1
53	3.3	11	6.04	3.5	1.54	12.2	7	<1
364	7.2	150	3.3	1.96	0.99	16.2	3.91	<1
27	2	17	1.34	0.94	0.24	5.39	0.99	<1
83	8.1	29	5.63	3.3	1.44	21.5	6.59	<1
18	1.5	5	2.96	1.69	0.73	5.55	3.81	<1
106	10.8	30	6.99	4.04	1.94	36.5	8.42	2
105	10.4	30	6.65	3.73	1.92	32.3	8.41	2
100	9.4	40	7.66	4.16	2.02	30.1	8.66	2
107	14.5	33	8.61	4.97	1.87	30	9.43	2
115	14.7	19	5.72	3.76	1.12	34	5.9	2
113	14.9	16	6	3.78	1.26	34.9	5.99	2
87	9.6	17	9.03	5.03	2.74	28.9	12.1	2
71	5.8	8	7.68	4.29	2.15	23.9	9.79	2
69	5.5	8	7.21	4.24	1.78	22.5	8.39	2
43	3	12	4.06	2.21	1.07	9.2	4.88	<1
117	13.4	24	7.09	4.04	2.05	31.4	9.13	2
117	12.9	25	6.48	3.77	1.91	29.4	8.42	2
109	10.7	28	6.36	3.74	1.67	28.1	7.57	2
106	10.7	30	6.52	3.74	1.69	27.6	7.57	2
60	4.9	14	5.04	2.98	1.18	17.5	5.1	2
35	3.7	55	2.91	1.64	0.8	8.54	3.48	<1
86	8.7	21	4.66	2.87	1.01	22.1	4.67	1
88	8.6	26	5.77	3.36	1.62	25.4	7.49	2
157	8.1	210	4.52	2.62	1.38	19.5	5.51	4
93	9.9	23	7.54	4.49	1.88	32.6	8.74	2
94	9.8	23	7.27	4.25	1.8	31.1	8.5	2
94	6	11	6.89	4.27	1.51	15.9	7.57	1
120	9.1	21	8.61	5.23	1.53	24.6	7.84	2
118	8.4	6	8.52	5.36	1.63	22.7	8.31	2
122	13	6	4.98	3.29	0.79	26.9	4.15	2
124	13.1	9	5.16	3.43	0.88	26.9	4.62	2
151	14.5 <5		6.17	4.05	1	28	5.15	3
68	2	5	4.21	2.7	0.74	6.74	3.93	2
56	2	5	3.96	2.55	0.71	6	3.85	2
62	2.8 <5		4.5	2.81	0.9	8.14	4.46	3

132	7.9	21	7.41	4.54	1.42	27.5	7.36	2
105	7.4	5	6.08	3.94	1.02	26	5.42	2
101	5.8	26	4.93	3.21	0.84	17.3	4.83	2
111	8.2	12	7.98	4.48	2.39	23.6	11	2
123	7.3	10	5.22	3.45	1.03	23.5	5.18	2
141	9	30	12.6	6.09	3.63	27.5	17.5	2
137	8.6	21	4.88	3.16	0.94	25.9	4.7	1
125	5.6	17	6.39	4.37	1.12	24.7	5.94	1
77	7.3 <5		5.9	3.73	0.94	16.3	5.3	1
152	10.5	19	4.92	3.11	0.83	30.5	4.14	2
75	6.4	16	3.9	2.58	0.73	19.5	3.98	6
149	11.4	14	6.53	3.88	1.77	34.1	7.89	2
165	11.5	8	5.77	3.56	1.42	31.7	6.54	2
173	8.2	26	5.88	3.93	0.76	21.8	4.42	2
103	7.4	10	4.6	3.08	0.59	22.8	3.36	45
69	4.5	36	7.59	3.86	2.08	10.6	10.5	2
87	6.3	27	4.52	2.84	0.98	15.3	4.66	3
88	6.8	26	4.48	2.7	1.03	16.7	4.81	2
75	6	17	5.58	3.04	1.62	14.8	7.22	2
95	7.1	28	7.21	3.68	1.87	16.9	9.57	2
85	6.9	25	4.29	2.7	0.95	16.9	4.55	2
83	7.2	21	4.89	2.75	1.41	17.4	6.31	2
89	6.8	22	4.05	2.59	0.9	17	4.32 <1	
103	8.1	19	6.52	3.77	1.58	25.6	7.41	2
91	7.4	59	8.42	4.32	2.29	21.4	10.8	2
81	4.7	6	4.75	2.82	0.99	15.7	5.1	2
86	5.6	38	6.4	3.76	1.47	18.6	6.82	2
115	6.7	12	5.61	3.44	1.3	21.3	6.25	2
162	5.2	15	4.62	3.19	0.66	26.6	3.67	2
145	9.1	8	4.76	3.35	0.91	27.7	4.55	2
149	11.5	30	5.7	3.68	1.01	29	5.2	2
156	12.7	41	5.53	3.7	1.01	28	5.34	2
79	7.2	19	5.94	3.29	1.55	18	6.98	1
110	11.1	27	4.66	3.01	1	22	4.72	2
117	11	40	3.68	2.55	0.72	21.1	3.53	1
103	8.2	22	3.85	2.63	0.92	21.3	4.51	2
101	8.6	33	5.92	3.41	1.37	19.8	6.63	1
109	11.3	7	6.08	3.59	1.78	23.3	8.4	2
103	8.1	9	4.22	2.46	1.02	18.2	4.98	1
105	10.4	8	5.67	3.23	1.44	22.9	6.93	2
106	10.4	13	5.98	3.41	1.51	26.2	7.32	2
98	10	13	5.37	3.16	1.26	22.4	5.75	2
90	9	11	4.36	2.8	1.06	19	4.71	2
87	8.5	20	4.55	3.2	1.03	19.3	5.27	2
64	7.4	34	3.8	2.23	0.91	11.7	4.38	1
99	12.2	21	3.69	2.28	0.76	18.1	3.98	2
106	12.9	7	4.94	3	1.45	20.6	6.61	2

109	13.1	12	6.16	3.33	1.54	20.5	7.32	2
117	14.7 <5		5.27	2.97	1.42	21.5	6.26	2
53	5.2	14	11.3	5.45	3.12	8.12	15.4	1
118	11.6	31	4.13	2.77	0.75	19.2	3.78	2
127	12.6	33	4.4	2.98	0.91	22.3	4.58	2
84	6	22	4.78	2.77	1.14	15.5	5.45	1
117	10.8	69	2.45	1.66	0.58	25.5	3.14	1
134	12	37	3.05	2.21	0.7	29	3.21	1
115	9.3	69	4.44	2.71	0.99	23.3	5.09	2
76	6.2	24	4.67	2.89	1.04	15	5.31	1
68	5.4	6	6.11	3.37	1.33	16	6.65	1
114	10.9	21	2.19	1.52	0.48	24.9	2.41	2
107	10.5	63	3.57	2.37	0.86	25.6	4.4	2
106	7.4	22	3.46	2.22	0.78	20.5	3.96	1
89	10.5	36	5.73	3.51	1.15	29	5.7	2
85	7.7	39	6.28	3.69	1.36	24.4	6.81	2
70	5.3	34	6.33	3.72	1.24	19.3	6.51	2
84	6.1	22	7.89	4.53	1.55	25	8.09	2
79	5.6	27	22.8	8.34	7.17	22.4	36.8	2
46	4.4	91	3.66	1.86	1.02	14.1	4.86	3
87	8.8	30	5.42	3.54	1.14	26.6	5.45	2
91	8.9	18	6.38	4.09	1.37	27.7	6.52	2
90	7.6	21	6.5	4.04	1.38	26	6.67	2
105	9.1	20	6.69	4.12	1.6	31.6	7.23	2
91	7.8	21	6.37	4.08	1.43	28.9	6.51	2
114	20.1	49	6.42	3.82	1.31	34.1	6.77	2
121	18.2	66	6.16	3.53	1.37	37.2	6.8	2
124	19.2	76	6.39	3.6	1.51	38.8	7.54	2
123	17.7	56	5.45	3.5	0.99	39.1	5.13	2
114	12	24	7.66	4.46	1.73	37.9	8.65	2
74	5.9	11	8.14	4.44	1.77	21.4	9.22	1
49	3.7	15	8.17	4.26	1.9	15.3	9.39	1
80	6.2	21	10.3	5.82	1.78	26.3	9.36	2
85	6.7	15	7.97	4.77	1.41	29.5	7.28	2
103	5.5	27	9.5	5.85	1.75	25.1	9.1	2
83	6.2	21	7.89	4.62	2.03	29.5	8.97	2
69	5.7	54	6.49	3.88	1.46	26.3	7.18	2
65	3.7	18	7.69	4.67	1.39	19.6	7.37	1
83	6.4	21	8.28	5.02	1.49	30.1	7.98	2
54	3.7	22	10.3	6.15	1.44	17.2	8.49	1
32	2.4	36	3.48	1.45	1.22	3.56	5.55 <1	
76	6.5	21	6.65	3.62	1.3	12.9	6.32 <1	
120	14.2	63	6.59	3.99	1.25	35.4	6.59	2
97	12.4	61	6.04	3.48	1.13	30.3	5.63	2
112	13.9	50	8.6	4.92	1.69	36.3	8.72	2
119	13.1	40	17.8	9.29	3.46	37.6	18.4	2
104	12.8	22	10.7	5.73	2.12	35	10.7	2

	84	7.8	17	11.8	6.17	1.85	26.1	10.2	2
	49	3.4	16	5.83	3.36	1.63	15.7	6.6	1
	92	8.6	12	6.87	4.06	1.33	26.6	6.97	2
	84	7.3	20	16.9	6.24	4.83	20.4	33.8	2
	82	5	14	6.83	4.41	1.4	19	6.69	1
	82	5.8	27	9.48	6.4	2.07	17	10.1	1
	122	9.8	52	5.6	3.62	1.08	25.5	5.87	1
	119	10	41	5.47	3.6	1.06	28.4	5.35	2
	87	5.9	14	6.09	4.02	1.35	23	6.36	2
	89	7.5	20	6.62	4.17	1.48	23.2	7.11	1
	461	5.9	265	10	6.15	2.33	13.6	8.97	1
<10		0.7 <5		1.42	0.87	0.09	2.77	0.77	22
	10	1.2	9	38.7	23	3.13	5.49	28.2	4
	110	12.2	51	4.87	3.14	0.99	32.4	4.43	2
	75	6.9	16	7.36	4.01	1.47	22.6	7.3	1
<10		0.2	15	1.26	0.77	0.13	2.66	0.76	20
	81	8.4	17	4.34	3.01	0.86	21.6	3.64	1
	60	5.1 <5		5.48	3.39	0.93	18.3	4.49	1
	348	6.8	99	4.99	2.8	1.32	20.7	6.22	2
	15	2.8	15	0.71	0.38	0.1	10.8	0.74	56
	174	4.1	48	7.02	4.07	2.06	34.2	8.17	2
	147	7.6	25	5.8	3.45	0.95	35.4	5.47	2
	18	0.9	11	1.95	0.63	1.22	5.16	4.42	15
	132	10.2	58	7.65	3.91	2.83	31.5	10.6	2
	126	11.8	7	5.38	3.22	1.2	31.2	4.92	2
<10	<0.1	<5		1.48	0.88	0.2	4.95	1.05	29
	129	10.2	162	20.5	8.47	6.14	35.2	28.1	2
	106	4.5	21	8.79	4.87	1.55	19.3	7.89	2
	458	6	200	7.52	5.02	1.4	15.1	7.92	1
	81	8.4	26	4.17	2.5	0.69	29	3.35	1
	84	6.8	29	7.33	4.37	1.12	26.3	6.75	1
	165	6.1	63	9.14	5.05	2.22	17.6	11.8	1
	60	3.4	30	7.33	4	2.09	15.1	8.91 <1	
	376	6.6	118	13.6	8.49	3.15	16.5	15.8	2
	159	5.1	126	5.19	3.23	2.37	37.1	6.76	2
	148	7.1	54	5.78	3.95	0.86	43.5	4.4	2
	90	7.9	67	3.5	2.26	0.97	17.8	3.74	1
	89	8.9	8	5.69	3.67	1.28	28	6.21	2
	76	6.2	26	7.54	4.49	1.85	24.9	8.64	2
	277	6.5	176	6.61	3.37	1.84	17.9	7.7	1
	207	10.1	75	3.36	2.43	0.67	25.1	2.5	2
	93	6.6	68	6.53	4.62	1.17	19	6.12	2
	109	10.1	36	6.11	3.79	1.25	29.7	5.83	2
	341	4.6	170	7.63	4.12	2.27	17.6	9.8	2
	164	6.7	47	7.15	4.25	1.78	34.6	8.07	2
	133	6.7	32	7.61	4.68	1.35	32.5	6.99	2
	134	8.4	37	5.71	3.64	0.97	37.9	4.83	2

119	11.1	9	6.53	3.87	1.41	30.1	5.77	2
143	13	49	6.35	3.83	1.45	37.6	6.43	2
150	11.4	29	6.2	3.68	1.35	32.7	6.6	2
416	4.2	131	3.4	2.28	0.92	12.5	3.81	<1
235	4.7	116	7.8	4.28	1.9	14.1	8.87	2
<10	0.4	6	0.87	0.53	0.14	1.58	0.7	42
105	10.5	26	5.71	3.15	1.46	22.5	6.46	2
104	9.4	40	6.75	3.97	1.88	23.7	7.93	2
135	13	62	8.86	4.42	2.61	33.7	11.4	2
260	8.3	99	7.62	3.89	2.3	18	10.1	2
363	4.4	216	3.48	2.2	2.57	11	4.42	2
<10	0.6	<5	0.85	0.58	0.23	1.3	0.84	2
126	7.5	54	5.5	3.83	0.62	24.1	3.24	1
85	7.4	34	6.17	3.58	0.86	24.2	4.32	2
105	9.6	24	4.49	2.88	1.16	28.3	4.27	2
194	7.7	59	31.6	15	8.69	17.9	45	4
107	9.2	36	5.47	3.38	1.47	26.6	6.1	2
117	8.7	33	5.43	3.54	1.25	25.6	5.1	2
184	5.6	80	6.94	3.77	1.79	18.7	8.07	2
147	8.2	67	4.67	2.93	1.23	21.7	5.67	2
186	6.5	58	7.06	4.63	1.67	39.1	6.09	2
99	7.4	20	6.3	3.73	1.01	26.2	5.18	2
84	6	35	6.62	3.49	1.51	19.9	6.8	2
32	2.2	9	1.3	0.72	0.36	6.55	1.39	12
156	11.5	39	4.83	3.32	0.84	32.7	3.95	2
72	7.3	30	9.63	4.13	2.86	19.3	12.6	2
125	9.6	29	8.45	4.31	2.2	19.8	9.7	2
18	1.5	6	0.75	0.48	0.12	2.92	0.7	3
579	7.3	115	10.2	5.35	2.55	16.9	10.5	2
127	14	34	4.88	3.07	1.18	26.9	4.75	1
53	4	13	9.51	5.43	2.2	15.4	10.7	1
102	9.1	29	5.24	3.38	1.38	27	5.88	2
12	1.3	6	1.28	0.75	0.32	2.8	1.31	11
127	11.9	20	5.63	3.58	1.29	25.6	5.71	1
121	10.3	28	6.96	4.15	1.77	33	8.38	2
132	13.1	45	6.91	3.96	2.06	30.9	7.31	2
95	9.6	21	7.67	4.15	2.28	24.3	9.08	2
32	2.6	9	0.94	0.6	0.17	7.54	0.9	9
699	5.4	186	8.83	4.99	1.91	16.8	9.61	2
86	9.6	38	3.96	2.68	1.13	23.5	4.33	2
30	2.3	9	4.37	2.6	0.94	9.42	4.5	<1
391	6.6	132	5.84	2.99	1.73	16	7.03	2
155	1.4	8	0.39	0.24	0.1	2.25	0.29	3
100	8.3	30	8.67	4.31	2.64	24.5	11.2	2
50	2.8	11	5.91	3.7	1.26	12.9	5.9	1
42	2.3	9	4.9	2.8	1.12	10.1	5.01	<1
281	7	98	5.06	2.93	1.4	16.1	5.6	1

14	0.5	5	1.07	0.67	0.14	2.31	0.75	24
90	8.6	32	4.71	2.89	1.18	32.7	4.65	2
90	6.6	48	5.29	3.17	1.3	29.2	5.72	2
166	6.8	59	7.7	4.3	2	22.1	9.24	2
49	2.2	34	2.29	1.41	0.76	9.93	2.64	5
70	7.1	32	6.65	4.4	1.3	23.5	6.2	1

Hf ppm	Ho ppm	In ppm	La ppm	Li ppm	Lu ppm	Mn ppm	Mo ppm	Nb ppm
7	1.48	<0.2	87.2	66	0.6	113	3	25.5
8	1.42	<0.2	66	59	0.61	48	<2	25.4
7	1.43	<0.2	68.4	60	0.66	71	<2	23.4
4	1.22	<0.2	57.3	67	0.54	133	2	17.3
5	1.36	<0.2	53.3	65	0.61	266	<2	18.2
9	1.59	<0.2	68	90	0.81	69	3	43
8	1.21	<0.2	54.3	73	0.54	117	<2	23.2
7	2.24	0.3	68.3	131	0.7	34	7	30.5
6	1.5	<0.2	56.3	104	0.62	85	<2	24.8
7	1.87	<0.2	68.4	102	0.73	160	<2	24.8
6	1.87	<0.2	73.1	86	0.76	132	2	23
5	1.64	<0.2	60.6	97	0.58	148	<2	22.5
5	1.57	<0.2	78.8	121	0.65	108	3	21
10	1.59	<0.2	169	159	0.64	<10	12	50.4
5	0.91	<0.2	51.7	92	0.43	33	3	24.9
5	1.22	<0.2	53.8	83	0.45	36	2	23
6	1.33	<0.2	56.2	76	0.5	77	<2	23
7	1.4	<0.2	74.7	192	0.64	39	<2	23.8
7	1.44	<0.2	86.1	164	0.64	47	2	23.1
7	1.65	<0.2	100	143	0.74	49	3	23.5
8	1.66	<0.2	80.5	123	0.67	47	3	24.3
7	1.9	<0.2	74.8	109	0.79	427	3	23.3
7	1.26	<0.2	61.8	583	0.64	20	3	28.9
10	1.3	<0.2	57.3	550	0.6	24	<2	26.6
14	1.5	<0.2	49.3	230	0.72	30	<2	24.9
11	1.53	<0.2	53.3	280	0.69	46	<2	25.6
8	1.43	<0.2	56.9	351	0.61	41	<2	25.1
7	1.34	<0.2	59.5	426	0.62	41	<2	25
6	1.57	<0.2	67.9	248	0.64	36	<2	19.8
7	1.56	<0.2	63.7	249	0.63	43	<2	20.5
6	1.53	<0.2	64.1	250	0.58	94	<2	16.9
5	0.84	<0.2	57.6	274	0.43	32	12	21.2
9	1.04	<0.2	55	97	0.54	26	6	20.5
5	0.76	<0.2	81.4	109	0.44	31	17	18.8
6	0.86	<0.2	77.6	75	0.45	43	8	18.9
10	1.76	<0.2	64.5	1000	0.81	43	4	49
7	1.17	<0.2	66.8	434	0.53	40	2	32.1
9	1.31	<0.2	47.4	356	0.61	56	<2	32.8
9	1.21	<0.2	43.2	232	0.55	63	<2	24.3
6	0.92	<0.2	43.2	128	0.46	60	<2	20.5

12	1.08 <0.2		42.9	66	0.57	33 <2		20.2
10	1.01 <0.2		44.6	74	0.51	38 <2		20.3
6	1.37 <0.2		59	66	0.57	200 <2		20.1
5	1.39 <0.2		57.2	64	0.55	198 <2		18.6
7	1.69 <0.2		71.7	67	0.66	245 <2		24.9
4	1.04 <0.2		58	48	0.45	95	9	16.8
6	1.41 <0.2		59.8	49	0.58	124 <2		19.9
8	1.28 <0.2		48	27	0.6	61	2	16
4	1 <0.2		47.3	243	0.41	51	4	15.4
4	0.93 <0.2		59.4	179	0.39	27	17	16.4
4	1.07 <0.2		41.1	107	0.47	52	2	19.1
5	1.34 <0.2		58.4	178	0.56	87 <2		20.4
4	1.4 <0.2		59.7	175	0.53	360	2	18.1
5	1.28 <0.2		45.8	313	0.48	556 <2		18.6
7	1.23 <0.2		60.2	174	0.51	814 <2		26.1
6	1.25 <0.2		97.3	140	0.54	74 <2		26.5
7	1.28 <0.2		56.2	144	0.6	2390 <2		27.5
8	1.32 <0.2		45.4	213	0.63	23	2	33.6
8	1.28 <0.2		44.2	240	0.56	42	3	34.2
11	1.45 <0.2		79.1	254	0.66	22	4	43.5
11	1.57	0.2	104	174	0.72	52	3	39.3
3	2.36 <0.2		61.3	37	0.96	80	5	11.1
9	1.39 <0.2		54.5	39	0.65	50 <2		18.1
9	1.56 <0.2		53.5	54	0.68	257 <2		18.1
8	1.43 <0.2		48.7	53	0.62	622 <2		17
6	1.35 <0.2		49.7	64	0.57	451 <2		17.5
5	1.32 <0.2		51.2	70	0.51	329 <2		18.2
4	1.15 <0.2		53.3	78	0.47	321 <2		17.2
4	0.76 <0.2		38.6	78	0.38	151 <2		14.6
6	1.02 <0.2		51.6	274	0.49	29 <2		23.1
5	1.04 <0.2		53.1	97	0.46	38 <2		20.6
7	1.47 <0.2		64.2	68	0.58	48 <2		22.3
7	1.65 <0.2		68.1	57	0.67	65 <2		22.8
3	0.54 <0.2		23.8	12	0.22	20	3	6
8	1.34	<0.2	56.5	110	0.62	36	<2	25.9
6	1.78	<0.2	99.1	205	0.59	28	3	24.4
10	1.23 <0.2		48.6	54	0.5	368 <2		17.3
10	1.13 <0.2		30.4	74	0.57	676 <2		20.2
11	0.99 <0.2		25.9	82	0.48	56 <2		18.6
12	1.19 <0.2		38	149	0.61	46 <2		22.5
8	1.24 <0.2		38	40	0.44	112	11	17.5
5	0.62 <0.2		74.5	63	0.43	28	8	17.4
5	0.76 <0.2		77.9	81	0.43	39	4	19.1
5	0.79 <0.2		57.6	185	0.42	28	17	21.6
15	1.17 <0.2		47.5	59	0.57	34 <2		21.4

7	1.01 <0.2	48.8	81.9	0.46	38.7 <2		20.7	
7	0.99 <0.2	44.7	106	0.43	40 <2		21.9	
7	1.05 <0.2	43.7	167	0.5	40 <2		23.2	
9	1.16 <0.2	43.2	286	0.52	21	3	35.3	
8	1.08 <0.2	46.3	271	0.5	30	2	30.7	
8	1.25 <0.2	56.5	268	0.61	45	12	32.3	
13	1.66 <0.2	55.2	492	0.9	39	3	50	
11	1.37 <0.2	48.7	99	0.74	56	9	25.7	
8	1.3 <0.2	79.6	85	0.59	35	12	45	
5	0.97 <0.2	66.5	99	0.43	36	7	24.1	
8	1.12 <0.2	35.9	60	0.56	28	6	24.9	
11	1.26 <0.2	45.2	38	0.65	42	4	22.1	
8	1.14 <0.2	36.3	66	0.54	32	5	24.6	
10	1.29 <0.2	52	51	0.6	72	2	23.6	
7	1.2 <0.2	58.8	42	0.61	362 <2		19.7	
6	1.3 <0.2	56.5	42	0.56	201 <2		18.1	
8	1.37 <0.2	70.2	55	0.66	297 <2		22.7	
10	1.1 <0.2	46.2	45	0.6	36 <2		23.4	
3	0.9 <0.2	39.5	37	0.44	344	3	12.7	
5	1.41 <0.2	48.4	24	0.56	492 <2		15.8	
5	0.78 <0.2	50.1	94	0.43	59 <2		20.3	
5	0.89 <0.2	49.1	96	0.47	88	2	19.1	
5	1.02 <0.2	53.7	79	0.48	98 <2		19.9	
5	0.94 <0.2	50.4	55	0.5	53	4	21.5	
6	1.01 <0.2	58.7	53	0.51	97	6	19.1	
7	1.03 <0.2	38	56	0.47	545 <2		13.7	
3	0.66 <0.2	34.3	23	0.35	41 <2		13.4	
9	1.3 <0.2	50.6	90	0.59	47 <2		21.4	
8	1.33 <0.2	40.4	24	0.51	314	5	15	
5	1.29 <0.2	55.5	177	0.55	255 <2		19	
5	1.43 <0.2	55.3	162	0.6	629 <2		19.2	
9	1.37 <0.2	43.3	348	0.62	50 <2		23.7	
7	1.08 <0.2	40.1	398	0.52	53 <2		21.5	
7	1.06 <0.2	42.5	369	0.52	61 <2		20.9	
6	1.05 <0.2	46.7	83	0.52	69 <2		20.4	
10	1.24 <0.2	47.1	55	0.59	53 <2		20.6	
9	1.4 <0.2	57.9	63	0.63	138 <2		20.3	
5	1.19 <0.2	79	163	0.57	84	8	20.4	
5	0.98	0.2	71.8	170	0.5	76	7	18.7
9	1.4 <0.2	79.2	116	0.74	64	8	35	
6	0.93 <0.2	60.1	95	0.51	57	8	25.6	
6	0.99 <0.2	46	54	0.49	53 <2		21	
6	1.25 <0.2	67.1	77	0.6	228 <2		21.8	
6	1.3 <0.2	63.9	72	0.6	689 <2		20.7	
7	1.51 <0.2	67.4	63	0.69	218 <2		22.9	
5	0.62 <0.2	43.9	15	0.39	73	6	19.2	
5	0.65 <0.2	59.2	16	0.44	68	4	18.6	

4	1.35 <0.2	45.6	26	0.45	154	4	13
7	0.68 <0.2	27	18	0.38	89	5	17.1
5	1.19 <0.2	50.4	70	0.47	35 <2		20.1
5	1.06 <0.2	42.6	69	0.44	30 <2		20.3
9	1.66 <0.2	80.4	80	0.72	216 <2		24.4
6	1.18 <0.2	50.1	164	0.53	36 <2		22.7
8	1.36 <0.2	48.9	64	0.61	259 <2		20.6
12	1.59 <0.2	57.3	59	0.65	117 <2		21.6
10	1.61 <0.2	63	56	0.63	216 <2		20.7
11	1.08 <0.2	46.6	67	0.48	130	12	18.1
7	1.55 <0.2	71.2	96	0.66	184 <2		19.1
10	1.28 <0.2	57.3	49	0.57	134	3	16.7
9	0.96 <0.2	46.8	152	0.5	166	8	17.7
6	1.02 <0.2	45.1	86	0.48	619	3	16.4
5	1.09 <0.2	76.7	86	0.54	683 <2		17
5	1.02 <0.2	49	67	0.48	135 <2		18.4
6	0.93 <0.2	46.9	344	0.41	163 <2		20.4
5	0.78 <0.2	29.2	118	0.43	223 <2		18.9
5	0.78 <0.2	67.2	98	0.4	181 <2		18.3
4	1.41 <0.2	43.3	31	0.5	4850 <2		14.3
14	1.16 <0.2	61.9	120	0.6	49	3	19.7
6	1.54 <0.2	111	171	0.63	43	7	24.1
10	1.46 <0.2	54.4	297	0.67	38	5	29.2
9	1.33 <0.2	48.6	284	0.64	31	4	29
9	1.34 <0.2	60.3	205	0.6	29	5	27.3
8	1.14 <0.2	78.4	142	0.56	42	5	24.5
11	1.25 <0.2	67.9	114	0.59	33 <2		21.8
12	1.14 <0.2	60.8	105	0.58	33 <2		22.2
12	1.38 <0.2	59.6	81	0.65	119 <2		18.9
13	1.55 <0.2	58.7	274	0.86	39	11	55.7
10	1.06 <0.2	59.6	194	0.64	22	5	40
11	1.18 <0.2	88.5	131	0.66	24 <2		36.5
10	1.36 <0.2	64.4	114	0.65	30 <2		30.2
11	1.27 <0.2	58.2	49	0.6	35 <2		21.3
10	1.42 <0.2	59.3	43	0.71	35 <2		23.9
9	1.37 <0.2	58.4	46	0.65	40 <2		20.6
8	1.25 <0.2	61	56	0.58	203 <2		18.8
10	1.49 <0.2	63.9	55	0.7	317 <2		19.8
8	1.33 <0.2	56.5	76	0.56	84 <2		24.9
4	1.04 <0.2	62.1	42	0.44	39 <2		19.4
5	1.33 <0.2	45.8	67	0.52	2660 <2		17
5	2.87 <0.2	127	77	0.95	216 <2		18.7
7	1.15 <0.2	50.2	79	0.54	191 <2		21.2
8	1.22 <0.2	42.3	387	0.57	76 <2		26.1
9	1.45 <0.2	64.7	125	0.63	62 <2		25.3
8	1.52 <0.2	67.5	807	0.62	73 <2		29.4
10	2.01 <0.2	83.4	156	0.66	75 <2		20.6

5	1.22 <0.2		45.6	138	0.48	1760 <2		17.6
10	1.22 <0.2		52.6	136	0.56	103 <2		23.9
15	2.12 <0.2		79.8	1010	1.14	156 <2		53.5
13	2.06 <0.2		154	194	0.9	161	8	56.4
10	1.28 <0.2		94.9	222	0.56	260 <2		29.8
6	1.31 <0.2		50.6	73	0.53	141 <2		23.7
5	1.28 <0.2		64.1	342	0.52	106	3	19.3
8	1.25 <0.2		38.9	261	0.52	39	4	24.1
4	1.36 <0.2		54.3	144	0.52	867 <2		17.4
5	1.24 <0.2		47.5	230	0.54	51 <2		22
7	1.23 <0.2		45.6	60	0.53	286 <2		18.3
6	0.98 <0.2		35.4	71	0.48	135 <2		20.2
4	1.03 <0.2		48.3	33	0.37	536 <2		17.6
6	0.42	0.3	114	73	0.39	65 <2		28.1
4	0.9 <0.2		54.6	62	0.45	291	5	17
10	1.49 <0.2		61.7	315	0.66	27 <2		36.3
10	1.15 <0.2		53.4	89	0.59	31 <2		23.1
15	1.38 <0.2		50	39	0.6	16 <2		22.9
8	1.27 <0.2		44.2	94	0.54	81 <2		25.6
11	1.68 <0.2		43.6	1100	0.77	182	6	42.1
8	0.98 <0.2		33.6	219	0.51	208 <2		22.6
6	1.25 <0.2		52.2	157	0.55	51 <2		23.4
7	0.68 <0.2		36	59	0.38	301	34	21.1
8	1.34 <0.2		56.2	236	0.6	58 <2		27.9
7	1.46	0.3	67.7	255	0.69	67 <2		24.8
8	1.55 <0.2		159	283	0.78	16	4	49.6
20	2.32 <0.2		81.6	117	1	20 <2		48.5
7	1.13 <0.2		55.4	66	0.6	119 <2		20
9	1.32 <0.2		54.6	73	0.66	37 <2		32.5
7	0.89 <0.2		34.9	34	0.48	32 <2		18.6
8	1.28 <0.2		57.3	71	0.55	113 <2		20.1
10	1.21 <0.2		47.3	62	0.54	117 <2		19.3
7	0.93 <0.2		47	31	0.47	35 <2		19.5
11	1.17 <0.2		47.2	44	0.58	25	3	24.5
9	1.87 <0.2		90.7	370	0.75	31 <2		35.9
9	1.83 <0.2		53.1	635	0.83	79	4	40
8	2.1 <0.2		58	240	0.69	58 <2		28.2
6	1.76 <0.2		59.5	253	0.73	46 <2		24.8
5	0.8 <0.2		26.1	28	0.4	81 <2		18.4
7	1.34 <0.2		54	96	0.57	248 <2		20.1
11	1.46 <0.2		50.1	85	0.72	37 <2		29.8
7	1.23 <0.2		50.7	142	0.55	54 <2		21.1
9	1.19 <0.2		29.9	311	0.58	26	3	40.4
20	2.98 <0.2		75.2	149	1.49	30	9	85.5
7	1.29 <0.2		36.3	250	0.57	43	3	29.9
10	1.42 <0.2		54.2	281	0.66	50 <2		28.2
24	1 <0.2		174	181	0.57	37 <2		27.1

11	1.32 <0.2		9.5	734	0.63	18	11	45.9
14	1.01 <0.2		40.1	279	0.53	26 <2		32.5
9	1.26 <0.2		46	60	0.57	42 <2		19.7
5	1.4 <0.2		39.8	60	0.57	1330 <2		17.1
10	1.64 <0.2		33.8	244	0.61	14 <2		31.6
10	1.63 <0.2		53.3	221	0.58	13 <2		33
8	1.15 <0.2		30.6	297	0.36	12 <2		29
11	1.18 <0.2		8	260	0.5 <10	<2		33
8	1.02 <0.2		55.3	15	0.48	35 <2		17.7
18	2.04	0.2	81.1	26	1.08 <10		8	72.9
15	1.59 <0.2		36.4	27	0.8 <10	<2		31.9
10	1.84 <0.2		59.5	74	0.71 <10		3	21.7
5	1.68	0.4	53.4	121	0.6 <10	<2		19.2
5	0.9 <0.2		28.4	26	0.46	34 <2		18.5
8	1.15 <0.2		28.1	23	0.53	32 <2		21.7
4	1.12 <0.2		26.8	50	0.49	11 <2		18.3
10	1.05 <0.2		37.4	24	0.48	31 <2		18
10	1.08 <0.2		36.2	32	0.49	31 <2		18
10	1.35 <0.2		53.3	42	0.59	34 <2		21.2
10	1.28 <0.2		46.4	35	0.55	29 <2		18.8
12	1.22 <0.2		41.4	40	0.55	31 <2		21
10	1.07 <0.2		38.5	46	0.52	29 <2		21
12	1.24 <0.2		41.9	118	0.65	29	2	26.2
6	1.88 <0.2		81.3	61	0.67	69 <2		20.7
6	0.95 <0.2		29.8	76	0.44	116 <2		18.1
6	1.03 <0.2		34.8	98	0.47	38 <2		20.6
6	1.03 <0.2		43.5	210	0.5	50 <2		24.8
9	1.3 <0.2		43.7	74	0.57	120 <2		18.3
9	1.15 <0.2		38.8	66	0.46	109 <2		17.6
9	1.29 <0.2		44.5	74	0.5	101 <2		19.2
9	1.28 <0.2		45.7	68	0.52	106 <2		19.1
9	1.23 <0.2		43.9	67	0.51	91 <2		18.4
8	1.34 <0.2		50.2	93	0.5	95 <2		19.4
7	1.25 <0.2		54.4	141	0.54	133 <2		21.3
8	1.42 <0.2		59.3	133	0.57	127 <2		22.3
8	1.56 <0.2		62.4	125	0.6	127 <2		22.1
7	1.51 <0.2		60	133	0.61	124 <2		21.1
7	1.69 <0.2		61.6	133	0.64	121 <2		20.1
7	1.48 <0.2		50	150	0.6	118 <2		20.9
7	1.4 <0.2		50	144	0.57	112 <2		22
7	1.42 <0.2		54.4	145	0.57	83 <2		22.3
6	1.17 <0.2		155	226	0.48	19	6	24.8
5	0.98 <0.2		43	223	0.4	62 <2		18.4
6	1.34 <0.2		53.2	119	0.53	53 <2		22.8
7	1.28 <0.2		52.3	115	0.54	44 <2		22.9
6	1.38 <0.2		43.5	91	0.56	615 <2		20.2
6	1.07 <0.2		67.1	258	0.51	24	3	25.2

6	1.49 <0.2		86.1	124	0.56	23	20	23.5
6	1.58 <0.2		79.7	55	0.58	30	6	21.8
6	1.43 <0.2		65.9	40	0.54	27	7	21.4
6	1.46 <0.2		65.3	53	0.55	26	5	21.9
6	1.14 <0.2		59.5	43	0.47	25	5	21.5
7	1.02 <0.2		54.6	37	0.52	27	2	23.2
7	1.06 <0.2		48.8	36	0.49	26	2	23.5
10	1.09 <0.2		43.5	32	0.51	29 <2		18.6
9	1.18 <0.2		46.8	84	0.53	43 <2		19.3
9	1.11 <0.2		45.2	108	0.51	95 <2		19
9	1.25 <0.2		45.7	108	0.55	95 <2		19.1
9	1.17 <0.2		50.1	106	0.55	79 <2		19.2
9	1.36 <0.2		49.5	86	0.58	60 <2		18.3
8	1.5 <0.2		50.9	90	0.6	55 <2		19
10	1.55 <0.2		55.8	81	0.6	42 <2		17.1
10	1.36 <0.2		56.3	88	0.56	39 <2		18.9
10	1.31 <0.2		53.2	91	0.54	37 <2		19.3
8	1.22 <0.2		60.8	107	0.51	38 <2		20
10	1.12 <0.2		52.9	102	0.53	35 <2		19.1
9	1.09 <0.2		50.1	106	0.49	35 <2		18.8
8	1.03 <0.2		49.9	105	0.47	34 <2		19.1
10	1.08 <0.2		49.6	104	0.49	33 <2		19.4
6	1.24 <0.2		46.5	87	0.49	409 <2		18.6
7	1.53 <0.2		51.3	77	0.53	203 <2		19.5
7	1.41 <0.2		51.5	75	0.53	209 <2		19.4
7	1.5 <0.2		53	73	0.57	509 <2		19.4
8	1.52 <0.2		56.4	70	0.57	414 <2		19.6
6	1.38 <0.2		57.3	118	0.51	422 <2		18.7
5	1.22 <0.2		45.7	411	0.46	354 <2		19.8
10	1.38 <0.2		46.8	116	0.56	27 <2		20.9
9	1.09 <0.2		40.4	103	0.47	24 <2		19.5
8	1.19 <0.2		49.8	230	0.52	27 <2		21.5
6	0.97 <0.2		70.4	493	0.5	30 <2		27.2
9	1.21	0.2	64.1	289	0.6	22	8	37.2
6	1.04 <0.2		66	160	0.46	32 <2		22.6
7	1.15 <0.2		54.2	115	0.53	32 <2		23.5
8	1.25 <0.2		63.4	116	0.62	33 <2		28.8
10	1.68 <0.2		75	187	0.78	33	3	41.9
7	1.69 <0.2		52	72	0.63	40	3	19.3
8	1.43 <0.2		52.7	79	0.58	59 <2		20
7	1.48 <0.2		53.3	97	0.59	143 <2		20.1
9	1.62 <0.2		50.7	79	0.65	155 <2		19.1
10	1.95 <0.2		57	82	0.79	249 <2		21.6
8	1.81 <0.2		50.8	84	0.71	355 <2		19.2
7	1.7 <0.2		52.9	89	0.7	350 <2		19.2
7	1.54 <0.2		51.6	93	0.62	146 <2		18.9
8	1.69 <0.2		55.1	93	0.69	125 <2		20.8

12	1.36 <0.2	46.4	47	0.57	32 <2		17.7
12	1.48 <0.2	48.4	57	0.66	39 <2		18.9
11	1.29 <0.2	102	144	0.61	20	3	24.5
8	1.19 <0.2	56.2	137	0.56	35 <2		22.7
7	1.01 <0.2	51.3	122	0.5	35 <2		22.3
8	1.16 <0.2	54.9	118	0.51	34 <2		19.9
6	1.04 <0.2	59	134	0.45	36 <2		20.5
6	1.16 <0.2	60.3	128	0.5	39 <2		20.4
9	2.13 <0.2	89.3	55	0.79	72 <2		24.2
11	1.52 <0.2	62.5	53	0.63	39 <2		20.7
11	1.47 <0.2	54	74	0.61	38 <2		21.9
10	1.29 <0.2	48.5	98	0.57	34 <2		22.7
8	1.24 <0.2	45.8	158	0.58	36 <2		23.2
10	1.36 <0.2	42	327	0.6	31 <2		27.4
7	1.49 <0.2	44.2	42	0.6	1600 <2		16.8
3	0.76 <0.2	32.4	92	0.29	151	3	11.4
6	1 <0.2	45.3	194	0.42	266	3	19.6
6	1.04 <0.2	42.7	244	0.4	110 <2		18.2
6	1.01 <0.2	47.7	177	0.44	155 <2		20.1
8	1.21 <0.2	40	71	0.56	45 <2		21.6
7	1.08 <0.2	41.6	71	0.46	51 <2		19.6
3	2.01 <0.2	50.3	42	0.61	1750 <2		11.9
5	1.15 <0.2	52.1	72	0.49	191 <2		18.9
5	1.97 <0.2	80.8	65	0.64	446 <2		18.1
5	1.19 <0.2	50.9	26	0.48	117 <2		16.9
6	1.31 <0.2	54.1	64	0.51	138 <2		18.6
5	1.36 <0.2	54.7	67	0.54	289 <2		18.6
5	1.45 <0.2	58.4	57	0.57	217 <2		17.8
5	1.28 <0.2	48.4	44	0.49	252 <2		17.5
8	1.23 <0.2	51.8	184	0.48	35	9	21.5
8	0.92 <0.2	35.3	158	0.42	33	4	21.5
8	1.02 <0.2	43	134	0.4	30	4	21
8	1.06 <0.2	41.2	79	0.44	57 <2		20.1
9	1.28 <0.2	44.2	88	0.55	68	2	20.7
9	1.39 <0.2	63.7	111	0.54	29	3	32.4
8	1.82 <0.2	80	105	0.62	28	3	31.7
8	1.5 <0.2	71.9	131	0.58	33	2	30.3
4	0.75 <0.2	38.3	153	0.32	94	4	17.1
7	1.01 <0.2	46.4	258	0.46	55	3	27.5
7	0.96 <0.2	52	128	0.47	43 <2		25
9	0.89 <0.2	48.2	71	0.42	41 <2		18.1
12	1.59 <0.2	53.3	48	0.75	93	4	39.5
11	1.33 <0.2	45.5	56	0.63	42 <2		30.5
11	1.16 <0.2	43.1	36	0.52	55 <2		22.1
12	1.55 <0.2	74.2	33	0.6	95 <2		21.1
6	1.08 <0.2	43.8	60	0.47	81 <2		18.8
8	1.42 <0.2	45.9	299	0.61	43 <2		25.3

4	1.01 <0.2	47.6	93	0.4	71 <2		16.8
9	1.42 <0.2	42.4	223	0.53	45 <2		25.4
9	1.4 <0.2	63.4	297	0.59	39 <2		23
8	1.27 <0.2	42.5	88	0.52	631 <2		16.4
6	1.22 <0.2	47.5	265	0.54	63 <2		24.3
6	0.98 <0.2	39.6	160	0.44	46	2	18.9
6	1.22 <0.2	51.9	137	0.45	48 <2		19
5	1.15 <0.2	45.9	113	0.44	43	2	16.1
8	1 <0.2	36.7	81	0.5	219 <2		16.7
8	1.02 <0.2	38.3	80	0.41	119 <2		15.9
7	1.13 <0.2	40.6	85	0.43	168 <2		15.7
8	1.22 <0.2	45.2	95	0.48	135 <2		17.8
9	1.18 <0.2	30.2	131	0.49	128 <2		22.3
6	0.92 <0.2	28.9	103	0.41	1230 <2		16.4
6	1 <0.2	37	126	0.44	305 <2		19
5	1.85 <0.2	101	134	0.6	578 <2		19.2
6	1.49 <0.2	70.7	118	0.55	288 <2		20.4
6	1.43 <0.2	62.8	110	0.56	1570 <2		18.8
7	1.22 <0.2	54.4	116	0.5	913 <2		19.2
12	1.18 <0.2	39.2	90	0.51	410 <2		19.7
10	1.11 <0.2	33.8	84	0.5	1160 <2		19.8
5	1.12 <0.2	59.5	119	0.45	1680 <2		18.7
14	1.03 <0.2	44.3	175	0.45	52 <2		17.8
17	1.13 <0.2	28	159	0.49	35 <2		17.6
13	0.86 <0.2	37.3	142	0.37	34 <2		14.6
5	1.3 <0.2	49.6	73	0.52	1760 <2		16.7
7	1.43 <0.2	46.8	224	0.53	54 <2		19.5
10	1.23 <0.2	46.8	144	0.49	78 <2		19.3
10	1.19 <0.2	39.4	128	0.53	428 <2		16.7
5	1.07 <0.2	44.1	128	0.45	131 <2		18.6
10	1.6 <0.2	58.7	232	0.63	166 <2		22.2
9	1.36 <0.2	50.5	363	0.57	107	7	24.5
13	1.26 <0.2	38.2	130	0.53	48 <2		23.2
15	1.13 <0.2	42	43	0.55	34 <2		19.4
5	1.09 <0.2	56	88	0.57	306 <2		19.3
5	1.1 <0.2	55.6	101	0.56	427 <2		18.4
5	0.73 <0.2	68.7	150	0.39	55	2	18.2
5	0.71 <0.2	49.8	115	0.39	69	2	18
6	0.9 <0.2	36.3	61	0.49	345 <2		19
5	1.82 <0.2	57.4	50	0.65	627 <2		18.4
5	0.85 <0.2	48.9	76	0.46	498 <2		18.2
5	1.02 <0.2	51.4	69	0.52	340 <2		17.4
9	1.16 <0.2	48.5	47	0.58	45 <2		22.5
9	1.09 <0.2	48	48	0.55	43 <2		22.8
6	1.06 <0.2	45.6	56	0.5	46 <2		22.5
9	1.14 <0.2	54.8	53	0.55	47	8	22.4
5	1.1 <0.2	56.8	282	0.5	262	5	20.9

5	1.26 <0.2	55.1	278	0.53	433	5	18.3	
6	1.37 <0.2	58.4	180	0.62	1180	3	18.7	
4	1.14 <0.2	36.2	106	0.5	6400	5	11.9	
6	1.35 <0.2	60.3	251	0.6	426	3	19.1	
11	1.28 <0.2	49.4	68	0.7	71	2	22.6	
11	1 <0.2	36.1	47	0.5	40	3	17.6	
9	1.32 <0.2	52.8	89	0.52	119	4	18.3	
4	1.43 <0.2	54.5	90	0.6	516	3	17.2	
9	1.24 <0.2	43.8	140	0.6	64	4	21.9	
9	1.14 <0.2	41	164	0.5	70	2	20.4	
11	1.21 <0.2	43.8	105	0.67	61 <2		21.8	
4	0.76 <0.2	57.4	72	0.38	38	3	18.6	
11	1.43 <0.2	67.8	59	0.69	33	2	24.3	
10	1.16 <0.2	51.4	71	0.56	32 <2		20.5	
11	1.18 <0.2	51.6	49	0.59	44	3	19.5	
4	1.72 <0.2	67.3	89	0.64	812 <2		18.8	
4	1.45 <0.2	57.9	80	0.64	3670 <2		19.2	
5	1.3 <0.2	58.8	171	0.51	182 <2		17.9	
5	1.21 <0.2	49.3	249	0.55	256 <2		18.3	
5	1.01 <0.2	55.1	103	0.46	106	2	18.3	
5	0.93 <0.2	52.6	56	0.44	145	2	17.9	
7	1.33 <0.2	49.5	236	0.56	46 <2		26.2	
6	1.15 <0.2	51.6	110	0.48	36 <2		22.3	
6	1 <0.2	49.5	72	0.49	37 <2		22.7	
6	0.76 <0.2	29.9	59	0.43	40	3	23	
10	1.68 <0.2	141	113	0.83	16	9	43.3	
6	1.32 <0.2	363	186	0.53		5	25.8	
7	1.3 <0.2	89	114	0.5	46	3	28.3	
5	0.98 <0.2	53.2	67	0.48	52	2	19.8	
5	1.05 <0.2	59.7	68	0.5	76	3	20.9	
5	1.49 <0.2	56.8	76	0.59	2100	8	17.9	
5	1.25 <0.2	50	77	0.48	1170	6	18.2	
5	1.59 <0.2	71.9	96	0.61	239 <2		22.1	
5	1.45 <0.2	67.8	95	0.57	126 <2		22.6	
6	1.46 <0.2	65.5	91	0.61	115 <2		22.1	
5	1.65 <0.2	66.2	107	0.64	115 <2		21.7	
5	1.85 <0.2	66.1	143	0.69	54 <2		22.8	
5	1.09 <0.2	73.7	183	0.56	47 <2		20.8	
5	1.24 <0.2	57.7	107	0.57	133 <2		21	
5	1.42 <0.2	59.7	91	0.56	275 <2		21.5	
6	1.9 <0.2	63.2	69	0.78	303 <2		22.8	
14	1.19 <0.2	48.5	51	0.61	32	11	22.4	
5	0.79 <0.2	41.8	36	0.41	90	2	17	
12	1.53	0.2	134	140	0.92	25	5	56.3
10	1.2 <0.2	97.6	112	0.72	71	3	39.7	
13	1.47 <0.2	50.7	74	0.85	105 <2		37.1	
<1	0.15 <0.2	3.4 <10		0.06 <10	<2		1.4	

<1		0.52 <0.2	9.1	17	0.12 <10		2	2.2
	10	1.55 <0.2	48	119	0.66	681 <2		19.7
	12	1.43 <0.2	44.6	44	0.61	323 <2		15
	9	1.49 <0.2	39.7	40	0.56	316	3	14.1
<1		0.32 <0.2	25.7 <10		0.1 <10	<2		0.5
	6	1.55 <0.2	47.7	215	0.61	49 <2		20.5
	7	1.73 <0.2	50.9	61	0.71	872 <2		17.5
	4	1.31 <0.2	52.5	98	0.54	881 <2		16.2
<1		0.32 <0.2	18.3 <10		0.09 <10	<2		1.1
	9	1.65 <0.2	56.6	204	0.71	45 <2		22.1
	12	1.67 <0.2	54.2	151	0.69	168 <2		20.1
	10	1.31 <0.2	34.2	34	0.55	2130 <2		13.4
	6	1.21 <0.2	48.5	67	0.52	51 <2		19.5
	7	1.25 <0.2	37.3	46	0.51	1200 <2		15
	5	1.07 <0.2	40.1	58	0.47	748 <2		15
<1		0.11 <0.2	2.5 <10	<0.05	<10	<2		1.4
	7	1.28 <0.2	56.6	215	0.52	24 <2		22.6
	5	3.21 <0.2	245	47	1	669 <2		18.3
	5	0.98 <0.2	48.8	50	0.44	86 <2		18.4
	6	1.15 <0.2	81.4	40	0.54	51 <2		20.1
	6	1.18 <0.2	37.9	48	0.51	1320 <2		15
<1		0.16 <0.2	4.2 <10		0.06	138 <2		1.8
	6	0.96 <0.2	32.6	258	0.47	31	3	23.2
	6	1.74 <0.2	128	89	0.64	125 <2		18.7
	4	0.99 <0.2	50.4	61	0.43	283 <2		16.3
	5	1.03 <0.2	44.3	48	0.5	124 <2		19.3
<1		0.14 <0.2	2.1 <10	<0.05		59 <2		1.5
	6	1.02 <0.2	37.8	34	0.47	299	17	15.7
<1		0.16 <0.2	1.3 <10		0.07	28	20	1
	7	1.07 <0.2	32.3	129	0.49	92 <2		20.9
	6	1.44 <0.2	60.3	48	0.56	311 <2		19.2
	4	2.12 <0.2	38.1	40	0.51	225	228	12.3
<1		0.28 <0.2	7	28	0.12	22	3	3.1
	7	1.17 <0.2	33.3	48	0.53	481 <2		18
	3	0.31 <0.2	21.7	40	0.21	212	339	9.8
<1		0.25 <0.2	3.9 <10		0.11	12	11	2.4
	11	0.79 <0.2	21.7	21	0.45	43	3	16
	8	1.37 <0.2	36.2	83	0.55	467 <2		15.3
	8	1.06 <0.2	36.1	125	0.5	209 <2		18.8
	3	0.98 <0.2	36.5	38	0.43	228	837	10.8
	9	1.71 <0.2	47	67	0.71	403	3	27
	6	1.19 <0.2	42.3	45	0.55	349	2	17.7
<1		0.27 <0.2	2.5 <10		0.09	15 <2		1.4
	7	1.16 <0.2	47.9	55	0.56	118	5	19.8
	9	1.12 <0.2	51.7	45	0.52	56 <2		19.6
	7	1.19 <0.2	45.8	58	0.56	353 <2		21.7
	4	1.03 <0.2	44.2	40	0.55	260	362	14.8

	7	1.28 <0.2	60.7	45	0.58	175	5	21.2
	3	1.52 <0.2	53.8	50	0.65	250	1110	11.3
<1		0.16 <0.2	6.3	20	0.08	53	178	2.5
	10	1.31 <0.2	25	252	0.66	28	6	35.6
<1		0.21 <0.2	3.2 <10		0.09	17	4	2
	4	1.1 <0.2	43.4	76	0.47	513 <2		15.2
	6	1.55 <0.2	80	72	0.61	196 <2		19.1
	4	1.46 <0.2	65.8	117	0.58	195 <2		15.7
<1		0.5 <0.2	11.4 <10		0.18	283	4	1.5
	4	1.17 <0.2	47.1	114	0.52	238 <2		16.2
<1		0.3 <0.2	9.4	13	0.13	16 <2		2.4
	8	1.06 <0.2	39.7	39	0.5	194 <2		18
	8	1.23 <0.2	43.3	30	0.49	961 <2		12.3
	2	0.67 <0.2	21.6	32	0.32	239	289	9.4
<1		0.31 <0.2	6.6 <10		0.13	57	3	4.3
	9	1.13 <0.2	34.3	28	0.51	165 <2		17.2
<1		0.62 <0.2	12	20	0.23	2530 <2		3.2
	6	1.4 <0.2	59.1	128	0.59	187 <2		20.9
	5	1.34 <0.2	59	122	0.54	175 <2		18.7
	6	1.48 <0.2	58.9	111	0.63	468 <2		19.5
	10	1.77 <0.2	55.1	142	0.75	90 <2		27.4
	6	1.26 <0.2	43.4	111	0.56	267 <2		20.4
	6	1.26 <0.2	44.7	115	0.57	191 <2		21.6
	4	1.86 <0.2	63.8	80	0.67	2320 <2		14.3
	11	1.49 <0.2	59.3	53	0.65	417 <2		17.8
	10	1.47 <0.2	53.3	56	0.66	401 <2		17
	1	0.8 <0.2	18.9	34	0.32	2960 <2		2.9
	8	1.43 <0.2	49	55	0.61	147 <2		21.7
	7	1.34 <0.2	44.8	57	0.54	150 <2		21.1
	6	1.35 <0.2	38.8	57	0.57	410 <2		18.4
	6	1.33 <0.2	39.9	62	0.58	484 <2		18.8
	8	1.05 <0.2	40.9	47	0.47	262 <2		14.8
	4	0.61 <0.2	15.8	12	0.25	38	3	5.3
	8	1.02 <0.2	41.1	28	0.46	104 <2		17.4
	8	1.21 <0.2	41.3	32	0.52	125 <2		18.1
	6	0.89 <0.2	41.4	218	0.41	54	4	10.1
	9	1.54 <0.2	61.2	169	0.67	182 <2		22.4
	8	1.49 <0.2	59.1	178	0.65	216 <2		20.5
	14	1.33 <0.2	48.2	109	0.57	53 <2		16.8
	12	1.72 <0.2	61.6	190	0.71	75	3	23.3
	12	1.67 <0.2	67.8	176	0.7	66 <2		21.1
	7	1.01 <0.2	30.6	169	0.44	49 <2		19.2
	9	1.05 <0.2	34.3	156	0.49	45 <2		20.9
	10	1.27 <0.2	37.8	269	0.59	52 <2		24.4
	9	0.83 <0.2	23.7	13	0.4	16 <2		13.5
	8	0.79 <0.2	21.9	14	0.35	16 <2		12
	8	0.89 <0.2	28.3	19	0.39	21 <2		14.5

9	1.42 <0.2	49.4	200	0.58	40 <2		21.8
10	1.2 <0.2	37.3	65	0.55	38 <2		20.2
10	0.99 <0.2	38.6	104	0.47	165 <2		16.7
10	1.49 <0.2	91.7	123	0.61	62 <2		18
11	1.05 <0.2	44.6	256	0.49	83 <2		19.6
5	2.2 <0.2	51.9	87	0.69	2680 <2		16.7
8	0.95 <0.2	40.8	39	0.47	50 <2		15.6
12	1.32 <0.2	24.8	446	0.62	103 <2		26.9
12	1.15 <0.2	30	97	0.52	79 <2		17
6	0.94 <0.2	40.6	61	0.44	52 <2		18.1
9	0.77 <0.2	24.9	21	0.38	579	16	16.1
4	1.25 <0.2	52.7	76	0.54	2710 <2		17.6
5	1.11 <0.2	55.1	70	0.45	57 <2		19.2
14	1.19 <0.2	23.1	74	0.55	26 <2		23.1
10	0.96 <0.2	15.2	331	0.48	22	8	26.5
4	1.34 <0.2	41.1	33	0.46	350	18	8.2
6	0.88 <0.2	30.1	41	0.39	236	42	13.7
5	0.86 <0.2	27.7	42	0.37	190	7	12.4
5	1.02 <0.2	49.3	32	0.39	431	6	10
5	1.28 <0.2	38.5	45	0.44	271	43	13
6	0.85 <0.2	27.4	38	0.39	185	50	12.2
5	0.89 <0.2	46.3	37	0.38	233	18	13
5	0.77 <0.2	26.5	37	0.34	169	13	11
6	1.23 <0.2	43.7	83	0.51	430 <2		20
7	1.53 <0.2	40.4	72	0.49	332 <2		15.4
8	0.91 <0.2	32.3	50	0.41	452 <2		14.2
7	1.2 <0.2	36.5	52	0.48	1070	4	16.5
7	1.08 <0.2	36.7	65	0.47	319 <2		16.5
11	0.92 <0.2	27.3	662	0.49	46 <2		21.4
8	1.01 <0.2	42.1	183	0.46	56 <2		18.9
5	1.16 <0.2	44.1	145	0.5	217 <2		19.7
6	1.14 <0.2	63.6	153	0.53	73 <2		23.1
2	1.09 <0.2	40.7	49	0.38	1850	7	7.3
6	0.9 <0.2	29.8	78	0.45	352	4	16.5
6	0.77 <0.2	26.3	126	0.4	200	4	16.8
5	0.77 <0.2	34.3	63	0.37	412 <2		15.6
5	1.1 <0.2	29.4	39	0.43	1090 <2		13.4
7	1.14 <0.2	82.9	44	0.5	146 <2		16.5
3	0.78 <0.2	25.1	61	0.35	318 <2		10.8
4	1.08 <0.2	33.5	59	0.42	403	2	14
4	1.09 <0.2	47	78	0.43	303 <2		14.5
5	1.01 <0.2	31.6	51	0.45	393 <2		14.9
5	0.86 <0.2	28.1	35	0.42	111	5	12.9
8	0.93 <0.2	126	39	0.47	103	3	17.6
3	0.7 <0.2	26.1	20	0.27	2590 <2		8.7
5	0.72 <0.2	23.4	29	0.35	184 <2		12.9
5	0.95 <0.2	56.3	41	0.39	128 <2		14.3

5	1.08 <0.2	37.1	42	0.4	166 <2		15.5
4	0.99 <0.2	38.1	36	0.4	113 <2		14.3
2	1.97 <0.2	84	15	0.57	742 <2		5.2
5	0.84 <0.2	22.9	97	0.4	83 <2		14.2
6	0.87 <0.2	30.7	101	0.44	89 <2		16.9
5	0.88 <0.2	22.2	29	0.37	497	14	11.9
4	0.5 <0.2	135	57	0.26	205	26	15.5
4	0.61 <0.2	43.9	144	0.32	237 <2		17.3
5	0.9 <0.2	28	50	0.39	254 <2		14.6
6	0.92 <0.2	27.1	37	0.39	999 <2		13.3
3	1.14 <0.2	36.1	63	0.42	1670 <2		9.6
3	0.47 <0.2	31.2	108	0.28	262	7	14.4
3	0.71 <0.2	51.9	96	0.36	122 <2		14
6	0.66 <0.2	21.7	64	0.32	340 <2		14.6
9	1.17 <0.2	44.6	122	0.54	95 <2		22.3
12	1.27 <0.2	53.1	130	0.59	115 <2		21.8
10	1.25 <0.2	46.9	75	0.56	893 <2		17.7
10	1.54 <0.2	51.8	74	0.67	449 <2		21.1
9	3.47 <0.2	49	67	0.8	1810 <2		16.9
3	0.67 <0.2	47.2	65	0.26	143	31	5.2
9	1.12 <0.2	57.5	107	0.57	107	5	20.4
9	1.33 <0.2	52.2	121	0.61	110 <2		23.2
10	1.33 <0.2	55.6	94	0.62	257	2	21.9
9	1.37 <0.2	61.4	100	0.62	159	2	25.7
11	1.33 <0.2	67.3	85	0.65	145 <2		25.3
8	1.26 <0.2	59.1	64	0.56	92	5	29.3
9	1.2 <0.2	53	80	0.54	122 <2		32.1
9	1.24 <0.2	56.2	72	0.58	129 <2		34.1
9	1.12 <0.2	46.5	79	0.54	94 <2		34
12	1.5 <0.2	73.5	98	0.65	81	2	35.4
9	1.57 <0.2	46.9	60	0.62	414	5	20.2
5	1.57 <0.2	40.7	38	0.55	1110	16	12.2
7	1.99 <0.2	43.2	60	0.85	1040 <2		20.5
10	1.56 <0.2	45.8	68	0.67	197 <2		24
11	1.87 <0.2	57.6	56	0.82	432 <2		22.6
11	1.61 <0.2	104	61	0.7	288 <2		25.6
10	1.31 <0.2	58.3	54	0.57	404 <2		21.6
8	1.56 <0.2	48.8	38	0.63	840 <2		17
10	1.65 <0.2	53.7	61	0.7	219 <2		24.7
4	2.05 <0.2	34.4	31	0.75	1820 <2		11.1
1	0.53 <0.2	24.7	11	0.17	248	19	1.3
3	1.22 <0.2	24.1	17	0.5	1430	22	7.2
7	1.34 <0.2	53.7	178	0.57	101	7	25.7
5	1.24 <0.2	53.3	144	0.53	79	7	20.4
6	1.69 <0.2	62.6	131	0.68	124	8	23.5
6	3.42 <0.2	80.5	129	1.13	147	5	23.3
6	2.01 <0.2	80.1	157	0.77	121	6	22.8

	9	2.18 <0.2	50.7	96	0.84	232	8	23
	11	1.13 <0.2	35.4	40	0.51	278	7	15.1
	11	1.38 <0.2	42.2	97	0.61	26	3	24.7
	8	2.71 <0.2	33.3	37	0.73	1060	4	18.1
	9	1.49 <0.2	49.3	57	0.66	1860	2	16.5
	6	2.15 <0.2	55	98	0.97	7440	3	12.8
	8	1.21 <0.2	32.3	212	0.54	99 <2		20.5
	9	1.18 <0.2	30	190	0.55	78 <2		21
	7	1.37 <0.2	45.8	67	0.56	1010 <2		18
	10	1.38 <0.2	46.9	103	0.63	901	2	18.2
	2	2.09	38.8	26	0.84	286	1620	7.4
<1		0.32 <0.2	1.8 <10		0.15	40	39	1
<1		8.37 <0.2	33.1	61	2.84	41	5	1.1
	4	1.11 <0.2	62	185	0.49	130	3	20.7
	9	1.42 <0.2	53.1	77	0.62	361 <2		18.9
<1		0.3 <0.2	1 <10		0.13	22	2	1.1
	9	1.02 <0.2	44.2	61	0.47	73	9	20.9
	9	1.16 <0.2	34.1	39	0.52	60	63	19.8
	4	1.08 <0.2	48.7	45	0.45	243	1240	12.1
<1		0.14 <0.2	4.9 <10		0.07	27	10	2.5
	10	1.45 <0.2	39	219	0.64	40	4	31.2
	9	1.21 <0.2	45.9	89	0.62	21	3	26.7
<1		0.28 <0.2	10.8	14	0.09	23	3	1.6
	6	1.36 <0.2	65.4	328	0.51	42	5	23.8
	5	1.08 <0.2	43.3	61	0.49	83 <2		18.1
<1		0.34 <0.2	2.5 <10		0.11	31 <2		0.5
	7	3.71 <0.2	106	182	1.04	50 <2		26.1
	12	1.65 <0.2	47.4	52	0.7	585 <2		20.4
	2	1.7 <0.2	50.7	30	0.74	150	1520	8.2
	3	0.91 <0.2	35.5	56	0.4	127	3	15.7
	8	1.49 <0.2	48.5	47	0.66	81 <2		21.5
	3	1.86 <0.2	36.8	32	0.71	648	55	11.6
	3	1.33 <0.2	43.8	31	0.53	2310	8	11.3
	3	2.94 <0.2	55.9	43	1.18	817	1170	10.9
	7	1.09 <0.2	114	294	0.58	39	10	27.9
	8	1.32 <0.2	36.1	530	0.65	32	5	29.9
	4	0.75 <0.2	35.4	31	0.4	265	386	13.1
	7	1.19 <0.2	61.5	57	0.57	2430 <2		20.5
	7	1.61 <0.2	55.9	55	0.64	232 <2		19.8
	3	1.25 <0.2	36.2	32	0.49	189	1120	9.9
	5	0.78 <0.2	56.2	32	0.47	76	23	18.4
	12	1.43 <0.2	40.7	50	0.69	108	25	24.4
	8	1.23 <0.2	80.5	141	0.65	39	2	23.3
	3	1.58 <0.2	42.9	33	0.57	177	1480	8.9
	9	1.4 <0.2	57.7	197	0.68	31	4	27.9
	10	1.68 <0.2	46.2	164	0.7	41	4	25.2
	9	1.27 <0.2	35.5	276	0.55	29	3	26.9

6	1.35	<0.2	50.7	58	0.63	295	<2	23.2
6	1.25	<0.2	61.2	222	0.58	45	<2	24.5
4	1.25	<0.2	54.1	119	0.56	1540	<2	17.9
2	0.73	<0.2	29	24	0.28	202	185	6
2	1.55	<0.2	35.9	28	0.49	267	1170	6.3
<1	0.18	<0.2	1.7	<10	0.12	180	21	1.3
6	1.1	<0.2	39.7	70	0.46	61	<2	18.9
8	1.38	<0.2	48.3	128	0.52	90	<2	19.8
5	1.7	<0.2	47	205	0.6	52	5	19.5
3	1.43	<0.2	42.1	44	0.53	341	36	11.6
2	0.8	<0.2	26.9	26	0.39	133	1490	6.4
<1	0.2	<0.2	1.5	<10	0.07	37	7	0.8
6	1.29	<0.2	25.2	106	0.63	38	11	23.5
4	1.3	<0.2	31	73	0.53	174	<2	14.5
4	0.99	<0.2	57.8	118	0.54	185	<2	16.9
4	6.08	<0.2	53.3	60	1.48	223	1090	14.3
4	1.19	<0.2	57	124	0.54	211	3	16.1
9	1.19	<0.2	87.3	86	0.62	66	3	22.4
3	1.46	<0.2	50.6	33	0.5	332	73	12.7
4	0.96	<0.2	44.1	43	0.46	217	187	15.8
8	1.51	<0.2	74.4	196	0.67	18	7	28.2
9	1.34	0.2	39.9	49	0.56	26	6	22.3
7	1.23	<0.2	43.4	51	0.49	873	<2	17.4
<1	0.26	<0.2	9.9	30	0.1	37	<2	3.1
7	1.05	<0.2	27.3	215	0.49	505	<2	23.4
4	1.69	<0.2	36.6	46	0.52	1800	<2	13.2
3	1.63	<0.2	51.7	45	0.56	1670	<2	12.9
<1	0.18	<0.2	5	<10	0.08	20	<2	2.2
3	1.95	<0.2	48.3	37	0.57	284	16	9.5
7	1.05	<0.2	39	128	0.51	95	<2	22.5
6	1.89	<0.2	54.1	50	0.72	1950	<2	13.7
4	1.14	<0.2	61.7	138	0.52	329	<2	16.4
<1	0.27	<0.2	8.5	19	0.13	17	<2	1.6
6	1.16	<0.2	38.9	118	0.55	177	<2	21.1
6	1.38	<0.2	37.1	76	0.58	378	<2	20.8
7	1.4	<0.2	78.4	145	0.59	143	<2	20.8
5	1.54	<0.2	49.8	45	0.58	679	<2	16.6
1	0.2	<0.2	10	14	0.1	66	3	5.3
2	1.78	<0.2	43.1	39	0.63	249	135	7.7
3	0.9	<0.2	40.1	44	0.42	447	4	10.4
1	0.85	<0.2	21.5	25	0.32	2300	<2	5.8
3	1.14	<0.2	39.2	32	0.38	225	25	10.2
<1	0.09	<0.2	3.2	<10	<0.05	18	44	7.2
6	1.58	<0.2	46.9	37	0.55	161	<2	17.9
8	1.26	<0.2	40	32	0.52	1390	<2	12.4
4	1	<0.2	28.4	29	0.38	1480	<2	9.3
3	1.02	<0.2	34.8	30	0.4	227	752	10

<1	0.22 <0.2	1.2 <10		0.12 <10		8	0.9
4	1.02 <0.2	46.4	73	0.44	173 <2		15.8
4	1.09 <0.2	50.8	76	0.47	547 <2		16.2
4	1.53 <0.2	51.2	49	0.58	1510 <2		16.3
1	0.48 <0.2	36.1	79	0.21	15	5	5
10	1.51 <0.2	41.3	205	0.64	63	3	21.9

Nd ppm	Ni ppm	Pb ppm	Pr ppm	Rb ppm	Re ppm	Sb ppm	Sc ppm	Se ppm
70.4	10	17	19.1	251	<0.02	0.5	21	<5
50.2	11	21	13.7	218	<0.02	0.5	20	<5
53.1	6	24	14.9	220	<0.02	0.5	20	<5
53.1	19	25	13.4	230	<0.02	0.6	16	<5
51.7	27	23	12.5	176	<0.02	0.9	16	<5
51.2	23	29	13.5	191	<0.02	0.5	17	9
45.4	16	22	11.7	197	<0.02	0.4	15	<5
84.3	27	67	18.4	128	<0.02	1.6	17	12
54.6	13	19	13.7	187	<0.02	0.4	19	<5
64.9	30	28	16.6	171	<0.02	0.8	19	<5
65.4	16	34	16.7	177	<0.02	1.5	18	<5
56.8	29	34	14.3	177	<0.02	1.4	18	<5
78.3	22	50	18.4	207	<0.02	2.4	18	<5
82.1	58	62	23.7	93.1	<0.02	1.9	11	10
35.3	10	31	9.96	189	<0.02	1.2	17	<5
44.7	7	28	12	196	<0.02	1.5	18	<5
47.9	19	36	13	188	<0.02	0.8	17	<5
53.9	39	48	14.6	167	<0.02	0.9	21	9
61	67	53	15.9	160	<0.02	1.2	23	7
90.7	116	58	23.5	168	<0.02	1.9	23	<5
76.1	88	43	18.7	155	<0.02	1.5	20	<5
66.4	75	40	16.5	172	<0.02	1.5	20	<5
43.9	21	56	12.1	98.3	<0.02	0.7	20	<5
43.1	14	37	11.6	95.8	<0.02	0.5	15	<5
39.3	11	16	10.4	94.8	<0.02	0.4	11	<5
40.8	21	22	10.7	115	<0.02	0.6	13	<5
44.7	30	35	11.7	133	<0.02	1	15	<5
44.4	23	30	12.1	145	<0.02	0.4	17	<5
62.1	23	34	15.4	155	<0.02	0.5	16	<5
60.5	39	40	15	147	<0.02	1	17	7
61.1	35	39	15.5	159	<0.02	0.5	19	<5
40.8	8	54	11.4	177	<0.02	2.3	16	<5
41.5 <5		30	11.2	144	<0.02	1.6	13	<5
62.1	18	52	16.4	193	<0.02	3.4	19	<5
61.8	37	29	16.6	169	<0.02	1.5	20	<5
46.3	130	56	12.4	39.1	<0.02	1.9	19	<5
46.1	57	37	12.5	104	<0.02	1	19	<5
34.7	93	32	9.05	86.2	<0.02	0.8	18	<5
34.2	38	25	8.98	128	<0.02	0.5	19	<5
28.2	32	25	7.87	141	<0.02	0.4	19	<5

32.6	18	15	8.49	92.3	<0.02	0.2	14	<5
32.6	9	17	8.63	100	<0.02	0.3	16	<5
49.2	110	23	12.6	169	<0.02	0.5	20	<5
47.6	22	22	12.2	169	<0.02	0.5	20	<5
65.7	28	28	16.7	199	<0.02	0.4	17	<5
44.8	7	58	11.8	203	<0.02	1.9	18	<5
50.2	12	22	12.7	175	<0.02	0.5	18	<5
39.5	<5	30	10.1	122	<0.02	0.8	12	<5
37.5	28	38	9.65	174	<0.02	1.5	19	<5
50.5	18	56	12	153	0.04	7.2	16	<5
31.3	18	30	8.17	208	<0.02	2.3	21	<5
47.3	15	23	12.2	210	<0.02	1.3	17	<5
45.3	40	35	11.9	197	<0.02	2.1	17	<5
37.8	35	30	9.47	120	<0.02	1	15	<5
43.8	24	38	11.3	69.7	<0.02	1.4	20	<5
63.9	<5	29	17.4	62.7	<0.02	1.6	18	<5
38.1	<5	27	10.3	69.1	<0.02	1	19	<5
34.7	26	52	9.7	81.3	<0.02	1.2	13	<5
28.8	32	36	7.8	68.8	<0.02	0.7	18	<5
46.5	38	44	12.2	61.6	<0.02	1	30	<5
73.6	36	72	18.9	89.7	<0.02	1.3	28	<5
58.4	<5	42	14.2	138	<0.02	2.7	11	8
44.9	<5	20	11.4	152	<0.02	0.5	6	<5
46	14	17	11.7	147	<0.02	0.5	8	<5
41.9	9	17	10.4	131	<0.02	0.4	8	<5
41.4	<5	18	10.5	161	<0.02	0.4	10	<5
42.1	16	20	10.8	175	<0.02	0.3	10	<5
42.3	9	18	10.7	190	<0.02	0.3	11	<5
27.7	<5	28	7.47	102	<0.02	0.5	9	10
36.6	8	23	10	167	<0.02	0.5	15	9
41.4	12	25	11	179	<0.02	0.7	16	<5
56.5	22	24	14.7	170	<0.02	0.7	17	<5
58.7	6	25	14.8	158	<0.02	0.7	17	<5
22	15	28	5.51	87.1	<0.02	0.7	<5	<5
48.9	25	38	12.3	127	0.02	0.7	22	8
103	48	37	25.4	92.8	<0.02	0.7	28	8
39.7	15	12	10.5	93.4	0.03	0.4	19	<5
22.8	16	13	6.32	104	<0.02	0.7	20	<5
19.5	16	10	5.21	80.6	<0.02	0.5	17	<5
28.4	18	12	7.44	86.3	<0.02	0.7	17	<5
37.1	32	19	9.15	90.2	<0.02	1.6	19	<5
56.2	20	23	15.2	161	<0.02	1.3	24	<5
47.5	13	27	13.5	174	<0.02	1	21	<5
41.3	7	55	11.6	165	<0.02	3.8	20	6
32.3	12	16	8.77	109	<0.02	0.3	17	<5

32.5	24.4	17	8.99	132 <0.02	0.4	19.2 <5	
28.5	18	18	7.97	146 <0.02	0.5	20 <5	
31.1	25	21	8.45	139 <0.02	0.7	20 <5	
30.1	40	24	8.04	72.1 <0.02	0.8	16 <5	
32	51	23	8.62	107 <0.02	1	19 <5	
50.4	29	46	12.8	136 <0.02	1.2	27 <5	
35.9	40	56	9.76	90.9 <0.02	1.2	27 <5	
39.2 <5		17	9.93	125 <0.02	0.3	15 <5	
49.1	91	62	14	128 <0.02	2.2	17 <5	
51.3	13	34	13.2	176 <0.02	1.4	24 <5	
25.4 <5		25	6.58	117 <0.02	1.6	17 <5	
31.2	27	22	8	89.1 <0.02	1	18 <5	
25.6 <5		23	6.68	116 <0.02	1.5	18 <5	
36.9	8	24	9.45	98.3 <0.02	0.7	19 <5	
43.5	19	19	11	163 <0.02	0.6	21 <5	
47	13	18	11.8	157 <0.02	0.6	21 <5	
53.6	34	20	13.4	171 <0.02	0.5	23 <5	
31.3	9	18	8.39	116 <0.02	0.6	18 <5	
33.5	58	26	8.41	172 <0.02	1.4	19 <5	
41.8	32	33	10	143 <0.02	0.6	17 <5	
35.4	30	36	9.36	181 <0.02	1.6	20 <5	
35.6	46	40	9.51	165 <0.02	1.7	20 <5	
41.3	14	32	10.8	167 <0.02	1.7	20 <5	
36.5 <5		33	9.56	187 <0.02	1.5	20 <5	
42.1 <5		23	11.2	139 <0.02	1.4	17 <5	
33.3	18	19	8.23	101 <0.02	0.7	14 <5	
21.7	7	14	6.11	199 <0.02	0.2	20 <5	
38 <5		20	9.89	135 <0.02	0.4	17 <5	
35.5	64	21	8.84	103 <0.02	1.4	12 <5	
47	23	31	11.5	136 <0.02	0.8	23 <5	
47.2	23	27	11.8	147 <0.02	0.6	22 <5	
32.8 <5		24	8.26	87.5 <0.02	1	20 <5	
28.6	10	21	7.25	117 <0.02	0.8	26 <5	
29.2	30	25	7.65	120 <0.02	0.8	26 <5	
31.7	23	36	8.25	123 <0.02	0.9	19 <5	
33.7 <5		17	8.9	112 <0.02	0.3	18 <5	
47.7 <5		21	11.9	120 <0.02	0.4	21 <5	
90.5	38	40	21	155 <0.02	2.9	37	7
72.1	30	38	17.2	155 <0.02	2.5	35	6
50.7	26	36	14.7	109 <0.02	1.4	18 <5	
40.6	9	45	10.8	141 <0.02	1.1	28	8
34 <5		18	8.79	157 <0.02	0.7	22 <5	
51.2	19	23	13.6	191 <0.02	0.3	20 <5	
50.4	52	33	13.1	182 <0.02	0.8	20 <5	
58.3	42	23	14.7	175 <0.02	0.6	20 <5	
18.2	14	33	5.68	224 <0.02	1.9	16 <5	
36.1	10	36	10.8	221 <0.02	1.8	16 <5	

47.1	32	25	11.3	115 <0.02	2.9	15 <5
19.8 <5		31	5.1	139 <0.02	3.3	12 <5
40.3	16	46	10.4	208 <0.02	2.4	18 <5
34.8	5	30	8.84	200 <0.02	1.7	19 <5
64.7	24	31	15.9	118 <0.02	1.1	20 <5
31.5	17	42	8.58	141 <0.02	0.9	21 <5
37.8	11	19	9.6	133 <0.02	0.8	18 <5
50.2	5	15	12.8	116 <0.02	0.4	16 <5
55.2	19	18	13.9	123 <0.02	0.4	17 <5
44.1	15	56	10.3	113 <0.02	5.8	14 <5
65.3	85	20	16.2	141 <0.02	0.7	21 <5
47.1	26	16	11.9	101 <0.02	0.8	16 <5
34.4	20	39	9.18	116 <0.02	3.6	16 <5
32.4	23	28	8.53	152 <0.02	1.7	19 <5
65.4	20	35	16.4	175 <0.02	1.7	22 <5
33.9	5	24	9.15	186 <0.02	1.1	21 <5
31.8	33	25	8.44	104 <0.02	1.4	17 <5
18.3	15	17	4.98	173 <0.02	0.9	21 <5
27.7	19	23	8.49	173 <0.02	0.9	19 <5
41.8	59	20	9.94	162 <0.02	0.7	17 <5
46.5	5	37	12.4	96.3 <0.02	1.3	12 <5
93.2	11	43	23.5	171 <0.02	1.9	24 <5
38	11	47	10.1	120 <0.02	1.6	19 <5
34.8	10	50	9.22	118 <0.02	2.3	20 <5
44.3	11	44	12.1	132 <0.02	1.6	22 <5
58.8	18	35	15.5	147 <0.02	1.5	21 <5
42.4	7	25	12.4	136 <0.02	0.5	18 <5
35.9 <5		18	10.3	133 <0.02	0.4	17 <5
44.2	12	19	11.2	119 <0.02	0.5	16 <5
40.8	20	56	10.8	108 <0.02	2.1	25 <5
27.2	49	46	7.99	78.7 <0.02	1.4	20 <5
46.7	15	48	13.7	103 <0.02	0.7	20 <5
42.1	13	32	12	129 <0.02	0.8	20 <5
40.7 <5		18	11	112 <0.02	0.5	18 <5
47.1 <5		19	11.9	139 <0.02	0.5	22 <5
46.4 <5		20	11.9	128 <0.02	0.5	22 <5
46.7 <5		44	12.1	125 <0.02	2	17 <5
55.7	7	20	13.7	128 <0.02	0.4	17 <5
44.4	18	23	11.5	168 <0.02	0.3	22 <5
51.9	20	30	12.9	181 <0.02	0.5	24 <5
39.9	53	22	10.1	137 <0.02	0.1	18 <5
141	96	27	33.8	214 <0.02	0.9	22 <5
37	27	22	10.2	163 <0.02	0.5	23 <5
28.7	27	39	7.33	149 <0.02	0.5	24 <5
48.5	85	20	12.8	168 <0.02	0.4	24 <5
44.6	50	37	11.8	122 <0.02	0.6	28 <5
68.3	11	23	17	110 <0.02	<0.1	20 <5

39	71	23	9.37	135 <0.02	0.6	19 <5	
34.8	34	21	9.74	132 <0.02	0.4	18 <5	
53.7	41	31	14.6	99 <0.02	0.2	26 <5	
95.2	50	64	25.3	93.4 <0.02	1.3	40	11
52	27	54	15.5	134 <0.02	0.1	24 <5	
41.2	53	22	10.3	200 <0.02	0.2	23 <5	
47.5	147	54	12.1	180 <0.02	0.9	21 <5	
29.9	206	31	7.76	153 <0.02	0.8	21 <5	
45.8	72	16	11.3	149 <0.02	0.1	22 <5	
33.3	35	10	8.67	157 <0.02	0.3	21 <5	
36.8	40	14	9.14	137 <0.02	<0.1	20 <5	
25.6	29	22	6.59	164 <0.02	0.5	26 <5	
41	46	23	10.1	94.6 <0.02	0.5	16 <5	
37.2	49	32	12.9	123 <0.02	0.7	17 <5	
34.3	52	39	9.31	165 <0.02	2	23 <5	
46.9	67	36	12.2	81.5 <0.02	0.3	26 <5	
35.8	37	20	10.7	96.4 <0.02	0.5	20 <5	
47.7 <5		6	11.6	28.8 <0.02	<0.1	10 <5	
28.1	34	23	7.63	147 <0.02	0.5	18 <5	
30.5	67	126	8.22	70.3 <0.02	1.9	25	5
22.1	26	13	5.92	109 <0.02	0.2	18 <5	
34	11	26	9.38	147 <0.02	0.6	20 <5	
20	66	46	5.75	81.9 <0.02	1.6	12	9
36.2	32	26	9.75	129 <0.02	0.5	18 <5	
51.9	56	35	14.5	173 <0.02	0.8	30 <5	
68.5	31	86	21.9	62.1 <0.02	0.8	33	13
56.6	16	53	16.1	69.3 <0.02	0.9	21	13
48.6	16	18	12.8	159 <0.02	0.5	19 <5	
40.2	13	21	11.5	154 <0.02	0.7	19 <5	
25.4	14	12	7.3	129 <0.02	0.5	13 <5	
51.6	51	18	13.9	153 <0.02	0.6	16 <5	
39.7	14	16	10.7	132 <0.02	0.6	15 <5	
31.8	15	22	9.37	187 <0.02	0.7	18 <5	
36.2	25	25	9.71	138 <0.02	0.6	16	6
78.1	75	36	19.6	123 <0.02	0.8	22 <5	
42.7	105	50	10.7	95.6 <0.02	0.8	20 <5	
51.8	39	32	12.6	171 <0.02	0.4	18 <5	
45.8	28	36	12.4	192 <0.02	0.5	23 <5	
18.4	27	26	5.08	193 <0.02	0.6	20 <5	
42.8	32	26	11.1	157 <0.02	0.6	20 <5	
37.8 <5		10	9.95	149 <0.02	0.5	15 <5	
35.6	33	38	9.52	170 <0.02	0.7	18 <5	
17.7	40	33	4.82	109 <0.02	0.4	26 <5	
53.9	13	62	14.6	121 <0.02	2.5	41	16
21.7	37	45	5.9	112 <0.02	1.6	27 <5	
39.8	17	16	10.7	188 <0.02	0.8	20 <5	
71.2	22	118	24.5	28.3 <0.02	0.3	13 <5	

8.7	11	55	2.12	18.2 <0.02	5.7	24 <5
13.7	39	41	4.94	7.3 <0.02	0.5	15 <5
33.4	13	29	9.04	123 <0.02	0.5	14 <5
29.7	54	28	7.84	118 <0.02	0.7	22 <5
37.1	35	35	8.93	3.5 <0.02	0.5	28 <5
46.3	21	22	11.7	3.8 <0.02	0.5	25 <5
49	30	36	10.8	3.8 <0.02	0.4	33 <5
6.2	24	34	1.6	3.3 <0.02	0.6	31 <5
31.9	16	20	8.96	101 <0.02	0.5	18 <5
50	5	47	14	22.2 <0.02	1.6	20 <5
25.4	6	19	6.96	39.3 <0.02	0.6	15 <5
62.9	41	25	15.3	7.2 <0.02	0.7	14 <5
52.2	39	24	13.2	7 <0.02	0.9	18 <5
17.2	12	15	4.67	137 <0.02	0.6	22 <5
19.5	10	20	5.19	140 <0.02	0.6	29 <5
26.5 <5		16	6.46	74.5 <0.02	0.3	22 <5
30.4	13	14	7.97	95.2 <0.02	0.2	14 <5
29.7	13	16	7.74	111 <0.02	0.4	17 <5
45.4	15	20	11.9	145 <0.02	0.4	19 <5
49.8	14	16	12.2	114 <0.02	0.4	17 <5
36.9	18	16	9.82	131 <0.02	0.8	18 <5
24.7	11	14	6.92	125 <0.02	0.7	17 <5
27.2	25	19	7.81	139 <0.02	0.9	19 <5
76.9	15	27	19.5	152 <0.02	0.6	23 <5
23.5	14	19	6.24	137 <0.02	0.8	23 <5
26.6	15	15	6.96	149 <0.02	1	22 <5
29.7	20	15	8.02	176 <0.02	0.7	23 <5
38.1	16	14	9.75	111 <0.02	0.5	17 <5
33.1	18	14	8.3	95.4 <0.02	0.4	15 <5
38.6	34	18	9.75	116 <0.02	0.7	18 <5
40.1	17	17	10	116 <0.02	0.5	18 <5
37.4	22	15	9.44	111 <0.02	0.6	16 <5
42.4	23	18	10.7	138 <0.02	0.8	19 <5
43.6	56	21	11.3	154 <0.02	0.4	20 <5
50.1	42	22	12.9	167 <0.02	0.6	22 <5
55.8	55	22	14	169 <0.02	0.3	23 <5
52.5	51	23	13.1	165 <0.02	0.4	22 <5
55.5	62	22	13.8	160 <0.02	0.5	22 <5
44.3	56	19	11.2	160 <0.02	0.5	23 <5
42	44	23	10.6	174 <0.02	0.5	24 <5
41	50	22	10.8	181 <0.02	0.8	24 <5
135	27	88	39.2	146 <0.02	1.7	35 <5
34.9	64	27	9	135 <0.02	0.6	25 <5
41.5	45	17	10.5	150 <0.02	1.1	25 <5
40.4	49	23	10.6	147 <0.02	1.3	23 <5
37	33	31	9.39	127 <0.02	0.9	26 <5
45.1	36	32	12.8	147 <0.02	2	26 <5

74.1	27	39	18.8	139 <0.02	3.1	28 <5
68.1	21	29	16.8	162 <0.02	2	23 <5
53.9	17	30	13.1	162 <0.02	2.5	21 <5
56.1	18	30	14.1	141 <0.02	1.8	21 <5
43.8	13	41	11.9	141 <0.02	1.8	24 <5
35.3	36	22	9.98	152 <0.02	0.9	25 <5
36.9	6	20	10.1	148 <0.02	1.2	24 <5
31.2 <5		13	8.52	117 <0.02	0.4	16 <5
34.2	12	16	9.16	140 <0.02	0.4	20 <5
34.7	23	15	9.28	125 <0.02	0.3	18 <5
35.2	23	14	9.42	122 <0.02	0.3	18 <5
42.3	19	16	11	121 <0.02	0.4	18 <5
41.6	15	18	10.8	117 <0.02	0.4	18 <5
42.5	13	18	10.9	121 <0.02	1.6	19 <5
46.1	12	17	11.9	106 <0.02	0.5	17 <5
44	15	14	11.3	117 <0.02	0.4	17 <5
40	10	19	10.6	118 <0.02	0.6	18 <5
44.8	10	21	11.9	136 <0.02	0.5	19 <5
39.2	9	14	10.7	122 <0.02	0.7	18 <5
37.8	22	14	10.3	119 <0.02	0.4	18 <5
36	9	12	10	123 <0.02	0.4	18 <5
37.2	12	16	9.63	117 <0.02	0.7	17 <5
37.2	38	22	9.87	134 <0.02	0.4	21 <5
42.7	52	21	10.9	131 <0.02	0.3	21 <5
42.3	38	16	10.8	131 <0.02	0.5	21 <5
45.3	35	19	11.5	131 <0.02	0.4	21 <5
47.1	44	18	11.9	130 <0.02	0.4	21 <5
48.5	33	23	12.5	133 <0.02	0.4	22 <5
37.5	37	26	9.58	113 <0.02	0.4	24 <5
37.2	36	13	9.71	97.5 <0.02	0.4	17 <5
28.7	14	12	7.58	80.9 <0.02	0.4	14 <5
32.9	20	22	8.96	102 <0.02	0.5	18 <5
42.1	33	30	11.8	117 <0.02	1.3	25 <5
36.6	49	64	10.1	79.1 <0.02	1.7	55 <5
43.2	17	30	11.9	150 <0.02	0.4	24 <5
37.5	12	18	10.1	133 <0.02	0.5	19 <5
40.9	14	26	11.2	150 <0.02	0.5	20 <5
48.5	16	30	12.9	146 <0.02	0.8	24 <5
43.3	10	21	11.1	141 <0.02	1.6	22 <5
42.7	24	18	11.1	132 <0.02	0.4	20 <5
44.6	48	19	11.4	140 <0.02	0.3	20 <5
42.6	40	19	10.9	116 <0.02	0.3	17 <5
49.8	26	19	12.5	127 <0.02	0.4	18 <5
44	26	18	10.9	120 <0.02	0.4	19 <5
43.1	25	27	11.1	128 <0.02	0.7	19 <5
41.3	24	21	10.6	133 <0.02	0.5	18 <5
44	36	26	11.3	154 <0.02	0.6	21 <5

38.6 <5		12	9.96	95 <0.02	0.3	14 <5
42.1 <5		14	11	111 <0.02	0.4	15 <5
82.4	11	60	21.6	88.8 <0.02	1.4	18
43.8	16	30	11.7	149 <0.02	0.3	21 <5
38.5	18	28	10.4	141 <0.02	0.3	20 <5
42.8	13	21	11.4	149 <0.02	0.5	19 <5
44	13	24	11.8	173 <0.02	0.5	21 <5
45.8	17	23	12.6	176 <0.02	0.5	22 <5
85.1	49	33	21.2	170 <0.02	0.5	24 <5
55.3	16	22	14.2	129 <0.02	0.5	19 <5
44.2	22	25	11.6	134 <0.02	0.6	21 <5
37.8	32	19	9.95	125 <0.02	0.5	21 <5
32.9	23	18	8.7	139 <0.02	0.4	22 <5
30	32	18	8.05	106 <0.02	0.8	18 <5
41.4	15	15	10.4	97.5 <0.02	0.4	12 <5
27.6	30	22	7.17	105 <0.02	0.4	14 <5
33.7	67	32	9.15	151 <0.02	2.5	18 <5
34.6	7	20	9.01	100 <0.02	1.1	15 <5
35.9	5	23	9.49	111 <0.02	0.8	14 <5
28 <5		19	7.92	129 <0.02	0.6	15 <5
30.4 <5		18	8.43	133 <0.02	0.5	17 <5
61.4	17	29	15.4	95.4 <0.02	0.2	17 <5
33.8	6	26	9.15	142 <0.02	0.5	19 <5
91.2	6	26	21.4	149 <0.02	0.4	19 <5
39.8	28	15	10.4	188 <0.02	0.3	19 <5
46.2	8	21	11.9	137 <0.02	0.5	18 <5
52.6	10	23	13.1	145 <0.02	0.5	18 <5
50.3	8	26	12.6	154 <0.02	0.5	19 <5
36.5	12	21	9.69	150 <0.02	0.5	18 <5
40.5 <5		27	10.5	92.3 <0.02	1.8	13 <5
22.9 <5		23	6.48	104 <0.02	1.1	12 <5
31.9 <5		25	8.4	95.6 <0.02	1.1	12 <5
31 <5		19	8.17	114 <0.02	0.8	12 <5
35.1 <5		16	9.19	114 <0.02	0.8	13 <5
46.8	7	43	12.6	66.5 <0.02	1.1	15 <5
69.6	13	50	18	69.5 <0.02	1.3	16 <5
50.3	12	37	13.8	75.4 <0.02	1.1	17 <5
24.4 <5		109	6.91	90.3 <0.02	3.2	11
29.1 <5		33	8.02	101 <0.02	1.4	16 <5
32.3	7	31	8.97	112 <0.02	1	15 <5
31.2	7	24	8.75	89 <0.02	0.7	10 <5
38.1 <5		22	10.4	124 <0.02	0.7	13 <5
32.3 <5		15	8.89	116 <0.02	0.5	14 <5
32.7 <5		16	8.51	101 <0.02	0.4	16 <5
62.4 <5		27	16.4	111 <0.02	0.5	14 <5
35 <5		52	9.25	131 <0.02	0.7	13 <5
33.8 <5		39	8.85	91.5 <0.02	1.5	17 <5

34	28	38	9.21	139 <0.02	0.6	19 <5
31.6	8	17	8.47	112 <0.02	0.6	21 <5
40.8	14	22	11.4	87.9 <0.02	0.5	21 <5
34.4	32	17	9.1	106 <0.02	0.4	18 <5
29.5	14	19	8.11	113 <0.02	0.6	23 <5
24.5	6	25	7.02	97.3 <0.02	1	18 <5
38.4	12	25	10	103 <0.02	0.9	19 <5
27.1 <5		29	7.35	105 <0.02	1	18 <5
26.3	7	15	6.98	83.2 <0.02	0.5	15 <5
30.1	7	14	7.57	80.2 <0.02	0.5	16 <5
33	14	17	8.48	85.3 <0.02	0.5	18 <5
36.2	20	18	9.49	96 <0.02	0.5	18 <5
21.5	9	16	5.69	83.6 <0.02	0.5	14 <5
20.8	24	19	5.66	87.5 <0.02	0.5	16 <5
25.1	16	22	6.54	111 <0.02	0.5	20 <5
90.4	42	26	23.1	132 <0.02	0.5	25 <5
63.4	30	25	16.2	138 <0.02	0.7	21 <5
47.8	52	27	12.3	117 <0.02	0.4	21 <5
42.6	44	24	11.2	120 <0.02	0.6	21 <5
31.4	15	19	8.17	64.3 <0.02	0.8	10 <5
23.1	9	15	6.34	79.5 <0.02	0.6	12 <5
51.5	34	24	13.1	113 <0.02	0.6	21 <5
24.4	10	17	6.77	34.3 <0.02	0.6	10 <5
21.7	23	12	5.55	31.7 <0.02	0.4	8 <5
24.5 <5		12	6.68	20.8 <0.02	0.4	7 <5
41.5	30	23	10.8	136 <0.02	0.5	21 <5
39.3 <5		29	10.1	109 <0.02	1	17 <5
31.6 <5		28	8.65	106 <0.02	0.9	15 <5
31.4 <5		50	8.28	74.8 <0.02	1.6	12 <5
31.4 <5		22	8.55	145 <0.02	0.6	21 <5
48.2	35	20	12.6	106 <0.02	0.7	17 <5
40.3 <5		28	10.1	95.1 <0.02	1.2	16 <5
29 <5		12	7.8	51.6 <0.02	0.6	10 <5
33.6 <5		13	8.65	57.3 <0.02	0.4	8 <5
41.2	14	27	10.9	180 <0.02	0.5	20 <5
40.9	18	26	10.8	184 <0.02	0.4	21 <5
42.4	21	25	11.5	198 <0.02	1.1	19 <5
31.4	7	23	8.72	191 <0.02	0.9	20 <5
29.2	31	23	7.59	188 <0.02	1	21 <5
63.4	88	23	15	177 <0.02	1.2	21 <5
32.5	30	34	8.51	194 <0.02	1.4	20 <5
39.1	29	25	10	185 <0.02	0.7	19 <5
34.9 <5		30	9.15	142 <0.02	0.8	18 <5
35.7 <5		24	9.1	134 <0.02	1.1	17 <5
30 <5		24	8.17	150 <0.02	0.8	19 <5
42.2 <5		27	11.3	122 <0.02	1	13 <5
42.1	34	27	11.6	122 <0.02	0.5	17 <5

46	47	25	12.2	123 <0.02	0.2	18 <5	
51.9	53	29	13.6	131 <0.02	0.5	16 <5	
32.5	99	20	8.27	89.7 <0.02	0.3	14 <5	
51.9	46	28	13.6	131 <0.02	0.4	18 <5	
37.8	31	29	10.3	139 <0.02	0.4	16 <5	
28.9 <5		16	7.8	106 <0.02		8 <5	
44.3	9	21	11.7	104 <0.02	0.3	10 <5	
48.8	76	40	12.6	193 <0.02	1.7	19 <5	
37.5	10	29	10.1	128 <0.02	0.8	15 <5	
33.9	15	19	9.18	116 <0.02	0.4	16 <5	
35.2	16	16	9.31	118 <0.02	0.4	14 <5	
40.5 <5		26	11.3	178 <0.02		16 <5	
59.5 <5		25	15.9	163 <0.02	0.2	12 <5	
39.6 <5		29	10.5	157 <0.02	0.3	13 <5	
39.8	26	18	10.7	118 <0.02	0.4	11 <5	
65.4	51	27	16.3	168 <0.02	1.3	18 <5	
48.2	41	16	12.6	154 <0.02	0.1	19 <5	
51	30	26	13.2	170 <0.02	0.3	19 <5	
42.1	32	25	11	167 <0.02	0.5	20 <5	
44.9	40	30	11.8	189 <0.02	1.3	18 <5	
41.8	29	28	11.2	175 <0.02	1.6	18 <5	
41.7	37	22	11.3	105 <0.02	0.6	17 <5	
42.7	18	24	11.4	161 <0.02	0.7	20 <5	
35.5	9	22	9.88	180 <0.02	0.8	22 <5	
18.1	23	33	5.25	188 <0.02	1.1	26	9
103	32	51	26.7	86.9 <0.02	1.4	22	16
156	25	140	55.7	47.6 <0.02	2.3	12	45
60.3	18	45	17.3	112 <0.02	1	22	6
39.5	21	50	10.8	227 <0.02	1.6	18 <5	
47.4	35	36	12.7	204 <0.02	1.7	18 <5	
47.5	88	47	12.3	168 <0.02	1.9	21 <5	
41.1	102	62	10.4	156 <0.02	1.7	20 <5	
66.5	45	24	16.6	182 <0.02	0.8	23 <5	
62.2	32	25	15.8	183 <0.02	0.7	25 <5	
61.8	31	24	15.6	179 <0.02	0.6	23 <5	
69.1	46	33	17.1	183 <0.02	0.6	24 <5	
68.7	50	30	16.7	190 <0.02	0.4	24 <5	
49.1	41	36	14	166 <0.02	0.3	24 <5	
42.1	27	27	11.4	194 <0.02	0.5	23 <5	
47.1	53	33	12.4	169 <0.02	0.4	22 <5	
57.4	50	28	14.7	189 <0.02	0.6	21 <5	
35.8 <5		32	9.6	110 <0.02	2	12 <5	
30	84	28	8.28	183 <0.02	1.9	23 <5	
101	73	95	27.2	84.2 <0.02	0.6	34 <5	
35.3	55	49	11.9	115 <0.02	1.1	19 <5	
30.5	26	26	9.13	104 <0.02	0.5	18 <5	
3.5	33	28	0.89	4.3 <0.02	0.2 <5		16

12.7	76	27	2.81	19 <0.02	1	7 <5	
46.4	21	22	12.3	111 <0.02	0.4	16 <5	
45	19	24	11.6	78 <0.02	0.4	12 <5	
41.2	81	26	10.6	73.5 <0.02	0.5	11 <5	
19.9	46	11	5.15	0.5 <0.02	1.4 <5	<5	
40.2	44	25	11.2	132 <0.02	0.5	20 <5	
49.6	35	16	13.2	122 <0.02	0.4	19 <5	
47.3	52	33	12.6	157 <0.02	0.5	20 <5	
22.4	21	10	5.54	3 <0.02	0.4 <5	<5	
47.6	43	28	13.4	119 <0.02	0.7	20 <5	
49.3	26	24	13.4	104 <0.02	0.6	17 <5	
31.9	18	24	8.66	76.9 <0.02	0.5	10 <5	
38.4	34	12	10.9	246 <0.02	0.8	22 <5	
34.5	25	15	9.38	88.5 <0.02	0.6	13 <5	
35.8	42	16	9.63	153 <0.02	0.6	17 <5	
1.9	47	8	0.54	10.2 <0.02	5.6 <5	<5	
49.4	28	39	13.4	67.5 <0.02	0.9	23 <5	
243	113	14	63.6	234 <0.02	0.7	22 <5	
33	58	20	9.84	178 <0.02	1.8	21 <5	
61.4	86	22	17.5	184 <0.02	1.1	21 <5	
35.6	35	18	9.48	116 <0.02	0.5	17 <5	
3.5	24	8	1.03	16.6 <0.02	1.6 <5	<5	
19.3	39	34	5.8	132 <0.02	1.1	22 <5	
143	74	27	38.7	200 <0.02	1.1	20 <5	
38.4	36	10	10.9	249 <0.02	0.4	15 <5	
37.1	23	17	10.3	204 <0.02	0.5	19 <5	
2.4	8	6	0.59	8.3 <0.02	0.3 <5	<5	
35.2	200	31	9.24	163 <0.02	3.9	17	21
1.3	37	10	0.32	4.1 <0.02	1.7 <5	<5	
25.9	46	25	7.33	181 <0.02	0.9	21 <5	
58.9	49	23	16	185 <0.02	1.1	22 <5	
61.5	221	29	12.9	135 0.76	9.6	17	79
5.7	8	13	1.62	17.8 <0.02	0.4 <5	<5	
32	44	25	8.53	172 <0.02	0.9	18 <5	
13.6	368	65	4.04	127 0.85	24.1	14	120
2.5	71	15	0.67	14.9 <0.02	14.4	5 <5	
18.4	19	22	5.14	78.9 <0.02	1.1	11 <5	
31.5	20	16	8.47	65.8 <0.02	0.9	14 <5	
30.6	31	21	8.37	107 <0.02	0.9	14 <5	
30.6	326	54	8.07	134 0.72	26.3	15	121
44.8	29	24	12	129 <0.02	0.9	16 <5	
29.8	47	27	8.83	155 <0.02	0.7	20 <5	
3.5	8	10	0.8	13.7 <0.02	0.1 <5	<5	
39.8	31	33	10.9	147 <0.02	<0.1	18 <5	
41.5	12	21	11.5	99.9 <0.02	0.3	15 <5	
37.9	30	29	10.3	157 <0.02	0.4	19 <5	
30.6	235	51	8.53	153 0.26	0.5	18	97

47	79	43	13.9	139 <0.02		0.4	20 <5	
46.7	521	124	12	134	0.8 <0.1		18	158
4.7	44	49	1.27	28.7	0.15 <0.1		5	7
20.3	61	31	5.43	19.5	0.02	1.5	14 <5	
2.6	44	135	0.7	21.2 <0.02		11.7	6 <5	
38.5	40	10	10.3	188 <0.02		0.4	21 <5	
97.2	32	18	25	201 <0.02		0.4	22 <5	
88.3	116	45	21.6	184	0.02	2.4	21 <5	
12.3	11	9	2.84	13.1	0.02	2.3 <5	<5	
43.6	48	28	11.7	191 <0.02		0.5	21 <5	
8	24	10	2.21	23.5 <0.02		0.7 <5	<5	
35.8	40	17	9.7	183	0.02	0.6	18 <5	
37.4	24	12	9.81	74.5 <0.02		0.6	12 <5	
21.7	371	26	5.39	139	0.47	29.5	16	156
4.4	35	16	1.22	30.8 <0.02		1.8 <5	<5	
34.1	35	19	8.96	174	0.02	2	15 <5	
13.8 <5		18	3.27	29.9 <0.02		0.3	9 <5	
52	46	23	14.2	223 <0.02		1.1	20 <5	
53.2	47	44	14.7	202 <0.02		0.9	19 <5	
55.6	37	27	15	191 <0.02		0.9	19 <5	
50.7	27	19	13.5	225 <0.02		0.7	19 <5	
33.3	34	27	9.58	202 <0.02		0.9	21 <5	
35.8	28	18	10.1	207 <0.02		0.6	20 <5	
67.7	29	34	17.6	151 <0.02		1.1	18 <5	
59.5	31	22	15.6	111 <0.02		0.7	14 <5	
49.4	28	23	13.3	105	0.07	0.7	14 <5	
20.9 <5		13	5.27	54.2 <0.02		0.4	14 <5	
48.7	36	22	13	242 <0.02		1	19 <5	
43.9	40	26	11.8	232 <0.02		1	19 <5	
38.5	56	33	10.1	196 <0.02		1.3	19 <5	
38.8	62	34	10.1	198 <0.02		1.4	19 <5	
32.2	30	19	9.07	104 <0.02		0.6	10 <5	
17.4	135	818	4.44	77.9 <0.02		6.7	5 <5	
33.1	27	18	9.57	198 <0.02		1.1	16 <5	
34.3	40	27	9.5	197 <0.02		1.5	16 <5	
38.5	69	45	10.4	90.2 <0.02		1.5	14 <5	
54.6	32	24	15.2	171 <0.02		0.8	18 <5	
52.1	38	23	14.5	164 <0.02		0.7	19 <5	
47.5	33	9	12.5	76.1 <0.02		0.3	13 <5	
47.5	97	18	13.6	118 <0.02		0.5	20 <5	
50.5	28	16	14.4	116 <0.02		0.5	18 <5	
22.3	76	13	6.19	142 <0.02		0.4	18 <5	
27.7	20	18	7.54	137 <0.02		0.4	17 <5	
27.6	22	42	7.72	142 <0.02		0.6	19 <5	
21	13	41	5.46	43.1 <0.02		0.3	5 <5	
19.3	13	13	5.16	47.3 <0.02		0.3 <5	<5	
25.2	14	16	6.71	57.7 <0.02		0.4	7 <5	

40.5	45	19	10.9	89.6 <0.02	0.4	19 <5	
29.3	24	19	8.13	128 <0.02	0.9	18 <5	
28.4	21	21	7.85	66.5 <0.02	0.4	13 <5	
87.5	38	26	23.1	119 <0.02	0.6	17 <5	
30	42	29	8.61	87.9 <0.02	0.4	17 <5	
56.5	138	26	12.3	129 <0.02	0.7	18 <5	
29.8	21	20	8.46	113 <0.02	0.4	18 <5	
27.2	74	27	6.76	39.4 <0.02	0.6	18 <5	
25.7	35	12	6.9	105 <0.02	0.3	13 <5	
21.6	27	16	6.42	181 <0.02	0.6	23 <5	
21.6	23	25	5.84	112 <0.02	4.4	11 <5	
49.4	61	19	13.2	144 <0.02	0.4	21 <5	
45.8	85	23	12.4	116 <0.02	0.7	26 <5	
16.2	28	14	4.61	59.7 <0.02	0.6	15 <5	
11.7	32	96	3.19	44 <0.02	3.4	12 <5	
48.4	66	34	11.8	78.5 <0.02	5.7	12	14
27	54	23	7.21	100 <0.02	4.2	13 <5	
26.6	46	16	7.1	112 <0.02	2.4	14 <5	
46.8	44	15	12.5	103 <0.02	1.8	16 <5	
45.2	67	24	11	121 <0.02	4.7	15	9
25.7	50	20	6.85	120 <0.02	3.2	14 <5	
43	44	18	11.7	124 <0.02	2.6	14 <5	
24.7	60	18	6.6	116 <0.02	2.3	14 <5	
40.7	58	13	10.6	150 <0.02	0.8	17 <5	
49.2	59	9	11.8	114 <0.02	0.7	15	7
28	43	5	7.49	85.1 <0.02	0.4	13 <5	
34.6	41	8	8.94	99.9 <0.02	1	18 <5	
33.1	60	7	8.68	115 <0.02	0.5	16 <5	
19.1	91	20	5.48	40.7 <0.02	0.6	17 <5	
28.4	36	26	8.34	110 <0.02	0.4	20 <5	
32.2	60	28	9.16	136 <0.02	0.6	24 <5	
39.3	103	47	11.8	132 <0.02	0.7	23 <5	
35.3	46	26	9.23	113 <0.02	0.9	20 <5	
26	55	18	6.97	130 <0.02	1.1	18 <5	
22	48	27	6.09	121 <0.02	1.5	19 <5	
26.6	56	45	7.3	144 <0.02	1.7	16 <5	
30.3	43	9	7.39	135 <0.02	1.2	16 <5	
60.8	55	12	17	165 <0.02	1.6	18 <5	
25	60	10	6.39	138 <0.02	1.4	19 <5	
33.4	56	15	8.46	166 <0.02	2.3	19 <5	
38.4	63	11	10.3	174 <0.02	1.7	20 <5	
31.3	58	10	7.99	158 <0.02	2.9	19 <5	
29.5	44	15	7.75	154 <0.02	4.9	17 <5	
63	44	12	20.6	142 <0.02	3.1	15 <5	
23	44	8	5.95	90.7 <0.02	1.3	11 <5	
21.1	54	6	5.6	155 <0.02	1.4	15 <5	
46.1	63	12	12.7	164 <0.02	1.9	18 <5	

36.1	69	42	9.16	162 <0.02	1.7	18	12
37.4	47	10	9.9	166 <0.02	1.7	19 <5	
70.7	18	5	17.9	60.8 <0.02	0.6	14 <5	
19.8	56	9	5.22	112 <0.02	1.5	20 <5	
24.4	80	16	6.56	114 <0.02	1.9	19 <5	
28.2	47	59	6.84	109 <0.02	2.6	14 <5	
46.6	38	50	18.2	170 <0.02	8.8	19 <5	
22.4	51	27	6.84	197 <0.02	0.8	23 <5	
25.6	49	8	6.67	142 <0.02	0.8	17 <5	
25.5	36	10	6.75	96.9 <0.02	0.7	13 <5	
32.4	31	6	8.45	92 <0.02	0.3	16 <5	
17.7	49	37	5.19	184 <0.02	0.6	20 <5	
31.3	47	21	9.38	176 <0.02	1.1	19 <5	
21.4	54	20	5.46	136 <0.02	0.8	14 <5	
38.3	49	69	10.3	220 <0.02	0.7	18 <5	
47	34	27	12.5	143 <0.02	0.5	14 <5	
44	87	78	11.4	103 <0.02	1.8	13 <5	
49.4	48	31	12.7	129 <0.02	0.9	15 <5	
96	46	33	18.9	122 <0.02	1.1	17 <5	
38.4	261	166	10.5	88 <0.02	5.8	12	7
46.4	81	35	12.6	187 <0.02	1.3	16 <5	
46	50	18	12.2	185 <0.02	0.4	16 <5	
48.1	49	13	13.1	157 <0.02	0.4	16 <5	
55.4	69	13	14.6	200 <0.02	0.3	18 <5	
59.6	29	11	15.9	171 <0.02	0.6	15 <5	
44	56	27	12.2	284 <0.02	1.1	19 <5	
44.5	38	34	12.2	292 <0.02	0.6	21 <5	
50.1	36	22	13.3	301 <0.02	0.6	22 <5	
33.5	36	24	9.53	256 <0.02	0.9	21 <5	
62	37	24	16.4	193 <0.02	1	17 <5	
49.4	30	21	12	109 <0.02	1.2	19 <5	
51.6	64	28	11.9	78.9 <0.02	2.9	16 <5	
41.8	39	18	10.6	148 <0.02	0.7	17 <5	
40	51	28	10.5	161 <0.02	1	15 <5	
53.4	23	15	14.1	137 <0.02	0.2	17 <5	
93.3	22	20	25.4	154 <0.02	0.2	15 <5	
50.2	36	13	13.2	140 <0.02	0.2	14 <5	
42.1	20	12	11.1	104 <0.02	0.1	15 <5	
47.5	49	13	12.7	164 <0.02	0.4	16 <5	
33.7	33	12	8.55	94.6 <0.02	0.2	18 <5	
29.3	76	32	7.3	23.7 0.02	1.3 <5		10
28	6	81	6.86	91.8 <0.02	2.1	13	6
39.5	107	78	11	191 <0.02	2.5	21 <5	
36.6	142	45	10.6	168 <0.02	2.3	19 <5	
49.1	122	31	13.7	197 <0.02	1.4	22 <5	
84.4	117	31	20.8	196 <0.02	1.4	22 <5	
79.1	116	30	20.8	179 <0.02	1.2	20 <5	

48.8	128	20	12.3	132 <0.02		1	17 <5	
49	55	12	10.1	75.3 <0.02		0.7	10 <5	
35.1	32	18	9.12	124 <0.02		0.6	15 <5	
33.3	18	32	7.75	109 <0.02		0.6	15	11
41	36	10	10.9	99.9 <0.02		0.6	17 <5	
49.1	85	9	12.4	92.9 <0.02		0.7	32 <5	
29	61	9	7.37	192 <0.02		0.5	20 <5	
26	51	8	6.88	195 <0.02		0.6	19 <5	
40.5	45	11	10.5	123 <0.02		0.6	17 <5	
41.5	49	11	10.6	128 <0.02		0.6	15 <5	
39.9	627	37	9.6	94.2	1.25 <0.1		13	41
1.5	7	44	0.47	15.1	0.04	3.1 <5	<5	
48.1	63	10	11.5	15.3	0.15	0.4	8	29
44.5	61	26	13.6	151 <0.02		0.7	23 <5	
43.8	25	19	12.2	123 <0.02		0.6	14	5
1.1	14	10	0.26	3.6 <0.02		0.2 <5	<5	
27.7	53	21	8.45	122 <0.02		1	14 <5	
26.8	54	14	7.55	115 <0.02		0.9	13 <5	
35.4	393	53	9.12	124	0.42	36.9	14	11
3.2	98	19	0.84	25.9	0.03	6.8	14 <5	
47.4	93	25	11.2	26.5 <0.02		1.8	23 <5	
31.3	37	47	8.58	69.9 <0.02		1.3	25 <5	
25.8	36	19	5.4	6.7 <0.02		0.6	10 <5	
68	73	37	17.2	90 <0.02		0.8	25 <5	
32.2	29	19	8.71	177 <0.02		0.5	24 <5	
3.5	65	13	0.9	1.4 <0.02		1.6 <5	<5	
97.8	84	34	24	167 <0.02		0.7	26	15
40.5	33	24	10.7	92.6 <0.02		0.5	16 <5	
34.1	561	22	9.03	101	0.57	52.4	14	19
21.4	42	24	6.41	171 <0.02		1.2	18 <5	
35.9	54	24	10.5	134 <0.02		0.8	17	5
36.2	182	26	9.08	115	0.17	7.5	19	6
47.6	94	33	12	57.1 <0.02		0.8	16 <5	
63.7	371	22	14.7	114	0.54	39	18	15
119	123	61	33.5	53.8 <0.02		1.5	33 <5	
19.1	128	54	5.97	75.6 <0.02		1.4	23 <5	
24.4	137	23	6.7	154	0.12	11.8	14 <5	
44.4	29	16	13.1	182 <0.02		0.6	18 <5	
52.5	33	16	13.9	151 <0.02		0.6	16	6
37	357	21	8.47	130	0.85	39.1	14	13
30.2	104	70	9.2	185	0.05	4	19	5
32.9	63	34	9.01	105 <0.02		3.1	15	6
50.5	43	29	14.8	143 <0.02		1.2	20 <5	
47.7	643	43	11.5	94.3	0.99	42.1	12	28
47.6	80	45	12.8	50.5 <0.02		2.2	24 <5	
31.4	40	31	8.97	59.2 <0.02		0.9	21	7
25.5	39	31	7	52.4 <0.02		0.8	22 <5	

37.5	43	29	10.9	71.6	<0.02	0.8	23	<5
44.5	70	35	12.8	146	<0.02	0.8	23	<5
39	47	32	11.3	160	<0.02	0.4	25	<5
23.8	284	19	5.91	92.4	0.58	14.8	10	185
39.5	454	16	9.21	94.3	0.74	23.3	13	56
1.9	7	<5	0.54	5.3	0.02	1.6	<5	<5
35.7	45	20	9.5	109	<0.02	0.9	19	<5
47.3	38	14	12.5	114	<0.02	1.2	19	6
54.1	64	24	13.3	158	<0.02	1.9	26	<5
49.4	132	31	12.1	154	0.23	6.8	19	16
21.6	804	23	5.26	76.7	0.78	52.8	10	110
1.8	<5	<5	0.46	9.8	<0.02	0.8	<5	<5
13.9	95	34	4.18	83.7	<0.02	1.3	18	12
24.7	42	25	6.84	143	<0.02	1.6	17	<5
42.5	36	22	12.2	167	<0.02	0.8	20	<5
124	385	30	22.4	132	0.36	21.6	18	51
48.3	47	35	13.2	168	<0.02	1.5	20	5
63.5	42	25	18.5	132	<0.02	0.9	16	<5
45.5	250	183	11.8	113	0.1	25.1	17	56
32.8	202	40	8.77	155	0.27	11.1	15	76
40.9	136	41	12.4	54	<0.02	1.6	32	<5
33.4	75	32	8.94	79.1	<0.02	1.1	16	<5
40.3	43	22	10.6	119	<0.02	0.7	15	<5
8.9	31	8	2.41	27.8	<0.02	1.4	6	<5
19.5	32	22	5.71	117	<0.02	1.1	24	<5
50.4	30	8	11.6	129	<0.02	0.4	19	5
52	83	39	13.2	134	<0.02	1.7	18	9
4.4	6 <5		1.12	16.2	<0.02	0.2 <5	<5	
51.2	250	20	12.5	130	0.28	3	16	83
32.6	40	13	9.18	215	<0.02	0.8	22	<5
55.8	29	13	14.5	88	<0.02	0.8	17	<5
49.7	41	9	14.1	180	<0.02	0.6	19	<5
7.9	27	11	2.1	11.5	<0.02	0.7 <5	<5	
35.1	47	11	9.61	182	<0.02	1	21	<5
38.1	49	16	9.78	180	<0.02	0.9	20	<5
54.1	52	23	15.4	182	<0.02	1.2	20	<5
49.2	48	15	12.7	170	<0.02	1	18	<5
7	12 <5		2.03	43.2	<0.02	1.2	6	<5
39	385	48	9.5	116	0.49	12.8	15	233
33	51	35	8.86	180	<0.02	3	19	<5
21.7	23	11	5.4	54.9	<0.02	0.8	8	<5
38.4	187	25	9.83	134	0.15	5.2	15	11
2.2	27 <5		0.65	20.4	0.27	1.8 <5		7
57	35	19	13.8	179	<0.02	1.3	17	<5
34	37	20	9.52	74.2	<0.02	0.8	15	<5
28.2	14	8	7.22	57.2	<0.02	0.4	12	<5
31.2	368	17	7.96	128	0.73	24	14	125

1.6 <5	<5		0.35	7.1 <0.02	3.1 <5	<5	
39.6	37	21	11.1	168 <0.02	1.2	19 <5	
38.1	44	20	10.9	165 <0.02	1.3	17 <5	
48.7	89	25	12.9	132 <0.02	3.1	19	6
35.7	40	12	9.5	28.6 <0.02	0.5	10 <5	
34.9	73	75	9.58	139 <0.02	2.5	15 <5	

Sm ppm	Sn ppm	Sr ppm	Ta ppm	Tb ppm	Te ppm	Th ppm	Tl ppm	Tm ppm
12.2	1	105	2.1	1.38	0.6	23	1.3	0.59
8.9	2	86	2.2	1.09	<0.5	23	1.1	0.63
9.7	4	88.2	2	1.18	<0.5	20.6	1.1	0.62
9.5	2	120	1.6	1.1	<0.5	17.3	1.4	0.48
9.5	3	114	1.5	1.13	<0.5	14.8	1.1	0.55
8.9	6	134	3.7	1.11	<0.5	21.3	0.9	0.73
8	2	83.7	2	0.95	<0.5	15.6	1	0.57
22.6	6	1460	2.8	2.84	<0.5	30.5	1.4	0.76
9.7	3	96	2.2	1.21	<0.5	22	1.1	0.62
11.8	4	100	2.2	1.58	<0.5	22.2	1.1	0.77
11.8	5	108	2	1.64	<0.5	19	1.3	0.78
11.2	5	118	2	1.36	<0.5	18.5	1.3	0.63
17.1	5	547	1.9	1.61	<0.5	22.1	1.7	0.65
16.3	10	2610	4.5	1.53	<0.5	36	5.2	0.66
5.4	7	230	2.1	0.75	<0.5	16.2	5	0.43
6.9	7	133	2	0.96	<0.5	16.5	1.9	0.52
7.6	6	182	2.1	1.05	<0.5	18.1	2.1	0.54
9.9	6	199	2.1	1.18	<0.5	19.8	1.2	0.63
11.6	6	246	2.1	1.25	<0.5	23.4	1.6	0.65
13.2	6	259	2.2	1.37	<0.5	24.8	1.4	0.76
14	6	290	2.2	1.35	1	20.3	1.1	0.75
13.3	6	297	2.1	1.78	<0.5	19.6	1.2	0.78
7.7	8	152	2.5	0.91	<0.5	22.2	1.3	0.6
7.4	6	124	2.2	0.91	0.7	16.6	1	0.6
6.8	4	87.5	2.1	1.08	<0.5	12.6	0.6	0.66
7	5	104	2.2	1.05	<0.5	14.6	0.9	0.68
7.2	5	123	2.2	1.01	<0.5	15	1.2	0.61
7.7	6	148	2.1	1.04	<0.5	15.5	1	0.56
11.9	5	142	1.7	1.4	<0.5	18.1	1.5	0.65
11.2	5	126	1.8	1.37	<0.5	17.6	1.5	0.66
11.4	5	125	1.5	1.37	<0.5	16.6	1.1	0.61
6.4	6	831	1.8	0.61	<0.5	15	2.2	0.41
7	5	757	1.8	0.75	<0.5	15.3	1.6	0.48
9.8	6	1440	1.7	0.58	<0.5	20.1	2	0.41
10.2	5	1180	1.4	0.74	<0.5	19	1.6	0.4
7.9	9	103	3.7	1.25	<0.5	27	0.7	0.78
8.1	6	125	2.5	0.9	<0.5	22	1	0.53
6.6	7	84.8	2.5	0.95	<0.5	24.1	0.8	0.56
6.2	4	86.4	1.9	0.9	<0.5	15.7	0.9	0.55
4.8	4	85.2	1.5	0.59	<0.5	14	0.9	0.41

5.9	3	62.4	1.4	0.81	<0.5	14.3	0.6	0.5
5.8	4	73	1.4	0.77	<0.5	14.3	0.6	0.47
9	5	90.9	1.4	1.1	<0.5	15.4	1	0.6
8.7	4	93.2	1.3	1.27	<0.5	14	0.9	0.59
12.4	7	102	2.2	1.52	<0.5	20.5	1.3	0.71
7.7	4	117	1.2	0.82	<0.5	14.9	1.7	0.48
9.5	4	106	1.4	1.19	<0.5	14.2	1	0.57
7.4	3	76.9	1.2	1.04	<0.5	10.7	0.9	0.53
6.7	4	120	1.2	0.75	<0.5	15.6	2.4	0.43
10.2	4	263	1.3	0.82	<0.5	12.1	6.3	0.39
5.7	5	78.7	1.4	0.84	<0.5	12.8	2.4	0.48
8.9	5	134	1.6	1.11	<0.5	19.4	1.7	0.55
8.3	5	228	1.4	1.15	<0.5	20.4	1.5	0.52
7.1	11	139	1.4	0.96	<0.5	16.1	1.1	0.52
7.7	5	132	2.1	0.98	<0.5	17.1	1	0.56
11.3	4	271	2.1	1.1	<0.5	21.1	0.6	0.55
6.3	4	101	2.1	0.9	<0.5	23.5	0.9	0.59
5.7	13	159	2.6	0.97	<0.5	26.2	0.8	0.59
5.5	8	185	2.8	0.87	<0.5	30.3	<0.5	0.56
9.7	10	666	3.5	1.1	<0.5	41.9	<0.5	0.67
13.4	8	1040	3.1	1.21	<0.5	43.1	0.8	0.68
11.7	4	121	0.9	1.79	<0.5	14.9	1	1
8.6	4	112	1.4	1.07	<0.5	15.2	1.1	0.64
8.9	4	110	1.4	1.25	<0.5	14.8	1.1	0.66
8.4	4	110	1.3	1.16	<0.5	13.5	0.9	0.61
8.2	5	133	1.3	1.09	<0.5	13.4	1	0.57
8.5	5	145	1.4	1.07	<0.5	14.4	1.2	0.52
8.1	4	141	1.3	1.06	<0.5	14.3	1.2	0.46
5.1	3	109	1.1	0.59	<0.5	12	3.5	0.36
6.2	5	83.9	2	0.76	<0.5	14.3	1.7	0.47
6.6	6	107	1.8	0.83	<0.5	15.3	1.5	0.49
10.3	5	91	1.9	1.31	<0.5	16.8	1	0.63
11.6	6	85.7	1.9	1.49	<0.5	17.3	1.1	0.7
4	3	57.2	0.6	0.42	<0.5	5	0.7	0.24
7.3	7	320	1.8	0.89	<0.5	19.5	0.8	0.62
21.7	6	101	1.7	2.13	<0.5	21.6	0.6	0.67
7.3	5	53.5	1.3	0.94	<0.5	15.8	0.6	0.53
4.2	6	55.1	1.4	0.8	<0.5	18.2	0.8	0.52
3.7	5	47.3	1.3	0.64	<0.5	14.8	0.6	0.51
5.3	6	61.5	1.7	0.85	<0.5	15.9	0.6	0.6
8.3	5	61.1	1.3	1.2	<0.5	13	1.2	0.48
8	6	1120	1.2	0.44	<0.5	22	1.3	0.37
7.6	7	728	1.4	0.55	<0.5	19.2	1.6	0.42
6	7	820	1.6	0.53	<0.5	15.1	2	0.4
5.9	5	68.6	1.4	0.81	<0.5	14.6	0.8	0.56

5.4	5	87.1	1.4	0.72 <0.5		14.2	0.9	0.47
4.6	6	87.6	1.5	0.68 <0.5		13.7	0.9	0.47
5.3	6	89.6	1.5	0.75 <0.5		14.1	0.9	0.51
6	8	69.7	2.4	0.86 <0.5		25.8	0.7	0.56
5.7	8	86.3	2.2	0.83 <0.5		21.4	0.9	0.52
10	7	83.9	2.7	1.03 <0.5		22.1	1.1	0.56
6.6	9	81.4	4.1	1.13 <0.5		28.1	0.6	0.79
7.4	10	46.2	2.5	1.04 <0.5		16.7	0.7	0.62
7.8	9	132	3.7	1 <0.5		31.2	2.1	0.58
8.4	6	177	2	0.79 <0.5		19	1.1	0.42
5.1	6	69.2	2	0.85 <0.5		14.4	0.7	0.52
6.3	5	66.8	1.8	0.98 <0.5		17.1 <0.5		0.58
5.3	6	77.7	1.9	0.86 <0.5		14.2	0.6	0.49
7	5	96.1	1.8	1 <0.5		16.3	0.6	0.53
8.5	5	253	1.6	0.91 <0.5		14.8	0.9	0.57
8.9	5	254	1.5	0.92 <0.5		15.7	0.8	0.57
9.1	5	251	1.9	1.04 <0.5		18.3	0.9	0.66
5.4	5	68.3	1.9	0.74	0.8	17.3	0.6	0.55
6.6	4	210	1.1	0.78 <0.5		12.1	0.9	0.4
8	4	387	1.2	1.15 <0.5		14	0.7	0.58
6	5	259	1.7	0.64 <0.5		13.7	1.8	0.38
6.6	5	77.9	1.6	0.75 <0.5		13.5	1.1	0.42
7.4	5	81.1	1.6	0.83 <0.5		14.9	1	0.49
5.6	5	202	1.7	0.69 <0.5		16.6	5.5	0.46
6.4	5	201	1.6	0.75	1.1	13.8	1.2	0.45
6	4	122	1.2	0.84 <0.5		10.9	0.7	0.46
3.5	4	85.4	1.1	0.43 <0.5		11.2	0.9	0.29
7.5	6	70	1.7	1.01 <0.5		16.2	0.8	0.55
7.2	4	109	1.4	1.06 <0.5		10.6	1.3	0.56
9.2	5	117	1.6	1.09 <0.5		14.7	0.8	0.56
9	5	112	1.6	1.13	0.7	14.8	0.9	0.6
6.2	6	99.5	2	0.98 <0.5		14.9	0.7	0.6
5.3	7	106	1.8	0.78 <0.5		16.5	0.8	0.5
5.5	2	107	1.7	0.8 <0.5		15.6	0.9	0.5
5.7	6	82.5	1.7	0.81 <0.5		16.8	1	0.47
6.3	5	79.4	1.7	0.9	0.7	15.2	0.6	0.53
8.8	5	86.5	1.7	1.13 <0.5		15.5	0.6	0.61
16.3	7	1120	1.7	1.07	1.1	17.8	1.1	0.53
13.2	6	1280	1.5	0.86 <0.5		20.1	1.1	0.43
7.7	8	417	2.8	1.04 <0.5		16.8	0.6	0.67
6.6	7	186	2	0.76 <0.5		30.4	0.7	0.43
6.2	6	101	1.7	0.8 <0.5		12.8	0.9	0.47
9	6	116	1.7	1.05 <0.5		18.5	1.1	0.56
9	6	110	1.7	1.07 <0.5		18.4	1	0.59
11	7	97.2	1.8	1.3 <0.5		18.3	1	0.66
2.9	5	205	1.5	0.43 <0.5		8.5	3.9	0.35
5.2	5	323	1.6	0.53 <0.5		10.6	2.9	0.33

9.9	6	294	1.1	1.3 <0.5		15.7	1.6	0.51
3.7	5	142	1.5	0.5 <0.5		12.9	5	0.36
7.7	6	72.2	1.6	0.99	0.7	10.2	6	0.47
6.8	6	57.1	1.7	0.92 <0.5		9.8	1.5	0.46
11.7	6	705	2	1.29 <0.5		16.7	0.7	0.73
5.5	7	113	1.8	0.87 <0.5		14.9	0.9	0.52
6.9	5	160	1.7	1.01 <0.5		15	0.8	0.59
9.6	6	67.1	1.7	1.28 <0.5		16.6	0.6	0.65
10.3	5	78.4	1.6	1.36 <0.5		15.6	0.7	0.7
9	4	63.1	1.4	0.99 <0.5		11.1	1.2	0.45
12.7	7	90.8	1.5	1.39 <0.5		15.7	0.8	0.66
8.6	4	73.2	1.4	1.06 <0.5		12.3	0.5	0.55
5.9	4	98.5	1.5	0.8 <0.5		13.5	1.1	0.46
6.4	5	89.9	1.4	0.81 <0.5		14.8	1.1	0.44
10.3	5	233	1.4	0.96 <0.5		18.2	1.1	0.49
6.2	7	109	1.5	0.77	0.7	16.9	1.2	0.44
5.3	6	140	1.7	0.67 <0.5		15.3	1.2	0.44
3.1	5	80.4	1.6	0.52 <0.5		14.4	1.1	0.4
4.4	5	144	1.5	0.54 <0.5		14.3	1.2	0.38
9.4	4	74.4	1.2	1.28 <0.5		11.4	0.9	0.53
8.7	4	69.6	1.6	1.06 <0.5		13.1	1.2	0.53
17.5	6	892	1.9	1.46 <0.5		20.4	1.6	0.63
7.2	7	96	2.4	1.09 <0.5		18.3	2	0.64
6.3	6	84.9	2.3	1.01 <0.5		16.4	1.7	0.6
7.1	4	155	2.3	0.99 <0.5		19.7	1.4	0.59
9.5	5	347	2.1	0.88 <0.5		20	1.2	0.55
7.4	4	243	1.8	0.93 <0.5		16	0.8	0.56
5.7	2	161	1.7	0.84 <0.5		15.3	0.8	0.53
7.8	3	114	1.6	1.07 <0.5		15.3	0.8	0.58
7.5	10	80.9	4.6	1.11 <0.5		29.2	1	0.78
4.5	8	93.9	3.4	0.75 <0.5		25.8	0.6	0.53
6.1	9	169	2.9	0.79 <0.5		23.3	0.7	0.59
7.5	8	124	2.4	1	0.8	17.1	0.8	0.62
7.2	3	76.6	1.8	1 <0.5		16.4	0.6	0.55
8	4	93.4	1.9	1.06 <0.5		17.2	0.7	0.62
8.4	3	92.3	1.7	1.05 <0.5		16	0.7	0.58
8.1	3	106	1.5	1.03 <0.5		13.9	1.8	0.55
10.4	5	111	1.7	1.24 <0.5		16.8	0.8	0.66
8.8	5	76.8	1.6	1.17	0.5	16.7	0.9	0.58
9.1	5	82.8	1.3	1 <0.5		17.4	1.1	0.48
8.4	5	128	1.2	1.14 <0.5		12.8	0.9	0.56
20.3	5	292	1.2	2.55 <0.5		15.4	1.3	1.08
6.6	5	115	1.4	0.88 <0.5		15.9	0.9	0.54
6.6	6	115	1.7	0.92 <0.5		18.7	0.9	0.58
9.1	6	69.3	1.7	1.22 <0.5		18	1.4	0.67
8.3	6	119	2	1.18 <0.5		21.8	0.9	0.67
13.4	5	67.3	1.4	1.86 <0.5		14.3	0.7	0.79

7.8	4	99.3	1.1	1.07 <0.5		12.3	1	0.53
6.2	5	90.8	1.5	0.91 <0.5		15.7	0.9	0.58
9.1	11	129	3.6	1.53 <0.5		25.5	0.9	1.05
18.1	9	2540	3.9	2.01	0.8	39.9	1.2	0.89
8	7	211	1.9	0.99 <0.5		21.7	0.7	0.57
8.5	6	165	1.6	1.16 <0.5		17.4	1.1	0.55
8.6	5	283	1.4	1.1 <0.5		16.7	1.3	0.57
5.5	20	98.4	1.6	0.95 <0.5		14.2	1.4	0.54
9.1	11	183	1.2	1.2 <0.5		14.5	0.9	0.59
6.2	7	103	1.4	0.94 <0.5		12.6	1.1	0.56
7.4	5	66.5	1.2	0.94 <0.5		14.3	0.8	0.54
4.9	7	126	1.3	0.75 <0.5		18.7	1	0.45
8	10	586	1.2	1.01 <0.5		13.5	0.7	0.41
2.8	8	514	2	0.19 <0.5		22.3	0.9	0.34
5.7	7	249	1.1	0.67 <0.5		18.8	1.1	0.46
9.1	9	115	2.4	1.29 <0.5		26.5	0.6	0.66
6.9	7	93.2	1.6	0.94 <0.5		16.4	0.6	0.55
9.7	7	38.5	1.5	1.15 <0.5		10 <0.5		0.63
5	7	82.6	1.6	0.86	0.9	16	1.1	0.56
6	8	73.2	2.8	1.16 <0.5		26	1	0.82
3.7	6	69.8	1.5	0.7 <0.5		16.1	0.7	0.49
6.1	7	208	1.5	1.01 <0.5		15.7	1.3	0.55
3.2	6	70.8	1.4	0.44 <0.5		9.7	1.1	0.37
6.2	8	94.5	1.8	0.95 <0.5		16.4	0.8	0.61
9.2	7	105	1.8	1.14 <0.5		23.5	1.1	0.69
10.8	11	227	3.6	1.3 <0.5		40.2	0.6	0.75
10.9	10	53	3.5	1.72 <0.5		29.5 <0.5		1.03
8.3	6	85.5	1.4	0.94 <0.5		15.7	0.9	0.52
6.7	8	72.7	2.3	1 <0.5		15.8	0.9	0.67
4.5	5	58.3	1.3	0.61 <0.5		11.1	0.7	0.44
9.9	5	89.7	1.4	1.16 <0.5		13.1	0.8	0.55
6.9	5	95	1.4	0.88 <0.5		11.3	0.8	0.55
5	5	84.9	1.4	0.62 <0.5		14.4	1	0.47
6.2	6	61.8	1.7	0.89 <0.5		13.8	1.9	0.59
14.2	9	398	2.4	1.58 <0.5		33.9	0.8	0.83
10.6	10	152	2.8	1.7 <0.5		38.4	0.7	0.78
12.7	7	114	1.9	2.18 <0.5		17.4	1	0.74
8.3	7	128	1.8	1.44 <0.5		17.5	1.1	0.74
3	6	55.8	1.3	0.5 <0.5		13.7	1.1	0.38
7.4	5	68.9	1.4	1.02 <0.5		15.7	0.9	0.62
6.5	7	68.1	2	0.99 <0.5		13.3	0.7	0.68
6.2	6	109	1.4	0.85 <0.5		13.8	0.9	0.55
3.8	9	88.3	2.7	0.8	0.6	25.6	0.7	0.58
9.8	16	90.3	6.3	1.91 <0.5		56.8	0.8	1.45
5	7	174	2.1	0.95 <0.5		22.1	1	0.58
6.8	7	114	2	0.98 <0.5		15.4	1.2	0.66
9.8	10	133	2.2	0.86 <0.5		24.4 <0.5		0.47

2.6	11	34.6	3.1	0.88 <0.5	36.2 <0.5		0.6
2.1	9	49.1	2.3	0.52 <0.5	24.8 <0.5		0.53
5.5	5	124	1.4	0.89 <0.5	15.1	0.6	0.6
6.1	5	176	1.3	1.13 <0.5	12.3	0.8	0.61
9	7	10.2	2.3	1.45 <0.5	25.7 <0.5		0.66
9.3	6	23.7	2.2	1.32 <0.5	23.2 <0.5		0.65
13.2	8	13.1	2.3	1.31 <0.5	25.6 <0.5		0.42
1.8	8	15.4	2.5	0.76 <0.5	26.1 <0.5		0.54
5.5	3	51.2	1.3	0.81 <0.5	14.9	0.6	0.49
8	13	322	5.1	1.3 <0.5	34.6 <0.5		1.03
4.5	6	97.2	2.3	1.05 <0.5	18.5 <0.5		0.78
12.8	4	13.7	1.6	1.64 <0.5	16.7 <0.5		0.76
9.9	8	12.6	1.4	1.51 <0.5	15.4 <0.5		0.67
3.1	4	53.1	1.3	0.62 <0.5	14.6	0.8	0.44
3.9	4	51.7	1.6	0.78 <0.5	19.5	0.8	0.53
5.3	4	18.9	1.3	0.85 <0.5	14.1 <0.5		0.51
5.4	3	56.8	1.3	0.76 <0.5	12.2	0.6	0.5
5.4	3	61.2	1.2	0.82 <0.5	12.6	0.7	0.52
7.8	3	62.2	1.5	1.06 <0.5	14.9	0.9	0.61
10.2	3	54.4	1.3	1.14 <0.5	14.5	0.7	0.57
6.9	4	59.3	1.4	0.97 <0.5	15.1	0.8	0.58
4.3	4	57.7	1.4	0.74 <0.5	14.2	0.8	0.52
4.7	14	80	1.8	0.84 <0.5	19.4	1.5	0.63
15.4	4	67.1	1.5	1.74 <0.5	17	0.8	0.75
4.4	4	53.8	1.3	0.71 <0.5	15.2	1	0.46
5	4	56.2	1.5	0.71 <0.5	16.1	0.9	0.48
5.1	5	72.3	1.7	0.73 <0.5	15.4	1	0.51
7.5	3	65.4	1.4	1.07 <0.5	13.9	0.7	0.56
6.7	3	56.7	1.2	0.91 <0.5	12.2	0.6	0.48
7.4	4	80.1	1.3	1.04 <0.5	13.9	0.7	0.55
7.9	4	70.3	1.4	1.04 <0.5	14	0.8	0.56
7.4	3	62.2	1.3	1.04 <0.5	13.9	0.7	0.54
7.9	4	69.7	1.4	1.18 <0.5	14.3	0.9	0.57
7.8	4	92.5	1.5	0.95 <0.5	15.6	0.9	0.57
9.2	4	102	1.5	1.2 <0.5	16.1	1.1	0.62
10.4	4	100	1.5	1.32 <0.5	16.4	1	0.67
9.6	4	104	1.4	1.27 <0.5	15.8	1	0.63
10.8	4	110	1.4	1.45 <0.5	15.3	1	0.71
8.3	5	114	1.4	1.2 <0.5	15.9	1	0.64
7.9	5	122	1.4	1.12 <0.5	15.9	1	0.61
7.3	5	263	1.4	1.19 <0.5	16	1.3	0.61
16.6	6	6290	1.7	1.26 <0.5	23.7	1.6	0.5
6.2	5	80	1.3	0.8 <0.5	14.6	1	0.44
8.5	6	110	1.6	1.17 <0.5	17.8	1.1	0.55
7.5	6	67.8	1.7	1.06 <0.5	19.3	0.9	0.6
7.5	5	65.2	1.4	1.09 <0.5	16.3	0.8	0.59
7	7	327	1.8	0.86 <0.5	19.7	1.5	0.54

14.4	6	1050	1.6	1.46 <0.5	19.8	1.6	0.6
14	6	649	1.6	1.51 <0.5	17.9	1.8	0.64
12.2	6	458	1.6	1.42 <0.5	17.4	1.8	0.58
11.5	6	292	1.5	1.39 <0.5	16.7	1.5	0.57
8.1	5	216	1.5	0.84 <0.5	17.1	1.4	0.56
5.2	6	145	1.7	0.68 <0.5	18.5	1.2	0.51
5.9	7	139	1.7	0.74 <0.5	18	1.2	0.53
5.6	5	71.9	1.3	0.79 <0.5	14	0.7	0.5
6	5	125	1.4	0.86 <0.5	14.9	0.8	0.57
6.4	5	109	1.3	0.81 <0.5	13.8	0.7	0.56
6.3	5	108	1.4	0.9 <0.5	13.7	0.7	0.55
7.3	5	167	1.3	0.87 <0.5	13.6	0.7	0.55
7.9	4	72	1.3	1.08 <0.5	13.8	0.8	0.59
8.1	4	74.1	1.4	1.16 <0.5	14.6	0.8	0.65
8.6	5	74	1.3	1.25 <0.5	14.5	0.7	0.67
8	4	72.2	1.4	1.1 <0.5	14.3	0.8	0.58
7.4	5	72.2	1.3	0.98 <0.5	13.7	0.8	0.56
7.8	5	87.5	1.4	0.98 <0.5	15.5	0.9	0.56
6.8	5	76.4	1.3	0.85 <0.5	14.1	0.8	0.53
6.5	4	78.5	1.3	0.8 <0.5	13.8	0.9	0.5
5.8	5	78.9	1.4	0.75 <0.5	14.5	0.9	0.49
6.6	5	80.8	1.4	1.09 <0.5	13.7	0.9	0.51
6.9	5	92.5	1.3	0.98 <0.5	13.6	0.9	0.54
8.1	5	94.1	1.3	1.1 <0.5	13.5	0.8	0.55
8.1	5	95.3	1.3	1.08 <0.5	13.7	0.8	0.6
9	5	95.6	1.4	1.19 <0.5	14.4	0.9	0.64
9	5	90.2	1.3	1.29 <0.5	14	0.9	0.65
9.3	5	86	1.3	1.26 <0.5	13.4	0.9	0.56
7	5	84.7	1.5	0.97 <0.5	17	1	0.51
6.1	5	72.8	1.5	1.07 <0.5	13.6	0.7	0.59
5.2	4	70	1.3	0.81 <0.5	12.8	0.7	0.49
5.9	6	102	1.6	0.92 <0.5	17.1	0.9	0.53
6.3	7	244	2	0.72 <0.5	18.2	1.2	0.5
6.8	10	170	2.7	0.94 <0.5	63.3	0.9	0.61
7.7	7	158	1.6	0.81 <0.5	18.4	1.2	0.5
6.4	6	125	1.7	0.88 <0.5	16.1	1	0.54
7	7	132	2.1	0.96 <0.5	16.6	1.3	0.59
9.1	9	163	3	1.26 <0.5	22.7	1.5	0.79
8.7	5	110	1.4	1.36 <0.5	14.8	1	0.72
8.9	5	113	1.4	1.17 <0.5	14.7	0.9	0.66
8.7	5	114	1.4	1.2 <0.5	14.8	1	0.66
8.5	4	116	1.3	1.28 <0.5	13.4	0.7	0.71
10.5	5	124	1.5	1.6 <0.5	15	1	0.81
8.9	5	117	1.3	1.41 <0.5	13.8	1	0.79
9	4	119	1.3	1.47 <0.5	13.8	1	0.77
8	5	106	1.4	1.18 <0.5	14	0.9	0.66
8.2	5	101	1.3	1.32 <0.5	14.8	1	0.69

7.1	4	54.1	1.1	1.09 <0.5		12.2	0.6	0.6
8.1	4	57.5	1.3	1.13 <0.5		14.2	0.7	0.69
13.9	5	842	1.6	1.15 <0.5		16.8	0.7	0.59
7.8	3	102	1.4	1.28 <0.5		16	1.2	0.56
6.5	3	85.9	1.3	1.08 <0.5		14.9	1	0.48
7.1	5	84.9	1.3	0.94 <0.5		15	1	0.53
7.1	5	94.1	1.4	0.78 <0.5		15.8	1.1	0.47
6.8	6	87.4	1.4	0.88 <0.5		16.5	1.2	0.53
16.9	6	102	1.6	1.94 <0.5		17.2	1	0.86
10.1	5	76.2	1.4	1.24 <0.5		15.4	0.8	0.63
8	6	76.6	1.5	1.1 <0.5		20.6	0.8	0.65
6.8	5	72.5	1.5	0.98 <0.5		16.3	0.8	0.61
5.6	5	81.7	1.5	0.89 <0.5		14.6	0.9	0.57
5.3	6	75	1.8	0.92 <0.5		16.9	0.9	0.63
8.7	4	74.9	1.4	1.18	0.5	11.5	0.5	0.62
5.3	3	117	1	0.66 <0.5		10.9	1.6	0.35
6.1	4	103	1.6	0.78 <0.5		14.6	1.2	0.47
6.3	4	105	1.5	0.83 <0.5		13	0.9	0.42
6.3	5	108	1.7	0.77 <0.5		12.8	1	0.48
5	4	84.6	1.7	0.84	0.6	15.7	0.8	0.59
5.4	4	88.3	1.5	0.79 <0.5		15	0.7	0.5
13.7	3	69.7	0.9	1.78 <0.5		10.2	0.6	0.76
5.7	4	112	1.5	0.89 <0.5		14.9	0.8	0.52
18.5	4	108	1.4	1.87 <0.5		14.1	0.9	0.78
7.4	4	84.3	1.4	0.97	0.5	14.1	0.7	0.5
9.2	4	98.1	1.5	1.05	0.5	15.1	0.8	0.56
10.3	4	94.5	1.5	1.2 <0.5		15.1	0.8	0.6
9.5	4	94.7	1.5	1.23 <0.5		15.6	0.8	0.63
7.2	4	87.9	1.4	1.01 <0.5		15.1	0.7	0.55
7.9	5	1270	1.7	1.03 <0.5		13.6	2.9	0.54
4.4	5	154	1.7	0.68 <0.5		10	1.6	0.44
5.9	5	405	1.7	0.8 <0.5		12.7	1.3	0.47
5.9	4	153	1.7	0.8 <0.5		12.4	0.9	0.5
6.9	4	223	1.6	0.97 <0.5		13.2	1	0.61
9.3	5	108	2.6	1.15 <0.5		22.2	2.1	0.59
13.8	5	155	2.6	1.61 <0.5		21.6	1.7	0.71
8.5	6	175	2.4	1.1 <0.5		19.9	0.6	0.64
4.3	5	119	1.4	0.5 <0.5		11.8	5.7	0.35
4.8	5	106	2.3	0.72 <0.5		16	1.3	0.51
5.1	5	130	2	0.68 <0.5		15.2	0.7	0.48
5	4	116	1.5	0.63 <0.5		12.8	0.6	0.42
7.5	7	86.5	3.2	1.13 <0.5		13.7	0.7	0.76
6.1	5	75.3	2.4	0.9 <0.5		11.6	0.6	0.61
6.5	5	64.2	1.7	0.87 <0.5		15.5	0.6	0.55
12.5	4	70.5	1.7	1.33 <0.5		16.7	0.7	0.65
6	4	95.3	1.5	0.78 <0.5		11.4	1	0.5
6.7	5	94.2	2.1	1.09 <0.5		13.8	0.8	0.64

6	4	124	1.4	0.75 <0.5		11.3	1	0.45
6.3	5	68.6	2.1	1.01	0.8	11.9	0.7	0.61
6.9	5	147	1.8	0.97 <0.5		15.7	0.7	0.62
7.4	4	73.2	1.3	1 <0.5		12.3	0.6	0.56
5.8	5	77.2	2	0.8 <0.5		16.1	0.7	0.54
4.5	4	68.5	1.6	0.69 <0.5		10.4	1.8	0.46
7	4	72.3	1.6	0.89 <0.5		9.9	1.2	0.5
4.4	4	72.9	1.3	0.77 <0.5		8	1.6	0.47
4.8	3	67.1	1.3	0.73 <0.5		12.3	0.6	0.47
5.5	3	59.4	1.3	0.78 <0.5		13.2 <0.5		0.47
7.1	4	60.4	1.3	0.84 <0.5		14	0.5	0.49
7.2	3	64.2	1.5	0.99 <0.5		14	0.5	0.56
3.9	4	54.6	1.8	0.76 <0.5		14.7 <0.5		0.52
4.2	3	56.5	1.4	0.61 <0.5		12.6 <0.5		0.4
4.5	4	63.3	1.6	0.69 <0.5		15.1	0.6	0.49
17.5	5	81.3	1.7	1.88 <0.5		16.8	0.7	0.71
12.1	5	68.4	1.7	1.33 <0.5		17.6	0.7	0.62
9.2	4	77.2	1.5	1.15 <0.5		16	0.7	0.64
8	4	79.4	1.6	0.94	0.6	15.2	0.6	0.53
6.3	3	49.9	1.7	0.87 <0.5		11.5 <0.5		0.54
4.1	3	54.6	1.7	0.76 <0.5		10.1	0.6	0.51
9.6	4	79	1.5	1.01 <0.5		16.2	0.6	0.47
4.3	3	71.8	1.5	0.72 <0.5		10.6 <0.5		0.47
4.8	2	30.3	1.5	0.78 <0.5		13.2 <0.5		0.5
5	2	50.2	1.2	0.69 <0.5		10.1 <0.5		0.4
8.1	4	94.1	1.4	1.09 <0.5		13.4	0.8	0.58
8.1	4	78	1.6	1.13 <0.5		9.7	1	0.58
5.9	4	79.8	1.6	0.89 <0.5		9.5	0.8	0.53
6.3	3	49.8	1.4	0.87 <0.5		9.1	0.9	0.52
5.9	4	76.2	1.6	0.79 <0.5		12.9	0.9	0.48
9.4	4	61.4	1.9	1.31 <0.5		16.7	0.6	0.7
7.5	4	75.5	2	1.06 <0.5		15	0.8	0.58
5.5	4	41.6	1.9	0.84 <0.5		11.2 <0.5		0.61
6.4	3	37.9	1.5	0.86 <0.5		10.3 <0.5		0.53
7	5	97.8	1.6	0.81 <0.5		16.1	0.9	0.49
7	5	101	1.5	0.83 <0.5		17.5	1	0.51
7.2	4	119	1.6	0.66 <0.5		14.6	1.5	0.36
5.3	5	94.6	1.5	0.55 <0.5		15.6	1.5	0.35
5.2	4	58.8	1.7	0.69 <0.5		15.8	1	0.44
13.4	5	103	1.5	1.69 <0.5		15.5	1	0.68
5.5	4	89	1.5	0.66 <0.5		15.5	1.1	0.45
7.3	4	81.3	1.6	0.84 <0.5		15.8	1.1	0.49
6.2	6	79	1.8	0.89 <0.5		15	0.9	0.53
6.4	5	142	1.8	0.87 <0.5		16.1	1.1	0.49
5.3	5	91.1	1.9	0.8 <0.5		15.4	1.2	0.47
7.3	7	301	1.7	0.93	0.8	19.5	1.1	0.54
7.7	6	104	1.5	0.98 <0.5		16.5	0.8	0.51

8	6	85.3	1.4	1.14 <0.5	17.2	0.6	0.58	
9.9	6	120	1.4	1.29 <0.5	17.4	0.8	0.62	
6.6	4	73.6	0.9	0.92 <0.5	10.6	0.9	0.53	
9.8	6	96.1	1.4	1.19 <0.5	17.7	0.8	0.61	
6.8	6	76.9	1.6	0.97 <0.5	18.1	0.7	0.61	
5.5	5	56.6	1.3	0.77 <0.5	10	0.8	0.48	
8.4	5	65.6	1.4	1.16 <0.5	14	0.7	0.56	
9.4	5	121	1.3	1.22 <0.5	16.3	1.5	0.64	
6.6	6	68.3	1.6	0.92 <0.5	17.2	1.6	0.57	
6.3	6	65.5	1.5	0.87 <0.5	18.7	1.1	0.53	
6.4	6	61.5	1.6	0.93 <0.5	18	0.9	0.59	
6.6	6	136	1.4	0.71 <0.5	20.5	2.1	0.38	
11.3	6	73.6	1.9	1.38 <0.5	20	1.1	0.66	
7.3	6	96.8	1.6	0.98 <0.5	18.3	1.2	0.55	
6.9	5	82.6	1.4	0.95 <0.5	16.8	0.8	0.57	
13.1	6	158	1.4	1.64 <0.5	17.5	0.9	0.69	
9.2	5	130	1.4	1.24 <0.5	16.7	0.9	0.68	
10.3	6	119	1.4	1.21 <0.5	17.9	1.1	0.6	
7.6	5	104	1.4	1.01 <0.5	15.8	0.9	0.56	
8.1	5	140	1.3	0.95 <0.5	15.9	1.2	0.43	
7.1	5	97	1.4	0.83 <0.5	16	1.1	0.41	
7.8	6	104	2	1.07 <0.5	21.6	0.9	0.57	
7.6	6	115	1.6	0.97 <0.5	18.6	1	0.52	
6.5	6	116	1.6	0.79 <0.5	18.6	0.9	0.46	
2.7	5	205	1.6	0.5 <0.5	15.8	2	0.39	
16.1	9	4070	3.2	1.31 <0.5	25.8	1.6	0.82	
22.9	7	11700	1.9	1.8 <0.5	33.9	0.8	0.5	
9.8	6	2150	2	1.18 <0.5	24.2	1	0.54	
7.2	5	111	1.5	0.86 <0.5	19	1.8	0.45	
8.4	6	57.3	1.6	0.94	0.9	18.5	1.6	0.5
9.4	5	96.5	1.4	1.28 <0.5	17.2	1.3	0.59	
8.1	5	143	1.4	1.13 <0.5	15.8	1.1	0.54	
13.2	6	116	1.6	1.64 <0.5	21	1.8	0.62	
12.5	6	106	1.6	1.48 <0.5	21.2	1.5	0.62	
12.6	6	102	1.6	1.5 <0.5	20.6	1.4	0.63	
14.1	6	201	1.6	1.67 <0.5	20.1	1.4	0.65	
14.8	6	147	1.6	1.72 <0.5	20.2	1.3	0.78	
7.6	6	161	1.5	0.94 <0.5	20.5	1.2	0.52	
7.9	7	129	1.5	1.06 <0.5	21.4	1.3	0.57	
8.8	5	138	1.5	1.24 <0.5	19.1	1.1	0.62	
11.8	5	106	1.6	1.53 <0.5	19.3	0.9	0.77	
6.3	5	74.2	1.7	0.92 <0.5	16.5	1.2	0.56	
5.4	4	321	1.3	0.6 <0.5	15.3	1.4	0.41	
12.4	10	2030	4.1	0.91 <0.5	45.9	0.6	0.79	
5.3	8	305	2.9	0.8 <0.5	27.7	0.7	0.64	
5.3	7	214	2.7	0.95 <0.5	21	0.5	0.77	
0.7 <1		18 <0.5		0.12 <0.5	1 <0.5		0.07	

3.9 <1		27.2 <0.5		0.63 <0.5		2.6 <0.5		0.14
9.4	3	78.9	1.6	1.4 <0.5		15.6	0.6	0.69
9.2	3	55.8	1.2	1.29 <0.5		11.6 <0.5		0.58
8.7	3	91.4	1.1	1.43 <0.5		10 <0.5		0.6
4	2	210 <0.5		0.35 <0.5		0.5 <0.5		0.12
7.7	4	118	1.5	1.31 <0.5		15.7	0.7	0.61
10.2	3	84.2	1.2	1.5 <0.5		12.9	0.7	0.73
9	4	180	1.2	1.18 <0.5		15.7	0.9	0.57
3.6 <1		315 <0.5		0.37 <0.5		1.1 <0.5		0.11
8.9	4	135	1.5	1.4 <0.5		17.1	0.8	0.71
9.8	3	122	1.4	1.45 <0.5		16	0.6	0.72
6.4	2	129	0.7	1.09 <0.5		11.8 <0.5		0.56
7	4	143	1.4	1.1 <0.5		17	1	0.54
6.9	3	129	1.1	1.09 <0.5		12.1	0.5	0.52
6.7	3	114	1.2	0.94 <0.5		12	0.7	0.46
0.4 <1		9.3 <0.5		0.09 <0.5		1 <0.5	<0.05	
9.4	5	61.9	1.7	1.25 <0.5		20.7 <0.5		0.53
47.6	4	92.3	1.3	5.01 <0.5		14.9	1	1.07
6.5	4	162	1.3	0.96 <0.5		16	0.8	0.43
9.3	5	564	1.4	1.08 <0.5		17.6	1	0.55
7.2	3	114	1.1	1.02 <0.5		11.3	0.6	0.51
0.7 <1		13.7 <0.5		0.12 <0.5		1.4 <0.5		0.07
3.1	5	97.8	1.6	0.65 <0.5		20.2	0.6	0.48
27.8	4	86.8	1.3	2.55 <0.5		17.4	0.8	0.71
6.8	4	151	1.1	0.9 <0.5		16.2	0.8	0.43
6.1	4	157	1.3	0.85 <0.5		17.4	0.8	0.49
0.6 <1		14.5 <0.5		0.11 <0.5		0.9 <0.5		0.06
7.2	4	114	1.1	1.01 <0.5		15.1	2.9	0.44
0.4	3	12 <0.5		0.1 <0.5		0.8 <0.5		0.07
4.7	4	80.3	1.4	0.81 <0.5		15.2	0.8	0.52
12	4	106	1.3	1.51 <0.5		15.2	0.9	0.57
19.1	4	127	0.9	2.74 <0.5		10.8	11.3	0.62
1.1	2	17.6 <0.5		0.21 <0.5		2.6 <0.5		0.12
6.9	4	104	1.3	1.05 <0.5		14	0.8	0.52
2.4	2	81.3	0.7	0.27 <0.5		9.1	16.8	0.17
0.6	1	16.8 <0.5		0.17 <0.5		1.6 <0.5		0.12
3.4	3	35.6	1.1	0.6 <0.5		12.3	0.7	0.43
6.5	2	113	1.1	1.07 <0.5		10.4 <0.5		0.56
5.8	4	95.3	1.3	0.87 <0.5		13.7	0.6	0.48
6.1	3	121	0.7	0.88 <0.5		9.6	10.4	0.4
9.1	4	122	1.8	1.46 <0.5		18.4	0.7	0.77
5.3	4	380	1.1	0.99 <0.5		15.6	1.3	0.54
1.1	1	10.2 <0.5		0.22 <0.5		1.3 <0.5		0.11
7.3	4	175	1.3	0.97 <0.5		15.6	1	0.5
7.4	4	154	1.3	0.92 <0.5		17.1	0.7	0.5
7.4	4	164	1.5	1.03 <0.5		16.7	0.9	0.55
5.4	5	147	1	0.8 <0.5		11.9	7.8	0.5

8.6	7	386	1.4	1.25 <0.5	14.2	1.2	0.58
9.5	2	151	0.8	1.36 <0.5	10.2	15.2	0.65
0.9 <1		23.2 <0.5		0.15 <0.5	2.3	0.9	0.07
4.4	6	48.7	2.4	0.94 <0.5	19.6 <0.5		0.64
0.6 <1		16.4 <0.5		0.13 <0.5	1.6	1.5	0.1
7.5	3	162	1.1	1.02 <0.5	14.4	0.9	0.48
19	4	106	1.2	1.93 <0.5	17.2	1	0.61
18.9	4	131	1.1	1.84 <0.5	18.1	1.5	0.61
3.4 <1		114 <0.5		0.42 <0.5	2.6 <0.5		0.18
8.5	5	212	1.1	1.13 <0.5	15.7	1.2	0.49
1.6 <1		16.9 <0.5		0.23 <0.5	2.4 <0.5		0.13
6.9	3	84.7	1.2	0.91 <0.5	14	0.9	0.5
7.1	2	137	0.9	1.06 <0.5	8.9 <0.5		0.52
4.7	2	118	0.6	0.58 <0.5	9.3	16.9	0.29
0.9 <1		20.3 <0.5		0.2 <0.5	2.5	0.8	0.14
6.9	3	79.4	1.2	0.99 <0.5	13.7	0.8	0.52
3.4	1	101 <0.5		0.57 <0.5	3.1	1.9	0.24
9.9	5	161	2.1	1.16 <0.5	18.1	1.3	0.58
9.6	4	202	1.5	1.17 <0.5	16.9	1.2	0.54
10.1	4	188	1.6	1.25 <0.5	17.2	1.1	0.61
9.6	4	75	2.3	1.37 <0.5	20.7	1.2	0.69
5.9	4	92.8	1.6	0.89 <0.5	17.2	1.1	0.55
6.3	4	94.3	1.3	0.94 <0.5	18.4	1	0.54
12.7	3	81.5	1	1.55 <0.5	13.4	0.9	0.7
11.1	3	82.8	1.1	1.3 <0.5	14.8	0.5	0.62
9.3	3	82.9	1.3	1.24 <0.5	14	0.6	0.61
4.7	1	127 <0.5		0.68 <0.5	5.6 <0.5		0.32
9.7	4	74.4	1.6	1.2 <0.5	17.9	0.9	0.56
8.5	4	77.9	1.4	1.11 <0.5	16.3	0.9	0.54
7.8	4	140	1.5	1.05 <0.5	14.4	0.9	0.56
7.8	4	139	1.3	1.05 <0.5	14.6	0.9	0.53
5.8	3	88	0.8	0.78 <0.5	10.6 <0.5		0.44
3.9	2	46	0.6	0.5 <0.5	5.7	5.7	0.24
5	2	115	1.1	0.72 <0.5	12.8	0.8	0.45
7.2	3	140	1.4	0.99 <0.5	13.4	0.9	0.5
7.2	5	114 <0.5		0.78 <0.5	17.3	1	0.39
9.8	4	121	1.3	1.23 <0.5	17.7	0.9	0.67
9.4	4	124	1.2	1.18 <0.5	16.3	0.9	0.63
7.9	2	79.2	1.6	1.15 <0.5	11.5 <0.5		0.61
7.9	3	98.7	2.3	1.37 <0.5	14.4	0.7	0.79
8.2	3	97.1	2.2	1.37 <0.5	13.7	0.6	0.77
3.7	3	74.2	1.8	0.74 <0.5	11.9	0.6	0.48
4.4	3	80.5	1.9	0.8 <0.5	12.7	0.7	0.49
4.8	4	88.6	2.4	0.95 <0.5	15.4	0.9	0.6
4	1	44.6	1.1	0.67 <0.5	5.9 <0.5		0.4
3.6	1	41	1	0.65 <0.5	5.3 <0.5		0.37
4.6	2	53.4	1.3	0.74 <0.5	5.6 <0.5		0.42

7.5	3	94.3	2	1.2 <0.5	14.5	0.5	0.65
5.4	3	64.2	2	0.92 <0.5	12.8	0.6	0.53
4.8	3	85.6	1.6	0.78 <0.5	10.7 <0.5		0.49
14.1	3	172	1.8	1.47 <0.5	15.5	0.6	0.64
5.2	3	80.8	1.9	0.86 <0.5	13.5	0.6	0.49
15	3	92.7	1.5	2.41 <0.5	13.6	0.7	0.8
5	3	92.6	1.7	0.77 <0.5	12.6	0.7	0.47
5.7	3	48.1	2.6	0.98 <0.5	18 <0.5		0.64
5	2	47.7	1.8	0.94 <0.5	12.9	0.5	0.55
3.8	4	170	1.9	0.76 <0.5	15.5	0.8	0.48
4.1	3	39	1.5	0.65 <0.5	9.9	2.4	0.38
8.8	4	145	1.7	1.17 <0.5	14.1	0.8	0.57
7.2	4	157	1.8	1 <0.5	18.8	0.6	0.47
3.3	3	46.6	2.1	0.86 <0.5	20 <0.5		0.56
2.6	4	47.6	2.6	0.65 <0.5	8.3	1.6	0.48
10.6	11	231	0.7	1.46 <0.5	7.8	1.8	0.52
5.1	2	160	1.2	0.75 <0.5	10.1	0.8	0.42
5.1	2	187	1.1	0.74 <0.5	9.3	0.6	0.39
8.2	2	380	1	1.03 <0.5	8.8	0.5	0.42
9.3	2	167	1.2	1.33 <0.5	10.6	1.4	0.5
4.9	3	151	1.2	0.72 <0.5	9.9	0.8	0.4
7.4	2	180	1.2	0.93 <0.5	9.7	0.7	0.4
4.7	2	158	1.4	0.66 <0.5	9.9	0.9	0.36
7.8	3	102	1.9	1.11 <0.5	12.4	0.7	0.52
10.8	3	124	1.4	1.51 <0.5	11.1	0.6	0.54
5.1	2	105	1.4	0.78 <0.5	10 <0.5		0.42
7.1	3	98.1	1.5	1.09 <0.5	11.2 <0.5		0.56
6.4	3	96	1.6	0.96 <0.5	11.3	0.5	0.49
3.3	4	79.4	2.1	0.68 <0.5	18.9 <0.5		0.49
4.4	4	105	1.7	0.77 <0.5	16.1	0.5	0.49
5.3	4	114	1.7	0.9 <0.5	16.4	0.7	0.54
5.6	4	166	2	0.9 <0.5	18.1	0.8	0.56
6.7	2	206	0.6	1.03 <0.5	8.1	0.6	0.44
4.9	3	107	1.6	0.75 <0.5	12.8	0.7	0.45
3.8	3	84.6	1.5	0.58 <0.5	12.6	0.7	0.4
4.8	3	135	1.5	0.64 <0.5	12	0.7	0.38
6.5	3	220	1.4	1 <0.5	11.2	0.6	0.48
9.7	3	226	1.6	1.15 <0.5	13.6	0.7	0.51
5.1	3	156	1	0.72 <0.5	9.1	0.6	0.35
6.7	3	169	1.3	1 <0.5	12.2	0.7	0.46
7.3	4	129	1.4	1.05 <0.5	12.9	0.8	0.47
6.2	3	127	1.4	0.9 <0.5	11.9	0.7	0.49
5.3	3	101	1.3	0.71 <0.5	10.9	0.7	0.41
6.6	3	386	1.5	0.81 <0.5	12.4	0.8	0.45
4.3	2	334	0.7	0.65 <0.5	6.6 <0.5		0.3
4	3	206	1.3	0.62 <0.5	11	0.7	0.36
7.7	3	111	1.3	0.92 <0.5	14.4	0.7	0.41

7.2	3	127	1.3	1.08 <0.5		13.2	0.7	0.46
7.1	4	146	1.3	0.96 <0.5		13.9	0.7	0.43
14	1	287 <0.5		2.11 <0.5		6.7 <0.5		0.7
3.7	3	122	1.3	0.65 <0.5		13	0.5	0.41
4.4	4	121	1.7	0.71 <0.5		15.3	0.6	0.46
5.7	2	310	1.2	0.8 <0.5		10.4	0.7	0.39
3.6	4	581	1.3	0.47 <0.5		12.9	1.3	0.28
3.5	4	140	1.5	0.51 <0.5		15.1	0.9	0.32
4.7	3	205	1.6	0.74 <0.5		13.7	0.7	0.41
5	3	236	1.3	0.8 <0.5		9.8 <0.5		0.4
6.5	3	480	0.9	1.02 <0.5		8.7	0.5	0.48
2.7	4	114	1.3	0.35 <0.5		12.8	1	0.27
4.8	4	291	1.2	0.66 <0.5		14	0.8	0.34
4.1	4	190	1.5	0.61 <0.5		12	0.6	0.31
6.2	4	104	1.9	0.91 <0.5		14.9	1.5	0.55
7.6	4	117	1.9	1.08 <0.5		16.4	0.9	0.57
7.4	2	112	0.6	1.02 <0.5		13.3	0.9	0.57
8.7	4	135	1.1	1.3 <0.5		15.7	0.8	0.69
30.5	4	130	0.8	4.62 <0.5		14.4	0.8	1.03
5.6	2	212 <0.5		0.66 <0.5		10.9	1.5	0.28
6.6	5	222	1.1	0.85 <0.5		16	1.2	0.57
7.6	3	228	1.4	1.01 <0.5		16.4	1	0.62
8	4	283	0.9	1.06 <0.5		16.2	0.8	0.63
8.8	4	358	1.3	1.11 <0.5		17.6	1	0.65
8.8	4	345	1.3	1.03 <0.5		17.6	0.9	0.68
7.6	5	126	1.9	1.08 <0.5		21.5	1.4	0.61
7.9	6	118	2	1.09 <0.5		23.1	1	0.58
8.9	6	120	2	1.12 <0.5		23	1	0.57
5.2	6	124	2.1	0.87 <0.5		22.9	1	0.54
10.4	5	290	2.4	1.24 <0.5		23.9	1	0.68
9.7	3	248	1.3	1.39 <0.5		12.7	0.7	0.7
10.4	2	255 <0.5		1.39 <0.5		10.6	0.7	0.62
8.6	4	126	0.7	1.61 <0.5		15.8	0.8	0.89
7.3	4	112	0.7	1.28	0.8	17.3	1	0.74
9.5	4	207	0.8	1.52 <0.5		16.5	0.8	0.87
12.7	4	370	1.2	1.36 <0.5		17.7	0.8	0.73
7.7	4	195	1.2	1.09 <0.5		14.8	0.8	0.6
6.8	3	126 <0.5		1.18 <0.5		12.5	0.5	0.7
7.9	4	106 <0.5		1.29 <0.5		17.8	0.8	0.78
6.6	2	81.8 <0.5		1.54 <0.5		9.3	0.5	0.89
5.8	2	102 <0.5		0.69 <0.5		3.8	5.1	0.19
6	3	58.8	0.7	1.12 <0.5		11	7	0.52
6.5	5	99	1.9	1.09	1.8	19.6	2.1	0.6
5.5	4	108	1.6	0.94 <0.5		16.9	1.9	0.57
8.1	5	136	1.6	1.4 <0.5		17.8	1.5	0.73
16	5	175	2	2.97 <0.5		19.7	1.5	1.32
11.2	5	233	1.9	1.77 <0.5		18.1	1.5	0.87

8.5	3	163	1.6	1.83 <0.5		15.5	1.1	0.91
10	2	615	1	0.92 <0.5		11.5	0.7	0.55
6.7	3	165	1.9	1.12 <0.5		14.7	0.9	0.62
14.5	4	136	1.7	4.23 <0.5		12.3	0.9	0.79
7.1	3	133	1.6	1.13 <0.5		12.9	0.6	0.64
9.6	2	81	1.2	1.66 <0.5		11.6 <0.5		0.97
5.6	4	76.7	1.8	0.96	0.5	16.3	0.7	0.55
5.1	4	67.9	1.9	0.96 <0.5		16.3	0.7	0.55
6.9	3	148	1.6	1.08 <0.5		12 <0.5		0.61
7.5	3	103	1.7	1.18 <0.5		17.8 <0.5		0.61
9.1	3	93.9	0.6	1.49 <0.5		7.4	18.5	0.91
0.3 <1		14 <0.5		0.19 <0.5		1.1	0.7	0.15
15.5 <1		736 <0.5		5.91 <0.5		1.8	0.9	3.35
5.7	4	197	1.4	0.77 <0.5		17.4	1.3	0.49
8.4	3	202	1.2	1.18 <0.5		13.2	0.9	0.66
0.5 <1		13.1 <0.5		0.18 <0.5		0.8 <0.5		0.14
4.5	2	280	1.4	0.69 <0.5		13.1	1.9	0.51
4.8	2	106	1.3	0.82 <0.5		9.5	1.7	0.53
5.9	8	181	0.8	0.97 <0.5		10.2	10	0.47
0.7	1	19.6 <0.5		0.12 <0.5		1.7	0.9	0.06
9.4	6	70.9	2.1	1.21 <0.5		23.7 <0.5		0.62
5.7	4	119	1.7	0.95 <0.5		17.9 <0.5		0.57
6.5 <1		19.3 <0.5		0.5 <0.5		2	0.6	0.09
15.5	4	139	1.5	1.52 <0.5		19.5	0.8	0.61
6	4	119	1.2	0.85 <0.5		15.1	1	0.49
0.9 <1		20.4 <0.5		0.21 <0.5		0.6 <0.5		0.12
24	5	863	1.8	4.12 <0.5		21.3	0.9	1.16
7.8	3	86.3	1.3	1.39 <0.5		15.3	0.6	0.75
6.5	2	148	0.5	1.24 <0.5		7.8	18.9	0.76
3.5	4	140	0.9	0.65 <0.5		13.6	1	0.4
6.6	4	130	1.3	1.22 <0.5		15.9	1.1	0.68
9.8	3	302	0.8	1.86 <0.5		11.7	2.4	0.77
9.3	2	1440	0.7	1.32 <0.5		9.3	1.3	0.55
13.6	2	280	0.8	2.38 <0.5		9.3	15.1	1.22
17.4	6	1440	1.8	0.96 <0.5		30	0.9	0.52
3.8	6	178	1.9	0.89 <0.5		24.5	0.7	0.65
4.7	3	123	0.8	0.58 <0.5		10.5	9.5	0.37
7.4	4	114	1.3	0.99 <0.5		16.1	0.9	0.56
9.9	5	98.4	1.3	1.4 <0.5		16.3	0.8	0.67
7.8	1	136	0.6	1.18 <0.5		9.5	14.7	0.51
3.8	2	182	1.2	0.5 <0.5		14.7	3.3	0.43
6.9	3	68.5	1.6	1.07 <0.5		19.5	1.1	0.7
7.7	4	167	1.4	1.01 <0.5		19.2	1	0.62
8.9	1	138	0.5	1.42 <0.5		8.1	16.2	0.61
8.7	4	88.9	1.8	1.24 <0.5		24.9	0.5	0.62
6.3	4	83.1	1.7	1.3 <0.5		22.2 <0.5		0.72
4.2	4	81.8	1.8	0.93 <0.5		20.8 <0.5		0.6

6.7	4	95	1.5	1.04	<0.5	18	<0.5	0.62
7.6	4	139	1.6	1.1	<0.5	20.3	0.8	0.56
7.1	3	118	1.1	1.16	<0.5	17.6	0.8	0.57
4.4	3	146	<0.5	0.57	<0.5	6.4	9.7	0.32
8.3	3	139	<0.5	1.36	<0.5	6.3	18.4	0.53
0.4	1	22.9	<0.5	0.11	<0.5	0.7	0.6	0.08
6.6	5	79.4	1.4	1.01	0.5	15.2	0.9	0.46
9.1	5	81.4	1.4	1.17	<0.5	15.5	0.8	0.54
12.3	6	121	1.4	1.61	<0.5	16.8	1	0.65
10.5	4	171	0.7	1.44	<0.5	15.6	2.1	0.53
4.4	3	676	<0.5	0.64	0.5	6.1	20.1	0.35
0.6	2	11.5	<0.5	0.15	<0.5	0.7	<0.5	0.08
2.6	5	258	1.5	0.77	1	19.6	1.7	0.61
4.4	5	94.8	1	0.86	0.8	12.8	1.1	0.51
6.1	5	174	1.1	0.69	<0.5	19.3	1	0.48
37	4	170	0.9	6.07	1.1	11.5	9.4	1.83
8.2	5	160	1.1	0.99	<0.5	17.8	1.1	0.5
8.6	6	421	1.4	0.9	<0.5	18.2	1	0.56
8.7	3	199	0.9	1.15	<0.5	10.1	2.5	0.55
5.7	3	154	1.2	0.81	<0.5	13.1	17	0.42
7.4	5	292	2.1	1.09	<0.5	24.7	0.7	0.7
5.5	4	87.4	1.5	0.95	<0.5	19.3	1	0.56
7.6	3	122	1.2	1.11	<0.5	12.5	0.6	0.54
1.6	1	24.8	<0.5	0.23	<0.5	2.8	<0.5	0.11
4.1	5	76.1	1.7	0.76	<0.5	19.3	0.7	0.47
12.1	3	192	0.8	1.79	<0.5	10.4	0.6	0.56
10.9	3	143	0.8	1.48	<0.5	14.5	1	0.63
0.9 <1		17.6	<0.5	0.11	<0.5	2	<0.5	0.07
10.4	3	142	0.6	1.73	<0.5	9.1	3	0.72
5.8	5	85.8	1.4	0.82	<0.5	17.1	1	0.49
11.1	3	189	0.8	1.63	<0.5	11.8	0.6	0.76
8.1	4	206	1.1	0.88	0.6	17.7	1	0.54
1.3 <1		14.6	<0.5	0.22	<0.5	1.8	<0.5	0.12
6.3	4	72.3	1.4	0.89	<0.5	15.7	0.9	0.53
8.4	4	93.1	1.5	1.17	<0.5	15.6	1	0.6
8.8	5	197	1.6	1.14	<0.5	18.4	0.9	0.59
9.7	4	200	1.1	1.38	<0.5	13.5	0.9	0.57
1.1	1	31.6	<0.5	0.17	<0.5	3.5	<0.5	0.12
7.5	3	182	<0.5	1.44	<0.5	8.2	7.6	0.66
5.6	4	113	0.7	0.69	<0.5	12.1	1	0.42
4.5	2	625	<0.5	0.69	<0.5	5.1	<0.5	0.32
7.6	3	121	0.6	1	<0.5	11.6	1.4	0.44
0.3 <1		18.8	<0.5	0.07	<0.5	1.6	0.8	<0.05
12.5	4	122	1.3	1.6	<0.5	14.4	1	0.59
6	2	328	0.8	0.97	<0.5	9.4	<0.5	0.55
5	3	440	0.5	0.81	<0.5	6.8	<0.5	0.43
6.1	3	120	0.6	0.88	<0.5	8.7	18.2	0.38

0.4 <1		12.3 <0.5		0.17	0.9	0.9	0.7	0.11
6.7	3	150	1.2	0.76 <0.5		14.8	1.1	0.47
6.5	3	157	1.1	0.87 <0.5		15.1	0.9	0.51
10.3	3	135	1.1	1.38 <0.5		16.7	0.7	0.66
5.2	2	132 <0.5		0.41 <0.5		8.1	0.7	0.21
6.7	3	78.7	1.6	1.08 <0.5		16	2	0.66

U ppm	V ppm	W ppm	Y ppm	Yb ppm	Zn ppm	Zr ppm	S %	Al2O3 %
6.31	157	3	38.1	4.3	144	235		26.06
5.49	146	3	37.8	4.3	59	285		23.36
5.93	144	3	37.4	4.3	180	244		23.53
4.47	134	2	30.2	3.6	70	146		23.04
3.53	126	2	35.6	3.8	94	177		20.36
5.01	131	4	45.6	5.2	68	349		21.19
3.87	105	2	33.4	3.9	44	316		22.71
6.54	204	3	58.4	5.1	62	253		27.28
5.58	150	3	39.8	4.5	68	223		25.66
6.81	145	3	49.9	5.1	113	242		24.96
5.38	137	2	53.1	5.2	89	206		24.38
5.9	138	2	42.1	4.4	95	170		25.42
13.2	162	3	40.1	4.3	76	164		25.87
6.78	169	5	42.6	4.4	19	331		23.71
5.61	144	3	25	3.1	24	175		26.43
6.49	151	3	32.1	3.5	25	192		26.32
4.25	142	2	35.4	3.6	44	213		22.9
5	166	2	36.9	4.4	53	248		28.84
5.55	193	2	37.3	4.6	133	253		28.01
6.58	184	2	43	5.3	232	238		27.53
6.16	159	2	42.8	5.1	199	309		24.78
6.61	160	2	53.1	5.3	290	262		24.57
5.5	138	3	34.3	4.3	32	262		25.66
4.61	120	3	35.8	4.3	44	363		22.67
3.97	85	2	42	4.7	38	521		16.38
4.18	105	2	41.4	4.6	70	415		19.54
4.12	124	2	37	4.2	67	315		22.44
4.26	143	2	36	4.2	88	251		25.28
4.16	159	2	44.4	4.5	58	226		24.33
4.4	173	2	43.3	4.4	71	256		23.42
4.03	162	2	40.7	4.1	93	202		23.32
4.31	152	2	22.9	3	50	177		23.26
3.68	129	2	27.8	3.5	27	334		19.45
3.22	209	2	19.2	2.9	88	178		25.7
3.16	181	2	20.6	3.3	63	213		24.33
5.72	189	5	46.9	5.8	70	380		30.52
4.47	178	3	30.9	3.8	52	260		31.47
5.98	170	3	37.2	4.1	102	332		30.6
4.82	158	2	34.4	3.8	82	304		26.03
4.5	149	2	22.4	3.2	76	221		25.29

4.09	117	2	29.9	3.5	24	472	17.69
3.84	127	2	28.7	3.4	26	409	19.22
3.99	139	2	36.8	4.1	124	228	21.18
3.68	139	2	37.2	4	121	199	21.5
5.58	117	3	45.9	5	96	244	23.75
6.87	178	2	27	3.4	39	162	22.06
4.3	138	2	37.5	4.2	58	225	19.99
3.44	99	1	34.2	3.8	26	296	14.93
4.87	152	2	26.1	3	91	123	23.57
10.7	143	2	24.8	2.8	38	146	20.92
4.56	153	2	29.6	3.3	42	167	23.85
5.1	181	2	35.3	3.9	85	168	25
7.51	199	2	35	3.9	128	147	25.13
6.15	179	2	34.3	3.7	105	173	23.3
9.04	204	3	32.2	4	47	226	27.47
9.14	215	2	31.7	3.8	38	227	30.92
7.61	200	3	31.4	4.2	53	234	29.66
6.42	161	3	32.8	4.1	57	291	25.9
6.94	148	3	31.7	4.2	49	315	28.51
11.3	190	5	35.1	5	46	383	30.19
12	166	4	37.1	4.9	61	400	27.57
4.26	140	1	63.4	6.9	102	105	16.73
3.89	108	2	37.9	4.4	65	346	16.5
3.93	113	2	39.7	4.7	156	319	17.68
3.65	105	2	38	4.2	165	312	16.31
3.53	126	2	37.3	3.9	165	206	18.86
3.45	136	2	34.6	3.9	171	166	20.2
3.5	138	2	31.3	3.4	164	148	21.31
2.8	89	1	21.6	2.6	89	150	16.39
3.5	101	2	29.1	3.3	28	225	22.38
3.88	111	2	29	3.2	54	186	22.77
3.87	119	2	39.2	4.2	40	258	20.71
4.04	111	2	44.5	4.8	82	274	20.88
1.9	40 <1		15.1	1.7	19	116	8.68
9.14	155	2	33.7	4.5	54	285	25.04
8.2	192	3	44.7	4.5	135	206	28.78
4.85	125	2	32	3.9	34	359	18.96
4.36	137	2	31.6	3.8	38	364	19.67
3.73	117	2	28.8	3.4	30	412	17.21
3.89	129	3	34.9	4	29	463	19.78
4.75	112	2	31.9	3.3	79	290	15.7
2.83	201	2	16.2	3	48	169	27.89
2.81	171	2	20.7	3	42	173	24.76
4.1	175	3	21.1	3.1	75	181	22.64
3.94	121	2	32.9	4.1	37	580	19.49

4.06	138	2	26.4	3.3	42.4	282	22.98
4.28	147	2	26.2	3.2	45	244	24.92
4.15	153	2	29.2	3.5	47	268	26.06
5.63	150	3	33.8	3.8	43	339	31.12
4.99	165	3	31	3.6	48	288	30.96
6.71	162	4	34.8	4	35	276	32.75
7.54	178	6	48.9	5.7	24	487	32.3
4.94	79	4	42	4.3	16	394	16.7
4	107	4	32.7	4	46	273	26.47
9.98	180	3	25.7	3.2	43	192	26.39
3.05	117	3	32.1	3.6	17	295	22.86
3.9	120	2	34	4.1	21	419	19.64
3.02	129	2	33.4	3.6	19	310	22.88
3.8	132	2	34.8	3.9	25	369	20.39
4.04	133	2	32.8	4.3	134	245	20.43
3.45	143	2	33.7	4.3	81	223	20.49
3.51	165	2	37.4	4.5	123	285	22.46
2.86	128	2	32.3	3.9	11	407	22.92
2.34	147	2	23.8	2.9	123	123	17.74
5.21	100	2	45.2	3.8	95	171	14.98
7.34	144	2	21.6	2.8	46	183	23.52
6.48	154	2	23.9	3	48	184	23.21
6.02	144	2	27.5	3.2	47	205	22.11
5.28	138	2	26.6	3.3	23	198	23.09
4.98	103	2	28	3.2	30	232	19.42
3.32	110	2	30	3.2	75	263	13.85
3.65	145	1	16.6	2.3	70	127	20.56
3.58	126	2	36	4	52	322	20.76
3.6	100	2	38	3.8	97	310	12.45
4.3	151	2	36	4	102	196	19.99
4.48	150	2	36.4	4	101	188	20.87
3.77	136	3	40.4	4.3	40	329	19.28
4.75	176	3	31.8	3.6	52	246	24.43
5.2	180	3	31.1	3.5	60	240	24.78
5.8	135	2	30.2	3.5	45	232	18.43
4.93	128	2	36.8	4.1	44	384	18.25
5.1	150	2	39.5	4.3	67	356	18.56
10.2	224	2	29.5	3.8	148	200	25.25
8.25	226	2	24.2	3.2	64	170	26.24
5.95	141	3	39.3	4.8	30	351	23.83
4.6	177	3	26	3.2	25	223	29.11
4.01	146	2	29.2	3.3	25	213	24.84
4.75	124	2	34.7	4	98	219	22.69
4.69	133	2	36	4.2	106	210	22.29
3.95	130	2	42.7	4.8	84	242	21.45
3.43	117	2	17.6	2.6	33	201	18.29
3.42	116	2	17.4	2.6	47	189	18.72

8.64	103	2	37.2	3.1	83	128	14.46
5.49	129	2	19	2.8	51	252	16.59
3.53	119	2	33	3.2	38	205	19.74
3.72	136	2	29.8	3.1	36	208	21.46
6.1	155	2	46.3	5	57	334	18.64
4.72	173	2	32.8	3.8	24	218	24.12
4.99	126	2	37	4.1	43	318	19.39
4.17	99	2	43.4	4.4	69	453	18.04
3.38	103	2	45.6	4.5	94	386	18.03
6.3	101	2	32.9	3.3	24	431	14.64
7.7	144	2	42.5	4.2	81	281	21.52
6.5	98	2	33.8	3.7	85	386	15.54
5.21	99	2	27.6	3	103	326	16.42
8.62	127	2	28.3	3.1	47	224	19.08
7.06	139	2	29.7	3.5	97	188	21.78
5.2	154	3	27.2	3.2	54	185	22.01
5.78	135	2	25	3.2	90	213	19.87
4.31	130	2	19.7	2.8	65	199	20.12
4.27	122	2	20.4	2.9	68	192	19.96
3.44	94	2	41.1	3.5	160	150	15.41
4.06	75	2	32.6	3.8	25	538	13.91
6.25	157	3	38.3	4.4	40	234	22.98
7.1	156	3	40.4	4.5	55	363	23
7.5	163	3	38.3	4.1	51	355	23.53
7.68	187	3	35.6	4.3	42	319	24.56
6.71	176	3	32.4	3.8	51	311	24.01
3.94	143	2	34.9	3.9	47	398	20.76
3.59	119	2	32.9	3.9	53	460	19.14
3.8	111	2	36.8	4.2	90	468	17.02
8.9	203	6	45.1	5.6	36	477	28.37
7.11	199	4	31.3	3.9	46	371	33.58
5.13	174	3	34.6	4	29	400	26.48
4.45	151	3	38.4	4.4	39	376	24.54
3.9	130	2	36	4	31	435	20.82
4.38	139	2	37.9	4.5	35	387	21.46
4.28	138	2	37.4	4.5	39	345	21.08
3.95	136	2	35.1	3.8	48	295	18.36
3.58	102	2	42.4	4.5	65	387	17.94
3.59	139	2	38.4	3.9	28	284	24.73
3.83	160	2	29.6	3.3	17	168	25.81
3.17	114	2	38	3.8	96	197	16.71
3.29	139	2	82.4	7.1	150	184	21.35
3.76	138	2	31.2	3.7	119	245	21.79
5.24	212	3	35	4	254	303	23.94
4.64	163	3	38	4.6	193	343	23.26
6.63	192	3	40.6	4.5	131	327	27.69
4.35	136	2	55.5	5	53	382	18.66

3.79	148	2	34.8	3.5	194	188	18.22
4.21	126	2	37.2	4.1	67	420	18.29
8.41	200	5	61.1	7.7	26	582	27.53
7.29	258	6	56.8	6.3	34	501	26.17
7.69	185	3	37.1	4	34	356	31.05
3.84	156	2	36.3	3.6	131	229	23.17
3.99	141	2	35	4	91	174	24.85
3.92	160	2	31.2	4	137	308	22.91
3.84	200	2	38.4	3.9	117	151	21.84
3.68	157	2	35	3.8	18	211	21.49
3.51	138	2	33.7	3.7	66	292	18.14
3.55	187	2	28.1	3.5	18	219	24.09
2.61	107	2	26.8	2.7	89	171	16.2
3.71	131	2	11.5	2.8	16	224	24.97
4.47	205	2	22.7	3.2	48	143	23.5
8.09	161	3	42.9	4.8	133	392	28.18
3.78	133	2	34.6	3.8	29	417	20.95
4.57	70	2	39.7	4.6	10	626	6.34
3.97	154	2	35.3	3.9	56	321	20.95
7.35	221	4	49.4	5.7	79	410	25.33
3.93	147	2	29.6	3.5	22	288	20.72
4	152	2	35.8	3.6	57	217	23.16
7.99	123	2	20.6	2.7	38	267	16
4.2	165	2	39.1	4.3	57	314	23.71
6.43	188	3	38	4.7	155	236	29.16
7.84	117	6	45.2	5.2	26	327	24.57
6.11	87	4	66.1	7	21	760	18.79
3.51	138	2	31.5	3.7	57	258	20.06
5.55	142	3	37.5	4.5	20	334	19.42
3.03	112	2	24.8	3.1	23	275	17.03
3.61	118	2	33.4	3.9	49	302	17.08
3.26	106	2	34.2	3.8	42	397	14.95
3.48	177	2	25.4	3.2	36	253	19.63
4.16	188	3	30.7	4	33	406	16.88
5.51	166	3	47.6	5.6	136	320	28.08
5.18	179	4	54.2	5.4	100	338	30.7
4.8	142	3	62.8	5.2	101	282	27.41
6.47	165	3	50.7	4.8	65	216	29.33
3.3	125	2	20.9	2.7	177	195	20.22
4.02	133	2	37.1	4.1	118	295	20.24
4.44	102	3	41.2	4.8	29	439	15.19
3.69	146	2	33.8	3.8	83	261	20.89
7.31	174	4	31.9	4.1	73	350	27.46
14.2	239	9	82.4	10.4	45	783	20.12
5.65	190	3	36.4	4	75	292	28.46
4.69	131	3	39	4.7	48	387	23.93
3.7	109	3	27.1	3.6	43	1010	37.25

7.33	254	5	36	4.2	44	439	41.09
4.53	233	4	28.1	3.7	45	535	35.87
4.38	112	2	33.3	4	55	358	17.12
4.77	143	2	38.8	4	126	198	16.05
6.02	205	2	44.2	4.4	64	374	32.05
4.71	185	3	43.5	4.3	53	384	29.7
5.46	243	2	25.9	2.6	80	305	37.16
5.66	223	2	31.2	3.6	47	409	32.56
3.31	121	2	28.2	3.5	28	324	17.77
11	126	8	59.5	7.2	11	729	20.6
5.69	93	3	44.6	5.3	9	576	17.54
4.3	95	2	47	5	25	359	19.67
3.42	102	2	45	4.5	33	201	23.58
3.36	164	2	26.2	3.1	19	195	24.59
4.78	171	2	32.5	3.8	16	288	23.04
3.48	155	2	30	3.5	9	159	27
2.97	92	2	28.7	3.6	21	422	13.88
3.23	106	2	29	3.4	22	388	16.8
4.12	131	2	35.6	4.3	30	408	18.61
3.83	115	2	33.1	3.9	23	398	16.92
3.97	120	2	34.1	4.1	23	459	18.42
3.66	120	2	30.6	3.8	22	428	19.31
4.69	152	3	35.7	4.7	32	432	24.99
4.28	139	2	47.3	5.1	26	250	21.64
4.38	142	2	27	3.2	35	205	20.28
3.89	147	2	29.1	3.3	23	231	21.68
3.57	153	3	30.2	3.6	28	248	23.22
3.28	96	2	36	3.9	49	371	15.9
2.93	91	2	31.8	3.4	42	358	14.88
3.17	107	2	34.8	3.8	43	365	16.78
3.47	104	2	35.6	4	44	356	16.68
3.18	96	2	34.6	3.8	38	371	16.11
3.48	117	2	36.5	3.9	37	302	18.56
4.88	123	2	35	3.8	121	292	21.61
4.84	136	2	39.5	4.2	122	304	21.72
5.31	132	2	42.7	4.4	108	303	21.73
4.43	138	2	43.4	4.4	112	265	21.78
4.4	136	2	45.8	4.7	124	276	21.54
4.53	141	2	38.7	4.2	86	257	22.77
4.95	144	2	38.2	4.2	90	264	22.78
5.53	168	2	38.2	4.1	80	255	23.08
6.61	248	3	27.4	3.4	31	233	28.16
3.04	164	3	25.4	3	124	171	25.48
3.79	142	3	37.2	3.8	97	223	23.29
4.79	135	3	36	4	87	263	22.11
4.43	142	3	34.5	4.1	75	223	19.74
5.48	197	3	28.3	3.6	66	223	27.71

4.68	182	3	39.1	4.1	45	218	26.8
4.68	189	3	40.2	4.3	41	204	25.14
5.87	184	3	37.8	4	37	221	23.66
5.3	167	3	36.5	4	38	246	22.76
4.43	165	4	32	3.9	37	238	23.13
3.82	153	3	28.5	3.5	36	254	23.09
4.01	139	3	29.4	3.6	36	245	22.6
3.43	113	2	30.2	3.5	38	396	14.62
3.71	129	2	33	3.8	65	347	18.62
3.88	116	2	29.9	3.7	125	325	17.61
4.03	116	2	32.9	4	119	356	17.14
3.72	120	2	30.3	3.9	102	360	17.32
3.71	120	2	37.1	4.1	84	352	17.17
3.64	131	2	39.9	4.4	71	305	17.48
3.7	111	2	42.6	4.3	38	358	15.97
3.56	119	2	36.8	4.1	36	366	17.42
3.53	123	2	35.7	3.9	39	370	17.78
3.58	136	2	33.3	3.9	39	325	19.32
3.67	126	2	31.3	3.7	40	380	18.22
3.5	127	2	29.3	3.6	33	352	18.68
3.49	134	2	28.1	3.3	37	323	19.37
3.53	127	2	30.5	3.5	33	381	18.67
3.12	132	2	33	3.6	107	219	19.43
3.3	132	2	36.9	3.8	119	262	19.65
3.35	135	2	36.6	4.1	109	255	19.81
3.56	134	2	39.3	4.3	111	268	19.59
3.57	136	2	41.1	4.3	118	296	19.45
3.48	147	2	37.2	3.9	142	203	20.98
3.65	158	2	31.2	3.5	115	182	22.45
4.07	120	2	36.1	4.2	39	373	17.73
3.42	104	2	30.4	3.4	35	365	16.13
4.07	145	2	33.6	3.8	46	313	22.66
4.76	207	3	26.4	3.8	49	232	31.45
9.87	334	5	29.9	4.3	39	337	30.01
4.61	175	2	27.5	3.5	37	207	28.96
3.83	136	2	31.9	3.8	32	262	24.46
4.25	154	3	35.1	4.2	35	286	26.09
4.96	172	5	47.6	5.3	39	367	28.6
4.01	162	2	46.2	4.8	67	259	19.71
3.74	126	2	41.8	4.5	48	292	19.31
4.19	137	2	39.8	4.3	80	280	20.12
3.61	113	2	43.5	4.8	89	331	17.07
3.9	124	2	51.5	5.6	95	360	17.69
3.73	129	2	48.6	5.4	144	293	18.53
3.83	129	2	48.4	5.3	184	276	18.6
3.52	134	2	42.5	4.5	80	277	19.37
3.88	143	2	49.3	4.7	97	306	19.95

3.27	87	1	38.9	4	36	515	13.9
3.69	95	2	39.8	4.5	37	488	15.34
5.11	130	2	33.7	4	31	460	18.23
4.18	141	2	31.6	3.7	38	279	22.86
4.05	142	1	27.1	3.2	40	257	22.15
4.01	142	2	31.9	3.7	36	320	21.65
3.82	158	2	29.2	3.2	40	236	22.9
3.97	150	2	31.6	3.7	43	227	23.25
4.72	150	2	54.9	5.6	121	379	20.42
4.2	127	2	37.9	4.3	55	438	17.91
4.77	137	2	38.7	4.3	64	410	19.41
4.24	137	2	34.8	4	50	391	19.64
3.91	143	2	34.9	4	53	331	22.39
4.12	118	3	38	4.3	63	394	20.64
2.69	96	2	42.9	4.2	105	267	14.93
2.45	117	1	20.6	2.3	125	120	16.97
4.79	187	2	26.8	3.2	109	222	21.62
3.21	130	2	29.2	3.1	60	229	20.4
3.34	134	2	28.4	3.3	58	261	19.89
3.74	143	2	34.4	3.9	30	345	21.04
3.32	154	2	31	3.6	35	272	21.8
2.22	128	1	49.4	5	343	110	14.48
3.63	168	2	31.2	3.6	94	209	22.44
3.9	165	2	51	5	176	176	21.16
3.53	159	2	33.1	3.5	40	209	19.27
3.82	158	2	35.9	3.9	86	234	21.12
3.48	150	2	35.6	4	113	195	20.22
3.86	159	2	39.4	4.2	88	188	20.26
4.02	162	2	34.2	3.8	69	176	19.88
3.18	127	2	36.8	3.8	25	345	19.35
2.73	127	2	28.1	3	26	331	20.78
3.04	117	2	31.4	3.1	23	339	18.09
2.94	105	2	31.2	3.3	35	349	17.86
3.31	105	2	37.6	4	40	391	17.44
3.29	137	3	37.2	4.2	31	341	21.83
3.29	155	3	51.4	4.9	33	310	22.11
5.88	178	3	41.4	4.3	42	326	21.61
3.08	124	2	20.5	2.5	48	184	16.25
4.35	152	3	28.8	3.4	36	293	24.6
3.74	175	3	28.2	3.4	24	297	23.26
2.92	127	2	24.9	3.1	19	372	16.76
4.45	134	4	46.4	5.3	43	506	20.67
3.57	114	3	36.2	4.5	25	448	22.3
4.12	129	2	31.6	3.9	24	458	18.58
4.08	117	2	40.9	4.4	52	481	17.5
2.98	127	2	31.5	3.4	43	226	17.66
4.33	141	2	41.1	4.5	39	328	23.21

2.77	174	2	29.8	3.2	69	159	20.17
3.69	163	2	39.5	4.2	53	369	21.8
4.22	159	2	36.9	4.5	66	367	20.56
3.34	132	2	34.8	3.8	124	353	15.72
4.28	163	3	34.4	3.9	54	273	25.77
3.6	164	2	29.2	3.2	26	260	20.96
3.33	158	2	33.4	3.5	27	226	21.35
3.35	169	2	30.8	3.2	23	187	20.13
3.47	133	2	29.9	3.2	28	323	15.51
3.78	128	2	27.7	3.3	58	309	15.93
4.12	133	2	32.4	3.5	76	291	16.61
3.97	142	2	33.4	3.8	80	308	17.8
3.51	131	2	33.5	3.7	65	397	16.75
2.94	165	2	26.8	3.1	123	234	17.96
3.28	181	2	28.1	3.2	108	242	22
4.2	194	2	51	4.8	47	205	25.66
3.18	139	2	39.6	4.3	59	216	24.58
3.63	128	2	39.5	4.3	185	237	20.96
3.87	130	2	32.7	3.7	105	263	21.62
3.91	76	2	33.7	3.8	44	512	11.76
3.42	94	2	31.1	3.8	50	401	14.24
3.92	133	2	30.7	3.3	42	194	23.03
3.14	55	2	31.3	3.3	19	603	13.08
3.3	46	2	33	3.5	18	752	11.57
2.91	37	1	25.1	2.9	14	575	9.54
3.08	116	2	35.6	3.9	143	184	19.96
2.89	104	2	41.1	3.8	70	260	20
3.03	105	2	33.2	3.7	81	393	16.02
3.14	79	2	33.1	3.8	53	420	13.27
3.49	138	2	29	3.3	81	198	20.94
4.2	119	3	44.5	4.8	143	396	17.94
4.75	109	2	39.1	4.3	67	370	19.18
3.19	67	2	36.9	4.1	21	556	14.17
3.19	58	2	31.4	3.8	26	589	12.76
4.33	126	2	29.3	3.5	103	194	20.99
4.24	157	2	28.8	3.6	109	167	22.12
4.76	154	2	19.9	2.7	38	157	24.41
4.05	150	2	19	2.7	51	170	23.04
3.9	115	2	24.1	3.3	126	203	21.29
3.93	131	2	51.4	4.4	121	195	20.58
3.7	145	2	24.3	3.3	95	166	20.85
3.38	126	2	28.9	3.4	101	180	20.38
3.45	153	2	32.4	3.7	22	327	22.06
3.99	121	2	31.8	3.6	26	344	20.72
3.6	139	2	29.5	3.4	26	235	24.06
4.6	131	3	30.3	3.8	43	326	19.73
3.95	162	3	29.4	3.4	62	175	26.32

4.44	161	3	33.6	3.9	109	184	24.71
4.88	142	2	38.7	4.1	135	215	21.73
2.92	113	2	30.6	3.2	144	148	15.03
4.49	161	2	36.1	4	114	204	24.26
4.52	143	3	36.8	4.4	55	410	21.84
2.65	87	2	28	3.3	27	414	15.98
3.49	104	2	35.5	3.7	83	332	17.2
3.74	158	2	40.8	4.2	241	152	22.12
4.45	122	2	34.6	3.8	76	333	21.02
4.21	125	2	32.9	3.6	71	325	20.82
4.29	118	2	35.2	4.1	58	438	20.45
6.48	163	2	22	2.7	37	124	25.48
4.2	99	2	38.1	4.2	64	417	20.06
6.39	119	2	32.2	3.9	74	372	20.37
4.08	102	2	33.9	3.8	93	414	16.65
6.64	158	2	48.9	4.5	156	161	21.02
4.06	135	2	41.6	4.2	152	161	20.21
4.63	151	2	35.9	3.8	117	166	21.92
4.38	145	2	32.7	3.6	157	171	22.81
4.62	162	2	26.8	3.1	236	166	20.49
4.14	185	2	24.8	3	199	165	20.04
4.63	134	3	36.3	3.9	61	261	24.61
7.01	168	2	30.8	3.4	47	209	25.14
6.88	167	2	28	3.4	60	203	24.44
20.6	166	2	19.1	2.9	135	209	23.71
20.2	240	5	40	5.6	39	368	31.76
9.11	308	3	28	3.5	52	221	35.87
8.53	118	3	31.4	3.7	66	264	28.65
3.34	135	2	28.1	3	113	193	22.04
3.38	164	2	28.5	3.5	127	198	22.64
4.1	157	2	41.6	4	199	173	20.99
5.43	150	2	36.5	3.5	188	185	19.4
3.71	158	3	43.2	4	105	193	24.33
4.81	163	2	42.3	4.2	87	202	24.87
4.74	156	2	42.2	4.3	84	197	24.98
5.72	149	2	43.3	4.5	129	189	24.07
7.2	162	3	53.3	5	121	195	25.92
6.93	180	2	30.3	3.6	105	172	26.44
6.4	174	2	32.1	3.9	128	165	25.04
6.83	163	2	40.4	4.2	179	190	22.66
6.46	162	2	51.2	5.3	186	228	21.68
4.55	91	2	35.4	3.9	25	548	16.8
6.09	180	2	21.4	2.8	181	179	22.31
9.38	223	6	38.5	6	38	462	30.89
4.5	179	4	32.4	4.8	35	400	26.43
5.13	137	3	42.2	5.2	39	482	20.84
0.29	14 <1		4.5	0.4	68	12.8	0.66 1.83

0.74	43 <1		15.2	0.9	189	19.5	0.981	3.42
3.82	111	2	40.5	4.6	100	377	0.019	16.3
3.25	86	2	38	4	83	426	0.007	11.8
3.18	81	1	40.8	3.6	91	357	0.127	11.1
0.19	7 <1		9.6	0.7	24	6	0.558	0.48
4.2	136	2	41.2	3.8	76	213	0.013	20.3
4.3	130	2	45	4.6	116	256	0.007	18
4.22	139	2	33.8	3.6	165	153	0.127	22.7
0.53	22 <1		8.7	0.7	17	11	0.54	1.59
5.27	130	2	43.5	4.8	81	311	0.08	20.7
4.9	112	2	43.7	4.5	63	446	0.028	17.3
3.78	90	1	34.7	3.6	125	376	0.011	10.9
2.52	143	2	31.5	3.6	43	208	0.009	22.3
4.21	69	1	33.6	3.4	56	271	0.136	12.4
2.93	112	2	28.5	3	74	166	0.026	18.9
0.47	12 <1		2.8	0.3	18	10.6	0.296	1.34
6.14	142	3	31.5	3.7	46	232	0.016	24.9
10.4	134	2	74.2	7	99	176	0.077	19.4
3.38	147	2	26.5	2.9	55	181	0.031	21.1
3.39	150	2	30.1	3.6	58	204	0.086	22
3.05	98	2	31.1	3.3	79	222	0.142	15.5
0.48	14 <1		4.2	0.4	21	16.1	0.491	1.53
5.35	172	3	24.3	3.2	45	228	0.104	24.5
4.56	149	2	38.5	4.4	53	209	0.324	21.1
2.91	158	2	26.3	2.8	58	151	0.067	20.8
2.78	156	2	25.8	3.4	39	170	0.007	20.8
0.51	16 <1		3.7	0.4	19	10.3	1.86	1.01
6.7	268	2	28.3	3	397	226	2.63	16.8
7	16	1	4.6	0.5	19	7.5	2.55	1.1
4.24	123	2	26.7	3.4	39	266	0.437	21.8
5.3	131	2	35.8	3.8	61	211	1.49	19.4
51.4	1210	1	54.2	3.7	1740	127	2.26	14.5
0.66	25	1	8.5	0.8	16	30.7	1.66	2.95
6.59	119	2	30	3.4	57	265	1.12	17
29.4	1360	1	8.6	1.3	2260	92.4	3.15	13.3
16.3	70 <1		5.5	0.7	95	20.2	2.61	1.67
3.53	64	2	20.7	2.8	115	435	0.319	13.5
3.06	78	2	35.5	3.6	34	293	0.476	10.4
3.24	104	2	27.6	3.1	43	306	0.534	16.8
90	1480	1	29.6	2.6	1440	100	2.51	13.3
5.16	100	3	44.8	4.7	48	297	2.05	17.8
3.92	132	2	30.4	3.7	120	194	1.62	18.4
0.62	13 <1		6.7	0.7	10	13.2	2.36	1.39
4.75	122	2	29.5	3.5	45	265	3.26	19.8
3.58	102	2	28.7	3.4	23	334	0.461	19.5
4.37	124	2	31	3.7	79	256	1.04	20.6
54.3	919	2	33.2	3.5	352	149	2.81	16.8

3.07	153	2	31.4	3.9	53	260	1.28	19.4
124	1250	1	52.4	4.3	1350	124	2.59	15.5
12.5	24 <1		4.5	0.5	19	27.3	4.99	3.16
5.86	126	4	37.4	4.7	44	380	0.206	26.1
2.84	18 <1		5.4	0.6	28	16.9	2.8	2.15
4.02	132	2	29.7	3.3	97	154	0.08	21.4
4.18	127	2	38.3	4.1	105	208	0.095	22.8
5.11	137	2	36.5	4.1	83	133	0.357	23.9
4.01	53 <1		13.4	1.3	80	12.3	0.952	1.77
3.94	138	2	30.4	3.4	109	135	0.049	24.1
0.67	25 <1		7.9	0.9	23	24.8	2.34	2.8
2.97	121	2	27.4	3.3	81	308	0.531	16.8
3.81	67	1	35.1	3.5	65	310	1.4	9.82
44.7	1880	1	17.6	2	1840	85.2	2.82	12.8
1.02	40 <1		7.5	0.9	24	31.4	2.45	2.92
3.57	94	2	29.9	3.5	70	362	0.443	15.3
0.71	36 <1		17.7	1.5	37	37.6		3.81
4.06	146	2	35.3	4	92	194		23.9
3.74	137	1	35.7	3.6	83	175		23.4
3.44	131	2	39.3	4.1	149	202		22.3
5.85	120	2	45.4	5	66	369		20
5.56	141	2	31.5	3.7	78	215		23.8
5.78	135	2	32	3.7	73	224		24.2
3.93	117	1	49.9	4.4	2970	154		19.3
5.13	83	1	38.5	4.2	79	390		17.4
4.5	84	1	36.2	4.2	75	370		17.3
2.24	263 <1		23.2	2	24	55.2		6.68
3.87	120	2	36.7	3.9	55	269		19.6
3.48	118	2	33.7	3.7	59	261		19.3
4.06	120	1	34.3	3.7	65	220		18.5
4.2	122	1	36	3.7	66	226		18.7
3.08	70 <1		26	3.1	53	279		13.3
1.93	30 <1		14.3	1.6	28	153		6.19
3.95	103	1	25.4	3.2	72	272		16.3
5.19	107	1	32.4	3.4	53	282		16.3
3.89	230 <1		24.9	2.8	93	227		12.4
4.68	115	2	40.6	4.5	73	307		21.3
4.28	118	2	40.4	4.3	81	270		21.3
3.67	92	2	34.1	4.2	28	527		11.3
4.47	140	5	42.7	5.3	38	416		17.8
4	116	2	43.4	5.2	26	437		17
3.47	158	2	26.6	3.3	28	258		19.6
2.97	148	2	27.7	3.4	20	305		19.6
3.37	163	3	32.8	4	34	360		19.5
1.8	37	1	22.8	2.8	9	362		4.86
1.68	37	1	20.8	2.5	12	294		4.66
2.06	42	1	23.5	2.9	9	298		6.47

4.31	126	2	37.2	4.2	110	336	20.4
3.3	121	2	32.4	3.9	22	364	18.2
3.36	85	2	27.1	3.2	32	383	12.2
4.06	126	2	40	4.3	38	367	17.9
4.25	114	2	27.6	3.5	70	407	17.7
7.53	134	2	55.9	5.1	287	156	22.1
3.58	132	2	25.9	3.2	56	282	17.6
7.02	136	2	34.1	4.4	66	453	20.1
3	81	2	28.7	3.9	44	449	12
2.35	164	2	23.3	3.4	23	205	21.1
3.82	75	2	19.4	2.8	237	313	13.2
2.45	164	2	32.1	3.9	87	148	25.3
4.65	184	2	28.2	3.3	40	164	25.6
3.86	128	2	32	3.9	26	524	14.3
7.39	108	2	24.9	3.4	32	355	20
8.69	56 <1		38	3.2 <5		156	9.06
3.5	86	1	22.7	2.9	15	229	12.1
2.75	87	1	22.1	2.8	13	198	13.1
2.46	74	1	26.1	2.9	21	174	11.1
15.7	106	1	35.4	3.2	129	185	13.5
3.32	84	1	21.2	2.7	23	204	13.1
2.6	77	1	22.5	2.8	29	191	13.3
2.18	79	1	19.5	2.6	34	185	13.9
2.89	120	2	32	3.5	95	197	18.7
2.3	104	1	39.4	3.5	101	242	16.7
2.31	86	1	23.6	2.9	70	283	13.4
2.4	127	2	31	3.6	66	262	14.6
3.45	120	2	28.1	3.3	80	243	16.7
5.86	148	2	25.5	3.5	29	396	22.3
4.53	150	2	26	3.4	25	318	21.5
4.45	182	2	29.2	3.7	33	188	23.2
4.75	150	2	29.9	3.9	99	233	22.5
6.32	92 <1		28.9	3	50	78.6	13.4
6.44	117	2	24.2	3.3	33	237	17.3
3.51	117	2	19.7	2.8	28	237	18.2
3.27	102	1	19.6	2.7	68	190	16.7
2.81	92	1	30	3.2	60	185	14.6
2.86	118	2	29.5	3.7	50	252	16.9
1.99	119	1	20.1	2.4	83	115	17.9
2.68	119	1	28	3	70	155	17.2
2.95	138	1	28.8	3.3	98	141	19.5
2.44	127	2	25.9	3.3	87	164	16.8
3.08	173	2	21.6	3	65	196	15.8
2.84	119	2	23.9	3.2	48	299	14.7
2.22	84 <1		19.2	2	35	100	8.85
2.07	95	1	19.3	2.5	43	172	13.9
2.31	109	1	23.8	3.1	65	188	15.8

2.48	110	1	28.7	3.1	67	162	16
2.16	108	2	25.3	3.1	48	159	16.4
18.4	40 <1		60.3	4.3	14	60.4	6.31
2.28	116	1	20.1	3	42	165	18
6.15	140	2	23	3.1	27	210	18.3
4.81	71	1	23.9	2.7	40	200	11.7
9.61	238	2	13.4	2	32	133	18.9
4.15	151	2	16.2	2.4	69	141	22.2
2.99	120	2	24.1	2.8	68	192	17.1
2.5	96	5	23.8	2.7	44	210	11.8
2.02	92	1	31.8	3.1	66	113	12.2
2.93	133	1	11.4	1.9	79	111	20.1
2.98	171	1	18.2	2.6	69	114	19.6
3.49	82	2	18.1	2.3	35	217	15.9
4.54	115	2	31	3.7	50	287	19.6
5.13	94	1	32.4	3.8	39	406	17.5
4.12	85 <1		33.4	3.8	39	328	14.7
4.42	100	1	42.3	4.4	58	337	16.9
5.29	95	1	94.8	5.8	59	316	15.8
11.1	133 <1		16.6	1.9	16	111	9.59
7.54	115	1	29.6	3.7	46	300	18.9
4.48	107	1	34.6	4.2	44	299	20.2
3.96	105	1	33.9	4.1	44	306	19.7
4.3	118	1	36.9	4.4	56	292	21
4.33	94	1	36.7	4.5	48	377	19.1
4.68	112	2	31	3.9	111	247	23.8
5.08	117	2	29.3	3.8	73	278	24.4
5.64	118	2	32	3.8	74	278	24.5
4.89	124	2	27.9	3.7	43	288	24.3
4.6	135	2	39.4	4.4	50	364	23.6
7.44	98	1	44.9	4.3	46	281	15.7
16.2	73 <1		46.8	3.9	138	160	10.4
4.56	112	1	51.3	5.8	133	250	17.5
3.3	102	1	42.1	4.7	67	340	19.1
3.54	109	1	50	5.6	97	347	17.6
3.54	101	1	42.2	4.7	91	380	18.4
3.31	99	1	37.3	4	85	356	16.7
2.98	95 <1		42.9	4.5	69	286	12.9
3.62	107	1	45.8	4.9	123	349	18.6
2.81	106 <1		64.6	5.3	80	134	10.8
2.54	42 <1		14.6	1.2 <5		50.3	3.97
5.34	91 <1		30.5	3.6 <5		103	8.99
10.5	146	2	35.6	4.1	106	214	22.4
5.24	135	1	32	3.5	312	174	20.6
5.97	153	1	46.9	4.7	186	190	22.8
7.77	155	2	99	7.8	165	195	23.2
6.22	147	1	51.5	5.6	260	176	23.8

8.06	110	1	58.8	5.8	207	300	18.7
5.08	65 <1		32.3	3.5	93	394	13.4
5.59	114	1	36.7	4.1	22	341	19.6
10.8	119	2	66	5	20	299	15.4
2.89	117	2	39.9	4.3	46	348	14.6
2.7	178	2	55	6.3	30	209	12.9
2.96	107	2	32.5	3.6	35	319	19.8
2.95	129	2	30.5	3.6	34	314	19.9
2.75	113	2	36.9	3.9	54	291	16.6
2.89	121	2	36.3	4.3	37	354	18.1
159	2770	2	78	5	5480	75.5	9.15
23.7	13 <1		8	1.1	75	10.2	1.46
4.42	12 <1		266	21.4	224	15.1	7.05
5.46	152	2	27.7	3.4	173	146	24.5
3.89	102	2	39.9	4.4	44	342	16.5
0.84	11 <1		6.6	0.9	25	8.6	1.01
6.55	103	2	26.2	3.5	120	321	18.7
8.37	96	1	31.1	3.7	20	345	15.6
150	1590 <1		31	3.2	1330	126	15.1
11	26 <1		3.7	0.4	17	21.5	2.29
13.4	159	3	37.9	4.5	77	356	27.4
7.89	206	3	33.9	4	29	330	23.5
1.15	19 <1		7.6	0.6	32	17.2	1.68
6.63	185	3	35.8	4.1	74	232	25
3.82	179	2	28.6	3.3	46	162	24.6
0.51	7 <1		9.6	0.8	8	6.7	0.67
6.56	126	2	102	7	184	253	24.4
4.38	119	2	46.7	5	156	406	14.7
219	2680 <1		74.1	4.9	3180	88.6	10.1
4.23	129	1	21.6	2.9	58	107	21.4
4.9	108	2	39	4.4	62	297	18.7
20.9	342	1	53.2	4.8	127	108	13.5
2.04	52	1	38.9	3.9	20	98.4	12
253	2190 <1		119	7.8	2180	128	12.8
11.1	220	3	26	3.9	67	253	29.6
9.31	200	3	31.9	4.5	93	277	34.1
21.3	488	1	21.1	2.7	235	133	14.1
3.98	116	2	30.3	3.9	87	237	19.2
2.95	108	1	42	4.7	103	253	17.6
104	1590	2	39.2	3.1	2970	96.2	12.3
40.2	905	3	19.1	3.5	300	189	18.3
11.2	109	3	37.1	4.9	23	453	14.6
8.49	154	3	32.9	4.2	83	296	22.8
236	1420	1	55.6	3.8	3850	106	9.64
13	152	4	38.5	4.4	53	319	28
10.1	152	3	46.3	4.9	49	349	24.1
9.84	163	4	31	4.2	30	319	24.4

3.52	147	3	35.1	4.4	88	227	24.3
4.82	168	3	33.5	4	73	203	29.2
4.2	178	3	31.8	3.8	83	152	25.5
51.1	1080	1	27.2	2	1080	59.5	2.73
179	1050	1	55	3.1	1690	63.5	2.75
20.4	53	<1	5.6	0.6	8	8.5	3.22
3.63	107	<1	28.3	3.1	44	201	0.501
7.07	113	3	33.3	3.5	54	280	0.624
3.32	227	<1	40.7	4	89	178	2.07
29.8	290	<1	37.5	3.4	124	101	2.7
155	2180	1	30.6	2.3	3860	70.9	3.41
3.24	8	2	5.5	0.5	13	7.6	2.87
5.93	134	3	30	4.1	25	176	3.02
4.15	136	2	34.1	3.4	90	133	2.03
3.73	156	2	24.8	3.3	69	134	0.67
269	787	2	208	10.3	681	153	2.93
4.33	174	2	27.9	3.4	89	123	1.82
3.9	129	3	31.2	3.8	40	324	0.746
18.5	215	2	44.7	3.3	94	128	8.4
21.1	734	2	26.7	2.9	227	157	3.07
23	242	4	32.1	4.6	55	280	0.386
8.84	139	2	32.2	3.8	110	306	0.772
3.16	104	1	33.7	3.4	85	251	0.542
0.81	25 <1		7.3	0.7	22	35.6	0.756
6.81	171	3	28.6	3.2	42	245	0.373
4.34	103 <1		43.5	3.6	31	126	0.064
4.07	174	1	40.8	3.8	113	119	4.3
0.54	22 <1		4.6	0.5	16	20.9	2.23
23.4	476	4	66.3	3.9	365	94.5	2.39
5.55	152	2	26.2	3.3	51	239	0.711
4.18	92	1	55.2	4.9	77	225	1.46
4.69	143	2	28.6	3.4	98	141	0.574
0.55	17 <1		7.1	0.6	8	17.9	2.47
2.85	153	3	29.6	3.5	94	236	0.63
7.69	143	2	35.2	3.8	71	228	1.92
4.41	152	3	33.3	3.8	63	238	0.725
4.38	117	2	40.5	3.8	45	183	0.124
1.34	38	1	5	0.8	27	50.1	2.43
49.7	1740	1	71.3	4.1	3610	76.7	2.44
2.57	135	1	20.9	2.7	97	121	3.78
3.05	47	1	25.7	2	55	61	0.511
18.5	191	1	32	2.6	296	100	2.37
8.99	1700 <1		2.4	0.4	16	47.5	2.48
3.12	118	2	38.7	3.8	38	235	1.12
2.17	78	1	31.5	3.5	34	288	1.54
1.82	56	1	28.2	2.6	35	155	0.541
99	1570	1	32.8	2.6	1060	98.2	2.61

0.61	11	1	5.7	0.7	12	8.6	3.03
3.68	131	2	23.3	3.3	59	134	0.848
3.66	128	2	27.1	3.1	69	154	2.6
11	249	2	41.9	4.1	298	145	1.32
4.68	97 <1		10.6	1.4	51	45	2.96
3.83	91	2	36.7	4.2	111	382	1.47

BaO %	CaO %	Cr2O3 %	Fe2O3 %	K2O %	LOI %	MgO %	MnO %	Na2O %
0.09	0.06	0.02	2.83	5.47	7.34	1.26	0.03	0.24
0.08	0.02	0.01	1.99	4.62	6.44	0.9	0.02	0.21
0.08	0.04	0.02	2.28	4.8	6.35	1.06	0.02	0.21
0.08	0.06	0.01	4.84	4.66	14.31	1.49	0.02	0.27
0.08	0.08	<0.01	5.1	4.12	7.05	1.7	0.03	0.22
0.07	0.06	0.02	1.9	3.28	18.66	0.86	0.02	0.18
0.09	0.08	0.01	2.32	4.47	9.2	1.04	0.02	0.21
0.12	0.12	0.02	2.03	2.58	12.27	0.58	0.01	0.15
0.08	0.05	0.02	2.09	4.22	7.94	0.99	0.02	0.18
0.08	0.03	0.02	3.43	4.02	8.46	1.28	0.02	0.18
0.08	0.02	0.02	4.04	4.05	8.49	1.22	0.02	0.17
0.08	0.03	0.02	4.42	4.03	9.32	1.34	0.02	0.2
0.09	0.05	0.02	3.84	4.2	10.21	1.15	0.02	0.19
0.18	0.06	0.02	2.64	1.96	11.07	0.41	<0.01	0.12
0.09	0.03	0.02	2.91	4.14	9.46	0.8	0.01	0.2
0.07	0.03	0.02	2.41	4.31	8.6	0.85	0.01	0.21
0.97	0.02	0.01	6.86	4.36	8.59	0.98	0.01	0.21
0.09	0.1	0.02	2.19	3.46	10.79	0.88	0.01	0.22
0.07	0.15	0.02	2.26	3.35	10.5	0.85	0.02	0.21
0.07	0.16	0.02	2.82	3.56	9.84	0.88	0.01	0.21
0.07	0.12	0.02	2.09	3.38	8.38	0.79	0.01	0.21
0.07	0.19	0.02	4.7	3.44	9.24	0.88	0.05	0.22
0.04	0.05	0.02	2.81	2.09	23.72	0.65	<0.01	0.24
0.05	0.04	0.02	2.06	2.12	13.4	0.63	<0.01	0.22
0.04	0.03	0.01	1.17	2.1	5.34	0.52	0.01	0.18
0.06	0.05	0.02	1.58	2.52	6.66	0.61	0.02	0.21
0.06	0.04	0.02	2.31	2.84	8.33	0.68	0.01	0.23
0.07	0.04	0.02	1.96	3.11	8.92	0.78	0.01	0.26
0.07	0.04	0.02	2.26	3.59	13.16	0.87	0.01	0.22
0.07	0.04	0.02	2.82	3.45	12.29	0.84	<0.01	0.22
0.07	0.04	0.01	3.05	3.66	8.97	1.07	0.02	0.22
0.07	0.06	0.02	4.19	3.52	11.87	0.89	<0.01	0.24
0.06	0.04	0.02	2.48	3.05	7.36	0.66	0.01	0.18
0.08	0.04	0.02	5.02	4.06	10.08	0.91	0.01	0.25
0.08	0.04	0.02	4.02	3.8	8.66	0.93	0.01	0.25
0.03	0.1	0.03	3.48	1.01	14.15	0.7	<0.01	0.18
0.05	0.07	0.02	3.31	2.57	11.55	0.79	<0.01	0.18
0.05	0.07	0.03	2.03	1.89	11.11	0.63	0.01	0.17
0.07	0.05	0.02	1.94	3.06	8.27	0.73	0.02	0.21
0.07	0.04	0.02	1.79	3.68	7.34	0.8	0.02	0.24

0.05	0.02	0.02	1.18	2.48	5.27	0.53	0.01	0.16
0.05	0.02	0.02	1.48	2.74	5.85	0.6	0.02	0.17
0.08	0.07	0.01	3.32	4.14	7.1	1.41	0.03	0.24
0.09	0.07	0.01	3.66	4.25	7.44	1.51	0.03	0.23
0.07	0.08	0.01	5.63	4.69	7.46	1.56	0.04	0.19
0.07	0.03	0.02	8.13	4.92	13.06	1.04	0.01	0.19
0.08	0.02	0.01	6.7	4.46	8.92	1.18	0.02	0.19
0.07	0.02	<0.01	6.54	3.41	8.54	0.65	<0.01	0.13
0.08	0.06	0.01	4.41	4.02	10.65	0.96	<0.01	0.22
0.07	0.08	0.02	3.93	2.98	20.93	0.62	<0.01	0.19
0.08	0.03	0.02	3.36	4.44	8.54	1.04	0.01	0.16
0.07	0.04	0.02	4.13	4.28	8.4	1.31	0.02	0.2
0.09	0.11	0.02	5.74	4.24	8.49	1.19	0.04	0.22
0.06	0.1	0.02	12.64	2.51	9.7	0.7	0.06	0.18
0.06	0.04	0.02	6.91	1.62	11.33	0.45	0.08	0.12
0.04	0.04	0.03	3.76	1.5	11.72	0.44	0.01	0.11
0.08	0.02	0.02	6.24	1.54	11.53	0.42	0.25	0.12
0.04	0.04	0.02	1.96	1.53	16.82	0.54	<0.01	0.12
0.04	0.05	0.03	1.76	1.54	12.15	0.59	0.01	0.12
0.04	0.04	0.03	1.72	1.48	12.13	0.55	0.01	0.12
0.05	0.07	0.03	2.14	2.04	11.36	0.57	0.01	0.17
0.05	0.04	0.01	17.32	3.2	31.99	0.6	<0.01	0.17
0.06	0.03	0.01	2.33	3.38	8.54	0.78	0.02	0.17
0.06	0.05	0.01	4.41	3.41	6.54	1.31	0.03	0.16
0.06	0.12	0.01	6.52	3.3	6.25	1.34	0.07	0.17
0.06	0.12	0.01	5.94	3.88	6.44	1.56	0.06	0.2
0.07	0.12	0.02	5.37	4.22	6.48	1.68	0.04	0.22
0.07	0.12	0.02	5.17	4.37	6.85	1.69	0.04	0.22
0.06	0.5	0.01	8.84	2.58	28.11	0.72	0.02	0.19
0.05	0.05	0.02	3.62	2.93	16.55	0.88	<0.01	0.14
0.08	0.04	0.02	1.92	3.77	8.94	0.8	0.01	0.18
0.08	0.03	0.02	2.08	3.8	6.2	0.84	0.02	0.16
0.08	0.05	0.01	2.48	3.7	7.4	0.91	0.02	0.18
0.04	0.02	<0.01	2.75	2.29	3.66	0.23	<0.01	0.07
0.06	0.07	0.02	1.59	3.09	7.65	0.63	0.03	0.26
0.02	0.08	0.02	1.7	2.6	13.92	0.69	0.02	0.32
0.04	0.09	0.02	1.06	2.21	6.14	0.53	0.06	0.07
0.04	0.07	0.02	1.24	2.38	6.25	0.58	0.1	0.08
0.04	0.07	0.02	0.96	1.82	5.56	0.45	0.02	0.05
0.03	0.08	0.02	1.36	2.01	6.67	0.56	0.02	0.1
0.04	0.23	0.02	4.44	2.48	7.12	1.08	0.02	0.05
0.07	0.07	0.02	3.99	4.06	10.1	0.86	0.02	0.25
0.07	0.05	0.02	4.11	3.82	9.34	0.95	0.02	0.18
0.06	0.07	0.02	5.46	3.49	10.63	0.83	0.02	0.2
0.06	0.02	0.05	1.29	2.79	5.72	0.6	0.03	0.1

0.07	0.02	0.03	1.43	3.42	6.67	0.72	0.02	0.14
0.06	0.03	0.04	1.67	3.54	7.35	0.75	0.03	0.17
0.06	0.03	0.03	1.95	3.35	8.08	0.75	0.03	0.17
0.02	0.05	0.04	1.71	1.5	11.5	0.5	0.02	0.07
0.04	0.04	0.03	1.72	2.36	10.89	0.65	0.02	0.1
0.08	0.05	0.02	2.33	2.92	14.05	0.75	<0.01	0.23
0.06	0.06	0.03	2.74	2.01	13.84	0.65	<0.01	0.22
0.05	0.04	0.01	1.2	2.6	23.78	0.5	0.01	0.16
0.11	0.05	0.02	3.76	1.72	16.92	0.51	<0.01	0.12
0.07	0.04	0.01	2.08	3.74	8.49	0.85	<0.01	0.22
0.05	0.02	0.01	1.76	2.47	7.67	0.54	<0.01	0.17
0.04	0.04	0.01	1.61	2	6.56	0.45	0.01	0.14
0.05	0.02	0.01	1.77	2.46	7.62	0.53	<0.01	0.16
0.05	0.05	0.01	2.07	2.38	6.83	0.5	0.01	0.15
0.08	0.31	0.03	6.22	3.94	6.84	1.06	0.04	0.21
0.08	0.28	0.03	5.41	4.06	6.7	1.01	0.03	0.25
0.08	0.32	0.02	6.06	4.61	7.05	1.41	0.03	0.22
0.06	0.09	0.02	1.15	2.98	6.74	0.59	0.01	0.18
0.06	0.45	0.01	13.44	3.84	6.61	2.54	0.04	0.57
0.06	7.13	0.02	4.16	3.23	11.97	1.77	0.06	0.81
0.06	0.11	0.02	3.99	3.41	10.47	1.11	0.01	0.17
0.06	0.1	0.02	4.29	3.51	8.9	1.22	0.01	0.18
0.06	0.21	0.02	4.59	3.45	9.02	1.25	0.01	0.18
0.08	0.08	0.02	2.66	3.81	9.8	0.9	0.01	0.19
0.08	0.05	0.01	4.51	3.4	9.7	1.03	0.02	0.19
0.06	5.84	0.01	3.99	2.74	11.29	3.33	0.07	0.59
0.08	0.56	0.02	3.71	4.45	7.07	1.42	0.01	0.18
0.08	0.25	0.02	2.06	3.22	6.73	0.93	0.02	0.2
0.06	0.5	0.01	5.38	2.81	4.31	0.99	0.05	0.8
0.07	0.11	0.02	4.67	3.5	11.39	1.38	0.03	0.24
0.09	0.14	0.01	5.12	3.73	9.83	1.52	0.08	0.25
0.05	0.17	0.02	2.67	2.12	7.2	0.6	<0.01	0.22
0.06	0.2	0.02	2.28	2.76	8.5	0.77	0.01	0.28
0.06	0.19	0.02	2.88	2.86	8.95	0.82	0.01	0.27
0.06	0.12	0.02	2.12	2.4	6.09	0.6	0.02	0.15
0.06	0.12	0.01	1.91	2.7	5.71	0.6	0.02	0.15
0.07	0.12	0.02	3.77	2.81	6.09	0.64	0.02	0.16
0.1	0.19	0.02	2.99	2.99	9.96	0.97	0.01	0.18
0.1	0.2	0.02	2.76	3.07	10.15	0.97	0.02	0.19
0.06	0.09	0.02	5.18	2.27	9.54	0.64	<0.01	0.18
0.05	0.09	0.02	1.89	2.85	10.72	0.78	0.01	0.18
0.07	0.06	0.01	1.88	3.72	7.54	0.82	0.01	0.23
0.08	0.05	0.02	4.44	4.21	7.09	1.63	0.03	0.26
0.15	0.09	0.02	5.8	4.1	7.89	1.75	0.09	0.24
0.08	0.07	0.01	5.82	4.08	7.39	1.61	0.03	0.22
0.19	0.08	0.02	4.88	3.49	12.3	1.56	<0.01	0.11
0.09	0.06	0.02	5.16	3.34	11.4	1.63	<0.01	0.11

0.05	7.52	0.01	10.04	2.31	16.68	0.86	0.02	0.27
0.04	1.49	0.01	8.62	2.89	11.66	1.16	<0.01	0.42
0.1	0.08	0.02	4.97	3.31	15.55	0.94	<0.01	0.19
0.05	0.04	0.02	4.03	3.49	10.31	1.05	<0.01	0.16
0.06	0.04	0.01	10.46	2.71	8.76	0.65	0.02	0.17
0.07	0.04	0.02	4.12	2.54	10.56	0.8	<0.01	0.19
0.06	0.03	<0.01	6.23	3.23	7.71	0.84	0.03	0.19
0.06	0.08	0.01	3.08	2.89	5.61	1.02	0.02	0.15
0.06	0.92	0.01	4.3	3.12	6.12	1.51	0.03	0.16
0.04	0.13	0.02	5.08	2.28	10.46	0.52	0.02	0.22
0.05	0.17	0.02	3.78	3	7.29	1.06	0.03	0.2
0.04	0.06	0.02	3.82	2.25	6.01	0.68	0.02	0.21
0.05	0.09	0.02	4.55	2.59	8.63	0.77	0.02	0.24
0.07	0.14	0.01	9.76	3.23	10.87	1	0.08	0.22
0.06	0.21	0.02	6.36	3.75	8.1	1.22	0.09	0.24
0.08	0.14	0.02	5.86	4.02	8.58	1.1	0.02	0.22
0.08	0.39	0.02	4.68	2.15	10.98	1.1	0.02	0.15
0.06	0.45	0.02	4.38	3.7	8.01	1.45	0.03	0.13
0.11	0.45	0.02	4.36	3.66	8.86	1.45	0.03	0.13
0.05	1.09	0.02	16.25	3.36	11.22	1.75	0.61	0.12
0.05	0.06	<0.01	3.09	2.08	6.27	0.49	0.01	0.47
0.12	0.09	0.02	3	3.48	9.27	0.88	0.01	0.2
0.04	0.09	0.02	3.26	1.78	13	0.66	<0.01	0.16
0.04	0.06	0.02	2.04	1.87	9.84	0.68	<0.01	0.15
0.04	0.06	0.02	2.21	2.08	9.92	0.65	<0.01	0.16
0.05	0.05	0.02	2.85	2.35	10.47	0.65	<0.01	0.17
0.05	0.03	0.02	1.96	2.78	7.24	0.72	0.01	0.17
0.05	0.03	0.02	1.78	2.83	6.34	0.7	0.01	0.17
0.06	0.04	0.02	6.63	2.55	7.15	0.61	0.02	0.16
0.05	0.16	0.03	2.82	2.24	13.03	0.78	0.01	0.17
0.05	0.1	0.03	1.85	1.24	13.52	0.46	<0.01	0.13
0.05	0.06	0.02	1.76	2.17	9.32	0.48	<0.01	0.19
0.07	0.05	0.02	2.24	2.87	7.97	0.56	<0.01	0.22
0.06	0.03	0.01	1.35	2.75	6.23	0.52	<0.01	0.18
0.08	0.04	0.02	1.45	3.5	5.83	0.63	0.01	0.24
0.08	0.07	0.01	1.42	3.36	5.88	0.62	0.01	0.21
0.08	0.08	0.01	4.19	3.2	16.48	1.06	0.03	0.34
0.07	0.1	0.01	5.05	3.3	7.48	1.43	0.04	0.48
0.1	0.01	0.02	1.6	4.31	7.57	0.79	0.02	0.37
0.1	0.02	0.02	1.26	4.49	9.17	0.77	0.01	0.37
0.1	0.63	0.01	12.26	3.46	8.58	1.98	0.3	0.12
0.08	0.16	0.02	5.5	4.93	5.73	1.63	0.03	0.16
0.05	0.1	0.02	3.19	4.25	6.28	0.89	0.03	0.13
0.13	0.09	0.02	1.83	3.78	6.93	0.8	0.01	0.16
0.07	0.06	0.02	1.53	3.81	6.3	0.7	0.02	0.1
0.06	0.12	0.02	2.35	2.64	9.3	0.76	0.01	0.16
0.04	0.06	0.01	1.51	2.65	5.45	0.62	0.02	0.06

0.05	0.3	0.01	14.73	3.3	10.85	1.22	0.19	0.11
0.04	0.05	0.02	1.6	3.02	5.39	0.68	0.02	0.1
0.05	0.12	0.02	2.45	2.32	11.32	0.85	0.02	0.24
0.09	0.11	0.03	2.3	2.24	11.13	0.46	0.02	0.11
0.06	0.22	0.02	6.61	3.2	11.94	0.72	0.03	0.12
0.06	0.38	0.02	3.15	3.48	7.24	1.27	0.02	0.29
0.07	0.2	0.02	3.39	3.81	12.1	1.27	0.01	0.2
0.07	0.08	0.02	1.99	3.34	6.67	0.75	0.01	0.27
0.09	0.48	0.02	8.34	3.62	10.41	1.62	0.1	0.25
0.1	0.08	0.01	1.7	3.58	7.06	0.81	0.01	0.24
0.06	0.18	0.02	5.01	3.42	5.68	0.9	0.03	0.14
0.09	0.14	0.02	2.71	3.96	6.93	0.76	0.02	0.23
0.04	14.56	0.02	3.12	2.08	15.43	0.85	0.07	0.4
0.06	0.16	0.02	2.4	2.15	10	0.72	<0.01	0.5
0.05	4.02	0.02	4.75	3.8	10.3	1.16	0.04	0.53
0.04	0.28	0.02	1.34	1.68	10.26	0.68	<0.01	0.11
0.06	0.16	0.01	1.16	2.31	6.56	0.59	<0.01	0.07
0.02	0.07	<0.01	0.44	0.76	2.48	0.19	<0.01	<0.01
0.08	0.21	0.03	3.11	3.19	7.18	0.82	0.02	0.12
0.04	0.25	0.04	8.52	1.63	12.59	0.82	0.02	0.18
0.05	0.19	0.02	7.94	2.78	8.9	0.73	0.02	0.14
0.08	0.05	0.03	3.08	3.66	7.43	0.86	<0.01	0.16
0.04	0.23	0.02	4.67	2.15	24.38	0.57	0.03	0.08
0.04	0.25	0.01	2.58	2.81	8.31	0.86	0.01	0.16
0.05	0.31	0.02	2.29	3.54	9.81	1.09	0.02	0.18
0.03	0.16	0.02	1.4	1.38	32.96	0.5	<0.01	0.09
0.03	0.19	0.02	0.88	1.29	13.93	0.37	<0.01	0.03
0.07	0.06	0.02	4.18	3.56	6.91	1.24	0.02	0.12
0.05	0.03	0.01	1.48	2.82	6.34	0.65	0.01	0.08
0.04	0.03	0.01	1.29	2.71	5.14	0.63	<0.01	0.06
0.08	0.08	<0.01	3.53	3.28	7.06	1.07	0.02	0.1
0.1	0.08	0.01	6.32	3.02	7.27	0.96	0.01	0.11
0.12	0.05	0.02	3.89	3.86	7.8	0.9	<0.01	0.08
0.06	0.05	0.02	2.54	2.4	7.21	0.6	<0.01	0.05
0.04	0.3	0.02	1.72	2.25	10.45	0.81	<0.01	0.1
0.05	0.32	0.02	2.12	2.12	11.13	0.92	0.01	0.14
0.07	0.2	0.02	1.84	3.75	8.22	0.92	0.01	0.18
0.08	0.21	0.02	1.92	4.21	8.61	1	0.01	0.23
0.05	0.12	0.02	3.52	3.95	6.16	1.37	0.02	0.08
0.06	0.11	0.02	3.98	3.6	8.69	1.56	0.04	0.16
0.06	0.15	0.01	1.06	3	4.63	0.6	0.02	0.11
0.05	0.14	0.02	2.28	3.45	6.64	0.91	0.02	0.15
0.03	0.2	0.03	1.47	2.15	8.73	0.73	0.02	0.07
0.08	0.14	0.05	1.48	2.48	22.83	0.54	0.01	0.1
0.05	0.24	0.03	1.98	2.23	9.15	0.75	0.02	0.12
0.07	0.12	0.02	1.67	3.76	6.91	0.78	0.02	0.14
0.01	0.02	0.02	2.22	0.71	13.22	0.25	0.02	<0.01

0.02	0.02	0.04	2.07	0.41	13.81	0.26	0.02	<0.01
<0.01	0.02	0.02	8.06	0.2	13.1	0.38	0.01	<0.01
0.04	0.18	0.01	1.29	2.61	4.64	0.68	0.02	0.08
0.04	0.18	0.01	19.45	2.52	7.34	0.7	0.16	0.08
<0.01	0.15	0.03	0.5	0.1	11.39	0.16	0.02	<0.01
<0.01	0.11	0.03	0.44	0.12	10.51	0.16	0.02	<0.01
<0.01	0.15	0.03	0.72	0.2	13.14	0.18	0.02	<0.01
<0.01	0.12	0.03	0.61	0.18	11.46	0.16	0.02	<0.01
0.04	0.04	0.01	1.31	2.37	4.8	0.48	0.02	0.05
0.03	0.06	0.02	0.41	0.67	7.1	0.12	0.02	<0.01
0.03	0.05	0.02	0.58	1.34	5.27	0.14	0.02	<0.01
0.02	0.02	0.01	0.52	0.22	6.99	0.1	0.02	<0.01
0.01	0.03	0.02	0.4	0.22	8.39	0.11	0.02	<0.01
0.06	0.02	0.02	1.21	3.42	6.51	0.63	0.02	0.11
0.06	0.03	0.02	1.12	3.28	6.22	0.61	0.02	0.08
0.04	0.04	0.04	0.9	2.5	7.79	0.23	0.02	<0.01
0.04	0.05	0.01	1.98	2.28	3.73	0.51	0.02	0.04
0.04	0.05	0.01	1.51	2.79	4.29	0.63	0.02	0.06
0.05	0.05	0.01	2.07	3.07	4.85	0.7	0.02	0.07
0.04	0.05	0.01	1.08	2.68	4.35	0.61	0.02	0.06
0.04	0.05	0.01	1.26	2.96	4.75	0.67	0.02	0.07
0.04	0.04	0.01	1.55	2.96	5.08	0.67	0.02	0.08
0.07	0.06	0.02	1.67	3.09	7.23	0.77	0.02	0.12
0.06	0.02	0.02	1.68	3.59	6.37	0.77	0.02	0.12
0.06	0.02	0.02	6.35	3.34	6.5	0.68	0.02	0.12
0.06	0.02	0.02	1.68	3.46	5.79	0.71	0.02	0.14
0.07	0.04	0.02	1.89	3.8	6.07	0.82	0.02	0.18
0.07	0.05	0.01	2.32	2.5	4.59	0.8	0.02	0.04
0.07	0.05	0.01	2.31	2.26	4.32	0.7	0.02	0.04
0.12	0.06	0.01	2.34	2.66	4.9	0.71	0.02	0.06
0.1	0.05	0.01	2.31	2.68	4.71	0.79	0.03	0.05
0.06	0.05	0.02	2.13	2.57	4.57	0.71	0.02	0.05
0.06	0.05	0.01	2.36	3.02	5.26	0.78	0.02	0.07
0.06	0.14	0.02	3.17	3.52	5.71	1.35	0.03	0.12
0.06	0.13	0.02	3.11	3.64	5.65	1.29	0.03	0.12
0.06	0.13	0.02	3.03	3.63	5.6	1.34	0.03	0.13
0.06	0.13	0.04	3.17	3.63	5.73	1.39	0.03	0.11
0.06	0.14	0.02	3.2	3.6	5.61	1.4	0.03	0.11
0.06	0.15	0.02	3.28	3.71	5.99	1.28	0.03	0.12
0.1	0.15	0.02	2.86	3.82	5.81	1.29	0.03	0.13
0.18	0.02	0.02	3.23	3.78	6.08	1.1	0.02	0.12
0.09	0.08	0.03	1.4	3.06	9.23	0.65	0.02	0.17
0.04	0.28	0.02	4.41	2.79	9.3	1.22	0.02	0.12
0.04	0.43	0.03	3.16	2.79	7.95	0.97	0.02	0.11
0.04	0.27	0.02	2.67	2.53	7.73	0.88	0.02	0.09
0.04	0.8	0.02	7.7	2.4	9.7	1.1	0.09	0.08
0.05	0.04	0.03	1.8	2.86	9.52	0.78	0.02	0.13

0.08	0.07	0.03	1.65	2.73	9.18	0.69	0.02	0.12
0.12	0.06	0.02	2.04	3.31	8.69	0.79	0.02	0.08
0.16	0.06	0.05	2.26	3.32	8.46	0.83	0.02	0.08
0.18	0.06	0.03	1.92	2.96	7.85	0.75	0.01	0.1
0.06	0.09	0.03	1.9	2.97	8.18	0.75	0.01	0.06
0.05	0.03	0.02	1.76	3.01	8.09	0.72	0.02	0.09
0.05	0.04	0.02	1.7	2.97	8.17	0.7	0.02	0.08
0.05	0.02	0.02	1.25	2.73	4.29	0.59	0.02	0.05
0.06	0.02	0.02	1.4	3.32	5.53	0.79	0.03	0.09
0.05	0.04	0.04	2.07	3.03	5.44	0.95	0.04	0.08
0.06	0.04	0.02	2.09	2.96	5.32	0.93	0.02	0.07
0.05	0.04	0.02	2.22	2.98	5.3	0.9	0.02	0.09
0.05	0.02	0.02	4.48	2.9	5.83	0.8	0.03	0.08
0.05	0.02	0.02	5.75	2.98	6.22	0.78	0.02	0.08
0.04	0.02	0.03	1.71	2.69	4.86	0.67	0.03	0.07
0.04	0.02	0.02	1.6	2.94	5.27	0.72	0.03	0.08
0.05	0.02	0.03	1.51	2.97	5.31	0.72	0.02	0.08
0.06	0.03	0.02	1.5	3.26	5.7	0.77	0.01	0.08
0.05	0.02	0.02	1.36	2.98	5.41	0.72	0.03	0.07
0.04	0.02	0.02	1.36	3.02	5.49	0.7	0.03	0.08
0.06	0.02	0.02	1.4	3.17	5.69	0.74	0.03	0.09
0.05	0.02	0.03	1.34	2.93	5.57	0.68	0.03	0.09
0.09	0.29	0.03	5.03	3.3	6.99	1.19	0.06	0.11
0.06	0.23	0.02	3.76	3.31	6.15	1.28	0.04	0.12
0.06	0.22	0.03	4.08	3.37	6.16	1.27	0.04	0.13
0.06	0.28	0.03	5	3.28	6.42	1.25	0.08	0.12
0.06	0.25	0.02	5.84	3.27	6.33	1.34	0.07	0.14
0.06	0.21	0.02	5.95	3.31	7.3	1.1	0.07	0.15
0.06	0.21	0.02	5.98	2.66	9.19	1.22	0.06	0.16
0.04	0.02	0.01	1.18	2.38	5.71	0.59	0.02	0.05
0.04	0.02	0.02	1.05	2.04	5.22	0.5	0.02	0.04
0.05	0.02	0.02	1.46	2.54	7.58	0.71	0.02	0.1
0.04	0.03	0.02	2.18	2.82	11.25	0.92	0.02	0.18
0.03	0.02	0.05	1.62	1.93	19.48	0.62	0.02	0.07
0.06	0.02	0.04	1.79	3.62	9.48	0.93	0.02	0.16
0.05	0.02	0.02	1.51	3.33	7.68	0.79	0.03	0.15
0.06	0.02	0.04	1.65	3.5	8.53	0.82	0.02	0.17
0.06	0.03	0.03	1.62	3.12	10.44	0.81	0.02	0.16
0.05	0.02	0.02	3.67	3.42	7.39	0.77	0.01	0.14
0.06	0.03	0.02	1.9	3.29	6.67	0.84	0.03	0.12
0.06	0.04	0.02	3.2	3.42	6.9	1.24	0.04	0.12
0.06	0.04	0.01	3.35	2.9	6.19	1.09	0.03	0.1
0.06	0.05	0.02	3.89	3	6.47	1.08	0.05	0.12
0.07	0.04	0.04	5.44	3.2	6.93	1.06	0.06	0.12
0.06	0.03	0.02	6.78	3.19	7.15	1.04	0.05	0.11
0.05	0.05	0.04	4	3.34	7.03	1.18	0.04	0.14
0.07	0.05	0.02	4.13	3.48	6.86	1.11	0.02	0.15

0.04	0.04	0.02	1.11	2.24	4.04	0.5	0.02	0.07
0.04	0.04	0.02	1.17	2.47	4.53	0.56	0.02	0.09
0.05	0.04	0.03	1.26	1.76	7.57	0.44	0.02	0.05
0.06	0.04	0.02	1.49	3.31	7.04	0.8	0.03	0.11
0.06	0.04	0.03	1.52	3.26	6.87	0.79	0.02	0.1
0.05	0.03	0.02	1.43	3.22	6.58	0.76	0.03	0.1
0.06	0.03	0.02	1.5	3.42	7.02	0.82	0.02	0.09
0.06	0.02	0.03	1.57	3.68	6.9	0.9	0.03	0.11
0.05	0.03	0.03	3.63	3.32	6.36	0.85	0.02	0.1
0.04	0.03	0.04	1.43	2.79	5.27	0.63	0.02	0.06
0.06	0.03	0.02	1.38	2.88	5.82	0.66	0.02	0.06
0.06	0.02	0.02	1.31	2.73	5.98	0.64	0.03	0.08
0.06	0.03	0.04	1.56	3.11	6.87	0.74	0.03	0.1
0.05	0.04	0.02	1.45	1.93	7.21	0.6	0.02	0.09
0.06	0.29	<0.01	9.79	2.68	6.59	1.33	0.17	0.49
0.04	0.39	0.02	4.23	2.41	34.51	1.42	0.02	0.15
0.05	0.41	0.02	5.56	3.09	10.23	1.56	0.03	0.08
0.08	0.12	0.02	4.69	2.46	16.94	0.77	0.01	0.12
0.06	0.09	0.02	4.47	2.62	15.41	0.79	0.02	0.16
0.07	0.05	0.01	2.09	3.49	7.05	0.74	0.01	0.12
0.07	0.06	0.02	1.89	3.74	6.55	0.8	<0.01	0.14
0.09	0.09	<0.01	29.06	2.58	13.55	0.61	0.18	0.09
0.08	0.11	0.02	3.09	4.09	6.68	0.9	0.02	0.15
0.07	0.14	0.01	6.63	4.11	6.8	0.95	0.05	0.14
0.05	0.26	0.01	3.92	4.11	6.46	1.11	0.02	0.09
0.06	0.15	0.02	3.92	3.73	6.85	0.86	0.02	0.13
0.07	0.22	0.02	5.74	3.81	7.95	0.98	0.04	0.15
0.06	0.2	0.01	5.35	3.69	7.1	0.97	0.03	0.11
0.06	0.28	0.02	4.25	3.69	8.1	0.98	0.03	0.13
0.1	0.13	0.02	4.48	2.36	10.99	0.57	<0.01	0.08
0.04	0.12	0.01	4.27	2.37	8.79	0.6	<0.01	0.06
0.08	0.12	0.02	3.28	2.46	8.36	0.57	<0.01	0.07
0.06	0.15	0.01	3.32	2.83	6.86	0.64	<0.01	0.09
0.06	0.11	0.02	3.05	2.81	9.82	0.69	0.01	0.1
0.02	0.26	0.02	2.72	1.05	11.6	0.52	<0.01	<0.01
0.02	0.23	0.02	3.22	1.15	11.56	0.51	<0.01	0.01
0.03	0.19	0.02	3.31	1.1	9.78	0.46	0.01	0.02
0.16	0.09	0.02	7.32	2.42	30.32	0.75	<0.01	0.16
0.07	0.09	0.02	3.3	2.07	11.63	0.71	0.01	0.11
0.05	0.07	0.03	2.77	2.8	8.86	0.78	<0.01	0.13
0.05	0.06	0.01	2.85	2.34	6.54	0.62	0.01	0.07
0.06	0.43	0.02	2.64	3.16	8.8	0.99	0.02	0.13
0.06	0.26	0.01	1.81	3.08	8.11	0.91	0.01	0.12
0.18	0.1	0.01	1.36	3	5.65	0.66	0.02	0.1
0.07	0.1	0.01	2.01	3.24	5.47	0.8	0.02	0.16
0.05	0.1	0.03	4.35	3.21	8.69	0.97	0.01	0.1
0.05	0.09	0.04	2.35	2.42	9.85	0.66	<0.01	0.11

0.05	0.12	0.02	3.53	3.31	11.64	0.96	<0.01	0.1
0.05	0.06	0.02	4.59	2.69	8.9	0.64	<0.01	0.11
0.05	0.08	0.02	2.07	2.42	8.44	0.6	<0.01	0.12
0.05	0.15	0.01	6.16	2.88	6.72	1.25	0.07	0.08
0.06	0.08	0.02	1.92	2.83	10.86	0.85	0.01	0.11
0.06	0.06	0.02	1.85	2.36	11.08	0.68	0.01	0.06
0.05	0.04	0.02	1.99	2.62	11.71	0.73	0.01	0.08
0.05	0.04	0.02	1.99	2.5	21.37	0.68	<0.01	0.08
0.05	0.03	0.02	5.68	2.06	9.25	0.56	0.02	0.03
0.04	0.03	0.02	6.03	2.09	9.21	0.67	0.01	0.03
0.05	0.02	0.02	7.26	2.19	9.98	0.71	0.02	0.04
0.05	0.03	0.02	6.51	2.22	10.51	0.72	0.02	0.04
0.05	0.04	0.02	1.16	1.96	5.89	0.5	0.02	0.04
0.05	0.06	0.02	16.85	2.06	10.99	0.58	0.12	0.05
0.05	0.05	0.02	6.07	2.54	8.4	0.71	0.03	0.06
0.06	0.1	0.02	2.28	2.94	8.96	0.9	0.06	0.09
0.06	0.06	0.03	3.29	2.99	8.83	0.89	0.04	0.07
0.05	0.06	0.02	5.39	2.66	8.88	0.89	0.16	0.06
0.05	0.06	0.02	4.17	2.7	9.16	0.96	0.1	0.08
0.04	0.06	0.02	3.6	1.34	6.41	0.37	0.04	<0.01
0.04	0.09	0.03	6.21	1.82	7.74	0.48	0.12	0.02
0.05	0.2	0.02	7.53	2.59	10.37	0.88	0.18	0.07
0.03	0.05	0.02	1.41	0.84	8.66	0.31	0.01	<0.01
0.02	0.04	0.03	0.73	0.74	4.84	0.27	0.01	<0.01
0.02	0.03	0.02	0.61	0.45	4.18	0.18	<0.01	<0.01
0.09	0.28	0.01	9.68	4.17	7.21	1.92	0.2	0.18
0.08	0.05	0.02	3.67	2.65	18.39	0.68	<0.01	0.11
0.07	0.04	0.01	6.39	2.75	7.65	0.65	0.01	0.13
0.05	0.04	<0.01	12.98	1.97	8.74	0.46	0.04	0.05
0.08	0.03	0.01	8.01	3.87	8.02	1.04	0.01	0.14
0.06	0.09	0.02	1.83	2.17	7.27	0.74	0.02	0.04
0.06	0.08	0.02	3.64	2.41	9.25	0.88	0.01	0.13
0.04	0.05	0.01	1.38	1.46	5.1	0.39	<0.01	0.04
0.04	0.03	0.01	1.15	1.51	4.41	0.3	0.01	0.01
0.08	0.12	0.01	6.89	4.33	8.65	1.79	0.03	0.16
0.08	0.09	0.02	6.86	4.45	8.03	1.87	0.05	0.17
0.07	0.07	0.02	3.04	3.86	9.87	1	0.01	0.12
0.07	0.08	0.02	4.26	3.9	9.81	1.1	0.01	0.12
0.06	0.08	0.02	4.52	3.81	7.67	1.64	0.04	0.05
0.06	0.68	0.02	5.83	3.84	7.7	1.95	0.07	0.08
0.07	0.11	0.02	8.29	4.2	9.77	1.85	0.05	0.13
0.07	0.14	0.02	7.8	4.21	9.01	1.91	0.04	0.12
0.07	0.08	0.01	1.94	3.33	7.01	0.72	0.01	0.09
0.08	0.08	0.02	1.96	3.01	8	0.63	0.01	0.06
0.07	0.11	0.02	1.95	3.31	7.86	0.75	0.01	0.1
0.06	0.08	0.01	2.92	2.91	9.23	0.64	0.01	0.16
0.05	0.12	0.02	2.94	2.72	12.62	1.01	0.04	0.19

0.06	0.12	0.02	3.96	2.9	9.88	1.1	0.05	0.18
0.05	0.17	0.02	6.58	2.95	9.75	1.16	0.14	0.16
0.04	0.38	0.01	23.46	2.03	15.85	1.18	0.74	0.12
0.05	0.16	0.02	3.43	3.01	9.79	1.19	0.05	0.18
0.06	0.12	0.03	2.22	3.11	7.55	0.92	0.02	0.14
0.06	0.08	0.01	2.21	2.64	5.69	0.52	0.02	0.19
0.05	0.05		2.58	2.41	8.64	0.73	0.02	0.15
0.09	0.4	0.02	7.07	4.37	7.99	1.5	0.06	0.23
0.06	0.44	0.02	4.28	2.82	9.34	0.64	0.02	0.18
0.06	0.43	0.01	2.94	2.83	7.82	0.73	0.02	0.18
0.06	0.14	0.01	2.18	2.92	6.97	0.78	0.02	0.16
0.07	0.27	0.01	2.09	4.13	14.2	1	0.02	0.22
0.05	0.16	0.08	1.55	2.71	7.38	0.64	0.01	0.14
0.16	0.2	0.07	1.67	2.84	7.67	0.69	0.02	0.16
0.08	0.1	0.03	1.79	2.68	5.47	0.6	0.01	0.14
0.08	1.5	0.02	11.08	3.65	8.56	2.01	0.08	0.23
0.06	3.54	0.01	8.93	3.49	10.4	2.29	0.4	0.23
0.07	0.31	0.02	5.44	3.65	9.39	1.73	0.03	0.22
0.07	0.26	0.01	4.28	3.78	8.66	1.57	0.03	0.26
0.36	0.5	0.02	3.75	2.67	10.59	1.26	0.02	0.15
0.13	0.46	0.02	6.24	2.66	10.17	1.14	0.02	0.13
0.06	0.27	0.02	1.38	1.45	10.43	0.68	0.01	0.14
0.05	0.21	0.02	1.53	2.58	8.87	0.74	0.01	0.2
0.06	0.2	0.03	1.58	3.19	7.94	0.82	0.01	0.19
0.06	0.22	0.02	2.41	3.42	10.22	1.04	0.01	0.17
0.15	0.25	0.03	1.32	1.77	12.69	0.49	0.01	0.14
0.24	0.26	0.03	0.94	0.89	16	0.33	0.01	0.16
0.11	0.26	0.02	1.48	1.9	11.49	0.55	0.01	0.15
0.16	0.11	0.02	3.73	2.78	13.15	1 <0.01		0.15
0.06	0.09	0.02	4.23	2.72	11.92	1.17 <0.01		0.13
0.11	2.36	0.02	7.62	2.31	11.44	1.49	0.22	0.13
0.05	6.31	0.02	5.45	2.32	12.71	1.41	0.13	0.24
0.11	1.54	0.02	2.4	2.4	11.39	1	0.03	0.14
0.06	0.57	0.02	2.2	2.55	10.81	1.05	0.02	0.15
0.06	0.58	0.02	2.19	2.56	10.82	1.05	0.02	0.16
0.06	1.63	0.02	2.89	2.38	11.41	1.02	0.02	0.14
0.05	0.35	0.02	2.28	2.41	10.56	1.02	0.01	0.18
0.06	0.38	0.02	2.14	2.66	10.19	1.02	0.01	0.19
0.06	0.49	0.07	3.11	3.54	9.14	1.13	0.02	0.22
0.08	0.65	0.05	5.12	3.37	9.09	1.09	0.03	0.2
0.08	0.1	0.02	4.64	4.1	7.08	1.42	0.04	0.24
0.06	0.05	0.02	1.7	2.49	6.06	0.53 <0.01		0.14
0.42	0.53	0.02	4.26	3.75	9.35	1.35	0.02	0.15
0.06	0.47	0.03	1.27	1.85	12.35	0.45	0.01	0.14
0.08	0.36	0.02	2.24	2.12	9.95	0.58	0.02	0.16
0.06	0.35	0.02	1.88	1.95	7.96	0.56	0.02	0.14
<0.01	0.03 <0.01		0.3	0.09	95	0.06 <0.01		0.16

<0.01	0.15	<0.01	0.25	0.25	89.3	0.09	<0.01	0.1
0.06	0.07	0.01	2.9	2.4	5.51	0.58	0.09	0.28
0.03	0.04	<0.01	1.7	1.86	3.82	0.45	0.04	0.23
0.04	0.08	<0.01	2.17	1.71	7.73	0.45	0.04	0.23
<0.01	0.04	<0.01	0.03	<0.01	95.8	0.03	<0.01	0.08
0.08	0.06	0.02	1.41	2.7	6.67	0.62	<0.01	0.39
0.07	0.08	0.02	8.84	2.91	8	0.93	0.11	0.3
0.07	0.26	0.02	6.74	3.45	11.5	1.5	0.11	0.42
0.01	0.12	<0.01	0.16	0.07	95	0.06	<0.01	0.12
0.06	0.06	0.01	1.65	2.77	7.08	0.7	<0.01	0.5
0.05	0.06	0.01	2.02	2.36	5.59	0.57	0.02	0.36
0.03	0.25	0.01	11	1.51	6.65	0.38	0.26	0.26
0.06	0.11	0.02	3.84	4.22	7.51	1.24	<0.01	0.66
0.05	6.71	<0.01	6.17	2.14	10.3	1.83	0.15	1.18
0.06	0.32	0.01	6.18	3.59	5.85	2.25	0.1	1.34
<0.01	0.02	<0.01	0.15	0.15	92.1	0.09	<0.01	0.14
0.03	0.09	0.02	1.25	1	11.3	0.49	<0.01	0.57
0.09	0.4	0.02	8.33	4.05	9.29	2.1	0.08	0.74
0.04	0.33	0.02	5.99	3.09	8.06	1.19	0.01	0.78
0.06	0.14	0.01	2.89	3.08	7.91	1.1	<0.01	0.84
0.05	0.5	0.01	7.79	2.7	6.91	1.9	0.16	1.29
<0.01	0.19	<0.01	0.68	0.22	86.8	0.15	0.02	0.13
0.05	0.09	0.02	1.64	1.88	9.36	0.73	<0.01	0.52
0.07	0.11	0.02	3.79	3.33	8.07	1.52	0.02	0.69
0.07	2.2	0.02	4.58	4.35	8.98	1.71	0.04	0.67
0.07	1.96	0.02	2.86	4.11	8.05	1.19	0.02	0.72
<0.01	0.37	<0.01	0.78	0.13	89.7	0.06	<0.01	0.07
0.06	0.94	0.05	5.27	3.33	12.7	1.19	0.04	0.99
<0.01	0.19	<0.01	0.76	0.06	92.1	0.06	<0.01	0.11
0.04	0.11	0.02	2.23	2.65	10	1.11	0.01	0.68
0.05	4.57	0.02	3.48	2.83	10.7	1.35	0.04	0.62
0.04	1.17	0.04	5.21	2.99	29.6	1.65	0.03	0.9
<0.01	0.35	<0.01	0.49	0.31	83.1	0.15	<0.01	0.18
0.03	1.4	0.01	3.68	2.99	7.66	1.53	0.06	0.96
0.03	0.94	0.08	6.21	2.8	36.8	2	0.03	0.54
<0.01	0.12	<0.01	0.92	0.19	93.5	0.1	<0.01	0.07
0.02	0.06	0.01	0.92	1.21	5.73	0.39	<0.01	0.44
0.03	6.04	0.01	3.26	1.2	11	2.94	0.06	0.4
0.04	2.6	0.01	2.88	2.14	8.62	1.87	0.03	0.41
0.03	0.79	0.03	5.51	2.87	35.2	1.74	0.03	0.62
0.04	2.21	0.01	5.86	2.5	7.94	1.15	0.05	0.48
0.04	6.6	0.02	4.11	2.89	11.6	1.19	0.05	0.5
<0.01	0.08	<0.01	0.63	0.14	93.7	0.06	<0.01	0.07
0.06	0.08	0.01	5.4	2.82	12	0.69	0.01	0.45
0.05	0.05	0.01	1.94	2.69	6.42	0.58	<0.01	0.62
0.04	1.37	<0.01	3.52	3.11	7.82	0.91	0.05	0.42
0.04	1.02	0.03	6.62	3.5	14.2	1.91	0.03	1.14

0.05	0.24	0.01	2.87	2.67	9.67	0.71	0.02	0.42
0.03	1.03	0.05	6.02	3.13	27.1	1.75	0.03	0.85
<0.01	0.83	<0.01	5.4	0.53	81.6	0.25	<0.01	0.12
0.01	0.08	0.02	1.42	0.39	11.2	0.29	<0.01	0.47
<0.01	0.06	<0.01	2.3	0.26	90.3	0.12	<0.01	0.12
0.06	0.31	0.02	5.43	4.21	6.88	2.27	0.06	0.96
0.08	0.13	0.01	4.34	3.56	7.45	1.21	0.03	0.55
0.07	0.12	0.01	5.57	3.62	8.94	1.21	0.02	0.47
<0.01	0.09	<0.01	1.86	0.2	92.4	0.14	0.04	0.09
0.08	0.11	0.02	4.01	4.07	9.65	1.62	0.03	0.41
<0.01	0.1	<0.01	0.89	0.36	89	0.11	<0.01	0.09
0.05	0.11	0.01	2.8	3.07	6.55	1.19	0.03	0.97
0.03	6.39	<0.01	4.97	1.7	6.95	1.09	0.12	1.1
0.04	2.87	0.05	5.83	2.99	30.3	2.15	0.03	0.61
<0.01	0.75	<0.01	1.25	0.51	85.1	0.23	<0.01	0.15
0.05	0.2	0.02	2.7	3.13	5.44	1.19	0.02	0.87
0.03	4.05	<0.01	44.7	0.68	31.6	7.01	0.32	0.12
0.08	0.66	0.01	4.06	4.42	7.89	1.69	0.03	0.58
0.08	0.75	0.02	4.08	4.24	8.82	1.61	0.02	0.57
0.08	0.97	0.02	4.75	4.09	8.26	1.65	0.05	0.66
0.06	0.05	0.02	1.83	2.91	7.25	0.72	0.01	0.47
0.07	0.07	0.02	4.08	3.43	9.83	0.88	0.04	0.51
0.07	0.06	0.02	2.79	3.45	9.23	0.9	0.03	0.51
0.06	0.28	0.01	16.7	2.84	13.7	0.81	0.31	0.42
0.06	0.06	<0.01	4.77	2.45	7.4	0.7	0.05	1.03
0.06	0.05	0.01	4.55	2.48	7.36	0.71	0.05	1.05
0.02	4.15	<0.01	35.1	1.05	28.4	7.02	0.38	0.34
0.03	0.22	0.02	3.58	3.58	8.61	1.69	0.02	1.21
0.03	0.25	0.02	3.77	3.55	9	1.68	0.02	1.19
0.03	3.21	0.02	4.51	3.25	9.4	1.68	0.05	1.1
0.04	3.35	0.01	4.74	3.25	9.37	1.7	0.07	1.1
0.04	0.84	<0.01	3.02	2.12	4.16	1.15	0.03	1.48
0.02	0.11	<0.01	16.7	1.36	43.4	0.5	<0.01	0.42
0.04	0.09	0.01	2.93	3.61	7.53	1.19	0.01	0.83
0.05	0.25	<0.01	3.48	3.42	7.75	1.14	0.02	0.88
0.07	0.14	0.02	3.44	1.44	53	0.53	0.01	0.19
0.06	0.05	0.02	3.64	3.42	7.4	1.38	0.02	0.58
0.08	0.06	0.01	3.86	3.44	7.92	1.39	0.03	0.57
0.03	0.04	0.01	1.11	1.88	3.89	0.49	<0.01	0.09
0.05	0.06	0.02	1.73	2.9	5.94	0.77	0.01	0.15
0.03	0.06	0.01	1.74	2.68	5.69	0.67	<0.01	0.12
0.05	0.04	0.01	5.16	3.09	11.8	0.76	<0.01	0.13
0.04	0.06	0.02	3.24	2.98	7.48	0.76	<0.01	0.13
0.04	0.07	0.02	2.77	2.87	7.66	0.75	<0.01	0.13
0.02	0.02	<0.01	1.21	1.37	7.89	0.19	<0.01	0.06
0.02	0.02	<0.01	1.01	1.31	2.18	0.18	<0.01	0.08
0.03	0.14	<0.01	0.85	1.66	4.27	0.33	<0.01	0.11

0.04	0.15	0.02	1.64	2.22	7.68	0.61	0.01	0.13
0.05	0.44	0.01	1.68	3.23	5.87	0.58	<0.01	0.15
0.04	0.26	0.02	7.15	1.73	6.69	0.33	0.02	0.1
0.06	0.03	0.01	4.08	2.74	8.47	0.57	<0.01	0.15
0.03	0.09	0.02	1.58	1.77	6.81	0.45	0.01	0.13
0.06	0.22	0.02	11.5	2.92	10.7	0.89	0.35	0.1
0.06	0.13	0.02	7.48	2.88	7.34	0.65	<0.01	0.12
0.03	0.1	0.02	1.67	0.74	8.7	0.42	0.01	0.09
0.04	0.18	0.01	0.95	1.58	3.99	0.45	0.01	0.49
0.04	0.37	0.02	4.47	3.43	8.19	1.08	<0.01	0.2
0.03	0.24	<0.01	2.01	2.11	6.14	0.78	0.08	0.23
0.06	0.11	0.02	7.53	3.18	9.62	0.82	0.39	0.14
0.06	0.04	0.02	5.99	2.86	9.51	0.71	<0.01	0.14
0.03	0.03	0.02	2.67	1.08	5.96	0.28	<0.01	0.1
0.03	0.07	0.01	1.56	0.63	10.9	0.28	<0.01	0.1
0.02	13.5	<0.01	8.43	1.7	9.64	1.73	0.04	0.57
0.02	5.86	0.01	4.9	1.84	10.7	1.99	0.03	0.73
0.02	4.99	0.01	3.59	2.19	10.8	2.26	0.02	0.73
0.02	11.2	<0.01	3.91	2.05	14.3	2.92	0.06	0.67
0.03	5.34	0.01	4.1	2.58	10.3	2.11	0.03	0.86
0.03	3.91	0.01	4.62	2.43	9.22	1.91	0.03	0.89
0.04	5.62	<0.01	4.2	2.55	9.36	2.06	0.03	0.9
0.03	3.19	0.01	4.28	2.78	8.24	2.03	0.02	0.93
0.06	0.84	0.01	6.67	3.36	5.79	2.18	0.06	1.05
0.06	1.88	<0.01	6.11	2.78	6.93	1.86	0.05	0.94
0.14	1.28	<0.01	4.21	2.1	4.72	1.44	0.06	1.3
0.04	0.75	0.01	10.2	2.43	5.35	1.67	0.13	1.18
0.05	0.43	0.01	4.45	2.84	4.88	1.86	0.04	1.3
0.01	0.15	0.02	2.15	1.02	9.81	0.62	<0.01	0.27
0.04	0.14	0.02	2.02	2.54	7.63	0.68	0.01	0.25
0.05	0.14	0.02	3.48	3.33	9.35	0.77	0.03	0.25
0.05	0.15	0.02	2.74	2.52	9.87	0.64	0.01	0.25
0.02	17.7	<0.01	6.21	2.61	17.2	2.51	0.25	0.52
0.01	3.15	0.01	3.42	2.4	8.56	1.48	0.05	0.8
0.02	0.24	0.02	3.68	2.19	10	1.05	0.03	0.72
0.03	1.23	0.01	5.42	2.94	10.7	2.54	0.06	0.91
0.03	6.92	<0.01	8.3	3.02	12.2	3.73	0.14	0.95
0.03	0.37	0.01	8.41	3.49	6.58	1.98	0.02	0.98
0.04	2.66	0.01	8.72	3.81	8.3	2.7	0.04	0.82
0.04	4.66	0.01	8.67	3.6	9.5	2.58	0.05	0.84
0.05	0.48	0.01	11	4.05	5.97	2.88	0.04	0.99
0.04	3.07	0.01	7.68	3.53	8.04	2.44	0.05	0.99
0.03	0.19	0.01	7.83	3.59	5.69	1.79	0.01	1.03
0.05	0.14	<0.01	5.1	3.19	4.72	1.38	0.01	1.21
0.01	19	<0.01	4.73	1.9	19.8	2.97	0.33	0.63
0.02	4.37	0.01	6.38	2.95	8.56	2.11	0.03	0.94
0.04	0.3	0.02	9.95	3.51	5.75	2.22	0.02	0.93

0.04	1.16	0.01	9.71	3.45	6.47	2.29	0.02	0.91
0.01	0.94	0.01	7.34	3.1	8.27	1.92	0.02	0.87
0.01	35.2	<0.01	3.36	1.05	30.3	1.2	0.1	0.34
0.02	0.35	0.02	7.18	2.4	8.46	1.68	0.01	0.68
0.01	1.83	0.02	3.67	2.29	8.8	1.64	0.01	0.67
0.04	10.9	0.02	6.68	2.63	9.99	1.86	0.06	0.79
0.06	0.3	0.02	5.73	4.05	11.7	1.96	0.02	0.86
0.06	0.37	0.01	6.3	4	9.84	2.14	0.03	0.4
0.05	3.27	0.01	5.65	3.61	7.73	2.58	0.03	0.9
0.03	7.47	<0.01	4.96	2.3	13.5	5.62	0.13	1
0.04	10.8	<0.01	6.2	2.28	19.6	7.26	0.21	0.61
0.05	0.16	0.02	5.79	3.83	12.2	2.3	0.03	0.92
0.06	0.36	0.01	4.9	4.25	7.82	2.31	0.02	1.02
0.04	1.64	0.01	4.72	3.61	8.35	2.88	0.05	1.51
0.08	0.05	0.02	2.87	3.45	8.79	0.81	0.01	0.77
0.05	0.07	0.01	2.46	2.84	6.35	0.72	0.01	0.99
0.04	0.18	<0.01	7.94	2.41	9.47	0.8	0.11	1.06
0.05	0.12	0.01	5.48	2.87	8.89	1.18	0.06	1.03
0.07	0.97	<0.01	8.55	2.76	9.46	1.09	0.22	1
0.02	0.11	<0.01	9.93	1.49	56.3	0.53	0.02	0.21
0.06	0.07	0.01	3.54	3.27	15	0.92	0.02	0.78
0.07	0.07	0.01	2.99	3.5	6.83	1.12	0.02	0.88
0.07	0.1	0.01	3.2	3.38	6.45	1.14	0.03	0.96
0.07	0.1	0.01	3.03	3.67	6.73	1.2	0.02	0.88
0.07	0.08	0.01	2.58	3.27	5.77	0.99	0.02	1
0.04	0.13	0.02	2.83	3.15	13.7	0.9	0.02	0.72
0.04	0.12	0.02	2.33	3.21	11.1	0.92	0.02	0.73
0.04	0.12	0.01	2.36	3.19	11.2	0.93	0.02	0.73
0.04	0.12	0.02	2.45	3.29	10.8	0.95	0.01	0.72
0.06	0.16	0.02	2.19	3.06	9.15	0.74	0.01	0.55
0.06	13	<0.01	2.32	2.34	14.6	0.72	0.05	0.32
0.03	18.7	<0.01	9.92	1.66	18.4	2.19	0.14	0.23
0.06	1.24	0.01	11.5	3.09	11.5	2.24	0.13	0.38
0.06	0.25	0.01	5.12	3.47	7.49	1.25	0.02	0.54
0.06	0.57	0.01	7.6	3.16	8.88	1.77	0.05	0.6
0.07	0.36	0.01	4.98	3.23	7.51	1.42	0.04	0.65
0.06	1.41	0.01	6.66	2.83	8.5	1.52	0.05	0.72
0.05	1.84	<0.01	17.2	2.29	14.1	2.7	0.12	0.58
0.07	0.42	0.01	6.8	3.46	7.95	1.62	0.03	0.69
0.09	1.97	<0.01	28.5	2.05	20.4	3.73	0.23	0.32
<0.01	1.72	<0.01	26.8	0.36	50.7	0.19	0.04	0.24
0.03	0.54	0.01	28.2	1.59	23.4	0.87	0.18	0.22
0.03	0.1	0.02	3.6	3.13	12.2	0.88	0.01	0.5
0.04	0.09	0.02	7.8	2.89	16.7	0.77	<0.01	0.52
0.05	0.08	0.01	4.22	3.41	11.4	0.9	0.01	0.55
0.06	0.06	0.02	4.28	3.42	11	0.9	0.02	0.53
0.07	0.07	0.01	4.37	3.44	10.7	0.85	0.02	0.53

0.06	0.06	0.01	6.35	2.83	9.38	0.78	0.03	0.58
0.08	0.22	<0.01	4.75	1.81	7.18	0.38	0.04	0.97
0.06	0.06	0.01	1.62	2.83	6.19	0.57	<0.01	0.47
0.06	1.15	0.01	6.5	2.46	7.96	1.04	0.12	0.54
0.04	0.63	0.01	9.92	2.45	9.02	1.75	0.23	0.86
0.05	1.81	<0.01	20.1	2.02	15.9	2.78	0.91	0.52
0.04	0.09	0.01	2.66	3.61	8.61	1.13	0.01	0.7
0.04	0.09	0.02	2.78	3.71	8.43	1.15	<0.01	0.73
0.05	0.51	0.02	7.95	2.81	8.17	1.78	0.12	0.84
0.05	0.28	0.01	5.15	2.89	7.55	1.3	0.11	0.79
0.03	0.98	0.06	4.6	1.97	52.6	1.05	0.04	0.54
<0.01	0.06	<0.01	1.17	0.28	85.8	0.12	<0.01	0.12
0.01	0.07	<0.01	4.01	0.23	80.1	0.09	<0.01	0.12
0.05	0.18	0.01	2.69	2.97	13	0.91	0.01	0.23
0.05	0.16	<0.01	4.93	2.75	12	0.83	0.05	0.37
<0.01	0.05	<0.01	4.37	0.08	91.2	0.05	<0.01	0.12
0.05	0.18	<0.01	2.58	2.28	9	0.54	0.01	0.17
0.05	0.08	<0.01	4.53	2.49	10.9	0.47	<0.01	0.3
0.05	0.68	0.05	5.31	3.01	27.2	1.66	0.03	0.6
<0.01	0.05	<0.01	3.32	0.37	87.6	0.14	<0.01	0.08
0.02	0.06	0.02	1.72	0.52	11.6	0.23	<0.01	0.34
0.04	0.08	0.02	1.23	1.42	8.16	0.34	<0.01	0.36
<0.01	0.56	<0.01	5.88	0.08	87.5	0.05	<0.01	0.09
0.05	0.06	0.02	3.16	1.95	14.6	0.54	<0.01	0.46
0.08	0.05	0.02	3.24	4.11	7.65	0.83	0.01	0.42
<0.01	1.55	<0.01	1.43	0.06	91.8	0.04	<0.01	0.1
0.11	0.35	0.02	1.62	2.77	8.76	0.68	<0.01	0.44
0.05	0.05	<0.01	3.25	2.33	4.96	0.63	0.07	0.22
0.04	1.66	0.06	3.97	2.2	46.1	1.25	0.02	0.34
0.08	0.18	0.02	5.82	3.74	15.6	0.99	0.02	0.28
0.08	0.11	0.01	2.62	3.05	8.66	0.64	0.01	0.18
0.06	10.4	0.02	10.2	2.8	16.9	1.49	0.08	0.42
0.05	19.4	<0.01	10.6	1.1	16.4	0.73	0.31	0.22
0.05	3.77	0.05	5.66	2.6	30.5	1.34	0.1	0.7
0.07	0.12	0.02	2	1.17	14.7	0.36	<0.01	0.45
0.06	0.11	0.02	1.97	1.56	13.9	0.48	<0.01	0.48
0.04	0.52	0.01	5.83	3.24	14.4	1.66	0.03	0.73
0.06	0.23	0.01	3.33	3.5	6.62	1.12	0.29	0.2
0.07	0.14	0.01	8.36	3.38	9.14	1.33	0.03	0.53
0.06	0.69	0.03	4.98	2.79	39.1	1.44	0.02	0.54
0.06	0.09	0.03	3.28	4.14	11.3	1.48	<0.01	1.24
0.04	0.07	0.01	2.42	1.66	8.28	0.53	0.02	0.46
0.06	0.08	0.02	2.13	2.21	8.76	0.59	0.01	0.51
0.04	1.45	0.05	4.35	2.06	50.3	1.3	0.02	0.55
0.04	0.08	0.02	1.6	0.84	11.5	0.34	<0.01	0.48
0.03	0.07	0.02	1.69	0.86	9.24	0.32	<0.01	0.46
0.03	0.08	0.02	1.46	0.94	9.63	0.41	<0.01	0.58

0.04	0.13	0.02	3.08	1.55	9.56	0.45	0.04	0.49
0.06	0.08	0.02	1.79	3.09	10.2	0.81	<0.01	0.63
0.06	0.11	0.03	8.52	3.46	10.7	0.92	0.2	0.5

P2O5 %	SiO2 %	SrO %	TiO2 %	V2O5 %
0.05	55.8	<0.01	1.18	0.03
0.04	61.34	0.01	1.19	0.03
0.04	60.52	<0.01	1.14	0.03
0.04	50.38	0.01	0.91	0.02
0.07	60.55	0.02	0.92	0.02
0.06	51.67	<0.01	2.18	0.03
0.03	58.83	<0.01	1.19	0.02
0.46	52.67	0.17	1.48	0.04
0.05	57.51	<0.01	1.22	0.03
0.05	56.52	0.01	1.22	0.02
0.05	56.22	0.01	1.11	0.03
0.06	53.95	<0.01	1.1	0.03
0.16	53.02	0.06	1.02	0.03
0.38	57.55	0.32	1.76	0.03
0.06	54.75	0.02	1.14	0.03
0.05	56.28	<0.01	1.12	0.03
0.05	53.92	0.02	1.13	0.02
0.08	52.35	0.02	1.26	0.03
0.09	53.12	0.03	1.24	0.04
0.1	53.45	0.02	1.25	0.04
0.1	58.58	0.04	1.3	0.03
0.11	55.36	0.04	1.23	0.03
0.07	42.94	0.01	1.6	0.03
0.05	57.12	<0.01	1.43	0.02
0.04	72.97	0.02	1.34	0.02
0.04	67.72	<0.01	1.37	0.02
0.05	61.61	0.01	1.37	0.02
0.05	58.39	0.03	1.37	0.02
0.07	54.04	<0.01	1.16	0.03
0.06	55.72	0.01	1.18	0.03
0.07	58.49	0.01	0.99	0.03
0.16	54.61	0.11	1.17	0.03
0.13	65.55	0.1	1.1	0.02
0.24	52.26	0.17	1.04	0.04
0.23	56.45	0.14	1.03	0.03
0.07	46.88	0.01	2.6	0.04
0.07	48.03	0.02	1.78	0.03
0.04	51.5	<0.01	1.78	0.03
0.04	58.02	0.01	1.47	0.02
0.03	59.45	0.01	1.29	0.03

FID	Shape	OBJECTID
291	Point	313
292	Point	314
293	Point	315
294	Point	316
295	Point	317
296	Point	318
297	Point	319
356	Point	320
357	Point	321
358	Point	322
359	Point	323
360	Point	324
361	Point	325
362	Point	326
363	Point	327
364	Point	328
365	Point	329
465	Point	330
466	Point	331
467	Point	332
468	Point	333
469	Point	334
470	Point	335
471	Point	336
472	Point	337
473	Point	338
474	Point	339
475	Point	340
476	Point	341
477	Point	342
478	Point	343
497	Point	344
498	Point	345
499	Point	346
500	Point	347
479	Point	348
480	Point	349
481	Point	350
482	Point	351
483	Point	352

0.03	71.52	0.02	1.25	0.02	484 Point	353
0.03	68.95	<0.01	1.26	0.02	485 Point	354
0.03	61.39	0.01	1.08	0.02	298 Point	355
0.03	60.37	<0.01	0.98	0.02	299 Point	356
0.09	55.36	0.02	1.15	0.02	300 Point	357
0.07	49.62	<0.01	0.88	0.03	366 Point	358
0.09	57.49	0.01	1.07	0.02	367 Point	359
0.12	65.02	<0.01	0.9	0.02	368 Point	360
0.06	55.23	<0.01	0.88	0.02	369 Point	361
0.12	49.04	0.03	0.99	0.02	370 Point	362
0.05	57.32	<0.01	1.13	0.02	371 Point	363
0.05	55.66	<0.01	1.14	0.03	372 Point	364
0.11	53.4	0.02	1	0.04	373 Point	365
0.12	49.74	0.01	1.14	0.03	374 Point	366
0.13	50.14	0.02	1.6	0.04	375 Point	367
0.15	49.62	0.02	1.65	0.04	376 Point	368
0.1	48.38	0.01	1.6	0.04	377 Point	369
0.06	51.44	0.02	1.83	0.03	486 Point	370
0.06	53.15	0.02	2.04	0.03	487 Point	371
0.12	51.08	0.07	2.56	0.04	488 Point	372
0.17	53.21	0.12	2.19	0.03	489 Point	373
0.07	29.41	<0.01	0.66	0.03	301 Point	374
0.05	67.31	0.02	1.13	0.02	302 Point	375
0.07	65.62	0.01	1.12	0.02	303 Point	376
0.08	64.88	0.02	1.09	0.02	304 Point	377
0.08	62	<0.01	1.06	0.02	305 Point	378
0.08	60.4	0.01	1.03	0.02	306 Point	379
0.07	59.07	0.02	1	0.02	307 Point	380
0.05	41.84	<0.01	0.89	0.02	490 Point	381
0.04	52.07	<0.01	1.26	0.02	308 Point	382
0.04	60.68	0.01	1.01	0.02	309 Point	383
0.04	65.14	0.01	1.1	0.02	310 Point	384
0.04	63.28	<0.01	1.13	0.02	311 Point	385
0.06	82.8	0.02	0.31	<0.01	378 Point	386
0.06	59.65	0.03	1.3	0.03	391 Point	387
0.06	49.95	0.01	1.38	0.03	392 Point	388
0.03	69.2	<0.01	1.04	0.02	641 Point	389
0.02	68.02	<0.01	1.17	0.02	642 Point	390
0.02	72.31	0.01	1.11	0.02	643 Point	391
0.03	67.4	<0.01	1.4	0.02	644 Point	392
0.15	67.02	<0.01	0.99	0.02	501 Point	393
0.27	51.14	0.12	0.96	0.04	502 Point	394
0.27	54.92	0.07	1.08	0.03	503 Point	395
0.18	54.72	0.08	1.25	0.03	504 Point	396
0.03	68.17	<0.01	1.3	0.02	491 Point	397

0.04	62.8	<0.01	1.28	0.02	492 Point	398
0.03	59.83	<0.01	1.29	0.03	493 Point	399
0.03	57.73	<0.01	1.36	0.02	494 Point	400
0.04	51.22	<0.01	1.85	0.03	495 Point	401
0.04	51.06	<0.01	1.62	0.03	496 Point	402
0.04	44.58	<0.01	1.77	0.03	118 Point	403
0.04	45	<0.01	2.68	0.03	119 Point	404
0.02	53.88	0.01	1.21	0.01	120 Point	405
0.05	49.19	0.01	1.04	0.02	122 Point	406
0.05	57.09	0.02	1.1	0.03	123 Point	407
0.03	63.18	<0.01	1.27	0.02	124 Point	408
0.03	68.76	0.02	1.17	0.02	125 Point	409
0.03	63.4	<0.01	1.28	0.02	126 Point	410
0.03	66.42	<0.01	1.21	0.02	127 Point	411
0.06	60	0.03	1.02	0.02	128 Point	412
0.07	60.8	0.03	0.98	0.02	129 Point	413
0.11	56.76	0.03	1.2	0.02	130 Point	414
0.02	64.27	<0.01	1.3	0.02	121 Point	415
0.14	54.15	0.02	0.72	0.02	144 Point	416
0.28	54.69	0.04	0.81	0.02	145 Point	417
0.11	56.28	0.03	1.08	0.02	131 Point	418
0.05	57.34	<0.01	1.08	0.03	132 Point	419
0.07	57.84	<0.01	1.07	0.03	133 Point	420
0.06	58.01	0.02	1.13	0.02	134 Point	421
0.05	60.37	0.02	1.03	0.02	135 Point	422
0.09	57.62	0.02	0.84	0.02	107 Point	423
0.02	61.09	<0.01	0.76	0.02	108 Point	424
0.03	64.91	<0.01	1.15	0.02	109 Point	425
0.11	72.04	<0.01	0.87	0.02	106 Point	426
0.04	57.26	0.02	1.12	0.02	110 Point	427
0.04	57.31	0.01	1.12	0.02	111 Point	428
0.03	66.46	0.02	1.32	0.02	112 Point	429
0.03	59.65	0.01	1.27	0.03	113 Point	430
0.04	58.04	<0.01	1.17	0.03	114 Point	431
0.03	69.15	<0.01	1.19	0.02	115 Point	432
0.03	69.47	0.02	1.16	0.02	116 Point	433
0.04	66.88	0.01	1.16	0.02	117 Point	434
0.22	55.9	0.12	1.08	0.04	136 Point	435
0.23	54.79	0.15	1.01	0.04	137 Point	436
0.1	56.19	0.05	1.83	0.03	138 Point	437
0.07	52.93	0.02	1.21	0.03	139 Point	438
0.04	59.74	0.02	1.04	0.03	140 Point	439
0.06	58.61	0.01	1.09	0.02	141 Point	440
0.06	56.52	<0.01	1.05	0.02	142 Point	441
0.12	58.02	<0.01	1.09	0.02	143 Point	442
0.21	58.12	0.02	0.95	0.02	146 Point	443
0.41	58.27	0.03	0.9	0.02	147 Point	444

1.44	38	0.03	0.61	0.02	148 Point	445
0.32	54.72	0.02	0.81	0.02	149 Point	446
0.05	54.03	<0.01	1.08	0.02	89 Point	447
0.03	58.32	<0.01	1.1	0.02	90 Point	448
0.15	57.05	0.09	1.31	0.03	91 Point	449
0.08	56.32	0.01	1.27	0.03	92 Point	450
0.05	61.47	0.02	1.09	0.02	93 Point	451
0.03	68.13	<0.01	1.13	0.02	94 Point	452
0.05	64.75	0.01	1.08	0.02	95 Point	453
0.03	65.57	<0.01	1.06	0.02	96 Point	454
0.04	61.73	<0.01	1.17	0.03	97 Point	455
0.03	70.82	<0.01	0.99	0.02	98 Point	456
0.04	65.52	0.01	1.01	0.02	99 Point	457
0.05	54.68	<0.01	0.92	0.02	100 Point	458
0.07	57.01	0.03	0.97	0.02	101 Point	459
0.04	56.99	<0.01	1	0.03	102 Point	460
0.05	59.41	<0.01	1.09	0.03	47 Point	461
0.03	60.66	<0.01	1	0.02	48 Point	462
0.05	59.97	0.02	0.98	0.02	49 Point	463
0.37	49.19	<0.01	0.78	0.02	50 Point	464
0.03	72.78	<0.01	1.15	0.01	103 Point	465
0.28	58.25	0.11	1.24	0.03	51 Point	466
0.05	55.95	<0.01	1.54	0.03	28 Point	467
0.04	60.05	0.01	1.56	0.03	29 Point	468
0.05	58.81	0.01	1.5	0.03	30 Point	469
0.09	58.17	0.04	1.36	0.03	31 Point	470
0.06	65.13	0.03	1.25	0.03	32 Point	471
0.05	67.45	0.03	1.22	0.02	33 Point	472
0.05	64.98	<0.01	1.09	0.02	34 Point	473
0.04	49.08	<0.01	2.91	0.03	35 Point	474
0.04	46.74	<0.01	2.07	0.03	36 Point	475
0.05	57.59	0.01	1.85	0.03	37 Point	476
0.04	59.9	<0.01	1.5	0.02	38 Point	477
0.03	66.81	0.01	1.2	0.02	39 Point	478
0.03	65.94	0.01	1.21	0.02	40 Point	479
0.04	66.27	0.02	1.2	0.02	41 Point	480
0.09	55.37	0.01	0.98	0.02	42 Point	481
0.13	62.94	0.02	1.06	0.02	43 Point	482
0.04	59.05	<0.01	1.22	0.03	769 Point	483
0.04	56.68	<0.01	1.05	0.03	770 Point	484
0.22	54.95	<0.01	0.88	0.02	755 Point	485
0.13	58.97	0.04	0.96	0.03	756 Point	486
0.04	61.85	<0.01	1.11	0.02	757 Point	487
0.04	60.59	0.01	1.37	0.04	758 Point	488
0.04	62.49	<0.01	1.29	0.03	759 Point	489
0.06	54.93	0.02	1.51	0.03	760 Point	490
0.04	69.43	<0.01	1.13	0.02	761 Point	491

0.04	50.37	<0.01	0.95	0.02	762 Point	492
0.04	69.43	0.02	1.23	0.02	763 Point	493
0.07	51.96	<0.01	2.91	0.04	764 Point	494
0.37	53.7	0.3	2.83	0.04	765 Point	495
0.09	44.52	0.02	1.44	0.03	766 Point	496
0.2	59.39	0.02	1.21	0.03	743 Point	497
0.12	52.77	0.03	1.09	0.02	744 Point	498
0.03	62.46	<0.01	1.27	0.03	745 Point	499
0.16	52.23	0.02	0.98	0.03	746 Point	500
0.03	63.58	0.01	1.2	0.03	747 Point	501
0.03	65.21	0.02	1.05	0.02	754 Point	502
0.03	59.91	<0.01	1.08	0.03	680 Point	503
1.19	44.03	0.07	0.8	0.02	432 Point	504
0.11	57.45	0.06	1.27	0.02	433 Point	505
0.04	49.94	0.03	0.84	0.04	431 Point	506
0.05	55.44	<0.01	1.8	0.03	668 Point	507
0.04	66.69	<0.01	1.25	0.02	669 Point	508
0.02	88.19	0.01	1.14	0.01	670 Point	509
0.03	62.6	<0.01	1.37	0.03	671 Point	510
0.03	47.94	<0.01	2.26	0.04	661 Point	511
0.03	57.18	<0.01	1.26	0.02	662 Point	512
0.08	59.96	0.02	1.18	0.02	663 Point	513
0.04	50.9	<0.01	1.16	0.02	672 Point	514
0.04	59.41	<0.01	1.43	0.03	673 Point	515
0.04	51.91	0.01	1.32	0.03	674 Point	516
0.11	36.19	0.03	2.45	0.02	675 Point	517
0.04	61.88	0.01	2.47	0.01	676 Point	518
0.03	62.31	<0.01	1.01	0.02	677 Point	519
0.04	67.27	0.01	1.68	0.03	678 Point	520
0.02	71.81	<0.01	1.01	0.02	679 Point	521
0.1	66	<0.01	1.06	0.02	664 Point	522
0.14	65.76	0.01	1.05	0.02	665 Point	523
0.03	62.37	0.01	1.03	0.03	666 Point	524
0.03	68.61	0.01	1.28	0.03	667 Point	525
0.09	54.28	0.04	1.65	0.03	656 Point	526
0.05	49.99	<0.01	1.99	0.03	657 Point	527
0.04	55.81	<0.01	1.25	0.03	658 Point	528
0.04	52.94	<0.01	1.16	0.03	659 Point	529
0.03	62.99	<0.01	1	0.02	709 Point	530
0.03	60.03	<0.01	1.14	0.02	710 Point	531
0.03	73.07	<0.01	1.7	0.02	711 Point	532
0.05	63.76	0.01	1.16	0.03	712 Point	533
0.02	56.97	<0.01	1.88	0.03	713 Point	534
0.05	46.98	<0.01	4.7	0.05	714 Point	535
0.03	55.13	0.02	1.69	0.04	715 Point	536
0.03	60.67	0.01	1.56	0.02	691 Point	537
0.11	44.12	0.01	1.49	0.02	734 Point	538

0.08	39.22	<0.01	2.37	0.05	735 Point	539
0.07	40.29	<0.01	1.75	0.05	736 Point	540
0.04	71.79	0.01	1.16	0.02	544 Point	541
0.11	52.6	0.01	0.92	0.03	545 Point	542
0.03	53.56	<0.01	1.85	0.04	546 Point	543
0.04	56.87	<0.01	1.75	0.04	547 Point	544
0.03	46.55	<0.01	1.84	0.04	548 Point	545
0.02	52.63	<0.01	2	0.04	549 Point	546
0.03	71.72	<0.01	1.1	0.02	605 Point	547
0.08	66.27	0.04	4.05	0.02	606 Point	548
0.03	72.59	<0.01	1.96	0.02	607 Point	549
0.04	70.84	<0.01	1.34	0.02	608 Point	550
0.04	65.65	<0.01	1.2	0.02	609 Point	551
0.02	61.89	<0.01	1.14	0.03	610 Point	552
0.02	63.87	<0.01	1.26	0.03	611 Point	553
0.02	60.01	<0.01	1.13	0.03	612 Point	554
0.02	76.05	<0.01	1.04	0.02	613 Point	555
0.03	72.2	<0.01	1.14	0.02	614 Point	556
0.03	68.9	<0.01	1.2	0.02	615 Point	557
0.03	72.6	<0.01	1.15	0.02	616 Point	558
0.03	70.04	<0.01	1.22	0.02	617 Point	559
0.03	68.65	<0.01	1.24	0.02	618 Point	560
0.03	59.96	<0.01	1.57	0.03	619 Point	561
0.05	64.01	<0.01	1.21	0.03	624 Point	562
0.03	61.26	<0.01	1.08	0.03	625 Point	563
0.03	64.86	<0.01	1.19	0.03	626 Point	564
0.03	62.21	<0.01	1.35	0.03	627 Point	565
0.07	72.24	0.01	1.07	0.02	628 Point	566
0.06	73.95	0.01	1.02	0.02	629 Point	567
0.12	70.74	<0.01	1.11	0.02	630 Point	568
0.09	71.25	0.01	1.1	0.02	631 Point	569
0.06	72.33	<0.01	1.08	0.02	632 Point	570
0.06	68.41	<0.01	1.12	0.02	633 Point	571
0.06	62.75	<0.01	1.21	0.02	645 Point	572
0.06	62.83	0.01	1.25	0.02	646 Point	573
0.06	62.72	<0.01	1.23	0.03	647 Point	574
0.06	62.45	0.01	1.22	0.02	648 Point	575
0.05	62.78	0.01	1.24	0.02	649 Point	576
0.05	61.06	<0.01	1.24	0.03	650 Point	577
0.04	61.42	<0.01	1.23	0.03	651 Point	578
0.06	60.56	0.03	1.23	0.03	652 Point	579
0.75	53.63	0.8	1.37	0.05	653 Point	580
0.04	55.12	<0.01	1.13	0.03	620 Point	581
0.15	59.58	<0.01	1.28	0.03	621 Point	582
0.06	62.16	<0.01	1.33	0.02	622 Point	583
0.04	57.04	<0.01	1.17	0.02	623 Point	584
0.08	55.33	0.02	1.41	0.03	574 Point	585

0.22	57.07	0.11	1.32	0.03	575 Point	586
0.24	58.1	0.07	1.18	0.03	576 Point	587
0.25	59.41	0.04	1.18	0.03	577 Point	588
0.25	61.43	0.02	1.2	0.03	578 Point	589
0.08	60.93	<0.01	1.2	0.03	579 Point	590
0.05	61.6	0.01	1.28	0.03	580 Point	591
0.05	62.19	0.01	1.35	0.02	581 Point	592
0.03	74.87	0.01	1.16	0.02	559 Point	593
0.04	68.57	<0.01	1.18	0.02	560 Point	594
0.04	68.07	0.01	1.17	0.02	561 Point	595
0.04	69.8	<0.01	1.17	0.02	562 Point	596
0.05	69.47	<0.01	1.16	0.02	563 Point	597
0.05	67.1	<0.01	1.15	0.02	564 Point	598
0.04	65.14	<0.01	1.14	0.02	565 Point	599
0.04	72.48	<0.01	1.11	0.02	566 Point	600
0.04	69.7	<0.01	1.18	0.02	567 Point	601
0.03	69.84	<0.01	1.2	0.02	568 Point	602
0.04	67.64	<0.01	1.2	0.02	569 Point	603
0.03	69.46	<0.01	1.18	0.02	570 Point	604
0.04	68.73	<0.01	1.19	0.02	571 Point	605
0.03	67.79	<0.01	1.22	0.02	572 Point	606
0.03	69.03	<0.01	1.25	0.02	573 Point	607
0.06	62.01	0.01	1.12	0.02	634 Point	608
0.08	63.88	0.01	1.17	0.02	635 Point	609
0.07	63.46	0.01	1.17	0.02	636 Point	610
0.07	62.79	0.01	1.16	0.02	637 Point	611
0.05	62.46	<0.01	1.18	0.03	638 Point	612
0.04	59.51	<0.01	1.15	0.03	639 Point	613
0.03	55.7	<0.01	1.18	0.03	640 Point	614
0.03	70.55	<0.01	1.22	0.02	550 Point	615
0.03	73.36	<0.01	1.15	0.02	551 Point	616
0.04	63.22	<0.01	1.32	0.02	552 Point	617
0.06	49.46	0.03	1.52	0.04	553 Point	618
0.06	43.65	0.01	2.04	0.06	554 Point	619
0.06	53.42	0.01	1.32	0.03	555 Point	620
0.05	60.27	<0.01	1.39	0.02	556 Point	621
0.05	57.2	<0.01	1.62	0.03	557 Point	622
0.06	52.48	<0.01	2.21	0.03	558 Point	623
0.05	63.32	<0.01	1.12	0.03	582 Point	624
0.05	66.19	<0.01	1.17	0.02	583 Point	625
0.05	63.02	0.01	1.15	0.03	584 Point	626
0.06	67.19	<0.01	1.14	0.02	585 Point	627
0.06	66.09	0.01	1.16	0.02	586 Point	628
0.09	63.14	0.01	1.15	0.02	587 Point	629
0.09	61.57	<0.01	1.13	0.02	588 Point	630
0.05	63.16	<0.01	1.15	0.02	589 Point	631
0.05	62.56	<0.01	1.16	0.03	590 Point	632

0.02	76.58	<0.01	1.07	0.01	591 Point	633
0.03	74.32	<0.01	1.11	0.02	592 Point	634
0.16	68.56	0.09	1.31	0.02	593 Point	635
0.04	62.71	<0.01	1.18	0.03	594 Point	636
0.04	63.63	<0.01	1.17	0.03	595 Point	637
0.04	64.46	<0.01	1.17	0.03	596 Point	638
0.04	60.83	<0.01	1.13	0.03	597 Point	639
0.04	61.88	<0.01	1.16	0.03	598 Point	640
0.06	63.54	<0.01	1.26	0.03	599 Point	641
0.05	70.17	<0.01	1.23	0.02	600 Point	642
0.04	68.13	0.01	1.28	0.02	601 Point	643
0.03	67.88	<0.01	1.29	0.02	602 Point	644
0.04	63.22	<0.01	1.35	0.03	603 Point	645
0.04	66.29	0.01	1.56	0.02	604 Point	646
0.21	62.63	<0.01	0.9	0.01	44 Point	647
0.19	39.04	0.01	0.75	0.02	105 Point	648
0.04	55.85	0.01	1.13	0.03	104 Point	649
0.07	53.42	0.02	1.03	0.02	45 Point	650
0.08	55.42	0.01	1.06	0.02	46 Point	651
0.03	64.02	<0.01	1.2	0.02	0 Point	652
0.03	63.67	0.01	1.13	0.02	1 Point	653
0.02	39.41	<0.01	0.61	0.02	2 Point	654
0.04	61.47	<0.01	1.07	0.02	3 Point	655
0.05	58.27	0.02	0.96	0.02	4 Point	656
0.03	63.66	0.02	0.98	0.03	5 Point	657
0.04	62.08	0.01	1.08	0.02	6 Point	658
0.05	59.81	0.02	1.02	0.02	7 Point	659
0.04	61.08	<0.01	1.03	0.03	8 Point	660
0.04	61.54	<0.01	1.04	0.03	9 Point	661
0.26	60.15	0.16	1.19	0.02	52 Point	662
0.05	61.71	0.01	1.18	0.02	53 Point	663
0.09	65.29	0.04	1.14	0.02	54 Point	664
0.05	66.84	0.02	1.12	0.02	55 Point	665
0.06	64.92	0.03	1.08	0.02	56 Point	666
0.18	60.12	0.02	1.35	0.02	10 Point	667
0.25	59.18	0.02	1.34	0.02	11 Point	668
0.13	61.8	0.02	1.41	0.03	12 Point	669
0.17	41.47	0.01	1	0.02	13 Point	670
0.09	55.33	0.02	1.54	0.02	14 Point	671
0.07	59.68	0.02	1.41	0.03	15 Point	672
0.07	69.59	0.02	1.07	0.02	16 Point	673
0.05	60.44	0.01	2.17	0.02	18 Point	675
0.03	61.5	<0.01	1.71	0.02	19 Point	676
0.02	68.78	0.01	1.19	0.02	20 Point	677
0.04	69.34	0.02	1.15	0.02	21 Point	678
0.06	63.68	<0.01	1.06	0.02	22 Point	679
0.05	59.85	<0.01	1.41	0.02	23 Point	680

0.11	57.43	<0.01	0.96	0.03	24 Point	681
0.05	59.73	0.01	1.37	0.03	25 Point	682
0.06	63.91	0.02	1.31	0.02	26 Point	683
0.06	66	<0.01	1	0.02	27 Point	684
0.04	55.8	<0.01	1.38	0.03	150 Point	685
0.03	59.98	<0.01	1.18	0.03	151 Point	686
0.04	60.11	<0.01	1.12	0.02	152 Point	687
0.03	52.06	<0.01	0.98	0.03	153 Point	688
0.05	65.9	0.01	0.96	0.02	154 Point	689
0.07	65.14	0.01	0.97	0.02	155 Point	690
0.08	62.44	<0.01	0.95	0.02	156 Point	691
0.08	61	<0.01	1.02	0.02	157 Point	692
0.02	71.95	<0.01	1.35	0.02	158 Point	693
0.04	50.67	<0.01	0.98	0.02	159 Point	694
0.04	58.65	<0.01	1.14	0.03	160 Point	695
0.06	57.64	<0.01	1.12	0.03	161 Point	696
0.05	58.08	<0.01	1.17	0.03	162 Point	697
0.06	59.71	0.01	1.05	0.02	163 Point	698
0.06	59.83	0.01	1.1	0.02	164 Point	699
0.02	74.87	<0.01	1.16	0.02	165 Point	700
0.03	68.17	<0.01	1.15	0.02	166 Point	701
0.05	54.29	<0.01	1.06	0.02	167 Point	702
0.04	74.35	0.01	1.08	0.01	168 Point	703
0.02	80.43	0.02	1.08	<0.01	169 Point	704
0.03	83.88	<0.01	0.94	<0.01	170 Point	705
0.15	55.69	<0.01	0.94	0.02	172 Point	706
0.06	53.08	<0.01	1.09	0.02	173 Point	707
0.05	65.27	0.02	1.08	0.02	174 Point	708
0.04	61.52	<0.01	0.94	0.01	175 Point	709
0.05	56.79	0.02	1.03	0.03	176 Point	710
0.04	67.95	0.01	1.27	0.02	171 Point	711
0.04	62.82	<0.01	1.37	0.02	177 Point	712
0.02	75.79	<0.01	1.34	0.01	178 Point	713
0.02	78.54	<0.01	1.07	0.01	179 Point	714
0.24	55.8	<0.01	1	0.02	180 Point	715
0.18	55.15	0.02	0.97	0.03	181 Point	716
0.09	56.21	0.01	0.98	0.03	183 Point	718
0.07	56.74	<0.01	0.96	0.03	184 Point	719
0.03	59.53	<0.01	1.04	0.02	185 Point	720
0.51	57.26	0.01	1	0.02	186 Point	721
0.14	53.5	<0.01	0.95	0.03	187 Point	722
0.29	54.96	<0.01	0.93	0.03	188 Point	723
0.03	63.4	<0.01	1.17	0.02	189 Point	724
0.04	63.97	0.01	1.1	0.02	190 Point	725
0.03	60.6	<0.01	1.17	0.02	191 Point	726
0.08	63.27	0.03	1.07	0.02	192 Point	727
0.05	52.79	<0.01	1.08	0.03	193 Point	728

0.04	55.81	<0.01	1.05	0.03	194 Point	729
0.05	56.38	0.01	0.98	0.03	195 Point	730
0.15	40.7	<0.01	0.64	0.02	196 Point	731
0.04	56.57	<0.01	1.07	0.03	197 Point	732
0.03	62.88	<0.01	1.25	0.02	198 Point	733
0.03	71.95	0.02	1.11	0.02	199 Point	734
0.03	67.28	0.01	1.06	0.02	200 Point	735
0.11	55.25	<0.01	0.92	0.02	201 Point	736
0.02	60.08	<0.01	1.14	0.02	202 Point	737
0.03	62.98	<0.01	1.14	0.02	203 Point	738
0.02	65.4	<0.01	1.13	0.02	204 Point	739
0.05	51.56	0.01	0.87	0.03	206 Point	741
0.04	66.47	<0.01	1.12	0.02	207 Point	742
0.04	65.3	0.01	1.09	0.02	208 Point	743
0.03	71.68	0.02	1.07	0.02	209 Point	744
0.26	50.76	0.01	0.94	0.03	239 Point	745
0.17	49.26	<0.01	0.95	0.02	240 Point	746
0.05	56.39	0.02	0.94	0.03	232 Point	747
0.03	57.56	0.01	0.98	0.02	233 Point	748
0.02	59.29	0.01	0.96	0.03	234 Point	749
0.02	57.79	0.01	0.96	0.03	235 Point	750
0.03	59.8	0.01	1.39	0.02	236 Point	751
0.03	59.4	<0.01	1.19	0.03	237 Point	752
0.03	60.43	0.01	1.1	0.03	238 Point	753
0.03	57.53	0.03	1.16	0.03	214 Point	754
0.45	47.8	0.46	2.32	0.04	215 Point	755
1.29	40.92	1.39	1.29	0.05	216 Point	756
0.33	53.47	0.23	1.36	0.02	217 Point	757
0.1	55.66	<0.01	1.06	0.02	218 Point	758
0.06	56.02	<0.01	1.07	0.03	219 Point	759
0.06	50.32	<0.01	0.98	0.03	220 Point	760
0.07	49.53	0.02	0.92	0.02	221 Point	761
0.05	54.2	<0.01	1.14	0.02	222 Point	762
0.07	55.88	<0.01	1.15	0.03	223 Point	763
0.07	55.89	0.01	1.15	0.03	224 Point	764
0.14	53.35	0.02	1.09	0.03	225 Point	765
0.08	55.8	0.01	1.2	0.03	226 Point	766
0.06	55.4	0.01	1.1	0.03	227 Point	767
0.05	55.96	0.02	0.98	0.03	228 Point	768
0.06	56.12	0.01	1.04	0.03	229 Point	769
0.04	59.49	<0.01	1.12	0.03	230 Point	770
0.03	71.06	<0.01	1.14	0.01	231 Point	771
0.07	57	0.03	0.9	0.03	210 Point	772
0.24	48.98	0.22	2.96	0.04	211 Point	773
0.07	56.15	0.03	1.87	0.03	212 Point	774
0.05	64.82	0.02	1.82	0.02	213 Point	775
<0.01	2.73	<0.01	0.07	<0.01	244 Point	1

0.09	4.83	<0.01	0.13	<0.01	245 Point	2
0.04	70.6	<0.01	1.07	0.02	246 Point	3
0.03	79.2	<0.01	0.88	0.02	247 Point	4
0.07	76.1	<0.01	0.81	0.02	248 Point	5
0.05	0.73	0.02	0.03	<0.01	249 Point	6
0.04	65.9	<0.01	1.13	0.03	250 Point	7
0.05	60	<0.01	0.97	0.02	251 Point	8
0.13	52.5	0.02	0.95	0.03	252 Point	9
0.1	2.29	0.04	0.06	<0.01	253 Point	10
0.04	65.7	<0.01	1.21	0.02	254 Point	11
0.04	71.3	<0.01	1.14	0.02	255 Point	12
0.09	66.7	<0.01	0.75	0.02	256 Point	13
0.06	58.9	<0.01	1.08	0.03	257 Point	14
0.05	58.1	0.01	0.76	0.01	258 Point	15
0.13	60.9	<0.01	0.88	0.02	259 Point	16
<0.01	2.96	<0.01	0.07	<0.01	260 Point	17
0.02	58.6	<0.01	1.25	0.03	261 Point	18
0.11	54	<0.01	0.96	0.02	262 Point	19
0.13	58.5	0.01	1.05	0.03	197 Point	20
0.13	60.1	0.06	1.09	0.03	198 Point	21
0.15	62.2	<0.01	0.88	0.02	199 Point	22
<0.01	4.23	<0.01	0.09	<0.01	200 Point	23
0.02	60	<0.01	1.24	0.03	201 Point	24
0.04	60.5	<0.01	1	0.03	202 Point	25
0.16	56.2	<0.01	0.87	0.03	203 Point	26
0.04	59.5	<0.01	0.99	0.03	204 Point	27
<0.01	3.18	<0.01	0.05	<0.01	205 Point	28
0.64	56.1	<0.01	0.84	0.05	206 Point	29
<0.01	1.91	<0.01	0.04	<0.01	207 Point	30
0.01	60.3	<0.01	1.09	0.02	208 Point	31
0.06	53.6	<0.01	0.98	0.02	209 Point	32
0.54	41.5	0.01	0.74	0.22	210 Point	33
<0.01	8.23	<0.01	0.2	<0.01	211 Point	34
0.12	62.6	<0.01	1	0.02	212 Point	35
0.15	35.3	0.01	0.57	0.25	213 Point	36
<0.01	3.39	<0.01	0.08	0.01	214 Point	37
0.01	76.6	<0.01	0.89	0.01	215 Point	38
0.05	62.4	<0.01	0.86	0.01	216 Point	39
0.04	62.7	<0.01	1.05	0.02	217 Point	40
0.21	38	0.01	0.58	0.27	218 Point	41
0.05	59.6	<0.01	0.95	0.02	219 Point	42
0.1	51.2	0.04	0.89	0.03	220 Point	43
<0.01	3.67	<0.01	0.07	<0.01	221 Point	44
0.06	57.4	<0.01	1.06	0.02	222 Point	45
0.05	66.7	<0.01	1.13	0.02	223 Point	46
0.05	60.5	<0.01	1.02	0.02	224 Point	47
0.34	52.4	0.01	0.8	0.17	225 Point	48

0.19	62.3	0.03	1.05	0.03	226 Point	49
0.71	42.4	0.01	0.66	0.22	227 Point	50
<0.01	7.72	<0.01	0.16	<0.01	228 Point	51
0.02	58.2	<0.01	1.91	0.02	229 Point	52
<0.01	4.68	<0.01	0.1	<0.01	132 Point	53
0.15	56.6	0.01	0.91	0.02	133 Point	54
0.05	58.4	<0.01	1.03	0.02	134 Point	55
0.06	54.9	<0.01	0.88	0.03	135 Point	56
0.04	3.36	0.01	0.08	<0.01	136 Point	57
0.09	54.5	0.02	0.95	0.03	137 Point	58
<0.01	6.51	<0.01	0.16	<0.01	138 Point	59
0.02	66.9	<0.01	1.01	0.02	139 Point	60
0.07	64	0.02	0.71	0.01	140 Point	61
0.19	41	<0.01	0.51	0.35	141 Point	62
<0.01	8.62	<0.01	0.15	<0.01	142 Point	63
0.1	70.1	<0.01	1	0.02	143 Point	64
0.25	7.46	<0.01	0.16	<0.01	144 Point	65
0.08	55.5	<0.01	1.03	0.03	145 Point	66
0.1	54.6	0.02	1.03	0.03	146 Point	67
0.1	56.3	0.01	1.09	0.03	147 Point	68
0.03	65.4	<0.01	1.42	0.02	148 Point	69
0.03	55.9	<0.01	1.13	0.03	149 Point	70
0.03	57.6	<0.01	1.18	0.03	150 Point	71
0.03	43.8	<0.01	0.85	0.03	151 Point	72
0.03	65.3	<0.01	1.05	0.02	152 Point	73
0.03	65.4	<0.01	1.02	0.02	153 Point	74
0.38	16.5	0.01	0.25	0.05	154 Point	75
0.13	59.9	<0.01	1.08	0.03	155 Point	76
0.13	59.3	<0.01	1.05	0.02	156 Point	77
0.11	55.1	<0.01	1.01	0.02	157 Point	78
0.11	55.6	0.01	1.01	0.02	158 Point	79
0.02	72.3	<0.01	0.82	0.01	159 Point	80
0.04	30.9	<0.01	0.38	<0.01	160 Point	81
0.04	65.9	<0.01	1.02	0.02	161 Point	82
0.11	65.1	<0.01	1	0.02	162 Point	83
0.04	27.2	0.01	0.63	0.04	163 Point	84
0.04	61.3	<0.01	1.08	0.02	164 Point	85
0.05	60	<0.01	1.08	0.02	165 Point	86
0.04	79	<0.01	0.89	0.02	104 Point	87
0.05	68.8	<0.01	1.32	0.02	105 Point	88
0.05	70.6	<0.01	1.26	0.02	106 Point	89
0.07	61.9	<0.01	1.11	0.03	107 Point	90
0.03	64.6	<0.01	1.11	0.03	108 Point	91
0.03	64	<0.01	1.39	0.03	109 Point	92
0.02	88.9	<0.01	0.73	<0.01	110 Point	93
0.01	89.1	<0.01	0.68	<0.01	111 Point	94
0.02	83.5	<0.01	0.82	<0.01	112 Point	95

0.05	65.9 <0.01		1.23	0.02	103 Point	96
0.03	68 <0.01		1.17	0.02	95 Point	97
0.1	70.2 <0.01		1	0.02	96 Point	98
0.07	64.3	0.01	1.06	0.03	97 Point	99
0.04	68.8 <0.01		1.09	0.02	98 Point	100
0.73	48.9 <0.01		0.91	0.03	99 Point	101
0.05	62.7 <0.01		1.04	0.02	100 Point	102
0.02	66.2 <0.01		1.41	0.02	58 Point	103
0.02	79.2 <0.01		1.09	0.02	59 Point	104
0.05	59.5 <0.01		1.1	0.03	60 Point	105
0.02	73 <0.01		0.9	0.01	61 Point	106
0.08	51.7 <0.01		0.99	0.03	62 Point	107
0.08	53.4 <0.01		1.07	0.04	63 Point	108
0.03	73.5 <0.01		1.26	0.03	64 Point	109
0.02	63.6 <0.01		1.49	0.02	65 Point	110
0.41	44.4	0.02	0.49 <0.01		50 Point	111
0.09	57.6 <0.01		0.73	0.02	51 Point	112
0.1	60.2	0.02	0.76	0.01	52 Point	113
0.09	50.8	0.04	0.63	0.01	53 Point	114
0.42	58.4 <0.01		0.73	0.02	54 Point	115
0.1	60.7	0.02	0.75	0.01	55 Point	116
0.09	60.1	0.02	0.75	0.02	56 Point	117
0.08	62.3	0.01	0.78	0.01	57 Point	118
0.21	59.3 <0.01		1.07	0.02	90 Point	119
0.43	60.9 <0.01		0.89	0.02	91 Point	120
0.11	68.7 <0.01		0.92	0.02	92 Point	121
0.19	62.1 <0.01		0.96	0.03	93 Point	122
0.16	64.6 <0.01		0.97	0.02	94 Point	123
0.02	62.1 <0.01		1.27	0.03	101 Point	124
0.05	63.8 <0.01		1.06	0.03	102 Point	125
0.04	57.3 <0.01		1.1	0.03	66 Point	126
0.05	58.4 <0.01		1.21	0.02	67 Point	127
0.11	36.5	0.02	0.44	0.01	68 Point	128
0.07	61.3 <0.01		0.96	0.02	69 Point	129
0.02	62.5 <0.01		1.01	0.02	70 Point	130
0.12	56.4 <0.01		0.89	0.02	71 Point	131
0.13	48.7	0.02	0.79	0.02	72 Point	132
0.15	59.4	0.02	0.93	0.02	73 Point	133
0.18	53.9 <0.01		0.83	0.02	74 Point	134
0.19	51.7	0.01	0.8	0.02	75 Point	135
0.16	52.8	0.01	0.82	0.03	76 Point	136
0.1	55.9 <0.01		0.85	0.02	77 Point	137
0.04	62.3 <0.01		0.85	0.03	78 Point	138
0.09	67.9	0.04	0.91	0.02	79 Point	139
0.09	40.5	0.03	0.48	0.01	80 Point	140
0.08	59.4	0.01	0.75	0.02	81 Point	141
0.09	60.1 <0.01		0.82	0.02	82 Point	142

0.16	58.6	0.01	0.82	0.02	83 Point	143
0.07	59	<0.01	0.82	0.02	84 Point	144
0.03	21.8	0.03	0.31	<0.01	85 Point	145
0.04	59.7	<0.01	0.93	0.02	86 Point	146
0.06	61	<0.01	0.98	0.02	87 Point	147
0.26	48.8	0.04	0.71	0.01	88 Point	148
0.14	53.5	0.06	0.83	0.04	89 Point	149
0.05	53	<0.01	0.92	0.03	43 Point	150
0.19	56.9	0.03	0.91	0.02	44 Point	151
0.07	51.6	0.02	0.72	0.02	45 Point	152
0.02	39.7	0.05	0.58	0.02	46 Point	153
0.04	53.3	<0.01	0.78	0.02	47 Point	154
0.18	57.5	0.03	0.75	0.03	48 Point	155
0.22	58.4	0.02	0.87	0.02	49 Point	156
0.04	62.4	0.01	1.07	0.02	0 Point	157
0.04	68.2	<0.01	1.07	0.02	1 Point	158
0.04	61.6	0.01	0.97	0.02	2 Point	159
0.06	61.6	<0.01	1.07	0.02	3 Point	160
0.61	58.2	<0.01	1	0.02	4 Point	161
0.11	21.2	0.02	0.42	0.03	5 Point	162
0.07	56.3	0.01	0.98	0.02	6 Point	163
0.07	63.8	0.02	1.12	0.02	7 Point	164
0.09	63.9	0.02	1.1	0.02	8 Point	165
0.12	61.6	0.02	1.09	0.02	9 Point	166
0.1	66.1	0.04	1.08	0.02	10 Point	167
0.05	53.8	<0.01	1.06	0.02	11 Point	168
0.04	55.8	<0.01	1.12	0.02	12 Point	169
0.05	55	<0.01	1.1	0.02	13 Point	170
0.05	55.8	<0.01	1.12	0.03	14 Point	171
0.12	59.1	0.02	1.23	0.02	15 Point	172
0.09	48.4	0.02	0.88	0.02	16 Point	173
0.05	31.8	0.02	0.51	0.01	17 Point	174
0.07	50.7	<0.01	0.87	0.02	18 Point	175
0.04	61.8	0.01	1.04	0.02	19 Point	176
0.07	57.6	0.02	1.01	0.02	20 Point	177
0.11	61.7	0.03	1.06	0.02	21 Point	178
0.1	59.8	0.02	0.93	0.02	22 Point	179
0.1	47.2	0.01	0.76	0.02	23 Point	180
0.07	59.3	<0.01	1.03	0.02	24 Point	181
0.15	29.7	<0.01	0.55	0.02	25 Point	182
0.07	16.3	<0.01	0.18	0.01	26 Point	183
0.09	35.1	<0.01	0.43	0.02	27 Point	184
0.04	55.4	0.01	1.11	0.03	28 Point	185
0.03	49.4	<0.01	0.94	0.03	29 Point	186
0.05	54.5	0.01	1.01	0.03	30 Point	187
0.06	55.3	0.02	1	0.03	31 Point	188
0.07	55.5	0.03	0.95	0.03	32 Point	189

0.05	60.1	<0.01	1	0.02	33 Point	190
0.1	69	0.06	0.8	0.01	34 Point	191
0.04	67	0.01	1.15	0.02	35 Point	192
0.55	63.1	<0.01	0.98	0.02	36 Point	193
0.05	59.2	<0.01	0.97	0.02	37 Point	194
0.03	41.5	<0.01	0.73	0.03	38 Point	195
0.03	61.8	<0.01	1.14	0.02	39 Point	196
0.02	62	<0.01	1.15	0.02	40 Point	197
0.06	59.9	<0.01	0.99	0.02	41 Point	198
0.03	62.5	<0.01	1.07	0.02	42 Point	199
0.5	27	0.01	0.36	0.5	179 Point	200
<0.01	3.69	<0.01	0.06	<0.01	180 Point	201
0.12	8.2	0.08	0.07	<0.01	181 Point	202
0.06	53.8	0.02	0.98	0.03	182 Point	203
0.11	60.6	0.02	0.95	0.02	183 Point	204
<0.01	1.75	<0.01	0.04	<0.01	184 Point	205
0.06	64.8	0.03	1.03	0.02	185 Point	206
0.03	63.9	0.01	0.96	0.02	186 Point	207
0.24	43.9	<0.01	0.68	0.29	187 Point	208
<0.01	5.24	<0.01	0.12	<0.01	188 Point	209
0.02	56.2	<0.01	1.55	0.03	189 Point	210
0.03	63.8	<0.01	1.32	0.04	190 Point	211
<0.01	3.09	<0.01	0.11	<0.01	191 Point	212
0.05	52.8	<0.01	1.22	0.03	192 Point	213
0.03	57.8	<0.01	0.97	0.03	193 Point	214
<0.01	1.13	<0.01	0.03	<0.01	194 Point	215
0.51	58.4	0.09	1.34	0.02	195 Point	216
0.04	72.2	<0.01	1.09	0.02	196 Point	217
0.75	31.1	<0.01	0.43	0.46	281 Point	218
0.03	50.7	<0.01	0.68	0.02	282 Point	219
0.03	63.7	<0.01	1.04	0.02	283 Point	220
0.17	38.2	0.03	0.59	0.06	284 Point	221
0.26	26.1	0.17	0.53	0.01	285 Point	222
2.44	37.5	0.03	0.59	0.38	286 Point	223
0.19	50.1	0.15	1.42	0.04	287 Point	224
0.03	45.2	<0.01	1.53	0.03	288 Point	225
0.16	58.1	0.01	0.66	0.09	230 Point	226
0.05	63.8	<0.01	0.99	0.02	231 Point	227
0.06	56.9	0.01	0.94	0.02	232 Point	228
0.23	35.9	0.01	0.5	0.28	233 Point	229
0.04	58.1	0.01	0.9	0.17	234 Point	230
0.02	70.2	<0.01	1.22	0.02	235 Point	231
0.05	61.1	0.02	1.15	0.03	236 Point	232
0.43	27.4	0.01	0.45	0.25	237 Point	233
0.04	55	<0.01	1.43	0.03	238 Point	234
0.03	61.9	0.01	1.3	0.03	239 Point	235
0.02	61.1	<0.01	1.35	0.03	240 Point	236

0.03	59.5 <0.01	1.18	0.03	241 Point	237
0.05	53 <0.01	1.34	0.04	242 Point	238
0.05	49 <0.01	1.01	0.03	243 Point	239
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280 Point	289

FieldNum	Latitude	Longitude	Datum	Country	State	LocationDet	topoq24_C	USGS_QD
231-036-B1	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	42050	38080-D7
231-036-B2	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	42050	38080-D7
231-036-B3	38.43616	-80.7858	NAD83	United Stat	WV	231-036 al	42050	38080-D7
230-092D-I	38.42451	-80.7866	NAD83	United Stat	WV	230-092D a	42050	38080-D7
230-092D-II	38.42451	-80.7866	NAD83	United Stat	WV	230-092D a	42050	38080-D7
230-092B-I	38.44225	-80.7863	NAD83	United Stat	WV	230-092B c	42050	38080-D7
230-092B-II	38.44225	-80.7863	NAD83	United Stat	WV	230-092B c	42050	38080-D7
231-093-B1	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
231-093-B2	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
231-093-B3	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
231-093-B4	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
231-093-B5	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
231-093-B6	38.54255	-80.7238	NAD83	United Stat	WV	231-093 an	42354	38080-E6
50-092A-B1	38.58351	-80.7377	NAD83	United Stat	WV	50-092A al	42354	38080-E6
50-092A-B2	38.58351	-80.7377	NAD83	United Stat	WV	50-092A al	42354	38080-E6
50-092A-B3	38.58351	-80.7377	NAD83	United Stat	WV	50-092A al	42354	38080-E6
50-092A-B4	38.58351	-80.7377	NAD83	United Stat	WV	50-092A al	42354	38080-E6
214-093C-F1	39.65838	-79.8355	NAD83	United Stat	WV	214-093C A	42466	39079-F7
214-093C-F2	39.65838	-79.8355	NAD83	United Stat	WV	214-093C A	42466	39079-F7
214-093C-F3	39.65838	-79.8355	NAD83	United Stat	WV	214-093C A	42466	39079-F7
214-093C-F4	39.65838	-79.8355	NAD83	United Stat	WV	214-093C A	42466	39079-F7
214-093C-F5	39.65838	-79.8355	NAD83	United Stat	WV	214-093C A	42466	39079-F7
214-093B-F1	39.6576	-79.8333	NAD83	United Stat	WV	214-093B A	42466	39079-F7
214-093B-F2	39.6576	-79.8333	NAD83	United Stat	WV	214-093B A	42466	39079-F7
214-093B-F3	39.6576	-79.8333	NAD83	United Stat	WV	214-093B A	42466	39079-F7
214-093B-F4	39.6576	-79.8333	NAD83	United Stat	WV	214-093B A	42466	39079-F7
214-093B-F5	39.6576	-79.8333	NAD83	United Stat	WV	214-093B A	42466	39079-F7
214-093A-F1	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	42466	39079-F7
214-093A-F2	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	42466	39079-F7
214-093A-F3	39.65746	-79.8302	NAD83	United Stat	WV	214-093A A	42466	39079-F7
MD-14-B1	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	42467	39079-F6
MD-14-B2	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	42467	39079-F6
MD-14-B3	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	42467	39079-F6
MD-14-B4	39.65869	-79.6589	NAD83	United Stat	WV	MD-14 alor	42467	39079-F6
MD-15-B1	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	42466	39079-F7
MD-15-B2	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	42466	39079-F7
MD-15-B3	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	42466	39079-F7
MD-15-B4	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	42466	39079-F7
MD-15-B5	39.65572	-79.7707	NAD83	United Stat	WV	MD-15 alor	42466	39079-F7

MD-15-B7	39.65572	-79.7707	NAD83	United Stat WV	MD-15 alor	42466	39079-F7
MD-15-B8	39.65572	-79.7707	NAD83	United Stat WV	MD-15 alor	42466	39079-F7
230-092A-I	38.42026	-80.7872	NAD83	United Stat WV	230-092A s	42050	38080-D7
230-092A-I	38.42026	-80.7872	NAD83	United Stat WV	230-092A s	42050	38080-D7
230-092G	38.42817	-80.7874	NAD83	United Stat WV	230-092G s	42050	38080-D7
50-092B-B:	38.58468	-80.7385	NAD83	United Stat WV	50-092 alor	42354	38080-E6
50-092B-B:	38.58468	-80.7385	NAD83	United Stat WV	50-092 alor	42354	38080-E6
50-092B-B:	38.58468	-80.7385	NAD83	United Stat WV	50-092 alor	42354	38080-E6
50-080-B1	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B2	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B3	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B4	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B5	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B6	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B7	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B8	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
50-080-B9	38.59372	-80.7336	NAD83	United Stat WV	50-080 alor	42354	38080-E6
272-095-B1	39.65644	-79.7735	NAD83	United Stat WV	Near truck	42466	39079-F7
272-095-B2	39.65644	-79.7735	NAD83	United Stat WV	Near truck	42466	39079-F7
272-095-B3	39.65644	-79.7735	NAD83	United Stat WV	Near truck	42466	39079-F7
272-095-B4	39.65644	-79.7735	NAD83	United Stat WV	Near truck	42466	39079-F7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
230-092D-I	38.42447	-80.7863	NAD83	United Stat WV	230-092D s	42050	38080-D7
90-037	39.66099	-79.851	NAD83	United Stat WV	90-037 loca	42466	39079-F7
230-092F-E	38.42698	-80.7864	NAD83	United Stat WV	230-092F a	42050	38080-D7
230-092F-E	38.42698	-80.7864	NAD83	United Stat WV	230-092F a	42050	38080-D7
230-092F-E	38.42698	-80.7864	NAD83	United Stat WV	230-092F a	42050	38080-D7
230-092F-E	38.42698	-80.7864	NAD83	United Stat WV	230-092F a	42050	38080-D7
50-092B-U:	38.58468	-80.7385	NAD83	United Stat WV	50-092 alor	42354	38080-E6
WV-EMRI-2	39.07819	-81.1938	NAD83	United Stat WV	Log of core	42379	39081-A2
WV-EMRI-2	39.07819	-81.1938	NAD83	United Stat WV	Log of core	42379	39081-A2
MD-9-A	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US	42599	39079-B2
MD-9-B	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US	42599	39079-B2
MD-9-C	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US	42599	39079-B2
MD-9-D	39.21625	-79.2062	WGS84	United Stat WV	Rt 42 at US	42599	39079-B2
MD-14-A	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We	42467	39079-F6
MD-14-B	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We	42467	39079-F6
MD-14-C	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We	42467	39079-F6
MD-14-D	39.65869	-79.6589	WGS84	United Stat WV	US 68 - We	42467	39079-F6
MD-15-A	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7

MD-15-B	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7
MD-15-C	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7
MD-15-D	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7
MD-15-E	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7
MD-15-F	39.65572	-79.7707	WGS84	United Stat WV	US 68 - Che	42466	39079-F7
OGS-CSHOC	39.46806	-82.3128	WGS84	United Stat OH	road outcro	36831	39082-D3
OGS-CSHOC	39.46806	-82.3128	WGS84	United Stat OH	road outcro	36831	39082-D3
OGS-CSHOC	39.46806	-82.3128	WGS84	United Stat OH	road outcro	36831	39082-D3
OGS-CSHOC	39.47257	-82.249	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47257	-82.249	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47257	-82.249	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47257	-82.249	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47257	-82.249	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.472	-82.2497	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.472	-82.2497	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.472	-82.2497	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.46784	-82.2501	WGS84	United Stat OH	road outcro	36831	39082-D3
OGS-CSHOC	39.3283	-82.0857	WGS84	United Stat OH	road outcro	36847	39082-C1
OGS-CSHOC	39.32831	-82.0857	WGS84	United Stat OH	road outcro	36847	39082-C1
OGS-CSHOC	39.43432	-82.1987	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.43432	-82.1987	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.43432	-82.1987	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.43595	-82.1996	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.43595	-82.1996	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.87326	-82.1167	WGS84	United Stat OH	road outcro	36791	39082-G1
OGS-CSHOC	39.86459	-82.1216	WGS84	United Stat OH	Maysville N	36791	39082-G1
OGS-CSHOC	39.86486	-82.1224	WGS84	United Stat OH	Maysville N	36791	39082-G1
OGS-CSHOC	39.78689	-82.6408	WGS84	United Stat OH	Private hor	36786	39082-G6
OGS-CSHOC	39.52574	-82.3598	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52574	-82.3598	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.52597	-82.3595	WGS84	United Stat OH	former pos	36817	39082-E3
OGS-CSHOC	39.47272	-82.2407	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47272	-82.2407	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47272	-82.2407	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47272	-82.2407	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47272	-82.2407	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47278	-82.2416	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47278	-82.2416	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.47278	-82.2416	WGS84	United Stat OH	road outcro	36832	39082-D2
OGS-CSHOC	39.1461	-82.0221	WGS84	United Stat OH	road outcro	36861	39082-B1
OGS-CSHOC	39.1461	-82.0221	WGS84	United Stat OH	road outcro	36861	39082-B1

OGS-CSHOC	39.14648	-82.0222	WGS84	United Stat OH	road outcro	36861	39082-B1
OGS-CSHOC	39.14648	-82.0222	WGS84	United Stat OH	road outcro	36861	39082-B1
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.0092	-81.5594	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07834	-81.5643	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07834	-81.5643	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07834	-81.5643	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07907	-81.5639	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07907	-81.5639	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.07907	-81.5639	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.14748	-81.5486	WGS84	United Stat OH	road outcro	35833	40081-B5
OGS-CSHOC	40.14748	-81.5486	WGS84	United Stat OH	road outcro	35833	40081-B5
OGS-CSHOC	40.14748	-81.5486	WGS84	United Stat OH	road outcro	35833	40081-B5
OGS-CSHOC	40.09065	-81.5581	WGS84	United Stat OH	road outcro	36767	40081-A5
OGS-CSHOC	40.14458	-81.5498	WGS84	United Stat OH	road outcro	35833	40081-B5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.29346	-81.5496	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.28688	-81.5669	WGS84	United Stat OH	outcrop alc	35819	40081-C5
OGS-CSHOC	40.30853	-81.5672	WGS84	United Stat OH	road outcro	35819	40081-C5
OGS-CSHOC	40.30853	-81.5672	WGS84	United Stat OH	road outcro	35819	40081-C5
PAGS-MRI-	40.82045	-76.4414	NAD83	United Stat PA	Wesier Stai	44188	40076-G4
PAGS-MRI-	40.82021	-76.4478	NAD83	United Stat PA	Wesier Stai	44188	40076-G4
IND063_23	40.42231	-79.1576	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42231	-79.1576	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42231	-79.1576	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42231	-79.1576	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42519	-79.1583	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42425	-79.1535	NAD83	United Stat PA	State Game	43543	40079-D2

IND063_23	40.42425	-79.1535	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42425	-79.1535	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42425	-79.1535	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42425	-79.1535	NAD83	United Stat PA	State Game	43543	40079-D2
IND063_23	40.42752	-79.1551	NAD83	United Stat PA	State Game	43543	40079-D2
PAGS-HW2	40.64755	-78.9187	NAD83	United Stat PA	NA	43517	40078-F8
PAGS-HW2	40.64755	-78.9187	NAD83	United Stat PA	NA	43517	40078-F8
PAGS-HW2	40.64755	-78.9187	NAD83	United Stat PA	NA	43517	40078-F8
PAGS-HW2	40.64755	-78.9187	NAD83	United Stat PA	NA	43517	40078-F8
PAGS-HW2	40.64755	-78.9187	NAD83	United Stat PA	NA	43517	40078-F8
PAGS-BRU2	40.50886	-79.0519	NAD83	United Stat PA	NA	43530	40079-E1
PAGS-KJ21	41.29497	-78.7545	NAD83	United Stat PA	NA	43448	41078-C7
PAGS-MB-1	39.85027	-80.416	NAD83	United Stat PA	NA	42446	39080-G4
PAGS-MB-1	39.8523	-80.4317	NAD83	United Stat PA	NA	42446	39080-G4
PAGS-NV-1	39.96185	-80.2758	NAD83	United Stat PA	NA	42432	39080-H3
MRI-23_To	40.96754	-80.3583	NAD83	United Stat PA	West-boun	43414	40080-H3
MRI-23_Ba	40.96754	-80.3583	NAD83	United Stat PA	West-boun	43414	40080-H3
MRI-24	40.96779	-80.3591	NAD83	United Stat PA	West-boun	43414	40080-H3
MRI-25	40.96771	-80.3611	NAD83	United Stat PA	West-boun	43414	40080-H3
MRI-26D	40.90445	-80.2247	NAD83	United Stat PA	Armstrong	43407	40080-H2
MRI-26E	40.90445	-80.2247	NAD83	United Stat PA	Armstrong	43407	40080-H2
MRI-27	40.96097	-80.1334	NAD83	United Stat PA	Northboun	43407	40080-H2
MRI-28C	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-28D_T	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-28D_E	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-28M	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-28Q	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-28X	40.96762	-80.3642	NAD83	United Stat PA	Eastbound	43414	40080-H3
MRI-29_To	40.96975	-80.3421	NAD83	United Stat PA	Exposure a	43414	40080-H3
MRI-29_Ba	40.96975	-80.3421	NAD83	United Stat PA	Exposure a	43414	40080-H3
MRI-30E_T	40.99851	-80.3927	NAD83	United Stat PA	State Route	43413	40080-H4
MRI-30E_B	40.99851	-80.3927	NAD83	United Stat PA	State Route	43413	40080-H4
MRI-30K	40.99851	-80.3927	NAD83	United Stat PA	State Route	43413	40080-H4
MRI-30LK	40.99851	-80.3927	NAD83	United Stat PA	State Route	43413	40080-H4
MRI-31_To	41.00131	-80.3928	NAD83	United Stat PA	State Route	43391	41080-A4
MRI-31_Mi	41.00131	-80.3928	NAD83	United Stat PA	State Route	43391	41080-A4
MRI-31_Mi	41.00131	-80.3928	NAD83	United Stat PA	State Route	43391	41080-A4
MRI-31_Ba	41.00131	-80.3928	NAD83	United Stat PA	State Route	43391	41080-A4
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.00145	-78.1306	NAD83	United Stat PA		43480	41078-A2
TGS872DH!	41.14117	-78.0747	NAD83	United Stat PA		43467	41078-B1
MRI-22-C	40.9429	-78.558	NAD83	United Stat PA	Abandonec	43491	40078-H5

MRI-22-E	40.9429	-78.558	NAD83	United Stat PA	Abandonec	43491 40078-H5
MRI-22-D	40.9429	-78.558	NAD83	United Stat PA	Abandonec	43491 40078-H5
MD-6-A	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-6-B	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-6-C	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-6-D	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-6-E	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-6-F	39.86294	-79.0567	WGS84	United Stat PA	Route 219	42530 39079-G1
MD-1-A	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-B	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-C	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-D	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-E	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-F	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-G	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-1-H	39.70324	-78.8292	WGS84	United Stat MD	Old clay mi	42546 39078-F7
MD-2-A	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-B	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-C	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-D	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-E	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-F	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-2-G	39.38866	-79.1981	WGS84	United Stat MD	Shallmar R	42571 39079-D2
MD-3-A	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-B	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-C	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-D	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-E	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-F	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-G	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-H	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-I	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-3-J	39.48727	-79.0888	WGS84	United Stat MD	Savage Rive	42572 39079-D1
MD-4-A	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-B	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-C	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-D	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-E	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-F	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-G	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-H	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-4-I	39.21604	-79.2101	WGS84	United Stat MD	US 48 west	42599 39079-B2
MD-5-A	39.41965	-79.1407	WGS84	United Stat MD	railroad on	42571 39079-D2
MD-5-B	39.41965	-79.1407	WGS84	United Stat MD	railroad on	42571 39079-D2
MD-5-C	39.41965	-79.1407	WGS84	United Stat MD	railroad on	42571 39079-D2
MD-5-D	39.41965	-79.1407	WGS84	United Stat MD	railroad on	42571 39079-D2
MD-7-A	39.66807	-78.961	WGS84	United Stat MD	MD-7, Pa, f	42545 39078-F8

OGS-CSH0C	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	36897	38082-G7
OGS-CSH0C	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	36897	38082-G7
OGS-CSH0C	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	36897	38082-G7
OGS-CSH0C	38.80742	-82.864	WGS84	United Stat OH	outcrop alc	36897	38082-G7
OGS-CSH0C	38.80854	-82.864	WGS84	United Stat OH	outcrop alc	36897	38082-G7
OGS-CSH0C	38.53788	-82.6752	WGS84	United Stat OH	outcrop alc	36926	38082-E6
OGS-CSH0C	38.5532	-82.7002	WGS84	United Stat OH	outcrop alc	36926	38082-E6
OGS-CSH0C	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.52082	-82.6514	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51859	-82.651	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51859	-82.651	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51859	-82.651	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51859	-82.651	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.44697	-82.3886	WGS84	United Stat OH	Proctorville	37122	38082-D4
OGS-CSH0C	38.44697	-82.3886	WGS84	United Stat OH	Proctorville	37122	38082-D4
OGS-CSH0C	38.41107	-82.5565	WGS84	United Stat OH	US-52 S ne:	37121	38082-D5
OGS-CSH0C	38.41107	-82.5565	WGS84	United Stat OH	US-52 S ne:	37121	38082-D5
OGS-CSH0C	38.47886	-82.6174	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.47886	-82.6174	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.47994	-82.6203	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.47994	-82.6203	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.47994	-82.6203	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.47994	-82.6203	WGS84	United Stat OH	ODOT site l	37121	38082-D5
OGS-CSH0C	38.4854	-82.6358	WGS84	United Stat OH	road outcro	37120	38082-D6
OGS-CSH0C	38.4854	-82.6358	WGS84	United Stat OH	road outcro	37120	38082-D6
OGS-CSH0C	38.4854	-82.6358	WGS84	United Stat OH	road outcro	37120	38082-D6
OGS-CSH0C	38.4854	-82.6358	WGS84	United Stat OH	road outcro	37120	38082-D6
OGS-CSH0C	38.4905	-82.6403	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.4905	-82.6403	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.4905	-82.6403	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.4905	-82.6403	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49128	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.49065	-82.6419	WGS84	United Stat OH	old mine si	37120	38082-D6
OGS-CSH0C	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	36926	38082-E6
OGS-CSH0C	38.51819	-82.6507	WGS84	United Stat OH	outcrop at	36926	38082-E6
SDH-217-1	39.17441	-87.1312	WGS84	Clay IN	Drill hole SI	36277	39087-B2

WP20-1	40.7254	-91.5476	NAD83	IA	5 miles we:	34333	40091-F5
SC20-1	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
SC20-2	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
SC20-3	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
SC20-4	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
SC20-5	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
SC20-6	40.8665	-92.2626	NAD83	IA	Salt Creek -	33488	40092-G3
RR20-1	41.376	-93.1084	NAD83	IA	Red Rock L	33412	41093-D1
Car20-1	41.1545	-93.1441	NAD83	IA	Carruthers	33439	41093-B2
Car20-2	41.1545	-93.1441	NAD83	IA	Carruthers	33439	41093-B2
Car20-3	41.1545	-93.1441	NAD83	IA	Carruthers	33439	41093-B2
330Ave20-	41.1597	-93.1183	NAD83	IA	330th Ave	33440	41093-B1
330Ave20-	41.1597	-93.1183	NAD83	IA	330th Ave	33440	41093-B1
330Ave20-	41.1597	-93.1183	NAD83	IA	330th Ave	33440	41093-B1
330Ave20-	41.1597	-93.1183	NAD83	IA	330th Ave	33440	41093-B1
WPD20-1	41.327	-94.0018	NAD83	IA	Winterset I	33345	41094-C1
WPD20-2	41.327	-94.0018	NAD83	IA	Winterset I	33345	41094-C1
WPD20-3	41.327	-94.0018	NAD83	IA	Winterset I	33345	41094-C1
WPD20-4	41.327	-94.0018	NAD83	IA	Winterset I	33345	41094-C1
NBS20-1	41.327	-94.0018	NAD83	IA	Middle Rive	33345	41094-C1
NBS20-2	41.327	-94.0018	NAD83	IA	Middle Rive	33345	41094-C1
NBS20-3	41.327	-94.0018	NAD83	IA	Middle Rive	33345	41094-C1
NBS20-4	41.327	-94.0018	NAD83	IA	Middle Rive	33345	41094-C1
MC20-1	41.057	-93.4087	NAD83	IA	510th Stree	33451	41093-A4
MC20-2	41.057	-93.4087	NAD83	IA	510th Stree	33451	41093-A4
MC20-3	41.057	-93.4087	NAD83	IA	510th Stree	33451	41093-A4
MC20-4	41.057	-93.4087	NAD83	IA	510th Stree	33451	41093-A4
MC20-5	41.057	-93.4087	NAD83	IA	510th Stree	33451	41093-A4
CP10-1	40.7111	-92.8657	NAD83	IA	Coal Projec	33498	40092-F7
CP10-2	40.7111	-92.8657	NAD83	IA	Coal Projec	33498	40092-F7
CP37-1	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-2	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-3	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-4	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-5	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-6	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-7	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-8	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-9	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-10	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-11	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-12	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-13	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-14	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-15	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-16	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7
CP37-17	41.069	-93.809	NAD83	IA	Coal Projec	33448	41093-A7

2466700_1	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_1	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_1	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_1	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
2466700_8	37.97407	-88.7121	NAD83	United Stat IL	330'S Line,	33112	37088-H6
14Q13-1	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-2	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-3	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-4	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-5	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-6	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-7	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-8	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-9	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-10	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-11	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-12	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-13	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-14	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-15	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-16	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-17	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
14Q13-18	38.7778	-87.1485	WGS84	Daviess IN	Drill hole 1.	36209	38087-G2
SDH-317-1	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-2	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-3	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-4	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-5	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-6	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-7	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-317-8	39.45275	-87.2024	WGS84	Clay IN	Drill hole SI	36374	39087-D2
SDH-377-1	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-2	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-3	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-4	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-5	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-6	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-7	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-8	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-9	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-10	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2
SDH-377-11	38.59692	-87.1602	WGS84	Daviess IN	Drill hole SI	36239	38087-E2

QUAD_NA	MAP_EDIT	ST_NAME1	ST_NAME2	ST_NAME3	ST_NAME4	DATE_REV	DATE_PUB	PHOTO_R
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Widen		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Little Birch		1 West Virgir				76	78	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Bruceton N		1 West Virgir Pennsylvan				76	78	
Bruceton N		1 West Virgir Pennsylvan				76	78	
Bruceton N		1 West Virgir Pennsylvan				76	78	
Bruceton N		1 West Virgir Pennsylvan				76	78	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	
Lake Lynn		7 West Virgir Pennsylvan					79	

Lake Lynn	7 West Virgir Pennsylvan		79
Lake Lynn	7 West Virgir Pennsylvan		79
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
Lake Lynn	7 West Virgir Pennsylvan		79
Lake Lynn	7 West Virgir Pennsylvan		79
Lake Lynn	7 West Virgir Pennsylvan		79
Lake Lynn	7 West Virgir Pennsylvan		79
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Lake Lynn	7 West Virgir Pennsylvan		79
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Widen	1 West Virgir	76	78
Little Birch	1 West Virgir	76	78
MacFarlan	1 West Virgir	75	77
MacFarlan	1 West Virgir	75	77
Greenland	1 West Virgir	79	82
Greenland	1 West Virgir	79	82
Greenland	1 West Virgir	79	82
Greenland	1 West Virgir	79	82
Bruceton N	1 West Virgir Pennsylvan	76	78
Bruceton N	1 West Virgir Pennsylvan	76	78
Bruceton N	1 West Virgir Pennsylvan	76	78
Bruceton N	1 West Virgir Pennsylvan	76	78
Lake Lynn	7 West Virgir Pennsylvan		79

Lake Lynn	7 West Virgir Pennsylvan		79	
Lake Lynn	7 West Virgir Pennsylvan		79	
Lake Lynn	7 West Virgir Pennsylvan		79	
Lake Lynn	7 West Virgir Pennsylvan		79	
Lake Lynn	7 West Virgir Pennsylvan		79	
Union Furn	1 Ohio	83	85	
Union Furn	1 Ohio	83	85	
Union Furn	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Union Furn	1 Ohio	83	85	
Athens	1 Ohio	83	85	
Athens	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Crooksville	1 Ohio	75	77	83
Crooksville	1 Ohio	75	77	83
Crooksville	1 Ohio	75	77	83
Carroll	1 Ohio	74	76	83
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Gore	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Nelsonville	1 Ohio	83	85	
Shade	1 Ohio	75	77	83
Shade	1 Ohio	75	77	83

Bolivar	1	Pennsylvan	77	82	
Bolivar	1	Pennsylvan	77	82	
Bolivar	1	Pennsylvan	77	82	
Bolivar	1	Pennsylvan	77	82	
Bolivar	1	Pennsylvan	77	82	
Commodor	1	Pennsylvan	77	82	84
Commodor	1	Pennsylvan	77	82	84
Commodor	1	Pennsylvan	77	82	84
Commodor	1	Pennsylvan	77	82	84
Commodor	1	Pennsylvan	77	82	84
Brush Valle	1	Pennsylvan	77	82	
Carman	1	Pennsylvan		72	83
New Freep	1	Pennsylvan	73	73	677
New Freep	1	Pennsylvan	73	73	677
Rogersville	1	Pennsylvan	73	73	677
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
Portersville	1	Pennsylvan	77	79	
Portersville	1	Pennsylvan	77	79	
Portersville	1	Pennsylvan	77	79	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
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New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
New Castle	1	Pennsylvan	77	80	
Bessemer	1	Pennsylvan	77	79	
Bessemer	1	Pennsylvan	77	79	
Bessemer	1	Pennsylvan	77	79	
Bessemer	1	Pennsylvan	77	79	
Edinburg	1	Pennsylvan	77	79	
Edinburg	1	Pennsylvan	77	79	
Edinburg	1	Pennsylvan	77	79	
Edinburg	1	Pennsylvan	77	79	
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Frenchville	1	Pennsylvan	77	82	83
Pottersdale	1	Pennsylvan	71	72	83
Curwensvil	1	Pennsylvan	77	82	84

Curwensvil	1	Pennsylvan	77	82	84
Curwensvil	1	Pennsylvan	77	82	84
Meyersdale	7	Pennsylvan		79	
Meyersdale	7	Pennsylvan		79	
Meyersdale	7	Pennsylvan		79	
Meyersdale	7	Pennsylvan		79	
Meyersdale	7	Pennsylvan		79	
Meyersdale	7	Pennsylvan		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Cumberland	7	Maryland Pennsylvan West Virgir		79	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Westernpo	1	West Virgir Maryland	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
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Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Greenland	1	West Virgir	79	82	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Kitzmiller	6	Maryland West Virgir		61	
Frostburg	7	Maryland Pennsylvan		79	

Fresno	1 Ohio	82	85	
Fresno	1 Ohio	82	85	
Fresno	1 Ohio	82	85	
Fresno	1 Ohio	82	85	
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
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Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Jackson	1 Ohio	75	78	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Jackson	1 Ohio	75	78	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Wellston	1 Ohio	75	77	83
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Oak Hill	1 Ohio	83	85	
Minford	1 Ohio		62	83

Minford	1 Ohio			62	83
Minford	1 Ohio			62	83
Minford	1 Ohio			62	83
Minford	1 Ohio			62	83
Minford	1 Ohio			62	83
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Huntington	7 Ohio	West Virgir		79	
Huntington	7 Ohio	West Virgir		79	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Catlettsbur	1 Ohio	West Virgir Kentucky	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
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Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ashland	1 Kentucky	Ohio	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Ironton	1 Ohio	Kentucky	83	85	
Jasonville	1 Indiana		77	81	

0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.500004	0.015625
0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.499986	0.015624
0.500004	0.015625
0.500004	0.015625
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0.813

Job No.	Lab No.	Field No.	Sample Description		La	Ce
MRP-1895: C-515257		KGS546-554.9	Dark gray s	1	0 118.9711	79.45879
MRP-1895: C-515258		KGS546-554.9Q	Dark gray s	1	0 163.3441	112.5461
MRP-1895: C-515259		KGS546-555.5	Dark gray s	1	0 210.2894	161.1316
MRP-1895: C-515260		KGS546-556.4	Dark gray f	1	0 236.9775	185.7319
MRP-1895: C-515261		KGS546-556.4Q	Dark gray f	1	0 240.1929	189.4219
MRP-1895: C-515263		KGS546-557.5	Black shale	1	0 215.4341	172.2017
MRP-1895: C-515264		KGS546-559	Gray sands	1	0 102.8939	89.42189
MRP-1895: C-515265		KGS546-619.5	Dark gray s	1	0 488.746	448.9545
MRP-1895: C-515266		KGS546-619.5Q	Dark gray s	1	0 165.5949	135.3014
MRP-1895: C-515267		KGS546-621.5	Dark gray s	1	0 147.2669	109.8401
MRP-1895: C-515269		KGS546-621.5Q	Dark gray s	1	0 203.8585	152.5215
MRP-1895: C-515270		KGS546-625.5	Dark gray r	1	0 302.8939	307.5031
MRP-1895: C-515271		KGS546-625.5Q	Dark gray r	1	0 198.0707	185.7319
MRP-1895: C-515272		KGS546-627.5	Dark gray s	1	0 179.4212	135.3014
MRP-1895: C-515273		KGS546-631.5	Dark gray s	1	0 405.1447	415.7442
MRP-1895: C-515275		KGS546-631.5Q	Dark gray s	1	0 107.3955	111.5621
MRP-1895: C-515276		KGS546-648	Dark gray r	1	0 153.6977	123.0012
MRP-1895: C-515277		KGS546-648Q	Dark gray r	1	0 173.955	135.3014
MRP-1895: C-515278		KGS546-649.5	Light gray g	1	0 171.7042	140.2214
MRP-1895: C-515279		KGS546-649.5Q	Light gray g	1	0 184.2444	145.1415
MRP-1895: C-515281		KGS546-651.5	Light gray g	1	0 130.2251	102.583
MRP-1895: C-515282		KGS546-651.5Q	Light gray g	1	0 138.9068	106.7651
MRP-1895: C-515283		KGS546-778	Mudstone	1	0 76.20579	53.99754
MRP-1895: C-515284		KGS546-779	Light gray g	1	0 440.5145	281.6728
MRP-1895: C-515285		KGS546-780	Dark gray v	1	0 398.7138	246.0025
MRP-1895: C-515286		KGS546-785	Dark gray f	1	0 120.5788	86.96187
MRP-1895: C-515287		KGS546-785Q	Dark gray f	1	0 146.9453	108.9791
MRP-1895: C-515289		KGS546-787	Light gray g	1	0 191.3183	130.3813
MRP-1895: C-515290		KGS546-797	Light gray g	1	0 131.5113	84.00984
MRP-1895: C-515291		KGS546-799	Light gray g	1	0 206.4309	140.2214
MRP-1895: C-515292		KGS546-815	Light gray g	1	0 134.0836	94.83395
MRP-1895: C-515293		KGS546-817	Dark gray s	1	0 150.4823	118.3272
MRP-1895: C-515499		MRI-1	Pennsylvan	1	0 258.8424	179.5818
MRP-1895: C-515500		MRI-2-A	Pennsylvan	1	0 144.373	110.0861
MRP-1895: C-515501		MRI-2-E	Pennsylvan	1	0 229.2605	166.0517
MRP-1895: C-515503		MRI-3	Pennsylvan	1	0 164.6302	127.9213
MRP-1895: C-515504		MRI-4-B	Pennsylvan	1	0 376.2058	289.0529
MRP-1895: C-515505		MRI-4-D	Pennsylvan	1	0 122.1865	94.83395
MRP-1895: C-515506		MRI-4-F	Pennsylvan	1	0 187.7814	141.4514
MRP-1895: C-515508		MRI-5	Pennsylvan	1	0 106.4309	85.23985
MRP-1895: C-515509		MRI-6	Pennsylvan	1	0 285.209	225.0923
MRP-1895: C-515510		MRI-6B	Pennsylvan	1	0 234.4051	146.3715
MRP-1895: C-515511		MRI-7	Pennsylvan	1	0 334.4051	265.6827
MRP-1895: C-515512		MRI-7B	Pennsylvan	1	0 180.7074	135.3014

MRP-1895!C-515513	MRI-8-G-Top	Pennsylvan	1	0	178.135	130.3813
MRP-1895!C-515515	MRI-8-G-Base	Pennsylvan	1	0	149.5177	107.1341
MRP-1895!C-515516	MRI-8-S	Pennsylvan	1	0	301.6077	253.3825
MRP-1895!C-515517	MRI-9	Pennsylvan	1	0	178.135	136.5314
MRP-1895!C-515518	MRI-10-C	Pennsylvan	1	0	166.881	127.9213
MRP-1895!C-515519	MRI-10-F	Pennsylvan	1	0	175.2412	130.3813
MRP-1895!C-515520	MRI-11	Pennsylvan	1	0	128.9389	100.123
MRP-1895!C-515521	MRI-12	Pennsylvan	1	0	179.7428	136.5314
MRP-1895!C-515523	MRI-13-J	Pennsylvan	1	0	172.9904	132.8413
MRP-1895!C-515524	MRI-13-F	Pennsylvan	1	0	130.2251	91.02091
MRP-1895!C-515525	MRI-13-A	Pennsylvan	1	0	181.0289	135.3014
MRP-1895!C-515526	MRI-15	Pennsylvan	1	0	115.1125	84.37884
MRP-1895!C-515527	MRI-16-C	Pennsylvan	1	0	207.717	163.5916
MRP-1895!C-515528	MRI-16-F	Pennsylvan	1	0	134.4051	113.4071
MRP-1895!C-515529	MRI-17	Pennsylvan	1	0	153.3762	118.6962
MRP-1895!C-515531	MRI-17B	Pennsylvan	1	0	318.328	271.8327
MRP-1895!C-515532	MRI-18-C	Pennsylvan	1	0	414.791	253.3825
MRP-1895!C-515533	MRI-18-G	Pennsylvan	1	0	118.9711	88.43788
MRP-1895!C-515534	MRI-18-I	Pennsylvan	1	0	135.3698	102.214
MRP-1895!C-515535	MRI-19	Pennsylvan	1	0	141.1576	98.27798
MRP-1895!C-515536	MRI-20-C	Pennsylvan	1	0	148.5531	118.5732
MRP-1895!C-515537	MRI-20-G	Pennsylvan	1	0	157.2347	120.4182
MRP-1895!C-515539	MRI-21	Flint clay or	1	0	82.63666	52.52153
MRP-1895!C-515540	MRI-22-A	Flint clay or	1	0	272.0257	153.7515
MRP-1895!C-515541	HUN061_0661_23-5	Air Rotary (1	0	134.0836	100.984
MRP-1895!C-515543	HUN061_0661_83-7	Air Rotary (1	0	115.4341	87.20787
MRP-1895!C-515544	CLY20-013_212_3	Core sampl	1	0	107.074	87.82288
MRP-1895!C-515545	CLY20-013_255_5	Core sampl	1	0	141.4791	105.9041
MRP-1895!C-515546	CLY20-013_284_7	Core sampl	1	0	195.8199	166.0517
MRP-1895!C-515548	CLY20-013_335_0	Core sampl	1	0	217.3633	177.1218
MRP-1895!C-515549	CLY20-013_408_15	Core sampl	1	0	117.6849	82.90283
MRP-1895!C-515550	CLY20-012_458_5	Core sampl	1	0	167.8457	117.5892
MRP-1895!C-515551	LCN20-002_209_1	Core sampl	1	0	199.0354	142.6814
MRP-1895!C-515552	LCN20-002_275_25	Core sampl	1	0	109.3248	77.61378
MRP-1895!C-515553	LCN20-002_445_6	Core sampl	1	0	165.5949	100.246
MRP-1895!C-515555	LCN20-003_457_65	Core sampl	1	0	134.0836	87.08487
MRP-1895!C-515556	LCN20-003_234_2	Core sampl	1	0	110.9325	87.20787
MRP-1895!C-515557	LCN20-003_380_4	Core sampl	1	0	127.6527	101.968
MRP-1895!C-515558	ScootackDH1_40_4	Core	1	0	182.3151	123.0012
MRP-1895!C-515559	ScootackDH1_27_3	Core	1	0	194.8553	141.4514
MRP-1895!C-515560	ScootackDH4_77_3	Core	1	0	207.3955	147.6015
MRP-1895!C-515562	ScootackDH4_86_3	Core	1	0	165.5949	140.2214
MRP-1895!C-515563	TGS872DH1_122_4	Core	1	0	139.2283	94.83395
MRP-1895!C-515564	TGS872DH1_170_8	Core	1	0	104.5016	74.90775
MRP-1895!C-515565	TGS872DH1_222_7	Core	1	0	166.881	122.3862
MRP-1895!C-515566	TGS872DH2_83_0	Core	1	0	143.0868	102.952
MRP-1895!C-515567	TGS872DH2_120_3	Core	1	0	155.9486	124.2312

MRP-1895!C-515569	TGS872DH2_317_6	Core	1	0	180.0643	124.2312
MRP-1895!C-515570	TGS872DH3_95_7	Core	1	0	131.1897	94.58795
MRP-1895!C-515571	TGS872DH4_74_85	Core	1	0	130.2251	104.428
MRP-1895!C-515572	TGS872DH4_177_25	Core	1	0	161.0932	115.0062
MRP-1895!C-515573	TGS872DH4_319_9	Core	1	0	141.1576	112.0541
MRP-1898:C-516589	KGSc334-85.3	smooth ligl	1	0	261.7363	196.802
MRP-1898:C-516590	KGSc334-86.3	dark gray s	1	0	183.9228	143.9114
MRP-1898:C-516591	KGSc334-87.3	light gray g	1	0	149.8392	121.2792
MRP-1898:C-516592	KGSc334-87.3Q	light gray g	1	0	142.7653	110.4551
MRP-1898:C-516594	KGSc334-88.3	light gray g	1	0	162.0579	132.8413
MRP-1898:C-516595	KGSc334-89.2	light gray s	1	0	154.3408	129.1513
MRP-1898:C-516596	KGSc334-90.2	medium gr	1	0	171.0611	125.4613
MRP-1898:C-516597	KGSc334-91.3	dark gray s	1	0	184.8875	138.9914
MRP-1898:C-516598	KGSc334-265	dark gray fi	1	0	272.3473	202.952
MRP-1898:C-516600	KGSc334-266	dark gray s	1	0	121.2219	89.29889
MRP-1898:C-516601	KGSc334-267	dark gray s	1	0	227.3312	179.5818
MRP-1898:C-516602	KGSc334-267Q	dark gray s	1	0	198.0707	150.0615
MRP-1898:C-516603	KGSc334-267.9	dark gray s	1	0	299.0354	223.8622
MRP-1898:C-516605	KGSc334-267.9Q	dark gray s	1	0	299.3569	228.7823
MRP-1898:C-516606	KGSc334-268.8	dark gray s	1	0	421.2219	366.5437
MRP-1898:C-516607	KGSc334-270	dark gray s	1	0	172.9904	123.0012
MRP-1898:C-516608	KGSc334-271	dark gray s	1	0	124.4373	83.88684
MRP-1898:C-516609	KGSc334-325.5	black shale	1	0	163.9871	124.2312
MRP-1898:C-516610	KGSc334-326.1	dark gray n	1	0	176.5273	135.3014
MRP-1898:C-516611	KGSc334-327	dark gray n	1	0	171.3826	132.8413
MRP-1898:C-516612	KGSc334-327Q	dark gray n	1	0	176.5273	138.9914
MRP-1898:C-516614	KGSc334-328	dark gray n	1	0	157.8778	121.1562
MRP-1898:C-516615	KGSc334-329	dark gray n	1	0	177.492	141.4514
MRP-1898:C-516616	KGSc334-365	dark layere	1	0	177.1704	140.2214
MRP-1898:C-516617	KGSc334-366	black sand)	1	0	187.4598	140.2214
MRP-1898:C-516618	KGSc334-367	dark gray s	1	0	190.0322	151.2915
MRP-1898:C-516620	KGSc334-368	dark gray n	1	0	162.0579	131.6113
MRP-1898:C-516621	KGSc334-368Q	dark gray n	1	0	160.1286	132.8413
MRP-1898:C-516622	KGSc334-369	dark gray n	1	0	192.6045	151.2915
MRP-1898:C-516623	KGSc334-370	light gray g	1	0	154.0193	118.4502
MRP-1898:C-516624	KGSc334-371	dark gray s	1	0	181.672	145.1415
MRP-1898:C-516625	KGSc334-371Q	dark gray s	1	0	188.746	148.8315
MRP-1898:C-516627	KGSc334-372	medium gr	1	0	174.5981	138.9914
MRP-1898:C-516628	KGSc334-445.1	black shale	1	0	171.0611	131.6113
MRP-1898:C-516629	KGSc334-446	medium gr	1	0	170.7395	121.7712
MRP-1898:C-516631	KGSc334-447	medium gr	1	0	164.3087	121.5252
MRP-1898:C-516632	KGSc334-447Q	medium gr	1	0	159.164	116.6052
MRP-1898:C-516633	KGSc334-448	gray sandst	1	0	170.418	126.6913
MRP-1898:C-516634	KGSc334-449	dark gray n	1	0	151.4469	114.2681
MRP-1898:C-516635	KGSc334-449Q	dark gray n	1	0	155.627	119.8032
MRP-1898:C-516734	WV-EMRI-001	Medium gr	1	0	180.3859	143.9114
MRP-1898:C-516735	WV-EMRI-002	Light gray	1	0	196.7846	135.3014

MRP-1898: C-516736	WV-EMRI-003	Dark gray t	1	0	164.9518	134.0713
MRP-1898: C-516738	WV-EMRI-004	Light mediu	1	0	157.8778	115.3752
MRP-1898: C-516739	WV-EMRI-005	Light mediu	1	0	249.5177	195.572
MRP-1898: C-516740	WV-EMRI-006	Light mediu	1	0	324.7588	264.4526
MRP-1898: C-516741	WV-EMRI-007	Light mediu	1	0	314.1479	237.3924
MRP-1898: C-516743	WV-EMRI-008	Light mediu	1	0	165.9164	118.9422
MRP-1898: C-516744	WV-EMRI-009	Very dark g	1	0	155.9486	127.9213
MRP-1898: C-516745	WV-EMRI-010	Medium gr	1	0	162.3794	120.4182
MRP-1898: C-516746	WV-EMRI-011	Brown gray	1	0	197.7492	132.8413
MRP-1898: C-516747	WV-EMRI-012	Brown gray	1	0	178.7781	127.9213
MRP-1898: C-516749	WV-EMRI-013	Brown gray	1	0	230.8682	180.8118
MRP-1898: C-516750	WV-EMRI-014	Dark gray t	1	0	385.8521	332.1033
MRP-1898: C-516751	WV-EMRI-015	Brown gray	1	0	291.3183	201.722
MRP-1898: C-516752	WV-EMRI-016	Dark gray a	1	0	229.2605	174.6617
MRP-1898: C-516754	WV-EMRI-017	Dark gray ;	1	0	170.7395	137.7614
MRP-1898: C-516755	WV-EMRI-018	Medium gr	1	0	129.2605	97.53998
MRP-1898: C-516756	WV-EMRI-019	Medium gr	1	0	107.3955	76.13776
MRP-1898: C-516757	WV-EMRI-020	Medium gr	1	0	182.3151	156.2116
MRP-1898: C-516758	WV-EMRI-021	Medium gr	1	0	149.1961	126.6913
MRP-1898: C-516759	WV-EMRI-022	Very dark g	1	0	284.2444	225.0923
MRP-1898: C-516761	WV-EMRI-023	Medium da	1	0	247.2669	178.3518
MRP-1898: C-516762	WV-EMRI-024	Medium da	1	0	243.4084	189.4219
MRP-1898: C-516763	WV-EMRI-025	Medium gr	1	0	224.4373	174.6617
MRP-1898: C-516764	WV-EMRI-026	Medium gr	1	0	164.6302	126.6913
MRP-1898: C-516765	WV-EMRI-027	Dark gray \	1	0	239.8714	174.6617
MRP-1898: C-516767	WV-EMRI-028	Medium gr	1	0	187.4598	136.5314
MRP-1898: C-516768	WV-EMRI-029	Medium gr	1	0	165.5949	123.0012
MRP-1898: C-516769	WV-EMRI-030	Dark gray l	1	0	163.9871	123.0012
MRP-1898: C-516770	WV-EMRI-031	Dark gray l	1	0	178.135	141.4514
MRP-1898: C-516771	WV-EMRI-032	Light-to-me	1	0	165.9164	118.2042
MRP-1898: C-516772	WV-EMRI-035	Medium gr	1	0	232.7974	183.2718
MRP-1898: C-516774	WV-EMRI-036	Black and c	1	0	181.3505	143.9114
MRP-1898: C-516775	WV-EMRI-037	Medium-tc	1	0	186.8167	135.3014
MRP-1898: C-516776	WV-EMRI-038	Dark gray; ;	1	0	281.0289	238.6224
MRP-1898: C-516777	WV-EMRI-039	Medium gr	1	0	183.6013	123.0012
MRP-1898: C-516779	WV-EMRI-040	Medium gr	1	0	154.6624	106.6421
MRP-1898: C-516780	WV-EMRI-041	Black; pyrit	1	0	205.7878	148.8315
MRP-1898: C-516781	WV-EMRI-042	Medium gr	1	0	217.0418	159.9016
MRP-1898: C-516783	WV-EMRI-043	Dark gray; ;	1	0	166.5595	120.1722
MRP-1898: C-516784	WV-EMRI-044	Dark gray; ;	1	0	158.8424	115.7442
MRP-1898: C-516785	WV-EMRI-045	Medium gr	1	0	161.4148	114.1451
MRP-1898: C-516786	WV-EMRI-046	Medium gr	1	0	206.1093	164.8216
MRP-1898: C-516788	MRIWV1a	lt gy ochre	1	0	112.8617	79.5818
MRP-1898: C-516789	WV-EMRI-047	Medium-tc	1	0	189.3891	138.9914
MRP-1898: C-516790	WV-EMRI-048	Medium-tc	1	0	161.7363	124.2312
MRP-1898: C-516791	WV-EMRI-049	Medium-tc	1	0	168.1672	121.2792
MRP-1898: C-516793	WV-EMRI-050	Medium-tc	1	0	142.7653	111.3161

MRP-1898!C-516794	WV-EMRI-051	Medium-tc	1	0	182.9582	146.3715
MRP-1898!C-516795	WV-EMRI-052	Medium-tc	1	0	155.627	103.567
MRP-1898!C-516796	WV-EMRI-053	Black with	1	0	175.2412	129.1513
MRP-1898!C-516797	WV-EMRI-054	Medium gr	1	0	146.6238	106.8881
MRP-1898!C-516799	WV-EMRI-055	Light-to-da	1	0	172.6688	129.1513
MRP-1898!C-516800	WV-EMRI-056	Medium gr	1	0	124.1158	96.80197
MRP-1898!C-516801	WV-EMRI-057	Medium gr	1	0	99.35691	71.21771
MRP-1898!C-516802	WV-EMRI-058	Medium gr	1	0	313.8264	225.0923
MRP-1898!C-516803	WV-EMRI-059	Light gray v	1	0	176.2058	124.2312
MRP-1898!C-516804	WV-EMRI-060	Dark gray; i	1	0	201.6077	154.9815
MRP-1898!C-516806	WV-EMRI-061	Dark gray; i	1	0	217.6849	161.1316
MRP-1898!C-516807	WV-EMRI-062	Dark gray; i	1	0	159.8071	125.4613
MRP-1898!C-516808	WV-EMRI-063	Medium-tc	1	0	221.865	169.7417
MRP-1898!C-516809	WV-EMRI-064	Medium-tc	1	0	235.6913	169.7417
MRP-1898!C-516810	WV-EMRI-065	Medium-tc	1	0	209.9678	158.6716
MRP-1898!C-516812	WV-EMRI-066	Dark gray-t	1	0	197.1061	135.3014
MRP-1898!C-516813	WV-EMRI-067	Medium gr	1	0	305.4662	230.0123
MRP-1898!C-516814	WV-EMRI-068	Medium gr	1	0	318.6495	236.1624
MRP-1898!C-516815	WV-EMRI-069	Light-to-me	1	0	137.9421	99.631
MRP-1898!C-516816	WV-EMRI-070	Dark gray; i	1	0	160.4502	120.5412
MRP-1898!C-516817	WV-EMRI-071	Light gray-l	1	0	47.26688	38.13038
MRP-1898!C-516819	WV-EMRI-076	Dark gray t	1	0	183.2797	141.4514
MRP-1898!C-516820	WV-EMRI-077	Dark gray t	1	0	191.3183	148.8315
MRP-1898!C-516821	WV-EMRI-078	Medium gr	1	0	318.9711	242.3124
MRP-1898!C-516822	WV-EMRI-079	Slightly silt	1	0	190.9968	146.3715
MRP-1898!C-516824	WV-EMRI-080	Black coal	1	0	104.5016	75.52276
MRP-1898!C-516825	WV-EMRI-081	Very dark g	1	0	165.2733	124.2312
MRP-1898!C-516826	WV-EMRI-082	Medium gr	1	0	163.0225	121.1562
MRP-1898!C-516828	WV-EMRI-083	Dark gray l	1	0	197.7492	136.5314
MRP-1898!C-516829	WV-EMRI-085	Dark gray :	1	0	194.5338	143.9114
MRP-1898!C-516830	WV-EMRI-086	Dark gray :	1	0	187.1383	138.9914
MRP-1898!C-516831	WV-EMRI-087	Light to me	1	0	498.3923	349.3235
MRP-1898!C-516833	WV-EMRI-090	Medium gr	1	0	201.6077	150.0615
MRP-1898!C-516834	WV-EMRI-091	Medium gr	1	0	182.9582	140.2214
MRP-1898!C-516835	WV-EMRI-092	Medium gr	1	0	140.5145	95.69496
MRP-1898!C-516836	WV-EMRI-093	Medium gr	1	0	206.1093	146.3715
MRP-1898!C-516838	WV-EMRI-094	Medium gr	1	0	218.6495	157.4416
MRP-1898!C-516839	WV-EMRI-095	Medium gr	1	0	211.5756	153.7515
MRP-1898!C-516840	WV-EMRI-096	Medium gr	1	0	198.0707	148.8315
MRP-1898!C-516841	WV-EMRI-097	Medium gr	1	0	165.9164	115.8672
MRP-1898!C-516842	MRIWV2a	lt gy sidera	1	0	118.328	83.27183
MRP-1898!C-516843	WV-EMRI-098	Silty; light g	1	0	164.9518	113.1611
MRP-1898!C-516845	WV-EMRI-099	Silty; light g	1	0	216.3987	154.9815
MRP-1898!C-516846	WV-EMRI-100	Dark gray; i	1	0	227.3312	179.5818
MRP-1898!C-516847	WV-EMRI-101	Dark gray; i	1	0	138.2637	101.107
MRP-1898!C-516848	WV-EMRI-102	Medium gr	1	0	122.1865	89.17589
MRP-1898!C-516849	WV-EMRI-103	Medium gr	1	0	385.8521	255.8426

MRP-1898! C-516851	WV-EMRI-104	Medium gr	1	0	259.164	156.2116
MRP-1898! C-516852	WV-EMRI-105	Shaly; med	1	0	216.7203	163.5916
MRP-1898! C-516853	WV-EMRI-111	Medium gr	1	0	269.4534	188.1919
MRP-1898! C-516854	WV-EMRI-112	Medium gr	1	0	188.1029	125.4613
MRP-1898! C-516855	WV-EMRI-113	Medium gr	1	0	168.8103	102.706
MRP-1898! C-516857	WV-EMRI-114	Dark gray;	1	0	180.3859	143.9114
MRP-1898! C-516858	WV-EMRI-115	Medium?tc	1	0	227.0096	159.9016
MRP-1898! C-516859	WV-EMRI-116	Medium?tc	1	0	168.8103	121.5252
MRP-1898! C-516860	WV-EMRI-117	Medium gr	1	0	200.6431	152.5215
MRP-1898! C-516861	WV-EMRI-118	Medium gr	1	0	214.791	158.6716
MRP-1898! C-516863	WV-EMRI-119	Light gray;	1	0	214.4695	138.9914
MRP-1898! C-516864	WV-EMRI-120	Light gray;	1	0	165.5949	129.1513
MRP-1898! C-516865	WV-EMRI-121	Medium gr	1	0	176.8489	137.7614
MRP-1898! C-516866	WV-EMRI-122	Medium gr	1	0	142.4437	99.508
MRP-1898! C-516867	WV-EMRI-123	Medium gr	1	0	256.2701	218.9422
MRP-1899! C-516869	WV-EMRI-131	Medium gr	1	0	158.5209	105.1661
MRP-1899! C-516870	WV-EMRI-132	Light gray-ξ	1	0	91.31833	76.38376
MRP-1899! C-516871	WV-EMRI-135	Medium gr	1	0	184.2444	130.3813
MRP-1899! C-516873	WV-EMRI-136	Medium gr	1	0	238.5852	177.1218
MRP-1899! C-516874	WV-EMRI-137	Medium gr	1	0	353.6977	268.1427
MRP-1899! C-516875	WV-EMRI-138	Medium gr	1	0	337.6206	239.8524
MRP-1899! C-516876	WV-EMRI-139	Light gray;	1	0	121.5434	86.83887
MRP-1899! C-516878	WV-EMRI-140	Light gray;	1	0	136.0129	94.46494
MRP-1899! C-516879	WV-EMRI-141	Medium gr	1	0	154.0193	113.2841
MRP-1899! C-516880	WV-EMRI-142	Light gray;	1	0	187.1383	126.6913
MRP-1899! C-516881	WV-EMRI-143	Light gray;	1	0	133.7621	90.0369
MRP-1899! C-516882	WV-EMRI-144	Light gray;	1	0	114.4695	78.35178
MRP-1899! C-516884	WV-EMRI-145	Light gray;	1	0	240.1929	189.4219
MRP-1899! C-516885	WV-EMRI-146	Light gray;	1	0	139.5498	94.46494
MRP-1899! C-516886	WV-EMRI-151	Predomina	1	0	127.6527	97.78598
MRP-1899! C-516887	WV-EMRI-152	Predomina	1	0	175.2412	125.4613
MRP-1899! C-516888	WV-EMRI-153	Predomina	1	0	175.8842	125.4613
MRP-1899! C-516889	WV-EMRI-154	Faint mediu	1	0	175.2412	129.1513
MRP-1899! C-516891	WV-EMRI-155	Light gray-r	1	0	199.0354	152.5215
MRP-1899! C-516892	WV-EMRI-156	Medium gr	1	0	235.6913	169.7417
MRP-1899! C-516893	WV-EMRI-157	Medium gr	1	0	305.7878	222.6322
MRP-1899! C-516894	WV-EMRI-158	Predomina	1	0	199.6785	163.5916
MRP-1899! C-516895	WV-EMRI-159	Predomina	1	0	136.6559	100.123
MRP-1899! C-516897	WV-EMRI-160	Predomina	1	0	130.8682	94.34194
MRP-1899! C-516898	MRIWV3a	3 ft underc	1	0	155.9486	109.8401
MRP-1899! C-516899	WV-EMRI-170	Brecciated	1	0	167.5241	127.9213
MRP-1899! C-516901	WV-EMRI-171	Light gray-ξ	1	0	178.135	125.4613
MRP-1899! C-516902	WV-EMRI-172	Light gray-ξ	1	0	249.1961	200.492
MRP-1899! C-516903	WV-EMRI-173	Light gray-ξ	1	0	193.8907	147.6015
MRP-1899! C-516904	WV-EMRI-174	Light gray-ξ	1	0	175.5627	150.0615
MRP-1899! C-516905	WV-EMRI-175	Brecciated	1	0	167.5241	131.6113
MRP-1899! C-516906	WV-EMRI-176	Brecciated	1	0	125.7235	98.89299

MRP-1899(C-516907	WV-EMRI-179	Medium gr	1	0	261.7363	188.1919
MRP-1899(C-516909	WV-EMRI-180	Medium gr	1	0	233.4405	175.8918
MRP-1899(C-516910	WV-EMRI-181	Medium gr	1	0	191.9614	145.1415
MRP-1899(C-516911	WV-EMRI-182	Light gray v	1	0	163.6656	111.0701
MRP-1899(C-516912	WV-EMRI-183	Light gray v	1	0	183.2797	142.6814
MRP-1899:C-516914	WV-EMRI-184	Light gray v	1	0	156.5916	119.4342
MRP-1899:C-516915	WV-EMRI-185	Light gray v	1	0	155.9486	107.9951
MRP-1899:C-516916	WV-EMRI-186	Light gray-ξ	1	0	182.6367	143.9114
MRP-1899:C-516918	WV-EMRI-187	Light gray-ξ	1	0	205.4662	159.9016
MRP-1899:C-516919	WV-EMRI-188	Medium gr	1	0	174.2765	136.5314
MRP-1899:C-516920	WV-EMRI-189	Medium gr	1	0	171.3826	135.3014
MRP-1899:C-516921	WV-EMRI-190	Medium gr	1	0	168.8103	134.0713
MRP-1899:C-516923	WV-EMRI-191	Medium gr	1	0	155.3055	120.1722
MRP-1899:C-516924	WV-EMRI-192	Medium gr	1	0	238.2637	178.3518
MRP-1899:C-516925	WV-EMRI-193	Light gray a	1	0	290.6752	223.8622
MRP-1899:C-516926	WV-EMRI-194	Gray-green	1	0	140.5145	104.674
MRP-1899:C-516927	WV-EMRI-195	Gray-green	1	0	128.6174	90.2829
MRP-1899:C-516929	WV-EMRI-199	Medium gr	1	0	213.5048	158.6716
MRP-1899:C-516930	WV-EMRI-200	Medium gr	1	0	331.1897	281.6728
MRP-1899:C-516931	WV-EMRI-201	Medium gr	1	0	257.5563	218.9422
MRP-1899:C-516933	WV-EMRI-202	Medium gr	1	0	193.5691	141.4514
MRP-1899:C-516934	WV-EMRI-203	Medium gr	1	0	369.7749	333.3333
MRP-1899:C-516935	WV-EMRI-204	Medium gr	1	0	517.6849	479.7048
MRP-1899:C-516936	WV-EMRI-205	Light to me	1	0	164.9518	125.4613
MRP-1899:C-516937	WV-EMRI-206	Light to me	1	0	272.9904	185.7319
MRP-1899:C-516938	WV-EMRI-207	Brecciated;	1	0	191.6399	123.0012
MRP-1899:C-516939	WV-EMRI-208	Brecciated;	1	0	154.0193	112.6691
MRP-1899:C-516940	MRIWV4a	bottom of i	1	0	187.1383	148.8315
MRP-1899:C-516941	MRIWV4b	4.5 ft from	1	0	173.955	132.8413
MRP-1899:C-516943	MRIWV4c	9 ft from b	1	0	157.5563	116.8512
MRP-1899:C-516944	MRIWV5b	from chanr	1	0	99.03537	78.22878
MRP-1899:C-516945	WVMRI9a	dg gy soft	1	0	249.5177	212.7921
MRP-1899:C-516946	WVMRI10a	soft clay wi	1	0	246.9453	191.8819
MRP-1956:C-534866	231-036-B1	0	1	0	281.2903	214.1089
MRP-1956:C-534867	231-036-B2	0	1	0	212.9032	152.2277
MRP-1956:C-534868	231-036-B3	0	1	0	220.6452	162.1287
MRP-1956:C-534869	230-092D-UC	0	1	0	184.8387	138.6139
MRP-1956:C-534872	230-092D-LC	0	1	0	171.9355	132.4257
MRP-1956:C-534873	230-092B-UC	0	1	0	219.3548	155.9406
MRP-1956:C-534874	230-092B-LC	0	1	0	175.1613	127.4752
MRP-1956:C-534875	231-093-B1	0	1	0	220.3226	181.9307
MRP-1956:C-534876	231-093-B2	0	1	0	181.6129	142.3267
MRP-1956:C-534877	231-093-B3	0	1	0	220.6452	175.7426
MRP-1956:C-534878	231-093-B4	0	1	0	235.8065	183.1683
MRP-1956:C-534879	231-093-B5	0	1	0	195.4839	153.4653
MRP-1956:C-534880	231-093-B6	0	1	0	254.1935	201.7327
MRP-1956:C-534883	50-092A-B1	0	1	0	545.1613	327.9703

MRP-1956: C-534884	50-092A-B2	0	1	0	166.7742	115.7178
MRP-1956: C-534885	50-092A-B3	0	1	0	173.5484	132.4257
MRP-1956: C-534886	50-092A-B4	0	1	0	181.2903	138.6139
MRP-1956: C-534887	214-093C-B1	0	1	0	240.9677	167.0792
MRP-1956: C-534888	214-093C-B2	0	1	0	277.7419	185.6436
MRP-1956: C-534889	214-093C-B3	0	1	0	322.5806	258.6634
MRP-1956: C-534890	214-093C-B4	0	1	0	259.6774	204.2079
MRP-1956: C-534891	214-093C-B5	0	1	0	241.2903	181.9307
MRP-1956: C-534892	214-093B-B1	0	1	0	199.3548	138.6139
MRP-1956: C-534894	214-093B-B2	0	1	0	184.8387	134.901
MRP-1956: C-534895	214-093B-B3	0	1	0	159.0323	114.7277
MRP-1956: C-534897	214-093B-B4	0	1	0	171.9355	121.9059
MRP-1956: C-534898	214-093B-B5	0	1	0	183.5484	132.4257
MRP-1956: C-534899	214-093B-B6	0	1	0	191.9355	137.3762
MRP-1956: C-534900	214-093A-B1	0	1	0	219.0323	169.5545
MRP-1956: C-534901	214-093A-B2	0	1	0	205.4839	162.1287
MRP-1956: C-534902	214-093A-B3	0	1	0	206.7742	164.604
MRP-1956: C-534903	MD-14-B1	0	1	0	185.8065	134.901
MRP-1956: C-534904	MD-14-B2	0	1	0	177.4194	127.4752
MRP-1956: C-534905	MD-14-B3	0	1	0	262.5806	191.8317
MRP-1956: C-534906	MD-14-B4	0	1	0	250.3226	194.3069
MRP-1956: C-534907	MD-15-B1	0	1	0	208.0645	153.4653
MRP-1956: C-534909	MD-15-B2	0	1	0	215.4839	150.9901
MRP-1956: C-534910	MD-15-B3	0	1	0	152.9032	110.396
MRP-1956: C-534911	MD-15-B4	0	1	0	139.3548	101.9802
MRP-1956: C-534912	MD-15-B5	0	1	0	139.3548	98.26733
MRP-1956: C-534914	MD-15-B7	0	1	0	138.3871	101.7327
MRP-1956: C-534915	MD-15-B8	0	1	0	143.871	105.0743
MRP-1956: C-534917	230-092A-B1	0	1	0	190.3226	154.703
MRP-1956: C-534918	230-092A-B2	0	1	0	184.5161	149.7525
MRP-1956: C-534952	230-092G	0	1	0	231.2903	181.9307
MRP-1956: C-534920	50-092B-B1	0	1	0	187.0968	144.802
MRP-1956: C-534921	50-092B-B2	0	1	0	192.9032	154.703
MRP-1956: C-534922	50-092B-B3	0	1	0	154.8387	122.896
MRP-1956: C-534923	50-080-B1	0	1	0	152.5806	122.0297
MRP-1956: C-534924	50-080-B2	0	1	0	191.6129	148.5149
MRP-1956: C-534925	50-080-B3	0	1	0	132.5806	104.703
MRP-1956: C-534926	50-080-B4	0	1	0	188.3871	148.5149
MRP-1956: C-534927	50-080-B5	0	1	0	192.5806	147.2772
MRP-1956: C-534928	50-080-B6	0	1	0	147.7419	121.4109
MRP-1956: C-534929	50-080-B7	0	1	0	194.1935	153.4653
MRP-1956: C-534931	50-080-B8	0	1	0	313.871	232.6733
MRP-1956: C-534933	50-080-B9	0	1	0	181.2903	144.802
MRP-1956: C-534934	272-095-B1	0	1	0	146.4516	122.401
MRP-1956: C-534935	272-095-B2	0	1	0	142.5806	99.75248
MRP-1956: C-534936	272-095-B3	0	1	0	255.1613	174.505
MRP-1956: C-534937	272-095-B4	0	1	0	335.4839	243.8119

MRP-1956: C-534938	230-092D-B1	0	1	0	197.7419	150.9901
MRP-1956: C-534939	230-092D-B2	0	1	0	175.8065	142.3267
MRP-1956: C-534940	230-092D-B3	0	1	0	172.5806	139.8515
MRP-1956: C-534941	230-092D-B4	0	1	0	157.0968	127.4752
MRP-1956: C-534942	230-092D-B5	0	1	0	160.3226	127.4752
MRP-1956: C-534943	230-092D-B6	0	1	0	165.1613	132.4257
MRP-1956: C-534944	230-092D-B7	0	1	0	171.9355	136.1386
MRP-1956: C-534945	90-037	0	1	0	124.5161	94.67822
MRP-1956: C-534946	230-092F-B1	0	1	0	166.4516	123.7624
MRP-1956: C-534947	230-092F-B2	0	1	0	171.2903	123.7624
MRP-1956: C-534948	230-092F-B3	0	1	0	207.0968	165.8416
MRP-1956: C-534950	230-092F-B4	0	1	0	219.6774	170.7921
MRP-1956: C-534951	50-092B-US	0	1	0	76.77419	61.01485
MRP-1934: C-528341	WV-EMRI-209	Brecciated;	0	0	181.672	145.1415
MRP-1934: C-528342	WV-EMRI-210	Dark gray t	0	0	318.6495	292.7429
MRP-1934: C-528324	MD-9-A	4 samples t	0	0	156.2701	124.2312
MRP-1934: C-528325	MD-9-B	0	0	0	97.7492	74.29274
MRP-1934: C-528326	MD-9-C	0	0	0	83.27974	61.86962
MRP-1934: C-528328	MD-9-D	0	0	0	122.1865	90.2829
MRP-1934: C-528330	MD-14-A	4 samples t	0	0	122.1865	101.353
MRP-1934: C-528331	MD-14-B	0	0	0	239.5498	183.2718
MRP-1934: C-528332	MD-14-C	0	0	0	250.4823	175.8918
MRP-1934: C-528333	MD-14-D	0	0	0	185.209	141.4514
MRP-1934: C-528334	MD-15-A	6 samples t	0	0	152.7331	108.2411
MRP-1934: C-528335	MD-15-B	0	0	0	156.9132	106.1501
MRP-1934: C-528337	MD-15-C	0	0	0	143.7299	97.53998
MRP-1934: C-528338	MD-15-D	0	0	0	140.5145	102.091
MRP-1934: C-528339	MD-15-E	0	0	0	138.9068	98.76999
MRP-1934: C-528340	MD-15-F	0	0	0	148.8746	106.3961
MRP-1955(C-534507	OGS-CSH0001A	uppermost	1	0	182.2581	147.2772
MRP-1955(C-534508	OGS-CSH0001B	6" sample l	1	0	178.0645	121.6584
MRP-1955(C-534510	OGS-CSH0002	6" sample	1	0	157.0968	116.4604
MRP-1955(C-534511	OGS-CSH0003A	uppermost	1	0	256.7742	183.1683
MRP-1955(C-534513	OGS-CSH0003B	6" sample '	1	0	214.5161	154.703
MRP-1955(C-534514	OGS-CSH0003C	6" sample '	1	0	115.8065	78.58911
MRP-1955(C-534515	OGS-CSH0003D	6" sample '	1	0	145.8065	99.25743
MRP-1955(C-534516	OGS-CSH0003E	6" sample	1	0	117.0968	80.56931
MRP-1955(C-534517	OGS-CSH0003F	6" sample	1	0	167.7419	117.698
MRP-1955(C-534518	OGS-CSH0004A	uppermost	1	0	189.6774	139.8515
MRP-1955(C-534520	OGS-CSH0004B	6" sample '	1	0	182.2581	137.3762
MRP-1955(C-534521	OGS-CSH0004C	6" sample '	1	0	226.4516	158.4158
MRP-1955(C-534522	OGS-CSH0005	6" sample	1	0	149.0323	105.4455
MRP-1955(C-534524	OGS-CSH0006	6" sample	1	0	127.4194	97.89604
MRP-1955(C-534525	OGS-CSH0007	6" sample	1	0	156.129	120.5446
MRP-1955(C-534526	OGS-CSH0008A	uppermost	1	0	161.6129	119.1832
MRP-1955(C-534527	OGS-CSH0008B	6" sample '	1	0	158.3871	117.203
MRP-1955(C-534528	OGS-CSH0008C	6" sample '	1	0	173.2258	132.4257

MRP-1955(C-534529	OGS-CSH0009A	uppermost	1	0	162.5806	109.7772
MRP-1955(C-534530	OGS-CSH0009B	6" sample '	1	0	189.3548	134.901
MRP-1955(C-534531	OGS-CSH0010	~1.5' samp	1	0	122.5806	94.67822
MRP-1955(C-534532	OGS-CSH0011	~1.2' samp	1	0	110.6452	74.13366
MRP-1955(C-534533	OGS-CSH0012	~2.5-3' sarr	1	0	163.2258	115.8416
MRP-1955(C-534535	OGS-CSH0013	~12" sampl	1	0	130.3226	100.8663
MRP-1955(C-534537	OGS-CSH0014A	uppermost	1	0	179.0323	139.8515
MRP-1955(C-534538	OGS-CSH0014B	~1.5' samp	1	0	178.3871	141.0891
MRP-1955(C-534539	OGS-CSH0015A	uppermost	1	0	139.6774	102.2277
MRP-1955(C-534540	OGS-CSH0015B	6" sample '	1	0	129.3548	89.97525
MRP-1955(C-534541	OGS-CSH0015C	6" sample '	1	0	137.0968	93.44059
MRP-1955(C-534542	OGS-CSH0016A	uppermost	1	0	150.6452	104.3317
MRP-1955(C-534543	OGS-CSH0016B	6" sample	1	0	151.9355	107.302
MRP-1955(C-534544	OGS-CSH0016C	6" sample	1	0	186.7742	139.8515
MRP-1955(C-534545	OGS-CSH0017A	uppermost	1	0	254.8387	220.297
MRP-1955(C-534546	OGS-CSH0017B	6" sample	1	0	231.6129	190.5941
MRP-1955(C-534548	OGS-CSH0017C	6" sample	1	0	255.4839	186.8812
MRP-1955(C-534549	OGS-CSH0017D	6" sample	1	0	193.871	128.7129
MRP-1955(C-534550	OGS-CSH0017E	6" sample	1	0	148.3871	103.4653
MRP-1955(C-534551	OGS-CSH0018A	uppermost	1	0	216.4516	159.6535
MRP-1955(C-534552	OGS-CSH0018B	6" sample	1	0	206.129	153.4653
MRP-1955(C-534553	OGS-CSH0018C	6" sample	1	0	217.4194	167.0792
MRP-1955(C-534555	OGS-CSH0019A	uppermost	1	0	141.6129	89.60396
MRP-1955(C-534556	OGS-CSH0019B	6" sample '	1	0	190.9677	143.5644
MRP-1955(C-534558	OGS-CSH0020A	uppermost	1	0	147.0968	125
MRP-1955(C-534559	OGS-CSH0020B	6" sample '	1	0	87.09677	62.5
MRP-1955(C-534561	OGS-CSH0021A	uppermost	1	0	162.5806	127.4752
MRP-1955(C-534562	OGS-CSH0021B	6" sample l	1	0	137.4194	109.0347
MRP-1955(C-534563	OGS-CSH0021C	6" sample	1	0	259.3548	185.6436
MRP-1955(C-534564	OGS-CSH0021D	6" sample	1	0	161.6129	112.005
MRP-1955(C-534565	OGS-CSH0021E	6" sample	1	0	157.7419	115.099
MRP-1955(C-534567	OGS-CSH0021F	6" sample	1	0	184.8387	146.0396
MRP-1955(C-534568	OGS-CSH0021G	6" sample	1	0	203.2258	154.703
MRP-1955(C-534569	OGS-CSH0022A	uppermost	1	0	150.3226	117.9455
MRP-1955(C-534570	OGS-CSH0022B	6" sample	1	0	229.6774	204.2079
MRP-1955(C-534572	OGS-CSH0022C	6" sample	1	0	184.8387	138.6139
MRP-1955(C-534573	OGS-CSH0023A	uppermost	1	0	150.9677	111.7574
MRP-1955(C-534574	OGS-CSH0023B	6" sample l	1	0	145.4839	103.5891
MRP-1955(C-534575	OGS-CSH0023C	~6" sample	1	0	247.4194	195.5446
MRP-1955(C-534576	OGS-CSH0023D	~6" sample	1	0	158.0645	116.0891
MRP-1955(C-534577	OGS-CSH0024A	uppermost	1	0	151.2903	109.5297
MRP-1955(C-534578	OGS-CSH0024B	6" sample l	1	0	94.19355	63.61386
MRP-1955(C-534579	OGS-CSH0024C	~6" sample	1	0	216.7742	123.7624
MRP-1955(C-534580	OGS-CSH0024D	~6" sample	1	0	139.6774	112.1287
MRP-1955(C-534581	OGS-CSH0025	12" sample	1	0	199.6774	149.7525
MRP-1955(C-534583	OGS-CSH0026	12" sample	1	0	358.0645	285.8911
MRP-1955(C-534585	OGS-CSH0027A	uppermost	1	0	175.4839	126.2376

MRP-1955: C-534586	OGS-CSH0027B	6" sample	1	0	156.7742	113.7376
MRP-1955: C-534587	OGS-CSH0027C	6" sample	1	0	194.5161	147.2772
MRP-1955: C-534588	OGS-CSH0027D	6" sample	1	0	252.9032	188.1188
MRP-1955: C-534589	OGS-CSH0027E	6" sample	1	0	219.0323	150.9901
MRP-1955: C-534590	OGS-CSH0027F	6" sample	1	0	196.129	136.1386
MRP-1955: C-534591	OGS-CSH0027G	6" sample	1	0	192.2581	138.6139
MRP-1955: C-534592	OGS-CSH0028A	uppermost	1	0	189.3548	132.4257
MRP-1955: C-534593	OGS-CSH0028B	6" sample	1	0	192.2581	112.7475
MRP-1955: C-534594	OGS-CSH0028C	6" sample	1	0	285.4839	193.0693
MRP-1955: C-534595	OGS-CSH0028D	6" sample	1	0	207.7419	148.5149
MRP-1955: C-534596	OGS-CSH0028E	6" sample	1	0	187.7419	131.1881
MRP-1955: C-534598	OGS-CSH0028F	6" sample	1	0	191.2903	134.901
MRP-1955: C-534599	OGS-CSH0028G	6" sample	1	0	188.3871	134.901
MRP-1955: C-534600	OGS-CSH0029A	uppermost	1	0	196.7742	146.0396
MRP-1955: C-534601	OGS-CSH0029B	6" sample	1	0	206.129	159.6535
MRP-1956: C-534954	PAGS-WeiserSF-1	Sampled or	1	0	182.2581	137.3762
MRP-1956: C-534955	PAGS-WeiserSF-2	Sampled or	1	0	200.3226	155.9406
MRP-1956: C-534957	IND063_2361_103	Sample tak	1	0	147.7419	115.4703
MRP-1956: C-534958	IND063_2361_99	Sample tak	1	0	409.6774	355.198
MRP-1956: C-534960	IND063_2361_92.5	Sample tak	1	0	161.9355	125
MRP-1956: C-534961	IND063_2361_91.7	Sample tak	1	0	136.4516	94.18317
MRP-1956: C-534962	IND063_2361_83.1	Taken 83.1	1	0	208.7097	163.3663
MRP-1956: C-534963	IND063_2362_123	Sample tak	1	0	217.7419	158.4158
MRP-1956: C-534964	IND063_2363_187	Sample tak	1	0	269.0323	207.9208
MRP-1956: C-534965	IND063_2363_65.5	Sample tak	1	0	147.0968	114.7277
MRP-1956: C-534966	IND063_2363_60.4	Sample tak	1	0	169.6774	122.896
MRP-1956: C-534968	IND063_2363_49.2	Sample tak	1	0	257.4194	178.2178
MRP-1956: C-534969	IND0632363_57.46	Sample tak	1	0	496.7742	342.8218
MRP-1956: C-534971	IND063_2364_192	Sample tak	1	0	306.129	216.5842
MRP-1956: C-534972	HW21-002_432	Sampled 1.	1	0	163.2258	122.6485
MRP-1956: C-534973	HW21-002_578	Sample tak	1	0	206.7742	150.9901
MRP-1956: C-534974	HW21-002_595	Sampled 1.	1	0	125.4839	91.95545
MRP-1956: C-534975	HW21-002_725	Sampled 0.	1	0	175.1613	136.1386
MRP-1956: C-534976	HW21-002_729	Sampled 0.	1	0	153.2258	110.1485
MRP-1956: C-534977	BRU21-001_403	0	1	0	147.0968	112.995
MRP-1956: C-534979	KJ21-002_300	0	1	0	114.1935	79.33168
MRP-1956: C-534980	PAGS-MB-1901	0	1	0	155.8065	121.9059
MRP-1956: C-534981	PAGS-MB-1904	0	1	0	367.7419	207.9208
MRP-1956: C-534982	PAGS-NV-1905	0	1	0	176.129	113.8614
MRP-1956: C-534984	MRI-23_Top	Sample tak	1	0	199.0323	153.4653
MRP-1956: C-534985	MRI-23_Base	Sample tak	1	0	172.2581	125
MRP-1956: C-534986	MRI-24	Sample tak	1	0	161.2903	139.8515
MRP-1956: C-534988	MRI-25	1.05 ft thic	1	0	142.5806	99.13366
MRP-1956: C-534989	MRI-26D	Exposure d	1	0	140.6452	105.9406
MRP-1956: C-534990	MRI-26E	Exposure d	1	0	108.3871	76.73267
MRP-1956: C-534991	MRI-27	0.3 ft-thick	1	0	168.3871	118.8119
MRP-1956: C-534992	MRI-28C	Sampled 0.	1	0	116.129	80.44554

MRP-1956: C-534993	MRI-28D_Top	Sampled 0.	1	0	181.2903	126.2376
MRP-1956: C-534995	MRI-28D_Base	Sampled 1.	1	0	218.3871	160.8911
MRP-1956: C-534996	MRI-28M	Sampled 0.	1	0	512.9032	308.1683
MRP-1956: C-534997	MRI-28Q	Sampled 0.	1	0	263.2258	189.3564
MRP-1956: C-534998	MRI-28X	Sampled 0.	1	0	178.7097	136.1386
MRP-1956: C-534999	MRI-29_Top	Sampled 2.	1	0	176.129	128.7129
MRP-1956: C-535000	MRI-29_Base	Sampled 2.	1	0	112.5806	81.93069
MRP-1956: C-535001	MRI-30E_Top	Sampled 0.	1	0	184.8387	150.9901
MRP-1956: C-535002	MRI-30E_Base	Sampled 1.	1	0	152.5806	117.8218
MRP-1956: C-535003	MRI-30K	Sample tak	1	0	151.6129	108.5396
MRP-1956: C-535004	MRI-30LK	Sample tak	1	0	152.2581	111.7574
MRP-1956: C-535006	MRI-31_Top	Sample tak	1	0	292.5806	210.396
MRP-1956: C-535007	MRI-31_Mid1	Sample tak	1	0	171.2903	123.3911
MRP-1956: C-535008	MRI-31_Mid2	Sample tak	1	0	187.0968	137.3762
MRP-1956: C-535009	MRI-31_Base	Sample tak	1	0	191.9355	137.3762
MRP-1934: C-528313	TGS872DH5_31_5	Core	0	0	83.92283	64.57565
MRP-1934: C-528319	TGS872DH5_54_5	Core	0	0	173.6334	134.0713
MRP-1934: C-528311	TGS872DH5_119_8	Core	0	0	161.0932	121.1562
MRP-1934: C-528316	TGS872DH5_166_0	Core	0	0	163.0225	119.5572
MRP-1934: C-528318	TGS872DH5_171_25	Core	0	0	96.14148	63.46863
MRP-1934: C-528314	TGS872DH5_227_1	Core	0	0	241.8006	178.3518
MRP-1934: C-528317	TGS872DH5_250_0	Core	0	0	116.7203	78.22878
MRP-1934: C-528312	TGS872DH4_378_7	Core	0	0	174.2765	129.1513
MRP-1934: C-528320	MRI-22-C	Flint clay oi	0	0	559.4855	369.0037
MRP-1934: C-528321	MRI-22-E	Flint clay oi	0	0	30.54662	28.78229
MRP-1934: C-528322	MRI-22-D	Flint clay oi	0	0	128.9389	82.28782
MRP-1934: C-528303	MD-6-A	6 samples t	0	0	147.91	108.7331
MRP-1934: C-528304	MD-6-B	0	0	0	127.9743	94.34194
MRP-1934: C-528305	MD-6-C	0	0	0	108.6817	100.984
MRP-1934: C-528307	MD-6-D	0	0	0	171.3826	140.2214
MRP-1934: C-528309	MD-6-E	0	0	0	98.39228	105.9041
MRP-1934: C-528310	MD-6-F	0	0	0	25.72347	20.0492
MRP-1934: C-528344	MD-1-A	0	0	0	177.8135	122.1402
MRP-1934: C-528345	MD-1-B	0	0	0	260.7717	184.5018
MRP-1934: C-528346	MD-1-C	0	0	0	117.0418	84.87085
MRP-1934: C-528347	MD-1-D	0	0	0	191.3183	164.8216
MRP-1934: C-528348	MD-1-E	0	0	0	171.7042	142.6814
MRP-1934: C-528350	MD-1-F	0	0	0	91.31833	61.74662
MRP-1934: C-528351	MD-1-G	0	0	0	90.3537	64.94465
MRP-1934: C-528352	MD-1-H	0	0	0	86.17363	73.06273
MRP-1934: C-528354	MD-2-A	0	0	0	120.2572	94.34194
MRP-1934: C-528355	MD-2-B	0	0	0	116.3987	90.2829
MRP-1934: C-528356	MD-2-C	0	0	0	171.3826	141.4514
MRP-1934: C-528357	MD-2-D	0	0	0	149.1961	142.6814
MRP-1934: C-528358	MD-2-E	0	0	0	133.119	116.7282
MRP-1934: C-528359	MD-2-F	0	0	0	123.7942	89.9139
MRP-1934: C-528360	MD-2-G	0	0	0	134.7267	93.48093

MRP-1934\ C-528361	MD-3-A	0	0	0	261.4148	230.0123
MRP-1934\ C-528362	MD-3-B	0	0	0	95.81994	72.93973
MRP-1934\ C-528364	MD-3-C	0	0	0	111.8971	84.99385
MRP-1934\ C-528366	MD-3-D	0	0	0	139.8714	101.107
MRP-1934\ C-528367	MD-3-E	0	0	0	140.5145	115.8672
MRP-1934\ C-528368	MD-3-F	0	0	0	124.7588	102.337
MRP-1934\ C-528369	MD-3-G	0	0	0	143.0868	117.7122
MRP-1934\ C-528370	MD-3-H	0	0	0	146.9453	120.2952
MRP-1934\ C-528371	MD-3-I	0	0	0	141.1576	114.8831
MRP-1934\ C-528372	MD-3-J	0	0	0	161.4148	131.6113
MRP-1934\ C-528373	MD-4-A	0	0	0	174.9196	138.9914
MRP-1934\ C-528375	MD-4-B	0	0	0	190.6752	154.9815
MRP-1934\ C-528376	MD-4-C	0	0	0	200.6431	167.2817
MRP-1934\ C-528377	MD-4-D	0	0	0	192.926	158.6716
MRP-1934\ C-528378	MD-4-E	0	0	0	198.0707	163.5916
MRP-1934\ C-528379	MD-4-F	0	0	0	160.7717	129.1513
MRP-1934\ C-528380	MD-4-G	0	0	0	160.7717	124.2312
MRP-1934\ C-528381	MD-4-H	0	0	0	174.9196	131.6113
MRP-1934\ C-528382	MD-4-I	0	0	0	498.3923	473.5547
MRP-1935\ C-528384	MD-5-A 4	4 samples t	0	0	138.2637	111.5621
MRP-1935\ C-528385	MD-5-B	0	0	0	171.0611	130.3813
MRP-1935\ C-528386	MD-5-C	0	0	0	168.1672	131.6113
MRP-1935\ C-528387	MD-5-D	0	0	0	139.8714	115.2522
MRP-1935\ C-528388	MD-7-A 8	8 samples t	0	0	215.7556	164.8216
MRP-1935\ C-528390	MD-7-B	0	0	0	276.8489	225.0923
MRP-1935\ C-528391	MD-7-C	0	0	0	256.2701	200.492
MRP-1935\ C-528393	MD-7-D	0	0	0	211.8971	164.8216
MRP-1935\ C-528394	MD-7-E	0	0	0	209.9678	173.4317
MRP-1935\ C-528395	MD-7-F	0	0	0	191.3183	147.6015
MRP-1935\ C-528396	MD-7-G	0	0	0	175.5627	132.8413
MRP-1935\ C-528397	MD-7-H	0	0	0	156.9132	125.4613
MRP-1935\ C-528398	MD-8-A	15 samples	0	0	139.8714	108.3641
MRP-1935\ C-528399	MD-8-B	0	0	0	150.4823	117.0972
MRP-1935\ C-528401	MD-8-C	0	0	0	145.3376	116.1132
MRP-1935\ C-528402	MD-8-D	0	0	0	146.9453	115.7442
MRP-1935\ C-528403	MD-8-E	0	0	0	161.0932	134.0713
MRP-1935\ C-528404	MD-8-F	0	0	0	159.164	134.0713
MRP-1935\ C-528406	MD-8-G	0	0	0	163.6656	135.3014
MRP-1935\ C-528407	MD-8-H	0	0	0	179.4212	147.6015
MRP-1935\ C-528408	MD-8-I	0	0	0	181.0289	145.1415
MRP-1935\ C-528409	MD-8-J	0	0	0	171.0611	136.5314
MRP-1935\ C-528411	MD-8-K	0	0	0	195.4984	158.6716
MRP-1935\ C-528412	MD-8-L	0	0	0	170.0965	138.9914
MRP-1935\ C-528413	MD-8-M	0	0	0	161.0932	131.6113
MRP-1935\ C-528414	MD-8-N	0	0	0	160.4502	129.1513
MRP-1935\ C-528415	MD-8-O	0	0	0	159.4855	126.6913
MRP-1935\ C-528416	MD-10-A	7 samples t	0	0	149.5177	119.4342

MRP-1935(C-528417	MD-10-B	0	0	0	164.9518	136.5314
MRP-1935(C-528418	MD-10-C	0	0	0	165.5949	134.0713
MRP-1935(C-528419	MD-10-D	0	0	0	170.418	138.9914
MRP-1935(C-528420	MD-10-E	0	0	0	181.3505	150.0615
MRP-1935(C-528421	MD-10-F	0	0	0	184.2444	148.8315
MRP-1935:C-528423	MD-10-G	0	0	0	146.9453	117.4662
MRP-1935:C-528424	MD-11-A	9 samples t	0	0	150.4823	117.8352
MRP-1935:C-528425	MD-11-B	0	0	0	129.9035	98.52399
MRP-1935:C-528426	MD-11-C	0	0	0	160.1286	117.2202
MRP-1935:C-528427	MD-11-D	0	0	0	226.3666	157.4416
MRP-1935:C-528429	MD-11-E	0	0	0	206.1093	142.6814
MRP-1935:C-528431	MD-11-F	0	0	0	212.2186	154.9815
MRP-1935:C-528432	MD-11-G	0	0	0	174.2765	129.1513
MRP-1935:C-528433	MD-11-H	0	0	0	203.8585	148.8315
MRP-1935:C-528434	MD-11-I	0	0	0	241.1576	173.4317
MRP-1935:C-528435	MD-12-A	17 samples	0	0	167.2026	136.5314
MRP-1935:C-528436	MD-12-B	0	0	0	169.4534	137.7614
MRP-1935:C-528437	MD-12-C	0	0	0	171.3826	141.4514
MRP-1935:C-528438	MD-12-D	0	0	0	163.0225	134.0713
MRP-1935:C-528439	MD-12-E	0	0	0	183.2797	152.5215
MRP-1935:C-528440	MD-12-F	0	0	0	163.3441	135.3014
MRP-1935:C-528442	MD-12-G	0	0	0	170.0965	140.2214
MRP-1935:C-528443	MD-12-H	0	0	0	165.9164	134.0713
MRP-1935:C-528445	MD-12-I	0	0	0	177.1704	138.9914
MRP-1935:C-528446	MD-12-J	0	0	0	149.1961	120.6642
MRP-1935:C-528447	MD-12-K	0	0	0	155.627	126.6913
MRP-1935:C-528448	MD-12-L	0	0	0	327.9743	270.6027
MRP-1935:C-528449	MD-12-M	0	0	0	180.7074	142.6814
MRP-1935:C-528450	MD-12-N	0	0	0	164.9518	129.1513
MRP-1935:C-528451	MD-12-O	0	0	0	176.5273	140.2214
MRP-1935:C-528452	MD-12-P	0	0	0	189.7106	147.6015
MRP-1935:C-528453	MD-12-Q	0	0	0	193.8907	153.7515
MRP-1935:C-528455	MD-13-A	6 samples t	0	0	287.1383	247.2325
MRP-1935:C-528456	MD-13-B	0	0	0	200.9646	163.5916
MRP-1935:C-528457	MD-13-C	0	0	0	173.6334	131.6113
MRP-1935:C-528458	MD-13-D	0	0	0	155.9486	117.0972
MRP-1935:C-528459	MD-13-E	0	0	0	147.2669	105.0431
MRP-1935:C-528460	MD-13-F	0	0	0	135.0482	99.01599
MRP-1955·C-534699	OGS-CSH0051D	6" sample	1	0	176.7742	128.7129
MRP-1955·C-534700	OGS-CSH0052A	uppermost	1	0	183.2258	128.7129
MRP-1955·C-534701	OGS-CSH0052B	6" sample	1	0	177.7419	131.1881
MRP-1955·C-534703	OGS-CSH0052C	6" sample	1	0	188.3871	147.2772
MRP-1955·C-534705	OGS-CSH0052D	6" sample	1	0	116.7742	89.4802
MRP-1955·C-534706	OGS-CSH0052E	6" sample	1	0	194.5161	146.0396
MRP-1955·C-534707	OGS-CSH0053	2" sample	1	0	159.3548	115.2228
MRP-1955·C-534708	OGS-CSH0054	12" sample	1	0	116.4516	84.03465
MRP-1955·C-534709	OGS-CSH0055	12" sample	1	0	170.3226	127.4752

MRP-1955: C-534710	OGS-CSH0056A	uppermost	1	0	175.8065	137.3762
MRP-1955: C-534711	OGS-CSH0056B	6" sample	1	0	141.2903	104.703
MRP-1955: C-534712	OGS-CSH0056C	6" sample	1	0	132.2581	96.28713
MRP-1955: C-534714	OGS-CSH0056D	6" sample	1	0	141.2903	101.1139
MRP-1955: C-534717	OGS-CSH0057A	uppermost	1	0	185.1613	128.7129
MRP-1955: C-534718	OGS-CSH0057B	6" sample	1	0	218.7097	172.0297
MRP-1955: C-534719	OGS-CSH0057C	6" sample	1	0	165.8065	117.8218
MRP-1955: C-534720	OGS-CSH0057D	6" sample	1	0	166.4516	121.0396
MRP-1955: C-534721	OGS-CSH0058A	uppermost	1	0	217.0968	183.1683
MRP-1955: C-534722	OGS-CSH0058B	6" sample	1	0	186.7742	139.8515
MRP-1955: C-534723	OGS-CSH0059A	uppermost	1	0	189.6774	146.0396
MRP-1955: C-534724	OGS-CSH0059B	6" sample	1	0	159.0323	119.9257
MRP-1955: C-534725	OGS-CSH0060A	uppermost	1	0	177.7419	125
MRP-1955: C-534726	OGS-CSH0060B	6" sample	1	0	169.6774	116.5842
MRP-1955: C-534727	OGS-CSH0061A	uppermost	1	0	159.6774	122.896
MRP-1955: C-534729	OGS-CSH0061B	6" sample	1	0	166.4516	125
MRP-1955: C-534730	OGS-CSH0061C	6" sample	1	0	159.6774	110.2723
MRP-1955: C-534732	OGS-CSH0062A	uppermost	1	0	96.45161	66.21287
MRP-1955: C-534733	OGS-CSH0062B	6" sample	1	0	454.8387	319.3069
MRP-1955: C-534735	OGS-CSH0062C	6" sample	1	0	1170.968	804.4554
MRP-1955: C-534736	OGS-CSH0062D	6" sample	1	0	287.0968	205.4455
MRP-1955: C-534738	OGS-CSH0063A	uppermost	1	0	171.6129	125
MRP-1955: C-534739	OGS-CSH0063B	6" sample	1	0	192.5806	141.0891
MRP-1955: C-534740	OGS-CSH0063C	6" sample	1	0	183.2258	133.6634
MRP-1955: C-534741	OGS-CSH0063D	6" sample	1	0	161.2903	115.3465
MRP-1955: C-534742	OGS-CSH0064A	uppermost	1	0	231.9355	185.6436
MRP-1955: C-534743	OGS-CSH0064B	6" sample	1	0	218.7097	178.2178
MRP-1955: C-534744	OGS-CSH0064C	6" sample	1	0	211.2903	170.7921
MRP-1955: C-534745	OGS-CSH0064D	6" sample	1	0	213.5484	180.6931
MRP-1955: C-534746	OGS-CSH0064E	6" sample	1	0	213.2258	172.0297
MRP-1955: C-534747	OGS-CSH0064F	6" sample	1	0	237.7419	158.4158
MRP-1955: C-534749	OGS-CSH0064G	6" sample	1	0	186.129	125
MRP-1955: C-534750	OGS-CSH0064H	6" sample	1	0	192.5806	143.5644
MRP-1955: C-534751	OGS-CSH0064I	6" sample	1	0	203.871	173.2673
MRP-1955: C-534752	OGS-CSH0065	12" sample	1	0	156.4516	112.2525
MRP-1955: C-534753	OGS-CSH0066A	uppermost	1	0	134.8387	95.91584
MRP-1955: C-534755	OGS-CSH0066B	6" sample	1	0	432.2581	315.5941
MRP-1955: C-534756	OGS-CSH0066C	6" sample	1	0	314.8387	174.505
MRP-1955: C-534757	OGS-CSH0066D	6" sample	1	0	163.5484	112.2525
MRP-1955: C-534603	OGS-CSH0029C	6" sample	1	0	142.5806	114.3564
MRP-1955: C-534604	OGS-CSH0030	6-9" sample	1	0	104.5161	81.06436
MRP-1955: C-534606	OGS-CSH0031	1.5' sample	1	0	146.129	109.7772
MRP-1955: C-534607	OGS-CSH0032A	uppermost	1	0	137.7419	102.9703
MRP-1955: C-534609	OGS-CSH0032B	6" sample	1	0	153.871	112.7475
MRP-1955: C-534610	OGS-CSH0033A	uppermost	1	0	129.0323	91.33663
MRP-1955: C-534611	OGS-CSH0033B	6" sample	1	0	134.1935	98.63861
MRP-1955: C-534612	OGS-CSH0033C	6" sample	1	0	162.2581	168.3168

MRP-1955:C-534613	OGS-CSH0033D	6" sample	1	0	168.0645	117.9455
MRP-1955:C-534614	OGS-CSH0033E	6" sample	1	0	260.6452	225.2475
MRP-1955:C-534616	OGS-CSH0033F	6" sample	1	0	164.1935	117.5743
MRP-1955:C-534617	OGS-CSH0033G	6" sample	1	0	174.5161	136.1386
MRP-1955:C-534618	OGS-CSH0033H	6" sample	1	0	176.4516	143.5644
MRP-1955:C-534620	OGS-CSH0033I	6" sample	1	0	188.3871	143.5644
MRP-1955:C-534621	OGS-CSH0033J	6" sample	1	0	156.129	110.8911
MRP-1955:C-534622	OGS-CSH0034A	uppermost	1	0	167.0968	126.2376
MRP-1955:C-534623	OGS-CSH0034B	6" sample	1	0	113.871	78.46535
MRP-1955:C-534624	OGS-CSH0034C	6" sample	1	0	138.7097	99.75248
MRP-1955:C-534625	OGS-CSH0034D	6" sample	1	0	132.9032	96.16337
MRP-1955:C-534626	OGS-CSH0034E	6" sample	1	0	142.5806	107.302
MRP-1955:C-534627	OGS-CSH0035A	uppermost	1	0	205.4839	147.2772
MRP-1955:C-534628	OGS-CSH0035B	6" sample	1	0	258.0645	199.2574
MRP-1955:C-534631	OGS-CSH0035C	6" sample	1	0	231.9355	169.5545
MRP-1955:C-534632	OGS-CSH0036A	uppermost	1	0	123.5484	87.62376
MRP-1955:C-534633	OGS-CSH0036B	6" sample	1	0	149.6774	103.9604
MRP-1955:C-534634	OGS-CSH0036C	6" sample	1	0	167.7419	114.604
MRP-1955:C-534635	OGS-CSH0036D	6" sample	1	0	155.4839	110.6436
MRP-1955:C-534637	OGS-CSH0037A	uppermost	1	0	171.9355	123.5149
MRP-1955:C-534638	OGS-CSH0037B	6" sample	1	0	146.7742	104.703
MRP-1955:C-534639	OGS-CSH0037C	6" sample	1	0	139.0323	102.2277
MRP-1955:C-534640	OGS-CSH0037D	6" sample	1	0	239.3548	189.3564
MRP-1955:C-534641	OGS-CSH0038A	uppermost	1	0	141.2903	107.6733
MRP-1955:C-534642	OGS-CSH0038B	6" sample	1	0	148.0645	110.5198
MRP-1955:C-534643	OGS-CSH0038C	6" sample	1	0	153.5484	114.8515
MRP-1955:C-534644	OGS-CSH0038D	6" sample	1	0	136.7742	100.8663
MRP-1955:C-534646	OGS-CSH0039	~6" sample	1	0	204.5161	144.802
MRP-1955:C-534647	OGS-CSH0040	~6" sample	1	0	137.0968	107.302
MRP-1955:C-534648	OGS-CSH0041A	uppermost	1	0	153.2258	102.8465
MRP-1955:C-534649	OGS-CSH0041B	6" sample	1	0	127.7419	86.75743
MRP-1955:C-534651	OGS-CSH0041C	6" sample	1	0	167.4194	122.896
MRP-1955:C-534652	OGS-CSH0041D	6" sample	1	0	148.0645	94.80198
MRP-1955:C-534654	OGS-CSH0041E	6" sample	1	0	118.3871	85.5198
MRP-1955:C-534655	OGS-CSH0041F	6" sample	1	0	123.5484	92.82178
MRP-1955:C-534657	OGS-CSH0041G	6" sample	1	0	130.9677	101.2376
MRP-1955:C-534658	OGS-CSH0041H	6" sample	1	0	145.8065	113.3663
MRP-1955:C-534659	OGS-CSH0042A	uppermost	1	0	97.41935	70.17327
MRP-1955:C-534660	OGS-CSH0042B	6" sample	1	0	93.22581	64.97525
MRP-1955:C-534661	OGS-CSH0042C	6" sample	1	0	119.3548	79.08416
MRP-1955:C-534662	OGS-CSH0042D	6" sample	1	0	325.8065	274.7525
MRP-1955:C-534664	OGS-CSH0042E	6" sample	1	0	228.0645	193.0693
MRP-1955:C-534665	OGS-CSH0042F	6" sample	1	0	202.5806	150.9901
MRP-1955:C-534666	OGS-CSH0042G	6" sample	1	0	175.4839	136.1386
MRP-1955:C-534668	OGS-CSH0043A	uppermost	1	0	126.4516	107.0545
MRP-1955:C-534669	OGS-CSH0043B	6" sample	1	0	109.0323	77.47525
MRP-1955:C-534670	OGS-CSH0043C	6" sample	1	0	191.9355	154.703

MRP-1955: C-534671	OGS-CSH0044A	uppermost	1	0	142.9032	87.12871
MRP-1955: C-534672	OGS-CSH0044B	6" sample	1	0	90.32258	64.60396
MRP-1955: C-534673	OGS-CSH0044C	6" sample	1	0	120.3226	79.57921
MRP-1955: C-534674	OGS-CSH0045	2.5' compo	1	0	160	125
MRP-1955: C-534675	OGS-CSH0046A	uppermost	1	0	150.9677	113.2426
MRP-1955: C-534676	OGS-CSH0046B	6" sample	1	0	150.9677	104.703
MRP-1955: C-534679	OGS-CSH0046C	6" sample	1	0	127.0968	96.0396
MRP-1955: C-534680	OGS-CSH0046D	6" sample	1	0	142.2581	103.3416
MRP-1955: C-534681	OGS-CSH0047	6" sample	1	0	189.3548	157.1782
MRP-1955: C-534682	OGS-CSH0048A	uppermost	1	0	162.9032	121.4109
MRP-1955: C-534683	OGS-CSH0048B	6" sample	1	0	123.2258	90.84158
MRP-1955: C-534684	OGS-CSH0048C	6" sample	1	0	135.4839	97.77228
MRP-1955: C-534685	OGS-CSH0049A	uppermost	1	0	180.6452	128.7129
MRP-1955: C-534686	OGS-CSH0049B	6" sample	1	0	179.3548	127.4752
MRP-1955: C-534688	OGS-CSH0050A	uppermost	1	0	221.6129	146.0396
MRP-1955: C-534689	OGS-CSH0050B	6" sample	1	0	160.6452	108.2921
MRP-1955: C-534690	OGS-CSH0050C	6" sample	1	0	117.0968	87.37624
MRP-1955: C-534691	OGS-CSH0050D	6" sample	1	0	185.1613	163.3663
MRP-1955: C-534692	OGS-CSH0050E	6" sample	1	0	157.7419	105.5693
MRP-1955: C-534694	OGS-CSH0050F	6" sample	1	0	165.8065	117.8218
MRP-1955: C-534695	OGS-CSH0051A	uppermost	1	0	156.4516	105.9406
MRP-1955: C-534696	OGS-CSH0051B	6" sample	1	0	154.8387	107.0545
MRP-1955: C-534698	OGS-CSH0051C	6" sample	1	0	147.0968	97.40099
MRP-1894: C-515082	SDH-217-1	Back shale	1	0	10.93248	8.97909
MRP-1894: C-515083	SDH-217-2	Bended du	1	0	29.26045	24.10824
MRP-1894: C-515084	SDH-217-3	Massive gr	1	0	154.3408	122.0172
MRP-1894: C-515086	SDH-217-4	Massive lig	1	0	143.4084	116.4822
MRP-1894: C-515087	SDH-217-5	Horizontal	1	0	127.6527	104.674
MRP-1894: C-515089	SDH-217-6	Bended co	1	0	82.63666	58.30258
MRP-1894: C-515090	SDH-217-7	Claystone	1	0	153.3762	118.9422
MRP-1894: C-515091	SDH-217-8	Massive gr	1	0	163.6656	135.3014
MRP-1894: C-515092	SDH-217-9	Massive bl	1	0	168.8103	130.3813
MRP-1894: C-515093	SDH-217-10	Bended co	1	0	58.84244	49.9385
MRP-1894: C-515094	SDH-217-11	Massive mi	1	0	181.9936	138.9914
MRP-1894: C-515095	SDH-217-12	Massive mi	1	0	174.2765	138.9914
MRP-1894: C-515096	SDH-217-13	Grey medit	1	0	109.9678	90.65191
MRP-1894: C-515098	SDH-4-1	Bluish-grey	1	0	155.9486	118.5732
MRP-1894: C-515099	SDH-4-2	Light grey f	1	0	119.9357	95.81796
MRP-1894: C-515100	SDH-4-3	Light grey r	1	0	128.9389	100.984
MRP-1894: C-515101	SDH-4-4	Bended bri	1	0	8.038585	5.781058
MRP-1894: C-515102	SDH-4-5	Grey muds	1	0	181.9936	146.3715
MRP-1894: C-515103	SDH-4-6	Grey muds	1	0	787.7814	627.3063
MRP-1894: C-515104	SDH-259-1	Grey massi	1	0	156.9132	110.8241
MRP-1894: C-515106	SDH-259-2	Greenish-g	1	0	261.7363	196.802
MRP-1894: C-515107	SDH-259-3	Grey horiz	1	0	121.865	97.66298
MRP-1894: C-515108	SDH-259-4	Bended co	1	0	13.50482	10.82411
MRP-1894: C-515109	SDH-259-5	Grey clayst	1	0	104.8232	68.51169

MRP-1894(C-515110	SDH-259-6	Grey clayst	1	0	411.5756	371.4637
MRP-1894(C-515111	SDH-259-7	Grey clayst	1	0	162.0579	116.1132
MRP-1894(C-515112	SDH-259-8	Grey clayst	1	0	142.4437	111.1931
MRP-1894(C-515114	SDH-259-9	Bended co:	1	0	6.752412	5.781058
MRP-1894(C-515115	SDH-259-10	Grey muds:	1	0	121.5434	89.05289
MRP-1894(C-515116	SDH-259-11	Bended co:	1	0	4.180064	3.198032
MRP-1894(C-515117	SDH-259-12	Grey clayst	1	0	103.8585	76.99877
MRP-1894(C-515118	SDH-259-13	Grey muds:	1	0	193.8907	158.6716
MRP-1894(C-515120	SDH-259a-1	Black mass	1	0	122.508	108.2411
MRP-1894(C-515121	SDH-259a-2	Bended co:	1	0	22.50804	17.09717
MRP-1894(C-515122	SDH-259a-3	Grey muds:	1	0	107.074	86.71587
MRP-1894(C-515124	SDH-259a-4	Black mass	1	0	69.77492	44.15744
MRP-1894(C-515125	SDH-259a-5	Bended co:	1	0	12.54019	7.749077
MRP-1894(C-515127	SDH-259a-6	Grey massi	1	0	69.77492	54.85855
MRP-1894(C-515128	SDH-259a-7	Massive lig	1	0	116.3987	89.6679
MRP-1894(C-515129	SDH-259a-8	Massive lig	1	0	116.0772	88.43788
MRP-1894(C-515130	SDH-259a-9	Black mass	1	0	117.3633	80.68881
MRP-1894(C-515131	SDH-259a-10	Massive lig	1	0	151.1254	118.5732
MRP-1894(C-515132	SDH-259a-11	Dark grey r	1	0	136.0129	96.92497
MRP-1894(C-515133	SDH-259a-12	Bended co:	1	0	8.038585	7.626076
MRP-1894(C-515134	SDH-259a-13	Grey muds:	1	0	154.0193	114.3911
MRP-1894(C-515136	SDH-259a-14	Light grey r	1	0	166.2379	121.0332
MRP-1894(C-515137	SDH-259a-15	Light grey c	1	0	147.2669	108.8561
MRP-1894(C-515138	SDH-259a-16	Black mass	1	0	142.1222	91.88192
MRP-1894(C-515139	SDH-259a-17	Grey massi	1	0	195.1768	148.8315
MRP-1894(C-515140	SDH-259a-18	Black mass	1	0	172.9904	99.38499
MRP-1894(C-515141	SDH-259a-19	Bended co:	1	0	20.25723	14.02214
MRP-1894(C-515142	SDH-259a-20	Grey massi	1	0	80.38585	58.67159
MRP-1894(C-515144	SDH-366-1	Bended co:	1	0	10.28939	7.626076
MRP-1894(C-515145	SDH-366-2	Grey massi	1	0	139.5498	108.6101
MRP-1894(C-515146	SDH-366-3	Dark grey c	1	0	257.2347	254.6125
MRP-1894(C-515147	SDH-366-4	Grey clayst	1	0	211.5756	206.6421
MRP-1894(C-515148	SDH-366-5	Bended co:	1	0	36.65595	25.46125
MRP-1894(C-515149	SDH-366-6	Grey muds:	1	0	151.4469	124.2312
MRP-1894(C-515150	SDH-366-7	Bended co:	1	0	30.22508	23.73924
MRP-1894(C-515152	SDH-366-8	Grey muds:	1	0	127.6527	102.583
MRP-1894(C-515153	SDH-366-9	Light grey s	1	0	139.2283	97.04797
MRP-1894(C-515154	SDH-366-10	Black orga	1	0	69.45338	51.16851
MRP-1894(C-515155	SDH-366-11	Bended to	1	0	21.22186	13.89914
MRP-1894(C-515156	SDH-366-12	Grey massi	1	0	110.2894	90.4059
MRP-1895(C-515231	KGS546-103.9	Dark grey s	0	0	38.58521	33.33333
MRP-1895(C-515232	KGS546-105	Dark grey s	0	0	190.0322	143.9114
MRP-1895(C-515233	KGS546-107.7	Dark grey s	0	0	189.7106	150.0615
MRP-1895(C-515234	KGS546-108.5	Dark grey s	0	0	189.3891	152.5215
MRP-1895(C-515235	KGS546-169.3	Light grey ξ	0	0	177.1704	140.2214
MRP-1895(C-515237	KGS546-169.8	Light grey ξ	0	0	139.5498	100.123
MRP-1895(C-515238	KGS546-169.8Q	Light grey ξ	0	0	143.7299	105.4121

MRP-1895(C-515239	KGS546-170.6	Light grey ξ	0	0	205.1447	175.8918
MRP-1895(C-515240	KGS546-171.3	Light grey ξ	0	0	190.6752	157.4416
MRP-1895(C-515241	KGS546-171.3Q	Light grey ξ	0	0	171.3826	136.5314
MRP-1895(C-515243	KGS546-356.2	Black shale	0	0	60.7717	49.8155
MRP-1895(C-515244	KGS546-366	Light grey ξ	0	0	157.5563	127.9213
MRP-1895(C-515245	KGS546-366Q	Light grey ξ	0	0	144.0514	116.2362
MRP-1895(C-515246	KGS546-367	Dark grey ξ	0	0	124.7588	98.89299
MRP-1895(C-515247	KGS546-367Q	Dark grey ξ	0	0	128.2958	100.984
MRP-1895(C-515248	KGS546-368	Light grey ξ	0	0	131.5113	95.44895
MRP-1895(C-515249	KGS546-441.6	Coal	0	0	50.80386	40.71341
MRP-1895(C-515250	KGS546-442.5	Dark grey ξ	0	0	132.1543	94.58795
MRP-1895(C-515252	KGS546-443.5	Light grey ξ	0	0	132.7974	94.34194
MRP-1895(C-515253	KGS546-492.8	Black shale	0	0	133.119	98.76999
MRP-1895(C-515254	KGS546-493.5	Light grey ξ	0	0	196.7846	142.6814
MRP-1895(C-515255	KGS546-493.5Q	Light grey ξ	0	0	190.0322	136.5314
MRP-1895:C-515295	WH20-1	0	1	0	154.9839	135.3014
MRP-1895:C-515296	WH20-2	0	1	0	198.0707	156.2116
MRP-1895:C-515297	WH20-3	0	1	0	218.0064	168.5117
MRP-1895:C-515298	WH20-4	0	1	0	98.39228	67.89668
MRP-1895:C-515299	WH20-5	0	1	0	110.2894	80.0738
MRP-1895:C-515301	WH20-6	0	1	0	121.5434	86.10086
MRP-1895:C-515302	WH20-7	0	1	0	76.20579	59.6556
MRP-1895:C-515303	WH20-8	0	1	0	70.41801	55.71956
MRP-1895:C-515304	WH20-9	0	1	0	90.99678	73.18573
MRP-1895:C-515305	WP20-1	0	1	0	158.8424	119.6802
MRP-1895:C-515307	SC20-1	0	1	0	119.9357	88.80689
MRP-1895:C-515308	SC20-2	0	1	0	124.1158	88.92989
MRP-1895:C-515309	SC20-3	0	1	0	294.8553	253.3825
MRP-1895:C-515310	SC20-4	0	1	0	143.4084	98.76999
MRP-1895:C-515311	SC20-5	0	1	0	166.881	124.2312
MRP-1895:C-515313	SC20-6	0	1	0	131.1897	91.38991
MRP-1895:C-515314	RR20-1	0	1	0	79.74277	71.09471
MRP-1895:C-515315	Car20-1	0	1	0	96.46302	72.69373
MRP-1895:C-515316	Car20-2	0	1	0	130.5466	76.99877
MRP-1895:C-515317	Car20-3	0	1	0	80.06431	62.36162
MRP-1895:C-515319	330Ave20-1	0	1	0	169.4534	135.3014
MRP-1895:C-515320	330Ave20-2	0	1	0	177.1704	130.3813
MRP-1895:C-515321	330Ave20-3	0	1	0	74.27653	54.73555
MRP-1895:C-515322	330Ave20-4	0	1	0	48.8746	36.53137
MRP-1895:C-515323	WPD20-1	0	1	0	132.1543	110.2091
MRP-1895:C-515324	WPD20-2	0	1	0	96.78457	77.12177
MRP-1895:C-515325	WPD20-3	0	1	0	89.06752	72.44772
MRP-1895:C-515326	WPD20-4	0	1	0	158.5209	137.7614
MRP-1895:C-515327	NBS20-1	0	1	0	123.7942	104.797
MRP-1895:C-515328	NBS20-2	0	1	0	88.10289	70.84871
MRP-1895:C-515330	NBS20-3	0	1	0	148.8746	129.1513
MRP-1895:C-515331	NBS20-4	0	1	0	85.209	69.6187

MRP-1895:C-515332	MC20-1	0	1	0	140.5145	109.3481
MRP-1895:C-515333	MC20-2	0	1	0	129.9035	113.1611
MRP-1895:C-515334	MC20-3	0	1	0	103.8585	82.65683
MRP-1895:C-515336	MC20-4	0	1	0	117.3633	93.72694
MRP-1895:C-515338	MC20-5	0	1	0	118.0064	92.74293
MRP-1895:C-515339	CP10-1	0	1	0	87.78135	60.76261
MRP-1895:C-515340	CP10-2	0	1	0	135.3698	94.21894
MRP-1895:C-515341	CP37-1	0	1	0	141.8006	102.583
MRP-1895:C-515343	CP37-2	0	1	0	204.5016	138.9914
MRP-1895:C-515344	CP37-3	0	1	0	130.8682	99.01599
MRP-1895:C-515345	CP37-4	0	1	0	95.81994	71.95572
MRP-1895:C-515346	CP37-5	0	1	0	84.56592	66.54367
MRP-1895:C-515347	CP37-6	0	1	0	110.2894	82.90283
MRP-1895:C-515349	CP37-7	0	1	0	94.53376	74.16974
MRP-1895:C-515350	CP37-8	0	1	0	266.5595	201.722
MRP-1895:C-515351	CP37-9	0	1	0	80.7074	64.94465
MRP-1895:C-515352	CP37-10	0	1	0	107.717	85.97786
MRP-1895:C-515353	CP37-11	0	1	0	151.1254	113.2841
MRP-1895:C-515354	CP37-12	0	1	0	101.6077	82.77983
MRP-1895:C-515355	CP37-13	0	1	0	90.3537	80.4428
MRP-1895:C-515356	CP37-14	0	1	0	405.1447	263.2226
MRP-1895:C-515357	CP37-15	0	1	0	83.92283	62.11562
MRP-1895:C-515358	CP37-16	0	1	0	75.24116	54.12054
MRP-1895:C-515360	CP37-17	0	1	0	181.0289	148.8315
MRP-1895:C-515361	CP37-18	0	1	0	119.2926	101.23
MRP-1895:C-515362	CP37-19	0	1	0	122.508	113.6531
MRP-1895:C-515363	CP37-20	0	1	0	270.0965	103.813
MRP-1895:C-515364	CP37-21	0	1	0	73.63344	53.62854
MRP-1895:C-515366	CP37-22	0	1	0	98.71383	66.05166
MRP-1895:C-515367	CP37-23	0	1	0	71.38264	64.69865
MRP-1895:C-515368	CP37-24	0	1	0	434.0836	266.9127
MRP-1895:C-515369	W27556-1	0	1	0	141.1576	87.20787
MRP-1895:C-515370	W27556-2	0	1	0	90.03215	67.89668
MRP-1895:C-515371	W27556-3	0	1	0	87.13826	68.01968
MRP-1895:C-515372	W27556-4	0	1	0	116.0772	75.89176
MRP-1895:C-515373	W27556-5	0	1	0	100.3215	60.2706
MRP-1895:C-515374	W27556-6	0	1	0	166.881	112.7921
MRP-1895:C-515375	W27556-7	0	1	0	69.77492	55.59656
MRP-1895:C-515438	2466700_689.8	0	1	0	143.4084	105.9041
MRP-1895:C-515439	2466700_690	0	1	0	170.7395	126.6913
MRP-1895:C-515441	2466700_690.3	0	1	0	150.8039	114.7601
MRP-1895:C-515442	2466700_691.2	0	1	0	166.5595	127.9213
MRP-1895:C-515443	2466700_691.8	0	1	0	157.5563	151.2915
MRP-1895:C-515445	2466700_798.1	anthracitic	1	0	151.7685	105.7811
MRP-1895:C-515446	2466700_798.3	0	1	0	184.8875	130.3813
MRP-1895:C-515447	2466700_798.9	0	1	0	167.8457	122.8782
MRP-1895:C-515448	2466700_799.3	0	1	0	178.7781	130.3813

MRP-1895(C-515449	2466700_799.6	0	1	0	197.4277	146.3715
MRP-1895(C-515451	2466700_800.5	0	1	0	216.3987	159.9016
MRP-1895(C-515452	2466700_1019	partly anth	1	0	190.0322	140.2214
MRP-1895(C-515453	2466700_1019.6	0	1	0	170.418	131.6113
MRP-1895(C-515454	2466700_1019.9	anthracitic	1	0	180.7074	142.6814
MRP-1895(C-515455	2466700_1020.5	0	1	0	149.5177	104.797
MRP-1895(C-515456	2466700_1021.5	0	1	0	236.3344	168.5117
MRP-1895(C-515457	2466700_1021.7	0	1	0	150.8039	116.4822
MRP-1895(C-515458	2466700_1022.4	0	1	0	130.8682	106.0271
MRP-1895(C-515459	2466700_1023	0	1	0	138.9068	102.214
MRP-1895(C-515460	2466700_1023.3	0	1	0	147.2669	103.567
MRP-1895(C-515462	2466700_1024	0	1	0	185.209	137.7614
MRP-1895(C-515463	2466700_1024.2	0	1	0	334.4051	254.6125
MRP-1895(C-515464	2466700_1025	0	1	0	187.4598	135.3014
MRP-1895(C-515465	2466700_1025.4	0	1	0	156.9132	114.3911
MRP-1895(C-515466	2466700_1026	0	1	0	172.6688	127.9213
MRP-1895(C-515467	2466700_1026.9	0	1	0	110.6109	85.11685
MRP-1895(C-515468	2466700_1071.3	partly anth	1	0	79.42122	71.95572
MRP-1895(C-515470	2466700_1071.4	0	1	0	77.49196	63.46863
MRP-1895(C-515471	2466700_1078.9	0	1	0	172.6688	115.3752
MRP-1895(C-515472	2466700_1079.7	0	1	0	171.3826	112.3001
MRP-1895(C-515474	2466700_1080.4	0	1	0	201.2862	137.7614
MRP-1895(C-515475	2466700_1080.6	0	1	0	258.8424	196.802
MRP-1895(C-515476	2466700_1081	0	1	0	257.5563	209.1021
MRP-1895(C-515477	2466700_1081.6	0	1	0	163.0225	117.7122
MRP-1895(C-515478	2466700_1082.6	0	1	0	113.8264	84.74785
MRP-1895(C-515479	2466700_1083.5	0	1	0	135.6913	93.72694
MRP-1895(C-515480	2466700_1084.8	0	1	0	107.074	78.59779
MRP-1895(C-515481	2466700_857	0	1	0	158.5209	119.6802
MRP-1895(C-515482	2466700_855.8	0	1	0	176.8489	142.6814
MRP-1895(C-515483	2466700_854.8	0	1	0	103.8585	79.8278
MRP-1895(C-515484	2466700_855.2	0	1	0	96.46302	75.03075
MRP-1895(C-515485	2466700_857.9	0	1	0	147.2669	111.4391
MRP-1895(C-515486	2466700_856.4	0	1	0	150.8039	114.6371
MRP-1909(C-520100	14Q13-1	Dark grey t	1	0	124.7588	80.93481
MRP-1909(C-520101	14Q13-2	Bended co:	1	0	5.787781	4.428044
MRP-1909(C-520102	14Q13-3	Bended co:	1	0	106.4309	122.1402
MRP-1909(C-520104	14Q13-4	Grey crumf	1	0	199.3569	148.8315
MRP-1909(C-520105	14Q13-5	Light grey c	1	0	170.7395	127.9213
MRP-1909(C-520107	14Q13-6	Bended co:	1	0	3.215434	2.460025
MRP-1909(C-520108	14Q13-7	Grey clayst	1	0	142.1222	92.61993
MRP-1909(C-520109	14Q13-8	Light grey t	1	0	109.6463	77.36777
MRP-1909(C-520110	14Q13-9	Dark grey t	1	0	156.5916	84.74785
MRP-1909(C-520111	14Q13-10	Bended co:	1	0	15.75563	9.840098
MRP-1909(C-520112	14Q13-11	Grey clayst	1	0	125.4019	107.7491
MRP-1909(C-520113	14Q13-12	Grey clayst	1	0	147.5884	96.18696
MRP-1909(C-520115	14Q13-13	Bended co:	1	0	34.72669	43.78844

MRP-1909: C-520116	14Q13-14	Grey clayst	1	0	210.2894	167.2817
MRP-1909: C-520117	14Q13-15	Dark grey c	1	0	139.2283	91.14391
MRP-1909: C-520118	14Q13-16	Bended co:	1	0	8.038585	8.610086
MRP-1909: C-520119	14Q13-17	Dark grey r	1	0	340.836	247.2325
MRP-1909: C-520120	14Q13-18	Grey muds	1	0	152.4116	113.4071
MRP-1909: C-520122	SDH-317-1	Dark grey t	1	0	163.0225	85.97786
MRP-1909: C-520123	SDH-317-2	Light grey c	1	0	114.1479	70.60271
MRP-1909: C-520124	SDH-317-3	Light grey c	1	0	155.9486	109.1021
MRP-1909: C-520125	SDH-317-4	Dark grey t	1	0	118.328	95.20295
MRP-1909: C-520126	SDH-317-5	Grey muds	1	0	140.836	114.6371
MRP-1909: C-520128	SDH-317-6	Dark grey t	1	0	179.7428	107.3801
MRP-1909: C-520129	SDH-317-7	Dark grey r	1	0	366.5595	334.5633
MRP-1909: C-520130	SDH-317-8	Grey-yellow	1	0	116.0772	73.30873
MRP-1909: C-520132	SDH-377-1	Grey shale	1	0	113.8264	76.26076
MRP-1909: C-520133	SDH-377-2	Light grey t	1	0	197.7492	143.9114
MRP-1909: C-520134	SDH-377-3	Black mass	1	0	179.7428	138.9914
MRP-1909: C-520136	SDH-377-4	Bended to	1	0	116.3987	81.91882
MRP-1909: C-520137	SDH-377-5	Grey-brown	1	0	180.7074	109.3481
MRP-1909: C-520139	SDH-377-6	Greenish-b	1	0	130.8682	94.09594
MRP-1909: C-520140	SDH-377-7	Grey massi	1	0	258.8424	169.7417
MRP-1909: C-520141	SDH-377-8	Black mass	1	0	137.9421	83.64084
MRP-1909: C-520142	SDH-377-9	Bended to	1	0	185.5305	135.3014
MRP-1909: C-520143	SDH-377-10	Grey muds	1	0	148.5531	97.53998
MRP-1909: C-520145	SDH-377-11	Light gray t	1	0	114.1479	75.89176
MRP-1909: C-520146	SDH-377-12	Black mass	1	0	163.0225	113.7761
MRP-1909: C-520147	SDH-377-13	Dark grey t	1	0	196.7846	132.8413
MRP-1909: C-520148	SDH-377-14	Grey muds	1	0	173.955	117.4662
MRP-1910: C-520150	SDH-379-1	Black mass	0	0	93.24759	60.63961
MRP-1910: C-520151	SDH-379-2	Black mass	0	0	115.4341	87.69988
MRP-1910: C-520152	SDH-379-3	Bended co:	0	0	5.466238	5.04305
MRP-1910: C-520154	SDH-379-4	Light gray c	0	0	127.6527	96.43296
MRP-1910: C-520155	SDH-379-5	Grey muds	0	0	155.3055	125.4613
MRP-1910: C-520157	SDH-379-6	Gray muds	0	0	151.1254	129.1513
MRP-1910: C-520158	SDH-379-7	Black mass	0	0	135.3698	123.0012
MRP-1910: C-520159	SDH-379-8	Black mass	0	0	86.49518	49.9385
MRP-1910: C-520160	SDH-379-9	Bended co:	0	0	4.823151	4.428044
MRP-1910: C-520161	SDH-379-10	Brownish g	0	0	81.02894	52.02952
MRP-1910: C-520162	SDH-379-11	Light gray c	0	0	99.67846	72.32472
MRP-1910: C-520163	SDH-379-12	Gray massi	0	0	185.8521	136.5314
MRP-1910: C-520165	SDH-379-13	Black mass	0	0	171.3826	161.1316
MRP-1910: C-520166	SDH-379-14	Grey shale,	0	0	183.2797	140.2214
MRP-1910: C-520167	SDH-379-15	Grey clayst	0	0	280.7074	212.7921
MRP-1910: C-520168	SDH-379-16	Dark grey t	0	0	162.701	109.9631
MRP-1910: C-520169	SDH-379-17	Dark grey r	0	0	141.8006	93.60394
MRP-1910: C-520170	SDH-379-18	Brownish-g	0	0	239.2283	150.0615
MRP-1910: C-520171	SDH-379-19	Light gray c	0	0	128.2958	96.80197
MRP-1910: C-520173	SDH-347-1	Gray massi	0	0	139.5498	110.9471

MRP-1910: C-520174	SDH-347-2	Bended bri	0	0	31.8328	25.09225
MRP-1910: C-520175	SDH-347-3	Massive lig	0	0	87.78135	63.71464
MRP-1910: C-520176	SDH-347-4	Massive lig	0	0	117.6849	107.2571
MRP-1910: C-520177	SDH-347-5	Dark gray s	0	0	166.2379	140.2214
MRP-1910: C-520179	SDH-347-6	Bended coi	0	0	16.07717	12.54613
MRP-1910: C-520180	SDH-347-7	Black shale	0	0	155.3055	118.4502
MRP-1910: C-520181	SDH-347-8	Light gray c	0	0	125.4019	96.55597
MRP-1910: C-520182	SDH-347-9	Massive, lig	0	0	173.955	142.6814
MRP-1910: C-520183	SDH-347-10	Gray to dar	0	0	198.3923	154.9815
MRP-1910: C-520184	SDH-347-11	Bended coi	0	0	27.33119	21.64822
MRP-1910: C-520185	SDH-347-12	Light gray r	0	0	125.0804	100.984
MRP-1910: C-520186	SDH-347-13	Massive, ve	0	0	119.2926	101.107
MRP-1910: C-520188	SDH-300-1	Dark grey r	0	0	252.09	175.8918
MRP-1910: C-520189	SDH-300-2	Light grey r	0	0	160.1286	129.1513
MRP-1910: C-520190	SDH-300-3	Grey-yellow	0	0	32.15434	23.61624
MRP-1910: C-520192	SDH-300-4	Grey massi	0	0	138.5852	89.9139
MRP-1910: C-520193	SDH-300-5	Grey massi	0	0	128.9389	100.615
MRP-1910: C-520195	SDH-300-6	Grey massi	0	0	69.13183	56.58057
MRP-1910: C-520196	SDH-300-7	Light grey r	0	0	126.045	102.706
MRP-1910: C-520197	SDH-300-8	Black mass	0	0	10.28939	6.888069
MRP-1910: C-520198	SDH-300-9	Grey massi	0	0	150.8039	129.1513
MRP-1910: C-520199	SDH-300-10	Grey massi	0	0	128.6174	99.26199
MRP-1910: C-520200	SDH-300-11	11 Grey to	0	0	91.31833	73.43173
MRP-1910: C-520201	SDH-300-12	12 Light gre	0	0	111.8971	78.59779
MRP-1910: C-520203	SDH-300-13	Grey massi	0	0	3.858521	3.198032
MRP-1910: C-520204	SDH-300-14	Grey muds	0	0	149.1961	116.8512
MRP-1910: C-520205	SDH-300-15	Grey clayst	0	0	163.3441	119.3112
MRP-1910: C-520206	SDH-300-16	Light grey v	0	0	164.6302	132.8413
MRP-1910: C-520207	SDH-300-17	Bended coi	0	0	116.0772	89.05289
MRP-1910: C-520208	SDH-300-18	Black mass	0	0	132.7974	99.877

Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er
0.123	0.603	0.197	0.074	0.26	0.047	0.323	0.0722	0.211
Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er
52.84553	34.99171	16.24365	9.459459	13.92308	15.53191	14.64396	14.26593	15.63981
79.18699	53.73134	25.38071	12.7027	18.15385	17.65957	16.09907	14.95845	15.30806
123.5772	91.87396	46.70051	21.62162	31.84615	30	25.75851	23.2687	22.98578
143.9024	110.7794	70.55838	31.75676	52.30769	46.17021	36.84211	31.44044	31.32701
149.5935	115.0912	69.03553	32.7027	52.69231	44.04255	34.98452	29.77839	29.24171
125.2033	96.0199	57.36041	32.02703	36.92308	26.59574	20.43344	18.42105	17.81991
73.41463	61.69154	38.57868	18.24324	29.26923	24.25532	18.45201	16.06648	16.68246
334.1463	266.9983	121.8274	51.89189	62.69231	43.40426	29.6904	25.06925	23.83886
102.439	80.26534	47.20812	26.21622	36.30769	33.40426	29.50464	26.31579	27.39336
84.55285	67.99337	42.63959	22.2973	31.30769	28.29787	23.62229	22.02216	21.70616
118.6992	96.18574	56.34518	29.05405	39.23077	33.19149	27.39938	24.65374	24.69194
273.1707	237.1476	148.731	77.97297	99.61538	71.2766	46.13003	34.90305	30.66351
160.1626	138.9718	107.1066	68.91892	100.7692	76.17021	53.25077	40.44321	34.69194
102.439	79.93367	43.65482	21.75676	28.38462	23.40426	17.95666	16.20499	16.77725
356.0976	313.4328	200.5076	100	115.3846	80	51.08359	36.84211	31.4218
103.252	106.4677	158.8832	162.1622	319.2308	308.5106	249.8452	189.7507	156.3981
95.93496	74.62687	43.65482	22.7027	31.11538	28.08511	22.87926	20.49861	21.89573
103.252	79.93367	45.68528	22.83784	31.5	26.38298	21.95046	19.52909	20.33175
112.1951	86.733	50.25381	25.94595	31.88462	27.65957	22.16718	18.83657	19.09953
114.6341	87.56219	49.74619	25.27027	32.30769	28.29787	23.0031	19.80609	21.04265
79.5935	63.51575	37.56345	19.45946	28.11538	24.25532	20.24768	18.28255	18.62559
85.36585	66.33499	39.59391	19.72973	28.80769	25.74468	21.39319	19.39058	19.62085
40.56911	31.01161	18.78173	10.54054	16.26923	17.23404	16.06811	14.95845	15.7346
182.9268	111.9403	35.02538	17.16216	22.84615	21.06383	16.78019	15.65097	17.53555
173.9837	120.2322	41.11675	17.83784	23.03846	20.21277	16.40867	15.37396	16.30332
60.89431	44.44444	25.38071	14.86486	21.5	20.6383	18.39009	18.00554	18.00948
78.21138	57.37977	32.48731	16.89189	25.38462	24.46809	21.26935	19.80609	20.80569
85.36585	59.20398	36.04061	24.05405	33.88462	27.23404	21.33127	18.97507	18.48341
61.70732	46.43449	22.84264	14.05405	18.30769	18.51064	16.03715	14.54294	14.78673
103.252	77.28027	39.59391	22.43243	29	26.38298	21.60991	19.11357	19.43128
67.72358	49.25373	27.91878	15.67568	20.23077	20.21277	18.76161	17.31302	17.91469
95.93496	75.12438	46.19289	25	33.61538	28.51064	23.34365	20.36011	19.57346
134.1463	100.1658	48.22335	21.08108	24.34615	21.06383	17.70898	17.59003	17.91469
82.11382	58.37479	30.45685	14.59459	20.73077	20	17.36842	16.759	16.82464
121.9512	84.90879	46.19289	24.05405	34.15385	32.34043	30.55728	29.77839	31.13744
96.74797	69.32007	43.65482	23.64865	38.84615	36.80851	32.19814	28.67036	28.19905
227.6423	177.4461	120.3046	80.81081	100.3846	68.93617	41.48607	29.36288	23.36493
77.39837	58.54063	37.05584	19.18919	28.19231	24.25532	20.65015	18.00554	18.62559
113.8211	85.73798	50.76142	27.43243	32.57692	25.31915	19.72136	17.86704	17.91469
64.30894	46.93201	27.41117	13.64865	20.57692	19.57447	17.18266	16.6205	17.20379
178.8618	133.8308	70.55838	41.48649	49.61538	38.7234	31.26935	27.97784	27.01422
95.93496	60.53068	29.94924	14.86486	21.46154	20.21277	19.59752	18.97507	20.14218
204.878	153.5655	82.2335	45	50.38462	38.7234	27.95666	24.37673	23.74408
99.18699	67.33002	37.05584	20.27027	27.23077	25.31915	23.62229	22.85319	24.50237

96.74797	68.32504	38.07107	22.02703	27.96154	27.87234	26.31579	25.06925	26.30332
78.53659	53.73134	28.4264	13.24324	18.46154	17.44681	15.17028	14.26593	15.35545
165.8537	105.4726	57.36041	35.67568	42.69231	36.80851	29.96904	26.86981	26.87204
104.878	76.78275	42.13198	22.56757	29.84615	26.17021	22.16718	20.22161	20.66351
100.813	72.80265	41.62437	21.35135	28.46154	23.40426	19.13313	17.03601	16.77725
101.626	71.64179	36.54822	15.94595	21.88462	18.51064	15.2322	14.40443	14.2654
76.17886	55.22388	30.96447	14.59459	22.69231	18.93617	16.93498	16.759	17.29858
97.56098	64.84245	34.01015	15.94595	24.46154	21.70213	19.41176	18.00554	18.48341
101.626	72.1393	34.51777	15.67568	21.53846	19.14894	15.85139	15.37396	15.26066
66.74797	46.43449	29.44162	20.81081	27.46154	28.08511	28.35913	27.70083	28.76777
105.6911	76.1194	37.05584	15.94595	20.53846	19.78723	17.21362	16.34349	16.54028
62.76423	43.61526	24.36548	13.37838	18.73077	17.23404	15.82043	14.95845	15.21327
117.0732	82.25539	47.71574	25.40541	32	25.31915	20.43344	17.72853	16.87204
78.86179	56.88226	30.45685	14.45946	21.38462	19.14894	17.02786	15.37396	15.21327
91.05691	65.00829	36.04061	18.37838	24.5	20.42553	17.02786	15.78947	16.16114
241.4634	199.005	113.198	67.02703	76.53846	44.68085	19.6904	12.32687	11.09005
140.6504	85.90381	53.29949	34.32432	40.38462	29.57447	22.94118	19.39058	17.96209
66.58537	47.09784	25.88832	12.83784	19.15385	17.65957	15.63467	15.78947	15.6872
77.07317	54.39469	28.93401	13.10811	18.92308	17.23404	14.48916	12.88089	13.5545
71.70732	50.08292	29.44162	16.62162	23.46154	22.97872	21.95046	21.32964	22.55924
90.2439	71.97347	41.62437	20.13514	27.76923	23.61702	20.6192	18.00554	17.29858
86.99187	63.34992	30.45685	14.72973	22.03846	20.85106	18.11146	16.6205	15.87678
31.38211	17.91045	8.629442	5.540541	10	12.76596	13.90093	15.65097	17.63033
141.4634	98.17579	42.63959	19.45946	27.07692	22.76596	19.16409	17.86704	19.09953
78.13008	57.54561	32.99492	16.08108	23.30769	20	17.4613	15.65097	15.59242
66.34146	48.59038	26.90355	13.91892	19.03846	17.65957	16.43963	15.51247	16.20853
67.31707	52.07297	32.48731	17.7027	23.73077	20.6383	17.58514	16.759	16.11374
82.92683	65.00829	37.05584	18.51351	25.5	22.55319	19.59752	17.45152	17.34597
129.2683	106.136	63.95939	35.94595	41.53846	32.12766	24.4582	21.74515	19.95261
132.5203	99.17081	55.32995	26.62162	36.84615	30.21277	23.74613	20.36011	20.33175
60.1626	42.45439	19.28934	7.702703	12.11538	12.12766	11.36223	11.49584	12.08531
85.36585	61.02819	30.96447	17.97297	23.42308	20.85106	19.28793	18.83657	20.04739
95.93496	61.02819	26.90355	11.35135	20.80769	21.91489	19.78328	17.45152	18.05687
58.37398	43.11774	21.82741	11.08108	15.76923	15.53191	13.31269	12.88089	13.45972
62.43902	40.29851	20.81218	13.78378	19.53846	20.6383	20.09288	18.83657	19.43128
61.05691	41.79104	19.79695	9.72973	14.92308	17.02128	15.69659	14.95845	15.87678
67.15447	52.07297	31.47208	16.48649	23.19231	22.12766	18.69969	17.17452	16.91943
79.10569	62.35489	36.54822	17.97297	24	21.06383	18.57585	16.6205	16.3981
87.80488	65.5058	34.01015	16.21622	22.15385	20.42553	16.13003	15.51247	15.59242
101.626	74.7927	39.59391	19.32432	28.88462	32.12766	29.81424	31.44044	34.69194
106.5041	75.29022	40.60914	20.81081	30.19231	30.85106	28.11146	27.83934	28.81517
108.9431	71.97347	27.91878	8.108108	19.76923	20.85106	18.60681	17.31302	17.96209
71.38211	53.06799	28.93401	16.75676	25.46154	28.08511	27.6161	28.25485	29.24171
56.17886	43.94693	23.35025	12.7027	17.46154	16.59574	13.77709	13.15789	13.69668
91.86992	69.32007	38.07107	20.54054	32.23077	35.74468	33.74613	34.76454	35.97156
87.80488	73.30017	50.25381	24.05405	31.19231	27.23404	22.13622	20.22161	18.86256
95.93496	75.12438	44.16244	23.24324	31.19231	28.08511	21.98142	20.36011	19.90521

86.17886	60.86235	31.9797	16.48649	22.38462	23.61702	19.93808	17.59003	18.15166
74.47154	55.55556	30.96447	15.40541	21.38462	20.42553	17.49226	15.65097	15.6872
82.92683	68.98839	44.16244	24.59459	31.84615	27.44681	19.44272	16.6205	15.21327
84.55285	56.71642	24.36548	11.89189	17.65385	18.29787	15.41796	15.09695	15.59242
86.17886	68.98839	42.13198	22.43243	29.38462	25.31915	19.90712	17.59003	17.25118
158.5366	124.8756	72.08122	37.43243	50.38462	43.61702	37.4613	32.68698	33.6019
114.6341	92.86899	52.79188	28.10811	41.92308	36.80851	31.26935	28.53186	29.52607
97.56098	77.77778	46.70051	23.78378	35.30769	29.14894	23.99381	20.91413	20.99526
89.43089	71.80763	43.65482	21.62162	32.26923	26.80851	22.60062	19.66759	19.2891
107.3171	84.57711	51.77665	24.86486	36.03846	29.78723	25.47988	22.71468	22.60664
107.3171	88.55721	56.34518	29.45946	40.38462	33.82979	26.09907	22.85319	22.46445
97.56098	73.79768	41.11675	20.94595	27.84615	25.31915	20.3096	19.52909	20.04739
107.3171	80.0995	43.65482	21.08108	29.84615	25.74468	21.73375	19.52909	21.13744
161.7886	129.0216	76.14213	42.43243	57.69231	53.61702	46.13003	39.19668	36.87204
71.70732	58.37479	42.13198	29.05405	45.76923	42.76596	33.74613	28.39335	26.72986
156.0976	152.073	145.1777	87.43243	106.9231	83.40426	65.01548	50.55402	45.35545
117.0732	103.6484	82.2335	53.10811	72.69231	69.14894	57.58514	47.22992	43.93365
152.0325	108.2919	80.71066	51.35135	67.69231	41.70213	31.26935	27.83934	30.85308
155.2846	107.6285	82.74112	69.18919	68.46154	41.48936	29.19505	25.62327	27.96209
344.7154	346.6003	284.264	143.2432	125.7692	69.14894	39.93808	30.33241	29.2891
90.2439	69.98342	34.01015	18.51351	23.69231	24.04255	21.67183	20.36011	22.03791
62.43902	46.43449	23.85787	15	20.42308	21.2766	19.13313	17.72853	18.24645
99.18699	78.44113	47.20812	27.02703	34.65385	29.3617	24.27245	20.77562	21.27962
105.6911	83.91376	50.76142	27.97297	36.61538	31.91489	26.06811	22.71468	22.08531
103.252	82.58706	46.70051	25.27027	35.34615	30	24.98452	22.85319	23.22275
112.1951	86.56716	50.76142	28.37838	36.80769	32.76596	26.59443	22.71468	22.93839
95.12195	74.7927	43.65482	24.45946	33.92308	29.3617	23.90093	21.46814	21.56398
111.3821	88.22554	51.26904	28.64865	36.80769	30.21277	25.69659	23.2687	21.89573
112.1951	90.21559	53.80711	27.7027	37.30769	32.76596	25.387	21.88366	22.18009
105.6911	79.93367	40.10152	21.48649	27.42308	24.25532	20.06192	17.31302	17.67773
120.3252	100	60.91371	32.7027	43.46154	37.87234	30.95975	27.14681	26.63507
108.9431	91.37645	58.37563	30.13514	44.61538	37.44681	29.13313	25.34626	24.02844
108.9431	90.7131	57.86802	31.21622	45.38462	36.80851	29.41176	24.65374	24.3128
121.1382	97.18076	59.89848	35.40541	46.53846	35.74468	28.11146	24.37673	23.31754
94.30894	72.63682	42.63959	22.83784	31.96154	25.53191	21.82663	19.39058	19.47867
113.8211	90.54726	52.28426	29.05405	40.38462	33.61702	27.43034	24.23823	24.17062
117.8862	94.36153	55.83756	30.40541	40.76923	34.89362	29.50464	25.76177	25.40284
109.7561	87.39635	50.25381	27.83784	36.07692	30.6383	25.10836	21.88366	21.65877
103.252	80.92869	47.71574	25	36.30769	33.61702	28.20433	25.34626	25.82938
92.68293	70.97844	38.07107	20.13514	27.92308	24.04255	19.8452	17.72853	18.34123
95.93496	73.466	38.57868	19.72973	27.92308	25.10638	20.55728	18.83657	19.33649
92.68293	71.14428	38.07107	19.86486	26	23.40426	20.49536	18.00554	19.2891
97.56098	76.28524	42.13198	19.32432	29.30769	26.59574	23.12693	20.91413	21.51659
89.43089	69.15423	40.10152	20.81081	29.11538	27.23404	23.52941	21.60665	22.93839
92.68293	73.96352	41.62437	22.56757	31.34615	29.78723	26.00619	23.82271	24.78673
114.6341	84.74295	54.31472	29.86486	37.57692	31.48936	26.31579	21.46814	20.33175
91.05691	58.87231	29.94924	15.81081	19.5	20	20.12384	19.39058	21.04265

104.065	78.44113	47.20812	23.64865	28.88462	25.31915	21.33127	17.45152	17.29858
90.2439	67.49585	57.86802	47.2973	96.92308	104.0426	87.6161	68.69806	58.29384
154.4715	121.393	86.80203	46.48649	51.92308	40.85106	32.50774	27.00831	25.87678
191.8699	130.5141	76.14213	42.56757	46.92308	33.61702	26.00619	21.88366	22.32227
178.8618	128.1924	72.08122	31.62162	45	42.97872	37.4613	34.07202	35.11848
91.86992	64.67662	36.04061	17.43243	22.57692	20.21277	17.83282	15.78947	15.87678
98.37398	68.32504	38.57868	17.97297	26.65385	25.10638	22.01238	19.25208	19.05213
89.43089	59.70149	32.48731	17.16216	25.19231	25.10638	23.96285	22.16066	22.8436
99.18699	68.98839	41.11675	20.67568	28.30769	27.23404	26.22291	22.99169	24.21801
99.18699	70.48093	42.63959	20.40541	27.5	25.95745	23.03406	19.80609	20.7109
144.7154	105.141	53.29949	20.94595	26.30769	23.19149	19.90712	17.31302	18.67299
265.8537	185.738	74.61929	27.56757	34.46154	28.29787	22.60062	19.11357	20.90047
150.4065	103.6484	61.92893	28.10811	41.92308	42.97872	39.31889	35.31856	36.54028
129.2683	89.05473	46.70051	21.48649	27.84615	27.87234	25.04644	22.29917	22.03791
110.5691	81.09453	46.70051	20.81081	27.92308	24.25532	20.03096	17.86704	18.34123
76.34146	56.55058	36.04061	18.78378	25.61538	24.04255	22.01238	20.22161	20.66351
60.1626	41.45937	24.36548	13.64865	17.38462	17.44681	16.65635	15.65097	16.4455
109.7561	81.26036	48.73096	23.64865	30.42308	25.74468	21.98142	19.52909	19.71564
98.37398	75.45605	51.26904	25.27027	35.61538	32.34043	27.70898	23.68421	22.70142
173.9837	124.7098	73.60406	33.51351	41.53846	38.7234	30.40248	23.96122	22.55924
130.0813	91.70813	56.34518	27.83784	36.92308	36.59574	31.26935	26.7313	25.82938
144.7154	101.99	67.51269	31.89189	41.92308	37.02128	30.68111	24.79224	23.79147
134.9593	95.85406	61.92893	33.10811	40.76923	36.80851	30.06192	25.76177	25.30806
100	73.96352	47.71574	24.72973	33.61538	29.3617	25.47988	22.02216	22.60664
124.3902	82.58706	40.10152	18.64865	24.61538	22.76596	19.81424	18.28255	19.43128
104.878	71.31012	33.50254	16.35135	21.80769	19.78723	17.64706	16.34349	16.96682
96.74797	67.82753	36.04061	19.32432	23.69231	20.85106	17.86378	15.37396	16.72986
96.74797	67.82753	35.53299	18.10811	22.84615	20.6383	17.24458	15.23546	16.4455
107.3171	82.25539	49.23858	25.27027	31.42308	29.57447	23.77709	20.77562	20.33175
86.99187	64.1791	35.53299	18.64865	24.03846	22.12766	18.85449	16.06648	16.63507
142.2764	113.7645	69.54315	38.78378	46.53846	36.17021	27.36842	23.13019	22.27488
115.4472	93.03483	44.67005	20.81081	23.42308	19.3617	14.73684	13.01939	13.31754
96.74797	71.80763	40.10152	21.21622	25.65385	21.91489	18.54489	16.34349	16.30332
182.1138	152.9022	123.3503	81.21622	91.92308	64.46809	40.86687	29.50139	25.11848
93.49593	68.65672	31.47208	13.10811	20.07692	22.12766	20.24768	17.72853	17.48815
80	55.72139	24.8731	11.75676	16.65385	17.44681	16.03715	15.37396	16.01896
111.3821	83.08458	44.67005	23.10811	26.11538	22.55319	18.45201	16.89751	17.34597
121.9512	91.21061	49.74619	24.05405	31.23077	28.08511	23.74613	22.43767	22.70142
91.05691	67.16418	36.54822	17.83784	24.30769	22.34043	18.32817	16.34349	16.3981
87.80488	65.33997	34.51777	16.21622	21.46154	19.78723	17.02786	14.54294	14.9763
86.17886	60.86235	29.94924	12.43243	16.80769	16.38298	14.4582	13.15789	13.31754
131.7073	101.8242	60.91371	31.62162	42.69231	36.59574	30.03096	25.62327	24.69194
53.08943	34.32836	19.28934	12.16216	18.76923	22.12766	20.06192	18.97507	19.19431
111.3821	81.75788	45.68528	21.21622	28.69231	25.31915	21.73375	19.52909	19.43128
100.813	76.28524	48.73096	25.40541	35	30.6383	24.67492	22.43767	22.18009
92.68293	66.33499	34.51777	17.56757	22.69231	19.14894	15.88235	14.26593	14.45498
90.2439	66.33499	39.08629	18.64865	26.69231	23.82979	20.18576	18.14404	18.72038

117.8862	89.05473	56.34518	29.86486	39.61538	35.74468	28.60681	25.34626	24.69194
74.71545	50.08292	25.38071	12.7027	15.69231	15.95745	15.13932	14.26593	15.92417
99.18699	71.64179	38.57868	17.97297	23.11538	21.70213	18.17337	16.06648	16.30332
86.17886	64.34494	37.56345	19.72973	22.92308	19.3617	14.73684	13.15789	13.31754
100	73.96352	44.16244	25.67568	30.46154	26.59574	21.33127	19.11357	18.15166
75.52846	56.71642	32.99492	17.97297	22.84615	20.42553	16.53251	14.81994	15.26066
51.30081	37.64511	24.36548	13.64865	16.88462	15.10638	13.25077	12.32687	11.94313
169.1057	116.5837	62.94416	35.67568	37.65385	31.06383	23.59133	21.19114	20.28436
95.93496	67.49585	34.51777	16.75676	21.65385	20.6383	17.86378	16.48199	16.96682
125.2033	93.03483	57.36041	30.27027	39.61538	32.12766	25.66563	21.46814	20.61611
125.2033	92.70315	60.40609	39.32432	48.07692	39.14894	30.77399	26.7313	24.88152
105.6911	81.92371	61.92893	42.02703	54.61538	44.89362	33.74613	27.28532	24.36019
140.6504	108.6235	71.5736	40.40541	47.69231	38.93617	29.78328	25.34626	23.83886
129.2683	92.20564	54.31472	28.91892	35.19231	31.91489	28.0805	25.06925	25.0237
125.2033	89.88391	45.17766	21.35135	29.80769	30	25.63467	23.54571	24.07583
104.065	71.31012	36.54822	18.10811	24.80769	26.17021	24.67492	22.71468	23.31754
185.3659	147.5954	117.2589	70.94595	72.69231	47.23404	32.50774	27.56233	26.58768
185.3659	140.2985	88.32487	39.86486	46.15385	32.55319	21.23839	17.45152	16.77725
76.82927	53.39967	28.93401	13.64865	19.76923	18.93617	16.74923	15.37396	16.77725
93.49593	67.49585	39.59391	18.91892	26.84615	24.68085	21.17647	19.25208	20.09479
31.46341	25.87065	22.84264	16.62162	22.11538	19.3617	16.03715	13.71191	12.891
116.2602	86.89884	53.29949	27.83784	34.42308	29.3617	23.28173	19.39058	19.14692
121.1382	89.71808	54.31472	28.91892	37	31.2766	25.10836	21.74515	21.18483
192.6829	143.7811	81.21827	40.67568	53.07692	45.10638	34.98452	31.30194	31.37441
119.5122	89.71808	52.28426	25.27027	34.65385	30.6383	25.97523	23.96122	23.5545
60.81301	46.93201	29.44162	14.18919	20.65385	19.57447	17.6161	17.31302	17.8673
100	77.11443	46.19289	23.10811	31.26923	26.80851	21.42415	19.66759	18.62559
97.56098	77.11443	47.20812	25.81081	34.26923	28.93617	23.28173	21.05263	19.47867
103.252	76.78275	42.63959	21.48649	28.07692	24.89362	22.10526	20.91413	20.23697
116.2602	88.0597	51.26904	25.27027	33.96154	28.29787	23.93189	22.16066	20.7109
113.0081	88.0597	54.82234	28.78378	38.07692	32.12766	25.60372	23.82271	21.65877
233.3333	153.3997	61.42132	24.32432	27.19231	18.08511	11.95046	11.35734	12.03791
117.0732	90.87894	53.29949	27.16216	37.23077	32.12766	25.66563	23.82271	22.18009
116.2602	92.53731	61.92893	33.51351	42.69231	36.59574	29.41176	25.76177	23.31754
77.15447	54.72637	26.90355	12.7027	15.69231	12.97872	10.92879	10.80332	11.4218
113.0081	85.73798	45.17766	21.48649	26.23077	21.91489	17.39938	15.65097	16.20853
122.7642	92.37148	52.79188	26.21622	30.73077	25.95745	21.08359	18.97507	19.33649
113.8211	86.56716	52.28426	27.83784	34.46154	29.57447	23.93189	22.02216	21.23223
113.0081	86.733	52.79188	31.35135	38.26923	34.04255	28.11146	26.7313	25.30806
90.2439	68.32504	40.60914	22.2973	29.03846	25.31915	19.6904	17.59003	16.49289
65.85366	50.58043	33.50254	20.67568	25.80769	23.19149	19.10217	17.17452	16.49289
90.2439	65.33997	37.56345	19.05405	24.96154	21.91489	17.36842	16.48199	15.59242
124.3902	91.37645	54.31472	25.67568	34.88462	31.2766	24.86068	22.85319	21.80095
139.8374	107.2968	63.95939	31.21622	37.92308	31.70213	24.05573	20.77562	19.43128
82.11382	63.51575	39.08629	22.16216	27.73077	23.61702	18.94737	17.59003	16.16114
73.41463	57.21393	41.11675	23.91892	33.34615	28.51064	23.59133	20.36011	19.00474
189.4309	142.7861	93.90863	55.13514	66.15385	45.74468	32.50774	28.67036	26.82464

104.878	70.8126	42.13198	22.2973	28.34615	28.08511	24.9226	23.4072	23.17536
130.0813	93.53234	47.71574	20	26.80769	24.04255	18.73065	17.86704	17.44076
146.3415	108.126	64.97462	36.08108	53.84615	54.68085	52.94118	54.01662	54.9763
91.05691	66.50083	38.07107	20	29.42308	29.78723	28.57585	28.39335	30.18957
78.61789	56.05307	30.96447	15.67568	23.42308	22.76596	20.71207	20.63712	21.4218
111.3821	87.72803	52.28426	24.32432	33.57692	28.7234	23.18885	21.05263	20.94787
123.5772	88.22554	49.74619	24.45946	32.03846	27.87234	23.68421	22.02216	21.70616
93.49593	69.15423	40.60914	20.54054	26.42308	24.25532	20.24768	19.39058	18.00948
121.9512	91.70813	55.32995	28.24324	35.15385	30.42553	23.86997	21.60665	20.75829
127.6423	98.00995	60.40609	30.54054	40	34.25532	27.98762	25.34626	23.69668
109.7561	94.02985	62.43655	30.13514	28.76923	21.48936	17.24458	17.03601	17.109
99.18699	73.96352	36.54822	17.2973	22.57692	21.06383	18.29721	17.72853	18.24645
105.6911	78.10945	45.68528	23.78378	29.03846	25.53191	20.68111	19.25208	18.62559
79.26829	57.71144	32.48731	17.16216	22.65385	19.57447	17.55418	16.48199	16.54028
186.9919	169.1542	103.0457	49.72973	40.38462	22.76596	14.9226	14.81994	15.7346
79.7561	55.05804	22.84264	10.13514	13.5	12.12766	9.93808	9.695291	10.37915
62.03252	46.43449	31.9797	20	24.03846	22.12766	18.0805	16.20499	15.92417
95.93496	68.65672	34.51777	16.62162	23.80769	24.68085	22.0743	21.88366	21.65877
134.9593	99.33665	57.86802	27.97297	30.96154	24.68085	19.41176	18.42105	17.53555
199.187	146.4345	92.8934	58.24324	63.46154	42.97872	30.03096	24.51524	22.46445
179.6748	143.4494	98.47716	48.37838	50.38462	36.59574	27.89474	23.96122	22.1327
66.50407	51.24378	32.99492	20.81081	25.15385	23.61702	21.70279	20.77562	20.94787
73.17073	52.23881	27.91878	14.05405	20.11538	19.14894	17.58514	16.6205	16.82464
88.61789	67.66169	40.10152	18.91892	24.88462	22.12766	18.60681	17.03601	17.109
95.12195	67.66169	37.05584	17.7027	25.34615	24.68085	22.56966	23.13019	23.5545
70.1626	52.07297	28.93401	15.40541	21.5	21.06383	18.42105	18.55956	18.81517
61.30081	45.27363	25.38071	14.18919	18.96154	18.51064	17.05882	16.89751	17.39336
151.2195	116.9154	71.5736	34.59459	43.84615	36.59574	27.86378	24.23823	21.61137
71.21951	51.07794	29.94924	17.02703	21.5	18.93617	16.16099	15.51247	15.92417
81.05691	64.01327	51.26904	29.32432	41.92308	35.10638	27.64706	24.09972	23.22275
95.93496	74.46103	41.62437	19.72973	24.38462	22.12766	18.82353	18.00554	17.91469
93.49593	69.65174	38.07107	18.64865	21.42308	19.3617	16.50155	15.78947	15.7346
100	73.96352	42.13198	19.72973	29	25.53191	22.16718	20.22161	19.47867
121.9512	98.17579	69.54315	38.51351	50.76923	40	30.09288	26.5928	24.64455
130.8943	95.02488	52.28426	26.62162	32.38462	28.7234	24.02477	22.57618	20.75829
177.2358	139.801	64.46701	27.97297	30.38462	26.38298	20.86687	20.91413	20.23697
139.8374	119.2371	92.38579	55.94595	71.15385	60	45.82043	38.50416	33.08057
77.15447	58.87231	31.9797	16.48649	24.30769	22.55319	19.44272	18.69806	17.72512
68.69919	47.76119	25.38071	12.43243	18.07692	18.51064	17.52322	16.89751	17.96209
86.99187	63.18408	38.07107	19.86486	24.46154	21.91489	18.57585	17.31302	17.01422
102.439	83.58209	64.46701	44.72973	65.76923	52.97872	40.24768	35.45706	31.94313
97.56098	69.81758	38.07107	19.72973	22.53846	20	16.84211	16.34349	16.54028
169.9187	145.937	77.15736	30.27027	29.80769	23.40426	17.4613	16.759	16.77725
108.1301	75.45605	36.54822	18.91892	26.38462	25.31915	21.98142	20.63712	20.75829
108.9431	81.75788	51.77665	27.02703	33.5	26.38298	21.30031	18.28255	18.62559
107.3171	83.41625	57.36041	32.02703	42.69231	36.17021	28.60681	25.76177	24.36019
80.4878	63.51575	40.60914	21.62162	30.92308	27.65957	22.16718	20.36011	19.33649

139.8374	101.8242	54.31472	24.05405	27.07692	23.82979	19.5356	18.28255	17.8673
135.7724	102.1559	61.42132	32.7027	32.96154	26.80851	22.01238	21.05263	20.80569
114.6341	84.74295	48.22335	24.86486	30.26923	24.04255	19.16409	17.59003	17.1564
82.11382	56.38474	26.90355	12.2973	15.88462	14.04255	12.41486	12.18837	12.70142
117.8862	95.19071	64.97462	39.45946	56.53846	41.48936	31.26935	26.45429	23.36493
98.37398	67.82753	42.13198	23.51351	32.5	24.25532	21.88854	18.55956	18.48341
80.73171	53.06799	31.9797	19.59459	23.88462	20.42553	20.12384	17.17452	17.91469
117.8862	82.7529	49.23858	25.13514	31.11538	24.89362	23.31269	18.97507	19.05213
129.2683	94.85904	57.86802	28.10811	37.11538	30.42553	28.35913	23.54571	23.12796
110.5691	75.29022	43.65482	21.89189	27.92308	23.19149	22.63158	19.66759	19.85782
108.9431	72.80265	41.11675	18.10811	25.92308	21.91489	21.73375	19.11357	20.09479
113.8211	79.60199	49.23858	26.08108	33.92308	26.17021	23.52941	18.97507	18.00948
93.49593	63.84743	40.10152	21.75676	27.57692	22.76596	21.54799	18.00554	18.10427
131.7073	82.91874	41.62437	19.59459	23.76923	18.29787	17.1517	15.37396	16.87204
175.6098	124.2123	75.1269	39.59459	43.84615	30.42553	26.37771	20.63712	20.75829
84.55285	62.02322	37.05584	16.75676	22.84615	19.57447	20.21672	17.72853	18.76777
71.62602	48.75622	31.47208	16.21622	21.46154	19.78723	21.08359	18.14404	19.33649
130.0813	88.88889	60.40609	35.27027	48.46154	40.6383	38.39009	30.47091	31.04265
245.5285	184.0796	134.0102	67.56757	73.84615	45.31915	38.39009	31.02493	31.23223
185.3659	133.8308	69.54315	28.24324	38.84615	30.21277	27.86378	23.96122	24.9763
111.3821	68.65672	31.9797	16.08108	24.46154	22.12766	22.3839	19.39058	20.61611
275.6098	213.9303	136.5482	64.86486	76.92308	46.38298	37.1517	30.47091	30.61611
390.2439	313.4328	259.3909	135	136.5385	68.51064	49.22601	38.36565	36.77725
102.439	68.65672	43.65482	23.37838	35.34615	29.78723	31.26935	27.28532	27.67773
152.8455	95.85406	45.68528	22.83784	31.46154	25.74468	25.387	21.74515	22.51185
100	67.66169	33.50254	16.21622	26.11538	22.97872	23.74613	21.05263	22.51185
94.30894	67.33002	37.05584	16.75676	24.73077	22.12766	22.97214	19.9446	21.23223
126.8293	87.56219	53.29949	25.81081	36.92308	27.87234	25.94427	21.32964	21.46919
116.2602	81.09453	47.20812	24.18919	35.23077	28.7234	27.08978	23.82271	22.8436
95.12195	63.18408	34.51777	17.43243	24.38462	19.3617	17.80186	15.23546	15.11848
62.35772	46.10282	37.05584	25.67568	37.11538	29.57447	26.56347	20.63712	19.19431
158.5366	112.1061	65.48223	31.75676	34.96154	23.61702	20.99071	16.6205	16.77725
155.2846	109.1211	77.66497	43.64865	56.15385	44.25532	41.17647	30.19391	27.77251
156.5574	117.3333	62.5641	28.43537	35.28958	29.11392	24.78261	20.61281	20.42857
112.2951	83.66667	45.64103	21.08844	26.9112	22.99578	22.29814	19.77716	20.61905
122.1311	88.5	49.74359	22.72109	30.11583	24.89451	22.57764	19.91643	20.52381
109.8361	88.5	48.71795	26.12245	30.03861	23.20675	19.81366	16.99164	16.7619
102.459	86.16667	48.71795	23.40136	30.61776	23.83966	21.92547	18.9415	19.66667
110.6557	85.33333	45.64103	22.44898	28.88031	23.41772	22.36025	22.14485	23.61905
95.90164	75.66667	41.02564	19.45578	26.139	20.04219	18.72671	16.85237	18
150.8197	140.5	115.8974	81.08844	97.2973	59.91561	43.1677	31.19777	28.71429
112.2951	91	49.74359	22.04082	30.07722	25.52743	23.85093	20.89136	21.66667
136.0656	108.1667	60.51282	30.20408	40.92664	33.33333	30.40373	26.04457	27.14286
136.8852	109	60.51282	30.47619	41.69884	34.59916	31.98758	26.04457	26
117.2131	94.66667	57.4359	27.61905	36.33205	28.69198	26.8323	22.84123	22.52381
150.8197	130.5	87.69231	55.64626	58.30116	33.96624	26.64596	21.8663	21.52381
194.2623	136.8333	83.58974	46.2585	54.05405	32.27848	26.77019	22.14485	22.14286

81.63934	58.83333	27.69231	12.10884	16.33205	15.82278	15.52795	12.67409	14.28571
98.36066	74.5	35.38462	15.10204	21.35135	20.25316	19.16149	16.99164	16.52381
106.5574	79.83333	38.97436	18.77551	24.90347	22.1519	21.42857	18.52368	18.14286
119.6721	89.83333	50.76923	26.80272	31.69884	24.89451	22.82609	19.49861	20.95238
130.3279	101.6667	59.48718	30.61224	35.98456	26.37131	22.63975	20.05571	20.80952
192.623	151.1667	67.69231	31.42857	36.60232	28.90295	26.77019	22.9805	24.42857
153.2787	126.8333	71.79487	33.87755	38.37838	28.48101	26.02484	23.11978	24.57143
135.2459	110.6667	68.20513	37.82313	49.42085	37.55274	32.29814	26.4624	26.80952
99.18033	73.16667	39.48718	18.5034	22.97297	19.19831	18.88199	17.54875	18.95238
95.08197	71.83333	37.94872	18.09524	22.58687	19.19831	20.2795	18.10585	19.04762
85.2459	65.5	34.87179	17.41497	24.78764	22.78481	23.01242	20.89136	21.95238
87.70492	68	35.89744	17.41497	25.40541	22.1519	22.32919	21.30919	22
95.90164	74.5	36.92308	19.59184	25.05792	21.30802	21.21118	19.91643	20.28571
99.18033	74	39.48718	20.81633	25.71429	21.94093	20.09317	18.66295	19.33333
126.2295	103.5	61.02564	31.42857	37.52896	29.53586	26.61491	21.8663	22.71429
122.9508	100.8333	57.4359	29.79592	37.49035	28.90295	26.0559	21.72702	22.38095
127.0492	101.8333	58.46154	30.88435	36.94981	28.90295	25.37267	21.30919	21.71429
93.44262	68	32.82051	15.2381	17.14286	12.8692	12.79503	11.69916	12.80952
91.80328	69.16667	35.89744	17.14286	19.96139	15.82278	15.49689	14.48468	15.47619
134.4262	103.5	50.25641	21.90476	18.91892	12.23629	11.58385	10.58496	12
136.0656	103	52.30769	21.76871	20.54054	15.61181	12.95031	11.97772	13.57143
101.6393	77.16667	40.51282	21.36054	31.58301	26.37131	25.71429	24.51253	27
102.459	76.83333	41.53846	19.18367	24.44015	18.98734	17.76398	16.29526	17.52381
74.18033	57.83333	33.84615	17.82313	24.40154	20.04219	19.44099	18.24513	18.95238
73.60656	57	31.79487	16.73469	21.77606	18.98734	18.01242	16.85237	17.57143
64.5082	47	24.61538	11.15646	14.82625	12.44726	13.6646	12.81337	13.57143
69.59016	54.33333	30.25641	15.2381	20	17.08861	16.52174	15.04178	16.28571
70.7377	54.33333	29.74359	15.64626	19.6139	16.24473	15.86957	14.06685	15.38095
103.2787	82	46.15385	23.80952	30.27027	23.20675	22.17391	19.08078	19.52381
100	79.33333	44.61538	23.80952	31.35135	26.79325	23.32298	19.35933	19.90476
136.8852	109.5	63.58974	31.56463	40.54054	32.06751	27.91925	23.5376	24.57143
96.72131	74.66667	39.48718	18.91156	21.62162	17.29958	16.5528	14.48468	15.33333
104.0984	83.66667	48.71795	26.2585	31.27413	25.10549	23.72671	19.63788	20.38095
82.78689	65.83333	37.94872	18.63946	26.21622	21.94093	20.52795	17.8273	18.38095
79.09836	62.5	34.35897	15.37415	18.95753	15.82278	15.34161	13.92758	13.61905
98.36066	84.16667	52.30769	25.57823	26.60232	17.29958	14.78261	12.95265	13.47619
66.96721	52.16667	29.23077	16.32653	21.46718	17.72152	17.1118	14.90251	15.33333
100	78.83333	45.64103	21.90476	28.57143	23.41772	20.99379	18.66295	18.42857
97.54098	75.5	42.5641	22.44898	28.88031	24.2616	21.64596	19.49861	19.52381
77.62295	63	36.41026	18.5034	24.20849	20.25316	19.47205	17.8273	18.2381
92.62295	73	39.48718	21.36054	24.2471	20.67511	19.96894	17.13092	18.42857
142.623	106.5	57.94872	30.34014	31.38996	23.20675	20.40373	17.40947	18.38095
84.42623	63.5	32.30769	18.09524	21.50579	18.98734	18.81988	17.8273	18.85714
79.5082	57.83333	29.23077	14.28571	20.96525	20.46414	19.2236	18.3844	19.47619
63.93443	48	28.20513	13.60544	19.2278	18.35443	18.38509	17.8273	18.57143
100	77.5	49.74359	22.58503	26.9112	23.20675	22.29814	20.19499	21.95238
154.918	122.6667	68.71795	30.61224	35.21236	25.52743	25.40373	21.8663	22.19048

116.3934	97.33333	60	36.32653	46.33205	37.76371	35.40373	32.86908	33.66667
93.44262	74.83333	44.10256	21.36054	28.0695	22.57384	22.26708	19.35933	20.28571
95.90164	76.66667	45.64103	24.89796	32.93436	26.37131	24.28571	21.72702	21.38095
85.2459	69.83333	43.07692	22.31293	30.42471	24.47257	23.13665	19.91643	20.66667
86.06557	69	42.05128	22.17687	29.57529	22.99578	20.99379	18.80223	20
88.52459	70.16667	43.58974	22.58503	30.50193	22.57384	20.59006	18.3844	18.7619
87.70492	70.5	41.53846	21.76871	27.02703	22.36287	19.2236	16.01671	16.33333
61.22951	46.16667	26.15385	11.70068	15.55985	12.44726	12.1118	10.58496	12
81.96721	61	31.79487	17.0068	20.65637	16.03376	15.21739	14.20613	15.04762
90.16393	69	33.84615	16.32653	20.23166	17.51055	16.77019	14.48468	14.95238
120.4918	94.16667	52.82051	27.48299	33.0888	27.63713	23.63354	20.47354	21.14286
121.3115	97.83333	59.48718	29.79592	38.61004	31.4346	26.77019	22.9805	24.2381
45.16393	36.66667	20.51282	10.34014	11.96911	8.860759	8.602484	7.520891	8.285714
100	81.09453	37.05584	15.54054	21.07692	18.93617	19.47368	18.55956	19.90521
206.5041	170.8126	110.1523	54.86486	68.46154	45.31915	33.12693	24.65374	22.79621
85.36585	65.83748	37.05584	16.75676	24.53846	20	18.97833	17.03601	17.67773
51.38211	37.81095	21.3198	12.16216	17.69231	17.02128	16.87307	15.65097	17.109
42.35772	32.33831	18.78173	11.08108	15.38462	13.61702	13.83901	13.71191	15.45024
60.4878	47.09784	26.90355	14.86486	20.38462	18.08511	17.36842	16.48199	18.86256
74.39024	61.5257	42.13198	22.97297	33.11538	25.53191	20.40248	17.17452	16.4455
123.5772	93.20066	40.60914	17.02703	14.42308	9.361702	8.575851	8.587258	10.42654
109.7561	78.7728	38.57868	16.35135	16.46154	11.70213	11.36223	10.52632	12.41706
94.30894	68.49088	30.45685	12.02703	13.96154	11.2766	11.02167	10.94183	12.65403
71.30081	53.56551	29.94924	15	19.53846	17.23404	17.4613	16.20499	16.82464
73.08943	53.89718	27.41117	12.97297	17.61538	15.31915	14.64396	13.98892	14.9763
64.79675	47.26368	23.35025	12.16216	15.80769	14.46809	14.33437	13.71191	13.83886
68.69919	51.57546	26.90355	13.37838	18.38462	15.95745	16.43963	14.54294	15.7346
65.36585	49.91708	30.45685	14.86486	22.84615	18.29787	17.4613	16.06648	17.20379
70.0813	53.06799	28.93401	14.32432	19.76923	17.65957	16.19195	14.95845	15.6872
104.918	84	51.28205	24.21769	29.2278	21.72996	21.02484	17.40947	18.61905
80	59.83333	33.84615	17.41497	25.3668	23.83966	25.80745	23.11978	26.14286
81.39344	65.33333	37.94872	16.59864	26.21622	21.94093	21.70807	19.08078	20.66667
114.7541	81.83333	40	17.0068	27.18147	21.09705	20.71429	18.10585	19.09524
108.1967	85.5	43.07692	17.55102	21.27413	16.66667	15.21739	13.50975	14
53.93443	42.33333	26.15385	13.60544	21.81467	17.93249	17.23602	15.59889	17.42857
65.57377	52	32.30769	15.78231	23.62934	20.67511	19.56522	17.54875	18.80952
54.7541	42.66667	27.17949	13.7415	21.31274	18.14346	17.23602	15.87744	17.28571
77.45902	61.5	35.89744	16.73469	25.79151	21.09705	20.52795	17.96657	18.71429
90.16393	72.5	43.58974	19.45578	23.78378	19.19831	19.56522	16.71309	19.2381
96.72131	78.33333	45.64103	19.86395	22.66409	19.40928	20.24845	18.10585	18.95238
109.8361	89.33333	46.66667	20.81633	27.06564	21.94093	20.21739	19.08078	19.95238
68.77049	52.16667	27.69231	12.78912	18.53282	15.61181	17.1118	15.32033	17.95238
68.93443	55.83333	33.84615	17.82313	21.9305	16.4557	15.68323	12.53482	14.04762
81.96721	69.66667	41.02564	23.26531	31.50579	24.2616	23.47826	19.63788	20.80952
76.72131	59	30.76923	15.78231	18.18533	13.50211	12.70186	10.86351	12.09524
77.95082	59.33333	33.84615	16.59864	19.57529	15.82278	14.65839	12.39554	13.7619
88.52459	68.83333	37.94872	18.5034	22.85714	17.51055	17.26708	14.20613	15.28571

78.36066	60.83333	28.71795	13.46939	16.48649	14.55696	13.72671	13.09192	15.47619
91.80328	70.16667	32.82051	15.5102	19.03475	15.82278	15.93168	14.06685	15.2381
67.45902	55.5	30.76923	16.87075	22.58687	17.72152	17.01863	14.3454	15.66667
50.08197	36.16667	17.94872	9.52381	9.92278	9.07173	9.192547	9.192201	9.857143
81.06557	63.33333	38.46154	17.95918	25.59846	21.30802	20.12422	18.10585	19
72.45902	59.16667	36.92308	20.81633	26.67954	22.36287	20.55901	18.52368	19.04762
94.2623	78.33333	47.17949	23.12925	30.15444	22.99578	21.92547	17.96657	19.80952
96.72131	78.66667	46.15385	24.7619	30.23166	23.83966	22.01863	19.91643	20.2381
67.70492	54.66667	31.79487	16.73469	23.4749	20.67511	22.01863	19.08078	20.95238
59.42623	47.66667	27.17949	13.19728	18.61004	16.4557	16.61491	15.04178	16.61905
62.70492	48.66667	28.20513	14.14966	18.91892	16.87764	16.45963	14.76323	15.95238
67.62295	52.83333	29.23077	14.69388	19.45946	17.08861	16.24224	14.62396	15.52381
72.95082	56.16667	32.30769	14.96599	22.74131	18.98734	19.25466	17.27019	19.04762
97.54098	79.5	45.12821	22.17687	28.72587	23.83966	22.6087	19.49861	21
172.1311	150.8333	83.58974	34.28571	32.97297	22.57384	19.28571	16.57382	17.42857
140.9836	120.1667	67.69231	28.70748	25.28958	18.14346	15.59006	13.64903	14.57143
120.4918	84.5	39.48718	19.59184	23.59073	21.94093	22.04969	19.49861	21.38095
88.52459	67.66667	33.84615	16.73469	19.42085	16.03376	15.03106	12.95265	14.90476
72.04918	56.66667	31.79487	14.96599	19.30502	16.87764	16.18012	13.7883	14.61905
111.4754	85.33333	46.15385	22.44898	28.10811	22.1519	19.96894	17.40947	17.90476
107.377	84	46.15385	22.17687	28.61004	22.57384	20.65217	18.10585	18.85714
120.4918	97.16667	56.41026	28.57143	35.67568	27.42616	25.71429	21.03064	23.19048
46.55738	30.33333	14.87179	8.571429	10.11583	9.07173	9.378882	8.635097	10.2381
88.52459	60.16667	26.66667	12.2449	13.28185	11.18143	9.968944	9.052925	10.42857
92.62295	78.5	50.76923	27.21088	35.17375	27.42616	23.75776	18.80223	18.09524
41.80328	33	18.97436	8.707483	11.9305	10.54852	10.40373	9.470752	11
85.2459	67.16667	39.48718	22.17687	26.10039	20.88608	19.06832	16.57382	15.80952
72.45902	58	34.87179	19.31973	24.09266	19.40928	18.13665	14.76323	15
130.3279	107.8333	60	29.93197	32.85714	27.21519	26.14907	23.11978	25.52381
70.32787	52.5	28.20513	17.14286	21.85328	18.35443	19.09938	16.43454	17.95238
78.68852	63	35.38462	17.27891	25.13514	21.30802	20.83851	18.9415	20.14286
104.918	83.66667	49.23077	25.30612	33.82239	27.00422	25.68323	22.14485	22.28571
113.9344	92	52.82051	27.21088	36.64093	28.69198	26.02484	22.4234	22.66667
84.42623	73.5	46.15385	23.12925	29.45946	20.88608	18.35404	15.04178	15.47619
132.7869	108.8333	65.12821	34.28571	40.92664	29.32489	25.55901	21.58774	22.57143
97.54098	78.5	44.10256	21.90476	26.79537	22.36287	20.49689	17.8273	18.28571
75.2459	57.33333	30.25641	15.37415	20	16.87764	15.62112	13.37047	15.04762
69.91803	54	32.82051	16.32653	20.23166	17.08861	16.49068	14.20613	14.33333
134.4262	109	52.82051	25.17007	26.94981	20.25316	17.36025	15.18106	16.47619
75	56.5	31.79487	15.5102	20.07722	16.24473	15.55901	14.20613	14.80952
69.18033	53	27.17949	12.78912	16.29344	14.13502	14.65839	12.95265	14.19048
40.81967	30.5	15.89744	8.979592	11.08108	10.97046	11.64596	10.86351	13.04762
69.59016	46.16667	22.5641	10.06803	12.66409	11.39241	11.58385	10.86351	12.47619
81.47541	69.66667	48.20513	27.34694	35.83012	27.00422	24.06832	19.63788	18.85714
101.6393	77.5	44.61538	22.44898	29.11197	22.36287	20.43478	16.15599	17.80952
192.623	155.3333	89.74359	41.90476	44.40154	30.80169	26.73913	21.44847	22.28571
82.78689	63.33333	36.92308	19.04762	26.48649	22.99578	23.29193	20.33426	22.04762

75.57377	58	32.30769	17.41497	23.4749	21.30802	21.11801	18.52368	19.80952
99.18033	73.83333	36.41026	17.55102	24.2471	20.88608	20.52795	18.66295	19.85714
127.0492	98	48.71795	22.9932	23.4749	18.5654	18.72671	15.87744	17.7619
101.6393	70.66667	37.94872	19.31973	23.59073	19.62025	20.03106	17.40947	17.85714
84.42623	59.83333	29.23077	14.96599	19.11197	17.72152	17.01863	15.87744	17.14286
91.80328	73.66667	40	21.08844	28.30116	22.57384	22.26708	19.22006	20.14286
88.52459	68	38.46154	18.77551	25.98456	23.41772	23.54037	21.58774	24.42857
65.4918	45.33333	23.07692	12.65306	16.60232	15.82278	16.0559	14.76323	16.85714
112.2951	77.83333	31.28205	14.42177	18.99614	16.66667	17.42236	16.43454	18.14286
98.36066	70.16667	38.46154	18.09524	24.36293	21.09705	21.24224	18.9415	19.85714
90.16393	67.83333	36.92308	18.23129	24.36293	21.09705	19.7205	17.68802	18.95238
97.54098	78.5	41.02564	20	27.91506	22.36287	22.14286	19.77716	20.47619
97.54098	77.33333	43.07692	19.04762	26.06178	22.1519	21.21118	19.08078	20.38095
99.18033	77.83333	41.53846	22.04082	27.64479	21.72996	20.62112	17.40947	18.61905
112.2951	92.83333	53.33333	25.98639	33.93822	26.16034	24.47205	20.75209	21.57143
94.2623	74	45.12821	22.31293	30.96525	24.68354	21.8323	18.52368	19.80952
105.7377	86.5	46.66667	20.68027	28.18533	21.09705	18.22981	14.48468	16.14286
82.78689	66.5	43.07692	24.4898	32.97297	24.05063	22.76398	18.52368	19.14286
277.0492	235	104.1026	49.79592	65.25097	53.79747	48.75776	39.97214	38.57143
83.60656	61.66667	33.84615	16.19048	21.1583	18.5654	17.82609	16.01671	17.2381
60.08197	47.83333	33.84615	19.72789	23.89961	19.40928	18.85093	16.99164	18.57143
104.918	80.83333	46.66667	24.62585	31.46718	25.7384	23.60248	20.19499	21.7619
96.72131	74.33333	42.5641	20.81633	29.07336	24.89451	23.9441	21.16992	21.61905
139.3443	113.8333	68.71795	33.46939	50.57915	39.24051	34.47205	27.99443	27.14286
76.80328	65	40	22.9932	27.95367	22.57384	19.62733	16.99164	17.57143
79.83607	58	31.79487	14.96599	22.08494	19.19831	19.44099	16.99164	18.90476
119.6721	89.5	46.66667	23.12925	33.62934	32.27848	31.67702	29.52646	33.33333
207.377	158.6667	92.82051	61.90476	65.63707	42.40506	35.09317	28.69081	29.2381
127.0492	86.66667	41.02564	21.76871	26.60232	20.88608	19.7205	17.8273	19.14286
84.42623	68.66667	43.58974	24.4898	33.01158	24.47257	21.27329	18.24513	18.14286
99.18033	79.16667	44.10256	25.30612	30.88803	23.20675	20.7764	17.8273	18.28571
63.60656	49.83333	28.20513	15.10204	22.16216	20.04219	19.40994	17.40947	18.28571
92.62295	76.33333	46.66667	27.48299	34.32432	25.31646	23.10559	18.9415	20.19048
71.06557	55.5	31.79487	18.23129	24.2471	19.83122	18.22981	17.27019	17.90476
74.91803	61.33333	37.94872	19.18367	25.59846	19.83122	18.69565	17.13092	17.61905
54.01639	42.66667	25.12821	14.28571	18.22394	15.82278	15.2795	13.64903	15.52381
82.78689	68.33333	41.02564	21.63265	26.87259	21.30802	18.60248	14.3454	14.52381
105.7377	62	14.35897	4.489796	4.169884	4.008439	4.596273	5.849582	8.857143
76.31148	57.16667	29.23077	14.01361	17.25869	14.13502	14.2236	12.53482	14
100	78.16667	46.66667	23.67347	31.31274	27.21519	24.93789	20.75209	22.85714
87.70492	59.66667	35.38462	16.46259	21.50965	19.83122	19.31677	16.01671	18
95.08197	79.5	49.74359	23.80952	32.77992	24.2616	22.91925	19.22006	20.38095
62.54098	46.83333	25.64103	13.06122	19.42085	18.14346	19.19255	17.68802	18.42857
67.37705	50.83333	30.76923	17.68707	25.86873	24.47257	25.55901	23.39833	25.66667
48.52459	36.83333	18.97436	11.15646	15.90734	14.76793	15.46584	13.64903	15.38095
76.88525	56.66667	31.28205	16.32653	24.36293	21.30802	19.96894	17.40947	17.85714
47.13115	33.33333	16.41026	8.027211	10.15444	9.2827	10.18634	9.470752	11.38095

79.91803	60.33333	31.79487	17.41497	22.35521	20.04219	21.11801	18.66295	20.47619
118.8525	86.5	47.17949	24.35374	28.68726	24.05063	24.56522	20.33426	21.61905
179.5082	114.1667	55.38462	26.39456	31.1583	27.42616	25.2795	21.58774	22.85714
131.9672	94.33333	55.89744	29.52381	40.54054	36.28692	36.02484	32.31198	35.09524
104.918	81	42.5641	21.76871	25.94595	19.83122	18.54037	15.73816	17.2381
94.2623	67	34.35897	18.5034	23.62934	21.09705	20.49689	18.3844	20.04762
59.83607	42.33333	23.07692	11.29252	14.36293	12.8692	13.9441	12.39554	13.95238
113.9344	86	50.76923	24.35374	31.31274	24.47257	20.74534	17.8273	18.47619
87.70492	66.16667	35.38462	17.95918	22.35521	18.5654	18.9441	16.85237	17.90476
76.80328	53	25.64103	12.2449	15.71429	13.08017	13.57143	12.95265	14.66667
79.59016	60.33333	31.79487	15.2381	20.3861	18.77637	17.23602	16.29526	17.42857
160.6557	130.1667	72.82051	33.06122	38.61004	33.33333	30.18634	26.04457	27.47619
87.70492	71.16667	54.35897	32.78912	44.78764	35.86498	31.67702	25.48747	26.66667
103.2787	86.33333	65.12821	41.76871	61.38996	45.99156	37.8882	29.24791	27.19048
101.6393	76.33333	42.5641	25.57823	35.48263	30.37975	29.78261	24.51253	25.2381
41.30081	30.5141	15.22843	7.702703	11.42308	10.6383	10.55728	11.08033	11.75355
90.2439	70.97844	37.56345	17.83784	24.96154	21.70213	19.96904	18.55956	18.81517
80.89431	62.68657	32.99492	16.08108	23.30769	21.06383	20.03096	20.22161	20.85308
77.39837	59.03814	31.47208	16.08108	21.15385	18.08511	17.4613	17.03601	16.96682
39.18699	29.35323	19.28934	11.21622	17.11538	17.02128	17.12074	16.48199	17.77251
118.6992	89.3864	49.74619	32.2973	40	40.6383	40.86687	41.27424	43.50711
47.96748	35.98673	25.38071	16.21622	23.11538	20.21277	18.54489	17.86704	18.48341
86.99187	66.00332	34.51777	17.16216	23.34615	20.85106	19.72136	19.66759	20.52133
199.187	118.0763	49.74619	25	25.38462	18.29787	15.10836	13.85042	14.12322
17.23577	14.42786	13.19797	10.13514	16.73077	18.7234	18.69969	18.28255	18.72038
40.1626	22.71973	10.6599	5.945946	9.538462	11.06383	12.5387	13.98892	15.54502
73.49593	55.38972	27.91878	14.59459	20.03846	18.93617	18.54489	17.45152	17.53555
63.73984	49.25373	30.96447	18.91892	26.03846	24.04255	21.54799	19.39058	19.62085
72.60163	61.5257	45.68528	24.32432	36.69231	30.85106	25.5418	22.71468	21.56398
95.12195	76.78275	47.20812	22.16216	33.53846	28.08511	23.83901	22.57618	21.13744
87.80488	81.26036	67.00508	30.67568	41.92308	27.87234	19.65944	15.92798	13.6019
13.00813	10.28192	9.137056	6.216216	13.15385	16.17021	17.05882	16.34349	16.3981
72.84553	52.90216	27.91878	16.21622	19.23077	17.23404	15.32508	14.12742	14.69194
113.8211	82.91874	40.60914	18.64865	27.15385	27.65957	28.45201	28.25485	30.94787
56.58537	42.12272	22.84264	13.37838	21.80769	22.34043	22.60062	22.02216	23.50711
124.3902	104.3118	64.97462	32.02703	42.69231	34.89362	29.59752	25.48476	24.50237
107.3171	86.56716	50.25381	27.43243	36.69231	32.12766	27.55418	23.2687	21.89573
37.96748	28.52405	15.73604	9.72973	12.5	13.19149	12.8483	12.46537	13.69668
42.19512	32.33831	19.79695	13.51351	17.15385	16.59574	16.50155	15.92798	16.54028
52.52033	43.94693	26.90355	14.45946	20.38462	18.08511	16.93498	15.51247	15.54502
64.79675	50.41459	27.41117	15	18.76923	16.17021	15.04644	14.54294	15.07109
62.92683	49.25373	27.41117	19.45946	19.15385	17.44681	16.25387	14.95845	15.6872
96.74797	75.29022	39.59391	18.91892	25.92308	22.55319	21.14551	18.69806	19.00474
99.18699	82.58706	51.77665	22.7027	30.5	24.25532	20.6192	17.72853	17.58294
79.8374	61.19403	35.02538	14.59459	22	20.6383	18.26625	16.89751	17.48815
56.26016	40.96186	21.82741	11.62162	15.23077	15.74468	15.66563	14.81994	16.4455
63.49593	45.10779	23.85787	15.81081	18.19231	17.87234	18.26625	17.17452	19.33649

158.5366	127.529	78.17259	34.18919	48.07692	37.02128	30.49536	26.03878	24.54976
50.73171	38.97181	22.33503	15.27027	17.26923	15.10638	14.30341	13.15789	13.79147
56.58537	44.11277	25.38071	15.40541	17.69231	15.10638	15.01548	14.26593	14.69194
65.20325	49.25373	25.88832	14.05405	17.80769	15.53191	14.98452	14.26593	15.78199
79.26829	63.18408	38.07107	20.81081	27.03846	22.76596	20.18576	18.00554	18.53081
67.47967	54.89221	34.01015	18.24324	24.26923	19.3617	17.27554	15.92798	15.78199
79.26829	64.01327	37.56345	20.54054	26.76923	22.12766	20	17.86704	17.20379
81.30081	66.50083	40.10152	20.81081	26.73077	22.12766	19.65944	17.72853	18.19905
76.74797	62.02322	37.56345	20	26.69231	22.12766	19.22601	17.03601	17.1564
86.99187	70.31509	40.10152	21.62162	29.65385	25.10638	21.02167	18.55956	17.53555
91.86992	72.30514	39.59391	19.45946	25.92308	20.21277	18.97833	17.31302	18.15166
104.878	83.08458	46.70051	22.97297	30.30769	25.53191	22.32198	19.66759	20
113.8211	92.53731	52.79188	27.43243	36.19231	28.08511	24.42724	21.60665	21.61137
106.5041	87.06468	48.73096	25.94595	32.92308	27.02128	24.36533	20.91413	21.46919
112.1951	92.0398	54.82234	29.45946	38.84615	30.85106	26.62539	23.4072	22.74882
91.05691	73.466	42.13198	25	30.07692	25.53191	23.37461	20.49861	20.85308
86.17886	69.65174	40.10152	20.94595	27.5	23.82979	22.04334	19.39058	19.76303
87.80488	67.99337	37.05584	18.51351	26.80769	25.31915	23.0031	19.66759	19.76303
318.6992	223.8806	84.26396	47.56757	48.46154	26.80851	20.06192	16.20499	16.35071
73.17073	57.87728	31.47208	15.40541	21.42308	17.02128	15.32508	13.57341	13.93365
85.36585	68.82255	43.14721	24.86486	31.03846	24.89362	21.02167	18.55956	18.34123
86.17886	66.99834	38.07107	19.18919	26.15385	22.55319	20.21672	17.72853	18.76777
76.34146	61.35987	38.07107	19.86486	26	23.19149	20.99071	19.11357	18.76777
104.065	74.7927	35.53299	15.54054	22	18.29787	16.43963	14.81994	16.11374
152.8455	122.8856	73.09645	39.05405	44.23077	31.06383	24.70588	20.63712	20.61611
136.5854	112.9353	71.06599	41.48649	44.61538	32.12766	26.22291	21.88366	21.23223
106.5041	89.3864	61.92893	36.35135	41.15385	30.21277	24.613	19.80609	19.2891
114.6341	93.03483	58.37563	34.05405	40	29.57447	24.52012	20.22161	18.86256
96.74797	72.63682	41.11675	19.45946	22.03846	17.87234	17.49226	15.78947	17.39336
81.13821	58.54063	26.39594	10.27027	16.19231	14.46809	14.39628	14.12742	15.49763
82.11382	61.19403	29.94924	11.89189	18.30769	15.74468	15.51084	14.68144	16.16114
69.26829	51.74129	28.4264	14.32432	19.76923	16.80851	16.34675	15.09695	15.7346
74.47154	56.71642	30.45685	16.08108	21.84615	18.29787	17.95666	16.34349	17.53555
75.44715	57.54561	32.48731	14.18919	20.03846	17.23404	16.68731	15.37396	16.96682
76.58537	58.37479	31.9797	14.86486	21.38462	19.14894	18.17337	17.31302	18.10427
89.43089	70.14925	37.05584	16.62162	21.84615	18.51064	17.6161	16.20499	17.53555
87.80488	68.98839	40.10152	20.94595	28.07692	22.97872	21.20743	18.83657	19.90521
88.61789	70.48093	41.11675	21.62162	29.61538	24.68085	23.40557	20.77562	21.4218
96.74797	76.45108	43.65482	22.7027	32.38462	26.59574	24.67492	21.46814	22.1327
91.86992	72.96849	40.60914	20.54054	28	23.40426	20.24768	18.83657	19.57346
86.17886	66.33499	37.56345	18.91892	25.88462	20.85106	19.93808	18.14404	18.29384
96.74797	74.29519	39.59391	18.37838	25.11538	20.85106	19.04025	16.89751	17.77251
86.99187	65.00829	34.51777	16.75676	21.46154	18.08511	17.3065	15.51247	16.77725
83.73984	62.68657	32.99492	16.08108	20.73077	17.02128	16.65635	15.09695	16.11374
81.30081	59.70149	29.44162	14.45946	19.07692	15.95745	15.88235	14.26593	15.16588
78.29268	61.69154	33.50254	16.89189	20.65385	23.19149	16.13003	14.95845	16.25592
80.2439	61.69154	35.02538	18.64865	25.61538	20.85106	19.19505	17.17452	17.39336

88.61789	70.8126	41.11675	21.62162	29.11538	23.40426	21.33127	21.19114	18.19905
87.80488	70.14925	41.11675	22.02703	29.03846	22.97872	21.20743	19.52909	19.76303
93.49593	75.12438	45.68528	24.45946	32.57692	25.31915	23.09598	20.77562	20.66351
96.74797	78.10945	45.68528	23.64865	33.73077	27.44681	23.65325	21.05263	21.37441
101.626	80.43118	47.20812	23.37838	33.34615	26.80851	22.10526	19.11357	19.05213
77.88618	62.18905	35.53299	19.18919	25.96154	20.6383	18.85449	16.89751	16.87204
78.94309	61.69154	30.96447	16.62162	25.03846	22.76596	20.71207	19.11357	20.09479
61.62602	47.59536	26.39594	16.35135	19.65385	17.23404	16.09907	15.09695	15.59242
72.84553	54.56053	29.94924	16.08108	21.96154	19.57447	18.20433	16.48199	17.81991
95.93496	69.81758	31.9797	16.62162	19.34615	15.31915	14.73684	13.4349	14.88152
82.11382	60.69652	34.51777	17.43243	21.42308	20	18.42105	16.759	18.38863
96.74797	71.64179	39.08629	19.86486	22.65385	17.23404	16.03715	14.40443	15.35545
82.11382	62.18905	32.48731	17.7027	22.65385	18.7234	16.78019	15.92798	16.91943
91.05691	67.82753	35.53299	18.37838	23.88462	20.42553	18.69969	17.31302	18.72038
104.878	80.43118	46.19289	23.37838	32.11538	26.80851	24.73684	23.2687	24.40758
90.2439	71.80763	44.16244	26.35135	34.61538	28.93617	26.40867	23.4072	23.88626
90.2439	70.8126	45.17766	22.2973	31.84615	24.89362	22.66254	19.80609	21.4218
92.68293	73.96352	44.16244	23.64865	32.15385	25.53191	22.47678	20.49861	21.27962
88.61789	70.64677	43.14721	23.24324	33.46154	27.23404	24.55108	22.43767	22.8436
101.626	82.58706	53.29949	29.05405	41.92308	34.04255	29.47368	27.00831	27.8673
88.61789	72.96849	45.17766	25.13514	36.34615	30	27.64706	25.06925	26.01896
90.2439	71.47595	45.68528	24.45946	35.88462	31.2766	26.68731	23.54571	25.6872
86.17886	68.49088	40.60914	20.94595	31.65385	25.10638	23.65325	21.32964	22.18009
91.86992	72.96849	41.62437	22.16216	31.73077	28.08511	24.98452	23.4072	22.891
80.97561	64.01327	36.04061	16.75676	25.76923	23.19149	20.24768	18.83657	18.62559
89.43089	69.81758	41.11675	19.45946	28.42308	24.04255	22.97214	20.49861	20.66351
175.6098	136.6501	70.55838	49.72973	33.73077	24.46809	19.8452	17.86704	17.53555
95.12195	72.63682	39.59391	24.05405	24.61538	27.23404	18.01858	16.48199	16.82464
84.55285	63.84743	32.99492	17.16216	19.73077	22.97872	15.20124	13.98892	14.50237
92.68293	70.97844	36.04061	20.67568	23.84615	20	17.24458	16.06648	16.06635
95.93496	72.96849	36.04061	16.62162	20.38462	16.59574	15.13932	14.40443	14.54976
102.439	75.95357	34.51777	17.16216	22.15385	18.7234	16.9969	16.06648	16.49289
172.3577	141.1277	85.7868	40.27027	51.15385	41.2766	34.36533	29.50139	27.63033
115.4472	91.70813	51.26904	22.7027	31.76923	26.38298	22.75542	21.05263	20.47393
94.30894	73.30017	40.60914	20.67568	26.88462	23.40426	21.20743	20.36011	20
80.89431	62.68657	34.51777	17.02703	23.38462	20.85106	19.07121	17.86704	18.38863
70.73171	54.56053	28.4264	15.54054	20.42308	18.93617	17.9257	17.17452	17.72512
65.44715	49.75124	26.90355	13.51351	20.76923	19.57447	18.73065	18.83657	18.90995
92.62295	70.33333	37.4359	17.68707	23.24324	19.62025	19.03727	15.87744	17.52381
95.08197	70.16667	39.48718	21.76871	24.82625	20.67511	18.35404	15.32033	16.14286
100	76.66667	41.02564	24.35374	28.68726	24.05063	21.36646	17.54875	19.09524
111.4754	86.5	50.76923	29.11565	34.44015	27.21519	23.9441	19.08078	20.52381
67.78689	54.16667	33.84615	19.45578	23.20463	19.40928	17.32919	15.87744	16.38095
111.4754	86.5	50.25641	28.16327	32.39382	25.10549	22.73292	18.80223	19.85714
84.42623	63	34.87179	18.63946	22.81853	20.46414	20.7764	17.8273	19.47619
63.93443	48.16667	28.20513	13.06122	18.14672	16.24473	15.12422	13.92758	15.19048
95.90164	73.83333	43.07692	22.04082	29.88417	24.47257	21.73913	18.3844	18.28571

103.2787	81.33333	48.20513	25.30612	32.74131	25.7384	23.22981	19.91643	20.85714
82.78689	62.5	33.84615	17.82313	24.44015	19.40928	19.13043	17.27019	17.66667
75.2459	56.5	32.30769	15.91837	22.62548	18.35443	17.42236	15.87744	17.2381
76.31148	58.66667	32.82051	16.46259	22.97297	19.62025	19.31677	16.85237	18.71429
92.62295	67.5	33.84615	17.41497	19.34363	14.9789	13.6646	10.58496	11.66667
130.3279	99.16667	57.94872	26.2585	37.6834	29.11392	24.65839	19.91643	20.52381
86.06557	66	37.4359	16.87075	23.82239	20.67511	18.6646	16.15599	18.71429
87.70492	66.33333	35.38462	17.68707	24.09266	20.04219	18.97516	16.43454	18.42857
133.6066	109	67.17949	34.01361	44.01544	34.59916	30.55901	23.95543	25
103.2787	80.33333	47.17949	24.35374	31.27413	26.16034	23.01242	20.19499	22.2381
108.1967	85	52.82051	26.93878	33.32046	25.52743	22.51553	18.10585	18.61905
90.16393	70.16667	38.97436	20.81633	25.90734	21.30802	19.81366	16.85237	17.61905
96.72131	74.83333	41.53846	23.40136	26.37066	20.04219	16.92547	14.06685	14.80952
91.80328	69.66667	36.41026	21.4966	25.13514	17.51055	15.86957	12.95265	13.33333
92.62295	69.5	40	22.31293	28.03089	22.57384	21.45963	18.52368	18.90476
93.44262	71.16667	38.97436	21.08844	24.6332	20.46414	19.84472	16.01671	16.57143
80.98361	59.16667	33.33333	17.14286	19.45946	16.66667	16.98758	13.92758	15.09524
43.03279	30.16667	13.84615	7.891156	9.227799	10.54852	11.61491	10.58496	12.42857
218.8525	171.6667	82.5641	37.68707	34.78764	27.63713	26.3354	23.39833	25.04762
456.5574	260	117.4359	75.64626	77.60618	37.97468	25.31056	18.3844	18.09524
141.8033	100.5	50.25641	28.43537	31.81467	24.89451	22.01863	18.10585	18.09524
88.52459	65.83333	36.92308	18.77551	22.7027	18.14346	16.73913	13.64903	15.14286
104.0984	79	43.07692	23.94558	26.94981	19.83122	17.91925	14.62396	16.2381
100.8197	79.16667	48.20513	27.34694	33.78378	27.00422	23.69565	20.75209	21
85.2459	68.5	41.53846	21.90476	28.68726	23.83966	20.96273	17.40947	18.19048
136.0656	110.8333	67.69231	37.14286	46.71815	34.59916	28.63354	22.14485	21.04762
129.5082	103.6667	64.10256	36.59864	42.08494	31.22363	26.77019	20.19499	21.42857
127.8689	103	64.61538	34.28571	42.08494	31.64557	26.52174	20.33426	20.95238
140.1639	115.1667	72.30769	40	48.64865	35.23207	29.00621	22.9805	23
136.8852	114.5	75.89744	40.40816	48.64865	36.28692	31.0559	25.76602	26.33333
114.7541	81.83333	38.97436	19.31973	23.39768	19.83122	18.60248	15.18106	17.42857
93.44262	70.16667	40.51282	20.27211	25.01931	22.36287	20.71429	17.27019	18.2381
101.6393	78.5	45.12821	24.4898	30.57915	26.16034	22.95031	19.77716	20.66667
120.4918	95.66667	60.51282	30.34014	39.38224	32.27848	30.93168	26.4624	26.90476
78.68852	59.66667	32.30769	14.28571	22.77992	19.40928	18.9441	16.57382	18.14286
67.86885	50	27.69231	13.19728	15.40541	12.65823	12.17391	11.00279	12.47619
222.9508	168.3333	63.58974	23.40136	20.84942	19.19831	21.08696	21.30919	25.33333
97.54098	58.83333	27.17949	12.92517	16.56371	16.87764	18.19876	16.71309	20.28571
74.83607	50.83333	27.17949	14.82993	19.72973	20.04219	21.39752	20.47354	23.71429
85.2459	69	44.61538	22.72109	32.85714	24.89451	23.4472	20.75209	20.71429
58.77049	46	27.17949	14.82993	18.80309	13.92405	12.20497	10.58496	10.90476
75	56.16667	31.28205	16.32653	20.07722	16.4557	15.86957	13.92758	15.2381
73.85246	57.66667	32.30769	17.14286	22.93436	17.51055	16.11801	14.48468	14.71429
77.78689	59.83333	32.30769	16.87075	21.62162	16.24473	16.27329	14.06685	15.2381
64.91803	46.66667	25.64103	13.60544	18.95753	17.72152	17.57764	16.85237	17.42857
69.09836	50.66667	27.69231	13.19728	19.45946	16.66667	16.3354	15.04178	16.33333
126.2295	102.3333	70.25641	38.77551	47.87645	37.55274	32.6087	27.99443	26.09524

75	56.33333	29.23077	15.10204	21.5444	18.77637	18.1677	16.01671	16.90476
175.4098	152	94.87179	49.79592	59.84556	39.45148	33.85093	27.43733	26.57143
85.2459	66.33333	37.94872	20.13605	27.41313	20.46414	18.32298	16.57382	16.95238
97.54098	77	47.17949	24.35374	30.84942	22.1519	20.62112	18.24513	18.52381
107.377	87.66667	52.82051	27.61905	34.36293	25.31646	22.63975	18.9415	19.57143
103.2787	83.83333	48.71795	25.57823	34.59459	25.94937	22.85714	20.19499	20.47619
79.42623	60.83333	36.92308	20.27211	26.25483	21.30802	19.7205	17.8273	18.42857
86.06557	67.5	40.51282	21.90476	31.69884	21.72996	19.87578	17.13092	18.33333
53.11475	38.16667	22.5641	11.29252	17.45174	14.34599	14.47205	12.81337	13.38095
68.85246	53.16667	30.25641	14.69388	21.08108	16.87764	15.83851	14.20613	15.7619
66.96721	51.66667	30.25641	14.42177	21.46718	16.87764	16.5528	14.76323	15.2381
75.32787	58.5	35.38462	17.95918	25.90734	20.46414	20	17.8273	19.66667
103.2787	78	47.69231	22.04082	31.96911	24.2616	22.32919	19.35933	19.47619
147.541	116	70.76923	34.14966	49.03475	33.96624	30.2795	25.34819	25.57143
113.1148	83.83333	43.58974	19.59184	28.95753	23.20675	23.75776	20.89136	21.57143
56.63934	40.66667	22.05128	10.34014	13.24324	10.54852	10.74534	10.44568	11.42857
65.7377	48.5	24.61538	12.2449	17.64479	15.18987	14.62733	14.06685	15.47619
73.52459	53.83333	26.15385	14.01361	17.91506	14.34599	14.03727	13.37047	15.04762
71.72131	52	25.64103	11.97279	17.37452	13.29114	13.57143	12.39554	13.61905
85.2459	63.5	38.46154	18.77551	28.37838	23.83966	23.35404	22.14485	24.19048
72.86885	53.83333	31.28205	14.69388	23.43629	18.98734	19.78261	18.52368	19.52381
69.7541	54.5	33.33333	14.01361	23.0888	18.35443	18.01242	16.15599	18.09524
134.4262	104	64.10256	32.2449	40.15444	28.05907	25.06211	21.58774	21.61905
75.81967	58.33333	30.76923	16.05442	20.84942	16.4557	16.42857	15.04178	15.7619
72.54098	56.33333	34.35897	20.27211	27.06564	22.99578	21.52174	19.77716	20.52381
75.4918	56.66667	30.76923	15.2381	20.92664	15.82278	15.46584	14.06685	15.09524
69.42623	52.66667	32.30769	17.27891	25.71429	21.30802	21.98758	19.77716	20.42857
93.44262	68	35.38462	17.68707	24.2471	20.46414	21.39752	19.49861	20.42857
74.59016	57.33333	37.94872	19.86395	26.60232	21.09705	18.88199	17.68802	17.7619
66.47541	49.16667	29.74359	15.37415	21.04247	16.87764	17.91925	16.99164	18.04762
57.54098	40.83333	23.07692	13.06122	17.33591	14.55696	15.43478	13.64903	14.61905
81.96721	64	35.89744	19.45578	25.90734	18.77637	18.91304	16.99164	17
60.2459	45.16667	22.5641	14.96599	19.34363	16.24473	16.80124	16.01671	16
57.21311	43.83333	24.61538	13.7415	17.06564	15.40084	15.59006	13.92758	15
62.04918	50.16667	28.20513	16.05442	21.23552	16.4557	15.59006	14.20613	14.90476
69.5082	55	36.41026	19.04762	23.82239	17.72152	17.36025	15.73816	16.2381
77.78689	60.33333	36.92308	20.13605	26.40927	20.88608	19.53416	16.99164	17.90476
46.63934	35.83333	20	12.10884	17.95367	16.03376	17.14286	16.43454	17.95238
46.39344	34.66667	21.53846	11.42857	16.75676	12.8692	14.19255	12.81337	13.66667
53.60656	41.83333	23.07692	12.78912	16.75676	14.55696	14.56522	13.92758	13.95238
189.3443	150.6667	89.74359	49.52381	61.77606	39.66245	33.22981	25.76602	24.66667
132.7869	105.6667	62.05128	33.46939	40.15444	28.05907	24.84472	20.75209	20.90476
100.8197	79.66667	47.17949	25.44218	33.861	24.2616	21.70807	19.91643	20.57143
91.80328	71	41.02564	22.31293	27.18147	19.83122	18.97516	16.99164	16.95238
66.96721	52.33333	32.30769	16.87075	22.66409	18.35443	17.91925	16.43454	17
51.96721	38.5	21.02564	11.56463	17.91506	16.03376	16.5528	15.45961	15.71429
107.377	85.83333	49.23077	24.89796	30.46332	21.30802	18.75776	15.59889	15.38095

55.4918	40.66667	22.05128	12.51701	19.72973	15.18987	15.24845	14.3454	15.52381
45.4918	36.16667	24.61538	12.10884	19.38224	16.4557	17.3913	15.73816	16.28571
54.7541	40.83333	25.64103	13.33333	18.4556	14.55696	12.54658	11.97772	12.7619
88.52459	69.16667	41.53846	22.31293	30.54054	22.99578	21.49068	18.10585	19.42857
82.78689	65.5	41.53846	20	29.72973	23.83966	21.80124	19.91643	20.19048
70.90164	52.66667	30.25641	15.5102	23.12741	18.77637	18.32298	17.13092	18
67.86885	52.33333	32.30769	16.87075	25.05792	18.35443	19.2236	16.57382	16.80952
70.08197	52.33333	30.25641	15.5102	20.50193	16.66667	16.21118	14.90251	14.85714
103.2787	80.33333	48.20513	26.66667	36.17761	27.63713	25.03106	22.28412	22.95238
82.78689	67.16667	38.46154	19.72789	28.14672	22.36287	21.30435	18.9415	19.85714
63.93443	48.33333	28.20513	13.19728	22.43243	17.72152	19.03727	17.54875	19.90476
70.90164	56	32.82051	15.64626	21.66023	18.14346	17.32919	15.73816	17.33333
89.34426	68.66667	35.89744	18.23129	21.96911	17.08861	16.73913	15.18106	16.19048
88.52459	68.16667	35.89744	18.09524	22.43243	17.51055	16.27329	15.32033	16.42857
94.2623	70.66667	36.92308	17.95918	19.2278	13.92405	12.14286	10.16713	11.19048
71.47541	52.33333	27.17949	12.65306	14.59459	11.60338	11.18012	9.888579	11.2381
62.21311	48.66667	26.66667	14.69388	16.5251	14.55696	13.4472	12.53482	14.57143
122.9508	105.6667	68.71795	36.87075	48.26255	35.65401	31.67702	25.34819	23.95238
69.7541	54.16667	28.20513	13.87755	17.49035	13.92405	13.32298	11.83844	14.28571
81.96721	65.16667	37.4359	17.55102	22.62548	17.72152	16.73913	14.20613	15.80952
75	58.16667	31.79487	14.82993	22.58687	18.77637	19.06832	16.15599	17.52381
74.59016	59.5	32.82051	14.96599	21.1583	18.35443	17.67081	15.18106	16.42857
66.96721	50	27.17949	13.60544	20.07722	16.87764	16.98758	14.76323	15.7619
7.235772	5.804312	3.553299	2.162162	2.653846	2.553191	2.074303	2.077562	2.085308
22.84553	21.06136	19.79695	12.7027	18.38462	13.40426	9.411765	7.202216	5.63981
100	76.94859	47.71574	25.81081	34.57692	29.78723	23.68421	21.46814	21.37441
94.30894	74.62687	46.70051	24.32432	33.88462	27.44681	22.2291	19.80609	19.76303
86.17886	68.32504	44.16244	25.13514	36.19231	30.42553	23.43653	20.63712	19.52607
41.86992	33.00166	20.30457	10.94595	11.61538	7.446809	5.108359	4.432133	4.218009
91.05691	66.66667	39.08629	21.62162	30.88462	27.87234	23.71517	21.46814	20.61611
107.3171	82.25539	51.77665	27.56757	36.65385	31.91489	26.62539	23.96122	23.83886
102.439	78.44113	45.68528	24.05405	30.53846	25.10638	20.49536	18.14404	17.63033
45.04065	37.1476	18.27411	9.324324	11.38462	7.87234	5.294118	4.432133	3.838863
108.9431	78.93864	45.17766	23.78378	32.07692	29.78723	25.69659	22.85319	23.27014
108.9431	81.75788	49.74619	26.08108	35.84615	30.85106	24.42724	23.13019	21.99052
70.4065	52.90216	32.48731	17.56757	24.92308	23.19149	19.22601	18.14404	17.109
88.61789	63.68159	35.53299	19.86486	25.26923	23.40426	19.04025	16.759	16.91943
76.26016	57.21393	35.02538	18.64865	26.5	23.19149	19.10217	17.31302	16.72986
78.29268	59.36982	34.01015	18.51351	23.96154	20	16.16099	14.81994	14.83412
4.390244	3.150912	2.030457	1.216216	1.692308	1.914894	1.609907	1.523546	1.516588
108.9431	81.92371	47.71574	27.2973	32.69231	26.59574	23.46749	17.72853	17.1564
517.0732	402.9851	241.6244	134.3243	158.0769	106.5957	63.15789	44.45983	37.91469
80	54.72637	32.99492	18.10811	22.92308	20.42553	15.66563	13.57341	13.83886
142.2764	101.8242	47.20812	23.91892	27.84615	22.97872	17.49226	15.92798	16.54028
77.07317	59.03814	36.54822	20.54054	26.15385	21.70213	18.04954	16.34349	15.92417
8.373984	5.804312	3.553299	2.297297	2.807692	2.553191	2.260062	2.216066	2.180095
47.15447	32.00663	15.73604	9.189189	12.65385	13.82979	12.87926	13.2964	13.88626

314.6341	237.1476	141.1168	71.35135	77.69231	54.25532	32.50774	24.09972	21.46919
88.61789	63.68159	34.51777	19.45946	24.38462	19.14894	15.60372	13.71191	13.45972
83.73984	61.5257	30.96447	15.81081	19.26923	18.08511	15.17028	14.26593	14.9763
4.796748	3.9801	3.045685	2.162162	2.730769	2.340426	2.291022	1.939058	1.943128
75.12195	58.37479	36.54822	19.32432	25.34615	21.48936	16.00619	14.12742	13.69668
2.601626	2.155887	2.030457	1.486486	1.923077	2.12766	2.167183	2.216066	2.369668
59.5935	42.95191	23.85787	12.7027	17.92308	17.23404	15.69659	14.81994	15.63981
130.0813	97.67828	60.91371	31.89189	40.76923	32.12766	22.66254	19.9446	18.15166
104.878	101.99	96.95431	59.05405	76.92308	58.29787	39.31889	29.36288	23.69668
13.17073	9.452736	5.583756	3.378378	12.07692	4.468085	4.117647	3.878116	3.696682
69.34959	53.06799	35.02538	19.72973	25.65385	22.34043	18.01858	16.20499	16.68246
32.84553	22.5539	12.18274	6.486486	7.346154	5.744681	4.674923	4.293629	4.691943
5.447154	4.145937	3.045685	2.297297	2.884615	3.617021	3.498452	3.462604	3.554502
41.78862	30.5141	17.25888	9.054054	13.42308	12.76596	11.57895	10.94183	12.46445
68.86179	52.23881	32.99492	19.18919	25.73077	22.76596	19.56656	18.97507	17.25118
68.04878	50.74627	29.44162	15.27027	20.34615	18.51064	15.78947	14.68144	14.54976
65.60976	50.74627	30.96447	17.2973	21.61538	18.7234	14.82972	13.57341	13.36493
97.56098	74.29519	46.19289	19.86486	32.92308	31.06383	25.2322	23.68421	22.93839
71.78862	49.41957	26.90355	16.35135	23	21.06383	17.7709	16.48199	16.58768
6.504065	5.804312	5.583756	3.648649	5	4.680851	3.931889	3.739612	3.412322
88.61789	66.00332	37.05584	17.97297	24.11538	20.6383	17.6161	16.06648	16.11374
93.49593	68.82255	37.56345	17.2973	23.07692	19.57447	16.40867	15.51247	15.87678
83.73984	62.8524	37.56345	18.64865	25.23077	21.91489	17.67802	16.48199	16.63507
69.34959	50.74627	27.41117	16.62162	20.15385	17.02128	14.79876	14.26593	15.45024
113.0081	77.94362	43.65482	23.91892	32.34615	26.59574	20.40248	17.72853	17.72512
97.56098	77.4461	48.22335	28.91892	37.19231	28.93617	22.87926	21.05263	20.33175
10.3252	7.794362	4.568528	3.513514	3.461538	3.191489	2.414861	2.216066	2.085308
44.14634	33.66501	22.33503	12.83784	18.26923	20	22.41486	18.14404	19.2891
5.691057	4.311774	3.045685	2.297297	2.615385	2.765957	2.817337	2.908587	2.890995
83.73984	63.84743	38.07107	22.2973	26.26923	21.70213	17.05882	15.23546	15.35545
203.252	161.194	96.4467	48.37838	56.92308	41.06383	27.55418	21.46814	19.81043
175.6098	146.4345	95.93909	48.37838	55.38462	39.14894	25.387	20.22161	19.2891
23.08943	20.39801	17.25888	11.08108	12.61538	8.93617	7.306502	6.925208	6.540284
95.12195	72.30514	43.14721	23.51351	29.38462	24.04255	18.63777	16.20499	15.82938
17.96748	13.267	8.121827	5.135135	5.423077	4.893617	4.365325	4.155125	4.075829
78.86179	59.36982	35.02538	18.10811	22.80769	19.3617	15.88235	14.68144	14.9763
79.7561	62.02322	36.04061	20.81081	26.92308	22.55319	18.69969	17.03601	16.58768
43.82114	35.98673	23.85787	13.37838	15.03846	12.34043	10.21672	9.279778	9.2891
9.918699	7.296849	4.568528	3.243243	3.807692	4.255319	4.148607	4.293629	4.454976
72.84553	56.55058	35.02538	19.45946	25.34615	21.06383	17.43034	15.65097	15.63981
26.58537	22.88557	17.25888	9.864865	14.65385	12.12766	9.164087	8.587258	8.009479
115.4472	86.23549	50.25381	26.21622	32.38462	24.68085	21.64087	19.39058	19.14692
119.5122	88.22554	48.73096	25.94595	32.34615	24.89362	20.58824	18.55956	17.67773
121.9512	92.20564	51.26904	27.2973	33.30769	26.59574	23.71517	20.49861	19.71564
109.7561	84.0796	48.73096	25.27027	36.26923	29.14894	26.65635	24.51524	23.5545
77.88618	55.22388	29.94924	15.13514	22.69231	18.93617	17.70898	17.45152	17.81991
82.11382	59.36982	31.9797	17.02703	23.03846	20	18.57585	17.45152	17.91469

143.0894	112.272	64.46701	37.02703	46.53846	32.97872	27.95666	25.76177	23.83886
126.8293	98.6733	56.34518	29.05405	37.65385	27.65957	23.77709	20.63712	20.33175
108.1301	81.92371	47.20812	24.05405	32.26923	26.38298	22.32198	20.36011	20.09479
42.84553	34.66003	23.85787	14.45946	18.76923	14.46809	12.56966	11.08033	10.47393
105.6911	80.76285	49.23858	27.7027	35.11538	25.53191	21.95046	19.80609	19.14692
95.93496	72.80265	43.14721	25.81081	32.38462	23.61702	20.06192	18.55956	17.8673
82.11382	63.84743	39.59391	22.56757	29.11538	22.34043	19.6904	18.69806	17.72512
82.11382	64.34494	39.59391	22.83784	29.11538	22.34043	20.18576	18.42105	17.72512
73.73984	53.39967	29.44162	15.94595	19.61538	16.59574	15.60372	14.54294	14.12322
36.09756	28.85572	19.79695	10.81081	13.38462	10.6383	9.009288	8.448753	7.772512
77.80488	54.89221	25.38071	13.64865	17.96154	15.31915	14.42724	14.12742	13.6019
77.23577	56.88226	36.54822	21.89189	28.80769	21.06383	17.86378	16.759	15.92417
84.55285	63.84743	36.54822	18.64865	21.19231	16.59574	13.99381	12.32687	12.41706
123.5772	90.54726	49.74619	25.40541	33.61538	26.17021	23.34365	21.32964	21.27962
117.8862	86.40133	47.71574	24.32432	32.69231	25.10638	22.50774	20.63712	20.14218
101.626	78.7728	40.10152	20.40541	29.11538	24.46809	21.33127	18.42105	20.23697
110.5691	78.7728	40.10152	20.67568	30.15385	29.14894	26.65635	23.82271	24.78673
117.0732	83.74793	41.62437	22.02703	31.96154	29.14894	26.37771	23.13019	25.40284
50.3252	36.98176	18.78173	10.67568	15.96154	15.74468	15.41796	13.98892	15.59242
61.30081	45.93698	22.33503	11.89189	17.76923	17.02128	15.97523	14.54294	16.25592
62.76423	45.77114	24.36548	13.51351	19.80769	20.21277	19.10217	17.59003	19.19431
44.39024	34.82587	20.30457	10	15.11538	14.25532	13.03406	11.49584	12.79621
41.95122	32.00663	18.27411	9.594595	14.80769	13.82979	12.26006	10.94183	12.08531
54.55285	41.79104	23.35025	12.16216	17.15385	15.74468	13.93189	12.32687	13.31754
88.61789	67.16418	38.07107	19.18919	28.30769	25.53191	22.94118	19.66759	21.51659
66.09756	48.59038	27.41117	13.78378	20.84615	19.57447	18.82353	16.6205	18.67299
63.82114	47.09784	24.36548	11.35135	18.57692	16.59574	15.26316	13.71191	15.21327
187.8049	145.1078	71.5736	32.2973	42.30769	31.2766	24.70588	20.63712	21.23223
70	49.75124	26.39594	13.91892	19.92308	18.29787	16.16099	14.54294	16.35071
100	93.69818	76.14213	49.05405	67.30769	51.2766	39.00929	30.47091	28.86256
68.78049	49.41957	25.38071	12.7027	18.07692	16.38298	15.10836	13.15789	14.9763
54.95935	45.10779	28.93401	15.13514	22.84615	20.85106	19.78328	18.28255	20.7109
56.09756	42.62023	25.38071	12.7027	20.38462	20	18.26625	15.92798	17.67773
52.19512	35.8209	19.28934	11.21622	15.92308	16.17021	15.2322	13.01939	14.73934
47.47967	35.8209	20.81218	9.864865	15.30769	13.82979	12.0743	10.66482	12.22749
107.3171	81.92371	44.67005	23.91892	30.34615	24.89362	20.21672	17.31302	18.38863
100.813	75.95357	36.54822	19.18919	25.15385	21.2766	17.86378	15.37396	16.87204
37.47967	26.86567	16.75127	10.27027	17	18.29787	18.20433	16.48199	18.62559
25.93496	19.40299	13.19797	7.972973	12.92308	13.82979	14.24149	13.2964	14.59716
95.93496	80.26534	53.80711	28.10811	40.38462	31.06383	23.49845	18.55956	18.29384
58.61789	44.77612	25.88832	13.24324	17.92308	15.95745	13.99381	12.18837	13.45972
57.72358	44.11277	25.88832	13.91892	18.5	15.74468	13.86997	11.91136	12.79621
101.626	77.61194	41.62437	21.89189	27.76923	21.91489	17.27554	14.12742	14.40758
89.43089	74.95854	47.20812	25.27027	36.80769	28.29787	22.32198	17.72853	17.44076
55.69106	42.62023	24.8731	12.83784	17.5	15.31915	13.28173	11.77285	12.79621
95.12195	71.31012	37.56345	19.05405	24.26923	19.78723	15.13932	12.32687	13.03318
53.65854	40.96186	23.85787	12.16216	16.61538	14.04255	12.5387	10.66482	12.27488

86.17886	67.49585	39.59391	21.35135	28.5	23.61702	20.18576	17.03601	17.8673
95.93496	81.59204	54.82234	30.94595	41.53846	32.12766	26.06811	21.19114	20.47393
60.89431	46.43449	25.88832	13.37838	19.61538	16.59574	14.70588	12.60388	13.36493
72.68293	57.37977	36.04061	19.86486	26.23077	23.19149	19.81424	16.6205	17.81991
70.56911	54.89221	32.48731	17.56757	24.03846	20.42553	17.36842	14.95845	16.30332
44.55285	31.67496	16.75127	8.918919	14.11538	14.46809	14.30341	12.74238	15.11848
67.80488	47.09784	22.33503	12.2973	17.5	16.38298	14.73684	13.98892	15.87678
74.47154	53.39967	26.90355	13.64865	20	19.14894	17.64706	16.06648	17.44076
95.93496	65.17413	28.4264	13.64865	20.53846	19.14894	17.12074	15.78947	17.53555
75.04065	58.54063	34.01015	20.94595	26.84615	21.91489	18.39009	15.09695	15.59242
56.66667	43.11774	24.8731	13.51351	18.15385	15.95745	14.42724	12.46537	14.2654
49.5122	36.48425	19.28934	9.72973	13.57692	12.34043	11.39319	10.66482	12.08531
59.34959	44.11277	24.36548	12.43243	17.34615	13.61702	11.9195	10.66482	12.46445
60.0813	50.24876	32.99492	18.51351	25.5	21.2766	18.32817	15.23546	16.16114
138.2114	100.8292	49.23858	24.05405	32.30769	24.46809	18.82353	15.78947	17.01422
51.95122	41.45937	25.88832	13.78378	19.15385	15.31915	13.06502	10.80332	11.65877
68.78049	55.38972	34.01015	19.45946	26.65385	21.2766	17.55418	14.95845	15.30806
83.73984	63.68159	37.05584	20.40541	28.15385	22.34043	18.51393	15.09695	16.16114
64.95935	51.90713	31.47208	17.02703	22.11538	19.14894	16.62539	13.98892	14.9763
63.00813	48.92206	26.90355	14.32432	18.11538	15.10638	13.49845	11.91136	13.27014
167.4797	104.4776	33.50254	13.91892	20.26923	17.23404	14.08669	12.88089	15.16588
48.37398	38.14262	21.82741	12.2973	16.84615	13.82979	11.76471	9.695291	10.56872
45.52846	34.99171	20.30457	10.27027	15.30769	13.19149	11.42415	9.972299	10.80569
103.252	76.45108	39.08629	19.59459	25.42308	19.57447	15.29412	13.15789	14.21801
74.47154	59.86733	36.54822	20.81081	28.15385	22.97872	19.07121	14.95845	15.78199
80.4878	62.02322	36.04061	19.18919	24.07692	20.42553	16.31579	13.71191	14.07583
145.5285	117.2471	71.06599	42.16216	59.23077	44.89362	34.98452	27.28532	25.82938
42.43902	32.83582	18.78173	10.13514	14.53846	13.82979	12.78638	11.63435	13.12796
53.33333	40.46434	22.33503	12.2973	17.61538	15.10638	13.62229	12.04986	14.12322
55.60976	46.76617	28.93401	15.40541	20.96154	17.02128	14.79876	12.18837	13.12796
147.9675	77.28027	18.27411	7.837838	12.07692	10	7.585139	6.925208	7.867299
55.60976	37.1476	17.7665	9.459459	12.34615	10.85106	9.442724	8.448753	10.47393
54.22764	42.45439	23.85787	13.37838	19.57692	15.74468	13.74613	12.46537	12.8436
54.87805	42.28856	25.38071	14.05405	20.42308	17.02128	14.4582	12.74238	13.69668
68.69919	53.73134	32.99492	17.97297	25.57692	21.70213	18.91641	15.78947	15.97156
42.19512	29.35323	13.70558	6.486486	9.269231	7.446809	6.780186	6.509695	7.203791
76.26016	51.90713	24.36548	11.62162	16.92308	14.04255	11.05263	9.833795	11.23223
44.39024	35.48922	20.81218	10.54054	15.23077	12.97872	10.71207	9.141274	10.52133
83.73984	63.51575	31.47208	15.54054	21.92308	19.3617	17.73994	16.20499	16.63507
101.626	77.94362	38.57868	18.37838	26.19231	22.97872	19.44272	17.59003	17.48815
92.68293	72.96849	37.56345	16.75676	25.03846	21.70213	19.59752	17.31302	17.63033
103.252	81.92371	44.16244	20.94595	31.11538	27.65957	24.42724	21.32964	21.46919
153.6585	159.204	154.8223	96.89189	141.5385	98.29787	70.58824	48.06094	39.52607
85.36585	63.68159	28.4264	13.78378	18.69231	14.04255	11.33127	9.279778	8.815166
102.439	76.94859	33.50254	15.40541	20.96154	18.08511	16.78019	15.51247	16.77725
99.18699	76.28524	38.57868	18.51351	25.07692	21.48936	19.75232	18.42105	19.38389
106.5041	79.76783	40.60914	18.64865	25.65385	22.55319	20.12384	18.42105	19.14692

118.6992	91.87396	44.67005	21.62162	27.80769	23.61702	20.71207	18.97507	19.52607
129.2683	98.83914	44.67005	19.32432	25.03846	21.91489	19.72136	18.42105	19.33649
99.18699	72.96849	38.57868	17.7027	26.03846	22.97872	19.87616	17.45152	18.10427
99.18699	73.79768	40.10152	18.51351	26.15385	23.19149	19.07121	16.6205	16.72986
108.1301	83.08458	45.17766	20.40541	29	23.82979	19.78328	17.17452	17.06161
77.47967	55.55556	26.39594	13.37838	19.73077	18.51064	16.87307	15.51247	16.58768
133.3333	102.8192	52.79188	23.37838	33.26923	26.38298	23.71517	20.77562	21.13744
97.56098	81.92371	49.23858	23.91892	35.46154	29.57447	25.20124	21.74515	21.04265
96.74797	85.57214	52.79188	25.67568	36.11538	29.57447	25.29412	21.74515	20.18957
86.17886	69.32007	43.65482	24.05405	36	34.25532	31.88854	27.56233	27.58294
85.36585	66.33499	37.05584	19.05405	28	27.23404	24.67492	21.60665	22.60664
114.6341	88.55721	48.22335	23.64865	35	32.34043	29.41176	25.90028	27.72512
206.5041	154.7264	64.46701	27.43243	34.5	28.93617	24.42724	22.29917	21.89573
107.3171	83.25041	39.08629	19.72973	27.61538	23.19149	20.09288	18.14404	18.38863
90.2439	69.81758	34.51777	18.78378	28.34615	25.10638	23.80805	21.60665	22.1327
103.252	78.7728	40.10152	20.13514	30.69231	27.44681	25.63467	22.85319	23.79147
69.5122	55.88723	33.50254	19.45946	32.65385	32.76596	31.88854	28.39335	29.14692
59.34959	48.59038	29.44162	16.48649	21.34615	14.68085	10.77399	7.34072	6.872038
55.77236	46.43449	30.45685	17.56757	24.30769	23.82979	20.58824	16.89751	17.1564
89.43089	65.5058	32.99492	16.89189	25.34615	23.19149	20.40248	18.55956	18.90995
86.17886	60.69652	27.91878	15.27027	21.65385	20	18.69969	17.17452	16.49289
111.3821	81.4262	41.11675	22.83784	33.53846	29.78723	26.62539	23.4072	23.31754
169.1057	139.9668	81.21827	46.75676	70.76923	63.19149	55.10836	47.36842	44.02844
169.1057	131.1774	56.85279	28.64865	41.15385	37.65957	33.12693	27.83934	27.1564
100	80.92869	43.14721	25	39.23077	38.93617	36.53251	30.19391	29.24171
82.11382	81.26036	50.76142	22.02703	25.38462	19.57447	18.04954	15.65097	15.92417
74.14634	58.20896	34.01015	17.97297	26.80769	23.82979	21.26935	19.11357	19.24171
63.00813	55.22388	73.60406	65.27027	130	90	52.32198	37.53463	29.57346
88.61789	67.99337	36.04061	18.91892	25.73077	24.04255	21.14551	20.63712	20.90047
100.813	81.4262	48.73096	27.97297	38.84615	35.31915	29.34985	29.77839	30.33175
59.9187	48.09287	28.4264	14.59459	22.57692	20.42553	17.33746	16.759	17.1564
55.93496	43.11774	25.88832	14.32432	20.57692	20.42553	16.93498	16.34349	17.06161
85.36585	67.16418	35.02538	18.24324	24.46154	22.97872	18.85449	18.97507	19.05213
86.17886	68.82255	38.07107	20	27.34615	25.10638	20.49536	19.11357	19.76303
78.04878	66.16915	46.19289	31.48649	34.5	31.70213	30.95975	28.94737	29.14692
3.821138	2.487562	1.522843	1.216216	2.961538	4.042553	4.396285	4.432133	4.123223
93.49593	79.76783	78.6802	42.2973	108.4615	125.7447	119.8142	115.928	109.0047
110.5691	73.79768	28.93401	13.37838	17.03846	16.38298	15.0774	15.37396	14.88152
99.18699	72.63682	42.63959	19.86486	28.07692	25.10638	22.78638	19.66759	19.00474
2.113821	1.824212	2.538071	1.756757	2.923077	3.829787	3.900929	4.155125	3.649289
68.69919	45.93698	22.84264	11.62162	14	14.68085	13.43653	14.12742	14.2654
61.38211	44.44444	24.36548	12.56757	17.26923	17.44681	16.96594	16.06648	16.06635
74.14634	58.70647	29.94924	17.83784	23.92308	20.6383	15.44892	14.95845	13.27014
6.829268	5.306799	3.553299	1.351351	2.846154	2.553191	2.198142	1.939058	1.800948
91.05691	78.60697	47.71574	27.83784	31.42308	25.74468	21.73375	20.0831	19.2891
69.7561	51.90713	28.93401	12.83784	21.03846	20.21277	17.95666	16.759	16.35071
43.90244	42.78607	32.99492	16.48649	17	10.6383	6.037152	3.878116	2.985782

139.8374	112.7695	78.6802	38.24324	40.76923	32.34043	23.68421	18.83657	18.53081
70.81301	53.39967	30.45685	16.21622	18.92308	18.08511	16.65635	14.95845	15.26066
7.317073	5.804312	4.568528	2.702703	4.038462	4.468085	4.582043	4.709141	4.170616
195.122	162.1891	121.8274	82.97297	108.0769	87.65957	63.46749	51.38504	40.14218
86.99187	67.16418	39.59391	20.94595	30.34615	29.57447	27.21362	22.85319	23.08057
73.41463	56.55058	32.99492	18.91892	30.46154	26.38298	23.28173	23.54571	23.79147
52.11382	35.48922	17.7665	9.324324	12.88462	13.82979	12.91022	12.60388	11.84834
85.36585	59.53566	33.50254	15.13514	25.96154	25.95745	22.6935	20.63712	20.7109
73.82114	60.03317	49.74619	30	45.38462	39.57447	28.29721	25.76177	23.93365
97.56098	78.93864	47.20812	28.24324	34.26923	28.08511	22.6935	18.42105	18.95735
119.5122	105.6385	69.03553	42.56757	60.76923	50.6383	42.10526	40.72022	40.23697
272.3577	197.3466	88.32487	32.02703	26	20.42553	16.06811	15.09695	15.30806
48.53659	31.67496	19.28934	11.62162	16.92308	18.93617	17.89474	18.28255	18.72038
54.47154	40.46434	23.85787	13.10811	14.38462	12.34043	10.83591	10.38781	10.7109
106.5041	73.63184	37.56345	17.2973	23.88462	21.06383	17.6161	16.48199	17.39336
113.0081	87.06468	50.25381	25	33.23077	29.78723	23.34365	22.29917	21.27962
68.86179	61.35987	39.59391	24.86486	29.61538	25.10638	20.4644	17.31302	15.97156
74.79675	50.08292	19.28934	9.054054	9.615385	10.6383	10.40248	10.80332	11.51659
73.25203	54.56053	35.02538	15.81081	23.53846	22.76596	20.21672	19.80609	21.89573
120.3252	83.74793	39.08629	16.89189	22.42308	21.48936	18.91641	17.03601	17.96209
93.49593	79.10448	45.17766	30.67568	37.69231	30.21277	23.62229	21.88366	19.52607
104.065	78.93864	44.16244	24.05405	31.03846	26.38298	22.13622	19.39058	20.14218
72.92683	52.07297	31.9797	18.24324	26.88462	27.65957	23.56037	23.2687	22.18009
56.91057	42.28856	21.3198	13.10811	18.57692	19.78723	17.67802	17.59003	17.25118
88.61789	62.18905	34.01015	19.05405	22.19231	22.12766	20.21672	18.69806	18.34123
104.065	73.79768	38.57868	19.59459	24.73077	23.40426	19.65944	17.31302	18.15166
91.86992	64.67662	36.04061	18.24324	25.38462	24.68085	19.19505	17.31302	17.44076
48.04878	39.46932	22.33503	12.43243	14.65385	12.12766	10.52632	10.1108	10.80569
74.87805	65.5058	42.13198	25.67568	34.11538	28.93617	24.14861	21.46814	20.28436
4.390244	3.150912	2.030457	1.891892	2.692308	2.340426	2.693498	2.493075	2.511848
77.23577	59.20398	33.50254	19.72973	24.84615	21.48936	17.67802	15.23546	14.92891
101.626	78.44113	46.19289	25.40541	30.5	24.89362	20.89783	19.11357	18.81517
108.1301	89.71808	62.43655	35.27027	43.84615	34.25532	27.43034	23.54571	20.94787
98.37398	81.92371	53.29949	31.08108	38.84615	30.6383	23.59133	19.80609	18.43602
42.76423	35.8209	22.33503	34.72973	17	13.61702	10.77399	11.08033	10.42654
3.739837	2.985075	3.045685	3.108108	3.230769	3.191489	2.631579	2.770083	2.748815
33.98374	23.05141	13.19797	8.378378	12.46154	16.38298	17.02786	17.86704	18.15166
55.60976	40.96186	22.33503	11.62162	16.61538	18.29787	19.10217	18.00554	16.96682
99.18699	70.48093	30.96447	15.67568	16.42308	14.68085	13.90093	13.71191	13.64929
182.1138	205.6385	187.8173	117.4324	173.0769	129.1489	97.83282	84.21053	71.09005
107.3171	80.0995	41.62437	19.86486	23.46154	21.06383	16.93498	16.48199	16.01896
150.4065	105.3068	43.65482	16.89189	19.61538	19.14894	16.81115	16.48199	16.77725
95.93496	75.45605	44.16244	24.18919	31.03846	24.46809	21.48607	20.22161	17.8673
71.30081	54.39469	28.93401	16.62162	21.80769	17.23404	14.4582	13.2964	13.88626
100.813	67.82753	37.56345	22.56757	23.42308	23.19149	21.85759	20.91413	21.94313
72.68293	55.38972	27.91878	13.64865	19.92308	20.21277	19.50464	18.55956	17.67773
86.17886	66.8325	38.57868	20.40541	26.15385	23.61702	20.49536	17.03601	16.54028

19.5935	14.75954	8.121827	4.864865	5.346154	4.893617	4.024768	3.601108	3.412322
46.42276	32.33831	20.81218	11.35135	15.19231	16.17021	14.95356	14.54294	15.7346
94.30894	83.58209	61.42132	38.64865	48.46154	38.08511	29.81424	23.4072	19.57346
107.3171	86.23549	55.32995	29.72973	37.30769	31.48936	26.16099	22.57618	20.42654
9.105691	7.296849	4.568528	1.621622	2.692308	2.340426	2.321981	2.493075	2.274882
101.626	84.90879	52.79188	34.45946	40.38462	36.80851	31.57895	27.00831	25.35545
74.63415	54.06302	29.44162	15.94595	18.26923	17.44681	15.10836	14.54294	14.54976
117.8862	92.53731	56.34518	29.72973	41.15385	34.68085	29.44272	26.17729	25.7346
114.6341	82.42123	41.11675	18.64865	22.61538	18.7234	16.22291	15.78947	16.01896
17.07317	13.10116	6.598985	4.324324	5.038462	4.680851	3.962848	3.739612	3.554502
78.13008	58.20896	31.9797	17.43243	21.96154	18.93617	17.43034	16.06648	16.96682
79.5122	63.18408	42.63959	23.91892	32.23077	24.89362	21.54799	19.11357	19.66825
125.2033	89.71808	44.67005	27.83784	28.11538	24.25532	21.39319	19.39058	18.76777
103.252	81.59204	49.23858	30.81081	34.92308	29.3617	23.74613	21.32964	19.66825
16.50407	11.60862	5.583756	2.297297	3.461538	3.617021	2.910217	2.770083	2.843602
77.23577	64.67662	38.07107	25.81081	36.96154	30.6383	27.33746	24.65374	23.64929
72.03252	54.72637	28.4264	15.27027	16.65385	14.68085	12.26006	12.46537	12.70142
43.90244	35.98673	22.84264	12.7027	17.30769	14.68085	13.52941	11.77285	12.32227
79.9187	63.68159	38.57868	23.37838	27.03846	21.2766	18.0805	15.78947	14.17062
5.284553	3.648425	1.522843	1.351351	1.115385	1.489362	1.20743	1.246537	1.137441
112.1951	94.52736	63.45178	35.67568	43.07692	34.04255	26.84211	21.88366	20.42654
77.39837	56.38474	30.45685	17.02703	22.69231	20.6383	18.29721	17.45152	17.53555
58.69919	46.76617	25.38071	15.13514	19.26923	17.23404	15.17028	13.85042	13.27014
64.71545	51.74129	30.96447	18.91892	21.53846	18.7234	15.66563	14.12742	13.88626
2.845528	2.6534	2.030457	1.891892	2.884615	3.617021	3.312693	3.047091	3.175355
90.2439	65.67164	34.01015	15.94595	17.88462	16.17021	14.58204	14.12742	13.69668
88.61789	63.18408	32.99492	17.56757	22	18.51064	16.37771	15.09695	15.0237
104.878	80.76285	52.28426	27.02703	35.53846	29.3617	23.83901	21.19114	20.37915
77.23577	59.20398	26.39594	10.27027	10.15385	8.723404	7.089783	6.648199	6.682464
77.88618	57.87728	34.01015	17.56757	23.84615	22.97872	20.58824	20.91413	20.85308

Tm	Yb	Lu	Y
0.0326		0.21	0.0323
			2.1

Tm	Yb	Lu	Y
14.72393	17.14286	14.86068	12.71429
15.64417	16.66667	15.47988	13.04762
21.77914	23.80952	22.29102	20.14286
29.1411	30.47619	26.62539	28.2381
28.22086	29.04762	26.31579	26.42857
18.09816	19.04762	17.02786	17.61905
15.64417	16.66667	16.71827	14.52381
21.77914	21.90476	19.50464	23.57143
23.61963	24.7619	22.29102	24.7619
20.8589	22.38095	21.05263	19.09524
23.31288	24.7619	22.29102	22.19048
25.15337	24.28571	22.60062	28.47619
28.52761	27.61905	24.4582	36
15.33742	16.66667	14.86068	14.42857
26.68712	26.66667	21.98142	26.90476
119.9387	101.9048	78.32817	157.1429
20.8589	22.38095	21.05263	18
19.0184	20.95238	21.05263	17.28571
18.71166	20	18.57585	16.57143
19.93865	21.90476	19.81424	16.85714
17.79141	19.04762	18.26625	16.38095
19.93865	19.52381	18.88545	17.33333
15.64417	16.66667	15.78947	13.95238
16.56442	18.57143	17.33746	14.09524
17.17791	18.09524	16.40867	13.47619
18.09816	20.47619	18.88545	15.2381
20.8589	22.85714	21.05263	16.57143
17.48466	18.09524	16.71827	17.7619
14.41718	15.71429	14.55108	14.57143
18.40491	19.52381	17.95666	18.14286
17.17791	18.57143	17.33746	15.42857
18.09816	20	18.26625	18
16.87117	18.09524	17.33746	14.42857
16.87117	18.09524	17.64706	14.28571
29.1411	32.85714	32.81734	27.47619
25.46012	26.66667	25.69659	25.09524
19.0184	19.52381	17.64706	22.19048
16.87117	17.61905	16.40867	15.28571
16.87117	18.09524	16.71827	15.52381
16.56442	19.04762	18.26625	15.14286
24.23313	26.66667	25.0774	25.04762
19.32515	21.42857	20.74303	15.19048
22.08589	23.80952	22.60062	19.04762
23.00613	25.71429	25.0774	21.09524

25.15337	27.61905	26.00619	23.71429
14.72393	15.71429	15.47988	12.66667
25.15337	26.66667	26.31579	24
18.71166	20	18.88545	17.57143
15.33742	16.66667	15.78947	15.14286
14.11043	14.7619	14.55108	12.61905
16.87117	19.52381	18.57585	14.95238
16.56442	20	17.95666	14.7619
14.41718	16.19048	15.17028	12.42857
27.60736	30	29.41176	24.47619
15.95092	17.61905	17.02786	13.66667
14.72393	16.19048	15.17028	13.09524
15.95092	16.66667	16.09907	13.38095
14.72393	15.71429	15.17028	12.33333
14.72393	16.19048	15.47988	13.47619
10.42945	12.38095	11.45511	9.047619
16.56442	18.57143	17.33746	15.95238
14.72393	16.19048	14.24149	14
11.96319	13.80952	13.0031	11.42857
21.47239	24.7619	25.0774	19.2381
16.87117	17.14286	17.95666	15.7619
16.87117	17.14286	17.95666	14.28571
19.0184	20	20.74303	14.14286
19.6319	21.42857	21.98142	15.7619
15.64417	16.19048	16.71827	14.2381
16.56442	17.61905	17.33746	14
15.95092	16.66667	17.02786	14.14286
16.56442	16.66667	16.40867	14.7619
18.09816	18.09524	17.33746	18.95238
19.32515	20	19.81424	16.71429
12.26994	13.33333	13.93189	9.904762
19.6319	20.95238	21.67183	17.47619
17.48466	18.09524	18.26625	15.04762
13.19018	14.28571	14.24149	10.66667
19.32515	20	19.81424	15.52381
15.64417	16.66667	16.09907	11.95238
16.25767	16.66667	16.71827	14.95238
16.56442	17.14286	17.64706	13.66667
16.25767	17.14286	18.26625	12.38095
36.50307	39.52381	41.48607	27.47619
31.90184	34.7619	35.91331	25.09524
17.79141	18.57143	18.57585	14.14286
30.67485	32.38095	33.74613	26.7619
14.11043	14.28571	15.47988	12.04762
36.80982	38.57143	40.86687	32
17.48466	19.04762	18.26625	16.66667
18.71166	19.52381	19.81424	17.52381

18.40491	19.52381	21.36223	15
16.25767	16.66667	17.33746	14.09524
14.11043	13.80952	14.55108	15.04762
15.95092	17.14286	17.64706	12.57143
16.87117	17.14286	17.64706	16.09524
30.67485	32.38095	29.10217	29.09524
26.68712	27.61905	25.0774	26.57143
19.93865	20.47619	18.26625	20.66667
18.40491	19.04762	17.33746	19.90476
21.47239	21.90476	20.12384	21.57143
21.16564	21.42857	19.81424	20.66667
19.32515	20.95238	20.74303	17.61905
20.2454	21.90476	20.12384	17.61905
34.66258	33.80952	29.41176	38.33333
23.31288	22.38095	20.74303	27.33333
40.18405	39.04762	33.74613	41.52381
38.03681	37.61905	32.50774	39.80952
30.67485	37.14286	34.98452	20.09524
29.44785	34.28571	34.67492	20.14286
27.30061	30	26.00619	23.04762
22.08589	24.7619	23.52941	17.14286
17.79141	18.57143	18.26625	15.66667
18.71166	20.47619	18.57585	18.66667
19.93865	20.47619	18.57585	19.80952
20.8589	22.85714	20.43344	20.61905
22.69939	22.38095	20.74303	20.85714
19.93865	21.90476	19.81424	21.04762
20.8589	21.90476	20.74303	20.42857
20.8589	21.90476	20.43344	19.33333
17.48466	18.09524	16.40867	14.57143
24.23313	25.2381	22.91022	25.2381
22.08589	23.80952	21.67183	23.95238
21.16564	22.85714	21.05263	22.7619
21.47239	22.38095	20.12384	22.14286
17.48466	19.52381	17.64706	17.47619
22.69939	24.28571	21.67183	22.90476
23.61963	24.7619	22.91022	23.42857
20.2454	21.90476	19.81424	18.95238
24.23313	27.14286	25.69659	23.7619
17.48466	19.04762	18.26625	15.85714
18.71166	20	18.88545	16.61905
18.40491	20	18.57585	16.71429
21.16564	24.28571	21.98142	18.42857
21.47239	22.85714	21.98142	18.85714
23.92638	24.7619	23.21981	19.95238
20.2454	20	18.26625	19.47619
23.61963	24.28571	23.83901	17.80952

18.09816	17.14286	16.40867	15.7619
48.77301	40.95238	36.22291	72.38095
24.23313	24.28571	21.98142	24.57143
22.39264	21.90476	21.36223	19.38095
37.42331	38.09524	38.0805	31.14286
16.87117	17.14286	16.71827	14.85714
18.71166	18.57143	17.33746	18.14286
23.61963	24.28571	23.21981	19.7619
24.84663	25.71429	24.7678	21.38095
20.2454	20.95238	20.74303	18.66667
19.0184	20	20.12384	15
22.39264	23.80952	23.83901	16.2381
38.03681	38.57143	37.4613	31.14286
22.69939	23.80952	21.98142	19.7619
17.48466	19.04762	18.57585	16.38095
19.6319	20.95238	19.81424	18.66667
16.87117	17.14286	16.71827	14.52381
19.0184	20.47619	19.50464	17.95238
21.16564	21.90476	20.12384	21.90476
19.93865	21.90476	20.12384	19.47619
25.76687	26.19048	26.00619	23.42857
22.39264	23.33333	22.60062	21.28571
23.31288	23.80952	22.29102	22.14286
22.08589	22.85714	22.29102	21
19.6319	21.90476	20.74303	17
17.17791	18.09524	17.64706	15.19048
15.95092	16.66667	15.78947	14.57143
15.64417	16.66667	16.71827	13.7619
19.32515	20.95238	19.81424	18.61905
15.33742	16.66667	15.47988	14.61905
20.55215	21.42857	20.12384	20.66667
12.57669	13.33333	12.6935	10.57143
15.95092	17.14286	16.09907	13.90476
20.8589	21.42857	19.81424	26.47619
17.48466	17.61905	17.64706	15.95238
15.64417	16.19048	15.17028	13.19048
17.48466	18.57143	17.33746	15.61905
22.08589	23.80952	22.91022	20.33333
15.64417	16.66667	15.78947	15.09524
15.03067	15.71429	15.47988	13.38095
13.19018	14.7619	13.93189	11.33333
23.00613	24.28571	22.91022	23.80952
17.79141	19.52381	18.57585	15.09524
19.93865	21.42857	20.12384	18.09524
21.47239	21.90476	21.36223	20.85714
14.72393	15.71429	15.17028	12.90476
16.87117	18.09524	17.95666	16.95238

23.31288	24.28571	22.60062	23.09524
15.64417	17.14286	17.33746	12.85714
16.56442	17.61905	17.33746	14.80952
12.57669	13.33333	12.6935	11.38095
16.87117	17.61905	16.71827	18.04762
14.72393	14.7619	14.24149	13.80952
11.04294	11.42857	10.83591	12.2381
19.6319	20.95238	19.81424	18.95238
16.56442	17.61905	17.33746	14.7619
19.32515	18.57143	17.64706	19
23.00613	22.38095	20.43344	26.04762
21.77914	21.90476	21.05263	26.19048
22.39264	23.33333	21.67183	21.80952
24.84663	25.71429	24.14861	21.28571
22.39264	23.80952	22.91022	21.28571
23.00613	24.28571	22.60062	19.85714
25.76687	26.19048	25.387	24.52381
15.33742	15.71429	14.86068	14.71429
16.56442	17.14286	16.40867	14.19048
18.71166	20.47619	19.50464	18.2381
12.57669	12.85714	12.0743	13.80952
17.79141	18.57143	17.95666	17.57143
19.32515	20	19.50464	19.19048
28.22086	29.04762	27.24458	27
22.69939	23.33333	21.98142	21.90476
18.71166	19.52381	18.26625	16.71429
18.09816	19.04762	17.33746	17.42857
19.32515	20.47619	18.57585	19.2381
21.16564	23.80952	22.29102	18.04762
20.2454	21.90476	20.12384	19.14286
21.77914	22.85714	20.74303	20.80952
12.57669	14.7619	13.93189	9.619048
22.08589	23.80952	21.67183	22.28571
22.08589	22.38095	20.74303	22.47619
12.88344	13.80952	13.0031	9.714286
16.87117	18.09524	17.02786	14.19048
19.0184	20	18.88545	17
20.55215	22.38095	20.43344	19.71429
25.15337	26.19048	24.4582	23.52381
15.64417	16.66667	15.78947	16.2381
15.95092	16.66667	15.17028	18.19048
15.03067	17.14286	15.78947	15
20.55215	22.38095	20.43344	20.38095
19.0184	19.52381	17.64706	17.80952
16.25767	17.14286	16.09907	16.57143
18.40491	19.52381	17.33746	18.61905
26.38037	28.57143	26.62539	24.90476

23.00613	25.2381	24.14861	21.09524
18.40491	20	17.95666	15.2381
56.13497	61.42857	58.20433	51.42857
30.67485	32.85714	32.50774	28.80952
21.77914	23.33333	21.36223	19.90476
20.2454	20	19.19505	18.61905
22.39264	23.33333	21.36223	20.85714
19.32515	20	18.88545	18.04762
20.2454	21.90476	18.57585	20.04762
24.23313	24.28571	23.83901	23.66667
17.48466	19.04762	17.33746	14.80952
18.40491	19.52381	19.19505	16.28571
18.40491	20	17.95666	17.47619
16.56442	17.61905	17.02786	15.80952
15.64417	18.57143	17.02786	12.90476
11.04294	12.85714	12.3839	8.333333
15.33742	16.19048	14.24149	14.38095
23.00613	25.2381	22.60062	18.95238
18.40491	20	17.33746	15.66667
21.77914	23.80952	21.67183	20.61905
21.77914	24.7619	21.98142	20.38095
22.08589	23.33333	22.29102	20.66667
16.87117	18.09524	17.95666	15.80952
16.87117	18.09524	16.71827	16
23.61963	25.71429	24.7678	22.09524
19.0184	20.47619	19.50464	18.38095
17.17791	18.57143	17.02786	16.85714
20.8589	23.33333	21.05263	20.14286
15.33742	17.61905	16.09907	15.38095
22.08589	22.85714	21.36223	23.04762
18.71166	20	18.88545	16.52381
15.64417	17.14286	15.47988	14.14286
20.2454	20.95238	18.57585	18.38095
23.92638	24.28571	22.91022	25.7619
20.8589	22.85714	21.36223	20.09524
20.8589	21.90476	19.50464	18
29.7546	30	25.69659	35.52381
18.40491	19.04762	18.57585	17.61905
17.48466	19.52381	18.57585	16.42857
17.17791	19.04762	18.57585	16.95238
26.68712	27.14286	25.0774	38.95238
16.56442	18.09524	17.95666	15.90476
17.79141	19.52381	17.33746	15.52381
20.2454	22.38095	20.43344	19.28571
16.56442	17.61905	17.02786	16.19048
21.77914	23.33333	21.36223	25.57143
18.40491	20.47619	17.64706	19.66667

18.09816	19.04762	17.33746	16.2381
20.2454	21.90476	20.43344	18.33333
18.09816	19.04762	18.26625	16.28571
13.80368	14.28571	13.0031	11.09524
20.8589	20.47619	18.88545	29.28571
17.48466	17.14286	17.02786	17.95238
16.56442	17.61905	17.64706	17
18.40491	18.09524	17.02786	17.28571
22.39264	21.90476	21.36223	21.71429
19.0184	19.04762	18.88545	17.80952
19.32515	20	19.81424	17
17.17791	17.14286	16.40867	17.47619
16.87117	17.14286	16.40867	16.14286
17.17791	17.14286	18.26625	13.66667
19.6319	19.52381	18.57585	18.7619
18.09816	18.57143	18.57585	16.04762
19.32515	20	19.50464	15.66667
29.44785	30.47619	29.41176	26.33333
29.7546	31.90476	30.95975	25.38095
23.92638	25.2381	24.4582	20.7619
20.55215	21.42857	21.05263	17.90476
30.06135	30.47619	30.03096	28.14286
34.35583	33.80952	33.43653	35.85714
26.68712	27.61905	26.62539	25.04762
22.39264	22.85714	22.60062	19.57143
21.47239	21.42857	21.36223	20.2381
20.55215	20.95238	20.12384	18.52381
19.6319	19.52381	19.50464	20.09524
21.77914	21.90476	20.74303	21.85714
14.72393	15.2381	14.86068	14.57143
15.95092	15.2381	14.55108	20.38095
15.95092	16.19048	15.78947	14.57143
24.23313	23.33333	21.36223	28.19048
18.20988	20.57416	18.63354	18.14286
19.44444	20.57416	18.9441	18
19.1358	20.57416	20.49689	17.80952
14.81481	17.22488	16.77019	14.38095
16.97531	18.18182	18.9441	16.95238
22.53086	24.88038	25.15528	21.71429
17.59259	18.66029	16.77019	15.90476
23.45679	24.40191	21.73913	27.80952
19.1358	21.5311	19.25466	18.95238
23.76543	24.40191	22.67081	23.7619
24.07407	24.88038	23.60248	25.28571
19.44444	21.05263	18.01242	20.04762
20.06173	20.57416	20.18634	19.09524
20.37037	21.05263	19.87578	20.28571

13.2716	14.83254	13.35404	11.90476
16.04938	16.74641	13.97516	15.28571
16.66667	17.22488	15.52795	16.85714
19.44444	21.05263	19.87578	17.57143
20.06173	22.00957	19.87578	17.7619
23.45679	25.35885	22.98137	20.47619
23.14815	24.40191	20.80745	20.38095
24.07407	25.35885	24.53416	25.28571
18.51852	20.57416	19.87578	16.33333
18.51852	20.57416	18.63354	17.04762
20.37037	22.48804	22.36025	20
20.98765	22.00957	21.42857	19.71429
18.82716	20.09569	18.9441	17.61905
17.28395	20.09569	19.25466	17.14286
20.06173	21.5311	19.87578	21.14286
20.37037	21.05263	19.56522	20.61905
18.82716	19.61722	18.01242	19.38095
12.65432	14.35407	13.35404	10.90476
14.81481	16.74641	16.77019	13.2381
12.65432	13.8756	13.6646	9.142857
12.34568	15.78947	13.97516	9.809524
24.07407	27.7512	25.15528	22.33333
16.35802	18.18182	16.45963	14.71429
17.28395	19.61722	18.9441	17.71429
16.97531	18.18182	17.08075	16.38095
12.65432	15.311	14.28571	10.66667
15.4321	16.74641	17.70186	14.2381
14.50617	16.26794	15.83851	13.66667
18.51852	19.61722	17.70186	17.52381
18.20988	19.13876	17.08075	17.71429
21.91358	23.92344	20.49689	21.85714
14.81481	16.26794	13.97516	12.85714
17.59259	20.09569	18.01242	17.85714
16.35802	18.18182	18.63354	16.28571
13.2716	14.35407	12.73292	12.42857
12.03704	13.39713	12.1118	11.80952
14.81481	15.78947	14.59627	14.09524
16.97531	18.66029	17.3913	16.80952
16.04938	18.66029	16.45963	16.66667
16.04938	17.70335	14.90683	16.33333
17.28395	19.13876	15.83851	15.33333
16.97531	18.18182	16.77019	15.09524
18.20988	20.09569	18.63354	14.95238
18.20988	19.61722	19.56522	15.61905
17.28395	20.09569	17.3913	15.09524
20.67901	23.92344	20.49689	16.71429
20.98765	23.44498	22.36025	17.66667

30.8642	33.01435	29.81366	30.19048
19.75309	21.05263	20.18634	18.04762
20.37037	22.48804	21.11801	18.90476
18.82716	20.09569	19.25466	18.09524
17.59259	18.66029	17.70186	17.7619
16.04938	18.66029	15.83851	16.47619
14.19753	16.26794	14.59627	14.90476
11.11111	12.44019	11.80124	10.28571
14.50617	15.78947	15.21739	13.85714
15.12346	15.311	14.28571	13.80952
19.44444	20.09569	18.01242	18.66667
21.60494	22.96651	20.80745	21.19048
7.407407	8.133971	6.832298	7.190476
19.0184	21.42857	19.19505	16.04762
20.55215	21.42857	18.26625	21.28571
16.25767	18.57143	15.47988	15.2381
15.95092	18.09524	17.64706	15.04762
15.64417	16.19048	14.86068	13.71429
18.40491	19.04762	18.88545	16.61905
14.72393	15.71429	13.62229	15.19048
11.34969	14.28571	13.31269	7.714286
12.88344	14.28571	13.31269	9.857143
12.26994	14.7619	13.0031	10.04762
17.17791	19.52381	17.64706	15.66667
14.41718	15.71429	14.24149	12.57143
14.41718	15.2381	13.31269	12.47619
15.64417	16.66667	15.47988	13.90476
17.17791	18.09524	16.09907	16.09524
15.95092	17.14286	15.47988	14.7619
17.28395	19.13876	18.9441	16.57143
24.38272	27.27273	27.95031	23.28571
19.1358	20.57416	22.98137	20
17.90123	19.13876	18.32298	15.57143
12.96296	15.311	13.35404	12.2381
16.04938	17.22488	17.3913	15.28571
17.90123	19.61722	20.18634	16.19048
15.12346	17.22488	16.77019	15.90476
16.35802	18.66029	18.63354	16.57143
17.59259	20.57416	18.9441	15.61905
17.59259	20.57416	17.3913	16.04762
20.37037	21.5311	20.49689	17.80952
16.97531	18.66029	18.63354	15.38095
12.34568	13.8756	13.6646	11.33333
17.90123	18.18182	17.3913	21.52381
11.7284	13.39713	13.35404	10.28571
12.96296	14.35407	14.59627	11.38095
15.12346	15.311	14.90683	13.09524

14.19753	15.78947	15.52795	12.66667
13.88889	15.311	15.83851	13.33333
14.19753	15.311	14.59627	14.28571
8.950617	11.00478	10.86957	7.904762
16.97531	19.13876	18.32298	17.14286
17.28395	18.18182	15.83851	18.09524
17.28395	19.13876	17.08075	17.14286
18.51852	19.13876	18.63354	17.33333
18.51852	20.57416	19.25466	19.2381
15.4321	17.22488	16.14907	15.14286
15.4321	16.74641	16.14907	14.80952
14.50617	16.74641	16.14907	14.38095
16.35802	19.61722	18.32298	17.52381
18.82716	20.57416	19.56522	18.80952
16.35802	18.18182	17.70186	14.04762
13.2716	15.311	15.52795	11.52381
20.67901	22.96651	22.98137	18.71429
13.2716	15.311	15.83851	12.38095
14.50617	15.78947	15.21739	13.90476
17.28395	19.13876	18.63354	16.52381
18.20988	20.09569	18.63354	17.14286
20.37037	22.96651	21.42857	20.33333
10.80247	12.44019	12.1118	8.380952
10.18519	12.44019	13.6646	8.285714
15.74074	14.83254	13.97516	17.71429
11.11111	13.39713	11.80124	9.047619
14.50617	15.311	14.59627	15.71429
14.19753	14.83254	13.6646	14.19048
22.53086	23.92344	22.36025	22.04762
16.04938	18.18182	16.45963	15.61905
18.20988	19.61722	18.9441	17.61905
20.06173	21.05263	20.18634	20.66667
21.60494	21.5311	19.56522	21.71429
13.88889	15.78947	14.90683	15.66667
20.37037	20.09569	20.49689	20.2381
16.97531	17.70335	17.70186	16.09524
14.19753	14.35407	15.52795	13.14286
13.58025	14.83254	14.90683	13.47619
15.12346	16.74641	16.77019	14.14286
13.58025	15.311	14.90683	12.95238
13.58025	15.311	12.73292	11.90476
12.34568	13.39713	13.35404	9.380952
11.7284	13.8756	12.42236	9.714286
16.35802	16.74641	15.52795	19.57143
16.35802	18.18182	18.63354	15.52381
19.44444	21.05263	19.56522	18.2381
19.75309	21.5311	20.80745	19.2381

18.51852	19.61722	19.87578	18.2381
18.20988	20.57416	18.63354	16.95238
16.97531	18.18182	17.3913	15.42857
17.28395	18.66029	18.32298	16.61905
16.35802	18.66029	18.01242	15.66667
17.90123	20.09569	20.18634	17.52381
24.07407	26.79426	26.70807	21.47619
16.35802	18.66029	19.87578	14.90476
18.20988	19.13876	20.49689	16.47619
19.1358	21.05263	20.18634	18.28571
16.97531	19.13876	18.63354	17.14286
19.1358	21.5311	22.04969	18.04762
17.90123	21.5311	20.18634	17.80952
16.97531	18.18182	18.01242	16.71429
20.37037	21.5311	21.73913	20.19048
17.90123	18.66029	17.3913	18.28571
14.81481	15.78947	13.6646	14.09524
17.28395	18.18182	16.14907	18.09524
33.33333	33.97129	29.50311	39.2381
16.66667	17.70335	16.77019	14.85714
17.90123	19.13876	17.70186	16.66667
20.67901	22.00957	19.56522	18.09524
20.67901	21.5311	19.25466	19.33333
24.38272	23.92344	20.49689	26.42857
16.35802	16.74641	14.90683	16.57143
17.90123	19.61722	17.3913	17.71429
32.40741	36.84211	35.40373	29.09524
27.46914	30.14354	27.95031	27.04762
17.59259	19.13876	17.3913	17.66667
16.97531	17.22488	16.45963	17.28571
17.59259	19.13876	16.14907	16.66667
16.66667	19.13876	16.14907	14.85714
18.20988	18.66029	16.14907	18.28571
17.28395	18.18182	16.77019	16.66667
16.66667	17.70335	16.45963	16.04762
13.88889	16.74641	14.90683	13.38095
12.65432	12.91866	11.49068	12.7619
10.49383	13.39713	12.1118	5.47619
14.19753	15.311	13.97516	10.80952
20.37037	22.96651	20.49689	20.42857
16.97531	18.18182	18.32298	16.47619
19.44444	22.00957	18.63354	18.90476
17.28395	18.66029	16.77019	16.80952
25.30864	27.27273	23.91304	23.52381
15.12346	16.74641	15.83851	14.09524
16.97531	17.22488	17.08075	17.04762
11.41975	12.91866	11.80124	9.809524

18.82716	20.57416	18.63354	18.61905
21.2963	22.48804	21.42857	18.09524
23.14815	24.88038	24.2236	21.52381
31.79012	33.49282	31.0559	31.47619
16.04938	17.70335	18.63354	15
20.67901	21.5311	20.49689	17.85714
13.58025	14.83254	14.90683	11.80952
16.97531	18.66029	17.08075	15.90476
16.97531	18.18182	16.77019	16.28571
14.50617	15.311	14.59627	12.09524
18.20988	19.13876	18.01242	14.61905
25.61728	26.79426	23.29193	22.66667
24.07407	25.83732	25.7764	25.80952
22.83951	24.88038	21.42857	29.90476
22.83951	22.96651	22.67081	24.14286
11.65644	12.85714	12.3839	9.952381
19.0184	19.52381	17.64706	17.66667
20.8589	22.85714	22.29102	19.61905
16.87117	18.09524	17.02786	16.09524
17.79141	19.52381	17.95666	15.19048
44.47853	49.52381	46.13003	39.2381
17.79141	19.04762	17.64706	17.33333
20.2454	22.38095	20.43344	18.57143
14.41718	17.14286	17.64706	12.90476
18.40491	20	19.50464	17.14286
16.25767	17.61905	16.40867	13.38095
18.40491	19.04762	17.64706	15.85714
18.71166	19.04762	17.64706	18.47619
20.2454	20.95238	18.88545	21.04762
19.93865	20.47619	17.95666	20.71429
12.88344	12.38095	11.14551	12.33333
16.56442	17.14286	15.47988	14.85714
15.03067	16.66667	14.86068	13.42857
31.59509	34.28571	33.43653	28.33333
23.92638	25.2381	24.7678	21.2381
23.31288	23.80952	21.98142	22.38095
20.55215	21.42857	18.57585	21.42857
13.49693	14.7619	14.24149	12.47619
16.25767	18.09524	16.40867	15.47619
15.64417	16.66667	15.17028	14.28571
15.33742	17.14286	14.86068	13.66667
15.95092	16.19048	15.17028	13.80952
18.71166	20.47619	18.26625	16.95238
17.48466	18.57143	17.02786	15.7619
17.79141	19.52381	17.02786	16.2381
15.95092	18.09524	16.09907	14.57143
19.32515	22.38095	20.12384	17

23.00613	24.28571	20.74303	22.52381
14.11043	15.2381	13.62229	12.85714
14.72393	15.71429	14.55108	13.85714
15.64417	17.14286	15.47988	14.38095
17.17791	18.57143	17.64706	17.14286
14.72393	16.19048	14.24149	15.14286
16.87117	18.09524	15.47988	16.57143
17.17791	19.04762	16.09907	16.95238
16.56442	18.09524	15.78947	16.47619
17.48466	18.57143	15.47988	17.38095
17.48466	18.09524	16.71827	16.66667
19.0184	20	17.64706	18.80952
20.55215	20.95238	18.57585	20.33333
19.32515	20.95238	18.88545	20.66667
21.77914	22.38095	19.81424	21.80952
19.6319	20	18.57585	18.42857
18.71166	20	17.64706	18.19048
18.71166	19.52381	17.64706	18.19048
15.33742	16.19048	14.86068	13.04762
13.49693	14.28571	12.3839	12.09524
16.87117	18.09524	16.40867	17.71429
18.40491	19.04762	16.71827	17.14286
18.09816	19.52381	17.33746	16.42857
16.56442	17.14286	15.78947	13.47619
18.40491	19.52381	17.33746	18.61905
19.6319	20.47619	17.95666	19.14286
17.79141	19.04762	16.71827	18
17.48466	19.04762	17.02786	17.38095
17.17791	18.57143	14.55108	15.2381
15.64417	16.66667	16.09907	13.57143
16.25767	17.14286	15.17028	14
15.33742	16.66667	15.78947	14.38095
17.48466	18.09524	16.40867	15.71429
17.17791	17.61905	15.78947	14.2381
16.87117	19.04762	17.02786	15.66667
16.87117	18.57143	17.02786	14.42857
18.09816	19.52381	17.95666	17.66667
19.93865	20.95238	18.57585	19
20.55215	20.47619	18.57585	20.28571
17.79141	19.52381	17.33746	17.52381
17.17791	18.57143	16.71827	17
17.17791	18.57143	15.78947	15.85714
16.25767	17.61905	16.40867	14.90476
15.33742	17.14286	15.17028	13.95238
15.03067	15.71429	14.55108	13.38095
15.64417	16.66667	15.17028	14.52381
16.56442	17.14286	15.17028	15.71429

16.87117	18.09524	16.40867	17.57143
18.40491	19.52381	16.40867	17.42857
19.6319	20.47619	17.64706	18.71429
19.93865	20.47619	17.64706	19.57143
17.17791	18.57143	15.78947	17.71429
15.64417	16.66667	14.24149	14.85714
18.09816	20	17.33746	17.19048
15.03067	16.19048	14.55108	14.47619
16.25767	18.09524	16.09907	16
15.33742	18.09524	15.47988	12.57143
18.71166	20.47619	18.57585	14.2381
15.33742	16.66667	14.24149	13.09524
16.56442	18.09524	16.40867	15.19048
18.09816	20	19.19505	16.71429
24.23313	25.2381	24.14861	22.66667
22.08589	22.85714	19.50464	22
20.2454	21.42857	17.95666	19.90476
20.2454	20.47619	18.26625	18.95238
21.77914	22.85714	20.12384	20.71429
24.84663	26.66667	24.4582	24.52381
24.23313	25.71429	21.98142	23.14286
23.61963	25.2381	21.67183	23.04762
20.2454	21.42857	19.19505	20.2381
21.16564	22.38095	21.36223	23.47619
18.40491	19.04762	17.64706	18.52381
21.16564	21.42857	20.43344	18.95238
18.09816	19.04762	18.88545	16.04762
17.17791	17.61905	17.33746	15.04762
14.72393	15.2381	15.47988	12.90476
16.25767	17.61905	15.78947	15.19048
14.41718	15.2381	13.93189	13.90476
16.25767	17.61905	15.47988	15.04762
26.38037	26.66667	24.4582	26.14286
19.32515	20.47619	19.50464	18.04762
19.93865	20.47619	18.88545	18.42857
18.71166	19.04762	17.64706	16.57143
17.48466	19.04762	17.95666	16.61905
19.32515	20.47619	18.57585	18.09524
16.66667	18.18182	17.08075	14.42857
15.74074	16.26794	15.52795	14
17.90123	18.66029	16.45963	16
19.1358	19.61722	19.25466	18.42857
16.35802	15.311	15.52795	14.57143
18.82716	19.13876	18.63354	17.19048
18.82716	21.05263	21.73913	17.52381
14.81481	15.78947	15.52795	13.33333
17.28395	17.70335	16.14907	16.90476

19.75309	20.09569	18.63354	19.42857
17.59259	18.18182	18.63354	16.47619
16.35802	17.22488	15.52795	15.66667
18.20988	19.61722	20.80745	16.7619
11.7284	12.91866	11.80124	10.47619
20.37037	20.09569	21.42857	18.14286
16.97531	18.66029	17.3913	15.33333
17.59259	18.18182	18.32298	16.14286
21.2963	21.5311	19.87578	23.28571
20.98765	20.09569	19.87578	19.80952
18.51852	18.18182	15.83851	17.09524
17.28395	17.22488	17.08075	15.57143
13.2716	14.83254	14.28571	12.7619
12.65432	14.35407	13.6646	11.80952
17.59259	18.66029	17.3913	17.28571
16.04938	16.26794	14.90683	14.66667
14.19753	16.26794	15.21739	13.33333
12.03704	13.8756	13.35404	9.095238
25.30864	26.79426	25.7764	19.04762
15.4321	16.74641	16.45963	13.33333
16.66667	17.70335	15.52795	14.95238
13.88889	14.35407	14.90683	13.38095
15.4321	16.74641	15.52795	13.57143
18.20988	19.13876	18.32298	19.80952
16.66667	16.74641	14.90683	17.38095
19.1358	19.13876	18.9441	20.57143
19.1358	20.09569	17.70186	20.14286
19.44444	20.57416	18.9441	20.09524
20.06173	21.5311	19.87578	20.61905
24.07407	23.92344	21.42857	25.38095
16.04938	17.22488	17.3913	14.42857
17.59259	18.66029	17.70186	15.28571
19.1358	20.09569	17.3913	19.2381
23.76543	25.35885	24.2236	24.38095
17.28395	18.66029	18.9441	16.85714
12.65432	13.39713	12.73292	10.19048
24.38272	28.70813	28.57143	18.33333
19.75309	22.96651	22.36025	15.42857
23.76543	24.88038	26.39752	20.09524
19.1358	20.09569	18.63354	20.42857
10.80247	11.00478	9.006211	9.809524
14.50617	15.311	13.04348	12.7619
12.96296	14.83254	12.42236	13.90476
14.81481	15.78947	13.6646	13.52381
18.20988	18.66029	17.3913	16.38095
15.4321	17.22488	14.28571	14.7619
23.45679	23.92344	18.9441	23.52381

16.04938	17.22488	15.21739	14.85714
24.07407	23.92344	19.87578	24.28571
15.4321	16.74641	14.90683	15.7619
17.28395	18.66029	15.83851	17.09524
18.51852	19.13876	16.77019	16.95238
19.44444	20.09569	17.70186	18.7619
16.97531	18.18182	15.21739	16.28571
16.66667	18.18182	14.90683	17.52381
13.58025	14.35407	13.04348	13.38095
14.50617	14.83254	12.42236	14.95238
15.4321	15.78947	13.6646	14.85714
18.82716	19.13876	17.08075	17.90476
18.20988	20.09569	16.77019	17.71429
21.91358	23.44498	19.25466	24.47619
19.75309	20.57416	18.01242	19.71429
10.80247	11.96172	9.937888	9.761905
15.74074	16.26794	14.28571	13.71429
14.81481	16.26794	14.59627	13.42857
12.96296	14.83254	13.04348	11.85714
23.45679	25.35885	23.29193	22.09524
18.82716	21.5311	19.56522	17.2381
16.97531	18.66029	16.14907	15.04762
20.06173	21.05263	18.63354	19.47619
15.4321	16.26794	14.59627	15
19.75309	21.5311	18.9441	19.57143
13.88889	15.311	12.42236	14.19048
18.82716	20.09569	16.45963	18.80952
19.1358	21.5311	18.32298	17.57143
17.28395	18.18182	16.14907	16.57143
16.66667	18.66029	16.77019	16.38095
14.19753	15.311	13.6646	13.90476
15.4321	16.74641	13.97516	15.90476
14.50617	15.311	13.6646	14.66667
14.50617	15.311	15.52795	14.2381
14.50617	15.78947	12.73292	13.19048
15.12346	16.74641	13.35404	15.42857
17.28395	18.18182	14.90683	15.90476
16.04938	17.70335	15.21739	15.95238
12.34568	14.83254	12.73292	12.7619
15.12346	15.311	13.6646	13.38095
21.91358	22.96651	18.63354	24.28571
19.1358	20.57416	17.08075	18.85714
19.75309	20.57416	17.3913	18.80952
16.35802	17.70335	15.52795	15.57143
16.66667	18.18182	15.83851	16.04762
15.74074	18.18182	15.52795	14.80952
14.50617	15.78947	13.97516	14.61905

14.50617	15.78947	13.97516	14.90476
15.4321	16.74641	15.21739	15.71429
12.34568	13.8756	11.49068	11.95238
17.90123	18.66029	16.14907	16.95238
17.90123	18.18182	16.45963	19.57143
16.35802	17.70335	15.21739	15.80952
16.04938	18.18182	16.45963	15.7619
14.81481	15.78947	13.97516	13.80952
21.60494	22.96651	19.56522	21.19048
17.90123	20.57416	17.70186	18.61905
18.82716	19.61722	16.45963	17.57143
16.35802	18.18182	17.08075	14.95238
15.12346	16.74641	17.70186	13.95238
15.74074	17.22488	17.3913	13.71429
11.11111	12.91866	12.1118	9.47619
10.80247	12.91866	12.1118	9.047619
13.58025	15.78947	15.21739	11.47619
20.98765	21.05263	20.18634	24.47619
13.88889	15.78947	14.28571	11.57143
15.12346	16.26794	16.14907	13.7619
16.35802	17.70335	18.01242	15.42857
15.12346	17.22488	17.08075	15.14286
14.50617	16.26794	15.52795	14.04762
2.147239	1.904762	1.857585	2.142857
4.294479	4.285714	3.71517	7.238095
21.16564	21.90476	20.43344	19.28571
17.79141	19.04762	18.88545	18.09524
18.40491	17.14286	17.33746	19.42857
3.680982	3.333333	3.095975	4.571429
18.71166	18.09524	18.88545	19.61905
22.39264	21.90476	21.98142	21.42857
17.48466	17.14286	16.71827	16.09524
3.374233	3.333333	2.786378	4.142857
21.77914	22.85714	21.98142	20.71429
22.08589	21.42857	21.36223	20.80952
17.17791	17.14286	17.02786	16.52381
16.56442	17.14286	16.09907	15
15.95092	16.19048	15.78947	16
14.11043	14.28571	14.55108	13.57143
	1.428571		1.333333
16.25767	17.61905	16.09907	15
32.82209	33.33333	30.95975	35.33333
13.19018	13.80952	13.62229	12.61905
16.87117	17.14286	16.71827	14.33333
15.64417	15.71429	15.78947	14.80952
2.147239	1.904762	1.857585	2
14.72393	15.2381	14.55108	11.57143

21.77914	20.95238	19.81424	18.33333
13.19018	13.33333	13.31269	12.52381
15.03067	16.19048	15.47988	12.28571
1.840491	1.904762	#VALUE!	1.761905
13.49693	14.28571	14.55108	13.47619
2.147239	2.380952	2.167183	2.190476
15.95092	16.19048	15.17028	12.71429
17.48466	18.09524	17.33746	17.04762
19.0184	17.61905	15.78947	25.80952
3.680982	3.809524	3.71517	4.047619
15.95092	16.19048	16.40867	14.28571
5.214724	6.190476	6.501548	4.095238
3.680982	3.333333	3.405573	2.619048
13.19018	13.33333	13.93189	9.857143
17.17791	17.14286	17.02786	16.90476
14.72393	14.7619	15.47988	13.14286
12.26994	12.38095	13.31269	14.09524
23.61963	22.38095	21.98142	21.33333
16.56442	17.61905	17.02786	14.47619
3.374233	3.333333	2.786378	3.190476
15.33742	16.66667	17.33746	14.04762
15.33742	16.19048	16.09907	13.66667
16.87117	17.61905	17.33746	14.7619
15.33742	16.66667	17.02786	15.80952
17.79141	18.57143	17.95666	14.95238
19.93865	20.47619	20.12384	24.95238
2.147239	2.380952	2.47678	2.142857
19.6319	22.38095	20.43344	17.80952
3.067485	2.857143	2.786378	2.571429
14.72393	15.71429	14.55108	14.14286
18.71166	19.52381	18.88545	18.2381
18.71166	19.52381	17.95666	17.38095
5.521472	6.190476	5.572755	6.380952
15.03067	16.19048	16.09907	14.47619
3.98773	4.285714	4.024768	3.761905
15.33742	15.71429	15.47988	13.04762
15.95092	16.66667	15.17028	16.71429
8.895706	9.52381	9.907121	8.380952
4.294479	4.285714	4.024768	3.571429
15.95092	16.66667	15.78947	14.2381
7.361963	7.142857	7.120743	8.428571
17.79141	19.04762	18.26625	16.80952
16.56442	17.14286	16.71827	17
18.71166	19.52381	19.50464	18.71429
21.16564	23.80952	23.21981	21.61905
16.87117	17.61905	17.33746	15
16.56442	17.61905	17.64706	15.2381

21.47239	20.95238	20.74303	23.7619
19.0184	20	20.12384	18.33333
18.71166	20	20.43344	17.2381
9.815951	9.52381	9.907121	11.04762
17.17791	18.57143	18.88545	17.47619
16.56442	17.61905	16.71827	16.04762
17.17791	17.61905	17.64706	16.33333
16.25767	17.61905	17.95666	17.14286
13.49693	14.7619	14.55108	12.38095
7.361963	7.619048	7.739938	6.809524
13.80368	15.2381	14.24149	12.09524
15.33742	16.19048	16.09907	15.42857
11.96319	13.33333	12.6935	11.85714
20.55215	21.42857	20.74303	19.33333
19.32515	20.47619	20.12384	19.2381
18.71166	20	17.64706	16.2381
24.23313	25.2381	21.98142	20.33333
23.61963	24.7619	21.67183	20.66667
14.72393	15.71429	13.62229	12.66667
15.03067	16.19048	15.17028	13.19048
18.40491	19.04762	18.26625	15.61905
12.26994	13.33333	12.3839	10.85714
11.34969	11.90476	10.83591	9.904762
12.88344	13.80952	12.0743	11.19048
19.93865	20	17.95666	17.71429
16.25767	18.57143	17.02786	15.42857
15.03067	15.2381	14.55108	12.90476
19.6319	20.47619	18.88545	19.04762
15.03067	16.66667	15.17028	13.14286
24.53988	24.28571	21.36223	26.61905
14.41718	15.2381	14.55108	12.33333
19.6319	20.95238	19.19505	16.2381
16.87117	18.57143	16.09907	13.66667
14.72393	16.19048	13.62229	11.09524
11.65644	13.33333	11.76471	9.238095
17.48466	18.57143	16.71827	15.28571
14.41718	15.71429	13.93189	13.42857
17.17791	18.57143	17.02786	15.2381
14.72393	16.19048	14.86068	11.85714
15.95092	15.2381	14.24149	18.09524
12.88344	13.80952	12.0743	10.80952
11.96319	13.33333	11.45511	10.52381
12.88344	13.80952	12.0743	12.42857
15.33742	15.2381	13.62229	16.85714
12.26994	12.85714	12.0743	10.09524
12.26994	13.33333	11.76471	10.71429
11.04294	12.38095	10.52632	9.285714

15.95092	16.66667	15.78947	15.2381
16.56442	16.66667	15.17028	18.7619
12.88344	13.80952	12.6935	11.2381
17.17791	17.14286	14.86068	14.7619
15.03067	15.71429	14.55108	13.38095
15.03067	16.66667	15.17028	12.14286
15.03067	16.19048	14.24149	12.38095
16.56442	17.61905	15.47988	13.90476
17.17791	18.57143	16.40867	14.2381
13.49693	14.28571	11.76471	13.7619
13.80368	15.71429	13.93189	11.52381
12.26994	13.33333	12.3839	9.380952
11.65644	12.85714	11.45511	9.333333
14.72393	15.2381	13.31269	14.28571
15.64417	17.61905	15.47988	14.04762
10.7362	11.42857	10.83591	9.571429
14.11043	14.28571	13.0031	13.33333
14.41718	15.71429	13.31269	13.71429
15.03067	15.71429	13.93189	12.33333
12.57669	14.28571	13.0031	10.28571
13.80368	15.2381	14.55108	11.38095
9.202454	9.52381	8.359133	9.142857
11.04294	11.90476	10.83591	9.190476
12.57669	14.7619	12.0743	11.33333
14.11043	14.7619	12.3839	13.66667
13.19018	14.7619	12.3839	12.04762
21.47239	20.47619	17.64706	28.71429
12.57669	14.28571	12.3839	9.571429
14.11043	14.7619	13.62229	10.95238
11.96319	12.85714	11.45511	11.38095
8.588957	9.52381	8.049536	6.380952
9.815951	11.42857	9.907121	7.714286
12.57669	13.33333	12.0743	11.47619
12.26994	12.85714	12.0743	11.33333
14.72393	14.7619	13.0031	15.14286
8.282209	9.047619	8.668731	5.428571
10.42945	12.38095	11.14551	8.666667
9.509202	10.95238	9.907121	8.619048
16.87117	17.61905	16.71827	14.7619
17.48466	18.09524	18.26625	15.42857
17.48466	18.09524	17.33746	15.90476
21.16564	20.95238	20.74303	20.14286
31.59509	27.61905	24.7678	45.14286
8.588957	9.047619	8.049536	7.904762
17.48466	17.61905	17.64706	14.09524
19.0184	20	18.88545	16.47619
19.32515	19.52381	19.19505	16.14286

19.93865	20.95238	19.19505	17.57143
20.8589	21.42857	20.12384	17.47619
18.71166	18.57143	17.33746	14.7619
17.79141	18.09524	16.71827	13.95238
17.48466	18.09524	17.95666	15.2381
16.56442	17.61905	16.71827	13.28571
20.8589	20.95238	20.12384	18.7619
21.47239	20.47619	19.19505	21.38095
19.0184	18.57143	17.02786	22.28571
27.30061	27.61905	26.31579	24.42857
22.69939	22.38095	20.74303	20.04762
26.68712	26.66667	25.387	23.80952
22.39264	22.38095	21.67183	20.09524
18.40491	19.04762	17.64706	17.7619
21.47239	21.42857	19.50464	20.42857
23.92638	23.33333	21.67183	21.80952
27.30061	25.2381	23.21981	30.7619
5.828221	5.714286	5.263158	6.952381
15.95092	17.14286	15.47988	14.52381
18.40491	19.52381	17.64706	16.95238
17.48466	16.66667	16.40867	15.2381
22.39264	22.38095	21.05263	22.33333
40.4908	37.14286	34.98452	47.14286
26.68712	26.66667	23.83901	24.52381
27.91411	27.61905	26.00619	28
16.87117	16.66667	15.78947	15.38095
19.0184	19.52381	18.88545	17.47619
24.23313	23.80952	22.60062	31.42857
19.6319	20.47619	20.43344	19
29.7546	30	30.03096	26.19048
16.87117	17.14286	16.71827	15.47619
16.87117	17.14286	17.02786	14.52381
18.71166	18.57143	17.33746	17.57143
18.71166	20.47619	19.50464	17.28571
27.91411	23.80952	26.00619	37.14286
4.601227	5.238095	4.643963	3.809524
102.7607	101.9048	87.9257	126.6667
15.03067	16.19048	15.17028	13.19048
20.2454	20.95238	19.19505	19
4.294479	4.285714	4.024768	3.142857
15.64417	16.66667	14.55108	12.47619
16.25767	17.61905	16.09907	14.80952
14.41718	15.2381	13.93189	14.7619
1.840491	1.904762	2.167183	1.761905
19.0184	21.42857	19.81424	18.04762
17.48466	19.04762	19.19505	16.14286
2.760736	2.857143	2.786378	3.619048

18.71166	19.52381	15.78947	17.04762
15.03067	15.71429	15.17028	13.61905
3.680982	3.809524	3.405573	4.571429
35.58282	33.33333	32.19814	48.57143
23.00613	23.80952	21.67183	22.2381
23.31288	23.33333	22.91022	35.28571
12.26994	13.80952	12.3839	10.28571
20.8589	20.95238	20.43344	18.57143
23.61963	22.85714	21.98142	25.33333
16.87117	18.57143	16.40867	18.52381
37.42331	37.14286	36.53251	56.66667
15.95092	18.57143	17.95666	12.38095
19.93865	21.42857	20.12384	15.19048
11.34969	12.85714	12.3839	10.04762
17.17791	18.57143	17.64706	14.42857
20.55215	22.38095	19.81424	20
15.64417	14.7619	15.17028	18.66667
13.19018	16.66667	14.55108	9.095238
21.47239	23.33333	21.36223	17.66667
19.0184	20	20.12384	15.66667
18.71166	18.09524	17.64706	26.47619
19.0184	20.95238	21.05263	18.33333
22.08589	23.33333	21.67183	22.04762
18.40491	20	17.02786	14.7619
19.0184	20.95238	19.50464	16.71429
17.17791	19.04762	17.95666	15.95238
17.48466	18.09524	17.33746	15.14286
9.815951	9.52381	8.668731	12.95238
16.25767	14.7619	15.17028	26.19048
2.453988	2.857143	3.71517	2.666667
14.11043	14.7619	14.24149	13.47619
16.56442	16.66667	16.09907	15.85714
19.93865	19.04762	18.57585	19.38095
16.25767	16.19048	16.40867	17.85714
10.7362	10.95238	12.0743	14.57143
2.453988	2.380952	2.167183	2.619048
18.71166	19.52381	19.50464	14.28571
15.64417	16.19048	16.40867	16.2381
14.72393	15.71429	16.71827	11.80952
56.13497	49.04762	45.82043	99.04762
15.33742	16.19048	16.71827	13.28571
17.17791	18.09524	19.19505	14.85714
16.87117	15.71429	15.47988	21.28571
12.88344	13.80952	14.24149	12.71429
21.47239	21.90476	20.74303	15.28571
17.17791	18.09524	17.33746	15.33333
16.56442	16.19048	15.17028	16.04762

3.374233	3.333333	3.095975	3.47619
14.41718	15.2381	15.17028	13.61905
17.17791	17.14286	16.09907	20.71429
19.32515	18.09524	17.33746	19.42857
2.147239	2.380952	2.47678	2.190476
22.08589	18.57143	17.64706	31.57143
15.03067	15.71429	15.78947	12.47619
23.31288	23.33333	22.29102	26.28571
16.56442	16.19048	16.09907	13.61905
3.680982	2.857143	4.024768	3.380952
16.25767	16.66667	17.02786	14.09524
18.40491	18.09524	17.95666	16.7619
18.09816	18.09524	18.26625	15.85714
17.48466	18.09524	17.95666	19.28571
3.680982	3.809524	3.095975	2.380952
20.2454	19.52381	19.50464	33.95238
12.88344	12.85714	13.0031	9.952381
9.815951	9.52381	9.907121	12.2381
13.49693	12.38095	11.76471	15.2381
	1.904762		1.142857
18.09816	18.09524	17.02786	18.42857
16.87117	16.66667	16.09907	15
13.19018	12.38095	11.76471	13.42857
11.65644	12.38095	12.3839	15.61905
3.374233	3.333333	3.71517	2.714286
14.41718	15.71429	13.62229	11.09524
15.64417	14.7619	14.55108	12.90476
20.2454	19.52381	17.95666	19.95238
6.441718	6.666667	6.501548	5.047619
20.2454	20	19.81424	17.47619

Appendix IV

Handheld XRF data provided by WVGES.

461 samples were analyzed with a Bruker Tracer i5 Handheld X-Ray Fluorescence (hhXRF) spectrometer equipped with a SDD graphene window detector and 50 kV Rh X-ray tube. Analyses were either conducted on the sample surface or samples were powdered using a mortar and pestle and tested in a sample mount. All samples were run with air under an 8mm spot window. Two different applications were run to test the variability of the applications. MudrockAir Dual, a calibration for sedimentary rocks with the elemental range of Na-U, was conducted at 90/180 second phase intervals and GeoExploration, calibrated for oxide analysis of certain elements with the elemental range of MgO to U was conducted at 60/60/60 second intervals. All data was reported in weight percent (wt %) and then converted to parts per million (ppm). If data were reported with <LOD or if the error is more than the reported value, the element is not detected.

ID	Na	Na Err	Mg	Mg Err	Al	Al Err	Si	Si Err	P	P Err	S
OGS-CSH0001A	1171	1157	2811	755	98825	534	126536	336	145	25	8817
OGS-CSH0001B	0	1235	1841	733	126645	599	153413	374	113	28	2208
OGS-CSH0002	3903	957	3948	570	27478	286	68662	230	64	18	10513
OGS-CSH0003A	1735	1053	2179	508	32952	302	61311	217	72	16	4584
OGS-CSH0003B	3468	1130	4553	625	77195	457	147445	351	0	20	2093
OGS-CSH0003C	2453	1185	3469	538	59705	398	120659	312	0	16	854
OGS-CSH0003D	3105	1301	2333	530	61061	403	125764	318	22	17	1103
OGS-CSH0003E	3051	1285	3622	566	63840	416	138310	337	0	18	942
OGS-CSH0003F	2523	1111	4335	640	84223	483	180617	394	25	23	579
OGS-CSH0004A	2774	1125	5139	726	68238	455	153673	374	0	26	341
OGS-CSH0004B	3077	1168	7420	720	83555	497	195807	423	114	26	316
OGS-CSH0004C	3907	1217	9114	791	100490	550	188942	423	87	27	297
OGS-CSH0005	1734	1115	3713	618	80282	463	160544	364	0	22	274
OGS-CSH0006	2636	1390	13428	1125	75790	572	209893	519	390	35	573
OGS-CSH0007	2653	1189	8728	849	65607	464	202985	444	773	40	668
OGS-CSH0008A	2674	1041	4884	705	62608	430	145113	356	280	25	4468
OGS-CSH0008B	2653	1081	6936	710	74168	467	166474	386	39	23	2072
OGS-CSH0008C	1598	1200	6428	771	73661	478	185876	416	268	28	3664
OGS-CSH0009A	2000	1175	5753	764	104596	553	219832	446	68	27	4701
OGS-CSH0009B	1367	1349	4293	900	74046	495	177333	410	254	30	16049
OGS-CSH0010	1842	1163	9596	776	36099	346	161138	383	122	33	510
OGS-CSH0011	2397	1139	5818	731	51439	397	141311	351	0	23	8183
OGS-CSH0012	2856	1043	6092	638	63839	420	153046	359	0	23	550
OGS-CSH0013	3197	1185	6784	767	49601	411	225122	466	342	30	545
OGS-CSH0014A	3042	1244	8882	855	97151	557	227206	473	131	30	3833
OGS-CSH0014B	3371	1082	6928	791	57205	438	138992	370	37	23	1519
OGS-CSH0015A	0	1932	0	457	29632	298	72950	244	45	15	849
OGS-CSH0015B	2886	1111	5085	677	91840	513	177156	398	25	24	537
OGS-CSH0015C	0	1582	2100	788	56255	483	106096	358	69	25	4790
OGS-CSH0016A	1493	1398	3374	787	83358	550	209758	481	49	30	481
OGS-CSH0016B	1733	1439	3941	807	75844	549	178639	465	61	30	462
OGS-CSH0016C	2395	1147	4589	672	79935	478	194910	413	0	24	520
OGS-CSH0017A	1469	1443	2908	905	67098	520	136261	400	496	34	7885

OGS-CSH0017B	0	1441	2586	808	96237	567	182065	432	851	38	2555
OGS-CSH0017C	4001	1198	3957	941	47192	457	93144	337	131	25	6201
OGS-CSH0017D	2678	1407	5554	822	120903	668	160954	439	148	29	919
OGS-CSH0017E	3343	1187	5462	780	75904	503	155622	396	124	25	2201
OGS-CSH0018A	2595	1303	7276	838	70521	500	161944	416	67	26	1122
OGS-CSH0018B	3041	1477	8665	959	81341	593	184380	494	35	31	923
OGS-CSH0018C	2583	1220	6563	818	76465	500	179524	421	318	30	2152
OGS-CSH0019A	1957	1422	4600	867	53668	475	159877	440	524	34	1653
OGS-CSH0019B	0	1480	4919	1068	55529	511	159392	455	1274	46	10168
OGS-CSH0020A	2398	1533	3523	1018	35795	422	91487	340	1892	46	13894
OGS-CSH0020B	0	1572	3629	981	46455	484	145188	448	401	36	7975
OGS-CSH0021A	2758	1204	3912	864	67095	487	163601	409	131	28	7019
OGS-CSH0021B	1931	1118	4607	787	68551	471	174770	407	53	25	5008
OGS-CSH0021C	3412	1104	4180	833	43632	410	112185	344	0	22	3338
OGS-CSH0021D	1726	1226	2446	770	94289	540	187186	419	239	29	7072
OGS-CSH0021E	3362	1131	4414	791	55412	438	138268	371	0	23	3084
OGS-CSH0021F	3186	1076	6488	722	68790	455	173214	397	35	23	1125
OGS-CSH0021G	0	1421	4223	881	57520	483	135019	398	106	28	1664
OGS-CSH0022A	3334	1317	3400	890	40599	388	108488	319	211	26	30526
OGS-CSH0022B	3161	1191	8537	821	112751	590	208628	451	45	28	1383
OGS-CSH0022C	2641	1116	4625	697	65565	440	186121	403	79	24	6333
OGS-CSH0023A	0	1351	3236	909	77388	502	185218	411	193	30	25527
OGS-CSH0023B	2493	1316	4392	919	47173	417	110314	328	245	27	25216
OGS-CSH0023C	0	1351	6636	962	87737	588	202604	491	107	33	3338
OGS-CSH0023D	1983	1231	3890	795	61258	434	138643	348	119	26	16418
OGS-CSH0024A	2641	1337	7402	911	74001	566	195786	508	82	33	648
OGS-CSH0024B	3003	1299	7757	908	67824	535	189277	490	46	31	655
OGS-CSH0024C	2819	1758	6751	1111	69358	635	181657	562	54	38	599
OGS-CSH0024D	3375	989	4783	644	21496	278	74906	258	443	23	525
OGS-CSH0025	1754	1234	2972	707	48260	409	160738	397	60	25	3646
OGS-CSH0026	0	1458	3885	915	99392	630	215373	514	502	39	2121
OGS-CSH0027A	0	1294	3078	772	81013	526	155850	402	113	27	4353
OGS-CSH0027B	1721	1198	3385	738	86864	526	189200	430	55	28	2708
OGS-CSH0027C	2735	1223	3877	753	92677	556	181915	434	200	29	1494

OGS-CSH0027D	0	1383	2761	864	93694	594	182579	457	320	35	7842
OGS-CSH0027E	3145	1145	6192	707	103119	544	225608	451	67	26	832
OGS-CSH0027F	2289	1106	4390	655	72922	453	178951	391	48	23	655
OGS-CSH0027G	1957	1058	2912	613	52385	386	120721	317	62	20	2023
OGS-CSH0028A	2099	1582	1703	855	66836	549	114237	395	48	29	1483
OGS-CSH0028B	2818	1364	2428	663	93140	550	111710	340	62	22	1748
OGS-CSH0028C	0	1515	1807	725	77920	537	144369	405	58	26	1284
OGS-CSH0028D	2495	1189	3426	711	90667	522	145706	368	37	23	1840
OGS-CSH0028E	1340	1326	3765	747	77973	527	184280	447	42	27	959
OGS-CSH0028F	2543	1524	4263	841	92786	602	190253	480	85	31	440
OGS-CSH0028G	2352	1301	4245	764	75761	521	157252	415	59	27	505
OGS-CSH0029A	3096	1828	3782	844	52643	493	120497	402	210	28	2544
OGS-CSH0029B	2838	1226	5041	676	44202	372	111124	315	245	22	2014
OGS-CSH0029C	0	1541	5512	1057	61078	535	142661	440	545	37	846
OGS-CSH0030	3506	983	4676	792	31793	337	70364	255	210	25	13652
OGS-CSH0031	3281	1063	6911	750	63739	442	150140	370	67	24	3469
OGS-CSH0032A	4167	1004	4699	644	57329	409	130993	338	103	21	748
OGS-CSH0032B	3397	1281	2839	618	66753	436	138481	345	161	21	719
OGS-CSH0033A	0	1385	1963	753	74963	506	172006	421	41	28	259
OGS-CSH0033B	3058	1126	5363	693	88362	506	209172	433	0	25	252
OGS-CSH0033C	2562	1104	5696	700	85391	496	206054	428	0	24	248
OGS-CSH0033D	3367	1231	4192	593	60467	412	143151	348	0	19	256
OGS-CSH0033E	3838	1289	5311	752	80094	505	183355	421	104	24	275
OGS-CSH0033F	4373	1083	6316	745	70889	472	201771	436	60	26	345
OGS-CSH0033G	3048	1132	4936	701	82418	491	189397	412	35	25	583
OGS-CSH0033H	3205	1128	5580	785	83609	518	205130	447	90	28	423
OGS-CSH0033I	2266	1170	5897	780	84054	518	218518	461	33	27	358
OGS-CSH0033J	4027	1099	4094	753	61577	447	178865	412	87	26	533
OGS-CSH0034A	1881	1411	2601	884	67557	520	154785	422	975	41	12570
OGS-CSH0034B	1945	1138	2228	736	79929	495	169029	395	394	30	3616
OGS-CSH0034C	1951	1143	3285	701	80717	488	193986	416	127	26	2173
OGS-CSH0034D	0	1607	2057	822	65119	508	158486	430	128	30	1283
OGS-CSH0034E	0	2021	2066	881	74601	573	177370	482	111	33	675
OGS-CSH0035A	0	1942	1220	847	79048	575	166920	457	670	42	4899

OGS-CSH0035B	1624	1294	1856	731	66221	474	145011	380	721	34	5634
OGS-CSH0035C	0	1304	1662	733	71943	485	163719	399	361	32	4046
OGS-CSH0036A	1957	1164	3157	807	75889	492	171261	401	342	31	7608
OGS-CSH0036B	0	1806	1321	828	68669	526	134209	399	207	34	5375
OGS-CSH0036C	0	1829	1706	861	75482	573	157042	454	128	34	2157
OGS-CSH0036D	3528	1031	3777	603	54081	387	147905	347	115	21	1354
OGS-CSH0037A	2088	1210	5206	809	88353	521	194327	425	204	30	7148
OGS-CSH0037B	1715	1165	4355	786	101039	546	192899	418	105	28	7028
OGS-CSH0037C	2090	1192	4821	661	84204	484	215630	430	0	24	769
OGS-CSH0037D	1661	1261	5826	732	100596	538	219121	443	85	27	2217
OGS-CSH0038A	1436	1220	4123	818	52322	419	163550	389	207	28	12436
OGS-CSH0038B	1550	1242	2977	784	61276	443	160457	382	301	28	8718
OGS-CSH0038C	2906	1148	3794	695	90479	506	180672	397	102	25	3637
OGS-CSH0038D	2657	1160	4614	709	104944	547	202698	426	36	26	1371
OGS-CSH0039	2195	1120	4348	683	92679	512	213416	433	242	28	777
OGS-CSH0040	3359	1389	5308	1529	60214	612	115863	440	299	37	11013
OGS-CSH0041A	2663	1135	4453	651	84785	485	154574	365	41	22	1106
OGS-CSH0041B	3124	1040	4131	634	71805	448	165968	376	42	22	1353
OGS-CSH0041C	3262	1073	4943	671	85730	492	199318	417	60	24	1259
OGS-CSH0041D	2298	1033	2535	706	62560	431	147218	357	48	23	6414
OGS-CSH0041E	3489	1084	3478	669	64763	436	178758	394	69	24	2578
OGS-CSH0041F	2253	1143	3525	796	70177	487	191696	436	185	28	1479
OGS-CSH0041G	2075	1249	2836	951	65429	509	148989	411	214	30	3928
OGS-CSH0041H	2339	1181	4044	1012	64448	518	147916	419	365	31	4540
OGS-CSH0042A	2436	1131	4297	648	77728	467	215072	429	28	24	432
OGS-CSH0042B	2799	1173	5769	753	105629	565	230250	466	88	28	736
OGS-CSH0042C	3073	1167	3984	640	55811	411	119413	327	41	19	656
OGS-CSH0042D	3483	1144	7409	786	115350	598	220588	466	160	29	698
OGS-CSH0042E	3900	1111	6865	713	104237	547	204120	431	90	25	554
OGS-CSH0042F	2662	1166	5328	842	75454	507	171833	419	206	29	1659
OGS-CSH0042G	3871	1063	6414	733	72759	471	155231	380	140	24	722
OGS-CSH0043A	0	1220	2186	725	67825	448	207456	421	81	26	9788
OGS-CSH0043B	0	1222	3363	716	78256	477	215560	431	66	26	7905
OGS-CSH0043C	2539	1187	5075	664	90728	506	170625	388	29	22	471

OGS-CSH0044A	2539	1069	3640	620	76801	456	173281	380	77	23	617
OGS-CSH0044B	1146	1093	2227	585	60922	405	160007	358	29	21	414
OGS-CSH0044C	0	1159	1580	575	60038	407	196007	399	84	23	385
OGS-CSH0045	2398	1267	9598	1031	74542	547	170846	453	389	34	445
OGS-CSH0046A	2503	1068	3267	735	66121	446	145899	359	88	25	7673
OGS-CSH0046B	2419	1170	4454	797	77460	500	192387	429	102	27	5542
OGS-CSH0046C	2929	1190	3027	700	53232	405	136581	347	34	22	6419
OGS-CSH0046D	2864	1203	7067	875	85564	546	201205	460	106	29	1770
OGS-CSH0047	2800	1095	5736	697	86692	501	232910	456	94	26	654
OGS-CSH0048A	2641	1161	6813	821	101386	567	213684	458	121	28	2809
OGS-CSH0048B	2270	1133	3195	610	65702	426	174934	381	0	21	1216
OGS-CSH0048C	2509	1197	3534	588	69033	433	165382	369	0	19	945
OGS-CSH0049A	3354	938	4788	644	26800	300	71812	250	614	25	1620
OGS-CSH0049B	2719	1386	5804	1108	64252	525	142698	412	2278	50	12427
OGS-CSH0050A	2444	1127	6264	700	95601	521	198639	420	86	24	749
OGS-CSH0050B	1831	1164	5199	787	83973	511	184608	417	158	27	3768
OGS-CSH0050C	2160	1196	9882	928	87705	547	210062	465	88	29	7899
OGS-CSH0050D	0	1255	7199	913	88704	537	218294	461	1379	44	5951
OGS-CSH0050E	0	1305	10752	1020	97304	582	221212	481	293	35	11563
OGS-CSH0050F	0	1405	6340	1054	72257	519	165478	416	1600	47	18038
OGS-CSH0051A	2948	1120	4802	710	101187	540	209512	434	42	26	1132
OGS-CSH0051B	2608	1094	6406	717	103434	544	218429	443	29	26	1247
OGS-CSH0051C	3671	1132	4911	640	75542	460	162659	374	23	22	919
OGS-CSH0051D	3622	1147	5653	686	85660	494	188399	408	49	24	663
OGS-CSH0052A	0	1211	3767	798	82298	513	151318	381	85	25	6118
OGS-CSH0052B	3750	1210	9127	755	119630	592	228104	463	98	26	658
OGS-CSH0052C	2577	1197	8072	858	85641	538	193781	447	74	27	665
OGS-CSH0052D	2669	1285	7521	887	83991	542	174371	431	328	30	2410
OGS-CSH0052E	2509	1130	7675	758	101154	546	202605	434	59	26	563
OGS-CSH0053	1921	1110	6100	775	76083	482	154791	378	68	25	2124
OGS-CSH0054	2092	1058	4795	680	80601	476	178456	392	28	23	2051
OGS-CSH0055	3074	1194	5827	780	81722	514	185716	428	37	25	999
OGS-CSH0056A	2918	1127	9738	857	100328	574	222494	477	138	29	553
OGS-CSH0056B	3644	1252	4137	839	77035	505	160134	394	67	27	10421

OGS-CSH0056C	2933	1114	5971	716	97059	530	212125	437	26	26	1228
OGS-CSH0056D	3507	1126	6419	692	106092	546	229294	452	0	25	541
OGS-CSH0057A	3089	1090	6307	720	94010	519	191126	413	175	27	1740
OGS-CSH0057B	1870	1196	4951	706	98300	532	215677	440	64	27	557
OGS-CSH0057C	3780	1159	5657	648	88384	494	192747	407	63	23	815
OGS-CSH0057D	3164	1140	6737	695	92813	514	214531	437	73	25	589
OGS-CSH0058A	2370	1385	12221	1099	104518	647	215909	517	959	43	357
OGS-CSH0058B	2071	1372	14034	1111	103068	636	225442	524	477	43	511
OGS-CSH0059A	3415	1179	8105	786	96525	545	219277	458	32	27	623
OGS-CSH0059B	3646	961	5706	648	29043	312	74064	257	41	17	564
OGS-CSH0060A	3390	1117	7814	753	83809	503	214956	447	0	26	1020
OGS-CSH0060B	3391	1079	6908	726	70963	465	184209	413	27	24	619
OGS-CSH0061A	1882	1095	5468	666	98296	520	206331	423	0	24	1025
OGS-CSH0061B	1869	1030	4776	645	80668	466	160613	366	0	22	1901
OGS-CSH0061C	3509	1134	7695	727	120361	583	244011	469	0	26	748
OGS-CSH0062A	3522	1187	7206	711	108414	557	226082	453	26	25	1033
OGS-CSH0062B	1551	1121	1496	689	93994	507	126199	328	3205	49	8717
OGS-CSH0062C	1570	1010	1903	598	82678	457	96682	278	1179	31	4551
OGS-CSH0062D	2223	1089	3168	653	81620	471	164407	371	724	31	1745
OGS-CSH0063A	2677	1227	4487	786	94659	539	208540	443	1698	43	1795
OGS-CSH0063B	4016	1321	5312	670	67889	445	150561	364	179	22	3641
OGS-CSH0063C	1627	1221	6124	823	76288	493	160998	391	157	27	7270
OGS-CSH0063D	3883	1095	7137	747	68451	460	157178	384	94	25	1492
OGS-CSH0064A	2113	1091	7397	736	104051	544	209060	432	83	27	3376
OGS-CSH0064B	2630	1106	6161	719	98804	530	202410	425	119	26	1285
OGS-CSH0064C	0	1319	2504	867	86795	523	168695	396	549	36	11914
OGS-CSH0064D	2264	1087	5810	717	98450	529	193426	415	137	27	997
OGS-CSH0064E	2807	1180	6234	754	115329	574	210797	436	322	31	3593
OGS-CSH0064F	2609	1109	6384	741	104339	552	196816	426	153	27	759
OGS-CSH0064G	3166	1105	6667	676	88912	498	180376	397	63	23	635
OGS-CSH0064H	2935	1244	6325	792	100267	556	198090	436	192	30	3781
OGS-CSH0064I	2888	1354	7766	1144	83469	615	175441	484	130	31	1036
OGS-CSH0065	3036	1134	5367	665	82941	482	192351	407	55	24	1121
OGS-CSH0066A	3160	1065	9614	776	81474	500	205567	441	0	26	385

OGS-CSH0066B	1310	1074	1549	665	98941	516	153745	361	756	33	1154
OGS-CSH0066C	1830	1222	3236	655	88249	499	193553	411	118	26	368
OGS-CSH0066D	1757	1126	3174	643	86011	486	201397	413	43	25	370
MD-1-A	3067	1096	4394	649	82110	478	212762	426	92	25	506
MD-2-A	2554	1068	5705	681	82966	483	182003	398	171	25	575
MD-3-A	3369	1204	3185	816	60014	444	134327	351	314	29	15707
MD-4-A	2809	1126	9301	771	93324	529	205710	440	266	28	397
MD-5-A	3900	1108	8139	744	105553	559	202089	436	88	26	267
MD-6-A	2856	1111	6065	685	82862	484	227419	445	162	27	300
MD-7-A	2744	1072	4532	577	70780	431	125143	319	20	18	404
MD-8-A	2763	1122	5147	634	67046	432	212784	422	41	23	618
MD-9-A	3505	1014	4409	578	63180	407	140264	335	25	19	170
MD-10-A	1962	1326	8398	922	86553	560	210738	481	301	33	1059
MD-11-A	1681	1173	5180	688	95006	521	217000	439	75	26	497
MD-12-A	2157	1141	5926	689	85460	491	219722	437	56	25	325
MD-13-A	3343	1117	6046	693	74062	464	168567	387	79	23	325
MD-14-A	3131	891	4534	570	25957	281	99427	281	184	20	947
MD-15-A	3087	1095	5062	672	94667	513	228790	445	57	26	440
MD-1-B	2070	1087	2144	669	75813	473	181636	403	544	31	586
MD-2-B	2646	1052	5331	653	77184	461	179133	389	124	24	374
MD-3-B	3858	974	3788	624	38238	344	105400	302	0	18	1558
MD-4-B	2736	1222	10152	824	121357	611	275622	519	242	32	295
MD-5-B	2802	1261	5560	800	94726	553	199809	446	219	30	472
MD-6-B	2083	1165	5080	764	91373	528	194124	427	546	32	831
MD-7-B	2067	1142	4404	665	99516	521	184316	398	575	30	1038
MD-8-B	3826	1096	6973	701	88366	500	200323	420	115	26	441
MD-9-B	3384	1207	5039	602	80528	466	168809	376	70	21	433
MD-10-B	1723	1240	5582	838	61935	454	156801	390	555	36	2620
MD-11-B	2490	999	4373	649	66990	430	116165	312	152	22	1172
MD-12-B	2263	1044	6003	671	76695	464	204847	419	62	24	332
MD-13-B	2338	1091	5364	669	83995	484	193286	408	69	24	366
MD-14-B	1927	1172	3764	799	110379	575	193212	424	1259	39	3231
MD-15-B	2251	1140	7142	720	118733	580	251773	477	71	28	443
MD-1-C	2144	949	2482	565	61699	403	152960	348	85	22	268

MD-2-C	2743	1093	5169	725	71430	466	187569	414	155	26	751
MD-3-C	0	1160	2617	781	65683	445	147481	355	141	26	16155
MD-4-C	2756	983	7548	680	68289	442	166775	381	112	23	269
MD-5-C	1810	1173	6365	709	90063	510	209539	434	30	25	381
MD-6-C	2259	1182	4321	750	94023	531	163486	391	677	33	1573
MD-7-C	2217	1137	5868	735	113848	571	235208	460	271	30	1359
MD-8-C	3261	813	4579	501	23340	258	61930	215	0	14	317
MD-9-C	3421	1077	5720	622	86170	480	171304	379	0	21	233
MD-10-C	3078	1162	8842	796	91897	535	228753	470	165	29	331
MD-11-C	2783	997	3787	515	39915	327	128904	315	35	17	330
MD-12-C	2874	1180	8020	772	96089	543	233164	472	126	28	400
MD-13-C	3709	877	2762	540	24996	275	69993	235	93	18	427
MD-14-C	3553	900	2819	574	29708	301	72404	243	262	21	935
MD-15-C	4260	884	2428	530	26998	281	61811	219	92	17	488
MD-1-D	5578	851	3476	558	10808	217	29960	163	295	19	1517
MD-2-D	4732	905	3227	562	17975	251	51086	206	89	17	479
MD-3-D	4344	894	3035	539	27141	285	67727	232	89	17	835
MD-4-D	4471	881	3992	560	22593	268	69464	237	114	18	425
MD-5-D	5639	1013	3837	703	12197	238	35374	186	35	32	712
MD-6-D	4405	806	2566	479	28576	281	45766	188	110	16	434
MD-7-D	4470	898	3333	584	20294	265	52753	211	225	20	2476
MD-8-D	4703	819	3817	501	13194	216	52434	201	79	16	414
MD-9-D	4617	853	3205	505	20841	253	61205	218	96	17	427
MD-10-D	6222	910	4287	584	13803	235	45436	200	116	19	615
MD-11-D	4552	859	3135	534	30294	295	48993	197	107	17	490
MD-12-D	4692	880	3552	546	16150	237	62771	224	122	17	448
MD-13-D	3528	900	2193	566	35296	320	102048	286	138	20	510
MD-14-D	3914	896	2981	570	27566	291	68366	236	115	19	650
MD-15-D	4078	933	2386	591	46671	361	89310	270	121	20	665
MD-1-E	4244	841	2328	500	27250	281	71175	235	407	21	532
MD-2-E	3612	919	2540	578	36792	326	108187	295	100	20	509
MD-3-E	4354	892	3110	561	22730	270	76943	250	194	19	490
MD-4-E	4789	877	3651	553	17526	244	52958	207	97	17	461
MD-6-E	4525	815	2279	500	31742	295	41820	180	146	17	491

MD-7-E	4146	877	3382	547	27769	287	70311	237	294	20	814
MD-8-E	4201	901	3379	567	17917	251	55887	216	106	17	610
MD-10-E	4951	1000	4428	694	22436	289	63623	242	258	25	2908
MD-11-E	5093	799	3503	495	13433	217	26137	144	131	16	876
MD-12-E	5419	864	3719	545	15580	235	61531	223	116	18	470
MD-13-E	4658	880	3410	546	26721	282	68454	233	100	18	472
MD-15-E	5006	874	2171	538	30792	301	48320	198	123	18	981
MD-1-F	3662	937	2661	589	41983	345	94732	277	111	20	496
MD-2-F	4398	892	3108	566	25024	281	76429	249	107	19	514
MD-3-F	5206	852	3513	515	13006	218	49507	198	166	17	427
MD-4-F	4713	915	3855	633	24326	291	62276	235	119	19	514
MD-6-F	4318	813	2572	495	32479	297	46365	190	120	16	461
MD-7-F	3549	911	2930	597	35517	325	86433	267	131	20	996
MD-8-F	4224	1015	3101	755	27136	332	71985	273	125	22	1814
MD-10-F	5350	891	4465	586	16110	244	45480	197	123	19	754
MD-11-F	3461	940	2643	588	45637	357	70065	239	188	20	572
MD-12-F	4548	898	3667	604	13580	237	49445	210	154	19	442
MD-13-F	4665	828	3443	505	19480	246	52185	201	112	16	453
MD-15-F	4839	881	2945	558	21240	267	37839	179	130	17	1740
MD-1-G	3645	873	2852	547	34247	311	70295	235	147	19	478
MD-2-G	4580	868	3044	534	24934	274	43505	186	107	17	620
MD-3-G	4827	868	3310	532	18259	247	60210	220	215	19	514
MD-4-G	4218	920	3669	591	31682	309	75461	249	96	19	463
MD-7-G	3567	935	2349	585	43145	349	101787	287	108	20	468
MD-8-G	4506	1079	4030	848	24919	342	60977	265	112	22	907
MD-10-G	3872	900	3711	567	26337	283	62066	223	131	18	667
MD-11-G	4001	963	2224	611	36843	336	78782	259	217	21	1030
MD-12-G	6054	1045	4618	807	20370	313	59827	260	230	23	520
MD-1-H	4928	795	3268	468	13866	215	37320	168	101	16	465
MD-3-H	4664	859	3450	531	16313	237	57643	215	159	18	433
MD-4-H	4516	876	3903	552	16630	242	46691	196	130	17	476
MD-7-H	4612	857	3194	521	24130	269	63275	223	102	17	440
MD-8-H	4884	920	4006	610	16278	254	47879	208	115	18	925
MD-11-H	4951	901	3227	569	27454	293	60472	224	170	19	978

MD-12-H	3730	953	3233	623	33197	321	90946	277	126	20	525
MD-3-I	4926	878	3300	523	21672	261	74001	242	127	18	444
MD-4-I	0	1122	2272	683	91700	495	155648	359	1700	39	3525
MD-8-I	2270	1189	6419	711	100952	539	252583	476	63	27	413
MD-11-I	0	1202	4673	741	137484	620	212079	437	187	30	536
MD-12-I	3908	1263	5365	1439	60653	622	108573	436	485	37	928
MD-3-J	2747	1150	6315	720	96284	529	239689	465	163	28	252
MD-8-J	2622	1160	6255	698	92023	514	243349	465	101	27	313
MD-12-J	2517	1103	5412	665	76114	464	229180	444	70	25	174
MD-8-K	2321	1095	5944	686	92590	509	226032	444	68	26	323
MD-12-K	2543	1028	3501	672	58455	416	126953	333	383	25	498
MD-8-L	2344	1169	6553	718	100169	535	254059	476	35	27	277
MD-12-L	0	1376	856	824	106671	594	272862	523	2055	52	1472
MD-8-M	2990	1102	5855	672	84778	486	218848	434	35	24	237
MD-12-M	0	1070	3090	631	67035	428	154815	357	105	23	177
MD-8-N	3019	1128	6302	685	88782	499	223266	440	96	26	410
MD-12-N	2223	1146	5243	694	96976	523	217317	437	37	26	244
MD-8-O	2011	1254	6377	728	114475	574	280054	503	122	30	349
MD-12-O	2129	1122	6382	709	109254	554	233450	455	70	27	263
MD-12-P	3674	1025	5911	652	86600	488	205240	419	41	24	215
MD-12-Q	3451	1095	6669	701	96053	521	219847	441	0	25	224
PAGS-MRI-WeiserSF-1	3313	1128	3879	812	83684	531	166187	411	295	30	1256
PAGS-MRI-WeiserSF-2	3024	1083	5994	678	105447	536	196273	412	136	25	548
IND063_2361_103.0FT	2126	1186	11533	859	72918	488	205318	451	742	34	360
IND063_2361_99.0FT	4247	1059	5439	655	22629	320	70577	287	49	18	358
IND063_2361_92.5FT	2751	1327	6523	819	87131	600	178714	480	67	28	450
IND063_2361_91.7FT	2637	1437	5856	841	101770	651	158576	458	0	28	627
IND063_2361_83.1FT	2364	1411	5357	832	99130	643	229014	546	0	31	535
IND063_2362_123.2FT	1322	1194	4636	756	124602	597	186295	412	226	30	2789
IND063_2363_187.2FT	2729	1107	4683	654	68822	444	245932	459	145	26	521
IND063_2363_65.5FT	0	1783	7860	2995	127938	1164	220850	801	249	59	8329
IND063_2363_60.4FT	0	1159	2948	684	56426	402	151347	352	46	24	9114
IND063_2363_49.2FT	2146	1410	5553	907	118576	711	169611	483	171	34	1023
IND063_2363_57.46FT	0	1501	1578	864	101653	651	184489	488	523	40	3218

IND063_2364_192FT	3453	1290	5545	870	113374	694	141010	438	213	31	232
PAGS-HW21_002_432F	3075	1503	5848	754	60474	502	136946	416	341	28	428
PAGS-HW21-002_578F	1469	1417	7508	965	106962	689	205706	536	431	39	1807
PAGS-HW21-002_595F	2944	1339	6594	870	98230	648	223252	547	35	32	878
PAGS-HW21-002_725F	1526	1523	10173	1099	107293	724	220004	580	406	42	2564
PAGS-HW21-002_729F	4388	1370	7471	880	103655	667	252123	583	124	33	573
PAGS-BRU21-001_403F	1773	1491	7849	1005	100947	696	244281	602	67	35	380
PAGS-KJ21-002_300FT	2639	1428	6295	876	114741	696	229590	555	0	33	422
PAGS-MB-1901	0	1331	3237	867	109990	578	240273	471	2160	53	6334
PAGS-MB-1904	0	1379	2782	904	114601	598	230388	463	420	36	16118
PAGS-NV-1905	3296	1217	8682	777	109235	566	194711	424	67	26	4366
MRI-23_Top	1893	1127	6019	679	128534	587	188391	406	82	25	286
MRI-23_Base	3597	1092	5449	638	83133	478	184251	397	48	23	371
MRI-24	3140	1155	3365	546	35035	319	160035	357	49	20	557
MRI-25	2042	1267	5277	712	82658	489	195591	415	126	26	4223
MRI-26D	0	1397	2590	998	94938	566	148920	380	180	32	26040
MRI-26E	1583	1170	5709	696	96602	522	216759	437	0	25	755
MRI-27	1401	1333	4787	850	73995	505	143723	382	278	27	4166
MRI-28C	0	1347	3069	1006	39044	381	71296	250	653	35	54278
MRI-28D_Top	1364	1222	5270	697	80972	481	166123	381	170	25	3298
MRI-28D_Base	2284	1104	6921	730	105595	545	162376	382	219	27	1356
MRI-28M	2780	1110	3085	658	90890	492	123462	322	126	24	3663
MRI-28Q	0	1488	2987	609	98117	505	137585	338	94	23	1472
MRI-28X	2628	1403	4346	1159	56645	515	139043	418	424	35	15679
MRI-29TOP	3346	978	3175	594	44123	355	135440	332	0	20	895
MRI-29Base	2299	1155	4440	591	55713	393	161099	364	0	19	479
MRI-29ETop	0	1466	4226	933	64703	479	179498	422	605	35	14099
MRI-29E_Base	0	1445	5019	863	79602	515	218398	462	441	33	8459
MRI-30K	2306	1457	6459	744	85879	507	213776	441	105	25	6704
MRI-30LK	0	1358	2137	715	56591	417	161512	374	91	23	10123
MRI-31_Top	0	1386	4333	771	98253	537	163030	387	166	36	2273
MRI-31_Mid1	2571	1469	6191	761	112242	574	160427	389	155	35	1646
MRI-31_Mid2	3292	1446	7540	731	119184	591	190302	424	140	26	530
MRI-31_Base	2250	1390	5644	621	97060	510	147473	355	66	21	422

231-036-B1	3224	1219	9486	788	128699	615	253365	489	61	29	1614
231-036-B2	0	1226	3133	828	72472	473	130149	338	171	28	20741
231-036-B3	1879	1117	7129	725	84434	494	193370	415	0	25	1155
230-092D-UC	3368	1167	12507	848	115659	598	233970	481	74	28	1555
230-092D-LC	2451	1282	12374	896	108171	592	278208	531	271	33	1835
230-092B-UC	4023	1039	3583	844	36309	377	95825	314	143	26	10752
230-092B-LC	3330	1142	9096	790	119185	596	218394	456	122	29	994
231-093-B1	0	1245	0	706	139071	619	219934	438	740	36	4146
231-093-B2	2816	1187	7890	769	122283	596	234329	466	162	29	1197
231-093-B3	2362	1223	10251	819	128558	622	242712	485	117	30	767
231-093-B4	3201	1170	9859	817	104532	567	210523	451	141	28	2370
231-093-B5	3051	1176	10856	815	107117	572	214197	456	132	28	963
231-093-B6	2729	1190	11150	843	113205	592	233309	479	194	30	1102
50-092A-B1	0	1251	1674	760	97882	528	189269	405	5263	62	11745
50-092A-B2	2484	1179	6262	740	127529	601	229132	454	108	27	2735
50-092A-B3	2488	1234	5738	745	124802	599	247821	475	219	30	2032
50-092A-B4	2862	1243	11567	875	143905	668	250108	501	90	31	580
214-093C-B1	0	1158	4963	721	120683	577	176723	395	280	29	2123
214-093C-B2	2322	1158	5913	708	113838	560	183253	401	166	27	1258
214-093C-B3	1699	1348	3119	640	77616	462	129584	330	135	22	3197
214-093C-B4	1921	1332	4230	657	80436	476	150402	361	134	23	2275
214-093C-B5	2509	1228	5468	742	115880	578	225310	453	344	31	1498
214-093B-B1	0	1202	2622	746	104447	545	149343	363	182	27	7025
214-093B-B2	1579	1250	5764	720	118982	585	281542	504	171	30	1037
214-093B-B3	1557	1254	5486	715	110290	563	258191	482	129	28	650
214-093B-B4	3886	1327	3712	568	56763	397	156511	360	47	19	436
214-093B-B5	0	1276	4566	623	79387	468	184003	396	60	21	428
214-093B-B6	2827	1173	6469	701	107729	549	205982	428	100	26	701
214-093A-B1	3066	1252	6890	745	129257	610	242642	473	150	29	638
214-093A-B2	2638	1192	6818	726	116998	574	208224	433	170	27	840
214-093A-B3	3289	1257	9538	831	121597	617	229583	479	217	30	783
MD-14-B1	1694	1203	6632	748	103885	552	207874	437	89	26	1856
MD-14-B2	0	1414	2822	867	82887	522	189154	423	252	31	15923
MD-14-B3	1257	1243	7596	780	124760	608	244553	480	287	31	1289

MD-14-B4	3327	1031	4409	590	57712	397	189271	392	108	22	974
MD-15-B1	0	1178	5033	728	116953	573	169419	391	157	27	2307
MD-15-B2	2806	1181	6151	709	126667	591	186633	408	114	26	791
MD-15-B3	1182	1166	4782	676	110951	550	169327	385	199	25	1138
MD-15-B4	2335	1259	8324	748	139852	632	245275	476	77	28	1253
MD-15-B5	2021	1124	6352	719	118496	575	214386	437	106	26	682
MD-15-B7	1988	1162	5452	668	82361	481	226655	442	51	24	366
MD-15-B8	3025	1123	4818	654	68779	442	204109	417	81	23	2038
230-092A-B1	2797	1269	8647	825	86954	533	222298	472	157	29	998
230-092A-B2	2691	1136	9232	784	74537	483	180244	414	34	24	1234
230-092G	3040	1234	9986	889	108013	596	202449	458	268	31	899
50-092B-B1	0	1237	8351	895	105663	584	212856	460	145	30	7243
50-092B-B2	0	1289	9120	866	110132	591	232443	480	224	31	3192
50-092B-B3	0	1255	3361	695	67919	444	198016	410	119	25	6962
50-080-B1	2720	1203	6144	700	70162	459	155023	375	66	22	2126
50-080-B2	2781	1202	4053	729	98046	533	176844	398	695	32	3678
50-080-B3	2315	1427	6334	824	90263	541	188539	431	132	27	4950
50-080-B4	2887	1393	6896	779	88049	526	174850	411	101	24	2885
50-080-B5	3331	1251	9369	865	95297	565	183973	437	234	29	555
50-080-B6	2615	1357	5694	943	81826	568	154011	426	200	28	563
50-080-B7	2757	1206	5088	717	122789	595	220997	450	315	29	1082
50-080-B8	2204	1127	6522	721	110855	559	191638	414	247	27	700
50-080-B9	1582	1182	3986	650	104146	534	158046	371	212	24	608
272-095-B1	0	1162	2789	703	108197	547	183723	400	273	29	3717
272-095-B2	0	1260	3569	726	126427	594	196306	418	385	31	2673
272-095-B3	0	1447	2793	671	122929	580	175278	394	400	29	822
272-095-B4	3034	1110	4244	640	125077	574	169247	381	95	23	1162
230-092D-B1	3209	1135	4399	771	76801	488	132627	350	113	25	5438
230-092D-B2	2363	1182	7230	724	90369	513	254323	478	184	28	932
230-092D-B3	2451	1164	7704	815	77758	502	205614	449	217	29	1602
230-092D-B4	2892	1256	9555	906	78204	528	227428	494	213	31	627
230-092D-B5	2692	1254	10394	953	81605	551	242139	520	348	34	450
230-092D-B6	2732	1183	12068	872	93133	556	231550	489	224	30	477
230-092D-B7	2818	1231	11058	928	90097	565	228004	498	234	31	463

90-037	2173	1233	8076	748	118854	586	243384	473	214	30	868
230-092F-B1	1579	1478	4735	774	91996	535	187402	421	142	27	6870
230-092F-B2	2118	1318	4335	649	85184	488	200203	415	61	23	1228
230-092F-B3	2578	1281	5272	718	79995	489	194243	419	57	24	4579
230-092F-B4	2976	1136	6600	721	83058	494	199997	424	40	25	2294
50-092B-US	2987	1381	3439	528	54076	380	173037	369	100	19	1183

S Err	K	K Err	Ca	Ca Err	Ti	Ti Err	V	V Err	Cr	Cr Err	Mn	Mn Err
50	19621	54	25	14	11849	23	120	11	118	14	45	8
29	14085	48	129	13	26237	30	45	13	193	15	41	8
49	11548	37	0	10	4906	15	57	7	30	9	32	6
33	4924	24	53	8	2673	12	48	6	84	11	31	6
26	20843	53	0	12	4341	15	126	8	102	13	31	7
18	12430	40	0	10	4818	15	72	8	77	12	24	7
19	12006	39	0	10	4228	14	64	7	82	13	34	7
19	18753	49	0	11	4090	15	74	8	85	14	40	8
18	17767	50	0	12	7070	18	112	9	88	13	49	8
17	24010	59	12616	36	4456	16	81	9	68	13	429	13
17	31221	68	992	18	5832	17	122	9	88	13	94	8
18	40566	79	207	18	6333	18	132	9	93	14	159	10
16	20115	52	125	13	6432	17	68	9	82	12	102	8
22	29154	76	3484	26	4807	19	205	11	110	17	627	18
21	25961	63	22547	48	4577	17	113	9	96	14	229	11
36	19017	51	220	14	4588	16	124	8	89	12	51	7
27	22011	56	117	14	5395	17	147	9	109	14	72	8
34	23863	60	209	15	5655	17	133	9	98	14	113	9
38	30666	69	0	16	6278	18	115	9	105	14	52	8
68	24812	63	0	15	5074	17	109	9	72	14	133	10
18	13728	44	34220	55	3212	14	52	8	50	12	138	9
47	22020	55	7159	28	2916	13	116	8	88	13	46	8
17	17834	49	7187	27	4617	15	99	8	65	11	29	6
19	19481	55	2547	21	4503	16	135	9	59	12	336	12
36	32423	73	1094	19	7395	20	121	10	103	15	559	15
25	21530	57	718	16	5325	18	150	9	70	15	3011	31
17	5996	27	446	10	3127	13	12	6	67	15	114	10
18	21909	57	793	16	7100	19	130	9	96	13	69	8
43	14709	53	355	15	4075	18	125	9	83	17	112	11
21	21191	63	511	17	6880	20	112	10	92	15	63	9
22	20573	64	435	17	5742	20	92	10	72	15	50	9
18	22570	57	462	15	6209	17	100	9	82	13	75	8
54	18358	59	1017	19	5210	20	200	11	140	21	95	13

33	24111	65	1018	18	5430	18	221	10	132	18	83	11
46	8635	41	273	13	7506	22	149	11	117	17	156	13
24	15694	57	332	15	5491	19	168	10	149	15	58	8
29	23471	62	0	14	5713	18	127	9	107	15	126	10
24	27397	68	0	15	5218	18	98	9	73	15	246	12
26	29891	80	0	18	5386	20	133	11	83	17	273	14
29	31386	71	0	16	5870	18	138	9	89	15	173	11
29	19360	61	29	15	4211	18	123	10	92	15	92	10
63	24011	70	0	17	4572	19	147	10	107	19	83	12
70	15201	54	3612	25	3262	17	134	10	108	18	118	12
59	18609	64	1209	21	3940	19	101	10	90	17	70	11
47	24439	64	0	15	5959	19	140	10	110	15	63	9
39	22662	59	0	14	5538	17	143	9	111	14	46	8
33	18024	54	0	12	4094	16	175	9	100	15	190	11
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35	18263	61	0	15	3819	18	64	9	76	20	159	14
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17	28873	66	0	14	6381	17	150	9	76	13	21	7
16	24355	59	0	13	5638	16	138	8	62	12	22	7
17	32033	69	0	14	5755	17	128	9	84	13	35	7
25	28279	68	0	14	6693	19	206	10	130	16	89	10
18	34221	70	0	14	5201	16	123	8	83	13	21	7
18	28225	66	1767	20	4733	16	113	9	76	13	524	14
16	11790	44	127	12	1846	12	57	7	35	9	59	6
21	30291	80	0	18	5800	20	90	10	93	13	75	8
23	30433	81	43	18	8809	25	163	12	148	15	64	8
23	26818	77	0	17	6194	21	103	11	73	12	38	7
31	23530	61	472	16	11972	23	222	11	185	16	62	9
18	16162	49	37	12	4894	16	74	8	59	11	39	7
73	23937	108	5193	38	4126	29	171	20	393	27	12967	97
49	20297	52	2747	20	5117	16	100	8	60	12	90	8
28	19473	67	525	18	21935	35	74	15	127	14	144	10
40	18080	64	314	17	17507	31	124	14	172	14	97	9

20	24251	74	767	19	8144	24	121	12	167	15	151	9
19	16736	57	1179	18	4120	18	83	9	111	14	84	8
33	31964	86	695	21	5379	21	138	11	117	14	103	9
25	27149	78	198	18	7092	22	115	11	87	13	40	7
38	32635	91	1540	25	6059	22	194	12	102	14	422	14
23	31051	85	236	19	6205	21	126	11	72	13	35	7
23	33642	92	406	21	5673	22	135	11	97	14	298	12
22	34878	90	356	21	6157	21	136	11	93	13	51	7
45	24624	64	15170	41	6398	18	112	9	124	13	141	9
69	18118	56	1488	19	13440	24	33	11	98	14	64	9
36	33619	72	473	17	4636	16	232	9	115	14	45	8
17	13990	47	1875	17	10714	21	87	10	130	14	21	7
17	17841	50	2350	19	6096	17	103	8	54	11	21	6
16	8789	34	1112	13	5525	16	54	8	46	11	51	7
36	23744	59	1837	19	7140	18	111	9	94	13	80	8
87	14860	51	3144	23	17362	28	90	13	162	15	98	9
20	23852	60	832	16	7419	18	105	9	85	12	42	7
37	23693	62	88	14	5578	18	172	9	123	16	123	11
122	13767	46	4001	26	17412	28	200	14	121	15	146	10
32	18090	51	2209	19	6662	18	103	9	65	13	57	8
23	28322	65	1636	19	7890	19	152	10	113	14	86	8
33	11367	40	808	14	20014	27	19	12	182	14	13	7
23	13123	43	1539	16	18846	26	0	11	127	14	30	7
73	22585	67	79	16	4626	19	223	11	123	18	177	14
19	16569	46	0	11	7871	19	77	9	73	10	26	6
16	17274	47	0	11	4570	15	63	8	70	11	30	6
65	26995	66	502	17	5888	18	122	10	101	15	120	10
51	28749	69	116	16	6124	18	103	9	91	14	122	10
44	27618	65	0	14	5079	17	133	9	99	15	34	8
52	17116	49	0	12	5261	16	103	8	85	14	38	8
29	16860	51	37485	59	10286	23	109	11	158	17	94	10
25	16089	50	33382	56	11581	24	130	11	131	17	745	18
18	28942	68	2577	21	6931	19	106	9	94	15	529	15
16	26047	60	2511	20	5447	16	116	8	87	14	71	8

26	44506	85	0	17	6213	18	143	9	89	14	81	9
75	27539	64	3807	25	5307	17	148	9	94	14	72	9
22	34482	71	0	15	6483	18	122	9	60	13	81	8
25	40929	82	0	16	5324	17	144	9	85	14	150	10
28	36905	80	0	17	5739	18	120	9	74	14	201	11
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22	45095	85	161	18	7266	19	140	9	82	14	68	9
37	10436	42	574	14	16945	26	174	11	126	13	25	7
23	36119	76	0	15	6843	18	130	9	95	14	52	8
21	36776	78	0	15	7384	19	153	9	93	14	123	10
29	31648	71	0	15	5751	17	146	9	89	14	147	10
22	31296	71	0	15	5986	18	137	9	81	14	171	10
23	36928	78	0	15	6331	18	149	9	97	14	153	10
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31	36647	76	0	15	6245	18	122	9	83	13	42	7
28	34673	74	0	15	7007	18	136	9	101	14	37	8
20	55566	98	0	18	8652	21	124	10	126	16	194	11
28	25621	62	197	15	10808	22	163	10	147	15	28	8
23	26367	63	497	16	6710	18	163	9	104	14	41	7
31	21011	53	1009	16	6248	17	136	9	132	15	38	8
27	21801	55	1402	17	5948	18	112	9	132	15	37	8
25	28479	67	562	17	7733	19	124	9	90	14	51	8
45	16449	50	129	13	11299	22	114	11	135	14	27	8
23	22461	60	0	14	8751	20	57	9	66	12	31	8
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16	18689	51	0	12	6965	18	80	9	70	13	37	8
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20	35547	76	0	15	7136	18	169	9	100	14	34	8
21	31250	69	0	14	7082	18	170	9	113	14	36	8
21	33431	75	0	15	5808	18	196	9	108	15	129	10
26	34144	73	0	15	5390	17	156	9	115	14	44	8
68	27740	67	0	15	5210	17	144	9	84	15	34	8
24	31535	72	0	15	6828	18	199	9	127	14	32	8

20	10732	38	0	10	3133	13	54	7	32	9	24	6
29	10203	40	415	13	20336	27	93	12	157	14	36	8
20	29681	67	0	14	8190	19	121	10	111	14	31	8
22	12470	43	287	12	12559	23	134	10	151	14	74	8
24	34739	75	0	16	8472	20	171	10	103	14	97	9
20	30516	68	0	14	8744	20	140	10	95	13	40	7
17	22396	57	0	13	6886	18	66	9	106	13	32	7
26	18667	51	0	12	5451	16	96	8	69	12	28	7
22	29506	70	0	15	6607	19	141	9	75	14	191	11
23	29884	67	0	15	4403	16	138	8	72	13	194	10
23	41126	83	145	18	7194	20	154	10	107	15	250	12
48	44350	86	0	17	6153	18	175	10	87	15	114	10
34	45078	87	0	17	7280	19	142	10	97	15	141	10
44	26924	62	0	13	5809	17	47	8	38	12	17	7
26	25619	60	0	13	3534	14	132	8	85	13	65	8
34	23158	59	175	14	5805	17	158	9	103	14	15	8
39	33826	74	0	15	6383	19	148	10	155	16	76	9
31	29478	68	0	14	6030	18	151	9	133	15	112	9
20	35879	77	149	17	4664	17	197	9	105	15	192	11
20	20331	62	25	14	6272	20	248	11	121	17	1679	25
23	20459	57	110	14	10957	22	177	11	198	15	49	8
20	37074	75	0	15	5165	16	222	9	153	15	43	8
18	17999	51	0	12	9362	20	166	10	128	14	317	12
34	12317	44	66	12	13744	24	109	11	176	15	26	8
31	13212	46	235	13	15327	25	195	11	206	16	64	9
21	11934	43	29	11	22617	28	105	12	289	17	42	8
22	7138	34	137	11	9498	20	95	10	130	13	34	7
40	34977	72	0	16	5667	18	151	9	119	14	51	8
21	29021	66	0	14	6401	18	90	9	68	13	60	8
26	25811	64	0	14	5947	18	133	9	69	14	159	10
21	28868	71	539	17	6175	19	148	10	71	15	3013	31
20	29706	73	351	17	5750	19	163	10	74	14	1000	19
19	36407	78	219	17	5204	17	181	9	80	14	529	14
20	34023	77	486	18	5747	18	167	10	92	14	698	16

21	32517	72	2400	22	8774	20	141	10	100	14	76	9
45	23143	61	0	14	7646	20	132	10	110	15	51	9
22	27692	63	0	13	5044	16	84	8	82	13	42	8
37	27506	64	0	14	5315	17	152	9	79	13	50	8
28	28834	65	0	14	6020	17	122	9	67	13	88	8
20	20078	50	0	11	1316	9	38	6	26	11	0	6

Fe	Fe Err	Co	Co Err	Ni	Ni Err	Cu	Cu Err	Zn	Zn Err	Ga	Ga Err	As
23754	72	6	1	27	1	53	3	29	2	63	2	100
14865	58	4	0	30	1	18	3	30	2	73	2	9
13224	53	3	1	27	2	11	3	23	2	30	3	8
20020	65	10	1	40	2	55	4	68	3	45	3	15
13934	55	4	0	19	1	4	2	46	2	45	2	13
13474	54	5	1	13	1	0	2	18	1	31	2	33
14183	56	5	1	14	1	2	2	21	1	30	2	11
14855	57	6	1	13	1	7	2	26	2	31	2	5
13897	54	5	0	15	1	4	2	23	2	31	2	15
36015	86	19	1	24	2	19	3	79	3	30	2	3
23470	69	9	1	23	1	59	3	84	3	31	2	5
27819	75	10	1	26	2	24	3	106	3	45	2	5
8043	41	2	0	22	1	0	2	16	2	30	2	4
113518	149	51	1	48	3	31	3	164	5	29	3	18
29003	78	13	1	30	1	19	3	87	3	22	2	8
24104	71	9	1	22	1	3	2	38	2	27	2	20
24755	72	9	1	24	1	4	2	44	2	31	2	15
31737	82	13	1	22	1	10	2	46	2	27	2	11
17079	60	5	0	13	1	0	2	21	1	30	2	16
43027	96	16	1	21	1	5	2	47	2	25	2	28
17668	62	10	1	19	1	9	2	53	2	14	2	7
27684	76	12	1	22	1	0	2	74	2	26	2	5
11189	47	4	0	23	1	11	3	54	2	32	2	5
37862	85	17	1	38	2	35	3	118	3	16	2	23
30270	79	10	1	29	1	30	3	84	2	28	2	11
48739	101	14	1	43	2	34	3	94	3	29	2	21
9923	57	8	1	14	2	36	4	30	2	22	2	10
15934	59	6	0	21	1	6	2	48	2	34	2	7
24858	92	11	1	37	2	39	4	69	3	38	3	67
12449	59	4	1	16	1	5	3	37	2	28	2	5
13911	64	5	1	16	1	10	3	39	2	26	2	4
15066	56	4	1	18	1	10	2	39	2	27	2	4
47196	122	11	1	39	2	107	5	92	3	33	3	20

19126	76	6	1	31	2	79	4	63	3	45	3	34
118618	171	43	2	56	2	9	3	43	3	40	3	23
12888	55	3	0	25	1	8	2	31	2	41	2	9
40275	93	14	1	24	1	15	2	55	2	33	2	13
32789	88	13	1	25	1	229	5	105	3	27	2	6
36723	103	15	1	25	2	10	3	98	3	30	2	4
31598	88	12	1	22	2	21	3	71	3	34	2	7
30176	94	14	1	16	1	10	3	35	2	22	2	36
56760	141	24	1	19	2	13	3	34	2	22	2	42
89562	167	41	2	27	2	7	3	39	3	25	3	58
40639	117	20	1	16	1	11	3	41	2	20	2	28
53296	108	21	1	20	1	21	2	38	2	26	2	131
39489	91	17	1	18	1	28	3	32	2	25	2	38
93607	139	33	1	46	2	24	3	52	3	32	3	4
32644	84	11	1	22	1	10	2	17	1	31	2	15
64167	115	22	1	39	2	26	3	55	3	34	2	3
27160	74	9	1	26	1	20	3	68	2	24	2	7
47429	116	22	1	30	2	49	4	87	3	27	3	17
66486	120	25	1	31	1	4	2	22	2	22	2	63
30608	80	10	1	30	2	12	3	75	2	40	2	5
18270	61	8	1	25	1	0	2	85	2	19	2	7
38928	90	14	1	29	1	8	2	78	3	26	2	37
68837	121	25	1	43	2	19	3	65	3	29	2	44
44885	99	15	1	30	2	75	4	94	3	32	2	16
30328	91	14	1	21	2	31	3	47	3	28	2	76
20353	90	9	1	27	2	29	4	76	4	29	3	6
23145	88	11	1	27	2	32	4	67	3	28	3	5
25070	93	12	1	26	2	28	4	71	3	26	3	5
44465	95	21	1	59	3	53	4	142	4	24	3	6
21934	73	10	1	16	1	0	3	22	2	15	2	18
18956	71	6	1	19	1	40	3	30	2	36	2	28
25070	79	9	1	21	1	5	2	46	2	35	2	23
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14214	60	5	1	20	1	0	2	34	2	40	2	22

18115	67	6	1	25	1	7	3	41	2	40	2	24
12617	51	4	0	19	1	4	2	41	2	29	2	8
10937	48	4	0	21	1	11	2	45	2	27	2	6
19098	63	7	1	23	1	9	2	45	2	31	2	12
13209	71	5	1	26	2	17	4	22	2	65	4	12
14935	65	5	1	35	2	8	2	33	2	56	2	12
14008	61	5	1	23	2	17	3	23	2	51	3	15
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8965	51	2	0	15	1	4	3	17	2	29	2	6
10336	55	3	0	15	1	4	3	22	2	34	2	6
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31917	111	16	1	17	2	0	3	47	3	27	3	10
39415	93	17	1	20	1	5	2	57	2	22	2	6
70503	126	16	1	84	3	84	5	196	5	31	3	6
38443	98	22	1	23	1	19	2	85	2	20	2	4
32063	82	15	1	38	2	91	4	185	3	32	2	28
23831	71	11	1	19	1	6	2	49	2	29	2	9
25579	76	11	1	18	1	8	2	43	2	29	2	14
12345	52	4	0	14	1	0	2	29	2	30	2	3
12288	51	4	0	16	1	0	2	32	2	31	2	5
14172	54	5	0	16	1	6	2	36	2	34	2	7
13207	54	6	1	13	1	4	2	50	2	26	2	7
53360	107	24	1	24	2	12	3	107	3	29	2	11
25517	74	10	1	24	1	9	2	29	2	23	2	4
15294	57	6	1	19	1	7	2	37	2	22	2	6
34491	85	15	1	18	1	16	2	86	2	26	2	10
27253	76	11	1	15	1	5	2	42	2	24	2	8
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29724	104	11	1	18	2	10	3	30	2	35	3	68
28009	79	10	1	16	1	7	2	27	2	31	2	34
20204	66	7	1	14	1	5	2	20	1	25	2	23
27537	86	13	1	17	1	20	3	31	2	27	2	21
26718	80	10	1	17	1	17	3	55	2	27	2	7
23910	81	11	1	23	1	0	2	27	2	32	2	44

32096	88	14	1	23	1	0	2	30	2	34	2	62
24022	74	12	1	25	2	0	2	35	2	38	2	22
35219	87	10	1	25	1	0	2	38	2	32	2	31
32311	90	17	1	19	2	0	2	28	2	35	2	29
13474	60	6	1	18	1	0	2	23	2	36	2	13
9444	44	3	0	17	1	0	2	17	2	22	2	9
27298	76	9	1	19	1	8	2	38	2	36	2	13
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7883	41	2	0	13	1	5	2	19	1	23	2	2
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41644	93	16	1	21	1	0	2	39	2	22	2	34
38873	91	14	1	19	1	0	2	45	2	32	2	18
17259	60	6	1	17	1	0	2	36	2	38	2	15
15548	57	4	0	20	1	2	2	46	2	39	2	6
12889	52	3	0	25	1	5	2	51	2	32	2	7
210720	215	45	2	104	2	58	3	189	5	17	3	0
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13238	53	4	1	18	1	0	2	23	1	28	2	23
13089	52	4	0	17	1	0	2	22	1	31	2	30
22154	69	7	1	19	1	0	2	19	1	30	2	80
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92582	140	26	1	40	1	32	3	51	2	23	2	9
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8568	42	3	0	22	1	15	2	70	2	24	2	7
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35011	85	13	1	40	2	15	3	91	3	31	2	17
17447	60	6	1	25	1	11	2	38	2	18	2	22
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26551	75	10	1	29	1	4	2	33	2	34	2	5

8686	43	2	0	21	1	4	2	18	2	18	2	5
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82474	128	16	1	126	3	30	4	176	4	34	3	13
26253	75	10	1	20	1	7	2	53	2	26	2	23
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59178	109	20	1	25	1	16	3	81	3	30	2	5
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10756	48	3	0	13	1	0	2	27	2	22	2	5
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42377	92	20	1	45	2	41	4	140	5	32	3	29
101453	148	25	1	47	1	25	2	73	3	30	2	37
17416	60	6	0	14	1	5	2	29	2	35	2	5
36426	87	13	1	16	1	12	2	37	2	29	2	24
47950	99	16	1	34	2	7	2	92	3	30	2	12
36204	85	13	1	36	2	29	3	88	3	30	2	11
51348	102	17	1	34	2	34	3	100	3	30	2	14
72852	123	24	1	49	2	17	3	102	3	33	2	11
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13955	54	4	0	13	1	0	2	20	1	32	2	9
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15691	58	5	0	15	1	0	2	25	2	28	2	7
46079	100	15	1	27	1	23	2	37	2	28	2	19
19704	65	6	0	29	1	15	2	76	2	29	2	7
64006	114	24	1	50	2	6	2	131	3	26	2	10
63157	115	21	1	52	2	7	2	131	3	29	2	17
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16060	66	3	1	46	2	121	6	35	3	83	4	136
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28427	78	9	1	23	1	34	2	78	2	29	2	15
29912	81	12	1	26	1	30	3	103	2	33	2	19
43394	95	17	1	49	2	38	3	133	3	34	2	13
35582	85	16	1	53	2	31	3	168	3	30	2	16
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22914	69	8	1	35	1	89	4	124	3	37	2	11
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42172	91	17	1	42	2	44	3	92	3	29	2	7
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35786	86	14	1	24	1	6	3	47	2	33	2	58
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68234	114	26	1	37	2	13	3	217	5	31	3	4
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36594	88	12	1	20	1	8	2	27	2	34	2	48
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26865	74	10	1	20	1	29	3	37	2	35	2	45
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As Err	Se	Se Err	Rb	Rb Err	Sr	Sr Err	Y	Y Err	Zr	Zr Err	Nb	Nb Err	
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Mo	Mo Err	Ba	Ba Err	Pb	Pb Err	Th	Th Err	U	U Err
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14	2	883	62	20	5	16	3	14	3
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ID	MgO	MgO Err	Al2O3	Al2O3 Err	SiO2	SiO2 Err	P
OGS-CSH0001A	0	8651	294922	5697	413517	4422	0
OGS-CSH0001B	11908	9008	390327	6455	515630	5028	0
OGS-CSH0002	12051	6935	107342	3600	268893	3354	0
OGS-CSH0003A	7170	5834	111356	3516	218925	2943	0
OGS-CSH0003B	7453	7436	228347	4989	468853	4627	0
OGS-CSH0003C	9205	6279	187321	4468	398908	4134	0
OGS-CSH0003D	7618	6369	191489	4517	413092	4217	0
OGS-CSH0003E	10652	6380	197496	4613	447909	4445	0
OGS-CSH0003F	13704	7511	246526	5149	557096	5092	0
OGS-CSH0004A	18259	7732	197009	4748	462882	4607	0
OGS-CSH0004B	14109	7713	223810	5016	548211	5098	0
OGS-CSH0004C	26280	8916	296766	5786	564510	5329	0
OGS-CSH0005	13762	7437	241450	5075	507638	4808	0
OGS-CSH0006	29211	9113	196596	5080	552090	5356	422
OGS-CSH0007	26314	8676	181125	4670	568726	5216	970
OGS-CSH0008A	12578	7753	186944	4613	457911	4557	225
OGS-CSH0008B	21031	7692	216039	4910	502959	4829	0
OGS-CSH0008C	18693	8372	214187	4967	559508	5175	123
OGS-CSH0009A	15268	8338	299375	5722	658437	5751	0
OGS-CSH0009B	14776	8870	216922	5073	556977	5223	0
OGS-CSH0010	24333	7831	103762	3619	466546	4502	195
OGS-CSH0011	17148	7651	152168	4243	439973	4440	0
OGS-CSH0012	19844	7370	195466	4624	480882	4627	0
OGS-CSH0013	17882	7735	136190	4110	628822	5480	285
OGS-CSH0014A	27570	9069	277723	5647	662954	5845	0
OGS-CSH0014B	17711	11729	235373	6366	571927	6413	0
OGS-CSH0015A	0	5040	106244	3489	271877	3337	0
OGS-CSH0015B	13227	8992	265137	5813	542370	5482	0
OGS-CSH0015C	0	8838	169454	5410	351073	4838	0
OGS-CSH0016A	0	9004	234768	5603	615750	5963	0
OGS-CSH0016B	0	11953	233992	7168	565764	7264	0
OGS-CSH0016C	17657	7387	191434	4632	501461	4786	0
OGS-CSH0017A	0	8108	200973	4889	438023	4559	352
OGS-CSH0017B	0	9271	270475	5883	544164	5509	909
OGS-CSH0017C	10906	7759	135752	4340	289257	3776	0
OGS-CSH0017D	8094	7581	217949	5010	407055	4375	0
OGS-CSH0017E	0	8801	217877	5572	470379	5241	0
OGS-CSH0018A	14861	9431	210019	5528	501641	5454	0
OGS-CSH0018B	21074	10129	223505	5921	526970	5854	0
OGS-CSH0018C	18030	8830	222317	5148	540626	5170	265
OGS-CSH0019A	13197	10044	155578	5282	487634	5771	594
OGS-CSH0019B	0	10689	159137	5293	482049	5618	1316
OGS-CSH0020A	0	10295	101616	4466	275649	4175	1805
OGS-CSH0020B	0	9102	138177	4687	455023	5152	226
OGS-CSH0021A	13187	8251	186008	4766	485267	4833	0
OGS-CSH0021B	9137	7917	201505	4875	536353	5081	0

OGS-CSH0021C	10644	6967	120404	3966	328242	3880	0
OGS-CSH0021D	0	8179	276386	5567	593664	5418	0
OGS-CSH0021E	11785	7629	154020	4366	407490	4346	0
OGS-CSH0021F	15636	7744	200684	4781	523752	4943	0
OGS-CSH0021G	15551	7638	168685	4489	422360	4408	0
OGS-CSH0022A	0	8217	123891	4052	367149	4116	0
OGS-CSH0022B	26181	9111	324364	6033	616250	5627	0
OGS-CSH0022C	14383	7705	191781	4662	576182	5194	0
OGS-CSH0023A	0	8884	221641	5117	586041	5375	0
OGS-CSH0023B	11476	7862	133995	4187	357223	4086	0
OGS-CSH0023C	23039	10596	243176	5970	588424	6056	0
OGS-CSH0023D	10042	8089	183184	4636	446137	4527	0
OGS-CSH0024A	30555	11998	213240	6552	574180	6936	0
OGS-CSH0024B	19963	12270	187054	6519	543906	7035	0
OGS-CSH0024C	16756	11788	206907	6640	555457	6970	0
OGS-CSH0024D	12846	6038	45040	2564	161881	2558	339
OGS-CSH0025	0	9909	142838	5118	494273	5841	0
OGS-CSH0026	18032	8687	288371	5696	653357	5775	381
OGS-CSH0027A	0	8418	246138	5477	507403	5114	0
OGS-CSH0027B	9927	8225	261007	5545	596335	5560	0
OGS-CSH0027C	0	8740	282495	5900	585146	5658	0
OGS-CSH0027D	0	9110	282703	6010	593122	5797	0
OGS-CSH0027E	19712	8450	296369	5754	668981	5867	0
OGS-CSH0027F	17347	7685	215720	4871	551625	5053	0
OGS-CSH0027G	8545	7339	160853	4288	392734	4151	0
OGS-CSH0028A	9214	9158	221492	5697	397457	4856	0
OGS-CSH0028B	0	8724	290082	6277	384238	4721	0
OGS-CSH0028C	8604	7422	251272	5215	490414	4759	0
OGS-CSH0028D	0	8594	258838	6092	450128	5228	0
OGS-CSH0028E	0	10520	233000	6480	568787	6614	0
OGS-CSH0028F	15929	9510	281341	6254	603293	6126	0
OGS-CSH0028G	0	9364	235391	6033	497305	5691	0
OGS-CSH0029A	0	8899	153686	5035	379708	4857	0
OGS-CSH0029B	12213	7011	132293	3992	345241	3896	0
OGS-CSH0029C	19225	8878	181183	4823	432914	4615	520
OGS-CSH0030	11604	8063	101962	3671	240522	3240	0
OGS-CSH0031	15667	7694	185775	4633	458387	4584	0
OGS-CSH0032A	8813	7342	175620	4473	418456	4323	0
OGS-CSH0032B	7108	6961	200646	4707	441658	4452	0
OGS-CSH0033A	0	9857	245029	6010	568354	5996	0
OGS-CSH0033B	16368	8110	252433	5337	616932	5536	0
OGS-CSH0033C	13928	8382	249451	5353	617836	5575	0
OGS-CSH0033D	8541	6823	183320	4532	449958	4498	0
OGS-CSH0033E	17270	7453	222996	5065	536865	5091	0
OGS-CSH0033F	16845	8292	204075	4937	589733	5406	0
OGS-CSH0033G	9626	8570	242629	5286	578862	5355	0
OGS-CSH0033H	20468	8477	233008	5276	595904	5513	0

OGS-CSH0033I	14125	8615	237746	5270	633254	5658	0
OGS-CSH0033J	14262	8298	177540	4670	534728	5103	110
OGS-CSH0034A	0	9299	196779	5485	476996	5408	844
OGS-CSH0034B	0	8364	207898	5090	481567	4932	370
OGS-CSH0034C	10720	7852	242952	5198	598969	5377	0
OGS-CSH0034D	0	8096	198952	4865	513107	4975	0
OGS-CSH0034E	0	9009	226894	5645	562657	5772	0
OGS-CSH0035A	0	7891	264661	5381	594613	5342	604
OGS-CSH0035B	0	7566	195085	4747	467368	4659	756
OGS-CSH0035C	0	7775	221122	4985	530734	4993	288
OGS-CSH0036A	0	8392	222675	5071	537441	5070	191
OGS-CSH0036B	0	8944	195700	5472	417013	5034	187
OGS-CSH0036C	0	8904	224310	5576	489155	5295	0
OGS-CSH0036D	0	7236	154596	4204	451778	4465	0
OGS-CSH0037A	12240	8562	257138	5400	595319	5411	0
OGS-CSH0037B	14761	8564	286728	5632	585391	5363	0
OGS-CSH0037C	16245	7628	250219	5200	650388	5595	0
OGS-CSH0037D	19375	8315	283271	5575	647628	5673	0
OGS-CSH0038A	9033	8072	150324	4311	501394	4832	0
OGS-CSH0038B	11146	7893	174531	4555	491371	4782	232
OGS-CSH0038C	10728	7720	267782	5374	568850	5192	0
OGS-CSH0038D	12728	7958	306447	5732	622731	5523	0
OGS-CSH0039	11629	7869	274410	5432	650023	5620	119
OGS-CSH0040	13634	9307	151924	4836	316290	4122	0
OGS-CSH0041A	12788	7993	256336	5276	499129	4819	0
OGS-CSH0041B	15258	7427	215039	4845	519637	4871	0
OGS-CSH0041C	15753	7719	245283	5167	601859	5351	0
OGS-CSH0041D	8520	7752	186717	4618	468803	4619	0
OGS-CSH0041E	11629	7675	195839	4694	557014	5078	0
OGS-CSH0041F	16379	7917	198867	4836	562020	5205	154
OGS-CSH0041G	0	8332	182637	4823	447820	4682	0
OGS-CSH0041H	0	8216	174018	4747	437794	4637	152
OGS-CSH0042A	16600	7642	230486	4994	658814	5598	0
OGS-CSH0042B	17518	8240	299963	5732	676779	5845	0
OGS-CSH0042C	0	6678	165842	4338	375899	4053	0
OGS-CSH0042D	19008	8765	332791	6054	656342	5803	0
OGS-CSH0042E	19413	7998	301697	5698	617130	5501	0
OGS-CSH0042F	13868	8316	219909	5112	515744	5023	132
OGS-CSH0042G	19875	7835	220217	4986	486218	4767	0
OGS-CSH0043A	0	7774	200283	4732	640501	5498	0
OGS-CSH0043B	12700	7708	234069	5066	664584	5663	0
OGS-CSH0043C	18535	7645	268644	5363	533659	4996	0
OGS-CSH0044A	11104	7379	234915	4992	552873	5015	0
OGS-CSH0044B	11067	6977	186771	4470	516835	4756	0
OGS-CSH0044C	6727	6560	176005	4351	592031	5139	0
OGS-CSH0045	27147	9230	204712	5131	478114	4930	451
OGS-CSH0046A	0	7912	202744	4816	470856	4664	0

OGS-CSH0046B	14830	8198	220562	5068	570630	5274	0
OGS-CSH0046C	0	7569	164381	4396	436319	4439	0
OGS-CSH0046D	15931	8497	233503	5282	572552	5367	0
OGS-CSH0047	15098	7868	257047	5284	694943	5844	0
OGS-CSH0048A	20875	8636	287806	5692	629767	5640	0
OGS-CSH0048B	13997	6961	202524	4674	554124	5006	0
OGS-CSH0048C	13631	6769	207153	4708	521973	4837	0
OGS-CSH0049A	15538	6621	84094	3292	230230	3113	652
OGS-CSH0049B	11359	8828	171898	4829	410730	4564	2405
OGS-CSH0050A	24184	7921	275374	5464	589167	5338	0
OGS-CSH0050B	14950	8082	243013	5253	553331	5183	138
OGS-CSH0050C	24371	9211	244189	5380	608591	5555	0
OGS-CSH0050D	20925	9223	243148	5331	625870	5606	1427
OGS-CSH0050E	30835	9950	264947	5631	634190	5747	136
OGS-CSH0050F	13022	9412	196124	4995	489343	4924	1630
OGS-CSH0051A	19913	8135	298040	5685	634303	5605	0
OGS-CSH0051B	16067	8140	299664	5695	651431	5693	0
OGS-CSH0051C	12270	7472	224300	4967	508931	4850	0
OGS-CSH0051D	15819	7989	252482	5267	567582	5207	0
OGS-CSH0052A	13395	8142	241925	5258	476596	4772	0
OGS-CSH0052B	24474	8338	343286	6070	673926	5855	0
OGS-CSH0052C	19943	8413	236623	5245	562274	5251	0
OGS-CSH0052D	17282	8431	228188	5220	507864	5004	219
OGS-CSH0052E	26323	8662	292578	5663	614330	5508	0
OGS-CSH0053	17526	8437	220773	5064	465286	4687	0
OGS-CSH0054	12156	7715	240442	5128	558927	5127	0
OGS-CSH0055	18847	8187	232963	5183	548788	5164	0
OGS-CSH0056A	28013	8870	276951	5660	628942	5689	0
OGS-CSH0056B	8323	8201	219226	5073	493406	4863	0
OGS-CSH0056C	18633	8293	284287	5563	640504	5614	0
OGS-CSH0056D	19287	8250	302512	5687	677107	5795	0
OGS-CSH0057A	17342	8217	275519	5498	575761	5291	168
OGS-CSH0057B	13869	8148	286534	5568	646503	5634	0
OGS-CSH0057C	16470	7538	257906	5251	580244	5224	0
OGS-CSH0057D	15622	7946	269800	5411	638356	5575	0
OGS-CSH0058A	27403	9761	277199	5874	584171	5592	1036
OGS-CSH0058B	36322	9891	269248	5758	594832	5597	553
OGS-CSH0059A	26187	8637	272595	5546	633739	5648	0
OGS-CSH0059B	16956	6525	86742	3315	232608	3120	0
OGS-CSH0060A	22035	8248	243130	5198	634788	5558	0
OGS-CSH0060B	18905	7900	203341	4806	553259	5098	0
OGS-CSH0061A	16370	7895	291282	5528	642801	5544	0
OGS-CSH0061B	18992	7531	240892	5063	510554	4815	0
OGS-CSH0061C	22193	8501	349593	6084	721807	6076	0
OGS-CSH0062A	18591	8185	314231	5796	672451	5791	0
OGS-CSH0062B	0	7988	288999	5539	426965	4473	3880
OGS-CSH0062C	0	7266	262156	5185	337713	3844	1317

OGS-CSH0062D	0	7903	247667	5155	526861	4922	636
OGS-CSH0063A	14263	8507	269898	5493	623485	5560	1863
OGS-CSH0063B	12968	7125	200257	4704	471736	4612	0
OGS-CSH0063C	24090	8741	223145	5077	500228	4874	0
OGS-CSH0063D	21403	7834	202927	4799	484324	4727	0
OGS-CSH0064A	22447	8474	301866	5688	637449	5586	0
OGS-CSH0064B	19942	8483	294690	5644	626227	5539	0
OGS-CSH0064C	0	8732	250353	5328	534191	5057	530
OGS-CSH0064D	17304	8096	288786	5564	598489	5367	0
OGS-CSH0064E	15131	8525	343258	6037	654312	5711	278
OGS-CSH0064F	22719	8510	309173	5786	608922	5474	0
OGS-CSH0064G	24726	7801	269777	5395	561757	5175	0
OGS-CSH0064H	18521	8732	287934	5675	599284	5457	186
OGS-CSH0064I	15777	9049	210970	5280	473681	4956	0
OGS-CSH0065	11120	7664	249097	5189	597039	5315	0
OGS-CSH0066A	28487	8221	234010	5147	592454	5367	0
OGS-CSH0066B	0	8152	311366	5744	512832	4908	690
OGS-CSH0066C	8888	7482	261638	5296	602201	5335	0
OGS-CSH0066D	13058	7601	255642	5226	624148	5430	0
MD-1-A	14202	7538	237912	5062	654281	5582	0
MD-2-A	15110	7695	238902	5113	551865	5088	0
MD-3-A	0	8161	175705	4632	423383	4457	0
MD-4-A	27732	8289	265790	5431	598091	5409	220
MD-5-A	22039	8230	310999	5798	611218	5486	0
MD-6-A	20372	7665	238436	5089	664529	5658	0
MD-7-A	15970	6983	222202	4839	410610	4231	0
MD-8-A	17349	7128	196271	4629	630642	5412	0
MD-9-A	10975	6993	196612	4579	453857	4445	0
MD-10-A	19284	8690	238869	5356	593686	5496	289
MD-11-A	16430	7777	274501	5434	651257	5631	0
MD-12-A	21131	7791	246509	5186	644376	5581	0
MD-13-A	14080	7528	218093	4931	512921	4884	0
MD-14-A	13117	6390	83053	3188	323265	3623	165
MD-15-A	15068	7809	276821	5436	686162	5795	0
MD-1-B	0	7775	228880	5040	569263	5154	239
MD-2-B	17481	7511	227128	4964	555684	5071	0
MD-3-B	13059	6728	114173	3707	329059	3743	0
MD-4-B	29644	9074	337415	6096	765359	6384	180
MD-5-B	14002	8416	269136	5528	595653	5440	131
MD-6-B	14996	8491	263227	5439	586877	5366	539
MD-7-B	15171	8022	292482	5572	570950	5213	502
MD-8-B	19867	8217	256047	5303	598451	5371	0
MD-9-B	15419	6981	240101	5043	529626	4915	0
MD-10-B	11433	8301	181390	4671	472712	4699	635
MD-11-B	13403	7478	204904	4746	374116	4068	0
MD-12-B	17647	7584	223508	4948	610371	5368	0
MD-13-B	15712	7793	244425	5162	582590	5251	0

MD-14-B	10475	8745	318409	5928	589482	5445	1339
MD-15-B	22421	8504	337481	6007	729100	6123	0
MD-1-C	0	6715	189783	4493	500584	4663	0
MD-2-C	13547	7961	202759	4833	555826	5134	0
MD-3-C	0	7996	198096	4784	479318	4716	0
MD-4-C	21653	7678	197582	4698	502677	4789	0
MD-5-C	16400	7850	264592	5350	631553	5520	0
MD-6-C	14629	8620	284257	5612	521467	5013	606
MD-7-C	12086	8631	329309	5950	698455	5958	0
MD-8-C	14997	6464	110487	3564	283624	3400	0
MD-9-C	15676	7345	258960	5223	538326	4977	0
MD-10-C	30983	8776	253796	5368	647927	5692	0
MD-11-C	14155	6162	124983	3705	414353	4131	0
MD-12-C	21554	8311	268814	5485	669299	5807	0
MD-13-C	7984	6119	86759	3244	241225	3127	0
MD-14-C	8822	6396	89882	3326	233953	3111	336
MD-15-C	10130	6145	91814	3302	211608	2925	0
MD-1-D	9949	5570	39565	2409	101773	2021	198
MD-2-D	12950	6038	62351	2874	173760	2659	0
MD-3-D	7940	6090	90916	3306	227928	3045	0
MD-4-D	9526	6440	74039	3074	232233	3069	0
MD-5-D	11353	6677	42277	2587	118280	2193	494
MD-6-D	7520	5764	87908	3159	152801	2424	0
MD-7-D	8974	6101	67111	2982	175694	2693	200
MD-8-D	12637	5579	46299	2518	177427	2631	0
MD-9-D	9540	5842	72389	2980	212944	2899	0
MD-10-D	10441	6149	44307	2576	146721	2451	0
MD-11-D	9086	6238	100913	3418	167610	2599	0
MD-12-D	10676	5861	54520	2709	210931	2897	0
MD-13-D	0	6478	115759	3668	346545	3802	0
MD-14-D	10113	6365	88995	3297	224731	3033	99
MD-15-D	0	7046	149414	4122	304001	3601	0
MD-1-E	8599	5987	87909	3197	240730	3079	329
MD-2-E	8142	6702	111562	3626	348889	3817	0
MD-3-E	12806	6292	76045	3092	261463	3259	0
MD-4-E	9909	6124	60824	2837	178214	2676	0
MD-6-E	11333	6084	108646	3473	150929	2433	0
MD-7-E	9555	6284	90136	3292	238806	3113	245
MD-8-E	10170	6150	59105	2826	187372	2757	0
MD-10-E	12863	7030	71827	3142	207585	2962	212
MD-11-E	10503	5682	47169	2522	87363	1863	0
MD-12-E	9998	5911	53866	2699	206978	2871	0
MD-13-E	10407	6501	89362	3285	231213	3059	0
MD-15-E	7903	5917	100997	3413	168677	2603	0
MD-1-F	9218	7269	130923	3911	309529	3626	0
MD-2-F	9811	6480	81477	3198	257255	3244	0
MD-3-F	10375	5861	43746	2499	167484	2569	0

MD-4-F	10254	6567	77841	3190	201121	2902	96
MD-6-F	6850	5960	111124	3499	167848	2560	0
MD-7-F	7252	6580	115959	3687	291471	3489	0
MD-8-F	12059	6977	81519	3358	226408	3158	0
MD-10-F	10929	6348	56308	2804	152999	2511	83
MD-11-F	8094	6921	145277	4058	233092	3140	0
MD-12-F	12845	6219	44926	2594	164589	2596	0
MD-13-F	8883	5913	65512	2867	177033	2637	0
MD-15-F	9595	5768	71144	2992	130387	2302	0
MD-1-G	9379	6581	112220	3599	237388	3114	0
MD-2-G	14776	8349	313161	5762	503329	4870	0
MD-3-G	14127	5837	60183	2795	195331	2790	100
MD-4-G	10969	6720	101327	3498	251515	3232	0
MD-7-G	7718	6885	138651	3966	337131	3770	0
MD-8-G	11459	6873	74379	3292	187361	2902	0
MD-10-G	8628	6502	86887	3236	208494	2890	86
MD-11-G	9277	6613	119841	3772	263883	3345	0
MD-12-G	9065	6996	58643	3029	175423	2799	133
MD-1-H	11740	5797	50011	2569	131260	2258	106
MD-3-H	13511	5999	54965	2722	192987	2775	0
MD-4-H	8144	6117	57538	2778	157857	2518	93
MD-7-H	8364	6344	77638	3092	211236	2904	0
MD-8-H	10078	6162	54244	2780	156435	2549	0
MD-11-H	8660	6593	96686	3448	214304	2986	95
MD-12-H	7258	6826	106475	3603	302864	3574	0
MD-3-I	9990	6077	72142	3006	250142	3164	0
MD-4-I	0	8152	277829	5440	503655	4861	1983
MD-8-I	18261	8188	285984	5567	722659	6037	0
MD-11-I	16765	9138	413194	6613	672007	5887	0
MD-12-I	9072	8393	149585	4760	284175	3868	394
MD-3-J	19347	8031	274424	5470	692631	5879	0
MD-8-J	21214	8195	259431	5334	696136	5879	0
MD-12-J	16995	7640	220756	4934	673461	5697	0
MD-8-K	18980	7713	263011	5324	659000	5660	0
MD-12-K	11705	7431	178196	4516	403716	4250	198
MD-8-L	21347	8250	281029	5522	727856	6057	0
MD-12-L	0	9425	306005	6535	784502	7185	1952
MD-8-M	16508	7768	244283	5147	645762	5566	0
MD-12-M	14951	7451	214789	4822	512069	4815	0
MD-8-N	19276	8005	256145	5266	662314	5669	0
MD-12-N	18157	8179	288309	5576	654988	5681	0
MD-8-O	23854	8457	322642	5886	798074	6472	0
MD-12-O	18156	8355	309022	5753	690620	5880	0
MD-12-P	20957	7746	251774	5202	610030	5380	0
MD-12-Q	20832	8057	279612	5508	650394	5661	0
PAGS-MRI-WeiserSF-1	10789	8333	240453	5334	494598	4937	0
PAGS-MRI-WeiserSF-2	16571	8100	312607	5770	598126	5406	0

IND063_2361_103.0FT	32212	8739	204338	4911	576742	5291	754
IND063_2361_99.0FT	14851	5924	70671	2969	224879	2994	0
IND063_2361_92.5FT	20651	7660	254876	5259	546147	5077	0
IND063_2361_91.7FT	18498	7906	303604	5722	495074	4869	0
IND063_2361_83.1FT	16138	7906	290191	5568	681655	5801	0
IND063_2362_123.2FT	0	8831	364239	6254	587972	5414	0
IND063_2363_187.2FT	13267	7434	195384	4642	708972	5824	0
IND063_2363_65.5FT	0	11556	250058	6583	470745	5491	215
IND063_2363_60.4FT	7658	7331	167931	4374	478597	4621	0
IND063_2363_49.2FT	14381	8514	350325	6135	536688	5116	0
IND063_2363_57.46FT	0	8226	310788	5766	593667	5355	438
IND063_2364_192FT	13195	8116	336491	6000	451036	4642	0
PAGS-HW21-002_432FT	19963	7047	184602	4501	433506	4365	259
PAGS-HW21-002_578FT	24981	8847	308415	5824	613147	5540	434
PAGS-HW21-002_595FT	22674	8131	290161	5599	666066	5744	0
PAGS-HW21-002_725FT	30639	9273	292839	5795	621513	5645	399
PAGS-HW21-002_729FT	24787	8295	294407	5637	722992	6047	0
PAGS-BRU21-001_403FT	20239	8649	273834	5582	680737	5906	0
PAGS-KJ21-002_300FT	23423	8420	326960	5932	680905	5879	0
PAGS-MB-1901	9575	9230	288285	5694	684902	5884	3064
PAGS-MB-1904	9611	9213	331695	6053	717353	6099	210
PAGS-NV-1905	21734	8615	310249	5827	578327	5351	0
MRI-23_Top	16000	8225	386606	6303	606109	5434	0
MRI-23_Base	17026	7382	242261	5069	560946	5077	0
MRI-24	9215	6106	107377	3524	504650	4632	0
MRI-25	18144	7879	246142	5203	604907	5387	0
MRI-26D	0	9298	275462	5669	494961	4927	0
MRI-26E	16591	7962	280011	5492	652986	5649	0
MRI-27	0	7863	204569	4943	429323	4514	142
MRI-28C	0	8623	120507	4048	261370	3463	201
MRI-28D_Top	13201	7962	243115	5153	523879	4935	0
MRI-28D_Base	20126	8428	308114	5776	501802	4913	263
MRI-28M	0	8001	286333	5517	422046	4378	0
MRI-28Q	13652	7350	302778	5605	456564	4550	0
MRI-28X	13215	8892	152482	4643	407467	4556	237
MRI-29TOP	7640	6784	136131	3964	429593	4304	0
MRI-29Base	18314	6772	169855	4328	504380	4727	0
MRI-29ETop	11922	8445	179795	4733	531942	5092	475
MRI-29E_Base	15486	8809	221781	5139	636393	5656	202
MRI-30K	15778	8194	239749	5187	630643	5552	0
MRI-30LK	0	7285	169293	4420	512243	4826	0
MRI-31_Top	11739	8259	294746	5667	515571	4937	407
MRI-31_Mid1	18953	8388	333671	6003	509107	4938	297
MRI-31_Mid2	21181	8233	351647	6160	583884	5406	0
MRI-31_Base	18397	7650	294493	5586	469396	4681	0
231-036-B1	19803	8959	356768	6237	714068	6134	0
231-036-B2	0	8312	219121	5052	427426	4491	0

231-036-B3	25621	8223	246147	5245	571113	5251	0
230-092D-UC	33282	9177	318939	5976	653181	5818	0
230-092D-LC	30705	9265	285887	5714	727307	6186	202
230-092B-UC	11464	7613	109583	3857	307542	3751	0
230-092B-LC	24260	9091	334045	6100	636187	5742	0
231-093-B1	0	8761	412608	6542	704977	5989	639
231-093-B2	19085	8806	348505	6144	688423	5962	0
231-093-B3	25570	9114	356971	6248	694783	6031	0
231-093-B4	28411	8762	300309	5792	617519	5587	0
231-093-B5	33640	9000	304411	5820	624677	5619	0
231-093-B6	30892	9072	326421	6026	674903	5924	140
50-092A-B1	0	8223	291418	5623	601370	5451	5751
50-092A-B2	19972	8560	365952	6249	685774	5944	0
50-092A-B3	20833	8816	359745	6215	729943	6173	0
50-092A-B4	35819	9838	404848	6718	707753	6234	0
214-093C-B1	12665	8484	347849	6086	554142	5206	226
214-093C-B2	17282	8916	346781	6087	586528	5387	0
214-093C-B3	12256	7290	237372	5068	419557	4357	0
214-093C-B4	9138	7363	240149	5122	477779	4695	0
214-093C-B5	15654	8648	334012	5999	670816	5827	246
214-093B-B1	0	8695	320884	5888	505309	4924	0
214-093B-B2	18313	8494	336264	5977	806204	6498	0
214-093B-B3	20591	8185	318021	5836	752576	6215	0
214-093B-B4	12687	6546	173304	4355	492820	4658	0
214-093B-B5	11396	7220	242935	5103	575247	5177	0
214-093B-B6	15840	8016	314730	5790	628252	5555	0
214-093A-B1	27070	8778	373622	6324	719170	6134	0
214-093A-B2	21091	8416	340596	6032	627501	5602	143
214-093A-B3	29057	8957	343682	6178	670228	5919	188
MD-14-B1	20748	8359	294827	5696	609698	5508	0
MD-14-B2	0	8569	239264	5294	580371	5370	0
MD-14-B3	19658	8839	347311	6142	701405	6034	261
MD-14-B4	10417	6793	176046	4362	590063	5139	0
MD-15-B1	21294	8619	355767	6138	553140	5166	0
MD-15-B2	25474	8817	379946	6341	590933	5437	123
MD-15-B3	12263	8167	335406	5938	547475	5112	0
MD-15-B4	25499	9047	401578	6535	724349	6177	0
MD-15-B5	26454	8431	347323	6074	652047	5725	0
MD-15-B7	15256	7602	242827	5133	678246	5734	0
MD-15-B8	10627	7328	200935	4705	610122	5328	0
230-092A-B1	14726	8897	238761	5343	625231	5669	0
230-092A-B2	19196	8049	208851	4923	523326	4999	0
230-092G	21850	9448	302980	5936	580634	5483	151
50-092B-B1	20576	9337	288994	5798	608176	5611	0
50-092B-B2	26428	9560	303810	5917	655557	5863	136
50-092B-B3	9713	7631	195829	4718	596201	5304	0
50-080-B1	14966	7385	201086	4779	472472	4676	0

50-080-B2	0	8250	284711	5575	548795	5140	695
50-080-B3	13654	8306	256141	5455	557422	5277	0
50-080-B4	25022	8257	252018	5362	519169	5027	0
50-080-B5	24105	8599	266170	5581	531269	5175	208
50-080-B6	14534	8166	221832	5231	444690	4698	176
50-080-B7	15808	8256	358777	6181	681039	5883	193
50-080-B8	20472	8494	322183	5907	576690	5347	131
50-080-B9	15778	7592	316153	5771	510347	4908	116
272-095-B1	0	8208	325173	5856	593794	5344	176
272-095-B2	8884	8683	378764	6311	634017	5615	235
272-095-B3	11740	8226	374194	6255	579222	5306	182
272-095-B4	11600	7902	389591	6288	572055	5226	0
230-092D-B1	10319	8340	225753	5145	408334	4423	0
230-092D-B2	21577	8060	251958	5271	717572	5989	0
230-092D-B3	18502	8249	219712	5061	595777	5408	0
230-092D-B4	27832	8662	212963	5083	627742	5649	206
230-092D-B5	27070	9036	229060	5321	674101	5975	354
230-092D-B6	30152	8965	254901	5465	637181	5714	206
230-092D-B7	32833	9096	245979	5436	626038	5690	186
90-037	23089	8636	339955	6054	703933	6013	169
230-092F-B1	13425	8251	270140	5508	579632	5339	0
230-092F-B2	16717	7608	247600	5188	605328	5377	0
230-092F-B3	14590	8095	230351	5117	586008	5330	0
230-092F-B4	18500	8008	241864	5192	593639	5354	0
50-092B-US	9950	6282	163906	4231	537320	4872	0

P Err	S	S Err	Cl	Cl Err	K2O	K2O Err	Ca	Ca Err
111	10808	238	0	131	22875	225	541	57
121	1534	130	0	127	16401	199	570	53
86	15338	265	0	124	15914	175	0	45
71	5568	167	0	112	5593	107	35	35
93	1955	129	0	123	25467	232	253	52
74	406	90	0	110	14806	174	0	41
75	778	99	0	113	14388	173	198	43
76	545	94	0	115	22681	216	263	48
94	0	92	0	123	21335	219	471	53
112	0	84	0	130	28869	249	14949	150
102	0	84	0	125	36087	280	1828	73
112	0	87	0	131	51224	338	1420	74
93	0	80	0	116	24400	228	660	55
132	0	99	0	136	35299	304	4722	103
160	0	104	0	138	31015	265	25694	195
109	5233	177	0	132	23166	223	675	58
96	2032	131	0	128	26401	240	671	57
114	4255	168	0	131	29353	258	859	61
111	5694	189	0	137	37559	295	886	64
122	20639	322	0	136	31175	270	681	61
134	0	93	0	129	16191	186	38675	229
97	10449	231	0	128	26888	237	8552	118
99	0	88	0	121	21596	213	8654	115
117	0	95	0	125	23758	237	3362	84
117	4365	175	0	142	40238	310	2181	78
146	1366	154	0	170	36013	350	1403	85
63	500	88	0	98	7583	124	544	44
111	0	99	0	137	26013	261	1494	72
110	5692	221	0	153	17534	235	613	66
128	0	106	0	136	24721	261	1156	68
165	0	136	0	179	26032	339	1125	89
90	0	82	0	126	22835	222	901	59
126	10070	234	0	133	22510	228	1593	70
162	2645	161	0	134	27045	267	1736	76
102	7283	205	0	143	10145	166	394	52
92	1404	121	0	133	22386	223	440	55
117	2132	150	0	149	28081	279	538	66
115	747	124	0	151	34782	309	593	69
123	486	123	0	153	35758	328	647	72
126	1983	138	0	137	38753	296	674	65
157	1460	153	0	160	24087	280	449	68
191	13135	309	0	169	30022	307	456	70
195	16839	335	0	161	17949	237	4156	108
133	10156	263	0	155	23058	256	1708	79
108	8626	219	0	145	29736	262	596	62
105	6055	191	0	137	28099	255	427	57

87	3449	150	0	135	21440	220	0	50
121	8826	225	0	138	23111	237	463	56
93	3219	149	0	133	24532	234	57	52
96	861	112	0	129	25384	237	293	53
96	1647	124	0	131	25514	236	315	55
114	40238	431	0	138	18844	208	284	53
116	1113	123	0	136	40073	308	1977	76
99	7833	209	0	127	21751	221	804	56
123	33956	409	0	133	25852	249	566	57
114	32911	393	0	137	21917	223	758	60
130	3695	182	0	148	34867	320	1504	78
112	21824	324	0	131	26359	239	6987	110
149	0	133	0	175	27382	330	2867	107
154	0	137	0	188	29920	358	3006	115
156	0	136	0	183	31024	357	3039	113
83	0	76	0	124	7650	125	1367	59
128	4244	206	0	155	16750	239	438	63
134	2173	142	0	136	40792	308	821	64
113	5158	188	0	137	15891	203	562	56
113	2933	157	0	133	15605	201	503	53
121	1202	131	0	140	19080	226	631	57
141	10107	257	0	145	21703	245	494	59
111	408	106	0	131	28999	265	490	56
97	185	95	0	125	23297	226	292	50
89	1988	127	0	123	17254	190	182	47
110	1317	139	0	146	13940	201	841	63
103	1568	138	0	135	8356	159	526	53
98	1032	115	0	120	16774	194	364	48
113	1691	145	0	147	22601	256	479	62
134	433	136	0	154	23429	292	354	65
121	0	105	0	144	37517	326	626	68
122	0	109	0	149	32042	308	632	71
117	2680	163	0	145	22184	254	245	61
90	1918	124	0	127	19670	202	355	53
129	485	108	0	139	27456	257	2690	83
107	17788	291	409	164	12030	164	2340	78
102	3907	160	0	138	24932	233	3078	82
91	238	95	0	133	17259	193	650	55
89	240	89	0	130	19071	203	425	51
125	0	102	0	147	30154	298	473	66
102	0	82	0	130	36891	289	595	60
105	0	87	0	131	38675	298	811	65
83	0	75	0	118	25217	229	579	55
95	0	77	0	134	32170	272	1183	66
109	0	91	0	143	38973	299	2283	81
107	0	100	0	135	32969	275	1318	70
112	0	95	0	141	40242	308	1967	79

113	0	94	0	141	36868	295	1852	76
109	0	97	0	148	32840	275	2580	83
175	14732	317	0	153	22547	258	1197	74
144	3563	172	0	137	19873	222	999	65
109	2203	139	0	134	25636	244	993	62
107	1045	120	0	133	24578	238	1270	66
120	174	111	0	138	27325	277	824	66
139	6677	201	0	132	11985	175	1873	67
139	6664	200	0	130	9688	156	1403	62
125	4621	176	0	133	9772	158	1344	61
125	9616	232	0	142	22356	230	799	61
145	5984	220	0	142	15005	213	430	60
144	1982	158	0	143	22340	247	552	62
97	1020	111	0	122	16819	189	322	49
123	8894	226	0	137	31707	272	2901	83
116	8778	223	0	140	32674	274	1714	72
98	286	100	0	120	29556	258	677	57
109	2279	141	0	127	38632	296	991	64
113	15866	283	0	131	26113	242	489	57
117	10755	238	0	132	27503	246	870	61
104	4183	166	0	129	22464	226	667	56
106	1203	121	0	132	26419	248	761	59
113	333	103	0	128	25660	244	742	58
132	12826	264	0	162	20296	247	543	66
98	782	109	0	129	21152	217	652	56
92	1109	115	0	130	20519	212	475	53
99	952	114	0	131	26164	243	419	55
97	7834	208	0	140	22290	221	335	55
102	2658	146	0	132	20383	215	322	52
110	1278	120	0	133	20831	224	314	52
118	4428	172	0	141	21440	232	130	54
120	5078	180	0	143	19336	224	134	54
99	0	89	0	123	20306	217	476	51
112	342	105	0	130	27709	259	729	59
79	115	86	0	117	15538	182	168	45
117	136	102	0	139	30348	273	1101	66
104	0	93	0	131	29139	260	679	59
114	1568	129	0	141	28662	260	516	61
101	194	95	0	135	24622	235	557	57
108	12904	262	0	126	15666	193	845	55
106	9766	232	0	127	21940	227	926	58
91	0	85	0	126	22656	226	1308	62
100	135	95	0	121	13077	173	476	48
90	0	83	0	116	9150	144	279	42
94	0	83	0	117	6576	128	328	42
129	0	96	0	141	36082	298	2541	85
104	9751	229	0	139	24845	234	401	57

109	6600	199	0	137	30478	267	520	60
96	7921	207	0	129	22934	222	233	53
112	1623	130	0	137	36069	294	418	61
107	150	99	0	131	22147	230	896	59
112	3056	153	0	141	30370	271	938	63
88	949	109	0	123	15204	185	409	48
82	480	97	0	113	16330	188	297	45
107	1389	114	0	130	16234	178	80	50
193	15581	287	0	147	34228	290	501	66
99	305	99	0	131	35305	279	675	59
108	4383	168	0	137	33748	277	747	62
118	9889	237	0	138	34584	289	960	65
171	7327	212	0	135	36157	292	3988	93
134	14811	284	0	141	41940	320	1159	70
185	23446	344	0	139	34647	287	5523	106
108	825	113	0	135	31844	272	1113	65
103	1309	123	0	135	34595	282	1051	65
93	534	103	0	125	27133	242	628	58
98	121	95	0	129	32895	269	671	60
102	7396	204	0	134	24053	236	781	60
109	202	98	0	134	31027	272	1406	66
106	0	98	0	132	26365	253	1140	65
118	2437	142	0	138	28778	263	1086	66
110	0	98	0	134	29473	262	1387	68
106	1954	134	0	134	33863	272	929	65
97	2006	134	0	132	28428	250	570	57
101	594	106	0	129	27694	255	499	57
115	0	97	0	145	45226	327	2820	86
108	13199	262	0	134	27002	251	3010	83
110	894	117	0	133	30155	265	3173	83
105	0	95	0	129	30930	268	1710	69
113	1512	127	0	137	39375	295	2463	81
109	0	96	0	126	27688	254	1517	67
96	377	99	0	124	25298	237	1715	67
105	0	96	0	127	30847	265	1201	64
163	0	96	0	142	39799	322	7120	119
159	0	104	0	142	36946	308	20319	182
112	111	99	0	134	40616	307	2350	80
75	0	83	0	125	13597	165	881	57
104	700	111	0	135	25107	243	3778	88
101	0	94	0	134	23464	231	3218	82
101	657	110	0	124	13149	180	2005	67
95	1801	127	0	123	19499	206	2197	70
110	206	101	0	126	33735	283	1793	70
101	531	106	0	133	28988	262	1660	69
220	10822	242	0	129	9747	155	1600	64
142	5241	175	0	123	4847	110	1121	53

136	1506	128	0	125	17487	198	1464	63
173	1677	134	0	138	27481	256	1436	68
94	4213	160	0	124	18995	204	537	52
115	8992	223	0	134	21369	224	5184	98
104	1299	120	0	132	19248	210	5082	96
115	3805	165	0	132	23917	238	4742	94
113	1068	119	0	132	24942	242	1878	70
148	14912	280	0	134	19413	216	13318	144
111	578	108	0	130	22137	227	1360	64
130	4053	169	0	130	22495	234	3804	87
113	243	103	0	132	24250	240	1242	64
99	0	91	0	129	32660	267	1353	66
128	4250	172	0	139	27460	257	9088	124
114	449	108	0	142	31105	288	1280	73
98	774	109	0	123	26099	241	631	56
99	0	87	0	133	35800	284	3301	86
144	668	115	0	129	17409	201	3752	85
107	0	87	0	120	15894	194	2230	70
106	0	88	0	121	16702	198	1900	67
105	0	87	0	121	23637	232	913	57
106	0	92	0	126	30664	258	1119	63
119	20472	316	0	136	31864	262	225	57
116	0	87	0	126	32800	273	1341	66
106	0	84	0	127	23904	239	2172	72
109	0	85	0	123	27867	251	1516	65
81	0	77	0	115	16581	185	222	45
92	222	93	0	115	24470	231	264	48
87	0	71	0	116	16812	187	340	47
129	619	113	0	131	31124	279	5016	101
103	0	91	0	119	25896	245	376	51
105	0	84	0	122	34322	276	425	55
96	0	82	0	124	30028	254	260	53
87	572	96	0	127	11594	151	598	50
107	0	92	0	123	27448	251	492	53
129	0	98	0	126	8790	150	961	54
101	0	85	0	123	27205	242	624	55
76	1383	112	0	126	18183	191	0	44
127	0	91	0	128	41586	319	1581	71
122	0	96	0	127	24240	243	3081	82
135	397	108	0	131	30940	268	2487	79
125	672	109	0	121	25200	238	1005	59
109	0	90	0	129	35770	280	764	61
89	0	81	0	116	20655	212	995	56
146	2638	149	0	135	25582	240	22392	183
95	763	104	0	128	22431	213	231	51
100	0	84	0	126	29999	256	524	55
101	0	85	0	124	31769	263	519	56

163	3520	162	0	134	38049	297	931	65
113	0	93	0	127	39454	304	770	61
95	0	78	0	121	10621	153	449	45
107	242	100	0	129	31562	264	644	59
109	21095	319	0	129	29504	252	337	55
97	0	78	0	126	26706	238	837	59
103	0	90	0	121	22471	229	1955	69
139	1289	128	0	133	19474	215	3324	83
126	1036	122	0	127	36940	294	729	60
74	0	70	0	121	15727	171	0	43
91	0	77	0	117	22252	220	768	55
114	0	88	0	128	35130	286	1555	70
71	0	71	0	111	9990	143	117	37
110	0	89	0	128	35166	288	659	59
79	0	83	0	141	11707	152	0	49
89	553	100	0	143	14046	166	0	51
77	0	84	0	141	11128	147	0	47
84	1249	110	0	147	2318	81	0	42
75	0	83	0	142	10530	144	0	48
77	368	95	0	141	12355	155	0	48
78	0	82	0	142	11137	149	57	51
146	0	102	0	155	4742	107	80327	327
74	0	79	0	138	465	54	401	42
88	2665	137	0	145	10923	148	0	49
71	0	79	0	140	7360	121	0	43
75	0	81	0	139	6601	118	0	46
81	108	89	0	146	8380	132	1872	72
76	0	84	0	142	7796	126	0	45
76	0	81	0	140	8895	134	0	46
86	0	90	0	147	12522	162	0	50
82	191	93	0	147	11386	151	0	50
93	164	97	0	150	14630	174	0	53
94	0	87	0	143	2235	81	146	43
86	0	90	0	146	13619	168	127	52
83	0	84	0	144	10040	144	0	49
76	0	83	0	144	9887	139	0	51
77	0	83	0	141	1468	70	516	47
90	349	95	0	140	10226	144	0	48
76	130	87	0	142	10158	142	0	47
105	3166	149	0	153	11693	159	13057	141
71	432	92	0	142	4457	97	0	42
77	0	84	0	144	8045	129	0	47
81	0	86	0	144	10780	146	0	48
80	563	100	0	148	5120	108	0	46
90	0	90	0	146	16807	184	0	54
82	0	88	0	145	11017	150	0	50
76	0	80	0	141	7082	120	0	45

83	0	87	0	150	11487	155	0	54
73	0	79	0	141	1066	65	459	45
86	655	104	0	146	11936	158	0	50
89	1636	124	0	153	11183	162	0	52
82	233	93	0	146	10581	146	2136	76
87	0	89	0	147	14825	172	0	52
81	0	83	0	144	8136	132	0	46
74	0	81	0	138	6170	113	0	44
78	1619	117	0	146	5469	111	0	45
83	0	85	0	142	11390	151	0	49
105	821	110	0	120	21507	219	624	54
82	0	84	0	143	8219	129	0	48
81	0	85	0	143	14433	169	166	55
89	0	89	0	145	13550	168	60	51
88	484	100	0	151	10784	163	0	51
78	195	89	0	142	7397	125	287	51
92	645	105	0	149	13620	168	0	51
93	0	90	0	155	11029	163	0	52
71	0	79	0	138	6237	111	0	43
79	0	82	0	141	8428	131	0	46
74	0	82	0	141	8589	131	0	45
75	0	82	0	141	8811	133	0	46
78	491	98	0	144	8803	137	0	46
86	715	103	0	148	11437	154	0	49
89	0	91	0	148	15247	177	0	53
79	0	83	0	141	9219	137	0	47
172	3885	164	0	124	25561	236	715	57
112	0	91	0	121	35069	286	499	56
126	178	104	0	127	33866	285	582	58
129	347	104	0	157	17022	229	0	56
112	0	84	0	124	34356	282	727	59
108	0	86	0	121	34428	281	471	56
105	0	79	0	120	31858	266	519	55
104	0	86	0	123	32118	269	407	55
109	0	89	0	126	22895	219	197	52
109	0	87	0	122	35078	285	516	56
226	1039	152	0	142	16497	237	785	64
102	0	82	0	121	30786	262	412	53
92	0	77	0	123	24370	227	273	50
103	0	89	0	123	32462	270	650	57
105	0	84	0	127	34296	279	516	58
118	0	91	0	122	38048	302	661	58
112	0	88	0	125	35223	285	564	58
96	0	79	0	124	29281	254	412	54
101	0	84	0	127	39383	297	550	59
119	840	116	0	138	34501	283	287	59
107	0	92	0	126	42279	304	553	60

137	0	91	0	128	34575	281	2793	82
66	0	68	0	116	13706	158	0	43
97	0	86	0	125	36902	280	861	61
98	0	90	0	122	37106	282	882	63
103	0	94	0	121	32697	273	796	59
128	2844	154	0	130	28219	258	1269	66
105	0	92	0	119	19532	213	542	50
167	8060	226	0	187	26635	341	6727	137
99	11674	244	0	124	24554	227	3507	84
116	515	110	0	127	23002	232	1116	62
139	3551	162	0	123	22047	226	894	58
109	0	78	0	128	29013	254	1524	68
98	0	78	0	115	20071	204	1663	64
128	1708	130	0	130	38813	298	1743	73
104	502	105	0	125	33461	277	1064	62
136	2582	149	0	132	39007	306	2660	83
109	103	97	0	124	37651	295	1325	66
113	0	89	0	131	40787	312	1485	71
112	0	91	0	127	42682	313	1510	70
240	5078	197	0	137	30097	269	37937	236
143	21008	332	0	131	21940	238	2245	74
109	5010	177	0	125	40570	302	1524	70
110	0	83	0	121	16580	200	2619	74
99	0	83	0	120	21121	216	3104	78
81	0	85	0	108	10479	150	1456	57
104	4918	176	0	120	29503	258	2750	78
134	33826	405	0	134	17820	212	3894	89
106	226	101	0	120	28953	258	1669	68
111	4738	171	0	125	28662	256	606	59
147	73646	573	974	177	16523	193	4395	96
108	3707	159	0	119	21761	220	2933	78
117	998	115	0	129	34092	273	2630	79
108	4162	165	0	129	13621	175	1193	59
96	1009	112	0	109	14978	182	2048	66
133	19568	317	0	145	27954	269	521	64
82	500	99	0	126	20117	202	169	49
78	0	81	0	113	21021	209	268	47
138	18001	303	0	130	33121	278	1256	68
133	10493	243	0	128	35418	290	962	64
104	8305	215	0	123	33634	277	663	58
95	13072	256	0	124	20941	215	371	50
158	2030	141	0	127	20148	215	42866	247
149	1247	126	0	122	19098	212	38291	234
108	0	89	0	123	34759	284	3846	89
96	0	81	0	114	31324	257	3499	85
116	1355	127	0	129	54069	356	1353	72
119	27558	362	0	136	33827	270	4950	99

103	817	112	0	125	42208	302	816	64
112	1412	124	0	132	49417	339	786	65
125	1848	136	0	130	43650	325	1080	67
107	13379	261	0	151	14433	183	180	53
119	535	111	0	135	55696	357	1526	75
153	4683	181	0	125	12314	181	1033	57
121	836	117	0	130	44069	321	723	63
118	268	104	0	128	44580	326	734	64
114	2424	143	0	129	38623	300	555	60
112	596	108	0	127	38017	297	632	60
116	811	113	0	131	45923	329	681	63
264	14863	282	0	129	20383	222	1545	67
114	2957	151	0	128	44686	322	698	62
124	1999	139	0	128	42489	317	772	62
124	0	101	0	138	68411	403	988	72
125	2176	139	0	126	30235	262	1000	63
120	968	118	0	125	33035	274	1390	67
94	3420	149	0	114	25382	229	1638	66
100	2224	134	0	116	26652	240	2127	72
129	1144	124	0	125	34243	284	1564	69
120	8972	223	0	133	20054	216	597	56
121	644	113	0	121	27076	259	654	55
114	176	100	0	121	30324	270	679	57
80	0	78	0	105	15827	184	235	44
93	0	83	0	112	22765	224	485	51
107	167	98	0	123	30588	265	685	58
118	145	101	0	126	43148	320	776	63
112	412	103	0	125	37823	294	692	61
121	377	106	0	127	40639	314	785	63
106	1690	129	0	126	41591	306	631	61
120	20732	324	0	125	34471	285	470	58
126	864	117	0	125	37249	299	738	61
92	617	102	0	116	13107	171	215	43
118	2352	142	0	123	12025	173	759	53
114	294	101	0	123	36247	287	736	60
109	697	109	0	117	14639	186	711	52
117	946	118	0	122	41963	317	1088	65
106	122	96	0	128	37750	294	786	60
101	0	85	0	118	27786	251	487	53
97	2006	131	0	118	22410	223	308	49
119	505	111	0	128	35247	292	819	64
99	919	112	0	126	36413	283	633	61
126	455	111	0	133	50725	344	1340	74
121	8673	224	0	131	53782	352	715	67
128	3395	162	0	130	54786	358	743	67
106	8830	220	0	119	33200	268	376	55
87	2054	128	0	119	31210	258	292	54

138	4148	168	0	123	28045	252	811	60
106	6074	190	0	126	41791	310	587	62
100	3135	149	0	120	35952	284	432	58
116	0	94	0	129	44068	319	1076	69
111	0	91	0	127	24437	248	475	58
123	718	113	0	123	24571	245	813	58
114	235	100	0	126	45034	315	730	63
103	0	90	0	115	21409	219	369	50
123	4158	169	0	134	14422	188	446	50
134	2852	154	0	125	15740	199	691	54
125	327	103	0	114	14087	186	424	48
107	790	109	0	120	8225	146	372	44
105	6591	194	0	140	43325	303	471	66
112	508	107	0	121	35177	285	511	56
112	1415	126	0	130	31616	272	409	57
119	155	100	0	131	35325	293	1374	70
130	0	98	0	132	37303	309	1336	71
122	0	95	0	130	44435	324	1321	71
121	0	94	0	134	41510	318	1459	73
124	405	108	0	126	39157	304	3675	89
111	8559	219	0	124	28062	257	536	56
93	929	109	0	117	34039	273	437	55
104	5508	184	0	121	34455	278	442	57
103	2337	138	0	123	35248	280	541	58
80	881	101	0	104	24762	225	147	46

Ti	Ti Err	V	V Err	Cr	Cr Err	Mn	Mn Err	Fe
10405	94	165	115	143	31	20	15	20151
18321	117	698	159	232	34	79	14	11867
6296	79	0	79	57	21	0	15	13354
2995	58	0	68	80	24	0	15	16438
4607	67	162	90	87	29	0	15	11683
5285	71	0	87	109	25	0	13	11344
4567	67	98	88	68	25	0	15	11927
4522	67	153	89	83	27	0	15	12616
7085	80	236	103	68	29	0	15	11966
4682	70	0	87	46	30	346	30	30474
5821	75	140	95	63	31	25	19	20536
6209	75	290	103	74	34	102	21	24858
6614	77	153	94	97	25	50	17	6968
4612	72	105	98	52	40	544	36	96098
4816	73	0	90	73	32	143	25	27130
4964	71	0	82	102	28	0	15	21311
5620	74	100	91	89	31	0	17	21171
5878	76	144	95	77	32	53	20	27827
6147	75	289	100	119	32	0	15	15027
5339	74	136	95	0	33	51	22	37357
3627	67	0	77	73	25	74	22	16802
3263	62	0	79	76	29	0	17	24680
4947	70	0	85	74	25	0	14	10113
4934	73	0	88	43	30	259	29	35137
7172	81	382	111	67	34	501	32	26482
6218	94	177	105	76	37	516	35	41472
3787	65	0	75	69	24	75	21	10525
6920	86	147	109	115	32	0	18	13780
4397	84	0	94	80	31	43	21	21149
6765	87	249	109	84	31	0	17	10982
6268	108	150	112	84	34	0	19	12333
5547	74	0	90	66	25	0	15	13439
5467	76	118	106	135	41	66	24	40840
5128	76	230	119	103	42	0	23	16745
7254	90	0	99	100	39	100	25	95899
5886	77	0	97	118	32	0	19	24018
5752	84	184	112	70	37	52	23	33433
5619	84	119	105	50	35	183	28	29549
5490	86	127	109	86	38	211	29	32082
5977	77	214	100	62	34	108	23	28831
4786	86	0	89	101	33	0	20	26700
4828	84	0	107	93	43	0	26	52722
3500	77	0	92	66	39	53	27	76554
4388	79	0	94	62	34	0	22	36918
6224	79	0	95	88	35	0	19	45947
5831	76	0	93	100	32	0	16	35098

4233	69	0	84	57	33	113	24	74996
7600	83	322	110	134	35	0	16	27898
4961	72	0	89	54	32	129	24	53546
5831	76	0	90	73	28	41	20	24753
5930	77	0	92	73	32	268	28	41244
4699	72	0	83	39	32	86	23	56403
6402	76	364	108	104	35	128	22	25901
4505	68	110	84	26	26	0	18	16262
5425	73	144	92	65	31	112	22	33145
3843	67	0	80	76	33	170	27	58038
5187	80	139	111	71	39	829	48	36307
4468	69	0	85	91	32	0	20	27676
5459	97	148	111	95	36	98	26	18298
4967	99	110	93	98	31	127	24	22822
4970	96	97	88	108	31	0	17	23126
1097	45	0	52	0	24	2014	62	49143
5949	96	0	110	58	30	0	20	18925
7055	80	386	116	89	36	0	17	16977
8084	90	174	110	114	32	0	16	21968
8624	91	224	114	132	31	0	15	11162
8425	91	328	121	143	36	0	15	12461
7839	90	296	117	122	35	0	16	15724
6768	79	323	112	109	33	0	15	10916
6303	77	192	97	69	27	0	14	9717
5253	73	0	86	102	28	0	16	16402
14613	129	0	146	228	37	51	17	12867
10042	104	218	133	204	37	0	15	12147
9038	89	0	127	151	35	0	16	11791
7448	93	210	118	143	38	0	18	29822
5936	96	157	110	69	29	0	16	8105
6342	86	257	110	100	32	0	15	9428
7451	98	148	115	84	31	173	26	9893
4294	80	0	99	59	34	92	26	28003
4333	68	0	87	56	29	419	32	33411
5259	76	0	93	64	36	12573	145	62414
12895	114	0	100	125	31	127	23	34683
6490	80	130	100	97	33	89	22	27719
5171	73	0	86	105	28	0	17	20606
4966	70	148	93	70	29	0	18	21555
6334	89	174	105	84	30	0	15	10586
6315	78	280	101	82	28	0	14	10920
5796	75	173	95	97	30	0	16	12746
4385	67	0	83	72	26	0	14	11547
4326	67	170	93	0	34	940	43	43500
5536	76	137	94	81	33	24	20	23175
5831	76	130	94	88	29	0	16	13545
5710	76	137	98	64	34	190	26	30273

5717	76	213	99	81	33	133	23	24309
5457	77	0	92	60	33	422	33	28955
7088	96	146	111	98	35	0	19	25986
6912	85	0	100	107	31	0	16	24684
6458	78	168	98	77	29	0	15	17749
5869	77	0	96	59	30	0	18	25597
6027	85	138	106	75	33	0	19	22910
8026	84	259	110	152	36	0	16	23805
6932	82	0	100	134	33	0	17	28081
7782	86	112	104	106	32	0	16	21924
9048	93	150	116	104	34	47	19	30726
6515	92	0	99	109	31	0	18	29644
7441	92	197	109	112	31	0	15	13085
4743	70	0	84	88	24	0	14	8033
8618	88	246	110	71	30	62	18	24017
8627	87	217	109	97	30	0	15	17434
6531	77	322	103	61	27	0	15	7136
7056	79	329	109	57	31	0	17	12390
4545	70	0	81	39	29	0	19	37098
4858	71	0	88	78	32	0	19	34173
8086	84	245	106	98	30	0	15	14791
8923	87	319	115	94	32	0	15	13357
7184	80	255	105	90	30	0	15	11404
4511	75	0	92	87	51	575	43	165932
7656	83	0	99	152	30	0	15	13314
6568	79	106	94	121	28	0	14	11553
6386	77	131	97	105	31	0	16	11616
5877	77	0	91	150	32	0	16	19698
5895	76	139	94	129	32	0	16	16999
5575	75	0	91	117	35	0	19	45781
5480	76	0	95	113	39	106	25	78348
5581	77	0	94	96	41	73	25	88991
8112	85	246	106	132	29	68	18	7809
7123	80	351	108	122	36	178	23	22316
4924	70	0	89	126	32	179	25	35888
6154	75	304	107	104	37	621	35	25506
6251	75	252	101	106	33	138	22	16263
7037	82	0	102	108	38	4482	87	39795
6013	76	150	98	121	35	408	32	30461
6969	82	196	101	98	30	418	31	15638
7280	82	312	106	141	32	49	18	12680
5523	71	238	98	90	31	511	32	21261
6769	78	137	96	135	29	65	19	7621
6955	80	0	92	170	28	0	13	4926
7275	82	0	96	157	29	0	14	5126
4820	73	0	98	52	39	19522	178	68416
6566	81	0	93	114	30	0	17	23143

6317	79	135	98	66	32	0	18	34783
5852	77	0	91	91	29	33	19	26770
5627	75	123	97	64	36	96	23	51236
7052	80	344	109	84	31	103	21	11582
7790	84	318	111	92	33	118	21	31072
7117	81	168	100	55	25	0	15	9335
5726	73	185	95	48	23	0	14	8505
2712	59	0	65	32	25	59	23	36727
5214	76	0	97	120	42	252	31	86128
4487	65	230	92	96	30	0	15	14458
4876	69	191	94	87	34	0	17	31397
5634	74	108	94	98	35	138	24	41771
5944	76	195	99	73	35	249	27	31623
5623	74	239	100	57	36	407	31	44219
4594	71	121	94	69	38	220	29	62123
6871	78	301	105	77	30	0	14	14483
6626	77	305	105	76	30	0	14	12128
5790	75	157	94	91	28	0	15	13216
5834	74	240	97	69	30	0	15	13821
5922	76	143	99	105	36	206	26	38774
6234	73	380	106	131	35	241	25	16632
5106	72	0	93	66	36	928	42	52415
5574	75	138	98	114	38	404	32	53272
6017	74	258	102	114	35	195	24	17930
8743	89	138	109	222	38	119	22	26947
6081	76	180	95	84	27	0	15	12014
6677	80	0	99	56	33	133	23	39177
5141	71	201	98	83	35	286	28	35233
5641	75	98	96	67	35	187	26	47417
6345	76	253	100	80	30	0	16	15138
6100	74	282	99	52	26	0	14	9400
4659	68	261	97	105	33	0	15	14089
6067	74	232	99	71	29	0	14	15372
5863	73	183	94	71	28	0	14	9677
6372	76	222	100	72	29	0	15	12190
5569	75	215	107	65	42	521	35	77092
5477	76	164	103	62	39	4860	90	64284
5459	72	189	95	86	33	51	19	24780
2848	60	0	68	57	28	58	22	42388
5738	74	210	98	91	33	0	17	20292
5463	74	155	94	102	32	0	17	25324
7983	83	297	107	117	29	0	13	8987
6831	78	146	95	114	27	0	13	9108
6253	73	418	104	87	30	0	13	9960
6087	74	357	103	84	29	0	14	13681
7864	85	219	135	119	43	0	20	13492
5365	72	0	113	122	36	0	16	6041

8420	87	165	113	107	31	0	16	7842
6805	79	272	105	129	36	0	17	24673
4752	68	181	93	106	32	0	18	25008
5999	77	164	99	97	35	502	34	36435
5216	73	0	89	80	31	1300	49	30776
6628	77	295	105	113	33	0	17	11451
6624	77	256	102	96	32	0	16	13180
5727	75	150	97	87	34	0	19	31051
6810	78	175	101	102	33	0	15	14154
6912	77	360	112	112	36	0	18	13159
6264	75	235	102	94	32	0	16	19473
4765	67	276	93	85	30	0	15	13441
5799	74	235	101	84	34	128	23	27679
4865	73	0	104	0	45	7381	112	113175
6274	76	240	98	78	27	0	14	10999
4722	69	157	86	113	31	0	16	24550
17585	118	459	151	197	36	455	29	6242
10498	95	306	120	147	31	17	15	13265
10807	96	285	118	112	27	0	14	7044
6319	76	173	95	74	26	0	14	7836
6549	77	192	98	94	29	0	14	13547
6322	80	0	98	110	35	29	20	35240
5843	74	171	96	70	31	72	20	22864
6373	75	285	102	78	32	23	17	23594
5956	74	240	96	78	28	0	14	9513
6505	76	191	99	129	28	0	13	10415
5301	71	189	89	48	23	0	12	6267
4601	67	0	78	73	23	114	20	5358
5862	77	166	106	77	39	729	40	55904
6776	77	361	108	67	30	0	14	13605
5875	74	233	95	77	27	0	14	9438
5834	75	0	93	72	31	0	18	19958
3049	59	0	61	28	20	0	17	12098
6192	74	272	97	99	28	0	13	8220
21462	134	610	168	164	34	180	19	18291
6014	74	122	89	82	25	0	13	9426
4104	67	0	76	71	27	0	18	31462
6773	76	412	110	73	33	54	19	19909
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5947	75	224	99	83	31	80	20	24533
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5730	75	0	89	80	29	0	15	24532
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7112	80	191	101	108	31	0	16	16083
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6218	76	204	99	42	32	113	22	26297
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3373	68	0	67	60	23	0	17	13799
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5317	70	282	96	114	31	0	14	19227
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6211	73	448	108	131	34	0	14	17191
3532	61	0	70	43	19	0	11	5336
15701	110	426	141	178	34	52	15	14483
7314	77	324	107	100	31	0	13	11653
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7368	77	489	114	99	32	28	16	11034
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7131	80	290	103	107	30	0	14	7697
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6438	79	237	106	69	34	128	23	33220
4548	69	0	89	60	31	121	24	31050
6687	79	242	106	54	37	175	24	37886
5862	74	241	101	74	35	33	19	32365
6825	79	322	108	59	35	74	20	27601
6224	77	129	93	34	25	0	15	12280
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6301	77	321	107	97	37	0	18	40037
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4590	68	169	92	94	35	93	22	44836
5878	77	131	101	90	39	1429	51	83619
9573	88	456	123	215	39	0	15	14912
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8496	84	337	113	129	33	241	24	13675
11792	97	342	126	172	34	0	14	10733
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8311	80	324	108	157	30	0	11	8243
5713	76	0	91	113	34	0	17	32689
6526	77	274	101	80	30	0	16	11252
6043	77	135	98	60	31	103	22	34942
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5837	76	183	101	55	36	688	38	60729
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5611	74	152	97	57	36	558	35	50238
8017	82	469	117	87	33	0	16	11217
7377	81	213	104	68	33	0	17	30974
5303	70	265	97	67	29	0	15	11654
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6093	76	182	96	68	30	26	18	17803
1487	44	78	61	0	20	0	12	4110

Fe Err	Co	Co Err	Ni	Ni Err	Cu	Cu Err	Zn	Zn Err	
143		0	24	32	6	34	5	19	3
110		21	20	45	7	8	4	18	4
121		0	19	12	6	0	4	13	3
132		47	23	49	9	13	5	38	5
112		24	20	16	5	0	3	32	4
109		0	19	7	4	0	3	12	3
112		0	19	6	4	0	3	12	3
115		0	20	7	4	0	3	18	3
111		20	19	9	4	0	3	17	3
183		110	31	22	7	10	4	54	5
147		31	25	26	7	40	5	65	5
159		63	27	36	7	18	4	84	6
84		0	15	21	5	0	3	10	3
324		295	54	72	12	36	7	135	10
176		49	28	33	7	18	4	73	6
150		32	25	19	6	0	3	29	4
148		0	25	22	6	6	4	31	4
171		70	29	21	5	12	4	37	4
123		0	21	5	4	5	3	18	3
199		58	33	15	5	6	3	34	4
143		32	22	14	5	7	4	42	4
165		46	27	18	5	0	3	53	5
103		0	17	19	6	10	4	39	5
195		41	32	46	8	30	5	97	7
166		36	28	38	6	28	5	75	6
211		0	35	33	7	22	4	84	6
110		0	19	9	5	12	4	17	3
129		0	22	24	6	7	4	38	4
159		35	27	51	8	22	5	45	5
116		0	20	11	5	0	4	31	4
133		0	23	13	6	8	4	32	5
119		0	20	15	5	9	4	31	4
223		0	36	48	7	83	7	69	5
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339		0	56	40	9	11	5	29	5
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213		60	36	21	7	12	4	39	5
192		64	33	26	7	157	9	75	6
212		80	36	29	7	9	4	75	6
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343		74	57	17	7	11	5	23	4
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290	0	47	30	7	19	5	33	5
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250	0	41	30	8	20	5	37	5
161	0	27	26	6	16	5	53	5
211	110	36	26	7	36	5	63	5
251	0	42	21	6	4	4	16	3
162	53	28	39	7	12	4	64	5
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254	0	42	34	8	17	5	41	5
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167	33	28	34	7	27	5	52	5
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235	0	39	91	16	26	9	73	9
173	0	29	7	7	0	4	21	4
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135	0	23	23	6	4	4	30	4
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107	0	18	25	6	6	4	41	4
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292	0	48	23	6	36	5	38	5
312	0	51	34	7	19	5	46	5
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127	25	22	34	6	9	4	32	4
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128	0	21	27	6	11	4	32	4
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147	68	26	40	6	4	3	24	4
88	0	15	18	5	9	3	13	3
72	0	12	20	5	11	3	16	3
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275	131	44	184	15	32	7	135	9
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232	55	39	22	7	18	5	65	6
109	0	19	33	6	12	4	92	5
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310	0	50	31	6	25	5	57	5
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181	42	30	11	5	10	4	30	4
208	0	34	40	7	12	4	76	6
182	58	30	46	8	25	5	75	6
213	85	36	45	8	32	5	79	6
260	0	42	44	8	15	5	75	6
121	0	21	9	4	0	3	17	3
111	0	19	6	4	0	3	15	3
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202	41	34	25	6	19	4	28	4
128	35	22	41	6	13	4	69	5
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238	75	40	71	8	9	4	99	6
134	0	23	41	6	14	4	57	5
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202	56	34	27	7	31	5	149	8
191	129	33	58	8	26	5	156	8
224	97	38	20	7	21	5	54	5
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124	0	21	12	5	16	4	29	4
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285	109	47	58	10	19	6	130	9
265	62	42	46	9	26	6	109	8
159	63	27	33	6	15	4	79	6
215	0	35	66	12	76	9	144	9
145	35	25	31	6	13	4	82	5
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96	0	17	36	7	19	5	25	4
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139	44	24	50	7	67	6	101	6
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114	0	19	32	8	0	4	30	4
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119	0	21	12	5	0	3	24	3
127	35	22	44	8	8	5	62	5
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113	0	19	53	8	0	4	14	3
126	37	22	12	6	6	4	35	4
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163	0	27	22	6	0	4	16	3
81	0	14	6	5	0	3	6	3
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340	0	56	24	6	128	8	61	5
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122	29	21	14	6	0	4	23	3
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84	0	15	6	5	0	3	9	3
216	0	36	15	6	39	5	19	3
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93	0	16	14	5	0	3	20	4
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95	0	16	11	5	0	3	19	4
177	0	29	32	7	135	9	21	5
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103	0	18	10	5	7	4	21	4
224	0	36	23	6	32	5	68	5
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196	46	32	50	8	29	6	74	7
128	26	22	73	14	16	8	85	8
114	0	19	15	6	12	4	21	4
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89	0	15	11	5	8	4	14	3
129	0	22	54	7	29	5	107	6
92	0	15	10	5	16	4	48	5
634	0	103	219	20	30	12	702	30
111	0	18	30	7	25	5	91	6
126	0	22	44	7	14	4	23	4
98	0	17	31	6	132	8	13	4
164	53	29	28	7	12	5	30	4
138	29	24	47	7	23	5	59	5
144	40	25	71	8	30	5	117	7
112	0	19	82	9	18	5	131	7
189	59	32	38	8	36	6	93	7
97	0	16	7	5	0	3	17	4
186	0	31	26	7	16	5	53	5
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139	24	22	26	7	32	5	63	6
165	41	28	46	7	47	6	23	4
148	60	26	37	7	45	5	34	5
87	0	16	50	7	13	4	67	5
82	0	14	19	6	8	4	20	4
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124	23	21	24	6	6	4	48	5
225	74	38	24	8	29	6	71	7
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98	0	17	5	4	0	3	21	3
235	40	38	19	6	16	4	47	5
202	48	33	12	6	11	4	45	5
152	0	26	5	5	0	3	33	4
181	0	30	18	6	0	4	35	4
132	39	22	63	8	55	6	213	8
146	47	24	83	8	39	5	105	6
153	28	26	33	6	8	4	148	7
111	0	19	24	6	4	3	49	4
119	0	20	7	5	6	4	64	5
171	0	28	15	5	34	5	65	5

123	0	21	10	6	21	5	135	7
155	54	26	20	6	24	5	48	5
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247	0	38	18	5	4	3	15	3
138	0	23	19	6	21	4	29	4
88	0	16	24	5	0	3	16	3
121	0	21	19	6	6	4	35	4
138	41	24	23	6	14	4	59	5
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157	39	27	31	7	15	5	80	6
155	51	27	35	7	28	5	81	6
114	0	20	45	9	0	5	17	5
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145	0	24	20	6	120	8	59	5
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104	0	18	40	7	28	5	33	4
127	33	22	56	7	55	6	97	6
142	30	25	50	7	15	4	82	6
118	0	20	20	6	19	4	19	4
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93	0	16	13	5	6	3	21	4
102	0	17	12	5	5	4	23	4
113	0	19	16	5	0	3	26	4
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109	21	19	27	6	13	4	46	5
111	0	19	36	6	11	4	40	4
170	90	30	86	9	80	7	88	6
139	0	23	12	5	5	3	28	4
204	0	34	7	5	7	4	13	3
130	0	22	18	5	12	4	25	4
74	0	13	7	5	91	7	83	6
118	0	21	91	9	120	8	37	5
105	23	19	35	6	77	6	51	5
99	0	18	71	8	51	6	109	6
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97	0	17	30	6	7	4	35	4
89	0	15	12	5	4	3	19	4
104	0	17	12	5	4	4	15	3
187	0	31	30	7	24	5	96	7
180	0	30	32	8	31	6	123	8
197	39	33	37	8	24	5	85	6
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168	0	28	16	6	10	4	53	5
114	0	19	0	4	0	3	12	3
174	35	29	30	7	6	4	53	5

146	39	25	31	7	5	4	16	4
205	49	34	18	6	15	4	33	4
193	68	33	42	7	21	5	57	5
215	65	36	65	9	36	6	98	7
298	158	51	51	9	27	6	60	6
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103	0	18	51	6	18	4	33	4
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186	50	31	26	6	31	5	19	4
107	0	18	34	6	9	4	131	7
191	0	32	34	7	22	5	87	6
226	69	37	91	10	18	5	102	7
252	72	41	37	9	11	5	179	10
194	41	32	37	8	13	5	90	7
228	93	38	46	9	10	5	124	8
106	0	18	19	5	16	4	104	6
178	0	30	15	5	11	4	20	4
109	0	19	34	6	48	5	134	7
157	42	26	10	5	20	4	31	4
135	28	23	11	6	0	4	31	4
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Ga	Ga Err	As	As Err	Se	Se Err	Rb	Rb Err	Sr
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8	5	4	3	3	1	83	4	40
13	6	10	4	1	1	127	5	133
27	5	10	2	0	1	153	5	140
14	4	28	3	2	2	92	4	86
13	4	0	2	0	2	88	4	123
16	4	3	2	0	1	137	4	99
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21	5	0	2	0	1	132	5	154
19	5	0	2	0	1	143	5	130
31	5	2	2	0	1	187	6	208
22	5	0	2	0	1	96	4	59
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9	4	5	2	0	1	120	5	328
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20	5	4	3	2	1	137	5	113
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24	5	6	2	0	1	110	5	101
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17	5	2	2	0	1	96	4	77
16	5	0	2	0	2	105	5	82
13	4	0	2	0	1	107	4	80
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27	6	22	4	5	2	144	5	1667
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27	5	0	2	0	1	165	5	111
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26	5	13	3	2	2	126	5	362
21	5	4	2	3	1	111	4	95
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19	5	3	3	0	1	115	5	86
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13	4	5	2	0	2	104	4	154
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22	5	8	3	0	1	155	5	79
23	5	13	3	0	1	156	5	70
21	5	6	3	0	1	177	6	86
24	4	5	2	2	1	107	4	94
26	4	3	2	0	1	112	4	81
15	4	7	2	3	1	105	4	101
17	4	5	2	2	1	110	4	124
19	4	11	3	0	1	98	4	103
23	4	4	2	0	1	114	4	86
17	5	4	3	0	1	97	4	74
18	4	9	3	0	1	123	4	113
21	4	5	2	1	1	99	4	94
12	5	7	3	0	1	82	4	63
16	4	5	2	0	1	91	4	55
16	5	0	3	0	1	103	4	59
22	5	9	3	0	1	163	5	110
21	5	28	5	2	1	112	4	68
25	4	0	2	0	1	122	4	64
20	4	0	2	1	1	104	4	52
21	4	3	2	4	2	151	4	155
17	4	4	2	2	1	142	4	85
17	4	2	2	0	1	133	4	78
19	4	0	2	0	1	114	4	90
25	6	10	4	0	1	157	6	139
22	6	0	3	0	1	137	6	104
23	5	5	2	0	1	174	5	107
12	7	11	5	0	1	153	7	80
19	4	6	2	0	1	156	5	81
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22	4	0	2	0	1	94	4	90
25	5	3	3	0	1	135	5	100
31	5	0	2	0	1	169	5	89
25	4	10	2	10	2	160	5	122
44	7	117	8	26	3	65	5	13207
24	6	34	8	123	6	19	4	8860

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21	5	8	3	0	1	164	5	72
19	5	11	3	0	1	131	5	80
22	4	2	2	0	1	149	4	79
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24	5	4	2	0	1	138	4	159
23	4	4	2	0	1	171	5	126
18	4	7	2	0	1	127	4	168
16	6	11	6	0	1	146	6	99
17	4	13	3	0	1	106	4	63
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25	4	7	2	0	1	79	3	210
26	5	0	2	0	1	75	3	91
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17	5	12	4	2	1	144	5	89
22	5	4	3	1	1	140	5	89
26	5	0	3	1	1	140	5	67
17	5	3	3	0	1	131	5	288
27	5	10	3	2	1	168	5	107
14	4	6	2	1	1	100	4	51
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19	5	0	3	0	1	146	5	101
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9	5	0	3	0	1	82	5	60
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9	5	3	2	0	1	118	4	102
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7	6	0	3	0	1	92	5	179
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6	5	4	2	2	1	93	4	127
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14	4	3	2	0	1	128	4	120
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6	6	0	2	0	1	124	5	119
32	5	0	2	0	1	1	1	9
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11	5	0	2	1	1	99	4	110
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8	5	2	2	2	1	73	3	93
10	5	0	2	0	1	108	4	70
33	5	3	2	2	1	111	4	119
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13	5	5	2	2	1	142	5	152
11	4	0	2	0	1	128	4	127
9	5	0	3	0	1	96	4	79
7	5	0	3	0	1	92	4	71
12	5	3	2	0	2	125	4	197
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13	6	0	2	0	1	65	4	21
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9	6	51	5	0	1	120	5	392
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7	5	4	3	3	1	94	4	77
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7	5	0	2	0	1	128	4	146
7	5	3	2	0	1	86	4	67
31	6	69	7	4	2	165	6	6334
20	4	0	2	0	1	132	4	64
44	5	4	3	3	2	135	4	148
13	6	15	7	3	1	95	5	84
19	5	3	2	0	1	140	5	68
20	4	4	2	2	1	129	4	69
13	4	0	2	0	1	95	4	50
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15	5	0	3	6	2	109	5	63
21	4	0	2	0	1	128	4	62
31	5	44	6	32	3	78	4	2285
20	5	4	2	2	1	132	5	64
21	5	3	2	0	1	128	5	82
20	5	3	2	2	1	139	5	60
21	4	2	2	0	1	130	4	80
22	4	4	2	0	1	133	4	63
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21	5	4	2	0	1	131	5	70
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28	5	4	2	0	1	177	5	71

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9	8	13	5	0	1	204	9	147
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30	5	6	4	0	1	163	5	118
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31	5	8	3	4	2	122	4	141
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15	5	5	3	2	1	136	5	75
45	6	0	2	0	1	90	4	123
33	5	8	3	4	2	97	4	981
33	6	0	4	0	1	136	5	182
14	5	4	3	0	1	209	6	198
29	5	8	3	0	1	174	5	268
33	5	6	3	2	1	158	5	80
26	5	20	4	0	1	168	6	177
26	5	3	2	0	1	159	5	82
22	5	0	2	1	1	160	5	61
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19	5	37	4	2	1	127	5	724
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27	5	11	3	2	2	162	5	305
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26	5	3	2	2	1	164	5	123
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23	5	0	3	3	1	163	5	109
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31	5	4	2	1	1	166	5	507
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32	5	0	2	0	1	161	5	79
17	4	0	2	0	1	102	4	57
15	4	3	2	0	1	85	4	55
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23	6	6	3	0	1	157	6	82
27	5	0	3	3	1	205	6	119
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29	5	5	3	0	1	208	6	112
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22	5	149	8	2	1	157	5	381
26	5	76	5	4	2	242	6	86
27	5	8	3	0	1	212	6	129
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26	6	11	4	0	1	154	6	98
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38	5	5	3	4	2	66	3	247
50	5	7	3	5	2	65	3	958
37	5	13	4	2	1	43	3	46
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17	4	0	2	1	1	143	5	96
15	5	5	3	0	1	139	5	96
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24	5	0	3	0	1	191	6	120
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28	5	6	3	0	1	158	5	124
24	4	37	4	7	2	172	5	101
22	5	7	3	2	2	175	5	100
21	5	16	4	3	1	148	5	90
24	5	4	3	0	1	149	5	81
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Sr Err	Y	Y Err	Zr	Zr Err	Nb	Nb Err	Mo	Mo Err	
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	6	47	5	355	11	0	12	0	7
	5	36	4	245	8	0	11	0	7
	4	54	5	511	11	0	12	0	7
	5	62	5	861	14	0	12	0	8
	5	69	5	572	11	0	12	0	7
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	5	38	4	306	8	0	9	0	6
	6	32	4	243	7	0	9	0	5
	3	38	4	620	11	0	10	0	7
	6	22	3	81	5	0	7	0	5
	8	43	4	173	7	0	9	0	6
	6	28	4	192	8	0	10	0	6
	4	34	4	245	8	0	10	0	6
	4	39	4	371	9	0	10	0	6
	4	30	3	210	6	0	9	0	6
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4	26	4	164	7	0	10	0	7	
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7	66	6	573	15	0	14	0	9
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3	44	3	579	9	0	10	0	6
4	39	4	269	7	0	10	0	6
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5	37	4	130	6	0	8	0	5
4	61	5	473	10	0	11	0	7

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3	28	3	208	6	0	9	0	6
4	42	3	187	6	0	8	0	5
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5	41	4	250	8	0	10	0	6
4	39	3	250	6	0	9	0	6
4	42	4	272	7	0	8	0	6
5	44	4	263	8	0	10	0	6
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4	63	5	3230	24	0	11	0	9
3	40	4	650	11	0	10	0	7
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4	36	4	297	8	0	10	0	6
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14	41	6	0	12	0	12	0	8
5	51	6	412	12	0	12	0	8
3	76	6	606	14	0	13	0	8
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5	50	5	360	11	0	12	0	8
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7	40	5	205	10	0	11	0	7
3	65	5	605	14	0	13	0	8
9	56	6	215	12	0	12	0	9
5	44	5	409	12	0	11	0	7
5	72	6	993	17	0	13	0	8
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8	45	5	260	12	0	13	0	8
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9	43	6	240	12	0	13	0	8
5	59	6	536	13	0	13	0	8
3	109	6	497	13	0	14	0	8
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5	55	5	595	14	0	12	0	8
6	71	6	321	12	0	12	0	7
2	39	5	599	14	48	14	0	8
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7	52	6	533	14	0	12	0	8
6	78	6	404	12	0	12	0	8
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7	65	6	499	13	0	13	0	8
6	47	5	258	10	0	10	0	7
3	47	5	242	10	0	11	0	7
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6	51	6	389	13	0	13	0	8
5	64	6	576	14	0	12	0	8
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6	84	6	428	12	0	12	0	8
4	58	5	684	14	0	12	0	8
33	38	5	85	16	0	10	0	6
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3	34	3	265	6	0	8	0	5
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3	43	3	571	9	0	9	0	6
4	35	3	312	7	0	9	0	6
4	49	4	551	11	0	10	0	6
3	32	3	348	7	0	9	0	6
17	49	3	509	9	0	10	0	6
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4	37	4	304	8	0	9	0	6
3	32	3	316	7	0	9	0	5
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3	30	3	275	7	0	9	0	6
3	33	3	189	6	0	9	0	5
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6	57	5	66	7	0	8	0	5
4	41	4	327	8	0	9	0	5
5	58	4	435	9	0	10	0	6
3	37	3	363	7	0	9	0	5
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5	8	2	12	3	0	5	0	4
4	42	4	496	10	0	10	0	7
5	74	4	703	11	0	11	0	6
12	58	4	594	11	0	11	0	6
6	42	4	397	9	0	9	0	6
6	59	5	347	10	0	10	0	6
6	40	3	167	6	0	8	0	5
4	34	3	324	7	0	8	0	5
5	38	3	142	5	0	8	0	5
3	36	3	174	5	0	8	0	5
3	30	3	245	6	0	8	0	5
4	30	3	204	5	0	8	0	5
6	18	2	174	5	0	8	0	5
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6	23	3	151	6	0	8	0	5
4	48	3	446	8	0	10	0	6
4	41	4	508	9	0	9	0	6
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4	46	4	461	9	0	9	0	5
3	35	3	375	7	0	9	0	6
8	44	4	251	8	0	10	0	6
6	33	5	327	11	0	12	50	9
4	51	4	401	9	0	10	0	6
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5	79	5	644	12	15	13	0	7
4	100	5	1111	14	0	13	0	7
6	39	4	303	9	0	10	0	6
4	40	4	391	10	0	10	0	6
4	34	4	412	9	0	10	0	7
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5	32	3	317	7	0	9	0	6
4	41	4	517	10	0	10	0	6
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6	73	4	475	9	0	11	0	6
5	81	4	376	8	0	10	0	6
6	73	5	338	9	0	10	0	6
3	27	3	155	5	0	8	0	5
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4	38	3	217	5	0	8	0	5
7	111	7	875	16	0	16	0	9
4	33	3	221	6	0	8	0	5
7	81	3	420	7	0	11	0	6
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4	64	4	179	6	0	9	0	5
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4	32	3	147	5	0	8	0	5
42	78	5	652	19	0	12	0	6
3	26	3	142	5	0	8	0	5
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6	48	3	314	7	0	9	0	5
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3	33	2	392	6	0	9	0	5
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5	60	5	763	13	0	11	0	7
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4	37	3	215	6	0	9	0	5
4	41	3	167	5	0	8	0	5
4	45	3	214	6	0	9	0	5
4	39	3	123	5	0	8	0	5
5	22	3	164	6	0	8	0	6
9	31	4	367	9	0	9	0	6
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3	35	3	586	9	0	9	0	6
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4	40	4	237	7	0	9	0	5
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4	49	4	229	6	0	8	0	5
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8	34	4	165	7	0	9	11	6
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5	39	4	131	6	0	8	0	5
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4	45	3	303	6	0	9	0	6
5	44	4	213	6	0	8	0	5
5	58	4	406	9	0	10	0	6
5	49	4	468	9	0	11	0	6
6	46	3	534	9	0	10	0	6
12	62	4	821	12	58	12	0	7
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4	31	3	137	5	0	8	0	5
4	38	3	263	6	0	9	0	5
4	40	4	323	8	0	10	0	6
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Rh	Rh Err	Pd	Pd Err	Ag	Ag Err	Cd	Cd Err	Sn	
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44	10	0	12	0	0	8	0	7	0
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42	10	0	12	0	0	8	0	7	0
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55	10	15	12	0	0	0	7	0
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64	11	0	14	0	0	0	7	0
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52	10	0	12	0	0	0	6	0
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57	10	0	0	0	0	0	6	0
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54	11	0	13	0	0	0	8	0
42	10	0	13	0	7	0	6	0
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46	10	0	13	0	0	0	7	0
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48	10	0	12	0	0	0	7	0
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40	10	0	12	0	7	0	7	0
57	10	0	0	0	0	0	7	0
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48	9	0	11	0	0	0	7	0
43	9	0	0	0	0	0	7	0
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Sn Err	Sb	Sb Err	Te	Te Err	Ba	Ba Err	La	La Err
12	0	30	0	7	390	64	0	104
12	0	29	0	6	266	64	0	108
15	0	26	0	8	243	77	0	115
17	0	27	0	9	240	89	0	133
12	0	31	0	6	419	64	0	99
12	0	33	0	7	280	66	0	101
12	0	34	7	7	349	67	0	104
13	0	34	0	7	575	71	0	106
11	0	32	0	6	299	61	0	96
14	0	27	0	7	509	74	0	117
13	0	28	0	7	507	72	0	110
13	0	28	0	7	624	70	0	113
12	0	29	0	7	423	67	0	105
17	0	25	0	9	515	96	0	155
13	0	29	0	7	336	64	0	107
12	0	29	0	6	224	61	0	96
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11	0	32	0	6	398	57	0	92
12	0	32	0	7	553	68	0	106
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12	0	30	0	7	458	64	0	96
14	0	26	0	8	543	74	0	114
13	0	27	0	7	378	74	0	110
12	0	31	0	7	646	69	0	110
13	0	32	0	7	617	74	0	114
18	0	39	0	10	493	99	0	149
13	0	33	0	7	415	73	0	115
15	0	35	0	8	391	81	0	123
13	0	33	0	7	352	68	0	107
14	0	38	0	8	419	78	0	123
13	0	30	0	7	399	68	0	104
13	0	33	0	7	1074	75	0	109
14	0	34	0	8	807	80	0	122
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13	0	36	0	7	213	70	0	107
14	0	39	0	7	231	72	0	112
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12	0	33	0	6	423	64	0	97
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16	0	27	0	9	568	90	0	134
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13	0	29	0	7	462	74	0	116
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15	0	36	0	8	274	81	0	130
25	0	19	0	13	323	130	0	194
16	0	35	0	8	260	85	0	131
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13	0	31	0	7	324	69	0	111
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12	0	36	0	7	208	66	0	107
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11	0	32	0	5	174	53	0	79
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13	0	32	0	7	431	71	0	111
12	0	31	0	7	538	68	0	107
12	0	31	0	7	525	68	0	106
12	0	33	0	7	611	68	0	103
14	0	33	0	8	733	81	0	127
11	0	33	0	6	263	56	0	91
11	0	32	0	6	361	60	0	96
12	0	31	0	6	367	62	0	98

11	0	32	0	6	344	59	0	94
11	0	34	0	6	289	57	0	89
14	0	35	0	7	1005	81	0	114
11	0	32	0	6	251	61	0	95
11	0	33	0	6	340	61	0	96
13	0	32	0	7	429	69	0	106
15	0	38	0	8	562	86	0	134
11	0	33	0	6	75	56	0	92
12	0	31	0	6	96	61	0	98
12	0	29	0	7	149	63	0	102
11	0	32	0	6	1075	66	0	92
13	0	30	0	7	432	68	0	103
12	0	33	0	7	326	66	0	104
13	0	30	0	7	283	68	0	104
11	0	32	0	6	381	62	0	100
11	0	32	0	6	387	61	0	98
12	0	32	0	7	419	65	0	105
12	0	32	0	7	533	67	0	108
13	0	31	0	7	344	67	0	102
12	0	33	0	7	321	64	0	98
11	0	31	0	6	228	61	0	97
11	0	31	0	6	339	62	0	102
12	0	30	0	7	368	66	0	105
17	0	31	0	9	633	98	0	149
10	0	34	0	6	274	55	0	88
11	0	32	0	6	328	61	0	95
11	0	32	0	6	319	61	0	97
11	0	32	0	6	271	57	0	88
11	0	33	0	6	211	58	0	91
13	0	29	0	7	319	73	0	116
14	0	32	0	8	376	76	0	118
14	0	30	0	8	397	79	0	121
12	0	31	0	6	343	65	0	101
12	0	30	0	6	390	65	0	104
13	0	31	0	7	315	68	0	103
11	0	30	0	6	361	60	0	99
11	0	30	0	6	385	63	0	103
12	0	33	0	7	135	63	0	102
12	0	30	0	7	285	64	0	102
12	0	31	0	7	333	67	0	103
11	0	32	0	6	326	64	0	101
12	0	31	0	7	403	68	0	109
11	0	31	0	6	136	62	0	99
12	0	32	0	7	141	63	0	100
11	0	34	0	6	128	61	0	97
17	0	25	0	9	876	95	0	142
11	0	31	0	6	820	65	0	93

12	0	30	0	6	382	64	0	100
12	0	31	0	6	331	62	0	94
13	0	29	0	7	567	73	0	116
11	0	32	0	6	292	59	0	94
11	0	31	0	6	418	63	0	100
12	0	32	0	6	253	63	0	99
12	0	33	0	6	297	64	0	100
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13	0	33	0	7	630	75	0	113
12	0	32	0	6	508	64	0	103
11	0	31	0	6	418	62	0	98
13	0	30	0	7	464	71	0	113
13	0	28	0	7	400	72	0	117
14	0	29	0	8	606	78	0	126
15	0	28	0	8	679	85	0	133
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11	0	32	0	6	446	61	0	95
12	0	32	0	6	316	62	0	98
12	0	32	0	7	459	65	0	108
14	0	28	8	8	366	75	0	121
13	0	32	0	7	482	70	0	110
11	0	31	0	6	313	59	0	95
13	0	30	0	7	171	67	0	110
11	0	31	0	6	338	62	0	98
13	0	30	0	7	413	76	0	120
12	0	30	0	7	588	68	0	109
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16	0	27	0	9	803	93	0	150
15	0	26	0	9	612	84	0	142
12	0	30	0	7	558	70	0	112
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13	0	28	0	7	366	72	0	115
13	0	31	0	7	602	74	0	111
13	0	28	0	7	513	74	0	117
13	0	27	0	7	339	72	0	118
12	0	28	0	7	402	71	0	111
13	0	29	0	7	392	71	0	109
12	0	30	0	7	302	68	0	106
14	0	27	0	7	369	74	0	114
13	0	30	0	7	798	78	0	120
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12	0	28	0	7	382	65	0	102
14	0	27	0	7	535	76	0	118
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12	0	29	0	7	406	69	0	111
13	0	28	0	7	321	73	0	117
13	0	28	0	7	416	73	0	115
16	0	25	0	9	538	91	0	131
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13	0	30	0	7	365	68	0	110
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13	0	30	0	7	564	72	0	115
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12	0	28	0	7	419	68	0	107
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13	0	28	0	7	726	72	0	116
12	0	29	0	7	570	67	0	110
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13	0	28	0	7	489	73	0	112
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12	0	29	0	7	249	67	0	108
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16	0	25	0	9	263	87	0	131
13	0	29	0	7	517	73	0	116
12	0	32	0	6	368	65	0	94
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13	0	31	0	7	519	68	0	97
14	0	29	0	7	0	69	0	103
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13	0	29	0	7	534	71	0	101
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13	0	30	0	7	672	70	0	96
15	0	26	0	7	281	75	0	108
13	0	29	0	7	269	66	0	95
15	0	27	0	8	471	80	0	113
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14	0	28	0	7	404	73	0	103
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12	0	33	0	6	501	64	0	93
12	0	32	0	6	102	60	0	91
12	0	32	0	6	353	64	0	95
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14	0	28	0	7	446	74	0	106
12	0	31	0	6	0	58	0	89
13	0	29	0	7	1257	76	0	95
14	0	29	0	7	334	72	0	104
14	0	31	0	7	662	75	0	108
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13	0	30	0	7	400	67	0	95
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12	0	33	0	6	511	64	0	93
12	0	31	0	6	272	65	0	95
14	0	28	0	7	609	74	0	100

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13	0	33	0	7	392	70	0	102
15	0	28	0	8	519	78	0	110
12	0	34	0	6	380	61	0	91
14	0	29	0	7	436	76	0	106
13	0	29	0	7	324	70	0	100
12	0	32	0	6	298	64	0	94
12	0	31	0	6	448	66	0	96
12	0	27	0	7	343	67	0	108
13	0	30	0	7	847	71	0	94
13	0	30	0	7	757	74	0	102
11	0	33	0	6	310	59	0	88
15	0	31	0	8	389	80	0	116
15	0	29	0	8	423	80	0	116
12	0	33	0	6	377	61	0	91
16	0	28	0	8	492	86	0	125
14	0	27	0	7	292	72	0	104
13	0	29	0	7	559	71	0	97
15	0	26	0	8	709	84	0	112
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14	0	29	0	7	302	74	0	106
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12	0	30	0	7	420	67	0	109
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12	0	29	0	7	542	70	0	109
11	0	31	0	6	401	64	0	102
12	0	30	0	7	344	68	0	108
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14	0	27	0	8	352	76	0	117
12	0	30	0	7	398	65	0	106
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13	0	27	0	7	366	70	0	108
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12	0	30	0	7	475	67	0	110
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12	0	29	0	7	369	67	0	106
12	0	29	0	7	522	66	0	105
13	0	30	0	7	765	76	0	115
12	0	27	0	7	720	69	0	108

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21	0	20	0	11	497	113	0	162
14	0	27	0	8	492	76	0	120
12	0	29	0	7	981	71	0	106
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25	0	25	0	14	243	140	0	237
13	0	29	0	7	449	72	0	109
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12	0	28	0	7	483	67	0	108
14	0	25	0	8	582	81	0	132
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13	0	27	8	7	626	72	133	116
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14	0	26	0	8	687	82	0	130
12	0	29	7	7	713	72	0	112
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13	0	31	0	7	162	67	0	102
13	0	30	0	7	497	71	0	112
16	0	24	0	9	412	93	0	153
12	0	29	0	7	357	66	0	107
14	0	30	0	8	872	81	0	119
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13	0	29	0	7	713	75	0	120
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13	0	28	0	7	747	72	0	118
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12	0	28	0	7	728	72	0	116
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13	0	27	0	7	664	76	123	122
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13	0	28	0	8	707	77	0	124
14	0	28	0	8	2459	98	736	141
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13	0	27	0	7	853	73	0	123
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12	0	29	0	7	501	69	0	112
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16	0	26	0	8	555	87	0	134
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11	0	30	0	6	214	61	0	98
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11	0	29	0	6	376	64	187	107
11	0	28	0	6	208	62	0	105
12	0	26	0	6	280	57	0	89
12	0	30	0	7	463	69	0	109
14	0	29	0	8	468	76	0	118
14	0	28	0	8	539	82	0	129
15	0	26	0	8	487	86	0	137
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11	0	29	0	6	491	64	0	104
12	0	30	0	7	420	67	0	109
12	0	31	0	7	646	69	0	108
13	0	29	0	7	658	72	0	111
13	0	28	0	7	671	76	0	118
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Ce	Ce Err	Hf	Hf Err	Ta	Ta Err	W	W Err	Pt
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0	139	0	105	28	12	0	35	0
0	163	0	130	45	14	0	33	0
0	104	0	82	57	13	0	24	0
0	111	0	97	52	13	0	22	0
0	114	0	108	38	14	0	21	0
0	114	0	92	48	13	0	21	0
0	96	0	66	49	12	0	22	0
0	121	0	75	27	11	0	28	0
0	109	0	64	33	11	0	26	0
0	108	0	47	35	9	0	24	0
0	110	0	68	35	11	0	24	0
0	135	0	64	13	10	0	31	0
0	106	0	60	25	11	0	27	0
0	101	0	79	30	11	0	26	0
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0	137	0	139	31	15	0	27	0
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0	123	0	80	29	14	0	28	0
0	108	0	71	37	11	0	27	0
194	112	0	108	42	14	0	25	0
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133	116	0	101	37	14	0	26	0
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0	113	0	90	36	14	0	26	0
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0	123	0	105	27	13	0	27	0
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0	106	0	38	31	9	0	22	0
0	107	0	63	26	12	0	27	0
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0	129	0	73	37	13	0	27	0
0	239	0	91	10	9	0	54	0
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0	105	0	56	42	12	0	24	0
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0	114	0	110	74	15	0	28	0
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222	123	0	76	27	12	0	22	0
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143	115	0	89	27	12	0	29	0
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0	123	0	150	0	16	0	35	14
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0	124	0	141	58	15	0	34	0
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0	144	0	148	27	14	0	42	0
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125	117	0	124	31	15	0	32	0
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329	134	0	72	45	11	0	28	0
120	99	0	25	32	9	0	22	0
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158	141	0	143	0	11	0	21	0
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190	126	0	82	30	10	0	25	0
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307	101	0	48	61	10	0	19	0
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113	108	0	60	37	11	0	26	0
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Pt Err	Au	Au Err	Hg	Hg Err	Tl	Tl Err	Pb	Pb Err	
9	0	0	0	0	6	0	5	216	11
7	0	0	0	0	6	0	3	21	5
8	0	12	0	0	4	0	4	8	5
8	0	0	0	0	6	0	5	24	7
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9	0	0	0	0	6	0	3	16	5
9	0	0	0	0	6	0	3	32	5
8	0	0	0	0	6	0	3	14	4
7	0	12	0	0	6	0	3	16	4
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6	0	10	0	0	5	0	3	10	5
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7	0	0	0	0	6	0	3	20	5
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8	0	0	0	0	6	0	3	9	4
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10	0	0	0	0	6	0	5	162	12
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7	0	0	0	0	5	0	3	11	4
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Appendix V

XRD counts provided by the USGS.

“These data are preliminary or provisional and are subject to revision. They are being provided to meet the need for timely best science. The data have not received final approval by the U.S. Geological Survey (USGS) and are provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the data.”

XRD References

FIZ/NIST Inorganic Crystal Structure Database, ICSD, NIST Standard Reference Database Number 84, National Institute of Standards and Technology, Gaithersburg, MD 20899, produced cooperatively with Fachinformationszentrum Karlsruhe, Germany

MDI Materials Data Inc, 2023. <https://materialsdata.com/>

Powder Diffraction File, PDF-4+ 2010; Kabekkodu, S., Ed.; JCPDS-International Centre for Diffraction Data: Newtown Square, PA, 2010.

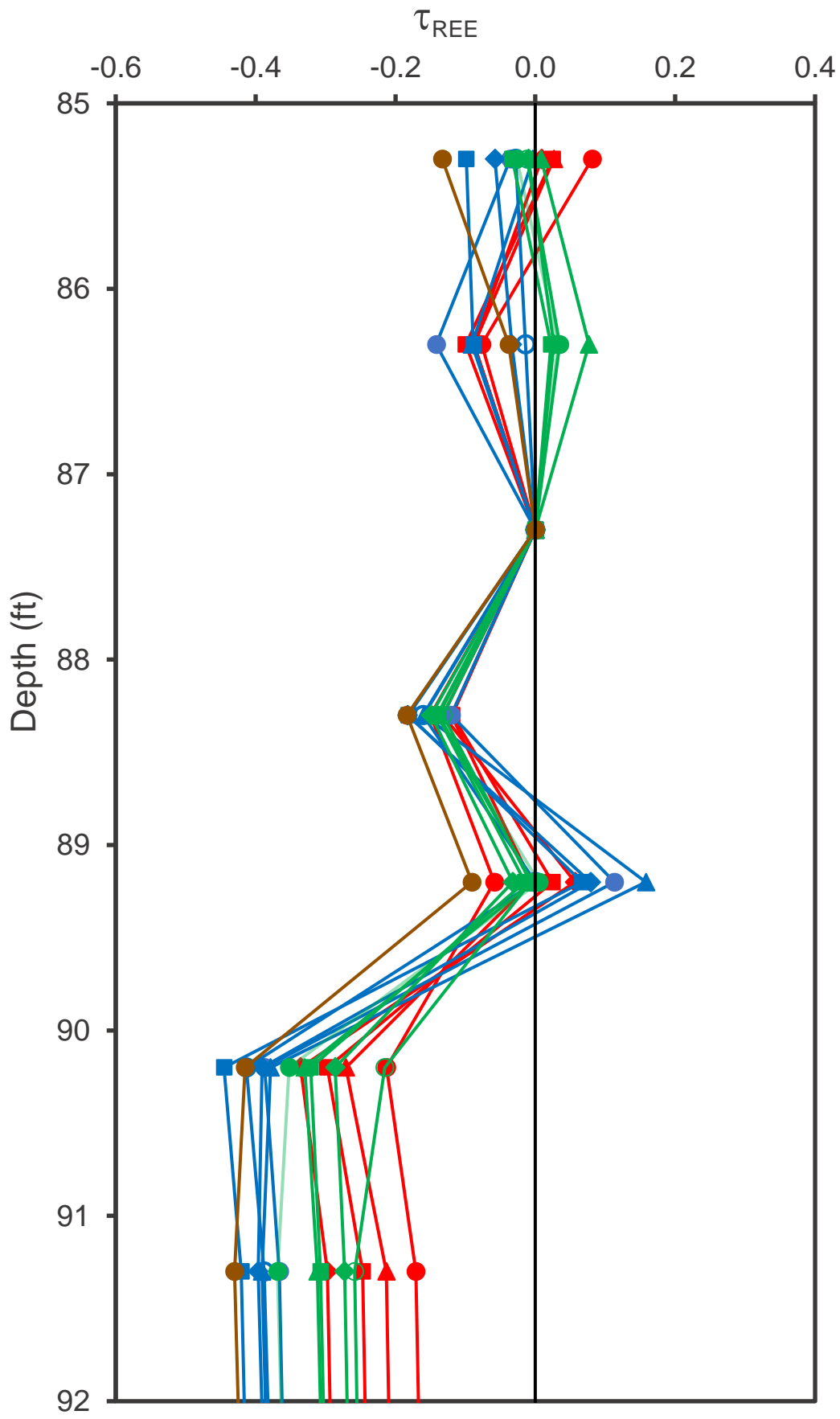
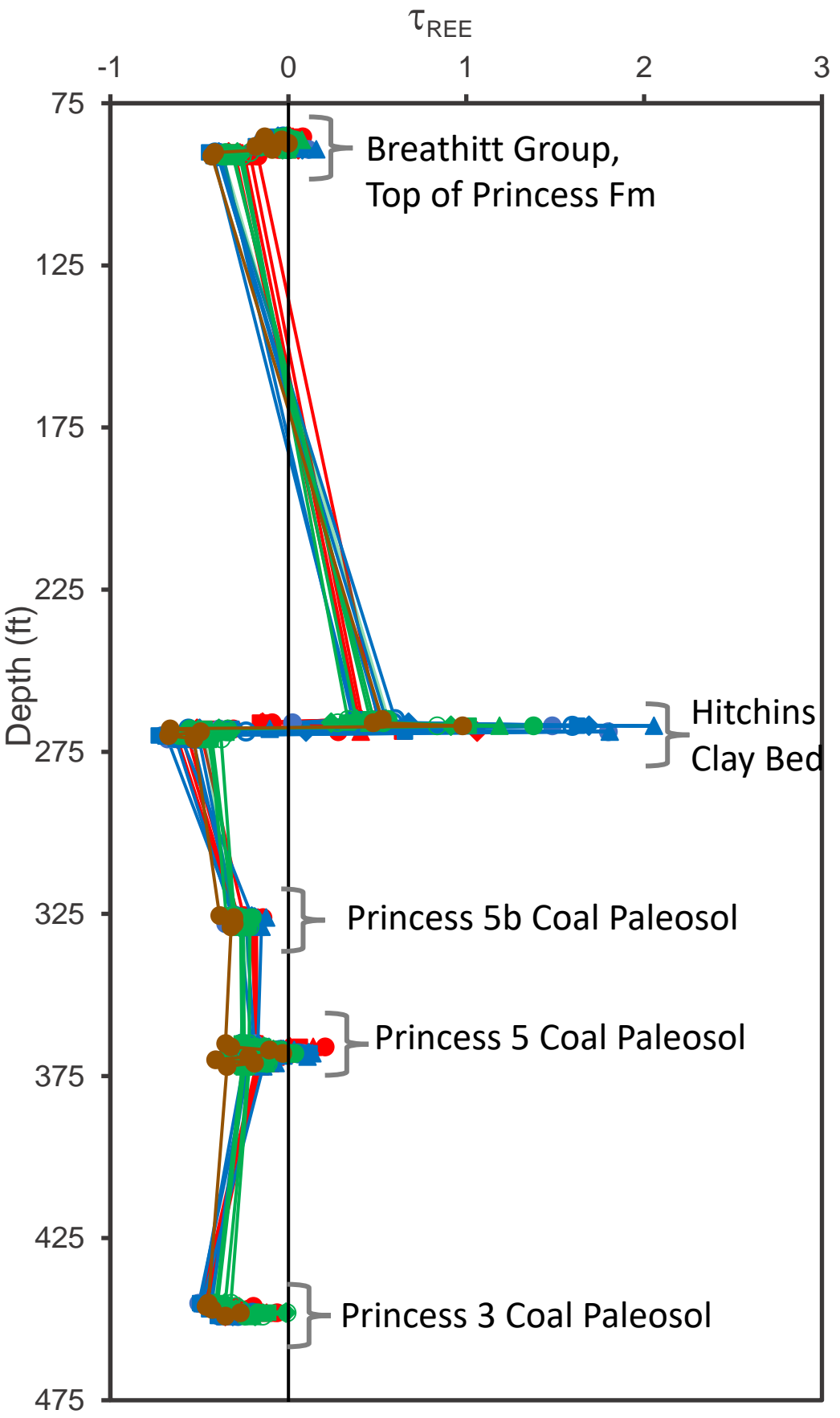
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C-516603	KGSc334-267.9	27	10		xx	51			6	
C-516606	KGSc334-268.8	23	25			41			5	
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C-516776	WV-EMRI-038	31	26			33		2	4	2
C-516821	WV-EMRI-078	9	39	8		42				
C-516849	WV-EMRI-103	40	10			40			3	3
C516874	WV-EMRI-137	21	21			48			6	
C-516935	WV-EMRI-204	52	19			20			6	
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C-528409	MD-8-J	8	27			62				
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C-528450	MD-12-N	18	27			53				
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C-534954	PAGS-WEISERSF-1	10	44			42		2		
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C-534963	IND063_2362_123	34	26	3		35				
C-534999	MRI-29_TOP	7	19		8	63				

greigite	anatase	rutile	Total
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		1	100
			100
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	tr	1	100
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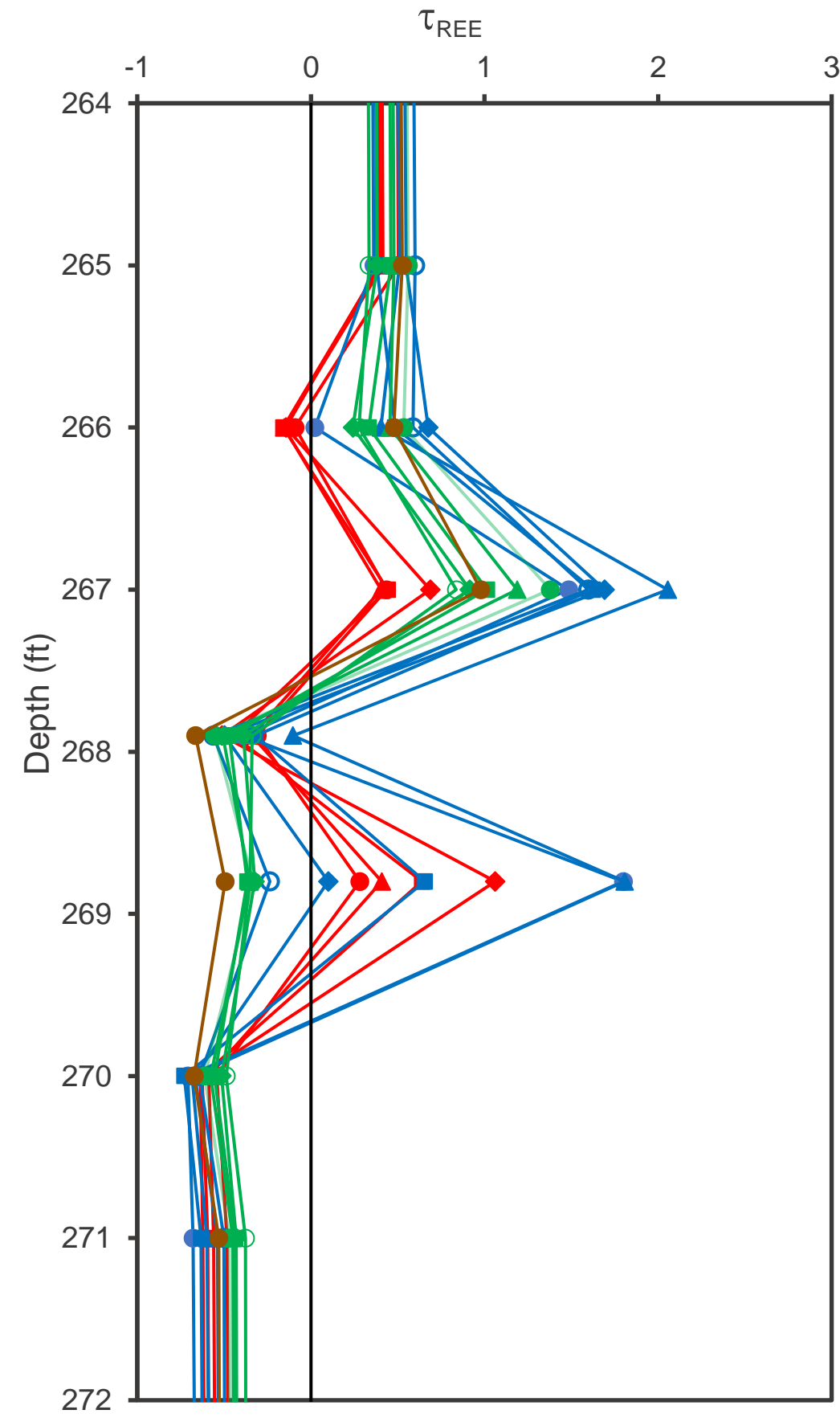
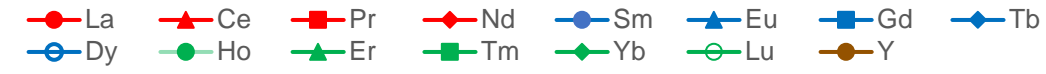
Appendix VI

Tau Plots were created by Dr. Heather Hanna P.G., from Hanna Forensics, LLC.

KGSC334

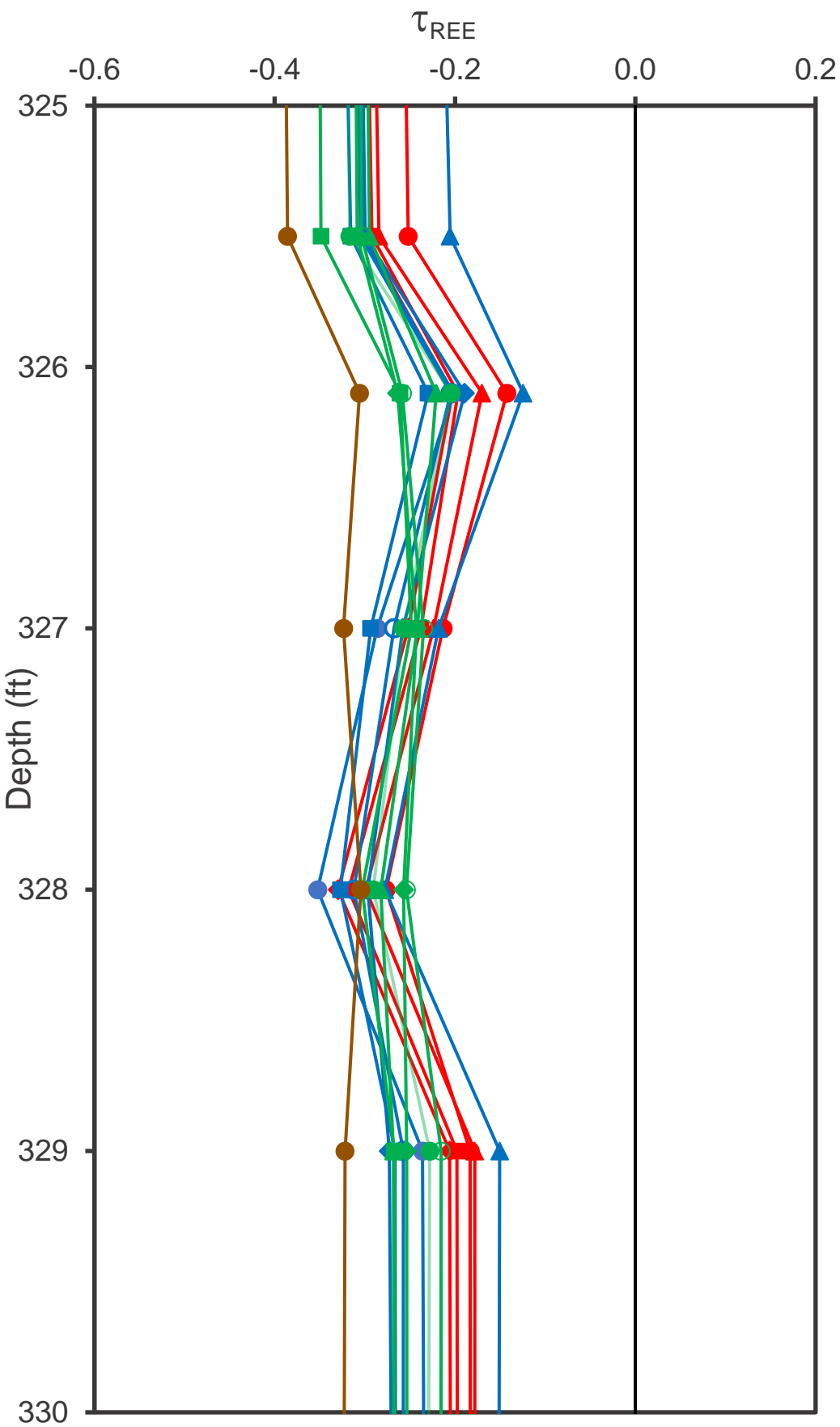


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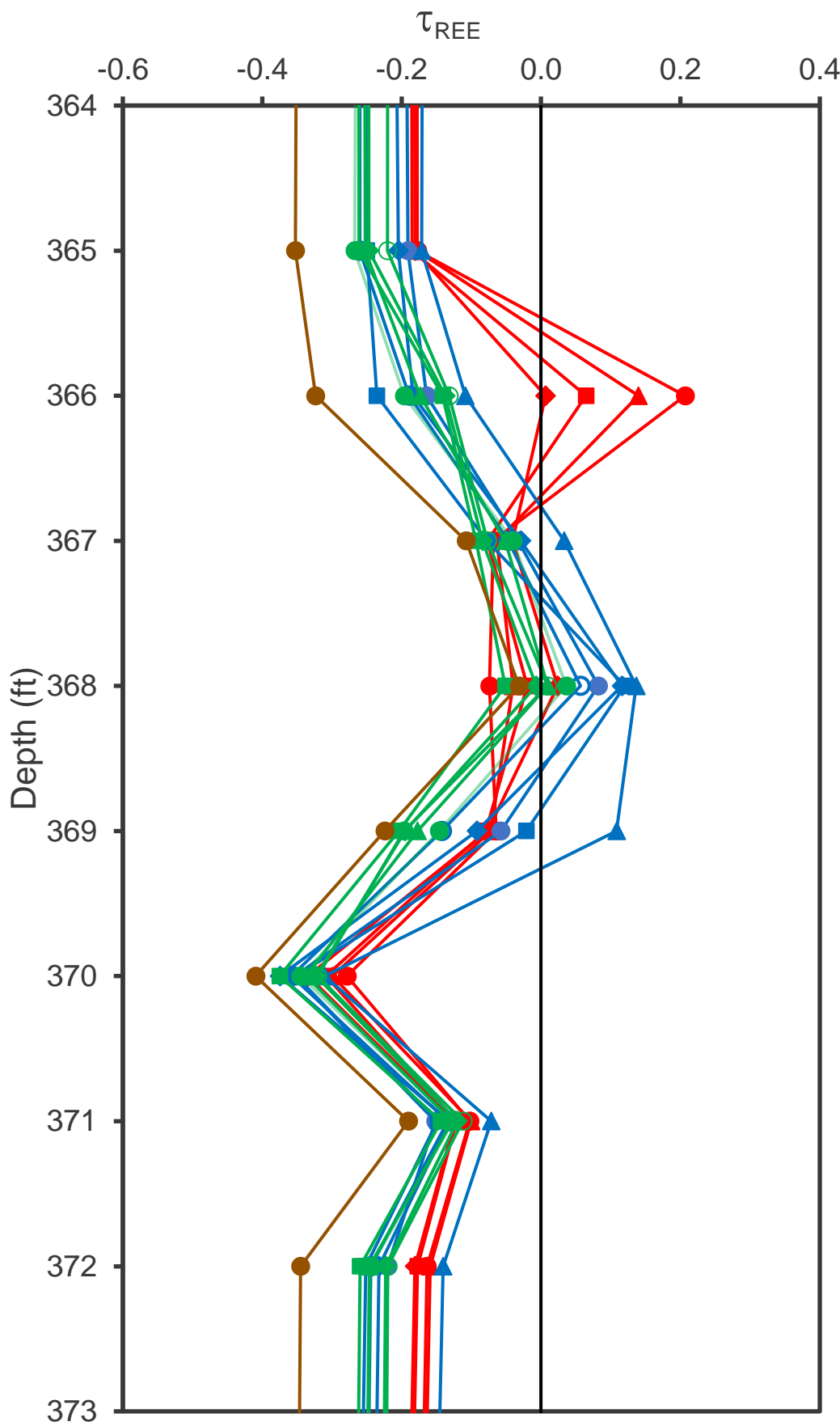


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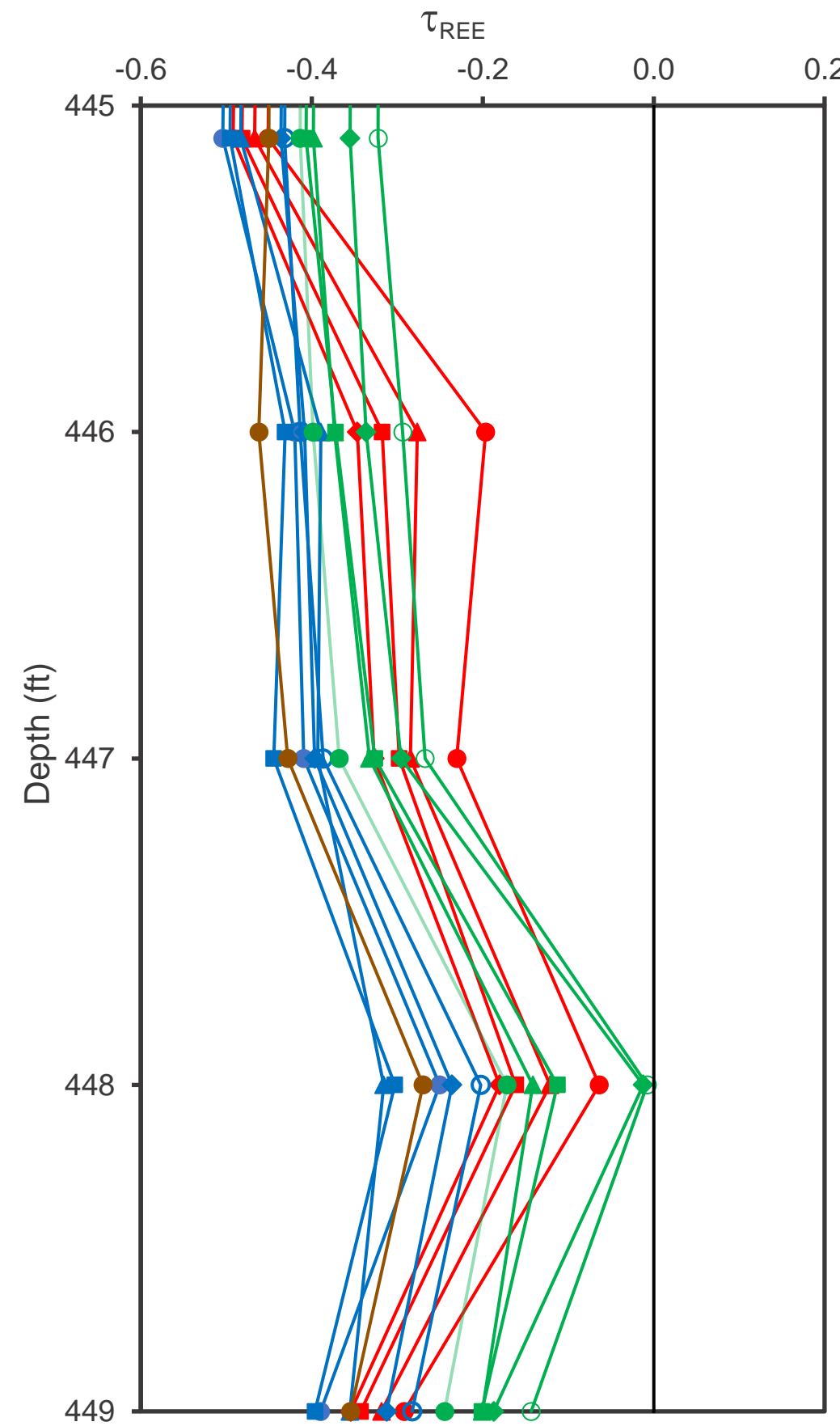
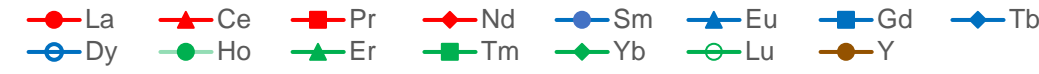
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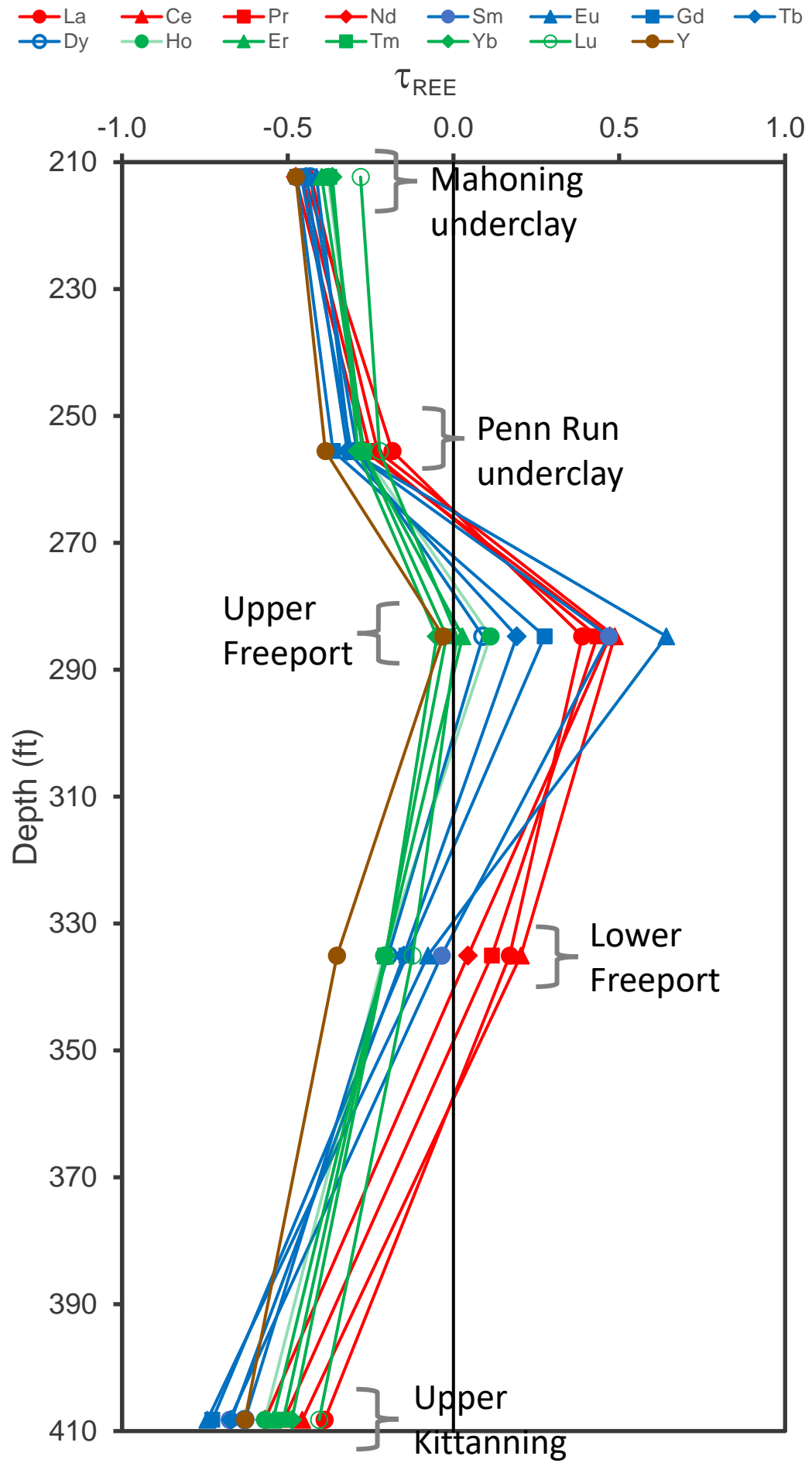


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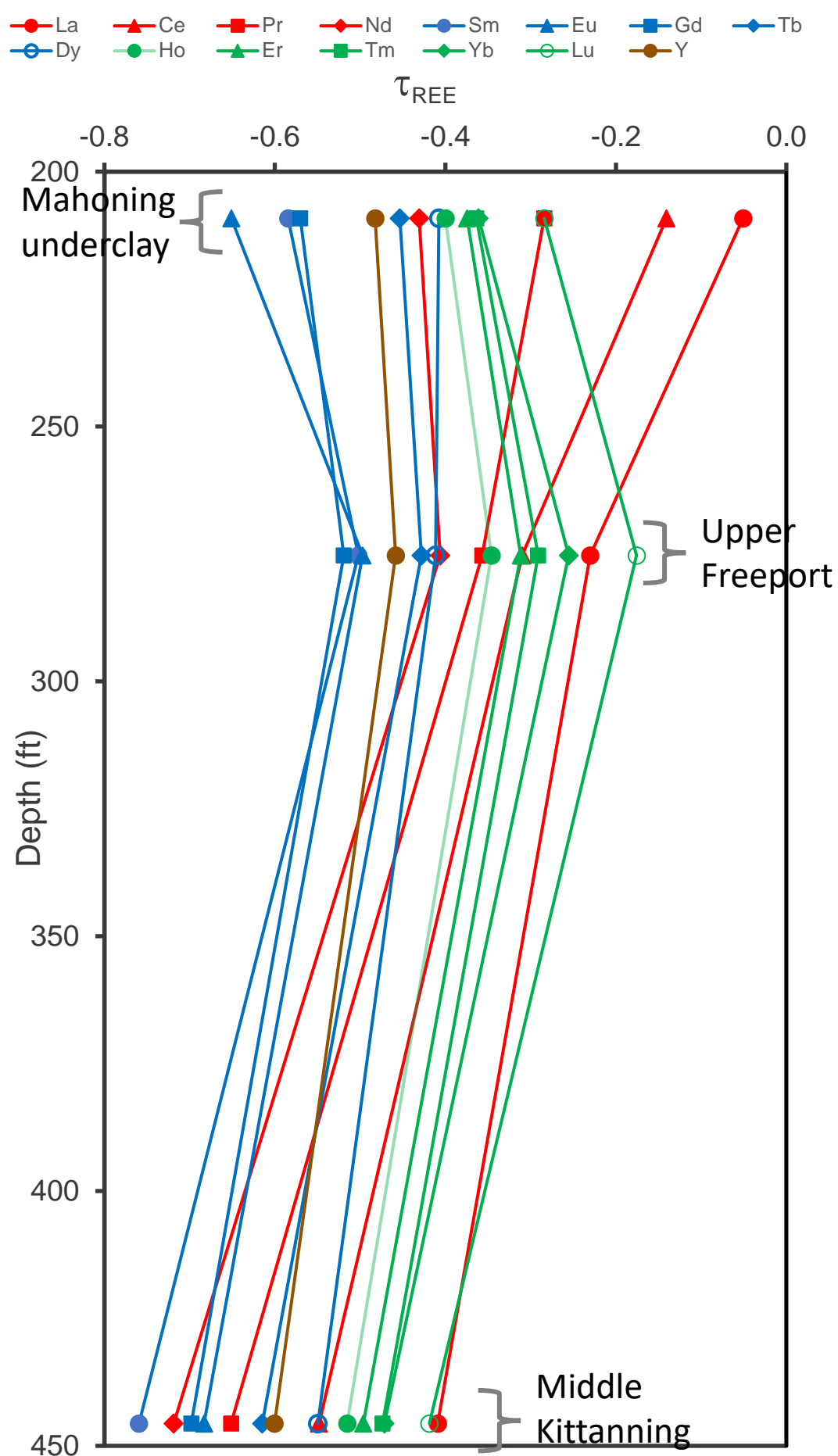


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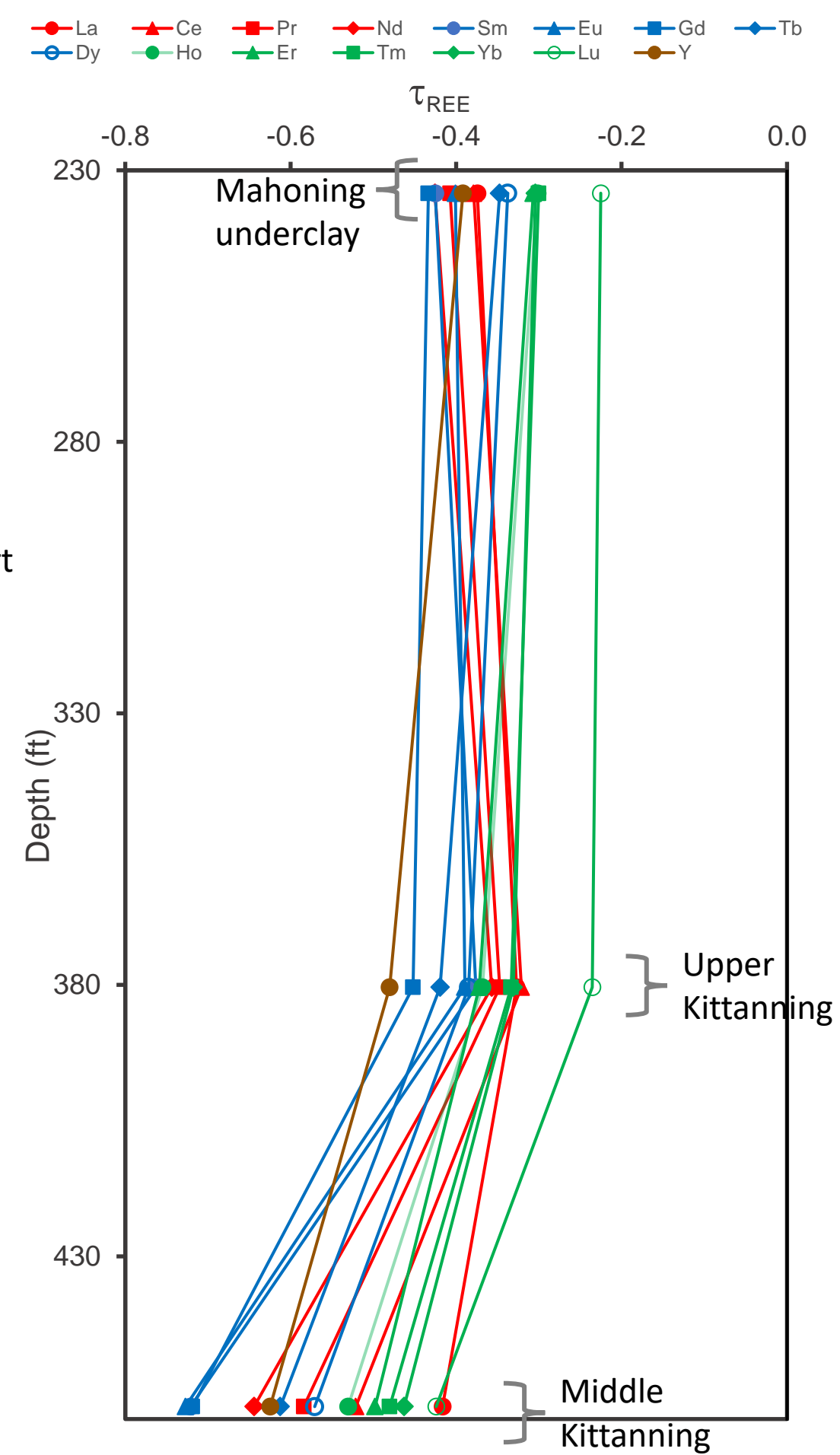
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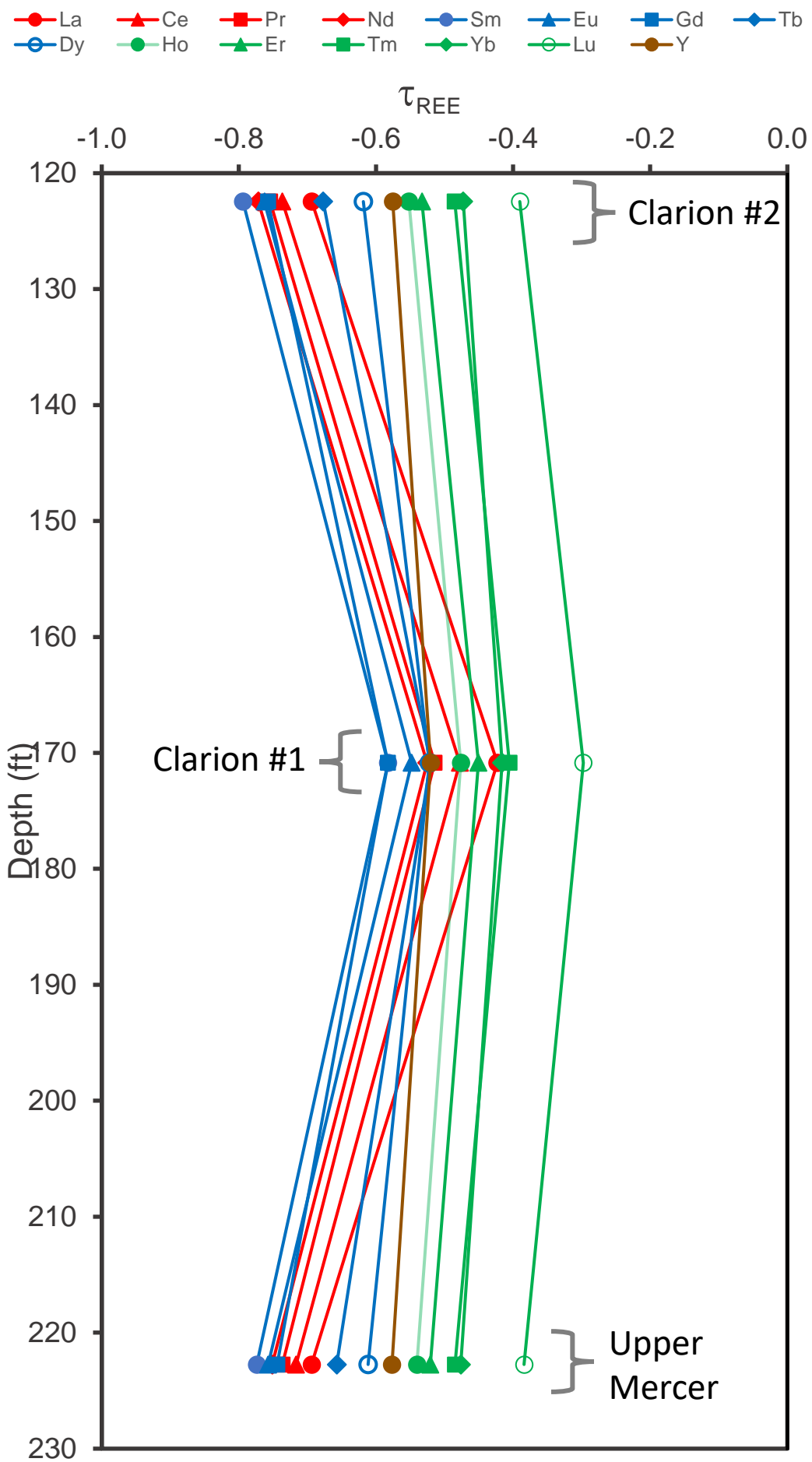
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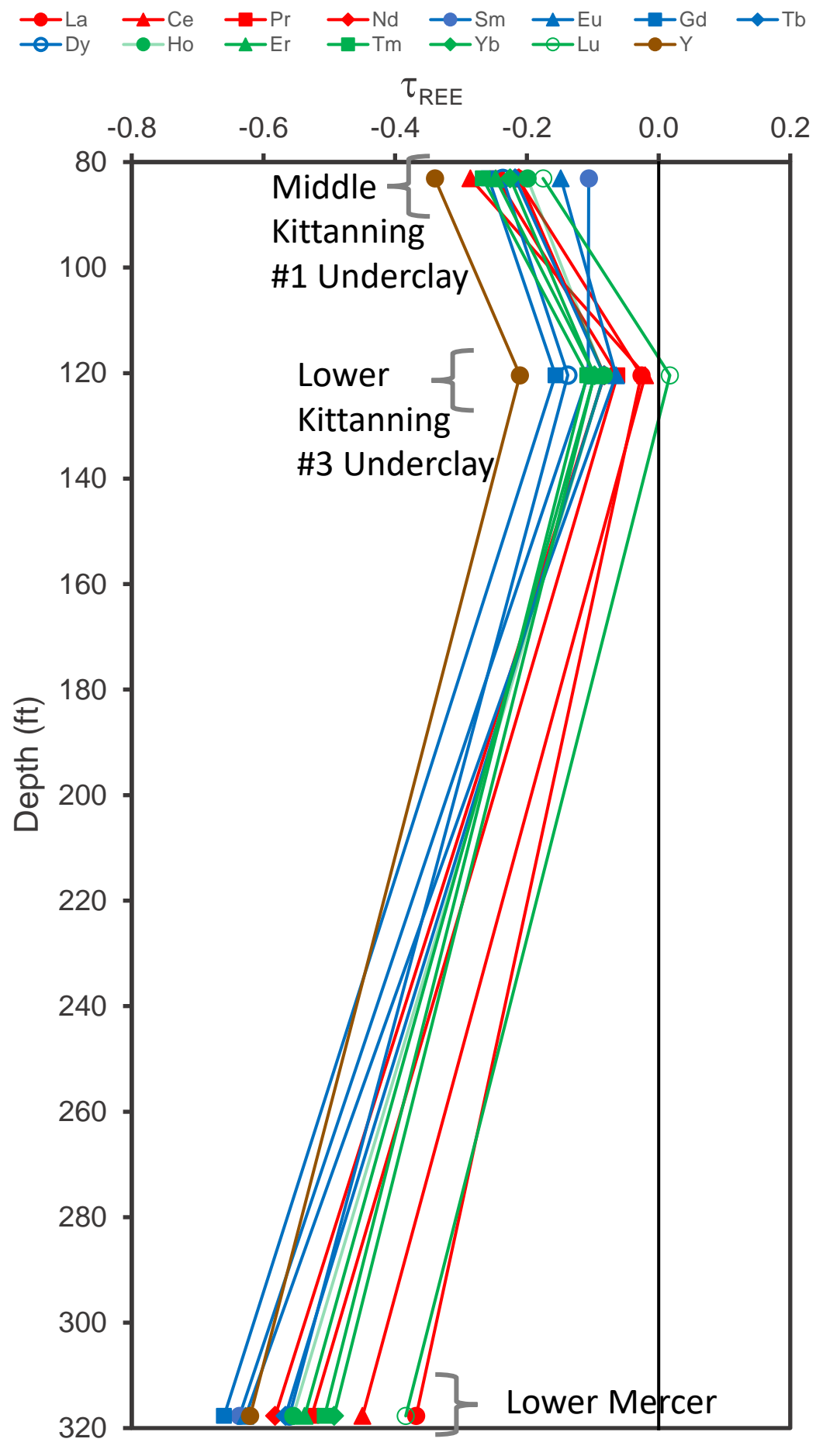
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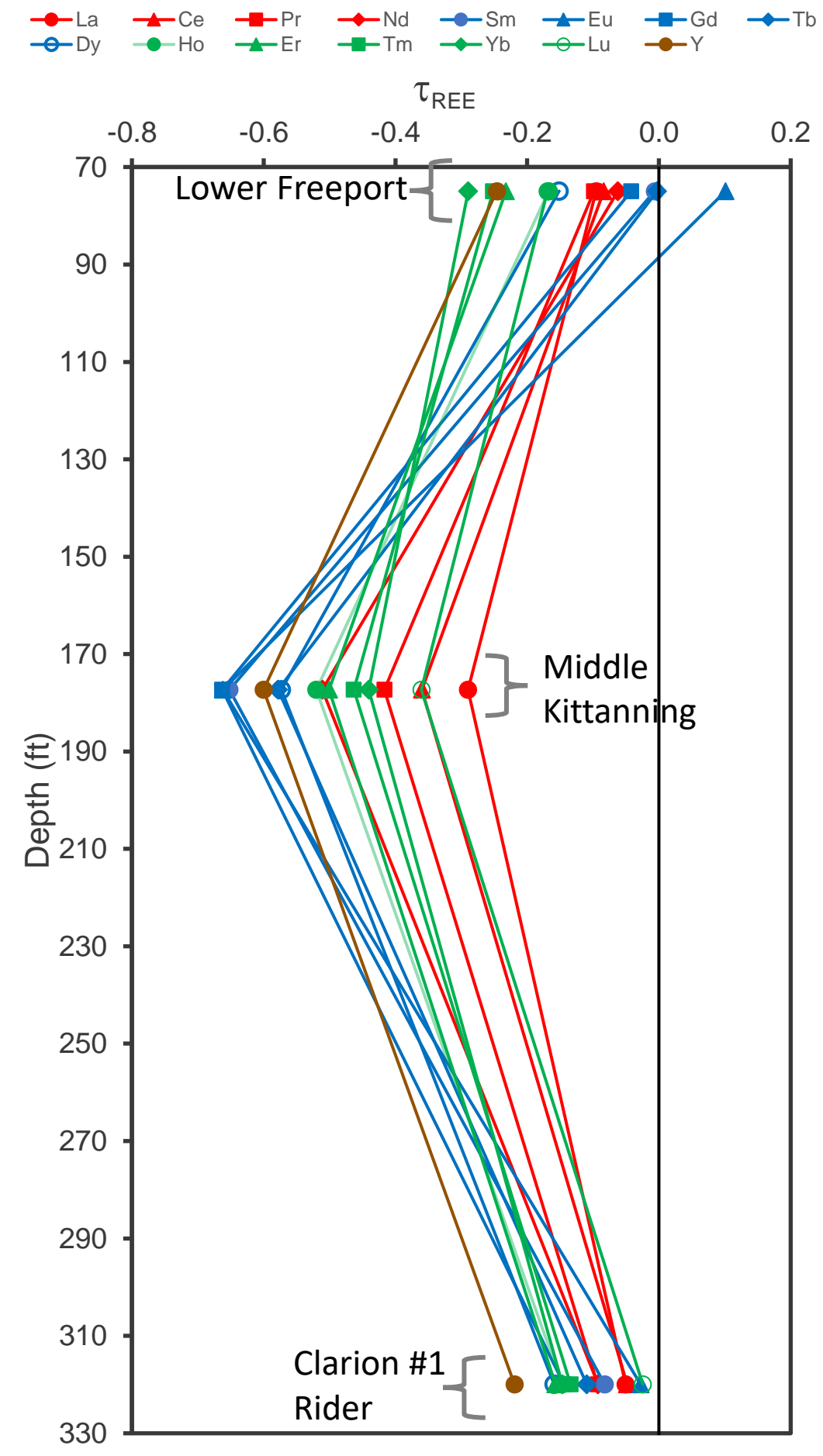
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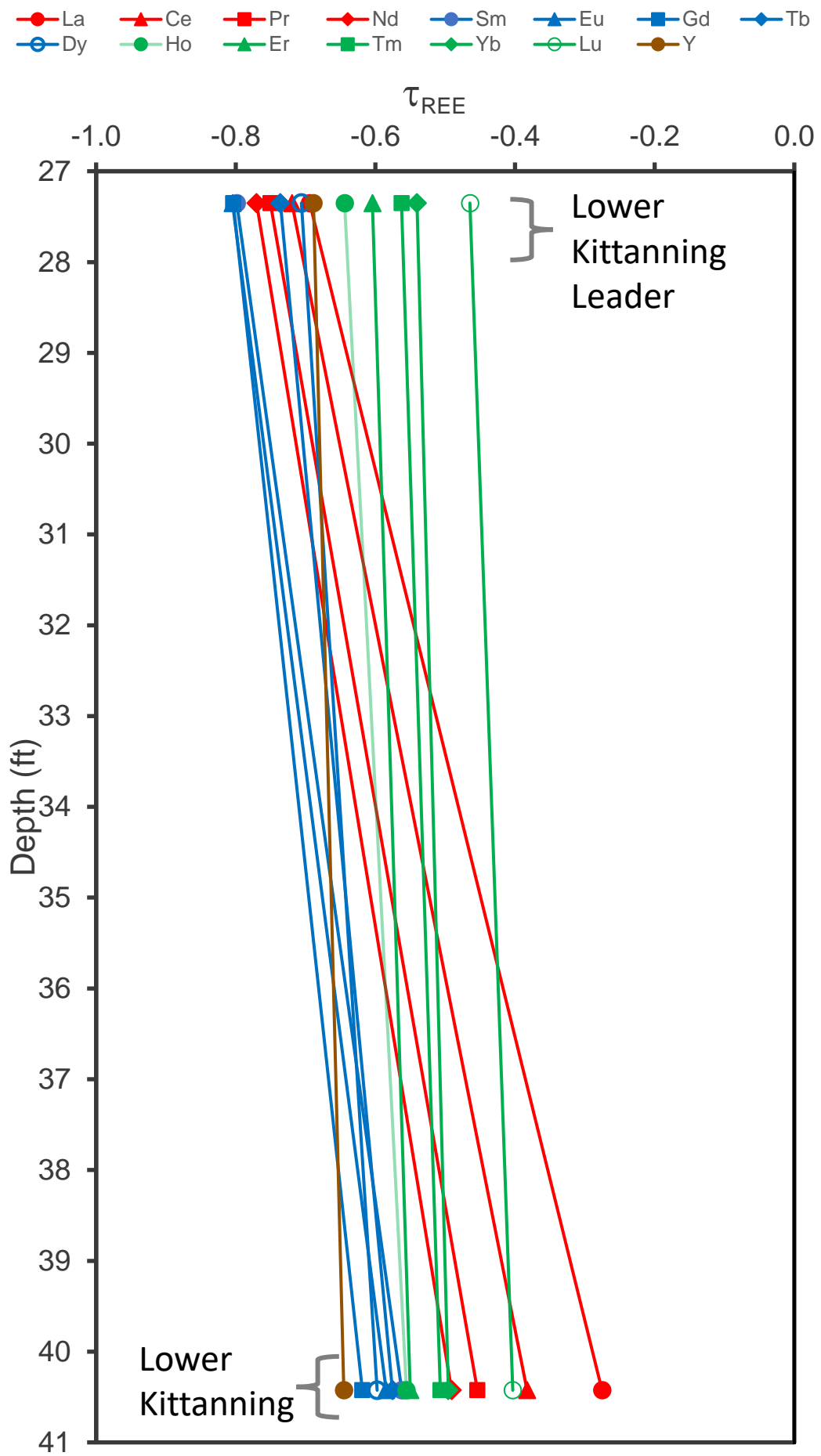
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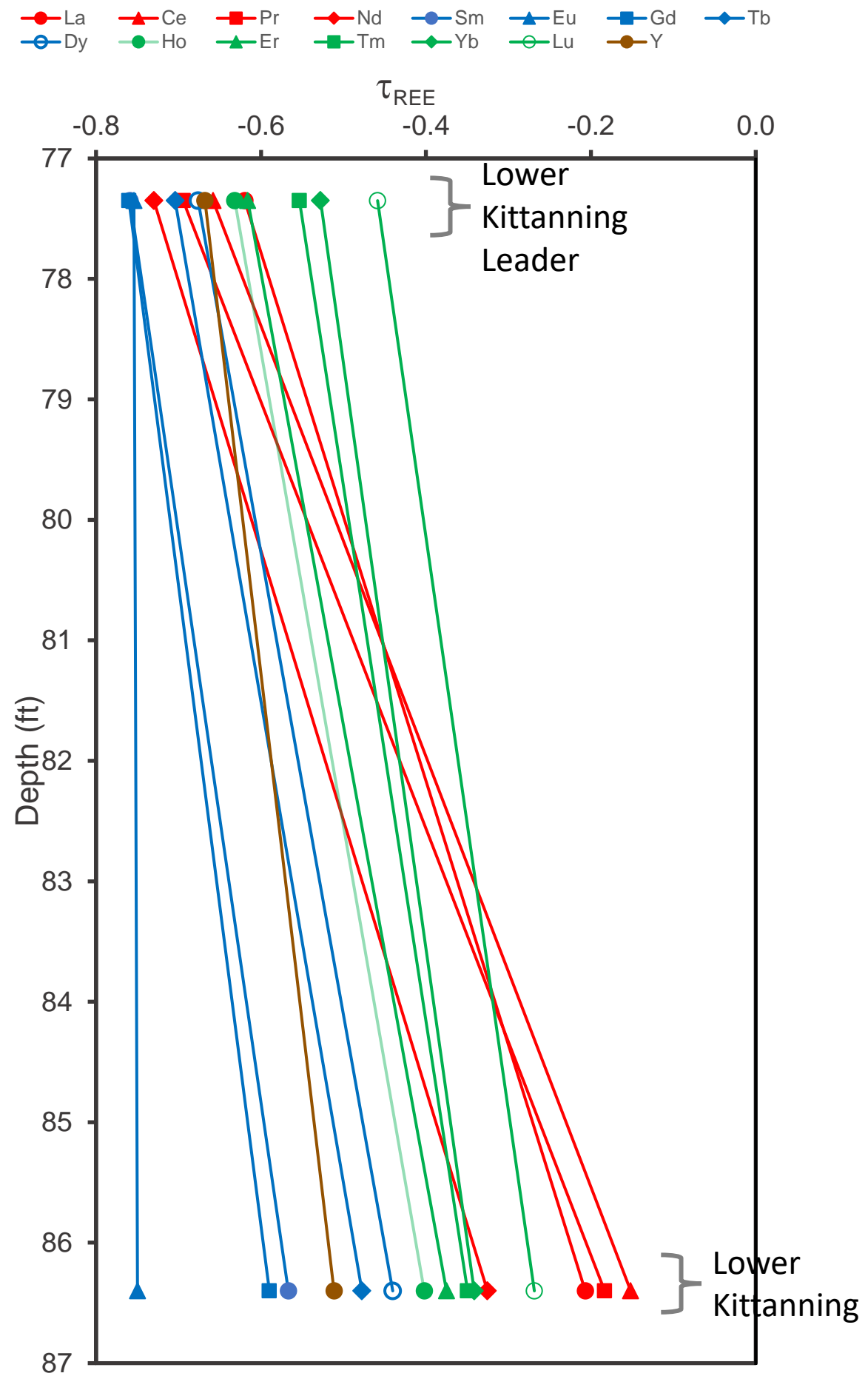
TGS872DH4



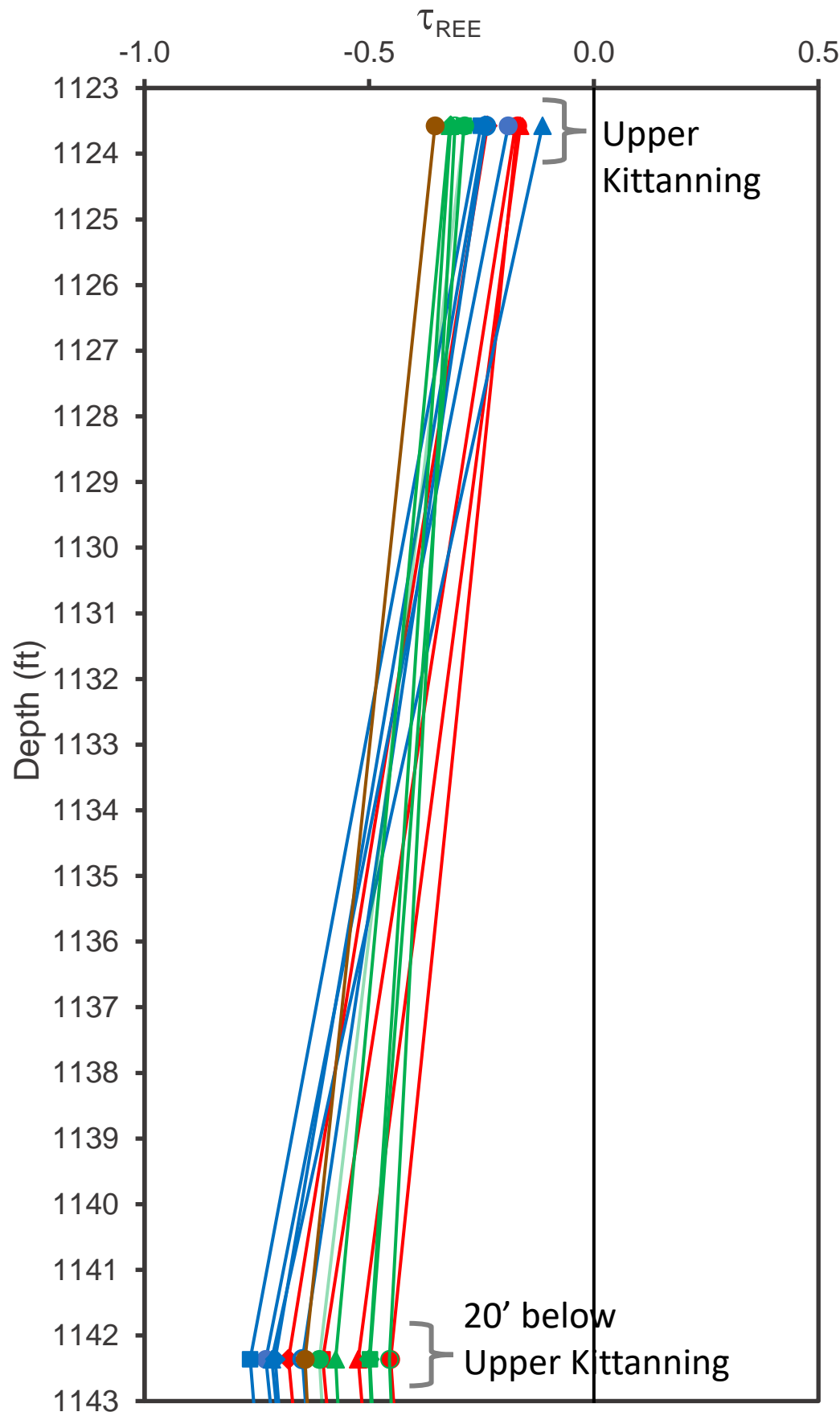
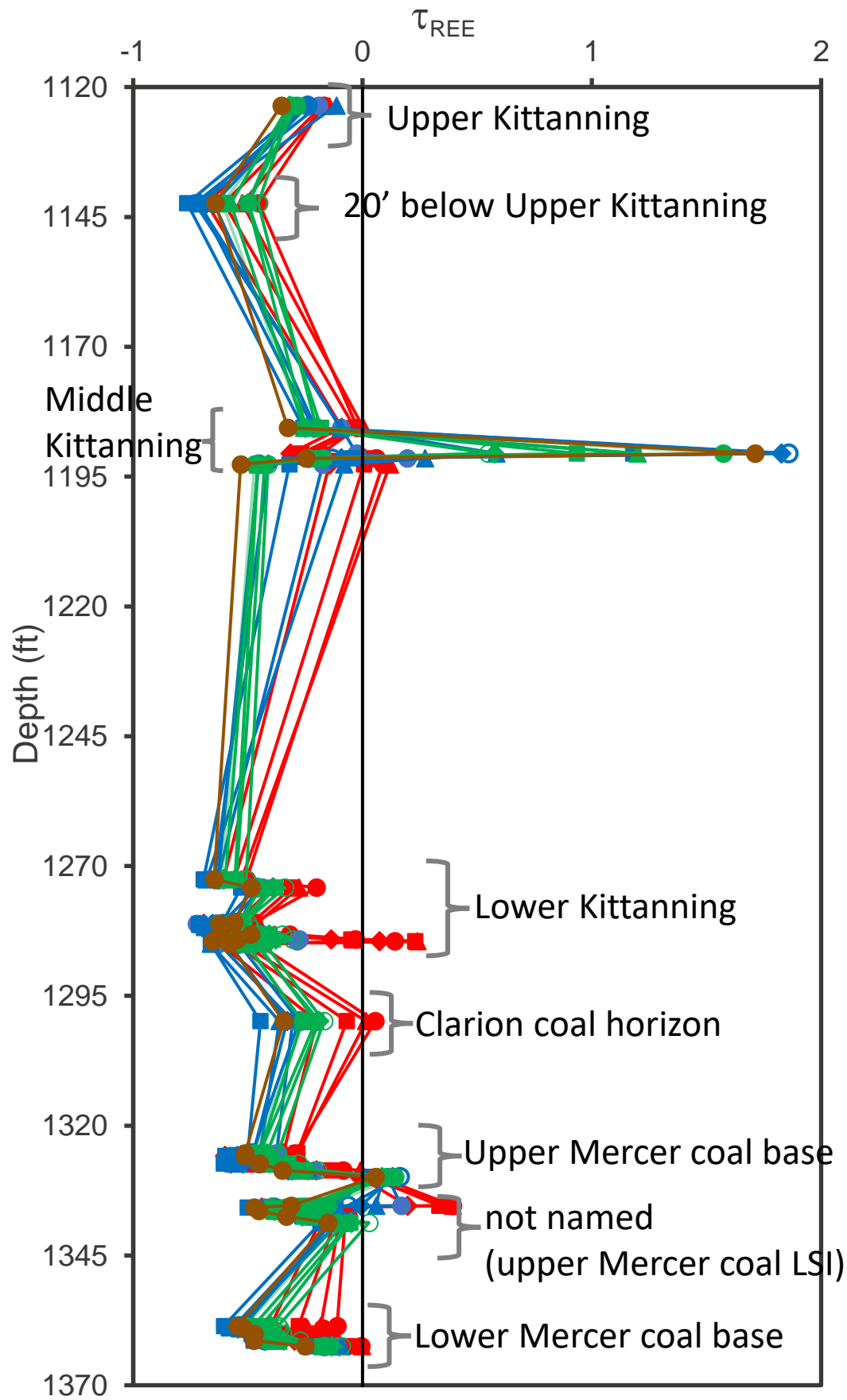
ScootackDH1



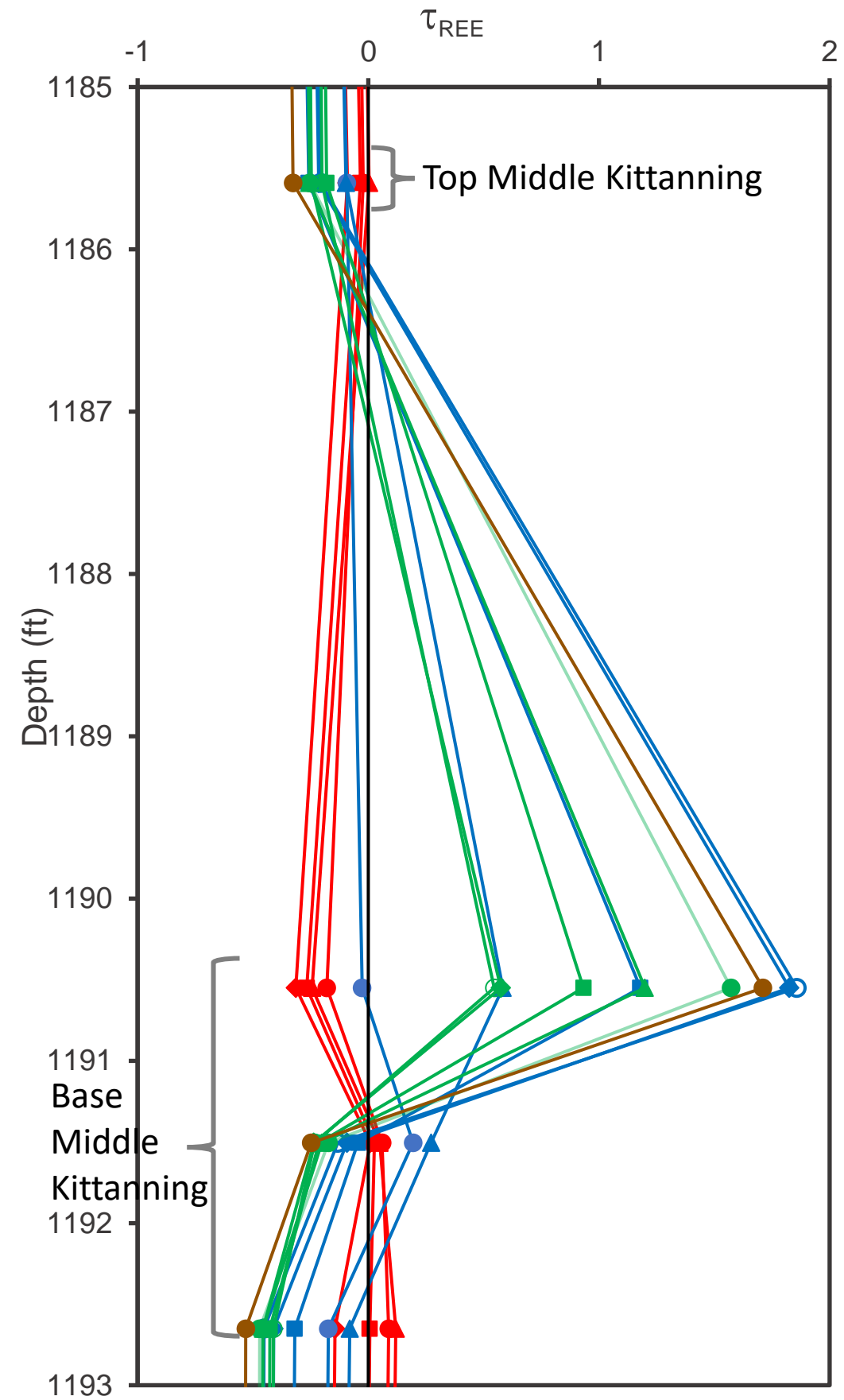
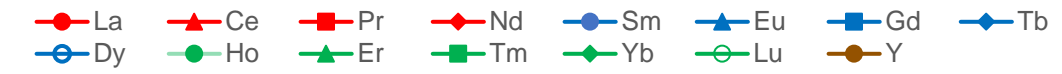
ScotackDH4



306-061

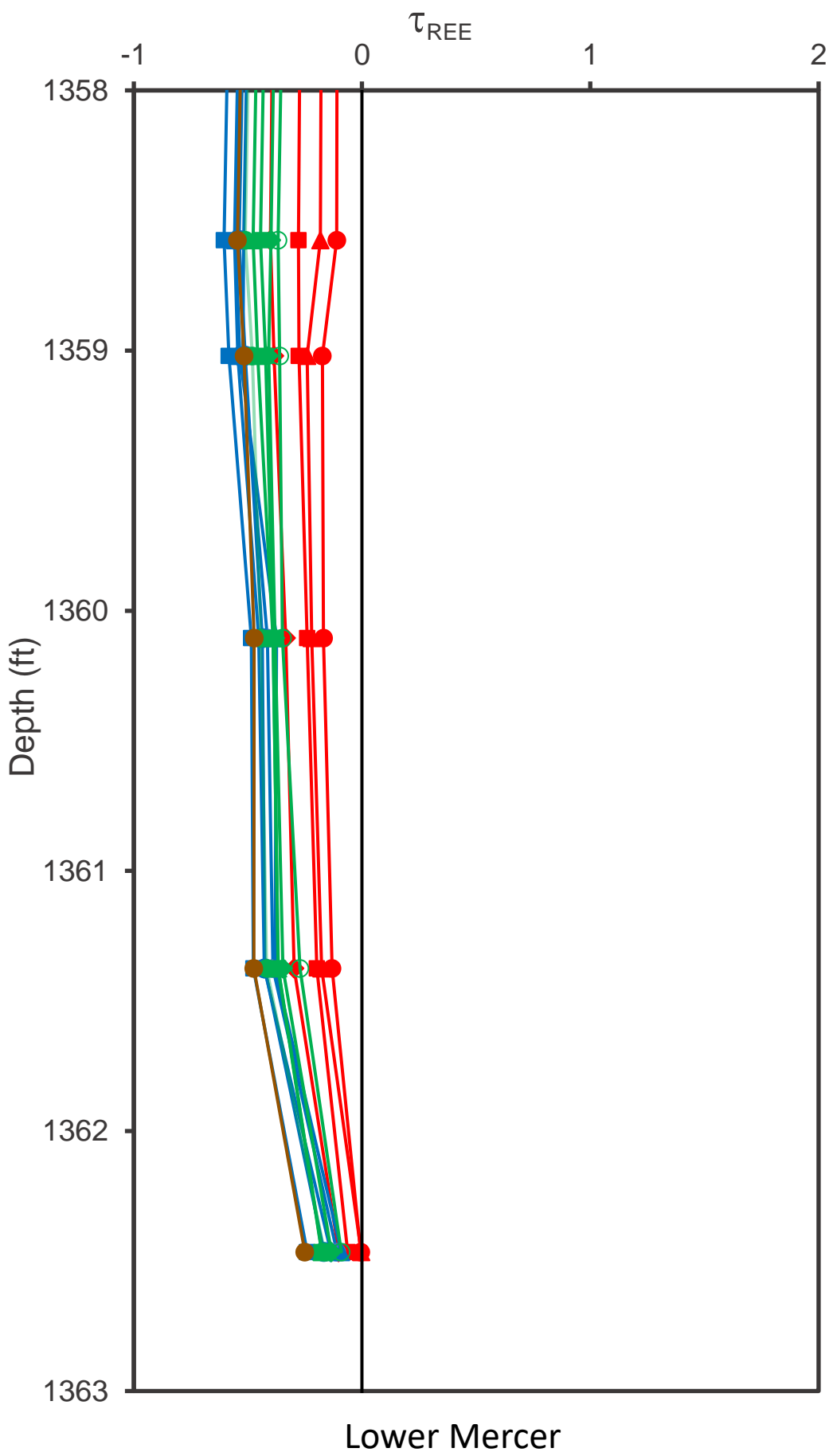
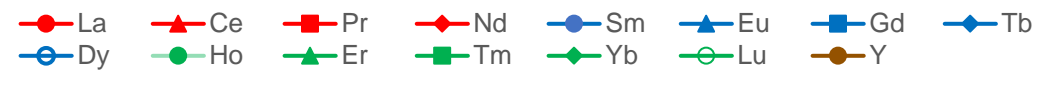
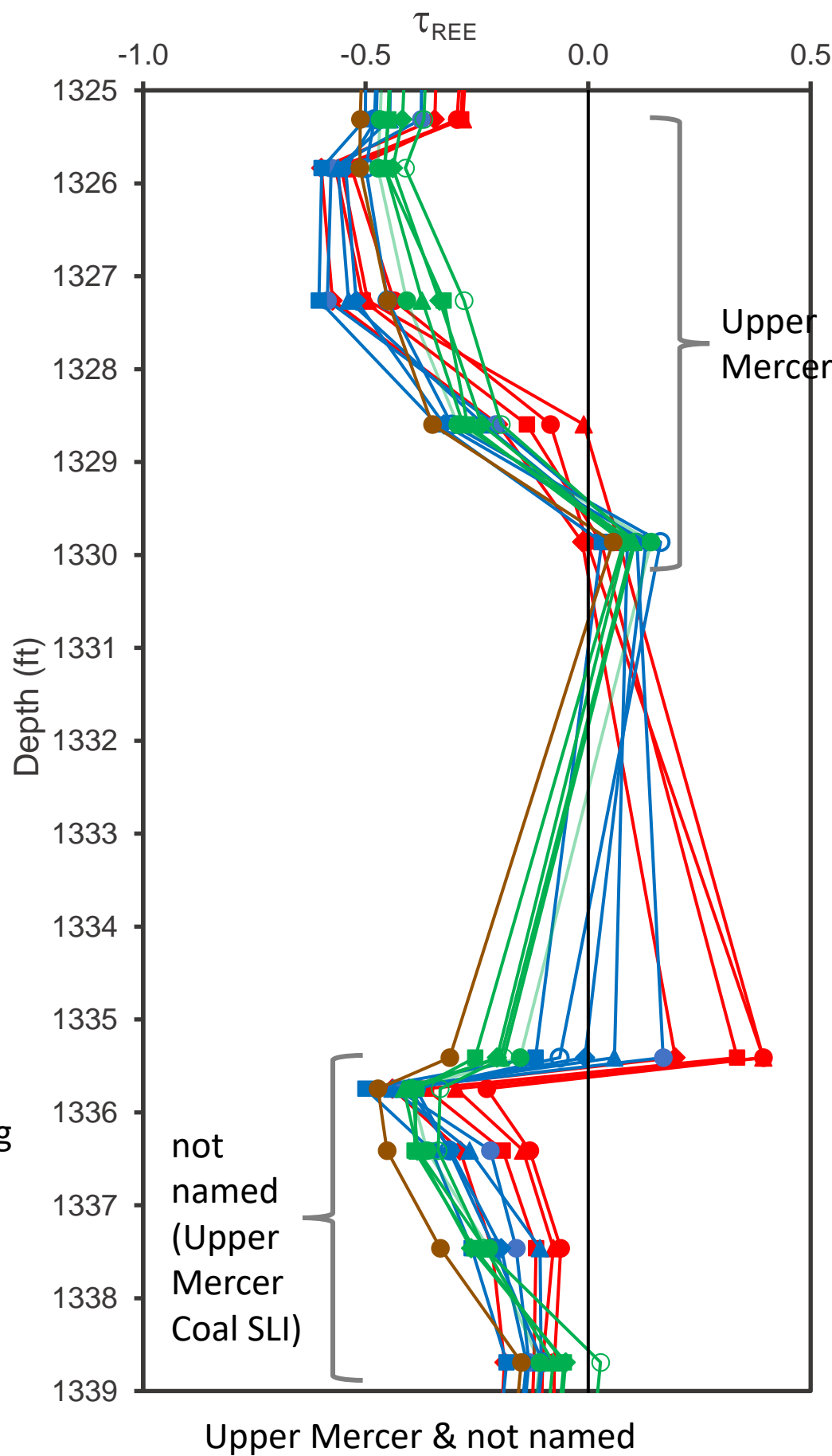
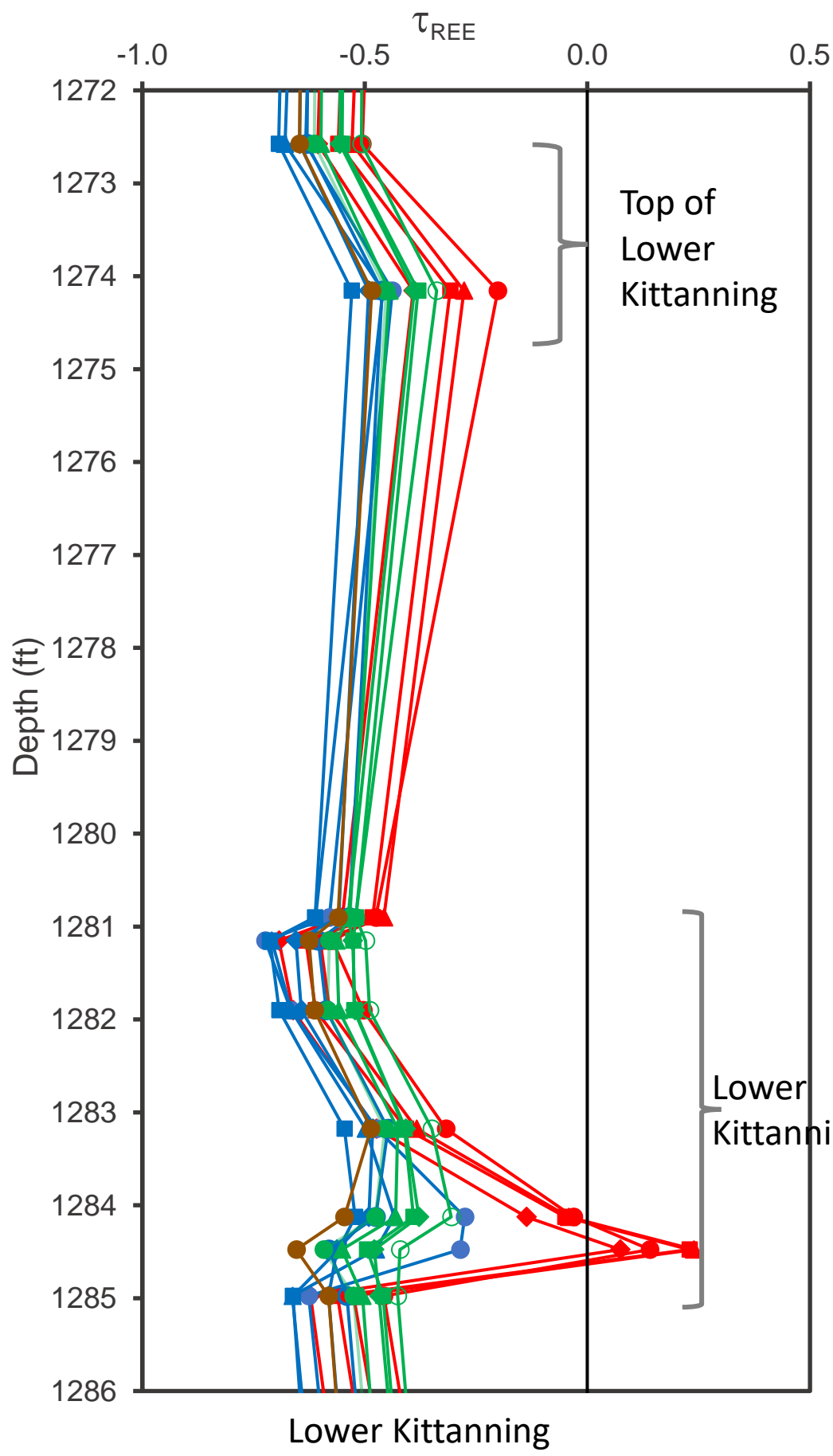


Upper Kittanning & 20' Below

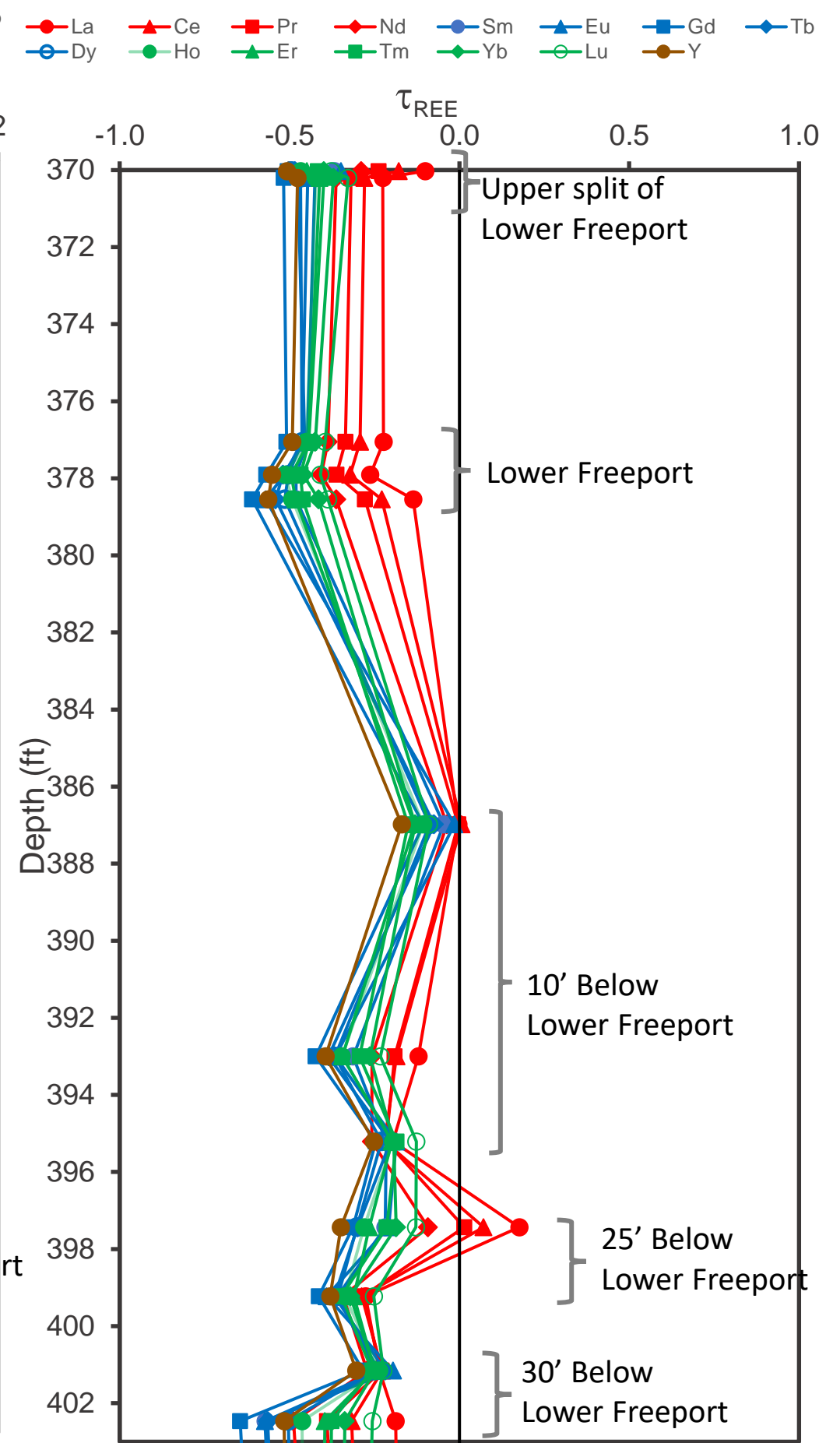
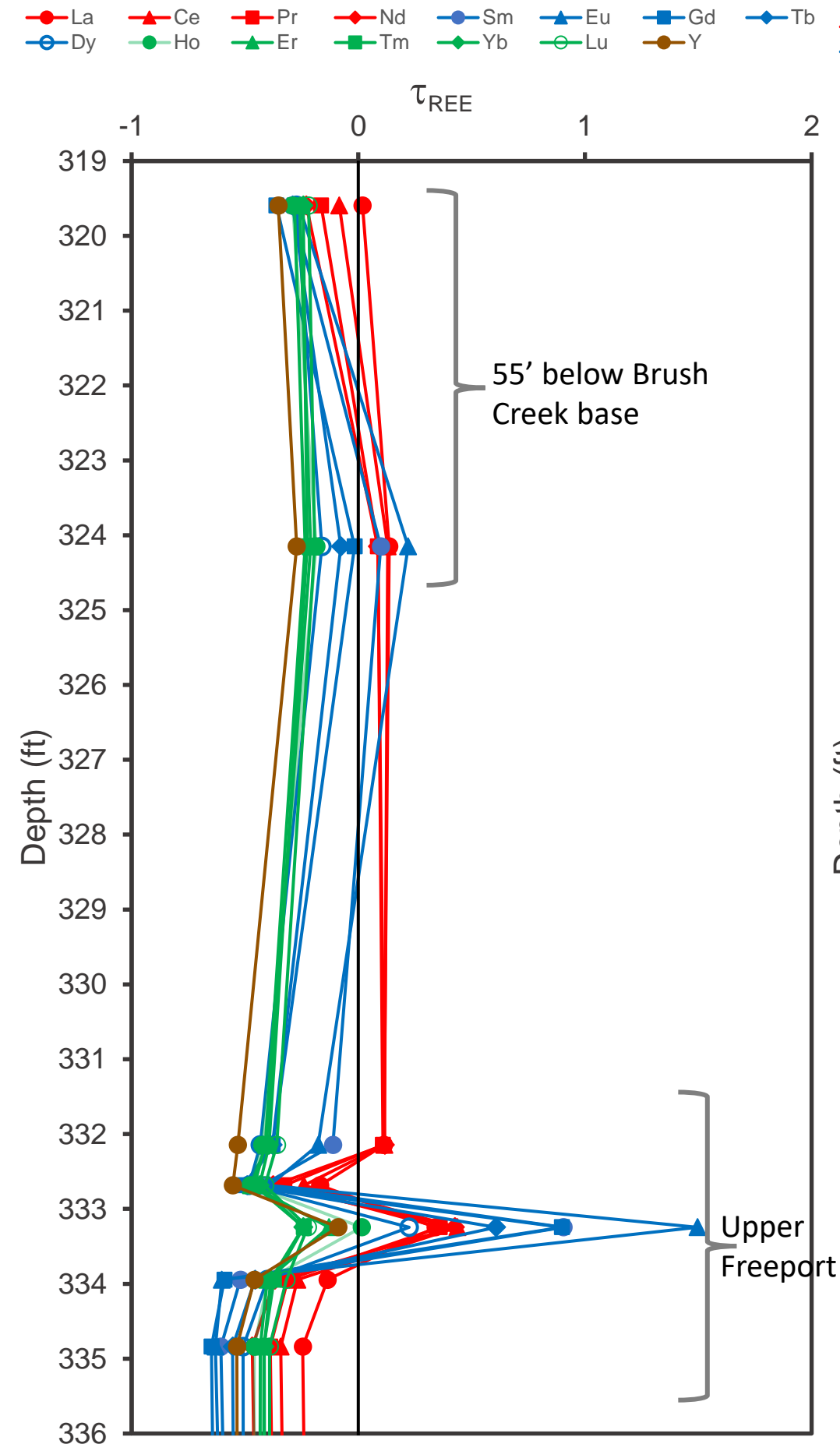
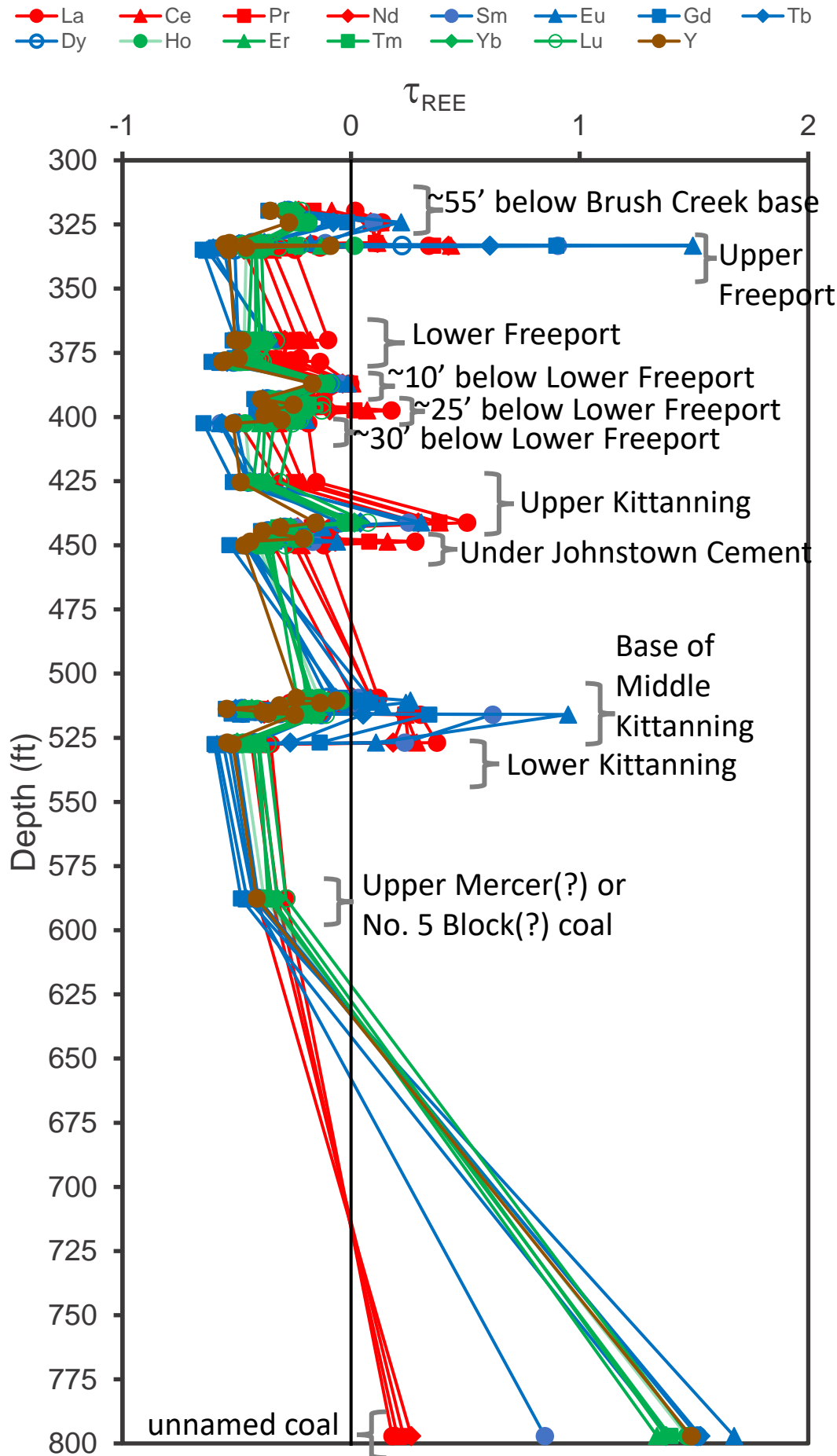


Middle Kittanning

306-061



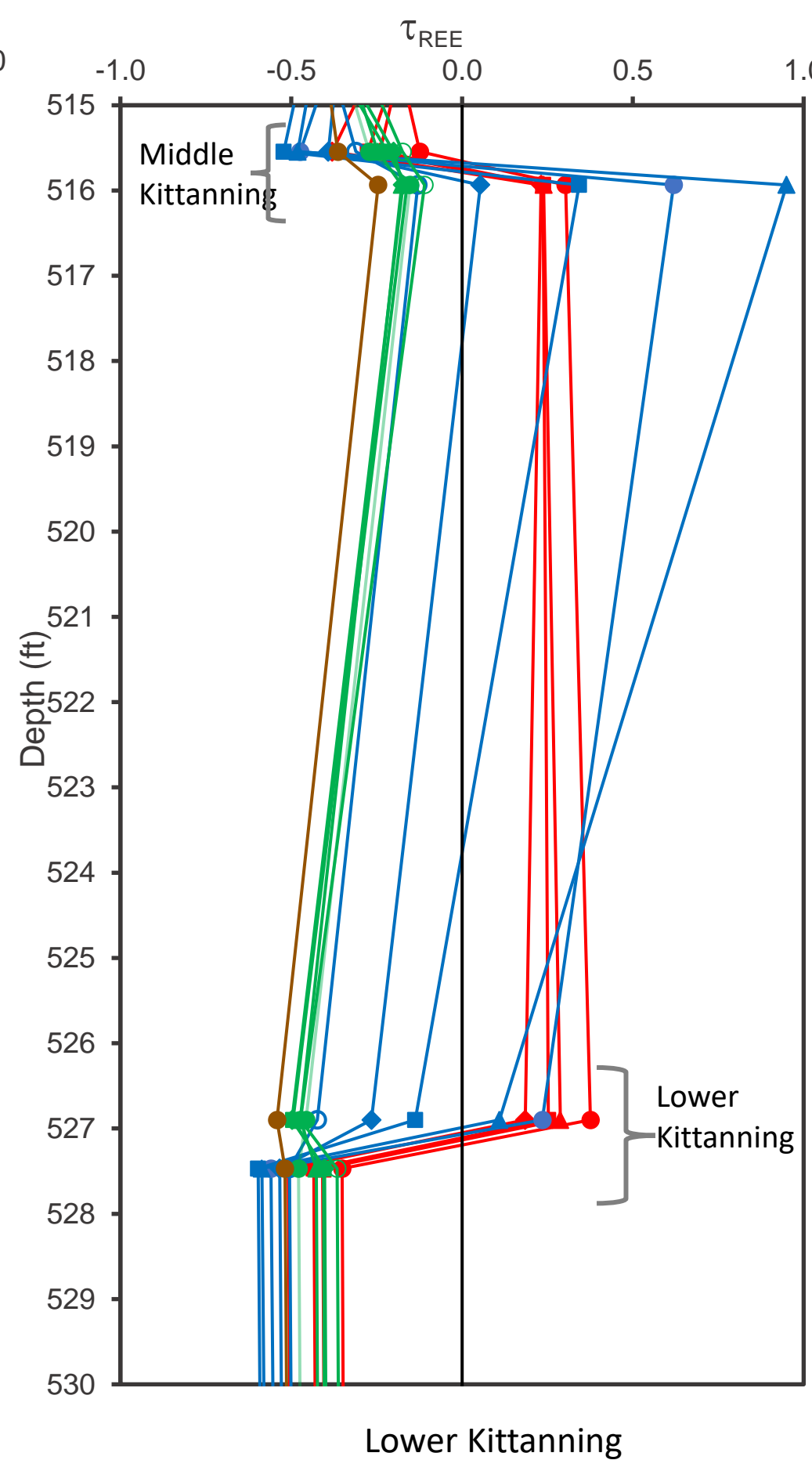
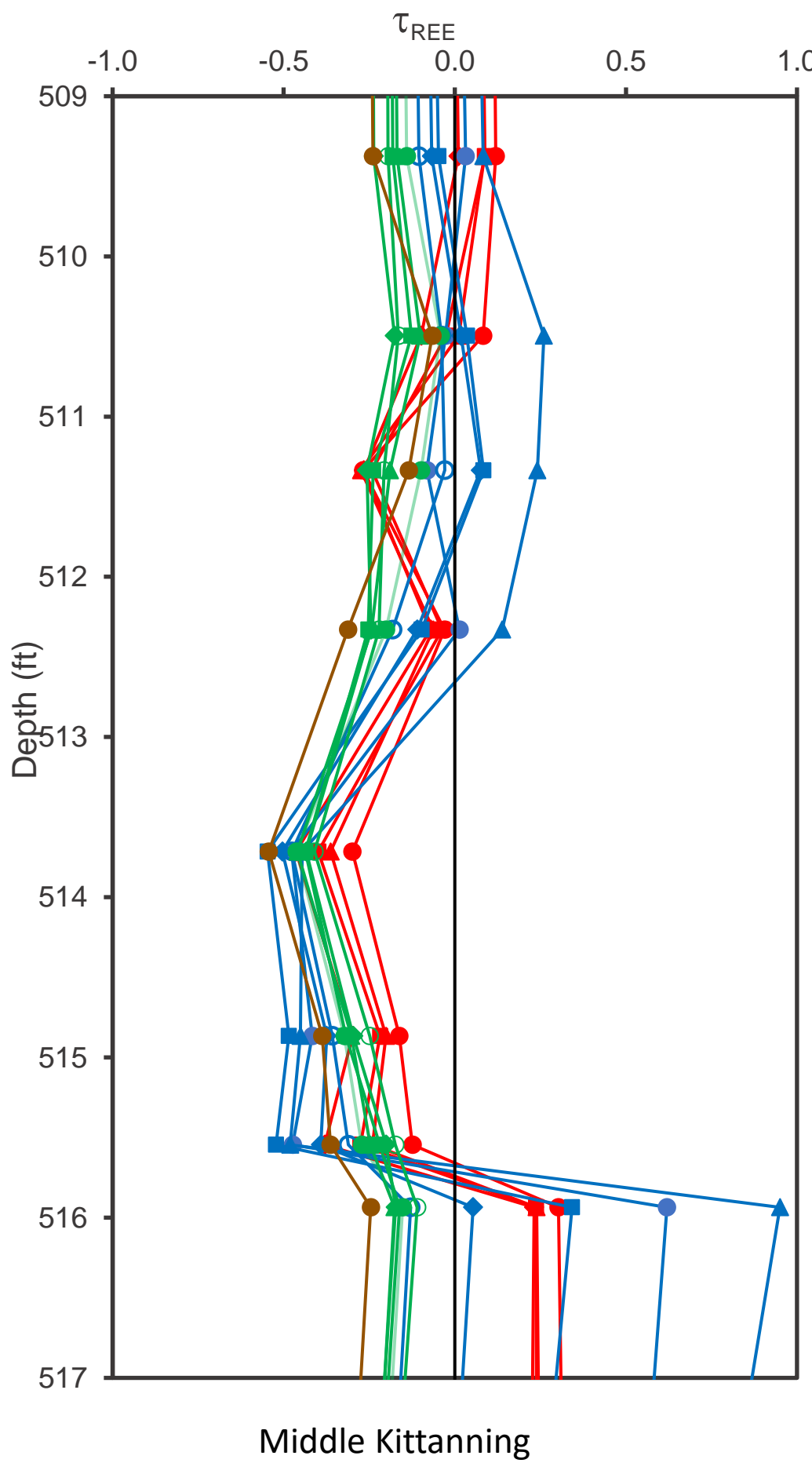
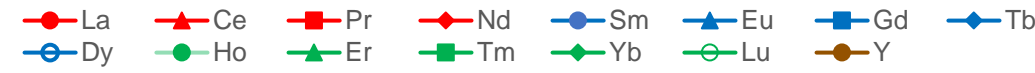
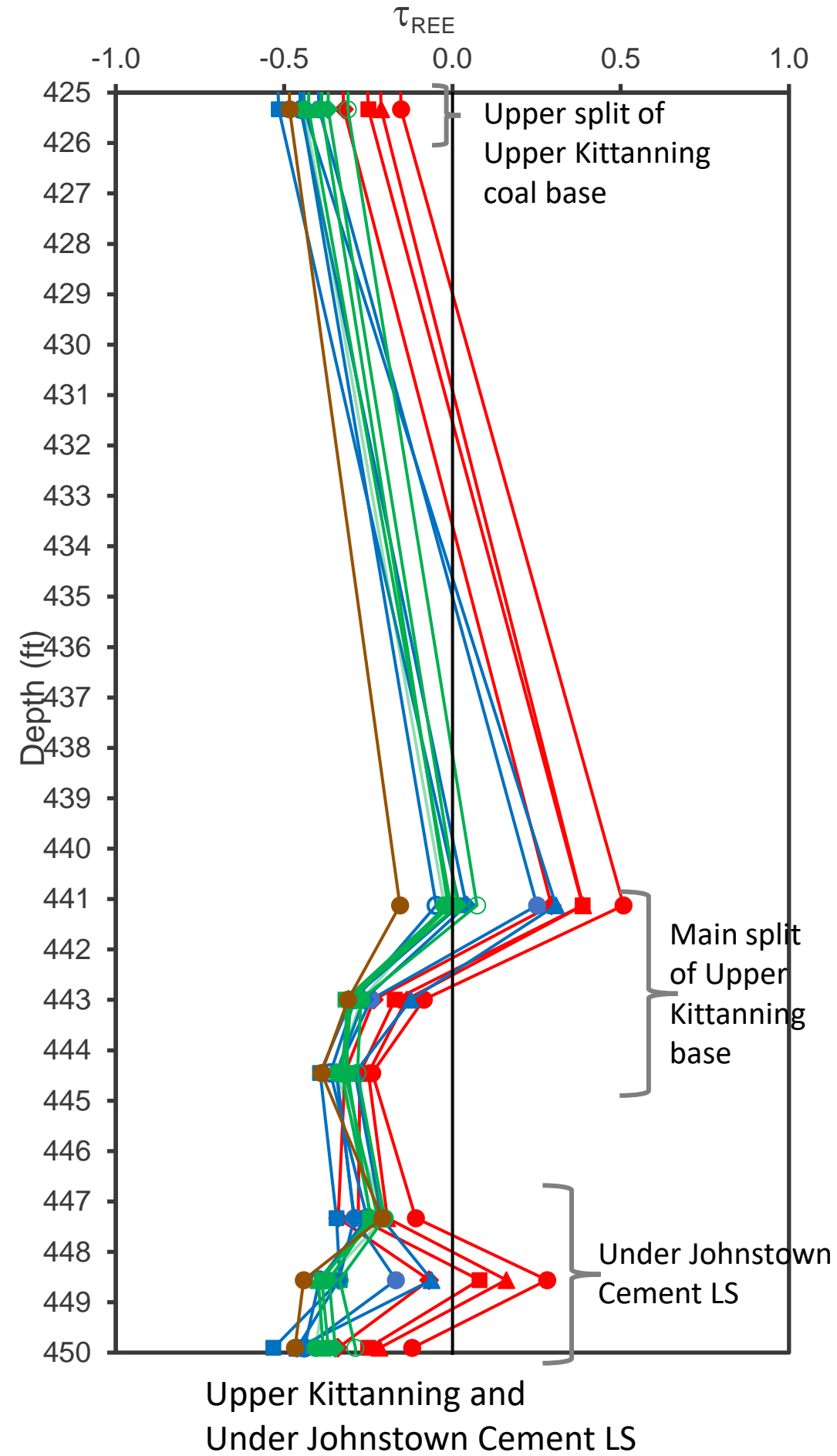
302-072



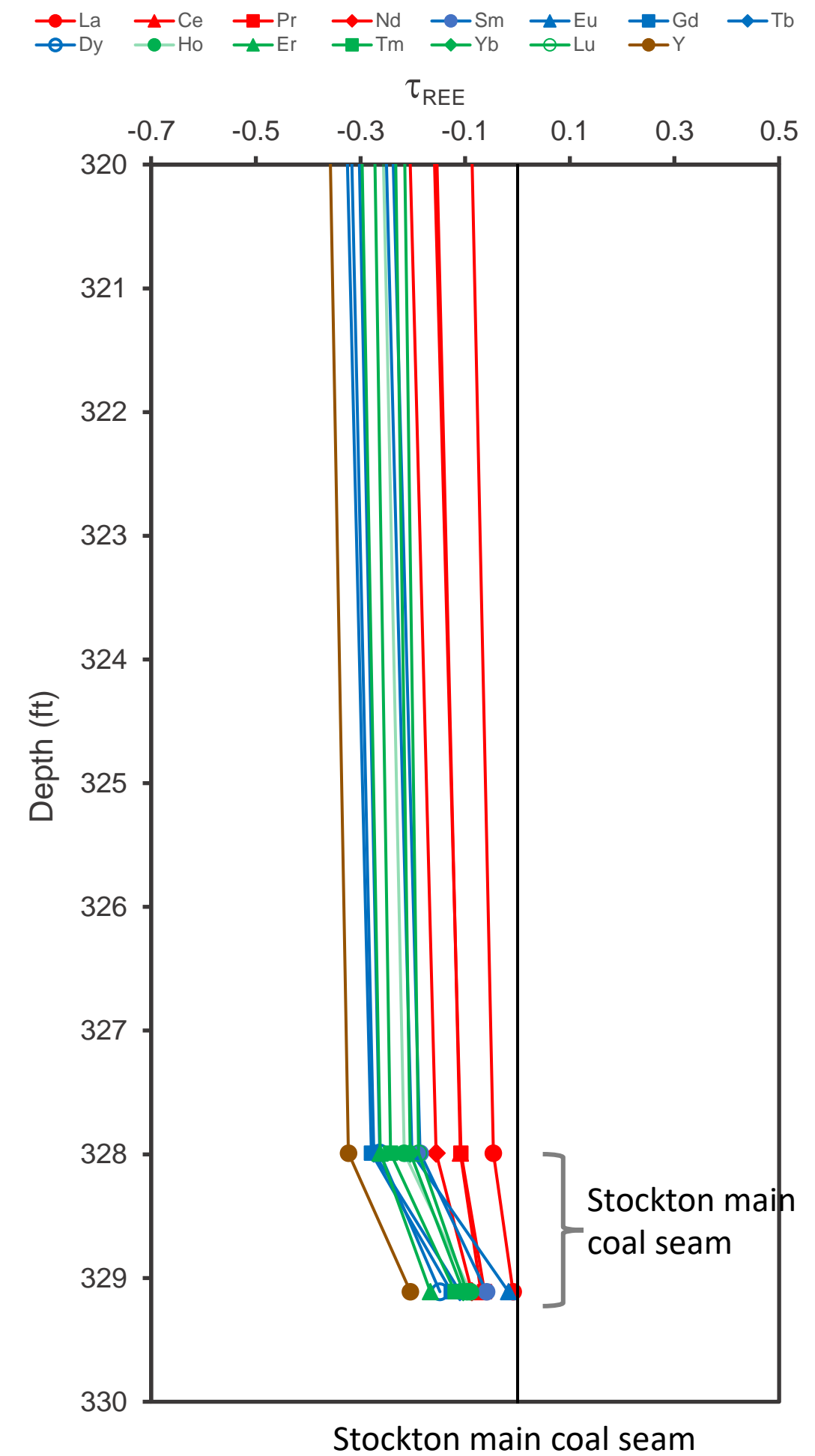
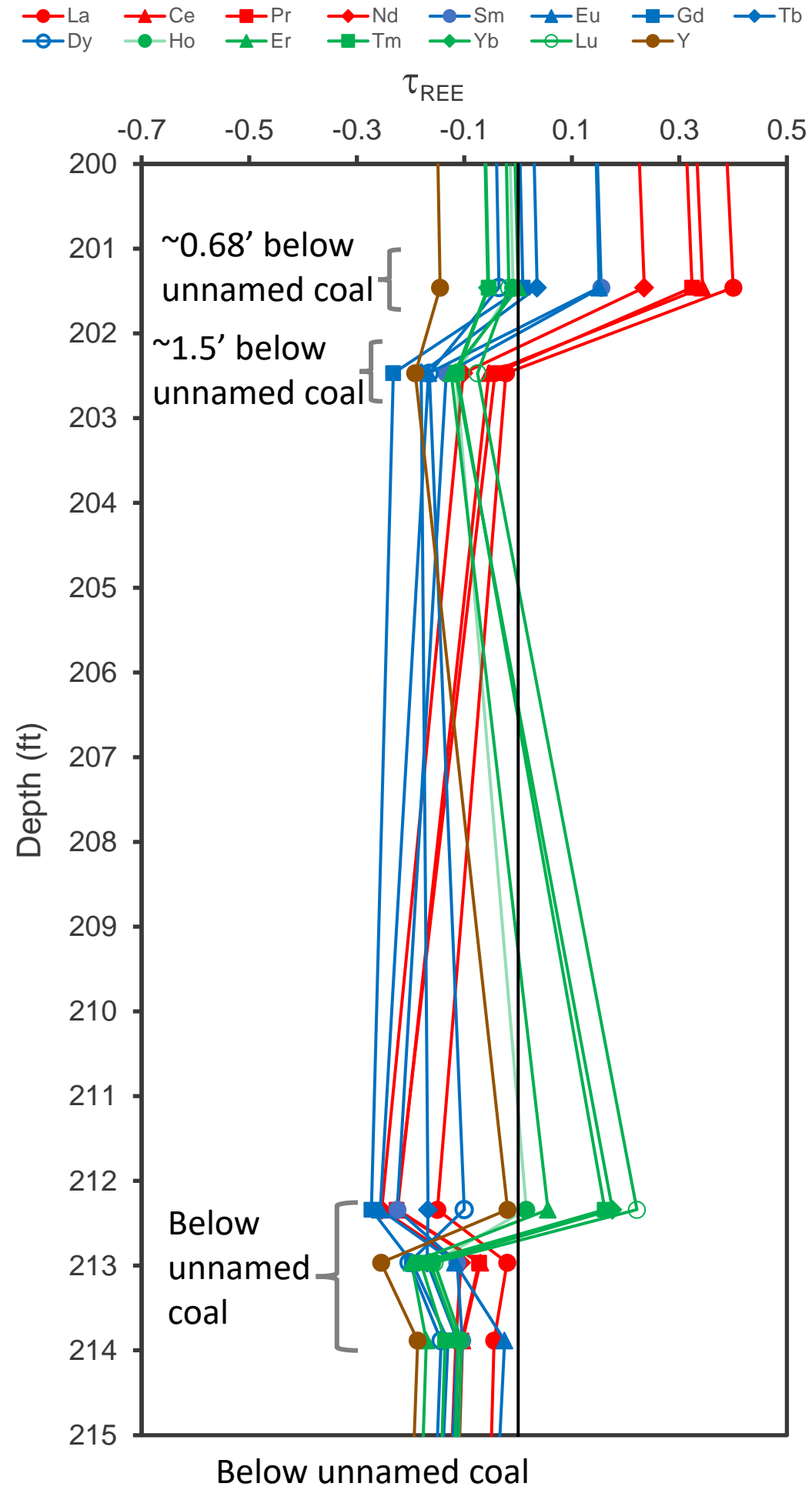
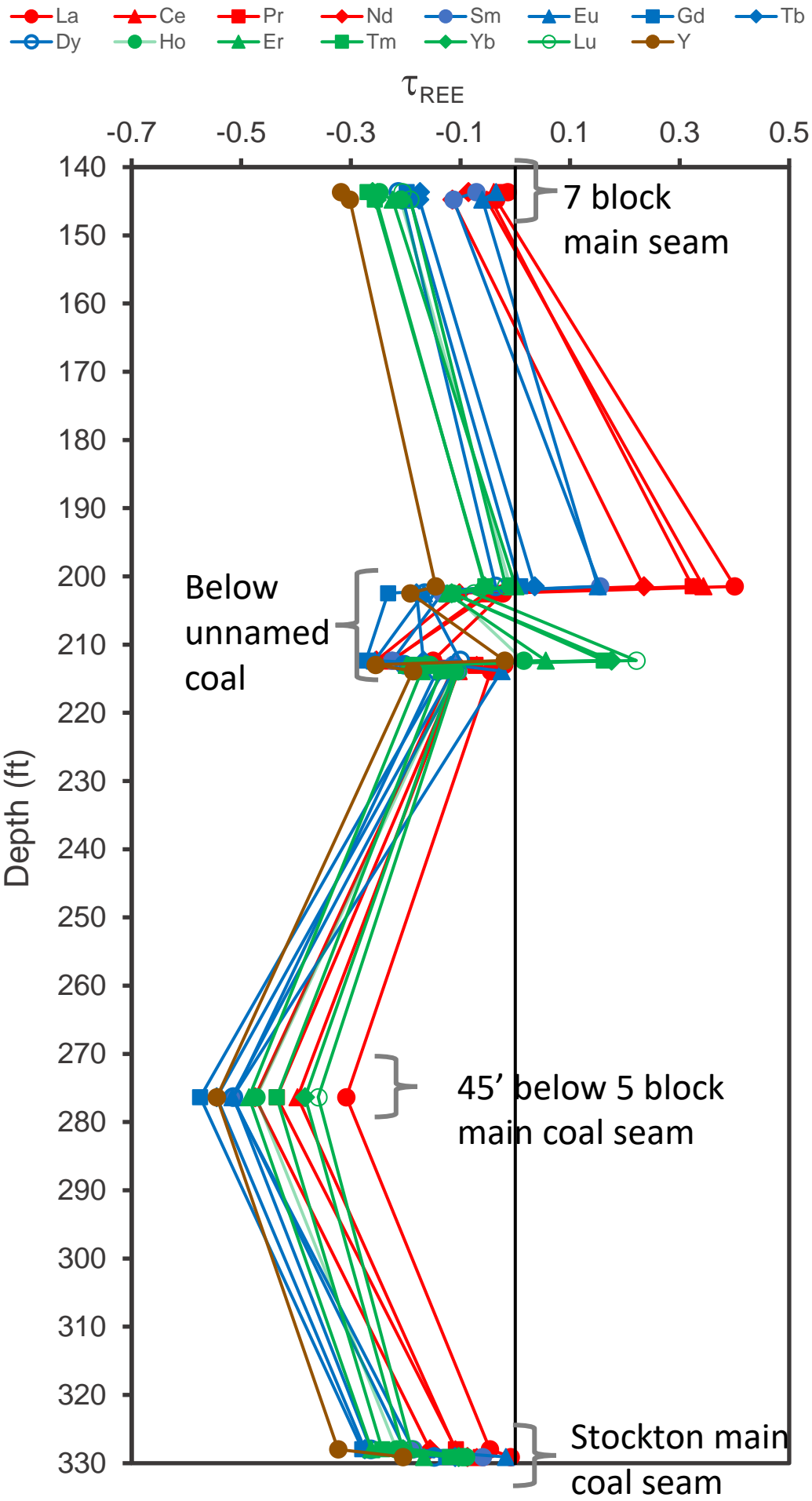
55' below Brush Creek Base & Upper Freeport

Lower Freeport and 10', 25', and 30' below

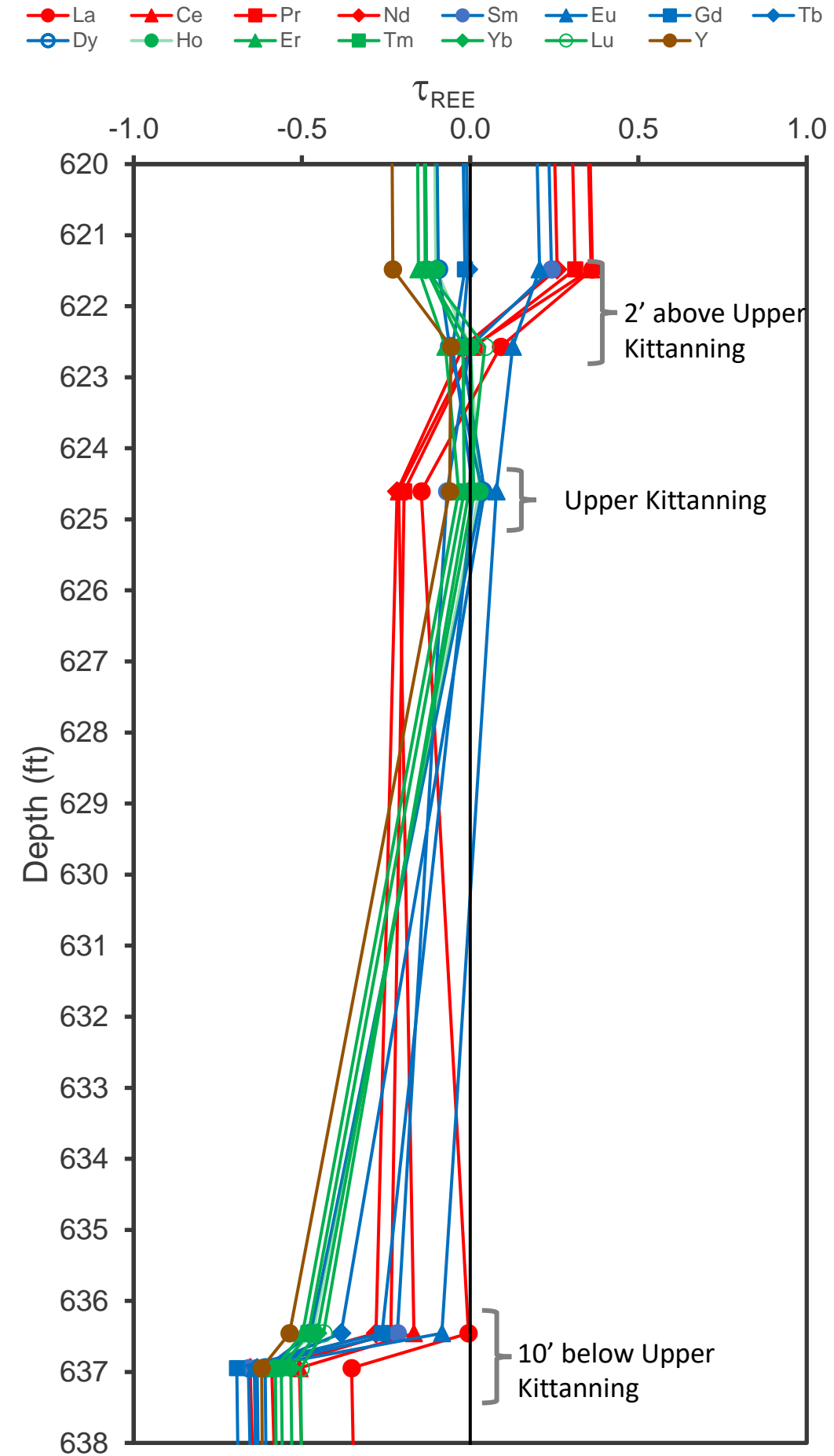
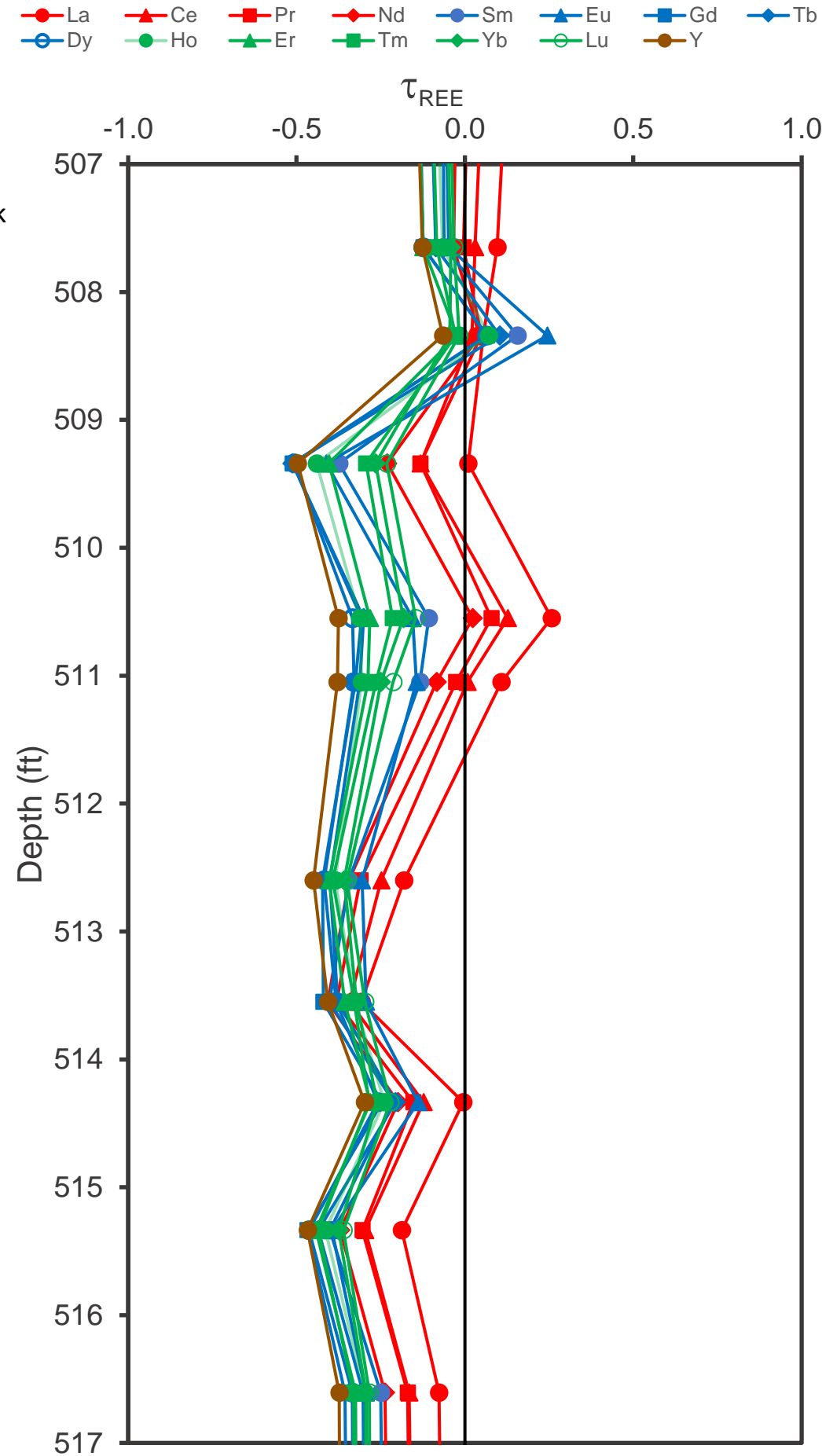
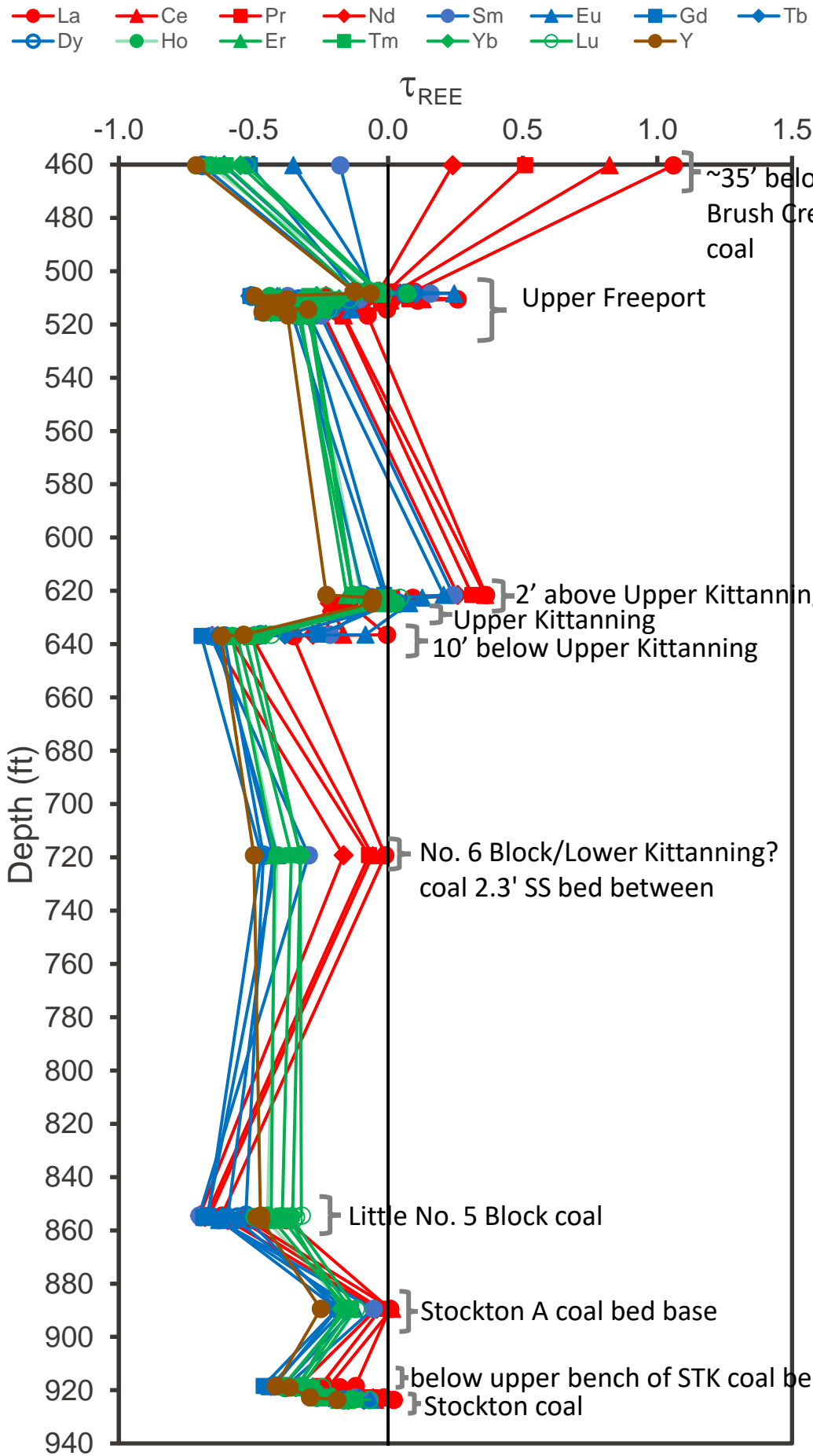
302-072



307-098



282-026

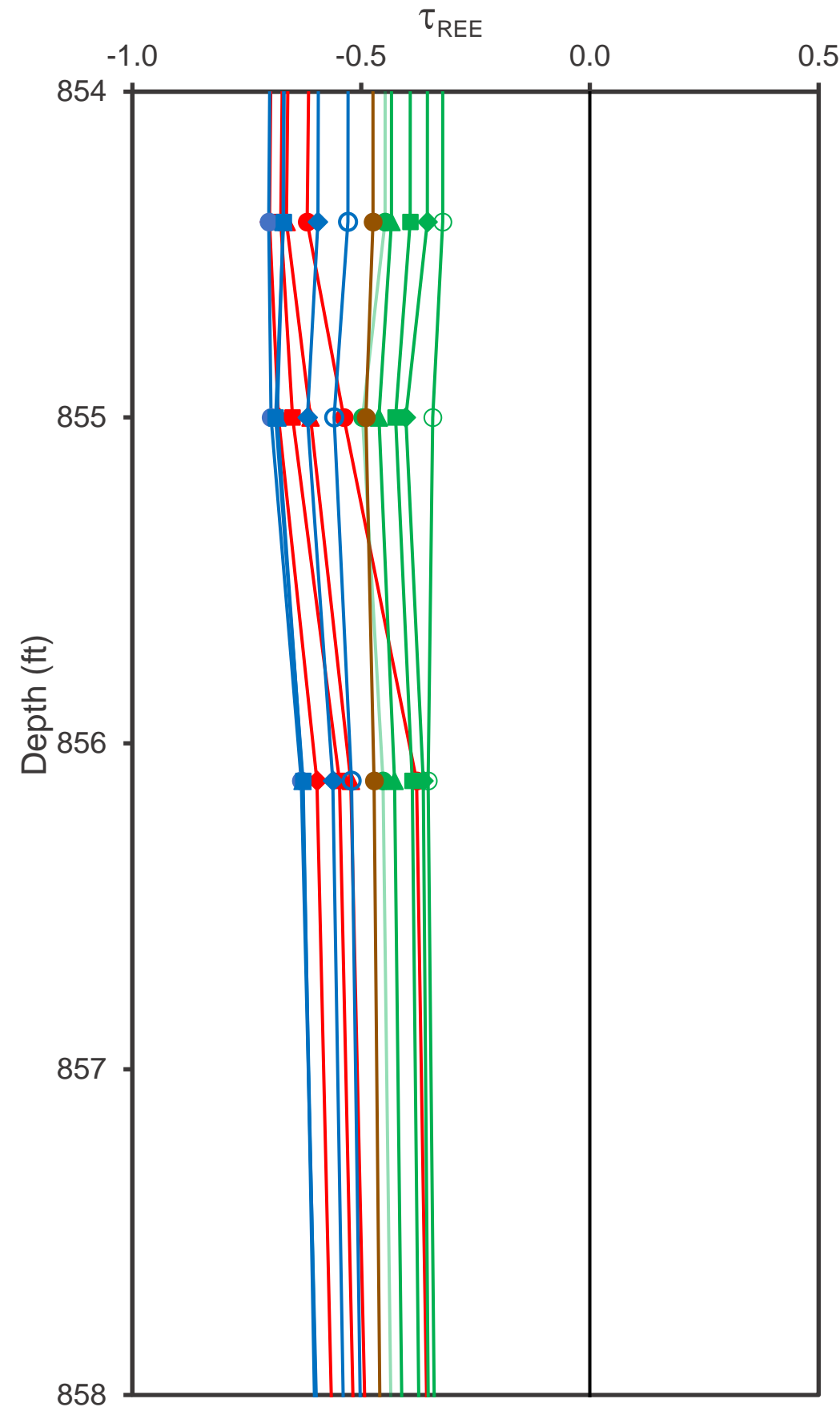


● La ▲ Ce ■ Pr ◆ Nd ● Sm ▲ Eu ■ Gd ◆ Tb
 ● Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

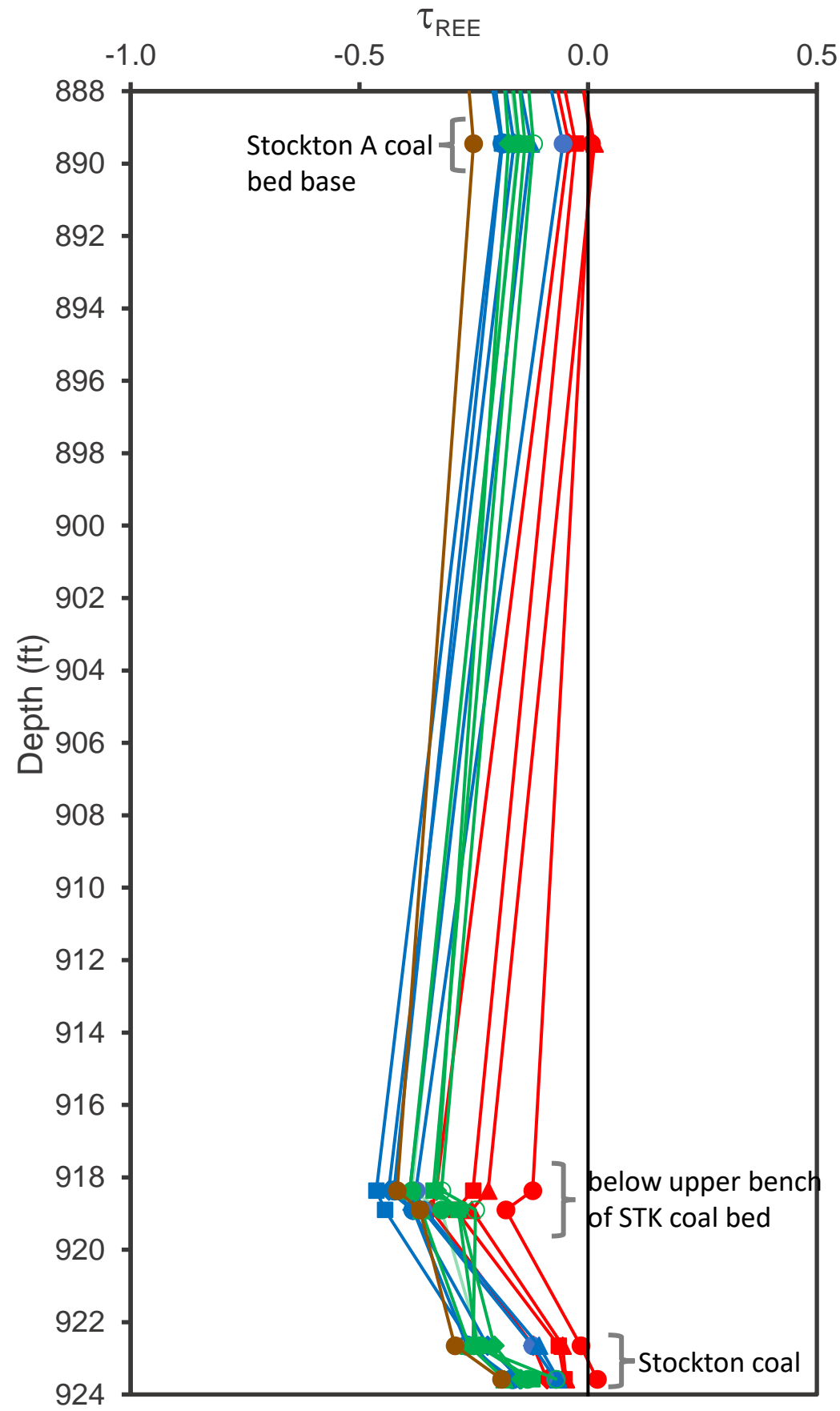
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 ● Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

● La ▲ Ce ■ Pr ◆ Nd ● Sm ▲ Eu ■ Gd ◆ Tb
 ● Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

282-026

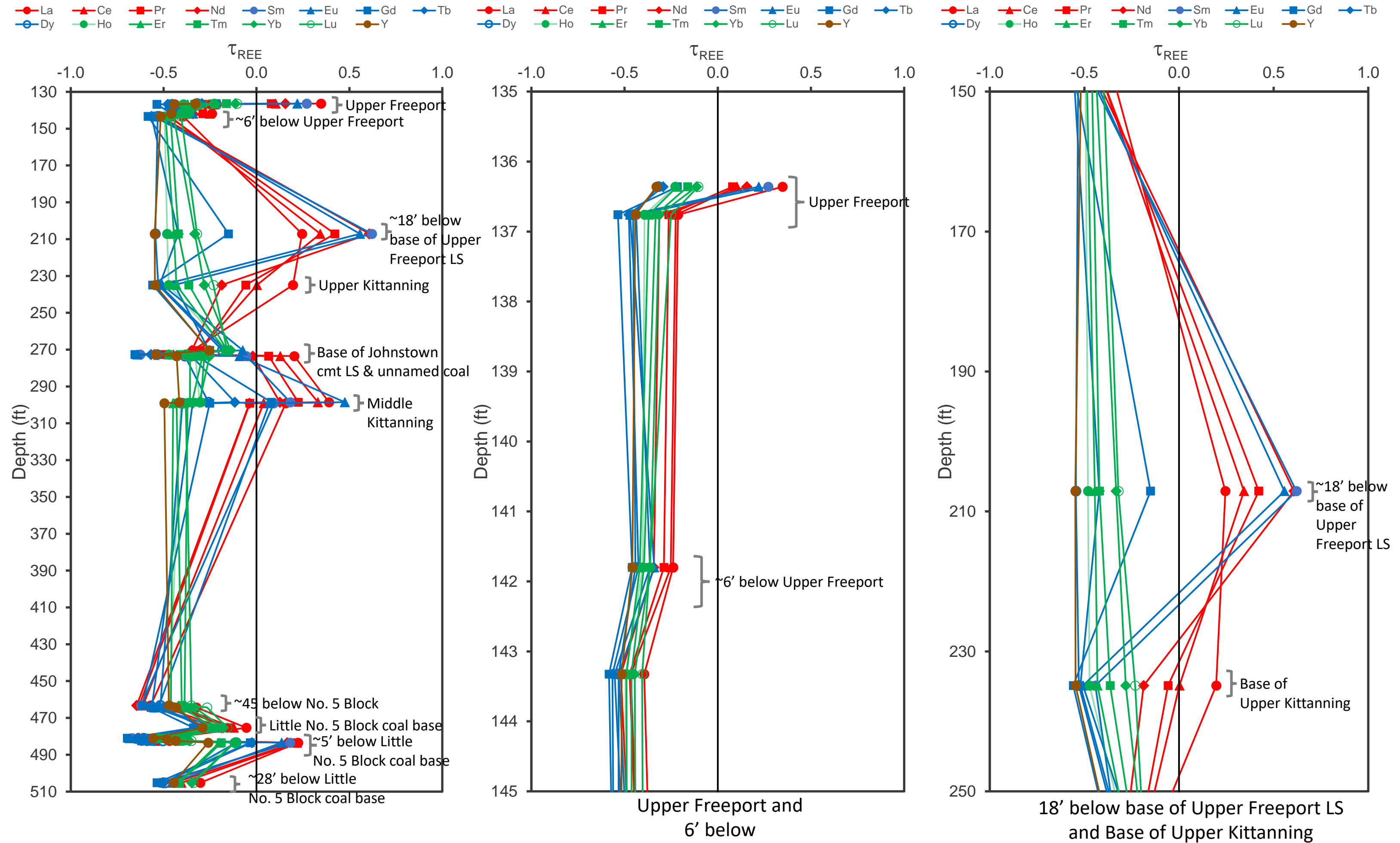


Little No. 5 Block coal underclay

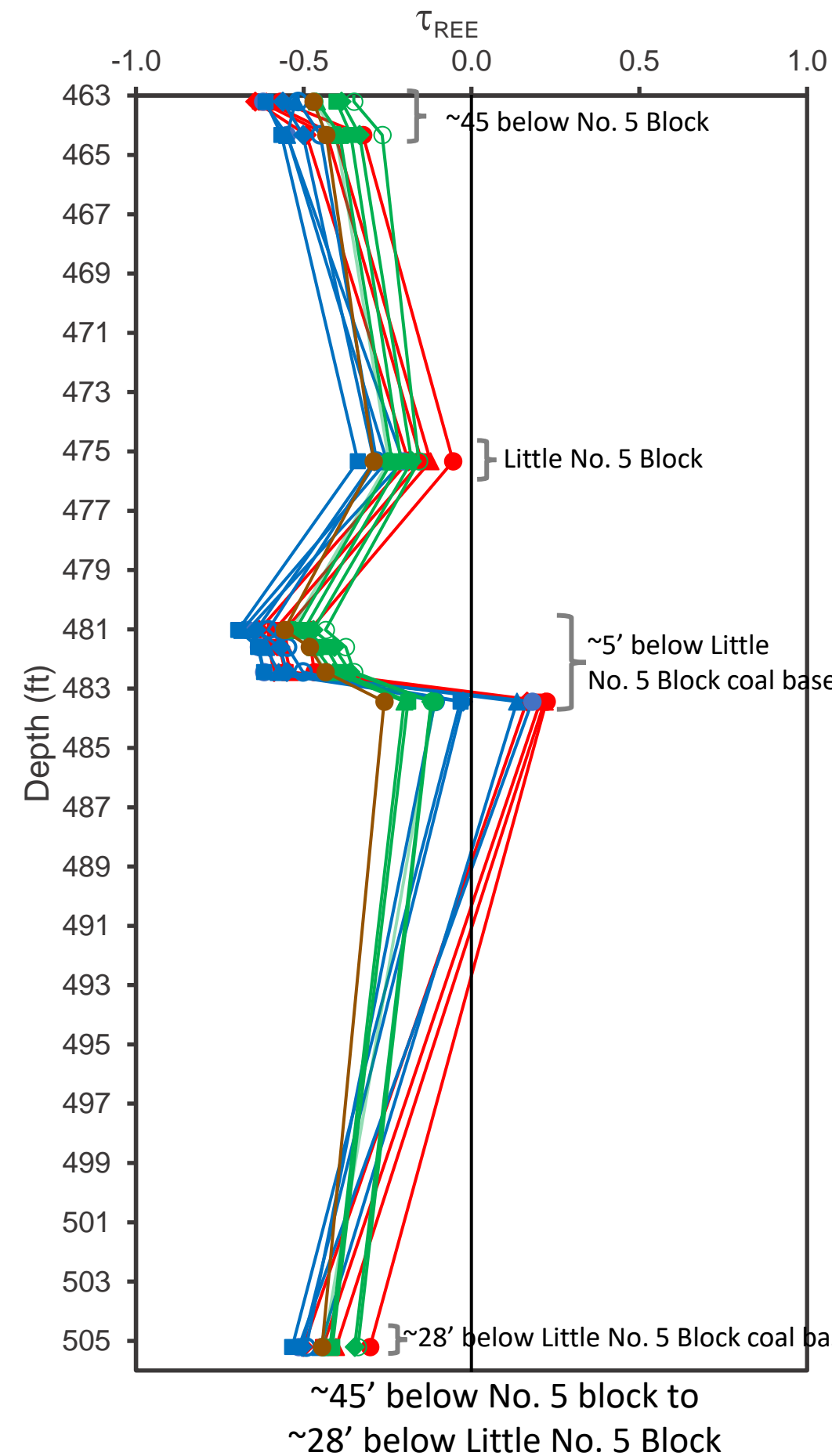
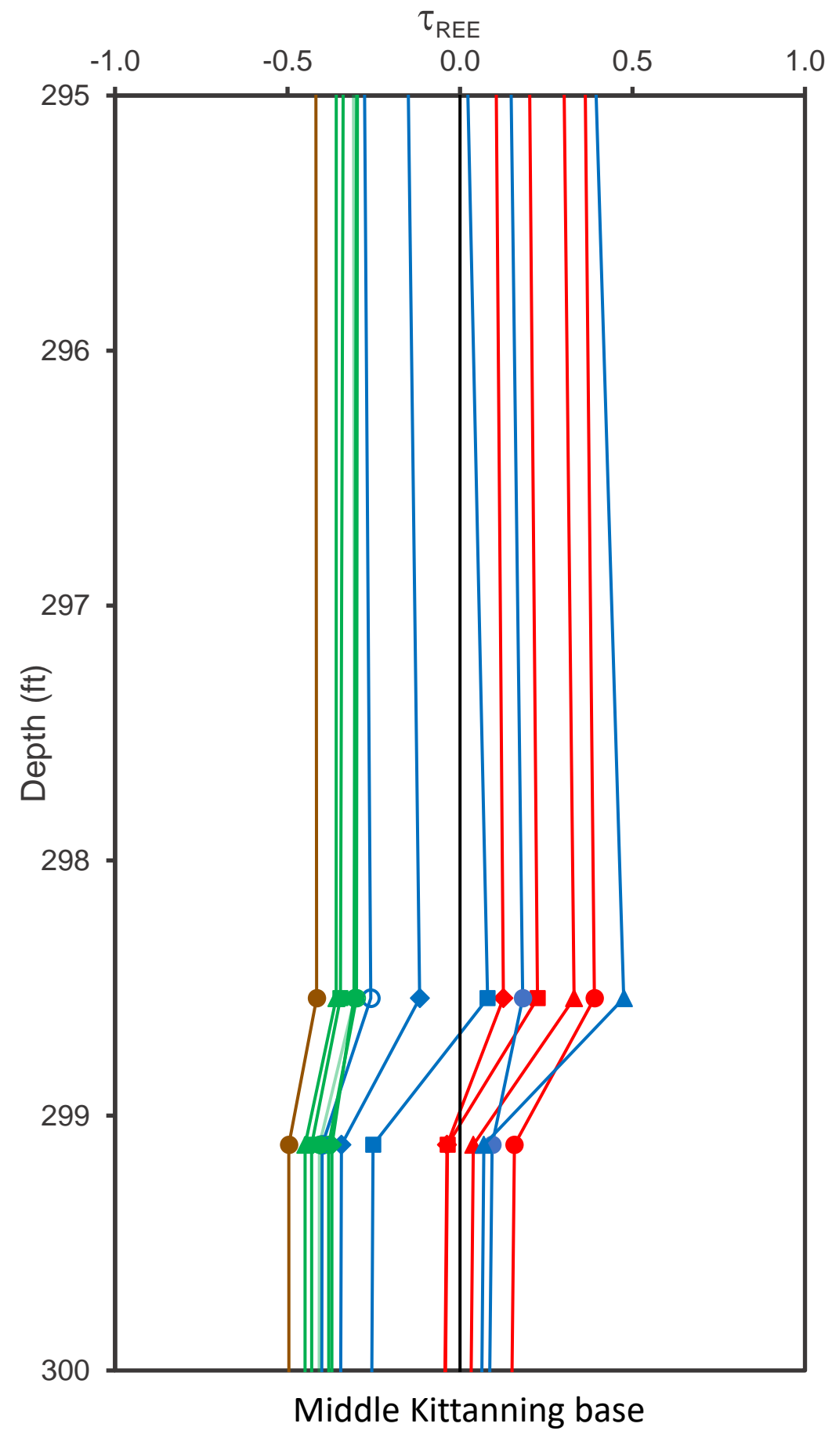
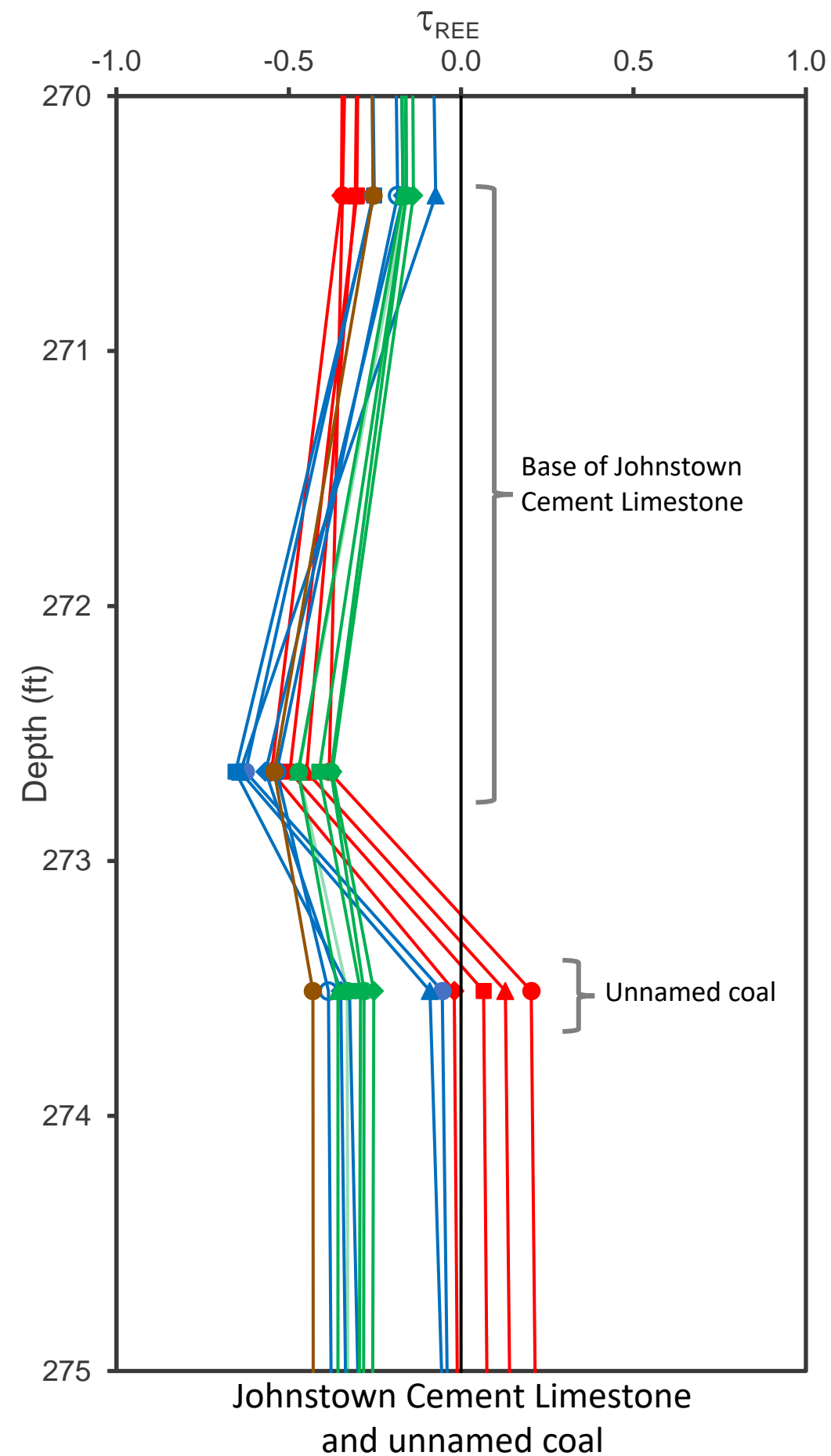
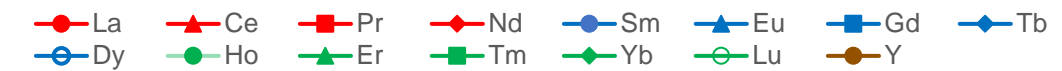


Stockton

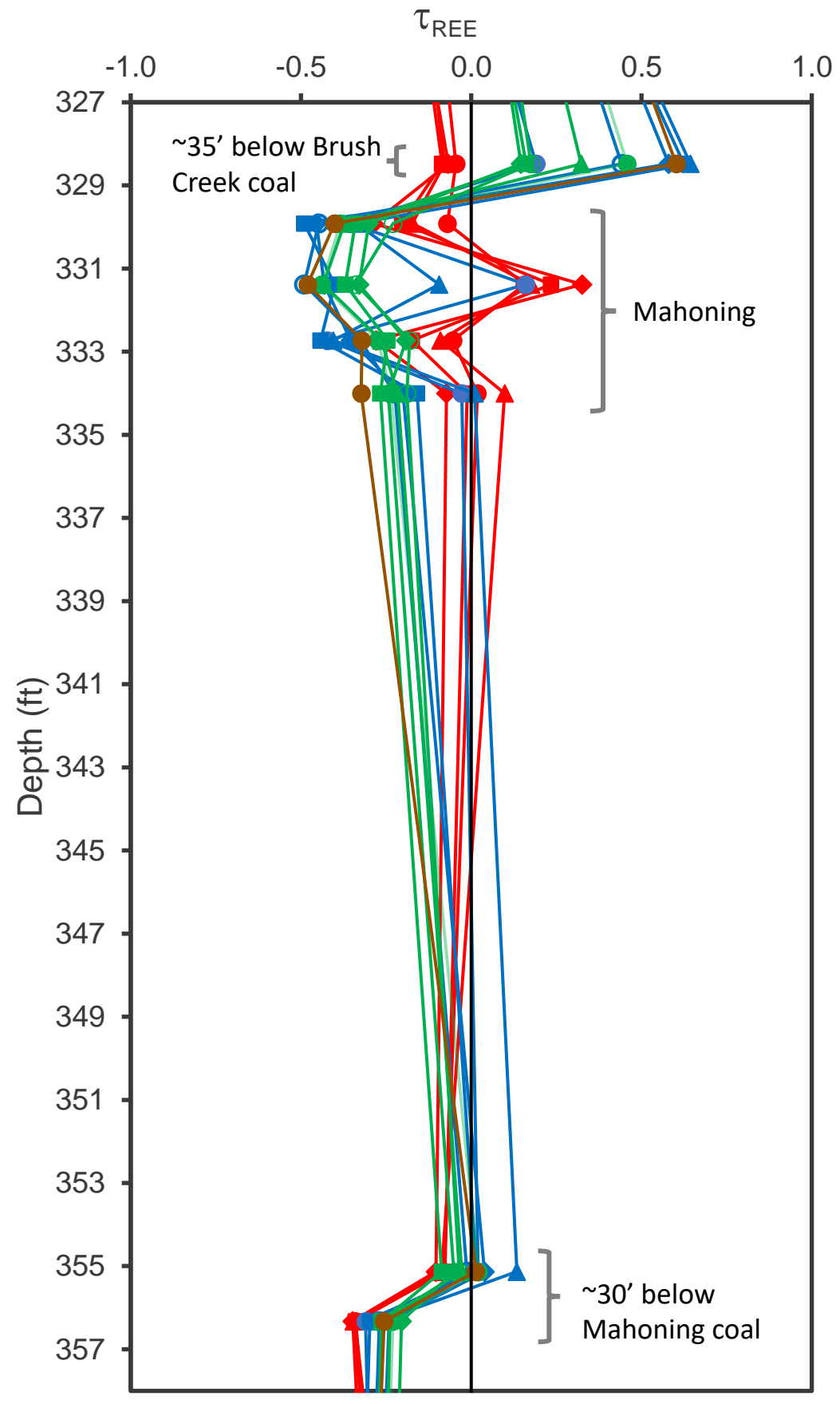
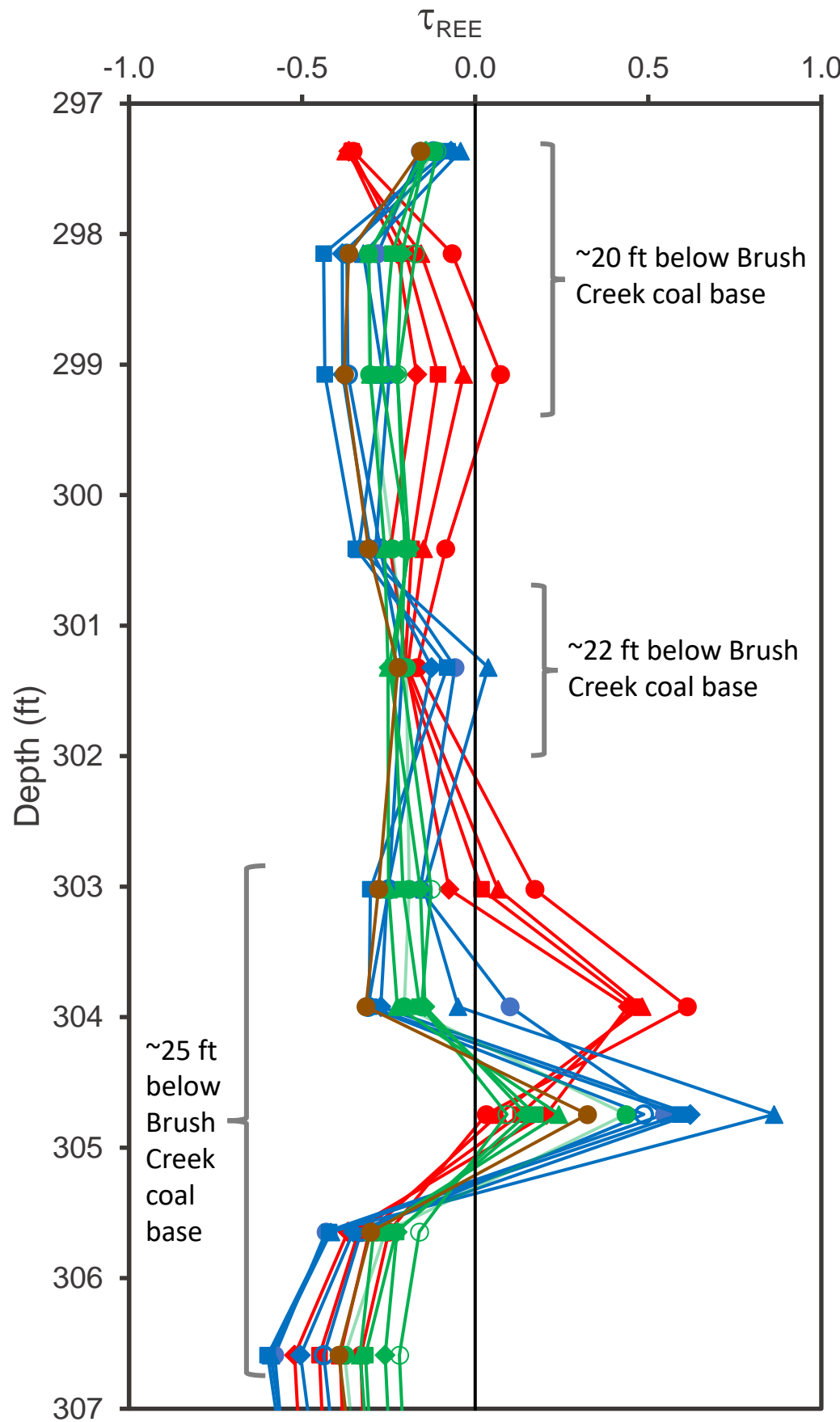
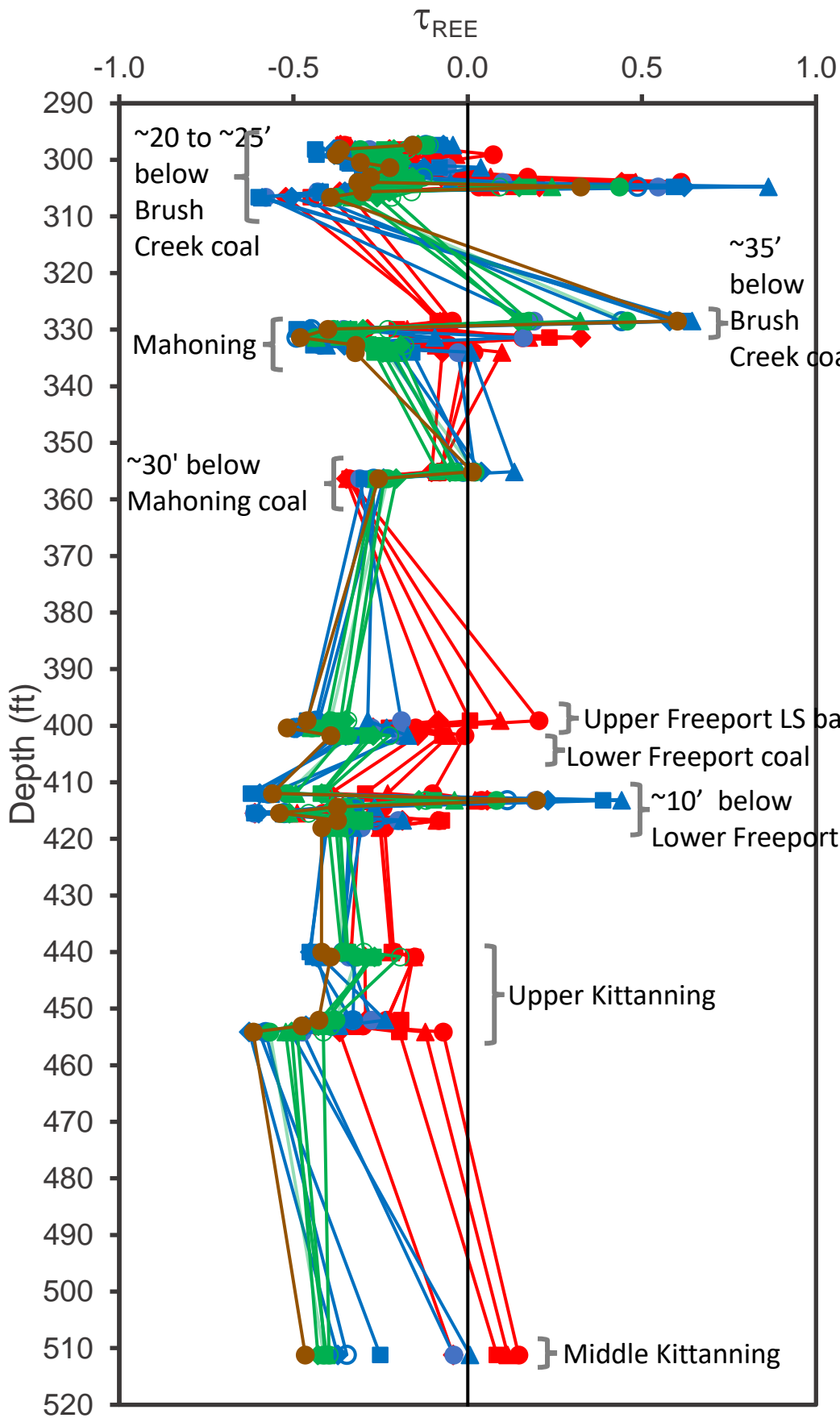
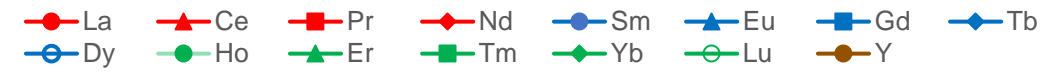
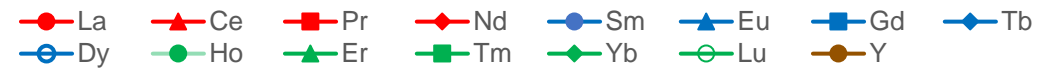
285-073



285-073



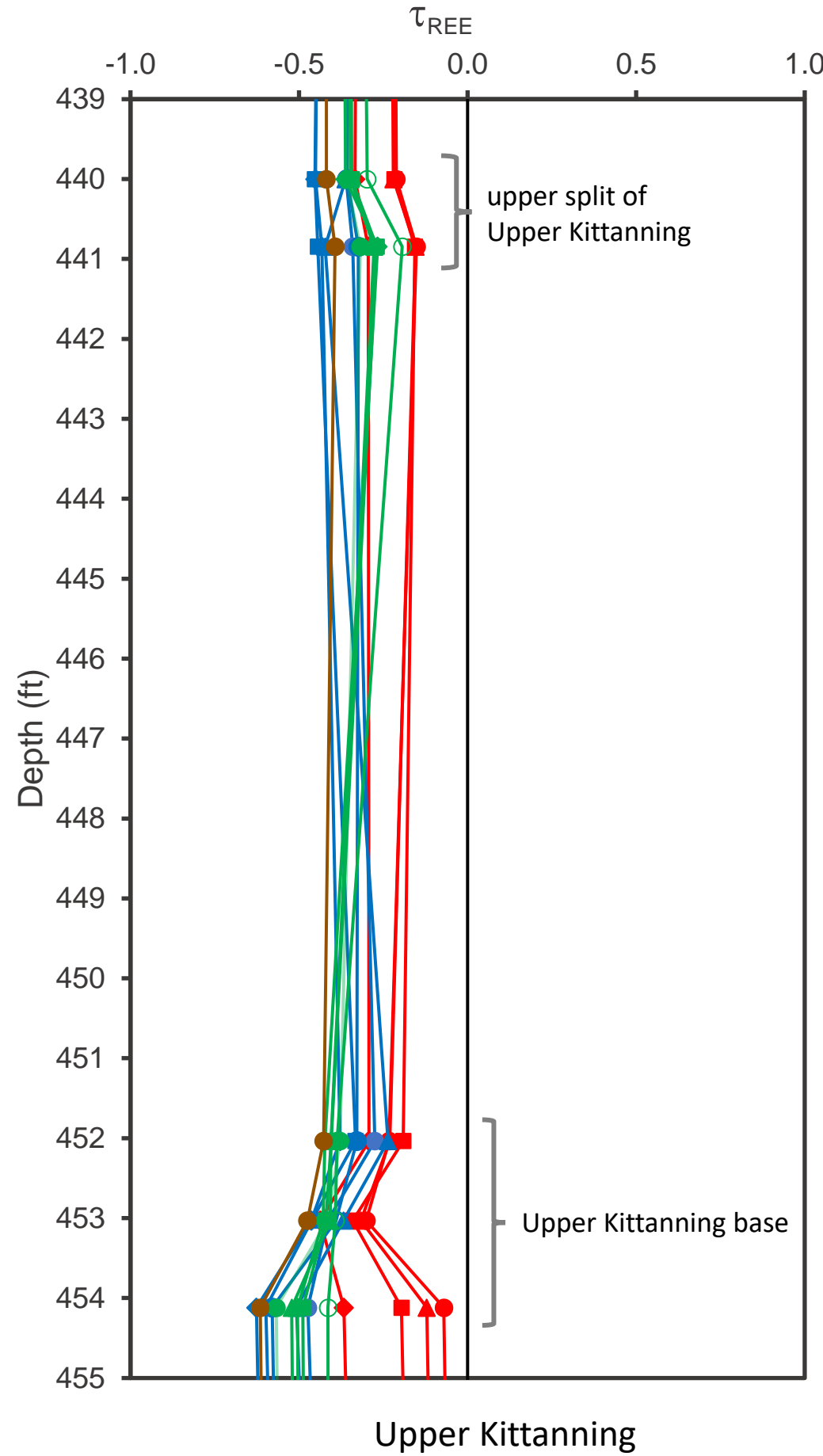
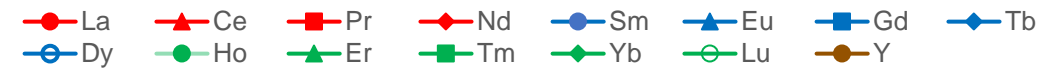
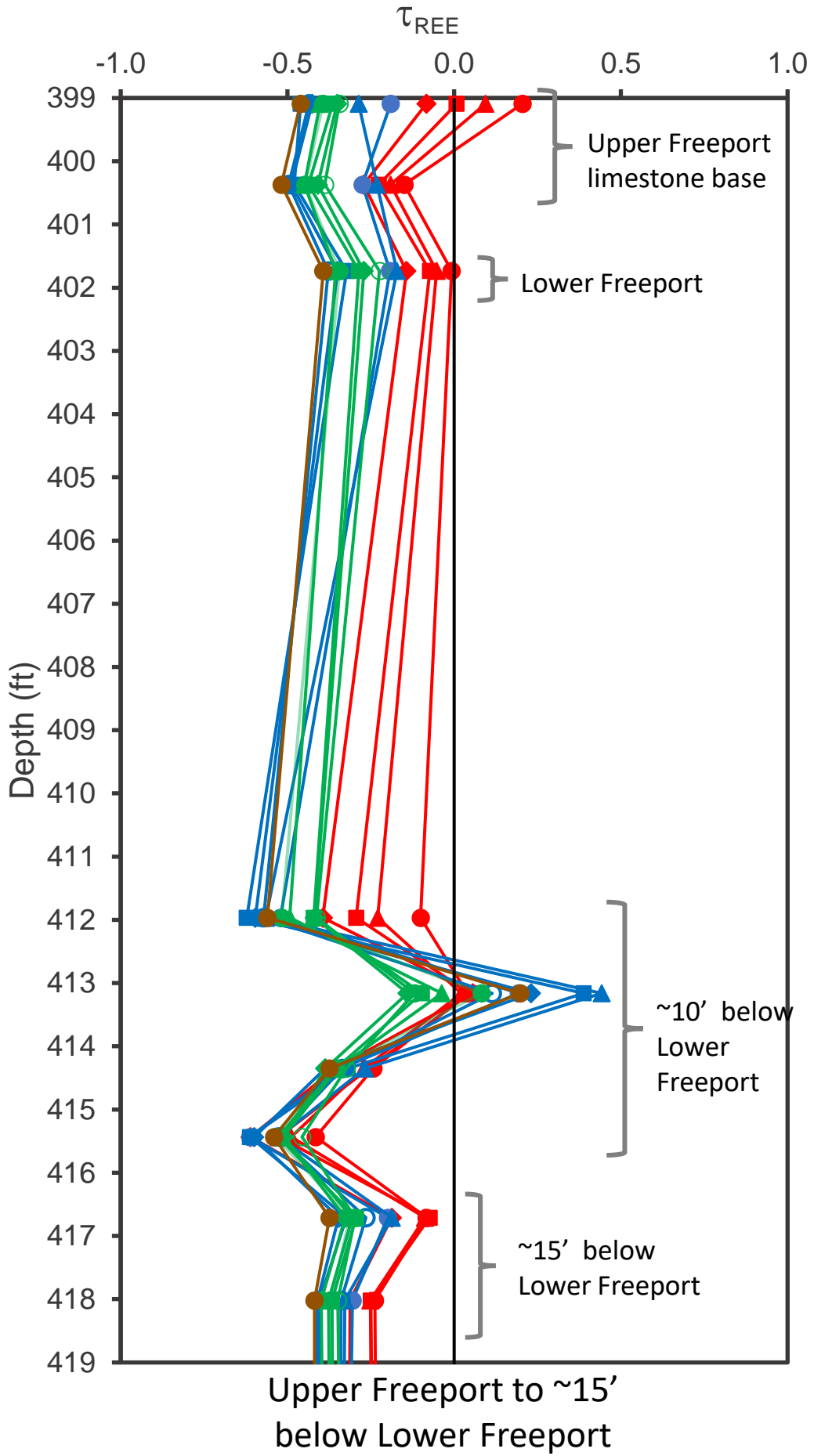
308-007



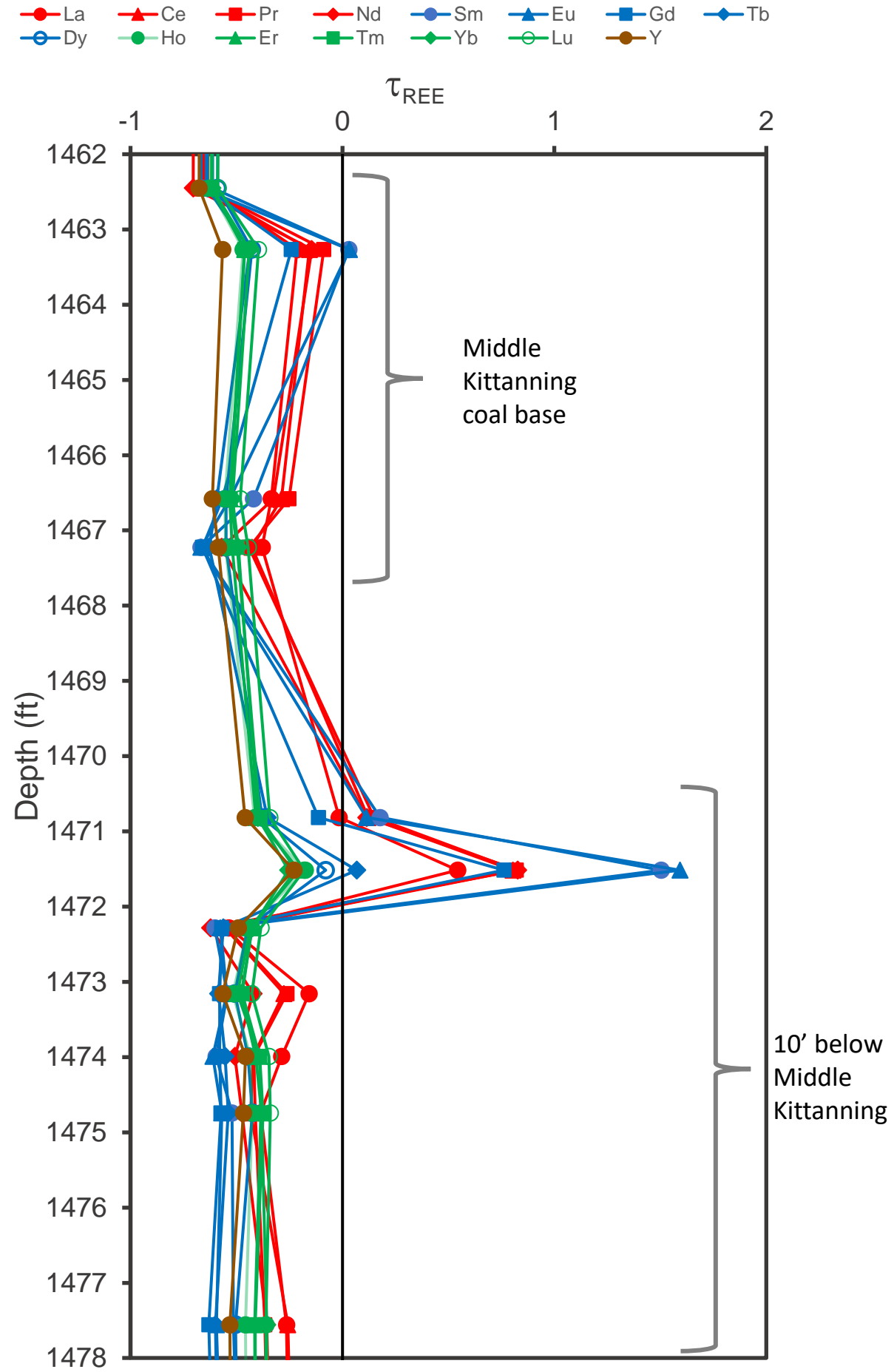
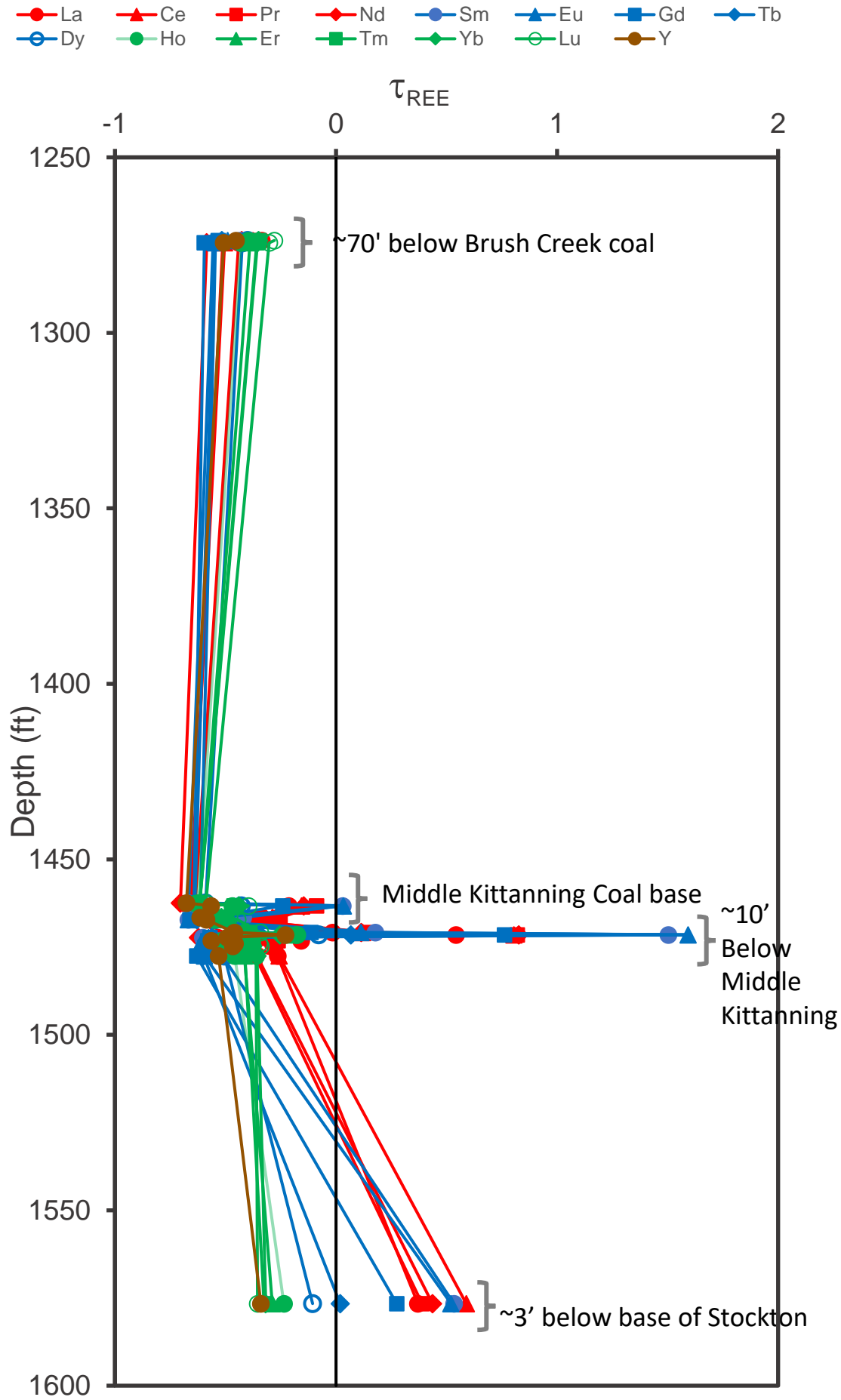
~20' to ~25' below Brush Creek

Little No. 5 Block coal

308-007

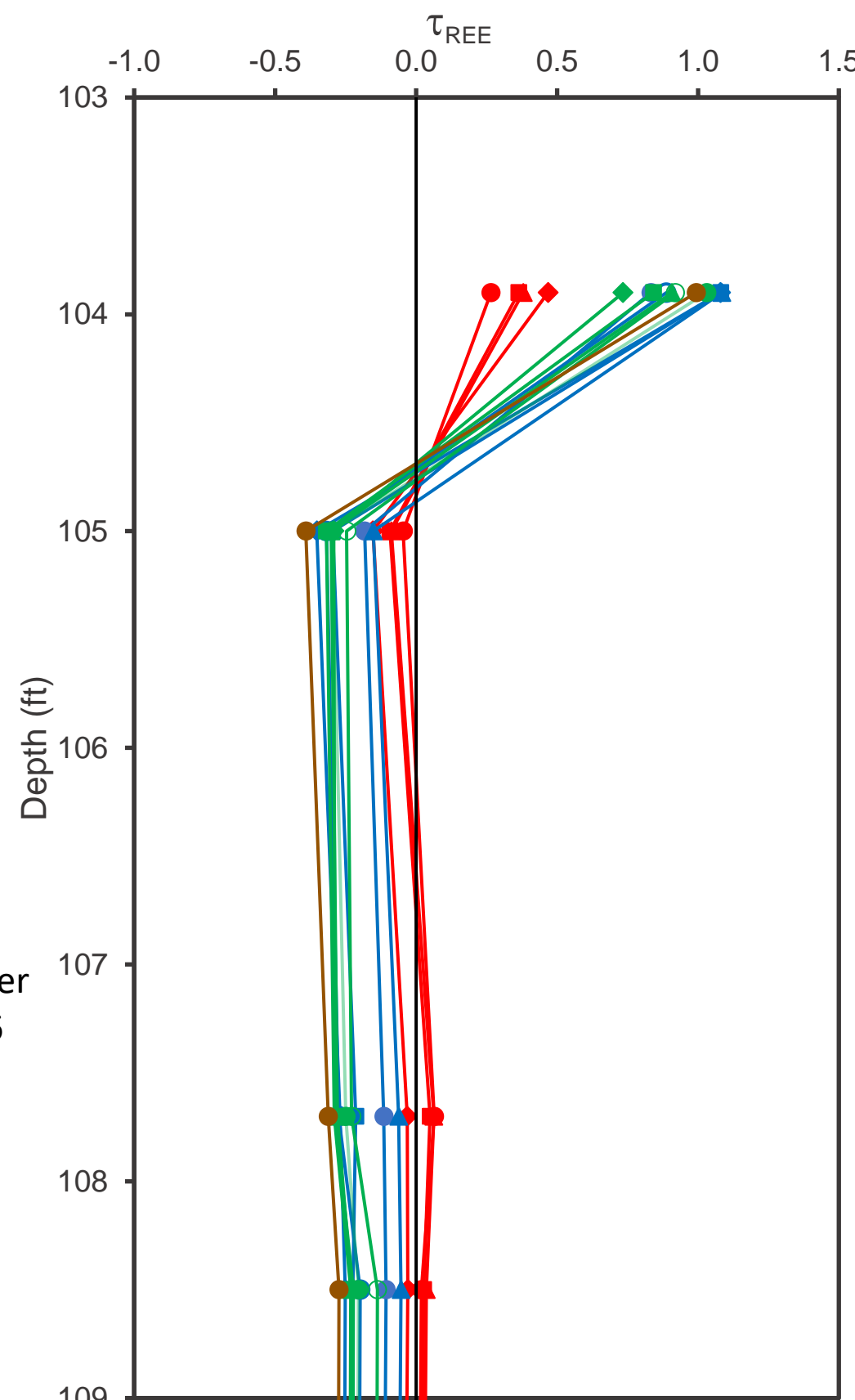
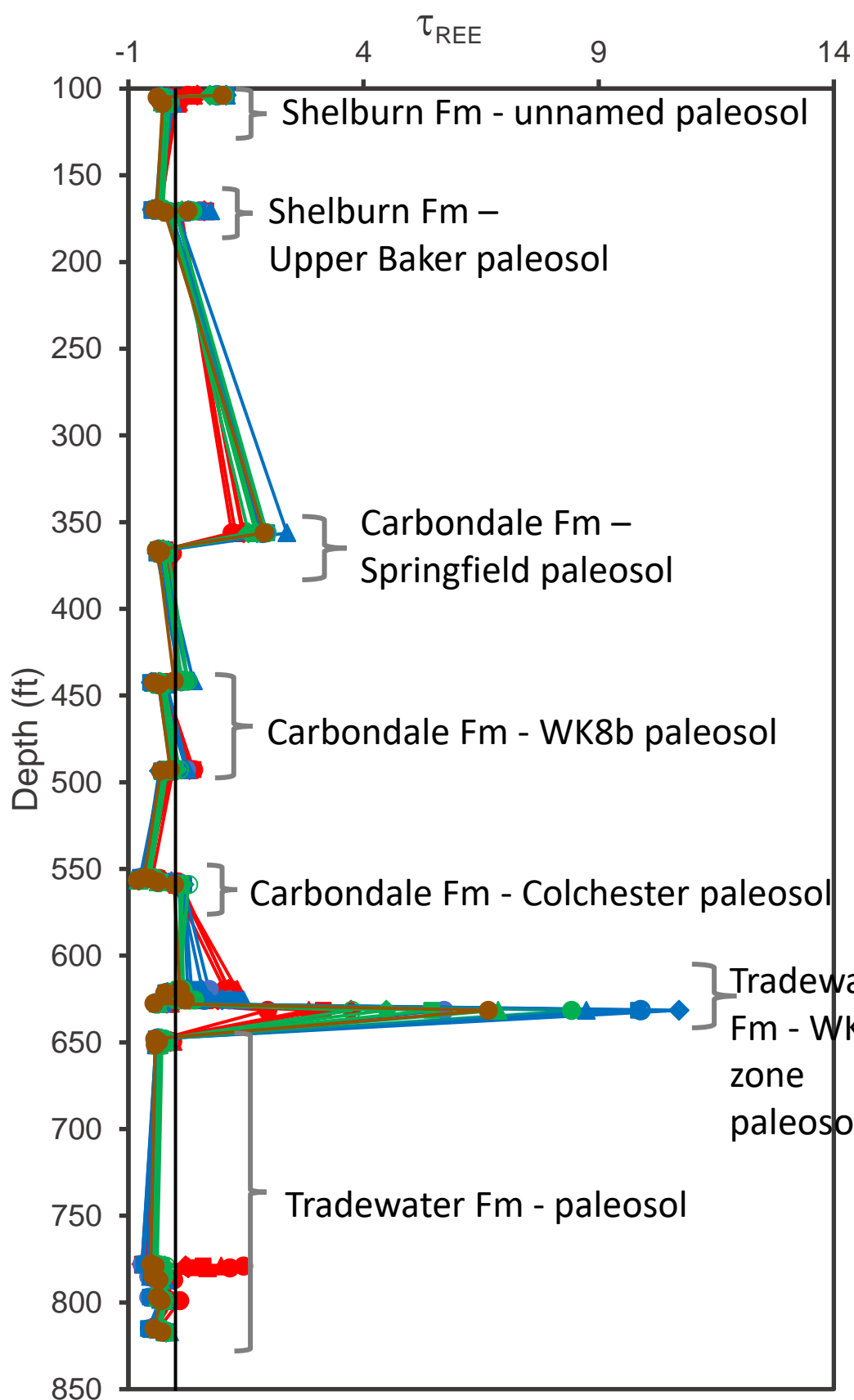
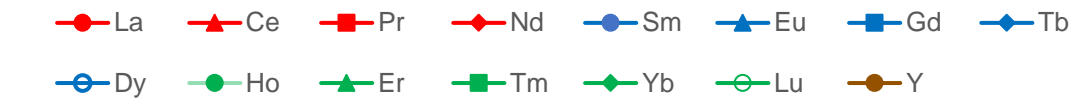
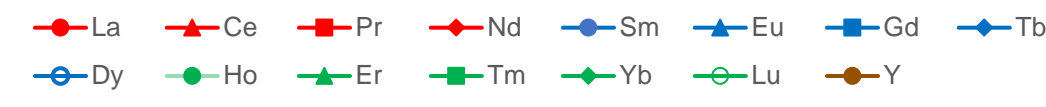


309-055

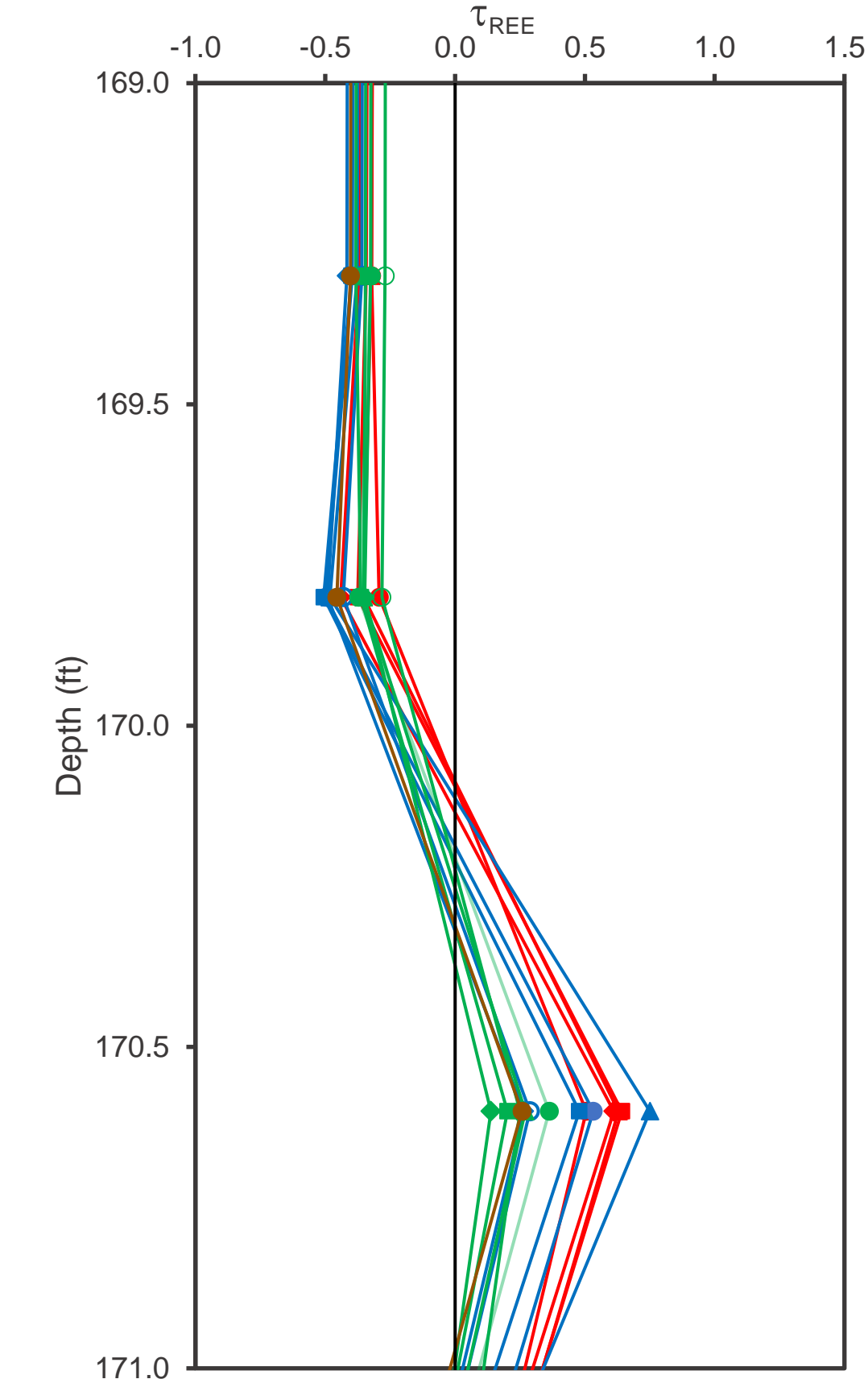


Middle Kittanning to ~10' below

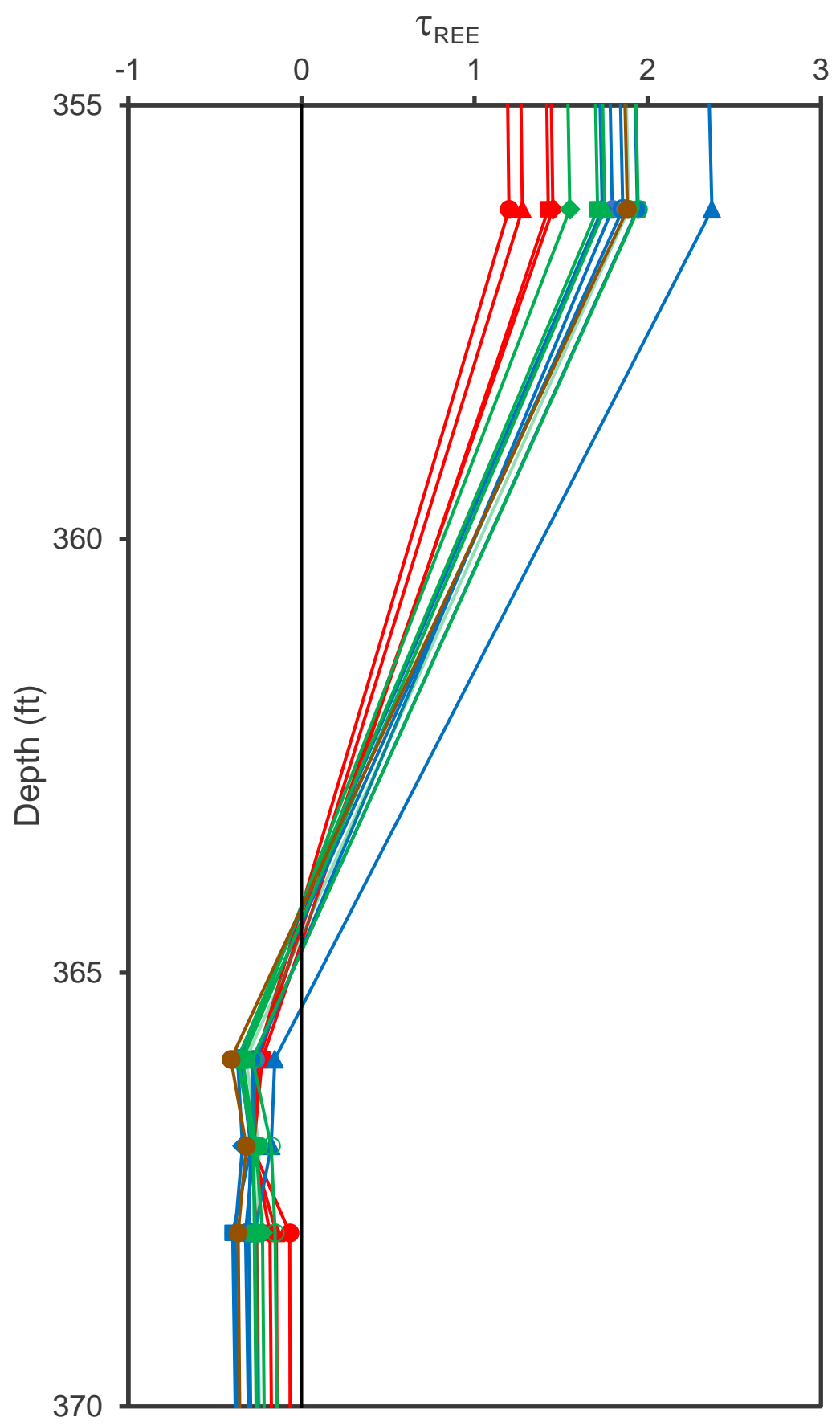
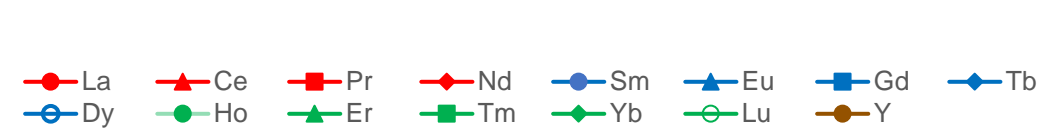
KGS546



Shelburn Fm - unnamed paleosol

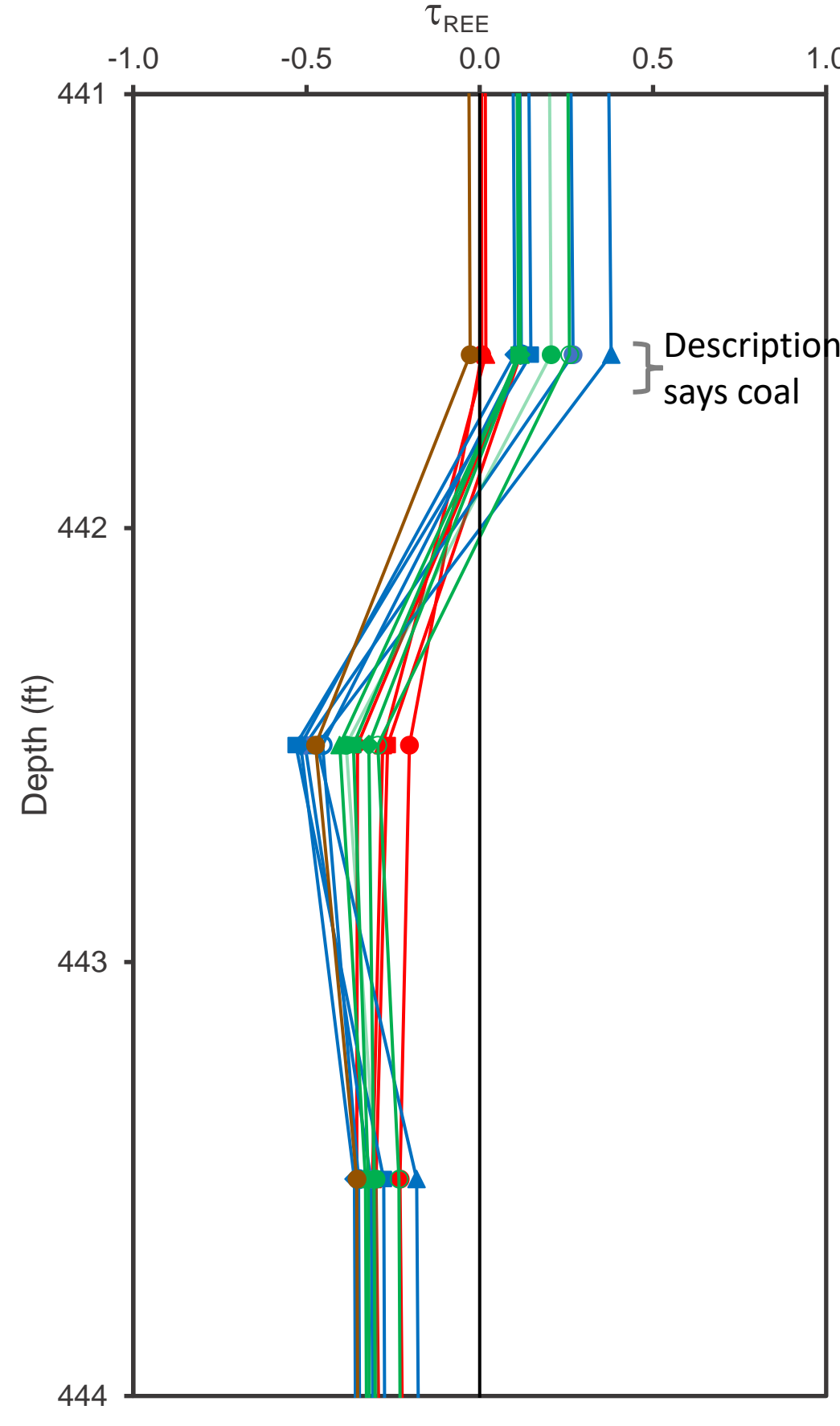
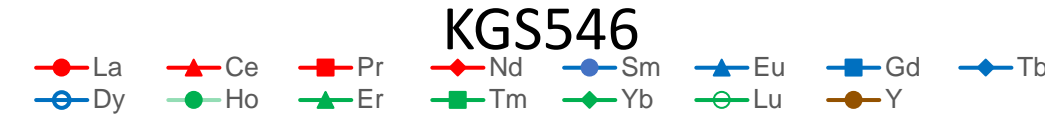


Shelburn Fm - Upper Baker paleosol

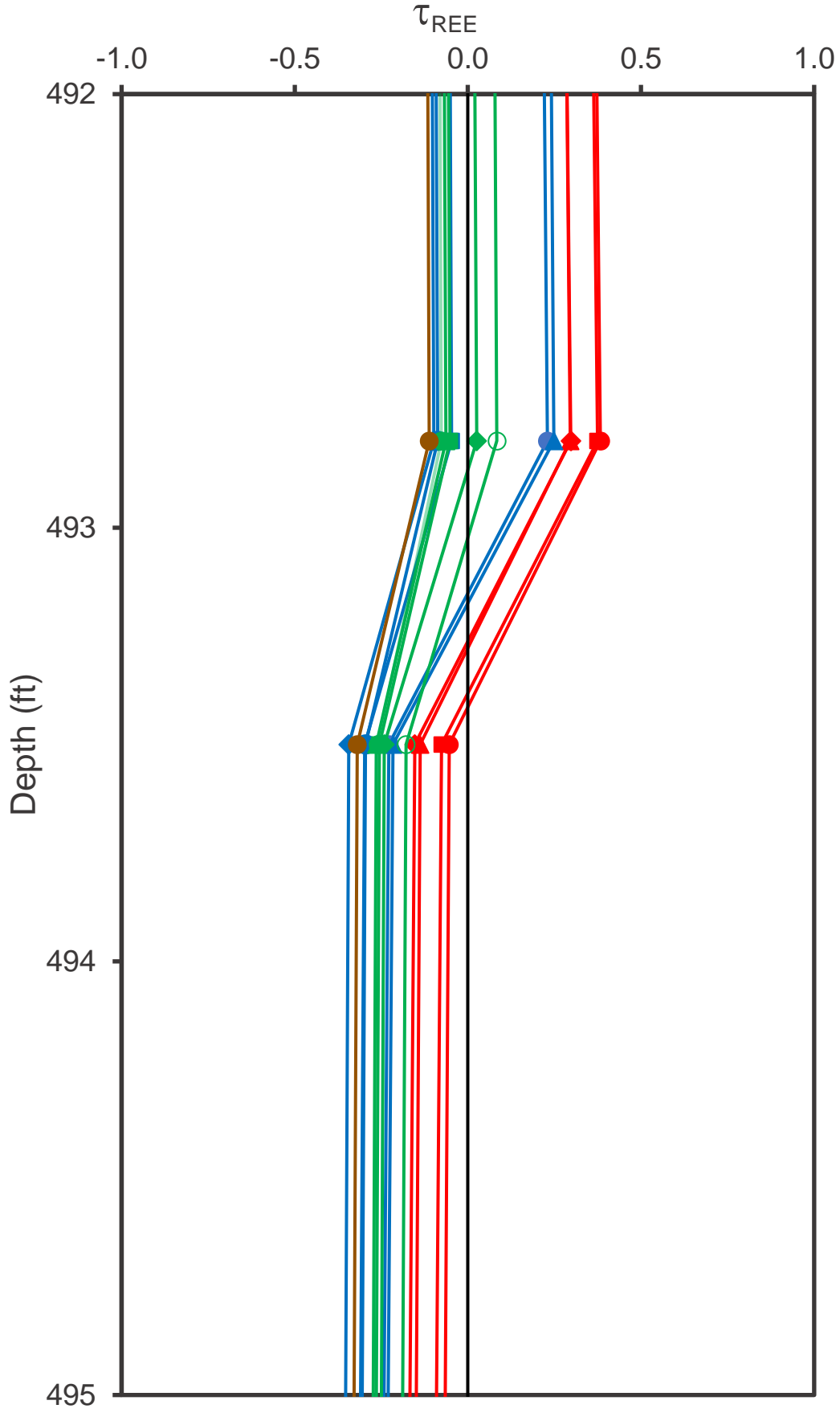


Carbondale Fm - Springfield paleosol

KGS546

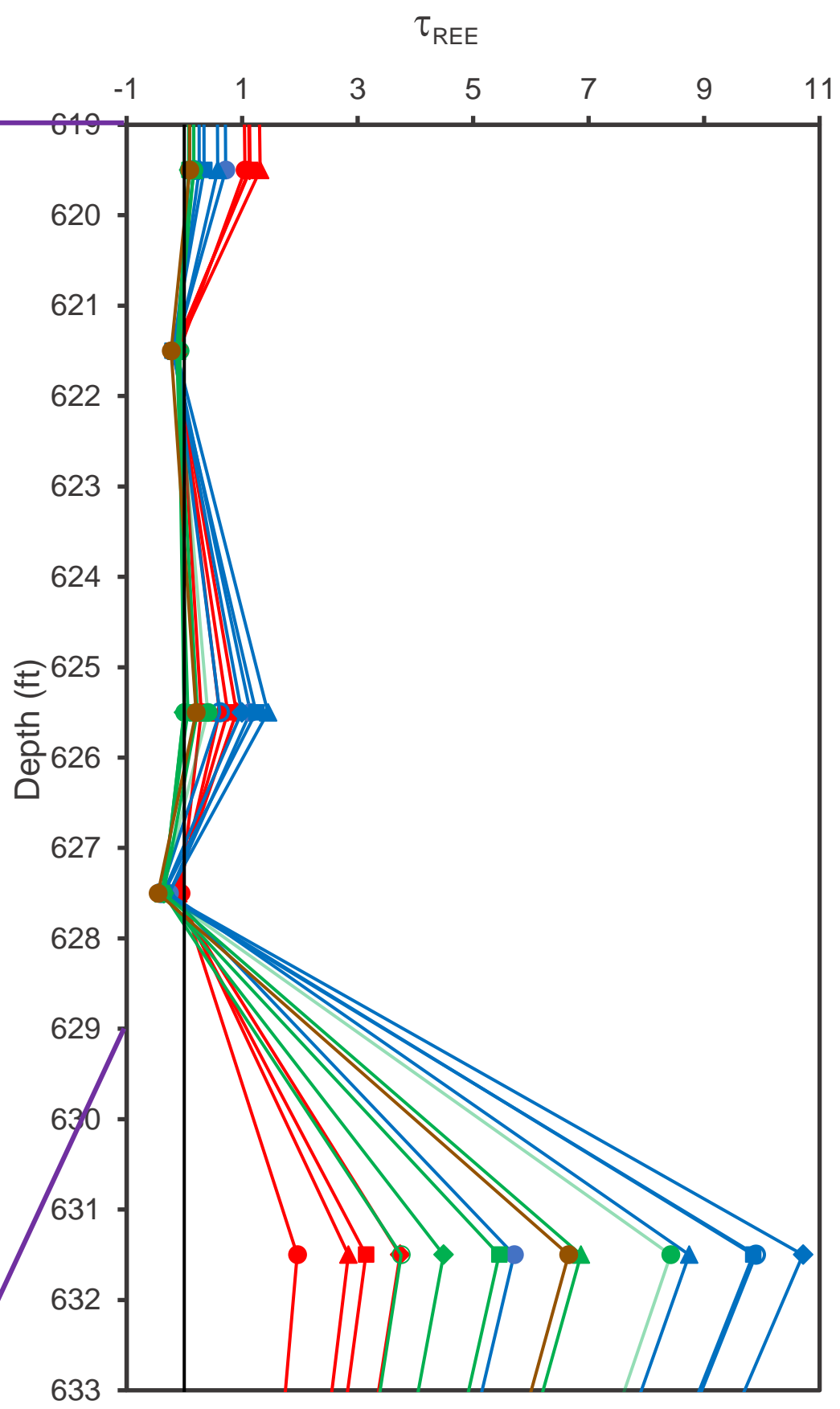
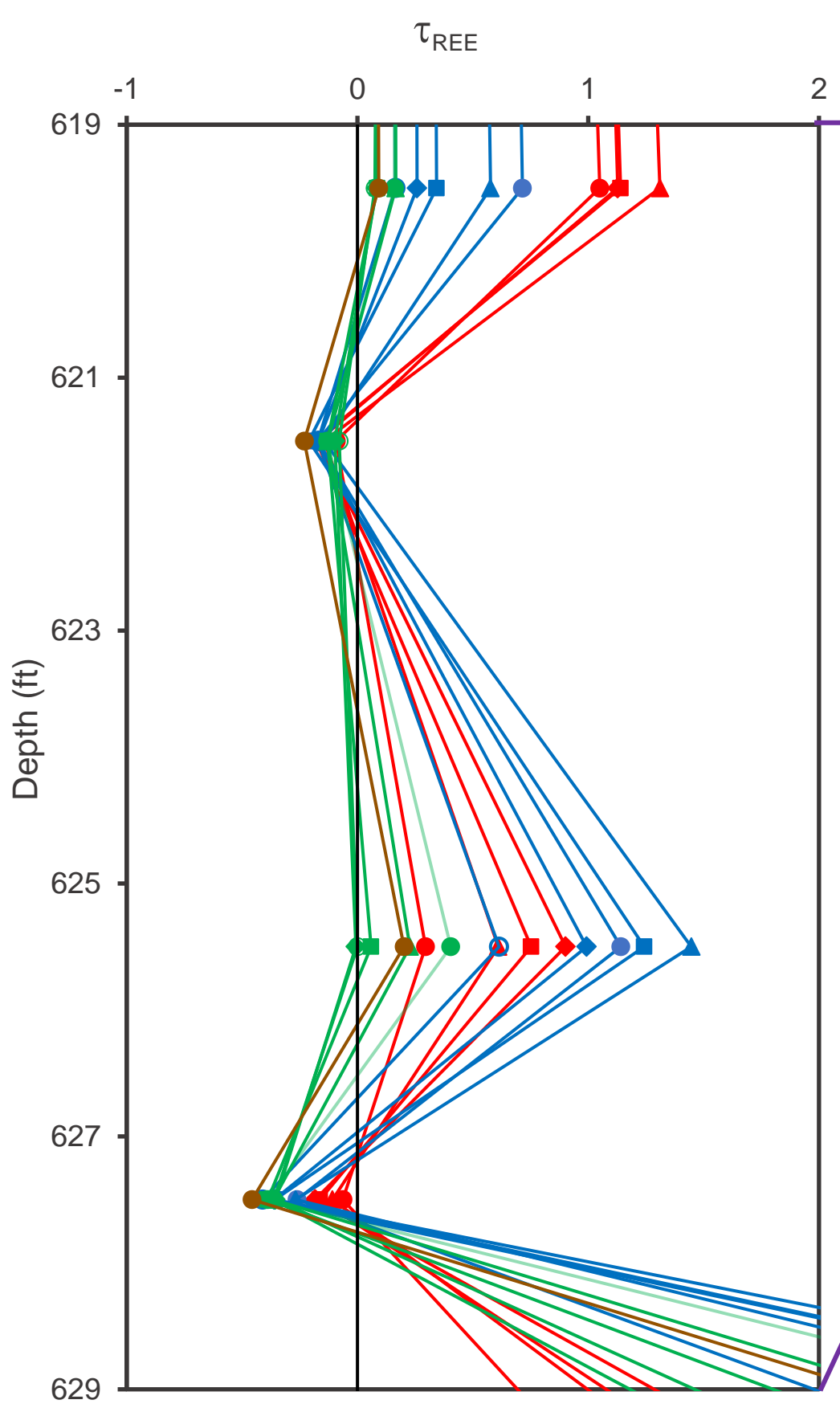
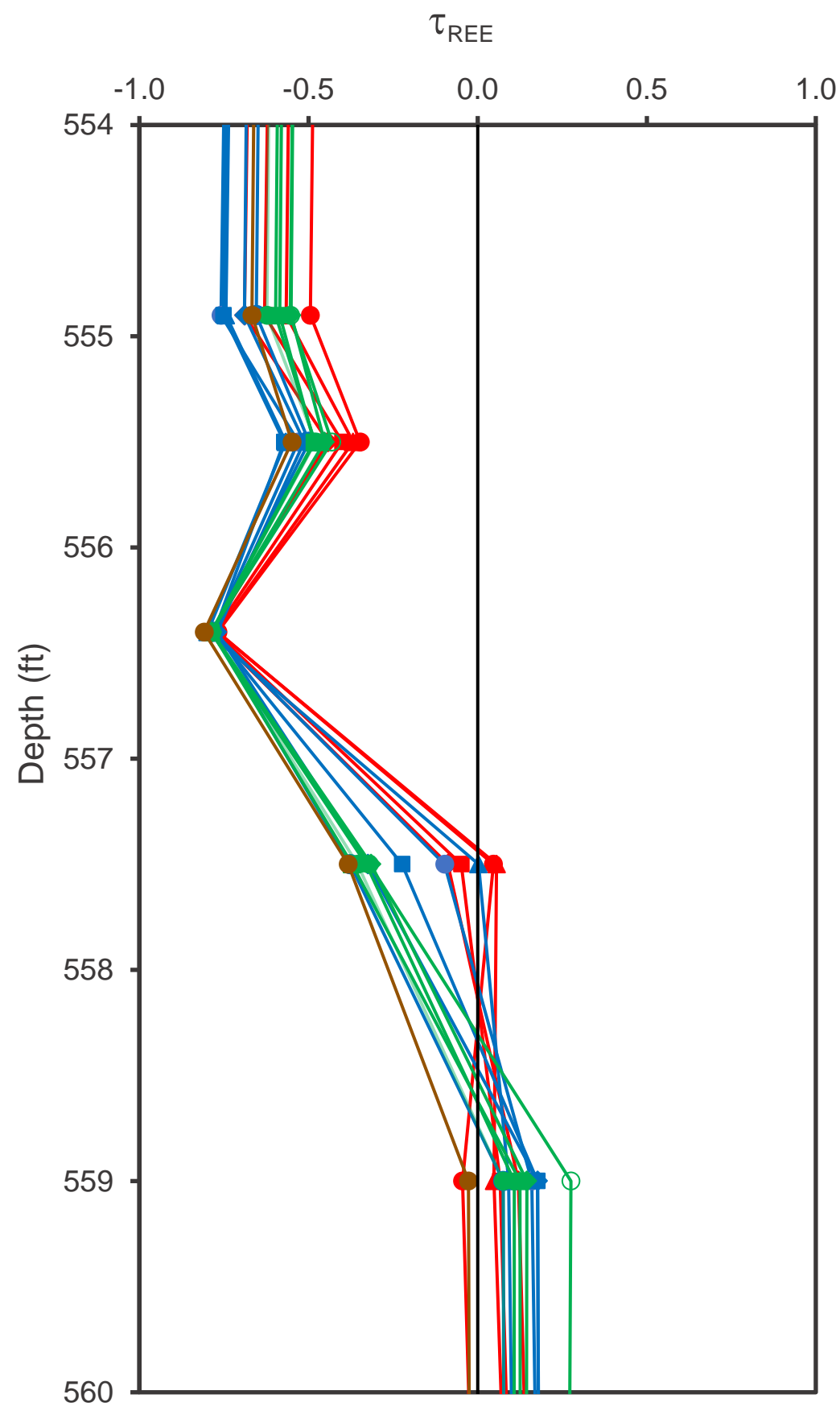
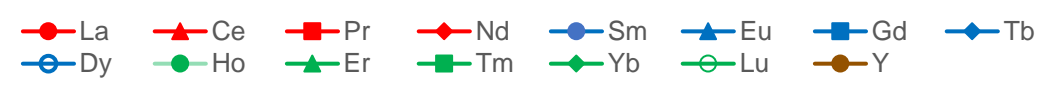
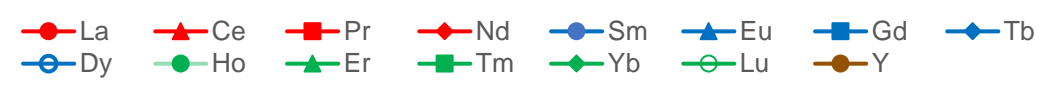
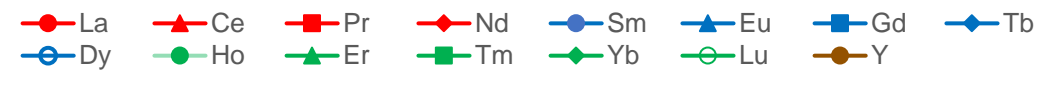


Carbondale Fm - WK8b paleosol



Carbondale Fm - WK8b paleosol, continued

KGS546

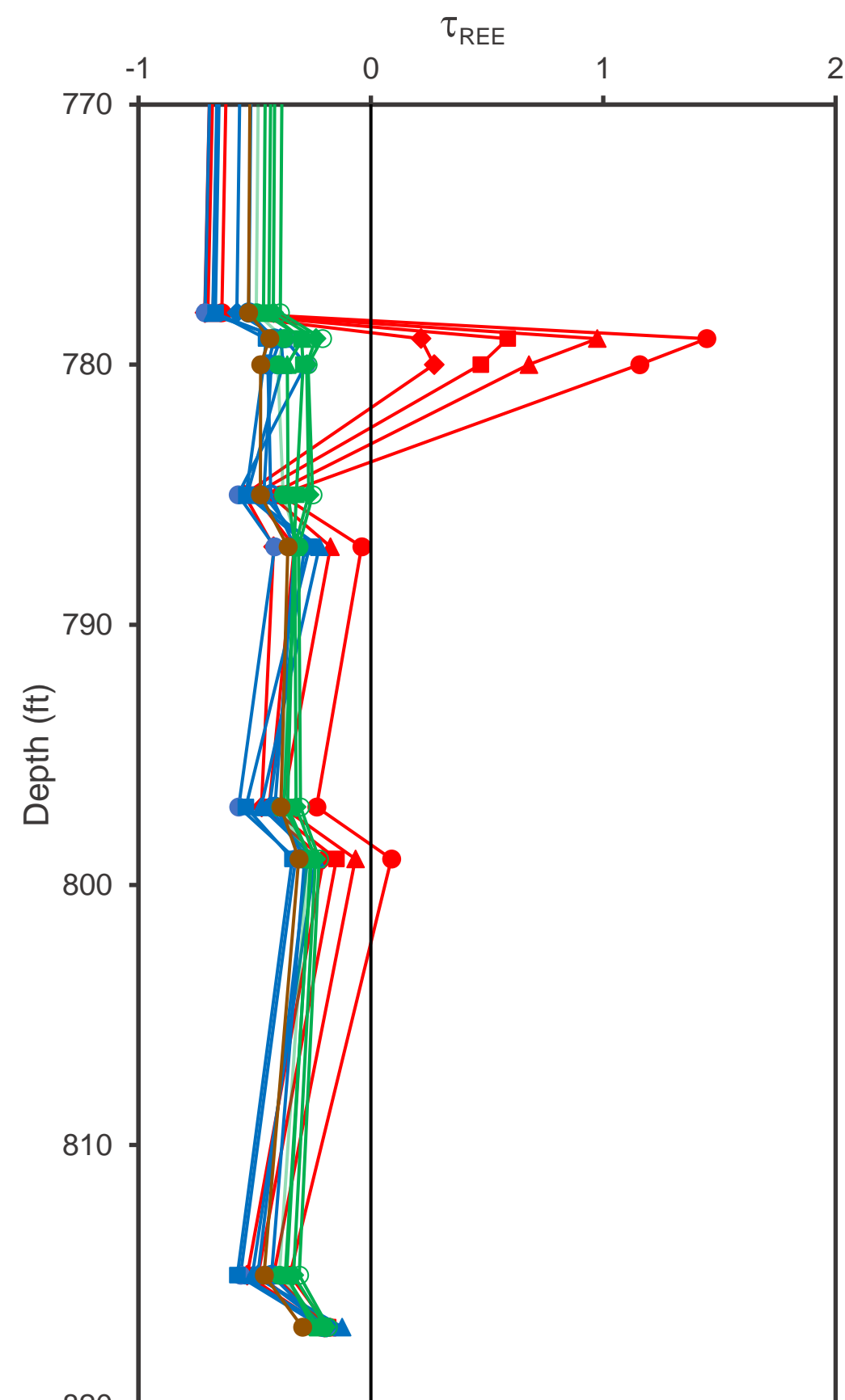
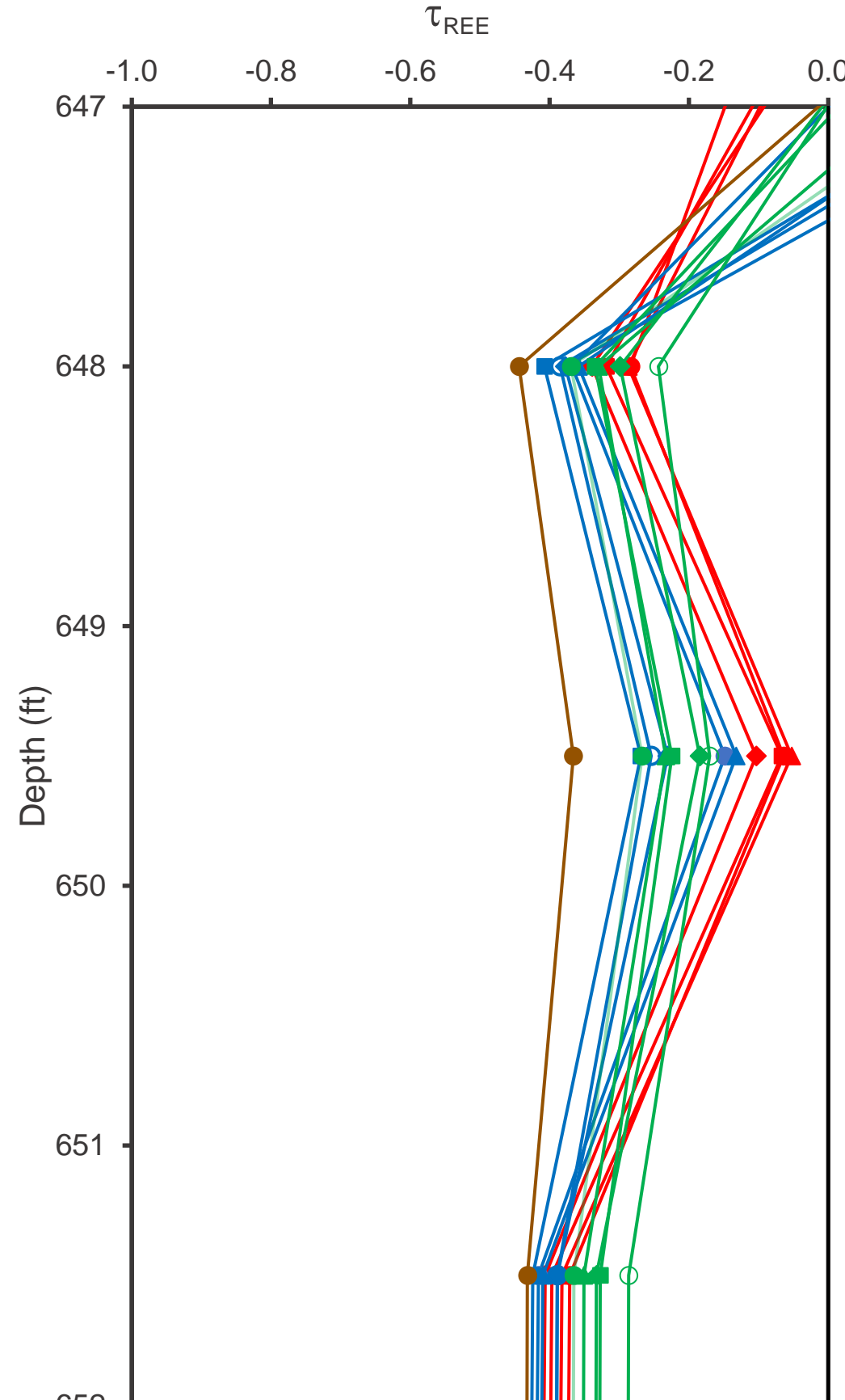
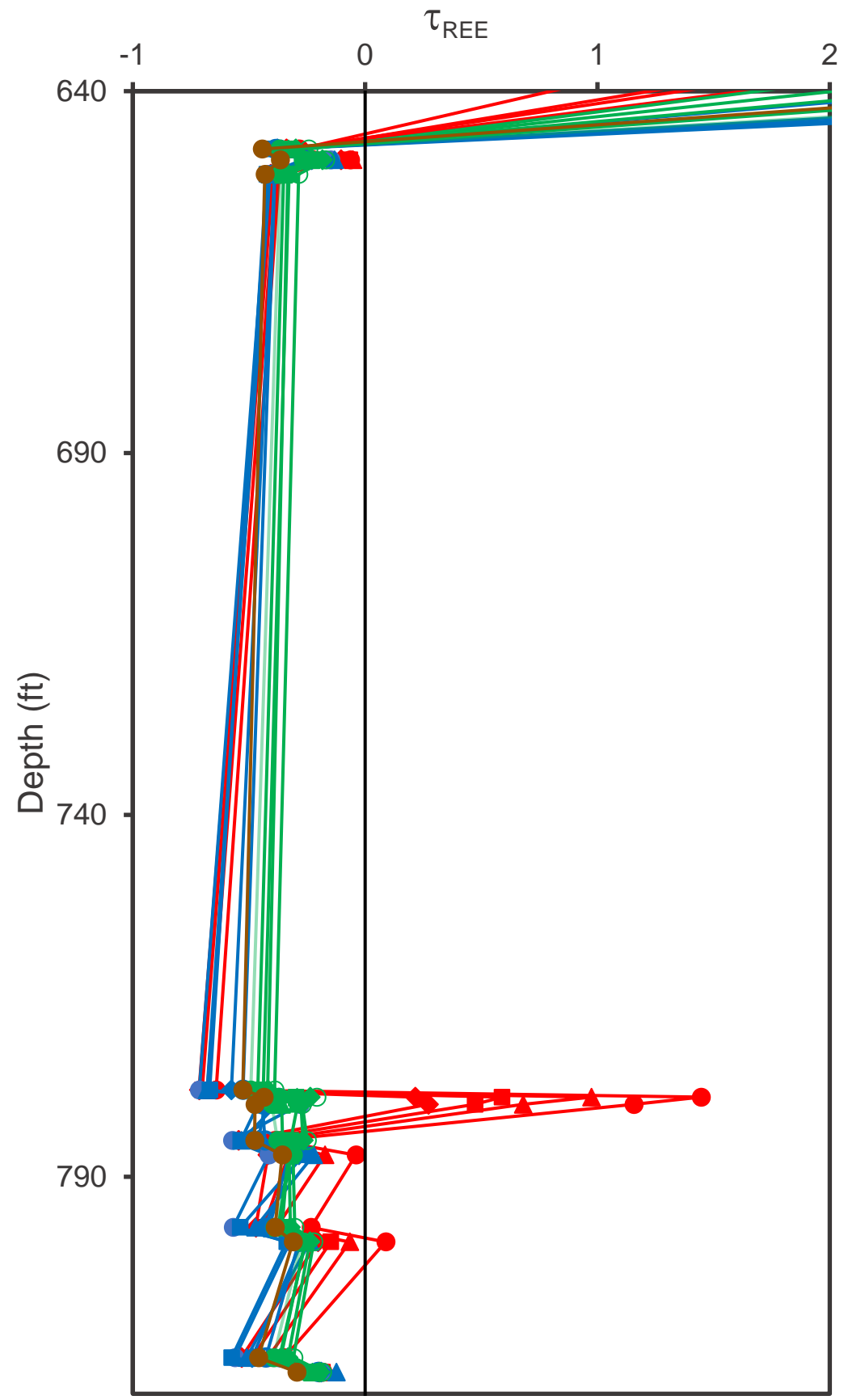
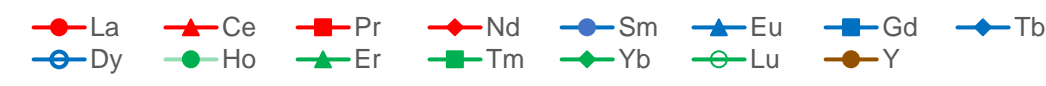


Carbondale Fm - Colchester paleosol

Tradewater Fm - WK6 zone paleosol

Tradewater Fm - WK6 zone paleosol, continued

KGS546

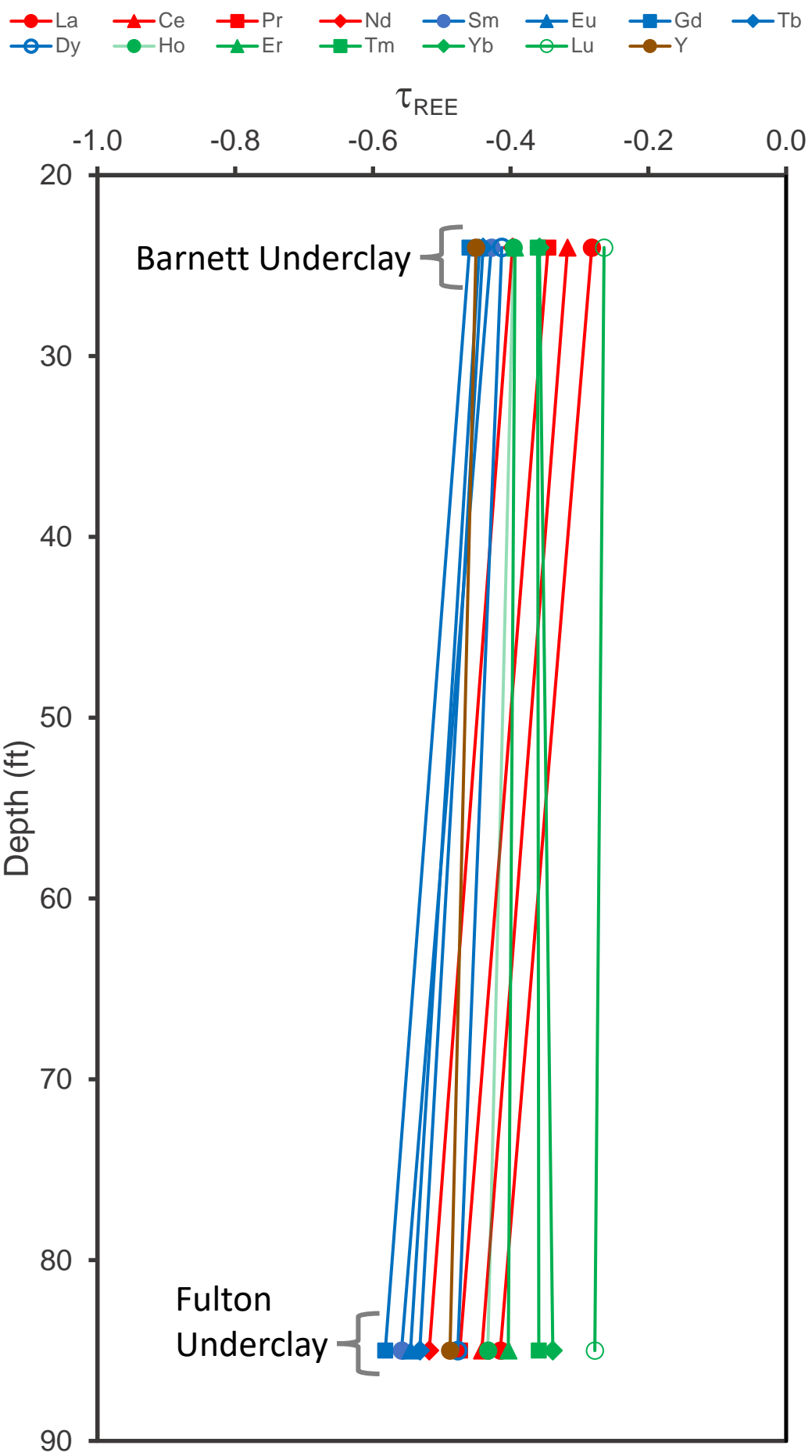


Tradewater Fm - paleosol

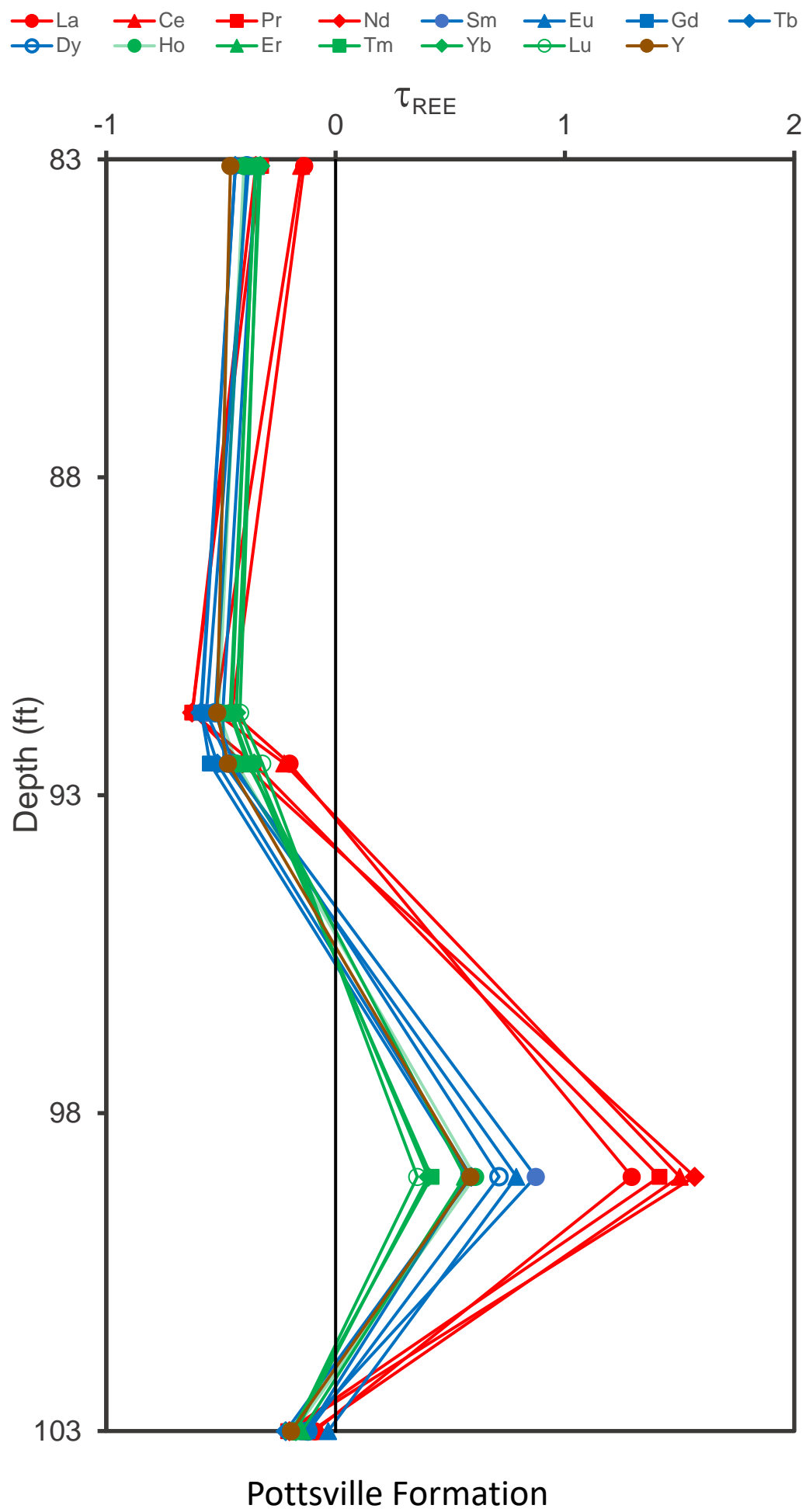
Tradewater Fm - paleosol, continued

Tradewater Fm - paleosol, continued

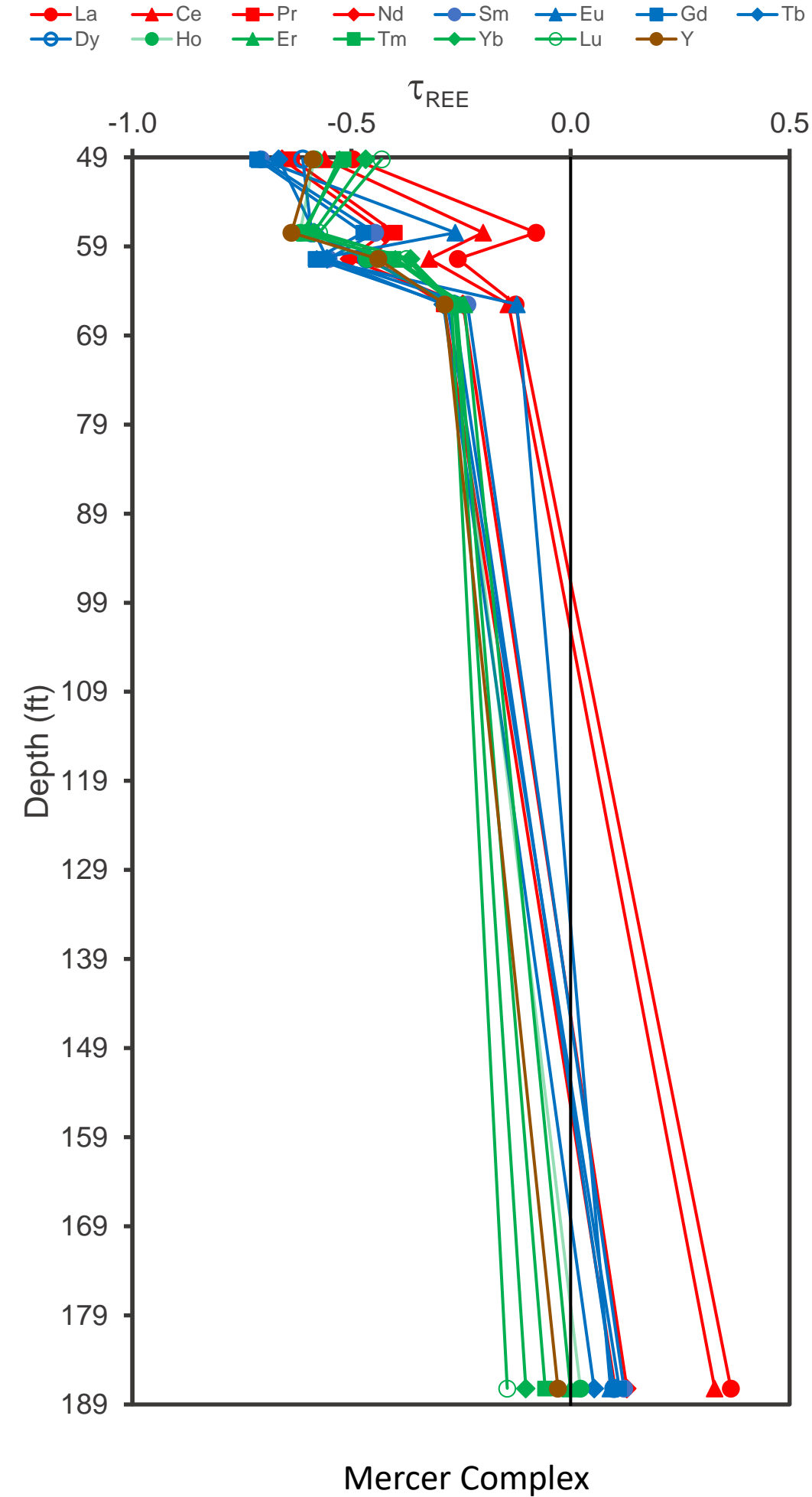
HUN061_0661



IND063_2361



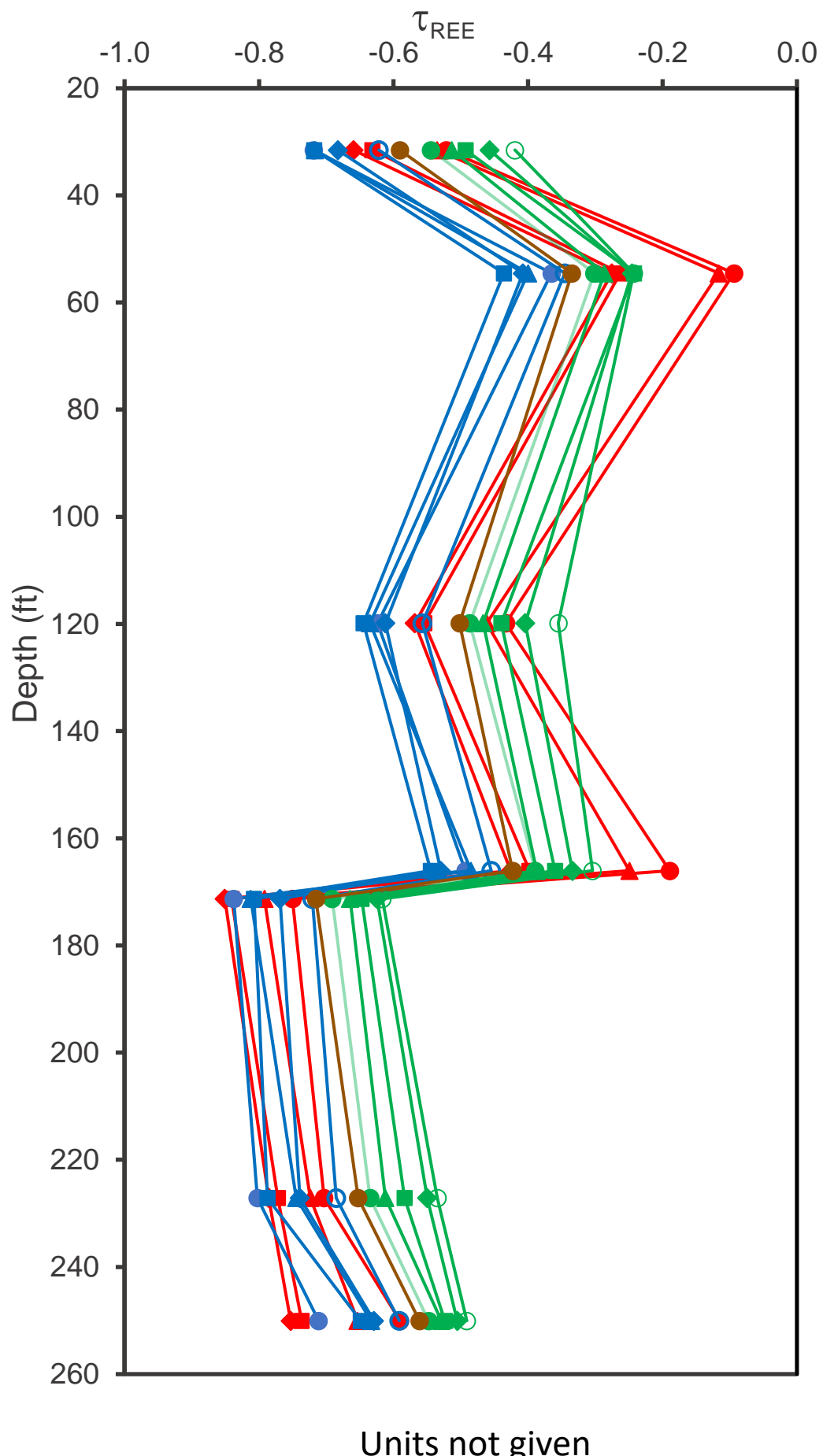
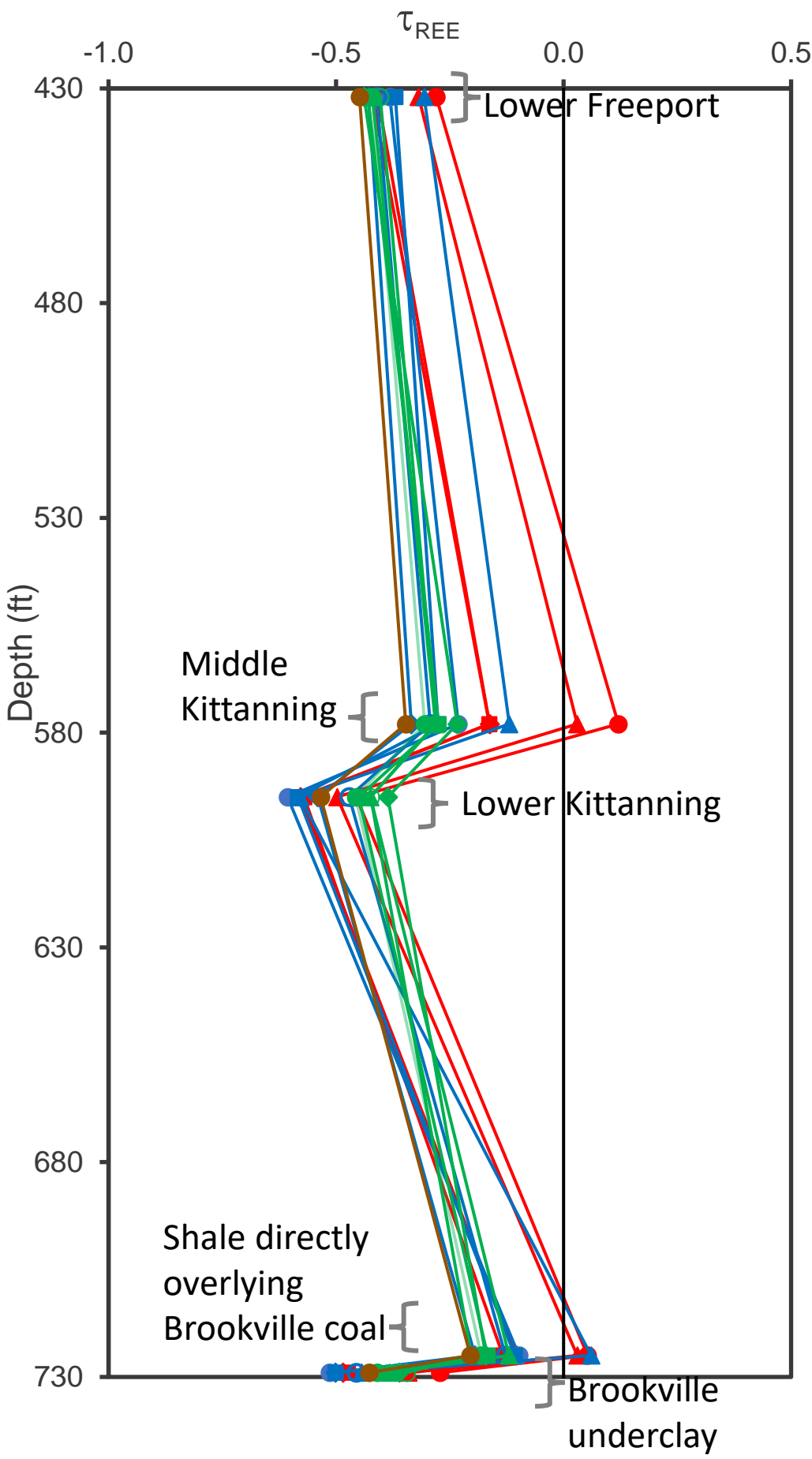
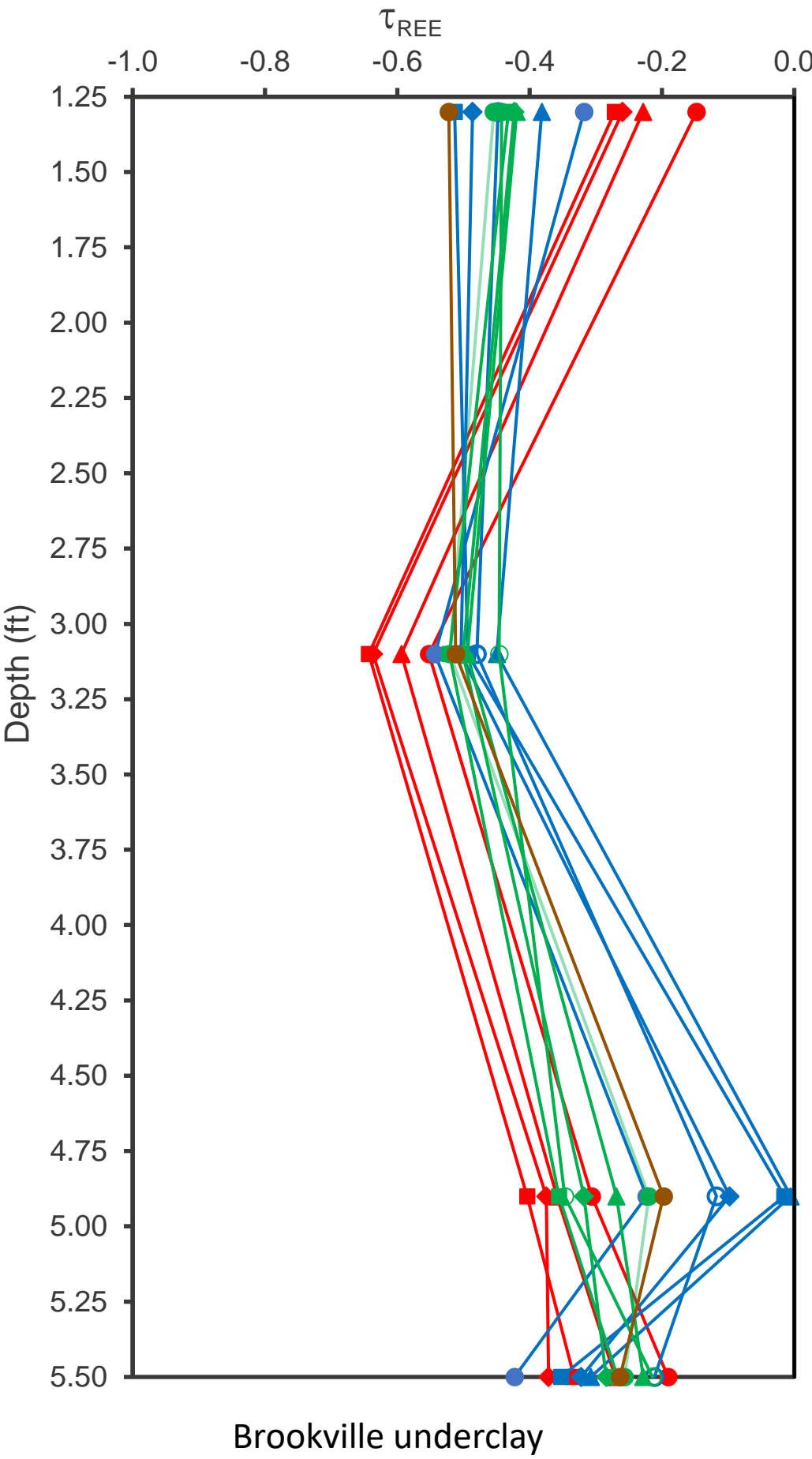
IND063_2363



MRI-31 – Depth relative to base of coal

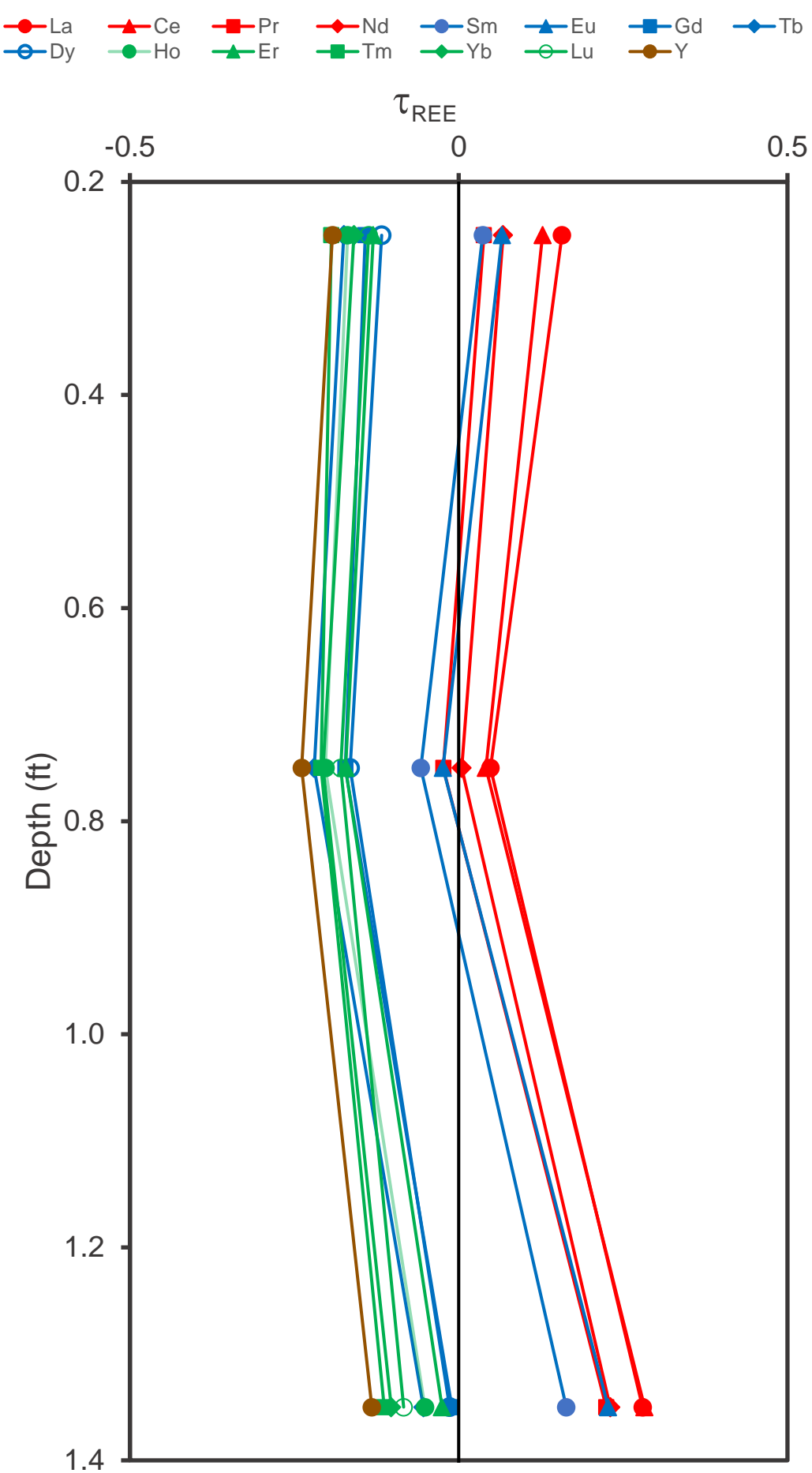
PAGS-HW21-002

TGS872DH5



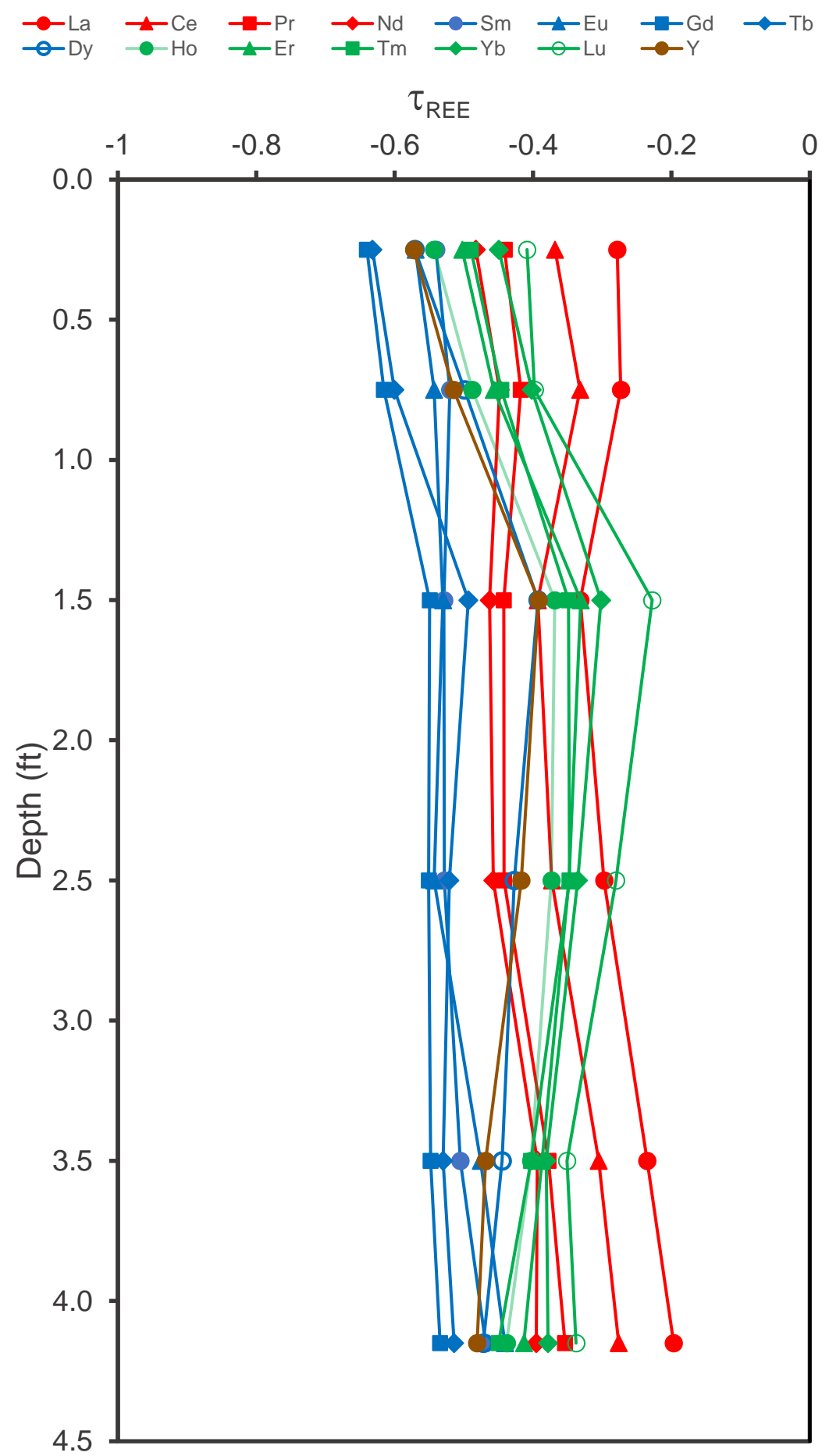
Units not given

214-093A



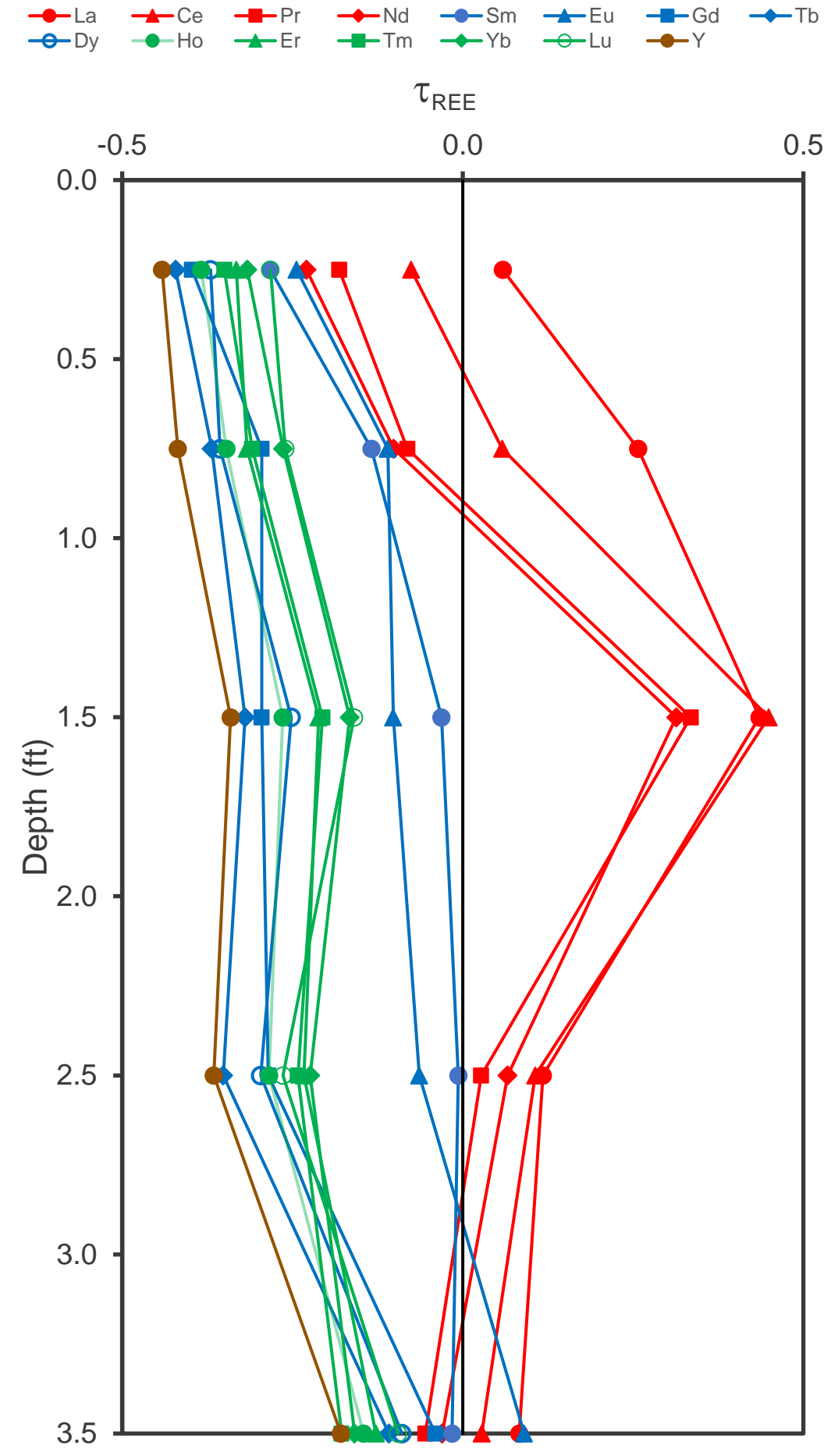
Middle Kittanning underclay

214-093B



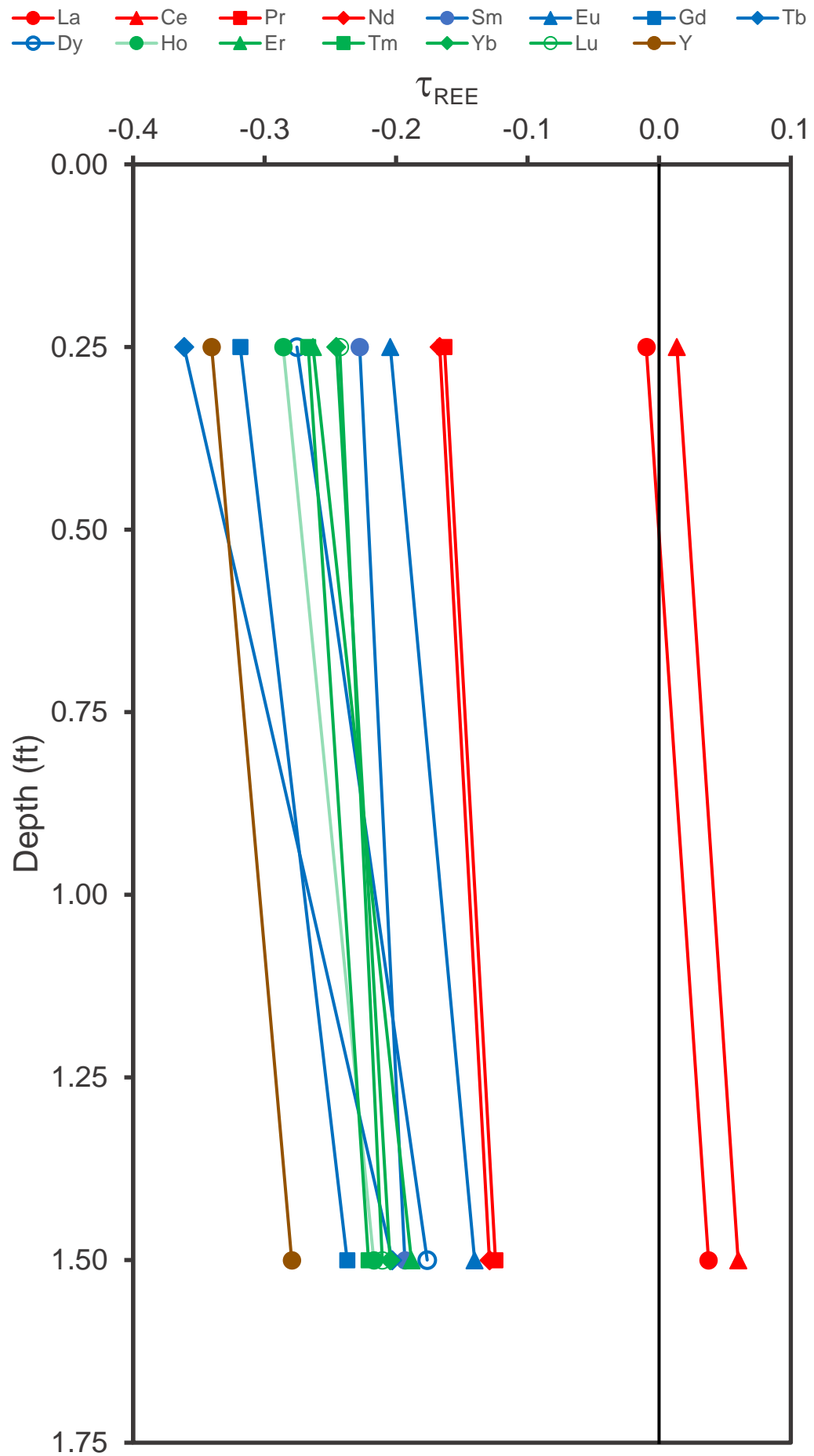
Lower Kittanning underclay

214-093C



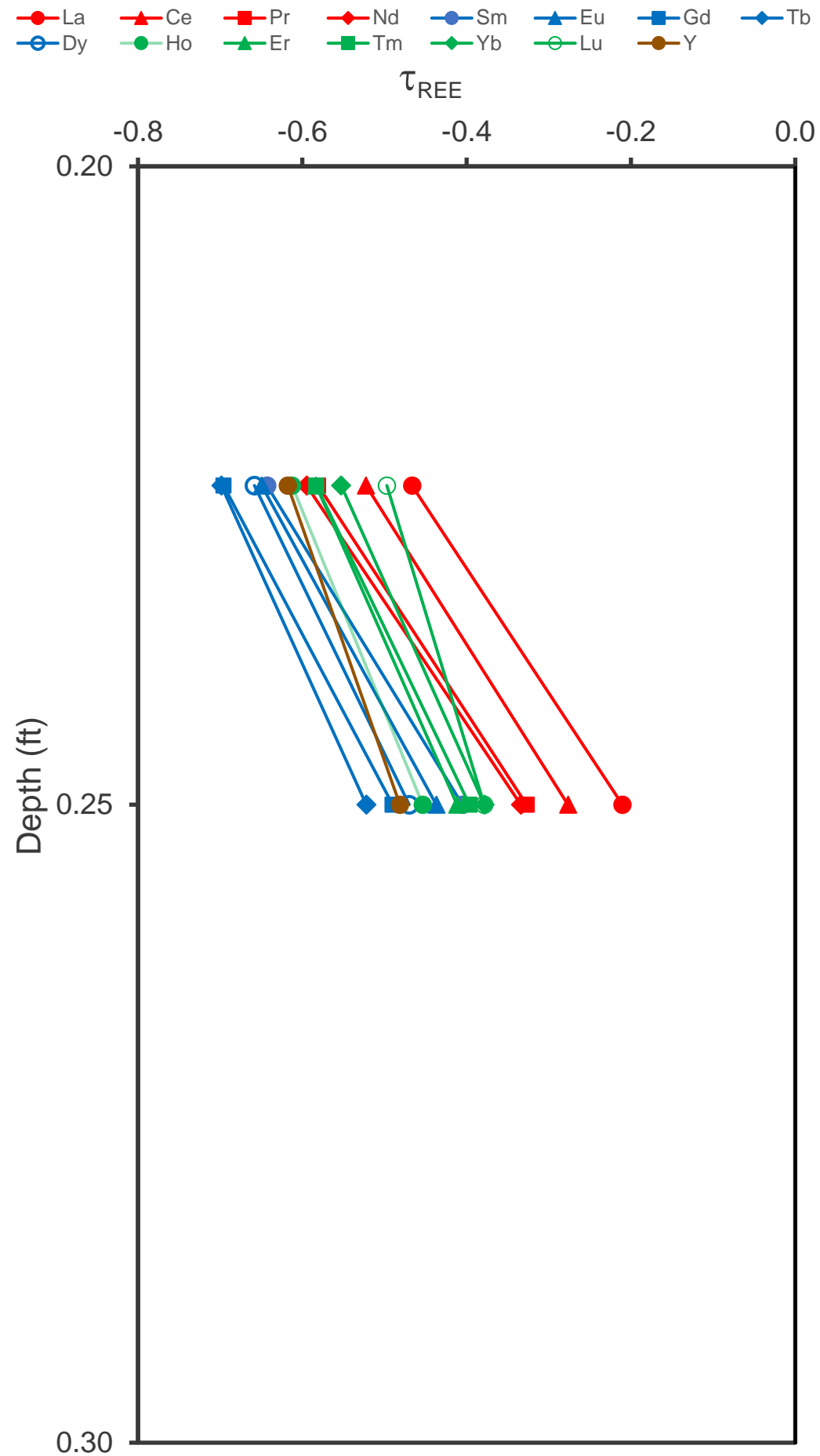
Above Lower Kittanning

230-092A



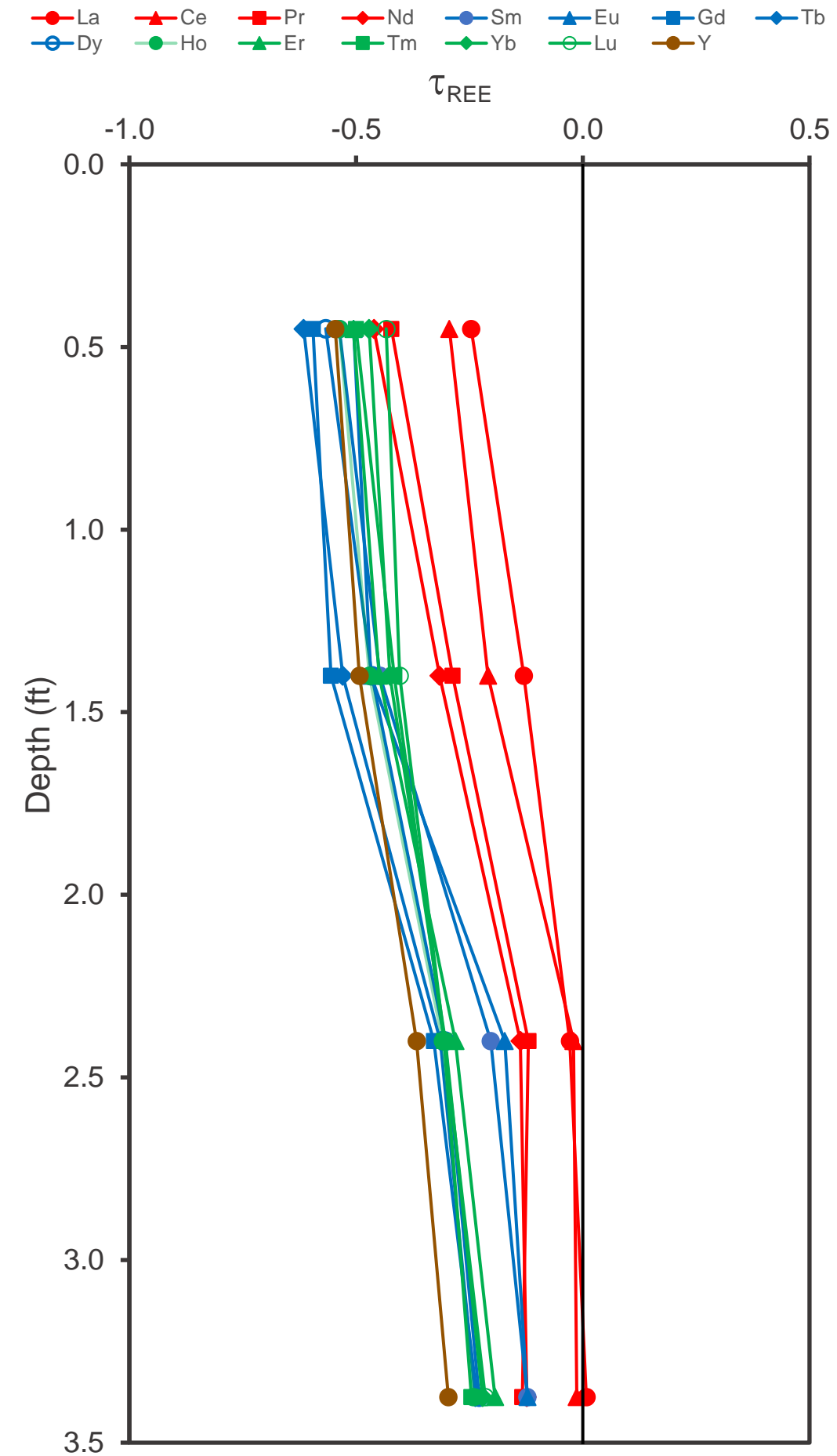
Kanawha Formation Below Winifrede

230-092B



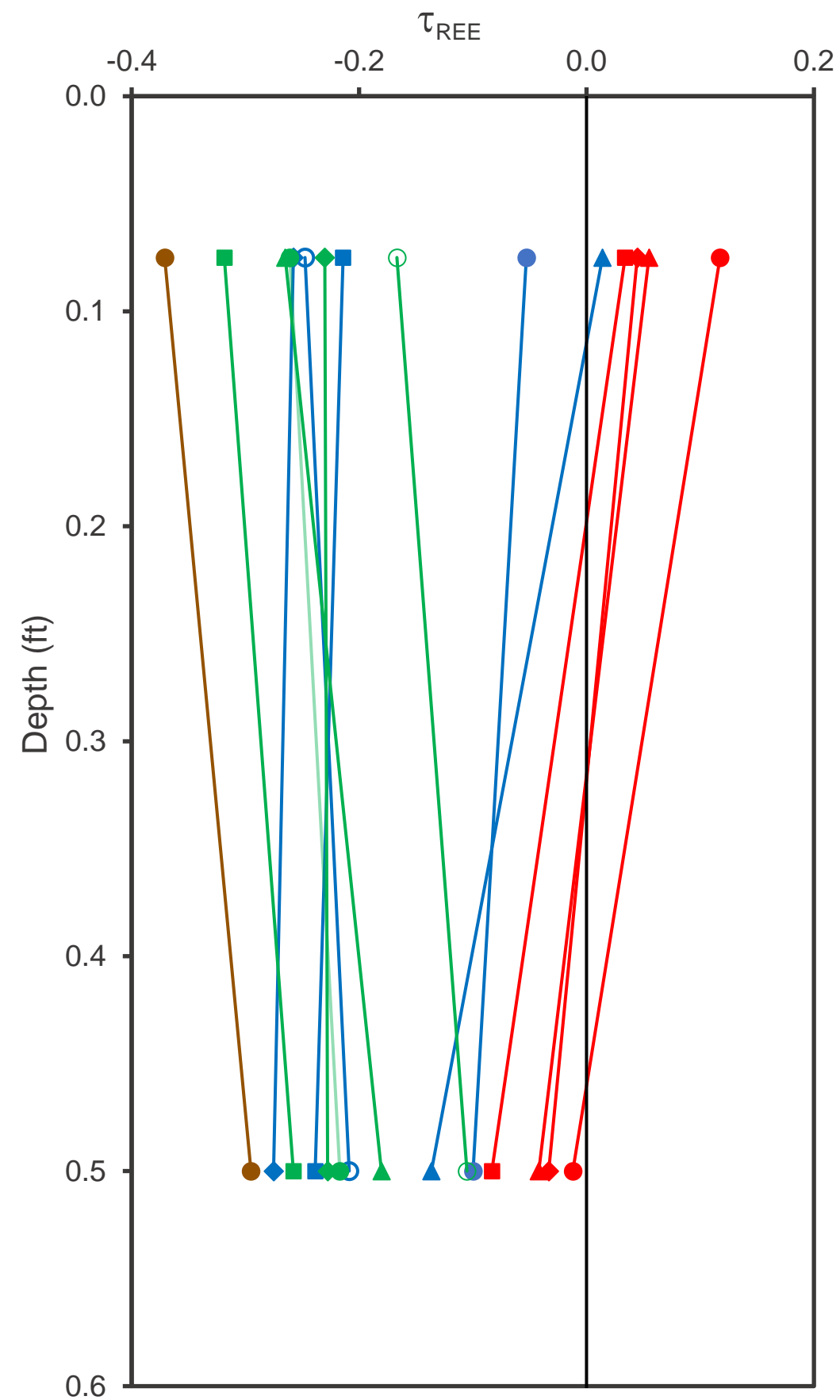
Kanawha Formation Below Coalburg

230-092F



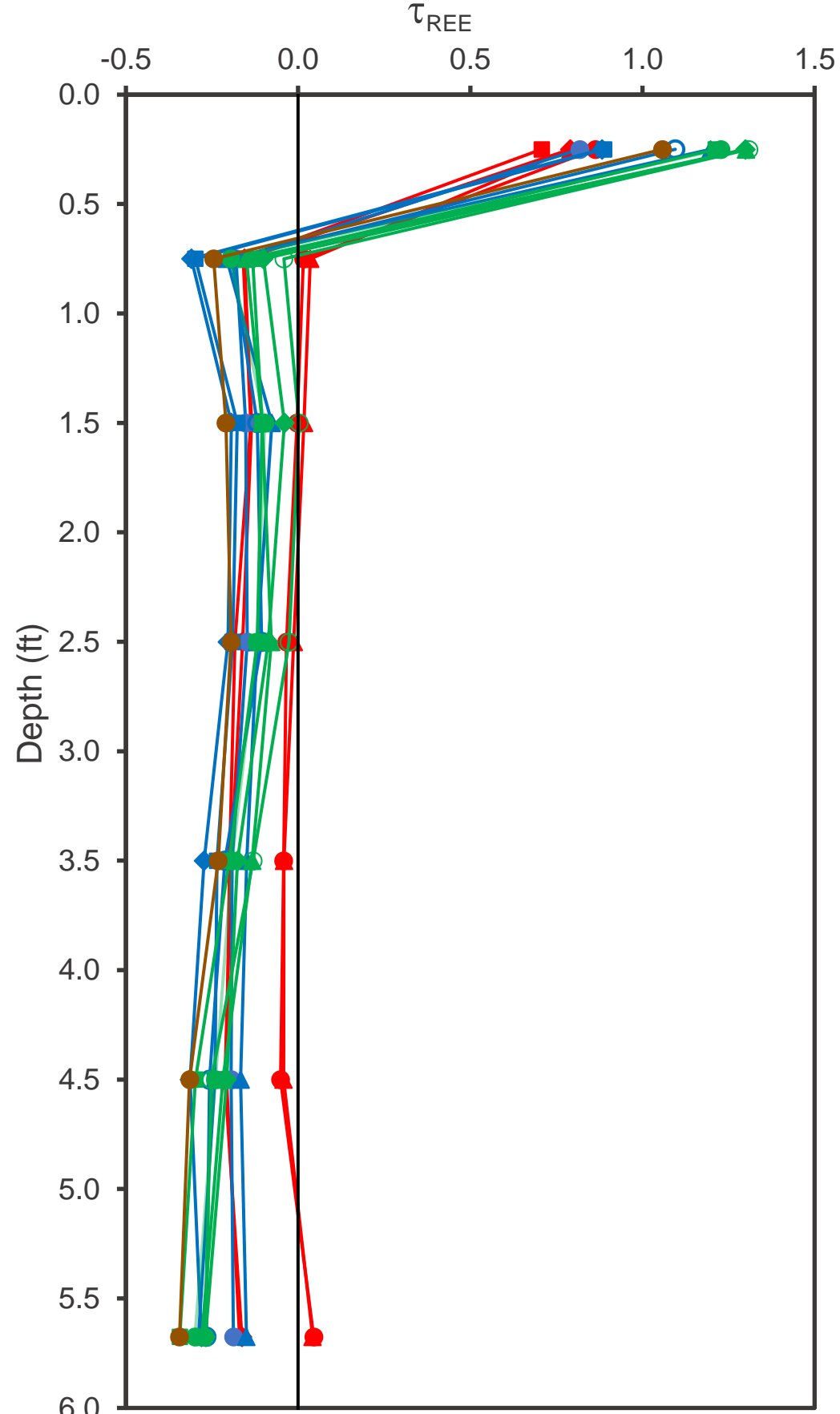
Middle Kittanning underclay

230-092D (UCLC)



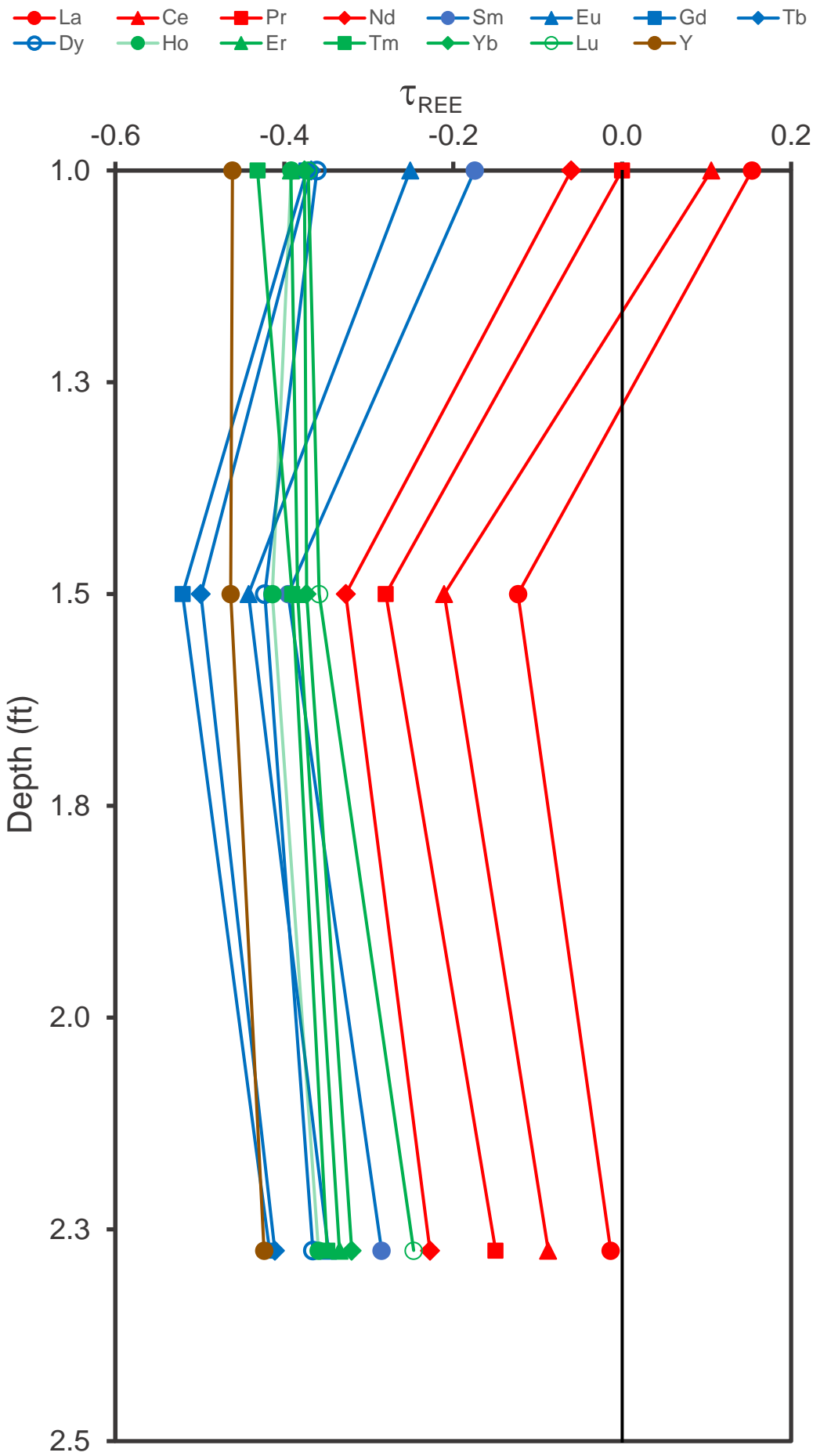
Underclay Below Stockton A

230-092D



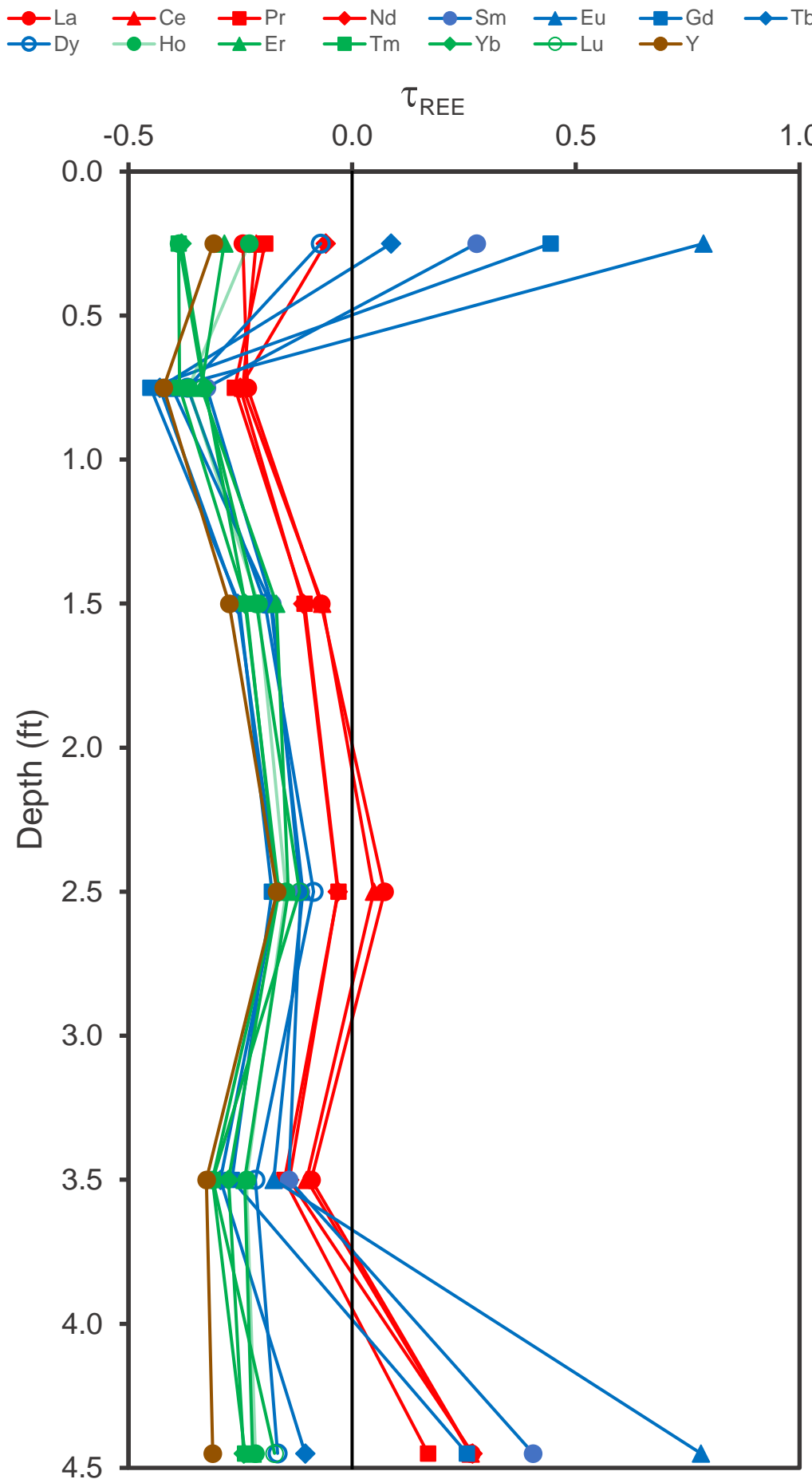
Underclay Below No. 5 Block Coal

231-036



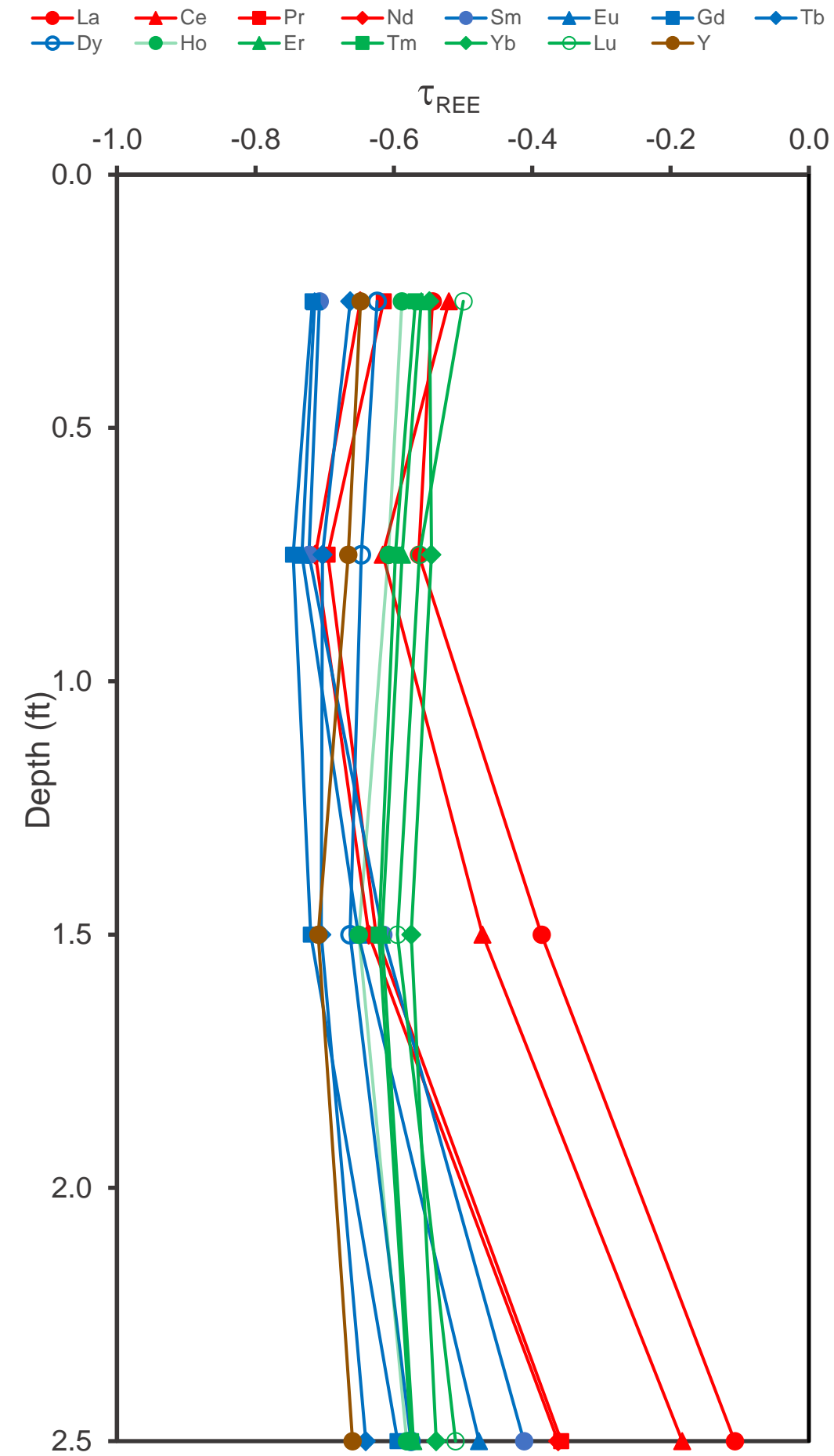
Upper Kittanning underclay

231-093



Upper Freeport underclay

272-095



Kanawha Formation below Lower Mercer

50-080

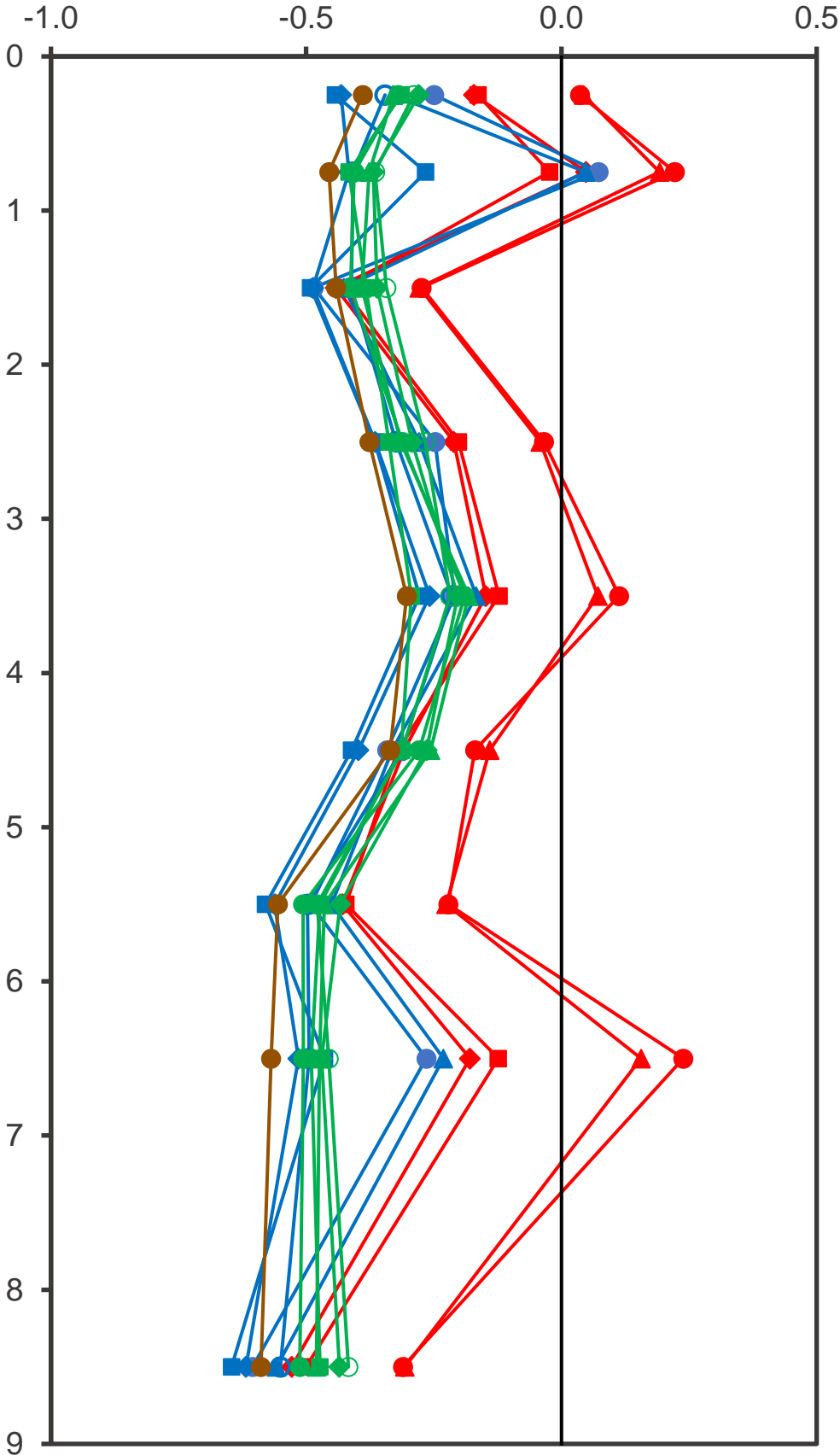
50-092A

50-092B

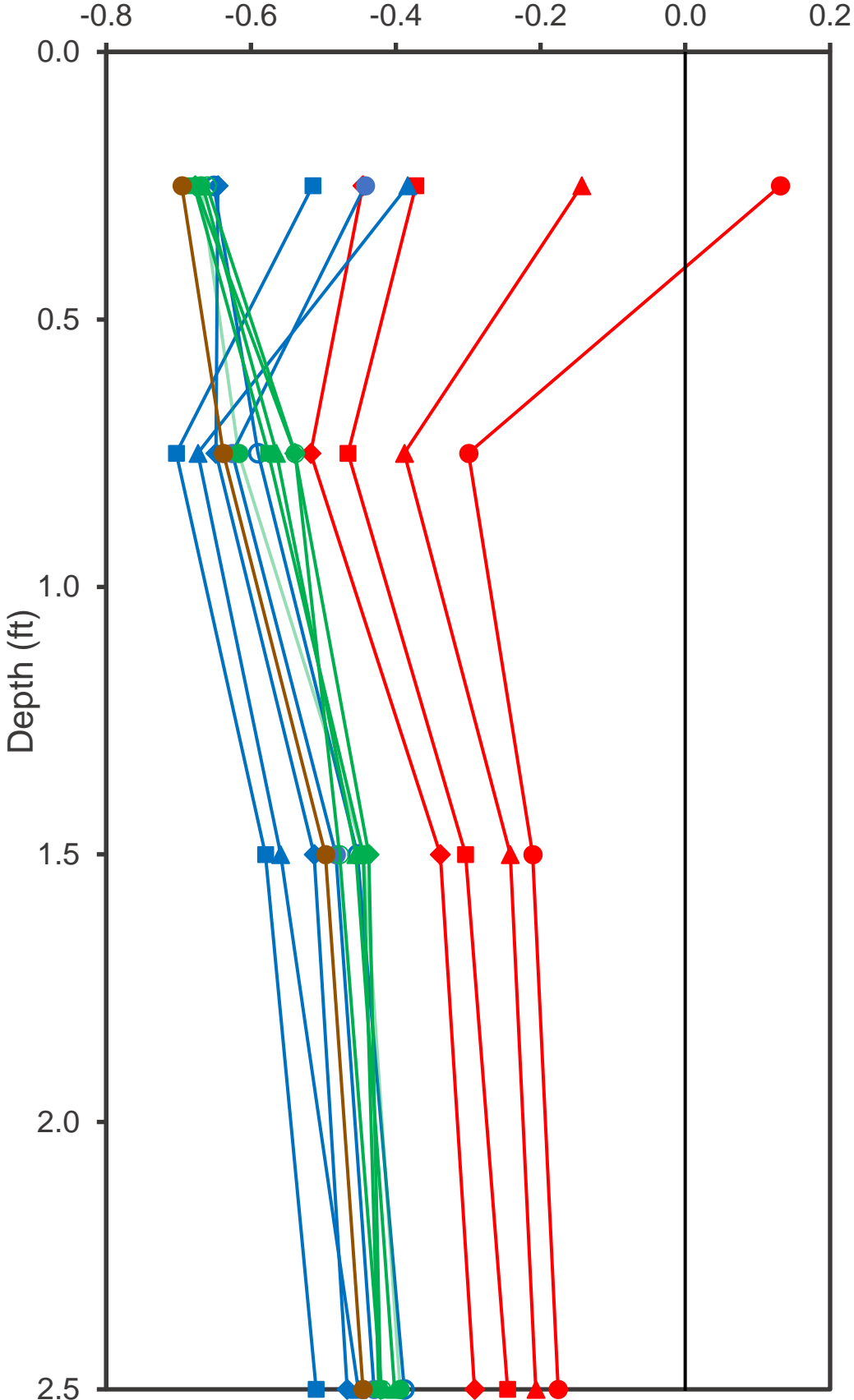
● La ▲ Ce ■ Pr ◆ Nd ● Sm ▲ Eu ■ Gd ◆ Tb
 ○ Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

● La ▲ Ce ■ Pr ◆ Nd ● Sm ▲ Eu ■ Gd ◆ Tb
 ○ Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

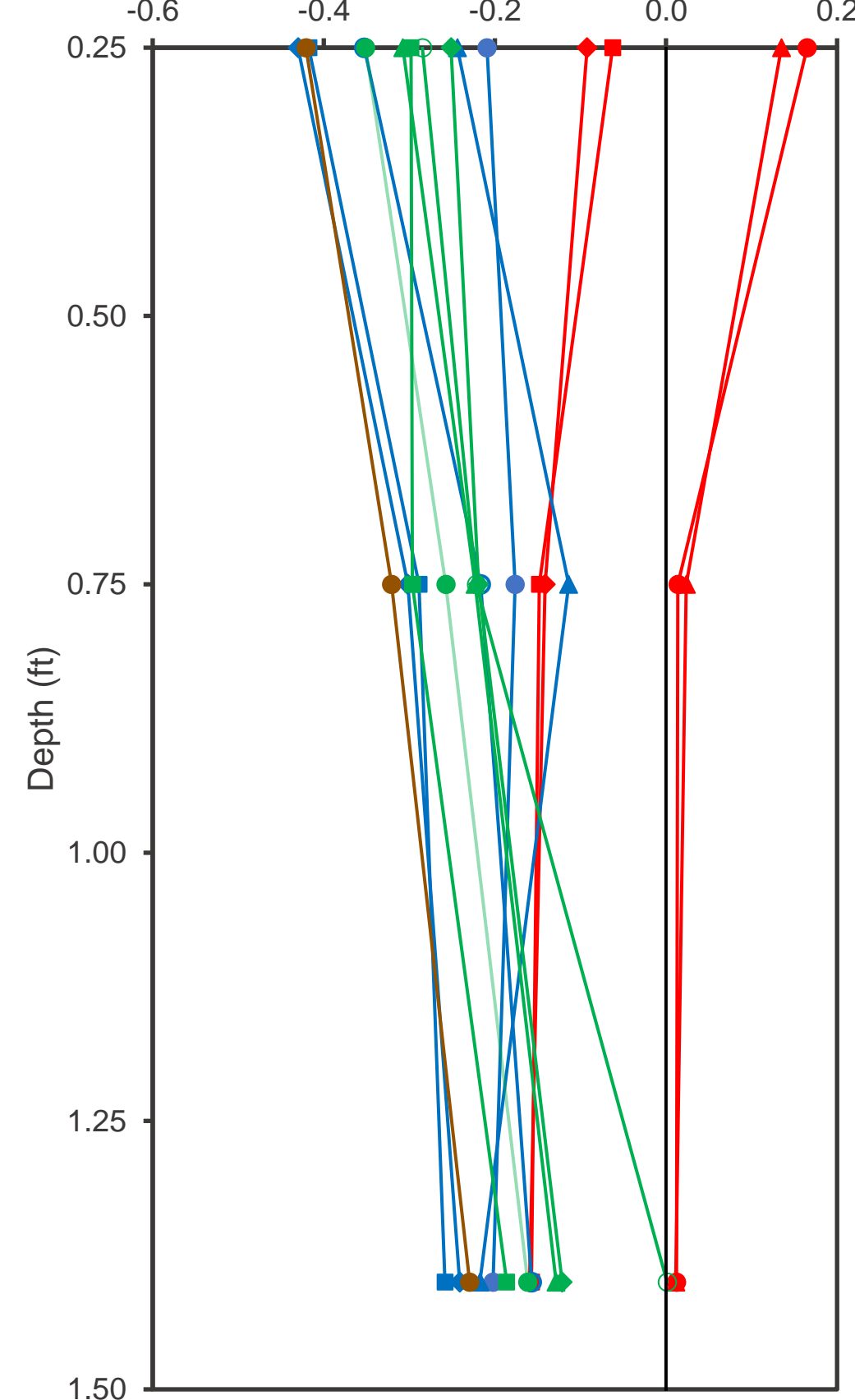
● La ▲ Ce ■ Pr ◆ Nd ● Sm ▲ Eu ■ Gd ◆ Tb
 ○ Dy ● Ho ▲ Er ■ Tm ◆ Yb ○ Lu ● Y

 τ_{REE} τ_{REE} τ_{REE} 

Upper Freeport underclay

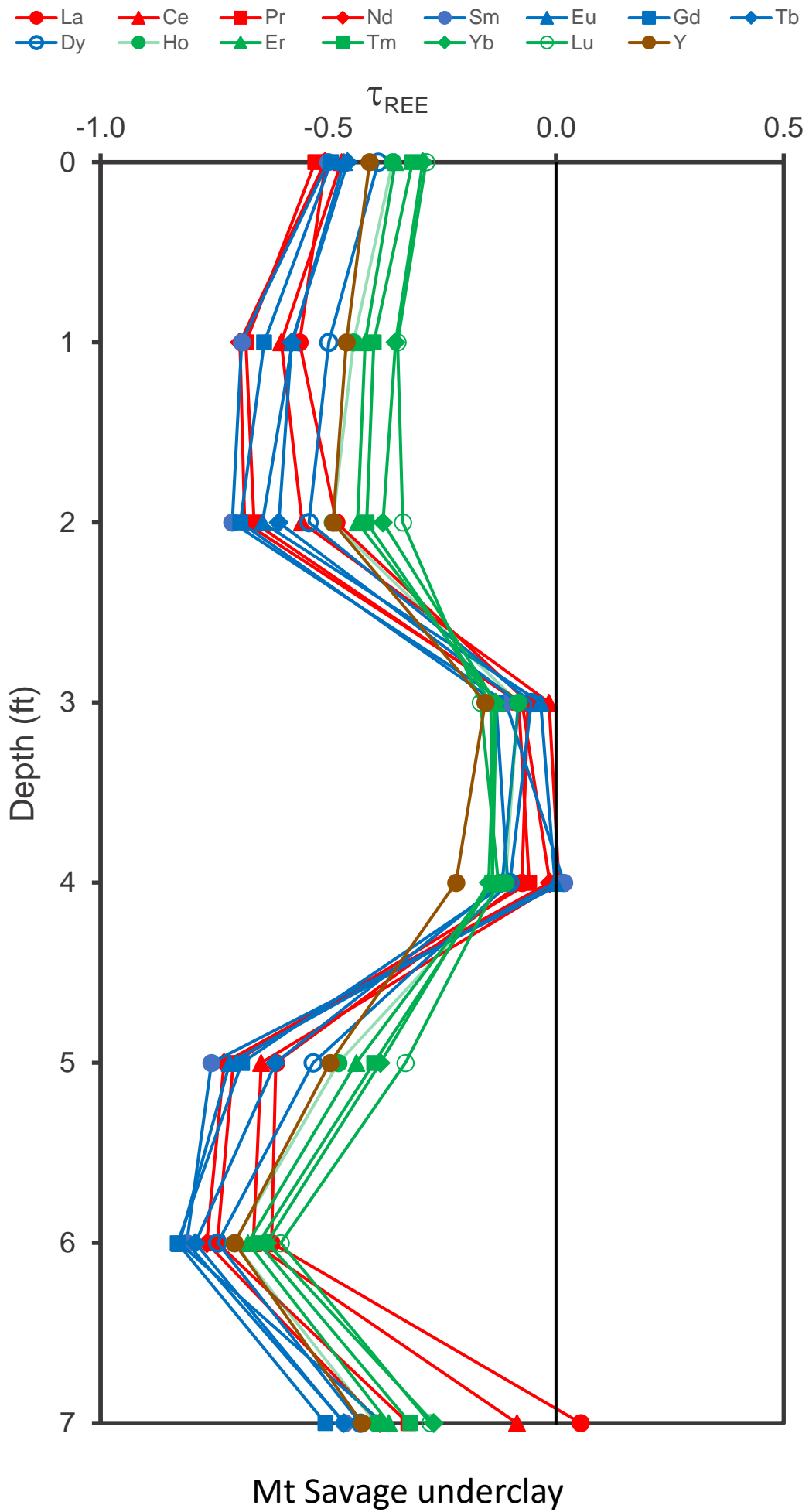


Upper Kittanning underclay

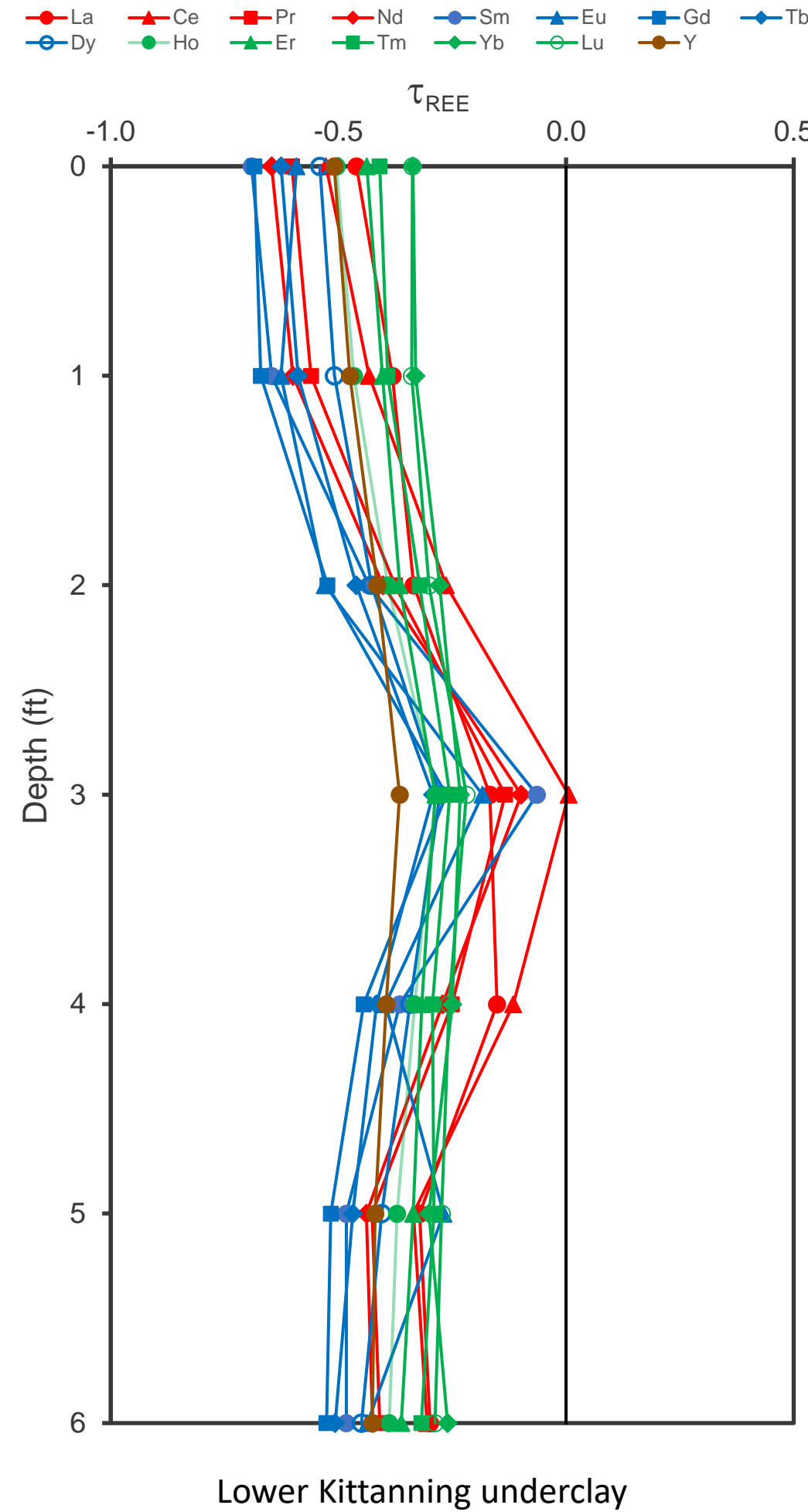


Middle Kittanning underclay

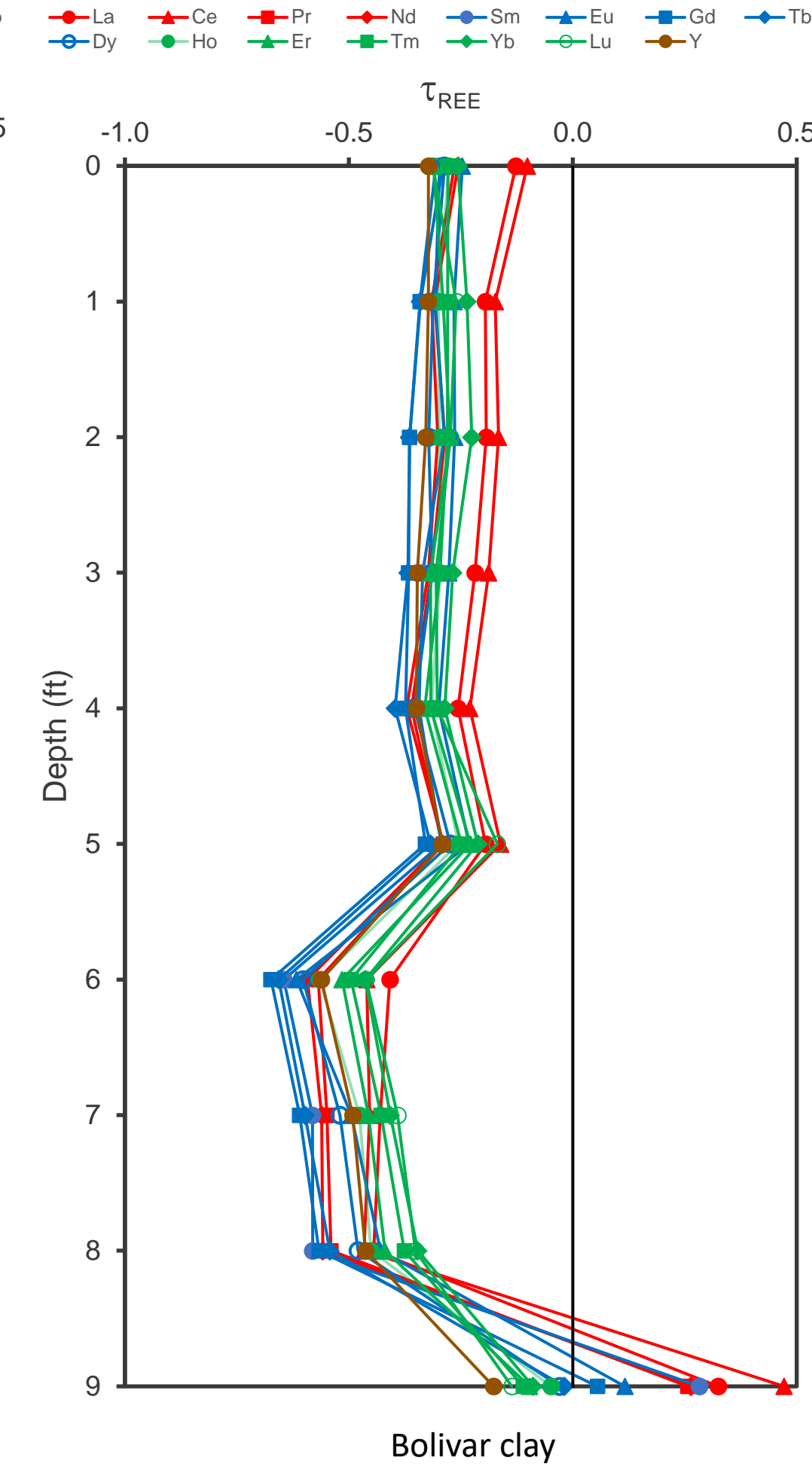
MD-1



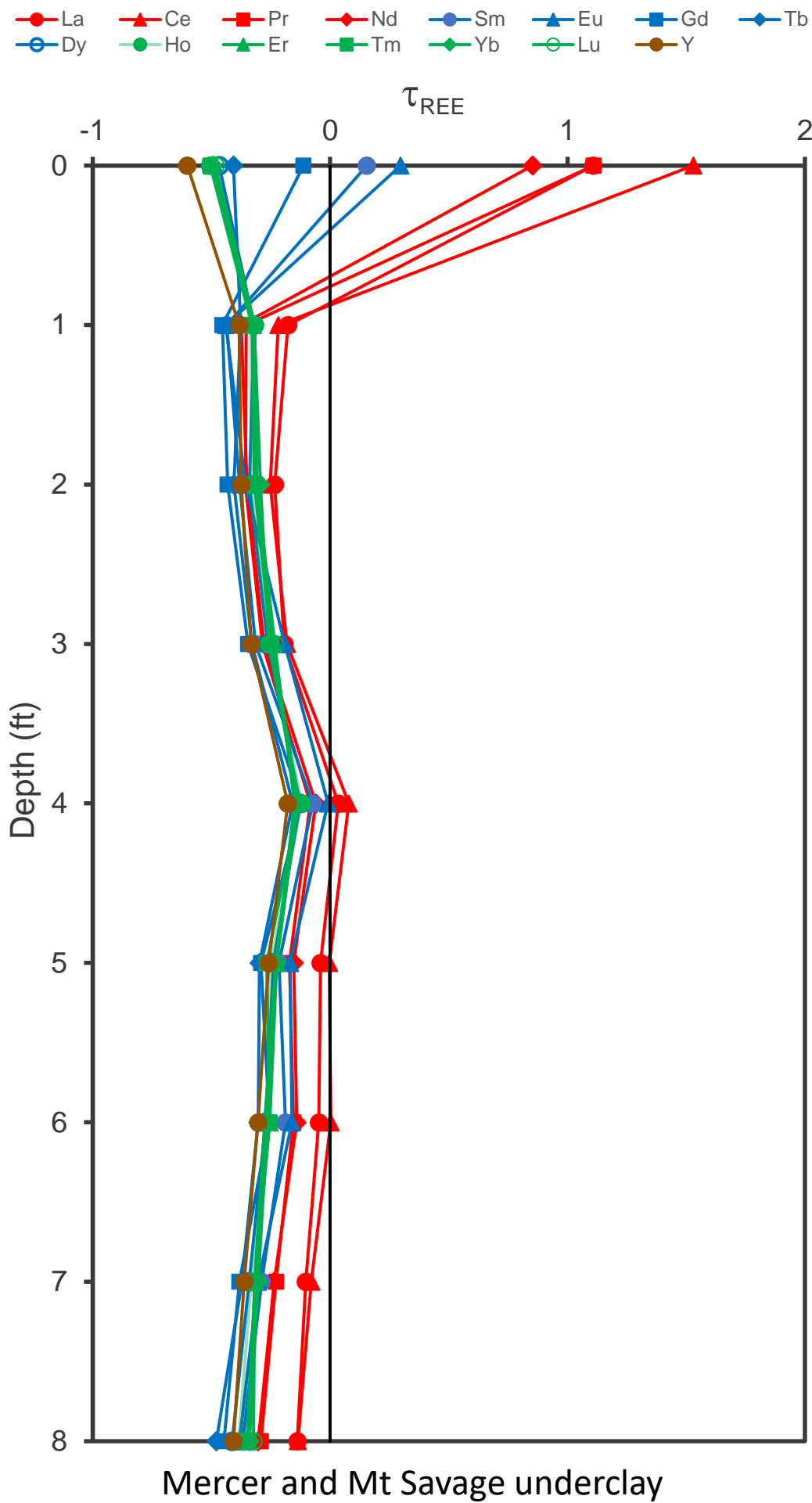
MD-2



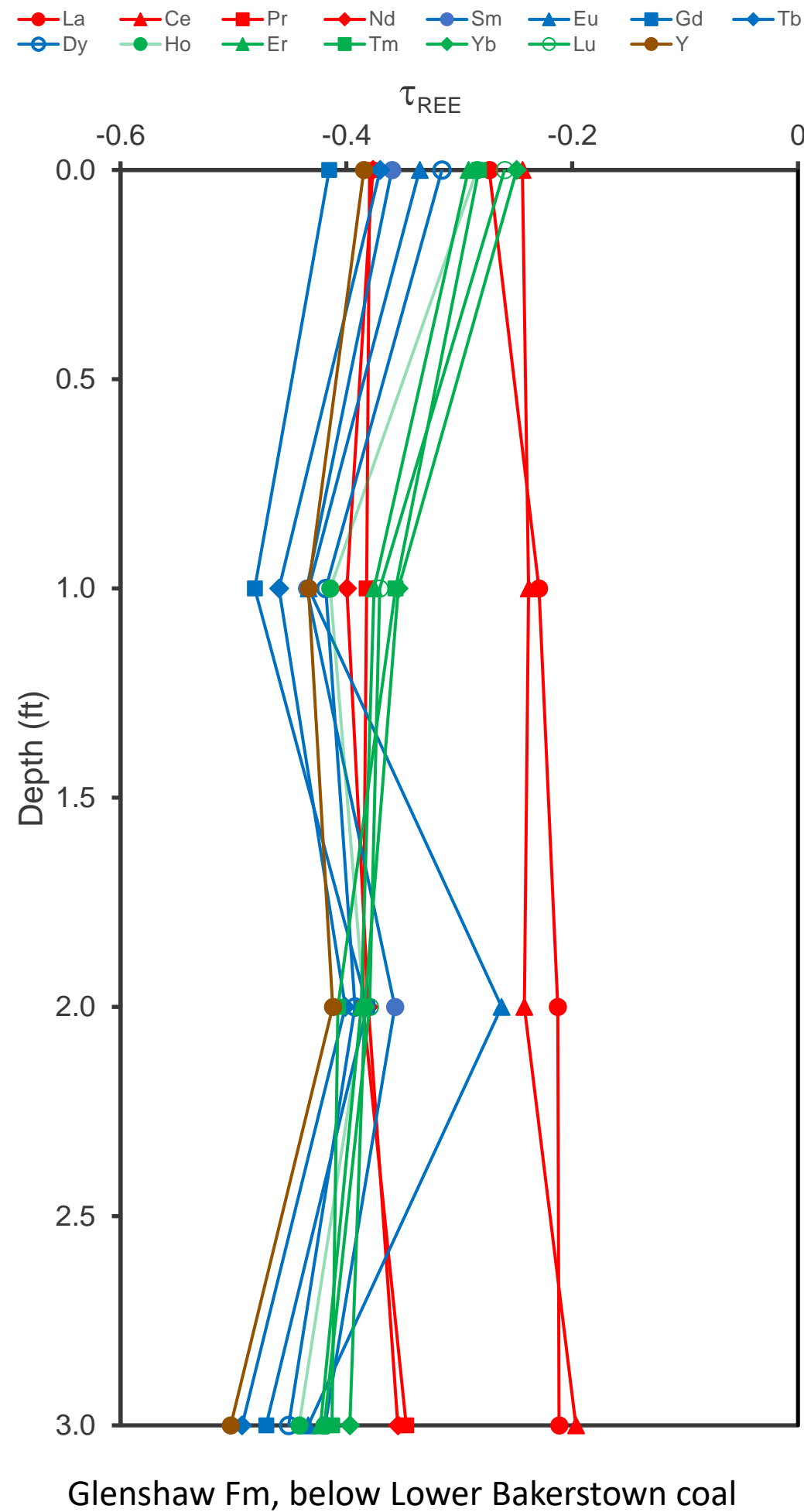
MD-3



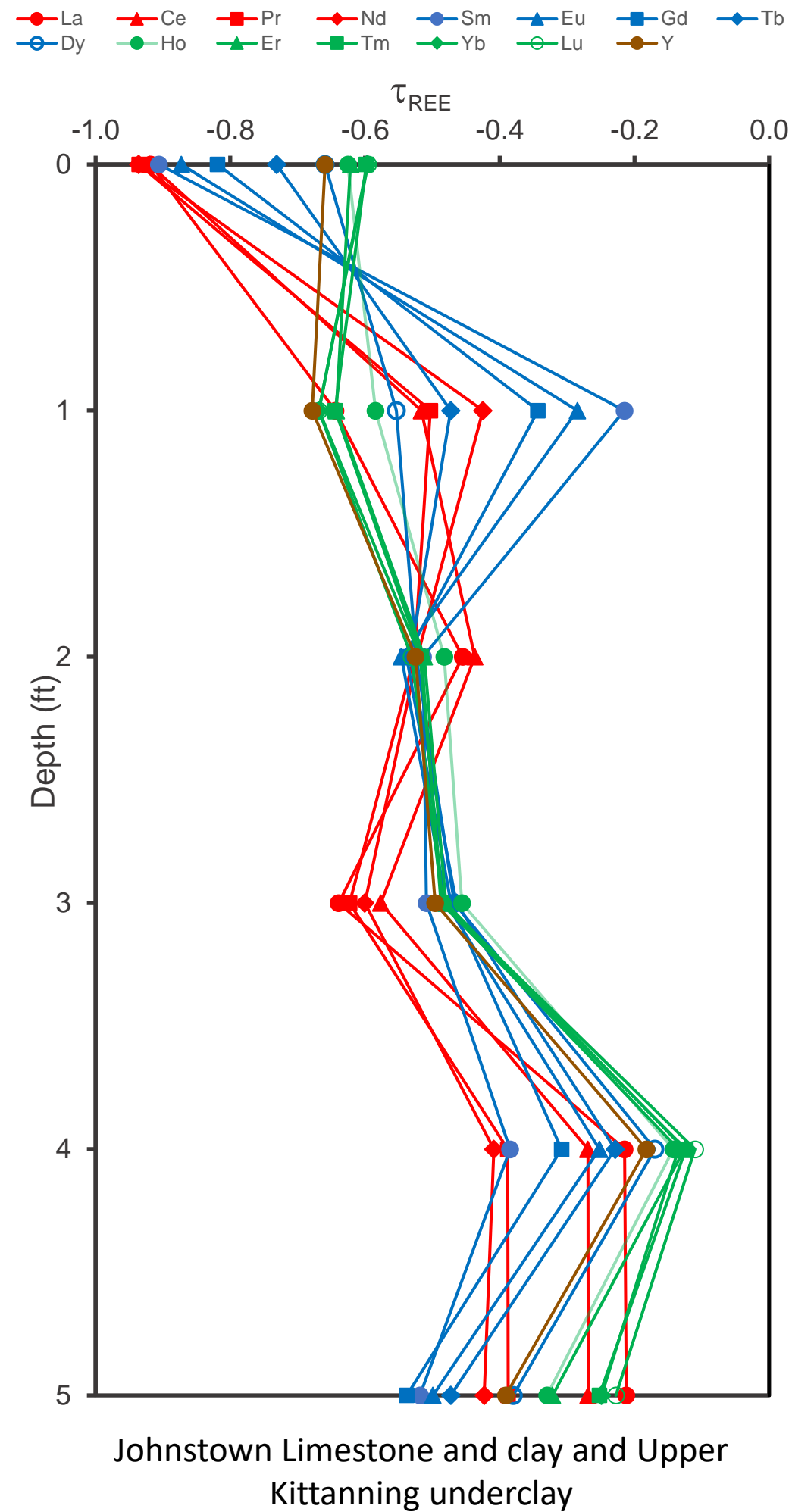
MD-4



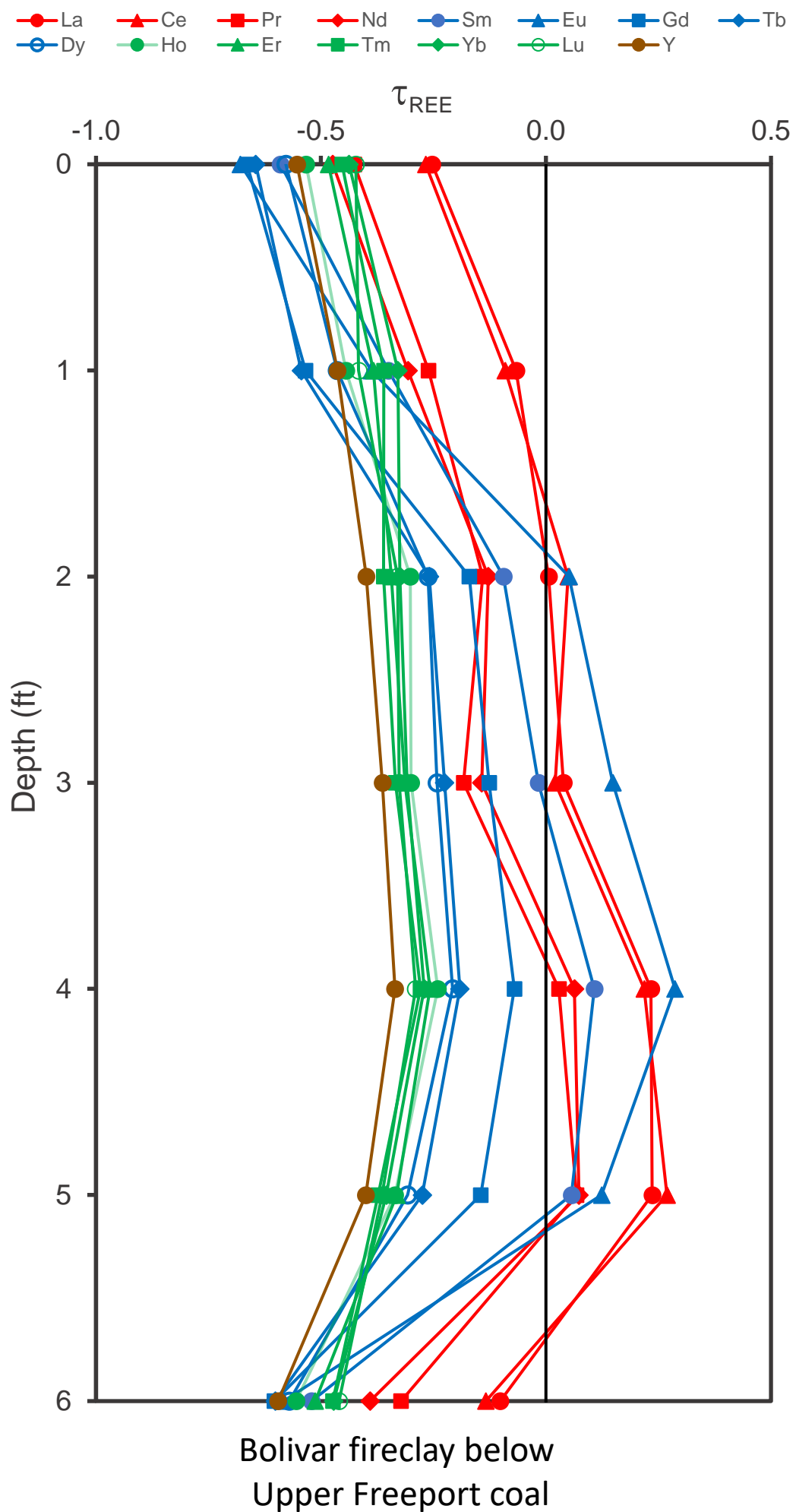
MD-5



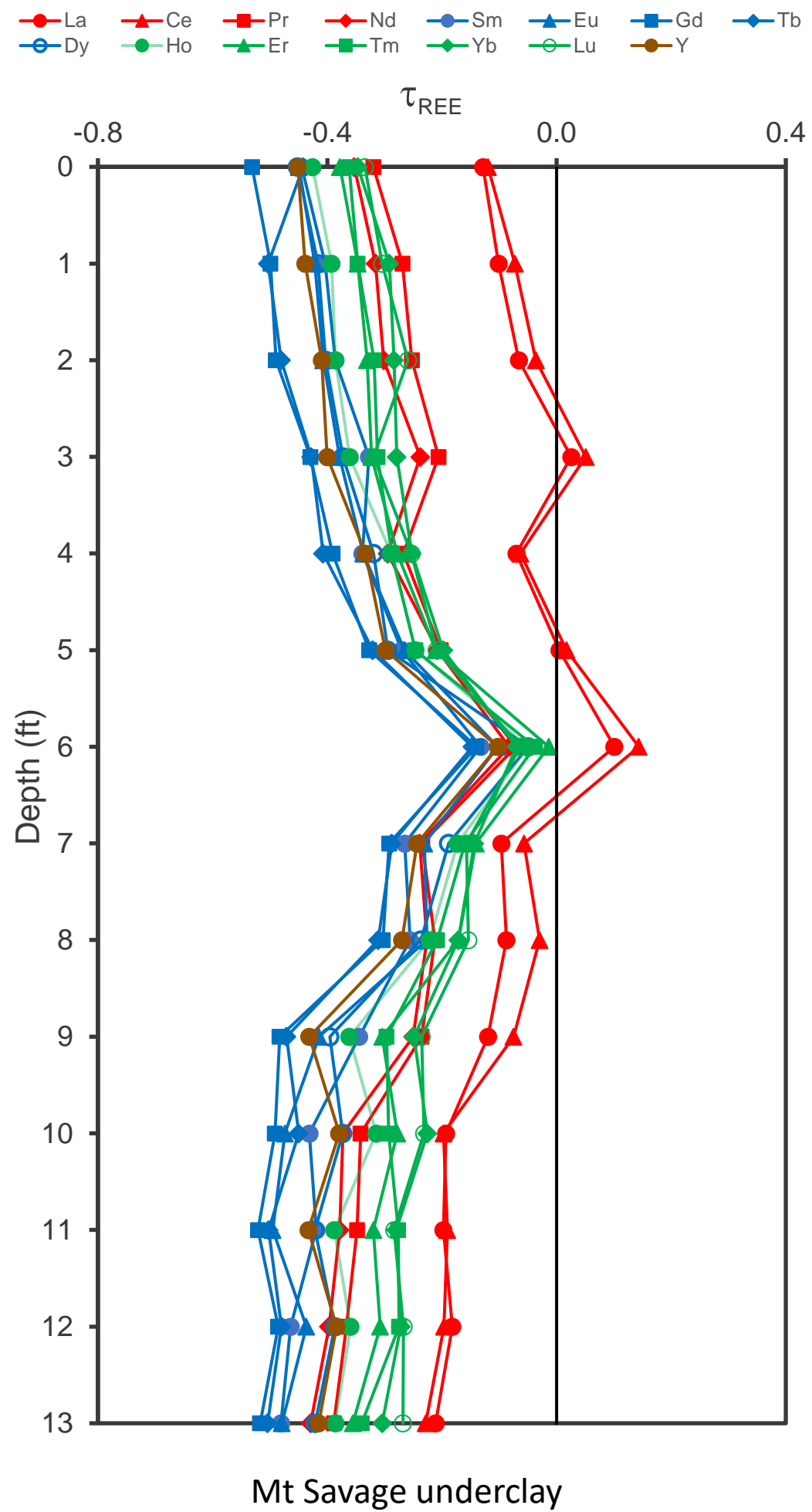
MD-6



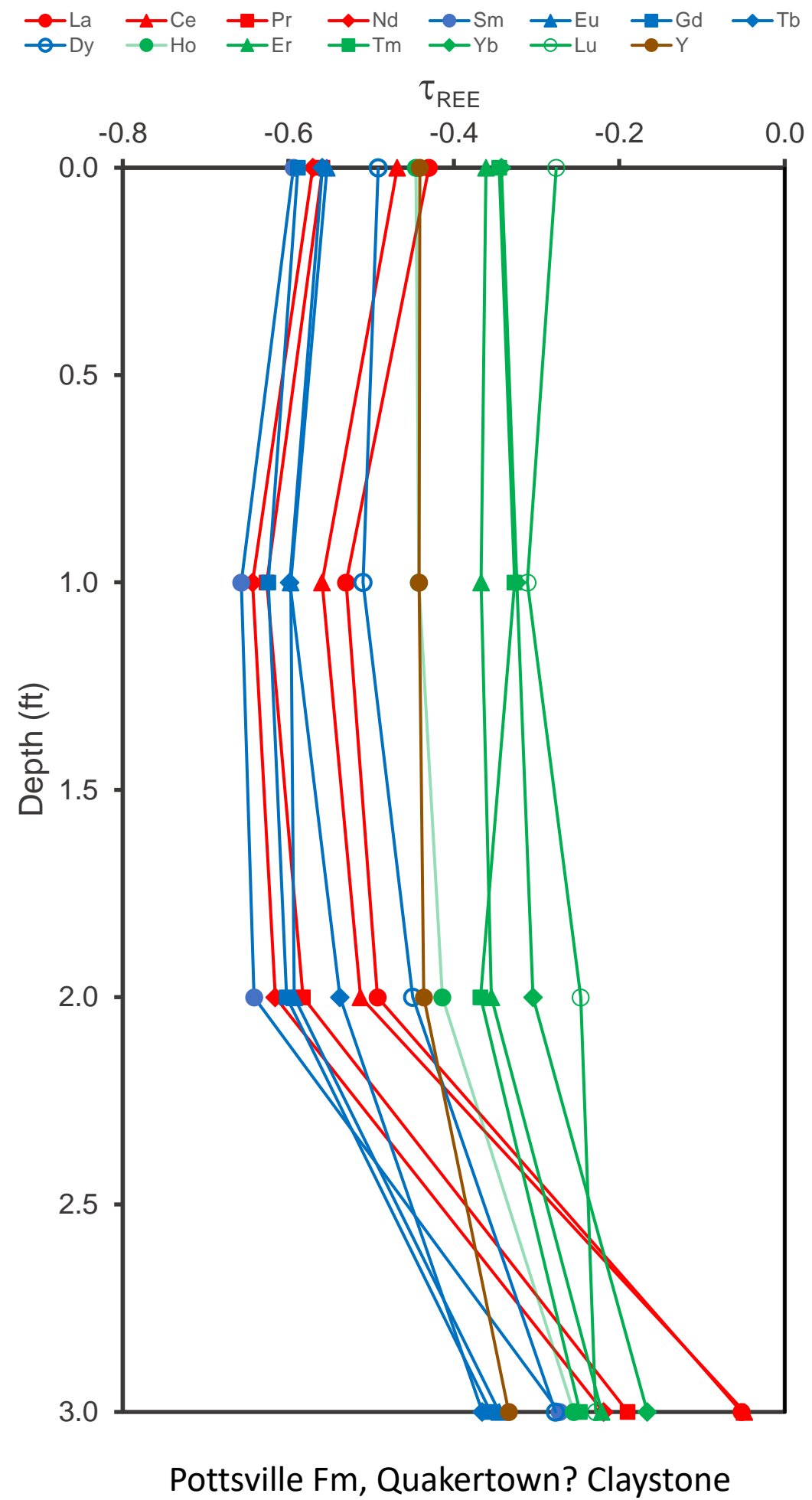
MD-7



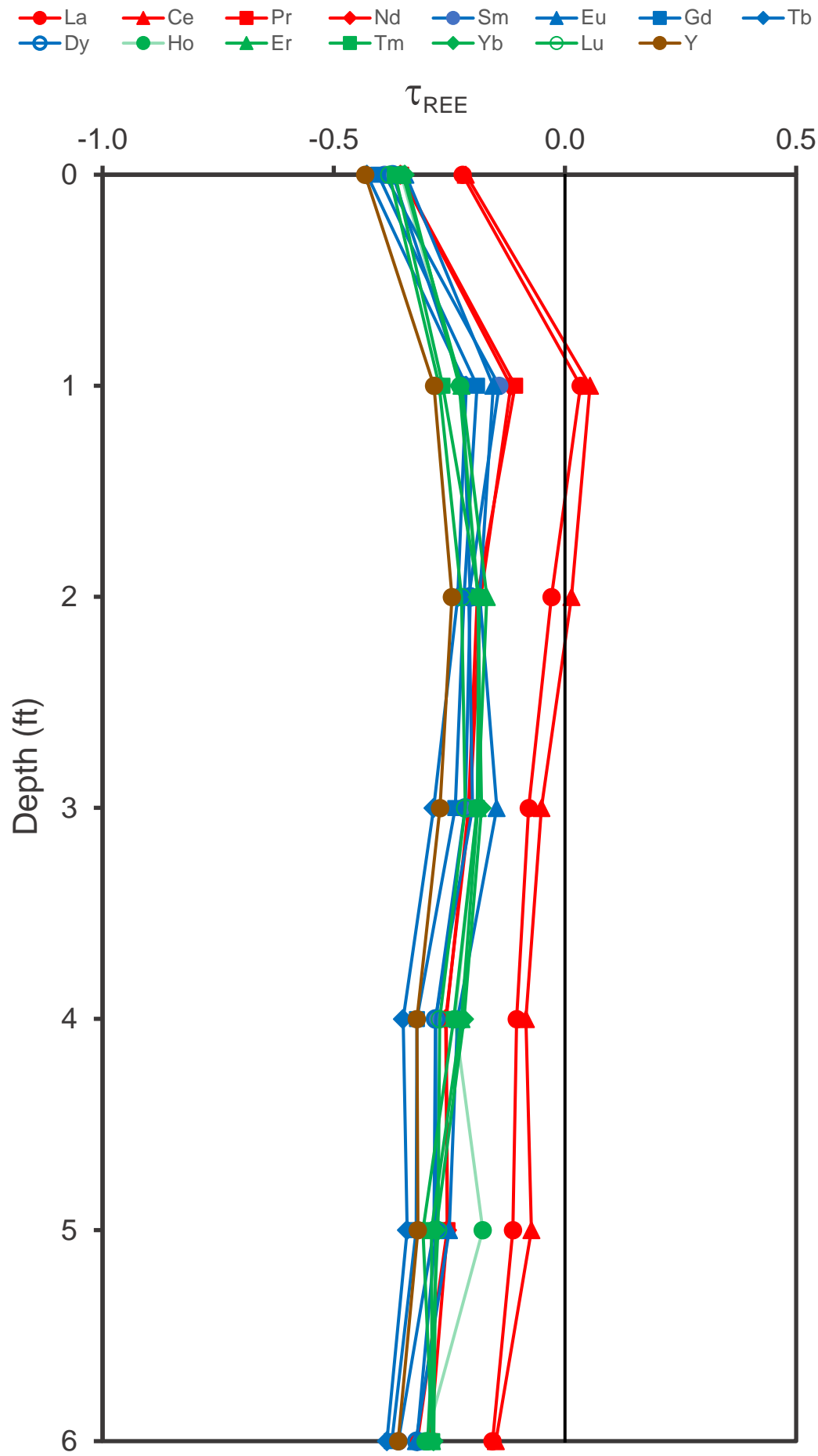
MD-8



MD-9

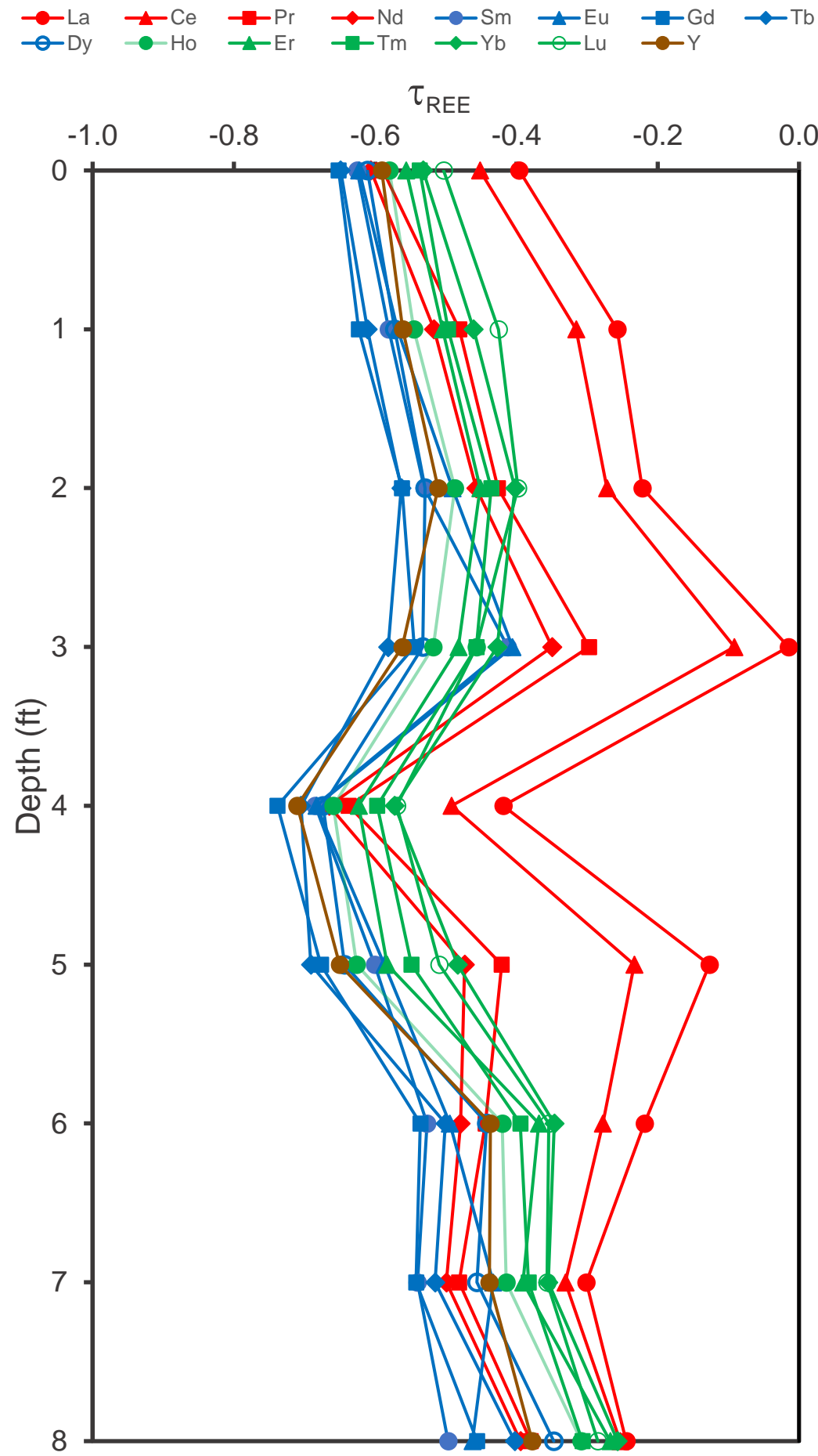


MD-10



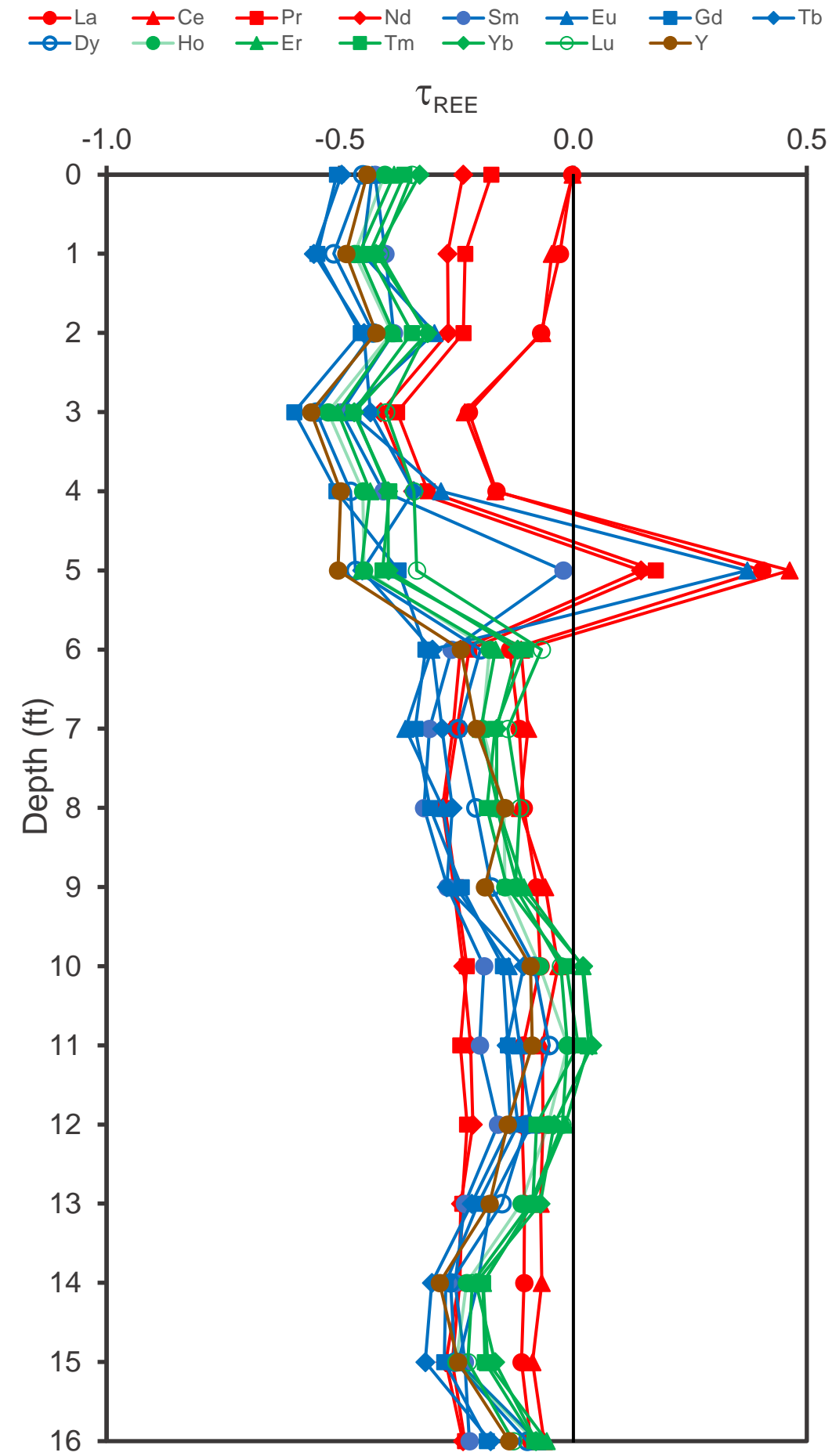
Luke claystone below Middle Kittanning coal

MD-11



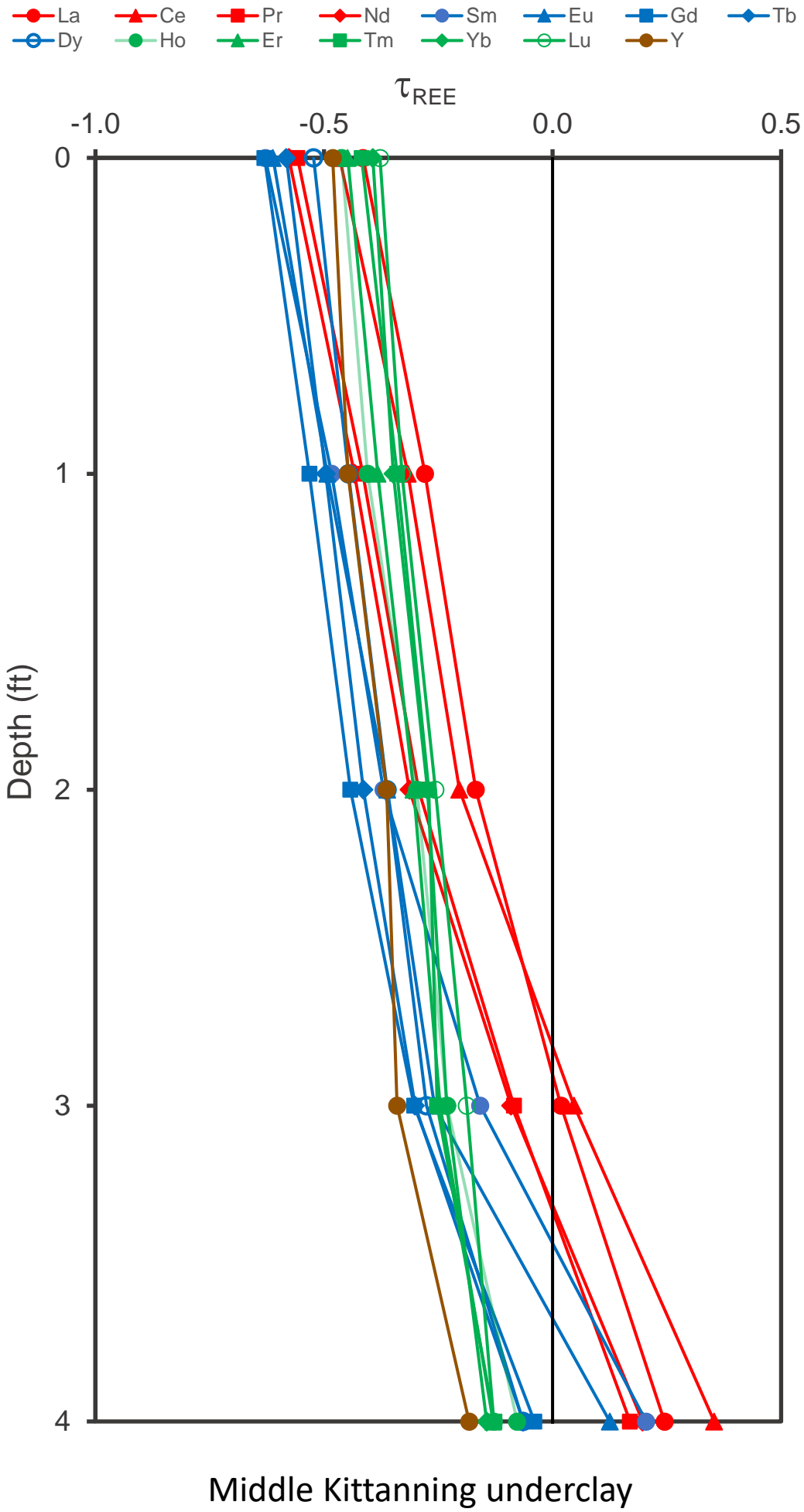
Lower Kittanning underclay

MD-12

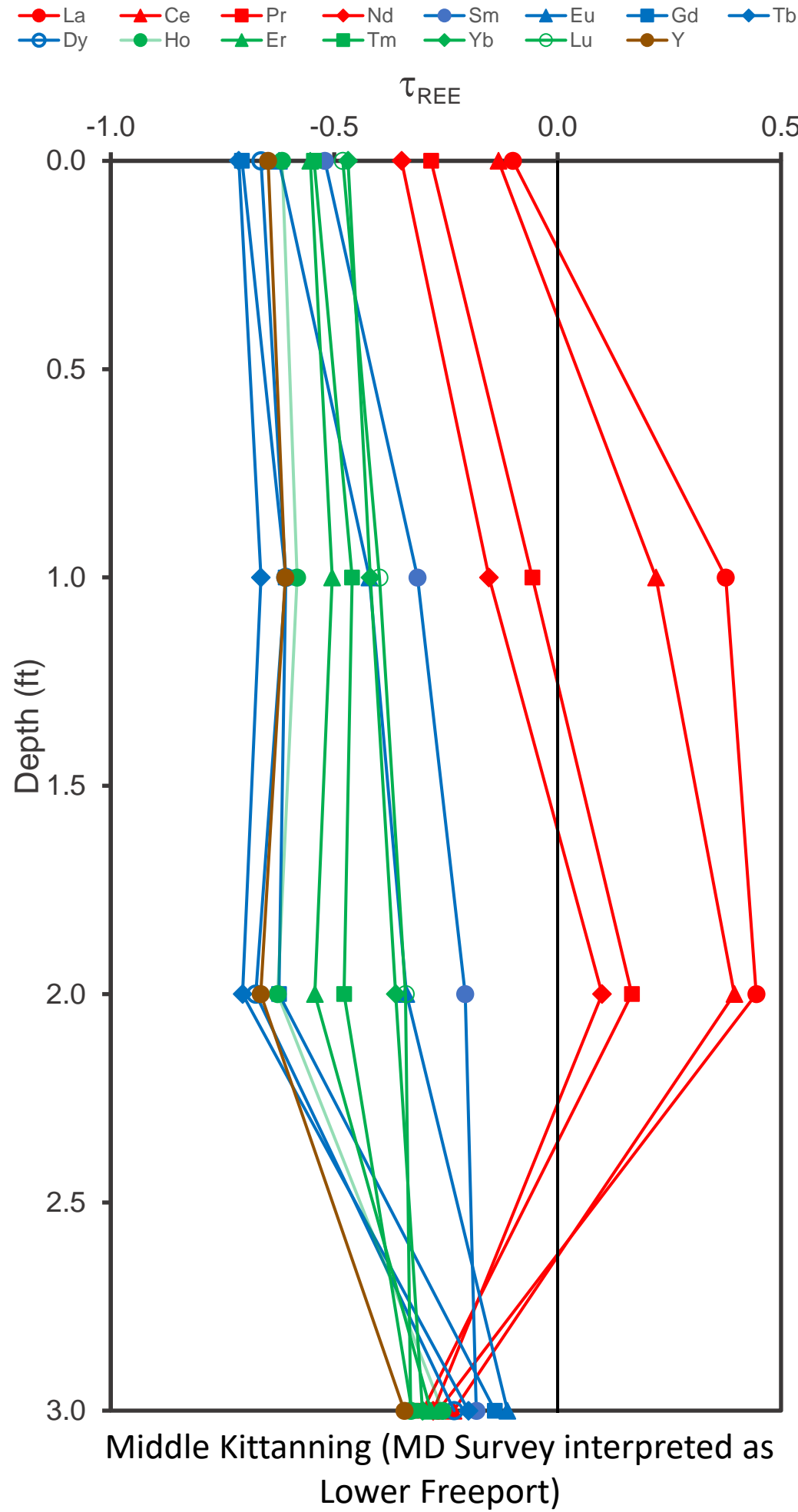


Mt Savage underclay

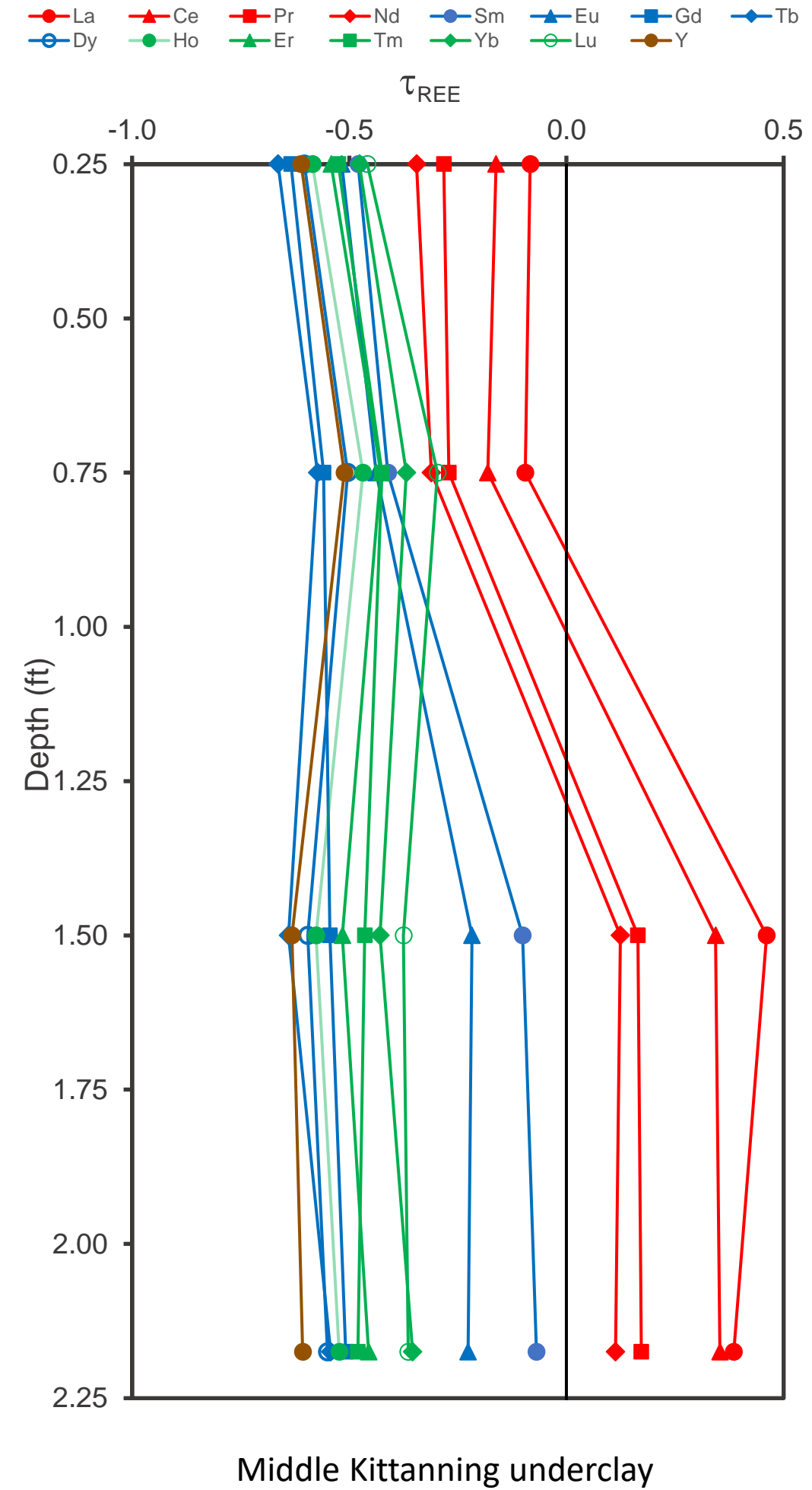
MD-13



MD-14

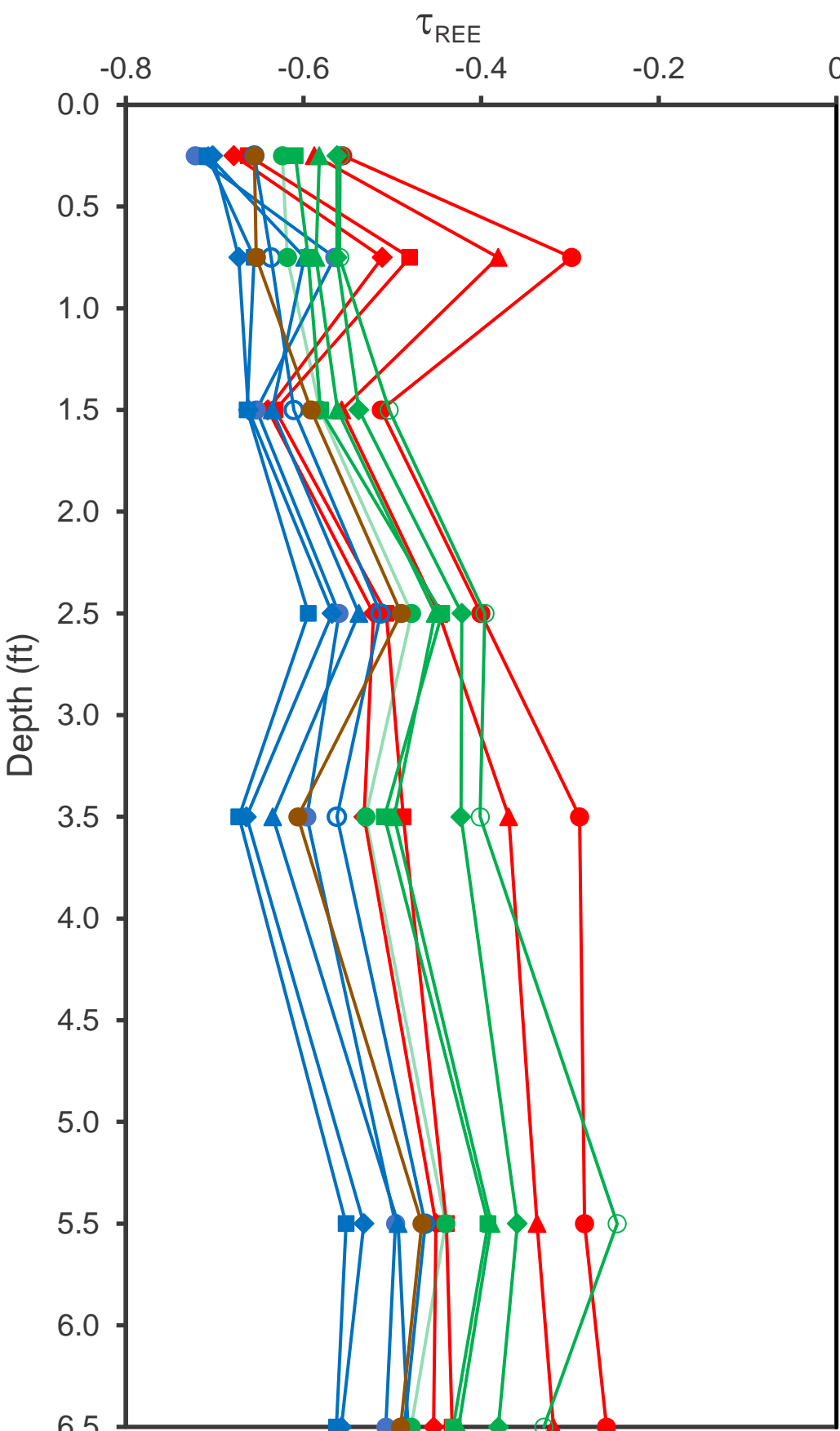
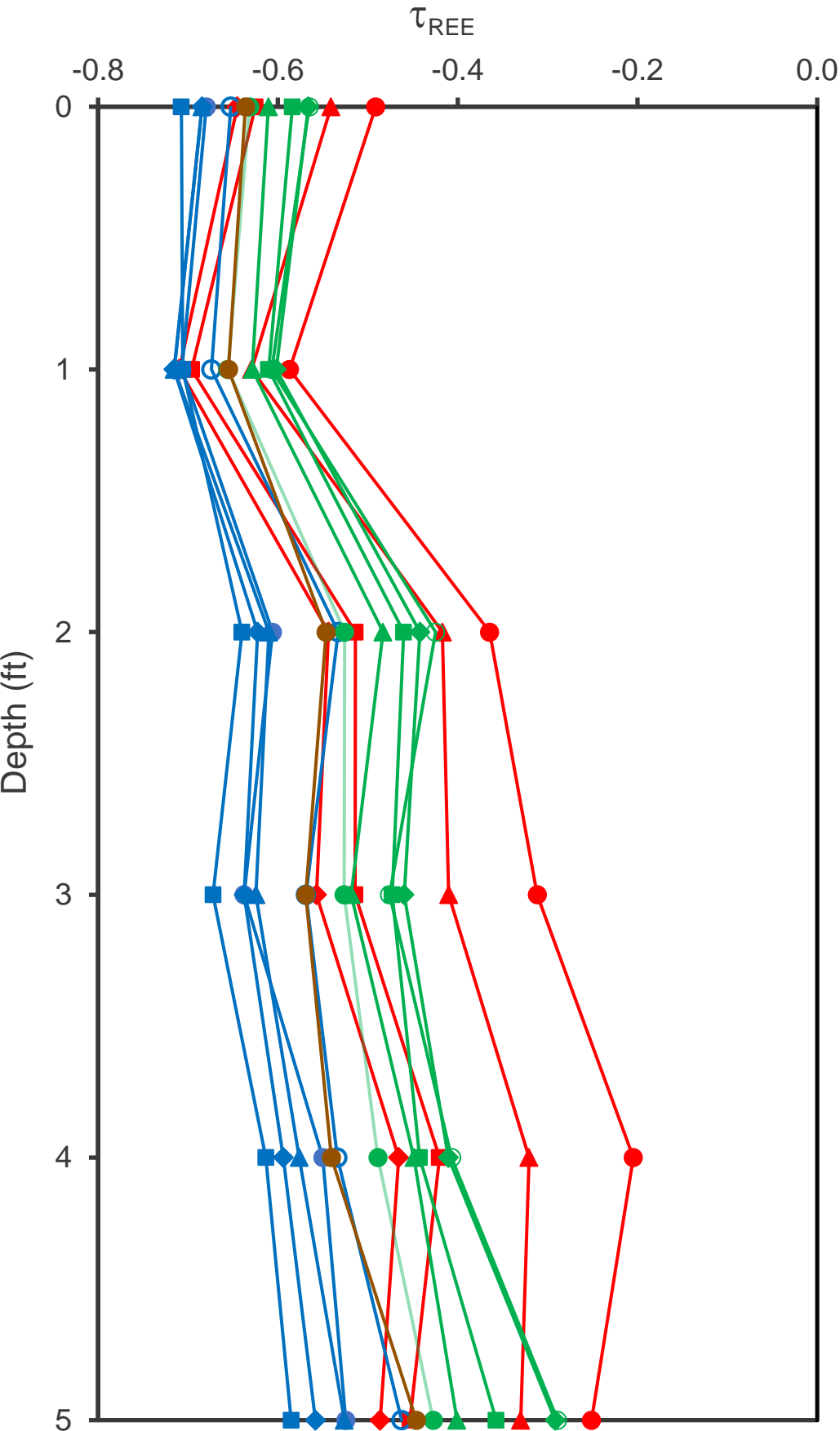
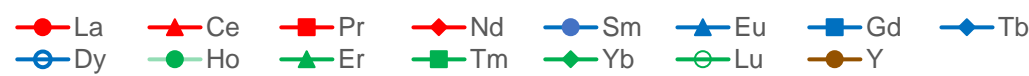


MD-14B



MD-15

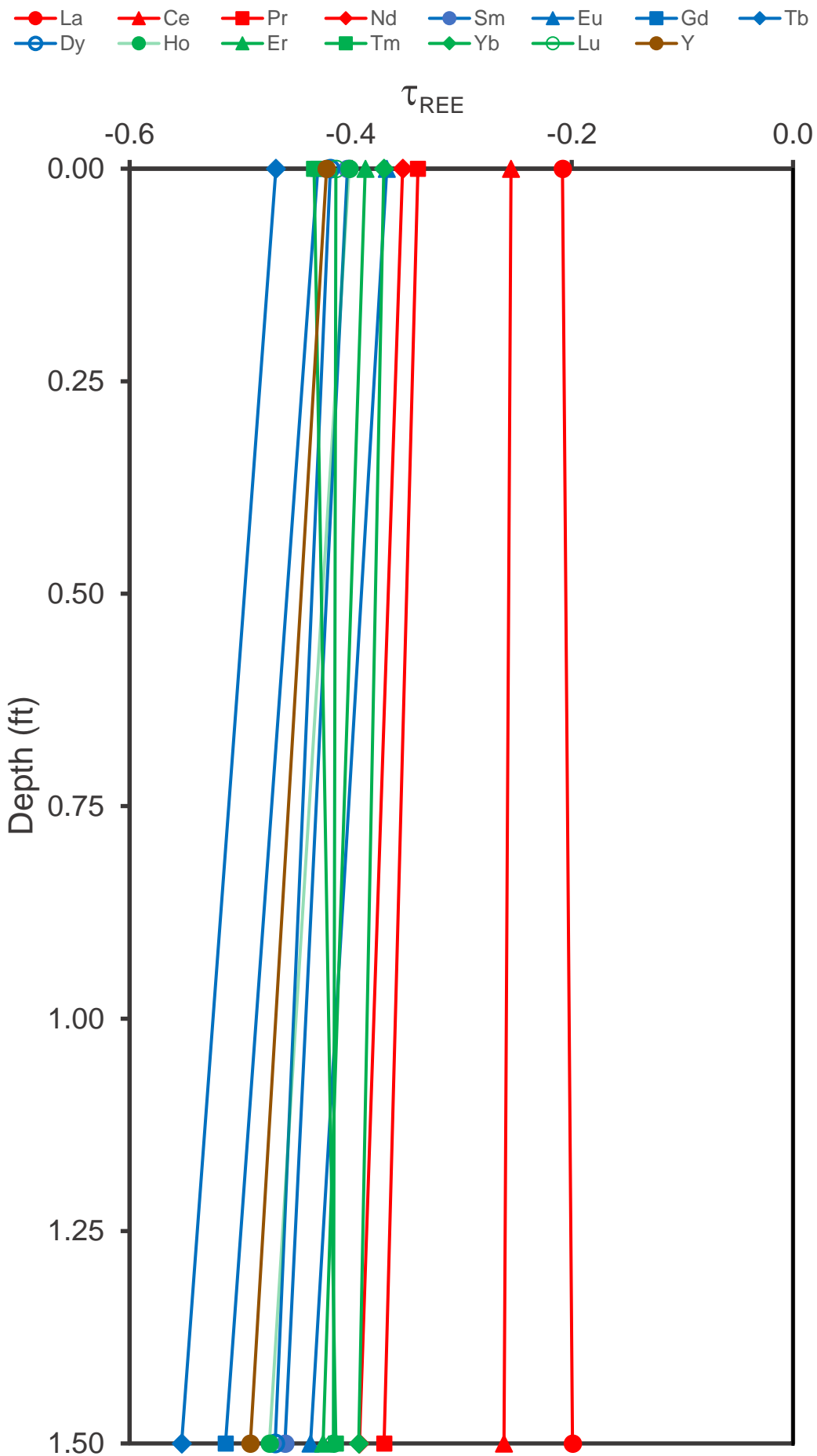
MD-15B



Clarion underclay (MD Survey interpreted as Allegheny Fm, Lower Kittanning underclay)

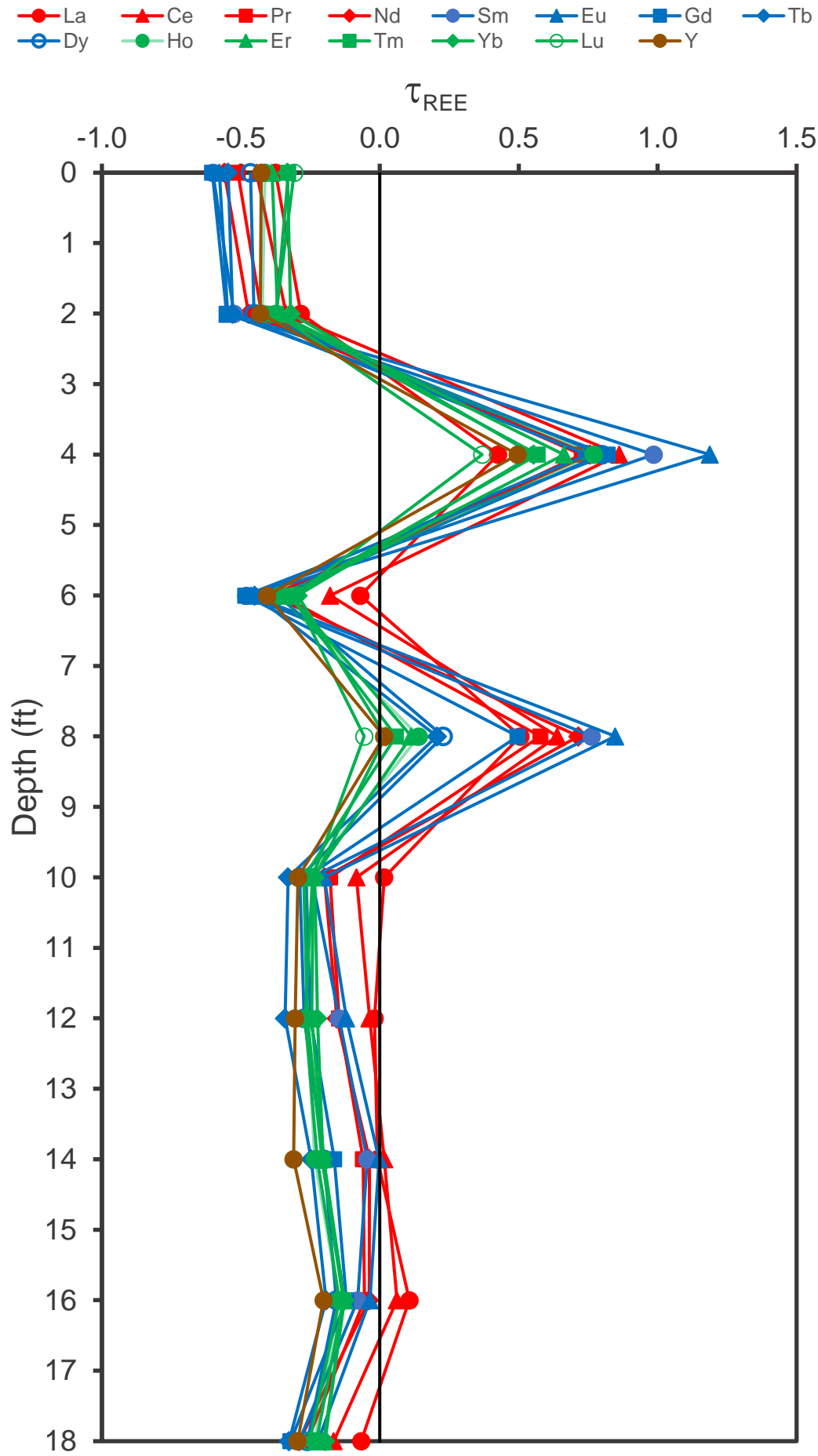
Clarion underclay

OGS-CSH0032



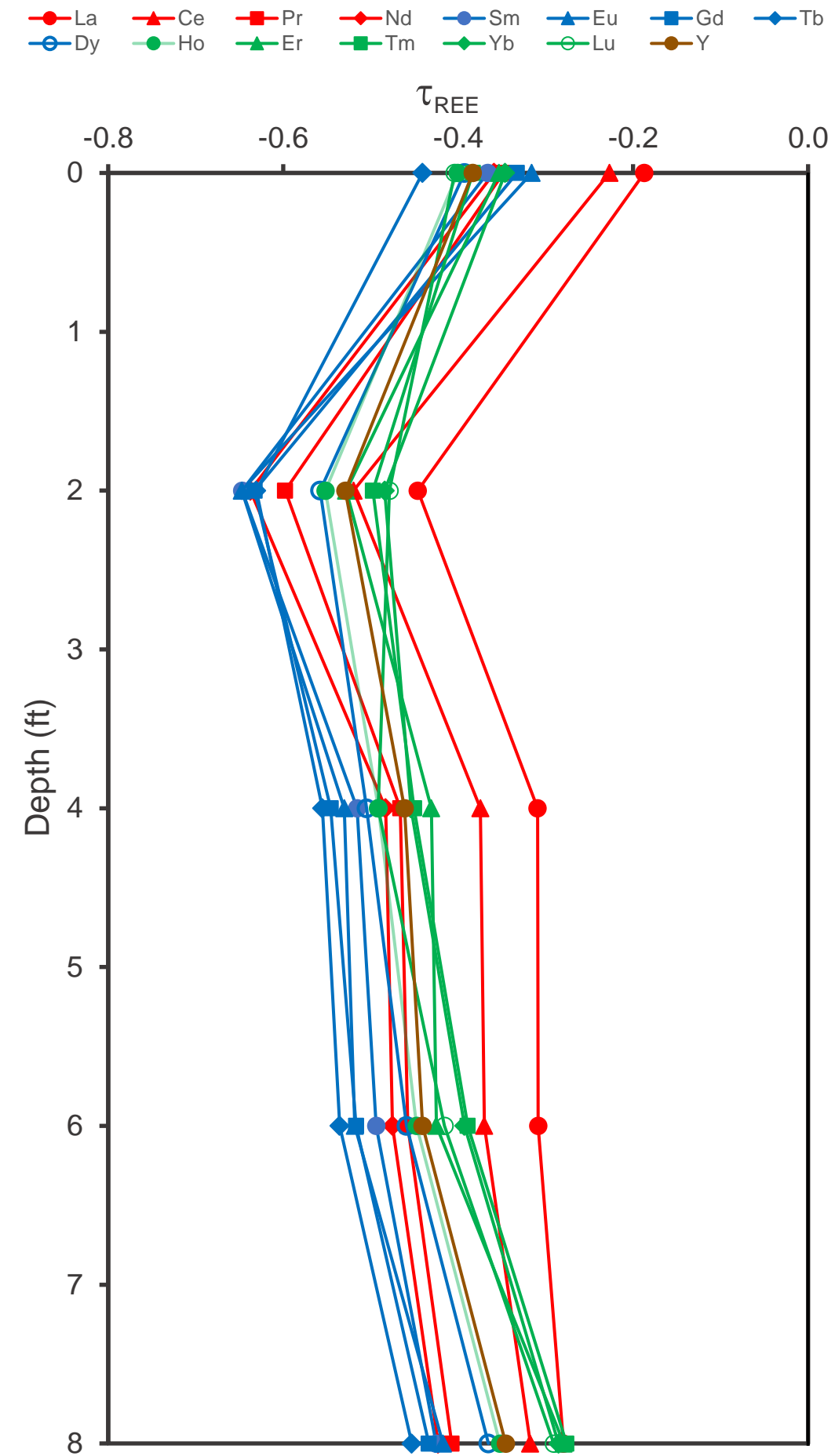
Upper Freeport underclay

OGS-CSH0033



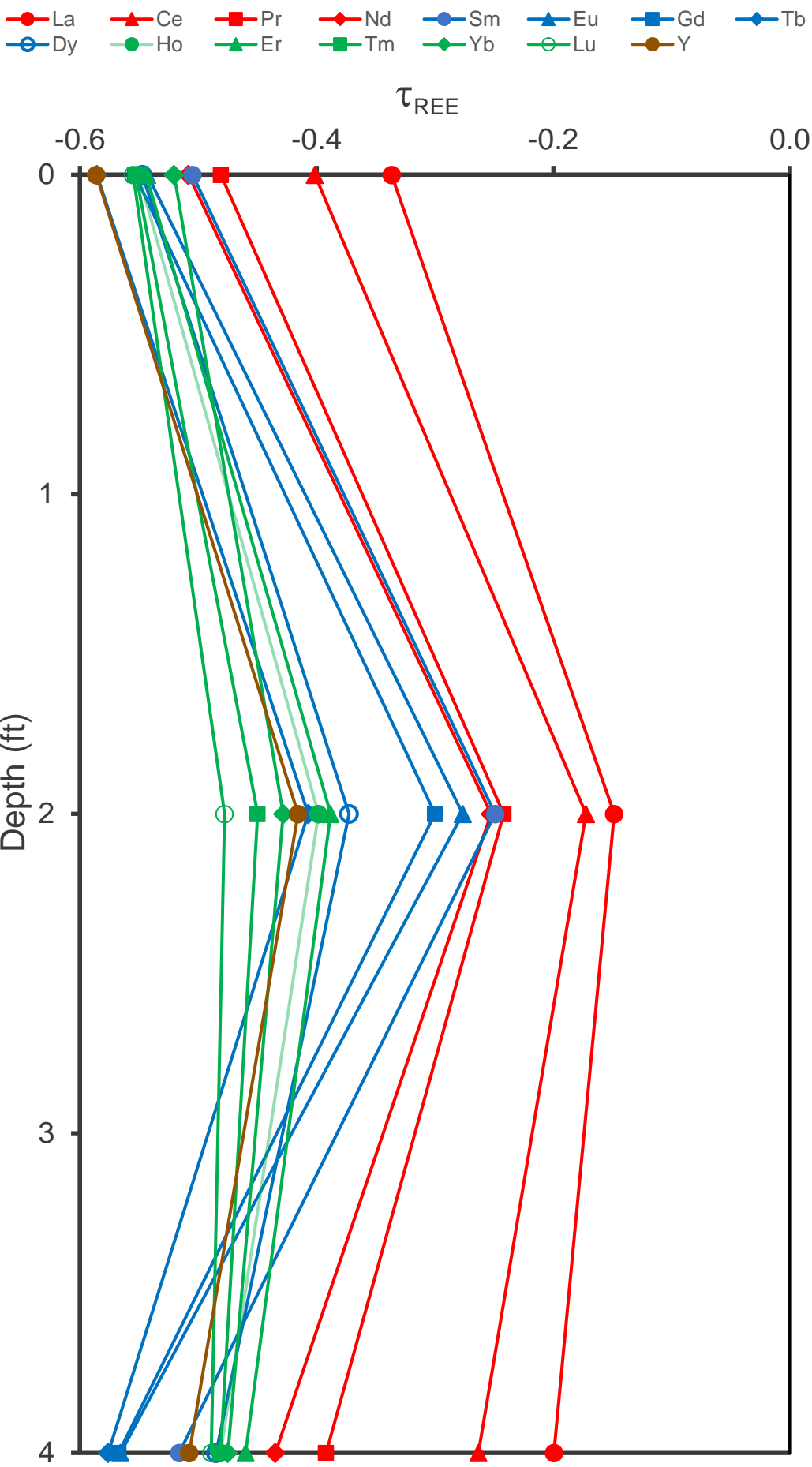
Middle Mercer underclay

OGS-CSH0034



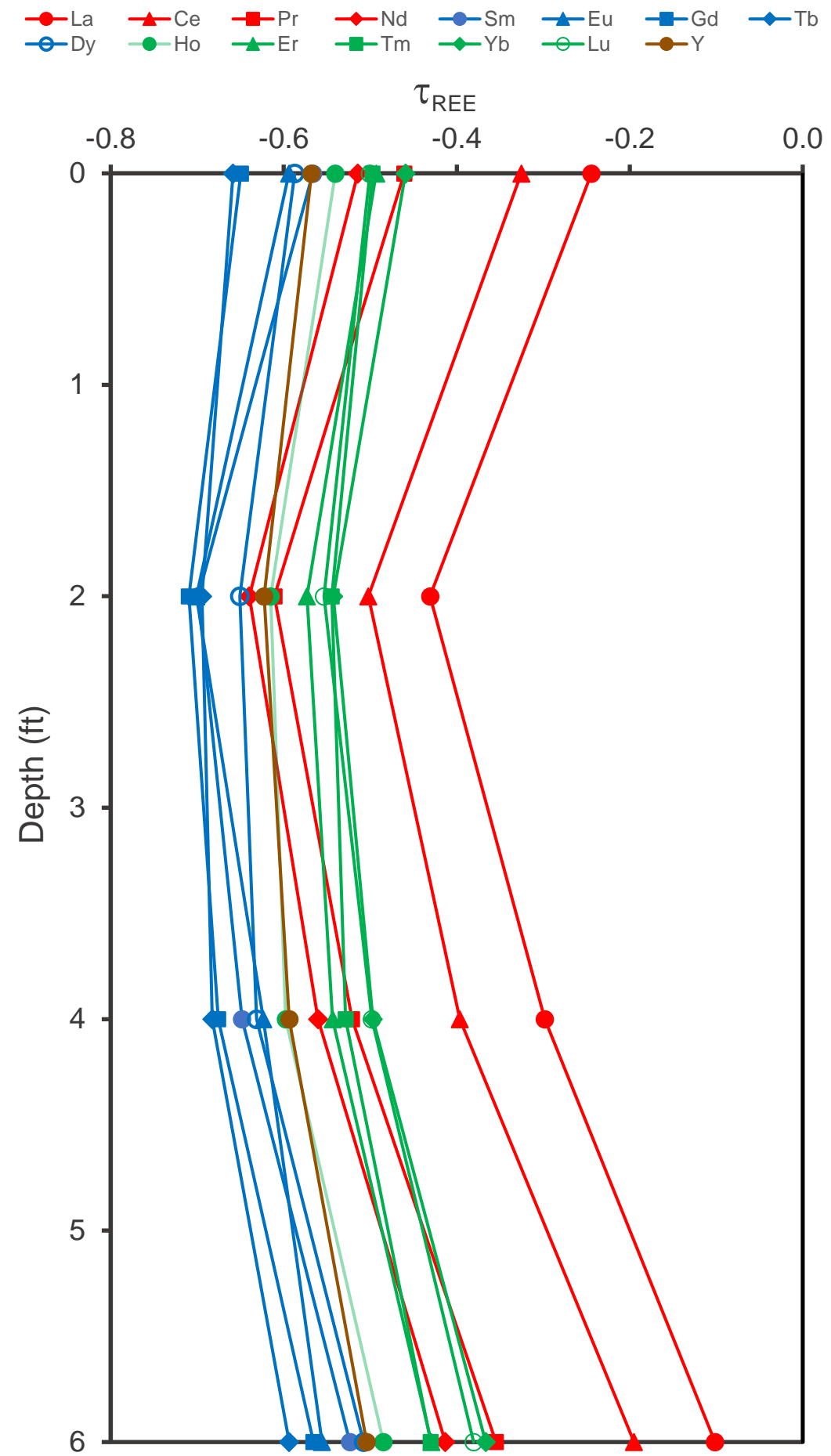
Upper Freeport underclay

OGS-CSH0035



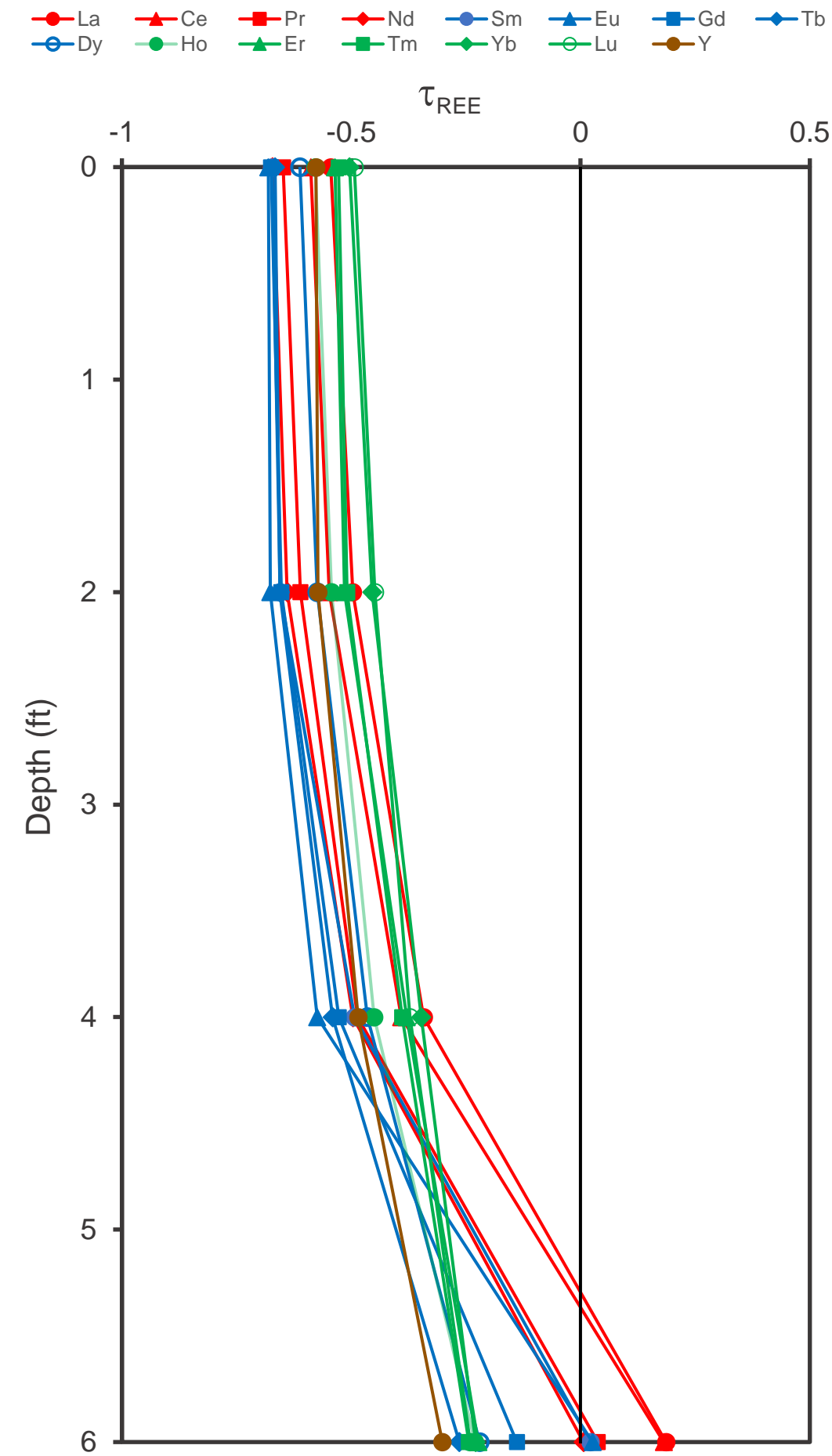
Lower Kittanning underclay

OGS-CSH0036



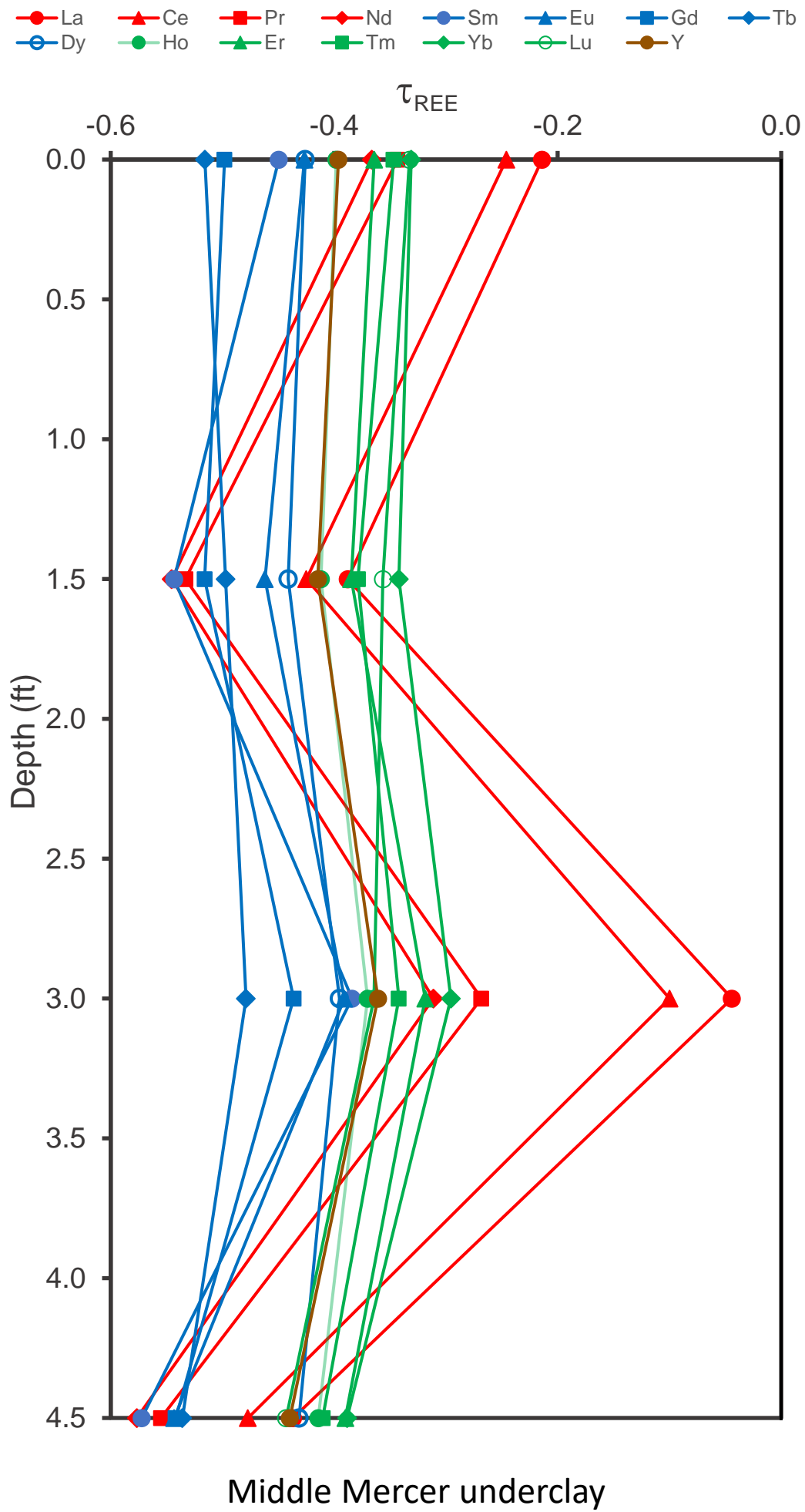
Middle Kittanning underclay

OGS-CSH0037

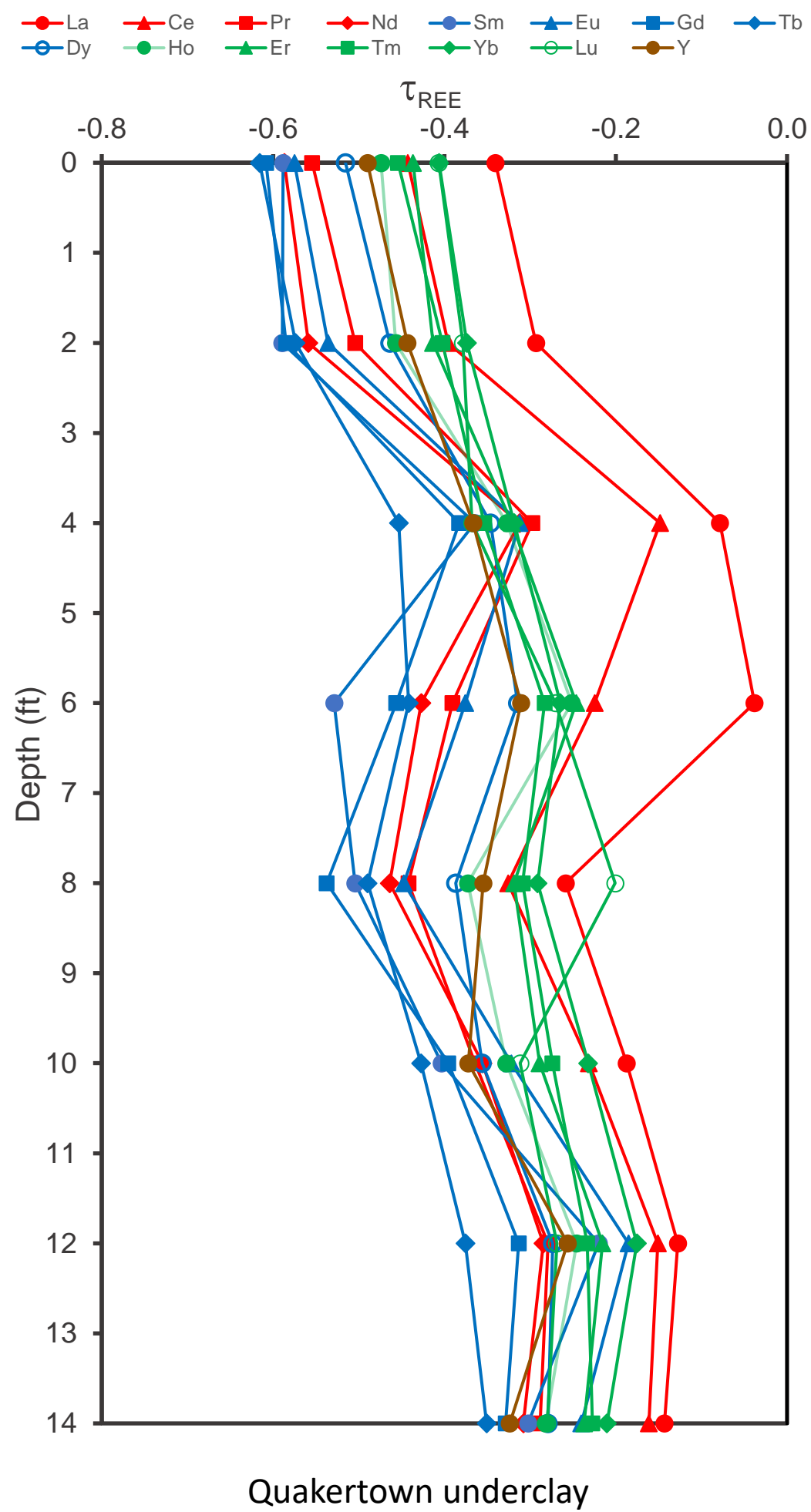


Bedford underclay

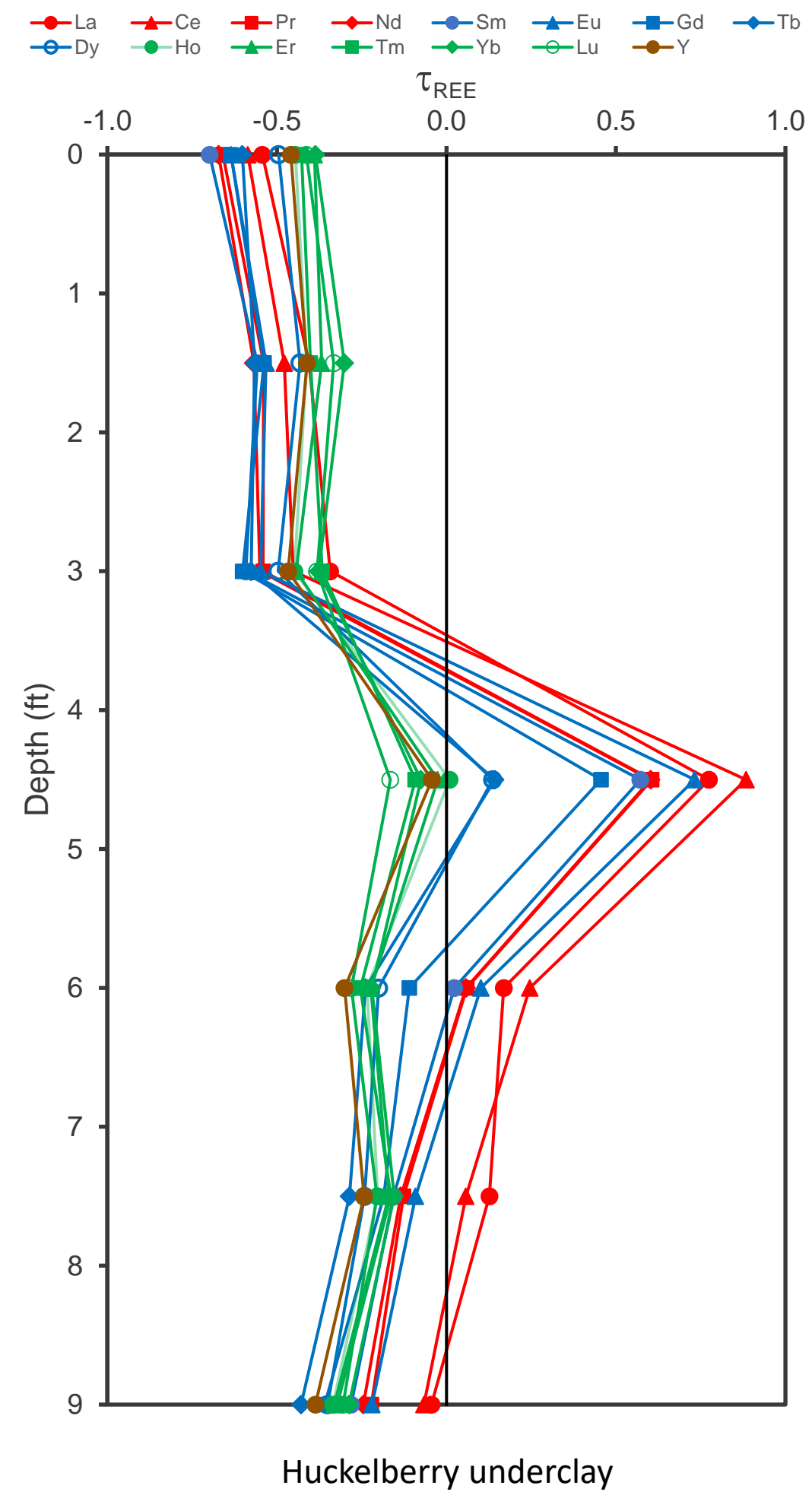
OGS-CSH0038



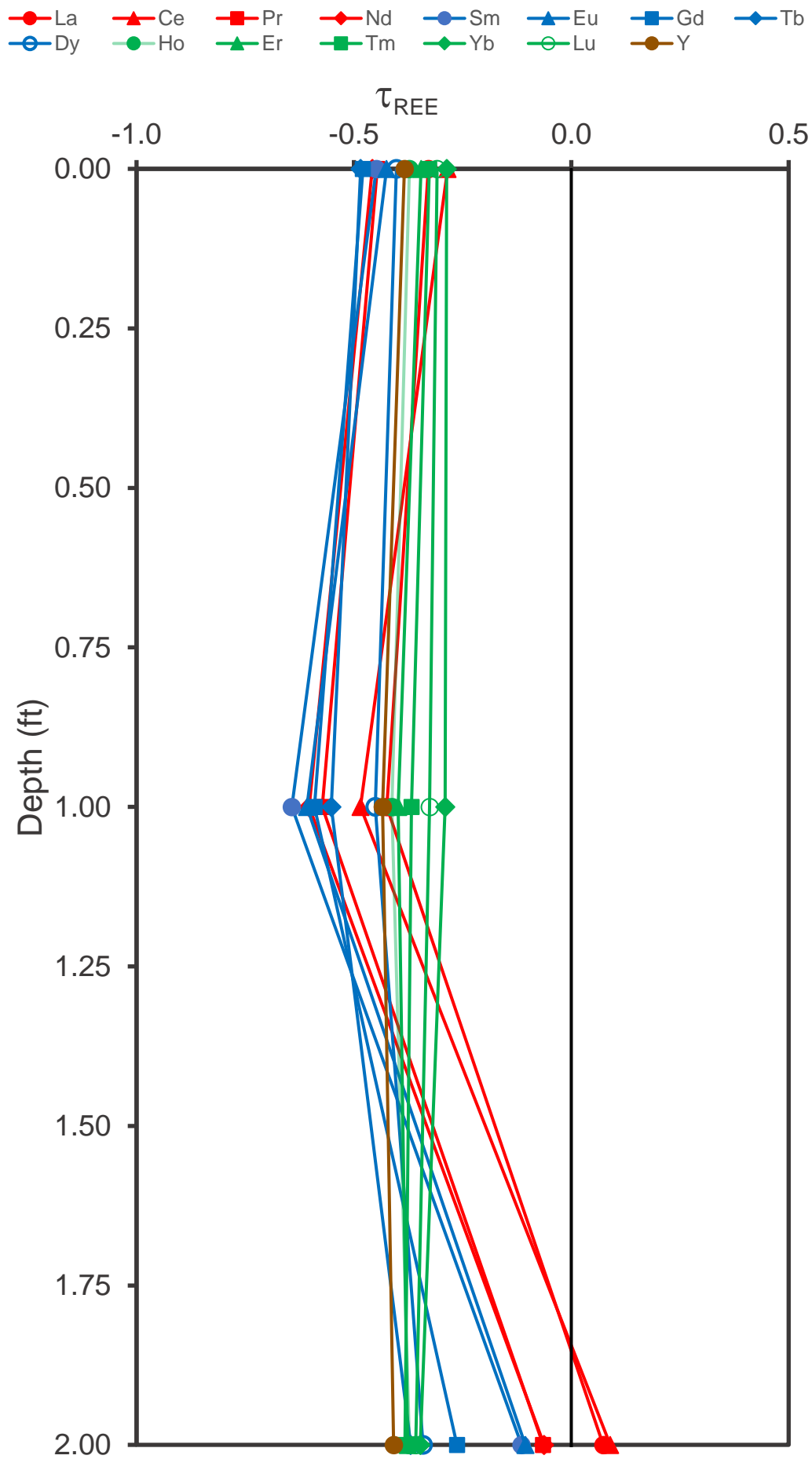
OGS-CSH0041



OGS-CSH0042

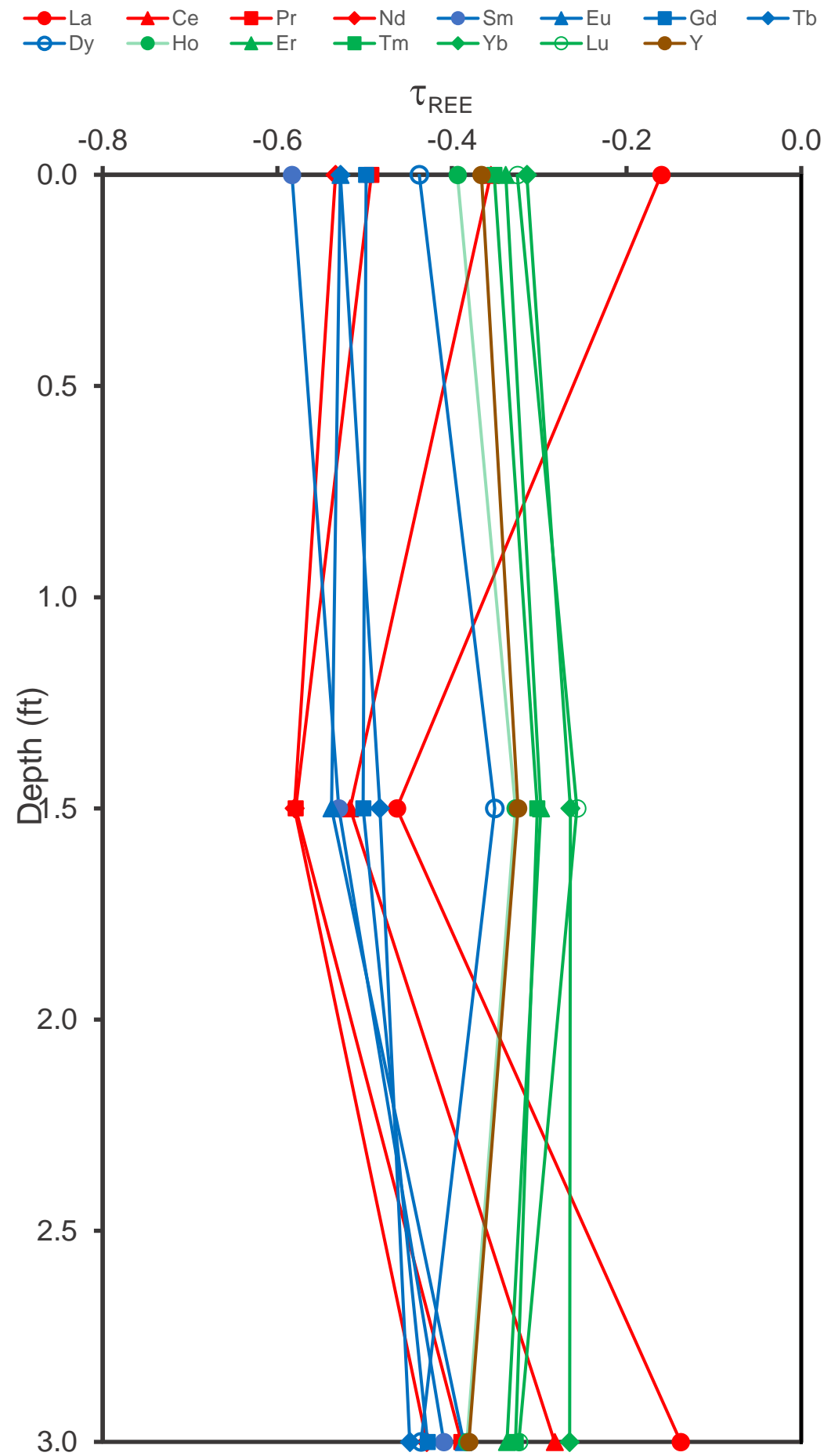


OGS-CSH0043



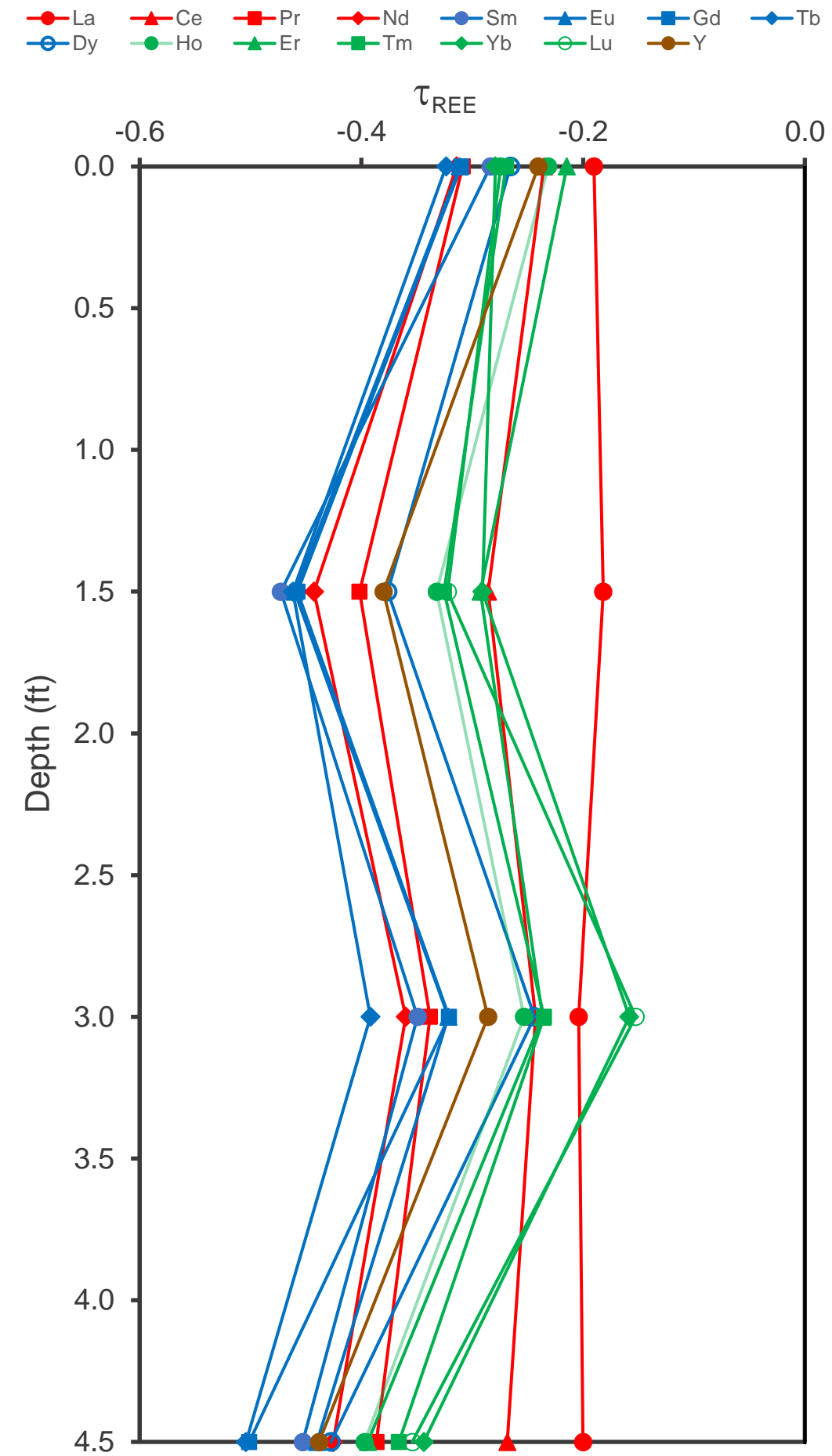
Anthony underclay

OGS-CSH0044



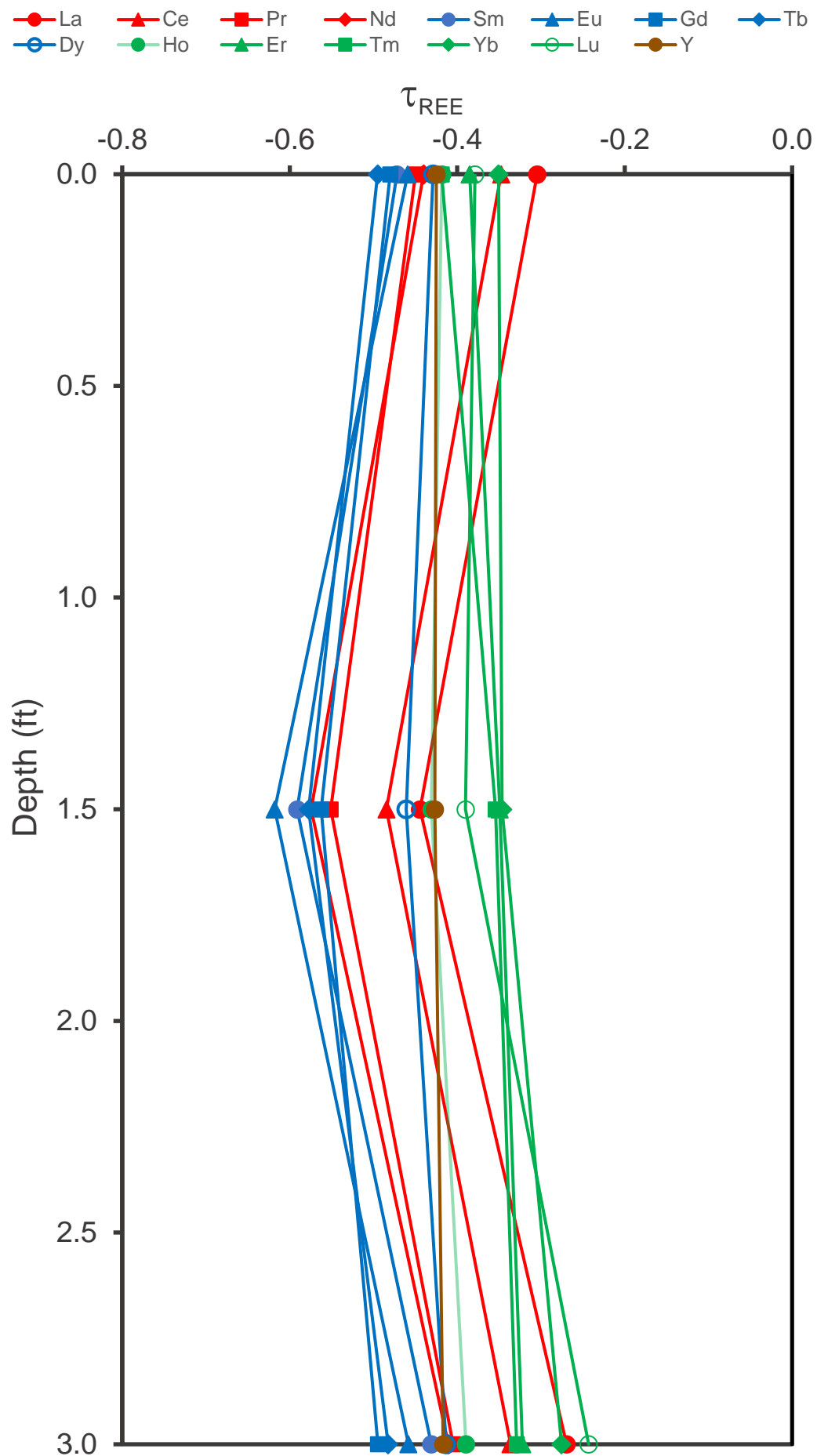
Sharon underclay

OGS-CSH0046



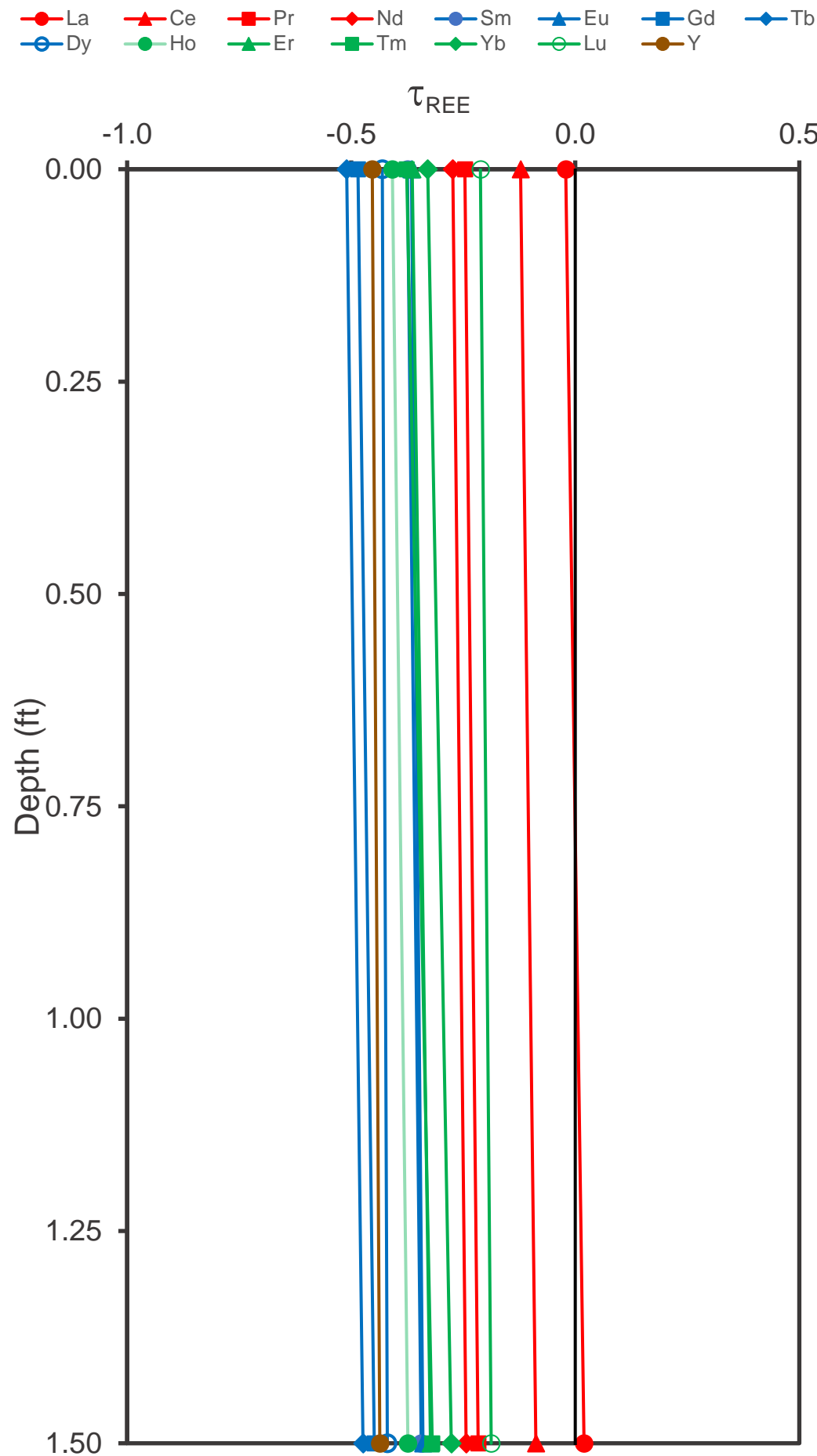
Lower Mercer underclay

OGS-CSH0048



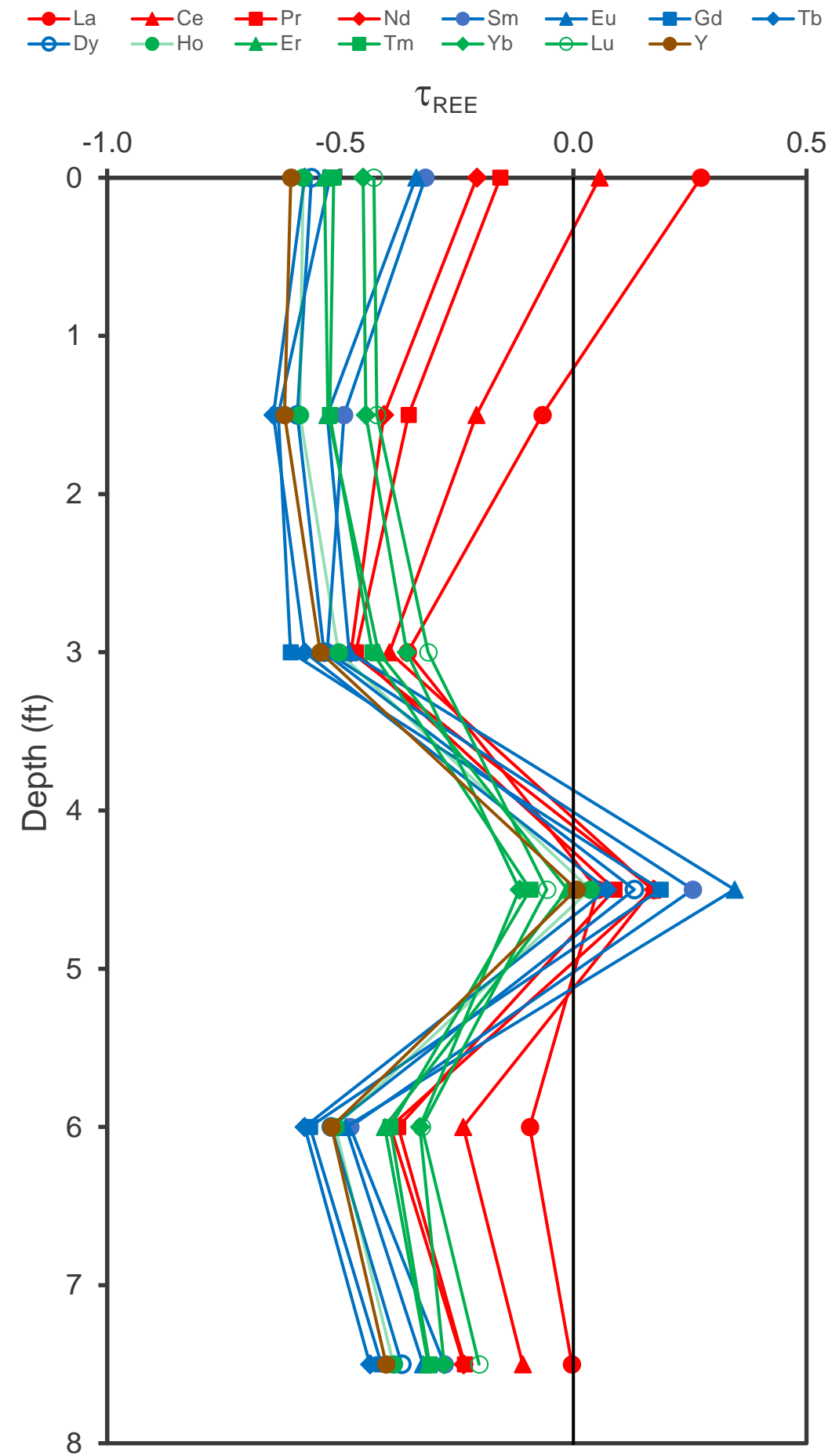
Upper Mercer underclay

OGS-CSH0049



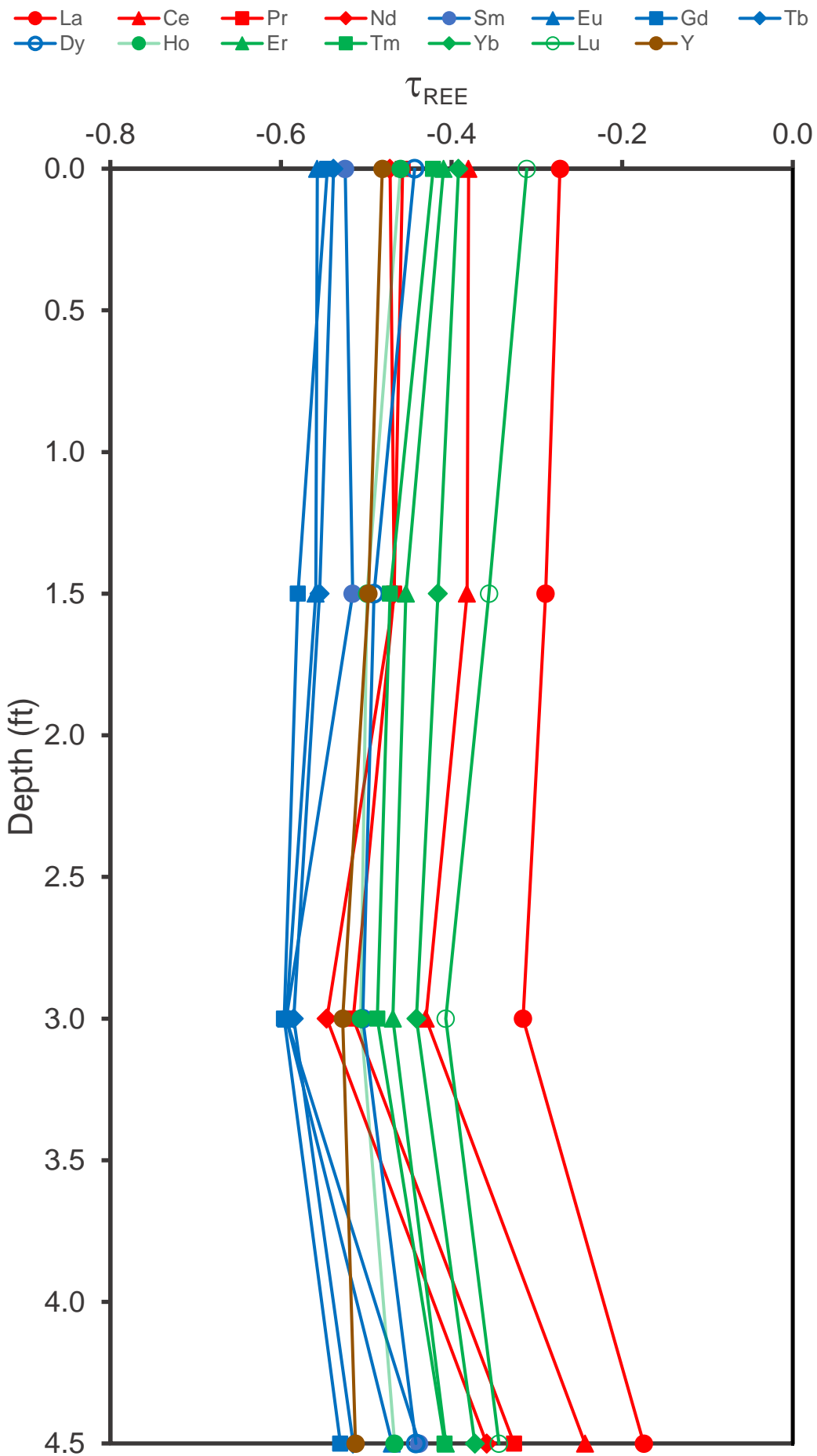
Pottsville - Dark clay shale between Upper Mercer coal and Bedford underclay

OGS-CSH0050



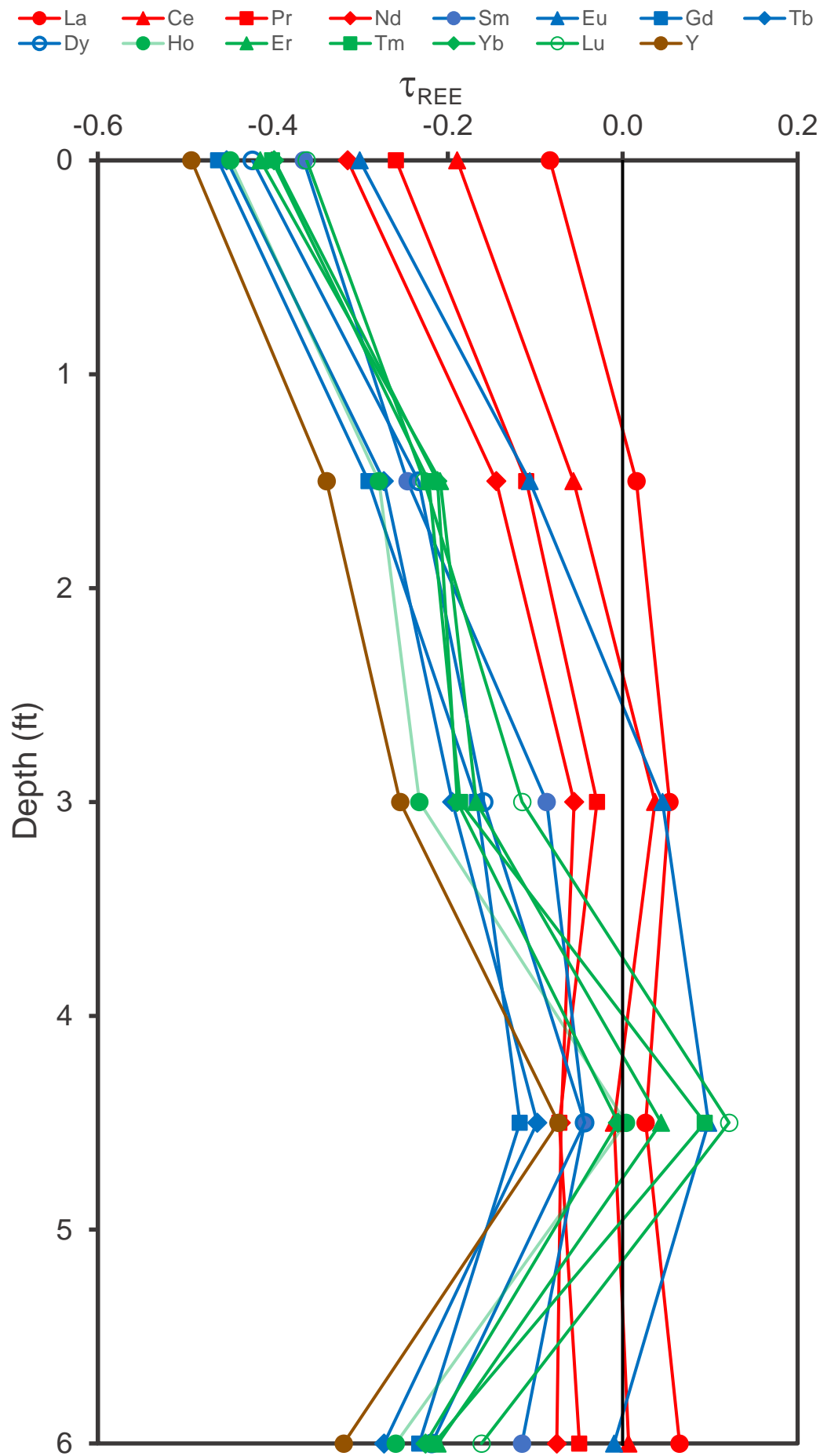
Lower Freeport underclay

OGS-CSH0051



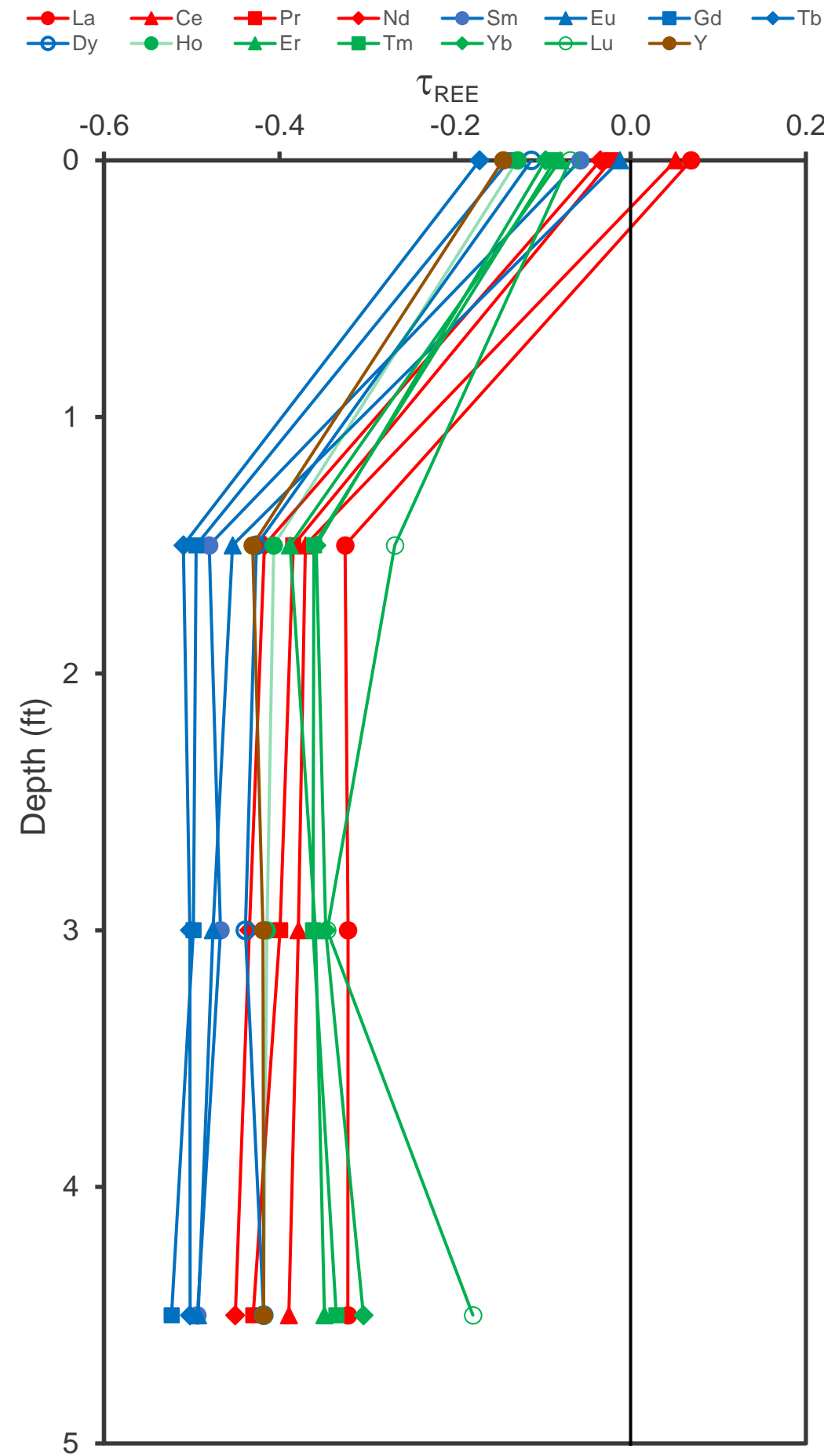
Lower Kittanning underclay

OGS-CSH0052



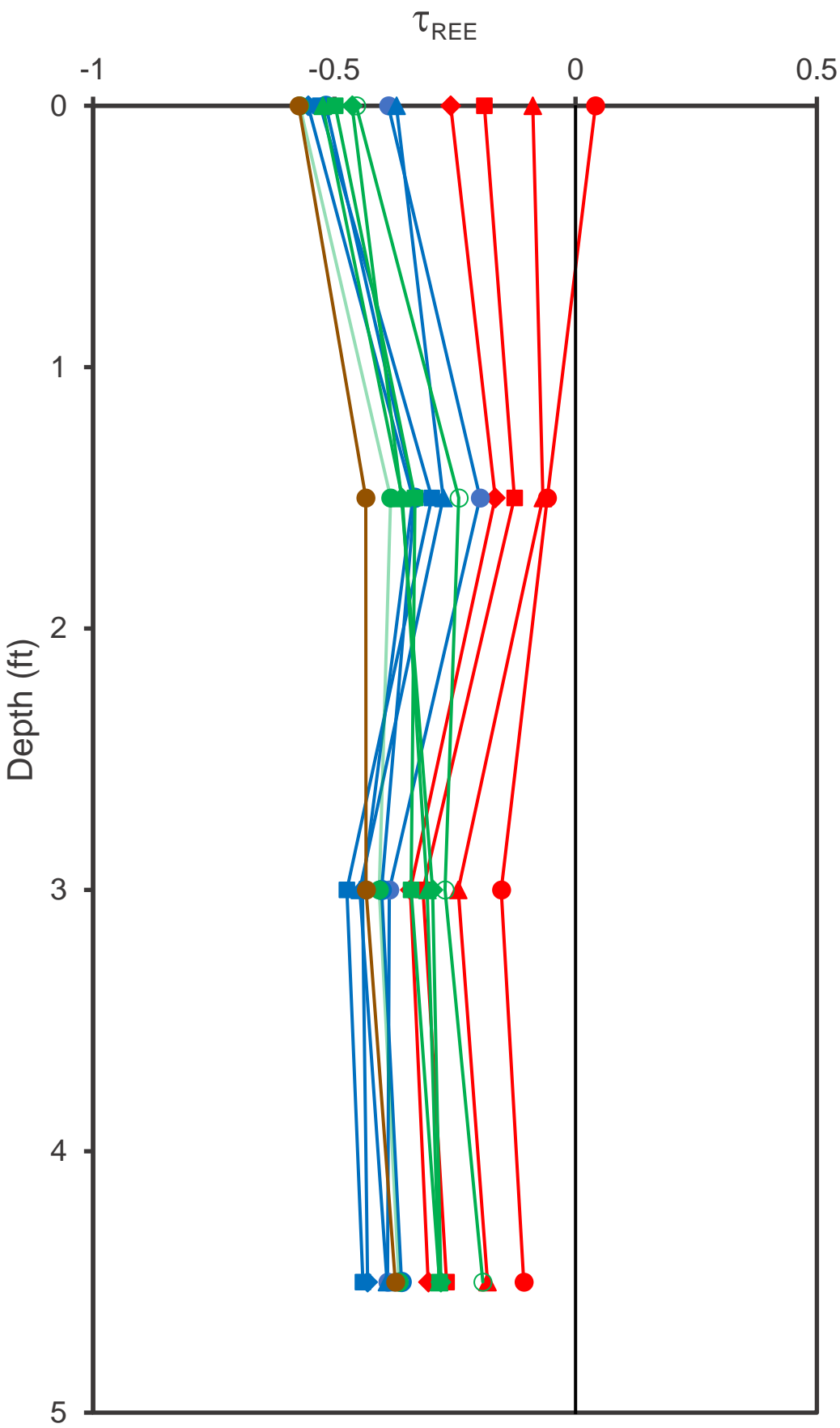
Sharon underclay

OGS-CSH0056



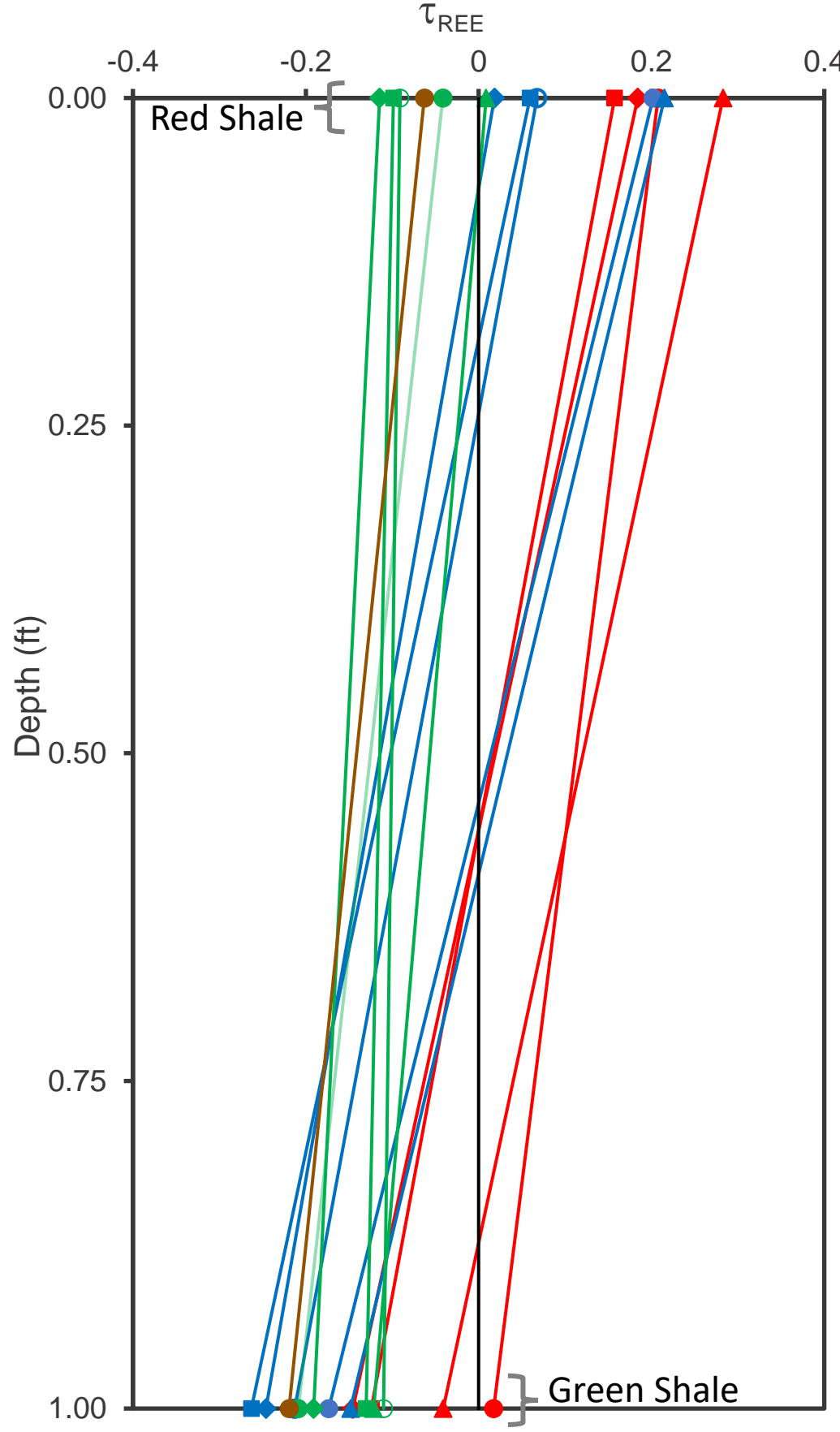
Lower Freeport underclay

OGS-CSH0057



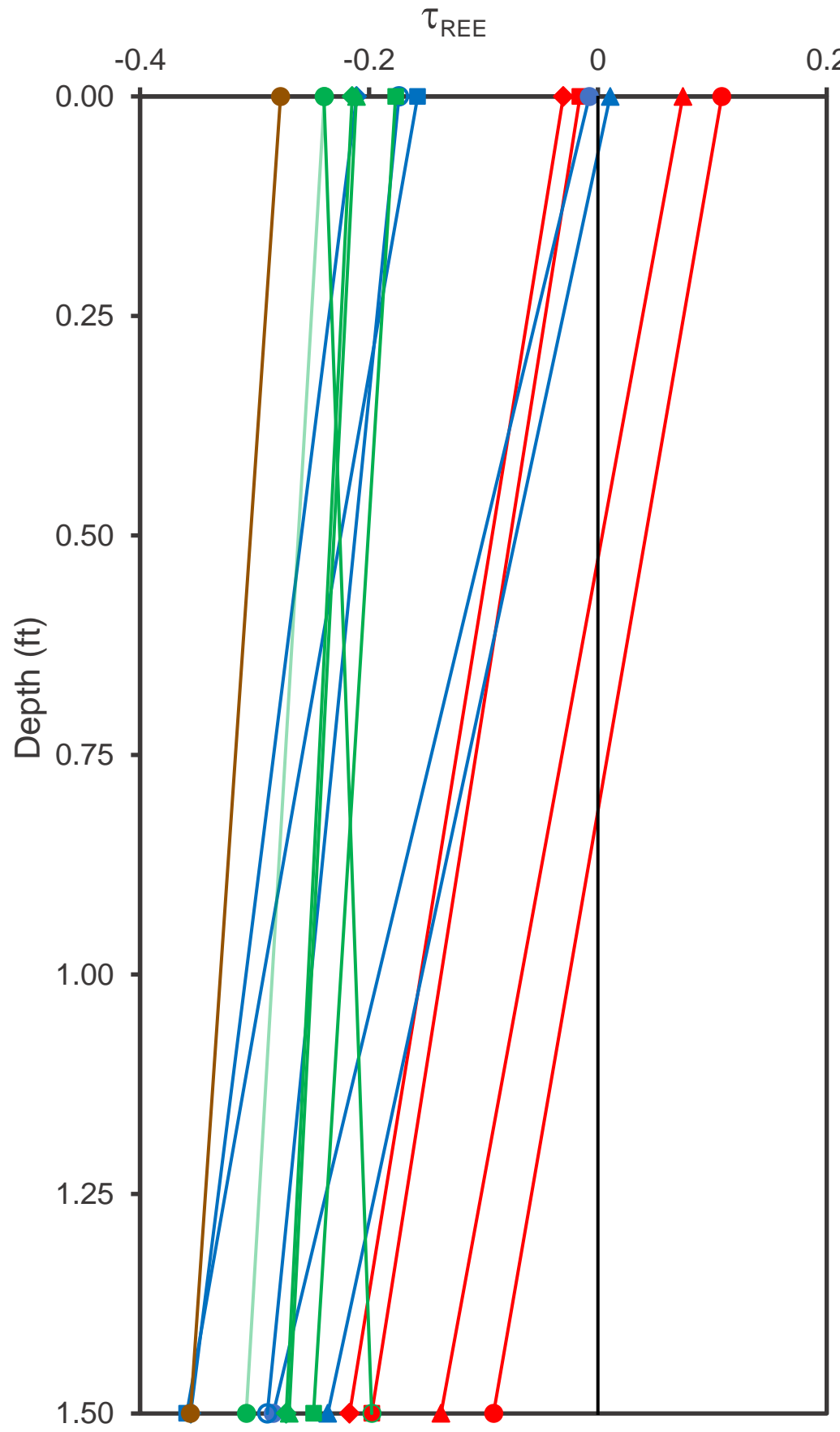
Lower Kittanning underclay

OGS-CSH0058



Conemaugh

OGS-CSH0059

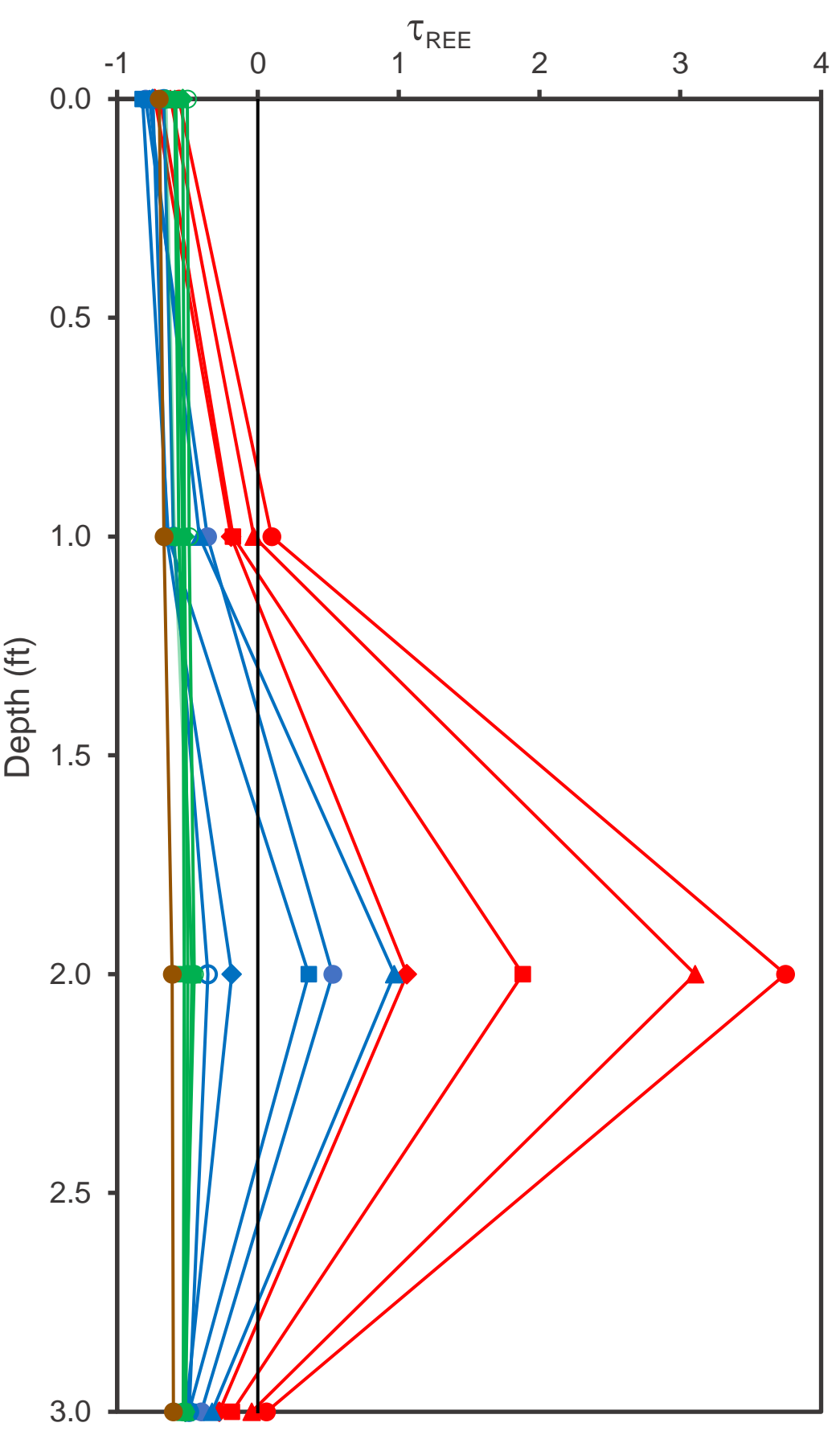
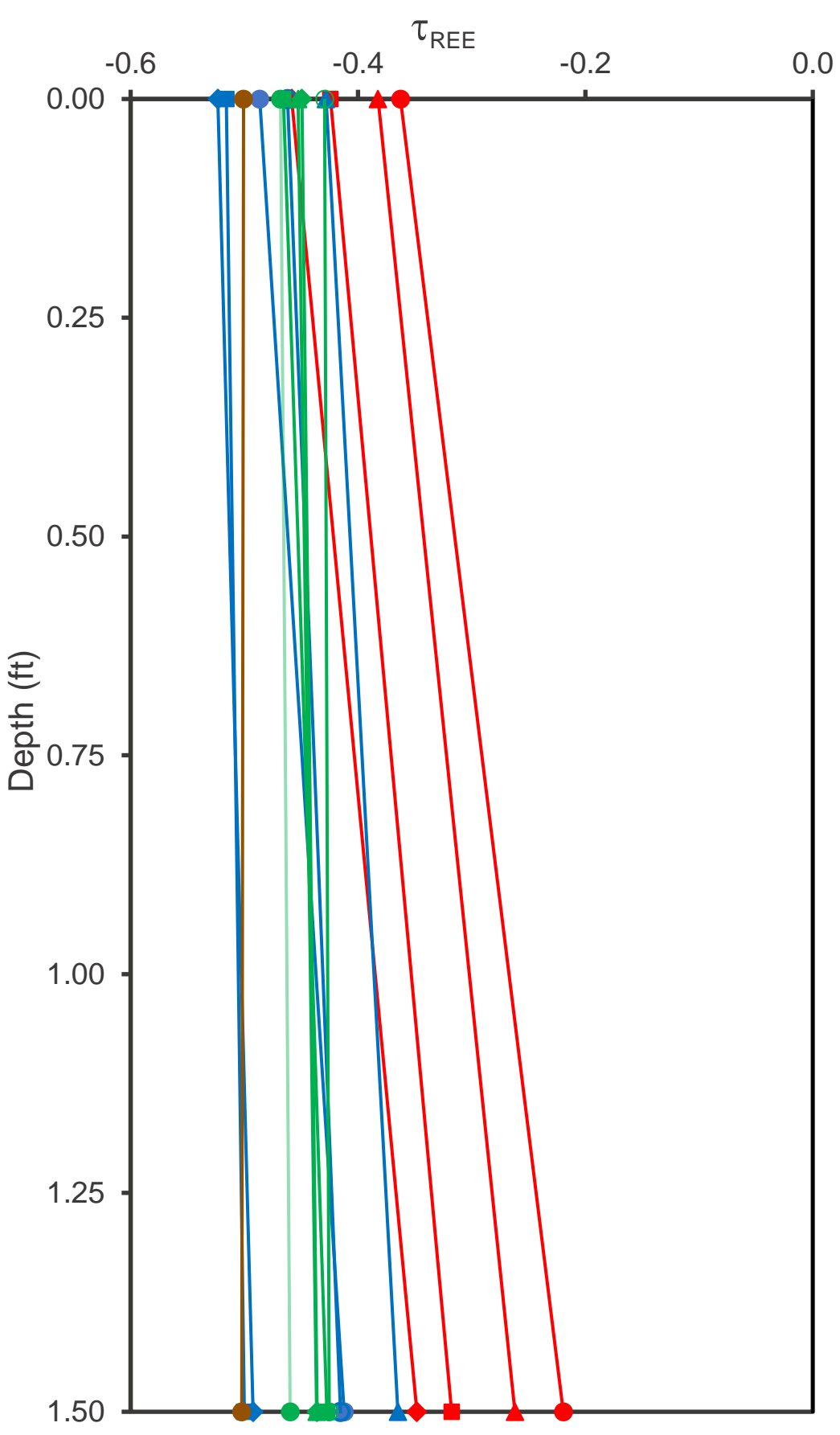
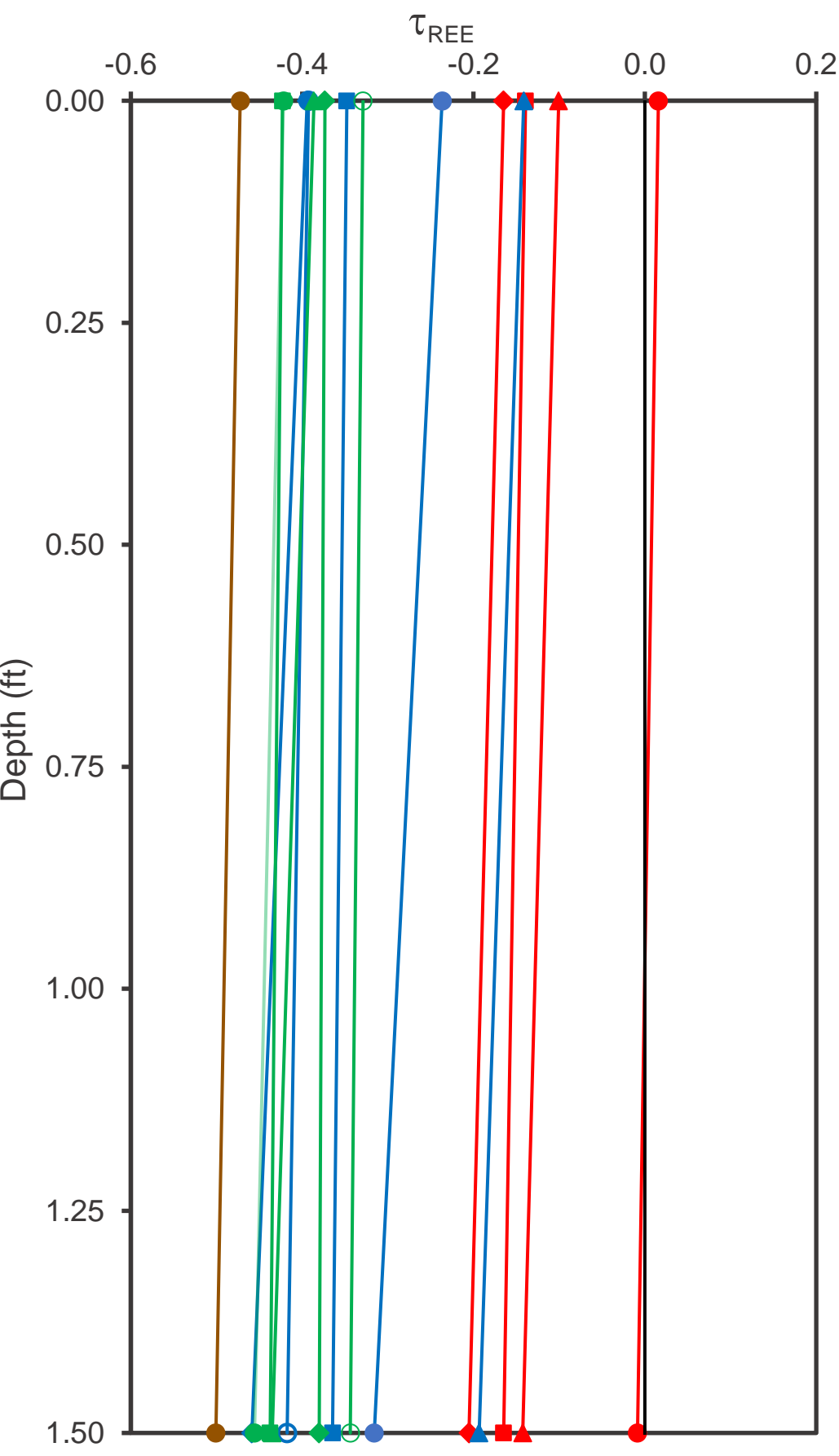


Conemaugh - Barton underclay

OGS-CSH0060

OGS-CSH0061

OGS-CSH0062

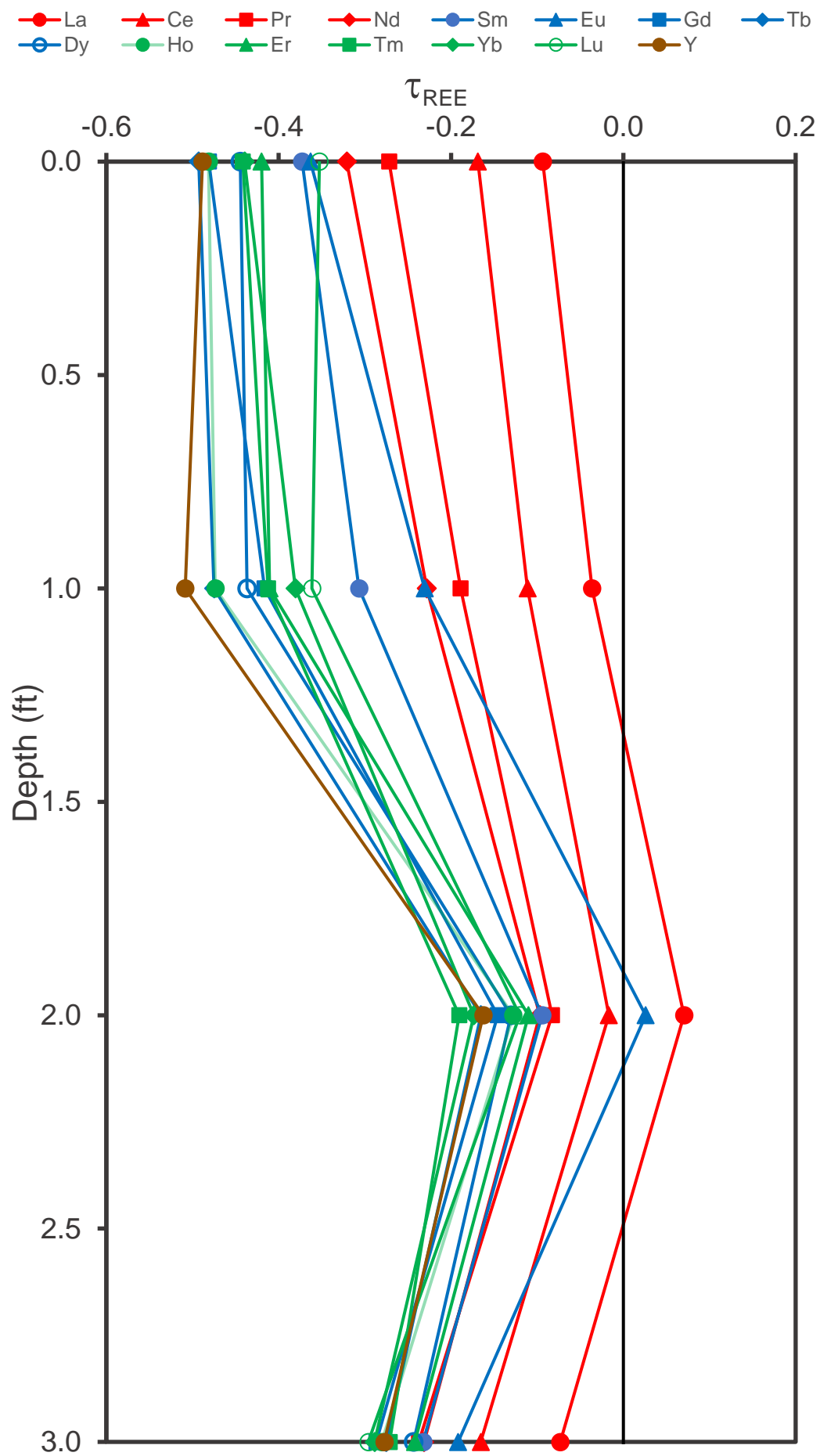


Upper Freeport underclay

Middle Kittanning underclay

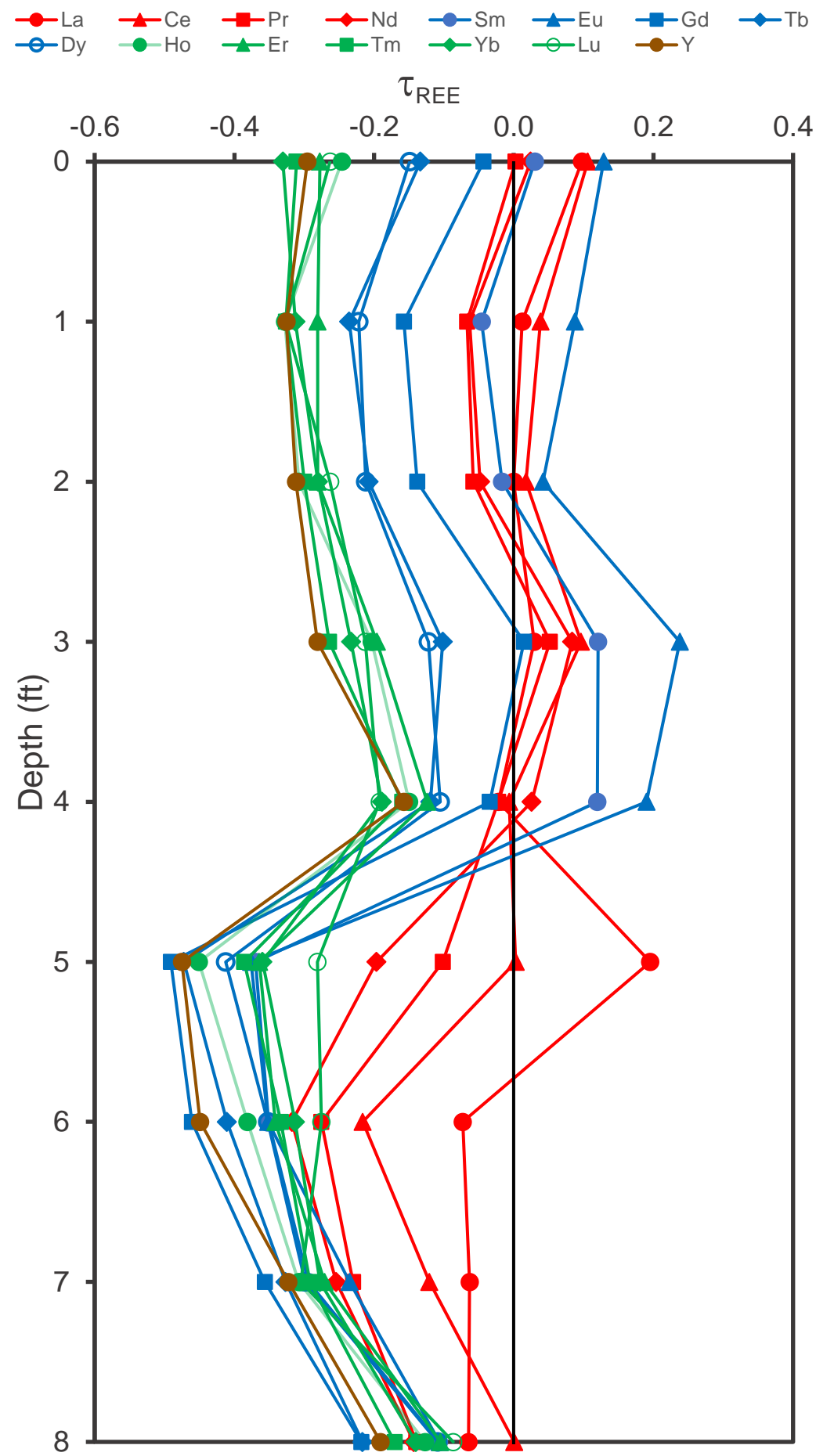
Clarion underclay

OGS-CSH0063



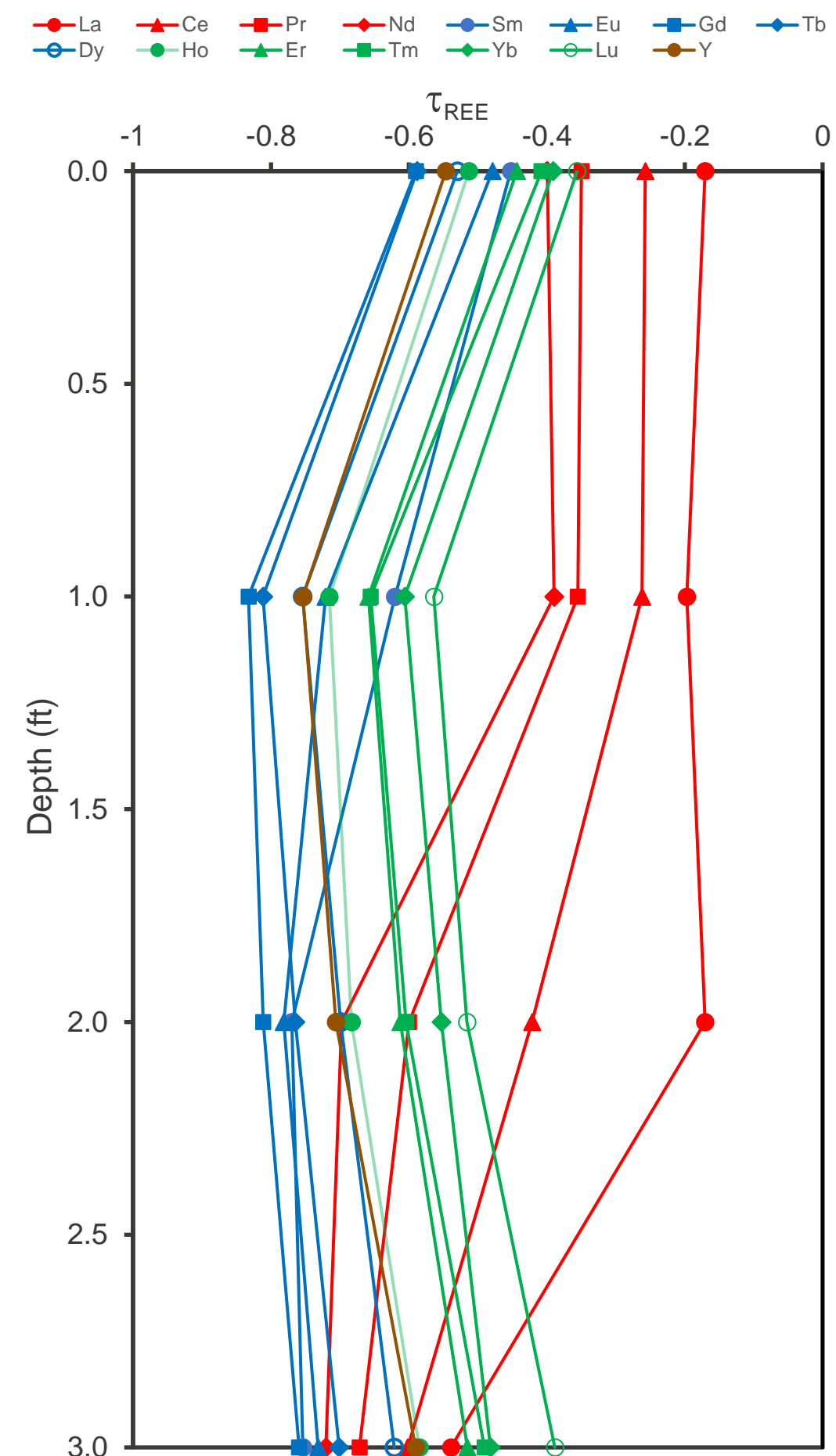
Upper Freeport underclay

OGS-CSH0064



Middle Kittanning underclay

OGS-CSH0066



Clarion underclay