A 16th century cattle horn core assemblage from the site of St. Mary's Guildhall, Lincoln.

by

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Introduction.

The site of St. Mary's Guildhall was excavated in 1973. It lies to the south of the River Witham in the lower portion of the city. The site basically yielded Roman material (which will be described in a separate report), but during excavations on the south range of the Guildhall, new trenches dug to the east of this area revealed a number of later features including a stone-lined pit (Context 2500).

The pit, probably once circular in shape, measured 1.1 by 1.5 metres. Within the void between the stone lining and the sides of the pit there was a vast assemblage of cattle horn cores and fragments of skull which appeared to have been deposited in horizontal layers.

Pottery sherds would seem to suggest a date of sometime during the 16th century for the bone bearing deposits. The one fragment of 13th century pottery in context 2514 is thought to be intrusive. It seems likely that the bones constitute waste from a hornworkers workshop, probably situated nearby. Such deposits are commonly found

at urban excavations (Armitage and Clutton-Brock, 1976, 329-48).

A total of 1,477 bone fragments were retrieved from the pit and identified. In general, the state of preservation of the bone was good though friable, which may account for the large amount of smashed up cattle skull.

It is assumed that all of the bone bearing contexts were basically contemporaneous and therefore, for the purposes of this report, all bones will be discussed together, as one group.

The bones and all copies of all records pertaining to this assemblage will be archived at the Trust for Lincolnshire Archaeology, The Sessions House, Lincoln.

The bulk of the data extracted from this assemblage became the biometry archive. A maximum of four measurements was taken on each horn core depending on the completeness of each individual bone. The measurements were:

1.Length of postero-dorsal (outer) curve (Length).

2.Greatest diameter measured at the base of the core. (GD)

3.least diameter measured at the base of the core. (LD)

4.Basal circumference (BC)

The measurements followed the system first devised by von den Driesch (1976). Table 1. shows the distribution of horn cores throughout the contexts of the pit, and the ratios of mature to immature, and left to right horn cores.

The small amount of bone other than cattle horn core is listed out in Table 2.

Results

A total of 1,113 horn core fragments were recorded, of which it was possible to take measurements from 616 of the more complete specimens. Although no pairing of horn cores was attempted, it is likely that many went into the pit as pairs, attached to the same skull fragment, as the number of right and left horn cores are very similar. (Table 1)

In Figure 1 a simple cross plot was made of the length of the horn core against basal circumference. What it appears to show is a fairly tight correlation up to about length 240mm, at which point there appears to be an ill defined break in the distribution. There seems to be a second group of cattle horn 'type' represented, characterised by a particularly long and slender core (much resembling 'long horn' cattle). It is just conceivable that there is a third horn 'type' represented in between the two groups, but it is more likely that the presence of 'hybrids' within the cattle populations accounts for this.

Figure 2 is a histogram showing the distribution of cattle horn core lengths within class intervals of 10mm. This seems to reinforce the implications of Figure 1 in that the distribution is skewed towards smaller horn cores with a gentle 'tailing off', and some very long individuals represented.

Figure 3. is an attempt to investigate any correlation between size (as represented by the basal circumference) and cross-sectional flattening of the horn cores (as defined by the greatest breadth divided by the least breadth). The result is a spectacular lack of correlation. Despite the size of the sample there appears to be no relationship whatsoever between the two parameters, i.e. the cross-sectional shape of the core is independent of its size. When the index of cross-sectional flattening (i.e. greatest breadth divided by least breadth) is expressed as a histogram (Figure 4) there is great diversity, from virtually circular horn cores with values of about 100, up to elliptical cores with values of up to 170. Figure 3 proves however that this flattening of the core is in no way directly linked to size.

Because this feature produced such an enormous volume of biometrical data of a known date, it stimulated a study of trends and improvements in the husbandry of cattle over many centuries. There already exists a substantial archive of measured cattle horn cores from Roman and medieval sites from the city and St. Mary's Guildhall extends the chronological sequence into relatively recent times.

To make conclusions one must first assume that the morphology of an assemblage of horn cores such as this to some extent reflects the genotype of the cattle represented. Apparent changes in the cattle population, as represented by changes in horn core type can only be surmised, but what one would expect to see is a general increase in the size of cattle over time, which would indicate improvement in stock towards greater yields of meat and milk. One would also expect to find a greater variety in the horn 'type' in the post-medieval period, reflecting this greater tendency towards selective breeding, and the emergence, amongst other breeds, of 'long horn' cattle. Because of the absence of reliable historical records, it is impossible to assess with certainty whether the selective breeding of cattle was being widely practiced before the middle of the 18th century. At around this time, a discrete longhorn breed begins to emerge. Presumably derived from unimproved longhorned stock from the

north and west of the country, its spread southwards and eastwards can be documented chronologically by the archaeological record. Longhorn cattle were bred in the north and west and driven 'on hoof' southwards to be fattened in the South Midlands and Home Counties before being slaughtered for the markets of London and the South. It would, therefore, be surprising to find evidence of the improved longhorn in Lincoln as early as the 16th century (the date of the horn pit assemblage).

This is apparently borne out in Table 2 which summarises cattle horn core size in Lincoln during the Roman through to Medieval periods (from sites studied by the author). What this reveals is an increase in length and size (as represented by basal circumference) from Roman to Medieval times. However, even the 16th century material from St. Mary's Guildhall falls far short of the minimum size limits for improved longhorns as defined by Armitage (1978). There were a number of horn cores with length in excess of 250mm which represent the emergence of a 'longer horned' type of cattle, but rather than a discrete group, it appears to be an upwards extension of the existing size range. Thus, it would seem that during the 16th century in Lincoln there appears to have been some development of the local stock. The minima of horn core lengths and basal circumferences do not fluctuate significantly over time. It is the maximum values that increase during the medieval period which suggests that some selective breeding of cattle was taking place leading indirectly to increased horn size.

Although a direct link between horn size and body size is impossible to establish, it seems likely that cattle were being bred specifically for an increased milk or meat yield, and the resulting increase in horn core size was a by-product of this selective breeding. It is however, important to stress that these larger horned individuals are not the stock from which true Longhorn cattle were later developed, merely larger horned versions of the local stock.

This confirms the known historical record which documents the spread of true Longhorns southwards across the country, and suggests that only by the mid to late 17th. century had they reached the Midlands (e.g. a large assemblage of horn cores from Hertford Castle of late 17th century date, the vast majority of which were Longhorns).

This large 16th century assemblage from Lincoln proves that by this date, the movement south of Longhorns had not reached the East Midlands, although development of local stock had resulted in increased variation in horn size and form. This provides a useful archive with which to compare other medieval and post-medieval groups of horn cores.

It is hoped that a late or post medieval group of horn cores from York or its hinterland may become available for study which may show whether early Longhorn stock appear earlier in the archaeological record in the more northerly market towns of England than in the East Midlands.

References

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Table 1 - The distribution of horn cores from Pit 2500 from St. Mary's Guildhall.

Context	Right		Left		Unknown
	Mature	Immature	Mature	Immature	
2514	222	22	218	9	341
2501	111	11	101	11	56
2512	7	2	7	3	0
+	6	1	9	2	4
Totals	346	36	335	25	401

Table 2 - A list of the carcass components excluding cattle horn cores from the site of St. Mary's Guildhall.

Context 2514			
Cattle	Sheep		
Skull=264	Horn core=2		
Vertebrae=1			
Humerus=1			
Context 2561			
Cattle	Sheep	Fue deer	Goose
Skull=43	Horn core=1	Metatarsal=1	Femur=1
Mandible=1	Rib=1		
Pelvis=1	Humerus=1		
Tooth=1			
Context 2512			
Cattle	Sheep	Cat	
Rib=1	Tibia=1	Tibia=1	
Skull=7			
Phalanges=1			
Pelvis=1			
Metapodium=1			
Context +			
Cattle			
Skull=2			

Table 3 - The size of cattle horn cores from a variety of sites in Lincoln

Site	Phase	Length	Basal circum.
1.St. Marks	Roman	Range: 99-210 N. 14 Mean: 138.9	95-202 39 145.2
2.Holmes Grainwarehouse	Roman	Range: 103-183 N. 7 Mean: 139.3	124-155 15 137.9
3.The Park	Late Roman	Range: 105-262 N. 27 Mean: 155	95-206 83 140.3
4.Holmes Grainwarehouse	Medieval	Range: 114-243 N. 4 Mean: 184.5	117-204 37 146.9
5.Lucy Tower St.	Early Medieval	Range: 128,166 N. 2 Mean: -	118-157 3 137.5
6.West Parade	Medieval	Range: 129 N. 1 Mean: -	106,125 2 -
7.St. Mary's Guildhall	Late Medieval	Range: 110-365 N. 232 Mean: 185.5	94-250 610 171.1

Figure 1 - Scattergram showing Length plotted against Basal Circumference

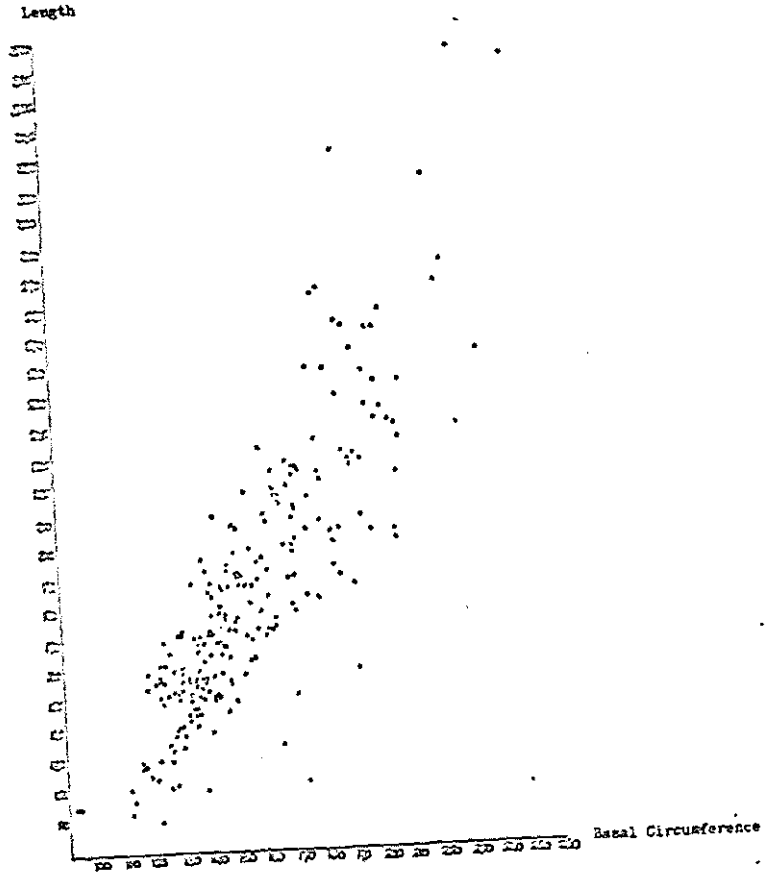
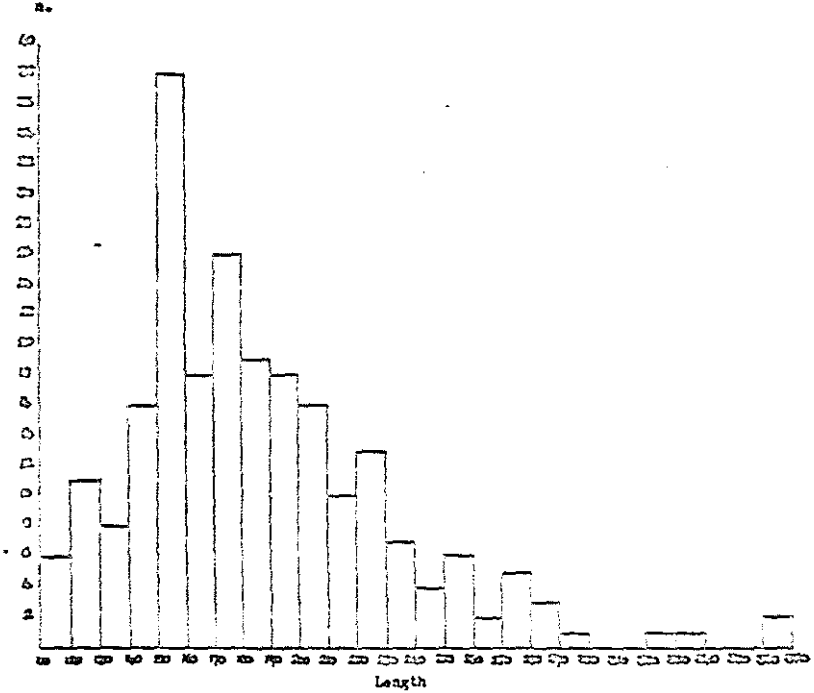


Figure 2 - Histogram showing the distribution of cattle horn core length



gure 3 - Scattergram showing the association between basal circumference and the cross-sectional flattening of the horn core.

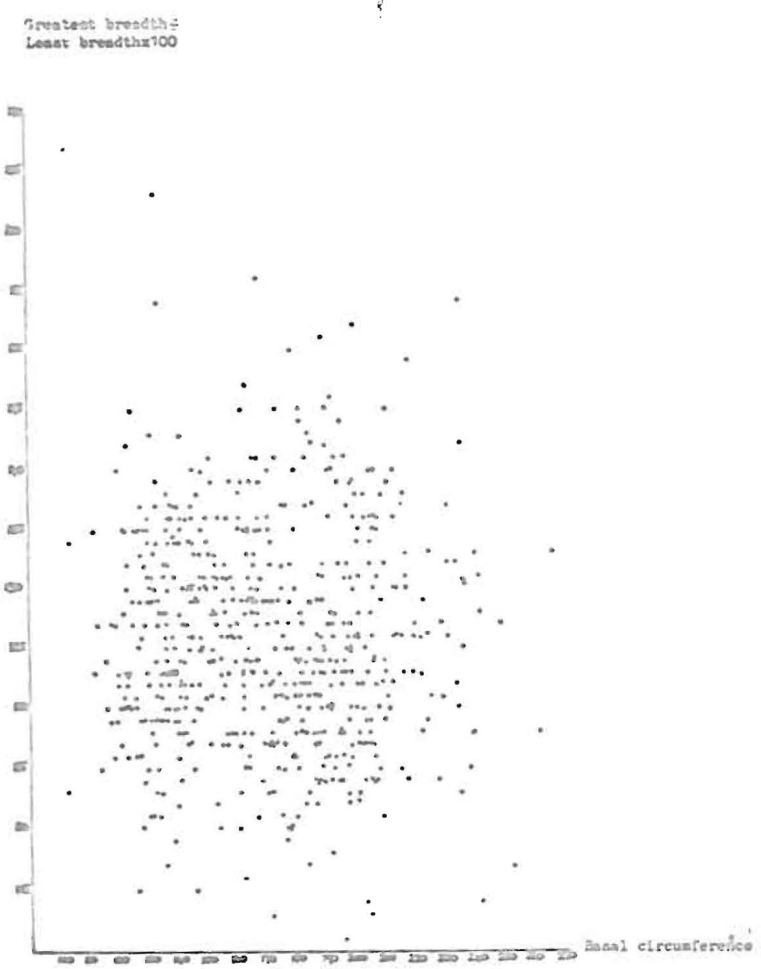
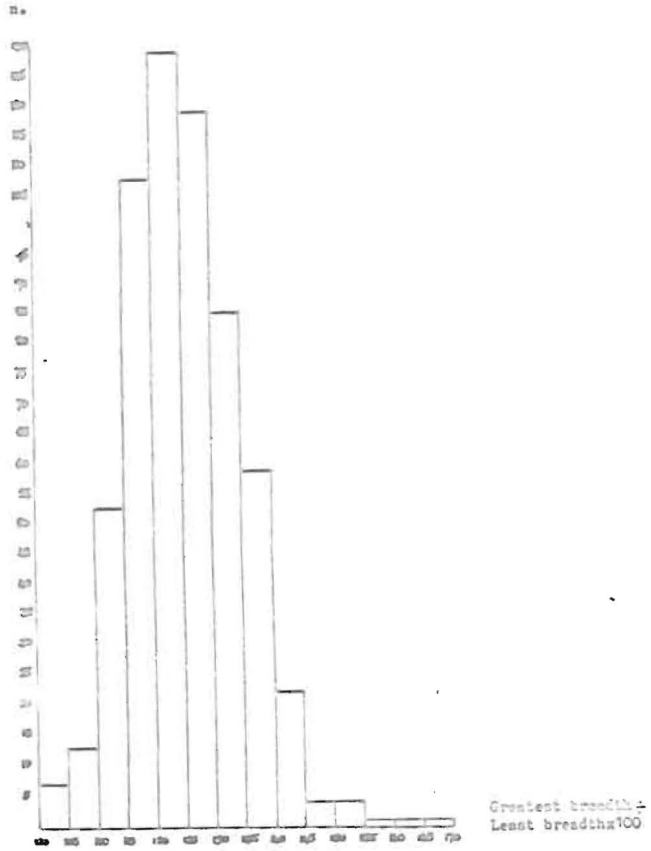


Figure 4 - Histogram showing the range of basal dimensions of cattle horn cores



Cattle Horn Core Measurements

Context	F/L	Length	SD	BD	HC
*	R	323	75.6	60.2	221
*	L	255	71.1	57.2	210
*	R	165	15.9	30.8	111
*	L	122	15.1	33.0	120
*	L	-	17.9	35.4	130
*	R	272	64.3	54.6	202
*	L	-	71.8	59.3	216
*	R	-	59.5	46.1	171
*	L	-	65.4	56.3	197
*	L	-	59.1	62.4	211
*	L	-	63.6	41.4	165
*	L	-	17.7	36.2	110
*	L	172	19.0	38.6	114
*	R	150	51.9	38.8	150
2512	L	193	60.6	48.6	179
2512	L	210	61.8	54.7	195
2512	R	224	60.4	45.9	172
2512	R	172	48.5	36.2	141
2512	L	-	64.2	48.6	180
2512	L	332	66.9	53.4	198
2512	R	-	11.6	33.6	132
2512	R	191	51.4	37.9	151
2512	L	-	64.6	51.1	189
2512	L	-	55.7	47.6	172
2512	R	-	31.4	29.6	120
2512	R	139	46.7	36.2	141
2512	L	189	45.4	37.6	135
2501	L	365	81.5	59.5	232
2501	L	-	66.5	52.6	202
2501	R	247	64.1	53.7	196
2501	R	-	70.3	52.7	210
2501	R	221	69.3	61.6	208
2501	L	171	53.1	36.7	130
2501	L	-	56.9	46.3	167
2501	R	-	-	54.7	-
2501	L	229	58.6	44.9	176
2501	L	206	57.0	43.7	170
2501	L	236	62.7	46.2	180
2501	L	-	66.1	56.5	199

2501	R	157	39.5	31.1	123
2501	R	273	72.2	40.3	191
2501	R	205	63.1	40.3	184
2501	R	-	55.2	43.8	163
2501	R	-	35.0	33.9	137
2501	R	110	37.0	35.6	121
2501	L	272	67.6	54.1	190
2501	R	160	40.9	30.6	115
2501	L	-	62.5	47.5	170
2501	R	-	37.1	32.2	111
2501	L	103	52.9	39.9	148
2501	R	125	40.9	32.2	110
2501	L	184	53.0	-	-
2501	R	-	34.6	32	133
2501	L	-	67.3	56.3	203
2501	L	-	79.6	61.7	220
2501	L	-	67.9	50.0	203
2501	L	-	68.5	57.6	224
2501	R	-	71.1	59.3	208
2501	L	-	63.7	55.7	195
2501	R	218	52.2	41.0	166
2501	L	104	61.3	51.3	185
2501	R	141	52.0	36.5	130
2501	R	-	65.2	57.6	202
2501	R	-	55.0	43.6	150
2501	R	-	73.1	55.3	194
2501	L	-	76.5	60.9	232
2501	L	-	52.0	40.1	159
2501	L	219	53.2	43.9	155
2501	R	-	57.0	32.1	134
2501	L	179	51.7	42.6	150
2501	R	-	47.9	39.7	141
2501	R	-	39.9	32.7	120
2501	R	-	41.7	33.9	129
2501	L	-	55.6	46.1	175
2501	L	150	36.6	30.3	134
2501	L	-	47.1	33.5	130
2501	L	151	46.1	38.3	117
2501	L	115	37.3	22.3	103
2501	L	-	50.3	37.9	146
2501	R	-	51.8	42.2	158
2501	R	-	64.6	53.7	191
2501	R	-	57.0	-	165
2501	R	134	45.7	37.2	165
2501	R	133	42.5	33.9	177
2501	R	-	62.2	51.6	170
2501	L	191	62.5	51.3	187
2501	L	-	66.7	55.0	198
2501	L	159	67.1	40.2	192
2501	L	-	67.1	53.2	198
2501	L	-	76.1	63.9	225

2501	L	-	61.6	51.1	190
2501	L	-	66.1	55.1	190
2501	L	-	77.1	61.4	223
2501	R	-	66.1	53.2	192
2501	R	-	81.4	61.6	235
2501	R	-	61.1	61.0	197
2501	R	-	77.1	74.3	213
2501	R	-	79.1	60.1	239
2501	R	-	77.7	57.1	237
2501	R	-	73.1	59.1	217
2501	L	-	71.3	56.1	210
2501	L	-	77.9	59.2	213
2501	L	226	59.1	46.0	174
2501	L	-	43.5	37.5	133
2501	L	-	51.9	42.7	161
2501	L	124	37.1	32.1	121
2501	L	-	47.3	38.9	142
2501	L	-	56.2	46.9	164
2501	L	170	42.5	32.9	125
2501	L	215	57.9	44.0	167
2501	L	190	56.3	40.1	158
2501	R	-	63.5	54.7	193
2501	R	-	49.4	36.8	144
2501	R	117	46.1	34.9	130
2501	R	-	57.1	52.8	177
2501	R	-	43.1	37.2	132
2501	R	115	42.7	37.3	133
2501	R	159	43.2	36.6	131
2501	R	-	67.5	55.1	199
2501	R	-	63.8	61.1	204
2501	R	-	41.6	37.2	136
2501	R	153	46.6	40.2	140
2501	L	-	85.1	63.2	247
2501	R	128	37.3	31.1	116
2501	R	-	48.5	42.2	146
2501	R	-	73.2	58.7	217
2501	R	-	51.3	39.4	151
2501	L	-	62.6	47.6	178
2501	L	-	56.9	47.6	171
2501	L	-	57.1	43.3	160
2501	L	-	66.9	53.9	194
2501	L	-	51.5	49.2	167
2501	L	-	72.1	47.6	201
2501	L	-	43.2	38.9	141
2501	L	-	51.0	44.7	162
2501	L	-	67.7	50.1	206
2501	[illegible]	166	47.7	35.6	137
2501	L	-	65.0	54.1	192
2501	L	-	62.5	49.4	172
2501	L	-	52.2	40.0	116
2501	L	-	71.1	52.4	207

2501	L	-	73.7	59.0	212
2501	L	-	61.3	52.6	172
2501	L	-	77.1	56.6	212
2501	L	-	45.1	38.2	130
2501	R	202	71.9	57.6	207
2501	R	-	61.8	51.1	190
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2501	R	-	66.2	53.3	190
2501	R	-	39.6	32.4	123
2501	R	-	60.0	51.1	180
2501	L	206	59.9	52.6	193
2501	L	-	55.2	42.9	168
2501	L	172	41.3	33.1	130
2501	L	-	57.7	40.9	167
2501	L	205	68.1	54.0	193
2501	L	173	51.9	44.1	163
2501	L	168	52.2	37.9	110
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2501	L	-	62.8	52.9	180
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2501	R	-	41.0	32.1	123
2501	R	-	78.3	65.1	235
2501	R	157	44.1	30.0	[illegible]
2501	R	-	71.3	61.7	232
2501	R	156	41.0	32.1	122
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2501	R	-	43.0	30.1	131
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2501	L	138	43.3	33.5	128
2501	L	115	36.2	27.1	104
2501	L	-	58.8	46.3	174
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174	52.1	38.0	145
-	65.5	53.9	196
-	51.8	46.3	157
165	49.3	37.8	145
-	73.1	52.1	207
-	61.7	52.0	193
-	52.6	44.4	158
138	41.6	34.2	131
173	52.2	39.7	146
141	46.0	38.2	136
-	81.7	71.1	260
-	51.9	47.2	164

2514	N	-	62.1	53.1	186
2514	N	-	56.8	51.6	190
2514	R	-	55.9	41.2	161
2514	R	-	75.7	52.2	212
2514	R	-	74.7	60.6	226
2514	R	211	56.1	51.9	178
2514	R	-	55.6	49.2	171
	R	-	71.1	53.1	206
	A	226	55.3	44.7	165
	A	-	62.3	45.6	177
	A	-	41.7	35.2	129
	A	209	56.8	43.3	162
	A	-	46.4	35.1	134
	A	-	50.9	46.1	176
	A	-	61.0	49.9	190
	A	249	58.6	46.3	181
	A	-	62.7	51.1	199
	A	-	62.8	50.1	192
	A	-	44.0	34.9	136
	A	-	60.1	52.3	198
	A	-	73.1	54.2	207
	A	-	66.1	52.0	192
	A	-	62.7	55.1	197
	A	-	57.3	43.0	166
	A	-	60.7	47.7	230
	P	-	70.3	56.7	207
	P	173	50.3	40.1	162
	P	-	77.5	58.3	216
	P	197	55.1	43.3	160
	P	-	67.7	47.7	181
	P	202	65.0	50.2	195
	P	-	55.8	42.0	164
	P	163	49.5	40.2	155
	P	229	61.5	54.9	191
	P	-	56.2	50.6	175
	P	-	40.2	37.7	139
	P	-	41.9	37.4	141
	P	-	63.5	49.7	192
	A	151	55.6	47.7	171
	A	-	52.3	39.3	153
	A	-	63.5	51.4	188
	A	-	50.4	39.4	149
	A	-	71.6	55.9	200
	A	201	57.6	42.6	168
	A	-	67.1	52.1	-
	A	179	52.9	40.5	156
	A	-	47.9	36.2	129
	A	-	57.6	40.1	144
	P	140	42.9	37.1	129
2514	P	146	52.1	37.9	147
2514	P	156	47.6	35.8	134

2514	R	-	52.2	41.1	143
2514	R	240	71.1	53.0	209
2514	R	152	51.9	34.2	136
2514	R	-	51.7	35.2	133
2514	R	-	-	40.7	150
2514	R	287	76.0	59.7	224
2514	R	-	66.1	54.1	201
2514	R	172	35.1	35.1	130
2514	R	272	65.5	52.1	199
2514	R	-	71.8	52.2	201
2514	R	242	65.4	50.2	201
2514	L	-	33.3	33.9	122
2514	L	-	62.7	54.7	193
2514	L	-	59.2	51.2	178
2514	L	-	69.5	52.9	197
2514	L	-	39.3	40.0	147
2514	L	-	56.6	46.3	169
2514	L	191	39.5	42.1	151
2514	L	200	52.7	40.7	156
2514	L	-	79.2	66.0	246
2514	L	-	62.3	55.3	190
2514	L	-	36.0	37.6	137
2514	L	-	61.6	54.0	192
2514	L	-	66.1	55.9	196
2514	L	-	72.6	49.0	207
2514	L	-	41.2	35.6	127
2514	R	-	52.9	40.7	153
2514	R	135	39.0	33.0	126
2514	R	161	41.9	31.3	131
2514	R	-	52.9	45.0	160
2514	R	172	37.2	39.2	142
2514	R	173	35.0	35.3	132
2514	R	170	59.4	46.2	171
2514	R	-	71.2	54.0	206
2514	R	-	36.9	36.4	130
2514	R	157	30.0	35.0	130
2514	L	-	59.3	45.8	170
2514	L	205	72.7	57.7	207
2514	L	162	33.3	34.1	125
2514	L	156	36.7	37.2	139
2514	L	150	39.0	39.0	138
2514	L	-	33.5	32.2	122
2514	L	-	61.6	49.7	184
2514	L	-	56.6	43.5	169
2514	L	227	59.2	48.0	173
2514	R	150	39.0	38.7	142
2514	R	210	52.7	47.0	161
2514	R	-	59.3	38.6	145
2514	R	-	51.6	41.0	164
2514	R	117	39.2	30.3	113
2514	R	-	52.7	45.0	161

2514	R	-	64.9	52.6	187
2514	R	-	65.3	47.8	176
2514	R	-	64.4	51.0	193
2514	R	-	64.9	42.9	179
2514	R	260	62.6	45.1	168
2514	R	-	57.1	42.3	163
2514	R	188	52.9	38.9	140
2514	R	-	75.9	54.4	214
2514	L	261	85.5	62.2	237
2514	L	193	44.6	37.6	140
2514	L	-	67.3	43.1	169
2514	L	220	54.0	46.4	165
2514	L	-	65.9	57.3	199
2514	L	214	55.7	50.6	172
2514	L	156	42.0	37.7	131
2514	L	-	43.0	33.1	123
2514	L	158	54.4	41.1	153
2514	L	158	42.9	33.2	123
2514	L	141	43.2	35.1	130
2514	L	-	62.2	43.1	177
2514	L	-	92.6	75.5	254
2514	L	-	51.4	41.1	158
2514	L	191	57.1	46.8	171
2514	L	192	49.8	40.3	151
2514	L	217	50.8	48.5	177
2514	L	-	73.8	56.2	218
2514	R	-	68.7	60.5	206
2514	R	173	53.3	40.7	152
2514	R	160	47.0	33.9	128
2514	R	129	38.8	32.6	117
2514	R	159	49.7	36.6	145
2514	R	157	43.2	35.9	139
2514	R	-	46.5	36.0	133
2514	R	192	51.0	42.0	151
2514	R	-	61.0	43.6	171
2514	R	207	51.9	40.6	152
2514	R	-	63.6	52.5	199
2514	R	-	45.9	40.2	140
2514	R	-	72.7	59.9	212
2514	L	-	55.1	44.7	167
2514	L	-	59.9	52.4	183
2514	L	-	53.8	50.0	180
2514	L	-	43.9	30.3	125
2514	L	-	71.6	53.9	210
2514	L	-	73.4	53.4	207
2514	L	189	48.2	37.1	132
2514	L	177	51.7	41.2	151
2514	L	-	57.2	41.3	165
2514	L	-	64.9	52.7	182
2514	L	211	43.2	33.6	134
2514	L	-	72.3	51.1	200

2514	L	-	58.3	43.2	164
2514	L	-	64.3	44.6	132
2514	I	258	67.2	54.0	197
2514	I	-	68.6	58.8	207
2514	P	-	61.6	47.3	193
2514	E	-	58.8	50.6	191
2514	P	158	42.3	39.3	112
2514	P	-	39.1	35.6	133
2514	T	-	61.3	51.8	183
2514	I	-	67.2	53.1	197
2514	L	-	71.6	64.8	213
2514	L	191	51.5	40.6	153
2514	L	-	41.1	33.9	156
2514	L	-	71.7	59.2	217
2514	L	-	73.2	56.3	214
2514	I	-	65.9	50.2	191
2514	I	163	46.7	39.1	139
2514	L	-	47.7	38.1	154
2514	L	-	75.9	61.7	223
2514	L	188	53.6	48.9	146
2514	L	-	73.6	59.2	217
2514	L	-	65.8	53.3	186
2514	L	-	58.3	48.6	169
2514	R	153	44.9	33.4	129
2514	R	231	56.1	46.8	161
2514	R	-	68.1	49.3	195
2514	R	113	41.1	36.3	133
2514	R	222	61.1	49.1	181
2514	R	166	44.8	38.3	137
2514	A	213	56.6	48.1	172
2514	A	130	41.5	32.5	120
2514	A	-	39.1	37.7	127
2514	A	227	68.1	48.3	192
2514	A	78	39.1	37.2	112
2514	A	187	66.2	53.0	192
2514	I	-	67.7	56.7	205
2514	L	-	52.6	41.1	161
2514	L	156	47.3	36.1	130
2514	L	-	51.7	44.1	156
2514	L	-	73.6	63.5	204
2514	L	-	79.3	64.1	235
2514	P	-	61.1	56.3	192
2514	P	120	37.2	35.2	116
2514	E	117	45.9	35.9	135
2514	E	150	39.7	31.2	119
2514	E	-	43.7	36.2	137
2514	P	221	56.0	46.9	176
2514	P	-	50.1	45.5	167
2514	P	-	56.9	46.3	162
2514	I	151	47.1	40.1	141
2514	I	121	33.1	26.9	112

2514		173	19.3	30.9	150
2514		162	12.9	31.1	129
2514		-	75.4	64.0	229
2514		-	75.2	59.1	221
2514		284	61.1	50.9	191
2514		-	71.6	55.2	206
2514		-	65.5	43.2	156
2514		-	59.9	50.3	177
2514		-	59.9	51.3	191
2514		-	51.7	48.6	183
2514		-	71.4	56.9	201
2514		-	59.2	35.1	112
2514		-	41.1	36.3	134
2514		-	57.3	47.1	176
2514		151	41.7	31.5	123
2514		-	55.7	42.5	161
2514		-	45.1	35.5	136
2514		-	49.9	42.7	156
2514		-	66.6	53.9	199
2514		-	59.9	50.3	176
2514		-	53.7	41.8	162
2514		190	61.2	53.7	169
2514		-	42.1	37.1	134
2514		-	41.3	32.9	130
2514		-	52.7	40.2	163
2514		197	47.2	39.6	139
2514		152	55.9	39.6	134
2514		110	49.3	32.1	122
2514		169	49.9	38.6	146
2514		187	49.1	40.9	146
2514		196	54.6	43.3	156
2514		113	39.1	29.9	112
2514		-	60.1	47.9	176
2514		-	61.7	56.3	193
2514		155	49.9	39.9	143
2514		-	54.1	45.9	162
2514		-	58.1	45.9	157
2514		-	61.1	46.9	166
2514		-	61.1	53.2	184
2514		-	70.3	60.9	208
2514		225	59.1	49.1	161
2514		-	81.4	65.9	237
2514		-	72.6	59.1	196
2514		-	69.3	53.2	194
2514		159	36.9	33.7	130
2514		-	55.7	45.2	162
2514		139	54.2	43.9	154
2514		131	63.9	36.1	130
2514		-	51.7	36.3	106
2514		-	63.5	52.9	183
2514		178	19.2	40.6	142

2514	I	265	66.7	72.0	193
2514	I	-	11.1	35.0	133
2514	I	-	61.1	49.4	170
2514	I	259	59.1	55.3	191
2514	I	181	51.3	31.6	162
2514	I	-	63.6	49.6	132
2514	R	-	39.0	76.1	263
2514	R	-	52.0	42.0	152
2514	I	170	18.3	41.5	146
2514	R	155	52.0	37.2	140
2514	R	-	57.1	41.7	169
2514	R	-	50.7	37.2	143
2514	R	216	67.7	66.6	203
2514	R	-	59.3	45.6	172
2514	I	275	61.7	58.3	189
2514	R	362	81.8	70.9	250
2514	R	278	71.0	52.0	201
2514	R	152	19.2	31.5	126