Rm1 FROM THE DEE/HUMBER TO THE SOLWAY/TYNE; AD79

THE ROMAN DISPOSITION OF FORTRESSES AND FORTS

SYNOPSIS

The normal interpretation of "*De Vita Agricolae*[1]" written by "*Cornelli Taciti*" which is the history of the Roman conquest of Britannia is that after subduing the south and midlands, the land either side of the Pennine Chain was to be subdued by a two prong assault from Chester and York. This two fold assault required cross Pennine contact via valleys and passes with the forts strategically and locally positioned. The positioning of these forts illustrates Roman Military survey skills which have not been explained by extant Roman literature.

This paper illustrates the survey and planning by the Roman Army and indicates that a large slice of technical history is missing from the extant manuscripts.

THE HISTORIANS DESCRIPTIVE TEXTS **Diagram Rm1D01**

1] R M Ogilvie and Sir Ian Richmond, OUP 1967 and 1983, pp55/57[1] quote,

"The nature of the conquest of the Brigantes by *Cerialis* is shadowy, and has not yet been fully determined by archaeology. He is described as 'having embraced a large part' of them 'by victory or warfare'. While the campaigning can be traced to the stronghold of Stanwick, near Catterick, and beyond it across Stainmore to Carlisle, where pottery has been claimed, and denied, to betoken pre-*Agricolan* occupation, permanent dispositions in Lancashire, West Yorkshire, Westmoreland, and Cumberland are recognizable as *Agricolan*. Pottery and structures of this period have been noted from at least 28 forts ranging from North Yorkshire to the Tyne and from the Mersey to the Eden. Only Brough on Humber, Malton [N Riding], and York emerge as securely tied to *Cerialis,* as if his permanent occupation had enveloped or protected the *Parisi* of East Yorkshire, shielding them by a legionary fortress which was to be the base for subsequent extension of the permanent system. The 28 forts marked on the map are certainly not a complete total, for numerous sites have not yet yielded the requisite evidence, and it might be thought that at least 10 more were involved, making 38 in all. The system was a simple one: the principle lines of communication were seized and patrolled and tribal movements, even in insignificant numbers, were paralysed. That is what is meant by the phrase used in connexion with the consolidation of AD 79, *Civitates… praesidiis castellisque circumdatae*, following *Agricola's* second campaign".

2] Sheppard Frere, R & K P Ltd 1967 and 1974 pp123/125[2] quote,

"Tracing the course of *Agricola's* six campaigns in the north has always been a matter of considerable difficulty, owing to the scarcity of topographical information given us by *Tacitus.* His account can, however, be supplemented by the evidence of archaeological discovery and especially of aerial photography, both of which have yielded a rich harvest. In 79 the advance northwards was begun. The only indications of its direction and extent given by *Tacitus* are the statement that *Agricola* himself chose the sites of camps and he himself reconnoitred estuaries and forests, and the information that the following years campaign ended at the Tay. Though personal reconnaissance of estuaries and forests is a stock attribute of good generals in Roman literature, it does suggest the western rather than the eastern side of the Pennines: and there is, in fact, no evidence that *Cerialis* had ever overrun this difficult area. The plan of campaign may have involved two parallel columns, one marching north from York and the other from Chester, contact being made from time to time across the passes. This is a deduction from the road system which *Agricola* soon established, no doubt on lines now explored, and it is one which suits the geography of North Britain. The roads were necessary to link the forts which, as we shall see, he established as he advanced. No doubt *Agricola* himself led the western column, giving the place of honour to his own division, *Legio XX*."

3] Peter Salway, OUP 1993 pp93[3] quote,

"*Cerialis* brought with him a fresh legion to replace the Fourteenth. This was *II Adiutrix,* newly formed during the civil wars. It was put into garrison at Lincoln, while *Cerialis* took his own old command, the hardened Ninth, forward into Brigantian territory. There it was eventually established in a

brand new fortress at York. In the meantime it became the spear head of *Cerialis'* campaigns. Traces are thought to have been identified at Brough-on-Humber, Malton, York, at the British fortification at Stanwick, near Richmond, in marching camps in the Stainmore Pass, and at Carlisle. We may imagine a strategy that moved the main force across the Humber, established a hold on eastern Yorkshire, and planned a pincer movement on the south Pennines. *Cerialis* will have advanced up to the Stainmore Pass to meet the Twentieth legion, under *Agricola,* moving up the western side of the country. The final stage would have been a probe at least as far north as Carlisle, with the whole army now united."

The landscape positioning of the forts can explain and change that perception.

STRATEGIC PLACEMENT OF LEGIONARY FORTS

Diagrams Rm1D02, Rm1D03, Rm1D04/5, Rm1D04/5, Rm1D06

From the original invasion port on the South Foreland, *Rutupiae*, the Legions spread throughout Britannia establishing fortresses capable of accommodating up to and including a full strength Legion. The position of each Fort can be indicated upon a map of Britannia utilizing the Ordnance Survey [O S] co-ordinates for each site and from these co-ordinates the direct inter distances can be calculated.

The Legions were dispersed throughout southern Britannia and the midlands, with Legionary Fortresses built at; *Camulodunum* (Colchester): *Isca Dumnoniorum* (Exeter): *Glevum* (Gloucester): *Viroconium Cornoviorum* (Wroxeter) and *Lindum* (Lincoln).

These fortresses vary from 63Rm to 226Rm direct distance apart. However, the basis of the original planning only becomes evident when marked similarities of distance are noted;

Exeter to Gloucester	104.89 Roman miles [Rm]
Wroxeter to Lincoln	104.68 Rm
Wroxeter to Gloucester	63.64 Rm
Dover/Cant. Prom to Colchester	60.624 Rm
Colchester to Lincoln	120.66 Rm

The phase two disposition of Legionary Fortresses, *Deva* (Chester) and *Eburacum* (York) produces these similarities;

Lincoln to York	59.91 Rm
Wroxeter to York	120.08 Rm
Lincoln to Chester	106.28 Rm
Chester to York	99.70 Rm

The important distances that become apparent from the foregoing data are thus c60 Roman miles and c105 Roman miles, with a large grouping of 25/50 Roman mile multiples. This data is abstracted from all of the possible inter related distances, fortress to fortress, as the diagrams illustrate.

The 50 Roman mile unit may be ascribed to the 10 mile , 12 hour, 2 Legion column on the march, as sourced from Caesar's *' de Bello Gallico*, II 17-28[4],' and the 60 Roman mile unit from a similar 12 mile , 12 hour, single legion column.

The Roman surveyors would have had a similar methodology to describe the dimensional disposition from fort to fort as we would utilize today. There were no angular bearings or compass bearings available to the Roman surveyors. From true north the description of another site would have been, for example, so far east and then so far north, the Tangent Ratio and this in all probability would have been based upon simple whole number ratios. Thus it must also have been grid based upon the major compass or sun points. Therefore any map which had Lincoln, Wroxeter, Colchester, Gloucester and Exeter Fortresses plotted thereon would have shown, for example, and have been very evident, that the direct lines Lincoln to Wroxeter and Colchester to Exeter were parallel and c120Rm apart. With Ordnance Survey [O S] angles of 24.13 and 23.34 Degrees, this is a calculated deviation of 0.79 degrees, which could not have been recognized as a deviation, given that the scale of map would have been equal to, or less than, the O S 1: 1,000,000 scale map of Roman Britain. Add to this the fact that the line Cantium Prom/Portus Dubris to Colchester is an angle of 23.95 degrees, distance 60.624 Roman miles and is thus a perpendicular to those lines, we see a northwesterly progression of distances based on 60 Roman mile multiples and southwesterly parallels.

Thus when we research the inter-distances of non-strategic fort placement, i.e. local forts which were established within separate campaigns, and, we find similar survey data applicable, we must consider the whole military survey strategy of the Roman Army.

FROM YORK TO CARLISLE AND THE CUMBRIAN LITTORAL

Diagrams, Rm1D07, Rm1D08, Rm1D09, Rm1D10, and Rm1D11 refer.

The obvious route, which is reasonably direct from York, is, Catterick, Brough, Brougham, Carlisle and thence around the western coast travelling in a southerly direction towards Ravenglass. This is the route possibly taken by the *Legio IX Hispana*. But we are informed that *Agricola* and the *Legio XX* probably came north from Chester and thus there was a meeting point at Brougham!

This is not really borne out by the landscape data which can be assessed from the positioning of the forts and the use of river valleys. It would appear that the first and probably easiest original contact between the two legions was via Wharfedale.

From York to Newton Kyme on the River Wharfe it is only 11 Roman miles and as such this fort may be considered an outpost for York, the Legionary Fortress. But, the next forts, Adel and Ilkley are similar distances apart and therefore point to a protected route across the southern Pennines to Elslack and the west. [Diagram Rm1D07]

However it would seem to be more important than that when the landscape positions are examined. From Newton Kyme fort via Ilkley fort to Elslack fort is a journey along the Wharfe valley and the over Rombalds Moor. *That journey is precisely 36 Roman miles in length and is also a direct and straight line!* The survey from Newton Kyme to Ilkley along Wharfedale is not particularly onerous, but from Ilkley to Elslack, the sudden climb up onto the moor, then across Airedale to Elslack would have required alignment skills and of course to achieve the resulting line a survey prior to the positioning of the forts. From Elslack, Ribblesdale would have allowed easy access to the marching route of *Legio XX* near Overborough fort. However, Elslack appears to be more than just a fort upon a cross Pennine communication route between the two Legionary forces. It appears to be the survey node for the whole locality.

From Elslack to Overborough is 27.5 Roman miles; Elslack to Bainbridge is 27.5 Roman miles and Overborough to Ribchester is also 27.5 Roman miles. Thus we have either two isosceles triangles or a parallelogram in the landscape. However, Overborough to Bainbridge is 24 Roman miles and Elslack to Ribchester is 21 Roman miles, [requiring a 3Rm movement west for a perfect parallelogram]. The Roman roads of the area illustrate the final routes chosen, but, the surveyors/Agrimensors data is conclusive, illustrating a full and formal survey prior to the situating of forts in their final landscape positions.

If we now follow the main force of the *Legio IX Hispana* northwards from York, Aldborough is 16.63Rm and Catterick 40Rm direct distance; by road the distance increases to 42Rm. From Catterick, the Stainmore Pass via Bowes to Brough and thence the Eden Valley to Carlisle is the Legions route. The direct distances are as follows; Catterick to Carkin Moor, 7.56Rm; Carkin Moor to Bowes, 11.43Rm; Bowes to Brough, 13.63Rm; Brough to Kirkby Thore, 13.06Rm; Kirkby Thore to Brougham, 6.93Rm; Brougham to Old Penrith, 7.2Rm; Old Penrith to Wreay, 8.29Rm and Wreay to Carlisle is 5.16Rm.

However, we should also complete the route of the *Legio IX Hispana*, by cataloguing that Catterick to Bainbridge is 20.2Rm, Bainbridge to Brough is 19.06Rm, and on the eastern flank, Catterick to Binchester is 21.77Rm, Binchester to Ebchester is 17.92Rm and Ebchester to Corbridge is 10.34Rm. Then to complete the circuit, Corbridge to Carlisle is 39.95 Roman miles, [calculated distances].

Similarities abound, but it is not until the sites are plotted upon the map that the survey notation becomes so very apparent. Thus we find that Overborough to Bainbridge is 9.74Rm north/south; Bainbridge to Brough is 10Rm east/west and Brough to Brougham is 10Rm north/south, with Bainbridge to Brough being 16.23Rm north/south and Brough to Brougham being 17.1Rm east/west. Thus we can consider the original setting out as being two triangles having side ratio of 3:5, the main survey line ratio through Britannia.

But the direct distances hide survey data which enabled the Roman army to determine just where these forts should be sited.

FROM STRATEGIC TO LOCAL PLANNING, Diagrams of Cumbria, Rm1D10 and Rm1D11

The AD79 campaign of *Agricola* to subdue and conquer the northern lands was based upon a two

prong assault commencing from Wroxeter [*Viroconium*] or Chester [*Deva*] by the *Legion XX Valeria Victrix*, and from York [*Eburacum*] by the *Legion IX Hispana.* However, these two lines of advance probably joined to one at an east west crossing of the Pennine Range [now the A66] from Barnard Castle to Brough [*Verteris*] and thence the Eden Valley, at Brougham [*Brocavum*]. The Eden Valley was then utilized as the route to Carlisle and thence it was a westerly and south westerly advance to the Cumbrian littoral.

Following [and also with] this advance, the surveyors would be assessing the landscape for road routes and fortification points. The Eden valley from Brough has on its eastern flank a series of low hills, generally 250 metres above sea level. Thus there is the opportunity to use an excellent set of survey points with which to ascertain direct alignments. Hence we can plot one of the simplest, a 45 degree or 1/1 ratio alignment based upon a north/south distance of precisely 24 Roman miles from Brough to Wreay, both sites of Roman forts. The proof of this putative survey line, its credibility, comes from the analysis of the sub-spacing of the forts along its length, as diagram A illustrates.

Between Brough and Carlisle, the direct distance is c57Km or c39Rm, with this distance subdivided by the Roman Forts as follows; Brough to Kirkby Thore to Old Penrith to Carlisle are one third distance or c13Rm, whilst from Brough to Brougham to Carlisle are equidistant at c19.5Rm, placing Brougham centrally to the survey line.

But, these Roman Forts are not situated upon the survey line; they are sited to suit local conditions from a strategic plan. Thus we see Kirkby Thore is 1.75Rm west; Brougham is 5Rm west; Old Penrith [*Voreda*] is 2.5Rm west and Carlisle is 1.5Rm east.

Thus the survey line Brough to Wreay can be shown to be a planning tool for the disposition of forts and the alignment of the main arterial road.

To emphasize this 45 degree alignment, at the two thirds point, Old Penrith [*Voreda*], we can construct a perpendicular alignment which has at c13Rm from the original survey line the accurately positioned fort at Troutbeck

This is part of a geometric pattern for alignments which commences at Catterick, and the distance to Carkin Moor of 7.56Rm. From Carkin Moor we find the northing distance to Brough is 3.85Rm and then the northing distance from Brough to Kirkby Thore is 7.71Rm or twice the former. There is then an easting to Brougham of 6.56Rm and a northing to Old Penrith of 6.56Rm. From Old Penrith to Troutbeck, as discussed, is a 45 degree line having a northing and easting of 7.57Rm, so very similar to those mentioned already. The northing from Old Penrith to Wreay is 7.5Rm. Diagrams D, E and F illustrate the distances and geometry.

A second perpendicular drawn from Carlisle positions the Fort at Caermote, some 18.55RM south west; [whether this should have been c19.5RM and hence the midpoint can be speculated upon, because northwest of Caermote is Beckfoot Roman fort and the whole layout is based upon a 3:5 ratio triangle from Carlisle]. In the area south west of Carlisle are Old Carlisle, Caermote, Papcastle and Parton/Moresby Forts and they indicate a planning layout such that Old Carlisle to Papcastle is parallel with Carlisle to Caermote, both at 45 degrees, and that Caermote is situated mid way between Carlisle and Parton, as diagram B illustrates.

But we also find that Carlisle to Kirkbride at 476 Actus and Carlisle to Old Carlisle is 486 Actus, then Kirkbride to Beckfoot is 462 Actus and Beckfoot to Caermote is also 462 Actus. Similarly, Old Carlisle to Caermote and Caermote to Papcastle are both 300 Actus and then Papcastle to Parton/Moresby is 466 Actus. The other distances which all exhibit surprising similarities are also indicated?

The alignment node northing of Wreay Fort, OS 549.6N, is similar to Beckfoot at OS 548.8N; they are35.2Km or 23.8Rm [24] apart. The alignment from Beckfoot, OS 309.0E, to Ravenglass, OS308.8E can be considered due north/south, distance 52.6Km or 35.56Rm [36]. Hence we can show a planning triangle having side ratio 2:3 and probably based upon a 12Rm distance. The calculated distance would be 11.9Rm. But if we construct a grid plot based upon this right angle, as we have already shown that Wreay is located some c24 Roman miles west of Brough, we have a significant planning grid of some 48 x 36 Roman miles in the landscape. This planning grid is therefore part of the original survey line from Brough to Wreay, as diagram C illustrates.

The next alignment, Maryport to [Papcastle] Ambleside to Watercrook, has calculated angles of; Maryport to Ambleside, 44.83 degrees [and as such may be considered parallel to the original

Brough/Wreay alignment], and a distance of 31.93Rm. The Maryport to Watercrook line is an angle of 44.51 degrees and a distance of 45.035Rm. The perpendicular distance between these two alignments is 24.67Rm.

There is also the simple alignment between Low Burrow Bridge and Hardknot Fort, having OS northings of 501.2 and 501.5 respectively. They are 26.5Rm apart thus reflecting the c13Rm planning distance of the Brough/Wreay alignment.

The landscape of Cumbria is not the easiest to allow major planning alignments. But, by using the Eden Valley for the original landscape alignment, and then transferring that alignment via a perpendicular, we can indicate that a large quantity of surveying data was collected prior to the final disposition of the forts. The Cumbrian littoral from Carlisle to Parton/Moresby has a closely planned set of inter-distances between forts which in terms of early landscape planning is quite enviable.

It must also be self evident that neither *Cerialis nor Agricola* would have carried out these tasks. Therefore the comments of the original author, *Tacitus*, must be considered stock material about Generals. Generals do not carry out these surveys!

WHY WAS IT SURVEYED?

The obvious answer is that knowledge of the inter-distances, geographical direction and landscape between forts and fortresses would enable a commander to comprehend what options were available to him in the event of attack or assistance to be given to others under attack. The order of March and timescale for a Legions movement is shown in various papers, notably *Julius Caesar's De Bello Gallico*[4]. With signal towers and the road system for fast messenger services, the direct route was preferable. When that was not possible roads were constructed with the appearance of serving the strategic necessity by maintaining a set distance from Legionary forts whilst at the same time serving the wider community. Given the fact that some Roman roads are definitely set out parallel and perpendicular to each other, some using the original survey line from *Cantium Prom* via Colchester to Lincoln to York to Catterick, as the diagrams illustrate, a survey is a necessity. All of the foregoing would have helped establish Britannia as a well planned province and made for easy governance. However, we should look to the Empire wide picture for perhaps a more prosaic reason to survey Britannia.

Following the original incursions of 55/54BC by *Julius Caesars'* Legions[4] the Roman military gained detailed knowledge of the landscape of Britannia. During the intervening century the Romans both at official and unofficial level, must have built up a store of information regarding Britannia, from academic texts, spies and merchants.There are two texts dating from the late fourth century CE which inform us of the original Roman World Survey. First, a geographical treatise by *"Julius Honorius*" and second a cosmography by an unknown author now conventionally known as *'Aethicus'*. Quote[5]:

"*In the consulship of Julius Caesar and M Antonius [44 BC], the whole world was traversed by four wise and chosen men: the east by Nicodoxus, the west by Didymus, the north by Theodotus; the south by Polyclitus. The east was measured in 21 years 5 months and 9 days, from the above consulship to that of Augustus [for the fourth time] and Crassus [30 BC]. The western part was measured in 26 years 3 months and 17 days, from the above consulship to that of Augustus [for the seventh time] and Agrippa [27 BC]. The northern part was measured in 29 years 8 months, from the above consulship to the tenth consulship of Augustus [24 BC]. The southern part was measured in 32 years 1 month and 20 days, from the above consulship to that of Saturninus and Cinna [garbled form of 19 BC]."*

These two texts were well known in the following centuries and are a feature of the *Ebstorf, Hereford and Cornwall mappaemundi*. Fortunately the question which requires to be posited at this juncture already exists in print, plus three definitive reasons for acceptance of the answer. In the text "*Julius Caesar and the Mappa Mundi*", Timothy Wiseman[5] poses the question," *Can we believe the testimony of Julius Honorius and 'Aethicus' on the world survey of Julius Caesar*?" He then continues," *I think there are three prima facie reasons to answer 'yes.'* " It is worth quoting the first and paraphrasing the second and third as follows; "*First, the names of the surveyors, Nicodoxus, Didymus, Theodotus and Polyclitus do not sound like late-antique inventions, and learned geographers in the first century BC would naturally be men of Greek origin and culture. [A recently discovered inscription reveals a 'land-measurer', geometres, making a dedication to Augustus at a town in Thessaly: unfortunately, the name is missing.] It is even possible that one of the four can be identified. A Didymus who wrote on measurements*

in Alexandria, the intellectual capital of the Hellenistic world, has been plausibly dated to the second half of the first century BC. 'Second, the four fold division makes no sense on a modern map and does not fit with the tripartite medieval world. It is Hellenistic. Thirdly, after 32 years work it would have deserved commemoration.'

Hence, what we can assume is that *Julius Caesars'* four commissioners report, the latest in 18 BCE and *Augustus, Caesars' adopted son,* who is now Emperor of Rome, is expanding the empire and a new world map is proposed. *Marcus Agrippa*[6] was entrusted with the project, but, surely he was only required to update the work of the four commissioners. This task was continued by *Vipsania Polla*, his sister but actually completed by *Augustus,* as is described by *Pliny the Elder* in his Natural History III 17, VI, 139[7].

Therefore by 43AD Rome had a considerable corpus of geographical literature ranging from Eratosthenes and earlier Greek writers including the recent work of *Strabo* (circa 63BC-23AD). From the latter's 17 books the military surveyors would have learned that Britannia's shape was triangular with one point at the narrowest part of the Channel (see Aujac[8] 1987a, 174). The south coast in particular would have been well explored and it is quite likely that latitudes had been measured using the *post method* of *Pytheas of Marseilles* (see Aujac[8] 1987, 151); indeed, *Pytheas'* data[9] may have been available. However, it is unlikely that prior to the Agricolan expedition they were really certain of anything northward of latitude 56^{o} N, the Clyde/Forth estuaries.

The invading force therefore, almost certainly had a map based on *Strabo*, as well as some data on latitudes and possibly longitudes. But, after the landing, a military survey team would have started a new survey, with one aim being the establishment of the actual form of the landscape and the mid longitude and latitude for the island, or at least that portion of it intended for the province. Without a reliable map showing important natural features and centres of population, the conquest and exploitation of the territory would have left much scope for error, misinformation and fraud. The latter was not a small matter; the younger *Pliny*, for example, when governor of Bythinia, asked *Trajan* for a survey in order to keep a check on contractors (see Radice[10] 1978, p213).

Thus we can be fairly certain that the *Claudian* invasion was prepared with prior knowledge of the landscape. Also, an idea of the strategy to be used in the preliminary disposition of the Legions, and with the approximate distances involved. Then as the invasion progressed accurate data was gathered by the Engineers and Surveyors and for future planning a proper geographical map established. That future planning would have been dependent upon an accurate assessment of the landscape and the confirmation of the original strategy.

Thus when we read that by 84AD *Agricola* had used the Legions and Roman Navy[1] to explore the whole of the Island of Britannia, and no doubt produced adequate survey notes, this would have allowed the last province of the Roman Empire, Britannia, to be afforded its proper form upon the *ROMAN Mappa-Mundi.* This coincides with *Agricola's* recall to Rome by *Domitian,* 84/85AD.

A PLANNED ROAD LAYOUT EMERGES, **Diagrams Rm1D12, Rm1D13 and Rm1D14**

That the Roman's had maps is no longer doubted. Indeed the opening sentence of a paper regarding Roman roads is, "*The central thesis of this paper is that the Roman's used land surveys and maps as integral parts of the road design process*" This paper then states, "*Even if we resist the temptation to seek geometric patterns, the straight forward evidence suggests that Roman's were capable of high quality planning*" (extracts from 'Designing Roman Roads ', H E H Davies Britannia XXIX 1998).

But to produce a map requires a land survey, a survey which can only have been carried out during the years 43AD to 84AD. Why? Because the location of forts in the landscape with similar inter-distances, due north/south or east/west alignments using rather precise distances and sub-distances and precise angular alignments all require prior knowledge of the landscape, and these forts are dated to that period.

Probably the most important road in Britannia was Watling Street[11]. It is the arterial road from the invasion ports to London, which in turn became the distributor point for the other major roads. It is then the route through the centre of Britannia to the fortresses of Wroxeter and probably Chester.

Watling Street truly commences at Canterbury, there being three port distributor roads[12] to this point. Thus Canterbury to Marble Arch or London Fort is 60.34 RM. In the *Antonine Itinerary*[13],

Canterbury to London is 59Rm. The second phase of Watling Street from Marble Arch northwards, is to Towcester; with a third stage Towcester to Wroxeter via High Cross (*Venonae*). The direct distance from Marble Arch to Towcester is 60.37Rm and Towcester to Wroxeter is 85.919Rm. But Towcester to High Cross and the Foss Way junction is 30.53Rm and then High Cross to Wroxeter is 62.897Rm. But these sections of road do not take the direct route, they deviate, one slightly, the other greatly.

Detailed analysis of Watling Street, from Marble Arch to Towcester as shown on diagram 9, illustrates that from a direct alignment of 60.374Rm, the road becomes two sub direct alignments of 19.754Rm, 1Rm for ST. ALBAN'S Civitas and then 40.346Rm. The equivalent route mileages are 20.96Rm; 1Rm; 40.87Rm. Surprisingly the deviation noted on the maps equates too little extra length in actual route miles, 61.1 to 62.83Rm. The *Antonine Itinerary* shows 61 Roman miles, but may not include the 1Rm of the Civitas. Thus we are again looking at planning distances of 60 Roman Miles.

60 ROMAN MILES

"Why is Watling Street built from Towcester to Wroxeter as a large arc, when the direct alignment was capable of being constructed with relative ease?"

"Why does the London to Gloucester route appear as a large arc to the south when the direct route was quite practical?" {In fact, is it more likely the road to Exeter?}

These questions refer to major fortresses and their service roads whose routes deviate quite spectacularly. Even the Foss Way, Exeter to Lincoln, by passes Gloucester by 20Rm, with part of the reason no doubt, the Somerset Levels, but thereafter attaining Gloucester was so very simple. This can only be the result of large scale road layout planning[14] and possibly, although unlikely, the use of existing Iron Age tracks. Thus if we analyze this planning, vis a vis the actual road profiles, we find that the 60Rm unit reappears both as a distance and radially. Not only as a radius but part of a whole 60Rm planned landscape. *Here it must be made quite plain that the circles drawn upon the diagrams are for indicative representations of the route profile, the strategic idea behind the route and not the methodology of aligning the road.* A 60Rm radius, using exactly one quarter of a circle, 90 degrees, describes the route of Watling Street from Towcester to Wroxeter. Thus Watling Street may be thought of by the Legions as distant from Gloucester "*by a Five Day March*" over this section of road, with the junction of the Foss Way being a prime point of measure.

The 60Rm radius which describes London Fort and Marble Arch to Cirencester is only a nominal marker for the London to Gloucester route. This is because the junction to the Foss Way must have taken precedence.

A surveyor[15] cannot stand at a given point and just assume an alignment will proceed over 36Rm for a local line or over 60Rm for strategic planning. Precise knowledge is required to achieve these alignments and precise measurements taken. We can deduce these facts by retro-surveying the site locations that exist. Thus the repetitive distances of c60Rm and c105Rm can be expressed as 12 and 13 or 15 Roman mile multiples, which can be shown to accord with the marching distances. But the more likely scenario is that these distances are the economical distance between forts for sub-legion forces, which can vary from fort to fort, such that each is able to reinforce or supply a varying force for specific reasons. Then when a territory was subdued, the forts were dis-assembled and more regional forts established to police a more subservient populace. Thus we see the original forts discarded or not even fully occupied.

But does this matter? If a fort is constructed, its position must have been carefully assessed and surveyed to suit the locale of the other forts. The manpower required to construct a fort would not have been easily allotted or wasted, even if it is suggested some works were made to keep legionnaires occupied!

The work of a surveyor is based upon the principles of geometry and in the landscape of Britannia those principles have been amply illustrated.
We do not need to seek out geometric patterns they are the basis of Roman Planning!

CONCLUSIONS

The circumstantial evidence, for that is all it can ever be, given the propensity for recording materials to degenerate and disappear, indicates the following;

1) Prior to the 43AD invasion the Romans had very good intelligence and basic maps of

Britannia, probably as far north as Lancashire/Yorkshire.

2) This allowed a determination, quite quickly after the invasion, that the Legionary Fortresses could be established to a design pattern required by the strategic considerations that incorporated distance and angular bearing by tangent ratios, to the strategic overall plan. This planned landscape positioning also continued to the local level when forts were required to police valleys and major highways.

3) Thus the gradual expansion northwards was part of that original planning and the logic of the separation distances between fortresses was maintained as best possible. All of the Legionary Fortresses other than the two Welsh sites, which are special cases, can be described by the already stated methodology. The Fortresses of Britannia are in a planned disposition for military purposes based upon the simplest of surveying data. That original planning has affected the whole layout of Britannia as the various diagrams illustrate.

4] The evidence indicates that the main arterial roads are similarly preplanned, designed and constructed to accord with a notional idea based upon 60 Roman Miles. Part of this preplanning is the use of compasses, a radial design, thus travel on the original roads would guarantee a direct line distance to major fortresses.

5] Thus Britannia, the province, was conceived with both the strategic positions of Legionary Fortresses and arterial roads planned by dimensional and angular alignment. Many roads can be shown to accord with the tangential geometry, most particularly the major routes. The military survey necessity gives way to the civil and therefore tax collecting survey in a Britannia that it appears was a planned environment.

MICHAEL J FERRAR

REFERENCES

1] De Vita Agricolae by Cornelli Taciti, edited by Ogilvie and Richmond, 1967, Oxford
2] Sheppard Frere, 1967, “Britannia”, Routledge and Kegan Paul Ltd. London
3] Salway P, 1993, “Roman Britain”, Oxford.
4] Julius Caesar, “de Bello Gallico”, Penguin Classics edition, London, 1951.
5] Wiseman T P, 1992, “Julius Caesar and the Mappa Mundi” in “Talking to Virgil”, Exeter U P.
6] Tierney JJ, 1963, “The Map of Agrippa”, Proc R I A, 63, sect C4
7] Pliny the Elder, “Natural History”, Penguin Books edition, London, 1991
8] Harley and Woodward, editors, 1987, “The History of Cartography” Univ of Chicago Press
Aujac G, chapters 8, 9 and 10.
9] Cunliffe Barry, 2001, “Pytheas the Greek”, Penguin Books London.
10] Radice B, 1978, “The Personal Letters” in book 10,176, “Pliny, a self portrait in letters” Folio Soc.
11] Roucoux Omer, 1984, “The Roman Watling Street”, Dunstable Museum Trust.
12] Margary Ivan D, 1955, “Roman Roads of Britain”, Phoenix House, London.
13] Antonine Itinerary [Britannia], ibid, appendix pages 247 to 256.
14] Ferrar and Richardson, 2003, “The Roman Survey of Britain”, B A R 359, 2003.
15] Dilke OAW, 1971, “The Roman Land Surveyors”, David and Charles, Newton Abbot.