

MsOHIO/10: THE SERPENT MOUND (1) AND THE NEWARK EARTHWORKS (2)

ABSTRACT

These are two of the most enigmatic sites in the State of Ohio, USA. There are near thousands of earthworks, large and small in Ohio, but, for sheer scale these outshine the others.

The essence of this paper is to determine just how they were set on the ground, their metrological being and thus their *raison d'être*.

Although having read many other papers, and there are hundreds, I have mostly ignored previous texts, although taken advantage of some survey data and photos for the sake of time saving in the research, and that is, as in previous papers, the use of LiDAR photos which would not other-wise be available. Thus it is an attempt to determine just where the origins of their skills emanated from unless of course they are homegrown by the savants of these tribes.

This is a narrative description paper, not necessarily a full Academic type.

It is the third of a series of three texts, similar in research following the metrology and Mound Building skills from the earliest known examples.

The texts preceding this one are; Ms5; From Mesopotamia via Europe to Mesoamerica and the Mississippi.; MsMO/9; The Mound Builders, Bolivia to Ohio.

The text is 06, A4 pages and contains 13, A3 diagrams for the first section. (19 parts)

The text is 08, A4 pages and contains 32, A3 diagrams for the second section. (29 parts)

MsOHIO/10: THE SERPENT MOUND AND THE NEWARK EARTHWORKS

INTRODUCTION

Text MsMO/9 was terminated with two short sections regarding the Serpent Mound and the Newark Earthworks as they were both too important and too large a text to include in a text which was already overloaded with examples.

Thus this text focuses on just these two sites in some detail to explain them properly.

PART ONE

THE SERPENT MOUND, OHIO; 39° 01' 33" N & 83° 25' 51" W STATE MEMORIAL

Located as follows by the Editor, American Antiquarian, "The series of effigy works, known under the name of "The Great Serpent Mound", is located on the land of J.J. Lovett, entry S010, Brattain township, Adams County, Ohio.

Quite fortuitously for my researches, William F Romain and John E Daley, provided a rather good survey plan of the whole effigy, carried out between February and April 1987,

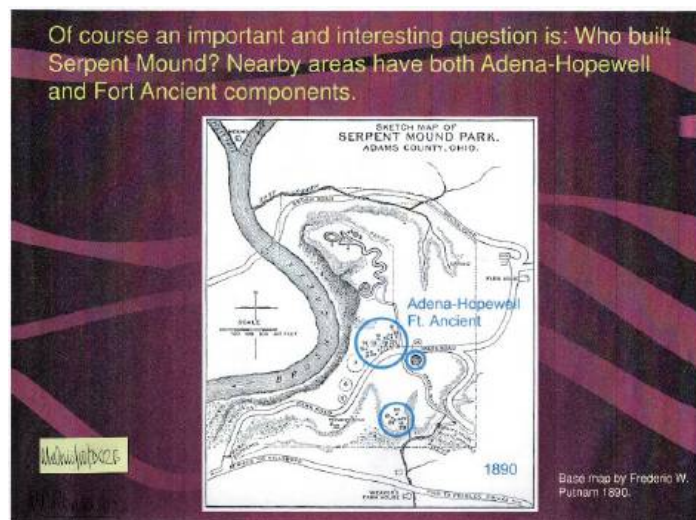
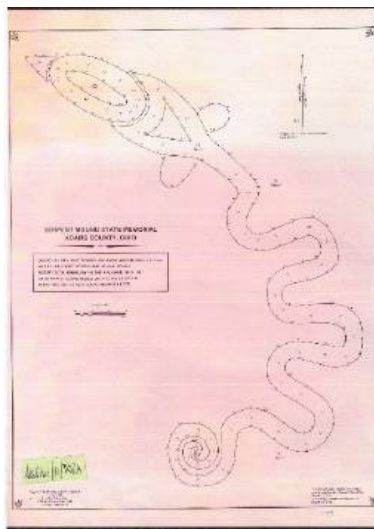
giving both distance and azimuth from known points. They also noted that the difference between True Astronomical North and Magnetic North was only, 0.9 degree.

It has been variously depicted on many “survey” drawings over two centuries and the site, now a State Memorial, is easily shown on an aerial photograph. MsOHIO/10/D01



Thus from this survey and data , which was thoroughly fact checked by retro-fitting the co-ordinates comes the following explanation of the metrology and geometry of the site.

MsOHIO/10/D02A &D02B

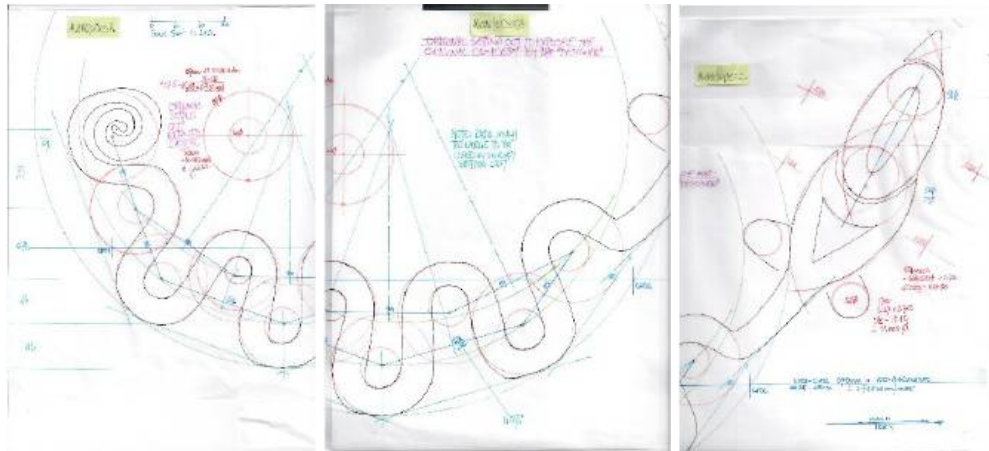


THE DESCRIPTION OF THE FINDINGS FROM THE SURVEY

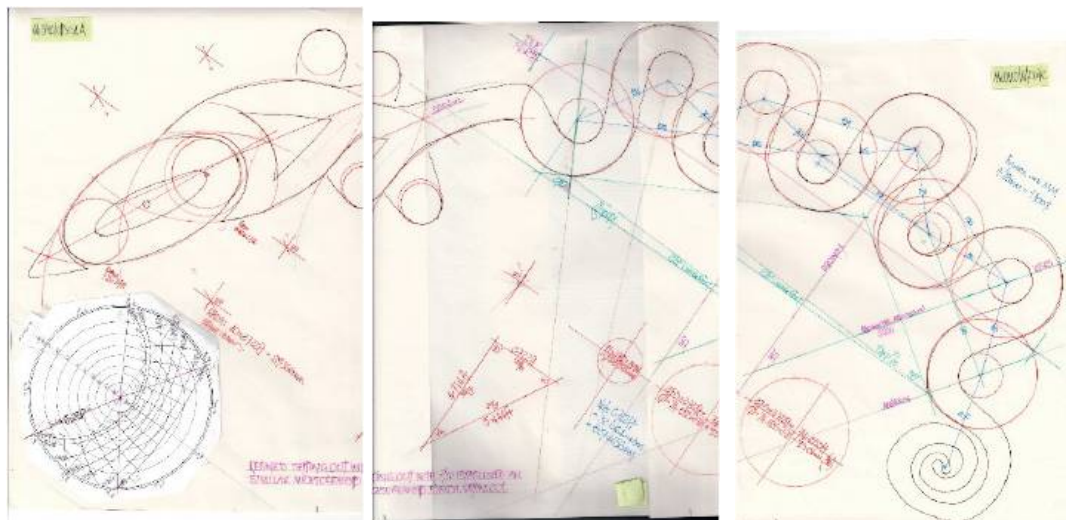
The diagrams are as follows; MsOHIO/10/D03A,B,C; 10/D04A,B,C & 10/D05A&B and are illustrated in the Diagrams of research section as well

The setting out of this rather large serpentine mound figure in the landscape intrigued me as viewing the various drawings in the older texts, the coils were shown similarly.

To ascertain how accurate the plot was drawn I reverse plotted the co-ordinates and azimuths onto a copy suitably enlarged to give accurate readings. The layout as drawn proved to be accurate and thus was used as a basis to determine the metrology of the Serpents form. Thus this survey forms the basis for the ensuing research. 10/D03A,B,C

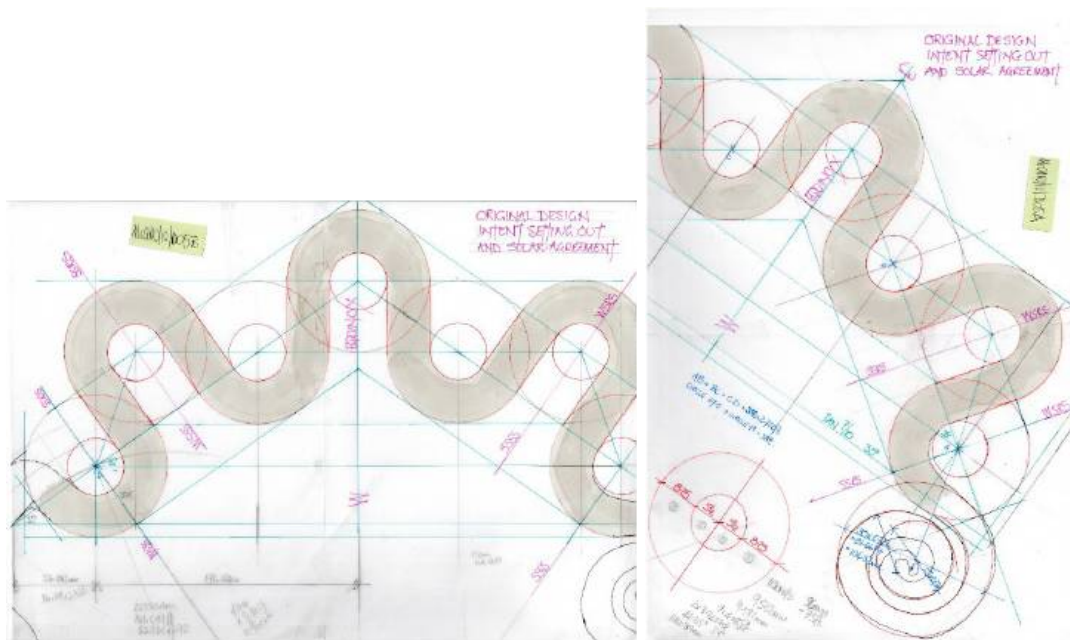


The first task was to establish the dimensions of the coils and the heads, plotting their putative survey centres to establish those. It was quite easy to plot the circles and curves on the survey and thus determined most were the same size and in doing so gradually the design method and metrology unfolded. 10/D04A,B,C



However it also showed quite conclusively one important feature. There was a mistake in the centre of the coil layout. Whether this was from an error in the original setting out or just a construction error in mounding the soil cannot be determined, but it is plain to see on the plot. The third coil was decidedly smaller than the other five which are very similar indeed.

However, by using the alignments and the centre points of the curves it was a simple task to correct the error in the setting out and show how it was conceived and the measurements utilised. 10/D05 A & B



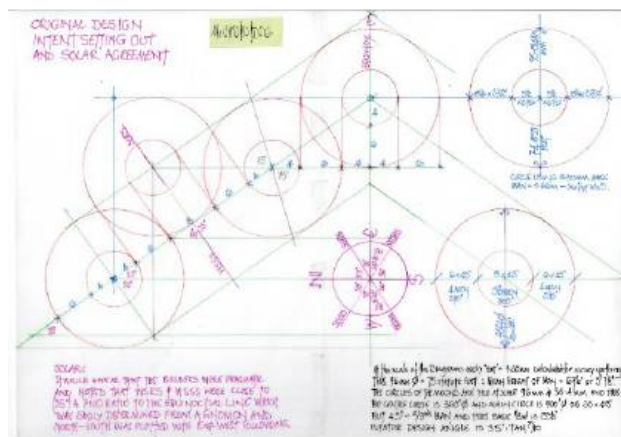
Basically the Serpent form is set out from 3 triangles all interlinked from a single base line which is set to Due North with the triangles being based upon a Tangent Ratio of 7:10 (i.e. 35 degrees) and three measurements of 27.5 x 2.722 feet. That is the outer circle of 27.5 and the inner circles of 11, totalling 27.5 x 2.722, the measure of man, 830mm and 1.66m height.

SOLAR POSITIONING OF THE COILS

However, analysing the Solar Chart led to a second and perhaps the major reason for the 7:10 ratio being used. The Solstice Rising in Winter was obviously the reason for the direction of the coils in the south and thus it became quite clear to me that in fact the whole of the coils were to be directed to the Summer and Winter Solstice positions. (I have used the latitude 40N diagram as it was readily available and a quick check showed the difference for 39N and 40N was negligible.) In fact the Winter Rising Sun is given as c34 degrees and the “Designer” of this effigy obviously using the horizon may well have encountered the minor aberration of the Sunrise angle not being exact, because the viewing and Sun were not at the same geographical elevation. The centre coil marks Due East/West and then Equinoctial Sun.

Due North itself is found by the use of a “Vertical Gnomon” and the suns path is plotted on the ground via the shadow line produced, Thus when the shadow is at its closest point to the gnomon, it signifies Due North, as the Sun traverses the sky via the south. The four cardinal points are therefore easily interpreted and the sun’s position at the Solstice determined. Hence it was quite obvious that the Sunrise/Sunset lines were taken as (35°) 7/10 ratio and was the *raison d’être* for the setting out of the complete Serpent.

MsOHIO/10/D06



However, many researchers have drawn the Solar Lines from the coils as surveyed, mostly wrong as has been shown in the re-aligning, but the “Designer/Savant” is perhaps responsible for this. To ensure a simple symmetrical layout as shown, all angles are the same when in fact the original survey clearly indicates they are not, and neither does the Sun Path have equal angles for the Rising and Setting against the Equinoctial line.

But, the “Designer/Savant” in choosing the 7:10 ratio angle for all Solar Directions from the coils has in fact shown awareness of the mis-match fact and aligned the “Head” to the actual Summer Solstice Setting Sun angle. This had to be done as anybody standing aligned to the “Head” would have noticed the c3 degree mis-alignment if 7:10 had been used. Complete pragmatism on the part of the “Designer/Savant”, but it still does not account for the “Egg” being off alignment!

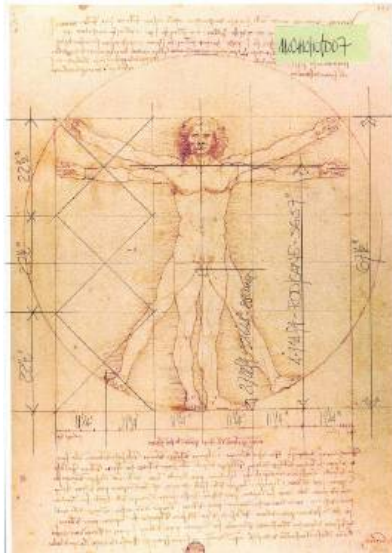
ALTERNATIVE MEASUREMENTS

When researching on my plot the actual diameter of the main coil circle was c96mm, However, 95.8144mm gave me the 27.5 x 2.722 feet or 830mm as found from Mesoamerica to Mississippi, but it became apparent that perhaps there was another measurement from the human body I found to be normal in the Plains Indians of the USA. That measurement was a height of 67 inches, when I had already discovered that a height of 67.5 inches provided for an exact fit to a circle diameter of 96mm. Thus I contacted Dr Bradley Lepper, Ohio Connection, Archaeologist, and was given in a personal communication the following information; *“The Ohio Connection’s biological anthropologist and Lepper independently calculated the height of the male buried at the base of the large conical mound near the Serpent Mound to be 170cm or 5 feet 7 inches. Paul Sciulli and Brenda M Hetland (2007;112) reported that the average length of Femora for a sample of 24 males buried in Early Woodland period mounds was 463.8mm and the average stature (calculated based on maximum length of the femur) was 168.0cm.”*

The 67.5 inch height divided simply into three parts of 22.5 inches and thus the 96mm circle is in fact 75 feet diameter and hence 20 x 45 inches, two thirds the height of man.

Thus the height of man used in Mesoamerica/Mexico/Mississippi of 166cm and the 67.5 inch height I had found from metrology were more than plausible and were obviously the main metrology of the OHIO SERPENT.

MsOHIO/10/D07



THE DIAGRAMS OF THE RESEARCH

Attached are two composite diagrams consisting of 3 x A3 sheets each to show the whole Serpent and all of its metrology. The first set are my initial workings to establish a basic measurement of the diameters and are at a larger scale than the following to ensure accuracy. Thus, finding a basic measurement the scale was slightly reduced to simplify the re-drawing to become 1 Foot is the equivalent of 1.28mm, determined from the survey base measurements for the Due North Line. Thus this second set of three sheets represents the final metrology determined for the coils. There are then 2 x A3 sheets which are the reconstruction of the coils and overlay precisely the large plots. They fill the same space as clearly indicated, and if the whole are printed at A3 or A4 and joined then the picture is so very clear. (MsOHIO/10/D03A,B, C and MsOHIO/10/D04 A, B, C)

A single A3 sheet sets down the setting out using both coil diameters 95.814 and 96mm with the entirely coherent repetitive measures which stem from this putative design for the “Originator” of it. The 7:10 ratio is used throughout the design. (MsOHIO/10/D05A & B)

It would be fascinating to have found the large open space of probably sandy soil onto which a small scale version was scribed out giving the workers a view of the finished Serpent and thus the capability of setting it out and constructing the earthen mounds.

One of the Archaeologists at Ohio History, Dr Brad Lepper asked the following questions in an email as follows;

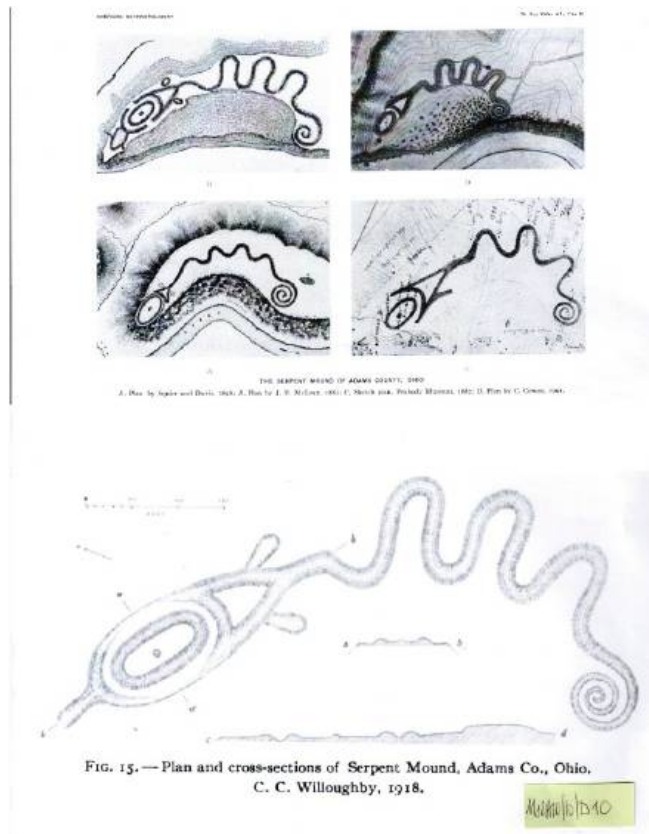
- 1) Do you have any thoughts about the large wish-bone shaped mound that once encompassed the NW part of the oval earthwork (now represented only by a small triangular mound) and whether it can be accommodated in the scaffold of circles that encompass the rest of the effigy.
- 2) Also, I would be interested to know what you think of the U-shaped geophysical anomaly that looks for all the world like another curve of the Serpents body that was erased (or perhaps never finished) at some point during the history of construction.

COMMENTS

Four of the many survey plans of the Serpent Mound prior to the W Romain survey are by;

- A) Squier and Davis, 1848 who dimensioned the “Oval Egg” as 160 x 80 feet
- B) J P McLean, 1883/1885 who dimensioned the “Oval Egg” as 113 x 50 feet
- C) F W Putnam, 1887 who dimensioned the “Oval Egg” as 120 x 60 feet
- D) C C Willoughby, 1918 who dimensioned the “Oval Egg” as 119 x 59 feet.

Diagram MsOHIO/10/D10



There are various other plans of the site mound which mostly show the cliff edge to the “Head” position similarly, only J P McLean, 1883 seems to extend the cliff edge to accommodate what he calls a “Frog” laying an Egg whilst chased by the Serpent. This occurs in historical glyphs, but would appear to be wishful thinking, unless the complete cliff end of the site has fallen into the creek?

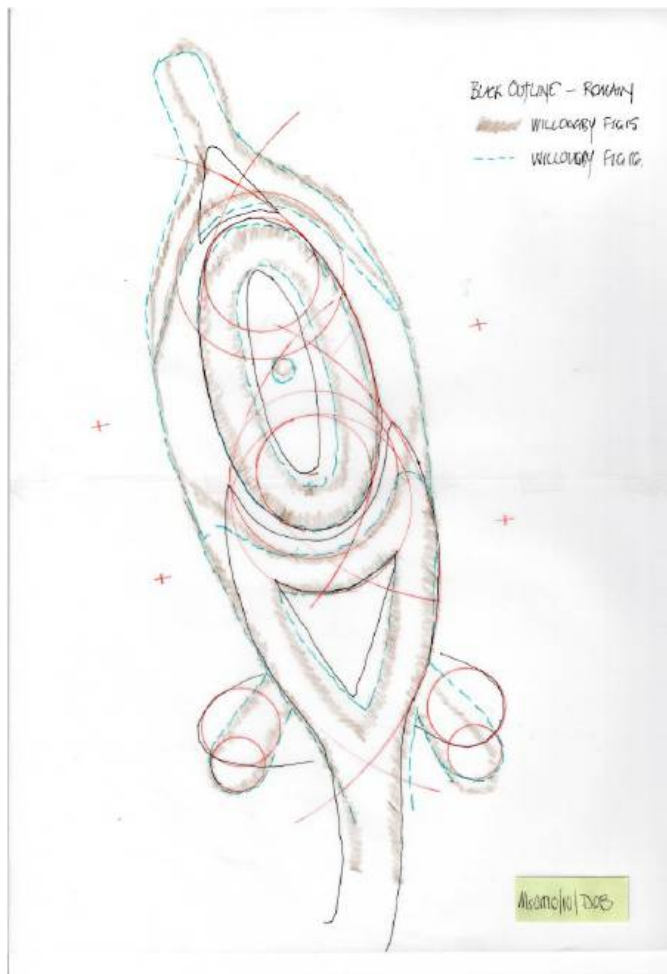
ANSWER 1

The Wishbone Shape Mound

I have endeavoured to precisely scale that feature from the C. C. Willoughby survey plan of the Serpent and append it to the W Romain Survey, and it does not increase the Serpent length greatly and would therefore fit adequately onto the ground at the top of the cliff. The results are that in part, quite obviously, the curves are the same, but the outer banking to the Egg appears to be a very large curve not easily surveyed in and thus probably

constructed “By Eye”. That is of course if this survey is accurate and I am afraid to say that it is a false hope.

MsOHIO/10/D08



ANSWER 2

The anomaly suggests that it is intended as one of the two “Serpent Appendages” and was in fact removed. Given that it appears to finish at a straight-line anomaly, I wonder if that was the original boundary and the mound constructed too close. MsOHIO/10/D09



The anomaly appears to be 17 x 2.722 or c13 ½ m or c44.3 feet, but the end circle is c33 feet diameter or 12 x 2.722 feet. Thus metrologically it would fit the main Serpent Features, but not in any way similar and without another corresponding to the “second” appendage, indeterminate.

COMMENT

Thus this Serpent is a fetish symbol for the peoples of this area/tribe who had the skill mathematically and geometrically to set down such a large earthwork feature. What function it held for them is also indeterminate as with so many “Glyphs” that we can only theorize over. But certain , the instigator knew his maths and geometry.

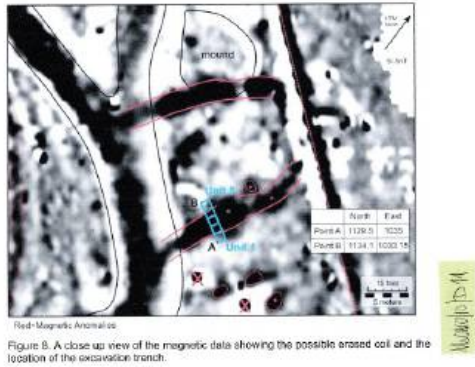
THE MAGNETIC PLOT OF THE SERPENT

The work of Jarrod Burks and his team to create the Magnetic Map of the Serpent Mound and their findings is so very helpful, but it also questions assumptions in the paper presented.

What my answer Number 2 did not mention was that the “U” shaped anomaly being 12 x 2.722 feet is nearly the same as the centre circle of the main coil which is 11 x 2.722 feet or 29.942 feet and alternatively 8 x 45” or 30 Feet. Quite frankly it is too close to call!

If a study is made of the magnetic plot and the use of the “Spurious” coil, it obviously does not align nor allow for a junction to the Serpent Head. But study the position of the “Spurious” coil and there is no certain curved section, it is cut by the “fence” line/mound and does not appear. And, obviously it does not fit with the Solar projections of the main coils. I have included an overlay (as best fit) of the main coils onto the magnetic plot for information and research.

MsOHIO/10/D11



The work by Jarrod Burks is to be found in the text “Geophysical and Test Excavation at Serpent Mound, 2011-2012” prepared for “Ohio Historical Society” and prepared by “Ohio Valley Archaeology Inc.” 2022.

LiDAR IMAGES

MsOHIO/10/D12

When William F Romain et al surveyed the Serpent Mound they also provided LiDAR pictures as the two attached show. One is from Jarrod Burks text (Fig1) and the other from a text by D Weintraub and K R Schwarz, from “Current Research in Ohio Archaeology 2013”(fig2).

They show a “Serpent” clearly forced into the end of the upland surrounded by Bluffs to the Ohio Brush Creek and a minor creek to the north. There is a gully clearly shown to the west of the Serpent, a limiting factor no doubt but the tail appears to be virtually on the “cliff” edge. Obviously the head had to be pointed towards the Solstice Setting Sun and fit to the pointed top of the karstic upland, and it would have been natural to ensure this, the main feature was properly aligned and in position at this point. The fact that the head has two

alignments actually questions that proposition.

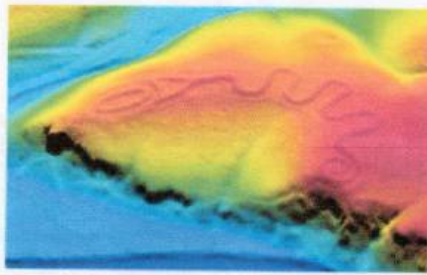


Figure 1 LiDAR image of Serpent Mound (image created by the author, DEM provided by William F. Romain, data from Ohio Department of Transportation).

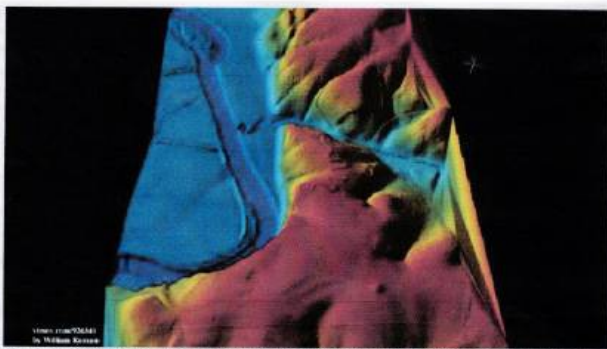


Figure 2. Screen capture of LiDAR (light detection and ranging) video showing Serpent Mound and the conical mound. Vertically exaggerated during processing (by William Romain, vimco.com/926341).

However, given the “free” land south towards the Adena Conical Mound, neither the awkward joint of coil to head or the curvature of the whole body was necessary, unless of course the body coils were set too far north creating the unlikely join of coils to head section.

That probably indicates that the coils were the first construction, but either way the “spurious” coil makes no sense in the finished construction.

COMMENT

The magnetic plot indicates possible earlier constructions on the site with parallel lines of “walls” which seem in part to align to the new setting out and thus could have been important in the distant past and be akin to the “spurious” coil feature. But, with no archaeology it will no doubt remain a mystery item.

CONCLUSIONS

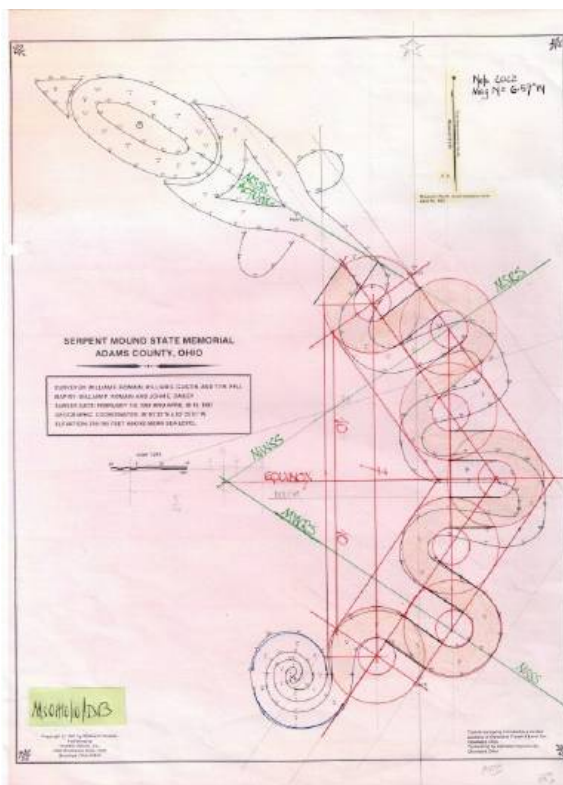
In the time of Megalithic Man and then the Farming Communities, the Sun played a major role in their lives. It informed them of the length of days from the minimum to the maximum throughout the year and thus the timing of sowing crops and preparing food stocks for winter. Hence a “Savant” of the Adena Peoples would be well versed in the Solstice and Equinox of the Sun.

Thus in setting out to construct the effigy of the Serpent swallowing the Sun, the daily occurrence at Sunset, having established NSEW from the gnomon, would have noted that the angular deflection of the Sunrise and Sunset positions from the Equinoctial line was formed by a ratio angle of 7:10 (35°)

MsOHIO/10/D13

NOTE: There are various ideas concerning this “Serpent” and the “Mouth” which can be variously interpreted. A researcher wrote that: “I do not think that the oval can have been intended to be a representation of the Sun as it is clearly an oval and the Sun never appears in indigenous iconography as an oval. I believe that “Romain” is forcing an appealing assumption onto the oval earthwork. There are many things the oval could represent, including the snake’s open mouth, the snake’s eye, and as I and my colleagues have argued, the vulva of the First Woman. Therefore, In think it is at least premature to claim to know with certainty that the builders of the oval intended it to represent the Sun.”

RESPONSE: What I have written in Ms5 is the history of measurement and how it re-appears in Mesoamerica/South America with on explanation for that occurrence except it is an undoubted fact. I include the Pyramid of Chichen Itza with its snake symbol of the Sun chasing up the steps, and thus from the books by Jose Diaz-Bolio which I purchased when my Wife and I made a very long tour of Mexico etc to understand it all. The work of Anthony Aveni is also very important. Hence, I believe it is the “Serpente Impluda” chasing the Sun to swallow it and regurgitate it reborn in the morning. That happens to coincided with the Egyptian Myths and shows no more than the Cultural thoughts which develop in societies, parallel development, when confronted with the same phenomenon. Then , in MsMO/9, I follow the history of the Americas and explain all of this following it from S America to the Mississippi. That is the reason I keep stating read the texts in sequence and understand it all, as the storyline is just too great for one text.



That would have been the master alignment for the Serpent. Thus, from a North South line angles of 7:10 ratio were set out to predetermined dimensions.

Those were either the Mesoamerican 830mm or a local measure of 1143mm (45 inches) based upon the height of a man of 67 ½ inches. As reported the dimension of 830mm or 2.722 feet is attested from Mesopotamia to Europe and thence in Mesoamerica and Mexico. The 67 ½ inches being a good average for the American Plains Indians and the “Adena Conical Mound” man.

The site was no doubt chosen because of the direction of the final point of the Karstic Plain above the Ohio Brush Creek, facing the Midsummer Setting Sun, a fitting point for the Serpent to Swallow the Sun ready for its rebirth the following morning.

All that was then necessary was a “tour de force” by the “Designer Savant” to set down on the level ground the plan of the Serpent and give each part of the setting out a “Number Of Parts” be they 830 or 1143mm as the diagram of setting out clearly shows, illustrating parallel lines and 7:10 ratio angles.

It was no doubt a mammoth undertaking and the error in the coils has spoilt what would have been a symmetrical layout about the Equinoctial Line.

The fact that the “Head has two alignments, one correct and one(?) Awry, is I am afraid to say a mystery. Did the “Design Savant” live to see it finished or is this an aberration on the part of the builder’s, the workers finishing the effigy who failed to project the alignment perfectly.

We shall perhaps never know?

PART TWO; THE EARTHWORKS AT NEWARK, LICKING COUNTY, OHIO.

COMMENT; Raison d’etre.

This text is in part due to my investigating the Mound Builders in the Mississippi area, then reading about the numerous mounds in Ohio and in so doing noting the surveys of the Newark Earthworks, dating to the 1840’s to 60’s which did not appear to be compatible.

I therefore looked for Archaeological texts, LiDAR texts and particularly survey data in order to understand the shape and form of these earthworks.

One look at Google Earth Pro (GEP) and the disposition of the Octagon circle and the Eagle Circle was enough to realise there was a serious mis-measurement for their positioning and it looked to be a matter of two surveys cobbled together by an estimated distance.

Thus the various parts of the following text became so very necessary to quantify distances exactly, bearing in mind the accuracy of GEP, and locating the Road and Canal which seemed to be the arbiter of the Square forms position. Then the fact that all the early surveys were carried out with a Magnetic Compass and the change from a positive to negative bearing occurred, it became a mammoth exercise to achieve what I was willing to accept as an accurate reconstruction.

Thus it is all in this text and perhaps some can be skipped as it is technical data.

ABSTRACT

Diagram MsOHIO/10/2/D01



Using the known “Earthwork” features extant was the only basis for constructing a “Map” of the “Earthworks” that was both accurate and capable of being used to quantify positionally areas for which no “Features” are known, but could be a future guide.

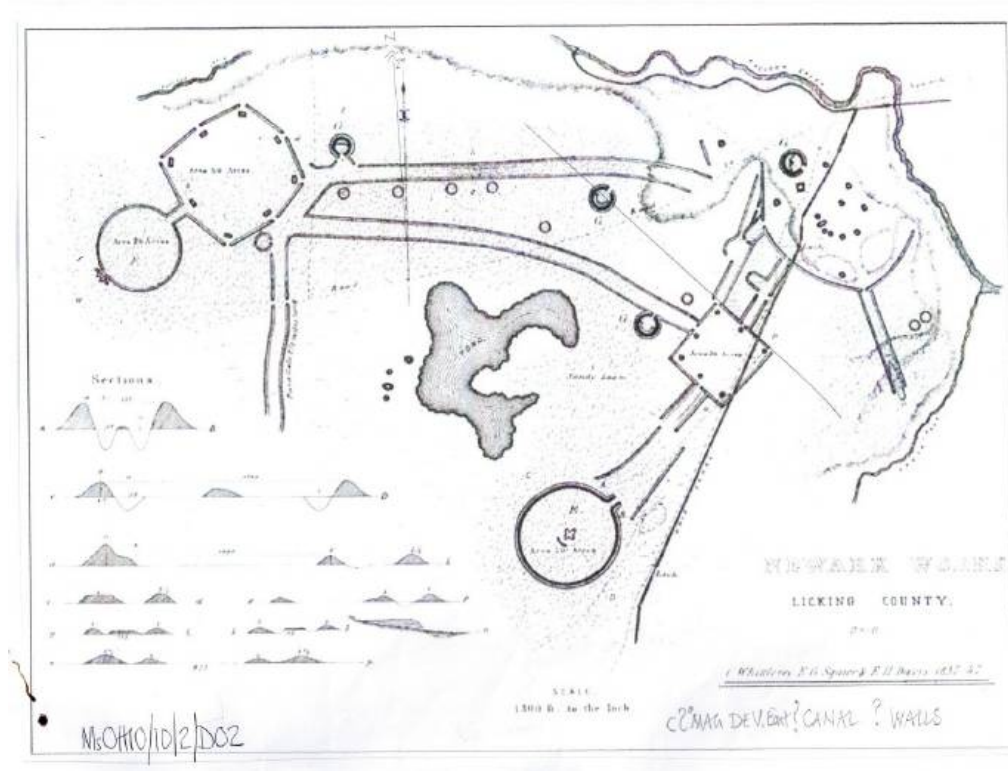
Distances are calculated from both GEP and Oblate Spheroid measurements for Latitude and Longitude for a known position. That was chosen as 40° 02' 47.5" or decimally 40.0465277778 North. That point was chosen as being nearly central to the two circles and as the difference per Minute of a Degree was only 1 Statute foot, the exactness was unwarranted.

The assistance of OHIO CONNECTION/OHIO HISTORY cannot be understated and from there came the Rectangle of land on James Street, a Blue Print of the “Earthworks” and photographs as here-in displayed. But on receiving this information I knew that there was a huge problem as that on the GEP and the Blue Print, they were wildly apart. This caused untold extra work and when the OHIO CANAL survey arrived, even more problems. The Canal Society hold a complete set of these survey drawings for examination and they have been a great help.

Thus this text is set down in date order as the data unfolded piece by piece.

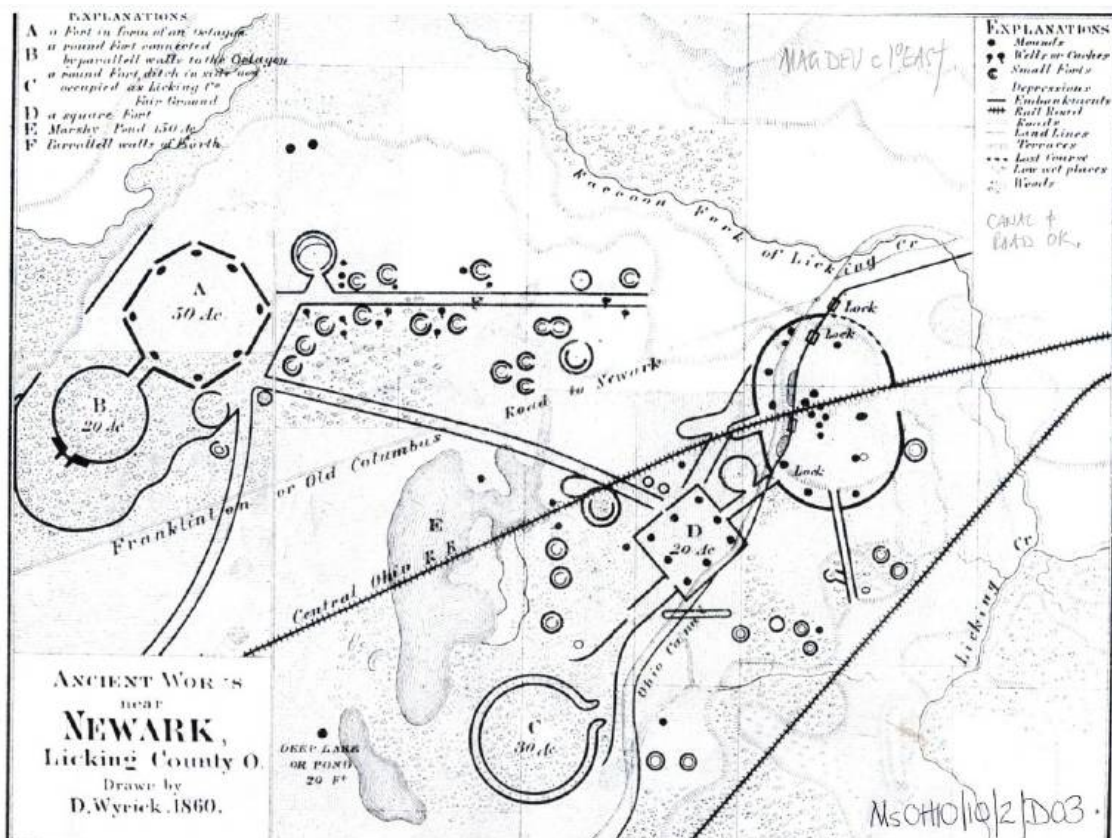
THE ORIGINAL SURVEY DRAWINGS

- 1) 18367/1847, by C. Whittlesey, E. G. Squier and E.H. Davis. Diagram D02.

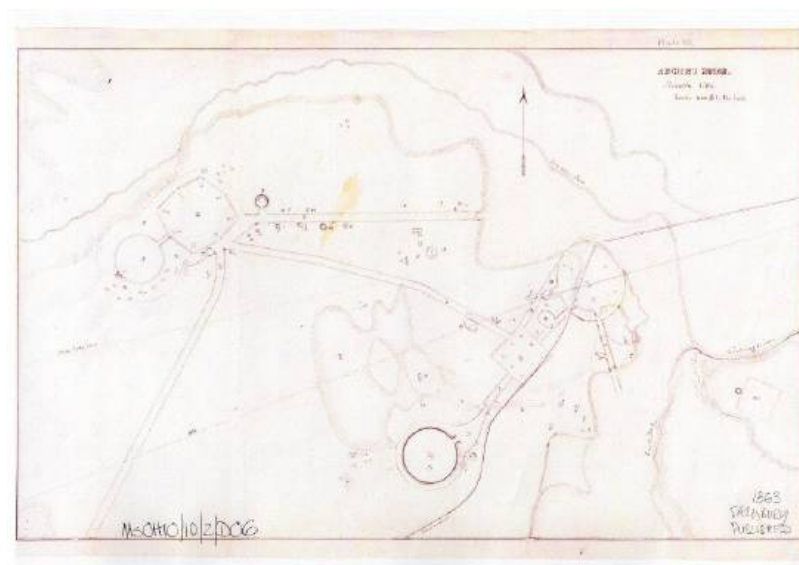
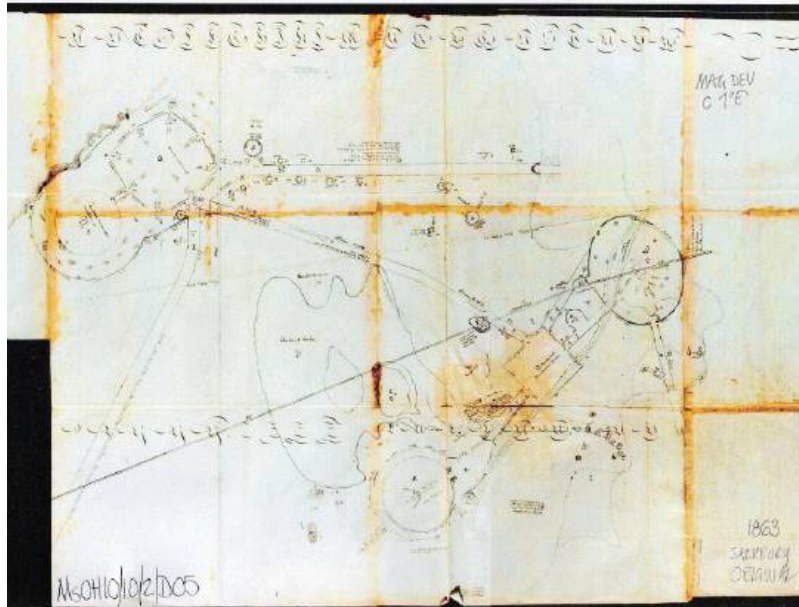


It is quantified in the book, “Earthworks of the Mississippi Valley” 1896.

- 2) 1860, and 1860, by David Wyrick and D Wyrick with J.S. Unzicker. D03/D04
Held in the L. Clements Library, University of Michigan, Ann Arbor.



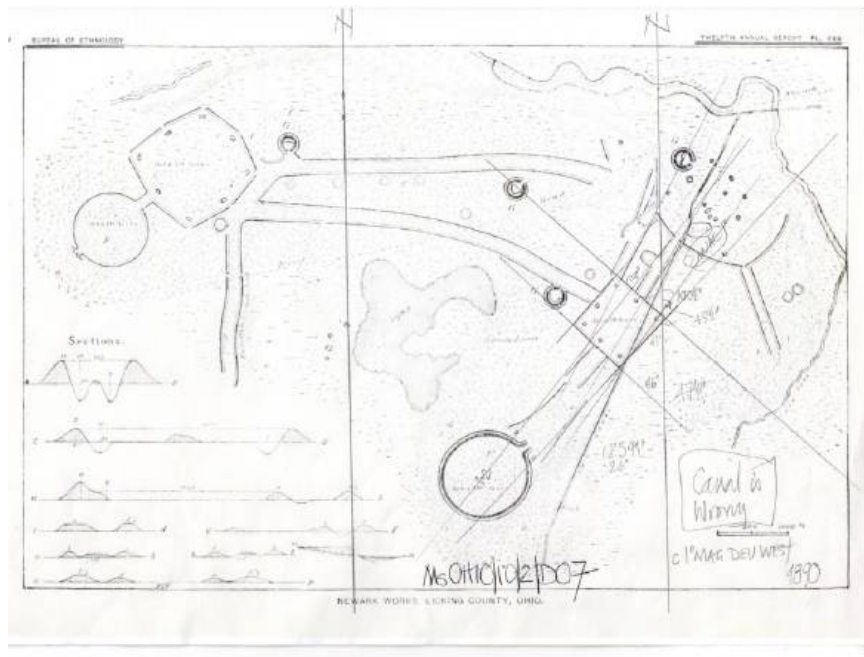
- 3) 1863 and 1863 by James and Charles Salisbury. Original and then published map. The original is held in the Cleveland Museum of Natural History and the second by the Antiquarian Society of America, who also hold the texts by the Salisbury Brothers for this site and many more in Northern Ohio. Diagrams D05 and D06



- 4) 1890, Bureau of Ethnology, 12th Annual Report, PLXXX, P573. This is a reproduction of the 1837/1847 survey, but updated! Diagram D07

They are all drawn to a very small scale varying from 1300 to 800 feet to one inch, and, hence caution must be observed when enlarging them as small errors, perhaps un-noticed become major problems. To quantify the problems; 1":1300' is 1:15600 and 1":800' is 1:9600. Thus the Octagon circle of 1054/1060 feet diameter is either 0.8 inches, i.e. 13/16ths

of an inch or 1.3775 inches, 21/16ths of an inch using both scales. These small dimensions on the maps/surveys having just an error of 1/32nd of an inch is either 40.625 or 25 feet. Note that 1/32nd of an inch is 4/5ths of a millimetre and hardly noticeable, but enlarged without care will make enormous errors in any plot.



There are also ideas for the layouts disposition on the GEP maps posted online as overlaid plots. They appear to be taken from the surveys, are visually attractive, but do not address the actuality of the ground layout. Wide white lines probably 1mm and rather large for the scale drawn.

However the Salisbury Brothers included a 24 page detailed measurement and bearing data for each item of their survey and the original survey map appears to be the most accurate. Obviously the second map is a “cleaned up” version of it.

The Bureau of Ethnology has similar information and includes small scale drawings of the main earthwork features, however, as will be seen they are inaccurate and actually do not agree with the larger plan PLXXX page 573.

Thus these required to be analysed first and actualities confirmed!

As the Circle/Octagon and the Eagle Circle are accounted for on GEP the only real problems are the Earthwork walls from the Octagon and Eagle Circle to the ellipse.

DETERMINING THE SQUARE.

The Salisbury Text is as follows;” An Accurate Survey and Descriptions; ancient earthworks- Newark, Ohio.”

“B, plate VII, is a perfectly square enclosure, each side being 918 feet in length and containing within the centre line of the walls a little more than 19 ¼ acres. Commencing at the south corner where the Canal and Road cuts off a portion of the SE wall, the courses and distances are as follows;- N45E 918 feet to corner, thence N45W 565 feet to the opening 72 feet in width leading into the parallels “J”, thence 418 feet to the corner whence there is an

opening of 25 feet leading into the parallels "K"; Thence S45W 314 feet to a gateway 72 feet in width leading into the parallels "L", thence 532 feet to the corner. Thence S45E, 548 feet to an opening 50 feet wide leading into parallels "I", thence 324 feet to beginning."

The Bureau of Ethnology has these notes, PP465/466, and plate XXXIV.

"The following are the field notes of the re-survey which commenced near the middle of the SE line of wall at 1, running thence to 2 and so on around, following the walls to station 7, whence, as the wall was visible no further, the close was made by running directly to station 1. The table is as follows;

1 to 2, N 47° 14' E, 369.5 feet // 2 to 3, N41° 53' W 928 feet// 3 to 6, S 47° 47' W, 926 feet // 6 to 7, S41° 47' E, 541 feet and 7 to 1, N82° 47' E, 679 feet.

Check lines

from 3 to 4 junction with eastern parallel = 268 feet

from 4 to 5 junction with western parallel = 158 feet

from 5 to 6 western corner = 500 feet

The inner angles as ascertained by measurement on the ground are as follows;

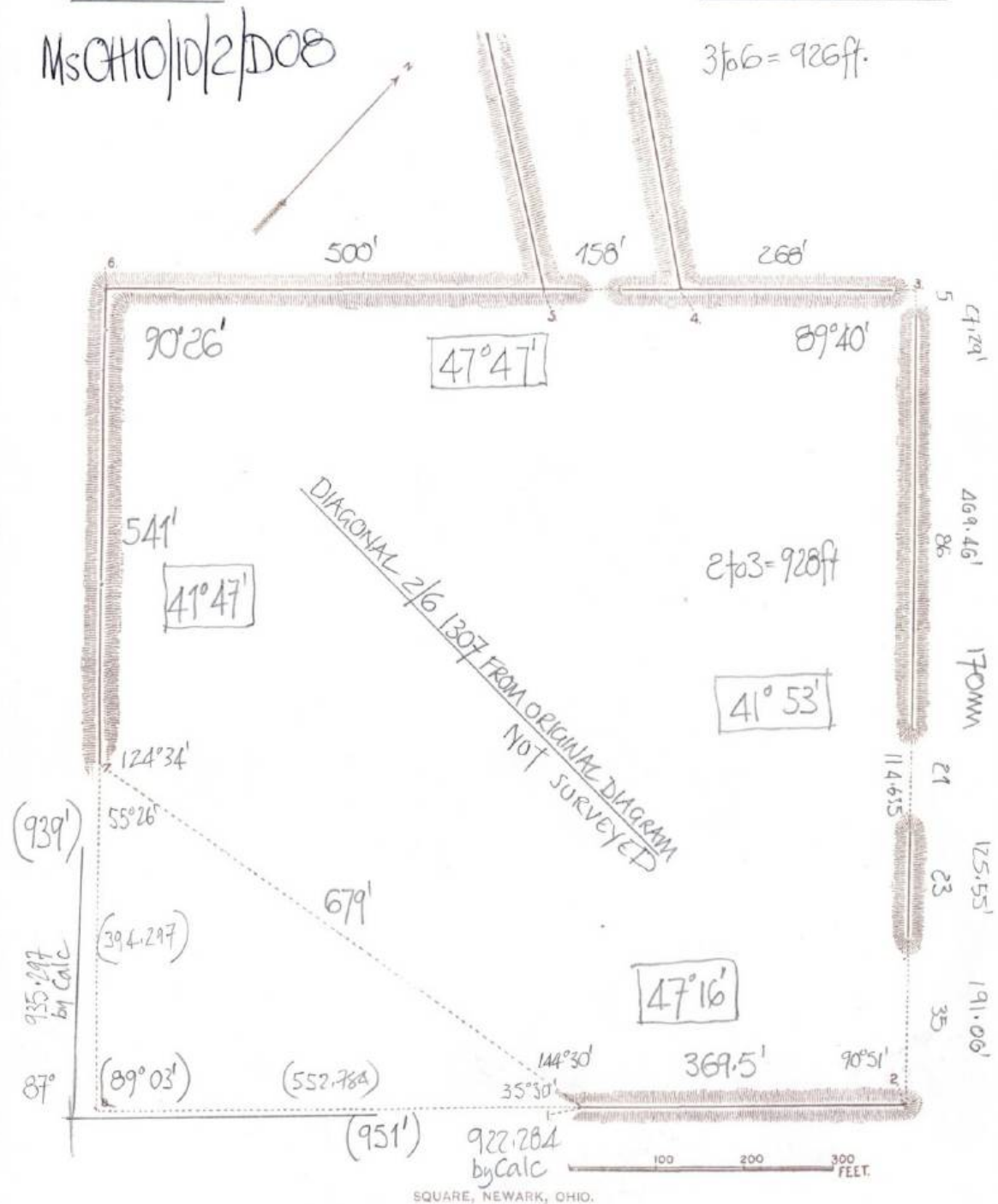
At station 1 = 144° 30'. // At station 2 = 90° 51'. // At station 3 = 89° 40'. // At station 6 = 90° 26'. // At station 7 = 124° 34'.

Supposing the obliterated parts of the lines about the southern corner to have been straight continuations of the remaining portions, as represented in the figure, this angle would equal 89° 03' and the side 6 to 8 would be 939 feet; and 8 to 2 would be 951 feet.

The length of the diagonal from station 2 to 6 is 1307 feet, ascertained from plat carefully drawn to large scale".

Study the drawing ETH12 PL XXXIV onto which I have added the above data and it does not tally to the diagram as clearly shown.

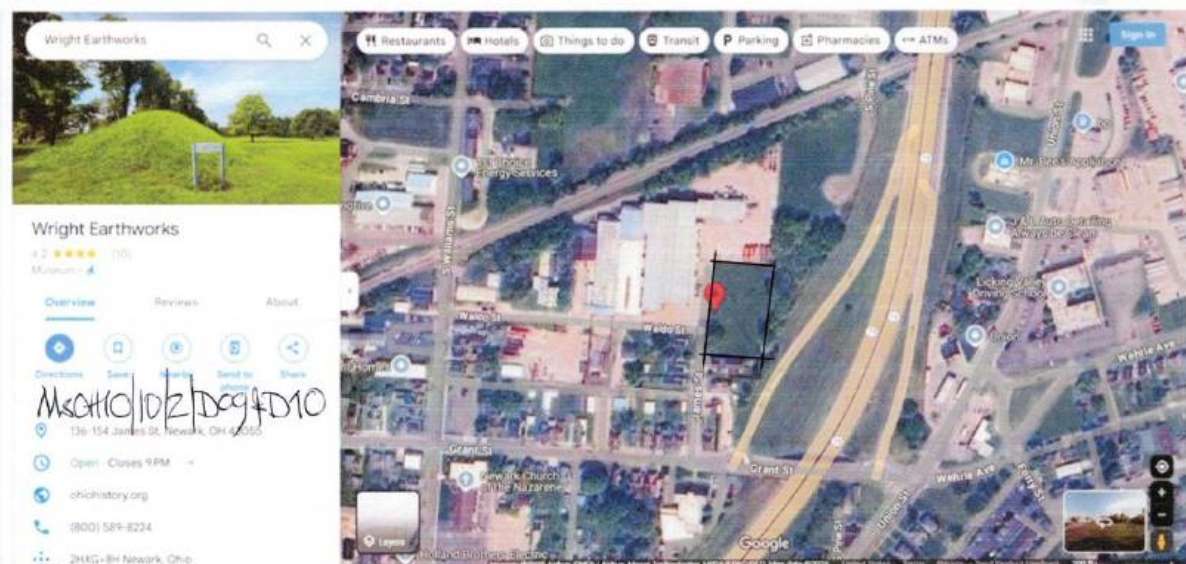
Diagram MsOHIO/10/2/D08



However being a re-survey some 40 years later the comments are not surprising, but, the fact that their supposition regarding the obliterated parts leads to wall lengths of 939 and 951 feet indicates that their survey for 6/8 and 8/2 walls is nonsense. And, if the overall survey is studied alongside this drawing the Road/Canal cuts through the NE wall where a minor opening is shown for the passage, whereas a major opening is shown adjacent to corner 2, being 190 feet and thus representing the Road/Canal route.

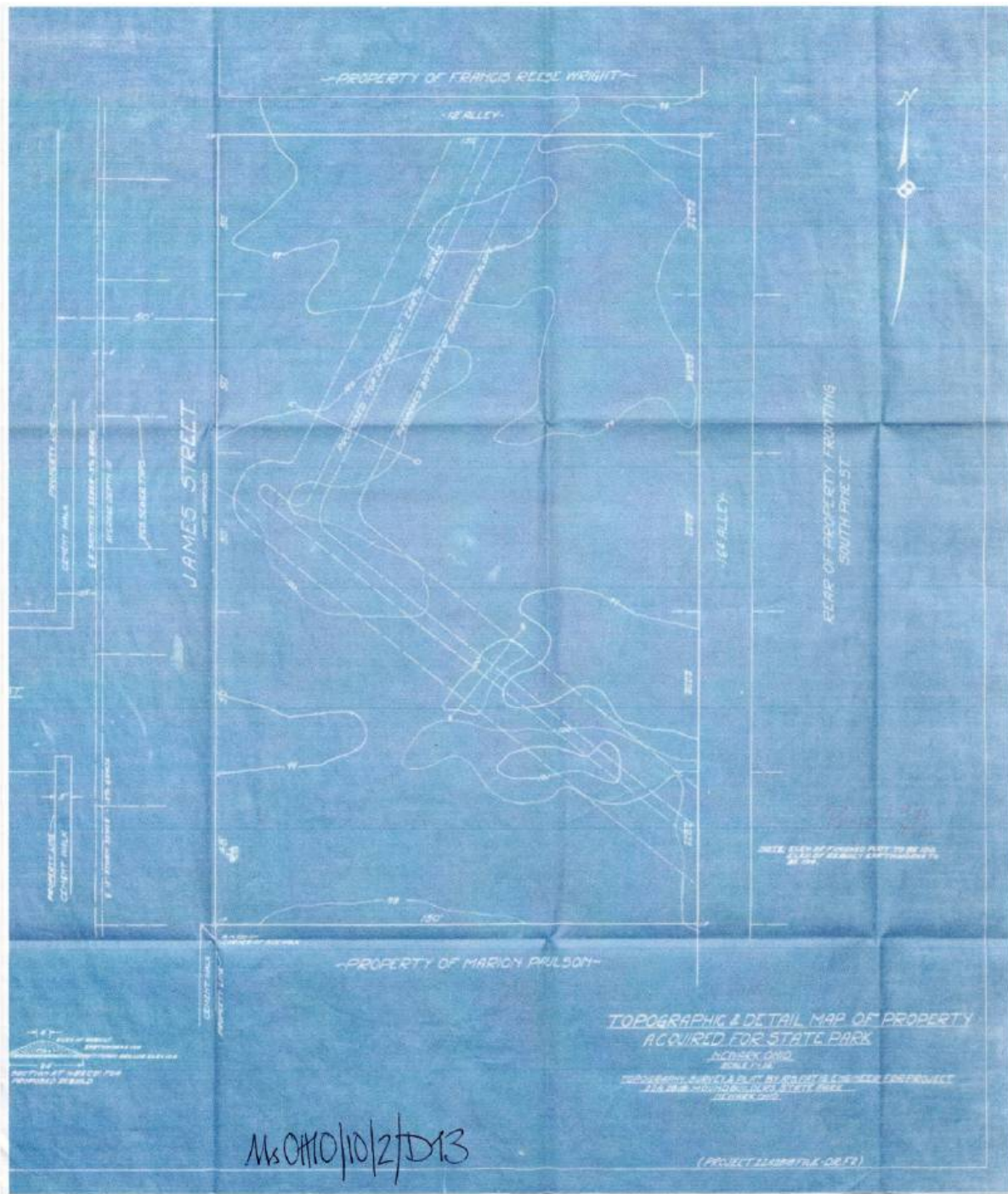
Thus the David Wyrick and Salisbury layouts were considered probably the accurate portrayal of the Square apropos Road/Canal, which on the D W plot has the Canal Locks positioned. (See Appendix 2, Diagrams MsOHIO/10/2/D31 and D32)

However, the “OHIO CONNECTION” had purchased the James St rectangle and placed a marker information board at the site as the photos indicate. Diagrams, D09, D10, D11 & D12

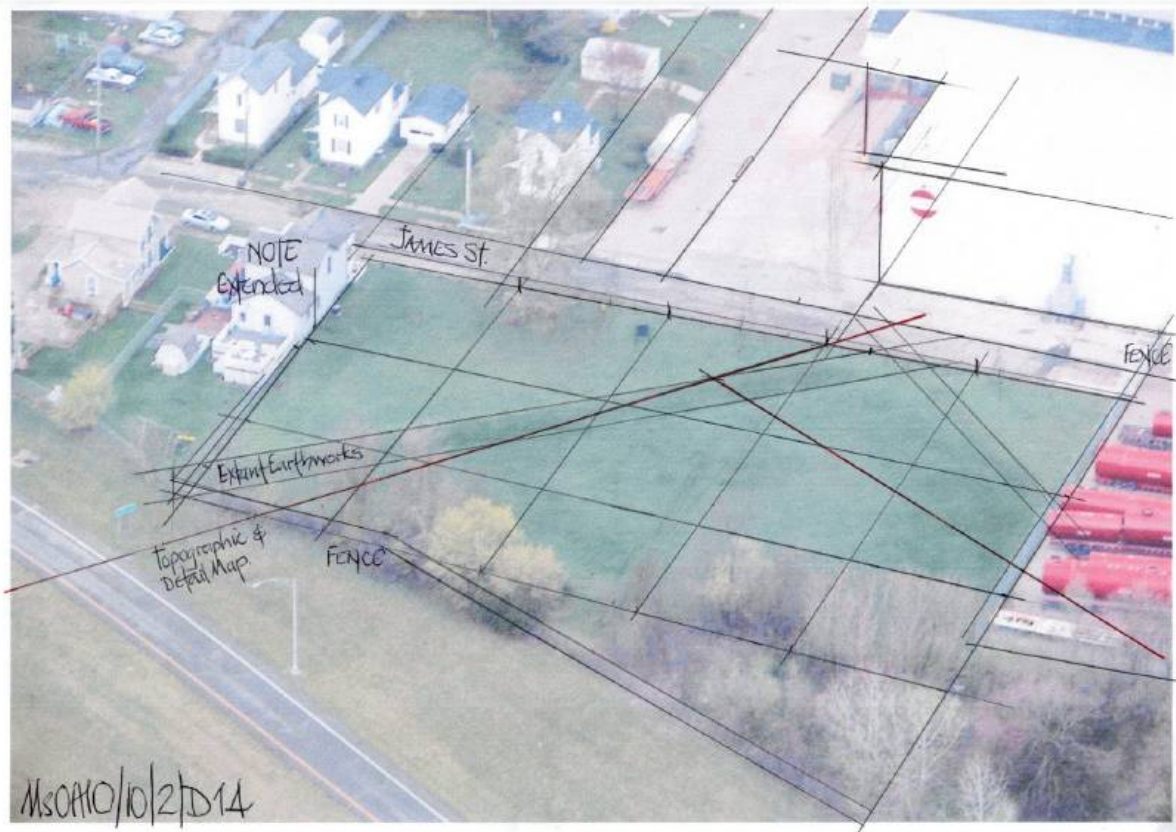




I was sent a copy of the Topographical Detail Map of the property acquired for State Park, Newark, Ohio, scale 1"=16 feet, which caused consternation. Diagram MsOHIO/10/2/D13



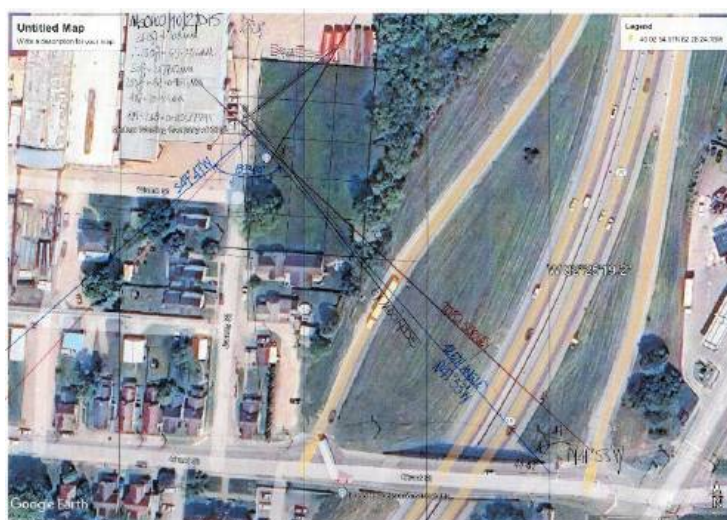
Although it appeared to agree with the Red Lines on the Info Board, it did not agree with the Earthworks as extant. The photographs clearly indicate different Earthworks, and I have added to them the Topographic Plan on the aerial photo.. I have also plotted the Topographic Plan on the GEP map (D14) and both clearly indicate a wide difference of alignment, and the probable ETH12 and Salisbury plots. Diagram MsOHIO/10/2/D14



A note on the Blue Print Topographic plot is very clear; “Section at ABCD for proposed rebuild”

In other words in 1936 it appears there was an attempt to build what was thought to be the “earthwork” as in the north corner as opposed to the possibility it was another portion or even a minor earthwork on the Square now missing. A proposed fiddle to make it work!!

However, by plotting the Squares from the Rectangle and placing the Road/Canal in position (Diagram MsOHIO/10/2/D15) the various bearings given and the sizes of the Square indicated the possibilities of layout.



Firstly, the angles of the various Squares were evaluated on the rectangle ensuring a 90 degree corner against the extant earthworks, which are set at 93 degrees, not at 104 degrees as the rebuild required, and with the Squares SE corner being the arbiter as it allows for the Road/Canal to pass across the Square, the various scenarios were plotted on the GEP map.

From that came the three setting out plots of the Squares on the GEP map with the Road/Canal 130 feet wide zone applied.

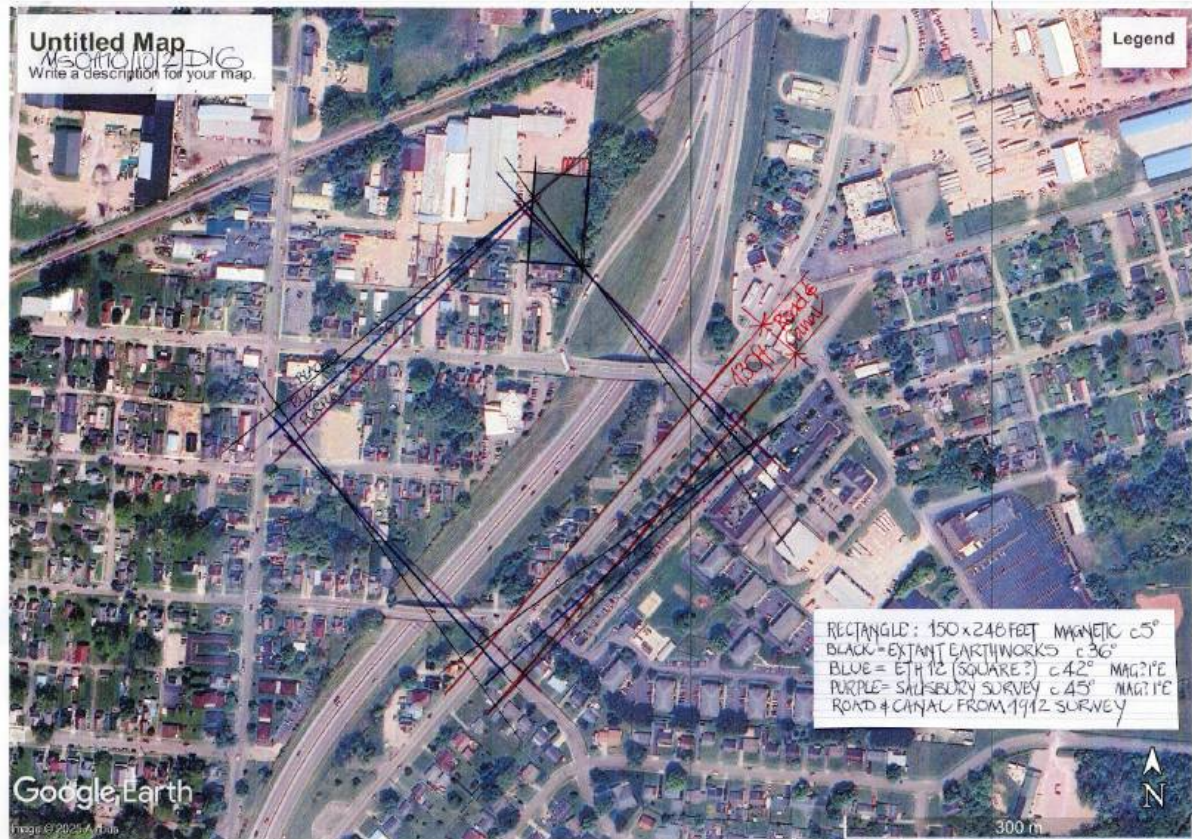


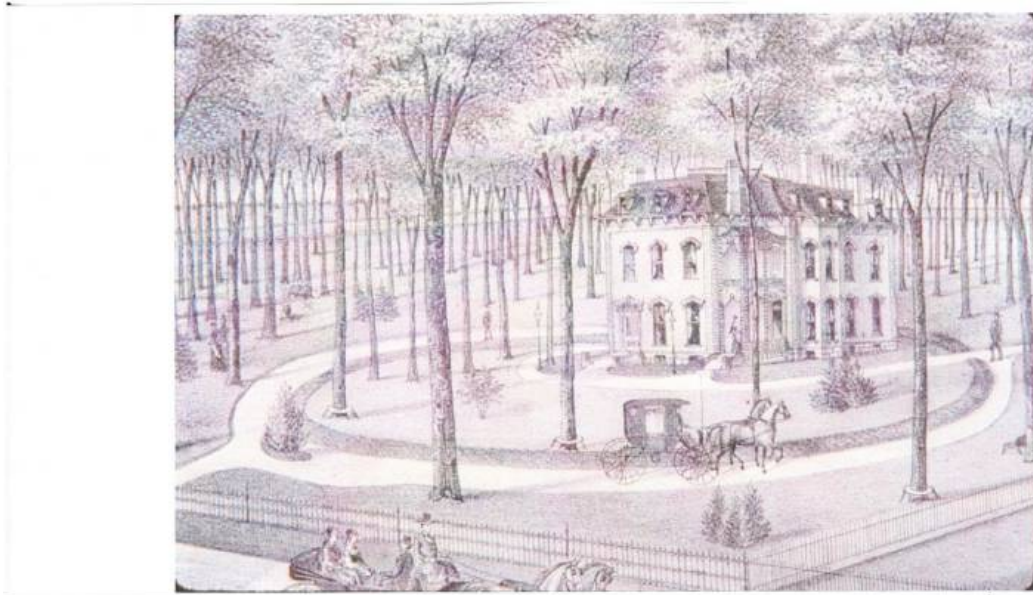
Diagram MsOHIO/10/2/D16. Basically the ETH12 Square is possible, but the Salisbury Square indicates a more practical alignment. However, study the “Black” Square from the Extant Earthworks and it is probably the alignment required for the schemes drawn.

The question to be answered is; “Are the extant Earthworks in the Rectangle true or another work of fiction?”

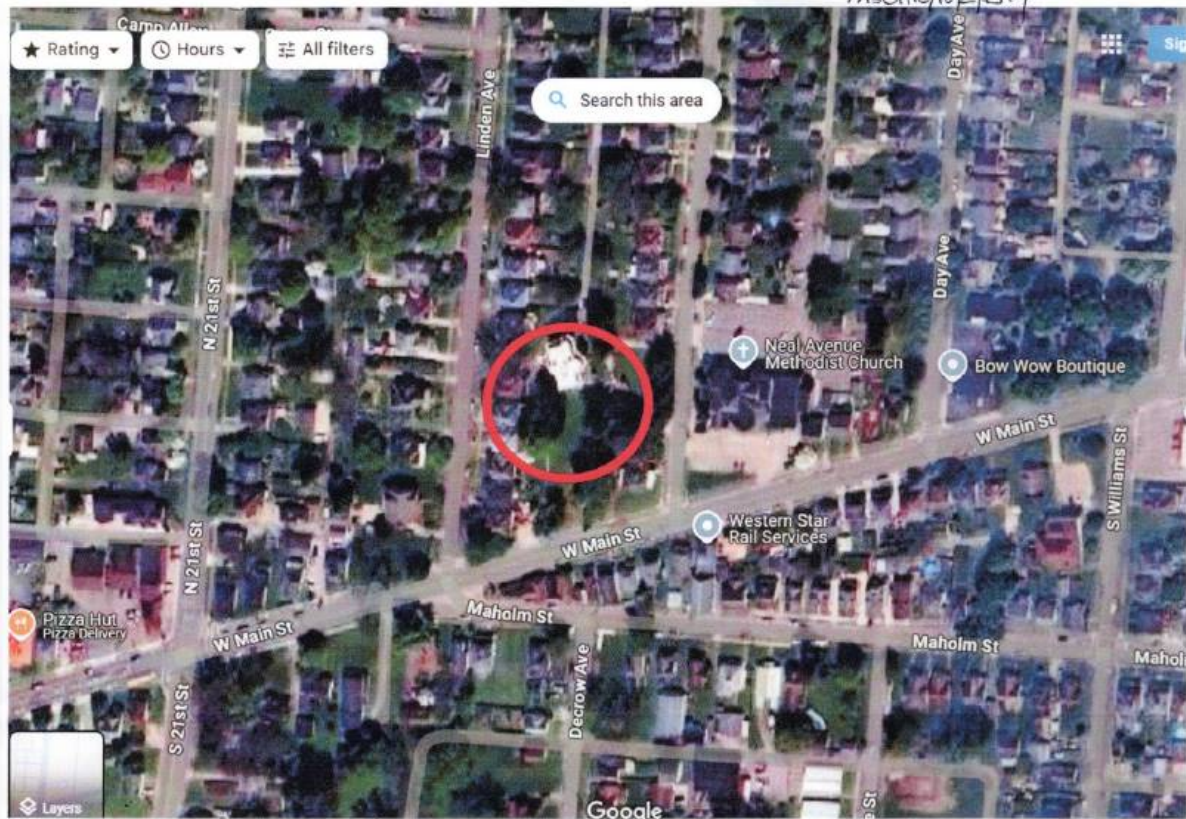
My final plot is my answer, hopefully agreeing with all the parameters set down.

THE HULL CIRCLE

Fortunately there is good evidence for this circle, with it being situate under a rather large mansion as the photo and GEP map clearly indicates, and is thus an excellent locator for the layout. Diagram MsOHIO/10/2/D17



MsOHO/102/D7



THE VAN HOORHIS WALLS OR THE GREAT HOPEWELL ROAD.

There are three papers which plot the route of these walls from the Octagon/Circle to the High Banks Works, Ross County, Ohio at Chillicothe. Catalogued in the Squier/Davis Book, 1846 Plate XVI, with the comment that the centre line from circle to octagon was set at 90 degrees to the Newark pairing. This route was traced by both LiDAR and ground observations. Lately the first extant section from the north has been catalogued by Lat/Long from the Airport at Newark southerly. The Van Hoorhis Walls are named from the WOOD Lot north of the Airport which is the subject of a LiDAR Scan.

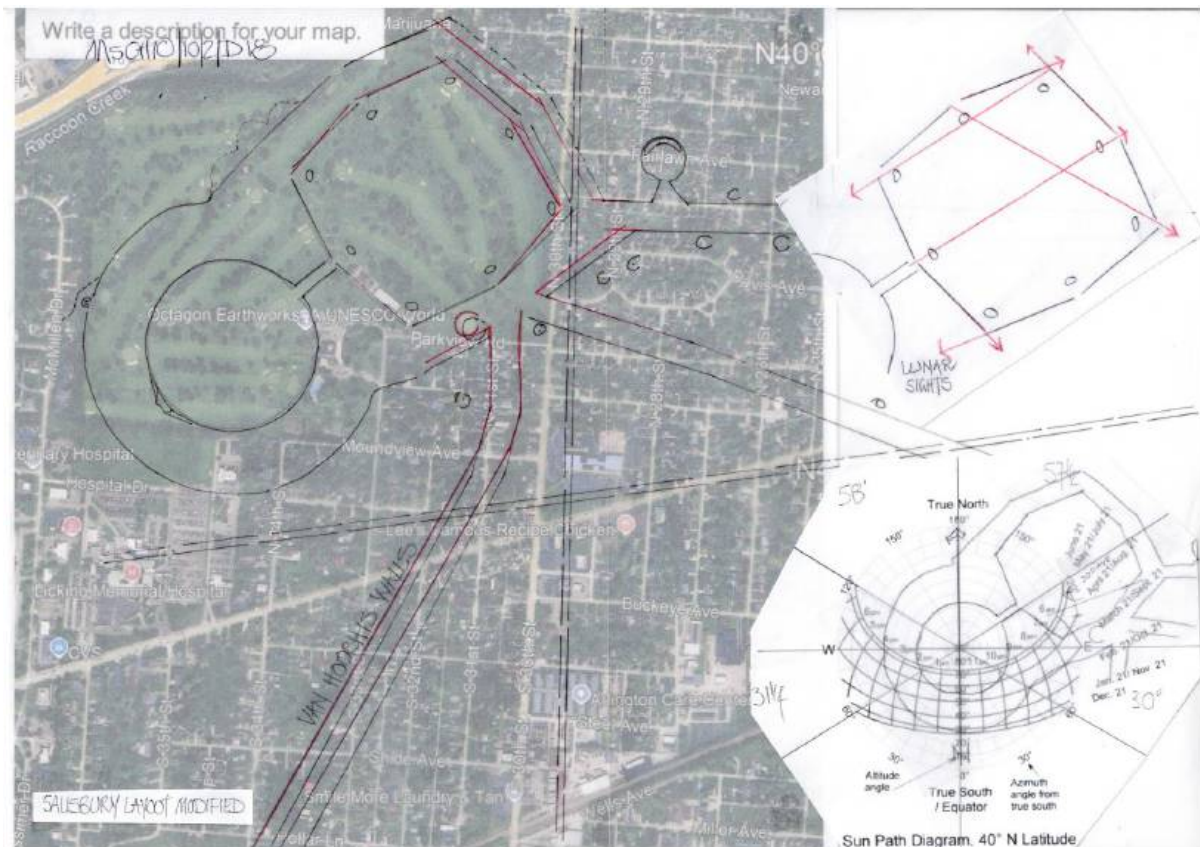
The works cataloguing the route are by, B T Lepper, 1995; W Romain and J Burks, 2008: K R Schwarz, 2016 and J Davis 2024.

THE PROPOSED LAYOUT

As already stated I believe the whole survey is a work of two parts, west and east joined by a single passage of two walls. The several earthworks situate between these two parts appear to be randomly positioned and the nearly due east passage from the Octagon, one would think, was meant to link somewhere, but again does not appear to have a direct *raison d'être*.

WESTERN SECTION

Diagram MsOHIO/10/2/D18



Thus the first and easiest section to deal with is in the west, comprising, the Octagon, Circle and Van Hoorhis Walls and those passages trending east. On this diagram I have deliberately set own in red lines the Salisbury Plot to indicate their accuracy, however, remember it is enlarged to suit the GEP map.

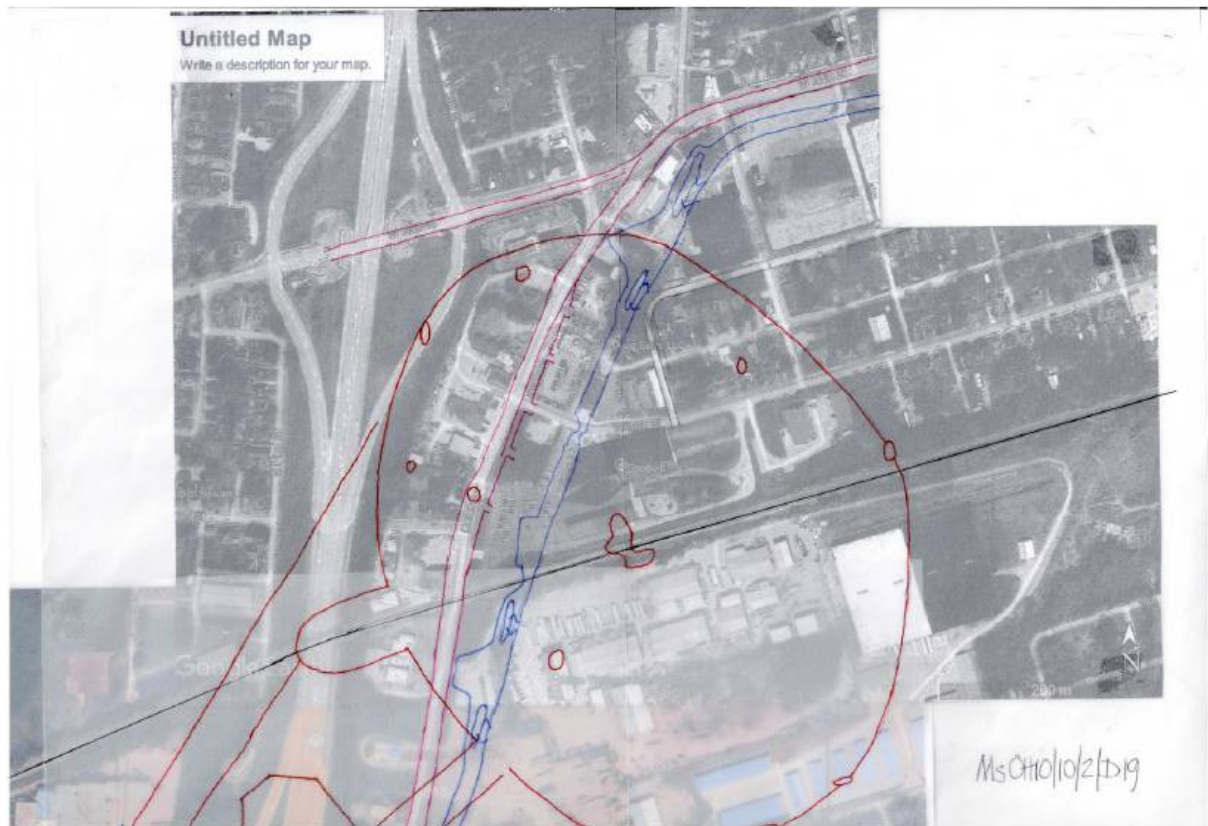
There is a large open garden area between S33rd ST and S34thST which may yield further indications of the Van Hoorhis walls. Unfortunately the Romain/Burks LiDAR plot does not extend this far north. The northern pair of walls trending east from the Octagon also appear to pass across the southern-most part of the School Site to the east.

EASTERN SECTION

co-joined Diagrams MsOHIO/10/2/D19, D20 & D21.

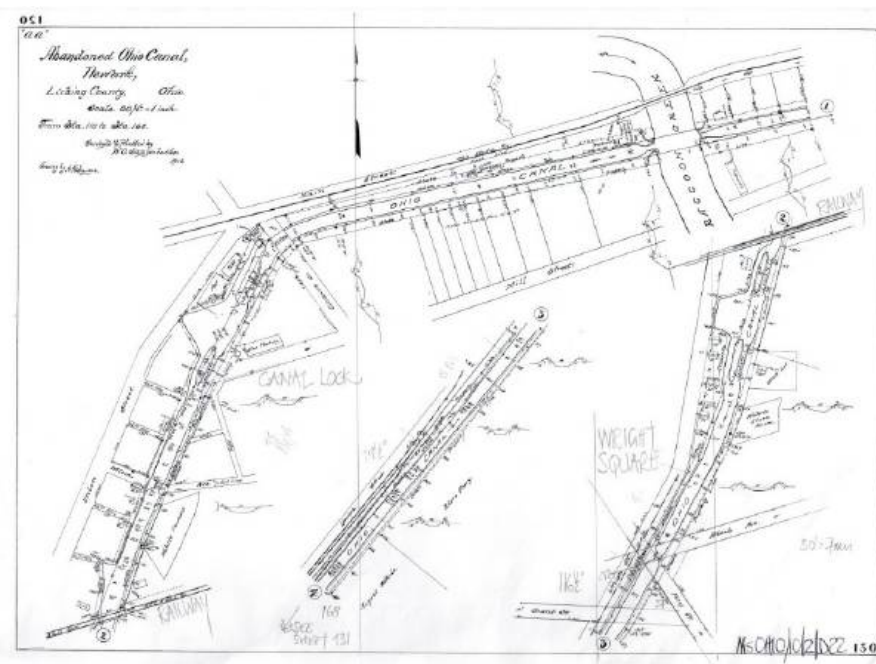
The eastern section plot consists of 3 x A3 sheets which overlap to form a coherent plan when printed at A3. They show the earthworks from the Ellipse, which commences

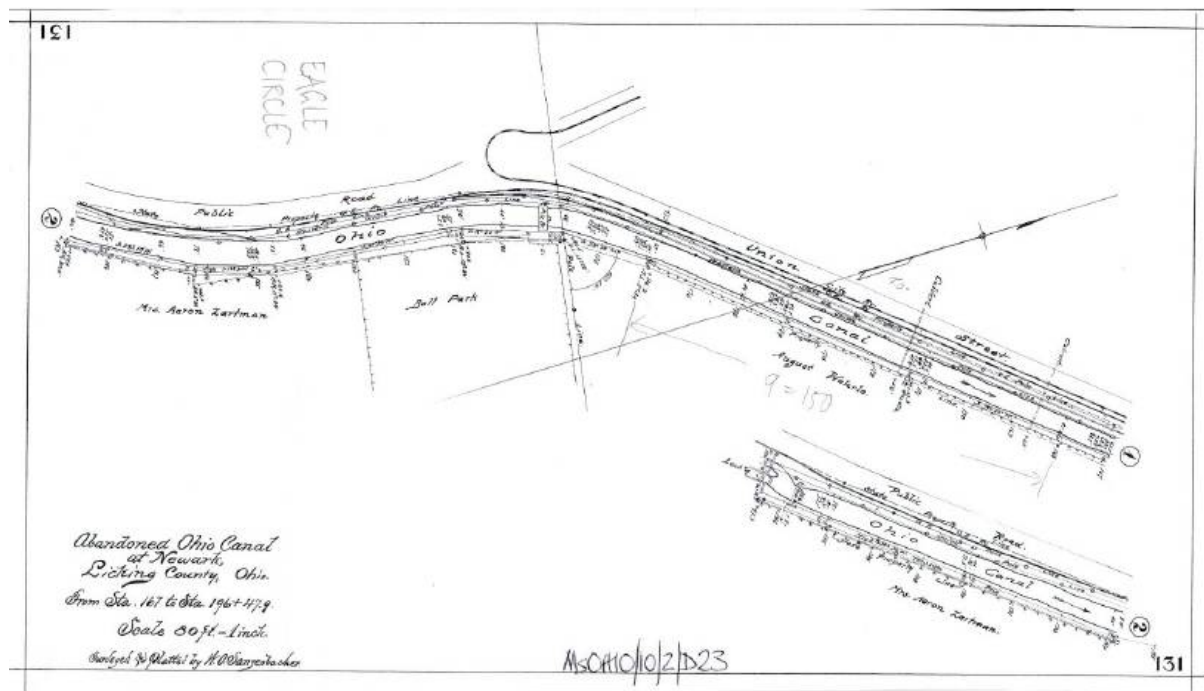
between the two locks on the Canal, as also suggested by D Wyrick in 1860, although his perfect Ellipse and Railway line are a little awry.





Next, the Wright Square is positioned to a best fit from the three options available. It meets the criteria of being able to show the 103-degree wall from the Rectangle and follow the extant earthwork profile south easterly to give a Road/Canal zone through the Square which accords with the old plans. Diagrams MsOHIO/10/2/D22 & D23

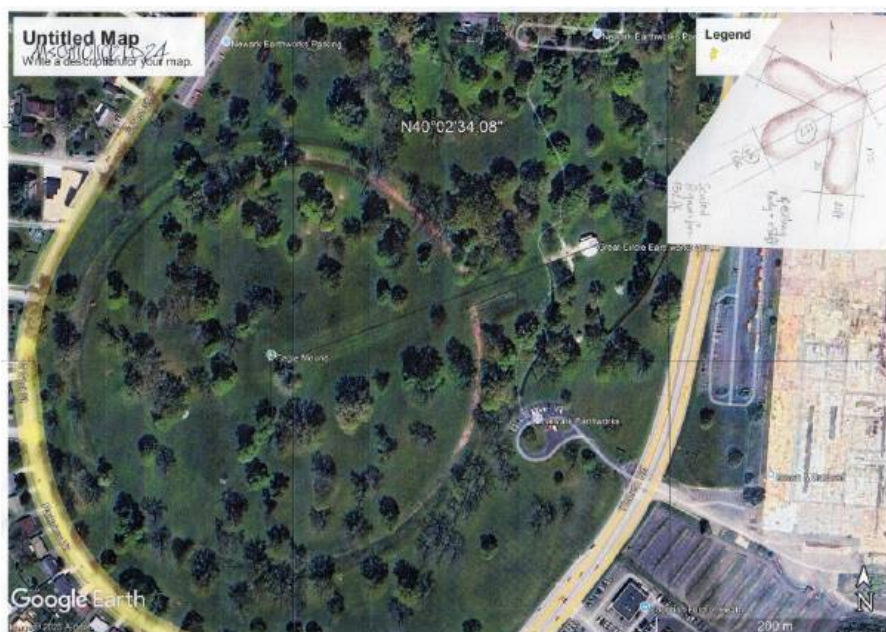




Each of the actual plots as drawn come with obvious problems and the Rectangle extant Walls give direction. Thus I consider it, best fit.

The Eagle circle has the perimeter earthworks appended and includes the extant section just west of the Route 79. It appears in a text by B T Lepper and R W Yerkes that the route 79 was being surveyed and Archaeologically inspected and that signs of a possible earthworks were found adjacent to S Pine St, which could be either a wall of the passage shown, although mention was made of a linear distribution between Wilson St and Malholm Street. Unfortunately they were not recorded, hence a major aid was lost.

Diagram MsOHIO/10/2 D24



1

Comment

It is thus imperfect, but I suggest that having tested all the evidence, unless “Real Evidence” of positional points is ever found to contradict it, then it stands as the only actual attempt to quantify these earthworks. I shall await any discoveries.

MAGNETIC DECLINATION; <https://www.ncei.noaa.gov/maps/historical-declination>

IN the years of these surveys they would be via prismatic magnetic compasses and thus may play an important part in finalising the layout positionally.

IN 1840 it was 1.95° East; in 1860, 0.97° East and in 1890 it was 1.02° West. The Historical Magnetic Declination Viewer comes with a warning that accuracy was to 30 Minutes or ½ a Degree of Arc, hence for 1860, the D Wyrick and Salisbury plans, given that caveat are probably as near to correct as necessary, given the small size of their plans. The measurements are also quite short and at a scale of 1:9600 the Declination is not readable. Hence balancing the three Squares bearings led to that chosen as the layout.

THE ARCHAEOLOGY OF MEASUREMENTS

Regardless of the foregoing, the whole Earthworks layout required to be visualized and set down upon the Earth's Surface by Design and Measurement. The Design can be ethereal, but measurement cannot!

Various reasons for designs have emerged but generally it is predicated upon that which affects the lives of the peoples. The text “Gathering Hopewell Society, Ritual and Ritual Interpretation by C Carr and D Taylor”, explains much. The sunrise/sunset, the Stars in the Sky at particular times and the “Tales” which emanate from them endeavouring to find answers to these phenomena are the norm. However, Professors Hively and Horn made Archaeoastronomical claims in 1984 that the Octagon was predicated upon Lunar Rise and Set points. In 2004, this was tested against the specific hypothesis and found to be statistically correct with 7 or 8 Lunar extreme azimuths represented. (see D18)

However, looking at the layout with the azimuths appended seems to be less than completely positive, but, it does confirm NO Solar azimuths possible (D18). Appended is the Solar Chart for 40N, the Sun Path Diagram, which gives the data for the Summer and Winter Solstice positions which can be set against the various features.

It is also possible that retrograde Star positions could be utilised but without corroborative data it is a matter of perhaps!

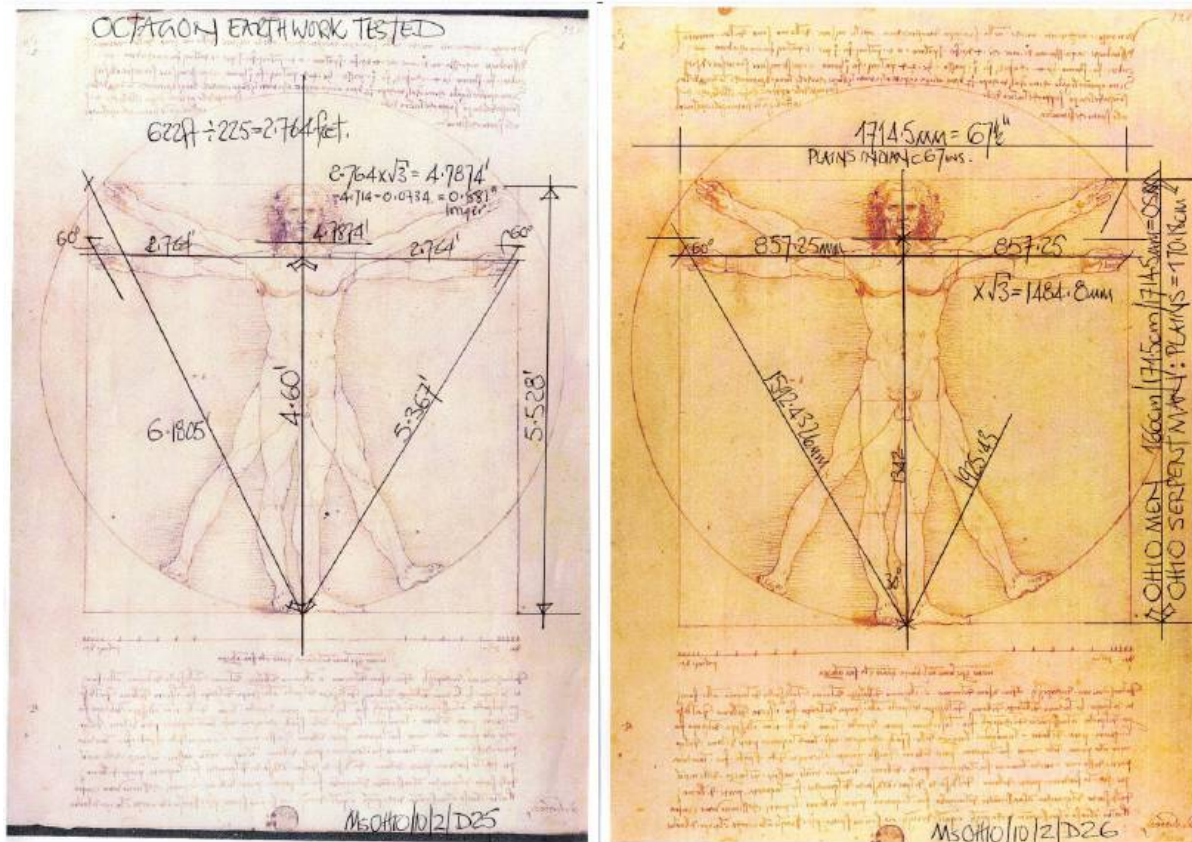
Actual measurement, using known basics such as the foot and inch however cannot be disguised. Hence they can be quantified by analysis to determine any basic figures, be they “ethereal” or from the Human Body. Read the Salisbury Brothers text and there are hundreds of measurements given in Statute Measure, but what the actual basic measures were is to be determined, and the main features are probably the best items to investigate.

PHYSICAL MEASUREMENTS

In the foregoing text regarding the OHIO SERPENT, the section “Alternative Measurements” and diagram MsOhio/10/D07 discussed various measurements. The basic units 2.722 feet, 4.714 feet and thus 5.444 feet were found and then other possibilities of 5 feet 7 inches or 5 feet 7 1/2 inches were found at the Ohio Serpent.

The raison d'être for the units 2.722 and 4.714 feet are from the “Stature of Man” found from a Man of 5.444 feet, with half the height being the basic measurement. These were also found

in the southern Mississippi area and Mesoamerica and Teotihuacan Mexico. The attached diagrams illustrate those measurements and as they are illustrated the number 15 is used to find a basic module. Diagrams MsOHIO/10/2/D25 & D26.



This comes from the POVERTY POINT layout where the basic setting out is 15 x 5.444 feet or 81.66 feet and 24.9 metres. Poverty Point is covered in the text MsMO/9.

INDIVIDUAL SECTIONS OF THE EARTHWORKS

The Octagon circle, either 1060 or 1054 feet diameter;

1060 = 389.4195 x 2.722 and 194.7098 x 5.444 feet and 13 x 15 = 195 units of 5.444 feet.
 = 224.8621 x 4.714 feet and 15 x 15 = 225 units
 = 376.8888 x 2.8125 feet and 25 x 15 = 375 units

1054 = 387.2153 x 2.722 and 193.6076 x 5.444 feet
 = 223.5893 x 4.714 feet
 = 374.7555 x 2.8125 feet

The Octagon Walls are either 622 ft (x5) 611 ft (x2) or 616 ft (x1) including openings.

622 feet = 228.50845 x 2.722 feet and 114.2542 x 5.444 feet.
 = 131.9474 x 4.714 feet
 = 221.1555 x 2.8125 feet

$$\begin{aligned}
616 \text{ feet} &= 226.3042 \times 2.722 \text{ feet and } 113.1521 \times 5.444 \text{ feet} \\
&= 130.6746 \times 4.714 \text{ feet} \\
&= 219.0222 \times 2.8125 \text{ feet}
\end{aligned}$$

$$\begin{aligned}
611 \text{ feet} &= 224.4673 \times 2.722 \text{ feet} \\
&= 129.6139 \times 4.714 \text{ feet} \\
&= 217.2444 \times 2.8125 \text{ feet}
\end{aligned}$$

The gateways are, 58; 90; 50; 90; 58; 82; 82; & 82 feet.

The Octagon, if the Lunar sightings are taken as correct, probably means the lengths of the walls/openings were manipulated to ensure they appeared exactly and any actual reason for a 15 ratio was probably lost in this setting out. It also points to the distinct possibility that the Octagon preceded the Circle so that the linking passage way was correctly aligned. Of course it is also possible the Lunar sightings were marked out first for the circle to be constructed first or alongside the Octagon. How long is a piece of string?

THE EAGLE CIRCLE

This circle which has a symbolic mound near the centre and is not a perfect circle. The Salisbury Brothers give just the dimension of the perimeter at the centre of the wall of 3742 feet and a single figure of 1196 feet diameter. Thus 3742 divided by PI is 1191.1155 and $1196 \times \text{PI} = 3757.3448$ feet.

However the figures given by the Archaeologists are that the diameter ranges from 1163 feet to 1189 feet. And, in the centre of the circle once stood a building some 100 x 23 feet and having wings extending outward at a 40-degree angle from the main access existed prior to the Mound. The circles walls are some 35 to 55 feet in width and thus as the Salisbury's generally measured to the centre of the enclosing walls, it is any bodies guess the diameter the builders used.

$$\begin{aligned}
1196 &= 439.3828 \times 2.722 \\
&= 253.7123 \times 4.714 \\
&= 425.2444 \times 2.8125
\end{aligned}$$

$$\begin{aligned}
1163 &= 427.259 \times 2.722 \\
&= 246.7119 \times 4.714 \\
&= 413.5111 \times 2.8125
\end{aligned}$$

$$\begin{aligned}
1191 &= 437.5459 \times 2.722 \\
&= 252.6517 \times 4.714 \\
&= 423.4667 \times 2.8125
\end{aligned}$$

$$\begin{aligned}
1189 &= 436.8811 \times 2.722 \text{ (29 x 15)} \\
&= 252.2274 \times 4.714 \\
&= 422.7175 \times 2.8125 \text{ (28 x 15)}
\end{aligned}$$

The GEP map illustrates the existing situation and clearly shows the main features. The angle for the view from the approximate centre through the entrance passage way is c70 degrees E of N which would place it as sunrise around the 7th or 8th of May and like the Octagon specifically avoids the main Solar events. Lunar events do not appear to be part of this.

THE WRIGHT SQUARE

The Salisbury Brothers give 918 feet per side; ETH has 928, 926, 939 & 951, but the archaeologists give an average as 931 feet.

Thus using the 918 and 931 feet measurements we have;

$$\begin{aligned}
918 &= 337.252 \times 2.722 \text{ (22.5 x 15)} \\
&= 194.739 \times 4.714 \text{ (13 x 15)} \\
&= 326.4 \times 2.8125
\end{aligned}$$

$$\begin{aligned}
931 &= 342.0279 \times 2.722 \text{ (22.8 x 15)} \\
&= 197.4968 \times 4.714 \\
&= 331.0222 \times 2.8125 \text{ (22 x 15)}
\end{aligned}$$

Again it is impossible to surmise that the 15 unit was applicable, however the complete lack of any accuracy of measurement and actual layout precludes any real research into the Archaeology of Measurement on this whole site.

CONCLUSION

If you can do better please do try and inform me of your efforts, particularly if this layout allows for the other earthworks to be even partly located and identified.

APPENDIX 1; TAKE CARE WITH THE EARTH MODELS

Most Earth models use a “Geoid”, a spherical model based upon an agreed medium for the difference in the latitudinal and longitudinal radii of this planet.

If you measure upon the face of the Earth, provided it is not in very hilly or mountainous terrain, where the profile of that terrain must be taken into account, the degrees of latitude and longitude will vary to a calculated degree and they are set down in a series of tables giving measurements in Metres, Feet and Nautical Miles at literally any given latitude, or part of a degree. As the latitudes from the Equator to the North Pole change minutely, each growing by similar measures of some 63 feet, and the longitudes reduce from an Equatorial maximum to a minimum at 90 degree north or south.

Hence ground measurement for complete accuracy should be made referenced to these figures for the larger monuments.

There are also two well-known methods, the Haversine Formula which uses a Spherical Earth and is used for general measurements, and the Vincenty Formula which uses the Oblate Spheroid Earth measurements, is very accurate and thus preferred.

Note; The USGS state that each degree of latitude equals 60 Nautical Miles, which is a Spheroid calculation, not true figures.

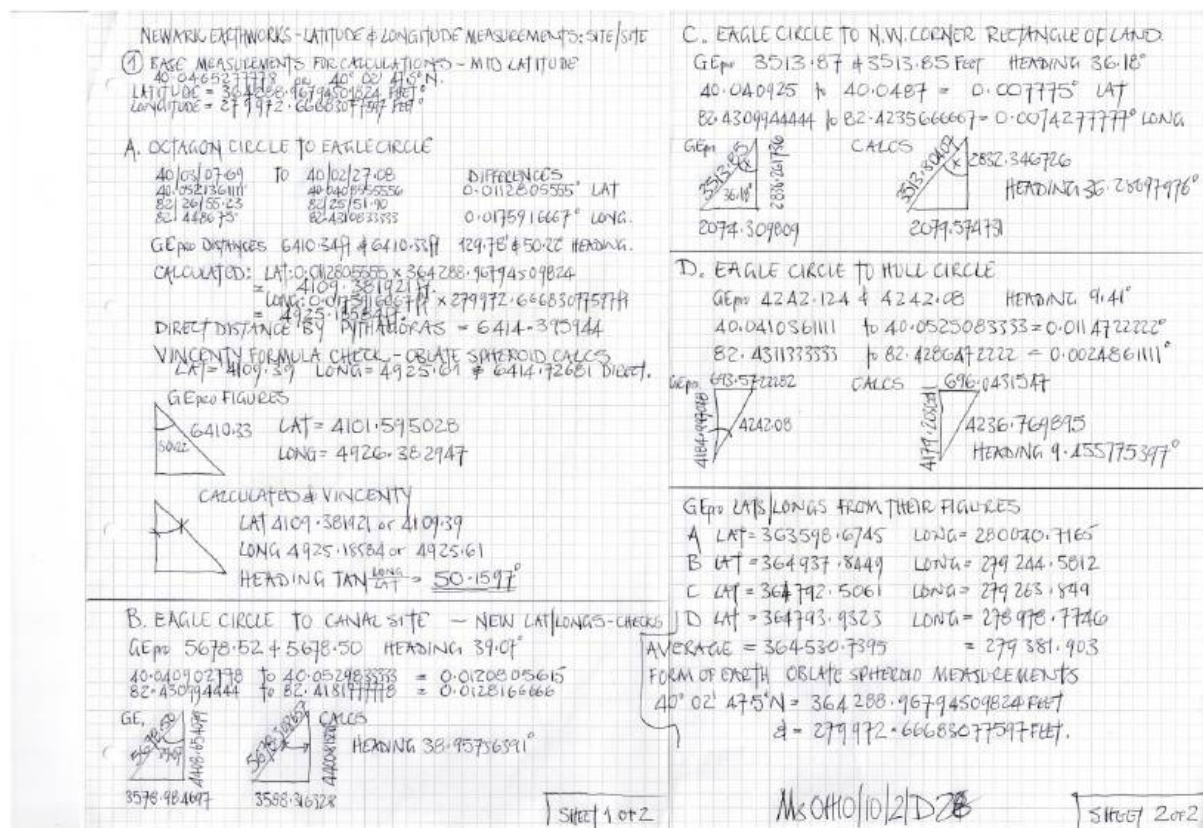
If you use G.I.S. etc you are getting Spheroid and using a hand held unit is the same and the accuracy for the uses they are put to is acceptable, but they have their limitations.

Finally, do not forget that even a Prismatic Compass with a levelling facility is still magnetic and the application of the Declination change is vital to obtain map positioning to the true latitude and longitude of the Location. And, ensure the declination is as exact as possible!

Hence this paper and its results are just like the Curates Egg!

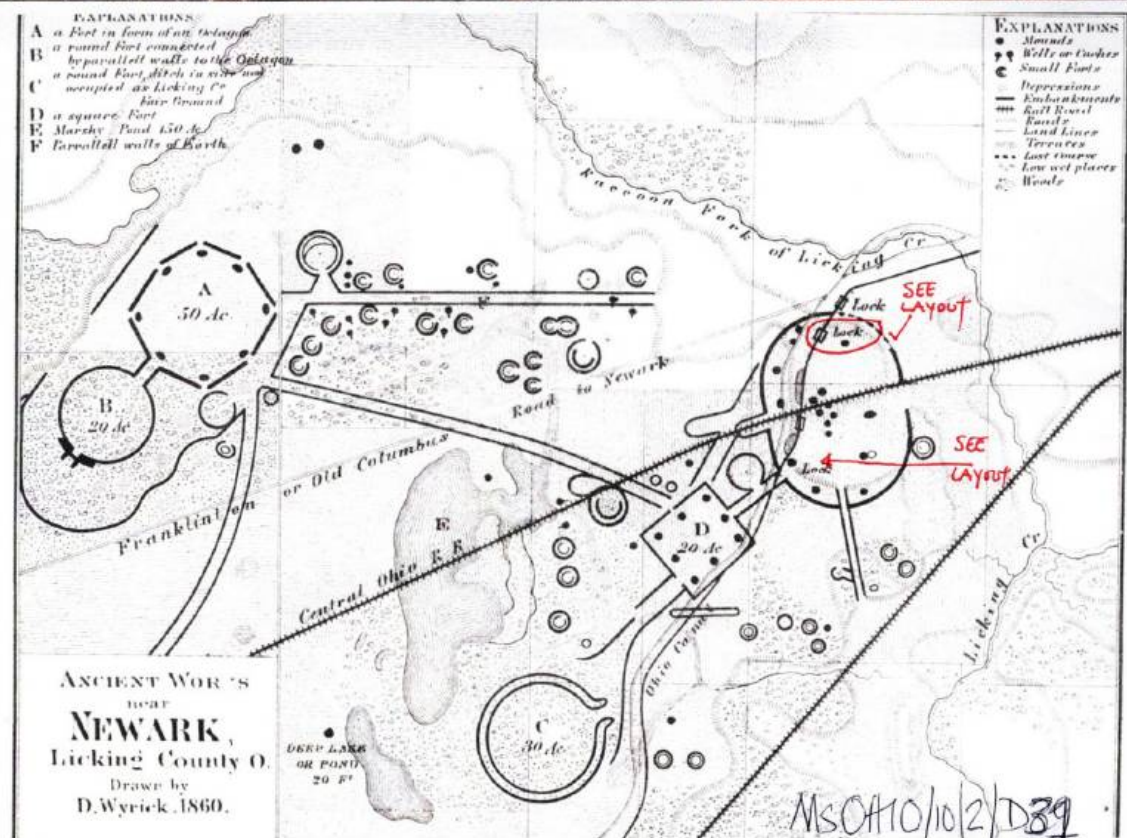
APPENDIX 2; CALCULATIONS AND ACTUAL MEASUREMENTS

DIAGRAMS D27; D28; D29 and D30



APPENDIX 3; THE CANAL LOCK IN THE NORTHERN ELLIPSE

Diagrams MsOHIO/10/2/D31 and D32





MICHAEL J FERRAR APRIL 2025