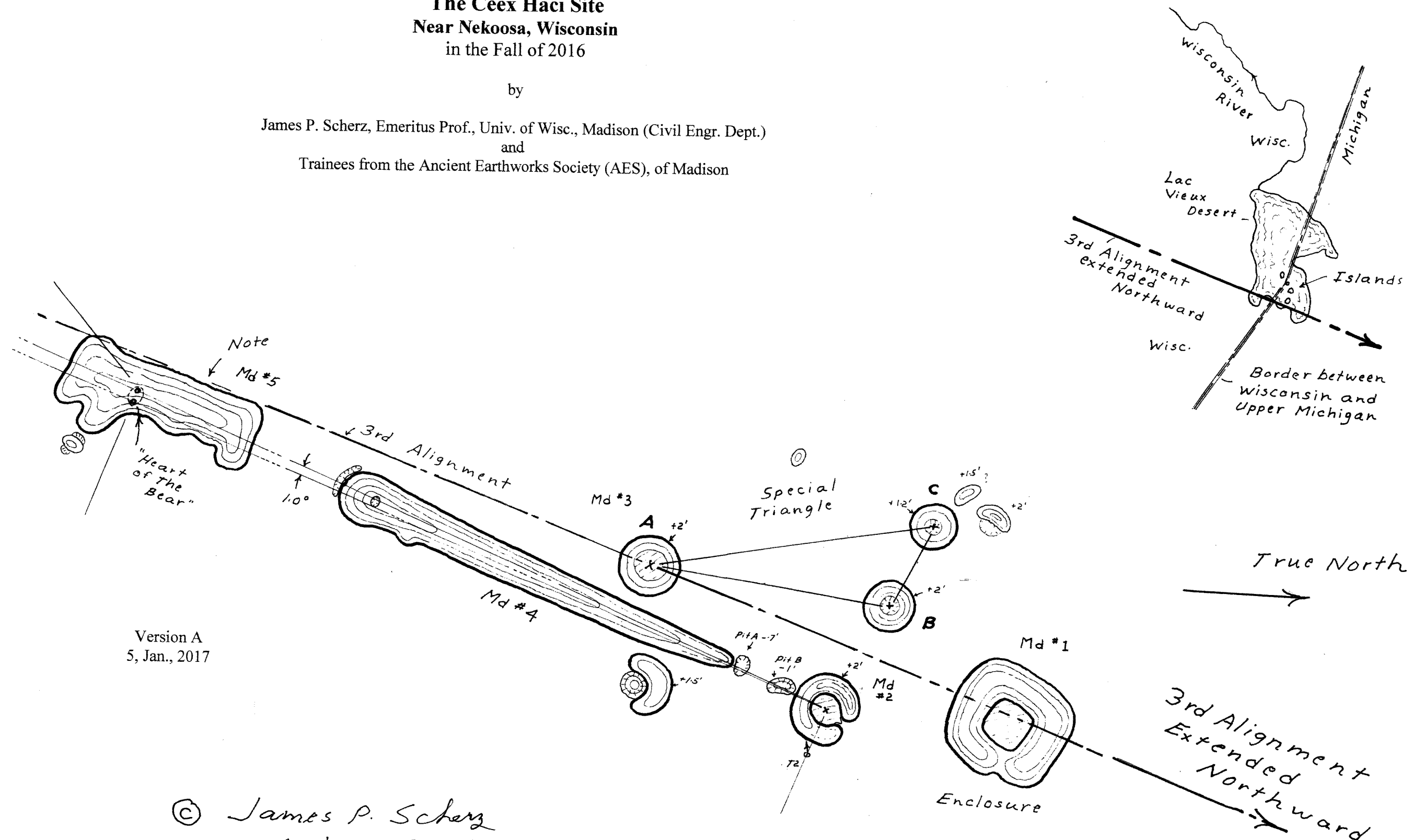


Survey Report
for
The Ceex Haci Site
Near Nekoosa, Wisconsin
in the Fall of 2016

by

James P. Scherz, Emeritus Prof., Univ. of Wisc., Madison (Civil Engr. Dept.)
and
Trainees from the Ancient Earthworks Society (AES), of Madison



Appreciation:

Most importantly, to Jay Mullins, our benefactor who allows us to use three rooms in one of his office buildings for the AES office and for map storage. And for his assistance in obtaining equipment and software needed in our work, including the Total Station, a map plotter, and the DeLorme mapping software used at the Ceex Haci Site. We also are indebted to Jay for financial contributions to our operating budget. Likewise, we acknowledge the generous financial contributions of the Ho-Chunk Nation, which gave us the confidence to take on such a large project as the Ceex Haci Site has proven to be.

To Chris Tyler, who acted as education coordinator last year when AES began to offer night classes on surveying Indian mounds, and who agreed to act as the coordinator of our surveys at the Ceex Haci Site. Without her able assistance, this project would never have been carried out.

To the other trainees, Diane Fox, Barbara Binkert, Chris Veit, and Erin Solawetz, who assisted in the surveying and field sketching at this site. To Christopher Veit who while working with the Ho-Chunk of Wisconsin brought to our attention this site and the fact that the HoChunk at Black River Falls were interested in having it surveyed.

To Tom Solberg, Doug Nogord, Dave Weier, and Gordon Schmitz of the AES offices for help getting started. To Nancy Kronstedt for information on the history of the area near the Ceex Haci Site. To officers present and past who keep AES alive and active over the two decades since when it was first formed. To numerous students and AES volunteers since the late 1980s who were interested in the unique effigy mound groups of southern Wisconsin and who participated in our surveys, hoping to better understand them and work for their protection. The processes which we developed over the past 30 years allowed us to do an accurate survey of the Ceex Haci Site. Special thanks are in order for Bob Johnson (now deceased) who as a practicing Mason and an active AES member, gave us subtle clues of how secret lodges work, and how we should proceed when trying to decipher sacred geometry encoded into ancient sites.

To Native Americans, Jones Funmaker, Merlin Redcloud, Ralph Redfox, Preston Thompson, Richie Brown, Tom and Lera Hopinka, Larry Johns, and others who participated and gave us insight into the mounds and what they mean. Especially to Pamita, trained in the ancient lodges on the Menominee Reservation who met us when we arrived to survey the mounds at Lizard Mound Park. He said that he had been appointed by his teacher as the traditional "keeper of the site" and was to educate people about it, provided they did not plan to dig. We did not dig, and he taught us much. And when it came to material for which it was clear that he had vowed to secrecy, he did not talk about it. But he talked about subtle clues in the mounds which we might use, provided we wanted to try and figure things out by ourselves. I have been doing so ever since. The Ceex Haci Site is no exception.

To people who come to the AES meetings and who give us an incentive to translate what we have perceived in the layout of the mounds into words that others might be able to understand.

Different Versions of this Report are Planned:

This version of the Survey Report is just to accompany the four maps. You have Version A in your hands. Version B is planned to expand the report and provide illustrations to many references to geometry at other sites mentioned, but not detailed in the maps. Version C will be Version B but with detailed survey data included. It will be targeted to be a survey reference to future inquiring minds of how the surveys were done, including taking sunshots, which in the next generations will not be taught to surveyors and will be considered old fashioned, as we now consider log tables and slide rules. The difference is that with sunshots, we directly get our maps oriented to true north, which we need in our geometrical analysis. But other present and future maps made by surveyors based on county or state plane grid systems (unless mathematically rotated) will illustrate north at some agreed-on direction in the county. This is definitely not the same as true north in most other locations in the county. Ancient New World Surveyors of Wisconsin clearly used accurate true north at the center of their sites in their layout of the Effigy Mound Groups.

Version C of this report will also explain how to use the computer programs which were used in preparing and analyzing the maps at the Ceex Haci Site. These programs (part of what is called the MAPIT Series) were developed and thoroughly tested in our surveying labs before I retired. Although written in Basic, they efficiently reduce sunshots, and will reduce field data from the Total Stations and Transits (for our particular applications) more simply and more reliably than any other methods I am familiar with. A modified version of these programs can also be used to reduce the historical notes of T. H. Lewis, who surveyed thousands of mounds in the 1800s. Several people are interested in reducing the notes of T. H. Lewis. If they understand how to reduce the Total Station or Transit notes with our programs, then they will already know how to reduce the Lewis data using computers.

Other programs developed decades ago and thoroughly debugged and tested were also used at the Ceex Haci Site to project Rhomb Lines across the landscape. These programs are called Trace.BAS, Trace3.BAS, etc. Other programs called Trilat.BAS, Trilat3.BAS, etc., were used to determine the included angles of the Special Triangle at the Ceex Haci Site, given the lengths of the sides. Lest such useful programs be forgotten about, lost, or otherwise not available to the future interested student, they will be detailed in Version C.

Overview:

This brief report is meant to accompany four maps which were produced from our surveys of an ancient Indian Mound Group which we call the "Ceex Hacı" Site in Wood Co., Wisc. in the fall of 2016. The name "Ceex Hacı" is Ho-Chunk (Winnebago) for "Marsh House." In Ho-Chunk verbal tradition, the area just south of the rapid waters of the Wisconsin River at Nekoosa is known as Ceex Hacı. "Nekoosa" means "Rapid Water." The first major rapids of the Wisconsin River began about 1/2 mile east of this site. Large dugout canoes (up to 40 ft. long) which were used by the Sioux and Ho-Chunk, naturally could come upriver from the south no further than the first major rapids of the Wisconsin River. Then they would have to change to the light birch bark canoes used by the Algonquians and French Voyageurs to go further up stream. (Of course, people from the south with giant dugout canoes could also have unloaded here and traded with people from the north who had light birch bark canoes which could negotiate the rapids--and visa versa.). Nancy Kronstedt, one of the landowners, pointed out records that there was once a native village made of people from different tribes along the river near this site. And there was once a large complex of Indian Mounds and cemeteries in the area, most of which have been destroyed by development, farms, and cranberry marshes.

The Effigy Mound Group which was surveyed is located in SW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 15, T 21 N, R 5 E, in Port Edwards of Wood Co., Wisconsin. There are two landowners: Nancy Kronstedt, and Frank Chojnacki. There is considerable interest in this site because a Canadian Pipeline is scheduled to be enlarged through the middle of the group. The site was brought to our attention by Christopher Veit, who was working with the Ho-Chunk tribal headquarters at Black River Falls, Wisconsin. Doug Norgord, and Dave Weier of AES brought to our attention that some of the mounds show up on Lidar Imagery. Tom Solberg and Gordon Schimtz helped with defining the parcels so we could obtain records from the Court House of Wood County for the area we surveyed.

The field surveys were done by J. P. Scherz, Chris Tyler (being groomed to be a survey field leader for such sites), Diane Fox (also a future survey team leader), Barbara Binkert, Christopher Veit, and Erin Solawetz. The field equipment was a Topcon Total Station. Directional control to precise true north was by celestial observations (sunshots in this case). We marked "surveyed points" on and adjacent to the mounds, and recorded the distance and direction from the Total Station. The location of the dozens of surveyed points are considered accurate to the nearest 0.5 ft. in a true north grid, relative to the beginning point where the sunshots were taken. Between surveyed points, we stretched a surveying tape to serve as local base lines for grids from which to make field sketches. At approximate right angles from the tape, an extended level rod was laid (with zero end next to the tape). This created a field grid where we could sketch in the edges and details on the earthworks to a field grid sketch sheet at a scale of 1 inch = 20 ft. Later, the coordinates from the Total Station were plotted at a scale of 1 inch = 20 ft., and the details from the field sketches were transferred to this base map. Barring mistakes (boo-boos), the location of details should be accurate relative to each other to about the nearest few feet, over the entire map. The edges of the mounds were determined by feeling with the feet, a very repeatable procedure.

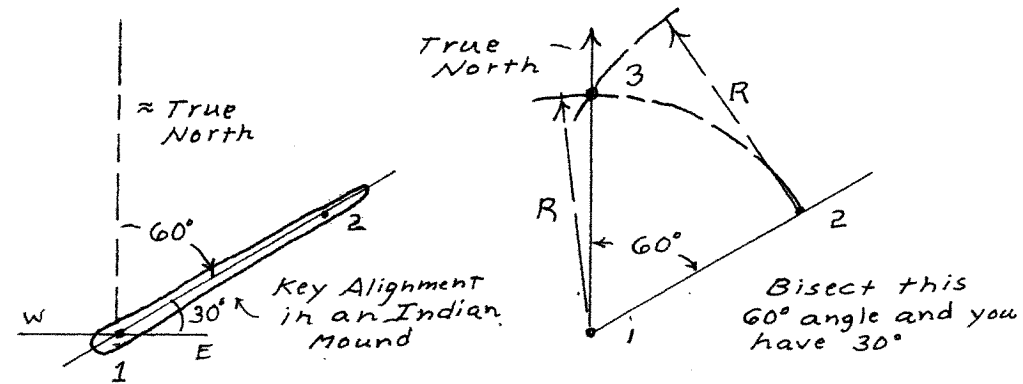
The results are four maps: (1) The base map, **Map Sheet Nek-F1**, (2) A Map emphasizing property lines (**Map Sheet Nek-F2**), which is meant to be used in cataloging the features, (3) A map emphasizing the geometrical layout of the mounds (**Nek-F3**), and (4) Map Sheet **Nek-F3a**, which is more geometry. Our maps are oriented to true north to an accuracy of better than 0.1 deg., and show geometry that cannot be discerned on earlier maps based on magnetic north, or on maps made by modern surveyors using satellites and country or state plane coordinate systems where their north grid can be up to several tenths of a degree from true or celestial north.

Like all such still intact Effigy Mound Groups, the revealed geometry is complex (purposely encoded) and was clearly also oriented to true north to an accuracy of at least 0.1 deg. (This was probably done by determining true north from observing the north celestial pole--the center of rotation of the northern stars).

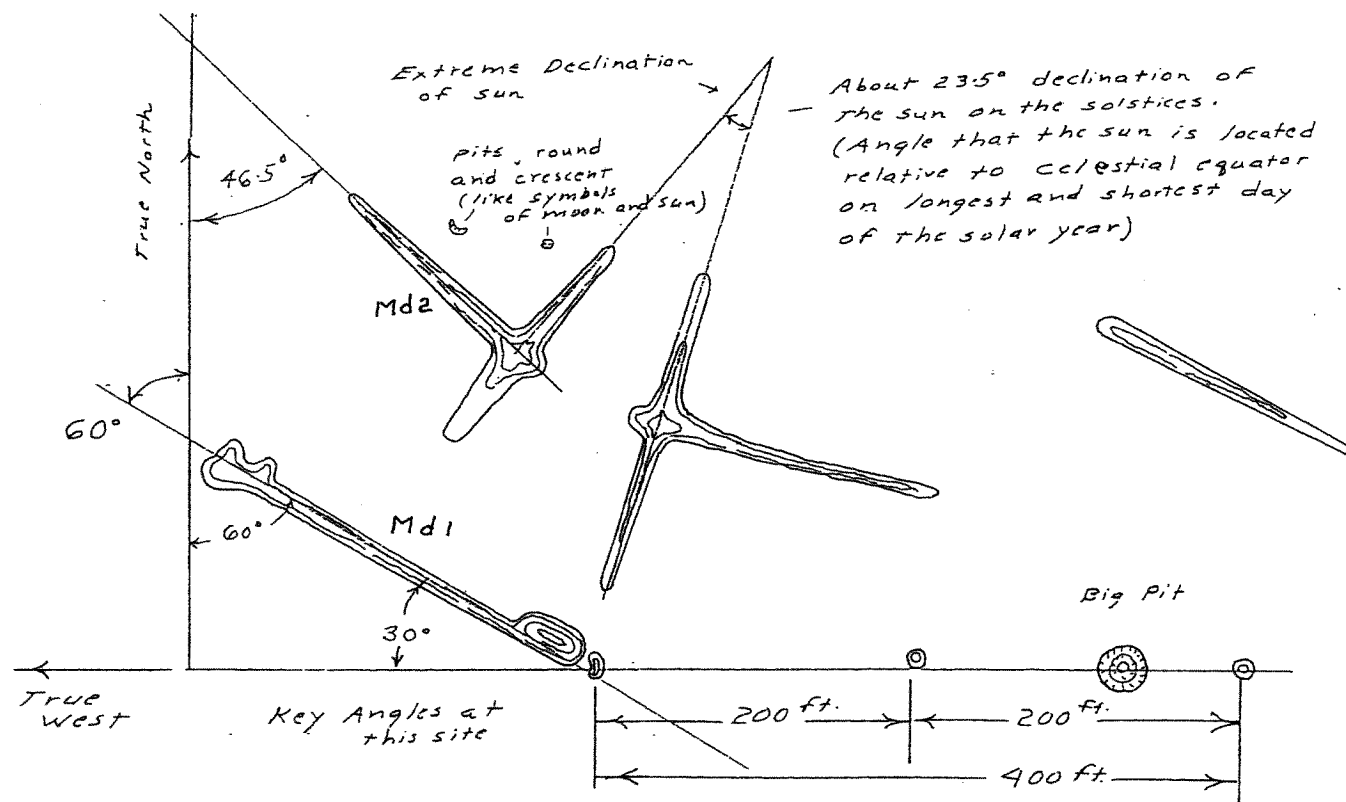
When we went to the site, our intentions were to simply survey three or four mounds which show up on the Lidar Imagery. They are labeled as Md #1, Md #3, and Md #4, and Md #5 on our final maps. One of our goals (besides using the mounds as training for future mound surveyors) was to create a map so that the mounds could be registered for protection. (See Map Sheet Nek-F2.) But we found much more on the ground than just these four mounds. The field work, which we had scheduled for two days, evolved into several weeks of intense work. The site is large and complex, and the property issues are complex as well. There are multiple landowners, and ownership data do not agree with each other in the Court House. It is an excellent site to thoroughly document as a future training reference.

With over 16 features, we also found intriguing ancient layout geometry. (Most Effigy Mound groups were laid out probably between about AD 300 and AD 1300.). In essentially all such groups which have not been overly damaged, the geometry can be seen oriented to true north (to at least an accuracy of 0.1 deg.). But the most important geometry is not open to public view. It is encoded, as from a secret lodge or ancient mystery school.¹ At most effigy mound groups in southern Wisconsin, there is a key alignment, at a key angle from true north. Most key angles are 60.0 deg., 30.0 deg. (60 deg. bisected), etc. These angles can be easily laid off from a line oriented at 60.0 deg., 30 deg., etc., using angles of 60.0 deg. or 30.0 deg. --easily made with rope geometry. Then, temporary stakes can be set at the key angle from the key alignment, to stake out the direction of true north. See Figure 1. Using this procedure, the priests conducting education or ceremonies would be able to access the all important true north-south direction, without a long and tedious process of observing the northern stars for precise north. This laborious process was apparently originally used when the site was laid out and constructed.

¹ Pamita, in the late 1980s, trained in the ancient "Fire Lodge" (then still active on the Menominee Reservation) said he was the traditional "keeper" of the site we know as Lizard Mound Park. He said that when the sites were laid out, the most important and key geometry was hidden from the non-initiated commoners even when the mounds were constructed. But, he said, the priests left clues (which he called Toths") which the initiated survey priests could use to unlock the geometry when they needed it.



Constructing angles of 60 deg. and 30 deg. from a key alignment



**Some angles in layout of effigy mounds at Lizard Mound Park
(West Bend, Wisc.)**

Figure 1. Some Key Alignments and Key Angles at other sites

As shown in Map Sheet Nek-F1, the alignment which I initially took to be the Apparent Key Alignment at the Ceex Haci Site was at 20.0 deg. from a true north-south line (and about 617 ft. long). The angle of 20.0 deg. is 60.0 deg. divided by 3, or an angle of 60.0 deg. trisected. Although they still teach in college classes that it is impossible to trisect an angle with geometry, Pamita said otherwise. Once our students realized that there might be a way, they found a solution for trisecting an angle with a rope within a few weeks. It is possible to trisect an angle using what we call the 1/4 Series Function, by multiple bisections with a rope. (See Annex A.) When the Greek scholar Euclid in about 300 BC was writing his books on geometry, he did not know about series functions (which modern mathematicians use to illustrate how calculus works). So trisecting an angle by using a rope with the 1/4 Series Function did not get into his books.

Euclid tried all his life to solve two of the riddles of initiation secrets of the ancient Egyptian priesthoods. These were trisecting angles and squaring circles with geometry. He failed, and concluded that both were impossible. And so we have been teaching the same ever since. But both of these ancient initiation riddles can, indeed, be solved. Part of the solutions is illustrated in the geometry near the Hopewell earthworks at Newark, Ohio.² Pamita said that it was here that the ancient Cat (Baalam) priests once had a college, and where they taught mathematics, geometry, astronomy, and surveying, "just like in your modern colleges".

Near Newark, Ohio, is a unique "Alligator" effigy mound which has a Key Alignment at 20.0 deg. from the true cardinal directions. When I found the second longest alignment at the Ceex Haci Site at 20.0 deg. from a true north-south line, I naturally assumed that this was the key alignment at this site, as well. (See Map Sheet Nek-F1.) An angle of 20.00 deg. results from trisecting an angle of 60.00 deg. An angle of 60.00 deg. can easily and precisely be constructed with a rope. So can trisecting an angle, but it takes a sequence or series of bisecting angles. See Annex A.

Key angles from key alignments could have been used centuries ago to temporarily stake out true north at a site, so that the important geometry could be revealed. Pamita said to look for small easily overlooked clues at the sites, which the initiated surveyor priests could have used to unlock the important geometry. They were meant to be hidden from the uninitiated commoners, even at the time that the sites were laid out. But with our maps precisely oriented to true north (towards the celestial pole, center of rotation of the northern stars--including our sun) the first part of the decipherment is already done.

² See Annex B for our solution for squaring the circle with rope geometry. It comes from studying the layout geometry for the great Octagon Mound, at Newark, Ohio.

As one ponders the maps, otherwise overlooked information might come forth. (Refer to Map Sheet Nek-F3a.) This sheet shows a special triangle which seems to be encoded into the site. There are several feet of errors in scaling the length of the sides of this triangle on the map. Within the error bounds, we have a triangle with unit sides of 101 ft., 36 ft., and 117 ft. Interestingly, this is a most unusual triangle which can be used to create a precise angle of 19.00 deg. (to an accuracy of 3 seconds of arc.). This is the bearing angle that was measured with a large protractor for what is shown on Map Sheet Nek-F1 as the 2nd Alignment, at a distance of 928 ft. long. Also see Figure 2. For someone who knew the mysteries of this unique triangle, then the key angle could have been 19.00 deg., and what is shown as the 2nd Alignment could conceivably have been meant to also function as a Key Alignment at the site. In any case, as with all such sites, we can expect to see multiple levels of information, keyed to people with different levels of understanding.

As with all our maps of ancient sites, the first step is to precisely survey the site, on a survey oriented to true north, determining the relative locations of playing cards pinned to the ground over points on or near the mounds. The relative location of these surveyed points (playing cards) will have an expected accuracy to each other on a true north-south grid of about ± 0.5 ft. to about ± 1.0 ft. over the entire map. Then field sketches are made by stretching a survey tape between two of the surveyed cards. Extended level rods are laid out from this tape to create a grid for field sketching. By feeling with the feet, we can repeatedly determine the edge of a mound to within about a foot. Other features such as stumps, pits, rocks, etc. can also be drawn on the field sketches, to an expected accuracy of a few feet. When the field sketches are overlain on a plot of the surveyed points, the features on the entire map should be accurate relative to each other to an accuracy from about 1 to 3 feet, over the entire map. When we scale distances from a map for further analysis, such as the lengths of a triangle between three round mounds (like a 101 ft., 36 ft., and 117 ft. triangle), we must work with the probable errors in such measurements, similar to working with probable errors in all scientific calculations.

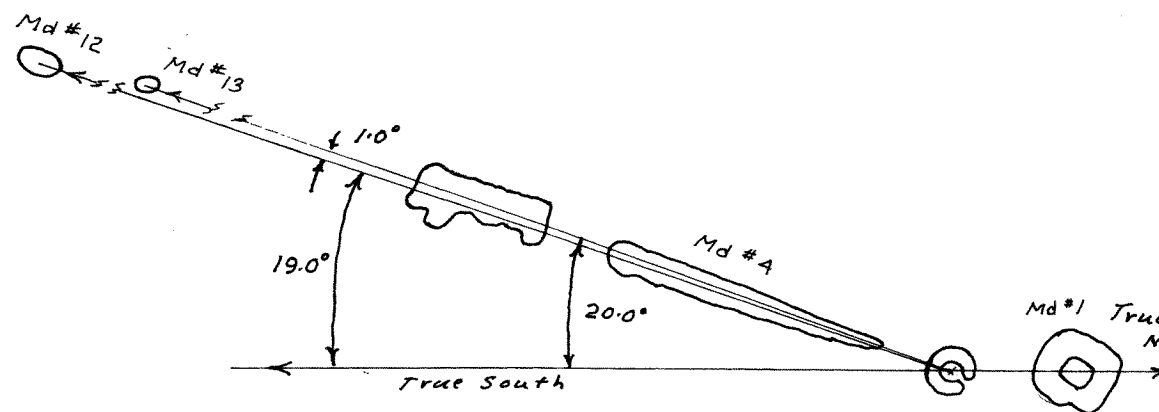


Figure 2. Unexpected apparent Key Angles of 20.00 deg. or 19.00 deg.
(See Map Sheets Nek-F1, Nek - F3, and Nek - F3a for more details)

We would normally expect a Key Alignment at this site to be 60.0 deg., 30.0 deg. or 15.0 deg. (60 deg. twice bisected). But we have the unusual alignments of 20.0 deg. (60 deg. trisected) and 19.0 deg. (20.0 minus 1.0 deg.). Naturally one would ponder the possible meaning of these unusual angles at this particular site. Relying on what we had learned from working with Ralph Redfox, in tracing long-distance Rhomb Lines³ for him, I used the same computer programs to extend the lines at 20.0 deg. and 19.0 deg. northward from the Ceex Haci Site. The line at 19.0 deg. goes through the north end of Portage Lake in the Keweenaw Copper Country of Northern Michigan. (See Map Sheet Nek-F3.) When a precise angle of 20.0 deg. is projected northward, it goes through the southern end of Portage Lake. Once we take seriously the legends of native "Thunderbird Lines" and accurate long-range alignments, we begin to discover apparent connections between different important ancient sites separated by even hundreds of miles. These connections might be very fruitful in our attempts to understand the prehistory of this land. If the people who laid out the Ceex Haci Site had lodge connections to Portage Lake, in the heart of the ancient Copper Country of the Keweenaw of Upper Michigan, we have a probable answer.

³ A Rhomb Line is a long line on the surface of the earth that is always at the same bearing angle from true north-south lines. It is the type of line that sailors have preferred, and have used for thousands of years. It is also the way that Ralph Redfox's ancestors apparently encoded the direction from the Bighorn Medicine Wheel in Montana to a site known in tradition as "The Home of the White Wolf" in the Copper Country of northern Michigan, about 900 miles away.

Until working with Ralph, I had never taken the legends from various tribes about long-range "Thunderbird Lines" (connecting ancient sites) very seriously. But I do so now, after we found an ancient site that Ralph had been looking for, about 900 miles away. My initial skepticism resulted from our culture where sailors, navigators and geodetic surveyors all agree that it is impossible to do long range surveying and navigation without Spherical Geometry, which the Persian genius Al-Biruni invented for such work in about AD 1000. Ralph's ancestors who laid out the alignment from the Bighorn Medicine Wheel to the Home of the White Wolf likely did not do so using Al-Biruni's equations of spherical geometry. But they would have had the type of sophisticated geometry we find in the layout of the effigy mound groups. Indeed, we find that long range surveying can be done without equations of spherical trig. It can all be done with rope geometry. And the process is ridiculously simple, as is the processes of trisecting angles and squaring the circle, as shown in Annex A and Annex B.

The problem is not with the geometry. It is with what we believe and teach in our culture. We teach that it is impossible to trisect angles, square circles, or do long-range surveying or navigation without using the dogma of our dominant culture, dogma which we vehemently insist must be used for such work. Ralph, who is said to be one of the last keepers of the Cheyenne Wolf Clan star knowledge (which I take to include surveying by the stars) had his traditional education in the mountains terminated at the age of about 9 years. He said that his grandfather brought him into town to go into a hardware store. There, a government Indian Agent caught him, had his hair cut, and forced him to go to the government school for Indian children. They forbade him to speak his native language, and he learned about the White Man's religion. His elder teachers in the mountains, then reluctantly buried the ancient medicine bundles of their Medicine Lodge. Ralph said that that the ancient writing system once used in the Medicine Lodge began to be looked at by the church and the younger people as something evil. "It was completely lost." (In Indian tradition, the term Medicine Lodge refers to high knowledge of any kind, not just that relating to health.)

"Man who says it cannot be done should not interfere with a man who is doing it."
(Chinese Proverb)

A Third Alignment:

Using a long straight edge and a bit of time, we also found a third alignment, which goes through the northeastern corner of the square enclosure (shown as Md #1). When this 3rd Alignment is projected northward, it goes precisely through Lac Vieux Desert, near the start of an ancient portage area between the headwaters of the Wisconsin River and rivers of Lake Superior. See Map Sheet Nek-F3a.

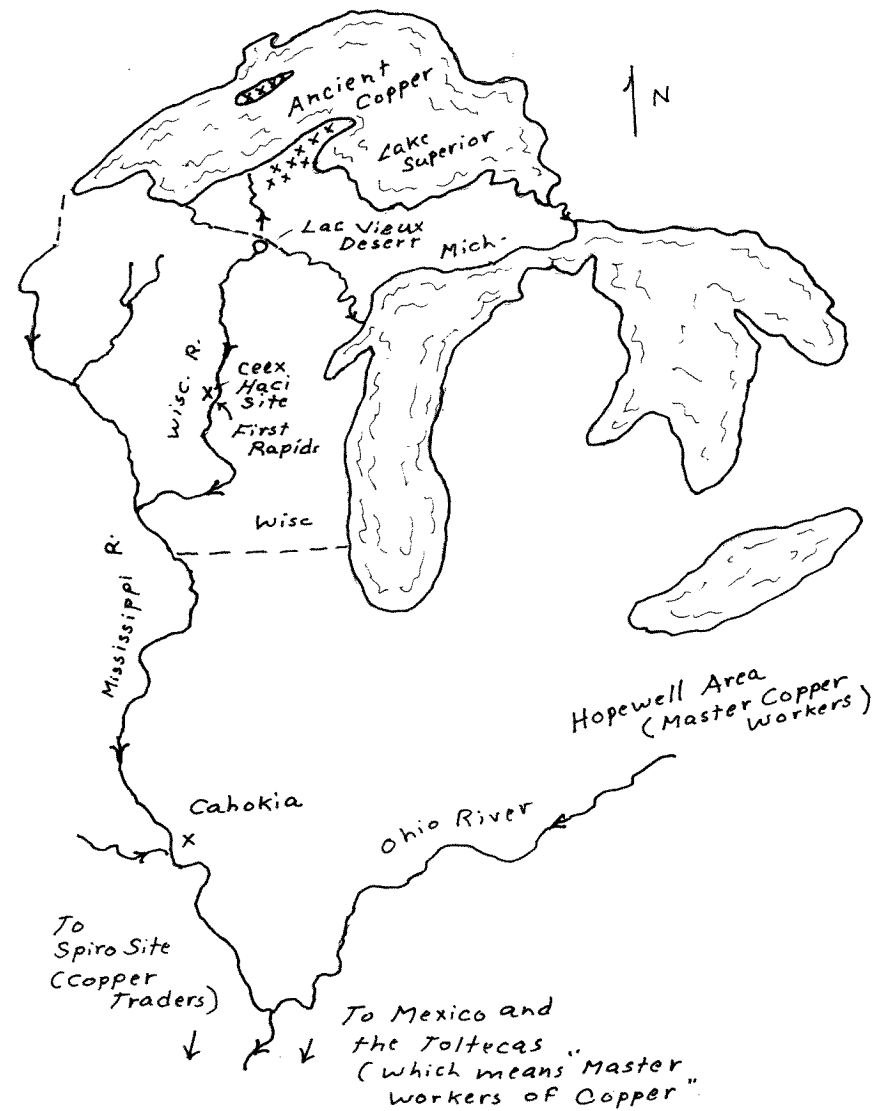


Figure 3. Location of the Ceex Hachi Site on Ancient Waterways to Lake Superior

Location of the Ceex Hachi Site:

Figures 3 and 4 show where the Ceex Hachi Site is located in the state of Wisconsin. Before the territory was divided into the states of Wisconsin and Michigan, the landmarks that earlier people would have referred to were the routes of rivers and the shores of the lakes. People in large dugout canoes coming upriver from the south would have been hindered by the rapids which began just south of Nekoosa. From here to the north, lighter birch bark canoes would have been required, which could be easily portaged over the falls and rapids. In days when the rivers and lakes served the transportation routes, as our roads now do, we see that the Ceex Hachi Site was at a very strategic position, indeed.

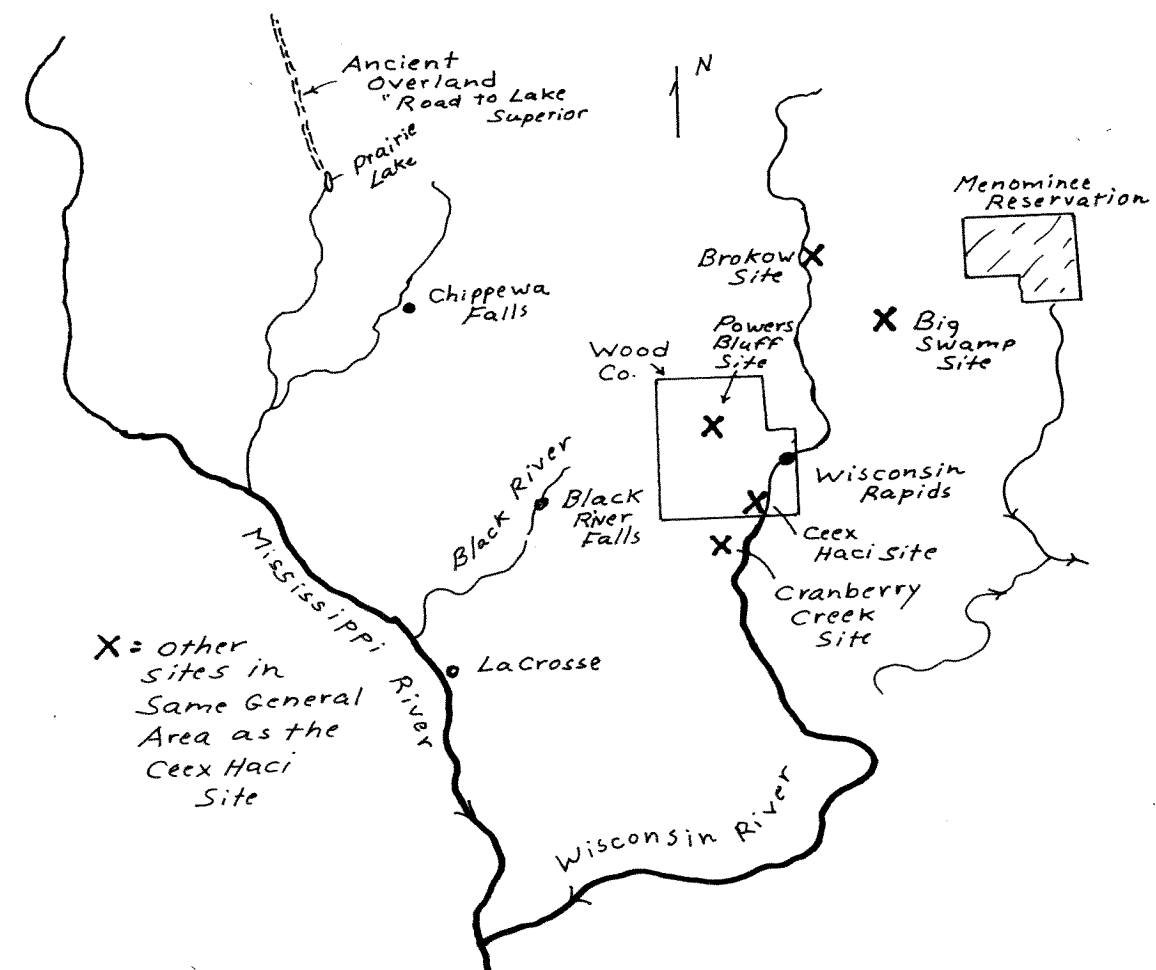
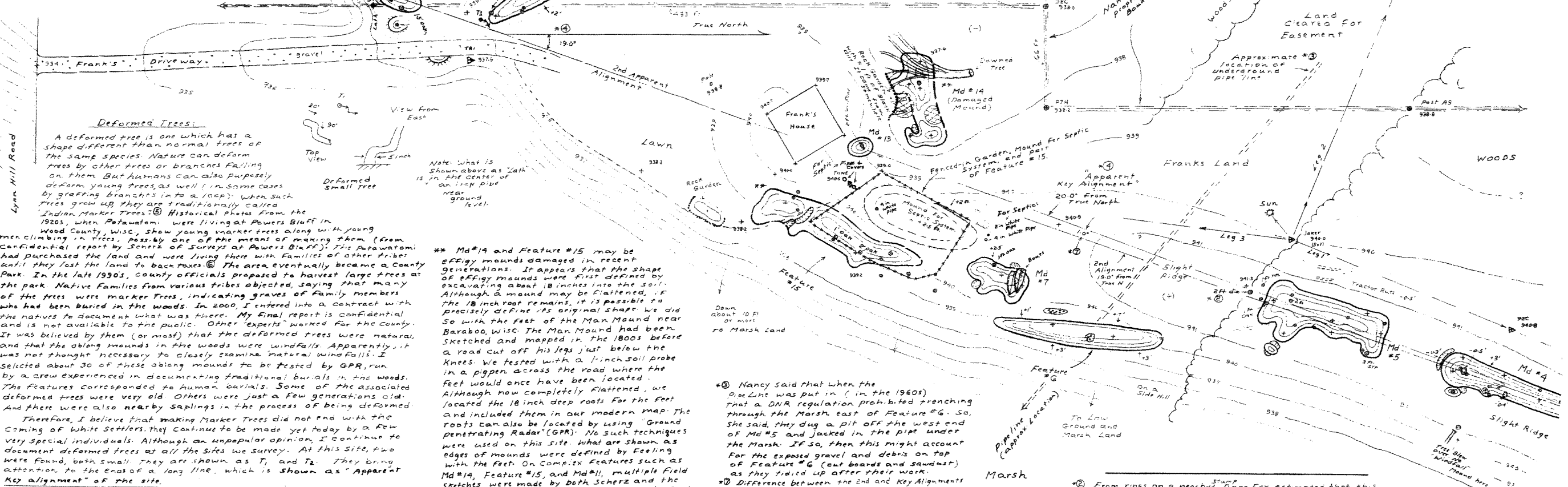


Figure 4. Location of the Ceex Hachi Site within Wood Co., Wisc. relative to other important sites we have surveyed (but not necessarily written up)

This survey began as a simple Training Exercise for members of the Ancient Earthworks Society (AES) who wanted to sharpen their skills in mapping about three Effigy Mounds. These are shown as Md #1 (The Enclosure), Md #4, and Md #5. These were brought to our attention by Christopher Veit, who was working with the Hackuk from Black River Falls, Wisc. Doug Morgord and Dave Weier also detected these same mounds on LIDAR Imagery. After meeting with landowners Nancy Kronstedt and Frank Chojnacki, we set a beginning station called "Joker" where we could see the sun for sunshots and also easily traverse to the above-mentioned mounds. We call this "Leg 1" of our Survey Traverse. In Leap Frog fashion, we traversed to Md #1 (The Enclosure) and the many other small earthworks near it. Previous surveys in Wood County showed similar features at Powers Bluff where they were obviously associated with ancient ceremonies. Such earthworks near the enclosure seemed to demand attention and a careful survey. When Nancy was showing us the metal posts she used to mark her property (Post A5, P7H, and B8C) she said there were mounds behind her garage which we should also consider. These are shown as Md #8, Md #9, and Md #10. These were included in our survey by what we call Leg 2. It ran from Station Joker to the northwest, and back of her garage. Chris Tyler, studying the LIDAR imagery, pointed out a pattern from Station Joker along the 1/2 of a ridge to near Frank's house. Investigating, we found Feature #6, Md #7, and within a dense raspberry patch in a fenced-in garden, a modern mound for a septic system, and Feature #15 next to it. Md #14, which Nancy suspected is a damaged effigy mound, is nearby. Christopher Veit and Frank pointed out rises west of Frank's driveway which they thought might be Indian Mounds (Md #11 and Md #12). A third leg of the traverse was extended westward from Station Joker to include these additional features. Leg 3 connected to Leg 2 at station B Spike between Md #8 and Md #9. The calculated X and Y coordinates of B Spike from the two legs check to within 0.5 ft, which is within the accuracy goals we set for this project.

This survey evolved from a simple exercise with a few mounds to one with more than 15 features, three traverse legs, and multiple landowners. Our work here will be thoroughly documented for future reference. It will also document what we have learned about mapping ancient sites relative to true north over the past three decades.

James P. Schurz
21 Dec.
2016



Deformed Trees:
A deformed tree is one which has a shape different than normal trees of the same species. Nature can deform trees by other trees or branches falling on them. But humans can also purposely deform young trees, as well. In some cases by grafting branches into a tree. When such trees grow up they are traditionally called "Indian Marker Trees". Historical photos from the 1920s, when Potawatomi were living at Powers Bluff in Wood County, Wisc., show young marker trees along with young men climbing in trees, possibly one of the means of making them. (From confidential report by Schurz of surveys at Powers Bluff). The Potawatomi had purchased the land and were living there with families of other tribes until they lost the land to back taxes. The area eventually became a County Park. In the late 1950s, county officials proposed to harvest large trees at the park. Native families from various tribes objected, saying that many of the trees were marker trees, indicating graves of family members who had been buried in the woods. In 2000, I entered into a contract with the natives to document what was there. My final report is confidential and is not available to the public. Other "experts" worked for the county. It was believed by them (or most) that the deformed trees were natural, and that the oblong mounds in the woods were windfalls. Apparently, it was not thought necessary to closely examine "natural" windfalls. I selected about 30 of these oblong mounds to be tested by GPR, run by a crew experienced in documenting traditional burials in the woods. The features corresponded to human burials. Some of the associated deformed trees were very old. Others were just a few generations old. And there were also nearby saplings in the process of being deformed.

Therefore, I believe that making Marker Trees did not end with the coming of white settlers. They continue to be made yet today by a few very special individuals. Although an unpopular opinion, I continue to document deformed trees at all the sites we survey. At this site, two were found, both small. They are shown as T1 and T2. They bring attention to the end of a long line, which is shown as "Apparent Key alignment" of the site.

② See article by Robert E. Ritzenthaler in Wisc. Archaeologist, Vol 46, No 3.
③ See book "Skunk Hill" (about the Powers Bluff community) by Robert A. Birmingham.

Map Sheet Nek-F1 (Base Map)
also see

Map Sheet Nek-F2 (Emphasis on Property Lines)
and
Nek-F3 (Emphasis on Geometry)

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Additional Features
in this area
not mapped

⑩ Nancy said that when the pipe line was put in (in the 1960s) that a DNR regulation prohibited trenching through the Marsh east of Feature #6. So, she said, they dug a pit off the west end of Md #5 and jacked in the pipe under the Marsh. If so, then this might account for the exposed gravel and debris on top of Feature #6 (cut boards and sawdust) as they jacked up after their work.

⑪ Difference between the 2nd and Key Alignments = 10', vital angle for surveying.

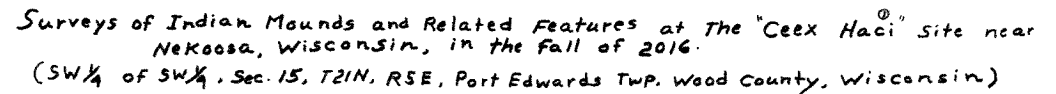
** Md #14 and Feature #15 may be effigy mounds damaged in recent generations. It appears that the shape of effigy mounds were first defined by excavating about 18 inches into the soil. Although a mound may be flattened, if the 18 inch root remains, it is possible to precisely define its original shape. We did so with the feet of the Man Mound near Baraboo, Wisc. The Man Mound had been sketched and mapped in the 1800s before a road cut off his legs just below the knees. We tested with a 1/2 inch soil probe in a pipe across the road where the feet would once have been located. Although now completely flattened, we located the 18 inch deep roots for the feet and included them in our modern map. The roots can also be located by using Ground Penetrating Radar (GPR). No such techniques were used on this site. What are shown as edges of mounds were defined by feeling with the feet. On complex features such as Md #14, Feature #15, and Md #11, multiple field sketches were made by both Schurz and the trainees. The shapes shown are from Schurz's final sketches. All the multiple sketches are shown in the accompanying report. We must await future work with soil probes or GPR to resolve any differences.

Md #11 looks like an ancient mound with possible more recent burials on or next to it. This is consistent with what Pamita (trained in the Menominee lodges) told me in the 1980s. He said that after Christianity came to the region, some of the traditional Indians wanted their final rest to be at ancient sacred sites rather than in church graveyards. He said that we would find evidence of this in some of the sites. The two small and relatively recent rectilinear holes found near the northwest end of Md #11 should be considered with this possibility in mind. Today, many people are cremated and their ashes deposited at special places. But when surveying at Powers Bluff, in Wood County, I found similar recent rectilinear pits made by archaeologists working there which they did not bother to cover up.

⑬ Our precise surveys based on true north indicate the ancient surveyors who laid out the effigy mounds also precisely oriented their work to true north (as from observing the center of rotation of the northern stars). But true north is almost always encoded. Pamita said that the key geometry of the effigy mounds was purposely kept from the uninitiated commoners even at the time the mounds were constructed. But, he said, the priests could access this geometry using clues and special knowledge. Our surveys indicate that this could be done using key alignments and key angles. In southern Wisconsin, the key angle is 60° (easily made with a rope) or 30° (60° bisected) or in a few cases 15° (60° bisected twice). In this rare case, it appears to be 20.0°, which is 60° trisected. This reflects very deep understanding of geometry. The unique Alligator Mound near Newmark, Ohio, also has a key angle of 20.0°.

Figure 5a.
Left-hand
Part of
Figure 5

A hand-drawn sketch map of a property layout. On the left is a rectangle labeled "Nancy's Garage" with a dimension of 939.0. On the right is a rectangle labeled "Nancy's Barn" with a dimension of 930.0. A curved dashed line labeled "Farm Road" separates the two buildings. A north arrow points towards the top right.

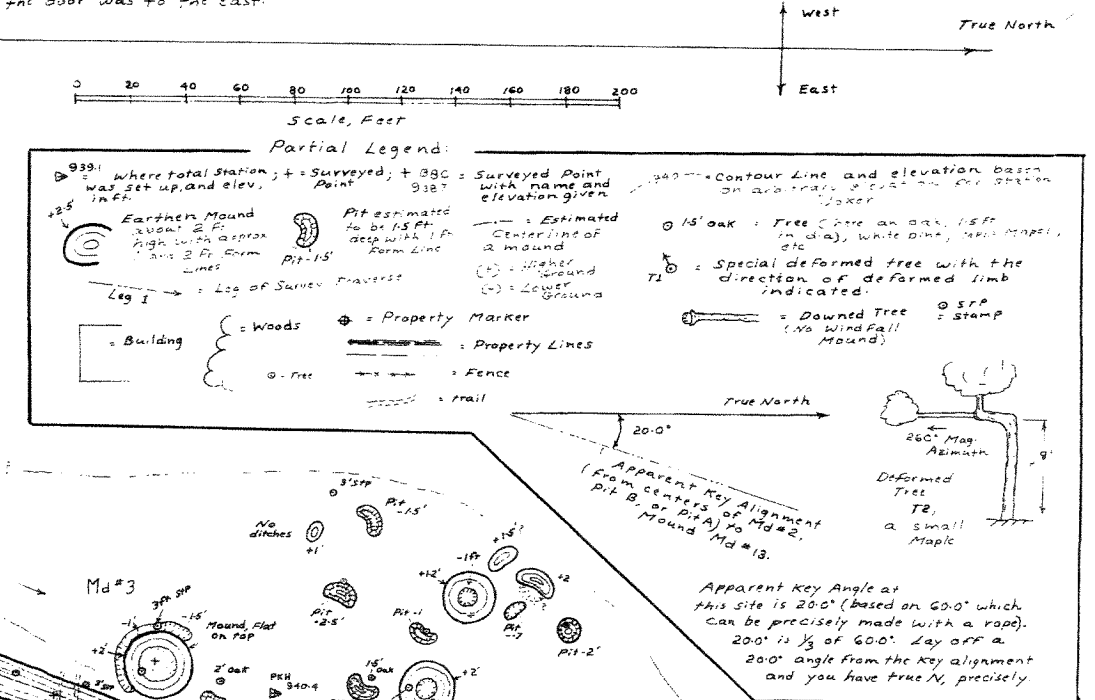


Survey Party Trainees Chris Tyler, Chris Veit, Erin Solawetz, Barbara Binkert, and Diane Fox, working under the supervision of James P. Schertz, Prof. Emeritus, Univ. of Wisc., Madison, Dept. of Civil Engr., Surveying Section

Survey Methods: A total Station Field Instrument Controlled by Sunshots to define True North (to better than 0.1 deg). It was used to locate the positions of Surveyed Points, marked by Playing Cards (relative positions accurate to better than 0.5 ft). Then, a surveyor's tape was stretched between Surveyed points to create local base lines for field sketching. An extended Level Rod was laid perpendicular to the tape (on both sides) to create a field grid for the field sketches. Pertinent features on the ground were marked on a sheet of Field Sketch grid paper at a scale of 1 inch = 20 ft. Location of the outline of a mound was transferred to the sketch by using an extended level rod at right angles to the tape. The estimated height was also noted at different locations and from both sides of the mound. The edge is best determined by feeling with the feet where the ground begins to rise from the background terrain, while walking towards the mound. This is especially important in tall grass, brush, or light snow. The edge should then be marked with a wad of toilet paper or colored tape for reference. For a complex mound, the entire outline should be marked before beginning the sketching. Form Lines are very valuable in defining shapes of effigy mounds: A one-foot Form Line is about 1 ft above the edge of the mound. If we imagine standing at the edge of a mound and flood water 1 foot deep, then the location of the 1-foot Form Line would be the water's edge on the mound. Using the rod, this location can be transferred to the Field Sketch. A two-foot Form Line would correspond to water at about knee height, and a three-foot line to water between the crutch and waist. Form Lines are similar to contour lines, but Team (using Form Lines) is really responsible for best defining the shape and form for all mounds on the final map. Location of trees, rocks, and pits on, or adjacent to, the mound can also be included, if desired.

Survey Reductions: After the sunshots to determine true North, the Total Station was used to determine precise angles and distances to other surveyed points. With these data, relative coordinates of all surveyed points could be calculated based on a starting point. This was station "Joker" where the sunshots were taken. It was given arbitrary coordinates of X (East), Y (North), and Z (or Elevation) of 6000.0, 6000.0, and 940 ft, respectively. These coordinates were plotted onto a base map at a scale of 1 inch = 20 ft. (the same scale as the field sketches). Details from the Field Sketch Sheets were transferred to the Base Map using a light table.

① The name of "Ceex Hachi" was suggested by George Garvin of the Ho-Chunk Tribal Office in Wisconsin. Lera Hopinka, teacher of the Ho-Chunk Language, said that "Ceex Hachi" literally translates to "Marsh House." And the name "Nexooosa" means "Rapid Waters." In their verbal histories, this area of Wisconsin is referred to as "Ceex Hachi" or "Marsh House." Tom Hopinka mentioned old Medicine Lodges in this area where the door was to the East.



Two Handheld GPS values for Sta. Joker:

$N = 44^{\circ} 17.699'$ Lat, $W = 89^{\circ} 54.064'$ Long.; $Z = 939 \pm 9$ Ft. Elev.
 $N = 44^{\circ} 17.698'$; $W = 89^{\circ} 54.065'$; $Z = 942 \pm 9$ Ft. Elev.

Figure 5c. Area A of Figure 5

Surveys of Indian Mounds and Related Features at The "Ceex Hachi"^① Site near Nekoosa, Wisconsin, in the Fall of 2016.

(SW $\frac{1}{4}$ of SW $\frac{1}{4}$, Sec. 15, T21N, R5E, Port Edwards Twp. Wood County, Wisconsin)

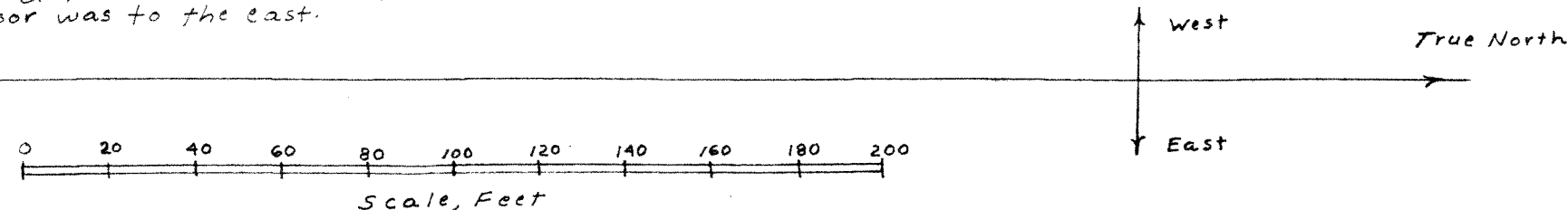
This Site is also referred to as the "Nekoosa Site" in the records of the Ancient Earthworks Society (AES), or the Mound Group presently owned by Nancy Kronstedt and Frank Chojnacki, of Wood Co., Wisc.

Survey Party: Trainees Chris Tyler, Chris Veit, Erin Solawetz, Barbara Binkert, and Diane Fox, working under the supervision of James P. Scherz, Prof. Emeritus, Univ. of Wisc., Madison, Dept. of Civil Engr., Surveying Section.

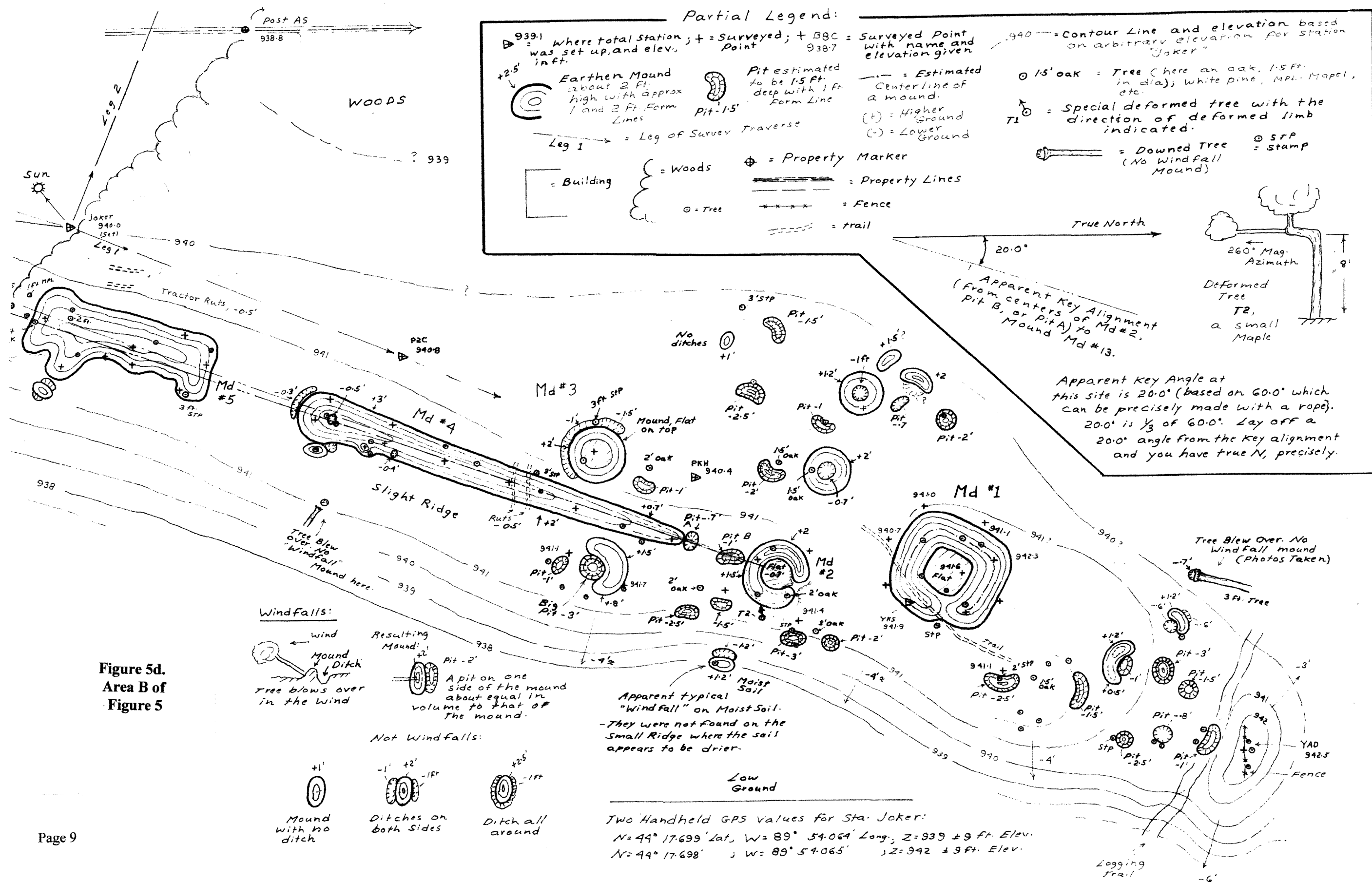
Survey Methods: A total Station Field Instrument controlled by Sunshots to define true North (to better than 0.1 deg.). It was used to locate the positions of surveyed points, marked by Playing Cards (relative positions accurate to better than 0.5 ft). Then, a surveyor's tape was stretched between surveyed points to create local base lines for field sketching. An extended Level Rod was laid perpendicular to the tape (on both sides) to create a field grid for the field sketches. Pertinent features on the ground were marked on a sheet of Field Sketch grid paper at a scale of 1 inch = 20 ft. Location of the outline of a mound was transferred to the sketch by using an extended level rod at right angles to the tape. The estimated height was also noted at different locations and from both sides of the mound. The edge is best determined by feeling with the feet where the ground begins to rise from the background terrain, while walking towards the mound. This is especially important in tall grass, brush, or light snow. The edge should then be marked with a wad of toilet paper or colored tape for future reference. For a complex mound, the entire outline should be marked before beginning the sketching. "Form Lines" are very valuable in defining shapes of effigy mounds. A one-foot Form Line is about 1 ft above the edge of the mound. If we imagine standing at the edge of a mound and flood water 1 foot deep, then the location of the 1-foot Form Line would be the water's edge on the mound. Using the rod, this location can be transferred to the field sketch. A two-foot Form Line would correspond to water at about knee height, and a three-foot line to water between the crotch and waist. Form Lines are similar to contour lines, but do not necessarily all close on themselves when the mound is on a side hill (as with Feature #6, below). The Field Sketching Team (using Form Lines) is really responsible for best defining the shape and form for all mounds on the final map. Location of trees, rocks, and pits on, or adjacent to, the mound can also be included, if desired.

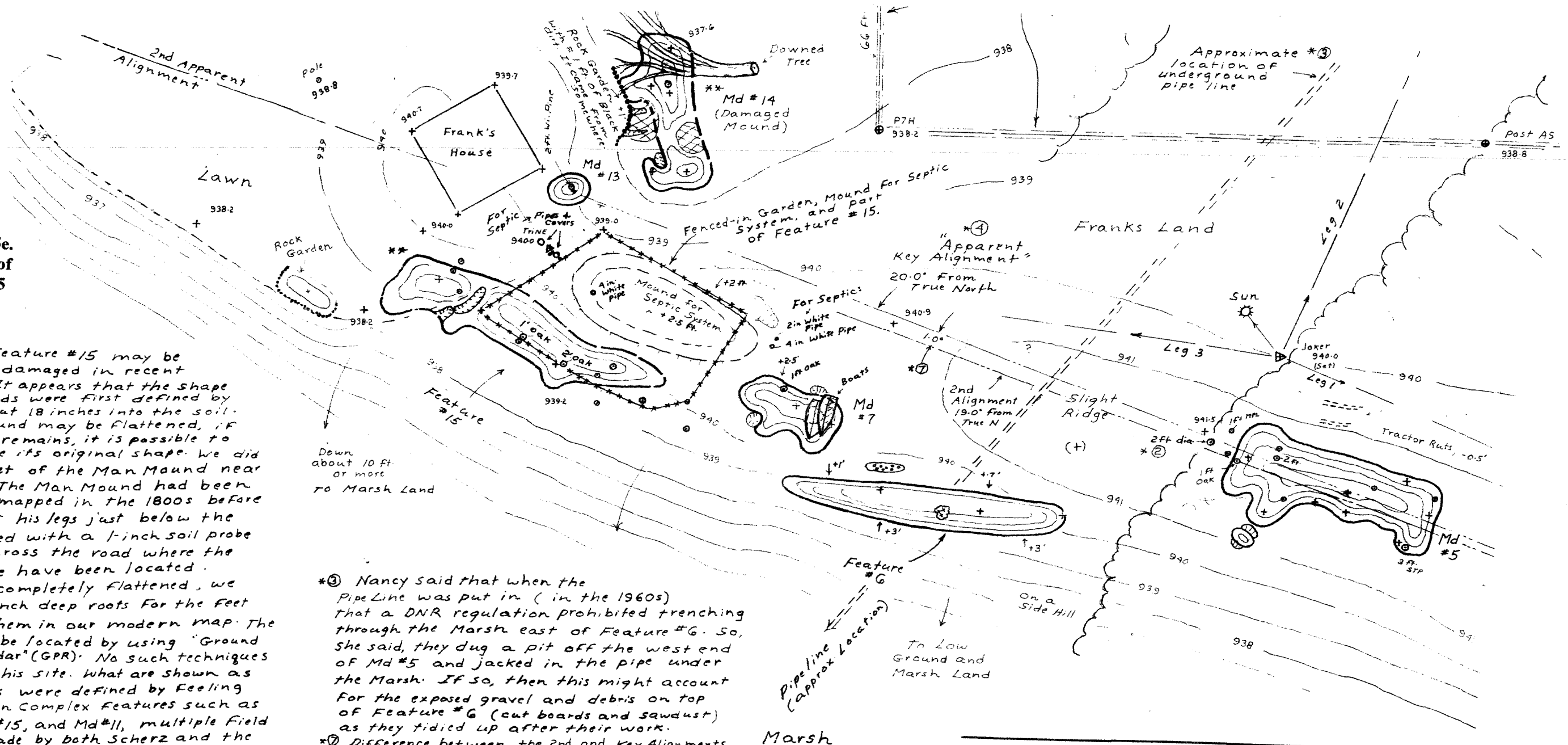
Survey Reductions: After the sunshots to determine true North, the Total Station was used to determine precise angles and distances to other surveyed points. With these data, relative coordinates of all surveyed points could be calculated based on a starting point. This was station "Joker" where the sunshots were taken. It was given arbitrary coordinates of X (East), Y (North), and Z (or Elevation) of 6000.0, 6000.0, and 940 ft, respectively. These coordinates were plotted onto a base map at a scale of 1 inch = 20 ft. (the same scale as the field sketches). Details from the field sketch sheets were transferred to the Base Map using a light table.

① The name of "Ceex Hachi" was suggested by George Garvin of the Ho-Chunk Tribal Offices in Wisconsin. Lera Hopinka, teacher of the Ho-Chunk Language, said that "Ceex Hachi" literally translates to "Marsh House." And the name "Nekoosa" means "Rapid Waters." In their verbal histories, this area of Wisconsin is referred to as "Ceex Hachi" or "Marsh House." Tom Hopinka mentioned old Medicine Lodges in this area where the door was to the east.



PJOK
939.1

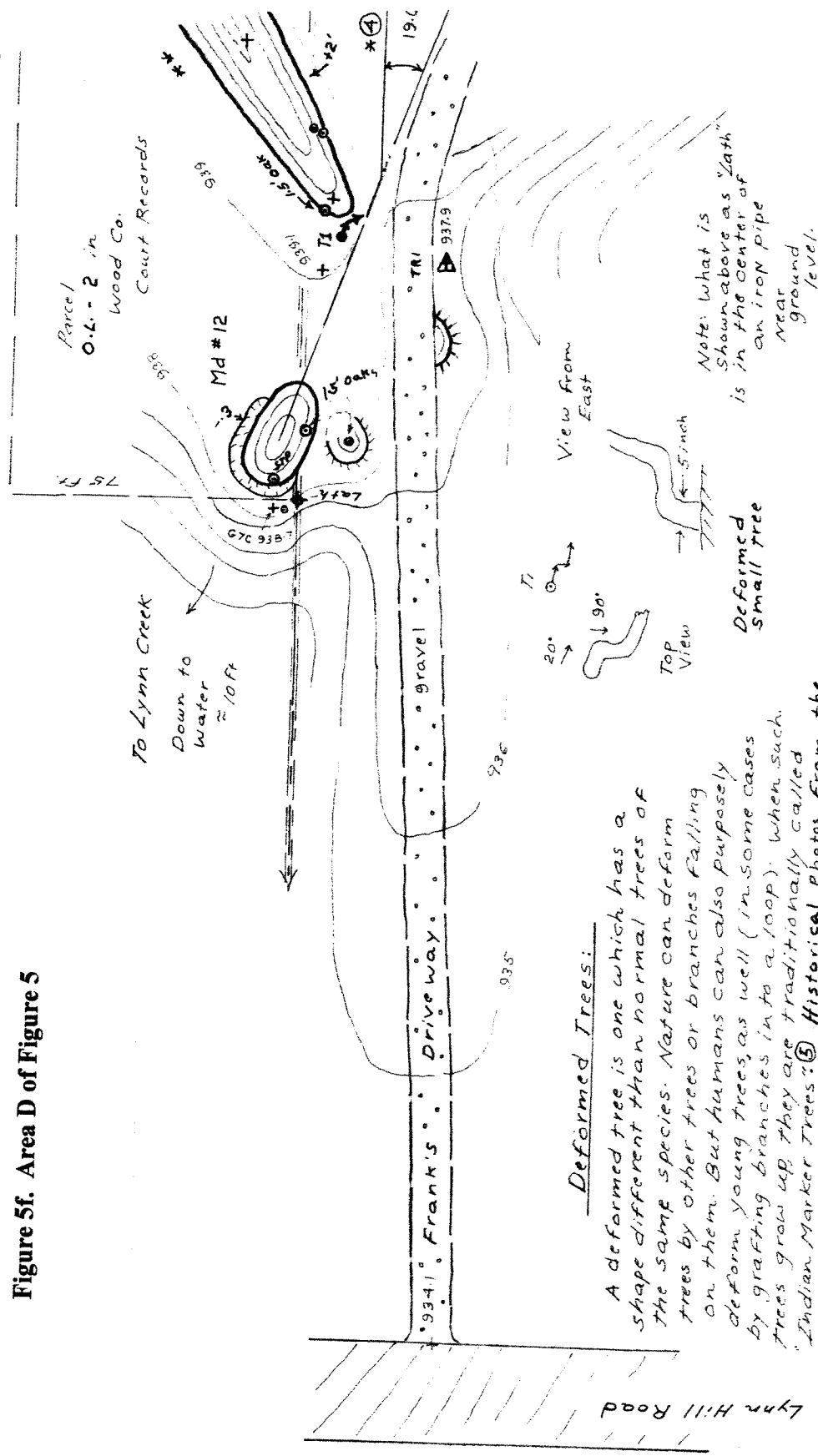




Md #11 looks like an ancient mound with possible more recent burials on or next to it. This is consistent with what Pamita (Trained in the Menominee lodges) told me in the 1980s. He said that after Christianity came to the region, some of the traditional Indians wanted their final rest to be at ancient sacred sites rather than in church grave yards. He said that we would find evidence of this in some of the sites. The two small and relatively recent rectilinear holes found near the north west end of Md #11 should be considered with this possibility in mind. Today, many people are cremated and their ashes deposited at special places. But when surveying at Powers Bluff, in Wood County, I found similar recent rectilinear pits made by archeologists working there, which they did not bother to cover up.

* ④ Our precise surveys based on true North indicate the ancient surveyors who laid out the effigy mounds also precisely oriented their work to true North (as from observing the center of rotation of the northern stars). But true north is almost always encoded. Pamira said that the key geometry of the effigy mounds was purposely kept from the uninitiated commoners even at the time the mounds were constructed. But, he said, the priests could access this geometry using clues and special knowledge. Our surveys indicate that this could be done using key alignments and key angles. In southern Wisconsin, the key angle is 60° (easily made with a rope) or 30° (60° bisected) or in a few cases 15° (60° bisected twice). In this rare case, it appears to be 20.0° , which is 60° trisected. This reflects very deep understanding of geometry. The unique Alligator Mound near Newark, Ohio, also has a key angle of 20.0° .

Figure 5f. Area D of Figure 5



Deformed Trees:

A deformed tree is one which has a shape different than normal trees of the same species. Nature can deform trees by other trees or branches falling on them. But humans can also purposely deform young trees as well (in some cases by grafting branches in to a loop). When such trees grow up they are traditionally called "Indian Marker Trees".

Historical photos from the 1920s, when Potawatomi were living at Powers Bluff in Wood County, Wisc, show young marker trees along with young men climbing in trees, possibly one of the means of making them (from confidential report by Scherz of surveys at Powers Bluff). The Potawatomi had purchased the land and were living there with families of other tribes until they lost the land to back taxes. The area eventually became a County Park. In the late 1990s, county officials proposed to harvest large trees at the park. Native families from various tribes objected, saying that many of the trees were marker trees, indicating graves of family members who had been buried in the woods. In 2000, I entered into a contract with the natives to document what was there. My final report is confidential and is not available to the public. Other "experts" worked for the County. It was believed by them (or most) that the deformed trees were natural, and that the oblong mounds in the woods were windfalls. Apparently, it was not thought necessary to closely examine natural windfalls. I selected about 30 of these oblong mounds to be tested by GPR, run by a crew experienced in documenting traditional burials in the woods. The features corresponded to human burials. Some of the associated deformed trees were very old. Others were just a few generations old. And there were also nearby saplings in the process of being deformed. Therefore, I believe that making Marker Trees did not end with the coming of white settlers. They continue to be made yet today by a few very special individuals. Although an unpopular opinion, I continue to document deformed trees at all the sites we survey. At this site, two were found, both small. They are shown as T₁ and T₂. They bring attention to the ends of a long line, which is shown as "Apparent Key alignment" of the site.

See article by Robert E. Ritzenthaler in Wisc. Archeologist, Vol. 46, No. 3.

See book "Skunk Hill" (about the Powers Bluff community) by Robert A. Birmingham.

Map Sheet Nek-F1 (Base Map)

also see:

Map Sheet Nek-F2 (Emphasis on Property Lines)

and

Nek-F3 (Emphasis on Geometry)

© James P. Schurz, 22 Dec, 2016

This survey began as a simple Training Exercise for members of The Ancient Earthworks Society (AES) who wanted to sharpen their skills in mapping about three Effigy Mounds. These are shown as Md #1 (The Enclosure), Md #4, and Md #5. These were brought to our attention by Christopher Veit, who was working with the Hochunk from Black River Falls, Wisc. Doug Norgord and Dave Weier also detected these same mounds on Lidar Imagery. After meeting with landowners Nancy Kronstedt and Frank Chojnacki, we set a beginning station called "Joker" where we could see the sun for sunshots and also easily traverse to the above-mentioned mounds. We call this "Leg 1" of our survey traverse. In Leap Frog fashion, we traversed to Md #1 (The Enclosure) and the many other small earthworks near it. Previous surveys in Wood County showed similar features at Powers Bluff where they were obviously associated with ancient ceremonies. Such earthworks near the enclosure seemed to demand attention and a careful survey. When Nancy was showing us the metal posts she used to mark her property (Post A5, P7H, and B8C) she said there were mounds behind her garage which we should also consider. These are shown as Md #8, Md #9 and Md #10. These were included in our survey by what we call Leg 2. It ran from Station "Joker" to the northwest, and back of her garage. Chris Tyler, studying the Lidar imagery, pointed out a pattern from Station "Joker" along the lip of a ridge to near Frank's house. Investigating, we found Feature #6, Md #7, and within a dense raspberry patch in a fenced-in garden, a modern mound for a septic system, and Feature #15 next to it. Md #14, which Nancy suspected is a damaged effigy mound, is nearby. Christopher Veit and Frank pointed out rises west of Frank's driveway which they thought might be Indian Mounds (Md #11 and Md #12). A third leg of the traverse was extended west ward from Station "Joker" to include these additional features. Leg 3 connected to Leg 2 at station B Spike between Md #8 and Md #9. The calculated X and Y coordinates of B Spike from the two legs check to within 0.5 Ft, which is within the accuracy goals we set for this project.

This survey evolved from a simple exercise with a few mounds to one with more than 15 features, three traverse legs, and multiple landowners. Our work here will be thoroughly documented for future reference. It will also document what we have learned about mapping ancient sites relative to true north over the past three decades.

James P. Schulz
21 Dec.
2016

Additional Features
in this area
not mapped

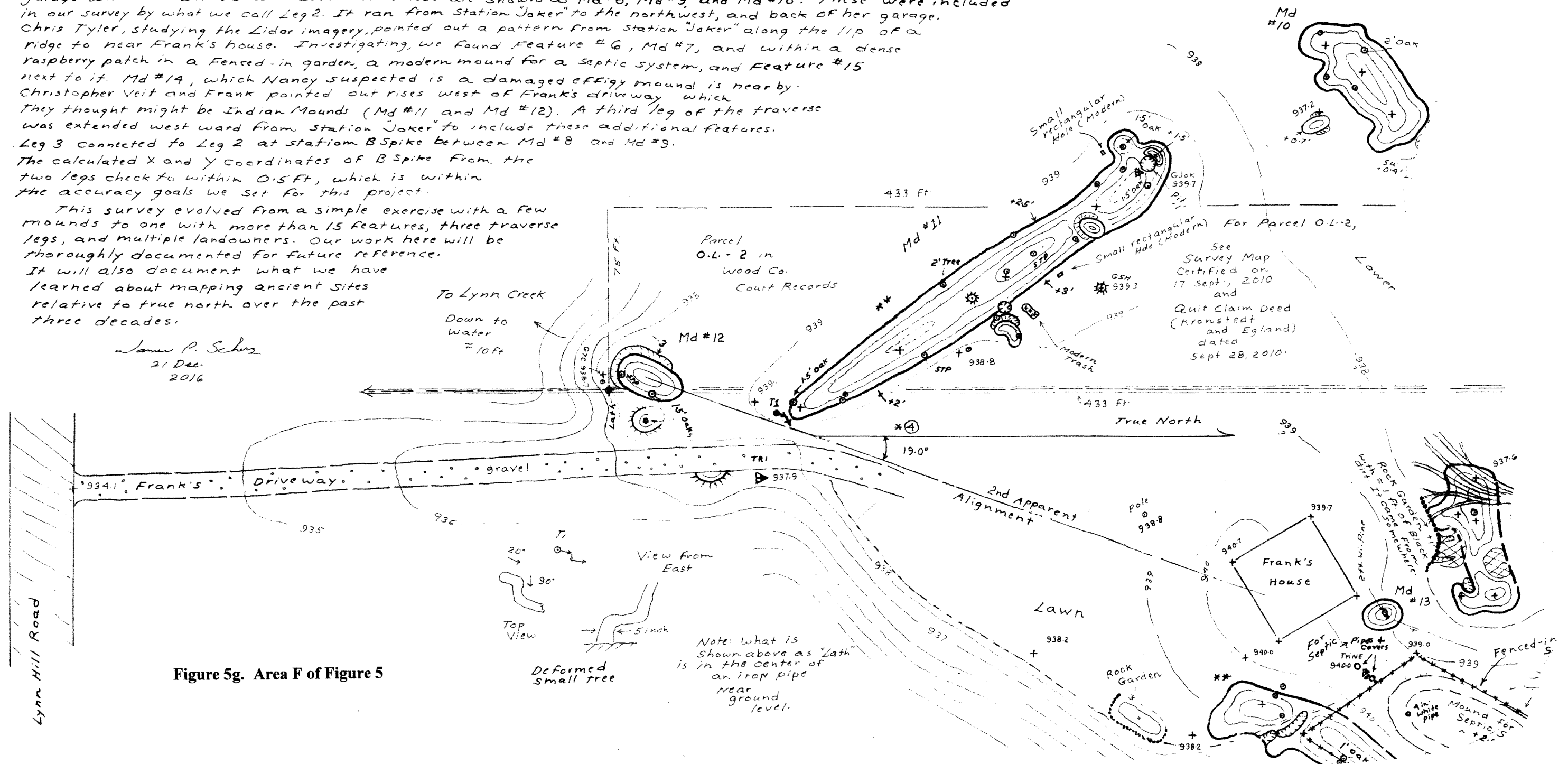


Figure 5g. Area F of Figure 5

[illegible]

Map Sheet Nek-F2:

Map Sheet Nek-F2 (shown in Figure 6) only presents the larger mounds and the boundaries between the two landowners Nancy Kronstedt and Frank Chojnacki. The mounds are on both parcels of land, and if someone is going to catalog and register the mounds for protection and property tax relief, getting the correct ownership is vital. Discrepancies in the property data from the Wood County Court House relating to these two landowners present an additional problem which we were forced to face. The following figures should illustrate what the issues are and that, indeed, the tax records are correct. But there is an obvious error which needs to be straightened out in the county GIS data presented to the public for the boundaries between these two landowners.

The apparent problem seems to have been caused by a mistake (or Boo-boo) in the final map from a survey in the fall of 2010, where the surveyor correctly wrote legal descriptions for two parcels he surveyed, but interposed the labels when he annotated these two parcels (L.O.-1 and L.O.-2) on his final map. The person who certified the map as correct on 17 Sept., 2010, apparently did not notice this mistake, and it remains in the records of the county. A mistake (or Boo-boo) of this nature can cause real problems for people later using the data (such as when we tried to do so). Apparently, the person creating the county GIS had some problems with these parcels, as well. In the fall of 2016, the GIS layer indicated that Nancy owned the land where Frank's garage is located, while Nancy said she did not (and, of course Frank, as well).

This apparent mistake or Boo-boo at this site provides a good training situation for teaching new trainees about Mistakes (Boo-boos). They are a perpetual problem for all surveyors at all times, and with all types of surveying equipment. They can happen to anyone at any time, unless we are very careful. To overcome the potential problem, I have been trying to teach all trainees to work together, like a pilot and co-pilot on an airplane. (Airplane crashes are usually caused by mistakes by the pilot and not by mechanical problems.)

In surveying, Boo-boos can ruin an otherwise precise and well-surveyed project, as our trainees have already learned when ridiculous Boo-boos ruined two of the four test projects which we have used for training. On the first project (a simple bird mound) which we call the Boda Project, cards placed on the mound were carefully surveyed in by two instrument teams with two separate Total Stations, as another team sketched the mound from a tape stretched between surveyed points. When we tried to combine the field sketches on a light table with the plotted points, we could not do so. The field sketches did not show the position of the cards, only the edges of the mound. Naturally, the job had to be completely redone from scratch, because the cards which were surveyed, had been pulled up.

Right after the second survey of the Boda Site, surveyor trainees and field sketchers went to the Fox Brother Site, and repeated essentially the same scenario. But this time, the cards between which the tape had been stretched were indicated somewhere near the end of each line. But no precise location was shown, just that the card was in the general area. Yet, I am confident that after this site is also re-surveyed, that the field sketch team members will begin to carefully watch each other and check for such Boo-boos--especially since two of the members of the field sketch team at the Fox Brothers Site had been at the two surveys of the Boda Site. One learns how to eliminate mistakes from experience, and we are, indeed, getting that. If we do not give up, I have no doubt that we will be able to put out competent crews who can efficiently and accurately produce maps of ancient sites, such as the Effigy Mound groups.

No similar type of problem with the field sketches were noted at the Ceex Haci Site. But for this work, both Chris Tyler and I carefully checked the survey notes and the field sketches before the cards got pulled.

There are those who think our field work can be made faster and more efficient with more updated field hardware and office software. That may be true if our Total Station operators want to eventually learn some additional steps to correctly carry out in the field. But more modern and fancy equipment will not eliminate mistakes, which we can call Boo-boos. I know of no way of doing so other than by being very careful in what one is doing, and by having someone else carefully check all the work. Perhaps when getting ready to survey a new site at the beginning of the day, the team members could all quietly sit down, review in the mind what must be done, and then calmly discuss with the other people at the site how to go forward for a successful, enjoyable, and fruitful day.

And since the persons running the Total Stations have so much at stake if the field sketches are not correct, I suggest that the Total Station team leaders review all of the field sketches before any of the cards get pulled to assure that the job does not have to be re-surveyed due to cards not correctly showing on the field sketches.

Although other people in the office should be trained for efficient reduction of the data to final map, I recommend that the Total Station operators initially do this work until they become well acquainted with how to transfer the data from the field sketches to the base map, and what is needed to make this a success.

Figure 6 shows the overview of Map Sheet Nek-F2. Figures 6a to 6h show portions of this map which can be more easily read. A large-scale copy of this map sheet is available for cataloging and registration. I will leave that for others to do.

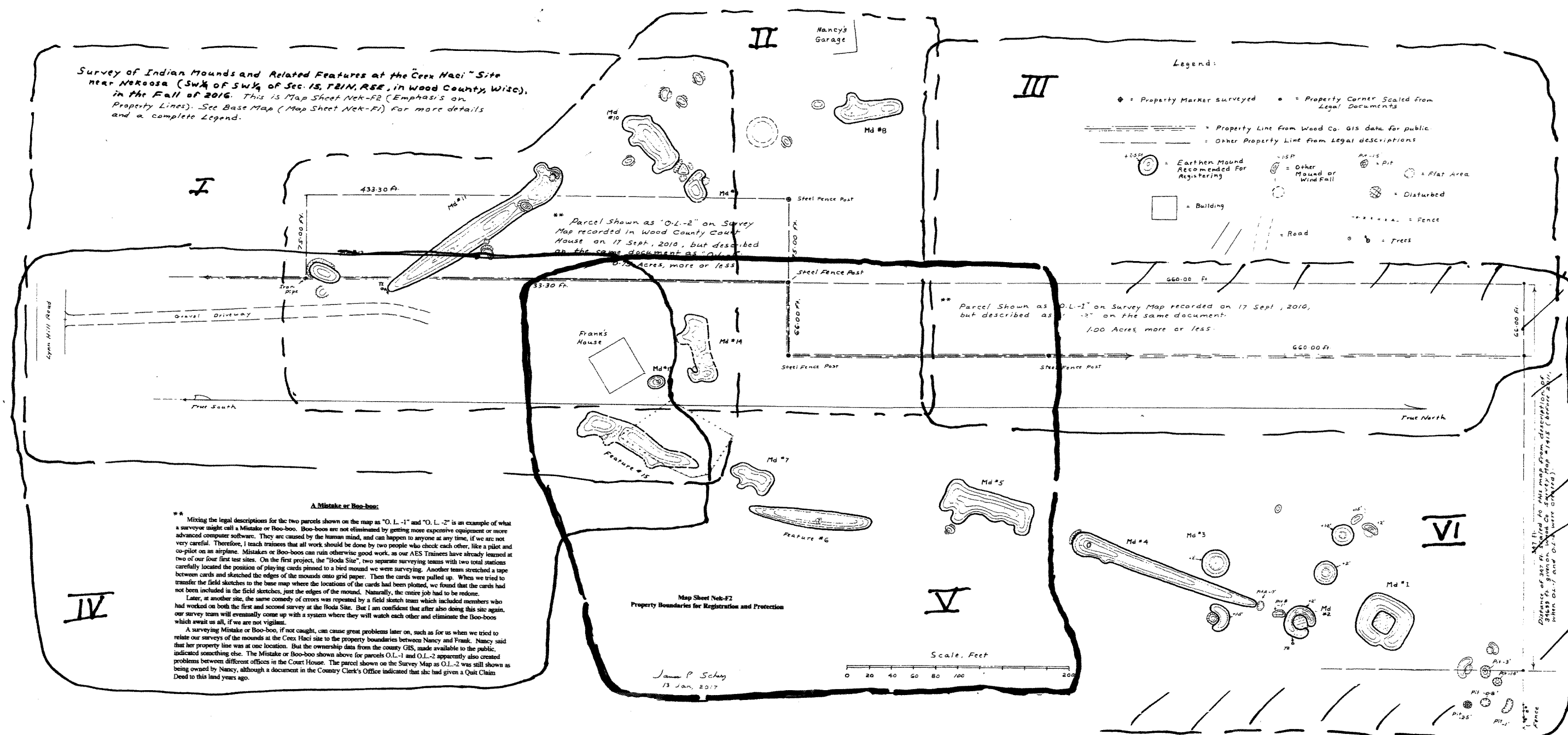


Figure 6. Map Sheet Nek-F2 (Emphasis on Property Lines)
See Figures 6a to 6h, which are more readable.

Survey of Indian Mounds and Related Features at the "Ceex Haco" Site near Nekoosa (SW¼ of SW¼ of Sec. 15, T21N, R5E, in Wood County, Wisc), in the Fall of 2016. This is Map Sheet Nek-F2 (Emphasis on Property Lines). See Base Map (Map Sheet Nek-F1) for more details and a complete Legend.

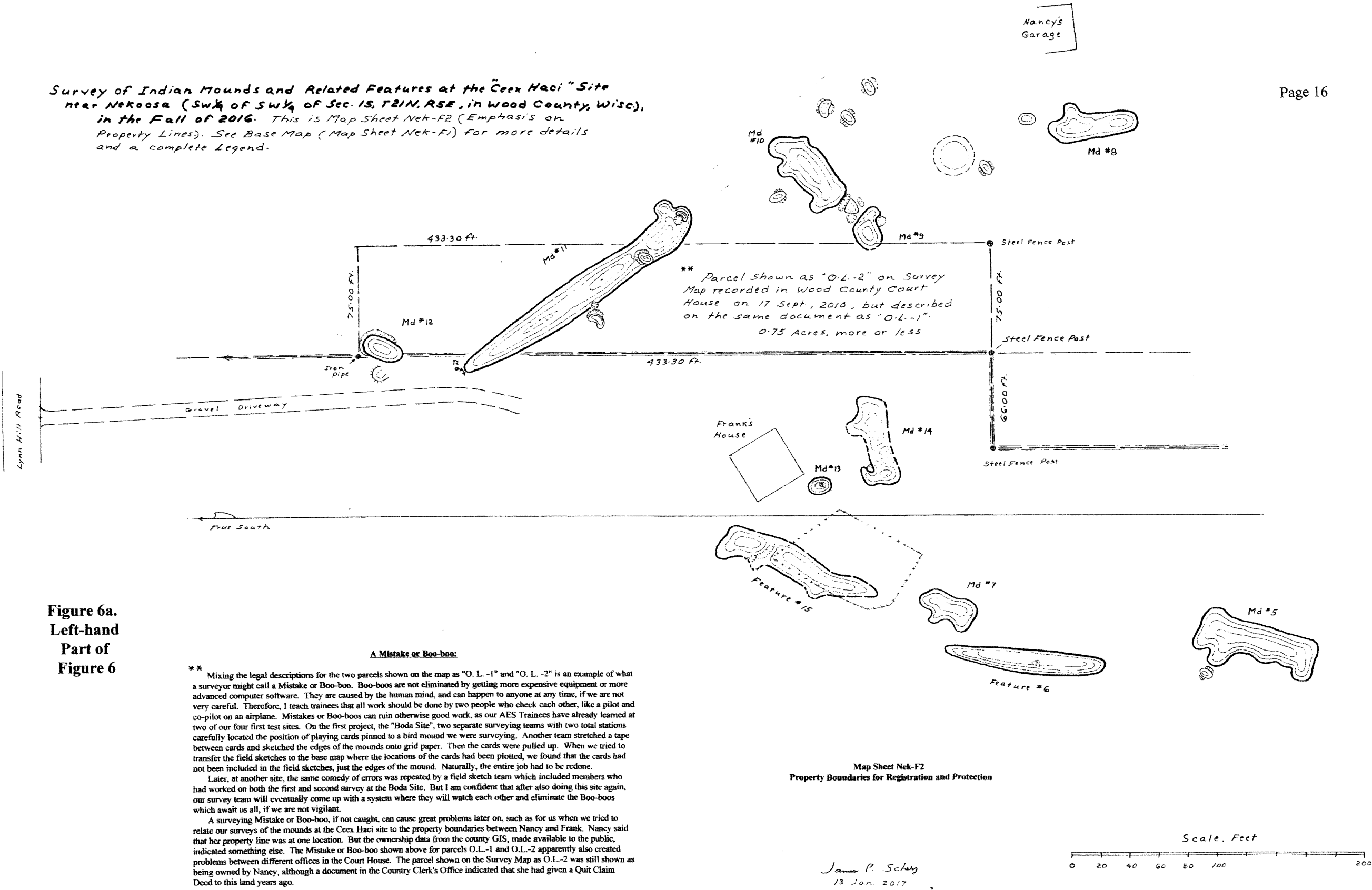


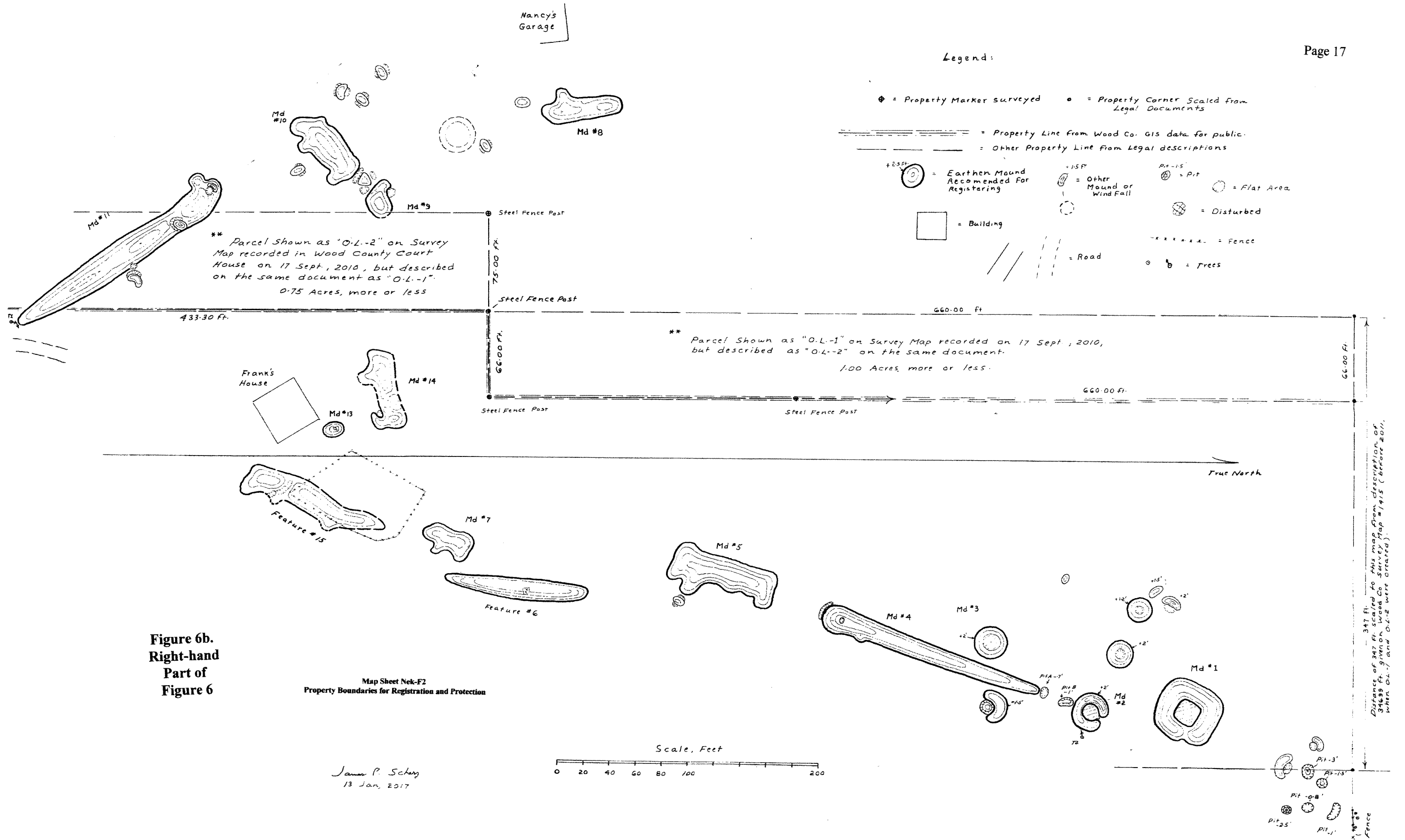
Figure 6a.
Left-hand
Part of
Figure 6

A Mistake or Boo-boo:

** Mixing the legal descriptions for the two parcels shown on the map as "O. L. -1" and "O. L. -2" is an example of what a surveyor might call a Mistake or Boo-boo. Boo-boos are not eliminated by getting more expensive equipment or more advanced computer software. They are caused by the human mind, and can happen to anyone at any time, if we are not very careful. Therefore, I teach trainees that all work should be done by two people who check each other, like a pilot and co-pilot on an airplane. Mistakes or Boo-boos can ruin otherwise good work, as our AES Trainees have already learned at two of our four first test sites. On the first project, the "Boda Site", two separate surveying teams with two total stations carefully located the position of playing cards pinned to a bird mound we were surveying. Another team stretched a tape between cards and sketched the edges of the mounds onto grid paper. Then the cards were pulled up. When we tried to transfer the field sketches to the base map where the locations of the cards had been plotted, we found that the cards had not been included in the field sketches, just the edges of the mound. Naturally, the entire job had to be redone.

Later, at another site, the same comedy of errors was repeated by a field sketch team which included members who had worked on both the first and second survey at the Boda Site. But I am confident that after also doing this site again, our survey team will eventually come up with a system where they will watch each other and eliminate the Boo-boos which await us all, if we are not vigilant.

A surveying Mistake or Boo-boo, if not caught, can cause great problems later on, such as for us when we tried to relate our surveys of the mounds at the Ceex Haco site to the property boundaries between Nancy and Frank. Nancy said that her property line was at one location. But the ownership data from the county GIS, made available to the public, indicated something else. The Mistake or Boo-boo shown above for parcels O.L.-1 and O.L.-2 apparently also created problems between different offices in the Court House. The parcel shown on the Survey Map as O.L.-2 was still shown as being owned by Nancy, although a document in the County Clerk's Office indicated that she had given a Quit Claim Deed to this land years ago.



Survey of Indian Mounds and Related Features at the "Ceex Haci" Site
 near Nekoosa (SW¼ of SW¼ of Sec. 15, T21N, R5E, in Wood County, Wisc.),
 in the Fall of 2016. This is Map Sheet Nek-F2 (Emphasis on
 Property Lines). See Base Map (Map Sheet Nek-F1) for more details
 and a complete Legend.

Lynn Hill Road

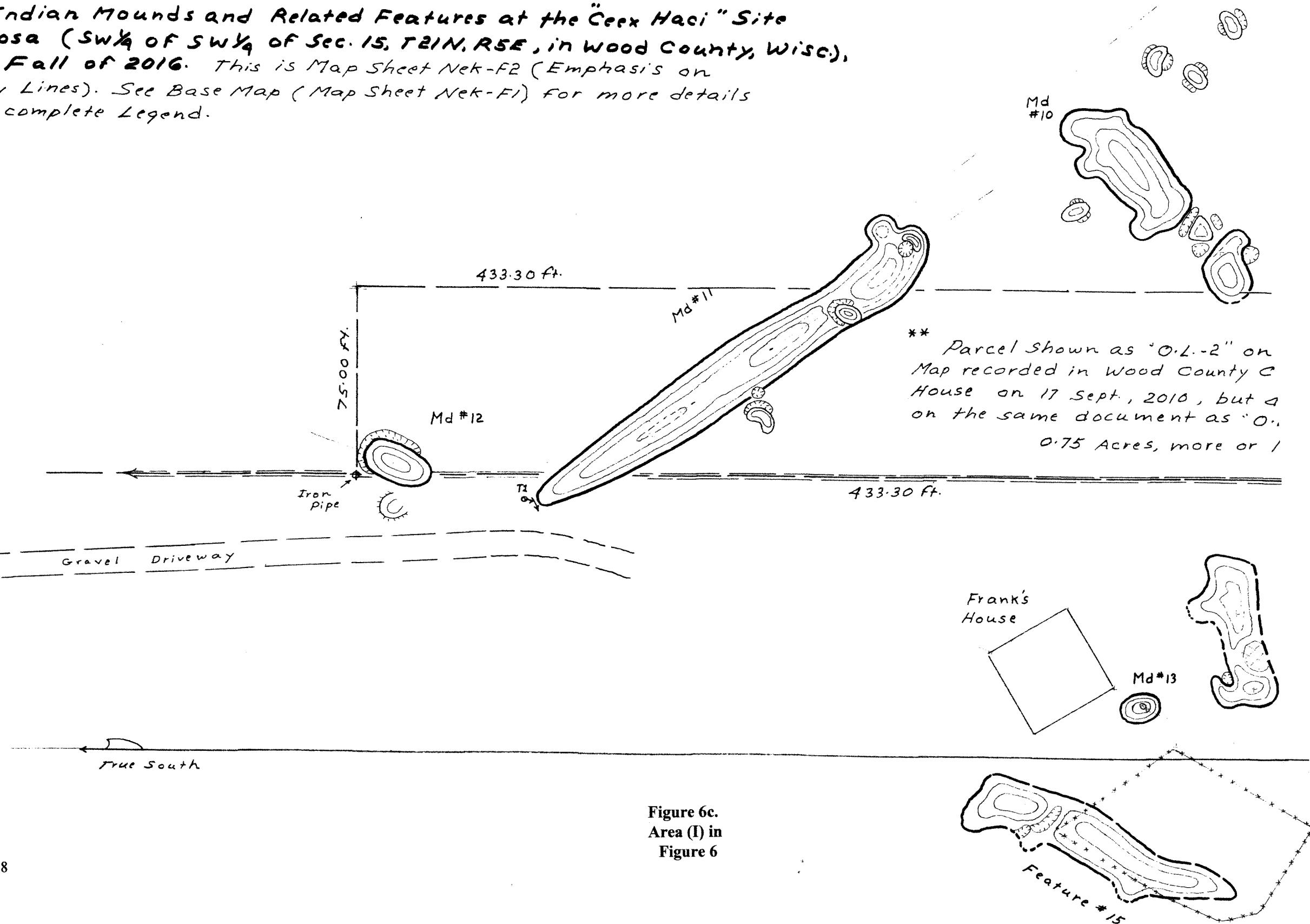
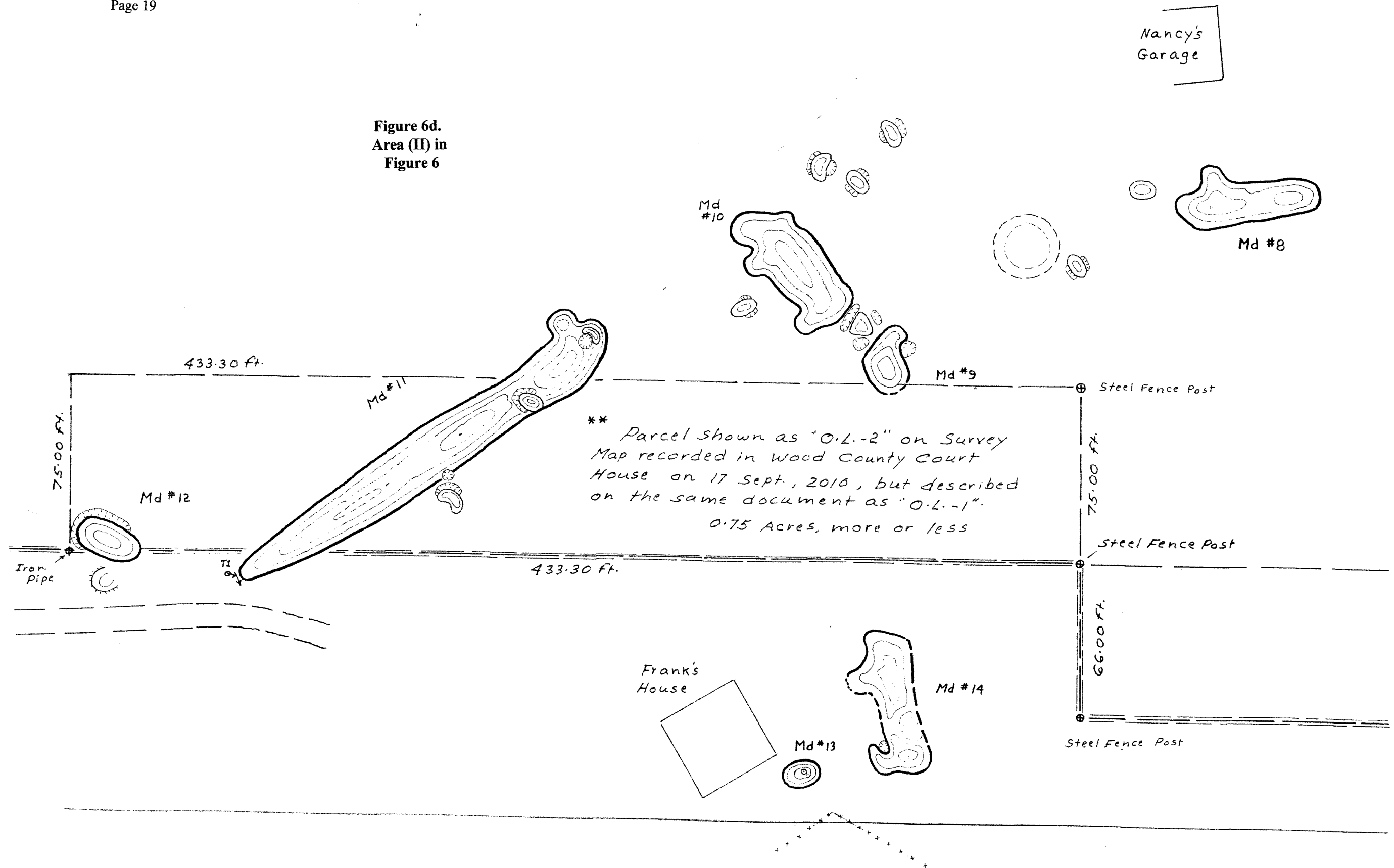


Figure 6c.
 Area (I) in
 Figure 6

Figure 6d.
Area (II) in
Figure 6



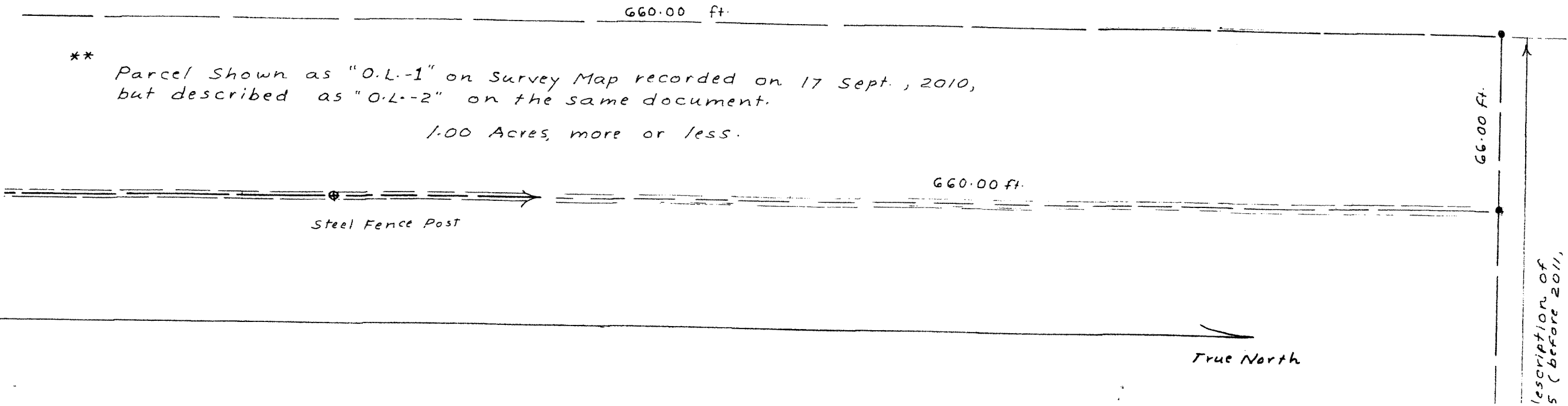
Legend:

⊕ = Property Marker surveyed • = Property Corner Scaled from Legal Documents

==== = Property Line from Wood Co. GIS data for public.
—— = Other Property Line from Legal descriptions

+2.5 ft. = Earthen Mound Recommended For Registering
 = Building
 = Other Mound or Wind Fall
 = Pit
 = Flat Area
 = Disturbed
-x-x-x-x-x- = Fence
 = Trees

Figure 6e.
Area (III) in
Figure 6



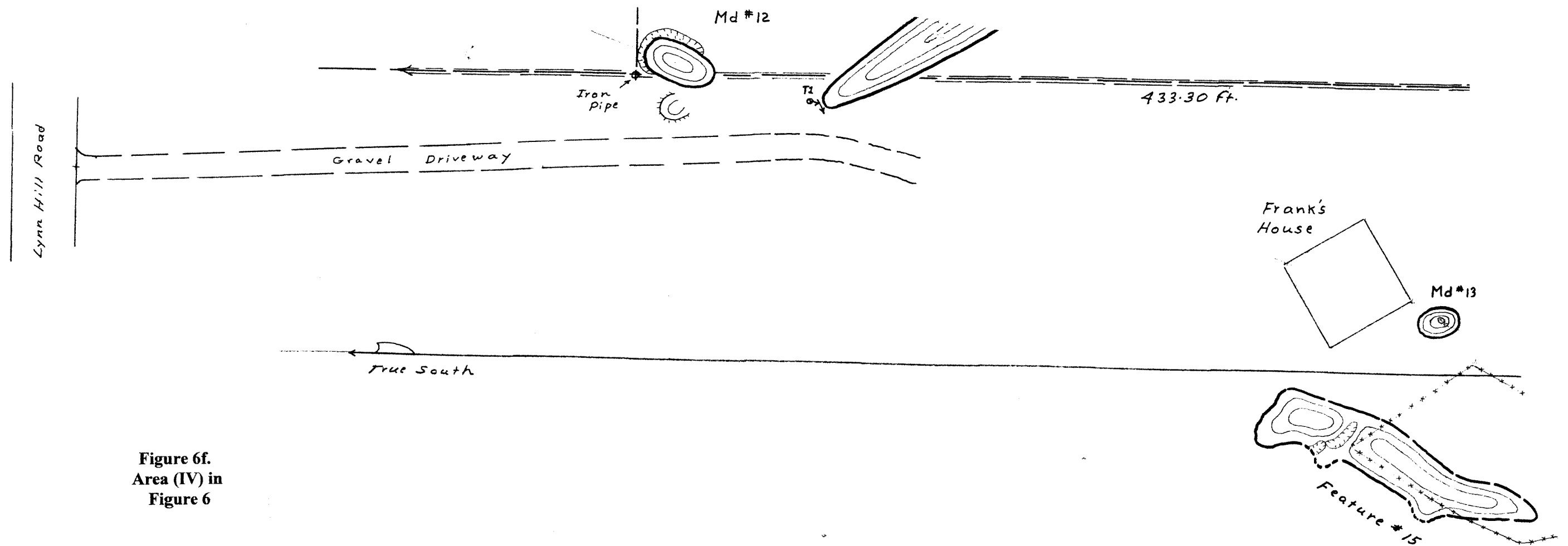


Figure 6f.
Area (IV) in
Figure 6

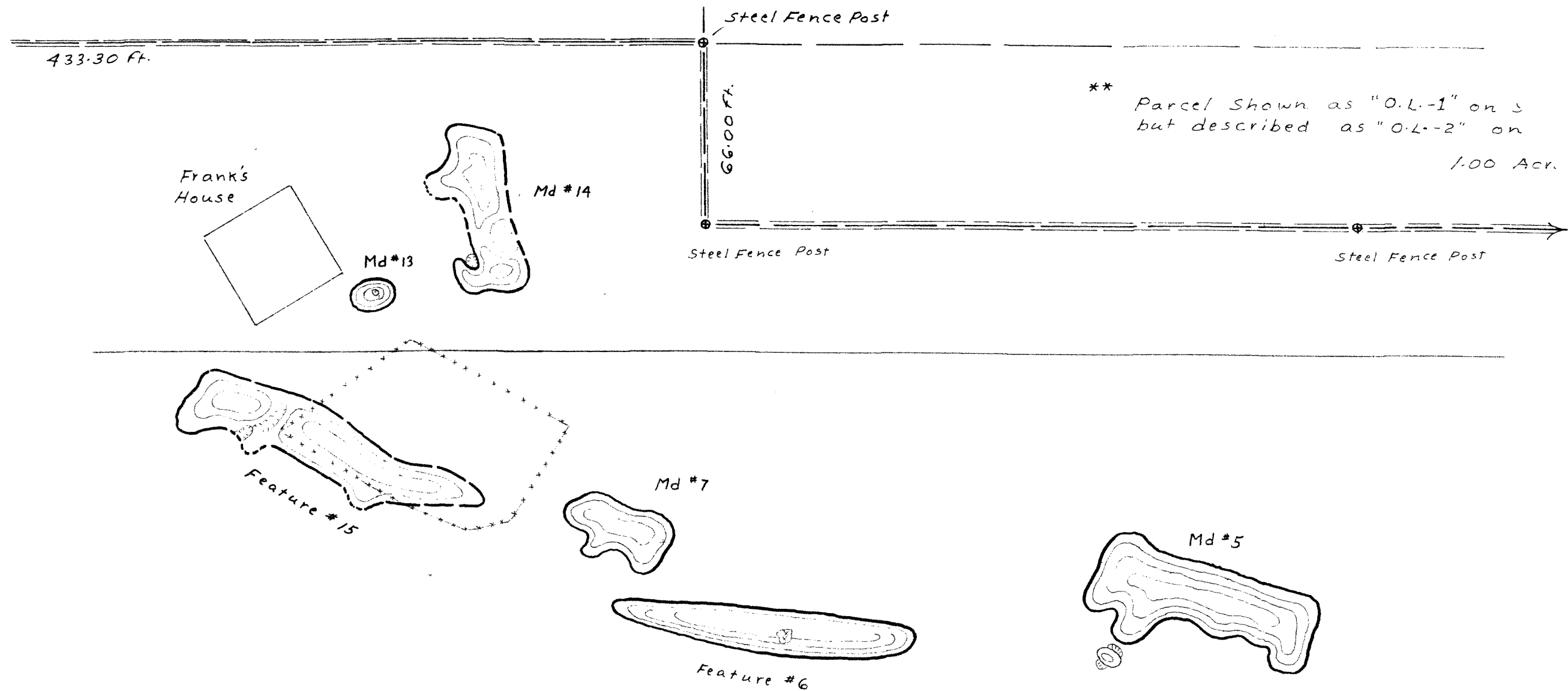
A Mistake or Boo-boo:

**

Mixing the legal descriptions for the two parcels shown on the map as "O. L. -1" and "O. L. -2" is an example of what a surveyor might call a Mistake or Boo-boo. Boo-boos are not eliminated by getting more expensive equipment or more advanced computer software. They are caused by the human mind, and can happen to anyone at any time, if we are not very careful. Therefore, I teach trainees that all work should be done by two people who check each other, like a pilot and co-pilot on an airplane. Mistakes or Boo-boos can ruin otherwise good work, as our AES Trainees have already learned at two of our four first test sites. On the first project, the "Boda Site", two separate surveying teams with two total stations carefully located the position of playing cards pinned to a bird mound we were surveying. Another team stretched a tape between cards and sketched the edges of the mounds onto grid paper. Then the cards were pulled up. When we tried to transfer the field sketches to the base map where the locations of the cards had been plotted, we found that the cards had not been included in the field sketches, just the edges of the mound. Naturally, the entire job had to be redone.

Later, at another site, the same comedy of errors was repeated by a field sketch team which included members who had worked on both the first and second survey at the Boda Site. But I am confident that after also doing this site again, our survey team will eventually come up with a system where they will watch each other and eliminate the Boo-boos which await us all, if we are not vigilant.

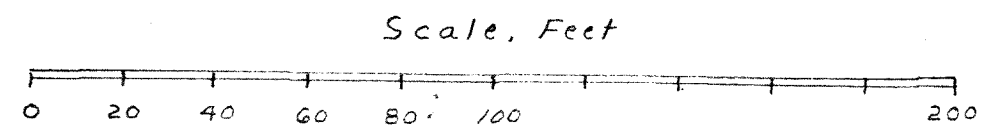
A surveying Mistake or Boo-boo, if not caught, can cause great problems later on, such as for us when we tried to relate our surveys of the mounds at the Ceex Haci site to the property boundaries between Nancy and Frank. Nancy said that her property line was at one location. But the ownership data from the county GIS, made available to the public, indicated something else. The Mistake or Boo-boo shown above for parcels O.L.-1 and O.L.-2 apparently also created problems between different offices in the Court House. The parcel shown on the Survey Map as O.L.-2 was still shown as being owned by Nancy, although a document in the Country Clerk's Office indicated that she had given a Quit Claim Deed to this land years ago.

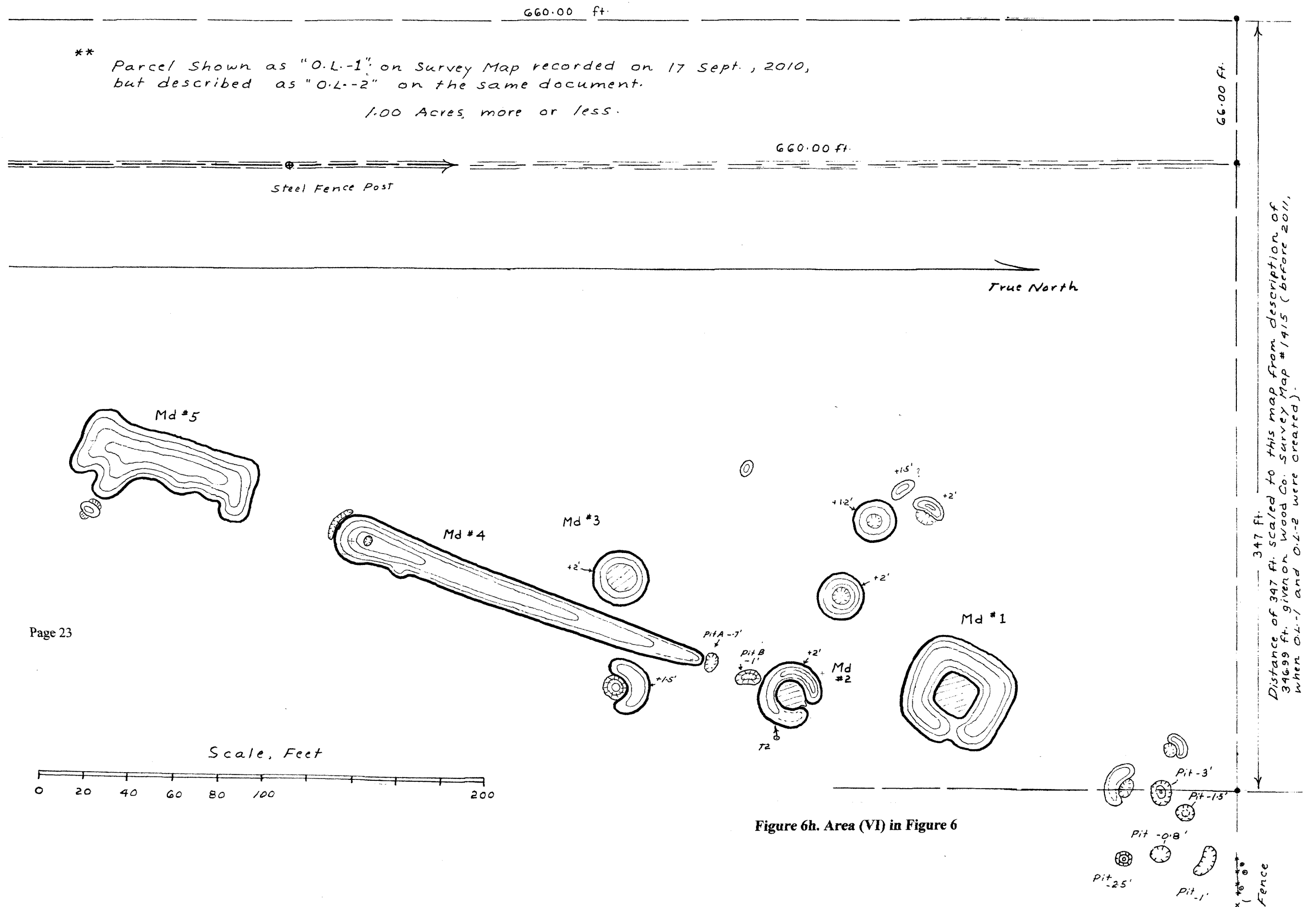


Map Sheet Nek-F2
Property Boundaries for Registration and Protection

Figure 6g.
Area (V) in
Figure 6

James P. Schery
13 Jan, 2017





Map Sheet Nek-F3

Map Sheet Nek-F3 illustrates our initial work to make sense of the obvious geometry in light of what we had learned from studying geometry at other sites. See Figure 7. The main features here are two long lines (within the error fan of the linear mound Md #4). They are shown as the Apparent Key Alignment and the 2nd Alignment. They are oriented to a true north-south line at 20.0 deg. and 19.0 deg., respectively. The angle between the two alignments is precisely 1.0 deg. (to the accuracy we can measure angles on the map with a large protractor). But the geometry at such sites is complex and there is more to these lines than the mere directions. They also have lengths, which we can measure accurately to within a few feet. The ratio of the two lengths is 1.5 which is also $3/2$ -- a ration very important to ancient metrology the world over. To us today, it is also the ratio of the length of strings on a violin which plays the most pleasing note within an octave, which we call the "Fifth".

Sophisticated ratios of distances are really no surprise at an important site like this one. We find important ratios at other sites, as well. But what is unusual at this site are the two alignments of 20.0 deg. and 19.0 deg. from a true north-south line. One would think (according to the pattern at other sites) that one of the angles would be a Key Alignment (related to an angle of 60.00 deg., which can accurately and easily be made by using a rope). Naturally, the angle of 20.0 deg. is related to 60.0 deg., being $\frac{1}{3}$ of 60 deg. But to trisect an angle would require knowledge of what is referred to as one of the best kept initiation secrets of the ancient priesthoods (trisecting an angle with geometry). We had not previously found a key alignment of 20.0 deg. in the Wisconsin Area, although we found a prominent one overlooking the valley where Newark, Ohio is located. Pamita said that the ancient Cat or (Panther or Jaguar) Priests once had a college in this valley where the famous Octagon Mound is located. And he further said *"Sure, Oh sure, those Jaguar Priests in that college could do that."* He was referring to my statement that I saw indications in the Hopwell mounds that ancient surveyors there could square circles and trisect angles.⁴

When I told my students what Pamita had said, they soon had found a method that will trisect any angle by applying the 1/4 Series Function to such an angle by bisecting with a rope multiple times. They began to question what they had been taught by their calculus professors about trisecting angles and squaring circles because Euclid said it was impossible. We all became confident that harmonies of geometry do allow us to trisect an angle to the limits of the tools of geometry. But how about the angle of 1.00 deg. which is encoded between the "Apparent Key Alignment" and the 2nd Alignment? A precise angle of 1.0000 deg. has been key to surveying for thousands of years, and is still so, yet today. This important angle is encoded into the Hensler Site and the Kolterman Site, as well. There is some uncertainty in my mind about the method or methods that ancient New World surveyors used at different sites to create a precise angle of one degree in the first place. Map Sheet F3a will shed some light on the possible methods, at least the method likely used at the Ceex Haci Site.

Long, seemingly important alignments at the Ceex Haci Site of 20.0 deg. and 19.0 deg. (from a true north-south line) led us to consider some other possible reasons why these very unusual alignments may have been laid out at this site. To check for other reasons, these two lines were extended far to the north (as Rhomb Lines). The computer programs we had developed years ago to help Ralph Redfox extend Rhomb Lines from the Bighorn Medicine Wheel in Montana to east of the Mississippi River were dusted off and also used to accurately extend these two lines northward from the Ceex Haci Site. These programs calculated the latitude and longitude where the lines cross from one 15 min. USGS Topo Quad map to the next. (Rhomb Lines are everywhere at the same bearing angle from true north, although the true north lines converge towards the north celestial pole.) This method allowed us to determine the precise location where these extended Rhomb Lines meet the south shore of Lake Superior.

The line at 19.0 deg. east of true north goes through the area where the Portage River and the old portage from Portage Lake (in the heart of the Keweenaw) connected to Lake Superior. (The area is now a Ship Canal built to service the copper mines in the area during historic times.) The extension of the line at 20.0 deg. east of true north goes through the area where the Portage River connects to Portage Lake from the south. These locations, indeed, were important in the late 1800s and early 1900s when the Keweenaw was known as the Copper Country of the United States. These locations would also have been important to local people before historic miners reopened the prehistoric copper mines of the Keweenaw and Isle Royal in the mid 1800s. These locations are shown on the right hand part of Map Sheet Nek-F3. (Also see Figure 7e.)

Figure 7 shows an overall view of Map Sheet Nek-F3. Figures 7a to 7h show portions of this image at a larger scale which are much easier to read.

⁴ When I protested, saying that we teach in our modern colleges that it is impossible to square circles and trisect angles by using only geometry, he looked puzzled and said, *"Now why would they say that?"* The logical answer is that the Greek Scholar Euclid, tried to solve these ancient temple riddles and could not. So we teach that it is impossible to do so. We like to believe that all important geometry was invented by the Classical Greeks.

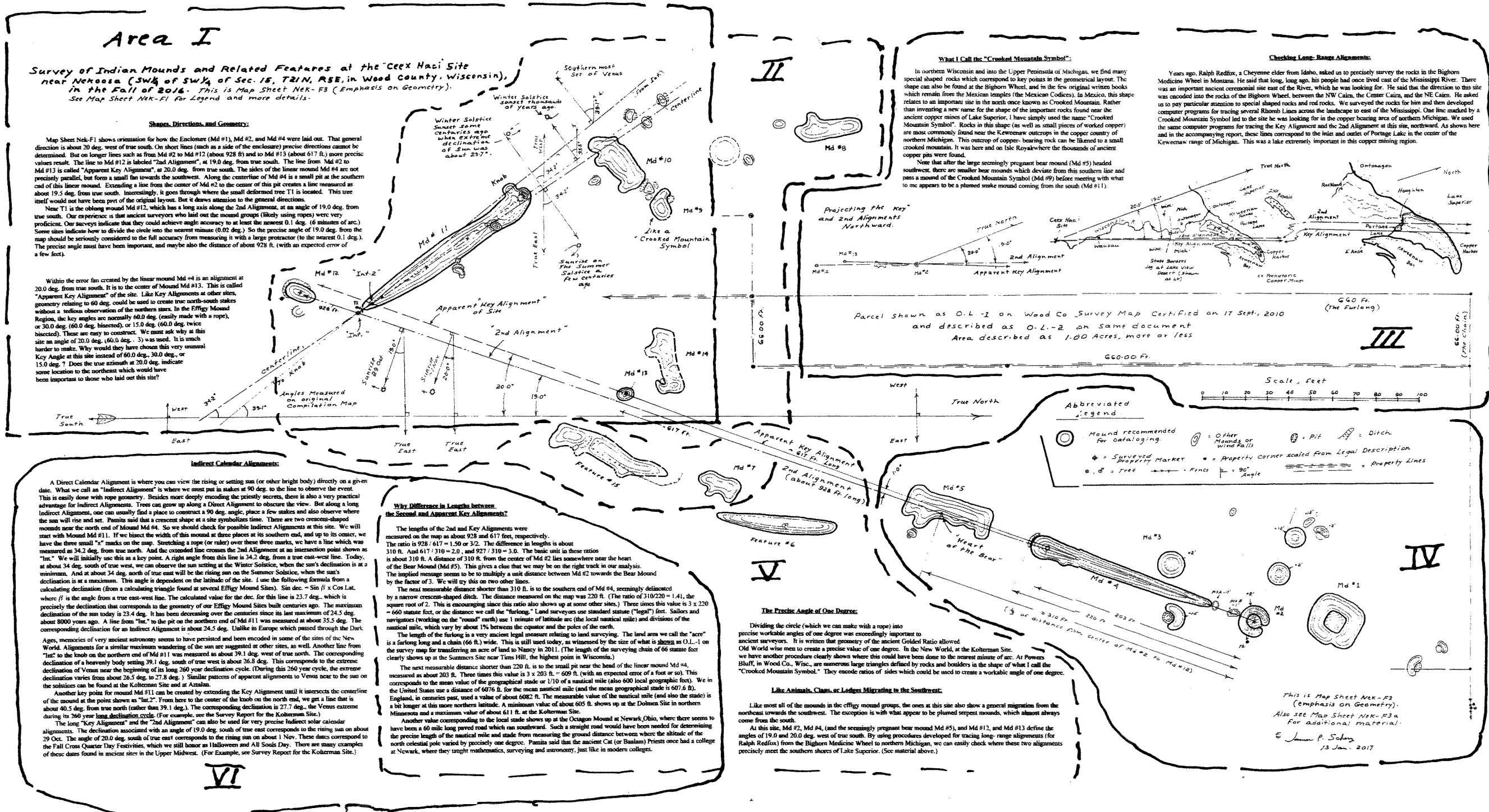


Figure 7. Map Sheet Nek-F3 (Shapes, Directions, and Geometry)
See Figures 7a to 7h, which are more readable.

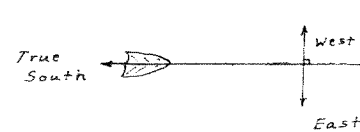
Survey of Indian Mounds and Related Features at the "Ceex Haci Site near Nekoosa (SW 1/4 of SW 1/4 of Sec. 15, T21N, R5E, in Wood County, Wisconsin), in the Fall of 2016. This is Map Sheet NEK-F3 (Emphasis on Geometry). See Map Sheet NEK-F1 for Legend and more details.

Shapes, Directions, and Geometry:

Map Sheet NEK-F1 shows orientation for how the Enclosure (Md #1), Md #2, and Md #4 were laid out. That general direction is about 20 deg. west of true south. On short lines (such as a side of the enclosure) precise directions cannot be determined. But on longer lines such as from Md #2 to Md #12 (about 928 ft) and to Md #13 (about 617 ft.) more precise values result. The line to Md #12 is labeled "2nd Alignment", at 19.0 deg. from true south. The line from Md #2 to Md #13 is called "Apparent Key Alignment", at 20.0 deg. from true south. The sides of the linear mound Md #4 are not precisely parallel, but form a small fan towards the southwest. Along the centerline of Md #4 is a small pit at the southern end of this linear mound. Extending a line from the center of Md #2 to the center of this pit creates a line measured as about 19.5 deg. from true south. Interestingly, it goes through where the small deformed tree T1 is located. This tree itself would not have been part of the original layout. But it draws attention to the general directions.

Near T1 is the oblong mound Md #12, which has a long axis along the 2nd Alignment, at an angle of 19.0 deg. from true south. Our experience is that ancient surveyors who laid out the mound groups (likely using ropes) were very proficient. Our surveys indicate that they could achieve angle accuracy to at least the nearest 0.1 deg. (6 minutes of arc.) Some sites indicate how to divide the circle into the nearest minute (0.02 deg.) So the precise angle of 19.0 deg. from the map should be seriously considered to the full accuracy from measuring it with a large protractor (to the nearest 0.1 deg.). The precise angle must have been important, and maybe also the distance of about 928 ft. (with an expected error of a few feet).

Within the error fan created by the linear mound Md #4 is an alignment at 20.0 deg. from true south. It is to the center of Mound Md #13. This is called "Apparent Key Alignment" of the site. Like Key Alignments at other sites, geometry relating to 60 deg. could be used to create true north-south stakes without a tedious observation of the northern stars. In the Effigy Mound Region, the key angles are normally 60.0 deg. (easily made with a rope), or 30.0 deg. (60.0 deg. bisected), or 15.0 deg. (60.0 deg. twice bisected). These are easy to construct. We must ask why at this site an angle of 20.0 deg. (60.0 deg. / 3) was used. It is much harder to make. Why would they have chosen this very unusual Key Angle at this site instead of 60.0 deg., 30.0 deg., or 15.0 deg.? Does the true azimuth at 20.0 deg. indicate some location to the northeast which would have been important to those who laid out this site?



Indirect Calendar Alignments:

A Direct Calendar Alignment is where you can view the rising or setting sun (or other bright body) directly on a given date. What we call an "Indirect Alignment" is where we must put in stakes at 90 deg. to the line to observe the event. This is easily done with rope geometry. Besides more deeply encoding the priestly secrets, there is also a very practical advantage for Indirect Alignments. Trees can grow up along a Direct Alignment to obscure the view. But along a long Indirect Alignment, one can usually find a place to construct a 90 deg. angle, place a few stakes and also observe where the sun will rise and set. Pamita said that a crescent shape at a site symbolizes time. There are two crescent-shaped mounds near the north end of Mound Md #4. So we should check for possible Indirect Alignments at this site. We will start with Mound Md #11. If we bisect the width of this mound at three places at its southern end, and up to its center, we have the three small "x" marks on the map. Stretching a rope (or ruler) over these three marks, we have a line which was measured as 34.2 deg. from true north. And the extended line crosses the 2nd Alignment at an intersection point shown as "Int." We will initially use this as a key point. A right angle from this line is 34.2 deg. from a true east-west line. Today, at about 34 deg. south of true west, we can observe the sun setting at the Winter Solstice, when the sun's declination is at a minimum. And at about 34 deg. north of true east will be the rising sun on the Summer Solstice, when the sun's declination is at a maximum. This angle is dependent on the latitude of the site. I use the following formula from a calculating declination (from a calculating triangle found at several Effigy Mound Sites). $\sin \text{dec.} = \sin \beta \times \cos \text{Lat}$, where β is the angle from a true east-west line. The calculated value for the dec. for this line is 23.7 deg., which is precisely the declination that corresponds to the geometry of our Effigy Mound Sites built centuries ago. The maximum declination of the sun today is 23.4 deg. It has been decreasing over the centuries since its last maximum of 24.5 deg. about 8000 years ago. A line from "Int." to the pit on the northern end of Md #11 was measured at about 35.5 deg. The corresponding declination for an Indirect Alignment is about 24.5 deg. Unlike in Europe which passed through the Dark

Ages, memories of very ancient astronomy seems to have persisted and been encoded in some of the sites of the New World. Alignments for a similar maximum wandering of the sun are suggested at other sites, as well. Another line from "Int." to the knob on the northern end of Md #11 was measured as about 39.1 deg. west of true north. The corresponding declination of a heavenly body setting 39.1 deg. south of true west is about 26.8 deg. This corresponds to the extreme declination of Venus near the beginning of its long 260 year declination cycle. (During this 260 year cycle, the extreme declination varies from about 26.5 deg. to 27.8 deg.) Similar patterns of apparent alignments to Venus near to the sun on the solstices can be found at the Kolterman Site and at Aztalan.

Another key point for mound Md #11 can be created by extending the Key Alignment until it intersects the centerline of the mound at the point shown as "Int2". From here to the center of the knob on the north end, we get a line that is about 40.5 deg. from true north (rather than 39.1 deg.). The corresponding declination is 27.7 deg., the Venus extreme during its 260 year long declination cycle. (For example, see the Survey Report for the Kolterman Site.)

The long "Key Alignment" and the "2nd Alignment" can also be used for very precise Indirect solar calendar alignments. The declination associated with an angle of 19.0 deg. south of true east corresponds to the rising sun on about 29 Oct. The angle of 20.0 deg. south of true east corresponds to the rising sun on about 1 Nov. These dates correspond to the Fall Cross Quarter Day Festivities, which we still honor as Halloween and All Souls Day. There are many examples of these dates found in ancient sites in the Upper Midwest. (For Example, see Survey Report for the Kolterman Site.)

Why Difference in Lengths between the Second and Apparent Key Alignments?

The lengths of the 2nd and Key Alignments were measured on the map as about 928 and 617 feet, respectively. The ratio is $928 / 617 = 1.50$ or $3/2$. The difference in lengths is about 310 ft. And $617 / 310 = 2.0$, and $927 / 310 = 3.0$. The basic unit in these ratios is about 310 ft. A distance of 310 ft. from the center of Md #2 lies somewhere near the heart of the Bear Mound (Md #5). This gives a clue that we may be on the right track in our analysis. The implied message seems to be to multiply a unit distance between Md #2 towards the Bear Mound by the factor of 3. We will try this on two other lines.

The next measurable distance shorter than 310 ft. is to the southern end of Md #4, seemingly delineated by a narrow crescent-shaped ditch. The distance measured on the map was 220 ft. (The ratio of $310/220 = 1.41$, the square root of 2. This is encouraging since this ratio also shows up at some other sites.) Three times this value is $3 \times 220 = 660$ statute feet, or the distance we call the "furlong." Land surveyors use standard statute ("legal") feet. Sailors and navigators (working on the "round" earth) use 1 minute of latitude arc (the local nautical mile) and divisions of the nautical mile, which vary by about 1% between the equator and the poles of the earth. The length of the furlong is a very ancient legal measure relating to land surveying. The land area we call the "acre" is a furlong long and a chain (66 ft.) wide. This is still used today, as witnessed by the size of what is shown as O.L.-1 on the survey map for transferring an acre of land to Nancy in 2011. (The length of the surveying chain of 66 statute feet clearly shows up at the Summers Site near Tims Hill, the highest point in Wisconsin.)

The next measurable distance shorter than 220 ft. is to the small pit near the head of the linear mound Md #4, measured as about 203 ft. Three times this value is $3 \times 203 \text{ ft.} = 609 \text{ ft.}$ (with an expected error of a foot or so). This corresponds to the mean value of the geographical stade or 1/10 of a nautical mile (also 600 local geographic feet). We in the United States use a distance of 6076 ft. for the mean nautical mile (and the mean geographical stade is 607.6 ft). England, in centuries past, used a value of about 6082 ft. The measurable value of the nautical mile (and also the stade) is a bit longer at this more northern latitude. A minimum value of about 605 ft. shows up at the Dolmen Site in northern Minnesota and a maximum value of about 611 ft. at the Kolterman Site.

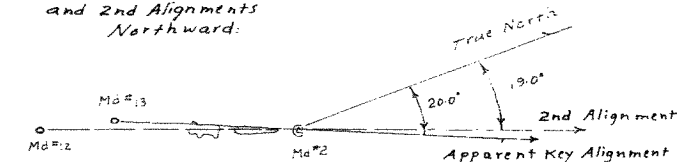
Another value corresponding to the local stade shows up at the Octagon Mound at Newark, Ohio, where there seems to have been a 60 mile long paved road which ran southward. Such a straight road would have been needed for determining the precise length of the nautical mile and stade from measuring the ground distance between where the altitude of the north celestial pole varied by precisely one degree. Pamita said that the ancient Cat (or Baalam) Priests once had a college at Newark, where they taught mathematics, surveying and astronomy, just like in modern colleges.

What I Call the "Crooked Mountain Symbol":

In northern Wisconsin and into the Upper Peninsula of Michigan, we find many special shaped rocks which correspond to key points in the geometrical layout. The shape can also be found at the Bighorn Wheel, and in the few original written books which remain from the Mexican temples (the Mexican Codices). In Mexico, this shape relates to an important site in the north once known as Crooked Mountain. Rather than inventing a new name for the shape of the important rocks found near the ancient copper mines of Lake Superior, I have simply used the name "Crooked Mountain Symbol". Rocks in this shape (as well as small pieces of worked copper) are most commonly found near the Keweenaw outcrops in the copper country of northern Michigan. This outcrop of copper-bearing rock can be likened to a small crooked mountain. It was here and on Isle Royale where the thousands of ancient copper pits were found.

Note that after the large seemingly pregnant bear mound (Md #5) headed southwest, there are smaller bear mounds which deviate from this southern line and pass a mound of the Crooked Mountain Symbol (Md #9) before meeting with what to me appears to be a plumed snake mound coming from the south (Md #11).

Projecting the Key and 2nd Alignments Northward:



Parcel shown as O.L.-1 on Wood and described as O.L. Area described a

Figure 7a. Left-hand Part of Figure 7

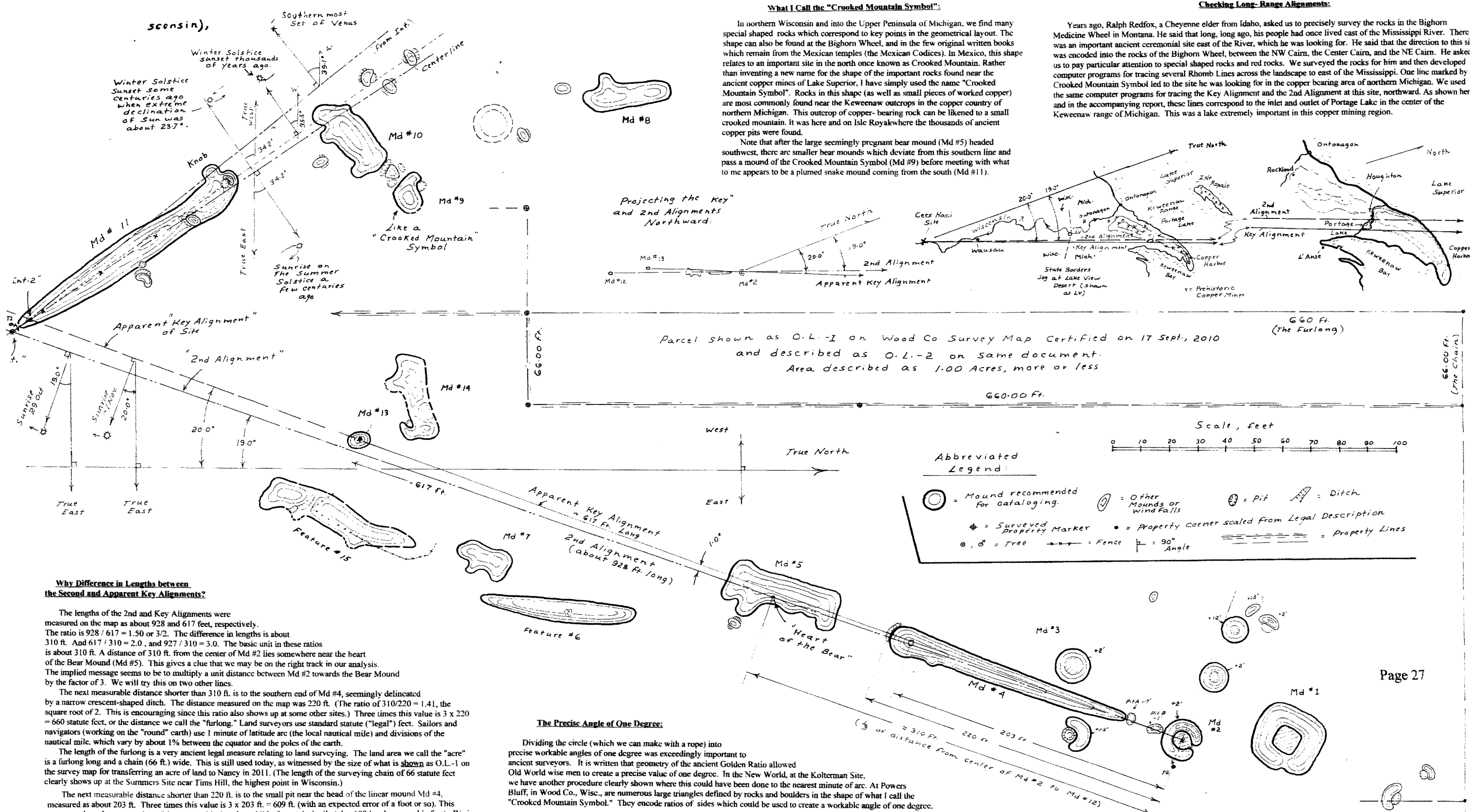
The Precise Angle of One Degree:

Dividing the circle (which we can make with a rope) into precise workable angles of one degree was exceedingly important to ancient surveyors. It is written that geometry of the ancient Golden Ratio allowed Old World wise men to create a precise value of one degree. In the New World, at the Kolterman Site, we have another procedure clearly shown where this could have been done to the nearest minute of arc. At Powers Bluff, in Wood Co., Wisc., are numerous large triangles defined by rocks and boulders in the shape of what I call the "Crooked Mountain Symbol." They encode ratios of sides which could be used to create a workable angle of one degree.

Like Animals, Clans, or Lodges Migrating to the Southwest:

Like most all of the mounds in the effigy mound groups, the ones at this site also show a general migration from the northeast towards the southwest. The exception is with what appear to be plumed serpent mounds, which almost always come from the south.

At this site, Md #2, Md #4, (and the seemingly pregnant bear mound Md #5), and Md #12, and Md #13 define the angles of 19.0 and 20.0 deg. west of true south. By using procedures developed for tracing long-range alignments (for Ralph Redfox) from the Bighorn Medicine Wheel to northern Michigan, we can easily check where these two alignments precisely meet the southern shores of Lake Superior. (See material above.)



**Figure 7b.
Right-hand
Part of
Figure 7**

This is Map Sheet Nek-F3
(emphasis on Geometry).
Also see Map Sheet Nek-F3a
for additional material.
© James P. Schatz
13 Jan. 2017

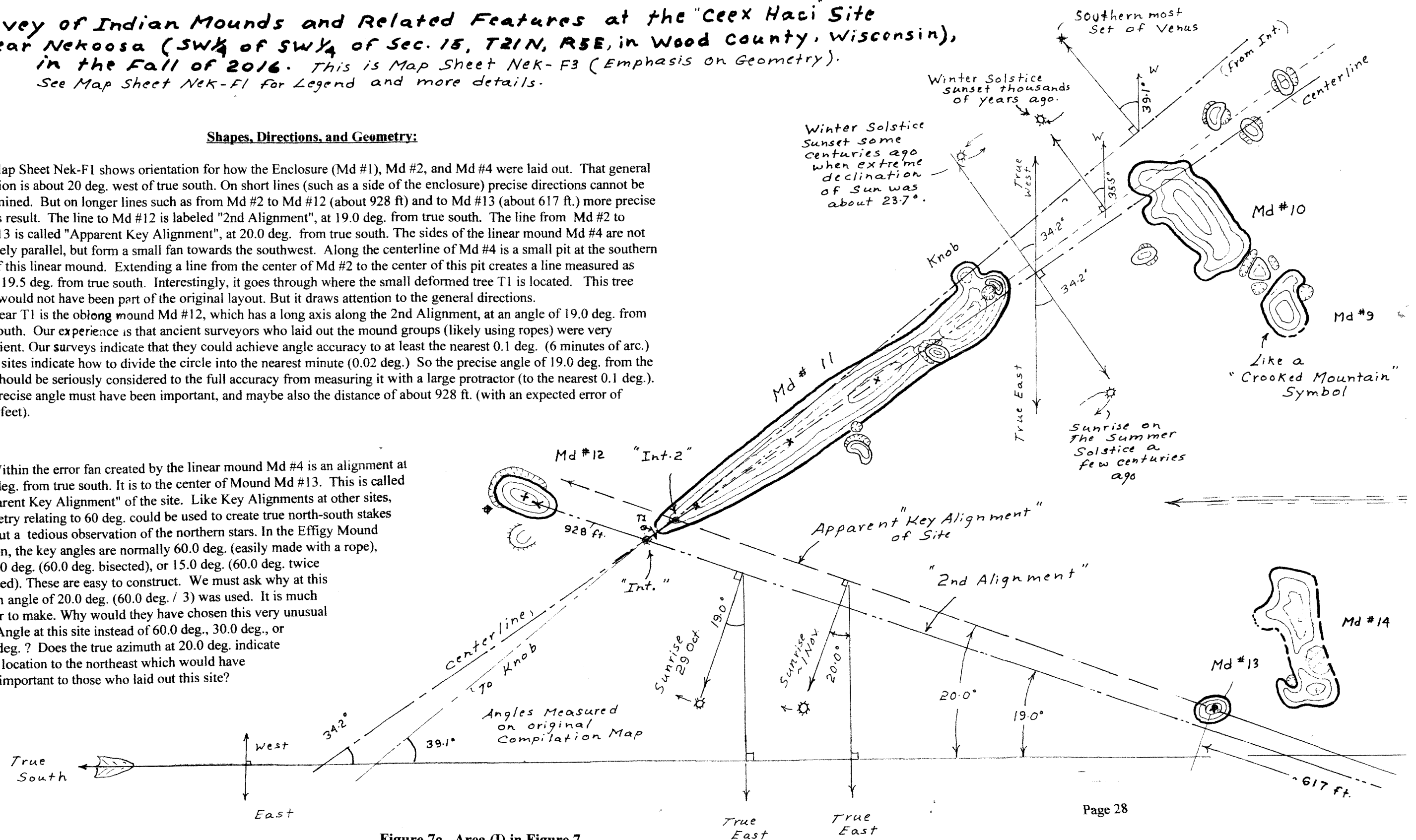
**Survey of Indian Mounds and Related Features at the "Ceex Haci" Site
near Nekoosa (SW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 15, T21N, R5E, in Wood County, Wisconsin),
in the Fall of 2016. This is Map Sheet Nek-F3 (Emphasis on Geometry).
See Map Sheet Nek-F1 for Legend and more details.**

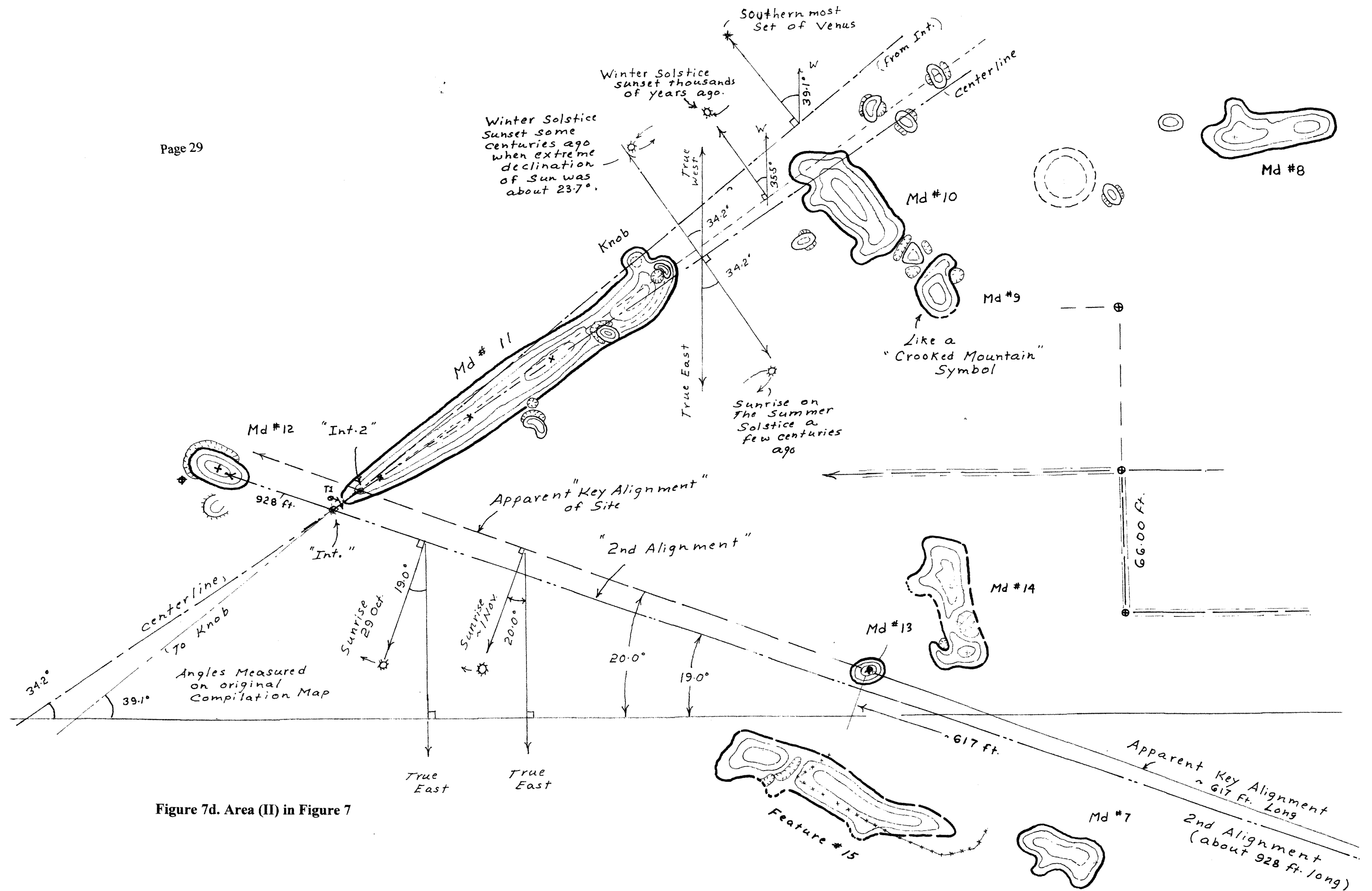
Shapes, Directions, and Geometry:

Map Sheet Nek-F1 shows orientation for how the Enclosure (Md #1), Md #2, and Md #4 were laid out. That general direction is about 20 deg. west of true south. On short lines (such as a side of the enclosure) precise directions cannot be determined. But on longer lines such as from Md #2 to Md #12 (about 928 ft) and to Md #13 (about 617 ft.) more precise values result. The line to Md #12 is labeled "2nd Alignment", at 19.0 deg. from true south. The line from Md #2 to Md #13 is called "Apparent Key Alignment", at 20.0 deg. from true south. The sides of the linear mound Md #4 are not precisely parallel, but form a small fan towards the southwest. Along the centerline of Md #4 is a small pit at the southern end of this linear mound. Extending a line from the center of Md #2 to the center of this pit creates a line measured as about 19.5 deg. from true south. Interestingly, it goes through where the small deformed tree T1 is located. This tree itself would not have been part of the original layout. But it draws attention to the general directions.

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What I Call the "Crooked Mountain Symbol":

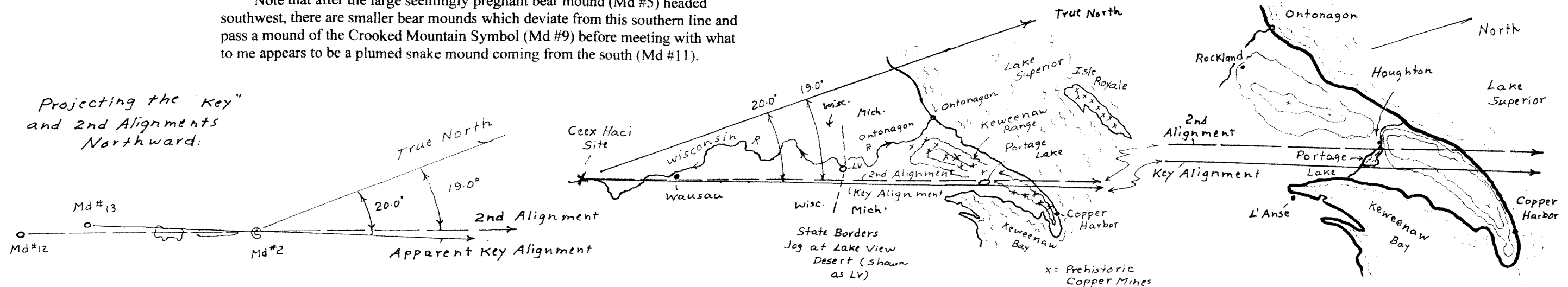
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Checking Long-Range Alignments:

Years ago, Ralph Redfox, a Cheyenne elder from Idaho, asked us to precisely survey the rocks in the Bighorn Medicine Wheel in Montana. He said that long, long ago, his people had once lived east of the Mississippi River. There was an important ancient ceremonial site east of the River, which he was looking for. He said that the direction to this site was encoded into the rocks of the Bighorn Wheel, between the NW Cairn, the Center Cairn, and the NE Cairn. He asked us to pay particular attention to special shaped rocks and red rocks. We surveyed the rocks for him and then developed computer programs for tracing several Rhomb Lines across the landscape to east of the Mississippi. One line marked by a Crooked Mountain Symbol led to the site he was looking for in the copper bearing area of northern Michigan. We used the same computer programs for tracing the Key Alignment and the 2nd Alignment at this site, northward. As shown here and in the accompanying report, these lines correspond to the inlet and outlet of Portage Lake in the center of the Keweenaw range of Michigan. This was a lake extremely important in this copper mining region.

Projecting the "Key"
and 2nd Alignments
Northward:



Parcel shown as O.L.-1 on Wood Co. Survey Map Certified on 17 Sept., 2010
and described as O.L.-2 on same document.
Area described as 1.00 Acres, more or less

660.00 Ft.

660 Ft.
(The Furlong)

66.00 Ft.
(The Chain)

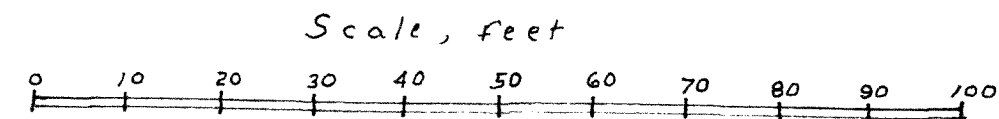
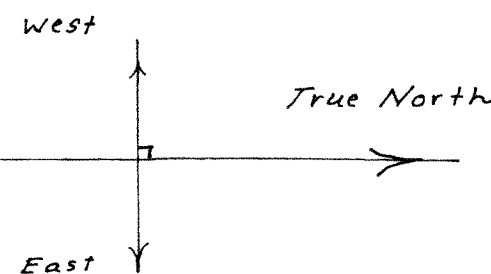


Figure 7e. Area (III) in Figure 7

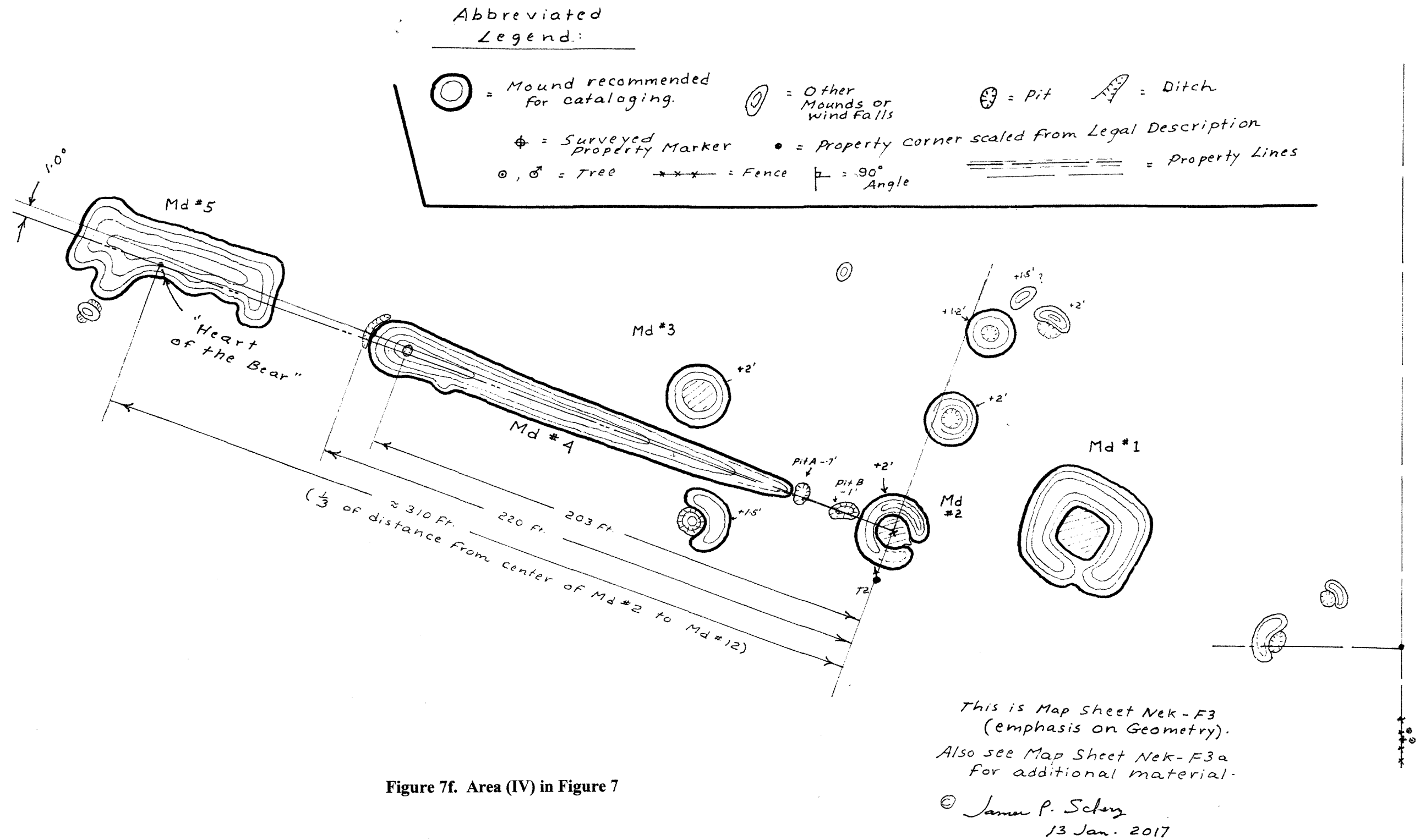


Figure 7f. Area (IV) in Figure 7

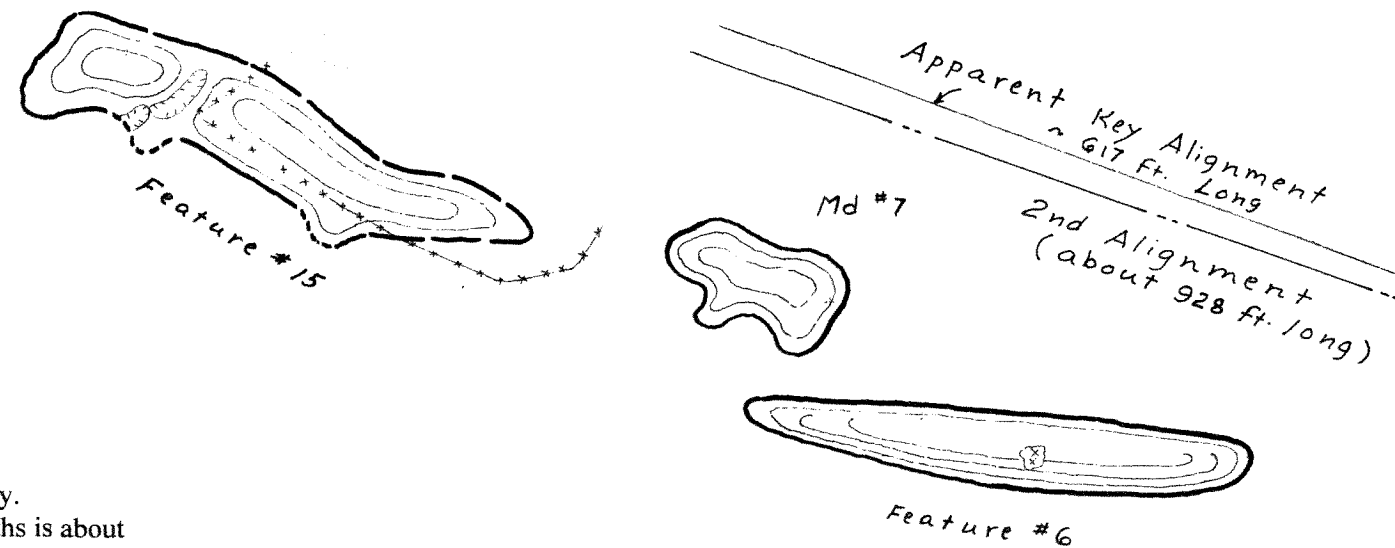


Figure 7g.
Area (V) in
Figure 7

Why Difference in Lengths between the Second and Apparent Key Alignments?

The lengths of the 2nd and Key Alignments were measured on the map as about 928 and 617 feet, respectively. The ratio is $928 / 617 = 1.50$ or $3/2$. The difference in lengths is about 310 ft. And $617 / 310 = 2.0$, and $927 / 310 = 3.0$. The basic unit in these ratios is about 310 ft. A distance of 310 ft. from the center of Md #2 lies somewhere near the heart of the Bear Mound (Md #5). This gives a clue that we may be on the right track in our analysis. The implied message seems to be to multiply a unit distance between Md #2 towards the Bear Mound by the factor of 3. We will try this on two other lines.

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The next measurable distance shorter than 220 ft. is to the small pit near the head of the linear mound Md #4, measured as about 203 ft. Three times this value is $3 \times 203 \text{ ft.} = 609 \text{ ft.}$ (with an expected error of a foot or so). This corresponds to the mean value of the geographical stade or $1/10$ of a nautical mile (also 600 local geographic feet). We in the United States use a distance of 6076 ft. for the mean nautical mile (and the mean geographical stade is 607.6 ft). England, in centuries past, used a value of about 6082 ft. The measurable value of the nautical mile (and also the stade) is a bit longer at this more northern latitude. A minimum value of about 605 ft. shows up at the Dolmen Site in northern Minnesota and a maximum value of about 611 ft. at the Kolterman Site.

Another value corresponding to the local stade shows up at the Octagon Mound at Newark, Ohio, where there seems to have been a 60 mile long paved road which ran southward. Such a straight road would have been needed for determining the precise length of the nautical mile and stade from measuring the ground distance between where the altitude of the north celestial pole varied by precisely one degree. Pamita said that the ancient Cat (or Baalam) Priests once had a college at Newark, where they taught mathematics, surveying and astronomy, just like in modern colleges.

The Precise Angle of One Degree:

Dividing the circle (which we can make with a rope) into precise workable angles of one degree was exceedingly important to ancient surveyors. It is written that geometry of the ancient Golden Ratio allowed Old World wise men to create a precise value of one degree. In the New World, at the Kolterman Site, we have another procedure clearly shown where this could have been done to the nearest minute of arc. At Powers Bluff, in Wood Co., Wisc., are numerous large triangles defined by rocks and boulders in the shape of what I call the "Crooked Mountain Symbol." They encode ratios of sides which could be used to create a workable angle of one degree.

Like Animals, Clans, or Lodges Migrating to the Southwest:

Like most all of the mounds in the effigy mound groups, the ones at this site also show a general migration from the northeast towards the southwest. The exception is with what appear to be plumed serpent mounds, which almost always come from the south.

At this site, Md #2, Md #4, (and the seemingly pregnant bear mound Md #5), and Md #12, and Md #13 define the angles of 19.0 and 20.0 deg. west of true south. By using procedures developed for tracing long-range alignments (for Ralph Redfox) from the Bighorn Medicine Wheel to northern Michigan, we can easily check where these two alignments precisely meet the southern shores of Lake Superior. (See material above.)

Figure 7h. Area (VI) in Figure 7

Indirect Calendar Alignments:

A Direct Calendar Alignment is where you can view the rising or setting sun (or other bright body) directly on a given date. What we call an "Indirect Alignment" is where we must put in stakes at 90 deg. to the line to observe the event. This is easily done with rope geometry. Besides more deeply encoding the priestly secrets, there is also a very practical advantage for Indirect Alignments. Trees can grow up along a Direct Alignment to obscure the view. But along a long Indirect Alignment, one can usually find a place to construct a 90 deg. angle, place a few stakes and also observe where the sun will rise and set. Pamita said that a crescent shape at a site symbolizes time. There are two crescent-shaped mounds near the north end of Mound Md #4. So we should check for possible Indirect Alignments at this site. We will start with Mound Md #11. If we bisect the width of this mound at three places at its southern end, and up to its center, we have the three small "x" marks on the map. Stretching a rope (or ruler) over these three marks, we have a line which was measured as 34.2 deg. from true north. And the extended line crosses the 2nd Alignment at an intersection point shown as "Int." We will initially use this as a key point. A right angle from this line is 34.2 deg. from a true east-west line. Today, at about 34 deg. south of true west, we can observe the sun setting at the Winter Solstice, when the sun's declination is at a minimum. And at about 34 deg. north of true east will be the rising sun on the Summer Solstice, when the sun's declination is at a maximum. This angle is dependent on the latitude of the site. I use the following formula from a calculating declination (from a calculating triangle found at several Effigy Mound Sites). $\sin \text{dec.} = \sin \beta \times \cos \text{Lat.}$, where β is the angle from a true east-west line. The calculated value for the dec. for this line is 23.7 deg., which is precisely the declination that corresponds to the geometry of our Effigy Mound Sites built centuries ago. The maximum declination of the sun today is 23.4 deg. It has been decreasing over the centuries since its last maximum of 24.5 deg. about 8000 years ago. A line from "Int." to the pit on the northern end of Md #11 was measured at about 35.5 deg. The corresponding declination for an Indirect Alignment is about 24.5 deg. Unlike in Europe which passed through the Dark

Ages, memories of very ancient astronomy seems to have persisted and been encoded in some of the sites of the New World. Alignments for a similar maximum wandering of the sun are suggested at other sites, as well. Another line from "Int." to the knob on the northern end of Md #11 was measured as about 39.1 deg. west of true north. The corresponding declination of a heavenly body setting 39.1 deg. south of true west is about 26.8 deg. This corresponds to the extreme declination of Venus near the beginning of its long 260 year declination cycle. (During this 260 year cycle, the extreme declination varies from about 26.5 deg. to 27.8 deg.) Similar patterns of apparent alignments to Venus near to the sun on the solstices can be found at the Kolterman Site and at Aztalan.

Another key point for mound Md #11 can be created by extending the Key Alignment until it intersects the centerline of the mound at the point shown as "Int.2". From here to the center of the knob on the north end, we get a line that is about 40.5 deg. from true north (rather than 39.1 deg.). The corresponding declination is 27.7 deg., the Venus extreme during its 260 year long declination cycle. (For example, see the Survey Report for the Kolterman Site.)

The long "Key Alignment" and the "2nd Alignment" can also be used for very precise Indirect solar calendar alignments. The declination associated with an angle of 19.0 deg. south of true east corresponds to the rising sun on about 29 Oct. The angle of 20.0 deg. south of true east corresponds to the rising sun on about 1 Nov. These dates correspond to the Fall Cross Quarter Day Festivities, which we still honor as Halloween and All Souls Day. There are many examples of these dates found in ancient sites in the Upper Midwest. (For Example, see Survey Report for the Kolterman Site.)

Why Difference in Lengths between the Second and Apparent Key Alignments?

The lengths of the 2nd and Key Alignments were measured on the map as about 928 and 617 feet, respectively. The ratio is $928 / 617 = 1.50$ or $3/2$. The difference in lengths is about 310 ft. And $617 / 310 = 2.0$, and $927 / 310 = 3.0$. The basic unit in these ratios is about 310 ft. A distance of 310 ft. from the center of Md #2 lies somewhere near the heart of the Bear Mound (Md #5). This gives a clue that we may be on the right track in our analysis. The implied message seems to be to multiply a unit distance between Md #2 towards the Bear Mound by the factor of 3. We will try this on two other lines.

The next measurable distance shorter than 310 ft. is to the southern end of Md #4, seemingly delineated by a narrow crescent-shaped ditch. The distance measured on the map was 220 ft. (The ratio of $310/220 = 1.41$, the square root of 2. This is encouraging since this ratio also shows up at some other sites.) Three times this value is $3 \times 220 = 660$ statute feet, or the distance we call the "furlong." Land surveyors use standard statute ("legal") feet. Sailors and navigators (working on the "round" earth) use 1 minute of latitude arc (the local nautical mile) and divisions of the nautical mile, which vary by about 1% between the equator and the poles of the earth.

The length of the furlong is a very ancient legal measure relating to land surveying. The land area we call the "acre" is a furlong long and a chain (66 ft.) wide. This is still used today, as witnessed by the size of what is shown as O.L.-1 on the survey map for transferring an acre of land to Nancy in 2011. (The length of the surveying chain of 66 statute feet clearly shows up at the Summers Site near Tims Hill, the highest point in Wisconsin.)

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Another value corresponding to the local stade shows up at the Octagon Mound at Newark, Ohio, where there seems to have been a 60 mile long paved road which ran southward. Such a straight road would have been needed for determining the precise length of the nautical mile and stade from measuring the ground distance between where the altitude of the north celestial pole varied by precisely one degree. Pamita said that the ancient Cat (or Baalam) Priests once had a college at Newark, where they taught mathematics, surveying and astronomy, just like in modern colleges.

Map Sheet Nek-F3a:

Map Sheet Nek-F3a shows more geometry which could not be shown on Map Sheet Nek-F3. Two additional alignments, clear in the mound layout, are shown on Map Sheet Nek-F3a. The most obvious additional alignment is shown as the "3rd Alignment." It consists of a straight line between the mounds Md #12 and Md #13 which define the precise ends of what is called the "Apparent Key Alignment" and the "2nd Alignment." A line between the centers of these two small mounds goes northward through the center of the large round mound Md #3, just west of the linear mound Md #4. This alignment grazes the back of the large Bear Mound Md #5, which suggests that this is also an important line. It makes a precise angle of 17.5 deg. from a true north-south line, creating precise angles of 2.5 deg. and 1.5 deg. from the Apparent Key Alignment and the 2nd Alignment, respectively.

When extended northward, the 3rd Alignment goes through the northeastern corner of the inside of the square enclosure Md #1. Extended as a Rhomb Line (which might not appear straight on some maps) this line goes through the eastern half of Lac Vieux Desert at the border between Wisconsin and Michigan. It is here that ancient portages connected the headwaters of the Wisconsin River to the waters of the Ontonagon River. The Ontonagon River runs past Rockland, Michigan (site of famous ancient and historic copper mines) into Lake Superior at the western end of the Keweenaw Range of copper bearing rock.

Not only was Lac Vieux Desert important in the days of canoe travel, but it is so yet today. The border between Wisconsin and Upper Michigan was defined to be from an island in this lake. Large-scale maps show a clear jog in this border yet today, which is not precisely on this island but in the lake a short ways away. Over the years, there were problems with the early surveys, and the line was rerun coming from both the east and from the west along what was taken to be the original border. Although the original border line was defined to be from an island (on which there is a long snake mound, not unlike Md #11) the surveys which were reran from the east and west, missed the island by a few hundred feet. This lake and its islands are shown on the right-hand portion of Map Sheet Nek-F3a. (Also see Figure 8e.)

In our analysis thus far, we have looked at essentially all of the mounds near the enclosure (Md #1) except the two small round mounds westward from Md #2. These, along with Md #3, create a triangle. Scaling on the map between the apparent centers of these triangles give rough values of about 100 ft., 117 ft., and 36 ft. Because of expected errors of a few feet for the location of each end of these lines, we can expect a larger possible error in the scaled length of the lines. We will assume there can be errors between about 1 and 4 feet for these values. Within these error bounds lies a triangle with unit sides of 101 ft., 114 ft., and 37 ft. This remarkable triangle creates an angle of 19.0008 deg. (19 deg. plus 3 seconds of arc).

Geometry within this triangle could have been used to lay out the 2nd Alignment at 19.0 deg. from a true north-south line. It can also be used to theoretically create a precise angle of 1.000 deg. (with an error theoretically less than a second of arc) by geometry. See Figure 8g.

Compared to an angle of 15.0000 deg. (60.0000 deg. twice bisected) we have 19.0008 deg. - 15.0000 deg. = 4.0000 + 0.0008 deg. Bisecting, we have, theoretically: 2.0000 + 0.0004 deg.

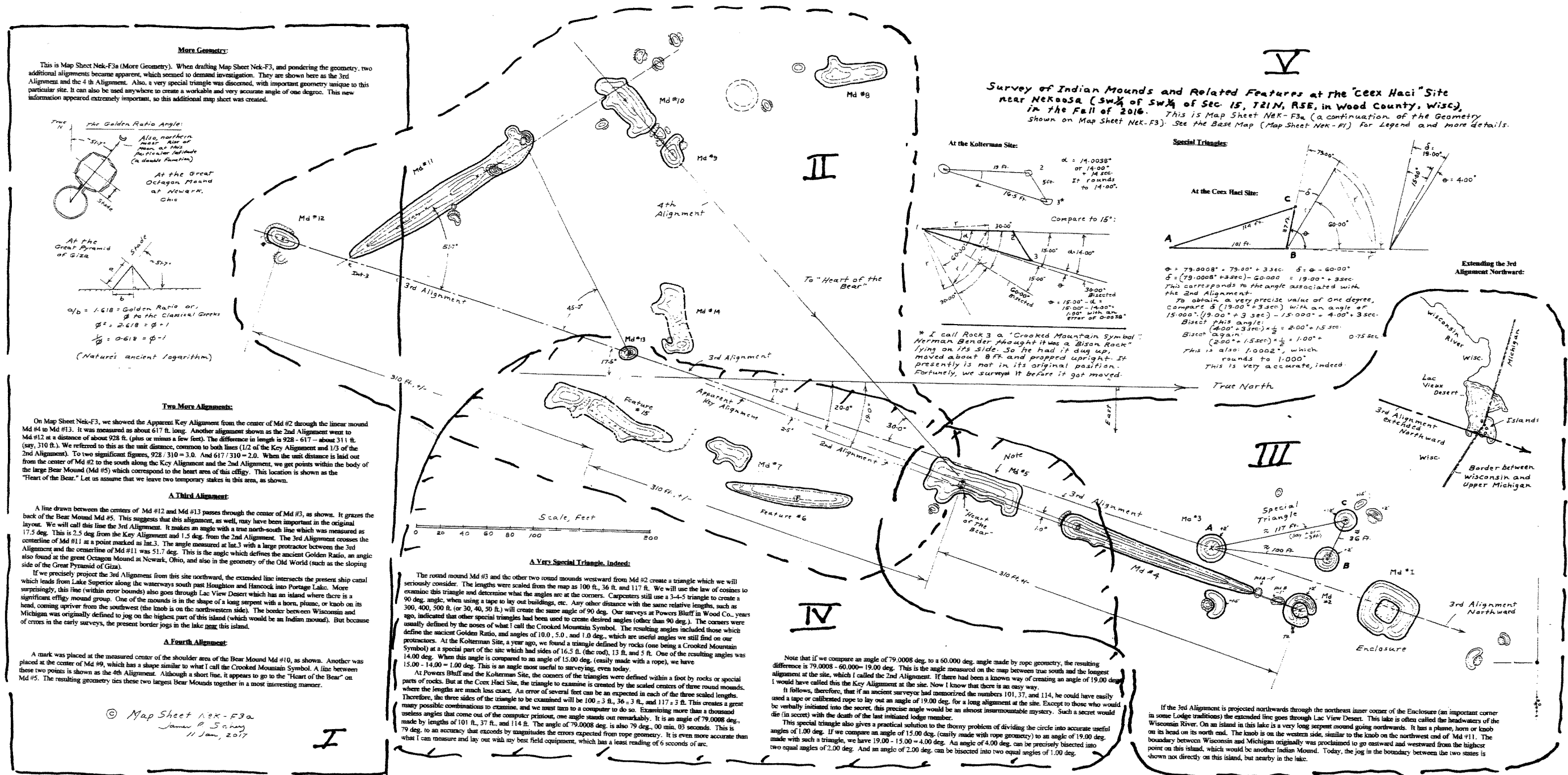
Bisecting again, we have 1.0000 + 0.0002 deg. This is also

1.0000 deg. + 1 second of arc.

But this precise angle is magnitudes more accurate than what can be measured or laid out by normal rope geometry. It is also more accurate than what I can measure or lay out with my best field instrument (least reading of 6 seconds or 0.0017 deg.). Yet, this extremely precise angle lies within the triangle which is near the enclosure, shown on the maps as Md #1.

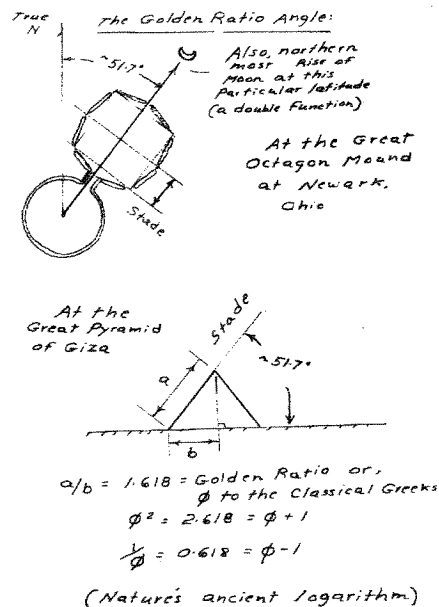
Figure 8 shows an overall view of Map Sheet Nek-F3. Figures 8a to 8g show portions of the overall view which are much more readable.

Figure 8. Map Sheet Nek-F3a (More Geometry)
See Figures 8a to 8g, which are more readable.



More Geometry:

This is Map Sheet Nek-F3a (More Geometry). When drafting Map Sheet Nek-F3, and pondering the geometry, two additional alignments became apparent, which seemed to demand investigation. They are shown here as the 3rd Alignment and the 4th Alignment. Also, a very special triangle was discerned, with important geometry unique to this particular site. It can also be used anywhere to create a workable and very accurate angle of one degree. This new information appeared extremely important, so this additional map sheet was created.



Two More Alignments:

On Map Sheet Nek-F3, we showed the Apparent Key Alignment from the center of Md #2 through the linear mound Md #4 to Md #13. It was measured as about 617 ft. long. Another alignment shown as the 2nd Alignment went to Md #12 at a distance of about 928 ft. (plus or minus a few feet). The difference in length is 928 - 617 = about 311 ft. (say, 310 ft.). We referred to this as the unit distance, common to both lines (1/2 of the Key Alignment and 1/3 of the 2nd Alignment). To two significant figures, 928 / 310 = 3.0. And 617 / 310 = 2.0. When the unit distance is laid out from the center of Md #2 to the south along the Key Alignment and the 2nd Alignment, we get points within the body of the large Bear Mound (Md #5) which correspond to the heart area of this effigy. This location is shown as the "Heart of the Bear." Let us assume that we leave two temporary stakes in this area, as shown.

A Third Alignment:

A line drawn between the centers of Md #12 and Md #13 passes through the center of Md #3, as shown. It grazes the back of the Bear Mound Md #5. This suggests that this alignment, as well, may have been important in the original layout. We will call this line the 3rd Alignment. It makes an angle with a true north-south line which was measured as 17.5 deg. This is 2.5 deg from the Key Alignment and 1.5 deg. from the 2nd Alignment. The 3rd Alignment crosses the centerline of Md #11 at a point marked as Int.3. The angle measured at Int.3 with a large protractor between the 3rd Alignment and the centerline of Md #11 was 51.7 deg. This is the angle which defines the ancient Golden Ratio, an angle also found at the great Octagon Mound at Newark, Ohio, and also in the geometry of the Old World (such as the sloping side of the Great Pyramid of Giza).

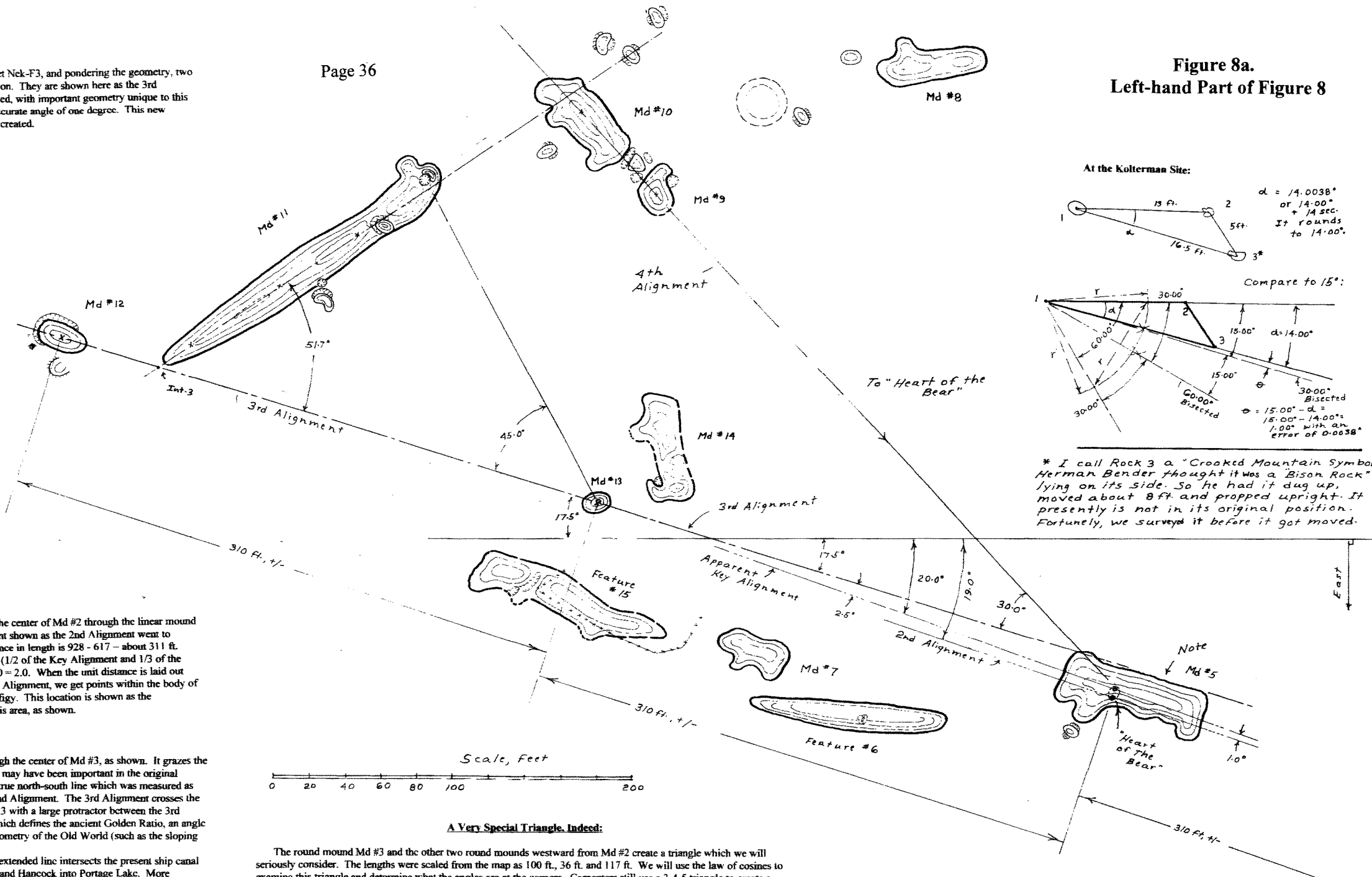
If we precisely project the 3rd Alignment from this site northward, the extended line intersects the present ship canal which leads from Lake Superior along the waterways south past Houghton and Hancock into Portage Lake. More surprisingly, this line (within error bounds) also goes through Lac View Deseré which has an island where there is a significant effigy mound group. One of the mounds is in the shape of a long serpent with a horn, plume, or knob on its head, coming upriver from the southwest (the knob is on the northwestern side). The border between Wisconsin and Michigan was originally defined to jog on the highest part of this island (which would be an Indian mound). But because of errors in the early surveys, the present border jogs in the lake near this island.

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A mark was placed at the measured center of the shoulder area of the Bear Mound Md #10, as shown. Another was placed at the center of Md #9, which has a shape similar to what I call the Crooked Mountain Symbol. A line between these two points is shown as the 4th Alignment. Although a short line, it appears to go to the "Heart of the Bear" on Md #5. The resulting geometry ties these two largest Bear Mounds together in a most interesting manner.

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11 Jan, 2017

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Scale, Feet

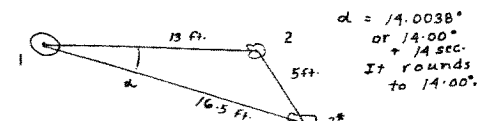
A Very Special Triangle. Indeed:

The round mound Md #3 and the other two round mounds westward from Md #2 create a triangle which we will seriously consider. The lengths were scaled from the map as 100 ft., 36 ft. and 117 ft. We will use the law of cosines to examine this triangle and determine what the angles are at the corners. Carpenters still use a 3-4-5 triangle to create a 90 deg. angle, when using a tape to lay out buildings, etc. Any other distance with the same relative lengths, such as 300, 400, 500 ft. (or 30, 40, 50 ft.) will create the same angle of 90 deg. Our surveys at Powers Bluff in Wood Co., years ago, indicated that other special triangles had been used to create desired angles (other than 90 deg.). The corners were usually defined by the noses of what I call the Crooked Mountain Symbol. The resulting angles included those which define the ancient Golden Ratio, and angles of 10.0, 5.0, and 1.0 deg., which are useful angles we still find on our protractors. At the Kolterman Site, a year ago, we found a triangle defined by rocks (one being a Crooked Mountain Symbol) at a special part of the site which had sides of 16.5 ft. (the rod), 13 ft. and 5 ft. One of the resulting angles was 14.00 deg. When this angle is compared to an angle of 15.00 deg. (easily made with a rope), we have 15.00 - 14.00 = 1.00 deg. This is an angle most useful to surveying, even today.

At Powers Bluff and the Kolterman Site, the corners of the triangles were defined within a foot by rocks or special parts of rocks. But at the Coex Haci Site, the triangle to examine is created by the scaled centers of three round mounds, where the lengths are much less exact. An error of several feet can be an expected in each of the three scaled lengths. Therefore, the three sides of the triangle to be examined will be 100 ± 3 ft., 36 ± 3 ft., and 117 ± 3 ft. This creates a great many possible combinations to examine, and we must turn to a computer to do so. Examining more than a thousand useless angles that come out of the computer printout, one angle stands out remarkably. It is an angle of 79.0008 deg., made by lengths of 101 ft., 37 ft., and 114 ft. The angle of 79.0008 deg. is also 79 deg., 00 min. 03 seconds. This is 79 deg. to an accuracy that exceeds by magnitudes the errors expected from rope geometry. It is even more accurate than what I can measure and lay out with my best field equipment, which has a least reading of 6 seconds of arc.

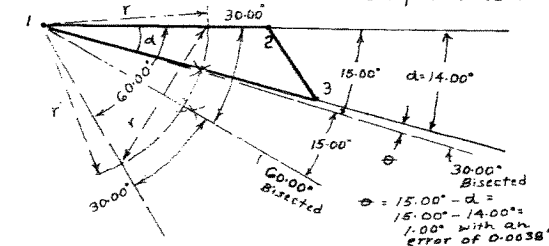
Figure 8a.
Left-hand Part of Figure 8

At the Kolterman Site:



$d = 14.0038^\circ$
or 14.00°
+ 14 sec.
It rounds
to 14.00° .

Compare to 15° :



* I call Rock 3 a "Crooked Mountain Symbol" Herman Bender thought it was a "Bison Rock" lying on its side. So he had it dug up, moved about 8 ft. and propped upright. It presently is not in its original position. Fortunately, we surveyed it before it got moved.

Note that if we compare an angle of 79.0008 deg. to a 60.000 deg. angle made by rope geometry, the resulting difference is 79.0008 - 60.000 = 19.00 deg. This is the angle measured on the map between true south and the longest alignment at the site, which I called the 2nd Alignment. If there had been a known way of creating an angle of 19.00 deg., I would have called this the Key Alignment at the site. Now I know that there is an easy way.

It follows, therefore, that if an ancient surveyor had memorized the numbers 101, 37, and 114, he could have easily used a tape or calibrated rope to lay out an angle of 19.00 deg. for a long alignment at the site. Except to those who would be verbally initiated into the secret, this precise angle would be an almost insurmountable mystery. Such a secret would die (in secret) with the death of the last initiated lodge member.

This special triangle also gives a practical solution to the thorny problem of dividing the circle into accurate useful angles of 1.00 deg. If we compare an angle of 15.00 deg. (easily made with rope geometry) to an angle of 19.00 deg. made with such a triangle, we have 19.00 - 15.00 = 4.00 deg. An angle of 4.00 deg. can be precisely bisected into two equal angles of 2.00 deg. And an angle of 2.00 deg. can be bisected into two equal angles of 1.00 deg.

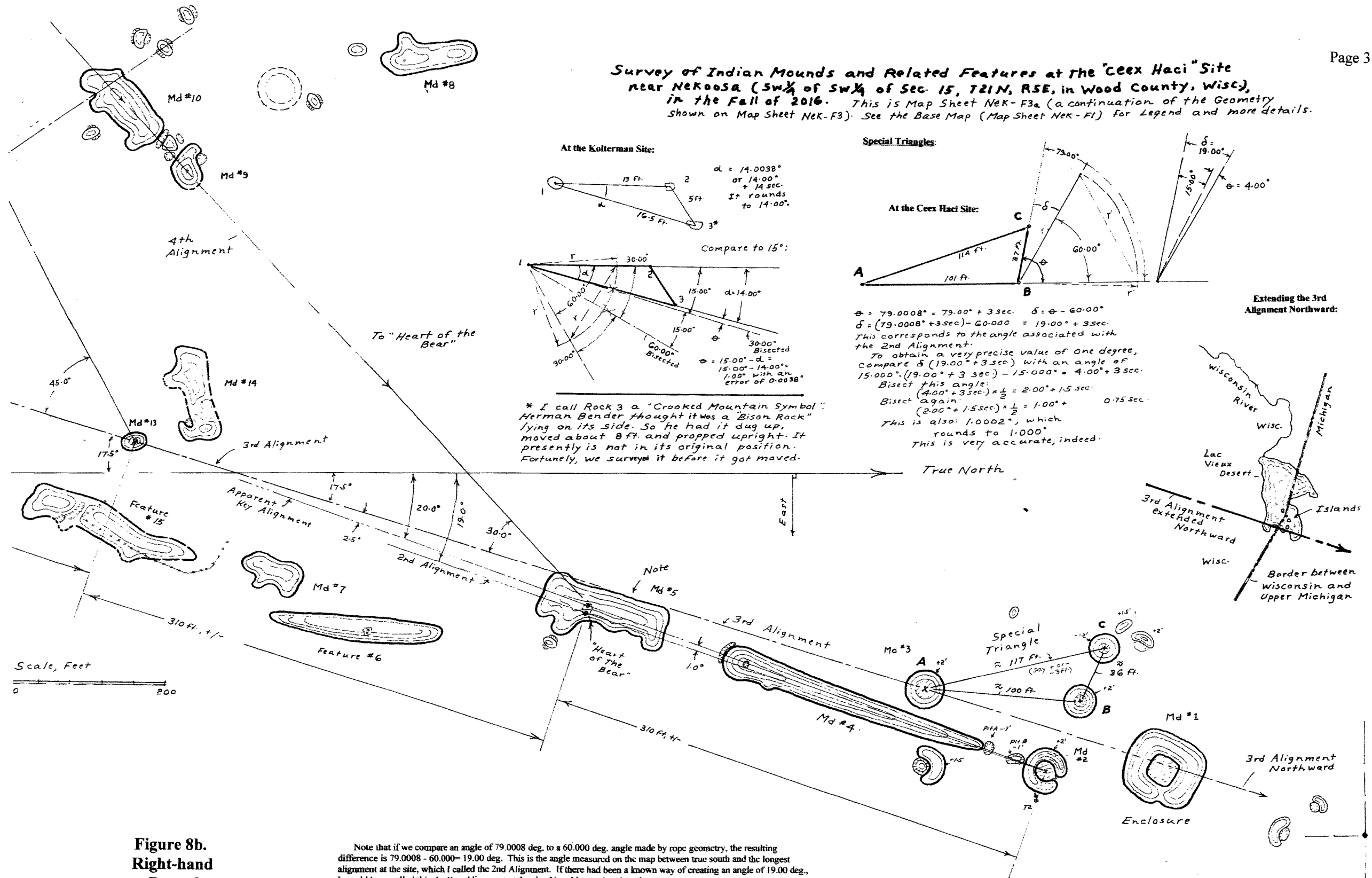
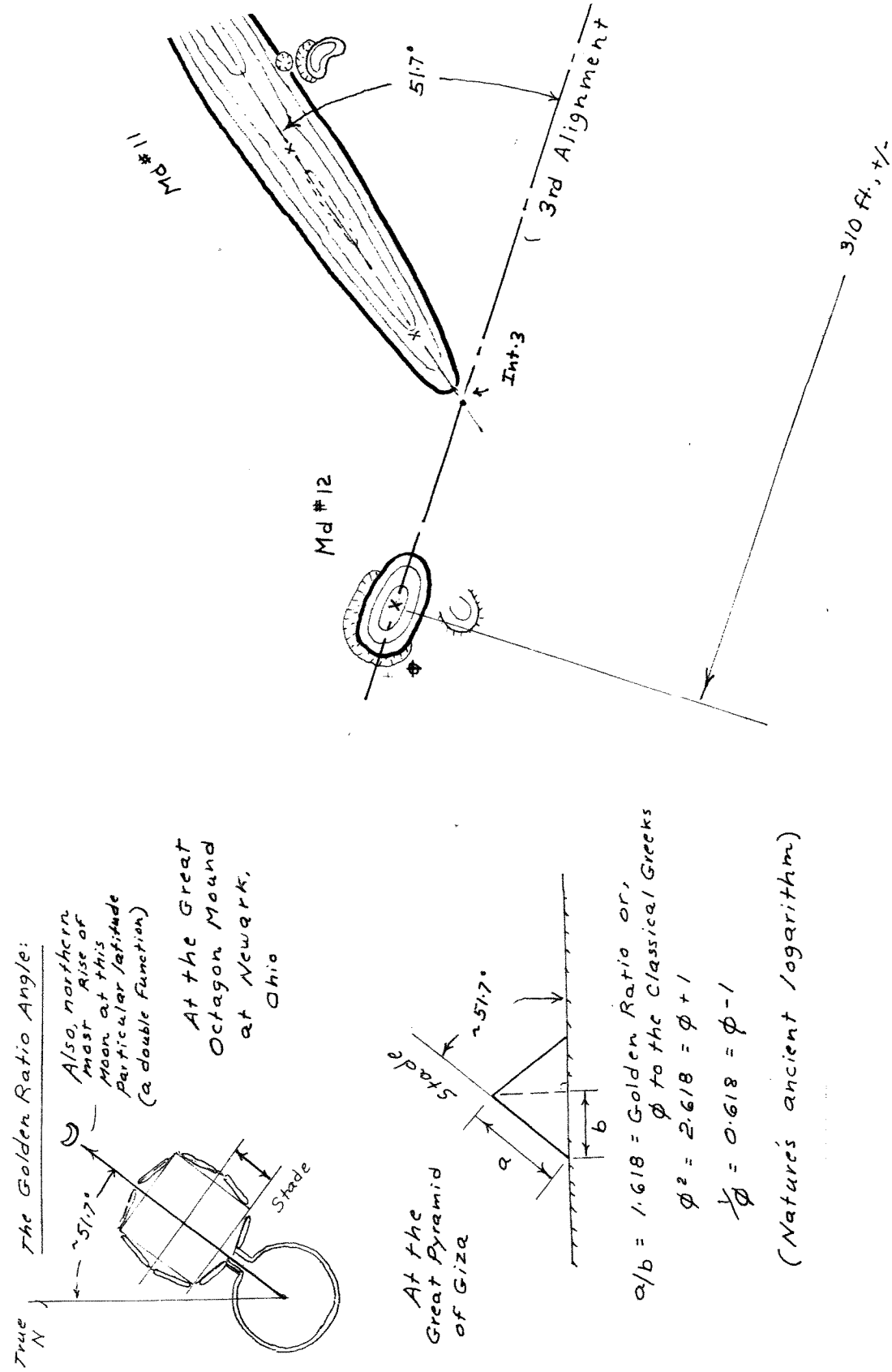


Figure 8b.
Right-hand
Part of
Figure 8

More Geometry:

This is Map Sheet Nek-F3a (More Geometry). When drafting Map Sheet Nek-F3, and pondering the geometry, two additional alignments became apparent, which seemed to demand investigation. They are shown here as the 3rd Alignment and the 4th Alignment. Also, a very special triangle was discerned, with important geometry unique to this particular site. It can also be used anywhere to create a workable and very accurate angle of one degree. This new information appeared extremely important, so this additional map sheet was created.



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If we precisely project the 3rd Alignment from this site northward, the extended line intersects the present ship canal which leads from Lake Superior along the waterways south past Houghton and Hancock into Portage Lake. More surprisingly, this line (within error bounds) also goes through Lac View Desert which has an island where there is a significant effigy mound group. One of the mounds is in the shape of a long serpent with a horn, plume, or knob on its head, coming upriver from the southwest (the knob is on the northwestern side). The border between Wisconsin and Michigan was originally defined to jog on the highest part of this island (which would be an Indian mound). But because of errors in the early surveys, the present border jogs in the lake near this island.

A Fourth Alignment:

A mark was placed at the measured center of the shoulder area of the Bear Mound Md #10, as shown. Another was placed at the center of Md #9, which has a shape similar to what I call the Crooked Mountain Symbol. A line between these two points is shown as the 4th Alignment. Although a short line, it appears to go to the "Heart of the Bear" on Md #5. The resulting geometry ties these two largest Bear Mounds together in a most interesting manner.

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Figure 8c. Area (I) in Figure 8

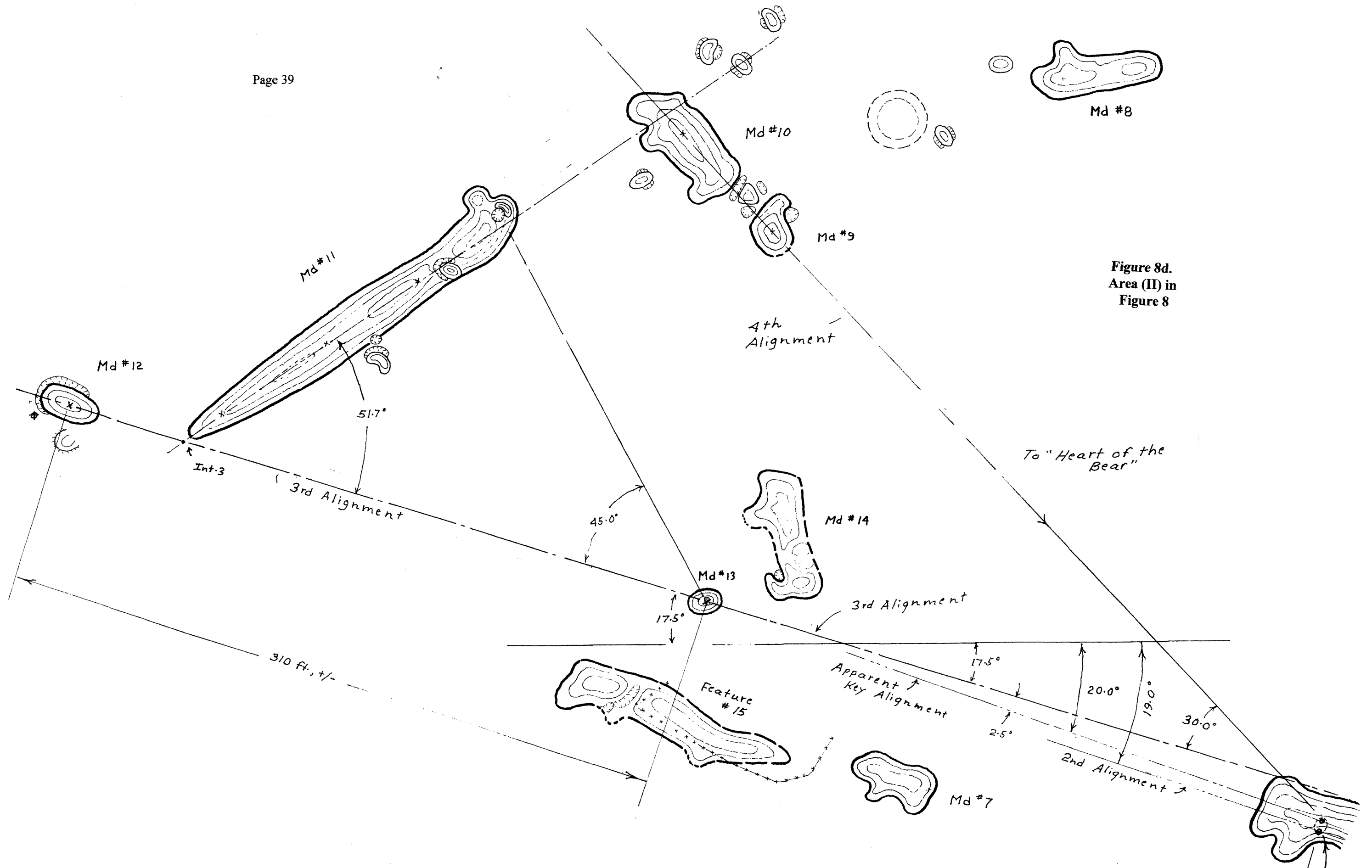


Figure 8d.
Area (II) in
Figure 8

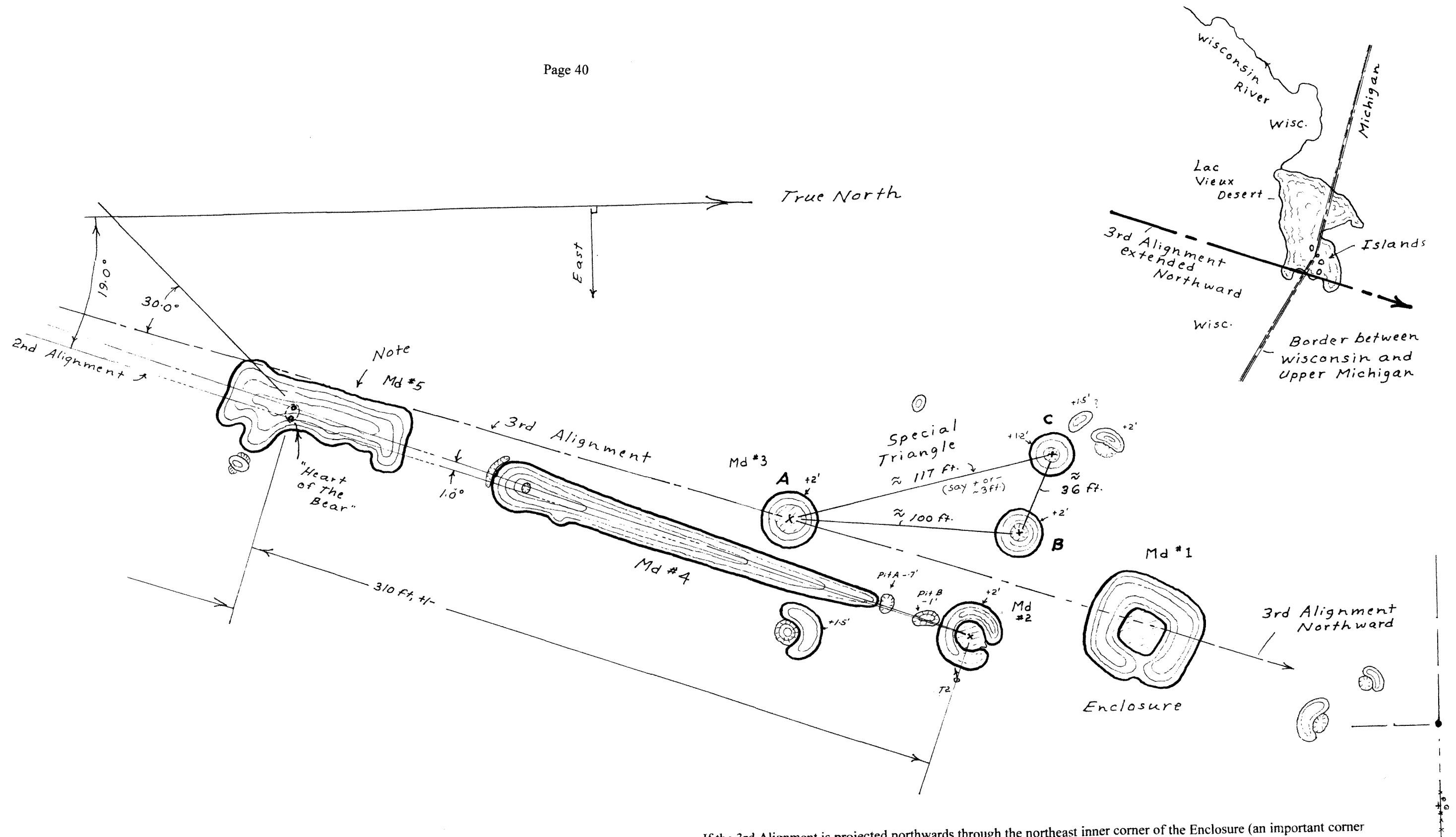
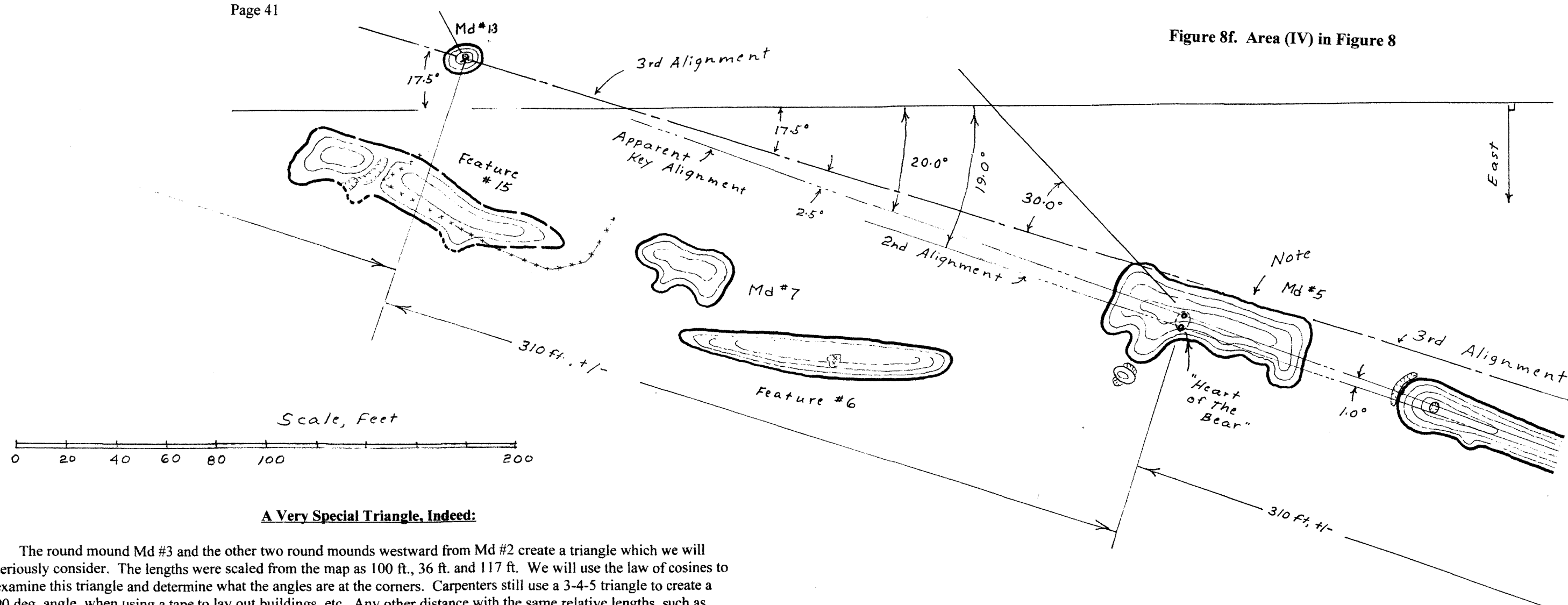


Figure 8e.
Area (III) in
Figure 8

If the 3rd Alignment is projected northwards through the northeast inner corner of the Enclosure (an important corner in some Lodge traditions) the extended line goes through Lac View Desert. This lake is often called the headwaters of the Wisconsin River. On an island in this lake is a very long serpent mound going northwards. It has a plume, horn or knob on its head on its north end. The knob is on the western side, similar to the knob on the northwest end of Md #11. The boundary between Wisconsin and Michigan originally was proclaimed to go eastward and westward from the highest point on this island, which would be another Indian Mound. Today, the jog in the boundary between the two states is shown not directly on this island, but nearby in the lake.

Figure 8f. Area (IV) in Figure 8



A Very Special Triangle, Indeed:

The round mound Md #3 and the other two round mounds westward from Md #2 create a triangle which we will seriously consider. The lengths were scaled from the map as 100 ft., 36 ft. and 117 ft. We will use the law of cosines to examine this triangle and determine what the angles are at the corners. Carpenters still use a 3-4-5 triangle to create a 90 deg. angle, when using a tape to lay out buildings, etc. Any other distance with the same relative lengths, such as 300, 400, 500 ft. (or 30, 40, 50 ft.) will create the same angle of 90 deg. Our surveys at Powers Bluff in Wood Co., years ago, indicated that other special triangles had been used to create desired angles (other than 90 deg.). The corners were usually defined by the noses of what I call the Crooked Mountain Symbol. The resulting angles included those which define the ancient Golden Ratio, and angles of 10.0, 5.0, and 1.0 deg., which are useful angles we still find on our protractors. At the Kolterman Site, a year ago, we found a triangle defined by rocks (one being a Crooked Mountain Symbol) at a special part of the site which had sides of 16.5 ft. (the rod), 13 ft. and 5 ft. One of the resulting angles was 14.00 deg. When this angle is compared to an angle of 15.00 deg. (easily made with a rope), we have $15.00 - 14.00 = 1.00$ deg. This is an angle most useful to surveying, even today.

At Powers Bluff and the Kolterman Site, the corners of the triangles were defined within a foot by rocks or special parts of rocks. But at the Ceex Haci Site, the triangle to examine is created by the scaled centers of three round mounds, where the lengths are much less exact. An error of several feet can be expected in each of the three scaled lengths. Therefore, the three sides of the triangle to be examined will be 100 ± 3 ft., 36 ± 3 ft., and 117 ± 3 ft. This creates a great many possible combinations to examine, and we must turn to a computer to do so. Examining more than a thousand useless angles that come out of the computer printout, one angle stands out remarkably. It is an angle of 79.0008 deg., made by lengths of 101 ft., 37 ft., and 114 ft. The angle of 79.0008 deg. is also 79 deg., 00 min, 03 seconds. This is 79 deg. to an accuracy that exceeds by magnitudes the errors expected from rope geometry. It is even more accurate than what I can measure and lay out with my best field equipment, which has a least reading of 6 seconds of arc.

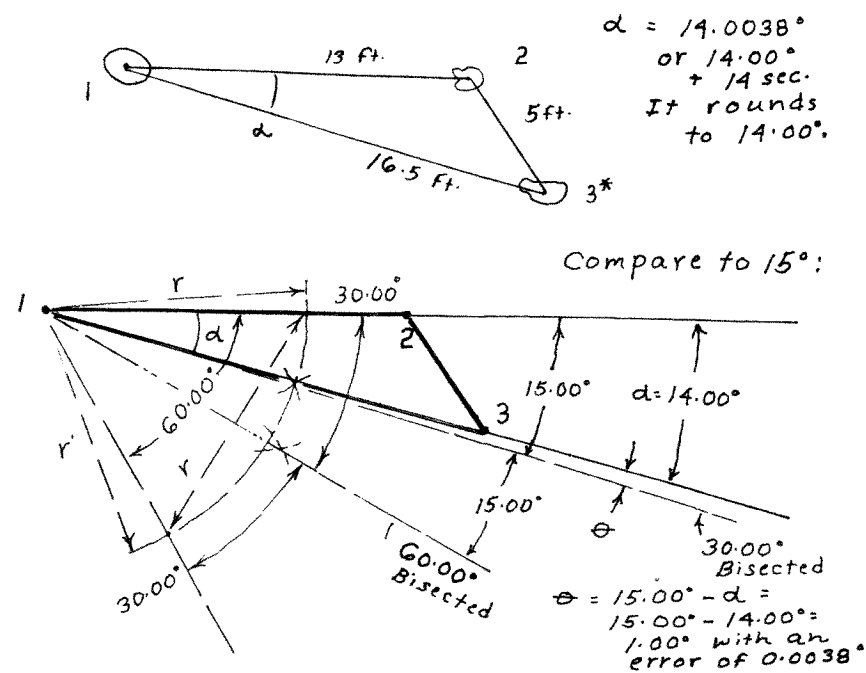
Note that if we compare an angle of 79.0008 deg. to a 60.000 deg. angle made by rope geometry, the resulting difference is $79.0008 - 60.000 = 19.00$ deg. This is the angle measured on the map between true south and the longest alignment at the site, which I called the 2nd Alignment. If there had been a known way of creating an angle of 19.00 deg., I would have called this the Key Alignment at the site. Now I know that there is an easy way.

It follows, therefore, that if an ancient surveyor had memorized the numbers 101, 37, and 114, he could have easily used a tape or calibrated rope to lay out an angle of 19.00 deg. for a long alignment at the site. Except to those who would be verbally initiated into the secret, this precise angle would be an almost insurmountable mystery. Such a secret would die (in secret) with the death of the last initiated lodge member.

This special triangle also gives a practical solution to the thorny problem of dividing the circle into accurate useful angles of 1.00 deg. If we compare an angle of 15.00 deg. (easily made with rope geometry) to an angle of 19.00 deg. made with such a triangle, we have $19.00 - 15.00 = 4.00$ deg. An angle of 4.00 deg. can be precisely bisected into two equal angles of 2.00 deg. And an angle of 2.00 deg. can be bisected into two equal angles of 1.00 deg.

Survey of Indian Mounds and Related Features at the "Ceex Haci" Site
near NeKoosa (SW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 15, T21N, R5E, in Wood County, Wisc.),
in the Fall of 2016. This is Map Sheet NEK-F3a (a continuation of the Geometry
shown on Map Sheet NEK-F3). See the Base Map (Map Sheet NEK-F1) for Legend and more details.

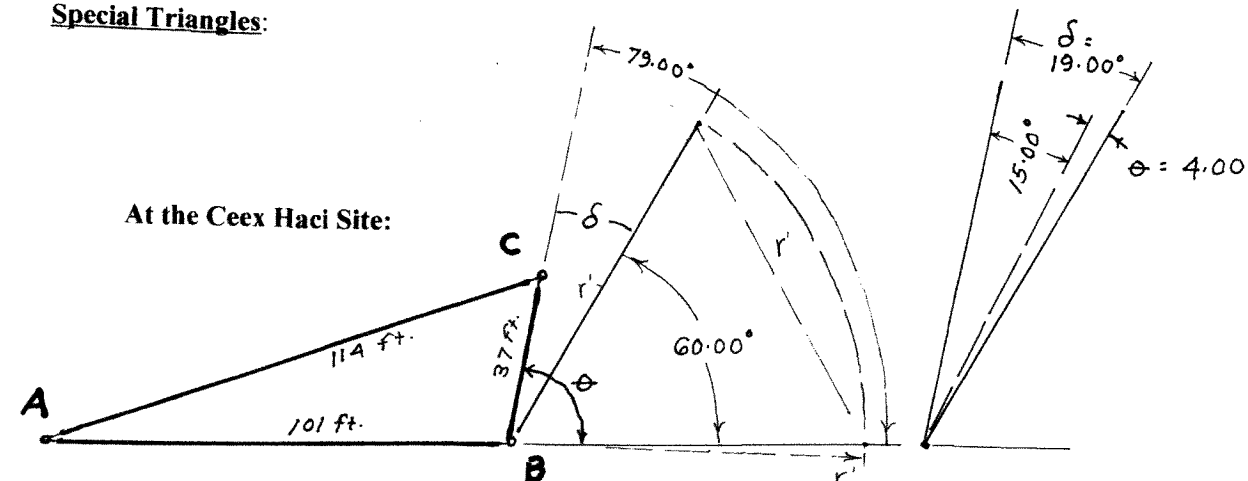
At the Kolterman Site:



* I call Rock 3 a "Crooked Mountain Symbol". Herman Bender thought it was a "Bison Rock" lying on its side. So he had it dug up, moved about 8 ft. and propped upright. It presently is not in its original position. Fortunately, we surveyed it before it got moved.

Special Triangles:

At the Ceex Haci Site:



Extending the 3rd Alignment Northward:

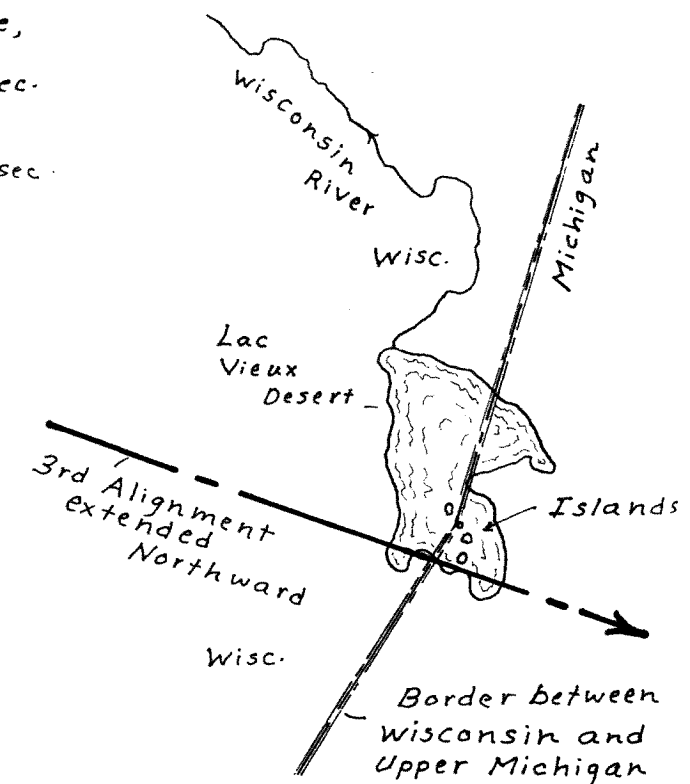


Figure 8g. Area (V) in Figure 8

Summary:

Four Maps, as presented here, were produced from our surveys at what we call the Ceex Haci Site just south of Nekoosa, Wisconsin, in Wood County. The field work was done by myself and 5 trainees from the Ancient Earthworks Society in the fall of 2016. The site proved to be much larger than expected, and at least eight trips from Madison to Nekoosa were required to survey what is shown in the above four maps.

Using a Topcon Total Station, and field techniques we had developed over the past 30 years for surveying Indian Mounds, our maps are automatically oriented to true north. This is something necessary for efficient and accurate geometrical analysis. With sunshots taken at a station in the middle of the group, our Y or North axis on the map is automatically oriented to true north to an accuracy well better than 0.01 deg.⁶ This allows us to simply analyze any apparently key alignment on the map with a large protractor. With such a protractor, true azimuths of such lines can be estimated to about the nearest 0.1 deg.

And the geometry was more than we would expect from our surveys at other sites. A particular puzzle was why there are three long alignments oriented at 20.0 deg., 19.0 deg., and 17.5 deg. from a true north-south line. Looking for a plausible answer, we projected these three lines northward, as Rhomb Lines, everywhere at the same bearing angle to true north. All three of these lines went through important land features further north. Two are associated with Portage Lake in the middle of the Keweenaw Copper Range of Upper Michigan. The other line goes through Lac Vieux Desert, which was a key connection between the rivers of Wisconsin and Michigan in days when canoes were the prime mode of transportation. So important was Lac Vieux Desert in the early 1800s, that the border between what is now Wisconsin and Upper Michigan was decreed to be laid out from this once famous water body. It was obviously known to anyone traveling between the waters of the Wisconsin River and the waters of Lake Superior in those days.

⁶ As surveying methods have drastically changed over the past decades, celestial observations (sunshots and starshots) have become a thing of the past. They are no longer taught to surveyors in our universities and technical colleges. Satellite-based GPS units are now becoming the state of the art as a field tool. And they are usually programmed to give coordinates not oriented to true north, but to the Y grid of a county or a state plane grid system. In effect, these pretend that the round earth is a flat plane covering an area as large as a county. True north lines converge towards the north celestial pole and are not parallel, as is assumed on a country-wide common grid system. So we pretend that the earth within a county is flat, when we really know better. But this pretending makes it much easier for the modern surveyors to do their work, as long as all of points surveyed are within that county.

But our experience is that ancient surveyors determined true north (to an accuracy of 0.1 deg. or better) at each of their sites. The difference between true north and modern Y for a county grid will vary considerably from the western to the eastern side of a county. One cannot simply use the Y axis (which is called the North axis) on such a map to do geometrical analysis (without a keen sense of the corrections which must be made).

In any case, the most direct and simple method to determine true north on a survey of one of our sites is to simply take sunshots with the Total Station. And since used Total Stations are now inexpensive, and we have several, this is in my view the standard method we should use when surveying Indian Mounds. This has been part of our education within AES. Chris Tyler and Diane Fox, have already demonstrated complete proficiency with sunshots on sites. And there are several other trainees near their level of proficiency, as well.

A Mental Map of the Landscape:

Prof. Jack Steinbring, a recent speaker at one of our AES meetings, spent considerable time in Canada, where he was formerly head of the Archeology Department at Winnipeg. He said that he learned from Native American friends that those people have a mental image of where they are on the landscape, in a manner quite foreign to people with European heritage. If the three long alignments at the Ceex Haci Site were meant to aid people in that area to visualize where important sites are located (relative to their location), then the whole pattern makes sense. And this also adds light to something I had learned years ago about how the natives viewed the different branches of the Ontonagon River. It was likened to the thumb and four fingers of apparently the right hand. They knew where they were by referring to which finger they were paddling on. And the ring finger would correspond to the branch needed to go to Lac Vieux Desert and to make the portage to the waters of the Wisconsin River. See Figure 9.

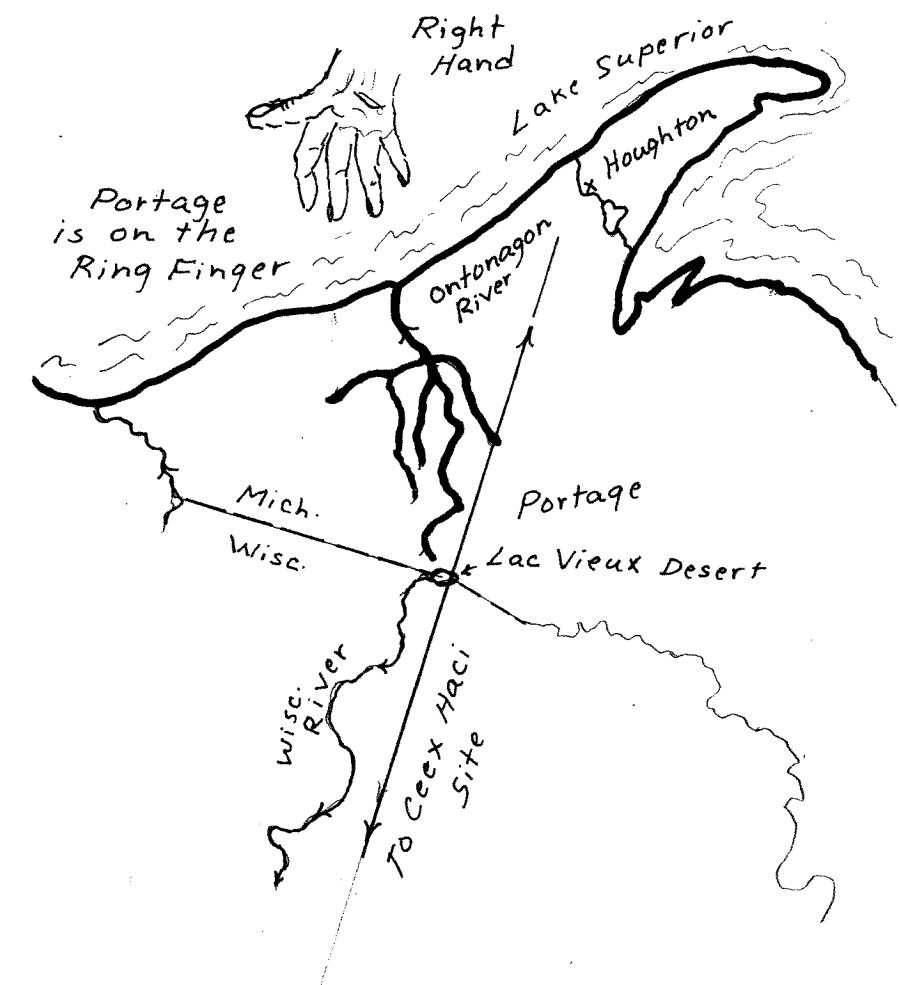


Figure 9. The branches of the Ontonagon River as Fingers of the Hand

Lessons as We Go Forward:

This fascinating exercise with the Ceex Haci Site has highlighted several patterns in the layout of the mounds which we had not adequately considered before. First, this exercise highlights the pattern of precise angles of 1.00 deg. encoded into the geometry, and different ancient methods which could have been used to create such a precise angle in the first place. We already had seen this pattern of a precise angle of one degree at the Kolterman Site. And we had previously noted the interplay between the Hensler Site and the string of mounds on a ridge visible to the southwest at the Garmin Mound Group. The angle between the northernmost and southernmost round mound on the ridge is 1.00 deg. to the full accuracy we could determine this angle with the surveying methods we used.

But more importantly, our careful examination of the geometry at the Ceex Haci Site also highlights the apparent long range geometry encoded into such sites, which ties some important ancient sites together over hundreds of miles. As already pointed out, there are three long alignments at the Ceex Haci Site, (1) "The Apparent Key Alignment," (2) "The 2nd Alignment", and (3) "The Third Alignment."

Projected northward, alignments (1) and (2) intersect the Portage River in the heart of the Keweenaw where it enters and exits from the extremely important Portage Lake. The 3rd Alignment crosses the ancient Portage River (now the Portage Ship Canal) where it connects to the south shore of Lake Superior. This 3rd line also passes through Lac Vieux Desert, where ancient travelers had to portage between the waters of the Wisconsin River and the Ontonagon River, which runs into Lake Superior.

We had previously not examined the possibility of long range alignments in most of the other effigy mound groups we had surveyed. One of the most unusual effigy mound groups in Wisconsin is at the Kolterman Site. It is unique because it is the only effigy mound group we have examined where there is an open true north-south base line. It is not encoded. To check the possibility that this extended base line might be important, a quick check was made by extending this line northward. It also goes through the north end of the Portage Ship Canal just south of where the waters enter into the south shore of Lake Superior. Furthermore, this line intersects the projection of the 3rd Alignment precisely on this river. See Figure 10. Since the 3 long alignments at the Ceex Haci Site and the extended base line at the Kolterman Site all pass through significant parts of the Portage River waterway across the Keweenaw, Figure 11 is provided which gives more detail to this area.

It is obvious that we need to consider possible long-range alignments at our other sites, as well. For the idea to do so, and for the computer programs we wrote which will extend Rhomb Lines from sites, we are indebted to Ralph Redfox. He insisted that his ancestors could lay out such lines and encode the directions into the geometry of ancient ceremonial sites. Through his requests to survey and study the layout of the Bighorn Medicine Wheel, we also came to believe as he did. We also were forced to see that such work can be done without the use of the complex equations of spherical trigonometry, which the dogma of our culture insists is necessary for such work. **It is not.** Rope geometry will suffice, if you know how to use it.

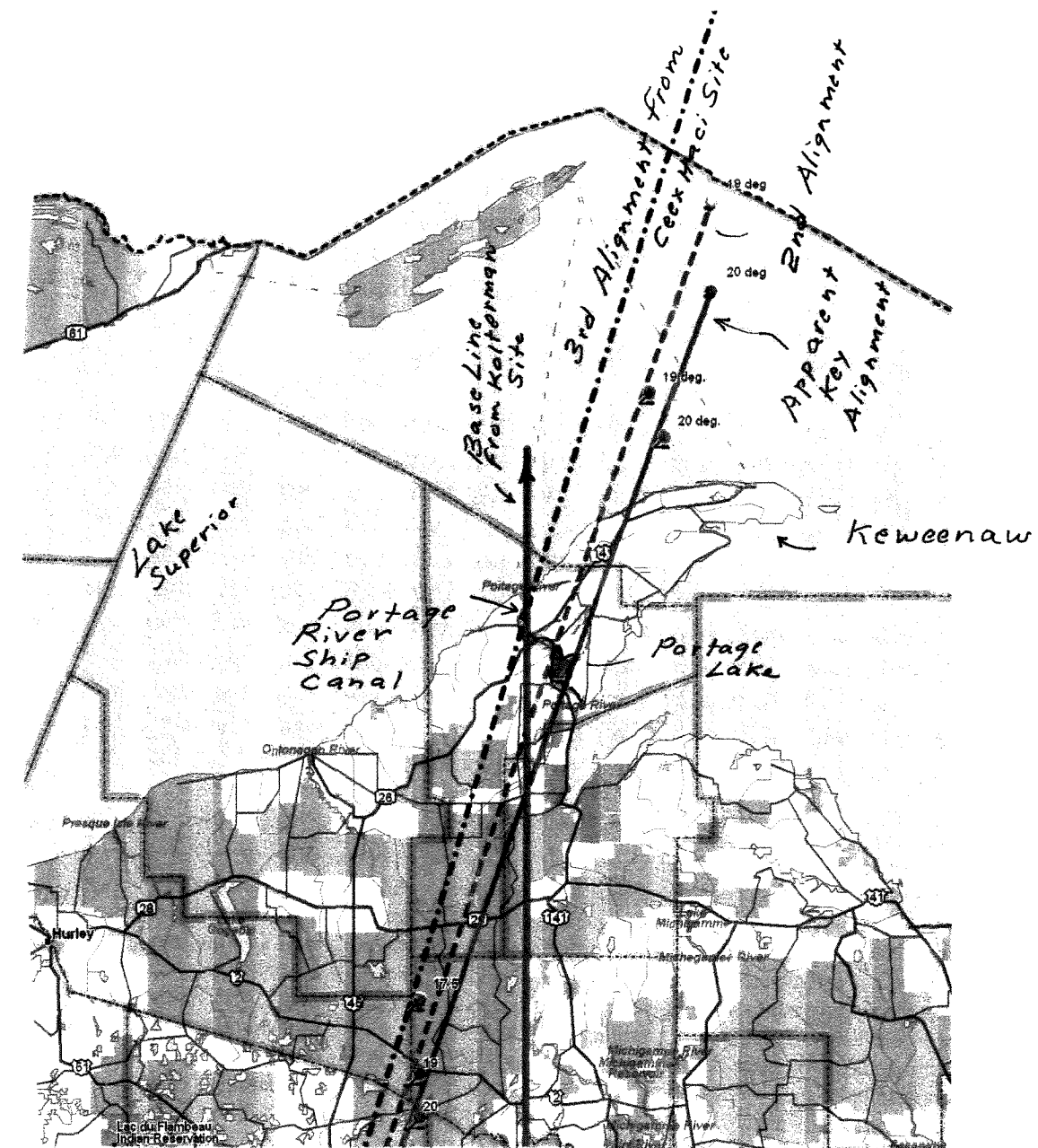


Figure 10.
The unique open true north-south base line at the Kolterman Site projected northward

Figure 11. Detailed Map of the Keweenaw Copper Range

Note: Neil Stiebe, who thoroughly examined the early French Maps, argues that Nicolet met the Winnebago in the 1630s, not at Green Bay, Wisconsin but at a native village in Keweenaw Bay, near Baraga, Mich. (lower central part of the map). See Stiebe, Ronald, 1999, "Mystery People of the Cove--A History of the Lake Superior Ojibwegou", Lake Superior Press, Marquette, Mich.

