The Pyramid of Hawara

A layman's guide

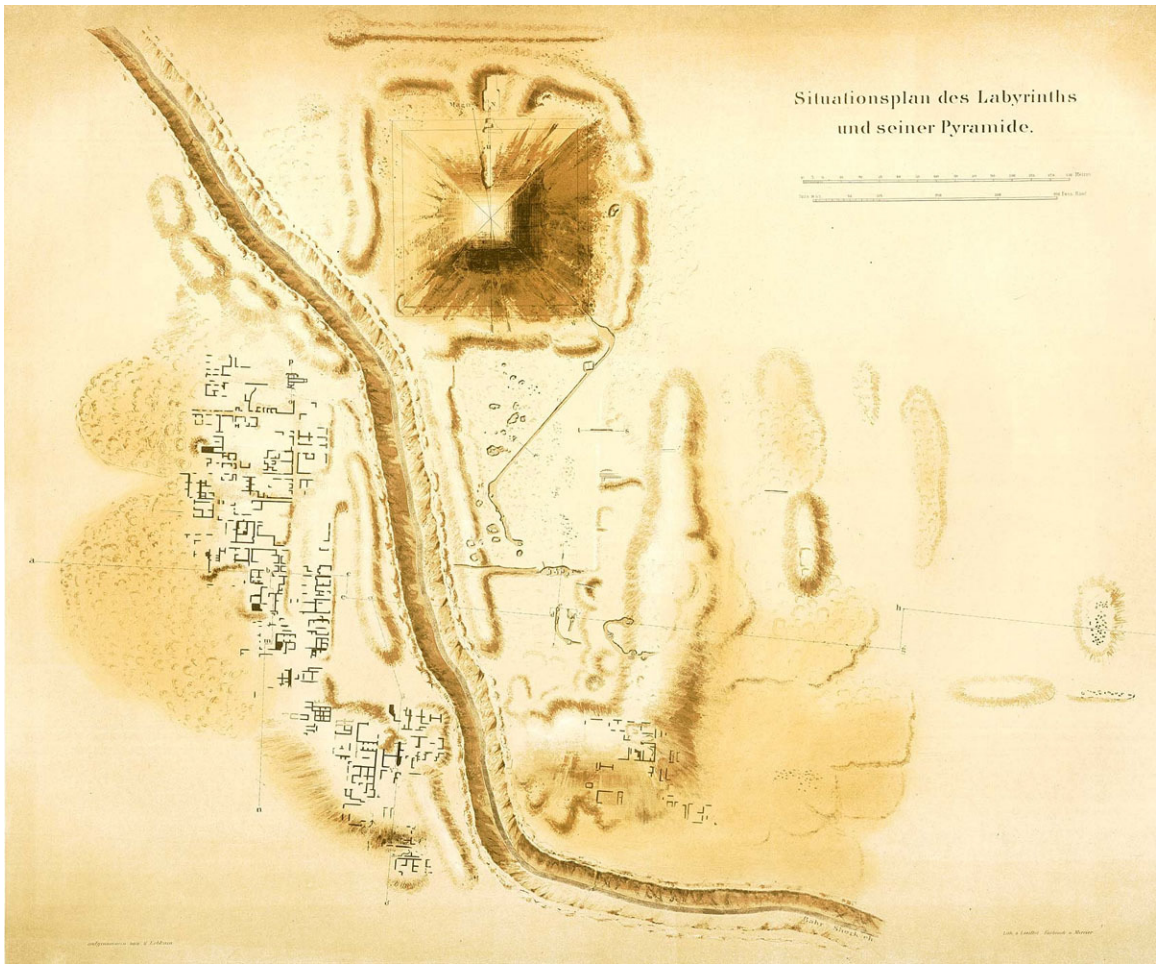
Keith Hamilton 19 December 2018

The pyramid of Hawara has been attributed to Amenemhet III; a king of the 12th dynasty, who reigned around 45 years (1842-1797 BC)[1]. He built two pyramids, the first at Dahshur, the so-called Black Pyramid, and it is thought that structural problems at this pyramid led to the construction of the Hawara pyramid, believed to be started in his 15th year.[2]

The site chosen at Hawara, was close to his grandfather's (Senusret II) pyramid at lahun; Petrie's description of the site,

[1] Chronicle of the Pharaohs, P. Clayton 1994, pg 84
[2] The Complete Pyramids, M.Lehner, 1997, pg 182

"The site of it is on a spur or corner of the limestone plateau of the desert, forming one side of the mouth of the shallow depression which leads into the Fayum. The Nile mud, brought in by the stream which has always run through this valley, is deposited within a quarter of a mile of the pyramid; thus any amount could be obtained close to hand, for making the mud bricks of which the pyramid is composed."



This early drawing (1849) by Lepsius, shows the Bahr Selah canal that runs close to the S.W. corner of the pyramid, and through the remains of what is believed to be the fabled Labyrinth. This canal is believed to have been built in the 1820's to take water from the Bahr Yussef to the north-western part of the Faiyum. Unfortunately the close proximity of this canal to the pyramid is believed to be the main factor in the raised water table. Today the pyramid is not accessible, as the chambers are submerged; in Petrie's time the burial chamber was nearly half submerged.

Exploration

The exploration of the pyramid is very scant; basically, Petrie's report on the structure is the primary resource. Petrie would begin excavations in January 1888 and publish his findings in *'Kahun, Gurob and Hawara, 1890'*. Petrie would notice that some previous excavator (he thought maybe Lepsius or Vassalli) had previously attacked the north face of the pyramid. Petrie would do partial clearances of the north and east sides in the hope of finding an entrance, but to no avail; he even excavated in the centre of the ruins of a small temple on the north side (where Lepsius found some blocks bearing the cartouches of Amenemhat III) in case this structure was built over the entrance to the pyramid.

The south side of the pyramid was deeply encumbered with debris, so Petrie reluctantly decided to tunnel into the middle of the pyramid from the north face, he states;

"*The pyramid being built of mud bricks laid in sand did not offer any serious difficulty, but yet the tunnel was not so simple as it seemed. The sand between the bricks was in very thick layers, usually half to one inch; and being quite dry and clean, it ran out interminably in some parts, coming down as in an hour-glass from the joints. It was needful therefore to board up the roof of the tunnel all along, and as no native would treat the place with sufficient tenderness to avoid loosening the bricks overhead, I had to fix every board myself as the tunnel advanced. The bricks moreover were so large and heavy, being double the size each way of an English brick, and weighing 40 or 50 lbs., that a single one dropped on a person would have settled his moving powers for some time to come. It was needful therefore to use the greatest care in loosening and taking down the bricks."*

This tunneling was dangerous work and many falls of brick occurred, during its excavation between 11th February to the 5th of April. As Petrie's tunnel neared the middle of the pyramid, he tunneled deeper in his search for the chamber. He states;

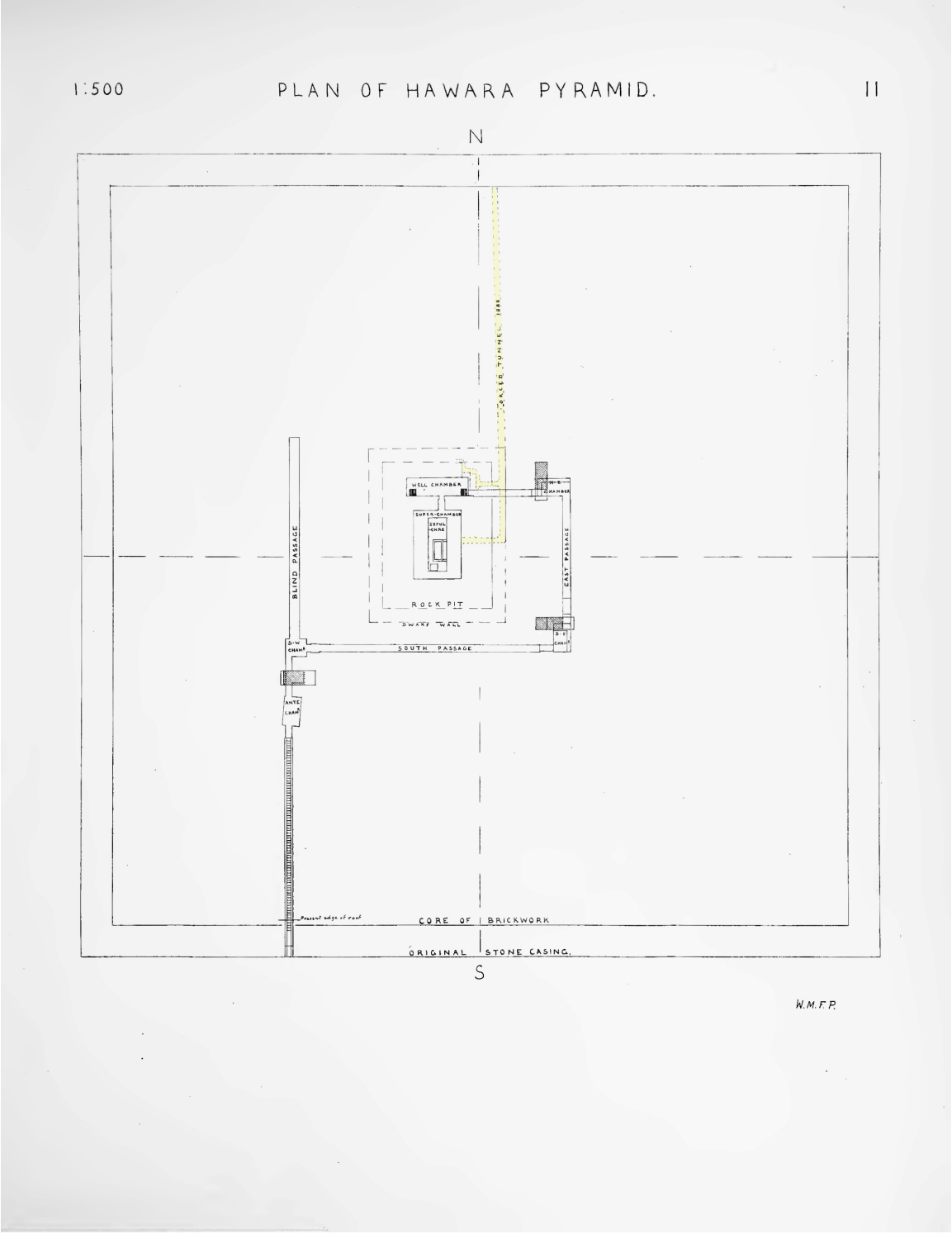
"While working in the tunnel, however, I noticed that on the east side the bricks were laid with mud mortar, and not in loose sand ; and this difference extended for nearly four feet above the base rock. As this mud mortaring continued along the side of the tunnel for forty or fifty feet it was probably a wall. And if a wall had been built on the ground before the pyramid, it would

be for keeping out the sand and dust from falling into the pit in the rock where the chamber was being built. So I argued that the chamber must be on one side or other of the dwarf wall. Which side? Was the question. On carefully cleaning the rock floor of the tunnel I found that there was a slight slope down to the west, and concluded that the pit must be on the lower side. We therefore turned at right angles westwards, as will be seen on PI. II where the dotted line of the tunnel turns toward the middle of the chamber. Soon we found the rock drop straight down, and knew that the pit and chamber were now before us. Then a brick arch was cut through; this gave further proof and fresh hope. And at last by half-past one in a dark night, one of the boys of the night gang came running down to the tents, and shouting, "The stone is found, the stone is found." I went up at once and saw that we had reached the sloping roof stone of the chamber. In the next few days we cleared and examined it, and made a slight trial on it which showed that skilled masons would be needed."[3]

Petrie would cut a second branch from this tunnel in the hope of reaching a thin end wall of the chamber that he could breach, but instead he came across massive blocks that roofed the well chamber (Plate II is shown overleaf) Unfortunately the first masons that he employed *"were quite helpless in the face of such a job",* he was therefore forced to earth over his tunnel entrance and wait till the next season which commenced on the 12th of November. Things did not get of to a good start; the next set of masons managed to cut a depth of six inches, *"and then threw it up in despair".*

On the mason front, it was third time lucky for Petrie, with clever monetary inducement, the next set of masons managed to cut down some seven feet, when on the 21st day a hole finally appeared in the floor of the cutting. The hole was made large enough for Petrie to squeeze through, were he found himself in a small forced passage made by ancient robbers that led to what Petrie would call his super-chamber. He would find a forced breach into the burial chamber, but in his eagerness, he got stuck fast in this breach and had to be rescued by the masons. A thin and active lad was introduced into the chamber, by rope, feet first, after sounding that the water in the chamber was no more than chest deep. Petrie watched the lad through the breach; *"I then saw the sarcophagi, the large one in the middle, and the curious added one at the side."*

[3] Kahun, Gurob and Hawara, Petrie, 1890, pg 6-7



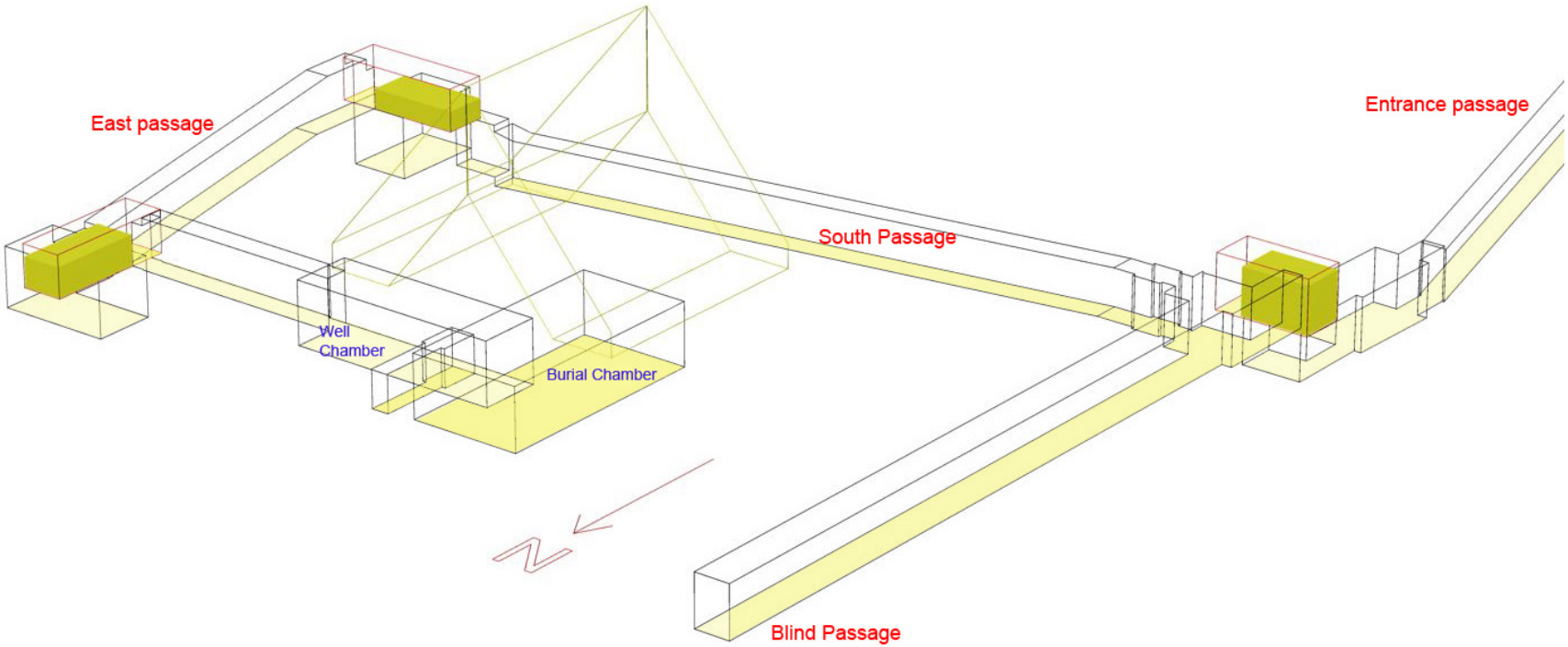
Petrie's plan, I have highlighted his tunnel.

The very next day after finding the burial chamber, Petrie set of to explore the passages and find the pyramid entrance, he says;

"Next day, after loosening and bringing down a heap of small blocks of stone which filled up the passage to the well chamber, and part of that chamber itself, I pressed through into the well chamber. Thence I went exploring through the passages. Up the east passage the muddy earth rose nearly to the roof, and we had to crawl through. At the south end of this there seemed to be no exit, but a slight gap under the S.E. trap-door showed that there was a way; and clearing out some earth I got in far enough to stick tight, and knocked the candle out. Matches had to be fetched, as we were streaming with the heat, so that nothing could be kept dry in the only garment I had on. Under the stone I got into the S.E chamber, and then the south passage was so nearly filled with mud that we had to lie flat and slide along it propelled by fingers and toes. At last I reached the S.W. chamber. The blind passage being level did not promise a way out; the lean lad got up on the top of the first trap-door in an incredibly shallow space, but found no exit; then I slid down the narrow forced hole beneath the trap-door, and waded through the water in the ante-chamber. There at last I found a passage sloping considerably upward, and knew that we were in the entrance passage. The way was worst of all here, as the ground was full of sharp crystals of sulphate of lime, and the walls lined with more crystals which cut like a knife. Scraping a clear way I squeezed up this passage as far as I could, and then began carefully measuring backward through all the passages to the tunnel, so as to know the position of the entrance."[4]

The passages took a circuitous route from the burial chamber to the entrance, which exited on the south face of the pyramid. Along this route three trapdoors were constructed to deter robbers; the passage system along with the trapdoors can be made out on Petrie's plan (previous page). Overleaf, I have made a wire frame model of the passage system to give the reader a clearer impression of the passage layout. The substructure will be discussed in more detail later, after a description of the exterior.

[4] Ibid, page 7-8


East passage
Entrance passage
South Passage
Well
Chamber
Burial Chamber
Blind Passage

The Exterior

Above, we have a view of the entrance on the south face; according to Petrie's calculations the entrance floor emerged at the pyramid base. The vertical face of the large lintel stone over the entrance is about 4.7m inside the finished casing and about 68.5cm inside the brick core of the pyramid. I would once again like to thank the Isida Project for the use of their images.

The bulk of the pyramid is made of mud brick, laid in beds of clean yellow sand; this was then cased in fine limestone. The angle of the pyramid is not known with any certainty; though the site is still fairly encumbered with debris, Petrie was unable to find any casing in position in the areas that he had cleared, and was reliant on fragments of casing that he found around the pyramid. These fragments ranged from 48°45' to 52°25'; for the lowest value, Petrie suggested a rise of 8 on a base of 7. The higher value is closer to that displayed in the Great pyramid at Giza. This variance in angle might be a result of laying casing blocks on a less rigid base of mud brick, which may not have been perfectly level; some casing blocks may have inclined slightly towards or away from the core, with any adjustment to the casing face angle being corrected by the mason's as they dressed the front face. The

casing blocks may have been dovetailed together as found in his fathers pyramid (Senusret III).

Petrie had more clues to work with, when it came to the pyramid base. Some paving survived at the N.W. corner and in the middle of the north side. Having carefully brushed this remaining paving he noticed traces of mortar and uneven weathering, which suggested a casing edge about 160 inches beyond the base of the mud brick core. This mud brick core he measured as 3692 inches (93.78m); if we add 2 x 160 inches to this we obtain a possible base length of the casing of 4012 inches (101.90m). This possible casing edge appears confirmed by Petrie's calculation of the entrance, he says;

"On PI. II it will be seen that the remaining part of the entrance passage slopes so that its floor would emerge at the base level at 157 inches outside of the face of the brick core. This agrees so nearly with the probable thickness of the casing as required by the sloping side of the core, and with the probable trace of the edge at about 160 on the N.W. paving, that I have here adopted it as presumptive truth."[5]

Petrie, would give a cased length of 4006 inches by adding 2 x 157" to the brick base, and a height of 2284 inches (58.01m) using a rise of 8 on a base of 7, which gives an angle of 48°48'36". He thought it strange that the base was not 10 feet longer, as this would provide a base of 200 cubits, he therefore suggested a possible connection to the burial chamber, he says;

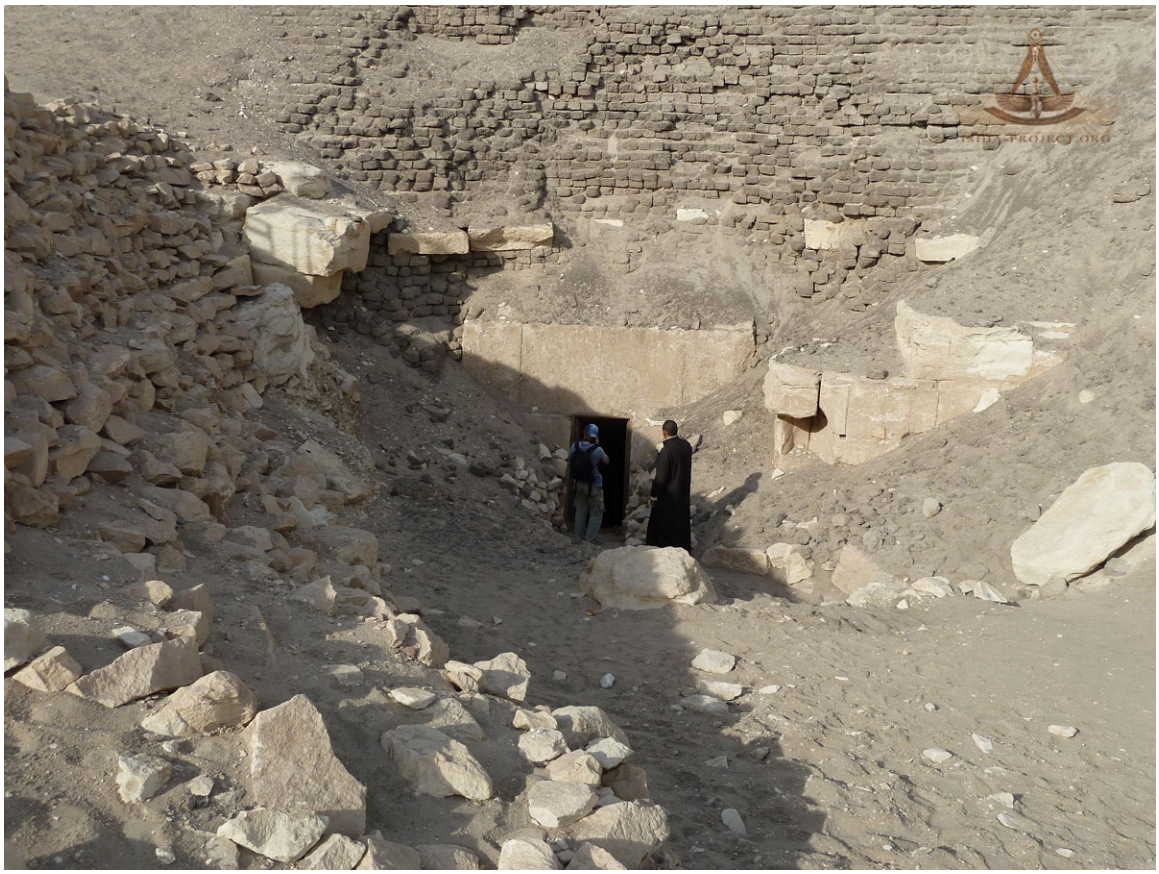
"A connection with the size of the sepulchral chamber would thus be possible; the chamber being 267.5 long, fifteen times this is 4012.5, with an uncertainty of not more than two or three inches".

The burial chamber at 267.5 inches long would appear to be 13 cubits long, giving a cubit of 20.58 inches; 13 x 15 would therefore suggest a base of 195 cubits. If we try a casing angle of the Great Pyramid, the height of the structure, increases from 58.01m to 64.75m. A compromise might be connecting this module of 13 cubits to the height, as 9 of these would give a height of 117 cubits (the base being 1 & 2/3rds longer than the height), which would provide a casing angle of 50°11'24", which is in the middle of the range of the casing fragments that Petrie found. Realistically the height

[5] Ibid, pg 13

and angles of this pyramid is an unknown, one can only hope that full clearance of the site, might provide further clues.

The Entrance

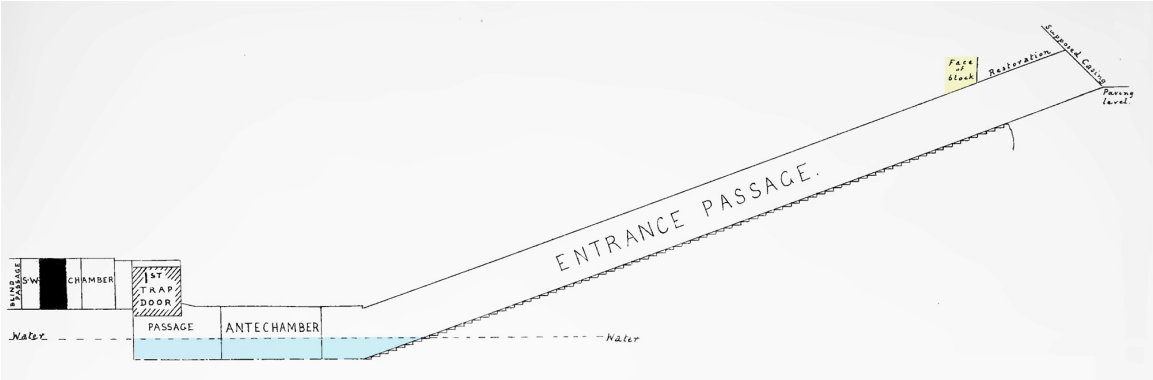


Petrie gives the axis of the entrance corridor above as 961.5 (24.42m) inches from the middle of the south face. Petrie suggested that the entrance is about midway between the middle and the south west corner of the south face; taking Petrie's base of 4006 inches the axis midpoint would be 1001.5 inches, therefore the passage axis would appear to be 40 inches short of the midpoint. The axis appears closer to the mean midpoints of the brick and casing values, which provides 962.25 inches.

Placing the entrance in the south face appears strange, especially as the more recognized pyramids of the Old Kingdom had their entrances predominately on the north face. This relocation from normal practice appears to have started under his grandfather Senusret II, who had his vertical entrance on the south side of his pyramid. His father Senusret III had his entrance on the

west side of his pyramid, while Amenemhet's first pyramid at Dahshur had two entrances, one on the east and one on the west; it has been suggested that these were attempts to thwart robbers, who would likely attack the north face in search of an entrance, sadly, all to no avail.

Compared to some of the Old Kingdom pyramids, the entrance passage is quite comfortable to traverse, thanks to the height of the passage and the steps built into the floor. The passage width Petrie gives as, upper end 38.4, mid 38.6, and bottom 38.0 inches; with the perpendicular height being 70.2 to 70.4 inches.



In Petrie's section above of the entrance passage, I have highlighted the water level in his time, and the large lintel stone above the entrance, which is visible on the previous page. The angle of the passage he gives as 19°37.5'. The steps he describes as;

"Half of the floor is taken up by a flight of shallow steps, which leave 9.4 or 9.5 width of slope at the sides. These steps were cleared and measured in one part, and hence drawn throughout; they were occasionally seen in clearing the passage, but not measured in other parts. Their average width of the tread is 13.27 on the slope, or I2.35 horizontal."[6]

It would appear that the slopes at the side of the steps were left to enable a sledge to traverse down the passage, that may have carried a wooden coffin etc; or even allow the passage to be plugged on closure after the burial if that was the intent, though given the height of the passage it may have consisted of two courses, like in the subsidiary pyramid at Meidum. Overleaf, we have a clear image of the steps in the entrance passage.

[6] Ibid, pg 14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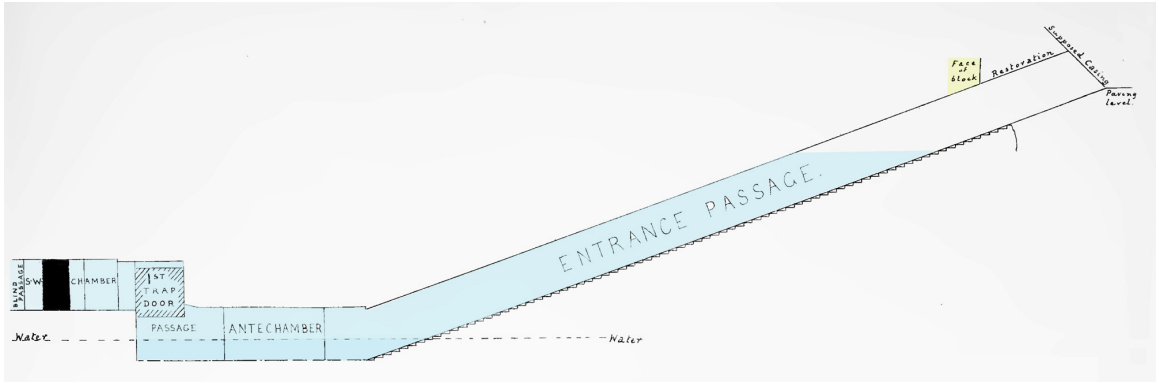
In the image above, we can see that the walls are made of two courses; there is nothing in Petrie's report to answer the question as to whether the floor is inserted between the walls or if the walls rest on the floor; though the impression I get from the images is that the walls rest on the floor. We can also see the deterioration of the limestone, due to the high water level; the stone laying on the floor above is the water level when the above image was taken in 2013.



Approximate water level in 2013

In 2004 Keatings et al, reported *"that the water level was within 2.5m of the entrance portico"*[7]

Water level in 2013

Petrie did not fully clear the entrance passage, he says;

"All the passages were cleared out down to the water level; but it was not desirable to go lower, as a dry path is required. Since I left the place I hear that both the tunnel entrance and the true entrance are choked; but it will be easy for anyone to reopen the mouth if a visit is desired."[8]

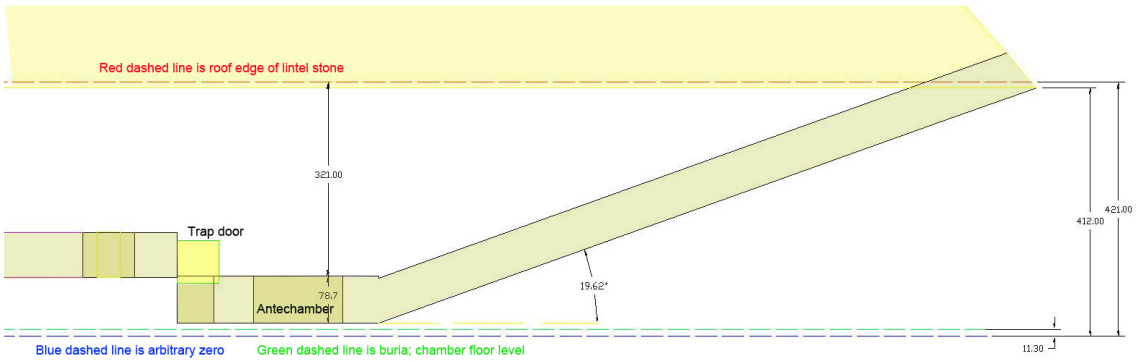
It would appear that Petrie may be the only one to explore inside the pyramid, as I have been unable to find any later reports.

[7] An Examination of Groundwater Within The Hawara Pyramid, Egypt. Available on Research gate
[8] Kahun, Gurob and Hawara, Petrie, 1890, pg 8

This is the limit of the photographic record for the underground apartments; the remaining images are CGI's based on Petrie's drawings and descriptions.

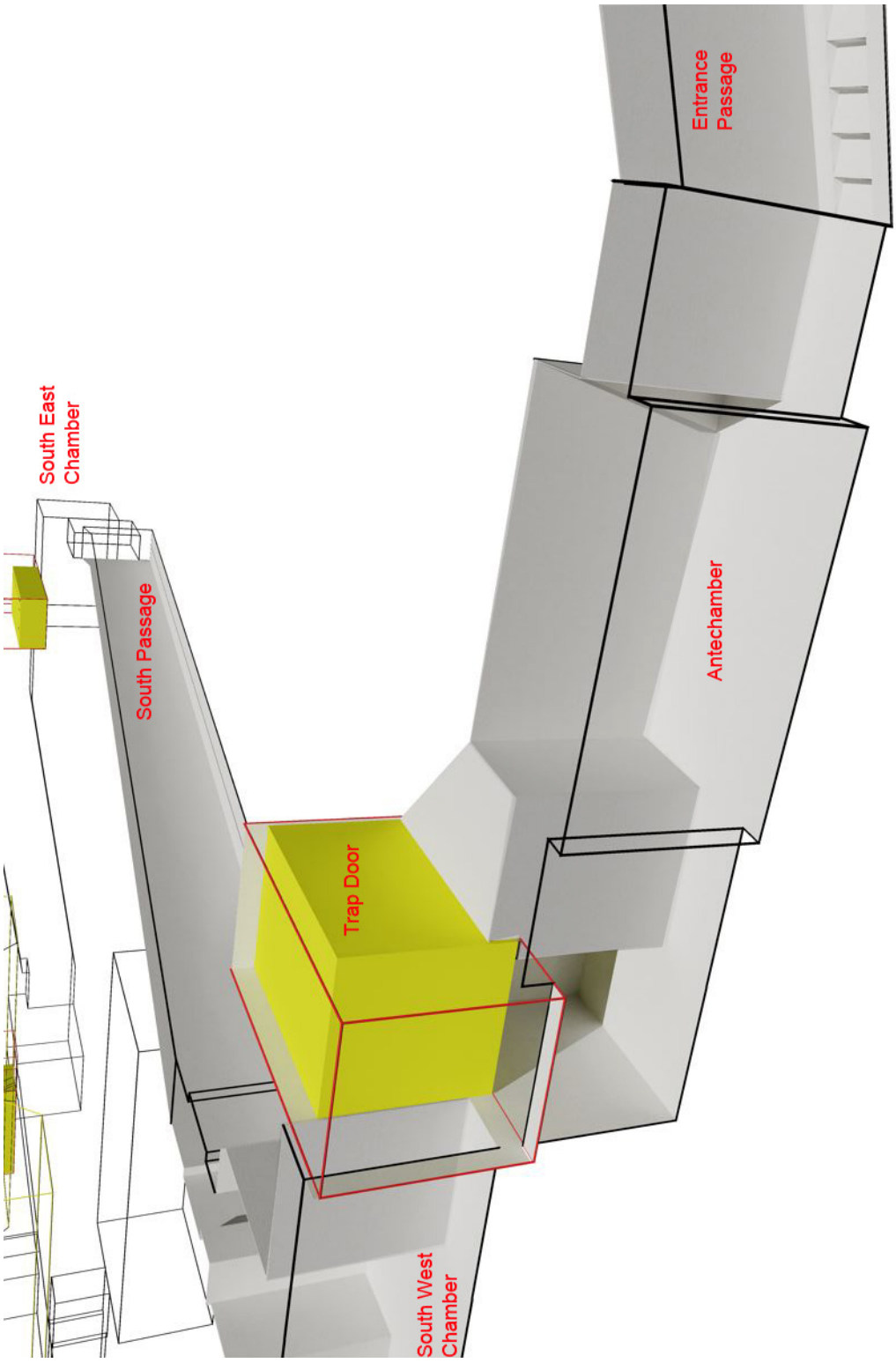
The Antechamber

The only information Petrie provides on the entrance passage that leads to the antechamber, dimension wise, is the angle and that the roof end is +96 inches. This roof end is taken from an arbitrary zero, such that the roof edge of the lintel stone above the entrance (see image page 10) is +421 inches and the floor of the burial chamber is +11.3. The casing pavement is 9 inches below the lintel, and the edge of the lintel is 184 inches inside the cased line. Placing the above information into CAD, the complete floor length is just over 1163 inches (56 cubits?) with its end just over 390 inches (19 cubits?) below base. The steps leading to the antechamber have a horizontal tread averaging 12.5 inches.



Section of entrance passage and antechamber

The floor of the antechamber is the second lowest chamber floor, being only 10 inches above the burial chamber floor (green dashed line above). It is remarkable given the conditions that Petrie had to work in that he was able to supply such information. At the end of the descending passage, the roof rises 4 inches form +96 to +100; he provides no floor level (chamber was partially submerged, but if we take the vertical height of descending passage 74.7 and add the 4 we have a probable height of 78.7 inches for the antechamber (4 cubits?). At the end of the descending passage, we have a short corridor 60.3 west, 59.4 east (3 cubits?) and 33.4 wide (see plan page 5). This corridor opens into the antechamber, that Petrie says, *"is curiously set askew, the ends and sides being all aslant to the passages."* The image on the next page gives a clearer idea of the area.



The antechamber Petrie gives as 148.6 W & 146.7 E (7 cubits?) and 84.2 wide (4 cubits?). Its axis does not align with the passage axis, but the chamber is mostly offset to the east (see plan page 5), unfortunately Petrie

provides no dimensions on this offset. On leaving the antechamber we enter another short corridor that narrows again to 31 wide (end of descending passage is 38 wide, then first corridor is 33.4 wide) and 67 long. This corridor leads to a small chamber located under the first trap door and measures 61 long by 89.5 wide (3 x 4&1/3 cubits?) According to Petrie's small plan it would appear that the antechamber corridors share the same axis.

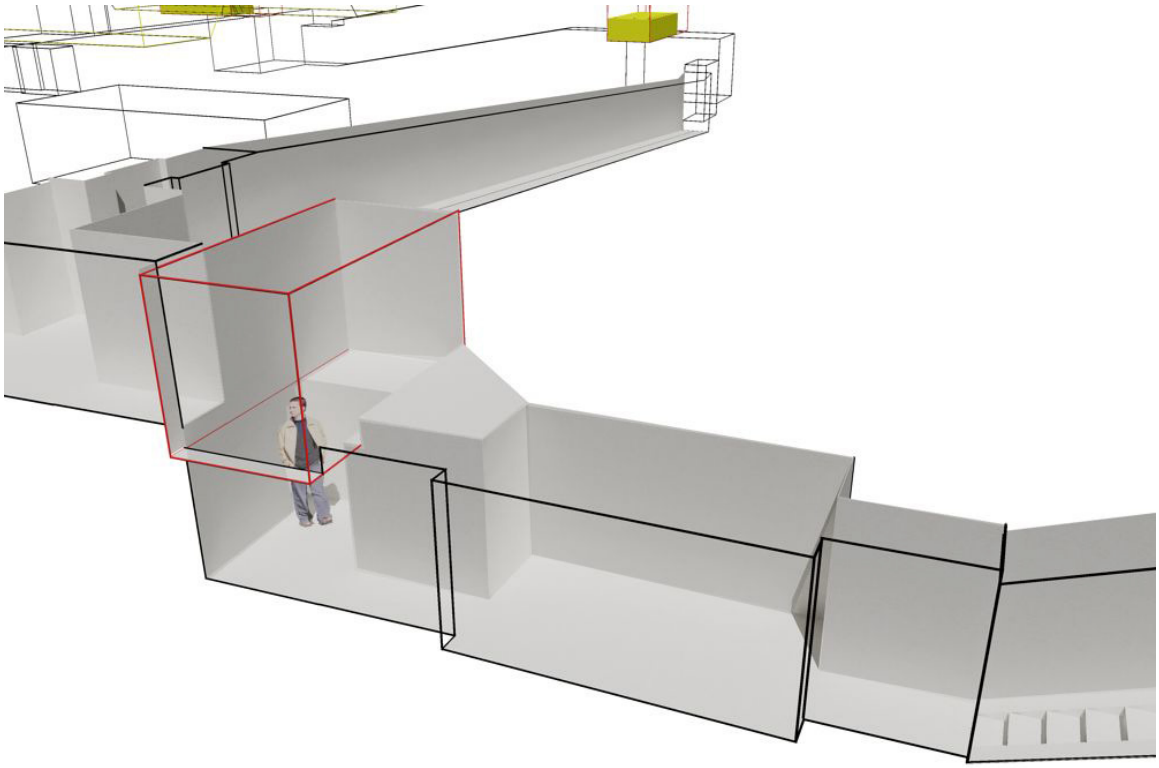
This first trap door is the largest of the three to be found in the subterranean apartments, measuring 104 long by 70 wide and 71.5 inches high; Petrie calculated that it weighed about 22 tons. In the image on the previous page I have placed the trap door in the open position; in this position access is possible through the short corridor that leads to the S.W. chamber. Petrie found this trap door in the closed position and discovered a narrow forced hole beneath the trap door that allowed him access into the antechamber (the other trap doors Petrie found in the open position).

A common feature of all three trap doors is that the floor of the higher passage that the trap door gives access to appears to be on the same level as the roof of the lower chamber. The first trap door rested on a ledge 9 inches wide on the south wall of its compartment and when moved to the closed position it rested on a 9 inch wide recess made on the west wall. Petrie gives the underside of the trap door as +87.5 (the antechamber roof is +100 and floor of upper corridor as +97.3); therefore its bottom is 9.8 below upper floor and 12.3 below antechamber roof.

It would seem strange that the edge of the trapdoor be made so visible, when they could have easily designed the system so as the closed trapdoor was on the same level as the other ceiling stones that would have covered the antechamber and corridor; robbers would surely question this unusual drop in the ceiling. It might therefore have been intended that the short corridor from the antechamber leading to the trapdoor chamber be filled with blocks and closed off. This could explain why the antechamber is offset, as it would allow plugging stones to be stored and not impede any funerary procession.

The method of closing the trapdoor is not known, Petrie states; *"all the trap-doors have a groove along the sides to allow of a rope being passed around them whereby to drag them along in their recesses, though in what way 22*

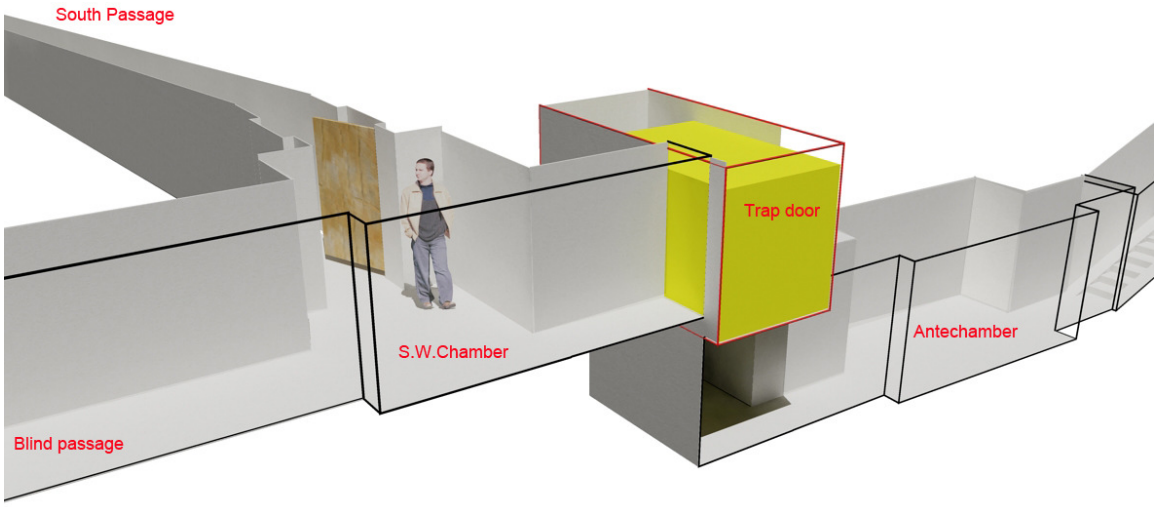
tons was to be thus slid along is hard to see."[9] Unfortunately Petrie provides no further info on these grooves, i.e. dimensions, locations on doors or door clearances in recesses; however it is another fine example of the ancient Egyptians fine art of moving large weights in confined spaces.



Above with the trap door removed, we can see the recess for the trap door, it would rest on a shelf some 45.5 inches deep to the east wall and the 9 inch ledge on the south wall. The figure at 5 feet 8 inches gives an idea of scale; the working area under the trap door is 61 x 89.5 inches, which limits the amount of people that can work in this space and move some 22 tons. It is possible that the corridor and antechamber were used in the closing operation; a long lever from the antechamber acting on a prop under the trap door, could have lifted some of the weight of the trap door, leaving the men under the door to use levers to slide it towards the ledge on the west wall; such a solution would have taken repeated operations, as they relocated levers after small incremental movements of the trap door (the askew nature of the antechamber could initially help the positioning of a long lever). The grooves that Petrie mentions, may have no function in the closure operation, but could have been related to the transport or placement of these trap doors.

[9] Ibid, pg 14

South West Chamber



In this view looking down into Petrie's S.W.Chamber, I have closed the trap door. The short corridor leading from the trap door is 71.3 long and 29.1 inches wide; here we see the corridor narrow once more, from the previous corridor of 31 inches. The internal width of the sarcophagus is 31.2, so any wooden coffin that may have been used, would be less than 29.1 wide, unless the coffin was placed on its side with a height less than 29.1. This short corridor that leads into the S.W. Chamber is the narrowest part of the passage system; however, things are further complicated by the width of the trench in the Well Chambers floor that leads to the burial chamber as the start of this trench is but 26 inches wide.

The S.W.Chamber, like the ones found in the S.E. & N.E. appears to be turning rooms, to allow long bulky items access to the burial chamber; it measures 105 x 85.7 x 74.1 high (5 x 4 x 3.5 cubits?). In the north wall of the chamber a blind passage 52.4 wide and level throughout, runs for a distance of 1010 inches (could be 48 cubits, based on value of cubit found in S.W. Chamber, which is around 21 inches). Petrie provides little information on this blind passage, other than to say; *"this has been all filled up with solid stone, in large blocks the whole height of the passage. A way has been most laboriously forced by breaking away the blocking stones, but all to no purpose."*[10]

[10] Ibid, pg 15.

How large these blocks may have been we do not know; likewise the well chamber was filled with solid masonry of unknown size, would they pass the narrow 29.1 corridor? No dimensions are provided for the axis of the blind passage in the north wall, but from Petrie's plan (see page 5) it appears shifted to the west. The end of the blind passage is not described, so its form is unknown, did it end in mud brick or stone? Petrie suggested that the blind passage was a false passage

"Thus it is clear that the true passages were ostentatiously left only closed by a wooden door, while the false passage was entirely filled up with solid stone to occupy the time and attention of the spoilers."[11]

This passage at 52.4 wide (2.5 cubits) is by far the widest passage, and would have required substantial roofing beams to protect it; if they wished a false passage, why not use the more common width of 38 inches as found in the entrance passage and elsewhere? Indeed they could have extended the east wall of the blind passage with sold masonry up to the south wall of the S.W.Chamber to hide the entrance to the long south passage, helping the deception, yet Petrie reports no evidence of blocking this entrance. It would seem illogical therefore to offer the robbers a hidden blind passage, and at the same time showing them the way to the south passage; should the south passage also not be concealed, and direct the robbers to waste their energy on the blind passage? On the Blind passage, Mark lehner would say;

"The ceiling passage leads to a second chamber, from which two passages depart. The first runs directly north. Petrie thought it was another blind passage and he had difficulty exploring it because it was filled with mud and water. The mud is probably disintegrated mudbrick that filled the passage. It is possible that the so-called blind passage might in fact lead to a south tomb, like that in the Dahshur pyramid. The second passage, once closed by a wooden door, makes a right-angled turn and runs directly east."[12]

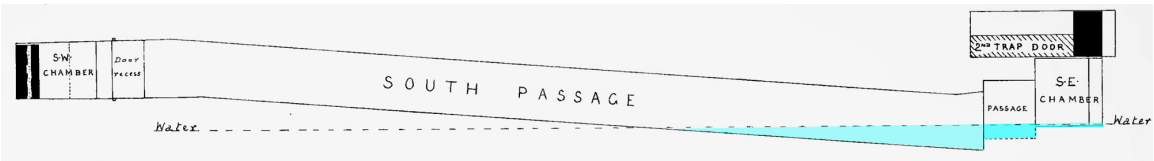
Lehner appears to have confused passages here, as Petrie makes no mention of mud and water in his north blind passage, but only in the south passage. Petrie also states that the blind passage was filled up with solid stone, and not mud brick. However, he makes a valid observation in respect of Amenemhet's first pyramid at Dahshur; here a more complex subterranean

[11] Ibid, pg 15.
[12] The Complete Pyramids, M.Lehner, 1997, pg 182

complex appears to be divided into two parts. Entrances in the east and west face of this pyramid led to two groupings of apartments; these groupings in turn were connected together by a long corridor. Something similar as lehner suggests may also exist in the Hawara pyramid.

The South Passage

In the east wall of the S.W.Chamber, we have the start of the south passage, at 38.8 inches wide, this runs east for 20.7 inches (1 cubit) wherein the passage widens on both north and south walls, and runs for 42.6 inches (2 cubits: Petrie provides no width for this recess). In the S.W. corner of this recess Petrie found pivot holes, which he believed was for a wooden door.



Above we have Petrie's section of the south passage; I have highlighted the water level in his time. The south passage leads to Petrie's S.E.Chamber and the second trap door. When Petrie first broke into this passage he stated, *"the south passage was so nearly filled with mud that we had to lie flat and slide along it propelled by fingers and toes."*[13]

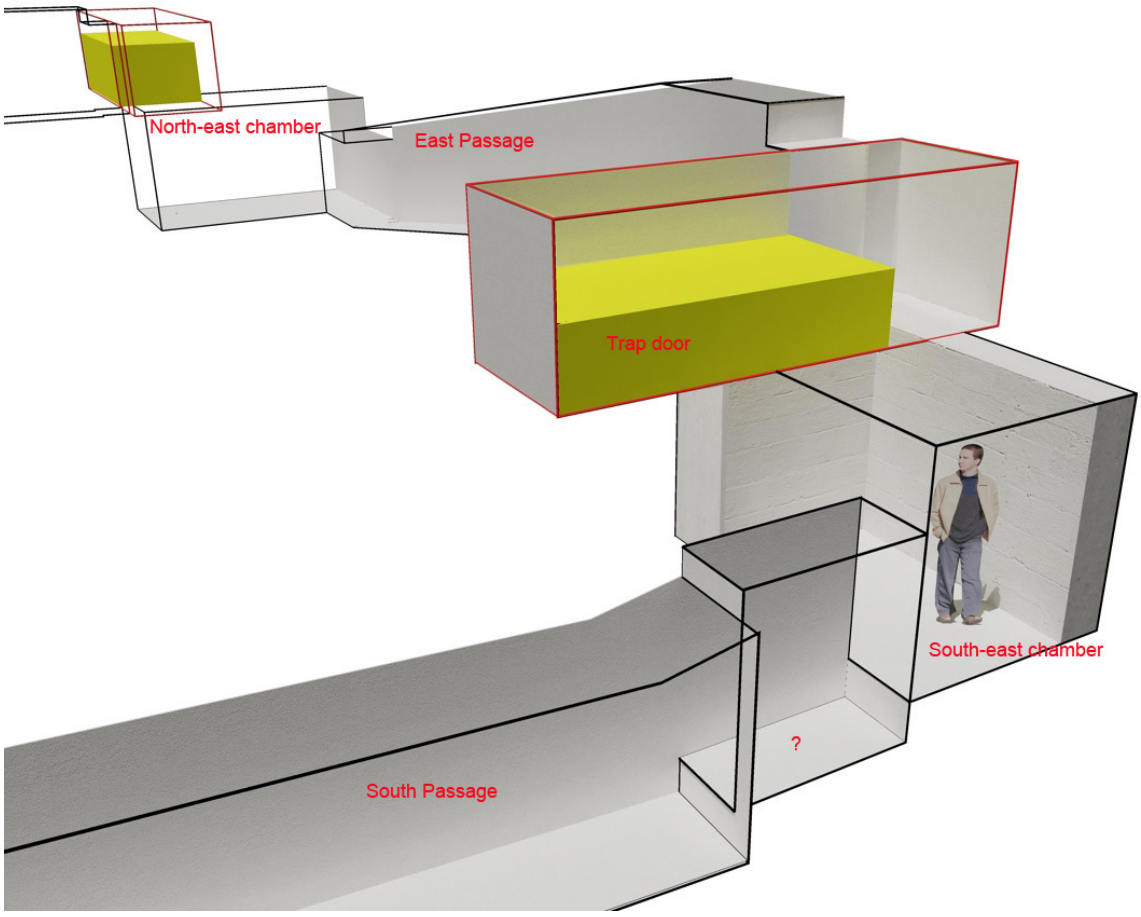
The extent of this mud found in the south and east passages and its origin can be gleamed from Petrie's report, he states;

"The east side of the small recess into which the end of it was intended to fit, in the east wall of the passage, (Petrie here is describing the recess for the 2nd trap door in the S.E.Chamber) *has been much broken away by plunderers searching for other passages. They thus broke through into the bed of sand of the pyramid, and the rains having found thus an entrance by soaking through the pyramid, have brought in a great quantity of sand and mud, enough to nearly fill the south passage, quite fill the S.E. chamber, and half fill the east passage and N.E. chamber. The whole of the passages must have been filled with water some dozens of times, as all the surface of the stone is dissolved away to an astonishing extent. The small scraps of the old face which resisted the solution are usually an inch beyond the roughed and*

[13] Kahun, Gurob and Hawara, Petrie, 1890, pg 8

pitted face of the water-eaten stone. No trace of sculpture has been seen on any of the portions of the original surface."[14]

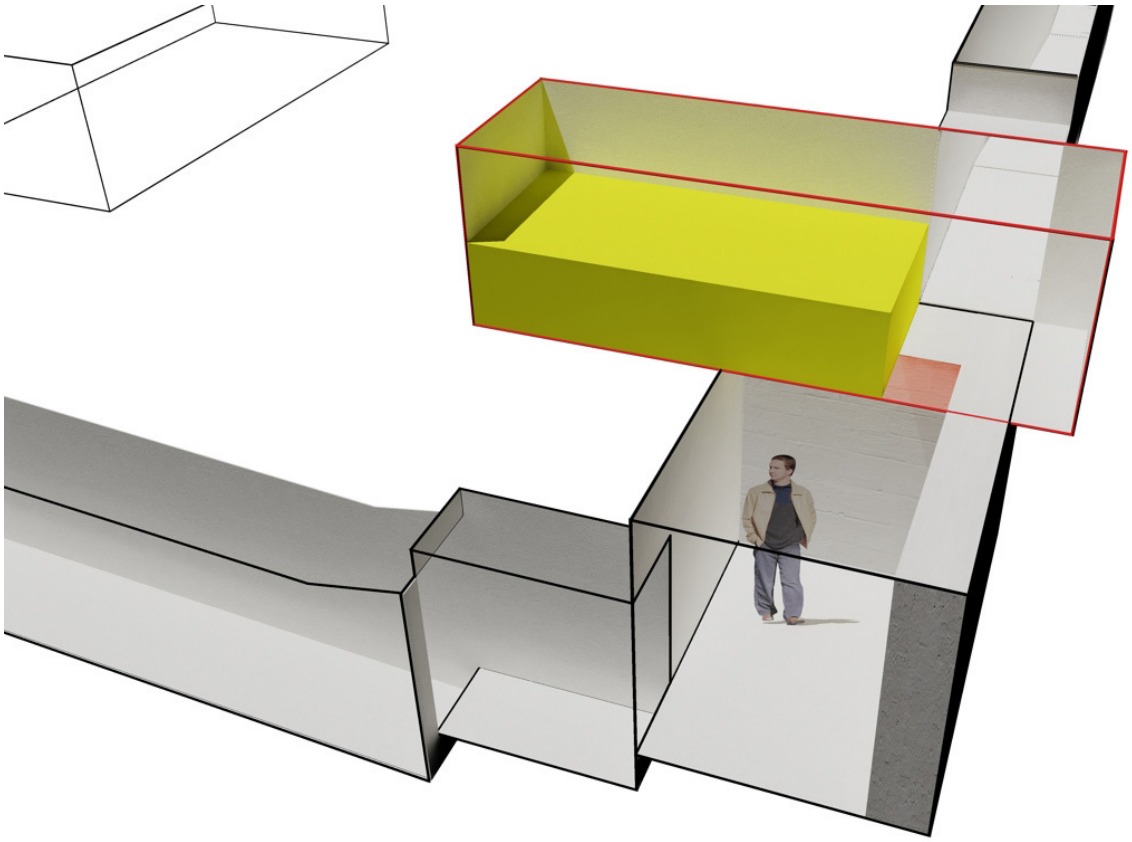
After leaving the door recess, the passage runs on for 33.5, being 38.5 wide and 76.1 high. The slope of the roof is 1044.0 inches long, it then slopes up for a further 34 inches towards the S.E.Chamber, probably to assist in the introduction of bulky items into this chamber. The height of the passage near the middle is given as 72.1; according to my CAD model, the angle of this passage is a gentle 4.34 degrees



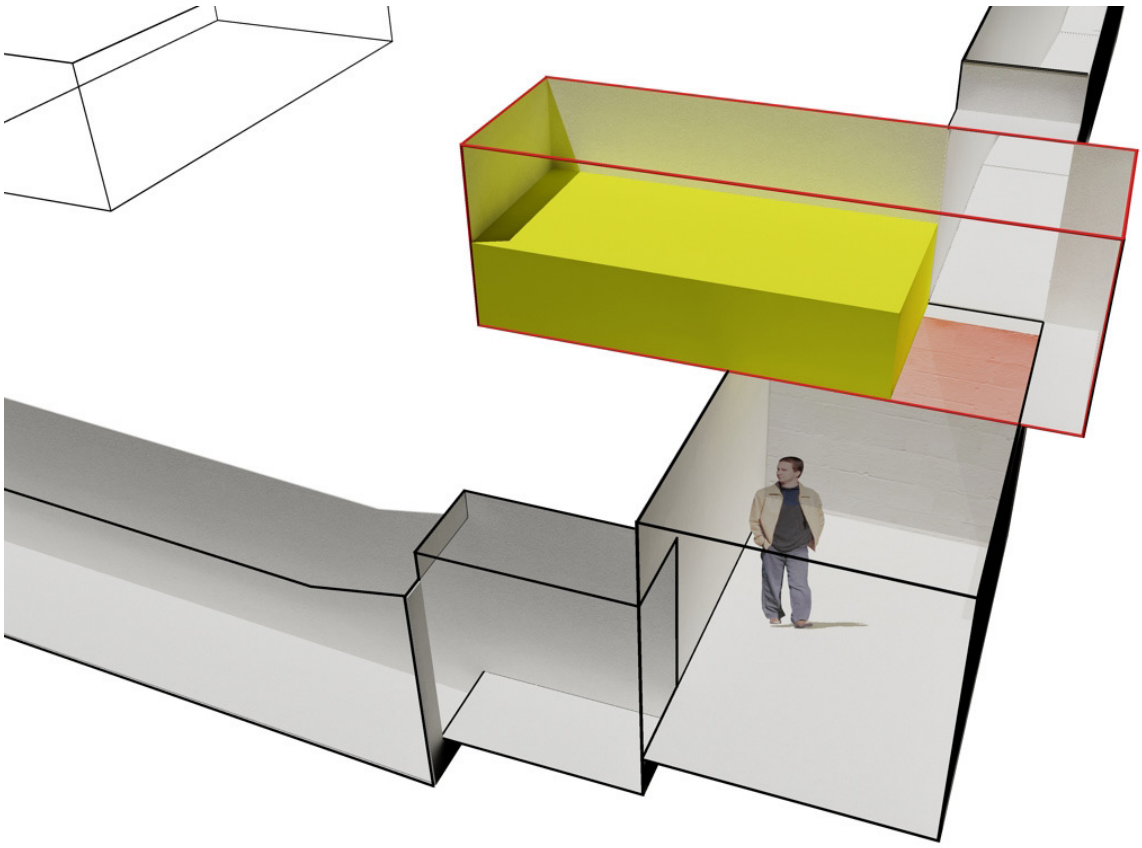
In the above view, we have a clearer view of the S.E.Chamber, based on Petrie's drawings and dimensions. The south passage ends against a step, the question mark on the floor is because Petrie shows this as a dotted line; we must recall that this area was submerged in water and mud. Petrie states that the short horizontal passage is 68.1 long by 31.0 inches wide; the inclined south passage he gives as 38.2 wide at its lower end. From his plan (see page

[14] Ibis, pg 15

5) it seems the south wall of the short passage comes forward 7.2 inches. This short passage meets another step, which leads into the S.E.Chamber; the chamber being 88.5 by 141.5 inches, and height 89.7 inches. A strange feature of this chamber is that the north and east walls have been filled with masonry; Petrie gives a thickness of 34.5 against the north wall and 18.2 against the east wall, thus reducing the chamber to 107 x 70.3 inches. One can understand the masonry against the north wall as this provides a ledge to slide the trapdoor into its recess in the east wall, however, the masonry filling along the east wall seems superfluous, as a ledge on the east wall is provided, moreover, this masonry has the effect of reducing the opening to the higher passage to a narrow 19.8 inches (the other dimension of this access hole through the ceiling is also reduced, as width of trap door 62.5 minus 34.5 leaves us with just 28 inches).



In the view above, I have highlighted in red the access hole (19.8 by 28) that is left by the masonry filling; this would appear to be rather small for the introduction of funerary items.



In this view I have created a 9 inch masonry lining against the north wall (the S.W.Chanber had a 9 inch ledge) and removed the east wall masonry filling; this would leave the access hole in the ceiling as 38 by 53.5 and giving more reasonable access for funerary equipment. This would suggest therefore that the masonry filling was introduced after the burial, possibly as an added security feature; in the well chamber and the blind passage we see large quantities of introduced masonry. Unlike the S.W.Chamber, the trap door above is level with the neighbouring roofing blocks of its chamber; masonry filling will help disguise the edges of the trap door, and should robbers gain access, the reduced access hole is another barrier to the removal of larger items.

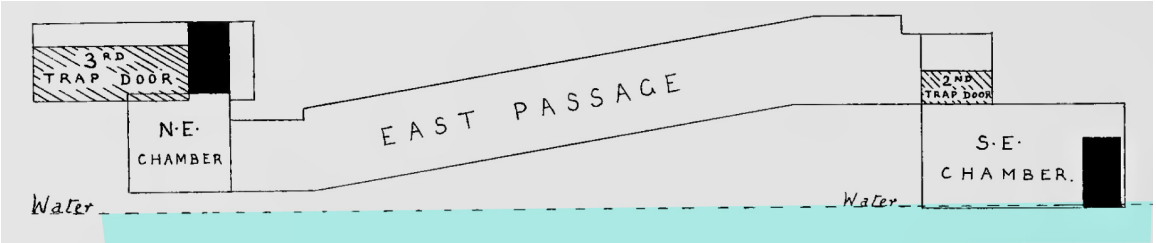
That the masonry filling is present, suggests that in the above scenario, that the trap door was closed, yet Petrie states, *"Of these trapdoors only the first had been drawn, the others were carelessly left in their recesses and presented no obstacle to the plunderers who had broken their way past the first"*[15]. However, I feel that it cannot be excluded that the robbers may have retracted these blocks back into their housings. We do not know who the

[15] Ibid, pg 14

robbers were, and if they had detailed knowledge of the passage layout; at the first trap door, the robbers cut under it, giving access to the upper passage. They could not fail to notice the design of this trap door from the above passage; on arrival at the S.E.Chamber they could have introduced beams at an oblique angle, and bashed them against the ceiling stones to see if any would lift, and therefore indicating a possible trapdoor. Using levers and props, it would be possible to retract the trapdoor back into its housing.

The second trap door is considerably lighter than the first (62.5 x 136 x 30 high (First trapdoor is 70 x 104 x 71.5 high), Petrie gives it as 11 tons, half the weight of the first trapdoor; though given the height of its housing a much higher trapdoor could have been fitted.

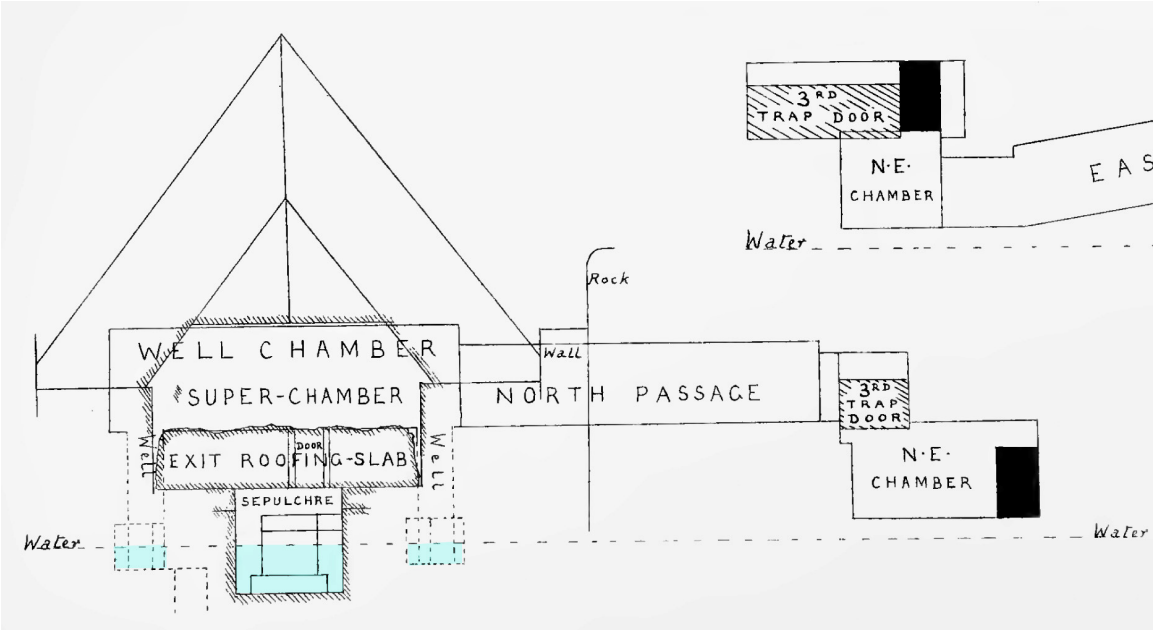
The East Passage



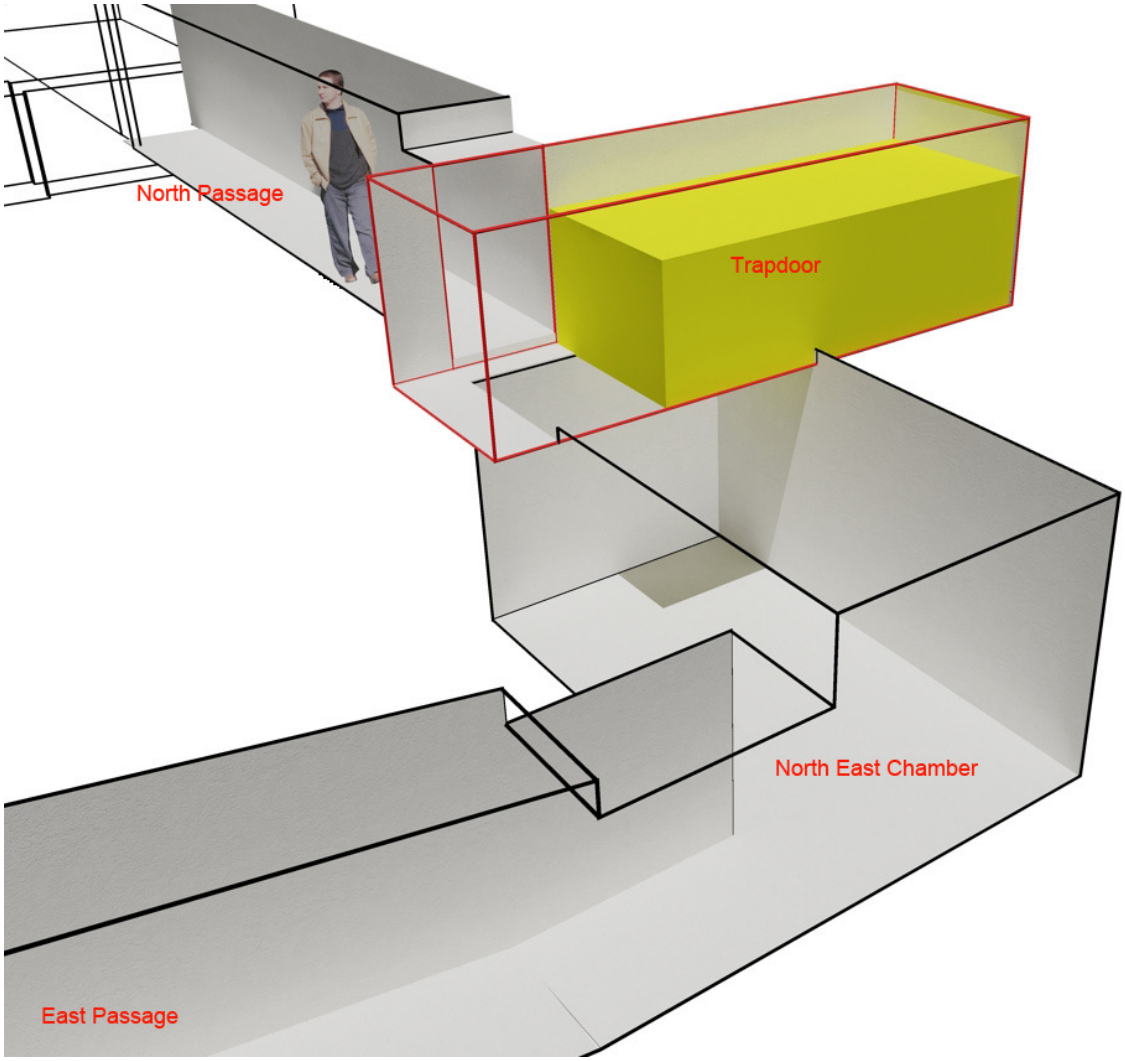
Petrie's section of the east passage above shows that the roof runs for 16.1, then it heightens by 16; then runs a further 79, before sloping for 450.2 inches. My CAD model suggests an angle approximately twice that of the south passage at 9.72 degrees. The height and width of the east passage match the preceding south passage; Petrie gives width as 37.6 – 38.4, with height 71.4. At the end of the slope, a passage 64 long and 62.5 high leads into the N.E.Chamber; this chamber is 166 long by 90 wide by 86 high (slightly larger than the S.E. Chamber, which is 141.5 by 88.5 and 89.7 high). This chamber likewise had masonry filling; 22 on west wall and 19 on north wall.

The N.E.Chamber's trapdoor is a bit similar to the first found in the S.W.Chamber, in that it appears to rest on a ledge some 10 inches beyond the west wall (in the section by Petrie below, he shows this ledge to be below the trapdoor, this space could have been filled with masonry or a wooden beam to the level of the trapdoor); yet given this, they still inserted a masonry filling against this wall. The trapdoor also appears to be lower than the neighbouring ceiling stones. The third trapdoor Petrie gives as 138 x 61

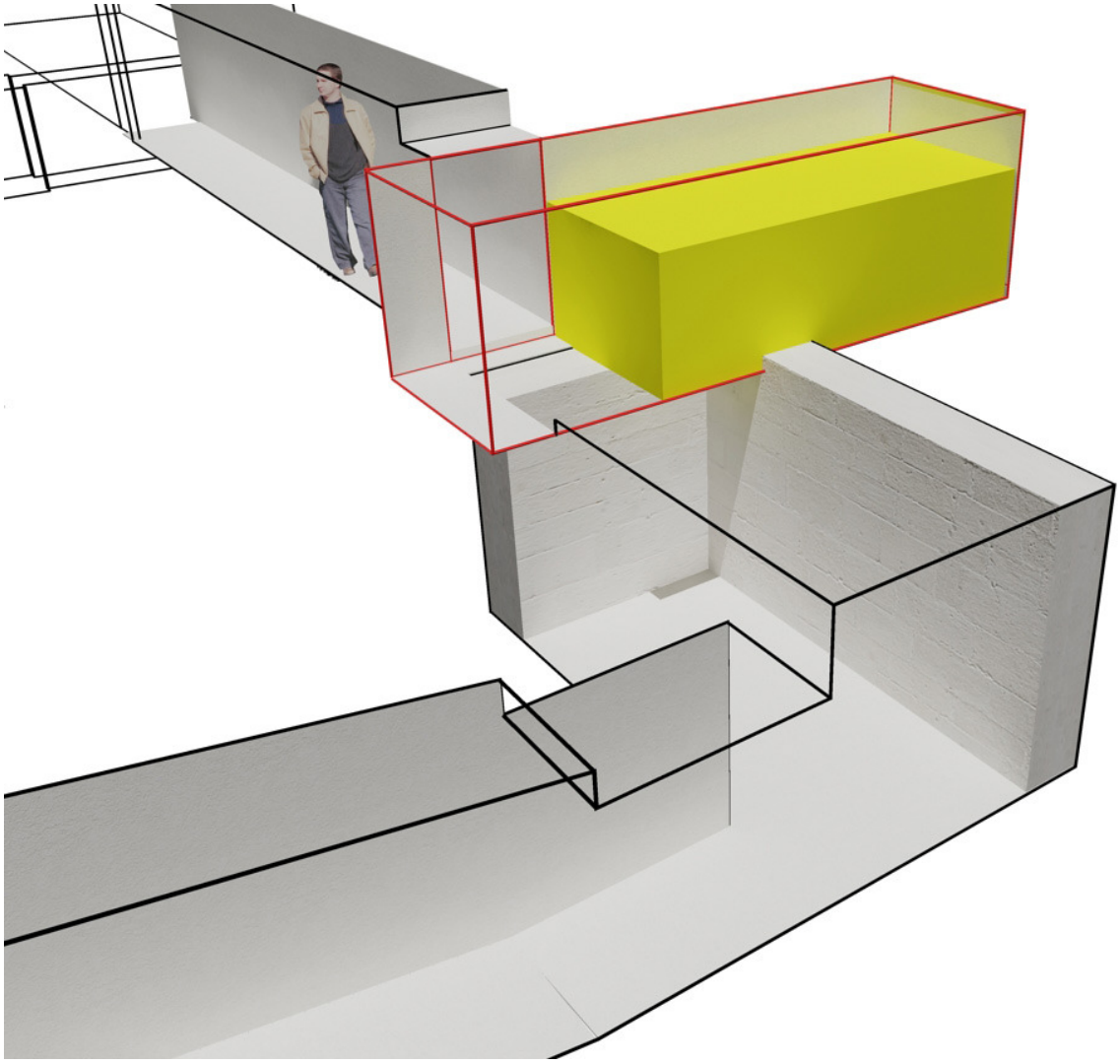
x 44 inches high, and weighing some 18 tons. Without the masonry filling, ceiling access is 35.3 wide and 51 long; masonry filling reduces this to 29 long. The masonry filling reduces the chamber to 144 by 71 (7 by 3.5 cubits?)



In Petrie's drawing above, we are given two elevations of the N.E.Chamber. The lower elevation shows the 10 inch ledge below the trapdoor; unfortunately Petrie provides no further information on it other than to say that the trapdoor covers 10 inches beyond the chambers west wall. As this is similar to the 9 inch cutout in the S.W.Chamber I have made the assumption that this may have had a similar function and in the image overleaf, I have brought this ledge up to the level of the trapdoor.



In this view based on Petrie's information, I have assumed that Petrie's 10 inch ledge was originally at the level of the trapdoor, to assist in moving the trapdoor into the recess made in the opposing wall. It may be possible that a similar ledge exists behind the deeper filling of the S.E.Chamber.

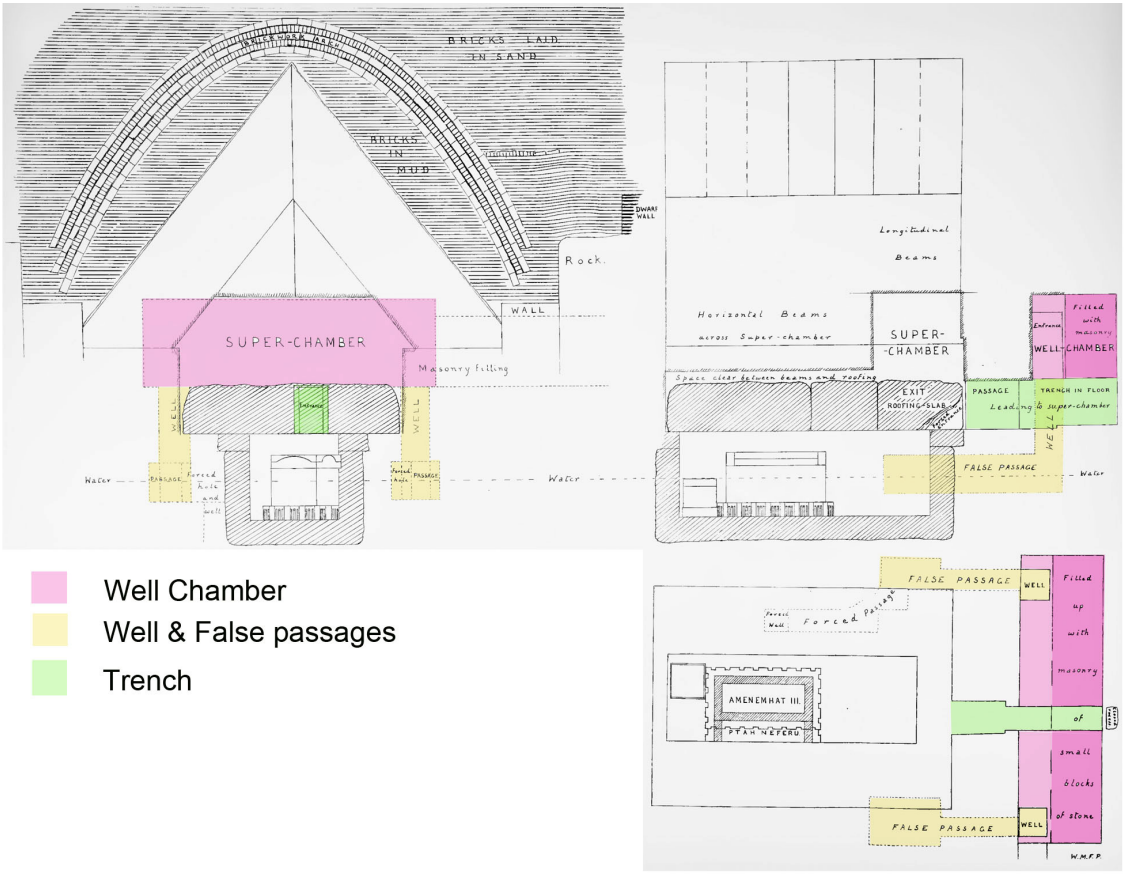


In this view I have inserted the masonry filling, which are 22 deep on west wall and 19 deep on north wall; this will reduce ceiling access to 35.3 wide by 29 long.

The North Passage

The north passage is a short level passage that leads to Petrie's Well Chamber (see section on page 26); the north passage runs for 17.4, were the ceiling becomes 10.5 higher. From here the passage runs for 319.0 to the well chamber, with the south wall brought forward 3.1 for the last 28.5 inches; the passage width Petrie gives as 35.3 and height 72.5 (the 3.1 at the passage end reduces this width further to 32.2; the end of the south passage is likewise reduced to 31, though no reduction is apparent at the end of the east passage)

The Well Chamber



The drawings above by Petrie, show the sections of the Well and Burial chamber; I have highlighted the Well Chamber and those features that run from it. Petrie states;

"The well chamber is so called from the two false wells, which were the only visible features in it originally, made on purpose to deceive plunderers, and to lead them to attack the solid masonry along the side of the real sepulcher. To further mislead the intruder all the north half of the chamber was filled up with solid masonry, which has been mostly dragged out now, and the remaining mass tunneled through. ------ Across the floor of the well chamber a trench existed, though filled with masonry and so concealed; and this led to a short passage in the south wall, which was thus entirely below the level of the chamber above.------In the well chamber were found the alabaster table of offerings for Ptah-neferu the daughter of Amenemhat III, and the fragments of eight or none large bowls of alabaster, shaped in the form of half a trussed duck, and mostly inscribed with the name of the same

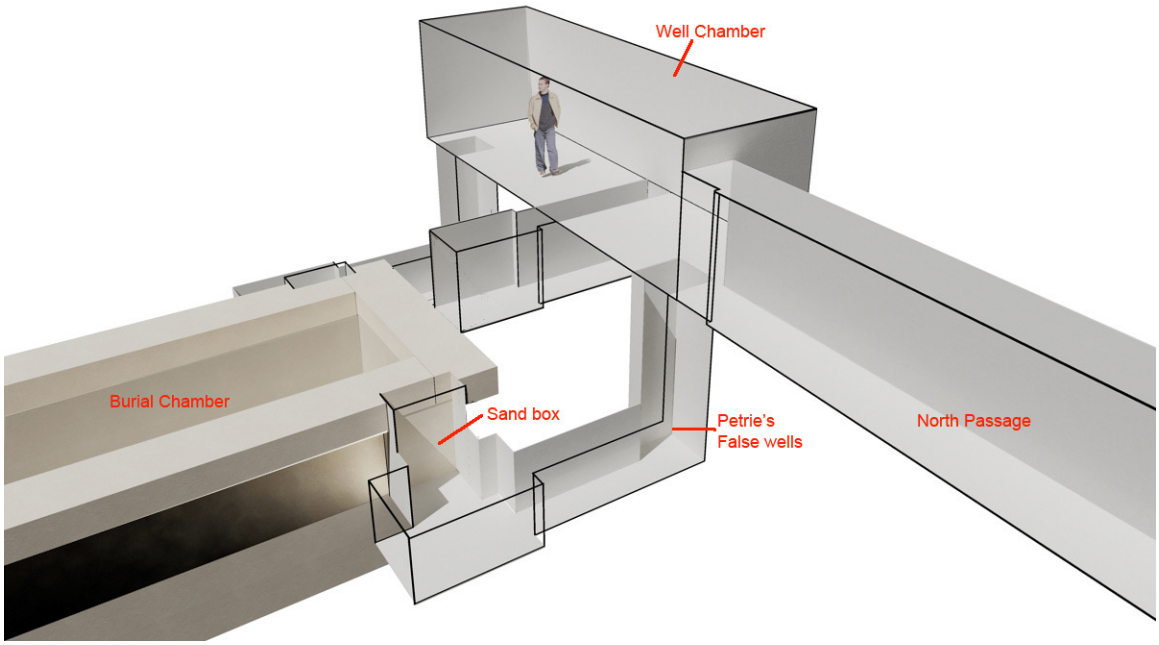
princess. But no trace of Amenemhat was found up here. At the end of the trench in the floor, but above the floor level, was a rough recess in the solid masonry, closed by a slab which was a part of the adjacent stones; it must therefore have been closed in course of building, and it was further covered by the masonry which filled this side of the chamber. The closing slab is now partly broken away, and the recess is empty."[16]

The masonry mass found in this chamber appears strange; the burial chamber is not particularly large, especially for funerary equipment to accompany a king. The well chamber in contrast would seem an ideal storage space for equipment; yet here we find it largely filled with masonry, that not only covered a recess in the north wall, but prevented a turning area that could have introduced a wooden coffin or other long objects, into the trench that led to the burial chamber. Would not the three trap doors be sufficient security? To allow a turning zone, a sizeable amount of this masonry would have to be missing and introduced after burial. If as Petrie suspected that this masonry was fitted to mislead any intruders, it is a sizeable operation to introduce this amount of masonry after burial. A possible option is that this masonry is not contemporary, but a later intrusive operation; did some benevolent king having heard that the tomb had been violated, instruct that the chamber be sealed with masonry?

Another curious feature is the presence of Princess Ptah-neferu sometimes spelled as Neferuptah; a makeshift sarcophagus appears to have been made for her next to her fathers. However, in 1956, some two kilometers south east of Hawara a tomb was found that contained a granite sarcophagus bearing her name, along with other items of burial equipment. This granite sarcophagus appeared to contain fragments of wooden coffins and linen bandages; this sarcophagus like the one at Hawara was largely waterlogged. Miroslav Verner, suggested the possibility that a tomb was initially prepared for her at Hawara, but that her fathers death and the sealing of his tomb, meant that another tomb had to be built for her.[17]

However, as we will see, the second sarcophagus in the burial chamber is very much a makeshift affair, like a last minute addition. It gives the impression that she predeceased her father.

[16] Ibid, pgs 15-16
[17] The Pyramids, M.Verner, 2001, pg 430



I have created the model above to give the reader a clearer view of the well chamber and its relationship to the burial chamber; I have omitted the masonry filling. The well chamber is 309.2 long, 89.6 wide and 91.3 inches high; at a possible 15 cubits long, it is two cubits longer than the burial chamber (or 1/13th of pyramid base of 195 cubits). In the floor of the well chamber a trench is found, Petrie states;

"This passage mouth is at 120.5 to 146.5 from the east end of the well chamber; and is 71.5 long and 36.1 wide."[18]

It will be noticed that the trench is not in the middle of the well chamber floor (though the burial chamber appears central to the well chamber), its axis being 133.5 from east wall (if 6.5 cubits, then west wall will be 8.5 cubits from axis). This offset to the east can be clearly seen in Petrie's plan (pg 29), the width of the trench in the chamber floor is 26 inches, and this is maintained past the south wall for about 14 inches (measure from scale rule), before widening to 36.1, were it meets the top edge of the burial chamber (the length of the passage from the south wall being 71.5, height about 52).
At either end of the well chamber we have two squarest holes in the floor, tight against the south wall; these are the openings for two vertical shafts about 122 inches deep and over 30 inches square (Petrie provides no measures for his wells, so approximations are taken from his scale

[18] Kahun, Gurob and Hawara, Petrie, 1890, pg 15

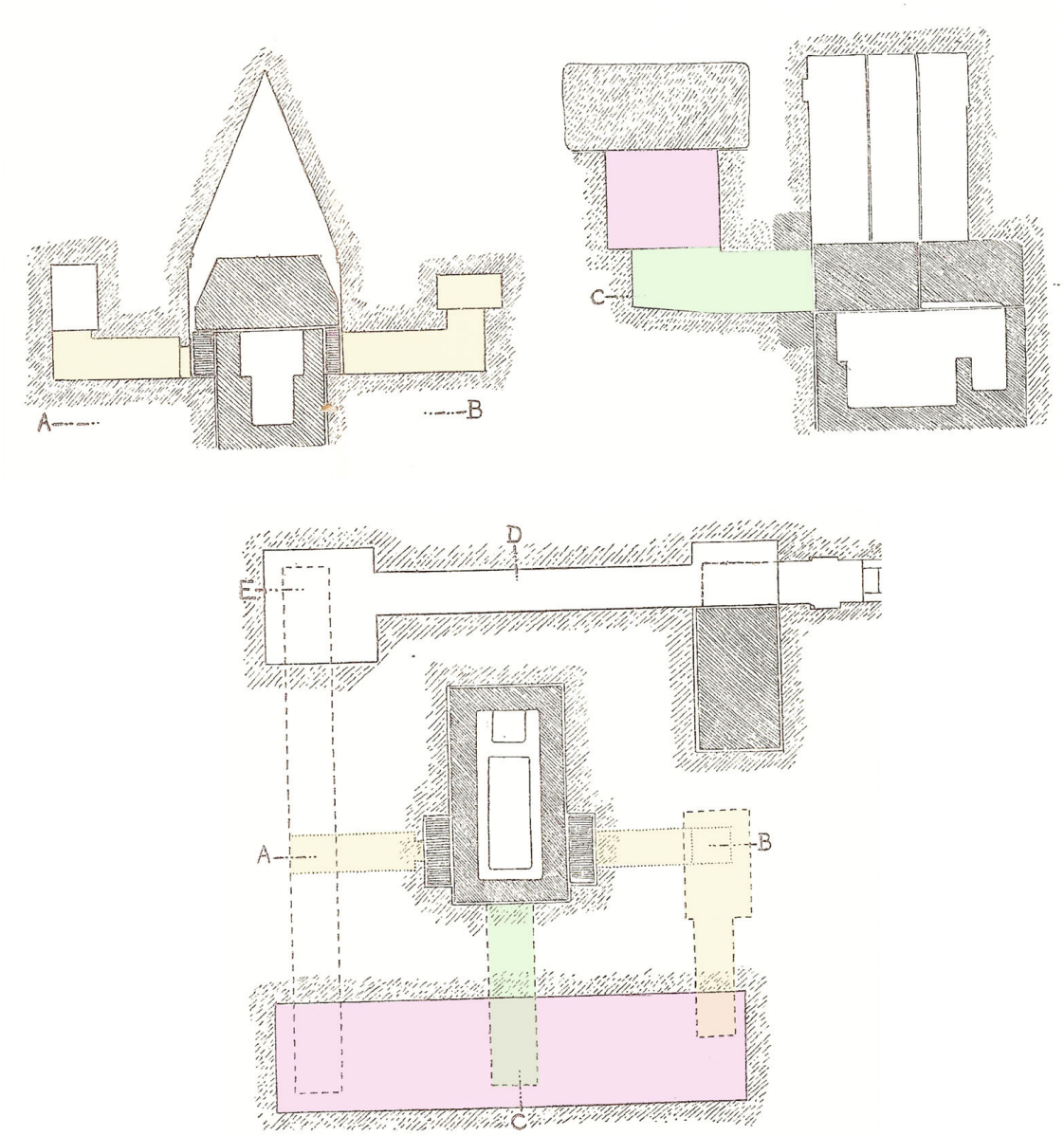
drawings). At the bottom of these shafts a passage heads south for about 82 inches (possible 4 cubits, with well depth a possible 6 cubits); the width of the passage is less than the shaft, about 21 inches (1 cubit?): this leads into a rectangular area about 76 long by 52 wide, whose height matches the height of the passage at about 40 inches (2 cubits?)

From Petrie's plan it appears that these two wells mirror each other, and it is interesting that he annotates forced holes on his drawing on the sides facing the burial chamber. Today we would suggest that these forced holes would lead to sand boxes, part of the lowering mechanism that sealed the burial chamber. In defence of Petrie, he was unaware of such mechanisms in his time, and we must recall the horrible conditions that he had to work in: in the burial chamber, he states;

"The chamber floor was covered with blocks, chips, and earth, which had fallen in; but the water was too deep to reach anything by the hand, and too salt and acrid to put eyes or nose beneath it."[19]

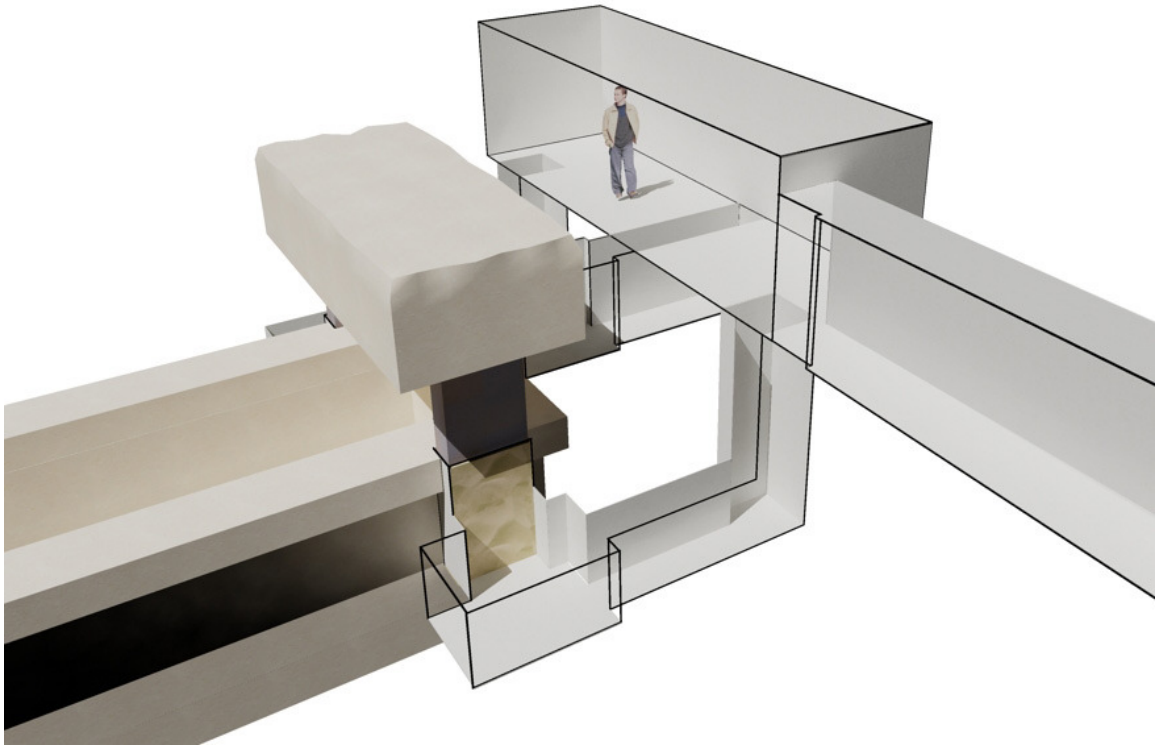
As we can see from his drawings, the water level filled over half the height of the well passages, so he was severely restricted in what he could observe by candle light. A clearer picture of the function of these wells would come apparent in Gustave Jéquier's report on the pyramid of Khendjer[20], which he published in 1933, some 43 years after Petrie's report on Hawara. In Khendjer's pyramid we see a very similar chamber design to what we see at Hawara; was the same architect's pen at use here? In the image overleaf we have Jéquier's drawings of Khendjer's chambers, and here we see similar elements, such as the well chamber, shafts and trench, which I have highlighted.

[19] Ibid, pg 8
[20] Deux Pyramides Du Moyen Empire, 1933



Above we have Jéquier's drawings, and we can see the clear similarity in design; the main difference being that the well shafts are not so deep, and that one of them branches of the corridor that leads to the well chamber. What Jéquier found, was that the large roofing stone that sealed the burial chamber was supported by two granite stones 1 metre long by 40 cm wide, these in turn rested on a column of sand held in a sand box. Jéquier reports that the sand boxes were the same size as the granite props that supported the roofing stone, and that at the bottom a removable stone held the mass of sand: lowering he suggests was accomplished by the removal of these stones and the careful removal of the sand at the same time, allowing the granite

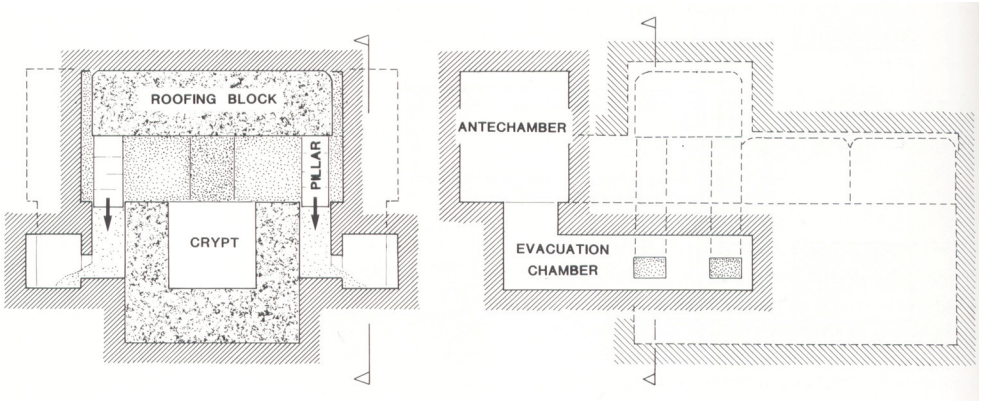
props and hence roofing stone to descend regularly and seal the burial chamber.



In the above image I have recreated a possible sand box for the Hawara chamber, using the same size granite props. Given the close proximity of the well passages to the side of the burial chamber, I suspect that the monolithic block of the burial chamber, formed one of the walls of the sand boxes; masonry built against the wall of the burial chamber would complete the sand box. The roofing stone on top of the granite props, Petrie gives as about forty-five tons. Though Jéquier mentions a removable stone to allow the sand to flow out, or dug out, he provides little detail on it, dimensions or exact drawings of the mechanism, or how this stone was held in place; this lack of information also applies to other structures were sand was used to lower heavy weights.

Indeed not all sand is the same; I recall a documentary many years ago on the raising of obelisks, were they found certain sands more preferable for use in their sand pits. Some sands demonstrated more flowing characteristics, while others could easily clump together and require much digging. I feel it would be beneficial for a study to be carried out to analyze the sands found in these lowering devices.

It has been said that the Hawara pyramid is the first known sand lowering device[21]; however, its design makes me feel that they had previous experience with using sand in this way. Indeed, one wonders if the sand cavities found behind the horizontal passage leading to the Queens chamber in the Great Pyramid were some sort of early precursor. The sand found in the Great Pyramid appeared to be not local, but large quartz grained sand sometimes referred to as weeping sand or music sand and similar to sand found in the Sinai.[22]



Though I have opted to use the example found in Khendjer's pyramid, the above reconstruction by Dieter Arnold[23], shows four props supporting the roof stone.

Before leaving the well chamber, a curious comment by Petrie caught my attention. When Petrie's mason's cut through the roofing beam, they were fortuitous to break into a small forced passage cut by ancient robbers; this Petrie climbed into and found that it led to the super-chamber. From the super-chamber he says; *"Searching around it I saw the top of the entrance passage on the north side, on a level with the floor I was on. Jumping down I found the passage was blocked; but there was a hole under the stone I had been standing on."* This would be the hole that Petrie got stuck in, a similar hole allowing a slim lad to enter was found in Khendjer's pyramid also. The curious thing is that the next day he says;

"Next day, after loosening and bringing down a heap of small blocks of stone which filled up the passage to the well chamber, and part of that

[21] The Complete Pyramids, M.Lehner, 1997, pg 183
[22] Studies in Egyptian Culture No.8, Non-Destructive Pyramid Investigation (2), pg 88
[23] Build in Egypt, Pharaonic Stone masonry, 1991, pg 78

chamber itself, I pressed through into the well chamber."[24] Unfortunately we have no clearer picture of what Petrie is describing here, other than he had to clear a way into the well chamber. Was this blockage of stone that prevented him gaining access to the well chamber, part of the original masonry filling, or stone thrown down into the passage from the well chamber; if original, how could robbers gain access, unless the masonry filling was done after robbing as I described earlier. In describing the well chamber trench, Petrie says; *"Across the floor of the well chamber a trench existed, though filled with masonry and so concealed-"*, again, was this what he observed or believed? The impression could be neat layering of small blocks to conceal the trench, rubble thrown in hap hazardly, would hardly conceal anything.

The small blocks that make up the masonry filling of the well chamber and trench is an unknown, Petrie gives no information on their size and quality; likewise the alabaster fragments and offering table found in the well chamber, no indication is given as to their locations, were some found within the masonry filling for example? Petrie's brief description of the well chamber and masonry filling is a major problem in understanding its function; the only other comparable chamber is the similar chamber in Khendjer's pyramid, and here no masonry filling is present.

The Burial Chamber

Petrie's description of the burial chamber;

"The sepulchre is an elaborate and massive construction. The chamber itself is a monolith 267.5 inches long, 94.2 wide, and 73.9 high to the top of the enormous block, with a course 18.5 high upon that, giving a total height inside of 92.4, the floor being at + 11.3, and the roof at + 103.7 level. The thickness of the upper course is 36 inches from its face; but the chamber itself is about 25 inches, according to the outside seen in the forced passage from the western well. It would accordingly weigh about 110 tons. The workmanship is most excellent; the sides are flat and regular, the inner corners so sharply wrought that—though I looked at them—I never suspected that there was not a joint there until I failed to find any joint in the sides, and the surface so polished that the hard flinty sandstone reflects the light of the candle one carries. The funeral furniture we will describe further

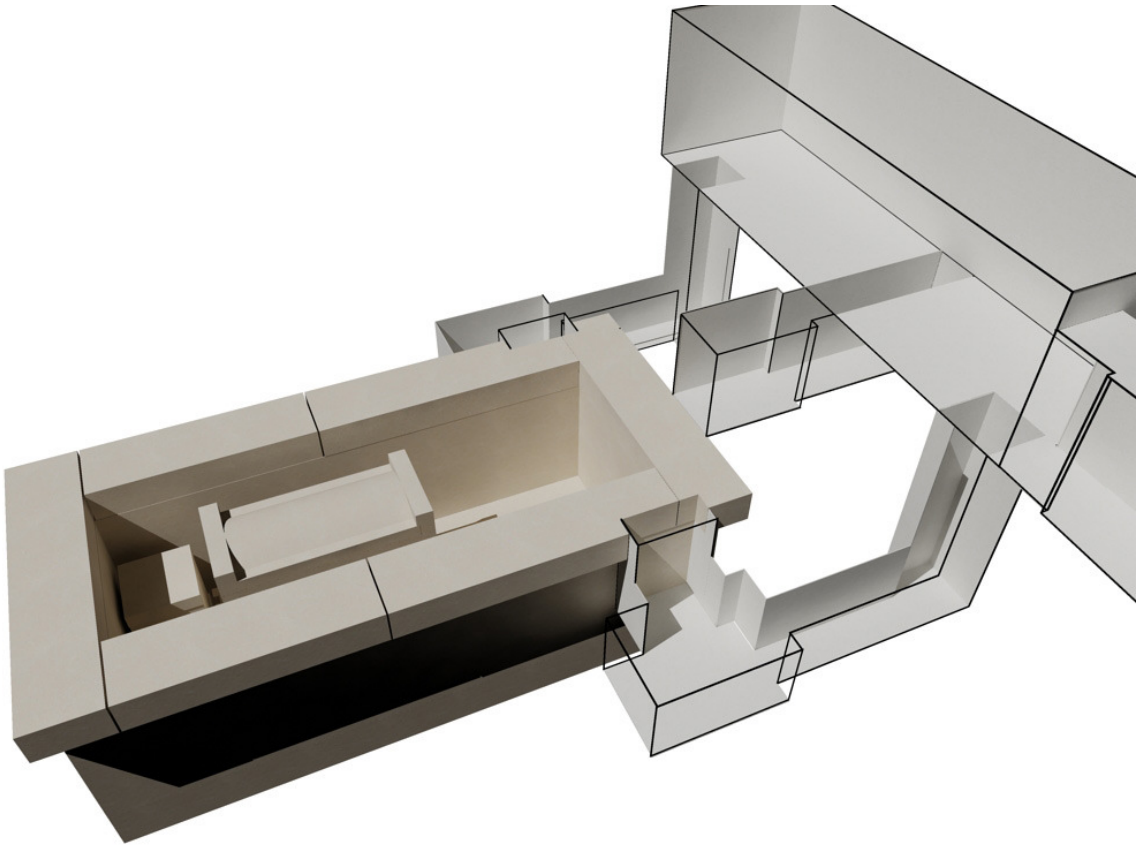
[24] Kahun, Gurob and Hawara, Petrie, 1890, pg 7

on. The total distance from the well chamber to the inside of the sepulchre is 109. 5."[25]

This hard flinty sandstone I have seen also described as quartzite (quartzite is a metamorphosed pure quartz sandstone); the monolithic box that makes the chamber along with the 18.5 course and three roofing stones that cover the chamber are said to be made of this hard sandstone. Unfortunately the stone makeup of the other chambers is not clear from Petrie's report, though the images of the entrance passage suggest limestone.

The roofing beams are over 4 feet thick and extend well beyond the chambers sides (see Petrie's drawing pg 29: from these scale drawings the roofing beams are nearly 6m long)); the 45 ton stone that closed the chamber, is a fine piece of engineering in getting it to rest on the props of the sandboxes. The large roofing stone above the sarcophagus, if Petrie's drawing is correct is close to 80 tons; though Petrie suggests that the monolithic chamber is around 110 tons, it could be more, as other sides could be thicker than the 25 inches, especially the bottom of the box. This box was probably lowered in a pit, and then built around with limestone to form the well shafts etc and provide a strong foundation for the pent limestone roofing beams. The floor of the burial chamber is 400.7 inches (10.2m) below the pavement; which is only 10 inches lower than the floor of the askew antechamber, before the first trap door.

[25] Ibid, pg 16



In the image above, we can see how the 18.5 inch high course of masonry, sits on top of the monolithic box and overlaps the box, probably to rest on surrounding masonry built up against the box. The sarcophagus is placed on the axis of the chamber, such that the long sides were 22.9 to 23.0 inches distant from the chambers walls; its end was 50.3 inches from the chambers south wall: in this space were found two possible canopic chests, one complete, and the other in broken fragments. In my CAD model the east-west axis of the pyramid appears to bisect the sarcophagus, such that the king would be half in the north and half in the south, with the centre of the sarcophagus being 5 cubits from the chambers south wall[26] (the whole burial chamber is placed in the west: centre of sarcophagus or long axis of chamber appears to be 10 cubits from pyramid centre). My CAD model also suggested whole cubit distances for the passage axes from the pyramids axes; however, caution is required, there are gaps in the dimensions that Petrie provides, such as passage azimuths, location of blind passage entrance in S.W. chamber; the effect of the askew antechamber etc. So my model makes assumptions, such as all passages are at right angles to each other.

[26] Half of Sarcophagus length, 53inches plus 50.3, distance to S.wall, provides 103.3 (5 cubits of 20.66)

In the previous image I have omitted the makeshift sarcophagus that filled the space between the central sarcophagus and the east wall of the burial chamber.

The sarcophagus is quite similar to that found in Amenemhet's Dahshur pyramid; though apparently less decorated. Petrie states; *"There is no trace of inscription visible, and no ornament beside the old panel-work, or false door ornament, around the bases."*[27] This base Petrie states as 15.3 high and projects some 9 inches, with the buttresses some 10 inches wide and 6 at the corners. Whether there was a larger doorway bastion on the south end of the east side, along with a pair of eyes on the east side, as found on the Dahshur sarcophagus is uncertain; as we have to recall the difficult conditions that Petrie worked in. On clearing the burial chamber he says;

"The chamber floor was covered with blocks, chips and earth, which had fallen in; but the water was too deep to reach anything by the hand, and too

[27] Ibid, pg 16-17

salt and acrid to put eyes or nose beneath it.------The panel work around the sarcophagi I could only examine and measure by feeling, as merely the upper part of it was within arm's reach under the water."

So one could imagine that Petrie did not spend too much time investigating the base; further, the makeshift sarcophagus that filled the gap to the east wall of the chamber, would also be a barrier to exploring the east side. The depth of the water from Petrie's drawings appears to be about 1 metre deep.

The exterior dimensions of the box above the decorated base, are 106 long, 48.4 wide, and 40.2 inches high (55.5 high if we include the base). The internal dimensions are 88.7 long, 31.2 wide and 41.8 inches high (this last figure of 41.8, is more than the external height of 40.2, suggesting therefore that the floor of the box has been cut some 1.6 inches deeper into the decorated base)[28]. Subtracting the internal length and widths from the exterior, gives 17.3 and 17.2 inches; suggesting that the walls of the sarcophagus all display a similar thickness of about 8.6 inches.

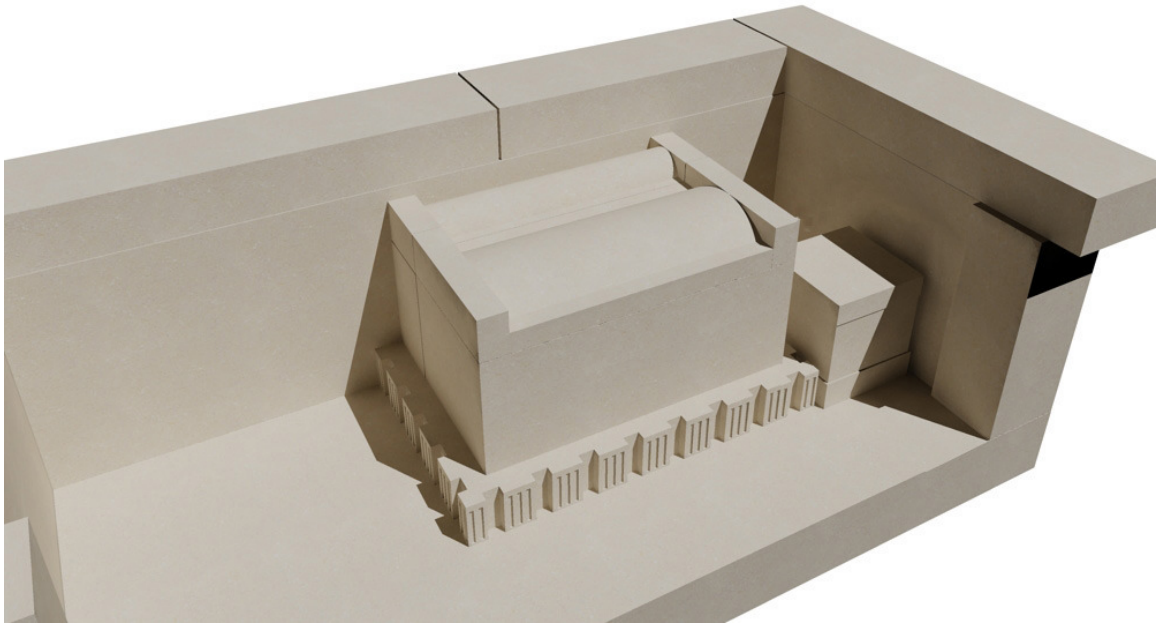
The lid is 14.1 high with its length and breadth the same as the box that it covers. The curved top does not take up the whole width of the lid, as there is a flat space either side of 5.8 inches, with this flat space being 6.8 high from the base of the lid. Petrie reports that the lids had no extra security, such as pins or ledges; they were merely flat underneath and laid in position.

The following is Petrie's description of the second sarcophagus;

"But an additional burial has been provided for here by building a second sarcophagus between the great one and the east wall. This was effected by filling up the floor, level with the foot, adding end pieces, which have ten inches length of the new bottom cut all in one with them; and then supplying a lid, which was let into the side wall a small amount. There can be no doubt that this was for the interment of the princess Ptahneferu, whose altar and ducks were found in the well chamber, and who must have died before her father."

This cutting for the lid in the east wall of the chamber can be seen on Petrie's drawing (see page 29).

[28] Ibid, pg 17 for sarcophagus dimension



In the above image, I have removed some of the west wall of the burial chamber, to better show the layout of the sarcophagi. The impression is that the added sarcophagus is very much a makeshift affair; they appear reluctant to move the king's sarcophagus, though happy to cut into the east wall to enable a support for the lid. The long sides of the smaller sarcophagus are the east wall of the chamber and the east side of the king's sarcophagus; the only new pieces needed to be brought in are the end pieces and the lid. I would imagine if the original intent at the start of construction had been the placement of two sarcophagi, then a neater solution would be apparent.

Compared to the king's sarcophagus, the other is less than half the exterior width (48.4 versus 23.0) however; the smaller shares its long sides with the chamber wall and king's sarcophagus, such that the full 23 inch space can be used. This internal 23 inches is only 8.2 inches less than the king's; this might look small, but it is certainly sufficient for a burial, the large granite sarcophagus in mastaba 17 at Meydum for example, has an internal width of 23.5 inches.[29]

In his description of the king's sarcophagus, Petrie says, *"It and all the other articles in this chamber are of the same quartzite sandstone as the chamber."*

[29] See my Mastaba 17 guide, pg 42-43

His view on the smaller sarcophagus;

Still the question of the second sarcophagus was unsolved; but it was distinctly an afterthought, built after the pyramid was built, when no larger blocks could be brought in, and yet before the death of Amenemhat III and his final interment. In the mass of blocks in the well chamber, however, a splendid table of offerings of alabaster was found (PI. V), and this was for the king's daughter, Ptahneferu----She seems to have died young, before her father, and to have been buried side by side with him in his pyramid."[30]

Below we have Petrie's description on clearing the burial chamber;

"While the men were clearing the ground outside I had the forced hole to the sepulchre enlarged a little, so that I could get in. There I spent three mornings in the water, searching the floor, besides employing three lads at it for some days. The chamber floor was covered with blocks, chips, and earth, which had fallen in; but the water was too deep to reach anything by the hand, and too salt and acrid to put eyes or nose beneath it. I therefore first cleared out the sarcophagi thoroughly, as they were shallower, and I could pick out everything by hand. And then the lads gradually picked up the stuff from the chamber, by shuffling it on to the broad blade of a native hoe with the foot, and so lifting up a little at a time. One on the sarcophagus then examined all that came up, and threw what was not wanted into the sarcophagi, so as to keep the sorted stuff from the unsorted. I promised half a piastre for every hieroglyph found, and a dollar for a cartouche. Within a day the cartouche was found on a bit of alabaster vase, Amenemhat III as I expected;"[31]

When it comes to the contents found inside the sarcophagi he says;

"I carefully cleared out all the chips and stuff from the sarcophagi, by groping under the water. I found some bits of bones, and much charcoal, showing the coffins had been burnt inside ; also grains of burnt diorite and granite, which were probably parts of inlaying of hard stones in the sarcophagi, as we found a beard of lapis lazuli for inlaying, among the rubbish in the chamber."[32]

[30] Kahun, Gurob and Hawara, Petrie, 1890, pg 8
[31] Ibid, pg 8
[32] Ibid. pg 17

Here Petrie describes the items found in the *sarcophagi*, but was the described items found in each sarcophagus, or is this a summation of what he found between the two? I do not know if Petrie retrieved these bone fragments, but if they exist in some store, and enough remains that could be tested, we might have a clearer idea that we have two distinct bodies and that one might be female. If we interpret Petrie's statement that both bones and coffin fragments were discovered in both sarcophagi, it would place a question mark on the other tomb ascribed to Ptahneferu that lay two kilometers to the south east of the Hawara pyramid. In the Wikipedia entry for Neferuptah (a variant spelling of Ptahneferu) it confidently states;

"A burial for her was prepared in the tomb of her father at Hawara. However, she was not buried there, but in a small pyramid at Hawara. Her tomb was intact in 1956 and still contained her jewellery, a granite sarcophagus, three silver vases and other objects."

It has been suggested by Farag Nagib who excavated the tomb of Neferuptah; *"Having died suddenly before preparing a special tomb for her, Princess Neferwptah was buried temporarily in the pyramid of her father Amenemhet III at Hawara. A special pyramid was later built for her, and the mummy of the princess and her coffins were put into another huge granite sarcophagus in the new burial place."*[33]

Though this other tomb is said to be intact, little evidence was found of human remains; Dr El-Batrawi examined the remains in the sarcophagus before their removal. In the same publication it states; *"He could not, however find any pieces or even tiny fragments of bones among these remains before touching them, neither during clearing out the contents of the sarcophagus nor in the debris which was all collected afterwards."*[34]

This lack of bone has been put down to the infiltration of water into the sarcophagus and its subsequent decomposition, the report states;

"Small fragments of skin could be collected from the debris. These fragments were analysed and showed the prescence of phosphorous, much ferric oxide, traces of calcium and much organic matter partly soluble in ethyl alcohol. Microscopic examination of these fragments showed the

[33] The Discovery of Neferwptah 1971, pg105
[34] Ibid, Chapter III

presence of epithelial cells, linen fibres and resinous matter. It is true that nothing of the bones could be found, but we believe that they disintegrated and escaped out of the sarcophagus. This may be objected to by the fact that the bones are more durable than the skin, and thus how can we explain the complete disappearance of the bones while few remains of the skin were preserved. This may be accounted for by the protective action of the resin or gum resin with which the linen bandages were stuck over the skin of the mummy. This is analogous to the fact that while the wooden parts of the coffins, boxes and staves had almost completely disappeared (except for tiny fragments), several fragments of the linen bandages of the mummy escaped complete destruction although linen is much more tender than wood."[35]

Further evidence to support remains, was water analysis that showed slight putrefaction, and that jewellery found inside the sarcophagus, such as anklets, bracelets, and neck collar were found in the correct positions. So we have two possible locations for the burial of Neferuptah, next to her father in Hawara or 2 kms away in a small pit covered with 7 large roofing stones that was covered with a mud brick superstructure, that has been suggested was a small pyramid. The ruinous nature of the site prevents us from knowing if any entrance passage led to this pit; indeed the impression from the report was that no passage could be traced in the surviving brick work and consequently; *"This shows that the princess was already dead before building her pyramid. She was buried in the burial chamber which was then closed with the huge limestone blocks and the pyramid completed without making a passage to the closed burial chamber since the mummy had been already put in it."*[36]

A option suggestion by Wolfram Grajetzki: *"The one within the pyramid of Amenemhat III at Hawara might have been a cenotaph or some kind of ritual burial; while the one found two kilometers away was the real one."*[37] In his paper he also mentions another option; *"Another option is that a burial was arranged in the tomb of her father, but he died earlier, and the pyramid was closed. According to this version, a new burial was then arranged for her at distance."*

[35] Ibid, pg 106-107
[36] Ibid , pg 106
[37] The two Burials of Neferuptak, Cahiers Caribeens d'Egyptolgie no 22 juin 2017, pg 36

We have a perplexing conundrum here; from Petrie's report he appears convinced that Ptahneferu was entombed with her father. His report on the contents of the sarcophagi is not clear; though I would think that if he found no burnt coffin or bone fragments in the smaller sarcophagus, he would have made this clear in his report. This suggests that he was confident that enough remains were in these sarcophagi to convince him that there were two burials in the chamber; and yet, how can this be, if remains are found 2 km's away?

Indeed, why was it thought necessary to bury her some considerable distance away? The make shift nature of the smaller sarcophagus, hints that she died before the king and that he was content to have her remains next to his, and the walls of his tomb damaged to accommodate it. If she died suddenly before a tomb was completed for her, could he not have stored her somewhere else until it was ready, somewhere easily accessible, until her tomb was ready. It seems strange to go to the trouble of maneuvering masonry pieces and wooden coffin through the passages as a temporary measure: the blending in of the paneled base also suggests a more permanent feature to blend in with the kings sarcophagi. Two canopic chests were found at Hawara, why was one of these not moved to the new location? Also, why was the offering table and bowls bearing her name not transferred? If the King was intent to have her remains carefully blended next to his empty sarcophagus; he must surely have thought that if he suddenly died, he would be buried next to her for eternity; if this was a concern to him, then he could have stored the body elsewhere.

The impression I get is that this was a permanent affair, if the king was content with having her remains next to him, why construct a second tomb so far away? The evidence seems to suggest two burials of people that shared the same name; so it was interesting to come across the following in the conclusions of Farag's report, he says;

"The name of Neferwptah mentioned in texts I and VIII did not, most probably, belong to her but belonged to another princess having the same name and was probably a daughter of Amenemhat I."[38]

This sharing of names is not an uncommon (we have four kings who had the name Amenemhat) feature in ancient Egypt, and therefore I feel it is another

[38] The Discovery of Neferwptah 1971, pg 105

option to place with the others in explaining the two tombs of Neferuptah. One other difference between the two tombs was that in Hawara, she bears the title 'king's daughter', whereas in the other tomb she holds additional titles, and her name is sometimes written in a cartouche. Grajetzki states;

"That might provide the impression that the burial within the pyramid of her father was arranged at some earlier stage of her life, before she received the other titles. However, another option might be simply that she received in the burial of her father only the title important for him stating her relation to him: 'king's daughter'. Her other titles were not significant in the burial chamber of the king."[39]

Amenemhat III had a lengthy reign of some 45 years, during which time it is possible that he had several children, with lengthy age gaps. One could imagine a younger sibling named Neferuptah who died young: subsequently he may have had another daughter and bestowed the same name on her. In such a scenario how would we ever know that he had two daughters sharing the same name, given the scant records from these distant times?

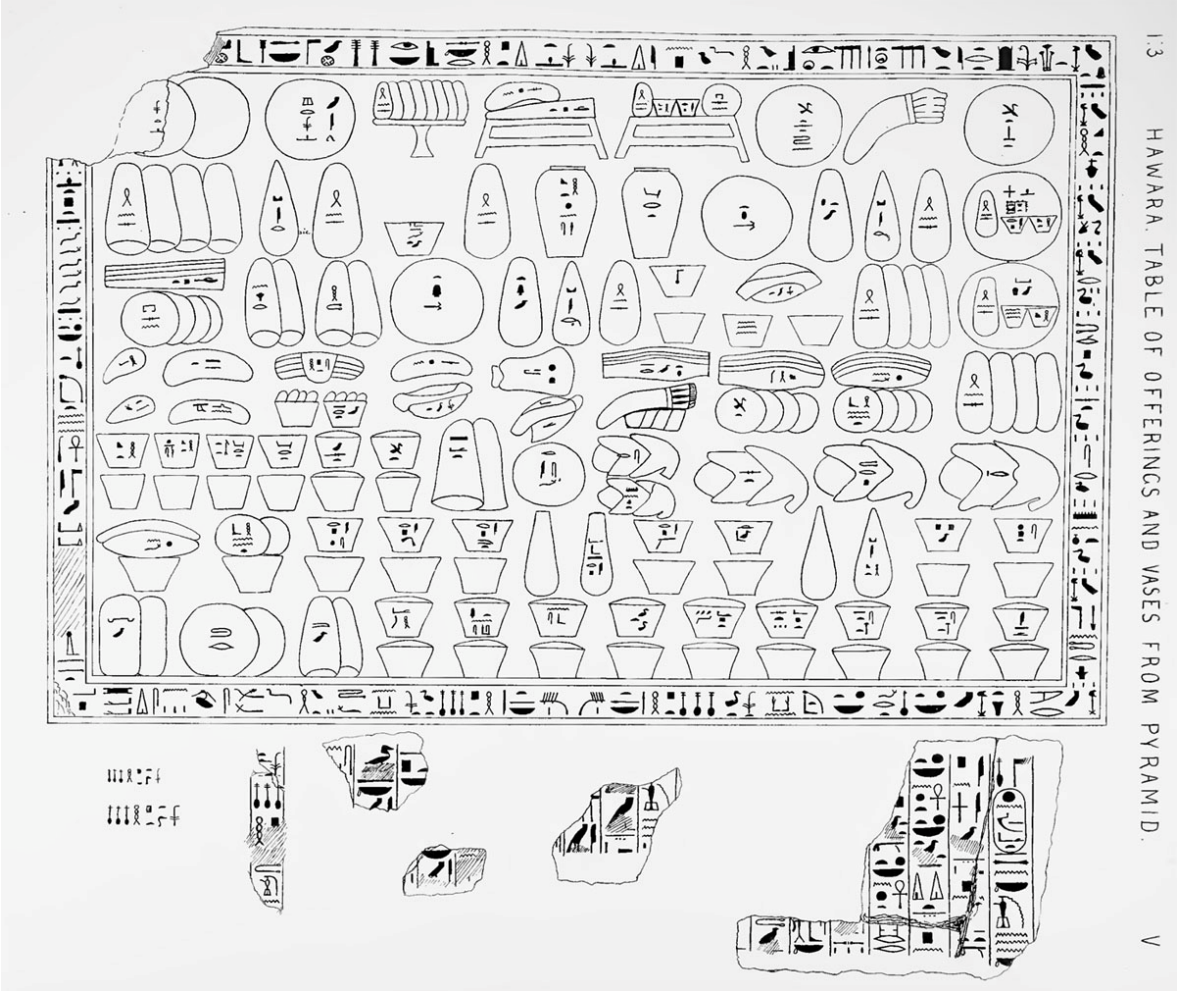
In the space between the sarcophagi and the chambers south wall stood two possible canopic chests, Petrie states;

"These coffers probably contained the funeral vases, of which the fragments were found among the rubbish in the chamber. All the pieces were closely searched for, but yet none of the vases could be completed, and of some only one or two fragments remain."

The intact chest was some 35.4 square and 33.3 high; with a slightly projecting foot some 10.3 high; its lid was 7.8 thick. The internal depth was 23.3, meaning the bottom was 0.3 if an inch below the foot. On the other chest Petrie just says;

"*One of these coffers had been broken up, and we took out all the fragments that we could move, and buried them in case they were wanted. M.Grebaut promised to have them fetched, and used to build a pedestal for the alabaster altar in the museum, as I urged him to do."*[40]

[39] The two Burials of Neferuptak, Cahiers Caribeens d'Egyptolgie no 22 juin 2017, pg 42
[40] Kahun, Gurob and Hawara, Petrie, 1890, pg 17



Above we have Petrie's drawing of Ptahneferu's alabaster offering table that was found in the well chamber; he would make the following observation:

"The most remarkable point about the inscriptions is the innovation of all the birds being without legs, though the leg hieroglyphs i, an*, and* b*, are not avoided. That the altar was so engraved not merely to save space or labour, is shown by the erasure of all the legs of the birds which had at first been engraved on the vase-inscriptions. Some mystical idea must, therefore, be attached to this remarkable change, a change which is quite unknown in later times."*

An offering table made of black granite was found in the other tomb ascribed to Ptahneferu, 2 km's away.[41]

[41] The Discovery of Neferwptah 1971, plate 6

'*This remarkable change'* as Petrie puts it, appears to have been introduced towards the end of Amenemhat's III reign; according to a study by Gianluca Miniaci,[42] as this form of incomplete hieroglyphs appears to be not present at Dahshur. It also appears distinct from the earlier practice of mutilating hieroglyphs that arose in the 6th dynasty, were certain animals were depicted as being pierced by knifes and decapitated. This new form of incomplete hieroglyphs, became fairly consistent till the mid 13th dynasty, and was eventually abandoned in the late 17th dynasty. The vase fragments that originally had the animal hieroglyphs whole, were subsequently altered; suggesting that this piece had been made in the earlier part of his reign, before the decision was taken to adopt the incomplete hieroglyphic system on funerary items, that offered some sort of magical protection.

The Super-Chamber

Petrie's super-chamber is basically a space that was left above the burial chamber, for the closing roof stone; the roof of this chamber he gives as +249.5 inches from his arbitrary zero (or 162.5 below pavement). This space was created by omitting some horizontal beams which spanned the width of the burial chamber and beyond the sandstone beams of the burial chamber. These horizontal beams were not in contact with the sandstone roofing beams, but rested on the masonry filling that surrounding the burial chamber, with the slanting beams resting on the haunches of these horizontal beams. Above the horizontal beams, we have a series of longitudinal beams that fill the space between the horizontal beams and the slanting beams; the bottom of some of these beams is in effect the roof of the super-chamber.

From Petrie's drawings and description it is not entirely clear how all these beams interact; his description:

"Above the sepulchre roof there is then, partly a very shallow space left between that and an upper roof of horizontal beams of limestone, and partly the super-chamber. But no pressure whatever bears upon the middle of the sandstone roof of the sepulchre, the beams above it being supported on blocks along the edges of the sandstone roof, and being so deep as to sustain their own weight and any pressure that may come on them. The super-chamber is roofed by longitudinal beams to support the great sloping roof. Above these double roofs then comes the third roof of the slanting beams of

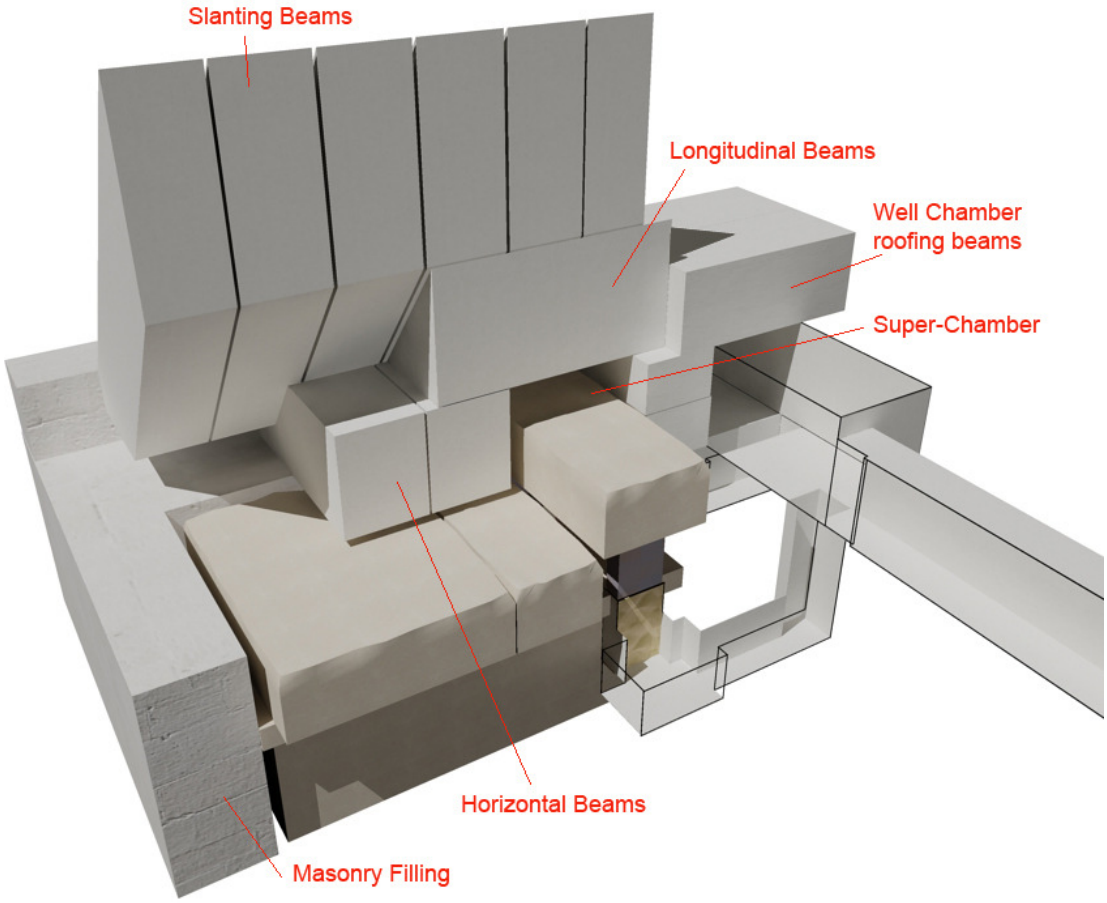
[42] The incomplete hieroglyphs system at the end of the middle kingdom, see academia.edu

limestone, the one which I cut through weighing about fifty-five tons. These beams are well dressed on the joints, and mortared together; along the outer edge the dressing ends in an even cut bevel edge, forming a beautifully straight side to the joint face, and beyond that the outer face of the stone projects roughly about a couple of inches. This pent roof rests on the masonry filling built up around the sepulchre, and the beams would therefore have tended to press against one another, unlike the earlier pyramids, in which the beams always act as cantilevers lying on the walls beneath them. But here such pressure was avoided by resting the beams on the haunches of the horizontal beams below them, thus tending to save those beams from the effect of their own weight; and in truth there need be here no thrust whatever, as the centre of gravity of the sloping beams is within—well within—the line of vertical support of the haunches of the horizontal beams on which they lie, which are again sustained by blocks from the sepulchre roof which rests on solid masonry. So here the pressure of the weight of the great cantilevers was ingeniously placed so as to tend to sustain the horizontal beams and chamber roof by putting weight on their haunches. The butting of the sloping beams was however well provided for, if it should be required, by a wall of fine stones between them and the side of the rock pit. And, as if to try and save even such a roof from pressure, an arch of brick, three feet in thickness, was thrown over the whole structure. The position of this arch, and the nature of the roof, was seen in my tunnelling into the chamber : and the dwarf wall of bricks laid in mud, which retained the sand and dust from falling into the rock pit during the building formed one side of my tunnel."[43]

A second branch from Petrie's tunnel would lead him to discover that the well chamber was roofed by *"enormous beams of horizontal roofing"*

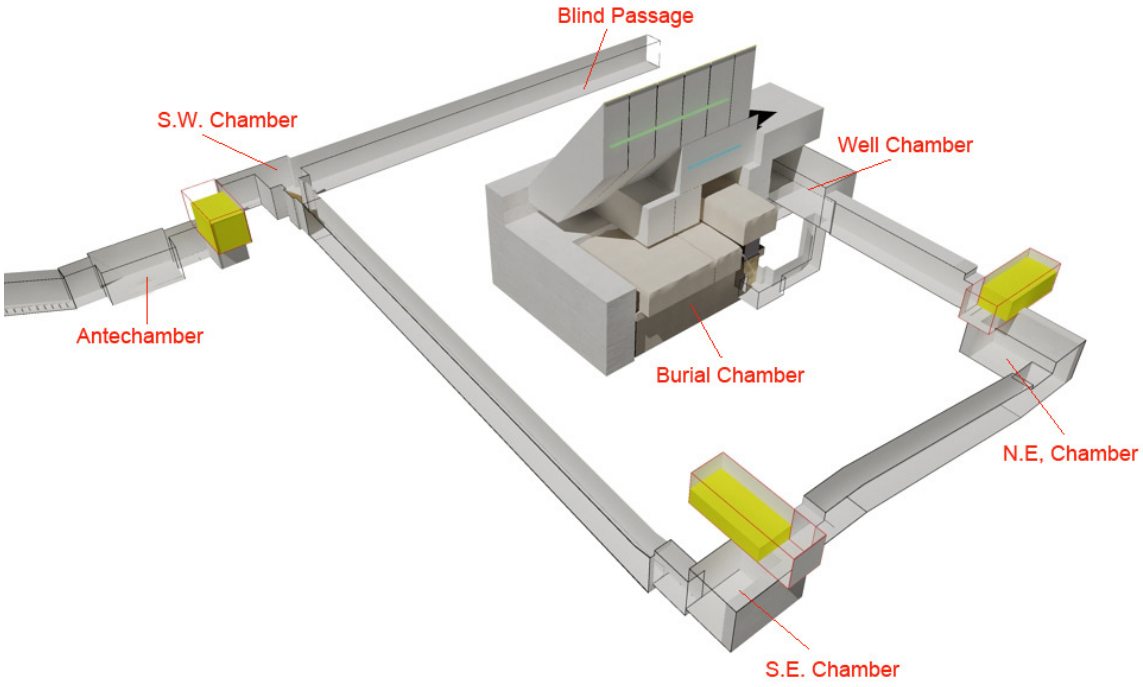
In the image overleaf, I have created a partial section of the possible roofing arrangement, and I have omitted some horizontal and longitudinal beams for clarity.

[43] Kahun, Gurob and Hawara, Petrie, 1890, pg 16



In this partial reconstruction, the horizontal beams rest on the masonry filling that surrounds the burial chamber. This shelf of masonry is slightly higher than the top of the three sandstone beams, so as no extra weight from the horizontal beams can bear down on the roof of the burial chamber. The total length of these horizontal beams is not known as they extend under the base of the slanting beams, which rest on them. From Petrie's scale drawing the horizontal base of the slanting beam is about 2.4 metres; if we assume that the horizontal beam extended half this amount, then total length of the beams would be about 9.0 metres. For comparison, the outside edge of the slanting beam from Petrie's drawing is also close to 9 metres.

The length of the longitudinal beams is also an unknown. In the image above I have assumed that its north end would rest on a ledge of the south wall of the well chamber. Above this massive masonry construction, we have mud brick laid in mud, which was protected by a brick arch: above this the brick was laid in sand.



This overview of the substructure gives a rough idea of the complex; the green line is approximately the pavement level, and the blue line is the water table level.

The Labyrinth

The fabled Labyrinth described by Strabo is believed to lie to the south of the Hawara pyramid. It is in such a ruinous state, that its form is hard to determine, Petrie would state;

"How far, then, will the remains at Hawara agree with the descriptions of the magnitude and importance of the labyrinth? We read of the enormous extent of the buildings, and of their exceeding in vastness all the temples of the Greeks put together, and that they even surpassed the pyramids. Of the beauty and magnificence of the work we cannot now judge, as almost every stone has long since been broken up and removed; but the extent of the area we can measure, as marked out by the immense bed of chips of fine white limestone which lies on the south of the pyramid. Wherever we dig down we find a bed of flat laid sand, or of beton made of chips of stone rammed down, on which to lay the pavement and walls of some enormous building, and over that lie thousands of tons of fragments of the destroyed walls; on tracing these signs to their limits it is found that they cover an area about

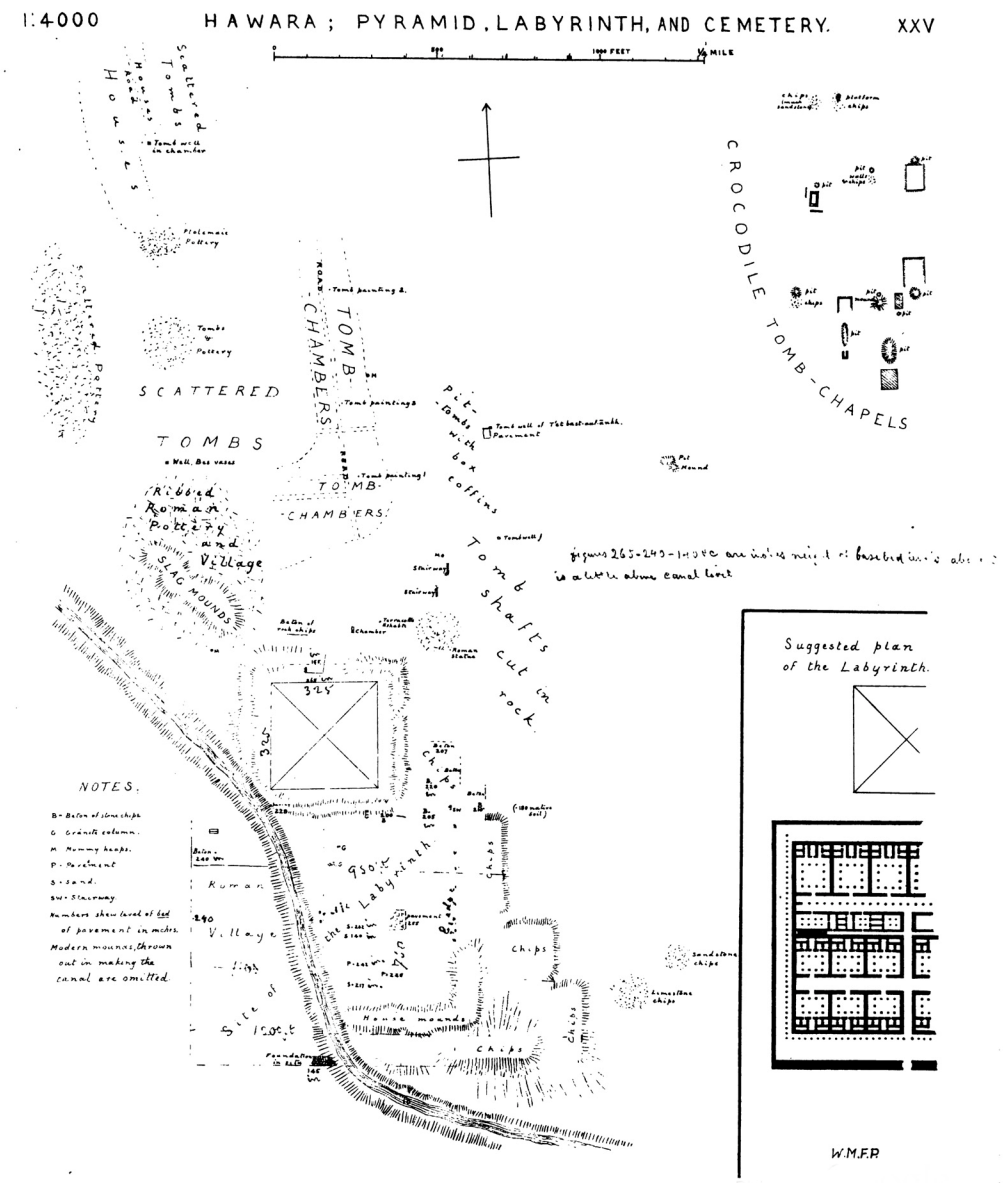
1000 feet long, and 800 feet broad. These mere figures will not signify readily to the mind the vast extent of construction; but when we compare it with the greatest of other Egyptian temples it may be somewhat realised. On that space could be erected the great hall of Karnak, and all the successive temples adjoining it, and the great court and pylons of it ; also the temple of Mut, and that of Khonsu, and that of Amenhotep III. at Karnak ; also the two great temples of Luxor ; and still there would be room for the whole of the Ramesseum. In short, all of the temples on the east of Thebes, and one of the largest on the west bank, might be placed together in the one area of the ruins at Hawara. Here we certainly have a site worthy of the renown which the labyrinth acquired."[44]

Looted of its fine stone, the labyrinth continued to be a quarry up to modern times, Petrie stated;

"Of the pavement the principal part to be seen is in the eastern half of the site; some years ago this covered a tolerable space, and perhaps some trace of walls might have aided us in recovering the plan. Unhappily, the engineers of the railway found the place, and steadily quarried it for stone, just as the barbarians of the Roman age had done here long before ; the last remains of the labyrinth were thus destroyed in our own time, and when an official of the Bulak Museum visited the place, he conveniently reported that this pavement of two different layers of stone was " native rock," so the quarriers had it their own way".

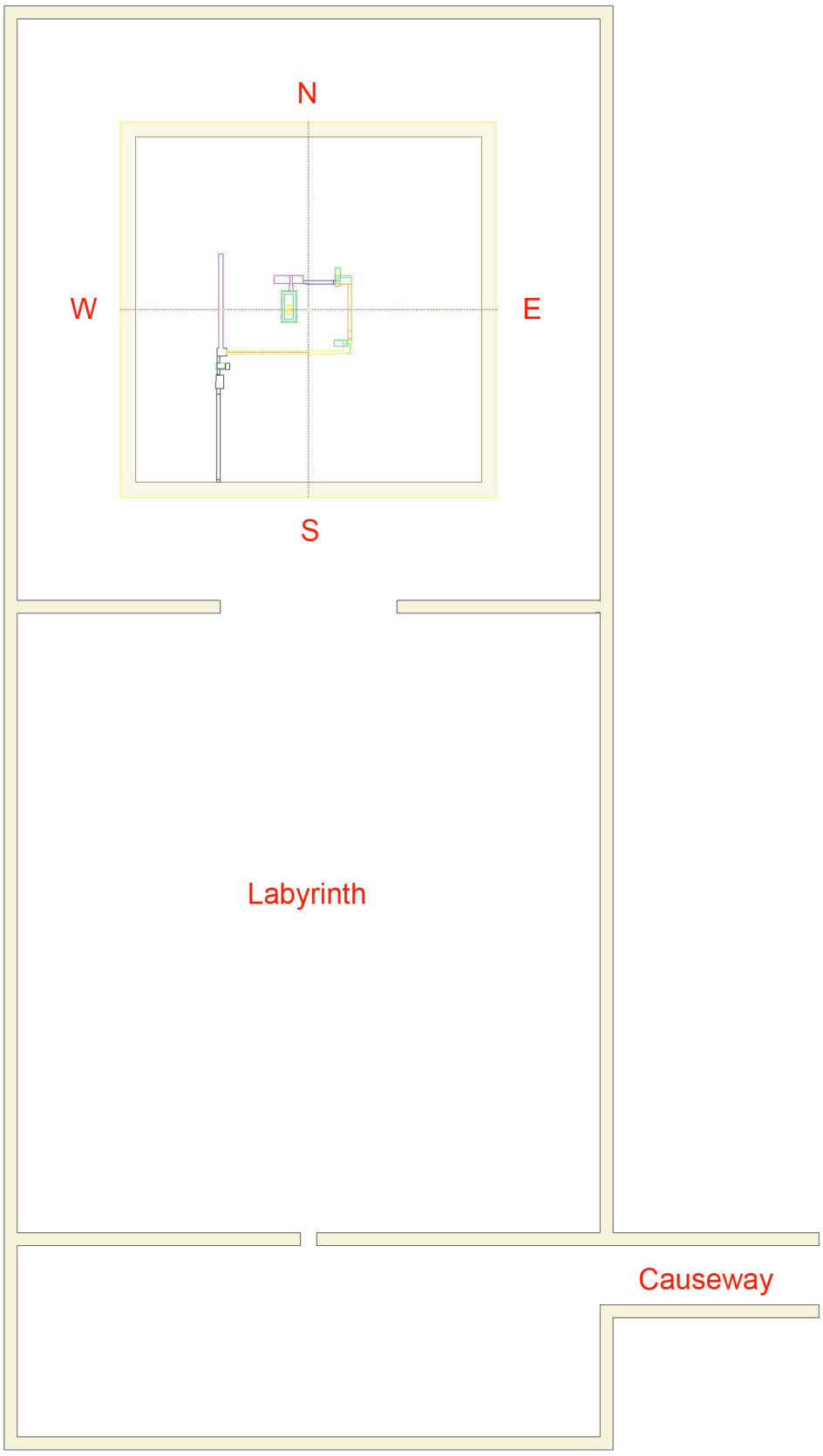
Petrie would attempt a reconstruction of the labyrinth on the scant clues available to him and his views can be found in the publications *Hawara, Biahmu, and Arsinoe, 1889,* and in *The Labyrinth, Gerzeh and Mazhuneh, 1912.* Both are freely available on the internet, should the reader care to delve further into the site.

[44] Hawara, Biahmu, and Arsinoe, 1889, pg 5



Above we have Petrie's map and partial reconstruction of the Labyrinth. Overleaf I have made a plan of the Hawara enclosure that Mark Lehner gives as 385 x 158m (1,263 x 518 ft), and similar to his plan.[45] I have not been able to locate the source of his information for this enclosure reconstruction; but there seems to be a conflict with Petrie's findings of the Labyrinths limits as 1000 x 800 feet. More confusion is apparent from the Mataha expedition of 2008; this Belgian Egyptian expedition did Geophysic surveys of the site, between 18th Feb – 12th Mar, and the results released by

[45] The Complete Pyramids 1997, pgs 181 & 183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Labyrinth
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the National Research Institute of Astronomy and Geophysics (NRIAG, Cairo) in August that year. A public lecture on the findings was held at Ghent University in October, which apparently resulted in Dr Zahi Hawass asking team members to stop communicating their results, and according to one report; *"intimidating the Mataha Expedition teams members with Egyptian National Security sanctions."*[46] The findings of the expedition suggest a lower layer of the labyrinth that may yet be intact, below Petrie's ruins.

Further GPR anomalies were displayed in a report by Dr Adam Szynkiewic[47]. The reader can search online for more information on these expeditions and good luck in trying to make sense of it all; to me it's as clear as the mud that resides in the water filled chambers of the pyramid.

Concluding Remarks

Given the conditions that Petrie worked in, some 120 years ago, he has done a fantastic job; yet more research is required, though unlikely due to the high water table. All we have to work on is around 9 pages of text that pertain to the pyramid itself. One can only hope that in the not too distant future that plans can be devised to save this pyramid for further research. Hopefully engineering solutions can be suggested to remove the water from the site, as well as the labyrinth to enable more research to be done. Such plans would undoubtedly be an expensive engineering project; that might require Unesco funding, though whether the Hawara pyramid is high enough up the food chain to warrant such intervention, given the competing pressures from other sites, is open to debate. Many questions remain open, that can probably only be answered by a more forensic investigation of the structure; lets hope that in the future the structure can be saved, and people can once again walk through its passages.

[46] https://issuu.com/yago1/docs/labyrinth_of_egypt_hawra_2015 Pg 5 of report
[47] hhttps://wisdomofnations.com/Egypt/hawara-research-2008-2009-report/
see also, VLF-EM study for archaeological investigation of the labyrinth mortuary temple complex at Hawara area, Egypt, by Mohamed Khalil et al. Available on researchgate.net