26 September 1914

A bad day at Sandfontein

The archaeology of a World War 1 battlefield in southern Namibia

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Namib Desert Archaeological Survey

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Brigadier General Sir Henry Lukin KCB CMG DSO

Chevalier Legion d'Honneur, Order of the Nile

and

Brilliant architect of his own defeat

EXECUTIVE SUMMARY

The Battle of Sandfontein on 26th September 1914 took place at the veritable "high noon" of British nationalistic patriotism, which was also the threshold of a new era of English and Boer in relation to a new adversary, Germany. Historical accounts of events at Sandfontein place much emphasis on the details of military strategy and political context, with little attention to the physical setting, the battlefield itself. This short study is an attempt to document the battlefield as it is today and link the evidence on the ground with the key documentary sources. The study places the German and South African antagonists that are identifiable from the sources in relation one to another on the ground. It reconstructs the disposition of the two forces, showing the effectiveness or otherwise of the South African defences using conventional archaeological approaches to map the concentration of German artillery fire and the rifle-fire from the South African defences. Systematic survey of the site indicates that much material evidence has been removed over the last century. However, there are promising possibilities for further research and these are sketched out in the conclusion of the report.

Table of Contents

INTRODUCTION

Background

The South African invasion of German South West Africa following the outbreak of World War 1 was a unique undertaking; it had far-reaching consequences for the territory that nearly a century later found independence as Namibia. This was the first successful campaign of the war carried out not by Britain but by the army of one of its dominions. The Union Defence Force, raised barely two years beforehand, was composed mainly of volunteers both English and Boer.[1] These men who had been bitter enemies in the Second Anglo Boer War little more than ten years before, were personally led by the South African premier, Louis Botha, a wily Boer general who faced down all critics by upholding his oath of allegiance to the British Crown.

Relying on their classic tactics, mounted Boer fighters, mobile and largely independent of cumbersome supply lines, quickly outmanoeuvred and overcame the German colonial army. Botha cleverly combined these strengths with the added facility of artillery, communications and engineering capacity provided by the more traditional British-style South African regiments under his command. It was not an easy campaign, for the German forces, though small in number, had fought a long series of local insurrections and knew the territory well. They were experienced and well-armed, in many ways an adversary quite equal to the Union Defence Force.

A force of nearly two and half thousand men under Brigadier General Sir Henry Lukin landed at Port Nolloth and reached the Orange River at Ramans Drift on 12th September 1914 after an arduous march from Steinkopf (Figure 1). Taking this and key adjacent crossings into German South West Africa, two hundred men of the 4th and 5th South African Mounted Rifles went forward to the wells at Sandfontein halfway to Warmbad, the first strategic objective of the invasion. Sandfontein lay deserted, and misconstruing this as a general retreat in the face of his superior force, Lukin failed to see that his German adversary Joachim von Heydebreck was about to spring a carefully laid trap. A campaign begun so auspiciously was to be crushed in a single day.

In the overall invasion history that developed after World War 1, the Sandfontein debacle struck a discordant note. Relegated to a mere footnote, it nonetheless continued to attract the interest of military historians. A considerable literature has been produced over the last

[1] The force of 327 that marched on Sandfontein in September 1914 was mainly English-speaking, with no more than 40 Afrikaans or Boer surnames listed, and none among the officer corps. This ratio was to change dramatically in the latter part of the campaign in German South West Africa.

one hundred years. Much of it deals with the wider political context of the Battle of Sandfontein; some focusses on the battle itself, but until now little attention has been paid to the actual site. The study presented here attempts to combine published accounts, unpublished reports and maps, and the material evidence of the site as a document in its own right, reflecting the events of 26th September 1914.

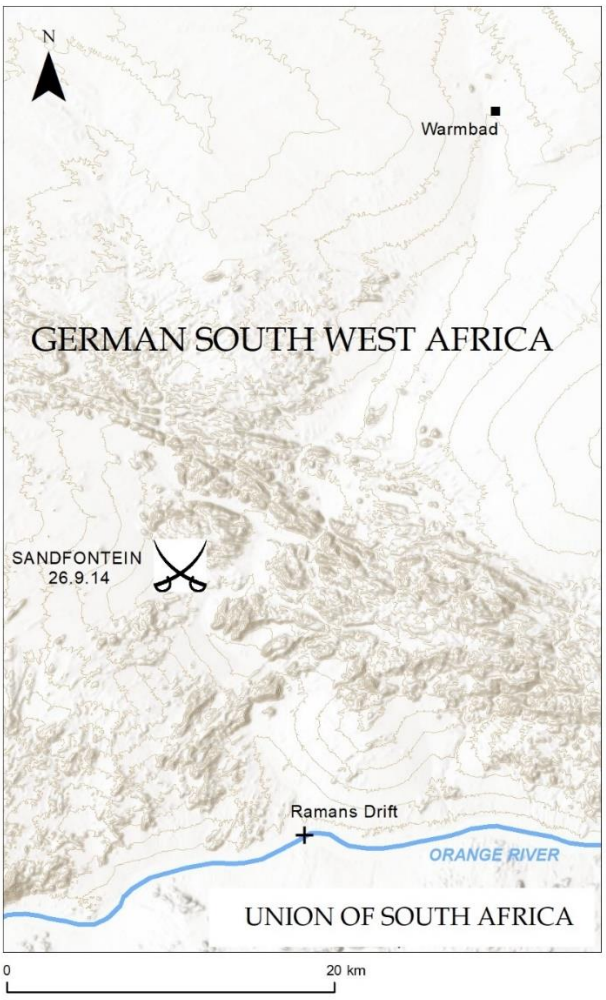

Figure 1: The location of Sandfontein in southern Namibia

Scope of this study

This study is based on a survey of the battlefield at Sandfontein to record the physical remains present there as a baseline for the conservation of the site as an important relic of Namibian history to be managed by the Sandfontein Lodge and Nature Reserve. In addition to the physical survey of the site the study was to provide an overview of available literature, both published and archival, relevant to the history of the site. In addition to the readily available sources, very helpful documents were provided by Mr & Mrs Adriaan Mulder of Sandfontein.

A detailed chronology of events as they unfolded during the approach from Ramans Drift and during the Battle of Sandfontein itself is set out in APPENDIX 1. Documentary references to these events are provided in the chronology and in the annotated bibliography presented in APPENDIX 2. The results of the field survey, with co-ordinate positions for each find are set out in APPENDIX 3. No materials were removed from the site save for a single iron ox-shoe taken to Windhoek for identification and to be returned to Sandfontein.

The field survey was carried out from 28th to 30th September 2024 and entailed detailed foot survey of the main Sandfontein kopje occupied by the Union Defence Force in 1914, its immediate surroundings and some of the positions occupied by the German colonial forces during their attack. All stone features including breastworks and sangars were mapped and photographed; the positions and inferred firing directions of all loopholes were recorded, as was the presence of expended cartridges. Particular attention was paid to the distribution of artillery shrapnel for purposes of comparison with accounts of the events during the Battle of Sandfontein.

Field survey data forms the baseline for future management of the site. This takes into account the need to present the site so as to provide an informative visitor experience that does not degrade the site. It is only under the present management of Sandfontein that access to the site is controlled and it is therefore necessary to take into account an entire century of souvenir hunting that has removed a great deal of important evidence. What remains is nonetheless worthy of conservation and serves as a unusual and relatively well-preserved illustration of military tactics as used during World War 1.

Outline of contents

The body of this report is in three parts, corresponding to successive stages in the chronology of the campaign and the localities in which these unfolded. Thus, the first part deals with the advance on Sandfontein, the second with the Battle of Sandfontein and the third with the aftermath of the battle. Each of the three parts sets out the events and the areas of concern, accompanied by maps, photographs and diagrams.

The first part covers the period of 12th to 25th September 1914. It commences with Lukin's forces occupying high ground on the northern (German) side of the Orange River at Ramans Drift, Homs River and Gudaus (Goodhouse), prior to the advance on Sandfontein. The report includes field survey data from previous studies undertaken along the Orange River[2]. The first part of the report covers the advance to Sandfontein by the Royal Engineers, their work on the construction of defences and the arrival of Col. Grant's column at the Sandfontein wells. This part also includes the southward movement of von Heydebreck's force and their move to block the defile to Homs Drift and the two routes to Ramans Drift.

The second and longest part concerns the events of 26th September 1914, commencing with Grant's discovery that the field telephone line to Ramans Drift had been cut. Thereafter, events moved quickly as the German attack developed at the Sandfontein kopje. This part attempts to reconstruct the successive phases of the attack and relate the positioning of German artillery under specific officers, to localities identified on the landscape. More detailed information exists for the disposition of UDF forces at the kopje and the positions as well as defensive structures occupied by specific officers in this force is identified and depicted on simplified maps. The second part concludes with the UDF surrender at 5:55pm that day.

The third and final part describes the aftermath of the Battle of Sandfontein, the neatly ordered, manicured graves of the fallen (White) soldiers, and the still uncertain location of

[2] J. Kinahan (2000) *A first approximation of archaeological site distributions in Namibia.* Commissioned by the Atlas of Namibia Projects, Directorate of Environment Affairs, Ministry of Environment & Tourism, Windhoek (QRS Job 15). J. Kinahan (2000) *A preliminary archaeological assessment of the lower Orange River*. Commissioned by Burmeister & Partners, Windhoek (Pty) Ltd. (QRS 40.). J. Kinahan (2003) Archaeological assessment of potential dam sites on the lower Orange River (Vioolsdrif and Komsberg), Commissioned by Burmeister & Partners (Namibia) on behalf of the Lower Orange River Management Study Consortium (QRS Job 49). J. Kinahan (2013) *Proposed run-of-the-river hydropower station near Onseepkans, Northern cape, South Africa.* Commissioned by Aurecon (Pty) Ltd. (QRS 195). J. Kinahan (2017) Archaeological assessment for the NVD Feasibility Study (on behalf of the Permanent Water Commission), Commissioned by AECOM – WCE JV (QRS Job 249).

the mass grave where the (African) horse-handlers and other workers were hurriedly interred. Correctly determining the position of the mass grave is one of several tasks for future work at the site. Another is the location of the peripheral German artillery positions which are still to be confirmed on the ground. The third part of the report ends with an outline of site conservation and management measures.

THE ADVANCE ON SANDFONTEIN: 12 – 25 SEPTEMBER

Occupation of Orange River crossing points

When Lukin's force reached the Orange River on 12th September they immediately moved to occupy the most strategically important river crossings. The 4th and 5th regiments of the South African Mounted Rifles (S.A.M.R.) under Dawson and Berrange respectively occupied the high ground on the northern side of the Orange at Ramans Drift and the mouth of the Homs River. Other elements of Lukin's 'A' force occupied Goodhouse (Gudaus). The stage was set for the advance on Sandfontein scheduled for 19th September. Figure 2 shows the location of the three crossing points on the Orange River in relation to archaeological and historical sites documented during previous surveys.

Much of the Orange River valley between Goodhouse and Homs Drift, a distance of approximately 40km, is typical narrow valley terrain, while the remaining half is typical broad valley terrain. The section between Goodhouse and Ramans Drift has well preserved silt terraces, with hummock dunes, as well as some gravel terrace and outwash fans. The narrow valley section is rather poor archaeologically, the area having been extensively disturbed by large-scale irrigation projects. However, the undisturbed terrain yielded only two archaeological sites, a drystone structure and an isolated burial cairn.

At Ramans Drift, the Orange River passes through a typical broad valley section, with wide expanses of silt and gravel terrace, and a well-developed outwash fan on the northern bank. At this point the river is accessible from both north and south, via wide sandy stream courses that served as wagon routes from the early eighteenth century and throughout the nineteenth century. Evidence of the historical importance of Ramans Drift is well preserved on both sides of the Orange River (Figure 3). On the northern side of the river the remains of a nineteenth century trading post include three large drystone enclosures, a small cemetery and a very extensive refuse dump with large quantities of bottle glass, iron barrel hooping, iron wagon tyres, harness pieces, wagon axles and other items. Nearby are several drystone

livestock enclosures. Overlooking the trading post is a fortified lookout point with loopholes, and a commanding view of the approaches from downstream and from both sides of the Orange River.

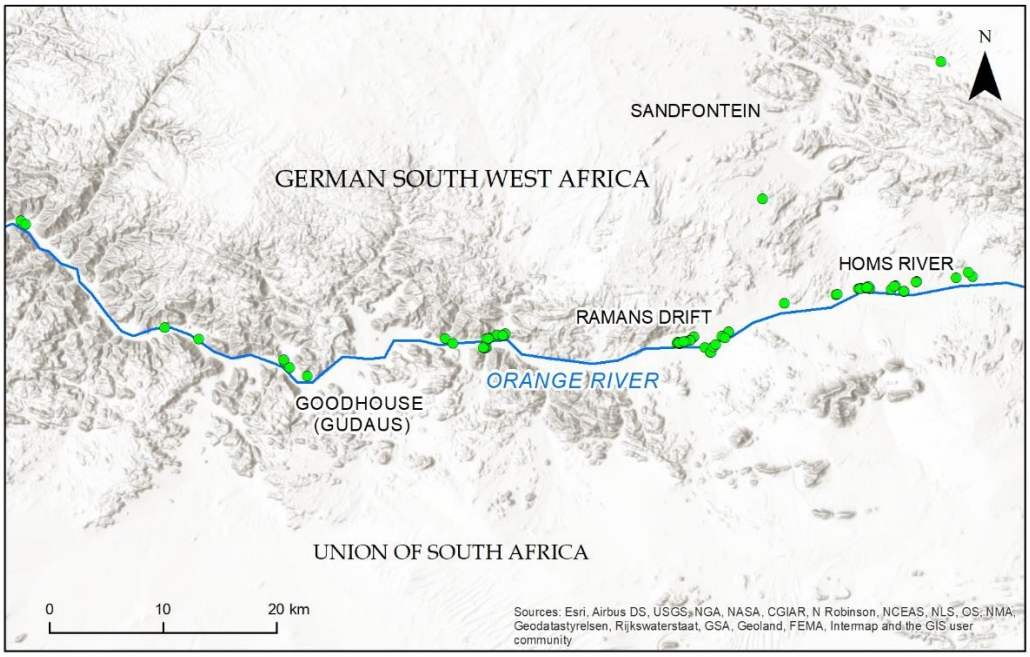

Figure 2: The Orange River valley showing Goodhouse (Gudaus), Ramans Drift and the mouth of the Homs River. Archaeological and historical sites documented during previous surveys are indicated as green dots.

At the end of the nineteenth century a German colonial police post was established at Ramans Drift. A number of mudbrick buildings were erected at the post and one of these is still standing, in a modified form. Near the police post is a German military cemetery containing twenty-three graves. All but four of the graves date from 1905 – 1907. The remaining graves date from 1914, or the outbreak of World War I. A cluster of ruined buildings on the southern bank of the river, almost immediately opposite the German post, is all that remains of a Cape Mounted Police post. The grave of a policeman who drowned at the site in 1908 indicates that border controls were in place at the drift before the outbreak of war. It is possible that the two posts were strengthened in 1914: a lookout point is visible on the summit of a prominent hilltop immediately to the north of the German post, and there is a corresponding fortification on the Cape side, occupying the crest of a slightly higher peak. These may have played some part in the events relating to the Battle of Sandfontein.

Upstream from Ramans Drift, the next section of broad valley terrain is at Gaidip, where access to the north is possible at a number of points. The ruins of nineteenth century mission buildings are still visible at both Gaidip and Homs River, five kilometres further upstream. A broad outwash fan and gravel terraces cover long stretches of the southern bank on this section. Narrow valley sections without access via tributary streams have low densities of archaeological sites. In contrast, the broad valley sections of the Orange River with access via tributary streams such as at Goodhouse, Ramans Drift and Homs Drift have significant densities of archaeological and historical sites which are well-preserved and relatively undisturbed. These sites include a total of 213 documented graves, an indication of their cultural and historical significance[3].

Figure 3: The Orange River valley looking west at Ramans Drift with historical drystone horse enclosures in the foreground

[3] J. Kinahan (2017) Archaeological assessment for the NVD Feasibility Study (on behalf of the Permanent Water Commission), Commissioned by AECOM – WCE JV (QRS Job 249).

Overnight march to Sandfontein

On 19th September 200 men of the 4th and 5th S.A.M.R. occupied Sandfontein, and five days later Capt. Turner Jones of the Royal Engineers arrived to inspect the defensive situation and begin constructing sangars and other fortifications at Sandfontein, accompanied by Capt. Genry with a staff of ten from Military Intelligence. A series of rapid developments ensued; Capt. Welby's 2nd squadron of the 1st S.A.M.R. relieved the 4th and 5th S.A.M.R. and Capt. Dawson arrived with a section of medical orderlies. By this time a field telephone line had been laid from Ramans Drift to Sandfontein. With these preparations in place Col. R.C. Grant, Officer Commanding 1st S.A.M.R. marched overnight to Sandfontein, reaching the wells early on the morning of 26th September.

At Sandfontein, Lieut. Cowley noticed columns of dust to the northeast in the direction of Warmbad, and the south-west. Von Heydebreck, with over 2000 men, had moved to block not only the route to the mouth of the Homs River, but also the route Grant had just travelled from Ramans Drift, cutting Sandfontein off. When Grant made to report his arrival, he found the telephone line had been cut: something was amiss. His troops had reached Sandfontein but their supply wagons could not reach them. In the interests of speed, they had carried almost no supplies on the night march. They had no food, and each trooper carried only his regulation supply of one hundred and twenty rounds Lee Enfield .303. The Transvaal Horse Artillery was equipped with two rapid firing 13 pounders under Lieut. Adler, and a machine gun section (two guns), all with limited ammunition supplies.

From the summit of the kopje, Grant and his Adjutant, Lieut. Wakefield, saw squadrons of German mounted troops approaching from the south. These were checked by volleys of rifle-fire but the Germans seemed to be closing in from all points of the compass. Patrols sent out to assess the threat quickly retreated and by mid-morning the UDF was effectively confined to the slopes of the kopje. The situation was about to become much worse, for the Germans brought four batteries of field artillery, 77mm mountain guns, to bear on the UDF defences from a range of between 1000 and 2500m. The UDF were completely outgunned, their two guns against twelve, but they managed to hold the Germans back for hours under a concentrated bombardment of between 2000 and 3000 shells. The artillery duel was to last until late afternoon when Col. Grant finally surrendered.

Description of fortifications

When the Royal Engineers – in advance of Grant's force- arrived to inspect the defensive situation and begin constructing sangars and other fortifications at Sandfontein, they would have found various structures already in place, including the wells, horse enclosures and the abandoned German police post. The route from Ramans Drift to Warmbad via Sandfontein had been in regular use for more than a century, by traders and missionaries (Figure 4). Anti-colonial conflict had raged up and down the Orange River valley between 1905 and 1907,[4] and several skirmishes took place at Sandfontein and Ramans Drift, most notably on 8th December 1905 when five German *Schutztruppen* were killed. Others died in ambushes or of their wounds while at Ramans Drift.[5]

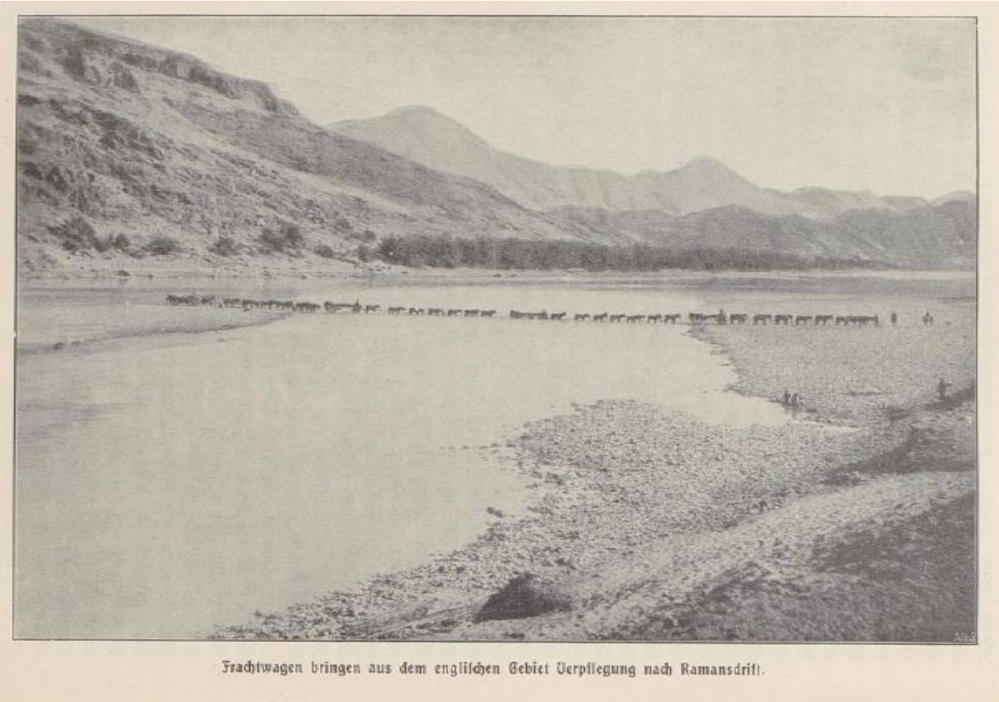

Figure 4: Ox-drawn wagons crossing into German South West Africa at Ramans Drift in 1905.

[4] Drechsler, H. 1980. *Let us die fighting: The struggle of the Herero and Nama against German imperialism*. London: Zed Press.

[5] *Die Kämpfe der Deutschen Truppen in Südwestafrika: der Hottentottenkrieg*, Preuβen, Groβer Generalstab, Berlin, 1907, ex Staats- und Universitätsbibliothek Bremen DFG-Projekt Digitale Sammlung Deutscher Kolonialismus.

In Figure 5 which shows the main structures on the Sandfontein kopje, those labelled as Grant's Command Post and the Spur Crest probably pre-date the UDF occupation in September 1915: these structures are rectangular and overlook the wells, and it is not likely that these could have been built in the short time prior to commencement of the battle. They were however essential to the UDF defences and Grant's Command Post in particular has firing loopholes in its walls.[6] Among the other structures, those labelled Outer NE and Inner NE are positioned to defend against an attack from the northeast, the direction of the German strongpoint at Warmbad. No attack was underway when the UDF arrived and so it is likely that the other defensive walling such as at NW Slopes and SW Spur were hurriedly thrown up as the German attack developed.

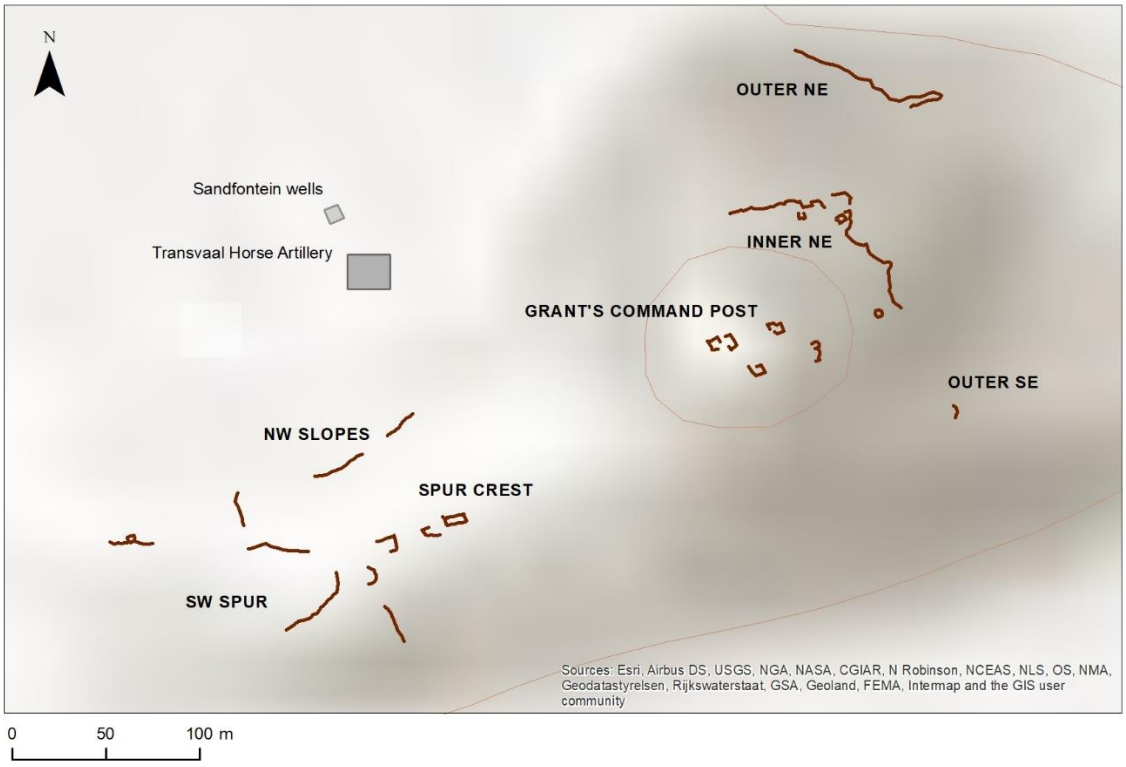

Figure 5: The main defensive and other structures on the Sandfontein kopje. Smaller firing positions and sangars are presented in other diagrams.

[6] These loopholes made to be used in a standing position are typical of German-era fortifications in Namibia and would tend to confirm that the structure pre-dates the UDF occupation of Sandfontein.

Figure 6 shows the cluster of rectangular structures identified as Grant's Command Post in the pinnacle of Sandfontein kopje. The same structures are seen in vertical view in Figure 7. Figure 8 shows the rectangular Spur Crest structures which probably also pre-date the Battle of Sandfontein.

Figure 6: Grant's Command Post on the pinnacle of Sandfontein kopje, seen from the west.

Figure 7: The structures at Grant's command post in vertical view. The central feature at bottom measures 5x5m

Figure 8: The rectangular Spur Crest structure measuring 4x9m which is built to overlook the wells probably pre-dates the Battle of Sandfontein. The remains of an artillery fragmentation shell are embedded in the ground at the building entrance, arrowed. The collapse of the top right wall may have been caused by this impact.

The defensive walling labelled Inner NE shown in Figure 9 is clearly intended to cover an attack from the northeast and it is likely that this and the walling further to the northeast and below labelled Outer NE in Figure 5 were constructed by the Royal Engineers on 25th September 1914. The Inner NE walling roughly follows the hill contour, while the Outer NE walling appears to provide a protective screen for movement between the wells and the defences on the hill.

Other defensive structures such as the SW Spur walling in Figure 5 might have been intended as a heavy machine gun position with the walling laid out as a field of fire (see Figure 10). The documentary record of the battle shows that machine gun positions were changed as the German attack developed but that these attracted determined artillery fire and were in due course abandoned. To compensate for the high profile of the Vickers .303 machine gun and provide some cover, the UDF gunners at Sandfontein constructed rectangular sangars rather than using the guns in exposed positions (Figures 11 and 12).

Figure 9: the Inner NE defensive line constructed by the Royal Engineers. The Outer NE defensive line lies below, near the foot of the kopje.

Figure 10: SW Spur walling with defined field of fire to the southwest from a heavy machine gun position located where the walls converge.

Figure 11: Defensive walling for Vickers heavy machine gun looking out over the northern approaches to the Transvaal Horse Artillery position at Sandfontein.

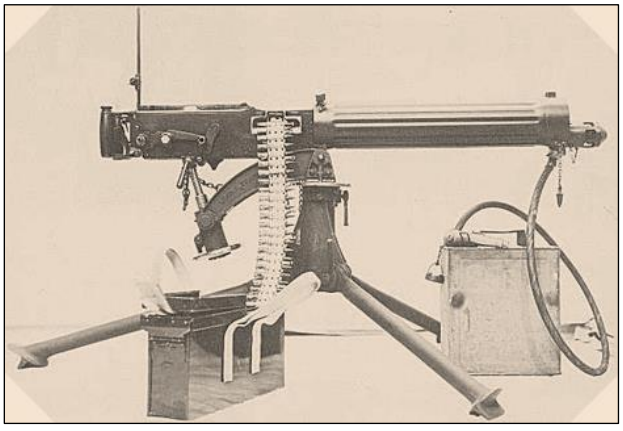

Figure 12: The water-cooled Vickers .303 heavy machine gun of the Mark 1 variant used at Sandfontein. The high tripod mount placed the gun crew in an exposed position if used in the open.

THE BATTLE OF SANDFONTEIN: 26 SEPTEMBER

Initial disposition and movement of forces

Col. Grant's column had barely arrived at the Sandfontein wells when they came under fire, and the attack was not just from the anticipated approach via Warmbad. At first, however, the northeastern side of the kopje was strongly defended by sections under Lieuts Gwatkin, Grahame, Clements, Cowley and Owen, primarily using the breastworks constructed by the Royal Engineers. Later, as the battle developed, this side of the hill was to attract far less attacking fire than the southwestern flanks, mainly due to the German fire directed at the two Transvaal Horse Artillery field guns.

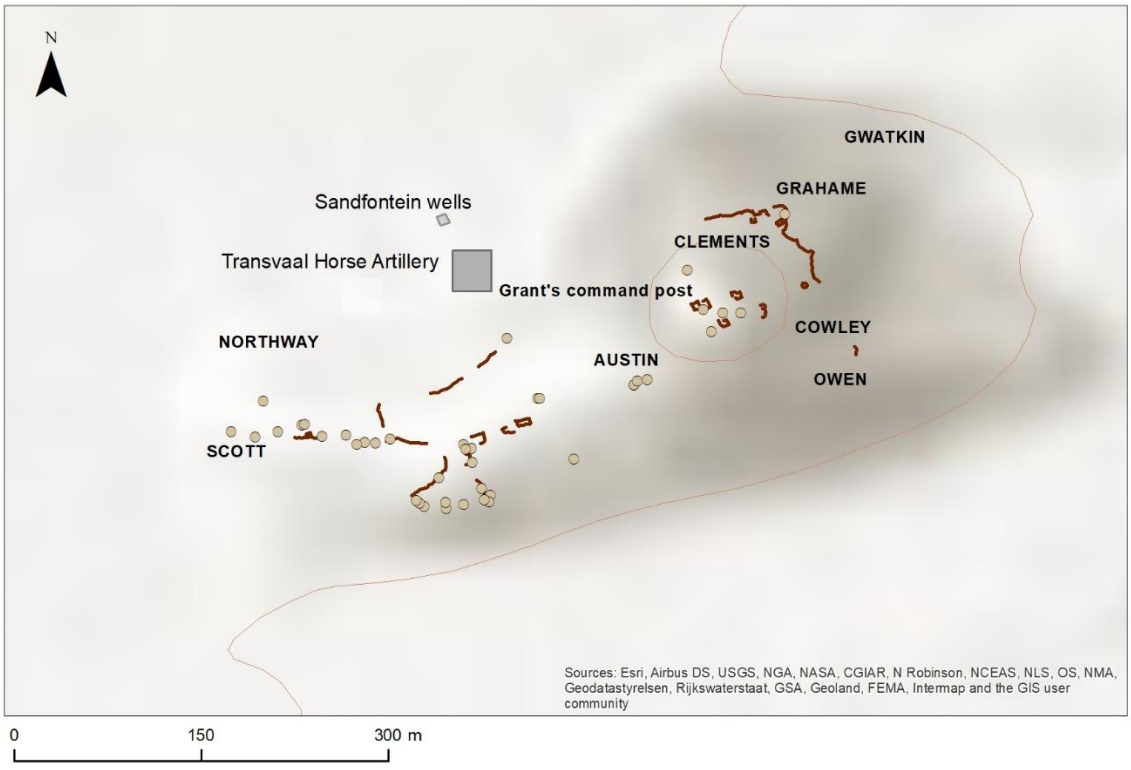

Figure 13: The initial defensive positions adopted by the UDF at Sandfontein. The main defensive structure are shown as heavy brown lines and the free-standing sangars and shooting positions as light brown circles.

With the UDF in these positions, the four German artillery batteries began what was to be an almost unbroken bombardment lasting until the eventual UDF surrender at the end of the day, showing that Lukin's misgivings were correct: Sandfontein was not defensible against artillery. The two Quick-firing 13 pounders of the Transvaal Horse Artillery (Figure 14) were unlimbered between the kopje and the horse enclosure (see Figure 13). It was not possible to excavate protective gun pits in the rocky ground and the two guns were operated throughout the engagement while completely exposed to enemy fire.

Figure 14: Quick-firing 13 pounder field gun of the type used by the Transvaal Horse Artillery at Sandfontein.

The positions of the German batteries are shown in Figure 15 and although they were for the most part concealed by uneven terrain, the UDF gunners found the correct range and the German guns were moved. The most distant German artillery fire was from over 2000m range, using percussion and time-fuse shells. Lieut. Adler in command of the UDF guns initially positioned himself as spotter on the Spur crest (see Figure 5) but came under fire and had to move down to the foot of the spur. The THA gunners scored a direct hit on the north westerly German battery, killing its commander Major von Rappard but were otherwise no match for the Germans. Von Rappard was in command of the northeastern German battery and he was probably killed just before 11am when that battery fell silent.

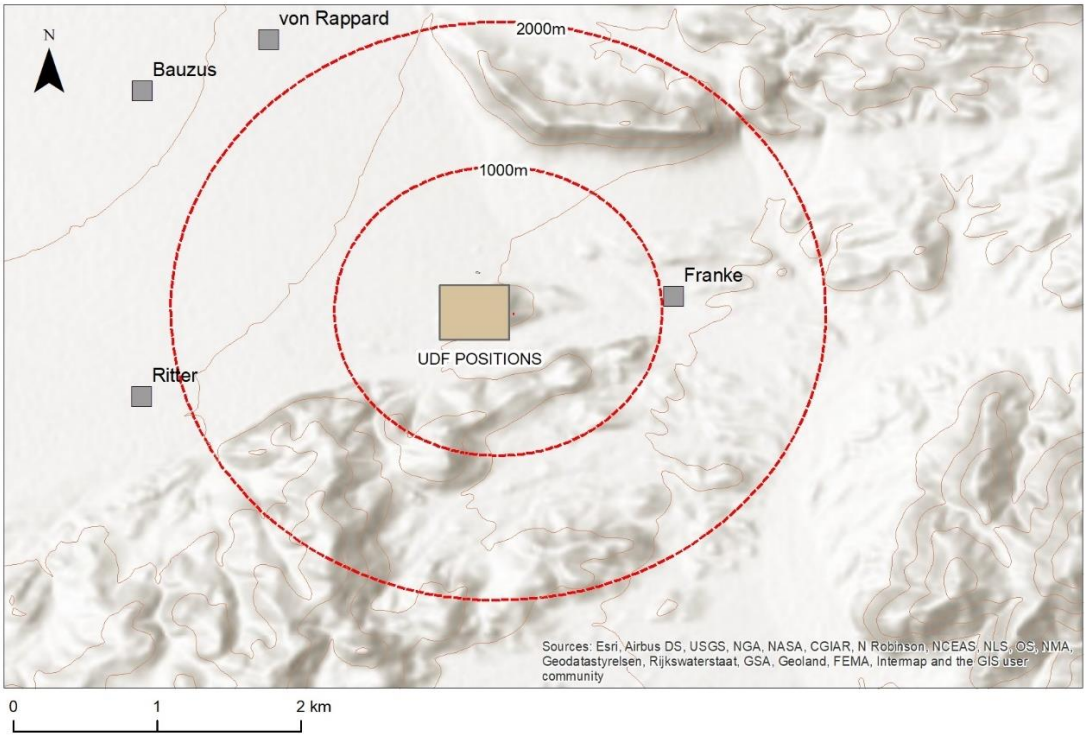

Figure 15: The UDF positions at Sandfontein in relation to the German field batteries under von Rappard, Bauzus, Ritter and Franke.

Evidence of artillery bombardment

Although they were ranged on the Sandfontein kopje from all sides except the high ridge to the south, the German artillery fire concentrated at first on the two Transvaal Horse Artillery guns. Several accounts of the battle mention the large number of shells fired by the German batteries, with estimates of between 2000 and 3000, such that at times the kopje was wreathed in smoke. It appears the German side assumed that the UDF artillery was being directed from the top of the kopje, or Grant's Command Post, rather than by Lieut. Adler who was at the guns.

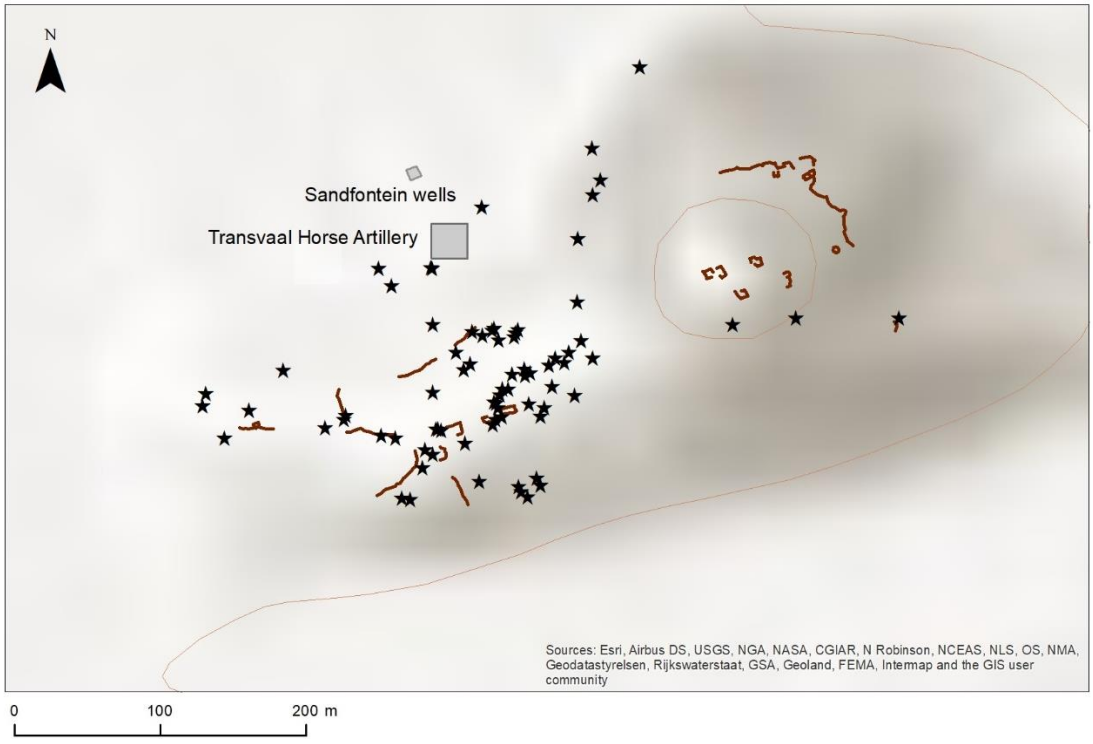

Figure 16: The position of the THA field guns and showing the distribution of shrapnel fragments on the site (black stars) and main defensive structures (brown).

The distribution of shrapnel fragments on the site is shown in Figure 16, where it is clear that most artillery fire was concentrated on the southwestern spur rather than the summit of the kopje. Almost no shrapnel was found on the summit or the eastern slopes, confirming that the German artillery was directed at the UDF field guns rather than the riflemen positioned elsewhere along the extended defences. However, although the distribution of shrapnel indicates the main target area, the amount of shrapnel is far less than would be expected from a sustained bombardment of thousands of shells aimed at this relatively small area.

This discrepancy between the number of shells reported as fired by the German batteries and the number of shrapnel fragments found on the site suggests that the volume of fire may have been overestimated. However, the site has been regularly visited by interested people over the last one hundred years and it is very likely that much shrapnel has been removed as souvenirs. Although apparently depleted in this way, the distribution of shrapnel fragments remaining on the site corroborates the documentary accounts that emphasize the high volume of fire directed at the UDF guns.

The likely loss of shrapnel fragments from the site due to souvenir collecting is paralleled by the very small quantity of Lee Enfield .303 cartridge cases representing defensive rifle-fire from the UDF positions. The documentary accounts suggest 200 rifles with each rifleman carrying a regulation 120 rounds. By the end of the day the UDF had almost exhausted their ammunition. Not counting the unknown quantity of .303 ammunition fired by the two Vickers heavy machine guns,[7] at least 24000 cartridge cases would have been left on the site. As it is, no more than seven .303 cartridge cases were found, with only two Lee Enfield ammunition clips.[8]

A total of 17 Mauser cartridge cases and four Mauser ammunition clips were found on the site, however, although no close quarters combat took place at the Battle of Sandfontein. These cartridges are head-stamped Spandau 1908, '09 and '10 and probably relate to the pre-World War 1 German presence at the site. The Mauser cartridge cases are concentrated on the southwestern spur of the kopje and the rectangular building on the Spur crest (see Figure 8). A number of broken early 20th century green glass beer bottle necks (Figure 17) found behind the south wall of the building is consistent with German-era military posts in Namibia.

Figure 17: Typical German-era green glass beer bottle necks from the pre-World War 1 occupation of Sandfontein.

[7] Vickers .303 heavy machinegun rate of fire was 450 – 500 rounds per minute.
[8] There is an unverified claim that 15000 rifle cartridges and 5000 machine gun rounds were captured after the UDF surrender at Sandfontein, suggesting that Grant's force was relatively well supplied.

Defensive fire from breastworks and sangars

Groups of German riflemen converged within a few hundred meters of the UDF defences over the course of the day. At first they were kept at bay by the concentrated fire of the two Vickers machineguns but these were eventually disabled by German artillery fire and the gun crews took up positions among the rough stone sangars and other defences. Snap-shooting by the UDF was effective in discouraging any closer advances by the Germans but raking artillery fire continued due to the fact that the Germans were unable to pinpoint the UDF firing positions.

Figure 18 shows that the main line of German attack was from the west and this corresponds with the orientation of UDF firing positions where this could be determined from loopholes in the defensive structures. With few exceptions the firing positions of the UDF riflemen were just above ground level. The contemporary accounts emphasize that the riflemen had to remain prone to avoid incoming fire from German riflemen, the defensive structures being quite low and with many gaps between the rocks used in their construction.

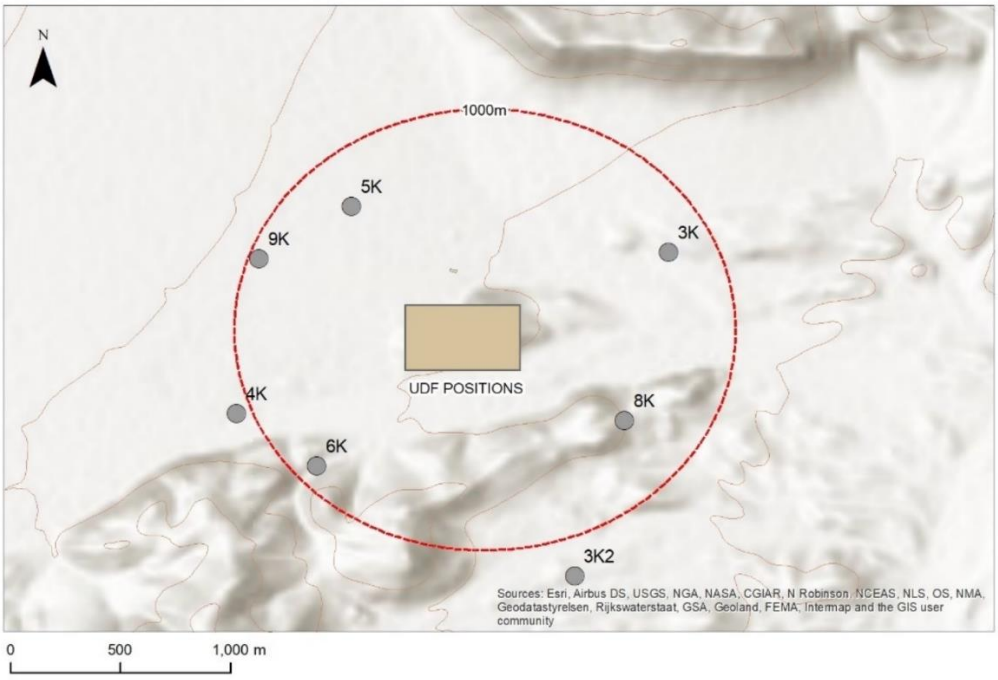

Figure 17: The UDF positions at Sandfontein in relation to converging groups of German riflemen.

Figure 18: Typical UDF rifle loophole. Note that the resting position is approximately 20cm above ground level.

A summary diagram of 117 UDF firing positions is presented in Figure 19. The firing direction was determined by compass and converted to local magnetic declination. These data show that while the defensive positions constricted on the eastern slopes of the kopje by the Royal Engineers had firing positions covering those approaches they could not simultaneously cover the western approaches. Figure 19 shows that the western approaches were in fact not even visible from the defensive positions on the eastern slopes. With the increasing intensity of the German attack on the Transvaal Horse Artillery field guns more firing positions were needed by the UDF on the western spur. Figure 19 shows that firing positions on the western spur were more numerous and that they covered the northern and southern approaches from that side. The focus of the German attack was clearly focused on the western approaches from an early stage in the Battle of Sandfontein, leaving the eastern defences if not redundant then certainly less important.

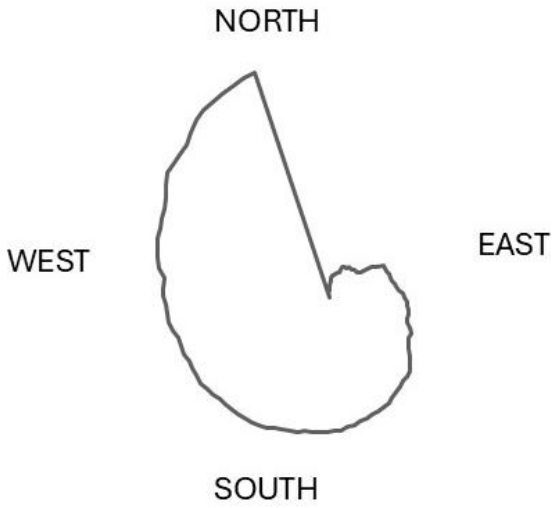

Figure 19: Radar diagram of UDF firing position orientations at Sandfontein, showing the concentration of fire from the western and southwestern slopes of the kopje.

During the morning, a German heavy machine gun fired on the horses and draught animals from a ridge to the east, killing several animals and native horse holders. Later, having at last silenced the Transvaal Horse Artillery guns, the German artillery turned their attention to the horses and mules in the adjacent enclosure. The horse-holders ran for cover but several were killed or wounded before they could reach safety. In leisurely fashion all of the approximately 300 animals were destroyed within two hours, either by direct hits from percussion shrapnel or several at a time by time-shrapnel.

The draught oxen had been moved to the riverbed south of the kopje but these too were shot by the Germans who were unable to pick off the UDF riflemen on the hillsides. One of the UDF firing positions overlooking the oxen was found to contain a number of iron half-shoes (Figure 20). These were available in sets of left and right for cloven hooves and commonly used on draught oxen.[9] Those at Sandfontein comprised six left and one right half-shoe, all unused. It is possible that these were in the possession of the man in charge of the animals

5. https://www.greatfallshistorymuseum.org/blog/ox-shoes; https://collection.powerhouse.com.au/object/246775; https://www.oskaloosa.com/news/local_news/artifact-of-the-week-ox-shoes/article_c3a8cad6-58f7-11e6-ad92-3711c8a630cb.html

and abandoned when the oxen were killed. The most likely role of the draught oxen might have been in drawing heavy wagons with ammunition for the quick-firing 13 pounders. Their different temperament would have dictated that they were not corralled with the horses and mules and so taken to the south side of the kopje.

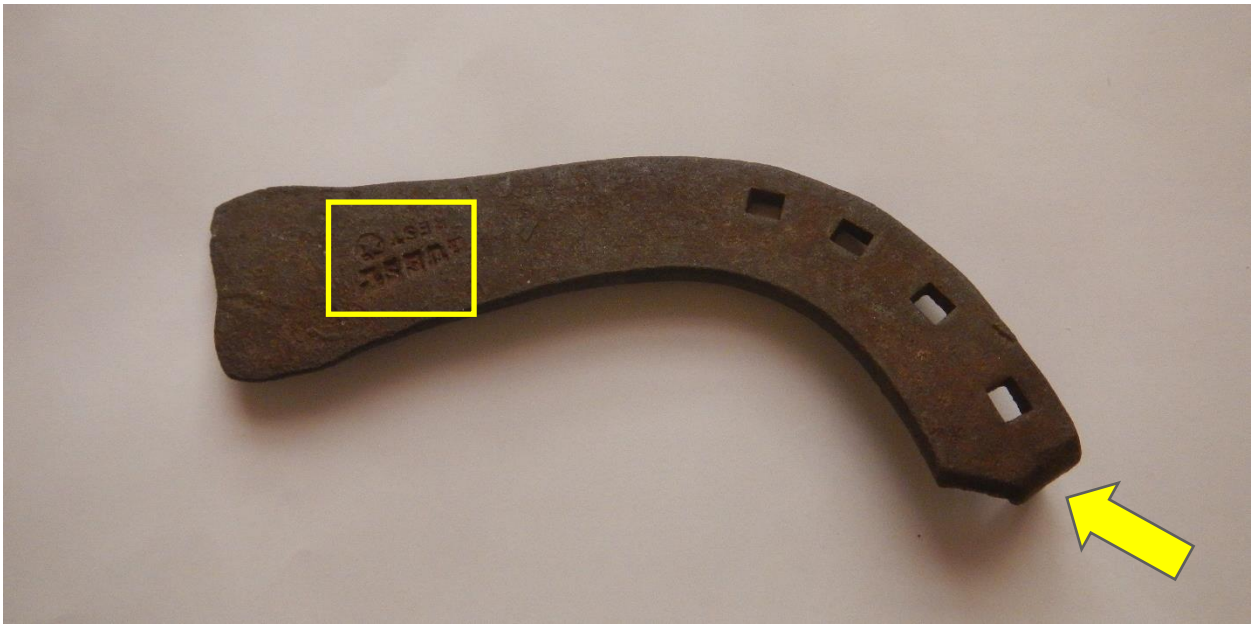

Figure 20: Iron draught ox half-shoe from Sandfontein. Inset shows manufacturer's stamp. Toe caulkin to ensure firm attachment of the shoe is arrowed.

AFTERMATH OF THE BATTLE: 27 SEPTEMBER

In the late morning one of the German batteries, probably that of Ritter, commenced firing from the southwest, with accompanying machinegun fire. The UDF medical orderlies and wounded took shelter in the horse enclosure. The Germans advanced under cover of heavy machinegun fire, wounding Col. Grant in the leg. UDF parties on outlying positions attempted to rejoin the main force at the kopje but those under Northway were killed as they retreated. The German 77mm mountain guns were brought to closer range and commenced a heavy bombardment of the kopje summit, wounding a further three UDF officers.

The situation was dire and although there was momentary relief at the sound of distant machinegun fire possibly from a relieving force, that soon died away. Deeming the situation quite hopeless the UDF raised a white flag on the summit of the kopje. The Battle of Sandfontein was over, after a full twelve hours of heavy fighting. German and South African servicemen converged on the wells to slake their thirst.[10] Several documentary sources note that Col von Heydebreck congratulated Col Grant on the valiant defence of the UDF, outnumbered 1500 rifles to 200 and outgunned with artillery pieces two to ten.

In the evening after the battle UDF prisoners, including Col Grant, were marched to Warmbad, officers having been provided with horses. A number of the wounded were allowed to return to Ramans Drift where they rejoined Lukin's force as it fell back to Steinkopf. The UDF prisoners were paraded through the streets of Windhoek, on their way to a prison camp at Tsumeb and later Fransfontein. German reports made much of what was to be a short-lived victory. Gen Botha's invasion force overran the German defence of the territory which fell into Allied hands on 9th July 1915.

Burial of UDF and German servicemen

In all, the UDF casualties were 67, with 16 killed or dying of wounds, as compared to 60 German casualties, with 14 killed. Von Heydebreck ordered that the UDF dead should be buried first, in a common grave with their German counterparts also in a common grave; he was anxious to retreat to Warmbad, for fear of a UDF attack. In 1922 the UDF dead were exhumed and moved to the military cemetery at Warmbad. A memorial to the dead stands

[10] Before their initial retreat from Sandfontein to lure the UDF into von Heydebreck's carefully laid trap, the Germans destroyed the well pumps and windlasses, and contaminated the water with several dead goats and dogs.

at Sandfontein on the edge of the German cemetery which is regularly tended by the German *Kriegsgräberfürsorge* group.

Possible location of mass grave

Large numbers of manual labourers were needed in military operations such as Lukin's invasion force which comprised a total of 3315 white men, 5 white female nurses and 653 black and coloured labourers. The latter included wagon drivers and horse handlers of which approximately 40 accompanied Col Grant's column advancing to Sandfontein. The 1912 Defence Act barred "persons not of European descent" from military service, except in non-combatant roles.

Black members of Lukin's force were not recognized as soldiers and for this reason as well as racial prejudice, could not be buried with the fallen white soldiers. As non-combatants the black wagon drivers and horse handlers should not have drawn the deliberate fire of the Germans. However, its does appear that they were pressed into service to carry ammunition to the two field guns and would have been targeted for this reason. Those who did remain with the horses were cut down in the concentrated fire directed at the horse enclosure.

Figure 21: A contemporary photograph of the horse enclosure with the wells to the left beneath the trees. The second stone enclosure at the large isolated tree still stands.

The number of dead among the black labourers at Sandfontein is not known, and neither is the exact location of the mass grave where they were interred. According to various accounts the mass grave was situated outside the northwestern corner of the horse enclosure. This has never been confirmed and the proximity of this spot to the wells makes it a questionable choice. An added consideration is that the location of the horse enclosure shifted over time, possibly to move the animals from parasite infested soil.

This area has seen some considerable changes in the last century. The horse enclosure that existed in 1914 is no longer to be seen and several new buildings have been erected on the northern side of the Sandfontein kopje. These include the lodge manager's house, a storage shed and an abattoir. A streambed adjacent to the foot-slope has a fairly shallow depth of soil, certainly less than 1m and probably inadequate for the mass burial reported. Slightly deeper soil is found on the northern side of the old horse enclosure site where an outwash fan extends towards the foot-slope. This may be the most likely place for the mass grave site.

Further research and suggested conservation measures

The correct location of the mass burial site is a priority to establish, particularly if any new building developments are planned in that vicinity. Ground penetrating radar, possibly accompanied by some limited test excavation should resolve the question of this site location.

The survey reported here investigated the eastern positions occupied by the German force under Franke's command. There are extensive remains of defensive structures in the area investigated and it would therefore be worthwhile to also cover the positions occupied by groups under von Rappard, Bauzus and Ritter, as well as the ground in between.

Outlying German positions such as at Alurisfontein and Kinderzitt where some of the German forces assembled before the Battle of Sandfontein need also to be investigated, and possibly sites used to ambush the UDF on the routes to and from Homs River and Ramans Drift.

A basic information poster or pamphlet for visitors could be based on this report with the addition of some contemporary archival photographs.

The present management of the site is exemplary. However, if visitors are permitted access without supervision it would be advisable to mark out a trail. Visitors should be cautioned about removal of material from the site and clambering on the (unstable) defensive structures.

APPENDIX 1: CHRONOLOGY OF THE BATTLE OF SANDFONTEIN, 26 SEPTEMBER 1914, from Scott 1916 unless otherwise stated. Checked against Ploeger's 1974 reproduction of Scott's account.

12.09.1914 4th and 5th regiments of S.A.M.R. under Dawson & Berrange respectively sent to Ramansdrift and Homsdrift to occupy high ground on northern side of the Orange (Ploeger 1974. The Action at Sandfontein *Scientia Militaria*, SA J of Military Studies 4(1): 35-60)

12.09.1914 Lukin's 'A' Force at the drifts at Homs, Ramans & Gudaus
(The battle at Sandfontein, 26 September 1914: SA military reform & the GSWA campaign, 1914-15, no author)

19.09.1914 4th & 5th S.A.M.R. (200 rifles) occupy wells at Sandfontein
As above; (Cruise 2015: 42, Louis Botha's War) on construction of sangars

24.09.1914 Capt Turner Jones Royal Engineers arrives to report on defensive capabilities and Capt Genry commanding Intelligence staff of 10
24.09.2024 Lukin (with headquarter) and Grant arrive at Ramansdrift. Telephone line set up. As above

24.09.1914 Capt. E.J. Welby 2nd squadron of 1st S.A.M.R relieves 4th & 5th SAMR

25.09.1914 am - pm Welby garrisoned at Sandfontein wells; sangars on koppie constructed by Royal Engineers Welby's guide was Bondelswarts leader Abraham Morris who found the exposed position at the wells absurd and disappeared overnight; 2nd squadron included Capt. T. Jones Royal Engineers As above; (Cruise 2015: 42, *Louis Botha's War*) on construction of sangars

25.09.1914 Capt. Dalton S.A.M.R. with medical orderlies at Sandfontein

25.09.1914 6:30 pm; 1- 3am Col. R.C. Grant (O.C. 1st S.A.M.R. leaves Ramansdrift for Sandfontein; off-saddle for rest 1 to 3 am but most troops on picket duty. No rations because the transport was to follow as soon as wagons had been loaded with provisions, escorted by 4th troop of S.A.M.R. under Lieut. G. Allen. THA with two 13-pounder quick firers (Lieut F.B. Adler); two machine guns 1st S.A.M.R. (Lieut. W.E. Butler); 3 troops of 3rd squadron 1st S.A.M.R. under Capt. P.E. Hale, & officers Lieuts D.G.S. Scott, F.B. Clements & W.G. Austin; a field ambulance (DSG Scott, the author of the official account; Ploeger 1974 Sandfontein.)

25.09.1914 later pm Lieut. Allen leaves Ramansdrift with rations, in number 122 excl. SA Medical Corps with field ambulance.

25.09.1914 at night German forces (2000+) march from Warmbad to Sandfontein to block the defile to Homsdrift & down the main road to straddle the 2 roads leading to Ramansdrift

26.09.1914 dawn Lieut. Cowley at Sandfontein notices columns of dust rising from hills to the NE and NW along main Warmbad road; patrols sent out to reconnoitre. Heydebreck with 2,000 troops occupying features around Sandfontein. 4 batteries of artillery and machine guns (Battle of Sandfontein, no author).

26.09.1914 7.30 am Grant's column arrives at the wells and line up to water animals, troops hungry, thirsty and exhausted.

7.30 am Telephone communication cut; Grant assumes command; desultory rifle fire heard; patrol under Sgt Spottiswood seen retiring in front of a superior number of mounted troops. Gwatkin and Clemens sent out to assist Spottiswood. (Battle of Sandfontein, no author).

7.45 am Grant & Adj. Lt. H.S. Wakefield on the summit of the kopje; 2 or 3 squadrons of mounted German troops pour out from the south behind the ridge hiding the road to Homsdrift onto the plain; German troops emerge from the direction of Warmbad.

Remainder of 2nd Squadron ordered into positions around the base of the main kopje (Cowley, Owen on eastern side, Grahame on northern face). Fire from these & from Clements & Gwatkin (on the north-east) checked German attack from NE. (Battle of Sandfontein, no author).

Clemens and Gwatkin withdrawn to man the northern face of the kopje: Gwatkin took up position in a stony outcrop at the foot; Clements occupied schantzes on an 'under feature'.

A troop (under Hale) earlier sent out to occupy a kopje overlooking the Ramansdrift road was recalled to take up position among sangar at the spur jutting out from the main kopje to the south-west (under Scott).

Remaining 3rd Squadron (under Austin) occupied the rest of the ridge overlooking the wells between Scott's troop and the kopje. German troops advance from the direction of Ramansdrift (from same direction as Grant had just come) on the wells (south-western face of the kopje). German troops advance from the northwest.

8.00 am THA guns unlimbered between walled enclosure and the main well, and between the main well and the kopje (western foot). Mule teams grouped against the northeast wall of the enclosure. Germans 4000 yds distant to SW. Situation tactically hopeless - entire force around the kopje, no offensive possible as the UDF troops were being attacked simultaneously from four different points (Battle of Sandfontein, no author).

Northway with 6 men retreats from the main Warmbad road (northwest), turning frequently to check the advancing Germans with rifle fire; large number of mounted German troops chasing him. Northway dismounts men in broken ground 500 yards from the western foot of the main kopje. Led horses sent to join the picket lines to the rear of the main well.

3rd patrol of 2nd Squadron (Barratt) retires from the southwest, is fired on in error but safely gets into main position.

8.00 am Main engagement begins with discharge to the southwest from the two UDF quick-firers, first 600 yds short, then on target (10 rounds). Germans open out and move to the right to shelter at the lower slopes of hills to the south. Artillery duel starts.

Discharge of guns from the hills on northeast (Lt Adler on low ridge overlooking guns); shrapnel explodes over building behind the UDF guns; guns in direct line of fire, native driver and mule hit.

Mules transferred to the other end of the enclosure. Sheltered by the northern slope of the kopje

Guns swung round to fire to the northeast. Adler descends to position near enclosure as northern slopes of kopje obscured German artillery position

Percussion and time fuse shells target enclosure (close to UDF guns) from 4,000 yds away concealed among hills to the northeast. Adler fires on northeast German guns over the concealing ridge.

Germans fire timed shrapnel directed at summit of kopje from the northeast. German riflemen develop the attack from the northeast.

UDF machine gun section under Lt Butler takes up position on a knoll southwest of the main kopje; Sgt Pizzey fires one gun at German riflemen attempting to cross an open space 1,000 yds away; gun and covering UDF rifle fire halt this advance and Germans retreat. Remaining gun under Lt Butler positioned in a sangar commanding the plain to the west and the Ramansdrift road. THA guns bring German fire to a temporary halt.

German artillery open fire; machine gun pack animals and horses retained on southern slope of the kopje away from fire from the northeast. Likely that there were draught oxen but these are not specifically mentioned.

8.30 am Second German battery started shelling from the northwest 3,000 yds away on the THA guns; THA guns fired at right angles to each other, engaging the batteries from the northeast and northwest, themselves exposed. German guns at first clearly visible then withdrawn behind a ridge; Western and northwestern faces of the kopje a deathtrap; position of horses and horse-holders precarious. (Battle of Sandfontein, no author).

First casualties among the gunners; SAMC orderlies doubled across the shrapnel swept area to get wounded men under cover of the wall of the enclosure. Adler gets the gun teams to where the remainder of the animals were grouped at the foot of the kopje.

German machine gun 800 yds away on the ridge to the east fired on the grouped animals and native horse-holders. These the draught animals and horse holders on the southern slope.

Natives abandoned animals and fled for cover on western face of the kopje; several were hit.

Majority of animals slaughtered by German gunfire; rest scattered in all directions to graze on the plain at the foot of the kopje in the crossfire.

Machine gun to the east directs search fire all over the southeastern slopes and the summit; Lt Owen wounded in the head and blinded.

9.00 am Pizzey's machine gun struck by a hail of bullets; gun upset to prevent its complete destruction. Tripod prevented concealment of the gun.

Continuous German machine gun fire from the east (at least two guns) making movement or control of fire difficult. Cover scattered, crude sangars 2 feet high loosely packed, not bullet proof.

Temporary halt in firing from the southwest over as parties of German troops emerge in skirmishing order from shelter of hills to the south within 500 yds. Stony outcrops, trees and bushes provide German riflemen with cover.

Lts Scott and Austin fire on skirmishers along with short bursts of machine gun fire from Butler whenever a target was visible.

10.00 - 10.30 am 50 German troops appear over a neck in the hills to the south descending to a watercourse at the foot; UDF fire wounds about 6, the rest take shelter in the watercourse and behind a knoll.

10.30 am Rifle fire ceases for about 3 hours but artillery duel continued without stopping.

10.30 am Shelling of the two UDF guns reaches a climax with a direct hit on gun under Harris; fire halted for a several minutes before reopening fire but ammunition nearly all expended. Harris killed, gun crew disabled; difficult to get more ammunition from little remaining in the wagons.

10.45 am Guns abandoned, remnant of men withdrew to the main kopje to continue defence with rifles. Adler disabled the guns so that they could not be used. If there had been gun-pits, they could have held out longer. Gun detachment had 50% casualties.

Machine gunfire from the southwest made the position of the medical corps with their wounded against the east wall of the enclosure untenable; removed all inside the enclosure through the gate which was nearby. Medical staff only a few yards from the guns - miraculously none hurt. They remained here for the rest of the day. The open space at the foot of the kopje deserted apart from the abandoned guns and ammunition wagons.

German battery to the northeast stopped firing.

German battery to the northwest directed fire on the horses and mules; horse holders ran for cover on the kopje, several being killed or wounded. Animals destroyed within two hours shelling, either direct hits by percussion shrapnel or 3 or 4 at a time by time-shrapnel. No cover except the 5 ft wall of the enclosure; a single building cover for max a dozen men. The majority of the animals huddled together, loose animals joining those secured to the picket lines. 200 dead animals lying within 50 square yds.

11:00 am German artillery detached from the northwest moved across the plain to the southwest. They crossed the Ramansdrift road and unlimbered on the plain at the foot of the hills to the south, 2,500 yds from the kopje, directing percussion and time fuse on the lower slopes of the main kopje and spur at its foot. German account 5 pm

12.00 pm German machine gun established along the Ramansdrift road. German advance resumes.

12.00 pm Grant wounded by machine gun fire from the south; Welby to take command.

1:00 pm Skirmishers within 600 yds of the kopje, adding rifle fire to artillery. Butler's machine gun was located and targeted. UDF riflemen lying at full length in the schanzes resorted to snap shooting between bursts of machine gun fire and held up the advance. Rifle attack from northeast and east continued under cover of machine gun fire. No shelling from the German battery on the northeast.

1:00 pm Two German guns to the southwest suddenly ceased firing. Distant machine gun fire to the south indicated the a relieving UDF force but sound grew fainter indicating the relieving force had been driven back. (Battle of Sandfontein, no author).

1.00-2 pm Lull in the fighting while Germans had midday meal and moved the two guns to the southwest into the centre of the plan due west of the kopje at 2,500 yds. UDF forces out of water, no provisions or shade.

2:00 pm German bombardment from northwest and west recommenced. Crude sangars not visible to artillery systematically raked the whole from end to end and top to bottom.

early pm Northway, fearing being cut off from main kopje, attempted to regain it with 3 men; all killed by machine gun fire.

2 - 5 pm Continuous shelling and machine gun fire from the west and northwest onto that side of the kopje. Shells in series of 4 or 6, percussion or time-fuse. Estimate of between 2 to 3,000 shells thrown during the course of the day; only 2 direct hits on sangars killing 2 men.

5:00 pm Situation critical: German troops had gained complete superiority of fire, and in thick firing lines within 300 yds of the kopje. Germans not assaulting with bayonet but still relying on artillery.

5.30-5.45 pm Germans advance mountain guns to within 1,200 yds of the northern face of the kopje and concentrated bombardment on the summit with high

explosive shell in salvoes of 4 , emitting flames and smoke and concealing the summit from those below. Rocks and boulders were flung in all directions and rolled down the slopes. Capts Turner-Jones & Geary wounded; Lt Wakefield wounded. Situation recognized to be hopeless; UDF men surrounded, had had no food or water, no hope of being relieved and had held on for 10 hours against an infinitly superior force.

5.55 pm UDF raised a white flag on the summit (German account 5 pm) (Battle of Sandfontein, no author).

After 6.00 pm Both forces dashed to the well at the foot of the kopje for water; Col. Von Heydenbracht congratulated Col. Grant for his excellent defence.

8.00 pm UDF prisoners marched into the interior under escort, officers provided with horses. Capts Holcroft & Dalton & Lt Cowley remained behind to look after the wounded.

27.09.1914 Dead buried, the British given the same honours as the Germans. UDF casualties 67; 16 killed or died of wounds; German casualties 60, 14 killed including Major von Rappard. Germans had ten guns, 4 machine guns and 1,500 rifles.

APPENDIX 2: ANNOTATED BIBLIOGRAPHY ON THE BATTLE OF SANDFONTEIN

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Sandfontein File A416, Ditsong Military History Museum. Box of information on the battle of Sandfontein found in the Military History Museum by Katz (2023). Also located in the Museum recently (the occasion of the 110th anniversary by museum curator Anzel Veldsman, tel. +27 78 726 0570.

[Wyndham, H.A.]. "History of the German South West Campaign." Draft history of the German South West Africa campaign presented to General Staff, Pretoria, I 9 1 6. According to 'Battle of Sandfontein', no author, Wyndham's was the first draft of the official history and omitted any mention of Sandfontein. Wyndham was appointed Chief Intelligence Officer on 21 September 1914. His report warning of several trainloads of troops travelling south from Keetmanshoop (sent by post) only reached Lukin on 7 October.

SAMR Box 1044 Sandfontein by Wyndham.

APPENDIX 3: SITE GAZETTEER

Site	Latitude	Longitude	Elev
QRS 362/0001	-28.709309	18.55158	1827
QRS 362/0002	-28.708304	18.552805	1824
QRS 362/0003	-28.709086	18.552414	1824
QRS 362/0004	-28.709027	18.552502	1826
QRS 362/0005	-28.708889	18.553393	1854
QRS 362/0006	-28.709059	18.553026	1847
QRS 362/0007	-28.709078	18.553009	1845
QRS 362/0008	-28.709102	18.553003	1849
QRS 362/0009	-28.70912	18.552908	1848
QRS 362/0010	-28.709069	18.552744	1836
QRS 362/0011	-28.709062	18.552869	1838
QRS 362/0012	-28.709052	18.552879	1840
QRS 362/0013	-28.709094	18.552806	1841
QRS 362/0014	-28.709159	18.552647	1843
QRS 362/0015	-28.709196	18.552646	1841
QRS 362/0016	-28.709198	18.552583	1844
QRS 362/0017	-28.709442	18.552501	1853
QRS 362/0018	-28.709332	18.552989	1862
QRS 362/0019	-28.709326	18.5531	1866
QRS 362/0020	-28.709342	18.553072	1862
QRS 362/0021	-28.709425	18.552968	1874
QRS 362/0022	-28.709511	18.552892	1885
QRS 362/0023	-28.709531	18.552879	1878
QRS 362/0024	-28.709539	18.552902	1882
QRS 362/0025	-28.709505	18.552878	1886
QRS 362/0026	-28.709612	18.552887	1889

QRS 362/0027	-28.709644	18.552872	1886
QRS 362/0028	-28.709585	18.552843	1895
QRS 362/0029	-28.709596	18.552926	1900
QRS 362/0030	-28.709517	18.553093	1890
QRS 362/0031	-28.709276	18.553219	1899
QRS 362/0032	-28.709262	18.553311	1904
QRS 362/0033	-28.709127	18.553414	1906
QRS 362/0034	-28.709464	18.553376	1893
QRS 362/0035	-28.70959	18.553166	1894
QRS 362/0036	-28.709539	18.553188	1888
QRS 362/0037	-28.709408	18.553238	1888
QRS 362/0038	-28.709758	18.552701	1894
QRS 362/0039	-28.709877	18.552431	1895
QRS 362/0040	-28.709826	18.5525	1909
QRS 362/0041	-28.709907	18.552438	1900
QRS 362/0042	-28.709799	18.552455	1891
QRS 362/0043	-28.710096	18.552309	1887
QRS 362/0044	-28.710104	18.552362	1888
QRS 362/0045	-28.709992	18.552788	1870
QRS 362/0046	-28.710024	18.55303	1864
QRS 362/0047	-28.710057	18.553045	1864
QRS 362/0048	-28.710086	18.553085	1854
QRS 362/0049	-28.710017	18.553165	1856
QRS 362/0050	-28.709972	18.553142	1866
QRS 362/0051	-28.709716	18.553121	1888
QRS 362/0052	-28.709712	18.553052	1893
QRS 362/0053	-28.709725	18.552272	1902
QRS 362/0054	-28.70967	18.552521	1904
QRS 362/0055	-28.709672	18.552535	1907

QRS 362/0056	-28.709678	18.552552	1907
QRS 362/0057	-28.709685	18.552577	1902
QRS 362/0058	-28.709711	18.552184	1897
QRS 362/0059	-28.709612	18.551953	1893
QRS 362/0060	-28.709588	18.551966	1885
QRS 362/0061	-28.709537	18.55191	1886
QRS 362/0062	-28.70961	18.551559	1899
QRS 362/0063	-28.709577	18.551365	1890
QRS 362/0064	-28.709591	18.550905	1895
QRS 362/0065	-28.709686	18.550926	1883
QRS 362/0066	-28.709715	18.55097	1893
QRS 362/0067	-28.709724	18.551218	1894
QRS 362/0068	-28.709707	18.551763	1899
QRS 362/0069	-28.709664	18.551836	1902
QRS 362/0070	-28.709657	18.551902	1906
QRS 362/0071	-28.708788	18.552246	1858
QRS 362/0072	-28.708682	18.552168	1852
QRS 362/0073	-28.707266	18.55382	1830
QRS 362/0074	-28.707321	18.553772	1831
QRS 362/0075	-28.707439	18.553778	1826
QRS 362/0076	-28.70794	18.553483	1852
QRS 362/0077	-28.708134	18.553535	1874
QRS 362/0078	-28.708228	18.553488	1878
QRS 362/0079	-28.708496	18.553397	1894
QRS 362/0080	-28.708959	18.554697	1999
QRS 362/0081	-28.708986	18.554739	1996
QRS 362/0082	-28.708972	18.554694	2002
QRS 362/0083	-28.709845	18.552595	1717
QRS 362/0084	-28.709839	18.552456	1714

QRS 362/0085	-28.709785	18.552414	1717
QRS 362/0086	-28.709773	18.552509	1718
QRS 362/0087	-28.709718	18.552532	1712
QRS 362/0088	-28.709744	18.552587	1715
QRS 362/0089	-28.70975	18.552547	1707
QRS 362/0090	-28.70966	18.552625	1708
QRS 362/0091	-28.709621	18.552738	1707
QRS 362/0092	-28.709584	18.552816	1708
QRS 362/0093	-28.709603	18.552844	1707
QRS 362/0094	-28.709541	18.552919	1700
QRS 362/0095	-28.709477	18.55309	1696
QRS 362/0096	-28.709385	18.553064	1693
QRS 362/0097	-28.709267	18.552732	1687
QRS 362/0098	-28.709386	18.553077	1705
QRS 362/0099	-28.709366	18.553239	1702
QRS 362/0100	-28.709326	18.553325	1700
QRS 362/0101	-28.709326	18.553323	1711
QRS 362/0102	-28.709825	18.553325	1682
QRS 362/0103	-28.709679	18.552985	1709
QRS 362/0104	-28.710036	18.552662	1686
QRS 362/0105	-28.710082	18.552724	1686
QRS 362/0106	-28.710131	18.552715	1687
QRS 362/0107	-28.710117	18.552678	1690
QRS 362/0108	-28.710122	18.552657	1692
QRS 362/0109	-28.710125	18.552613	1696
QRS 362/0110	-28.71015	18.552532	1699
QRS 362/0111	-28.710181	18.552406	1703
QRS 362/0112	-28.710136	18.552402	1706
QRS 362/0113	-28.710166	18.552246	1707

QRS 362/0114	-28.710139	18.552215	1702
QRS 362/0115	-28.710123	18.552189	1698
QRS 362/0116	-28.710031	18.552236	1702
QRS 362/0117	-28.709958	18.552352	1706
QRS 362/0118	-28.709734	18.552254	1706
QRS 362/0119	-28.709721	18.552136	1707
QRS 362/0120	-28.709707	18.552095	1704
QRS 362/0121	-28.709677	18.552002	1707
QRS 362/0122	-28.709702	18.551964	1703
QRS 362/0123	-28.709588	18.551968	1705
QRS 362/0124	-28.709482	18.551944	1701
QRS 362/0125	-28.709469	18.551981	1699
QRS 362/0126	-28.709386	18.551942	1700
QRS 362/0127	-28.709408	18.552034	1702
QRS 362/0128	-28.709703	18.551816	1712
QRS 362/0129	-28.709707	18.551895	1706
QRS 362/0130	-28.709718	18.55176	1708
QRS 362/0131	-28.70965	18.551684	1704
QRS 362/0132	-28.709584	18.551718	1708
QRS 362/0133	-28.709648	18.551638	1710
QRS 362/0134	-28.709771	18.551597	1706
QRS 362/0135	-28.709661	18.551512	1712
QRS 362/0136	-28.709664	18.55144	1711
QRS 362/0137	-28.709571	18.551383	1706
QRS 362/0138	-28.709634	18.551289	1713
QRS 362/0139	-28.709631	18.551263	1711
QRS 362/0140	-28.709626	18.551195	1708
QRS 362/0141	-28.70977	18.55134	1706
QRS 362/0142	-28.709749	18.551294	1705

QRS 362/0143	-28.709742	18.551278	1705
QRS 362/0144	-28.709663	18.551029	1713
QRS 362/0145	-28.709705	18.550977	1704
QRS 362/0146	-28.709624	18.550856	1699
QRS 362/0147	-28.70953	18.550907	1700
QRS 362/0148	-28.709343	18.550855	1687
QRS 362/0149	-28.709406	18.551086	1693
QRS 362/0150	-28.709453	18.551102	1698
QRS 362/0151	-28.709526	18.551084	1696
QRS 362/0152	-28.709571	18.551121	1698
QRS 362/0153	-28.70958	18.551101	1699
QRS 362/0154	-28.709328	18.552396	1698
QRS 362/0155	-28.709237	18.552601	1698
QRS 362/0156	-28.709303	18.552694	1707
QRS 362/0157	-28.709415	18.552802	1716
QRS 362/0158	-28.70916	18.552692	1698
QRS 362/0159	-28.709015	18.552809	1695
QRS 362/0160	-28.708979	18.55283	1696
QRS 362/0161	-28.708952	18.552845	1698
QRS 362/0162	-28.708966	18.552943	1698
QRS 362/0163	-28.708984	18.55252	1687
QRS 362/0164	-28.708677	18.552491	1668
QRS 362/0165	-28.70868	18.552497	1671
QRS 362/0166	-28.705307	18.559967	1601
QRS 362/0167	-28.705143	18.559832	1601
QRS 362/0168	-28.705154	18.559784	1598
QRS 362/0169	-28.705055	18.559936	1601
QRS 362/0170	-28.70503	18.56013	1606
QRS 362/0171	-28.705052	18.56024	1605

QRS 362/0172	-28.705566	18.560068	1587
QRS 362/0173	-28.705059	18.56023	1603
QRS 362/0174	-28.704363	18.560983	1568
QRS 362/0175	-28.704672	18.561541	1586
QRS 362/0176	-28.704777	18.56186	1595
QRS 362/0177	-28.704779	18.561903	1590
QRS 362/0178	-28.70478	18.561936	1598
QRS 362/0179	-28.704782	18.561966	1592
QRS 362/0180	-28.704773	18.561998	1592
QRS 362/0181	-28.704776	18.562047	1591
QRS 362/0182	-28.704558	18.56208	1569
QRS 362/0183	-28.70452	18.562029	1569
QRS 362/0184	-28.704521	18.561946	1572
QRS 362/0185	-28.704435	18.561724	1570
QRS 362/0186	-28.704411	18.561605	1570
QRS 362/0187	-28.708038	18.552412	1465
QRS 362/0188	-28.707438	18.553148	1450
QRS 362/0189	-28.707532	18.553218	1450
QRS 362/0190	-28.707121	18.553459	1444
QRS 362/0191	-28.707251	18.553614	1443
QRS 362/0192	-28.707322	18.554591	1459
QRS 362/0193	-28.707526	18.555275	1494
QRS 362/0194	-28.708114	18.555154	1548
QRS 362/0195	-28.708058	18.554845	1583
QRS 362/0196	-28.708101	18.554832	1584
QRS 362/0197	-28.708031	18.554707	1585
QRS 362/0198	-28.708079	18.554602	1593
QRS 362/0199	-28.708049	18.554501	1599
QRS 362/0200	-28.708077	18.554331	1608

QRS 362/0201	-28.708182	18.554496	1611
QRS 362/0202	-28.707976	18.554862	1578
QRS 362/0203	-28.708216	18.554945	1587
QRS 362/0204	-28.708303	18.55504	1588
QRS 362/0205	-28.708506	18.555075	1600
QRS 362/0206	-28.708535	18.555058	1602
QRS 362/0207	-28.708551	18.555017	1605
QRS 362/0208	-28.708769	18.555289	1576
QRS 362/0209	-28.7088	18.555311	1571
QRS 362/0210	-28.708986	18.555377	1564
QRS 362/0211	-28.709146	18.555277	1570
QRS 362/0212	-28.709166	18.555254	1571
QRS 362/0213	-28.709057	18.555028	1585
QRS 362/0214	-28.7092	18.554858	1595
QRS 362/0215	-28.708903	18.554317	1675
QRS 362/0216	-28.708813	18.554417	1683
QRS 362/0217	-28.708771	18.554398	1684
QRS 362/0218	-28.708678	18.554264	1689
QRS 362/0219	-28.708676	18.554211	1690
QRS 362/0220	-28.708707	18.554388	1688
QRS 362/0221	-28.70877	18.554528	1682
QRS 362/0222	-28.708834	18.554599	1676
QRS 362/0223	-28.708806	18.554637	1672
QRS 362/0224	-28.708745	18.554692	1666
QRS 362/0225	-28.708736	18.554693	1667
QRS 362/0226	-28.708686	18.554686	1669
QRS 362/0227	-28.70869	18.554681	1664
QRS 362/0228	-28.70862	18.554483	1680
QRS 362/0229	-28.708622	18.55444	1680

QRS 362/0230	-28.708568	18.554087	1687
QRS 362/0231	-28.708483	18.554037	1685
QRS 362/0232	-28.708462	18.554141	1685
QRS 362/0233	-28.70833	18.554152	1675
QRS 362/0234	-28.708747	18.554259	1700
QRS 362/0235	-28.709028	18.554349	1673
QRS 362/0236	-28.709289	18.553758	1597
QRS 362/0237	-28.70929	18.553757	1595
QRS 362/0238	-28.70926	18.553782	1602
QRS 362/0239	-28.709252	18.553855	1607
QRS 362/0240	-28.709233	18.553487	1589
QRS 362/0241	-28.709196	18.553341	1582
QRS 362/0242	-28.709231	18.553256	1576
QRS 362/0243	-28.7093	18.553065	1572
QRS 362/0244	-28.709422	18.55293	1574
QRS 362/0245	-28.709459	18.552917	1577
QRS 362/0246	-28.7095	18.552994	1576
QRS 362/0247	-28.709555	18.551367	1566
QRS 362/0248	-28.708714	18.548672	1556
QRS 362/0249	-28.708166	18.545724	1602
QRS 362/0250	-28.7045	18.56394	1521
QRS 362/0251	-28.704491	18.563986	1525
QRS 362/0252	-28.704426	18.564048	1527
QRS 362/0253	-28.704512	18.564075	1527
QRS 362/0254	-28.704552	18.564107	1521
QRS 362/0255	-28.704523	18.564187	1525
QRS 362/0256	-28.704497	18.564377	1524
QRS 362/0257	-28.704568	18.564404	1519
QRS 362/0258	-28.704709	18.564358	1520

QRS 362/0259	-28.704705	18.564538	1523
QRS 362/0260	-28.704718	18.564568	1520
QRS 362/0261	-28.704849	18.564859	1525
QRS 362/0262	-28.70506	18.56473	1523
QRS 362/0263	-28.705663	18.564956	1501
QRS 362/0264	-28.705665	18.564966	1496
QRS 362/0265	-28.705682	18.564992	1496
QRS 362/0266	-28.705683	18.565009	1498
QRS 362/0267	-28.70569	18.565273	1516
QRS 362/0268	-28.705574	18.565282	1522
QRS 362/0269	-28.70557	18.565352	1521
QRS 362/0270	-28.705618	18.565309	1515
QRS 362/0271	-28.705831	18.56501	1485