Chapter One: Description of the Project

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SUMMARY

This volume describes the archaeological excavation, recovery and analysis of the human skeletal remains and associated artefacts of 250 First World War servicemen, and presents the methodology that was developed to combine this evidence with DNA and historical evidence in an attempt to identify the soldiers. The work formed part of a wider Australian and UK joint government mission to re-bury the soldiers with full military honours in a new Commonwealth War Graves Cemetery, and to commemorate them on headstones by name, wherever possible.

The Australian and British soldiers were among those killed in the Battle of Fromelles, 1916, and had been buried in unmarked mass graves behind German lines on the edge of Fromelles village, Northern France (Fig. 1.1). The graves went unnoticed for decades, only gaining recognition early this century following a series of preliminary investigations by historians and archaeologists. This work indicated that up to 450 Australian and British soldiers were buried in the graves, along with their uniforms, equipment and some personal items. However, primary evidence of each soldier's identity, such as dog tags and identification papers, had been removed at the time of interment and therefore the majority of the assemblage was likely to comprise indirect identification evidence only.

This chapter sets the scene by describing the background to the project. It presents the project-specific aims and objectives which concern buried soldiers as individuals, unlike most conventional archaeological cemetery excavations where the focus is on groups of people. It details previous historical and archaeological investigations of the graves and considers the context of the soldiers with reference to the Battle of Fromelles, the soldiers' physical attributes, Australian and British First World War uniforms, equipment, and weaponry, and injuries sustained on the battlefield.

INTRODUCTION

In 2009 Oxford Archaeology carried out the excavation and analysis of the skeletal remains of 250 soldiers who fought and died in the Battle of Fromelles, 1916, and had been buried in unmarked mass graves adjacent to Pheasant Wood, Fromelles, Northern France (Figs 1.1-1.3). The work was undertaken on behalf of the Commonwealth War Graves Commission (CWGC) acting for the Australian Department of Defence and the UK Ministry of Defence as part of a wider joint government initiative to re-bury the soldiers in individual marked graves with full military honours and, where possible, to identify them for their commemoration on headstones. Recovery and analysis of the soldiers was undertaken between May and October 2009 and was followed by their re-burial in January and February 2010 in a newly built CWGC cemetery called *Fromelles (Pheasant Wood) Military Cemetery*. Between January 2010 and April 2014, a Data Analysis Team (DAT) convened on an annual basis to attempt to attribute identifications to the soldiers, considered by the Joint Australian and United Kingdom Identification Board (JIB). At the time of writing, a total of 144 Australian soldiers have been named, with a further 75 identified as soldiers of the Australian Imperial Force (AIF) and two soldiers identified to the British Army. The identification of 29 soldiers is presently still unknown.

Employing an unprecedented methodology that combined modern forensic practices and traditional archaeological techniques (as has been developed for investigations of more recent mass graves), this is the largest recovery and identification operation for First World War soldiers since the work of the 1920s burial parties (Summers 2010). This report concerns the archaeological investigations of the mass graves, specifically the recovery of the buried soldiers and associated items, and the analysis of these for identification information. It describes the methodologies that were employed and presents the anthropological and artefactual results. It also describes how this work was employed alongside historical and DNA evidence in the process of attempting to attribute identifications to the soldiers.

PROJECT BACKGROUND

The project was instigated by the Australian and British governments following work by Pollard *et al.* (2007; 2008) that confirmed the existence of the graves. Represented by the Fromelles Management

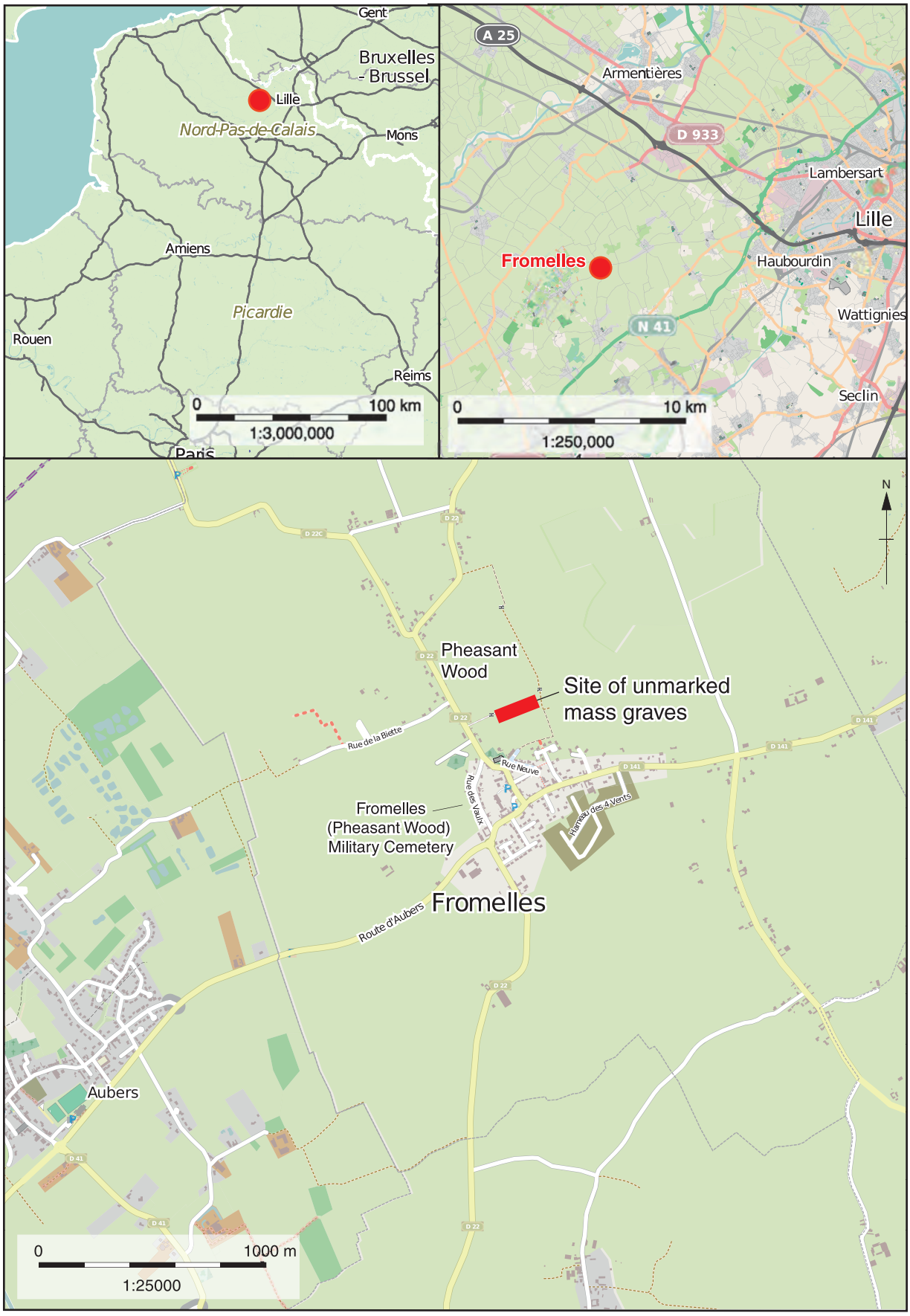

Fig. 1.1 Map showing location of the 1916 unmarked graves

Board (FMB), the governments announced that they would jointly fund the excavation, recovery and identification of the soldiers and re-inter them in a new CWGC cemetery. The CWGC was asked to oversee the project, and the governments awarded the excavation, recovery and analysis to Oxford Archaeology following a formal tender process.

All archaeological investigations were carried out in accordance with a brief that was set by Professor Margaret Cox (CWGC 2008) on behalf of the CWGC. The primary aim was to recover the skeletons and examine them in order to obtain, where possible, evidence to assist in their identification. More specifically, all the skeletons and associated materials were to be excavated for reburial in individual marked graves in the commemorative cemetery constructed in the village of Fromelles, and, where possible, identified as soldiers of either the British Army or Australian Imperial Force and to an individual level.

The objectives were as follows:

i. To completely excavate, record, recover and analyse the eight graves recovering all the human remains and associated evidence in an appropriate archaeological manner to the standards set out by the Institute for Archaeologists (IfA 2008a; 2008c) and English Heritage (1991).

ii. To establish a temporary mortuary for analysing the human remains, with facilities for radiography and preliminary analysis of artefacts.

iii. To take samples for DNA analysis, the condition of which would be established through a pilot study undertaken as soon as possible to establish if sufficient DNA survived in adequate condition for successful extraction and amplification to take place.

iv. To, as far as possible, contribute to the determination of a presumptive or positive identification for each individual. This was to the following levels:

- None.
- To either the Australian Imperial Force or the British Army based upon, for example, the associated recovery of British or Australian military artefacts or trade names (unique to each force) on objects such as footwear.
- To an individual at a presumptive level based upon a combination of indicators, for example, a dog tag, initials on associated artefacts and/or particular physical characteristics (for example, a protruding anterior dentition, disease, unusual trauma, etc) that can be linked to a photograph.
- A positive identification to individual level based upon DNA.

v. To recover, record, and analyse all human remains and all contextual and associated evidence for the purposes of determining the cause of death and for reconstructing the activities associated with the mode of interment at Fromelles, in so far as to assist with identification (for example, by identifying whether the individuals had been buried in a particular order, or in groups, such as by rank).

vi. To ensure that the recovery, recording, analysis and temporary storage of human remains and other evidence was undertaken in a manner and to a standard that enabled a secure 'chain of custody' to be maintained (see Methods in Chapter Two). In particular, this would ensure that no post-excavation commingling, mixing or mislabelling of human remains and artefacts took place.

vii. To employ a database for the collection, collation and analysis of data that ensured that all data could subsequently be imported into a further database that could be used to help determine individual identification.

viii. To package and store the human remains and artefactual evidence in a secure and environmentally appropriate manner until they were required for burial at the Fromelles (Pheasant Wood) Military Cemetery.

ix. To liaise closely with the historians who were undertaking a concurrent programme of historical and genealogical research into all German and British records pertaining to the Battle of Fromelles and the forces concerned.

x. To complete the fieldwork, anthropological and artefactual analyses by the 30th October 2010.

xi. To complete confidential case reports on each recovered individual by January 2010

xii. To complete a full and detailed technical report on the excavation and analyses by May 2011.

xiii. To provide a senior anthropologist to participate in the Identification Commission.

More detailed aims and objectives pertaining to excavation, anthropology and finds are given in the relevant sections of the methods statement (Chapter Two). It should be made clear at the outset that the aims of this project differ from those usually employed in an archaeological context as it concentrates only on the aims and objectives as set out above and does not seek to understand some processes fundamental to an archaeological context from the more distant past. Whereas most cemetery excavations focus on issues around groups of people and context this project focuses on the buried soldiers as individuals.

Excavation officially commenced on 5th May, marked by a formal ceremony attended by senior officials, dignitaries, and locals from Fromelles and the region (Fig.1.4). Reverend Ray Jones of St George's Memorial Church in Ypres led a service and Defence Minister Questin Davies formally initiated the project. The site was blessed, and the first sod was ceremoniously turned before it was handed over to Oxford Archaeology to begin its investigations. Detailed analysis of artefacts and human remains was concurrent with the excavation and was undertaken adjacent to the recovery site. Also involved was the collection of bone and tooth samples, which were sent for DNA analysis by another service provider (Laboratory of the Government Chemist Forensics (LGC Forensics)). The excavation and recovery of bodies and artefacts from all graves was completed on the 3rd September 2009. All anthropological and artefactual analyses were completed on the 2nd October 2009. Subsequently, all data were entered onto a bespoke database and a confidential case report was compiled for each individual at Oxford Archaeology's head office in Oxford (see Chapter Two).

Confidential case reports were completed by 7th January 2010 and together with primary site records (photographs, 360° videos of rotated complete skulls positioned in the Frankfurt Horizontal plane, on-site and anthropology recording forms) were employed by the DAT to compile a portfolio of evidence for each individual. This took place at Australia House, London between January and March 2010.

The DAT comprised subject matter experts (SMEs) from the organisations, including Oxford Archaeology, that provided scientific services for the project, in addition to the chair (Margaret Cox) and deputy chair (Peter Jones) who both oversaw and contributed to the analysis of the evidence. They were also responsible for the formulation and documentation of recommendations made to the JIB. The JIB comprised one Australian and one UK government official and was responsible for making final decisions regarding identifications. While data analysis and identifications were ongoing, the DAT and JIB met annually to consider new evidence. The last DAT and JIB meeting, representing jointly both governments, convened in 2014, but further national boards are likely to convene in the future as required.

Each portfolio, with recommendations, was initially considered at a JIB that sat in March, May and July 2010, April 2011, March 2012, April 2013 and April 2014, and was used to determine identifications to name, army or 'Known unto God'. Three data sets were included in each portfolio of evidence. The DNA samples analysed by LGC Forensics, in addition to the archaeology and anthropology, comprised the datasets for the buried soldiers. Datasets for the missing soldiers (the Missing) comprised information extracted from army records, army unit diaries, memoirs, photographs and other such historical sources, and data sets for the families comprised family trees and DNA profiles of relatives of the Missing (see 'source material' below). Missing and family datasets were collated by a team from the Australian Army, latterly the Unrecovered War Casualty Unit (UWCU) of the Australian Army, and the Joint Casualty and Compassionate Centre (JCCC), of the UK Ministry of Defence (MoD). To ensure analytical objectivity all excavation and post-excavation work took place independently of the ante-mortem data collection, although the scope and type of available data were relayed to the Oxford Archaeology team early on in the operation to ensure that optimum archaeological, anthropological and finds data were gathered.

All the recovered soldiers have been re-buried with full military honours, in individual graves at Fromelles (Pheasant Wood) Military Cemetery, marked by ceremonies presided over by Australian and UK chaplains and supported by troops from the Australian and UK units connected to those who fought at Fromelles. The cemetery was built between May 2009 and January 2010 and is the first CWGC cemetery to be built in 50 years. The first and last burials to take place were marked by ceremonies held in January 2010 and on 19th July 2010. At the last ceremony, held on the 94th anniversary of the Battle of Fromelles, a dedication service was held and the last soldier, presently unidentified, was reburied (Fig. 1.5). The ceremony was attended by HRH the Prince of Wales and the Duchess of Cornwall, the Honourable Dame Quentin Bryce, then Governor-General of the Commonwealth of Australia, families of the Missing and the buried soldiers, residents of Fromelles, members of the French, Australian and British governments and armed forces, and members of the various organisations who have worked on the project.

Each soldier in the new cemetery has a headstone, which gives his name or army where possible. Soldiers who have not yet been identified are commemorated with the inscription: 'A soldier of the Great War. Known unto God'. Headstones are updated regularly as new identifications are made.

LOCATION AND SITE CHARACTER

Centred on grid reference 50036'35''E, 2051'16''N (Fig. 1.1), the graves occupied a narrow strip of land that is bordered on its northern side by Pheasant Wood and bounded by fields on all other sides (Figs 1.2-1.3). Pheasant Wood is situated on the edge of the village of Fromelles, located on Aubers Ridge 22 kilometres west of Lille, Northern France. It is approximately 11km south of the French/Belgian border.

The graves comprised a total of eight rectangular features that were approximately 10m long by 2m wide and between 1.57m and 0.98m deep, organised in two parallel rows of four and aligned with their longest sides running along the length of Pheasant Wood (see Fig. 2.1). They lie on a flat terrain at an elevation of 21m at the bottom of a gentle slope which rises for approximately 160m to the south, where it joins the village of Fromelles at

Fig. 1.2 Location of graves, Pheasant Wood, with new cemetery under construction in the foreground

Fig. 1.3 1918 aerial photograph showing three open features

the top of Aubers Ridge. The underlying geology consists of clayey and silty subsoils overlying blue Ypresian clay at about 2m below the surface, while the slope is composed of sandier soils.

Although once used to grow crops, the area under investigation was given over to grassland and grazing at the time of the project. Its situation and poorly draining soil mean that it is particularly prone to extensive waterlogging, often with surface water. For this reason, coupled with the high water table, the land is considered to be too wet for arable farming.

HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The Battle of Fromelles was an Australian Imperial Force (AIF) and British Army joint operation, fought on a 4,000 yard section of the German front-line (*c* 3.7km) on the 19th/20th July 1916 (Fig 1.6). It involved the Australian 5th, British 61st and the 6th Bavarian Reserve divisions. The focus of the attack was a notorious German strong point called the Sugar Loaf. Planned by Sir Richard Cyril Byrne Haking of the British Army as a feint to divert German attention from the Battle of the Somme and to retake the salient, it was the first action that the AIF saw on the Western Front (Corfield 2009; Lindsay 2008).

The attack started as a heavy but largely ineffective bombardment on German lines, which intensified seven hours prior to the general assault at about 6pm on the 19th July. A combination of poor planning, poor supplies of ammunition and well prepared German defenders, among other factors, put the attackers at a severe disadvantage (Barton 2007; Lindsay 2008). When assault battalions moved into No Man's Land, advancing in waves, they were met almost immediately by German shells, small arms and machine gun fire. Soldiers attacking in the centre of the front-line, heading towards the Sugar Loaf, were cut down by machine gun fire. The scene was one of total chaos (Barton 2007, 100).

Fig. 1.4 The ceremony held on 5th May 2009 to mark the commencement of the recovery operation

Some soldiers made it through into German lines, particularly at the extreme right and left of No Man's Land where it was narrowest, and engaged in hand to hand combat. However, they were forced to withdraw back across No Man's Land when support did not arrive. The order to withdraw did not reach some soldiers, who remained behind German lines and were either killed or taken prisoner, while others refused to surrender.

The attack was a complete failure with no tactical advantages gained. There were over 5,500 Australian and 1,500 British casualties, of which almost 2000 and over 500 respectively were fatalities. The Germans suffered fewer than 1500 casualties (Lindsay 2008).

In the days following the battle, the Australians and British sent parties out into No Man's Land, still under fire, to rescue the wounded. Those who had died close to or in the German front-line were gathered up by the Germans, separated according to whether they were German or Allied forces, and buried behind German lines. A number of the bodies were laid out to be conveyed by a light railway (known by the Germans as the Turkenbahn) to the outskirts of Fromelles village where eight mass graves had been dug to the south of Pheasant Wood at the orders of Major-General Julius Ritter von Braun of the Imperial Bavarian Reserve Infantry Regiment No. 21 (Barton 2007). Von Braun's orders indicate that the burials started on 22nd July (ibid.). Aerial photographs suggest the burials were completed at Pheasant Wood later that month (Pollard *et al.* 2008) (see below).

THE DISCOVERY OF THE GRAVES

Following the Armistice (1918), the battlefields were extensively searched for bodies by Army Graves Concentration Units, who buried them in CWGC cemeteries. This included bodies from known unmarked graves, but those at Pheasant Wood went unrecognised until the late 1990s/early 2000s when they were identified through historical research by former Melbourne school teacher, Lambis Englezos AM, and other researchers. Focusing on VC Corner (Fig. 1.6), one of the cemeteries where recovered bodies were buried, this research highlighted the fact that at least 163 bodies were unaccounted for. VC Corner, situated 3km north-west of Fromelles village, is the only CWGC cemetery in France that exclusively contains Australian soldiers, all buried in mass graves. The mass graves contain unidentified soldiers, who fought in the battle and were recovered from the battlefield in 1918. A stone wall next to the graves records an Honour Roll of the names of 1299 Australians missing from the battle. A total of 410 are buried in the mass graves at VC Corner and a further 1136 are buried at other CWGC cemeteries (Lindsay 2008, 216).

Further research identified aerial photographs, housed at the Imperial War Museum, London, that recorded the presence of eight negative features dug in two lines along the border of Pheasant Wood. These features were not present on aerial photographs taken in the spring and early summer of 1916, including the 17th June 1916 (taken a month before the battle), but they were present on all aerial photographs taken after 23rd July (Pollard *et al.* 2008). Aerial photographs taken on 29th July and 1st August show five features filled in (Lindsay 2008; Pollard *et al.* 2008). Another aerial photograph dated 16th September 1918 showed that three features were still open and empty (Fig. 1.3). The features are also visible on several editions of British trench maps, first as a group of eight and, on later editions, as a group of six (ibid.).

Other evidence that pointed to the existence of the graves includes references to mass graves for Australian and British dead behind German lines in Private Bill Barry's (29th Battalion) memoirs (Corfield 2009) and in letters written by Charles Bean to Leslie Chinner about his brother, Lieutenant Eric Chinner, who had died in the battle (Lindsay 2008, 248-9). In addition, records of the International Red Cross on the burial place of Lieutenant Jack Bowden and Lieutenant Robert David Burns refer to mass graves at Pheasant Wood.

However, the most compelling historical evidence of the graves' existence consists of two documents from the German archives in Munich, a report by the 21st Bavarian Reserve, and an extract from the 21st Bavarian Reserve's war diary. The first document records the orders of Major-General von Braun of the Bavarian Division to his men on 21st July 1916. It details instructions for burying the English dead ('English' here referring to Australians and British) in mass graves south of Pheasant Wood. In the second document an entry for 21st July records the digging of mass graves at Pheasant Wood for the enemy dead.

In 2007, subsequent to these discoveries, the Australian Department of Defence commissioned GUARD Archaeology Ltd to undertake a non-invasive survey on the strip of land adjacent to Pheasant Wood. This work included topographic, geophysical, ground penetrating radar and metal detector surveys, which confirmed the existence of eight features (Pollard *et al.* 2007). Documentary research did not find any evidence among CWGC records that there had been any post-war investigation of these, or that any bodies had been recovered from them and reburied, suggesting that they were still occupied (ibid.).

Following the results of their non-invasive survey, GUARD was commissioned by the Australian Department of Defence to undertake an archaeological evaluation of the area in 2008. The aims of the investigation were to estimate the number of individuals present, assess their condition, verify their nationality and to assess the potential for their identification and the feasibility of removing them (Pollard *et al.* 2008). Sondages encompassing a 16% sample of the total area covered by the graves were hand excavated and

confirmed the presence of large numbers of burials with evidence for Australian and British soldiers. It was concluded that they were soldiers who had fought and died in the Battle of Fromelles and had subsequently been buried by the Germans in 1916. No evidence for burials was found in graves seven and eight and grave six was found to contain limited burials in the western end only.

Prior to the archaeological evaluation, the Australian Army History Unit commissioned British historian, Peter Barton, to undertake three weeks' research on the Bavarian records held at Munich's *Hauptstaatsarchiv Krieksarchiv* (2007). He found no definitive list of those buried at Pheasant Wood, but he found incredible detail referring to how the Germans dealt with the enemy dead. Included were instructions to remove all personal and military papers, which were to be sent to the Divisional Intelligence Officer, Captain Lübcke, and non-military personal items, including identification, which were to be sent to the Red Cross in Berlin to return to families (Barton 2007).

It is possible that, prior to their burial at Pheasant Wood, soldiers were deliberately sorted according to their rank. Thus, officers were perhaps buried in groups in one or more of the graves. However, based on his research, Barton (2007, 177) argued that no such sorting occurred. German orders instructed the body recovery teams to remove insignia (demonstrating rank) at the time of their discovery and therefore visible indicators of rank would have been removed prior to the arrival of the deceased at the interment site (Barton 2007, 177).

ESTIMATED NUMBER OF BURIALS AND MISSING

The German orders refer to graves being dug for 400 bodies. Based on the number of skeletons observed during their evaluation Pollard *et al.* (2008, 45-6) estimated that between 250 and 450 bodies were potentially within the graves, with between 45 and 90 individuals per grave. A more precise estimate was not possible because the evaluation did not afford the opportunity to investigate the lower burial deposits in sufficient detail. Estimates based solely on the minimum number of individuals partially or fully exposed during the evaluation suggested a total of between 45 and 50 individuals per grave, or a total of between 225 and 250 (ibid., 45-6). Estimates that took into account the lower deposits were between 80 and 90 individuals in each grave, with a total of between 400 and 450 individuals (ibid., 45-6). Pollard *et al.* (2008) also suggested that of those buried, at least 173 could be Australian and around 55 British (ibid., 57).

No exact numbers for the missing British and Australian soldiers exist, but the number of Australian names has been estimated at 169 or 170 Australian names, depending on what source material is interrogated (Lindsay 2008, 255). Source material includes names listed on the Honour Roll at VC corner, CWGC records of the buried soldiers, names researched and listed by Corfield (2009), German death lists, Red Cross records, and names included in battalion lists. In preparation for the 2009 recovery operation the Australian and British armies employed this material to draw up a list of 191 British and Australian names considered most likely to be buried at Pheasant Wood. Further names were later added to the list, bringing the total possible number to 1,645.

SOURCE MATERIAL

Information about the soldiers who fought in the battle is preserved in army records, held in the national archives of Australia and Great Britain. The collection of First Australian Imperial Force (1st AIF) service records and unit war diaries are housed by the National Archives of Australia and are accessible online (www.naa.gov.au). The former includes personnel dossiers dating between 1914 and 1920, and applications to enlist in the AIF dating between 1915 and 1918. The AIF also holds a database of these records. The personnel dossiers (or World War I Service Records) include attestation papers, service and casualty forms and military correspondence. Attestation papers were completed by individuals on enlistment and give next of kin, employment details, marital status, age, place of birth and a physical description, including eye and hair colour, height, weight, chest size and details of any additional physical traits, such as scars. Service and casualty forms detail movements and transfers between units, promotions and details of when and how soldiers were injured and the treatment received. Military correspondence details notifications to next of kin, the most relevant here being those that refer to wounds or death.

British Army service records (1914-1919) are curated at the National Archives, Kew, London and are available online (ww.ancestry.co.uk). Unfortunately, most service records were destroyed in 1940 during an air raid and only about 30% of the total original records have survived (called the 'Burnt Documents'). There is also a small series of records (called the 'Unburnt Documents') which were extracted from the main series and form a subset of the main service records. The service records relate to non-commissioned officers and other ranks who served in the First World War and did not re-enlist in the Army prior to the Second World War. The type of information contained in these records includes the name of the soldier, their age, birthplace, occupation, marital status, and regiment number.

Additional source material for British soldiers comprises officer records, medal index cards covering all ranks, and information extracted from 81 volumes of lists of soldiers who died during the First World War. Officer records are not available online and records of officers who continued to serve after 1922 are not available to the public. Campaign medal index cards can be accessed via

www.ancestry.co.uk, and other gallantry medals and other awards can be accessed via the national archives website.

The volumes of lists of soldiers were published by His Majesty's Stationery Office on behalf of the War Office and give basic details of each soldier. Information extracted from these has been compiled in an online database (accessed through www.ancestry.co.uk and other websites) and includes information such as soldier's name, birthplace, enlistment place, residence, number, decoration, rank, regiment, battalion, type of casualty, date of death, place of death and the theatre of war in which they served. Details relating to over 703,000 individuals are included.

Other sources are Red Cross records held at the Australian War Memorial. Those that are relevant to Fromelles were created through the Wounded and Missing Enquiry Bureau of the Red Cross. They concern enquiries made by the Red Cross about the fate of missing soldiers and include 30,000 individual case files relating to Australian soldiers who were reported wounded or missing during the First World War (Lindsay 2008, 217). Information includes a searcher's report, place and circumstances of death or wounding (based on eye witness accounts from friends or comrades), place of burial and correspondence between the Red Cross and friends and relatives (Lindsay 2008, 218).

Corresponding records are held at the headquarters of the International Committee of the Red Cross (ICRC) in Geneva, Switzerland and consist of index cards and registers compiled between 1914 and 1918 and covering some 400m of shelf space (www.awm.gov.au). They were compiled when the Red Cross was acting as an intermediary, passing on and logging information between 30 countries engaged in war. Currently these records are not available, but a programme to digitise them started in 2009.

All the above records form the primary source material that has been scrutinised by ante-mortem data collection teams from the Australian Department of Defence and the UK MoD to compile a database of details about the Missing. In addition, given the relative paucity of information available about the British casualties, it was decided to construct a questionnaire that was circulated to all known families of possible British casualties. This was designed to elicit information that would help with identification and included questions relating to hair colour, stature, occupation, ethnicity, health and disease. It also asked families for copies of photographs of their missing soldier and their family trees (if available) to help decide who in the extant families would be the most informative DNA donors.

Additional source material includes a wealth of literature that recounts events leading up to, during and following the battle (for example, Cobb 2007; Corfield 2009; Lindsay 2008). Key among these are Bean's (1941) *Official History of Australia*, and Lieutenant Hugh Knyvett's *Over There with the Australians* (1918). Knyvett, a scout of the 59th Battalion, served in the battle but later died of his wounds in New York. Bean was the Australian war correspondent and was covering the Somme offensive when the battle took place. He rushed to Fromelles the day after the battle to report on it.

SOLDIERS' ATTRIBUTES: BIOLOGICAL PROFILE OF THE MISSING

During the 2009 operation all the recovered skeletons were examined for information pertaining to identification. In accordance with standard forensic practice, this involved establishing for each individual a biological profile, comprising estimated ancestry, sex, age at death and living stature, followed by an assessment of any individuating characteristics, such as build, facial attributes, dental status and evidence for disease and/or trauma (Hunter and Cox 2005; Scheuer and Black 2007; see Chapter Two).

All this information exists, or can be deduced to a greater or lesser degree in or from source material collected on the Missing. According to army enlistment records and British Military recruitment standards of the time, the individuals generally comprise a predominantly Caucasoid all male group, aged between 18 and 45 years, with a stature of at least 5'2'' (1.58m). These records did not specifically record ancestry, but it is known that Aborigines and Maoris were among the Australian troops and this is alluded to in records held by the National Australian Archives and the ICRC that refer to 'halfe-caste' individuals (R Wright pers. comm. 2010) and employ terms such as 'darky'. Ages at enlistment were recorded, but are not necessarily a reflection of a person's true age. In 1916 the required age was 18-45 years for volunteer Australians (Australian War Memorial 2010), and for British conscripts, 18-41 years (Military Service Act 1916), but it is widely recognised that under- and over-aged individuals signed up throughout the First World War, on occasions using falsified documents (Australian War Memorial 2010; Van Emden 2005). Fromelles was no exception; for example, Knyvett's (1916, 75) account mentions the rescue of an injured underage soldier.

Stature is another criterion pertaining to the biological profile of the soldiers and this was also recorded at enlistment. Australian enlistees were required to be a minimum of 5'2'' (1.58-1.59m) (Australian War Memorial 2010), which is slightly shorter than the required height of British Army recruits of over 5'3'' (1.6-1.62m), established prior to the Military Service Act of January 1916 that brought conscription into effect (presumably this did not change following the Act). Chest size was also recorded, but this information is of less relevance here because there are currently no accepted methods for estimating chest size from archaeological evidence.

While it is widely recognised that dental evidence is a key aspect of personal identification today in an era when detailed dental records are made of patients in the developed world (Hunter and Cox 2005; Scheuer and Black 2007), no dental records are known to exist for the Missing. This might reflect the fact that any that were made have either been destroyed, have been lost, or were not maintained. No detailed dental records were made on enlistment until after the Battle of Fromelles, though occasionally dental health and treatments were commented upon but not in a manner that was often detailed enough to be helpful. Further, not all individuals could afford to go to a dentist or, if they did, detailed records of their dentition were not made at that time. Dentistry did not become fully regulated in the UK until the 1921 Dentists' Act which required anyone who practised dentistry to be registered. A similar act was passed in 1900 in New South Wales (www.vlib.us). It is presumed that other Australian States and Territories had similar legislation at the turn of the 20th century. Dental treatment was often carried out by civil practitioners, and in Britain this often led to the unnecessary extraction of teeth and replacement with a denture (McGowan 2008). Nevertheless, at the outbreak of the war in 1914, both nations recognised the importance of good oral and dental health for troops serving overseas and enlistees were frequently turned away on account these being too poor (McGowan 2008). Enlistment records of the Fromelles Missing frequently refer to poor dental health, with some noting that recruitment was conditional on the enlistee receiving dental treatment.

By 1916 the respective military establishments were taking remedial measures to increase the pool of available enlistees/recruits by offering free dental examinations and treatments to soldiers at home and overseas. Thus, the First World War was the catalyst for the universal provision of dental treatment to serving soldiers, a feature that still continues today. It was not, however, until much later in the 20th century when dental records of sufficient detail to be a tool for identification were made, maintained and retained.

SOLDIERS' ATTRIBUTES: MILITARY ISSUE UNIFORMS AND EQUIPMENT

According to the orders issued to the German burial parties by Major-General von Braun, the soldiers were buried in their uniforms, although they were stripped of insignia, dog tags, or any personal items, for sending to the Red Cross to pass onto families and for passing to army intelligence. The British and Australian army throughout the war wore different uniforms and insignia which were clearly distinguishable from each other and are therefore valuable forms of evidence for identification (Fig. 1.7).

However, although separate forces, the two were very much a 'commonwealth' army and therefore some elements of their uniforms were interchangeable. Furthermore, there were occasions during the First World War when Australian uniforms and equipment were manufactured in the UK (Martin Boswell, pers. comm.) and incorporated British elements. For example, uniforms that were usually made in a distinctive Australian wool textile, with a different weave to the British wool serge, were sometimes made to the Australian pattern, but in the British textile (examples of this can be seen at the Imperial War Museum stores). Australian uniforms were manufactured with the small hook fastener, typically used to hold together the collar of British uniforms, and there are examples held at the Imperial War Museum and Australian War Memorial with distinctive large hooks for holding webbing equipment in place at either side of the waist band, usually associated with a British jacket, on British-made Australian tunics.

A shortage of Australian supplies meant that when an Australian uniform became damaged, it was common to repair it with British materials, such as buttons, or replace it entirely with a British uniform. This practice is unlikely to have been considered problematic among Australian and British soldiers, among whom little distinction between nations was probably made; many would have still considered Australia to be part of Britain (Federation had only taken place in 1901) and many of the soldiers of the AIF were born in the UK (and elsewhere), some perhaps only having been in Australia for a few years. However, it is unlikely that a British soldier wore elements of the Australian uniform, mainly because the supply shortages documented in the Australian Army were not a problem for the British supply chain, at least at this point in the war.

British Expeditionary Force (BEF)

Soldiers of the British Army, specifically the British Expeditionary Force (BEF), which was sent to northern France, wore the 1902 pattern service dress tunic and trousers of khaki wool serge with a woollen under-shirt, woollen puttees, worn around the lower legs to keep the trousers neat and clean, and black leather lace-up boots. The issued uniform also included a khaki cap, but after the introduction of the steel shrapnel helmet, or Brodie helmet, this was not worn in the trenches. Equipment was carried in the innovative 1908 pattern cotton webbing set, designed to distribute the weight of equipment evenly. The khaki (meaning 'mud covered' in Hindi) colour of the uniform was developed in 1902 as a replacement for the traditional red-coat of the 19th century uniform, mainly in order to be less conspicuous on the battlefield.

The tunic jacket was a loose fitting garment with a turn down collar and patches at the shoulders to minimise wear from carrying equipment. It had four large pockets on the front, the top two of which

Fig. 1.5 The ceremony held at Fromelles in 2010

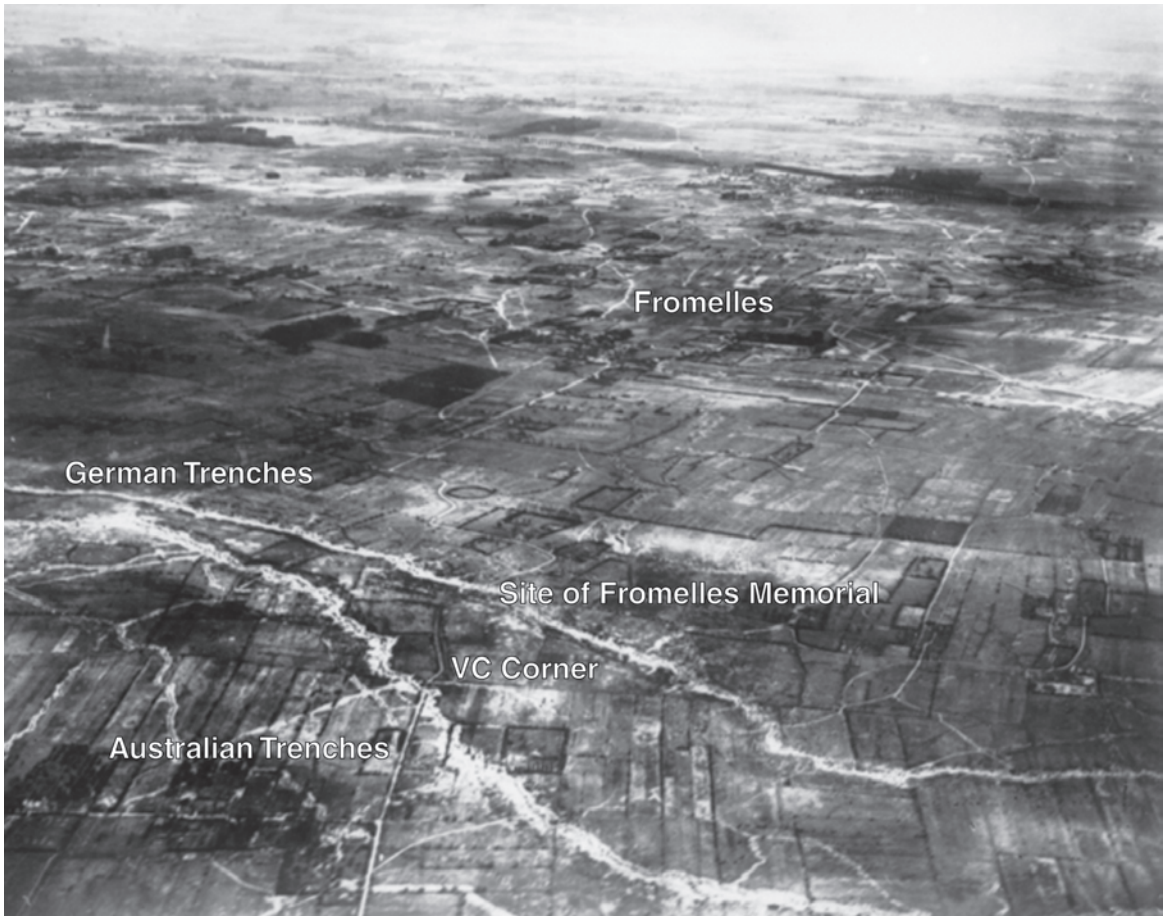

Fig. 1.6 The battlefield (Australian War Memorial image E05990)

were pleated. The back of the jacket was also pleated to improve fit. The inside right part of the tunic had a pocket in which to carry a field dressing kit; the sides bore two brass hooks, used to support the webbing set, and the shoulders bore epaulettes. Five large general service buttons were used to fasten the tunic along the front, with smaller versions on each patch pocket and on each epaulette. The collar was fastened by a tiny brass hook. A 'utility' version of the tunic was produced during the war, that had no pleating, brass hooks, shoulder patches or reinforcements, but was not as hard wearing as the 1902 pattern tunic and was never as popular.

The army issue under-shirt was traditionally made of grey flannel, but was also worn in several different fabrics, many of which are likely to have been private purchase. These shirts had simple shell, ivory, plastic or white metal buttons and no collar. The underwear was made of simple cotton. In cold weather a cardigan with plastic or wooden buttons was sometimes worn between the under-shirt and the tunic.

The wool serge trousers were held up by braces or a belt and had up to 12 buttons around the waist-band for the attachment of the braces. These were usually made of metals such as zinc or tin. The trousers were fairly close fitting, particularly in the lower leg, and puttees were worn over the top with the intention of keeping a neat clean silhouette.

British pattern boots were roughly square toed and made of thick hide, worn with the rough side out. They were primarily manufactured in North-ampton (as indeed were those of many of the allies), but other manufacturers were used when they were stretched to capacity. The boot generally had 10 lace holes and the sole was covered in metal studs, although half studded soled boots were worn by mounted soldiers. Other boots worn by British soldiers included a higher topped variety worn by mounted soldiers and the officer's riding style boots. These varied in style because they were privately purchased from approved manufacturers, along with the rest of the officer's uniform.

British soldiers at Fromelles would have worn little decoration on their khaki uniforms. Apart from their general service buttons, they wore regimental shoulder titles made of brass, attached by two lugs and a pin to the tunic's shoulder epaulettes. Shoulder badges, which included a huge array of different titles, were also worn, but were sometimes removed in battle, possibly carried in pockets, to avoid catching them on equipment straps, worn over the shoulder. Although soldiers would have been issued with packs, these were not carried into the battle and are therefore not relevant here.

Australian Imperial Force (AIF)

The uniform of the AIF consisted of a tunic made of Australian wool, with notably lighter and more open weave than that of the British tunic. It had four large pockets on the front and a large pleat at the back. The inside pocket was on the lower left side of the jacket (the opposite side to the British) and, like the British version, was used to carry the field dressing kit. A notable difference between Australian and British tunics was that the pocket flaps of the former were pointed, while those of the latter were straight.

The fabric belt was a key feature of the Australian uniform because this was integral to the tunic and had an attached brass buckle of distinctive design (Fig. 1.8). This holds particular significance for identification because neither the belt, nor the buckle, which were sewn into the tunic, could be removed and passed between individuals. It is unlikely that a British soldier would have worn an Australian jacket and therefore the identification of either the brass buckle or the integral fabric belt from an Australian tunic was a strong indicator of AIF soldiers.

The Australian issue breeches were made from the same wool as the tunic jacket but were a heavy cord textile, easily distinguishable from the British pattern. The breeches had six buttons around the waistband for the attachment of braces and a concealed button fly. The inside legs were reinforced with another layer of the same fabric as the main part of the trousers. The lower part of the breeches were fastened in a laced fashion, with pairs of eyelets and either a leather thong or cotton cord. The under-shirt would have been the same as the British issued pattern, or alternatively may have been a private purchase version.

The Australian uniform also consisted of three hats, consisting of a wool felt 'slouch hat', which was worn with one side pinned up, a peaked cap, and a Brodie helmet. The peaked caps were not brought to the western front, and the slouch hats were replaced with British Brodie helmets when in action and in the trenches. However, in the Battle of Fromelles many of the soldiers had not been issued with helmets (Cobb 2007, 110, and see Chapter Five).

Australian insignia was very distinctive and was worn by all soldiers. The basic set consisted of three 'rising sun' badges (one large one on the slouch hat, and one smaller version on each collar) and two 'Australia' shoulder titles, worn on the epaulettes (Figs. 1.9 and 1.10). Infantry soldiers also wore a small shoulder badge bearing the initials 'INF'. The battalion number was demonstrated in the early years of the war by small brass numbers worn on the shoulder, just above the INF badge. However,

Fig. 1.7 Australian (a) and British (b) military issue uniforms (both of the soldiers shown here served in the Battle of Fromelles, see page ii for details)

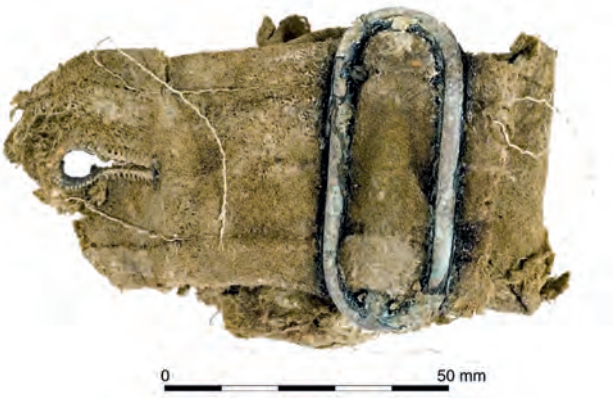

Fig. 1.8 Australian jacket belt and attached buckle

Fig. 1.9 'Australia' shoulder title

Fig. 1.10 Rising sun badge (3rd pattern rising sun badge included to show detail)

starting in 1915, these were replaced with colour patches. Both types were found in the graves at Pheasant Wood. Australian uniform buttons were mainly made from cellulose, also known as 'vegetable ivory'. These were large round plastic orange/brown buttons; there were usually five large ones along the front of the jacket and smaller versions on the pockets and epaulettes.

Australian boots were renowned for being particularly hard wearing and were manufactured in Australia, in some cases of kangaroo leather. However, some boots were made in the UK when demand could not be met and Australian troops were also issued with British boots on occasion.

Equipment (both armies)

British issued equipment was made in the UK and Australian equipment was made in both the UK and Australia. Thus, items bearing Australian makers' marks suggest a soldier of the Australian army, while items bearing a British maker's mark suggest either army. Despite this, much of the equipment used by both troops was identical and is therefore of limited use for the purposes of identification. Artillery, including live rounds, rifles, grenades, bayonets and all related equipment, could be marked with initials or personal numbers, but because it was centrally issued, was usually the same for both armies.

The main type of webbing equipment that was used was the cotton 1908 pattern (Fig. 1.11) and is recorded in a photograph taken of some of the soldiers just prior to the battle. This 1908 pattern, which had replaced the leather webbing used earlier in the war, had large numbers of press-studs, buckles and strap ends made of brass. Other standard issue equipment included the PH hood gas mask (Fig. 1.12), which was superseded by the box respirator in the autumn of 1916, a rubberised groundsheet/cape, items such as trenching tools, water bottles, wire cutters and first aid kits, which were carried inside a jacket pocket. All soldiers were also issued with a cloth holdall, which contained items necessary for everyday life. These may have included (among other items) a shaving brush, spoon and fork, toothbrush, pocket-knife, button cleaner, comb and bootlaces. It was often stipulated that such items should be marked with the service number of the owner. These holdalls were always carried, even on the front line (Doyle 2008), although specific battle orders would dictate whether the pack in which it would have been carried was left at battalion headquarters or taken to the front line.

Battle orders

Details of what the soldiers carried with them into the battle are given in the battle orders which are recorded in war diaries. Extracts that are particularly relevant here are from the July 1916 brigade diaries of the 8th and 14th Brigades of the 5th

Fig. 1.11 Fittings from pattern 1908 webbing equipment

Fig. 1.12 PH hood gas mask fragments

Division AIF. These are cited below (as written). Also cited (as written) are relevant extracts from battalion records, which are more detailed than the infantry orders and, in some cases, contradict them.

8th Brigade – July 1916 diaries (AWM4 23/8/8):

"Dress – Marching order, no packs."

"Each man will carry 150 rounds of ammunition, 2 mills grenades and 2 sandbags."

"Every third man will carry pick and shovel alternately."

"Men's packs are useful to carry magazines for Lewis guns, 6 will fit in a pack".

"Leading two battalions will carry filled water bottles and 1 day's iron ration, remainder, filled water bottles and two days iron rations."

"Packs will not be carried, they will be stored in battalion dumps under brigade arrangement."

With regard to prisoners, *"no souvenirs are to be taken from them."*

14th Brigade –July 1916 diaries (AWM4 23/14/4):

"Dress. Fighting Order. Greatcoats. Steel Helmets."

"Packs will not be carried, they will be stored in battalion dumps under brigade arrangement."

15th Brigade – July 1916 diaries (AWM4 23/15/5):

"All packs and surplus kit will be parked near battalion headquarters."

"Also waterproof sheet – Dress fighting order."

From the 54th Battalion orders 16/7/16 (AWM4 23/71/6):

"All (a) Field Dressings & bottles of iodine
(b) Gas Helmets
(c) Identity discs
(d) Pay Books
will be inspected today to ensure that they are in the possession of every man – that (a) & (b) are in good order & that (c) & (d) are corrected to date."
"Each man will carry 150 rounds S.A.A. in web equipment & an extra bandoleer of 50 slung on his left shoulder."

"Greatcoat & iron rations will be carried in the pack. All other articles usually carried in the pack will be wrapped in a towel or similar article, tied up securely and properly labelled. These will be collected in a place to be indicated this afternoon. All ranks will carry the waterproof sheets in packs."

"Steel helmets covered with sandbag or similar material will be worn by all ranks to whom they have been issued."

"All ranks will wear web equipment."

"Company commanders will draw periscopes today & issue same to Officers & NCOs."

"Two grenades will be issued to each man and carried in the haversack on the right side."

"Luminous compasses are to be exposed to sunlight as much as possible to ensure that they will be of use at night."

From the 59th Battalion orders 18/7/16 (AWM4 23/76/6):

"10 men per platoon will be detailed as wire cutters."

WEAPONRY, INJURIES AND THE INFANTRY SOLDIER

Warfare, weaponry and the requirements of the infantry soldier during the First World War provide the context to the peri-mortem trauma sustained by the Pheasant Wood soldiers. Understanding the circumstances of a First World War battlefield, in particular those at Fromelles, and the vulnerabilities of the human body underpin the interpretation of individual wounds and wound patterns that were observed on the recovered bodies.

The First World War was fought between soldiers occupying opposing lines in the form of trenches, with the area in between – No Man's Land – fully exposed to explosive munitions and small arms fire from both sides. It was also a symmetrical war in which both sides employed the same military tactics and hardware. Thus, there are no distinctions in types of injuries inflicted by weaponry from either side. At Fromelles, the trenches, designed to shelter troops from enemy small arms and artillery fire, were in the form of breastwork (raised trenches as opposed to a dug in) (Knyvett 1916), made from sandbags and wood planking. This was in contrast to the German trenches, which were more robust, commodious and made from concrete (Cobb 2007). Both sides defended their front trenches with barbed wire and machine gun emplacements (ibid.).

From a tactical perspective, trench warfare is often characterised as a war of attrition (ibid.), because breakthroughs in the stalemate required soldiers to leave the relative safety of the trenches and cross no man's land if new territory was to be captured. A successful incursion into enemy trenches may involve hand-to-hand combat with enemy soldiers and the use of grenades, small arms and bayonets.

The 1916 Battle of Fromelles had all the tactical characteristics of the many battles fought on the Western Front, with an initial artillery bombardment of enemy trenches to cut down front line defences, followed by infantry troop attack. The intricacies of this particular battle are covered in a number of published texts (Knyvett 1916, Bean 1918; Cobb 2007; Lindsay 2008). The explosive munitions and small arms employed in the attack would have included artillery, grenades, mortars, bombs, pistols and rifles. Gas and its effects will not be considered as these signatures do not persist into the archaeological record. In addition, soldiers had bayonets and machine guns and may have carried home-made, improvised or personalised weapons, such as knives and knuckle dusters.

Considering the sequence of events involved in the Battle of Fromelles, in conjunction with weaponry, an approximate sequence of exposure to the lethality of weapons can be suggested. The greatest risk to an infantry soldier exiting the trenches would have been rifle and machine gun fire. Knyvett (1916, 74) refers to a "hail of gunfire like a veritable blizzard" when the allied soldiers "went over the top" (ibid.). German machine guns were fired at a low angle (a 'grazing fire'; Lindsay 2008, 100), a method afforded to them because the battleground was clear of any dead ground that could have been used for cover. Thus, soldiers were exposed to a greater concentration of fire at leg level that, if they were hit in that region, caused them to fall into the line of fire (Lindsay 2008, 100). Crossing No Man's Land, soldiers would have been exposed to explosive munitions and small arms, both evidenced by historical references to large craters

and chunks of shell casing and enemy sniper fire, which impeded rescue efforts to extract wounded soldiers from no man's land in the days immediately after the battle (Knyvett 1916). Finally, soldiers who made it through to into German lines, particularly at the extreme right and left of no man's land, where it was narrowest, engaged in hand to hand combat, but were probably also exposed to small arms fire and explosive munitions, such as hand grenades. According to Lindsay (2008), a grenade battle ensued in the German trenches between the soldiers of the opposing armies. However, Knyvett's account (1916) describes the accuracy of German artillery fire on the occupied German trenches, which is slightly contradictory, as one would assume that German artillery would not fire on its own troops. However, there are likely to have been a number of stages to the battle in the German trenches and different areas of the trenches may have engaged in different tactics.