Tracks and Traces

An archaeological survey of railway construction related sites on the Otago Central Railway

Peter Mitchell

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Abstract

The focus of this thesis is the archaeology of workers’ camps associated with the Otago Central Railway. The railway was begun in 1880 and completed in 1920. Using the historical record in conjunction with remote sensing and site survey, this thesis separates sites related to the construction of the Otago Central Railway from those involved with the everyday operation and maintenance of the line. Eight sites are investigated using a two site type model to determine whether a site was a Public Works Department site or that of a private contractor. The research has shown that Public Works Department camps were situated in the most favourable locations, while those of the private contractors’ were located as near to the work at hand as possible.

Key words: archaeology, railways, workers camps.
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1. Introduction

“Typically, the monument has been privileged at the expense of the mundane.”

Kate Hill 1999

This thesis is an archaeological and historical analysis of sites associated with the construction of the Otago Central Railway in the South Island of New Zealand during the late 19th and early 20th centuries.

The archaeology of railways is part of the broader field of industrial archaeology, which is in turn a sub-discipline of historical archaeology. As the name implies, industrial archaeology is the archaeology of the industrial evolution and the post industrial world (Bracegirdle 1974). Industrial archaeology has traditionally focused mainly on the technologies, buildings and landscapes associated with industry, rather than the study of the people who worked with and within these machines, buildings and landscapes (Shackel 2010 in Fennell 2010:178).

Like industrial archaeology, railways archaeology is, for the most part, concerned with the study of the physical features associated with the day to day operation of rail systems (McVarish 2008:68). This includes locomotives and rolling stock, as well as features such as bridges, culverts, signals, viaducts, railways related architecture, and the rails themselves (Nock 1981:7, Coulls 1999, McVarish 2008:68). While obviously a valid approach, as Hill (1999) and Shackel (2010) point out, this emphasis on the things people have made fails to acknowledge the role of the people who made them. In focusing on the camps in which the workers who built the Otago Central Railway lived, I hope to bring these people out from under the shadow of the bridges and viaducts they laboured so hard to construct.

However, before any fine grained analysis of the life-ways of those employed in the construction of the Otago Central Railway can take place, we must first ascertain where they were living. That is the intention of this thesis.

1.1 Research question

Using the historical record in conjunction with remote sensing and field work, is it possible to distinguish sites and features associated with the construction of the Otago Central Railway from those associated with its maintenance and operation? Having done so, can we then determine which were established by the Public Works Department and which were established by private contractors?

1.2 Why this is relevant and / or important

I believe this is an important area of study because while there are the obvious questions of worker living conditions and social / spatial relationships within and between the workers’ camps, it has relevance on other levels. There are questions of nation building, the
development of infrastructure in a remote colonial outpost, and the effects of the global economic down-turn of the 1880s on that infrastructure development.

There is also the added bonus that due to the temporary nature of the camps, (they were often only in use for between two and five years) there will be firm dates associated with any material culture recovered from future excavations at the sites.

1.3 What is a Railway?

Before any archaeological or historical study of a particular railway line or system can be undertaken, it is important to define what a railway actually is. Until the 1950s, historians and industrial archaeologists had not clearly defined what constituted a railway, a state of affairs which John Geise sought to remedy with his 1959 description of a railway as “... a combination of technical devices and specialised personnel which is designed to provide overland transportation of freight and passengers according to established schedules and standard rates” (Geise 1959:76). This accurate, if rather cumbersome description, provided a starting point for defining what a railway is, and further refinement led to Charles Lee’s definition of a railway as “a combination of track and vehicle which is self steering” (Lee 1973:41). Dr Michael Lewis describes a railway as “a prepared track which so guides the wheels of the vehicles running on it that they cannot leave the track” (Lewis 1974 in Coulls 1999:1). Anthony Coulls is more succinct, though a little simplistic, when he describes a railway as “a linear transport feature, the rest is detail” (Coulls 1999:1).

The principle of a self steering track appears as far back as the 2700 BP, when the Greeks used a track made of stone to haul ships overland. This ‘proto railway’ was in use for some 1500 years (Coulls 1999:1). Other examples from this period are found in Malta and Italy (Lee 1973:41, Hughes 1999). The mines of medieval Europe featured railways with wooden rails which carried vehicles with flanged wheels, though these were mainly underground and did not usually extend beyond the pit head (Lee 1973:41, Coulls 1999:1). It is industrial Britain with which the railway is most associated, and this association began with the coal mining industry. The earliest example of a coal mining railway in Britain is from 1604 in Nottingham (Lee 1974:41). This railway ran on wooden rails and was horse drawn, as were all ‘railways’ of this period. Throughout the 17th century the use of mining railways (or ‘wagonways’ as they were known at the time) became widespread (Lee 1974:41).

By the 18th century, horse drawn wooden railways were being used to carry larger loads further, and for other, more diverse purposes (Lee 1973:41, Coulls 1999:1). Later in the 18th century iron rails and wheels replaced those of wood (Coulls 1999:1). At about this time (1756) the word ‘railway’ first appears in the English language, followed in 1773 by the first use of the word ‘railroad’ (Lee 1974:41).

At this time the horse was still the only means of motive power available, but things were about to change. In 1769 James Watt produced his first steam engine (Hudson 1963:57). These were originally developed by Thomas Newcoman in 1712 as standing engines to power pumps which drained coal mines, but were inefficient and only economic because
coal was so cheap (Hudson 1963:97, Trinder 1982:38). Watt added a separate condenser which cooled the expended steam back into water, meaning the engine-cylinder itself could remain hot, thereby saving steam and coal (Cousins 1974:112). His next breakthrough was to create a system which enabled an engine to provide rotary motion in order to drive machinery, at the same time doubling the power output of the engine by placing valves above and below the piston (Hudson 1963:98). Despite these improvements, Watt’s engines still operated at low pressure, and it was not until the early 1800s, after Richard Trevithick had developed a high pressure cylindrical boiler and coupled it to Watt’s engine, that steam became a powerful and economic source of energy (Hudson 1963:99).

Using these improvements in steam technology, Trevithick experimented with building self propelled steam engines, and made the first railway locomotive for a tramway at Penydarren, South Wales, in 1804. Trevithick also ran a steam engine on a passenger circuit near Euston Square in 1808, but this was purely a novelty, and was short lived (Buchanan 1974:257). Despite his best efforts, Trevithick’s steam locomotives were not financial successes, and it was not until 1813 that steam locomotives were considered reliable enough to be used on Tyneside’s colliery tramways (Buchanan 1974:311).

Despite these advances, it would be a further sixteen years before self propelled steam locomotives became the principle form of traction on railways. In October 1829 George and Robert Stephenson’s famous Rocket performed sufficiently well at trials in Rainhill, in the north of England, to be accepted as the standard for rail traction (Trinder 1982:151). These trials were undertaken to find the most efficient means of transporting goods and passengers on the soon to be completed Liverpool and Manchester Railway (Lee 1974:46-47, Buchanan 1974:312).

Opened in 1830, the Liverpool and Manchester Railway is considered the prototype of the modern railway due to its combining a specialised track, the ability to accommodate public traffic, carry passengers as well as freight, mechanical traction and a measure of public control (Robbins 1998 in Coulls 1999:1). This was the dawning of the ‘railway age’ and by 1850 a national rail network linked most of the centres of heavy population and industry in Britain, and railways were beginning to appear throughout Europe (Lee 1973:54, Coulls 1999:2).

The 1850s saw a period of worldwide expansion of railways as nations linked to the imperialist expansion of Britain and Western Europe sought to industrialise and join the modern world (Coulls 1991:2). By 1869 the East and West coasts of the United States of America had been linked by the Trans-Continental Railway, and Canada’s Great Western and Pacific railways were fully operational.

1.4 Railways in New Zealand 1845-1925
The development of overland transport networks represents the second phase of European colonisation in New Zealand. Coastal settlements had been established where possible, and connecting these became of paramount importance. As well as linking the major urban areas, railways provided a quick and effective means of transportation for goods and passengers, facilitating the growth of the economy and the expansion of the country.

The first railway in New Zealand was the Wellington & Cartersville Railway, which opened in 1860 connecting Wellington to Carterton. This was followed by the Wellington & Picton Railway, which opened in 1866, providing a link to Picton and the South Island. The Tram Road Railway, opened in 1869, connected Christchurch to Lyttelton, providing a vital link to the port. The Otago Central Railway, opened in 1880, provided a link between Dunedin and Middlemarch, facilitating the development of the Central Otago area.

By the end of the 19th century, the railway network had expanded significantly, connecting most of the major urban areas and providing a vital link for transportation of goods and passengers. The railway system played a crucial role in the development of New Zealand, facilitating the growth of the economy and connecting the various regions of the country.
areas, opening up the interior of the country for primary extraction such as mining, forestry
and agriculture was high on the agenda. In the second half of the 19th century, railways
were the fastest and most economic means of moving large numbers of people and bulk
freight over land.

As was the case in most British colonies, the first railways in New Zealand were ‘bush
trams’, which as early as the 1850s had been used to haul logs and sawn timber to and
from sawmills located near forestry blocks. Like early British industrial railways, these
were initially horse drawn, with trolleys running on rails of wood (Mahoney 2004:13).

The New Zealand railway network came into being, on paper at least, in 1870 when Julius
Vogel, the Colonial treasurer, advocated for investment in infrastructure and immigration
in order to promote “the settlement of the country”. This entailed the borrowing of large
amounts of capital, some 6 million Pounds Sterling (Churchman and Hurst 1990:15). Thus
was born the National Debt. Acts of Parliament were passed in September 1870 to
facilitate Vogel’s grand vision. These included the Immigration and Public Works Act
(1870), the Railways Act (1870) and the Canterbury Gauge Act (1870). The Railways Act
(1870) was important in that it set the national standard railway gauge at 3 feet 6 inches
(1,067 mm), thus assuring that all regional lines could be connected into a coherent
network, as at this time the country was administered by a system of provincial
governments which had led to the independent development of railway systems without a
standard gauge being agreed upon (Churchman and Hurst 1990:14).

The first of these provincial railways had been validated by the Colonial Government in
1860, when the Christchurch and Lyttelton Railway Act (1860) was passed. The Act
allowed the construction of a 6.8 km 1,600 mm (Irish gauge) line between Christchurch
and Ferrymead, (Churchman and Hurst 1990:14). This was followed in 1861 by the
decision to allow the Dun Mountain Copper Mining Company of Nelson to extend its
‘bush tram’ line. Facilitated by an act of parliament at the behest of the Company, the line
was to be 22.5 km in length, and would be horse powered rather than running steam locos
(Churchman and Hurst 1990:14). By 1862 the Dun Mountain Copper Mining Company
had opened its horse drawn railway from the mine head to the port at Nelson. This line was
the first in New Zealand to carry passengers, and by the late 1860s several mining districts
have tramways which carried both ore and passengers (Churchman and Hurst 1990:14,

In 1863 the Christchurch and Ferrymead became first railway in New Zealand to use steam
locomotives (Watson 1996:87). It featured a 2-4-0 locomotive, built by Slaughter Gruning
and Company of Bristol, England, the first of four imported between 1863 and 1868

Other railways at this time included a wooden railed 4 feet 8 ½ inches (1,425mm) gauge
(British standard) railway between Invercargill and Makarewa opened on 18 October
1864. Unfortunately the wooden rails proved inefficient and the line was abandoned by
1866 (Churchman and Hurst 1990:14). There was also a line begun in the Waikato, from
Auckland to Drury in 1865. This line was intended to transport troops to the front line of the Maori Wars, but work ceased in 1866 when the military no longer needed the line (Churchman and Hurst 1990:14).

February 1867 saw the opening of New Zealand’s second steam railway, an iron railed 3 feet 6 inches (1,067mm) gauge line from Invercargill to Bluff (Mahoney 2004:83). This line later expanded to include the route previously occupied by the wooden railed Makarewa line (Churchman and Hurst 1990:15). By 9 November the Christchurch to Lyttleton line was opened. Built to 5 feet 3 inches (1,600mm) gauge, this line has the added distinction of including New Zealand’s first railway tunnel, the 2.6 km Lyttleton tunnel (McGavin 1973:5, Churchman and Hurst 1990:178). Also in this year the Bay of Islands Coal Co. opened a 4 feet 8 ½ inch (1,425mm) gauge line between Kawakawa and Taumarere. This was New Zealand’s first steam worked industrial railway, and used a Chaplin 0-4-0 vertical boiler locomotive to pull rolling stock (Mahoney 2004:83).

This brings us to 1870 and Julius Vogel. When Vogel began his quest to unite the provinces and open up the hinterland of New Zealand, there were no heavy engineering works, and skilled or specialised labour was in short supply. To remedy this situation Vogel negotiated with railway contractors John Brogden and Sons of London for the construction of railways in New Zealand (Olssen 1984:88-89, Churchman and Hurst 1990:16). He also negotiated for skilled labourers and this led to the immigration into New Zealand of 1,298 British railway workers (navvies) and their families over the next two years (Olssen 1984:88-89, Rollo 1981:5, Watson 1996:105). These became known as Brogden’s Navvies and would play no small part in the development of infrastructure and labour organisation in New Zealand.

The first tracks to be constructed to Vogel’s recently adopted 3 feet 6 inches (1,067 mm) standard gauge were laid in late 1870 by the recently formed Public Works Department on the Dunedin to Clutha line (Churchman and Hurst 1990:16).

In November 1871 the Railways Act (1871) was passed, authorising the construction of more railways. This was followed by the Railways Act (1872), which in addition to allowing the construction of new railways, also required that all railway construction contracts be submitted to public tender and that no work could begin until the Chief Engineer, at this time John Carruthers, had deemed the line likely to “pay working expenses from the date of completion” (Churchman and Hurst 1990:18).

Also in 1872 New Zealand’s first 3 feet 6 inches (1,067mm) gauge (New Zealand standard) railway line was opened from Dunedin to Port Chalmers. The railway was built by the Dunedin and Port Chalmers Railway Company, and was later purchased by the government under the Railways Act of 1872 (Olssen 1984:67, Churchman and Hurst 1990:18).

Julius Vogel requested authority to raise a further 1.5 million Pounds Sterling for railway construction in 1873 and between then and 1877 the construction of several more lines was started. The year 1877 was a watershed in the development of the railway network in New
Zealand. It was in this year that the construction of railways was separated from the management of working railway lines. This led to the development of the Railways Department, which took over the running of working lines. A set of operating rules and regulations for the “Conduct of the Traffic and the Guidance of the Officers and Men of the New Zealand Railways Department” were also put in place (Churchman and Hurst 1990:18).

Other important events in 1877 were the passing of the District Railways Act (1877) which allowed any district which could support its own railway to build one, and the Engineer in Chief of Public Works of the Middle Island (it would not be called the South Island until 1907) W. N. Blair, reported in July that all public works schemes thus far undertaken in the Middle Island had been completed (Churchman and Hurst 1990:19).

By 1879 the main trunk line from Lyttleton to Bluff was opened. As of June 1,275 km of railway line had been opened to traffic in the South Island, while in the North Island the figure was much lower, only 542 km (Churchman and Hurst 1990:19). So far, Vogel’s scheme of borrowing heavily to invest in infrastructure seemed to be paying off, but problems lay ahead.

Though the 1870s had seen the rapid expansion of the rail network in New Zealand, at the dawn of the 1880s the spectre of world-wide economic depression loomed large (Dangerfield and Emerson 1995:14). This led to a reduction, and in some cases curtailment, of Government spending on railways infrastructure. Cuts were made to staff numbers and to services provided, and the construction of new and existing railways was reduced (Churchman and Hurst 1990:19, Watson 1996:151). Several local railways were taken over by the state as they proved unable to pay their own way (Watson 1996:151). While some unemployed workers were assigned to railway construction, roads were far cheaper to construct, and the road network grew at the expense of the railway network (Watson 1996:152).

As a response to the depression, in 1881 the government passed The Railways Construction and Land Act (1881). This was an updated version of the 1877 Act, and although intended to provide impetus for private companies to construct railways in local areas, the lack of funds meant that in reality, not much was done (Churchman and Hurst 1990:20).

In 1887 the first locally produced locomotives were manufactured in local workshops such as Scott Brothers in Christchurch (Churchman and Hurst 1990:21). These railway workshops become hotbeds of trade union organisation, due mainly to the large number of skilled workers who were “determined to defend their way of work” (Watson 1996:122).

By 1891 the loan monies acquired by Vogel were exhausted. Richard Seddon increased funding to the Public Works Department and instigated the ‘co-operative system’, whereby work was contracted to gangs of workmen rather than being put up for tender (Gibbons 1973:54, Watson 1996:154, Dangerfield and Emerson 1995:21-22).
As the economic depression eased at the end of the 1880s, the pace of railway construction picked up briefly and 169 km of new railway were laid between 1893 and 1895, mainly on provincial branch lines. By 1900 the construction of new lines had slowed as by this stage all major railways in the national network were completed, and only branch lines such as the Otago Central Railway remained unfinished. The network totalled 3,548 km, 2,222 km of which were in the South Island and 1,326 km in the now more populous North Island (Churchman and Hurst 1990:21).

The dawn of the new century saw the appointment of Joseph Ward as the Minister for Railways. Ward allowed two and a half million Pounds for railways over the next five years. This was to be spent mainly on locomotives, rolling stock and fixed capital plant, while spending on bridges, signals and telegraphs was reduced (Churchman and Hurst 1990:23). The network progressed slowly under this regime, and in 1910 the North Island Main Trunk Line was completed. Although the operating ratio (expenses to revenue) of the railway network was deemed to be satisfactory, the Railways Department had an accumulated debt of 28 million Pounds (Churchman and Hurst 1990:24).

Due to on-going wear and tear by 1914 all New Zealand’s main trunk lines had been relaid twice, and most branch lines once. The North Island network now totalled 1,930 km and the South Island 2,666 km. In August the new general manager of the railways Mr E. Hiley proposed increased spending on railways over the next five years. However, the outbreak of WW1 meant funding was hard to come by, though the network did increase by 209 km during the war years of 1914-1919 (Churchman and Hurst 1990:24).

The New Zealand railway network reached its peak by 1925 (Figures. 1 and 2), and developments in automobile technology and improved roads meant that railways began to lose passengers and freight to cars and trucks. This eventually led to a serious decline in the economic viability of the rail network, and while some branch lines were completed after this time, the general trend was more towards reducing the network than expanding it (Churchman and Hurst 1990:28, Watson 1996:181).
Figure 1. Extent of rail network in the North Island 1925. Appendix to the Journals of the House of Representatives, 1925 Session I, D-02a 18.
Figure 2, Extent of rail network in the South Island 1925. Appendix to the Journals of the House of Representatives, 1925 Session I, D-02a 18.
1.5 Approaches to the archaeology of railways

International approaches to the archaeology of railways fall into six basic categories; the history, development and structure of rail networks; field guides to railways related features and sites; rescue archaeology of features and sites associated with railways; the archaeology of labour related to railways; railways as heritage sites; and railways as landscape features.

Of the six approaches to railways archaeology, by far the most common are books and articles related to the history, development and structure of railway networks. These are largely British in origin and range from basic histories and regional guides (Hudson 1963, Smith 1965, Buchanan 1972, Bracegirdle 1974, Brook 1977, Trinder 1982), to more specific histories and descriptions of railways related bridges, viaducts, culverts, buildings, and the tracks themselves (Bracegirdle 1974, Nock 1981, Rynne 2006: 359-388, Stratton and Trinder 2000: 159-169). As a rule most of the early examples of this approach appear to be primarily about industrial archaeology, and seem to be aimed more toward the amateur railways historian or enthusiast than the academic.

While this approach is generally British, there are examples from Australia (Kiernan, McConnell, Bannear, McGowan and Airey 1989, Campbell, Brougham and Caldwell 2009). These are more detailed in that they deal not only with railways history but also with investigations of specific archaeological sites. This is also true of the contributions from the United States of America (Baram 2011).

Field guides to railways related features and sites are another common theme in railways archaeology. These generally include descriptions of railways related features and sites, from the rail-bed itself to tracks, signals, bridges, culverts, viaducts, sidings, engine sheds, workshops and stations (Hudson 1963, Smith 1965, Buchanan 1972, Brook 1977, Haselfoot 1978, Rynne 2006: 359-388). Again these tend to be largely British publications, focused primarily on industrial archaeology. American examples of this approach have a more academic bent than their British counterparts, but again they contain little or no site specific archaeology (McVarish 2008: 68-94). Rescue archaeology is, as the name implies, archaeology carried out when a structure or site of potential historical or archaeological interest is threatened with destruction. As governments and town planners look to the future, more and more of the past is being destroyed, and often the archaeological record of a site is all that remains. This is as true of railway lines and railways related architecture as it is for any other relics of industry. Examples of this approach include the archaeological assessment of the Limes railway embankment, Herefordshire, England (Sherlock, Pikes and Newby-Vincent 2002).

The archaeology of labour associated with railways is the closest area of international study to that undertaken in this thesis. Paul Shackel (2010) is critical of ‘conventional industrial archaeologies’ for their ‘celebration of capital’ and focus on the machinery and buildings of industry over labour (Shackel 2010:180). He sets out a framework for the study of labour and provides examples of particular case studies rather than an in-depth archaeology of any particular site (Shackel 2010:178-192).
Wegars and Sprague (1981) in their investigation of the ‘Joso Trestle’ railway workers’ camp at the Lyons fish hatchery site in Washington U.S.A looked at the differing patterns of consumption and disposal between the permanent site foreman and the more itinerant workers. They also investigated the workers’ leisure time activities (Wegars and Sprague 1981). When Cleveland (1983) examined the same camp, he focused on its layout and mapped surface features. He also looked at the disposal habits of the workers (Cleveland 1983: 99-126 in Schalk 1983).

Michael Morris (1994) has undertaken extensive archaeological studies of navvie’s huts in Britain, mostly related to railway construction (Morris 1994:573-584). Morris divides the settlements into four periods, from the canal builders of the 1760s to the road builders of the 1930s, and looks at issues of change over time in structure, layout and behaviour (Morris 1994:574).

Archaeological investigations undertaken in Australia by Lucy Taksa (2005) at the site of the Eveleigh Railway Workshops in New South Wales, have focused on labour issues (Taksa 2005:8-27). Taksa has studied the spatial layout (or cultural landscape) of the workshops from the Eveleigh site, in addition to archival and oral histories, for evidence of company control and worker defiance and resistance (Taksa 2005:8).

The idea that some railways may be classified as World Heritage sites is relatively new (Coulls 1999, Stratton and Trinder 2000: 205-210). In his paper on the subject for the International Council on Monuments and Sites, Anthony Coulls (with C. Divall and R. Lee 1999) sets out a series of four criteria for a railway or section of railway, to be considered as a World Heritage Site (Coulls 1999: 9-11). While an interesting possibility, such an approach is beyond the scope of this thesis.

All railway lines are landscape features, and examples of the landscape archaeology approach include Trinder’s (1982) book on the industrial landscapes of England, and Uzi Baram’s (2011) recent article on the railroads’ in place in early twentieth century Florida. Workers camps related to the construction of railways are also landscape features, so there will be some aspect of landscape archaeology in this thesis.

1.6 Approaches to the archaeology of workers camps

Although this thesis is primarily concerned with locating camps associated with the construction of the Otago Central Railway and separating these from sites and features involved in the maintenance and day to day running of the railway, it is important to position it within the international literature relating to the archaeology of worker’s camps. This study will be, at best, a very coarse grained one, involving indentifying where the camps are and surveying and mapping the surface features of at least two selected sites. In order for it to have relevance beyond being a mere mapping exercise, this thesis needs to align itself with one or more of the approaches taken to the archaeology of worker’s camps in previous studies.

There are several possible approaches to the archaeology of workers camps, most of which could be described as ‘social archaeologies’ and which provide “ethnographic snapshots of

Perhaps the most common approach to the archaeology of worker’s camps is the comparative one. Using this method, things such as living conditions, change over time, and internal structure can be compared and contrasted within and between sites (Cleveland 1983, Franzen 1992, Morris 1994, Gillespie and Farrell 2002, Davies 2005). Gregory Cleveland (1983:99-126) in his investigations at the Joso Trestle construction camp in Washington State U.S.A, examined the differences between the relative permanence of the buildings occupied by the camps foremen, and the more temporary accommodation used by the itinerant labourers who made up the majority of the work force. John Franzen (1992:76) compared the types of foods consumed and table-wares used in different logging camps in pre 1900 Michigan, U.S.A. as a means of investigating claims that the food provided by the logging companies deteriorated, as did working conditions, as timber was depleted and worker numbers increased.

Franzen also examined how people living in workers camps adapted their surroundings and adapted to their surroundings has been studied in association with logging camps in the United States (Franzen 1992). Priscilla Wegars (1991) has studied dome ovens associated with different types of labour camps in the United States and Australia (Wegars 1991). She has also looked at patterns of consumption and disposal at the Joso Trestle construction camp in Washington State U.S.A (Wegars and Sprague 1981).

Landscape archaeology, when applied to workers camps, positions them within landscapes and examines the camps themselves as landscape features. There are also questions of the spatial layout of camps within landscapes and how different features or material remains relate to each other and the broader landscape (Cleveland 1983, Franzen 1992, Gillespie and Farrell 2002, Davies 2005). In his study of Henry’s no.1 Mill, Victoria Australia, Peter Davies used the landscape approach to examine the patterns of housing, amenities and movement of people between the mill and nearby towns (Davies 2005: 59-72).

Lucy Taksa (2005:8-27), in her examination of the material culture from the Eveleigh Railway Workshops, New South Wales, Australia, examined issues of control, resistance and defiance between workers and bosses. While this was situated within a landscape archaeology approach, her choice of subject was more about ideologies, and how the beliefs of the workers were reflected in their work environment.

Workers camps are essentially communities, albeit highly specialised communities. In investigating the “settlement morphology” of navvy communities in industrial England, Michael Morris (1994) was able to build up a picture of change over time in the structure of these settlements. From the small, unstructured and somewhat ramshackle camps of the early period of the industrial revolution, to the larger, more structured sites of the 1880s and beyond, Morris was able to show how living and work conditions improved from the
early days of laissez faire capitalism to the slightly more benevolent approach of

Even the most casual reader of the above can not help but notice the appearance of many
of the authors and studies mentioned in more than one category. For example, Morris’s
(1994) investigation of navvy settlements included aspects of comparative and community
approaches to the archaeology of workers camps, while Franzen’s (1992) included
landscape, adaptation and comparative studies. This clearly illustrates the
interconnectedness of approaches to the archaeology of work camps, and shows that no
single approach is sufficient to explain the myriad of human behaviours.

1.7 Archaeology of railways in New Zealand

Railways archaeology in New Zealand, like its international counterpart, has thus far
focused on the structural remains of sites and features relating to the operation and
maintenance of railway lines and bush trams (see for example Hamel 1994, 2008, Best
2001, Watson 2009, O’Keeffe 2010 a, Middleton 2010). These investigations have mainly
been in urban areas such as Auckland’s Britomart (Bickler, Baquie, Clough, Mace, Prince,
Plowman and Turner 2005) and Glen Eden Station (Best 2001). Work has also been done
at Wellington’s rail yards (O’Keeffe 2010 a) and Te Aro station (McFadgen 2009), and at
the site of the old railway station at Oamaru (Middleton 2010). All of these studies fall into
the category of rescue archaeology.

Where railways in rural areas are subject to archaeological scrutiny, it is usually bridges,
viaducts, culverts or architecture associated with railways which are investigated (Hamel
1994, Watson 2009). Jill Hamel’s archaeological survey of the Otago Rail Trail, on the
former route of the Otago Central Railway between Middlemarch and Alexandra, is an
example of this approach, which could also be described as heritage archaeology.

Several bush tramways have been the subject of archaeological investigation (Petchey
2000, Watson 2005). These are associated with extractive industries, most notably logging,
and are to be found throughout the country, from Stewart Island to the far north of the

As a rule it is only when the construction of a new railway threatens or exposes existing
Pre European archaeology, such as at the Wiri Railway site in Auckland (Veart 1984), or
at Kapiti, near Wellington (O’Keeffe 2010 b), that people are mentioned at all. However,
Kate Hill’s thesis and subsequent monograph on the Raurimu Frontier Town 1900-1925
(Hill 1999) is the exception. Focused mainly on issues of social archaeology and gender,
Hill’s study of how a canvas railway construction camp became a lumber town, also looks
at issues relating to transience and labour relations (Hill 1999).

All the above mentioned studies, with the exception of Hill (1999), reveal the lack of
research into the lives of the people who built the railway network; the navvies and their
families, the Chinese, the European stone masons, the drifters from the goldfields, and the
‘unemployed workers’ who due to circumstances beyond their control, found themselves
marginalised by the depression of the 1880s. Most historical or industrial archaeological
studies of the conditions under which workers lived in post contact and early European New Zealand have generally been associated with extractive industries such as whaling and sealing (Campbell 1992, Dudfield 2004), mining (particularly gold mining) and forestry. These have been concerned largely with Chinese groups, especially in the South Island (Ritchie 1984, 1986, Ritchie and McGovern-Wilson 1986, 61-71), though the whalers and sealers tended to be European or American, at least initially (Campbell 1992, Dudfield 2004).
2. Central Otago and its Railway History

2.1 Geographical setting

Figure 3. Map of the route of the Otago Central Railway. Image from Dangerfield and Emerson Over the Garden Wall: story of the Otago Central Railway 1995:6
The landscape through which the Otago Central Railway winds its way is, like most New Zealand landscapes, formed by a combination of volcanism, erosion, metamorphism, and tectonic activity. From the volcanic bedrock of the Otago Peninsula and the clay which forms the subsoil of much of the flatter areas in and around the city of Dunedin, the railway travels across a graben fault (rift) between the coastal and inland hills. This fault underlies the Taieri Plain, which in turn has been formed by sediments deposited by the Taieri River.

The Taieri River has played a large part in the formation of the Otago landscape as it tries to reach the sea, continually wearing down whatever tectonic activity has thrown in front of it. This explains its convoluted course, which the railway follows for the next two thirds of its former length.

On leaving the Taieri Plain the railway enters the Taieri Gorge, where it follows the path the river has carved out of the hills. This is a landscape of streams, gulches, steep drops and rocky outcrops (Dangerfield and Emerson 1995:7). These hills were formed by the uplifting and folding of the schist bedrock which underlies much of inland and central Otago, and gives it its unique character.

Schist is a high grade metamorphic rock, created when sediments deposited by water are buried and subjected to high pressure and temperatures in excess of 500°C (Skinner, Porter and Park 2004: 205-210). Millions of years of tectonic activity have pushed and pulled and folded this metamorphic rock into a landscape of mountain ranges and upland plateaus, cut through by rivers (McCraw 1965: 30). What made this particular schist so important, at least to Europeans in New Zealand in the 1860s, was its gold bearing capabilities.

The gold rush of the 1860s put Otago briefly at the forefront of economic activity in this country. However, the easy gold, played out fast and when the idea of the Otago Central Railway was first mooted in 1871 the initial gold rush was over. Although the easily obtained gold had gone the railway was seen as means of transporting the heavy machinery required for the more mechanised, intensive gold mining and dredging needed to extract what gold remained (Dangerfield and Emerson 1995:9). The tailings of this intensive gold extraction are even today a notable feature of the Central Otago landscape.

The Otago Central Railway exits the Taieri Gorge near Middlemarch, where the line now ends, and crossed the Strath Taieri Plain before skirting the northern end of the Rock and Pillar Range, all the while following the path of the Taieri River. This upland area, some 550 metres above sea level, is a dry landscape of schist rock outcrops (tors) and few trees. The railway continued across the landscape, over upland basins and around ranges of hills, and left the Taieri River at Waipiata, near Ranfurly.

This area of Central Otago, a large sub alpine basin, is mainly associated with the production of stone-fruit and a large population of rabbits. From here the former railway, now the Otago Central Rail Trail struck out across the Maniototo Plain and skirted the northern end of North Rough Ridge. Next it negotiated a series of valleys separated by
ridges, before the line reached Alexandra. It then followed the upper Clutha River to Clyde, where it entered the now flooded Cromwell Gorge and followed this to its final stop, the town of Cromwell.

2.2 What was there before the Otago Central Railway?
The diverse nature of the New Zealand landscape made the development of an overland transport network problematic and expensive. Swamps, mountains, wide, deep and/or braided rivers, scrubland and dense forests all provided challenges to those attempting to open up the land for exploitation (Watson 1996:49). Rivers in particular proved dangerous to the traveller, and drownings were so common they became known as the ‘New Zealand Death’ (Watson 1996:40).

New Zealand’s early European settlers had to create roadways and tracks to open up the land and clear forests. This required a great deal of labour as trees had to be felled, the stumps removed and the track surface tarred, all by hand and barrow (Arnold 1981:289, Scott 1983:6). Often tracks and roadways became impassable after rain, and the forest canopy prevented drying in the areas of denser bush. Even in relatively open country, the amount of traffic these tracks and roads had to carry proved too much, and the surface would deteriorate rapidly (Arnold 1981:289, Watson 1996:52). The droving of sheep and cattle also caused much damage on these early tracks and roadways (Watson 1996:52).

Due to the problems associated with overland transport in early European New Zealand, most commerce and inter-settlement communication was carried by coastal shipping (Scott 1983:3). This meant that the major settlements developed in relative isolation, which was reflected in the provincial system of local governments acting independently to overcome local transport problems, without central government establishing a network of roads or setting national standards for things such as railway gauge (Watson 1996:31, Scott 1983:5).

Many rivers were navigable to some extent, and craft suitable for carrying goods and passengers were soon employed where possible. These ranged from the Maori waka to various forms of European designed craft (Watson 1996:40).

At this early stage the most common means of overland transport was by foot, the humble leather boot being the main type of transport technology in use by Europeans in early New Zealand (Watson 1996:34). Bullocks were introduced into New Zealand in the 1820-40s, more for ploughing and pulling sledges and carts than carrying people (Watson 1996:35, Scott 1983:6, Jacomb 2000:47). Bullocks were particularly useful for pulling drays (two wheeled carts without springs, used to carry large loads slowly) and larger four wheeled wagons, across land without roads (Watson 1996:37, Jacomb 2000:47). Carts were smaller and had springs, which made them considerably more comfortable for passenger transport than drays or wagons.

As a team of bullocks could not be expected to cover more than 15-20km per day, a number of generally short lived accommodation houses and hotels sprung up along the most popular routes (Jacomb 2000:48, Hamel 2001:112). Horses provided easier and more
rapid overland transport than walking or bullocks, and had the added advantages of providing their riders with a better view of the surroundings and a safer way of crossing rivers. They were, however, expensive to buy and maintain, especially if fed on oats (Watson 1996:34).

While some roads, especially in the North Island, were built by the military or local constabulary as supply lines during times of tension with local Maori, during the 1840s it was the unemployed who were responsible for the construction of much of New Zealand’s early road network (Watson 1996: 66-67, 69).

As roads improved, especially in urban areas, and more people arrived in the colony, private and public transport became more sophisticated, though still animal powered (Watson 1996:37). Horse drawn omnibuses, or buses (enclosed vehicles with rear doors and seating for several passengers), were in service by 1858 (Watson 1996:38).

In Otago, roads slowly developed from tracks made by run-holders heading inland with their flocks (Hamel 2001:108) From this skeletal system of droving and dray tracks a more substantial network developed from the bullock tracks created to service the goldfields of Central Otago (Scott 1983:6, Hamel 2001:112). Prior to the discovery of gold in 1861, most Central Otago landowners and their employees travelled to and from the east coast on horseback across open country (Cunningham 2005:67). This was not the shortest route from the interior to the coast, and miners travelling on foot to Central Otago following the discovery of gold, used the shortest route which was via the trail which became known as the Old Dunstan Road. This ran from Clarks Junction, over the Rock and Pillar Range to the ford across the Taieri River at Styx, from here the trail ran along the valley floor before crossing Rough Ridge and into the Ida Valley and Alexandra (Cunningham 2005:67). However, it was steep and winding, with much of the trail being at high altitude and therefore often muddy or snowbound in the winter. This made travel difficult for the increasing number of wagons and carts using the trail, including the gold escort which carried gold from Central Otago to Dunedin. What was required was an alternative route into the interior, and this was provided by what is today known as the Pigroot (Cunningham 2005:67).

Beginning at Palmerston on the coast, this trail ran inland along the south side of the Horse Range to Kyeburn and from there through the Ida and Manuherikia valleys to the goldfields. This eventually became the favoured route to the interior, and although very muddy on occasions, was much easier on horses and wagons, not to mention the people and freight making their way inland (Cunningham 2005:68).

2.3 History of the Otago Central Railway

As gold mining became more industrialised, a means of carrying heavy freight to the gold fields was necessary, and to this end a railway between Dunedin and Central Otago was mooted in 1871 by Thomas Shepherd the MP for Dunstan (Central Otago). This motion was ‘negatived’, but by 1872, the General Government had requested a survey of possible railway routes to Central Otago (Dangerfield 2001:9). To this end the Otago Provincial
Council appointed John Millar FSA to carry out a survey of the midland districts of Otago. Millar surveyed several possible routes (Furkert 1958:227) and although in 1873 committees were convened and resolutions passed, no further action was taken at this time (Dangerfield and Emerson 1995:9).

By this time of course the gold rush was long over. However, in the interim much land had been settled and turned over to farming and orcharding, and a means of quickly transporting produce from Central Otago to the city of Dunedin and its port was needed (Churchman and Hurst 1990:200).

By 1877, the threat of a proposed railway line running to Central Otago direct from Oamaru led Vincent Pyke (an active promoter of the Central Otago region) to make an impassioned plea to the Mayor of Dunedin for a rail link between Dunedin and Central Otago (Emerson and Dangerfield 1995:11). District engineer W. N. Blair was commissioned to survey possible routes for a line linking the port of Otago with the interior, especially the gold fields of Central Otago (Churchman and Hurst 1990:200). The railway was to be built using money made available from Jules Vogel’s policy to invest heavily in infrastructure. Over the years seven routes had been proposed, and after R. Hay re-surveyed the route through the Taieri Gorge, this was eventually the one chosen by the Otago Main Central Railway Committee (Churchman and Hurst 1990:200, Leitch and Scott 1995:92, Dangerfield and Emerson 1995:11-12). The Public Works Department was the overseeing organisation (Dangerfield and Emerson 1995:14).

So it was that on 7 June 1879 Vincent Pyke, amongst much pomp and ceremony, turned the first sod of the Otago Central Railway at Wingatui (McLintock 1949: 662, Cunningham 2005:70, Leitch and Scott 1995:92). Daniel McKenzie held the contract to construct the first 10.7 km of the railway and optimism was high, with the railway expected to reach Wanaka by 1884 (Churchman and Hurst 1990:200, Dangerfield and Emerson 1995:14). E.R Ussher was the engineer in charge of this first section of the Otago Central Railway, and to provide the steel for the track and bridge work a temporary iron-works were established at Wingatui by Andersons Ltd, an engineering firm from Christchurch (Dangerfield and Emerson 1995:18).

Any initial optimism was quashed when the economic depression of the 1880s began to bite. This was felt particularly strongly in the colonies, especially New Zealand (Olssen 1984:90). Work ceased on Taieri Gorge line, and then proceeded sporadically as money became available through various forms of government work schemes (Dangerfield and Emerson 1995:14). Unfortunately for the railways, roads were far cheaper to construct than railway lines, and many were built or upgraded during this time (Watson 1996:152). In August 1880, 700 men were employed by the Public Works Department on the stretch of line from Mullocky Gully to Deep Stream under government measures to deal with unemployment, but wage reductions and labour relation issues reduced the workforce to 115 by December (Dangerfield and Emerson 1995: 14). Several Public Works Department camps were set up along the proposed path of the railway through the Taieri Gorge.
By March 1881 only 60 of the 700 Public Works Department employees remained in the Mullocky Gully to Deep Stream the section of the railway (Dangerfield and Emerson 1995:14). After a Government report commissioned on the progress of the line recommended that “...construction should never have started and must now cease”, Vincent Pyke advocated strongly in favour of work continuing on the Otago Central Railway, and thanks mainly to his efforts, work recommenced (Cunningham 2005:70). The Deep Stream Bridge was constructed with R. Hay as chief engineer (Furkert 1958:185).

Far from reaching Wanaka by 1884, the Otago Central Railway reached Hindon, barely half way through the Taieri Gorge. Only the track bed had been formed at this stage and no rails laid. The workforce was largely gleaned from the ranks of the local unemployed, alongside drifters from the goldfields, particularly the Chinese. In addition, there were still many navvies imported earlier from Britain under Vogel’s agreement with John Brogden and Sons (Olssen 1984: 88, Watson1996:105). One of the reasons for the slow progress of the Otago Central Railway was the lack of a bridge over the Taioma Stream at Mullocky Gully, and in January 1885 the contract for the Wingatui Viaduct (originally known as Taioma Viaduct), was let to R. S. Sparrow and Co. of Dunedin. The viaduct was designed by P. S. Hay and W. N. Blair under the supervision of J. Blackett (Dangerfield and Emerson 1995:18) and construction began soon after (Churchman and Hurst 1990:200). Goods and materials for the construction of the line beyond this point were bought in via a temporary tram way on the Outram branch (Dangerfield and Emerson 1995:15).

Construction of the Wingatui Viaduct was eventually completed in 1887, after which the iron rails could be transported direct to the railhead from Anderson’s temporary foundry at Wingatui. The completion of the viaduct accelerated the speed of construction, and the line through to Deep Stream was completed soon after (Churchman and Hurst 1990:200). Beyond the Deep Stream bridge lay the most challenging section of the gorge, with the area known as The Notches involving the bridging of four ravines and cutting of four rock spurs, all this within 281 metres (Dangerfield and Emerson 1995:19).

Although the economic depression of the last decade was easing, in 1889 there were still many workers drafted from the ranks of the unemployed on the Otago Central Railway. On 24 October the line was opened to Hindon and this became the railhead. The track bed from Hindon to Middlemarch was laid by the afore-mentioned workers from the ranks of the unemployed (Dangerfield and Emerson 1995:19, Bromby 2003:93), and by 1891 the line reached Middlemarch (McLintock 1949:664, Churchman and Hurst 1990:200). The Railways Department took over the running of this section of the line and it was officially opened on 27 May 1891 (Dangerfield and Emerson 1995:20). By this time the loan monies acquired by Vogel in the 1870s were exhausted. Richard Seddon increased funding to the Public Works Department and instigated the ‘co-operative system’ in which work was contracted to gangs of workmen rather than being put up for tender (Gibbons 1973:54, Watson 1996: 154, Dangerfield and Emerson 1995:21-22). Under this system workers provided their own tools, barrows and even explosives. Larger plant was provided, along
with a tent, the upkeep and replacement of which was up to the individual (Dangerfield and Emerson 1995:22).

In 1894 the Otago Central Railway reached Hyde and this section of the line was officially opened on 24 May (Dangerfield and Emerson 1995:24). As a consequence the district boomed and business folk followed the work camps as they moved. This movement of workers also affected school rolls in the area, so it is to be assumed the workers were not all single men (Dangerfield and Emerson 1995:24).

By 1896 work on the line between Kokonga and Waipiata was underway but problems with late contract placement and late delivery of iron work for bridges caused delays (Dangerfield and Emerson 1995:25). This meant that the line to Ranfurly was not completed until late in 1898 and was officially opened on 1 December of that year. Ranfurly housed a permanent locomotive depot, and its position as the rail head led to its flourishing at the expense of nearby Naseby. This was ironic because the towns folk of Naseby had lobbied hard for the construction of the Otago Central Railway. Also as a result of the Otago Central Railway reaching Ranfurly, coaches no longer had to use the Pigroot to Palmerston and the road houses and settlements which had sprung up to service the coach trade began to whither (Churchman and Hurst 1990:200,Dangerfield and Emerson 1995:25).

Wedderburn became the terminus for some 18 months at the turn of the 20th century. Wedderburn was a coach road town and during this time became the local headquarters for the Public Works Department. Most settlers in the area were employed on railway construction (Dangerfield and Emerson 1995:27). Up until this time, trains running to and from Dunedin had carried both freight and passengers, but now passenger only trains came into service (Churchman and Hurst 1990:201, Bromby 2003:92).

With the terrain now more favourable to railway construction, the Ida valley section of the railway was completed in 1901. Laying the next stretch of the line (from Ida Valley to Poolburn) entailed the construction of a large workers camp at Rough Ridge (Oturehua) (Churchman and Hurst 1990:200). This camp was the largest associated with the Otago Central Railway and housed 300 men for three years (Dangerfield and Emerson 1995:27, Cunningham 2005:73).

In 1904 the section through the Poolburn gorge to Omakau came on line (Churchman and Hurst 1990:200). This section of the railway depended on the Poolburn Viaduct, construction of which was delayed by floods, frosts, heavy snowfall, and Government cutbacks (Dangerfield and Emerson 1995:28, Cunningham 2005:73 Leitch and Scott 1995:92). In September, the New Zealand Railways took over the running of this section of the line.

By August of 1904, 200 men were working on the section at Chatto Creek (Dangerfield and Emerson 1995:30). In July 1906 the line to Chatto Creek was opened, and a station built there. At the end of the year the line reached Alexandra, although the station and goods sheds were incomplete (Churchman and Hurst 1990:200, Dangerfield and Emerson
The township of Clyde was connected to the system in 1907 and there was a pause of several years before the final push on toward Cromwell (McLintock 1949:668, Churchman and Hurst 1990:200, Dangerfield and Emerson 1995:32).

It was not until 1914 that work was begun on the line from Clyde to Cromwell and the laying of this last section of the Otago Central railway was not without incident. In 1916 a cloudburst caused slips and washouts on the section of line (and road) between Clyde and Doigs. The engine Josephine (now on display at the Otago Settlers Museum) was caught between two slips and had to be temporarily abandoned (Churchman and Hurst 1990:200, Dangerfield and Emerson 1995:34). The line finally reached the station at Cromwell in 1917, and with this being the end of the line, a turntable was installed. In January 1918 the Public Works Department ran the first passenger trains to Cromwell and on 11 July 1921 the Railways Department took over the running of the Otago Central Railway (Churchman and Hurst 1990:200, Dangerfield and Emerson 1995:34).

The Otago Central Railway operated until 1990, although it never returned a profit, despite early restrictions on how far goods could be moved by road in competition with railways (Leitch and Scott 1995:94). Freight carried included wool, livestock and stone-fruit as well as heavy equipment for the dredges on the Clutha River (Churchman and Hurst 1990:200). Mixed trains ran between Dunedin and Cromwell until 1936 when the service was split between passenger and freight trains (Bromby 2003:92). Eventually a return to mixed trains took place in 1951 (Dangerfield and Emerson 1995:43).

An accident on 4 June 1943 claimed 21 lives after excessive speed caused a derailment between Hyde and Rock and Pillar. Driver negligence was found to be the cause of the accident, and the engine driver was convicted of manslaughter (Dangerfield and Emerson 1995:43, Cunningham 2005:74).

In 1956 a regular railcar service, utilising Vulcan railcars was started between Cromwell and Dunedin. This was halted briefly in 1957 when a series of derailments meant sections of the line had to be re-laid with new sleepers (Dangerfield and Emerson 1995:49). The railcar service eventually ceased in 1976 Dangerfield and Emerson 1995:51). 1956 also saw the introduction of diesel locomotives, and in 1968 the last steam locomotives were withdrawn from regular service (Churchman and Hurst 1990:201).

The route through the Cromwell gorge was closed in 1980 prior to its being drowned by the Clyde high dam. Ironically, the haulage of construction materials for the hydro dam had kept the line open through the 1970s, but this was only a temporary stay of execution and the line beyond Middlemarch was finally closed on 30 April 1990 (Leitch and Scott 1995:94, Bromby 2003:93). The 64 km of line through the Taieri Gorge, from Wingatui to Middlemarch was purchased by the Dunedin City Council and kept open as a route for tourist excursion trains (Churchman and Hurst 1990:201).

After the line was closed to rail traffic in 1990 the tracks between Middlemarch and Clyde were lifted and the former route of the Otago Central railway between these two towns
became The Otago Rail Trail, a walking track, horse track and cycleway. It is administered by the Department of Conservation and the first section was opened in June 1994.

2.4 The Existing Archaeological record of the Otago Central Railway
To date the archaeology of the Otago Central Railway has been limited to an assessment of the railway related features on the disused section of the line between Middlemarch and Clyde, which became the Otago Central rail trail recreational track (Hamel 1995). Sole (2011), recorded a trench through an embankment at Chirnside Farm near Waipiata (N.Z.A.A. site no. H42/136), and Hamel recorded surface features and chimneys at the Flat Stream Public Works Department campsite (N.Z.A.A. site nos. I43/118, I43/119, I43/12).

Hamel’s (1995) report on the railway related sites and features of what was to become the Otago Central rail trail lists and describes the remains of stations, sidings, bridges, culverts and tunnels. There is no mention of the remains of any camp sites in Hamel’s assessment, though there must have been contractors’ camps near the some of the bridges and tunnels on this section of the line.

The mapping and recording of the surface features and standing structures at the Flat Stream Public Works Department camp shows the site to have consisted of three levels, the uppermost of which appears to have been occupied by the local constabulary (N.Z.A.A. site no. I43/118). There are the remains of some 20-30 occupation sites and a small room, separate from the rest of the site, made of schist slabs which may have been the powder magazine (N.Z.A.A. site no. I43/119, I43/121). Aside from the probable police camp and the presumed powder magazine, no distinction is made between the possible function of features. They are all recorded as occupation sites.
3. Method
As described above, Hamel (N.Z.A.A. site nos. I43/118, I43/119, I43/12) interpreted the archaeological features at the Flat Stream Public Works Department camp as the Police camp on an upper terrace, a series of occupation sites spread over two lower terraces, and a powder magazine at some remove from the other structures.

To what extent the Flat Stream camp is typical of construction related camp sites associated with the Otago Central Railway may be in some part answered by this thesis. Equally, the accuracy of Hamel’s interpretations may also be verified.

The first task at hand was to attempt to locate as many of the camp sites relating to the construction of the Otago Central Railway as possible. This was done using a combination of historical documents, remote sensing, modelling, and investigation of surface features present at sites visited.

3.1 The Historical Record
At the risk of stating the obvious, one of the most useful tools for the historical archaeologist is the historical record. Therefore the first avenue of research was a survey of the written record pertaining to the construction of the Otago Central Railway. This included company archives, Public Works Department archives, newspaper articles, maps, memoirs, photographs, private collections of railways related material and previous studies of the Otago Central Railway.

3.2 Railways related material housed in the Hocken Library
Jim Dangerfield, author of “Over the Garden Wall story of the Otago Central Railway” (1995) amassed a huge collection of railways related material over his lifetime. Fortunately, he bequeathed his collection to the Hocken Library, and it is an invaluable source of written and pictorial material relating to the history of the Otago Central Railway. However a thorough search of this material failed to locate much about railway-related construction camps, save for some photographs.

3.3 Newspapers
Papers Past, a digital collection of newspapers from the late nineteenth and early twentieth centuries (http://paperspast.natlib.govt.nz/cgi-bin/paperspast), has many useful articles and photographs relating to the construction of the Otago Central Railway. These include articles on the railway itself, the contractors involved in the construction of the structures associated with the railway such as bridges, tunnels and culverts, and pictures of various aspects of the construction of the railway. There are also reports on government expenditure on railways, as well as changes in legislation pertaining to railway construction.

In addition to the Papers Past web site there are numerous repositories of newspapers including the Hocken Library, Dunedin Public library and the Otago Settlers Museum. These are also a good source of historic images. Unfortunately the Otago Settlers Museum
was under-going renovations while this thesis was being written, and subsequently I was denied access to their archive of images.

3.4 Appendices to the Journal of the House of Representatives
The Appendices to the Journal of the House of Representatives contains the published annual reports of all Government Departments, including the Public Works Department and the Railways Department (New Zealand Railways). These records list the contracts let for the construction of tunnels and bridges on the Otago Central Railway, and to whom the contracts were let. They also provide reports on the progress of construction of the Otago Central Railway.

3.5 Archives New Zealand
Archives New Zealand holds the official New Zealand Government Railways records. Initial investigations of archival material held in the Dunedin office of National Archives, relating to the construction of the Otago Central Railway revealed that while there are a plethora of maps and contract details, there are no direct references to the location or lay out of any camps related to railway construction.

3.6 Land Information New Zealand
Land Information New Zealand holds the Survey Office (SO) and Deposited Plans (DP) compiled over the years. Although I did not directly access these, I was given a copy of SO map 1249 which was used in this thesis.

3.7 Interviews
W. A. (Bill) Cowan, a local railway enthusiast and author of several articles on railways in the lower South Island, as well as a book on the Roxburgh branch line, was interviewed about the Otago Central Railway. Although Mr. Cowan’s knowledge of local railway history is extensive, he was unable to furnish any further information about the camps associated with the construction of the Otago Central Railway. However he was able to supply a memoir written by James Robertson, whose father worked as a carpenter on the construction of the Otago Central Railway (this is reproduced in full as appendix 9).

3.8 Photographs
Photographs proved to be an important aid in locating the sites of camps related to the construction of the Otago Central Railway. Beyond their importance in helping to place the camps in the landscape, photographs can also provide clues as to whether a camp was a Public Works Department or private contractors’ site, and camp size, structure and layout. Even the purpose of some structures may be ascertained from photos. For instance, latrines are likely to be down-slope from the main camp area and are unlikely to have chimneys, while larger buildings with big chimneys are likely to be workshops. Small tents and structures may be single men’s quarters, while larger tents and structures may be for families.
3.8a The Hocken Collection of Photographs
F. Coxhead’s collection of photographs of the construction of the Otago Central Railway through the Taieri Gorge circa 1885 contains 14 images which show workers camps. Some photographs are described as ‘contracts’ (e.g. “Deep Stream contract”) which leads me to believe that these are images of works undertaken by contractors rather than the Public Works Department. The camps in these images tend to be small, just a few tents and the odd, more substantial building. Other photographs which show camp sites are not labelled as ‘contracts’ and I therefore assume that they images are of Public Works Department camps. This certainly appears to be the case with the image of Mullocky Gully, which shows a large camp containing some substantial buildings.

Other collections of photographs (Burton Brothers and Guy Clayton Morris) were examined but were found to be of limited use.

3.9 Remote Sensing
A remote survey of the Otago Central Railway using aerial photographs and maps, along with digital technologies such as Google Earth, was conducted in an attempt to locate construction camps and other features and sites associated with the construction of the railway.

3.9a Aerial Photographs
The Geology Department at the University of Otago has an excellent collection of aerial photographs of the Taieri Gorge. These were studied for evidence of railway construction camp sites. Although they provided excellent topographical information when viewed in stereo, the photographs were taken from too high an altitude for potential camp sites to be visible. However, evidence of the bullock tracks used to supply the camps in the Taieri Gorge was visible, pointing to potential camp locations, and allowing comparisons with track ways shown on modern maps and the more recent images available via Google Earth.

3.9b Google Earth
The Google Earth web site was a useful tool in determining the position of the larger camp sites on the Otago Central railway. Although the sites themselves were not clear, as with the aerial photographs, the track ways used to supply the camps were sometimes visible, along with possible crossing points on the river. One site which had previously eluded railway historians was located using Google Earth.

3.10 Modelling
Because there have been limited previous investigations of railway construction related sites done in New Zealand, there are few studies on which to base any form of modelling as to where such sites could be expected to be found. The text I have used to base my modelling of site location is William Buckles Models for Railroad Construction Related Sites in the West (Buckles 1983), an American study based on sites in the West Rockies, Colorado.
William Buckles (1983) proposes three basic categories of railway construction related camps: those relating to activities ahead of the tracks (surveying, bridge and culvert construction, formation of cuttings and tunnels), those relating to track laying (ballasting, rail laying), and those relating to activities conducted following track laying (Buckles 1983: 215). He also notes that environment, technology, social structure and economics will all play a role in dictating the position and lay out of camps associated with railway construction.

The texts relating to the history of the construction of the Otago Central Railway have shown that, especially in the Taieri Gorge, many aspects of the first two categories were taking place simultaneously, while all of the variables he mentions were also present. For this reason Buckle’s model requires some modification to be applicable to this thesis.

Kate Hill (1999) sets out a three phase model for settlement development in New Zealand railway towns, from tent living to permanent beginnings (timber and brick buildings), and growth of an established town (Hill 1999:1). Although this did happen in at least two cases on the Otago Central Railway, at Hyde and Ranfurly, Buckles’ model of site location is of more use for the purposes of this thesis.

3.10a Using modelling how do we identify where the camps might be?
Using Buckles’ (1983) model building approach, what criteria might be chosen for the locating of possible railway construction related camp sites?

Buckles’ model is based on American railway construction techniques, which differ greatly from those employed in the establishment of the New Zealand rail network. The main difference is that in most American railways, the rails were laid as the line progressed, which was certainly not the case on the Otago Central Railway. Also American railways were built by private enterprise, as opposed to being government funded infrastructure projects. For the purposes of this thesis I will simplify Buckles’ model from three to two categories; that is sites relating to the construction of the track bed by the Public Works Department, and those sites relating to the construction of tunnels and bridges by private contractors. This model applies only to the campsites themselves, as the network of supply stores and track ways was used to provide for both government and private camps.

Workers employed by the Public Works Department formed the track bed and made any necessary cuttings, but were prevented from laying any tracks until the railway bridges had been completed, as the rails were too heavy to be transported by any other means than train. While the Public Works Department workforce was doing the basic grunt work, private contractors were constructing the tunnels, culverts and bridges in the same areas, sometimes ahead and sometimes behind the basic track formation. Unfortunately for the construction of the Otago Central Railway, the first and therefore most important bridge, over the Taioma stream at Mullocky Gully (the Wingatui Viaduct), was not completed until 1887. This had obvious implications for the progress of the railway through the Taieri
Gorge, not the least of which was the amount of time taken to complete this section of the work.

3.10b Site Function
The function of a camp can be expected to have dictated its position in relation to the railway. While most of the Otago Central Railway was constructed by unskilled labourers, who were housed in the large Public Works Department camps, structures such as bridges and tunnels required a specialised labour force. The camps of these specialised groups are likely to have been located as close as possible to the structures they are constructing, meaning that it is most likely a tunnelling gang’s camp will be near the mouth of a tunnel, while a bridging gang’s camp will be near a bridge.

In contrast, the Public Works Department camps, especially in the Taieri Gorge, are more likely to have been situated so as to capture maximum sunlight. Access to water will have been important, as would having sufficient space.

3.10c Environmental factors
The landscape must have played a significant role in dictating where camps were situated. In the Taieri Gorge camps are most likely to have been; near the work site, on flat land where possible, on the north facing sunny side of gorge if possible, as Otago winters can be severe and sun would have been important, and near a constant supply of fresh water. Camps would not have been located immediately beside the river because of the risk posed by flash floods, as these had the potential to destroy anything and anyone in their path.

On the plains I would expect the camps to have been; near the work site, near a constant supply of fresh water, and if possible sheltered from the prevailing wind. Flat land sites are likely to have been laid out in a more organised fashion than those in the hills and gorges.

3.11 How might the camps be laid out?
The landscape can be expected to have played a large role in dictating how a camp was laid out. Factors such as terrain and plant cover are important. In the Taieri Gorge I would expect the latrines to have been down slope from the ‘living areas’. In the Public Works Department camps the powder magazine is likely to have been at some remove from the rest of the camp, while the smithy, carpentry workshops, and the engineers hut to have been situated more toward the centre of the camp site.

All the Public Works Department camps had private boarding houses and supply stores associated with them. The Public Works Department also ran their own stores, which were provisioned by an as yet unidentified Dunedin company. Buildings associated with such activities are likely to have left a larger archaeological footprint than standard huts or tents.

3.12 What clues are there in the landscape which may help identify camp sites?
The most obvious landscape features associated with railway construction are the embankments bridges, culverts and tunnels themselves. Many of these had contractors’
camps nearby. Other landscape features which may be of use in locating construction related camp sites, especially in the Taieri Gorge, are the remains of track-ways.

The camps associated with the construction of the Otago Central Railway were supplied by wagon and dray using tracks. Perishable goods were stored in sheds on the top of the hill above Hindon, and the same was done on the sections at Deep Stream and Nenthorn (Robertson, ms: 4). It was anticipated that these track ways may still be visible in aerial photographs, on maps, and on Google Earth images. There is a problem with track ways however, because the many modern day farm tracks tend to make identification of original track formations difficult. Also, as there was much gold mining in the Taieri Gorge, many of the old tracks may be associated with these activities. In most cases the tracks created at this time are still in use, or at least still visible in the landscape. However, there are now multiple farms and much forestry in the Taieri Gorge, and track ways associated with these activities will need to be identified and discarded.

Although most features associated with construction camps will be too small to be positively identified from aerial photographs and Google Earth imaging, larger features such as track ways and enclosure walls may be visible.

Other landscape clues will include standing chimneys, terraces or platforms which may have been occupation sites. Such features will only be visible when sites are visited, and their presence or otherwise will be, in essence, a form of ground truthing.

3.13 Were sites reused?
Newspaper articles suggest several sites and buildings were reused by successive private contractors. This occurred when the original contractor failed to fulfil their obligations and the contract was re-let. Private contractor’s camps at the tunnel mouth at Mullocky Gulley and at Deep Stream are examples of sites and buildings being reused. However, site or building reuse will be very difficult to ascertain from a survey of surface features.

3.14 Site Survey/ Fieldwork
This entailed the visiting, surveying and mapping of several sites. After consultation with Grant Craig, the Operations Manager of the Taieri Gorge Railway, it was arranged to travel by train to any of the sites in the Taieri Gorge, where I would be dropped off and picked up on the return journey. Sites beyond the Taieri Gorge were visited by car and bicycle.

Site locations and their main internal details were recorded using a Trimble GPS unit. Measurements were taken of main terraces and other features, Walls, chimneys, hut sites and any surface finds were photographed. The extent of each site was determined by searching the area on foot looking for cut or revetted terraces, chimneys, other structures and artefact scatters. No excavation was undertaken but surface exposures of artefacts were inspected to determine the likely date range and nature of occupation.
In all seven sites were surveyed, four in the Taieri Gorge (Mullocky Gully, Sparrows’ workshop at the Wingatui Viaduct, Deep Stream and Nenthorn) and three in the Maniototo (Oturehua, Poolburn Viaduct and Poolburn Gorge).
4. Historical Survey of Railway Construction
Camps

Locating the camps associated with the construction of the Otago Central Railway relied on two strands of research. The first was the examination of the historical record which included newspapers, archival documents, contemporary photographs, aerial photographs and published railway histories. By far the most useful of these published histories was Dangerfield and Emerson’s *Over the Garden Wall: story of the Otago Central Railway* (1995), which includes much detailed information of the railway construction processes and the associated workers camps. The second research strand involved the application of a modified version of Buckles’ model for the location of railways construction related camp sites, in conjunction with Google Earth and historical images.

4.1 The Camps

As already discussed there were two categories of camp site, those established by the Public Works Department and those established by private contractors. It is expected that the contractor camps were situated as near as is possible to the structures being constructed, while the Public Works Department camps were on any suitable area in the general vicinity of the section of line under construction. I would expect the camps to be on north facing land where ever possible, as this receives the bulk of the sun’s warmth. A ready supply of water will also be a factor in site location.

Any camps on the first stretch of line between Wingatui and Mullocky Gully were private contractor’s camps (McKenzie had the contract for this section of the railway, including the two tunnels required to enter the Taieri Gorge), but as yet I have found no mention of any such sites, and the navvies employed on this section of the line may have travelled to the railhead each day from Wingatui (Otago Daily Times, 7 December 1880: 3). There were five main Government camps on the section of the Otago Central Railway, which runs through the Taieri Gorge. These were located at Mullocky Gully, Mt Allan, Hindon, Deep Stream, and Flat Stream. As mentioned earlier, each camp had a blacksmith’s workshop, a carpentry workshop, engineers office, powder magazine, a boarding house and at least one supply store (Cowan 2009: 148). They were all in use at the same time, as the line was pieced together between major bridges and tunnels.

Although the section of the Otago Central Railway between Mullocky Gully and Deep Stream was overseen by the Public Works Department, the tunnels and bridges in this section were all constructed by private contractors, who had their own camps. The Chinese also had separate camps, and although their diligence and stone masonry skills were much admired, they were always regarded with some antipathy, due largely to European distrust and racism (Dangerfield and Emerson 1995:15).

Beyond the Taieri Gorge there were Public Works Department Camps at Sutton, Middlemarch, Ngapuna, Rock and Pillar, Hyde, Tiroti (Capburn), Kokonga (Waipata), Ranfurly (Eweburn), Wedderburn, Ida Valley (Oturehua, Rough Ridge), Poolburn
(Blackstone), Lauder, Omakau (Ophir), Chatto Creek, Galloway Flat, Alexandra, Dunstan Flat and Clyde (Dangerfield and Emerson 1995:15-34). As the line beyond Clyde was flooded and now lies beneath Lake Dunstan, I have not included any railways construction related sites which may have been on this section of the line.

Private contractors’ camps were located close to the structures they were constructing, such as at the mouths of tunnels, or beside bridges, culverts and viaducts. Sometimes this meant they were close to the Public Works Department camps, for instance at Mullocky Gully, Deep Stream and Flat Stream, but often they were on their own.

The known camps are described below in the order they appear when following the route of the Otago Central Railway from Dunedin.

**Mullocky Gully** – This camp was first opened in August of 1880, when there were as many as 700 men working on the section of track between here and Deep Stream (Dangerfield and Emerson 1995:14). In addition to the railway navvies and their families, there were also miners working gold claims in the area. The navvies and miners lived in tents or mud huts. These typically measured 9 x 7 ft (3 x 2.5 m) for a single man’s quarters and 18 x 15 ft (6 x 5 m) for a family (Cowan 2009: 144). Mud huts had thatched roofs lined with calico and family abodes had a calico ‘wall’ dividing them into two rooms (Cowan 2009: 144). Tents and earth huts had a chimney at one end, usually of sod or stone, topped with perhaps a biscuit tin or other of similar size.

Besides the tents and earth huts of the workers, there were also an engineer’s office, carpenter’s and blacksmith’s shops a stable and a powder magazine. The magazine was a substantial stone building (Otago Daily Times, 7 December 1880: 3). A Mr Webb ran a boarding house at or near this site. There was also a Webb and Sons store at Mullocky run by the same family. The Gore brothers held the contract for the construction of the tunnel at Mullocky.

Daniel Mackenzie held the original contract for the tunnels on this section of the railway, and Black & Allison reused the site of Mackenzie’s camp near the entrance to the second tunnel at Mullocky when they took up the contract to construct the abutments of the Wingatui viaduct (Otago Witness 22 August 1885: 12). In addition, they also relocated some of his buildings to the site, most notably his residence and stables (Otago Witness 26 September 1885: 12).

**Rabbit Flat** – It is unclear whether this was a mining settlement, a contractor’s camp or a calico town which sprang up to provide the navvies with goods and services not provided by the Government. The Otago Daily Times of 7 December 1880 describes Rabbit Flat as “the once flourishing calico township” so perhaps it had been a mining settlement (Otago Daily Times, 7 December 1880: 3). Rabbit Flat was synonymous with ‘sly grog’ sellers (Otago Daily Times, 7 December 1880: 3).

On the lower side of the track beyond Rabbit Flat was the Government store for this section of the track, which was supplied by a Dunedin firm. This firm also supplied the
Government stores at the Mount Allan and Hindon camps (Otago Daily Times, 7 December 1880: 3).

Many of the workers on this section of the line were family men and a one roomed school was built between Mullocky Gully and Parera, on the upper side of the track beyond Rabbit Flat. This school, which catered for 30 or 40 pupils, was without heating or even a blackboard, due largely to the Education Board believing that construction would proceed at a more rapid pace than actually occurred (Otago Daily Times 7 December 1880: 3, Dangerfield and Emerson 1995:16).

**Duck Point** – The Gore brothers held the contract for the construction of the Duck Point tunnel. There was a party of Italian navvies employed on the section just beyond Duck Point (Figure 4) (Otago Witness 25 July 1885: 12).

![Figure 4. Looking downstream to the eastern portal of the Duck Point Tunnel. The construction workers’ dwellings are just visible on the slope above the track. Image by F.A.Coxhead c/n F103/9 courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago](image)

**Mount Allan** – This was the site of the second Government camp in the Taieri Gorge. Like Mullocky Gully it hosted Public Works offices, workshops and a powder magazine. There was also a cottage with a large kitchen garden. Mount Allan was a camp for the ‘unemployed’. Charcoal making was carried out near the Mount Allan camp (Otago Daily Times, 7 December 1880: 3). The Gore brothers held the contract for the construction of the Tunnels at Mount Allan, but whether their camp was near the Public Works Department site is unclear. In December 1886 there were 23 men employed in relief work at Mt Allan (Otago Witness 31 December 1886: 28).

**Little Mount Allan** – There was a contractors’ camp associated with the construction of the bridge at Little Mount Allan. It was located on the track bed on the south side of the Little Mount Allan Stream (F.A. Coxhead C/NE 1453/20 Hocken Collections, Uare Taoka o Hakena, University of Otago).

**Ross Point** - The Gore brothers held the contract for the construction of the tunnel at Ross Point (Otago Daily Times 29 August 1885: 2). Their camp is most likely to have been situated on the track bed adjacent to the tunnels portals.
Hindon – This camp was located on the flat ground on which the present Hindon station now sits, near the river about seven km beyond the Mount Allan site. As at Mullocky Gully and Mount Allan, there were Public Works Department offices, carpentry and blacksmith’s workshops and a powder magazine. The Gore brothers held the contract for the construction of the tunnels at Hindon. The Hindon station and camp site are approximately seven km from the township of the same name. In the 1860s there were up to 10,000 men seeking gold in the area (Otago Witness, 19 January 1884: 10).

Machine Creek (Pay Office Creek) – there was a Public Works Department pay-masters office at this site. The Gore brothers held the contract for the construction of the tunnel at Machine Creek though it is likely that the contract was sublet to another contractor, as the Gore Brothers frequently did this. The Otago Witness (31 December 1886:28) states that 133 men were employed on ‘relief work’ at Machine Creek, but they may have been based at the Deep Stream Public Works Department camp.

Deep Stream – a large Public Works Department camp was located at Deep Stream, as was at least one contractor’s camp. At least three contractors were involved in the construction of the viaduct at Deep Stream, with the contract being relet to Collier and Clapham on 8 December 1883, Miller and Smellie on 22 August 1886, and Whittaker and Co. in 1888 (Otago Daily Times 19 Feb 1884: 2, Otago Daily Times 29 August 1885: 2, Otago Witness 24 August 1888: 17). A Mr Rutherford ran a boarding house at or near this site, as did a Mr Phillips, though it is unclear whether these boarding houses operated at the same time (Otago Witness 25 July 1885: 12).

The Deep Stream contract was let and relet to at least six different contractors before its final completion. It is unclear whether they all used the same campsite, but this seems probable.

Flat Stream – this large Public Works Department camp was situated on the hillside above the tin hut which serves as the present Flat Stream station. In addition to the usual structures associated with Public Works Department camps, there was also a police camp, complete with lock-up at Flat Stream (Cowan 2009: 144). The jail was by the mouth of tunnel 9, and was still partly standing in 1976. The police camp was set up after a murder occurred at the Nenthorn camp in 1884. Whittaker & Co. held the contract for the construction of the viaduct at Flat Stream (Otago Witness 24 August 1888: 17). Chimneys and other evidence of the large Public Works Department construction camp which was situated here can still be seen on the hillside above the Flat Stream siding (Dangerfield and Emerson 1995: 92).

The Flat Stream site is the only railway construction related camp on the Otago Central Railway which had been recorded archaeologically prior to the commencement of this study (NZAA Site Records I43/118, I43/119, I43/121). Hamel has identified the probable location of the police camp (NZAA I43/118), a terrace, hut sites, hut floors, chimneys and a sod wall/fence (NZAA I43/119), and the main Public Works Department camp site, which consists of a cluster of hut sites and chimneys (NZAA I43/121). All features
recorded were on the surface and no archaeological excavations have been undertaken at the Flat Stream site.

*Nenthorn* – At Nenthorn there was a contractor’s camp for workers employed by R. Meikle and Co, and, a separate Chinese ‘village’ located somewhere nearby (Otago Witness 26 September 1885: 12).

The main Nenthorn camp had at least one store, which was run by the Mercer Brothers. A boarding house at Nenthorn, built by W. Mitchell and owned by John Wyatt, burnt down in 1885 (Otago Witness 26 September 1885: 12). Nenthorn also housed a police camp and lock-up, set up in 1887 after the murder of a sly grog seller in the camp in 1884 (Cowan 2009: 144).

The Chinese village was apparently located near the present Pukerangi railway station. I am not sure why this is described as a village as opposed to a camp, as the forty or so men who lived there lived in tents. There were two stores, piggeries, and many chickens at this site. According to the correspondent from the Otago Witness, gambling and opium smoking were the preferred leisure activities (Otago Witness 26 September 1885: 12). Apparently there was an ‘air of comfort surrounding the Chinese tents which was absent from the European settlements’ (Otago Witness 26 September 1885: 12). Perhaps it was the opium.

*Sutton* – There was a surveyor’s camp at Sutton before the Public Works Department camp was established. This camp housed ‘unemployed workers’, to whom the government supplied tents and tools (Otago Witness 19 October 1888: 11). Other provisions were purchased from local storekeepers, but whether these businesses were already in place or followed the camps is unclear. There are bridges at Sutton, so there was probably a contractor’s camp associated with them.

*Middlemarch* – Messer’s J. Hazlett, W. Simpson, Montagu Pym, J. Mitchell, T. Brown and A. Burt were granted the contract to construct the Otago Central Railway between Middlemarch and Wanaka in May 1888 (Otago Witness 1 June 1888: 11). However it seems they did not honour the contract and it was once again the Public Works Department who resumed construction of the line beyond Middlemarch.

There were 12 bridges required on the section of railway between Middlemarch and Hyde, so it is assumed there would have been private contractor’s construction camps associated with these.

*Tisdalls Ballast Pit* – Ballast from this site was used in the initial levelling of the track bed. However its continued use makes the site one more involved with ongoing track maintenance rather than the construction of the railway, at least for the purposes of this thesis.

*Ngapuna* – This was the first camp beyond Middlemarch, but other than that there was a small siding there for many years (Dangerfield and Emerson 1995:100). I have not been able to locate any additional information on this site.
Rock and Pillar – I have not been able to find any references to this site, although staff on the Taieri Gorge Railway have mentioned there being the remains of chimneys and other surface features associated with the Public Works Department camp at Rock and Pillar.

Hyde – The arrival of the Public Works Department railway construction workers at Hyde was soon followed by the arrival of merchants keen to supply them. Bakers, butchers, storekeepers, and carriers were among those who established businesses in the wake of the workers, and many followed the camps as they moved up the line (Dangerfield and Emerson 1995:24).

Tiroiti (Capburn) – There was a Public Works Department construction camp site on the hill behind the station from 1895 to 1897. This camp had a school house (Dangerfield and Emerson 1995:102).

Kokonga (Waipiata) – A substantial Public Works Department construction camp site was situated here for several years. It was a family camp and there was a school which was opened after the Tiroiti camp was abandoned in 1897 (Dangerfield and Emerson 1995:102).

Ranfurly (Eweburn) – Ranfurly began life as a Public Works Department railway camp, but became a town (Cowan 2009: 149). The town has most likely been built over the site of the construction camp.

Wedderburn – In early 1899 the Public Works Department camp was relocated from Ranfurly to Wedderburn in five dray-loads (Cowan 2009: 149). This was in stark contrast to the early camps in the Taieri Gorge section of the railway, which were longer term settlements with permanent structures. This portability does not necessarily preclude the existence of surface features at these later sites as hearths and chimneys would have been present, even if the population had been living in tents.

Ida Valley (Rough Ridge, Oturehua) – The Public Works Department camp here was reportedly the largest associated with the construction of the Otago Central Railway (Dangerfield and Emerson 1995:27). According to Bill Cowan, a railway historian who taught at the school in Oturehua in the 1950s, the remains of this camp can still be seen approximately one kilometre south-west of the present railway station. The police maintained a station at Ida Valley between 1902 and 1903. There appears to have been a mining settlement at Rough Ridge before the railway.

Poolburn (Blackstone, Blackstone Hills) – The Public Works Department camp was situated on “a slight elevation just where the railway takes to the hills on the way down to the Poolburn Gorge” (Otago Witness 30 January 1901: 12). In addition to the ubiquitous tents, there were wooden buildings, one of which was the Public Works Department headquarters. Other wooden buildings housed the engineers. The blacksmith’s shops were clad in corrugated iron, and in addition to the workshops in the camps, there was also a smithy at the entrance to the first of the tunnels at Poolburn (Otago Witness 30 January
1901: 12). The contractor’s camp relating to the construction of the Poolburn (Auripo) viaduct is also in this area.

**Lauder** – This was a railways town, having started life as a railway terminus and holding yard (Dangerfield and Emerson 1995: 28)

**Omakau (Ophir)** – There was a mining town here before the railway was constructed (J. Hall – Jones 2005:156).

**Chatto Creek** – There was a Public Works Department camp here from 1903. The camp contained a blacksmiths shop, a pay office and an engineer’s office (Otago Witness 3 August 1904: 60). A police station was set up at Chatto Creek in 1903 after the Ida Valley camp was shut down and the station there closed. A school was opened at Chatto creek by the Chief engineer of the Public Works Department on 25 March 1904 (Otago Witness 6 April 1904: 32). There were 200 men employed on this section of the line in 1905 (Otago Witness 10 May 1905: 14).

**Galloway Flat** - There was a large Public Works Department camp here in the early 1900s. In addition, R. Mclean had the contract for the culverts on this stretch of the line so there should be a camp associated with his workers (Otago Witness 5 September 1906: 38).

**Manuherikia Bridge** - The contract for this bridge was let to G. M. Fraser, with the steel work being done by A and T. Burt (Otago Witness 2 May 1906: 26). Newspaper images show at least one corrugated iron clad structure on the river bank at this site, with tents clustered on the high ground nearby.

**Alexandra** – The Chatto Creek camp was packed up and moved to the site of the railway station at Alexandra in June 1905 (Otago Witness 24 May 1905: 32). G. M. Fraser held the contract for the rail bridge at Alexandra, but whether the workers were housed in the town or in a camp is unclear (Otago Witness 5 September 1906:38).

**Dunstan** – There was a Public Works Department camp at Dunstan Flat, near Alexandra (Otago Witness September 6 1905:46).

**Clyde** – Robson and Crawford held the contract for the construction of the railway to Clyde, so any camps associated with culverts or bridges on this section of the line were likely to have housed workers employed by them (Otago Witness 5 September 1906:38).

### 4.2 Evidence from Photographs

Contemporary photographs were examined to provide evidence of camp layout (discussed later in this thesis) and construction techniques and materials relating to structures within the camps, such as workshops, stores and worker accommodation.

The first group of photographs examined were by F. A. Coxhead. These were taken in the Taieri Gorge in 1885 and the six used in this thesis show railway construction camps at Mullocky Gully, the Duck Point Tunnel, Little Mount Allan, Hindon, Deep Stream and
Flat Stream. Photographs from contemporary issues of the Otago Daily Times and Otago Witness were also examined.

The private contractor’s camps tend to be small and located close to the bridges and tunnels the workers were constructing. These camps are predominantly composed of a cluster of tents, although the occasional larger building is visible. Public Works Department camps tended to be larger and are situated where there is sufficient space and a supply of fresh water nearby. From the photographic evidence it appears that the Public Works Department camps are north facing where possible, but the private contractors’ camps, being as they were as close as possible to the task in hand, were not afforded this small luxury.

Although not visited as part of the research for this thesis, the Public Works Department camp at Dunstan is worth mentioning here if only because it represents a late phase flat land site. The historical image below (Figure 5) shows a camp which is spread out over a large area and consists of various sizes of buildings, many of which are prefabricated. The smaller structures appear to be accommodation for the workforce and their families, while others, larger and clad in corrugated iron, are obviously workshops. There seems to be some degree of formal lay out, with the accommodation huts or tents being on the outer perimeter of the camp and the workshops and larger structures occupying more central areas.

![Figure 5. Dunstan Public Works Department camp 1905. Note the reused corrugated iron on the workshop at the left of the picture. Image by Guy, from Otago Witness, September 6 1905:46. Image courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago](image)

There is no trace of permanence about this camp, no earth or stone chimneys, walls or enclosures. A camp such as this could easily have been packed up and transported to another site further up the line. This was typical of Public Works Department flat land camp sites, and had previously been done in 1899 when the Public Works Department Engineer “shifted his camp, all five dray loads,” from Ranfurly to Wedderburn (Cowan 2009:149). From here the camp was moved to Oturehua. It appears from this image that
handcarts were still being manufactured on site in 1905, just as they had been from the very beginning of construction of the Otago Central Railway. This type of camp stands in stark contrast to those situated in the Taieri and Poolburn Gorges, as discussed below.

4.2a Tents and structures

Figure 6. Typical early 20th century railway construction related single men's tents. Note the earth chimney topped with biscuit tins. Image by Olsen from Otago Witness April 1 1903:37, courtesy of Hocken Collections, Uare Taoka o Hokena, University of Otago.

Tents appear to have been of canvas or felt, sometimes a combination of the two. In some instances it appears two tents have been joined together end to end, and I presume that these were family accommodations or for several occupants. Tents in later Public Works Department camps appear to be of light timber framing covered in canvas. Most tents had a chimney at one end (Figure 6). These were constructed of a variety of materials such as sod, clay, corrugated iron, flat iron (from large tins), schist slabs or river cobbles. Chimneys are often topped with biscuit or other large tins.

Small tents with chimneys were likely to have been for accommodation, while large tents with chimneys are likely to have been workshops, boarding houses or supply stores. Although it is impossible to be certain, it is likely that tents without chimneys were likely to have been for storage or latrines. The tents which were without chimneys and were separate or down-slope from the rest of the camp site are very likely to be latrines. Similarly, any tents which were without chimneys and were next to culverts are also likely to have been latrines.
4.2b Other materials used in structures in the workers camps

Timber. Some buildings appear to be constructed entirely of timber. These were usually associated with the Public Works Department camps and were either site engineer’s huts, stables, boarding houses or supply stores. A photograph of the Mullocky Gully site shows several wooden buildings, some with additional structures added (Coxhead 1885 E2672/2).

Sod / turf blocks. Some huts appear to have been constructed from sod or turf blocks. These had chimneys and would appear to have been accommodation. Many had thatched, canvas or iron roofs, though some also appear to have had turf roofs. Many chimneys appear to be of turf blocks topped with biscuit or kerosene tins. A typical family hut would be some 18ft x 15ft (6m x 5m) in size (Cowan 2009: 144). It would be likely that a single person’s accommodation would be smaller, though some tents may have been shared.

![Figure 7. Tents modified with mud brick walls and chimneys. Image by Olsen from Otago Witness April 1 1903:38, courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago.](image)

Flat tin / iron Corrugated iron. Some of the larger structures in the camps appear to have been clad in flat iron or corrugated iron. Structures clad in this fashion may include engineer’s huts, workshops, or stores, and at least one appears to have been a stable. In the early twentieth century Public Works Camps some of the corrugated iron cladding appears to have been reused at least once (see Figure 5).

Stone. Some structures appear to be constructed from stone, either river cobbles or slabs of schist. Buildings made of stone without chimneys are likely to have been powder magazines. It is unclear what larger stone buildings with chimneys were used for, as the evidence from photographs is hard to interpret. A photograph of a chimneyled stone building near deep stream shows shuttered windows and what appear to be barrows and tools stacked outside (Coxhead 1885 E1440/42).
4.3 Evidence from Newspapers

Contemporary issues of the Otago Daily Times and the Otago Witness provided much useful information regarding the construction of the Otago Central Railway. These were accessed via the Papers Past website http://paperspast.natlib.govt.nz/cgi-bin/paperspast?a=d&d=ODT18801207.2.25&e. Especially useful were the articles furnished by an Otago Witness correspondent who referred to himself only as Peripatetic Jotter. The reports of the Peripatetic Jotter were published in the Otago Witness between May and September 1885, after which time they ceased (Cowan 2009: 143).

The reports of the meetings of the Otago Central Railway League were also very informative. Aside from these two sources, articles on the Otago Central Railway, such as Public Works Department reports, were more about politics and finances than the workers camps and their conditions.
5. Field Survey of Selected Railway Construction Camps

Eight sites were selected for more detailed study based on a combination of the written record, historical images, remote sensing and predictive site modelling. The sites were; Mullocky Gully Public Works Department camp, Sparrow Bros workshop at the Wingatui Viaduct, Hindon Public Works Department camp, Deep Stream Public Works Department camp, Deep Stream Viaduct workshop, Nenthorn contractors’ camp, Oturehua public Works Department camp, Poolburn Viaduct contractors’ camp and the Poolburn Gorge Public Works Department camp. These sites are described below.

5.1 Mullocky Gully

The first Public Works Department camp on the Otago Central Railway was situated at Mullocky Gully, near the intersection of Mullocky Creek and Reef Stream. A photograph, taken in 1885 by F. A. Coxhead (Hocken Collection No.E2672/2) prior to the construction of the Wingatui viaduct, shows a number of tents and buildings at the site, some of which were quite substantial (Figure 8).

Figure 8. Site of the Public Works Department camp at Mullocky Gully, 1885, looking west towards the Taieri River. Image by F.A. Coxhead 1885 (E2672/2) courtesy of Hocken Collections, Uare Taoka o Hokena, University of Otago.
It was hoped that this area might provide archaeological evidence of occupation or site function but this was not to be. Sometime between July 2009 and July 2010 a new road from Wenita Forest Products Ltd depot at Salisbury through to Mt Allan Road, beyond Mullocky Gully, was put in by the forestry company. This new road follows the railway line around the hills from Salisbury rather than going over the top as the old Taioma Road does. The creation of this road, along with an associated log storage area, involved the large scale use of earthmoving equipment, the importation of aggregates, and the construction of a substantial embankment. These activities have combined to cover most of the camp area, potentially destroying any in situ evidence of occupation or function related to this railway construction related site (Figure 9).

The purpose of the visit to Mullocky Gully was to endeavour to find and record any artefacts or features associated with the camp shown in the photograph (Figure 8). A sketch was map of the area was made (Figure 10), and any artefacts found on the surface or in the cuttings between areas of level ground were recorded by hand held GPS. Some surface fragments were collected for later identification in the historic laboratory at the University of Otago.
A thick covering of scrub and long grass made it difficult to locate artefacts on the surface and although several small deposits of broken bottle glass and ceramics were located these were unfortunately mostly in areas modified by earth moving activities. One deposit appeared to be *in situ*, having apparently been sheared off by the bulldozer blade.

Some bottle glass, including a complete bottle, along with timbers and metal artefacts were found in the cuttings between areas of level ground. The metal artefacts, one a piece of galvanised trough, the other an iron pipe, appear to have been related to drainage or water management from the terrace immediately above where they were found.

The extent of destruction of the Mullocky Gully site makes it of very little use as a comparative example of a railway construction camp, but it was recorded for the NZAA site recording database as site I44/544.

![Figure 10. Map of the area modified by Wenita Forestry Products Ltd at the site of the 1880s Public Works Department camp at Mullocky Gully.](image)

Some 500m to the west of the Mullocky Gully site, on the south side of the hill, are the remains of a track-way. This is well constructed, with extensive revetting, and appears to be related to the construction of the Wingatui Viaduct. There are uprights fashioned from lengths of light railway iron, which probably carried telegraph or electric wires at some stage after the railway work in the area was completed.
5.2 Sparrow’s Workshop site Wingatui Viaduct
During construction of the Wingatui Viaduct from 1885 -1887 Sparrow’s Engineering Company, who held the contract for building the viaduct, erected a workshop on high ground at the north side of Mullocky creek. This large building is visible in many photographs of the construction of the Wingatui Viaduct, and was situated at its northern end immediately to the east of the second trestle (Figure 11).

The platform on which Sparrow’s workshop stood is still clearly visible, though much overgrown with long grass and scrub (Figure 12). A vehicle track cuts through the platform, and although there was a track there when the site was in use, this was modified to allow heavy equipment access when the Wingatui Viaduct was cleaned and painted in the later part of the twentieth century. Due to long grass and scrub the only evidence of Sparrow’s workshop visible on the surface was a single piece of concrete block. A sketch map was completed (Figure 13) and the platform was recorded by GPS for the NZAA site recording database as site I44/545.

Figure 11. Sparrow’s Workshop circa 1888. This image was taken after the viaduct was completed. Image by Burton Brothers, Dunedin.
Figure 12. The site of Sparrow's workshop in 2012.

Figure 13 Map showing location of Sparrow's 1887 workshop (I44/545)
5.3 Little Mount Allan

The railway construction camp at Little Mount Allan was situated on the track bed itself, prior to the rails being laid. This was a common practice during the construction of the Taieri Gorge section of the Otago Central Railway, as there was often insufficient level ground close enough to the work site on which to establish a camp. An 1885 photograph (Coxhead 1885: E 1453/20) shows a line of tents to the south of the cutting which leads to the bridge over Little Mount Allan stream (Figure 14). Due to the position of this camp it is highly unlikely that any surface evidence of it remains, and the presence of any subsurface features is also unlikely (Figure 15). There is the possibility of a midden scatter down the bank beside the site, but this area is now overgrown.

Figure 14. Contractors’ camp on the track bed at Little Mount Allan viewed from the river bed. Image by F.A Coxhead 1885 (E1453/20) courtesy of Hocken Collections Uare Taoka o Hokena, University of Otago.

Figure 15. Site of the Little Mount Allan camp 2012. This view was taken from the train so differs slightly to the 1885 photograph
5.4 Ross Point Tunnel

The Gore Brothers held the contract for the construction of the Ross Point tunnel, which they sub-contracted out. This was common practice for the brothers Gore, and their name appears in the court pages of the time with some regularity as they seem to have had difficulty meeting their financial responsibilities (Otago Witness 29.08.1885:13). While no surface evidence of any construction camps remains, there is a large flat area at the northern or Hindon end of the Ross Point Tunnel which is a likely site for a contractor’s camp. There is evidence of a track on the hill above the tunnel, which may date from its construction.

As the 1885 photograph of the contractor’s camp at Little Mount Allan shows (Figure 14 page 47), if there was insufficient flat land available in the immediate vicinity of the worksite, camps were placed on the track bed itself prior to the tracks being laid (Coxhead 1885:E1453/20). This does not appear to have been the case at the southern approach to the tunnel (Figure 16). There is a flat area of ground at the northern end of the tunnel but there is nothing on the surface to indicate that it was ever a camp site.

![Figure 16. Southern entrance of the Ross Point tunnel. Image by F.A Coxhead 1885 (E1440/41) courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago.]

5.5 Hindon

Hndon was the site of a large Public Works Department camp during the construction of the Otago Central Railway. The Public Works Department camp was most likely situated
on the flat ground on which the present railway station at Hindon now stands. In addition to this camp, there were also private contractors’ camps in the area (Dangerfield and Emerson 1995: 15). The school house still stands (it is the uppermost of the two buildings which can be seen on the opposite bank of the Taieri River in Figure. 16, above), though it is now a private residence. Several old track ways are still visible, but there are no standing remains of the habitations of the railway construction workers, nor any associated buildings such as boarding houses or workshops.

Some surface scatters of archaeological material are visible, mainly in ditches beside the road and railway. It is presumed that these have washed down or eroded out of banks and cuttings, and their lack of secure provenance makes them of little use in attempting to locate sites associated with the construction of the Otago Central Railway.

While it is likely that there is some surviving sub-surface archaeological evidence, all that remains on the surface are many of the old trackways and platforms with their associated stone revetting. These trackways and platforms can be clearly seen from the hill side opposite Hindon, as well as on Google Earth images of the area. However, even these are subject to some uncertainty as far as context is concerned. Due to the varied activities which have taken place in the Hindon area over the years it is possible that these are associated with evidence of other activities such as mining. Local resident Leila Graham who has lived at the Ardachy Station, Hindon, since the 1930s, reports miners living in camps in the area up until the 1960s (Leila Graham pers. comm 2012). Mrs Graham was also able to provide a context for some of the archaeological scatter found in the banks and ditches beside the road and railway, much of which is associated with the railway tea rooms which operated at Hindon for many years.
5.6 Deep Stream
In contrast to the camp sites at Mullocky Gully, Mt Allan and Hindon, the camps associated with the Deep Stream Viaduct were private contractors’ camps. Photographs taken at the Deep Stream section of the Otago Central Railway during and just after its construction, show several buildings in a flat area immediately north of the Deep Stream Viaduct (Coxhead 1885, E1440/42, Burton Bros 1890, 465B, in Dangerfield and Emerson 1995:25) (Figure 17, Figure 18). These buildings were located in a large cutting just to the north of the Deep Stream Viaduct. Up to six different contractors were used to complete the work at Deep Stream, but the lack of firm dates for most of the photographs makes it impossible to determine which contractor is responsible for which buildings.

Figure 17. workshops at the northern end of the Deep Stream Viaduct. There appears to be a camp site on the slope beside the workshops. Image by Burton Brothers, Dunedin circa 1890

Figure 17 above, shows a camp site up the slope immediately to the north-west of the flat area. An attempt to locate and record this site was unsuccessful as the scrub proved to be impenetrable. In addition to the ubiquitous gorse and broom, wild roses and elder were also present, which may indicate human activity at some time in the past.
The flat area where the workshops previously stood is now overgrown with long grasses and there is a raised area in its centre which may be the remains of the demolition of these stone buildings (Figure 19). No artefacts or building rubble were visible on the surface. A GPS point reading was taken and a sketch map drawn (Figure 20). The site was entered on the NZAA site database as I44/547.
The former Deep Stream passenger stop shelter shed and siding was situated on a large area of flat ground on the south side of Deep Stream between the railway line and the slope down to the Taieri River which had been formed dumping by the spoil from the railway cutting at the southern approach to the Deep Stream Viaduct (Figure 21). The building was removed to Waenga in the Cromwell Gorge in 1945 (Dangerfield and Emerson 1995: 92). This area may also have been used as a camp site at some stage.

Figure 21. Site of former Deep Stream passenger stop.
A study of aerial photographs of the Deep Stream area showed a track way above the railway line on the southern side of Deep Stream. This was to enable supplies to be bought in by dray and bullock wagon from the settlement at Hindon (some 6 km inland from the Hindon station in the Taieri Gorge). The presence of this track way indicated that there was more than likely a contractors’ camp on this side of the stream. Above the railway line along this track way was a complete schist block chimney, beside which was an enclosure / hut made of the same material (Figures 22 and 23). Both structures were sketched, photographed and measured, and a GPS point reading taken. The site was entered on the NZAA site database as I44/546

Figure 22. Schist block chimney above the railway line at Deep Stream. The walled enclosure can just be glimpsed to the left of the chimney.
The chimney was 2.5 metres in height and 1.4 metres wide, with the fire place being approximately 0.9 square. There were several stones in the bottom of the fire place. A low wall, also of schist, was built off the back of the chimney on its eastern side.

The walled enclosure / hut was also constructed of schist blocks and appeared to be well made. The eastern wall measured 8 metres long, its external height was 1 metre and the walls were 0.5 metres thick. The internal width of the enclosure was 3 metres. Its southern end was built into the slope of the hill, and the western wall had collapsed at its northern end due to tree growth. The interior height of the walls was somewhat greater than that of their exterior height, which may be the result of soil build up since the site was abandoned (Figure 24). The site was much overgrown with trees and vines, and bush lawyer was particularly prevalent. There was a tree growing inside the structure which will cause further collapse of the walls in the future.
Figure 24. Interior east wall; the image on the right is the interior of the west wall.

Figure 25. Map of Deep Stream hut and chimney site (I44/546).
At least one other chimney or hearth site was located in the area. This consisted of three large schist slabs stood on end to form an open sided cube (Figure 26). Numerous schist blocks were scattered around, presumably further remains of the chimney. The hearth was photographed but tree cover made a GPS reading impossible.

![Figure 26. Remains of chimney west and down slope from hut site](image)

Near the base of the slope in a damp area there was a patch of culinary mint growing. These plants would indicate human activity in the area at some time in the past. There are also elder berry, wild rose and other fruiting plants in the area, but as these may be spread by birds eating the fruit and passing the pips, they cannot be positively attributed to the presence of humans or human activities.

The combination of a track way, building and chimneys most likely represent a construction camp site, but whether it is a Public Works Department or private contractors’ camp is impossible to determine at this stage.
5.7 Flat Stream

Three camp sites associated with the Flat Stream viaduct were surveyed by Hamel in 1995 and recorded in the New Zealand Archaeological Association site recording scheme in 2000 (sites I43/118, I43/119, and I43/121). The three sites Hamel recorded are on terraces above the railway line and consist mainly of chimneys, hearths and hut sites. An 1885 photograph (F. A. Coxhead 1885, F102/7) shows the camp site above the railway line (Figure 27). There is another image (F. A. Coxhead 1885, E1438), which the staff of the Taieri Gorge Railway are adamant is of the Flat Stream Camp, though labelled as Deep Stream, showing a cluster of huts below the line. In Dangerfield and Emerson (1995) this camp site is described as being situated half way between Deep Stream and Flat Stream (Dangerfield and Emerson 1995:26). This site was not surveyed as part of this thesis.

![Figure 27. The Flat Stream camp in 1885. The site can just be made out above the railway, running parallel to it. Image by F.A. Coxhead 1885 (F102/7) courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago.](image)

According to Dangerfield and Emerson (1995) stone chimneys and other signs of a major construction camp may still be seen on the hillside above the tracks at this location (Dangerfield and Emerson 1995:92). However the site is now much overgrown with scrub and is all but invisible from the train.
Figure 28. The Flat Stream Camp site 2012. Note the scrub which now obscures most of the camp site. Note the viaduct in the background which had not been constructed when the Coxhead image (Figure 27) was taken.

The uppermost of the three terraces identified by Hamel (2000) was presumed to have been the site of the police station and cell block (Figure 30), while those lower down the slope and nearer to the railway line were recorded as possible domestic dwellings (Figure 29). The middle terrace (I43/119) contained the remains of 12 huts, mainly only visible as chimneys (Figure 31). There were some walls, all of schist with construction styles ranging from well-made to ‘very rough construction’ (J. Hamel 2000, NZAA site recording scheme I43/119:3).
Figure 29. Hamel's sketch map of the upper terrace of the Flat Stream Public Works Department Camp I43/119 (Hamel 2000, fig104)

Figure 30. Hamel's sketch map of the enclosure and what she interprets as the Police Camp at the Flat Stream Public Works Department Camp I43/118 (Hamel 2000, fig103)
Figure 31. Hamel’s sketch map of the lower area of the Flat Stream Public Works Camp I43/121. North is to the bottom right of the page (Hamel 2000, fig 105).
5.8 Pukerangi / Nenthorn / Barewood

There are two camps marked on SO (Survey Office) map1249 as being the Nenthorn Camp (Figure 32). Nenthorn is the original name of the area now known as Pukerangi. The camps are located at the end of a track way which ran from a store near the Flat Stream camp, to a point immediately south of the railway line, just beyond a section of the line known as the Reefs. One of these camps is likely to have been that of contractors R. Meikle and Co. who were responsible for the construction of railway embankments in the area between 1885 and 1886. The other camp may have been associated with an earlier contractor who I have been unable to trace. Bill Cowan, a local railway historian, believes that there was a Public Works Department camp at Nenthorn but I have been unable to find any corroborating evidence in my research for this (Cowan 2009:144).

Figure 32. Detail of SO map1249 showing Nenthorn camps and track way from Flat Stream store.

There was also a Chinese camp on this section of the line, which was located in the upper Nenthorn, perhaps near the site of the present Pukerangi station. The Chinese camp was ‘probably near Pukerangi station’ (Cowan 2009:147). It was described as a ‘village’ by the Otago Witness correspondent and around 40 men were said to have lived there (Otago Witness 26 September 1885:12). There is a line of bricks set into the ground behind the station building, and several historic period artefacts were observed under trees in the vicinity. However, conversations with locals have revealed that there were railway houses and Rabbit Board dwellings in this area, so these artefacts and features may post-date the Chinese camp. There is the possibility that the Chinese camp is the second site on the SO map 1249.
Using the SO maps in combination with Google Earth images of the area it was possible to pinpoint the probable location of the Nenthorn camp. When the SO map was compared to the Google Earth image of the area, the site of the camp was clearly visible, due mainly to the presence of a large walled enclosure which dominates the central area of the camp (Figure 33).

Figure 33. The Nenthorn camp as it appears on Google Earth. Note the large walled enclosure in the central area.

The Nenthorn camp is located on a gentle north facing slope which drops off sharply at its front and sides. There would have been water on three sides of the camp when it was
occupied, but modern farm water management and low rainfall have since reduced this to an area of damp ground, with some standing water under rocks, to the west of the site. There is deeper water at the front of the site where an embankment and culvert have been constructed over the stream bed.

The slope down from the camp toward the railway embankment was littered with fragments of late nineteenth century cultural material including bottle glass, ceramic table wares and ceramic storage vessels. This was also the case on the slope at the eastern edge of the camp, where in addition to the material already mentioned there were also small pieces of coal and some iron slag or similar burnt material. At least two late nineteenth century tin cans were present at the site, as well as a metal cooking vessel which was found near the large hut platform (A).

Also on the slope down toward the railway embankment there is a small structure built under an overhanging schist outcrop, which appears to have been an explosives store (marked X on the above site map). It is constructed of loosely stacked schist and is divided into two small cells, each approximately one metre square. Hamel (2000) reported a similar structure at some remove from the main body of the Flat Stream Public Works Department camp, though without the dividing wall, which she described as a possible explosives store.

A large three walled enclosure of stacked schist, open to the north-west, is the most obvious feature of the site. This enclosure is approximately 60m x 60m, with walls on average one metre thick and 700mm high. The walls are built using parallel lines of schist slabs or blocks which are in filled with smaller schist stones, making it a substantial construction. There are smaller openings on the eastern, southern and western walls of the enclosure, which were part of the original build. A smaller section of wall runs from north to south at the approximate centre of the enclosures open end. The interior of the enclosure is devoid of surface features which could give some clue as to its purpose, though there are several large broom bushes growing from green areas within it, which I believe could mark rubbish or cess pits.

There are several hut platforms on the site ranging in size from small single hut or tent sites (1.9m x 4.2m) to a much larger (3m x 6m). Some of these hut platforms have mounds at one end or around their sides (Figure 35). These mounds appear to be of earth and most likely represent the remains of earth walls or chimneys. Contemporary newspaper photographs show that sod walls and chimneys were used in the railway construction camps, but only excavating these features will confirm the existence of sod structures. The largest platform (marked A on the above site map) has a floor of laid schist slabs and the remains of a substantial fireplace of stacked schist at its eastern end (Figure 37).
Figure 35. The earth mound at the rear of this building platform is visible as the raised area behind the stone work.

Figure 36. A small hut platform 1.9m x 4.2m

Figure 37. Schist fireplace associated with the large (3m x 6m) hut platform.
At least two huts appear to have been constructed by building stacked schist walls on to an existing schist outcrop. There is one in the north eastern corner of the site, which has a standing side wall one metre wide and five metres long, as well as a three metre collapsed wall at its northern end and a pile of collapsed schist blocks at its southern end. To the north-west of the walled enclosure (marked B on the above site map) is a similar structure with a fireplace built hard up against the large schist outcrop and a low wall to the eastern side of this (Figure 38).

![Figure 38. Low wall and fireplace built against schist outcrop.](image)

A large schist outcrop (marked as Blacksmiths rock on the above site map) was found to be covered by a primary deposit of blacksmithing related detritus (Figure 39). This included various types of nail, horse shoes, bolts and washers of differing sizes, and links of chain. Although no surface evidence of a forge was present, I am confident that the smithy was located nearby.

![Figure 39. Blacksmiths rock.](image)
Overall the Nenthorn camp site is in remarkable condition, aside from the inevitable damage caused by erosion and grazing livestock. Its location out of sight from the railway track and on private land, and the fact that it does not appear in any of the existing histories of the Otago Central Railway, mean that it has not been fossicked or otherwise disturbed by bottle hunters and amateur archaeologists. The site was entered on the NZAA site database as (I43/153).
5.9 Oturehua / Rough Ridge

This was apparently the largest Public Works Department camp on the Otago Central Railway and was situated beside the river approximately 1 km south-west of the present township. Large it may have been, but all that remains now are three tumbledown shacks under some willow trees (Figure 40). The huts would appear to have been left behind when the rest of the camp was packed up and moved at the turn of the Twentieth century. According to Bill Cowan, a local railway historian who taught at the Oturehua School in the 1950s, at least one of the huts was lived in then (W. Cowan pers. Comm, 2011).

The huts are timber framed, and if typical of Public Works Department huts of the time, would be easily disassembled for transporting to the next flat land camp up the line. They are presently clad in planks and corrugated iron sheet, and roofed with corrugated iron (Figure 41), though they would originally been covered in heavy canvas. One is partially constructed using old railway sleepers, though whether this is original or a later repair is impossible to ascertain (Figure 42). The corrugated iron cladding may also have been added post construction, as a garage in the town which appears to have been a blacksmith or other workshop, is clad in the same iron (Figure 43). The site has been recorded on the NZAA site database as H41/232.

Figure 40. All that remains of the Oturehua Public Works Department camp site, once the largest on the Otago Central Railway. Photograph courtesy of Peter Petchey.
Figure 41. Hut cladding. The front appears to have been re-clad in corrugated iron.

Figure 42. Railway sleepers incorporated into hut structure. These were probably a later addition or repair.
Figure 43. This private garage may have begun life as a Public Works Department smithy.

Figure 44. The Oturehua Public Works Department camp (H41/232).
5.8 Poolburn Viaduct

This site was a private contractor’s camp relating to the construction of the Poolburn (Auripo) Viaduct and was located on flat ground below the viaduct itself. Although there are structures visible in an historical image of the site (Figure 46), apart from one possible hut platform no trace of the people living and working at the contractor’s camp remains on the surface. There are track ways at the site which are most likely associated with bringing cut stone to the site for the construction of the viaduct piers (Figure 48), The only definite evidence of railway construction related activity is two large, square platforms constructed of cement bonded schist blocks on the south side of the stream directly beneath the viaduct which I believe to be the footings for the derricks required to lift the schist blocks for the pillars and the iron super structure of the viaduct into place (Figures 46, 47).

Flat areas on either side of the southern approach to the viaduct may have once been the site of workshops (as was the case at Wingatui and Deep Stream), but I have found no documentary evidence of this being the case. There are certainly no features visible on the surface.

The Poolburn Viaduct contractors’ camp site has been recorded on the NZAA site database as H41/233.

Figure 45. Site map of the Poolburn Viaduct camp (H41/233).
Figure 46. The Poolburn Viaduct site as it appeared in 1903 with the camp in the background. The footings for the derricks are still in situ (see below). Image by Olsen, Otago Witness 01/04/1903 courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago.

Figure 47. Derrick footings of cement bonded schist blocks. These and some track ways are all that remains on the surface of the viaduct contractor’s camp site.
Figure 48. Construction of the Poolburn Viaduct. Note the derrick and track ways used to bring the cut stone to the site. Image by Olsen, Otago Witness 01/04/1903 courtesy of Hocken Collections, Uare Taoka o Hakena, University of Otago.
5.9 Poolburn Public Works Department Camp

In contrast to the contractor’s camp at the viaduct, the Public Works Department camp at the northern end of the Poolburn Gorge has many surface features associated with its inhabitants. There are nine standing chimneys and their associated hut platforms, at least eight hut terraces without chimneys, and the remains of several stacked schist walls.

Figure 49. Site map of the Poolburn Gorge P.W.D camp (H41/234).

This large camp site is situated on a north facing slope which runs down to the river’s edge at the bottom of the gorge. It appears to have been placed so as to make full use of any available sunshine while limiting exposure to the southerly wind. This was certainly noticeable on a visit to the site around midwinter 2012, where it was found to be much warmer and more sheltered than anywhere else in the vicinity.

The chimneys are of stacked schist bonded with mud, the standard construction method for such structures on the Otago Central Railway (Figures 50, 51). A contemporary image of the site (Figure 7, page 39) shows a structure which comprises a canvas wall and roof with a chimney of stacked and mud bonded schist, combined with a wall of stacked schist and a wall of stacked sod. This one image combines most of the hut construction techniques used at campsites on the Otago Central Railway.
Figure 50. A typical chimney of stacked schist bonded with mud. The tape is set at 1m. Photograph courtesy of Cathleen Hauman.

Figure 51. More mud bonded stacked schist chimneys at the Poolburn PWD camp. The tape is set at 1m. Photograph courtesy of Cathleen Hauman.
There is no uniform size of terrace at this site. Some have enough space to hold a single 
hut or tent (3m x 3m, 4.35m x 1.9m), while others are larger and held either multiple tents 
or larger structures (5.5m x 5m, 8m x 2.9m). One of the largest terraces (6.9m x 3.75m) 
appears to have been the base of a substantial building with walls of stacked schist, the 
remains of which are largely in situ. The east wall has a partition built into it dividing off 
one corner into an alcove some 700mm wide and at least as deep. The purpose of this 
alcove is unclear, though it does not appear to have been a chimney (Figure 52).

Overall the site is very well preserved, and while there are no glass or ceramic artefacts 
visible on the surface (no doubt due to its being a picnic spot on the Otago Central Rail 
Trail and thereby subject to some fossicking) there are several types of late nineteenth 
century tin cans associated with the structures. These include small cylindrical tins, about 
the size of a modern baked bean can, larger oblong ‘bully beef’ type tins, and large biscuit 
or kerosene tins of the type often seen used as chimney tops in historic images of the 
camps. There are also metal billy cans, lids and cooking vessels at the site, as well as some 
galvanised metal of indeterminate purpose. In this respect the site is similar to the 
Nenthorn camp, which also has these types of metal artefacts visible on the surface. The 
site has been recorded on the NZAA site database as H41/234.
Figure 53. An *in situ* grouping of tins and cook wares from the Poolburn Public Works Department camp.
6. Discussion

6.1 Modelling Site Location
The main technique used in this thesis to locate possible construction related sites on the Otago Central Railway is an adaptation of Buckles’ *Models for Railroad Construction Related Camps in the West* (Buckles 1983). Buckles’ model for the location of railway construction related camps is based on three site activity types; activities ahead of the track (that is sites relating to bridge building, tunnelling, cutting and embankment construction), activities relating to actual track laying (ballasting, grading, track laying), and post track laying activities such as track maintenance (Buckles 1983: 216-217). Other factors which may dictate site location include environmental variables (for example bridge builders being based near rivers), technological variables (was a blacksmith present, which tools were in use), social structural variables (ethnicity of workforce occupying site, contractor or sub-contractor), and economic variables (working conditions, terms of contract) (Buckles 1983: 218-220).

For the purposes of this thesis, Buckles’ model was simplified from a three site or activity type approach to a two site or activity approach. This is mainly because of the somewhat haphazard way the Otago Central Railway was constructed, especially in the initial period when the line was being put through the Taieri Gorge. Also, the division of labour between the Public Works Department workforce who were as a rule unskilled, general labourers working under a foreman, and private contractors who tended to be specialised workers, means that there were only really two types of camp site on the Otago Central Railway. Therefore a two site or activity model, based on whether a site is a Public Works Department camp or a private contractor camp seems more applicable to the task at hand.

All of the variables put forward by Buckle’s (1983) are applicable to this thesis. The location and lay out of camps associated with the construction of the Otago Central Railway was certainly influenced by the environment, and this will be the main variable considered. While the others no doubt contributed, it will be difficult to establish to which degree technology, social structure, and economics were factors until some of these sites are excavated

According to this model the Public Works Department camps should be situated on or near the line in positions which would make best use of any favourable conditions, particularly north facing sites sheltered from the worst of the winds. These would be long term occupation sites, especially in the Taieri Gorge where construction of the railway took a decade. In contrast, I would expect the private contractors’ camps to be situated as near as was practicable to the structures or tunnels they were contracted to construct, regardless of conditions. These would be short term occupation sites, only being required for as long as it took to construct the bridge or tunnel contracted for.

I will use four basic criteria for where campsites might be located (as shown in table 1 below) and apply them to the sites studied in this thesis. The criteria are; aspect (is the site
north facing or otherwise), availability of clean water, availability of alternate site location, and proximity of campsite to worksite. If my model is applicable, we should see a distinct difference between sites chosen for Public Works Department campsites and those of the Private contractors.

6.1a Public Works Department
Mullocky Gully is the site of the first Public Works Department camp on the Otago Central Railway. It was a large camp which was situated on the flat land beside Mullocky Stream, and appears to have covered a large area. This location was chosen as a camp site because there was much earthmoving required on this section of the railway, for both embankment building and creating cuttings. While not the warmest location, it was near a constant supply of fresh water and on the only suitable land for a camp of its size.

Mount Allan was the second Public Works Department camp in the Taieri Gorge and was situated on a small hill which sits in a loop in the river. The camp was located at Mount Allan because it was the most suitable spot, being roughly half way between Mullocky Gully and the next camp on the line at Hindon. While there is no surface evidence of the site now, due to flooding and scrub re-growth, it had a large and flourishing garden, which suggests it was in a prime location.

There were two Public Works Department camps at Hindon; or rather there was one camp which covered two areas. The larger camp was situated on flat ground where the Hindon railway station now sits, while a smaller camp lay some 50 metres to the north. There were several reasons for the camps being located where they were, not the least of which was that these were the only areas of flat ground on the western side of the river. A single roomed school building associated with the Public Works Department camp is still in situ on the hillside behind the station. This is the only remnant of the construction camp still visible above ground. The other building of the period still standing at Hindon was a gangers hut, but this is associated with the maintenance of the railway rather than its construction.

The Deep Stream Public Works Department camp was located above the railway line on a north facing slope on the east side of the stream. This site was positioned to make maximum use of any available sunshine and would have been sheltered from the worst of the southerly winds during winter. The camp may have also extended onto the track bed prior to the tracks being laid, and staff on the Taieri Gorge Excursion train report that there are possible hut sites below the track bed by the river. However, this area was apparently being used to grow marijuana during the time of my visit so it was decided not to investigate further.

At Flat Stream the Public Works Department camp was located on a north east facing slope above the railway line, again to maximise sunlight and reduce the effects of the southerly winds. As the Public Works Department camps in the Taieri Gorge were long term sites, consideration had to be given to winter conditions, which could be very hostile indeed.
There is no evidence that the camp extended down onto the track bed itself at Flat Stream, and the slope down to the river below the track is too steep to have been of any use as an occupation site.

Oturehua Public Works Department camp was the largest construction relate site on the Otago Central Railway and was situated just to the south west of the township. The site is in what is now basically a large flat field, which backs onto a creek at its southern boundary. The eastern edge of the site is bounded by the lower slopes of the North Rough Ridge Range, and the western edge is defined by the railway itself. Aside from the size and flatness of the site, there is no apparent reason for its location. The fact that the area had been extensively mined for some time and had a shop and a pub may have had something to do with the decision to locate the Public Works Department camp at Oturehua.

The Poolburn Gorge Public Works Department camp was situated in a slight depression on a north facing slope which runs down to the Poolburn Stream. Again the site was chosen to make best use of the sunlight hours and avoid the worst of the southerly winds. This site is by far the most suitable in the Poolburn Gorge, so it is hardly surprising that it was selected as a campsite by the Public Works Department.

Even from a casual glance at this list it is clear that the Public Works Department camps were placed in the best positions possible in what was in places an inhospitable environment. In the first stage of construction through the Taieri Gorge, the Public Works Department campsite locations were chosen well in advance of any work being undertaken, and this was probably the case for sites beyond the Gorge.

6.1b Private contractors
All the tunnels in the Taieri Gorge section of the Otago Central Railway were constructed by private contractors. Due to the nature of the landscape in the gorge their camps would often be located on the prepared track bed at either end of the tunnels. If the location was too cold for a campsite, for instance at the south end of a tunnel in a sheer cutting, the camp could be situated at the north end and the workers would cut a track way to access the work face at the other end of the tunnel. This was done at Ross Point near Hindon and most tunnels have walking tracks on the hills through which they are cut.

Tunnel contractors' campsites could also be situated on the slopes of the hills through which the tunnels were cut, or perched on a hillside nearby. A contemporary image by Coxhead around 1885 (F103/9 Hocken Collection) taken up river from the Duck Point Tunnel, shows a scatter of tents along the hillside at the north end of the tunnel.

Sparrow brothers were the contractors for the construction of the Wingatui Viaduct, the first viaduct on the Otago Central Railway. While workers employed by the public works Department had been in nearby Mullocky Gully since 1880 construction of the viaduct did not begin until 1887. It is unclear from the historic record whether the Mullocky Gully works camp was still in use in 1887 but Sparrow Brothers definitely had a workshop on the north side of the gully at this time. Although there is no archaeological evidence on the surface to indicate habitation, Sparrow Brothers workforce would have lived near the
viaduct site. The Mullocky camp site is only some ten minutes walk away, and with conditions close to the viaduct being less than ideal for habitation, the Mullocky Gully site is the most likely candidate for the camp used by the workers employed to construct the viaduct.

The contractors’ camp associated with the construction of the bridge at Little Mount Allan was situated on the track bed on the eastern approach to the bridge. This was because there was no other suitable land in the vicinity on which to site a camp. Most bridges and viaducts in the Taieri Gorge were in locations where useable land was in short supply and the track bed was the logical place to set up camp.

At least six different contractors were used to construct the Deep Stream viaduct. In addition to workshops on the track bed on the north side of the stream there was a camp on the eastern slope of the hill beside the track.

The Nenthorn private contractors’ camp established to house workers employed by Meikle & Co. was situated on a north facing spur above the railway line. Overall the site is relatively flat, though it slopes down to the north toward the line and drops away quite sharply at its sides and front. There is a small creek immediately to the west of the site which would have provided ample fresh water, as the camp was at some remove from the Taieri River. While the site is on a gentle north facing slope, it would nevertheless have been exposed to the worst of the southerly winter winds. To counter this some hut platforms seem to have been positioned in the lee of the many large schist outcrops which dot the site. In 1885 some 180 men were employed by Meikle & Co in the area, which would have meant a large camp.

Workers employed on the construction of the Poolburn Viaduct had one of the coldest campsites on the entire Otago Central Railway. Situated on the lower slopes of the gully which the viaduct was built to span, the site was exposed to the southerly wind and received minimal winter sunshine. The site may have been more hospitable during the summer months but in winter the frost could stay on the ground all day, even if the sun did come out.

6.2 Factors influencing site location
Geology and geography were the two main factors in the location of railway construction related camps on the Otago Central Railway. Where ever possible camp sites were chosen to make best use of available sunlight and to be sheltered from the worst of the winds, especially the winter southerlies. The campsites were all close to a source of clean fresh water, and were all located near the worksite.

As expected the Public Works Department Camps were situated in the most favourable positions at regular intervals along the Otago Central Railway, while the camps of the private contractors were located on any piece of suitable land near the tunnels and structures they were constructing. This made for some very unpleasant living conditions, especially in the Taieri and Poolburn Gorges where decent campsites near bridges and
tunnels were few and far between. The exception is the Nenthorn contractors’ camp, which is in an almost ideal location.

Table 1. Criteria for the location of construction related camps on the Otago Central Railway

<table>
<thead>
<tr>
<th>Camp</th>
<th>Aspect</th>
<th>Availability of water</th>
<th>Alternative site availability</th>
<th>Immediate proximity to work site</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.W.D site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mullocky Gully</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mt Allan</td>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hindon</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Deep Stream</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Flat Stream</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Oturehua</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Poolburn Gorge</td>
<td>North</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Contractors site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wingatui Viaduct</td>
<td>North</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Duck Point Tunnel</td>
<td>North</td>
<td>Yes</td>
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<td>Yes</td>
</tr>
<tr>
<td>Ross Point Tunnel</td>
<td>North</td>
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<td>Yes</td>
</tr>
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<td>Yes</td>
</tr>
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</tr>
<tr>
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<tr>
<td>Poolburn Viaduct</td>
<td>South east</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

My proposed two site type model for locating construction related camp sites on the Otago Central Railway, as adapted from Buckles (1983), is feasible. Using this two site type model it should be possible to identify other potential construction related camp sites on the Otago Central Railway. It should also be possible to apply this model to locating construction related sites on other New Zealand railway lines, especially those built or begun during the Public Works Department era. The model cannot stand alone however, and ideally will be used in conjunction with the historic record.

6.3 To summarise

My initial results indicate that the model proposed for where sites may be situated is a sound one. The Public Works Department camps are in the most favourable positions possible, while the private contractors’ camps are as near as to the work site as is practical, but are often in less than ideal situations.

This difference is most apparent in the Poolburn Gorge. Here, the private contractors’ camp was situated beneath the viaduct on a south-west facing slope which in winter receives maximum cold and minimal sunshine. When I visited the site in mid winter 2012, the grass and rose bushes were still sheathed in ice at midday, and there were icicles on the banks of the stream. In contrast, the Public Works Department camp, which was situated in a slight bowl on a north facing slope, was warm and dry. This site was sheltered from the worst of the southerly wind and exposed to maximum winter sunshine, making it an altogether more pleasant place to be.
Of course there will always be variations in occupation span and site use and reuse. At Deep Stream for instance, six different contractors were used before the viaduct was completed, though they probably used the same camp sites and stone buildings which are visible in historic photographs of the area.

6.4 Modelling camp layout

The question of site layout is an interesting one. Was there a standardised layout for the work camps associated with the construction of the Otago Central Railway, and if so, is it recognisable form the remaining surface features at the camp sites?

The Public Works Department camps, being basically government run, would be expected to have had a standardised layout. There would be less expectation of a standardised layout of the private contractors’ camps, and these would also have varied greatly in size. The written record contains some excellent site descriptions, especially those supplied by the Otago Witness correspondent known as Peripatetic Jotter. The reports of the Peripatetic Jotter were published in the Otago Witness between May and September 1885 (Cowan 2009: 143). By combining these descriptions with the photographic record of the camps and the archaeological surveys of their surface features, the function of some structures can be inferred.

Images of the early sites in the Taieri Gorge show a haphazard jumble of tents and larger wooden buildings, with no specific activity sites discernible. Images of later Public Works Department camp sites situated on flat land appear far more ordered, with tents and buildings laid out in formal grid patterns, but again, no specific activity sites can be recognised. It would appear that wherever possible the camps, especially those associated with the Public Works Department, were laid out with the engineer’s or foreman’s huts central, the workshops (blacksmith and carpentry) nearby and the boarding houses, stores, workers tents and huts scattered beyond. The powder magazine will always be at the furthest remove.

These constituent components and their relative positions are very much ‘standard’ across all types of work camp over a certain size and level of enterprise, be it the lumber camps of Australia (Davies 2005), the navvy settlements of Victorian Britain (Morris 1994, Wessex Archaeology 2009), or the late nineteenth century camps of those employed by the ‘railway barons’ who profited so greatly from the American methods of railway funding and construction (Buckles 1983, Cleveland 1983, Wegars and Sprague 1981).

The private contractors’ camps with their random layout and sly grog shanties fit Morris (1994) early 18th century site types, as a navvy in New Zealand in the late nineteenth century had far more of the ‘traditional navvy’ lifestyle than their late Victorian British brethren (Morris 1994: 573-584). There, the trend was toward a more ordered barrack type of settlement, meant to curb the more morally disturbing behavioural aspects of the itinerant workforce (Morris 1994: 573-584). This policy was followed to some extent by the Public Works Department in the camps on the flatland sections of the Otago Central Railway.
In all the site surveys undertaken for this thesis, the nearest I have been able to get to identifying a specific activity area is at the Nenthorn contractors’ camp site. Here there is a large rock on the western edge of the site which has a spread of detritus associated with blacksmithing. There is no surface evidence of a forge or workshop, but the composition of the material (various types of nail, horse shoes, washers and bolts), and the strong likelihood of its being a primary deposit would indicate that the smithy, if not on that exact spot, was in the immediate vicinity.

The private contractor’s camps were all different, both in size and composition, so the question of a standardised layout for such sites is somewhat superfluous. This also applies to the camps occupied by various ethnic groups such as the Chinese and Western European immigrants.

6.5 Camp comparisons

The Nenthorn contractors’ camp and Poolburn Gorge Public Works Department camps are the two best sites to compare for the purposes of this thesis. The Flat Stream Public Works Department camp recorded by Jill Hamel is also a good candidate as it also has standing and surface features, but its current overgrown state meant that it was not visited for this thesis. However, Hamel’s maps and field notes of the site are detailed enough to allow comparisons to be made with the other two sites.

The Flat Stream and Nenthorn camps were long term sites, being occupied on and of between 1880 and 1887. Poolburn Gorge Public Works Camp, in contrast was only in use for some two years, from 1901 until late 1903 (Dangerfield and Emerson 1995:28). Both the Flat Stream and Nenthorn camps had a police hut and cells. The first, at Flat Stream, was set up after the murder of William Meldrum, the keeper of a sly grog shanty at the Nenthorn camp, by Thomas Crowley, Lawrence White and a man named only as Fitzgerald (Otago Witness 13 December 1884:8). A police officer was stationed at the Nenthorn site in 1887, but by then it been otherwise abandoned (memoirs of the late James Robertson, Middlemarch). Hamel (2000) located the police building on the highest occupation terrace at the Flat Stream camp, but there is no clear candidate for such a structure at the Nenthorn site.

Flat Stream camp appears to be the largest site, laid out over three distinct levels and with at least 17 platforms some of which were large enough to accommodate up to three huts or tents (Hamel 2000). The Poolburn Gorge camp is only slightly smaller in size with some 15+ platforms or terraces, most of which are single hut or tent sites. Stock damage and erosion at the Nenthorn site have made it difficult to discern the exact number of platforms, but there are at least ten.

All three sites feature stacked schist walls which have been built abutting existing schist outcrops. These average one metre in height, and are between 600mm and one metre wide. The lack of height suggests that the upper walls and roof would have been of canvas. Flat Stream and Nenthorn camps both have walled enclosures of stacked schist, the larger of which is at the Nenthorn site and is clearly visible on Google Earth. Hamel (2000)
interprets the Flat stream enclosure as possibly being a yard for a horse. The Nenthorn enclosure is open at its northern end, though there may have been additional fencing which has since been removed.

There is evidence of sod or earth being used for walls and chimneys at the Flat Stream and Nenthorn sites. These are visible as low mounds around hut platforms at the Nenthorn camp and as mounds at the end of platforms at both sites. Earth does not appear to have been used for construction of walls or chimneys at the Poolburn Gorge Public Works Department camp, probably because there was plenty of stone available for building. It may also be that there was insufficient soil depth at the Poolburn site to allow for earth to be utilised in this way, or that the soil was of such low clay content that any earth structures have simply dissolved.

Chimneys at Flat Stream and Poolburn were predominately of stacked schist construction, many of which are bonded with earth. Hamel (2000) recorded at least 10 such structures at the Flat Stream site, and nine were recorded at the Poolburn Gorge site. At the Nenthorn site only the fireplaces seem to have been constructed of stacked schist, and the chimneys themselves were either of sod or iron. Railway iron was used to support some fireplace lintels at Flat Stream (Hamel 2000) and Nenthorn but not at Poolburn. This may only have been done in the larger fireplaces, and was perhaps not necessary at Poolburn due either to all the fireplaces being small, or there being schist slabs of sufficient length to act as lintels.

Hamel (2000) reported a small structure of stacked schist at some remove from the main body of the Flat Stream Public Works Department camp which she interpreted as a possible powder store. All Public Works Department camps had these, and there is a similar structure at the Nenthorn contractors’ camp. The possible powder store at the Nenthorn camp is also at some remove from the main body of the site, being built into an overhanging schist outcrop facing the railway track bed. This structure is of loose stacked schist construction, one metre in height and is divided into two cells by a partition wall. There are the remains of two structures below and to the side of the main body of the Poolburn Gorge site, but these are in too great a state of disrepair for their purpose to be even guessed at.

The only surface evidence for any type of on site workshop is the scatter of blacksmithing detritus on ‘blacksmith rock’ at the Nenthorn camp. At the Poolburn Gorge site the blacksmithing workshop was located on the track bed at the north end of the tunnel nearest the camp. There is no indication in Hamel’s (2000) site records of where the smithy or carpentry workshops at the Flat Stream Public Works Department camp may have been.
My comparison of the Flat Stream, Nenthorn and Poolburn Gorge camps leads me to the conclusion that, going on surviving surface features, there is not a great deal of difference between a Public Works Department camp and a large private contractors camp site. All three sites have similar features and any variations are as much about environment as they are about who was responsible for the site.

6.6 Housing

![Figure 54. A Lancashire Party Working On The Line, Otago Witness 01/04/1903: 37. Hocken Collections, Uare Taoka o Hakena, University of Otago. A typical family dwelling, if not a typical family scene, on the Otago Central Railway.](image)

Most workers employed in the construction of the Otago Central Railway, at least in the initial stages, were housed in tents of canvas or felt. Engineer’s offices and other larger
structures were of wood, and the powder magazines were of stone. Due to the long term nature of some of the sites, especially the Public Works Department camps in the Taieri Gorge many chose to construct more permanent accommodation. Due to a dispute over access at Mullocky Gully, the *ad hoc* approach to railway construction in the Taieri Gorge, and the nature of the terrain, it was not possible to utilise ‘kitset camps’ as was done later on the flatlands. Building materials were somewhat limited in most areas of the Otago Central Railway, and many were restricted to using either the local schist rock or earth.

**Schist** As well as the standard issue tents of felt and canvas, workers involved in the construction of the Otago Central Railway utilised other approaches to the problem of housing themselves and their families. The most common construction material anywhere on the railway was the ubiquitous schist rock. Slabs of schist were used in everything from the construction of simple chimney stacks and walls to walled enclosures and larger buildings whose walls were made entirely of stacked stones. Many of these walls and buildings were constructed dry stone, others merely had mud plastered on their interiors, while some were fully bonded inside and out by mud and clay.

Large schist boulders were also incorporated into houses structures, where they were used as walls. A suitable rock, usually one with a relatively vertical face, was selected and a fireplace and chimney would be constructed against it. The rest of the structure was simply built up around this and against the vertical face. This was then covered with a roof, usually of canvas.

Schist slabs were also used as floors and flag stones. It appears that some wooden or corrugated iron structures were erected on a base of schist slabs. These buildings could then be dismantled and removed to the next camp up the line.

**Sod** Many house sites in the camps I have surveyed show evidence of having been at least partially constructed of earth. According to sources the most common method of earthen construction used in the camps was sod (Dangerfield and Emerson 1995:16). Sod is made by cutting blocks of turf and stacking them face down to form walls.

Sod walls should not be confused with those constructed of mud brick or cob (stamped earth). Mud brick construction is a totally different technique, which involves combining earth with water and straw or animal dung, and pressing this mixture into moulds to harden. Stamped or rammed earth, involves earth being stamped down between shutters or vertical supports, which leave distinct layers in the finished wall.

As earth built structures break down they slump and thicken, leaving distinctive wide, low mounds. While such mounds are a feature in sites associated with the construction of the Otago Central Railway, especially at the Nenthorn Public Works Department camp, without archaeological excavation there is no way of being certain which building method was actually used.

**Timber and iron** In the later stages of railway construction on the flatlands, entire camps were of timer, corrugated iron and canvas. The Dunstan Flat Public Works Department
camp near Alexandra (1905) was this type of camp, as were as earlier camps such as the Ranfurly Public Works Department camp (1899). These could be erected and dismantled with comparative ease, and moved on to the next site up the line. This has parallels with the 1870-1875 Risehill navvy’s’ camp in Cumbria, where wooden structures were erected on a base of stone and then dismantled and moved when work at the site was completed (Wessex Archaeology report no.68737.01, 2008:10).

6.7 Factors influencing selection of construction material
As the same building materials were present at most of the camp sites associated with the construction of the Otago Central Railway, it would seem logical that the same building techniques be used from camp to camp. For the most part this certainly appears to be the case, at least as far as the remaining surface features are concerned. However, some sites have the remains of predominately stone chimneys and walls (Flat Stream and Poolburn Public Works Department camps), while others consist mainly of earthen walls and chimneys (Nenthorn camp).

I believe the reason for this difference in choice of construction material is to do with the nature of the site. The Poolburn camp was associated with tunnelling and cutting so there was a plethora of waste stone which could be utilised in the construction of walls and chimneys. In contrast, the Nenthorn camp was situated near two large embankments. Any cut stone would have been required to construct these meaning that there was less available for domestic construction. While there are the remains of some quite substantial stone walls at this site, including a large enclosure, the majority of hut platforms show evidence of having had earthen or sod walls and chimneys.

6.8 How long were sites in use?
The early Public Works Department camps associated with the construction of the Otago Central Railway through the Taieri Gorge were long term occupation sites. As noted previously this was due to the difficult nature of the terrain, the ad hoc approach to construction and the lack of bridges in the gorge. Because the work of cutting and levelling the track bed in preparation for the rails was all done by hand, except for some areas where blasting was possible, progress through the gorge was slow.

The nature of the work and the times meant that workers came and went, often finding alternative work during the coldest months, meaning the population of the camps was somewhat fluid (Dangerfield and Emerson 1995: 14). So while the Public Works Department campsites were in situ for many years, they were not necessarily fully occupied the entire time. Such nuances of site use are beyond the scope of this thesis however, and can only be teased out through excavation.

The private contractors’ camps were in use for as long as it took to complete the work at hand. Like the Public Works Department camps the populations of the contractor’s camps could also ebb and flow. Some sites such as the Deep Stream workshop and camp were used by multiple contractor groups but again without excavating the sites there is no way of telling one from the other. The camp site at Nenthorn was a long term site, used by at
least two different contractors between 1880 and 1887, when it became the residence for the local law enforcement officer.

6.9 Factors influencing site preservation

Location is the most important factor influencing site preservation. All other reasons for the condition of a site depend on where it is. Any sites located on the track bed will of course have been destroyed when the rails were laid, as at little Mount Allan, the Duck Point tunnel, Hindon and the Deep Stream workshop site. As we have seen at Mullocky Gully, if a site happens to be situated anywhere near where heavy earth moving activity is taking place, unless it is a registered archaeological site its chances of survival are nil. In contrast, if a site is tucked away in a small hollow on a hillside where only low intensity farming has taken place, as at the Poolburn Gorge Public Works Department camp, then its chances of survival are good.

Most of the railway construction related sites in the Taieri Gorge have either disappeared completely under a canopy of re-growth, as at Mount Allan, or are in the process of doing so, as at Deep Stream and Flat Stream. The Mount Allan site was also severely damaged by flooding in 1980. Much of this re-growth of scrub is limited to a narrow band some 20 metres in width on the slopes above the railway line. This is where the majority of the camps were located, but the re-growth occurs regardless of whether there was a camp site there or not, so the two cannot be linked.

Although the Nenthorn site is reasonably well preserved, there has been some damage caused by ploughing. Areas near the schist outcrops which dot the site have not been affected, but away from these much surface detail has been ploughed away. Although this part of Otago is usually associated with sheep farming, in the winter of 2012 cattle were introduced onto the Nenthorn site, which has caused pugging and erosion of the slopes around the site. Erosion has also been a factor generally at the site, with sod walls and chimneys succumbing to the elements, aided by stock damage.

Cycles of freeze and thaw have the potential to damage stone and earth wall and chimney remains in the Otago region. Water expands as it freezes and as it thaws small amounts of earth or stone may fall away, leading over time to extensive undermining of walls and destruction of earthen features (Jones 2007:33).

As most of the sites associated with the construction of the Otago Central Railway are on or adjacent to farm land, the most likely threat to continued site preservation will be from livestock. Damage associated with farm animals includes soil compaction, pugging (repeated trampling of wet soils), tracking, pawing, dust bowls, ‘camping’ areas for shelter from sun or wind, downhill soil creep, terracette formation and slumping (Jones 2007:21).

Because of their size and propensity for rubbing themselves on vertical structures, cattle appear to have done most of the post abandonment damage to the sites I have surveyed. This appears to be the case at the Nenthorn camp site, where no chimneys and few fireplaces survive. The Poolburn and Flat Stream camps have suffered minimal stock damage, most likely due to having only been grazed by sheep. This is something of a
mixed blessing in the case of the Flat Stream site in that it is rapidly disappearing under a covering of scrub.

Whether rabbits, hares, feral pigs and goats have impacted on sites is difficult to determine, but they certainly have the potential to do so. Rabbits and hares are certainly present at all the sites surveyed for this thesis, and some archaeological material has been brought to the surface by them at the Nenthorn camp site. The fact that larger feral animals such as pigs and goats do not occur in the same concentrations as domestic livestock will certainly diminish any impact they may have.

6.10 Track-ways
I initially thought it would be possible to locate potential sites by using the remains of the track-ways associated with the supply of goods and materials to the railway construction camps on the Otago Central Railway. Because of a dispute over access, the railway construction camps in the Taieri Gorge had to be supplied via Outram and the town of Hindon (Dangerfield and Emerson 1995:15). Some material was taken by road from North Taieri to Mullocky Gully and from there up river via an old whale boat which was towed by two men and steered by a third (Dangerfield and Emerson 1995:15). However the boat could only be towed some three km beyond Mount Allan as the banks became too steep beyond this point. In order to supply the camps beyond Mount Allan, goods were then transported by sled or dray from the town of Hindon down to the campsites. In some instances, the track ways created when supplies were moved in this fashion can still be seen in aerial photographs and Google Earth images.

Figure 55. Detail of SO map 1294 showing track way linking the Flat Stream Public Works Department camp site with the Nenthorn camp site.

The Survey and Ordinance map 1294 (1896) (Figure.55) which was used to locate the Nenthorn camp shows a track which runs from a store at the Flat Stream Public Works
Department camp to Nenthorn. This track is also visible on Google Earth images of the area. This is the only instance I have come across of a railway construction related camp and a track-way being marked on a SO map.

Unfortunately, because so many different activities have occurred in the Taieri Gorge in the last 150 years (mining, farming, hunting, recreational vehicle use), it is difficult to definitely associate track-ways with railway construction related sites. The only way to be sure a track-way is associated with a construction camp site is to start at the site itself and follow the track back to its source.
7. Conclusions

7.1 Modelling
The two site type model, adapted from Buckles (1983) was tested and shown to be feasible, though not faultless. As predicted, the Public Works Department campsites were usually in the better locations, while the contractors’ camps were positioned as near to the worksite as possible. The exception is the Nenthorn site, which is a contractors’ camp that resembles a Public Works Department site, both in location and surface features.

7.2 Camp Layout
While this thesis is a coarse grained one, concentrating as it does on the surface remains of the camp sites associated with the construction of the Otago Central Railway, some interpretation of the layout of the camps is possible from the analysis of surface remains and the historical record.

In the Taieri Gorge campsites were constrained by their environment, making it impossible to conform to any pre-set design. Beyond the confines of the gorge it would have been possible to establish camps to a standard plan, but without excavating the sites, there is no way of telling which activities were undertaken in any given area. All the Public Works Department camp sites along the Otago Central Railway had basically the same components. Each camp consisted of workers tents or huts, a blacksmiths workshop, at least one carpentry workshop, a site foreman’s hut, an engineer’s hut, and a powder magazine. Some sites also had boarding houses and stores, and several sites had schools either in the camp or nearby.

Small hut platforms were most likely to have supported single men’s’ tents or huts, while larger platforms were more likely to have been associated with family accommodations, or in some cases perhaps sly grog shanties. The largest platforms would have been the bases of the boarding houses, workshops and stores. Contractors’ camps were generally smaller and more randomly set out, although they often contained the smithies and carpentry workshops associated with the Public Works Department camps.

The camps in the Taieri Gorge were occupied for up to six or seven years, and although considered temporary, most sites still contain extant features such as chimneys, platforms and walls. Flat land camps were more spread out than their counterparts in the gorges, and were of a much more portable and temporary nature. Any archaeology associated with this site type will be subsurface.

7.3 Has this thesis achieved its intended outcomes?
Using the historic record, remote sensing and field-work, we can differentiate between sites and features associated with the construction of the Otago Central railway and sites and features associated with the day to day operation and maintenance of the line. Using the two site type model it is also possible to establish which camps were operated by the Public Works Department, and which were associated with private contractors.
Sites and features associated with the day to day operation of the line include stations, water towers and signal boxes, as well as all the bridges tunnels, embankments and cuttings along the line. Maintenance sites include gangers’ huts, ballast pits and sleeper caches. Structures relating to the day to day running and maintenance of the railway, such as water towers, signal boxes, stations, gangers’ huts and sleeper caches are located on the track bed beside the rails.

These are distinct from the construction related sites and features, which were situated as near as possible to construction projects but were abandoned on completion of the task at hand. If sites were situated on the track bed, or were ‘portable sites’ they are now invisible. Surface features are visible at some sites, usually chimneys, walls or hearths. The private contractors’ sites were situated immediately adjacent to the work site, while the Public Works Department sites could be at some remove and were situated for maximum exposure to the sun.

Ballast pits are as near to the railway as geology allows, and were linked to the main line via sidings or short tracks. Many of these pits were associated with the construction of the railway: Tisdalls, Hyde, Chatto Creek and Doigs, while others were purely maintenance based. Because ballast pits were multi use sites, I have not included them in this thesis.

### 7.4 Recommendations for further study

As not much work on the archaeology of railway construction related sites has been undertaken in New Zealand, the options for further study are numerous. To me, the most obvious course of further study in the field of railways construction related sites would be to excavate at least one of the camps surveyed in this thesis, preferably the Flat Stream or Nenthorn sites. Ideally one other site, I would suggest the Poolburn Public Works Department camp, would be excavated in order to create a comparison between conditions in an 1880-1887 Public Works Department camp and a 1901-1904 camp, or between a Public Works camp and a contractor’s camp.

Although I have mapped surface features visible at the sites visited, without excavating there is no way of knowing what any particular feature actually is. Obviously a chimney is a chimney, but the purpose of the structure associated with said chimney is not so obvious. A detailed analysis of surface and subsurface features and artefacts from these sites would provide a solid foundation for the study and comparison of railway construction related sites of the same era in other parts of the country.

Construction related sites associated with other railways built at the same time as the Otago Central Railway could be investigated and compared to the Otago sites. Potentially this could include most of New Zealand’s rail network, as most of it was constructed between 1870 and 1920.

I believe the archaeology of the world wide economic depression of the 1880s and its effect on the local economy is a subject worthy of attention. New Zealand was on the very edge of colonial economic feasibility, being so distant from the rest of the British Empire, yet dependant on it for trade and infrastructure funding. Any attempted study of the effects...
of the economic downturn would be largely based on the excavation of rubbish pits and the like, in order to investigate changes from imported goods to more locally produced wares, and any decline in the quality of foods being consumed.

7.5 The people and the landscape
The people who built the railway through Central Otago left their mark in more than just the camps. Evidence of them can be found all over Otago, perhaps over the country. In addition to the Otago Central Railway, these people built the culverts, bridges, road and rail cuttings, embankments and tunnels, which we take for granted as part of the human aspect of our local environment.

Much of the infrastructure created at this time relied on the same pool of itinerant craftspeople and skilled labourers, augmented by any number of unskilled labourers, who came and went as the work required. Because the railway work was so intermittent, navvies went mining or worked on the roads. Likewise miners worked on infrastructure projects when the gold played out. Were we able to excavate all the camps associated with the construction of the Otago Central railway, chances are we would find traces of the same core group of workers and their families spread out over the length of the railway.

While this thesis has been essentially an attempt to locate where the people who constructed the Otago Central Railway lived, it opens the way to more detailed study of who they were and how they interacted with their environment and each other. Through historical archaeology we are able to begin to bring the lives of these people to light. Our role as practical social historians is ideally suited to telling their tale, as we are able to follow them from site to site through time and the landscape.
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Accessed via Papers Past (2011-2012)

http://paperspast.natlib.govt.nz/cgi-bin/paperspast?a=d&d=ODT18801207.2.25&e

Appendix 1

NZAA site record for Mullocky Gully Public Works Department camp
SITE RECORD FORM

NZAA SITE NUMBER: I44/544
SITE TYPE: Transport/communication
SITE NAME(s): Mullocky Gully
DATE RECORDED: 29/08/2012

SITE COORDINATES (NZTM) Easting: 1392875 Northing: 4924699 Source: Handheld GPS

IMPERIAL SITE NUMBER: METRIC SITE NUMBER:

Finding aids to the location of the site
Follow Taioma Rd from the end of Gorden Rd north of Mosgiel. Cross railway line and head down hill approx 400m.

Brief description
Public Works Department Camp site relating to the construction of the Otago Central Railway.

Recorded features
Artefact - historic

Other sites associated with this site
## Site description
Updated: 29/08/2012, Visited: 29/01/2012 - NZTM E1392875 / N4924699 (Handheld GPS). Originally several buildings and tents on level ground beside Mt Allen Rd. An 1887 image by Coxhead (Hocken collections E2672/2) shows the camp covered a large area. The site has been much modified by Wenita Forestry, to the extent that all surface features, apart from some terracing and part of the track way have been bulldozed. An access road and log dump now cover the site. Inspected by: Mitchell, Peter.

## Condition of the site
Updated: 29/08/2012, Visited: 29/01/2012 - All that remains on the surface are some old terraces and a section of the original track way. Some insitu glass fragments indicate the possibility of subsurface material remaining. Site much modified by bulldozing and importation of aggregate to build up embankment for access road to Mount Allen by Wenita Forestry.

## Statement of condition
Updated: 17/09/2012, Visited: 29/01/2012 - Below surface - Surface evidence has been obliterated, however, there is likely to be subsurface material present. Note that this is different from a destroyed site.

## Current land use:
Updated: 29/08/2012, Visited: 29/01/2012 - Production forest

## Threats:
Updated: 29/08/2012, Visited: 29/01/2012 - Forestry operations
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publication Details</th>
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</table>

Supporting documentation held in ArchSite

![Site Plan: Mulloky Gully - Site of 1885 Railway Construction Camp]
Appendix 2

NZAA site record for Sparrow’s Workshop, Wingatui Viaduct
Finding aids to the location of the site
Follow Taioma Rd from end of Gordon Rd north of Mosgiel. Cross railway line and drive to gate at end of public road. The site is approx 1km beyond the gate, below the Wingatui Viaduct to the east of the second northern pier.

Brief description
Platform and mound associated with Sparrows workshop 1885-1887. Sparrows were the contractors responsible for the construction of the Wingatui Viaduct.

Recorded features
Mound, Platform

Other sites associated with this site
<table>
<thead>
<tr>
<th>SITE RECORD HISTORY</th>
<th>NZAA SITE NUMBER: I44/545</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site description</strong></td>
<td></td>
</tr>
<tr>
<td>Updated: 29/08/2012, Visited: 29/01/2012 - NZTM E1391994 / N4924898 (Handheld GPS). At the northern end of the Wingatui Viaduct, to the east of the second pier is the platform where Sparrows 1885-1887 workshop stood. Photographs from the time show a large corrugated iron clad building (Burton Bros Dunedin). The building was most likely removed when the viaduct was completed, but the mound may contain associated debris and artefacts. It is currently covered by long grass and scrub. Inspected by: Mitchell, Peter.</td>
<td></td>
</tr>
<tr>
<td><strong>Condition of the site</strong></td>
<td></td>
</tr>
<tr>
<td>Updated: 29/08/2012, Visited: 29/01/2012 - The site was modified in the late 20th century when heavy equipment was brought in to repaint the Wingatui Viaduct. A single piece of burnt brick was found at the edge of the mound when the site was visited. The site is covered by vegetation. Wenita Forestry are currently clear felling the area and their access way may further damage the site, although they have been made aware of its existence.</td>
<td></td>
</tr>
<tr>
<td><strong>Statement of condition</strong></td>
<td></td>
</tr>
<tr>
<td>Updated: 17/09/2012, Visited: 29/01/2012 - Below surface - Surface evidence has been obliterated, however, there is likely to be subsurface material present. Note that this is different from a destroyed site.</td>
<td></td>
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<tr>
<td><strong>Current land use:</strong></td>
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<tr>
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<td><strong>Threats:</strong></td>
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</tr>
<tr>
<td>Updated: 29/08/2012, Visited: 29/01/2012 - Forestry operations</td>
<td></td>
</tr>
</tbody>
</table>
SPARROW'S WORKSHOP SITE 1887: WINGATUI VIADUCT

MULLOCKY STREAM BED

RAILWAY / VIADUCT ROAD

SITE OF SPARROW'S WORKSHOP 1887 X

0 30
30 m
Appendix 3

NZAA site record for Deep Stream workshop
## Site Record Form

### Imperial Site Number: **144/547**

### Metric Site Number: **NZAA SITE NUMBER: 144/547**

### Site Type: **Transport/communication**

### Site Name(s): **Deep Stream Workshop**

### Date Recorded: **29/08/2012**

### Site Coordinates (NZTM) Easting: **1390125**

### Northing: **4935607**

### Source: **Handheld GPS**

### Finding aids to the location of the site

*Take the Taieri Gorge train to Deep Stream. Disembark from train on north side of viaduct. The site is immediately to the west of the tracks.*

### Brief description

*The flat area beside the railway was the site of at least one workshop associated with the construction of the Deep Stream Viaduct and the Otago Central Railway.*

### Recorded features

- **Mound**

### Other sites associated with this site
### Site description

Updated: 29/08/2012, Visited: 17/02/2012 - NZTM E1390125 / N4935607 (Handheld GPS). The flat area is overgrown with long grasses. There is a mound toward the northern end of the flat area which may be the rubble of at least one stone building. This building is visible in an historical photograph (Coxhead circa 1885 E1440/42 Hocken Collections). Another image (Dangerfield and Emerson 1995:25, Burton Bros. Dunedin, Museum of New Zealand) shows at least four buildings on the site. Inspected by: Mitchell, Peter.

### Condition of the site

Updated: 29/08/2012, Visited: 17/02/2012 - The site is overgrown with grass, but that is all. There are no surface features visible but there may be the remains of buildings or artefacts associated with industry or railway construction beneath the grass cover.

### Statement of condition

Updated: 17/09/2012, Visited: 17/02/2012 - Below surface - Surface evidence has been obliterated, however, there is likely to be subsurface material present. Note that this is different from a destroyed site.

### Current land use:

### Threats:
Supporting documentation held in ArchSite
Appendix 4

NZAA site record for Deep Stream camp
SITE COORDINATES (NZTM) Easting: 1390242 Northing: 4935198 Source: Handheld GPS

IMPERIAL SITE NUMBER: METRIC SITE NUMBER:

Finding aids to the location of the site
Take Taieri Gorge train to Deep Stream Viaduct. Disembark train on south side of viaduct and head up hill approx 70m south of viaduct. Go through the fence and follow the track way west until you reach a clearing. The site is in this clearing.

Brief description
Bonded schist chimney and low wall or shelf. Bonded schist enclosure, probably large hut or similar building. Camp site associated with the construction of the Deep Stream Viaduct and the Otago Central Railway

Recorded features
Chimney, Fireplace/ hearth, Hut floor/ site, Ruins - building or structure

Other sites associated with this site
**Site description**
Updated: 29/08/2012, Visited: 17/02/2012 - NZTM E1390242 / N4935198 (Handheld GPS). A schist bonded chimney 2.5m high, 1.4m wide at the base with a hearth .9m wide. Directly behind this is a low wall or shelf, also of bonded schist, which extends 1.5m beyond the chimney base to the east. To the west of the chimney, some 2m distant, is a walled enclosure, also of bonded schist, which appears to be a large hut site or similar building. It is 8m long and has an internal width of 3m. The walls are 1m high and .5m thick. The north wall and the front third of the west wall have collapsed, and there appears to have been a doorway in the north wall. The stonework is of good quality in both structures and they appear to have been constructed at the same time. There are other chimney and hearth sites in the vicinity. Camp site associated with the construction of the Deep Stream Viaduct and the Otago Central Railway. Inspected by: Mitchell, Peter.

**Condition of the site**
Updated: 29/08/2012, Visited: 17/02/2012 - Both structures are being overgrown by climbing plants, and there is a tree growing inside the building which may cause further collapsing of the walls, especially the eastern wall.

Plant growth appears to be the major cause of deterioration of the standing structures. There are stock on the land.

**Statement of condition**
Updated: 17/09/2012, Visited: 17/02/2012 - Fair - Some intact features, but others may be unclear or damaged

**Current land use:**
Updated: 29/08/2012, Visited: 17/02/2012 - Grazing

**Threats:**
Updated: 29/08/2012, Visited: 17/02/2012 - Stock trampling
Supporting documentation held in ArchSite
Appendix 5

NZAA site record for Nenthorn Contractors' camp
## Site Record Form

**NZAA SITE NUMBER:** I43/153  
**SITE TYPE:** Transport/ communication  
**SITE NAME(s):** Nenthorn Railway Construction Contractors’ Camp  
**DATE RECORDED:** 17/09/2012

<table>
<thead>
<tr>
<th>SITE COORDINATES (NZTM) Easting:</th>
<th>1384287</th>
<th>Northing:</th>
<th>4942662</th>
<th>Source: On Screen</th>
</tr>
</thead>
</table>

**IMPERIAL SITE NUMBER:**  
**METRIC SITE NUMBER:**

---

**Finding aids to the location of the site**

Take Lee Stream Outram Rd; continue along Sutton Clarks Junction Rd. Turn right into Pukerangi Rd and continue to Pukerangi railway station. Follow Reefs Rd for approx 3 km, then head north across paddocks. The site is beside a large railway embankment.

**Brief description**

Camp associated with the construction of the Otago Central Railway 1880-1888.

**Recorded features**

Artefact - bottle, Artefact - ceramic, Artefact - historic, Building - hut, Hut floor/ site

**Other sites associated with this site**
**Site description**

Updated: 17/09/2012, Visited: 25/05/2012 - NZTM E1384287 / N4942662 (On Screen).

Take Lee Stream Outram Rd; continue along Sutton Clarks Junction Rd. Turn right into Pukerangi Rd and continue to Pukerangi railway station. Follow Reefs Rd for approx 3 km, then head north across paddocks. The site is beside a large railway embankment. Alternatively, take the Taieri Gorge excursion train to Pukerangi and walk back down the tracks toward Dunedin for approx 30 mins to the embankment. The site is on the south side of the rails adjacent to the embankment.

Camp associated with the construction of the Otago Central Railway 1880-1888. The site is situated on a north facing aspect which slopes down toward the railway line. There is a creek which runs through a gully on the western edge of the site and eventually goes beneath the embankment. There are several hut platforms, a large three side enclosure of stacked schist, a rock covered with blacksmithing detritus, several hearths, the remains of earth walls and at least two huts consisting of walls of stacked schist butting onto larger schist outcrops. There are also artefacts including glass, ceramics, coal and metal.

Inspected by: Mitchell, Peter.

Updated: 24/09/2012, Visited: 21/09/2012 - Cattle on site over winter 2012 has led to erosion and damage to the site.

Inspected by: Mitchell, Peter.

**Condition of the site**

Updated: 17/09/2012, Visited: 25/05/2012 - The site is in good condition, aside from some plough damage and stock trampling.

**Statement of condition**

Updated: 17/09/2012, Visited: 25/05/2012 - Good – Majority of visible features are intact, but some minor loss of definition and/or damage

**Current land use:**

Updated: 17/09/2012, Visited: 25/05/2012 - Grazing

**Threats:**
<table>
<thead>
<tr>
<th>SITE RECORD INVENTORY</th>
<th>NZAA SITE NUMBER:</th>
<th>I43/153</th>
</tr>
</thead>
</table>

Observations about this site made in

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publication Details</th>
</tr>
</thead>
</table>

Supporting documentation held in ArchSite
Appendix 6

NZAA site record for Oturehua Public Works Department camp
SITE COORDINATES (NZTM) Easting: 1355695 Northing: 5010330 Source: On Screen

IMPERIAL SITE NUMBER: METRIC SITE NUMBER:

Finding aids to the location of the site
Take State Highway 85 to Idaburn, take the Ida Valley - Omakau Road to Oturehua. The site is situated approx 1.5 km south west of the present township, in a large paddock on the far side of the rail trail.

Brief description
The site was the largest Public Works Department camp on the Otago Central Railway, and was occupied in the 1890s, being abandoned at the turn of the 20th century.

Recorded features
Building - hut

Other sites associated with this site
<table>
<thead>
<tr>
<th>SITE RECORD HISTORY</th>
<th>NZAA SITE NUMBER: H41/232</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site description</strong></td>
<td>Updated: 19/09/2012, Visited: 22/06/2012 - NZTM E1355695 / N5010330 (On Screen). Three huts remain in situ at the southern end of the site. These have been much modified over the years, and were lived in as late as the 1950s. Whether any of the original late 19th century fabric of the huts remains is debatable, the frames being perhaps the exception. Inspected by: Mitchell, Peter.</td>
</tr>
<tr>
<td><strong>Condition of the site</strong></td>
<td>Updated: 19/09/2012, Visited: 22/06/2012 - Three huts remain, all other evidence is below ground. Surface artefacts may relate to the area being part of a farm.</td>
</tr>
<tr>
<td><strong>Statement of condition</strong></td>
<td>Updated: 20/09/2012, Visited: 22/06/2012 - Fair - Some intact features, but others may be unclear or damaged</td>
</tr>
<tr>
<td><strong>Current land use:</strong></td>
<td>Updated: 19/09/2012, Visited: 22/06/2012 - Grazing</td>
</tr>
<tr>
<td><strong>Threats:</strong></td>
<td>Updated: 19/09/2012, Visited: 22/06/2012 - Stock trampling, Ploughing/ cultivation</td>
</tr>
</tbody>
</table>
Supporting documentation held in ArchSite

Oturehua P.W.D camp site

Otago Central Rail Trail
River
Township of Oturehua
Pub
Shop
Possible Blacksmith site
P.W.D huts
Train Station
Road

200m
Appendix 7

NZAA site record for Poolburn Viaduct Contractors’ camp
---

### Site Record Form

**NZAA SITE NUMBER:** H41/233  
**SITE TYPE:** Transport/communication  
**SITE NAME(s):** Poolburn Viaduct Contractors’ Construction Camp  
**DATERecorded:** 19/09/2012

<table>
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<tr>
<th>SITE COORDINATES (NZTM) Easting: 1343782</th>
<th>Northing: 5004852</th>
<th>Source: On Screen</th>
</tr>
</thead>
</table>

**SITE COORDINATES (IMPERIAL):**  
**METRIC SITE NUMBER:**

---

**Finding aids to the location of the site**  
Follow the Otago Central Rail Trail to Poolburn Viaduct. The site is below and to the south east of the viaduct.

---

**Brief description**  
Site of contractors’ camp associated with the construction of the Poolburn Viaduct.

---

**Recorded features**  
- Ruins - building or structure, Stone retaining/ facing, Track - bullock, Track - horse

---

**Other sites associated with this site**
### Site description
Updated: 19/09/2012, Visited: 22/06/2012 - NZTM E1343782 / N5004852 (On Screen). The footings of derricks used to construct the viaduct are visible, as are track ways used to convey stone to the site. Historic images of the site show portable buildings were used, and platforms associated with at least one of these are present. Inspected by: Mitchell, Peter.

### Condition of the site
Updated: 19/09/2012, Visited: 22/06/2012 - Minimal evidence of campsite remains. Much eroded and stock trampled.

### Statement of condition
Updated: 20/09/2012, Visited: 22/06/2012 - Fair - Some intact features, but others may be unclear or damaged

### Current land use:
Updated: 19/09/2012, Visited: 22/06/2012 - Grazing

### Threats:
Updated: 19/09/2012, Visited: 22/06/2012 - Stock trampling
**SITE RECORD INVENTORY**

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publication Details</th>
</tr>
</thead>
</table>

**NZAA SITE NUMBER:** H41/233

Observations about this site made in

Supporting documentation held in ArchSite

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![Map of Site Record Inventory](image)
Appendix 8

NZAA site record for Poolburn Gorge Public Works Department camp
**Site Record Form**

**NZAA SITE NUMBER:** H41/234  
**SITE TYPE:** Transport/ communication  
**SITE NAME(s):** Poolburn Gorge P.W.D Camp  
**DATE RECORDED:** 19/09/2012

<table>
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<th>SITE COORDINATES (NZTM) Easting: 1343005</th>
<th>Northing: 5006043</th>
<th>Source: On Screen</th>
</tr>
</thead>
</table>

**SITE TYPE:** Transport/ communication  
**SITE NAME(s):** Poolburn Gorge P.W.D Camp  

**DATE RECORDED:** 19/09/2012

**Finding aids to the location of the site**

Follow the Otago Central Rail Trail to Poolburn Gorge. The site is just beyond the northern portal of the second tunnel (Tunnel 13, Poolburn No.2). Follow side track to picnic area. The site is downslope of the picnic area and is marked by a DOC sign.

**Brief description**

Public Works Department camp associated with the construction of the Otago Central Railway 1901-1903.

**Recorded features**

Artefact - historic, Chimney, Hut floor/ site

**Other sites associated with this site**
### Site description
Updated: 19/09/2012, Visited: 22/06/2012 - NZTM E1343005 / N5006043 (On Screen). Several chimneys of stacked and bonded schist, and hut platforms dot the north facing slope down to the Poolburn Stream. Metal artefacts including turn of the 20th century tins and cookwares on surface. Inspected by: Mitchell, Peter.

### Condition of the site
Updated: 19/09/2012, Visited: 22/06/2012 - Chimneys still standing. Minimal stock damage. Site is DOC managed.

### Statement of condition
Updated: 20/09/2012, Visited: 22/06/2012 - Excellent – Visible features are intact and clearly defined

### Current land use:
Updated: 19/09/2012, Visited: 22/06/2012 - Grazing, Reserve/ recreation

### Threats:
Updated: 19/09/2012, Visited: 22/06/2012 - Stock trampling, Erosion, Fossicking
<table>
<thead>
<tr>
<th>SITE RECORD INVENTORY</th>
<th>NZAA SITE NUMBER: H41/234</th>
</tr>
</thead>
<tbody>
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<td>Observations about this site made in</td>
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<td>Author</td>
<td>Year</td>
</tr>
<tr>
<td>Supporting documentation held in ArchSite</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 9

The Memoirs of the late James Robertson, whose father was a carpenter during the construction of the Otago Central Railway
The construction of this railway was authorised in 1873 and tenders called for the first contract, a distance of nearly six miles sixty chains. The successful tenderer being J. & D. McKenzie for the amount of £23,639. The first sod was turned at Wingatui on 7 June 1873 by Mr Vincent Pyke, Resident Magistrate for the Dunstan District. He was the first Chairman of the Vincent County Council, the district being named after him. He was also Member of the House of Representatives for Wakatipu in 1873, Dunstan 1875, and Tuapeka in 1893. He died in 1894, aged 67.

There were about 150 guests at the turning of the first sod. Mr Pyke was presented with a gold shovel made by Mr John Hislop, Jeweller, Dunedin, by the contractors, J. & D. McKenzie. Mr Pyke was a strong advocate for the Otago Central line as also were several of Dunedin's businessmen. The Otago Central railway has played a great part along with irrigation in the development of Central Otago, opening up arable country that was no better than a shingle pit before. The Otago Central railway leaves the Main Line at Wingatui, nine miles South of Dunedin, crosses the Taieri Plain, and winds its way till it strikes the Taieri River between Taiora and Parera, a distance of approximately nine miles from Wingatui. The railway follows the Taieri river watershed to a few miles past Wedderburn at a height of nearly 1800 feet above seal level. Then it descends into the Hamurikia watershed till it reaches Alexandra, 490 feet above seal level, a distance of 125 miles from Wingatui. It then follows up the Clutha watershed to Cromwell 629 feet above seal level and 146 miles from Wingatui. The Otago Central railway has been surveyed to Hawea Flat, a distance of about 40 miles from Cromwell. It is just questionable if the railway will go past Cromwell for many years.

In surveying and constructing a railway like the Otago Central there are various problems to be taken into account - the route to be taken where it is most beneficial to settlement lack of heavy grades, sharp curves, costly tunnels and bridges, and heavy rock work have all to be considered. On the railway from Wingatui to Rock and Pillar there are only about thirty miles which could be termed really rough country. The other ten miles are practically easy going. Before such construction work can be done, culverts have to be put in all gullies and low-lying places, and large enough to carry water in flood time. Several of the
culverts are pitched at the outlet end to carry the water well clear of the banks. The stone for the culverts had to be sledged, and in many cases the sand was packed out of the river by pack-horses. Then there were roads and tracks made to take any necessary material to the different cuttings. Some of these tracks are still to be seen where they are not grown over with scrub. Below Hindon, willows were planted to protect the railway banks in the river.

In McKenzie's Contract which consisted of six miles and sixty chains there were two small bridges, one over the Silver Stream and the other over Mill Creek. Neither of these bridges very big. There are also two tunnels, the two longest on the line. The first being 10 chains, the second one just under 17 chains long. The rock in these tunnels was not very hard so they had to be lined with bricks. The bricks were railed to the North Taieri railway station, and a tramway was laid alongside the public road and zigzagged up the face of the hill until it reached the railway. The hauling of the bricks was done by horses. The approaches to these tunnels were done in stone and cement mortar, the bricks being also built in cement mortar. Besides employing European labour, the McKenzie also employed quite a number of Chinese who had come from the diggings. Some of the cuttings taken out by them, one would think they had been carved out, the work was so neat. They also worked in the tunnels and were good on the hammer and drill. On one occasion they had to put the Crown Bar into position. This consisted of iron-bark timber about 16 feet long and about 14 inches square to support the roof of the tunnel. Being short-handed the European shift-boss thought they would not manage it. The Inspector supervising the work said "the Chows will put it there. There is nothing to heavy for the B's but a red-hot stove". Needless to say they got it into position. I remember meeting eight of them walking to Dunedin by way of the Black Bridge and Half Way Bush one Saturday afternoon, for their weeks supply of rice, curry, preserved ginger, Chinese brandy, etc. Talk about being well dressed, they had good navy serge suits and Bin hats, and wore a scarf or sash round their waists which was often worn in those days. All had their pigtails. They would arrive back on the Sunday night carrying their loads on a bamboo. They also had a store and most of them lived in sod huts thatched with tussock. Some of them kept poultry. They say that when a Chinaman is doing well, he lives well. Most of the Europeans
had tents, some had huts. On one occasion the Chinese were going
to make a raid on the Europeans who were always tantalising them.
This happened in one of the tunnels, the Chinese put out the lights
and were getting to business when the shift-boss thought that
something funny was going on. He into the Chinese with a hammer,
right and left, but there was very little damage done. However
it quietened the European, he never bothered them after that.

McKenzies had their own horses working in the tunnels
and cuttings. It was great to see these horses breast a muck
wagon up to the face with their chests. The horses all had
open winkers so that they could get out of the road of danger.
The shift bosses I knew were W. Middleton, Peter McKay and Jim
McLaren.

McKenzies had for their Inspector, David Mitchell.

The next five tunnels, Mullochy, Duck Point, Mt Allan,
Ross Point, and Machine Creek are all short, average length about
five chains each. Mullochy and Ross Point proved to be very hard
rock, while Duck Point and Mt Allan required a good deal of
timbering to support the roofs. Machine Creek was not so hard.
Mullochy and Ross Point are just lined a portion at each end,
the former lined with brick and Ross Point with concrete blocks.
Duck Point is lined with brick and Mt Allan with concrete blocks.
In the Mt Allan tunnel in some parts they had to put in what is
known as an "invert", that is the roof and walls are the shape of
an egg to withstand the pressure. The blocks for this tunnel were
made on the site. Machine Creek is lined with concrete blocks.
The approach to Mullochy tunnel is stone while the others are
crconcrete.

The timber used for props and slabs was manuka got from
the bush at Mt Allan. The concrete blocks for these different
tunnels were made close to the site of the tunnels. The gravel
being got from the river. The Contractors for these tunnels were
Chas. and John Gore. Gores had a brick kiln at Wanganui from
where they got the bricks for those tunnels which were lined with
bricks. The brickwork and concrete blocks were all built with
cement mortar. Some of the shift bosses in these tunnels were
W. Middleton, Peter McKay, Bill Hawke, Jim Milne, John Burt,
Davy Sullivan and others.
Transport for a railway like the Otago Central was a costly item. There was a road made from the North Taieri over the hill to Mullocky, a distance of about nine miles. The carting consisted of tools, cement, bricks, timber, explosives, smithy coal, etc., etc. This all came by way of Mullocky to the river where the Public Works had a whale boat and the material was taken up the river to about two miles beyond Mt Allen. The boat was pulled by two men with a man to steer. They shifted backward and forward to get better tracks to pull on. John Ross was the captain, he sounded the horn when approaching any cutting to warn the navvies to cease of blasting. Ross always had a Newfoundland dog on board with him. If the rope parted the dog would swim ashore with a new rope to the men who were hauling. The men were often wet to the waist. The river at that time was more confined than it is today, the mining up country accounting for the silting up. A quantity of the material was railed to Outram and carted to the top of the hill at Hindon, (W. Paul being the principal carrier) and sledged down the hill at several places in the gorge. The same thing was done on the Deep Stream and Nenthorne sections. Sheds had to be erected at the top of the hill to store anything that was perishable. From the end of McKenzie's section to Deep Stream the work was started by unemployed labour, but after some time the work was held up. Some of the men who had their wives and families stayed on while others went shearing and harvesting. When the work started again it was done by contract, the successful contractors being J. Dick and Mathieson Bros. The Mathiesons had the biggest contract, and a lot of very hard rock bridge foundations where necessary trial holes had to be sunk. Boring rods were used to strike suitable foundations. At some of the foundations on the Mullocky Viaduct, totara piles had to be driven to firm the ground. On this bridge the abutments were stone, the piers and foundations that carried the iron columns were concrete. The gravel for those being carted from the river. The stones were got on the site and cranes were used to put the stones into position. The contractors for this work were Black and Allison.

When all the formation from Wingatui to the end of the Viaduct was completed, the rails were laid and the ballasting done. The ballast engine brought the iron-work for the Viaduct. The iron-work was all got ready in Dunedin. The girders are all on the lattice girder principle, and consist of five girders 65 feet long and three of 105 feet, a total of 648 feet long. A height of 150 feet above the water. The three long centre spans were
lifted from the ground by hydraulic pressure - a great bit of work. The columns were built in sections, and hoisted into position with a derrick pole and winding engine. The engineer responsible for the lifting of these girders was Mr Edward Roberts. There were gangs of riveters to do the riveting, which was all done by hand. Four men in each gang. There was no provision made for the safety of workmen in those days. No guard rails or nets, and not too many planks to walk on, however it was built without any serious accident. At that time it was considered the largest job of its kind in the Australasian Colonies. R.S. Sparrow and Coy were the contractors for the ironwork. The total cost including foundations was just under £22,000. Shortly after completion it was tested by two heavy locomotives with very satisfactory results. On the opening day there were about 150 persons present amongst whom were several MR., Leading Engineers and prominent Dunedin citizens who had the railway at heart. Some of the visitors walked across the bridge, while others walked down and across the gully. The opening was in 1888 and about eight miles of track from Wingatui completed.

The contractors for the laying of the rails and ballasting were Whittaker and Mackie. A branch line was made to a ballast pit near where the Taieri racecourse was, and the platelaying and ballasting went on till Mt Allan bridge was reached. The foundation for Mt Allan, Little Mt Allan, and Christmas Creek were about finished by this time. They had to use centrifugal pumps operated by an engine before they could get the foundations in. The abutments and piers were all stone. The contractors for the foundations were Cuthbert and Watson. The foundations for the Taieri bridge, Deep Stream, and three bridges in between are all stone abutments and piers. Pumps had to be used at the Taieri and Deep Stream bridges to get the foundations in. Black and Allison were the contractors.

The next section of formation was from Deep Stream to about a mile past the last tunnel (No.10). This was known as the Deep Stream section which was easily the roughest bit of work on the line. A distance of about four and a half miles with deep banks and perpendicular bluffs known as "the notches", these are between No.9 and No.10 tunnels. The three tunnels in this contract did not prove to be very hard, they are lined with concrete blocks while the approaches are of concrete. No.10 is lined with bricks. The contractors for this section were Millar and Smellie. Two of the overseers were D. Robertson and J. Innes.
The next section which is known as the Kenthorn section
starts at the end of the Deep Stream section and goes to the
Sutton Creek, a distance of about ten miles. There are some
hard rock cuttings and deep banks in this section. From
Pukerangi to Sutton Creek the work is lighter. The contractors
had their own horses working in the cuttings. Dunedin men,
Meikle and Campbell, also Mercer and Low, were the contractors
for this section. The foundations for bridges from Deep Stream
to Sutton Stream are all stone, but the foundations for the
columns at Flat Stream are concrete. For these bridges the
contractors were Whittaker and Mackie. The Flat Stream is the
longest and highest, with six spans each of 66 feet. The bridge
over the Sutton is a combined road and rail bridge and is 100 feet
long. The ironwork for these bridges was manufactured at
Wingatui where the contractors had a small foundry. The girders
and columns were all assembled, marked and dismantled. Then
railed to each bridge as the platelaying and ballasting proceeded.
Andersons of Christchurch were the contractors. Mr William Sneddon
was the man in charge of the foundry. I remember once someone
asked Sneddon "what was the life of an iron bridge?". With some
pomp his reply was "the age of an iron bridge is unknown".

The ballast, rails and sleepers were hauled from the
Taieri to near Pukerangi by the P&D locomotive.

The station at Hindon was built and the line opened
on 2 October 1889 when the NZR took over. The depot for rails
and sleepers after the opening of the line to Hindon was just
past the station as was the shed for the ballast engine. Sitting
on top of a load of sleepers on a frosty morning was no joke. It
was cold travelling up the gorge on a frosty morning in open trucks.

The construction work from Sutton bridge to the ballast
pit at Tisdalls was done by unemployed labour. Sutherland and
Nelson were the contractors for the different bridges across the
plain to Middlemarch. The station yard at Middlemarch had to be
filled, also the road at the back of the station. William Meade
has the contract for making up the station yard. Tenders were
called for the station buildings which comprised station, goods
shed, engine shed, coal shed, three surfacemens houses, station-
masters house, loading bank, cattle yards, etc. Sanderson and
Coy of Oamaru had this contract. These buildings were finished
by the latter end of 1890, by which time the rails were laid to
Middlemarch and beyond to the ballast pit at Tisdalls. The ballast
was then run back till it joined the ballast near Pukerangi.
Coming up the gorge, five trucks of ballast were a load, the grades being heavy. But from the Pit at Tisdalls the engine could pull eight trucks down the gorge. This pit proved to be hard and shallow with plenty of big stones through it. The old hands could manage to fill their twenty-five yards a day, but any new hand taking the job on and trying to keep up would get knocked up. If they took it easy for a few days they would be all right.

The ballast engine after the days work would take down loaded trucks and bring goods back from Hindon to Sutton and Middlemarch. The woolclip from Gladbrook and surrounding stations was carried out by train from Sutton and Middlemarch in 1890. That was the end of the carriers from Outram to the Strath-Taieri.

After the ballasting was finished the NZR took over and the line opened to Middlemarch on 22 April 1891 nearly twelve years after the first sod was turned at Wingatui, a distance of forty miles.

The first stationmaster was Mr Grocott, who was soon followed by Mr J. Duff with Mr Bob Jenkins as Porter. The Postal business and Telephone Exchange were transferred to the station from Watkins store.

Before the coming of the railway the township of Middlemarch and Arden comprised of one hotel (built in 1883), two stores, a school, two blacksmiths-shops and about 20 navvies tents.

In September 1891 the formation to Hyde was started, the work being done on the co-operative system. Some of the gangs made good wages. The engineer measured up every month and the men were paid for the amount done at a schedule price. The work to Rock and Pillar was not very hard, no rock to contend with. Several culverts and bridges had to be built, some of the stone coming from the Cottesbrook side of the river. Further on it was obtained from the Rock and Pillar side. The station and goods shed at Rock and Pillar were built on the co-operative system as were the bridges and culverts from Tisdalls ballast pit onwards.
HOUSES AND STORES

This is as far as the Strath-Taieri District goes so I will give an account of the different camps, stores, etc., etc., from Wingatui to Rock and Pillar. The first camp was at Mullocky Gully which consisted of four rooms, office, two bedrooms and kitchen. Blacksmith shop; carpenter's shop, stores, magazine and stable. At each of the following places there was a camp; Mount Allan, Hindon, Flat Stream, and Sutton. The one at Sutton was shifted to the Wandle Creek, near Rock and Pillar and now serves as a railway surfaceman's house at Tirruti. Some of the others I have mentioned have been shifted, but the ones at Mount Allan and Hindon are still in the same places and are railway surfacemen's houses. At these different camps they had good gardens. The best crop of strawberries ever noticed was grown at Mount Allan. Each camp had their own cook, and the different contractors their own camps. At Mullocky Gully the storekeepers were C. Webb, H. Hogan, Esther and Low. The bread coming from Mosgiel and Webb supplied meat. At Hindon, W. Lovell from Hindon (Township?) also had a store, the bread coming from Outram. Lovell also supplied stores on the Deep Stream section later. Prentice and Faulkner had a store at Deep Stream managed by J. Gillies, they afterwards shifted to Middlemarch.

On the Nenthorn section, Mercer had a store also McFarlane, and the meat came from Hindon and Strath-Taieri. After the ballast engine started to run, H. Mills sent bread from Mosgiel and A. Barron sent meat. Previous to the ballast engine all stores and meat had to be packed on horses.

There were also a few boarding houses; C. Webb, J. Bart, Mrs Sullivan and J. Rutherford at Deep Stream and James Gawn at Nenthorn.

POLICE ACCIDENTS

Sly-grog shanties were quite common all up the line. They carried on for some time before being raided. Several were caught and fined, one man rolled his casks into the river but omitted to obliterate the marks, his was an easy win for the Police.

There were no police on the line for a few years after work started, they worked from Outram and Mosgiel if there was any business. After the Nenthorn murder which happened on 1 December 1884 (a man named Heldrum was the victim) all who were concerned in it were the worse for liquor. While being carried on a stretcher to Hindon the man died. There was an inquest held and in the evidence it was stated that if a doctor had been there
in time his life could have been saved. Heldrum was a very powerful man, but he had got a very rough handling. The three men implicated were Crowley and White who served five years each and Fitzgerald who served three years, all with hard labour. Fitzgerald was at large for some time before he was arrested, all three prisoners were young men.

The first constable was James Murphy who came to Flat Stream on 13 December 1884. The Department built a small house, stable and lock-up there. He had a large district to get over, stretching from Strath-Taieri to Mullocky Gully and about Hindon, and cut Mt Stoker way. The next nearest constable being at Cutram. They did not have the telephone on till some time afterwards.

On the construction works there were cases of men getting drowned, killed and injured which was a common occurrence, so the police had that all to attend to. They also delivered and collected the census papers. There was the hotel at Strath-Taieri, one at Hindon, and also the shanties, so it is easily seen that a constable was kept busy, with all travelling done on horseback. They also escorted the contractors when the pay was taken up from Dunedin - the wages for the men.

After about 18 months Constable Murphy was transferred and Constable Timothy McCarthy followed, then Constables Eoghe and Grey. Constable O'Brien came to Netnew in July 1887 and was stationed in the old camp which belonged to the contractors. He shifted to Middlemarch in April 1889, by which time the bulk of the work down the gorge was almost completed, and the police duties were extended to Hyde. Shortly after he arrived in the Strath-Taieri his daughter was drowned in the Rock Creek, he shifted then to the coachman house at Garthmyl. He afterwards built a house for himself in Middlemarch. The lock-up was shifted from Moosgiel, consisting of two cells and is still in use at the present police station. Constable O'Brien was very smart and active, a fine cut of a man on horseback. The first constable in the Strath-Taieri, he afterwards went to Taranaki. Any court cases were held in the school, then later on in the old hall.

**MAILS**

Mails were carried from North Taieri, there being a Post Office there, and anyone called and collected it. Mail was usually left at Webbs store at Mullocky Gully.

Heagerty carried the mail from Cutram to the Hindon Post Office and the Storekeeper collected it and distributed it along the line. The different stores were agents for the
Otago Witness, the principal newspaper. If anyone happened to be in town they always brought a Times home with them and it went the rounds.

The first telephone to come to the Strath-Taieri followed up the Otago Central line. It was installed in some of the Public Works Camps and Police Camps and then to Watkins Store, that would be about 1890. Watkins store was a busy place on a Saturday night after the mail coach arrived. Settlers getting their stores, bread, mails and papers. Often in the winter time the coach was late and at times they would have to pack it on horseback.

SCHOOL

There was quite a lot of the navvies and others who had families of school age, and a school was built midway between Mullochky Gully and Mount Allan in the year 1880. Previous to that time some walked to the North Taieri school, a distance of about five miles over rough tracks. One boy who fell into a diggers hole sat in school all day with wet clothes, caught rheumatism and was a cripple for the rest of his life.

The school at Mullochky was far too small for the attendance which was often from 30 to 40 pupils, ranging from infants to the fifth standards. There was no fireplace in the school. The bigger boys carried the bricks from the railway up to the school in the lunch hour and the bricklayer from one of the tunnels built it on a Sunday. There was very little in the way of furniture or material such as maps, books, etc. No blackboard, the teacher just wrote on the bare walls with chalk. There was one desk which ran the full length of the school. After about four years a blackboard came with some other odds and ends. One thing that we did get was free books. One thing the Otago Education Board would think was that the construction work would have made faster progress than it did. So they did not go to much expense with the building. However it was a school at Mullochky for twelve years. After that it was shifted to Tiroliti and after it had done service as a school there, it was shifted to Mataroa and is now a railway surfacemans house. The first teacher was Mr Chas. Hubbard, a native of Madras India, a good teacher but inclined to be easy. He resigned in 1886 and went to Taranaki where he had another school. After Mr Hubbard left there was no school for about two months. The older pupils walked to the North Taieri, Mr G. Anderson being Headmaster, a teacher well known in early Otago schools. The next teacher to come to Mullochky Gully was Mr James Cusack, a native of Ireland. He had been in the Civil
Service and lost his left hand in a gun accident. He found when he took charge, that the pupils were backward so he got the higher classes to go for two hours on a Saturday morning. There was a certain amount of scheming to try and dodge going, but it was no use, we HAD to go. However he brought the pupils on and had quite good passes and reports. At that time the school Inspectors examined the schools once a year. The chief ones being Messrs Taylor, Petrie and Goven. Mr Cusack afterwards was transferred to Upper Kyeburn and later to Hamilton South. Amongst his pupils at Hamilton was Mr E. Kinsman of Mataraae. Mr Cusack left Mullocky Gully in 1891. There was always the annual picnic and sports. There were some good athletes among the navvies and bridgemen. There was also the school concert and dance, but the school was far too small to accommodate the crowd. Many had to stand outside, to look on and listen. The teacher also gave the use of his two rooms. The programme consisted of songs, recitations and step dancing and continued until daylight. There was a charge for admission and it was a common thing to collect £20 up to £25 which went to provide supper and school prizes. Some of the prizes for the upper standards were real good books. Every child got a prize. At one school break-up one of the Inspectors gave three well bound books as "specials". One for the best boy or girl with highest marks, one for best attendances and the other for the best liked boy or girl in the school - to be chosen by the pupils.

At Hindon, on top of the hill, several families of miners and farmers with school-age children, so a school and residence was built. The Hindon school was known as Tahora and several children from the railway in the gorge attended. They had to walk a distance of from five to six miles on rough tracks and long tussock. The first teacher being Mr Kennard, then Mr Harrison and later Miss Harrison. The settlers and miners gradually left and now Hindon is held by two or three run-holders. There is now a small school at Hindon railway station, the pupils are mostly railwaymen's children. Quite a number travelled at one time to Sutton by train. The first to open tea rooms at Hindon was Mrs Gridman, a widow, whose husband had worked on the line. The rooms had at one time been one of the engineers offices. Though the tea rooms were small it was not long before she had to enlarge them. After a few years she retired and her daughter carried them on, till she sold out to Mr Riggett. The place has changed hands a few times since.
Some of the early athletes and wrestlers on the line were Harry Dunn, Jimmy Dunn, Ben Höre, Bill Ford and J. Tiffen. Harry Dunn was a heavy-weight world champion. Tiffen was a light-weight wrestler. They all competed at the Otago Caledonian Society sports. The Society staged a three day programme at that time. These men had all worked in the different tunnels. There was also Joe Scott, champion-walker when he was on the line he repaired boots at Tiroiti.

**CHURCH SERVICES**

Presbyterian Minister Rev. John Sutherland visited Mullocky Gully and the Rev. G. Findlayson from Waitati preached from Mullocky Gully to Hindon for a few Sundays. Then came the Rev. John Waters, he preached from Mullocky to Sutton every second Sunday and on other Sundays Hindon in the morning, Mount Allan in the afternoon, and Mullocky in the evening. The services were usually held in the different stores and blacksmiths shops. These were cleaned out on the Saturday afternoon and trestles and planks were rigged up for seats. If the weather was fine services would be held in the open air. At times the minister had the use of one of the Public Works horses, sometimes he used a trolley after the rails were laid, but most of his work was done on foot. Mr Waters was not a young man but he was a great walker. When he went to Dunedin he usually came back on a Friday with a bag load of good useful books which he sold to the navvies and others at practically cost price. When he went to Dunedin he made a point of visiting the Dunedin Hospital looking up anyone of the men who had been injured on the works. He was popular with all denominations, visiting their tents and huts and often having a meal with them. He could talk on almost any subject.

**CARTERS**

Some of the early carters from North Taieri to Mullocky Gully and Mount Allan were D. Cochran and J. Stuart with bullocks. The Mcleans and J. Stuart had horses. G. Webb and A. Munro carted stone and gravel to the Wingatui Viaduct. William Meade and Thorburn Bros and others had horses working in the cuttings. John Meade and his son Frank carted stone to Mount Allan bridge, Little Mount Allan and Christmas Creek with sledges. John Meade was a powerful man, he could lift a 400 lb cask of cement into a dray without any trouble. He also carted stone for some of the bridges between Middlemarch and Hyde. Later they carted dredge material when the dredge boom started. W. Brown and J. Kirk carted stone for culverts and bridges between Sutton and Rock and Pillar.
Horse feed down the gorge came from the Taieri, Hindon, Barewood and Strath-Taieri. It was usually a wet day job or a Sunday job to go for horse feed. Hindon and Barewood at that time grew great oat crops. Horse shoeing was done by the different blacksmiths along the line.*

From Hindon railway to Hindon Township a good metalled road was constructed by the Public Works with unemployed labour, a distance of four and a half miles.

The Deep Stream was crossed by a boat running on a wire rope; the boat was known as the Vincent Pyke and the landings are still to be seen.

**INSPECTION**

On 18 December 1889 the Hon. Thomas Fergus gave a banquet to a party of NEW Commissioners. They came by train to Hindon, then the ballast engine took them as far as Flat Stream bridge which was not finished at that time. The return journey was made to Little Mount Allan where the banquet was held. There were between 300 and 400 guests including some of Dunedin's leading men with their wives. J. Robertson had charge of erecting the marquee; when one sees the site where it was held one wonders where they got room to stand. I don't know who was responsible for the catering, but there was no expense spared. Anything that was perishable was left and given to the different workmen. Anything that was not opened was cased up and returned.

From Mullocky Gully to Deep Stream there was ample firewood. The heaviest of the bush being on the opposite side of the river from the railway. There was a little scrub and some matagouri from Deep Stream to Sutton - not too much - so there was firewood got from Outram. From Sutton to Rock and Pillar there was matagouri but in the wintertime some of the navvies got coal.

**PLACE NAMES**

**MULLOCKY GULLY** was named after a shepherd by the name of Malloch who got lost in the bush there. It was called Malloch's Gully but after the miners came it was called Mullocky Gully.

**MOUNT ALLAN** was named after a shepherd named Allan.

**CHRISTMAS CREEK** where a party of miners found gold on Christmas Day.

**THREE O'CLOCK CREEK** was the name given by the shepherds from the Silverstream to the Cottesbrook station; they arrived there at 3 p.m. The route taken was via Powder Hill, Mount John, Lamb Hill and Mount Stoker.
MACHINE CREEK named after a crushing machine at Hindon.

BAREWOOD because of the scarcity of firing.

SUTTON after the man who first took up the Barewood station.

MIDDLEMARCH a creek, the boundary between two stations.

**FORDS**

There were only certain places where it was safe to cross the Taieri river. Some of them could be mentioned, Chinamans, Duck Point; Mr Heagerty built a bridge there in the early mining days, Mount Allan and Cameron's Ford, the latter named after Mr Ewing Cameron who had a run out at Three O'Clock, and Long Ford.

Different cuttings were known by the gangers over them. Such as Crowleys, Kellys, Douglas, Downs, Edwards, and McLarens. There was Big Bluff and Sailors Bluff named after a gang of sailors who worked there.

When the railway opened to Middlemarch in 1891, a small coach ran from Middlemarch to Naseby twice weekly driven by D. Pollock, it ran for about six months. Then Craig and Coy shifted their horses and coaches and all the plant to Middlemarch. Their coaches ran thrice weekly to Naseby and connected with the trains at Middlemarch. They ran till the railway was opened to Hyde in 1894. In all that time I only knew of the coach missing the train once. A howling nor' western sprang up after leaving Hyde and by the time it reached Rock and Pillar the driver waited until the wind calmed down. He loaded the floor of the coach with stones to prevent it from capsizing. At ordinary times they drove four or five horses but if the roads were bad they used six. The majority of the commercial travellers hired a horse and buggy from Craigs stables at Lawrence to do the trip around the goldfields and finished up at Middlemarch. When the buggies and horses accumulated they sent a groom from Lawrence to take them back. They would take three or four at a time and travel by way of Waipori. At that time there were only two bridges on the road from Middlemarch to Naseby. The Taieri River and the Kyeburn were not bridged. The coach travelled by the top road to Rock and Pillar. Parts of the road from the Six Mile Creek to Rock and Pillar were axle deep in the winter time. All horses and gear was well kept. They started from the old Strath-Taieri Hotel where there were large stables. James Sutherland was the regular driver and he was with Craig and Coy up to the time they gave up the coaches.
In 1891 the Right Hon. R.J. Seddon made a tour of Central Otago. They travelled to Middlemarch by train and H. Craig drove the party through the Central. The party consisted of the Premier, Members of Parliament, Public Works engineers and Press reporters. A big crowd at Middlemarch met the Premier. The party adjourned to the front of the Strath-Taieri Hotel, where the coach was ready. The Premier gave a speech, some of the Members also spoke on the possibilities of Central Otago. The Prime Minister in one of his remarks mentioned that from the allocation grant to finish the line to Middlemarch there were a few shillings over. Doctor Fletcher, who was there, said this would be a good place to spend it, meaning the hotel.

When the railway first opened to Middlemarch, it (the train) ran to Dunedin thrice weekly and as traffic improved it ran daily. But on a Wednesday there was a train ran when you could go down and back the same day. It was put on to suit the sales at Burnside and was well patronised by the farmers. The locomotive, which was a small one, was stationed here and the train crews came up on Tuesday and returned on Thursday. It was one of the events of the week to see the Wednesday nights train which arrived about eight in the evening.

ENGINEERS

The following is some of the engineers who had charge of the construction work from Wingatui to Rock and Pillar. Mr E.R. Ussher who was District Engineer visited the works frequently. Mr G.L. Cook, who afterwards was on the North Island Main Trunk Railway. Mr Hunter Macandrew, afterwards Engineer for the Dunedin district of Working Railways, and Mr W. Gavin, who for a time was engineer for the contractors for the Otira tunnel. Mr H. Macandrew is now living retired, at Macandrews Bay (Dunedin).

INSPECTORS

Mr A. Fraser was head Inspector and known as the Boss, D. Fraser, a McKenzie, (known as Steel Fingers) having got his hands badly disfigured in working a crane. J. Crombie, J. Cross, W. Goodlet, A. McMillan, W. Barkley, W. Knox and G. Lamb. Mr Barkley was inspector for the ironwork for the bridges. W. Knox was the inspector for the Middlemarch railway buildings, all the others were inspectors on the formation work, bridges and tunnels, etc. Before the formation was finished to Hyde, Mr A. Fraser was transferred to the North Island Main Trunk between Hunterville and Waiouru; he afterwards retired to live at Hunterville.
CHAIINEN

Some of the engineers chainmen were W. Taylor, J. Murphy, G. Webb, W. Guy and others.

BALLAST ENGINE

Was one of the "F" class, named "ROEROY". She was a very old model but quite suitable for the class of work she had to do. The first driver was John Kirk, then George Freeman who drove up past Idm Valley on the ballasting. The first fireman was Robert McKinlay followed by A. Gow and D. Hay. Cleaners J. Shaw and D. Hay looked after Robroy.

Guard John Durt had general control of the ballast train and his duties included the shifting of points and the lifting and dropping down of handbrakes.

STONE MASONS


BLACKSMITHS

W. Walters, W. Scott, H. Gillespie, R. McKinlay, G. McKnight (Scottie), J. Ashley (known as Long Joe), Andrew Carr, John Walls and a few others. The principal smith work being navvy's tools, horse shoeing and general other smith work.

STRIKERS

V. Jones, W. Scott, G. Gridgman, J. Gridgman, W. Bart, J. Robertson, and Vick Walton. The strikers usually tempered all the tools, such as drills, jumpers, picks and masons tools.

CARPENTERS

J. McRae, G. Barton, J. Robertson. The principal work being bridge work, centres for the different tunnels, making and repairs of all plant, buildings, cattle stops, gates, stations, etc., etc., E. Grogan made and repaired wheelbarrows and handcarts. J. Robertson was the principal carpenter being almost from the start till past Rock and Pillar.
PIATELAING

George Gregory was head man, and the gang were mostly of Polish descent.

BALLASTING

George Lamb was headman, having done the work from the Viaduct to Ranfurly.

STATION BUILDINGS

J. Robertson erected the Hindon, Deep Stream, and Sutton railway stations. The NZR erecting Taiaoa, Mount Allan, Reefs, Pukerangi, Matarae, and Ngapuna stations. The Deep Stream station has since been shifted. The station buildings at Rock and Pillar were erected by Russell and party, on the co-operative scheme.

FENCING

On each side of the line from Sutton to Rock and Pillar fencing was erected by J. Cotteril at all roads and boundaries. cattle stops had to be erected. The former having two cattle stops and the latter one. At some of the private crossings gates were erected.

FORESTRY

Since the line opened the Railways Department have planted some fine larch and these are doing well. There could still be a lot more plantations put in. Those planted have rabbit proof fencing around them. Prior to the starting of the railway there was plenty of wild pigs, pheasants, wekas, kingfishers, tuis, and bell birds about Mullocky Gully and Hindon. But after the rabbits came and the phosphorised cats used to kill the rabbits, these birds and pigs became extinct, though there is still wild pigs in the Three O'Clock creek. Some of the navies used to go out pig hunting on Sundays. Wild ducks were rare, but there was a lot of parakeets for a time and then they disappeared.

EARLY MINING ON THE Otago Central Railway to Rock and Pillar

At Salisbury a lignite coal mine was worked by Hunter Bros and quantities of coal were railed to Dunedin. After a time it closed down, but I have heard since that it has been worked again. At Mullocky Gully there was alluvial gold mining. Some of the miners were E. Hamilton, J. Welsh, G. Webb, W. Guy, T. Price and others. Two miners, Joe Jacobson and Joe Comi (better known as Big Joe and Little Joe) worked in Reef Gully. Jacobson was a German and Comi an Italian. Afterwards they both worked on the line, Jacobson in the Tunnels and Comi as a stone mason. When
Comi (Little Joe) asked the contractor at the Hullocky tunnel to give the stone approaches, the contractor not knowing him said, "If you quarry a stone to the satisfaction of the engineer, you can have the job". Needless to say he got the work. After the line moved on both Joess started mining in the Three O'Clock where they did well. They worked all the summer, retired to Dunedin for the winter, and came back in the spring.

At Deep Stream, where the chair crosses the Taieri River, Peter Lyders had a battery driven by water taken from the river about a mile above the site of the battery. The quartz being won on Lamb Hill ground. Lyders also worked an Antimony mine on what is part of W. Bray's property. The stone had to be bagged, sledged down the hill, taken over the river, then sledged to a site by the railway about a mile below Flat Stream. I never heard the cause of its closing down, whether the stone had run out, or if the price offering was not sufficient to pay wages. The old sledge track is still to be seen.

At Matarae there was an alluvial claim worked by J. Thomsen and E. Morgan. It started at Sutton Creek and continued up to just behind Mr Kinsman's homestead. The water was taken out of the Sutton Creek. There was about nine miles of a race with several flumes in it, and in this claim there was fall to carry away the tailings. This claim was known as the Sutton Claim while across the river was the one known as the Hibernian. D. Ross and party worked this and at first the wash-dirt went down a chute to the river to be sluiced. Then it was decided to amalgamate with the Sutton Claim in order to get water out of the Sutton, pipe it across the river and work their claim. They found that the ground started to dip, so it was decided to drive a tunnel from the river up to the claim to take away the tailings. The tunnel proved to be in very hard rock. A gang of four men started work at 10s. per foot, the price was raised to £1 per foot, and still they could not make anything like wages. Then four Italians started a new tunnel forty feet higher up. They put the tunnel through, but the claim was dipping all the time till the tunnel was useless. It would have been hopeless to put in an elevator as there was not enough water in the Sutton and if there had been a new race would be needed. In a dry season there is little water in the creek. There is gold there but not enough to warrant all that expense.
Brenner Bros and party worked a claim close to Mr Ken Burn's homestead, the water being taken out of the Washpool Creek above the Smooth Conc Hill. The length of their race is said to be 22 miles with several wooden flumes in it. The scarcity of water in a dry season was one of the causes of failure, nevertheless they did sluice away quite a lot of ground.

The first dredge to be put on the Taieri river was at Rock and Pillar, just below where Mr W. McLintock lives. The pontoons and machinery were brought from the Mataura river. The pontoons were brought up on the railway and hauled to the river with winches. She worked for some time and then was shifted to the Fillyburn Creek. The next dredge named the First Taieri was brought from the Upper Kyeburn. She was dismantled and carted to a site on the river about a mile above Mr George Hendrick's homestead. She was made eight feet longer and had an overhand of three feet on each pontoon, for more deck space. Before she could be launched a dam had to be built of sand bags across the river to get her floated. Once afloat she soon dredged a hole for herself. She got a bit of gold but it was light and difficult to save. When she closed down, she lay in the claim for a few months before being bought by a Mr Sligo. The machinery went to Ōnawāpā while Mr J. Robertson bought the timber which was kauri and hardwood.

J. Rae was first dredgemaster and J. Robertson had the contract to dismantle, cart and rebuild her in the river. Mr F. Atkinson had the contract to cart the coal from Ngapuna. This was in the year 1900.

At Barewood there was a reef worked by a man of the name of Waters. The stone was sledged down to the railway, there being a siding just where the Reef's railway station is now. The stone was bagged and sent to a battery at Saddle Hill. The crushings were quite satisfactory so the battery was shifted to the Flat Stream. It was taken over by a German, W. Walters, who just worked the stone that was easily got and where he was not troubled by water. The Reef paid working expenses and those employed were mostly men from Hindon. After a time a Company was formed to develop the mine, the Anglo-Continental Coy Ltd. There was a lot of outside as well as New Zealand Capital in it. When they started, three shafts were sunk, known as No.1, No.2 and Scott's Cully. They erected poppet heads, engine sheds and drying sheds. The shafts were strongly timbered and steam engines installed to drive powerful pumps. The working
expenses must have been great as all coal, etc., had to be carted from Pukerangi and the roads to Dacrewood were axle deep in the wintertime. Tunnels were driven off the main shafts. In the end water proved too much for the company and the mines were abandoned. One idea was to drive a tunnel from the river bank, under the railway to try and drain the different shafts, some of which were sunk to nearly 200 feet. Over fifty men were employed and they lived in quite a little township. Mr C.D. Smith had a small store and Mrs Gawn kept a boarding house. Some people think that the Dacrewood will be worked again if cheap electrical power can be had. It is said that all mining gear is now removed.

W. Fairlane, S. Stevens, A. Campbell, and J. McPherson all prospected about Mataroa, while some beachcombing was done on the river in the Strath-Taieri district.

A man named McDonald was killed in October 1889, crushed by a fall of earth in the Hibernian Claim, Morgan who worked in the Sutton Claim fell over the bank and was killed. The water race taken out of the Sutton river was about two miles up from the road bridge. This was cut by Penwick and party, a distance of about nine miles. A constant watch had to be maintained because of leakages, often caused by rabbits burrowing into the banks.

**EARLY DOCTORS ON THE OTAGO CENTRAL LINE AND STRATH-TAIERI DISTRICT**

On the railway construction works men were always meeting with accidents, some fatal, others by drowning in the Taieri River. Doctor McCaw from Mosgiel visited the line one day a fortnight but for anything urgent he was sent for. There was no telephone in those days so someone had to go for him and state the nature of the case. All travelling had to be done on horseback over rough tracks and fords in the Taieri River. If there was a case beyond Mullocky Gully the road to Hindon would be taken and the river would have to be forded, either at Heagerty's or the Mount Allan Ford. Often these trips had to be made at night. If it was a bad case the Doctor would set the limb and order his or her removal to the Dunedin Hospital, the patient being carried by relays of men to the nearest railway station.

At the F.W.D camps a supply of medicines was kept, bandages, splints and drugs. Doctor McCaw was not a very robust man and the nature of the work must have been very trying for him. After some time Dr P. Fletcher from Green Island joined Doctor
McCaw. Later Doctor Fletcher moved to Hindon, where he worked from Mullocky Gully to Strath-Taieri. By that time there was a lot of farmers with their families on Hindon, also miners all of whom required medical attention at times. Doctor Fletcher was a heavy and powerful man. His horse named Havelock was a great swimmer, and if the Taieri was in flood it was nothing to see the Doctor put the horse to it and he himself get wet to the waist. A small amount of the wages was kept to pay for a doctor or the line. But in many other cases the Doctor was never paid.

When Doctor Fletcher first came to New Zealand he took a job as a station shepherd, he always seemed to have a liking for sheep working. On one occasion on the station, one of the employees broke a limb and Fletcher set and dressed it. A case for the Dunedin Hospital and when the town doctor saw the dressing and setting he asked who had done the work. When told that it was Fletcher he stated that he would like to meet him. When the railway to Strath-Taieri was about finished the doctor moved to Middlemarch where he practised for a few years, his district extending to cover Hyde.

Doctor McBrearty practised in Outram in the early days and he was often called to the Strath-Taieri district and on the Menthorn section of the Central line. He travelled by way of Lee Stream and Deep Stream. Sometimes he came by way of Hindon. At first most of his travelling was done on horseback, but as the roads improved from Outram to Strath-Taieri, he drove a buggy and pair.

BULLOCK DRIVERS IN STRATH-TAIERI AND SURROUNDING DISTRICTS

In the early days of Strath-Taieri and surrounding districts such as the Mount Stoker, and the Three O'Clock Creek and Barewood, all carting was done with bullock drays, sledges and wagons. Before the Outram railway was built, in the late 70's, all carting was done right into Dunedin. The principal loading being wool, with a back loading of stores, fencing and building materials. In the slack season they carted out to Mount Stoker and Three O'Clock stores, etc., for the shepherds, who were mostly married men with families. The bullock drivers had to find their own tracks along some leading ridge and had to lead galloos.

Traces of bullock tracks are still to be seen on parts of Cottesbrook, Gladbrook, Barewood, and on the Strath-Taieri Outram road.
It was a common occurrence to have capsizes with the drays and sledges. At that time there were no rabbits, there was an abundance of feed and the tussocks and grass were so long that the bullocks were difficult to find when they were laying down. There were few paddocks and few fences. On a foggy morning and in the long grass the animals were hard to find, so the drivers tied a bell to the horns of some of them to assist in the finding. Most driver kept a led horse behind their wagon, to assist with the locating of the animals in the mornings.

Bullocks are slow but sure and can go where it would not be safe to take horses. Teams usually consisted of eight or ten bullocks. At one time on the Rock and Pillar there were logs of totara and cedar sledged off the mountain for posts and firewood.

The bush at one time must have been good, but all the logs brought down were found at a certain height and all charred. Before the coming of the railway into the district, Gladbrook burnt nothing else but peat, sledged from the top of Rock and Pillar with bullocks.

The following list is some of the early bullock drivers: W. Watson, Charles Webb, Thomas Johnstone, who drove mostly on Cottesbrooke station and Barewood, Thomas Potter, Fred Bee, T. Jenkins, who drove on Gladbrook and Rocklands stations and Fred Stoker for whom Mount Stoker is named.

W. Watson and Charles Webb played for the local dances, Watson playing the concertina, a present from Mrs Humphreys of Garthmyl, and Webb accompanying on the piccolo.

**Horse Wagons**

As the roads were improved and some of the worst streams bridged, horse drawn wagons came on the road from Outram to the Strath-Taieri. The roads were still rough with no metal on them, after rain and during the winter they badly cut up. (Clay roads). The carriers carted their own horse feed, but where there was any settlement they got horse feed from the settlers. The teams were usually eight and ten horses, and took nearly a week for the trip to Outram and back, provided the weather was good. On steep hills the drivers used what was called a shoe which was placed under one of the hind wheels and held to the body of the wagon by a chain, this preventing the wheel from turning and acting as a sledge. The usual load hauled would be about five tons by ten horses. Carriers usually
tried to get to an accommodation house at night, but between
Clarks and Strath-Taieri there was no accommodation. They
just camped on the road, usually close to a creek. One camping
place was at the Red Gate, another camp was at the Dough Boy
Creek, near Sutton. If possible two teams travelled together
with plenty of food with them. Spear grass and Matagouri was
plentiful for firing. Most of the wagons had tiles(?) to
keep the loads dry in case of rain. The drivers always slept
in the wagons. Many a swaggie received a lift, a meal and a
shakedown. Carrying was a rough life, out in all weathers, and
travelling early and late. While unloading in Outram or
Strath-Taieri there was horse shoeing and general repairs to
be done. The down loading was wool and grain, and the back
loading was stores, fencing or building materials, coal, etc.
In the early days there were only two roads into the Strath-Taieri
from Outram. The top road by Gladbrook crossed the Sutton just
above the bridge, passed Gladbrook and the foot of the Rock and
Pillar till it reached the road to Hyde at the Six Mile Creek.
A road turned left at what is known as Brown's Corner to
Middlemarch. This was the road used for the carriage of mails
and passengers from Outram. The lower road crossed the Sutton
lower down and passed the Sutton railway station, the Dough Boy
Creek, on to Middlemarch continuing on until it met the top road
at the Six Mile Creek. The road to Barewood branched off the
main road near Clarks and crossed the Deep Stream at what is known
was Wallace's Ford. A lot of the material for the Deep Stream
and Nenthorn sections of the railway were carted on this road,
while the wool from Barewood station was carted the other way.

In the early days all wagons were fitted with shafts
but were later converted to pole wagons, all the horses pulling
on bars and swingle trees. This was said to be a much better
type of yoke. Early wagons were built by the firms of Wattson
and Gov, whose shop was near the present tram sheds, and by Reid
and Gray.

The following is a list of the early carriers on the
Outram Strath-Taieri route.
Chas Brennsell, Senior and his four sons; W. Brennsell who was
killed on the Deep Stream; Charley Brennsell who had been carrying
to the Strath-Taieri, moved to Kyoburn and carted to Otago Central
from Dunback. He later moved back to Outram where he was
engaged in carting heavy material in connection with the Waipori
Electric Power Scheme. Some of his family are still about the
Outram district. J. Brennsell who afterwards was carting to Otago
Central and Lakes District; Harry Brennsell carted to the Flat
Stream and Nenthorn sections of the railway. W. Wallace who at
one time had the hotel at Lee Stream carted to the district. Wallace brought his team one time over the Rock and Pillar from Patearoa and came down the track at Gladbrook station. It is said that he crossed the Long Ford on the ice on the Taieri River. Both foolhardy performances. Wallace afterwards sold his team to J. Leslie who carted from Outram to Strath-Taieri till the railway came to the district. He afterwards carted dredge material to Cromwell. Later he farmed at Cambrians where he was killed by a wagon skidding on the frost and capsizing pinning him underneath.


NOTE: The following names appear but your copyist knows not where they should be included in the story: Lindsay, Clark, Atkinson, Osborne, Mason, Brown, Tisdall, James, Rottage, Fitn(?), Cart(?), Pugh, Jones, Giddings, Nolan, Harvey, Blackie, Allan, Spark, Harrison, Dowling, Beattie, O'Connel, Brown, Casseldin, Warwick.

W. Welham was the driver for the Gladbrook station wagon used for carting wool to Outram and loading stores back. R. Gawn and R. Irrie carted the material for the Gladbrook woolshed, also for the house at Garthmyl. W. Paul and R. Ferguson had the contract for carting material for the railway buildings at Middlemarch. They started to cart from Outram and after making a few trips found that they could not keep the timber up to the builders. The timber was then hauled to Castle Creek near Puketawhirangi from where they could do a trip in two days whereas it took nearly a week carting from Outram.

Some of the carriers mentioned carted to Barewood, Rocklands, Waipori and over the mountain on the Dunstan road when there was loading available.

INDEPENDENT CARTING

Some of the first settlers in the Strath-Taieri did their own carting to and from Outram.

CHANGES IN TRANSPORT

When the railway to Middlemarch opened, a few of the carriers left Dunback to cart from Middlemarch to Hyde, Naseby and other places in Central. Among some of them were C. Brennsell, P. Lewis, A. Gunn, R. Carr, J. Bruhns, and L. Bruhns. The opening of the line to Hyde was the finish of the horse waggons in Strath-Taieri. Now all transport is done with motor lorries.
Of all these carriers mentioned there are only two alive today (1948). H. Brennseall of Moa Flat and W.L. Bruhns of Hyde.

THE STRATH-TAIERI PLAIN

The Strath-Taieri plain stretches from Sutton to Rock and Pillar with the Taieri river on the Eastern boundary and the Rock and Pillar range on the Western boundary. The plain is approximately fourteen miles in length with an average width of about three miles, and is about 720 feet above sealevel. The land for the most part is good with some belts of shingle running through it. The plain is well watered by never failing creeks fed from the Rock and Pillar range. Some of the winters are very severe, others not so cold. The general rainfall is moderate, snow does not stay long on the flats. There was a good deal of wind but of later years these winds have not been so strong. Perhaps the planting of trees has something to do with the greater rainfall and less winds. The Strath-Taieri plain is not suitable for irrigation, there being a clay subsoil and hard cemented gravel. Some land on the Rock and Pillar end could be irrigated as the soil is a good deal lighter. Taking the plain all over it grows good crops of turnips and other root crops, in addition to wheat, oats and barley.

The bulk of land from Sutton to Middlemarch and alongside the Taieri was covered with Matagouri and swamp with different creeks spreading over the plain. After the matagouri was cleared and the creeks straightened, these Swamps soon dried up. At Blair-Taieri and at Poplar Grove it is quite common to get matagouri up to ten feet high. The land in that state would have been of little value except for grazing cattle.

EARLY SETTLERS

Among some of the early settlers to take up land in the Strath-Taieri district, not mentioning the Gladbrook and Six Mile stations, were W. Brown in 1879 on the top road followed by T. Popham and W. Kirkland in 1882. Other settlers who took up land about Sutton 1883 were J. Kirk, P. Spratt, W. Scott, J. Gilbert, A. Cullan, and J. Allan. Their farms have all changed hands, with some of them grouped. Poplar Grove Homestead is still held by James Kirkland, a son of William Kirkland. Afterwards W. Kirkland acquired the land known as Kimo's, also part of Brown's. This was all known as the Poplar Grove estate which was later sold to the Government for Returned Soldier Settlement.
BLAIR-TAIERI

Some of the early settlers to take up sections on Blair-Taieri were Messrs D. Cattanach, S. Grant, A. Cockerill, A. Marshall, R. Welham, T. Jenkins, S. Spratt, F. Keynihan, and others. Mr W.D. Mason was the prime mover in getting the Centre Road opened. In Strath-Taieri there are two townships, one named Middlemarch and one named Arden. The boundary between the townships is Mold Street, which runs from the soldiers memorial, crosses the railway to Brecon Street. Middlemarch which was once party of Garthmyl was owned by Mr E.W. Humphrey. Most of the streets in Middlemarch are known as avenues, such as Snow Avenue, Olive Avenue, Bank Avenue. Snow Avenue is the street behind the railway station. Dora and Nottage Streets were named after two very old residents. The township of Arden is High School Endowment, the streets have mostly Welsh names; Swansea, Cardigan, Bangor and others. Swansea Street is on the Main Highway and that particular part of the road is wider than Mold Street to Milford Street. This Township was surveyed in 1883. The land from Middlemarch to Rock and Pillar was originally part of the Six Mile Station held by Mr E.W. Humphrey. In 1883 this was cut up for closer settlement into about 26 farms. Of the original owners, some of their sons are still carrying on with the farms. Some could be mentioned - Messrs J. Beattie, J. James, R. Tisdall, H. Tisdall, Burnett Bros, W. Mason and A. Atkinson.

STRATH-TAIERI

The early settlers in Strath-Taieri had an uphill job. The land had to be cleared of scrub and fenced. A tent or a hut was all they had to live in. With no roads or railway everything had to be carted to or from Outram. This was eight years before the railway arrived. The children of the early settlers had a long way to walk or ride to school. Many of the tracks were rough. It was quite a common thing to see from twelve to eighteen children riding to school. One girl could be mentioned as riding from the Shannon to the Strath-Taieri school every day.

FIRST BUILDINGS

The first building to be erected in Middlemarch was part of what is now Mr Cockburn store; the stone house owned by J. Kirk and the house owned by J. Nottage. In 1890 the townships of Middlemarch and Arden consisted of one hotel built by James Olive in 1883. Two blacksmiths shops owned by G. McDonald and one by T. Tait. Two stores, one owned by S. Watkins and the other by T. Johnston. Nine houses and the school which comprised of one room and a small porch. The school was the only place in which to hold meetings, church
services and entertainments. The next buildings to be erected were the railway buildings, and after the railway came into the district more places were erected. Additions were made to the Strath-Taieri Hotel, additions to the stables and a new Billiard Room. An Infant Room was added to the school. Then came the Railway Hotel which was shifted from the Nenthorn Diggings. Mr Cuttle (?) had the contract for dismantling and re-erecting it. Mr W. Brown and his two sons doing the carting.

HOTEL LICENCES

Mr C. Swanson was the first owner, but he had no licence. This was in May 1891. Mrs Webb the holder of the licence of the Buckeye Hotel at Catran transferred with the Licence in October 1891. After being in Middlemarch for some years Mrs Webb moved to Timaru. Since then the hotel has changed hands a few times, some of the owners could be mentioned. Messrs P. Williams, A. McIvor, J. Hair, E. Turnbull, J. Turnbull and others. The first proprietor of the Strath-Taieri Hotel was Mr J. Olive and on his death his wife carried on. Later by Messrs P.M. Petersen, Fisher, McCorkindale and Freyers. The Hotel, Billiard Room and Stables were destroyed. The new Strath-Taieri Hotel is now at the rear of the railway station. The proprietors have changed several times, the present one being W. McLaughlin.

ARDEN HALL

The first hall was shifted from Nenthorn in 1891 and gave service for many years for dances, entertainments, Court House, and the different churches all held services there. The old hall is now turned into bedrooms and a Sample Room.

STORES

From what information can be gained, the first store was opened by a man named Middleton on the site of T. Cockburn shop. Mr J. Olive ran a store, bakery and butchery in conjunction with the Strath-Taieri Hotel. Mr I. Watkins store was where Mr T. Cockburn store was. It was also the Post Office and had the telephone. T. Johnston had a store in Arden and when the Nenthorn diggings were in full swing he drove there with stores. Bishop and Palmer had a store close to where McDonalds blacksmith shop was. This store was destroyed by fire in 1884. The next store was opened by Falconer and Prentice on the opposite side of the road to the old Strath-Taieri Hotel. J. Gillies managed this store for a time. Later this store was taken over by Mr C.D. Smith. Previous to Mr Smith taking over this store he had the run now held by Mr K. Burns of Matarae. Smith had for managers Messrs J. Stenhouse, and G. Girle.
Other storekeepers were R. McVicar, R. Neill, D. Main, Mrs Wilson, Mrs Mathieson. J. Beattie started where A. Horn and Sons is, followed by P. Boyer, J. Gillies, A. Armstrong, A. Horn and Son, Miss F. Keast (as Manager), T. Wise, T. Cockburn, and L. Mitchell.

BAKERS

The first bread came from Otamere by the mail coach. Then Olive and Watkins had bakeries which they ran in conjunction with their stores. When T. Johnston had his store he got his bread from Gladbrook Farm. Chas Erensell Snr, being the baker. Other bakers were D. Main, R. Neill, W. Hill, W. Williams, and later his son, Andy. The bake house is now closed, all bread coming from Dunedin and being retailed by Mrs A. Williams. The different stations made their own bread.

MeATsHtERS

The following had butcheries together with their stores - W. Tarpin, J. Jonison, H. Stephenson, W. Jones, D. Fisher, W. Bennett, J. McMaster. There was also the Middlemarch Meat Supplies.

BOOtMAKERS

W. Steele was the first, his shop was next to the old barn. T. McIvyntock who started in 1902, gave up business in 1944, R. Chitty. After T. McIvyntock gave up there was no bootmaker in the district until a returned soldier named Hancock started up in E. Messent shop.

BLACKSMITHS

S. Watkins started in a shop near to the school about 1881. He also did smith work on the different stations. T. Tait worked in the same shop in 1890, he afterwards started a blacksmiths shop in Patearoa. George McDonald started blacksmithing in the district in 1894 and had one of the best equipped shops in Central Otago. For a time he did all the work for the railway construction and for the Gladbrook station. He had three fires going in his shop for a time. He was good at shoeing horses for the wagons and coaches when they were on the road. In the harvest time he would go out to do repairs to the reapers and binders. He Held the Agency for the Woods Binders, but would repair any make of machine. For a time there were five employees and several apprentices served their time under his instruction. Some of the early employees were: the three brothers Hogg, Sandy, Dick and "J", J. and C. McKenzie, A. Jack, A. Irvine, K. Murray, H. Webb and several others. After a few years D. Chisholm joined G. McDonald in the business. Later owners were R. Garrett and
R. Johnston. Like most country blacksmith shop it was closed by the coming of the motors and tractors which replaced the horses. Others who had blacksmith shops were Messrs A. Irvine, W. Palmer.

At Sutton Mr A. Kilgour opened up to be followed by M. McGrath and T. Finn who also had a motor carrying business.

G. McDonalds shop is now a garage for the Taieri Council lorries. Mr McDonald had some horseshoes made by himself on exhibition in the Early Settlers Hall.

**WHEELwrights**

G. McDonald, C. Cattle, C. Thomson. Most of the blacksmiths built drays, springcarts, buggies and gigs.

**STONEMasons**

Most of the first houses in the district were built of stone. J. McDonald and R. Paterson built the Cottesbrooke Woolshed. J. Hanson built several of the outbuildings at Cottesbrookes and Garthmyl. H. Taylor, W. Steel, J. Milne and W. Coatsworth were also builders, the latter building the Presbyterian Church. The big house at Gladbrook Farm was built by a gang of Dunedin Masons. Masons are like the blacksmiths, a trade that is dying out ...

**NOTE:** Here the booklet ends. Presumably because Mr James Robertson was no longer capable of writing. It is said that he died soon after. This material was written by him during the years 1947 and 1948. He has done a service to his country by recording this extremely valuable contribution to the history of Otago Central.

Mr Robertson's father was a carpenter for the Public Works Department and worked on the construction of the Otago Central Railway. Mr Robertson was one who attended the Mullocky Gully school which had no fireplace during five cold winters.

Presented by Mr & Mrs C.J. Williams