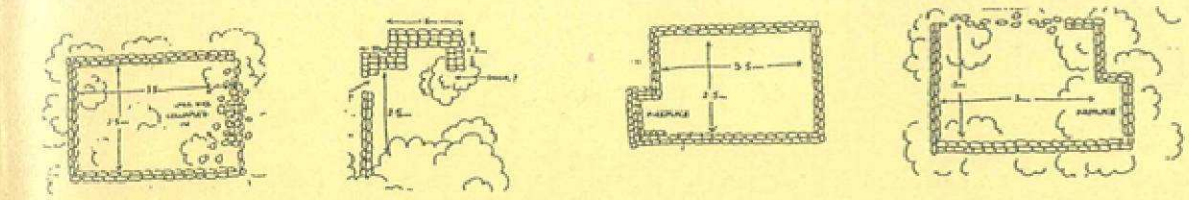

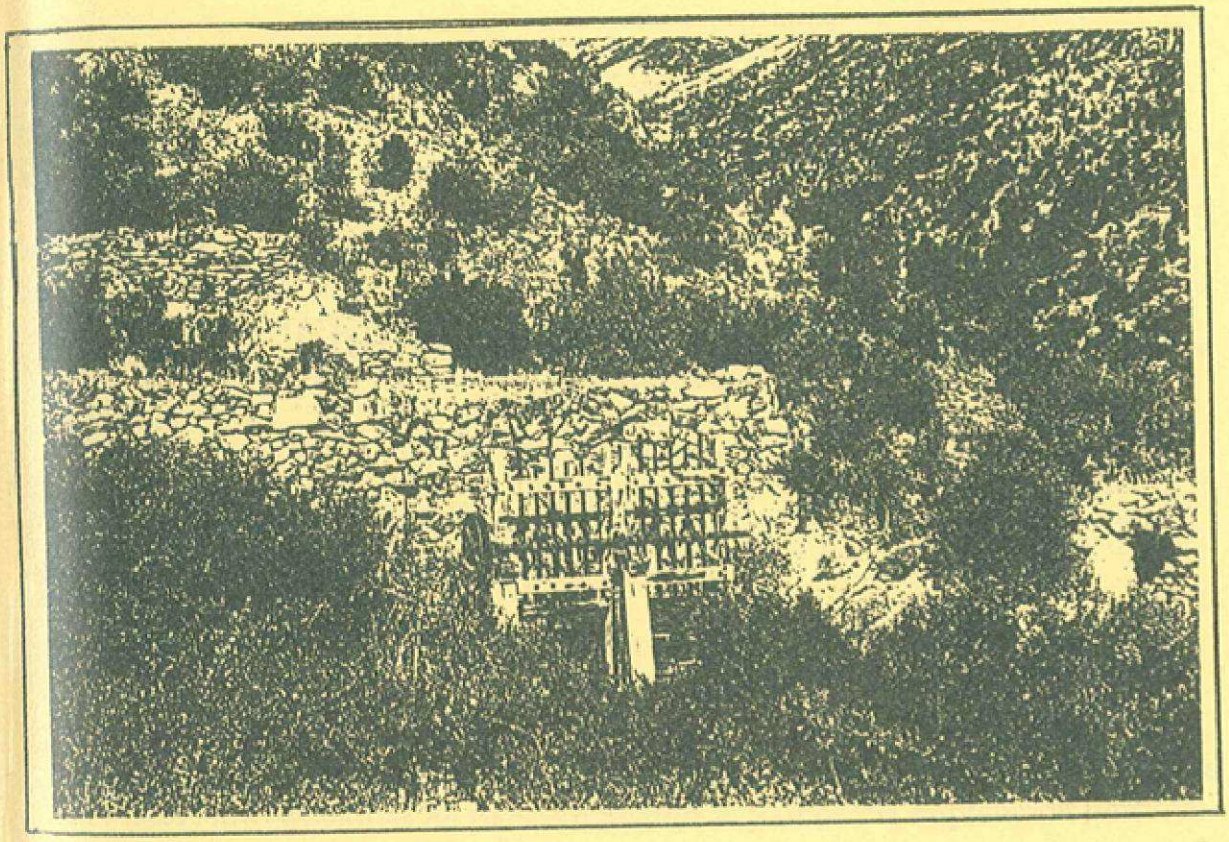

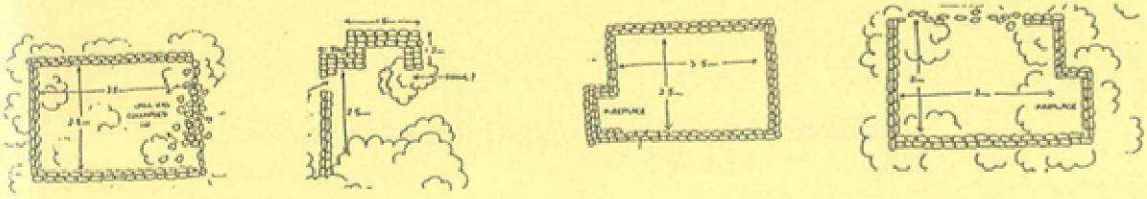

The rich fields of Bendigo

Jill Hamel, February 1993

With my compliments
JM Hamel

The rich fields of Bendigo

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This report to the Department of Conservation, Dunedin, considers the historic and cultural values on Bendigo Station as part of the implementation of the Protected Natural Areas Programme.

Funded by the Department of Conservation

The rich fields of Bendigo

Jill Hamel February 1993

Contents

List of maps, drawings and photographs

Chapter 1:
Introduction

Like most of the big fields of Otago, gold was found at Bendigo in 1862. Unlike the others it was the only *quartz* field in Otago where at least a few men made a fortune. Initial settlement around Bendigo was influenced by the presence of the Thomson's Saddle route over the Dunstan Range at the head of Shepherds Creek (Figs 1a,b,c). Having crossed the saddle, it was easy for the miners in the 1860s to follow the spurs down to the Clutha River and cross by Hugh McPherson's punt near Rocky Point or George Hassing's ferry to Luggate and Cardrona. This route allowed miners from Clyde and Alexandra to avoid the rough ground of the Cromwell Gorge and was on the most direct route from Dunedin via the Old Dunstan Road and the Poolburn Gorge to Wanaka and Cardrona.

The valley systems of Bendigo Station, from the top of the range to the river flats, are infested with gold mining sites. These have been surveyed and described off and on since the 1970s, when the Otago Goldfields Park site was established under a Private Protected Land tenure around the main quartz mining area. (This area is to become a reserve and will be referred to in this report as the Bendigo reserve.) These surveys include extensive work carried out by students under Neville Ritchie in 1979-80 for the Clutha Development Project archaeological surveys, which is documented only in site record forms. Some of these records are of variable quality, but the records for Aurora Creek compiled by Sheridan Easdale and Chris Jacomb are competent work. Subsequently two Lincoln students, Paul Hellebrekers and M Moffitt, carried out a more intensive survey of the Goldfields Park area, so as to explore and map more of the shafts, but made only brief descriptions of the sites. Their map, however, is very useful and doubled the number of recorded sites.

The opportunity was taken during the implementation of the Protected Natural Areas Programme to locate other sites within Bendigo Station (both Pastoral Lease and Freehold) and to make landscape drawings of many of the sites. The field work for this survey was carried out in 1990 and did not include the Goldfields Park area, which still lacks integrated maps linking related sites.

A geological map from Park (Fig.2) does, however, provide a very useful model to explain the distribution of the sites between Logantown and the Matilda Battery, and helps to explain the sites in the lower part of Perrys and Aurora Creeks. A topographic survey by Mackay in 1876, marking numerous mining features, huts and gardens, came to light while this report was being written, and will be of enormous value if further survey and field work can be done to correlate it with field evidence (Figs 2a, 2b). Sites described in this report are concentrated in the catchments of the Rise and Shine and Bendigo Creeks, but there are unrecorded tailings and prospecting holes in the gullies to the south, such as Chinamans Creek and Devils Creek (John Perriam: pers.comm.)

Unfortunately when the Goldfields Park area was cut off in 1981, its boundaries were not matched to the main mining property boundaries, and it is doubtful if the latter were even determined during surveying of the reserve. Of the archaeological surveys only Hellebreker and Moffitt (1983) shows the boundary of the reserve in relation to the sites

plotted on to an aerial photograph. The aerial photograph does not cover the whole of the reserve, and an extension has been drawn in on the south side to include three shafts (A7-9) and a trench (A10) (Fig. 3). This extension also brought S124/363, a stone walled enclosure, into the Goldfields Park area.

It was difficult to match the official survey to Hellebreker's map, let alone to the outline of the reserve drawn on to the topographical NZMS 1 map S124 in the Departmental files. The site record forms identify the positions of sites by grid references on NZMS 1 S124, which give over 100 yard tolerances and are quite often inaccurate. The boundary was walked to check these discrepancies and determine which sites fall outside the surveyed Goldfields Park area. Further work is being done by a graduate student which will help solve this problem (Matthew Campbell: pers.comm.).

This report provides a general history covering the whole Bendigo field, so as to show the linkages of the sites. Where appropriate, material from the 1979-80 record forms will be included. They are indicated by the word "Record" followed by their map and accession number, i.e. S124/24. No report is ever complete, and judging by John Perriam's comments sites were missed to the south of Bendigo reserve, and the big race from Devils Creek was not properly surveyed.

Chapter 2:
Maori sites

Ritchie (1980) provides a useful summary of the scant archaeological evidence of Maori settlement in the upper Clutha basin. Ovens associated with moa bone and moa eggshell, as well as finds of Archaic adzes, indicate that the basin was occupied from the first stages of Maori settlement in New Zealand about A D 1200. The scattered sites indicate that there were small settlements around the edges of Lakes Wanaka and Hawea for eeling and bird catching, occupied by people from coastal Otago. Judging by the evidence from Lee Island, Lake Te Anau, these settlements may have been occupied in winter when the birds were fattest. Parties would also have moved through the area seeking and exploiting scarce stone resources, such as silcrete, porcellanite and greenstone.

There are six oven sites recorded on the valley flats within 20 kilometres of Bendigo (Records S125/21, S124/3, S124/4, S124/28, S124/68, S133/3) on both sides of the river, the largest being on the other side of the river opposite Bendigo Station and north of the Park Burn confluence. Here on the edge of terraces facing north there was a site, described by Charles Perriam as consisting of 12 distinct ovens (Record S124/4, GR073808). Slightly downstream Perriam found another small site of moa eggshell and charcoal amongst stones after a flood had washed away overlying silt (Record S124/3, GR077807), suggesting that this material may have been washed out of the larger site in a previous flood. The nearest oven to Bendigo (Record S124/28) on the eastern side of the river is out in the middle of the flats between Bendigo Terrace and the river (Fig.1b). Virtually all traces of these sites had been destroyed even by the time they were reported.

Other sites in the valley were findspots, the most interesting being a paddle presented to the Otago Museum (D20.226) in 1877 by Vincent Pyke, who recorded it as being found in a cave at Bendigo by John Evan (Record S124/5, Skinner 1948). A report on the Cromwell Argus 14 June, 1892, described another group of artefacts found in a cave on Ardgour Run, north of Bendigo, consisting of "one Maori chisel, two mats, two Maori needles, two firesticks and the preserved tail of a dog" (Ritchie 1980a:11). These finds are described here to indicate the possibility of undiscovered material being preserved in dry rock clefts on Bendigo Run itself.

Chapter 3:
Farming at Bendigo

The early history of farming at Bendigo is the history of the giant Morven Hills station, consisting of four contiguous runs, stretching from the Cromwell Gorge up the Dunstan Range almost to the Lindis Pass. Taken up by the McLean family in 1858, the run as a business looked north to the Waitaki Valley for its route to the outside world, and the great stone woolshed and main farmstead were built well up the Lindis Valley. A secondary corrugated iron woolshed and associated stone buildings were placed off Ardgour Road, south of Tarras. The history of the run is summarised in Hamel (1990), where only the farm buildings on the modern and very much smaller run are described.

John McLean, the brother who spent most time on Morven Hills in the 1860-70 period, treated the settled miners at Bendigo kindly and allowed them to graze their cows and horses on his land around the Bendigo flats. Frederick Gonnerman Dalgety, who bought the run in 1875, was a very different type of farmer. His farms were investments and Morven Hills was run by a succession of managers, including John Stronach who shifted the centre of the run to Tarras, and cultivated large areas of the flats on a sharecropping system which helped establish many small farmers around Tarras. He was also responsible for planting some fine groups of trees, probably acquiring the seedlings from the new Lands Department nursery in the mouth of the Cardrona Valley. The station was subdivided in 1910 and the stations such as Bendigo, Ardgour and Northburn were established as separate entities. Bendigo has been farmed in the twentieth century by the Begg, Lucas and Perriam families. The homestead and its outbuildings, especially the shearers' quarters, were built about 1910 in the conservative hip-roofed Neo-Georgian style developed in outback Australia and beloved by the occupiers of the big Central Otago farms. The two-paned double sash windows in the shearers' quarters are typical of the turn of the century buildings.

All through these runs, there are isolated and venerable huts and buildings known to have been established during the time of old Morven Hills station. Unfortunately because my historic surveys are limited firstly to the pastoral leases during field work and secondly to individual stations for report writing, it has not been possible to produce an integrated description of the old Morven Hills run.

We know that the corrugated iron woolshed at Tarras burnt down in 1885 and that the site was abandoned for the new shed near the present Morven Downs house. The three quite impressive stone buildings which were associated with the old iron woolshed remain hidden by willows at the base of the hill about 250 m off Ardgour Road (Fig.4, Record S124/51, GR163894). From analogy with other early woolshed outbuildings, they appear to be a bunkhouse of two rooms, a cookhouse of three rooms with a bread oven, and a head man's hut with a very unusual curved chimney. They are neatly aligned along a terrace with one small stone hut set apart against the hill slope, but there is no trace of the foundations of the woolshed. The site in general is well sheltered from the worst of both southerly and nor-westerly winds. Out on the road there is a mud brick cottage still in use, considered to have been an musterer's cottage for Morven Hills Station (Record S124/43, GR169896). Its interior walls are of mud brick 60 cm thick. About six kilometres south west and on the western side of SH8 at Willowbank there are two other Morven Hills buildings, erected in 1884 and presumably associated with the shift of the station "farmstead". These were a stone stables (Record S124/184), still intact and in use,

and a three roomed cob building (Record S124/182, GR114877), used now as a storage shed.

None of these buildings are on Bendigo Pastoral lease but they provide a context for the stone hut and stone stock yards in the mouth of Shepherds Creek. These are about four kilometres up the main access route from the old woolshed to the tops, now followed by the Thomson Gorge Road over the range to Matakanui. The stock yards (Fig. 5, Record S124/45, GR182854) are a simple rectangle of Galloway double dyke walling, enclosing a space 34 x 60 m with one 10 m wide entrance on the north side. (The entrance was only 5 m wide when the yards were recorded in 1977 and stone may have been taken from them.) The walls are about one metre wide at the base and up to one metre high, with side stacked stone. They are similar in design to another set of Morven Hills yards (Record S124/38) about 16 kilometres to the north off Jolly Road but these have been destroyed. Another more valued set are on Moutere Station across the Dunstan Range to the south, and all are relatively simple rectangles of Galloway double dyke walling with no internal divisions. They would seem to be holding yards associated with mustering rather than working yards for drafting or drenching. The Bendigo yard is nicely set on flat ground, sheltered by a rise of the terraces from southerly winds and partially from north westerlies.

A stone hut, 6 x 4.5 m, placed about 50 metres east of the yards was presumably a shepherd's hut and is well constructed of split schist with concrete mortar and a corrugated iron roof. The gable is 3 m high, and the door and window are still intact though there is no glass. The window is of the old four pane, top hung design and the door had a six-pane window in the upper half. The stone chimney at the south end is 2 x 1 m across and the walls are 50 cm thick. The hut is well situated in the corner formed by the creek coming off the terrace, but it is down wind of the yards during a hot north westerly wind.

Within the mouth of Shepherds Creek two live races run down each side of the creek above a small earth dam, (Fig.5, Record S124/46, GR183853) which also had a small race exiting from it but now obliterated by ploughing. The dam is a simple earth wall, 20 m long and about 50 cm high, now silted up. Either the dam or the race running round to the south west would have provided water for the yards and the hut, or for mining downstream which has now been destroyed by cultivation.

An adobe hut of unknown use was recorded during the 1976 survey, sited between the road and the river 230 m south of the Devils Creek Bridge (Record S133/158, 062778). The walls were about 30 cm thick, and only the south wall was intact to the original height of 2.2 m. The floor was compacted soil. It may have been a rabbiter's hut and was not found during this survey, probably because it has been destroyed by lake edge modifications by MWD.

Chapter 4:
The townships, a short history

The short lived township of Wakefield developed in 1862 on the site now known as Crippletown beside the ferry where the oldest building in the district, the Wakefield Ferry Hotel was established, along with a store, three or four saloons, a post office and a butchery (Parcell 1976:124). These buildings were close to Rocky Point (Fig.1b). Bendigo township was selected by the Superintendent of Otago, James Macandrew himself, when he visited the area in 1869, and fully surveyed 1869-1871 at the foot of the hill where the road ran up to the reefs from the corner of Loop Road (Fig.1b). In the early stages of mining at Bendigo, the main street, York Street, was described as about 400 metres long and lined with tents and shanties containing stores and saloons. There was the Bendigo Reefs hotel, at least three other hotels, three stores, the A1 bakery run by Stevenson and Raby of Clyde, two or three butcheries, a billiards saloon, a blacksmiths, a draper's shop, and a Miners Temperance restaurant (truly!). The buildings were wood, iron and cob, and their usefulness was fairly short lived, as business in the township dropped off even during the 1870s. At a later stage Parcell describes Bendigo as including the carter John Kane's residence, the Solway hotel and store owned by Minchinson, with the bootmaker's opposite, the bakery below the Solway hotel, the battery manager and mine manager's houses, several restaurants and several miners' cottages. The blacksmith had gone by 1871.

Logantown and Welshtown up the hill, where most of the stone building remains are at present, were unofficial townships, but the former was much the same size as Bendigo. In 1869 the Cromwell Argus reported that Logantown had an irregular line of corrugated iron buildings along its one street, consisting of a cottage for Thomas Logan, four general stores, three hotels, two butcheries, a bakery and a drapers. In 1874 the community erected a corrugated iron building to serve as a community hall, Union church and for a brief period as a school (Duff 1978). It is marked on Mackay's 1876 map as a church between Welshtown and Logantown, and by then occupation had shifted again to concentrate around Welshtown.

The school and athenaeum (a grand name for a circulating library) was shifted in 1878 to a site now marked by a concrete chimney and some old pine trees under the transmission lines and equidistant from Logantown and Bendigo township. It was shifted again in 1909 to a site beside SH 8 not far from Crippletown.

There is some confusion in the archives between Bendigo and Logantown, and it is not always clear which township is being described. Startup (1977) states that there was a post office at Rocky Point (alternative name Wakefield) 1863 to 1878 and a post office at Bendigo (alternative name Logantown in the 1870s) from 1870 to 1924. Wakefield/Crippletown and Rocky Point are close enough together but Bendigo and Logantown are about three kilometres and 200 vertical metres apart. Duff (1978) adds to the confusion by commenting that it was Charles O'Donnell about two kilometres up Bendigo Creek who had the post office in his general store and hotel, presumably the one built by Goodall (see below).

Though the sheltered flat of Logantown in the midst of the mining area was an obvious site for people to live, there was probably always a need for an off-loading site (an entrepot) at the base of the hill where the contents of heavy drays could be transferred to

lighter drays and pack horses for the steep uphill section. Six and eight-horse drays were apparently using the punt at Rocky Point by 1870, since a new punt owner, McLauchlan, advertised that he could transport with ease six to eight horse waggons and loads of up to forty tons. Bendigo and Logantown could be seen as having the same relationship to one another as Quartzville and Carricktown on the Carrick quartz field. (There were close ties between the Quartzville-Bannockburn and Bendigo/Logantown settlements. John Kane ran a cartage business between the two fields in the 1870s, carting coal from Bannockburn to the engines that drove the batteries at Bendigo, and buildings and people translocated frequently from one site to the other.)

Only a few of the surveyed sections within Bendigo township have traces of dwellings and only the owners of these were traced. The section on which the bakery lies (Sec 11 Block 9) was taken up in 1873 by Josiah Michenson, storekeeper, and sold to James T Mackerras in 1873. Michenson also owned Sec 3, Block 10, the only section to have a continuous history of ownership through Charles ODonnell, hotel keeper at the turn of the century, to rabbiters and miners mid century. Sections 1, 2, and 31 Block 10 where the road runs up the hill to Bendigo were taken up by William Grant, builder. Section 4,5 and 6 of 6 acres next door to Minchinson (or Michinson) were taken up by William Usher Goodall, hotel keeper, but there were no subsequent owners.

The buildings that are left

Parcell (1976) commented that the Wakefield Ferry Hotel *was* the oldest building in the district as if it had already vanished by 1951 when he wrote his book. There is still a stable building at Crippletown, said to belong to the Rocky Point Hotel (Record S124/27, GR103838). Still used as a craft pottery shed, it is a plain rectangular building with rammed clay walls, 35 cm thick, on a foundation of split schist blocks 20-25 cm high. The roof is a simple gable of corrugated iron and floor compacted earth. It has not been possible to confirm whether or not the Wakefield Ferry Hotel and Rocky Point Hotel were different names for the same building but both would have dated to the time when Crippletown was called Wakefield.

The hotel burned down in 1903 but there seems to have been a boarding house of some sort on the site subsequently. The present owners have had many elderly visitors who had various associations with the site, including Hannah Stevenson who had lived there with her mother and siblings in the 1920s. She revisits the site to put flowers on a burial site of a baby brother who died when she was nine. This site is under a willow tree on the west side of a massive rock opposite and slightly south of the driveway into the pottery. (The twin brother of this baby, Les Stevenson, lives in Mosgiel.) The school was shifted to the present site of a cottage north of the gateway into Bendigo Station. When the cottage was built 38 years ago, only some traces of concrete steps was left on the site. No other traces of Crippletown are known.

At Bendigo township proper (Figs 6 - 7) there are mature poplars, the remains of a bakery (Record S124/232), a spread of broken ceramic and glass, a corner of the stone hotel and its garden wall (Record S124/233) with old fruit trees, a stone and mud holiday cottage (S124/234) which looks to date to the turn of the century, remnants of sod walls and a horse paddock outlined in mature poplars. York Street, as surveyed, is only about 250 metres long, part of it cuts through the remaining cottage, and it does not run past the bakery. Judging by the position of the bakery on Section 11, Block 9, and the hotel garden

angled across Secs 4,5,6 Block 10, it is more likely that the original main street ran east-west on the surveyed line of Oxford Street and swung round the corner on to the part of York Street which runs up the hill. The foundations of the old township are likely to lie along these road formations.

The remains of the bakery (Fig.6a) consist of a rectangle of stone walls 5 x 3 m, (Record S124/232, GR137847) with the foundation of the bread oven behind the north wall. The walls are 50 cm thick, 3 m high at the highest point and there is a window and door in the south wall, both still framed. The oven was a massive structure of stone, brick and earth, about 4 x 4 m square and at least a metre high judging by the opening into it. Much of the material from it has been removed and the mound is now only about 50 cm high. From inside the building the opening into the bread oven has a massive lintel stone and is about 80 cm wide with the chimney flue, 40 x 25 cm in cross section, running up inside the stone back wall. It is no longer possible to tell how the smoke and ventilation from the oven was controlled but a double doorway like the Lauder oven would have been the only feasible method. There is a heavy lintel stone projecting down into the opening where the inner door should have been beyond the flue opening. A broken section to the right of the oven may be an opening for an ash pit or just a break, but there was also an opening to the left, covered by a lintel stone 80 cm long and only 20 cm above the floor. There is burnt clay mortar all round the oven opening. A photograph taken prior to 1970 (Fig.6a) shows the walls very much as they are today, but also shows a chimney nearby which has vanished (Wood 1970).

The one occupied cottage of the township (Record S124/234, GR137848) is a standard Georgian miner's cottage and lies right across the legal lines of York Street. It has subsequently had its own section surveyed off in alignment with Loop Road. This suggests that it was built at a later date than the structures listed above and cannot be identified with the stores, hotels and butcheries of the 1870s town of Bendigo. The front part is made of roughcast over mud brick with two-pane double-hung windows like the shearers' quarters behind Bendigo homestead, suggesting that the cottage was also built at the turn of the century as a farm outbuilding. A lean-to at the back is in stone and there is a mud-brick wall around the garden. In the paddock to the south of the house and behind the bakery a modern drainage ditch has thrown up a mass of broken ceramics and glass, with a flat perforated iron plate about 1.0 x 1.4 m nearby.

The stone walls (Record S124/233, GR137847) near some old fruit trees on the south side of the turn off from Loop Road up the hill to Logantown were poorly interpreted during the 1980 survey and are clearly the remains of a large building from which over half of the building stone has been removed. It lies at the south west corner of an enclosure, about 60 x 30 m, outlined by the remains of a sod wall with old roses, lilacs, a massive rosemary bush and fruit trees planted along it . The fruit trees include a peach as well as the usual plum trees. A medium sized race from the hillside behind would have provided sufficient water for the garden (Figs 6a,7).

Not everyone who owned a section necessarily built on it, and Goodall is described as building the Bendigo Gully Hotel a mile or more up Bendigo Creek (Parcell 1976:125). He sold this building in 1870 to Smith and ODonnell, and so could have built another hotel on his own ground at Bendigo. The Solway Hotel and store was owned by Minchinson and could have been on his ground (Sec 3) or extended on to Goodall's sections next door. The base of a mud wall runs along the front boundary of Michenson's

Section 1 and William Grant's Sec 1, with a sunken gateway still outlined by rough gateposts at the north end of Michenson's section of the wall. The ground on these sections looks relatively undisturbed, though the sections at the back have been partly disturbed by the bulldozing of briar.

The remains of a sod wall also runs at the foot of the hillslope, bisecting Sec 31 and the sections laid out to the west of it on Wells Street. A small race may have run behind it. The ground between it and the road is hummocky as though there may be foundations under it, and the only clear feature west of the hotel is a roughly rectangular enclosure marked by drains and mature Lombardy poplars which would have made a useful horse paddock, downwind of the buildings. The enclosure lies at an angle across Bath Street and the two blocks on either side, and has no relation to the survey lines. It is about 120 x 60 metres in extent, and the poplars have proliferated both into the enclosure and back up towards the hillslope. The ages of the poplars, either from fallen logs or by increment corer, would indicate whether or not this enclosure was associated with mining or farming activities.

Though not within the surveyed area of the township, the schoolhouse site relates to it rather than to the mining sites. It is still clearly marked by a group of pine trees and the lone chimney (Record S124/262, GR141844). The school was centrally placed for Welshtown, Logantown, Wakefield and Bendigo, and was not shifted until 1909 when the road along SH8 would have provided better access for the local farm children. The concrete chimney up the hill is 5 m high resting on a base of schist slabs 1.0 x 1.2 m and with a fireplace on each side.

Chapter 5:
A brief history and geography of the Bendigo gold field

Most of the following is from either Parcell (1976) or the very useful compilation put together by Paula Smith for a conservation plan for the Otago Bendigo (Smith 1991). Some extra material has been drawn from the Mines Department annual reports in the Appendices to the Journals of the House of Representatives, including Professor Ulrich's 1875 report on quartz workings of Otago (AJHR 1875, H-3:27).

The first alluvial workings at Bendigo lasted only a short time - from about 1862 to 1866 and seem to have been concentrated in three areas - lower Bendigo Creek around Goodalls hotel, Aurora Creek and in the upper Rise and Shine. One area known as Swipers Row was presumably in the Swipers Creek, marked in the 1876 map (Fig.2a) as the western tributary of Aurora Creek running up through Welshtown. The name was derived from a incident in local tradition when the miners were said to have swiped the hotel cash box to pay for their Saturday night party after a flood had washed them out. The name seems to have been lost for this fork of Aurora Creek.

William Goodall established the Bendigo Gully Hotel and store about a mile or more up Bendigo Creek from the mouth of the gorge in the midst of the alluvial workings, but was burnt out in 1872 (though the hotel is still marked on the 1876 map). The alluvial workings around the hotel were described as claims marked by putting four corner posts to enclose an area 24 feet square (which surely means a square 7 x 7 m rather than one 1.5 x 1.5 m). Rich strikes were made from 15-50 ounces per week (Duff 1978:70-71). A group of Swedes did well in Rise and Shine Creek in the mid 1860s, and in 1867 brought in a race of 12 heads from Thomsons Creek across the range. It is likely that some alluvial workings continued for several decades, judging by the odd comment from the warden, but they were overshadowed by the quartz mining.

(The Rise and Shine water right from Thomsons Creek was taken over by John Ewing in 1889 to work his claim at Matakanui. To get the 20 heads of water to his side he had to cut a race three miles long, 3 feet wide at the bottom and often through rock cuttings with high stone walls.)

The Cromwell Reefs

In 1863 Thomas Logan located several lines of reefs at Bendigo but could not develop them because of a lack of capital, until Julian Coates reported the reefs in 1865 to a group of Dunedin businessmen. The Dunedin men formed the Bendigo Quartz Mining Company, which failed after disagreement with Logan who pottered on in partnership with two other men, Brian Hebden and William Garrett, also lacking capital. Hebden was a charcoal burner, who provided miners with the charcoal needed to heat picks for tempering and other forge work. No coal pits had been opened at this early stage.

In 1868 Logan invited a Californian hotel keeper, George Wellington Goodger, who had worked at quartz mining to join them. Goodger put up money to buy a battery from Hindon, a 12 head machine which had to be put at the foot of the gorge to obtain sufficient water power to run it. The ore was brought downhill two kilometres by dray road to the battery which was set up as the Solway Battery at Bendigo township. The initial returns of 238 ounces of gold for 10 days work started the Bendigo rush (Parcell 1976:128). The

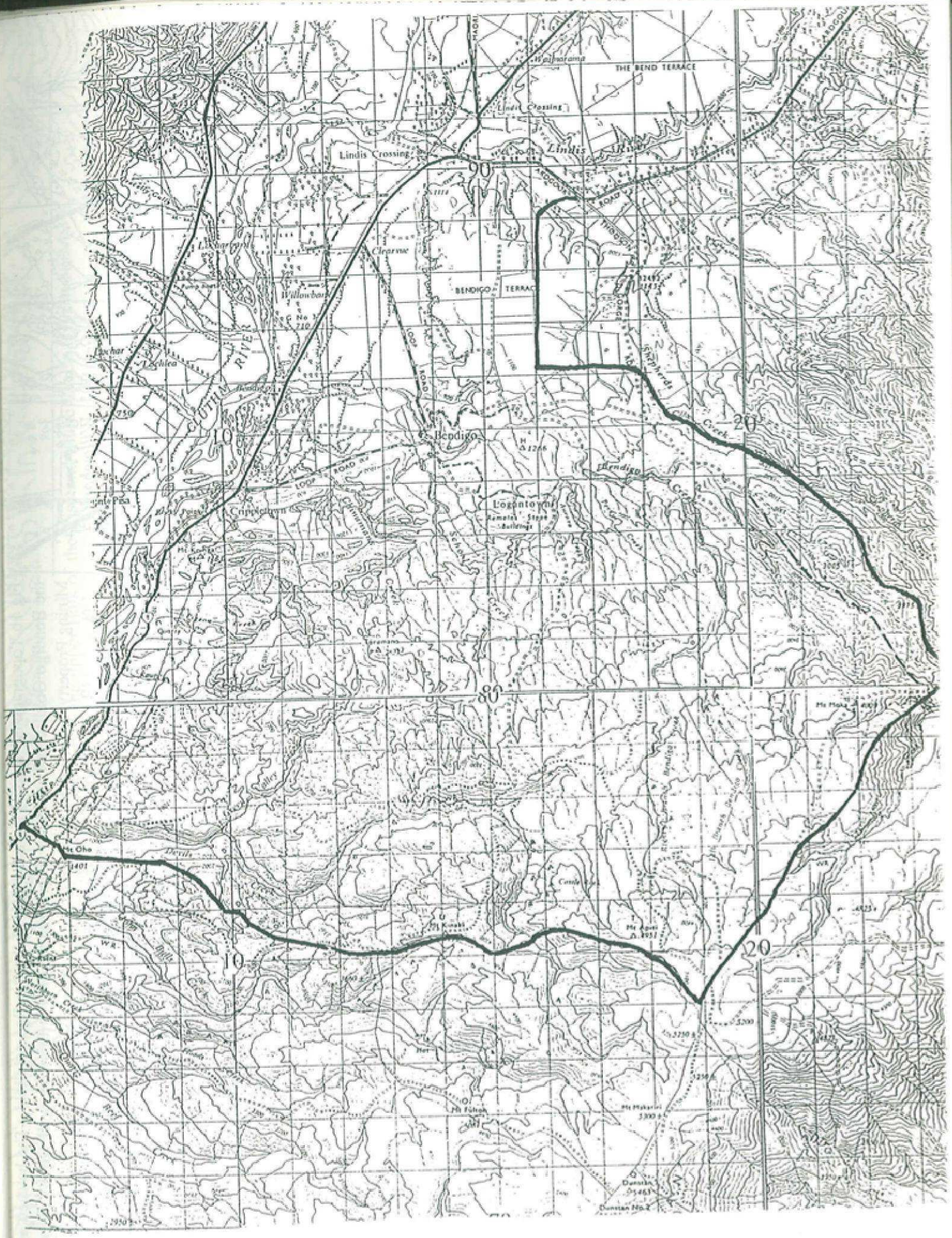


Figure 1a Topographical map of Bendigo Station showing the station boundaries, both Pastoral Lease and freehold

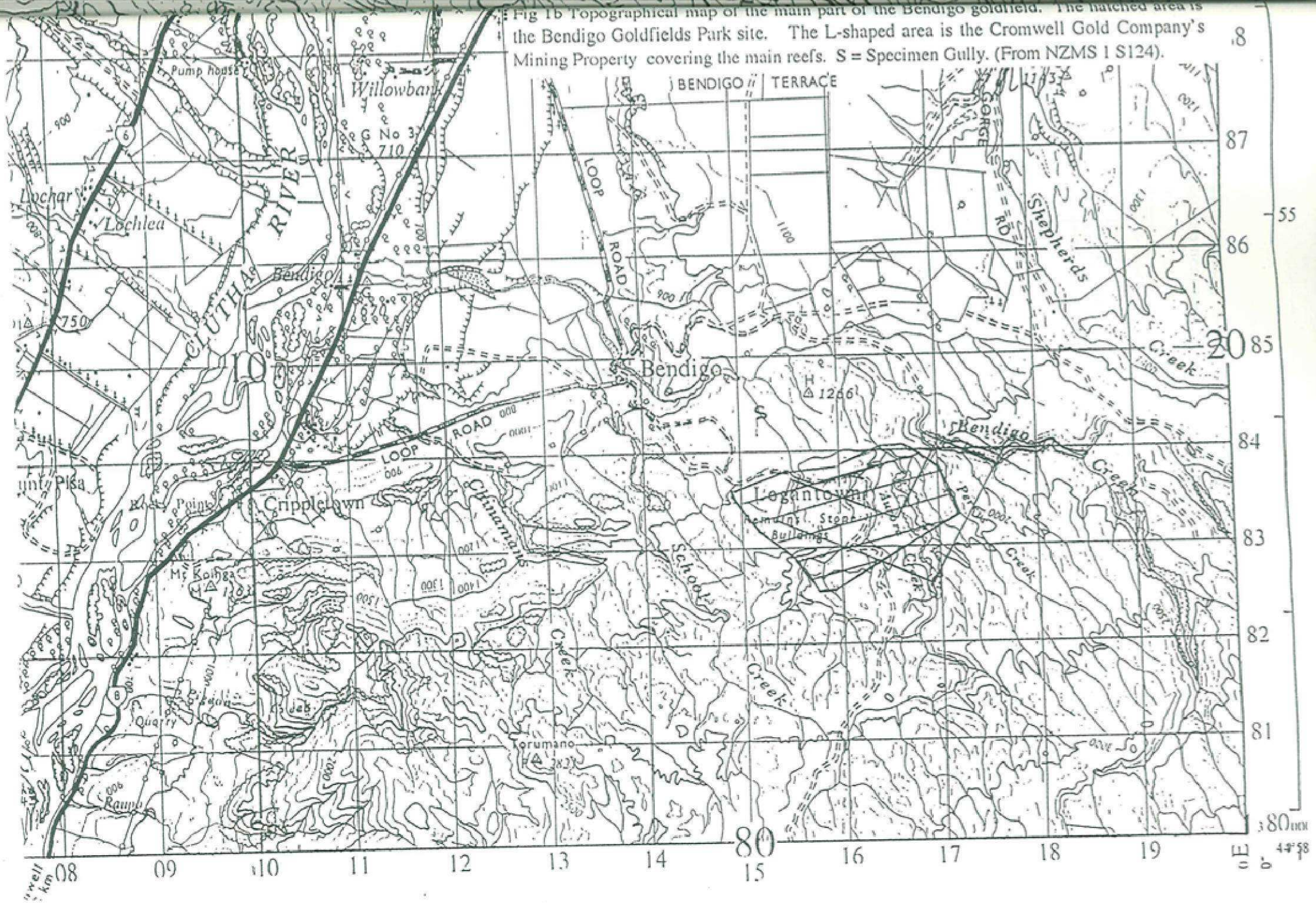


Fig 1b Topographical map of the main part of the Bendigo goldfield. The hatched area is the Bendigo Goldfields Park site. The L-shaped area is the Cromwell Gold Company's Mining Property covering the main reefs. S = Specimen Gully. (From NZMS 1 S124).

Fig 1c Topographical map of the upper flats of the Rise and Shine Creek. (From NZMS 1 S125).

Fig 1b Topographical map of the main part of the Bendigo goldfield. The hatched area is the Bendigo Goldfields Park site. The L-shaped area is the Cromwell Gold Company's

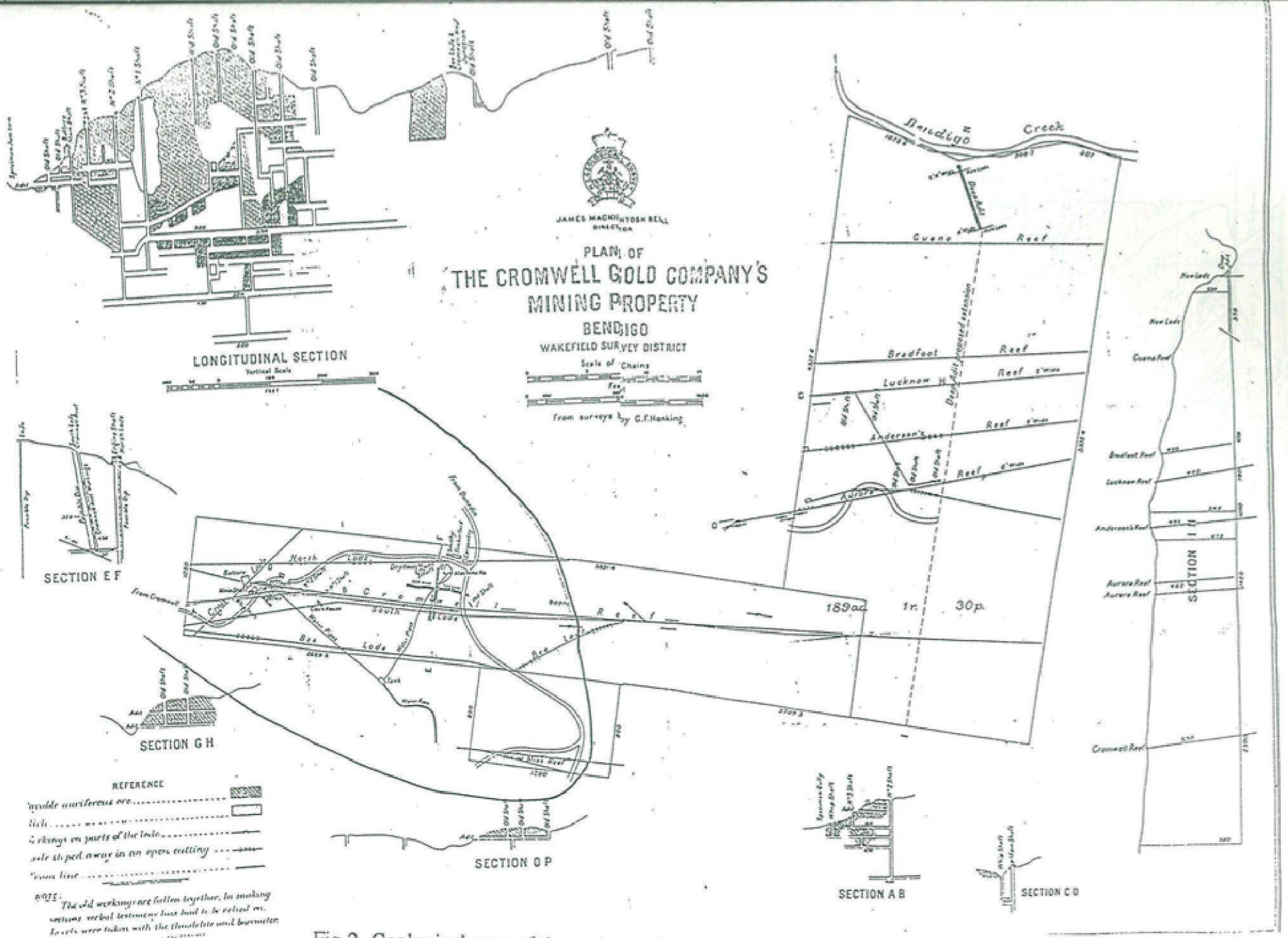


Fig 2 Geological map of the main workings at Bendigo in 1907, showing the reefs both in plan view and cross sections (Park 1908)

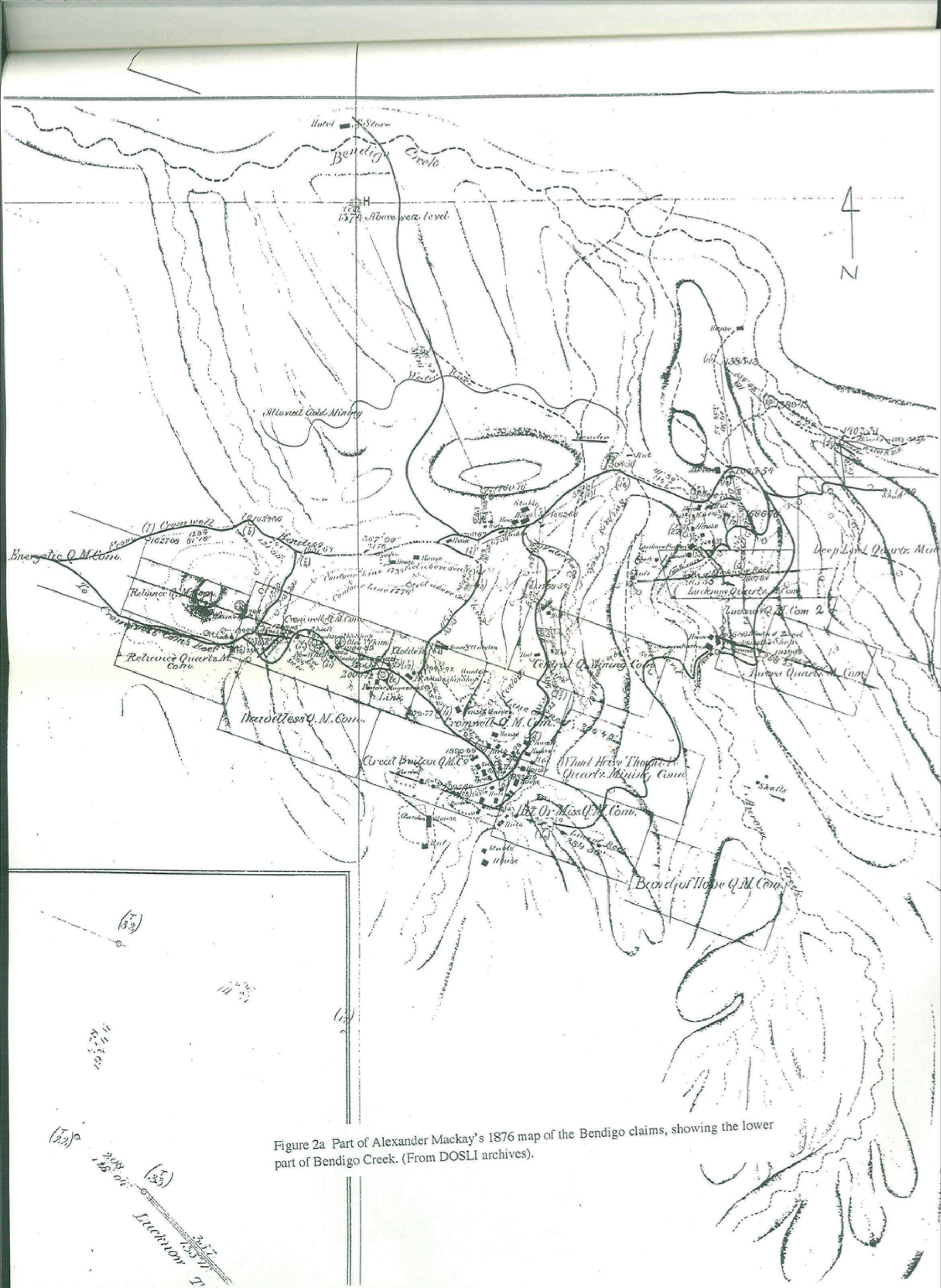


Figure 2a Part of Alexander Mackay's 1876 map of the Bendigo claims, showing the lower part of Bendigo Creek. (From DOSLI archives).

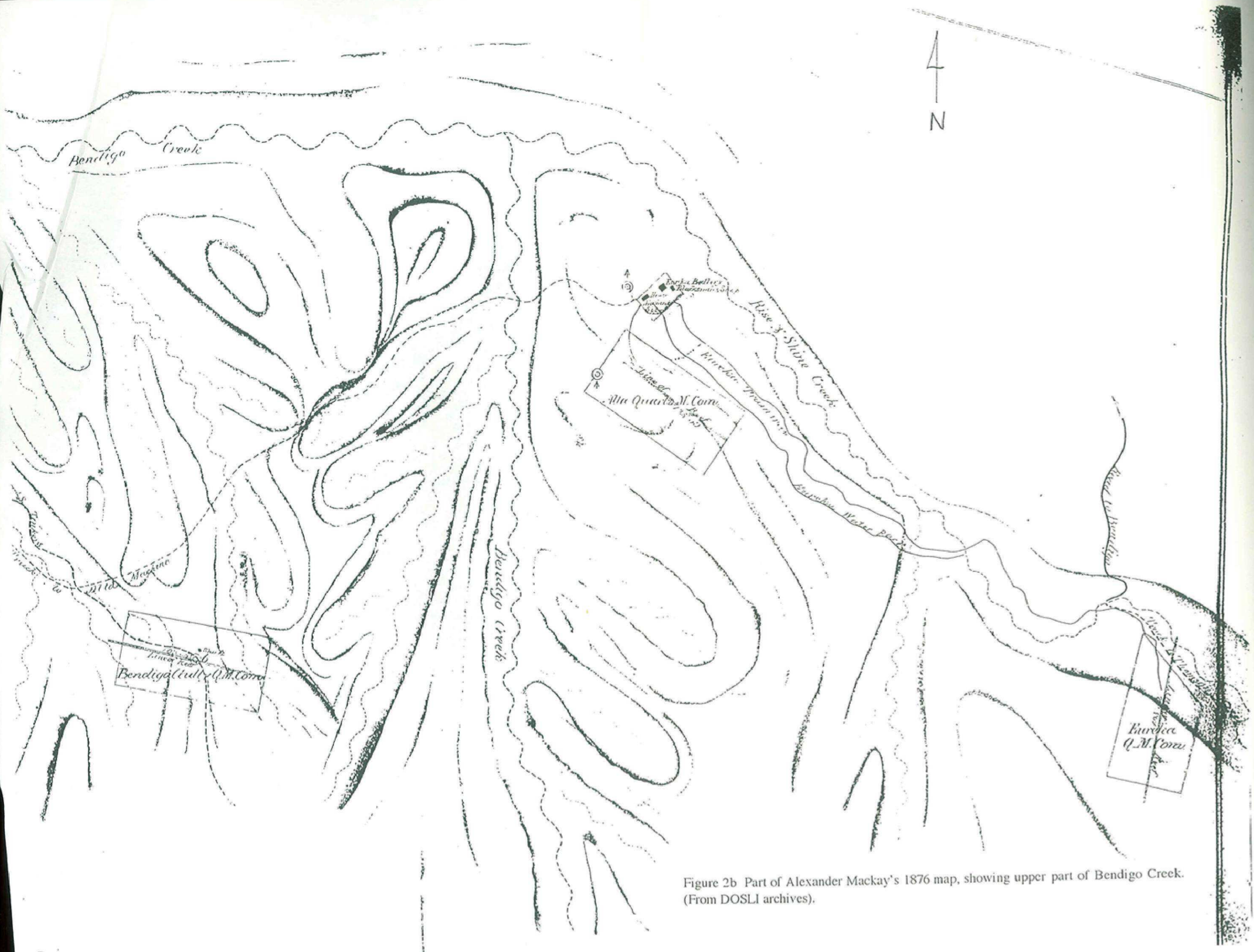


Figure 2b Part of Alexander Mackay's 1876 map, showing upper part of Bendigo Creek. (From DOSLI archives).

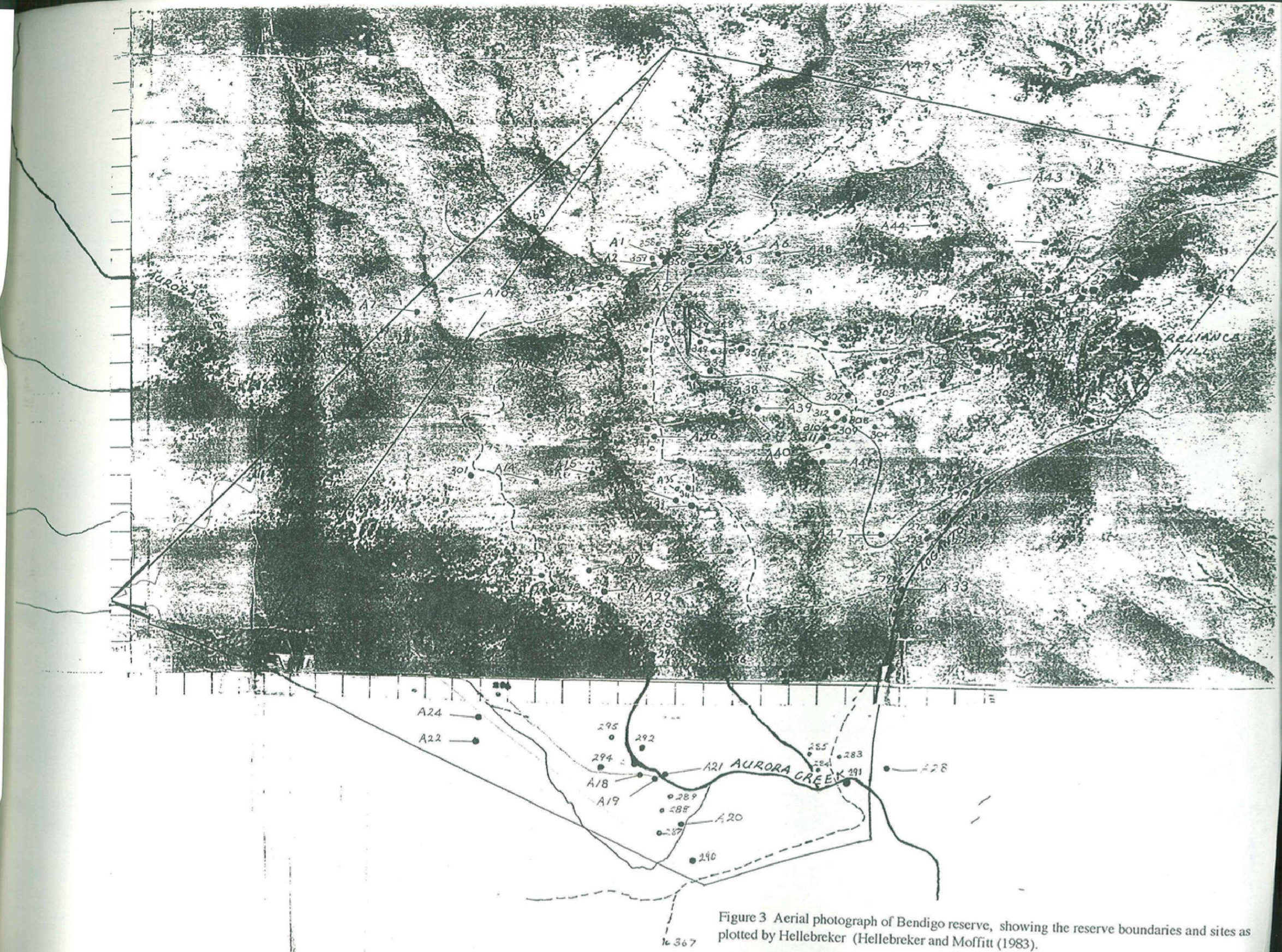


Figure 3 Aerial photograph of Bendigo reserve, showing the reserve boundaries and sites as plotted by Hellebreker (Hellebreker and Moffitt (1983).

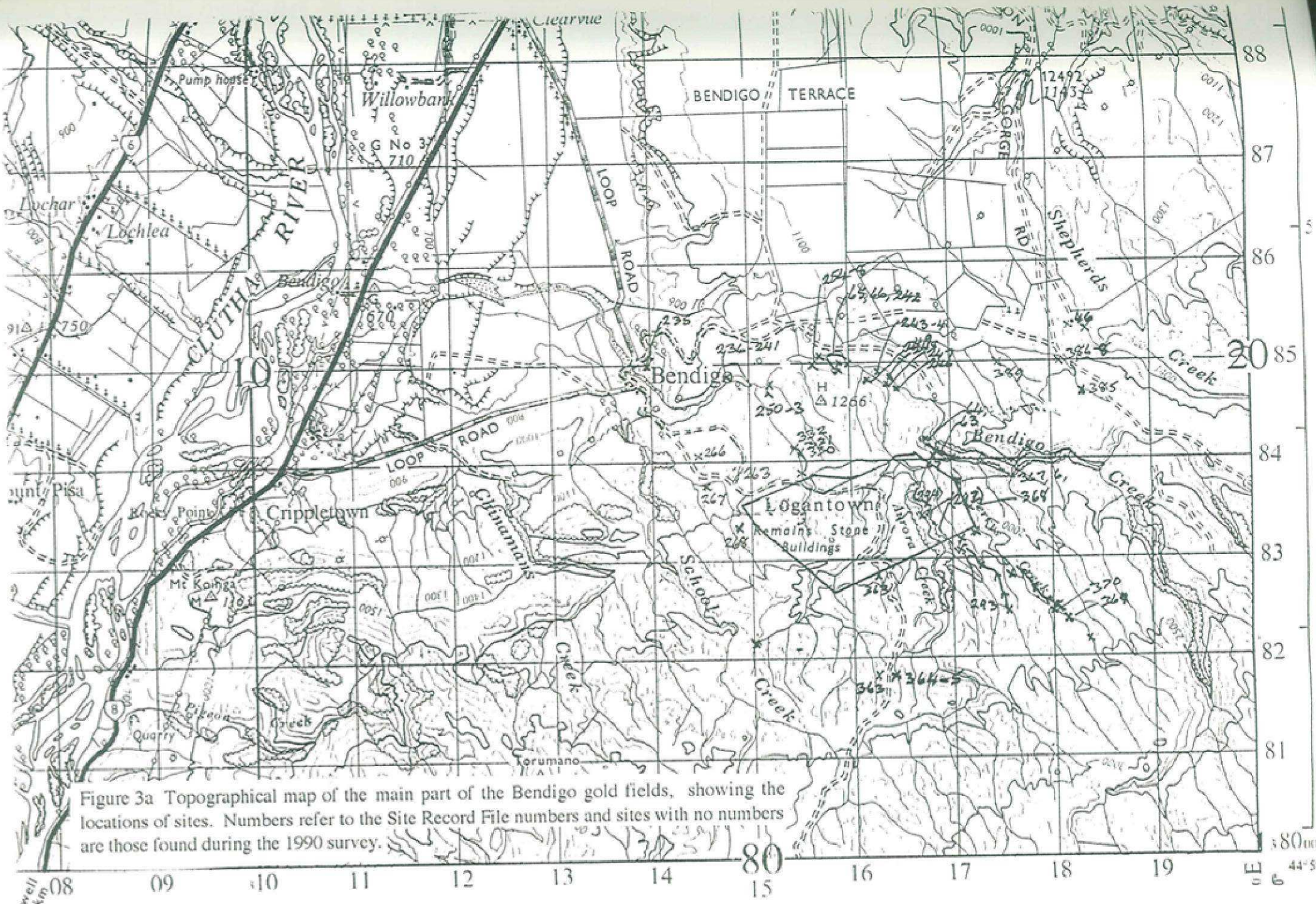


Figure 3a Topographical map of the main part of the Bendigo gold fields, showing the locations of sites. Numbers refer to the Site Record File numbers and sites with no numbers are those found during the 1990 survey.

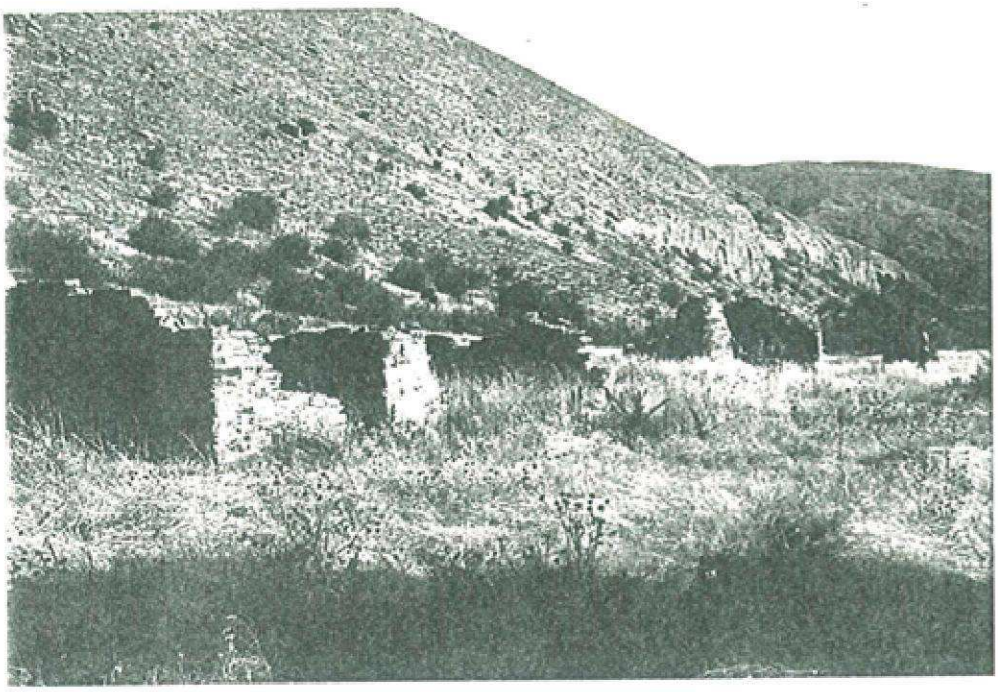


Figure 4. Photograph and plans of the remains of stone outbuildings of the old Tarras woolshed of the Morven Hills station.

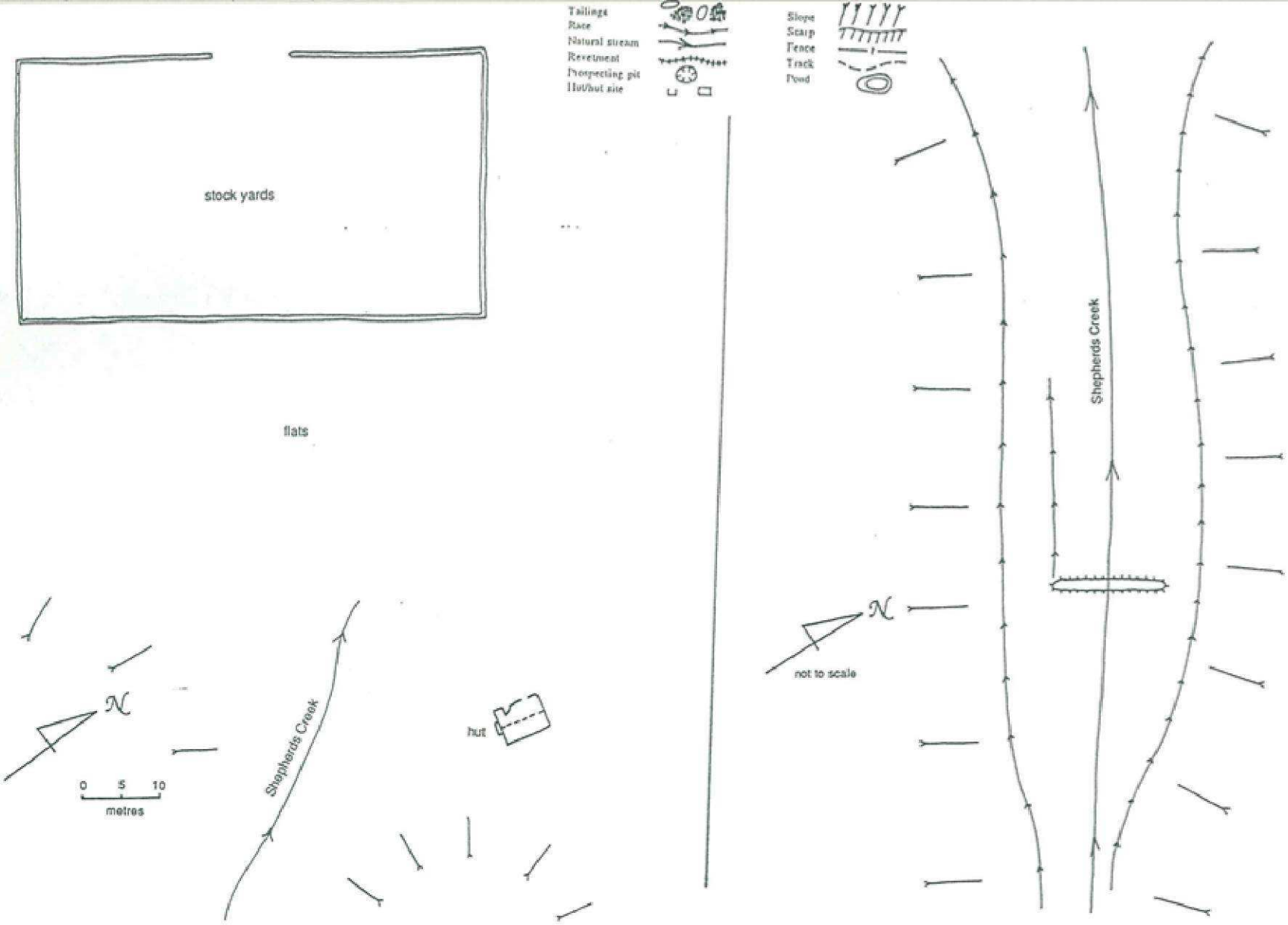


Figure 5. Left: The stone stockyards and hut of Morven Hills station in the base of Shepherds Creek.
Right: A small dam in the mouth of Shepherds Creek above the stock yards.

Figure 6. Modern survey map of Bendigo township showing location of bakery and stone walls

IT V	678 544·54	28
IT VII	678 584·65	29
IT IX	678 797·75	29
IT XVI	678 450·80	29
OIT I, SO 12450	678 434·53	29

This plan is concurrent with SOs 23852 - 23853 & 23855 -

All roads legal.

All distances measured elect

Boundaries unfenced unless s otherwise.

For origin of bearings, see SOs 23852 & 23855.

See field book for additiona occupation, etc.

Adoptions from SO 14115 unle otherwise.

SO 23854

DATUM : GEODETIC 1949
CIRCUIT : LINDIS PEAK

Total Area ——

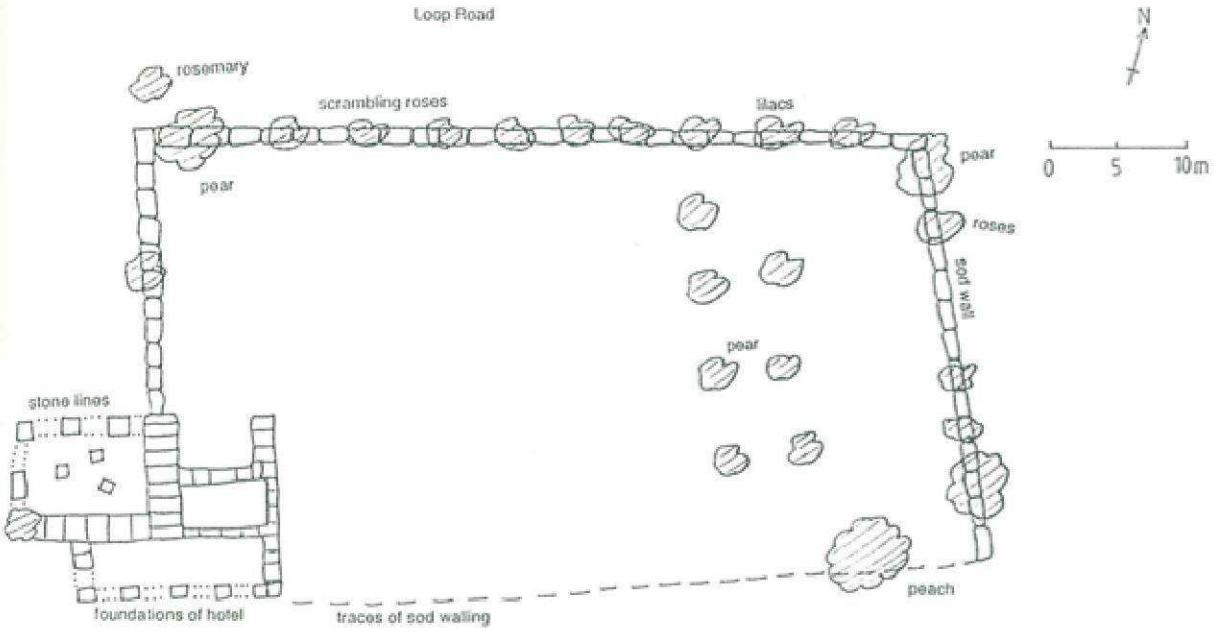
Comprised in ——

I, RONALD JAMES KEEN
Registered Surveyor and holder of an annual practising may act as a registered surveyor pursuant to section 2 1986) hereby certify that this plan has been made fro by me or under my directions, that both plan and surv have been made in accordance with the Survey Regul regulations made in substitution thereof.

Dated at DUNEDIN this 31st day of JULY 1992 Signature

Field Book 2431 p. 39-51 Traverse Book

Reference Plans SOs 1203, 1652, 7455, 8757,



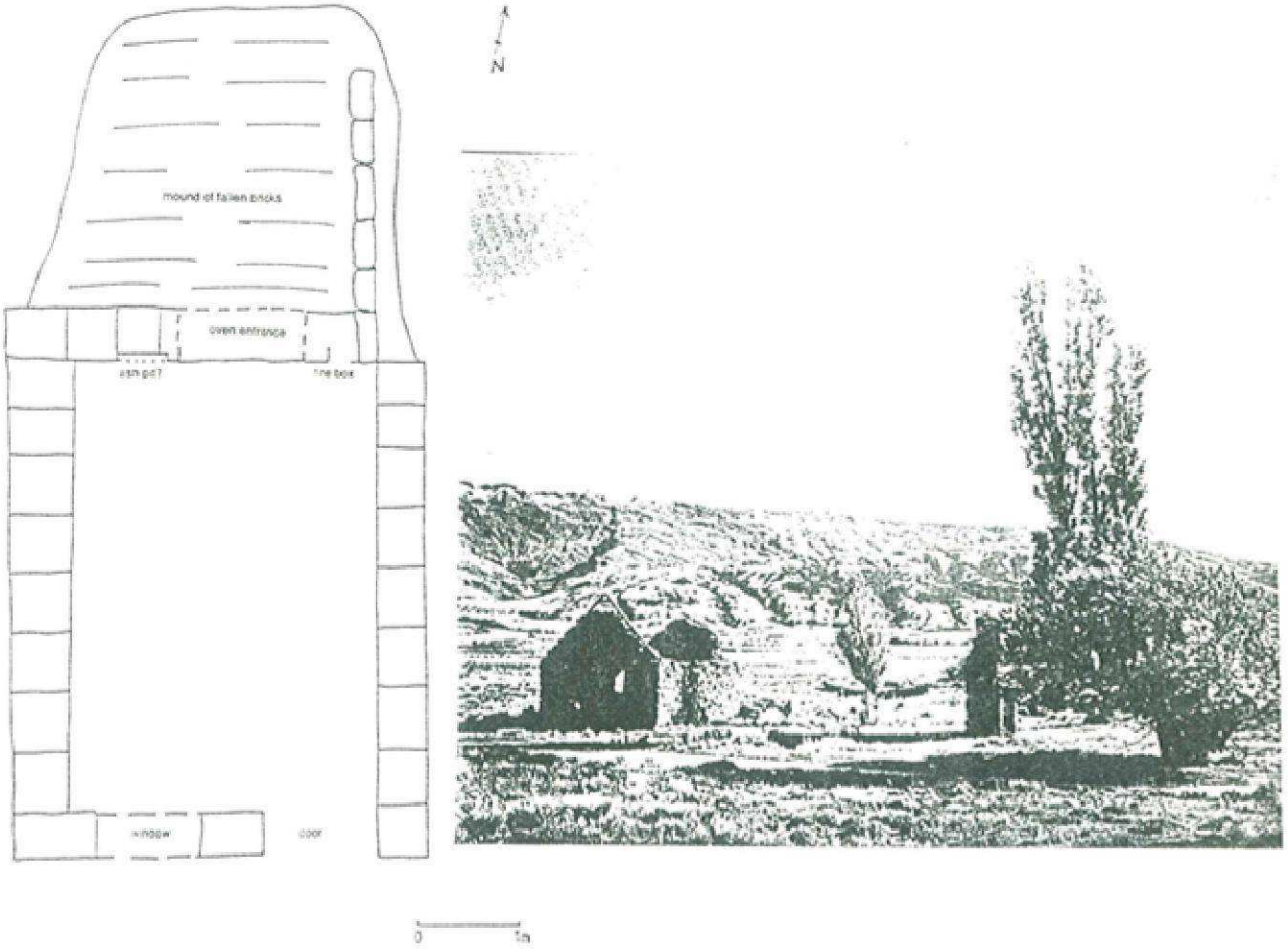


Figure 6a Remains of Bendigo Township
Above: Details of the hotel foundations and garden
Below left: Plan of bakery. Below right: The bakery ruin prior to 1970 (Wood 1970).

Figure 7. Sketch map of the remains of Bendigo township.

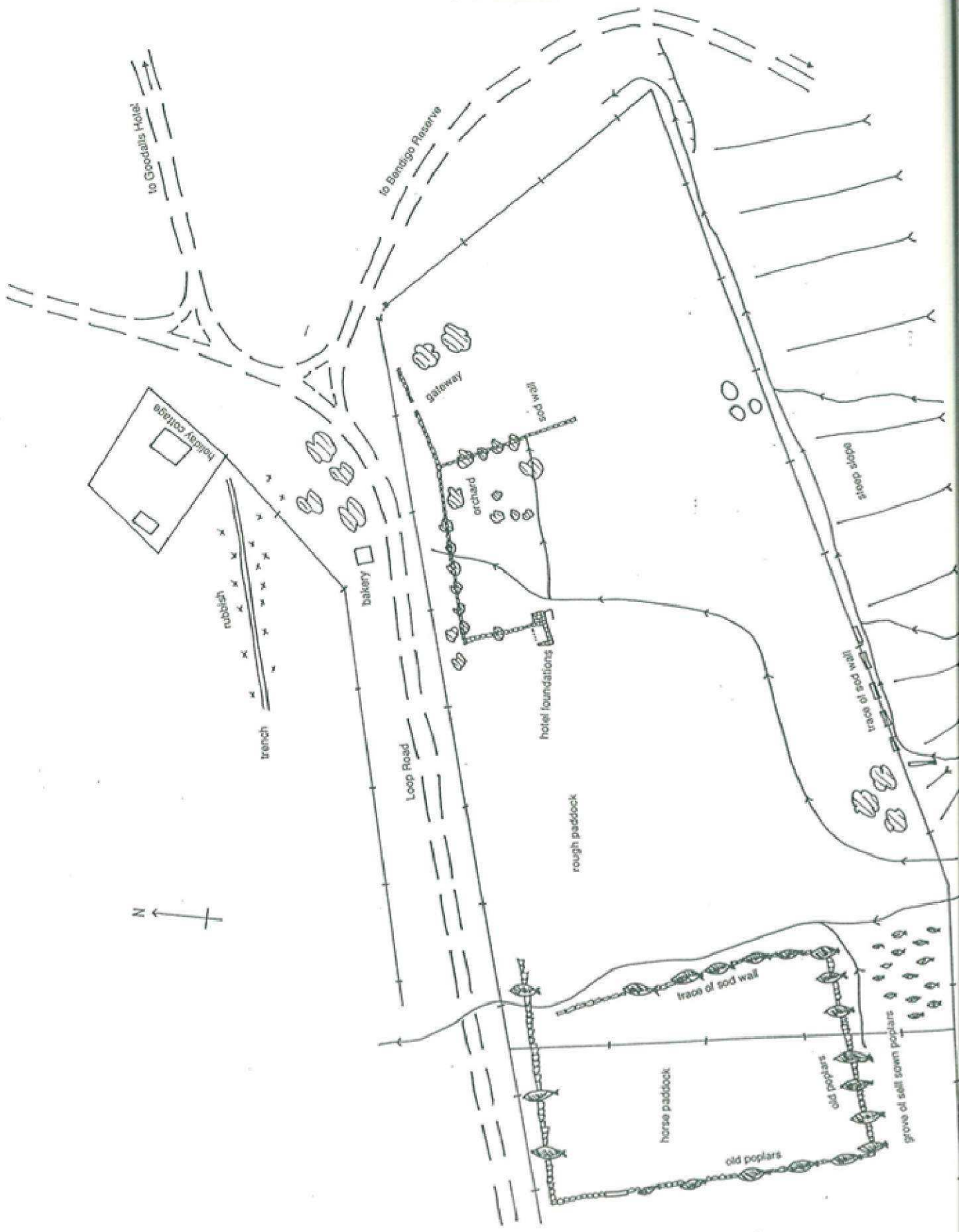


Figure 7a The Martha battery in 1907, looking north east, showing the barren nature of the landscape after mining ceased (Park 1980).

Figure 8. Geological map of Bendigo area 1907, showing course of the big water race from Devils Creek to Bendigo workings (Park 1908).

Stamping Batteries at Bendigo

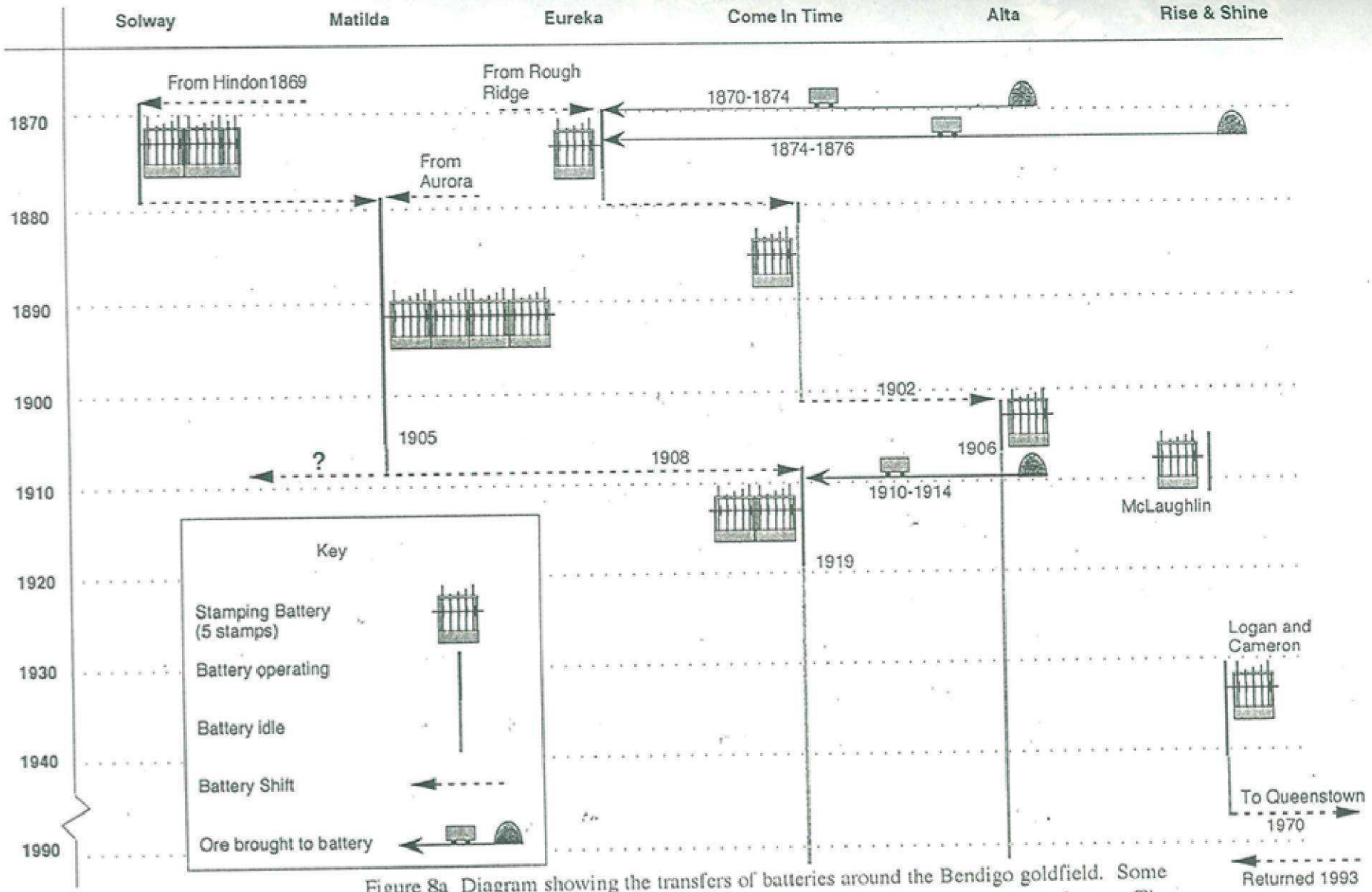


Figure 8a Diagram showing the transfers of batteries around the Bendigo goldfield. Some of the short-lived early batteries, such as the Lucknow and Aurora, are not shown. The Solway 12 stamp battery probably had six stamps in each frame, not 5,5,2 as shown for convenience in the diagram.

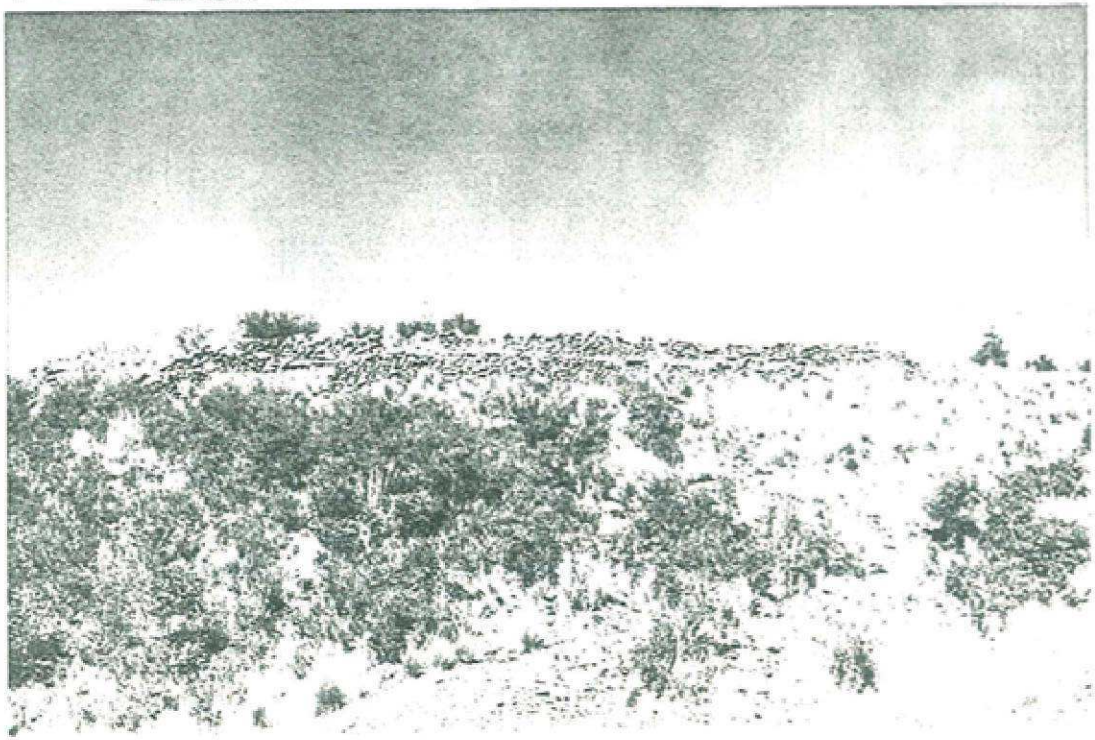


Figure 9 Sites on the upper flats of Rise and Shine Creek
Upper left: The chimney of Hut a in the eastern sluicings nearly buried in matagouri scrub (Record S125/32).
Right: Two views of the tiered stone revetted reservoir in the western sluicings (Record S125/34).

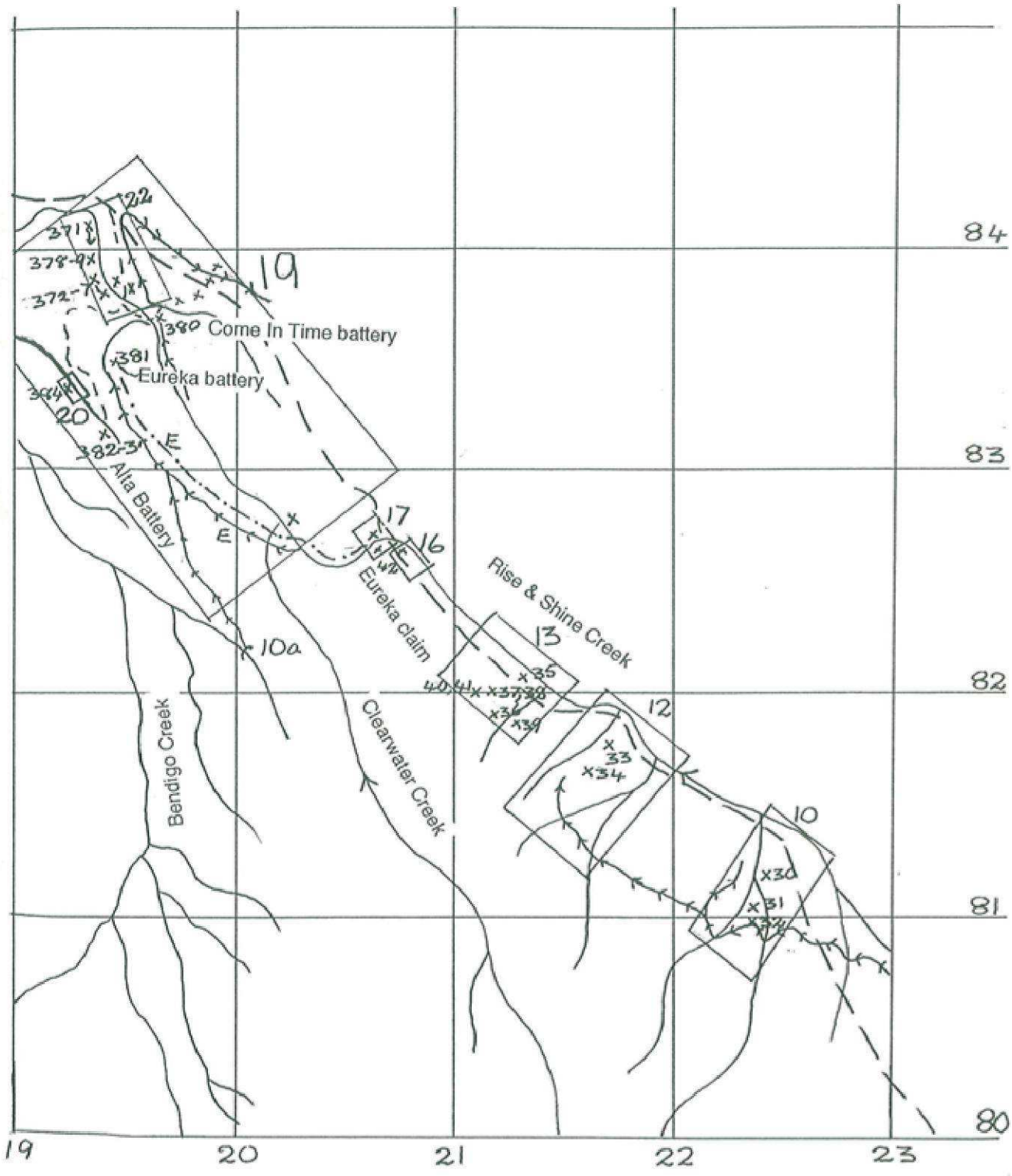


Figure 10. Diagram of Rise and Shine Creek showing the location of sites and other maps. The large numbers are map numbers and the smaller are site record numbers.

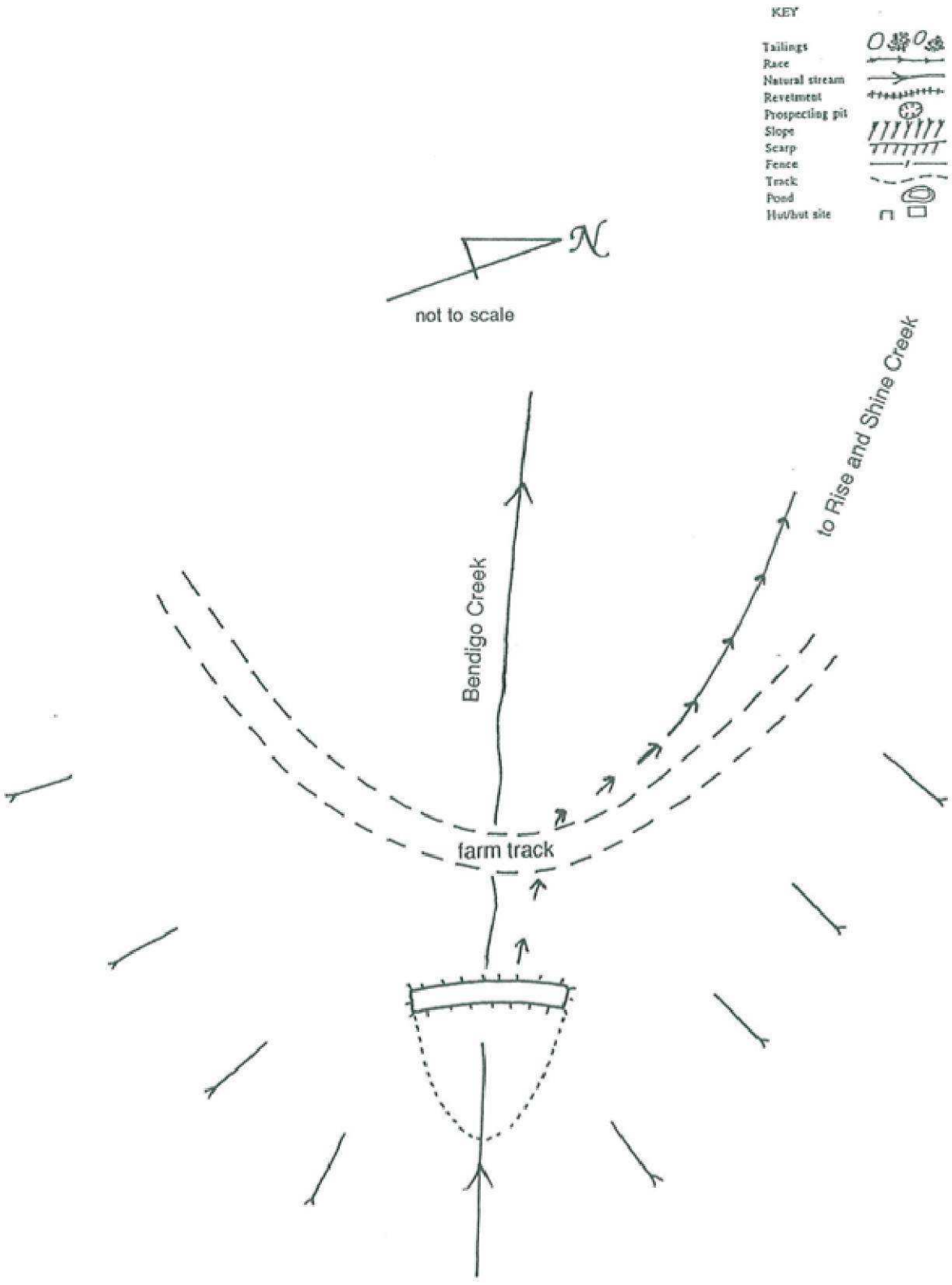


Figure 10a The small dam on Bendigo Creek at the head of a branch race for the Eureka/Come In Time battery sites.

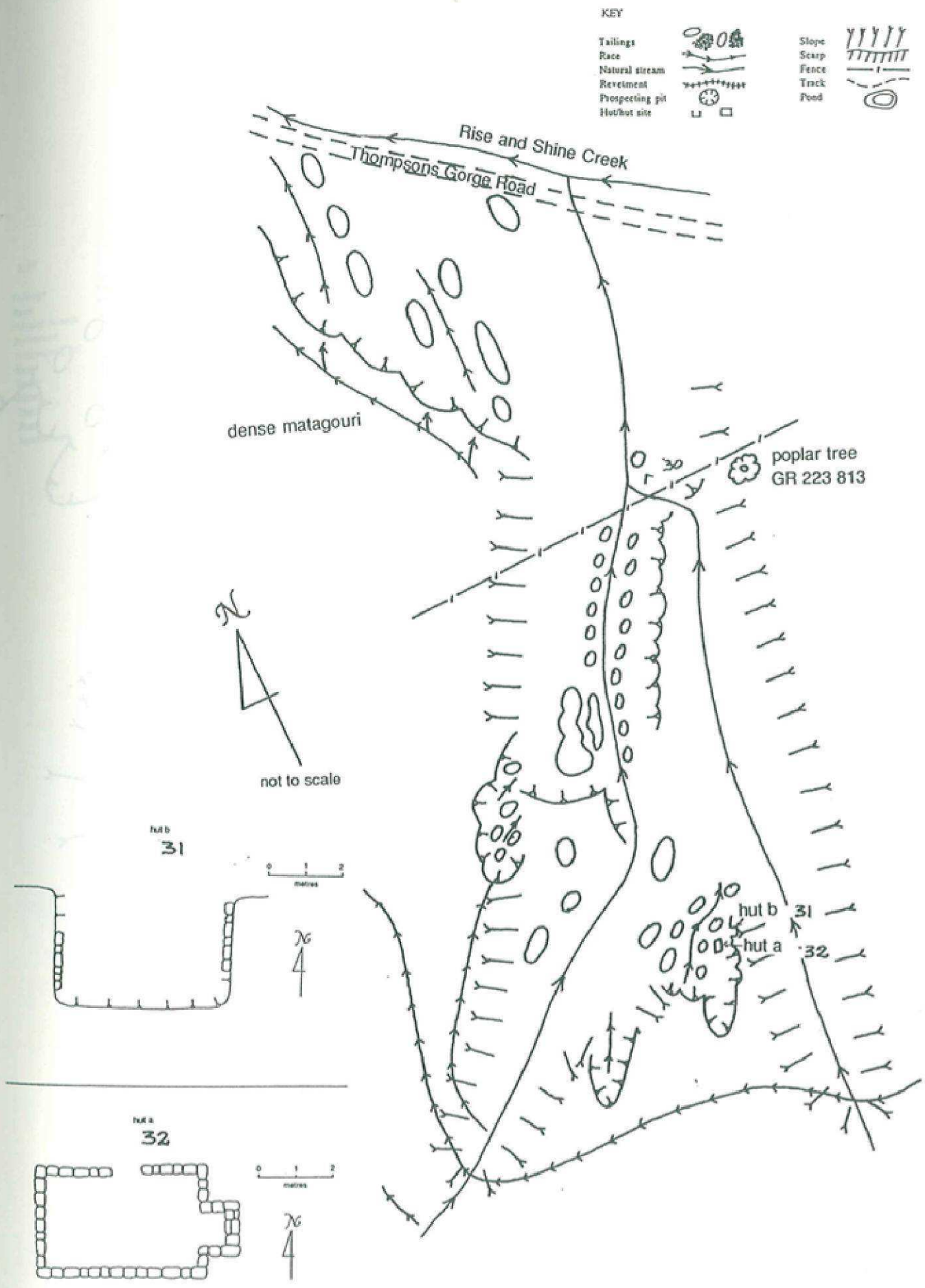


Figure 11 Alluvial workings in the eastern gully in the upper flats of the Rise and Shine Creek. The numbers are record numbers of the huts.

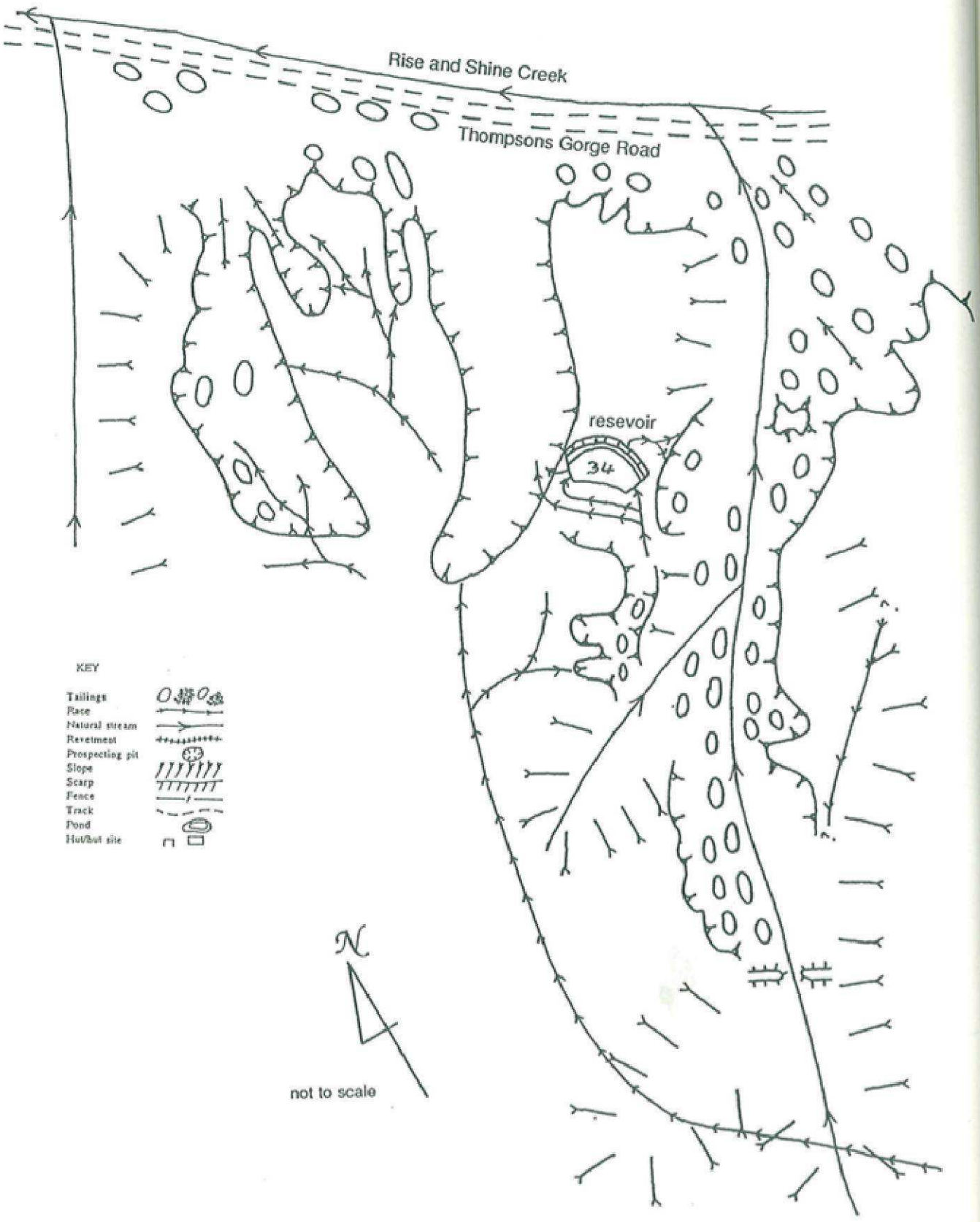


Figure 12 Alluvial workings in the western gully in the upper flats of the Rise and Shine Creek. The reservoir (S125/34) is shown in more detail in Figure 15.

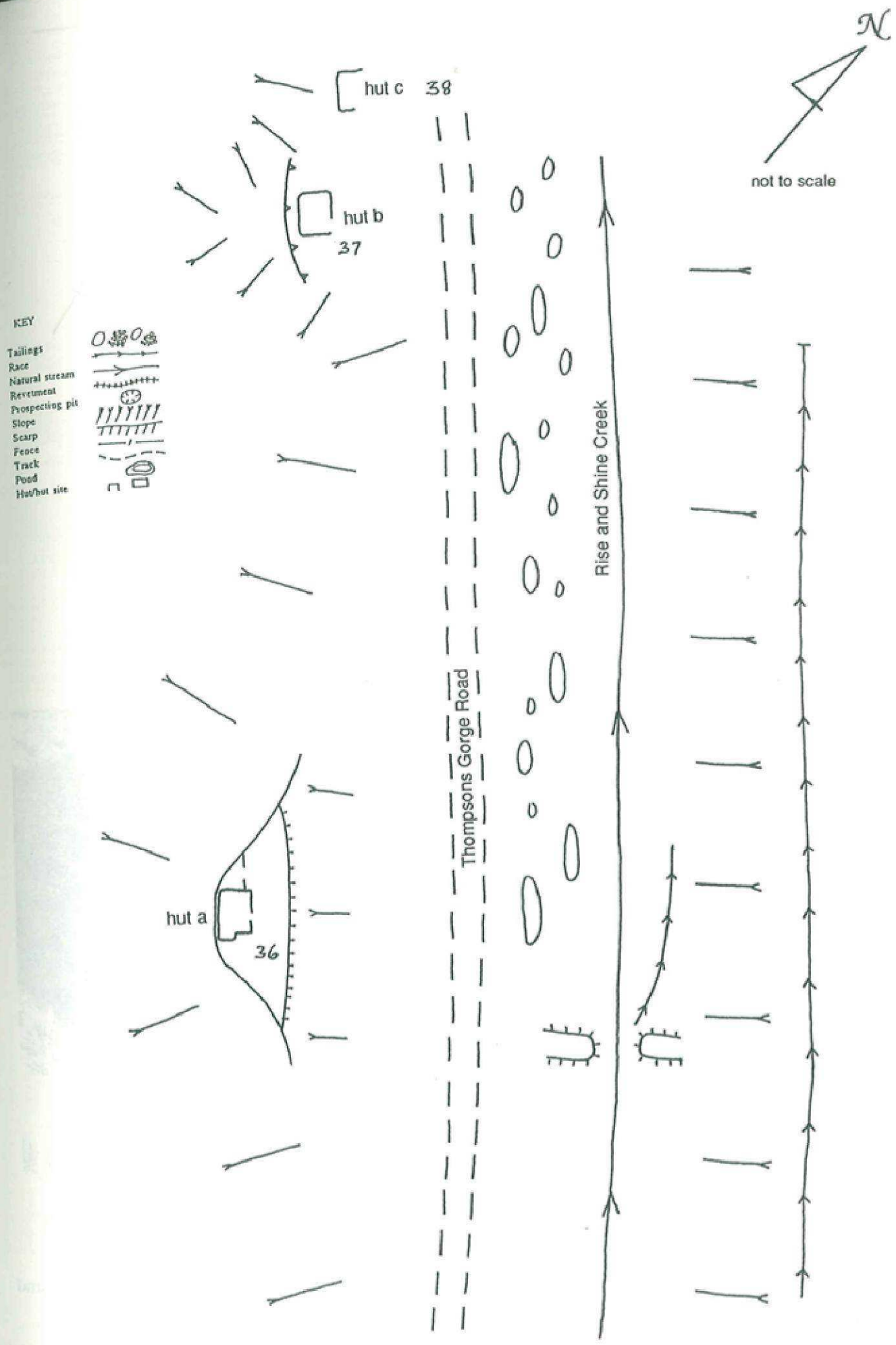


Figure 13 Some of the sites in the settlement near the northern end of the upper flats of the Rise and Shine Creek. See also Figs 14 and 14a.

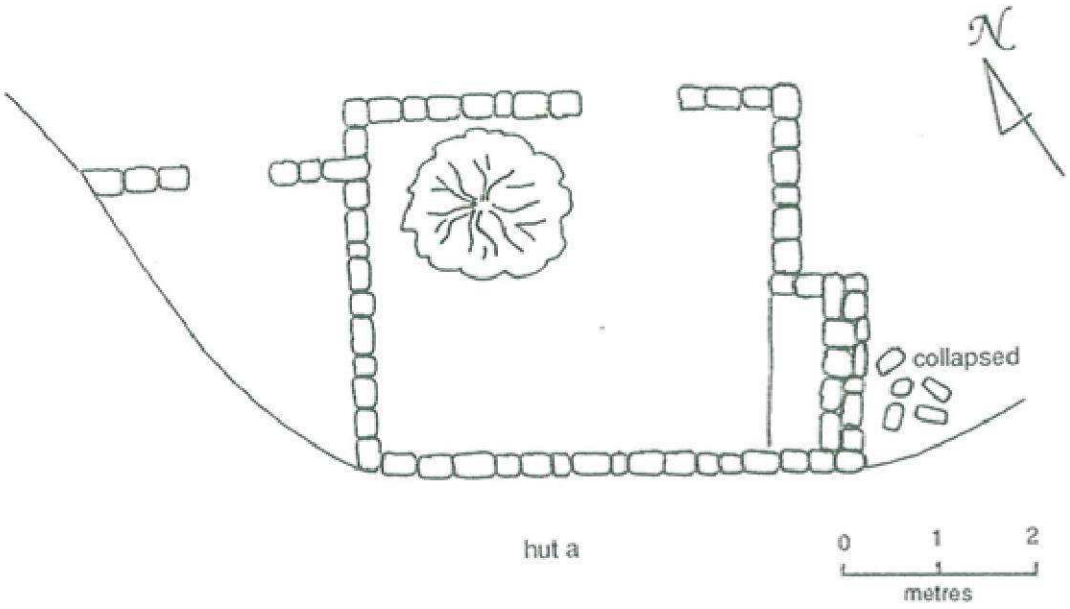
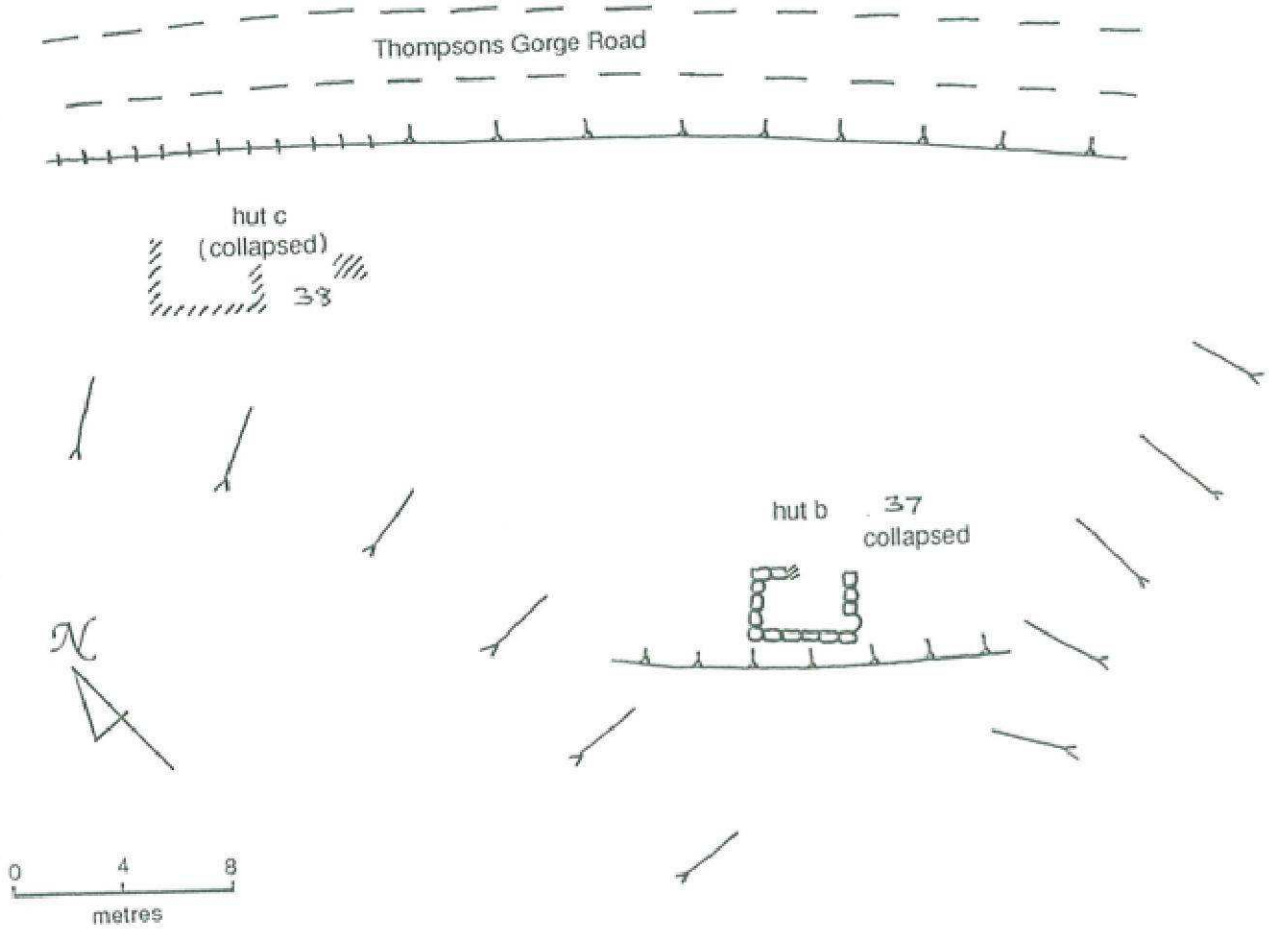


Figure 14 Plan and photograph of Hut a in the main settlement on the upper flats of Rise and Shine Creek (Record S125/36), which had a magnificent lintel stone over the fireplace.



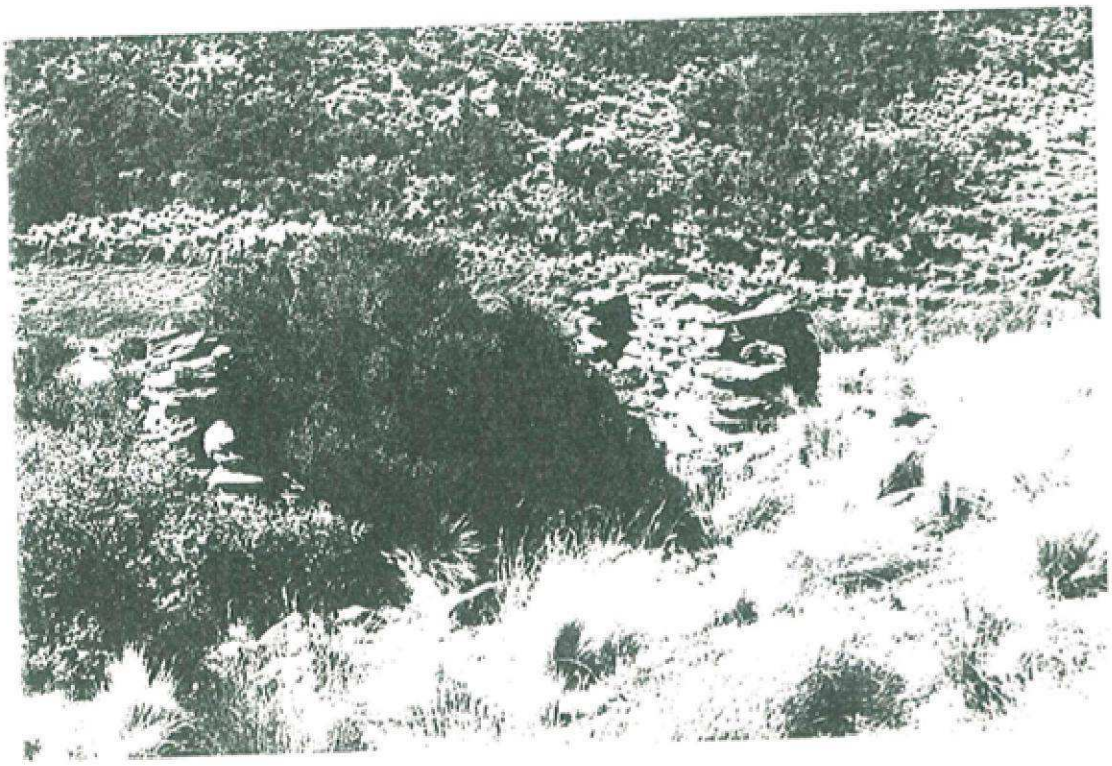


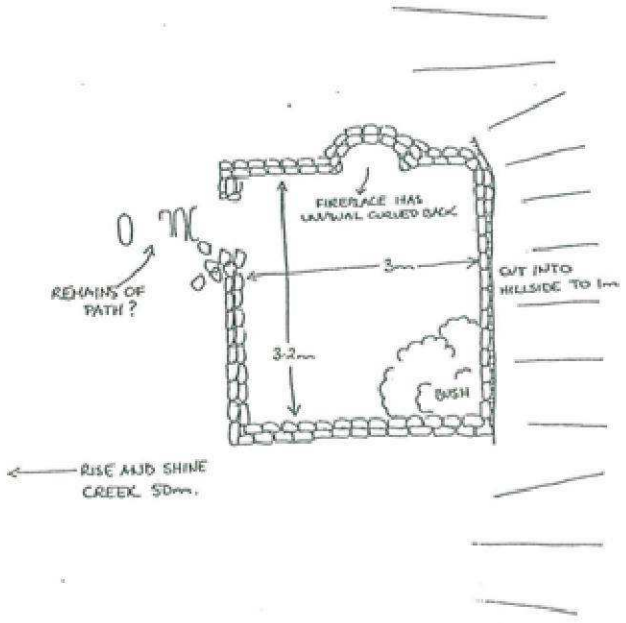
Figure 14a Plan and photograph of Hut b in the main settlement on the upper flats of Rise and Shine Creek (Record S125/37. The rounded back to the fireplace on the right does not show up well in the photograph.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number	S125
Map Name	St Bathans
Map Edition	1st 1969
Grid Reference	213 820

SITE NUMBER S125/37
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

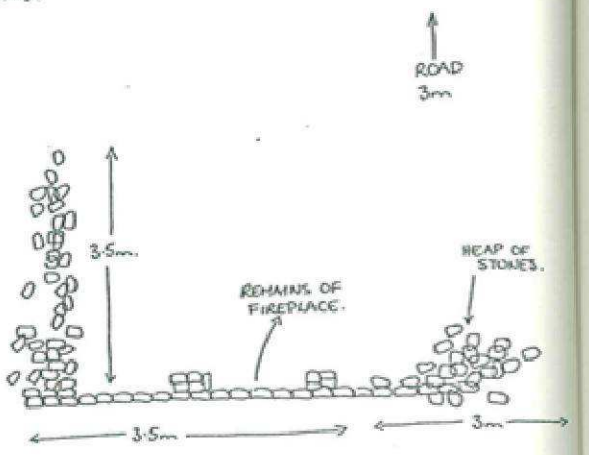


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number	S125
Map Name	St Bathans
Map Edition	1st 1969
Grid Reference	213 820

SITE NUMBER S125/38
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

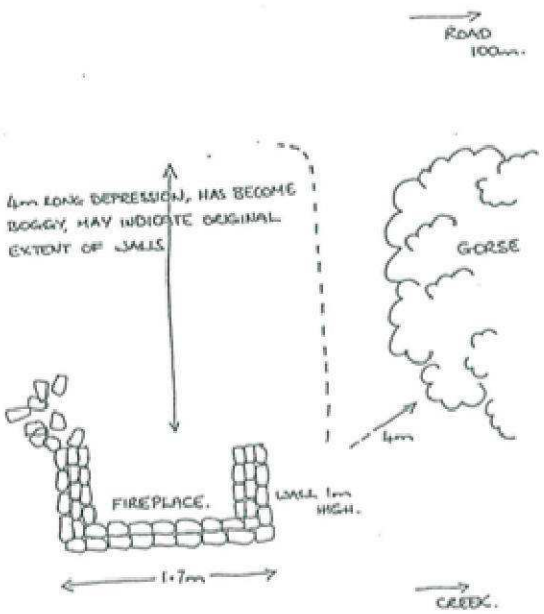


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number	S125
Map Name	St Bathans
Map Edition	1st 1969
Grid Reference	214 810

SITE NUMBER S125/39
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number	S125
Map Name	St Bathans
Map Edition	1st 1969
Grid Reference	212 820

SITE NUMBER S125/40
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut/fence?

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

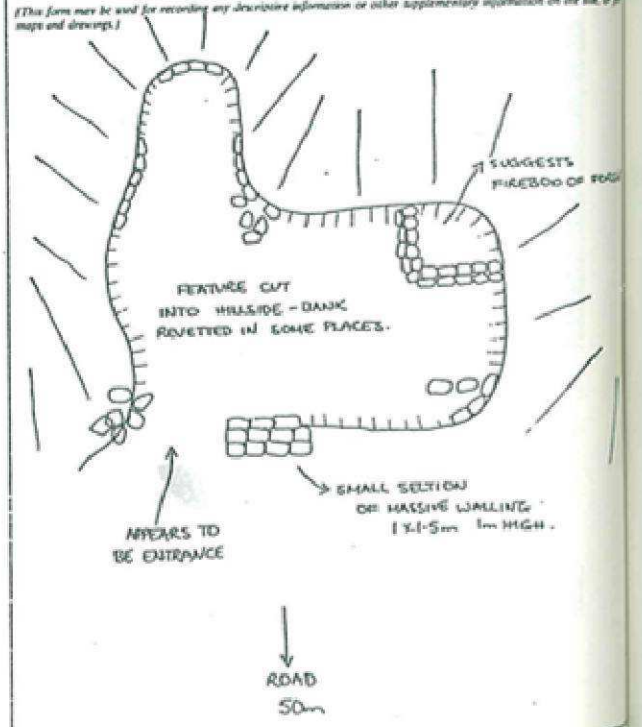
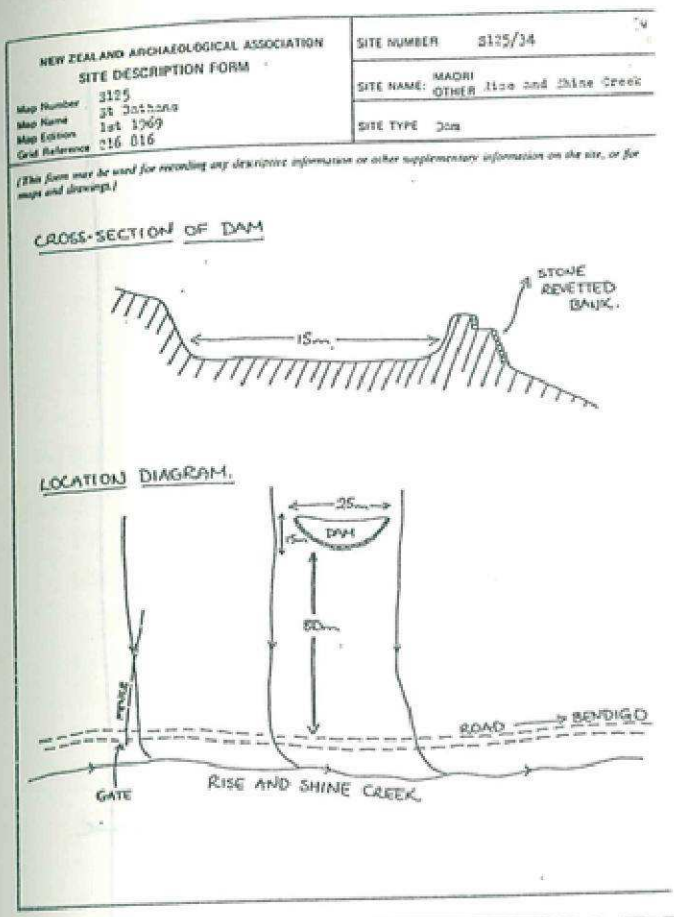
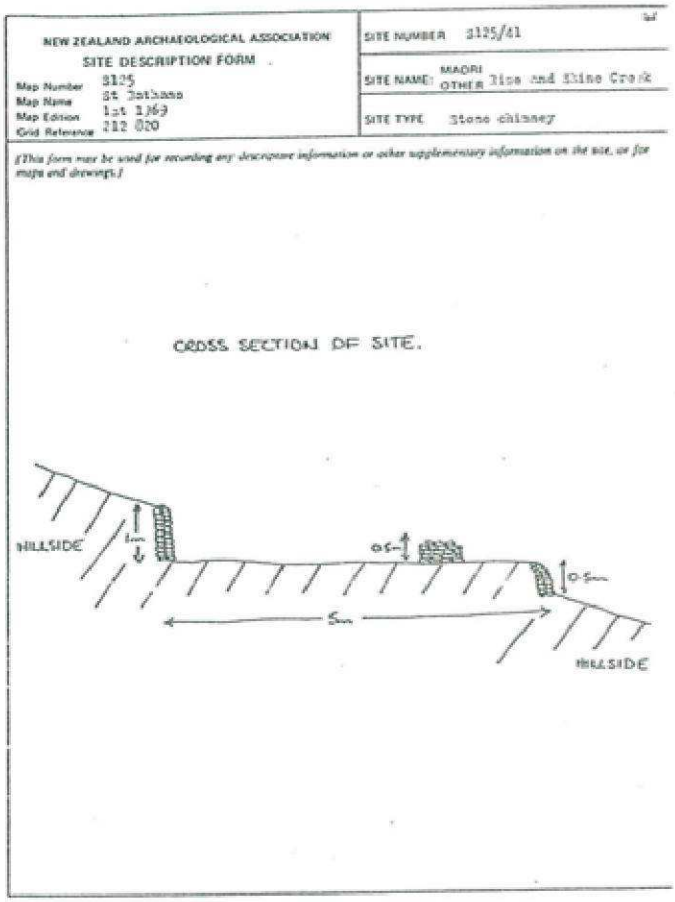
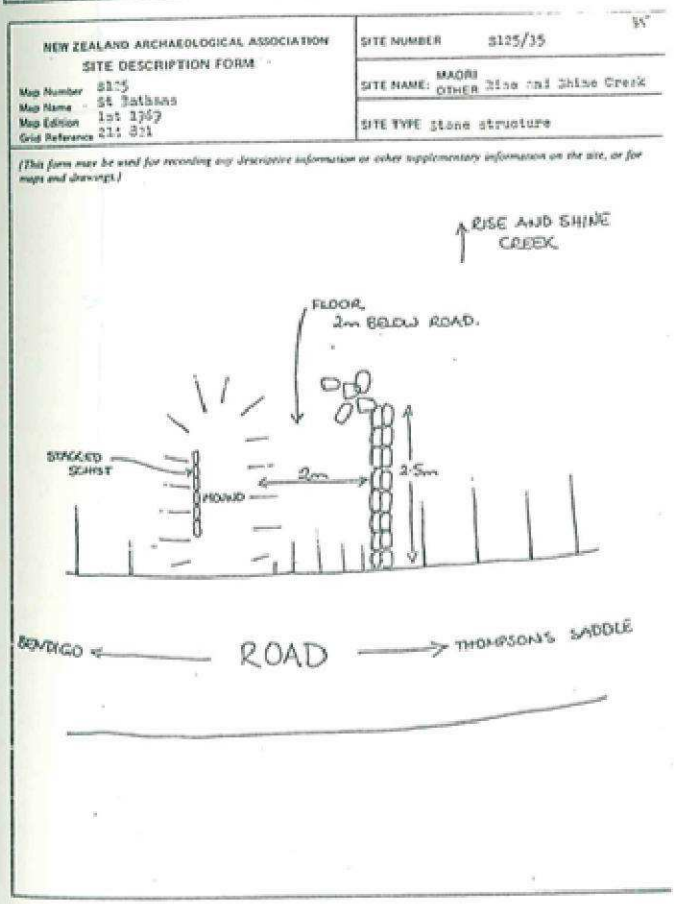


Figure 14b Site record forms of huts and structures in the main settlement on the upper flats of the Rise and Shine Creek.







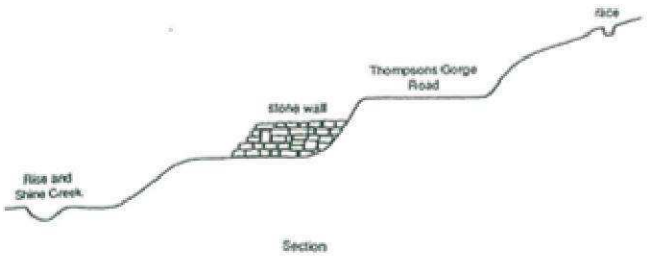


Figure 15 Structures on the upper flats of Rise and Shine Creek
Upper left: The reservoir in the western gully as drawn in 1980.
Right: Two areas of revetting, walling and a chimney, above and below the road at the north west end of the main settlement.
Lower left: This site may be stone wall recorded in 1990 and shown on lower right.

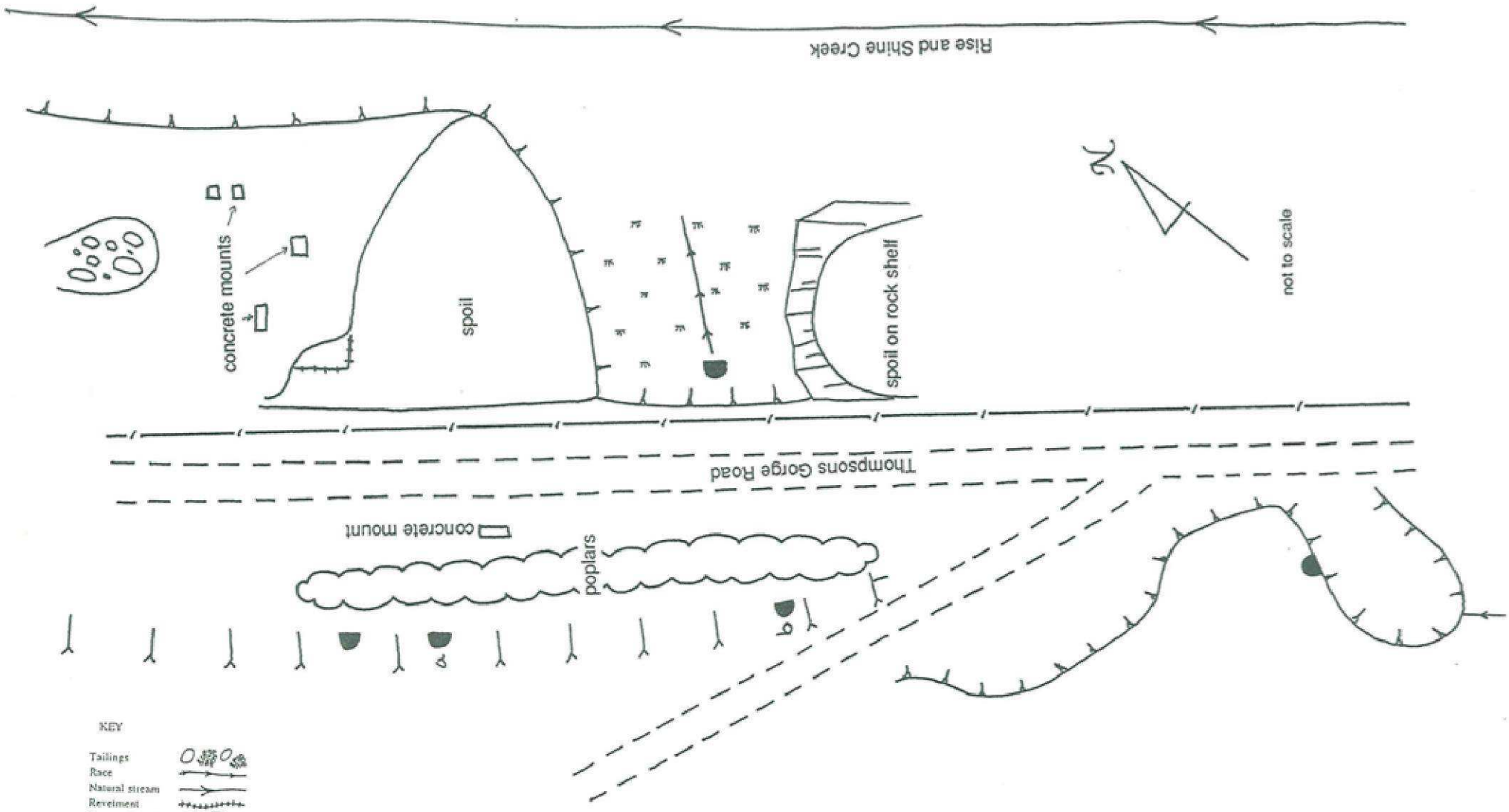


Figure 16 The foundations of a battery and location of drives in the north west end of the upper flats of Rise and Shine Creek. This is thought to be the site of McLaughlin's battery. The track to the west runs to the cattle yards and the second battery site.

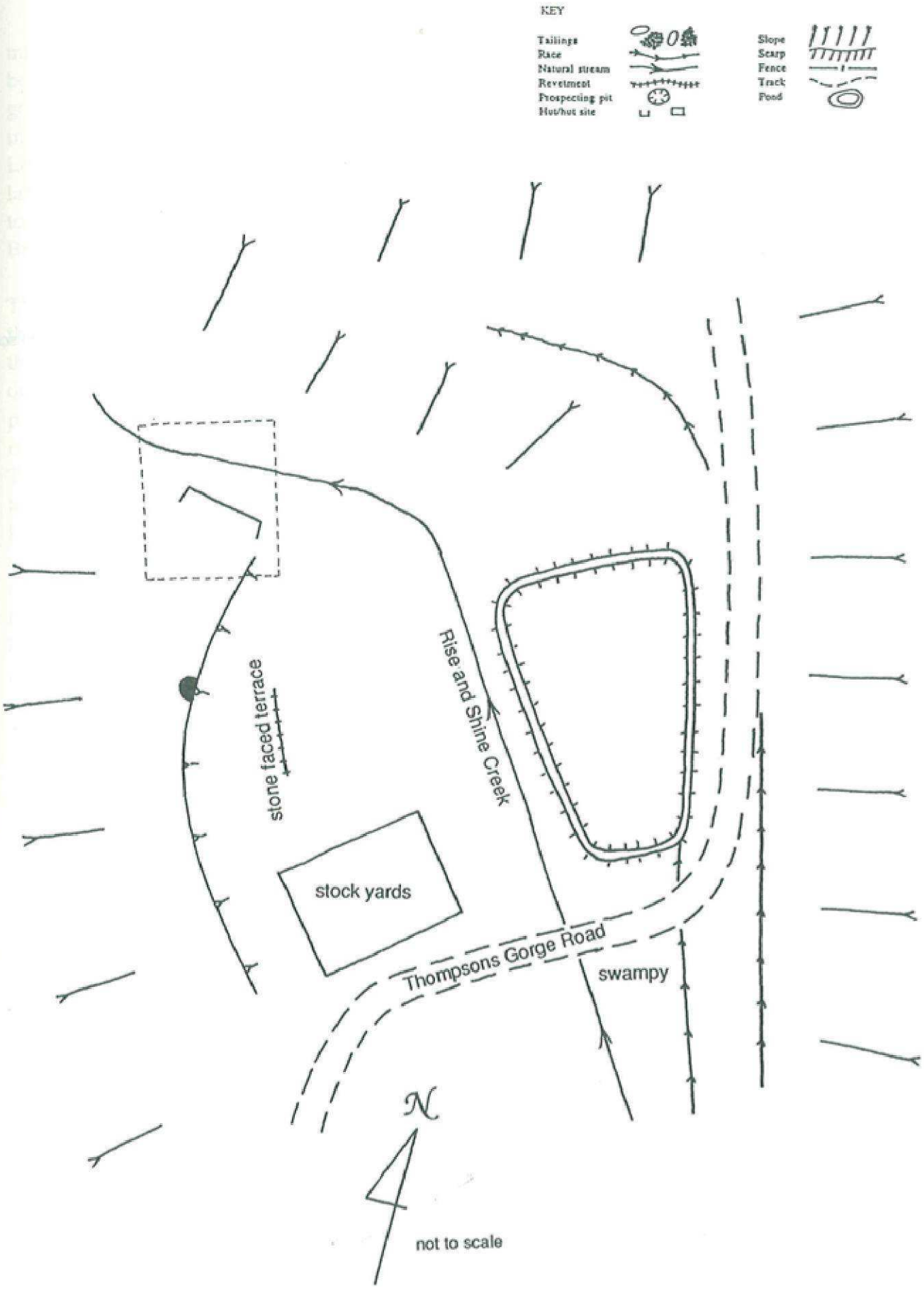


Figure 17 The big reservoir, races and second battery site at the north west end of the upper flats of the Rise and Shine Creek. The battery site is shown by a dotted rectangle, drawn in detail in Figure 18.

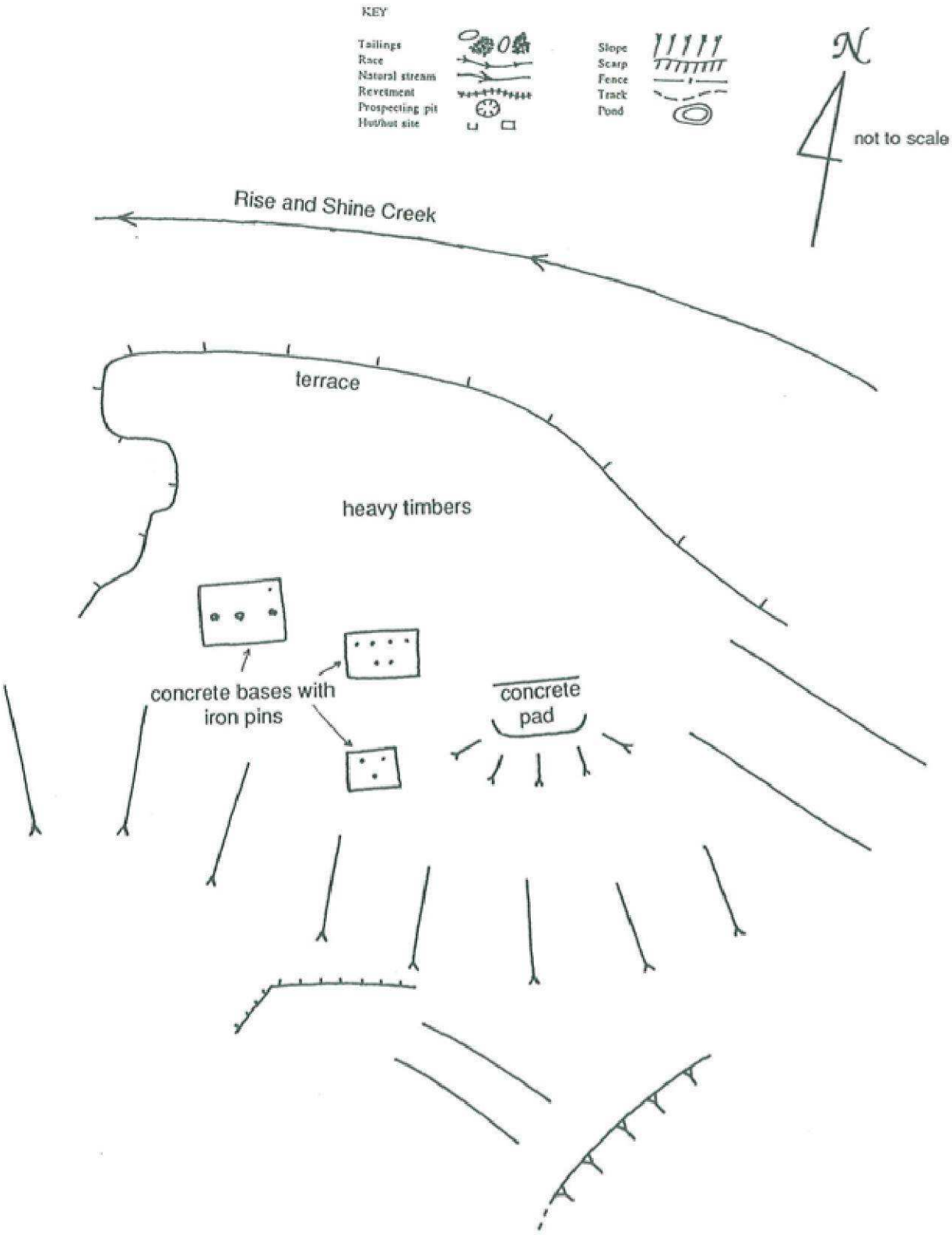


Figure 18 The Rise and Shine battery site. This is thought to be Logan and Camero battery used in the 1930s.

mine returned enormous dividends, up to 6,000 pounds to each partner, and continued to be prosperous in the 1870s. For the six months to July 1870 they obtained 8,129 ounces of gold, and when William Garrett died his estate realised about 3000 pounds on his shares in various claims. In 1875 B R Baird was partner with Logan and Goodall. When Thomas Logan sold out, his share of about one third of the mine was worth 15,000 pounds, a very large sum at that time. Altogether Logan and his partners were said to have obtained gold to the value of half a million pounds (Handbook of New Zealand Mines 1887:41). The Bendigo workings were critical in the early development of Cromwell.

The Cromwell Reef which Logan and his partner worked was one to five feet wide and their main workings were at a level of about 1500 feet asl, that is about the lower edge of the Bendigo reserve. In 1875 Ulrich (Appendix 1) described the reef as the richest and best defined in the province, extensively worked for half a mile (800 m) and traceable for perhaps another 1200 m along the strike. There were at least six reefs in main group running roughly east west and named:-
The Hit and Miss reef, the Cromwell Reef consisting of a complex of lodes (the Main lode, North, South and Bee lodes), the branched Aurora Reef, Anderson's, Lucknow, Bradford Reef and Guiano (or Guano) Reef (Fig.2). The pattern of the reefs form an L-shape on the hill, with the foot of the L running across Aurora Creek and down to Bendigo Creek. The reefs have well defined walls with clay casings but are not solid quartz. They include irregular blocks of mullock (Ulrich 1875). It is not easy to place the mining licence as outlined in Figure 2 on the modern topographical map but the position is shown in Figure 1b, as well as the boundaries of the reserve, as well as possible. It is apparent that the lower reefs of Guano and Bradfoot are probably not within the reserve, but the old shafts and trenches at the western ends of Lucknow and Andersons probably are. The Logantown buildings are on a sheltered flat among the main workings and Welshtown on the hill above.

Perriam and Barnes had started exploring the Aurora Reef in the 1860s, though Perriam probably spent more time at his Kawarau and Lowburn stores. Barnes and party on Aurora Reef put in the second eight-head battery, also down at Bendigo near the Solway battery. It had a 26 foot overshot wheel and would obviously have needed a lot of water. By the end of 1869 there were 500 miners at Bendigo and about 52 claims, not all of them quartz claims. The claims were surveyed by George and Bates, and later by Alexander Mackay, District Surveyor (Figs 2a , 2b). John Perriam put in third battery of ten stamps, the Aurora battery, beyond Logantown., using water brought in a long race from Devils Creek for a large overshot wheel (Fig.8). A smaller mine, the Golden Link was developed beside the Cromwell reef of Logans and the two mines employed 40 miners in 1871.

The Lucknow reef was mined by a small company formed in 1870, using a five-stamp battery driven by a pelton wheel, but returns were poor and worked ceased about 1877 when the plant was sold and presumably shifted.

In 1877 the Aurora Battery was bought by the Cromwell Company who now owned the main reef. Since there was still no surveyed road up to Logantown they had to maintain the road for their drays. They decided to use parts of both their Solway and the Aurora Battery to build one up at Logantown. It was opened in 1878 and named the Matilda battery after Miss Matilda Goodger (Fig. 7a). It was driven both by steam power from an eighteen horse-power engine and from a water turbine, driven with water from the south.

Industrial strife as well as poor returns destroyed any further hopes of making a fortune and the company went into liquidation, selling up all the stock in 1884.

A new company was formed in the mid 1880s which sank the No 2 shaft, a huge shaft 2.7 x 1.2 metres across. Its property of 76 acres ran right down to the creek and included the Aurora, Lucknow and Guano reefs. They were forced to sell to a London company in 1887, who continued sinking the No.2 shaft and who actually began the low level adit which was to drain the reef and provide a level exit for stone (see below). This company, with a capital of 100,000 pounds, timbered the No 2 shaft down to 90 metres, refurbished the big 20 stamp Matilda Battery, repaired the water races, installed four new berdans to treat the tailings, and installed winding, air-compressing and pumping machinery on heavy timbering in substantial buildings. The main rods of the pump were heart kauri, about 22 cm square, and in sections 250, 214 and 70 feet long, and kept going night and day to lift the water out. Though they observed the safety rules, William Campbell was killed in 1892. They brought in the two rock drills of the latest design as well as an "electro-dynamic exploding apparatus"! (Presumably this was a battery and detonator to replace the old slow-burning fuse.) They did get substantial amounts of gold from some of the leaders that they worked such as a leader at 197 feet down, where they opened out a chamber and ran a cross-cut level. They also followed a small lead for 50 feet at a higher level, about 100 feet from surface. The shaft went down to 534 feet (178 metres) all told. Their races include the one from Devils Creek with 14 heads and coming in 160 feet above the workings to drive both a pelton wheel and a Whitlaw turbine, mostly for the pumping machinery. The winding machinery was a 15 hp turbine and 16 hp steam engine. In 1897 they had a claim area of 137 acres, with three levels opened up at 115, 420 and 520 feet, which produced 262 ounces of gold from a work force of 20 men. The company gave up in the mid to late 1890s and the mine was leased to tributors. (Under this system a percentage of the takings was paid to the owners of the mine only if the miners earned more than about two pounds per week.)

The tributors in the late 1890s struck a rich patch and got out 3451 ounces during 1899. They put down a third shaft on the main line of the reef, 600 yards east of the main shaft, but by the following year had closed down. Professor Park drew up his map of the mine at this stage (Fig.2) and shows the underground workings in detail. (Note that the vertical section runs with east at the left hand side of the page.) In 1902 a group set out to work the tailings with the cyanide process on lower Bendigo Flat, and worked through 477 tons of tailings by erecting a small vat and throwing a wing dam across the creek. They did not last much more than a year. When J Stevenson, the Dunedin engineer, bought the mine in 1907 he repaired the races yet again and did some sluicing on the terrace beside Bendigo Creek. A new group of miners in 1910 continued the low level adit with no results and the mine closed until 1933 when an Unemployment Board subsidy was used to continue driving the adit until the claim and plant were closed finally in 1938.

The Great Drains

Even by 1870 all the workings on the main reefs were getting very deep, and pumping water from them was very expensive. In 1871 it was proposed to drive a low level adit about 800 feet below the top of the main shaft on the Cromwell lode to cut across all the adjacent reefs at a low level and avoid the problem of water filling the shafts. Described by Ulrich (1875) as a spirited and highly promising prospecting exercise, the adit had been driven only three or four metres into a "high precipitous mountainside" when Ulrich (who lived in Melbourne) saw it in 1875. In the end two adits were driven, one from Bendigo

Creek as shown on the both the 1876 and 1907 maps and one from Specimen Gully (not shown on any surveys so far located). Confusion between them has caused some discrepancies in accounts of work on them. In the 1876 map (Fig.2a) a tunnel is shown running about 100 metres from the bed of the creek to the edge of the Deep Level Company property which encompassed the Guano and Bradford lodes. In the 1907 survey (Fig.2) the first adit is shown as extending only 130 metres from Bendigo Creek and had apparently not even reached the Guano Reef, the most easterly of the group. The proposed extension of the full 1900 feet was still sufficiently alive to be shown on the 1907 map.

The adit in Specimen gully unfortunately was not shown on the 1907 survey, presumably because it started outside the claim area. It certainly exists on the ground. According to Parcell (1951), a Cromwell company started it in 1888, about 260 m down the hill from the Matilda battery and drove 130 metres before running out of capital. The 1910 and 1930s workings concentrated on driving this adit and Charles Todd , using Unemployment Board subsidies extended it to a total of 2,100 feet (about 640 metres). The archival evidence suggests that both the old and the new adit were very similar in length and driven in probably roughly parallel to drain different sections of the Cromwell reef.

Alta Reef and Rise and Shine Creek.

The history of work in the Rise and Shine Creek is very complex and the following is the most "economical" correlation of Duff's (1978) account and the warden's reports with the local topography and known sites.

The geological structure in Rise and Shine Creek is described by Park (1908) as an impregnated shear zone, rather narrow quartz reef. It runs from the edge of the Tarras terrace, across Thomsons Saddle and into Thomsons Creek where shafts were sunk about five kilometres from the Saddle on "a bunch of small leaders, without meeting with payable results" (Park 1908). Park does not show this extension on his map but he continues in the text to remark that the zone was probably one of the sources of alluvial gold at Tinkers (Matakanui).

In 1870 Williamson and party found the Alta Reef which included scheelite, to the east and well separated from the Bendigo reefs (Figs 2a, 2b and 8). The company erected a battery in Rise and Shine gully with a race to drive the machinery, and a tramway from the reefs to a chute above the battery (Duff 1978:82). The scheelite hindered recovery of the gold and the plant closed down and the machinery was sold in 1874. The Eureka Company took over the battery and opened a drive much further up the range. They formed a mile long tramway down to the battery (Fig.2b) and possibly also constructed the longer race. However they were also unsuccessful and closed down after two years (Duff 1978: 84). (The 1876 map make sense of the warden's comments quoted by Duff, in that the Eureka battery is close to the Alta claim and a long way down valley from the drives on their own claim.)

In 1880 John Kane, who carted coal from Bannockburn to the reefs, distinguished part of the Rise and Shine reefs as the Come In Time Reef on a a sharp ridge between the Rise and Shine and Shepherds Creeks. This is the ridge along which the present road runs. The old five stamp Eureka battery was shifted across the creek, probably on to the present site. (This was the first shift for the Come In Time. See Fig. 8a) A double tramway and a steel rope conveyed the ore from up on the hill down to the battery. The first washup

gave the poor results of 110 ounces from 350 tons (over an ounce per ton had been expected) and the company was wound up in less than a year.

In 1902 according to the warden the Eureka battery was shifted back across the creek and over the ridge to the Alta claim. (This was the second shift.) It consisted of 5 heads worked with a seven hp engine. Water for the tables was brought from Clearwater Creek and higher up in Bendigo Creek via a four mile race. A shaft was sunk 35 feet on the reef and a level driven in from the battery area (AJHR 1903, C2-109). Though 100 tons of stone was taken from the drive, the results were patchy and by the following year there was only one man prospecting the scheelite ore (AJHR 1904, C2:66). By 1906 the mine was closed and the diesel engine sold to Morven Hills to generate power for the station (AJHR 1906, C2: 61). It is likely that this battery is the one still falling to pieces on the Alta site.

In 1907 the big mine up the hill was finally selling off all its machinery (AJHR 1907, C-3:35) and J Stevenson of Dunedin Engineering works acquired some of it for alluvial sluicing down in Bendigo Creek. The following year the Come In Time reef was prospected again, and the company involved bought part of the Matilda battery (AJHR 1909,C3) and shifted it to the present site. Though tests were favourable the work did not pay.

The final work on this section of the reef was done in 1912-13 during the scheelite boom before the 1914-18 war, when Sandy and Jack Cameron used an aerial tramway to lower quartz from the Alta Reef to the recently re-erected Come In Time battery with moderate success until the good stone ran out (Duff 1978:82). This scheelite would have been sold to Germany.

If this historic account is correct, the present ten-stamp battery on the Come In Time site was originally part of the larger Matilda Battery which operated in Specimen Gully from 1878-1905. Part of the battery was shifted over the hill to the Come In Time site about 1908 (this was the third and longest shift) and used for only one year, until the Cameron's used it about 1912 to 1914. The site itself, the stone walls and revetments such as the double roadway, date from 1880. There is no indication that this battery was resurrected during the 1930s.

Though the old Eureka claim was worked down to a battery site beside the Alta claim in the 1870s, the twentieth century miners decided they could work a battery right beside the claim. McLaughlin put a five stamp battery closer to the mine as late as 1910 and worked it successfully for a year or two (Duff 1978:82). Again in the 1930s more shafts were driven and even a five stamp battery installed, driven by a diesel motor, and placed about 400 metres from the mine. (This battery was removed to the Golden Terrace Mining Village at Queenstown.) Some of this 1930s work was done by two second generation miners, William Cameron and George Logan. With the help of a government subsidy, work by subsequent groups lasted until 1943, the last workings on the whole field until the 1980s.

Dredging

There is no record of dredging on the Bendigo flats during the main boom at the turn of the century. During the 1930s the Bendigo Gold Light Company bought a dredge from

Waikaka to work the alluvium at the mouth of Bendigo gorge. Fulton and Hogan dug a pond for the dredge, using a traction engine, but the ladder of the dredge was not long enough and there was trouble with disposing of the tailings. The dredge worked for only about a year and was dismantled and sold for parts.

Chapter 6
The Field Evidence

The sites will be described from the top of the Rise and Shine Creek, down Bendigo Creek to the mouth of Perrys Creek, the sites in Perrys and Aurora Creeks, the sites in Bendigo Creek down to lower Bendigo Creek and its lower tributaries and a few in School Creek.

The upper flats of Rise and Shine Creek

Alluvial workings

The flats in the upper valley of Rise and Shine Creek (732 metres asl) are remote and beautiful. The gold here derives from a shear zone, and has been deposited into wide low terraces along the true left of the creek, where it has been worked by ground sluicing (Figs 9-15). Though it is likely that most of the alluvial workings were completed in the 1860s by the group of Swedes, it is possible that some minor work was done right through to the 1930s. Though not walked to their sources during the survey, the topographical maps (Fig.1c) show two races sneaking over the divide to carry water from the upper tributaries of Thomsons Creek into the top of the Rise and Shine. One or both will be the race of 12 heads built by the Swedes in 1867. These races were carried along the upper slopes and provided good fall to sluice side gullies on the true left of the Rise and Shine Creek. There is a suspiciously large race on the true right of the creek as well, and it may also have been fed from Thomson's Creek. Since there are virtually no sluicings on the true right this race must be heading for the batteries at the lower end of the flats. The workings along the flats divide up into relatively discrete groups (Fig.10).

The most eastern of the gullies (Fig.11, Record S125/29, GR223813) contains sluicings running up the hillside for more than 500 m from the road. Traces of a pack track come down the hill to the true right of the gully. There are sluice faces up to 6 m high, but the dense growth of matagouri both protects and obscures the details, particularly the course of the races and any small head reservoirs. Three hut sites were located, one of which had been partially destroyed by bulldozing for a fence prior to the 1980 survey. A corner of its stacked schist walls still stand about one metre high close to a poplar tree (Record S125/30). Further up the gully, there is a relatively intact stone hut, 5 x 3 m, almost buried in briar and matagouri (Figs 9 and 11, hut a, Record S125/32). Its chimney still stands 2.5 m high, the side wall 1 m high and the other gable 2 m high. The outer wall of the high fireplace has partially collapsed, and the fireplace was blocked up with stone when seen in 1980. The door faces north to the creek. Below it a smaller hut, 3 x 4 m, was cut into the bank with revetted walls on three sides, the revetments now only 60 cm high but probably once extending up the full 1.7 m height (Fig.11, hut b, Record S125/31).

The next large gully to the west has even more extensive workings (Fig.12), more thoroughly concealed by matagouri over miniature "badland" topography, running for about 800 m up from the road. A complex of head races brought Thomson Creek water to the tops of the faces and to a small dam (16 m long, 1.5 m high, now broached) at the top of the gully. Relatively low down in the sluicings there is a well-formed reservoir (70 m long, 20 m deep) with an earth wall 3.4 m high in the middle and revetted in two steps on the outside (Figs 9, 12, 15, Record S125/34). A very complex network of races carried water to the reservoir and across the slope above it to the sluicings below. The 1980 survey found traces of a forge or fireplace in these sluicings, 40 m from the road, consisting of stone walling 1 x 1 m square and 50 cm high (Record S125/33), but it was not relocated.

For some reason, no definite hut sites were found within the western set of sluicings. They could have been concealed by the matagouri shrubland or else the miners lived just down the road in the main settlement of huts (Figs 13 - 15, Records S125/35-41). These run along the creek above minor sluicings on the true left bank of the creek and include five or six huts with stone walls and/or stone chimneys, as well as an area of stone walls and terracing which may have been for a forge and loading area. The sluicings in the creek below may have been worked from a dam across the creek (15 m long and about 1.5 m high, now broached), but a race takes off from the dam and runs downstream on the true right as if heading for the battery sites. It is paralleled by a higher race which came out of the Rise and Shine higher up (Fig.13). Some of this water may have been taken right down to the Come In Time battery.

The most intact of the huts in the main settlement is 4 x 3.5 m long (Fig.13, Fig.14 and Record S125/36), with a chimney still 2 m high (though about to collapse), and a massive 1 m lintel stone over a fireplace, 1.5 m wide and 1 m high. The side walls were cut into the bank and have little stone work left but the west gable is still 2.5 m high. Its front door faces north to the road and the creek is 20 m away. The hut and its small annex are built on a terrace (10 m long and 6 m deep) cut out of the slope and revetted along its front edge.

About 100 m north west down the valley are the remains of two other stone huts (Fig.13, Huts b and c, Fig.14a, Records S125/37 - 38). Hut b (Fig.14b) is particularly interesting because it has a curved chimney similar to the unusual chimney at the old Morven Hills Tarras woolshed site (Fig.4). Rather than assume that Hut b was a Morven Hills musterers' hut set in the middle of the gold miners' huts, it would be more parsimonious to suggest that the huts were built about the same time by the same man, possibly one of the Swedish miners. Built of schist slabs, the hut is set on a terrace up to a metre high at the back. The walls enclose an area 3 x 4 m and still stand 1.9 m high at the front but only 0.8 m high at the back. There are traces of a path leading down from the door towards the road 20 m away. The wall beside the door opening is broken down, but the hut seems to have deteriorated very little between the 1980 and 1990 surveys. The hut nearby, Hut c (Figs 13, 14a, 14b, Record S125/38) is 20 m away, and though in much worse condition may be the remains of a much larger hut, up to 4 x 5 m, with the remains of the chimney and fireplace only 0.7 m high.

About 150 m north of Hut c and below the edge of the road there is a section of stone walling (Fig.15) about a metre high and three metres long, which in 1980 was described as associated with another smaller revetted mound 2 m west (Fig.15, Record S125/35) It may also be related to another site recorded in 1980 (S125/41), consisting of a levelled area, 5 x 8 m, revetted front and back with a stack of stone 50 cm high which may be the remains of a chimney. This site is recorded at the same grid reference but is 40 m up the hillside above the road. Above it again, the 1980 survey found an irregular terrace cut back into the hillside with what appeared to be the remains of a forge at the back of a terrace and a small section of massive walling, 1 x 1.5 m across and 1 m high, near the front (Record S125/40, Fig.15). Unfortunately the 1980 survey did not make plans showing the relationships of their sites to one another and the physical features of the terrain, and sites 40 and 41 were not relocated in 1990. Likewise Site S125/39, a fireplace 100 m from the road and about 150 m south east of Hut a (Fig 10) was not

relocated. All that remained at this site was a wide fireplace (1.7 m) still standing 1 m high on the south east side of a flattened area about 4 x 3 m. It is near some dead trees and 3 m below a race crossing the hillside.

The old Eureka quartz workings and associated sites

The next group of sites on these flats are very different, consisting of the remains of batteries and drives connected to quartz mining. Ulrich (1875) noted three drives but does not say where the ore was processed, and does not comment about the Eureka tramline. As noted above the first quartz miners put drives into the Eureka Claim about 1874 (Fig.2b), and took the stone 1.2 kilometres down the valley by a tramline. It was later miners who built at least two separate batteries, of which only the concrete bases now remain. McLaughlin's 1910 battery is identified as the more eastern one beside the road (Fig.16) on the not very sound basis that Cameron and Logan's 1930s Rise and Shine Battery was removed from the site further down the creek (Fig.17).

The race which came down the true right of the Rise and Shine Creek probably crossed by a siphon near the huts shown in Figure 13, since a race of similar size appears on the true left. There seems to have been a house terrace on this race about 400 m north west of the huts shown in Figure 13. It has been dug over by bottle hunters, who have left behind the usual debris of a nineteenth century hut - broken case gin bottles, broken sherds of stone ware, an enamel basin, pieces of crockery, clear and black glass and sheep bones.

Six drives were located between the two battery sites, the most easterly one driven in from a sluice face. The sluiced pit (20 x 10 m and about 6 m deep) runs up off the road, and the drive, 1.5 m in diameter, seemed to run in only 2 m. The serious drives behind the silver poplars (Fig.16, a and b) run down into a sluiced face at about an angle of 20 degrees for an unknown distance. The spoil from them seems to have been carted across the road to be piled close to the creek, and as is to be expected looks more recent than the alluvial tailings higher up the creek. The most northern pile extends 15 m from road and stands about 4 m high. The drive in the bog above it which might run in under the road is 2 m in diameter and has fallen in. It is not possible to distinguish the drives and spoil heaps of the three different periods of mining. The drives appear to be into silts and alluvial gravels, but presumably the shattered shear zone rock is under the alluvium.

The supposed McLaughlin battery foundations of 1910 consist of a group of four concrete mountings with bolts, each concrete block about 60 x 40 cm across and 20-30 cm high, a typical configuration for a 5 or 10 stamp battery. A revetted area, 3 x 2.5 m, beside them has been set into the spoil heap. Downstream the flattened tailings in the creek bed appear to be alluvial workings. Across the road beside the poplars there is a single large concrete mounting, 200 x 40 cm across and 100 cm high. Since it is 20 m from the battery foundations, this large block could hardly be the mounting for an engine or waterwheel for driving the battery.

These upper flats of the Rise and Shine end in a most complex cultural landscape, from early sluice faces to a modern set of steel cattle yards (Figs 17 and 18). There are at least two battery foundations, the old Eureka mine drives, a large reservoir, assorted alluvial sites and sections of tracks and races.

The flats narrow and the creek turns sharply west and runs into a gorge. The hillside on the the true left has been sluiced back to form a 50 m long face. A drive, 1.5 m high and 1.2 m wide, runs into the base of the sluiced face for only 3 m but may have fallen in. A stone faced terrace, 10 m long, in front of it may be part of early workings, possibly the start of the tramway (see below) from the Eureka workings to the battery 1.2 k down the creek (Fig.2b), or it may just be part of a dray road to the battery site immediately to the north-west (Fig.18). The sluicings are likely to have been the earliest workings, but it is not possible from this survey to say which drives date from the early period of mining.

The battery site is considered to be the one from which the Rise and Shine battery was removed in 1978 (John Perriam:pers.comm.), and the presence of heavy timbers still on a large terrace confirm this (Record S125/42). Three large concrete mountings still have iron pins in them, and there is a concrete floor pad, 3 x 1.5 m, set back into the slope nearby. Above the mountings there is a stone revetted platform, 4 x 2 m across and 1.5 m high, with a track leading to it which could have been the route by which the rock was dropped into the battery. This track is interrupted though by the sluice face, which may have eroded back naturally to cut into it. Considering that the battery is said to have operated until 1943, it is unlikely that there has been serious alluvial sluicing later than that. This is assumed to be the battery operated by William Cameron, George Logan and Frank Austin in the 1930s when they reopened the old Eureka workings. Since all the drives are within 200 m of each other they can be considered to be within the old Eureka Claim as shown on the 1876 map (Fig.2b).

The most enigmatic site is the big reservoir (Fig.17), a complete rectangle of earth walls which are 4 m high at the north end, 1 m high at the southern end and 3.0 m thick at the base. They enclose a space 60 m long, 28 m along one end and 12 m along the other. The wall beside the creek is breached by a 2 m wide gap. A race from further up the Rise and Shine Creek runs into it but no obvious race runs out of it. (The race down stream of it is higher and comes from even further back up the creek). The reservoir is across the creek and slightly upstream of the 1930s battery, and might possibly have supplied it by pipeline (the levels were not checked). It could also be a holding reservoir to supplement the flow of the creek which is picked up by several races downstream, from the early Eureka race down to later ones for batteries on the Come In Time site.

The bench for the Eureka tramway was found during both surveys in a very overgrown state running down the true *right* and crossing again to the true left of the Rise and Shine Creek as shown in the 1876 map (Figs 2b and 10). The bench was 2 m wide and in places revetted up to 4-5 m high. It was obstructed in some places by large boulders which narrowed it to 1 m and appeared to be older than the bench.

Both the Clearwater Creek and the gorge of the Rise and Shine Creek are steep sided and densely choked with matagouri scrub, making exploration of the track and water systems between the upper flats and the Come In Time battery difficult. It is likely though that the intake of the old Eureka Race was found. Two races rise at about GR202829 close to the confluence of the Clearwater and Rise and Shine Creeks. The higher comes from the Clearwater and the lower from the Rise and Shine, and both run parallel down the true left of the Rise and Shine with extensive revetting visible as far as they were followed. If the 1876 map is correct one race shifted over the ridge into a tributary of the Bendigo Creek to run to the old Eureka Battery site (Fig. 10), and the other may be linked to the race which

feeds the Come In Time site. Not far from these intakes and 300 m below the Rise and Shine Battery site, there is a short section of alluvial tailings on the true right bank of the Rise and Shine Creek. Though they extend for only 20 m, the edge of the creek has been revetted up to 4- 6 m high to hold back the 5 m wide stack of rock.

Chapter 7:
The field evidence around the main battery sites
The Eureka and Alta batteries and associated sites.

The last of these batteries, the Come In Time, is still an impressive sight, in a steep gully of the Rise and Shine Creek (Figs 18a, 19, 21 and 21a, Record S124/380). The other battery sites in the gullies nearby must be the Eureka and Alta sites. Since a revetted road and a parallel water race, which can be identified as the Eureka tramway and race, lead down the true left of the Rise and Shine Creek to a terrace described under Record S125/381, it is likely that this was the original Eureka Battery site and the first battery in the area. It fits well with the topography shown in the 1876 map (Fig.2a), and the battery nearby in Bendigo Creek (Record S125/382) fits neatly on the Alta claim on the same map.

In order to show the relationships between the three battery sites, the compilers of the 1980 survey did make an landscape sketch (Fig.19), but they did not record numbers to linked systems of sites. Instead they divided the map into three rectangular areas for Records 380,381 and 382. Hence Record 382 includes the Eureka terrace, race and tramway *and* a siphon for taking water to sites on Record 380.

The Eureka site (Fig.19) is a terrace, 8 x 10 m, which now has only a stone wall, 1 m long and 1 m high, left of the battery installation of five stamps. Since the site is early and in the midst of other workings it was probably robbed of any good building stone. A chimney stands 30 m upstream from the terrace, still in good condition. The first drive and tramway to the battery were not securely identified, but are likely to be the drives around the later Alta battery (Record S124/382) and the revetted road and a cutting leading from the drives over the ridge to the terrace (Fig.19). The cutting considerably reduced the gradient for getting ore to the battery. It was not possible to determine which of the drives on the Alta Reef would have been the one worked by Williamson in 1870 (see above). At least two of these shafts will be those described by Ulrich (1875) as injudiciously used to open the reef. (He considered that the drives should have run in from the other side of the ridge beside the battery.) The 1874-76 workings involved the building of the tramway and race from the Eureka workings.

When the five stamp Eureka battery was shifted over to the Come In Time site in 1880, the warden commented that it was fed with ore via a double tramway and a steel rope from the drive up the hill. Under the description of the Come In Time battery (see below) parts of these early workings are identified.

In 1902 the battery was shifted back to the Alta claim, presumably to the battery site in Bendigo Creek (Record S124/382), which is almost opposite the main set of drives, shafts and spoil heaps. These extend for about 150 m up the creek. Even in 1875 the reef had been abandoned for some years.

In 1980 the remains of the 1902 battery with five stampers and crushing boxes were still present though said to be collapsing. When relocated during the 1990 survey the stampers were still standing. There was also a platform, 4 x 4 m with dry stone walling up to 3 m high about 3 m east of the battery. There was some confusion about relocating the site during the 1990 survey, because it is marked in Fig. 19 as being on the true left of the creek, but described as being on the true right. The 1980 survey shows three shafts up

the hill behind the battery. The 1990 survey described a shaft west of the battery as being 1 x 2 m and about 18 m deep, as well as two adits below the main drive and close to the stream. As shown on the 1980 drawing there is no trace of races running to the battery.

There are the remains of a forge 50 m upstream of the battery (Record S124/383) on a levelled area sheltered by a schist outcrop on the true left of the creek. The forge base is a one metre cube of stacked schist with a second fire base to one side, 50 cm square and 15 cm high. On the north side of the terrace a stream has been channeled with schist slabs. In 1980 there was the remains of a portable forge nearby, consisting of a circular tray mounted on legs with a bellows below worked by a lever, all in poor condition. The site was not relocated in 1990.

As well as the drives upstream of the battery, there is another set about 200 m downstream on both sides of the creek (Figs 19,20, Record S124/384). The area is marked by a chimney of stacked schist standing 2.5 m high at the end of a levelled area where a hut once stood. 6 m downstream a hollow, now only 50 cm deep and infilled with rubble, has been carefully revetted with stone to make a bin 2 m deep and 1 m across. Three shafts and their mullock heaps are within 50 m (Fig.20).

The Come In Time battery and drives

The following material is derived from three separate reports over 12 years, and presented some problems of correlation.

The Come In Time battery is the focus of two separate water systems and two separate sets of drives (Figs 19, 21, 21a, Record 124/380), and probably had batteries erected twice on the same foundations. One water race, now 80 cm wide and 20 cm deep, comes down the true right side of Rise and Shine Creek, and though its source was not found presumably rises in that creek. This race apparently continues past the battery and sidles up and out of the Rise and Shine, across the ridge to the north and runs *back* to an area in Shepherds Creek where there is a scatter of terracing and machinery (see below). (I was not entirely convinced that the race crossing the ridge flowed north. It could equally well have brought water *from* Shepherds Creek to the battery.) The other water supply came from the old Eureka race high on the opposite hillside, probably by pipeline. The old Eureka race came from the Rise and Shine (Fig.2b) but is seems likely that another branch was added from a tributary of Bendigo Creek (Figs 10 and 10a). The origin of this latter branch was found during the 1990 survey and consisted of a small dam only 8 m long, 1.5 m high and wide across a gully with a small race partly obliterated by a farm track leading away from it (Fig.10a).

The 1980 survey considered that the stone supports dropping 500 feet down the hillside (Fig.19) were for a pipeline (for water), but they are more likely to have been for the aerial cableway which Sandy and Jack Cameron erected to carry ore from the Alta Reef to the battery in 1912-13. The battery was mostly used, however, for ore from the Red Mine north east up its own side gully.

Four drives have been found in the Red Mine area (Fig.19), three of which are on the south side of the sharp ridge along which the Thomson Gorge Road runs and one on the north side. One was described as a bay in the hillside in the 1980 survey (Fig.19, Drive 1) but could be a collapsed tunnel, 1.5 m high, running 8 m back to a collapsed portal. Two

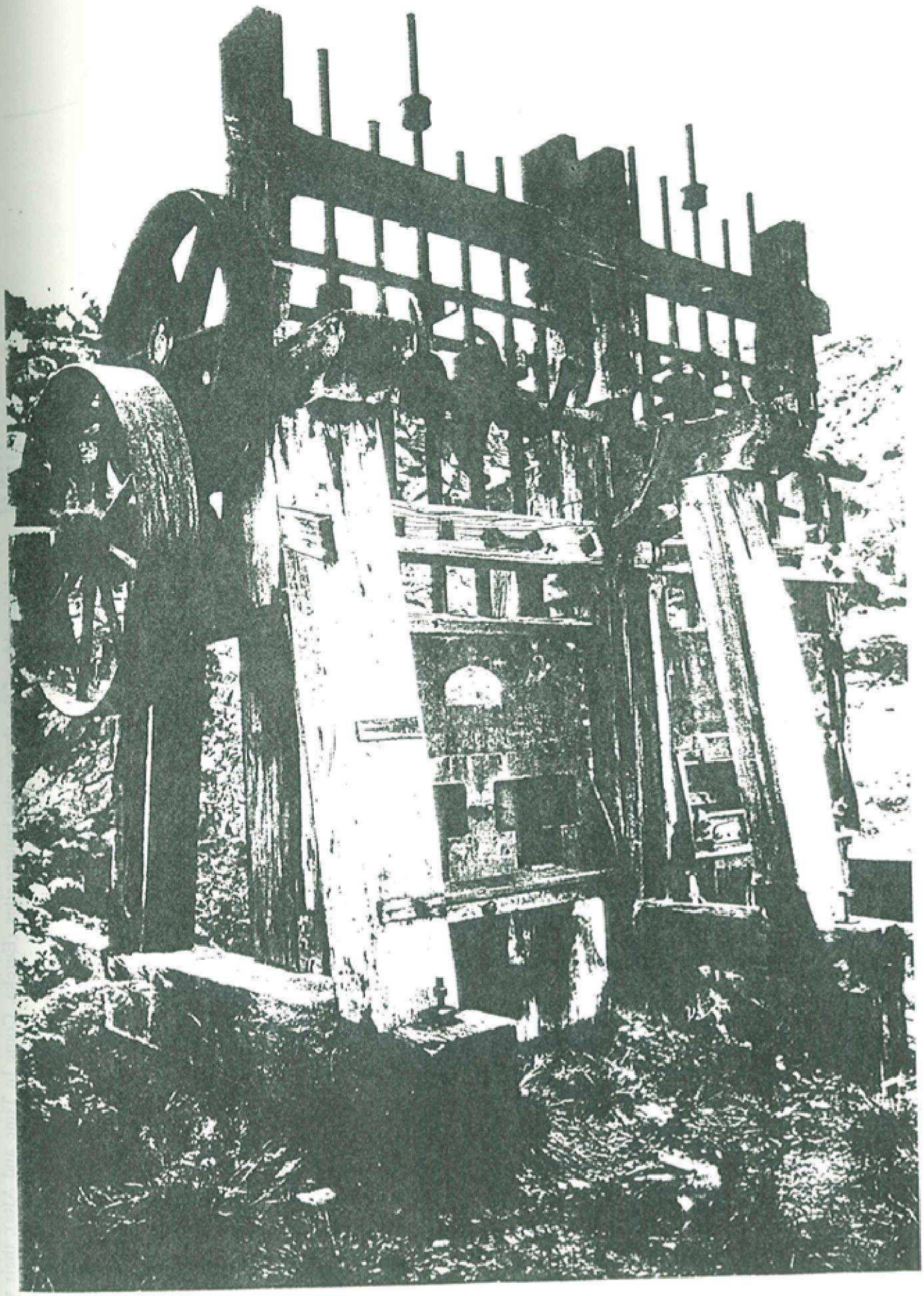
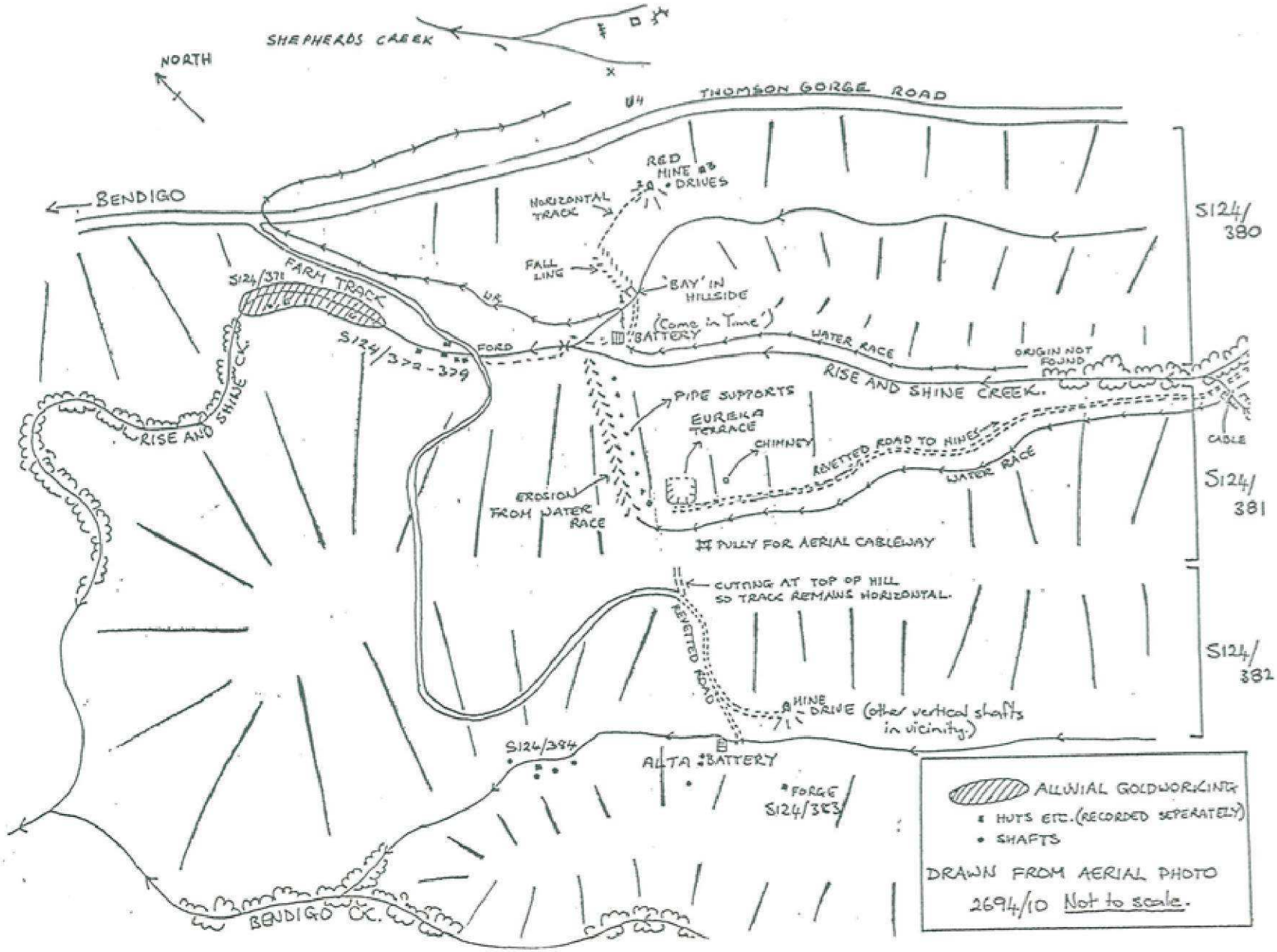
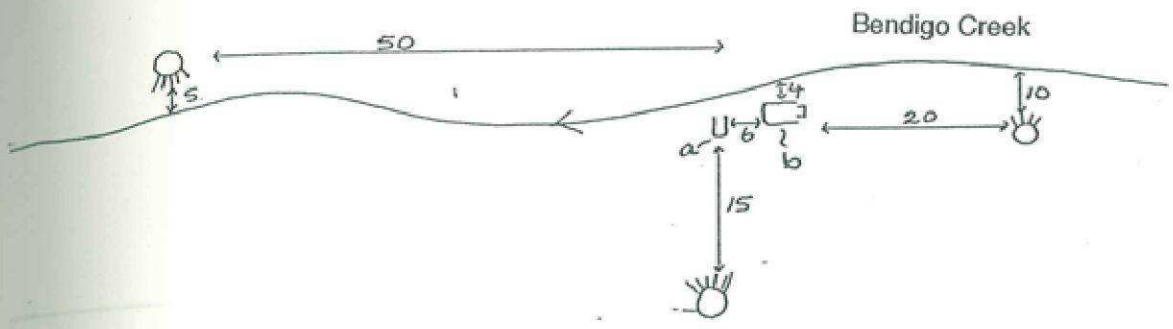


Figure 18a The Come In Time battery as seen by Tom Field before 1976 (Field and Olssen, 1976:94).

Figure 19 Overview of the Lower Rise and Shine Creek from the 1980 survey, showing the relationship of the three main battery sites (Eureka, Come In Time and Alta), their water systems and settlements.





NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

SITE NUMBER S124/384

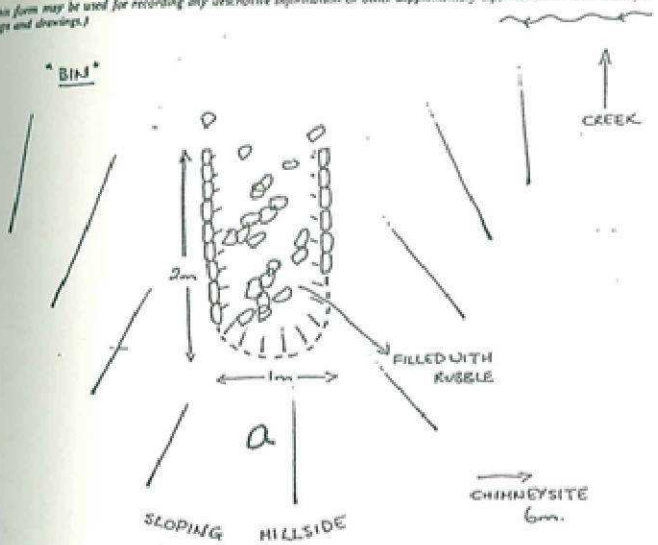
SITE NAME: MAORI / OTHER ~~Alta and Chino Creek~~

SITE TYPE Chimney and mineshafts

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 132 833

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

"BIN"



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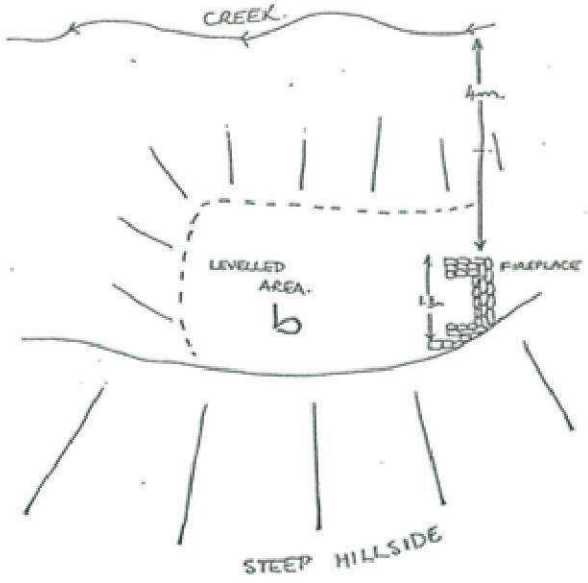


Figure 20 Structures and mine shafts 200 m downstream of the Alta battery site.
Upper: Diagram of the location of the sites derived from the site record forms.
Below. Two drawings from Record S124/384 showing (left) a bin or a collapsed entrance to a drive and (right) a hut site with chimney.

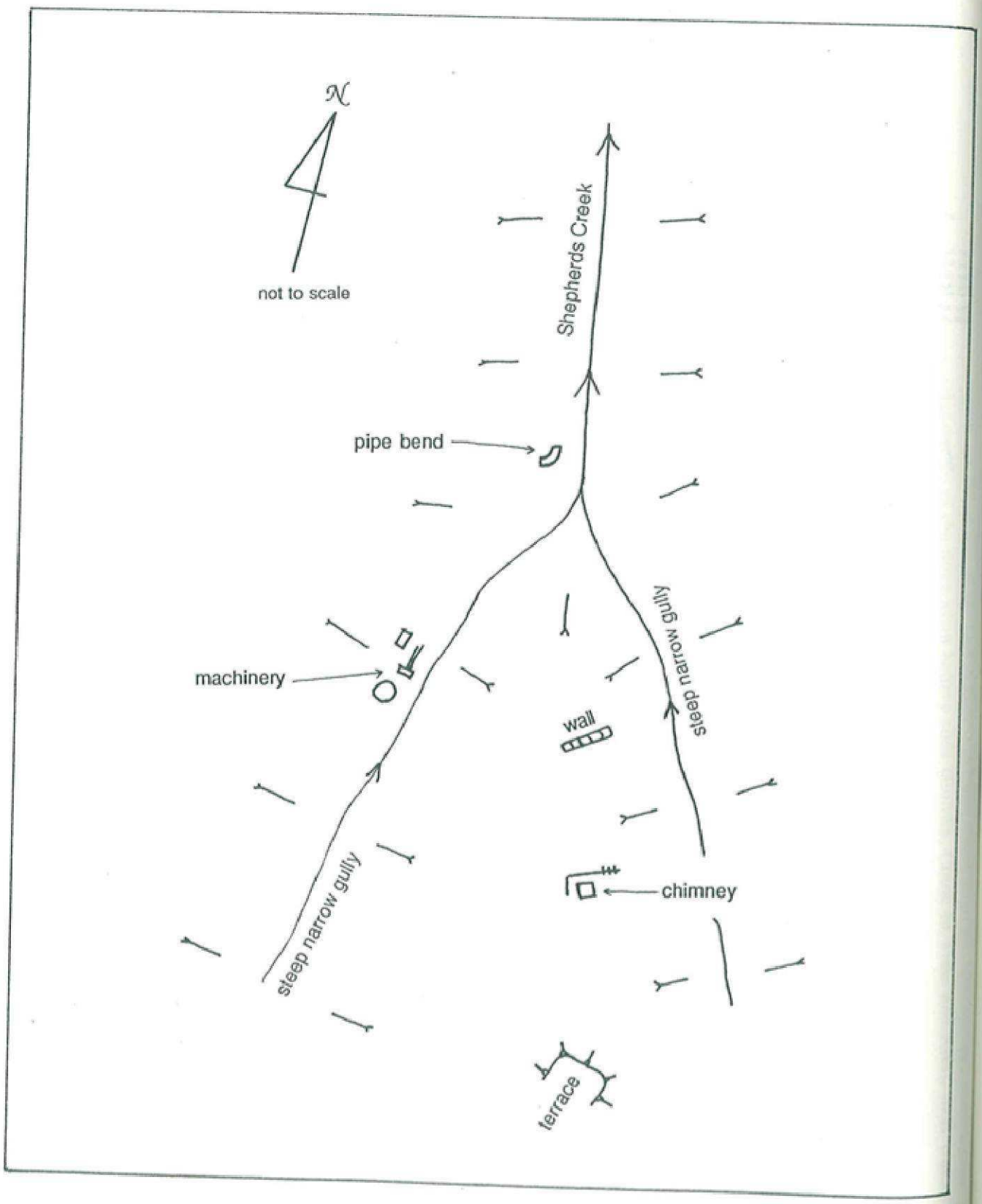
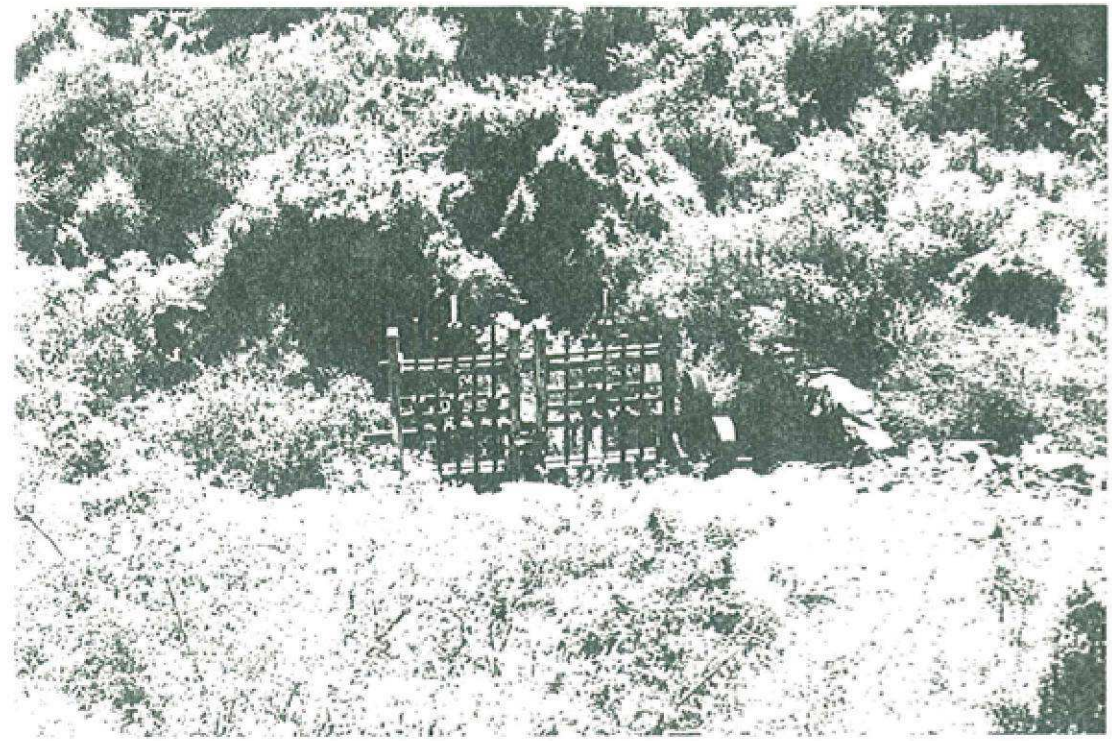


Figure 20a The mystery site below Red Mine in Shepherds Creek.



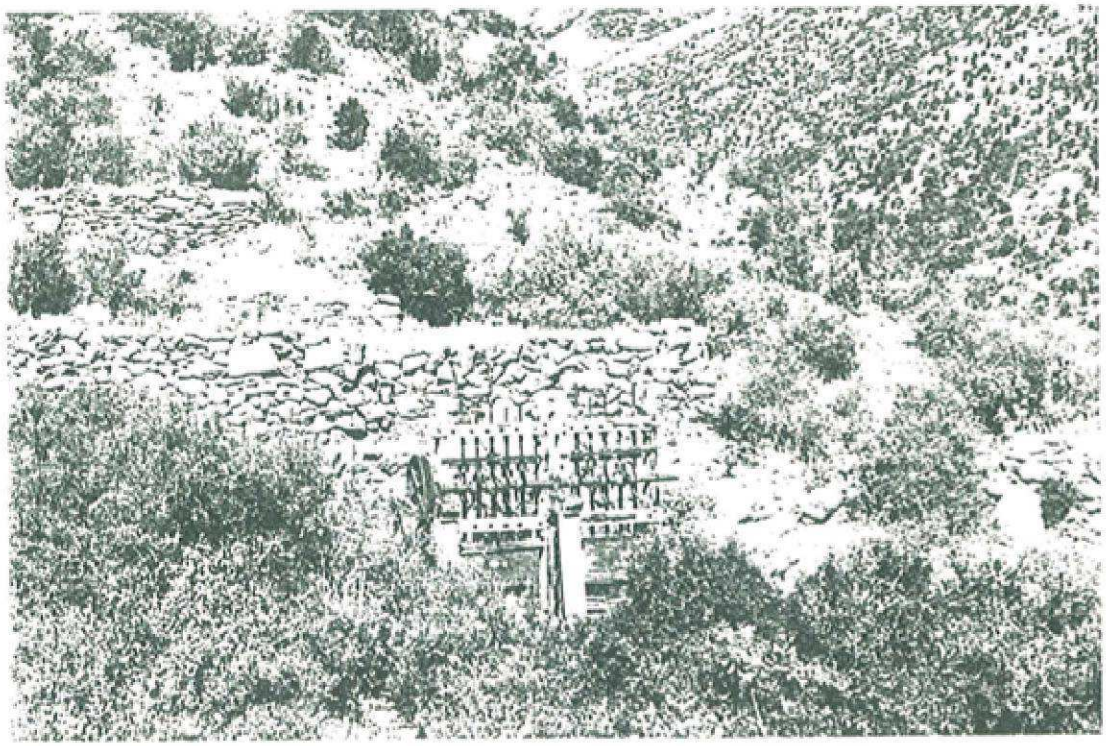


Figure 21a The Come In Time battery from above and from the opposite hillside in 1990.

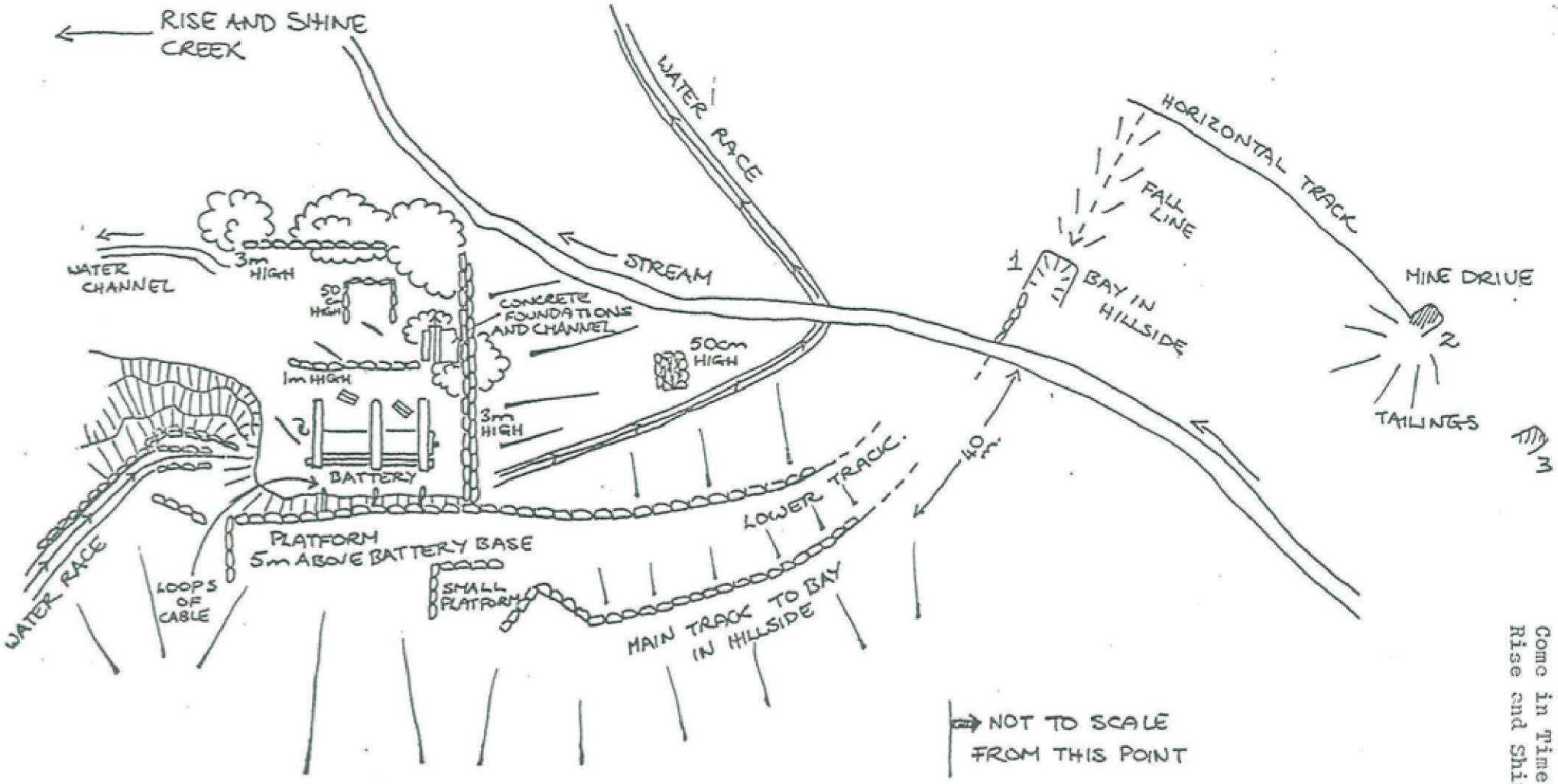
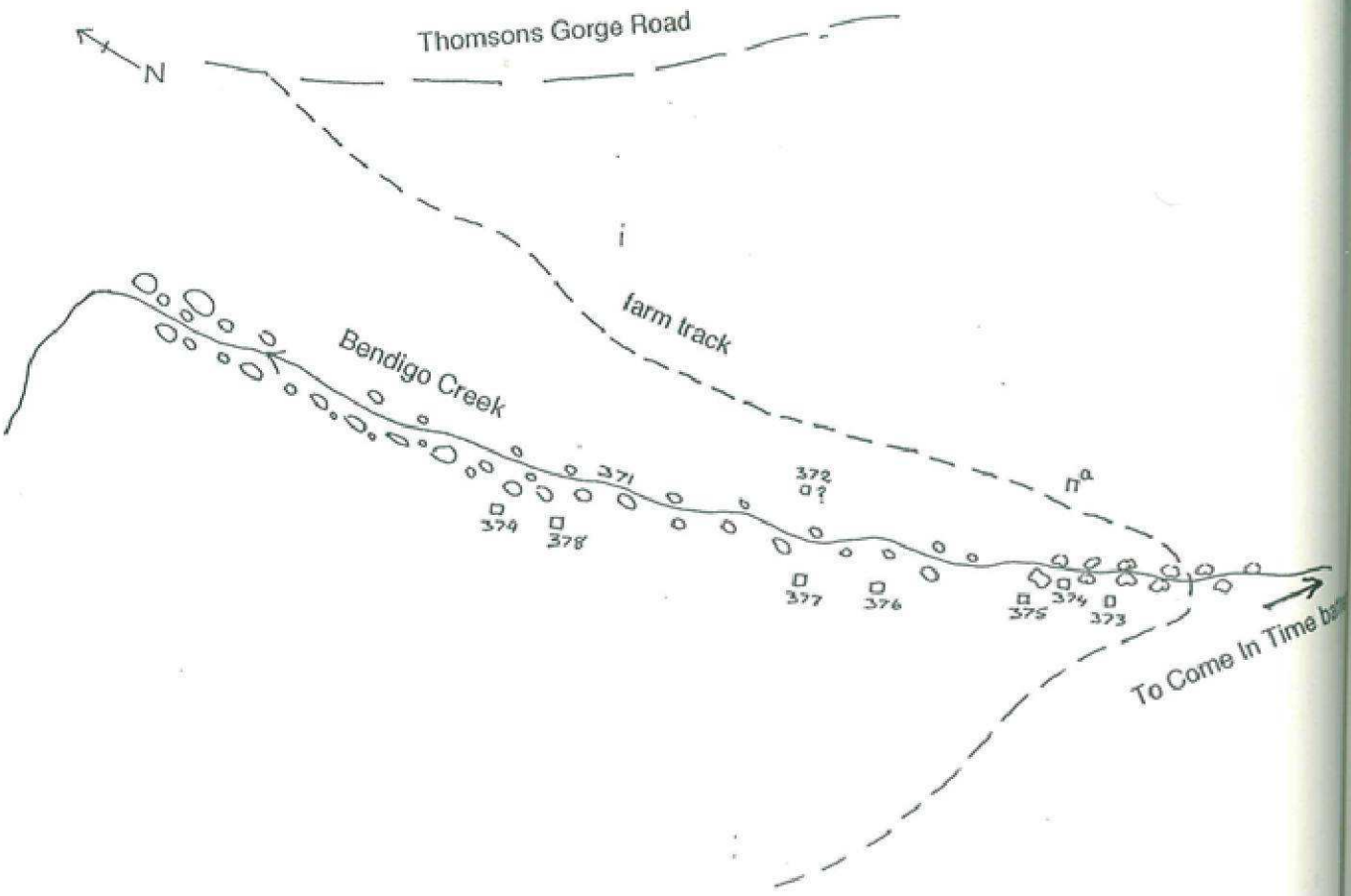


Figure 21 Details of the Come In Time battery and its links to the Red Mine, developed from the 1980 survey

s124/380
August 1980
Mining/Battery site

Come in Time Battery
Rise and Shine Creek



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 134 842

SITE NUMBER S124/372

SITE NAME: MAORI / OTHER Rise and Shine Creek

SITE TYPE Stone structure

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

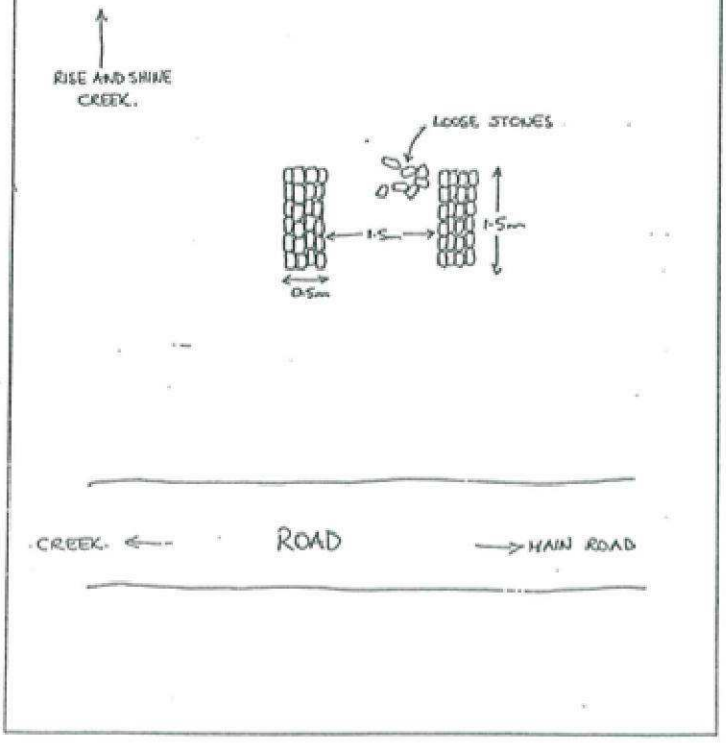


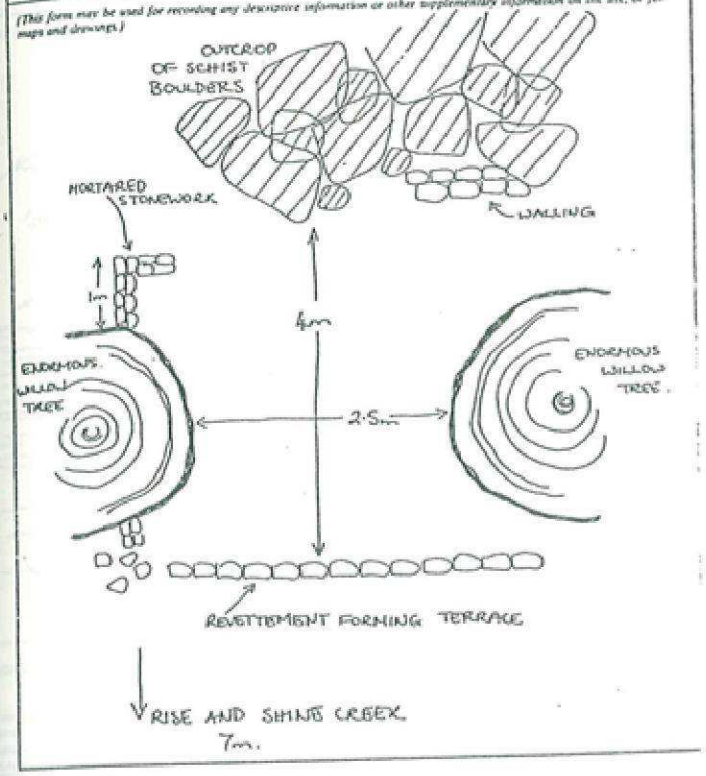
Figure 22 Settlements in Lower Rise and Shine Creek.
Above: Diagram of the location of tailings and huts, derived from the 1980 site record forms.
Below: A stone structure which may not be a hut.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193.5 841

SITE NUMBER S124/374
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Enclosure

(This form must be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

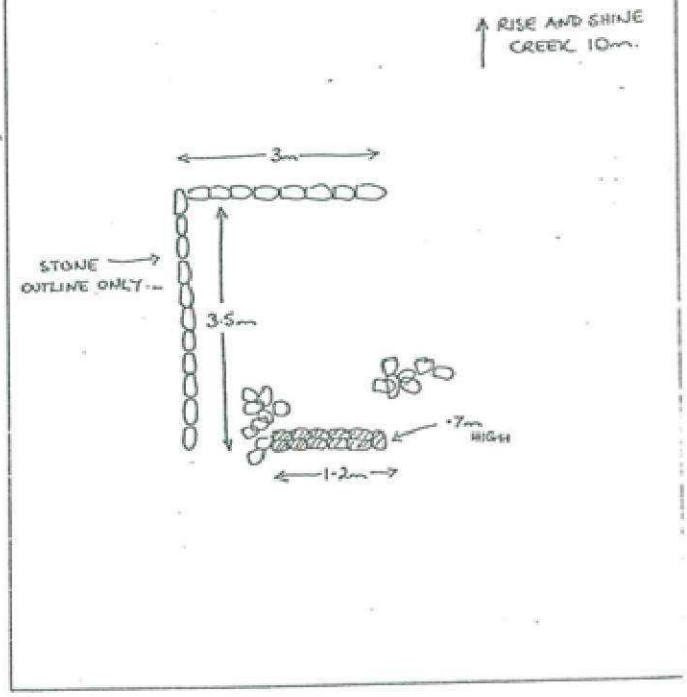


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193.5 841

SITE NUMBER S124/373
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form must be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193.5 841

SITE NUMBER S124/375
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form must be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

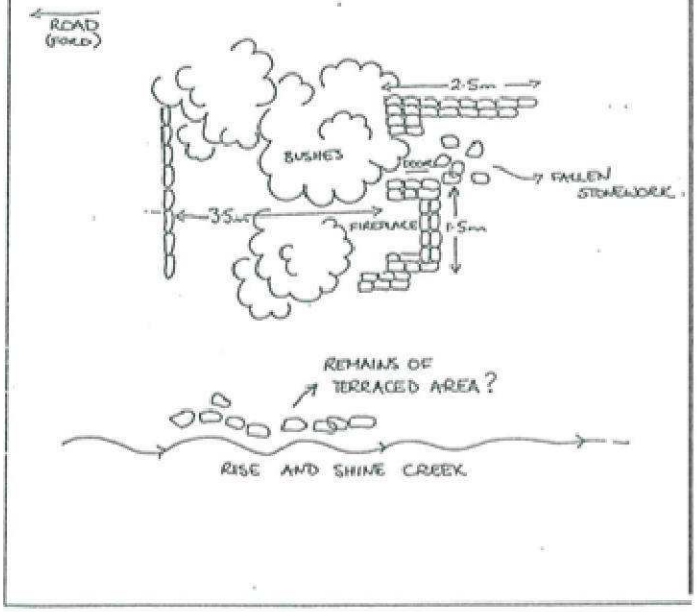


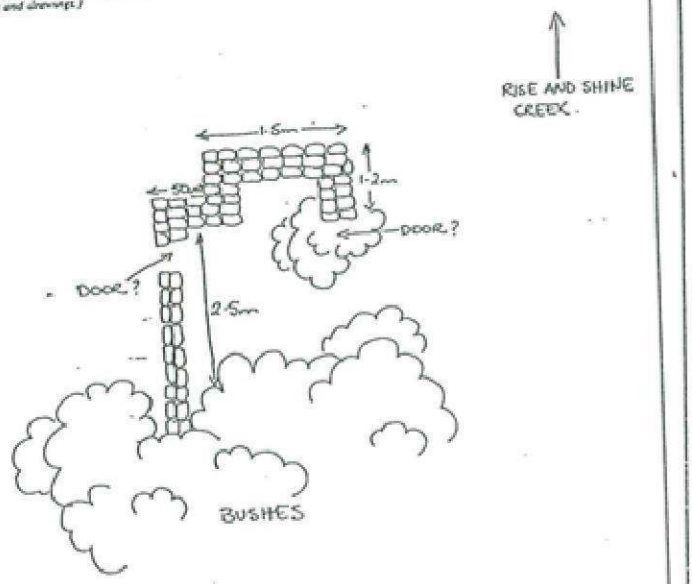
Figure 23 Settlements in Lower Rise and Shine Creek.
Drawings of three adjacent sites from the 1980 survey.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193 841.5

SITE NUMBER S124/376
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

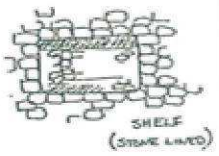


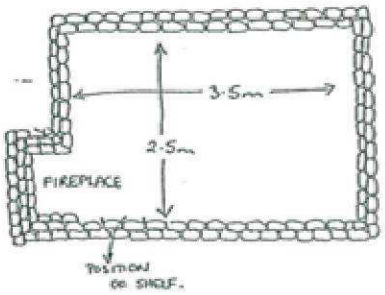
NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193 842

SITE NUMBER S124/377
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)





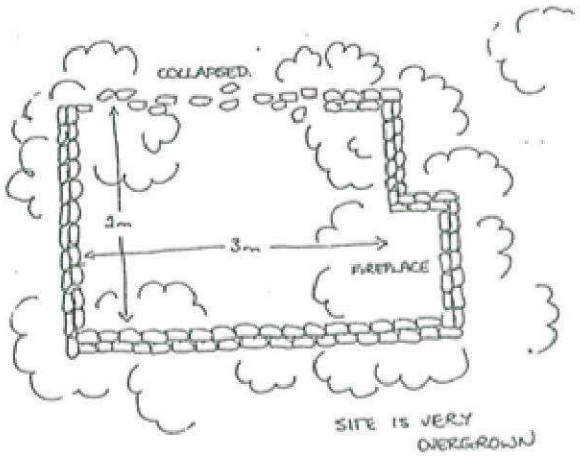
HUT IS BUILT IN LOW AMONGST TAILINGS MOUNDS AND NO DOORWAY WAS EVIDENT.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193.5 841.5

SITE NUMBER S124/378
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



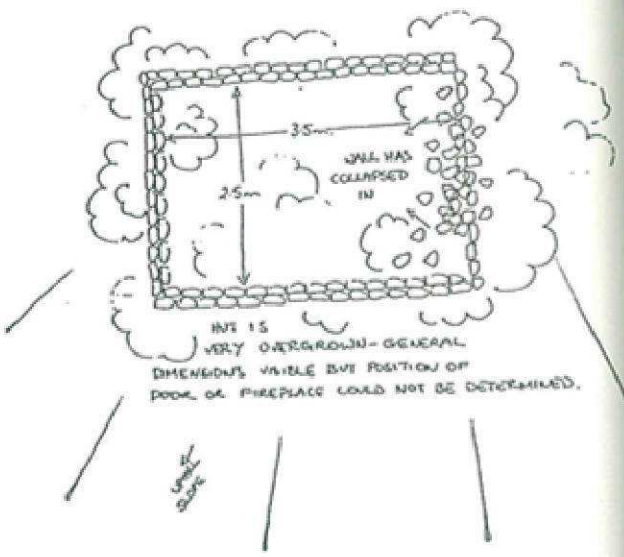
SITE IS VERY OVERGROWN

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 193.5 842.5

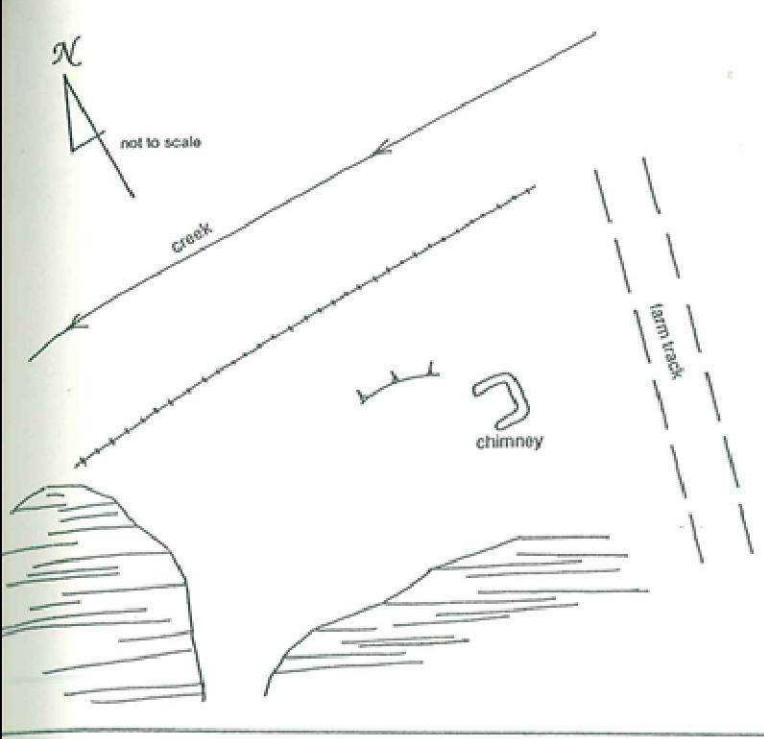
SITE NUMBER S124/379
SITE NAME: MAORI / OTHER Rise and Shine Creek
SITE TYPE Stone hut

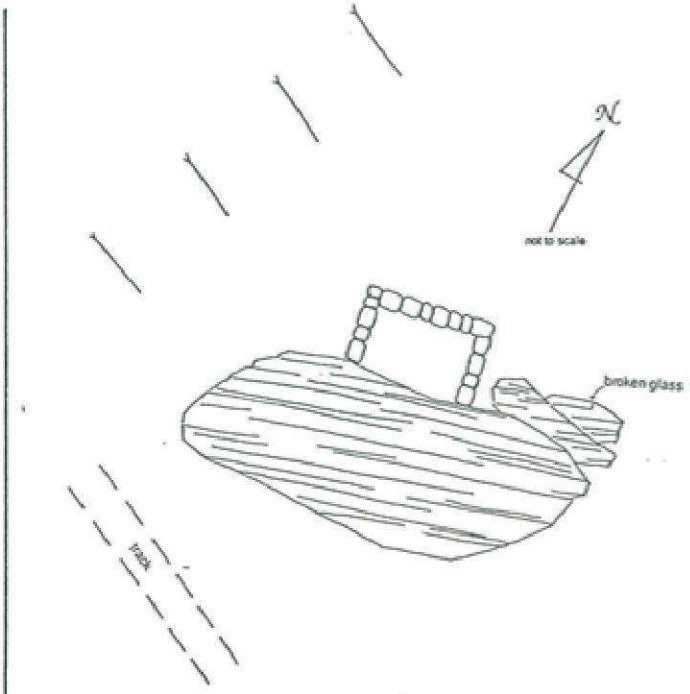
(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



HUT IS VERY OVERGROWN - GENERAL DIMENSIONS VISIBLE BUT POSITION OF DOOR OR FIREPLACE COULD NOT BE DETERMINED.

Figure 24 Settlement in Lower Rise and Shine Creek.
Drawings of four hut sites from the 1980 survey



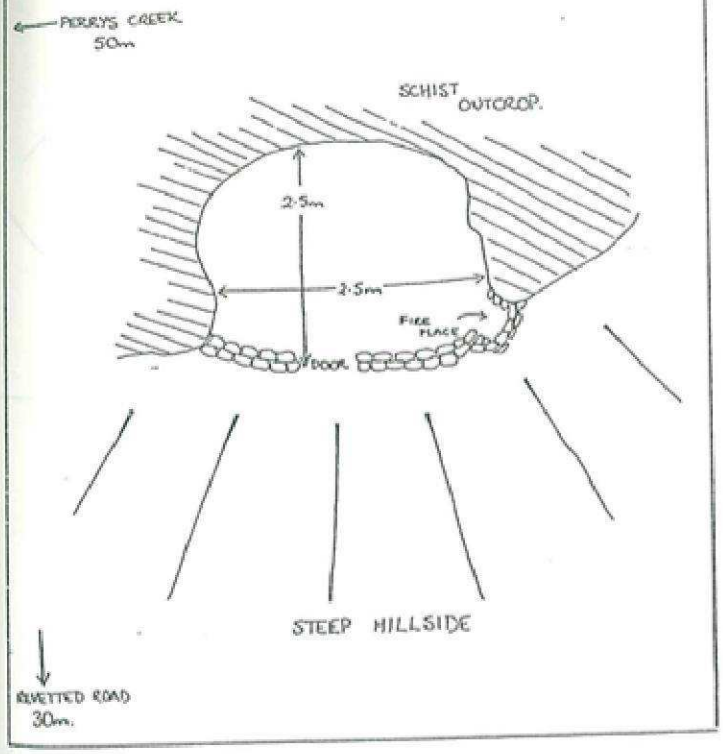


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

SITE NUMBER S124/67
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Rockshelter

Map Number S1 4
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 163 041

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

SITE NUMBER S124/366
SITE NAME: MAORI / OTHER Perrys Creek
SITE TYPE Stone platforms

Map Number S1 4
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 171.5 038

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

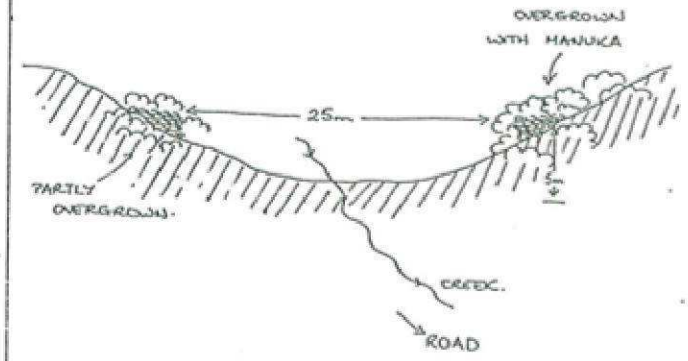
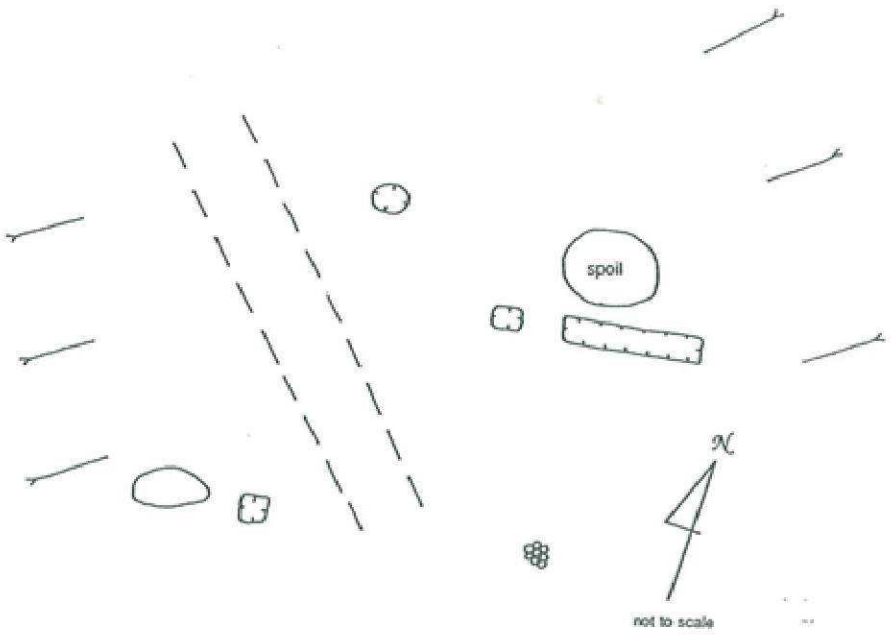
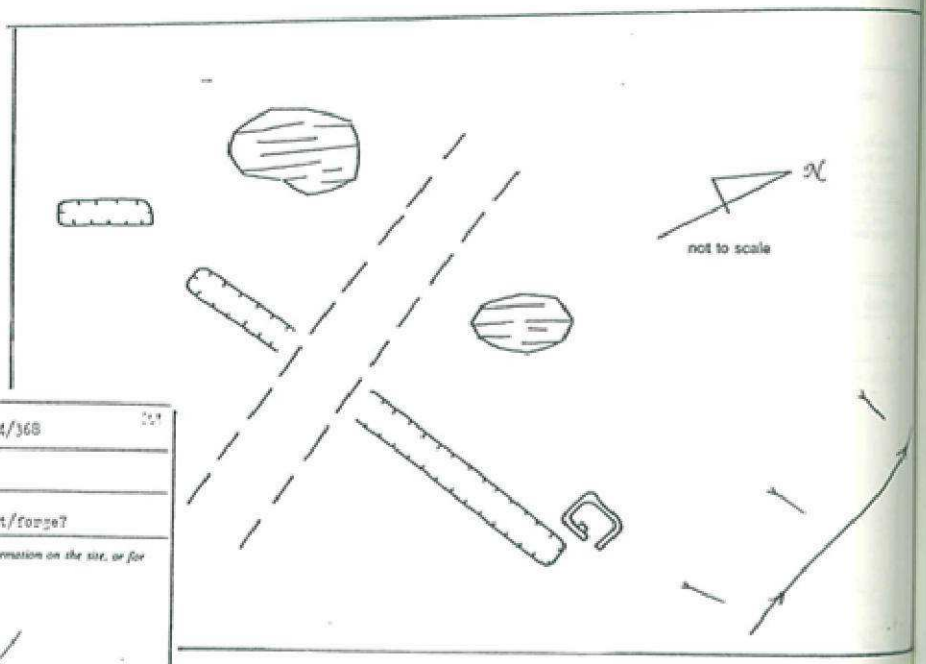


Figure 25 Sites around the mouth of the Deep Lead adit in Bendigo Creek.
Above right: a square of stone which may be the site of the forge marked on the 1876 map.
Above left: the remains of a camp site (Record S124/64) as seen in 1990.
Below left: a rock shelter found in 1980.

Below right: Bridge abutments in Perrys Creek





NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number	S124
Map Name	Cardrona
Map Edition	1st 1970
Grid Reference	173 837

SITE NUMBER S124/368

SITE NAME: MAORI / OTHER

SITE TYPE Stone hut/forge?

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

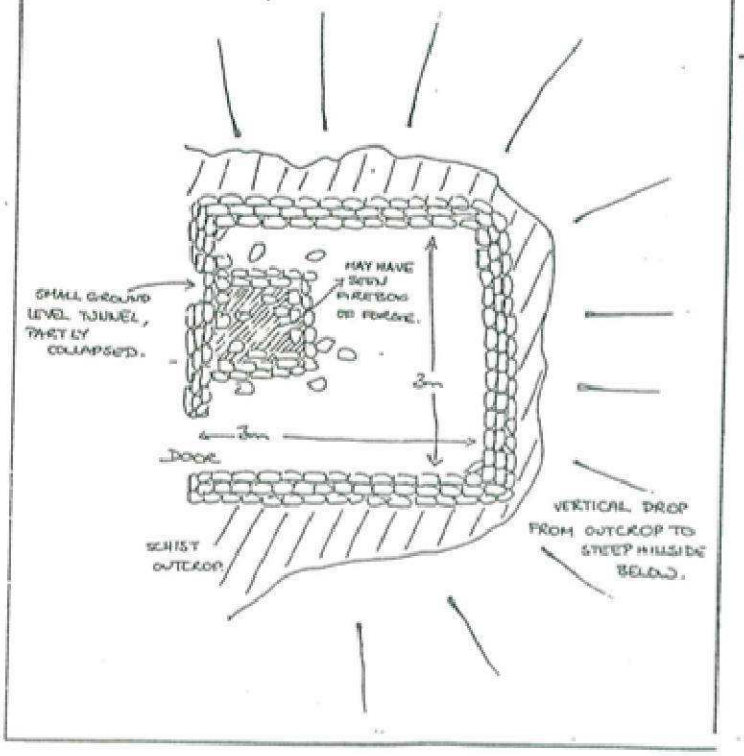
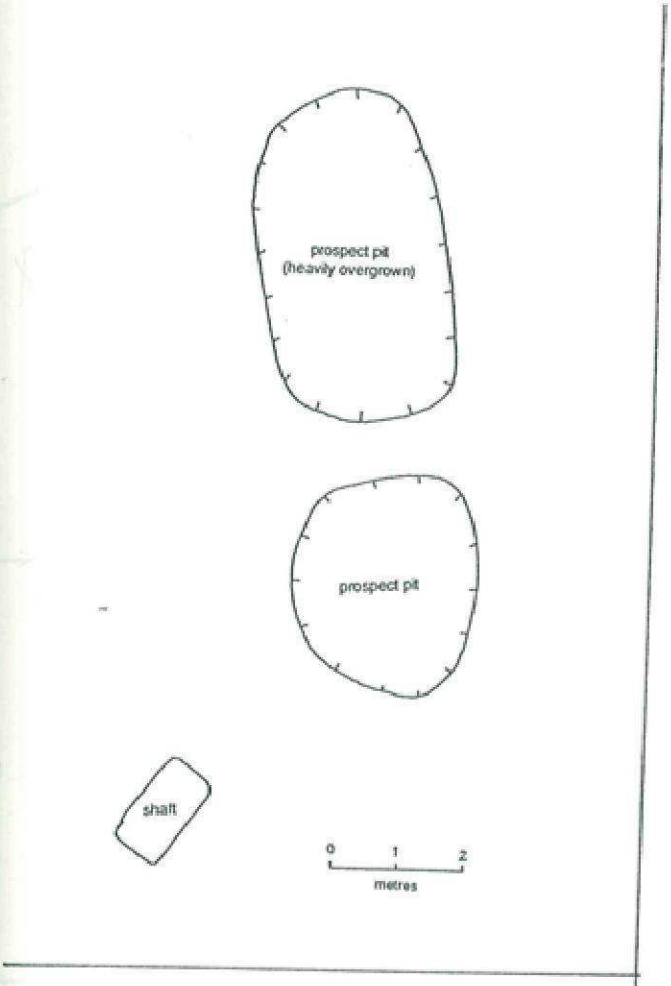
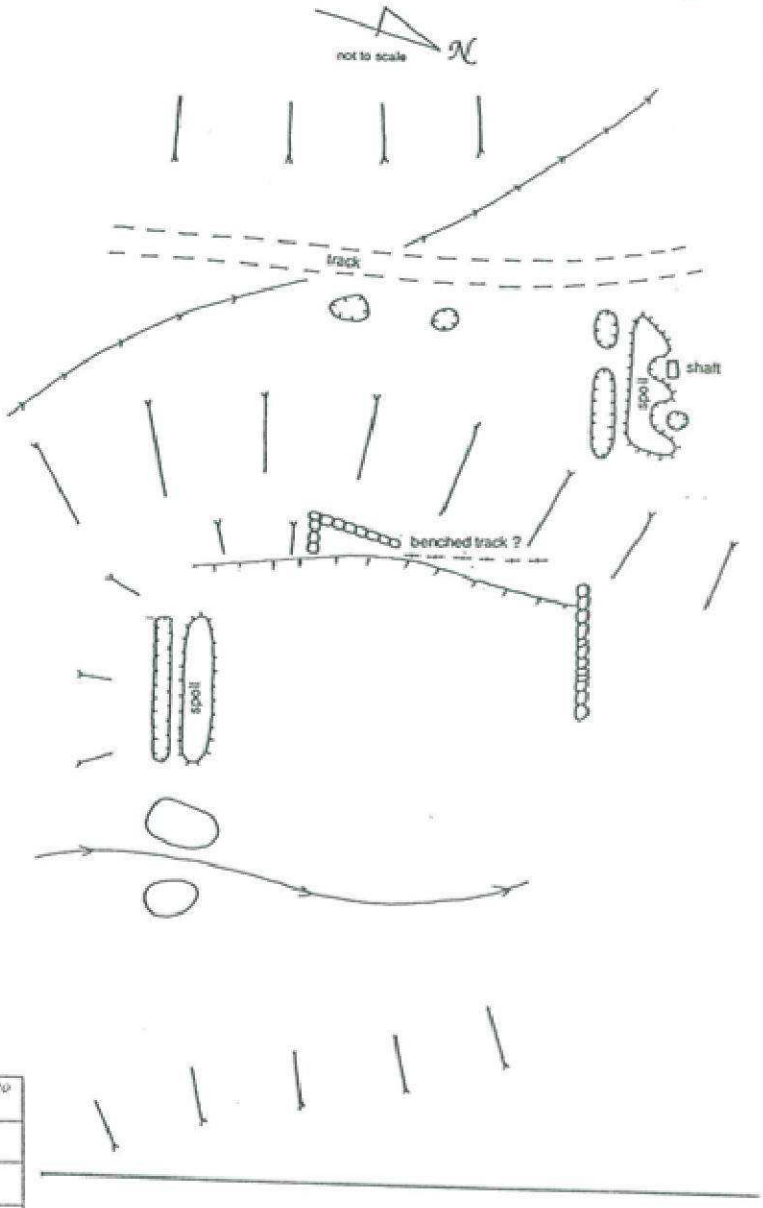


Figure 26 Mining sites in Perrys Creek
Top: The highest site found in Perrys Creek in 1990 (GR184822) with trench and prospecting pits.
Middle and bottom: The forge built on a rock beside a trench about 100 m above the ford





NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE DESCRIPTION FORM

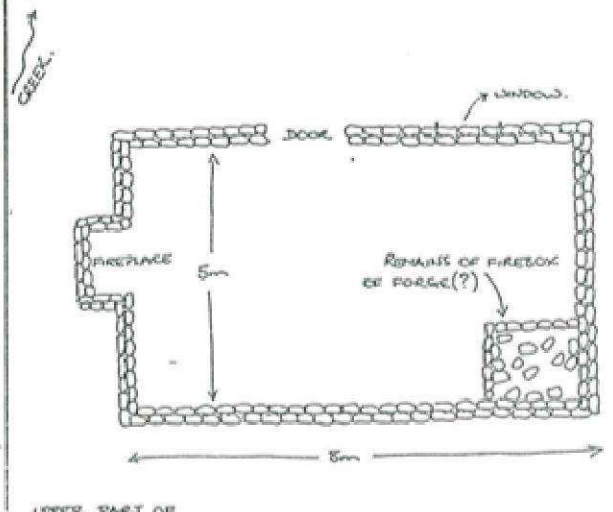
Map Number S174
Map Name Cardroom
Map Edition 1st 1970
Grid Reference 170 785

SITE NUMBER S124/370 370

SITE NAME: MAORI / OTHER Perrys Creek

SITE TYPE Stone hut/forge?

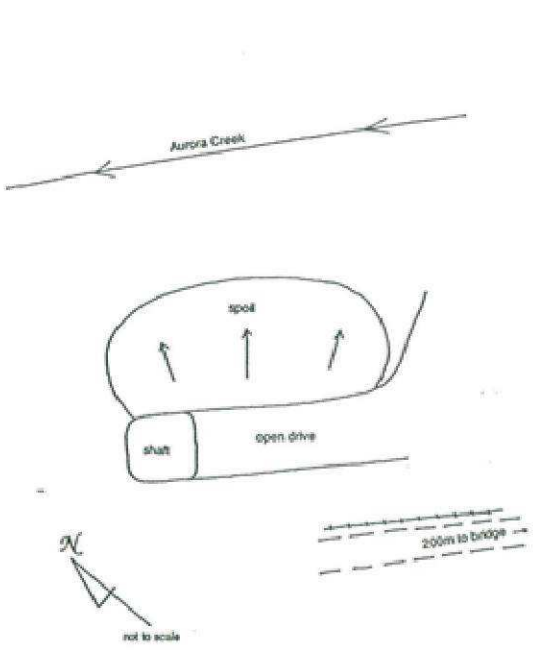
(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

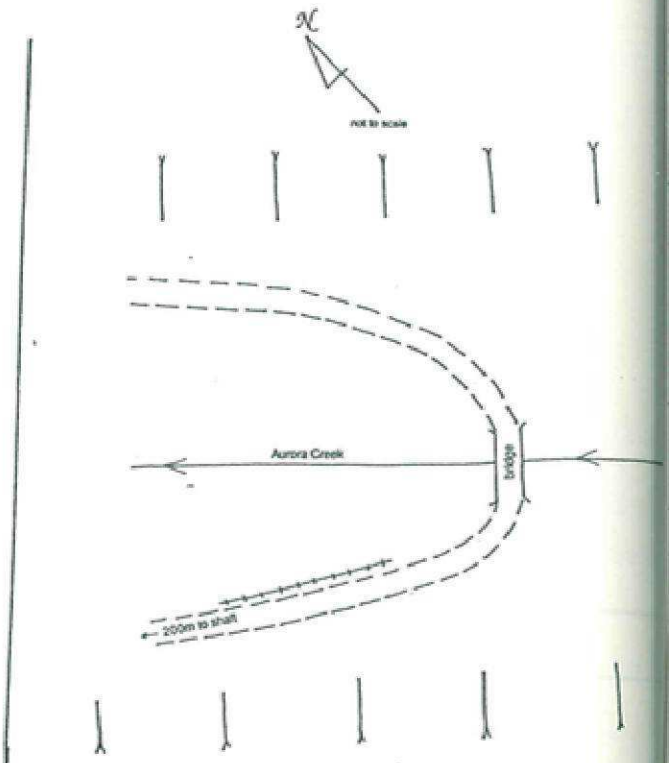


UPPER PART OF SOME WALLS WAS BEEN MUD BRICK.

WATER RACE 10m EAST OF HUT.

Figure 27 Mining sites up Perrys Creek.
Top left.:Large prospecting pits and a shaft on a ridge (GR176829)
Top right:The complex site (GR173833) with two trenches 500 m above the ford.
Lower left: the isolated forge in the top of the creek.





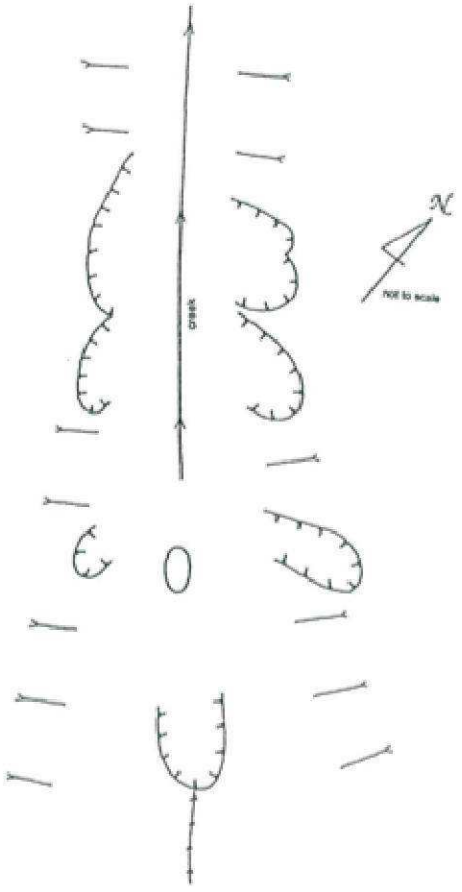


Figure 28 Mining sites in Aurora Creek above the reserve boundary
Top left: Drive running into a shaft (GR171831)
Top right: Stone culvert upstream of the shaft.
Below. Alluvial workings (GR172831).

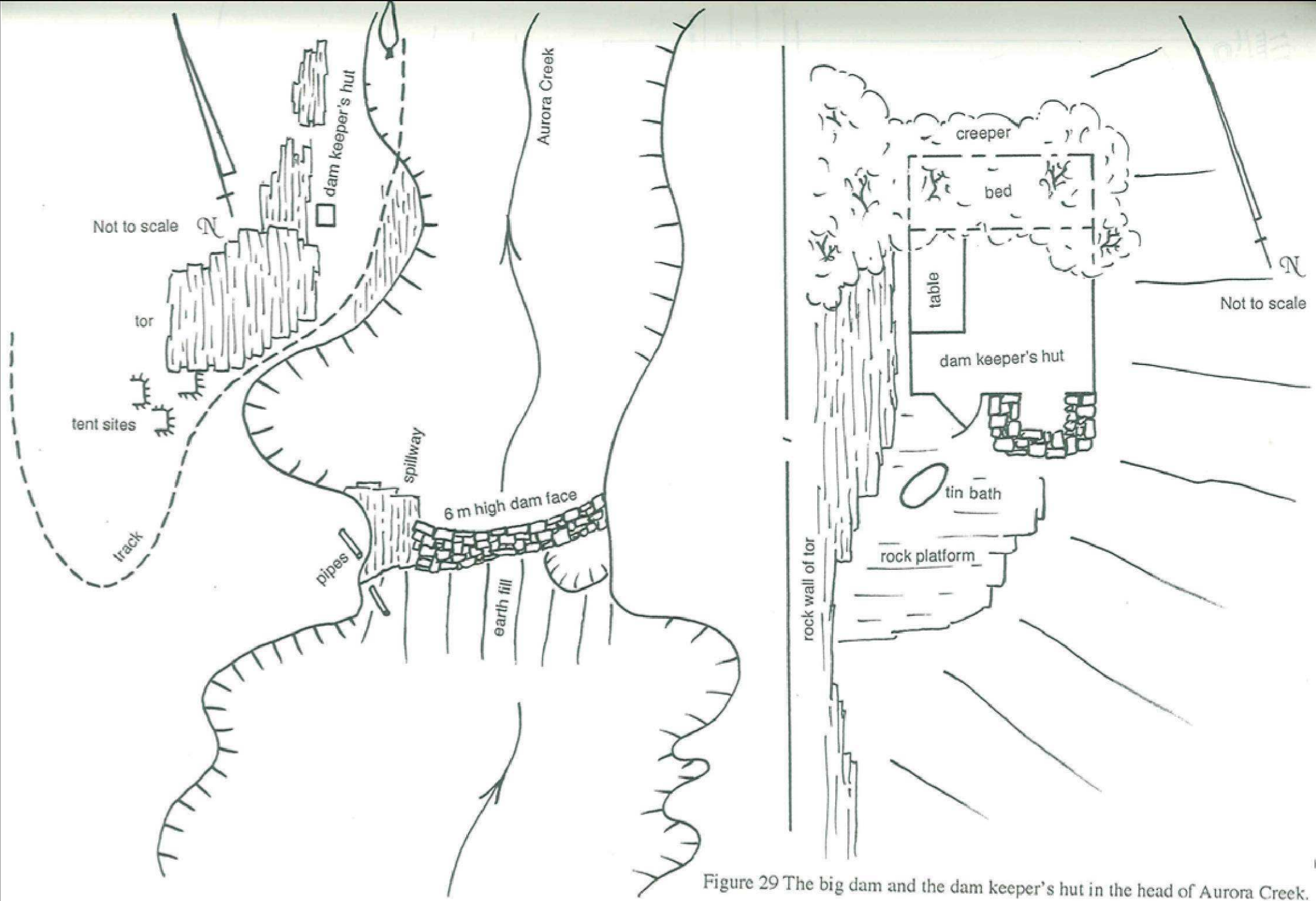
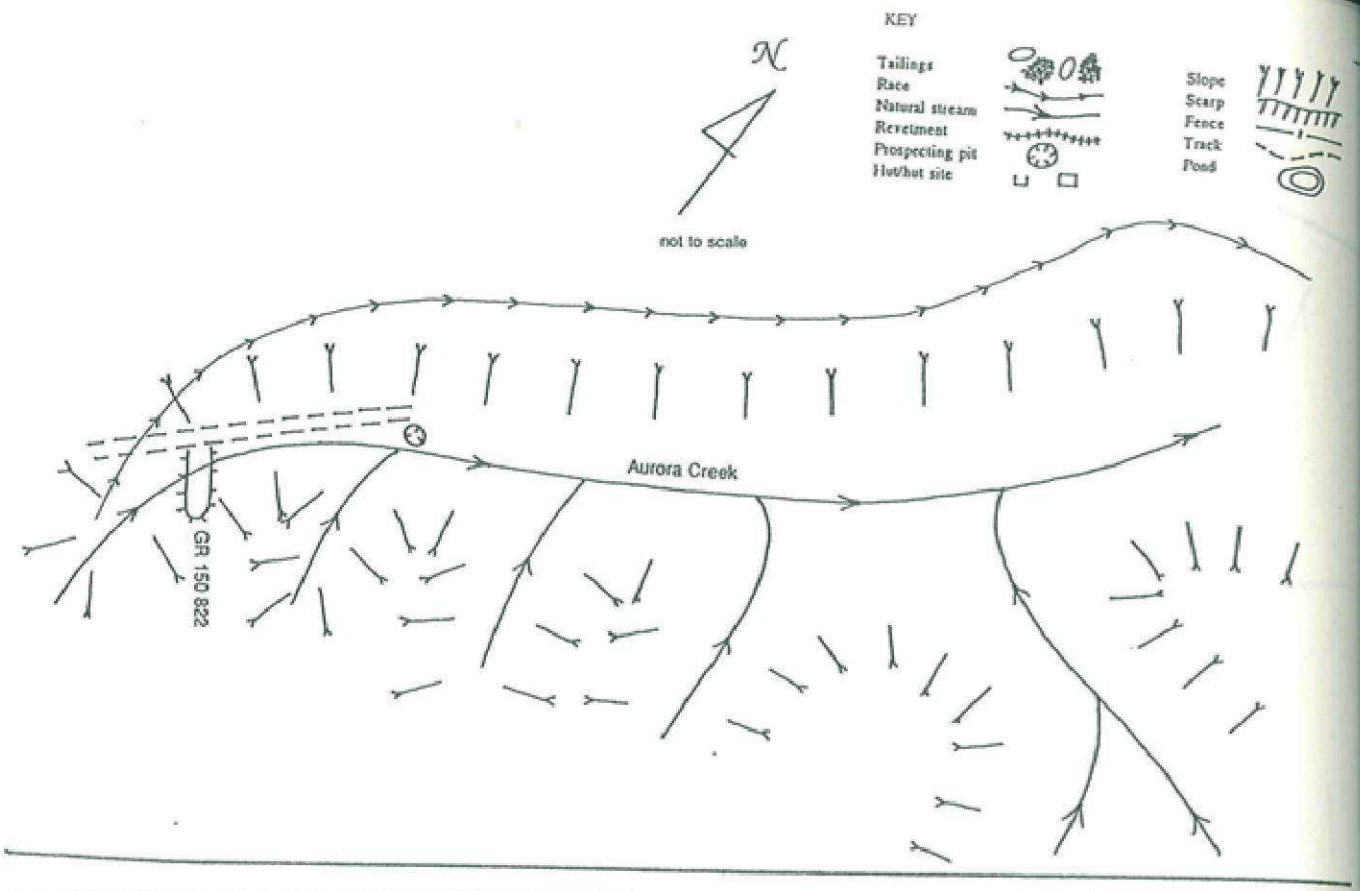


Figure 29 The big dam and the dam keeper's hut in the head of Aurora Creek.

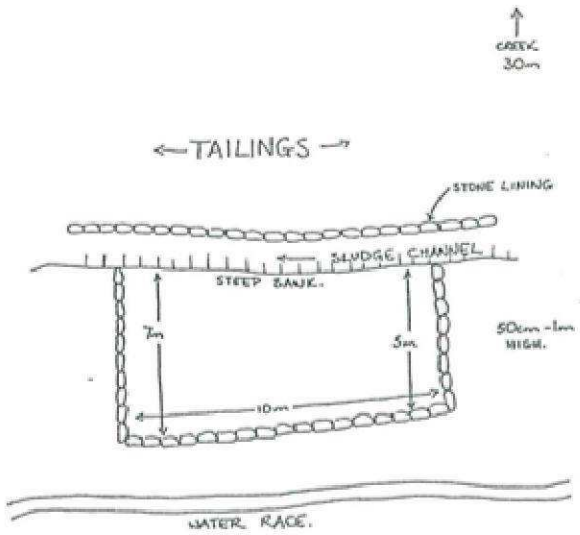


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 148 847

SITE NUMBER 3124/246
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Enclosure and water race

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 148 748.5

SITE NUMBER 3124/248
SITE NAME: MAORI / OTHER Aurora Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

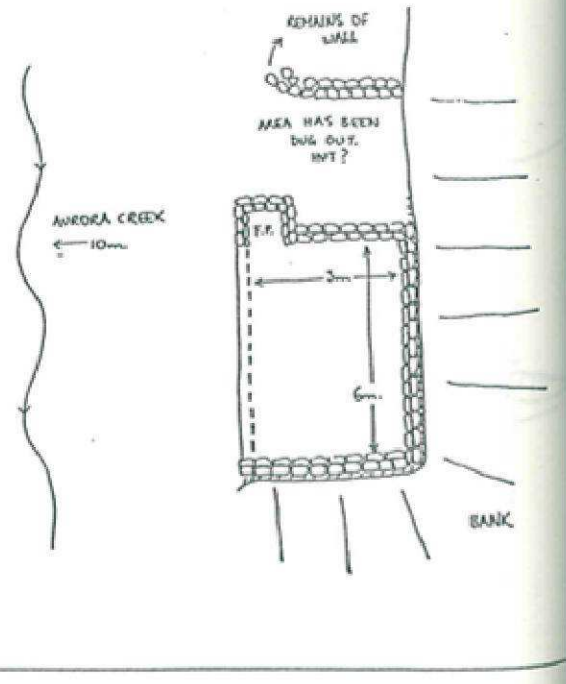


Figure 30 Above: the intake in Aurora Creek of the big race running down to Welshtown, Bendigo reserve.
Bottom left: Garden enclosure in Bendigo Creek above Aurora Creek confluence
Bottom right: Hut near Aurora Creek confluence.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

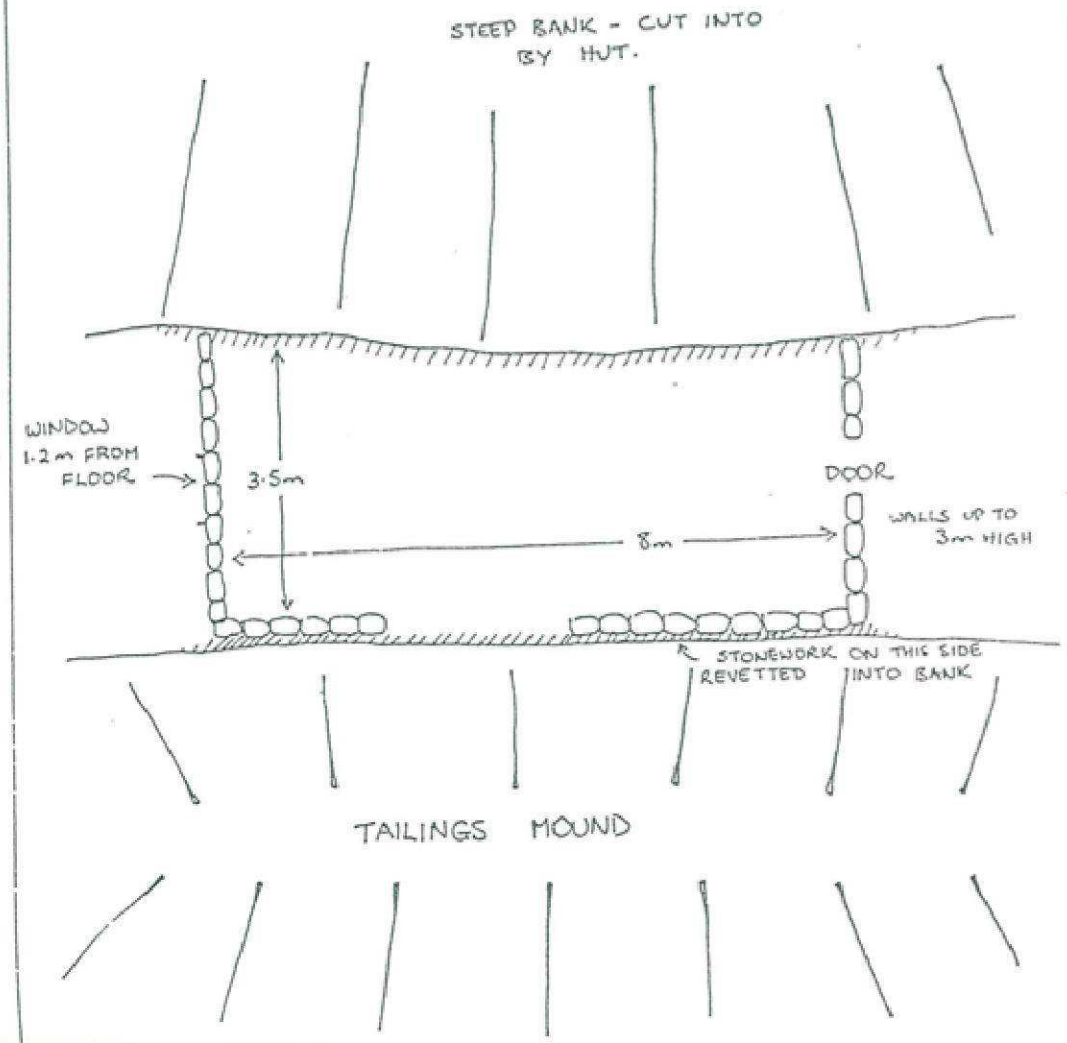
Map Number S123
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 163 848

SITE NUMBER S124/243

SITE NAME: MAORI / OTHER Bendigo Creek

SITE TYPE Stone hut (Chinese?)

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



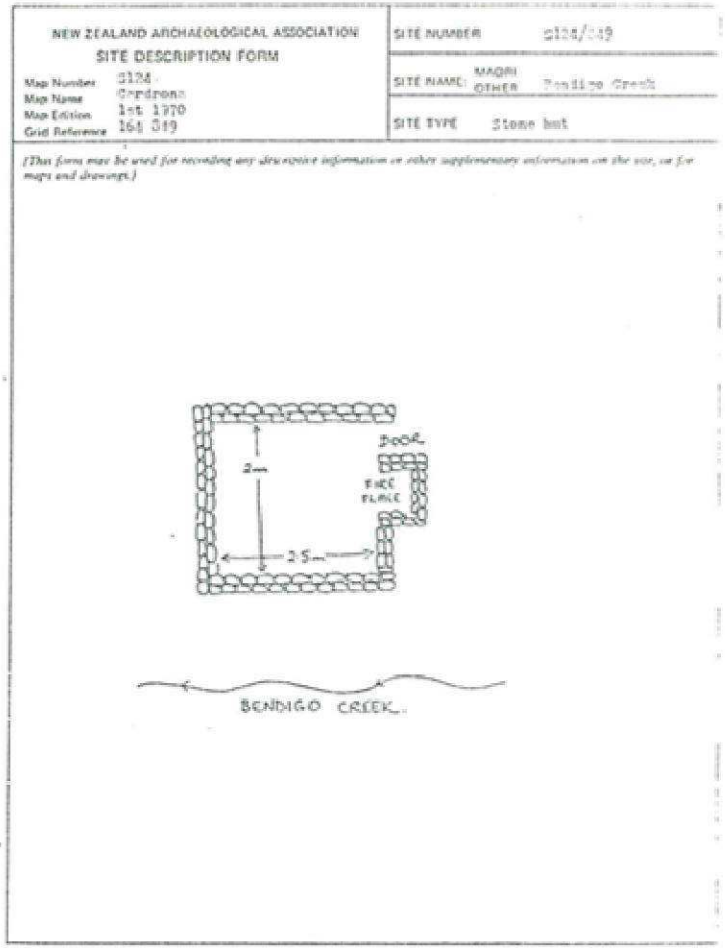


Fig 31 Huts near the confluence of Aurora and Bendigo Creeks.
Left: a long hut with Chinese ceramics S124/243,
Right: a very small hut.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE DESCRIPTION FORM

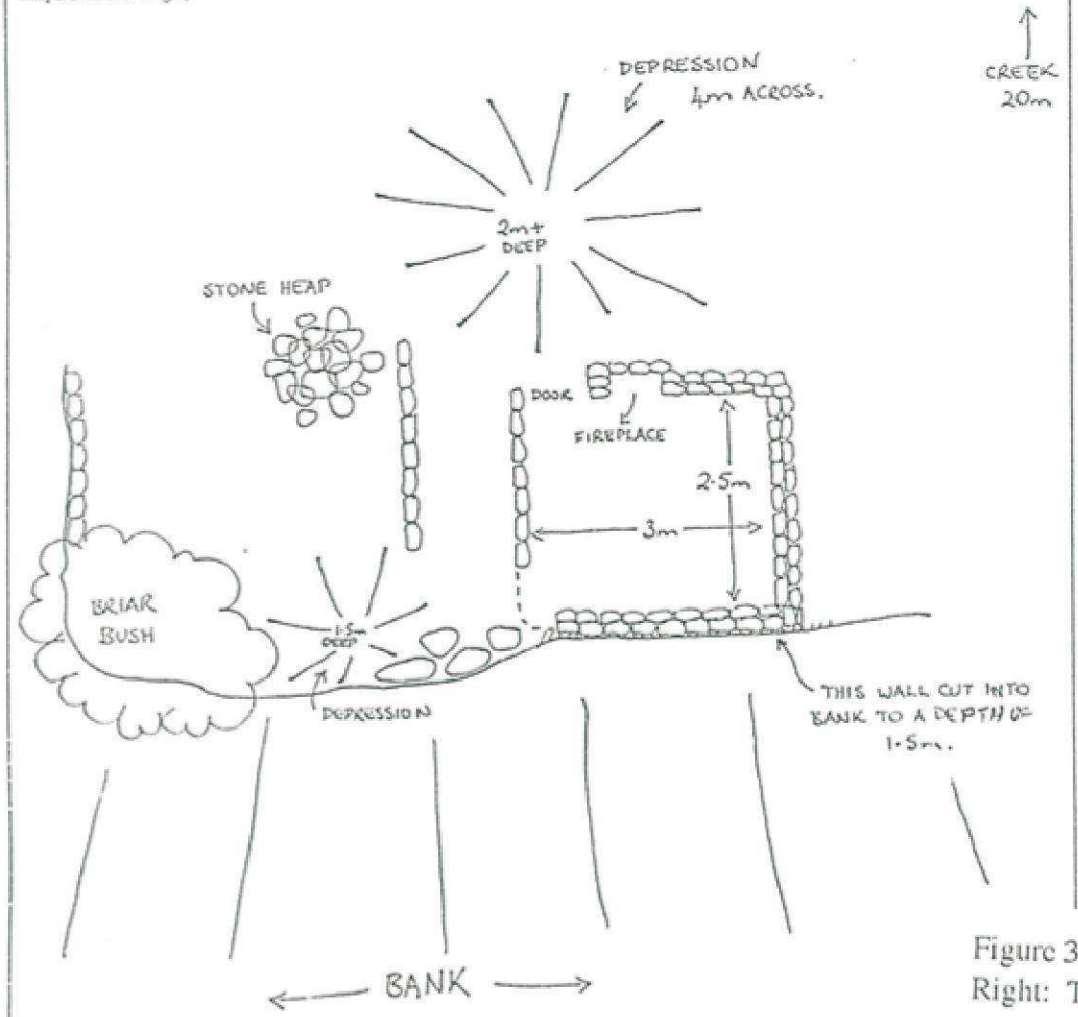
Map Number	S124
Map Name	Cardrona
Map Edition	1st 1970
Grid Reference	163.5 847

SITE NUMBER S124/344

SITE NAME: MAORI / OTHER Aurora Creek

SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE DESCRIPTION FORM

Map Number	S124
Map Name	Cardrona
Map Edition	1st 1970
Grid Reference	163.5 823

SITE NUMBER S124/363

SITE NAME: MAORI / OTHER Telethorn

SITE TYPE Enclosure

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

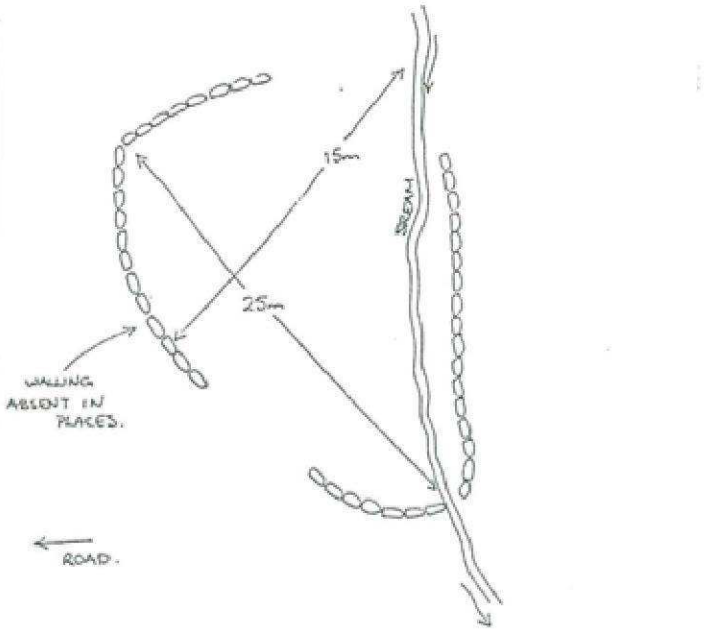


Figure 32 Left: Complex of small huts and depressions in lower Aurora Creek. Right: The mislaid stone enclosure (Record S124/363)

Figure 33a Ruins of Goodalls Hotel and tailings. Above: Looking downstream. Below: Looking upstream.

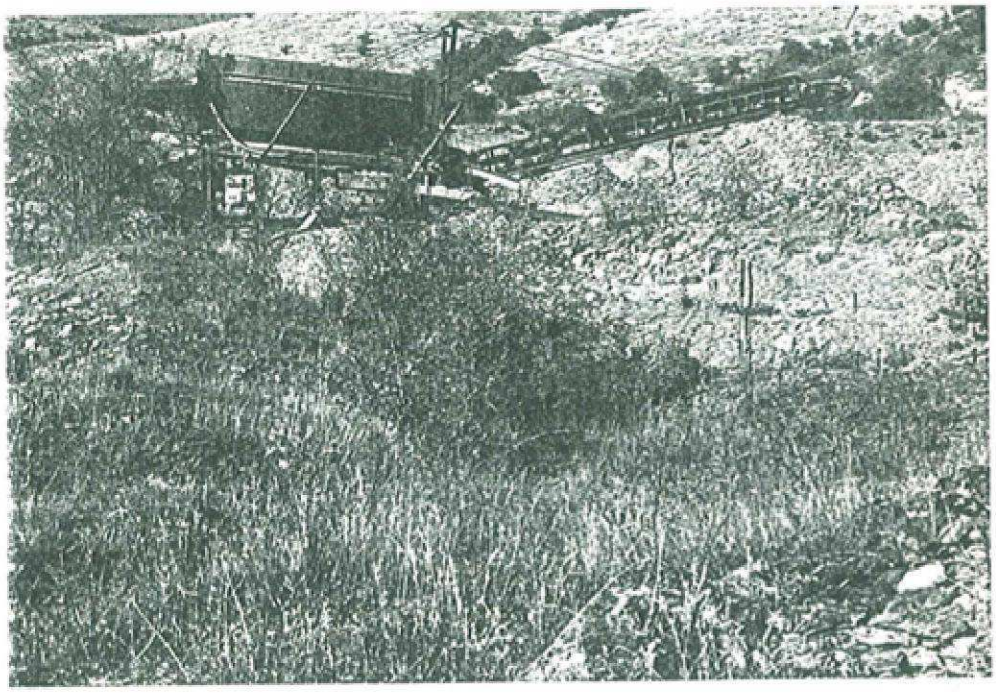


Figure 33b Goodalls Hotel workings in Lower Bendigo Creek
Above: The damaged remnant of a hut in the tailings
Below:: Modern gold mining plant in the centre of the tailings

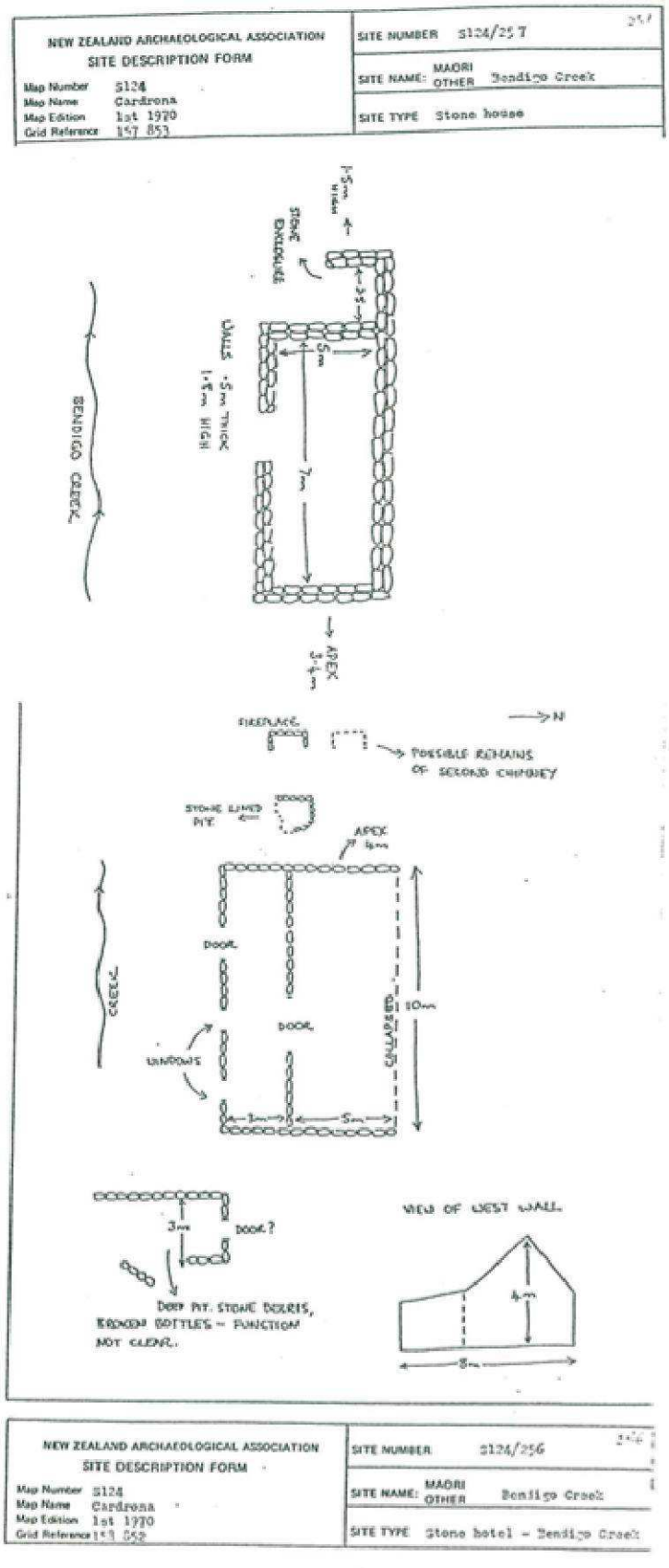


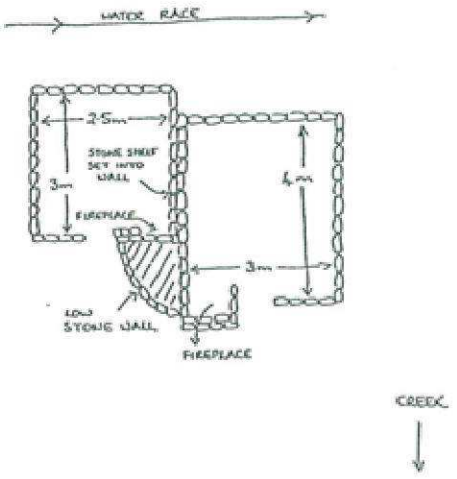
Figure 34 Plans of Goodalls Hotel in 1980, made up and correctly oriented from both site record forms (Records S124/65,256,257).

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 158 849

SITE NUMBER 3124/255
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Stone huts (3)

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

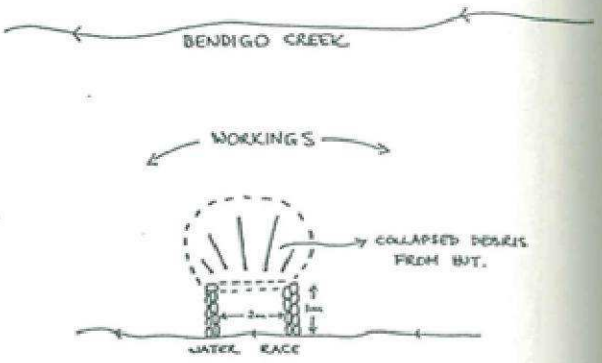


NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number 3124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 156 850

SITE NUMBER 3124/254
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Chinese hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



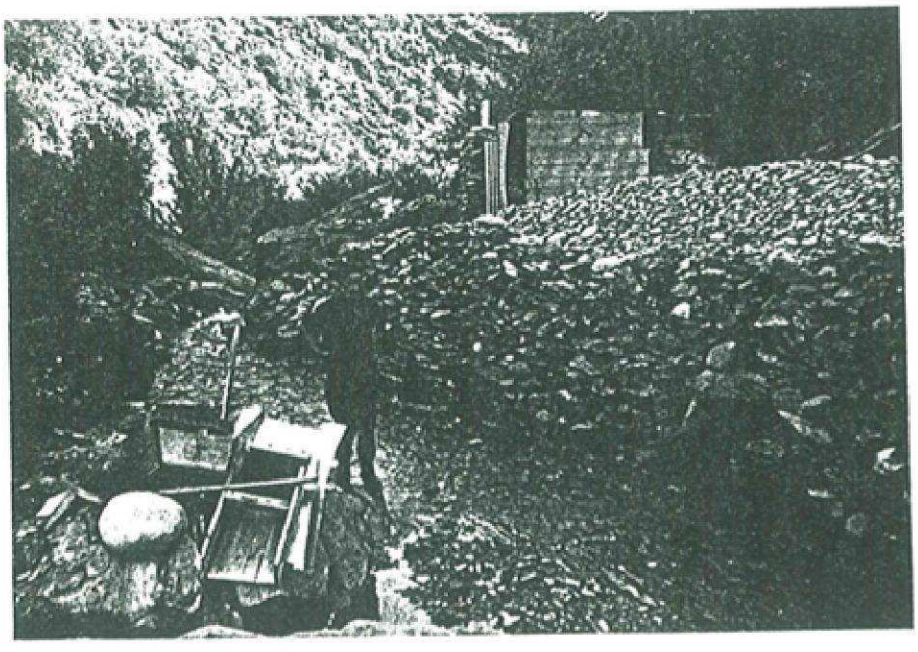


Figure 35 Above: The huts near the poplars at the hotel workings, Bendigo Creek. Below: Wattie Thomson with his stacked tailings, hut, cradle and a small sluice box (Wood 1970).

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 154 816

SITE NUMBER S124/250
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Sluicing

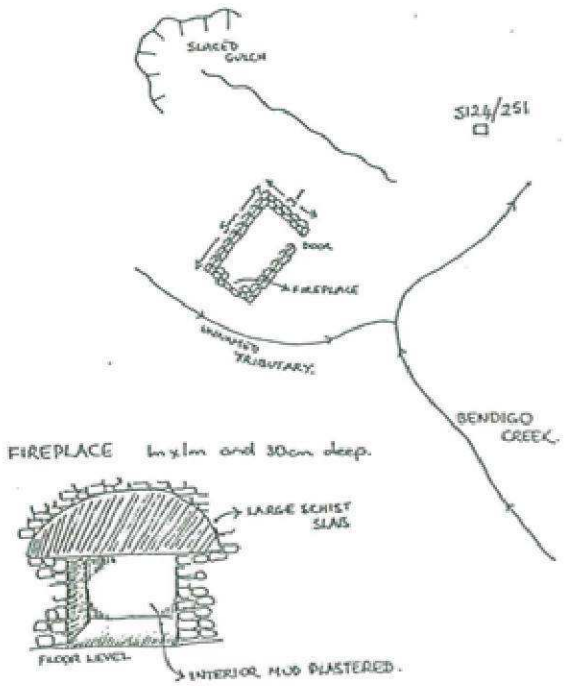
(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 154 817

SITE NUMBER S124/252
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



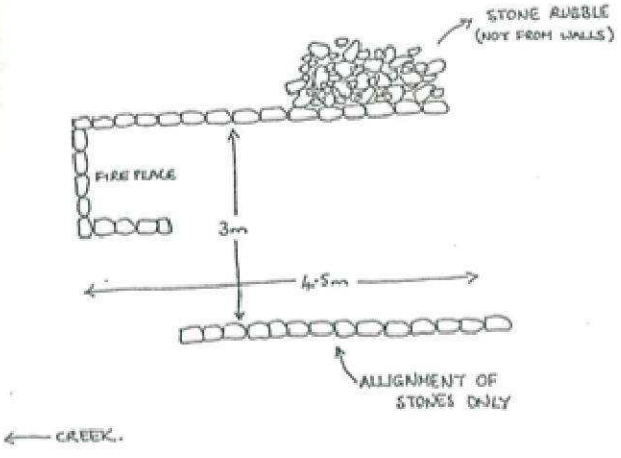
FIREPLACE 1m x 1m and 30cm deep.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 154 818

SITE NUMBER S124/253
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S124
Map Name Cardrona
Map Edition 1st 1970
Grid Reference 153 817

SITE NUMBER S124/151
SITE NAME: MAORI / OTHER Bendigo Creek
SITE TYPE Stone hut

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

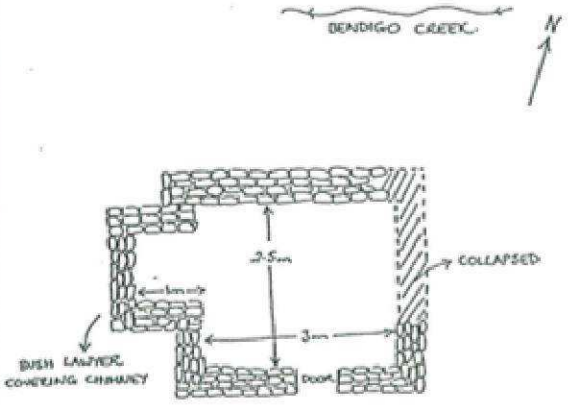
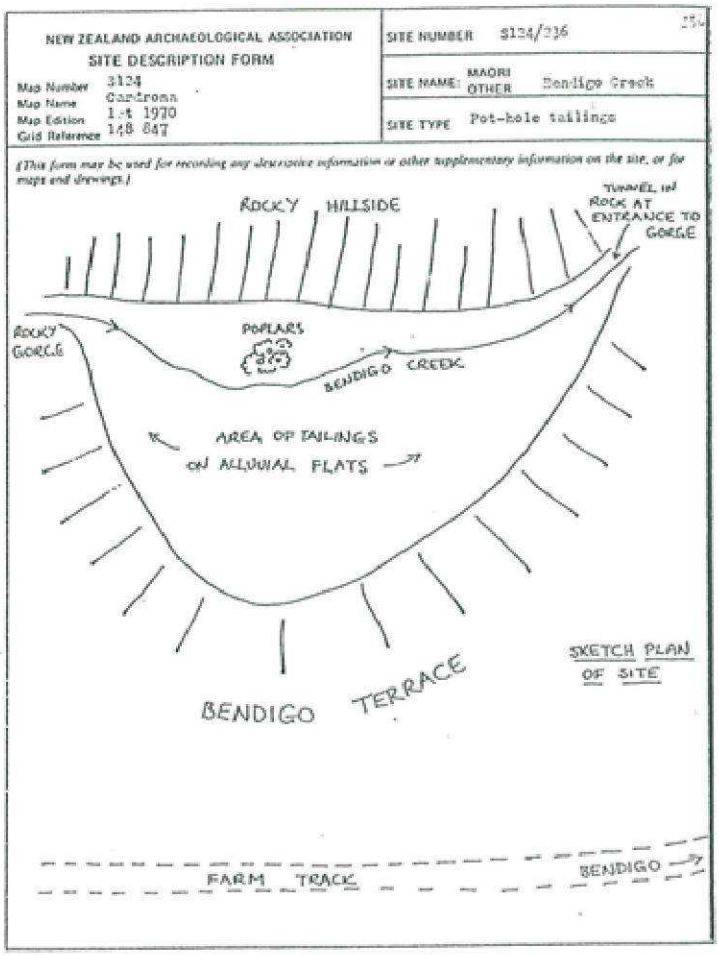
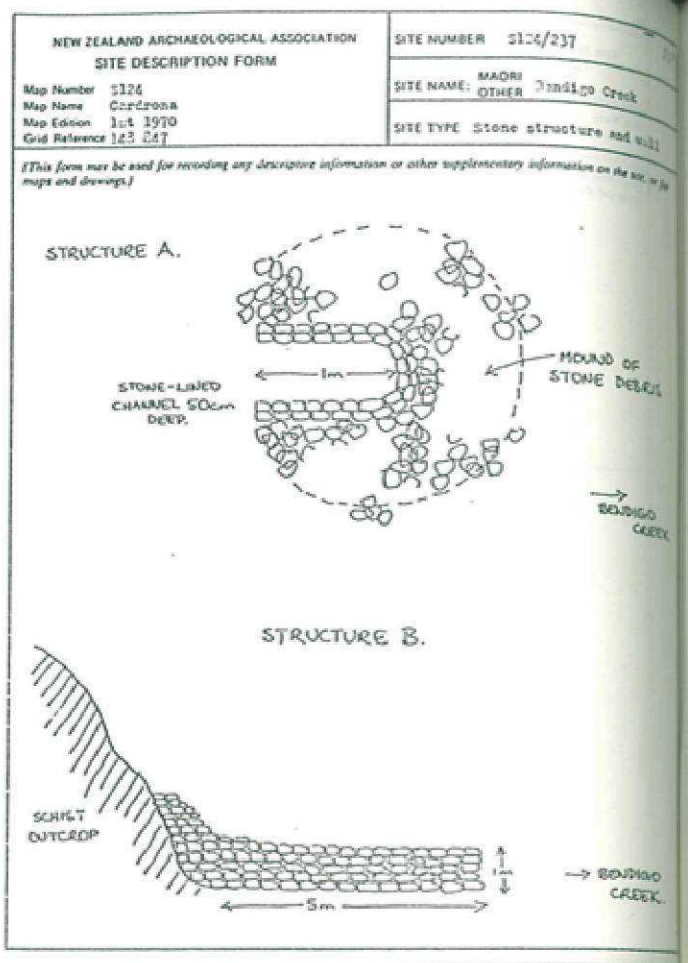
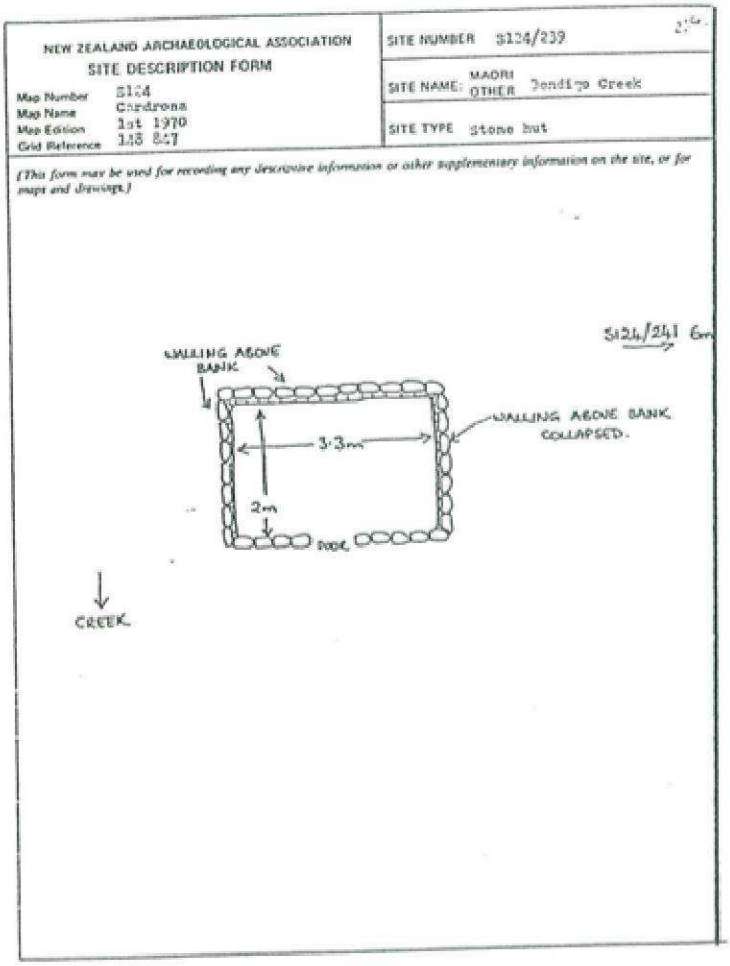


Figure 36 Sluice pit and huts at the western end of the hotel workings, lower Bendigo Creek.







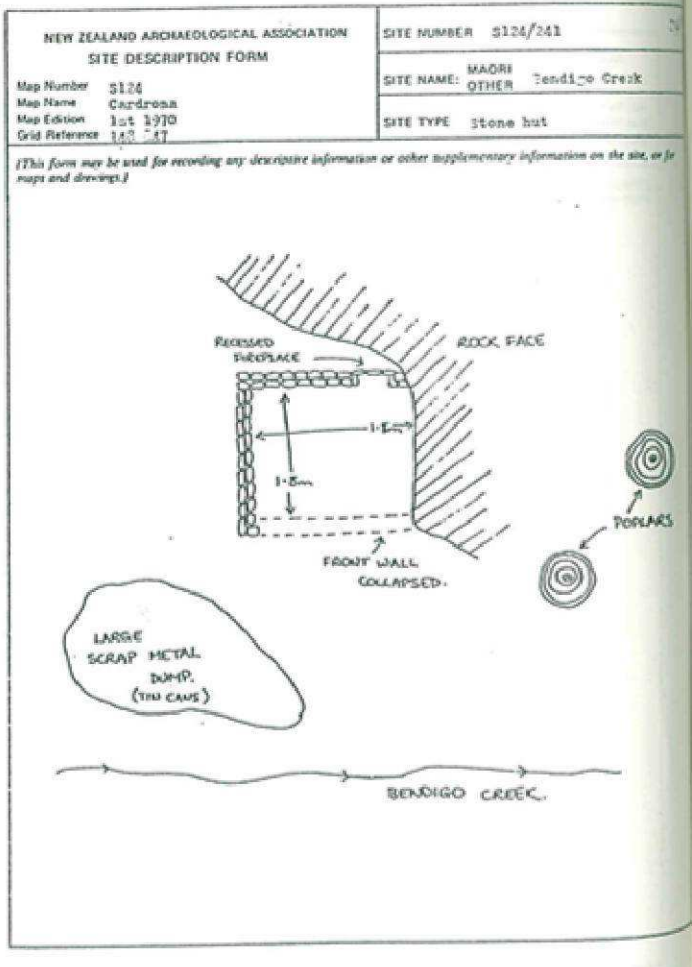
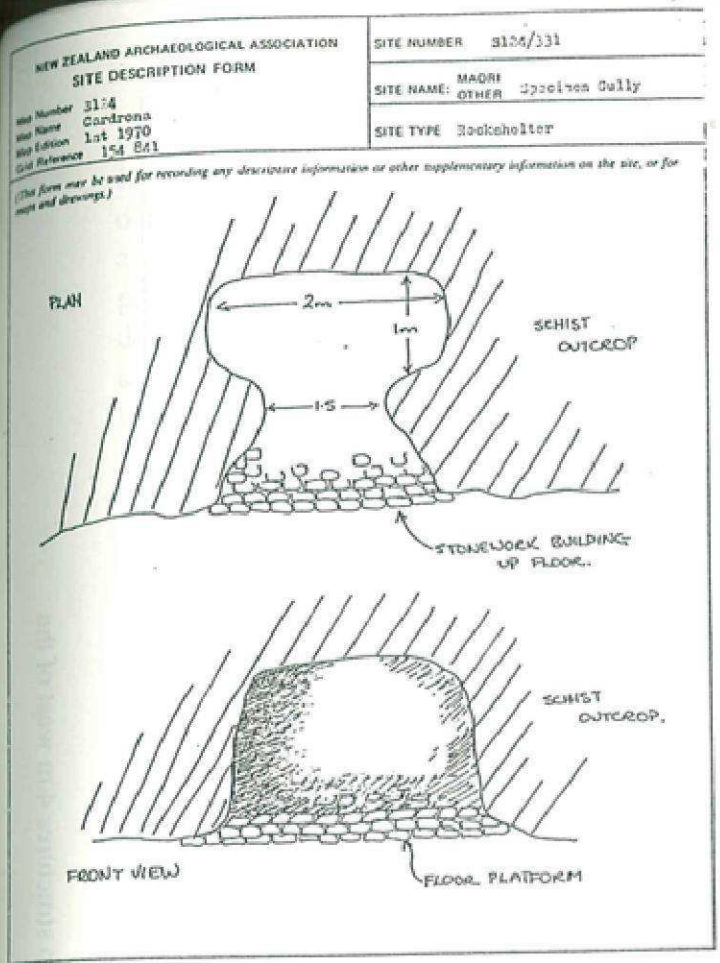
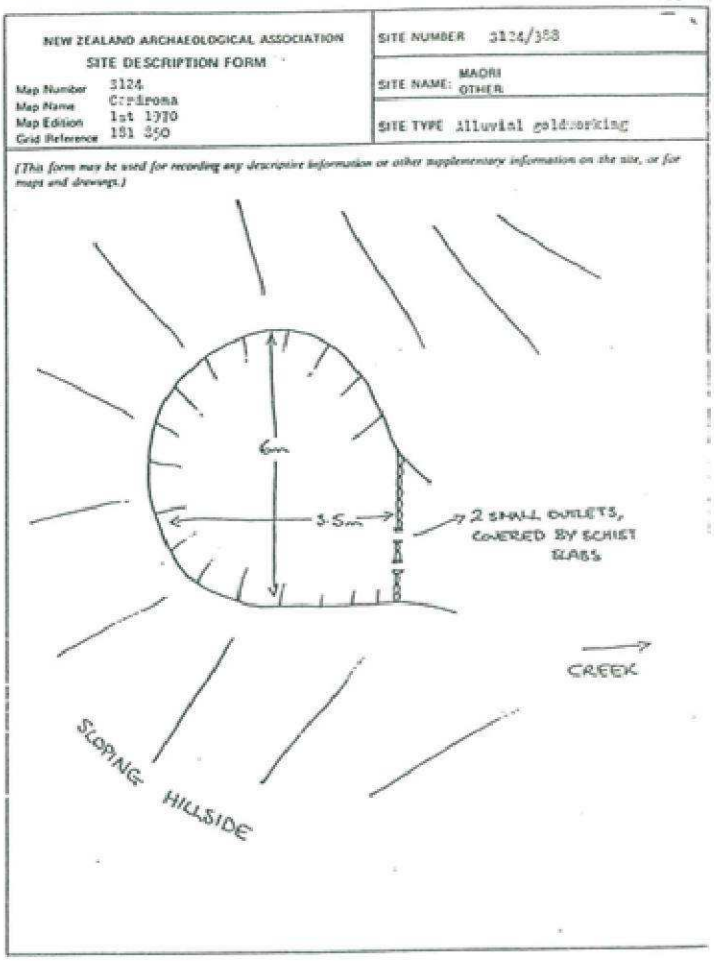
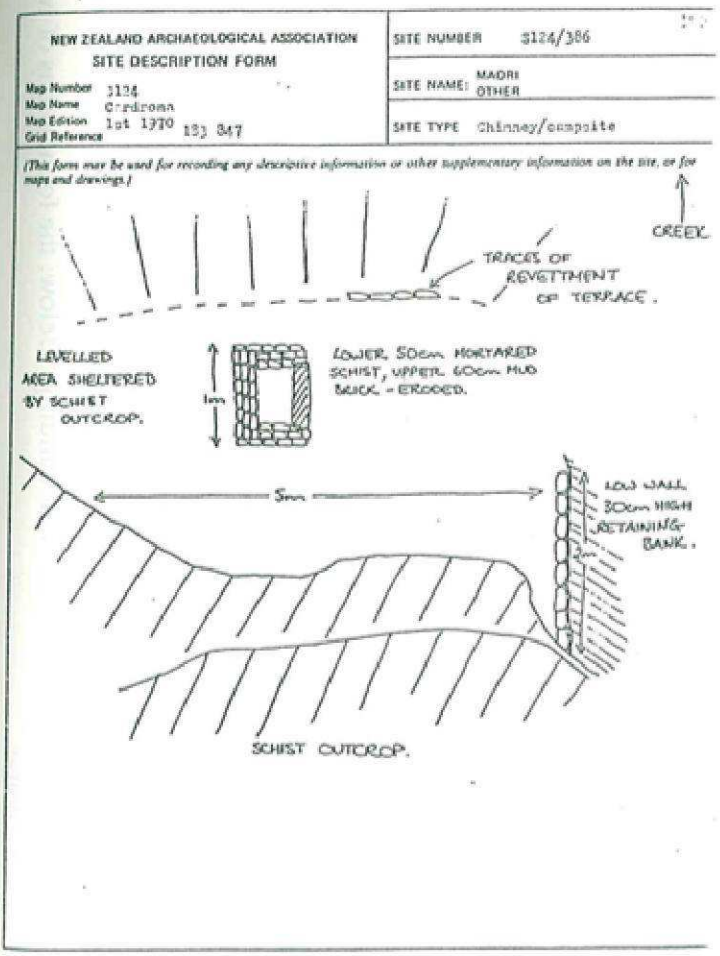


Figure 37 Tunnel Flat workings and sites, lower Bendigo Creek. Plans taken from Records S124/236, 237, 239, 241.







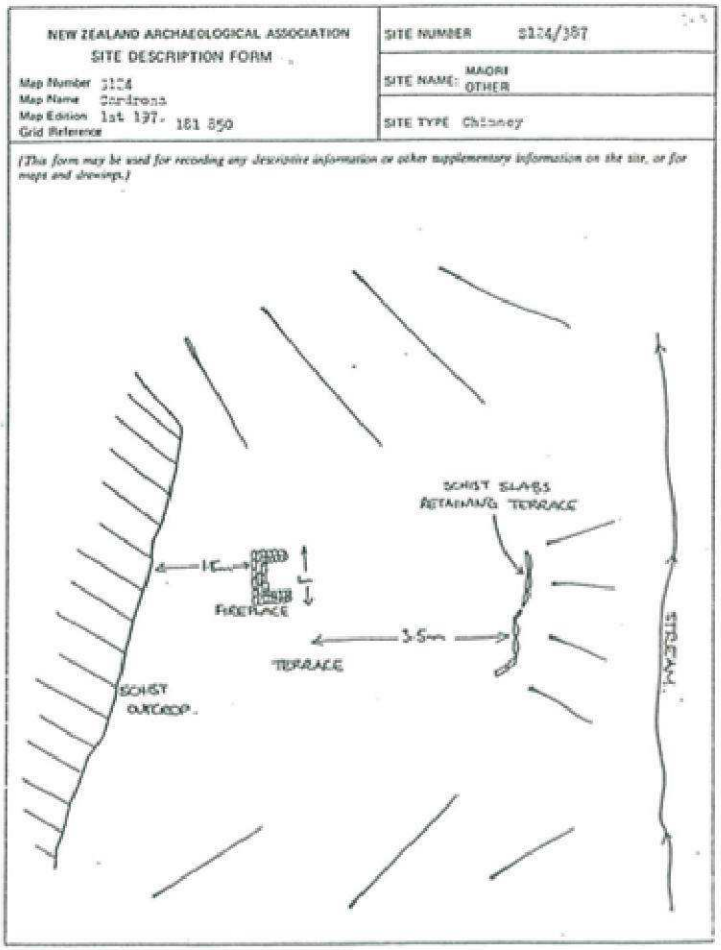


Figure 38 Minor sites north of the Bendigo reserve
Upper left: Rockshelter beside the entrance to the low level tunnel in Specimen Creek.

Three sites in a minor eastern tributary of Bendigo Creek.
Upper right: Reservoir in a sluice pit at the lower end of the sluicings
Below:Two camp sites with fireplaces on revetted terraces.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE DESCRIPTION FORM

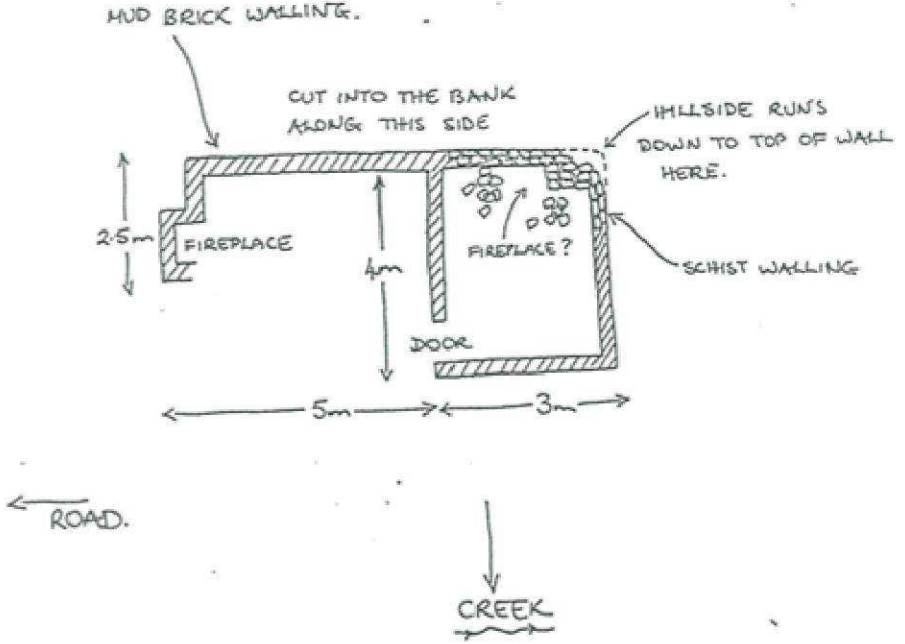
Map Number	S124
Map Name	Cardrona
Map Edition	1st 1970
Grid Reference	148 834

SITE NUMBER S124/268

SITE NAME: MAORI / OTHER School Creek

SITE TYPE Stone and mud brick hut and associated features

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE DESCRIPTION FORM

Map Number	S124
Map Name	Cardrona
Map Edition	1st 1970
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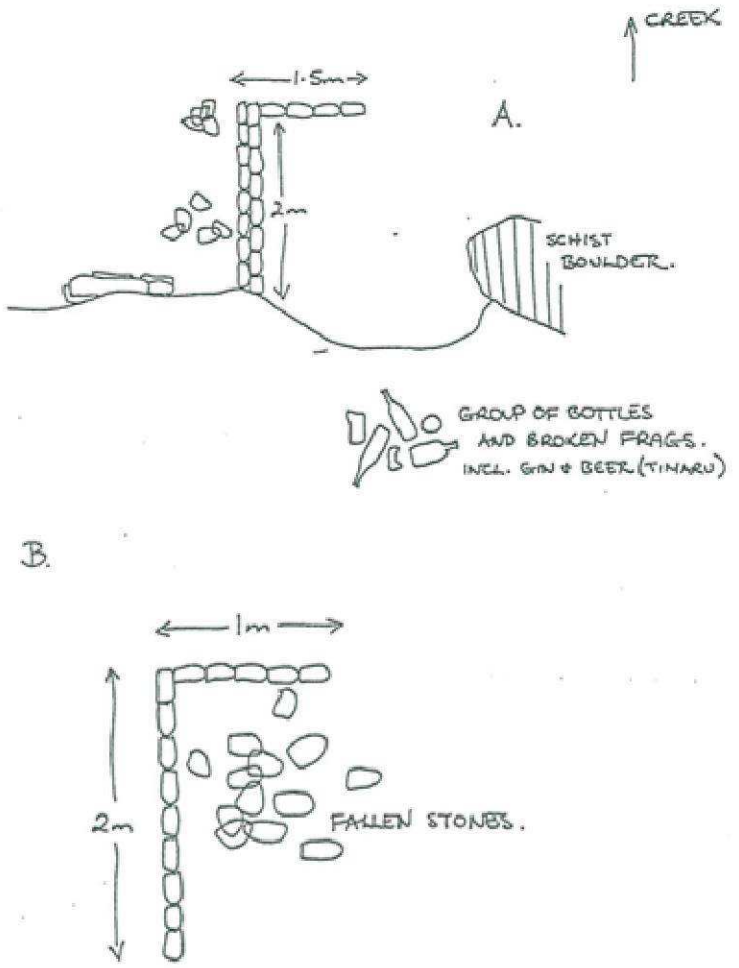

Figure 39 The complex in School Creek.
Above: The two roomed building. Below: the foundations of two structures 4 m west of the house.

tracks with revetted edges run from it to the battery (Fig.21), which fits the description of John Kane's double tramway of 1880. The entrance to Drive 1 may have been deliberately destroyed to provide a landing for ore from Drive 2, which was provided with a level track to immediately above Drive 1. A scour line down the hill suggests the presence of some sort of sledge track or cableway. This system tallies well with the description of John Kane's first use of the battery site in 1880 - a double tramway and an aerial cableway to carry ore to the battery. Since this was the first use of the site, it may be that Drive 1 does not run into the hill and is only a landing bay for the cableway.

Drive 2 runs into the hill for at least 25 m in a tunnel 1.6 m high and 1.2 m wide. Mullock from it is piled 15 m high and the revetted track to the top of the cableway is about 80 m long, 1.0 - 1.5 m wide and well revetted. About 150 m further uphill there is a short length of track which could have provided access for ore from Drive 4 over the other side of the ridge and opposite Drive 2. Drive 4 only goes in 5 m, however, and may have been only a prospecting drive. Another short prospecting drive, 1 m, long was driven at the same level as Drive 1 and 20 m to the south east.

About 100 m below Drive 4 in a gully of Shepherds Creek there was a group of sites which was difficult to interpret (Fig 20a). There were three areas for buildings on one side of a spur and on the other side, in a small steep gully, the remains of heavy machinery which looked to be unused. The structures were:

A short length of dry stone wall neatly finished at both ends, 3.5 m long, 1.7 m at its highest point and 70 cm thick,
A square stack of stone, 1.3 x 1.3 m and 80 cm high, suitable for a forge base but with no sign of firing, and set on a terrace, 3 x 5 m across and revetted on the downhill side.
Another terrace about 6 x 4 m.
The sites are strung out, 30 m apart, along the hillslope. The machinery in the creek downhill included a cam 1 m in diameter, attached to a 2.5 m long shaft, gradually thickening to 50 cm diameter. Beside it but not attached was a butterfly valve, 80 cm in diameter (truly), and 15 m below it was a pipe bend 70 cm in diameter. None of us have any idea, then or since, what this site was used for.

The battery is wedged into a remarkably steep piece of ground (Fig.21a) with relatively little flat ground around it for ancillary buildings. Extensive stone revetting surrounds it on all sides, and the only concrete, other than the battery mountings, is a channel and foundations for the gold sorting tables below the battery. Water was led away into a tail race that runs 100 m into the Rise and Shine Creek. It crosses sloping ground where there may have been other buildings but no trace of them was found among the briar and broom, and the area may have been used for spreading out sludge from the battery.

The battery itself stands 4.5 m high, on a base 3.5 x 4.25 m, with a pulley belt wheel and secondary gear wheel both about a metre in diameter. There is no longer any trace of a water wheel which could have fitted on either side. Considering that in 1906 a diesel engine was being used on the nearby Alta battery, it seems probable that some sort of internal combustion engine was used to drive the Come In Time during its final use in 1913. The battery is remarkably intact but in need of repair. The timbers from the southern end are lying on the ground, as well as a cam wheel and the louvred boxes from under the stamps. About 5 or 6 stamps are also missing. The tops of the big bearing frames are nicely finished with an ogee cut. The two crushing boxes are slightly different

in detail, showing the different origins of the two sets of stampers, and the middle stamper of each group of five is about 20 cm longer than the others, with an extra weight which shows severe evidence of being pounded. According to the warden's reports these would have been two sections of the old Matilda 20 stamp battery, which used parts of the older Solway battery. Portions of this battery may have been used off and on from 1870 to 1914.

The easiest access to the site is from the 4WD road that fords the Rise and Shine Creek about 300 m downstream. A benched and revetted pack track, hidden by broom and partly eroded, runs up the true left and once crossed on a bridge now washed away just below the battery. The numerous house sites along the Rise and Shine Creek below the ford suggest that the men lived downstream where the valley was sunnier and more open and walked to work each day up this track.

Settlement and workings in the lower Rise and Shine Creek

The remains of stone huts below the ford in the lower Rise and Shine form a definable settlement, each site described during the 1980 survey and shown diagrammatically on the overall plan of the batteries (Fig.19, Records S124/371 - 379). Neither the plotted positions on Fig.19, nor the grid references agree, with the descriptions of location on the records. The sites were not revisited during the 1990 survey, and I have assumed that the 1980 descriptions are the best guide to the pattern of this settlement.

Most of the hut sites run down the true left bank for about 230 m from the ford, but there is one foundation on the true right where the track to the ford levels out (Fig.22). Here two short lengths of stone walling, each about 50 cm high, form two sides of a rectangle 2.5 x 1.5 m, whose function was not determined.

Of the line of seven huts down the true left, the first three (S124/373-5) are 20-30 m below the ford, 7-10 m from the creek and within 4-10 m of one another. They are more likely to be separate dwellings than part of the same homestead. The middle one between two willows close to the creek (S124/374) is relatively large - about 4 x 4 m - but it is more likely to be a dwelling than an enclosure. All the sites seem to have been roughly made and/or very old, judging by their ruinous state. The highest standing walls, up to 1.5 m, are in the hut with a visible fireplace (S124/375).

The other huts are two pairs, each 30 m apart, and 70 m and 170 m respectively downstream from the ford (Fig.24, S124/376-379), and were overgrown with scrub in 1980. All were clearly defined huts with chimneys but tended to lack mortar except on the chimney. One hut (Record S124/377) had a particularly solid chimney, standing up to 3 m high when seen during the 1980 survey. Other walls were still 1 m high, the fireplace was 1.5 x 1.0 m across, and 1.0 m deep and there was a neatly built-in stone shelf. This hut is set low in the tailings and curiously has no obvious doorway. The second pair of huts also had some walls standing 2.5-3.0 m high during the 1980 survey, but were very overgrown.

The huts described are all built from durable schist, and there could well have been many other corrugated iron and sod huts, as well as huts of canvas over wooden frames with iron or sod chimneys. Traces of these would now be buried under soil, gravel and scrub, which helps to provide some protection from bottle hunters. The crack willows are very

large, but these are fast growing trees and may have been planted this century. Since most of these huts are so closely associated with the alluvial tailings, they are likely to have been built in the 1860-75 period, with some reconstruction possibly for the few men who worked the Eureka and Come In Time batteries later on. The alluvial tailings stretching down the creek (S125/371) are small amorphous heaps forming hummocky ground overgrown with matagouri.

Chapter 8
Field evidence in mid Bendigo Creek
In Bendigo Creek itself

Further down Bendigo Creek below the Rise and Shine confluence is the overgrown site of one of the great drains - the first Deep Level adit - started about 1871 to cross the lines of all the reefs (Figs 2, 2a). The 1876 map shows the adit labelled "tunnel", with a blacksmith's shop near the entrance and a track running up the creek to it. The only survey which managed to locate the entrance to the adit was Jacomb and Easdale's in 1980, and they recorded the opening as about 2.5 x 1.8 m and almost hidden by briar (S124/260). The floor of the drive was covered with water in which there was the remains of a cart with tramline wheels.

The mouth of the drive was 20 m from a revetted road (S124/63,260, GR169841) which runs downstream for 200 m, climbing steadily until it is 100 m above Bendigo Creek. It is at creek level immediately below the drive, and tailings from the drive spill downhill between the road and the creek. This end of the road has been used more recently to convey concrete pipes which cross the creek and carry water into an irrigation race for the Bendigo Terrace. Though the 1990 survey did not find the drive, they found:
1) a shaft about 200 m up the hillside above 2) some stone walling under a large rock which in turn was 120 m to the east of 3) a lone chimney on a terrace (Fig.25). The lone chimney was probably part of a camp site found in 1980 (S124/64) on a terrace about 5.5 x 3.5 m in extent below some large rocks. The chimney stood 3.5 m high, 1.5 m across the base. The camp site had some sluicing running down to the creek from it. The square of stone walling found in 1990 could possibly be the forge marked on the 1876 map, but it was difficult to correlate the relationship of the forge, road and tunnel mouth. The rock shelter (S124/67, Fig.25) found in 1980 was not relocated. This shelter was first found in 1977, but even by 1980 it could not be entered because of the dense growth of briar, matagouri, lawyer and bracken. The relationships between all these sites was very difficult to interpret, partly because of the dense shrub growth.

Perrys Creek and upper Aurora Creek

The sites around the mouth of the Deep Level adit are close to the confluence of Perry and Bendigo Creeks, and along with the workings up Perrys Creek are outside the Bendigo reserve (Fig.1b). As far as we could tell the reserve boundary runs up the hillside on the true left of the lower part of Perrys Creek, and workings in the whole of the creek have been included in this report. In the lower part of the creek these are trenches and shafts on the eastern ends of the Bradfoot, Lucknow, Anderson and Aurora Reefs (Figs.2 and 2a). At least 10 sets of workings, marked on the landscape by their mullock heaps (S124/369), extend for about three kilometres up Perrys Creek (GR170839 - 184822), suggesting that there are more reefs than those shown on Park's map or the old miners were prospecting fairly wildly. The 1980 survey found a chimney (S124/367), stone abutments (S124/366) and forge (S124/368) at the lower end of the creek (Figs 25 and 26). They also found the remains of a hut with a forge in it right at the top of the creek (S124/370). The 1990 survey relocated both forges and described several of the sets of workings.

Working upstream, an old road line from Logantown crosses Aurora Creek and runs on to ford Perrys Creek. It probably follows the alignment shown on the 1876 map (Fig.2b). The possible bridge abutments (Fig.25) are only 5 m above the ford, the platform on the true right being 1 x 4 m and one on the true left being 2 x 3 m, both built of stacked schist

and opposite each other. The chimney found on the true left downstream of the ford was on a terrace 5 x 5 m close to the creek , and in 1980 still stood 2 m high and 1.2 x 1 m across the base.

About 100 m upstream from the bridge abutments on the true left of the creek, there is a typical mining site of trench, prospecting pit and hut site, which in this case contained the base of a forge (Record S124/368, Fig.26). What is probably a more recent farm track runs across the trench and the hut is 25 m below the road. The trench, probably along a surface outcropping of a reef, is about 50 m long, 1.5 m wide and up to 5 m deep. A prospecting trench was opened to the west. The remains of a stone hut, about 3 x 3 m, built partly on a rock with walls still stacked 1.5 m high at the doorway, had a forge base of schist slabs with coal next to it beside the doorway. This forge is unusual in having the firebox to the left of the door as you enter, rather than to the right.

The lowest of the mining sites described in 1990, but not in 1980, is about 500 m above the bridge abutment site and ford on the true left of Perrys Creek (Fig.27, GR173833). It is a complex site, close to where a race crosses the farm track, and includes two sets of trenches, their spoil heaps, a shaft and stone revetments. The trench closest to the road is 20 m long, 1.2 - 2 m wide and only 2.5 m deep. The shaft beside it (1.5 x 0.6 across) appears to be only 3 m deep. The lower trench is also 20 m long, 1 m wide and only 2 m deep. Between the two trenches on the hillside is a benched track connecting two lengths of stone walling, an L- shaped one running 10 m along the hill and another running 20 m down hill at right angles. Both are about 1 m high and the hillside has dropped away below them, possibly removing the rest of an enclosure. Some of these workings may be the Victoria Company's, mentioned by Ulrich (1875:45) as being a trench 400 m beyond the main Aurora workings.

A further 300 m up Perrys Creek on top of the ridge between two tributaries of the creek, the 1990 survey located a group of two prospecting pits and a shaft and a drive about 100 m to the north (Fig.27, GR176829), which may be two of the ten sites seen in 1980. The pits were 5 x 3 m and 3 x 3 m respectively and the nearby shaft 1.5 x 0.75 m across and about 10 m deep. The isolated drive was 2 x 1 m across and about 4 m deep but partially collapsed. It sloped down at about 15 degrees and had been revetted for one metre on the north side.

The remains of a large hut with a forge even higher up Perrys Creek (Fig.27, S124/370, GR180825) is rather puzzling. There are some scattered workings further up the creek but it seems an isolated place for a forge. A water race does come out of the creek on the true right about 110 m upstream of the hut and runs only 10-15 m from the hut. The forge may have been used to make pipes and fluming for sections of the race. The hut is on a terrace about 3 m from the creek on the true right. It size is variously reported as 4 x 5 m or 5 x 8 m and its chimney still stood 1.8 m high in 1990. This is an unusual hut in that the schist slab walls had been topped with mud bricks. Some heaps of stone rubble about 40 m downstream may have been other structures.

The 1980 survey found workings up Perrys Creek as far as GR182825 where a race crossed the road. The 1990 survey located some even higher at GR184822 (Fig.26). They were the usual trench (17 m long, 1 m wide and up to 3 m deep) with its spoil heap, and a shaft (1 x 1.8 m and about 7 m deep) placed 3 m from the end of the trench to work a

deeper section of the reef. There were some outlying structures - a heap of stone, another prospecting pit and across the road another collapsed shaft and spoil heap.

Unlike Perrys Creek, most of the Aurora Creek workings are in the Bendigo reserve, but since the southern corner of the Cromwell Company claim was not included in the reserve (Fig.1b), there are sites to the south of the reserve boundary. It should be possible to correlate these sites with those marked on the 1876 map, though the creeks tend to be shown only diagrammatically. The workings are reached via one of the most impressive sites in the Bendigo reserve - a revetted road which crosses Aurora Creek on a massive stone bridge. The old roadline continues past workings within the reserve, crosses the boundary fence and runs up the true right of Aurora Creek. It crosses over into a major tributary to the east and continues up its true left.

The only alluvial workings recorded for the upper parts of Perrys or Aurora Creeks lie about 700 m from the stone bridge (Fig.28. GR172831) in an eastern tributary of Aurora Creek. They are simple sluice faces with some tailings in the creek and were probably worked by a race which rises in the head of the tributary (GR176825), runs over the watershed into Perrys Creek and back into the Aurora beside the sluicings. The old road line continues up the true left of the tributary and about 100 m above the sluicings passes two shafts and two trenches with associated spoil heaps (Fig.28, S124/293, GR171831), of which only one shaft and trench was found in the 1990 survey. This latter trench runs down about 8 m and then drops into a vertical shaft, about 2.5 m across and 8 m down to water level. Above it the old roadline is partly revetted, but this had not saved it from considerable erosion which considering the bareness of the ground is likely to continue. The age of the road is apparent from the stone culvert 200 m further up the creek where the road crosses (Fig.28, GR172829). The crossing is made of stacked stone to form a bridge 8 m long, 4 m wide and 0.6 m high. The culvert passing under it is only 30 cm diameter. This is a small version of the big bridge downstream in Bendigo reserve.

The most important sites to the south of the reserve in terms of the whole mining system are the dams and water races. We found a dam and two race systems, but since they were supplying works within the reserve we could not expend the time required to follow them, illustrating the difficulties of doing surveys of only part of a mining landscape. The largest dam in the Bendigo field, according to John Perriam, is this one in the headwaters of Aurora Creek (S124/364, Figs 29, 29a, GR165818). There are a few poplars immediately downstream, three or four tent sites and a minute hut beside the dam. About 30 m below the hut, a levelled terrace on the rocky ledge may have held another building. The dam wall is 6 m high in the middle, 16 m long, built of stacked stone with a steep, curved, front face and apparently deliberately back filled with earth, a very unusual design. It held back a pool of water about 120 m long and 40 m wide. A natural rock ledge has been used for the spillway at the western end, and pipes still lying about suggest that there was a piped outflow but no obvious race was found downstream. Though the dam is not breached it does not hold water and leaks at the base. This appears to have been a control dam but we were unable to work out how the water was used within the reserve downstream.

The dam keeper's hut (S124/365) under a massive tor nearby is a fragile gem, almost buried under a large bush of leafless lawyer. Its corrugated iron walls enclose an area only 2.0 x 2.5 m with a small, stacked stone chimney (1.5 m high) to allow light in. The wooden door, corrugated iron roof, jute sack lining and simple bed and box shelf table are

still intact. The floor is wooden except under the bed which is paved with stone slabs. To the north of the hut under the vegetation there is cave-like space under the rock tor which could have been used for storage. A few utensils such as an enamel basin, billy, tin mugs and a metal bath tub provide a sense of domesticity.

During the 1980 survey a stone walled enclosure was described as about 150 m west of the dam (S124/363, GR163828) in the creek to the west. It is described as a stone walled enclosure about 15 x 25 m (Fig. 29a) with walls only 0.7 m high. The site is said to have been south west of "an area of mining with hut", but no such site is described for this grid reference and neither the hut nor the enclosure were relocated. Judging by Hellebreker's map (Fig.3) they are closer to the reserve boundary.

The last site in the Aurora Creek catchment is the intake of a major race running down to Welshtown (Fig.30, GR150822). Below it is a relatively modern dam and a prospecting pit which are probably unrelated. The race runs off down the true left of the creek and is visible within the reserve beside a track that runs out of the reserve through the south western boundary fence. Since we were not working within the reserve we could not work out the function of this race either. The other major race runs from Devils Creek and its course was not traced. It is clearly shown on the 1907 geological map (Fig.8) and is in such good condition that there is a proposal to use it for modern irrigation. The 1907 map shows quite clearly that it extended as far as Swipers Creek, suggesting that it was originally built for alluvial mining and could be an 1860s race. Its most important section within the reserve was not traced.

Chapter 9.
The field evidence in Lower Bendigo Creek

A series of small gorges and steep hillsides confine Bendigo Creek at intervals all along its course, and mining sites are grouped mostly where the gully opens out or a large tributary enters. Above the mouth of Aurora Creek there are alluvial tailings along the creek bed and the ruins of about three stone structures. These will be early sites, belonging to the period of alluvial workings in the 1860s. There are another three hut ruins nearby in Aurora Creek. These sites were surveyed in 1980 but not in 1990 and the grid references do not agree with the locality descriptions, making it difficult to provide a summary of their relationships.

A major area of gold tailings extends upstream in Bendigo Creek from GR165847 (Record S124/246) with a water race running along the true left bank and below it a stone lined sludge channel. There is a low saddle through to Aurora Creek only 50 m downstream. At the lower end of the tailings there is a large enclosure (10 x 7 m) with partly collapsed stone walling only 1-0.5 m high, lying between the race and the sludge channel and suitably placed to be a garden (Fig.30). There is no indication of the origins or destinations of the race and sludge channel. Further downstream and only 50 m above the Aurora Creek confluence, there is a similar enclosure, 8 x 3.5 m, (Record S124/243, Fig.31), revetted into the bank but described as a hut with window and a door and walls up to 3 m high, set in a channel between a steep bank and a mound of tailings in the creek. (The tailings are not described and I suspect that there are almost continuous tailings from Goodalls Hotel up Bendigo Creek for a kilometre above the Aurora Creek confluence.) There was no obvious fireplace in this long hut, and pieces of pale green Chinese rice bowl were found with glass and china debris beside the hut. A short distance upstream, still on the true left, there were the remains of a very small stone hut, 2.0 x 2.5, with walls still standing 1.6 m high and a small chimney, 1 m high, and 50 x 50 cm across (Record 249, Fig.31).

Within Aurora Creek there are three stone structures on the true left of the creek, the first only 50 m from the confluence. It is again a long hut, 6 x 3 m, dug back into the bank and made of relatively rounded schist cobbles which have largely collapsed (Record S124/248, Fig.30). About 100 m further up Aurora Creek there is a small complex described as a stone walled enclosure (6 x 3 m) and beyond it a small hut with depressions and stone heaps around it (Records S124/247,244, Fig.32). The enclosure is largely collapsed and dug back into a revetted bank with walls standing now only 50 cm high. It is only on the grounds of the poor nature of the masonry that the recorders considered it to be an enclosure rather than another long hut, but the masonry was mortared. The small hut (3 x 2.5 m) adjacent to the south is also cut back into the bank, revetted 1.5 m high, and may have been beside another hut of which only two walls and a stone heap from the chimney remain. The deep holes nearby may be vandalism due to bottle hunters. These structures are 20 m from the creek.

Records S124/242- 245 describe sluicings on a small alluvial flat below a steep gorge with waterfalls at the downstream end of Aurora Creek before it enters Bendigo Creek but does not relate them to the this group of huts. (The grid references do not help.) The tailings are amorphous mounds with stone-lined tail races among them. A water race runs along the true left bank above them, arising from the creek where it levels out below the falls. The 1980 survey did not find dwellings immediately adjacent to the sluicings, and judging

by the contours on the topographic map this must indicate that the tailings are upstream of the two sites described above at about GR164844 (north of the Bendigo Reserve boundary). This whole group of tailings and long and small huts, lying a few 100 metres above the main alluvial workings in Bendigo Creek, would be well worth detailed investigation.

The flats downstream of the Aurora Creek confluence were described in 1980 as covered with tailings stretching for more than a kilometre and 250 m wide (Record S124/242, Fig.33). In 1990 almost the whole flat had been worked by modern gold miners, apparently without any realisation that these were the early alluvial workings in the Bendigo field. In 1980 the site was described as hummocky ground with tailings mounds resulting from pot-hole type workings, also called paddocking. (These were the claims described by Duff (1978) as 24 feet square.) Stone lined tail races and other stone work were scattered through the site, but unfortunately no sketch map was made of the workings. Some sluicing had occurred especially in the gully at the western end (Record S124/250, see below). Races on the adjacent hillsides are mentioned but their intakes and destinations not detailed. A large one coming down the true right bank, which has been partly utilised for an irrigation race, rises opposite the Deep Level adit (Record S124/260, see above). It came round bluffs on fluming, whose supports are still visible at the upper end, and below a section in concrete pipes the original race continues down the true right bank.

A number of dwellings were described among the tailings in 1980, and one in a damaged state still exists. The major ones are Goodalls Hotel buildings and associated structures which are still in place on the true right side of the tailings (S124/65,256, 257, Figs 33,34). A survey in 1977 described five buildings but drew only four (Fig.34). The 1980 survey described the remains of two large building, two chimneys and two stone lined pits. (The record forms separate one of the large buildings from the complex, and Figure 34 is a composite drawn from both records.) The upstream building in 1980 was described as 10 x 8 m with a central longitudinal wall, and a gable up to 4 m high, and no sign of a fireplace. The downstream building (S124/257) is shown as 7 x 5 m, with a gable up to 3.4 m, no trace of a chimney and only a single window. Both may have been dormitory buildings, filled with bunks, and the kitchen/dining area was built around the two chimneys between the two buildings. One of the stone lined pits was 2 x 3 m and 1.5 m deep with much broken glass about, and was probably a cellar. There were also vast amounts of broken glass around the downstream building. It seems likely that only one of these buildings was burnt down in 1872 and the other remained to be recorded as a hotel by Mackay in 1876 (Fig.2a). About 50 m downstream there is another fireplace (S124/258), standing only 1 m high with an interior 50 x 75 cm and no sign of stone walls, suggesting either a corrugated iron or sod hut. The clearance of briar and scrub from this whole complex would probably reveal more structures.

On the true left of the creek is a group of poplars with other dwellings near them. One is a double hut (S124/255 or 65, Fig.35), each room having its own fireplace and outside door, a very unusual pattern. One of the poplars is growing inside the larger hut which is 4 x 3 m, and the smaller is only 2.5 x 3 m. The walls are badly collapsed. Behind the hut there is a race running along the hillside and above it a revetment 1.5 m high. According to the 1977 survey the water race was built by Wattie Thompson who mined there until about 1972. (He also mined near the old Lindis Hotel and in the lower part of Luggate Creek,

where I have previously recorded his huts and workings.) The photograph in Wood (1970:53) shows him using a cradle and small riffle box beside a massive stacked-stone wall. This site appears to be in a narrow gorge and not on the hotel flats, and has not been identified during the field surveys. Downstream of the poplars was a minute hut, 1 x 2 m, (Fig.35) below a water race, with nearby fragments of a fluted opium pipe, parts of a Chinese dried vegetable container and green ginger jar, and glass fragments from bottles of "Davis Vegetable Painkiller". The 1977 survey also recorded the presence of three stone structures at the upper end of the flats (S124/66) apparently in the mouth of Aurora Creek and 10 m west of where a water race meets the confluence. The description was too vague to distinguish them from later recorded sites.

At the western end of the hotel flats before the creek runs into a gorge, there are some sluice faces associated with the stone ruins of three huts (S124/250-253, Fig.36). The relatively small sluice pit has faces up to 10 m high and among the tailings below it are the remains of two huts. The upper one, 5 x 3 m (S124/252), 25 m from Bendigo Creek, was in good condition in 1980 though overgrown. Its walls were 50 cm thick and standing up to 1.7 m high. The lower one, 2.5 x 3 m (S124/251), was also in good condition and made of unusually small stones, with a deep recessed fireplace well plastered . The chimney still stood 3.5 m high in 1980. The third hut (S124/253) is really at the western end of the hotel workings but only 50 m upstream of the sluice pit. Only the fireplace is intact, 1 m high, and the other walls are marked by stone rows, suggesting that it may have been a sod hut.

Downstream of the hotel workings, there is a similar but much smaller flat covered with pot hole workings (Records S124/236-241, Fig.37). They cover about 200 x 400 m, again with a patch of poplars on the true left side. Bendigo Creek flows through gorges at both ends, but at the western end the creek flows through a man-made tunnel which lowers the creek level and provides a bridge over the creek. Within the tailings, there are sections of walling, tail races and stone platforms, especially towards the western end.

Structures and two huts near the poplars were separately recorded in 1980, as well as two structures on the true right near the western end. Unfortunately the positions of these sites were not plotted on the sketch map of the workings. There is a small domestic complex upstream of two large poplars on the true left of the workings, consisting of a minute hut, 1.8 x 1.8 m, built against a rock face and a larger hut, 3.3 x 2 m, built into a bank 6 m upstream (Records S124/241,239, Fig.37. Between the two huts low terraces edged with rocks have been formed, possibly for a garden. The smaller hut against the rock had walls 50 cm thick and up to 1.5 m high in 1980, whereas the walls of the larger hut were still up to 2.2 m high. The latter did not seem to have a fireplace and the smaller hut may have been its kitchen. Near the poplars and the hut complex was a stone lined bin and a freestanding wall (Record S124/237). The bin, 1 m deep, was built into a mound of tailings and the wall, 5 m long and 1 m high, was built very solidly out from a schist outcrop with an extra piece running up the cliff (Fig.37). The only other structures described in 1980 on the flat were 200 m downstream from the poplars on the true right. They were another stone-lined bin (Record S124/238) built back into the hillslope, 4 m long, 1.8 m high and only 1.4 m wide. (These bin sites could have been entrances to adits.) Nearby was a stone fireplace (Record S124/240), 1 x 0.5 m, on a levelled area suitable for a tent, with a low retaining wall 10 m down slope from it. (No drawings were made of the latter sites.)

The final sites within Bendigo Creek itself are the dredge pond and tailings (S124/235) adjacent to Bendigo township. In 1980 there were tailings 100 m long and 10 m wide on one side of the road with a pond about 100 x 100 m and up to 25 m deep on the other side. Quarrying for gravel has largely destroyed these sites which were formed in the 1930s.

Still within the Bendigo Creek catchment, sluicings (S124/330) run downhill in Specimen Creek from where the road crosses it within the reserve, through the reserve boundary fence to well below the entrance to the great low-level adit (S124/332, GR155842). The 1980 survey described a complex race system feeding into the sluicings, with four races from higher in Specimen Creek (three on the true right and one on the true left) and two more from the creek west of Specimen Creek. About four dams of schist walling have been placed across Specimen Creek between the road and the adit entrance to provide intakes for the races. The highest of these dams is only 20 m below the road, and 35 m west of it there were two stone revetted terraces which may be camp sites.

Down near the adit, a line of stone supports thought to be for a pipeline run downhill from the dam immediately above the adit. There are still pegs with cables attached driven into the ground along the line, which finishes at a revetted platform, 6 x 4 m, 10 m from the creek on the true left (GR155141). At the back of the platform are the last two stone supports along the line (S124/330) The cable and the platform at the bottom suggest that this could have been an aerial cableway for transporting ore. (Unfortunately no plans were made of these workings.)

The mouth of the adit (S124/332, GR155842) is clearly marked by a group of poplars in the creek bed and four ridges of tailings fanning out into the gully 50 to 100 m downstream of the tunnel entrance. A track leads in through the tailings from the west, among which there are various timbers and a dump of tin cans. The adit enters the hill under a natural scarp where the creek fell over a waterfall. The creek has been dammed above the scarp and diverted down a stone lined channel 3 m to the right of the tunnel entrance, which is 2 m across and now only 1.5 m high. The entrance was probably originally higher, as it is now silted up and had about 25 cm of water in it in 1980. There is a stone platform 5 m to the west of the tunnel entrance, which could have held the foundations of machinery. A rock shelter (Fig.38, S124/331, GR154841) only 50 m upstream from the tunnel entrance has had a stone platform carefully constructed to provide a level floor. It is a true cave with a narrow entrance and a small room at the back 2 x 1 m, suggesting that it may have been a store room for explosives.

Outliers

There are two outlying areas of workings within Bendigo Station in an eastern tributary of Bendigo Creek and west of the reserve in Schoolhouse Creek.

Three or four small parallel gullies drain the main terrace edge between Shepherds Creek and the main course of Bendigo Creek (Fig.1b). They carry minor gold bearing gravels, and small sets of sluicings have been worked back into them which were recorded by the 1980 survey but not during the 1990 one (Records S124/385-388). Between the two most eastern gullies a reservoir has been formed on the saddle to enclose an area 30 x 25 m with an earth wall 1 m high and 2 m wide (S124/385, GR183847). A water race running along the north facing hillside nearby feeds it, probably from Shepherds Creek . The races which emerge just above the stone stockyards are probably too low down to supply this

reservoir. (See above, Farming at Bendigo.)

Water from the reservoir could have been taken down to the three small gullies to the west (S124/389), each with their extensive sluicings and small tailings mounds, and down to the most eastern of the gullies (S124/388), which contains a sluice pit converted into a reservoir by putting stone walling across its mouth (Fig.38). Near to the sluice pit is a fireplace, still standing 1.1 m high built of small pieces of mortared schist on a terrace 3.5 m long (S124/387, Fig.38). Further up the creek is a more elaborate camp site (S124/386, Fig.38), with a chimney made of stone at the bottom and mud brick at the top. It is on a revetted terrace against a schist outcrop.

The sites between the western boundary of the reserve and School Creek are a mixed bag. The lowest one (S124/266, GR145841) was considered to be a reservoir, 20 x 10 m, dug into the hillside with a scarp 4 m high at the back and 1 m high at the front. It is not obvious what such a reservoir could have been used for, unless it supplied the Solway battery at the bottom of the hill. It could not have supplied the nearest alluvial workings which are to the south and uphill (S124/267, GR145837), and which consist of a number of small tailings mounds within a tributary of School Creek.

On the road up to the reserve there is the inevitable shaft and its spoil heap only 40 m below the road and about 300 m from the gate into the reserve (S124/263, GR149838). The shaft is 3 m across and was filled with fencing rubbish in 1980. It may be the workings identified by Duff (1978:81) as an unsuccessful attempt by the Golden Gate Company in 1869 to strike a westward extension of the main line of reefs.

The last site is distinctly enigmatic. It is in the upper part of the eastern tributary of School Creek and includes the remains of a two roomed house, orchard, outbuildings, a race and rubbish dump (S124/268, Fig.39, GR148834). In 1980 the house, 8 x 4 m, was recorded as built of mud brick with schist slabs incorporated into some walls. The walls still stood 2 m high with a fireplace in each room. The record form describes another fireplace, depressions, Chinese ceramics, various sorts of bottle glass and the remains of two structures, A and B, 4 m west of the house. Unfortunately there is no overall plan of the site. Across the track which passes within 20 m of the house, there was a dead macrocarpa with the remains of a schist structure among its roots. A race begins in the stream 50 m upstream of the ford near the house.

Chapter 10
Discussion and recommendations

Describing a field of quartz working is much more frustrating that describing alluvial workings. The latter can be organised into catchments with a top, a middle and a bottom end - races and reservoirs above, sluicings in the middle and tail races below with some sort of settlement off to one side. The only organising principle for quartz workings are the lines of the reefs, which in the faulted rocks of Central Otago can run any which way. This report is even more inchoate because it is describing only sites outside the major workings already protected within the Bendigo reserve. Only the Rise and Shine sheer zone and the butt ends of reefs within the reserve are being considered.

In the descriptions given above, I could have described all the alluvial workings first in a separate section, but they are so intermixed with the quartz workings that I could not always be sure which hut sites belonged to which type of workings. I consider that it is more illuminating to look at entire landscapes as entities, an extension of the principle of looking at sites as groups and systems within a landscape, rather than as separate entities each with its own site record form.

One of the most difficult things to decide was the relationship between the sites on the ground and the features shown on Park's 1907 and Mackay's 1876 maps. Work is in progress by a graduate student to match both these early maps to the modern topographical maps (Matthew Campbell: pers.comm.).

Summary of sites

There are no known Maori sites on Bendigo Station, but the distribution of sites in the vicinity indicate the possibility of undiscovered material preserved in dry rock clefts.

The only early farming sites on the pastoral lease are the stone stock yards and stone hut at the mouth of Shepherds Creek, which would have been mustering yards and accommodation for Morven Hills run, especially when the woolshed for the area was on Ardgour Road. The stone huts belonging to that early woolshed are on freehold associated with the run. All these structures are over 100 years old and protected under the Historic Places Act 1980 as archaeological sites.

Bendigo township at the foot of the hill was a staging post for goods brought by large drays up the Clutha Valley, which had to be transferred to lighter drays and pack horses for the steep climb to the workings. It lost its importance at an early stage and of the many buildings along its main street, only a few traces remain. The bakery is the best of the ruins, and the hotel and store is only indicated by a few foundation stones, rubbish and the outline of a garden with roses, fruit trees and a rosemary bush. A possible holding paddock for horses is outlined by mature poplars to the south, and numerous traces of sod walls and rubbish indicate that there may be more remains to be discovered within the top soil. All these structures and traces are over 100 years old and protected as archaeological sites. The one occupied cottage probably dates from the period of the establishment of Bendigo Run as an entity about 1910. Though not spectacular this site has considerable charm and would lend itself to low key interpretation to the public if access could be arranged. There has been a proposal to survey the bakery off as a small reserve.

The school for Logantown and Bendigo (S124/262) was placed mid way between them, and though only trees and isolated chimneys mark the site it would be appropriate to provide some interpretation linked to that of the township. At present there are only two wooden signs, one at the township and one at the turn off to the school. The sign boards claim that the school was in place from 1880 to 1914, but the sign at Bendigo Township gives the same dates which are obviously wrong. Dates for the township should be avoided as there was no definite end to its occupation.

One isolated residence site in School Creek (S124/268) may need to be considered for protection by covenant. It requires some further investigation to determine what its function was and whether or not it is likely to be over 100 years .

Now for the difficult part. I have used natural catchments as far as possible to organise the descriptions of the gold field workings, starting at the top of the Rise and Shine/Bendigo Creeks catchment and working downstream, branching off up major tributaries as I came to them. I will try now to sort the sites into functional groups of:
1) Alluvial workings with their settlements and major buildings, 2) battery sites and mines, 3) inevitable miscellaneous.

1) Alluvial workings
The alluvial workings in the upper Rise and Shine include ground sluicings in two major gullies running south west from the main creek and an area of amorphous tailings within the main creek (Fig.10). Water races were brought in from Thomsons Creek along both sides of the valley. A large stone lined reservoir (Record S125/34) still exists in the eastern gully, and there are remains of stone cottages mostly grouped together in a settlement towards the lower end of the flats (Record S125/Fig.13). They include one distinctive hut with a rounded chimney, similar to one built beside the old Morven Hills Tarras woolshed (Fig.4, Record S124/51). Virtually all of these alluvial workings will date from the 1860s and be protected as archaeological sites over 100 years old. Some of the water races may have been built or reworked to supply the batteries at the turn of the century and in the 1930s.

Below the upper flats the Rise and Shine and Bendigo Creeks run through alternating gorges and open sections, now heavily overgrown with briar, matagouri and other shrubs. There are probably short sections of early workings in many places down the creeks, similar to the tailings we found about 300 m below the Rise and Shine Battery site, where 20 m of the edge of the creek had been worked. One of the more interesting workings lie below the ford for the farm track leading to the Alta battery (Fig.22). Amorphous tailings are scattered down an open section of the creek bed for about 200 m, with the remains of about seven stone huts spread out among them in twos and threes. There were probably many others of more perishable materials among them. This settlement may also have provided accommodation for the people who worked the Eureka, Alta and Come In Time batteries in the creeks just up stream right through to about 1919. The alluvial workings themselves and probably the lower huts at least will belong the 1860s and be protected as archaeological sites.

Alluvial workings in Perrys and Aurora Creeks have been poorly surveyed. The famous ones in Swipers Creek are likely to be wholly within the reserve, but there are also minor sluicings in the middle reaches of Aurora Creek (Fig.28, GR172831) fed by a small water

race from higher in the creek. Below the reserve there are workings in Aurora Creek (Record S/124/245) above its confluence with Bendigo Creek, which may be linked to the interesting but scattered settlement of long houses/enclosures down stream (Records S124/246-249).

Within Bendigo Creek itself the largest area of early workings stretched upstream from below Goodalls Hotel to include not only the big flat but also the narrower parts of the creek running up past the confluence with Perrys Creek. These tailings covered an area more than a kilometre long and 250 m wide. These will be the main 1860s workings with numerous house sites and the hotel adjacent to them. The hotel includes two of the largest intact stone buildings outside the reserve with a complex of outbuildings. Most of the tailings have been destroyed by modern mining, and it is important to discover how far up the creek the destruction has gone. Mining has shifted the creek channel in the past and put the hotel site in danger from flooding (John Perriam: pers.comm.). This is an example of a site which was legally protected but in practice was easily destroyed because nobody involved realised that the tailings constituted a site.

Wattie Thompson worked in the vicinity of the hotel workings in the 1970s, so that some minor part of the workings will be recent, and should be readily distinguished by his method of creating high stacked walls alongside of the creek bed. Sluiced hollows are uncommon on the Bendigo field and the one at the bottom of the hotel flats (S124/250-252, Fig.36) is the largest seen with faces up to 10 m high and at least two stone hut sites among it s tailings. It is not a large sluice pit by Otago standards but it is impressive in its context. Its age is not obvious.

Downstream of the hotel flats the 1980 survey described a smaller flat of similar pot hole tailings with at least three associated hut sites (S124/236-241). The lower end of the flat is interesting because the creek has been diverted into a tunnel cut at a lower level through solid rock. These may the most intact and accessible of the early alluvial workings and, though protected as archaeological sites, could be given more visible protection by appropriate interpretation and foot access for the public. Specimen Creek drains down into Bendigo Creek just upstream of these workings and not surprisingly considering the section of the reef that it drains has alluvial workings in it (S124/330) running from within the reserve boundary down to near the mouth of the deep adit. These workings are complete with races and two or three hut sites. They are likely to be early but there is nothing in either the descriptions of them or the archival material to confirm this.

There is an outlier area of alluvial workings in an eastern tributary of Bendigo Creek towards the Shepherd Creek stockyards (Record S124/385-388). These workings have a large reservoir, appropriate races and at least two hut sites. They are likely to be early but this needs to be confirmed from their appearance and resemblance to other early workings. There is also a small set of alluvial workings in School Creek (Record S124/267).

2) Quartz workings.

The most important of the quartz workings centre around definable battery sites. These are summarised graphically in Figure 8a. The Eureka claim in the upper Rise and Shine flats was worked at first by carrying the ore by tramline down to a battery on the hillside between the Alta and Come In Time batteries, and some of the drives on the Eureka claim will date to about 1874. The two battery foundations near the Eureka claim belong to Mclaughlin's battery (1910, beside the road) and Logan and Cameron's battery (1930s,

Rise and Shine battery beyond the cattle yards). Both sites consist now of concrete mountings and revetments, but the parts of the Rise and Shine battery are in the process of being recovered. The water system of reservoir and races associated with the batteries has not been clearly defined, but the ages of these sites, other than the Eureka tramline and race, are likely to be less than 100 years. This is an area where a covenant over the historic values shown in Figs 16-18 would give useful protection.

The complex of batteries, drives, shafts, tracks, races and revetments shown in Figs 18a-21a include three battery sites - Eureka, Alta and Come In Time - with the best standing battery in the whole Bendigo field. The sites range in age from the Eureka platform and tracks (1870s) to the Come In Time last used in 1919. Half of the Come In Time battery came from the break up of the big Matilda battery about 1908. It is in fairly good repair but requires stabilisation. Considering just its association with the Matilda Battery, it is worthy of full protection. Though the site itself is more than 100 years old, the battery and some of the concrete work dates from about 1910-1919 and requires protection by a conservation covenant.

As shown in Fig.8a the batteries formed a complex interlinked system, and it would be preferable if a covenant were devised to protect the entire cultural landscape. The Red Mine and its extension into Shepherds Creek should be included. The boundaries for the area within which all cultural remains are protected should be related to the linkages between the sites and not to fence lines, roads or other unrelated boundaries.

Though at present much of the ground around the Come In Time and Alta batteries is covered with shrubland, there are numerous tracks and easy gradients which would provide visitor access to the central part of the workings. A track downstream from the ford would provide access to alluvial workings, providing the visitor with the full chronological range of mining activities close to the Come In Time battery. A walkway up the Eureka tramline would provide a few hour's walking, with easy road access at either end.

The most difficult sites to summarise are the prospecting pits, trenches, and forges in the upper parts of Perrys and Aurora Creeks. They are spread over several kilometres and none are individually spectacular. I have no reason to think that any are less than 100 years old and their protection as archaeological sites it probably sufficient.

The sites around the entrance to the Deep Level adit (Record S124/260) are a different matter. Though scattered and not very well described the adit and the adjacent forge, revetted road and hut sites are of sufficient historic importance to warrant further examination and plotting on to landscape maps. The remark that part of the road had been used to assist in putting modern irrigation pipes in place suggests that protection of these sites needs to be discussed with other land users. Visitor access may be difficult and it may be more appropriate to direct the public to the other low level tunnel (Record S124/332) in Specimen Gully. This is not far below the main access road to the reserve, down easy slopes, and is associated alluvial workings and other sites. It is a "mixed-age" site, begun about 1888 and still being worked on in the 1930s. It requires covenanting to protect it as a whole, from its portal to its far end, even if entry at present is dangerous. If any site is to be developed to allow visitors to go underground, this would seem to be the most appropriate one at which to tackle the safety problems. The recent discussions on the

preservation of Golden Point mine make it apparent that there is a need to define and protect the invisible sections of underground mines as archaeological sites *per se*.

3) Miscellaneous sites

The most important site not considered so far is the large dam and dam keeper's hut in Aurora Creek, south of the reserve (S124/364, Fig.29). The dam is of an unusual design, intact with its spillway but with no races leading from it. The very small hut nearby still with household gear is an example of the effects of careful protection on the part of the occupier of the land. John Perriam monitors visitors to the site by means of a locked gate on the reserve boundary. Unfortunately there is no way of dating this site, since there is no specific mention of it in the archives. It is a very isolated, and access should be controlled as at present. Its legal protection would be improved by a conservation covenant.

The long race from Devils Creek is definitely early. The fact that it continues beyond the Cromwell mine to Swipers Creek indicates that it may even pre-date the Matilda Battery, which it is known to have supplied. It will have been cleaned out since its first formation and like the Mount Ida race it may be difficult to define it as an archaeological site. There has been a proposal to use part of it for carrying irrigation water to the Bendigo Flats. Its full course should be walked and described, with a view to negotiating protection of some sections and careful recording of any parts to be destroyed, assuming that the old profile is still present.

General comments

Good legal protection is provided for sites more than 100 years old, though as in the case of the hotel alluvial workings there needs to be vigilance in upholding that protection. The procedures of the Resource Management Act should help provide that vigilance, though it is worth noting that the duty of monitoring the effects of resource consents on heritage values has not been clearly assigned. It does not seem to be a part of the duties of the regional councils (Grant Richards: pers.comm.). The Resource Management Act can be used to protect all heritage values and there is no age restriction. It remains to be seen, however, whether or not local councils will regard historic mining sites as worthy of protection under the act. There is a body of decisions being built up on the West Coast, where Planning Tribunals have thrown out appeals which do not taken heritage values into proper consideration (Ray Hooker; pers.comm.).

In considering where scarce resources are best spent at Bendigo, consideration should be given to retaining representative sites from each era - early alluvial mining, the main quartz mining period, turn of the century mining and 1930s quartz workings. Using criteria being developed for the Otago Goldfields Park, for sites outside the Bendigo reserve emphasis should be given to intact, historically significant and informative sites, in good condition, still within an appropriate setting, and with an attractive landscape. Some of these sites should be selected as appropriate to add to the reserve because they could be presented to the public and would provide complementary material to the sites within the reserve.

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more like chicken scratchings are my hasty efforts to provide summaries of where plans fit on the topographic maps.) I am very grateful to John Perriam for permission to work on Bendigo Station and for information willingly shared with me about the sites.

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length, but is traceable for twelve to fifteen chains further. The first workings consisted of small shafts and open cuttings, but afterwards, when some water was struck in the deepest shaft, an adit nearly 400 feet in length was driven in the strike of the reef from the slope towards Conroy's Gully, but starting so shallow that it required an open cutting over two chains in length, and nearly two more of a tramway, to obtain fall for the waste, and principally that it lies only 50 feet beneath the surface at the end. In fact, when it reached so far, a great portion of the backs had already been worked out from the top. If on this account the adit must be pronounced, to say the least of it, a very injudicious piece of work, it appears still more so on considering that not far in advance of where the cutting begins the slope towards the bottom of the gully suddenly becomes very abrupt, and that it (the adit) might, therefore, have been put in from a point in the latter in the line of strike of the reef lying at least 150 feet lower, and not perhaps more than 300 feet farther, than where it now commences. After all the backs above the adit had been worked out, a shaft was commenced in the reef at the far end of the adit, but after sinking ten feet, where water made its appearance, the work was given up, and the reef shortly after deserted. Down the shaft, and left in the bottom, a vein of quartz was followed of six to eight inches in thickness, showing a tendency to widen out, of which the last twenty-five tons crushed yielded over 1 oz. of gold per ton. Touching the aggregate of the returns, it amounted, according to Mr. Poole, to £2,005 from less than 500 tons crushed; whilst the total expenditure on the claim, including crushing machinery, tools, &c., was £3,756. The crushing machinery, which stood in the bottom of Conroy's Gully, close below the line of the reef, was sold to Williams and party, on the Carrick Range, who are there erecting it on a reef claim, to be noticed further on. All accounts agree that a considerable amount of the, in the average, very fine gold, as also of quicksilver, was lost in the tailings, through the crushing and gold-saving process not being at all well understood at the time. Comparing the great waste of money, through injudicious workings, with the total returns, and looking at the above-indicated facility with which it could be opened at a good depth, whilst relying on the information concerning its character as left under-foot at the end of the old adit, I certainly think this reef deserves another systematic trial.

APPENDIX 6.

Auriferous Reefs of the Bendigo District.

In my examination of most of the reefs of this extensive district, I was kindly accompanied by Mr. G. B. Douglas, the manager of the Bendigo Deep Level Company, and I am indebted to him for much of the information about the yields, workings, and other particulars given in the following descriptions:—

Logan's Reef and Cromwell Company.—This celebrated reef, in the possession of Messrs. Thomas Logan, B. R. Baird, and G. W. Goodger, the latter of whom was kind enough to show us through the workings, is without question the richest and best defined in the province, and has been very extensively worked for nearly half a mile in length, but is traceable for perhaps three-quarters of a mile further east in strike. It cuts through nearly horizontal, very quartziferous mica schist, at a strike of E. 5° S., dipping with slight bends for about 100 feet from the surface, close upon vertical, and then bearing gradually to the north, at an angle of 75°. Its walls are especially well defined and even, and there is a clayey ferruginous casing on either. According to Mr. J. Parry, the mining manager, its thickness in the present workings ranged in places from two to six feet, but the average was about three feet. It did not, however, consist of quartz throughout, but there were larger and smaller mullock patches, the larger ones with a step-like outline at the top, of which some carried very good gold. The quartz shows a fine seamy structure, and is of a brownish colour and ferruginous near the surface, but in depth assumes a bluish colour, whilst becoming more and more strongly impregnated with pyrites, galena, and zinc-blende (Black Jack). The gold occurs both in the seams and in the mass of the quartz, but was on the large scale not found evenly distributed through the reef, but to be accumulated in shoots dipping eastward in strike at rather sharp angles. Thus in places the quartz paid hardly a few pennyweights of gold per ton, but was succeeded by such paying over two ounces, and this again by a shoot yielding up to and above six ounces per ton. The average yield from different working places has for some time been over three ounces per ton. In the lowest part of the present workings, a few feet above the bottom of a whim shaft 260 feet in depth (there are two other shafts, 170 feet and 114 feet deep, worked by derricks, besides), one of the rich shoots, paying up to six ounces per ton, has been struck, which dips at an apparently sharp angle eastward into the so-called "Golden Link" ground, where the reef was first opened and most extensively and successfully worked. The deepest shaft on this line of workings, which has for some time been at a standstill, is 330 feet, and excellent gold (three to six ounces per ton) from large quantities of stone, wrought either side, was obtained to about 150 feet in depth. Below that the quartz became gradually poorer, and from near the bottom, where the water grew very troublesome, it paid only seven pennyweights per ton. There is every probability, however, that the rich shoot just noticed as existing at the bottom of the whim-shaft will be struck on further sinking. In parts of these workings the walls of the reef came close together, whilst in others they were up to ten feet apart, both quartz and mullock, which filled these wide places, paying over six ounces per ton throughout. Towards the east the reef deteriorates very much in quality, and there are only a few places—one at about four chains, and another at two to three chains still further on—where it has been superficially worked, and paid up to sixteen pennyweights per ton. Good-looking leaders, running at acute angles towards the reef, have been struck here and there along the line worked, but none have been followed, and not a single prospecting cross-cut has been driven throughout the whole extent of the workings. Whilst showing occasional outcrops through the Golden Link ground, the reef came to a point in the line of the present workings; and whilst sending out two strong branches—one on the north, the other on the south—it itself continues in the centre, but dips rather sharply in strike westwards, as indicated by its disappearance down the pretty steep slope of the hill—on which the workings are situated. This feature has, however, only been properly understood lately; for whilst the workings on the main reef were carried on westward from the Golden Link ground, the northern one of the two branches—which soon assumes

the same strike as the main reef, dips also close upon vertical, and shows a strong outcrop of massive quartz, in places three to four feet thick, down the slope of the hill just noted—was mistaken for its continuation, and worked for some distance eastward into the hill slope—*i.e.*, towards the other workings, and for about 130 feet in depth, paying in the average sixteen pennyweights per ton. The fact of its becoming poor and very thin in the face at that depth, whilst the workings on the main reef, but little in advance, showed the latter rich and strong, and appeared to run gradually more south out of the line, induced Mr. Parry, the manager, to drive a cross-cut south, which at 42 feet struck the main reef, rich, and nearly three feet thick. From this point, which has since been connected with the main workings east, a drive is being carried on westward—the reef continuing of the same thickness and richness—and will soon extend beneath the gully at the foot of the hill. Touching the southern branch of the main reef, it is of a rather mullocky character, and also soon assumes the strike of the latter, with a nearly vertical dip, its thickness ranging from nine inches to two feet. It has been worked up the slope and near the top of the hill in several places—at one rather extensively—by open cuttings, but the returns were not very satisfactory. Still there is chance of its proving, perhaps, very rich near the foot of the hill, whence it is seen disappearing westward underneath the alluvial of the gully, at a point where it would be struck by a cross leader, which has been worked up to within half a chain on the south. This leader, which is from three to six inches thick, and runs rather crookedly towards it at a mean strike of N. 40° E., and dipping N.W. at 65–75°, has been worked for about half a chain in length by a shallow open cutting, and the quartz obtained is said to have been very rich. The mode of exploitation adopted for this mine is by under-hand stoping, some of the steps or stopes being from 20 up to 40 feet high, and there were large places left open overhead, very unsafe for the men working underneath, and which ought, therefore, to be filled with waste, to guard against accidents. As I have already given at another place my opinion on the comparative merits of over-hand and under-hand stoping, I need only remark here that I should certainly advise the owners of the mine to prosecute its future working in depth by the over-hand system of exploitation. The crushing machine of the Cromwell Company (manager, Mr. Edward Rigg) lies at the foot of the range near the mouth of the Bendigo Creek, about one mile and a half from the reef. It consists of ten heads of revolving stamps, in two batteries, fed by hand, and driven by a water-wheel. The coffers are shallow, and the gratings have 122 holes per square inch; formerly such with only 100 holes per square inch were used. As gold-saving appliances, serve common amalgamating tables, and ten feet of blanket-strakes, four for each battery, with an inclination of nearly two inches per foot; for the treatment of the blanket-sand, serve a revolving-barrel and shaking-table. Owing to the large quantity of pyrites and other ores in the quartz, the saving of the gold is very difficult, and though Mr. Rigg carefully superintends the working, I feel convinced of both gold and quicksilver being lost in considerable quantities, and that it would pay well to treat the large heap of tailings accumulated near the battery. Before leaving this splendid mine, I may mention that the fortunate owners have very materially enhanced its value by the late purchase from the Aurora Company of a fine water-race, capable of furnishing sufficient water power, not only for working pumps and hoisting gear for a main shaft, but also for effecting crushing on a more extensive scale direct at the reef, and thereby saving the heavy expenses at present entailed by the carting of the quartz so far to the mill over a difficult road.

The Reliance Company.—This company, managed by Mr. J. Mitchinson, of Bendigo, to whom I am indebted for information about it and the district generally, holds the ground westward of the Cromwell Company, in the line of Logan's Reef, commencing at foot of the hill repeatedly mentioned in the foregoing description. Misled by the workings of the neighbouring company, before the true position of the main reef was discovered, a fine whim-shaft was sunk to a depth of 170 feet on the line of the northern branch of Logan's Reef, close to the eastern boundary of the company's lease, and right at foot of a high vertical precipice of mica schist. The upper 50 feet sunk through consist of drift; below that the reef branch was struck, but the quartz proved not payably auriferous, and also soon pinched out, the walls coming close together. There was water coming in at the bottom, but not very strong. When afterwards understanding how Logan's main reef really ran, the company abandoned this shaft, and sunk another southward abreast in the supposed line round the foot of the high rock precipice; but this, according to a subsequent mining survey, seems to lie a few feet beyond the correct line. When I saw this shaft, it had penetrated to a depth of 110 feet, and, curiously enough, through nothing but small, angular, and washed drift from top down, whilst a very strong influx of water had made its appearance—features which, considering the vicinity of the rock, clearly indicate the existence at that place of a deep kind of pot-hole or gulch. As the water was too strong for further hand-bailing, Mr. Mitchinson intended to shift the whim from the other shaft to this one, and he may by this time already have ascertained whether, what seems not unlikely from the close neighbourhood of Logan's Reef, a deposit of rich washdirt exists at the bottom of the lode.

Regarding the chance of the existence of that reef in the ground, I think it is very good, judging from the strength of the reef in the nearest part of the Cromwell Company's workings; but touching the striking of it by the shaft, all depends upon its angle of dip westward in strike; for the deeper this is, the deeper will the shaft require to be sunk, though, should it be flat, the reef might actually exist at the bottom of the gravel hole. The northern branch of the reef, on which the first shaft has been sunk, crops out on the top of the precipice, and is traceable for a a good distance down the smooth western slope, where several old shafts from 50 to 75 feet in depth are said to have followed good quartz, whilst numerous auriferous specimens have been found along the line on the slope. Considering this, it would, no doubt, be advisable to prospect that reef-branch systematically along its line, and more extensively near that one of the old shafts in which the best indications are said to have been obtained. The southern branch of the reef looks not at all unpromising, where it crops out at the foot of the hill, and would also, in my opinion, deserve to be well prospected.

The Aurora Reef.—This reef, which has been abandoned for the last two years, but, from its really good prospects, certainly deserves another trial, runs about a quarter-mile north of Logan's, at a strike of E. 5° N., and dipping northward at 75-80°. The only accessible portion of the old workings is an adit driven in the strike of the reef, though in a rather irregular and crooked manner, a length of 700 feet,

from a gully in which the crushing machine also stands, near by. Similar to that on the Conroy's Gully Reef, this adit was also a very injudicious undertaking; for it lies only about 70 feet beneath the highest part of the hill into which it penetrates, and the greater portion of the reef had been worked out by shafts and open cuttings when it came to the end. Had it been continued about another 400 feet, there would have been a prospect of some 200 feet of backs to work up to a place at the surface, where in a superficial opening the reef was found 12 to 14 inches thick, and paid, according to Mr. Douglas, 22 dwts. per ton. In the adit, the reef was first struck on the left-hand side at 500 feet in, but the adit runs up to that point in such a manner—curving in and out—as to render it probable that along the whole or part of the above distance the reef exists still undiscovered in the left-hand wall—a supposition that might easily be proved by small cross-cuts. At the point in the adit where it first appears it is very thin, but very quickly increases to five feet in thickness, and a shaft sunk on it from the adit, 58 feet deep, proved it to continue regularly downward, and to gradually widen to six feet at the bottom. Adjoining the shaft, is a cutting 20 feet long, and 15 feet deep, in which it is also left nearly five feet thick underfoot throughout. The quartz from both these working paid from 7 to 9 dwts. of gold per ton; but as it is indeed very rich in mostly arsenical pyrites, and the gold-saving appliances of the machine are of the usual imperfect kind, and were, as it is said, very badly superintended, I feel quite convinced that a great deal of gold and quicksilver was lost in the tailings. Beyond the just-mentioned cutting, the reef has not any more been prospected under foot in the adit, but some distance further on it has been seen five inches thick in the roof of the latter, and continues of that thickness right to the face, the hanging wall being especially well defined. Judging from this behaviour on the whole, I strongly suppose that the stone followed in the shaft and cutting represents a good and strong shoot, which dips at a rather sharp angle eastward in strike. As regards the old workings, they extend for a length of 280 feet, and the reef has been taken out right down to the adit. The stone was there of a very ferruginous character, and ranged in thickness from one to five feet—average about 2½ feet. Extremely rich patches of golden quartz were found in places, and some of the crushings produced 2 oz. 16 dwts. of gold per ton; the average yields varied, however, from 16 dwts. to 1 oz. per ton. At the eastern end of the workings, the reef splits into two branches, and a tributers' party, who worked there last, followed the northern branch for some distance, and realised from 8 to 13 dwts. of gold per ton. Further east, on the opposite rise of a little gully, intersecting the line of the reef, they sunk two shafts—one about 75 feet in depth—for prospecting the branch, but, strangely enough, though the line of the latter across the gully is clearly apparent, neither of the shafts lies on it, but one too far north, the other south, and a cross-cut between the two has still good chance of discovering it. Some five or six chains further along the line from this point are the last workings of the tributers, consisting of several shafts ranging up to 60 feet in depth, from which the yields varied from 8 to 12 dwts. of gold per ton. Beyond these, there are no workings on the same line for the distance of over a quarter of a mile, where we came to those of the Victoria Company—an open cutting—from which 38 tons of stone were raised that produced at the rate of 14 dwts. of gold per ton. This yield of gold being too low to pay for working, carting, and crushing combined, the place was deserted. Touching the southern branch of the reef, it has been superficially prospected in several places for over a quarter of a mile in length, and proved to be auriferous, but not payably so. The, through long neglect, somewhat dilapidated crushing machinery of the old Aurora Company consists of two batteries of five heads of revolving stamps each, driven by a water-wheel; common amalgamated copper-plate tables and blanketst-rakes 14 feet in length, lying at a pitch of nearly two inches per foot. Small remnants of blanket sand near the tail-race proved, on examination, to be rich in finely divided quicksilver and amalgam.

The Lucknow Reef and Company.—The strike of this reef is nearly E. and W., its dip close upon vertical, and the walls are well defined. It has been opened along the surface for about 300 feet in length, the main workings lying on top of a spur, which it crosses nearly at right angles. As these workings were inaccessible, Mr. Ch. Colclough, the original discoverer of the reef and present legal manager of the company, kindly afforded me information about them, and gave me other particulars concerning the reef. The latter has been worked out to depths ranging from a few feet to 60 feet, and yielded from 8 dwts. to over 3 oz. of gold per ton. In the main shaft the reef, which proved about one foot thick, was followed vertically down to a depth of about 100 feet, but there a body of stone made its appearance, rich in gold and arsenical pyrites, and showing a thickness of 3 feet—*i.e.*, one foot of quartz on either wall, and one foot of mullock in the centre—and which was found to dip, flat, southward. The shaft was therefore turned on the underlay of this body, which was supposed to represent the main reef, and for a length of 14 feet followed it down to a depth of about 146 feet, where water was met with. A crushing from this underlay portion greatly disappointed, however, all expectations; for, instead of several ounces, it paid only from 8 to 11 dwts. of gold per ton. As it was thought that the water would give too much trouble in further sinking, and also in order to provide an easy road for the stuff to the machinery standing in the gully at the foot of the spur, an adit was at once projected and started from near the machine, without considering that the length it would have to be driven through hard, nearly horizontal, mica schist to strike the reef, and, consequently, its large expense was greatly disproportionate to the small height of backs—estimated at hardly 40 feet—to be rendered available by it. Irrespective of that—in which most opinions agree—closer examination would have shown that the water in the shaft was mostly due to surface percolation, and might have been easily beaten by a horse-whim. At the time of my visit, this adit, which makes two strong angles in direction, had progressed to a point which Mr. Besanko, the mining manager, considered, from rough measurements—(the want of a proper mining survey and working-plans is here painfully apparent)—to lie south abreast, or already a little beyond, beneath the bottom of the previously mentioned shaft—the last 100 feet having, at the rate of £8 to £10 per foot, been driven E., in the line of a flat slide which he took, from its position, to represent the continuation of the flat reef left in the shaft; and in this supposition he seemed, to all appearances, to be correct. But if so—considering that only few small pockets of rich gold-bearing quartz had been met with in the slide along the whole distance, and that, moreover, but a comparatively small stream of water had made sit appearance in the face, though there were nearly 60 feet of water standing in the shaft above—the prospects of the flat reef at that depth appeared to me far from cheering. On the supposition of its forming a block dipping from the shaft

eastward in strike, there was no doubt still the chance of its being found of some thickness further a-head; however, on looking at the uncertainty and the expense of further work, I advised the manager to discontinue driving on the slide altogether, and, instead, to open out eastward on a quartz reef, 9 inches thick and dipping vertical, which crosses the adit E. and W. some distance from its mouth, and in which gold is said to have been found when penetrated. In fact, there can hardly be a doubt that this reef represents the continuation of the main reef, worked at the surface; for, besides having the same strike and dip, its position in the adit—as ascertained by tape measurement—agrees tolerably well with that of the main reef, as given on a plan prepared by Mr. Evans, mining engineer, on which also a good length of the adit is marked. As regards the prospects of the proposed workings, I think they are very fair, judging from the character of the reef at the surface, and that gold has already been found in the portion crossing the adit; but it must not be forgotten that as soon as the available backs are worked out, opening of the reef in depth will have to be effected by shaft, and requires pumping and hoisting machinery. The flat reef may either be a so-called "dropper," or represent a reef parallel in strike to the main reef, which, on crossing the latter in depth, shifted it a little southward; still, whatever its nature, I take it to be uncertain in extent and auriferous character. The portion left in the shaft might perhaps be easiest opened by a rise from the end of the adit. Touching the crushing machine of the company, it consists of five heads of revolving stamps, driven by a turbine, copper-plate table, and blanket-strakes; a rippled tailing-race forming not a bad addition.

Golden Crown Reef.—This is apparently a continuation of Logan's Reef, from which it lies about one and a-half miles distant to the east. The discoverers, J. Wrightson and Co., have not done much work on it as yet; but from what it disclosed, it seems to be of a mullocky character, and from 9 to 16 inches thick. A crushing of 17 tons yielded about 8 dwts. of gold per ton.

Claim No. 10.—This lies also in the line of, and about two miles distant from, Logan's Reef. It contains a well-defined quartz reef, from 2 to 4 feet wide, in which superficial prospecting has not disclosed any gold as yet; but near to this reef, on the south, and dipping towards it, runs a parallel leader from 6 to 10 inches thick, from which a crushing of 26 tons produced at the rate of 26 dwts. of gold per ton. The reef deserves, in my opinion, to be properly prospected.

The Bendigo Deep Level Company: Managed by Mr. G. B. Douglas.—This is a spirited, and, in my opinion, highly promising prospecting enterprise. The adit, which at the time of my visit was only 10 to 12 feet in, starts from the Bendigo Creek, southward, into the high precipitous mountain side, in a direction nearly at right angles to several reefs presently to be mentioned, and also to the lines of the main reefs previously described, though at more or less considerable distances east of their workings. Thus, according to Mr. Douglas's survey, it would intersect, at 60 feet in and 100 feet beneath the surface, the line of a reef 1 foot wide, which has proved auriferous; at 160 feet in and 300 feet below the surface, the line of the *Guano Reef*, a well-formed reef, 2 feet wide, opened right above the line of the adit, and which has yielded from 16 to 26 dwts. of gold per ton from five crushings that ranged from 26 to 48 tons each. Next comes, at 260 feet in and 45 feet beneath the surface workings, the line of *Broadfoot's Reef*, also a tolerably defined reef of 2 feet in thickness, from which three crushings, of from 28 to 42 tons each, gave at the rate of 12½ to 14½ dwts. of gold per ton. Beyond this reef, at 400 to 500 feet in and about 560 feet beneath the surface, come two leaders, or small reefs, from which crushings have yielded 7½ to 9 dwts. of gold per ton. The line of the Lucknow Reef would be intersected at 700 feet in and 550 feet beneath the surface, that of the Aurora Reef at 1,400 feet in and 700 feet beneath, and that of Logan's Reef at 1,900 feet in and 1,000 feet below the surface; also two leaders, each about 12 inches wide—one between the Lucknow and Aurora, the other between the latter and Logan's Reef, of which crushings yielded respectively 9 dwts. and 13 dwts. of gold per ton. A great collateral advantage the site of the adit has is, that from the Bendigo Creek running past its mouth a never-failing supply of water could be procured for crushing purposes, native power included. The adit has been commenced only wide enough for single tramway, though I think double tramway width would have been far more advisable. What I would specially recommend to the company is to start as soon as possible work with a good boring machine driven by compressed air, which would save special ventilation of the adit, and to use gun cotton, or better still, Nobel's dynamite, for blasting.

The Alta Reef.—This reef has been deserted for a long time, though its prospects seemed encouraging enough, up to the last, for an extended trial. It lies about three miles E.N.E. of Logan's mine, and seems, from what could be seen in some of the old workings, to run in a rather crooked way, at a mean strike of E. 3° to 5° W., and to dip nearly vertical; walls apparently not very well defined. Its thickness seems to have ranged from 2 feet to 6 to 8 feet in places. Eight crushings realized at the rate of from 3½ to 19 dwts. of gold per ton.

A peculiar feature in the reef was the occurrence on the south wall of masses of a very heavy, yellowish-white mineral, which proved very troublesome during crushing; and on examination of the spoil heaps from the workings, I discovered specimens and recognized it as "scheelite," or tungstate of lime. As this is a mineral that most frequently accompanies bismuth ores, there might be a chance of the reef carrying these ores in depth, or of their occurring in the immediate vicinity. The reef has, not very judiciously, been opened by two adits of 90 and 140 feet in length, and at the respective depths of 64 and 80 feet, whilst, according to Mr. Douglas, an adit from the opposite side of the range, where the machinery stands, would at a length of about 680 feet have struck it at a depth of 280 feet, and crossed besides four other reefs, of which one yielded 14 dwt. per ton, from a trial crushing of 12 tons.

The crushing machine, connected by a long tramway and shoot with the mine, consists of ten heads of revolving stamps, in two batteries, driven by turbine; amalgamating tables of the usual pattern, and blanket-strakes. Not being housed in, it is suffering much from exposure to the weather.

The Rise and Shine Reef.—This peculiar occurrence of auriferous stone—for it cannot be called a reef—lies about three-quarters of a mile east of the Alta machine. Judging from three small shafts, the only workings as yet executed—one 18 feet deep lying in the bottom of a gully, the other two shallower, sunk several chains apart on the slope of the southern range—it consists of a zone of highly mineralized mica schist of considerable width, and apparently striking north and south; dip uncertain. The stone worked out of the gully shaft—amounting to about 30 tons—is densely traversed with

quartz veins in all directions, in which fine gold can freely be seen: and there is besides a considerable quantity of iron and arsenical pyrites present. Good prospects of fine gold can also be washed out of a streak of loose stuff, resembling a casing, on one side of the shaft, whilst the fact that from below the line of the formation down the gully, and on the slope of the range, the alluvial drift has furnished rich returns of angular or not waterworn gold, is a clear proof of the richly auriferous character of the portion of the outcrop removed by denudation. In reviewing all these different points, I think that the proper opening and working of this singular formation—which may likely represent a so-called "blow" leading to a defined lode in depth—would be a very profitable undertaking, more especially as there is a fine water-race near at hand to furnish the necessary supply of water, motive power included, for crushing purposes. If found to extend from the gully into the southern bounding range, it could there be opened and worked by an adit, lying at a vertical depth of perhaps near 400 feet below the top of the range.

APPENDIX 7.

Auriferous Reefs and Companies of the Carrick Range.

Besides the managers of the mines subsequently mentioned, the gentlemen who kindly afforded me information about the reefs were Mr. James Marshall, Mr. Charles Colclough, Mr. William Grant, and Mr. James Stuart, of Cromwell; and Mr. Buchan, of Carricktown. Progressing upward from the foot of the range, the reefs I visited are:—

New Royal Standard Company's Reef.—This strikes N. 20° W., and dips easterly at an angle of about 75°, but runs very irregular and is not well defined. It cuts apparently through the disturbed-looking country rock—a rather soft phyllite—both in strike and dip. In parts of the old workings, which consisted of an open cutting and irregular short drives, extending over several chains in length, it was formed of nothing but leaders of quartziferous mullock, from 15 to 16 feet thick, which yielded on crushing from 6 to 12 dwts. of gold per ton. Several small crushings from narrow places produced, however, up to 2 oz. per ton. As it may likely become more defined, and perhaps richer in depth, it would be advisable to prospect it by an adit from the steep slope of the spur which it crosses.

Crown and Cross Claim.—This is owned by Watson, Herbert, and Co. The reef (worked by a shaft 47 feet deep, which will soon be in connection with an adit, driven from the bottom of the adjoining gully) strikes N. 20° W. with an easterly underlay at 75–80°, cutting through much disturbed phyllite, and ranges in thickness from 6 inches to 3 feet, and over 4 feet in bunches. Its hanging wall is defined and smooth, the foot wall rather uneven. It consists of quartziferous mullock, traversed by occasional small quartz veins, with gold fairly distributed throughout. 200 tons crushed paid at the rate of about 1 oz. per ton. The prospects under-foot and in strike south are very encouraging: a prospect of the mullock from the bottom, washed in my presence, gave a fair quantity of very fine gold, besides several small quartz specimens. At the northern end of the workings, which—small prospecting shafts included—extend about three chains along the reef, the latter was found faulted 10 feet eastward by a clay slide 15 feet in thickness. In a small claim, next adjoining the Crown and Cross on the south, owned by Robert Scott and John Myers, the reef was just struck by a small adit, during the presence of our party on the ground.

This reef is considered to be the continuation of the "White Horse" or "Try Again" Reef, next to be mentioned; but as it runs some distance—about one and a-half chains—sideways of the latter, this can only be the case on its representing a faulted portion of it—a supposition not unlikely to prove correct, judging from the identity in strike, dip, and character of the two reefs, and the frequency of faults in the district.

White Horse and Try Again Reef: Worked by Saltoun, Campbell, McKersie, and Co.—This reef strikes N. 20° W., and dips eastward at an angle of about 75°, cutting through alternating harder and softer beds of phyllite—a feature which renders its course rather irregular; strong turns, both in strike and dip, being very frequent. The walls are in places well, in others badly defined; where well defined, they mostly show polished and striated casings. Its thickness ranges from 9 inches to over 4 feet, and it consists of quartziferous mullock, traversed by broken quartz veins, generally rich in arsenical pyrites, and sometimes pretty thick, carrying good gold, though the latter occurs also finely impregnated throughout the mullock mass.

Touching the occurrence of the gold on the large scale, it seems to be accumulated in shoots, which have a decided dip in strike southward. The average yield of gold has hitherto been about 1 oz. per ton from several hundred tons crushed, and there is no sign of the reef becoming poorer under-foot. The main workings consist of an adit, extending about 300 feet along the reef, from which stoping is being extensively carried on, the height of backs available up to the crown of the hill amounting to nearly 100 feet. Another adit could be put in in the strike of the reef over 100 feet lower down the slope of the range; and this work it would be wise soon to enter upon.

Caledonian Company: Managed by Mr. G. T. Stephenson.—This company is at present engaged in driving from the bottom of a deep gully an adit, which is intended to open the Caledonian Reef 180 to 200 feet beneath the level of the first adit, in which work has been stopped, on account of what was considered payable of the available backs—about 70 feet high—having been worked out. According to the direction of this upper adit, which followed the reef southward a length of 400 feet, the latter runs in a wavy line at a mean strike of S. 30-35° W., whilst several shafts sunk on it from the adit show it to dip very close upon vertical. Its walls seem very well defined, and show thin clay casings. Touching the behaviour of the reef in the old workings, yields, &c., Mr. Stephenson kindly afforded me the following information:—The reef ranged in thickness from 1 to 7 feet, but was in places pinched to a mere casing; and there were also shelves of hard rock, which frequently altered its course in dip, throwing it, step-like, several feet eastward. At end of adit it runs thin, but still looks promising enough to induce a party of miners to drive a deep adit from the opposite slope of the spur, for the purpose of opening it in depth beyond the company's ground. Above the stopes, towards the surface of the spur, a considerable extent of ground is still unproved. The reef was of a mullocky character, but contained frequently broken veins and bunches of quartz, richer in gold than the rest. There