

## **Too much haste, not enough prospecting: Mount Garnet Mine and Smelters, North Queensland**

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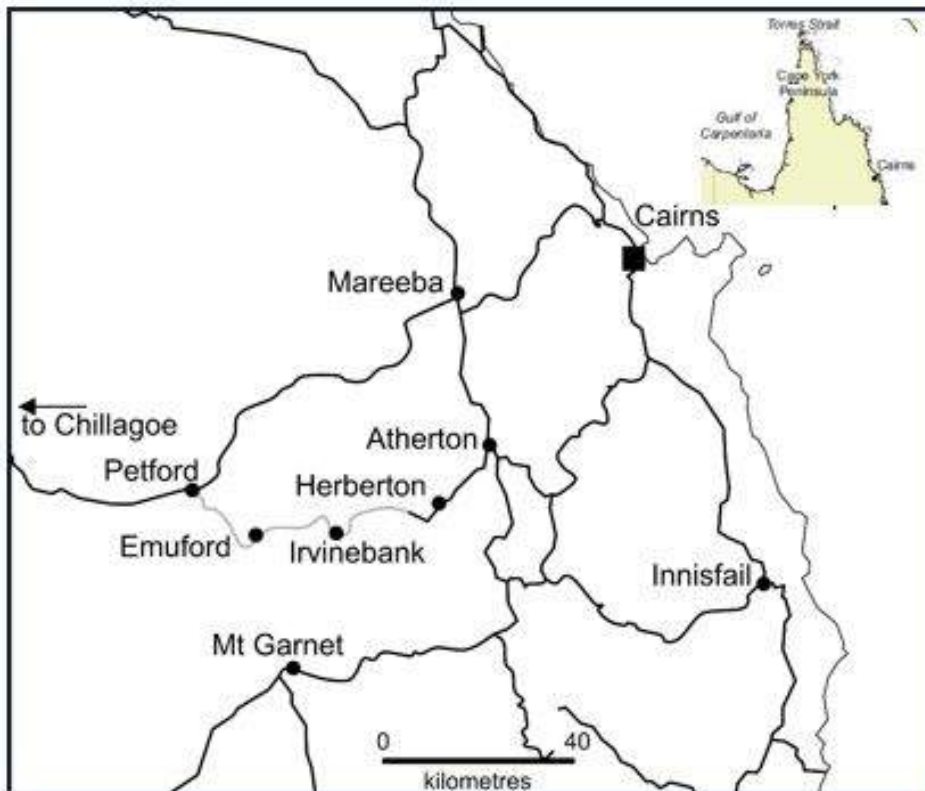
The Mount Garnet mine and smelter site is a testament to the failings of North Queensland's pre-World War II mining industry. Even more clearly than most, it shows the pattern of overcapitalised enterprises spending too much on surface work on the basis of unproven ore bodies which were expected to carry their own development costs. Often traps for investors, such mines were given impressive surface works and plant to lure in potential shareholders, and help promoters to offload their own holdings at a handsome profit. Most of these failed within a few years and there would usually follow a sorry history of company reconstructions and attempts to revive the mine, sometimes stretching over decades. Mount Garnet exemplifies the type. It began well, with an impressive outcrop of copper, silver and lead ore developed cautiously at first, using second hand plant. However, once a company was floated, caution was thrown to the winds with expensive new smelters and ancillary plant using up most of the working capital, and even a railway constructed, all on the basis of shallow prospecting and little development. This story can easily be read in the surface remains, some of which have survived further mining, and they supplement the documentary and secondary sources.<sup>1</sup> By the end of the 20th century, these remains consisted of some building and machine foundations, artefact scatters, smelter slag heaps, terracing, two tramway embankments, iron columns used to support the blast furnaces, collapsed shafts, two open pits of which the larger was 18 metres deep, and the sole remaining building, the assay office. While the history of the Mount Garnet company and its shortcomings has been told from a number of perspectives,<sup>2</sup> particularly the financial, political and railway aspects, more could be said on the technology chosen for the mine and the expensive surface plant. This study aims to provide more analysis of the mine's failure through both the documentary and material evidence.

The copper, silver, lead and zinc lode was originally found in 1882 on Return Creek, in the Herberton mineral field, by a band of prospectors that included Albert Vollenweider, Henry Faasch and Richard Baldicue, who acquired a 60 acre<sup>3</sup> freehold title over it under the *Mineral Lands Act* of 1872. This was the only Queensland mining act to allow freehold title over mineral lands, and was repealed in 1882; the prospectors acquired their freehold just in time.<sup>4</sup> Despite enthusiastic reports of its size, the lode was unpayable at the time.<sup>5</sup> North Queensland's biggest base metal mining entrepreneur John Moffat gradually acquired control of the property, testing it when copper prices were higher in 1888 and 1896 and adding leases to an eventual total of 110 acres.<sup>6</sup> The tests indicated a copper content of up to 25 per cent in a lode of about 20 metres wide, and was developed by three shafts.<sup>7</sup> There was no estimate of ore reserves at this point, which would in any case have been impossible with the small amount of surface testing

and underground development done.

In 1897, eight men were employed to further define the ore-body, by shafts and trenches.<sup>8</sup> They found it was 21 metres long, striking north-south with a dip to the west at 25 degrees of slope. There were four shafts sunk, the deepest to 32 metres, and an adit (referred to as ‘the tunnel’) driven 49.5 metres.<sup>9</sup> Samples gave percentages of copper between 5 percent and 46 percent.<sup>10</sup> In 1898 construction of surface plant began, with equipment brought in from one of Moffat’s enterprises at Glenlinedale. These included an engine, boiler, pump and tools.<sup>11</sup> Return Creek nearby was dammed by an overshot crib dam, using logs and clay-puddled rocks, and with a pump shaft sunk next to it, so the water percolating underground from the dam would be filtered and cleaner. A brickmaking plant nearby began to churn out bricks, using clay from the creek banks.<sup>12</sup> Two such plants and a clay mill were listed for the site, though photographic and mine plan evidence shows only one brickmaking plant; the reporter may have meant the two brick kilns (see plan in Fig. 3). The bricks were formed in moulds and were 11 by 25 cm. Fireclay (kaolin) for furnace bricks was mined elsewhere on the freehold, this shaft later hitting ore.<sup>13</sup>

**Map 1:** *Location Map North Queensland.*



Source: Compiled by Cartographer, Adelle Edwards.

The poor level of mine development did not stop Moffat and his associates floating the property in Melbourne in 1899 as the Mount Garnet Freehold Copper and Silver Mining Company (hereafter Mount Garnet company). His fellow directors were mostly mining entrepreneurs with Broken Hill Propriety (BHP) and Mount Lyell Railway and Mining Company interests; besides Charles William Chapman and Moffat,

who was Managing Director, there were Harvey Patterson of Mount Lyell and BHP; Neal Wigg, also of Mount Lyell and BHP; Colin Templeton, an early Kalgoorlie investor; John Bower Mackenzie, a mining investor and engineer who became first Chairman of Directors; and J.T. Lempriere, ore buyer and investor.<sup>14</sup> The capital was 290,000 shares at £1 each, with £48,000 of the share float earmarked for working capital. To put this into perspective, £96,000 worth of paid-up shares were allocated to the company, its directors, and the sole remaining prospector and part-owner Vollenweider, and £8000 in cash to Moffat.<sup>15</sup> The relatively small size of the working capital is typical for Queensland mining company floats at the time, and indicates that the mine was expected to provide for most of its development costs through profits. Mining promoter Randolph Bedford called it 'one of the great mines of the earth', though the fact that his own lease bordered the freehold may explain his enthusiasm.<sup>16</sup>

The float was related to the huge Chillagoe development by some of the same investors: Moffat, Chapman and J.S. Reid. In the region, the Mount Garnet company was called 'one of the Chillagoe pups'.<sup>17</sup> The Chillagoe Proprietary Co. had acquired a number of Moffat's mines at Chillagoe and became the foundation of one of Australia's biggest mining ventures at the time, with a plan to build smelters and railways linking the mines to the Government railway terminus at Mareeba, and thence to the port of Cairns. They floated the Chillagoe Railways and Mines Ltd in 1899. The agreement with the Queensland government to build the railway included the right to construct 10-mile branch lines. Knowing that Mount Garnet mine could be crippled by transport costs without a railway, it was agreed that the Chillagoe company would construct part of the railway link to Mount Garnet from Lappa on the newly-constructed Chillagoe line, while the Mount Garnet company would raise the capital for the remainder, it being understood the Mount Garnet company would initially have to pay for all the construction.<sup>18</sup> A share issue on the London stock market failed thanks partly to rumours of zinc ore appearing at depth in the orebody, and agreement was reached with the railway contractors, Willcocks and Overend, to build the line for debentures worth £97,000 at a 'hefty' 6 per cent interest.<sup>19</sup> Zinc could be a major problem in a copper mine as it interfered with smelting. A railway to be constructed privately by the Company was approved by the Queensland parliament, through the *Mount Garnet Freehold Company's Mining Railway Act* of 1900, despite a stonewalling attempt by the Labour<sup>20</sup> opposition, which disapproved of private railways and the concessions that accompanied them for the capitalists involved.<sup>21</sup> Work on the line began straight away. The intention was originally to approve a 2-foot gauge tramway, but the Labour party was responsible for amending the bill to a railway constructed to government standards in the case of the Queensland government later taking it over.<sup>22</sup> This would have added to the cost of construction. Until its completion, transport was supplied by teamsters and 100 camels of Abdul Wade's Bourke Carrying Co.<sup>23</sup>

In the meantime, the mine and smelter had been developed further in response to a sharp rise in copper prices, and more leases were added.<sup>24</sup> By 1899 there were 150 employees. The miners had by now proven the orebody at 29 metres wide via two adits, as well as the four shafts, and were driving levels north and south from the main adit at 21 metres.<sup>25</sup> Available ore was roughly estimated at 200,400 tons containing 3 to 25 per

cent copper; there seemed to be no sign of decreasing values at depth. Mine and smelter plant was chosen and set out along textbook lines. A 3-compartment main shaft was put down to exploit the orebody at depth, allowing for 2 compartments for winding and the other for a pump rising main, ladderways, compressed air pipes and steam pipes.<sup>26</sup> Having two compartments allowed for balanced winding, with the empty descending cage helping to raise the ascending cage with a full load. Levels driven from the shaft joined up with winzes sunk from the adit in order to use overhead stoping, which was more efficient. New machinery, including two water jacket blast furnaces each of 100 tons capacity per day, was ordered for the site.<sup>27</sup> Some second hand machinery was brought in from Moffat's failed mine at Montalbion, and one of the blowers providing a draught to the smelters was from another of his properties at Muldiva.<sup>28</sup> Ruth Kerr states that Moffat wanted to use second-hand furnaces from Montalbion too but was overridden by the rest of the Directors.<sup>29</sup> In hindsight, Moffat's parsimonious approach was the right one.

1900 saw the blast furnaces, a compound two-stage air compressor, and 20 horsepower winding-engine arrive by horse and bullock team from Mareeba, a lengthy process, to be erected on site. The furnaces were ordered from the Kilkenny Foundry of G.E. Fulton and Co. Ltd, Adelaide.<sup>30</sup> Thompson and Co. of Castlemaine, Victoria, made the compressor, and the concrete foundations remaining were certainly typical for those machines.<sup>31</sup> From the remains of the foundations and a band brake lying nearby, it appears that the winding engine was a standard two-drum second motion steam-powered winder.<sup>32</sup> The compressor ran nine rock drills, an unusually large number for north Queensland, and the shaft was equipped with safety devices, also an advance over most north Queensland mines. The safety measures consisted of Chessel safety cages to stop the cage falling down the shaft if the rope broke; Middleton safety hooks to prevent the cage accidentally unhooking from the rope; and self-closing doors at the shaft mouth to prevent people and objects falling down the shaft.<sup>33</sup> A changing-house for the miners, with four baths, was also an improvement on most mines.<sup>34</sup> The assay office, an attractively designed building for such a practical purpose, was finished in this year.<sup>35</sup> Drought in the period 1899-1900 induced the Company to build another dam 5 kilometres above the first, using the same construction technique, and creating extra capacity of 300 million litres, which was further increased to 545.5 million litres the next year by raising the dam wall from 7 metres to 9.5 metres.<sup>36</sup> Mining Warden Haldane called it 'an inland sea'.<sup>37</sup>

Other preparations were made for the start of smelting; huge heaps of wood were being fired for charcoal in lieu of coke for smelting fuel. Fluxes for smelting were obtained from close by, notably limestone 5½ kilometres north, which itself bore 3 per cent copper, while siliceous ironstone ore was itself a flux.<sup>38</sup> The limestone lease also supplied a limekiln, for cement and mortar.<sup>39</sup> Ore was being stockpiled from stopes below the adit for the smelters. Director Reid confidently reported that roasting the ore was not necessary given the large quantities of oxidised ore in the form of carbonates, a curious statement when knowledge of the ore-body was still so hazy.<sup>40</sup> 18,000 cubic metres of overburden was stripped from the ore-body in preparation for open-cutting,

and the waste used to fill the underground stopes and build the tramway embankment from the mine to the smelter. Some of the waste was also drawn over a short tramway and tipped over the face of a terrace built out from the hill to the south of the main shaft,<sup>41</sup> and removal of the overburden was the main mining activity for the year. Ore was drawn down to the adit for trucking to the smelter over the inclined tramway. As mining went deeper, ore was sent down to the 64-foot level to be trucked to the main shaft and raised into ore bins, and a 150-foot level was begun for mining below that.<sup>42</sup> The mine manager, Captain Potter, believed these arrangements would keep mining costs down to a shilling a ton – low for a Queensland mine.<sup>43</sup> Due to greater mine development, ore estimates were more accurate but still much the same as the previous year at 209,600 tons, while prospecting at depth had only reached 46 metres. Ore assays indicated 2-20 per cent copper.<sup>44</sup> Zinc was appearing in the orebody, and a layer of zinc ore with very low grades of copper caused concern. Experiments were initiated to separate the copper from the less valuable zinc.<sup>45</sup>

**Figure 1:** *Edge of the slag dump. The vehicle's nose is pointed at the smelter site, in the bushes.*



Source: Author's photograph, 2000.

The new mine and smelter plant was up to date, with electric lighting for the mine and smelters provided by a compound wound Parker dynamo with a Tangye vertical engine. 'Compound wound' meant the current remained stable regardless of the load.<sup>46</sup> Even electric blasting was introduced - a major advance in safety over the use of fuses, and an advanced technique for north Queensland at that time. However, John Walker died of burns after a spark from a fuse got into his black powder bag; clearly the electricity supply did not reach the whole of the mine.<sup>47</sup> The mine plant also included a stone-breaker and a single cylinder engine to power it.<sup>48</sup> At the small dam, the pump station boasted a large Manchester pump.<sup>49</sup> In 1898, the Glenlinedale engine ran this pump, a lathe and drills in the attached engineer's shop, a saw bench in the carpenter's shop, and a blacksmith's forge, all driven by belt-wheels on an overhead driveshaft. According to a 1901 plan, all of these elements were by then in separate buildings and



presumably each had its own power supply, such as the sawmill driven by a 12-horsepower portable engine.<sup>50</sup> At the smelter, a 30 h.p. compound high pressure Robey steam engine was installed to drive two Baker's elevators, two jaw crushers and a belt elevator. Two Baker blowers powered by the Robey engine, and a third blower run by an American 'Green' blower engine, provided the blast for the furnaces.<sup>51</sup> It is significant that the plant and construction up to September 1900 cost £32,000 while mine development to that date was £10,000.<sup>52</sup>

By the end of 1901, with the drought broken and water available, the enterprise was in full swing. The mine plant at the main shaft had been erected, with two multitubular boilers to power it, and an ore trestle ran out from the brace in the headframe to 8 large timber ore bins set back to back on a brick base. From there, the ore was loaded into trucks drawn to the smelters along the earth tramway embankment, an extraordinarily large structure 276 metres long and around 5 metres wide, with approximately 4 degrees of slope upwards to the ore bins at the smelter. A double cylinder hoist at the top floor of the smelter building provided the power.<sup>53</sup> A double tramway meant greater efficiency as empty ore trucks returning to the ore bins would help to pull full trucks up to the smelters. Gravity was not used to deliver the trucks, presumably because the expense of running a hoist was better than a rake of runaway ore trucks loaded with ore smashing into the smelter building. The size of the embankment at the smelter end, 8.55 metres high, was due to the fact that the smelter was downhill from the main shaft (Fig. 1).

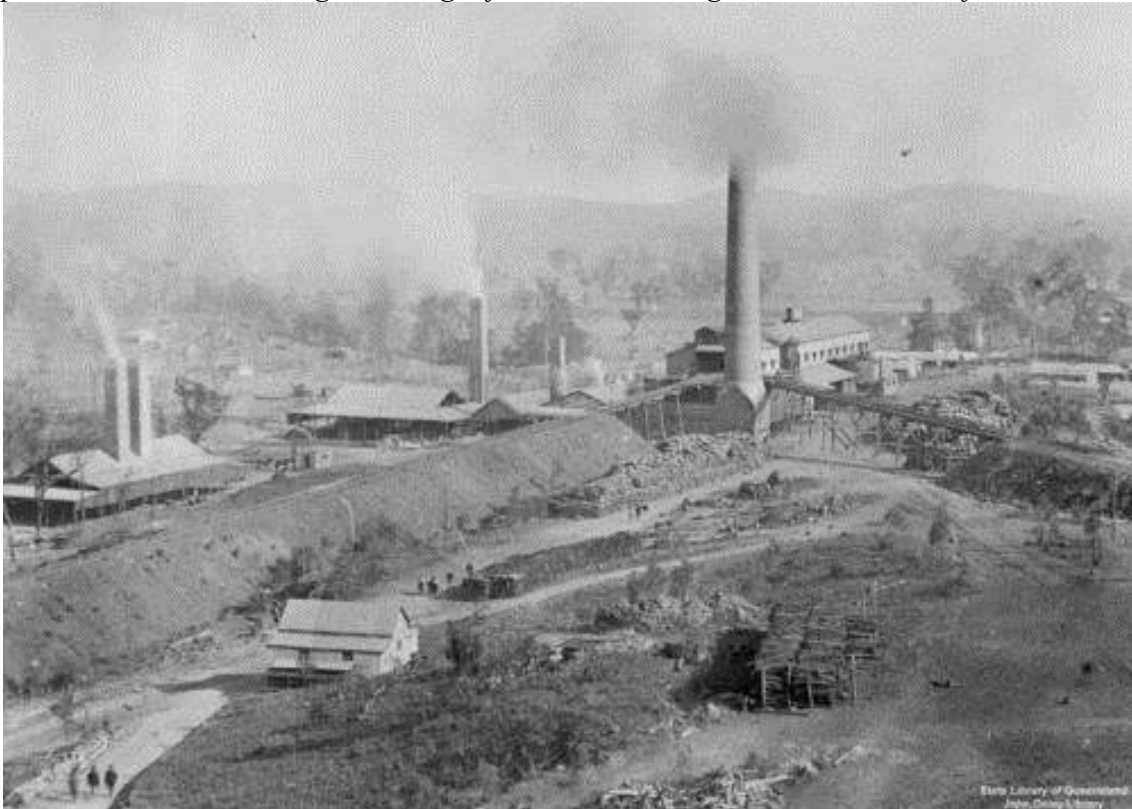
**Figure 2:** *The mine in 1901. The 'Tunnel' is to the right of the headframe, and the trestle in the foreground leads to the main ore bins on the left.*



Source: Mine site at Mount Garnet, c. 1900. Courtesy State Library of Queensland, <http://trove.nla.gov.au/version/167816527>.

The smelter itself was a large three-storey building housing the two blast furnaces. Flux, fuel and ore bins were situated above the upper floor of the smelter, the charge floor, where these constituents were mixed before being tipped into the furnaces. On the lower level were the two blast furnaces, the engines and the boiler room. A flue took fumes from the smelter to a tall brick chimney, 36.5 metres high.<sup>54</sup> The copper matte was run into slag pots, cooled, crushed, and bagged for transport by the camels.<sup>55</sup> Slag – the waste molten rock - was used to extend the smelter level and was formed into tiles to make a smooth level floor, as was common for smelters, but Mount Garnet has the unusual feature of bricks used as formwork on the southern face of the slagheap to make a neat vertical edge 1.3 metres tall and 37.2 metres long. Crushed slag also ended up in concrete bridge piers and ballast for the railway.<sup>56</sup>

**Figure 3:** *The smelters in 1902, probably taken from the brace on the headframe. The buildings with the square smokestacks housed the two sets of reverberatory furnaces, and the large tramway embankment brought ore from the mine and orebins outside the photo. The trestle leading to the right from the smelter goes to Potter's Shaft.*



Source: State Library of Queensland, <http://trove.nla.gov.au/version/47923652>.

Smelting began in mid January 1901 with one furnace, but there were problems: an inexperienced workforce; charcoal fuel instead of the hotter-burning coke; and other imponderables such as reactions between ores and fluxes in the furnace, which until adjustments were made, forced a brief cessation.<sup>57</sup> Teething problems were inevitable for any new processing plant because every ore was different, requiring adjustments to the process, and Mount Garnet ore tended to be variable. Part of the problem was that A.L. Mills, the metallurgist, was anxious to increase the percentage of copper in the

matte (the impure product from the smelters), from around 40 per cent. However, the process was causing difficulties.<sup>58</sup> A former manager at Mount Lyell copper mine in Tasmania, he proposed re-smelting the matte, trying to coat the bitter pill by pointing out that others such as Mount Lyell did the same. It was in fact an inefficient practice, leading to a decision to build 4 reverberatory furnaces of 12-14 tons capacity to re-treat the matte. It was estimated that purifying the matte in this way would save 50 per cent on the cost of transporting it to the coast.<sup>59</sup> This was a curious decision, as copper converters would have done the job much more efficiently, and they had been used at Mount Lyell since 1896.<sup>60</sup> Reverberatories did have the advantage of providing spare smelters if the blast furnaces were forced to close for lack of water, which indeed happened in 1902 and 1903. However, this proved inefficient, as a reverberatory was only able to handle 12 tons to a blast furnace's 160 tons over the same period, and swallowed four times the fuel.<sup>61</sup> A low earth incline tramway 146 metres long was built from the main shaft to the nearest reverberatory, presumably for these episodes. It was also decided to bring in coke to mix with the charcoal to make smelting easier, and the expense of transporting it by camel train from Lappa on the Chillagoe railway was reduced a little as it was back-loading for the matte being sent away.<sup>62</sup> Competition from the camels also had the effect of forcing down other carriers' rates.<sup>63</sup> Smelting recommenced in June 1901 and the second smelter began in October, with neither experiencing major problems thereafter. Construction of the reverberatory smelters was also started. The produce for the year was 1,884 tons of copper and 389,677 troy ounces of silver from 35,616 tons of ore.<sup>64</sup>

At the mine, the emphasis was on production, with development continuing to be woefully neglected; the half-yearly report even admitted that mine development had lagged behind due to shortage of funds.<sup>65</sup> In order to explore the orebody during the year, only 39 metres of sinking was done over a number of shafts and 141 metres of driving. The only really positive development was to open up the 150 feet level from the main shaft. Unfortunately, efforts were concentrated on working out the ore to that level rather than deeper prospecting.<sup>66</sup>

To increase production even more, the open cut became the major source of ore. Open cutting was cheaper, and would supply larger tonnages to the smelters at a higher rate, but would also have guided more water down into the underground workings, which would necessitate the cost and trouble of using either bailing or steam driven pumps. There are two likely reasons for the high rate of production. The first was a common tale for larger north Queensland mines: a promising mine would be floated into a company, and to raise working capital by share issue, it was important that potential investors should see impressive surface plant. Working capital was meant to pay for this and further development of the mine, but was never enough. Further shares could be released onto the stock market but if this tactic failed to provide more capital, ripping out the oxidised and therefore easy to treat surface ore was the quickest way to pay for development and other expenses like a railway, and to create profits and therefore dividends, which would in turn attract more potential shareholders. This tactic was in a sense forced on company directors; as one expert observed,



The failure of so many mines [is due] to the reluctance with which the capitalist will consent to put up money for the proper testing of a property, while he is generally willing to provide an extensive plant – a course of procedure which condemns the property to an early demise.<sup>67</sup>

**Figure 4:** *The larger open cut, in 2000.*



Source: Author's photograph, 2000.

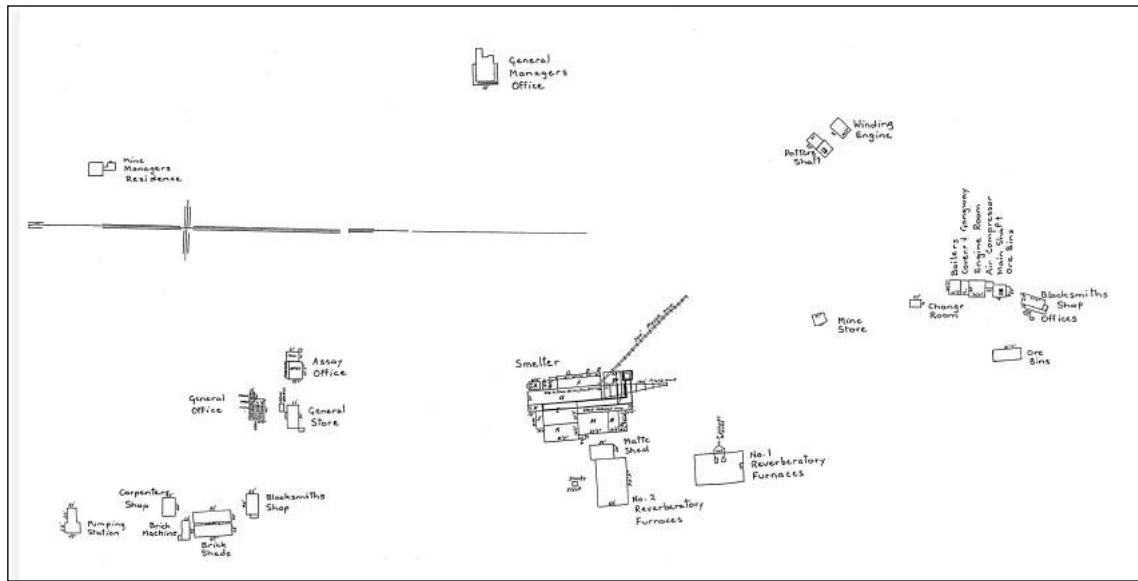
The other possible reason is a little more sinister. Zinc had been reported in the ore as early as 1898, and the zinc content increased with depth.<sup>68</sup> The directors assured the press that the percentage of zinc in the ore was acceptable,<sup>69</sup> but if they were aware of the likely problem from the beginning, it would explain why they concentrated on taking out the ore closest to the surface, as it held mainly copper, silver and lead ores.

1902 began well, with a profit reported from the previous year, and the railway with its promise of cheap freights opened in May.<sup>70</sup> Siliceous ores acting as fluxing ores to the basic sulphides now being mined in Mount Garnet's underground workings, could be brought in by train from the Tartana mine at Chillagoe, and other mines were also sending their ore to the smelters.<sup>71</sup>

For underground work, the main shaft proved to be in an awkward position with the ore-body trending away from it at depth, necessitating long levels of 40 to 49 metres to reach the stopes.<sup>72</sup> This led to Potter's Shaft being sunk to work the orebody to the north, with the added advantage of supplying siliceous ore to the smelters to act as flux instead of imported ores.<sup>73</sup> A winding engine was placed on the new shaft and a timber and earth ore trestle built to the smelter ore bins, though later in the year another open cut was begun nearby.<sup>74</sup> Another shaft sunk on the south boundary showed fair, if patchy, ore. The manager noted that ore reserves had increased but could not estimate by how much – surely a bad sign. Stopping continued at the same hectic rate, with three

more rock drills purchased. However, a severe fall in copper prices the previous year stopped lower-grade ore from being exploited, thereby shortening the mine's life, for the high and low grades should have been treated together.<sup>75</sup> On the smelting side, despite a shortage of bricklayers, the four reverberatory furnaces made of Company bricks were completed, and the first began working in April 1902.<sup>76</sup> That year 43,288 tons of ore were smelted for 2,057 tons of copper and 486,651 ounces of silver.<sup>77</sup> However, by the end of the year the Company was in trouble.

**Figure 5:** Plan of the Mount Garnet mine and smelters, 1902.<sup>78</sup>



Source: Cairns Historical Society Map A1544/A.

Basically, the Company ran out of money for prospecting at depth, and ran out of ore worth smelting. Besides the fall in copper prices, there were a number of other contributing factors including the 1902 drought, one of the worst in north Queensland's history, that caused a water shortage which shut down smelting a few months into the year.<sup>79</sup> A pipe from the big dam would cost £3,000, so water had to be released from the dam into the dry creek in the hope that it would filter downstream to the smaller dam tapped by the pump – but very little actually arrived there.<sup>80</sup> The railway had been completed in late April 1902, but the Company was so short of funds that it could not take over from the contractors, who continued to run it themselves while charging high freight prices.<sup>81</sup> One of the open-cuts had to be cut back on one side because of a 'creep' in the rock face, stopping smelting for six weeks while unproductive removal of overburden occurred.<sup>82</sup> As well, there were two large collapses in the mine: 500 tons of rock fell in one of the wider stopes off the main shaft, killing a man, and following rain, 50 tons fell when one side of the main open cut collapsed in early December of that year.<sup>83</sup> Mining had resumed by January the next year.<sup>84</sup> Ironically, given the earlier disastrous drought, flooding at the end of the year also caused problems. The 1902-1903 wet season floods damaged the Return Creek railway bridge and destroyed the smaller dam, as well as damaging the larger 'top' dam.<sup>85</sup> However, the main reason for the collapse was that the company suddenly ran out of payable ore for the smelter. Ore

persisted at depth, but consisted of low-grade sulphides with increasing percentages of zinc, which required different treatment and had a more limited market than copper. The annual general meeting reported a 'tale of disappointment and failure' as well as a loss of £15,679 for six months to the end of September.<sup>86</sup> Liabilities included a bank overdraft of £7,600 and a debenture debt of nearly £93,000 for the railway.<sup>87</sup> Any returns available were being used to satisfy the bank overdraft. The smelter stopped working in May 1903, though the Company took out every scrap of ore it could find; it reopened the Lead shaft, on a lead-bearing ore body which had been neglected because lead lowered the value of the copper matte, and Potter's shaft was abandoned in favour of the second open-cut.<sup>88</sup> Returns for 1903 were 72,303 ounces of silver and 474 tons of copper from 10,992 tons of ore, which at least paid out the bank overdraft.<sup>89</sup>

As Russell, the Inspector of Mines observed, Mount Garnet's resources 'were not up to expectations'.<sup>90</sup> Mine, smelter and auxiliary plant, and railway had been set up on a large scale and at great expense for copper ore reserves, which turned out to be surface deposits with secondary enrichment, and with the whole being built on the gamble of continued high copper prices.<sup>91</sup> The company's annual report ruefully noted that had prospecting gone deeper and found how limited the ore was at depth, the big smelting plant and the railway would never have been started.<sup>92</sup> It is ironic that the collapse of the Chillagoe Company a year earlier had occurred for exactly the same reason: huge expenditures on railways and smelters not being justified by the available ore. While managers often did not deserve the blame heaped on them at the time for such failures, which were more often the fault of the directors, it is notable that two of the mine managers, Potter and Brander, went on to manage Smith's Creek (Nymbool) which failed for the same reasons: overcapitalisation and insufficient development.<sup>93</sup> As noted previously, the Mount Garnet Company's working capital had never been generous. Only 69,000 of its 200,000 shares were initially offered to the public, with the rest going fully paid up to the vendors. Had a greater proportion of the share issue been used to raise money to invest in mine development and prospecting in its early stages, the zinc problem may have been discovered sooner.

The debenture holders, Willcocks and Overend, foreclosed on the mine when the Company was unable to meet its interest and debenture repayments, and operations ceased.<sup>94</sup> One bitterly critical newspaper article said that the real victims were the workers and small businessmen and their families, who had expected to settle for some years in the booming new town and had built houses and shops, which were now almost worthless. The article blamed the company's failure on expensive management and money being wasted on plant and buildings set up on too grand a scale.<sup>95</sup>

In May 1903 the Company and the debenture holders arranged for a reconstruction, the Mount Garnet Railway and Freehold Mines N.L., with 250,000 shares of 10 shillings each, paid up to 5 shillings. The existing shareholders were offered 165,000 shares paid up to six shillings for 6 shillings on allotment and a further 6 shillings later, but not enough were taken up and the attempt at reconstruction failed.<sup>96</sup> The stock market's opinion of the mine can be traced by the decline of its share prices from a high of 84 shillings in June 1899 to 7 shillings in August 1902. By April 1903, the shares were worthless.<sup>97</sup> The debenture holders refused to wait for their next interest

payment.<sup>98</sup> The mood of the stock market would not have been encouraged by the earlier collapse of the larger Chillagoe Company, though that company was more successful with its own reconstruction. Hopes that the Mount Garnet smelter could exist on purchased ores were illusory, as there were not enough mines in the vicinity to support a central smelter. Willcocks and Overend, recognising the low value of their seized asset, sold the debentures cheaply to Moffat, and in 1907 he formally applied for foreclosure on the Mount Garnet company - it ceased to exist in that year.<sup>99</sup>

While under the debenture holders' management, the smelters were removed in 1904 to the OK Mine, a copper producer whose directors included Willcocks. Its cautious management made it a roaring success, in direct contrast to Mount Garnet; John Kerr attributes this to the directors' refusal to build a railway.<sup>100</sup> The rest of the Mount Garnet plant was slowly dismantled over a number of years.<sup>101</sup> The New Chillagoe Railway and Mines Ltd took the mine itself on tribute for two years from February 1904, and 9,124 tons of ore was railed to the Chillagoe smelters. The smelters valued the ore because it was basic, acting as a flux for the siliceous Chillagoe ores.<sup>102</sup> While there was some underground prospecting by shaft sinking and extensions of levels, most of the reports on the mine indicate an emphasis on stoping the remaining copper ore not too contaminated with zinc. While the mine manager recognised the value of the zinc ore beneath the copper, there was no spare money to provide a treatment plant.<sup>103</sup> There was talk in 1905 about Willcocks hiring a diamond drilling company to test the mine, and parcels of zinc ore were sent away to find the best treatment method, but nothing happened.<sup>104</sup>

From 1906 attempts were made to reopen the mine for zinc. Moffat and Willcocks sent samples of the zinc ore for testing and were encouraged by the results; with estimates of 200,000 to 1 million tons of ore available, the aim was to concentrate the ore and send it overseas for treatment.<sup>105</sup> The property was offered to William L. Baillieu of Melbourne for £50,000 provided the zinc ore was amenable to treatment. Baillieu was one of the principals of the newly formed Zinc Corporation Ltd., later to become Consolidated Zinc. The project was given the nod and machinery said to be on its way, but nothing seems to have eventuated.<sup>106</sup> Moffat, by then the principal debenture holder, appears to have satisfied orders for zinc ore when requested.<sup>107</sup> The Queensland government purchased the railway in 1914 under the *Mount Garnet Railway Act*, for £35,000, but placed conditions on the use of the money. £20,000 was to be used to guarantee Moffat's company with the Queensland National Bank to enable it to re-open the tin smelter at Irvinebank so as to allow it to continue buying ore from small miners in the region, while the rest was to go to reducing liabilities and re-opening the Mount Garnet mine.<sup>108</sup> A new company, the Mount Garnet Ltd., was formed; mine and plant were put in order, two rock drills installed and 'several hundred tons of high grade ore stoped', apparently because of the high zinc prices ruling during the First World War. However this only lasted a couple of years, and locals soon were asking what had happened to the £10,000 supposed to be spent on the mine.<sup>109</sup> Ruth Kerr points out that in fact, Moffat and his family – who owned most of the shares – lost heavily on the venture.<sup>110</sup> The lode was later tested by diamond drilling in 1948 and

1956 but found uneconomic to mine at the time,<sup>111</sup> and the mine was eventually reopened as a zinc property by Kagara Ltd. in 2002.<sup>112</sup>

The railway and tin mining were the salvation of the Mount Garnet township, which continued to exist as the railhead for the surrounding pastoral and mining district.<sup>113</sup> The line was closed in 1961, but the road, now known as the Kennedy Highway, was constructed through the town in the 1930s, and further developed as an inland defence road from Cairns to Charters Towers during World War II. In addition, the Beef Road Scheme of the 1960s further linked it by the Gulf Developmental Road to Normanton. As a service centre for traffic on the highway, its future is assured.<sup>114</sup>

The Mount Garnet mine was well provided with everything needed for a big mining venture except the right kind of ore in sufficient quantity to carry it beyond its paltry few years of operation. The main shaft was well equipped and while using mostly standard technology, the mine had some advanced features for North Queensland mining, such as electric lights and electric blasting, and safety features for winding. The smelter was similarly well planned and equipped, despite the use of reverberatory smelters instead of converters. Once the company took over, nearly all plant was purchased new, from as far away as South Australia and New York. This was in contrast to the management of the mine under Moffat, which proceeded cautiously on second hand plant. The incline tramway embankment was on an impressive scale and the two large open cuts give an indication of the scale of ore recovery over the 3-4 years of operation. Ancillary plant – brickmaking facilities, blacksmith's shops, carpenter's shop, engineering shop – and two dams made the mine self-sufficient, but a 55 km railway for just one mine was at best ambitious, and at worst, extravagant. Unfortunately the most basic requirement was missing: adequate prospecting to make sure there was enough ore to justify it all.

### **Acknowledgements**

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### **Endnotes**

<sup>1</sup> The smelter smokestacks were destroyed during World War II to prevent them being used as landmarks to guide enemy planes. Mining resumed in 2002. A new open cut subsumed the old pits and the shaft with its machinery foundations and associated sites, and new treatment plant was erected over the remains of one set of reverberatory furnaces. Site visit by the author, 2007.

<sup>2</sup> Ruth Kerr, *John Moffat's Empire*, J.D. and R.S. Kerr, Brisbane, 1979; Ruth Kerr, *John Moffat of Irvinebank*, J.D. and R.S. Kerr, Brisbane, 2000; John Kerr, 'The Mount Garnet Railway', *Australian Railway Historical Society Bulletin* vol. 48, no.718, August 1997; John Kerr, 'Directing and deflecting development by railway', in B.J. Dalton (ed.) *Peripheral Visions: essays on Australian regional and local history*, Department of History and Politics, James Cook University, Townsville, 1991; K.H. Kennedy, 'They stumble that run fast': in the wake of the Chillagoe Company', in K.H. Kennedy (ed.) *Readings in North Queensland Mining History* vol. 1, History Department, James Cook University, 1980; Lyndon Megarrity, 'Don't You Think They Know Their Business Best?' The Failure of Private Railway Companies in Late Colonial Queensland', *Journal of Australian Colonial History*, vol. 2, no. 2, October

2000.

<sup>3</sup> Units used in this paper: 1 foot = 0.3048 m; 1 acre = 0.4047 hectares; 1 troy ounce = 20 dwt = 31.10348 g; 1 ton (long) = 1.01604 tonnes; 20 shillings = 1 pound (£).

<sup>4</sup> Michael Drew, 'Queensland Mining Statutes 1859-1930', in K.H. Kennedy (ed.), *Readings in North Queensland Mining History* vol. 2, History Department, James Cook University, Townsville, 1982, p. 131.

<sup>5</sup> Reports by R.N. Williams 1 September 1882, William H. Short 13 January 1883, Peter G. Grant 18 April 1883, Reports to shareholders of the Mount Garnet Mine 1882-1890, item 332327, Queensland State Archives (QSA). The mine was named for the large garnet-bearing cap of the lode.

<sup>6</sup> Kerr, *John Moffat's Empire*, pp. 80, 81; *Northern Miner*, 22 June 1898, p. 2. Of the prospectors, only Vollenweider held on to his one-sixteenth share. *Northern Miner*, 22 June 1898, p. 2. Most of the newspaper references have been found on the National Library's Trove Digitised Newspapers site.

<sup>7</sup> George Waddell (Mine Manager) to John Moffat, 28 November 1896, correspondence re opening of Mount Garnet Mine, item 332329, QSA.

<sup>8</sup> George Waddell to John Moffat, 28 July 1897, 1 November 1897, 1 December 1897, 15 February 1898, item 332329, QSA.

<sup>9</sup> Annual Report of the Department of Mines (A.R.) for 1897, in *Votes and Proceedings of the Queensland Legislative Assembly (QV&P)* 1898, pp. 106-107.

<sup>10</sup> Waddell to Moffat 1 November 1897, 1 December 1897, item 332329, QSA. The ore also contained native silver.

<sup>11</sup> Report - Waddell to Moffat, 22 June 1898, item 332329, QSA.

<sup>12</sup> Waddell to Moffat 10 August 1898, 2 September 1898, 22 September 1898, item 332329, QSA; A.R. for 1898 in *V&P* 1899 p. 391; *Northern Miner*, 11 July 1899, p. 2; *North Queensland Register*, 17 September 1900, p. 36.

<sup>13</sup> 'Mount Garnet Freehold Copper & Silver Mining Company Ltd. Half-yearly Reports', *Queensland Government Mining Journal (QGMJ)*, 15 April 1902, vol. 3, no. 23, p. 204.

<sup>14</sup> Kerr, *John Moffat of Irvinebank*, p. 174. This source has a comprehensive history of the company and its finances.

<sup>15</sup> Kerr, *John Moffat of Irvinebank*, pp. 175-6; *North Queensland Register*, 18 September 1899, p. 10.

<sup>16</sup> *The Clarion*, vol. 1, no. 4, 7 November 1899, p. 24.

<sup>17</sup> K.H. Kennedy, 'J.S. Reid and the Chillagoe Company', in K.H. Kennedy (ed.), *Readings in North Queensland Mining History*, vol. 2, History Department, James Cook University, 1982, pp. 219-220; Debate on the Mount Garnet Tramway Bill, Introduction in the Legislative Assembly, 9 August 1900, *Queensland Parliamentary Debates (QPD)* for 1900, Vol. LXXXIV, p. 283.

<sup>18</sup> *Melbourne Argus*, 25 June 1903, p. 8.

<sup>19</sup> Kerr, *John Moffat of Irvinebank*, p. 178; Kennedy, 'They stumble that run fast', p. 197; *North Queensland Register*, 26 March 1900, p. 35, 8 April 1901, p. 10; *Melbourne Argus*, 30 March 1901, p. 5; *Brisbane Courier*, 21 May 1901, p. 3.

<sup>20</sup> The name of the party in Queensland did not change to its current spelling of 'Labor' until 1918.

<sup>21</sup> Lyndon Megarrity explains the reasons for Labour's opposition in Megarrity, 'Don't You Think They Know Their Business Best?', pp. 41-62.

<sup>22</sup> *QPD*, 1900, vol. LXXXVI, Legislative Assembly in committee, 10 December 1900, pp. 2510-11. As Ruth Kerr notes, Thomas Givens of the Labour party also opposed the Bill because it gave the Company control of the Evelyn 'scrub' and its rich timber resource; the resulting sawmill was the most successful part of the Mount Garnet venture. For a fuller explanation, see Kerr, *John Moffat of Irvinebank*, pp. 256-8.

<sup>23</sup> *Ibid.*, p. 177.

<sup>24</sup> *Northern Miner*, 22 June 1898, p. 2.

<sup>25</sup> *North Queensland Register*, 18 September 1899, p. 10.

<sup>26</sup> The shaft was 12 feet by 4.5 feet, with each compartment 4 by 4.5 feet. AR for 1899 in *QV&P* 1900, p. 215; 'Mount Garnet, North Queensland', *QGMJ*, 15 October 1900, vol. 1, no. 5, p. 187.

<sup>27</sup> A.R. for 1899 in *QV&P* 1900, p. 215; *North Queensland Register*, 18 September 1899, p. 10.

<sup>28</sup> A.R. for 1899, p. 222; *North Queensland Register*, 17 September 1900, p. 38.

<sup>29</sup> Kerr, *John Moffat of Irvinebank*, p. 177.

<sup>30</sup> *Ibid.*; *South Australian Chronicle*, 6 July 1895, p. 8.

<sup>31</sup> *Queenslander*, 20 April 1901, p. 777. 'Compound two stage' means a piston in a high pressure steam cylinder was connected to a large air cylinder to begin the compression; waste steam from the steam cylinder was fed to work a piston in a large steam cylinder, which then completed the compression of the air which had been fed into a small air cylinder. Hence the steam engine was 'compound' and the



compression was 'two stage'.

<sup>32</sup> Second motion means that the drums on which the rope was wound had to be put into gear by a clutch to work. A band brake consisted of a steel hoop lined with wooden blocks, which was tightened onto a path on the drum, using friction to slow and stop it.

<sup>33</sup> A.R. for 1899 in *QV&P* 1900, p. 215; A.R. for 1900 in *QV&P* 1901, p. 398; *Queenslander*, 20 April 1901, p. 777. Safety cages were equipped with spring-loaded arms with claws which bit into the shaft timbers if the rope broke.

<sup>34</sup> A.R. for 1899 in *QV&P* 1900, p. 215; A.R. for 1900 in *QV&P* 1901, p. 398.

<sup>35</sup> D. Nichols, 'Mount Garnet and its historic assay office', *Northern Sun*, vol. 12, no. 39, 1997, p. 7; Ruth Kerr, typescript, n.d., in possession of Kagara Zinc Ltd. The building was used as a station workers' quarters until purchased and adapted by Bruce Nichols as a home. It later became the Kagara Zinc Ltd. mines office. It retains the fume cupboards, small ore sample crusher, and the concrete table used to prepare samples.

<sup>36</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1901, vol. 2, p. 178; 'Mount Garnet, North Queensland', *QGMJ*, 15 October 1900, vol. 1, p. 187; A.R. for 1900 in *QV&P* 1901, p. 398, A.R. for 1901 in *Parliamentary Papers of the Queensland Legislative Assembly (QPP)* 1902, p. 320.

<sup>37</sup> A.R. for 1901 in *QPP* 1902, p. 320. This dam was destroyed by a flood in 1967. D. Blake, *Regional and Economic Geology of the Herberton/Mount Garnet Area – Herberton Tinfield, North Queensland*. Bureau of Mineral Resources, Geology and Geophysics Bulletin No. 124, AGPS, Canberra, 1972, p. 114.

<sup>38</sup> 'Mount Garnet, North Queensland', *QGMJ*, 15 October 1900, vol. 1, p. 187; Report of T.A. Brown on the property for Mount Garnet Freehold Mining Co., 12 September 1898, item 332329, QSA. A lease had been pegged over the limestone in 1898. Waddell to Moffat, 22 June 1898, item 332329, QSA.

<sup>39</sup> *North Queensland Register*, 17 September 1900, p. 38.

<sup>40</sup> *Ibid.*, p. 36.

<sup>41</sup> Site inspection by the author, 2000; *North Queensland Register*, 26 March 1900, p. 35, 17 September 1900, p. 38.

<sup>42</sup> *North Queensland Register*, 17 September 1900, p. 36.

<sup>43</sup> *Adelaide Advertiser*, 5 May 1900, p. 10.

<sup>44</sup> *Ibid.*; mine plan 1900, item 115150, QSA; *North Queensland Register*, 3 September 1900, p. 43.

<sup>45</sup> *North Queensland Register*, 17 September 1900, p. 37.

<sup>46</sup> Ron Wegner, personal communication, December 2015.

<sup>47</sup> A.R. for 1900 in *QV&P* 1901, p. 398; Report of the Inspector of Mines, A.R. for 1901 in *QPP* 1902, p. 410.

<sup>48</sup> A.R. for 1900 in *QV&P* 1901, p. 398.

<sup>49</sup> *Ibid.*; *Northern Miner*, 5 November 1900, p. 3.

<sup>50</sup> Plan of pump house n.d. (c. 1898), item 332329, QSA; Map of the mine and railway siding signed by A.S. Frew, 23 August 1901, item 634038, QSA.

<sup>51</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1901, vol. 2, p. 178; A.R. for 1901 in *QV&P* 1902, p. 320; *North Queensland Register*, 17 September 1900, p. 37.

<sup>52</sup> *North Queensland Register*, 3 September 1900, p. 43.

<sup>53</sup> A.R. for 1900 in *QV&P* 1901 p. 398; 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 10 April 1901, vol. 2, p. 178; site inspection 2000.

<sup>54</sup> A.R. for 1900 in *QV&P* 1901, p. 396.

<sup>55</sup> 'Cradlings: Queensland', *QGMJ*, 15 May 1901, vol. 2, p. 194.

<sup>56</sup> Memo Chief Railway Auditor to Secretary for Railways, 25 May 1914; Report on railway by District Engineer Cairns, J.A. Fraser, 16 November 1912, Railway Batch File 299966, QSA. The local Shire Council later used part of the slagheap for road gravel (site inspection by the author, 2000).

<sup>57</sup> *Cairns Morning Post*, 18 January 1901, p. 2, 5 March 1902 p. 3, 12 March 1901 p. 5; *Melbourne Age*, 18 March 1901, p. 7.

<sup>58</sup> 'Mount Garnet Copper & Silver Mining Company Ltd. Half-yearly Reports', *QGMJ*, 15 April 1902, vol. 3, p. 206.

<sup>59</sup> A.R. for 1901 in *QPP* 1902, p. 320; *Adelaide Observer*, 23 March 1901, p. 13. Mills resigned after criticisms of his work and was replaced by J.W. Ashcroft of the Cockle Creek works in New South Wales see *Melbourne Argus*, 30 March 1901 p. 5, 25 September 1899, p. 9, 17 October 1901, p. 9.

<sup>60</sup> *Australian Star*, 13 August 1896, p. 2.

<sup>61</sup> 'Miscellaneous', *QGMJ*, 15 January 1903, vol. 4, p. 52; *North Queensland Register*, 3 November 1902, p. 15.

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- <sup>62</sup> 'Cradlings: Queensland', *QGMJ*, 15 May 1901, pp. 177-8; *Melbourne Argus*, 30 March 1901, p. 5.
- <sup>63</sup> 'Report by Warden A.C. Haldane for Walsh and Tinaroo Mineral Field', *QGMJ*, 15 August 1901, vol. 2, p. 388.
- <sup>64</sup> A.R. for 1901 in *QPP* 1902, p. 319.
- <sup>65</sup> *Sydney Morning Herald*, 28 September 1901, p. 13.
- <sup>66</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1901, vol. 2, p. 178; 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Directors' Report', *QGMJ*, 15 July 1903, vol. 4, p. 372.
- <sup>67</sup> Professor Maynard, reported in 'Mine sampling', *QGMJ*, 15 April 1903, vol. 4, p. 212.
- <sup>68</sup> *Northern Miner*, 22 June 1898, p. 2; Kerr, *John Moffat*, p. 174.
- <sup>69</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1901, vol. 2, p. 177.
- <sup>70</sup> John Kerr, 'The Mount Garnet Railway', p. 264.
- <sup>71</sup> *Queenslander*, 10 May 1902, p. 1005; *Northern Miner*, 12 May 1902, p. 7, 26 September 1902, p. 2; *Cairns Morning Post*, 29 July 1902, p. 3.
- <sup>72</sup> Mine plans dated 1916, Cairns Historical Society Collection D2079.
- <sup>73</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1902, vol. 3, p. 204.
- <sup>74</sup> 'Miscellaneous', *QGMJ*, 15 August 1902, vol. 3, p. 435; 'Miscellaneous', 15 October 1902, vol. 3, p. 588.
- <sup>75</sup> The *Northern Miner* was highly critical, but believed the policy was to help the Chillagoe Company's reconstruction. See *Northern Miner*, 30 December 1902, p. 3.
- <sup>76</sup> 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Half-yearly Reports', *QGMJ*, 15 April 1902, pp. 204, 206; *Cairns Morning Post*, 18 April 1902, p. 2.
- <sup>77</sup> A.R. for 1902 in *QPP* 1903, p. 949.
- <sup>78</sup> The compressor's location is inaccurate on this plan; the foundation was beside the winding engine.
- <sup>79</sup> *Charters Towers Evening Telegraph*, 14 March 1902, p. 2.
- <sup>80</sup> *Northern Miner*, 7 October 1902, p. 2.
- <sup>81</sup> *Melbourne Argus*, 29 April 1902 p. 8; A.R. for 1902 in *QPP* 1903, pp. 948-9.
- <sup>82</sup> *North Queensland Register*, 21 April 1902, p. 11; *Brisbane Week*, 30 May 1902, p. 11.
- <sup>83</sup> Report of the Inspector of Mines, A.R. for 1902 in *QPP* 1903, p. 1030; *Cairns Morning Post*, 9 December 1902, p. 5.
- <sup>84</sup> *Cairns Morning Post*, 27 January 1903, p. 3.
- <sup>85</sup> A.R. for 1903 in *QPP* 1904, p. 1218; 'Mount Garnet Freehold Copper & Silver Mining Co. Ltd. Directors' Reports', *QGMJ*, 15 July 1903, vol. 4, p. 373.
- <sup>86</sup> 'Mount Garnet Freehold Copper & Silver Mining Company Annual Meeting in Melbourne', *QGMJ*, 15 November 1902, vol. 3, p. 588; Kerr, 'Mount Garnet Railway', p. 264.
- <sup>87</sup> 'Mount Garnet Freehold Company Annual Meeting', *QGMJ*, 15 November 1902, vol. 3, p. 588.
- <sup>88</sup> 'Miscellaneous', *QGMJ*, 15 April 1903, vol. 4, p. 218; 'Mount Garnet Freehold Copper & Silver Mining Company Ltd. Directors' Reports', *QGMJ*, 15 July 1903, vol. 4, pp. 372-3.
- <sup>89</sup> A.R. for 1903 in *QPP* 1904, p. 1218; 'Mount Garnet Freehold Copper & Silver Mining Company Ltd. Directors' Reports', *QGMJ*, 15 July 1903, vol. 4, p. 372; *Launceston Examiner*, 4 June 1903, p. 2.
- <sup>90</sup> Report of the Inspector of Mines, A.R. for 1902 in *QPP* 1903, p. 1030.
- <sup>91</sup> A.R. for 1903 in *QPP* 1904, p. 1218.
- <sup>92</sup> *Launceston Examiner*, 20 October 1902, p. 2.
- <sup>93</sup> William Lees, *The Copper Mines and Mineral Fields of Queensland*, Queensland Country Life, 1907, p. 24.
- <sup>94</sup> John Kerr, 'Mount Garnet Railway', p. 264.
- <sup>95</sup> *Brisbane Truth*, 28 June 1903, p. 6.
- <sup>96</sup> 'Mount Garnet Freehold Copper and Silver Mining Company Ltd. Directors' Report', *QGMJ*, 15 July 1903, vol. 4, p. 372.
- <sup>97</sup> Kennedy, 'They stumble', p. 197; 'Mining companies', *QGMJ*, 15 April 1903, vol. 4, p. 218; *Melbourne Age*, 25 June 1903, p. 7; *Launceston Examiner*, 2 October 1903, p. 2.
- <sup>98</sup> Kerr, *John Moffat of Irvinebank*, p. 187; Kennedy, 'They stumble', p. 193.
- <sup>99</sup> Kerr, *John Moffat of Irvinebank*, p. 260; 'Return of mining companies registered during month ended 30 April 1907', *QGMJ*, 15 May 1907; *Cairns Morning Post*, 14 March 1907, p. 5.
- <sup>100</sup> Kerr, 'Directing and deflecting development by railway', pp. 232-234; *Cairns Morning Post*, 10 September 1904, p. 2.
- <sup>101</sup> *Townsville Daily Bulletin*, 26 February 1913, p. 11.

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<sup>102</sup> Kerr, 'Mount Garnet Railway', p. 264; *North Queensland Register*, 15 February 1904, p. 10, *Cairns Morning Post*, 26 February 1904, p. 3.

<sup>103</sup> For example, *North Queensland Register*, 18 July 1904, p. 10; *Launceston Examiner*, 9 January 1906, p. 2; *Cairns Morning Post*, 29 March 1905, p. 4.

<sup>104</sup> *Gympie Times and Mary River Mining Gazette*, 19 October 1905, p. 2; *North Queensland Register*, 5 June 1905, p. 9; *Northern Miner*, 4 December 1905, p. 3.

<sup>105</sup> *Northern Miner*, 5 December 1905, p. 4.

<sup>106</sup> 'Notes and News: Mount Garnet Freehold, North Queensland', *QGMJ*, 15 January 1906, vol. 7, p. 2; 'Notes and News: Mount Garnet', *QGMJ*, 15 August 1906, vol. 7, p. 399; *Cairns Morning Post*, 9 July 1906, p. 2; *Truth*, 3 February 1906, p. 2; *Northern Miner*, 1 December 1908, p. 5.

<sup>107</sup> Elder, Smith to Moffat 12 March 1907, Mount Garnet Debenture Trust to Moffat 18 March 1904, Mount Garnet Debenture Trust correspondence with Irvinebank Mining Co., TR1012/1, QSA; *Mount Garnet Railway Act of 1914*, Schedule; *Cairns Post*, 22 March 1910, p. 5.

<sup>108</sup> *Mount Garnet Railway Act of 1914*, s. 4.

<sup>109</sup> Kerr, 'Mount Garnet Smelter Site'; *Northern Herald*, 20 August 1915, p. 49; *Cairns Post*, 7 May 1917, p. 4; *Northern Herald*, 9 May 1918, p. 64; *Cairns Post*, 21 February 1916, p. 7.

<sup>110</sup> Kerr, *John Moffat of Irvinebank*, p. 261.

<sup>111</sup> Blake, *Regional and Economic Geology of the Herberton/Mount Garnet Area*, p. 110.

<sup>112</sup> Kagara Zinc Ltd., by then Kagara Ltd., went into liquidation in 2013. Delisted Australia, <http://www.delisted.com.au/company/kagara-ltd>.

<sup>113</sup> W.H. Peterson, 'Memories of Mount Garnet', typescript, n.d., held by Cairns Historical Society, D7049.

<sup>114</sup> John Kerr, *Triumph of the Narrow Gauge: A history of Queensland Railways*, Boolarong Publications, Brisbane, 1990, pp. 99, 188.