BEFORE THE AN INDEPENDENT HEARINGS PANEL
OF THE WAIKATO DISTRICT COUNCIL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of the proposed Waikato District Plan (Stage 1) Hearing 19

STATEMENT OF EVIDENCE OF DEAN ANDREW FERGUSSON ON BEHALF OF THE RALPH ESTATES

MINERAL RESOURCE & MINING

13 August 2020

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1. INTRODUCTION

1.1 My full name is Dean Andrew Fergusson.

1.2 I am the principal consultant and managing director of my business, Resource and Reserve Limited (**RARL**). RARL provides exploration, geological, mining and engineering geology services to a variety of New Zealand based and overseas clients.

1.3 I have the following academic qualifications:

(a) BSc in Earth Science; and

(b) MSc Hons (first class) in Geology.

1.4 I am a long-standing member of the Australasian Institute of Mining and Metallurgy (**AusIMM**). I am a Chartered Professional geologist of the Institute and meet the requirements of a Competent Person for classification of coal resources. I was chair of the AusIMM NZ Branch 2017-2019. I am also a member of the Geoscience Society of New Zealand.

1.5 My 35 year professional career in New Zealand includes extensive experience in the coal mining sector and large civil earthworks projects. Between 1991 and 2013 I held a wide range of technical and middle to senior management roles in both underground and opencast coal projects and operations for Solid Energy. In August 2013, I left Solid Energy to form my consultancy RARL. I now provide specialist mineral resource, geoscience and expert evidence services to a wide range of New Zealand and overseas clients.

1.6 My experience in the New Zealand coal industry covers both the North and South Island, and includes: exploring, modelling and estimating coal resources; accessing land and private minerals; managing tenure over Crown minerals; consenting underground and opencast coal mines; undertaking due diligence to feasibility studies for individual mining projects; managing a very large portfolio of mining projects; and managing mine development capital works. I have authored and co-authored several published papers on coal exploration methods, engineering geology of large-scale landslides and risk-based slope stability assessment methods.

1.7 I have been aware of the geology and coal resources in the Ohinewai Sector of Waikare Coalfield since my earliest involvement in the coal industry starting in in 1986. At this time, State Coal Mines (later to become Coal Corporation of New Zealand in 1987; rebranded Solid Energy in 1997; the company went into voluntary administration on 13 August 2015, hereafter referred to as **Solid Energy** for simplicity) was actively exploring these coal resources, investigating the technical issues and assessing the feasibility of mining.

1.8 Between 2004-2013, I was involved in the following work related to assessing the resource and mining potential at Ohinewai:

(a) Obtaining an exploration permit (**EP**) over all Crown coal in the Waikare Coalfield;

(b) Involvement in negotiating an Exploration and Mining Option Agreement (**EMOA**) over the Ralph Estates' mineral titles;

(c) Negotiating land access for coal exploration and geotechnical testing;

(d) Maintaining the compliance work programme for the EP and EMOA;

(e) Undertaking negotiations to acquire land required for the Ohinewai mine;

(f) Managing technical, environmental and conceptual mining studies for Ohinewai opencast mine options; and

(g) Engaging with regulators (Waikato Regional Council) and local Iwi (Matahuru Marae)

1.9 In the past five years, RARL has been engaged by the Public Trust to assist with the following matters related to the Ralph Estates' mineral interests at Ohinewai:

(a) Assessing the impact of the Huntly By-Pass expressway designation on the Ralph Estates' mineral holdings at Huntly and Ohinewai;

(b) Liaising with Solid Energy (then in receivership) to obtain from them all geological, geotechnical and feasibility study data and information generated by them during the term of the 2008 Ohinewai EMOA;

(c) Sorting through the very large Solid Energy data repository to create an organised archive for future use by and on behalf of the Public Trust;

(d) Assisting with monetising the Ralph Estates' mineral holdings at Ohinewai; and

(e) Preparing an information memorandum outlining the Ralph Estates' mineral interests and the associated development potential.

1.10 I have read the Code of Conduct for Expert Witnesses (**Code**) outlined in the Environment Court's Consolidated Practice Note 2014 and confirm that I will comply with it in preparing my evidence. I confirm that the issues I will address are within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses. I also confirm that I will not omit to consider material facts known to me that might alter or detract from my opinions.

2. SCOPE OF EVIDENCE

2.1 I have been asked to provide evidence on the Ralph Estates' mineral interests at Ohinewai and the effects that Ambury Property Limited (**APL)**'s request to rezone land at Ohinewai may have on those interests. More specifically, my evidence will cover the following:

(a) An overview of Waikare Coalfield and the significance of Ohinewai Opencast Sector;

(b) A summary of the Ralph connection to mineral interests at Ohinewai;

(c) A summary of recent coal resource estimates, technical investigations, mining and economic studies for the Ohinewai opencast;

(d) A summary of the market potential for Ohinewai coal;

(e) An assessment of the affect the proposed rezoning would have on the Ralph Estates' mineral interests;

(f) An overview of the potential Ohinewai mine life cycle, including relevant examples of mine closure;

(g) Rebuttal of evidence by Mr Cameron Lines for APL;

(h) An explanation of the background to the draft Information Memorandum (**IM**) on Ohinewai (attached as Appendix A); and

(i) Conclusions

2.2 There is an enormous amount of historic data and reports generated over four decades of coal exploration and investigation at Ohinewai. For reasons of practicality and relevance, my evidence draws largely from the recent work conducted by Solid Energy from the early 2000's until around 2016. I was either involved directly or responsible for overseeing this work until the later part of 2013.

3. SUMMARY OF EVIDENCE

3.1 The Ralph Estates have a 150 year history in the Waikato of exploring and mining coal and other minerals such as aggregate and fireclay within its extensive mineral titles around Rotowaro, Huntly and Ohinewai.

3.2 These mineral titles provide unfettered rights of access to the surface land to mine their minerals, subject to providing reasonable compensation for land damage.

3.3 The Ralph Estates' mineral interests under and adjacent to the land that is the subject of the rezoning proposal include a very substantial quantity of coal resources in the Ohinewai Opencast and Ohinewai Sectors of Waikare Coalfield.

3.4 Coal resources, geotechnical and mining challenges, environmental effects and economics at Ohinewai have been extensively explored, investigated and assessed in the past 40 years, first as part of the New Zealand Coal Resources Survey (**NZCRS**) and then by Solid Energy.

3.5 A series of opencast mine proposals have been developed. The most recent proposal, developed by Solid Energy, has been developed with a mine design that addresses geotechnical risks, materials handling characteristics and associated productivity impacts on cost. It would avoid Lakes Rotokawau and Ohinewai, minimise impact on the wetlands around the south of Lake Waikare and reduce the land and development requirements for the mine.

3.6 A smaller opencast pit containing a coal resource ranging between 17 and 22 million tonnes (**Mtonnes**) looks most likely. The Ralph Estates own the majority (~75%) of this opencast coal resource (12-16 Mtonnes). The remaining coal resource is owned by the Crown and other private coal owners.

3.7 In my opinion an opencast mine at Ohinewai is technically feasible and appears it would be economic at the proposed mine scale proposed by Solid Energy and anticipated production level, even when capital requirements are considered. In my opinion there is a sufficient long term market for this coal. It is recognised that resource consents would be required to realise the economic value.

3.8 The proposal to rezone the land would effectively prevent access to the Ralph Estates' coal north of Tahuna Road.

3.9 Based on both high-level estimation and deduction from recent mine planning by Solid Energy and a design based approach by Mine Design Systems Limited (**MDS**), the proposed rezoning would sterilise approximately 9 Mtonnes and 7.5 Mtonnes, respectively.

3.10 The potential rezoning of land clearly prevents the Public Trust from realising full commercial value from the Ralph Estates' mineral interests at Ohinewai. Using appropriate valuation methodologies defined in the VALMIN code, MDS have estimated the value of the sterilised coal quantity to be between $4.1 and $7.0 million. The evidence of Mr Gray on behalf of the Ralph Estates explains the methodology used for this valuation.

3.11 I have reviewed Mr Cameron Lines' evidence on behalf of APL. Some of this evidence relies on information from the 1970-80s New Zealand Coal Resources survey which is now out of date. More recent work has been undertaken by Solid Energy to investigate and plan a mining operation. I agree with Mr Lines that opencast mining at Ohinewai would pose a number of technical challenges. The key risks are material excavation rates, cut slope stability, and overburden storage. In my opinion, and in view of the technical work carried out to date,

these challenges are not insurmountable and there are feasible solutions to the issues raised in Mr Lines' evidence.

4. WAIKARE COALFIELD AND OHINEWAI SECTOR

Historic connection between Ralph Estates and Ohinewai

4.1 Anthony and Margaret Ralph established the Taupiri Coal Mine Company (**TCMC**) in 1874 and operated the Taupiri (Ralph) collieries at Huntly for some 30 years. During this time, the Ralph family purchased extensive land titles that included the minerals in the land, around Huntly, Ohinewai and Rotowaro.

4.2 Anthony Ralph died in the early stages of the TCMC and the family interests were run by his wife, who had remarried (Margaret Schlinker), son William and daughter Sarah. The majority of the minerals west of the Waikato River (in the Rotowaro and Huntly Coalfields) were owned by William and those to the east by Sarah and Margaret. The latter held hers through a Trust she had settled with the final beneficiaries William, Sarah and another son Robert.

4.3 Most of the surface land was subsequently sold but the Ralphs retained the mineral titles and the right to enter the land to mine the minerals. By the 1900s, the majority of the minerals were leased by the respective family members, TCMC and, subsequently, by Solid Energy for 100 years.

4.4 Although coal was the main mineral exploited by the TCMC, other minerals in the Ralph Estates' titles have been mined, including fireclay to produce the distinctive Huntly brick. The mineral titles include good quality greywacke adjacent to an established quarry immediately south of Huntly township. There is also aggregate and possibly other mineral potential in the Tauranga Group sediments.

4.5 Mining of the Ralph Estates' coal continues today in the Rotowaro Coalfield under a renewed mineral lease and mining agreement, so the Ralph minerals have been mined for almost 150 years.

4.6 The Ralph Estates' mineral titles provide for unfettered access to the land to exploit the minerals subject to an obligation to provide reasonable compensation for any damage that cannot be avoided to the land when extracting the resource. The land access afforded by the Ralph Estates mineral rights are advantageous to any plan to exploit the coal resource.

Coal at Ohinewai

4.7 The existence of coal near Ohinewai township was first discovered by TCMC in 1891. Further drilling in the period at 1900-1960 proved workable coal seams to be extensive enough to consider mining.

4.8 In the 1950's, TCMC undertook mine feasibility studies to develop an underground mine. An access drive (tunnel) was begun in the west of the coalfield near State Highway 1 but was abandoned after only 10m of driving through the upper soils (Tauranga Group) due to soft and saturated ground conditions. The tunnelling methods used at the time were no doubt rather basic by today's standards.

4.9 No further work was undertaken at Ohinewai until the early 1970s, when the NZCRS commenced throughout the Waikato region. Drilling in the Waikare Coalfield began in 1975 with one drillhole intersecting near continuous 25.5m of coal beneath 65.5m of cover in the southern part of the field, an area that is now recognised as the Ohinewai Opencast sector.

4.10 By 1985 close to 500 holes had been drilled, and tested, and an extensive area of coal identified east of the Waikato river. This defined what is now the Waikare Coalfield. Some 200 of these holes were drilled to define the extent of shallow, thick coal in the south of the coalfield, near Ohinewai. Thereafter, this would form the basis of work on the Ohinewai opencast prospect (Figure 1).

4.11 During and since the NZCRS, at least 45 significant technical studies have been undertaken on the Ohinewai opencast prospect. These include geological reports and resource estimates, specialised and regional geotechnical and hydrological investigations, environmental effects assessments and mining feasibility studies both open pit and underground operations.

4.12 To compliment this technical work, State Coal Mines had acquired the land over much of the opencast prospect, using the Public Works Act. Regrettably, that land was declared surplus to the Crown's requirement by Solid Energy in the late 1990's during a time of economic hardship, offered back to the original land-owners and sold.

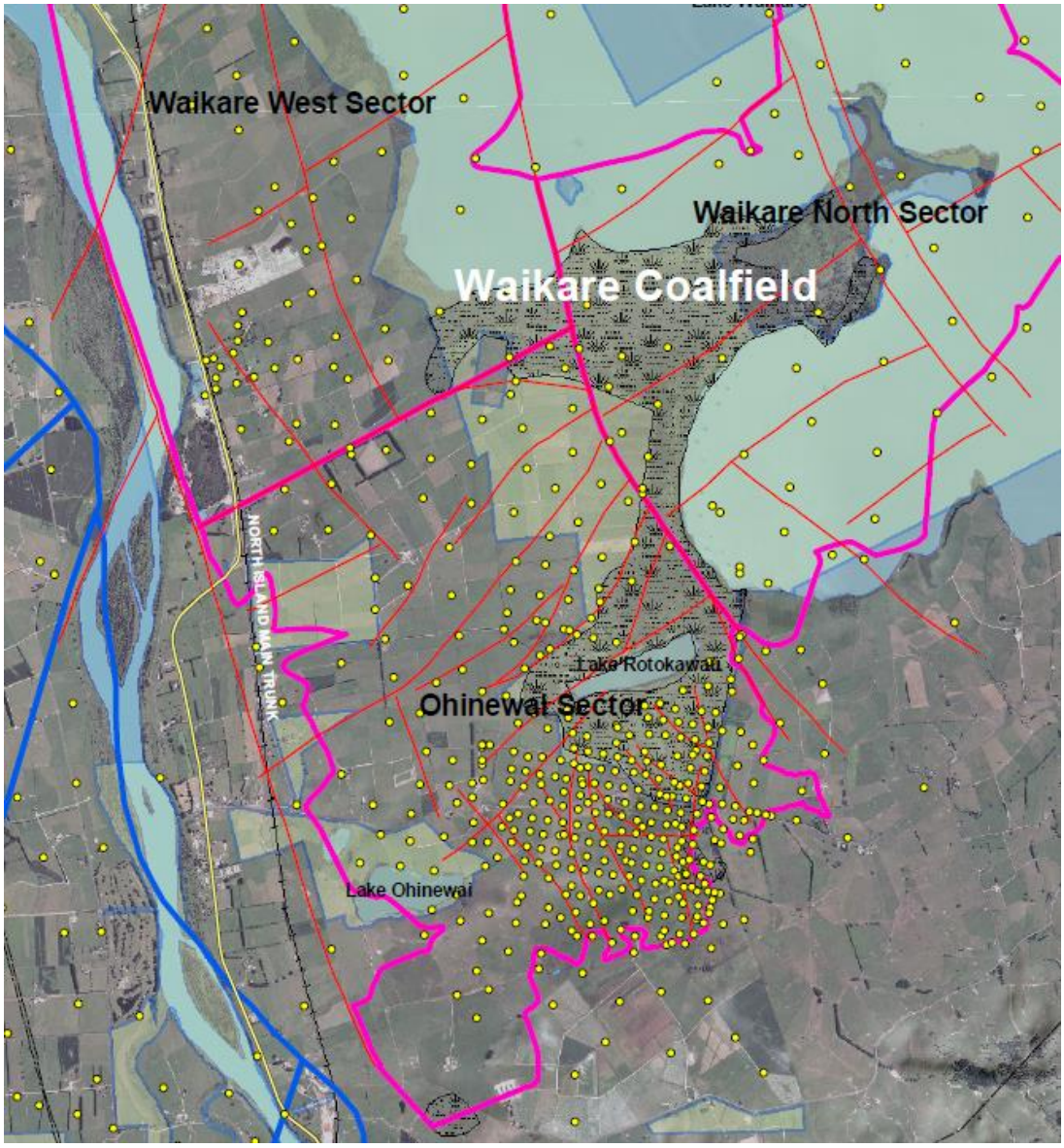


Figure 1 – Drillholes in the south of Waikare Coalfield (Solid Energy, 2003). Note the intensification of drilling in the Ohinewai Opencast sector. Since this plan was prepared, a further 21 resource and geotechnical holes have been drilled.

4.13 Further investigations were completed by Solid Energy in the 2000's mainly for preparing a resource model and geotechnical assessment of mining the overburden soils and hydrogeology of the area. These activities were also needed to meet requirements of its Exploration Permit (**EP**) 40632 covering all Crown coal in Waikare Coalfield and the Ohinewai EMOA.

4.14 A number of mining studies were undertaken between 2000 and 2016 by Solid Energy. These include:

(a) A search for potential opencast resources in the North Island around 2004;

(b) Further assessment of identified potential opencast resources in Ohinewai sector in 2004-05;

(c) Assessment of underground mining potential in connection with EP 40632 in 2006;

(d) EP 40632 compliance drilling in 2007-08;

(e) Hydrogeological testing in 2010;

(f) Pit optimisation, mine design and scheduling in 2013;

(g) Resource modelling and reporting in 2015; and

(h) High level economic assessment in 2016 of a staged mine development plan.

4.15 The pertinent outcomes of the latest work are covered in Sections 5 to 7 of my evidence.

Waikare Coalfield location

4.16 Waikare Coalfield underlies a large part of the North Waikato basin north of Huntly, immediately east of the Waikato River and State Highway 1 (Figure 2).

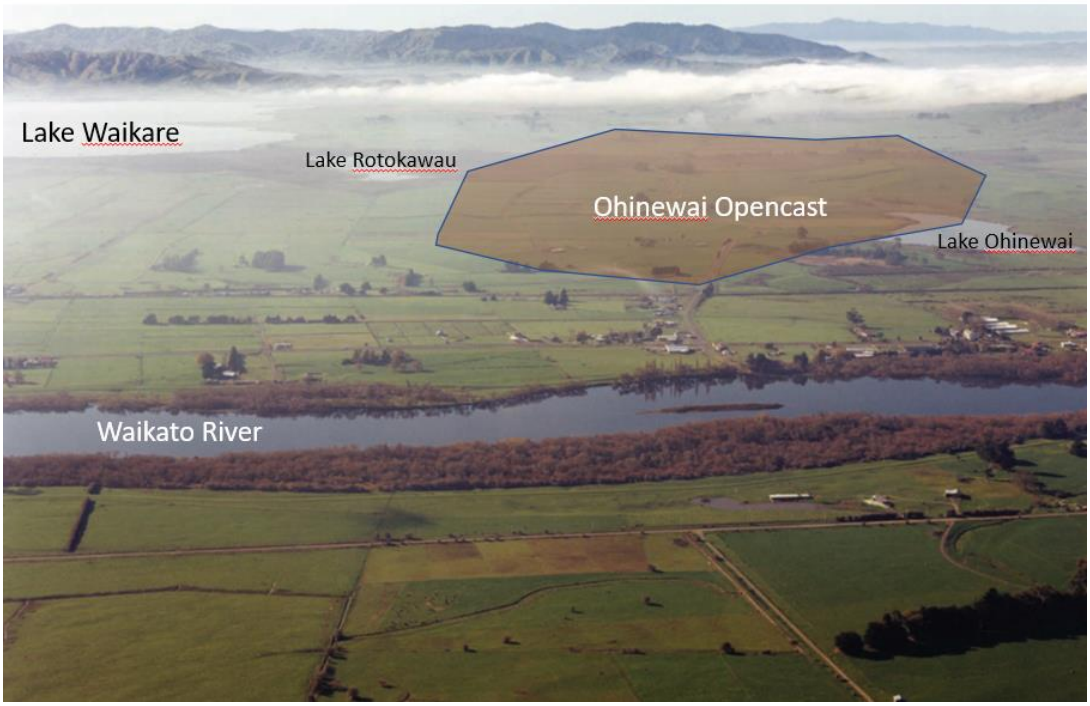


Figure 2 - View to the east over the Waikato River to the Ohinewai Sector of Waikare Coalfield. A large part of the coalfield underlies Lake Waikare on the left. The indicative extent of the Ohinewai opencast is shown between the small Lake Rotokawau and Lake Ohinewai (photo source: Lloyd Homer/GNS Science, in Sherwood 2019).

4.17 The NZCRS had established the limits of potentially mineable coal to be 6km north of Huntly township, and the two kilometres east of Rangiriri. The total area of Waikare Coalfield underlain by coal more than two metres thick in any one seam is about 27 km^2 (Figure 3).

4.18 Waikare Coalfield was subdivided into five sectors based on interpreted faulting, coal seam limits and coal depth. The Ohinewai Opencast was given sector status to recognise its significance for future mining. While about one third of the coalfield – the deeper parts - are beneath Lake Waikare, the Ohinewai Sector and Ohinewai Opencast Sector avoid this large water body (Figure 3).

4.19 Reports produced from the NZCRS reported an estimated total of 220 Mtonnes of coal-in-ground for the coalfield, almost all at less than 350m depth. At Ohinewai, thick coal comes very close to the ground surface in the south.

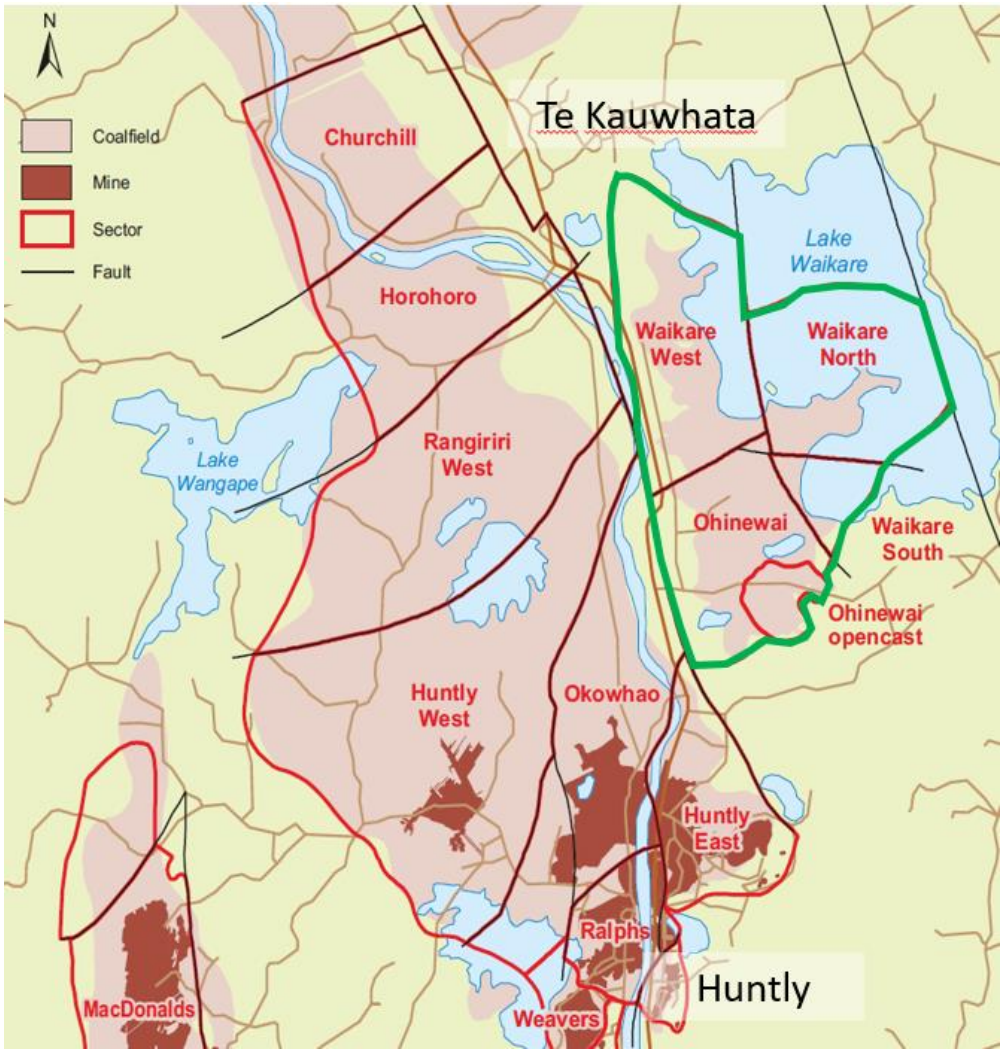


Figure 3 – Map showing Waikare Coalfield (green outline) and its component sectors. The coalfield lies east of the Waikato River between Huntly and Te Kauwhata. Note the location of Ohinewai Opencast at the up dip, southern end of the coalfield. Modified from Sherwood 2019

5. RECENT ASSESSMENTS OF COAL RESOURCE AND MINING POTENTIAL

5.1 Between 2000 - 2004, Solid Energy prepared a new resource model and an updated resource estimate for Waikare Coalfield. This formed the basis of a search for potential resources in the North Island as part of a strategy to identify coal deposits that could be secured and maintain its long term (50 year) resources pipeline.

5.2 This work re-examined the mining potential at Ohinewai and confirmed a range of opencast pits containing from 14 Mtonnes to 35 Mtonnes with favourable

stripping ratios.[1] The study opted to assess two pits one containing 35 Mtonne, the other 19 Mtonne of coal (Figure 4).

5.3 The 35 Mtonne pit, similar in extent to that assessed by RWL Mining Consultants in 1985-86 for State Coal Mines, would mine through Lakes Rotokawau and Ohinewai. Each of these scenarios required large land holdings to be secured and required considerable development capital.

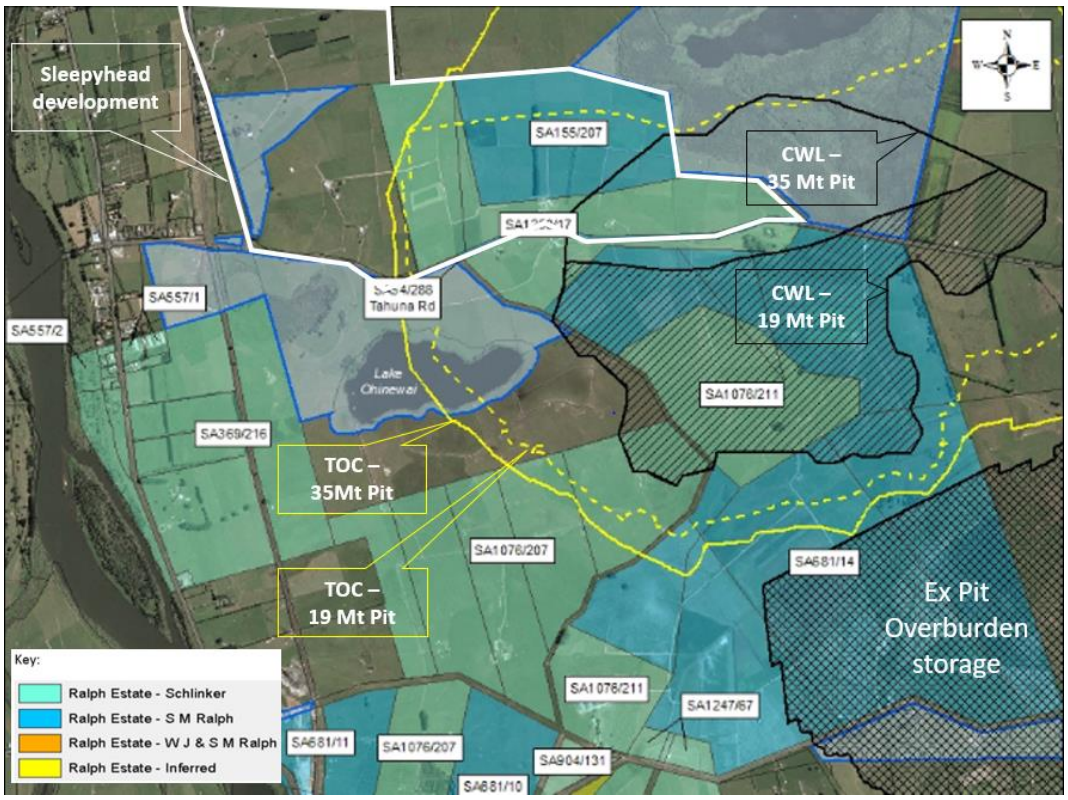


Figure 4 – 35 Mtonne and 19 Mtonne conceptual opencast mines at Ohinewai defined by Solid Energy in 2004. TOC denotes the "top of cut", the pit limit at the ground surface; CWL denotes the "coal winning limit", the extent of coal extracted in the mine. The proposed land rezoning area is 176 Ha and indicated by the bold white outline.

5.4 Around 2010, renewed technical work was undertaken by Solid Energy, including: validating drillhole data; re-interpreting the stratigraphy; checking the historic coal quality data; and remodelling the geology. Hydrogeological and geotechnical studies, including pump tests, were also undertaken.

1 The main factor (metric) in designing an opencast coal mine, which largely determines the cost of mining, is the stripping ratio. Stripping is the removal of overburden from above and around the target coal. The stripping ratio is defined as the quantity of overburden stripped, measured in bank cubic metres or in situ overburden (**BCM**), divided by the tonnage of coal won from the pit. It varies over the life of the mine and represents the main operating cost. Mines are typically designed to mine to the breakeven stripping ratio where the stripping costs equate the revenue from the coal. Capital, processing, transportation to market and rehabilitation costs are not included in this metric.

5.5 The 19 Mtonne pit (Figure 4) was selected as the basis for further assessment. This pit mitigated geotechnical performance risk associated with the 35 Mtonne pit highwall (by avoiding the soft papa units of the Te Kuiti Group), avoided the small Lakes Rotokawau and Ohinewai, minimised the impact on the wetlands around the south of Lake Waikare and reduced the land requirement for the mine.

5.6 Pit optimisation, design and scheduling based on the 19 Mtonne pit limits followed in 2013 using the 2004 resource model and the results of the further technical studies conducted since 2010. This showed a potentially viable pit containing 16.5 Mtonne at a stripping ratio of ~12:1 (BCM of overburden to 1 tonne of coal).

5.7 In 2015, Solid Energy completely revised and updated the resource estimate for the Ohinewai Sector and the Ohinewai Opencast in anticipation of the asset sale programme. This work resulted in an JORC-compliant resource estimate for the coal contained in the 2013 conceptual pit (**2015 Resource Estimate**).[2]

5.8 The 2015 Resource Estimate classified the Ralph Estates' coal as a JORC Resource (there are reasonable prospects of "eventual" economic extraction[3] (in some cases meaning in excess of 50 years), and the coal owned by the Crown and other private interests as 'Inventory' coal (an estimate of in situ coal that is not considered or does not pass the reasonable prospects of extraction test). The non-Ralph coal was classified as 'Inventory' solely because Solid Energy did not have access to this coal in the form of a permit in the case of crown coal or access arrangement for the private coal). In every other respect, the so-called Inventory coal would justify being classified as a Resource and is considered as such in the following paragraphs.

2 The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (**JORC Code**) is a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves. Since 1989, the JORC Code has provided a mandatory system for the classification of minerals Resources and Reserves according to the levels of confidence in geological knowledge and technical and economic considerations. JORC Code has been incorporated in the Listing Rules of the Australian and New Zealand Stock Exchanges, making compliance mandatory for listing public companies in Australia and New Zealand. While not a public company, it was used by Solid Energy from around 2012 and was essential for the asset sale process and reporting using the JORC Code has been a requirement of the Crown Minerals Act since 2013.

3 JORC Code 2012.

5.9 A breakdown of the 2015 Resource Estimate is summarised below:

2015 resource estimate	Ralph Estates	Crown	Other Private	TOTAL
Opencast coal resources:				
In situ	**16.0**	2.1	3.7	21.7
15% geological loss	**13.6**	1.8	3.1	18.5
Underground coal resources:				
In situ	**4.0**	32.1	9.6	45.7
15% geological loss	**3.4**	27.3	8.2	38.8
Other coal outside 2015 pit and <6m thickness:				
In situ				70.5

5.10 This 2015 Resource Estimate determined that the in situ opencast coal resource amounted to 21.7 Mtonnes of in situ opencast coal. The Ralph Estates own 16 Mtonnes (73%) of this resource.

5.11 The in situ opencast coal quantity was further reduced by 15% apparently to account for geological losses, leaving 18.5 Mtonnes. Of this, the Ralph Estates own 13.6 Mtonnes of this resource. However, in my opinion, this represents an arbitrary and excessive reduction and was unnecessary. Drillhole intercepts of coal seams would reflect fault-thinned coal and opencast mining methods would mine all coal either side of any small to medium scale (up to 15m offset) faults. Some coal recovery losses are expected at seam boundaries but these amount to no more than five percent and such losses are normally captured in the basic resource modelling assumptions.

5.12 A further 45.7 Mtonnes of underground coal resource (defined as coal with more than 40m of Te Kuiti Group cover strata and seams greater than 6m thickness) are present in the Ohinewai and Waikare South Sectors. The Ralph Estates own 4.0 Mtonnes of the underground resources estimated in the Ohinewai Sector.

5.13 Figure 5 below shows the areas that were reported as JORC Resources in 2015 by Solid Energy. The Ohinewai Opencast Pit resource corresponds to the green outline in the figure. This is the coal winning limit derived from the 2013 pit design.

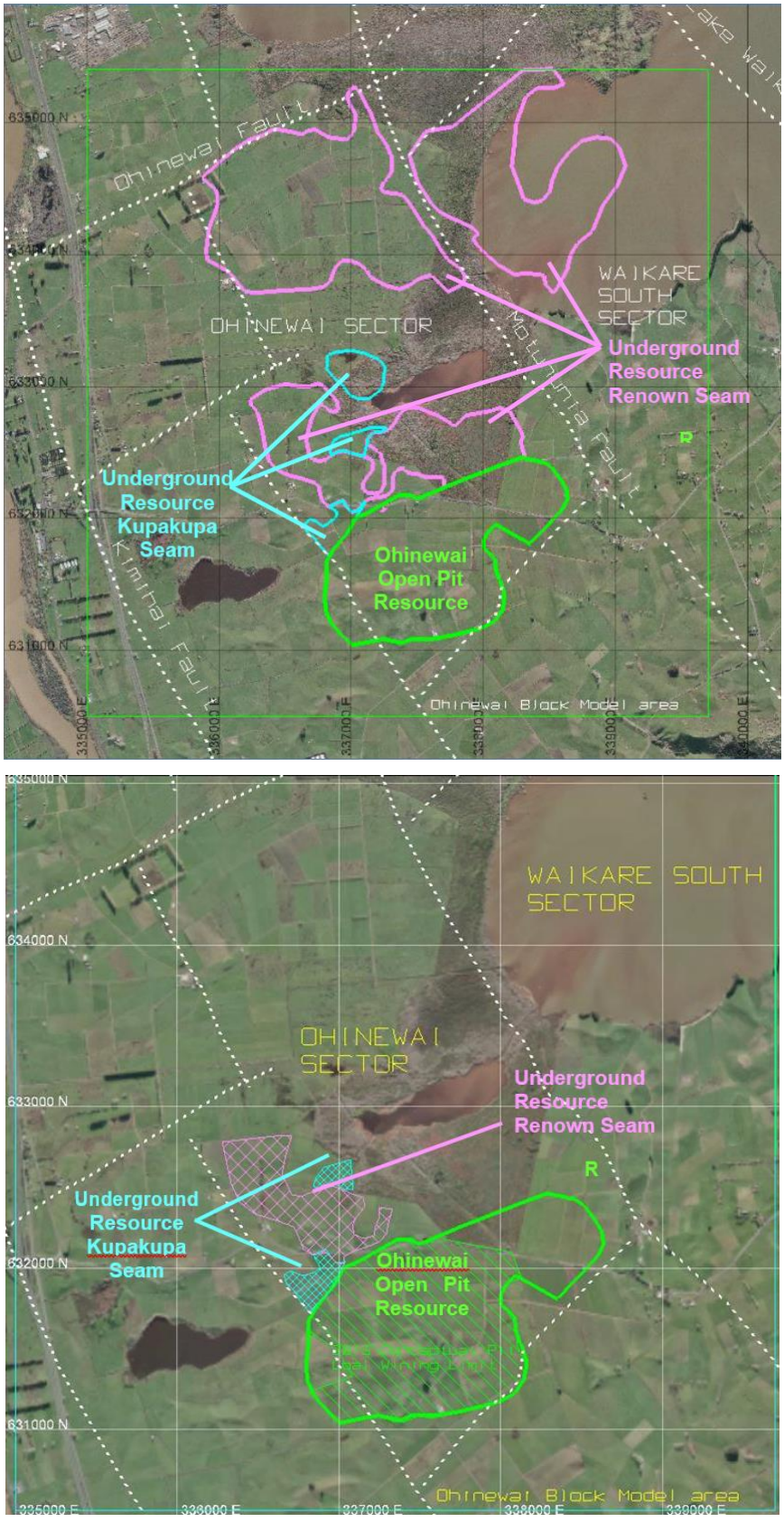


Figure 5 – the 2015 Ohinewai Opencast and underground resources. The top image shows the full extent of the resources. The bottom image the Ralph Estates' component.

5.14 Coal resource estimates and mine design criteria typically improve over time as more exploration data comes to hand and there are changes in the key assumptions used in:

(a) the geological model (such as minimum mineable coal thickness and applied loss factors);

(b) pit design parameters (such as slope angles, pit depth and surface extent); and

(c) economic and market considerations (e.g. stripping ratio and coal quality limits).

5.15 The opencast coal resource estimates from the past 15 years are summarised below. I have not included the 35 Mtonne pit resources identified in 2004 as that option was not advanced for further assessment after 2004 (as explained in paragraph 5.5) and I consider it unlikely that it would be in the future. There is a consistency in the resource quantities indicating that the Ohinewai Opencast contains a resource of between 17 and 22 Mtonnes of coal. Approximately 75% of this coal resource is owned by the Ralph Estates.

Year	Pit	Coal Resource (Mtonne)	Aproximate Ralph Estate coal (Mtonne)
2004	35Mt pit ignored	19	14.3
2013		16.5	12.4
2015	In situ	21.7	16
	15% geological loss	18.5	13.6

5.16 In 2016, Solid Energy updated its economic assessment for Ohinewai Opencast using the 2015 Resource Estimate resource model and the 2013 pit limits. In updating the project financial analysis, Solid Energy took the view that the mine development should be undertaken in two stages. It was perceived that the main customer(s) would be unlikely to underwrite a large scale mine development at Ohinewai. Staging the project would minimise the initial capital required for mine development, infrastructure works and land access.

5.17 This exercise revised the economics of mining using operating costs specific to a truck-shovel operation excavating the soft overburden materials and the expected hauls at Ohinewai, relevant processing, overhead and selling costs (energy resources levy, coal royalties) and order of magnitude capital costs and

a range of coal prices between $100 - $140 per tonne. This price range brackets the likely value in use of the coal.

5.18 The key mining schedule and economic assumptions used for the Stage 1 pit were:

(a) "Reserves" based on in situ and 15% geological loss coal resource estimate;

(b) Coal sales of 850 Ktonnes per annum over 10 years;

(c) Maximum overburden of 12 Million bank cubic metres (**BCM**) per annum;

(d) Operating costs using unit rates for stripping etc derived from first principles for the various material types, especially the softs; and

(e) The 2013 capital estimates were $60 million when inflated to 2016 dollars for land acquisition ($35 million), consenting, infrastructure construction and mine development works.

5.19 The result was a range of coal resource for both the in situ and the 15% geological loss resource options. The pit resources ranged from:

(a) 5.7-7.5 Mtonnes for the in situ coal resource with strip ratio 10-11:1; and

(b) 4.6-6.4 Mtonnes for the 15% loss coal resource with strip ratio 11-13:1

5.20 Although more work would be required to develop more accurate operating and capital costs, pit design and schedule, Stage 1 net present value (**NPV**) is positive as summarised below. While the adopted discount rate (5%) indicates this NPV may be optimistic, including the price used is possibly conservative. Given the NPVs, the financial assessment suggests the project to be financially viable. At the lower revenue making a case for investment would be difficult. However, a relatively modest lift in revenue as shown below demonstrates that Ohinewai would add significant positive values (as would a decrease in capital and/or operating costs).

	Optimum Pit Coal tonnes (Mtonne)	NPV at $105/t Revenue	NPV at $126/t Revenue
0% Geological Loss	7.1	$58M	$175M
15% Geological Loss	4.8	$7M	$91M

5.21 Stage 2 would necessitate further land access and resource consent, diversion of Tahuna Road and an expansion of the overburden storage area to the south east to create in pit backfill space for the mine expansion. While an NPV is not available for the second stage, based on the additional development capital and stripping ratio of Ohinewai opencast resources, the remaining coal may be expected to have a positive NPV.

6. COAL MARKETS

6.1 Before I examine the effects of the rezoning on the Ralph Estates' mineral interests, I wish to outline the potential markets and demand for Ohinewai coal.

6.2 Economic opencast coal is fast being depleted in the Waikato. Awaroa 4 Opencast in the Rotowaro Coalfield is in the final years of its economic life. At its comparatively modest current production, the Kopako Opencast in the Maramarua Coalfield will continue to operate for the foreseeable future. However, this mine could not supply all of New Zealand Steel's coal needs due to coal quality constraints, nor could it supply the full North Island market demand for any significant length of time. Ohinewai is one of the few remaining opencast resources in the North Island that could supply the market(s) for a significant number of years, and by far the largest.

6.3 Coal mined from Ohinewai opencast would have good quality (notably low ash, low sulphur and energy content similar to Rotowaro coal). The coal properties would be a good match to requirements for North Island customers.

6.4 While North Island demand for thermal coal in the immediate future is relatively stable, opportunities for thermal coal in the domestic market are becoming increasingly constrained by low or zero carbon government energy policies.

6.5 Despite this, given the nature of the current national electricity generation system, coal still plays an important role in providing energy security in times of gas shortages and low hydro-lake levels during dry years. Genesis' Huntly Power station is used as a back-up for when the industry faces challenging

weather conditions and was relied on heavily in 2018 when power prices hit a seven-year high.[4]

6.6 In fact last May, Radio New Zealand reported that Genesis Energy signaled that their intent is to remove coal by 2030 "if we can", adding that Genesis' goal to only use coal in exceptional circumstances from 2025 remained.[5] In these instances, Huntly Power station draws down from its large stockpiles of coal to make up the generation short-fall. These stockpiles are then replenished as and if required from nearby mines.

6.7 Bathurst Resources (investor presentation September 2019) correctly states, "there is no replacement for coal when it comes to steel making; likewise there is currently no other financially viable energy source in the South Island, and the North Island relies on coal and gas as a backup for renewable energy sources".[6]

6.8 Indeed, during the recent Covid-19 lock down, the government conceded that domestic thermal coal is essential energy primarily for food processing.[7]

6.9 According to the Coal Association of New Zealand (**CANZ**), "New Zealand has reserves of coal that can provide affordable, environmentally sustainable and secure energy for hundreds of years. Energy is (still) important to the New Zealand economy and a key policy objective must be to deliver the lowest cost energy possible with the least possible environmental impacts. The need to maintain competitiveness and developing technologies demand that coal reserves be part of New Zealand's future energy portfolio in the medium term".[8]

6.10 The North Island domestic coal demand is currently from the following markets:

(a) power generation at Genesis' Huntly Power Station;

(b) heat-raising at various industrial plants, including some of Fonterra's North Island milk factories, such as Te Awamutu; and

4 RNZ (20 May 2019) Genesis Energy to end coal use 'if we can' by 2030 <https://www.rnz.co.nz/news/business/389580/genesis-energy-to-end-coal-use-if-we-can-by-2030#>.
5 Ibid.
6 Bathurst Resources Limited – Investor Presentation, September 2019, at page10.
7 RNZ (26 March 2020) Miners exempt from lockdown as govt classifies coal as essential energy < https://www.rnz.co.nz/news/business/412626/miners-exempt-from-lockdown-as-govt-classifies-coal-as-essential-energy>.
8 Coal Association of NZ: <https://www.straterra.co.nz/coal-association-of-nz/>.

(c) Steel making at New Zealand Steel's Glenbrook steel mill

6.11 The North Island coal market is unique in so far as New Zealand Steel's Glenbrook steel mill annually consumes up to 750,000 tonnes of sub-bituminous coal for steel making. Glenbrook mill combines pure iron ore, derived from the ironsands mined at Waikato North Head, and carbon, derived from "devolatising" sub-bituminous coal, to make steel. No other operation in the world makes steel in the same way. The steel products are used in local construction and building sectors.

6.12 An exact breakdown of annual demand by market segment is difficult to obtain. However, investor presentations published by Bathurst Resources Limited in late 2019 provide some insights into medium term market demand for coal in the North Island. The following synopsis necessarily relies on making some assumptions as most coal consumers do not publish their annual coal consumption:

(a) Current North Island annual coal demand is 799,500 tonnes;

(b) It is assumed New Zealand Steel continues to consume 750,000 tonnes per year, which appears reasonable based on historic and current steel production;

(c) BT Mining Limited (a joint venture between Bathurst Resources Limited and Talley's Energy Limited) operates mines at Rotowaro and Maramarua supply approximately 500,000 – 600,000 tonnes per year to New Zealand Steel;

(d) By difference (quantity "a" less quantity "c"), BT Mining supply thermal coal markets (notably Fonterra dairy plants and Genesis' Huntly Power Station) to the order of between 200,000 – 300,000 tonnes per year; and

(e) To meet its annual demand, it is reasonable to deduce that New Zealand Steel probably imports around 250,000 tonnes of coal per year.

6.13 My estimates, therefore, are that the total annual potential demand for coal in the North Island is between 750,000 – 1,000,000 tonnes. It is noted that reliance

on coal for traditional thermal uses may be completely phased out over the next 10 years.

6.14 In this scenario, the underlying demand would be New Zealand Steel's coal use of around 750,000 per year. If developed, Ohinewai Opencast would be capable of supplying New Zealand Steel's coal demand for at least 20 years.

6.15 Using coal sourced from mines in the Waikato would have a lower global carbon footprint compared to imported coal which must be shipped from places like Indonesia.

7. RALPH ESTATES' MINERAL INTERESTS AFFECTED BY REZONING

7.1 Coal, unlike minerals such as gold or petroleum, can be in private ownership in New Zealand. Waikare Coalfield is a mix of Crown and private ownership.

7.2 The Ralph Estates' mineral titles (Figure 6) include all minerals including coal, aggregates (sands, gravels etc), peat, fireclay, greywacke and other minerals not reserved to the Crown that may be present in the land. These titles include land access rights, albeit subject to compensation to the surface land-owner for land disturbance.

7.3 As can be seen in Figure 5, most of the coal with opencast potential in the Ohinewai Sector is owned by the Ralph Estates with subordinate amounts owned by other private interests and the Crown.

7.4 The land APL is seeking to rezone for Sleepyhead's proposed development directly overlies two Ralph Estates mineral titles, north of Tahuna Road (Figure 6). However, the restriction the rezoning places on opencast mine development will impact the Ralph Estates' mineral resources much further to the south.

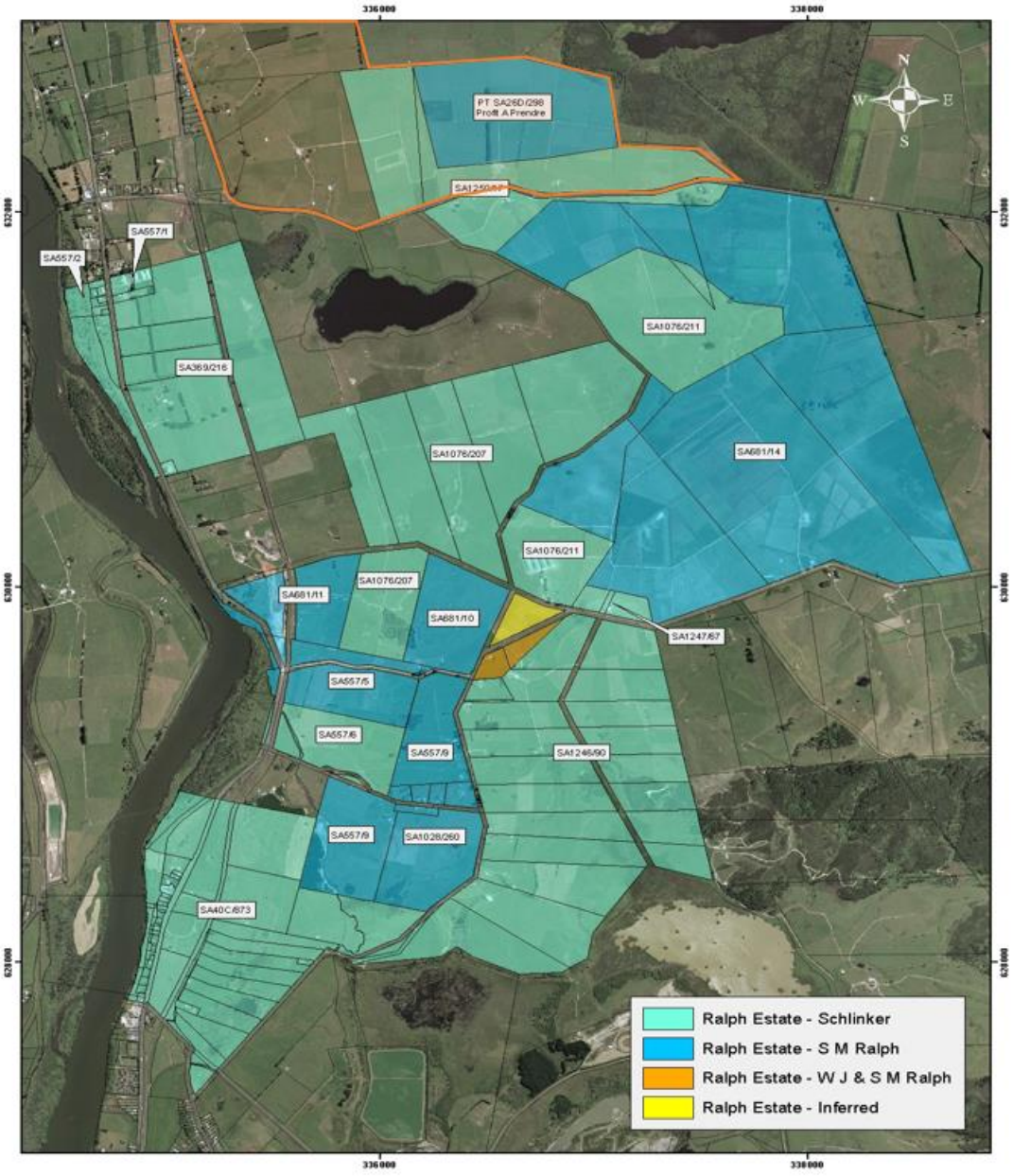


Figure 6 – Ralph Estates' mineral titles in the vicinity of the proposed rezoning area (orange outline). The Ralph mineral titles are also present west and south west of the Waikato River.

Effects on pit dimensions

7.5 The amount of the Ralph Estates' coal affected by the zoning varies somewhat as this is a function of the extent of the pit at ground surface which is in turn a function of the highwall overall slope angle and stripping ratio of the coal being targeted for extraction. These elements are highly inter-dependent and the combined effect is illustrated in the cross section in Figure 4 of Mr Gray's evidence on behalf of the Ralph Estates.

7.6 If the land rezoning goes ahead, consequently preventing access to the mineral titles north of Tahuna Road because of the development that would be enabled on land which is currently not developed, it would have a major adverse impact on the extent of the opencast mine. The top of cut would need to be repositioned up to 600m to the south and, after battering down to top of coal, the coal winning limit would be severely reduced in area, effectively preventing recovery of ("sterilising") potentially mineable coal. The general effect on the extent of pit dimensions and mineable coal is illustrated in Figure 7 below.

Effects on quantity of mineable coal

7.7 As a general indication, the sterilised coal quantity can be estimated using the percentage of Ralph coal in the pits, times the percentage reduction in the coal winning limit (**CWL**) times the unaffected estimate of Ralph Estates coal resources. As can be seen in the table below, I estimate an 8-10 Mtonnes reduction of the Ralph Estates' coal that could be mined by opencast methods.

Year	Unaffected Coal Resource (Mtonne)	Approx. % Ralph Coal	Unaffected Ralph coal (Mtonnes)	% areal reduction in CWL	Ralph Coal % in reduced CWL	Remaining OC Coal Resource (Mtonne)	Sterilised Ralph coal (M tonnes)
2004	19.0	80%	15.2	70%	95%	5.1	10.1
2013	16.5	80%	13.2	60%	95%	5.7	7.5
2016	21.7	80%	16.0	60%	95%	6.9	9.1
	18.5	80%	13.6	60%	95%	5.8	7.8

7.8 The above estimate is supported by work done by Solid Energy. As mentioned in Section 5 of my evidence, in 2016 Solid Energy considered a scenario involving the staged development of the Ohinewai opencast. Stage 1 limited the pit to south of Tahuna Road. Effectively, this replicates the effect of not extending the mine into the rezoned land and provides an estimate of the amount of coal that is "sterilised" (i.e. rendered unmineable) by this constraint (Figure 7).

7.9 As indicated in the table below, the effect of the rezoning would be to restrict access to, and effectively sterilise, approximately 9 Mtonnes of Ralph Estates minerals. This sits in the middle of my estimate in paragraph 7.7 above which was based on factoring down resources by percentage area reduction.

	Coal in pit (Mtonnes)			TOTAL	Ralph coal south of Tahuna Road	Sterilised Ralph coal (Mtonnes)
2015 resource estimate	Ralph Estates	Crown	Other Private			
In situ	**16.0**	2.1	3.7	21.7	6.7	9.2
15% geological loss	**13.6**	1.8	3.1	18.5	4.6	9.0

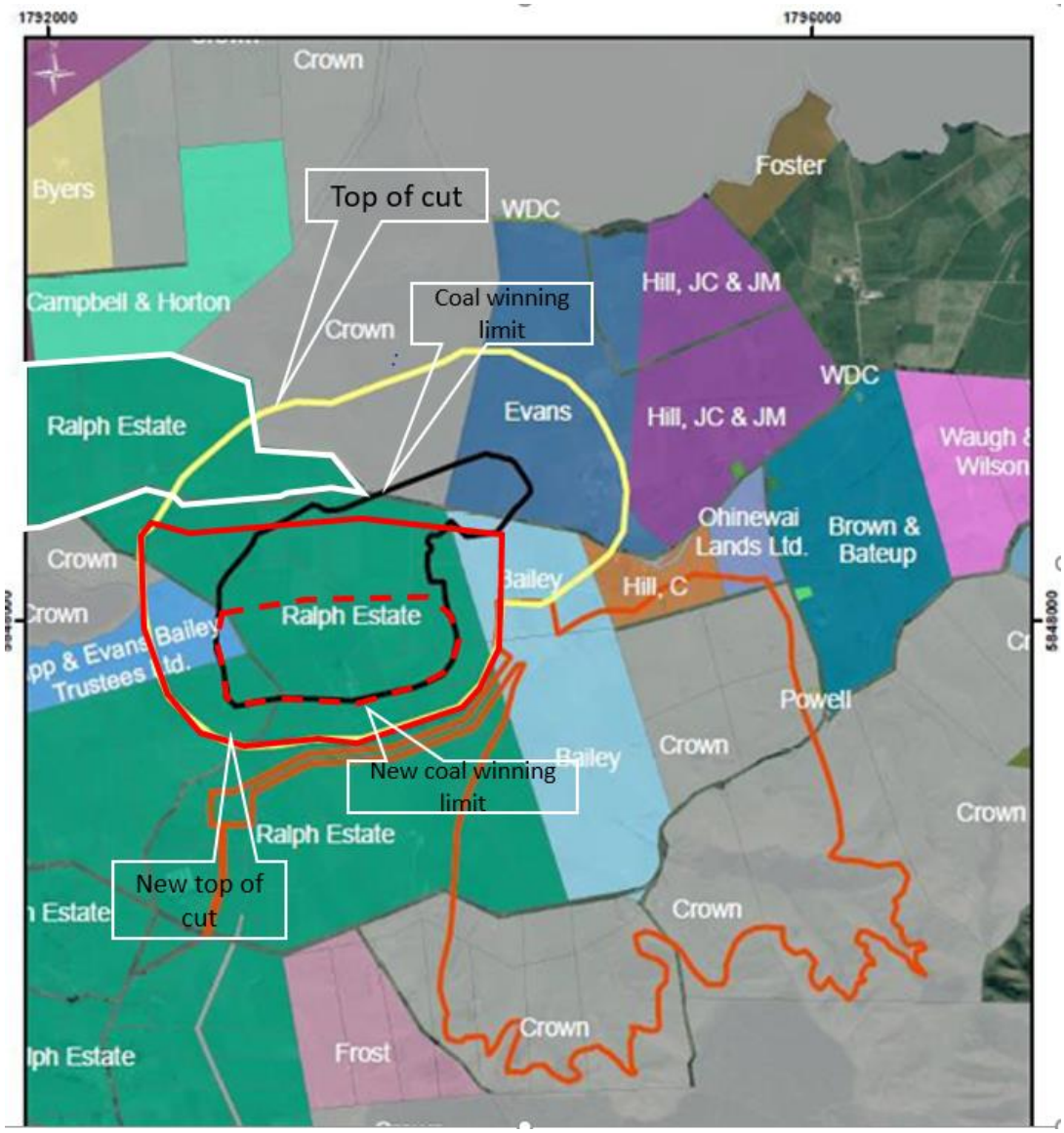


Figure 7: Avoiding mining on the proposed rezoned land would necessitate repositioning the pit Top of Cut (TOC) limit (yellow) approximately 100m south of Tahuna Road. Battering down to coal from this limit (solid red line) would result in a severe restriction of the coal winning limit (the red dashed outline) compared to the unconstrained coal winning limit (black outline). The background layer shows the mix of Ralph (green), Crown (grey) and other private coal. Land requirement for external overburden storage and infrastructure is outlined in orange.

7.10 By way of verification, the Public Trust engaged MDS to quantify the affected coal quantity using a mine design approach. This is described in greater detail in Mr Gray's evidence.

7.11 As explained by Mr Gray in his evidence, MDS has developed a resource model using stratigraphic surfaces from the resource model developed by Solid Energy to produce the 2015 Resource Estimate. An unconstrained pit shell has been developed using the same overall slope angles for the mine design and planning work undertaken by Solid Energy for the pit optimisation in 2013 and

subsequently for the 2016 economic update. A constrained pit based on a 100m set back south of Tahuna Road was also developed to simulate the effect of not accessing the coal in the rezoned land (Figure 8).

7.12 Coal resources in the unconstrained and constrained opencast pits have been quantified by MDS. The difference in quantity is 7.5 Mtonnes. This includes a small quantity of underground coal.

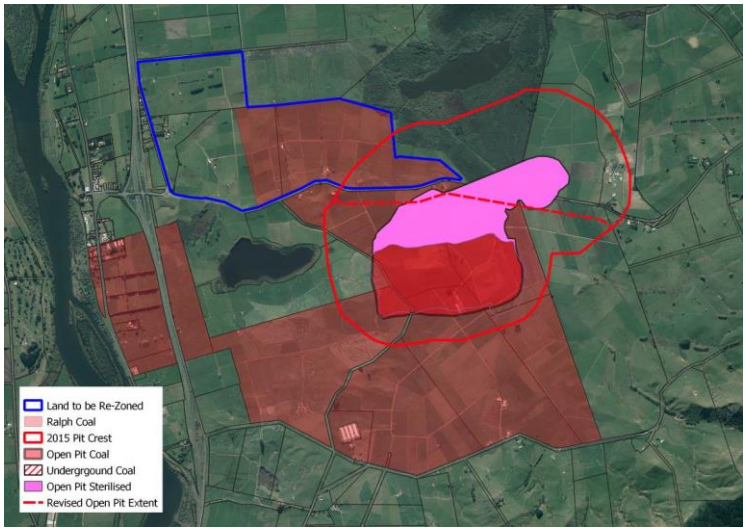


Figure 8 Location of sterilised open pit coal (from MDS 31 July 2020)

7.13 MDS Limited have used the AusIMM VALMIN code to value the sterilised coal quantity. As set out in Mr Gray's evidence this value is estimated at between $4.1 and $7.0 million, subject to the chosen valuation approach.

7.14 In addition to the resource that could be accessed via an open cast mine, the proposed rezoning will also have impacts on the ability to recover potentially underground mineable coal and other minerals such as aggregate in the affected Ralph Estates mineral titles.

7.15 I have not prepared an estimate of the underground coal resource that would be affected because in my opinion the opencast mine is the more likely scenario.

8. MINE DEVELOPMENT, OPERATION AND CLOSURE

8.1 This section is provided to give an overview of the activities that would occur over the Ohinewai opencast mine life cycle. The main elements of the opencast

mine layout are shown in Figure 8. Typical durations are given in brackets for each major stage of the mine life cycle work.

8.2 Feasibility study, land access and resource consent (10 Years): To move the opencast mine to a point of readiness, further assessment would need to be completed to confirm technical and commercial feasibility, for land and other mineral access arrangements to be negotiated and for resource consent obtained. To help manage the timeframes involved, the project could be implemented in stages as outlined in paragraph 5.16.

8.3 I have not commented on the resource consents that would be required (or the likelihood of obtaining those consents) as this is outside my area of expertise. However, in my experience while obtaining the resource consents necessary for an opencast coal mining operation of this scale is a complex and involved process, this is normal in the mining industry. Obtaining resource consents for a large opencast coal mine is possible, even on environmentally sensitive land, as has been demonstrated by Escarpment Mine on Denniston Plateau in the Buller region.

8.4 Civil and mine development (2-3 years):

(a) Construction of surface infrastructure (office facility and carpark, workshop and lube bay, mobile plant park up, diesel fuel storage area, water treatment plant, coal handling and load out facility);

(b) Surface earthworks to establish a foundation for an overburden and rehabilitation soil storage areas and associated drainage external to the pit; and

(c) Road works for site access/entrance, boundary fencing and other security works.

8.5 Mining operation – Stage 1 (~10 years):

(a) Pre-stripping of overburden and placing it out of the pit on to an engineered, long term storage area;

(b) Steady state overburden stripping and placement in pit with coal winning to meet coal demand. Production levels (market demand) of

between 0.5-1.0 Mtonnes of coal per annum would be expected and necessary to justify the mine investment and risk;

(c) Stockpiling of coal according to its quality, then reclaiming to meet supply specification, and loading out to train and truck; and

(d) Progressive (operational) rehabilitation via surface shaping and planting of overburden and hard stand slopes to minimise soil erosion and dirty water production.

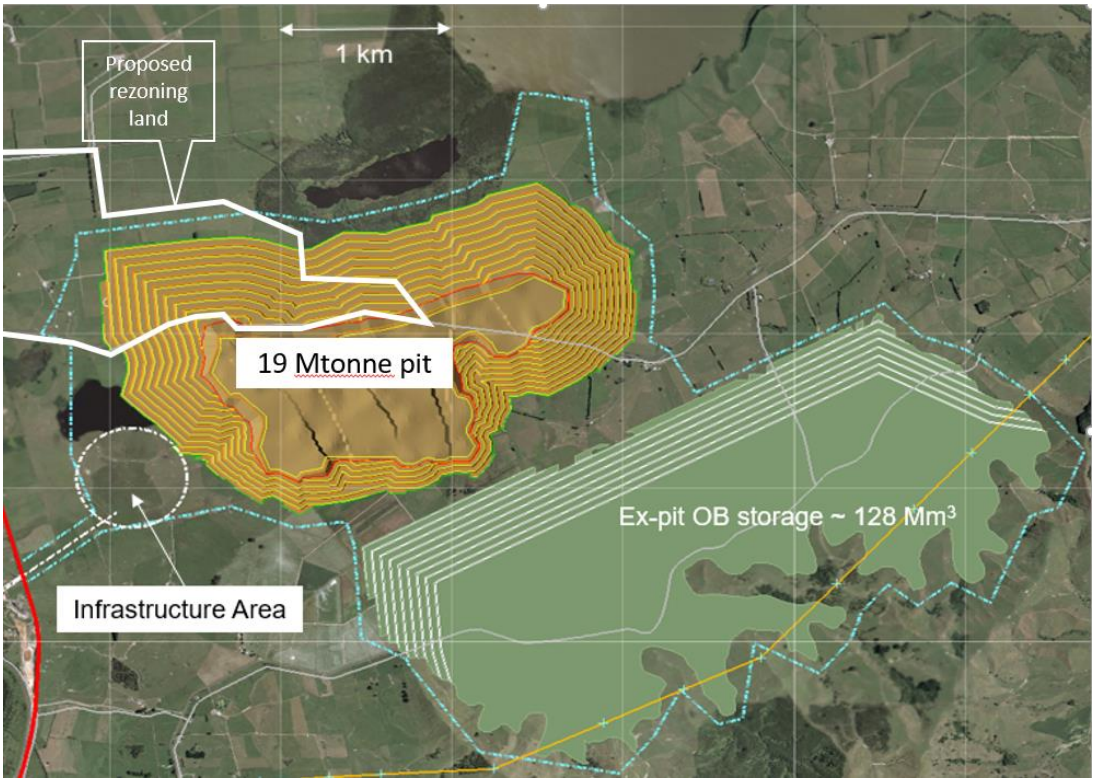


Figure 8 – The 2004 19 Mtonne pit conceptual design. This concept pit plan is similar in extent to the 2013 pit and shows elements of the mine development external to the pit. The rezoning land outline is shown for context.

8.6 Mining operation – Stage 2 (~10 years):

(a) Expansion of the overburden storage area for overburden and rehabilitation soil storage external to the pit;

(b) Further pre-stripping and placement of overburden outside of the pit to create more pit room; and

(c) Diversion of Tahuna Road.

8.7 Final rehabilitation (3 years):

(a) During the pre-strip and operational stages, surface soils would be removed ahead of the advancing cut, placed in a dedicated rehabilitation soil stockpile for rehabilitation of completed overburden slopes. Where possible these soils are taken to final overburden slopes when they are complete and ready;

(b) Once mining is completed, the surface infrastructure will be removed once it is no longer required to support the mine rehabilitation;

(c) Full and cut slope and hardstand areas are contoured, covered with soil and planted in a mix of production pasture and forestry, and native species;

(d) As with the majority of opencast mines and certainly all of those in the Waikato, a residual void would remain after mining. This would be flooded over time to create a mine lake (Figure 9). The duration of flooding is a function of the local surface and groundwater hydrology but would take several years;

(e) Typically alternative land uses commence many years prior to final lake level being reached. Surplus land is on-sold or, if leased, returned to the land owner; and

(f) An example of completed opencast rehabilitation with many parallels with Ohinewai is the former Weavers Opencast near Huntly (Figure 9).

Figure 9 – Lake Puketirini is the mine lake resulting from rehabilitation in the late 1990's of Weavers Opencast at Huntly. It represents the outcome of what was then prevailing best practice rehabilitation and is a valued community amenity (Top - Weavers Opencast 1990; Bottom - Lake Puketirini 2007). The highwall in the top image is steeper than that envisaged for Ohinewai.

9. REBUTTAL OF EVIDENCE PROVIDED BY CAMERON LINES

9.1 In this section I respond to matters raised in Mr Lines' evidence on behalf of APL.

Section 2 - Summary of evidence

9.2 I agree with Mr Lines that opencast mining at Ohinewai would pose a number of technical challenges. The key risks are material excavation rates, cut slope stability, and overburden storage. In my opinion, and in view of the technical work carried out to date, these challenges are not insurmountable and there are feasible solutions. An opencast at Ohinewai would in fact have many parallels with the Weavers Opencast near Huntly which mined through similar sequence of overburden materials adjacent to a shallow lake (Lake Waahi) in the 1980s-90s (Figure 9). The thicker Tauranga Group sequence at Ohinewai offers its

own set of challenges but considerable hydrogeological investigation has been focused on finding a credible solutions to address the geotechnical risks.

9.3 Investigations conducted to date have targeted the technical risk areas associated with the particular mining challenges present at Ohinewai. The conceptual mine design, planning and economic assessment have incorporated outcomes that address these risks:

(a) Well pointing to dewater the Tauranga Group soils ahead of excavation;

(b) Very flat pit cut and fill slopes in the soft overburden materials (10-12 degrees);

(c) Foundation and drainage works in advance of overburden placement;

(d) In pit sump storage and water treatment facilities;

(e) Low height ex pit disposal for overburden with separation of organic soils (peat); and

(f) Excavation methods tailored to the particular overburden characteristics.

9.4 As outlined in Sections 5 and 8 of my evidence, opencast mining at Ohinewai is likely to be technically feasible, and subject to: market demand (section 6); long term supply contracts and the coal price (paragraph 5.20); and other economic factors. Land access, resource consenting and social licence issues would be the main challenges to development and exploitation.

Section 5 - Regional geology and coal resources

10. At paragraph 5.3 of his evidence, Mr Lines states that the greywacke is the only other geological unit that could be considered for extraction (as a construction aggregate). This is not correct. The Tauranga Group soils may include exploitable aggregates such as sands and gravels and may in fact host mineralisation that has not yet been discovered by exploration.

11. At paragraph 5.12 of his evidence, Mr Lines states that the coal seam is approximately 20 m thick and present at depths of between 120-160m. Coal at Ohinewai has been confirmed by intensive drilling as being much shallower in the south of the opencast area for example, 25m thick coal is present at 65m depth.

Section 6 - Demand for thermal coal

11.1 Mr Lines states that demand for thermal coal is expected to continue to decline for the foreseeable future. However, the main North Island coal user does not fall into the traditional thermal coal use category. As mentioned in Section 6 of my evidence, if New Zealand Steel sourced all of its coal needs from domestic sources such as Ohinewai, demand would be in the order of 750,000 tonnes per annum. Ohinewai could supply this demand for at least 20 years.

11.2 While Genesis have signaled they intend phasing out coal use by 2030, they haven't ruled out its use beyond 2025 in exceptional circumstances. Fonterra have stated they "will transition to renewable energy where it can to meet its target of net zero emissions at its manufacturing sites by 2050".[9] However, given the need to balance environmental and economic considerations, I agree with statements made by Fonterra that the actual transition to 100% renewable sources of energy could well be "more complex than many people think", and "will come at a very significant price".[9] Therefore, in my opinion thermal coal use may persist longer than some expect, albeit at diminishing, possibly erratic, demand.

11.3 In addition, the large-scale use of coal at Huntly Power Station would potentially change if Carbon Capture and Storage technology is shown to be feasible for New Zealand based industries that use fossil fuel.

Section 7 - Opencast Mining

11.4 At paragraph 7.3 of his evidence, Mr Lines states that opencast mines have a very large footprint of disturbed ground, require a very large footprint for overburden disposal all of which require a significant level of rehabilitation on completion of mining. He then proceeds to elaborate on the disturbance and infrastructure area in paragraphs 7.4-7.27 using the State Coal Mines' 34 Mtonne mine referenced in paragraph 5.3 of my evidence. The following

9 Fonterra: electrifying plants comes at a high cost, Inside Resources 13 July 2020.

statements are made to provide some perspective regarding the area and duration of mining related disturbance

11.5 in 2004, the total land required for the 19 Mtonne Pit was estimated to be 1300-1400 ha. This was made up of the opencast pit, the out of pit Overburden storage area, the mine infrastructure and a 100-200m wide buffer zone around the extremities of the operational footprint (Figure 8).

11.6 As with all opencast mines, the initial stages of mine development and pre-stripping create the largest disturbance footprint in the mine life cycle. Pre-stripped overburden is placed external to the pit at what Mr Lines calls an overburden disposal area (**OBDA**) in paragraphs 7.13-7.18 of his evidence.

11.7 In the case of Ohinewai, the conceptual mine plan has this OBDA located partially on top of the foothills of the low greywacke range to the south east of the pit (Figure 8), not to the north or east as shown in Figure 6 of Mr Lines evidence.

11.8 Pre-stripping continues until there is sufficient space inside the pit to allow back-filling of the mine void. The efficiency of overburden storage is a function of the mine sequence geotechnical characteristics of the overburden materials and foundation stability.

11.9 Once out of pit overburden storage slopes have reached design levels, they will be rehabilitated (Figure 10). This involves shaping, creating long term drainage, covering with soils and planting with grass and/or trees to minimise on-going environmental effects and ultimately to free up the rehabilitated land for sale or return to the owner. Good practice involves undertaking this rehabilitation as soon as practicable after the overburden slopes have reached final level.

Figure 10: Recent rehabilitation at Rotowaro's Township Opencast. The 2007 image shows rehab soils being spread along-side recently grassed slopes. The 2009 image shows similar rehabilitation process but the foreground surfaces have been planted in pine. A long-term drain (linear grey structure) is being constructed (right hand side) at the foot of the recently completed slope.

11.10 The rehabilitated slopes are geotechnically designed to be stable long-term and take account of the soil's geotechnical properties, surface erosion and drainage characteristics, and the seismicity expected to be experienced in the area.

11.11 For the Ohinewai opencast, the maximum disturbance foot print over the life of mine would be in the order of 1200-1300 ha, the equivalent of 7-8 ADFs based on national average areas published by Diary NZ Ltd (2018) and South Island Dairying Development Centre (2020).

11.12 At any one time during the mine life, the disturbance area would be less than this and would coincide with disposal of all planned overburden to the external OBDA. The OBDA land (500-600 ha) could be fully rehabilitated within 2-3 years of the final out of pit overburden placement, leaving an active pit area of 400-500 Ha for the remaining operational mine life.

11.13 Once mining and final rehabilitation is complete, there would be a residual mine void of perhaps 100-200 ha - the equivalent of one ADF in area. This void would be flooded to create a mine lake like the Weavers Opencast/Lake Puketirini example (Figure 9). As was the case for Lake Puketirini, the lake margins would be profiled and vegetated for both long term stability and amenity reasons. The

void storage capacity and/or water resource it could contain would have a range of utility if not amenity uses, such as:

(a) Land irrigation during times of low rainfall or drought;

(b) Lake Waikare water improvement; and

(c) Supplementary water supply to the Waikato River for use by Auckland city during times of drought

Section 7 - Groundwater and geotechnical risks to mine development

11.14 In paragraphs 7.19-7.22 of his evidence, Mr Lines has identified some geotechnical issues related to groundwater flow into the pit. I acknowledge that groundwater behavior has long been identified as a risk for Ohinewai.

11.15 This importance of the issue was reiterated in an updated geotechnical gap assessment by Tonkin and Taylor (**T+T**) (work undertaken by Mr Lines) for Solid Energy in November 2010. This work concluded that there was a suitable body of data for soil properties and geology for prefeasibility design and the most significant risk is understanding groundwater flow in the upper 100m of the highwalls which would be consist of Tauranga soils. T+T concluded that groundwater will have a major bearing on the design of pit slopes angles but that there is sufficient geotechnical data to support this after further, planned hydrogeology study has been completed.

11.16 Guided by T+T's recommendations, Solid Energy commissioned further investigations and modelling to better understand the groundwater flows and to find solutions to address the likely risks.

11.17 One such study was a pump test in the south western corner of the proposed Ohinewai pit in mid to late 2010 to understand the Tauranga Group groundwater flow and response to pumping. Engineering consultants GHD Limited also undertook numerical modelling for the Ohinewai area. Their model was successfully calibrated to observed groundwater levels resulting from drawdown during past pump tests. The model was used to develop predictive scenarios, based on biannual mine stages for the 2004 Ohinewai pit shell. Three pump bore configurations (200, 400 and 600 meter spacing) were considered and dewatering strategies using perimeter and in-pit sacrificial bores were

investigated. 400 m and 600 m perimeter well spacing and in-pit sacrificial bores, provided the most satisfactory dewatering results.

11.18 The 2013 updated conceptual pit design was predicated on very low (10-12 degree) highwall slope angles for the Tauranga soils which assumed moderate levels of dewatering using a network of 30 pump bores installed in and around the pit perimeter. The material stability and handling risk is reflected in the resultant stripping volumes and capital costs in the 2016 financial assessment.

11.19 In addition, the surface peat layer between the pit and the Lake Waikare would be preloaded and consolidated by a bund to control near surface groundwater flows toward the pit.

11.20 Furthermore, some comfort can be taken from the Weavers Opencast precedent whereby the opencast pit was developed without incident in a sequence dominated by thick Tauranga Group soils immediate adjacent to Lake Waahi.

11.21 Nevertheless, despite the considerable work that has already been undertaken, I do acknowledge that additional work would be required to complete detailed technical feasibility studies and to support an assessment of environmental effects.

Section 7 – Key considerations for Opencast mine development at Ohinewai

11.22 In paragraph 7.23 of his evidence, Mr Lines' states that opencast mining would need to overcome strip rates that are "high", but within commonly accepted thresholds for economic mining. The stripping ratio for various scales of opencast mine at Ohinewai have stripping ratios in the range between 10:1 to 12:1. Since 2005, Awaroa 4 Opencast has been mined profitably at a strip ratio of 11:1, and in recent years the strip ratio has significantly increased above this and the mine still operates profitably. Kopako Opencast in the Maramarua Coalfield was recently re-opened and has operated for around five years at a similar strip ratio.

11.23 I agree that all mines require substantial capital investment for land acquisition, mine development and infrastructure. This is a necessity for any mine owner who chooses to develop a new mine. Estimates prepared for Solid Energy for Stage 1 of the proposed Ohinewai opencast were $60 Million in 2016 dollars,

with around $35M of this for land. There are potential alternatives for land acquisition to avoid upfront payment. These include negotiation with the affected landowners and mining under a lease and royalty arrangement, or forming a joint venture for mining of privately owned coal.

11.24 As I have described above, while the 2004 35 Mtonne Pit would mine out Lake Rotokawau, the 19 Mtonne 2004 Pit (2013-2016 pits are variants of this in extent and location updated equivalent) was designed to avoid this lake and minimise removal of wetland and other ecological effects.

11.25 Mr Lines refers to opencast coal mine slopes that have failed in the Waikato. However, these were designed and constructed to standards well below those developed and implemented in the early 2000's when I was Solid Energy's North Island Technical Manager. These new standards included appropriate levels of geotechnical site investigation, a risk-based design methodology and monitoring performance in real-time with the associated trigger action response plans (TARPs). Examples of successful application from the early to mid-2000's include:

(a) Stabilisation of highwalls at the new Township pit in the early 2000's;

(b) Construction of the 200m highwall at Awaroa 4 Opencast in very weak, structured strata; and

(c) Preventing the risk of reactivating the historic slope instability of the northern highwall of Kopako Opencast at Maramarua when dewatering mine lake.

11.26 I agree with Mr Lines that if mining proceeded the formation of a residual mine lake following opencast mining is likely. In my opinion, and as Lake Puketirini amply demonstrates, long-term stable lake margins are realistic outcomes.

11.27 I disagree with Mr Lines' statement at paragraph 7.27 of his evidence. I believe mining at Ohinewai is technically feasible and economic provided a long-term market such as New Zealand Steel exists. That said, in order to realise the economic potential, and while the mineral titles provide for land access with appropriate compensation terms, resource consents will need to be obtained and the environmental effects of the mine will be considered as part of that process.

Section 8 – Underground mining

11.28 Mr Lines has made a several statements about how underground mining could be carried out and concludes that it would be uneconomic. I have a number of comments in response to this section of Mr Lines' evidence:

(a) A preliminary evaluation of underground mining in Waikare Coalfield by Solid Energy in 2006 suggested this method would be technically feasible. The was based on adopting the "bespoke" mining method developed between 1990-2015 by Solid Energy used to develop and partially extract coal on the west side of Waikato River (**Huntly East Mining Method**).

(b) The Huntly East Mining Method was used to economically to mine coal seams greater than 6m thick at depths less than 300m. However, coal deeper than 300m proved uneconomic given the overall circumstances faced by the Huntly East Mine. These circumstances included the need for extra ventilation to support an additional mine section and the abandonment of the shaft while it was only half-completed due to capital rationalisation and falling coal prices caused by the 2012 commodity price down-turn. Due to the combination of these factors, plus other internal factors I won't go into, the mine could not cover its costs and was eventually closed.

(c) Further to Mr Lines' statement at paragraph 8.25 of his evidence, due to the hydrogeology of the coalfield (extensive surface water and thick upper aquifer) an intact rock head of at least 40m of Te Kuiti Group is required to prevent interconnection between the mine workings and this water. The geology of the Ohinewai Opencast area doesn't afford this level of protective cover rock and so an underground mine in the opencast footprint would be vulnerable to hydraulic interconnection and hence flooding.

(d) The 2015 Resource Estimate estimated 4 Mtonnes of Ralph Estates coal resources (i.e. coal thicker than 6m with at least 40m of rock head) is present in the Ohinewai Sector (Figure 5). As outlined in paragraphs 5.9 and 5.12 above, this coal is contiguous with more extensive in situ

coal owned by the Crown and other private mineral owners, totaling a further 42 Mtonnes.

(e) In the Ohinewai Sector, underground mining may form part of a life of mine plan where the deeper coal is accessed directly off the northern highwall once the technical/economic opencast limit is reached. There has been no work since a preliminary study in 2006 that would indicate whether the economics are favourable, or not.

(f) In my experience, any underground mine plan in the Waikare Coalfield would need to be based on the Huntly East Mining Method. It was successfully used to mine coal on the west side of Waikato down to depths of 300m.

(g) Coal recovery levels using the Huntly East Mining Method were as low as 15-20% due to the thick, faulted coal seams. The maximum amount of the Ralph Estates coal resource that could be extracted would therefore amount to 0.6-0.8 Mtonnes.

11.29 Experience at the Huntly underground mines in the mid to late 1980's proved that longwall/shortwall extraction methods are completely inappropriate for the Huntly Coalfield. Due to the similarities in geological conditions, this would apply to Waikare Coalfield also.

12. INFORMATION MEMORANDUM

12.1 Following instructions from Public Trust, I obtained the digital data archive from Solid Energy (then in receivership) in March 2018. I sorted through this archive, re-organised the files and provided two copies to Public Trust in April 2018. The intention was to use this information to support marketing the Ralph Estates mineral interests at Ohinewai.

12.2 The proposed Sleepyhead land development was made public on 23 July 2019 via an article in the New Zealand Herald. I prepared a summary of the implications of that proposal for the Public Trust in early August 2019.

12.3 I was asked to prepare an Information Memorandum (**IM**) on Ohinewai in March of this year. The most recent draft version is provided at **Appendix A**.

12.4 The IM provides an outline of key geographic, technical and environmental assessment and market aspects of the Ohinewai Opencast coal resource and mining opportunity for domestic or overseas parties who may be interested in acquiring the Ralph Estate's Ohinewai mineral interests.

12.5 The intention was that these parties would be invited to undertake due diligence and given access to a data room containing the geological and geotechnical data, as well as reports and plans from the many technical, environmental and economic studies conducted to date.

12.6 The IM would be used to market the Ralph Estates mineral rights as the key to this mining opportunity. Seeking expressions of interest was going to be the next step for the Public Trust, but I understand that is on hold pending the outcome of these proceedings.

13. CONCLUSIONS

13.1 The Ralph family have owned and mined their mineral interests in the Huntly, Rotowaro and Ohinewai areas for 150 years. The associated mineral titles provide for unfettered rights of access with appropriate compensation for land damage caused by mining.

13.2 Coal resources in the Ohinewai Opencast sector have been extensively drilled as part of the New Zealand Coal Resources Survey as part of exploring the wider Waikare Coalfield. A large amount of investigatory work and several mining studies were carried out by Solid Energy as recently as 2016.

13.3 While opencast mining at Ohinewai would pose a number of technical challenges, including material excavation rates, cut slope stability, and overburden storage, in my opinion, and in view of the technical work carried out, these challenges are not insurmountable and there are feasible solutions.

13.4 The key technical risks are reflected in mine design, planning, production scheduling and the associated capital and operating costs.

13.5 An opencast mine containing between 17-22 Mtonnes has been defined by mining studies conducted by Solid Energy since the early 2000's. The Ralph Estate's own approximately 75% of this coal resource.

13.6 In my opinion the Ohinewai Opencast mine is at least technically feasible. I consider it is also likely to be economic subject to sale price, volume per annum and duration of supply contracts.

13.7 Ohinewai coal is well suited to all North Island markets. The main long-term market is not be thermal coal *per se* but rather for use in steel making at New Zealand Steel's Glenbrook steel mill. The long-term demand for coal ranges between 0.75 - 1.0 Mtonnes per annum.

13.8 Based on the coal resource and markets, the Ohinewai mine could supply markets with 1 Mtonnes per annum for up to twenty years. The full mine life would be 30 years from development to closure.

13.9 Current coal reserves in the current North Island mines could be exhausted in the next 10 years. Detailed feasibility work, environmental effects assessment and consenting for Ohinewai Opencast could be undertaken in this time frame.

13.10 An Information Memorandum has been developed to seek expressions of interest from potential developers and to initiate this work using the very substantial database and technical archive held by the Public Trust.

13.11 The land rezoning proposed by APL would limit the opencast pit to south of Tahuna Road and compromise the opportunity for the Ralph Estates to fully exploit their mineral resource.

13.12 In my estimate, the effect of this restricted mine development would be to sterilise approximately 9 Mtonnes of Ralph Estates coal. As is explained in Mr Gray's evidence, MDS has determined that 7.5 Mtonnes would be sterilised and, using the VALMIN methodology, has valued this at between $4.1 and 7.0 million.

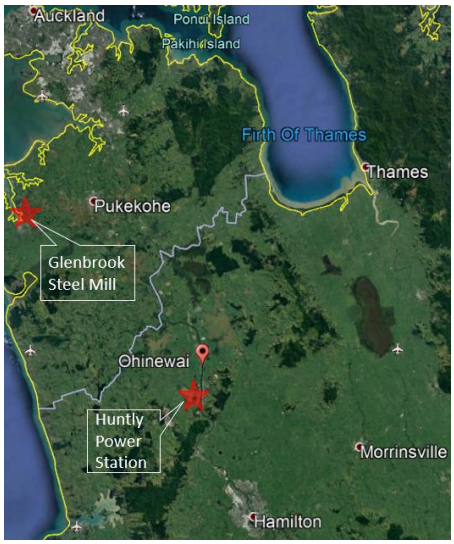
Dean Andrew Fergusson
07 August 2020

Appendix A: Information Memorandum

Ohinewai opportunity brochure - DRAFT Ver 1.2, 18 March 2020

Location

Ralph Estate owns significant mineral interests in the Waikato Coal Region including in the Waikare Coalfield. Waikare Coalfield covers an area of 27km^2 lying between the Waikato River and along the western and southern margins of Lake Waikare in central north Waikato. The southern part of the coalfield immediately east of Ohinewai contains the most significant unmined shallow coal resource in the Waikato (**Ohinewai prospect**).



Ohinewai location (embed image in text)

Ohinewai prospect is situated approximately 9 kms north of Huntly township, 35 kilometres north of Hamilton and 80 kms south of Auckland. The main access to Ohinewai is off the main Waikato Expressway (SH1) via Tahuna Road which passes through the central part of the prospect.

Physiography and Land use

The terrain is predominantly flat and low-lying land. The land is drained by a network of drains which discharge into the large and very shallow Lake Waikare. There are two small, shallow lakes near the prospect, Lakes Ohinewai and Rotokawau. To the south, greywacke hills forming the northeastern end of the Taupiri Range reach up to 220m above sea level. The Waikato River is immediately west of the project area.

Land use at Ohinewai is dominated by farming, with dairying the main type. The terrain in the northeast includes some wetland around Lake Ohinewai and near surface peat on the southwest margins of Lake Waikare.

Mineral ownership

Most of the coal is privately owned. Land ownership is private ownership but the mineral rights provide for access.

Opportunity

Ohinewai prospect contains the North Island's largest unmined coal resource. Recent mine plans and schedules are based on mining almost entirely within the private coal. It has both opencast and underground mining potential. Producing at between 0.5-1 Million tonnes per annum, the resource

would support opencast mining for 20 years or more. The opencast resource has an attractive stripping ratio of around 12:1 bank cubic metres per tonne of coal. The coal quality is typical of Waikato sub bituminous coals and suited to nearby NZ Steel and thermal markets.

Waikare Coalfield, and Ohinewai in particular, has a long history of exploration and investigation since its discovery in the 1890's. A large geological database exists and many mining and economic feasibility studies can be made available for due diligence assessment by interested parties.

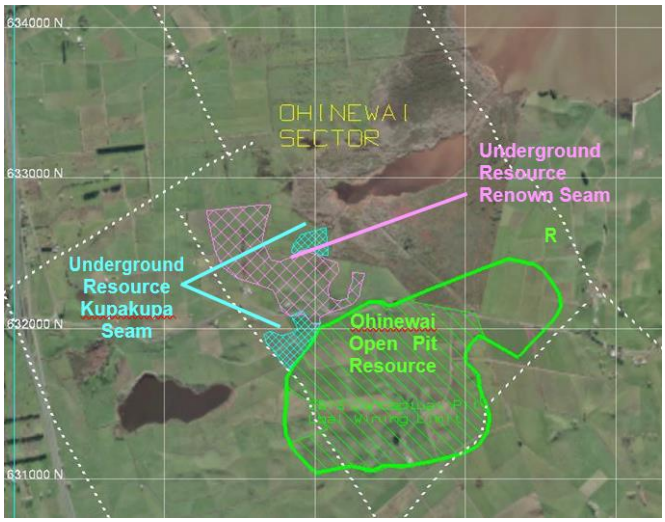
Previous studies

Coal was first identified in a shallow drillhole in 1891 and the discovery was confirmed in the 1940-50's. In 1975 the NZ government began exploring Waikare Coalfield in 1975, with hole 8037 intersecting near continuous 25.5m of coal beneath 65.5m of cover in the southern part of the field. Subsequent drilling has identified an extensive area of potentially open cast coal in the south of the coalfield, near Ohinewai. Over 200 holes were drilled in the Ohinewai prospect by 1985.

In the 1980's at least 45 major studies, including coal resource assessment, geotechnical and hydrogeological studies, mine feasibility studies on both open pit and underground operations and environmental effects assessments, have been completed.

Since 2013, pit optimisation and a conceptual mining study by Solid Energy in 2013 confirmed the presence of a significant coal resource. An in situ JORC resource of approximately 20 Mtonnes was estimated and 17Mtones when geological losses are applied to account for coal losses due to faulting and other structural uncertainties.

The coal is generally low ash 3 – 5% (air dried) and total sulphur contents consistently below 0.3% (air dried). Ohinewai coal quality compares well with coal mined from Maramarua and Rotowaro Coalfields.



Ohinewai coal resource (embed image in text)

Environmental effects

There are a range of environmental issues that would need to be successfully consented in order to develop and operate an opencast mine at Ohinewai. The pit size would need to be carefully selected to minimise the scope of these effects. The foremost effect would be the land use change in the footprint of the overall operation, including the ex-pit overburden disposal area.

There is environmental improvement potential using the end of mine lake that may help mitigate

some of the water quality issues at Lake Waikare. The final rehabilitation would be similar to Lake Puketirini in Huntly. This was once Weavers Opencast and is now a highly regarded community amenity.

Lake Puketirini in the middle ground was the Weavers Opencast mined on the eastern margin of Lake Waahi in the 1980-90s (Embed image in text)

Markets

Key markets are from 12 km (Huntly Power Station) to 70 km (Glenbrook steel mill) by road or rail. More than 80% of NZ's domestic industrial coal consumption goes into steel making, dairy, wool and leather, cement and lime-making, hothouse horticulture, and wood processing. If we didn't have extensive domestic supplies, coal would be imported, and, at times it is, mostly from Indonesia. The environmental impacts and carbon emissions associated with imported coal are no doubt far greater than coal mined and supplied from an indigenous source.

There are two major NI coal users:

- Genesis' Huntly Power Station uses coal to offset generation shortfalls when national supply is compromised dry years in the South Island lakes and/or impaired gas production from Taranaki. Genesis plan to burn coal till 2030.
- New Zealand Steel's Glenbrook steel mill uses a unique direct reduction method to make iron from black sands mined at Waikato North Head. This is turned into steel using carbon derived from sub-bituminous coal. Glenbrook uses approximately 750,000 tonnes, producing up to 650,000 tonnes of steel per year. Coal is supplied from Waikato coal mines but a significant proportion of imported coal from Indonesia. Capturing 100% of this supply is a major long-term market opportunity.

Interest

For further information about this opportunity, please contact *<Name and Email address etc>*