

Regulatory Impact Statement

Royalties on minerals

Agency Disclosure Statement

- 1 This Regulatory Impact Statement has been prepared by the Ministry of Business, Innovation and Employment.
- 2 It provides an analysis of options on royalty rates to apply to all new high-value (coal, metallic, offshore) minerals.
- 3 The analysis is based on financial models of various “representative” mining developments. Key uncertainties hinge on the input assumptions used for each mining scenario (commodity price, exchange rate, grade of ore, capital and operating costs). The financial models were developed by KPMG in consultation with selected industry participants. The input assumptions were subsequently refined by the Ministry using information held by NZP&M and following further consultation between Ministry officials and selected industry participants. A further round of consultation occurred following receipt of submissions. The Ministry also conducted a Monte Carlo simulation of each mine development scenario. This produces a large number of plausible combinations of input variables, and has allowed the Ministry to investigate the effect of different royalty structures and rates post-tax economics.
- 4 The proposed changes would only apply to new permits. For existing permits, licences and privileges, the current royalty rates would continue to apply. The grandfathering proposals would extend to all mining permits awarded as subsequent permits to existing exploration and prospecting permits. There is therefore no additional cost or impairment of private property rights from the proposed changes for existing explorers and miners.
- 5 For new permits, the proposed changes represent an approximate doubling of the royalty rates that apply to high-value mineral producers. The Ministry has concluded that the proposed royalty rates would be internationally competitive and have a negligible impact on future mine developments.

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Status Quo and Problem Definition

- 6 A royalty is a payment by a miner to the owner of the mineral resource as compensation to the owner for granting the miner the right to remove the minerals and to develop the resource for the miner's own benefit. The Crown receives royalties from the development of Crown-owned minerals.
- 7 A central purpose of the proposed amendments to the Crown Minerals Act 1991 is to ensure that the Crown receives a fair financial return for the development of its minerals for the benefit of New Zealand. The term "fair" is interpreted by the Minister as referring to the need to balance the interests of the Crown (as the owner of Crown-owned minerals for the benefit of New Zealand) and those of mineral prospectors, explorers and miners, taking into account:
 - a. That minerals are a non-renewable resource
 - b. The need to attract ongoing investment in mineral prospecting, exploration and mining in a competitive international environment
 - c. That mineral prospecting, exploration and mining is a high-risk, high-cost and high-reward activity
 - d. The need to provide certainty and security for investors by not changing royalty rates during the life of a permit or subsequent permit.
- 8 A discussion paper released in March 2012 titled *Review of the Crown Minerals Act 1991 Regime*¹ proposed a formal review of the royalty rates that apply to Tier 1² minerals against criteria for fairness and international competitiveness.
- 9 The proposal for a formal review arose from a sense that the royalties received from minerals development were too low. The nominal Crown take (royalties plus taxes) from mineral development in New Zealand is approximately 33 percent of accounting profits. This compares to a nominal Crown take in overseas jurisdictions which typically ranges from 37 percent to 59 percent of accounting profits, depending on the commodity and the jurisdiction.
- 10 The effective Crown take in New Zealand for "specified minerals" (which include gold, silver, and ironsand) has historically been well below 33 percent of accounting profits. This is due to the concessionary tax rules that apply to specified mineral mining. Inland Revenue and the Treasury are conducting a separate review of the tax rules that apply to specified mineral mining.³
- 11 This formal review of mineral royalties was completed in October 2012 with the public release of a discussion document titled *Review of the royalty regime for minerals*⁴.
- 12 The review of the royalty rates for high-value minerals (metallic minerals, coal, ironsand and all offshore minerals) focused on two questions:
 - a. Is the Crown receiving a fair financial return from the development of its mineral estate?

¹ <http://www.med.govt.nz/sectors-industries/natural-resources/pdf-docs-library/oil-and-gas/crown-minerals-act-review/Review%20of%20the%20Crown%20Minerals%20Act%201991%20regime%20-%20Discussion%20paper.pdf>.

² Tier 1 minerals broadly relate to metallic minerals, coal, ironsand and all offshore minerals.

³ <http://taxpolicy.ird.govt.nz/sites/default/files/2012-ip-mineral-mining.pdf>.

⁴ <http://www.med.govt.nz/sectors-industries/natural-resources/pdf-docs-library/oil-and-gas/crown-minerals-act-review/consultation-on-the-royalty-regime-for-minerals/discussion-paper.pdf>.

- b. Is the royalty regime internationally competitive, particularly when compared to Australia?
- 13 For the purposes of the review, and consistent with the interpretation provided in the Draft Minerals Programme⁵, the Ministry considers that a fair financial return to the Crown means the highest level of Crown revenue across a range of scenarios and sensitivities (such as commodity prices and exchange rates), within the following constraints:
- a. The Crown receives a guaranteed minimum payment at the outset of production
 - b. Total Crown share (royalty plus taxes) is internationally competitive measured against Australia, Canada and other comparable jurisdictions.

Objectives

- 14 In responding to the review questions, the review used four key objectives. These are the same as those used in the royalty review for petroleum⁶. Namely, New Zealand's royalty and fiscal regime for minerals should:
- a. **Provide a fair return to the Crown as owner of the resource:** This objective has been weighted far more heavily than the other three objectives for the purposes of the review as it is a key part of the purpose statement to the Act under proposed amendments.
 - b. **Be neutral and non-distortionary:** The system should not have the effect that developments that are economic before a royalty is applied become uneconomic after the application of a royalty.
 - c. **Provide appropriate risk-sharing between private investment and the Crown:** The objective relates to the need to balance the interests of the Crown and those of miners. In assessing royalty options against this objective, the Ministry has measured the relative upside to the miner in each P90⁷ (more conservative) scenario (in terms of lower royalty payments to the Crown relative to current royalty levels) and then the upside to the Crown in each P10⁸ (more optimistic) scenario. In order to provide an objective and consistent methodology across each commodity modelled, now weighting was applied to the relative importance of upside to the miner in marginal developments versus upside to the Crown in highly profitable price environments.

Whether risks are shared appropriately between private investment and the Crown affects mining companies' perceptions of New Zealand's international competitiveness⁹. The Ministry weighted this as the second most important objective, after the fair financial return objective.
 - d. **Be simple to administer for both the Crown and industry:** Unit-base royalties¹⁰ are administratively simpler than revenue-based royalties, which are in turn simpler than profits-based and hybrid-based royalties.

⁵ <http://www.med.govt.nz/sectors-industries/natural-resources/pdf-docs-library/oil-and-gas/crown-minerals-act-review/Draft-Minerals-Programme-Minerals-excluding-petroleum.pdf>.

⁶ <http://www.med.govt.nz/sectors-industries/natural-resources/pdf-docs-library/oil-and-gas/crown-minerals-act-review/review-of-the-royalty-regime-for-petroleum.pdf>.

⁷ A p90 estimate represents the 10th percentile of 500 observations from the model.

⁸ A P10 estimate represents the 90th percentile of 500 observations.

⁹ International comparisons varied on the mineral being reviewed and were chosen based on jurisdictions comparable to New Zealand and the importance of the commodity to national GDP in particular countries.

¹⁰ Unit-based royalties apply a specified price to be paid on the tonnage produced.

The Ministry did not weight this objective heavily for the reason that very few permit holders have chosen to move from the 1996 Minerals Programme for Minerals (MPM) (which was a hybrid royalty of the higher of a one percent ad valorem royalty and a five percent accounting profits royalty) to the more administratively simple royalty regime in the 2008 MPM (which was a unit-based royalty for coal and a tiered ad valorem royalty for gold and silver).

15 The table following paragraph 28 sets out the ranking of each royalty option against each of these objectives and the weightings used.

Regulatory Impact Analysis

Royalty options reviewed

16 There are three broad types of royalty regimes that apply to minerals. These are:

- a. **Unit-based royalty:** a unit-based royalty is a specified price applied to each unit produced. Units are typically measured in tonnes or cubic metres, depending on the commodity.
- b. **Ad valorem royalty (AVR):** a value-based – or “ad valorem” - royalty is levied on the value of the mineral sold
- c. **Profit-based royalty:** profit-based royalties take into account both output prices and input costs. There are two main types:
 - i. **Accounting profits royalty (APR):** an accounting profit royalty assesses profit for royalty purposes primarily in financial terms, using defined accounting conventions relating to the treatment of profits, operating and capital expenditures.
 - ii. **Resource rent royalty:** under a resource rent approach, a project is effectively granted a royalty holiday in anticipation of relatively high governmental returns later in mine life. The payment of the resource rent is deferred until all expenditures have been recovered and the project has yielded a predefined target return expressed as an uplift rate or rate of return. A high marginal royalty is then applied to all subsequent operating revenue.

17 The Ministry does not favour unit-based royalties because they are economically inefficient. Unit-based royalties do not take account either the market value of the mineral resource or the costs of extraction and production.

18 The Ministry does not favour resource rent royalties on the basis that it fails to provide a guaranteed return to the Crown at the outset of production (and therefore it fails to meet the fair financial return objective). It is also administrative complexity, both for miners and the Crown.

19 This led the Ministry to focus on AVR, APR or a hybrid of AVR/APR royalty options. The Ministry selected the following five royalty options to be assessed under this review:

- a. **AVR 1:** a one percent ad valorem royalty
- b. **AVR 2:** a two percent ad valorem royalty
- c. **APR:** a 10 percent accounting profit royalty. A five percent accounting profit royalty results in outcomes that are very similar to a one percent AVR. The Ministry was keen to test outcomes with a higher APR
- d. **Hybrid 1:** a hybrid of a one percent AVR and a 10 percent APR
- e. **Hybrid 2:** a hybrid of a two percent AVR and a 10 percent APR.

- 20 Higher royalty rates were not evaluated as it was judged that this would undermine New Zealand's international competitiveness, particularly when combined with potential changes to the tax rules that applied to specified mineral miners.
- 21 In the case of coal and gold, the Ministry added a materiality threshold. For coal, the 10 percent APR would only be payable by those coal mines with annual accounting profits of more than \$5 million, while for gold the 10 percent APR would apply to those mines with annual accounting profits of more than \$2 million. The purpose here is to tailor the royalty regime to a scenario where the range of future mines to which this royalty might apply is similar to the current range of producing and royalty paying coal and gold mines. Both the coal and gold sectors are characterised by a few highly profitable and productive mines and then a long tail of much smaller, less profitable mines. The materiality threshold is designed to distinguish between these two types of operations.
- 22 In the case of PGE, ironsands, phosphates, and seafloor massive sulphides (SMS), any future mine developments would have to be very large operations. Accordingly, no materiality threshold has been added.

Models used by the Ministry to benchmark royalty options

- 23 The Ministry assessed the commercial viability of mining various mineral deposits using a set of discounted cash flow models that include all the relevant income and costs a mining company would expect in the course of exploring, developing and producing from a mineral deposit.
- 24 Models were built to test revenue shares for the Crown, the operator and the landowner across a range of royalty regimes. "Commercial viability" for a mining operation has been defined as where the operation has a positive net present value (NPV), using a discount rate of 10 percent.
- 25 Separate models were developed for each mineral type, because the approaches to mining each mineral and the relevant market characteristics are so different. The exceptions were gold and silver: these were modelled together because silver is a by-product of gold production.
- 26 The financial models are driven by a set of general assumptions (for example, exchange rates and discount rates) and a set of mineral- and mine-specific assumptions (for example, commodity prices, capital and operating expenses, tax rules, and freight and decommissioning costs).

Modelling results

- 27 The results of the modelling carried out by the Ministry included some consistent themes:
- a. The **hybrid options performed best under the fair financial return objective** as they provide both a guaranteed minimum return at the outset of production and upside to the Crown in cases where the mine is highly profitable. In contrast, the pure APR option performed poorly against this objective, mainly because it fails to deliver a guaranteed minimum return to the Crown at the outset of production. Given the high capital requirements of mine development, the modelling indicated it could take several years before a pure APR royalty regime would result in a royalty payment to the Crown in some mine development scenarios.

- b. The **pure APR royalty performs best against the “neutral/non-distortionary” and “appropriate risk-sharing” objectives**. However, the modelling highlighted the overwhelming importance of commodity prices, development costs and exchange rates to the overall economics of the mine. The number of additional mines under the pure APR option relative to the other royalty options was negligible across all the commodities modelled. For this reason, the “neutral/non-distortionary” objective was given a relatively low weighting.
- c. The **pure AVR royalty options are simple to administer**, but they take no account of the profitability of different mining operations. While pure AVR royalties provide a guaranteed minimum return to the Crown, they provide little upside to the Crown in the case of highly profitable developments. The AVR options therefore performed relatively poorly against both the “fair financial return” and “appropriate risk-sharing” objectives.

28 The results of the modelling are summarised in the table below. The results have been ordered from one to five, with one being the best and five the worst.

Ranking of royalty options against objectives					
	Coal	Gold/silver	PGE	Ironsand	Phosphate
Fair financial return (55%)					
AVR 1%	5	3	3	3	3
AVR 2%	4	3	3	3	3
APR 10%	3	5	5	5	5
Hybrid 1% AVR / 10% APR	2	2	2	2	2
Hybrid 2% AVR / 10% APR	1	1	1	1	1
Neutrality/non-distortionary (10%)					
AVR 1%	2	1	2	1	2
AVR 2%	4	4	4	4	4
APR 10%	1	2	1	2	1
Hybrid 1% AVR / 10% APR	2	3	3	3	2
Hybrid 2% AVR / 10% APR	4	5	4	5	4
Appropriate risk sharing (25%)					
AVR 1%	4	5	5	5	5
AVR 2%	5	4	4	4	4
APR 10%	1	1	1	1	1
Hybrid 1% AVR / 10% APR	2	2	2	2	2
Hybrid 2% AVR / 10% APR	3	3	3	3	3
Administrative simplicity (10%)					
AVR 1%	1	1	1	1	1
AVR 2%	1	1	1	1	1
APR 10%	3	3	3	3	3
Hybrid 1% AVR / 10% APR	4	4	4	4	4
Hybrid 2% AVR / 10% APR	4	4	4	4	4
Weighted total					
AVR 1%	5	3	4	3	4
AVR 2%	4	4	3	4	3
APR 10%	3	5	5	5	5
Hybrid 1% AVR / 10% APR	2	2	2	2	2
Hybrid 2% AVR / 10% APR	1	1	1	1	1

29 The impact of each royalty option, relative to the status quo, on the project economics for miners is summarised in Tables 6, 11, 16, 21, 26 and 30 of the discussion document and is reproduced in Annex 2.

Consultation

30 A discussion document titled *Review of the royalty regime for minerals* was released for public consultation in October 2012.

31 Nine submissions were received from industry representatives, lobby groups and iwi. There was a mixture of support and disagreement over the proposed royalty rates.

32 Straterra, the West Coast Commercial Gold Miner's Association (WCCGMA) and the Chatham Islands Enterprise Trust supported the proposed rates, with some caveats expressed around the modelling assumptions used.

33 Solid Energy, OceanaGold and New Zealand Coal & Carbon disagreed with the proposed rates and argued that:

- a. the broader economic benefits of mining should have been a factor in determining what was a fair financial return
- b. the proposed rates would reduce New Zealand's international competitiveness
- c. the modelling assumptions used were not representative of their operations
- d. the distortionary impact of the AVR would result of high-grading of the resource and a less than optimal extraction of the resource.

34 Follow up consultation was undertaken with selected industry participants (Straterra, Solid Energy, New Zealand Coal & Carbon, OceanGold, WCCGMA) to work through the modelling assumptions. The discussions clarified the reasons behind choosing particular mine development scenarios, the source of input assumptions and, in a few instances, correcting the royalty and/or tax rates used in the international comparisons where this was shown to be incorrect. These discussions did not require the Ministry to rerun the models using different input assumptions.

35 No submissions were received from Newmont Waihi Gold, Trans-Tasman Resources, Chatham Rock Phosphate Ltd and Bathurst Resources. Each of these companies was consulted extensively during the course of the review to test the input assumptions used in the financial modelling. Each of these companies expressed their comfort with the proposed royalty rates to officials.

36 Other issues raised in submissions included:

- a. regional distribution and/or distribution of royalties to iwi
- b. the ongoing application of the Energy Resources Levy to opencast coal mining and South Island lignite development
- c. the extension of the proposed grandfathering provisions to include the amalgamation of permits.

37 Each of these issues is outside the scope of the review and is not addressed here.

Conclusions and Recommendations

- 38 The Ministry considers the “fair financial return” objective to be far more important than the other objectives. This has led to the Ministry favouring a hybrid of a low ad-valorem royalty, which ensures that the Crown (for the benefit of New Zealand) always receives some return from the mining of its minerals, and an accounting profits royalty, so that the Crown shares in the benefits if a mining development proves to be particularly profitable. The Hybrid 2 royalty option performed better than the Hybrid 1 royalty option against the “fair financial return” objective and is what is the Ministry recommends.
- 39 The modelling work undertaken also showed that:
- a. the proposed royalty rates would be internationally competitive
 - b. geological prospectivity, commodity prices, exchange rates and development costs are far more material to the project economics of mining than royalty rates at the proposed levels
 - c. the proposed royalty rates will have a negligible impact on future mine developments.
- 40 On this basis, the Ministry recommends the following new royalty rates:
- a. For **new coal, offshore and metallic minerals**, a hybrid royalty of the higher of a two percent AVR or a 10 percent APR. Coal and gold would be subject to the following materiality thresholds before the 10 percent APR would apply:
 - i. For coal – annual accounting profits of \$5 million
 - ii. For gold – annual accounting profits of \$2 million.
 - b. For **underground coal gasification**, a hybrid of the higher of a one percent AVR or a 10 percent APR. This is a holding rate which would be reviewed once the project economics of underground coal gasification become clearer.
 - c. The existing threshold of \$200,000 of annual net sales revenues, after which permit holders are liable to pay a royalty would remain.
- 41 A comparison of the proposed rates to the current rates is provided in Annex 1.
- 42 The proposed new royalty rates would apply to new permits only. For existing permits, licences and privileges, the current royalty rates would continue to apply.
- 43 The proposed hybrid royalty would mirror the hybrid royalty regime used in the 1996 Minerals Programme for Minerals and the 1996 Minerals Programme for Coal.
- 44 No change is proposed to the royalty regime and rates that apply to low-value minerals. The specified royalty rates in the 2008 Minerals Programme for Minerals, adjusted by changes in the Producer Price Index, will continue. For those low-value minerals to which no specified royalty rate has been stipulated, a catch all royalty one percent AVR is proposed. This is a continuation of current practice.

Financial implications of the proposed royalties

- 45 The proposed new royalty rates represent an approximate doubling of the royalty rates that currently apply.

- 46 The implications for future royalty take are estimates based on “representative” future mine developments. Using the base case scenarios and a discount rate of 10 percent, the net present value to the Crown is calculated at \$399 million, an increase of \$194 million from existing levels.
- 47 Aggregating the more conservative P90 and more optimistic P10 outputs across each of the base case scenarios modelled, results in an additional net present value to the Crown relative to the status quo of \$105 million and \$419 million respectively.

Implementation

- 48 Subject to Cabinet agreement, the new royalty regime will be drafted into regulations. These regulations will then be subject to a short period of public consultation.
- 49 The new regulations would come into force at the same time as the passage of Crown Minerals (Permitting and Crown Land) Bill into law and the 2013 Minerals Programme for Petroleum and the 2013 Minerals Programme for Minerals. The package of changes is slated to come into force in April 2013.

Monitoring, Evaluation and Review

- 50 The grandfathering proposals mean that it could be some time before the proposed changes to the new rates have any noticeable impact on Crown royalty returns. The Ministry proposes to conduct a review after five years (i.e. in 2018). The review would seek to evaluate the impact of the changes to royalty rates:
 - a. On royalty receipts
 - b. On mineral exploration and mining activity.
- 51 The assessment of mineral exploration and mining activity is likely to be largely qualitative as exogenous factors such as commodity prices and mineral exploration and development costs have a far larger impact on mining activity than royalty rates.
- 52 Should New Zealand’s prospectivity change due to a series of large discoveries, the review could assess the potential to lift royalty rates further.

Annex 1: Current royalty rates and proposed changes

Mineral	Current regime			Proposed royalty regime		
	Royalty type	Rates	Thresholds	Royalty type	Rates	Thresholds
Coal	Unit-based (per tonne)	\$1.40 hard and semi-hard coking \$0.80 thermal and semi-soft coking \$0.30 lignite	-	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	APR applies to >\$5m accounting profit
Gold and silver	Tiered AVR	1% or 2% AVR	2% AVR applies to annual net sales revenue >\$1.5m	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	APR applies to >\$2m accounting profit
Platinum group elements	Tiered AVR	1% or 2% AVR	2% AVR applies to annual net sales revenue >\$1.5m	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	-
Ironsands	Ministerial discretion		-	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	-
Phosphate	Ministerial discretion		-	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	-
Seafloor massive sulphides	Ministerial discretion		-	Hybrid AVR/APR	Higher of <ul style="list-style-type: none"> • 2% AVR • 10% APR 	-

Annex 2

Table 1: Net present value to operator (NZ\$ million) for future mine developments (Coal)

	One million tonne pa HCC opencast			100,000 tonne pa sub- bituminous opencast		
	P90	P50	P10	P90	P50	P10
Status quo	-47.8	262.3	590.7	-28.6	3.1	35.3
1% AVR	-47.8	260.4	585.3	-28.7	2.8	34.8
2% AVR	-54.2	250.9	573.0	-29.5	2.0	33.7
10% APR	-44.9	239.8	536.7	-27.8	3.0	32.2
Hybrid 1%AVR/10% APR	-49.2	237.8	535.6	-28.7	2.8	32.2
Hybrid 2%AVR/10% APR	-53.6	235.9	534.4	-29.5	2.0	32.0
1% AVR versus status quo	-0.1	-1.8	-5.4	-0.1	-0.3	-0.5
2% AVR versus status quo	-6.4	-11.4	-17.7	-1.0	-1.1	-1.6
10% APR versus status quo	2.9	-22.4	-54.0	0.7	-0.1	-3.1
Hybrid 1%AVR/10%APR versus status quo	-1.4	-24.5	-55.1	-0.1	-0.3	-3.1
Hybrid 2%AVR/10%APR versus status quo	-5.8	-26.4	-56.2	-1.0	-1.1	-3.3
	300,000 tonne pa HCC underground			100,000 tonne pa lignite opencast		
	P90	P50	P10	P90	P50	P10
Status quo	-167.1	32.0	177.3	-9.7	1.6	12.3
1% AVR	-167.5	31.1	175.1	-9.7	1.5	12.1
2% AVR	-172.8	27.1	169.9	-10.1	1.1	11.6
10% APR	-161.9	29.0	160.9	-9.3	1.4	11.1
Hybrid 1%AVR/10% APR	-167.5	27.4	160.1	-9.7	1.5	12.1
Hybrid 2%AVR/10% APR	-172.8	26.0	159.1	-10.1	1.1	11.6
1% AVR versus status quo	-0.4	-0.9	-2.1	-0.1	-0.1	-0.3
2% AVR versus status quo	-5.7	-4.9	-7.4	-0.5	-0.5	-0.7
10% APR versus status quo	5.1	-3.0	-16.3	0.3	-0.3	-1.2
Hybrid 1%AVR/10%APR versus status quo	-0.4	-4.6	-17.1	-0.1	-0.1	-0.3
Hybrid 2%AVR/10%APR versus status quo	-5.7	-6.0	-18.2	-0.5	-0.5	-0.7

Table 2: Net present value to operator (NZ\$ million) for future mine developments (Gold)

	Opencast gold mine			Underground gold mine			Alluvial gold mine		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
Status quo	-452.3	175.0	1,041.3	-119.5	312.9	861.6	-5.4	4.7	11.7
1% AVR	-452.3	190.4	1,069.2	-106.6	329.7	884.5	-5.4	4.4	12.0
2% AVR	-461.1	174.3	1,040.1	-120.1	312.1	860.4	-5.7	4.4	11.6
10% APR	-441.8	171.9	976.7	-113.0	287.6	794.6	-5.0	4.7	11.1
Hybrid 1%AVR/10% APR	-452.3	167.4	972.9	-120.5	282.6	789.8	-5.4	4.4	12.0
Hybrid 2%AVR/10% APR	-461.1	162.5	969.0	-128.0	277.6	785.0	-5.7	5.0	11.6
1% AVR versus status quo	0.0	15.3	27.9	12.9	16.8	23.0	0.0	-0.3	0.3
2% AVR versus status quo	-8.8	-0.7	-1.1	-0.6	-0.8	-1.2	-0.4	-0.2	-0.0
10% APR versus status quo	10.5	-3.1	-64.6	6.6	-25.3	-67.0	0.4	0.0	-0.6
Hybrid 1%AVR/10%APR versus status quo	0.0	-7.6	-68.4	-1.0	-30.3	-71.8	0.0	-0.3	0.3
Hybrid 2%AVR/10%APR versus status quo	-8.8	-12.6	-72.2	-8.5	-35.3	-76.6	-0.4	0.3	-0.0

Table 3: Net present value to operator (NZ\$ million) for future mine developments (PGE)

	One million tonne pa mine			700,000 tonne pa mine			Two million tonne pa mine		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
Status quo	83.9	266.4	523.2	-214.2	-35.3	113.5	702.6	1,149.5	1,629.7
1% AVR	89.8	275.1	534.5	-214.2	-35.0	118.5	718.9	1,172.2	1,658.1
2% AVR	82.8	266.4	523.0	-218.0	-41.3	112.2	702.6	1,149.5	1,629.7
10% APR	86.2	255.4	491.3	-209.6	-28.5	111.9	661.5	1,075.8	1,518.2
Hybrid 1%AVR/10% APR	85.6	255.1	491.0	-214.2	-35.0	111.5	661.5	1,075.8	1,518.2
Hybrid 2%AVR/10% APR	82.8	254.9	490.7	-218.0	-41.3	109.9	661.5	1,075.8	1,518.2
1% AVR versus status quo	5.9	8.8	11.3	0.0	0.3	5.0	16.3	22.7	28.4
2% AVR versus status quo	-1.1	0.0	-0.3	-3.8	-6.0	-1.2	0.0	0.0	0.0
10% APR versus status quo	2.3	-11.0	-32.0	4.6	6.8	-1.6	-41.2	-73.7	-111.4
Hybrid 1%AVR/10%APR versus status quo	1.6	-11.2	-32.2	0.0	0.3	-2.0	-41.2	-73.7	-111.4
Hybrid 2%AVR/10%APR versus status quo	-1.1	-11.5	-32.5	-3.8	-6.0	-3.5	-41.2	-73.7	-111.4

Table 4: Net present value to operator (NZ\$ million) for future mine developments (Ironsands)

	10 million tonne pa (low price)			10 million tonne pa (industry price)		
	P90	P50	P10	P90	P50	P10
Status quo (1% AVR / 5% APR)	-398.7	77.6	546.5	29.9	508.2	1,120.3
1% AVR	-398.7	84.4	569.5	32.8	531.1	1,168.1
2% AVR	-421.0	59.6	540.1	7.7	500.7	1,131.6
10% APR	-379.0	63.6	508.4	20.5	471.8	1,051.0
Hybrid 1%AVR/10% APR	-396.7	54.3	502.3	11.1	466.7	1,045.5
Hybrid 2%AVR/10% APR	-414.4	45.3	497.8	1.7	461.5	1,039.9
1% AVR versus status quo	0.0	6.8	23.0	3.0	22.9	47.8
2% AVR versus status quo	-22.3	-18.0	-6.4	-22.1	-7.5	11.3
10% APR versus status quo	19.7	-14.0	-38.1	-9.4	-36.4	-69.3
Hybrid 1%AVR/10%APR versus status quo	2.0	-23.3	-44.2	-18.8	-41.6	-74.9
Hybrid 2%AVR/10%APR versus status quo	-15.7	-32.3	-48.7	-28.2	-46.7	-80.5

	25 million tonne pa (low-price)			25 million tonne pa (industry-price)		
	P90	P50	P10	P90	P50	P10
Status quo (1% AVR / 5% APR)	996.0	2,790.9	4,979.9	3,216.6	5,023.4	7,317.1
1% AVR	1,068.2	2,942.6	5,220.9	3,373.7	5,265.2	7,639.4
2% AVR	970.5	2,821.9	5,079.6	3,268.1	5,114.5	7,450.7
10% APR	890.4	2,573.3	4,645.2	2,982.9	4,693.3	6,855.9
Hybrid 1%AVR/10% APR	849.8	2,542.0	4,621.4	2,957.1	4,674.1	6,835.3
Hybrid 2%AVR/10% APR	809.2	2,513.9	4,597.6	2,934.1	4,646.3	6,813.9
1% AVR versus status quo	72.2	151.6	241.0	157.1	241.8	322.3
2% AVR versus status quo	-25.4	31.0	99.7	51.5	91.1	133.6
10% APR versus status quo	-105.5	-217.7	-334.7	-233.7	-330.1	-461.2
Hybrid 1%AVR/10%APR versus status quo	-146.1	-249.0	-358.5	-259.5	-349.3	-481.8
Hybrid 2%AVR/10%APR versus status quo	-186.7	-277.1	-382.3	-282.5	-377.1	-503.2

Table 5: Net present value to operator (NZ\$ million) for future mine developments (Phosphates)

	Base scenario			Conservative scenario			Optimistic scenario		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
Status quo - 1% AVR / 5% APR	-16.3	419.2	954.2	-942.0	-179.3	471.3	831.9	1,704.1	2,550.5
1% AVR	-16.3	421.2	978.5	-942.0	-179.3	472.6	831.9	1,731.5	2,618.3
2% AVR	-37.4	400.7	954.0	-966.5	-203.2	446.2	778.1	1,669.0	2,551.3
10% APR	1.5	397.3	903.8	-922.1	-152.9	448.7	797.0	1,614.2	2,416.1
Hybrid 1%AVR / 10% APR	-16.3	397.3	903.8	-942.0	-179.3	448.7	797.0	1,614.2	2,416.1
Hybrid 2%AVR / 10% APR	-37.4	396.5	903.8	-966.5	-203.2	443.6	778.1	1,614.2	2,416.1
1% AVR versus status quo	0.0	2.1	24.3	0.0	0.0	1.3	0.0	27.4	67.8
2% AVR versus status quo	-21.1	-18.4	-0.2	-24.5	-23.9	-25.1	-53.8	-35.1	0.9
10% APR versus status quo	17.8	-21.8	-50.4	19.9	26.3	-22.6	-34.9	-89.9	-134.4
Hybrid 1%AVR / 10%APR versus status quo	0.0	-21.8	-50.4	0.0	0.0	-22.6	-34.9	-89.9	-134.4
Hybrid 2%AVR / 10%APR versus status quo	-21.1	-22.6	-50.4	-24.5	-23.9	-27.7	-53.8	-89.9	-134.4

Table 6: Net present value to operator (NZ\$ million) for future mine developments (SMS)

	Base (not concentrated)			Base (concentrated)		
	P90	P50	P10	P90	P50	P10
Status quo - 1% AVR / 5% APR	69.4	215.2	361.4	730.9	947.5	1,239.0
1% AVR	80.8	229.8	379.7	768.8	990.2	1,294.5
2% AVR	63.6	210.9	359.1	741.8	963.5	1,258.0
10% APR	57.2	196.3	336.5	682.4	889.1	1,163.2
Hybrid 1%AVR / 10% APR	48.9	188.6	329.4	675.4	883.4	1,156.9
Hybrid 2%AVR / 10% APR	39.2	180.7	322.2	670.4	876.2	1,150.9
1% AVR versus status quo	11.4	14.6	18.2	37.9	42.7	55.5
2% AVR versus status quo	-5.8	-4.4	-2.3	10.9	15.9	19.0
10% APR versus status quo	-12.2	-19.0	-25.0	-48.5	-58.4	-75.8
Hybrid 1%AVR / 10%APR versus status quo	-20.5	-26.6	-32.1	-55.5	-64.1	-82.2
Hybrid 2%AVR / 10%APR versus status quo	-30.2	-34.5	-39.2	-60.5	-71.3	-88.1
	High-grade (not concentrated)			High-grade (concentrated)		
	P90	P50	P10	P90	P50	P10
Status quo - 1% AVR / 5% APR	-74.4	35.4	148.2	374.6	536.5	720.3
1% AVR	-69.6	42.1	157.0	395.5	561.7	750.4
2% AVR	-82.3	28.5	141.2	376.7	542.7	728.6
10% APR	-76.4	29.0	136.0	347.4	503.6	676.4
Hybrid 1%AVR / 10% APR	-83.4	22.9	129.5	341.3	496.8	671.3
Hybrid 2%AVR / 10% APR	-91.3	15.6	123.6	335.0	489.9	663.1
1% AVR versus status quo	4.8	6.7	8.7	20.9	25.2	30.1
2% AVR versus status quo	-7.9	-6.9	-7.0	2.1	6.2	8.3
10% APR versus status quo	-2.0	-6.4	-12.2	-27.2	-32.9	-43.9
Hybrid 1%AVR / 10%APR versus status quo	-9.0	-12.5	-18.7	-33.3	-39.6	-49.0
Hybrid 2%AVR / 10%APR versus status quo	-16.9	-19.8	-24.7	-39.6	-46.6	-57.2