

APPENDIX 10



**CONONISH GOLD MINE
TYNDRUM - 2017**

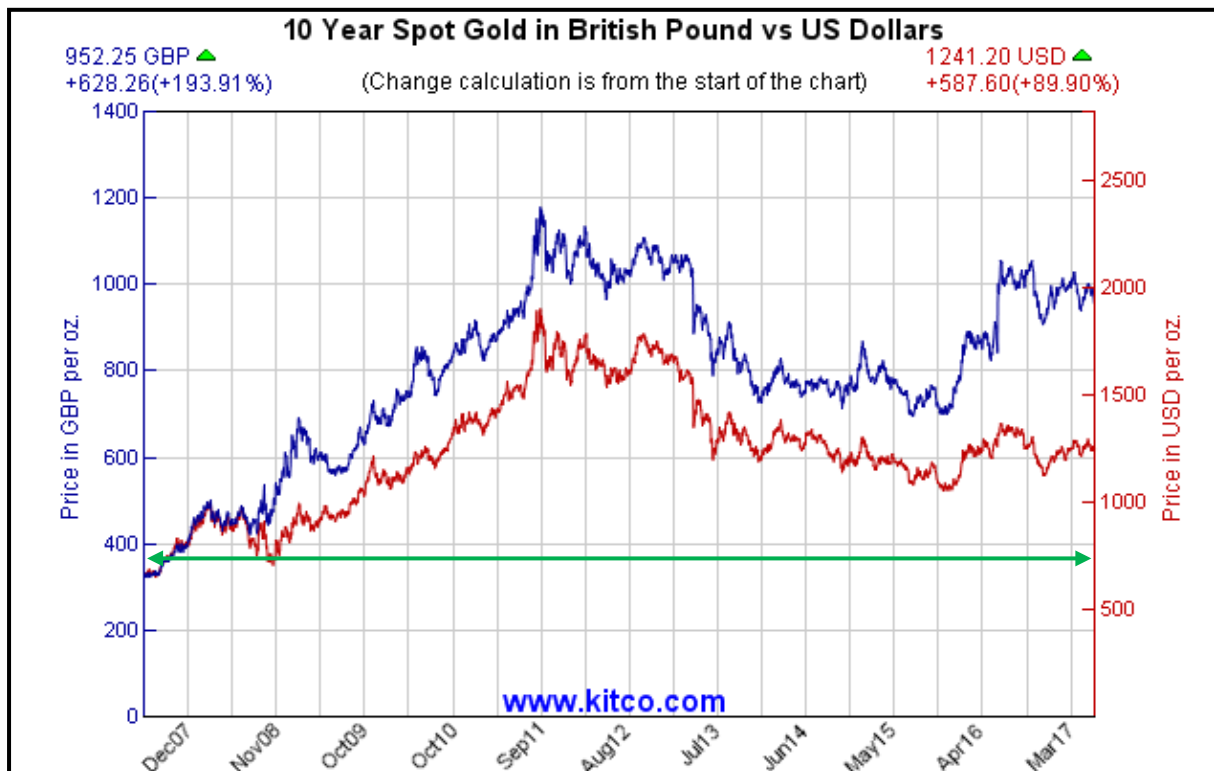
**SOCIOECONOMIC ASSESSMENT
(2011 - Updated)**

The following report was prepared by Professor David Bell of Stirling University in support of the application made in 2011, and approved subject to agreement on certain conditions; such agreement on the conditions was concluded with all relevant legal agreements in February 2012.

The report aimed to address, amongst other things, concerns regarding the ongoing potential economic viability of the operation as well as to assess the socio-economic benefits of the project in a demonstrative and quantitative manner. The comments below relate specifically to areas of the report relating directly to the economics of the project.

Whilst the report is slightly dated from a perspective of the current gold market (though the market fundamentals have not changed significantly), the underlying principles ascribed to determining and evaluating the economic benefits remain valid though some of the numbers may have changed. It is the Company’s opinion that these have not changed significantly (and probably generally increased due to the improved financial metrics as presented from the project) and that the financial benefits ascribed to the project in the report remain intact (or better).

Plate A10.1 10 year spot gold in British pounds vs US Dollar



Note: The green line represents the 2017 estimated cash operating cost (see Table xxx) at Cononish in GBP and relates to the GBP Au price shown in blue.

Plate A10.1 shows the GBP£ and US\$ gold price over the last 10 years; of note is the considerable divergence between the respective prices extenuated recently by the vote in favour of Brexit. Since the report, in respect of the gold price, a major 'structural' or 'other' adjustment occurred in H1 2013 which negatively impacted on the ability of Scotgold to raise finance for the project, albeit that the project financials remained and continue to remain robust in terms of an investment decision. (The lowest prices registered in the 2013 (and indeed since 2008) and succeeding price lows would not have made the project uneconomic as operating cash costs remained (and continue to remain) significantly below the lowest prices registered.

Table A10.1 below shows the financial metrics from successive studies on the project by its Consultants. It is noted that between the 2013 and 2015 studies, a revised resource was estimated for the project using more complex geostatistical techniques and a further improved understanding of the ore body model based on the drilling completed in 2012. This re-estimate considerably improved the grade (and hence economics) of the resource.

Table A10.1 Progressive Study Metrics

PROGRESSIVE STUDY METRICS			
DATE	2013	2015	2017
SOURCE	AMC	BARA	BARA
Physical Parameters			
Tons treated	450,006	555,003	553,344
Feedgrade Au	9.04	11.12	11.03
Au produced	121,800	177,666	175,567
Financial Parameters			
Au price \$	1300	1100	1150
Au price £	812.5	687.5	920
Ex rate \$:£	1.6	1.6	1.25
Financial Metrics			
NPV₁₀ £M	11.8	22.9	42.89
IRR	26%	45%	82%
Op cost £/oz	436	327	379
Op cost \$/oz	698	523.2	473.75

The project, whilst as stated, has impressive financial metrics by all comparative standards in terms of Internal Rate of Return and payback period, the quantum of finance required is 'niche'. Traditional sources of mining project finance generally operate at the minimum +£50M with a preference for over +£100M and generally for larger numbers syndicated to share risk. The fees associated with such a transaction are considerable and in relation to the borrowing requirements of the Cononish project, disproportionately high (as being a relatively fixed cost covering due diligence and extensive legal work common to all projects irrespective of size). It is noted that during the 2011 application, an offer of financing was available that was highly suited to the prevailing gold price. As a result of the decline in the price in 2013, whilst the offer remained, it was unlikely that the balance of finance not provided by the offer could be obtained and hence the project did not progress at that time.

Since 2013, Scotgold has continued to actively seek financing for the project. Post the adjustment in 2013 of the gold price from 2011/2 highs to the \$1100 - \$1300 range in 2013 and onwards, access to finance for junior companies with small projects has remained extremely difficult. Whilst opportunities have gradually appeared through 'royalty' and 'streaming' deals from 2014 onwards; these, in the case of Cononish, have proved prohibitively 'expensive' and / or value 'destructive' from a shareholder perspective. In addition, there has until recently been little appetite for possible equity financing of the remaining portion of the funds required to bring the project to fruition.

The recent technology and operations review alluded to in the ES, has enabled the Company to present what it believes to be meaningful environmental impact benefits in comparison to the previously permitted development and the subsequent changes to the financing profile will significantly increase the prospects of obtaining finance in order to achieve the benefits of the project.

The original Professor Bell report is set out below with appropriate comment added by Scotgold (SGZ) where it has considered necessary.

**SOCIO-ECONOMIC ASPECTS OF THE CONSTRUCTION OF A GOLD-MINE AT
CONONISH**

Professor David Bell MA, MSc, PhD, FRSE

June 2011

Executive summary

- The economics of gold have changed radically (SGZ: and remain so) since the previous Cononish mine was established.
- Under present conditions in the gold market, it is extremely unlikely that the mine would not be viable during its expected lifetime
- Since the gold market is highly liquid, there are a number of hedging strategies available to reduce the risk of fluctuations in the gold price
- On reasonable assumptions regarding the amount of supply chain activity that would be generated in Scotland, one would expect that around an additional £80 million worth of economic activity would be generated as a result of the establishment of the mine (SGZ – figures not updated to current project model though likely to exceed).
- It is extremely difficult to assess how much of this activity will be located within the Park. The national Park goods and labour markets are both highly porous.
- Within the limits set by employment law, ScotgGold can try to ensure that as many employees as possible live within the Park boundaries. However, as with most other Park residents, it is difficult to ensure that a high proportion of household spending amongst such employees will take place within the Park.
- Tourism is the major industry of the National Park. In comparison, the mining activity will provide better paid and more stable employment.
- Using evidence directly from climbers and making generous assumptions about the number of walkers that take the Dalrigh approach to Ben Lui, the valuation of the loss of amenity resulting from the positioning of the mine might be around £1 million over the lifetime of the mine. However, the benefits clearly exceed this amount.
- There are distributional aspects to the cost benefit analysis. Most of the negative effects will impact on the relatively affluent. The employment benefits will mainly accrue to lower income households.
- The non-use amenity value is difficult to assess. For some who do not use the Park, there may be a negative impact on their welfare from the existence of the mine. For others, there may be positive welfare effects from the knowledge that there is a goldmine in Scotland.

INTRODUCTION

This report assesses some of the social and economic aspects of the issues raised in previous discussions of the establishment of a gold mine at Cononish. Specifically it addresses the following issues:

1. The economic viability of the mine
2. The multiplier effects on the local, regional and national economies
3. The impact of the mine on the local labour market
4. The costs of the negative impacts of the mine on users and non-users of the National Park

This report addresses these issues in turn.

1. ECONOMIC VIABILITY OF THE CONONISH MINE

A previous attempt to establish a goldmine at Cononish encountered difficulties when the price of gold fell. Therefore it is reasonable to question whether a new proposal might be subject to the same risk. I would argue that this is not the case for the following reasons:

- a) the economics of the gold industry have substantially changed in the last decade
- b) the Cononish gold mine has a favourable cost profile relative to other gold mines
- c) there are well developed market based solutions to reduce the risk associated with price fluctuations

These reasons are discussed in turn below. We subsequently discuss two factors that differentiate the market for gold mined at Cononish – the concept of ethical gold and the marketability of Scottish gold.

a) The Changing Economics of the Gold Industry

In a previous planning application (SGZ – this relates to the original application in 2010), the issue of *volatility* in the gold price was raised as a significant risk which might undermine the viability of the Cononish gold mine project. In what follows, to better understand this issue, we look at both the history of gold prices and the evolving economics of the gold market.

Figure 1 traces the monthly gold price (measured in £ per oz) from 1971 to 2010 (SGZ – see preamble for updated price graph). There is a vertical line in 1996, when the Cononish mine was

previously granted planning permission. At that time, the price was around £220 per oz. The price declined from 1996 to 2000 at a rate of 10.1 per cent per annum. But from the 40 year history shown in Figure 1, such a period was very much the exception. Instead of declining, the annual average change over the entire period was for an *increase* of 10.5 per cent. The current price on April 12th 2011 was £892 per oz, more than four times greater than its 1996 value. (SGZ – current price July 4th 2017 London am fix £947)

Could gold prices return to the levels experienced in the mid 1990s or to a level that would make the present proposals uneconomical? There are two approaches to this, one using statistical techniques, the other using economic arguments. Using statistical techniques, we test whether the gold price time series has the property of “mean-reversion”. A time series with this property has a tendency to return to its long-run mean. Thus, if it increases, even over a fairly long period, it will at some point fall back to this long-run mean. If this were true one might be pessimistic about the prospects for gold production since the mean gold price between 1970 and 2010 was £231 per oz and costs have since risen.



Casual inspection suggests that there is no tendency for gold prices to revert to the mean. Instead, there is a clear upward trend, punctuated by short periods of stagnation. In recent years, the upward trend has accelerated. But these observations do not provide a statistical test which confirms the behaviour of the gold price time series. The standard inferential test of whether a series reverts to the mean is known as a unit root test. There are a variety of tests for unit roots.

We have applied a Phillips-Perron test, one of the most common such tests and one that is implemented in a number of software packages. Our result, generated using the Stata software package, do not reject the hypothesis that gold prices have a unit root at a 5 per cent level of significance¹. Thus, there is no statistical evidence that the gold price will revert to its long run mean, which is significantly lower than its current price.

This statistical approach is somewhat “black box” in that it focuses simply on the history of gold prices. The statistical result can be supplemented with economic arguments which are consistent with the evolution of the gold price as shown in Figure 1.

There are three main sources of demand for gold - jewellery, industry and investment. There are strong reasons to believe that each of these has been putting upward pressure on the gold price in recent years. First, the demand for gold from rapidly developing countries such as India (SGZ – and China) has soared. This is partly due to their very rapid growth rate of the Indian (and Chinese) economy which has fuelled a huge rise in the demand for gold, particularly for ceremonial occasions such as weddings. India is the world’s largest gold market, consuming 960 metric tons in 2010 (China has now overtaken India in gold consumption). In 2010, world jewellery demand (excluding the use of scrap) amounted to 1333 metric tons, 15.6 per cent up on the previous year².

Industrial demand has also been growing, mainly for the electronics sector. Industry consumes a much smaller share of gold output, at around 420 tons, but still showed strong growth of around 12 per cent in 2010. In this sector, there is strong competition from other metals and demand for silver has been growing even more rapidly. Silver will also be produced at Cononish and its price quadrupled between 2000 and 2010.

There have also been substantial increases in the demand for gold for “portfolio” purposes. This means that sovereign states and individuals are investing in gold because they believe it to be a secure store of wealth. Why should this be the case? The period from the mid 1980s to the early part of this century is now described by economic historians as the “Great Moderation”³. World politics were stable, economic growth in the West was steady and inflation was low. Investors were

¹ The detailed results are shown in Appendix 1

² Commodity Online, China, [‘India fuel global gold jewellery demand’](#)

³ [The Great Moderation, Wikipedia](#)

willing to take risks to earn high returns and therefore saw little need to hold gold in their wealth portfolios. The outlook has changed radically since the 2008 financial crisis. World politics are no longer stable. Many western economies have long-term sovereign debt problems and inflation has increased. Given that the difficulties of repaying sovereign debt may lead to currency depreciation, gold has become attractive to investors. Better to hold gold, even though it offers no rate of return, than assets denominated in currencies whose value may fall. Gold prices have the property of being negatively correlated with stock returns which is very beneficial for defensive investors⁴. The experience of the financial crisis has made investors more risk averse, one consequence of which has been the rapid rise in the gold price.

Thus, the underlying issue regarding the viability of gold production at Cononish is not whether gold prices are “volatile”. Rather it is whether one expects (1) demand for gold from the rapidly growing economies of India and China to fall suddenly and (2) whether the world economy will return to the political and economic stability experienced during the 1990s. This would give investors an incentive to be less defensive in their portfolio choices. At present, my assessment is that neither of these possibilities is likely and therefore that the gold price will remain around its current level for the foreseeable future.

b) Cononish gold has a favourable cost profile

The costs of extracting gold vary widely across different parts of the world. Issues such as geological conditions, access, labour costs and taxation regime all have an impact on costs. The gold industry publishes regular assessments of costs. The “gold production cost curve” shows how the costs of global gold production vary – from the lowest cost to highest cost. The lowest cost production is well below \$200 per oz, while the most expensive currently mined costs around \$1200 per oz. If the price of gold were to fall, the most costly mines would be the first to close since they would be the first not to make a profit. Figure 2 shows a recent estimate of the gold production cost curve⁵.

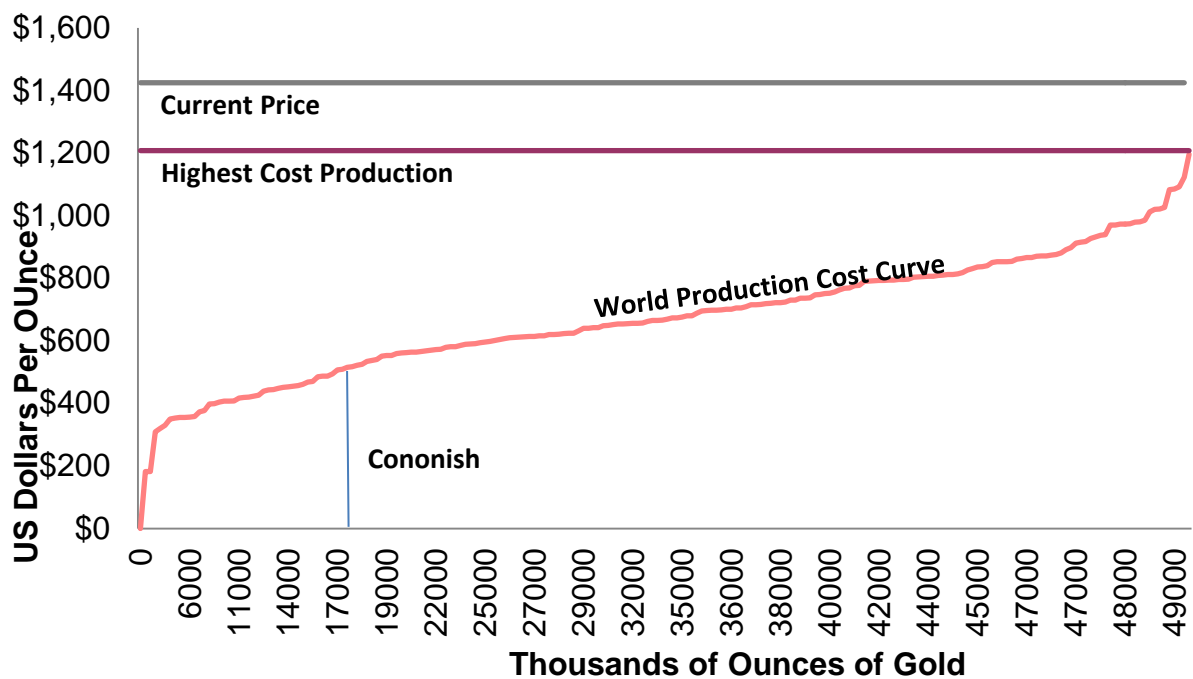
Figure 2 also shows the current price of gold at just over \$1500 per oz. At this price, all of the mines, which together produce 48.8 million ounces of gold, are profitable. It also shows estimates of costs

⁴ See for example: http://www.asx.com.au/documents/research/gold_article.pdf

⁵ GFMS and SB Global Markets Research - Mine Costs. Based on data from 213 mines

at Cononish. These are approximate. Nevertheless, even with a wide margin of error, the conclusion that many mines would be rendered uneconomic before Cononish is valid. Given current world demand for gold, the costs associated with the Cononish mine are consistent with its ability to make a profit during its lifetime and therefore for the operation to continue to be viable. (SGZ – as a result in the decline in price in 2013 to the c.\$1100 – 1300 levels, cost profile have reduced slightly – the position of Cononish is now slightly lower than that indicated)

Figure 2: The Gold Production Cost Curve



c) Market Solutions to Reduce Risk Associated With Price Fluctuations

The environment around the mine will be protected by a bond of sufficient value to restore its condition should the mine close. In addition, the economic return to the mine can be protected by “hedging” against future fluctuations in the gold price.(SGZ – it is possible the terms of any financing strategy will require hedging of a certain amount of production to cover debt repayments – this was a condition of the previously proposed financing). The gold futures market is highly liquid, enabling many types of forward contract to be bought and sold. Some examples taken from Yahoo finance are contracts for delivery in Dec 2012 - \$1560.90 per oz; delivery in Dec 2014 - \$1565 per oz; delivery

in Dec 2016 - \$1736 per oz⁶. Using such contracts, the production of the mine could be sold before production began. This would entirely take away the price risk associated with the mining operation, giving complete certainty over the value of the mine's gold production. Volatility of the gold price would be of no concern.

There are intermediate market possibilities, where one can reduce, rather than eliminate, risk. These use a mixture of options to buy and sell in the future. These could be used if one expected prices to rise further and wished to benefit from this increase. The costs would be the associated increase in risk and the cost of setting up a more complex trading structure. However, the principle of the contracts is the same: since gold is traded in highly liquid markets, gold producers can reduce the amount of risk they face from complete exposure to the spot market to zero where they sell their entire production in the forward market.

Ethical Gold

Not all gold is the same. In recent years, consumers have been at the forefront of the movement in support of what is known as "ethical" gold. Unfortunately, much of the gold that is produced around the world is not "ethical". The [Earthworks campaign](#) against "dirty" gold cites human rights violations, forest destruction, toxic pollution, and the loss of lands and livelihoods as being synonymous with gold extraction, particularly in the developing world. The earthworks campaign has managed to enlist 73 jewellery retailers, including Target, the third largest US retail chain, in rejecting gold sourced from irresponsible mining enterprises. Ethical gold is increasingly likely to command a premium, certainly in the developed world.

Cononish gold would be ethical gold. It would be mined under UK health and safety regulations; it would not involve child labour nor threaten human rights. Those employed would be earning on average £26,000 per year (SGZ – see updated). It would not involve destroying critical ecosystems. Waste from the mine would be carefully dealt with. One of the criticisms of the decline in manufacturing in the UK has been that this process has led to increased pollution, inefficient energy use and denial of workers' rights in those countries from which we now import manufactures. Domestic production to the highest environmental and employment standards reduces such costs

⁶ Source: [Yahoo Finance](#)

elsewhere in the world. Production of ethical gold in Scotland may restrict the expansion of "dirty" gold and the consequent negative impacts on societies and environments outside Scotland.

Scottish Gold

There is support from jewellers for the use of Scottish gold because of its ethical qualities. The amount of gold is likely to be used in Scottish jewellery will be small. It may command a premium of perhaps 15%. But it will help maintain the Scottish jewellery sector by providing its marketing focus. ScotGold Resources has discussed the market for jewellery made from Scottish gold and silver with local jewellers. There is already a market for products made from gold "panned" in Scotland. But due to the labour intensity of this process, there is an extreme shortage of gold with which to make the jewellery. The level of interest among jewellers suggests that there are significant opportunities to increase the local multiplier effects from the gold mine, by supporting the production of high value-added, low transport cost jewellery that is highly marketable world wide. Clearly, it would be particularly advantageous if production was located within the National Park area, but this would be a commercial decision. (SGZ – Production of Scottish Gold from the BPT has attracted considerable interest with a significant premium being generated from the sale of the first commercially produced Scottish gold in the form of 'rounds' Scotgold has also recently concluded an agreement with two very well known Scottish jewellers for further Scottish gold from the BPT at a considerable premium (commercially sensitive)

2. MULTIPLIER EFFECTS ON THE LOCAL AND NATIONAL ECONOMIES

Most economic impact studies use multipliers derived from input-output tables to estimate the indirect and induced effects of proposed developments. An input-output table aggregates the economy into different production sectors. The tables themselves comprise the set of inter-industry transactions necessary to produce final demand. More detailed estimates of multipliers can be constructed when many separate industries are identified in the input output tables. However, greater detail comes at the cost of sampling a larger number of firms.

With the current UK industrial classification, a gold mine would be classified within the "Metal ores extraction" industry. Unfortunately there are no recently estimated multipliers for metal ores extraction in Scotland. This is because in 2007, when the last input output tables for Scotland were constructed, there were no extant metal mines in Scotland. Thus the most recent income (Type 1)

multipliers for Scotland, which are based on 2007 data, are absent for this sector. (SGZ - There are still no metal mines in Scotland)

One would expect that the pattern of purchases during the construction phase of the mine will differ substantially from those when it is operating. This means that different multipliers apply during the construction phase. There are multipliers from the 2007 Scottish input output tables for the construction industry and we use these to estimate indirect and induced impacts during construction.

Consider first, the multipliers during mine operation. Any multiplier is an estimate of the indirect effects of an industry on other parts of the economy. These estimates are based on the *average effect* of those firms belonging to that industry which happen to be sampled during the construction of the input-output tables. These are inevitably subject to large margins of error which increase as the number of sampled firms falls. When no firms are sampled, no multipliers are available. As already mentioned, this explains the absence of multipliers for metal ores extraction from the 2007 Scottish Input-Output tables.

However, when a firm's business plan is available, multipliers can be estimated directly, since a description of the pattern of purchases is an integral part of a normal business plan. Multipliers can therefore be constructed that are more accurate than the estimated average multipliers derived from the input-output tables. This applies to Type 1 multipliers: Type 2 multipliers include purchases of goods and services *induced* by increases in employment and incomes arising from purchases along the company supply chain. For these, additional information has to be utilised.

Thus, to calculate the Type 1 multiplier for the proposed Cononish mine, we start from the expected value of sales. At current gold prices this is likely to be around £132 million. The value of purchases from other UK suppliers listed in the business plan is £33.9m. Of this total, £11.8m will be spent on wages. We assume that 75 per cent of the non-labour purchases are made in Scotland and all of the labour is employed in Scotland. Then the *first round* multiplier effect of the mine is $1 + (11.8 + 0.75 * 22.6) / 132 = 1.22$

Purchases from other sectors will largely be focussed on purchases of mining and milling activity, which is most closely aligned to "Other mining and quarrying" within the industrial classification. This industry had a Type 1 multiplier of 1.43 in the 2007 Scottish input-output tables. To calculate the subsequent round multiplier effects we apply this multiplier to the estimated first round effects

yielding an overall estimate of the Type 1 multiplier for the mine's activity in Scotland of $1 + 0.22 + 0.43 * 0.22 = 1.31$.

Entirely independently, the most recent (1998) estimate of the Type 1 multiplier for metal ores extraction in Scotland is 1.38. Thus, the direct estimates of the multiplier effects of the Cononish mine are consistent with historic estimates of the multiplier effects of metal ores extraction in Scotland.

This calculation means that every £1m production from the mine will indirectly generate a further £310,000 worth of purchases of goods and services within Scotland.

For Type 2 multipliers there is no recent Scottish (or UK) data upon which to draw. Our approach is to use the Type 2 multiplier in the most closely aligned sectors from the industrial classification, namely "Other mining and quarrying". In the 2007 Scottish input-output tables this industry had a Type 1 multiplier of 1.43 and a Type 2 multiplier of 1.67. We then add the *difference* between the Type 1 and Type 2 multipliers for this sector to our estimated Type 1 multiplier for the mine to arrive at an estimated Type 2 multiplier. The rationale for this is that the difference between the Type 1 and Type 2 multipliers for the mine is the amount of induced expenditure by households receiving income through the operation of its supply chain. There is little reason to believe that the types of households receiving income from the mine will spend their income in radically different ways from those receiving income from the "Other mining and quarrying" activity. Hence the difference between the Type 1 and Type 2 multipliers is likely to be broadly similar across these sectors.

Based on this estimate, the estimated Type 2 multiplier for the mine is 1.55. Note that the estimates of the Type 1 and Type 2 multipliers for the mine pass the plausibility test of being close to multipliers in related sectors and close to historic values within the same sector.

The construction phase will involve spending of £14.7m in Scotland (a further £3.3m will be spent on importing a purpose built mill from Australia). The construction and restoration phases will have different multiplier effects from the operation activity. The most relevant Type 2 multiplier for this activity is that for the construction industry. The value of the Type 2 construction multiplier in Scotland in 2007 was 2.08. Assuming conservatively that only 75 per cent of this activity is purchased in Scotland, the income induced by the construction phase in Scotland will cause further indirect and induced purchases worth £9.2m.

For the operational phase, the analysis suggests that every £1m production from the mine will indirectly generate a further £520,000 worth of purchases of goods and services within Scotland. In total the operational phase of the mine will generate additional economic activity in Scotland to the value of £72.2m, while the construction phase will generate a further £9.2m. This implies that in total the mine will generate an additional £81.4m of economic activity in Scotland over its lifetime. (SGZ – note as a result of the proposed change to the TSF design, there is less upfront construction cost, though slightly increased costs above the previous ‘construction’ costs are registered in operating costs and the Company believe the overall impact is negligible if not increased overall when new figures are substituted).

How much of the income will be retained within the LLTNP? There are no estimates of input output tables for the National Park and therefore there are no multipliers available by which one might measure the impact of introducing a new economic activity within its boundaries. One therefore has to proceed with caution in trying to gauge economic impact within the LLTNP boundary.

Most of the workers and some of the contractors are likely to reside within its boundaries. These will undoubtedly help generate additional economic activity within the National Park. However, it is almost certainly the case that individuals employed directly or indirectly by the mine will spend a large part of their incomes outside the Park. This behaviour mimics that of other National Park residents who tend to spend a large proportion of their income outside the park boundaries.

The supply of goods and services within the Park is limited. For example, the annual turnover of its retail businesses is estimated to be £46m. “In the National Park, there are no hypermarkets, and non-specialised shops concentrating on food are relatively small and deal overwhelmingly in food and household consumables”⁷ Local residents’ spending tends to be outside the National Park - “Local residents appear to be purchasing two-thirds of their food and 90 per cent of their other shopping from outwith the park. The clothing shops in the Park, for example, cater primarily for the tourist trade and petrol stations with the passing trade”⁸

The mine will increase the income earned in the National Park by £1.45m pounds each year of its operation. The recipients of this income may spend a large share of it outside the park: it is

⁷ Loch Lomond and National Park (2011), Valuing the National Park, Final Report, P 107 (Draft)

⁸ Loch Lomond and National Park (2011), Valuing the National Park, Final Report, P 108 (Draft)

important to stress that this would be true whatever form of new economic activity was being proposed. Leakage of income outside the park is caused by the lack of scale and consequent lack of competitiveness of businesses within the Park. Nevertheless, even with relatively high levels of income leakage, the mine will help slow down the decline of the park economy by contributing to additional spending power. It will also confer other economic benefits that we will discuss subsequently.

Finally, this analysis does not take account of the distribution of income from the firm's profits. This will have beneficial effects on economic activity depending how shareholders choose to spend this income. Many of these are likely to be in the UK and Scotland. Some income will be retained by the company, which will create opportunities for further exploration activity in Scotland and possibly the return of a vibrant ore extraction sector to Scotland.

3. THE IMPACT OF THE MINE ON THE LOCAL LABOUR MARKET

One of the key benefits that the mine will bring will be an increase in employment in the National Park. During the operation phase, there will be 52 (SGZ – 62) persons employed in the mine. Their average salary will be £25,600 (SGZ – now c. £32,500 excluding bonus etc). This is 21 per cent above the median wage for employees in the whole of the Stirling local authority⁹. The projected average wage at Cononish is lower than the average UK wage in “Other mining and quarrying” in 2010, which was £30,600, but more than double the UK mean of £12,400 in the industry described as “Accommodation and food services”. This industry captures most of the tourism sector, which is the mainstay of the LLTNP economy. Thus, if the data on “Accommodation and food services” reflects wages in the tourism sector in LLTNP, the projected average wage in the mine will be more than double that in the largest industry in employment terms in the Park. (SGZ - Although the numbers will have changed, the relative positioning in relation to the metrics above remain)

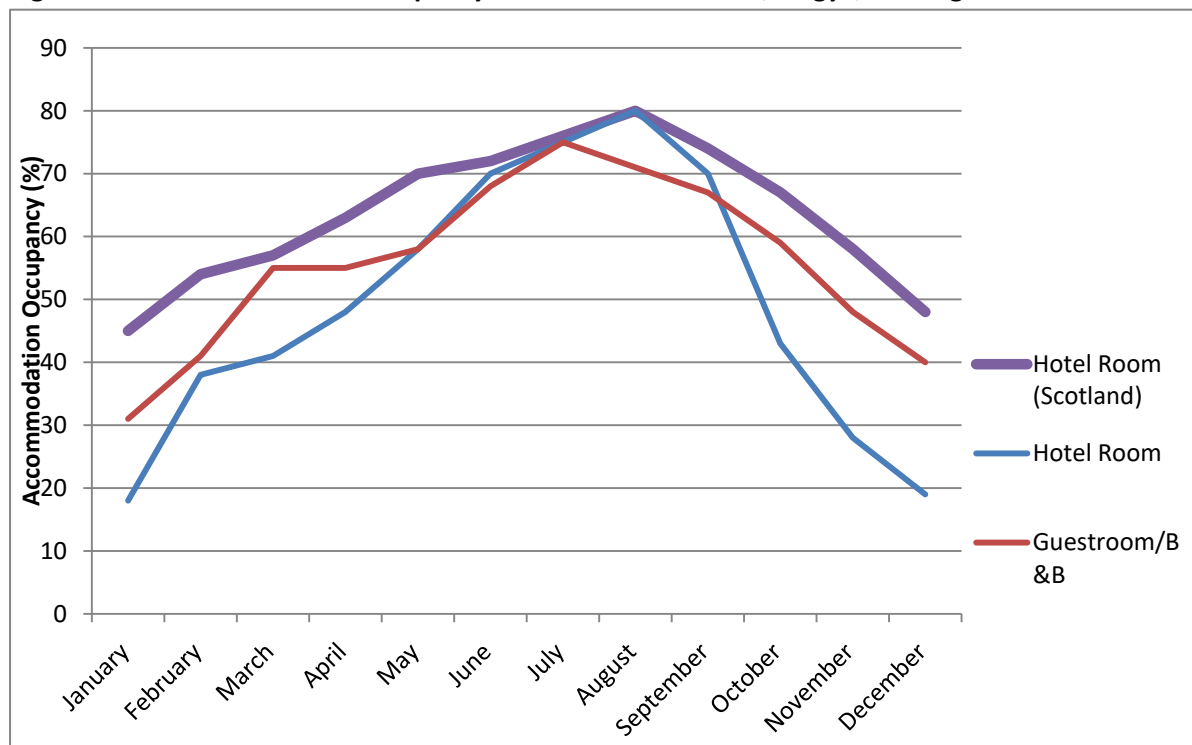
It has been argued that the mine jobs will be temporary, due to the limited life of the mine. This may be true in relation to the current deposit. Yet the same was said of North Sea Oil. While it is true that there has been a sharp decline in oil and gas production in the North Sea, the same is not true of *employment* in the oil and gas industry in the North-East of Scotland. The reason is that much of the expertise gained in the North Sea has found application elsewhere in the world. As well as gold and

⁹ Source: Annual Survey of Hours and Earnings (2010) Office of National Statistics

silver, the mine will produce a great deal of skills and competencies associated with mining that have been lost to the UK in recent decades. It would be wrong to assume that these will not command a premium in the labour market after the Cononish deposit has been extracted. These may be applied outside the Park area, but workers may choose to reside in the Park for quality of life reasons. This pattern of commuting out of the park is very common among existing Park residents. In 2001, 3440 (47%) of the 7269 employees resident in the Park worked outside its boundaries.

It is also clear that income in the Park is highly seasonal Figure 3 shows occupancy rates for hotels and guest rooms in Loch Lomond, Argyll, Stirling and the Trossachs in 2009. For reference, hotel room occupancy rates in Scotland as a whole are included on the graph. It is immediately evident that there is a huge seasonal variation in occupancy rates. In the Loch Lomond etc. area, hotel room occupancy rates vary by a factor of four between August and December. There is also greater seasonality in occupancy rates in the Loch Lomond etc. area than in Scotland as a whole. This variability in demand for the product must cause a similar variation in the demand for labour, implying that the industry that is the mainstay of employment in the Park (rather than the employment of Park residents) is subject to very significant swings in its requirements for workers. It follows that for most of these workers, the average employment spell is very short.

Figure 3: Accommodation Occupancy Rates: Loch Lomond, Argyll, Stirling and the Trossachs



Source: http://www.visitscotland.org/pdf/vs_western.pdf

The instability of employment in the tourism sector is further confirmed by data on how long workers have been in their present job for the UK as a whole which is shown in Figure 4. It shows that in the hospitality sector, less than 5 per cent of employees have been in the same job for more than 20 years. In contrast, more than 15 per cent of employees in the public and voluntary sectors have been in the same job for more than 20 years. At the other end of the spectrum, 27.6 per cent of hospitality employees have been in their job for less than a year, while only 19.4 per cent of private sector workers and 12.9 per cent of the public sector fall into this category. These data are for the UK as a whole. The data in Figure 3 indicate that hotel occupancy rates are more variable in the Loch Lomond, Argyll, Stirling and the Trossachs than in Scotland as a whole. There is no reason to believe that the Scottish hotel trade is less seasonal than is the UK as a whole. Therefore the likelihood is that tenures for workers in tourism are even shorter in the National Park. One of the main weaknesses of the exiting LLTNP economy is the instability of its employment. Having unstable employment patterns deters employers from investing in training and makes workers more likely to move away. By comparison, if workers stay the course with the Cononish mine, their tenure will be relatively long compared with those working in the industry which sustains most jobs in the National Park.

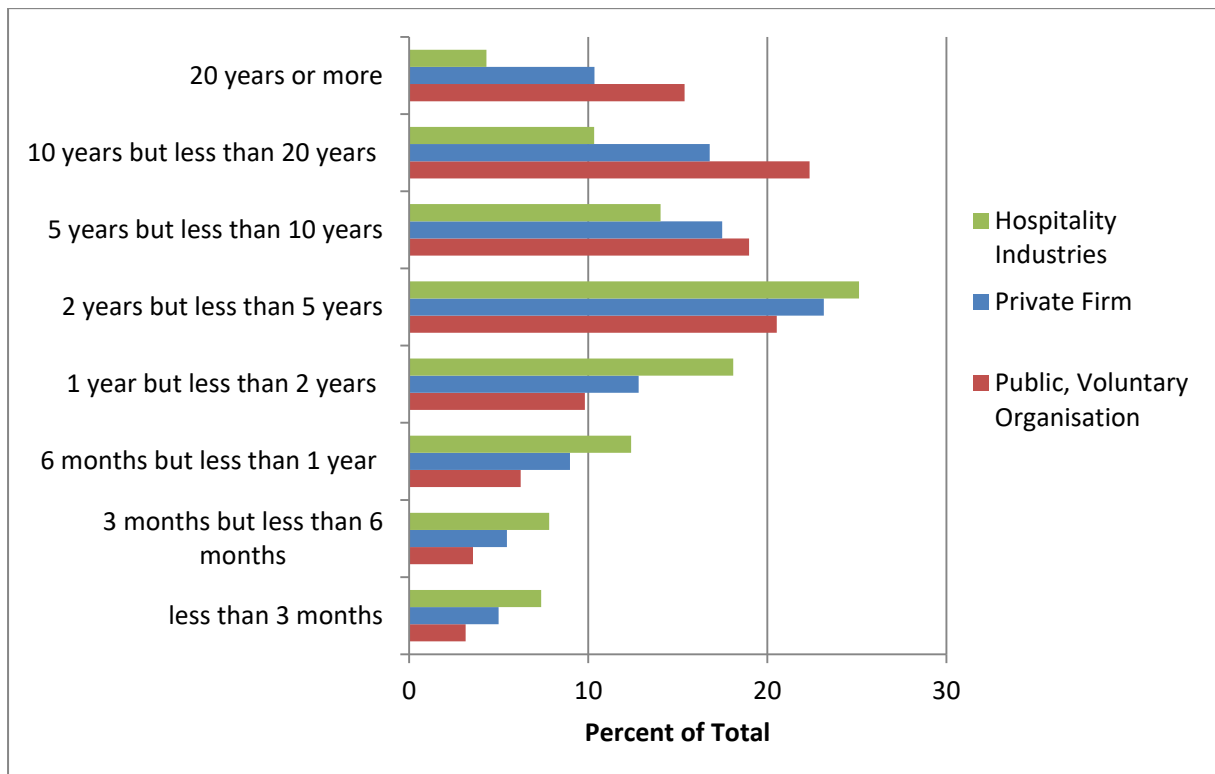
Thus far, we have established that jobs in the mine will be relatively well-paid and more stable than the modal form of employment in the National Park. These arguments coincide with the findings reported in the “State of the Park 2005” report - “The STEAM report 2002 indicates that nearly 6,000 FTE jobs in the Park are directly or indirectly dependent on tourism, with over a third of these in tourist accommodation. However this part of the local economy is subject to seasonal fluctuations and is often characterised by low-paid, part-time work.”¹⁰

It also is the only sector for which there is a large volume of commuting *into* the Park. The draft “Valuing the National Park” report suggests that around 380 individuals commute into the Park to work in the hotel and restaurant sector.¹¹ This, along with the finding that 47 per cent of employed Park residents work outside its boundaries, illustrates the porous nature of the National Park labour market. This is a labour market which is very difficult to plan, and it is against this background that the employment consequences of the mine should be assessed.

¹⁰ State of the Park Report 2005 P237 http://www.lochlomond-trossachs.org/images/stories/archive/file/stateofthepark/profile_economy_employment.pdf

¹¹ Loch Lomond and National Park (2011), Valuing the National Park, Final Report, P 60 (Draft)

Figure 4: Length of Employment by Type of Job



Source: UK Labour Force Survey 2004-2010

It would, of course, be illegal to favour Park residents at the hiring stage for the jobs that will be created by the mine. But it is quite legitimate to work with other agencies to highlight to Park residents the employment opportunities that are being created. ScotGold has already engaged in this process and received a number of expressions of interest from Park residents. However, it is impossible to predict how many of the new hires will be from Park residents, which in turn makes it impossible to predict what effect the mine will have on the demand for housing and public services within Park boundaries.

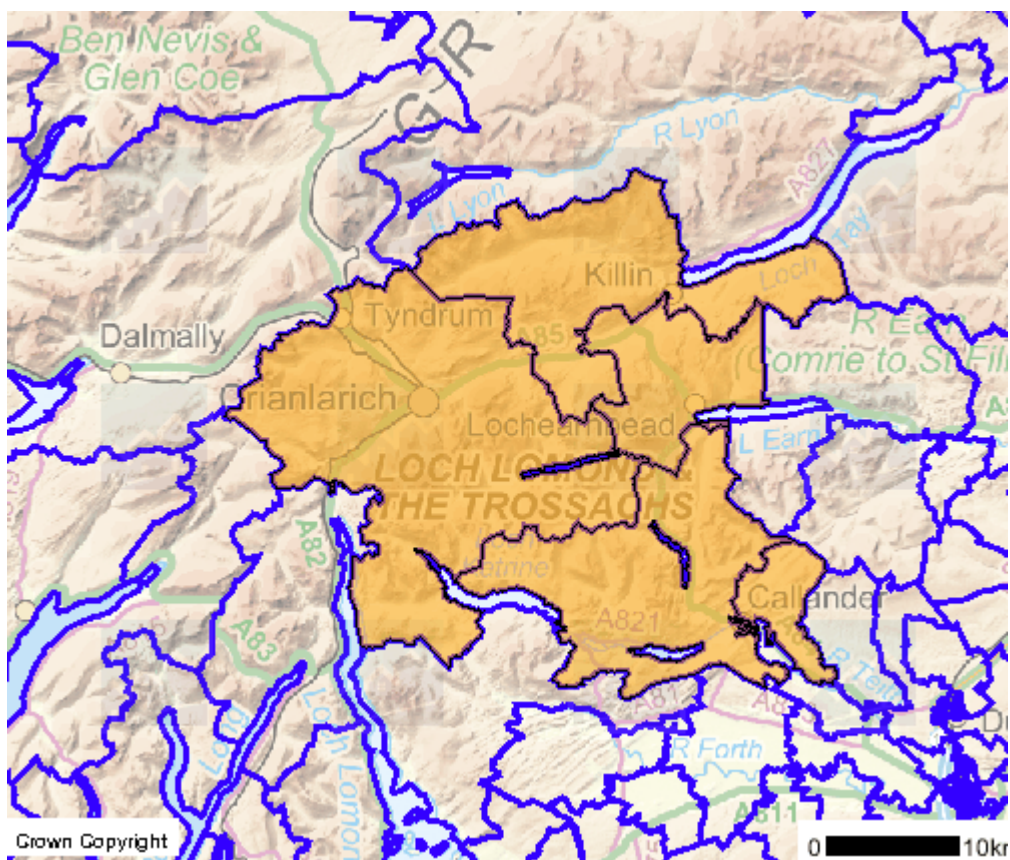
If employment opportunities are not created within the Park area, the decline in the working age population will continue. The “Valuing the National Park” report suggests that, on present trends, the working age population in the Park will fall by 25 per cent by 2030¹². The changing age structure would clearly create significant difficulties in the provision and therefore the viability of public services. Some of these trends are already clear. Data from Scottish Neighbourhood Statistics

¹² Loch Lomond and National Park (2011), Valuing the National Park, Final Report, P 58 (Draft)

indicate that the population of Stirling Highland and Callander Intermediate zones (see map) in 2009 was 7.8 thousand people. Of these only 15.7% were children, compared with 17.6% in Scotland as a whole. Only 59.5% were of working age compared with 62.6% in Scotland as a whole. This means that while pensioners comprise only 19.9% of the Scottish population, 24.8% of those living in the Highland and Callander data zones are of pensionable age. Having a more balanced age profile would reduce the demand on public services if employment in the mine increases the number of working age households in the Park, with other members of the household potentially supplying services to older residents.

The wealth profile of National Park residents is also substantially different from Scotland as a whole. Housing is the major form in which wealth is held in British households. In this area of the National Park, 28 per cent of residents live in houses in Council Tax bands F to H: the equivalent proportion in Scotland is 12 per cent. In the National Park, only 7 per cent of houses are in Band A compared with 22 per cent in Scotland.

Map of Stirling Highland and Callander Intermediate Zones



Source: Scottish Neighbourhood Statistics

Residents in this part of the National Park are relatively old and affluent compared with the Scottish population as a whole. Having a relatively small cohort of younger people of working age is a disadvantage to older people wishing to purchase services locally. But more fundamentally, it indicates that jobs are scarce for those of working age in this area of the National Park.

The average house price in the National Park in 2009 was £177,000, which compares with £134,000 in Scotland as a whole. Given that mortgages are in very short supply for first-time buyers and deposit requirements are much higher than they were before the financial crisis, young people find it especially difficult to purchase accommodation in the National Park, further increasing the age imbalance. Because, as we have seen, jobs in tourism are typically low-paid, there is little chance that workers in this sector could afford to buy properties in the Park. This difficulty in accessing the housing market is entirely consistent with the finding that the “hotels and restaurant” sector is the only industry with significant commuting into the Park. Expanding tourism is unlikely to be a solution to increasing the number of working-age adults in the Park, because these jobs simply do not pay well enough to allow the workers to buy their own homes or better quality rented properties.

The concentration of economic activity in the tourist sector makes the Park economy susceptible to external shocks, such as increases in the oil price, travel disruption etc. A more diverse economy would be less susceptible to such shocks. However, there was little evidence of diversification between 2007 and 2010. The number of businesses in the Highland Stirling and Callander intermediate zones¹³¹⁴ declined between 2007 and 2010. This is shown in Table 1. Weakness in the local economy has concentrated in the primary sector, wholesale, retail and repairs and there was a small decline in the number of hotels and restaurants. The decline in retailing may reflect increasing competition from outside the Park area, which is consistent with the evidence from the visitor survey by Lowland Research (2005) that residents purchase two-thirds of their food and 90 per cent of their other shopping outside the National Park. The declining numbers of business may be self-reinforcing since each closure reduces purchasing opportunities for Park residents. A smaller population of firms has adverse effects on employment and spending within the area.

¹³ These include the main potential "catchment areas" for the mine inside the National Park. The main settlements comprise Tyndrum, Callandar, Crianlarich, Killin, Lochearnhead, Stratheyre

¹⁴ For a description of the “intermediate zones” geography see:
<http://www.scotland.gov.uk/Publications/2005/02/20732/53083>

Table 1: Businesses in Highland Stirling and Callander 2007-2010

	2007	2008	2009	2010
Total no business sites	565	565	555	545
Primary Industries	90	85	85	75
Manufacturing	15	15	20	15
Construction	50	55	50	55
Wholesale, retail and repairs	105	95	90	95
Hotels and restaurants	110	105	105	105

Source: Scottish Neighbourhood Statistics

These statistics show a decline that is consistent with the projected decline in the number of working age residents in the Park. They certainly do not suggest that there are a plethora of opportunities for working age people within the Park area. There is clearly a danger that the Park is increasingly populated by relatively affluent retirees and by high-income commuters who can afford to travel outside the Park to find work. This is hardly consistent with the objective of achieving social balance within the Park population.

4. THE COSTS OF THE NEGATIVE IMPACTS OF THE MINE ON USERS AND NON-USERS OF THE NATIONAL PARK

One of the issues raised in previous assessments of the mining activity is its effect on the landscape qualities of the Park. Clearly, the Park provides a range of environmental amenities for individuals and communities. Unlike goods that are traded in a market, environmental goods have to be valued by indirect means. Investigators often use evidence such as the costs of visiting an environmental attraction to indirectly assess willingness to pay and therefore the “value in use” of the amenity. These methods are mainly useful in assessing marginal changes to ecosystems or environmental resources. The introduction of the mine is such a marginal change since it poses no major threat to ecosystems or species.

A comprehensive environmental valuation should account for a number of “uses” of an environmental amenity. These issues are also explored in Section 2.3 of the “Value of the National Park” draft report. They are also more comprehensively explored in the recently launched UK

National Ecosystem Assessment¹⁵. Here we focus on the *direct use* value and *non-use* value of the proposed mine, arguing that these are most relevant to the planning application. The direct use value is the value of the goods and services directly consumed or derived from the amenity. These would include marketable products – gold and silver in the case of this development. But in addition, the value of its effects on other activities such as recreation, research and education should be included in the calculation of direct use value¹⁶. The non-use value is more difficult to assess. It consists of the value placed on a resource by those who do not use it. They include the option value placed on a resource for future use. Thus, for example, an individual who did not make use of an amenity might negatively value the fact that some development would not only affect current recreational usage of that amenity but would also negatively affect its future use. We deal with these in turn.

1. Direct use value

In relation to the mine proposal, on the positive side of the direct use calculation are the economic benefits associated with the construction and the mining activity. We have already dealt with these in some detail including both the multiplier effect of the mining activity and the employment created by the project.

We have also mentioned the increase in human capital associated with the mining activity – skills and competencies that will be of value in other settings. Related to this is the effect on the education of young people not directly employed by the mine. Scotland has a long history in the development of geology. Notable historical contributors to the subject include James Hutton, Roderick Murchison and Hugh Miller. The Universities of Edinburgh, Glasgow and Aberdeen each have departments involved in the study of geology. Having access to working local mines can be inspirational to those thinking of taking up a career in geology. Mineral ore extraction has almost disappeared from the whole of the UK, leaving potential students of geology with no exemplars of working mines.

¹⁵ UK National Ecosystem Assessment (2011) <http://uknea.unep-wcmc.org/>

¹⁶ see for example: National Oceanic and Atmospheric Administration notes on "Environmental Valuation" [accessed at: <http://www.csc.noaa.gov/coastal/economics/envvaluation.htm>]

The Cononish mine has already provided support for one Ph.D. and seven MSc dissertations. It is likely to prove very popular among geology departments wishing to take students on field trips. Through such activities it will help develop Scotland's and the UK's skill base and so enhance the competitiveness of the respective economies.

On the negative side are the adverse effects on users of the Park. These include the direct and indirect impacts that arise from activities not explicitly forming part of the project which were mentioned in the "Scoping Response" letter¹⁷. An example of a potential negative effect is the impact on tourist activity.

The "Valuing the National Park Study" attempts to estimate the value of the consumer surplus associated with a number of tourist-related activities in the Park. These include: boating (powered and non-powered), tour boats, fishing, golf, cycling and hillwalking. The study estimate that the annual value of these activities is around £26m, of which £4m comes from hillwalking. Hillwalking, and the specialised activity of ice climbing, are the activities most likely to be affected by the mine. If we accept this estimate at face value, only a relatively small share of the value will be affected by the mine development which occupies only a small fraction of the National Park area.

It has been suggested that the mine will have a negative effect on the "remote and wildness qualities and the associated walk-in to enjoy-dramatic mountain ascent such as to Ben Lui". It will also adversely affect the ice climbing resource at Eas Anie because of the "effects of blasting and associated vibration destabilising the ice wall". But if the total value of the hillwalking amenity in the National Park is only £4m, then these direct use costs must be significantly less than this sum.

A key issue is therefore the number of walkers and climbers whose amenity might be affected by the development. There are no reliable estimates of the number of walkers and climbers ascending the different peaks in the Park. The "Valuing the National Park" study noted that only the Cobbler and Ben Lomond have fitted counters to assess numbers of walkers on these hills. These yielded estimates of 30,000 and 40,000 per annum respectively, though these are subject to very wide margins of error. Estimates by the Park Authority suggested a figure of 10,000 to 15,000¹⁸ people

¹⁷ Loch Lomond and Trossachs National Park, Scoping Response Letter, 25-5-2011, P10

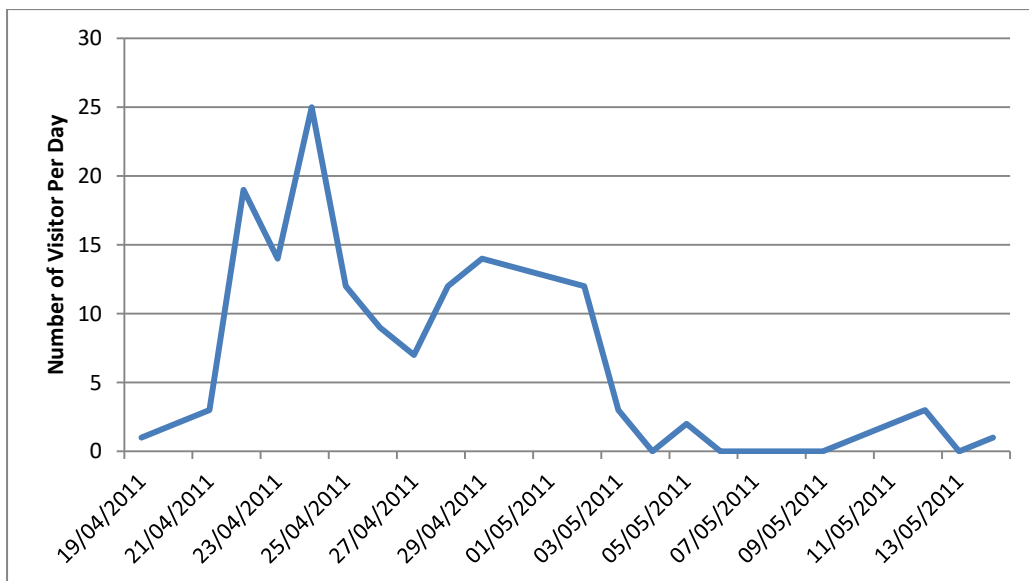
¹⁸ Loch Lomond and Trossachs National Park, Planning Permission Appeal (2010) P40
<http://www.dpea.scotland.gov.uk/Documents/qJ12912/J161672.PDF>

climb Ben Lui every year. This does not tell the whole story, since there are two routes into Ben Lui. The one by Cononish is the more scenic, but the alternative is much shorter. Hence, in approaching the mountain, walkers have to trade off saving time against scenic quality. Preference for the shorter walk is likely to increase during the winter when the available light is limited. The trade-off is described in the following advice to climbers on the Walkhighland website.

“Ben Lui is a graceful peak, one of the finest in the Southern Highlands. It offers its best side towards Dalrigh, and approaches from this side can involve a scramble round either rim of its north eastern corrie, but it is more usually climbed from Glen Lochay, a much shorter route.”¹⁹

There are no accurate statistics on the number of walkers using the Dalrigh approach to Ben Lui and so potentially passing the mine. An ad hoc survey of numbers was recently carried out by ScotGold. Counts were taken around Easter 2011 when the weather was benign. A graph of numbers of climbers observed is shown in Figure 5.

Figure 5: Number of Walkers Passing the Cononish Mine Site in April 2011.



Source: ScotGold

There was a peak around Easter weekend. Outside weekends, there are relatively few visitors. Given the expected working pattern, this suggests that activity in the mine will occur at times when walking activity is subdued and vice versa. Assuming these weeks are representative, this would suggest the number of visits to Ben Lui using the Dalrigh approach might be in the region of 2500.

¹⁹ Walkhighlands accessed at: <http://www.walkhighlands.co.uk/munros/ben-lui>

Given the level of uncertainty, one might argue the number of climbers lies in a range between 2000 and 3000. This is not necessarily inconsistent with the National Park estimate of overall numbers climbing Ben Lui, though it would suggest a strong preference for the shorter approach. As we shall see, such a choice is quite consistent with the revealed preferences of climbers. Having now constructed an estimate of the annual number of climbers, we now consider the average value which climbers place on having a scenic approach to a mountain.

In general, there is little information on the value placed by walkers and climbers on their experiences. The "Valuing the National Park" study uses information from a Travel Cost Method (TCM) study by Hanley. The travel cost method (TCM) is a revealed preference technique used to establish how individuals value different non-market goods. It is essentially founded on the simple rationale that the people visit amenities from different locations. Their willingness to bear different travel costs is an implicit measure of their willingness to pay to access the amenity. Using a TCM study by Hanley in car parks on the eastern side of Loch Lomond, the "Valuing the National Park" study assumes that the consumer surplus generated by hill walking is around £8.74 per trip. This measure is applied to the estimated number of hillwalking trips to arrive at the estimated annual value of hill-walking in the National Park of £4m. The estimated value per trip seems relatively low, and may have been contaminated by a failure to discriminate between hill walkers and day trippers' use of car parks.

Perhaps a more robust approach would be to elicit willingness to pay directly from climbers. This is known as the contingent valuation method (CVM) and is in wide use to value environmental amenities. A good example is the study by Hanley, Koop and Wright (2002)²⁰ which uses a hedonic choice experiment to value the attributes of climbing. In this context, a choice experiment means that experienced climbers are presented with descriptions of climbs that have different characteristics and asked to choose between these. In this case, the characteristics included travel distance and time, which could be converted to money costs using data on travel costs and the individual's estimated wage (opportunity) costs. From their responses, the value of different attributes of climbs can be estimated.

²⁰ Hanley, N., G. Koop and R.E. Wright, (2002), "Modelling Recreational Demand Using Choice Experiments: Rock Climbing in Scotland", *Environmental and Resource Economics*, vol. 21, no. 3, pp. 449-466

The study was conducted in 1999 and the sample was drawn from members of mountaineering clubs in Scotland. Thus, it was clear that the sample was drawn from the population of interest rather than day trippers. A random sample of members' addresses was selected, and questionnaires mailed to these individuals. A total of 267 usable responses were received. The results indicated that climbers prefer routes that:

1. Are not crowded;
2. Have more scenic qualities;
3. Have a shorter walk-in;
4. Are better quality climbs.

The value of being on a non-crowded, rather than a crowded, climb is estimated at £18.22²¹. In 2010 prices, rather than 1999 prices, this would translate to £22.40²². Further, climbers are implicitly willing to pay £11.61 to reduce their "walk-in" time by an hour. This explains the relative popularity of the A85 route over the Dalrigh approach to Ben Lui.

Now consider the application of this model to the costs of the environmental disamenity represented by the mine. Suppose that its introduction downgrades the quality of the approach to Ben Lui from "very scenic" to "scenic". This is based on the argument that (a) the development affects a small portion of the route and (b) on many occasions the mine will not be visible due to cloud and mist. From the model estimates, the difference in value to an average climber between a "very scenic" and a "scenic" route is £25.06 - £10.62 = £14.44 in 1999 prices, which translates to £17.91 in 2010 prices.

The upper limit to the estimated number of climbers using the Cononish approach to Ben Lui based on the ScotGold survey is 3000. Suppose that it was instead, 5000. Further assume that *everyone* taking this route assesses that its scenic value has fallen from very scenic to scenic as a result of the mine. This precludes climbers taking an interest in the mine and finding that has a positive amenity value. The amount required to compensate climbers resulting from this negative externality would total £89,600 per annum in 2010 prices. This would be accrued each year during the operation of the mine: it might also persist for some time thereafter until the environment was fully reinstated.

²¹ Based on the multinomial logit estimator. The nested logit model gives similar results.

²² Applying the Consumer Price Index (CPI)

Note that the response would not be entirely linear. If fewer climbers use the Cononish route, this ascent will have more value for those climbers that do use this approach since it will be less crowded. Further, this is a much higher estimate for the negative amenity value than would have been arrived at using the methodology in the “Valuing the National Park” methodology since it values each trip at only £8.74. Nevertheless, suppose that the value of these negative direct use effects of the mine total £1m over its lifetime. Even at this figure, it is clear that these are relatively small in relation to the positive direct use effects – e.g. the £11.8m increase in incomes accruing over the lifetime of the mine.

Note further that there will be distributional implications from the establishment of the mine. Due to the lack of public transport to most major climbing venues in Scotland, this activity is mainly undertaken by the relatively affluent. On the other hand, the benefits from the mining activity will be distributed more widely across social groups, since a range of different skills will be required both in the construction and operations phases.

2. NON-USE VALUE

Although not mentioned in the Scoping Response, the issue of non-use value is discussed in the “Valuing the National Park” report. It is also discussed in the UK National Ecosystem Assessment. Non-use values are associated with the *existence* of an environmental amenity. Individuals may value the existence of an unpolluted Loch Lomond, even though they do not visit it or make use of its amenities in any way. The application of “non-use” values helps protect “unfashionable” environmental goods because they are accorded little use value. A good example might be snakes. Many individuals may place value on snakes not being extinct, even though they have no wish to directly observe them. However, this issue can be overcome by requiring that ecosystems are not depleted beyond possible repair. Such a dramatic event as extinction is not relevant for the proposed mine, since with appropriate controls in place, it will cause only a small and temporary detriment to the local ecosystem.

So what is the correct approach to assessment of the non-use value associated with the mining development? Typically people would be asked to reveal their preferences as to how they value having the mine and some degradation of landscape quality as opposed to the status quo. To do this, one might use stated preference approaches such as contingent valuation or discrete choice experiments. Nevertheless, a technical paper produced by the National Ecosystem Assessment argues that:

“stated preference approaches such as contingent valuation and discrete choice experiment methods should, in theory, be applicable to a wide range of ecosystem service goods and typically they are the only option available for estimating non-use values. Such methods are defensible in cases where respondents have clear prior preferences for the goods in question or can discover economically consistent preferences within the course of the survey exercise. Where this is not the case then elicited values do not provide a sound basis for decision analysis. Such problems are most likely to occur for goods with which individuals have little experience and poor understanding”

A badly informed revealed preference can lead to incorrect valuations, which in turn lead to policy errors. The “Valuing the National Park” report concludes that the “existence value” of the National Park itself is £11.3m²³. This is based on estimated non-use values of the Natura 2000 (N2K) sites in Scotland²⁴. This valuation attaches to 7,326 square kilometres. Hence the non-use value of a small fraction of this total is inevitably small. A low valuation is reinforced by the LLTNP Wildness Survey indicating that the land on which the mine is located does not have a particularly high wildness designation.

Further, this approach fails to take account of positive non-use value associated with the mine. Many citizens might regard the existence of a gold mine as a positive attribute for the locality and for Scotland as a whole. Given that it would be the only working gold mine in Scotland, its marginal value might be larger than the loss of some amenity in an area when many substitute pieces of land with similar amenity value are to hand nearby.

In this section, we have examined use and non-use value of the proposed mining development. This approach also addresses some of the concerns mentioned in the Scoping Letter of 25th May 2011. These include the negative impacts, particularly those that affect hill walkers. Our conclusion is that these are relatively small in relation to the benefits associated with the mine development. The amounts associated with the non-use values are particularly uncertain, especially given that it is not clear whether the net non-use value would be positive or negative.

²³ Loch Lomond and National Park (2011), Valuing the National Park, Final Report, P 124 (Draft)

²⁴ Environment Group Research Report An Economic Assessment of the Costs and Benefits of Natura 2000 Sites in Scotland 2004 Final Report <http://www.scotland.gov.uk/Publications/2004/06/19426/38107>

