APPENDIX W

Economics

CLIENTS | PEOPLE | PERFORMANCE

Vista Gold Australia Pty Ltd

Mt Todd Gold Project

Economics

June 2013

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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It is not the intention of the Report to cover every element of the economic environment, but rather to conduct the assessment with consideration to the services detailed in Section 1.3.

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The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described throughout this Report. GHD disclaims liability arising from any of the assumptions being incorrect.

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1. Introduction

1.1 Project overview

The Mt Todd Gold Project (the Project) is a brownfield gold mining project located approximately 55 kilometres northwest of Katherine and 250 kilometres south of Darwin.

The existing gold mine was acquired by Vista Gold Corp (Vista Gold) in 2006. Since then, Vista Gold has spent approximately $60 million on pre-feasibility activities including environmental rehabilitation activities on the brownfilled site.

Once operational, approximately 17.8 million tonnes per annum (Mtpa) of ore is expected to be processed. Based on current known data, the Project is expected to have a life of around 19 years inclusive of construction, operations and closure. Construction is anticipated to take two years, including 6 months for pre-production. The mine is scheduled to operate for a further 13 years. Closure and rehabilitation of the mine is expected to take four years.

1.2 Statutory requirements

The former Northern Territory Minister for Natural Resources, Environment, The Arts and Sport (NRETAS) determined that the Project requires formal assessment under the *Northern Territory Environmental Assessment Act* 1982 at the level of an Environmental Impact Statement. The proposal has also been referred to the Australian Government under the *Environment Protection and Biodiversity Conservation Act* 1999 and has been determined to be a controlled action.

This economic assessment has been prepared in accordance with Section 7.8.2 of the Guidelines for Preparation of an Environmental Impact Statement: Mt Todd Gold Project, Katherine Region NT (NRETAS, 2011).

1.3 Scope of report

This report addresses potential impacts on the local and regional economies that are expected to be affected (both positively and negatively).

The report:

- provides a snapshot of the demographic characteristics of the region;
- identifies trends in economic indicators, such as employment by sector and business entries and exits;
- describes the structure of the economy including identifying and describing trends in key industries such as mining, construction and agriculture;
- estimates the potential economic impacts (e.g. employment and economic output) of the Project on the local and regional economy; and
- outlines opportunities for local industry and employment opportunities for local people including Indigenous people.

2. Methodology

2.1 Study area

The study area for the purposes of the economic assessment includes the regions directly and indirectly affected by the Project. It is assumed that development of the Project will affect the economies of:

- the Katherine region[1] (comprising the Local Government Areas of Katherine, Victoria-Daly and Roper Gulf Shires); and
- the Northern Territory.

2.2 Data sources

Data was collected from a range of sources including:

- Australian Bureau of Statistics (ABS) 2011 Census of Population and Housing (ABS 2012a, 2012b, 2012c, 2012f).
- Australian Bureau of Statistics (ABS) 2011 Counts of Australian businesses (ABS 2012d).
- Australian Bureau of Statistics, Australian National Accounts, State Accounts (ABS 2012e).
- Australian Bureau of Statistics, National Regional Profile (ABS 2012e).
- Northern Territory Government, Katherine economic profile (NTG 2008).
- Northern Territory Government, Towards a Katherine Land Use Plan (NTG 2013).
- Vista Gold company data and information (Vista Gold 2013).

2.3 Desktop assessment

2.3.1 Economic baseline

The first step in undertaking an economic assessment is to establish the socio-economic baseline. This allows potential economic impacts (positive and negative) to be assessed against the baseline.

The economic baseline overview involves collection, analysis and presentation of data for the Katherine and Northern Territory regions - the regions where the mine and its infrastructure are expected to have the greatest impact. The economic baseline gives an indication to the region's general economic profile, conditions and trends.

The economic baseline gives a general overview of the Katherine region. More detailed, local-level analysis has been provided for the Katherine Local Government Area level in the Social Impact Assessment (Appendix F and Chapter 7).

2.3.2 Input-output analysis

The potential economic impacts of the Project on the regional economy and the Northern Territory economy have been assessed for the construction and operations phases of the Project.

1 The Katherine region is defined as the Katherine Statistical Area Level 3 as used by the Australian Bureau of Statistics (code: 70205). This statistical region includes the Local Government Areas of Katherine, Roper Gulf Shire and Victoria-Daly Shire. The Katherine region for the purposes of the economic assessment is therefore broader than the Katherine region profiled in the demographic profile presented in the social impact assessment (Appendix F).

The estimates of economic impact presented in this report were based on the use of the input-output (I-O) method. I-O analysis provides a comprehensive economic framework that is useful in the resource planning process. Broadly, there are two ways in which the method can be used.

First, the I-O transactions table provides a numerical picture of the size and shape of the economy and its essential features. It can be used to describe some of the important features of an economy, the interrelationships between sectors and the relative importance of the individual sectors.

Second, I-O analysis provides a standard approach for the estimation of the economic impact of a particular activity. The I-O model is used to calculate industry multipliers that can then be used to estimate economic impacts arising from some change in the local economy or the economic contribution of an existing industry.

The economic impact of the project is measured by the contribution of the project to:

- Gross Regional Product (GRP)[2] – a measure of the value of a region's outputs minus the cost of inputs. It is therefore able to measure the net contribution of the Project to the relevant economies (i.e. the Katherine region and Northern Territory).
- Employment - identifies the number of Full Time Equivalent (FTE) persons engaged in work within a region. In this assessment, employment is measured by place of remuneration rather than place of residence.

The impact of the Project on these indicators has been assessed at the regional level and for the Northern Territory.

2.4 Limitations

The assumptions underpinning the economic model are outlined in Appendix A.

[2] Gross Regional Product is a measure of the market value of all final good and services produced within a region in a given period of time.

3. Existing environment

3.1 Demographic profile

3.1.1 Population growth trend

The population of the Katherine region was 21,379 in 2011 (ABS 2012a). The population of the Katherine region increased from 20,458 persons in 2001 to reach 21,379 persons in 2011. This equates to an increase of 5 per cent in the period between 2001 and 2011 or an average annual growth rate of 0.5 per cent per annum (Figure 1).

For comparative purposes, the population of the Northern Territory has increased at an average rate of 1.1 per cent per annum between 2001 and 2011.

The town of Katherine is the key service hub for the Katherine region. In 2011, the ABS reported that the population of the Katherine Local Government Area was 10,698 (ABS 2012b).

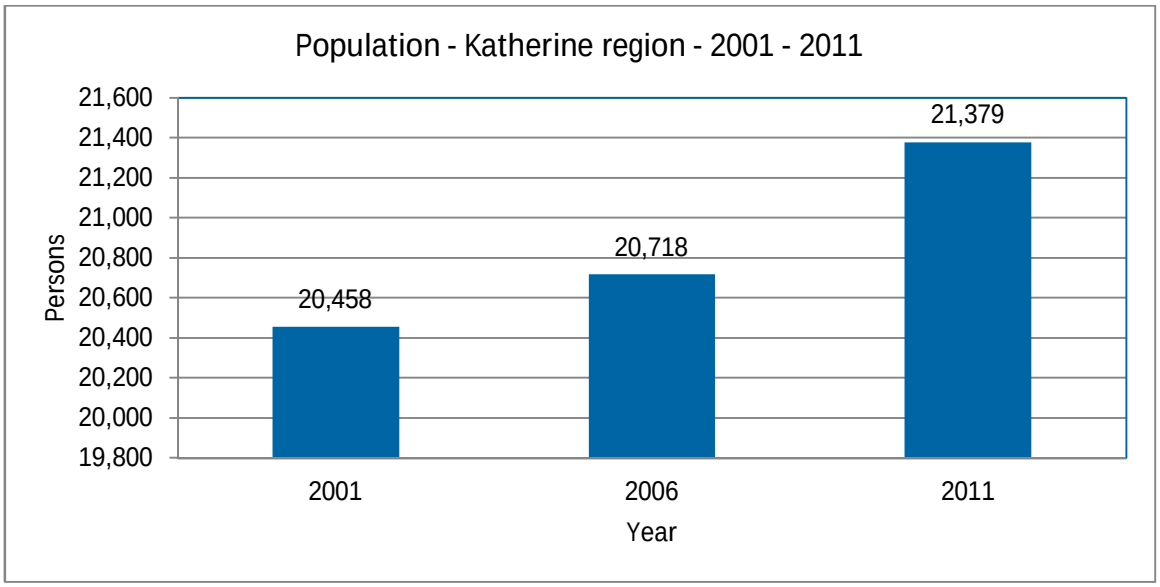

Figure 1: Katherine region historical population growth

Source: GHD analysis based on ABS (2012b)

3.1.2 Indigenous persons profile

The land surrounding the town of Katherine has been home to the Jawoyn people for thousands of years (NTG, 2013). The Katherine region is home to a comparatively high proportion of Indigenous persons. In 2011, 9,121 people identified themselves as being Aboriginal, Torres Strait Islander or both. This represents approximately 43 per cent of the total population (ABS 2012a). By comparison, in the same year, the proportion of people across the Northern Territory and the whole of Australia who identified themselves as being Aboriginal or Torres Strait Islander was approximately 25 per cent and 2.5 per cent respectively (ABS 2012e).

3.2 Labour market

3.2.1 Employment profile

In 2011, there was an estimated 8,035 persons working in the Katherine region (ABS 2012b). This is up from 7,522 in 2006. Between 2006 and 2011, the number of persons working within the Katherine region grew by 513.

The major employing industries in the Katherine region in 2011 were public administration and safety (24 per cent), health care and social assistance (11 per cent), agriculture, forestry and fishing (9 per cent), education and training (9 per cent) and retail trade (7 per cent) (Figure 2).

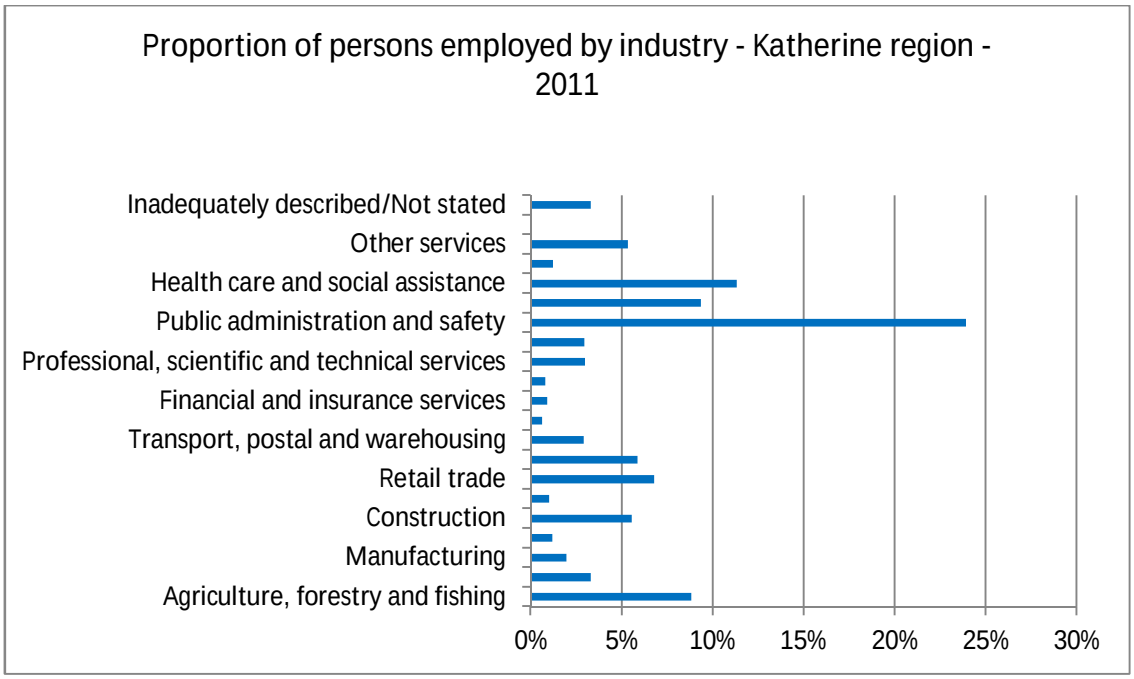

Figure 2: Proportion of people employed in the Katherine region

Source: ABS (2012b)

Figure 3 shows the dominance of the public administration and safety sector as an employer in the Katherine region although the total number of persons employed in the sector has declined between 2001 and 2006 and again between 2006 and 2011. The health care and social assistance sector is the second largest employing sector in the Katherine region. Persons employed in the education and training, and agriculture, forestry and fishing sectors has increased gradually between 2001 and 2006 and again between 2006 and 2011.

The accommodation and food services and retail trade sectors support a stable level of employment in the Katherine region. Katherine and surrounds are a popular destination for tourists who are drawn to the area due to its natural assets which include Katherine Gorge.

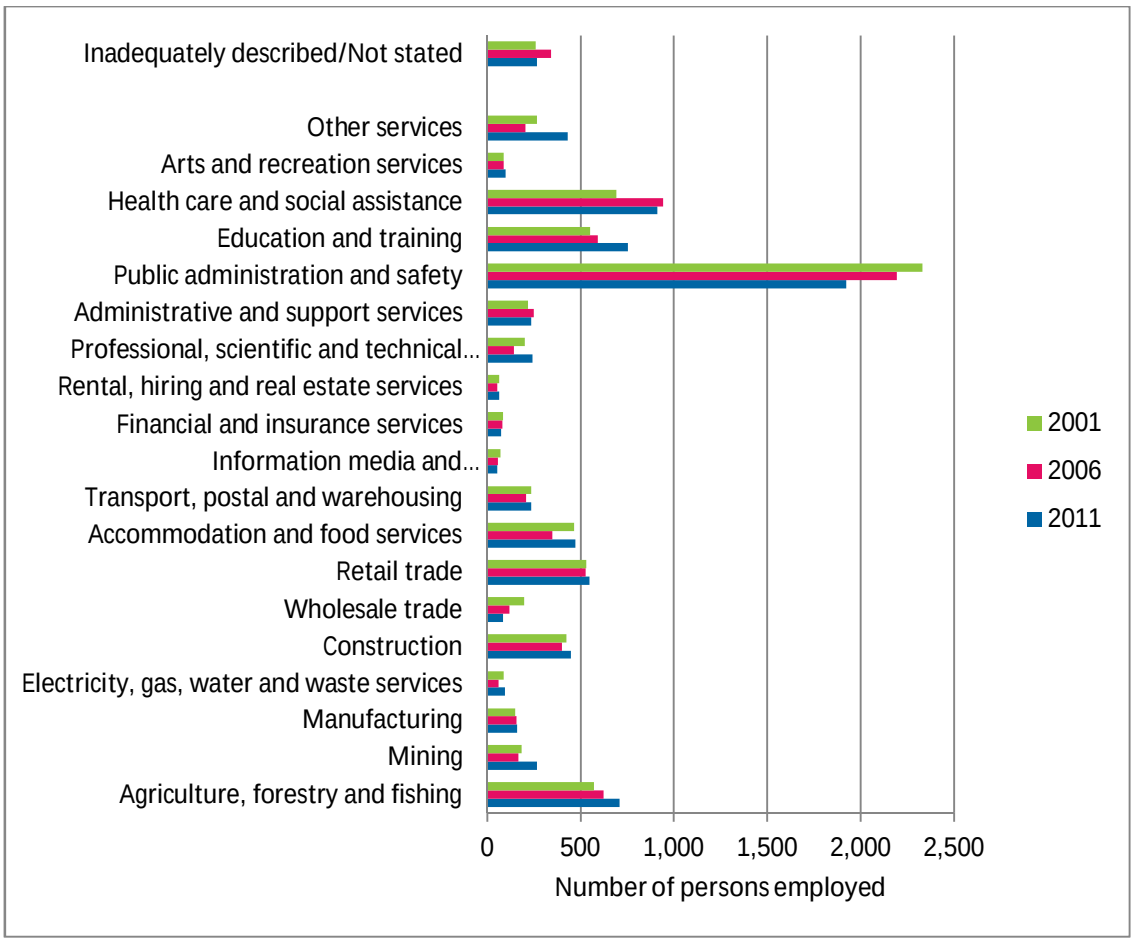

Figure 3: Employment by industry – Katherine region – 2001, 2006 and 2011

Source: ABS (2012b)

3.2.2 Unemployment profile

The unemployment rate in the Katherine region followed the general trend of the Northern Territory and declined between 2001 and 2006. Between 2006 and 2011, the unemployment rate in the Katherine region increased markedly from 5.3 per cent in 2006 to 8.7 per cent in 2011 (Figure 4). At 8.7 per cent, the unemployment rate in Katherine was higher than that of the Northern Territory (5.1 per cent) and Australia (5.6 per cent) in 2011 (ABS 2012a).

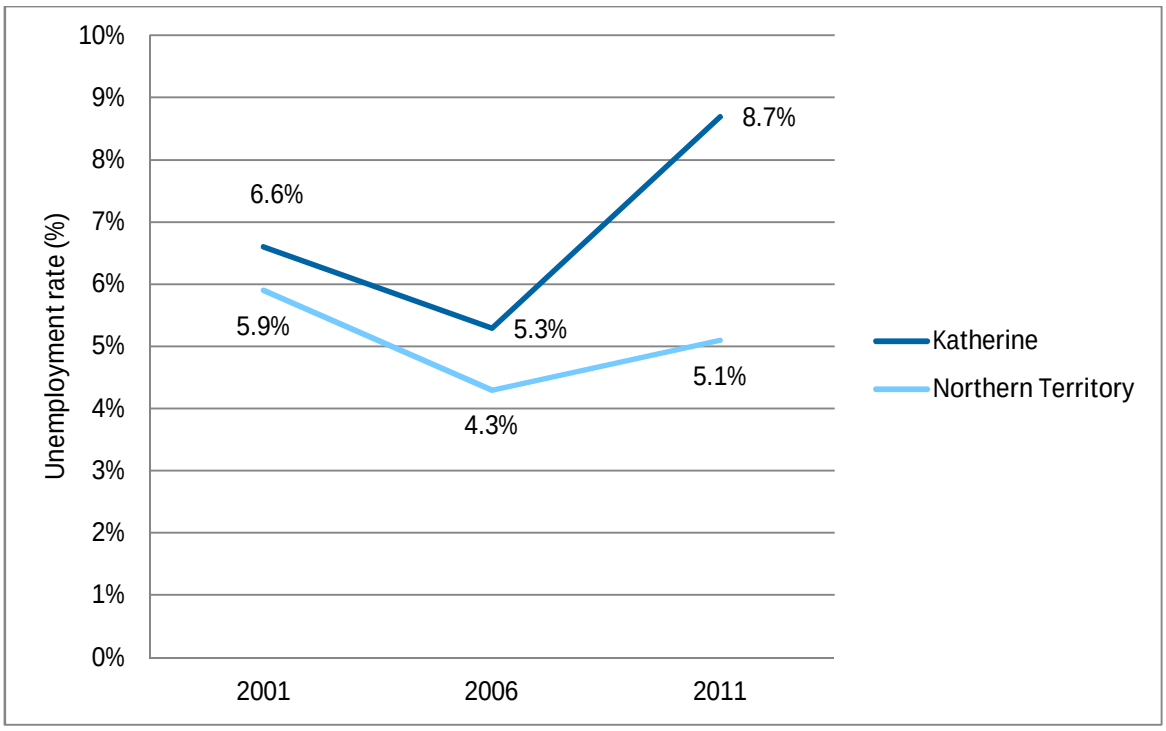

Figure 4: Unemployment rate – Katherine and Northern Territory – 2001 - 2011

Source: ABS (2012b)

3.2.3 Income profile

Median personal and household income levels have been rising at a steady rate in the Katherine region between 2001 and 2011. During this time, median personal incomes have risen at an average rate of 7 per cent per annum while median household incomes have risen at an average annual rate of 5 per cent per annum (Figure 5). By comparison, median personal and household income in the Northern Territory has increased at a rate of 7 per cent per annum between 2001 and 2011 (ABS 2012f).

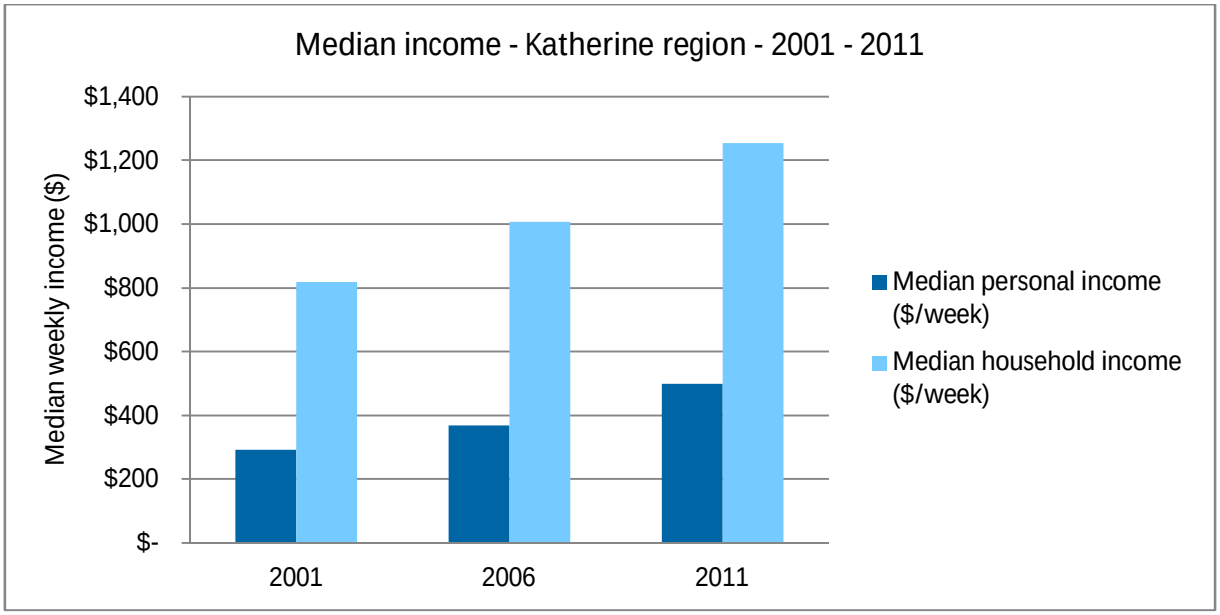

Figure 5: Median income - Katherine region - 2001 - 2011

Source: ABS (2012b)

3.3 Economic baseline

3.3.1 Economic output and industry trends – Katherine region

GRP is an indicator of regional economic performance and can be used to demonstrate the size and make-up of an economy. The Northern Territory Government reports that the GRP of the Katherine region in 2006 was $1.12 billion[3]. This represented 8.4 per cent of the total Gross State Product (GSP) of the Northern Territory in 2006 which was estimated at $13.4 billion (NTG 2008).

The top six sectors in terms of contribution to the GRP of the Katherine region in 2006 were:

- Mining ($270 million);
- Government administration and defence ($145 million);
- Agriculture, forestry and fishing ($73 million);
- Health and community services ($68 million);
- Construction ($57 million); and
- Education ($40 million) (NTG 2008).

In 2006, the mining industry was a key contributor to economic output in the Katherine region. At this time, the major mining operation operating in the Katherine region was the McArthur River zinc mine which is located 65 kilometres south-west of Borroloola. The mine commenced operations in 1995 and is estimated to continue to produce zinc and lead through to 2027 (McArthur River Mining 2013). The mine has an annual production capacity of 2.5 million tonnes. Other smaller mining operations operating in the Katherine region include limestone and gravel operations (NTG 2008).

The agriculture, forestry and fishing industry is also a major contributor to GRP in the Katherine region. Key primary industries include:

- Pastoral activity - predominantly cattle production however there is also some buffalo produced in the region (NTG 2008);
- Horticulture – including mangoes, melons, citrus and sandalwood (NTG 2013); and
- Dryland farming.

Residential and non-residential construction activity is also a key industry in terms of contribution to GRP and to employment. As outlined in section 3.3.3, the construction sector also accounts for the most number of businesses in the Katherine region.

3 This is the most recent data that was available.

3.3.2 Economic output – Northern Territory region

GSP for the Northern Territory has been increasing gradually since 2004 at an average annual rate of 4 per cent (Figure 6).

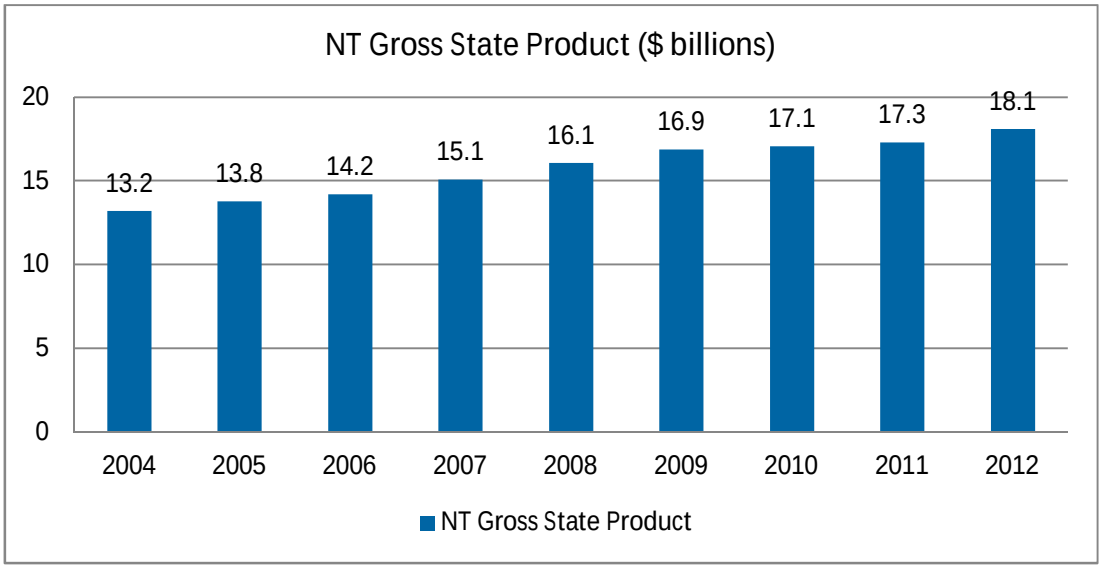

Figure 6: Northern Territory Gross State Product (2004 – 2012)

Source: ABS, 2012(d), Chain volume measures, denominated in 2011 dollars.

In 2012, key sectors in terms of contribution to the Northern Territory GSP were:

- Mining (19 per cent);
- Construction (12 per cent);
- Ownership of dwellings (11 per cent); and
- Public administration and safety (8 per cent) (ABS 2012e).

3.3.3 Business counts - Katherine

The construction and agriculture, forestry and fishing sectors were the dominant sectors in terms of businesses in Katherine in June 2011 (Figure 7).

The number of business entries (new businesses) in the Katherine region has been steady between 2008 and 2011. At the same time, the number of business exits in the Katherine region declined slightly between 2008 and 2011 (Figure 8). The net result is a slight increase in the number of businesses in the Katherine region between 2008 and 2011 from 864 to 911 (ABS 2012d).

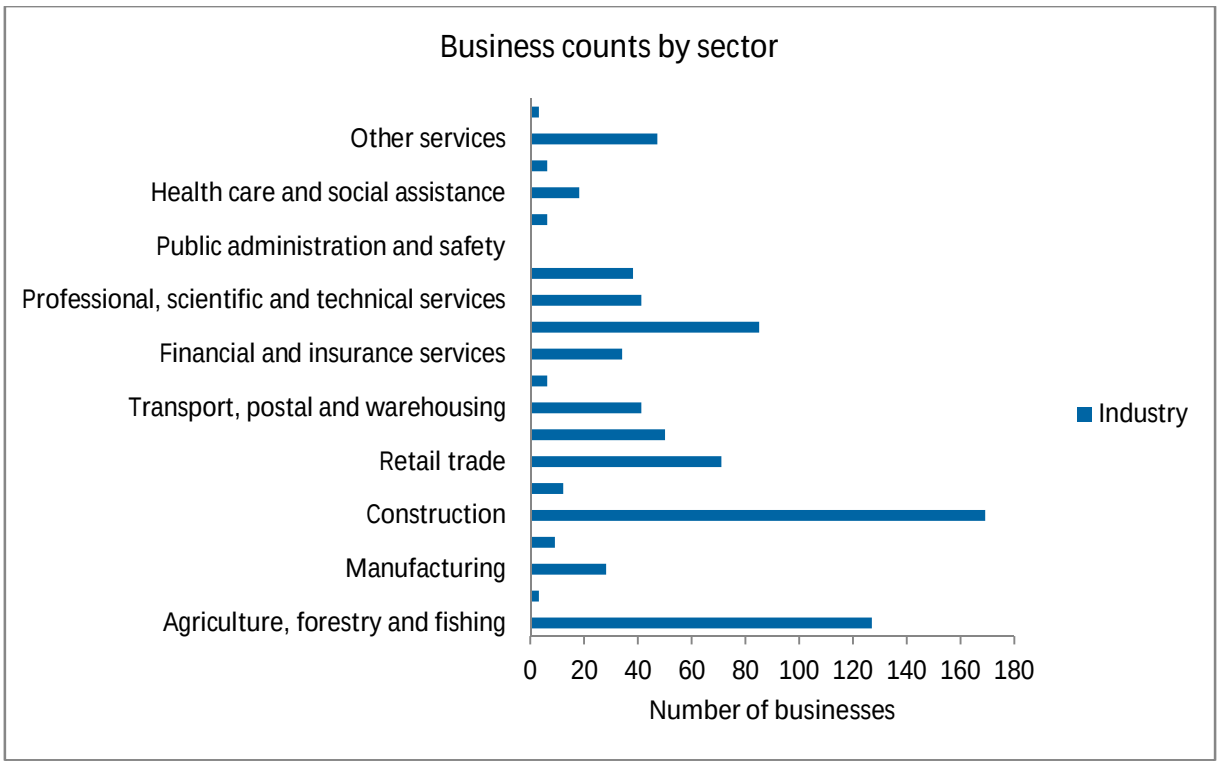

Figure 7: Business counts by sector – Katherine – June 2011

Source: ABS (2012c)

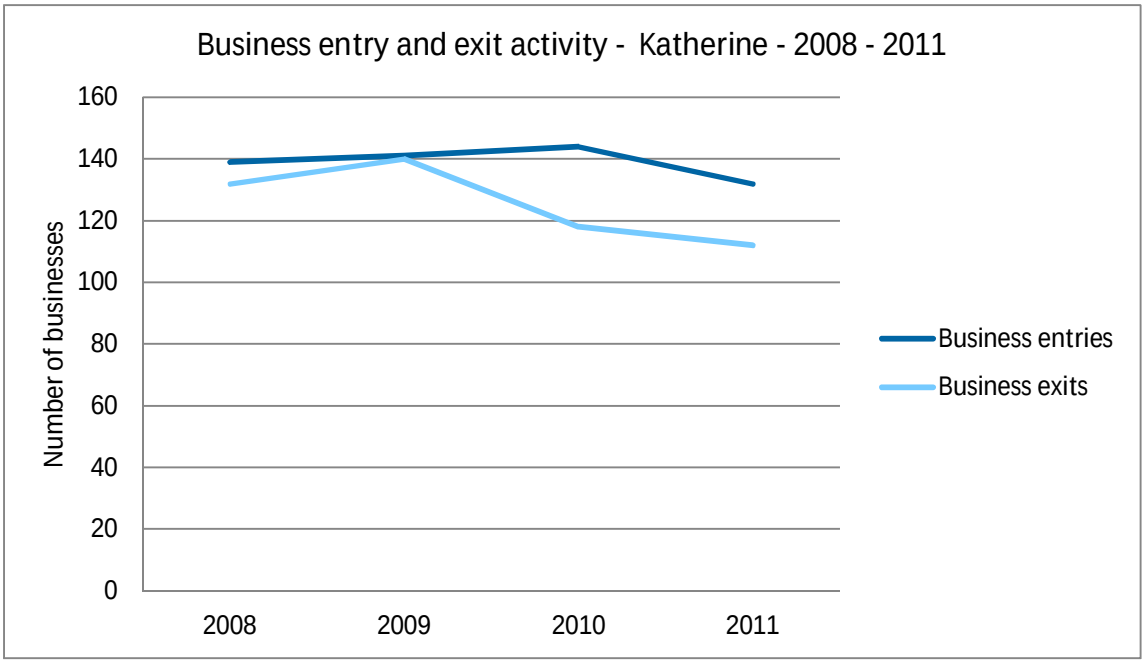

Figure 8: Business entries and exits – Katherine – 2008 - 2011

Source: ABS (2012d)

3.4 Property values

Median house values have risen by 22 per cent in Katherine in the four years between 2009 and 2013. Much of this rise occurred between early 2009 and mid-2010. Since mid-2010, the median house price in Katherine has been flat. Between February 2012 and February 2013, the median house price in Katherine fell 3.5 per cent (Property Observer 2013) (Figure 9).

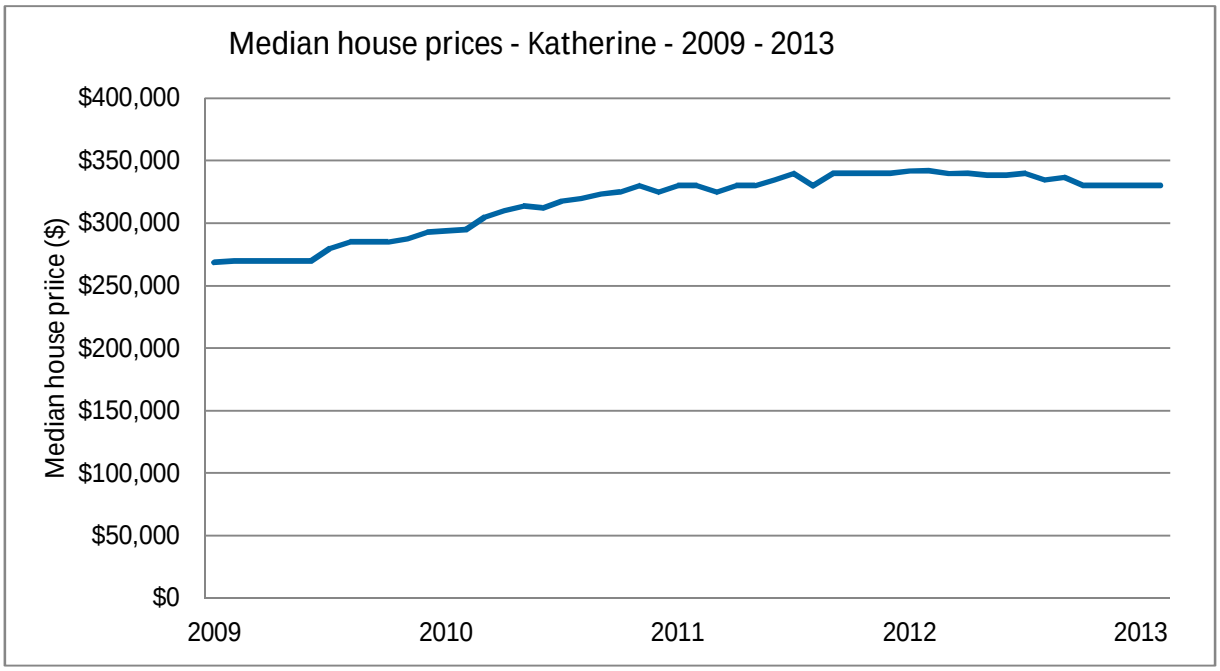

Figure 9: Median house prices – Katherine – 2009 – 2013

Source: Property Observer, 2013

4. Economic impact assessment

4.1 Potential economic impacts of the project

The potential economic impacts of the Project on the local/regional economy and the economy of the Northern Territory have been assessed for the construction and operations phases of the Project.

Subject to all necessary approvals being achieved, project construction is anticipated to take two years, including six months pre-production. The mine is scheduled to operate for a further 13 years followed by a four year closure and rehabilitation period.

As noted in section 2.3.2, estimates of economic impact are based on the use of an input-output (I-O) method. I-O analysis provides a comprehensive economic framework that provides a numerical picture of the size and shape of the economy and its essential features. The I-O model can then estimate economic impacts arising from a proposed project, including estimating industry multipliers and flow-on effects.

The economic impact of the Project is measured by the contribution of the Project to:

- Gross Regional Product (GRP) - a measure of the value of a region's outputs minus the cost of inputs. It is therefore able to measure the net contribution of the Project to the relevant economies (i.e. the Katherine region and the Northern Territory).
- Employment - identifies the number of Full Time Equivalent (FTE) persons engaged in work within a region. In this assessment, employment is measured by place of enumeration rather than place of residence.

Economic indicators, which provide a picture of economic activity in a region resulting from a specific activity, can be considered at two levels:

- Direct/initial impacts - identify the change in final demand or level of economic activity generated by the development;
- Indirect/flow-on impacts – are the total of:
  - Production induced impacts – purchasing goods and services from other industries and employment;
  - Consumption induced impacts – additional output and employment stemming from the consumption of additional goods and services by households that are the result of increased wages or employment in the development and associated activities; and
  - Offset consumption effects – the lost consumption by the local unemployed before they take a new job and the lost consumption of those who have lost a job before they start receiving welfare payments.

Direct and indirect flows into affected economies are summed in order to ascertain the total impact. Economic impacts (GRP and employment) are assessed at the regional and state levels during both the construction and operations phases of the mine.

The indirect (flow-on) impacts were calculated using the I-O models constructed for this Project and they measure the economic effects in other sectors of the economy generated by direct activities, that is, the multiplier effects. In addition to the assumptions embodied in the input-output model itself (Appendix A), it was necessary to make a number of other general assumptions in estimating the economic impacts:

- The impacts were measured using models that represent the structure of the regional and state economies for the year in which the most recent data are available (2011/12). However, over time there are likely to be improvements in primary factor productivity in these economies. To allow for these improvements, an across-the-board (all sectors) labour productivity improvement rate of 1 per cent per annum for subsequent years of the construction period has been incorporated into the modelling.
- When new jobs are created, it should be determined where the people come from to fill those jobs. In some cases, these jobs will be taken by previously unemployed locals or by someone who is currently employed locally but whose own job is taken by a previously unemployed local. In both cases, the impact of the newly created job and associated income is partially offset by the fact that someone who was previously receiving unemployment benefits is no longer doing so. To calculate this effect requires estimates of the parameter rho (Appendix A). Rho represents the proportion of new jobs that are likely to be filled by previously unemployed locals. For the construction phase, it was estimated to be 50 per cent for the local area and 60 per cent for the Northern Territory as a whole.

4.2 Economic impact – construction phase

The Project will involve capital expenditure of approximately $1.5 billion in total during the construction phase. Construction is anticipated to commence in the first quarter of 2014 and take two years, including six months pre-production. Some construction activity will continue throughout the course of the Project as indicated in Table 1. For presentation purposes, the years 2024 to 2029 have been omitted. Construction expenditure in these years gradually declines from the expenditure reported in 2023.

It was estimated that, over the life of the mine, 11 per cent of the capital investment for the construction of the mine will occur in the Katherine region and 32 per cent elsewhere in the Northern Territory. The remaining capital expenditure (58 per cent of the total) will occur outside the Northern Territory.

Table 1: Direct expenditure – construction phase ($m)

Year →	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023.....	2030	Total[4]
Katherine region	54.5	55.8	9.6	1.8	8.0	3.1	2.6	3.5	2.4	4.0	3.1	162.8
Elsewhere in the Northern Territory	164.1	168.1	28.9	5.3	24.0	9.2	7.9	10.6	7.1	12.0	9.3	489.9
Outside the Northern Territory	296.8	304.1	52.2	9.6	43.5	16.7	14.3	19.1	12.9	21.7	16.8	886.1
Total	515.4	528.0	90.7	16.7	75.5	28.9	24.8	33.2	22.4	37.7	29.2	1,538.8

[4] Does not include expenditure data years 2024-2029 – refer section 4.2

GRP and GSP are a measure of the net contribution of an activity or industry to the regional economy. They represent payments to the primary inputs of production (labour, capital and land) and are a regional/state level equivalent of gross domestic product. Estimates of GRP for the Katherine region and elsewhere in the Northern Territory and GSP for the Northern Territory as a whole during the construction period are provided in Table 2. For presentation purposes, the years 2024 to 2029 have been omitted.

During the construction phase, the direct and flow-on GRP in the Katherine region is expected to be around $27.1 million in 2014 and $27.8 million in 2015. Expenditure on mine construction is expected to continue until 2030 but at a significantly lower level from 2016 onwards. As such, the GRP total impact is expected to fall to $4.8 million in 2016 and gradually decline for the remainder of the construction phase. The Project is estimated to boost GRP in the Katherine region by around 2.9 per cent in 2015 (the peak year) based on current (2011/12) regional total GRP ($957 million).

For the Northern Territory, the Project is expected to generate GSP of $133 million in year 1 and $136 million in 2015. The GSP total impact is expected to fall to $23.4 million in 2016 and gradually decline for the remainder of the construction phase. In the context of the Northern Territory's GSP in 2011/12 ($18.6 billion) (ABS 2012b), the estimated GSP total impact in 2015 (the peak year) would represent an increase of 0.7 per cent.

Employment is an important indicator of both regional economic activity and the welfare of regional households. Table 3 shows total (direct plus flow-on) employment in the Katherine region, elsewhere in the Northern Territory and for the Northern Territory as a whole as a result of the construction phase of the Project. Employment numbers are expressed in Full Time Equivalent (FTE) terms. Table 3 shows that total (direct plus flow-on) employment in the Katherine region is expected to increase to 242 FTE in 2014 and 245 FTE in 2015. As a result of construction expenditure falling significantly in the remaining construction period post 2016, employment declines to 42 FTE in year 3 of construction and falls further in subsequent years. The direct plus flow-on employment in the peak year (2015) is 3.3 per cent of the estimated employment (FTE) for the Katherine region for 2011/12 (7,400 FTE).

For the Northern Territory, direct and indirect employment is expected to increase to 859 FTE in 2015, the peak year. This would represent a 0.8 per cent increase in employment over 2011/12 levels (112,000 FTE).

Table 2: Economic impact of the Mine – construction phase ($m)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023……	2030
Katherine region GRP ($m)											
Direct	18.5	19.0	3.3	0.6	2.7	1.0	0.9	1.2	0.8	1.4	1.0
Flow-on	8.6	8.8	1.5	1.3	1.3	0.5	0.4	0.6	0.4	0.6	0.5
Total	27.1	27.8	4.8	0.9	4.0	1.5	1.3	1.8	1.2	2.0	1.5
Elsewhere in the Northern Territory GRP ($m)											
Direct	62.7	64.2	11.0	2.0	9.2	3.5	3.0	4.0	2.7	4.6	3.5
Flow-on	43.1	44.1	7.6	1.4	6.3	2.4	2.1	2.8	1.9	3.2	2.4
Total	105.8	108.4	18.6	3.4	15.5	5.9	5.1	6.8	4.6	7.7	5.9
Total Northern Territory GSP ($m)											
Direct	81.2	83.2	14.3	2.6	11.9	4.6	3.9	5.2	3.5	6.0	4.6
Flow-on	51.7	52.9	9.1	1.7	7.6	2.9	2.5	3.3	2.3	3.8	2.9
Total	132.9	136.1	23.4	4.3	19.5	7.4	6.4	8.6	5.8	9.8	7.4

Table 3: Employment impact of the Mine – construction phase ($m)

Year →	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023……	2030
Katherine region employment (FTE)											
Direct	174	177	30	5	25	9	8	10	7	12	8
Flow-on	67	68	12	2	9	4	3	5	3	4	3
Total	242	245	42	7	34	13	11	15	10	16	12
Elsewhere in the Northern Territory employment (FTE)											
Direct	380	385	66	12	53	20	17	23	15	25	18
Flow-on	225	229	39	7	32	12	10	14	9	15	11
Total	605	614	104	19	85	32	27	37	24	40	29
Total Northern Territory employment (FTE)											
Direct	554	562	96	17	78	30	25	33	22	37	27
Flow-on	293	297	51	9	41	16	13	19	12	19	14
Total	847	859	146	26	119	45	38	52	34	56	41

4.3 Economic impact –operations phase

The economic impact analysis of the operational expenditure of the mine was conducted using the operational expenditure profile presented in Table 4.

The operating phase will be characterised by the additional expenditure on mine operation, which will begin in 2016, increase until it reaches a maximum in 2020 (around $330 million) and gradually decline as production of the mine winds down. Total operational expenditure in 2020, once the mine is in full production, of around $330 million will comprise mining costs ($165 million), processing costs ($164 million) and water treatment plant costs ($1 million). There will be 20 per cent of operating expenditure spent in the Katherine region, 45 per cent will be spent elsewhere in the Northern Territory and 35 per cent will be spent outside the Northern Territory. For presentation purposes, the years 2024 to 2029 have been omitted.

In 2020, at full production of the mine, the direct and flow-on GRP in the Katherine region from the operation of the mine is expected to be $40.6 million, which represents 4.2 per cent of the current (2011/12) regional total GRP ($957 million). For the Northern Territory, the Project is expected to generate GSP of around $146 million in 2020. In the context of the Northern Territory's GSP in 2011/12 ($18.6 billion) (ABS 2012b), the estimated GSP total impact would represent an increase of 0.8 per cent.

In 2020, full production of the mine, total (direct plus flow-on) employment in the Katherine region is expected to be 139 FTE which represents 1.9 per cent of the estimated employment (FTE) for the Katherine region for 2011/12 (7,400 FTE). For the Northern Territory, direct and indirect employment is expected to be 426 FTE in 2020 which accounts for 0.4 per cent of total FTE employment in the Northern Territory for 2011/12.

Table 4: Mine operating expenditure profile ($m)

Year →	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025……	2030
Katherine region	53.1	58.5	65.5	65.9	66.0	65.3	62.8	59.7	61.5	60.8	0.3
Elsewhere in the Northern Territory	119.6	131.6	147.4	148.3	148.5	146.9	141.4	134.2	138.4	136.7	0.6
Outside the Northern Territory	93.0	102.4	114.6	115.4	115.5	114.3	110.0	104.4	107.6	106.3	0.4
Total	265.7	292.5	327.5	329.6	330.0	326.5	314.2	298.3	307.5	303.8	1.3

Table 5: Economic impact of the Mine – operating phase

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025……	2032
Katherine region GRP ($m)											
Direct	25.6	28.2	31.6	31.8	31.8	31.5	30.3	28.8	29.6	29.3	0.1
Flow-on	7.0	7.8	8.7	8.7	8.7	8.7	8.3	7.9	8.2	8.1	0.1
Total	32.7	36.0	40.3	40.5	40.6	40.1	38.6	36.7	37.8	37.3	0.2
Elsewhere in the Northern Territory GRP ($m)											
Direct	58.7	64.7	72.4	72.9	72.9	72.2	69.5	65.9	68.0	67.2	0.3
Flow-on	26.4	29.0	32.5	32.7	32.7	32.4	31.2	29.6	30.5	30.1	0.1
Total	85.1	93.7	104.9	105.6	105.7	104.5	100.6	95.5	98.5	97.3	0.4
Total Northern Territory GSP ($m)											
Direct	84.3	92.9	104.0	104.7	104.7	103.7	99.8	94.7	97.6	96.5	0.4
Flow-on	33.4	36.8	41.2	41.4	41.4	41.1	39.5	37.5	38.7	38.2	0.2
Total	117.7	129.7	145.2	146.1	146.2	144.8	139.3	132.2	136.3	134.7	0.6

Table 6: Employment impact of the Mine – operations phase

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025……	2032
Katherine region employment (FTE)											
Direct	61	67	74	74	73	72	68	64	65	64	0
Flow-on	56	61	67	67	66	65	62	58	59	58	0
Total	117	127	141	141	139	136	130	122	124	122	0
Elsewhere in the Northern Territory employment (FTE)											
Direct	102	111	123	123	122	119	114	106	108	106	0
Flow-on	138	151	167	167	165	162	154	144	147	144	1
Total	240	262	290	290	287	281	268	250	255	250	1
Total Northern Territory employment (FTE)											
Direct	163	178	197	197	195	191	182	170	173	170	0
Flow-on	194	212	234	234	231	227	216	202	206	202	1
Total	357	390	431	431	426	418	398	372	379	372	1

4.4 Value of production/exports

Vista Gold estimates total gold production of 4.81 million ounces over the course of the 13 year operation phase of the Project. This equates to an average production estimate of 370,000 ounces of gold per annum.

Assuming a gold price of $1,400 AUD per ounce, the value of this production is estimated at approximately $6.7 billion (undiscounted). At $1,300 AUD per ounce, the value of this production is estimated at $6.3 billion (undiscounted).

4.5 Royalties and taxes

It is estimated that the Project will generate the following taxes and royalty payments:

- $70 million in royalty payments to the local indigenous community (the Jawoyn people).
- $277 million in royalty payments to the Northern Territory Government.
- $469 million in taxation payments to the Australian Government.

Source: Vista Gold Corp, 2013.

4.6 Markets for gold produced at Mt Todd

It is proposed that gold dore bars will be produced on site at the mine. The gold dore bars will then be transported to Darwin where they will be shipped to a refinery where the dore bars will undergo a further purification process.

Major markets for Australian produced gold include Asia (particularly India) and the United Kingdom. The Australian Department of Foreign Affairs and Trade report that in 2010, India and the United Kingdom accounted for approximately 73 per cent of Australian gold exports (DFAT 2011). Other export destinations for Australian produced gold include Thailand, Singapore and Hong Kong.

Demand for gold includes:

- consumptive uses including use in jewellery, electronics and other industrial applications; and
- financial uses where central banks purchase and hold gold as part of a suite of assets that make up their reserves. Gold is often held by central banks together with foreign currency reserves. Gold provides diversification to reserve portfolios and is often seen as a safe haven during times of economic uncertainty and devaluation of more traditional reserve assets such as the US dollar and the euro (World Gold Council 2013).

4.7 Breakdown of skills/trades required and opportunities for skills development

A range of skills will be required during construction and operation of the mine including:

- a Construction Manager and other specialist mine managers;
- engineers;
- tradespeople (e.g. carpenters, electricians and boilermakers);
- civil construction personnel;
- machine operators;
- mobile plant operators;
- labourers;

- health, safety and environment personnel;
- accountants and administrative staff;
- mining Superintendent and support staff;
- mining engineers, geologists and surveyors;
- electrical superintendents and instrumentation technicians;
- truck drivers;
- stationary and mobile plant operators;
- mining labourers;
- specialist support staff including Human Resources personnel.

Vista Gold intends to develop training and employment policies and targets. It is intended that training will be done in collaboration with local and Northern Territory Government agencies where possible.

Any employment and training opportunities that the Project can provide to local residents should create an ongoing benefit to the local community in terms of improving the skill base of the local community. The extent to which this potential benefit is realised will depend on the extent to which local residents are employed either in the construction or operational phases of the Project and the extent to which these people remain in the Katherine region once the mine operations have been finalised.

4.8 Opportunities for local industry and indigenous workforce participation in the construction and operation phases

The I/O analysis estimates that the Project is expected to employ up to 554 direct workers during construction and up to 197 direct workers once the mine is operational.

The I/O analysis also estimates significant opportunities in flow-on employment with up to 293 flow-on jobs across the Northern Territory during construction and up to 234 during peak operations. Many of these opportunities will occur locally.

The Project is expected to require a range of skills and provide for a range of employment opportunities. Vista Gold has specified a preference for a local, residential workforce.

Vista Gold is aware of local and regional recruitment/employment agencies and will consult with them prior to the start of operations in order to facilitate local and regional employment opportunities.

Recruitment will commence approximately 6 months before the start of operations, and will be ongoing during operations as the workforce requirements evolve.

Vista Gold will develop human resource policies tailored for the residential workforce and to attract and retain local and regional employees.

4.9 Contribution to indigenous economic development and wider regional development

As outlined in section 3.1.2, approximately 43 per cent of the Katherine region population are Indigenous. The mine site and tenements are located on freehold land owned by the Jawoyn people. Vista Gold has an agreement in place to support local indigenous employment prior to and once the mine becomes operational (Vista Gold 2013). Vista Gold has also advised that they will develop an Indigenous employment strategy under the Jawoyn Partnership Agreement (Appendix F).

Vista Gold has been and will continue to be engaged in discussions with the local community - including the local business community. For example, in early June 2013, Vista Gold participated in the Katherine Regional Mining and Exploration Forum. The forum provided an opportunity to showcase the importance of the mining sector to the Katherine region. The forum also provided an opportunity for discussions between local business and staff of Vista Gold, with a focus on opportunities for possible joint ventures (Vista Gold 2013).

4.10 Negative impacts or potential synergies with exisiting land uses

The mine site has existing environmental and water quality issues that require ongoing management. Since acquiring the brownfield mine in 2006, Vista Gold has spent approximately $9 million on 'environmental stewardship' activities designed to treat water quality issues related to previous operations at the mine. This expenditure, and future environmental stewardship activities, provide a benefit to the local and regional community and the environment in the form of improved environmental outcomes and benefits to other land uses in the surrounding region. This includes the agricultural sector and for the nearby Werenbun Aboriginal community.

4.11 Socio-economic impacts upon local residents, communities and towns

Development of the Project is estimated to deliver considerable economic benefits to the region in the form of direct and indirect employment opportunities and expenditure. A detailed analysis of social impacts can be found in Appendix F.

4.12 Contribution to community benefit

Under the *Mineral Royalty Act* 1982, the Northern Territory Government collects royalty payments "in respect of the profit derived from minerals taken or produced" (Northern Territory Treasury 2013). The royalty scheme aims to encourage exploration and development of the Northern Territory's mineral resources whilst "compensating the Northern Territory community for allowing the private extraction of the Northern Territory's non-renewable resources" (Northern Territory Treasury 2013).

The Project is expected to generate approximately $277 million in royalty payments to the Northern Territory Government. Some of this revenue could fund community infrastructure across the Northern Territory.

Generation of employment and economic output in the Katherine region could in-turn lead to investment in new community infrastructure which has a lasting legacy in the local area.

Vista Gold is working with local and State Government to identify and address key infrastructure issues. For example, Vista Gold will encourage a 'whole of government' approach to develop a strategy to provide housing and accommodation options particularly during the operations phase.

4.13 Informing the local business community and workers of business and employment opportunities

Vista Gold will incorporate the following strategies to inform local businesses and residents of business and employment opportunities:

1. Advertise employment opportunities through a variety of media including local and regional print media (e.g. NT News, Katherine Times) and online (e.g. the Mt Todd gold mine website).
2. Continue dialogue with the local community and participate in local business development forums such as the recent Regional Mining and Exploration Forum held at Katherine.

4.14 Socio-economic parameters to be monitored

Development of the Project is expected to have a range of positive economic impacts for communities in the Katherine region and in the Northern Territory more broadly. Economic benefits include:

- Job creation;
- Increased income benefits; and
- Investment in residential and non-residential buildings.

Socio-economic indicators or parameters that should be monitored on an ongoing basis in order to gain an understanding of actual benefits include:

- Employment by industry – particularly in the mining sector but also in supporting sectors including the construction sector;
- Unemployment rates – it is expected that the unemployment rate in the Katherine region would decline as a result of job creation through the Project;
- Median personal and household income levels – a significant new industry in the Katherine region is expected to have a positive impact on income levels in the region;
- Value of residential and non-residential approvals – it is expected that the Project will generate direct and indirect expenditure in residential and non-residential property as income levels rise and unemployment falls.

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Appendices

Appendix A - An overview of Economic Impact Analysis using the Input-Output method

Economic impact analysis based on an input-output (I-O) model provides a comprehensive economic framework that is extremely useful in the resource planning process. Broadly, there are two ways in which the I-O method can be used.

First, the I-O model provides a numerical picture of the size and shape of an economy and its essential features. The I-O model can be used to describe some of the important features of an economy, the interrelationships between sectors and the relative importance of the individual sectors.

Second, I-O analysis provides a standard approach for the estimation of the economic impact of a particular activity. The I-O model is used to calculate industry multipliers that can then be applied to various development or change scenarios.

The input-output database

Input-output analysis, as an accounting system of inter-industry transactions, is based on the notion that no industry exists in isolation. This assumes, within any economy, each firm depends on the existence of other firms to purchase inputs from, or sell products to, for further processing. The firms also depend on final consumers of the product and labour inputs to production. An I-O database is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given point in time.

As noted above, I-O models provide a numerical picture of the size and shape of the economy. Products produced in the economy are aggregated into a number of groups of industries and the transactions between them recorded in the transactions table. The rows and columns of the I-O table can be interpreted in the following way:

- The rows of the I-O table illustrate sales for intermediate usage (i.e. to other firms in the region) and for final demand (e.g. household consumption, exports or capital formation).
- The columns of the I-O table illustrate purchases of intermediate inputs (i.e. from other firms in the region), imported goods and services and purchases of primary inputs (i.e. labour, land and capital).
- Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

In summary, the I-O model can be used to describe some of the important features of a state or regional economy, the interrelationships between sectors and the relative importance of the individual sectors. The model is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the economy.

Using input-output analysis for estimation of economic impacts

The I-O model conceives the economy of the region as being divided up into a number of sectors and this allows the analyst to trace expenditure flows. To illustrate this, consider the example of a mine that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include fuel, machinery and spare parts, transport services, and, of course, labour. The direct employment created by the vineyard is regarded in the model as an expenditure flow into the household sector, which is one of several non-industrial sectors recognised in the I-O model.

Upon receiving expenditure by the vineyard, the other sectors in the regional economy engage in their own expenditures. For example, as a consequence of winning a contract for work with vineyard, a spraying contractor buys materials from its suppliers and labour from its own employees. Suppliers and employees in turn engage in further expenditure, and so on. These indirect and induced (or flow-on) effects[5], as they are called, are part of the impact of the vineyard on the regional economy. They must be added to the direct effects (which are expenditures made in immediate support of the vineyard itself) in order to arrive at a measure of the total impact of the vineyard.

It may be thought that these flow-on effects (or impacts) go on indefinitely and that their amount adds up without limit. The presence of leakages, however, prevents this from occurring. In the context of the impact on a regional economy, an important leakage is expenditure on imports, that is, products or services that originate from outside the region, state or country (e.g. machinery).

Thus, some of the expenditure by the vineyard (i.e. expenditure on imports to the region) is lost to the regional economy. Consequently, the flow-on effects get smaller and smaller in successive expenditure rounds due to this and other leakages. Hence the total expenditure created in the regional economy is limited in amount, and so (in principle) it can be measured.

Using I-O analysis for estimation of regional economic impacts requires a great deal of information. The analyst needs to know the magnitude of various expenditures and where they occur. Also needed is information on how the sectors receiving this expenditure share their expenditures among the various sectors from whom they buy, and so on, for the further expenditure rounds.

In applying the I-O model to economic impact analysis, the standard procedure is to determine the direct or first-round expenditures only. No attempt is made to pursue such inquiries on expenditure in subsequent rounds, not even, for example, to trace the effects in the regional economy on household expenditures by vineyard employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the vineyard.

The I-O model is instead based on a set of assumptions about constant and uniform proportions of expenditure. If households in general in the regional economy spend, for example, 13.3 per cent of their income on food and non-alcoholic beverages, it is assumed that those working in vineyards do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (i.e. multiplier calculations). Once a transactions table has been compiled, simple mathematical procedures can be applied to derive multipliers for each sector in the economy.

Input-output multipliers

Input-output multipliers are an indication of the strength of the linkages between a particular sector and the rest of the state or regional economy. As well, they can be used to estimate the impact of a change in that particular sector on the rest of the economy.

Detailed explanations on calculating I-O multipliers, including the underlying assumptions, are provided in any regional economics or I-O analysis textbook (see, for example, Jensen and West[6]). They are calculated through a routine set of mathematical operations based on coefficients derived from the I-O transactions model, as outlined below.

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[5] A glossary of I-O terminology is provided in Appendix 2.

6 Jensen, R.C. and West, G.R. 1986, Input-Output for Practitioners, Vol.1, Theory and Applications, Office of Local Government, Department of Local Government and Administrative Services, AGPS, Canberra.

The transactions table may be represented by a series of equations thus:

$$X_1 = X_{11} + X_{12} + \ldots\ldots\ldots\ldots\ldots + X_{1n} + Y_1$$
$$X_2 = X_{21} + X_{22} + \ldots\ldots\ldots\ldots\ldots + X_{2n} + Y_2$$
$$X_n = X_{n1} + X_{n2} + \ldots\ldots\ldots\ldots\ldots + X_{nn} + Y_n$$

Where X_i = total output of intermediate sector *i* (row totals);

X_{ij} = output of sector *i* purchased by sector *j* (elements of the intermediate quadrant); and

Y_j = total final demand for the output of sector *i*.

It is possible, by dividing the elements of the columns of the transactions table by the respective column totals to derive coefficients, which represent more clearly the purchasing pattern of each sector. These coefficients, termed 'direct' or 'I-O' coefficients, are normally denoted as aij, and represent the direct or first round requirements from the output of each sector following an increase in output of any sector.

In equation terms the model becomes:

$$X_1 = a_{11}X_1 + a_{12}X_2 + \ldots\ldots\ldots\ldots\ldots + a_{1n}X_n + Y_1$$
$$X_2 = a_{21}X_1 + a_{22}X_2 + \ldots\ldots\ldots\ldots\ldots + a_{2n}X_n + Y_2$$
$$X_n = a_{n1}X_{11} + a_{n2}X_2 + \ldots\ldots\ldots\ldots\ldots + a_{nn}X_n + Y_n$$

Where a_{ij} (the direct coefficient) = X_{ij}/X_j. This may be represented in matrix terms:

$X = AX + Y$

Where A = $[a_{ij}]$, the matrix of direct coefficients.

The previous equation can be extended to:

$(I\text{-}A)X = Y$

Where $(I\text{-}A)$ is termed the Leontief matrix,

or $X = (I\text{-}A)^{-1}Y$

where $(I\text{-}A)^{-1}$ is termed the 'general solution', the 'Leontief inverse' or simply the inverse of the open model.

The general solution is often represented by:

$Z = (I\text{-}A)^{-1} = [z_{ij}]$

The I-O table can be 'closed' with respect to certain elements of the table. Closure involves the transfer of items from the exogenous portions of the table (final demand and primary input quadrants) to the endogenous section of the table (intermediate quadrant). This implies that the analyst considers that the transferred item is related more to the level of local activity than to external influences. Closure of I-O tables with respect to households is common and has been adopted in this project.

The 'closed' direct coefficients matrix may be referred to as A*. The inverse of the Leontief matrix formed from A* is given by:

$Z^* = (I\text{-}A^*)^{-1} = [z^*_{ij}]$

Z^* is referred to as the 'closed inverse' matrix.

A multiplier is essentially a measurement of the impact of an economic stimulus. In the case of I-O multipliers the stimulus is normally assumed to be an increase of one dollar in sales to final demand by a sector. The impact in terms of output, contribution to gross regional product, household income and employment can be identified in the categories discussed below.

(i) The initial impact: refers to the assumed dollar increase in sales. It is the stimulus or the cause of the impacts. It is the unity base of the output multiplier and provides the identity matrix of the Leontief matrix. Associated directly with this dollar increase in output is an own-sector increase in household income (wages and salaries, drawings by owner operators etc.) used in the production of that dollar. This is the household income coefficient hj. Household income, together with other value added (OVA), provide the total gross regional product from the production of that dollar of output. The gross regional product coefficient is denoted vj. Associated also will be an own-sector increase in employment, represented by the size of the employment coefficient. This employment coefficient ej represents an employment/output ratio and is usually calculated as 'employment per million dollars of output'.

(ii) The first round impact: refers to the effect of the first round of purchases by the sector providing the additional dollar of output. In the case of the output multiplier this is shown by the direct coefficients matrix [aij]. The disaggregated effects are given by individual aij coefficients and the total first-round effect by Σaij. First-round household income effects are calculated by multiplying the first-round output effects by the appropriate household income coefficient (hj). Similarly, the first-round gross regional product and employment effects are calculated by multiplying the first-round output effects by the appropriate gross regional product (vj) and employment (ej) coefficients.

(iii) Industrial-support impacts. This term is applied to 'second and subsequent round' effects as successive waves of output increases occur in the economy to provide industrial support, as a response to the original dollar increase in sales to final demand. The term excludes any increases caused by increased household consumption. Output effects are calculated from the open Z inverse, as a measure of industrial response to the first-round effects. The industrial-support output requirements are calculated as the elements of the columns of the Z inverse, less the initial dollar stimulus and the first-round effects. The industrial support household income, gross regional product and employment effects are defined as the output effects multiplied by the respective household income, gross regional product and employment coefficients. The first-round and industrial-support impacts are together termed the production-induced impacts.

(iv) Consumption-induced impacts: are defined as those induced by increased household income associated with the original dollar stimulus in output. The consumption-induced output effects are calculated in disaggregated form as the difference between the corresponding elements in the open and closed inverse (i.e. z*ij - zij, and in total as Σ(z*ij - zij). The consumption-induced household income, gross regional product and employment effects are simply the output effects multiplied by the respective household income, gross regional product and employment coefficients.

(v) Flow-on impacts: are calculated as total impact less the initial impact. This allows for the separation of 'cause and effect' factors in the multipliers. The cause of the impact is given by the initial impact (the original dollar increase in sales to final demand), and the effect is represented by the first-round, industrial-support and consumption-induced effects, which together constitute the flow-on effects.

Each of the five impacts are summarised in It should be noted that household income, gross regional product and employment multipliers are parallel concepts, differing only by their respective coefficients hj, vj and ej.

The output multipliers are calculated on a 'per unit of initial effect' basis (i.e. output responses to a one dollar change in output). Household income, gross regional product and employment multipliers, as described above, refer to changes in household income per initial change in output, changes to gross regional product per initial change in output and changes in employment per initial change in output. These multipliers are conventionally converted to ratios, expressing a 'per unit' measurement, and described as Type I and Type II ratios. For example, with respect to employment:

Type I employment ratio = [initial + first round + industrial support]/initial

and

Type II employment ratio = [initial + production induced[7] + consumption induced]/initial

7 Where (first round + industrial support) = production induced.

Table 7: The structure of input-output multipliers for sector *i*[8]

Impacts	General formula
Initial	1
First-round	$\Sigma_i a_{ij}$
Industrial-support	$\Sigma_i z_{ij}$-1-$\Sigma_i a_{ij}$
Consumption-induced	$\Sigma_i z^*_{ij}$-$\Sigma_i z_{ij}$
Total	$\Sigma_i z^*_{ij}$
Flow-on	$\Sigma_i z^*_{ij}$-1
Household income multipliers ($)	
Initial	h_j
First-round	$\Sigma_i a_{ij} h_i$
Industrial-support	$\Sigma_i z_{ij} h_i$- h_j-$\Sigma_i a_{ij} h_i$
Consumption-induced	$\Sigma_i z^*_{ij} h_i$-$\Sigma_i z_{ij} h_i$
Total	$\Sigma_i z^*_{ij} h_i$
Flow-on	$\Sigma_i z^*_{ij} h_i$-h_j
Gross Regional Product multipliers ($)	
Initial	v_j
First-round	$\Sigma_i a_{ij} v_i$
Industrial-support	$\Sigma_i z_{ij} v_i$- v_j-$\Sigma_i a_{ij} v_i$
Consumption-induced	$\Sigma_i z^*_{ij} v_i$-$\Sigma_i z_{ij} v_i$
Total	$\Sigma_i z^*_{ij} v_i$
Flow-on	$\Sigma_i z^*_{ij} v_i$-v_j
Employment multipliers (full time equivalents)	
Initial	e_j
First-round	$\Sigma_i a_{ij} e_i$
Industrial-support	$\Sigma_i z_{ij} e_i$- e_j-$\Sigma_i a_{ij} e_i$
Consumption-induced	$\Sigma_i z^*_{ij} e_i$-$\Sigma_i z_{ij} e_i$
Total	$\Sigma_i z^*_{ij} e_i$
Flow-on	$\Sigma_i z^*_{ij} e_i$-e_j

[8] In a DECON model, Z* (the 'closed inverse' matrix), includes a population and an unemployed row and column (see below for details).

Model assumptions

There are a number of important assumptions in the I-O model that are relevant in interpreting the analytical results.

Industries in the model have a linear production function, which implies constant returns to scale and fixed input proportions.

Another model assumption is that firms within a sector are homogeneous, which implies they produce a fixed set of products that are not produced by any other sector and that the input structure of the firms are the same. Thus it is preferable to have as many sectors as possible specified in the models and the standard models for this study were compiled with 66 sectors.

The model is a static model that does not take account of the dynamic processes involved in the adjustment to an external change, such as a permanent change in natural resources management.

Extending the standard economic impact model as a DECON model

Based on work undertaken by EconSearch (2009[9] and 2010a[10]) and consistent with Mangan and Phibbs[11], the I-O model developed for this project was extended as demographic-economic (DECON) model. The two key characteristics of the DECON model, when compared with a standard economic model, are as follows.

1. The introduction of a population 'sector' (or row and column in the model) makes it possible to estimate the impact on local population levels of employment growth or decline.
2. The introduction of an unemployed 'sector' makes it possible to account for the consumption-induced impact of the unemployed in response to economic growth or decline.

The population 'sector'

The introduction of a population 'sector' to the standard I-O model allows for the calculation of population multipliers. These multipliers measure the flow-on population impact resulting from an initial population change attributable to employment growth or decline in a particular sector of the regional economy.

Calculation of population multipliers is made possible by inclusion of a population row and column in the 'closed' direct coefficients matrix of the I-O model.

Population row: the population coefficient (pj) for sector j of the DECON model is represented as:

pj = -rhoj * ej * family sizej

where rhoj = the proportion of employees in sector j who remain in the region after they lose their job (negative employment impact) or the proportion of new jobs in sector j filled by previously unemployed locals (positive employment impact);

ej = the employment coefficient for sector j; and

family sizej = average family size for sector j.

9 EconSearch 2009, Input-Output Tables for South Australia and its Regions, 2006/07: Technical Report, report prepared for the Department of Trade and Economic Development, May.
10 EconSearch 2010a, Local Input-Output Modelling of Victorian Primary Industries, report prepared for the Department of Primary Industries (Victoria), June.
11 Mangan, J. and Phibbs, P. 1989, Demo-Economic Input-Output Modelling with Special Reference to the Wollongong Economy, Australian Regional Developments 20, AGPS, Canberra.

Population column: the population column of the DECON model is designed to account for growth or decline in those sectors of the economy that are primarily population-driven (i.e. influenced by the size of the population) rather than market-driven (i.e. dependent upon monetary transactions). Clearly, many of the services provided by the public sector fit this description and, for the purpose of this analysis, it was assumed that the following intermediate sectors were primarily population-driven:

- public administration and defence;
- education;
- health and community services; and
- cultural and recreational services.

Thus, the non-market coefficient for sector j of the DECON model is represented as expenditure on that non-market service (by governments) in $million per head of population.

The population multiplier for sector j is represented as: z*pj / ppj

where z*pj = coefficient of the 'closed inverse' matrix in the population row for sector j; and

ppj = coefficient of the direct coefficients matrix in the population row for sector j.

Sources of local data for the population sector of the DECON models used in this project included the following:

- rho: little or no published data are available to assist with estimation of this variable, particularly at a regional level. The DECON models have been constructed to enable the analyst to estimate this variable on the basis of the availability superior data or assumptions.
- Family size: in order to estimate average family size by industry, relevant data were extracted from the Australian Bureau of Statistics 2006 Census of Population and Housing using the TableBuilder database. These data were modified by the consultants in order to ensure consistency with the specification and conventions of the I-O models.

The unemployed 'sector'

As outlined above, the introduction of an unemployed 'sector' to the standard I-O model makes it possible to account for the consumption-induced impact of the unemployed in response to economic growth or decline.

Through the inclusion of an unemployed row and column in the 'closed' direct coefficients matrix of the standard I-O model it is possible to calculate Type III multipliers (for output, gross regional product, household income and employment).

The key point to note is that, in the situation where at least some of the unemployed remain in a region after losing their job (negative employment impact) or some of the new jobs in a region are filled by previously unemployed locals (positive employment impact), Type III multipliers will be smaller than the more frequently used Type II multipliers.

Unemployed row: the unemployed coefficient (uj) for sector j of the DECON model is represented as:

uj = -rhoj * (1-essj) * ej

where:

rhoj = the proportion of employees in sector j who remain in the region after they lose their job (negative employment impact) or the proportion of new jobs in sector j filled by previously unemployed locals (positive employment impact);

essj = the proportion of employed in sector j who are not eligible for welfare benefits when they lose their job; and

ej = the employment coefficient for sector j.

Unemployed column: the unemployed column of the DECON model is an approximation of total consumption expenditure and the consumption pattern of the unemployed. It is represented as dollars per unemployed person rather than $million for the region as a whole, as is the case for the household expenditure column in a standard I-O model.

Sources of local (i.e. state and regional) data for the unemployed sector of the DECON models used in this study included the following.

ess: in order to estimate the proportion of employed by industry who are not eligible for welfare benefits when they lose their job, relevant data were extracted from the Australian Bureau of Statistics 2006 Census of Population and Housing using the TableBuilder database. These data were modified by the consultants in order to ensure consistency with the specification and conventions of the I-O models.

Unemployed consumption: total consumption expenditure by the unemployed was based on an estimate of the Newstart Allowance whilst the pattern of consumption expenditure was derived from household income quintiles in the 2003/04 Household Expenditure Survey (ABS 2006).

Incorporating a tourism demand profile in the I-O model

Tourism expenditure is a measure of the value of sales of goods and services to visitors to the state or region. The following method and data sources were used to estimate tourism expenditure by industry sector for the region.

The primary data were sourced from Tourism Research Australia (TRA)[12].

Base datasets included total tourism expenditure by TRA tourism region and average expenditure profiles, by region, across a range of goods and services (e.g. food and drink, fuel, shopping, etc.).

Estimates were available for domestic day, domestic overnight and international visitor expenditure.

The first adjustment to the base data was the development of a concordance between the TRA tourism regions and I-O model regions and the allocation of these base data to the relevant I-O model region. These allocations were based, in turn, on an ABS concordance between TRA tourism regions and SLAs.

The second adjustment to the base data was the application of a more detailed expenditure breakdown from the ABS Australian National Accounts: Tourism Satellite Account for both domestic and international visitor expenditure.

The third adjustment to the base data was the conversion of tourism expenditure estimates from purchasers' to basic prices (i.e. reallocation of net taxes (taxes minus subsidies) and marketing and transport margins) to make the data consistent with accounting conventions used in the national, state and regional I-O models. Purchasers' to basic price ratios for tourism expenditure categories were derived from ABS data.

12 Tourism Research Australia 2012, Regional Tourism Profiles 2011/12, Canberra.

The final adjustment to the base data was the allocation of the tourism expenditure data in basic prices to the relevant input-output sectors (intermediate sectors, taxes less subsidies or imports) in which the expenditure occurred, thus compiling a profile of sales to final demand. This process was undertaken for each type of tourism expenditure (domestic day, domestic overnight and international visitor) and the results aggregated to form a single tourism demand profile. Profiles were developed at the state and regional levels.

Constructing a RISE v3.0 economic impact model

In the final model construction stage the data described above were incorporated into a Microsoft Excel spread sheet based economic impact model for the region and state (i.e. RISE v3.0)[13]. This model allows for description of the structure of the economy. It can also be used for the estimation of economic impacts over time in response to the introduction of a new industry or a change in the final demand for the output of one or many sectors. Model assumptions can be modified to account for:

Price changes between the model construction year (2009/10) and the base year for the analysis;

- labour productivity change over time (as above and for the subsequent years);
- the level of regional migration (e.g. for a positive employment impact, the proportion of new jobs filled by previously unemployed locals).

13 For further details on the use and application of this type of model see: EconSearch 2010b, User Notes for the RISE Version 3.0 Impact Model, report prepared for the Department of Primary Industries (Victoria), June.

Appendix B – Glossary of Input-Output terminology

Basic price is the price received for a good or service by the producer. It is also known as the producers' price. It excludes indirect taxes and transport, trade and other margins.

Changes in inventories (stocks) "consist of stocks of outputs that are held at the end of a period by the units that produced them prior to their being further processed, sold, delivered to other units or used in other ways and stocks of products acquired from other units that are intended to be used for intermediate consumption or for resale without further processing" (ABS 2008b).

Consumption-induced impacts are additional output and employment resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as 'induced effects'.

DECON model is a demographic-economic model based on a traditional input-output model. The introduction of a population 'sector' (or row and column in the model) makes it possible to estimate the impact on local population levels of employment growth or decline. The introduction of an unemployed 'sector' makes it possible to account for the consumption-induced impact of the unemployed in response to economic growth or decline.

Direct (or initial) impacts are an estimate of the change in final demand or level of economic activity that is the stimulus for the total impacts.

Employment is a measure of the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalents and total (i.e. full-time and part-time) jobs. Employment is measured by place of remuneration rather than place of residence.

ess is an estimate of the proportion of employed who are not eligible for welfare benefits when they lose their job.

Exports (other) are a measure of the value of goods and services sold from the region/state of interest to consumers in other regions, interstate and overseas, net of sales to visitors to the region.

Final demand quadrant (components of) includes household and government consumption expenditure, gross fixed capital formation, changes in inventories (stocks), tourism expenditure and 'other' exports.

First-round impacts are estimates of the requirement for (or purchases of) goods and services from other sectors in the economy generated by the initial economic activity.

Flow-on impacts are the sum of production-induced impacts, consumption-induced impacts and offsetting consumption effects.

Government consumption expenditure includes "net expenditure on goods and services by public authorities, other than those classified as public corporations, which does not result in the creation of fixed assets or inventories or in the acquisition of land and existing buildings or second-hand assets. It comprises expenditure on compensation of employees (other than those charged to capital works, etc.), goods and services (other than fixed assets and inventories) and consumption of fixed capital. Expenditure on repair and maintenance of roads is included. Fees, etc., charged by general government bodies for goods sold and services rendered are offset against purchases. Net expenditure overseas by general government bodies and purchases from public corporations are included. Expenditure on defence assets that are used in a fashion similar to civilian assets is classified as gross fixed capital formation; expenditure on weapons of

destruction and weapon delivery systems is classified as final consumption expenditure" (ABS 2008b).

Gross fixed capital formation (GFCF) includes government, private and public corporation expenditure on new fixed assets plus net expenditure on second-hand fixed assets, including both additions and replacements (see ABS 2008b for further detail).

Gross operating surplus and gross mixed income. Gross operating surplus (GOS) is a measure of the operating surplus accruing to all enterprises, except unincorporated enterprises. It is the excess of gross output over the sum of intermediate consumption, household income and taxes less subsidies on production and imports. Gross mixed income (GMI) is a measure of the surplus or deficit accruing from production by unincorporated enterprises (ABS 2008b). The National Accounts definition of this indicator, as specified in the 2004/05 National I-O table (ABS 2008a), includes drawings by owner operators (or managers). In the state model used in this project, drawings by owner operators have been included in household income.

Gross regional/state product (GRP/GSP) is a measure of the net contribution of an activity to the regional/state economy. GRP/GSP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as the sum of household income, 'gross operating surplus and gross mixed income net of payments to owner managers' and 'taxes less subsidies on products and production'. It represents payments to the primary inputs of production (labour, capital and land). Using GRP/GSP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose.

Household consumption expenditure includes "net expenditure on goods and services by persons and expenditure of a current nature by private non-profit institutions serving households. This item excludes expenditures by unincorporated businesses and expenditures on assets by non-profit institutions (included in gross fixed capital formation). Also excluded is expenditure on maintenance of dwellings (treated as intermediate expenses of private enterprises), but personal expenditure on motor vehicles and other durable goods and the imputed rent of owner-occupied dwellings are included. The value of 'backyard' production (including food produced and consumed on farms) is included in household final consumption expenditure and the payment of wages and salaries in kind (e.g. food and lodging supplied free to employees) is counted in both household income and household final consumption expenditure" (ABS 2008b).

Household income is a component of GRP/GSP and is a measure of wages and salaries paid in cash and in-kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and income tax, but excluding payroll tax.

Imports are a measure of the value of goods and services purchased by intermediate sectors and by components of final demand in the region/state of interest from other regions, interstate and overseas.

Industrial-support impacts are output and employment resulting from second, third and subsequent rounds of spending by firms.

Input-output analysis is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

Input-output model is a transactions table that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

Multiplier is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the state or regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy.

Offsetting consumption effects are 'lost' consumption expenditure by the local unemployed before taking a job or 'new' consumption expenditure of those losing a job as they shift to welfare payments.

Output (Value of) is a measure of the gross revenue of goods and services produced by commercial organisations (e.g. farm-gate value of production) and gross expenditure by government agencies. Total output needs to be used with care as it can include elements of double counting when the output of integrated industries is added together (e.g. the value of winery output includes the farm-gate value of grapes). For sectors where superior regional data are not available, value of output by industry is allocated across regions on an employment basis, rather than in terms of the location of other factors of production such as land and capital.

Purchasers' price is the price paid for a good or service paid by the purchaser. It includes indirect taxes and transport, trade and other margins.

Primary input quadrant (components of) includes household income, gross operating surplus and gross mixed income net of payments to owner managers, taxes less subsidies on products and production and imports.

Production-induced impacts are the sum of first-round and industrial support impacts. Production-induced impacts are sometimes referred to as 'indirect effects'.

rho is an estimate of the proportion of employees who remain in the region after they lose their job (negative employment impact) or the proportion of new jobs filled by previously unemployed locals (positive employment impact).

Taxes less subsidies on products and production (TLSPP) is defined as 'taxes on products' plus 'other taxes on production' less 'subsidies on products' less 'other subsidies on production'. Taxes on products are taxes payable per unit of some good or service. Other taxes on production consist of all taxes that enterprises incur as a result of engaging in production, except taxes on products. Subsidies on products are subsidies payable per unit of a good or service. Other subsidies on production consist of all subsidies, except subsidies on products, which resident enterprises may receive as a consequence of engaging in production (ABS 2008b).

Tourism expenditure is a measure of the value of sales of goods and services to visitors to the state or region.

Total impacts are the sum of initial (or direct) and flow-on impacts.

Type I multiplier is calculated as (direct effects + production-induced effects)/direct effects.

Type II multiplier is calculated as (direct effects + production-induced effects + consumption-induced effects)/direct effects.

Type III multiplier is a modified Type II multiplier, calculated by including a population and unemployed row and column in the 'closed' direct coefficients matrix of the standard I-O model. Calculated as (direct effects + production-induced effects + consumption-induced effects + offsetting consumption effects)/direct effects.

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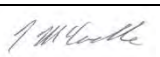
1	Rod Coulton	David Rolland	*D Rowland*	I McCardle		21/6/13