



**ASX Announcement**

2 December 2013

## **Positive scoping study confirms economic viability of Bird-in-Hand Gold Project**

### **HIGHLIGHTS**

- **Scoping Study confirms technical and economic viability of the Bird-in-Hand Gold Project**
- **Total gold production of 200,000 ounces over 4 years**
- **Potential to increase mine life as ore body is open down plunge and other shoots occur along strike**
- **Life of mine C1 Cash Cost of US\$641/oz**
- **Low start-up capital cost (including contingency) of A\$25.6m**
- **Net cumulative cash flow of A\$90.5m and payback of 0.9 years from first ore**
- **Project utilises existing Angas infrastructure which significantly enhances project economics and de-risks the Project**
- **Surplus processing capacity at Angas provides opportunity for additional feed sources**
- **Pre-feasibility study has commenced**



Terramin Australia Limited (ASX:TZN) (“Terramin” or “the Company”) is pleased to announce that it has returned positive results from a scoping study (“the Scoping Study”) on the Bird-in-Hand Gold Project, (“the Project”), located near Woodside in the Adelaide Hills, South Australia.

The Scoping Study has returned strong economics and confirmed the technical and economic viability of the Project. Major project attributes include:

- Large amount of existing infrastructure at the Angas Zinc Mine such as processing plant and tailings storage facility suitable for use with minimal modification;
- Low start-up costs;
- Straightforward and well understood mining method;
- Low operating costs with C1 Cash Cost at US\$641/oz and total operating Costs (including sustaining capital and royalties) at US\$837/oz.

Utilising the updated Mineral Resource Estimate of 557,000 tonnes at 13.0g/t for a contained 233,000 ounces of gold (at a cut-off grade of 1.0g/t gold) the Project delivers an average production profile of 50,081 ounces of gold per annum over 4 years. There is an expectation of increasing the mine life through the addition of further ore along strike, at depth and in the immediate footwall of the resource.

The Scoping Study is based on an underground, panelled cut and fill mining method and a gravity concentration and flotation processing approach to produce doré bullion and gold concentrate. The Company plans to undertake mining on an owner/operator basis with the mining fleet expected to be made up of Terramin’s existing fleet or a leased fleet. The average mill throughput is planned to be 140,000 tonnes per annum over 4 years.

Start-up capital costs are estimated to be A\$25.6m (including initial underground development) with total life-of-mine capital cost (including sustaining capital) estimated to be A\$57.7m. Operating costs (C1 Cash Costs) are estimated at US\$641/oz (net of silver credits) including costs of leasing the mining fleet.

The Scoping Study confirms the potential for strong economics with the Project estimated to generate A\$90.5m of post-tax cumulative net cash flow over the life of the mine at a gold price of US\$1,400/oz. Payback is calculated to be 0.9 years from first ore.

These strong economics are further enhanced with the potential for improvement through the following opportunities:

- Additional and higher grade metal tonnes identified through further drilling and resource definition. Bird-in-Hand mineralisation is open down plunge and along strike which also presents opportunity for additional metal tonnes;



- Processing capacity at Angas is underutilised, providing potential for processing of satellite deposits in conjunction with Bird-in-Hand feed.

Terramin's Chief Executive Officer, Martin Janes said: "We are very pleased with the results of the Scoping Study for Bird-in-Hand, which clearly demonstrates that we have a strong project with an enviable value proposition. We have a high-grade deposit amenable to our core skillset of underground mining, low start-up capital requirements due to our existing site and processing facilities, a history of being able to turn projects into operating assets, and a positive track record in community and regulator engagement.

"In addition to all of this we have further opportunities to increase project value with the deposit open down plunge and further along strike and underutilised processing capability providing opportunities for the processing of regional feed sources.

"The Project will not only provide an economic benefit for South Australia, it also directly benefits the local community through employment and supply of goods and services. Approximately 100 people are expected to be employed on a permanent basis during the production phase of the Project.

"Terramin's aim is to commence work on the pre-feasibility study for the Project immediately with activities including technical and environmental studies and resource drilling."

For further information, please contact:

**Martin Janes**  
Chief Executive Officer  
Terramin Australia Limited  
+61 8 8213 1415  
[info@terramin.com.au](mailto:info@terramin.com.au)

Level 3  
70 Hindmarsh Square  
Adelaide  
SA  
5000

## **PROJECT DESCRIPTION**

The Bird-in-Hand Gold Project is located approximately 30km north of Terramin's existing mining and processing facilities at the Angas Zinc Mine near Strathalbyn. The Project has a high-grade Resource of 557,000 tonnes at 13.0g/t for 233,000 contained ounces which is amenable to underground mining.

In July 2013, Terramin Australia Limited acquired 100% of the Bird-in-Hand Gold Project and a portfolio of Adelaide Hills exploration tenements from Maximus Resources Limited ("Maximus"). The acquisition completed on 11 November 2013 following Ministerial approval.

The Bird-in-Hand Gold Project will involve underground mining at the Bird-in-Hand site, the transportation of material to the Angas site for processing and sale of gold doré and gold concentrate products to market. Due to the level of existing processing and related infrastructure at Angas Zinc Mine suitable to the processing of Bird-in-Hand material, it was concluded that this site would be used in place of a greenfield site.

Therefore it is anticipated that, subject to required regulatory approvals, the material mined at Bird-in-Hand will be processed utilising the facilities at Angas which can be modified to process the gold resource. The existing tailings dam at Angas has the capacity to hold all the tailings generated from the existing Bird-in-Hand resource.

The Angas Zinc Mine, which was placed on care and maintenance in early October 2013, is a zinc-lead-copper-gold-silver mine and a part of the greater Angas site contains processing and general site infrastructure. The infrastructure remains in suitable condition for continued use, with the processing plant able to be modified at a low cost to treat precious metal feeds.

## **SCOPING STUDY**

Subsequent to the announcement of the binding agreement with Maximus, the Scoping Study was commenced to provide an assessment of the Bird-in-Hand Gold Project and whether it should proceed to further study phases.

Most of the evaluation work has been undertaken through the use of internal Terramin resources with additional support from industry contacts, external consultants and previous studies undertaken by Maximus.

Of the multiple mining methods evaluated, one was analysed in detail with a mine plan and production schedule prepared and used as the basis for the financial evaluation. Processing assessments identified multiple treatment options. A preferred option was analysed with operating and capital costs, metallurgical recoveries and product specifications all estimated for use in the financial evaluation.

## KEY STUDY PARAMETERS AND OUTCOMES

Parameter	Assumption
Life of Mine (LOM)	5 years (including 12 months of pre-production development).
LOM Production	200,000 gold ounces; 75,000 silver ounces
Mining Method	Underground panelled cut and fill method
Mining Dilution	15%
Mining Recovery	95% in development
Processing Method	Gravity concentration for on-site smelting to doré; and flotation to gold concentrate
Processing Rate	Average of 140,000 tonnes per annum over 4 years
Metallurgical Recovery	94% gold; 92% silver
Gold Price	US\$1,400 per ounce
Exchange Rate	A\$1=US\$0.925

## MINERAL RESOURCES

As announced on 2 December 2013, Terramin updated the Bird-in-Hand deposit's maiden resource estimate released in 2008 with its own Mineral Resource Estimate. The Scoping Study is based on this updated Mineral Resource Estimate of 557,000 tonnes at 13.0g/t and 233,000 ounces of gold. See Table 1 for further information.

**Table 1 – Summary of Updated Bird-in-Hand Mineral Resource Estimate.**

Lode	Inferred			
	Tonnes	Au (g/t)	Ag (g/t)	Ounces
Main Reef	437,000	13.9	6	195,000
White Reef	105,000	10.5	2	36,000
Yellow Reef	22,000	6.0	1	4,000
<b>Total</b>	<b>557,000</b>	<b>13.0</b>	<b>5</b>	<b>233,000</b>

For further detailed information on the updated mineral resource estimate refer to the ASX announcement 'Revised Resource Estimate for Bird-in-Hand Gold Project' dated 2 December 2013.

Based on structural and lithological interpretations, grade distribution (the mineralisation is open at depth), and the shapes and distribution of historic gold mines close to Bird-In-Hand, Terramin has reasonable expectations for additional mineralisation to exist down plunge of the defined resource and as separate lodes along strike, Figure 1. Furthermore, infill drilling of the resource is likely to define small but readily accessible mineralisation in the immediate footwall. For example, drillhole BH033 intersected from 162m, 2m @ 43.74g/t gold located only eight metres (true width) below Main Reef.

Potential to discover additional high grade mineralisation further along strike is highlighted by the presence of the historic mines Bird-Extended and The Ridge located on Figure 1 and Figure 2 are respectively 200m and 400m to the south. These mines were last worked in the 1890's. The Ridge has a recorded (incomplete) production of 517 ounces of gold from 2,766 tonnes at an average grade of 5.8g/t gold but later retreatment of 6,266 tonnes of tails by cyanide leach gave an additional 977 ounces.

Figure 1 - Bird-in-Hand longitudinal section (looking west) showing Resource wireframes, drill intersections (+/-25m) and exploration potential.

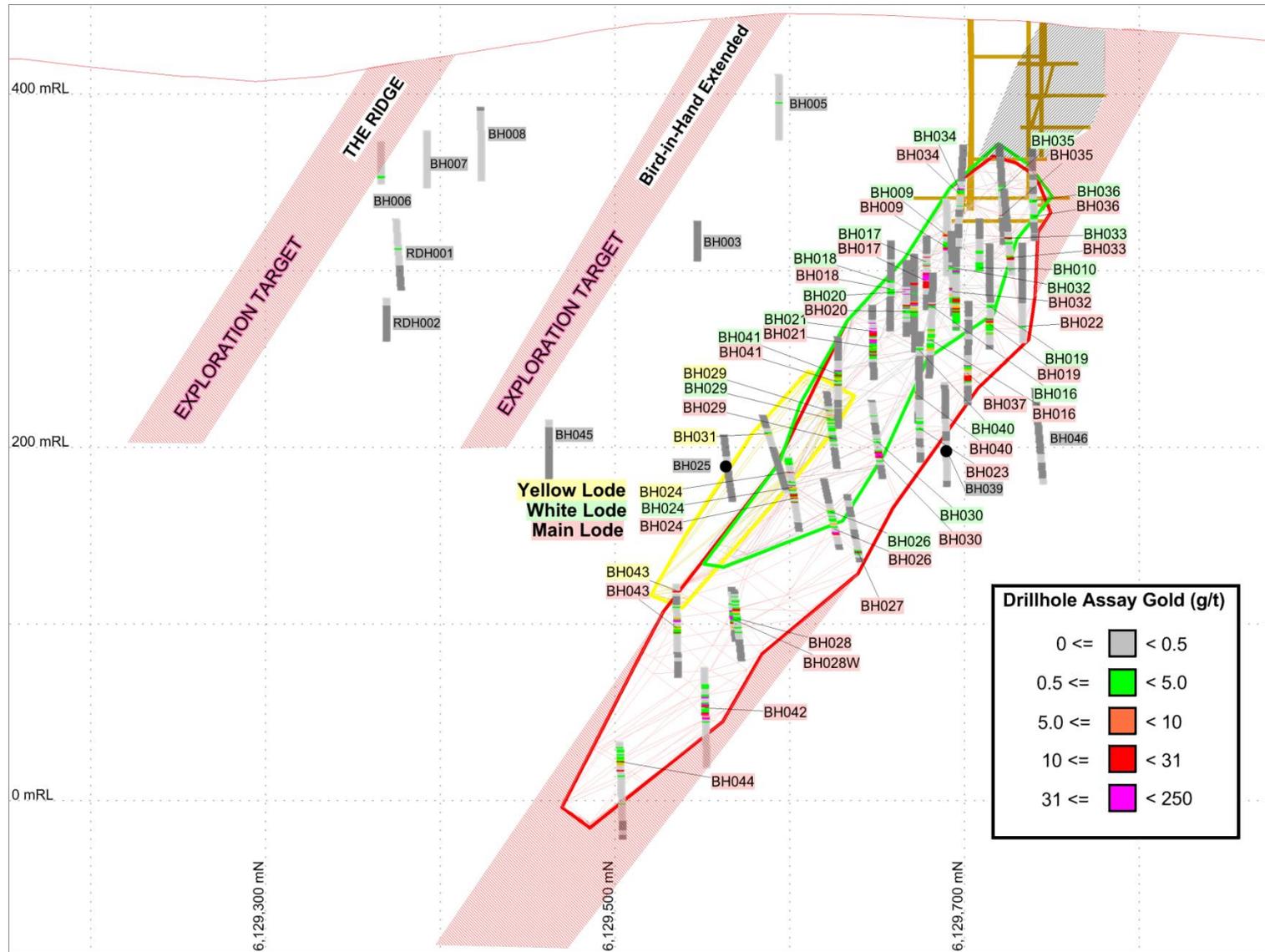
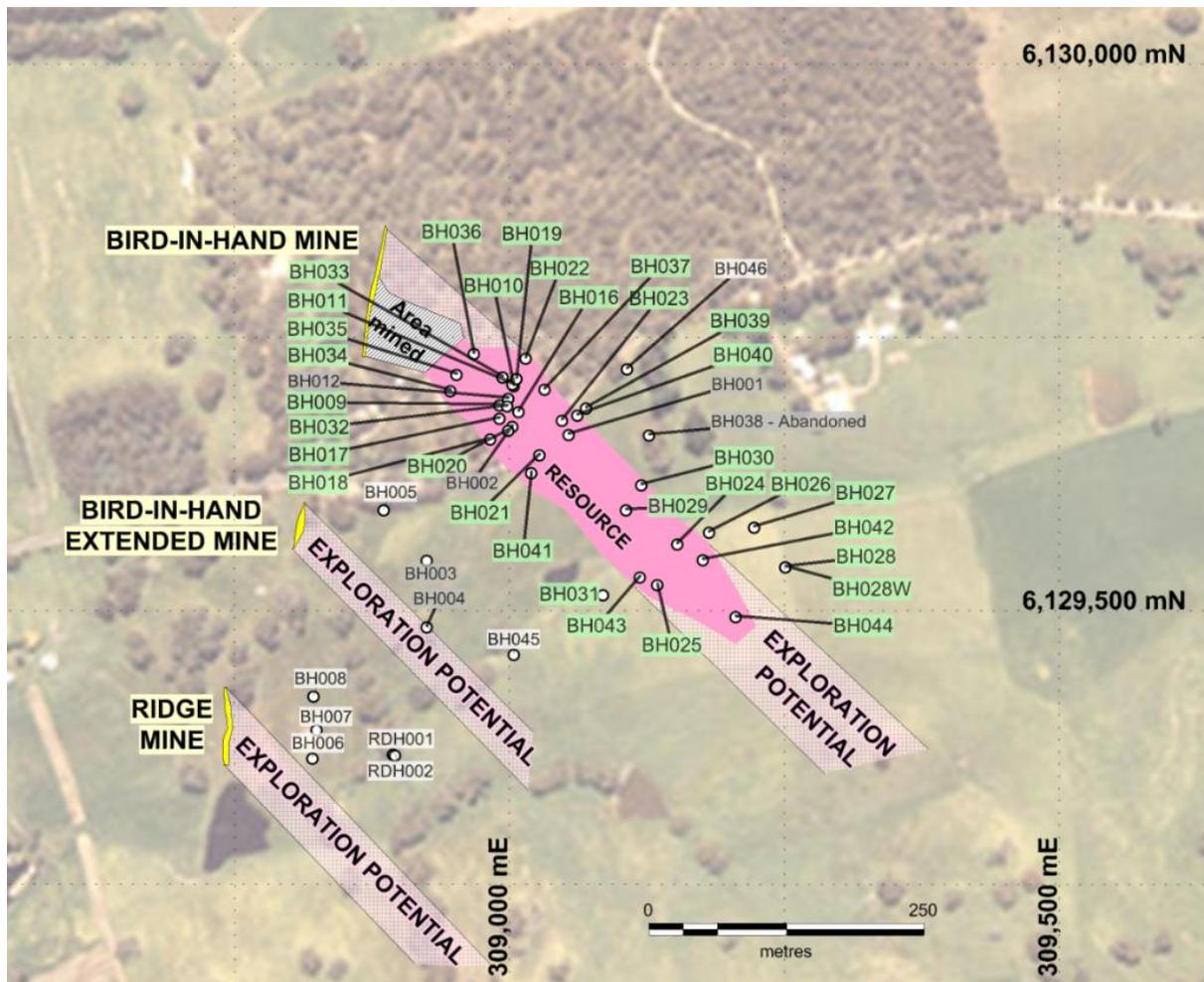


Figure 2 - Bird-in-Hand plan view of drilling collar locations and exploration potential.



## MINING

A review of potential mining methods has concluded that the preferred option for mining extraction is a panelled cut and fill method. Cut and fill will provide for the highest material recovery based on resource geometry and the best opportunity to control variable ground conditions with in-cycle ground support. The proposed site is able to contain all the necessary infrastructure for the Project, with sufficient stockpile areas and capital works on a similar scale to Angas. Fill for the cut and fill will utilise capital development waste, which will be crushed and screened to create an engineered cemented aggregate fill.

Mining is expected to be completed in 5 years (including 1 year of development) with processing expected to commence approximately 7 weeks following first underground production. This is intended to enable suitable stockpile quantities to ensure adequate stocks for commissioning and first production. A total of 560,000 tonnes of production material and 585,000 tonnes of waste are expected to be mined over the mine life.

The variations in resource geometry, ground conditions and demands on underground mining equipment generally means a range of equipment must be utilised to allow flexibility in mining strategy and efficiency. To meet scheduled processing targets, the following underground fleet in Table 2 has been determined to be most suitable in the mining strategy. An owner/operator model will be adopted similar to the Angas mining approach with the mining fleet expected to be made up of Terramin's existing fleet or leased equipment.

**Table 2 - Major Mining Equipment**

<b>Equipment</b>	<b>Quantity</b>
Development Jumbo	2
Production Drill/ Cable bolter	1
UG Loader	2
UG Truck 40t – Articulated	2
Integrated Tool Carrier (IT)	1
Shotcreter	1
Grader	1
Surface Loader	1
Charge Up Unit	1
<b>Total</b>	<b>10</b>

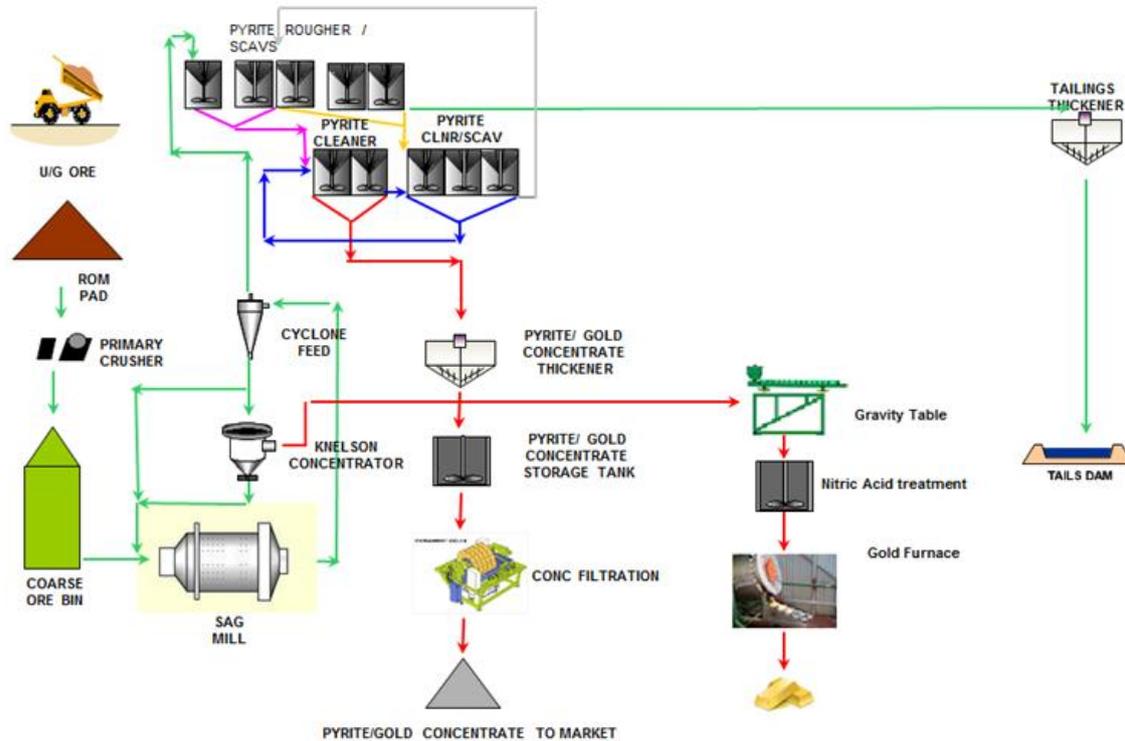
## **PROCESSING**

Metallurgical processing is proposed to be undertaken through a modified Angas plant. Costs of constructing a new plant and tailings storage facility close to the Bird-in-Hand site outweighs the cost of haulage back to the Angas site as well as adding to the complexity of the Project permitting.

The Scoping Study is based on gravity concentration for coarse gold with on-site smelting to create doré bullion and flotation for remaining gold content to create a gold concentrate.

Several processing options were reviewed for the production of a saleable product. The first option reviewed was a typical Carbon-in-Leach/Carbon-in-Pulp (CIL/CIP) process with an Inco cyanide destruction circuit. This option was recommended in early scoping studies commissioned by Maximus where a plant would be constructed specifically for the Project, but has been discounted due to the availability of infrastructure at Angas and the cost of construction of a new facility. The second option reviewed was the modification of the Angas facility to a CIL/CIP process, again with a cyanide destruction circuit. This process would require a number of modifications to the existing facility and initial estimations showed that this would also be a capital intensive option. The third option reviewed was the modification of the Angas plant to have a gravity-recovered component of the gold as well as a gold bearing sulphide concentrate for sale. This option has been costed as the least capital intensive and for the life of the Project appears to be the preferred option. The preferred option will utilise the lead float circuit already in place at Angas and will require the addition of a gravity recovery circuit at an estimate cost of A\$4.4m. See Figure 3 for the preferred Angas gold process flow diagram.

**Figure 3 - Angas Gold Process Flow Diagram**



### TAILINGS STORAGE FACILITY

The existing tailings storage facility has sufficient capacity to accommodate tailings produced through the treatment of the Bird-in-Hand material. There is currently spare capacity of approximately 300,000m<sup>3</sup> since placing the Angas operation on care and maintenance. Based on the amount of material to be processed from Bird-in-Hand, the tailings production has been calculated as 275,000m<sup>3</sup> for the current resource. There is a further 60,000m<sup>3</sup> storage capacity if a portion of tailings is utilised as backfill into the underground workings at Angas.

### INFRASTRUCTURE

The Project utilises a large amount of existing infrastructure at the Angas mine site which will be suitable without upgrade or alteration. Only relatively minor alterations to processing infrastructure are required in order to be able to process gold bearing material from Bird-in-Hand.

A site presence for the Bird-in-Hand mining operation will need to be constructed and will consist of power and water supply; mechanical workshop for onsite maintenance; and general infrastructure including offices, communications and other facilities.

Power supply to the Bird-in-Hand mine is assumed to be facilitated through the construction of a 33kV/11kV substation at the mine site with approximately 3km of line required to connect to the 33kV distribution network that travels through Woodside. Power to the mine site will be supplied from the substation via an overhead power line. No expensive on-site power generation is required.

The road between Angas and Bird-in-Hand is currently rated as a 19m long semi-trailer capable road with a mass limit of 45t and it is not anticipated that this will require significant capital upgrade. No provision for upgrading of this road has been made in the assessment as it is considered that the material haulage will make up a small component of current road usage. There will be a requirement to construct a heavy vehicle turn out zone at the entrance to the Bird-in-Hand site.

Process and potable water arrangements for the Angas site remain suitable without any upgrade or alterations required. For the Bird-in-Hand site, water retention dams are planned to be constructed to deal with mine water in addition to pre-mining dewatering and planned aquifer-reinjection. Potable water will be required for site offices and ablutions. A study on the potable water supply running past the site will be required to determine whether there is adequate supply or if the supply network will require upgrading.

## PRODUCT LOGISTICS, SALES AND MARKETING

It is envisaged that gold-rich sulphide concentrate will be marketed and sold to an overseas smelter, shipped in regular increments throughout the year. The cost of container transport is competitive and is likely to lead to favourable logistics costs.

Gold doré is expected to be sold to the AGR Matthey gold refinery in Western Australia.

## CAPITAL COSTS

Start-up capital costs (including contingency) for the mine, processing facility and associated infrastructure are estimated at A\$25.6m. This cost includes underground and surface infrastructure; capitalised pre-production costs (being operating costs until material is first processed) and development costs. No allowance has been made for the acquisition of mining fleet, as existing fleet will be utilised and it is envisaged that any necessary new fleet will be leased over the life of the mine (included in operating costs). Table 3 provides a summary of capital cost estimates.

**Table 3 - Summary of Capital Cost Estimates (including contingency)**

Item	Cost (A\$m)
Development	36.1
Surface infrastructure	9.4
Sustaining	6.5
Pre-production (capitalised)	3.5
Underground infrastructure	2.0
Mining fleet (included in opex)	-
<b>Total</b>	<b>57.5</b>

## OPERATING COSTS

Life-of-mine operating costs have been estimated at A\$224 per tonne of material processed for total mining, processing, and general and administration costs. This is based on a total of 560,000 tonnes of feed being processed. The life-of-mine C1 Cash Cost<sup>1</sup> is US\$641/oz net of silver credits.

An owner/operator model will be adopted similar to the Angas mining approach with part of the mining fleet expected to be leased over the life of the mine.

<sup>1</sup> As defined by Brook Hunt

**Table 4 - Life-of-Mine Average Operating Costs**

Item	Cost (A\$/t)
Mining	157.8
Processing	36.5
General and Administration	29.1
<b>Total</b>	<b>223.5</b>

**Table 5 – Life-of-Mine Average C1 Cash Costs**

Item	Cost (US\$/oz)
Mining	443
Processing	103
General and Administration	82
Treatment and Refining	14
Transport	8
By-products credits	(8)
<b>Total</b>	<b>641</b>

**Table 6 - Life-of-Mine Cash Cost Measures**

Item	Cost (US\$/oz)
<b>C1 Cash Cost</b>	<b>641</b>
Post-Production Capital	160
<b>C2 Cash Cost</b>	<b>801</b>
Royalties	36
<b>C3 Cash Cost</b>	<b>837</b>

## ENVIRONMENT, PERMITTING AND COMMUNITY

Pre-permitting environmental studies will be crucial to achieving the required project timelines. Particular considerations for the Project will be flora, fauna, groundwater, surface water, soil aspects (including previous contamination from historic mining) noise, dust and vehicle movements.

A large focus will be placed on water management for the site and establishing the baseline environmental conditions. Much of the early project work will be focused on establishing the best outcome for aquifer management and developing a management system that is robust and can be maintained throughout the life of the Project.

Community engagement will be undertaken throughout the life of the Project. The terms of reference for a community consultative committee are currently being formalised by the regulator, DMITRE, and are expected to form the basis of the regional consultative group. Actively engaging the community is a priority for both regulators and Terramin. In order to support the local community the site workforce would be residential only with a preference for local hires within the region. High success was achieved at Angas Zinc Mine by employing locals where possible and training them into skilled positions over a number of years. This reduced staff turnover levels and increased staff loyalty. The employment of locals

also increased the ability to utilise overtime labour for leave coverage rather than expensive contract labour. It is estimated that around 100 full time employees will be required during normal operations.

The financial analysis of the Project was carried out using a discounted cash flow (DCF) financial model. Annual cash flow projections were estimated over the project life based on capital expenditures, production costs, revenues, royalty costs (government and transaction royalties) and taxes.

Project economics are presented in Table 7.

**Table 7 - Summary of Project Economics**

Metric	Unit	Value
Operating cash costs	US\$/oz	649
Silver credits	US\$/oz	(8)
Cash costs net of credits (C1 Cash	US\$/oz	641
Cumulative net cash flow	A\$m	90.5
EBITDA	A\$m	144.8
Payback period (from first production)	Years	0.9
Pre-production capital	A\$m	25.6
Life-of-mine capital	A\$m	57.7

Processing capacity is expected to be underutilised presenting potential for additional material to be processed throughout the planned mine life. There is opportunity for this material to come from tenements surrounding Bird-in-Hand which present strong regional exploration potential. Additional feed during or subsequent to planned mine life would significantly enhance the project economics.

## PRE-FEASIBILITY

Terramin's aim is to commence work on the pre-feasibility study for the Project as soon as possible. A portion of funds from the recently announced capital raising will be directed to establish the baseline environmental studies, water studies and to undertake additional resource drilling to allow the Project to move to the next phase.

The study will be led by members of Terramin's staff who have extensive operational experience in the Adelaide Hills region and have developed working relationships with key regulators and service suppliers through the Angas operation.

## Cautionary Statement

*The Scoping Study referred to in this report is based on low-level technical and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the Scoping Study will be realised.*

*The use of the word "ore" in the context of this report does not support the definition of "Ore Reserves" as defined by the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. The word 'ore' is used in this report to give an indication of quality and quantity of mineralised material that would be fed to the processing plant and it is not to be assumed that 'ore' will provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the scoping study will be realised.*

## Competent Persons Statement

*The information in this report that relates to Exploration Results and Mineral Resources is based on information compiled by Mr Eric Whittaker, a Competent Person who is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Whittaker is an employee and Principal Resource Geologist of Terramin Australia Limited. Mr Whittaker has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Whittaker consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.*

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