TECHNICAL REPORT ON
THE LIHIR PROPERTY
IN
PAPUA NEW GUINEA

Prepared by Newcrest Mining Limited in accordance
with the requirements of National Instrument 43-101,
Standards for Disclosure of Mineral Projects,
of the Canadian Securities Administrators.

Qualified Person:
Mr Colin Moorhead BSc (Hons), FAusIMM

Effective Date of Report: 31 December 2013
# CONTENTS

1 SUMMARY .......................................................................................................................... 6  
   Introduction and Terms of Reference.................................................................................. 6  
1.1 Geology .............................................................................................................................. 6  
1.2 Mine Production .................................................................................................................. 6  
1.3 Mineral Resources ............................................................................................................ 6  
1.4 Mineral Reserves ............................................................................................................... 7  
1.5 Infrastructure ..................................................................................................................... 7  
1.6 Environmental and Community Management ................................................................... 8  
1.7 Capital and Operating Costs ............................................................................................. 8  
1.8 Conclusions ....................................................................................................................... 9  
1.9 Recommendations ........................................................................................................... 9

2 INTRODUCTION ................................................................................................................. 10  
   2.1 General and Terms of Reference .................................................................................. 10  
   2.2 Report Authors ............................................................................................................. 10  
   2.3 Units of Measure and Currency ................................................................................... 11

3 RELIANCE ON OTHER EXPERTS .................................................................................. 13

4 PROPERTY DESCRIPTION AND LOCATION .................................................................... 14  
   4.1 Property Location ........................................................................................................... 14  
   4.2 Land Tenure .................................................................................................................. 14  
   4.3 Royalties, payments or other agreements ..................................................................... 17  
      4.3.1 Integrated Benefits Package Agreement .................................................................. 17  
      4.3.2 Mining Royalty ....................................................................................................... 17  
   4.4 Environmental Liabilities ............................................................................................. 17

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY ................................................................................................................................. 18  
   5.1 Topography Elevation and Vegetation ........................................................................... 18  
   5.2 Climate .............................................................................................................................. 20  
   5.3 Natural Hazards ............................................................................................................. 20  
   5.4 Access ............................................................................................................................. 20  
   5.5 Surface Rights .............................................................................................................. 21

6 HISTORY ............................................................................................................................. 22  
   6.1 Project Ownership ......................................................................................................... 22  
   6.2 Exploration ..................................................................................................................... 22  
   6.3 Historic Mineral Resources .......................................................................................... 22  
   6.4 Production ..................................................................................................................... 23

7 GEOLOGICAL SETTING AND MINERALIZATION ............................................................. 24  
   7.1 Regional Geology .......................................................................................................... 24  
   7.2 Deposit Geology ............................................................................................................ 24  
      7.2.1 Geological Setting ..................................................................................................... 24  
      7.2.2 Alteration ................................................................................................................ 26  
      7.2.3 Mineralization .......................................................................................................... 26

8 DEPOSIT TYPES ................................................................................................................. 27

9 EXPLORATION ....................................................................................................................... 28

10 DRILLING ............................................................................................................................ 29  
    10.1 Overview ...................................................................................................................... 29  
    10.2 Drilling Statistics ......................................................................................................... 29  
    10.3 Drilling Conditions ....................................................................................................... 31
Contents

10.4 Hole Surveying ................................................................. 31
10.5 Core Orientation ............................................................ 31
10.6 Core Recovery ............................................................... 32
10.7 Logging and Sampling .................................................... 32

11 SAMPLE PREPARATION, ANALyses AND SECURITY ....... 33
11.1 Historical QA/QC Summary ............................................. 33
11.2 Drill Core Sampling ....................................................... 33
11.3 Sample Preparation ....................................................... 34
11.4 Analysis ........................................................................... 34
11.5 QA/QC Procedures ........................................................ 35
11.6 Certified Reference Materials (2011 to 2013) .................... 35
11.6.1 Blanks ........................................................................ 36
11.6.2 Coarse Duplicates ....................................................... 37
11.6.3 Pulp Replicates .......................................................... 37
11.7 Comparison of Second Laboratory with Lihir Historical Data 38
11.8 Additional QA/QC Practices Adopted ............................... 40
11.9 QA/QC Summary ............................................................ 41

12 DATA VERIFICATION ........................................................ 42

13 MINERAL PROCESSING AND METALLURGICAL TESTING .... 43
13.1 Introduction ................................................................. 43
13.2 Ore Type and Mineralogy ................................................ 43
13.3 Gold Recovery ............................................................... 44

14 MINERAL RESOURCE ESTIMATES .................................... 45
14.1 Introduction .................................................................... 45
14.2 Mineral Resources ......................................................... 45
14.3 Modeling and Estimation ................................................ 45
14.3.1 Geological Interpretation and Domaining .................... 45
14.3.2 Compositing and Exploration Data Analysis ............... 47
14.3.3 Grade Capping .......................................................... 49
14.3.4 Variography .............................................................. 50
14.3.5 Estimation Parameters ............................................... 51
14.4 Resource Model Validation .............................................. 52
14.5 Resource Classification .................................................. 53
14.6 Comparison to Previous Mineral Resource Estimate .......... 54
14.7 Factors Affecting Mineral Resource Estimate .................... 54

15 MINERAL RESERVE ESTIMATES ...................................... 55
15.1 Introduction .................................................................... 55
15.2 Mineral Reserve Assumptions ......................................... 55
15.2.1 Commodity Prices and Exchange Rate ....................... 55
15.2.2 Ore Processing Rates and Metallurgical Recovery .......... 56
15.2.3 Operating Cost Estimates ........................................... 56
15.2.4 Cut-off Grade .......................................................... 56
15.3 Lihir Mineral Reserve ..................................................... 56
15.3.1 Mineral Reserve Estimate .......................................... 56
15.3.2 Production Reconciliation ......................................... 58
15.3.3 Estimation Procedure ............................................... 59
15.4 Comparison to Previous Mineral Reserve Estimate .......... 60
15.5 Factors Affecting the Mineral Reserve Estimate ............... 60

16 MINING METHODS ............................................................ 62
16.1 Mining Operations ......................................................... 62
# TABLES

<p>| Table 1.1 | Lihir Mineral Resource Estimate at 31 December 2013 | 7 |
| Table 1.2 | Lihir Mineral Reserves Estimate at 31 December 2013 | 7 |
| Table 1.3 | Lihir FY 2013 Actual Operating Cost | 8 |
| Table 1.4 | Lihir FY 2014 Cost and Capital Guidance | 8 |
| Table 2.1 | Persons who Prepared or Contributed to this Technical Report | 10 |
| Table 2.2 | Terms and Abbreviations | 11 |
| Table 4.1 | Lihir Property Land Tenure Details | 15 |
| Table 10.1 | Drilling Statistics to 31 December 2013 | 30 |
| Table 11.1 | Lihir Assay Techniques and Detection Limits | 35 |
| Table 11.2 | Precision of second laboratory pulp check assaying at ALS Brisbane and NLSO when compared to Historical Lihir analysis | 39 |
| Table 14.1 | Lihir Mineral Resource Estimate at 31 December 2013 | 45 |
| Table 14.2 | Lihir Modeling Domains for Au, Ag, As, Cu &amp; Mo compared to Interpreted Fault Domain | 48 |
| Table 14.3 | Lihir Modeling Domains for Sulphide Sulphur compared to Interpreted Fault Domain | 48 |
| Table 14.4 | Lihir Modelling Domains for Dry Bulk Density compared to Interpreted Alteration Domain | 49 |
| Table 14.5 | Grade Caps Applied to Lihir Resource Estimation | 49 |
| Table 14.6 | Gold Variogram Models | 50 |
| Table 14.7 | Lihir Block Model Parameters | 51 |
| Table 14.8 | Lihir Search Neighbourhood Parameters for Gold Estimation | 52 |
| Table 15.1 | Lihir Mineral Reserve Estimate at 31 December 2013 | 57 |
| Table 15.2 | Lihir Production Reconciliation | 59 |
| Table 16.1 | Lihir Current Mine Production Fleet | 62 |
| Table 17.1 | Lihir Processing Performance for the Year Ending 30 June 2013 | 68 |
| Table 21.1 | Historical Production and Costs per Ounce of Gold Produced | 77 |
| Table 21.2 | Lihir FY 2013 Actual Operating Cost | 77 |
| Table 21.3 | Historical Capital Expenditure | 77 |
| Table 21.4 | Lihir FY 2014 Costs and Capital Guidance | 78 |</p>
<table>
<thead>
<tr>
<th>FIGURES</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 4.1</td>
<td>Property Location</td>
<td>14</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Lihir Island Exploration and Mining Tenements</td>
<td>16</td>
</tr>
<tr>
<td>Figure 5.1</td>
<td>Lihir Island Physiography</td>
<td>19</td>
</tr>
<tr>
<td>Figure 7.1</td>
<td>Regional Geological Framework</td>
<td>24</td>
</tr>
<tr>
<td>Figure 7.2</td>
<td>Lihir Island Geology</td>
<td>25</td>
</tr>
<tr>
<td>Figure 8.1</td>
<td>Conceptual Genetic Model for Gold Deposition at Lihir</td>
<td>27</td>
</tr>
<tr>
<td>Figure 10.1</td>
<td>Cross Section 9400E</td>
<td>29</td>
</tr>
<tr>
<td>Figure 10.2</td>
<td>Drill Hole Locations and Topography</td>
<td>30</td>
</tr>
<tr>
<td>Figure 10.3</td>
<td>Drilling Operations at Lihir</td>
<td>31</td>
</tr>
<tr>
<td>Figure 11.1</td>
<td>Lihir gold z-scores</td>
<td>36</td>
</tr>
<tr>
<td>Figure 11.2</td>
<td>Lihir sulphide z-score</td>
<td>36</td>
</tr>
<tr>
<td>Figure 11.3</td>
<td>Lihir Coarse Gold Duplicates, Precision = 9.1%</td>
<td>37</td>
</tr>
<tr>
<td>Figure 11.4</td>
<td>Lihir Coarse Sulphide Duplicates, Precision = 13.6%</td>
<td>37</td>
</tr>
<tr>
<td>Figure 11.5</td>
<td>Lihir Gold Pulp Replicates, Precision = 8.8%</td>
<td>38</td>
</tr>
<tr>
<td>Figure 11.6</td>
<td>Lihir Sulphide Pulp Replicate, Precision = 5.1%</td>
<td>38</td>
</tr>
<tr>
<td>Figure 11.7</td>
<td>Comparison of the Historical Lihir site laboratory with ALS for Gold</td>
<td>39</td>
</tr>
<tr>
<td>Figure 11.8</td>
<td>Comparison of the Historical Lihir site laboratory with NLSO for Gold</td>
<td>40</td>
</tr>
<tr>
<td>Figure 14.1</td>
<td>Graphical representation of the different fault domains (North top)</td>
<td>46</td>
</tr>
<tr>
<td>Figure 14.2</td>
<td>3D Representation of Lihir Alteration Domains, Looking North-West</td>
<td>47</td>
</tr>
<tr>
<td>Figure 14.3</td>
<td>Cross Section 9400E through resource block model</td>
<td>54</td>
</tr>
<tr>
<td>Figure 15.1</td>
<td>Lihir Final Pit Limits and Phase Locations</td>
<td>58</td>
</tr>
<tr>
<td>Figure 17.1</td>
<td>Simplified Process Flow Sheet</td>
<td>65</td>
</tr>
</tbody>
</table>
1 SUMMARY

Introduction and Terms of Reference

The annual Mineral Resources and Mineral Reserves update of Newcrest Mining Limited (Newcrest) of Melbourne, Australia has recently been completed and includes materials changes to the Lihir Property (Lihir or the Property).


1.1 Geology

The Lihir Gold Mine is 100% owned by Newcrest and was acquired through the acquisition of Lihir Gold Limited in August 2010. The Property is located on Niolam Island, approximately 900km north-east of Port Moresby in PNG. As Niolam Island is the principal island of the Lihir group, it is generally referred to as Lihir island. The Property comprises a group of mining and exploration tenements that host epithermal gold mineralization within a Pleistocene volcanic caldera complex.

Exploration has identified several adjacent and partly overlapping mineral deposits in the Luise Caldera, which are collectively called the Ladolam Deposit. The principal components are called Lienetz, Minifie, Kapit and Coastal. This is also essentially the sequence in which the pits are mined. The limits of the mineralization have not been completely defined and are open at depth, along strike and to the east (currently limited by the Pacific Ocean).

1.2 Mine Production

In the financial year (FY) ending 30 June 2013, Lihir mined 29.6 million tonnes (Mt) of ore and milled 6.9Mt of ore to produce 649 thousand ounces (oz) of gold. Cash cost for the year was A$689 per oz.

1.3 Mineral Resources

The 31 December 2013 Mineral Resource update has been based on a detailed review completed by Newcrest of all Lihir production sources to take into account Newcrest’s current view of long term metal price, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades and physical mining parameters.

This has resulted in the most marginal ounces being removed and this has been reflected in changes to Mineral Resources. The Measured and Indicated Mineral Resources for Lihir as at 31 December 2013 includes a material reduction of approximately 4.2Moz of gold to 51Moz of gold, compared with the 31 December 2012 estimate of 55.2Moz of gold.
The Lihir Mineral Resources as at 31 December 2013 are presented in Table 1.1. They comprise Measured Resources, which are the low, medium and high grade stockpiles; as well as Indicated and Inferred Resources. There are no Measured Resources in the insitu orebody model.

**Table 1.1  Lihir Mineral Resource Estimate at 31 December 2013**

<table>
<thead>
<tr>
<th>Resource Classification</th>
<th>Tonnes (Mt)</th>
<th>Gold Grade (g/t)</th>
<th>Contained Gold (Moz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured</td>
<td>100</td>
<td>2.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Indicated</td>
<td>660</td>
<td>2.1</td>
<td>44</td>
</tr>
<tr>
<td>Inferred</td>
<td>130</td>
<td>2.1</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Notes: 1. Cut-off grade 0.9 g/t Au based on a gold price of US$1,350/oz  
2. Reported within pit shell developed using gold price of US$1,400/oz  
3. The figures above include those resources converted to reserves

1.4 Mineral Reserves

The 31 December 2013 Mineral Reserve update has been based on a detailed review completed by Newcrest of all Lihir production sources to take into account Newcrest’s current view of long term metal price, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades. This has resulted in the most marginal ounces being removed and this has been reflected in changes to Mineral Reserve estimates. The Mineral Reserves for Lihir as at 31 December 2013 includes a material reduction of approximately 3.7Moz of gold to 29Moz of gold, as against the 31 December 2012 estimate of 32.7Moz of gold.

The Proven Mineral Reserve estimate is generated from estimates of stockpiled ore that is classified as a Measured Mineral Resource. There are currently numerous separate stockpiles containing high grade, medium grade and low grade ore. The Probable Mineral Reserve estimate is generated from Indicated Mineral Resources within the final pit limits generated by the life-of-mine (LOM) plan.

Lihir Mineral Reserves as at 31 December 2013 are presented in Table 1.2.

**Table 1.2  Lihir Mineral Reserves Estimate at 31 December 2013**

<table>
<thead>
<tr>
<th>Reserve Classification</th>
<th>Tonnes (Mt)</th>
<th>Gold Grade (g/t)</th>
<th>Contained Gold (Moz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proven</td>
<td>100</td>
<td>2.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Probable</td>
<td>290</td>
<td>2.3</td>
<td>21.8</td>
</tr>
</tbody>
</table>

Notes: 1. Cut-off grade of 1 g/t Au based on a gold price of US$1,250/oz

1.5 Infrastructure

Lihir has established the normal range of infrastructure expected of a large remote mining operation. The construction and ongoing servicing of the mine and related infrastructure required the construction of port facilities, an upgrade of the existing airstrip, the development of accommodation facilities and infrastructure services to support the operation. All key services required for the mine were constructed by the property owners i.e. power, water supply, roads, and other infrastructure.
Most travel to and from the island is via aircraft, however, sea passenger services do operate to local islands. Marine facilities are established and service oil tankers, general cargo ships, passenger ferries, and work boats.

1.6 Environmental and Community Management

Prior to the discovery of gold at Lihir, the population of the Lihir island group was approximately 7,100. The economy was centered on subsistence agriculture and the population lived in many small villages around the island.

Environmental, social, and community issues have been managed through pro-active planning, and the development of environmental management systems and protocols based on thorough baseline studies and modeling.

1.7 Capital and Operating Costs

Lihi annual operating cost for FY2013 in Australian dollars is shown in Table 1.3. The Newcrest financial year closes on 30 June each year.

Table 1.3  Lihir FY 2013 Actual Operating Cost

<table>
<thead>
<tr>
<th>Lihir Island</th>
<th>Unit</th>
<th>FY13 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Production</td>
<td>koz</td>
<td>649</td>
</tr>
<tr>
<td>Total site cash costs</td>
<td>A$M</td>
<td>650</td>
</tr>
<tr>
<td>Waste stripping and ore inventory</td>
<td>A$M</td>
<td>(227)</td>
</tr>
<tr>
<td>Third party smelting refining and transporting</td>
<td>A$M</td>
<td>3</td>
</tr>
<tr>
<td>Royalty</td>
<td>A$M</td>
<td>21</td>
</tr>
<tr>
<td>Depreciation</td>
<td>A$/oz</td>
<td>206</td>
</tr>
</tbody>
</table>

Lihi cost and capital guidance for FY 2014 in Australian dollars is shown in Table 1.4.

Table 1.4  Lihir FY 2014 Cost and Capital Guidance

<table>
<thead>
<tr>
<th>Lihir Island</th>
<th>Unit</th>
<th>FY14 Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Cost (including by-product credits)</td>
<td>A$M</td>
<td>670 – 735</td>
</tr>
<tr>
<td>On-site exploration expenditure</td>
<td>A$M</td>
<td>1 – 2</td>
</tr>
<tr>
<td>Production Waste Stripping</td>
<td>A$M</td>
<td>140 – 155</td>
</tr>
<tr>
<td>Sustaining Capital</td>
<td>A$M</td>
<td>150 – 165</td>
</tr>
<tr>
<td>Corporate, rehabilitation and other</td>
<td>A$M</td>
<td>2 – 3</td>
</tr>
<tr>
<td>All-in sustaining cost</td>
<td>A$/oz</td>
<td>965 – 1,060</td>
</tr>
<tr>
<td>Production Waste Stripping</td>
<td>A$M</td>
<td>140 – 155</td>
</tr>
<tr>
<td>Sustaining Capital</td>
<td>A$M</td>
<td>150 – 165</td>
</tr>
<tr>
<td>Projects and development capital</td>
<td>A$M</td>
<td>2 – 5</td>
</tr>
<tr>
<td>Total capital expenditure</td>
<td>A$M</td>
<td>295 – 350</td>
</tr>
</tbody>
</table>

1 Costs assume AUD:USD 0.96, silver price US$22.0/oz
2 Duplicated above under All-in sustaining costs and under Capital expenditure
1.8 Conclusions

Lihir Gold Mine is an established operation with a long history to support development of plans to exploit the available Mineral Resources.

Factors that may have a material impact on the Lihir Gold Mine include those discussed in the risks section of Newcrest’s annual operating and performance review which forms part of Newcrest’s Full Year Financial Results for the year ended 30 June 2013, which can be found on its website at www.newcrest.com.au and at www.sedar.com.

1.9 Recommendations

Lihir is an established mining operation with Mineral Reserves sufficient for an extended mine life. In view of the nature of Lihir and the substantial Mineral Reserve inventory, no recommendations are included.
2 INTRODUCTION

2.1 General and Terms of Reference

This Technical Report (the Report) on the Lihir Property (Lihir or the Property) in the Province of New Ireland, Papua New Guinea (PNG) has been prepared by Newcrest Mining Limited (Newcrest) of Melbourne, Australia as an update in response to material changes in the Lihir Mineral Resource and Mineral Reserve.


2.2 Report Authors

The overall Report was assembled by Mr Kevin Gleeson under the direction of the Qualified Person (QP) Colin Moorhead, with contributions from other Newcrest employees. A listing of details of the authors of the Report, together with those who assisted and sections for which they are responsible or to which they contributed is contained in Table 2.1.

Table 2.1 Persons who Prepared or Contributed to this Technical Report

<table>
<thead>
<tr>
<th>Qualified Person</th>
<th>Position</th>
<th>Employer</th>
<th>Independent of Newcrest</th>
<th>Date of Site Visit</th>
<th>Professional Designation</th>
<th>Sections of Report</th>
</tr>
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<tbody>
<tr>
<td>C Moorhead</td>
<td>Executive General Manager Minerals</td>
<td>Newcrest Mining Limited</td>
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<td>Jan18-20 2014</td>
<td>FAusIMM (CP)</td>
<td>All Sections</td>
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<tr>
<td>K Gleeson</td>
<td>Head of Mineral Resource Management</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>March 2013</td>
<td>MAusIMM</td>
<td>Compilation of Report</td>
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<tr>
<td>L Bowyer</td>
<td>Manager Land Tenure</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>-</td>
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<td>4</td>
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<tr>
<td>P Griffin</td>
<td>Head of Processing Operations</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>Nov 2013</td>
<td>MAusIMM</td>
<td>13, 17</td>
</tr>
<tr>
<td>S Perkins</td>
<td>Manager-Minerals &amp; Technical Services Lihir</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>Site based</td>
<td>MAusIMM</td>
<td>14</td>
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<tr>
<td>S Butt</td>
<td>Group Manager Mine Planning</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>August 2013</td>
<td>MAusIMM</td>
<td>15, 16</td>
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<tr>
<td>Albert de Sousa</td>
<td>General Manager-Marketing &amp; Logistics</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>-</td>
<td>N/A</td>
<td>19</td>
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<tr>
<td>Blair Sands</td>
<td>Head of Health and Environment</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>Aug 2013</td>
<td>N/A</td>
<td>20</td>
</tr>
<tr>
<td>K Kerr</td>
<td>General Manager-Commercial and Planning</td>
<td>Newcrest Mining Limited</td>
<td>No</td>
<td>Oct 2012</td>
<td>CA (Chartered Accountant)</td>
<td>21, 22</td>
</tr>
</tbody>
</table>
Mr Colin Moorhead is currently an employee of Newcrest and accepts Qualified Person responsibility for the Report. Mr Moorhead last visited the Lihir operations in January 2014. Mr Kevin Gleenon and Mr Paul Griffin are employees of Newcrest who visit Lihir to review relevant aspects of the operation. Mr Stephen Perkins is an employee of Newcrest and has been appointed as the Competent Person for reporting Lihir Mineral Resources under the JORC Code1. Mr Steven Butt is an employee of Newcrest and has been appointed as the Competent Person for reporting Lihir Ore Reserves under the JORC Code1.

This Report is based on internal Newcrest information (listed in Section 27), site visits undertaken by the Qualified Person (QP) and discussions with other Newcrest personnel.

This Report is effective as of 31 December 2013.

2.3 Units of Measure and Currency

Throughout this Report, measurements are in metric units and currency is expressed in Australian dollars, United States dollars and PNG kina. Table 2.2 includes key terms used and their abbreviations.

<table>
<thead>
<tr>
<th>Unit/Term</th>
<th>Abbreviation</th>
<th>Unit/Term</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity or basicity</td>
<td>pH</td>
<td>Mining Easement</td>
<td>ME</td>
</tr>
<tr>
<td>Acid Rock Drainage</td>
<td>ARD</td>
<td>Megawatts</td>
<td>MW</td>
</tr>
<tr>
<td>Carbon-In-Leach</td>
<td>CIL</td>
<td>Mining Leases</td>
<td>MLs</td>
</tr>
<tr>
<td>Counter-current decantation</td>
<td>CCD</td>
<td>Metres Reduced Level</td>
<td>mRL</td>
</tr>
<tr>
<td>Cubic metres</td>
<td>m³</td>
<td>Million Ounces</td>
<td>Moz</td>
</tr>
<tr>
<td>Cubic metres per hour</td>
<td>m³/hr</td>
<td>Net Present Value</td>
<td>NPV</td>
</tr>
<tr>
<td>Cyanide</td>
<td>CN</td>
<td>Net Smelter Return</td>
<td>NSR</td>
</tr>
<tr>
<td>Dead weight tonnes</td>
<td>DWT</td>
<td>Non-Acid Forming</td>
<td>NAF</td>
</tr>
<tr>
<td>Deep sea tailings placement</td>
<td>DSTP</td>
<td>One millionth of a metre</td>
<td>micron</td>
</tr>
<tr>
<td>Department of Environment and Conservation</td>
<td>DEC</td>
<td>Ordinary Kriging</td>
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<td>DBD</td>
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<td>PNG</td>
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<td>%</td>
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<td>Exploration Licences</td>
<td>ELs</td>
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<td>FGO</td>
<td>Per cubic metre</td>
<td>/m³</td>
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<tr>
<td>Gold</td>
<td>Au</td>
<td>Per kilowatt hour</td>
<td>/kWh</td>
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<td>Grams per tonne</td>
<td>g/t</td>
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<td>/oz</td>
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<tr>
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<td>g/t Au</td>
<td>Per tonne</td>
<td>/t</td>
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<td>HFO</td>
<td>Potentially Acid Forming</td>
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1 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, The JORC Code 2012, effective 1 December 2013, prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).
<table>
<thead>
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<th>Unit/Term</th>
<th>Abbreviation</th>
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<td>Kilogram(s)</td>
<td>kg</td>
<td>Quality Assurance Quality Control</td>
<td>QA/QC</td>
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<tr>
<td>Kilograms per cubic metre</td>
<td>kg/m³</td>
<td>Reverse Circulation</td>
<td>RC</td>
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<td>km</td>
<td>Run-Of-Mine</td>
<td>ROM</td>
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<td>km/h</td>
<td>Semi-autogenous grinding</td>
<td>SAG</td>
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<td>koz</td>
<td>Square kilometres</td>
<td>km²</td>
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<tr>
<td>Kilotonne per annum</td>
<td>ktpa</td>
<td>Square metres</td>
<td>m²</td>
</tr>
<tr>
<td>Kilowatt</td>
<td>kW</td>
<td>Tailings Storage Facility</td>
<td>TSF</td>
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<tr>
<td>Kilowatt-hours</td>
<td>kWh</td>
<td>Tonne(s)</td>
<td>t</td>
</tr>
<tr>
<td>Kilovolts</td>
<td>KV</td>
<td>Tonnes per cubic metre</td>
<td>t/m³</td>
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<td>Internal diameter</td>
<td>ID</td>
<td>Tonnes per day</td>
<td>tpd</td>
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<td>LOM</td>
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<td>tph</td>
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<td>Life of province plan</td>
<td>LOPP</td>
<td>Uniform Conditioning</td>
<td>UC</td>
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<tr>
<td>Lihir Sustainable Development Plan</td>
<td>LSDP</td>
<td>Volt(s)</td>
<td>V</td>
</tr>
<tr>
<td>Litre</td>
<td>l</td>
<td>Weak acid dissociable cyanide</td>
<td>CNWAD</td>
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<tr>
<td>Metre(s)</td>
<td>m</td>
<td>Wet metric tonnes</td>
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<td>Mt</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Million Tonnes per annum</td>
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<tr>
<td>Millimetres</td>
<td>mm</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Million ounces (troy)</td>
<td>Moz</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
3 RELIANCE ON OTHER EXPERTS

The Qualified Person has relied, in respect of legal, environment, marketing and commercial aspects, upon the work of certain Experts listed below. To the extent permitted under NI 43-101, the Qualified Person disclaims responsibility for these sections of the Report.

The following disclosure is made in respect of each of these Experts:

Ms L Bowyer, Manager Land Tenure, Newcrest:
- Report, opinion or statement relied upon: Information on mineral tenure and status, title issues, royalty obligations, etc.
- Extent of reliance: full reliance following a review by the Qualified Person.
- Portion of Report to which disclaimer applies: Section 4, excluding Section 4.3.

Mr B Sands, Head of Health and Environment, Newcrest:
- Report, opinion or statement relied upon: Information on environmental, permitting, and social/community matters.
- Extent of reliance: full reliance following a review by the Qualified Person.
- Portion of Report to which disclaimer applies: Section 20.

Mr A de Sousa, General Manager, Marketing & Logistics, Newcrest:
- Summary report on Newcrest marketing.
- Extent of reliance: status of Newcrest’s sales arrangements.
- Portion of Report to which disclaimer applies: Section 19.
4 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Lihir operations are on Niolam Island which is part of the Lihir Group in the Province of New Ireland, PNG. The island, generally referred to as Lihir Island as it is the largest island in the Lihir Group, is located approximately 900km north-north-east of the national capital Port Moresby. The Property is located at approximately 3°06’54”S latitude, 152°38’27”E longitude. The location is shown in Figure 4.1. Lihir consists of a single open pit mine from which ore is processed on site to produce gold doré.

Figure 4.1 Property Location

4.2 Land Tenure

Mine development and operations at Lihir are conducted in accordance with the agreed development plans stipulated in the mining development contract i.e. the Approved Proposal For Development (APFD) and Special Mining Lease Number 6 (SML 6) (Department of Mining and Petroleum, 1995) signed by the Independent State of PNG in 1995 (Department of Attorney General, 1995).

The Property consists of SML 6, two granted Mining Leases (MLs) and one granted Exploration Licence (EL), plus a number of miscellaneous mining purpose and easement leases. The total area under licence is approximately 257km². The registered holder for all tenure is Lihir Gold Limited and the total statutory annual expenditure commitment for the project is PGK150,000.
SML 6 expires 16 March 2035 and EL485 expires 31 March 2014. An extension of term application from 1 April 2014 to 31 March 2016 has been lodged for EL485.

Details of leases and licences are provided in Table 4.1 and Figure 4.2.

### Table 4.1  Lihir Property Land Tenure Details

<table>
<thead>
<tr>
<th>Lease</th>
<th>Lease Type</th>
<th>Lease Status</th>
<th>Grant Date</th>
<th>Expiry Date</th>
<th>Area km²</th>
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<td>SML6</td>
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<td>17.39</td>
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<td><strong>Total</strong></td>
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<td><strong>257.2</strong></td>
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</table>
Figure 4.2  Lihir Island Exploration and Mining Tenements
4.3 Royalties, payments or other agreements

4.3.1 Integrated Benefits Package Agreement

A revised Integrated Benefits Package Agreement (IBP) was signed in 2007 with the Lihir Mining Area Landowners Association and the Nimamar Rural Local-Level Government (NRLLG). The IBP sets out the heritage and compensation arrangements for the local landowners, with the main objectives of ensuring that development in Lihir occurs in parallel with mining, is balanced across the island, is sustainable and is stable.

The revised IBP sets out a framework for:

- Financial commitments over five years, totaling PGK107M.
- Commitments to assist the Lihir people to establish commercial ventures on Lihir Island, including participation in mining related activities.
- Developing the capability and capacity of the Lihir people to manage their own affairs.
- Implementing all incomplete projects agreed to under the original IBP.
- Compensation associated with land affected by mining and related operations.
- Requirements associated with rehabilitation and mine closure.

The above agreement is currently being reviewed. Final terms of the revised agreement are still being negotiated.

4.3.2 Mining Royalty

A royalty of 2% of gold revenue (net of refining and transport costs) is payable, divided between federal, provincial governments, and local level governments and landowners.

4.4 Environmental Liabilities

The Mineral Resource Authority in PNG holds a total of PGK111,000 in security deposits for compliance with obligations under the *Mining Act 1992* and as prescribed under the *Mining Regulations 1992*. 


5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Topography Elevation and Vegetation

Lihir Island is formed around extinct volcanoes and is approximately 20km long by 10km wide with an area of 197 km² (Figure 5.1). The mine is located within the Luise Caldera of the Luise Volcano which is located on the east coast of the island. The caldera is an extinct volcanic crater that is geothermally active. It has a 6km by 4km elliptical crater with steep walls reaching 600m above sea level. Several hundred thousand years ago the eastern (seaward) part of the caldera collapsed, with debris flows extending 25km to 40km eastward such that the submerged slope now forms the base of Luise Harbour.

Natural vegetation on the island is predominantly tropical rain forest. At the mine site, flooding effects are generally limited to a need for increased pit sump pumping, an increase in local backwater and occasional inundation of the Luise Harbour foreshore region.

Soils are naturally highly mineralized and contain elevated heavy metal concentrations. The gold mineralization within the Luise Caldera is hosted within volcanic and intrusive rocks and breccias that have undergone extensive alteration.

Parts of the narrow coastal plain, particularly in the northern and eastern areas, have formed on coral platforms. This includes the regions around the Putput ore processing plant, Londolovit town site and Kunaye Airport.
Figure 5.1 Lihir Island Physiography
5.2 Climate

Lihir Island is located at latitude 3° south and does not experience distinct wet or dry seasons. Lihir experiences high rainfall, averaging about 3.9 m per annum, with mean relative humidity of 80%. Periods of rainfall extremes often, but not always, correlate with the El Niño Southern Oscillation.

Air temperatures at Lihir are relatively constant from month to month, with daily air temperatures ranging between 21.1°C and 33.7°C. Temperatures at the mine site range from 21.0°C to 34.2°C while the sea temperature remains relatively constant at approximately 27°C to 28°C throughout the year.

Winds close to sea level are generally light, with monthly mean wind speeds of less than 5 knots. There are two wind seasons of variable duration. Between May and September/October, winds are mainly from the south-east and east and between December and March, winds are mainly from the north and west. November and April are transitional months. Luise Caldera has a noticeable effect on wind flow. Wind speeds at the mine site are light and variable and range from 0.6 km/h to 16.6 km/h.

Lihir lies north of the cyclone belt, which is at latitude 10° to 20° south; however, high-intensity, short-duration storms with accompanying winds do occur which do not affect normal operational activities.

Air quality at Lihir is affected by both natural and anthropogenic emissions. Natural air emissions include hot springs and geothermal discharges that release steam and other gases including H₂S. These vary in intensity throughout the year. Anthropogenic emissions arise from mining operations, power generation and ore processing activities, and from local community activities such as road use, and subsistence agricultural burn-offs.

5.3 Natural Hazards

PNG extends across several major tectonic plate boundaries and is one of the most seismically active regions in the world. Lihir Island is located in the West Melanesian Arc seismic source zone where earthquakes of up to magnitude eight have been recorded. Most earthquakes in the region result from strike-slip movement but some occur along steeply dipping reverse faults resulting in a strong vertical motion component and have potential to generate local tsunamis. Both tsunami and earthquake risks have been assessed and incorporated into the project design criteria.

Volcanic activity on Lihir Island is limited to remnant hydrothermal venting in the Luise Caldera in the form of hot springs and fumaroles. Steam and gas (including H₂S) naturally discharge within the pit area and along the Kapit beach and near shore region. The hydrothermal reservoir temperatures can reach 100°C at the water table and exceed 200°C at depth. Isolated geothermal activity in the form of hot springs is evident elsewhere on the island, such as within the southern Kinami caldera.

5.4 Access

Prior to the discovery of gold at Lihir, the population of the Lihir Island group was approximately 7,100. The economy was centred on subsistence agriculture and the population lived in many small villages around the island.
The construction and ongoing servicing of the mine and related infrastructure required the construction of port facilities, an upgrade of the existing airstrip, the development of accommodation facilities, and infrastructure services to support the operation. Most travel to and from the island is via aircraft, however, sea passenger services do operate to local islands. Marine facilities are established to service oil tankers, general cargo ships, passenger ferries, and work boats.

All key services required for the mine were constructed by the Property owners i.e. power, water supply, roads, and other infrastructure.

A mine village has been constructed at Londolovit to house mine staff, contractors and families who are not Lihir residents (that is a component of the workforce commutes on FIFO rosters), as the local area is unable to supply the workforce required by the mine. The mining leases are accessed by sealed road from Londolovit, which is approximately four kilometres north of the mine.

5.5 Surface Rights

Lihir has been granted rights to undertake mining and processing of gold and related activities, through negotiations with the state and local government, and landowners in the area.

Newcrest holds a granted mining lease, but there are some areas of the lease where agreements are not yet in place with local landowners or the community.
6 HISTORY

6.1 Project Ownership

In 1982, gold mineralization was discovered on Niolam Island leading to a major exploration campaign by a joint venture between Kennecott Exploration and Niugini Mining Limited.

In 1992, Kennecott Mining completed a feasibility study, culminating in the PNG Government granting a Special Mining Lease in 1995 to the Lihir Joint Venture Project comprising Rio Tinto Limited (Rio Tinto) and Niugini Mining Limited.

In 1995, Lihir Gold Limited (LGL) was established to own and operate the Lihir Gold Mine on behalf of joint venture between Kennecott Mining and Rio Tinto Limited. Construction started in the same year and first gold was poured in 1997.

In 2005, Rio Tinto divested itself from the joint venture.

In August 2010, Newcrest Mining Limited acquired LGL by scheme of arrangement.

6.2 Exploration

The first systematic mineral exploration in the region was undertaken by the PNG Bureau of Mineral Resources and the Geological Survey of PNG between 1969 and 1974.

Gold mineralization at Lihir was initially discovered in 1982 by a joint venture between Kennecott Exploration and Niugini Mining. Geologists sampled pyritized, silicified outcrops and boulders along the beach of the harbour, adjoining Luise Caldera on the east side of Lihir Island. These samples were highly anomalous in gold grades.

Semi-detailed mapping, soil samples, rock chips and hand-cut trenches made in 1983 outlined surface gold mineralization in the Luise Caldera, ultimately identifying four areas of gold mineralization within the Luise Caldera i.e. Minifie, Lienetz, Coastal and Kapit.

Diamond drilling commenced in the Coastal area in 1983, and continued in conjunction with bulldozer trenching in both the Coastal and Lienetz areas throughout 1984. By the end of 1984, the presence of a potential large gold resource had been confirmed and in 1985 the drilling program was expanded to include reverse circulation (RC) drilling in order to delineate oxide Mineral Resources. The Minifie area, immediately south of Lienetz, was drill-intersected in 1986 and the first drill hole in the Kapit area found a thick section of potentially economic gold mineralization in late 1987.

In addition to drilling that has continued through to 2013, exploration work has included detailed topographic, geochemical and geophysical surveying, surface geological mapping, trenching, auger sampling, specific gravity determinations, hydrogeology, petrology and mineralogy studies.

6.3 Historic Mineral Resources

Historic Mineral Resources are not reported here as they are available in Newcrest and various owners’ annual reports.
6.4 Production

Production commenced from Lihir in 1997 and has generated cumulative production in excess of 10 Moz of gold since start up. Production statistics are presented in Table 6.1.

Table 6.1 Historical Mill Production from Lihir

<table>
<thead>
<tr>
<th>Period</th>
<th>Mill Throughput (t 000's)</th>
<th>Feed Grade (g/t Au)</th>
<th>Gold Recovery (%)</th>
<th>Gold Production (oz)</th>
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<tr>
<td>Jan – Dec 1997</td>
<td>717</td>
<td>6.69</td>
<td>88.0</td>
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<td>Jan – Dec 1998</td>
<td>2,352</td>
<td>6.94</td>
<td>93.7</td>
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<tr>
<td>Jan – Dec 1999</td>
<td>2,911</td>
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<td>95.1</td>
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<tr>
<td>Jan – Dec 2000</td>
<td>3,413</td>
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<td>91.6</td>
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<td>Jan – Dec 2001</td>
<td>3,619</td>
<td>6.18</td>
<td>90.0</td>
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<td>Jan – Dec 2002</td>
<td>3,828</td>
<td>5.46</td>
<td>89.6</td>
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<tr>
<td>Jan – Dec 2003</td>
<td>3,926</td>
<td>4.95</td>
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<tr>
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<td>89.7</td>
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<td>Jan – Dec 2006</td>
<td>4,344</td>
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<td>86.0</td>
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<td>6,154</td>
<td>4.76</td>
<td>82.5</td>
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<td>Jan – Dec 2009</td>
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<td>81.3</td>
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<td>Jan – Jun 2010</td>
<td>3,316</td>
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<td>81.9</td>
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<tr>
<td>Jul 2011 – Jun 2012</td>
<td>6,042</td>
<td>3.96</td>
<td>81.1</td>
<td>604,336</td>
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<td>Jul 2012 – Jun 2013</td>
<td>6,941</td>
<td>3.41</td>
<td>85.2</td>
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<td><strong>Total</strong></td>
<td>72,813</td>
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Notes:  
1. This is a 6 month period  
2. Now reporting financial period
7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Bismarck Archipelago is located in north-east PNG (Figure 7.1) and includes the islands of New Britain, New Ireland, Bougainville and the Solomons. Lihir Island is one of four volcanic island groups that form a chain parallel to the New Ireland coast line called the Tabar to Feni Chain. The islands in this chain are volcanic of largely Pliocene age to recent rising from a submarine platform. The island chain has a varied but predominately shoshonitic composition.

Figure 7.1 Regional Geological Framework

7.2 Deposit Geology

7.2.1 Geological Setting

Lihir Island is formed from the remnants of five volcanoes (Figure 7.2). Lihir operations are located within the youngest volcano, the Luise Caldera on the eastern side of the island (approximately one million years old), although gold mineralization itself dates from 0.15 to 0.90 million years. The Island Group lies along a north-north-east (~025°) trending submarine ridge. The most prominent faults on Lihir Island are normal faults striking 040° to 050° and dipping 40 to 50° to the north-west.
Figure 7.2 Lihir Island Geology

Exploration has identified several adjacent and partly overlapping mineral deposits in the Luise Caldera, which are collectively called the Ladolam Deposit. The principal component deposits are called Lienetz, Minifie, Coastal and Kapit. The limits of the mineralization have not been completely defined and are open at depth, along strike and to the east (currently limited by the Pacific Ocean).

Gold mineralization in the caldera is hosted within volcanics, intrusives, and breccias which have undergone extensive alteration. Two major alteration episodes have been identified which have destroyed much of the original host rock lithologies, and due to this an “ore type” classification has been developed based largely upon various combinations of alteration, hardness, the degree of brecciation and/or leaching of matrix material, and the presence of late stage anhydrite veining.

Whilst this is more a metallurgical classification than a geologic one, it has proved useful in determining many of the mining and processing characteristics of the orebody and the host rocks. The ore types are roughly sub-horizontal in occurrence and form a fairly consistent vertical sequence of clay-rich rock, grading into white mica-feldspar rock, then feldspar-biotite and, at depth, into feldspar-biotite-anhydrite rock.

Within and at the boundaries of the ore types, geological structure is also a major influence on the localization of higher gold grades in the ore bodies.
7.2.2 Alteration

Two major alteration episodes have been identified. There was an earlier and deeper “porphyry style” event resulting in potassic alteration grading laterally into propylitic alteration. This was followed by a later and higher level epithermal event producing argillic, advanced argillic, phyllic, and lower temperature potassic alteration.

Early stage potassic alteration occurred, associated with the emplacement of alkalic stocks within the volcanic edifice, with peripheral and broadly contemporaneous propylitic alteration.

Sudden collapse of the volcanic edifice is interpreted to have resulted in the rapid depressurizing of the system and subsequent telescoping of “epithermal style” alteration and associated gold mineralization upon the porphyry environment. Argillic and advanced argillic alteration assemblages developed through continued geothermal activity, driven by post mineralization magmatism. Geothermal activity continues.

7.2.3 Mineralization

Gold is the only metal of economic significance present within the Luise Caldera. A number of mineralization styles have been recognized, ranging from early porphyry to late stage epithermal mineralization. Two of these represent economically significant phases of gold mineralization at Lihir.

- The most important is refractory potassium feldspar-sulphide mineralization. In this association, gold occurs primarily as sub-micron size particles in sulphide minerals. Overall sulphide content is relatively high, with the average sulphur grade of the reserves being above 6%. The main sulphide mineral is pyrite, with the marcasite form present as an accessory mineral and rare arsenopyrite.

Gold also occurs as small (less than 100 micron) blebs within fine pyrite crystals. The sulphides are characterized by their fine grained nature, and have been deposited through wholesale flooding and deposition within all host rocks, imparting a sooty, dark grey coloring to the host rocks. Within the Lienetz and Kapit orebodies (and in some localized portions of Minifie) this style of mineralization has been associated with strong leaching of the original lithologies creating pinhole to open, vughy textures.

Cavities of up to 10m in extent have been encountered in Lienetz. This secondary porosity is thought to have been the result of dissolution of host rock by hot alkaline fluids as a result of boiling.

- The second significant style of gold mineralization occurs as a low sulphidation quartz-chlorite-bladed anhydrite association, more typical of epithermal style mineralization, deposited through the mixing of magmatic fluids with oxidizing near-surface water. Occasional free gold, up to several millimetres in size, has been observed in association with this mineralization style.

Mineralization occurs as discrete fracture filled veins through all levels of the deposits, and is inferred to be an overprinting style of epithermal mineralization associated with the cooling of the active geothermal system within the Luise Caldera. It is also characterized by relatively high, though erratic, gold grades when compared with the high sulphidation style of mineralization.
8 DEPOSIT TYPES

A model for gold emplacement at Lihir is presented in Figure 8.1. Listric faults (developed during the collapse of the Luise volcanic edifice) acted as conduits for hot magmatic fluids rising towards the surface. Extensive phreatomagmatic brecciation which developed after the unloading of the system by edifice collapse is interpreted to have provided sites of increased permeability and fluid mixing.

High sulphidation refractory gold deposition subsequently occurred along these feeder structures and closely linked breccia units. Clay rich, argillically altered material acted as a cap to the system, with gold deposition penetrating into this overlying material constrained to strongly developed structures only. As the system cooled, low sulphidation, epithermal style gold mineralization developed as discrete, generally narrow (<10 cm), structurally controlled mineralized veins or vein sets, closely associated with the listric feeder structures of the earlier high sulphidation mineralization.

Figure 8.1 Conceptual Genetic Model for Gold Deposition at Lihir
9 EXPLORATION

The first systematic mineral exploration in the region was undertaken by the PNG Bureau of Mineral Resources and the Geological Survey of PNG between 1969 and 1974. In their report (which was released in 1982), it detailed the hydrothermal alteration and geothermal activity evident on Lihir Island and suggested that it was a favorable geologic environment for epithermal gold mineralization.

Gold mineralization at Lihir was initially discovered in 1982 by a joint venture between Kennecott Exploration and Niugini Mining. Geologists sampled pyritized, silicified outcrops and boulders along the beach of the harbour, adjoining Luise Caldera on the east side of Lihir Island. These samples were highly anomalous in gold grades.

In November 1982, the PNG Government lifted a moratorium previously imposed on the issuance of new prospecting authorities, and on the same day the participants in the Joint Venture applied for a prospecting authority (now called an EL) covering the whole of Lihir Island and part of Luise Harbour. This prospecting authority was issued seven months later.

Semi-detailed mapping, soil samples, rock chips and hand-cut trenches made in 1983 outlined surface gold mineralization in the Luise Caldera, ultimately identifying four areas of gold mineralization within the Luise Caldera i.e. Minifie, Lienetz, Coastal and Kapit.

Diamond drilling commenced in the Coastal area in 1983, and continued in conjunction with bulldozer trenching in both the Coastal and Lienetz areas throughout 1984. Although all holes intersected mineralization, extensive disseminated gold mineralization was first discovered in hole L13-3 at Lienetz. By the end of 1984, the presence of a potential large gold resource had been confirmed and in 1985 the drilling program was expanded to include reverse circulation (RC) drilling in order to delineate oxide Mineral Resources. The Minifie area, immediately south of Lienetz, was drill-intersected in 1986 and the first drill hole in the Kapit area found a thick section of potentially economic gold mineralization in late 1987.

Newcrest exploration drilling from 2010 has focused on delineating the extent of mineralization in the Kapit North East area. This mineralization extends up to and beyond the current seaward constraint (proposed coffer dam).

In addition to drilling, exploration work has included detailed topographic, geochemical and geophysical surveying, surface geological mapping, trenching, auger sampling, specific gravity determinations, hydrogeology, petrology and mineralogy studies. No significant exploration activities were conducted in 2013.
10 DRILLING

10.1 Overview

Drilling is the primary source of data for Mineral Resource estimation at Lihir. Data is sourced from a number of methods including diamond coring, reverse circulation (RC) drilling and rotary drilling (used for grade control sampling). All data is used for interpretation with only the diamond and RC drilling used for grade estimation.

10.2 Drilling Statistics

Figure 10.1 shows drill hole traces overlaying resource block model on cross section 9400E and Figure 10.2 shows drill hole locations at Lihir. Table 10.1 summarizes the drilling statistics of the Property to date. The majority of drilling for resource estimation is diamond drill core, comprising PQ (84.8 mm core diameter), HQ (63.5 mm core diameter) and NQ (47.6 mm core diameter).

There were 63 diamond drill holes for 22,157.5m drilled in the period from January 2012 to December 2013 inclusive (included in the total Property to date drilling of 2,568 drill holes for 512,987m as detailed in Table 10.1).

Figure 10.1 Cross Section 9400E
Table 10.1 Drilling Statistics to 31 December 2013

<table>
<thead>
<tr>
<th>Drilling Type</th>
<th>Number of Holes Drilled</th>
<th>Metres Drilled (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond drilling</td>
<td>1,636</td>
<td>400,804</td>
</tr>
<tr>
<td>RC Percussion drilling</td>
<td>700</td>
<td>33,076</td>
</tr>
<tr>
<td>Open Hole percussion drilling</td>
<td>232</td>
<td>79,106</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,568</strong></td>
<td><strong>512,987</strong></td>
</tr>
</tbody>
</table>
10.3 Drilling Conditions

Lihir is an active geothermal area and all drilling activities are established carefully to ensure that drilling is safely conducted when zones of high pressure steam are intersected (Figure 10.2).

Figure 10.3 Drilling Operations at Lihir

10.4 Hole Surveying

All completed drill hole collars are surveyed by the mine surveyors.

A variety of methods have been used to measure down-hole deviation (dip and azimuth), including conventional camera, electronic single shot and gyroscopic methods. The majority of the holes have been surveyed using conventional camera methods. At present, single shot electronic surveys are completed at an initial depth of 50m and thereafter every 50m down hole.

10.5 Core Orientation

Very little core orientation is performed on site as the ground conditions down hole are generally quite poor due to broken or faulted ground and high clay contents in the upper sections of the deposit. This makes it very difficult to transfer orientation lines or match between runs.
10.6 Core Recovery

There are only minor zones of lost core or poor core recovery and usually restricted to broken or faulted ground and high clay contents in the upper sections of the deposit. Core recovery is generally excellent with core recoveries around 99%.

10.7 Logging and Sampling

All diamond drill holes are processed in-house. Core photography, geological and structural logging, bulk density measurements and geotechnical data are collected prior sampling and assaying. Logging data are entered into the database via a laptop computer.

At the completion of drill core logging, the geologist defines which intervals of a drill hole are to be cut for analysis. All recent drilling is analyzed on 2m intervals on the metre mark. PQ series and HQ series drill core is sampled by cutting the core in half with a diamond blade saw. NQ series core is not cut in half as the entire section is sampled so that sample support is maintained.

All data collection and sampling is conducted on site at the Lihir core processing facility, which includes logging sheds, core cutting, and storage areas.
11 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 Historical QA/QC Summary

Historical QA/QC (up to and including 2011) performance at Lihir has been relatively poor and all control measures used indicate that there have been problems at the mine with sample mix-ups, swaps and mislabeling of control samples, and by inference the routine drill samples.

The data for gold analysis suggested there is a systematic negative bias in the Lihir assay laboratory performance for gold of the order of negative 5%.

The data for sulphide sulphur analysis suggests there is a systematic positive bias in the Lihir assay laboratory performance for sulphur of the order of 15-20%. The positive bias is considered to be due to the degradation of the Labfit procedure over time such that it measured total sulphur rather than the sulphide sulphur the procedure was established for and also the procedure used to generate the expected value of the CRMs. It is noted that sulphide sulphur assays are used for metallurgical characterization and are not directly applied to Mineral Resource and Mineral Reserve estimates.

Historical QA/QC results do not suggest there is a serious bias in the performance of the Lihir laboratory in terms of gold analysis. Therefore whilst there are concerns over the accuracy of individual samples, this problem does not translate into a concern at a global level.

In the Qualified Person's opinion the QA/QC data indicates the historical (prior to 2011) sample preparation, security and analytical procedures have been adequate and results independently verified and as such the data is deemed acceptable input into the Mineral Resource estimate.


QA/QC performance for the period 2011 to 2013 inclusive is detailed in Sections 11.6 onwards

11.2 Drill Core Sampling

Lihir has a well maintained core logging and storage facility at the mine where all logging and sampling activities take place.

After core logging, a cut-line is drawn on the core and the core is photographed. Intact and competent drill core is cut in half along the cut-line using a diamond saw. Where the core is too soft to be cut with a diamond saw, a knife is used to cut the core in the core tray. Where the core is too broken or brittle to be cut by the saw, the fragments are manually sampled.

The standard sampling interval is 2m. The left hand half of the core is placed in a calico bag marked with the appropriate sample number and sent to the laboratory for sample preparation and assaying. The remaining half core is stored in the original trays on pallets at the core processing facility.
Gold and sulphur reference material and blanks are inserted at a ratio of 1:20 and recorded on the dispatch sheet.

11.3 Sample Preparation

Lihir has a sample preparation facility at the mine and all routine drill core samples are processed on site.

Sample preparation for analysis is as follows:

- Samples are dried in an oven at 160°C for several hours.
- Samples are crushed to 10 mm maximum diameter and split to a maximum weight of 3 kg using a riffle splitter.
- Split samples are dried in an oven at 160°C for several hours.
- Each 3 kg sample is pulverized using a Labtechnics LM5 pulverizing mill to specified grind parameters of 90% passing 106 micrometers.
- A 200 g sub-sample is collected for analysis and submitted to the assay laboratory.

11.4 Analysis

Lihir has an assay laboratory at the mine and all routine drill core samples are processed on site. Samples are analyzed routinely for gold, copper and sulphide sulphur. Results are recorded electronically and sent to the Geology Department to be uploaded to the resource database for checking and validation.

The basic analytical scheme is unchanged from that used historically (summarized in Table 11.1), but there has been a great deal of time and effort put into improving both the precision and accuracy of gold fire assays. Initiatives taken include: engaging a highly experienced fire assay specialist to recommend changes to procedure, optimising the fire assay flux for Lihir ore, extensive retraining of fire assay operators and chemists, increasing supervision, and documenting procedures to be followed. Sulphide sulphur analyses have also come under a great deal of scrutiny; the original method has been identified as inappropriate and likely to lead to bias and precision issues. Improved methods have been identified and the necessary instrumentation purchased, implemented and training of site staff continues. This process is being implemented for mill control samples initially and will be standard for all future resource drilling for sulphide sulphur analysis.

The three Newcrest laboratories (Orange, Telfer and Lihir) are now working collaboratively and this has had the benefit of allowing highly trained and experienced chemists to visit other sites and implement changes that will lift standards across the Group.

In addition there has been a programme of multi-element analysis of old drill samples designed to fingerprint the Lihir mineralization and produce vectors to mineralization for future work. Initially the multi-element analyses were carried out by independent commercial laboratory (ALS Brisbane) using aqua regia and then 4-acid digest (HF-HClO₄-HNO₃-HCl) mixed ICP-OES – ICP-MS. Subsequently, the multi-element work was transferred to the Newcrest Laboratory Services facility at Orange (NLSO) in NSW. NLSO used similar analytical methods to those used by ALS.
Table 11.1 Lihir Assay Techniques and Detection Limits

<table>
<thead>
<tr>
<th>Element</th>
<th>Technique and Detection Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Au</td>
<td>Fire assay with 25 g charge and Atomic Absorption Spectroscopy (AAS) finish. Detection limit of 0.01 ppm (g/t).</td>
</tr>
<tr>
<td>Cu</td>
<td>Primary analysis with 0.5 g sample using digestion by mixed acid (perchloric, hydrochloric and nitric) digest followed by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES). Ore grade (&gt;1%) mixed acid digest for Cu &gt;= 1% with flame AAS finish. Detection limit of 0.01%</td>
</tr>
<tr>
<td>Sulfide S</td>
<td>The sample is ignited at high temperature in a stream of oxygen. The resulting sulphur dioxide is measured by an infra-red detector using a Carbon/Sulphur analyser. S detection limit of 10 ppm</td>
</tr>
</tbody>
</table>

11.5 QA/QC Procedures

All assays are checked and verified in accordance with the Newcrest Resource Development Quality Assurance Quality Control (QA/QC) and database management procedures. QA/QC procedures have been in place for all of the historic drilling programs at Lihir.

A detailed QA/QC program is in place for ongoing assessment of sampling and analytical procedures. The process currently involves submission and analysis of:

- Blind submissions of certified reference material (CRMs) to Lihir laboratory.
- Duplicates from the LM5 pulverizer pulp, assayed during the same batch.
- Blind resubmission of pulps to Lihir laboratory.
- Replicate submissions of pulps to an alternative laboratory for analysis.
- Replicate submissions of coarse duplicates to an alternative laboratory for analysis (from 2012 Newcrest Laboratory Services-Orange).
- Submission of coarse blank samples (Non-Lihir Island barren rock samples).
- Checks on grind and crush size from the sample preparation steps.
- Visits to the laboratory for confirmation of actual procedures applied.
- Monthly QA/QC meetings with laboratory personnel.

A monthly report is prepared for the site Mineral Resource Manager detailing QA/QC performance and an annual report is prepared to support the documentation of the Mineral Resource estimate.

11.6 Certified Reference Materials (2011 to 2013)

Refer to section 11.1 for historical QA/QC summary (up to and including 2011).

From the beginning of 2011 to the end of 2013 there were 1600 CRMs analyzed for gold. The median bias for that period was -4% (i.e. on average the assay results were 4% below the CRM preferred value).

Figure 11.1 shows the pattern of results expressed in z-score units (one z is the same as one standard deviation). Data have been curtailed at both ends; any z-score greater than 6 has been attributed a value of 6 and any with a z-score below -6 has been attributed -6. This reduces the impact of the outliers, many of which are a product of the poor precision at Lihir. The red moving average line shows that the bias oscillated around -2 standard deviations.
deviations (equivalent to about -5%) for much of the time followed by a period of reverse bias and then more moderated bias (-3 to -4%) and improved precision.

**Figure 11.1 Lihir gold z-scores**

The median bias for sulphide blanks was +18.8%. The moving average (Figure 11.2) wavers about z = + 2 (equivalent to a bias of about 22%) before diminishing slowly to z = 0. Work carried on at the laboratory, initially with the intention of removing the sulphur bias, has shown that the method used for the determination of sulphide was fundamentally flawed but significant improvements in bias have been achieved by refining the current method.

**Figure 11.2 Lihir sulphide z-score**

11.6.1 Blanks

There were almost 500 gold blanks analyzed during the three year period 2011 to 2013 inclusive). Of these seven had excessive gold analyses, indicative of contamination or swapped sample material. Sulphide blanks were similar with approximately 16 similar over range points. Points that have been investigated nearly always turn out to have been the subject of a blunder (e.g. inserting a standard instead of a blank) rather than contamination.
11.6.2 Coarse Duplicates

Approximately 600 coarse duplicates have been collected as splits from the crusher. The primary sample and duplicate are analyzed in the same job, generally within the same fire assay batch within the job. Gold precision (Figure 11.3) was calculated to be 9.1% at one standard deviation and sulphur precision (Figure 11.4) was 13.6%. Both figures are within the target level of 25% that applies within the company for coarse duplicates. These figures suggest that the split taken from the crusher is representative of the crushed material.

Figure 11.3 Lihir Coarse Gold Duplicates, Precision = 9.1%

![Lihir Coarse Duplicates - Au](image)
P=9.1%

Figure 11.4 Lihir Coarse Sulphide Duplicates, Precision = 13.6%

![Lihir Pulp Replicates - Sulphide >= 1.0%](image)
P=5.1%

11.6.3 Pulp Replicates

Pulp replicates are additional samples taken from the primary Kraft envelope and are part of the laboratory’s internal QA/QC. They are expected to have a precision of 10% or better for
gold and 8% or better for the ICP suite. For gold samples greater than 0.2 g/t the pulp replicate precision was 8.8% (Figure 11.5). For sulphur samples greater than 1% the precision was 5.1% (Figure 11.6). Both results are in line with expectations.

**Figure 11.5**  Lihir Gold Pulp Replicates, Precision = 8.8%

![Lihir Gold Pulp Replicates](image)

**Figure 11.6**  Lihir Sulphide Pulp Replicate, Precision = 5.1%

![Lihir Sulphide Pulp Replicate](image)

11.7 Comparison of Second Laboratory with Lihir Historical Data

As part of the multi-element programme conducted in 2011 to 2013 on historic drill pulps, the opportunity was taken for gold and sulphur to be determined at an independent commercial laboratory (ALS Brisbane) with a smaller quantity of analyses being carried out
by NLSO. Sulphur was part of the ICP package while gold was determined by fire assay. This would allow further assessment of historical QA/QC performance of historical data.

Table 11.2 and the Figures 11.7 & 11.8 show the gold relationship between results from the second laboratories when compared to Lihir site laboratory for historical data.

**Table 11.2** Precision of second laboratory pulp check assaying at ALS Brisbane and NLSO when compared to Historical Lihir analysis

<table>
<thead>
<tr>
<th></th>
<th>Au Precision (Au &gt; 0.2 g/t)</th>
<th># of samples</th>
<th>S Precision</th>
<th># of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS</td>
<td>21.2%</td>
<td>6994</td>
<td>45.9%</td>
<td>11250</td>
</tr>
<tr>
<td>NLSO</td>
<td>17.3%</td>
<td>537</td>
<td>45.6%</td>
<td>924</td>
</tr>
</tbody>
</table>

When comparing samples for gold grades > 0.2 g/t ALS the one standard deviation precision was calculated to be 21.2% while for the much smaller NLSO set the precision was marginally better at 17.3%. Note the company target precision when comparing a primary laboratory and an independent second laboratory is 15%.

**Figure 11.7** Comparison of the Historical Lihir site laboratory with ALS for Gold
Figure 11.7 and Figure 11.8 compare independent second laboratory analyses to historical Lihir gold analysis (entire data sets). These outliers on Figures 11.7 and 11.8 (that is results far off the red line) are most likely to be evidence historical sample swaps.

Table 11.2 also confirms the poor precision of the historical sulphide sulphur analysis.

The Lihir laboratory has during 2013 changed over to the Leco method of sulphide sulphur determination and this has dramatically improved the analytical performance in mill results. Future resource data acquisition will be done by the Leco method.

Second lab checks of historical assay data have demonstrated that the gold analyses at Lihir have been reasonably accurate with acceptable precision. Sulphide sulphur second laboratory checks have confirmed the historical data to be based on a technique that has degraded over time and better represents a total sulphur analysis. Improvements have subsequently been made to both analytical methods.

11.8 Additional QA/QC Practices Adopted

In addition to the QC sample types discussed above there are several other practices that assist in keeping QA/QC foremost in the minds of those preparing and working with the data that have been adopted during 2012 to 2013 inclusive.

- Peer sampling audits and observations are carried out on a semi-regular basis and the results discussed with the sampling crew, core cutter etc.
- Fortnightly meetings are held with the laboratory during which time topics such as QA/QC and turnaround time are discussed.
- Every 20 to 25 samples a size analysis is carried out on the pulp to ensure that pulps are being prepared to the agreed grainsize (95 % passing 106 micrometres). Whenever the sample fails to meet the size requirement, standing instructions state that samples half-way back to the last passing standard are to be reprepared and sized before analysis.
• Once a month, whenever samples have been generated or results returned, a QA/QC report is prepared and sent to Melbourne office where it is examined and summarised and the summary included in a monthly company-wide QA/QC report to management.

• A QA/QC issues register is maintained so that every issue to do with sampling, sample preparation, analysis and storage of results is listed so that action taken is documented and the frequency of specific types of issue assessed so that preventative steps can be taken where appropriate.

• Certain procedure are carried out on the much more numerous production blast hole samples that are not undertaken on resource development samples. These include the blind resubmission of samples to the assay laboratory to monitor laboratory reproducibility. The resubmission of blast hole samples allows on-going monitoring of the Lihir laboratory whilst resource drilling is on hold.

11.9 QA/QC Summary

There has been a great deal of work undertaken to resolve the QA/QC problems described in the “Technical Report on the Lihir Property in Papua New Guinea” 31 December 2011. The work undertaken has been successful for gold analysis although the introduction of best practice procedures, especially for sulphide sulphur determination, has been a slower task than was envisaged.

The number of outliers due to mix-ups, swaps and mislabelling of individual samples and boxes of samples has been cut dramatically and precision is now largely under control. The source of the sulphide bias and poor precisions has been identified and the bias has been eliminated elsewhere in the operation (mill production analysis) through the introduction of appropriate instrumentation, procedures and training. Identical instrumentation and analytical techniques are will be implemented for future resource development programs.

QA/QC results for 2011 to 2013 period and checks on historical data do not suggest there is a serious bias in the performance of the Lihir laboratory in terms of gold analysis. Therefore whilst there can be concerns over the accuracy of individual samples, this problem does not translate into concern at a global level.

QA/QC results suggest there is a significant positive bias in the performance of the Lihir laboratory in terms of sulphide sulphur analysis, both historically and the period 2011 to 2013 inclusive. This is believed to be due to Lihir laboratory using an analytical technique and instrumentation that has degraded over time and lead to poor precision and bias over time. Improved bias performance is observed late in the period 2011 to 2013 and the adoption of new instrumentation, procedures and training have significantly improved sulphur precision and bias for mill production samples. It is noted that sulphide sulphur assays are used for metallurgical characterization and are not directly applied to Mineral Resource and Mineral Reserve estimates as they use gold only based cut-off.

In the Qualified Person’s opinion the data is adequate for the purpose intended. The sample preparation, security, and analytical procedures are of industry standard, with every effort being made to improve as discussed above. As such the data is deemed acceptable input into the Mineral Resource estimate.
12 DATA VERIFICATION

The Qualified Person has, through examination of internal and public Newcrest documents, personal inspections on site and discussions with other Newcrest personnel, verified the data in this Report and is satisfied that the data is adequate for the purpose of this Report.
13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

The Lihir gold processing facility commenced operations in 1997 treating high grade ore (HGO) with lower grade ore stockpiled for later processing. The tonnes of ore processed has progressively increased since plant start-up, with an annual gold production of 649kozs in year ending June 2013. The original process plant flow sheet consisted of ore grinding, auto-thermal whole ore oxidation in pressure autoclaves, followed by gold recovery from washed oxidized slurry using conventional Carbon-In-Leach (CIL) cyanidation. The plant has been expanded with the installation of a flotation plant installed in 2007 which allows the sulphur content of lower grade ore types to be increased in autoclave feed.

In 2008, a decision was made to undertake a further major expansion to the plant. The expansion is now complete. The processing technology and flow sheet selected for the upgrade is as per previous operations. The current process plant operations and the changes to be introduced with the major plant upgrade are described in Section 17 of this report.

A second flotation plant was installed in 2013 to allow an increased tonnage of low sulphur ore to be processed. Most of this ore is originating from the previously stockpiled grade ores.

A significant amount of metallurgical testwork was undertaken as part of the original feasibility for the project. The range of ore types to be treated in future operations are now well understood from 14 years of continuous operations. The metallurgical parameters of various ore types from the deposit are well established, and therefore no major new test work programs have been undertaken as part of the recent plant upgrade implementation.

13.2 Ore Type and Mineralogy

Metallurgical test work undertaken as part of the original Lihir Feasibility Study (FS) showed that the ore is refractory. Direct cyanidation of finely ground ore yielded less than 30% gold extraction, and coarse gold is extremely rare. Gold present in ore is principally as auriferous pyrite and accessory marcasite. Other base metal sulphides and sulfosalts (such as chalcopyrite, sphalerite, arsenopyrite, and tennantite-tetrahedrite) are also present at minor and trace levels. The ore generally contains low levels of arsenic, principally as an impurity in pyrite. After a number of oxidative test work campaigns in the original FS, whole ore pressure oxidation was selected for Lihir over other processes tested, including flotation and roasting, bio-oxidation and whole ore roasting.

Metallurgical test work and operating experience at site has shown that there are main five rock types of increasing hardness identified as:

- Argillic Clay
- Advanced Argillic
- Leached Soak Domain
- Boiling Zone
- Anhydrite Sealed
Comminution test work undertaken on the various rock types as part of the feasibility studies allows prediction of the hardness properties of each block of ore, and prediction of plant power requirements.

The target sulphur content in slurry to the autoclave is in the range 5-7% to ensure auto-thermal operation of the autoclave. Ore blending and flotation plants operation is undertaken in a manner to maintain this feed sulphur content.

### 13.3 Gold Recovery

The mean gold recovery over the 12 month period ending June 2013 was 85%. Ore treated in the flotation plant has a lower overall recovery due to gold losses in flotation tail.
14 MINERAL RESOURCE ESTIMATES

14.1 Introduction

The 31 December 2013 Mineral Resource update has been based on a detailed review completed by Newcrest of all Lihir production sources to take into account Newcrest’s current view of long term metal prices, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades and physical mining parameters. This has resulted in the most marginal ounces being removed and this has been reflected in changes to Mineral Resource estimates. The Measured and Indicated Mineral Resources for Lihir as at 31 December 2013 includes a material reduction of approximately 4.2Moz of gold to 51Moz of gold, compared with the 31 December 2012 estimate of 55.2Moz of gold.

The Mineral Resources have been prepared under the direction of Competent Persons under the JORC Code using accepted industry practice and have been classified and reported in accordance with the JORC Code.

There are no material differences between the definitions of Measured, Indicated and Inferred Mineral Resources under the CIM Definition Standards and the equivalent definitions in the JORC Code.

Mineral Resources comprise the open pit Mineral Resources plus surface ore stockpiles. Open pit resources are reported inclusive of Mineral Reserves and represent the resources located inside a pit shell developed using a gold price of US$1,400 per oz. A cut-off criterion of 0.9 g/t Au has been applied to Mineral Resources for reporting purposes in December 2013, based on a gold price assumption of US$1,350 per oz.

14.2 Mineral Resources

Table 14.1 presents the Lihir Mineral Resources. Mineral Resources comprise Measured Resources, which are the low, medium and high grade stockpiles; as well as Indicated and Inferred Resources. There are no Measured Resources reported from the block model.

Table 14.1 Lihir Mineral Resource Estimate at 31 December 2013

<table>
<thead>
<tr>
<th>Resource Classification</th>
<th>Tonnes (Mt)</th>
<th>Gold Grade (g/t)</th>
<th>Contained Gold (Moz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured</td>
<td>100</td>
<td>2.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Indicated</td>
<td>660</td>
<td>2.1</td>
<td>44</td>
</tr>
<tr>
<td>Inferred</td>
<td>130</td>
<td>2.1</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Notes: 1. Cut-off grade of 0.9 g/t Au based on a gold price of US$1,350/oz
2. Reported within pit shell developed using gold price of US$1,400/oz
3. The figures above include those resources converted to reserves

14.3 Modeling and Estimation

14.3.1 Geological Interpretation and Domaining

An updated resource block model was developed in 2012 and is the basis of the 2013 Mineral Resource estimate. Geological interpretation of ore type and gold domains is based on drilling information nominally spaced at 35m intervals in cross section and 10m intervals in plan.
The Lihir mineralised envelope is approximately 3km x 1.5km x 0.5km (along strike, down dip and thickness). The limits of the mineralization have not been completely defined and are open at depth, along strike and to the east (currently limited by the Pacific Ocean).

The Lihir orebody has been domained by site geologists via two methods;

- Structural domains (9) - developed using interpreted fault boundaries, and,
- Alteration (Ore Type) domains (5) - based on the major alteration types present in the deposit.

**Figure 14.1** Graphical representation of the different fault domains (North top).

The nine structural domains have been interpreted i.e. southern background, western background, Borefields, Minifie West, Coastal, Kapit North-East, Minifie East, Lienetz and Kapit (Figure 14.1).

Five alteration styles have been interpreted i.e. Argillic, Anhydrite sealed, Boiling Zone, Leached-soaked, and Advanced Argillic (Figure 14.2).
14.3.2 Compositing and Exploration Data Analysis

Drill hole data was composited at 6m intervals for gold prior to flagging by mineralization and alteration domains. The drill hole data was also composited at 2m intervals for estimating sulphur and copper which are important for process considerations. The drill holes were composited down hole without any boundary constraints to ensure that no data was lost adjacent to boundaries.

The 9 fault domains and 5 alteration domains that were flagged in the initial data set were reduced to 5 estimation domains for Au, As, Ag, Cu & Mo. Sulphide sulphur was estimated in a combination of both fault domains and alteration domains. CaCO3 has been estimated into two alteration domains. The Exploratory Data Analysis (EDA) below was used to determine the estimation domaining strategy.

Exploration data analysis consisted of the following:

1. Basic Statistics - tabulation of mean grades, variability (CV).
2. Scatterplots of Au and S - to establish relationships (if any)
3. Top Cut Assessment - to identify risk metal (if any)
4. Slice Plots of grade by easting, northing and level – to capture variability within global and geological domains.
5. Contact Analysis – to check for ‘abrupt’ or ‘gradational’ boundaries.
6. Q-Q Plots and preliminary variogram comparisons - to further support the choice of 'Estimation' domains.

Based on this review, Newcrest adopted the following criteria for grade estimation:

- For gold grade estimation, the 14 initial structural and alteration domains were consolidated into five domains (Table 14.2).
- For sulphur grade estimation, the 14 initial structural alteration domains were consolidated into ten domains (Table 14.3).
- For dry bulk density (DBD), three domains were created matching subsets of the initial alteration domains (Table 14.4).
- For carbonate grade estimation, the 14 initial structural and alteration domains were consolidated into two domains.

### Table 14.2  Lihir Modeling Domains for Au, Ag, As, Cu & Mo compared to Interpreted Fault Domain

<table>
<thead>
<tr>
<th>Model Domain Code</th>
<th>Interpreted Fault Domain Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>Lienetz</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>Kapit</td>
</tr>
<tr>
<td>12</td>
<td>1 &amp; 2</td>
<td>Background</td>
</tr>
<tr>
<td>56</td>
<td>5 &amp; 6</td>
<td>Coastal &amp; Kapit NE</td>
</tr>
<tr>
<td>347</td>
<td>3, 4 &amp; 7</td>
<td>Minifie</td>
</tr>
</tbody>
</table>

### Table 14.3  Lihir Modeling Domains for Sulphide Sulphur compared to Interpreted Fault Domain

<table>
<thead>
<tr>
<th>Model Domain Code</th>
<th>Interpreted Fault Domain Code</th>
<th>Interpreted Alteration Domain Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>2</td>
<td>Minifie Argillic</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
<td>Minifie Boiling</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Minifie Anhydrite</td>
</tr>
<tr>
<td>4</td>
<td>3 &amp; 7</td>
<td>2</td>
<td>Borefields Argillic</td>
</tr>
<tr>
<td>5</td>
<td>3 &amp; 7</td>
<td>3</td>
<td>Borefields Boiling</td>
</tr>
<tr>
<td>6</td>
<td>3 &amp; 7</td>
<td>5</td>
<td>Borefields Anhydrite</td>
</tr>
<tr>
<td>7</td>
<td>2, 5, 6, 8 &amp; 9</td>
<td>2</td>
<td>Argillic</td>
</tr>
<tr>
<td>8</td>
<td>2, 5, 6, 8 &amp; 9</td>
<td>3</td>
<td>Boiling</td>
</tr>
<tr>
<td>9</td>
<td>2, 5, 6, 8 &amp; 9</td>
<td>5</td>
<td>Anhydrite</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>2, 3 &amp; 5</td>
<td>Southern waste</td>
</tr>
</tbody>
</table>
Table 14.4  Lihir Modelling Domains for Dry Bulk Density compared to Interpreted Alteration Domain

<table>
<thead>
<tr>
<th>Model DBD Domain Codes</th>
<th>Interpreted Alteration Domain Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDOM1</td>
<td>1</td>
<td>Advanced Argillic</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Argillic</td>
</tr>
<tr>
<td>BDOM2</td>
<td>3</td>
<td>Boiling Zone</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Leached Soaked</td>
</tr>
<tr>
<td>BDOM3</td>
<td>5</td>
<td>Anhydrite Sealed</td>
</tr>
</tbody>
</table>

14.3.3 Grade Capping

Two methods were used to assess the risk metal for gold;

1. Raw histograms. The histograms were reviewed to ensure that outliers were not unnecessarily given too much weighting. Hermite polynomials fit a continuous curve, so care must be taken to ensure that the volume under the curve is not inflated because of an outlier.

2. Metal per Composite assessment. This involved answering a relatively simple question - What proportion of metal is contained by the top 1% of the declustered samples? As a working guide, top cuts are chosen to limit the top 1% of samples to approximately 5% of the contained metal.

Assessment of the need to cap high grades was made by reviewing the raw histograms, and by a metal per composite assessment, i.e. reviewing how much metal is contained by the top 1% of the declustered samples. As a working guide, top cuts are chosen to limit the top 1% of samples to approximately 5% of the contained metal.

Table 14.5 documents the grade caps applied for the 2013 Lihir resources.

Table 14.5 Grade Caps Applied to Lihir Resource Estimation

<table>
<thead>
<tr>
<th>Gold</th>
<th>Sulphur</th>
<th>Dry Bulk Density</th>
<th>Carbonate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
<td>Cap (g/t)</td>
<td>Domain</td>
<td>Cap (%)</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>56</td>
<td>8</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>347</td>
<td>50</td>
<td>5</td>
<td>–</td>
</tr>
</tbody>
</table>

14.3.4 Variography

Variography was completed for gold, sulphur, copper, dry bulk density, arsenic, silver and molybdenum.

The variogram models for each estimation domain were aligned to the average orientation of each domain wireframe because none of the experimental variograms were structured enough to demonstrate unambiguous directions of continuity. As a result, the interpreted plane of maximum continuity for the majority of domains dips at a shallow angle to the north-east.

The variogram models were generally interpreted as being isotropic in the plane with shorter ranges perpendicular to the plane of maximum continuity.

Raw experimental variograms were generally un-interpretable due to the highly skewed distributions of gold and the variography was performed on Gaussian transformed data and the back-transformed variograms were utilized for interpolation.

The nugget effect was obtained from the down hole variograms of the 6m composites. In general, the nuggets were in the range 20-40%.

The gold variograms models are presented in Table 14.6.

### Table 14.6 Gold Variogram Models

<table>
<thead>
<tr>
<th></th>
<th>Nugget</th>
<th>Structure 1</th>
<th>Structure 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gold Estimation Domain 8 (Top Cap of 30 g/t)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sill</td>
<td>1.35</td>
<td>1.55</td>
<td>1.09</td>
</tr>
<tr>
<td>Proportion of Total</td>
<td>33.8%</td>
<td>38.8%</td>
<td>27.3%</td>
</tr>
<tr>
<td>Range D1 (m)</td>
<td>122</td>
<td>665</td>
<td></td>
</tr>
<tr>
<td>Range D2 (m)</td>
<td>110</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>Range D3 (m)</td>
<td>97</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Rotation (Isatis Geology)</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Gold Estimation Domain 9 (Top Cap of 30 g/t)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sill</td>
<td>1.88</td>
<td>3.38</td>
<td>2.59</td>
</tr>
<tr>
<td>Proportion of Total</td>
<td>23.9%</td>
<td>43.1%</td>
<td>33.0%</td>
</tr>
<tr>
<td>Range D1 (m)</td>
<td>97</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>Range D2 (m)</td>
<td>90</td>
<td>265</td>
<td></td>
</tr>
<tr>
<td>Range D3 (m)</td>
<td>85</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>Rotation (Isatis Geology)</td>
<td>70</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td><strong>Gold Estimation Domain 12 (Top Cap of 8 g/t)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sill</td>
<td>0.09</td>
<td>0.053</td>
<td>0.133</td>
</tr>
<tr>
<td>Proportion of Total</td>
<td>32.6%</td>
<td>19.2%</td>
<td>48.2%</td>
</tr>
<tr>
<td>Range D1 (m)</td>
<td>70</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>Range D2 (m)</td>
<td>70</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>Range D3 (m)</td>
<td>70</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>Rotation (Isatis Geology)</td>
<td>90</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Gold Estimation Domain 56 (Top Cap of 30 g/t)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sill</td>
<td>1.8</td>
<td>2</td>
<td>0.96</td>
</tr>
<tr>
<td>Proportion of Total</td>
<td>37.8%</td>
<td>42.0%</td>
<td>20.2%</td>
</tr>
</tbody>
</table>
14.3.5 Estimation Parameters

A three dimensional block model was created to gold, sulphur, copper, dry bulk density, arsenic, sliver and molybdenum as summarized in Table 14.7.

Table 14.7 Lihir Block Model Parameters

<table>
<thead>
<tr>
<th>Variable</th>
<th>X (m)</th>
<th>Y (m)</th>
<th>Z (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>7800</td>
<td>2200</td>
<td>500</td>
</tr>
<tr>
<td>Maximum</td>
<td>11480</td>
<td>6600</td>
<td>1532</td>
</tr>
<tr>
<td>Block Size</td>
<td>20</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>No. of Blocks</td>
<td>184</td>
<td>220</td>
<td>86</td>
</tr>
</tbody>
</table>

Uniform Conditioning (UC) was used to estimate local recoverable resources within 100m x 100m x 12m panels for gold and into 200m x 200m x 12m panels for sulphur, arsenic, silver, molybdenum, carbonate and copper. The UC estimate was based on a selective mining unit of 20m x 20m x 12m. This technique estimates the tonnage and grade of mineralization which can be extracted as smaller selective mining units from large blocks (panels) estimated by OK. UC estimates the proportions of recoverable mineralization in each panel without specifying the actual locations within these blocks.

The estimates were then post processed utilizing Localized Uniform Conditioning (LUC) into 20m x 20m x 12m blocks. In this process spatial grades are estimated that conform to the proper grade-tonnage curves obtained by the UC method, as well as maintaining the relative spatial grade distribution pattern approximated by direct kriging of the small blocks.

Ordinary Kriging (OK) was used for the local estimation of density.

A summary of the search neighborhood parameters for gold is presented in Table 14.8.
### Table 14.8 Lihir Search Neighbourhood Parameters for Gold Estimation

<table>
<thead>
<tr>
<th>Domain</th>
<th>Orientation</th>
<th>Dimensions</th>
<th>Angular sectors</th>
<th>Min Samples/Opt Samples per sector</th>
<th>Discretization</th>
<th>Max No of Samples per hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>100 0 0</td>
<td>665x480x250</td>
<td>4</td>
<td>4 / 6</td>
<td>10x10x2</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>70 -10 0</td>
<td>560x440x275</td>
<td>4</td>
<td>4 / 6</td>
<td>10x10x2</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>90 0 0</td>
<td>550x550x550</td>
<td>4</td>
<td>4 / 6</td>
<td>10x10x2</td>
<td>4</td>
</tr>
<tr>
<td>56</td>
<td>50 0 0</td>
<td>900x550x325</td>
<td>4</td>
<td>4 / 6</td>
<td>10x10x2</td>
<td>4</td>
</tr>
<tr>
<td>347</td>
<td>80 -20 -20</td>
<td>754x475x340</td>
<td>4</td>
<td>4 / 6</td>
<td>10x10x2</td>
<td>4</td>
</tr>
</tbody>
</table>

NB – Orientations provided in Isatis Geology Rotation nomenclature.

The UC/LUC approach is summarized as:

1. Gaussian transformation of variables and construction of back-transformed functions using Hermite polynomials.
2. Support correction using the Discrete Gaussian Model.
3. Conditioning by panel grades.
4. Preparation of grade-tonnage curves to validate the UC estimates against the theoretical selectivity curves.
5. Conversion of the UC model to a LUC model, to estimate gold into a new block model of size 20 m x 20 m x 12 m.

### 14.4 Resource Model Validation

The Lihir resource model for gold has been extensively validated by:

- Comparison to Ground Truth Model which is based on blast holes (where possible).
- Comparison of the UC grade-tonnage curves against the theoretical Discrete Gaussian Model.
- Comparison of the slice statistics of each variable with the corresponding block estimates
- Comparison of various declustered grades with the various estimated grades (and Metal at Risk analysis)
- Locally comparing drill holes and estimated blocks in cross-section and plan, and
- Comparing the resource model to the previous estimate by area and level.

A ground truth model was created for the mined areas - Lienetz and Minifie. The data set includes 68,841 blast hole samples of mixed lengths, but the majority are close to 12m bench composites (with some 6m bench composites). The average spacing of blast hole samples is in the range of 5.5 to 6.5m. The UC model has been compared to the Inverse Distance ground truth model via grade-tonnage curves.

The UC estimate has been compared (by domain) to a Discrete Gaussian Model (a theoretical grade-tonnage curve based on the data). For all domains, the grade-tonnage curve comparisons between the UC estimate and the DGM's are +/- 5% for tonnes and grades at all cut-offs for gold.
The Resource model was the comparison of the various declustered grades, with the various estimated grades. The “Metal at Risk” is therefore the difference between the metal provided by any of the declustered grades minus the metal provided by the Resource estimate(s). For gold and sulphur the “Metal at Risk” by domain is generally between 0 and -10% (Estimate < Benchmark Metal).

The estimates for the minor elements of sulphur, copper, dry bulk density, arsenic, silver and molybdenum have been validated via two methods:

- Comparison of the slice statistics of each variable with the corresponding block estimates; and
- Comparing the basic statistics of the estimate to the composites by domain.

The global comparisons between composite and block grades are within 5% for most domains and variables. All estimates are considered to be robust.

14.5 Resource Classification

All stockpiles at Lihir are reported as Measured Resources.

The Mineral Resource has been classified into Measured, Indicated and Inferred after assessing the following factors: drill hole spacing (only areas drilled to 70m x70m drill density have been classified as Indicated Resource), style of mineralization and geological continuity, data quality and associated QA/QC, grade continuity and proposed mining selectivity and scale of mining.

Two methods have been used to determine the optimal drill spacing for Indicated and Inferred Resource classification at Lihir:

- Variogram method which analyses proportions of the sill, and
- An extension variance method.

For Indicated Resource classification, wireframes have been constructed based on the average weighted drill spacing of 70m x 70m (and constrained to 25m beyond the extent of drilling).

For Inferred Resource classification, wireframes have been constructed based on the average weighted drill spacing of 150m x 150m (and constrained to 50m beyond the extent of drilling). The data spacing and distribution is sufficient to establish geological and grade continuity appropriate for Mineral Resource estimation and classification and supported by historical reconciliation to actual production.

The only Measured Mineral Resources are in stockpiles which have been grade controlled via blast holes sampling at the time and tracked using the mining tracking and recording systems. Stockpile models have been built using the best available data.
14.6 Comparison to Previous Mineral Resource Estimate

Newcrest has reported a Mineral Resource estimate for Lihir as at 31 December 2013. Newcrest has completed a detailed review of all production sources to take into account current view of long term metal price, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades and physical mining parameters.

This has resulted in the most marginal ounces being removed and these are reflected in changes to Mineral Resources. The Measured and Indicated Mineral Resources for Lihir as at 31 December 2013 includes a material reduction of approximately 4.2 Moz of gold to 51 Moz, as against the 31 December 2012 estimate of 55.2 Moz of gold.

14.7 Factors Affecting Mineral Resource Estimate

Lihir Gold Mine is an established operation with a long production history to support development of plans to exploit the available Mineral Resources.

The Mineral Resource estimates are based on long term capital and operating costs assumptions based on the current operating cost base modified for changing activity levels and reasonable cost base reductions over the life of the mine. Any material change in long term cost base or metal price assumptions may impact the Mineral Resource estimate.
15 MINERAL RESERVE ESTIMATES

15.1 Introduction

The 31 December 2013 Mineral Reserve update has been based on a detailed review completed by Newcrest of all Lihir production sources to take into account Newcrest’s current view of long term metal prices, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades. This has resulted in the most marginal ounces being removed and this has been reflected in changes to Mineral Reserve estimates. The Mineral Reserves for Lihir as at 31 December 2013 includes a material reduction of approximately 3.7Moz of gold to 29Moz of gold, compared with the 31 December 2012 estimate of 32.7Moz of gold.

The Mineral Reserve estimates reported in this release have been prepared under the direction of a Qualified Person, as defined in NI 43-101, using accepted industry practice and have been classified in accordance with the JORC Code. Except as described below, there are no material differences between the definitions of Proven and Probable Mineral Reserves under the applicable definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum (the “CIM Definition Standards”) and the corresponding equivalent definitions in the JORC Code for Proved and Probable Ore Reserves.

It is noted that under the CIM Definition Standards, the completion of a pre-feasibility study is the minimum prerequisite for the conversion of Mineral Resources to Mineral Reserves. The JORC Code 2012, which came into effect on 1 December 2013, prescribes completion of a pre-feasibility study as a minimum prerequisite to declare an Ore Reserve (the JORC equivalent of a Mineral Reserve); however this requirement of the JORC Code does not come into effect until 1 December 2014.

Mineral Reserves at Lihir comprise the Lihir open pit Mineral Reserve and surface ore stockpiles. The Mineral Reserves have been prepared under the direction of Competent Persons under the JORC Code using accepted industry practice and have been initially classified and reported in accordance with the JORC Code. The Mineral Reserves are reported at 31 December 2013.

There are no material differences between the definitions of Proven and Probable Mineral Reserves under the CIM Definition Standards and the equivalent definitions in the JORC Code. The Lihir Mineral Reserves comply with the CIM Definition Standards.

15.2 Mineral Reserve Assumptions

15.2.1 Commodity Prices and Exchange Rate

Lihir Mineral Reserves were estimated using a gold price of US$850 per oz to define pit limits, which was completed in June 2011 and has not been updated. There was no contributing revenue from any other minor elements. Selling costs of US$4.66 per oz for refining, 2.0% for royalties and a 0.25% mining levy were applied to estimate the revenue received. Mineral Reserves within the final pit limits were reported for December 2013 using a cut-off grade based on an updated gold price of US$1250 per oz and updated selling costs of US$5.81 per oz for refining. For December 2013 reporting, royalty and mining levy remained consistent with June 2011 assumptions.
15.2.2 Ore Processing Rates and Metallurgical Recovery

The installed capacity of the Lihir ore processing facilities to approximately 12Mtpa, with further upgrades planned to increase capacity to 15Mtpa. Newcrest has forecast a reduction in unit fixed processing costs as a result of the increased throughput of the ore processing facilities. This has been factored into the Mineral Reserve estimation process in the form of cut-off grade calculations and reduced ore processing costs.

Mineral Reserves were estimated using ore processing recovery estimations completed by the ore processing team and provided as a series of recovery formulae. Recovery relationships are complex and were converted to a simplified linear relationship for use in pit optimization software. Newcrest has assumed for pit optimization that ore processing recoveries will be improved by an additional 1% of recovery through process improvements as a result of the plant expansion.

15.2.3 Operating Cost Estimates

The mine design that supports the Mineral Reserves has been based on the Life of Mine (LOM) plan developed specifically for Mineral Reserve reporting. Operating cost estimates used in the preparation of the mine design supporting the Mineral Reserves have been developed from the same LOM plan.

15.2.4 Cut-off Grade

The Mineral Reserves comprise all mineralized material, that when delivered to the pit rim, has a recovered value greater than the cost of all of the downstream processes, including the expected fixed site costs that are projected to be applicable at the time the material is processed.

Lihir Mineral Reserves are reported at a cut-off grade of 1 g/t Au.

As the Lihir operation is constrained by the ore tonnes that can be processed by the mill, the lower grade fraction of ore is currently stockpiled in long term stockpiles and the higher grade fraction processed through the mill. As a result, the majority of low grade stockpiles are expected to be processed at the end of the mine life when mining operations have been completed. The cut-off grade for this material has therefore been calculated based on the estimated costs of a small reclaim fleet re-handling ore from long term stockpiles for processing through the mill.

15.3 Lihir Mineral Reserve

15.3.1 Mineral Reserve Estimate

The December 2013 Lihir Mineral Reserves are based on the Mineral Resource model used to prepare the December 2013 Mineral Resource estimate and a LOM plan prepared specifically for reporting Mineral Reserves. The December 2013 resource estimate is described in Section 14. The Mineral Reserves as at 31 December 2013 are shown in Table 15.1.
Table 15.1  Lihir Mineral Reserve Estimate at 31 December 2013

<table>
<thead>
<tr>
<th>Mineral Reserve Classification</th>
<th>Stockpiles</th>
<th>Lihir Pit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tonnes (Mt)</td>
<td>Gold Grade (g/t)</td>
<td>Contained Gold (Moz)</td>
</tr>
<tr>
<td>Proven Reserve</td>
<td>100</td>
<td>2.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Probable Reserve</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>291</td>
<td>2.3</td>
<td>21.8</td>
</tr>
<tr>
<td>Total</td>
<td>391</td>
<td>2.3</td>
<td>29.0</td>
</tr>
</tbody>
</table>

Notes:  
1. Cut-off grade of 1 g/t Au based on a gold price of US$1,250/oz  
2. Rounding may cause apparent computational discrepancies in totals

The Proven Mineral Reserve estimate is generated from estimates of the tonnage and grade of stockpiled ore that is classified as a Measured Mineral Resource. There are currently numerous separate stockpiles that are recorded and monitored using mine site recording software and reconciled through regular stockpile surveys. Most of the stockpiled ore is within long-term ore stockpiles, with the three largest stockpiles at Kapit Flat, Minifie and Kapit North containing approximately 80% of the tonnes. The economic viability of the Lihir stockpiles has been assessed using the same approach applied to the in-situ pit reserve. This cut-off grade approach accounts for the calculated metallurgical recovery based on the grade of each stockpile and the long term site cost base assumptions including reclaim, ore processing, site general and administration and relevant sustaining costs.

The Probable Mineral Reserve estimate is generated from Indicated Resources within the final pit limits identified in the LOM plan. The LOM plan has been developed from pit optimization, phase and final limits designs, and a detailed production schedule, in which multiple phases have been used to derive a practical production schedule over the life of Lihir. Multiple phases operate at any time within the Lihir pit to provide a continuous feed blend to the ore processing plant.

The planned final dimensions of the pit are approximately 2,000m by 1,400m, with a final depth of approximately 300m below sea level. A plan showing final pit limits and the location of each phase is shown in Figure 15.1.
The Lihir Mineral Reserve has been prepared using accepted industry practice and has been classified and reported in accordance with the guidelines of the JORC 2012 Code. The mine planning processes used for the estimate are logical and well documented.

Inferred Mineral Resources have not been included within the Lihir Mineral Reserve.

15.3.2 Production Reconciliation

Lihir Mineral Reserves are supported by close reconciliation of tonnes (-5%), gold grade (+2%) and contained gold ounces (-3%) between the mine plan depletion and mill production. A summary of recent reconciliation for the period January 2012 to December 2013 is shown in Table 15.2.
Table 15.2  Lihir Production Reconciliation

<table>
<thead>
<tr>
<th></th>
<th>Tonnes (Mt)</th>
<th>Gold Grade (g/t)</th>
<th>Contained Gold (Moz)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource Model Depletion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Mined Depletion</td>
<td>27.41</td>
<td>2.38</td>
<td>2.10</td>
</tr>
<tr>
<td><strong>Total As Mined</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Mined Depletion</td>
<td>26.60</td>
<td>2.47</td>
<td>2.11</td>
</tr>
<tr>
<td><strong>Mill Reconciled</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Milled (Mined &amp; SP Reclaim)</td>
<td>26.06</td>
<td>2.43</td>
<td>2.03</td>
</tr>
<tr>
<td><strong>Variance (% Resource Model to Mill Reconciled)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Variance</td>
<td>-5%</td>
<td>+2%</td>
<td>-3%</td>
</tr>
</tbody>
</table>

15.3.3 Estimation Procedure

Lihir is a mature gold mining operation that has been in production since 1996. Inputs to mine planning and pit optimization are based on operating practice and regularly reviewed mine planning forecasts. Information is available to confirm mine planning parameters in the following areas.

- Orebody model to production reconciliations are available to calibrate the resource model against past production and determine how well previous models were able to forecast mine production. Reconciliations showed that no additional ore loss and dilution needed to be included within the model used to generate Mineral Reserves.

- Equipment operating parameters such as availability, utilization, operating efficiency, required ancillary equipment hours and equipment productivity are available to determine annual operating hours and annual production rates. These parameters were used to determine mine production levels and equipment requirements in the LOM plan used to support the Mineral Reserve ultimate pit design.

- Operating costs such as equipment operating and maintenance costs, labour costs, explosives costs, dewatering and other associated costs are available and were used to estimate operating costs. These operating costs have been used in the LOM plan used to support the Mineral Reserve ultimate pit design.

The Mineral Reserve process for Lihir follows industry standard processes, the key steps are:

- Input assumptions are collated and signed off.
- Pit optimization is run with Whittle software to generate a range of pit shells at different gold prices.
- Pit shells are selected that generate the maximum discounted value.
- Selected pit shells are used as the basis for final limits and phase designs. The final limits pit design is based on the revenue factor 1.0 pit shell.
- Final limit and phase pit designs are interrogated for tonnes and grades applying appropriate cut off grades, and exported to mine scheduling software.
• Mine scheduling and financial modeling confirms a practical and economical mine schedule.

• Mineral Reserves are generated from Indicated Resources within the final pit limits.

The pit optimization process underpinning Mineral Reserve estimation is well documented. An independent review of the Reserve process was completed after the last update of the ultimate pit limit in June 2011. This report concluded that the Reserve was prepared using accepted industry practice and is classified and reported in accordance with the JORC Code.

Inferred Mineral Resource blocks were included within the pit optimization, but were not reported within the Mineral Reserve. Inferred Mineral Resources constitute approximately 1% of tonnes within final pit limits above the cut-off grade.

15.4 Comparison to Previous Mineral Reserve Estimate

Newcrest has reported a Mineral Reserve estimate for Lihir as at 31 December 2013. Newcrest has completed a detailed review of all production sources to take into account the Newcrest’s current view of long term metal price, foreign exchange and cost assumptions, and mining and metallurgy performance to inform cut-off grades and physical mining parameters.

This has resulted in the most marginal ounces being removed and these are reflected in changes to Mineral Reserves. The Mineral Reserves for Lihir as at 31 December 2013 includes a material reduction of approximately 3.7Moz of gold to 29Moz of gold, compared with the 31 December 2012 estimate of 32.7Moz of gold.

15.5 Factors Affecting the Mineral Reserve Estimate

The relevant factors that could materially affect the Lihir Mineral Reserve include:

• Cost assumptions
• Resource model confidence
• Mining assumptions
• Metallurgical assumptions
• Infrastructure assumptions

Capital and operating costs have been determined based on the current operating cost base modified for changing activity levels and reasonable cost base reductions over the life of the mine. Ore dilution and recovery loss is specifically accounted for in this resource modeling process and no additional mining dilution or recovery factors are applied to the Lihir Open Pit Mineral Reserve estimate. This assumption is supported by the actual reconciliation between resource model and mill performance at Lihir project to date being within an acceptable uncertainty range for the style of mineralization under consideration. Metallurgical inputs to the Mineral Reserve estimate are generally consistent with current operating practices and experience. Sensitivity analysis was conducted on the key input parameters of costs, grade and recovery which confirmed the estimate to be robust.

The Lihir is an operating mine and has the most of the necessary infrastructure in place for its continued operation to support the Mineral Reserve. Additional infrastructure is required for the Kapit orebody for the construction of a coffer dam across Luise Harbour and relocation of some existing site infrastructure. Modifications to the comminution circuit to
achieve a 15Mtpa processing rate and power station upgrades are also required; allowances for these activities have been included in the economic evaluation of the Mineral Reserve estimate.

There are agreements in place with landholders of Lihir. There are community and compensation agreements in place with landowners at Lihir for the purposes of current and future operations. Those agreements are subject to periodic review, with current review ongoing. Naturally occurring risks that might have a material impact upon the Lihir Mineral Reserve are discussed in the risks section of Newcrest’s annual operating and performance review and include the potential impacts of seismic activity.
16 MINING METHODS

16.1 Mining Operations

Production mining operations at Lihir are conducted by Newcrest using their own equipment fleet and workforce. A separate mining contractor operation using a smaller pioneering fleet is developing new areas on the steeply dipping caldera slopes. Production mining uses a fleet of 500t class hydraulic face shovels loading into 135t rear dump haul trucks. Ore and waste is drilled and blasted on 12m benches and mined in a single pass, except where excessive heave has required a second lift for safety reasons. The ground is frequently too hot for conventional explosives, requiring high temperature blasting products and specialized blasting procedures for mining in hot ground.

Ore is mined to stockpiles segregated by gold and sulphur grade. Ore is blended off ROM stockpiles by front end loaders and 90t haul trucks into the crusher according to a blend plan provided by the ore processing plant. An additional small stockpile of crushed ore is maintained by a contractor with a mobile crusher in case of crusher breakdowns.

Waste rock from the mine is either dumped into 1,500t barges for off-shore submarine disposal or stockpiled for used as construction fill. Submarine disposal is carefully planned and controlled to achieve a continuous rill slope along the steeply dipping sea floor and prevent uncontrolled slumping triggering a tidal surge event.

The current mining fleet used at Lihir is listed in Table 16.1.

Table 16.1 Lihir Current Mine Production Fleet

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Description</th>
<th>Size</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Equipment</td>
<td>Terex O&amp;K RH200</td>
<td>500 t</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Terex O&amp;K RH120</td>
<td>250 t</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Caterpillar 992 front end loader</td>
<td>600 kW</td>
<td>3</td>
</tr>
<tr>
<td>Haul Trucks</td>
<td>Caterpillar 785</td>
<td>135 t</td>
<td>15</td>
</tr>
<tr>
<td>Dozers</td>
<td>Caterpillar D10</td>
<td>430 kW</td>
<td>6</td>
</tr>
<tr>
<td>Graders</td>
<td>Caterpillar 16H</td>
<td>220 kW</td>
<td>1</td>
</tr>
<tr>
<td>Ancillary</td>
<td>Caterpillar 385 excavator</td>
<td>85 t</td>
<td>1</td>
</tr>
<tr>
<td>Drills</td>
<td>Ingersoll Rand D45</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>Barges</td>
<td>Bottom dump barge</td>
<td>1,500 t</td>
<td>2</td>
</tr>
<tr>
<td>Contractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Equipment</td>
<td>Various</td>
<td>190 t</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Various</td>
<td>120 t</td>
<td>1</td>
</tr>
<tr>
<td>Haul Trucks</td>
<td>Caterpillar 777</td>
<td>90 t</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Various</td>
<td>40 t</td>
<td>10</td>
</tr>
</tbody>
</table>

Mobile equipment fleet requirements fluctuate over the life of the mine and are driven by waste stripping of future phases and scheduled stockpile re-handle movements. Appropriate cost provisions are included in the Mineral Reserve process to cover these fluctuations.
The grade control of ore is managed by sampling blast-holes. Assay analysis of the samples is completed through an on-site laboratory. Ore block tonnes and grades are uploaded into a truck dispatch system which tracks mine production and records the tonnes and grades of ore blocks mined for orebody reconciliation and ore stockpile monitoring in commercial reconciliation software.

16.2 Mine Schedule

The Lihir pit comprises three separate mining areas in Minifie, Lienetz and Kapit. These areas have been further sub-divided into 7 separate zones for mine scheduling purposes. Current mining at Lihir is focused on the Minifie and Lienetz pits, with future mining extending to the Kapit mineralized area that is adjacent to the existing pits. Development of this pit requires relocation of some of the existing low grade ore stockpiles and construction of a coffer-dam within Luise Harbour.

Mining production rates are determined by the throughput of the ore processing plant. The mining schedule has been completed to target high free cash flows. This is achieved by balancing timing of low cost stockpile reclaim against development timing and rate of future mining phases to provide high grade ore feed to the ore processing plant. This assumed mining operation projected date for completion is 2047 and the ore processing operation projected date for completion is 2049.

Phase 9 is currently being mined with stockpile reclaim making up mill feed requirements. On average approximately 30 Mt of material is planned for mining and stockpile re-handle each year with fluctuations driven by waste stripping of future phases and stockpile re-handle movements. The remaining LOM strip ratio is about 2:1 (waste:ore).

16.3 Geotechnical, Geothermal and Hydrological Considerations

Pit geotechnical control is through a complex pit slope model containing 53 geotechnical zones across the three pit areas based on lithology, structure, and level within the pit. Inter-ramp angles vary from 12 to 55°, with batter angles from 25 to 70°. Slope failures have occurred, including a major failure of the caldera wall in the Kapit area in 2005. Geotechnical design is undertaken by independent engineering consultants and is independently reviewed on an annual basis.

Horizontal pit wall holes are drilled to allow dewatering and controlled venting of steam to depressurize pit walls. The mine undertakes probe hole drilling to identify cavities within the rock mass and measure rock temperatures prior to blasting and for input to the development of a temperature block model for the deposit. Extensive prism, pit face radar and geotechnical monitoring of pit slopes and seismic monitoring is also undertaken. Earthquake, tsunami and landslide events have been recorded at the site.

Lihir receives high annual rainfall and has extensive groundwater volumes which are managed through a pit dewatering program and surface water management facilities incorporated into pit designs. Pit dewatering bores are located outside the pit or on pit berms to intercept as much groundwater as possible and minimize groundwater seepage into the pit. Groundwater is highly saline and is discharged into the ocean.

Pit perimeter diversion drains are installed on a 50m wide drainage berm sloping at 3% to intercept as much surface runoff as possible from the caldera, which is diverted around the
mining operation and into the ocean. Remaining surface runoff, groundwater seepage and rainfall is collected by 16m wide drainage berms incorporated into pit designs and directed into sumps. Water is then pumped by in-pit dewatering pumps to external holding dams before discharge into the ocean. In-pit water is acidic from contact with sulphide rocks.

Geothermal depressurization for Kapit pit mining has been underway since 2004 using a program of steam relief and monitoring wells. Pressure trends to date indicate that depressurization will be sufficient to allow mining to proceed in accordance with current life-of-mine plans. Maintenance of steam relief wells is critical to the successful mining of the Kapit pit.

Newcrest maintains a Geo-hazard Management Plan to identify and manage the various geotechnical and geothermal hazards on site. The plan recognizes and details controls for hazards such as:

- Earthquakes and tsunamis
- Slumping from sub-sea barging operations
- Slumping of pit walls
- Slumping of ore stockpiles
- Geothermal outbursts
- Cavities
- Inrush of water from the sea or perimeter drains

16.4 Future Plans

Future upgrades to the ore processing plant are required to reach capacity of 15Mtpa, additional power generation capacity is also required. Expansion of the mine into the ROM area will require the relocation or construction of new maintenance workshops and mine offices.

Later expansion of the mine into the Luise Harbour will require the construction of an off-shore coffer-dam to allow the enclosed portion of the harbour to be dewatered. The coffer-dam will be a significant structure, designed to be approximately 200m wide and will be engineered to cope with earthquake and tsunami events. A 100m wide buffer zone between the toe of the coffer-dam and crest of the pit has been included in the design. The final design for the coffer-dam will be completed by an independent specialist engineering firm and will be independently reviewed.

Infrastructure costs are considered during mine planning by including the cost for construction or relocation of significant infrastructure before that mining area can be developed. Examples of this are where the relocation of a stockpile needs to be included before a mining area can begin or where the coffer-dam needs to be constructed before pit development in that area can proceed.
17  RECOVERY METHODS

17.1 Introduction

Gold present in ore from Lihir consists primarily of sub-micron size particles in sulphide minerals and is therefore refractory to conventional gravity and cyanidation gold recovery techniques. The sulphide minerals must be oxidized to release the gold to make it amenable to cyanide leaching. The oxidation process selected for treatment of ore at Lihir is pressure oxidation whereby the ore is oxidized as a slurry using nearly pure oxygen. Heat evolved from the oxidation is controlled within operating limits to maximize the oxidation rate.

The Lihir gold processing facility commenced operations in 1997 treating High Grade Ore (HGO) with lower grade ore stockpiled for later processing. Gold production has increased progressively since start up. The original process plant flow sheet consisted of ore grinding followed by auto-thermal whole ore oxidation in three pressure autoclaves, and then recovery of gold from washed oxidized slurry using conventional cyanidation techniques. The plant facilities were expanded in 2007 with the addition of a flotation plant which allows the sulphur content of lower grade ore types known as flotation grade ore (FGO) to be increased in autoclave feed. A second flotation plant was installed in 2013.

A major plant expansion approved in 2008 involved the installation of one additional large autoclave as well as additional crushing, grinding, thickening, oxygen and cyanide leach plant facilities. Figure 17.1 presents the current process flow sheet, including all the additional processing operations added as part of the plant expansion.

Figure 17.1  Simplified Process Flow Sheet
17.2 Existing Operations

17.2.1 Crushing and Milling

Ore is crushed in two primary crushing circuits. The first circuit consists of a 42-65” gyratory crusher and Abon toothed rolls crusher. Competent ore is crushed in the gyratory crusher and softer ore types in the Abon crusher. Both crushers discharge on to an overland conveyor up to a radial stacker for stockpiling ahead of the grinding circuits, providing mainly high grade ore to the third milling circuit (known as HGO2 circuit) installed as part of the major plant expansion.

The second primary crushing, installed for the plant expansion, consists of two jaw crushers operating in parallel. This circuit typically receives more competent lower grade ores and supplies the FGO and HGO mills via a separate overland conveyor and radial stacker.

Summarizing, there are now three grinding circuits. One circuit (HGO2) treats high grade ore that is fed direct to the downstream oxidizing autoclaves, The second and third circuits (FGO circuit and HGO circuit) grind lower sulphur grade material known as “flotation grade” ore which feed the flotation plants. All three grinding circuits have a primary semi-autogenous grinding mill (SAG), followed by a secondary ball mill in closed circuit with classifying hydrocyclones. The HGO and HGO2 circuits include two cone crushers for crushing pebbles exiting the SAG mill. The current capacity of the HGO, FGO and HGO2 mills is approximately 3.5, 4.0 and 4.5 Mtpa respectively, with an optimization program in place to increase further. Ground ore is thickened and washed with raw water to minimize chloride concentration in autoclave feed.

17.2.2 Flotation

Ground flotation grade ore from the FGO circuit Mill is subjected to simple bulk rougher flotation in a single roughing stage consisting of a bank of five 150m$^3$ flotation tank cells (2007 installation). Ground flotation ore from the HGO circuit Mill is processed by five 300m$^3$ flotation tank cells (2013 installation). The mass recovery to flotation concentrate is high at approximately 35-40%. The flotation concentrate is thickened to 50-55% solids (%w/w) and then blended with direct ore slurry to achieve the required target autoclave feed sulphide grade.

17.2.3 Pressure Oxidation

Thickened ore slurry is pumped to the three parallel autoclave circuits, and a fourth larger autoclave installed as part of the last major plant expansion. The fourth autoclave is 2.2 times the capacity of the existing three autoclaves. Conventional gold processing Sherritt autoclave technology at a temperature of 205°C and a pressure of 2,650 kPa is utilized. Feed slurry is first preheated in heat recovery vessels before being pumped under pressure to each of the six-compartment agitated autoclave vessels. Pure oxygen (O$_2$) from four operating cryogenic oxygen plants (includes a 70tph oxygen plant installed as part of the major plant expansion), is injected into the autoclaves to oxidize approximately 90% of the contained sulphide minerals. Each autoclave has a heat recovery circuit involving a single stage of steam flashing and the flashed steam is used in the direct contact pre-heater vessel.
17.2.4 CCD Washing, Neutralization and Gold Recovery

Oxidized slurry passes through two trains of two stage counter-current decantation (CCD) circuit, where it is washed with process water and seawater as required minimizing slurry acidity. Note that a second train of CCD washing, neutralization, CIL and tailings disposal system was installed as part of the major plant expansion to handle the additional feed from the fourth autoclave.

The washed slurry is then neutralized with lime slurry prepared from slaking imported quicklime, and then gold is recovered from the neutralized slurry by cyanide leaching using conventional CIL technology and a series of agitated tanks. The slurry is conditioned with lime in the first tank and cyanide is added to the second tank. The slurry is then agitated with granulated carbon in the remaining tanks and passes through the tanks while the carbon is retained by screens.

Loaded carbon from the CIL circuit is stripped of gold in an elution system. The gold is eluted from carbon using hot caustic/cyanide solution and the carbon is then rinsed with water. The resulting gold solution is circulated through electro-winning cells where gold is recovered through electroplating to form a gold sludge. The sludge is dried and then smelted to produce doré bars which are shipped to a refinery. Barren carbon is regenerated in a rotary kiln.

17.2.5 Residue Tailings

The CIL leach residue tailings are detoxified by formation of strong metal complexes such as ferrocyanide, and through dilution with seawater (cooling water return) in the junction box upstream of the de-aeration tank.

Under these conditions weak acid dissociable cyanide ($CN_{WAD}$) converts to stable ferrocyanide. The tailings gravitate to a common disposal system which also collects the flotation tailings; remaining CCD wash water as well as oxygen plant and power plant cooling water return streams. The tailings disposal method is by deep sea tailings placement (DSTP). The combined stream flow discharges through a de-aeration tank to the ocean via a pipeline outfall at a depth of 128 m below sea level. The depth of the outfall discharge is below the surface mixing layer of the ocean. Being denser than the receiving seawater, the tailings gravitate down the steep submarine slope.

17.2.6 Process Reagents

Key processing reagents are lime and cyanide. Quick lime is imported in dedicated shipping containers. Cyanide is imported as sodium cyanide briquettes in one tonne bags and then dissolved in water for distribution to the cyanidation circuit. Other minor reagents are for flotation (collector and frother) and flocculent for thickening. Grinding balls are imported in sea containers and stored in bunkers.

17.3 Plant Performance

Actual plant operating performance for the 12 months ending June 2013 is presented in Table 17.1.
**Table 17.1  Lihir Processing Performance for the Year Ending 30 June 2013**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGO Ore Milled</td>
<td>Mt</td>
</tr>
<tr>
<td></td>
<td>Au g/t</td>
</tr>
<tr>
<td>FGO Ore Milled</td>
<td>Mt</td>
</tr>
<tr>
<td></td>
<td>Au g/t</td>
</tr>
<tr>
<td>HGO2 Ore Milled*</td>
<td>Mt</td>
</tr>
<tr>
<td></td>
<td>Au g/t</td>
</tr>
<tr>
<td>Overall Gold Recovery</td>
<td>%</td>
</tr>
<tr>
<td>Gold Production</td>
<td>Moz</td>
</tr>
</tbody>
</table>

* The HGO2 Mill was commissioned during the year and does represent a full production year.
18  PROJECT INFRASTRUCTURE

18.1 Mine Infrastructure

Mine facilities, including ROM ore stockpiles, crushing facilities, pit dewatering wells and mine support facilities, are located in the Ladolam Creek valley, immediately to the north of the ultimate pit boundary.

The ore processing plant is on the northwestern side of Putput Point on the relatively flat land adjacent to the shoreline and on the more gentle lower slopes of the eastern end of the caldera.

Support buildings include a main office, laboratory, training building, warehouse and bond store, plant workshop, and an emergency and security services building. An environmental laboratory has been built, and field and laboratory equipment provided for air and water sampling, steam gauging, sediment sampling, fish sampling, weather monitoring, oceanographic monitoring and industrial hygiene measurements.

Haul roads join the ultimate pit boundary to the crushing facilities and ROM stockpiles at Ladolam and to the barge loading dock in Luise Harbour. The haul road to that dock extends northwards along the shoreline to the low grade ore stockpile for Kapit.

Haul roads are designed for 140t rear dump trucks, and have a width of 23m between berms or shoulders. Road construction comprised a crushed rock base course on a sub-base of broken weak rock or coronous material.

Facilities for handling and transport of the various fuels, reagents, and consumables required by the processing plant are located near the general ship berth and the processing plant.

Heavy fuel oil (HFO) discharges from oil tankers to two bulk storage tanks using the supplying tanker’s pumps. These HFO tanks measure 36.6m in diameter by 14.6m high and have a total capacity of 26,500 tonnes. An estimate of average HFO consumption is 205t/d.

Using the supplying tanker’s pumps, distillate (diesel fuel oil) discharges to two bulk storage tanks of 18.3m diameter by 14.6m high. These tanks have a total capacity of 6000 tonnes. Average distillate consumption is estimated at 70 t/d.

18.2 Power

Power is produced at site by a combination of HFO reciprocating engines and geothermal steam turbines.

The HFO power supply consists of twelve 6.3MW units, and ten 8.8MW units.

Geothermal power commenced in 2003. The initial geothermal plant was a pilot project consisting of a single 6MW back pressure steam turbine. The success of this pilot plant led to a 30MW geothermal power station commissioned in 2005 and then a 20MW extension which was commissioned in 2007. The plant was designed and built by external contractors and is now operated and maintained by mine power station staff. The steam wells supplying the station are located around the mine pit area. Steam supply has declined in recent years with no active drilling program to replace steam supply.
The existing total mine site power demand is around 105MW with geothermal power providing approximately 20MW and the balance from the HFO-fired generators.

18.3 Water

Fresh water required for mine and processing operations, as well as township requirements is sourced from a small weir on the Londolovit River approximately 8km north of the processing plant. The water storage capacity behind the weir is relatively small, but due to the consistent rainfall all year the weir continuously overflows and provides water to downstream users.

Raw water is primarily utilized in the grind thickeners to facilitate washing of ground ore for control of ore chloride concentrations. Four large turbine pumps supply the plant via a pipeline which discharges to both the plant raw water storage tank and the thickener circuit. Supply capacity reduces under short term drought conditions. Sea water substitution measures are implemented under drought conditions.

Following completion of the major plant expansion, and a change in the mine plan, the raw water demand has increased marginally to 4,000 m$^3$/hr. The additional supply requirement has been achieved with the installation of a second pipeline to the existing weir and connection of a natural fresh water spring within the caldera. This spring also provides some drought risk mitigation.

18.4 Public Roads

A public road was constructed from the village of Putput to the accommodation centre at the Londolovit plantation, and from there to the airstrip at Kunaie and on to the limestone quarry at Tanandon. Existing road alignment between Putput and Londolovit was used where practicable, with the road widened and strengthened to carry passenger vehicles, buses and trucks.

A public road from Putput to Palie Mission has also been widened and improved, and an island ring road has been completed from Palie Mission to Kunaie village. Public roads are 6.5m wide, with a coronous pavement.

18.5 Port Facilities

Port facilities are installed to service oil tankers, general cargo ships, passenger ferries and work boats. Putput wharf can berth general cargo ships of up to 13,000 dead weight tonnes (DWT), and oil tankers of up to 12,000 DWT, with draughts to 10m. The wharf is 78m long and is constructed from steel sheet piling. General cargo ships breast against the wharf, from where most holds are accessible without warping. For fuel unloading at the wharf, oil tankers secure in position from mooring dolphins constructed on the edge of the coral reef away from each end of the wharf.

Small boats with a draught up to 2m berth in a harbour excavated in the coral platform. Several small boats service the western side of Lihir Island and the outlying islands of Mahur, Masahet and Mali. Permanent marine facilities have been constructed at these locations for passenger loading and unloading.
18.6 Air Services

The Lihir airstrip is located at Kunaie and has a runway 1,200m long and 23m wide, with an unsealed coronous surface. It complies with the requirements for a standard PNG Class X airstrip and is suitable for use by a variety of small passenger aircraft up to 40 passengers.

The airstrip includes a taxiway and aircraft parking area for up to three aircraft. Runway lighting is provided for night operations, and there is a non-directional beacon to aid navigation.

A terminal building next to the aircraft parking area contains arrival and departure facilities and baggage handling equipment. Fuel storage and distribution facilities, equipped with regulation fire-fighting equipment, are sited adjacent to the aircraft parking area.

18.7 Housing

The Londolovit accommodation centres provide housing for senior staff living on site with their families and a number of government employees. Single persons’ quarters are provided for commuting personnel. Kitchens and dining rooms, with toilet blocks, laundries, and offices have been constructed to service the accommodation centre.

Raw water is pumped from the Londolovit valley to a tank and water treatment plant for filtration and chlorination, before being distributed throughout the accommodation centre via a network of underground water mains. Fire protection is by a series of fire hydrants on the potable water mains, with pressure boosting during fire-fighting by diesel and electric fire pumps.

Sewage disposal is through underground gravity sewers, which flow to two sewage pumping stations. The sewage is then pumped to a packaged treatments plant, one located in Upper Londolovit and one near Lakunbut Creek. The treated effluent drains through a gravity pipeline extending from the treatment plant to the shoreline near the Lakunbut Creek outlet and continuing as a sub-sea pipeline to a depth of 30m.

Power supply is distributed by overhead power lines, and street lighting and area lighting is provided throughout the accommodation centre area.

Recreation facilities comprise a recreation centre, two tennis courts, a swimming pool, a general purpose sports field, a basketball court, two gymnasiums, a squash court, children’s playground, and barbecue areas.

Community facilities have been constructed including:

- Police station.
- Local and National Government Offices.
- Community Relations and Business Development Offices.
- Business Development area including supermarkets, maintenance shops, office spaces, and general trade.
- Bank, post office, and amenities block.
- Open market.
• Medical centre consisting of an eight-bed ward, a two-bed ward, an X-ray and treatment room, a trauma reception area, delivery room, a dental treatment room, pharmacy, and two consultation rooms.
• Central bus station.
• International primary school.
MARKET STUDIES AND CONTRACTS

Lihir produces gold doré containing 91% to 97% gold, 1.5% to 5.5% silver and 3% to 5% base metals. The bullion bars are securely transported by air freight from the mine site to a refinery for further processing.

Within the Asia-Pacific region, there are a number of acceptable refineries which have the capacity to refine doré; the West Australian Mint refinery (WAM) in Perth, WA, W.C Heraeus – Precious Metals in Hong Kong, Logam Mulia in Indonesia and new refineries in India as well as a number of established refineries in Europe and the Middle-East. Currently WAM in Perth is the preferred refiner.
20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Statutory Environmental Approvals and Compliance

Mine development and operations (i.e. processing) at Lihir commenced in 1997 in accordance with the agreed development plans stipulated in the approved Proposal for Development submitted by the company, which forms the basis of the Mining Development Contract (MDC) and the subsequently issued Special Mining Lease (SML 6). The original Environmental Plan associated with mine development was completed in 1995 (NSR, 1995) and approved by the PNG Environment Minister.

The mine prepared an Environmental Impact Statement (EIS) under the Environment Act (2000) to incorporate all existing environmental permits into two new permits, including an extension to the mine life of 14 years out to 2039, increases to total ore and waste mining tonnages, increases to total tailing disposal and an enlarged mine footprint (LGL, 2005). The EIS was subsequently approved by the PNG Department of Environment and Conservation (DEC) in 2008, with new environmental permits issued for mine discharges and water abstraction being issued in October 2008 (DEC, 2008a and 2008b).

Newcrest completed a major plant upgrade in 2013 to expand the production of Lihir which did not require any change to the current rate of mining or to the extent of the pit footprint. Instead, additional ore processing was made possible by increasing the rate of processing for stockpiled low-grade ore and increases to tailing disposal. An EIS for the expansion was submitted to the PNG DEC (Coffey, 2009) and was approved by the PNG Environment Council in February 2011. The existing discharge and abstraction permits were updated in March 2012.

A regulatory approved Environmental Management and Monitoring Plan is used to manage and monitor the predicted environmental impacts associated with the project (LGL, 2013). In addition, an annual environmental report is prepared and submitted to the PNG DEC (LGL, 2013). Newcrest has an operating environmental management system (EMS), which is ISO14000 certified.

20.2 Waste and Tailings Management

Lihir operations comprise an open pit mine, ore processing plant, and associated supporting infrastructure. Higher-grade ore is processed via pressure oxidation and carbon-in-leach cyanidation methods, with lower grade ore stockpiled for later processing. Lihir operates an ISO 14001 certified Environmental Management System (EMS), which assists in the planning and implementation of environmental management measures.

Lihir uses deep sea tailings placement (DSTP). In view of the heavy rainfall typically experienced on Niolam Island, the lack of suitable area for a tailings storage facility and the high seismicity of the region, DSTP was the preferred tailings placement method for Lihir. The plant tailings are premixed with sea water within the confines of the mining lease before being placed offshore. Baseline studies were undertaken prior to the approval by PNG environmental authorities and commencement of the DSTP. Regular monitoring is undertaken to verify the operational performance of the system and are subject to the regulatory criteria established by the PNG Department of Environment and Conservation. Waste rock from the mine is either used for construction purposes or transported in barges for off-shore submarine disposal. Submarine disposal is carefully planned and controlled to
achieve a continuous rill slope along the steeply dipping sea floor and to prevent uncontrolled slumping triggering a rise in water levels.

Given that the waste rock and tailing materials contain sulphide minerals (including pyrite), submerging these materials prevents oxidation and potential generation of acid and metalliferous drainage (ARD).

Newcrest has conducted numerous studies to investigate the performance of the DSTP system including potential impacts from mine derived sediment, waste rock and tailing disposal (CSIRO, 2009). The PNG Government has also conducted studies on the DSTP system independently of Newcrest (SAMS, 2008). The studies have found that the system performs according to approved environmental permits and regulatory monitoring requirements.

Management of ARD is an ongoing focus for the mine as part of an integrated planning process. There is potential for ARD to be generated from medium term storage of ore stockpiles prior to processing. This requires management of runoff and drainage to ensure discharges comply with environmental and operating permits. Medium and long term planning is applied to process ore stockpiles as soon as practicable to help mitigate potential environmental impacts and realize economic benefits.

Current monitoring data indicates that ore stockpiling at the site and exposure of sulphidic ore and waste rock at the pit wall areas does not appear to result in any significant increases in acidity or metal concentrations in Luise Harbour, possibly due to interaction with groundwater, geothermal brine and seawater at the site.

20.3 Community and Social Issues

Newcrest’s ongoing commitment to sustainable development on Lihir Island is encapsulated in its Community and Environment Policy (2013). Commitments to the local community around compensation and community development are embodied in a revised Integrated Benefits Package (IBP) Agreement signed in 2007, which incorporates the Lihir Sustainable Development Plan (LSDP). The IBP is currently being reviewed. Final terms of the revised agreement are still being negotiated. The LSDP is the overall implementation plan and provides a framework for future development initiatives to be aligned and focused over the life of the project. Through these actions, Newcrest has made a strong commitment to support the local population and to prepare the community for a post mining environment.

Newcrest has in place a Social Impact Monitoring Program (LGL, 2009) via which the company monitors social issues related to the mine and uses the reports to develop mitigation strategies in consultation with the local community. The overall approach to social and community related issues on Lihir align well with the requirements of the International Council for Mining and Metals (ICMM) performance standards and Equator Principles (EPFI, 2009).

Newcrest has established a good working relationship with the local communities and occasional disruptions due to disputes are relatively minor in nature, although there have been infrequent issues that have been more significant in terms of resolution.

20.4 Mine Closure

In compliance with regulatory requirement the company commissioned a conceptual mine closure plan in 1995, which was submitted to the PNG government, and which has been
updated three times since (LMC 1999, LGL, 2005 and 2011). The latest of these studies indicates that at mine closure the harbour waste platform/coffer-dam will be left in place but modified to allow flooding of the pits with tidal flushing of the final void.

Ore stockpiles will be processed and stockpile footprint areas will be remediated and rehabilitated. The LSDP flags the potential for transfer of mine assets to the community or the State on closure, subject to negotiation at the time. The importance for closure planning is that both liability and risk are extinguished as soon as title is restored to the State, following at least a five year post-closure monitoring program.

The mine rehabilitation and restoration provision for the Newcrest Group at 30 June 2013 was A$317M.
21 CAPITAL AND OPERATING COSTS

21.1 Historical Costs

Lihir cash costs for the year ending June 2013 averaged A$689/oz.

Recent unit operating costs for Lihir for FY2011 to FY2013 are set out in Table 21.1, with actual operating costs for FY2013 in Australian dollars presented in Table 21.2. Table 21.3 presents historical capital costs in United States dollars for FY2011 to FY2013.

Table 21.1 Historical Production and Costs per Ounce of Gold Produced

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Production</td>
<td>(oz)</td>
<td>790,974</td>
<td>604,336</td>
<td>649,340</td>
</tr>
<tr>
<td>Mine</td>
<td>(A$/oz)</td>
<td>252</td>
<td>339</td>
<td>331</td>
</tr>
<tr>
<td>Mill</td>
<td>(A$/oz)</td>
<td>192</td>
<td>271</td>
<td>381</td>
</tr>
<tr>
<td>Administration and Others</td>
<td>(A$/oz)</td>
<td>175</td>
<td>252</td>
<td>290</td>
</tr>
<tr>
<td>Third Party Smelting Refining and Transportation</td>
<td>(A$/oz)</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Royalties</td>
<td>(A$/oz)</td>
<td>30</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>By Product Credits</td>
<td>(A$/oz)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Waste stripping and Ore Inventory Adjustments</td>
<td>(A$/oz)</td>
<td>(233)</td>
<td>(342)</td>
<td>(349)</td>
</tr>
<tr>
<td>Cash Cost</td>
<td>(A$/oz)</td>
<td>419</td>
<td>560</td>
<td>689</td>
</tr>
<tr>
<td>Depreciation and Amortization</td>
<td>(A$/oz)</td>
<td>162</td>
<td>165</td>
<td>206</td>
</tr>
<tr>
<td>Total Cost</td>
<td>(A$/oz)</td>
<td>581</td>
<td>725</td>
<td>895</td>
</tr>
</tbody>
</table>

Table 21.2 Lihir FY 2013 Actual Operating Cost

<table>
<thead>
<tr>
<th>Lihir Island</th>
<th>Unit</th>
<th>FY13 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Production</td>
<td>koz</td>
<td>649</td>
</tr>
<tr>
<td>Total site cash costs</td>
<td>A$M</td>
<td>650</td>
</tr>
<tr>
<td>Waste stripping and ore inventory</td>
<td>A$M</td>
<td>(227)</td>
</tr>
<tr>
<td>Third party smelting refining and transporting</td>
<td>A$M</td>
<td>3</td>
</tr>
<tr>
<td>Royalty</td>
<td>A$M</td>
<td>21</td>
</tr>
<tr>
<td>Depreciation</td>
<td>A$/oz</td>
<td>206</td>
</tr>
</tbody>
</table>

Table 21.3 Historical Capital Expenditure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustaining</td>
<td>197</td>
<td>231</td>
<td>304</td>
</tr>
<tr>
<td>Development</td>
<td>34</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Feasibility</td>
<td>0</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>Expansionary</td>
<td>374</td>
<td>537</td>
<td>421</td>
</tr>
<tr>
<td>Total capital expenditure</td>
<td>605</td>
<td>793</td>
<td>756</td>
</tr>
</tbody>
</table>

*Relates ten month period of ownership
21.2 Forecast Costs

FY2014 cost and capital guidance for Lihir, as released 12 August 2013, is shown in Table 21.4.

Table 21.4  Lihir FY 2014 Costs and Capital Guidance

<table>
<thead>
<tr>
<th>Lihir Island</th>
<th>Unit</th>
<th>FY14 Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Cost (including by-product credits)¹</td>
<td>A$M</td>
<td>670 – 735</td>
</tr>
<tr>
<td>On-site exploration expenditure</td>
<td>A$M</td>
<td>1 – 2</td>
</tr>
<tr>
<td>Production Waste Stripping²</td>
<td>A$M</td>
<td>140 – 155</td>
</tr>
<tr>
<td>Sustaining Capital²</td>
<td>A$M</td>
<td>150 – 165</td>
</tr>
<tr>
<td>Corporate, rehabilitation and other</td>
<td>A$M</td>
<td>2 – 3</td>
</tr>
<tr>
<td>All-in sustaining cost</td>
<td>A$/oz</td>
<td>965 – 1,060</td>
</tr>
<tr>
<td>Production Stripping²</td>
<td>A$M</td>
<td>140 – 155</td>
</tr>
<tr>
<td>Sustaining Capital²</td>
<td>A$M</td>
<td>150 – 165</td>
</tr>
<tr>
<td>Projects and development capital</td>
<td>A$M</td>
<td>2 – 5</td>
</tr>
<tr>
<td>Total capital expenditure</td>
<td>A$M</td>
<td>295 – 350</td>
</tr>
</tbody>
</table>

¹ Costs assume AUD:USD 0.96, silver price US$22.0/oz
² Duplicated above under All-in sustaining costs and under Capital expenditure
22 ECONOMIC ANALYSIS

Lihir was developed in 1995 and is a well-established mining and ore processing operation.

In the reporting year to June 2013, the Newcrest realized gold price was A$1,550/oz. Lihir's cash cost of production for the same period was A$689/oz.

As a producing issuer Newcrest is not required to provide an economic analysis as laid out in Item 22 of NI 43-101 Form 1.
23 ADJACENT PROPERTIES

There are no adjacent properties to Lihir and there is no other mining undertaken elsewhere on Lihir Island.
24 OTHER RELEVANT DATA AND INFORMATION

No additional data or information is required to make the Report understandable and not misleading.
25 INTERPRETATION AND CONCLUSIONS

Lihir Gold Mine is an established operation with a long history to support development of plans to exploit the available Mineral Resources.

Factors that may have a material impact on the Lihir Gold Mine include those discussed in the risks section of Newcrest’s annual operating and performance review which forms part of Newcrest’s Full Year Financial Results for the year ended 30 June 2013, which can be found on its website at www.newcrest.com.au and at www.sedar.com.
26 RECOMMENDATIONS

Lihir Gold Mine is an established operation with a long history to support development of plans to exploit the available Mineral Resources.

In view of the nature of Lihir and the substantial Mineral Reserve inventory, no recommendations are included.
REFERENCES


DEC (2008a). Environment Permit WD-L3 (191) issued to Lihir Gold under Section 65 of the Environment Act 2000 to carry out works within SML 6, ME73, ME72, ME71, ML126, LMP35, LMP38, LMP39, LMP40, ML125, LMP34 and LMP1, (the “premises”) on Lihir Island in New Ireland Province; and to discharge wastes into the environment from the premises while carrying out a Level 3 (Sub-category 17.1) activity associated with mining activities which require the issue of a Special Mining Lease under the Mining Act 1992. Issued 15 October 2008.

DEC (2008b). Environment Permit WE-L3 (143) issued to Lihir Gold under Section 65 of the Environment Act 2000 to extract water from surface and groundwater sources within the premises on Lihir Island in New Ireland Province while carrying out a Level 3 (Sub-category 17.1) activity associated with mining activities which require the issue of a Special Mining Lease under the Mining Act 1992. Issued 15 October 2008.


IBP (2007). Integrated Benefits Package Revised Agreement. An agreement between LMALA, NRRLLG and LGL (commonly referred to as the Lihir Sustainable Development Plan (LSDP)). Lihir Island.


NML (2013c). 2012/13 Full Year Financial Results Presentation. Greg Robinson (Managing Director and CEO) and Gerard Bond (Finance Director and CFO)


NML Capital Expenditure Reconciliation (SAP), FY13, FY12, FY11


28 QUALIFIED PERSON’S CERTIFICATE

Colin Moorhead
Newcrest Mining Limited
Level 8, 600 St Kilda Road
Melbourne, Victoria 3004
Australia

1. I, Colin Moorhead, do hereby certify that I am the Executive General Manager, Minerals employed by Newcrest Mining Limited.

2. I am a graduate of the University of Melbourne and hold a Bachelor of Science (Hons.) in Geology with a geophysics major.

3. I am a Fellow of the Australasian Institute of Mining and Metallurgy.

4. I have worked as a geologist for a total of 27 years since my graduation from university. My relevant experience includes 18 years fulfilling the roles of exploration geologist, mine geologist, geology manager and technical services manager at Newcrest’s Australian open pit and underground mining operations, two years as geology manager at Newcrest’s Indonesian mining operation, two years as General Manager Technical Services responsible for technical excellence and resources and reserves governance and six years in the role of Executive General Manager, Minerals responsible for exploration, mine geology and resources and reserves governance throughout Newcrest.

5. I have read the definition of “Qualified Person” set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a “Qualified Person” for the purposes of NI 43-101.


7. I have had prior involvement with the property that is the subject of the Report. This involvement is via my role as Executive General Manager, Minerals with Newcrest where I am the executive responsible for exploration, mine geology and resource and reserves governance throughout Newcrest.

8. I am not independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.

9. I have read National Instrument 43-101 and Form 43-101F1, and the Report has been prepared in compliance with that instrument and form.

10. As of the effective date of the Report, to the best of my information, knowledge and belief, the part(s) of the Report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the Report not misleading.

31 December 2013
Original signed by

Colin Moorhead