



**FRIEDA RIVER**

Frieda River Limited

## **Sepik Development Project**

Environmental Impact Statement

Chapter 2 – Viability and Purpose of the Development

SDP-6-G-00-01-T-084-004





## **2. VIABILITY AND PURPOSE OF THE DEVELOPMENT**

The viability of the Project depends on a combination of economic, engineering, environmental and social considerations. If developed, the Project will be the second largest capital investment in the resource sector in PNG and will attract significant local employment and foreign investment.

This chapter outlines the credentials of the proponent, the various studies completed, the objective of the development and its compatibility with PNG Government strategies.

### **2.1 Overview**

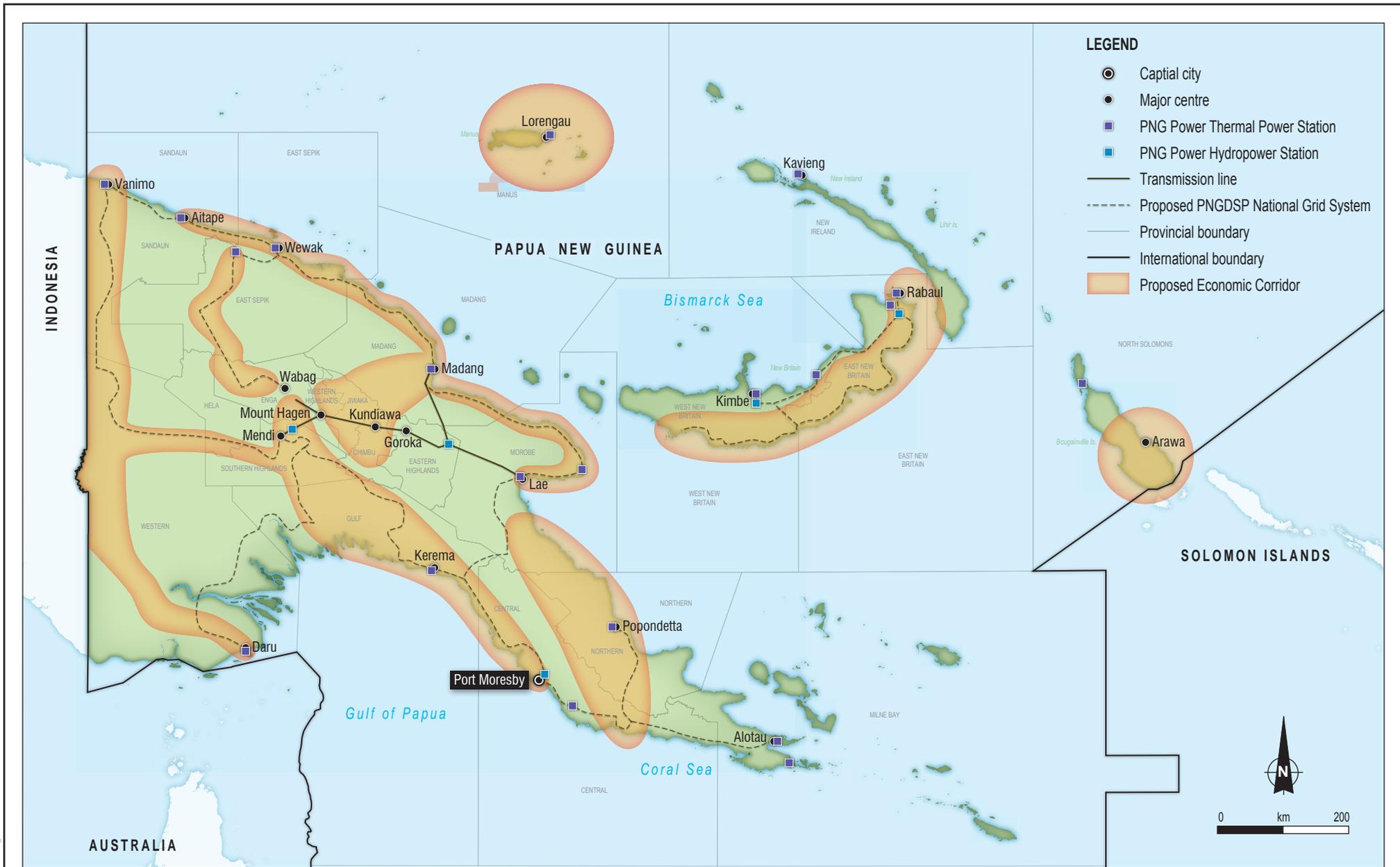
The Project presents broad commercial and socio-economic development opportunities for PNG and aligns with PNG's development plans. In particular, the Papua New Guinea Development Strategic Plan 2010 to 2030 (PNGDSP) sets out to provide direction in policy making to achieve the goals of Vision 2050, which describes the country's long-term strategy and reflects the aspirations of Papua New Guineans, with the goal that PNG will be ranked in the top 50 countries in the United Nations Human Development Index by 2050 (NSPT, 2009).

While the Project is underpinned by the development of the FRCGP, which is a national priority of the PNG Government, one of the central themes of the PNGDSP is for the PNG economy to advance beyond the mining and petroleum sectors. There is a focus on creating the enabling environment for investment and economic participation through the construction, operation and renovation of physical structures that provide a platform for most other economic activities. This includes telecommunications, electricity, water and waste services, roads and public works programs, ports and airports, shipping and aviation services (Kaiku, 2016). The Project provides such an enabling environment for the investment and economic participation envisaged by the PNGDSP.

The PNGDSP has identified ten regions across PNG as economic corridors that will be transformed to provide access to transport, utilities, education and health services. This includes future electricity super-corridors that connect areas where electricity can be generated at low cost (such as by the FRHEP) to a national grid.

The Northern Transmission Line aligns with the Border Corridor economic region for the Western, Southern Highlands and Sandaun provinces. It is envisaged that the FRHEP and SPGP will assist in supplying the power to northwest PNG and enable a reliable, long-term supply of energy long after the FRCGP has closed. It will assist in the strategic plan's target of 70% of households having access to electricity by 2030 and will also supply other industries such as agriculture, fisheries, food and timber processing, mining and manufacturing. There is also opportunity to establish a new industry from the export of power to neighbouring Indonesia. Figure 2.1 shows the PNG energy development and super-corridors as described in the PNGDSP. The FRHEP is configured to provide an excess in the order of 150 MW of power to supply a future regional power grid.

The SIP includes a 286-km-long extension and upgrade of the existing road from Vanimo to Green River. The public access extension will continue to Hotmin and then extend via a 39-km-



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Source:  
Adapted from DNPM, 2010. Papua New Guinea Development Strategic Plan (PNGDSP) 2010–2030.  
Report prepared by the Department of National Planning and Monitoring, Port Moresby, Papua New Guinea.



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**Frieda River Limited**  
**Sepik Development Project**



**Proposed energy development in PNG**

Figure No:  
**2.1**

long private road to the mine and FRHEP sites. There is potential for a connecting road between Hotmin and Telefomin; however, this extension is not required for development of the FRCGP and therefore is not included in this EIS. A connecting road to Telefomin provides an opportunity for public transport and commercial ventures along a route that currently has no transport infrastructure in a remote part of PNG. The extension and upgrade of the existing roads will contribute to meeting the PNGDSP's 2030 target of tripling the PNG road network.

## **2.2 Proponent's Credentials**

### **2.2.1 Overview**

The Project proponent is the Frieda River Joint Venture.

The FRCGP will be developed by Frieda River Limited (FRL) on behalf of the Frieda River Joint Venture. It is anticipated that third-party entities may own and operate the remaining project elements at some stage during the life of the Project.

Detail about the credentials of Frieda River Joint Venture participants is provided in the following section. Further details about the credentials of the third-party entities who will own and operate the FRHEP, SIP and SPGP will be provided to the PNG Government as arrangements are proposed.

### **2.2.2 The Frieda River Copper-Gold Project**

The FRCGP is held by the Frieda River Joint Venture, an unincorporated joint venture between FRL, a PNG incorporated company and wholly owned subsidiary of PanAust, and Highlands Frieda Limited (HFL), a wholly-owned subsidiary of Highlands Pacific Limited. FRL manages the Project and holds an 80% interest; HFL holds the remaining 20% interest. The Independent State of PNG has a right, prior to the grant of a Special Mining Lease (SML) or Mining Lease (ML), to purchase up to 30% equity in the FRCGP.

FRL's owner, PanAust, is an Australian incorporated company that is owned by Guangdong Rising H.K. (Holding) Limited, a wholly owned subsidiary of Guangdong Rising Assets Management Co. Ltd (GRAM). GRAM is a Chinese state-owned company regulated under the State-owned Assets Supervision and Administration Commission, the People's Government of the Guangdong Province in China.

PanAust is a copper and gold producer in Laos and has pre-development opportunities in Laos, PNG, Myanmar and Chile. PanAust's producing assets are the Phu Kham Copper-Gold Operation and the Ban Houayxai Gold-Silver Operation; both are located in the Phu Bia Contract Area in Laos.

PanAust is an internationally recognised and awarded leader in environmental management and sustainability.

The successful development of its Lao operations demonstrates PanAust's experience and capabilities in building and operating mining projects in remote locations in a tropical, mountainous, high-rainfall environment within a developing country and in close proximity to local communities.

PanAust employs approximately 3,400 people (as of 31 December 2017) and its revenue for 2017 was approximately US\$792 million.

HFL's owner, Highlands Pacific Limited, is a PNG incorporated company listed on the Australian Securities Exchange (ASX) and the Port Moresby Stock Exchange (POMSoX). HFL has been operating in PNG for more than 20 years as a minerals explorer, developer and producer.

### **2.2.3 Frieda River Hydroelectric Project**

The Frieda River Joint Venture is the proponent for the FRHEP. It is anticipated that a third-party entity with expertise in hydroelectric projects may own and operate the FRHEP at some stage during the life of the Project. Further details about the third parties credentials will be provided to the PNG Government as arrangements are formalised.

### **2.2.4 Sepik Infrastructure Project**

The Frieda River Joint Venture is the proponent for the SIP. Many of the SIP facilities form part of the PNG Government's national development plan. It is anticipated that individual elements of the SIP will be constructed and, if necessary, operated by third-party entities with the expertise in the relevant infrastructure project. Further details about the third parties credentials will be provided to the PNG Government as arrangements are proposed.

### **2.2.5 Sepik Power Grid Project**

The Frieda River Joint Venture is the proponent for the SPGP. It is anticipated that the SPGP will be constructed and operated by third parties. Further details about the third parties credentials will be provided to the PNG Government as arrangements are proposed.

## **2.3 Feasibility Investigations**

The 2016 FRCGP Feasibility Study report accompanied the application for a Special Mining Lease and formed the basis for the 2016 EIS. This was updated in 2017 as a Feasibility Study Addendum.

An updated Feasibility Study was completed in 2018 to reflect the new Project scope, which includes the:

- Extension of the mine life from 17 years to approximately 33 years.
- Inclusion of a larger hydroelectric power facility in an alternative location (FRHEP) with potential to export excess power via a new transmission line (the SPGP).
- Inclusion of the SIP which incorporates an infrastructure corridor from the mine site to Vanimo including a 286-km-long public road, airport and an upgraded Vanimo Ocean Port.
- Inclusion of the SPGP which incorporates the 370-km-long 275 kV Northern Transmission Line from the FRHEP to the Indonesian border via Vanimo.

The 2018 Project Feasibility Study is based on the development of the Horse-Ivaal-Trukai, Ekwai and Koki (HITEK) porphyry copper-gold deposits and supporting infrastructure and facilities. The HITEK deposits contain an estimated total combined Measured, Indicated and Inferred Mineral Resource of approximately 2.6 billion tonnes at an average grade of 0.44% copper and 0.23 grams per tonne gold (Table 2.1), representing one of the largest known undeveloped copper resources in the world.

**Table 2.1 HITEK Mineral Resource Estimate**

Classification	Tonnes (millions)	Copper Grade (%)	Gold Grade (g/t)	Silver Grade (g/t)
Measured Mineral Resource	620	0.53	0.30	0.82
Indicated Mineral Resource	1,240	0.44	0.22	0.75
Inferred Mineral Resource	780	0.35	0.18	0.83
Total	2,640	0.44	0.23	0.79

Source: FRL, 2018

g/t = grams per tonne

Outcomes of the 2018 Project Feasibility Study included:

- A large-scale, open-pit mine with an average 45 million tonnes per year (Mt/year) process plant throughput and 33-year mine life. It is anticipated that the large Mineral Resource and potential for further exploration success will support the development of the Project beyond the development proposal outlined by the Feasibility Study.
- Fugitive sediment emissions from the mine site and the potential for acid and metalliferous drainage will be limited by subaqueous storage of mine waste rock and process tailings in an ISF. The ISF is designed to Australian National Committee on Large Dams Incorporated (ANCOLD) standards.
- The remote location and absence of existing infrastructure demands a significant capital investment in supporting infrastructure.
  - The infrastructure corridor spans a distance of 325 km between Vanimo and the mine site and includes an access road to deliver inbound freight and a pipeline to transport copper-gold concentrate for export.
  - The Northern Transmission Line will run along the infrastructure corridor to provide power from the FRHEP to Green River and Vanimo.
  - The Project will require regional infrastructure to be developed and/or existing infrastructure upgraded as part of the SIP. The components include an ocean port, river ports and an airport.
- The FRCGP will have robust economics during operations with a life of mine operating cost in the first quartile of global production costs supporting positive cash flow through the low point in commodity price cycles.

Exploration, metallurgical, engineering, commercial and environmental investigations have been conducted intermittently since mineralisation was discovered at Frieda River in the 1960s. The following summarises the more recent studies undertaken for the FRCGP.

### 2.3.1 Scoping Studies (2007 to 2008)

In 2007 and 2008, the previous owner undertook scoping studies (Xstrata Copper, 2008; SKM, 2009a) for the development of the Frieda River copper-gold deposits to assess the value of the FRCGP and allow a decision on whether to proceed with a Pre-Feasibility Study. The decision-making process was informed by advancing the level of understanding of the mine through a series of investigations and programs that included:

- Geological modelling and Mineral Resource estimation.
- Metallurgical test work.

- Infrastructure siting options, e.g., tailing and waste rock storage options, power supply, ports.
- Financial evaluation.
- Project risk assessment.
- Community consultation, engagement and development programs.

### **2.3.2 Pre-Feasibility and Feasibility Studies (2010 to 2012)**

The previous owner completed a Pre-Feasibility Study in September 2010 which indicated that the mine could be technically and commercially viable and could progress to the feasibility study phase. A Feasibility Study was completed in 2012 and included preparation of an EIS for the FRCGP as then defined. The EIS was not submitted to the regulatory authorities as the owner decided not to proceed with the development at that time.

### **2.3.3 Due Diligence and Scoping (2013 to 2015)**

PanAust acquired an 80% interest in the FRCGP in 2014. As part of its due diligence during the acquisition process, PanAust conducted a preliminary evaluation that included re-assessment of the data collected from previous exploration activities and studies.

PanAust's interest is held by a wholly-owned subsidiary, FRL. In its capacity as manager of the Frieda River Joint Venture, FRL formulated a development concept, schedule and estimates for capital and operating costs and a financial evaluation was undertaken to assess the viability of the development concept. Contingency allowances were applied to the implementation schedule and estimates of capital and operating costs consistent with the degree of confidence in the underlying data.

Initial investigations focussed on a reassessment of the strategic development opportunities before applying constraints to the mine design. A field work program and metallurgical test work program was conducted to gather additional information related to: the proposed process plant; the location of the ISF; open-pit hydrogeology; and, open-pit slope design for a smaller open-pit than was proposed by the previous owner.

Between 2014 and 2015, a series of alternative cases were developed and examined by FRL to determine a feasible outcome for the development of the mine and potential future expansion. A review of the 2012 Feasibility Study produced a revised concept based on a reduced ore processing rate. A further assessment was completed which focussed on optimising capital costs against the risk profile and ultimately future operating costs.

### **2.3.4 2016 Feasibility Study (2015 to 2016)**

In 2015 and 2016, FRL re-assessed the FRCGP scale, scope and implementation, and completed a Feasibility Study. This included refining the Mineral Resource estimate, assessing mine waste storage options including alternative ISF locations, and a review of logistics options. Trade-offs between initial capital cost, long-term operating costs, scale, expansion and risk profile were examined.

The 2016 Feasibility Study evolved from the original scope as information was evaluated and assessed. Significant changes included: the addition of the Ekwai and Koki Mineral Resource into the mine plan; incorporation of hydroelectric power generation from the ISF; use of pipelines to transport concentrate and fuel between the Sepik River port and the mine site; the development of a new concentrate handling port at Cape Moem; and, the construction of a new airport at Kaugumi Creek to handle 50-seat passenger aircraft.

FRL completed the Feasibility Study in May 2016. This was lodged as part of an SML application with the Mineral Resources Authority in accordance with the conditions of EL58. On 24 June 2016, this SML application was registered by the Mineral Resources Authority which included:

- Proposal for development.
- Feasibility Study.
- Landownership Study.
- Business Development and Supply and Procurement Plan.
- Employment and Training Plan.
- Applications for supporting tenements.

### **2.3.5 Feasibility Study Addendum (2016 to 2017)**

The Feasibility Study Addendum was finalised in 2017. The Addendum incorporated additional data and further analysis which led to a significant improvement in the understanding and economics of the FRCGP. This included data from the 2016 Ekwai and Koki resource definition and geotechnical drilling program which led to an amended open-pit design and consequent updated mine plan and production schedule.

### **2.3.6 2018 Feasibility Study (2017 to 2018)**

The 2018 Feasibility Study incorporated changes to the proposed Project including a larger hydroelectric power facility (FRHEP), inclusion of an infrastructure corridor to Vanimo – notably, a 325-km-long access road – together with an upgraded ocean port at Vanimo (SIP) to provide import and export facilities for FRCGP construction and operations and an extension of the mine life from 17 years to approximately 33 years. The new infrastructure corridor to Vanimo means the Sepik River will no longer be required for transport of concentrate and materials during operations.

The Project description described in Chapter 5 of this EIS is based upon the Project design described in the 2018 Feasibility Study.

### **2.3.7 Environmental Studies**

Environmental investigations relating to the Project began in 1979 and have continued intermittently over subsequent years. An extensive baseline environmental monitoring program and characterisation studies were conducted by the previous owner between 2008 and 2013 which included:

- Meteorological data collection.
- Surface water sampling and analyses.
- River sediment sampling and analyses.
- Aquatic biological monitoring.
- Background river sediment load monitoring.
- River and creek stream gauging.
- Terrestrial biodiversity surveys.
- Nearshore marine surveys.
- Geochemical characterisation.
- Soils characterisation.

Additional environmental studies commissioned by FRL as part of this EIS were undertaken from 2014 to 2018 to:

- Confirm baseline conditions.

- Characterise additional disturbance areas associated with the change in Project design.
- Provide a basis for environmental impact assessment.
- Develop appropriate management and mitigation measures.

The studies were scoped to characterise the existing terrestrial and aquatic environment that may be impacted by the Project to the level required for impact assessment purposes. These studies and the assessment of impacts are detailed in Chapters 7 and 8.

### **2.3.8 Social Studies**

From 1979 to 1997 various social and land investigation studies were completed.

Since 2007, there has been a series of social studies completed as part of the impact assessment process to:

- Establish and/or confirm existing conditions.
- Identify potential economic, educational, health, employment and community development opportunities.
- Provide a basis for a social impact assessment.
- Develop appropriate management and mitigation measures.

Between 2008 and 2016 social characterisation studies and surveys were undertaken to support the social impact assessment. These included:

- Community health and nutrition surveys.
- Archaeology and cultural heritage surveys.
- Landscape and visual assessment.

Additional social studies commissioned by FRL as part of this EIS were undertaken from 2014 to 2018 to:

- Confirm baseline socio-economic conditions.
- Characterise socio-economic conditions in additional areas due to the change in Project design.
- Characterise land use change that has occurred along the infrastructure corridor due to the recent expansion of agroforestry in this part of Sandaun Province.
- Provide a basis for a social impact assessment and resettlement planning.
- Develop appropriate management and mitigation measures.

The studies were scoped to characterise the existing socio-economic environment that may be impacted by the Project to the level required for impact assessment purposes. These studies and the assessment of impacts are detailed in Chapters 7 and 9.

## **2.4 Objectives**

FRL has a number of objectives that guide its actions. These include financial and production objectives as well as objectives that relate to its sustainability performance.

The aim of the Project is to support the development of the FRCGP and the FRHEP while providing a transformative development opportunity for an under-developed region of PNG. The

Project legacy will be the development of key infrastructure that has the potential to underpin social and industry development.

This will be achieved while operating in a manner that is consistent with:

- PNG Government strategies.
- PNG regulatory requirements.
- PanAust Group Sustainability Policy and Sustainability Standards and other commitments including:
  - The Mineral Council of Australia’s Enduring Value Framework.
  - The International Council on Mining and Metals Sustainable Development Framework.
  - The International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability.
  - The Voluntary Principles on Security and Human Rights.
  - Consistency with the Universal Declaration of Human Rights.

## **2.5 Compatibility with PNG Government Strategies**

### **2.5.1 National Constitution of PNG**

The Independent State of Papua New Guinea promotes the development of its natural resources through various policies to encourage investment. It is a priority of the government that the people of PNG benefit from the development of their resources. The Constitution of PNG includes national goals and directives that outline the aspirations and principles for the development of the nation. The fourth of these national goals and directives states:

We declare our Fourth Goal to be for Papua New Guinea’s natural resources and environment to be conserved and used for the collective benefit of us all, and be replenished for the benefit of future generations.

The development of the Project in a manner that is environmentally aware, technologically achievable, economically viable and socially responsible is consistent with this goal.

The Constitution is supported by a legislative and policy framework that ensures that proposed developments assess, reduce and manage residual environmental and social impacts such that they are as low as practicable. In particular, the environmental and socio-economic considerations relevant to the Project are governed by the *Environment Act 2000*, which provides for, and gives effect to, the relevant national goals and principles of the constitution.

### **2.5.2 PNG Development Goals and Planning Guidelines**

#### **Vision 2050**

In 2009 the PNG Government, through the National Strategic Plan Taskforce (NSPT), released ‘Vision 2050’ that describes the country’s long-term strategy and reflects the aspirations of Papua New Guineans, with the goal that PNG will be ranked in the top 50 countries in the United Nations Human Development Index by 2050 (NSPT, 2009). As at 2015, the country was ranked 154 out of 188.

To achieve this goal, NSPT (2009) lists seven strategic areas for Vision 2050:

- Human capital development, gender, youth and people empowerment.
- Wealth creation.
- Institutional development and service delivery.
- Security and international relations.
- Environmental sustainability and climate change.
- Spiritual, cultural and community development.
- Strategic planning, integration and control.

Consistent with the second strategic area for Vision 2050, the Project presents a potential new source of wealth and growth for PNG. An objective of the wealth creation strategic area in NSPT (2009) is to bolster and maintain a strong, dynamic, competitive and productive economy.

The priority activities to achieve this goal are to develop agriculture, forestry, fisheries and tourism sectors based on revenue from the mining and energy sectors (NSPT, 2009).

Conducting the Project in a manner that is environmentally aware, socially responsible, technologically achievable and economically viable is consistent with this goal.

### **Papua New Guinea Development Strategic Plan**

In 2010, the PNG Department of National Planning and Monitoring released the PNGDSP. The PNGDSP sets out to provide direction in policy making to achieve the goals of Vision 2050.

While one of the central themes of the PNGDSP is for the PNG economy to advance beyond the mining and petroleum sectors, the PNGDSP acknowledges that the mining sector provides an important source of revenue for nation building. The FRCGP development is consistent with mining sector targets for 2030 that aim to double exports from mining, generating an extra PGK790 million in revenue, and create an additional 40,000 jobs (DNPM, 2010). The contribution of the FRCGP to this is detailed in Chapter 9.

### **Medium Term Development Plan**

The Medium Term Development Plan III, 2018 to 2022 (DNPM, 2018), is a five-year plan describing the objectives, strategies and financing plan to fund the Government's key development priorities. This plan builds on the two previous Medium Term Development Plans I (2011-2015) and II (2016-2017). Volume 1 of the Medium Term Development Plan III provides the road map for a sustainable future towards Vision 2050 and supports the guiding principles of sustainable development established in the National Strategy for Responsible Sustainable Development for PNG. It is designed to provide strategic direction to Government investment decisions and the main indicators and targets needed to meet development objectives. Volume 2 of the plan sets out the framework and investment plan with outcomes and targets, deliverables and annual investments for each sector.

Eight key result areas for investment are identified in Volume 1 of the plan, which includes Increased Revenue and Wealth Creation, Quality Infrastructure and Utilities, and Responsible Sustainable Development. These categories are relevant for the FRCGP, FRHEP and SPGP. The FRCGP is specifically mentioned in Volume 1 of the plan as a key investment under the Increased Revenue and Wealth Creation goals and strategies. The development of the FRCGP is consistent with the goal of managing a socio-economically beneficial and environmentally sensitive world class mineral extraction industry (Volume 2).

The Medium Term Development Plan III acknowledges the important role the minerals sector has had in PNG's economy and its future importance in PNG's development, specifically referring to the FRCGP as one of the key mining projects supported by the Government.

The FRHEP is consistent with the targets for use and distribution of clean energy such as hydro power, and avoids the need to power the FRCGP using higher-emission fuel sources such as intermediate and heavy fuel oil.

### **2.5.3 Social and Economic Benefits**

Benefits to the people of PNG will be derived from the Project (FRCGP, FRHEP, SIP and SPGP) in the form of:

- The availability of a reliable supply of clean and sustainable power to remote areas of PNG.
- An international ocean port close to Asian markets in north-western PNG.
- New regional roads connecting two provinces in rural PNG, providing access to isolated villages and enabling public transport and commercial ventures along a route that has no current transport infrastructure. The road link to the mine will be maintained for at least the life of the mine of at least 33 years, supporting the longer-term development of agricultural development and government delivery of social services such as health and education that can be facilitated by reliable road access.
- Upgraded regional airport allowing for commercial air services to population centres such as Vanimo, Wewak and Mount Hagen that facilitates tourism, fresh produce distribution and employment opportunities.
- Direct and indirect employment and training opportunities, over the long life of the mine.
- The potential for new business opportunities and industrial development enabled by access to roads and reliable power.
- Participation in community development opportunities.
- Improved access to health and education.
- Taxes and levies, which can contribute to improvements in the nation's physical and social infrastructure, depending on the funding decisions of the PNG Government.

The Project will generate substantial economic benefits including providing 5,200 jobs at the peak of construction and approximately 2,500 direct jobs during a mine life of at least 33 years (with the credible potential for extension beyond this). The PNG Government will also accrue revenue from the collection of personal income tax from Project workers. Further flow-on benefits will be generated locally as a result of additional provincial government spending from their share of national government tax revenues.

The estimated pre-production capital expenditure for the Project is US\$6.9 billion. The average operating expenditure for the Project will average approximately US\$685 million (PGK2.2 billion) per year, with a total tax, royalty and production levy revenue to the PNG Government and landowners of PGK29 billion over the life of the Project.

The social benefits of the Project are discussed in more detail in Chapter 9.

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