Ok Birim Tailings Storage Facility Project

Environmental and Social Impact Assessment

Chapter 2

Purpose and viability of proposed development

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OK TEDI MINING

2. PURPOSE AND VIABILITY OF PROPOSED DEVELOPMENT

This chapter details the purpose and viability of the Ok Birim Tailings Storage Facility (TSF) Project (the project), considering the objectives and anticipated benefits of the project, how the project aligns with national planning and development frameworks, and investigations into the feasibility of the project.

2.1 PURPOSE OF THE DEVELOPMENT

Ok Tedi Mining Limited (OTML) is committed to reducing the environmental impact of tailings disposal at the Ok Tedi Mine by largely eliminating the currently approved practice of riverine tailings disposal. The purpose of the project is to provide a technically proven, environmentally sound, and economically viable alternative to riverine tailings disposal. Compared to the continuation of riverine tailings disposal, the project is expected to:

- Provide up to 368 Mt storage capacity in a new TSF that will accommodate projected tailings from the mine for its current mine life and planned life of mine extensions up to 2050.
- Reduce the downstream environmental impacts of tailings disposal at the Ok Tedi Mine.
- Facilitate the mine's transition to a tailings management method that is acceptable to stakeholders and aligns with Papua New Guinea's (PNG's) development goals and planning guidelines.

2.1.1 Project objectives and benefits

The commercial objective of the project is to sustain the profitable operation of the Ok Tedi Mine, including ongoing copper, gold and silver production over the medium- to long-term (to 2050) in accordance with the Ok Tedi Mine's Strategic Business Plan.

Largely eliminating riverine tailings disposal at the mine will bring environmental and social benefits and represents a significant opportunity to enhance the mine's environmental and social performance while contributing positively to the mine's legacy as a responsible and sustainable mining operation.

Key benefits at various levels are expected to include:

- National level – Aligns with PNG's commitments to sustainable development and responsible mining practices to encourage the continued investment of mining projects within the country.
- Regional level – Reduces downstream environmental impacts on the river system upon which downstream communities rely.
- Local level – Contributes to addressing long-standing environmental concerns.

2.1.2 Alignment with national frameworks

The project supports the maximisation of benefits of the mine and demonstrates OTML's commitment to reduce the environmental impacts of tailings disposal. This aligns with the Constitution of the Independent State of Papua New Guinea (the Constitution) and key planning documents, including the National Strategic Plan (NSPT 2009), the PNG Development Strategic Plan (PNGDSP) (DNPM 2010) and the Medium Term Development Plan IV (MTDP IV) (DNPM 2023). These are discussed below.

2.1.2.1 Constitution of the Independent State of Papua New Guinea

The Third Goal of the Constitution, which promotes PNG's political and economic independence, states:

> *We declare our third goal to be for Papua New Guinea to be politically and economically independent, and our economy basically self-reliant.*

The project supports reserve calculations for current and future mine plans, including extending the life of mine to 2050. The project will contribute to the mine's medium- to long-term success, aligning with the Third Goal of the Constitution.

The Fourth Goal of the Constitution, which refers to natural resources and the environment, 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 and managing tailings in a manner that is environmentally aware, technologically achievable, economically viable and socially responsible is consistent with this goal.

2.1.2.2 PNG development goals and planning guidelines

The Constitution and its goals are supported by a legislative and policy framework, which cascades though the National Strategic Plan, the PNGDSP and the MTDP IV.

National Strategic Plan 2010–2050 (Vision 2050)

The National Strategic Plan 2010-2050, also known as Vision 2050, provides a long-term strategy that seeks to address PNG's social and economic indicators through the strategic development of seven pillars (NSPT 2009):

1. Human capital development, gender, youth and people empowerment
2. Wealth creation
3. Institutional development and service delivery
4. Security and international relations
5. Environmental sustainability and climate change
6. Spiritual, cultural and community development
7. Strategic planning, integration and control

The project aligns with pillar 2, wealth creation, and pillar 5, environmental sustainability and climate change.

While Vision 2050 emphasises the importance of expanding the manufacturing, services, agriculture, forestry, fishing, and eco-tourism sectors, it recognises that the current economy is heavily dominated by the mining and energy sectors. Vision 2050 acknowledges that growth in the mining and energy sectors can serve as a catalyst for broader economic development, creating opportunities in other key sectors. Additionally, an objective of the wealth creation strategic area is to bolster and maintain a strong, dynamic, competitive and productive economy (NSPT 2009). The project will contribute to the mine's medium- to long-term success, facilitating operations to continue to 2050 in accordance with OTML's Growth 2050 vision.

The project is a significant mitigation measure to support the mine operating in an environmentally aware, socially responsible, technologically achievable and economically viable manner. Consistent with Vision 2050, the project will significantly reduce impacts associated with current riverine tailings disposal practices and contribute to reducing environmental degradation and promoting sustainable development. Transitioning to a TSF aligns with the principle of using natural resources responsibly for future generations.

PNG development strategic plan 2010-2030

The PNGDSP translates the focus areas of Vision 2050 into economic and public policy by creating clear objectives, quantitative targets and baseline indicators to achieve its vision. The PNGDSP sets out the 20-year strategies and targets to achieve Vision 2050 and interprets the directives and goals of the Constitution. The goal of the plan is for PNG to become a middle-income earning country by 2030, guided by five broad objectives (DNPM 2010):

1. Integral human development
2. Equality and participation
3. National sovereignty and self-reliance
4. Natural resources and environment
5. Papua New Guinea ways

A series of directives and goals have been developed to align with these objectives. The project broadly aligns with objective 4, natural resources and the environment. The PNGDSP acknowledges that mining is an important source of revenue for PNG and outlines a target of doubling mining exports between 2010 and 2030, while minimising adverse environmental impacts. It also identified riverine tailings disposal as an activity that has historically compromised sustainable development in PNG. The purpose of the project is to transition from riverine tailings disposal to use of a terrestrial TSF, which aligns with the PNGDSP's goal of promoting a sustainable environment.

Medium term development plan IV 2023-2027

The PNG Department of National Planning and Monitoring releases a Medium Term Development Plan every five years. Medium Term Development Plan IV (2023–2027) (MTDP IV) builds on the three prior plans, and sets out the objectives, strategies and funding priorities to support the PNG Government's development priorities from 2023 to 2027 (DNPM 2023).

The overarching theme of the MTDP IV is 'National Prosperity through Growing the Economy'. Key objectives to achieve this relate to growing the economy, creating additional jobs, and improving the quality of life for PNG citizens. To achieve these objectives, the plan identifies series of strategic priority areas for PNG government agencies and stakeholders to align to. These areas are supported through implementing deliberate intervention programs. The strategic priority areas are:

1. Strategic economic investment
2. Connect PNG infrastructure
3. Quality and affordable health care
4. Quality education and skilled human capital
5. Rule of law and restorative justice
6. National security
7. National revenue and public finance management
8. Digital government, national statistics and public service governance
9. Research, science and technology
10. Climate change and natural environment protection
11. Population, youth and women empowerment
12. Strategic partnerships

The project aligns with strategic priority areas 1, strategic economic investment, and 10, climate change and natural environment protection.

The MTDP IV identifies mining as a key sector for driving economic growth. The project will provide storage capacity to accommodate projected tailings from the mine up to 2050, thereby facilitating continued mine operations during this time. Additionally, the project will reduce downstream environmental impacts associated with riverine tailings disposal, consistent with the MTDP IV's commitment to protect the environment.

2.2 VIABILITY OF THE PROJECT

The viability of the project is determined by a range of economic, engineering, environmental and social considerations. Feasibility studies will identify these considerations, and align the project with good industry practices, sustainable development goals and stakeholder expectations.

2.2.1 Proponent's credentials

The Ok Tedi Mine is wholly owned and operated by OTML, an unlisted PNG majority State Owned Enterprise, with 67% of shares directly owned by the Independent State of PNG and 33% owned by the Provincial Government and people of Western Province (OTML 2024a).

Apart from its direct monetary contribution, OTML is also extensively involved in PNG's Western Province development through the Tax Credit Scheme and other infrastructure projects such as health centres, school classrooms, houses, roads, airstrips, jetties, water supply and communication systems.

OTML is the single largest employer in the Western Province, and one of the largest in Papua New Guinea.

OTML has its registered office in Tabubil, Western Province, PNG. It also has a representative office in Port Moresby, PNG and a logistics facility and offices in Brisbane, Australia.

OTML is committed to managing existing environmental issues. Over the past 27 years, OTML has implemented the following major strategies to manage environmental impacts associated with riverine mine waste disposal:

- A dredging program in the Ok Tedi at Bige to extract mine-derived sand-sized sediment from the river. This sediment is stored on the east and west banks of the river and is reworked into stable, engineered stockpiles that are progressively revegetated. Since dredging began in 1998, the lower Ok Tedi bed level has decreased, and the Middle Fly riverbed level is stabilising.
- Additional limestone added to waste rock. Since 2006, additional limestone has been added to waste rock (when required) to control acid formation in the downriver environment.
- A limestone management plan to reduce the net acid producing potential of tails. Since 2011, OTML has added neutralising capacity (limestone) to the tailings mill feed to counteract acid formation associated with tailings discharge.
- The Mine Waste and Tailings Project (MWTP) implemented from 2008 to reduce the potential for acid formation by extracting pyrite from the tailings prior to riverine disposal. The pyrite concentrate (PCon) produced at the Tailings Processing Plant is transferred to Bige via pipeline where it is stored subaqueously. Along with the addition of limestone, removal of PCon renders the tailings non-acid forming.

2.2.2 Capital costs

Based on the 2024 pre-feasibility study (KCB 2024a), GR Engineering Services estimated the initial and sustaining capital for the project (GR Engineering Services 2024). Initial construction capital expenditure is estimated to be in the order of US$830 million. This includes construction of initial TSF starter dam (cell 1), the tailings pipeline, hydro-cyclone house, access road, bridge and water crossings, and the associated construction vehicle and equipment fleet. The TSF sustaining capital cost over the life of the project is

estimated to be in the order of US$900 million. This includes development of the continuous ring-dyke lifts and embankment earthworks for the starter dams of the TSF cells.

Estimated capital and operating expenditures will be further refined as the project progresses towards the detailed design stage.

OTML is considering a range of funding options for the project, including self-funding. Certain funding arrangements may be subject to approval of the project under the *Ok Tedi Environmental Management Act 2019* (OTEMA).

2.2.3 Scoping and feasibility studies

There have been numerous investigations into the feasibility of alternative tailings storage and disposal methods since the 1980s. Table 2.1 presents a summary of pre-feasibility (PFS) and related studies undertaken since this time. Chapter 7 provides a summary of alternative methods and sites considered.

Table 2.1 Summary of pre-feasibility and related studies

Publication year	Report title	Author	Purpose	TSF sites investigated
1978	Permanent tailings disposal feasibility study	KL	TSF feasibility study	10+ potential TSF sites
1985	Sand storage and alternate storage concepts	KL	Conceptual project descriptions and cost estimates for tailings storage options	Bonamkit, Ok Ningi, Ningerum
1985	Ok Mani sand storage	KL		Ok Mani Valley
1985	Tapko Feasibility Study	KL	TSF Feasibility study	Tapko
1987	Lukwi Tailings project	KL	Design for Lukwi TSF	Lukwi
1998	OTML Waste Control Study – Cost Benefit Assessment	KL		
1989	Ore Residue Storage Ningerum	KL	PFS for TSF and tailings pipeline	Ningerum
1991	Tailings disposal study	Slurry Systems	Conceptual design for tailings pipeline	N/A
1995	Waste Management Study: Summary Report	KL	Feasibility study for 32 tailings storage options	32 options, including Lukwi, Tapko, Ningerum, Lower Ok Tedi Sand Storage
2006	Ok Fum Tailings Dam Feasibility Design Report	KC	Feasibility study	Ok Fum
2010	Mine Life Extension Feasibility Studies Tailings Storage Facility Conceptual Options Assessment	KCB	Conceptual design for four TSF sites	Ningerum, Bige East Bank, Bige West Bank, Aran
2011	Mine Life Extension Feasibility Studies Tailings Storage Facility Pre-Feasibility Study	KCB	PFS designs for two TSF options	Ningerum, Bige East Bank
2013	OTML Tailings Storage Facility Project: TSF Options Scoping Study	KCB	An update to the 2011 study	Twelve sites, including Ok Birim

Publication year	Report title	Author	Purpose	TSF sites investigated
2014	OTML Tailings Storage Facility Project: Phase II TSF Site Selection Study	KCB	TSF site selection at seven sites	Lukwi, Ok Daksum, Ok Iluk, Ok Nong, Ok Lang, Ok Teren, Ok Birim
2014	Lower Ok Tedi Crossing Alternate Location Assessment	KCB	Bridge crossing and road alignment option assessment	N/A
2015	OTML Tailings Storage Facility Project: TSF Pre-Feasibility Study	KCB	PFS for three TSF sites	Lukwi, Ok Lan, Ok Birim
2018	Conceptual Design Report – Tailings Pipeline Project	OSD		N/A
2024	Ok Birim TSF PFS Design Update	KCB	Design update for the Ok Birim TSF assessed in the 2015 PFS	Ok Birim
2024	Ok Birim Tails Storage Facility – Capital and Sustaining Cost Estimate Prefeasibility Study Report	GR Engineering Services	Cost estimate for Ok Birim TSF	Ok Birim

Source: KCB 2024a; KCB 2024b.

2.2.3.1 Scoping and initial pre-feasibility studies

The Ok Birim site was identified in the 2013 TSF Options Scoping Study and was investigated further in the Phase II Site Selection Study, along with six other sites. A PFS was prepared in 2014-2015 (KCB 2015a), assessing the feasibility of the Ok Birim, Lukwi and Ok Lan sites. The outcome of this assessment was the nomination of the Ok Birim site for further investigations and design. While a possible TSF site was identified in 2014, the expected mine closure date at the time was 2025; given the long lead time and projected cost of the TSF it was decided not to progress the studies to feasibility study level at that time. In 2024, a major revision of the mine plan indicated that it was feasible to extend the life of the mine to 2050. This extended mine life required and supported the investigation of the TSF design and costing to full feasibility level.

2.2.3.2 Updated pre-feasibility study

In 2024, the PFS design was updated, focusing on the proposed site at Ok Birim. This included refinements to the design and a revised TSF layout compared to the version assessed in 2014, a range of PFS-level technical assessments and an updated bill of quantities for TSF embankments, surface water management, TSF closure, and pipeline construction. OTML approved the progression of the project from PFS to Feasibility Study level in October 2024.

2.2.3.3 Feasibility studies

OTML is currently undertaking a range of technical studies and site investigations to further refine and optimise engineering, environmental, social and economic aspects of the project. The feasibility study for the project commenced in early 2025 and is scheduled for completion in mid-2026. This will be followed by detailed design.

The project's currently preferred general arrangement and design parameters may be subject to further refinement during the feasibility and detailed design phases; however, no material changes to the overall project design are anticipated at this stage. The PNG Conservation and Environment Protection Authority and Mineral Resources Authority will be notified of material changes that might result from subsequent engineering studies.

2.2.4 Environmental and social studies

In addition to the technical studies undertaken to inform this ESIA, a range of environmental assessments have been prepared as part of previous feasibility studies.

Extensive environmental and social studies have been conducted over the mine life, with particular focus on impacts riverine mine waste disposal has on riverine water quality, bed aggradation, river and floodplain dynamics, aquatic ecology and vegetation dieback.

OTML's environmental compliance reporting for the Ok Tedi Mine includes downstream environmental and social data relevant to the project. Relevant data includes surface water quality (for drinking and aquatic ecosystem health); chemistry and geochemistry; fish diversity, biomass, abundance; fish, aquatic plant and terrestrial fauna edibility; market basket survey and diet; vegetation dieback; river navigability; and bioavailable copper. Additionally, socio-economic data is available from the existing community health monitoring programs established by OTML, as well as through the OTML's environmental compliance reporting and through sustainable community development initiatives.

Information from ongoing baseline and compliance monitoring, and previous pre-feasibility studies was used as a foundation to guide additional surveys and tailor characterisation and impact assessment studies to support this ESIA. Additional environmental and social studies commissioned by OTML as part of this ESIA were undertaken in 2025 and 2026 to:

- Confirm existing conditions.
- Characterise additional disturbance areas associated with the latest project design.
- Provide a basis for environmental and social impact assessment.
- Develop appropriate management and mitigation measures.

The studies were scoped to characterise the existing terrestrial and aquatic environment and social conditions that may be impacted by the project to the level required for impact assessment purposes.

Existing conditions and are described in Chapter 8 and Chapter 9. The impact assessment and management measures are provided in Chapter 10 and Chapter 11. Environmental and socio-economic studies prepared to inform this ESIA are provided in Volume C.