# TRINITY METALS

## NYAKABINGOTUNGSTEN PROJECT
## PHASE TWO: DEFINITIVE FEASIBILITY STUDY
## OPEN BOOK REIMBURSABLE PROPOSAL

## 1568-0000-BTND-002.01

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# 1. INTRODUCTION

Obsideo offers experience in designing and implementing mineral processing and infrastructure projects. Experience pertaining to the management, design, and execution of major mineral processing projects include the Grootegeluk Medupi Expansion Project at Lephalale, the Tormin Mineral Sands Project in the Western Cape, the Bisie Ultra Fine Tin Project in the DRC, the Mpama South Tin Project in the DRC, the Khanye Colliery Greenfields Project and numerous other mineral processing plant projects and studies.

Obsideo has relevant experience in metal processing and MGS technology. Obsideo has successfully implemented and commissioned the Gakara Rare Earths Minerals Plant in Burundi, the Alphamin Mpama North Ultra Fine Tin Recovery Project in the DRC, as well as the new greenfields Mpama South Tin Concentrator. Both Tin projects in the DRC utilizes MGS technology.

Image 1 below shows the MGS ultra-fine tine recovery plant during construction as part of the Mpama South Tin project.

*Image 1: Mpama South Tin Concentration Plant during construction*

# 2. BACKGROUND

Nyakabingo Mine is located on a mountainous site approximately 14km northwest of Kigali in Rwanda. The mineral deposit at Nyakabingo consists of mineralised quartz with tungsten, which occurs as wolframite and ferberite and potentially increases quantities of scheelite. The majority of the current mining and ore concentration is done artisanally.

HCF International Advisers Limited and Trinity reached out to Obsideo Consulting to develop a proposal for the definite feasibility study. Due to the limited amount of test work, the proposal will be broken down into two phases, namely:

**Phase 1:** Consists of a technical and costing study to define the feasibility study's scope and generate accurate CAPEX and OPEX estimates.

**Phase 2:** Consists of a definitive feasibility study of the processing plant and infrastructure with the deliverables being aligned with an AACE Class 3 estimate with a CAPEX and OPEX accuracy of -5% to +15%.

This proposal covers the scope required for Phase 2 of the project.

# 3. FEASIBILITY STUDY OBJECTIVE

The study objective is to engineer and optimise the proposed design as developed during phase 1 of the project and improve the accuracy of the CAPEX and OPEX to -5% + 15%. The study's deliverables will be done under AACE Class 3 estimate guidelines. The details regarding these deliverables will be addressed in a subsequent section of the document.

# 4. FEASIBILITY STUDY METHODOLOGY

Engineering for the selected option from the concept study will be developed to AACE class 3 estimate, and the key outputs will be the design criteria, GA and Design drawings, Piping & Instrumentation Diagrams (P&IDs), HAZOP reviews, bulk services designs, infrastructure layouts class 3 CAPEX & OPEX estimate, business case, project execution planning.

The design criteria will be signed off upfront as a major milestone before commencing with engineering designs.

# 5. SCOPE OF WORK

## 5.1 SCOPE OF FACILITY

### 5.1.1 Process Description

The final process description will be developed during phase 1 of this project; however, for the purpose of this document, the following processing flow description was used for the costing. A Frontend loader will feed the primary double-deck screen which will be in a closed crushing circuit for the oversize. Further screening stages will then produce different grain size fractions for the following beneficiation steps. A 10-30mm fraction will go to the dry sorting plant which will consist of a suitable X-Ray transmission sorting machine producing a waste and a product fraction. Depending on the grain size the other fractions from the screen will either go to Jig's (1-10mm) for a first beneficiation stage or directly go to the fine wet gravity plant (0-1mm). Products from Jig and sorter machinery will go to a crusher/mill circuit with screens which will produce feed for the fine wet gravity plant. Thickeners and filter presses or belt filters will be used to reduce the raw water requirements of the processing plant. Figure 1 shows the block flow diagram of the proposed process.

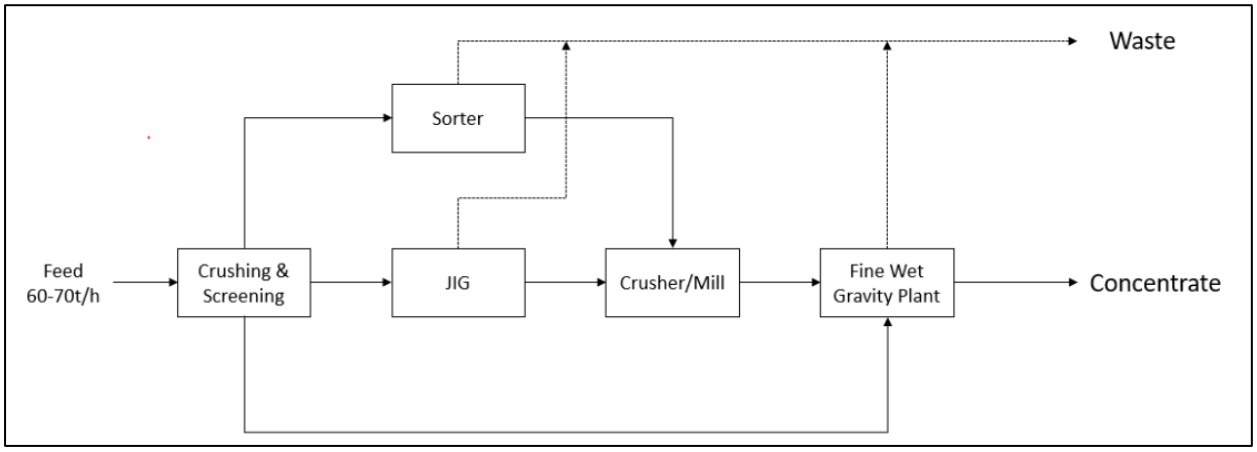



**FIGURE 1: BLOCK FLOW DIAGRAM**

### 5.1.2 Plant Area Layout

The drawing below shows the area's layout with key processing areas indicated.

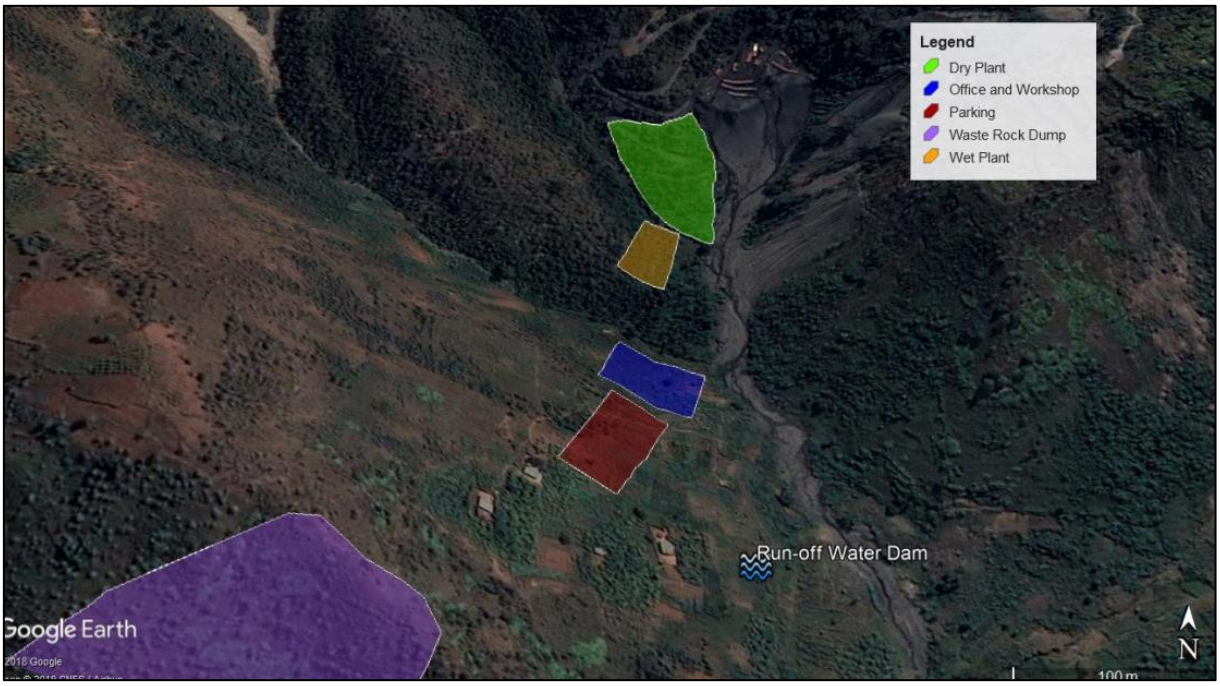



**FIGURE 2: PLANT BLOCK PLAN**

### 5.1.3 Plant throughput

The plant throughput per plant area is shown in Table 1.

**TABLE 1: PLANT THROUGHPUT**

| Description | Unit | Value |
|---|---|---|
| Head Feed Rate | t/h | 50 |
| Run of Dump treated per year | t | 350 400 |
| Run of Dump treated per month | t | 29 200 |
| Head Feed Grade | % | 0.30 |
| Hours per day | h/d | 20 |
| Days per year | d/y | 365 |

## 5.2 SCOPE OF SERVICES

### 5.2.1 Scope for the Feasibility Study

The proposal included the DFS to be developed using data from phase 1. The focus of the work will be on the following chapters:

### 5.2.2 Metallurgy

- Design criteria and basis of design
- Flowsheets
- Datasheets
- Design drawings
- P&IDs
- Input into the capital and operating cost estimate
- Input into the environmental specialist works
- Drafting of Metallurgical chapter for DFS report

### 5.2.3 Environmental

- Incorporate current environmental impact assessment into the design
- Undertake environmental gap analysis between EMP/IWUL/Waste licences in place and the Feasibility study Block plan
- Undertake specialist work and application for amendments to current permits (if necessary)
- Incorporate the existing environmental chapter into the DFS report

### 5.2.4 Waste Disposal

- Development of waste management storage and disposal design
- Incorporate the 3rd party design report for the tailing and rock dump storage facility into the draft DFS report.

### 5.2.5 Energy Consumption

- Develop energy load requirements
- Develop energy consumption parameters
- Power supply and reticulation
- Assessment of the availability of the power supply to the mine
- Supply point/substation prelim design (SLD, Basic layout and datasheets of primary equipment)

- Update power requirements from Utility.
- Technical support in discussions with the power utility
- Prelim design of generator plant, including Datasheets for costing.

### 5.2.6 Mining & Mineral Resources

- Review of current data - Gap analysis
- Update to mining chapter

### 5.2.7 Engineering & Infrastructure

- Design criteria and basis of design for civil, structural, mechanical, platework, piping, electrical, instrumentation and control as well as supporting infrastructure.
- Flowsheets.
- General Arrangements (GA) layouts and DFS Design drawings.
- Block plans.
- P&IDs.
- Fire detection and suppression designs.
- TSF, stormwater, and raw water supply designs, including overland pipe design.
- Data sheets and equipment lists.
- Earthworks and Bulk services supply of water and electricity and waste treatment facilities
- Site preparation, temporary facilities and laydown areas.
- Drafting of engineering chapter for the DFS report.

### 5.2.8 Hydrological Study

- Information gathering (BFS Phase) - gaps identified as part of the technical and costing study
- Flood line Determination
- Flood line Analysis
- 3D modelling from survey information and Stormwater run-off calculations.
- Division of infrastructure area in terms of dirty and clean areas and positioning of stormwater infrastructure.
- Hydrological Calculations and Stormwater Management Plan.
- Stormwater infrastructure elements design (PCDs, Silt Traps, Silt Retention Ponds, Berms, Channels, Culverts, etc.).
- Static Water Balance
- Engineering Drawings
- Bill of Quantities
- Drafting of hydrological study in the DFS report

### 5.2.9 Risk Management

- Development of a risk register and risk management plan.
- Risk workshops – Both Qualitative and Quantitative assessments.
- Hazard and Operability (HAZOP) review.
- Drafting of risk management chapter for DFS report.

### 5.2.10 Capital Expenditure

- Development of the Work Breakdown Structure (WBS).
- Development of a Basis of Estimate.
- Development of CAPEX and OPEX estimates for implementation (at least class 3)
- Detailed Quantitative Risk Assessment (QRA).
- Development of a techno-economic financial model and business case for project approval.
- Drafting of Financial chapter for DFS report.

### 5.2.11 Project Execution Plan (PEP)

- Development of a detailed PEP for the implementation phase.
- Development of basis of schedule.
- Development of a level 5 implementation schedule – developed to task level.
- Construction management and methodology.
- Develop relevant discipline management plans to govern processes during execution i.e. Controls Management, Change Management etc.

### 5.2.12 Human Resources

- Development of the human resources plan and labour plan
- Drafting of Human Resources chapter for DFS report

### 5.2.13 Procurement Operating Plan

- Development of procurement operating plant.
- Drafting scope of work documents.

### 5.2.14 Operational Readiness

- Development of operational readiness plan.
- Development of operational readiness schedule for the implementation phase.
- Drafting of Operational Readiness chapter for DFS report

### 5.2.15 Project Approval

- Preparation of DFS report and investment memorandum

# 6. ASSUMPTIONS

The following assumptions apply:

- The selected flowsheet from Phase 1 will not change. Only technology options within the selected option and scenario will be evaluated.
- Tie-ins will remain as planned in previous studies.
- All metallurgical test work will be completed before the FS commences
- No further geotechnical drilling or test work is required for the design.

# 7. COSTS

The reimbursable cost estimate for the proposed scope of work can be summarised as follows:

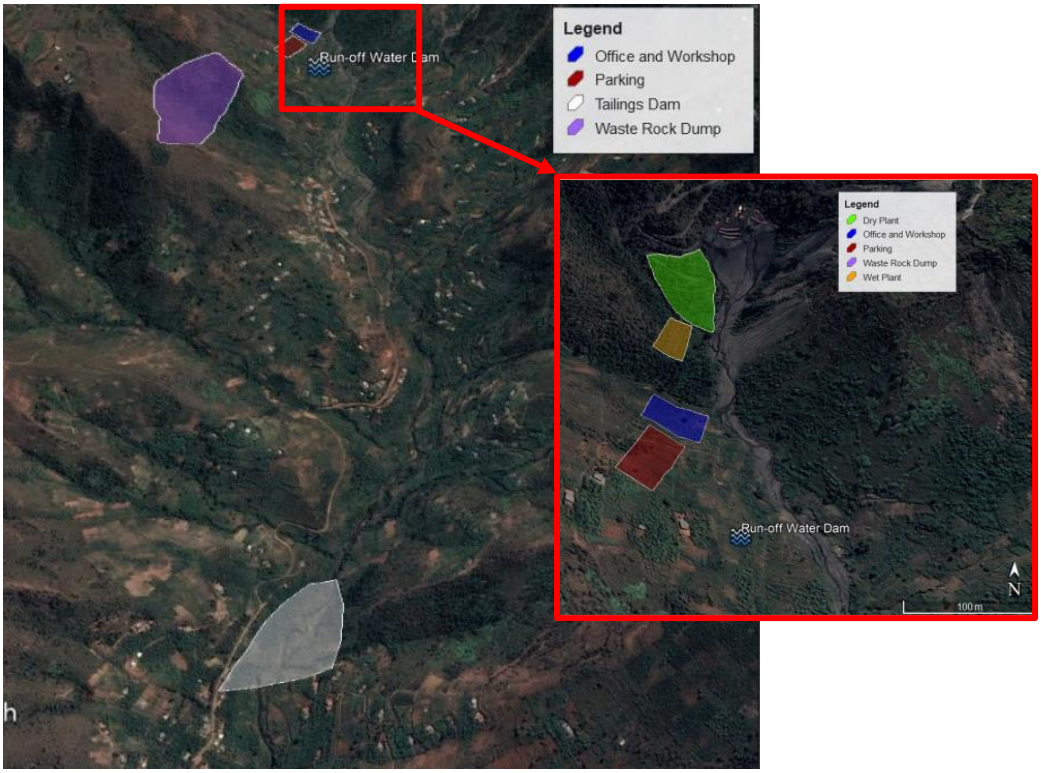
**TABLE 2: COSTING MATRIX**

| Discipline | | Principle Design Engineer | Design Engineer | Senior Quantity Surveyor | Junior Quantity Surveyor | Project Manager | Project Planner | Senior Draftsman | Junior Draftsman | Admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Description** | **Rate (USD/h)** | 75 | 71 | 51 | 32 | 80 | 60 | 54 | 34 | 27 |
| **Crushing and Screening** | | 55 | 18 | | | | | 65 | 16 | |
| **Oversize Concentration** | | 55 | 18 | | | | | 48 | 16 | |
| **Jigging** | | 100 | 36 | | | | | 52 | 32 | |
| **Concentrate Crushing & Screening** | | 55 | 18 | | | | | 47 | 16 | |
| **Spirals & Shaking Tables or MGS units** | | 96 | 33 | | | | | 89 | 26 | |
| **HF Screening & MGS plant** | | 89 | 30 | | | | | 56 | 22 | |
| **Final Product Cleaning** | | 76 | 27 | | | | | 53 | 26 | |
| **Thickening & Dewatering** | | 79 | 27 | 97 | 246 | 247 | 75 | 84 | 22 | 80 |
| **Plant Services** | | 93 | 33 | | | | | 17 | 29 | |
| **Plant Supporting Offices & Workshops** | | 31 | 9 | | | | | 23 | 10 | |
| **Water Supply & Treatment** | | 48 | 15 | | | | | 14 | 13 | |
| **Camp Site** | | 24 | 6 | | | | | 80 | 6 | |
| **Roads & Other Infrastructure** | | 218 | 15 | | | | | 57 | 13 | |
| **Hydrological Study & Water Management** | | 151 | | | | | | 127 | | |
| **Provision for Travelling** | | 200 | | | | | | | | |
| **Total Hours** | **3 469** | 1 370 | 285 | 97 | 246 | 247 | 75 | 812 | 247 | 80 |
| **Total Cost (USD)** | **215 267** | 102 750 | 20 235 | 4 947 | 7 872 | 19 789 | 4 500 | 43 848 | 8 398 | 2 160 |

# 8. BATTERY LIMITS

The following battery limits apply:

- The access road battery limit will start with the tie-off from the RN1.
- The supporting infrastructure development will be limited to within the areas shown below unless otherwise stated in this document




The following battery limits apply in terms of the processing facility:

Incoming:

- Feed Ore — ROM tip pad.
- Water — Suction of raw water supply pump.

Outgoing:

- Final Concentrate — Final product on the stock pad.
- Final Tailings — Final dry tailings discharge.
- Slimes Discharge — Discharge of piping into the residue storage

# 9. INFORMATION REQUIRED

The client requires the following information:

- Metallurgical test work;
- Soft copies of all study work done to date;
- Topographical survey; and
- Geotechnical survey.

# 10. EXCLUSIONS

The following are excluded from our proposal:

- Laboratory test work of representative samples to verify process parameters as required to develop the PDC;
- Shipping costs;
- Permitting;
- Topographical survey;
- Sampling and testing of water;
- Geohydrological studies (underground water);
- Tailings storage facility design;
- Waste rock stockpile design;
- Environmental authorisation and environmental studies;
- Detail design (part of next phase);
- Traveling and VISAs;
- Procurement (next phase);
- Fabrication (next phase);
- Construction (next phase);
- Any third party expenditure;
- Independent Risk Practitioner;
- Independent HAZOP facilitator;
- Costs for bonds subject to commercial requirements;
- Any other deliverables not specifically included in this document;
- Management and retrieval of information from the Department of Energy; allowance has been made for technical guidance only.
- All scope descriptions and deliverables in Section 5.2 shown in grey; and
- VAT.

# 11. STUDY SCHEDULE

The total duration of the study is estimated as 14 weeks from the receipt of a purchase order and the client information as specified.

The preliminary key milestones of the estimated time required to complete the study can be summarised as follows:

- Completion of preliminary process design - 2 weeks
- Obtaining of equipment pricing and drawings - 3 weeks
- Plant concept 3D model - 9 weeks
- Project CAPEX and OPEX - 12 weeks
- Study report - 14 weeks

**Note:** The number of weeks specified for each study milestone is referenced from the commencement date.

# 12. LIMIT OF LIABILITY

Obsideo Project & Technical Services is unable to accept responsibility for the loss of profits or consequential damages, whether direct or indirect, sustained by yourselves as a result of goods supplied or installations effected by us being defective or not conforming to specifications or as a result of incorrect or late delivery or installation or failure to deliver or install due to breakdown of machinery, labour disputes, war, riots, civil commotion, delay in transport, shortage of material or any cause whatsoever wholly or partially beyond our control.

Obsideo Consulting's total liability in terms of this proposal, whether its servants, agents or consultants, to the Client arising out of the performance or non-performance of the Services, whether under the law of contract, tort or otherwise, shall be the re-performance of the Services already completed but limited to value of the contract. The calculation of the re-performance costs shall be as per the standard schedule of rates as appended to this proposal.

Obsideo, its servants, agents and consultants shall be deemed to have been discharged from all liability whatsoever in respect of the Services, whether under the law of contract, tort or otherwise, at the expiration of one year from the completion of the Services unless otherwise provided in this proposal, and the Client shall not be entitled to commence any action or claim whatsoever against Obsideo, its servants, agents or sub-consultants in respect of the Services after that date.

If the Services include giving to the Company an estimate of the likely costs for the Project or the provision of a report concerning the Project, Obsideo warrants only that it will exercise the reasonable skill, care and diligence of a consulting engineer in the preparation of its professional opinion of those estimated costs or the provision of the report. Any estimates or opinions on or

relating to estimated costs shall be verified by the Client independently and Obsideo accepts no responsibility arising in any way whatsoever for error or omissions, nor does Obsideo accept any liability for any commercial decisions or actions arising from the opinions and valuation stated in the estimated costs or the report.

# 13. CONFIDENTIALITY

Any and all information in this document is considered confidential to Obsideo, and the client undertakes not to distribute or communicate anything contained herein to any third party without our prior written consent.