DEVELOPMENT OF LEGACY TAILINGS MANAGEMENT AND RIVER REHABILITATION PLAN FOR RUTONGO, NYAKABINGO AND MUSHA CONCESSIONS: PHASE I

Detailed Scope of Works

31 January 2025

Trinity Metals Group

Northern Province, Rulindo

Prepared by:

Lead Consultant:

Joanne Daneel
Trinity Metals ESG Consultant

Specialist Consultants:

GroundTruth Consulting
SLR Consulting

Trinity Metals Limited

+250 788 307 422 | www.trinity-metals.com

TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 Background and Context 1

1.2 US International DFC Technical Assistance 1

1.3 Purpose of this Document 3

2. PROJECT SCOPE 3

2.1 Project Overview 3

2.2 Key Activities and Tasks 4

2.3 Boundaries and Constraints 5

2.4 Assumptions 8

2.5 Exclusions 8

3. APPROACH AND METHODOLOGY 9

3.1 Overall Project Approach 9

3.1.1 Project Team Composition 9

3.1.2 Integrated Approach 9

3.1.3 Project Phasing 10

3.2 Methodology for Key Components: Phase I 10

3.2.1 Stakeholder Engagement 10

3.2.2 Desktop Mapping and Geographic Information System Data Derivation 10

3.2.3 Water Quality (WQ) Monitoring Protocols 10

3.2.4 Source, Pathway and Receptor Analysis 10

3.2.5 Baseline Geochemical and Source Assessment 11

3.2.6 Freshwater Ecosystem Assessments 12

3.2.7 Hydrocensus 13

3.2.8 Ecosystem Goods and Services Assessments 13

3.2.9 Catchment Hydrological Modelling 14

3.2.10 Flood Line Determination 15

3.2.11 Legacy Tailings Assessment and Categorisation 16

3.3 Methodology for Key Components: Phase II 17

4. DELIVERABLES 17

4.1 Reports and Documentation 17

4.1.1 Reports 18

4.1.2 Spatial coverages 18
4.1.3 Water Quality Database and Reporting Dashboard 18
4.2 Training or Capacity Building 18
5. Project Timeline and Milestones 19
5.1 Detailed Timeline 19
5.2 Key Milestones and Deliverable Deadlines 21
6. Resource Requirements 22
6.1 Budget and Cost Breakdown 22
6.2 Personnel and Expertise 25
7. Roles and Responsibilities 27
7.1 Project Team Structure, Roles and Responsibilities 27
8. Risk Management 28
8.1 Identification of Key Risks and Mitigation Strategies 28
9. Quality Assurance and Control 29
9.1 Standards and Guidelines to Be Followed 29
9.2 Review and Approval Processes 29
9.3 Performance Monitoring 30
10. Project Governance 30
10.1 Communication and Reporting Protocols 31
10.2 Decision-Making Processes 31
Consensus-Based Decision Making 31
Escalation Procedures 32
Approval Gates 32
11. Conclusion 32
11.1 Summary of the Scope of Work 32
11.2 Anticipated Benefits and Outcomes 33
12. Annexures 33
Annexure 1: SLR Scope of Works for Geochemical and Soil/Sediment Analysis 33
Annexure 2: GroundTruth Input into Phase 1 of the Legacy Tailings Management and River Rehabilitation Programme for Trinity Metals Concessions, Rwanda 33

FIGURES

Figure 2.1. Trinity Metals Concession Areas covered by the Project 6
Figure 5.1. Detailed Programme for TA4: Legacy Tailings Management and River Rehabilitation Plan 20

TABLES

Table 1.1 TA Activity 4 Tasks, Deliverables, Budget allocation and MP schedule..... 2
Table 5.1. Key Milestones and Deliverable deadlines 21
Table 6.1. Budget and Cost Breakdown for TA4 illustrating TM Cost-share items 23
Table 6.2. Key Personnel 25
Table 7.1. Project Team Structure, Roles and Responsibilities 27

1. INTRODUCTION

1.1 Background and Context

Trinity Metals Limited (the Company) is a privately owned company engaged in the mining and exploration of tin, tungsten, tantalum and lithium in Rwanda. The Company is currently developing and operating three mining complexes in Rwanda near the city of Kigali: Rutongo Mine (tin); Trinity Nyakabingo Mine (tungsten); and Trinity Musha Mine (tin and tantalum, with lithium exploration).

Trinity Metals Limited was formed in May 2022 with the amalgamation of the three mines under Trinity Metals Group. The Company is committed to the expansion, modernisation and mechanisation of its activities, and to addressing mining-related environmental and social impacts in a responsible and sustainable manner.

All three mines have a long history of artisanal-scale mining dating back to the Belgian times in the late 1930's. This has resulted in significant environmental and social legacy issues, including legacy features, such as low-grade stockpiles and waste deposits, altering the natural hydrological functioning of the river systems and potentially impacting on water quality.

Trinity Metals has recently concluded the updates to the Environmental and Social Impact Assessments (ESIAs) and Management Plans for all three mines in line with Rwandan law and international best practice. The ESIAs are informed by comprehensive specialist baseline assessments, including hydrological and geochemical assessments.

As an outcome from the ESIA process, and in order to address the legacy issues related to historical tailings facilities and hydrological impacts, Trinity Metals is developing a Legacy Tailings Management and River Rehabilitation Programme for all three of the mining concessions.

1.2 US International DFC Technical Assistance

In June 2024 Trinity Metals (TM) entered into an agreement with the United States International Development Finance Corporation (DFC) for technical assistance (TA) funding to facilitate key activities. These activities are primarily aimed at preparing TM to receive equity investment by modernising practices and meeting IFC Performance Standards. Among other objectives, the TA focusses on **identifying and assessing existing E&S impacts and historical mine legacy issues and developing management plans and programs to addresses them.**

The DFC TA funding will primarily contribute to the following activities, which have been identified by DFC's Office of Infrastructure as Critical Path actions in order to achieve investment:

1. Trinity Metals Group Skills Training and People Development.
2. Development and Implementation of an integrated, group-wide SHEC Management System.
3. Formulation of an Integrated Development Plan (IDP) for Rutongo, Musha and Nyakabingo Concessions.

4. The Development of a Legacy Tailings Management and River Rehabilitation Plan for Rutongo, Musha and Nyakabingo Concessions.
5. Preliminary Environmental Assessment/Site Inspections for all three of the TMG mines (Rutongo, Nyakabingo, and Musha).

This document covers the Scope of Work for **TA Activity 4: Development of a Legacy Tailings Management and River Rehabilitation Plan for all concessions**.

The total value of the funding received from DFC is USD3,865,000 of which USD 950,000 is allocated to this activity. In addition to the DFC funding, TM is required to demonstrate cost share to the equivalent amount.

Revisions to the TAIP milestone payment schedule were proposed by TM in December 2024. These were accepted by the DFC in January 2025. The tasks, deliverables, budget breakdown and milestone payment allocation are provided in the revised TAIP for TA Activity 4, as indicated in **Table 1.1.**

The first Deliverable (1.1) for TA Activity 4 identified in the revised TAIP is the **Detailed Scope of Work, Resources and Responsibilities and Programme**. This is provided in this document.

Table 1.1 TA Activity 4 Tasks, Deliverables, Budget allocation and MP schedule.

Phase		Task	Deliverable	DFC TA Budget (USD)	Milestone Payment #
PHASE 1	1	Develop detailed SOW, R&R and Programme for the TM&RR project	1.1. Detailed SOW, R&R and Programme for the TM&RR project	**36 750**	MP 2
	2	Mapping of all sources and receptors of contamination and GIS Analysis	2.1. Desktop mapping and Geographic Information System data derivation.	**24 950**	MP 3
			2.2. Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.	**23 900**	MP 3
			2.3. Hydrocensus – location of community water sources (springs) and nature of utilisation.	**10 550**	MP 3
			2.4. Geochem Assessment (waste materials and sediments)	**65 000**	MP 3
	3	Ecological health and drivers of the river and wetland ecosystems.	3.1. Determination of the PES of all the river and wetland systems	**49 700**	MP 3
	4	Ecosystem Goods and Services Assessments.	4.1. Ecosystem Goods and Services Assessment	**36 900**	MP 4
	5	Modelling catchment hydrological flows and sediment movements.	5.1. Catchment hydrological models	**65 450**	MP 4
	6	Determining flood lines for major streams, including climate change scenarios	6.1. Flood line Determination Report	**47 200**	MP 4
	7	Tailings assessment and categorization	7.1. Tailings Resource Report	**80 000**	MP 4
	8	**Review and assessment of GAP analysis of Phase 1.**	8.1. Gap Analysis Report	**19 600**	MP 4

Phase		Task	Deliverable	DFC TA Budget (USD)	Milestone Payment #
PHASE II	9	Additional data collection, analysis and reporting as recommended by DFC to address gaps identified in Phase 1 of this activity.	9.1. Additional studies as recommended by DFC to address gaps identified in Phase 1 of this activity.	**95 000**	MOB
	10	Feasibility studies for all mining concessions including comparative analyses of options for mineral recovery from legacy tailings, and remediation of waste sources and areas of contamination.	10.1. Legacy Tailings management and recovery feasibility study reports for each mine / mining area.	**105 000**	MP 5
	11	Scenario modelling and determination of management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience	11.1. River rehabilitation scenario modelling	**120 000**	MP 5
	12	Develop Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession	12.1. Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession	**170 000**	MP 6
			TOTAL DFC SHARE	**950 000**	

1.3 Purpose of this Document

This document provides the detailed Scope of Work, Resources and Responsibilities and Programme for the DFC TA Activity 4. Input into this document is provided by the specialist service providers: GroundTruth Environment and Engineering; and SLR Consulting. The full proposals received from GroundTruth and SLR Consulting are included in the Appendices.

This document is submitted as a deliverable under DFC TA Milestone Payment 2 for TA Activity 4.

2. PROJECT SCOPE

2.1 Project Overview

The specific purpose of the project is defined as follows:

- To develop a sustainable, cost-effective and achievable management strategy for all mining legacy tailings facilities within the TM concessions, taking into account their physical and chemical properties, pollution potential and inherent grade.
- To determine management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience.

- Ultimately, to develop an integrated tailings management and river rehabilitation strategy for each of the concessions.

Key objectives include:

- Identify, assess and classify all legacy tailings facilities in the concessions, including historical Belgian process tailings and low-grade ore.
- To assign responsibility for the various legacy tailings to the relevant parties: e.g. some may predate recent operations and be the responsibility of the Government of Rwanda.
- To determine the pollution potential of such facilities and the pathways and potential receptors of the pollutants. This will enable the company to focus resources on addressing key problematic facilities.
- To assess the ecological condition of the aquatic systems (rivers and wetlands) which are impacted by the mine's activities. This will build on the baseline investigations undertaken as part of the ESIA updates completed in 2024.
- To undertake catchment hydrological and sediment modelling to inform management strategies for river restoration.
- To clearly define the management strategy for each of the legacy tailings depending on their characterisation and classification.
- To establish a monitoring framework and database for the freshwater ecosystems to inform management decision relating to both mining operations and river restoration.

2.2 Key Activities and Tasks

The project is broken down into two phases as follows:

PHASE 1:

- Develop detailed SOW, R&R and Programme for the TM&RR project
- Mapping of all sources and receptors of contamination and GIS Analysis
  - Desktop mapping and Geographic Information System data derivation.
  - Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.
  - Hydrocensus – location of community water sources (springs) and nature of utilisation.
  - Geochem Assessment (waste materials and sediments)
- Reviewing water quality monitoring protocols including the development of an online water quality monitoring database and dashboard.
- Determination of ecological health and drivers of the river and wetland ecosystems.
- Conduct Ecosystem Goods and Services Assessments.
- Catchment hydrological modelling to characterize present water flows and potential future changes.
- Floodline determination for each of the concession areas, including projected flood events under climate change scenarios.
- Tailings assessment and categorization.

Phase 2:

- Review and assessment of GAP analysis of Phase 1.
- Additional data collection, analysis and reporting as recommended by DFC to address gaps identified in Phase 1 of this activity.
- Feasibility studies for all mining concessions, including comparative analyses of options for mineral recovery from legacy tailings, and remediation of waste sources and areas of contamination.
- Scenario modelling and determination of management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience.
- Develop Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession.

2.3 Boundaries and Constraints

This activity will include all three of the TM concession areas, i.e Rutongo Mines Concession; Trinity Nyakabingo Mine Concession and Trinity Musha Mines Concession. The concession areas are illustrated in **Figure 2.1.**

Given that the scope includes hydrological modelling and the assessment of ecological health and drivers of aquatic systems which extend beyond the boundaries of the concessions, the geographical boundaries of the study will not be strictly defined by the concession boundaries.

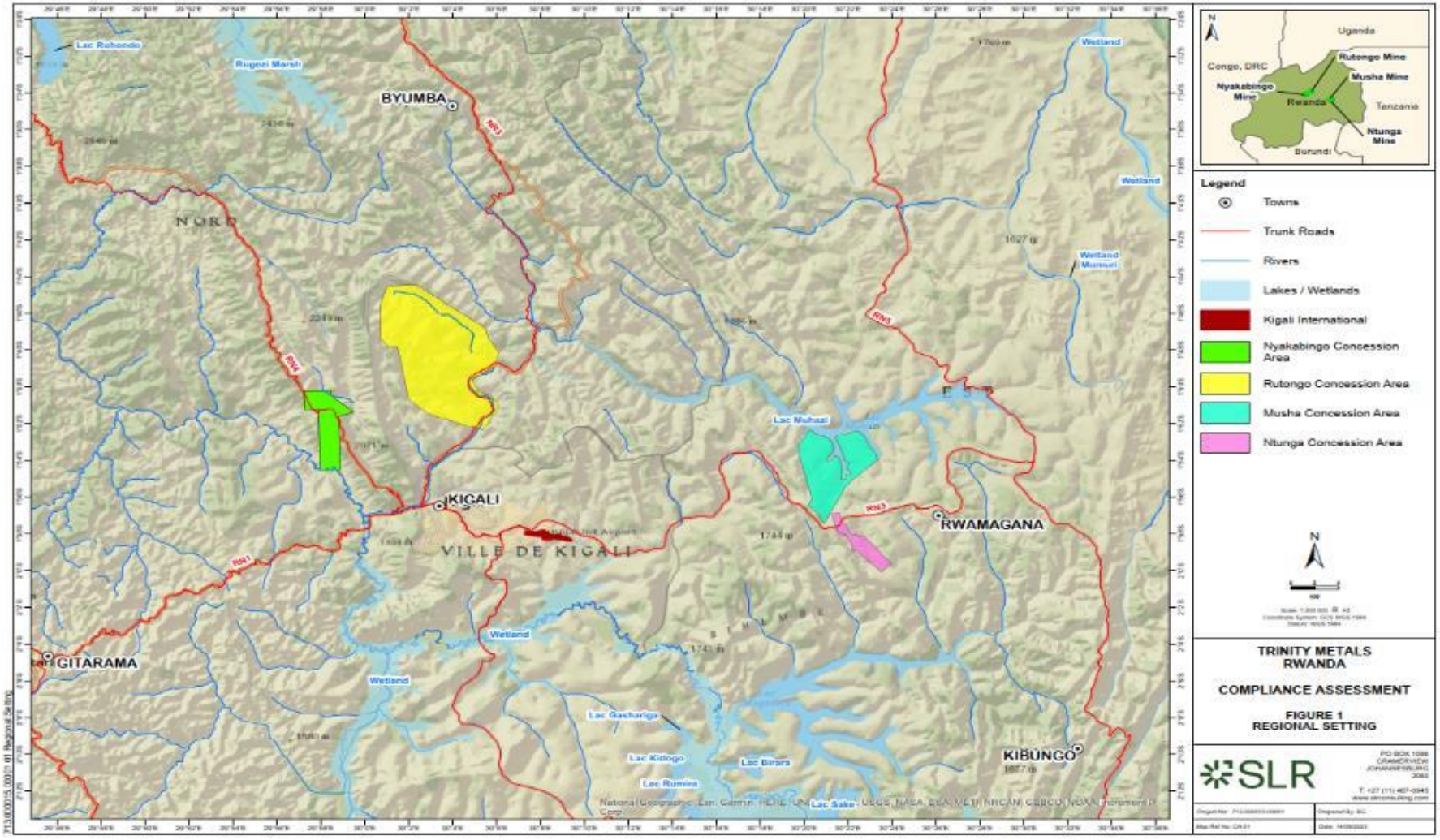
The following **constraints** to the study are identified:

- **Elevation data for the study area is not consistent**: Recent Lidar imagery and survey is provided for Nyakabingo Concession, Karambo area within the Rutongo Concession and Musha mines in the Musha concession. Recent Airbus satellite survey data (resolution of 0,5m contour intervals) is available for a large area which includes the whole of Nyakabingo and Rutongo concession. Some ground survey data is available for specific mining areas. The accuracy of the hydraulic models and associated floodlines is largely dependent on the accuracy of the elevation data, and thus ground truthing and site surveys are necessary for calibrating these models.

- **Meteorological Data is not complete**. Meteorological data, specifically rainfall volumes and intensity are required for the hydrological modelling and flood line determination under different climate change scenarios. Historical data are available for a number of weather stations in the project areas, however, these datasets are not fully complete, necessitating the patching of data between stations.

  In the absence of observed catchment related data, donor catchment information will be adopted for modelling purposes. Hydrological modelling will be undertaken using theoretical methods in the absence of measured flow records, where model calibration may only be undertaken on observed flows collected during the field work.

Figure 2.1. Trinity Metals Concession Areas covered by the Project



- **Short-term Water Quality Monitoring Data.** Water quality monitoring focussing on the impacts of mining activities on natural water sources only commenced in September 2023. Therefor no long-term water quality data is available to inform the pollution source, pathway and receptor assessment. The project does, however, allow for geochemical analysis of legacy tailings as well as downstream sediment sampling. This work builds on the baseline geochemistry assessment undertaken of the mining operations during the update to the ESIAs.
- **Identification and mapping of freshwater ecosystems** utilises environmental indicators namely, landscape position, soil properties and vegetation indicators. Freshwater ecosystems seldom form on steep hill sides and scarp slopes and as such areas where there is a high chance that freshwater ecosystems may exist will be assessed in detail, whereas areas precluded by their position in the landscape will only be briefly assessed.
- **Assessment of Present Ecological State (PES) of rivers and wetland** will be subject to the availability of appropriate historical aerial imagery. Where this is limited in terms of coverage or image quality, the project team may rely on interpretation of patterns and trends across the broader landscape to inform the assessments.

  Assessment of PES of rivers and wetland takes into consideration both in-system and catchment conditions, and as such ecological conditions and functioning of the systems may be influenced by activities beyond Trinity Metals direct influence and would be subject to broader stakeholder engagement to effect change.

  The level of transformation within the landscape may pose a constraint to accurately deriving PES of rivers and wetland using the adopted assessment techniques. In these instances, the project team will document the approach adopted in detail, supported by relevant publications and best practice.

  The assessments of the identified wetland and river systems will be based on an individual site visit, i.e. a 'snap-shot' in time. As such, changes in the recorded features and/or characteristics within the freshwater systems and their catchments, which may be subject to the influences of seasonality and/or land use changes, may not be accounted for in the assessments.

  The wetlands and rivers may be inundated with water, and while the team may be able to access these areas (i.e. water depths being less than 30cm), the systems may be characterised by depressions, deeper sections and floating vegetation mats and care must be exercised when accessing the systems. Accessibility issues of this nature may result in certain sections of the ecosystems being assessed from landscape vantage points.

  Intensive rainfall and runoff events occurring one to two weeks prior to the site assessments can significantly affect the PES results, particularly for river systems due to drift of macroinvertebrates, scouring of benthic diatoms, etc.

  The geomorphic and sediment transport assessments require accurate channel and depression dimension data which can only be measured using green LiDAR, or will have to

be manually measured on the ground. Therefore, the geomorphic and sediment surveys will have to take place in the dry season to ensure sufficient channel access.

There is extensive cultivation occurring in the catchment and freshwater ecosystems onsite, which means that the collection of data needs to be sensitive to the use of these areas by the community. As such, a community liaison officer may need to accompany the field team to liaise with the community members and to organise site access when necessary.

Should areas require field teams to be accompanied by Trinity Metals representative and/or a community liaison officer, it is recommended that contingency time be considered to allow for any scheduling issues.

2.4 Assumptions

Key assumptions influencing the scope and execution of this project include:

- The extents of the wetland and river ecosystems would be determined based on the presence of intact soil profiles and natural vegetation cover. While it is understood that portions of the landscape have been historically transformed, it is assumed that intact and/or relic areas will still be present to inform the identification and mapping of these ecosystems.
- In order to accurately model future scenarios for the geomorphic and sediment transport assessments, it is imperative that all future 'fixed-points' that cross or intrude into the fluvial ecosystems (i.e. roads, buildings, platforms etc.) are predefined and accounted for. The modelling process assumes these variables are unchanging and would therefore need to be predefined. In the same vein, it is assumed that the mining footprint in the valleys will be predefined and will be adhered to.
- It is assumed that particle size distribution analyses will be undertaken in Rwanda (preferably onsite) and that the client will provide details of a registered and reliable lab where soil samples can be sent to.
- It is assumed that the mining of minerals from the soils in the valley bottom areas will not have a substantial impact on the average soil particle size and therefore on the soil binding properties. Therefore, the geomorphic and sediment models will assume that both the pre- and post-mining soil analyses will be comparable and therefore no post-mining soil samples will be required. However, should the modernised mining process result in substantial fining of the sediments in the valley systems, it may be necessary to carry out additional sediment sampling for the post-mining landscape.

2.5 Exclusions

This project focusses specifically on the impact of Legacy Tailings. These are defined as historical, inactive waste deposits which are remnants of former mining activities, pre-dating the current operations. These legacy tailings may date back to colonial era mining activities undertaken by Belgian companies, or more recent post-colonial mining by national or private organisations.

Current mining activities produce tailings from manual sluicing and panning, as well as from small processing plants located at Nyamyumba and Karambo mines in the Rutongo Concession area. Sluice tailings are generally stockpiled as these still contain sufficient grade to process through a mechanical plant at some future stage.

Trinity Metals is in the process of modernizing and mechanising its operations, with the objective to establish fit-for-purpose mineral recovery processing plants at all of the mining operations. Increased mechanical processing will result in mine waste in the form of graded tailings. It is envisaged that new Tailings Storage Facilities (TSFs) will be designed and constructed in tandem with the process plants to accommodate the waste streams. These TSFs will be designed to international best practice, specifically GISTM (Global Industry Standard on Tailings Management).

Mitigation of impacts arising from current mining activities is covered under the Mine's Environmental and Social Management Plans (ESMPs).

3. Approach and Methodology

3.1 Overall Project Approach

3.1.1 Project Team Composition

A multidisciplinary team has been established to support the successful outcome of this project. This includes experts in the fields of:

- Tailings and resource management.
- Mines rehabilitation and closure.
- Geochemistry and Acid Mine Drainage.
- Hydrological engineering and modelling.
- Aquatic ecology.
- Ecosystems goods and services assessments.
- Wetland engineering and rehabilitation.

3.1.2 Integrated Approach

An integrated approach has been adopted to the execution of TA Activity 3 (Community Development Plans) and this project. Common ground and opportunities for mutual benefit were clearly identified during the scoping of these two projects. These include, but are not restricted to:

- Stakeholder engagement.
- GIS Mapping, in particular as it related to landuse, land capability and land condition.
- Hydrocensus exercise and outcomes.
- Ecosystem Goods and Services Assessment.
- The development of an integrated tailings management and river rehabilitation plan and programme.

It is proposed that the two projects run in tandem with regular integrated sessions. This will allow for more effective use of resources and cross pollination of ideas and initiatives.

3.1.3 Project Phasing

A detailed scope or works, deliverables, programme and budget has been developed for Phase 1 of the project. This is described in the section below. A gap analysis and external review of the Phase 1 outcomes will inform the detailed scope for Phase II, which may involve additional data collecting or studies to support the development of an integrated tailings management and river rehabilitation plan.

3.2 Methodology for Key Components: Phase I

3.2.1 Stakeholder Engagement

The project team will provide input into the **Stakeholder Engagement Plan (SEP)**, to be developed under the TA Activity 3: Community Development Plans. This will allow key stakeholders to be engaged during the development of the river rehabilitation management strategies. This will include the identification of stakeholders that can influence or be influenced by the project and its outcomes and understanding each stakeholder's influence and impact on the project. Furthermore, this will allow the co-development of solutions, alternative livelihoods, and prioritizing ecosystem services, which will empower local communities. Stakeholders from various categories will be involved throughout the project at all three sites, informing implementation and refining engagement approaches. The goal is to foster effective dialogue, collaboration, and efficient information communication.

3.2.2 Desktop Mapping and Geographic Information System Data Derivation

Desktop mapping and deriving spatial coverages of the various features within the study area will be undertaken to inform each of the following aspects of the projects, with spatial data being critical to derive information that relates to the sources, pathways and receptors, freshwater ecosystems, ecosystems goods and services, catchment hydrological and flood analyses, the hydrocensus, and the water quality monitoring.

This will include specialist GIS analyses and modelling to provide spatially robust information that can be presented as visual maps to enhance the various specialist studies, as well as to enhance and guide stakeholder engagements and management decisions.

3.2.3 Water Quality (WQ) Monitoring Protocols

All existing WQ data will be reviewed and analysed to update the WQ Monitoring Protocols and sites for monitoring WQ. In addition, the GroundTruth team, through consultation with Trinity Metal's environmental management team, will develop and implement an online WQ monitoring database and dashboard that will facilitate and optimise the future monitoring and engagement of projects.

3.2.4 Source, Pathway and Receptor Analysis

A systematic assessment of sources, pathways, and receptors of potential contaminants will be conducted to help understand the environmental risks associated with the past (e.g. legacy tailing) and current mining operations, including illegal artisanal mining. The outputs from this

process will be used to guide and prioritize management actions required to mitigate contamination risks through rehabilitation and ecosystem restoration. The source, pathway and receptor analysis will be informed by the hydrological modelling, hydrocensus and the baseline geochemical assessment, described in sections below.

The source, pathway and receptor analysis will commence with a review of baseline ESIA assessments to gather and analyze existing hydrological, groundwater, water quality and geochemistry data and how data is spatially and temporally distributed across the three mining concessions and associated catchments. Key information gaps relating to catchment characteristics, water sources, surface water and groundwater flows, soil and water chemistry, heavy metals, nutrients, sedimentation, etc. will be identified from the outset to ensure that these gaps can be addressed through additional desktop assessments, field studies and data collection where necessary.

Sources of water and contamination will be identified and mapped in relation to existing receptors within the landscape context of each site. The level of contamination risk will be determined using available limits considered safe and/or acceptable for human and ecosystem wellbeing. The pathways along which contaminants travel from sources to receptors will be determined based on surface runoff and groundwater flow patterns, which will be informed by the surface water and groundwater hydrological modelling. Depending on the various combinations of source-pathway-receptor profiles identified, mapped and assessed, important and/or sensitive receptors (e.g. drinking water sources, aquatic ecosystems, communities, etc.) will be highlighted and used to inform the Legacy Tailings Management and River Rehabilitation Programme.

3.2.5 Baseline Geochemical and Source Assessment

The Baseline Geochemical and Source Assessment will be undertaken by Dr Andrea Baker from SLR Consulting. Dr Baker is familiar with the project areas, having conducted the Geochemical and AMD assessments undertaken as part of the 2024 ESIA updates for all three mines.

The proposed scope of work to achieve the project objectives is summarised below. A full scope of work is included in **APPENDIX A.**

Desktop study

- Gap analysis and request for information.
- Sampling schedule plan development using regular point sampling methodology (or gridding) in QGIS and expert knowledge to plot sampling locations.

Site sampling visits to Rutongo, Musha and Nyakabingo mine complexes to

- Locate QGIS and expert knowledge determined sampling points,
- Undertake visual soil assessment to classify the soils based on the IUSS working group reference base,
- Collect designated soil and sediment samples for analysis to confirm classification, OM content and delineate any contaminants,

- Identify, describe and sample representative legacy tailings for geochemical assessment.

Specialist laboratory analysis program

- Soil and river sediment assessment analysis will include:
  - Particle size analysis
  - pH, electrical conductivity, cation exchange capacity, bioavailable macro nutrients, trace metals and organic matter content.
- Geochemistry assessment analysis will include:
  - Total concentrations on solids for waste classification
  - Total leachable on solids for waste classification
  - Acid based accounting and sulfur speciation
  - Net acid generation and carbon speciation
  - XRD minerology
  - Synthetic Precipitation Leachate Procedure for source term modelling

Assessment and Reporting

- Baseline soil assessment, waste classification, geochemical risk assessment for acid rock drainage and metal leaching potential of the legacy tailings.
- Provide mitigation measures and recommendations to inform legacy tailings management and river rehabilitation plans.
- Reporting will include 3 technical geochemical and soil baseline assessment reports for each mine site.

3.2.6 Freshwater Ecosystem Assessments

The project focuses on freshwater ecology, which significantly influences biodiversity patterns, ecosystem functions, and the delivery of ecosystem goods and services. This aspect of the study will assess freshwater systems, distinguishing between riverine and wetland ecosystems, and recognizing their landscape linkages.

IFC PS6 emphasizes the need to identify and assess natural and critical freshwater habitats at risk from project developments. The freshwater ecosystem assessments will characterize and map wetland and riverine habitats (and associated biodiversity) based on their ecological patterns/processes and landscape positions. A desktop review using high-resolution aerial imagery, proposed mining layouts, historical data, topographical maps, and contour data will establish the baseline extent of wetland and riverine habitats. Outputs from the mapping will guide future studies and measurements and identify key sites for vegetation sampling and determination of present ecological state (PES)/condition.

The approach that will be followed to assess riverine and wetland ecosystems will be as follows:

- Undertaking desktop studies and field-based surveys of associated ecosystems within the area of influence for each site;
- Characterise patterns and processes of freshwater systems in terms of biota (i.e. fauna and flora), vegetation, hydrology, geomorphology, etc.;

- Establish baseline ecological conditions/PES, as well as the provision of ecological benefits and services.
- Highlighting any species of conservation concern (i.e. rare, endemic, Red Data species), in particular species that trigger Criterion 1 to 3 IFC PS6 that will need to be considered in the CHA; and
- Identifying and assessing key indicators suitable for monitoring (e.g. biomonitoring) and determining additional *in-situ* water quality indicators for assessment and longer-term monitoring.

In-field surveys of rivers and wetlands will include the collection of data to determine system drivers, focusing on assessment of freshwater ecosystem condition and functioning. This will include on-site observations regarding ecosystem characteristics, impacts/disturbances, vegetation communities, aquatic biota (e.g. fish, macroinvertebrates, diatoms), water quality, etc. This information will be used as the baseline against which the site activities can be monitored into the future.

Importantly, the use of specific wetland and river habitat assessment tools will facilitate the reporting of different scenarios (i.e. current vs. post-development or post-rehabilitation) thereby enhancing EGS reporting requirements. In addition, the usefulness of ecological monitoring techniques is to provide detailed information in terms of various factors that affect the receiving and downstream freshwater environments thus providing an integrated understanding of impacts occurring within the catchment areas.

3.2.7 Hydrocensus

A hydrocensus will be undertaken to collect information regarding community water use and water-related issues (e.g. potential pollution). This will be done in a systematic manner within the respective study areas and associated catchments. The freshwater ecologist team will assist with identification, recording and assessing water sources (e.g. springs, wells, boreholes, water pumps, water storage systems, etc.) encountered during the baseline field assessments.

A hydrocensus form will be created prior to field studies to ensure that key questions regarding water use, demands, source type, condition are captured. The hydrocensus forms will also help facilitate the social engagement team when undertaking discussions with community members. The community engagements will be structured so as to target the full spectrum of water users present in the study areas.

All data collected from the hydrocensus will be collated, captured, and analysed. The output results will be used to help identify and prioritise areas/communities requiring water supply interventions/schemes. Recommendations will be provided for specific water resource management and protection measures that will build a more resilient and sustainable future for local communities.

3.2.8 Ecosystem Goods and Services Assessments.

Ecosystem goods and services (EGS) must be identified and assessed to ensure sustainable and equitable benefits for the environment and community while maintaining economic

viability. This project will conduct an ecosystem services assessment (ESA) in accordance with International Finance Corporation (IFC) Performance Standard 6 (PS6).

PS6 recognizes biodiversity's importance in delivering valued ecosystem services, and impacts on biodiversity can affect service delivery. The ESA will focus on two groups of ecosystem services: those impacted by the project and communities (e.g. erosion, soil loss, sedimentation, biodiversity, etc.) and those the project depends on (e.g. heavy metal resources, water supply, flood attenuation, etc.).

Key challenges to the provision of goods and services include river system degradation due to extensive tin and aggregates mining, poor soil retention by gum trees, and flood attenuation issues in the wetlands. However, after implementation of potential river and wetland rehabilitation interventions, the landscape could offer improved ecosystem goods and services, such as better runoff management, soil stability, crop yields, water quality, and biodiversity conservation.

The assessment of ecosystem goods and services (EGS) in the study sites will involve using modelling tools and toolkits such as Final Ecosystem Goods and Services (FEGS), Toolkit for Ecosystem Services Site-Based Assessments (TESSA), and Integrated Valuation of Ecosystem Services and Trade-offs (InVEST). These tools can be linked to other modelling tools (e.g. ACRU for hydrological modelling). Additionally, the assessment will consider alternative livelihoods and ecosystem goods that could be introduced into the landscape to build socio-economic resilience. For example, climate and soil suitability will be evaluated to determine the potential for planting spice trees or crops as alternative income sources through profitable and innovative subsistence farming practices. This approach ultimately aims to improve the resilience of the natural environment and nearby communities.

3.2.9 Catchment Hydrological Modelling

The hydrological assessment will utilise GIS spatial data and historical rainfall records to perform hydrological modelling of the catchments. The scope of work covered by the hydrological assessment includes:

- Modelling of hydrological flows generated by the catchment, under both the present landcover scenario, and in comparison, to future potential land use/landcover changes;
- Drawing on the above studies, provide a discussion of the potential impacts of land use/landcover changes on the hydrology of the receiving systems; and
- Provide recommendations to mitigate the impact of the changes in hydrology on the receiving catchments and users.

To undertake the hydrological modelling to the desired level of detail and confidence, a daily timestep process-based model, such as the ACRU model, is envisaged, to be used. Essentially, this model relies on input data and then processes this information to determine hydrological outputs. Hence, it can be utilised, in conjunction with the latest available outputs from multiple Global Circulation Models (GCMs), as inputs to simulate projected future impacts of climate change on the hydrology of these systems. The hydrological modelling component of the study broadly comprises of the following tasks:

- A detailed sequence of GIS-derived workflows;
- Design rainfall estimation;
- The estimation of design floods to inform the flood line modelling where the flood estimates also include climate change scenario projections;
- Estimation of present water flows from the catchment; and
- Estimation of water flows from the catchment for future potential land use and landcover changes.

It is important to highlight that the design flood estimates will be done for the 1:2 to 1:100 year Return Periods (RPs). The abovementioned process will be subject to oversight and review by Prof. Jeff Smithers, with predefined steps being subject to review and signoff, both internally and externally i.e. the proposed approach and results of the data analysis will be shared with both the tailings and mine closure specialists for review, comment and signoff to ensure alignment on the outputs of the studies.

In addition, a detailed geomorphic appraisal is essential to understand and predict flooding and sediment dynamics in river and floodplain wetlands within the concession areas. This appraisal will inform the impact of proposed rehabilitation approaches by examining sediment regimes, which are crucial for creating physical habitats and supporting ecosystems. Both natural and human-induced disturbances can significantly alter these regimes, affecting morphology, downstream users, and ecosystem services. Given the complexity and variability of sediment regimes, especially in modified landscapes, a spatially explicit sediment modelling framework will be applied at both catchment-wide and local scales, aiding in the planning and prediction of current and future sediment transport scenarios.

3.2.10 Flood Line Determination

The flood line determination will be done for only major rivers directly associated with the mining activities, which impact downstream users within each concession area, on the assumption that accurate and detailed survey data of these watercourses and surrounding areas will be provided. Ideally, this survey data should be obtained through recent high resolution LiDAR surveys.

Using the results from the hydrological modelling component described above, flood lines will be developed for each concession area, including projected flood events under climate change scenarios. The flood lines will be determined for the same RPs as the hydrological modelling. The peak discharge relating to the associated flood event will be used to determine the corresponding flood inundation.

A digital terrain model (DTM) will be developed from the high resolution remotely sensed survey data and used in a HEC-RAS (Hydrologic Engineering Centre-River Analysis System) 2D model, along with the hydrological inputs, land cover roughness values, and hydraulic infrastructure details to generate the relevant flood lines. Generally, the 1:100 year RP or lower floodlines are sufficient for ecological and environmental engineering purposes. Nevertheless, the hydrological modelling and floodline estimation processes will be subject to oversight and review by Prof. Jeff Smithers, with predefined steps being subject to review and signoff, both internally and externally i.e. the proposed approach and results of the data analysis will be

shared with both the tailings and mine closure specialists for review, comment and signoff to ensure alignment on the outputs of the studies.

3.2.11 Legacy Tailings Assessment and Categorisation

Utilising baseline data collected in the steps described above, legacy tailings will be assessed and categorised according to the following criteria:

Grade Potential

Legacy tailings are the spoils of historical mining activities which may not have been entirely efficient in extracting the target ore (Cassiterite for Rutongo and Musha Mines and Wolfram for Nyakabingo Mine). Given this, there is the potential to reprocess the materials using updated and more efficient extractive processes. In addition to processing tailings, low-grade, unprocessed dumps exist from the Belgium era, which may contain economically viable grade.

Firstly, it is necessary to establish the inherent grade of the tailings through sampling and laboratory analysis. Trinity Metals has the in-house capability to undertake this assessment, using the mine mineralogical laboratories. The grade will determine whether it is economically viable to reprocess the deposits and if so, the most efficient method of extraction. This may vary from in situ processing using largely artisanal methods (sluicing and panning) to mechanical processing at a centralised processing plant.

Physical stability

Historical / legacy tailings vary in terms of their physical stability depending on the original deposition method and location in the landscape; their susceptibility to wind and waterborne erosion; and the extent to which they have become vegetated either through natural vegetation or through cultivation of crops or commercial plantations. Furthermore, unauthorised (illegal) mining may destabilise the deposits both physically and chemically through creating highwalls, channelling stormwater and removing vegetation cover.

Legacy tailings may present a biophysical and social risk as a result of collapse of unstable slopes or highwalls, slumping of material or erosion and deposition of sediments on nearby lands and into drainage lines. For Phase 1, the physical stability aspects will be assessed based on surface observations of the condition of the deposits, with more detailed geotechnical engineering assessments undertaken of specific dumps during Phase II of the project. The Phase I assessments will be conducted by ETEK Consulting engineers and Trinity Metals geotechnical staff (assisted by geotechnical consultants OHMS if necessary).

Chemical stability / pollution potential

The chemical stability and pollution potential, as well as source, pathway and receptor analysis will be conducted as outlined in the relevant sections above. The information from these studies will inform the final classification of the tailings deposits and subsequent individual management strategies for each of these dumps.

Current landuse and ownership

While all of the legacy tailings covered in this study are located in the TM concession areas, not all of them are on land for which the TM mines hold the surface rights under the Mining

Agreements and licences. Some of the deposits are located on privately held land, on government land utilised for other purposes (such as plantations) or on protected areas such as river buffer zones.

The assessment will identify the current land ownership, including title deed holders (if private) and the existing landuse. The assessment will include the area of influence surrounding the deposits where relevant.

Closure criteria

Each of the deposits will be assessed in terms of interventions required to meet pre-determined closure criteria which are currently being defined in the Trinity Metals Mine Rehabilitation and Closure planning and costing exercise. This work is being undertaken by ETEK consultants currently under contract to Trinity Metals.

Purpose of the Categorisation

Clear categorisation of the legacy tailings facilities will inform the Phase II feasibility studies and comparative analyses of options for mineral recovery from legacy tailings, and remediation of waste sources and areas of contamination.

3.3 Methodology for Key Components: Phase II

Phase II will involve the following activities:

- Review and assessment of GAP analysis of Phase 1.
- Additional data collection, analysis and reporting as recommended by DFC to address gaps identified in Phase 1 of this activity. This may involve more detailed assessments of some of the legacy tailings deposits.
- Feasibility studies for all mining concessions, including comparative analyses of options for mineral recovery from selected legacy tailings, and remediation of waste sources and areas of contamination.
- Scenario modelling and determination of management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience.
- Develop Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession.

The detailed methodology for these Phase II activities has not been defined as yet, although budgetary resources have been allocated. The approach and methodology will be determined based on the outcomes of Phase I and on 3rd party review and gap analysis.

4. DELIVERABLES

4.1 Reports and Documentation

The following deliverables, in terms of reports and GIS data, are envisaged from the abovementioned project tasks (Phase I):

4.1.1 Reports

- Source, pathway and receptor analysis.
- Ecological health and drivers of the river and wetland ecosystems.
- Ecosystem Goods and Services Assessments.
- Geochemical Assessment reports.
- Hydrological study report including maps of the catchment boundaries, design flood volumes and peaks for the 1:2 to 1:100 year RP events under selected land use/landcover change scenarios.
- Sediment balance and geomorphology assessment.
- Estimated hydrological flows and sediment movements.
- Flood line report including floodlines for the 1:2 to 1:100 year RPs, including selected climate change scenarios.
- Hydrocensus report.
- Legacy Tailings Assessment and Categorisation Report.

4.1.2 Spatial coverages

- Extent of freshwater ecosystems (rivers and wetlands) and the disturbance units and habitat/system types
- Extent of freshwater ecosystem catchments and landcover mapping within those catchments following the WET-Health (Version 2) landcover classification system.
- Location/extent of sources, pathways and receptors of pollutants
- Location/extent of priority ecosystems in terms of ecosystems goods and services and those communities reliant on these resources
- Catchment boundaries and floodlines for major streams for selected RPs.
- Baseline sediment flow paths and sediment flux values and spatial representation of sediment accumulation/erosion risk areas. Location and extent of major sediment sources and major sediment sinks.
- Location of community water sources (springs) and nature of use.
- Water quality monitoring locations

4.1.3 Water Quality Database and Reporting Dashboard

- Water quality monitoring database and dashboard, incorporating existing and future data.

4.2 Training or Capacity Building

Training and capacity building is an important component of all contracts which involve the engagement of external specialist consultants in the provision of services for Trinity Metals. It is envisaged that the specialists involved in this study will liaise closely with mine SHEC and MRM (Mineral Resource Management) personnel, in particular, in conducting their investigations. The following training is proposed as part of this TA Project:

- Short course in Geochemistry and Acid Mine Drainage – Provided by Dr Andrea Baker.
- Water quality monitoring protocols, data capture and reporting of results via a WQ monitoring database.

- One day training session in Mine Rehabilitation and Closure Planning and Costing – provided by E-Tek Consulting.

In addition to formal training, relevant personnel will be exposed to the following methodologies through assisting the consultants' teams:

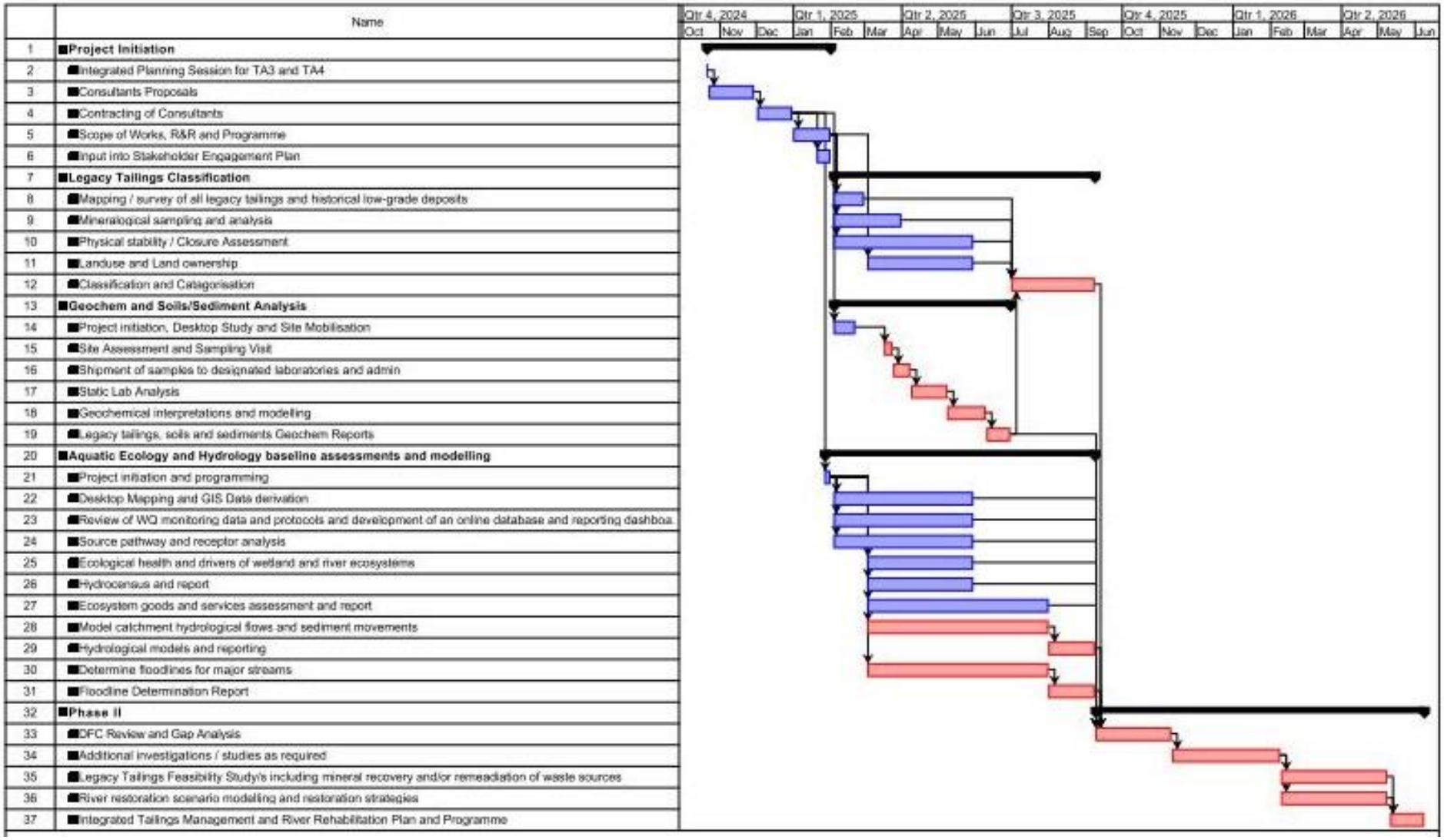
- Hydrocensus;
- Ecosystem Goods and Services Assessment
- Assessment of Present Ecological State (PES) of aquatic systems.
- River rehabilitation techniques.

5. PROJECT TIMELINE AND MILESTONES

5.1 Detailed Timeline

The detailed timeline is presented in Figure 5.1.

Figure 5.1. Detailed Programme for TA4: Legacy Tailings Management and River Rehabilitation Plan



5.2 Key Milestones and Deliverable Deadlines

Key milestones and deliverable deadlines are provided in Table 5.1

Table 5.1. Key Milestones and Deliverable deadlines

PHASE		TASK	DELIVERABLE	DEADLINES
PHASE 1	1	Develop detailed SOW, R&R and Programme for the TM&RR project	1.1. Detailed SOW, R&R and Programme for the TM&RR project	**31 Jan 25**
	2	Mapping of all sources and receptors of contamination and GIS Analysis	2.1. Desktop mapping and Geographic Information System data derivation.	**31 May 25**
			2.2. Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.	**31 May 25**
			2.3. Hydrocensus – location of community water sources (springs) and nature of utilisation.	**31 May 25**
			2.4. Geochem Assessment (waste materials and sediments)	**30 June 25**
	3	Ecological health and drivers of the river and wetland ecosystems.	3.1. Determination of the PES of all the river systems	**31 May 25**
	4	Ecosystem Goods and Services Assessments.	4.1. Ecosystem Goods and Services Assessment	**31 July 25**
	5	Modelling catchment hydrological flows and sediment movements.	5.1. Catchment hydrological models	**31 Aug 25**
	6	Determining flood lines for major streams, including climate change scenarios	6.1. Flood line Determination Report	**31 Aug 25**
	7	Tailings assessment and categorization	7.1. Tailings Resource Report	**31 Aug 25**
	8	**Review and assessment of GAP analysis of Phase 1.**	8.1. Gap Analysis Report	**31 Oct 25**
PHASE II	9	Additional data collection, analysis and reporting as recommended by DFC to address gaps identified in Phase 1 of this activity.	9.1. Additional studies as recommended by DFC to address gaps identified in Phase 1 of this activity.	**31 Jan 26**
	10	Feasibility studies for all mining concessions including comparative analyses of options for mineral recovery from legacy tailings, and remediation of waste sources and areas of contamination.	10.1. Legacy Tailings management and recovery feasibility study reports for each mine / mining area.	**30 April 26**

PHASE		TASK	DELIVERABLE	DEADLINES
	11	Scenario modelling and determination of management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience	11.1. River rehabilitation scenario modelling	**30 April 26**
	12	Develop Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession	12.1. Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession	**31 May 26**

6. RESOURCE REQUIREMENTS

6.1 Budget and Cost Breakdown

The Budget and cost breakdown for TA Activity 4, is indicated in Table 6.1.

Table 6.1. Budget and Cost Breakdown for TA4 illustrating TM Cost-share items

Activity	#	Tasks	Phase	Status	Service Provider	Deliverables	TMG Co-spend	TA Budget
The Development of a Legacy Tailings Management and River Rehabilitation Plan for Rutongo, Musha and Nyakabingo Concessions	4,1	Develop detailed SOW, R&R and Programme for the TM&RR project	1	In progress	GT / SLR	4.1.1. Detailed SOW, R&R and Programme for the TM&RR project		**36 750**
	4,2	Mapping of all sources and receptors of contamination and GIS Analysis	1	In progress	GT	4.2.1. Desktop mapping and Geographic Information System data derivation.	-	**24 950**
			1	not started	GT	4.2.2. Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.	-	**23 900**
			1	not started	GT	4.2.3. Hydrocensus – location of community water sources (springs) and nature of utilisation.		**10 550**
			1	not started	SLR	4.2.4. Geochem Assessment (waste materials and sediments)		**65 000**
	4,3	Ecological health and drivers of the river and wetland ecosystems.	1	Not started	GT	4.3.1. Determination of the PES of all the river systems		**49 700**
	4,4	Ecosystem Goods and Services Assessments.	1	Not started	GT	4.4.1. Ecosystem Goods and Services Assessment		**36 900**
	4,5	Modelling catchment hydrological flows and sediment movements.	1	Not started	GT	4.5.1. Catchment hydrological models		**65 450**
	4,6	Determining flood lines for major streams, including climate change scenarios	1	Not started	GT	4.6.1. Flood line Determination Report		**47 200**
	4,7	Tailings assessment and categorization	1	not started	TM / SLR / ETEK	4.7.1. Tailings Resource Report		**80 000**
	4,8	**Review and assessment of GAP analysis of Phase 1.**	2	Not started	tbd	4.8.1. Gap Analysis Report		**19 600**
	4,9	Additional data collection, analysis and reporting as recommended by DFC to address gaps identified in Phase 1 of this activity.	2	Not started	tbd	4.9.1. Additional studies as recommended by DFC to address gaps identified in Phase 1 of this activity.		**95 000**

Activity	#	Tasks	Phase	Status	Service Provider	Deliverables	TMG Co-spend	TA Budget
	4,10	Feasibility studies for all mining concessions including comparative analyses of options for mineral recovery from legacy tailings, and remediation of waste sources and areas of contamination.	2	Not started	TM / BARA	4.10.1. Legacy Tailings management and recovery feasibility study reports for each mine / mining area.		**105 000**
	4,11	Scenario modelling and determination of management strategies and interventions required to restore rivers and wetlands to a predetermined ecological state to maximize climate resilience	2	Not started	GT	4.11.1. River rehabilitation scenario modelling		**120 000**
	4,12	Develop Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession	2	Not started	TM / GT	4.12.1. Integrated Tailings Management and River Rehabilitation Plan and Programme for each Concession		**170 000**
Trinity Metals - Cost Share (TA4)	*25% of Project budget : In kind: Tech Services salaries and expenses etc*						***237 500***	
	Consulting fees from Tailings Engineers (TAILINGS SOLUTIONS) for the design of engineered and GIIP-compliant tailings facilities						***40 000***	
	Water quality monitoring database and dashboard, incorporating existing and future data (Ground Truth)						***20 515***	
	Taxes WHT and VAT (28% on SLR fees)						***18 200***	
	Taxes WHT and VAT (28% of GT consultant fees)						***82 712***	
	28% WHT and VAT taxes on Phase 2 consulting fees						***89 600***	
	Physical rehabilitation work at Karambo mine						***198 000***	
	Masoro and Karambo Illegal Miner Integration Pilot Projects (re-mining of tailings)						***20 000***	
	Additional consulting fees from Mining and Resource Consultants						***150 000***	
	TOTALS						***1 035 277***	**950 000**
GT = Groundtruth Consulting; SLR = SLR Consulting (Geochem) ; ETEK – E-Tek Consulting (Closure and rehab) ; BARA = Bara Consulting (Mining Consultants); TM = Trinity Metals MRM								

6.2 Personnel and Expertise

Key personnel retained for the purpose of this project are detailed in the table below:

Table 6.2. Key Personnel

Key Person Name	Proposed Function	Experience Levels	Qualifications
Joanne Daneel	Project Manager	30+ years experience in Environmental Management in the mining and engineering sectors. Key areas of expertise include: • Design and implementation of E&S Management Systems. • Project management and execution of large scale ESIAs for mining operations. • Management and integration of specialist studies. • Environmental, Social and Governance in the mining sector	MSc. Agriculture (soil science) BSc. Agriculture (Grassland Ecology and Zoology)
Dr Andrea Baker –	Senior Geochemist	10 years geochemistry research and consulting experience. PhD and subsequent postdoctoral research fellowship in the Earth Sciences Department at Stellenbosch University. Research focused on marine/terrestrial water and soil stable isotope and elemental analysis, statistical assessment, geochemical PHREEQC modelling of groundwater quality and soil redox chemistry. Involved in complex pit water quality modelling closure projects, mining waste source term generation, ground water quality investigations, TSF performance monitoring, waste assessments and site wide acid rock drainage and metal leaching risk assessments for water use and mining licenses applications.	PhD, Biogeochemistry, Stellenbosch University
Vibhishan Moodley	Project Consultant – Soil Scientist / Geochemist (Africa)	Vibhishan has 3 years' experience in the mining industry of which most is associated with the coal mining sector in the Mpumalanga Province. He offers versatile proficiencies in the fields of geology, soil science as well as environmental monitoring and compliance. He holds a MSc in Soil Science from the University of Pretoria. His research focused on the development of soil liming strategies for irrigation with attenuation of acid mine drainage.	MSc. Soil Science, University of Pretoria
Mark Graham	Senior Ecologist	30^{+} years' experience in the environment and water sector specialising in : • Terrestrial and aquatic ecosystem functioning; • Water resource and water quality management; • Understanding of community development projects, particularly those involving citizen science as	Ph.D (Botany,) MSc (Biological Sciences) BSc (Agriculture) -Majoring in Rangeland Ecology

Key Person Name	Proposed Function	Experience Levels	Qualifications
		well as large infrastructural and mining operations/projects.	
François Xavier Tetero	Water Resources Management Specialist	>15 years' of experience in the fields of Sustainable water management & development; • Watersheds management; • Transboundary water cooperation; • Climate resilience with focus on urban resilience institutional development; and • Projects' development & management.	MSc (Water Resources and Environmental Management)
Gary de Winnaar	Biodiversity Specialist	16 years' experience in terrestrial and aquatic biodiversity studies, including: • Terrestrial and aquatic biodiversity surveys including fauna and flora and IFC Critical Habitat Assessments; • River biomonitoring and E-flows; • GIS mapping, modelling and spatial analyses, and risk/ vulnerability assessments; • Invasive alien plants – assessments & management; • Offsets, rehabilitation, etc.	B.Sc (Zoology & Hydrology), MSc (Hydrology), Pr. Sci. Nat. - Ecology
Simlindile Mahlaba	Environmental Scientist, Social and Stakeholder Engagement Consultant	5 years of experience in the environment sector, including: • Integrated environmental management planning and implementation • Climate change adaptation and mitigation • Water resource management • Catchment management and rehabilitation • Stakeholder engagement and social facilitation • Environmental research and GIS	MSc (Environmental and Geographical Science), BSc (Hons) Environmental and Geographical Science BSc. Environmental and Geographical Science and Geo-Informatics
Craig Cowden	Wetland Specialist	24 years' experience, with input into various wetland studies, including: • Mapping/inventories, delineation and assessments; • Rehabilitation planning; • Wetland creation; • Mitigation and offset requirements; • Wetland rehabilitation implementation support; and • Monitoring and evaluation of wetland rehabilitation.	M.Sc. (Environmental Science) BSc (Agriculture) – Majoring in Wildlife Science Pr.Sci.Nat - Ecology

Key Person Name	Proposed Function	Experience Levels	Qualifications
Trevor Pike	Environmental Engineer	25+ years' experience, with input into various environmental engineering studies, focusing on: • Wetland rehabilitation and constructed wetland design; • Stormwater management; • Project management	B.Sc. (Agricultural Engineering) Pr.Eng
Prof. Jeff Smithers	Agricultural/Bioresources Engineering and Engineering Hydrology	40+ years of academic and consulting experience, including: • Design and engineering hydrology; • Soil and water conservation engineering; and • Agro-hydrological and water resources simulation model development and application.	PhD (Engineering) Pr.Eng

7. ROLES AND RESPONSIBILITIES

7.1 Project Team Structure, Roles and Responsibilities

Project team structure and roles and responsibilities for Phase I are indicated in Table 7.1

Table 7.1. Project Team Structure, Roles and Responsibilities

	Role / Function	Person	Responsibility
Project Management and Administration	ESG Consultant - Project Lead	Joanne Daneel	Overall project management and coordination.
	Group Sustainability Manager – Quality Control	Sam Ryumugabe	Client Report Review and Approval
	Project Administration	Martina Bennett	Contract Management, monitoring and evaluation.
Aquatic Ecology and Hydrological (GrouthTruth)	GT Project Manager	Jackie Viviers	Project management from the GroundTruth team.
	GT Project Director – Senior Ecologist	Dr Mark Graham	Project Director and Oversight
	Water Resources Management Specialist	Francios Tetero	Inputs and review of Stakeholder Engagement Plan, Source pathway and receptor, Hydrocensus, EGS, Water Quality
	Biodiversity Specialist	Gary de Winnaar	River's assessments, river restoration and EGS oversight
	Environmental Scientist, Social and Stakeholder Engagement Consultant	Simlindile Mahlaba	Stakeholder Engagement and EGS
	Wetland Specialist	Craig Cowden	Wetland Assessments and River rehabilitation

	Role / Function	Person	Responsibility
	Environmental Engineer	Trevor Pike	Hydrological Modelling and Floodline determination
	Agricultural/Bioresources Engineering and Engineering Hydrology	Prof. Jeff Smithers	External Review
Geochemistry, soils and sediments (SLR)	Senior Geochemist	Dr Andrea Baker	Project Management, Geochemical sampling and analysis. Reporting
	Project Consultant – Soil Scientist / Geochemist (Africa)	Vibhishan Moodley	Soil and sediment sampling, analysis and reporting
Closure and Rehabilitation Aspects (ETEK)[1]	ETEK Project Director	Jeanette Erasmus	Project Lead
	Environmental Manager	Nadine Coetzer	Assessment and reporting on E&C aspects
	Structural stability assessments	Jaundre Stander	Assessment of mining-related physical aspects.
	Hydrology and Geohydrology aspects	Gerrie van Wyk	Assessment and Reporting on hydrological and geohydrological aspects
Tailings Sampling Programme (Trinity Metals)	Group Mineral Resource Manager (MRM)	Justin Uwiringiyimana	Overall responsibility for reporting
	Group Resource Geologist	Siobhan Joubert	Project management
	Operational MRMs	Titus Habiyakare Eric Niyokiri Wisdom Mugwagwa	Field Sampling
	Processing Laboratory	Juliet Kabatesi	XRF Analysis
Geotechnical Engineering (TM and OHMS)	Group Geotechnical Engineer	Freddy Chikwiri	Internal Geotechnical Assessments and monitoring
	Senior Consulting Geotechnical Engineer (OHMS)	Quinton Enslin	External Geotechnical assessments

8. RISK MANAGEMENT

8.1 Identification of Key Risks and Mitigation Strategies

Key risks to the successful and timeous completion of Phase I of the Project are identified as follows:

- **Delays in completing fieldwork due to adverse weather conditions:** The fieldwork is scheduled to commence in March and extend into June 2025. April and May typically experience extremely high rainfall which could disrupt activities, specifically those conducted in rivers and wetlands.
    - This risk has been mitigated by allowing additional time for fieldwork.

[1] E-Tek Consulting are under contract to provide a conceptual Mine Rehabilitation and Closure Plan and Cost for all three TM mines. Their input into this TA Project forms part of their current contract.

- **Security risk in encountering unauthorised miners during field investigations.** While this is considered to be a low risk to the personal safety of field workers, there is a potential for a negative response from unauthorised miners during field study work – particularly in areas where unauthorised mining is actively taking place (such as rivers and old Belgium tailings). This risk is exclusive to the Rutongo Concession. This risk will be mitigated by the following measures:
    - Consultations with local leadership prior to any field work commencing to inform them of the purpose of the investigations;
    - Close cooperation with the CoreAfrica volunteers who are active in communities within the Rutongo Concession, engaging their assistance in sensitising communities as to the purpose of the work;
    - Ensuring that fieldworkers do not work alone and are always accompanied by TM mine staff, preferably a Community Liaison Officer; and
    - In high-risk areas, ensure that fieldworkers are accompanied by mine Asset Protection Guards.
- **Uncertain geopolitical situation** in the Great Lakes Region and eastern DRC potentially impacting on funding streams for Trinity Metals as a result of potential sanctions on Rwanda. This is viewed as a relatively low risk currently, but will be closely monitored. While it is not possible to fully mitigate this risk, the following measures will be undertaken:
    - Ongoing, close communication with the DFC, assessing the risk potential and agreeing and implementing contingency plans as required. Contingency measures may include the temporary suspension of project activities which could result in the overall timeframe for project completion.

9. QUALITY ASSURANCE AND CONTROL

9.1 Standards and Guidelines to Be Followed

- IFC Performance Standards on Environmental and Social Sustainability;
- World Bank Group IFC Environmental Health and Safety (EHS) Guidelines for Mining.
- ICMM Guideline for Integrated Mine Closure Good Practice (2019)
- South African Waste Assessment Regulations (GN R. 635 of 2013).

9.2 Review and Approval Processes

A structured review and approval process ensures that the final products meet all necessary quality standards.

- **Internal Review**: The project team reviews drafts to ensure completeness, accuracy, and adherence to objectives. Advanced drafts are also shared with the Trinity-led DFC TA Grant Steering Committee for review and comment.

- **Technical Review**: Subject-matter experts assess the feasibility of proposed interventions.
- **Community Validation**: Present draft plans to stakeholders for feedback and ensure alignment with community needs.
- **DFC Approval**: Submit the plan to the DFC for compliance verification.
- **Final Endorsement**: Obtain formal approval from key decision-makers (e.g., local councils, community boards) before implementation.

9.3 Performance Monitoring

Performance monitoring for the process of developing a Legacy Tailings Management and River Rehabilitation Plan will focus on tracking and assessing activities, timelines, and stakeholder engagement to ensure the plan is created effectively, inclusively, and within the set time frame.

Key Components:

- **Clear Objectives and Milestones**: Specific milestones for the process will be defined, such as conducting the various studies, analyses and modelling, facilitating stakeholder engagement and community consultations, drafting the plans, and obtaining approvals.
- **Indicators and Metrics**: Performance indicators will be developed to track progress, such as the number of studies completed, percentage of stakeholder participation, adherence to timelines, and quality of collected data.
- **Stakeholder Engagement**: The involvement of community members, local leaders, and relevant organizations will be monitored to ensure diverse and inclusive participation throughout the process.
- **Regular Reviews**: Periodic reviews will be scheduled to evaluate progress against milestones, identify bottlenecks, and make necessary adjustments to the process.
- **Accountability Mechanisms**: Roles and responsibilities will be assigned to team members and stakeholders, ensuring transparency in decision-making and resource use during the plan development.
- **Risk Management**: Risks such as delays, lack of participation, or resource constraints will be monitored, and mitigation strategies will be implemented to keep the process on track.

10. PROJECT GOVERNANCE

The governance structure for the DFC TA project consists of a Steering Committee and the Project Management Team. This structure ensures effective oversight, strategic direction, and smooth implementation of the project.

- **Steering Committee:** The project will report to and be overseen by the Trinity Metals DFC TA Grant Steering Committee, an internal high-level advisory group that is responsible for providing overall strategic direction and guidance for the DFC TA implementation and outreach. The Function of the DFC TA Steering Committee is to take responsibility for the business issues associated with the DFC TA project across all activities. The Steering Committee is responsible for approving budgetary strategy, defining and realising benefits, and monitoring risks, quality and timeliness. The Steering Committee meets on a monthly basis, and the CDP Activity is a standing item on the agenda.
- **Project Management Team**: Responsible for day-to-day management and implementation. Includes project managers, technical experts, and coordinators who execute tasks, manage resources, and monitor progress.

10.1 Communication and Reporting Protocols

Internal Communication: Regular project team meetings and internal updates (e.g., weekly or bi-weekly) to track progress, share information, and address any challenges.

Stakeholder Engagement: Regular community consultations and feedback mechanisms as per the Stakeholder Engagement Plan to ensure the plan reflects the needs and priorities of the community.

Reporting: Structured reporting to the Steering Committee and to the DFC, typically through monthly or quarterly progress reports, highlighting the activity's current status, achievements, challenges, and any deviations from the plan. Progress reports can be in the form of slides presented during the monthly Steercom meetings or Quarterly Update Meetings with the DFC. A detailed Annual Report is required to be prepared and submitted to the DFC no later than 90 days following the end of the Fiscal Year, and the Project Management Team will be expected to contribute to the report for this activity.

Recordkeeping: Record of workshops and meetings summarising key outcomes will be prepared and circulated to attendees and key stakeholders. All activity-related documents will be stored on the project's sharepoint site and accessible to the Project Team.

10.2 Decision-Making Processes

The decision-making process for the project ensures that key stakeholders are involved, challenges are addressed efficiently, and progress is reviewed at critical points. This process is structured around three key mechanisms: Consensus-Based Decision Making, Escalation Procedures, and Approval Gates.

Consensus-Based Decision Making

At the initial stages of decision-making, the project team collaborates to reach a consensus on major aspects of the plan. This includes setting strategic priorities, defining key interventions, and allocating resources.

- Decisions are made through participatory discussions, ensuring broad input and agreement.
- Tools such as project coordination meetings facilitate discussion and alignment.

Escalation Procedures

If a decision cannot be resolved within the project management team, the issue follows an escalation process to higher authorities within the governance structure.

- Issues are first addressed at the project management level, where teams attempt to resolve concerns internally.
- If unresolved, the matter is escalated to the Steering Committee, which provides high-level oversight and final resolutions.
- Escalation ensures that challenges do not stall progress while maintaining fairness and transparency in decision-making.

Approval Gates

At key milestones, the development process includes structured approval gates, where progress is formally reviewed and validated before proceeding to the next stage.

- Critical decision points include:
  - Completion of baseline studies.
  - Drafting of the TM&RR Plan for review.
  - Final validation and approval of the plan before implementation.
- The Steering Committee and the DFC evaluates these milestones, ensuring the plan aligns with priorities and regulatory requirements.
- Only after passing the approval gate does the project advance to the next phase.

11. CONCLUSION

11.1 Summary of the Scope of Work

The SOW provides the detailed approach to the Project, with an emphasis on Phase I tasks. Phase I will serve to provide the baseline information related to: legacy tailings structural and chemical stability and pollution potential; pollution pathways and receptors; present ecological state of impacted rivers and wetlands; catchment ecosystems goods and services and hydrological modelling and sediment movement. These assessments will be undertaken in the context of climate change scenarios with an intention of building climate resilience within the affected catchments and communities.

Input into Phase I is provided by a team of specialists, including: geochemists, soil scientists, hydrologists, aquatic and wetland ecologists, hydrological engineers, civil and mining engineers, and mine rehabilitation and closure specialists.

Phase I will inform the development of an Integrated Tailings Management and River Rehabilitation Plan and Programme for each of the TM concession areas, undertaken as part of Phase II.

11.2 Anticipated Benefits and Outcomes

The primary outcome of the Project is to formulate a focussed, practical and achievable Integrated Tailings Management and River Rehabilitation Plan for TM based on accurate data and detailed specialist investigations and assessments. The outcomes will serve to support and inform future equity or debt investment in Trinity Metals by the US International DFC or other potential investors.

12. ANNEXURES

Annexure 1: SLR Scope of Works for Geochemical and Soil/Sediment Analysis

Annexure 2: GroundTruth Input into Phase 1 of the Legacy Tailings Management and River Rehabilitation Programme for Trinity Metals Concessions, Rwanda

Annexure 1:

SLR Scope of Works for Geochemical and Soil/Sediment Analysis

10 December 2024

Attention: Jo Daneel
Trinity Metals
Kigali
Rwanda

SLR Project No.: 713.P00084.00001

RE: Trinity Legacy Tailings and River Rehabilitation Program – Geochemical and Soil / Sediment Assessments

1.0 Introduction

Thank you for inviting SLR Consulting (Africa) (Pty) Ltd (SLR) to submit a proposal to undertake Soil and Geochemical specialist assessments to inform legacy tailings and river rehabilitation plans at Trinity Rutongo, Trinity Nyakabingo and Trinity Musha mining concessions.

The proposal includes the following:

- This letter, including Scope of Work;
- Details of the professional costs and disbursements (Annexure A);
- The commercial agreement and assumptions linked to the cost estimate (Annexure B);
- The SLR Standard Conditions of Engagement (Annexure C); and
- An acceptance form (Annexure D).

SLR is ISO 9001:2015 certified and has quality management systems in place that assure the quality of the service delivered to our clients.

2.0 Background Information

Trinity Metals Limited was formed in May 2022 with the amalgamation of the three mines under Trinity Metals Group. The Company is committed to the expansion, modernisation and mechanisation of its activities, and to addressing mining-related environmental and social impacts in a responsible and sustainable manner.

All three mines have a long history of artisanal-scale mining dating back to the Belgian times in the late 1930's. This has resulted in significant environmental and social legacy issues, including altering the natural hydrological functioning of the river systems and water quality impacts.

Trinity Metals is in the process of updating the Environmental and Social Impact Assessments (ESIAs) and Management Plans for all three mines in line with Rwandan law and international best practice. Technical assistance (TA) programs have been developed to identify and assess existing environmental and social (E&S) impacts of the operational and historical

mining legacies and implement management plans and programs to address those E&S impacts identified. As part of TA 4, the development of legacy tailings management and river rehabilitation plans look to include different specialist studies and technical task teams to address the impacts. Geochemical and soil / sediment baseline assessments of the legacy tailings material and the soils associated with these stockpiles will be undertaken to assess the physical and chemical stability of the tailings and the capacity of the soils to remediate any metal leaching and acid rock drainage still occurring in the stockpiles.

3.0 Scope of Work

The proposed scope of work to achieve the project objectives is detailed below.

1. Desktop study
    a. Gap analysis and request for information.
    b. Sampling schedule plan development using regular point sampling methodology (or gridding) in QGIS and expert knowledge to plot sampling locations.

2. Site sampling visits to Rutongo, Musha and Nyakabingo mine complexes to
    a. Locate QGIS and expert knowledge determined sampling points,
    b. Undertake visual soil assessment to classify the soils based on the IUSS working group reference base,
    c. Collect designated soil and sediment samples for analysis to confirm classification, OM content and delineate any contaminants,
    d. Identify, describe and sample representative legacy tailings for geochemical assessment,

3. Specialist laboratory analysis program
    a. Soil and river sediment assessment analysis will include:
        i. Particle size analysis
        ii. pH, electrical conductivity, cation exchange capacity, bioavailable macro nutrients, trace metals and organic matter content.

    b. Geochemistry assessment analysis will include:
        i. Total concentrations on solids for waste classification
        ii. Total leachable on solids for waste classification
        iii. Acid based accounting and sulfur speciation
        iv. Net acid generation and carbon speciation
        v. XRD minerology
        vi. Synthetic Precipitation Leachate Procedure for source term modelling

4. Baseline soil assessment, waste classification, geochemical risk assessment for acid rock drainage and metal leaching potential of the legacy tailings.

5. Provide mitigation measures and recommendations to inform legacy tailings management and river rehabilitation plans.

6. Reporting will include 3 technical geochemical and soil baseline assessment reports for each mine site.

4.0 Approach and Methodology

On completion of the desktop study, gap analysis and request for information (RFI), SLR will compile a sampling plan and recommend the number of geochemical and soil / sediment samples to be collected for analysed to ensure a representative study. For the purposes of compiling the proposal budget the following number of samples have been conservatively estimated and costed for each site as per Table 4-1.

Table 4-1: Estimated number of samples per site for geochemistry and soil analysis

Geochemistry Analysis		Total		Soil / Sediment Analysis		Total
Rutongo x 6 sites	2 samples per site	12		Rutongo x 6 sites	4 samples per site	24
Nyakabingo site	4 samples per site	4		Nyakabingo site	6 samples per site	6
Musha & Ntunga sites	2 samples per stie	4		Musha & Ntunga sites	2 samples per stie	4
		20				**34**

The number of samples sent for analysis will be confirmed once the infield assessment has been completed. In the unlikely event that there is a requirement for additional samples to be collected and analysed to ensure a comprehensive study, in agreement with the client, a variation order will be submitted to the client for approval. Storage and shipping of the samples to certified laboratories will be the responsibility of the client and has not been costed for in this proposal.

4.1 In Country Site Visit

The number of site days have been estimated according to each mine site's size and layout. We envisage the following number of days required at each site to ensure a comprehensive scoping, infield assessment and sampling program as per Table 4-2 and associated travel logistics as per Table 4-3 below:

Table 4-2: Site days per mine / activity

Site	Days
Rutongo mine	5
Nyakabingo Mine	3
Musha and Ntunga Mine	2
ARD Workshop	1
Contingency day	1
Total	12

Table 4-3: Site visit travel and accommodation requirements

No of consultants	Activity	Days
	Air Travel	
2	Flight from OR Tambo International to Kigali, Rwanda return	
	Kigali and mine site visits	
2	Transfers to and from airport and Kigali / mine sites, accommodation & subsistence	
2	Rutongo Mine	5
2	Nyakabingo Mine	3
2	Musha & Ntunga mine	2
1	ARD Workshop	1
2	Contingency day	1

4.2 Laboratory analysis

On completion of site sampling, the materials will be transported by the client to an accredited geochemistry and soil laboratory, accompanied with a chain of custody document, for comprehensive geochemical and soil / sediment analysis.

4.2.1 Waste Assessment

To determine the requisite barrier liner for any proposed waste containment facilities, a waste assessment is required to determine the waste type of the legacy tailings materials. To our best knowledge, Rwanda does not have prescribed waste assessment regulations and therefore we suggest using the South African National Environmental Management: Waste Act (NEMWA) 59 of 2008, which is based on international best practices underpinned by the legal provisions which prescribes the following in terms of waste streams:

- Undertake a waste type assessment in terms of GN R. 635 (23 August 2013); and
- Determine the liner requirements as per GN R. 636. (23 August 2013).

The South African waste classification regulations provide norms and standards for assessing/classifying (GN Regulation 635) waste material. Although the Norms and Standards refer to landfills, the definition of waste in South Africa includes mine residues such as tailings/slimes and waste rock and therefore the norms and standards apply to mine residue classification. In terms of the regulations, the total concentration (TC) of chemical substances specified in Section 6 of GN R. 635 that are known to occur, likely to occur or can reasonably be expected to occur are determined. The TC of the chemical substances is compared to the total concentration threshold (TCT) limits specified in Section 6 of GN R. 635.

The leachable concentrations (LC) of the chemical substances must be determined and compared to the leachable concentration threshold (LCT) limits specified in Section 6 of GN R. 635. The TC and LC limits of elements and chemical substances in the waste material exceeding the corresponding TCT and LCT limits determine the specific waste type according to Section 7 of GN R. 635.

The waste type and related risk-based assessment approach is used to inform the potential liner requirements. Figure 4-1 illustrates the flow diagram of the general processes to be followed to determine the waste type and then associated liner requirements.

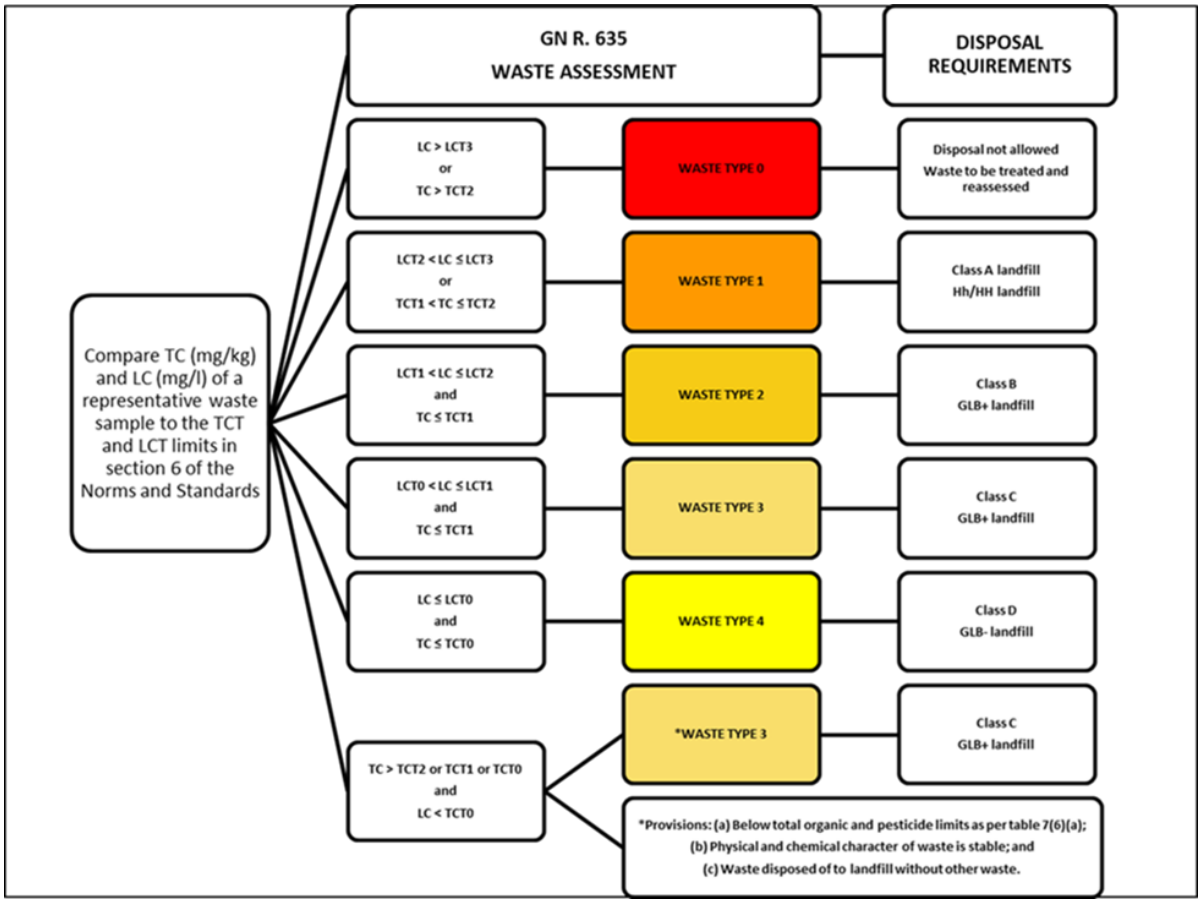


Figure 4-1: Flow Diagram for Assessing Waste in Terms of South African Waste Assessment Regulations (GN R. 635 of 2013).

4.2.2 Acid Base Accounting

Acid Base Accounting (ABA) provides an industry-recognized assessment of the acid generation or acid neutralisation potential of materials. The ABA method used for the characterisation of the samples is the Modified Sobek ABA method (EPA 600), which includes both laboratory analysis and empirical calculations based on acid generating potential (AP) and neutralising potential (NP).

Paste pH analysis is undertaken in conjunction with the ABA test. The test is a simple, rapid, and inexpensive screening tool that indicates the presence of readily available NP (generally from carbonate) or stored acidity and involves the placement of ‘crushed’ sample with distilled water at a low solid to liquid ratio (to produce a paste) and the pH measured after approximately two minutes. Paste pH values of less than 5 indicate the presence of stored acidity, whereas higher paste pH values suggest the presence of reactive neutralising minerals.

The classification of each material in terms of its potential to generate acid is based on the criteria shown in Table 4-4 below.

Table 4-4: Acid Rock Drainage Classification

Parameter	Potentially Acid Generating (PAG)	Uncertain/Marginal	Non-Potentially Acid Generating (non-PAG)	Reference
Paste pH	<3.5	3.5 - 5.5	>5.5	Price and Errington, 1995
NNP	<-20	-20 – 20	>20	Roberson and Broughton, 1992
NPR	<1	1:1 – 2:1 = Possible 2:1 – 4:1 = Low	>4	Price *et al.,* 1997
Sulphide %	> 0.3%	-	< 0.3%	Soregaroli and Lawrence, 1998

4.2.3 Sulfur and Carbon Speciation

The ABA tests assume that all sulphide minerals in a rock sample are acid generating. Some of the sulfur in the rock may be present in non-acid producing sulfates. If a significant part of the total sulfur occurs as sulphate sulfur instead of sulfide sulfur, the overall risk of acid generation is reduced.

Even though mine waste and extractive materials are not normally associated with high organic content, even low percentages can affect ABA results and therefore carbon speciation must be taken into consideration when interpretating the results.

4.2.4 Net Acid Generation

Static Net Acid Generation (NAG) test work is carried out in order to determine the maximum potential for acid generation from the samples. The static NAG test differs from the ABA test in that it provides a direct empirical estimate of the overall sample reactivity, including any acid generated by semi-soluble sulphate minerals as well as potentially acid generating sulphide minerals. As such, the NAG test may provide a better estimate of field acid generation than the more widely used ABA method, which defines acid potential based solely on sulphide content independent of the site mineralogy and geology.

The guidelines used for assessing the acid generation potential based on NAG results are summarised in Table 4-5.

Table 4-5: Acid Generation Capacity for NAG (Price, 2009)

Acid Generation Capacity	Final NAG pH
Potentially Acid Generating	<4.5
Non-Potentially Acid Generating	≥4.5

4.2.5 Minerology: X-Ray Diffraction

Minerals are the building blocks of rocks. Mine drainage quality is generally a function of mineral dissolution (or precipitation) during interaction of rocks with water. X-ray Diffraction (XRD) analysis identifies the main crystalline mineral phases in each sample. XRD is conducted on whole rock samples that have been crushed and ground to a powder. The powdered sample is placed on a flat holder, which faces the X-ray beam. The X-rays are diffracted by the crystal planes in the minerals, with diffraction peaks at characteristic angles. The phases are identified by comparing the locations and intensities of the diffraction peak with the peaks of mineral reference standards (Price, 2009). Limitations of XRD are that it is

not easy to identify non-crystalline minerals, and minerals present in low concentrations may not be detected.

4.2.6 Synthetic Precipitation Leaching Procedure

The Synthetic Precipitation Leaching Procedure (SPLP) is a quick and inexpensive method to determine:

- The mobility/leachability of low volatility organic and inorganic analytes in liquids, soils, and wastes.
- The measure of desorption of contaminants from soil (rather than adsorption).
- The possibility of leaching metals into ground and surface waters.
- A site-specific impact to groundwater soil remediation standard.

Since the test uses custom pH levels to simulate rainfall in a particular geographic region, this test is often recommended over other methods when predicting leachate quality and risk to ground water.

Many factors can affect the leaching potential of organic constituents: pH, redox conditions, liquid-to-solid ratio, solubility, partitioning, presence of organic carbon, and non-aqueous phase extraction. Therefore, SPLP concentrations are used as input concentrations to Geochemical models to simulate realistic field conditions and produce more accurate source terms.

4.2.7 Particle Size Analysis of Soils / Sediments

The particle size distribution of a given material is an important analysis parameter in quality control processes and research applications, because many other product properties are directly related to it. Particle size distribution influences material properties like flow and conveying behaviour (for bulk materials), reactivity, abrasiveness, solubility, extraction and reaction behaviour.

4.2.8 Total Digestion Metal Concentrations of Soils / Sediments

Sample preparation for trace metal analysis involves metal digestion, which aims to destroy the sample matrix by adding an acid (oxidizing agent) and treating it with heat. This process removes unwanted components, leaving only the target analyte and achieving homogenization and pre-concentration. ICP-MS analysis requires a pre-treated sample in which the analytes are present in dissolved and measurable form. The results of the analyses will be reviewed to assess if any element is significantly enriched in the soils / sediments sampled.

4.2.9 Cation Exchange Capacity and Bioavailable Nutrients of Soils / Sediments

Cation exchange capacity (CEC) is a measure of the soil's ability to hold positively charged ions. It is a very important soil property influencing soil structure stability, nutrient availability, soil pH and the soil's reaction to fertilisers and scavenging of heavy metals.

The soil capacity to supply nutrients is termed soil nutrient bioavailability and is the ability of the soil system to supply essential plant nutrients for plant metabolism. Release of nutrients from the solid phase to the soil solution is controlled by the physiochemical processes of desorption and dissolution. It is also a biochemical process by way of mineralization.

5.0 Project Team

The project team will be comprised of the following people.

Dr Andrea Baker – Associate Geochemist (Africa)	
Key qualifications	PhD, Biogeochemistry, Stellenbosch University
Experience	Andrea has 10 years geochemistry research and consulting experience which she gained during her PhD and subsequent postdoctoral research fellowship in the Earth Sciences Department at Stellenbosch University. Her research focused on marine/terrestrial water and soil stable isotope and elemental analysis, statistical assessment, geochemical PHREEQC modelling of groundwater quality and soil redox chemistry. Since joining SLR, Andrea has been involved in complex pit water quality modelling closure projects, mining waste source term generation, ground water quality investigations, TSF performance monitoring, waste assessments and site wide acid rock drainage and metal leaching risk assessments for water use and mining licenses applications. Andrea has generated several redox and speciation dependent geochemical source terms for numerical and reactive groundwater models for mine expansion and waste backfilling feasibility studies, as well as risk assessments for ESIA and prefeasibility studies for proposed mines and recommissioning / reclamation of rehabilitated pits and tailings. Andrea is a registered Professional Natural Scientist with SACNASP (Earth Science). As research professional, she has contributed to numerous publications, conference proceedings and technical workshops.
Professional registration	South African Council for Natural Scientific Professional: PrSciNat Reg # 125024
Email address	abaker@slrconsulting.com
Vibhishan Moodley – Project Consultant – Soil Scientist / Geochemist (Africa)	
Key qualification	MSc. Soil Science, University of Pretoria
Experience	Vibhishan has 3 years' experience in the mining industry of which most is associated with the coal mining sector in the Mpumalanga Province. He offers versatile proficiencies in the fields of geology, soil science as well as environmental monitoring and compliance. He holds a MSc in Soil Science from the University of Pretoria. His research focused on the development of soil liming strategies for irrigation with attenuation of acid mine drainage. Since joining SLR, Vibhishan has been involved in the earth sciences service line as a geochemist and soil scientist consultant. He also assists the land quality and remediation team, in the downstream oil and gas retail section.
Email Address	vibhishan.moodley@slrconsulting.com
Stephen Weber - Service Line Director: Earth Sciences, Land Quality & Remediation	
Key qualification	MSc. Environmental Geochemistry, University of Cape Town BSc Eng. Civil Engineering (Environmental Option), University of the Witwatersrand

Experience	Stephen has extensive experience in the Energy, Mining, infrastructure and industrial sectors, assisting numerous global and local organisations, such as BHP Billiton, Anglo American, Newmont, AngloGold, Lonmin Platinum, Plascon, ACSA, Avis, AECI, CABGOC, PetroSA, BP, Sasol, Total Energies, Total Africa, Shell, Engen, JBS, SFF, SANRAL, SANEDI, GIZ, WRC, KfW, SAPREF, TRANSNET, SAPO and Chevron, to name a few. He has over 20 years of management, research and analysis experience and has been exposed to over 1000 petroleum, mining and chemical facilities throughout Africa and South America, namely exploration and active mining operations, onshore & offshore logistical operations, aviation facilities, marine & port environments, refinery & chemical processes, downstream and midstream facilities (including retail, commercial & bulk storage sites) and transport & distribution networks. Stephen has assisted clients with environmental authorisation processes, permitting & compliance matters, supporting acquisitions and divestiture transactions at downstream and midstream facilities, mining waste source term generation, site wide acid rock drainage and metal leaching risk assessments, waste management, emergency response, toxicological risk assessments (human health and ecological), decommissioning of downstream and midstream facilities and contaminated land related issues (in downstream, midstream and upstream environments). Additionally, Stephen has assisted the mining and the infrastructure sector, through the decommissioning/assessment of waste and water treatment facilities, landfill sites, railway yards, marine ports and road and railway networks.
Email address	sweber@slrconsulting.com

SLR reserves the right to substitute these personnel with equivalent resources, if required. Full CV's can be provided on request.

6.0 Programme

The starting date, programme and milestone dates will be confirmed upon receipt of a formal order or formal acceptance of this proposal. Only guideline dates and timelines are provided below.

Project initiation can take place within ten days of receipt of written appointment. It is anticipated that the proposed scope of work can be completed within ~ five months from appointment as per Table 6-1 below.

Table 6-1: Estimated timeframe for completion of study

Weeks from start	Work description
1 - 3	Project initiation, desktop study, site mobilisation and HSSE planning.
4 - 5	Site assessment and sampling visit to Rutongo, Nykabingo and Musha mine sites. 1 day geochemistry workshop.
6 – 8	Shipment of samples to designated laboratories and laboratory admin
9 - 12	Up to 4 weeks will be required to complete the static lab analysis and receive the results.
13 - 20	Once the lab analysis has been received six weeks will be required to complete the geochemical interpretations, modelling and produce the 3 final draft technical reports.

7.0 Cost Estimate

The cost estimate for the proposed work for each mine site is summarised in Table 7-1, Table 7-2 and Table 7-3 below. A breakdown of the cost estimate associated with the specific tasks is provided in Annexure A. The commercial agreement and assumptions relevant to this cost estimate are included in Annexure B.

Table 7-1: Detail of Professional Costs and Disbursements for Rutongo Mine site

Item	Detail	Cost estimate USD (excl. Taxes)
SLR	Professional fees	USD 14 835.00
	Disbursements	USD 1 612.00
Sub-contractors	Specialist Laboratory Analysis	USD 12 216.00
Total (excl. Taxes)		USD 28 663.00

Table 7-2: Details of Professional Costs and Disbursements for Nyakabingo Mine site

Item	Detail	Cost estimate USD (excl. Taxes)
SLR	Professional fees	USD 14 835.00
	Disbursements	USD 1 613.00
Sub-contractors	Specialist Laboratory Analysis	USD 3 649.00
Total (excl. Taxes)		USD 20 097.00

Table 7-3: Details of Professional Costs and Disbursements for Musha Mine

Item	Detail	Cost estimate USD (excl. Taxes)
SLR	Professional fees	USD 14 835.00
	Disbursements	USD 1 613.00
Sub-contractors	Specialist Laboratory Analysis	USD 3 226.00
Total (excl. Taxes)		USD 19 674.00

While SLR has applied our professional expertise in compiling this proposal, it must be noted that the scope of an environmental process is subject to change. The cost provided is an estimate for budget purposes only. Changes to the project scope or environmental process may result in additional costs not provided for in this proposal.

It is assumed that the client has fully disclosed all information that may materially impact the project and the scope of work detailed in this proposal to SLR.

8.0 Conditions of Engagement

The work will be carried out in accordance with the SLR Standard Conditions of Engagement (see Annexure C). An acceptance form to this proposal is provided in Annexure D.

Should the proposal be accepted, it will form the basis of an agreement between SLR and Trinity Metals. The acceptance should be conveyed in writing. Should you need to discuss any aspect of this proposal further please do not hesitate to contact us.

Kind Regards,

SLR Consulting (Africa) Proprietary Limited

Dr Andrea Baker, PhD
Associate Geochemist, Africa
abaker@slrconsulting.com

Stephen Weber, MSc
Service Line Director: Earth Sciences, Africa
sweber@slrconsulting.com

Annexure A Detail of Professional Costs and Disbursements

ITEM NO.	DESCRIPTION OF SCOPE OF WORK	TOTAL HOURS	TOTAL PROF	TOTAL DISB	TOTAL
	Rutongo Mine				
1	Project Initiation and Administration				
1.1	Project meetings	4	340	26	366
1.2	Project management and admin	8	960	72	1 032
2	Desktop research				
2.1	Gap analysis and request for information	3	220	17	237
2.2	Desktop study	3	220	17	237
2.3	Sampling plan development and protocols	3	220	17	237
3	Site assessment by Geochemist & Soil Scientists				
3.1	Mobilisation, H&S procedures, workshop prep	11	1 000	75	1 075
3.2	In country site visit and workshop (5 days)	62	5 340	401	5 741
3.3	Travel, per diems and sampling supplies	20	1 700	628	2 328
4	Soil laboratory analysis (24 samples)				
4.1	Sample prep and lab liaison	2	100	5 081	5 181
4.2	Particle size analysis, pH, EC, CEC, bioavailable nutrients, OM				
4.3	Total and leachable metals				
5	Geochemical laboratory analysis (12 samples)				
5.1	Sample prep and lab liaison	2	240	7 160	7 400
5.2	Total concentrations on solids for waste classification				
5.3	Total leachable on solids for waste classification				
5.4	Acid Base Accounting and sulfur speciation				
5.5	Net Acid Generation and carbon speciation				
5.8	XRD minerology				
5.9	Synthetic precipitation leachate procedure for modelling				
6	Geochemical and soil assessments				
6.1	Baseline soil assessment	5	320	24	344
6.2	Waste Classification of legacy tailings	4	270	20	290
6.3	Geochemical risk assessment of legacy tailings	6	440	33	473
6.4	Source terms modelling	6	440	33	473
7	Mitigation measures to inform management plans	7	685	51	736
8	Reporting				
8.1	3 draft reports with reviews	26	2 070	155	2 225
8.2	Final reports	4	270	20	290

ITEM NO.	DESCRIPTION OF SCOPE OF WORK	TOTAL HOURS	TOTAL PROF	TOTAL DISB	TOTAL
	Nyakabingo Mine				
1	Project Initiation and Administration				
1.1	Project meetings	4	340	26	366
1.2	Project management and admin	8	960	72	1 032
2	Desktop research				
2.1	Gap analysis and request for information	3	220	17	237
2.2	Desktop study	3	220	17	237
2.3	Sampling plan development and protocols	3	220	17	237
3	Site assessment by Geochemist & Soil Scientists				
3.1	Mobilisation, H&S procedures, workshop prep	11	1 000	75	1 075
3.2	In country site visit and workshop (12 days)	62	5 340	401	5 741
3.3	Travel, per diems and sampling supplies	20	1 700	628	2 328
4	Soil laboratory analysis (6 samples)				
4.1	Sample prep and lab liaison	2	100	1 276	1 376
4.2	Particle size analysis, pH, EC, CEC, bioavailable nutrients, OM				
4.3	Total and leachable metals				
5	Geochemical laboratory analysis (4 samples)				
5.1	Sample prep and lab liaison	2	240	2 399	2 639
5.2	Total concentrations on solids for waste classification				
5.3	Total leachable on solids for waste classification				
5.4	Acid Base Accounting and sulfur speciation				
5.5	Net Acid Generation and carbon speciation				
5.8	XRD minerology				
5.9	Synthetic precipitation leachate procedure for modelling				
6	Geochemical and soil assessments				
6.1	Baseline soil assessment	5	320	24	344
6.2	Waste Classification of legacy tailings	4	270	20	290
6.3	Geochemical risk assessment of legacy tailings	6	440	33	473
6.4	Source terms modelling	6	440	33	473
7	Mitigation measures to inform management plans	7	685	51	736
8	Reporting				
8.1	3 draft reports with reviews	26	2 070	155	2 225
8.2	Final reports	4	270	20	290
	Musha Mine				
1	Project Initiation and Administration				
1.1	Project meetings	4	340	26	366
1.2	Project management and admin	8	960	72	1 032

ITEM NO.	DESCRIPTION OF SCOPE OF WORK	TOTAL HOURS	TOTAL PROF	TOTAL DISB	TOTAL
2	Desktop research				
2.1	Gap analysis and request for information	3	220	17	237
2.2	Desktop study	3	220	17	237
2.3	Sampling plan development and protocols	3	220	17	237
3	Site assessment by Geochemist & Soil Scientists				
3.1	Mobilisation, H&S procedures, workshop prep	11	1 000	75	1 075
3.2	In country site visit and workshop (12 days)	62	5 340	401	5 741
3.3	Travel, per diems and sampling supplies	20	1 700	628	2 328
4	Soil laboratory analysis (4 samples)				
4.1	Sample prep and lab liaison	2	100	853	953
4.2	Particle size analysis, pH, EC, CEC, bioavailable nutrients, OM				
4.3	Total and leachable metals				
5	Geochemical laboratory analysis (4 samples)				
5.1	Sample prep and lab liaison	2	240	2 399	2 639
5.2	Total concentrations on solids for waste classification				
5.3	Total leachable on solids for waste classification				
5.4	Acid Base Accounting and sulfur speciation				
5.5	Net Acid Generation and carbon speciation				
5.8	XRD minerology				
5.9	Synthetic precipitation leachate procedure for modelling				
6	Geochemical and soil assessments				
6.1	Baseline soil assessment	5	320	24	344
6.2	Waste Classification of legacy tailings	4	270	20	290
6.3	Geochemical risk assessment of legacy tailings	6	440	33	473
6.4	Source terms modelling	6	440	33	473
7	Mitigation measures to inform management plans	7	685	51	736
8	Reporting				
8.1	3 draft reports with reviews	26	2 070	155	2 225
8.2	Final reports	4	270	20	290
	TOTALS	**528**	**44 505**	**23 929**	**68 434**
	TOTAL (Excl Taxes)	**USD**	**68 434**		

Annexure B Commercial Agreement and Assumptions

Commercial Agreement

- The work will be carried out in accordance with the SLR Standard Conditions of Engagement).
- In the event that Trinity Metals places a formal order on SLR with different terms and conditions to those contained in this letter, and if SLR has already been instructed to proceed with the work by Trinity Metals the terms and conditions as set out hereunder shall apply from the time of notification to proceed with the work to the time that such an order is signed and accepted by both parties. Any work undertaken between the date of acceptance of this proposal and the date of acceptance of the client's order or any revised conditions, shall be in accordance with the terms and conditions set out in this proposal.
- SLR's invoices will be in US Dollars (USD) and will exclude all taxes and levies (VAT, NHIL etc.) where applicable. In the event that withholding tax is applicable, the client will be responsible for the calculation, withholding, paying and securing of the withholding tax certificate from the appropriate tax authority. The client will comply with the agreed payment terms and will timeously pay SLR, regardless of any withholding taxes payable, the amount after the withholding tax % is applied. The client will remain indebted to SLR until the withholding tax certificate, which is issued by the tax authorities as proof of payment of the withholding tax, is provided to SLR.
- All amounts due to SLR in accordance with this Agreement shall be paid within 30 days of the date of SLR's invoice.
- The work will be charged on a Fixed price basis as per Table 7-1, Table 7-2 and Table 7-3. SLR reserves the right to adjust the allocations of the budgets per work scope item whilst maintaining the total as per the budget.
- Note: In the event that the activities described extends across calendar years, SLR reserves the right to escalate the fees at an inflation rate to be discussed and agreed with the client.
- In the event that the project is put on hold for more than one-month SLR reserves the right to invoice for all work up to that point irrespective of any agreed payment schedule.
- A professional indemnity insurance policy is maintained by SLR. Professional indemnity insurance cover up to a maximum value of twice the fee value is included in the cost of this proposal.
- This proposal has taken into consideration certain known measures and controls that may be required due to pandemics. SLR notes that the full impacts of pandemics are not fully understood. The proposed scope of services, cost and schedule do not consider additional potential impacts caused by a pandemic, beyond what has been described in the proposal. Any adjustments required due to any additional impacts to accommodate pandemic related concerns (including but not limited to travel restrictions, projects delays, economic interruption, supply chain issues, or any governmental guidance) will require an equitable adjustment in scope, schedule and cost.
- The content of this proposal is the intellectual property of SLR and should not be shared with any third party for any purpose without prior written consent from SLR.

Cost Estimate Assumptions

- Air travel, taxi, parking, accommodation and subsistence will be charged at cost plus 10%.
- Laboratory services and sub-consultants will be charged at cost plus 10 %.
- Mileage will be charged at USD 0.60 cents / km.
- 7.5% of professional fees has been included in the budget and will be charged for incidental office expenses such as IT, telephone, minor printing, etc.
- Incidental printing jobs (on all printers and plotters at SLR), that are not separately priced in the proposal/tender/contract are covered by the mark-up on professional fees.
- SLR reserves the right to postpone or cancel any SLR site visits if the area or proposed travel route is perceived to be unsafe by the SLR Health and Safety management team.
- This proposal will only remain valid for a period of 30 days from 10 December 2024.
- The cost estimate (Table 7-1, Table 7-2 and Table 7-3) only provides for the scope of work as set out, subject to the assumptions set out in Annexure B. Any additional work forming part of an appointment will require an adjustment to the cost estimate.
- SLR will be provided with all relevant project documentation, including applicant information, property information shapefiles of the site and sufficient activity detail in order to describe the project and all its alternatives. If the figures, drawings, or data are in a format that requires additional work, this may require an adjustment to the cost estimate.
- SLR would be provided all the required information timeously, in order to ensure that the deadlines and budgets can be met.
- Client review periods are reasonable so as not to delay the process, and the number of iterations and reviews are agreed upon as soon as possible after commissioning.
- Documentation will be prepared in English only. No allowance is included for translation
- No allowance is included for laboratory test work or field measurements, except where expressly provided for in the scope.
- Client will be responsible for transporting the soil and tailings samples to a designate certified laboratory. If the samples must be shipped outside the country, client to secure the services of an international courier company that facilitates custom clearance in both the exporting and importing country and provides door to door delivery.
- Client will source sampling consumables (bottles / sample bags etc.).
- While SLR has applied our professional expertise in compiling this proposal, a conservative estimate of the number of samples (Table 4-1) to be analysis has been included in the costing. This number will be confirmed once the infield assessment has been completed. If the study requires additional samples to ensure a comprehensive study, in agreement with the client, a variation order will be submitted to the client for approval.

Annexure 2:

GroundTruth Input into Phase 1 of the Legacy Tailings Management and River Rehabilitation Programme for Trinity Metals Concessions, Rwanda

GroundTruth
environment & engineering
email: admin@groundtruth.co.za
www.groundtruth.co.za
Tel: +27 33 343 2229

Project Ref: GT1377/201124/01

20 November 2024

Attention: Joanne Daneel
Trinity Metals
cc: Sam Ryumugabe

Dear Jo

Re: Input into Phase 1 of the Legacy Tailings Management and River Rehabilitation Programme for Trinity Metals Concessions, Rwanda.

GroundTruth take pleasure in confirming the Scope of Works (SoW) for input into Phase 1 of the development of a Legacy Tailings Management and River Rehabilitation Programme for all three of Trinity Metals mining concessions, namely Rutongo Mine; Trinity Nyakabingo Mine; and Trinity Musha Mine.

The project team's involvement in the programme, will focus on the following Phase 1 tasks for each of the concession areas:

- Input into the Stakeholder Engagement Plan (SEP) to facilitate input and feedback into the river rehabilitation and management strategies.
- Undertaking a comprehensive source, pathway and receptor analysis of potential contamination, including a review of gaps in relevant baseline ESIA assessments. Additional assessments will be undertaken if necessary.
- Determining ecological health and developing an understanding of the drivers of the river and wetland ecosystems.
- Ecosystem goods and services (EGS) must be identified and assessed to ensure sustainable and equitable benefits for the environment and community while maintaining economic viability. This process will include an ecosystem services assessment (ESA) in accordance with International Finance Corporation (IFC) Performance Standard 6 (PS6).
- Determining flood lines for major streams, including deriving flood events under project climate change scenarios.
- Modelling catchment hydrological flows and sediment movements to characterize present and future flows and movements.

As requested, additional tasks have been included for consideration by Trinity Metals:

- A hydrocensus will be undertaken to collect information regarding community water use and water-related issues (e.g. potential pollution).

- Reviewing existing data and updating the water quality monitoring protocols and sites to be monitored. This will include the development and implementation of an online water quality monitoring database and dashboard.

Input into the Stakeholder Engagement Plan (SEP)

The project team will provide input into the **Stakeholder Engagement Plan (SEP)**, to be developed in other aspects of the project. This will allow key stakeholders to be engaged during the development of the river rehabilitation management strategies. This will include the identification of stakeholders that can influence or be influenced by the project and its outcomes and understanding each stakeholder's influence and impact on the project and the site's ecosystem goods and services, as prioritizing ecosystem goods and services will be informed by stakeholder engagement. Furthermore, this will allow the co-development of solutions, alternative livelihoods, and prioritizing ecosystem services, which empowers local communities. Stakeholders from various categories will be involved throughout the project at all three sites, informing implementation and refining engagement approaches. The goal is to foster effective dialogue, collaboration, and efficient information communication.

Desktop mapping and Geographic Information System data derivation.

Desktop mapping and deriving spatial coverages of the various features within the study area will be undertaken to inform each of the following aspects of the projects, with spatial data being critical to derive information that relates to the sources, pathways and receptors, freshwater ecosystems, ecosystems goods and services, catchment hydrological and flood analyses, the hydrocensus, and the water quality monitoring. This will include specialist GIS analyses and modelling to provide spatially robust information that can be presented as visual maps to enhance the various specialist studies, as well as to guide enhance and guide stakeholder engagements and management decisions. Where possible, GroundTruth will look to work alongside Trinity Metals employees and/or appointed GIS consultants to facilitate the supply of the required data.[1]

Source, pathway and receptor analysis

A systematic assessment of sources, pathways, and receptors of potential contaminants will be conducted to help understand the environmental risks associated with the past (e.g. legacy tailing) and current mining operations, including illegal artisanal mining. The outputs from this process will be used to guide and prioritize management actions required to mitigate contamination risks through rehabilitation and ecosystem restoration. The source, pathway and receptor analysis will commence with a review of baseline ESIA assessments to gather and analyze existing hydrological, groundwater, water quality and geochemistry data and how data is spatially and temporally distributed across the three mining concessions and associated catchments. Key information gaps relating to catchment characteristics, water sources, surface water and groundwater flows, soil and water chemistry, heavy metals, nutrients, sedimentation, etc. will be identified from the outset to ensure that these gaps can be addressed through additional desktop assessments, field studies and data collection where necessary. Sources of water and contamination will be identified and mapped in relation to existing receptors within the landscape context of each site. The level of contamination risk will be determined using available limits considered safe and/or acceptable for human and ecosystem wellbeing. The pathways along which contaminants travel from sources to receptors will be determined based on surface runoff and groundwater flow patterns, which will be informed by the surface water and

[1] It is understood that additional budget is available for Trinity Metals to expand the GIS outputs from the broader project, which is likely to include local consultants, and as such GroundTruth undertakes to interact with the broader team in this regard.

groundwater hydrological modelling. Depending on the various combinations of source-pathway-receptor profiles identified, mapped and assessed, important and/or sensitive receptors (e.g. drinking water sources, aquatic ecosystems, communities, etc.) will be highlighted and used to inform the Legacy Tailings Management and River Rehabilitation Programme. It is important to note that although GroundTruth will principally drive this process, it will be important to involve and integrate findings from other role players, particularly in terms of groundwater and geochemistry studies – which are currently being initiated by Trinity Metals.

Freshwater ecosystem assessments

The project focuses on freshwater ecology, which significantly influences biodiversity patterns, ecosystem functions, and the delivery of ecosystem goods and services. The study will assess freshwater systems, distinguishing between riverine and wetland ecosystems, and recognizing their landscape linkages. IFC PS6 emphasizes the need to identify and assess natural and critical freshwater habitats at risk from project developments. The freshwater ecosystem assessments will characterize and map wetland and riverine habitats (and associated biodiversity) based on their ecological patterns/processes and landscape positions. A desktop review using high-resolution aerial imagery, proposed mining layouts, historical data, topographical maps, and contour data will establish the baseline extent of wetland and riverine habitats. Outputs from the mapping will guide future studies and measurements, and identify key sites for vegetation sampling and determination of present ecological state (PES)/condition.

The approach that will be followed to assess riverine and wetland ecosystems will be as follows:

- Undertaking desktop studies and field-based surveys of associated ecosystems within the area of influence for each site;
- Characterise patterns and processes of freshwater systems in terms of biota (i.e. fauna and flora), vegetation, hydrology, geomorphology, etc.;
- Establish baseline ecological conditions/PES, as well as the provision of ecological benefits and services.
- Highlighting any species of conservation concern (i.e. rare, endemic, Red Data species), in particular species that trigger Criterion 1 to 3 IFC PS6 that will need to be considered in the CHA; and
- Identifying and assessing key indicators suitable for monitoring (e.g. biomonitoring) and determining additional *in-situ* water quality indicators for assessment and longer-term monitoring.

In-field surveys of rivers and wetlands will include the collection of data to determine system drivers, focusing on assessment of freshwater ecosystem condition and functioning. This will include on-site observations regarding ecosystem characteristics, impacts/disturbances, vegetation communities, aquatic biota (e.g. fish, macroinvertebrates, diatoms), water quality, etc. This information will be used as the baseline against which the site activities can be monitored into the future. Importantly, the use of specific wetland and river habitat assessment tools will facilitate the reporting of different scenarios (i.e. current vs. post-development or post-rehabilitation) thereby enhancing EGS reporting requirements. In addition, the usefulness of ecological monitoring techniques is to provide detailed information in terms of various factors that affect the receiving and downstream freshwater environments thus providing an integrated understanding of impacts occurring within the catchment areas.

Ecosystem Goods and Services Assessments.

Ecosystem goods and services (EGS) must be identified and assessed to ensure sustainable and equitable benefits for the environment and community while maintaining economic viability. This project will conduct an ecosystem services assessment (ESA) in accordance with International Finance Corporation (IFC) Performance Standard 6 (PS6). PS6 recognizes biodiversity's importance in delivering valued ecosystem services, and

impacts on biodiversity can affect service delivery. The ESA will focus on two groups of ecosystem services: those impacted by the project and communities (e.g. erosion, soil loss, sedimentation, biodiversity, etc.) and those the project depends on (e.g. heavy metal resources, water supply, flood atienuation, etc.). Key challenges to the provision of goods and services include river system degradation due to extensive tin and aggregates mining, poor soil retention by gum trees, and flood atienuation issues in the wetlands. However, atier implementation of potential river and wetland rehabilitation interventions, the landscape could offer improved ecosystem goods and services, such as betier runoff management, soil stability, crop yields, water quality, and biodiversity conservation. The assessment of ecosystem goods and services (EGS) in the study sites will involve using modelling tools and toolkits such as Final Ecosystem Goods and Services (FEGS), Toolkit for Ecosystem Services Site-Based Assessments (TESSA), and Integrated Valuation of Ecosystem Services and Trade-offs (InVEST). These tools can be linked to other modelling tools (e.g. ACRU for hydrological modelling). Additionally, the assessment will consider alternative livelihoods and ecosystem goods that could be introduced into the landscape to build socio-economic resilience. For example, climate and soil suitability will be evaluated to determine the potential for planting spice trees or crops as alternative income sources through profitable and innovative subsistence farming practices. This approach ultimately aims to improve the resilience of the natural environment and nearby communities.

Catchment Hydrological and Sediment Modelling

The hydrological assessment will utilise GIS spatial data and historical rainfall records to perform hydrological modelling of the catchments. The scope of work covered by the hydrological assessment includes:

- Modelling of hydrological flows generated by the catchment, under both the present landcover scenario, and in comparison, to future potential land use/landcover changes;
- Drawing on the above studies, provide a discussion of the potential impacts of land use/landcover changes on the hydrology of the receiving systems; and
- Provide recommendations to mitigate the impact of the changes in hydrology on the receiving catchments and users.

To undertake the hydrological modelling to the desired level of detail and confidence, a daily timestep process-based model, such as the ACRU model, is envisaged, to be used. Essentially, this model relies on input data and then processes this information to determine hydrological outputs. Hence, it can be utilised, in conjunction with the latest available outputs from multiple Global Circulation Models (GCMs), as inputs to simulate projected future impacts of climate change on the hydrology of these systems. The hydrological modelling component of the study broadly comprises of the following tasks:

- A detailed sequence of GIS-derived workflows;
- Design rainfall estimation;
- The estimation of design floods to inform the flood line modelling where the flood estimates also include climate change scenario projections;
- Estimation of present water flows from the catchment; and
- Estimation of water flows from the catchment for future potential land use and landcover changes.

It is important to highlight that the design flood estimates will be done for the 1:2 to 1:100 year Return Periods (RPs). The abovementioned process will be subject to oversight and review by Prof. Jeff Smithers, with predefined steps being subject to review and signoff, both internally and externally i.e. the proposed approach and results of the data analysis will be shared with both the tailings and mine closure specialists for review, comment and signoff to ensure alignment on the outputs of the studies.

In addition, a detailed geomorphic appraisal is essential to understand and predict flooding and sediment dynamics in river and floodplain wetlands within the concession areas. This appraisal will inform the impact of

proposed rehabilitation approaches by examining sediment regimes, which are crucial for creating physical habitats and supporting ecosystems. Both natural and human-induced disturbances can significantly alter these regimes, affecting morphology, downstream users, and ecosystem services. Given the complexity and variability of sediment regimes, especially in modified landscapes, a spatially explicit sediment modelling framework will be applied at both catchment-wide and local scales, aiding in the planning and prediction of current and future sediment transport scenarios.

Flood Line Determination

The flood line determination will be done for only major rivers directly associated with the mining activities, which impact downstream users within each concession area, on the assumption that accurate and detailed survey data of these watercourses and surrounding areas will be provided. Ideally, this survey data should be obtained through recent high resolution LiDAR surveys.

Using the results from the hydrological modelling component described above, flood lines will be developed for each concession area, including projected flood events under climate change scenarios. The flood lines will be determined for the same RPs as the hydrological modelling. The peak discharge relating to the associated flood event will be used to determine the corresponding flood inundation.

A digital terrain model (DTM) will be developed from the high resolution remotely sensed survey data and used in a HEC-RAS (Hydrologic Engineering Center-River Analysis System) 2D model, along with the hydrological inputs, land cover roughness values, and hydraulic infrastructure details to generate the relevant flood lines. Generally, the 1:100 year RP or lower floodlines are sufficient for ecological and environmental engineering purposes. Nevertheless, the hydrological modelling and floodline estimation processes will be subject to oversight and review by Prof. Jeff Smithers, with predefined steps being subject to review and signoff, both internally and externally i.e. the proposed approach and results of the data analysis will be shared with both the tailings and mine closure specialists for review, comment and signoff to ensure alignment on the outputs of the studies.

Hydrocensus

A hydrocensus will be undertaken to collect information regarding community water use and water-related issues (e.g. potential pollution). This will be done in a systematic manner within the respective study areas and associated catchments. The freshwater ecologist team will assist with identification, recording and assessing water sources (e.g. springs, wells, boreholes, water pumps, water storage systems, etc.) encountered during the baseline field assessments. A hydrocensus form will be created prior to field studies to ensure that key questions regarding water use, demands, source type, condition are captured. The hydrocensus forms will also help facilitate the social engagement team when undertaking discussions with community members. The community engagements will be structured so as to target the full spectrum of water users present in the study areas. All data collected from the hydrocensus will be collated, captured, and analysed. The output results will be used to help identify and prioritise areas/communities requiring water supply interventions/schemes. Recommendations will be provided for specific water resource management and protection measures that will build a more resilient and sustainable future for local communities.

Water Quality (WQ) Monitoring Protocols

All existing WQ data will be reviewed and analysed to update the WQ Monitoring Protocols and sites for monitoring WQ. In addition, the GroundTruth team, through consultation with Trinity Metal's environmental management team, will develop and implement an online WQ monitoring database and dashboard that will facilitate and optimise the future monitoring and engagement of projects.

Specialist Team

Due to the nature of the study, the project team consists of multiple team members to ensure that the project objectives can be met. All GroundTruth team members have comprehensive experience in projects involving the rehabilitation of ecosystems and the implementation of rehabilitation/creation activities and its associated monitoring (**Table 4**). It should be noted that GroundTruth will be working in collaboration with associates, including François-Xavier Tetero[2] (Water Resource Management Specialist), Michelle Browne (Environmental Economist), and Prof. Jeff Smithers (Engineering and design hydrology and Flood hydrology) to achieve the project objectives.

Table 4 Team members, roles, experience levels and qualifications

Key Person Name	Proposed Function	Experience Levels	Qualifications
Mark Graham	Senior Ecologist	30+ years' experience in the environment and water sector specialising in : • Terrestrial and aquatic ecosystem functioning; • Water resource and water quality management; • Understanding of community development projects, particularly those involving citizen science as well as large infrastructural and mining operations/projects	Ph.D (Botany,) MSc (Biological Sciences) BSc (Agriculture) - Majoring in Rangeland Ecology
François Xavier Tetero	Water Resources Management Specialist	>15 years' of experience in the fields of • Sustainable water management & development; • Watersheds management; • Transboundary water cooperation; • Climate resilience with focus on urban resilience institutional development; and • Projects' development & management.	MSc (Water Resources and Environmental Management)
Gary de Winnaar	Biodiversity Specialist	16 years' experience in terrestrial and aquatic biodiversity studies, including: • Terrestrial and aquatic biodiversity surveys including fauna and flora and IFC Critical Habitat Assessments; • River biomonitoring and E-flows; • GIS mapping, modelling and spatial analyses, and risk/ vulnerability assessments; • Invasive alien plants – assessments & management; • Offsets, rehabilitation, etc.	B.Sc (Zoology & Hydrology), MSc (Hydrology), Pr. Sci. Nat. - Ecology
Juan Tedder	Ecologist	15 years' experience ranging from: • The application of various indicators of ecological health, namely benthic diatoms, macroinvertebrates, fish and riparian vegetation; • Routine and ad-hoc monitoring of water quality and river health for development construction and operational phases, as well as, following toxic material spills; • Providing specialist inputs into implementation of water quality monitoring plans associated with numerous large development projects; and • Providing specialist input into various studies covering water related issues.	B.Sc. (Honours) – Majoring in Environmental Monitoring and Modelling B.Sc. (Ecological Sciences) – Majoring in Wildlife Science. DWS SASS5 Accreditation
Simlindile Mahlaba	Environmental Scientist, Social and Stakeholder	5 years of experience in the environment sector, including:	MSc (Environmental

[2] While François-Xavier Tetero forms part of GroundTruth's team to undertake the studies, Trinity Metals will need to confirm if his involvement would be subject to an independent contract due to tax implications.

Key Person Name	Proposed Function	Experience Levels	Qualifications
	Engagement Consultant	• Integrated environmental management planning and implementation • Climate change adaptation and mitigation • Water resource management • Catchment management and rehabilitation • Stakeholder engagement and social facilitation • Environmental research and GIS	and Geographical Science), BSc (Hons) Environmental and Geographical Science BSc. Environmental and Geographical Science and Geo-Informatics
Michelle Browne	Environmental Economist	11 years' of experience in environmental economics, including: • Application of environmental and ecological economic theory and methods; and • Socio-ecological interactions taking into consideration key issues including poverty, inequity, land degradation and climate change.	Ph.D (Economics, Environmental & Natural Resources) MSc (Agricultural Economics) BSc (Agric) - Agribusiness
Craig Cowden	Wetland Specialist	24 years' experience, with input into various wetland studies, including: • Mapping/inventories, delineation and assessments; • Rehabilitation planning; • Wetland creation; • Mitigation and offset requirements; • Wetland rehabilitation implementation support; and • Monitoring and evaluation of wetland rehabilitation.	M.Sc. (Environmental Science) BSc (Agriculture) – Majoring in Wildlife Science Pr.Sci.Nat - Ecology
Fiona Eggers	Wetland Specialist	13 years of experience, with input into various wetland studies: • Delineation; • Assessments; • Rehabilitation planning; • Monitoring and evaluation of wetland rehabilitation projects; • Mitigation & offset studies; and • Wetland creation.	M.Sc. (Botany) Pr.Sci.Nat. – Ecology UNESCO-IHE – Online course on Constructed wetlands for wastewater
Steven Ellery	Wetland Specialist	6 years of experience, with input into various wetland studies including: • Delineation; • Assessments; • Rehabilitation planning; • Monitoring and evaluation of wetland rehabilitation projects; • Wetland geomorphology studies; • Soil conservation and soil transportation studies; and • Wetland monitoring using UAV technology	M.Sc. (Geography with a focus on wetland geochemistry and geomorphology) Pr.Sci.Nat. – Ecology Registered UAV Pilot
Trevor Pike	Environmental Engineer	25+ years' experience, with input into various environmental engineering studies, focusing on: • Wetland rehabilitation and constructed wetland design; • Stormwater management; • Project management	B.Sc. (Agricultural Engineering) Pr.Eng

Key Person Name	Proposed Function	Experience Levels	Qualifications
Prof. Jeff Smithers	Agricultural/Bioresources Engineering and Engineering Hydrology	40+ years of academic and consulting experience, including: • Design and engineering hydrology; • Soil and water conservation engineering; and • Agro-hydrological and water resources simulation model development and application.	PhD (Engineering) Pr.Eng
Tyler Harvey	Environmental Engineer	6 years' of experience, with input into various environmental engineering studies, focusing on: • Hydrological and hydraulic modelling; • Wetland rehabilitation / constructed wetland design; • Wetland rehabilitation setting out and implementation support; • Earthworks design and quantification using Model Maker Systems; • Soil conservation plans; • Surveying and analysis of survey data; • Stormwater management plans and flood mitigation plans; and • Flood line and flood risk assessments using HEC-RAS and mapping using GIS.	B.Sc. (Agricultural Engineering)
Keanu Singh	Hydrologist	5 years' of experience, with input into various environmental engineering studies, focusing on: • Hydrological and hydraulic modelling; • Flood line and flood risk assessments.	M.Sc. (Hydrology)

Previous Experience

The project team has been involved in several rehabilitation and creation projects over the last few years. Recent projects have been included to illustrate the teams experience in this field (**Table 5**)

Table 5 Recent project experience of the project team

Client	Nature of Work	Completion Date/Status
Letšeng Diamond Mine	Creation of wetland habitat and implementation support along the Qaqa River in the Lesotho Highlands.	The creation plan was submitted in June 2012. The implementation support was completed by June 2013
Exxaro Belfast[3]	The initial wetland rehabilitation planning involved a week-long site visit with wetland ecologists and engineers to determine the best means to improve the functioning and integrity of the wetland systems remaining within the post-mine development landscape. Once this was approved by authorities, intensive onsite implementation support was provided	Onsite rehabilitation plan submitted in November 2016. Construction completed in 2020
Exxaro Grootegeluk[4]	Principle agent and wetland supervision for pan creation within the Grootegeluk mine.	2021
Letšeng Diamond Mine	Wetland creation plan for the RTZ valley.	The creation plan was submitted in 2023.
Aurecon / Zutari	Working for Wetlands: Oversight of rehabilitation planning for the Free State, KwaZulu-Natal and Eastern Cape Provinces	2016-2021
C40 City Finance Facility (CFF)	River Vulnerability Assessment and Proto-Masterplan for the Ohlanga Catchment to inform the Business Case for Durban's Transformative Riverine Management Programme (TRMP)	2020
C40 City Finance Facility (CFF)	Transformative adaptation of rivers in an urban context: An ecological infrastructure and socio-ecological toolkit	2020
Development Bank of South Africa	Mapping and prioritisation for maintaining and/or rehabilitating ecological infrastructure for the uMngeni Catchment, and development of management and investment plans for the Green Fund Project "Investing in ecological infrastructure to enhance water security in the uMngeni River catchment".	2014-2015
eThekwini Municipality (funded by AFD – Agence Française de Développement)	AFD CICLIA Durban Transformative Riverine Management Programme Support Project, assisting eThekwini Municipality by developing four Catchment Partnership Development Frameworks and eight Precinct Business Management Plans within the Ohlanga, uMhlangane, Palmiet and uMhlatuzana Catchments in the Durban area by identifying and assessing current water quality and flood risks, and to propose recommendations on how risks	2022

[3] Please refer to the video link of the work undertaken at Belfast https://youtu.be/8NVKgDZN33E

[4] Please refer to the video link of the work undertaken at Grootegeluk https://youtu.be/hxadmmh-gWQ

Client	Nature of Work	Completion Date/Status
	and issues can be prioritized and addressed by developing, while building on strengths of collaborative involvement of various stakeholders.	
Swedish Agency for Marine and Water Management (SwAM)	Socio-Economic Analysis of the Costs of Inaction of Plastic Debris Leakage into the uMngeni River Catchment in KwaZulu-Natal, Durban, South Africa	2022
Water Research Commission and the Department of Water and Sanitation	Updating the 2014 Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) Database for Rivers from within the Inkomati/Usuthu catchment and Pongola to Mtamvuna Water Management Area, with inclusion of wetlands and estuaries.	Current (2023-2025)
Willowton Group Facility (Pietermaritzburg)	Monitoring river health and functioning following the Willowton oil and grease spill into the Baynespruit and Duzi Rivers of the uMngeni Catchment, including a reintroduction of fish, notable *Labeobarbus natalensis*	2019-current (ongoing)
ERM and Globeleq	Environmental flows (E-flows) assessment for a hydroelectric project on the Kalungwishi River in the Northern Province of Zambia	2017-2018
Naidu Consulting	Hammarsdale Dam: Wetland creation and implementation plan Conceptual design for the creation of wetland habitat within the basin of the Hammarsdale Dam, to 'polish' the effluent originating from the Waste Water Treatment Works (WWTW) and base flows of the Sterkspruit River	November 2013
PE Continental	Legionella and water quality monitoring and stormwater contamination treatment plant development	2016-2019
Glencore	Groundwater remediation piloting and in situ site treatment solutions	2017-2019
Mauritius Government	Port Louis Ring Road and materials borrow pit geotechincal investigation	2000

Deliverables

The following deliverables, in terms of reports and GIS data, are envisaged from the abovementioned project tasks:

- Reports
    - Source, pathway and receptor analysis
    - Ecological health and drivers of the river and wetland ecosystems.
    - Ecosystem Goods and Services Assessments.
    - Hydrological study report including maps of the catchment boundaries, design flood volumes and peaks for the 1:2 to 1:100 year RP events under selected land use/landcover change scenarios.
    - Sediment balance and geomorphology assessment
    - Estimated hydrological flows and sediment movements
    - Flood line report including floodlines for the 1:2 to 1:100 year RPs, including selected climate change scenarios.
    - Hydrocensus report
    - Monitoring
- Spatial coverages (in the specified datum and projection, including metadata files)
    - Extent of freshwater ecosystems (rivers and wetlands) and the disturbance units and habitat/system types
    - Extent of freshwater ecosystem catchments and landcover mapping within those catchments following the WET-Health (Version 2) landcover classification system.
    - Location/extent of sources, pathways and receptors of pollutants
    - Location/extent of priority ecosystems in terms of ecosystems goods and services and those communities reliant on these resources
    - Catchment boundaries and floodlines for major streams for selected RPs.
    - Baseline sediment flow paths and sediment flux values and spatial representation of sediment accumulation/erosion risk areas. Location and extent of major sediment sources and major sediment sinks.
    - Location of community water sources (springs) and nature of use
    - Water quality monitoring locations
- Water quality monitoring database and dashboard, incorporating existing and future data.

Assumptions

The following assumptions are made related to the hydrological modelling:

- The client will supply high resolution elevation data to GroundTruth, and
- All climatic and catchment specific data such as rainfall, soil information temperature, evaporation will be made available to GroundTruth.

Budget

The following budget has been derived based on GroundTruth's understanding of the project objectives and the key tasks, and represents the professional fees associated with the required studies. It is understood that disbursements costs, in terms of laboratory fees, travel, accommodation and subsistence costs will be facilitated through Trinity Metals procurement processes.

KEY TASKS (DFC TA Grant)	**DELIVERABLES**	**COSTS (US $)**
4.1 Development of a Scope of Works (incl. workshops and meetings)	**4.1.1. Detailed SOW, R&R and Programme for the TM&RR project**	**$ 20 100**
Input into the Stakeholder Engagement Plan (SEP) to inform river rehabilitation and management strategies.		**$16 650**
4.3 Desktop mapping and Geographic Information System data derivation.	**4.3.1. Mapping of all sources and receptors of contamination and GIS Analysis**	**$ 24 950**
Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.		**$ 23 900**
Hydrocensus – location of community water sources (springs) and nature of utilisation.		**$ 10 550**
4.2 Baseline Assessments: a. Ecological health and drivers of the river and wetland ecosystems.	**4.2.4. Determination of the PES of all the river systems**	**$ 49 700**
Ecosystem Goods and Services Assessments.	**4.2.5. Ecosystem Goods and Services Assessment**	**$ 36 900**
4.5 Modelling catchment hydrological flows and sediment movements.	**4.5.1. Catchment hydrological models**	**$ 65 450**
4.4 Determining flood lines for major streams, including climate change scenarios.	**4.4.1. Floodline Determination Report**	**$ 47 200**
Sub-Total		**$ 295 400**
OTHER TASKS (Trinity Cost-Share)		**COSTS (US $)**
4.10 Reviewing water quality monitoring protocols including the development of an online water quality monitoring database and dashboard.	**4.10.1. Water quality monitoring database and dashboard, incorporating existing and future data**	**$ 18 650**
Sub-Total		**$ 18 650**
TOTAL		**$ 314 050**

Programme

The following programme has been derived for the envisaged Phase 1 studies:

Project Tasks	Jul to Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25
Development of a Scope of Works (incl. workshops and meetings)								
Input into the Stakeholder Engagement Plan (SEP) to inform river rehabilitation and management strategies.								
Source, pathway and receptor analysis, including a review of gaps in ESIA assessments.								
Ecological health and drivers of the river and wetland ecosystems.								
Ecosystem Goods and Services Assessments.								
Desktop mapping and Geographic Information System data derivation.								
Determining flood lines for major streams, including climate change scenarios.								
Modelling catchment hydrological flows and sediment movements.								
Hydrocensus – location of community water sources (springs) and nature of utilisation.								
Reviewing water quality monitoring protocols including the development of an online water quality monitoring database and dashboard.								

Proposal validity

The above proposal is valid for thirty (30) days and should you wish for GroundTruth to commence with the study, please authorise us to do so by providing the relevant letter of appointment and/or contractual documents. Please contact us should you have any further queries.