

HYDROCENSUS OF THE RUTONGO MINE CONCESSION AREA

TRINITY METALS

DRAFT





GroundTruth

AUGUST 2025

GT1377

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| Title | HYDROCENSUS OF THE RUTONGO MINE CONCESSION AREA TRINITY METALS |
| Report Issue | DRAFT |
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EXECUTIVE SUMMARY

A hydrocensus was conducted by GroundTruth for Trinity Metals in the Rutongo mine concession to identify gaps in water supply information, gather data on source availability, dependency, alternatives, and risk to guide water supply interventions, and inform future rehabilitation plans as part of Phase 1 of Trinity Metals' Legacy Tailings Management and River Rehabilitation Programme. This study was carried out during the dry season (June to September) and through informal conversations with community members at 34 village sites within the mine concession area.

The main water sources used by communities within the mine concession area are water collection points constructed by the government and managed by private operators as well as natural springs. However, the natural springs are critical water resources as they are the main water sources that also supply the water collection points.

Many water collection points were found to be non-functional, including those in the Ruri, Amataba, Rusenyi, Marembo, Kabuga and Gisiza villages. A critical issue to note is that the Mutagata spring source and pumphouse, which supplies multiple sectors, currently operates with only one functional pump out of two, drastically reducing pumping and supply capacity. Moreover, pipeline infrastructure has been lost due to vandalism and theft, disrupting potable water to some villages. Numerous water points in Rusenyi, Marembo, and Kabuga villages have been non-functional for approximately three years, indicative of broader system failures.

High turbidity was a common observation in rivers and their tributaries linked to illegal mining activities and operations by the Rutongo Business of Sand and Stone (RBSS). The Rusenyi Village Spring is concerningly located adjacent to a historical mine waste dump, which poses potential contamination risks, especially during heavy rainfall, and its water has been reported to become turbid during the rainy season. The Nyarurembo village spring within the Trinity Rutongo Gasambya Mine is at high risk of contamination from mining activities, rendering it unsuitable for domestic use.

When local collection points fail, community members are forced to undertake long walks to alternative sources. Accessing springs in areas with steep topography, such as in Iraro, Musega and Kabeza, imposes a physical burden on households, who must carry water uphill. Many households and businesses also face additional financial costs for water, by paying individuals to transport water. In some areas, like the Buliza Village, there is an over-reliance on single functional collection points which serve as critical alternatives for several surrounding villages and leaves these villages at a vulnerable position if these water collection points were to fail.

Communities do engage in some rainwater harvesting within the concession area, but current implementations are very limited. The broader potential of rainwater harvesting as a reliable alternative remains largely untapped. If expanded and made more affordable and accessible, rainwater harvesting could boost local water security, reduce dependence on unreliable primary sources, and ease the economic and physical burdens on households.

The hydrocensus clearly indicated a stressed water supply system within the mine concession area. This included challenges such as non-functional infrastructure, compromised water quality, difficult accessibility, and economic burdens to obtain water. To address these issues, restoring the non-functional pump unit and expanding storage capacity at the Mutagata spring source to enhance reliability and meet demand fluctuations is recommended. Urgent and comprehensive interventions are needed, which include the repair and protection of water infrastructure, policing of mining activities to prevent water quality decline, and the development of additional, easily accessible, and sustainable water sources to ensure reliable water access for communities.

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ACKNOWLEDGEMENTS

We would like to express our gratitude to all the community members and COWBE staff who generously shared their time and insights during the hydrocensus, providing valuable information on their water use and challenges. We are also grateful to Mr Francois Tetero and Trinity Metals staff for their collaboration, logistical support and assistance with fieldwork, which greatly contributed to the successful completion of this study.

1. INTRODUCTION

GroundTruth Environment and Engineering (“GroundTruth”) was appointed by Trinity Metals to conduct a hydrocensus of the communities located in the Rutongo mine concession area (**Figure 1-1**) as part of Phase 1 of Trinity Metals’ Legacy Tailings Management and River Rehabilitation Programme. The main objectives of the hydrocensus study were to:

- i) Identify gaps in the information currently available on water supply at villages within the mine concession area;
- ii) Capture information relating to water source availability, dependency, alternatives and risks to the communities within the mine concession area;
- iii) Guide Trinity Metals in terms of communities requiring water supply interventions; and
- iv) Contribute information on community water supply for consideration in the river rehabilitation plans (Phase 2).

This hydrocensus report provides spatially contextualised water source use and dependencies in communities across the mine concession area, gathered from informal conversations with a limited number of respondents as well as mine personnel. The report also attempts to supplement the information in the 2023 hydrocensus study conducted by SLR (SLR, 2024) thereby giving more resolution to the water supply situation at the villages within the Rutongo Mine concession area.

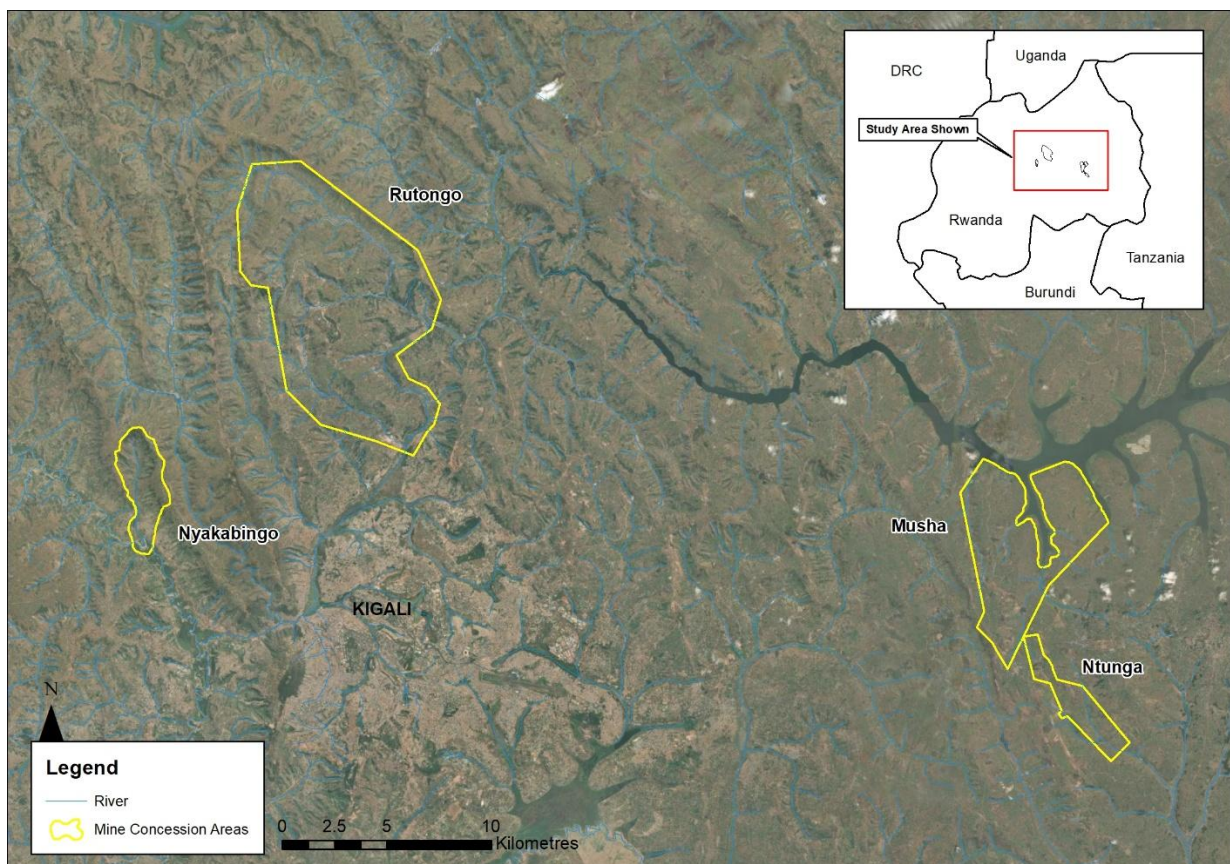


Figure 1-1 Map of the regional locations of the four Trinity Metals mine concession areas.

1.1 Background

Communities within the Trinity Rutongo mine concession area rely on a diverse mix of water sources for domestic and agricultural needs, including natural springs, communal water collection points, and, to a lesser extent, rainwater harvesting (**Figure 1-2**).

The Government of Rwanda has invested in developing formal water distribution networks to expand access to safe drinking water. These networks are typically constructed by government agencies and then entrusted to private operators, such as COWBE Ltd., who are responsible for routine maintenance and day-to-day management. COWBE is a private rural water operator responsible for managing and maintaining water supply infrastructure within the Rulindo District. Water from these networks is accessed by communities at water collection points, usually located in central areas of the villages. Despite this, many households continue to rely directly on natural springs, particularly because the water collection points can experience intermittent supply, maintenance challenges, or limited operational hours.

Natural springs remain a critical water resource in the mine concession area, not only supporting households directly but also serving as a primary source for water collection points, highlighting their important role in sustaining both domestic and agricultural water needs. Access to these springs can require considerable travel for some households, reflecting disparities in water availability and underscoring the need for targeted water management interventions in the area.

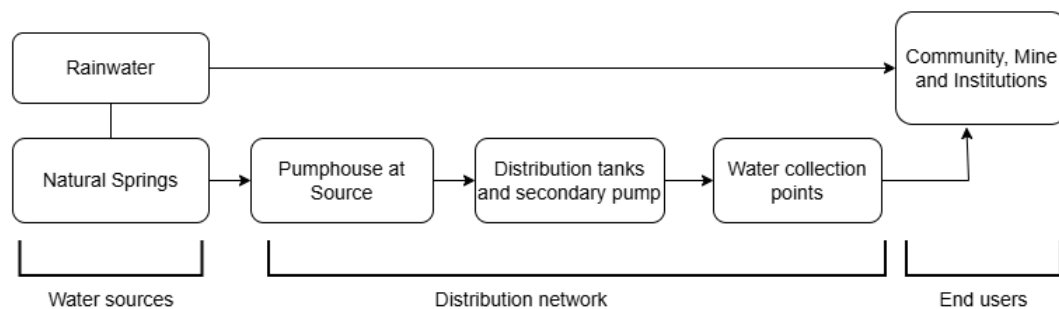


Figure 1-2 Schematic presentation of the typical water supply in the Rutongo Mine concession area

1.2 Study Area

The Trinity Rutongo Mine concession area is located in the Rulindo District, approximately 26 km northwest of Kigali. The concession comprises six mine sites—Gisanze, Masoro, Nyamyumba, Gasambya, Karambo, and Mahaza, and is known to contain some of the largest cassiterite deposits in Africa. The area encompasses approximately 92 villages, spread across 23 cells, seven sectors, and two districts.

The study area encompassed villages within the Rutongo Mine concession area (**Figure 1-3**). Due to time constraints associated with conducting the assessment, focus was placed on villages situated in or adjacent to currently active mine areas i.e. the Karambo, Gasambya, Mahaza, Senzani, Nyamyumba, and Masoro mines.

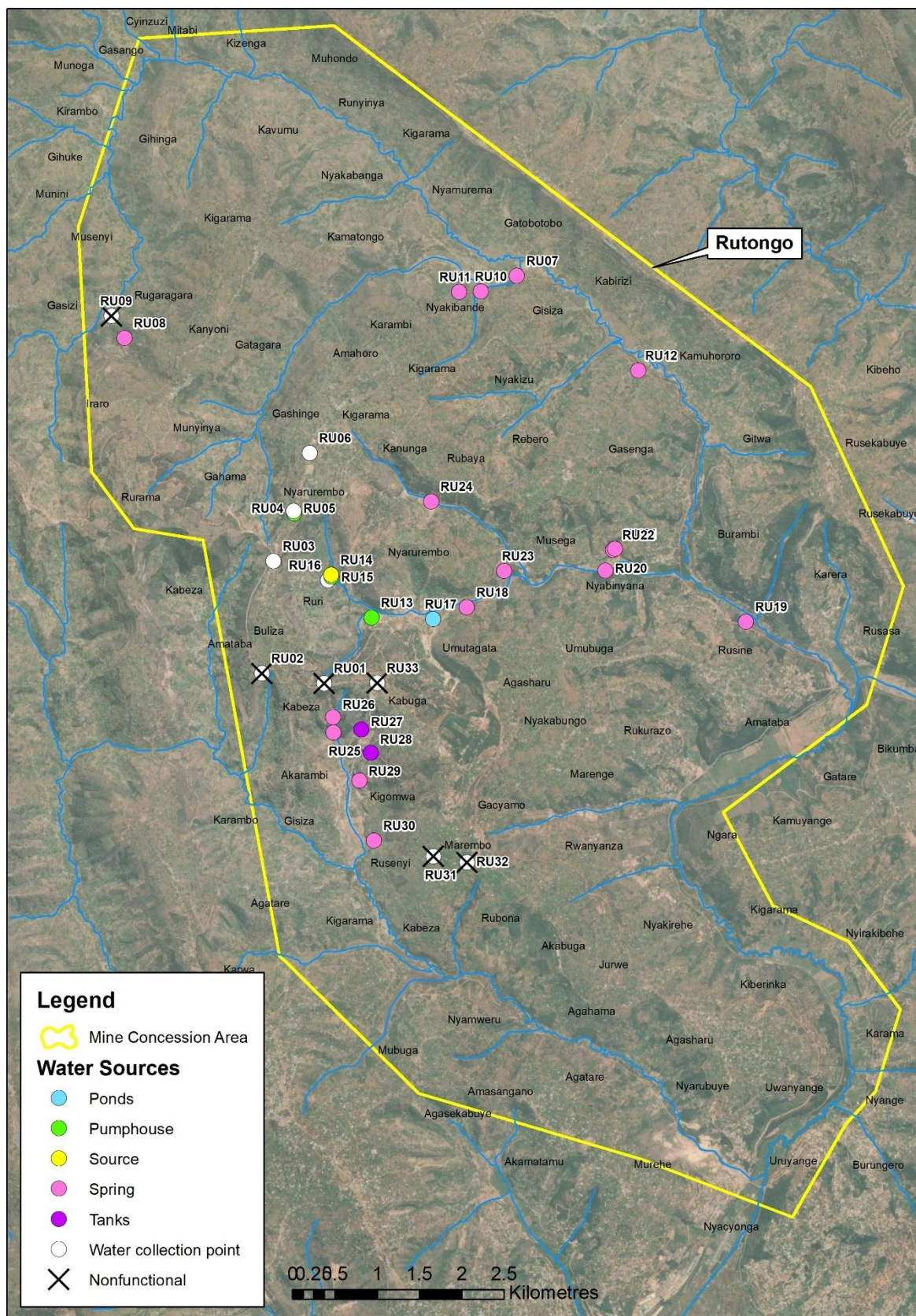


Figure 1-3 Map of Rutongo mine concession area, including villages, sites visited during the hydrocensus study characterised according to type (source, spring tanks etc.) and functionality status at the time of the study.

1.3 Study Limitations

While the hydrocensus provided valuable insights into community water use, source types, and related challenges, several limitations should be acknowledged:

- Time constraints limited the hydrocensus to villages near active mine areas, so findings may not reflect the full concession area.
- The survey provides a snapshot from one season (dry) and may not capture seasonal variations in water supply and demand.
- Household water use data relied on self-reporting, which may be affected by recall bias or inaccuracies.
- Although many households reported not treating water, no direct water-quality testing was done; instead, available results were drawn from the 2023 SLR study.
- Non-functional infrastructure was noted, but detailed technical assessments of failures or repair needs were not performed as part of this study.

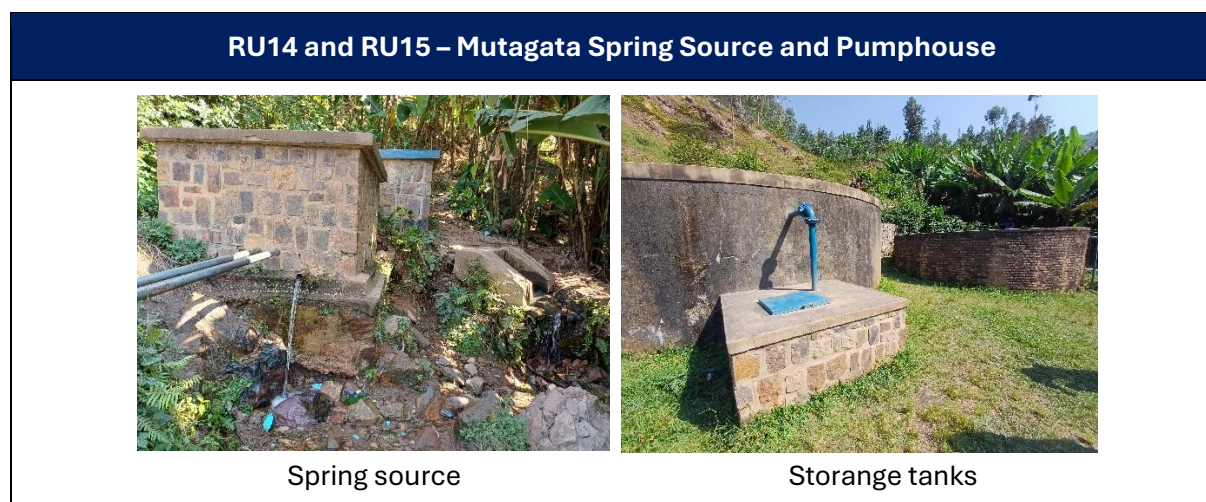
2. APPROACH

The study was carried out through visits to the water sources within the mine concession area on 29-30 July and 1 August 2025. Where possible, informal discussions with community members and mine personnel were held to gather contextual information on patterns of use, accessibility, dependency, and alternative water options within the respective communities in the mine concession area.

The study was carried out with the assistance of Mr Francois Tetero, as well as staff from COWBE Ltd. and the Trinity Rutongo Mine. Several water source points were visited, and their locations, operational status and issues were recorded.

3. RESULTS

In total, thirty-four (34) points were visited during the study. These comprised water collection points, natural springs and water supply tanks. Information on each of these points is detailed below.



RU14 and RU15 – Mutagata Spring Source and Pumphouse



Pumphouse

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.801937° | Longitude | 30.042856° |
| Cell | Mugambazi | Sector | Murambi |

This water source is a spring located in the headwaters of the Mutagata River in Ruri village. A water supply scheme has been developed around the spring, consisting of two storage reservoirs (one with a 100 m³ capacity and another with a 50 m³ capacity) and a pumphouse. There is also a community water collection point here. This system provides potable water to Murambi, Masoro, and Kanzuzi sectors within the Rulindo District including Trinity Rutongo Mine headquarters and Nyamyumba mine, serving as a critical supply point for these communities and also as an alternative water source for surrounding villages such as Nyarurembo and Buliza.

During the field assessment, the team engaged with Mr. Theoneste Karihije, the operator responsible for the pumphouse. The facility is equipped with two pumps; each rated at 23 m³ per hour under normal operating conditions. In theory, and with both pumps functional and operated in alternation, the system could sustain continuous pumping (24 hours per day), providing a reliable flow to storage and onward to the distribution network. However, this system is limited by technical failures. At the time of the study, only one pump was operational, with the second pump having been out of service for approximately two years. This has effectively halved the pumping capacity and also potentially increased the operational risk, as the entire supply now depends on a single pump. To avoid overheating and mechanical strain, the remaining pump is operated in two shifts: 3:00–9:00 a.m. and 4:00–10:00 p.m. This schedule allows the pump to cool during the day. This results in intermittent supply at most, or no supply at some villages at the three sectors.

The two major limiting factors at this point are storage capacity and pumping capacity. The total existing storage of 150 m³ is insufficient to cater for demand fluctuations across the day. At current pumping rates (23 m³/h for 12 hours/day yields 276 m³/day), storage capacity can only hold just over half a day's supply. This means that during demand peaks, stored reserves are quickly depleted. Additionally, with only one pump working, a breakdown would result in an immediate and total disruption of water supply to all three sectors.

These constraints translate into reduced reliability of water access. Households in Murambi, Masoro, and Kanzuzi sectors experience shortages during peak demand hours. Additionally,

RU14 and RU15 – Mutagata Spring Source and Pumphouse

during dry periods, when the natural yield of the spring may decline, the system becomes even more vulnerable, with the limited storage unable to cover the shortfalls.

To address these challenges, two interventions are recommended:

- Restoration of the pump unit: Repairing or replacing the non-functional pump would restore full design capacity, enable alternating operations, and reduce the risk of total supply failure.
- Expansion of storage capacity: Constructing additional reservoirs or upgrading existing tanks would allow greater volumes to be stored during low-demand hours, ensuring that adequate reserves are available during peak use periods and the dry season.

RU16 - Ruri Village Water Collection Point



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.802504° | Longitude | 30.042529° |
| Cell | Mugambazi | Sector | Murambi |
| Flow rate | 0.17 litres per second | | |

This water collection point is located approximately 60 m from the pumphouse and the Mutagata spring source, which supplies water to the point. Its close proximity to the source ensures a reliable and continuous supply, making it a critical access point for the surrounding villages. The site also serves as an alternative water source for nearby communities, particularly during periods when other collection points experience limited or no water availability. According to the operator at the spring source pumphouse, some community members from surrounding villages arrive as early as 03:00 AM to secure water, coinciding with the start of the first pumping shift.

Despite the reliability of this collection point, maintenance issues or pump failure at the spring or pumphouse, could significantly impact water availability for multiple villages, highlighting the need to fix the issues at the source.

RU13 – Pumphouse for Rutongo Mine Headquarters



Storage tanks at the mine pumphouse

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.806502° | Longitude | 30.047146° |
| Cell | Nyamyumba | Sector | Masoro |

Water is pumped from the Mutagata spring source to the storage tanks at this point. This water is then pumped from the storage to the Trinity Rutongo Mine headquarters and Nyamyumba mine.

RU05 – Distribution Tanks and Pumphouse at Nyarurembo Village



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.795399° | Longitude | 30.038904° |
| Cell | Mugambazi | Sector | Murambi |

RU05 – Distribution Tanks and Pumphouse at Nyarurembo Village

Water from the Mutagata spring source at Ruri village is pumped to these distribution tanks located in Nyarurembo village. The system comprises two tanks, a 50 m³ tank and a 100 m³ tank, with the larger 100 m³ tank observed to be empty at the time of the study, likely due to operational issues with the pump at the Ruri village source and perhaps also reduced yield due to the dry season. These tanks form a critical component of the local water supply network, serving approximately 40 water collection points through a combination of direct pumping to Bubangu and Mvuzo cells, and gravity-fed distribution to the remaining villages in the area.

In addition to village collection points, the tanks provide water to the Murambi Health Centre, located a few metres from the distribution site, and to nearby schools such as Groupe Scolaire APAPEC Murambi. It was noted that Groupe Scolaire APAPEC Murambi maintains multiple tanks for rainwater harvesting, which are likely used to supplement water supply during periods of reduced water availability from the main distribution network.

Observation at the site highlighted the importance of functional pumping infrastructure at the source, as disruptions directly impact the storage and distribution capacity, affecting both residential and institutional water access across the network and that these issues may become more pronounced during the dry season.

RU04 – Nyarurembo Water Collection Point



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.795173° | Longitude | 30.038871° |
| Cell | Mugambazi | Sector | Murambi |
| Flow rate | 0.09 litres per second | | |

RU04 – Nyarurembo Water Collection Point

The water collection point located behind the Murambi Health Centre in Nyarurembo Village is situated only a few metres from the main water distribution tank, contributing to its relative reliability compared to other points in the area.

Community members, including the individual responsible for managing this point, reported that during the dry season, water availability may be limited to approximately three days per week, indicating a seasonal decline in supply from the Mutagata spring source. When water is unavailable, community members must walk to alternative collection points, which increases the time and effort required to access sufficient water for domestic use.

Although staff at the distribution point indicated that seasonality is not a limiting factor, it is possible that their perception is influenced by their constant presence at the main distribution tank where water is consistently available, which may not necessarily reflect availability at the villages. Observations also indicated that one of the pumps at the source pump station has been out of service, suggesting that the combination of the non-operational pump and seasonal fluctuations may further reduce water supply at the village level.

RU06 – Nyarurembo Water Collection Point



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.789003° | Longitude | 30.040588° |
| Cell | Mugambazi | Sector | Murambi |
| Flow rate | 0.13 litres per second | | |

The water collection point is located close to the Murambi Sector Office and serves as an additional water collection site within Nyarurembo Village. This point also provides an alternative and reliable source of water for community members, particularly during periods when other collection points experience reduced availability. Adjacent villages such as Kigarama and Gashinge are likely to use this point as a source of water.

RU06 – Nyarurembo Water Collection Point

While this collection point is generally reliable, its capacity and supply depend on the functionality of the main distribution system. Although this point remains reliable, during periods of high demand or when both pumps at the source go out of service, community members may experience limited or no access to water, potentially necessitating travel to farther alternative points or springs and increasing the burden on households.

RU03 – Buliza Village Water Collection Point



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.800495° | Longitude | 30.036712° |
| Cell | Mugambazi | Sector | Murambi |
| Flow Rate | 0.28 litres per second | | |

The water collection point located next to the Mugambazi Cell Office in Buliza Village was functional at the time of assessment, with several community members observed collecting water. This site serves as an alternative supply point for residents from surrounding villages, including Amataba and Ruri, when water is unavailable at their primary collection points, as indicated by the large number of jerry cans at this point present during the study.

The collection point is maintained by COWBE Ltd. Community members pay between 20 to 30 Rwandan Francs to fill a 20-litre jerry container, and these funds are utilised by COWBE to support the maintenance of the water supply infrastructure.

Field observations indicated that this collection point is reliable, largely due to its proximity to the main distribution tank, and serves as a critical water source for the Mugambazi Cell.

A concern about this point is that despite its reliability, there is an overreliance on this single collection point for Buliza, Ruri, and Amataba villages. Given the sizes of these communities, there is a need for additional reliable water sources closer to the communities.

RU02 – Amataba Village Water Collection Point



Water distribution point



Rainwater harvesting

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.812424° | Longitude | 30.035493° |
| Cell | Gatwa | Sector | Murambi |

The water collection point supplying Amataba was found to be non-functional at the time of assessment, with no water available. Surrounding the site, small subsistence plots cultivated with cassava and sweet potato were observed, reliant on rainfall for irrigation.

The supply tank at this point was connected to a gutter for rainwater harvesting; however, this arrangement is limited, as it only captures runoff from a small section of roof on a nearby house and therefore provides an insignificant supplementary volume during periods of rain.

A concern associated with this collection point is the lack of reliable supply from the source, with rainwater harvesting serving only as a minimal and unsustainable alternative. The alternative water source for the community members is a water collection point at Buliza village (RU03), at approximately 1.5 km from this point.

RU01 – Ruri Villages Water Collection Point



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.813467° | Longitude | 30.042140° |
| Cell | Mugambazi | Sector | Murambi |

RU01 – Ruri Villages Water Collection Point

The water collection point at Kabuga Centre in Ruri Village was found to be non-functional at the time of assessment, with no water available. This point is supplied by the distribution tank at Nyarurembo village and the pump and capacity issues at the source has had knock-on impacts affecting the distribution tank and water collection points especially farther from the distribution tank including the point at Amatoba (RU02) approximately 1km from this point.

Local users reported that in order to access water, they must either walk to the nearest functioning collection point likely at Buliza village, which involves a 10km round trip, or hire individuals with motorcycles or bicycles to transport water at an approximate cost of 1 500 Rwandan Francs per trip. Another alternative water source for the village is located approximately 1.2 km as the crow flies, at Mutagata spring source (RU14).

A key concern associated with this supply system is the inadequate pumping capacity, which limits the reliability of water delivery across the network and places an additional burden on households and small business owners who have to incur an additional cost of hiring individuals with motorcycles/bicycles to get them water.

RU33 –Kabuga Village Water Collection Point



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.813435° | Longitude | 30.047771° |
| Cell | Nyamyumba | Sector | Masoro |

The water collection point in Kabuga Village, located approximately 600 m from the Ruri village point (RU01), was observed to be non-functional at the time of the study. Community reports indicate that this point has been without water for approximately two months, forcing households to rely on alternative and often distant sources, which can increase the time and effort required for daily water collection. This point is connected to the same supply network as the Ruri and Amatoba points, all of which are fed by the distribution tanks located at Nyarurembo Village. Field observations suggest that at the time of the study, the water supply effectively terminated at Buliza Village, leaving the three downstream points (Amatoba, Ruri, and Kabuga) without reliable access. This interruption in service highlights a critical vulnerability in the distribution network, with direct implications for community water security and, household burdens especially for the Kabuga, Amatoba and Ruri villages.

RU25 –Kabeza Village Spring



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.818743° | Longitude | 30.043121° |
| Cell | Gatwa | Sector | Masoro |
| Flow rate | 0.02 litres per second | | |

The spring is located in Kabeza Village, across the valley from the Trinity Rutongo Masoro Mine. The spring water is actively used by community members for small-scale irrigation, with shallow trenches directing the flow to nearby crop fields. Banana and sweet potato are cultivated in the fields. Kabeza village is located across the road from Buliza and Iraro villages, it also neighbours Amataba village. It is likely that households in Kabeza village closer to the water collection points at Amataba and Ruri villages utilise these points when they are functional.

RU26 –Kabeza Village Spring



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.817098° | Longitude | 30.043074° |
| Cell | Gatwa | Sector | Murambi |

RU26 –Kabeza Village Spring

| | |
|-----------|------------------------|
| Flow rate | 0.08 litres per second |
|-----------|------------------------|

The spring is located in Kabeza Village, across the valley from the Masoro Mine, and serves as the primary water source for the community. It is situated at the base of a hill, approximately 280 metres from the nearest household. Community members collect water from the spring and carry filled containers uphill to their homes, which can be physically demanding and may limit the efficiency of water collection. The spring has a relatively low flow rate of approximately 0.08 L/s, which may be influenced by seasonal variation during the dry season or by a declining yield over time. There were only children at this point and the context of water supply at the village could not be ascertained. However, the close proximity of Kabeza village to Amataba and Ruri water collection points suggests that the households at Kabeza village may utilise these points when they are functional.

The combination of low flow and the physically demanding collection process increases vulnerability of this community to water shortages, particularly during periods of peak demand or extended dry seasons.

RU29 –Tunnel 7 Spring



Locked entrance to Tunnel 7

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.823838° | Longitude | 30.045869° |
| Cell | Nyamyumba | Sector | Masoro |

The spring is located at Tunnel 7 of the Trinity Rutongo Masoro Mine, across the valley from Kabeza village. It serves as a critical source of potable water for the Masoro Mine and, under normal circumstances, for the Kigomwa village. However, according to mine personnel responsible for this infrastructure, approximately three months prior to this study, illegal miners vandalised and stole the pipeline infrastructure that conveyed water from the spring to the Kigomwa village collection point. This incident effectively disrupted the community's supply. As a result, Kigomwa residents now face increased difficulties in securing water for domestic use, with the nearest alternative source located on the border between Rusenyi and Kigomwa villages which is approximately 1.25 km from the farthest households in

RU29 –Tunnel 7 Spring

Kigomwa. Mine personnel did also report that Kigomwa village does receive water via a tank located at Kabuga village (RU34)

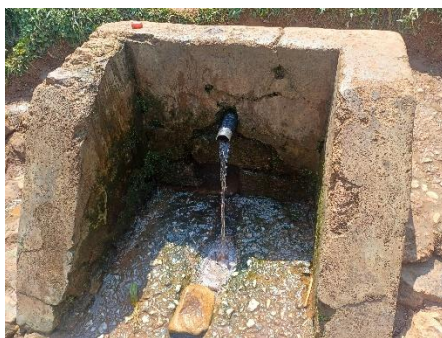
RU34 –Kabuga Village Tanks Supplying Kigomwa Village



| | | | |
|----------|-------------|-----------|-----------|
| Latitude | -1.8196219, | Longitude | 0.0550421 |
| Cell | Nyamyumba | Sector | Masoro |

The tanks are located adjacent to the Masoro Learning and Sports Centre at Kabuga village and supply water to Kigomwa Village. Water is distributed twice daily in three-hour shifts, with each 20-litre container filled at a cost of 100 Rwandan Francs. While this arrangement provides some relief to the Kigomwa community, it also highlights their continued vulnerability, as the village’s designated water collection point has been non-functional for an extended period. Reliance on paid, time-restricted access reflects the same concerns raised at nearby collection points—namely limited availability, financial strain on households, and the absence of a reliable, sustainable water supply system. At the time of the study, no operator was present, and details on the water source and operational specifics could not be confirmed. The information provided for this water source was obtained from local mine personnel.

RU30 –Rusenyi Village Spring



| | | | |
|-----------|-----------------------|-----------|------------|
| Latitude | -1.830207° | Longitude | 30.047406° |
| Cell | Nyamyumba | Sector | Masoro |
| Flow rate | 0.38 litres per litre | | |

The spring is located in Rusenyi Village, approximately 145m from the Gatiti River, and serves as a key source of potable water for both Rusenyi and Kigomwa villages. However, community members reported that the water often becomes turbid during the rainy season, raising concerns about its quality and reliability especially with the two villages depending on this source. In addition, mine personnel indicated that the spring is located adjacent to a historical mine waste dump, which could pose potential risks of contamination, particularly during periods of high rainfall when runoff and leaching are more likely. These factors highlight the vulnerability of the spring and the dependence of local communities on a potentially at-risk water source. SLR lab tested water from this spring in 2023 and found that it was within the 2022 WHO Guidelines for Drinking Water (WHO, 2022).

RU31 –Rusenyi Village Water Collection Point



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.832512° | Longitude | 30.057306° |
| Cell | Nyamyumba | Sector | Masoro |

RU31 –Rusenyi Village Water Collection Point

The water collection point in Rusenyi village, located approximately 2.5 km uphill from the Rusenyi spring (RU30), has reportedly been without water for the past three years. Community members suggested that the source of this collection point may be at Marengé (location not confirmed during this study) and indicated that a malfunctioning pump is likely the cause of the interruption, though they were not certain of this. As a result, residents are forced to rely on alternative sources, such as the Nyamateke spring (location not confirmed during this study) or the Rusenyi spring (RU30) down the hill. However, and as stated, the Rusenyi spring itself is associated with concerns, as it becomes turbid during the rainy season and is situated adjacent to a historical mine waste dump. This raises water quality and quantity concerns for both Rusenyi and Kigomwa villages, which depend on this spring for potable water.

RU32 –Marengo Village Water Collection Point



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.832512° | Longitude | 30.057306° |
| Cell | Nyamyumba | Sector | Masoro |

The water collection point in Marengo Village is located approximately 380m from the Rusenyi Village collection point (RU30). Similar to RU30, this point has also been without water, for approximately three years, due to the same underlying issues as with RU30. The close proximity of the two collection points suggests that both may be supplied from the same source or pumping system, indicating a broader system failure rather than an isolated problem.

Within the village, a few households have installed small rainwater harvesting tanks. Critical institutions in the area, including the Business Centre, churches, and Masoro Secondary School, are also very likely affected by the lack of reliable water supply. This raises concerns not only for household use but also for schools, businesses, and other public facilities.

The situation at Marengo reinforces the concerns raised at Rusenyi (RU30): prolonged non-functionality of water points, likely linked to pumping and infrastructure failures, has forced communities to rely on distant and uncertain spring sources. Therefore, communities at

RU32 –Marengo Village Water Collection Point

Rusenyi, Marengo and even Kigomwa face persistent vulnerability in terms of access to safe and reliable water.

RU24 –Nyarurembo Village Spring



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.794157° | Longitude | 30.053498° |
| Cell | Kivugiza | Sector | Masoro |




The spring is located in Nyarurembo Village within the Trinity Rutongo Gasambya Mine along the Kivomo River. No community members were observed collecting water from this point, which may suggest that it is not commonly used for domestic purposes. Its location within an active mining area places the spring at high risk of potential contamination from mining activities. This makes the source unsuitable for safe domestic use unless d. The nearest villages to this source are Rubaya and Kanunga.

RU18 – Nyabinyana Village Spring



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.805400° | Longitude | 30.057293° |
|----------|------------|-----------|------------|

| RU18 – Nyabinyana Village Spring | | | |
|---|------------------------|--------|--------|
| Cell | Shengampuri | Sector | Masoro |
| Flow rate | 0.33 litres per second | | |
| <p>The spring located in Nyabinyana Village is situated approximately 45 m from the Mutagata River and downstream of Nyamyumba Mine. It provides a perennial source of water for the village. It also functions as an alternative water source for Mutagata and parts of Nyarurembo villages. The spring is utilised for domestic purposes and for irrigating crops. Agricultural activity was observed in the surrounding area, with shallow trenches constructed to channel water from the spring to the cultivated fields.</p> | | | |

| RU20 –Nyabinyana Village Spring | | | |
|---|-------------|--|------------|
|  <p>Spring source</p> | |  <p>Shallow trenches dug to water crops</p> | |
|  <p>Gum trees planted on the surrounding hills</p> | | | |
| Latitude | -1.805400° | Longitude | 30.057293° |
| Cell | Shengampuri | Sector | Masoro |
| <p>The spring is located approximately 2km downstream of the Nyamyumba Mine and located 30 metres from the Sanzare River. The spring supplies households at the other end of Nyabinyana Village. It provides a perennial source of water used for domestic purposes and for irrigating crops in the surrounding fields. Water from the spring is channelled to the fields via shallow trenches, allowing the households to support small-scale agriculture.</p> | | | |

RU20 –Nyabinyana Village Spring

Gum trees have been planted on the surrounding hills, which may affect the spring’s flow by increasing water uptake from the soil and potentially reducing recharge to the aquifer feeding the spring. Careful management of the surrounding land, including vegetation impacts, is recommended to maintain the reliability and sustainability of the spring.

RU21 –Musega Village Spring



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.799177° | Longitude | 30.073046° |
| Cell | Kivugiza | Sector | Masoro |

Musega village is located across the Sanzare River from Nyabinyana village. The spring at this point was historically the main water source for Musega Village and played an important role in meeting the community’s daily water needs. Over time, however, the yield from the spring has declined, reducing its reliability as a sustainable supply. As a result, the community now relies on an alternative spring located approximately 28 metres away (RU22).

The decline in yield may be linked to changes in groundwater recharge, land use pressures, or catchment conditions. This highlights the need for appropriate catchment management and serves as an indication of existing potential threats to other spring sources in the area as well.

RU22 – Musega Village Spring



Spring source

Location of the spring at the bottom

| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.799296° | Longitude | 30.072819° |
| Cell | Kivugiza | Sector | Masoro |
| Flow rate | 0.15 litres per second | | |

The spring supplying Musega Village is located approximately 160 metres from the Sanzare River. Accessibility to the source is limited, as it is situated at the base of a steep slope, making it difficult to navigate with filled water containers. The spring is currently utilised as an alternative to the original supply source (RU21), which was previously preferred due to its ease of access but has since experienced a decline in yield.

A key concern associated with this source is the physical challenge of access, which poses risks to users and may limit the reliability of the spring as a sustainable supply option for the community.

RU19 – Rusine and Nyabinyana Villages Spring



Spring source






Livestock watering





Cattle at the far bank of the Rusine River

| RU19 – Rusine and Nyabinyana Villages Spring | | | |
|--|------------------------|-----------|------------|
| Latitude | -1.805400° | Longitude | 30.057293° |
| Cell | Shengampuri | Sector | Masoro |
| Average flow rate | 0.19 litres per second | | |
| <p>The spring located in Rusine Village is situated approximately 105 m from the Rusine River and 1.4 km upstream of the confluence with the Nyabugogo River. This spring provides a perennial source of water. It supplies both Rusine Village and parts of Nyabinyana Village. In addition to domestic use, the spring water is utilised for livestock watering. Livestock were observed grazing in the vicinity of the spring, indicating that the source plays a critical role in supporting both household and agricultural needs for the surrounding villages.</p> | | | |

| RU08 – Iraro Village Spring | | | |
|--|------------|---|------------|
|  | |  | |
| Spring source | | Turbid water in the Rusine River tributary | |
|  | | | |
| Child (in red circle) walking down the hill to the spring to collect water | | | |
| Latitude | -1.776764° | Longitude | 30.020901° |

| RU08 – Iraro Village Spring | | | |
|--|------------------------|--------|---------|
| Cell | Mvuzo | Sector | Murambi |
| Flow rate | 0.55 litres per second | | |
| <p>The spring located within the Gisanze Mine area at the headwaters of a tributary of the Rusine River, also forms the boundary between Mvuzo and Budakiranya cells. It is utilised by the communities of Iraro, Rugaragara, and occasionally Gasizi villages. The source is readily accessible to a limited number of households nearby. Households located on the surrounding hills are required to walk down to the spring and back up steep slopes carrying containers filled with water, while households at the bottom of the hill must walk uphill to access the water, indicating significant physical effort required for collection.</p> <p>Illegal mining activities were observed along the tributary, with sluicing operations directly utilising the spring water. These activities contribute to elevated turbidity in the tributary. Livestock, including goats, were also observed accessing the water, and community members confirmed that the spring is used for watering animals.</p> <p>The primary risks associated with this spring include water quality degradation due to illegal mining and turbidity in the tributary. Additionally, the steep topography surrounding the spring imposes a significant physical burden on households collecting water, particularly for those located on hillsides, limiting the accessibility and equitable distribution of the resource.</p> | | | |

| RU09 – Iraro Village Spring Extension Water Collection Point | | | |
|--|------------|--|------------|
|  | |  | |
| Water collection point | | Illegal mining in the Rusine River | |
| Latitude | -1.774420° | Longitude | 30.019509° |
| Cell | Mvuzo | Sector | Murambi |
| <p>This water collection point was constructed by Trinity Rutongo Mine as an extension of the Iraro village spring (RU08), with the objective of providing a more accessible water source for households located at the bottom of the hill such as Rugaragara and Gasizi. The infrastructure</p> | | | |

RU09 – Iraro Village Spring Extension Water Collection Point

at this site has reportedly been subjected to vandalism, with pipework stolen, limiting the functionality of the system.

The primary concerns at this collection point include compromised infrastructure due to vandalism and theft, reducing the reliability of water supply to the community. Additionally, downstream illegal mining significantly affects water quality due increasing turbidity. These factors, combined with the dependence of households on a single source, underscore the vulnerability of water access for the Iraro, Rugaragara and Gasizi villages.

RU10 – Nyakibande Village Spring



| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.771825° | Longitude | 30.058780° |
| Cell | Kabuga | Sector | Masoro |
| Flow rate | 0.26 litres per second | | |

The spring is located along the Nyakibande River and serves as a water source for Nyakibande village and as an alternative water source for Gisiza village. The spring is also likely utilised by surrounding communities, including Karambi, Kigarama, and Nyakizu. Community members reported that the spring becomes inundated during the rainy season and noted the presence of another alternative spring approximately 250 m from this site (RU11).

The main risk associated with this spring is seasonal flooding, which may limit access. This point also needs to be adequately upgraded to allow for community members to easily collect water and avoid inundation during the rainy season.

RU11 – Nyakibande Village Spring



Spring water source



Crops planted downstream of the spring

| | | | |
|-----------|------------------------|-----------|------------|
| Latitude | -1.771877° | Longitude | 30.056469° |
| Cell | Kabuga | Sector | Masoro |
| Flow rate | 0.29 litres per second | | |

This spring is located in Nyakibande village approximately 220 metres from the Nyirabukingore River and 250 metres from RU10. The spring provides a perennial source of water for Nyakibande village, utilised for domestic purposes as well as the irrigation of crops. Surrounding villages, including Karambi, Kigarama, Gisiza, and Nyakizu, are also likely to rely on this spring as an alternative water source.

Agricultural activity was observed in the vicinity, with plots cultivated with banana plants, sweet potatoes, and other crops. Water from the spring is directed to these fields through shallow trenches, allowing continuous irrigation supported by the spring’s perennial flow.

RU07 – Gisiza Village Water Collection Point



Water collection point



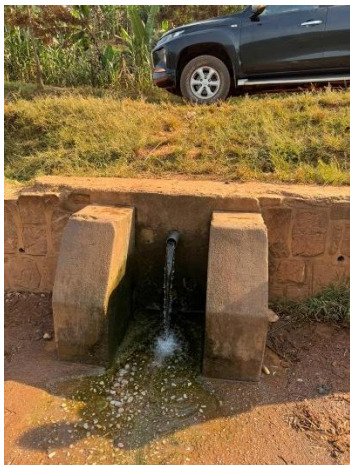

Mining within the Nyakibande river causing turbid water

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.770148° | Longitude | 30.062607° |
|----------|------------|-----------|------------|

RU07 – Gisiza Village Water Collection Point

| | | | |
|---|--------|--------|--------|
| Cell | Kabuga | Sector | Masoro |
| <p>The water collection point in Gisiza Village was non-functional at the time of the study. It was noted that no other functional water collection points were recorded in Gisiza village, although the geographical location of the village may offer natural spring alternatives which were not assessed during the study. According to available data, the alternative water sources relied upon by the community are natural springs at Rebero and Nyakibande villages, located approximately 2.2 km and 0.5 km, respectively, from the Gisiza collection point.</p> <p>During the assessment, water in the Nyakibande River was observed to be severely turbid, likely resulting from upstream sand and stone mining activities conducted by the Rutongo Business of Sand and Stone (RBSS). Subsistence farming was observed in the village, with small plots cultivated with banana plants. Local residents indicated that these crops are primarily rainfed and used for household consumption rather than commercial purposes.</p> <p>The primary concerns at this collection point are the lack of functional water infrastructure within Gisiza Village and the limited accessibility of alternative sources which may be far for community members without alternatives ways of transport. Water quality at the nearest river source is also compromised due to turbidity from upstream mining activities. Together, these factors present challenges to ensuring safe, reliable, and convenient water access for the Gisiza community.</p> | | | |

RU12 – Rebero Village Spring

| | | | |
|---|------------------------|--|------------|
|  | |  | |
| Spring water source | | Cattle grazing near the spring | |
| Latitude | -1.780240° | Longitude | 30.075501° |
| Cell | Kivugiza | Sector | Masoro |
| Flow rate | 0.50 litres per second | | |

RU12 – Rebero Village Spring

The spring is located in Rebero village and is situated approximately 150 m from the Rusine River. It provides a reliable source of water that is utilised for domestic purposes, as well as for irrigating crops and watering livestock. Surrounding villages, including Kabirizi, Gasenga, Kamuhororo, and Nyakizu, are also likely to rely on this spring as an alternative water source.

Some crops were observed near the spring; however, the majority of the surrounding fields remain uncultivated, likely serving primarily as grazing grounds for cattle.

SLR lab tested water from this spring in 2023 and reported that it was within the 2022 World Health Organisation’s (WHO) Guidelines for Drinking Water.

RU17 – Nyamyumba Mine Recycled Water Ponds



| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.806670° | Longitude | 30.053692° |
| Cell | Nyamyumba | Sector | Masoro |

In an effort to reduce the mine’s reliance on natural water sources for processing, Trinity Rutongo Mine implements a water recycling system. Process water is captured and directed through a series of settling ponds, which allow suspended solids and sediments to settle before the water is collected for reuse. This water is subsequently reintroduced into processing, effectively reducing the demand on freshwater sources and minimising the volume of water discharged into the surrounding environment.

By recycling process water in this manner, the mine mitigates its impact on local water resources, helps maintain downstream water availability for communities and ecosystems, and contributes to more sustainable operational practices. Dam safety management is however very important to prevent process water from reaching the environment.

RU27 and RU28 –Water Supply Tanks at Masoro Mine



Tanks at Tunnel 11

Tanks at top of the hill

| | | | |
|----------|------------|-----------|------------|
| Latitude | -1.818391° | Longitude | 30.046086° |
| Cell | Nyamyumba | Sector | Masoro |

The tanks supply water used in processing at Masoro Mine. Water is pumped from the decline at Tunnel 1 to the storage tanks located at the top of the hill. From there, it is gravity-fed to the tanks at Tunnel 11 and subsequently to the sluicing area, where it is used for processing.

4. CONCLUSIONS

The hydrocensus of the Trinity Metals in the Rutongo mine concession area was carried out during the dry season and involved informal discussions with community members and mine personnel at 34 sites. The study revealed a precarious and often unreliable water supply situation across the mine concession area.

Key findings from the assessment include:

- **Widespread Non-Functionality and Infrastructure Issues:**
 - Several water collection points were found to be non-functional at the time of the study, including those in Ruri , Amataba , Gisiza Rusenyi, Marembo, and Kabuga villages, with some of these points being out of commission for three years indicating broader infrastructure issues.
 - The critical Mutagata spring source and pumphouse, which supplies Murambi, Masoro, and Kanzuzi sectors, operates with only one functional pump out of two, significantly halving its pumping capacity and leading to intermittent supply.
 - The loss of pipeline infrastructure due to vandalism and theft has disrupted potable water supply to Kigomwa and Iraro villages.
- **Water Quality Degradation and Contamination Risks:**
 - High turbidity was frequently observed in rivers and tributaries, directly linked to illegal mining activities and operations by the Rutongo Business of Sand and Stone (RBSS)
 - The Rusenyi Village Spring is located adjacent to a historical mine waste dump, posing potential contamination risks, especially during periods of high rainfall. Water from this spring also becomes turbid during the rainy season.
 - The Nyarurembo Village Spring, situated within the Trinity Rutongo Gasambya Mine, is considered at high risk of contamination from mining activities, making it unsuitable for domestic use without protection.
 - Direct water quality testing was not performed as part of this hydrocensus which limited the assessment of health risks.
- **Accessibility Challenges and Community Burden:**
 - When local collection points are non-functional, community members face long walks to alternative sources.
 - Accessing springs in areas with steep topography, which is often the case, imposes a significant physical burden on households carrying water uphill.
 - Many communities incur additional financial costs for water by hiring individuals to transport water.
 - There is an over-reliance on single functional collection points, such as Buliza Village, which serve as critical alternatives for multiple surrounding villages, indicating a need for more distributed reliable sources.
- **Environmental and Resource Sustainability Concerns:**
 - Seasonal fluctuations significantly impact water availability, with supplies declining during the dry season and some springs becoming inundated during the rainy season.
 - Declining spring yields were noted, attributed to changes in groundwater recharge or land use pressures.
 - The planting of gum trees near springs is expected to reduce water yield over time due to increased water uptake from the soil.
 - Unregulated mining in or adjacent to rivers has also contributed to riverbank collapse, which in time may threatened springs in close proximity to these areas.

- Springs remain an important water source, however, concerns about continuous water flow were observed, as the water is left to run even when not being collected, which represents a missed opportunity for storage promoting sustainable use.
- Rainwater harvesting is largely unpractised at the villages within the mine concession area. This could present another opportunity to supplement water supply, especially during periods of water shortages from communal water collection points.

The study highlighted the stressed water supply system in the Trinity Rutongo Mine concession area. Communities face widespread challenges including non-functional infrastructure, potentially compromised water quality, and economic burdens to secure water. These issues are exacerbated by environmental factors and inadequate storage and pumping capacities.

To address these critical challenges, it is recommended that the non-functional pump unit at Mutagata be restored and storage capacity improved to enhance reliability and address demand fluctuations. More broadly, there is an urgent need for comprehensive interventions including the repair and protection of water infrastructure, stricter policing of mining activities in the river systems to prevent water quality degradation, and the development of additional, easily accessible, and sustainable water sources to ensure reliable and safe water access for household and institutions within the concession area.

5. REFERENCES

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