THE MSA GROUP

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Rainbow Rare Earths Limited
Gakara REE Project
Burundi

Technical Report on the Gakara REE Project

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1 SUMMARY

1.1 Introduction

The MSA Group (Pty) Ltd ("MSA") was commissioned by Rainbow Rare Earths Limited ("Rainbow" or the "Company") to compile a Competent Person's Technical Report (the "Report" or "CPR") in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code" or the "Code"), 2012 Edition.

Rainbow is presently mining a Rare Earth Element ("REE") deposit, the so-called Gakara REE Project (the "Project"), which is located in western Burundi and comprises a Mining License ("ML"), referred to as the "Property". An Exploration License ("EL") expired in July 2018 and is no longer part of the Company's Property.

The REE mineralisation is hosted in a system of narrow veins consisting predominantly of the mineral bastnaesite with secondary monazite. These veins have been mined intermittently in the last century at several localities within the Project area.

This Report presents data and results of all exploration work and includes information on Rainbow's mining and processing activities conducted since the end of 2016 to November 2018. The Report also incorporates relevant information from the previous CPR (the "2016 CPR") compiled by MSA in October 2016.

The Project is considered an Exploration Target, as defined in the JORC Code. Substantial historical and present mining activities and considerable exploration work have been undertaken by Rainbow.

All three authors of this Report have visited the Project and their findings, conclusions, recommendations, risks and opportunities are presented in the respective Sections.

All monetary figures expressed in this report are in United States of America dollars (US$), unless otherwise stated, and the metric system is used for all weight, height and distance measurements. A glossary of technical terms and abbreviations is included as Appendix 1.

1.2 Material Changes since the 2016 CPR

The previous CPR compiled by MSA was the "JORC Competent Person's Report for the Gakara REE Project, Burundi" with an effective date of 30 September 2016. Such report was requested by Rainbow for a prospectus for the listing on the London Stock Exchange which took place in January 2017.

Since then a considerable amount of work including greenfields and brownfields exploration, mining, processing and production has been carried out, or was commissioned by Rainbow. Such works have produced a significant amount of new technical information and data that have materially changed the knowledge of the geology of the deposit and of the REE mineralisation.

These material changes since the 2016 CPR are presented in Table 1-1.

Table 1-1
Summary of material changes derived from Rainbow's work since 2016

Work Stream	Key Activities	2016 CPR	2019 CPR (Material Changes)
Geology	PhD thesis (in preparation) on the genesis of the Gakara REE mineralisation, including petrography, structural study, fluid inclusions study, geochronology	Carbonatitic source postulated; Review of historical data	Carbonatitic source confirmed; New metallogenic model in preparation
Greenfields Exploration	Rock sampling of new REE occurrences; Airborne geophysical survey	798 REE occurrences reported; No airborne geophysical data	1,191 REE occurrences recorded; Large magnetic intrusion mapped with response akin of known large carbonatite complexes
Brownfields Exploration	Drilling of the Kiyenzi target; Trenching and channel sampling at Gasagwe and Murambi South Trenching at Gomvyi site started Q4 2018; Detailed ground gravity surveys on all targets	No drilling: No trenching and channel sampling at Gasagwe, Murambi South and Gomvyi	1,428.5 m of core drilling completed on Kiyenzi; 2,181 channel samples collected at Gasagwe and 452 channel samples collected at Murambi South; Delineation trenching started at Gomvyi
Mining	Mining commenced at Gasagwe site in mid-2017; Mine development commenced at Murambi site in Q3 2018	No mining	Gasagwe REE veins mined down to a depth of 40 m
Processing and Production	Treatment plant constructed and operational since Q1 2018; Concentrate export/sale commenced in Dec 2017	No processing plant in place; No actual production figures available; No sale figures available	Approx. 1,760 t of Gasagwe feed treated with 1,025 t of final concentrate (>58% TREO) produced to date; approx.73 t of Murambi feed test-treated; approx. 24 t of Kiyenzi feed test-treated
Exploration Target	Data gathered for 4 mine sites (Gasagwe, Murambi South, Kiyenzi and Gomvyi) in order to better quantify exploration targets. More REE vein occurrences identified.	Exploration target range: 20,000 t to 80,000 t of in-situ REE mineral vein material.	Exploration target range: 27,000 t to 103,200 t of in-situ REE mineral vein material. At Kiyenzi, 50,000 to 90,000 tonnes at a grade of between 2.5% and 3.0% TREO.

Note: *TREO – total rare earth oxide*
Source: *Rainbow, 2018, modified by MSA*

1.3 Mineral Tenure and Ownership

The Gakara REE Project comprises a Mining Licence ("ML").

Rainbow International Resources Limited ("RIR"), which is 100% held by Rainbow Rare Earths Limited ("Rainbow"), was granted its Exploration Licence ("EL") (in French "Permis de Recherche") for REE and associated minerals in the Gakara region by Presidential Decree No. 100/141 of 16 May 2011. The Decree was based on the Mineral Agreement ("Convention de Recherche Minière"), dated 9 May 2011, between the State of Burundi and RIR. The EL was valid for an initial period of three years and was renewed twice for periods of two years each time. The EL expired in July 2018.

A ML ("Permis d'Exploitation") was granted by the Burundi Ministries of Energy and Mining and Finance and Economic Development on 27 March 2015 through the execution of a "Convention Minière" (Mining Agreement) between the State of Burundi and RIR. The ML was subsequently ratified by Presidential Decree No. 100/110 on 18 April 2015. Following the granting of the ML, a new company, Rainbow Mining Burundi SM ("RMB") was created in which the State of Burundi acquired a 10% interest by Presidential Decree No. 100/194 of 16 June 2015.

The ML provides RMB (as well as Rainbow and its shareholders) with a guaranteed stability of fiscal and legal regimes which will be applicable to the mining operations over the 25-year validity period of the ML.

1.4 Property Description and Location

The Gakara REE Project is located in the Bujumbura Province in Western Burundi, approximately 20 km south-southeast of Bujumbura. The Mining Licence covers an area of approximately 39 km^2.

An exploration and mining operation base camp has been established at the Gasenyi Catholic Mission in the village of Mutambu, a local administrative centre located in the north-central part of the ML. The processing plant was constructed approximately 15 km south of Bujumbura near the town of Kabezi immediately adjacent to the RN3 tar road.

Access to the Property from Bujumbura is by tarred road via the N3 in a southerly direction along the eastern coastline of Lake Tanganyika, followed by 20 km of an all-weather dirt road to the local administrative centre of Mutambu. The total distance by road from Bujumbura to Mutambu is approximately 40 km and takes about 90 minutes in a 4x4 vehicle.

The Project area is located on the eastern escarpment of the Lake Tanganyika Graben within a rugged topography with deep V-shaped valleys and a dense, well-developed erosional drainage system. The main rivers in the Project area are the Mugere and the Karonge. The Project area lies at an altitude of between 1,500 metres above mean sea level ("mamsl") and 2,000 mamsl. The Gomvyi Mountain (2,040 mamsl) forms a dominant topographic high in the region.

The Project area is intensely cultivated with subsistence plantations. Remaining areas of natural vegetation are being cleared to make way for the expanding subsistence agricultural needs and to supply local building requirements. Burundi has a large rural population with a current density of 470 inhabitants per square kilometre.

Burundi has a humid, equatorial climate influenced by the relatively high altitude of the rift system (horst and graben), with a rainy season from October to May. The dry season lasts from June to September. The average annual rainfall for Burundi is approximately 1,300 mm.

Modern facilities, goods and services are available from Bujumbura and basic food supplies are sourced locally in Mutambu. Bujumbura is served by daily commercial flights from Nairobi and Kigali (Kenya Airways and Rwandair). Cellular phone coverage is available over most parts of the Project area. The 8 megawatt Mugere River hydroelectric plant, the main power supplier to Bujumbura, is situated approximately 3 km north of Mutambu and has been identified as a potential source of electricity to the Project area, although at this stage Rainbow provides electricity to the Kabezi processing plant via its own power generators.

Rainbow exports its final concentrate product to the port of Mombasa in Kenya using the tarred network linking the various East African countries.

1.5 Geology and Mineralisation

The Project area is situated within the northeast-trending Kibaran Fold Belt ("KB") which stretches across Burundi from the eastern Democratic Republic of Congo to western Tanzania. The KB in

Burundi consists of a highly deformed sequence of Mesoproterozoic granites, granitoids and amphibolite-greenschist facies metasedimentary and metavolcanic rocks, referred to as the Burundi Supergroup.

The Gakara REE deposits are located near Lake Tanganyika, on the western branch of the East African rift system. REE mineralisation is typically related to carbonatitic and/or peralkaline magma emplacement. Such magmatic activities and associated REE mineralisation have been identified along the western branch of the East African rift, approximately 60 km northward from Gakara in the alkaline complex of the Upper-Ruvubu containing the Matongo carbonatite (Midende, 1984). This complex and the associated REE mineralisation have been dated around 600-700 Ma, i.e. during the Pan-African orogeny. Already in 1958 (Thoreau *et al.*) a tentative relationship between these REE deposits and carbonatites was suggested and has been confirmed in recent studies (Ntiharirizwa *et al.*, 2018).

Except for the Archean Mugere complex, the Gakara REE mineralisation is hosted in Mesoproterozoic rocks belonging to the Karagwe-Ankole polymetamorphic belt. The latter is composed of metasediments and orthogneisses intersected by pegmatites which have been dated at 969 Ma. The Gakara Property is mainly composed of rocks formed during the Mesoproterozoic, Kibaran orogenic event between 1,375 Ma and 985 Ma.

The Gakara REE mineralisation occurs as narrow (centimetre to decimetre) vein stockworks and consists mainly of coarse grained, locally brecciated, metasomatised bastnaesite and monazite (Lehmann, 1994). The gangue accompanying the REE mineralisation consists of quartz, biotite, barite, microcline, pyrite and galena. Supergene alteration formed a new mineralogical assemblage composed of rhabdophane, cerianite, crandallite-florencite, goethite and kaolinite (Lehmann, 1994).

New data from a PhD thesis (Ntiharirizwa, in preparation) has revealed the following critical information:

- The fluids at the origin of the Gakara deposit as well as their P-T conditions of emplacement have been established. The mineralisation took place at temperatures between 400 and 450 °C in the upper crust with pressure variations (160 to 330 MPa), under a brittle deformation regime.
- The transition from the primary mineralisation (formation of bastnaesite) to the secondary mineralisation (formation of monazite) occurred during the hydrothermal stage, whereby the major element composition of the fluid has not changed between the two stages of mineralisation.
- New geochronological ages have been determined: the bastnaesite formed at 602 ±7 Ma and the monazite formation followed at 589 ±8 Ma. Despite these two ages being almost within the margins of analytical error, it demonstrates that the secondary mineralisation (monazitic) formed very shortly after the primary mineralisation (bastnaesitic).
- The REE vein stockworks developed in a brittle regime of deformation and re-used/re-opened former heterogeneity of the gneissic and granitic host rocks. The fragmentation of the host rocks is enhanced by hydraulic fracturing, resulting in the formation of the REE bearing breccia facies (e.g. Kiyenzi).

- The composition of the fluids contained in the Gakara bastnaesites as well as the isotopic signatures indicate that the mineralisation precipitated first from a carbonatitic magma.
- The age (approximately 600 Ma) obtained for aplites from Gashirwe and Kiyenzi, suggests also that the REE mineralising event is related to an alkaline intrusion. The occurrence of white aplitic veins therefore presents a useful guide for REE exploration within the Gakara area.

1.6 Status of Exploration

1.6.1 Exploration work 2011 to 2016

The exploration programmes completed by Rainbow between 2011 and 2016 are summarised in chronological order in Table 1-2.

Table 1-2
Summary of exploration work on Gakara EL completed between 2011 and 2013

Activity	Details
Pitting and trenching	85 pits (75 in Gasagwe and 10 in Kiyenzi area); 34 trenches in eight target areas
Geological mapping	3,418 observations points including 813 REE occurrences of which 520 are *in situ* veins/veinlets
Rock grab sampling	632 sites sampled and analysed by Niton; 150 samples analysed by ALS Chemex, South Africa
Soil sampling (orientation survey)	591 samples from three blocks (500 m by 500 m); all analysed by Niton and at ALS Chemex, South Africa
Ground Gravity (orientation survey)	3.6 line kilometres on seven sites
Ground Magnetic (orientation survey)	10 line kilometres on seven sites
Detailed soil geochemical sampling	2,906 samples from 4 geophysical grids; all analysed by Niton only

Source: *MSA, 2016*

Rainbow's exploration programme in 2011 started with a pitting and trenching programme in an attempt to validate historically reported REE vein occurrences. However, this prospecting approach was discontinued because of its inefficiency.

Geological mapping traverses were conducted along existing tracks, foot paths and river incisions due to general paucity of outcrop, and the hilly nature and intense agricultural usage of the Project area. Approximately 3,400 individual observation points with geological information were recorded, including the discovery of close to 800 REE vein or vein float occurrences. The emplacement of veins appears to be controlled by a regional structure pattern, with the REE veins observed intruding all lithologies except the Archaean basement inlier in the western part of the Project area.

Geophysical orientation work included ground gravity and magnetic surveys. The former method is considered an effective but time consuming technique to delineate the approximate position of REE veins, whilst ground magnetics appears to be a useful tool to assess structural and lithological features.

The results of a detailed soil sampling programme over selected areas with known REE occurrences, showed relatively broad and diffuse anomalies with a wide range of anomalous REE concentrations. Although this technique is very effective in confirming the occurrence of REE veins or float in a targeted area, it fails to locate the narrow veins with the precision required to follow up with a single pit or short trench.

The main objective of the geological mapping was to locate in-situ REE veins and float material. By April 2013 a total of 798 occurrences of bastnaesite/monazite in-situ veins and float had been identified in the Project area.

No further exploration fieldwork was undertaken by Rainbow between the end of April 2013 and 2016, except the collection of a 125 kg sample of REE vein material for mineralogical and metallurgical test work and detailed mapping at Gasagwe and Gashirwe West. These two localities are within the ML and were subject of conceptual mining studies in 2016 and a trial bench mining exercise conducted by Rainbow in 2015.

Trial benching and trenching was conducted as an exploration activity to establish the continuity of mineralised veins. The exercise confirmed the strike and down-dip continuity of the veins on a local scale.

1.6.2 Exploration work 2016 to 2018

The following greenfields exploration programmes were carried out in the EL by Rainbow between 2016 and July 2018, when the validity of the EL expired, with the following programmes:

- Regional geological mapping with consequent locating and sampling of new REE occurrences
- A high-resolution airborne geophysical survey comprising magnetics and radiometrics

Brownfields exploration was undertaken on three sites identified for their potential to be "promoted" to trial mining. They are: Kiyenzi, Murambi South and Gomvyi Centre. On these deposits intensive exploration programmes were completed and included:

- Drilling at Kiyenzi
- Trenching and associated channel sampling at Murambi South and Kiyenzi
- Trenching and rock chip sampling at Gomvyi Centre
- Detailed ground gravity surveys at Kiyenzi, Murambi South and Gomvyi Centre

The objectives of the brownfields exploration work were twofold: a) to provide data for more accurate estimates of tonnage and grade and b) to identify additional mineralisation for the mining operation.

Additionally, a detailed channel sampling programme was completed at the Gasagwe mine, as REE veins were exposed during mining, in order to establish the most robust and accurate geological model for the vein stockwork. Such model provides some guidance of continuity of the veins that could be applied to other deposits of similar type within Rainbow's ML.

1.7 Drilling

Diamond drilling ("DD") was carried out by Rainbow between February and September 2018. This was the first drilling programme ever undertaken on the Project. The programme was divided into two phases aimed at achieving the following objectives:

- At the Gasagwe Mine: to test the possibility of using drilling as a method for establishing continuation of known REE veins at depth
- To investigate the cause of the magnetic and radiometric anomalies identified from the airborne geophysical survey
- To establish the source of a ground gravity anomaly at the Kiyenzi target
- To provide data for a three dimensional geology and grade model at Kiyenzi. This objective was the exclusive focus of the second phase of the drilling campaign

A total of 38 diamond holes with a combined metreage of 2,115.50 m were drilled over six sites. The key information about these drill holes is summarised in Table 1-3.

Table 1-3
Summary of Diamond Drill information

Drill Purpose	No. of Targets Drilled	No. of Holes Drilled	Total Metres Drilled
Gasagwe: establishing depth continuation of REE veins	1	3	150.0
Airborne magnetic targets testing	4	4	437.0
Airborne radiometric targets testing	2	2	100.0
Kiyenzi: drilling of ground gravity anomaly	1	6	464.6
Kiyenzi: delineating potential tonnage and grade.	1	24	963.9
TOTAL	**9**	**39**	**2,115.5**

Source: *Rainbow, 2018*

A total of 1,428.5 m were drilled on the Kiyenzi target from 30 DD holes. The DD holes were drilled on a variable grid spacing of between 15 m and 33 m depending on practicalities of drill pad construction on the steep slope. Except for three holes drilled vertically in the initial stage of the campaign, the remaining 27 holes were drilled inclined at either 50° or 60°, depending on the angle of the hill slope. The inclined holes were drilled in 4 directions: NW, SE, NE and SW.

The core drilling of the Kiyenzi target has revealed a new type of REE mineralisation for Gakara, characterised by relatively large tonnage but lower REE grades compared with the narrow veins found at other targets. The REE mineralisation of the Kiyenzi body comprises a combination of:

- Brecciated units, which tend to be large in volume but with extremely variable grades; and
- Thin high-grade veins (mm to cm) which have extensively invaded the host rocks (gneiss and aplite).

1.8 Exploration Target

Resulting from further regional mapping mainly during 2017, the REE occurrence database has increased from approximately 800 records in 2016 (MSA, 2016) to approximately 1,200 records. Of these 1,200 occurrences, approximately 840 are in-situ veins, which represents an increase of 320

records from the 520 data points used in 2016 in calculating the range of potential tonnage of REE mineralisation.

The same methodology and criteria were used in this CPR to calculate a new range in tonnage based on the increased number of vein occurrences.

A revised tonnage range of 16,550 t to 64,000 t of in-situ TREO is estimated for the Property, which MSA considers to represent an Exploration Target as shown in Table 1-4. Excluding Kiyenzi, this equates to between 27,000 and 103,200 tonnes of vein material compared with 20,000 t to 80,000 t reported in the 2016 CPR compiled by MSA. This is primarily the result of the discovery of addition REE vein occurrences on the Property.

Table 1-4
Gakara Exploration Target as at February 28, 2019

Area	Tonnes (t)		TREO Grade (%)		TREO Tonnes (t)	
	Lower	Upper	Lower	Upper	Lower	Upper
Gasagwe	1,400	2,600	58.9	58.9	800	1,500
Murambi Sth	1,500	2,400	57.2	57.2	900	1,400
Gomvyi Centre	1,100	4,200	56.9	56.9	600	2,400
Kiyenzi	50,000	90,000	2.5	3.0	1,250	2,700
Other	23,000	94,000	55.0	60.0	13,000	56,000
Total					**16,550**	**64,000**

It should be noted that the potential quantity and grade of the Exploration Target is conceptual in nature, there being insufficient exploration to estimate a Mineral Resource and that it is uncertain if further exploration will result in the estimation of a Mineral Resource.

The Exploration Target was estimated as a range as required by the JORC Code (2012). The Exploration Target is based on data of varying quantity and quality, although is based largely on actual Exploration Results.

With brownfields exploration being carried out on an ongoing basis by Rainbow's geology team, it should be noted that the tonnage range could change materially. However, the focus of Rainbow's exploration programmes is now towards evaluating individual Exploration Targets to ensure the medium to long term life of mine.

1.9 Mineral Processing and Metallurgy

Rainbow's processing plant was commissioned in the first quarter of 2018 and has been in production mode since then. The plant has been treating mostly vein material produced from the Gasagwe mine (2,027 t of Run of Mine (ROM)) as well as 257 t ROM from Murambi South. Since December 2017, the plant has consistently managed to generate a high grade REE concentrate, grading on average 58.2% TREO.

The plant was constructed at a site near the town of Kabezi, some 15 km south of Bujumbura, sandwiched between Lake Tanganyika to the west and the N3 road to the east. The location near the capital city and the national road offers many, obvious logistics advantages to the operation.

The plant, which has a capacity to treat five tonnes per hour, produces a concentrate by separating gangue material from the denser REE minerals using one jig and two shaking tables.

The Rainbow plant has also been used to carry our performance tests on REE enriched vein material from future mining sites, namely Murambi South and Kiyenzi.

1.10 Mining

Rainbow has been mining the Gakara REE deposit since mid-2017. During this period, Rainbow has constructed the actual mine at the Gasagwe site (with the acquisition and renting of all the earthmoving equipment, building of required infrastructure support, construction and management of waste dumps, and compensation of local inhabitants for expropriation).

Whereas the mining of the first site, Gasagwe, has had to face technical aspects (namely geological variations of the veins and mining method challenges), which were not fully appreciated before the operation started last year, Rainbow has proved its capability in mining such a complex deposit. The learnings are being applied to the mining of future sites with the commencement of Murambi South.

The mining production plan envisages continuous access to a minimum of four separate open pit mine sites to ensure continuous production feed to the plant. The capital purchase for additional mining equipment has been factored into the production plan to cater for the increase in production.

In order for Rainbow to ensure that a steady state annual ROM production target of 7,000 tonnes of high-grade vein material is achieved sustainably, multiple mine sites will have to be developed and exploited at any one time. Such operation will strongly mitigate the risks that are associated with the complexity of the deposits and with the actual mining of thin veins. The Rainbow production plan allows for four mines sites being mined simultaneously. MSA recommends that additional mine sites are continuously being made available due to the unpredictable nature of the veins.

A key component of the future production plan is the "Other" category which constitutes all the remaining exploration targets. The ability to execute the production plan is dependent on multiple exploration sites being available for mining thereby providing production flexibility. In order to bring the "Other" category into the production plan, the Rainbow management team will need to coordinate all the technical and production resources to ensure new sites are continuously available for mining.

A key constraint to vein mining is the amount of waste removal required to access the veins. Additional mining equipment is required to be purchased and be well maintained and utilised in order to achieve the waste production target and the Rainbow production plan.

The key risk is the rainy season from (October to May) and the monthly production plan has been adjusted accordingly by Rainbow.

1.11 Recommendations

In order for Rainbow to ensure that a steady production target is achieved sustainably, multiple mine sites will have to be developed and exploited at any one time. Such operation will strongly mitigate the risks that are associated with the complexity of the deposits and of the mining of the thin veins.

Further exploration is required on the Kiyenzi target before including this in the mining plan. This deposit is unlike the normal Gakara veins as it appears to be a complex breccia pipe and has uncertain grade and geological continuity.

Rainbow should set aside a yearly budget in order to undertake a minimum brownfields exploration programme aimed at defining 5,000 t to 10,000 t of potentially mineable mineralisation every year. The brownfields exploration activities should comprise trenching/benching, ground gravity surveys and drilling.

Rainbow should continue to encourage academic studies on the Gakara deposits, with a particular focus on the structure of the deposits. The present PhD study has provided information that has proved invaluable for the understanding of the geology of the Gakara REE mineralisation.

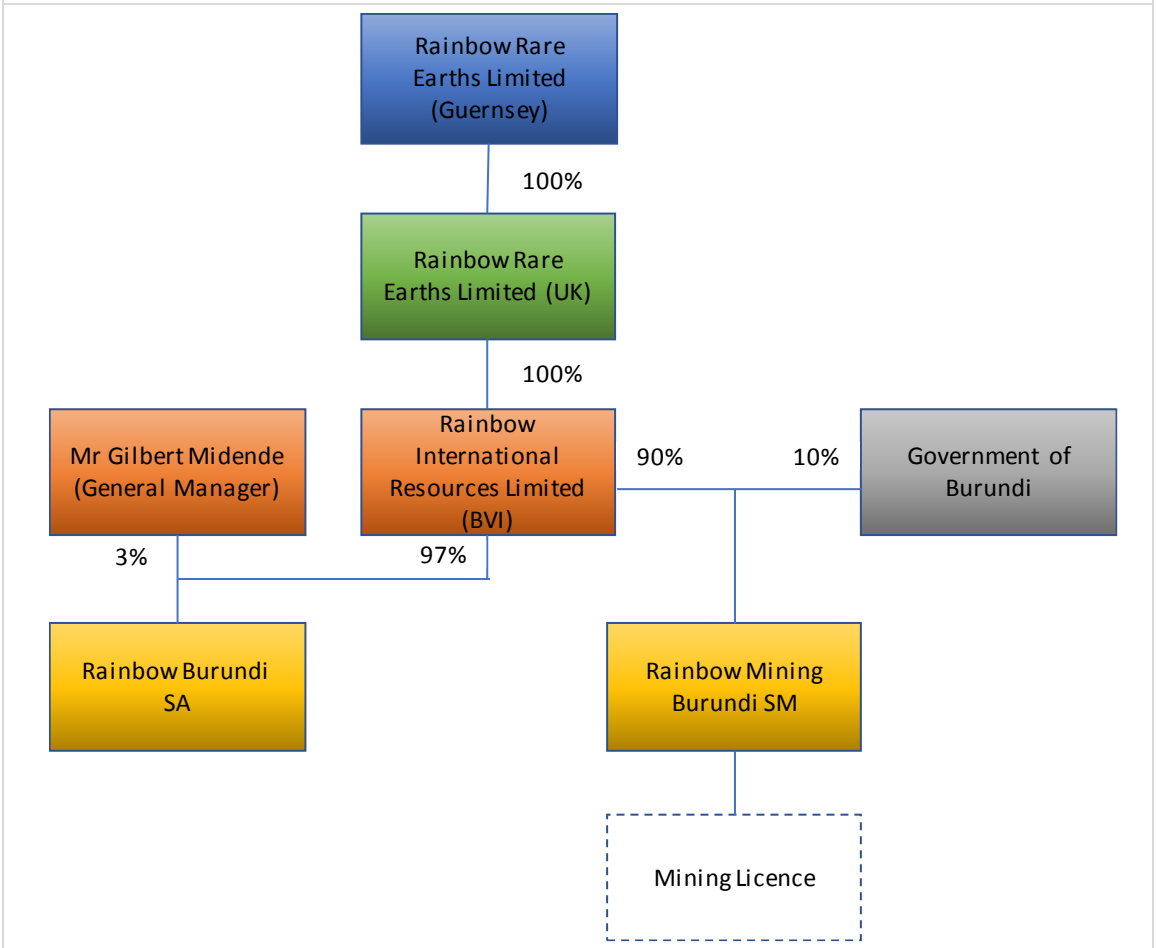
2 INTRODUCTION

2.1 Scope of Work

The MSA Group (Pty) Ltd ("MSA") was commissioned by Rainbow Rare Earths Limited ("Rainbow" or the "Company") to compile a Competent Person's Technical Report (the "Report" or "CPR") in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code" or the "Code"), 2012 Edition.

Rainbow is presently mining a Rare Earth Element ("REE") deposit, the so-called Gakara REE Project (the "Project"), which is located in western Burundi and comprising of a Mining License ("ML") (the "Property"). Rainbow was the holder of an Exploration Licence ("EL") which expired in July 2018 and is no longer part of the Company's Property. Rainbow is a Guernsey registered company and has a 90% interest in the ML (Figure 2-1).

Figure 2-1
Rainbow Company Structure



Source: *Rainbow, Modified by MSA*

This Report presents data and results of the exploration work and includes information on Rainbow's mining and processing activities conducted since the end of 2016 to November 2018. In

addition, the Report incorporates relevant information from the previous CPR (the "2016 CPR") compiled by MSA in October 2016.

Apart from the mining activities, the Project is still considered an Exploration Target, as defined in the JORC Code, despite substantial historical and present mining activities and considerable exploration work undertaken by Rainbow.

All three authors of this Report have visited the Project and their findings, conclusions and recommendations are presented in the respective Sections.

2.2 Principal Sources of Information

MSA has based its review of the Property on information provided by Rainbow, along with technical reports by Government agencies, previous tenement holders and other relevant published and unpublished data. A listing of the principal sources of information is included at the end of this Independent Technical Report. We have endeavoured, by making all reasonable enquiries, to confirm the authenticity and completeness of the technical data upon which the Independent Technical Report is based. A final draft of the report was also provided to Rainbow, along with a written request to identify any material errors or omissions prior to lodgement.

MSA considers that the Property has been acquired on the basis of sound technical merit. The property is also generally considered to be sufficiently prospective, subject to varying degrees of mining and exploration risk, to warrant further exploration and a full assessment of its economic potential.

The Independent Technical Report has been prepared on information available up to and including 28 February 2019.

2.3 Qualifications, Experience and Independence

MSA is an exploration and resource consulting and contracting firm, which has been providing services and advice to the international mineral industry and financial institutions since 1983.

This Report has been compiled by Dr Friedrich Johannes Reichhardt, Mr Jeremy Witley and Mr Jonathon Hudson

Dr Reichhardt is a professional geologist with over 30 years' experience and has been involved in the design, execution, management and evaluation of exploration programmes and public reporting on various mineral deposit types and commodities particularly in southern, central and west Africa. He is a Principal Consulting Geologist with MSA, a Member of the German Geological Society, is registered with the South African Council for Natural Scientific Professions ("SACNASP") and is a Fellow of the Geological Society of South Africa ("GSSA"). Dr Reichhardt has the appropriate relevant qualifications, experience, competence and independence to act as a "Competent Person" as defined in the JORC Code.

The Exploration Target estimates were undertaken by Mr Jeremy Witley who is a professional geologist with 30 years' experience in base and precious metals exploration and mining as well as Mineral Resource evaluation and reporting. Mr Witley is Principal Resource Consultant for MSA, is registered with SACNASP and is a Fellow of the GSSA. Mr Witley has the appropriate relevant

qualifications, experience, competence and independence to be considered a "Competent Person" under the definitions provided in the JORC Code.

Mr Jonathan Hudson, responsible for Sections 13 and 17 of the Report, is a professional mining engineer with 30 years' experience. He is registered with the Engineering Council of South Africa ("ECSA") and is a Fellow of the South African Institute of Mining and Metallurgy ("SAIMM"). Mr Hudson is an Associate Principal Mining Engineer for MSA and has the relevant qualifications, experience, competence and independence to be considered a "Competent Person" under the definitions provided in the JORC Code.

Peer review of the report has been undertaken by Mr David Dodd, Head of Geology at MSA. Mr Dodd has over 20 years of multi-commodity exploration experience throughout Africa and the Middle East. He is registered with SACNASP and is a Member of the GSSA.

Neither MSA, nor the authors of this report, have or have had previously, any material interest in Rainbow or the mineral properties in which Rainbow has an interest. Our relationship with Rainbow is solely one of professional association between client and independent consultant. This report is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report.

3 RELIANCE ON OTHER EXPERTS

In preparing this document, the Qualified Persons have relied on technical input and the provision of data from Rainbow staff, particularly with regard to historical exploration activities undertaken on the licence by previous operators.

Rainbow staff consulted with respect to the geological and geophysical exploration programmes include:

- Mr Cesare Morelli has over 30 years' experience in minerals exploration in Africa including 18 years in diamond exploration with De Beers, managing projects in south, west and central Africa. Mr Morelli was appointed as Technical Director of Rainbow since the inception of the Project in 2011. He has designed and executed all the exploration works completed on the Property as well as part of the mining development operation. As Technical Director of Rainbow, Cesare remains responsible for all geological, exploration and technical programmes executed by Rainbow and has been visiting the Project nearly on a monthly basis in the past two years.
- Dr Medard Kubanza, who holds a PhD in Geophysics from the University of Tohoku, Japan. He is a geoscientist and seismic and electrical imaging specialist with expertise in minerals exploration geophysics for base metals, gold and REE. Dr Kubanza has experience with various geophysical techniques used in minerals exploration including ground and airborne magnetic and radiometric surveys, gravity, and induced polarisation. He has over ten years' experience in academic research and exploration geophysics across Africa, Japan and Canada.
- Joël Ntungwanayo, who holds a Hons. Degree in Geological and Mineralogical studies from the Free University of Brussels (Belgium) and is Chief Geologist at Rainbow. He has over 25 years' experience and has worked on a variety of exploration programmes in Burundi.
- The drilling programme on the Kiyenzi target was managed and executed by Mr Uswege Seme. Mr Seme is a Tanzanian national and has executed several REE exploration programmes for the past two years. Mr Seme has over 25 years' industry experience, most of it with De Beers in diamond exploration, and joined BHP Billiton in 2008 where he managed diamond, manganese and nickel exploration projects. Mr Seme joined Benzu Minerals (Pty) Limited ("BM") in 2010 with which he has been managing precious and base metals projects.
- Dr Gilbert Midende (Burundian) is responsible for all of Rainbow's administration and Government relations in Burundi, but he also brings to the Project a vast knowledge about REE mineralisation and deposit styles. Mr Midende obtained his Doctorate in Geological Science in 1984 at the Université Libre de Bruxelles, Belgium. His PhD thesis was on the Matongo REE carbonatite in central Burundi. He was appointed Burundi Director General of Geology and Mines in 1987 and was Minister of Mines between 1988 and 1993. From 1996 to 2001, he was Principal of the University of Burundi and Minister of Higher Education and is currently Professor in Economic Geology at the University of Burundi.
- The geological, mineralogical and petrographic sections of this Report have been largely compiled by Ms Seconde Ntiharirizwa, a Burundian student who is preparing a PhD at the Geosciences Laboratory, University of Rennes 1 in France. The title of her PhD thesis, which is partly sponsored by Rainbow and which should be completed in 2019, is the following:

"The REE mineralisation of the Gakara area (Burundi): structural controls, petrological and geochemical characterisation and metallogeny model".

- Mr Braam Jankowitz (South African) was appointed Project Manager at Rainbow Mining Burundi in early 2017. Mr Jankowitz has worked in the mining industry since 1979 and has a Masters degree in geology, which he obtained in 1986 at the University of the Orange Free State, South Africa. He has worked as a consultant in the minerals exploration industry in many countries and is experienced in the sampling and analytical techniques relevant to the Gakara REE Project.

Chemical analyses, were undertaken by the following independent accredited laboratories:

- ALS Chemex South Africa and Canada
- SGS Lakefield South Africa.

Metallurgical test work, processing and plant design were conducted by Obsideo Consulting (Pty) Limited in Irene, South Africa.

MSA has relied on a report titled: "Gasagwe and Gashirwe West Conceptual Study (Mine Plan and Schedule)", dated February 2016 and authored by Dr Steven Rupprecht, for information on the conceptual mine plan.

Environmental and Social Impact studies were carried out by Burundi based EGEE S.A.

Risk analysis data were obtained from ControlRisks, an independent global risk consultancy specialising in political, integrity and security risk.

Rainbow's Project is understood to consist of a Mining Licence covering an area of approximately 39 km^2 issued in terms of the Mining Code (2013) of Burundi. MSA has not independently verified, nor is it qualified to verify, the legal status of the license. The present status of the licences is based on information and copies of documents provided by Rainbow, and the Report has been prepared on the assumption that the licence will prove lawfully accessible for further exploitation and evaluation.

No warranty or guarantee, be it express or implied, is made by MSA with respect to the completeness or accuracy of the legal aspects of this document, or environmental issues associated with Rainbow's Property.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Location

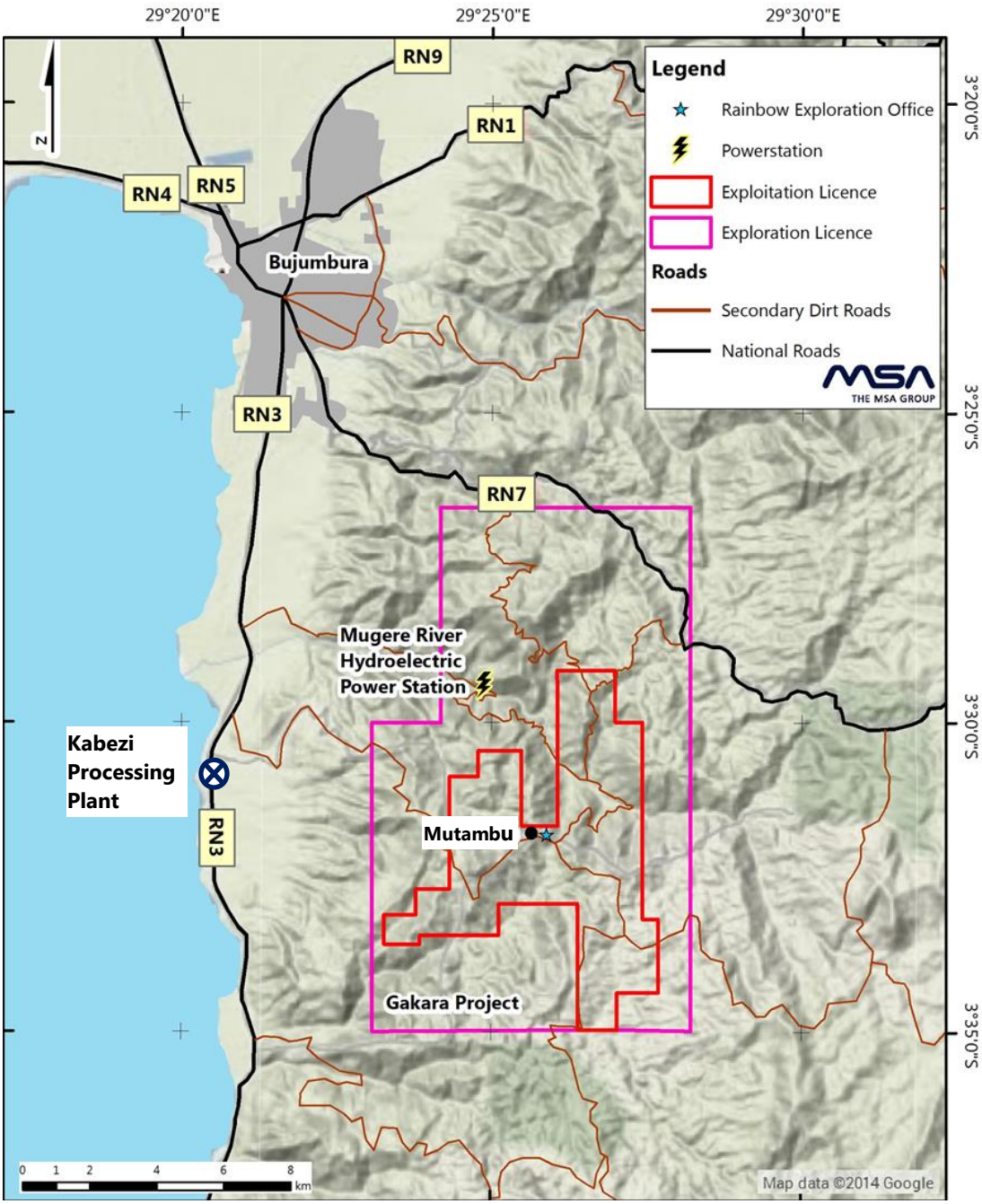
The Gakara REE Project is located in the Bujumbura Province in Western Burundi (Figure 4-1), approximately 20 km south-southeast of Bujumbura. The Project area previously covered an area of approximately 135 km^2, comprising an Exploration License of 96 km^2 and a Mining License of 39 km^2. The EL expired in July 2018 and the Project area now covers only the ML (39 km^2).

Figure 4-1
Location of the Gakara Exploration (EL) and Exploitation (ML) Licenses in western Burundi

Source: *Modified after map from the Cartographic Section of the United Nations (2013)*

An exploration and mining operation base camp has been established at the Gasenyi Catholic Mission in the village of Mutambu, a local administrative centre located in the north-central part of the ML. The processing plant was constructed 15 km south of Bujumbura, adjacent and to the west of the RN3 tar road (Figure 4-2).

Figure 4-2
Road and general infrastructure of the Gakara Project and surrounds

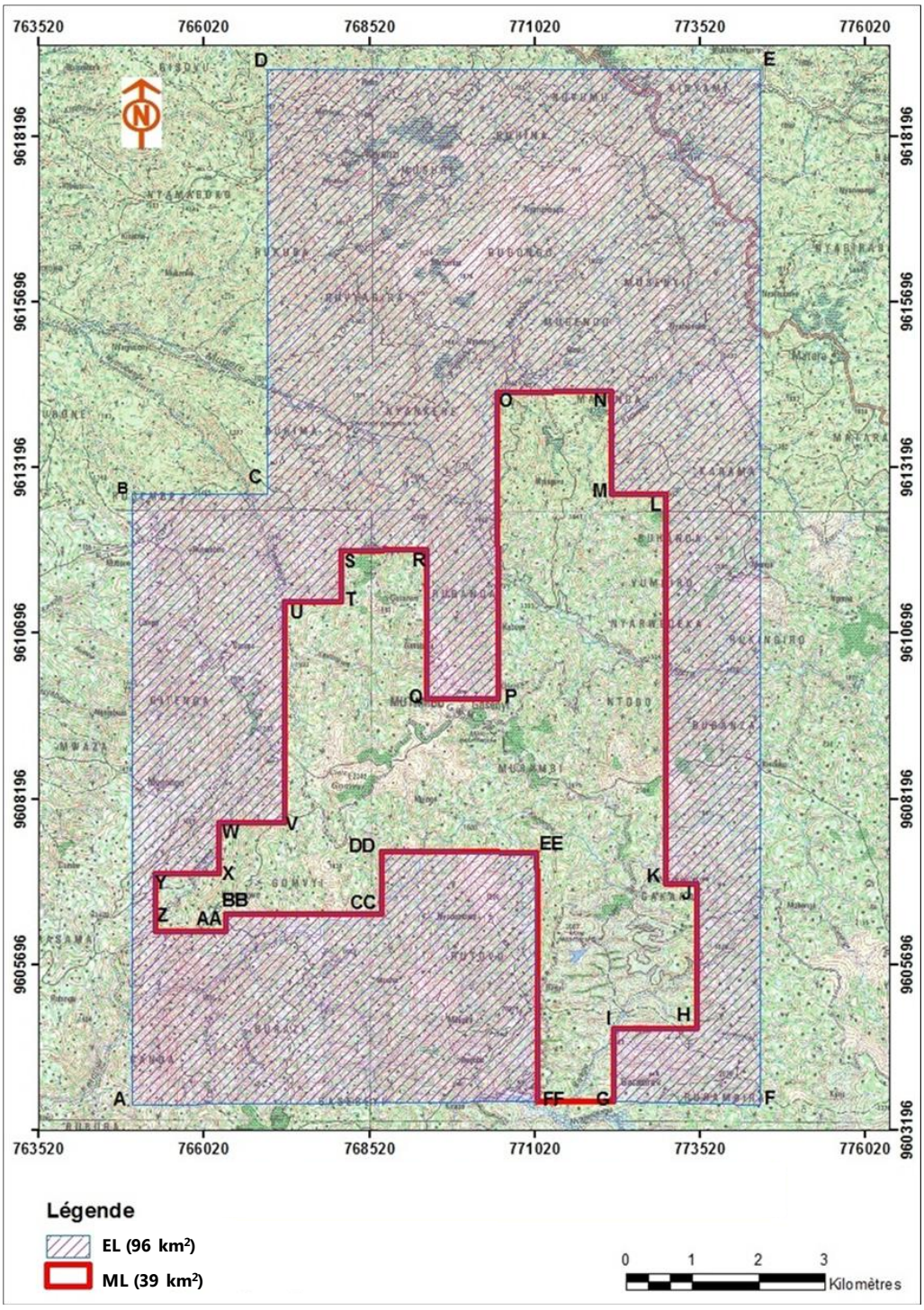


Source: *Background map sourced from Google, 2014*

4.2 Mineral Tenure, Permitting, Rights and Agreements

The Gakara REE Project comprises a ML. Previously, an EL was included but this has since expired. The extents of the expired EL and the current ML are shown in Figure 4-3. The corner coordinates for the ML, as reported in the Mining License issued by the Ministry of Energy and Mines are listed in Table 4-1.

Figure 4-3
Detailed map with corner points of the Gakara ML and expired EL



Note: *Area with blue hatching shows the Exploration License (EL); area outlined in red is the Mining License (ML)*

Table 4-1
Gakara Mining Licence coordinates

ML Date Granted	ML Expiry Date	ML Commodity	WGS 1984					
				Latitude	Longitude		Latitude	Longitude
27 March 2015, ratified 18 April 2015	17 April 2040	Rare Earth Elements and Associated Minerals	G	29°27'01''	3°34'58''	T	29°24'47''	3°30'52''
			H	29°27'42''	3°34'21''	U	29°24'19''	3°30'52''
			I	29°27'01''	3°34'21''	V	29°24'19''	3°32'41''
			J	29°27'42''	3°33'11''	W	29°23'47''	3°32'41''
			K	29°27'26''	3°33'10''	X	29°23'47''	3°33'6''
			L	29°27'26''	3°29'59''	Y	29°23'16''	3°33'6''
			M	29°26'59''	3°29'59''	Z	29°23'16''	3°33'34''
			N	29°26'59''	3°29'09''	AA	29°23'51''	3°33'34''
			O	29°26'04''	3°29'09''	BB	29°23'51''	3°33'26''
			P	29°26'04''	3°31'40''	CC	29°25'07''	3°33'26''
			Q	29°25'29''	3°31'40''	DD	29°25'07''	3°32'55''
			R	29°25'29''	3°30'27''	EE	29°26'23''	3°32'55''
			S	29°24'47''	3°30'27''	FF	29°26'23''	3°34'58''

Rainbow International Resources Limited ("RIR"), which is 100% held by Rainbow Rare Earths Limited ("Rainbow") was granted an EL (in French "Permis de Recherche") for REE and associated minerals in the Gakara region by Presidential Decree No. 100/141 of 16 May 2011. The Decree was based on the Mineral Agreement ("Convention de Recherche Minière"), dated 9 May 2011, between the State of Burundi and RIR. The EL was valid for an initial period of three years and was renewed twice for periods of two years each time. The 2nd and last renewal was granted to RIR in July 2016 (by Decree No. 100/174) with a reduced area of 96 km^2. The EL expired in July 2018.

The ML ("Permis d'Exploitation") was granted by the Burundi Ministries of Energy and Mining and Finance and Economic Development on 27 March 2015 through the execution of a "Convention Minière" (Mining Agreement) between the State of Burundi and RIR. The ML was subsequently ratified by Presidential Decree No. 100/110 on 18 April 2015. Following the grant of the ML, a new company, Rainbow Mining Burundi SM ("RMB") was created in which the State of Burundi acquired a 10% interest by Presidential Decree No. 100/194 of 16 June 2015.

The ML, which covers an area of approximately 39 km^2 (Figure 4-3), provides RMB (as well as Rainbow and its shareholders) with a guaranteed stability of fiscal and legal regimes which will be applicable to the mining operations over a 25-year validity period of the ML.

Rainbow does not own the surface rights covered by the ML but has free and unrestricted access to the Project area, following statutory consultation with the local communities.

4.3 Burundi Mineral Legislation

The current Mining Code of Burundi was enacted by President Pierre Nkurunziza on 15 October 2013 as Law No 1/21, after being approved by Burundi's Senate on 10 October 2013. The Mining Code 2013, which deals only with the mining sector, replaces the previous Mining Code which was in force in the country since 1976.

Rainbow has complied with all statutory requirements and was granted a Mining Licence in April 2015 in which the State of Burundi has a 10% interest. The individual conditions and commercial terms with the State have not been assessed by MSA and no commentary can be provided.

Rainbow is presently the only industrial-scale mining operation in Burundi.

4.4 Environmental Liabilities

The Environmental and Social aspects of the Gakara mining Project are ruled by the following Burundian laws and regulations:

- The Environmental Code of Burundi, Law No. 1/010 (dated June 2000).
- The Decree N°100/22 of 7 October 2010 pertaining to the application of the Environmental Code regarding the process to establish environmental impact studies.
- The national strategy on the environment in Burundi (2002).
- The scope of environmental and social impact assessments.
- The Mining Code of Burundi (Law No. 1/21 of October 2003) and its Regulations in respect of matters related to environment.

4.5 Royalties, Taxes and other Contributions

Rainbow's operations in Burundi are subject to the following Tax and Royalty conditions:

- An annual Environmental fixed tax of Burundian Francs ("BIF") 500,000, (as at 2 May 2019, US$ 272.47, using an exchange rate of BIF 1 = US$ 0.000545 (www.xe.com)).
- Exploration and mining companies are subject to the fiscal and customs regime in place in Burundi. Rainbow is subject to a corporate income tax rate of 30% per the Loi 01/02 du 24 janvier 2013 Relative aux Impots sur les Revenus, Article 94 (p28). Companies can benefit from tax advantages and incentives in accordance with the applicable law. A 5% reduction in the tax rate is applicable to companies that employ more than 200 Burundian Nationals per Article 4 of the 2009 Code des Investissement. Rainbow employs more than 200 Burundian Nationals. The minimum tax is 1% of turnover in the event that no taxable profits are made.
- USD 30,000 per year statutory commitment to two local communes (US$ 15,000 each) within the Project area, as per agreement (Convention Minière, Chapter 11, Article 41) between Rainbow and the State of Burundi.
- A Royalty of 4% is paid to the Government of Burundi, as per the Burundian Mining Code, Article 147.

4.6 Country Risks

According to the CIA World Factbook Burundi is "…a landlocked, resource-poor country with an underdeveloped manufacturing sector. Agriculture accounts for over 40% of GDP and employs more than 90% of the population. Burundi faces several underlying weaknesses – low governmental capacity, corruption, a high poverty rate, poor educational levels, a weak legal system, a poor transportation network, and overburdened utilities – that have prevented the implementation of planned economic reforms". The World Bank's 'Doing Business 2019' report ranks Burundi 168 out of 190 economies. Access to credit and to electricity are two areas where the country has the most progress to make. The 'World Investment Report 2018' noted Foreign Direct Investment inflows of

US$ 0.1 million and US$ 0.3 million in 2015 and 2016 respectively, down from US$ 47 million in 2014.

4.6.1 Project Risks

The pinch-and-swell nature, a lack of continuity along strike and down-dip and minor variations in the REE concentrations of the REE veins can impact negatively on the available tonnage and grade of an individual mining area. The occurrence of REE veins with a high concentration of radioactive minerals needs to be anticipated and mitigated by regular measurements with a Geiger counter.

Evaluation of the REE veins involves a high degree of uncertainty. Although Rainbow's understanding of vein continuity has significantly improved as a result of mining activities at Gasagwe, anticipated future mining on the Property is based on an Exploration Target.

Further potential risks to the financial success are declining REE prices, rising operating costs, availability of fuel and qualified labour.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

Access to the Property from Bujumbura is by tarred road via the RN3 in a southerly direction along the eastern coastline of Lake Tanganyika (Figure 4-2). The tarred road then connects via an all-weather dirt road to the local administrative centre of Mutambu, located in the central part of the Mining License, where Rainbow has established an operation base camp within the Gasenyi Catholic Mission premises, with safe accommodation, storage facilities, water, electricity and communication. The total distance by road from Bujumbura to Mutambu is 40 km and takes approximately 90 minutes in a 4x4 vehicle.

The Project area is served by variably maintained dirt roads, which due to the rugged terrain, become difficult to negotiate during the rainy season. The dirt roads or tracks usually follow local watersheds, with access to valley bottoms and/or primary and secondary drainages via local footpaths that are extensively developed throughout the Project area.

5.2 Physiography and Climate

The Project area is located on the eastern escarpment of the Lake Tanganyika Graben in the Mirwa Mountains area. The topography is rugged with deep V-shaped valleys and a dense, well-developed erosional drainage system. The main rivers in the Project area are the Mugere and the Karonge Rivers which flow into Lake Tanganyika over a short distance of 12 km to 15 km with a vertical drop of approximately 1,500 m.

The Project area lies at an altitude of between 1,500 mamsl and 2,000 mamsl. The Gomvyi Mountain (2,040 mamsl) forms a dominant topographic high in the region. The eastern part of the Gakara Project area marks a transition to the Congo-Nile ridge and plateaux and is characterised by steep slopes and convex-shaped valleys. The Heha Mountain (2,670 mamsl) which is the highest peak in Burundi, is located approximately 5 km to the southeast of the Project area.

The entire area has undergone significant and deep lateritic weathering, which results in a paucity of hard-rock outcrops, the vast majority of which can only be observed along road cuts or along streams.

The Project area is intensely cultivated with subsistence plantations (manioc, vegetables, coffee, maize, trees etc.). Remaining areas of natural vegetation are being cleared to make way for the expanding subsistence agricultural needs, and to supply local building requirements. Due to the steeply incised terrain and intensive subsistence agricultural methods (Figure 5-1), erosion is intensive and marked by the development of several deep erosion gullies and landslides.

Burundi has a humid, equatorial climate influenced by the rift altitude, with a rainy season from October to May. There is a period of decreased rainfall in December to January, the so-called "petite saison sèche". The dry season lasts from June to September. The average annual rainfall for Burundi is about 1,300 mm. Temperatures are relatively moderate, varying between 17°C and 23°C on the plateaux. Above 2,000 mamsl, the average winter minimum temperature is 6°C.

Figure 5-1
Rugged terrain with incised drainage, intense cultivation and thick weathering profile

Source: *MSA, 2016*

5.3 Local Resources and Infrastructure

Burundi has a large rural population with a density of 470 inhabitants per square kilometre. Modern facilities, goods and services are available from Bujumbura, while Mutambu provides basic food supplies. Bujumbura is served by daily commercial flights from Nairobi and Kigali (Kenya Airways and Rwandair). Cellular phone coverage is available over most parts of the Project area.

The 8-megawatt Mugere River hydroelectric plant, the main power supplier to Bujumbura, is situated approximately 3 km north of Mutambu and has been identified as a potential source of electricity to the Project area, although at this stage Rainbow provides electricity to the Kabezi processing plant via its own power generators.

The nearest rail link can be accessed by road and/or by boat on Lake Tanganyika down to the port of Kigoma (Tanzania), which is linked by rail to the port of Dar es Salaam in Tanzania. Rainbow exports its final concentrate product to the ports of Mombasa (Kenya) using the tarred network linking the various East African countries.

6 HISTORY

A comprehensive and detailed account of the history of the Gakara Project, both in terms of exploration and mining, was compiled by MSA in the 2016 CPR. The compilation comprised reviews of all historical reports and data, from the 1930's up to the mid 1980's, gathered by Rainbow from various sources (mainly from the Tervuren Central Africa Museum in Belgium and from the Bundesanstalt für Geowissenschaften und Rohstoffe ("BGR") in Germany).

Very few new historical records have been retrieved by Rainbow since the MSA report was compiled and therefore only a brief history of the Gakara Project is provided in the present CPR, with the focus on the historical mining information.

6.1 Summary of Historical Exploration and Mining

The Gakara Mining Project from the 1930's to the 1970's was held and controlled by the Belgian company SOMUKI (Société Minière de Muhinga et de Kigali) and later by SOBUMINES, (51% owned by the Belgian Société Minerale de Karonge and 49% by the Government of Burundi) (Ntungwanayo *et al.*, 2013).

The first reports of the presence of REE in the Project area date back to 1936 when SOMUKI discovered bastnaesite in alluvial deposits. From 1941 to 1942, research into the bastnaesite vein occurrences resumed and trial mining was undertaken from alluvial deposits but mainly from in-situ REE veins at Gakara. However, this operation was suspended due to unfavourable market conditions associated with the Second World War.

An increase in REE prices from 1947 to 1957 resulted in renewed mining activities at the Gakara and Rusutama deposits with a total of 2,137 tonnes of bastnaesite produced from these two deposits. A further two discoveries of bastnaesite mineralisation were made at Gasenyi and Murambi, with the bastnaesite mineralisation occurring in a network of thin veins and stockworks. Exploration and mining stopped in 1957 due to a fall in the global REE prices. In those years the main rare earth elements of interest were cerium and lanthanum.

SOBUMINES returned to the Gakara area in 1965, by which time the general understanding of the geochemistry, mineralogy and metallurgical characteristics of REE had advanced. Improved separation techniques resulted in higher purity of concentrates and better processing technology assisted in the extraction of individual REE oxides. In the 1970's exploration and mining operations were extended to other sites including Gasenyi, Murambi, Gasagwe and Mugere. Mining operations until 1978 comprised open pits (terraces and galleries) for most deposits except for Mugasenyi and Murambi, where underground mining was conducted due to the paucity of surface veins and the considerable thickness of overburden. In 1978 SOBUMINES stopped all operations due to a decline in REE prices, which rendered mining in the Gakara area uneconomical (Ntungwanayo *et al.*, 2013).

In summary, during nearly 30 years of intermittent mining, approximately 5,000 t of high grade (>50 % TREO) bastnaesite/monazite mineralised vein material was extracted, processed and exported with the majority derived from the Gakara mine (BGR, 1983).

From 1981 to 1985 BGR undertook an exploration and evaluation programme on six selected REE-bearing sites, within a framework of bilateral cooperation between the Burundian and the German

Governments. Their "Feasibility Study" (BGR, 1985) reported an estimated 5,000 tonnes of REE material at a grade of 50% TREO available for mining at these six deposits. The Gasagwe deposit alone was estimated by BGR to contain approximately 2,800 tonnes of REE material (BGR, 1985).

Prior to the granting of the Gakara EL to Rainbow, no other exploration or mining licences were awarded in the Project area since the cessation of mining activities in the late 1970's.

6.2 Historical Mining Areas

BGR (1983) estimated that approximately 5,000 tonnes of high grade bastnaesite-/monazite-bearing material/concentrate (>60 % TREO) were produced from 12 to 15 individual sites during the approximately 30 years of mining activities. The majority of this reported historical production was derived from the Gakara, Rusutama and Gasenyi mines which together were estimated to have produced approximately 4,500 t, of which 3,465 t was produced from the Gakara mine (BGR, 1983). The historical estimates are summarised in Table 6-1.

Table 6-1
Summary of historical mining and exploration records

Deposit Name	Estimated Tonnes of Deposit	Exploration and Mining Works	Historical Production Tonnes	Mineralisation	Maximum Vein Thickness Observed or Exploited (cm)
Gasagwe (SOBUMINES, 1977)	3,603	Pits, trenches, galleries (150 m)	27	Bastnaesite & Monazite	50
Gasagwe (BGR, 1983-85)	2,773	Pits (1,500 m; 20 m depth), 7 trenches & 13 galleries (556 m)	n/a	Bastnaesite & Monazite	40
Mugere 1	1,032	17 pits, 9 trenches, 2 galleries	n/a	Bastnaesite	4
Mugere 2	354	29 pits, 4 trenches	1.5	Bastnaesite	8
Nyamikole	741	8 pits, 14 trenches, 1 gallery	n/a	Bastnaesite	10
Rugembe (Gomvyi N)		18 pit, 7 trenches	1.5	Bastnaesite	15
Murambi Sud	491	36 pit, 2 trenches, 3 galleries	n/a	Bastnaesite & Monazite; eluvium and veins	7
Murambi		Pit, 2 galleries	n/a	Bastnaesite & Monazite	5
Rusutama		Benches, galleries	500	Monazite; irregular stockwork type veinlets	15
Gasenyi		Pits, 9 galleries	504	Bastnaesite: 3 veins exploited	15
Gakara		Benches, galleries	3,465	Bastnaesite: massive and breccia types with large lenticular veins	10
Misugi		Pits, trenches	1	Eluvial monazite	n/r
Bigugo		1 gallery	16	Monazite; 3 lenticular veins in gneiss, max. 10 m depth	20-30
Nyabigati Nord & Sud		Trial quarry	13	Monazite	n/r
Karinzi		Trial quarry, pits	1	Bastnaesite & Monazite	n/r
Kigunguzi		Gallery, trenches	5.5	Monazite	10
Zinga		Small scale quarry	1.6	Bastnaesite & Monazite: lenticular vein	12

Note: *n/r = not reported; n/a = not applicable*

Source: *Aderca and Van Tassel (1971); Thoreau et al. (1958); BGR (1983, 1985)*

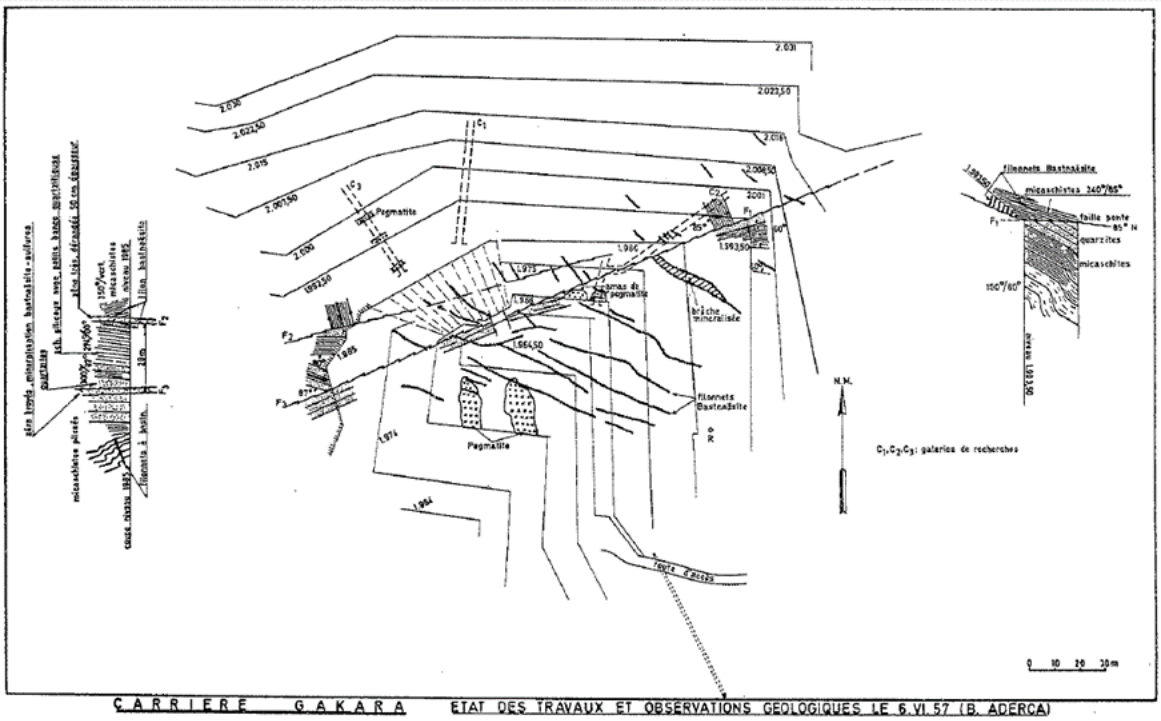
The information in Table 6-1 was compiled from various historical reports including Aderca and Van Tassel (1971), Thoreau et al. (1958) and the BGR (1983, 1985) and from photos and diagrams presented in these reports. These records provide invaluable descriptions of the dimensions of historical mines, depth of excavations, lateral extent of REE veins and information on average widths, type of mineralisation and vein types. Rainbow's mining of the Gasagwe deposit since mid-2017 has corroborated most of the morphological characteristics of the REE deposits historically reported, such as vein lateral and depth continuation, vein thickness variations and general consistency of TREE (total rare earth element) grades.

6.2.1 Gakara Historical Mine

A copy of the Gakara mine plan is published in Aderca and Van Tassel (1971) (Figure 6-1). From this plan the following can be observed:

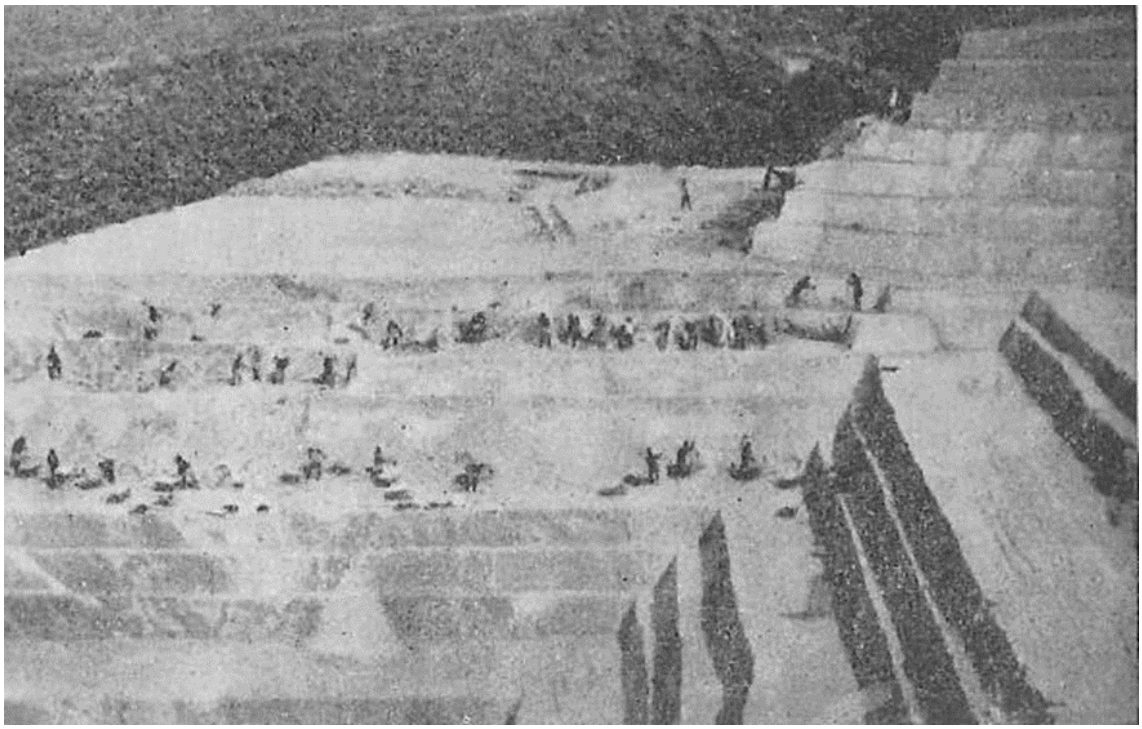
- Gakara pit was excavated to a depth of at least 80 m, with benches of between 1.5 m to 2 m (Figure 6-1 and Figure 6-2).
- Approximately thirty veins were mined over a lateral extent of 180 m, with reports of some single veins continuous over strike lengths of up to 60 m.
- The vein system is reported to continue beneath the (now abandoned) mine floor.
- Some 3,465 t of final export product (grading >55% TREO) are reported to have been extracted from this deposit.

Figure 6-1
Gakara Mine Plan prior to 1971



Source: *Aderca and Van Tassel, 1971*

Figure 6-2
Photo of the Gakara Mine in 1957



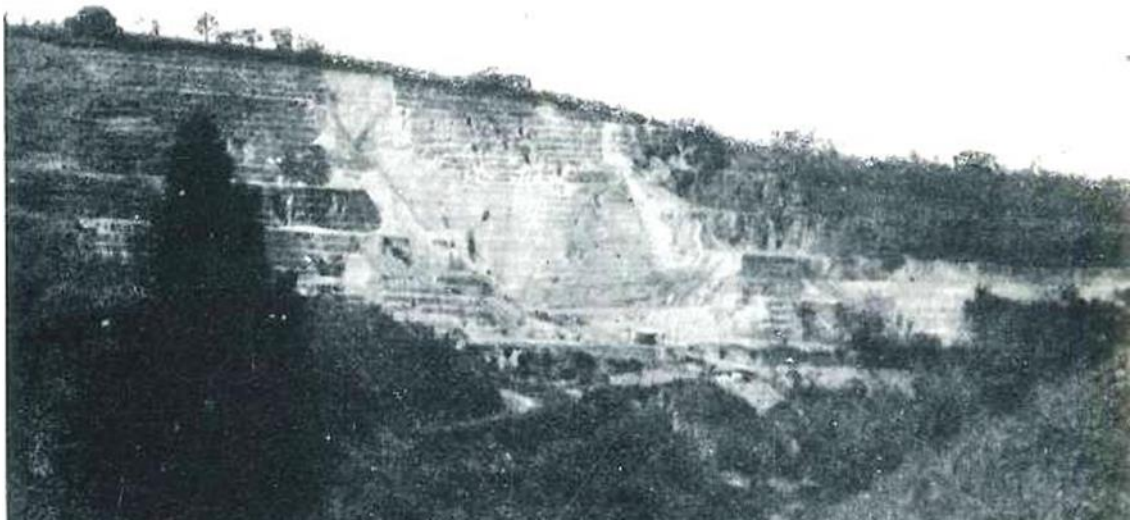
Source: *Thoreau et al., 1958*

6.2.2 Rusutama Historical Mine

The historical records of the Rusutama Mine (Aderca and Van Tassel, 1971) describe geology and mining as follows (Figure 6-3):

- The lateral extent of the mine was approximately 150 m and the vertical height was 50 m to 60 m.
- Approximately 30 benches of 1.5 m to 2.0 m height were excavated by hand.
- The deposit consisted of a very irregular stockwork of thin but numerous veins, often brecciated as well, with the largest veins being 15 cm wide/
- Some 500 t of mineralised vein material were extracted and produced from this site.

Figure 6-3
Historical photo of one portion of the Rusutama Mine



Source: *Aderca and Van Tassel, 1971*

6.2.3 Bigugo Historical Mine

A recent photo from the defunct Bigugo mine (Figure 6-4) provides additional evidence of the size of some of the deposits mined: 10 benches of 2 m height each for a total depth of excavation of 20 m.

The veins mined at Bigugo are reported to have been relatively thick ranging from 20 cm to 30 cm (Aderca and Van Tassel, 1971).

Figure 6-4
Overgrown benches of the historical Bigugo Mine

Source: *Rainbow, 2018*

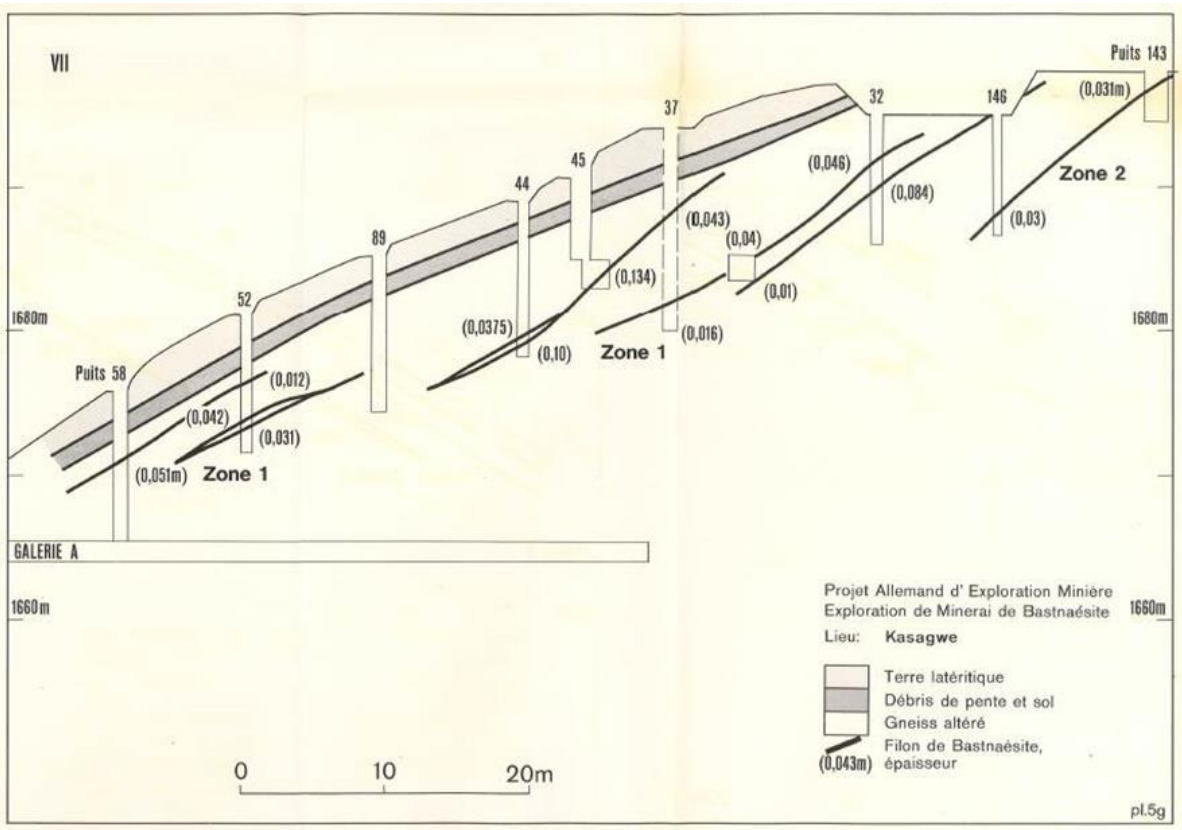
6.2.4 Gasagwe Historical Mine

The Gasagwe deposit was sporadically mined by the Belgians before the operation closed in the mid 1970's, with less than 30 t reportedly produced. However, BGR undertook a comprehensive exploration and tonnage estimation programme at Gasagwe between 1983 and 1985, culminating in the delineation of approximately 2,700 tonnes of REE mineralisation.

The detailed historical exploration plans and sections (Figure 6-5) provide further information on the general deposit characteristics, already observed at the other historical mines:

- Vein stockwork extension over a depth of 40 m.
- Irregular continuation of the vein system at depth.
- Stacking of sub-parallel veins, the thickest of which was reported to be 50 cm wide (BGR, 1985).

Figure 6-5
Example of a section through the Gasagwe Mine



Source: *BGR, 1985*

7 GEOLOGICAL SETTING AND MINERALISATION

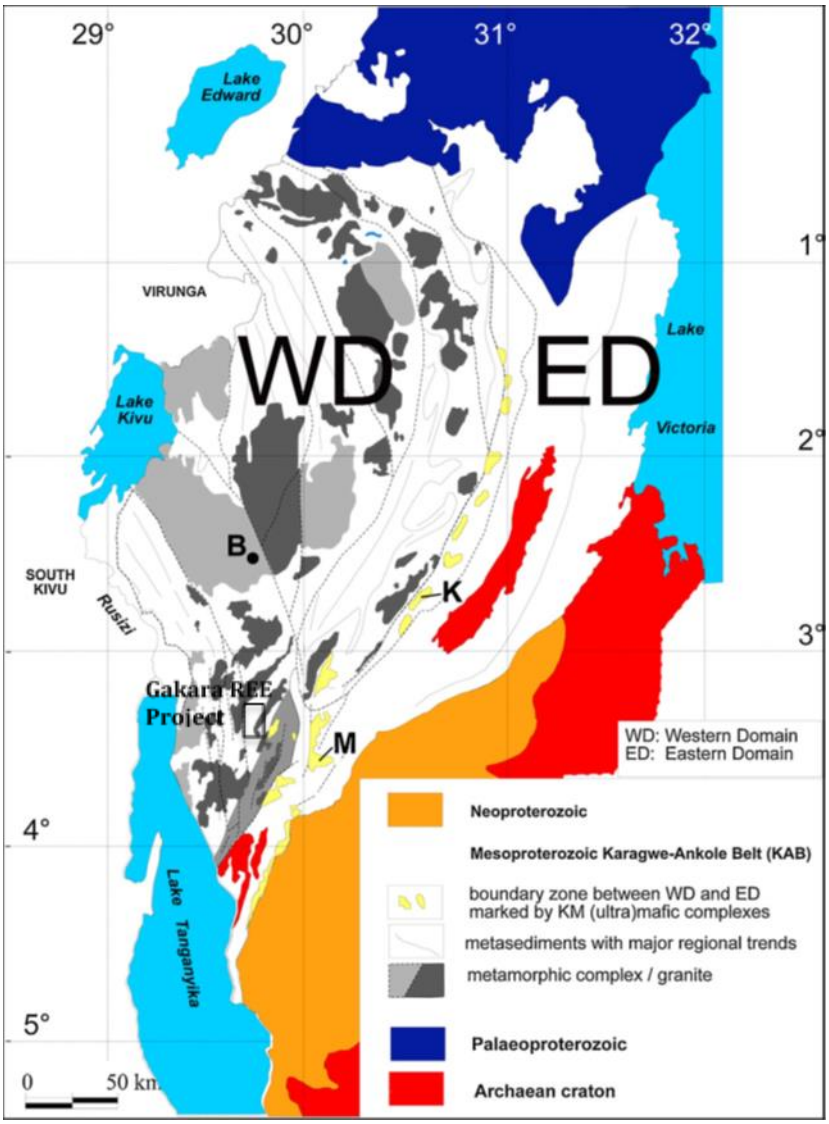
7.1 Regional Geology

The regional geology of Burundi is dominated by the northeast trending Kibaran Fold Belt, commonly named the Karagwe-Ankole Belt ("KAB") (Tack *et al.*, 2010) (Figure 7-1). The KAB is subdivided into a Western Domain ("WD") and an Eastern Domain ("ED"). The ED is less deformed and metamorphosed and is thrusted over the Neoproterozoic-age continental sedimentary and volcanic rocks which rest upon the Archaean Tanzanian Craton (Deblond and Tack, 1999; Duchesne *et al.*, 2004). The WD consists of a highly deformed sequence of Mesoproterozoic granites, granitoids and amphibolite-greenschist facies metasedimentary units and metavolcanic rocks, referred to as the Burundi Supergroup (Deblond and Tack, 1999; Tack *et al.*, 2010). The granitoids occur as large, heterogeneously deformed sheet-like intrusions within the metasediments of the Burundi Supergroup and frequently form the core of antiformal domes. The granitoids are commonly associated with metasedimentary inclusions, mainly quartzite, and have ages between 1.37 Ga and 1.38 Ga (Tack *et al.*, 2010), coinciding with extensional deformation and peak thermal metamorphism in the Kibaran Belt.

The Burundi Supergroup is believed to have accumulated in shallow basins during an early rifting phase of the Kibaran orogeny (Deblond and Tack, 1999) and is intruded by a series of mafic and ultramafic complexes (the Kabanga–Musongati belt) and two types of granites and granitoids classified as A-type and S-type (Tack *et al.*, 1994).

The north-easterly aligned Kabanga–Musongati belt (Figure 7-1) is located along the interface between the Kibaran orogen to the west and its foreland basin sediments overlying the Tanzanian Craton in the east (Tack *et al.*, 2010). Granitic rocks are more concentrated in the western part of the Kibaran Belt where they form extensive and complex intrusions which are frequently associated with smaller mafic intrusions of amphibolite-bearing dolerite and gabbro (Klerkx *et al.*, 1987). The geological and tectonic framework of Burundi and adjacent countries have been strongly influenced by repeated episodes of rifting along existing structural trends (Lehmann et al., 1994).

Figure 7-1
Simplified geological map of the Karagwe-Ankole Belt and regional framework



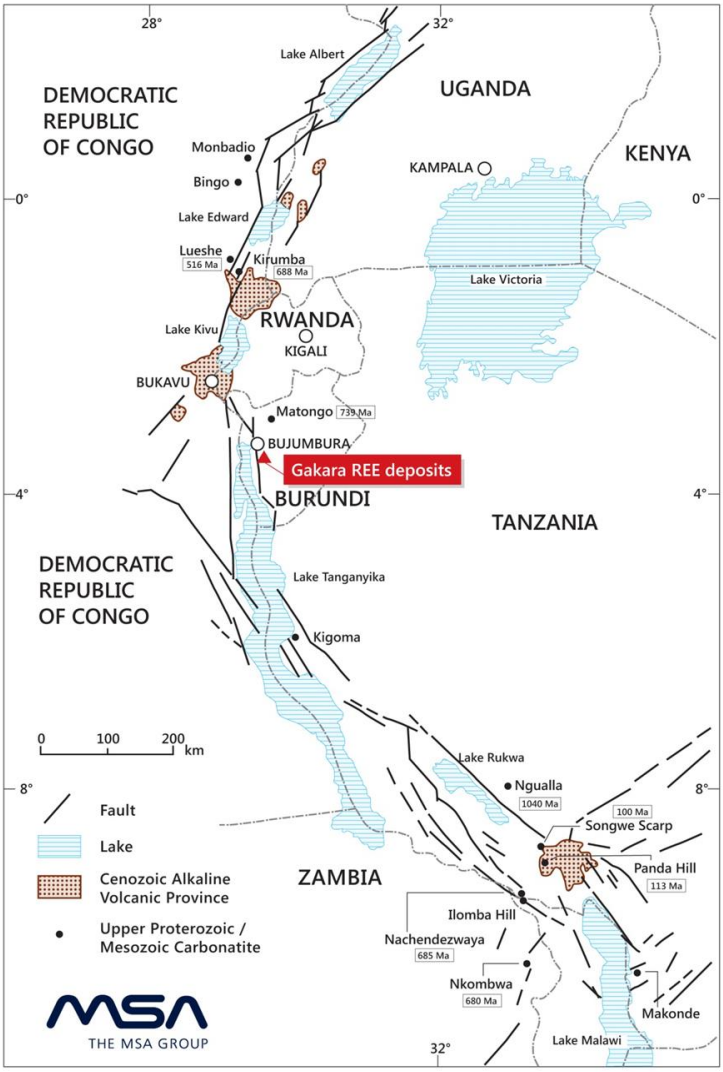
Note: *K: Kabanga Complex; M: Musongati Complex*

Source: *Rainbow, 2018 modified after Tack et al., 1994 and Fernandez-Alonso, 2007*

7.2 Local Geology

The Gakara REE deposits are located near Lake Tanganyika, on the western branch of the East African rift (Figure 7-2). REE mineralisation is typically related to carbonatitic and/or peralkaline magma emplacement. Such magmatic and mineralised context has been identified along the western branch of East African rift, about 60 km northward from Gakara in the alkaline complex of the Upper-Ruvubu containing the Matongo carbonatite (Midende, 1984, Midende *et al.*, 2014; Decrée *et al.*, 2015). This complex and the associated REE mineralisation have been dated around 600-700 Ma, i.e. during the Pan-African orogen. The REE mineralisation at Gakara is however 100 Ma younger that at Matong. As early as 1958 (Thoreau *et al.*, 1985) a tentative relationship between these deposits and carbonatites was suggested. Although never definitively confirmed, this hypothesis is commonly accepted (Andrade *et al.*, 1999; Rasoamalala *et al.*, 2014).

Figure 7-2
Carbonatite and alkaline intrusions of the western branch of the East African rift system



Source: *Modified from Lehmann et al., 1994*

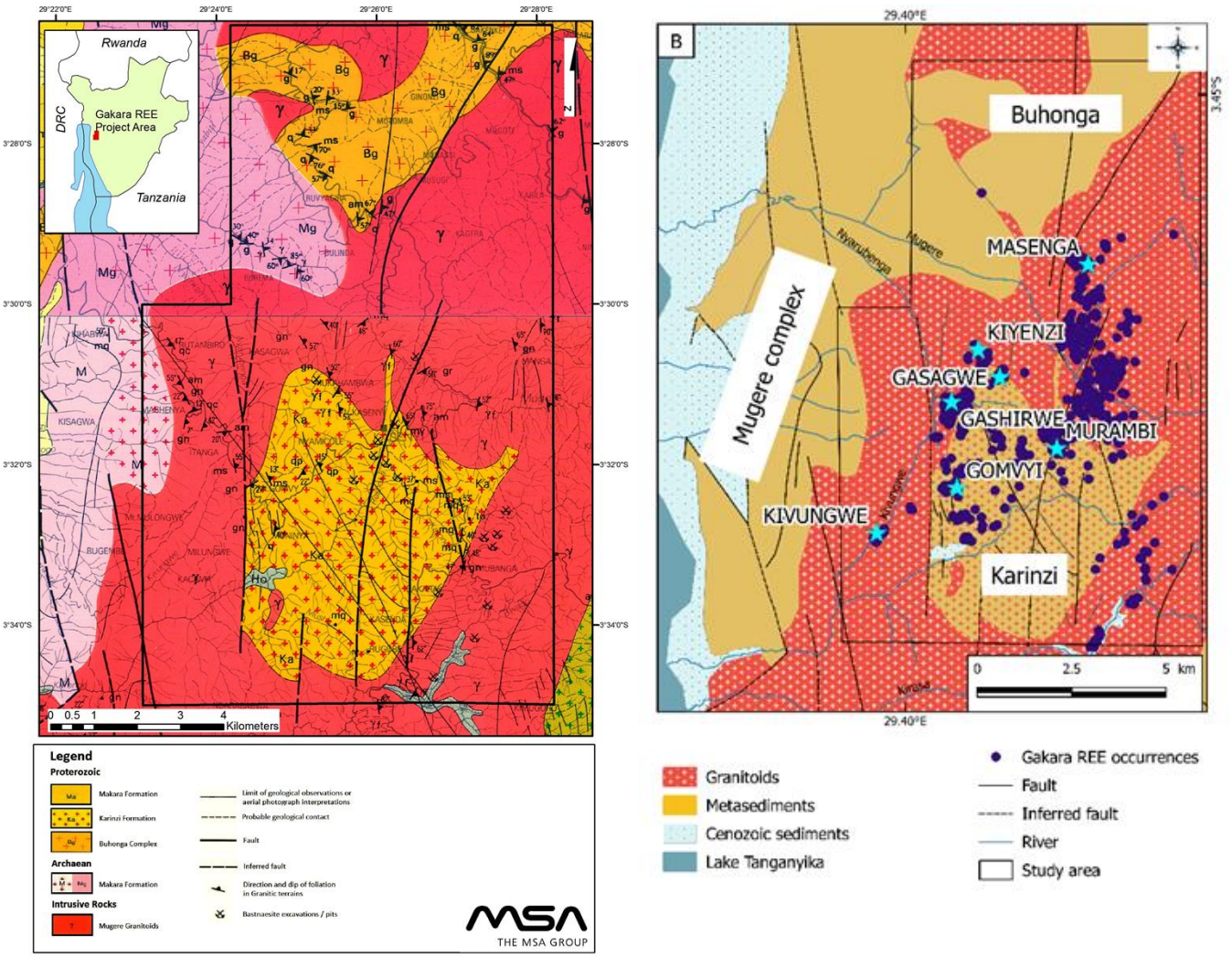
Except for the Archean Mugere complex, the mineralisation is hosted in Mesoproterozoic rocks belonging to the Karagwe-Ankole polymetamorphic belt composed of metasediments and orthogneisses intersected by pegmatites which have been dated at 969 ± 17 Ma (Lehmann *et al.*, 1994). Several formations have been described including the Karinzi Formation, consisting of metaquartzites and metapelites intruded by Kibaran granitoids (Klerkx *et al.*, 1984), in which the Gakara mineralisation is hosted (Figure 7-3). The Gakara Property is mainly composed of rocks formed during the Mesoproterozoic, Kibaran orogenic event between 1,375 Ma and 985 Ma. Those rocks are divided into metasediments and granitoids (Figure 7-3). These units are intruded by a high-density network of Kibaran pegmatites and aplite (Lehmann *et al.*, 1994). REE veins have been found in both types of rocks. The mineralised veins cross-cutting host rocks have been dated around 600 Ma (Ntiharirizwa's PhD in progress and Nakai *et al.*, 1988). Consequently, if a single mineralising event is postulated, this mineralisation is Pan-African in age and postdates the last events of the Kibaran orogeny.

7.3 Property Geology

The Mugere migmatitic complex in the westernmost part of the Project area is the oldest formation present and consists of metamorphic sediments including phyllites and migmatitic gneiss, with a probable age of deformation and metamorphism of 2.8 Ga (Brinckmann *et al.*, 1983).

The Kibaran-aged (±1.4 Ga) Mugere granitoid and Karinzi and Makara metasediments are the dominant host rocks for the bastnaesite/monazite mineralisation in the Project area. The granitoid is a large batholitic complex of foliated granites and banded gneiss containing quartzite lenses. The foliation shows commonly a northerly orientation and dips to the east. The Mugere granitoid and the metasediments are intruded by massive or sill-type pegmatite and meta-dolerite dykes. Pegmatite bodies can be several hundred metres thick and cut the host rocks at various angles and in an irregular and intermittent manner. The commonly foliated meta-dolerites are intrusive bodies in the form of dykes and sills and can be several hundred metres wide.

Figure 7-3
Geolocical map of the Gakara Project area and individual REE occurrences (Map B)



Source: *Background geology from Feuille Rumonge S4/29 SW and Feuille Bujumbura S4/29 NW, Republique de Burundi, l'Institute Geographique National de Belgique, 1986; Map B: Rainbow, 2018 showing locality names of individual REE occurrences referred to in this CPR.*

7.4 Mineralisation

The information and data presented in the following sections of the Report (7.4, 7.5, 7.6 and 8.2) were mostly derived from the PhD study by Ms Seconde Ntiharirizwa, which is in progress (partly sponsored by Rainbow).

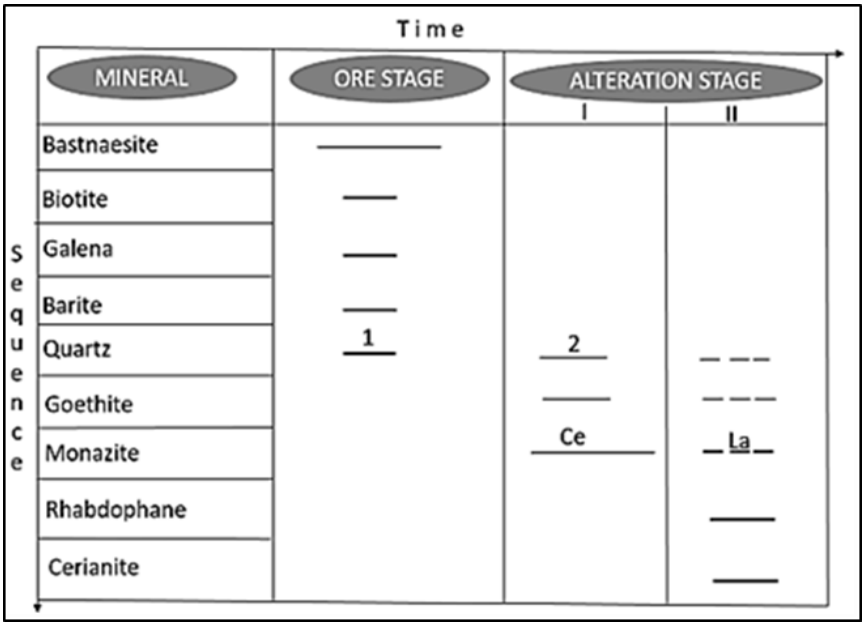
The Gakara REE mineralisation occurs as a stockwork of centimetre to decimetre wide veins and consists mainly of coarsely grained, locally brecciated, metasomatised bastnaesite and monazite (Lehmann, 1994). The gangue accompanying the mineralisation consists of quartz, biotite, barite, microcline, pyrite and galena (Thoreau *et al.*, 1985; Aderca and Tassel, 1971; Van Wambeke, 1977, Ntiharirizwa, in preparation). The supergene alteration gave way to a new mineralogical assemblage composed of rhabdophane, cerianite, crandallite-florencite, goethite and kaolinite.

The paragenetic sequence (Van Wambeke, 1977; Ntiharirizwa, in preparation, Figure 7-4) shows that the genesis of the mineralisation took place in three successive stages:

- The first stage consists of depositing the primary mineralisation comprising bastnaesite, barite, biotite, galena and quartz (Qz 1).
- The second stage begins with the formation of monazite (Ce-rich) and quartz (Qz 2).
- The third stage is the formation of monazite (La-rich), cerianite and rhabdophane, and is probably associated with a process of lateritisation.

The texture of the veins corresponds to a brittle opening of the fracture with crystallisation of the bastnaesite in the space created. The "monazitisation" of primary bastnaesite (Figure 7-5) was due to a series of fractures responsible for brecciation with jigsaw-puzzle texture observable in the field and in thin section. The presence of automorphic crystals of quartz co-precipitating with monazite (Figure 7-5 and Figure 7-6) implies space available for crystal growth (i.e. cavities must have been opened before crystallization of quartz and of the monazite).

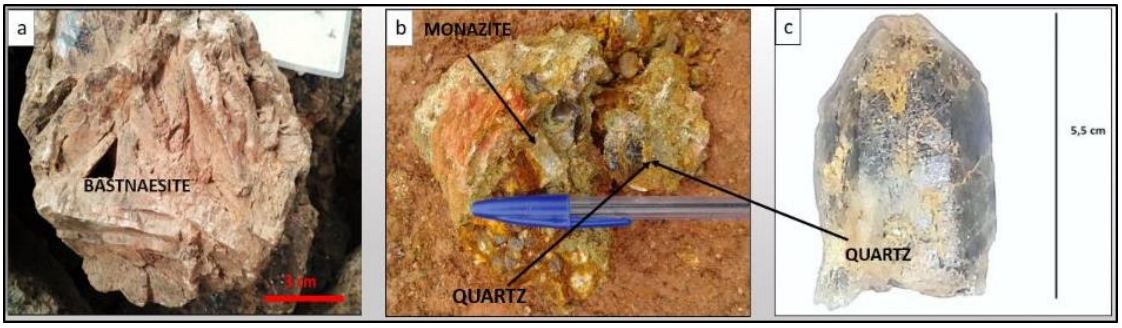
Figure 7-4
Paragenetic sequence of Gakara REE mineralisation



Source: *Ntiharirizwa, PhD thesis in preparation*

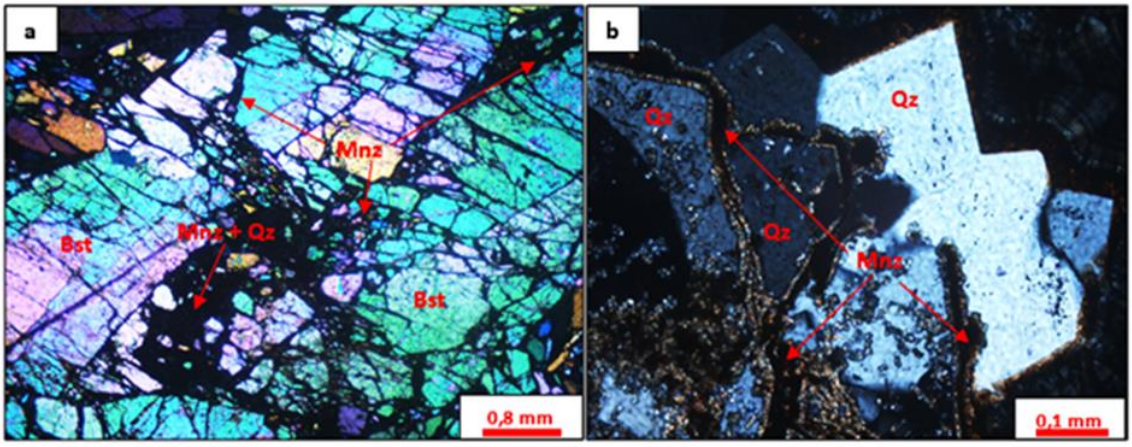
Many host rock clasts are also incorporated into the veins, corresponding to the brecciation of the host rock by numerous mineralised veins. These observations made it possible to hypothesise that the mineralised veins were set up in a brittle deformation regime where the fracturing was reinforced by hydrostatic fluid pressures that could have a pulsatile character during the formation of the bastnaesite and the subsequent alteration in monazite that followed (Ntiharirizwa, in preparation).

Figure 7-5
Photographs of representative samples of dominant minerals in the Gakara deposit



Source: *Rainbow, 2018; a: pure bastnaesite; b & c: automorphic quartz crystals associated with monazite from Gasagwe*

Figure 7-6
Microphotographs of representative samples of Gakara REE mineralisation



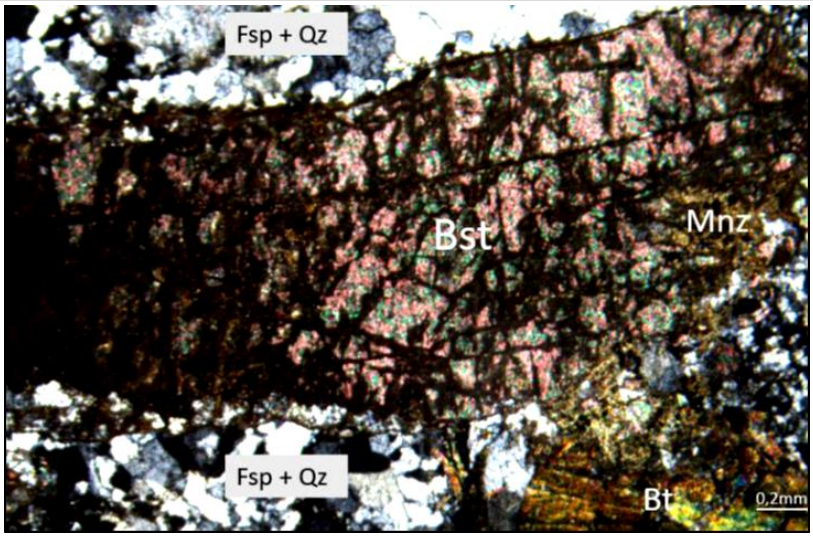
Source: *Rainbow, 2018; a: Bastnaesite (Bst) brecciated in jigsaw-puzzle texture with fracture-filling by monazite (Mnz) and quartz (Qz); b: Monazite (Mnz) and automorphic quartz crystals (Qz)*

Twenty four samples from the Kiyenzi core were collected for petrographic work (Ntiharirizwa, 2018). They included samples from breccias (9), from aplites (2), from gneisses (4), mafic rocks (4) and various contacts between these rocks (5). The key findings of this study are the following:

- The aplites and gneisses, at the contacts with the breccias, contain REE mineralisation in the form of bastnaesite and monazite veinlets as well as large phenocrysts or xenocrysts (Figure 7-7 and Figure 7-8).
- The monazite appears to occur as a secondary alteration of the bastnaesite; the monazite being found on the rim of the bastnaesite crystals as well as inside those crystals (Figure 7-9).

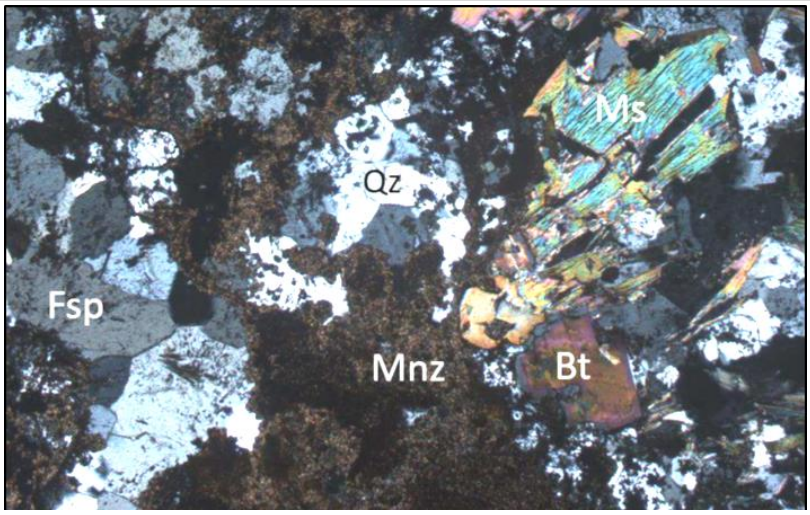
- One of the gneiss samples is a paragneiss showing a strong schistosity and is very rich in biotite. A very strong sericitisation alteration has affected this rock (Figure 7-10). By definition, sericitisation is a hydrothermal alteration which is expected to occur in close proximity to carbonates.
- One of the mafic rocks has been identified as a metamorphic rock very rich in alkaline and calc-alkaline amphiboles. This rock, together with the aplite, which contains such an abundance of alkaline minerals (albite and microcline in the aplite; glaucophane and hornblende in the mafic rock) provides further evidence of the presence of alkaline (viz carbonatitic) formations in the Gakara area.

Figure 7-7
Microphotograph of a sample of aplite in drill hole GAK-DD-029



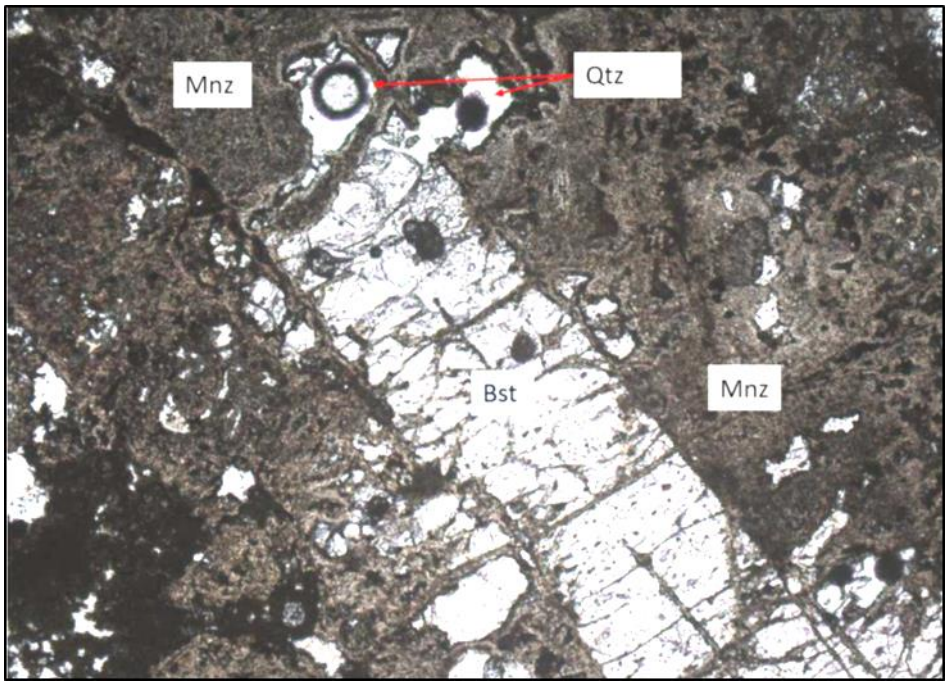
Note: *White and grey colours indicated with Fsp+Qz) showing a large bastnaesite crystal (or vein?) with monazite alteration at its edge as well as inside the aplite fabric. Note the size of the bastnaesite grain.*
Source: *Rainbow, 2018*

Figure 7-8
Microphotograph of a gneiss with two micas and monazite



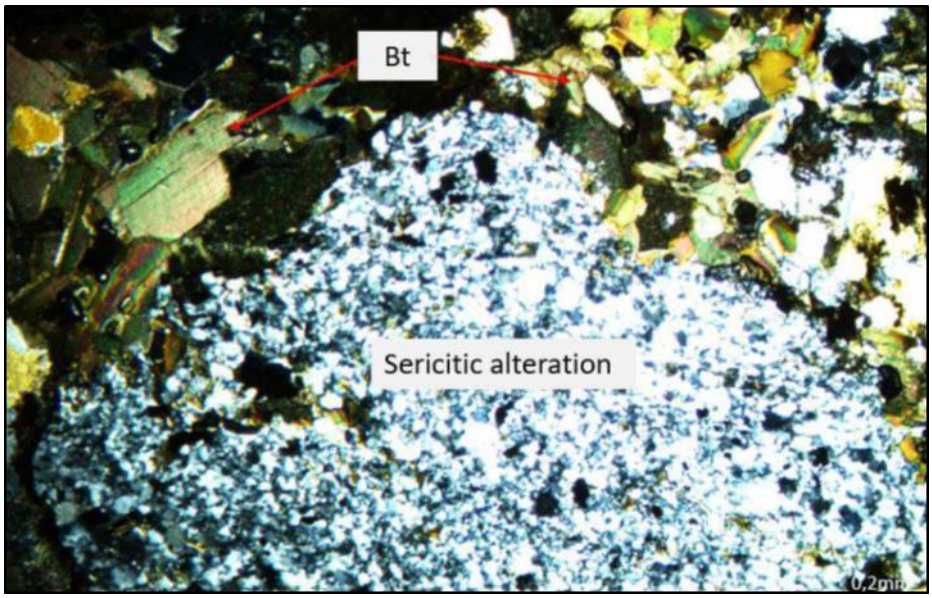
Note: *Biotite (Bt) and muscovite (Mn) showing monazite (Mnz) invading the gneiss fabric (feldspar Fsp and quartz qz).*
Source: *Rainbow, 2018*

Figure 7-9
Microphotograph of a sample of breccia showing large phenocysts of bastnaesite



Note: *Bastnaesite occurs within a matrix of monazite (Mnz) and dissolution voids filled with quartz (Qtz).*
Source: *Rainbow, 2018*

Figure 7-10
Microphotograph of a sample of biotite gneiss (Bt) showing sericitic alteration



Source: *Rainbow, 2018*

7.5 Structural Controls of the REE Mineralisation

The REE vein stockworks formed in a brittle regime of deformation and re-used/re-opened former heterogeneity of the gneissic and granitic host rocks. The fragmentation of the host rocks was enhanced by hydraulic fracturing, with probable supra-hydrostatic fluid pressures which might present a pulsatile character during bastnaesite deposition and subsequent monazitisation. It is this

"violent" intrusion mode that could have caused the formation of the REE-bearing breccia facies described in the Project area (e.g. at Kiyenzi).

The REE veins morphologies and textures are very similar to magmatic sills and dykes injected within very shallow water-rich rocks, as for example hypabyssal feeder zones of volcanoes with a phreato-magmatism dynamism. In such context, the regional stress field (if it exists) exerts a weak control due to the very low overburden (i.e. lithostatic load close to zero bars) and the injected hot melts/magmas intrude by a self-propagation mechanism in which former anisotropies of host rocks are systematically re-opened. At Gakara, it is not known exactly what the physical nature of the REE-bearing liquids may have been: melt, magma or dense brines or a polyphased mix of these. The REE-bearing liquid was hot and likely dense and might have behaved as a magma rising up below a phreato-magmatic igneous intrusion.

7.6 Geochronology

The only geochronological data available from the Gakara area was obtained on bastnaesite by Nakai *et al.*, 1988. They used the 138 La -138 Ba isochron method applied to bastnaesite and obtained a Pan-African age of 586.8 ± 3.7 Ma. The main unresolved question from the work of Nakai *et al.* (1988) concerned the time elapsed between bastnaesite deposition and its alteration into monazite.

In her PhD study, Ntiharirizwa uses the U-Th-Pb dating technique for bastnaesite and monazite, making it possible to discuss the evolution of mineralisation in the regional geodynamical context. U-Th-Pb geochronology of bastnaesite and monazite grains from the Gakara deposit was conducted by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) at Géosciences Rennes Laboratory in France.

Twenty-six grains of bastnaesite were dated, following a double-standardisation protocol, using the U and Th contents measured directly in the Bastnaesite by LA-ICP-MS (U<26 ppm and Th<63 ppm). When all the data acquired on bastnaesite (i.e. standardised with monazite and calcite) are plotted, they define a lower intercept date of 602.1 ± 7.2 Ma which is therefore the age of the bastnaesite crystallisation; in other words, it is the age of the bastnaesite mineralisation emplacement.

Thirty-five rutile grains contained in aplite samples from the Gashirwe and Kiyenzi deposits were also analyzed by LA-ICP-MS using a monazite standard. The age obtained around 600 Ma suggests that the white aplite is co-genetic with the primary mineralisation in bastnaesite.

Fourteen monazite grains were analysed. All the chronometers utilised (U/Pb and Th/Pb) have returned dates that are comparable within error at approximately 589 Ma, a date that is interpreted to correspond to the age of the crystallisation of these monazite grains.

In summary, the geochronological sequence of events that would explain the Gakara REE mineralisation is as follows:

- Firstly, at 600 Ma, a massive intrusive igneous event resulted in the emplacement of the aplites within gneiss/granite host rocks
- Nearly contemporaneously, the bastnaesite mineralisation occurred with injection of hot fluids in the form of veins and/or in breccias deposits

- Finally, at c.588 Ma (i.e. some 10-15 million years after the emplacement of the aplites and the bastnaesite mineralisation), the monazite mineralisation occurred, reusing the fracturing in the host rocks caused by the previous magmatic intrusions

8 DEPOSIT TYPES

8.1 General Models

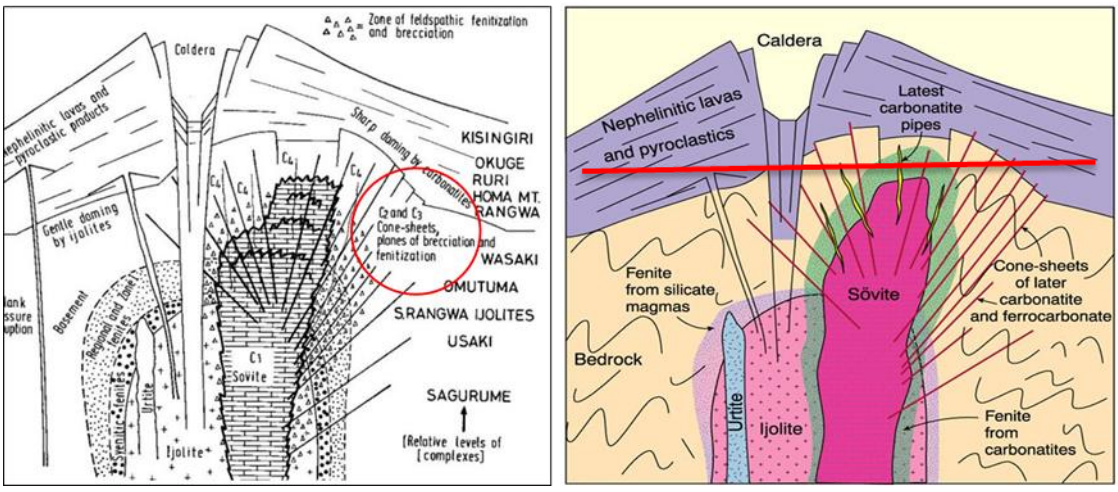
REE mineralisation is typically related to carbonatitic and/or peralkaline magma emplacement. Carbonatite is a type of intrusive or extrusive igneous rock defined by mineralogical composition consisting of greater than 50% carbonate minerals.

Carbonatites usually occur as small plugs within zoned alkaline intrusive complexes, or as linear dykes, arcuate dykes (also referred to as 'ring dykes' and 'cone sheets'), sills, breccias, and veins. Carbonatite complexes are always built of several intrusive phases. These igneous intrusions are characteristically rimmed by metasomatised country rocks, a "fenitised aureole" with both sodium (Na) and potassium (K) dominated metasomatism found sometimes in one aureole.

Carbonatites are almost exclusively associated with continental rift-related tectonic settings, which is precisely the geological context of the Gakara REE deposit. Such magmatic and mineralised context has indeed been identified along the western branch of East African Rift, about 60 km northward from Gakara in the alkaline complex of the Matongo carbonatite (Midende, 1984, Midende *et al.*, 2014; Decrée *et al.*, 2015).

The commonly referred to schematic carbonatite model of Le Bas (1987, Figure 8-1) has been reviewed in recent times by Hou *et al.*, 2015 and Xie *et al.*, 2015 and provide updated models of emplacement of REE-related carbonatites (Figure 8-2).

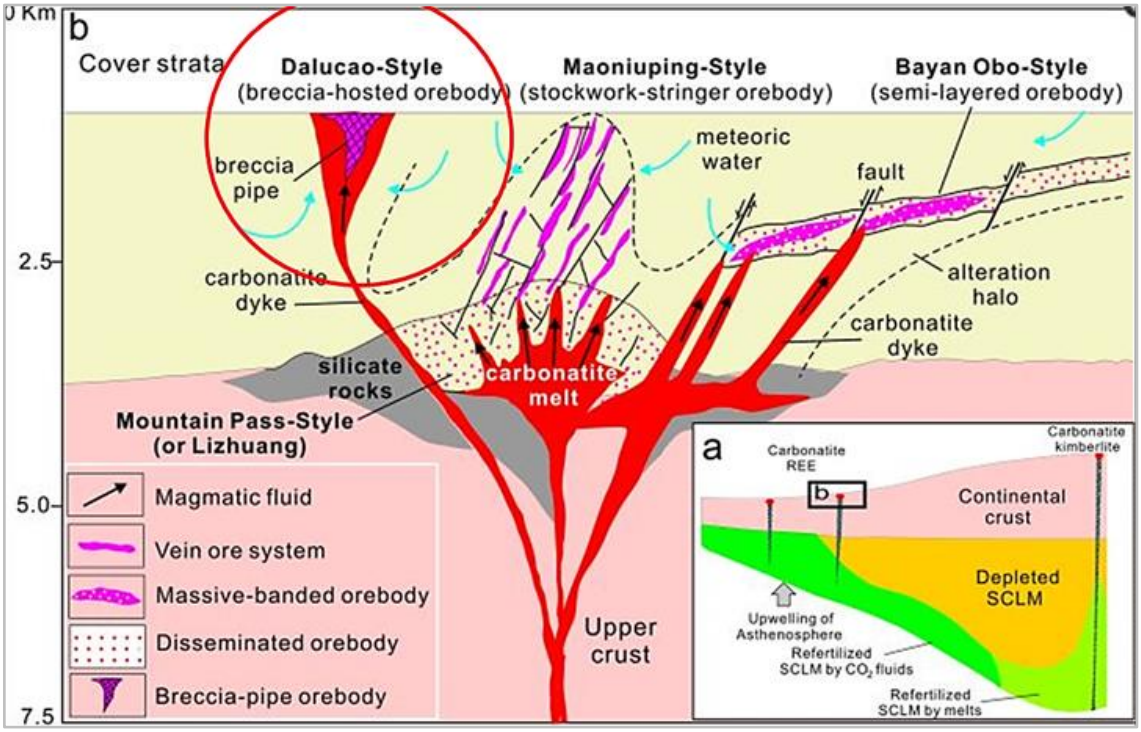
Figure 8-1
Schematic model of emplacement by Le Bas; original drawing (left); revised (right)



Note: *The red line in the right picture indicates the conjectured level at which the Gakara REE mineralisation is observed today. The red circle in the left picture indicates the occurrence of breccias associated with the carbonatitic intrusion event.*

Source: *Le Bas, 1987*

Figure 8-2
Schematic model of carbonatite emplacement



Note: *The model shows the different forms of intrusions and of REE mineralisation, including a so-called "breccia pipe orebody" (red circle).*

Source: *Hou et al., 2015.*

As illustrated in Figure 8-2, REE mineralisation can occur in variable forms derived from a carbonatite melt; vein systems, massive and disseminated bodies and breccia pipes. The vein system characterises most of the Gakara mineralisation (e.g. Gasagwe, Murambi South) whereas the breccia type has been identified at Kiyenzi. Breccias have been frequently described in many carbonatitic intrusions e.g. Matongo in Burundi (Midende, 1984) and Songwe Hill in Malawi (MSA, 2015).

8.2 The Gakara REE Deposit Model

The PhD research work carried out by Ms Ntiharirizwa helped in the understanding of the importance of magmatic fluids in the formation of the Gakara deposit as well as their pressure - temparature conditions at the time of emplacement. Mineralisation took place at temperatures between 400°C and 450°C in the upper crust with pressure variations (160 MPa to 330 MPa), under a brittle deformation regime as evidenced by the presence of microfractures. These results are consistent with field observations that indicate that mineralisation has occurred in a fragile area with significant pressure gradients accentuating the fracturing of the host and the mineralisation itself.

The results from the PhD study demonstrate that the transition from primary mineralisation to secondary mineralisation occurred during the hydrothermal stage, whereby the major element composition of the fluid has not changed between the two phases of mineralisation. This is compatible with ages obtained for bastnaesite (602 ±7 Ma) and monazite (589 ±8 Ma). Despite these two ages being almost within the margins of analytical error, it demonstrates that the

secondary mineralisation (monazitic) formed very shortly after the precipitation of the primary mineralisation (bastnaesitic).

The composition of the fluids contained in the Gakara bastnaesites as well as the isotopic signatures strongly suggest that the mineralisation precipitated first from a brine exsolved from a carbonatitic magma. The latter then fractionated and another fluid with lower salinity was subsequently introduced to the mineralisation. The age of approximately 600 Ma obtained for aplites from Gashirwe and Kiyenzi, suggest that REE mineralising event is related to an alkaline intrusion. The occurrence of white aplitic veins therefore presents a useful guide for REE exploration within the Gakara area.

Cenozoic rifting affected the whole area with a general uplift. Normal faults accommodating this rifting are not clearly recognized in the Gakara area, however some large blocks could have been tilted during these extensional tectonics. There is evidence of deformation postdating the REE mineralisation e.g. at Kiyenzi. Deformation occurred along polyphased cataclasite fault zones, which were reactivated at each tectonic event particularly if the deformed pegmatites and foliation have a vertical orientation. Consequently, continuity of REE-veins is limited in those areas and the mineralisation may occur as discontinuous lenticular clasts within a cataclasite matrix with various amount of offset between them. Therefore, drilling could miss large lenses of mineralisation in the latter scenario.

9 EXPLORATION

9.1 Exploration work 2011 to 2016

The exploration programmes completed by Rainbow between 2011 and 2016 are summarised in chronological order in Table 9-1.

Table 9-1
Summary of exploration work on Gakara EL completed between 2011 and 2013

Activity	Details
Pitting and trenching	85 pits (75 in Gasagwe and 10 in Kiyenzi area); 34 trenches in 8 target areas
Geological mapping	3,418 observations points including 813 REE occurrences of which 520 are *in situ* veins/veinlets
Rock grab sampling	632 sites sampled and analysed by Niton; 150 samples analysed by ALS Chemex, South Africa
Soil sampling (orientation survey)	591 samples from 3 blocks (500 m by 500 m); all analysed by Niton and at ALS Chemex, South Africa
Ground Gravity (orientation survey)	3.6 line kilometres on 7 sites
Ground Magnetic (orientation survey)	10 line kilometres on 7 sites
Detailed soil geochemical sampling	2,906 samples from 4 geophysical grids; all analysed by Niton only

Source: *MSA, 2016*

Rainbow's exploration programme in 2011 started with a pitting and trenching programme in an attempt to validate historically reported REE vein occurrences. However, this prospecting approach was discontinued because of its inefficiency.

Geological mapping traverses were conducted along existing tracks, foot paths and river incisions due to general paucity of outcrop, and the hilly nature and intense agricultural usage of the Project area. Approximately 3,400 individual observation points with geological information were recorded, including the discovery of close to 800 REE vein or vein float occurrences. The emplacement of veins appears to be controlled by a regional structure pattern, with the REE veins observed intruding all lithologies except the Archaean basement inlier in the western part of the Project area.

Geophysical orientation work included ground gravity and magnetic surveys. The former method is considered an effective but time consuming technique to delineate the approximate position of REE veins, whilst ground magnetics appears to be a useful tool to assess structural and lithological features.

The results of a detailed soil sampling programme over selected areas with known REE occurrences, showed relatively broad and diffuse anomalies with a wide range of anomalous REE concentrations. Although this technique is very effective in confirming the occurrence of REE veins or float in a targeted area, it fails to locate the narrow veins with the precision required to follow up with a single pit or short trench.

The main objective of the geological mapping was to locate in-situ REE veins and float material. By April 2013 a total of 798 occurrences of bastnaesite/monazite in-situ veins and float had been identified in the Project area.

No further exploration fieldwork was undertaken by Rainbow between the end of April 2013 and 2016, except the collection of a 125 kg sample of REE vein material for mineralogical and metallurgical test work and detailed mapping at Gasagwe and Gashirwe West. These two localities are within the ML and were subject of conceptual mining studies in 2016 and a trial bench mining exercise conducted by Rainbow in 2015.

Trial benching and trenching was conducted as an exploration activity to establish the continuity of mineralised veins. The exercise confirmed the strike and down-dip continuity of the veins on a local scale.

9.2 Exploration work 2016 to 2018

The following greenfields exploration programmes were carried out in the EL by Rainbow between 2016 and July 2018, when the validity of the EL expired:

- Regional geological mapping with consequent locating and sampling (rock chips) of new REE occurrences
- A high-resolution airborne geophysical survey (magnetics and radiometrics).

The exploration focus was placed on activities to increase the confidence in REE tonnage and grade estimates. Brownfields exploration was undertaken on three sites identified for their potential for trial mining. These sites are: Kiyenzi, Murambi South and Gomvyi Centre. On these deposits intensive exploration programmes were completed and included:

- Drilling at Kiyenzi.
- Trenching and associated channel sampling at Murambi South and Kiyenzi.
- Trenching and rock chip sampling at Gomvyi Centre.
- Detailed ground gravity surveys at Kiyenzi, Murambi South and Gomvyi Centre.

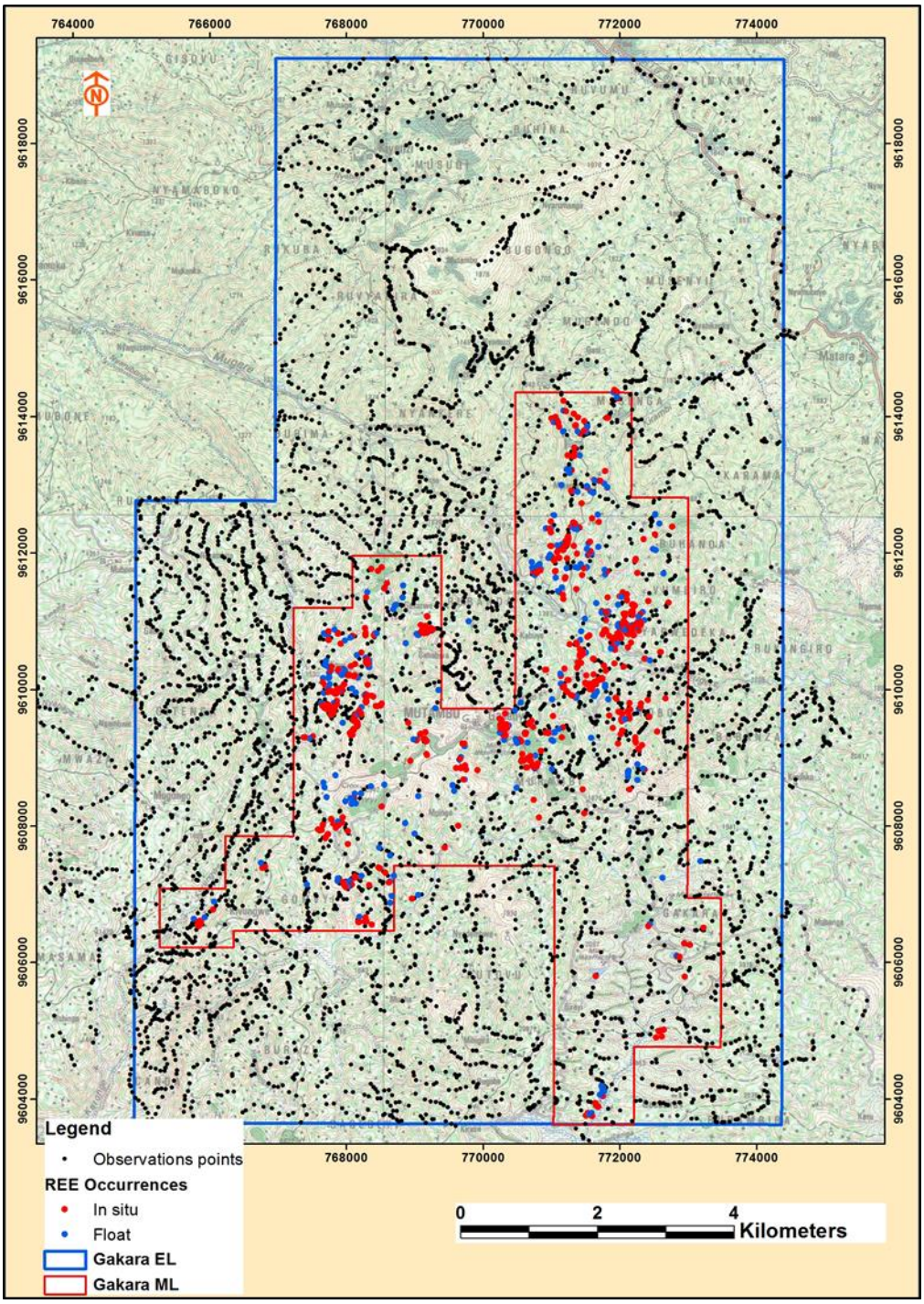
The objectives of the brownfields exploration work were twofold: a) to produce estimates of tonnage and grade, and b) to locate new sources of mineralisation for the mining operation.

Additionally, an intensive channel sampling programme of REE veins exposed during mining was completed at the Gasagwe mine. This was completed on order to get a better understanding of continuity and thickness of the veins in the stockwork, which may be applicable to other deposits of similar type within Rainbow's ML.

9.2.1 Mapping, Locating and Sampling of REE Occurrences

Due to the hilly nature, sparse outcrop and intense agricultural coverage of the Project area, mapping was conducted in the form of traverses along existing tracks, foot paths and streams. Most of the regional mapping and REE occurrence detections between 2016 and 2018 were focussed on the areas outside the ML (Figure 9-1) prior to the expiry date of the EL. The key objective of this prospecting work was to determine if any of the REE veins within the boundary of the ML extend into the surrounding EL. The other objective was to identify and sterilise areas with no, or very low potential.

Figure 9-1
Mapping traverses, observation points and positions of REE occurrences



Source: *Rainbow, 2018; Blue line outlines the EL while the red line marks the area covered by the ML*

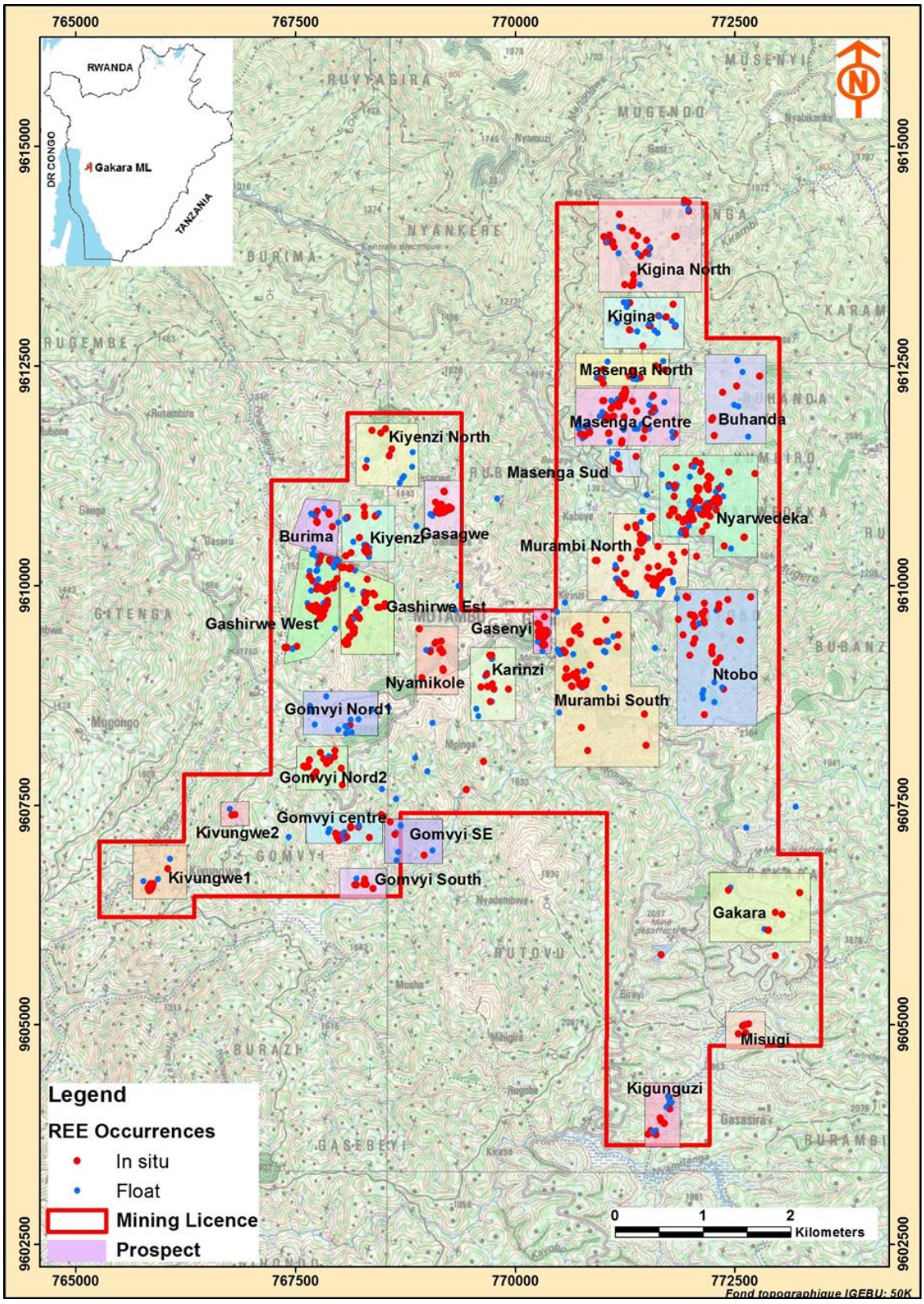
Geological mapping was undertaken by Rainbow staff with the main objective of locating in-situ and float occurrences of REE veins. This exercise also involved the local population who located numerous REE vein occurrences due to their good knowledge of the area and previous exposure to the historical exploration and mining operations. All vein occurrences were verified in the field by Rainbow geologists and the diagnostically high REE content was semi-qualitatively confirmed with a portable XRF spectrometer (Niton XL3t GOLDD+). The position of all in-situ REE veins and floats

were recorded with a handheld GPS and geological parameters, such as width, length, strike and dip direction, were recorded in customised field sheets together with a brief description of the physical site, lithology of the respective host rock and the degree of weathering. This information was captured in the Project database (MS Office Excel spreadsheet) at the Rainbow field office and regular data back-ups were carried out at Rainbow's head office in Bujumbura.

The regional mapping and REE occurrence locating exercises were completed by January 2018, although new REE occurrences within the ML are continually being reported. Rainbow's current database contains 1,332 REE occurrences, of which 843 are in-situ veins with the remainder being recorded as "float". The latter include loose fragments, boulders and cobbles of REE veins found within colluvium, eluvium or saprolite horizons in cultivated lands, gullies and most often on steep hill slopes. The locations of all the REE occurrences within the Project area that are recorded in Rainbow's database are shown in Figure 9-1 and Figure 9-2.

Based on the frequency and locality of REE vein occurrences, Rainbow defined 28 "prospects" (or targets) which were named after the nearest village or other geographic features (Figure 9-2). A ranking exercise has been performed by Rainbow in order to assign a relative level of potential and priority to each prospect. The categorisation took into account geological factors as well as infrastructure and mining parameters.

Figure 9-2
Location of the 28 Prospects defined by REE occurrences



Source: *Rainbow, 2018*

9.2.2 Airborne Geophysics

An airborne geophysical survey involving magnetic and radiometric techniques was completed in October 2017 covering the entire Gakara Property (Figure 9-3). The key objectives of the survey were twofold:

- Mapping and selecting magnetic anomalies that could be associated with intrusions potentially indicative of large carbonatite bodies that could be the source of the REE vein system
- Mapping of geological structures/lineaments apparently associated with REE mineralisation in order to improve the geological understanding of the deposit

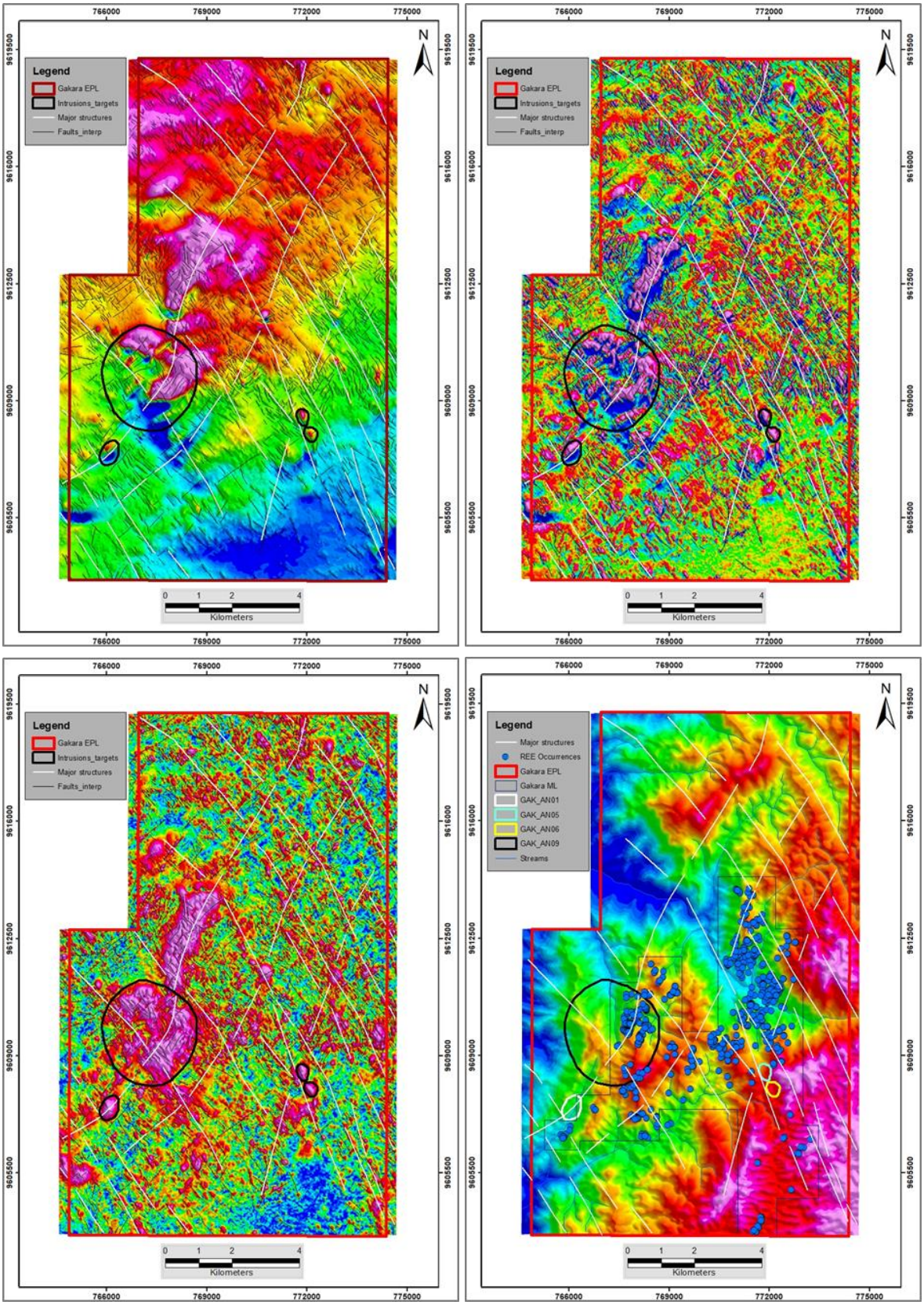
Rainbow contracted New Resolution Airborne Geophysics (Pty) Ltd ("NRG") to undertake the helicopter-borne geophysical survey, which covered a 130 km^2 area. The survey flight lines were east to west orientated, with 50 m line spacing, and comprised of a total of 2,969 line km flown at an average altitude of 20 m to 30 m above the general topography.

Magnetic data proved effective in mapping and identifying potential targets for REE mineralisation associated with high magnetic zones and geological structures. As such, five conspicuous magnetic anomalies were selected for further investigation. These targets, which were conjectured to be related to large intrusions at depth, appear to be structurally controlled and vary in diameter from 300 m to 2,700 m. The magnetic data also mapped geological formations and structural fabric of the entire original EL and current ML, thus greatly improving the understanding and knowledge of the geology of the Property.

Radiometric data also proved useful as a reconnaissance geological mapping tool revealing major changes in lithology due to the change in the concentration of the three radioactive elements K, Th, and U. However, the radiometric data being limited to surficial geological mapping, they could not contribute to the selection of targets which are deemed to be deep-seated or under cover. Nevertheless, eight radiometric (Th) anomalies were selected for further investigations, three of which coincided with the already known prospects of Gasagwe, Kiyenzi and Gasenyi.

Of particular interest is target GAK_AN09 because of its size (2,700 m in diameter), its complex magnetic signature and its location covering several key clusters of REE occurrences, including Gashirwe East & West, Kiyenzi, Gasagwe and Gomvyi North. The various filtered magnetic signatures of this broad and heterogenous anomaly resemble those published for large carbonatite bodies (e.g. Zandkopsdrift, Mount Muambe, Okorusu, Kalkveld, Evate). A collection of magnetic responses of large, known carbonatite complexes is shown in Figure 9-4 as a comparison with the magnetic signatures of GAK_AN09.

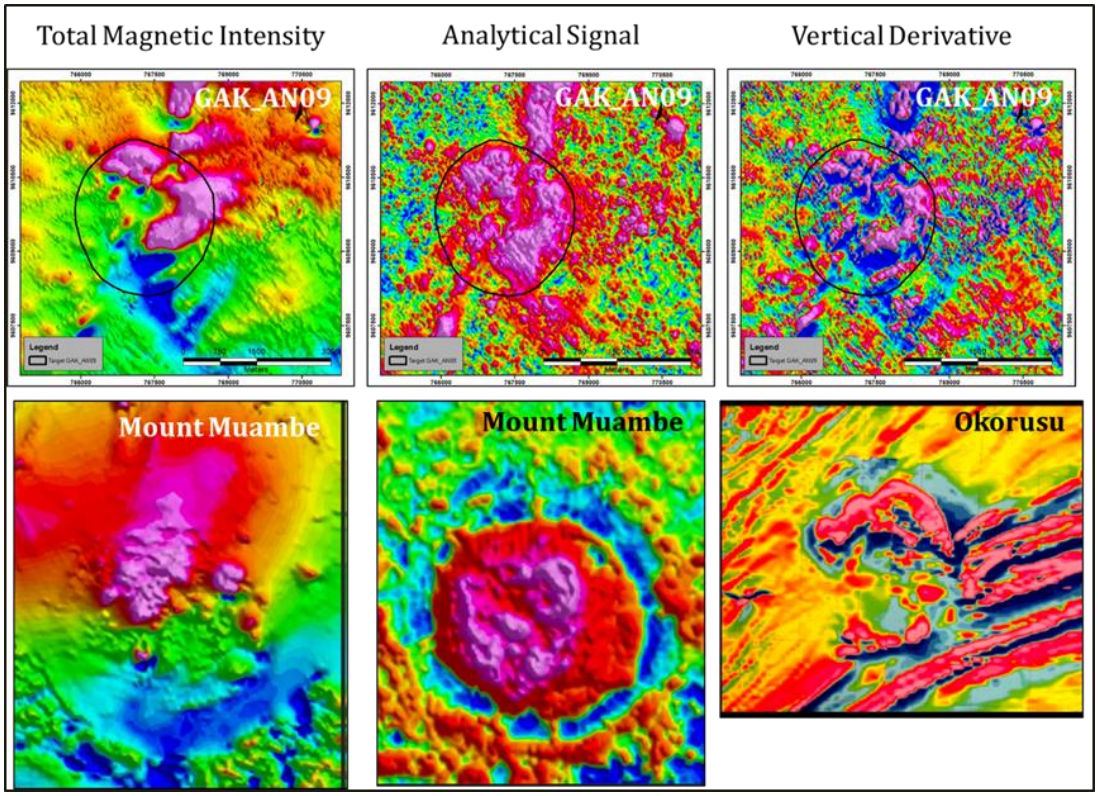
Figure 9-3
Airborne geophysical maps of the Property and magnetic targets



Note: *Top Left: Total Magnetic Intensity field. Top Right: Vertical Derivative 1. Bottom left: Analytical Signal. Bottom Right: Digital elevation model ("DEM") and REE occurrences*

Source: *Rainbow, 2018*

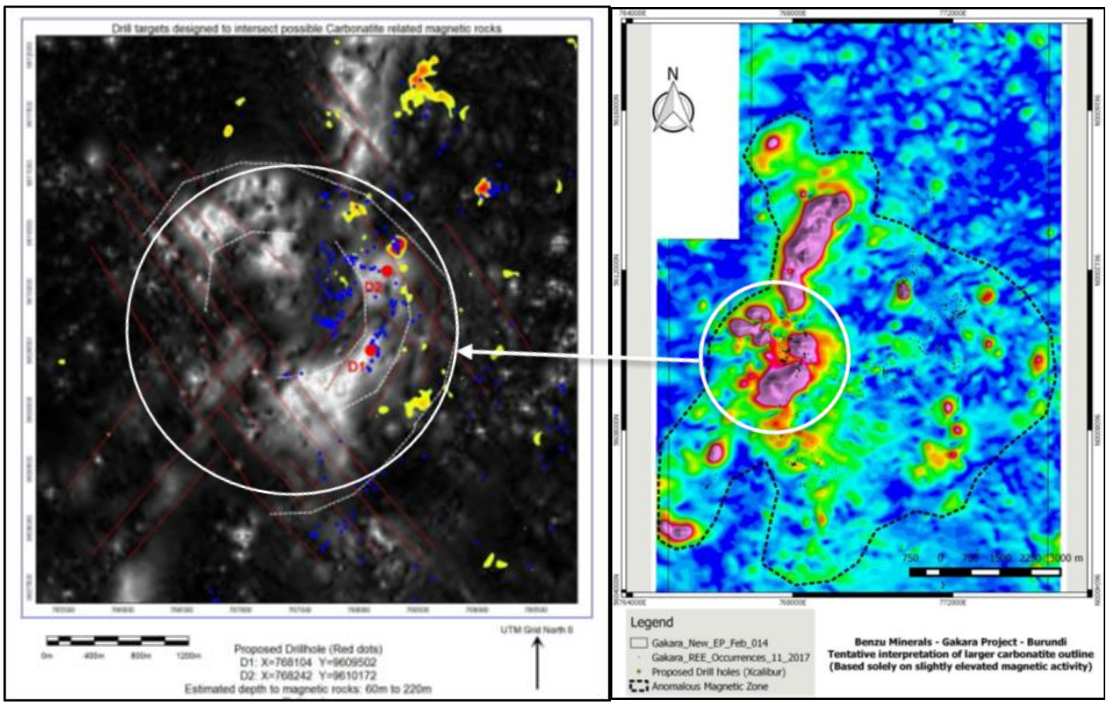
Figure 9-4
Magnetic responses of anomaly GAK_AN09 compared to known carbonatites



Source: *Rainbow, 2018*

A broader, regional interpretation of the airborne magnetic and radiometric data by Le Roux and Steenkamp (Xcalibur Geophysics, 2017 and 2018) has confirmed the high interest of anomaly GAK_AN09 as a potential carbonatite intrusion within a much larger "system" defined by slightly elevated magnetic anomalism as seen in the Analytical Signal, and thus probably caused by a moderately deep intrusion (Figure 9-5).

Figure 9-5
Analytical Signal (left) of GAK_AN09 and anomalous magnetic "system" (right)



Note: *Anomalous magnetic "system" was interpreted to potentially represent a large carbonatite complex*
Source: *Rainbow, 2018*

From Figure 9-5 (left), it is evident that many of the REE occurrences mapped (blue dots) follow an apparent zonation shown as a semi-circular pattern of magnetic anomalies (grey and white shades) and elevated Th readings (yellow spots).

9.2.2.1 Results of Core Drilling of Magnetic Targets

Because the magnetic anomalies were believed to be relatively deep-seated, drilling was required to investigate the nature of these selected magnetic and radiometric targets. Six holes were drilled to explore the anomalies, as shown in Table 9-2.

Table 9-2
Airborne geophysical targets tested with core drilling

Anomaly No.	Anomaly Type	Drill Hole No.	Drill Depth	Result/Causative Source
GAK_AN01	magnetic	GAK_DD017	80 m	Magnetic gneiss at 53-71m
GAK_AN06	magnetic	GAK_DD016	60 m	Magnetic gneiss at 15-17m
GAK_AN09-1	magnetic	GAK_DD014	150 m	Inconclusive – no magnetic rocks intersected
GAK_AN09-2	magnetic	GAK_DD015	147 m	3 separate magnetic horizons traversed
DX06 (Gasagwe)	radiometric	GAK_DD018	50 m	Weathered gneiss – no causative rocks
DX07 (Kiyenzi)	radiometric	GAK_DD09	50 m	REE mineralised breccias

Source: *Rainbow, 2018*

In three of the magnetic targets, the source of the anomalies was found to be highly magnetic horizons within gneissic lithologies. The magnetic readings in such units ranged between 400 and 6,000 x 10^{-5} SI units.

In the fourth magnetic target, GAK_AN09-1, drilling was stopped at a depth of 150 m without intersecting any magnetic causative lithologies. The modelled depth for this target ranged between 60 m and 220 m and it is therefore possible that this hole was not drilled deep enough to accommodate the inherent modelling uncertainty for a relatively deep-seated anomaly. It remains plausible that GAK_AN09-1 could be caused by a large and deep circular intrusion, akin to a carbonatite complex.

It is important to note that GAK_AN09-1 is located less than 500 m from the Kiyenzi target which comprises of a large amount of aplite intruded in the gneiss. From the petrographic work carried out by Ntiharirizwa (2018), it has now been established that the aplitic intrusion event was synchronous with the emplacement of REE-bearing bastnaesite mineralisation and hence part of a deeper-seated carbonatitic complex. Similar occurrences of aplite have also been mapped at Gashirwe West, which, together with Gashirwe East and Gasagwe, fall within the large magnetic rim that characterises anomaly GAK_AN09. It is therefore possible that GAK_AN09 represents the magnetic signature of a 3 km wide carbonatite complex.

9.2.3 Trenching and Channel Sampling

Trenching and the associated channel sampling were carried out as brownfields exploration activities with the objective of obtaining sufficient data to constrain the spatial distribution and characteristics of REE veins in order to determine the likely tonnage and REE grade of three sites selected for mining; Murambi, Gomvyi Centre and Kiyenzi.

Trenches were excavated either by hand or by using excavators. Twenty-four trenches totalling 1,524 m in combined length, were excavated over the three mining targets. In total, 745 channel samples (as well as 95 quality control and quality assurance samples) were collected for geochemical analysis.

9.2.3.1 Channel sampling Protocol

Once a REE vein is exposed by trenching, the surveyor delineates contour lines on the outcrop (Figure 9-6). A sample is then taken between two successive contour lines and given a number. The channels, which are 10 cm wide, are cut using a petrol engine rock cutter or a chisel and hammer. Two to four kilograms of sample are collected and put in a pre-numbered calico bag. The distance between channels is 2 m (Figure 9-7).

Figure 9-6
Example of a channel sample collected between 2 elevation contour lines

Note: *Contour lines (purple lines) are 1 m apart; The width of the channel is 10 cm (between two red arrows)*
Source: *Rainbow, 2018*

The data collected by the geologist comprise sample ID, coordinates, length of the channel, trend, average thickness and a brief description of the material sampled. A photo is also taken. The thickness of the REE vein is measured with a measuring tape, taking a reading at the top, at the bottom and in the middle of the channel, and also by the surveyor using a DGPS to record the XYZ coordinates of the corners of the channel.

All these data are captured in an MS Office Excel database. The surveyor then processes all data recorded to produce Excel, dxf, and pdf files, which are later used to plot the channel samples using other software (ArcGIS or Micromine).

Figure 9-7
Channel sampling on a REE vein at Gasagwe Mine

Note: *Channels are 2 m apart and are cut to traverse hanging and foot walls to determine the vein thicknesses*
Source: *Rainbow, 2018*

The channel samples selected for laboratory analyses were sub-sampled to achieve a weight of approximately 500 g per sample. The rest of the sample material was crushed and pulverised using a hammermill set up at the Kabezi plant. After each sample the mill was cleaned using a hand-held blower and a small fraction of the following sample was pre-crushed and discarded before the next sample was fully pulverised. This procedure was aimed at minimizing potential inter-sample contamination. The pulverised sample was riffled and split using a sample splitter. Around 500 g to 1000 g were extracted and bagged for Niton XRF analysis. Each sample wa analysed at three different points through the bag and the readings were subsequently averaged. Only Ce, La, Nd and Pr were analysed. The Niton-analysed sample was then stored for future reference whereas the remainder was weighed, put in a bag and eventually put through the processing plant together with routine production vein material.

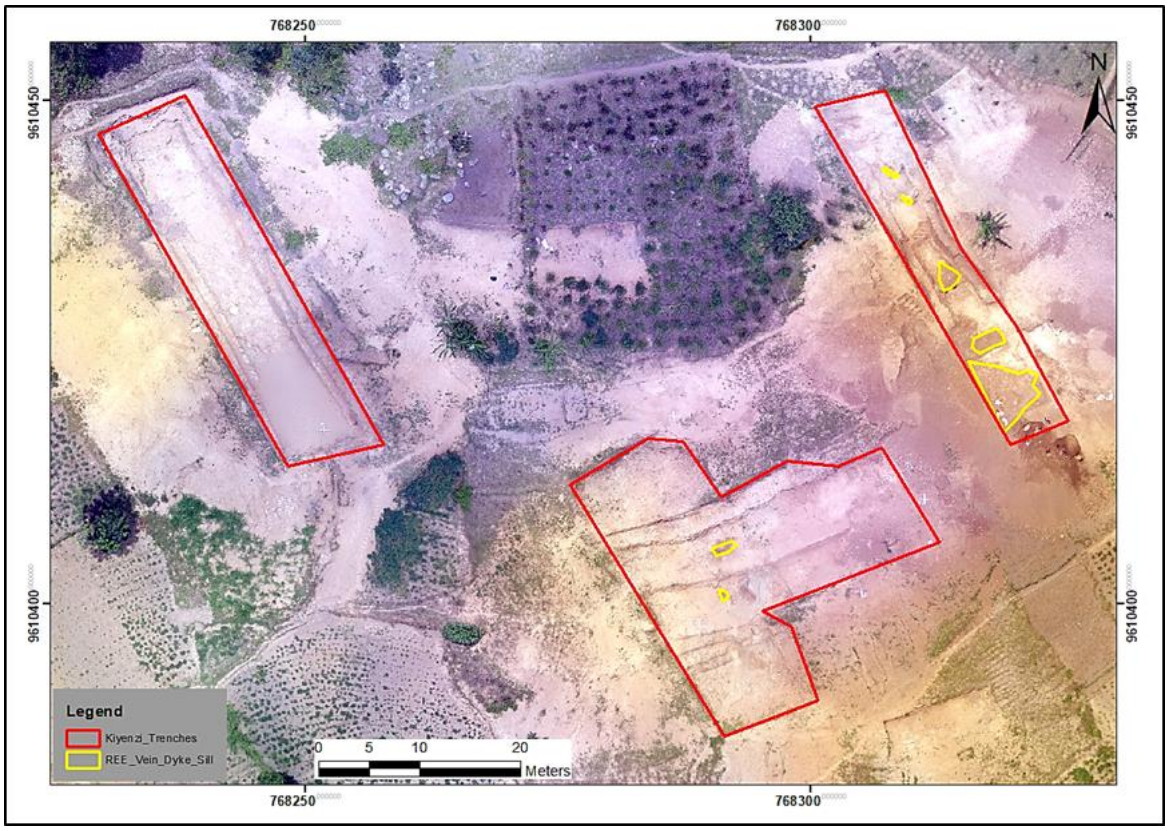
9.2.4 Kiyenzi Target

Trenching on this target was carried out by hand using casual labourers. Three trenches with a combined length of 103 m were excavated (Figure 9-8). The first two trenches on the western side of the target were excavated for the purposes of investigating a circular ground gravity anomaly. The third trench was excavated to expose the continuation of REE veins discovered at surface when preparing drill platforms as well as the REE breccia intersected at shallow depth (<2 m) in two of the drill holes. The trenching work was carried out using the benching method in order to avoid sidewall collapse and this ensure a safe working environment.

The western-most trench did not expose REE mineralisation. Two veins of REE-bearing breccias were encountered in the middle trench and in the eastern trench, five REE-bearing veins were exposed. (Figure 9-8). One of these bodies, which appears to be extensive and fairly thick (0.2 m to

1.3 m), seems to be a sill comprising mostly pure bastnaesite/monazite but also of the mineralised brecciated type (Figure 9-9). Approximately 20 tonnes of this material were collected from this body for metallurgical test work.

Figure 9-8
Drone aerial image of the Kiyenzi target showing the location of the 3 excavated trenches



Note: *Trenches are shown with red outline as well as REE veins (yellow outline) exposed in the excavations*

Source: *Rainbow, 2018*

Figure 9-9
Exposed bastneasite sill on the eastern trench at Kiyenzi

Note: *The white dotted line on the left photo outlines the upper surface of the sill. The white dotted line on the right photo shows the contact between the bastnaesite and the underlying aplite*
Source: *Rainbow, 2018*

In total, 17 channel samples and 14 rock chip samples were collected from the flat-lying bastnaesite/monazite layer. These samples were analysed using the hand-held Niton XRF which yielded indicative TREO grades of between 49% and 57% with an average of 52.5% TREO.

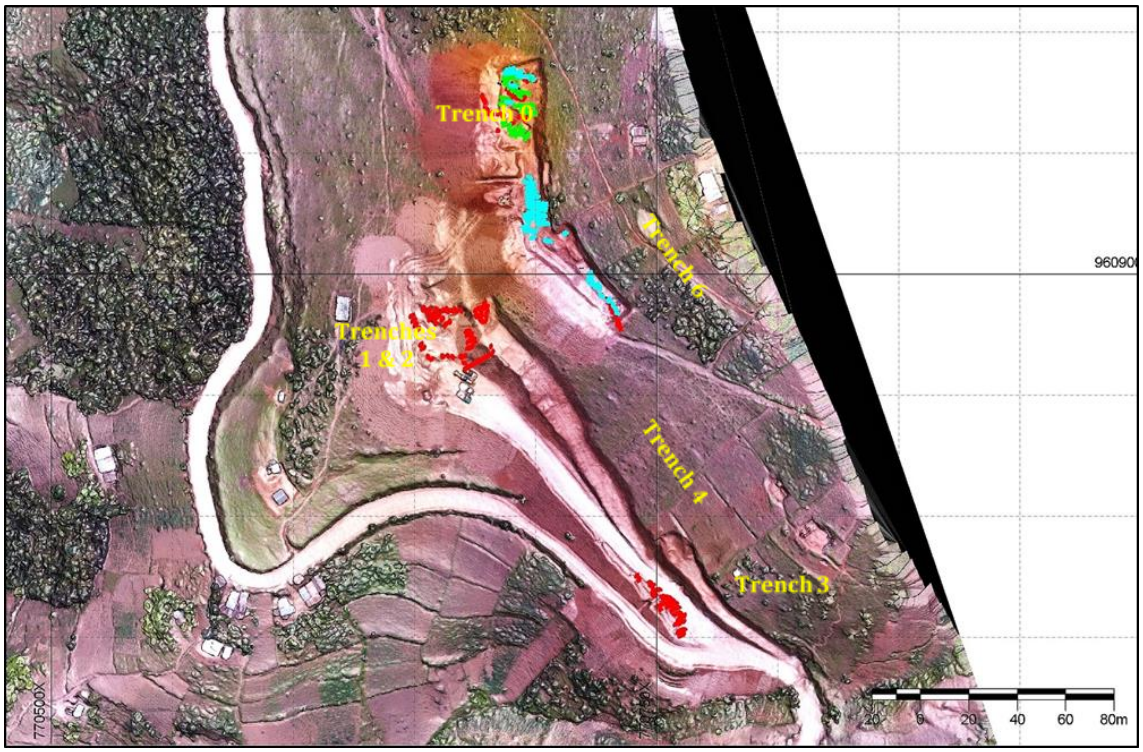
For completeness, mention is made here that the Kiyenzi target was also extensively drilled and some 434 core samples were selected for full chemical analyses (refer to Section 10.7).

9.2.5 Murambi South Target

Trenching on this target was carried out by hand using mine labourers as well as by excavator. Six trenches with a combined length of 290 m were excavated (Figure 9-10). The intensive trenching programme at Murambi South was undertaken concurrently with the trial mining. As such the objectives of the trenching were twofold: a) to explore for the presence, extent and continuation of the REE veins historically reported by SOBUMINES and BGR and b) to gather bulk samples for metallurgy test work and for mine production.

In total, 452 channel samples, 34 rock chip samples and 73 tonnes of REE vein material have been extracted from Murambi South. The channel sampling was carried out strictly in accordance with the protocol described in Section 9.2.3.1 of this Report. Vein thicknesses were also measured according to the protocol using a DGPS for accurate topographic data. A total of 65 vein thicknesses have been recorded which form the basis for the tonnage and REE grade estimation at Murambi South.

Figure 9-10
Drone arial image showing trench and channel sampling sites at Murambi South Mine



Note: *Channel sample sites are shown in red, green and magenta.*
Source: *Rainbow, 2018*

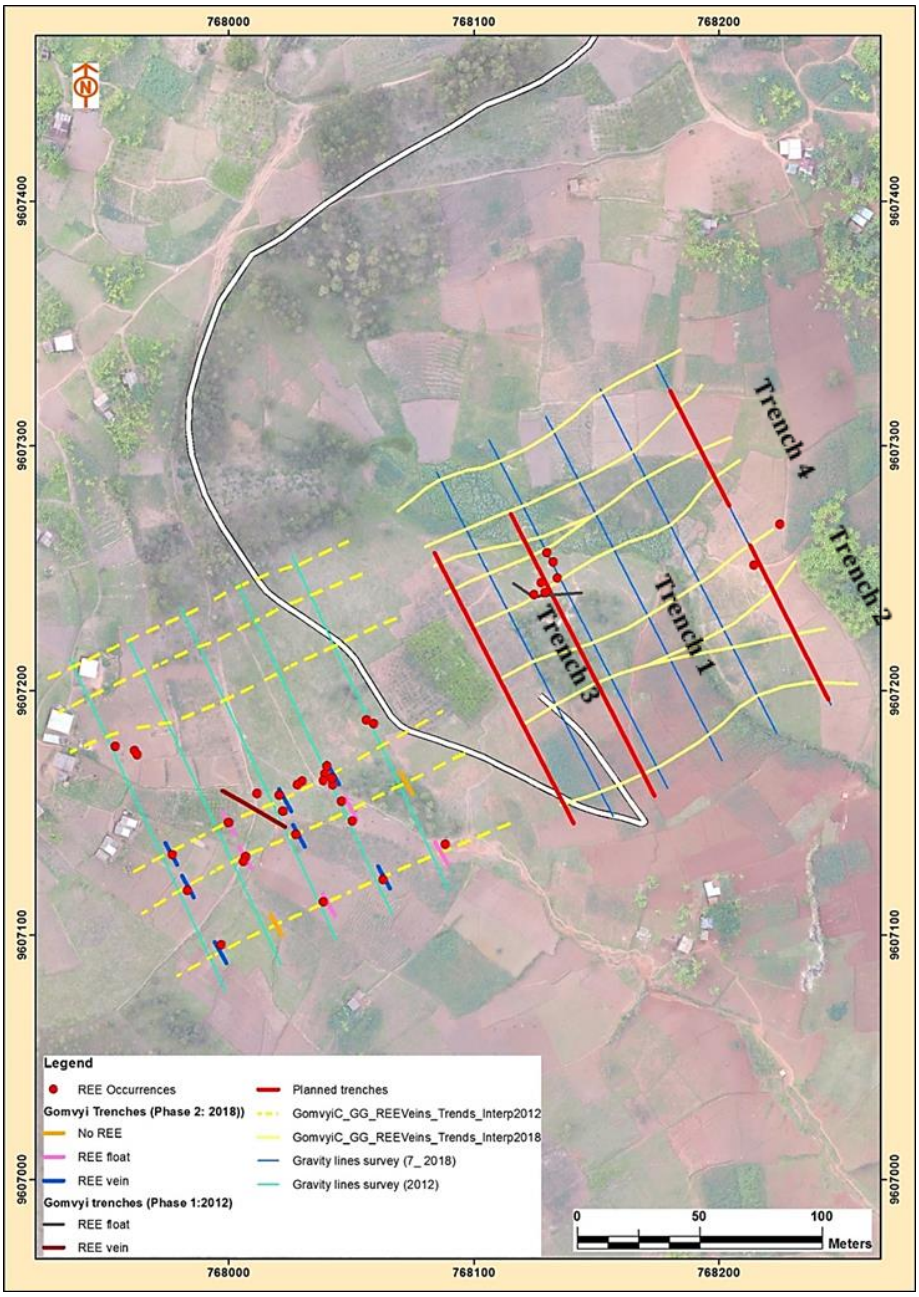
9.2.6 Gomvyi Centre Target

Based on the outcome of the ground gravity survey at the Gomvyi Centre site (see section 9.3.3), a trenching programme consisting of four trenches (total of 500 metres) commenced in September 2018 by hand digging. The aim of the trenching programme was to verify the lateral extent of the REE veins that had been identified during a 2012 trenching exercise and investigate a series of NE-SW gravity lineaments highlighted by a detailed ground gravity survey. The same trends were observed by the 2018 survey, hence the recent trenching programme (Figure 9-11).

The discovery of veins coinciding with the gravity lineaments identified by the two gravity surveys, and their sampling (by channel or chips) has provided data that will be used in order to estimate the potential extent of the veins at this site.

In total, 26 REE occurrences have been discovered at Gomvyi Centre and all of these were sampled and analysed using the Niton XRF. Additionally, 15 of these samples were also submitted to ALS Minerals (Canada) for complete geochemical assays. Gomvyi Centre has yielded some of the thickest REE veins recorded in Rainbow's database, with some measurements being greater than 50 cm. These occurrences are in the northern part of Trench 1 (Figure 9-11).

Figure 9-11
Trenching (completed and planned) at the Gomvyi Centre site



Source: *Rainbow, 2018*

9.3 Ground Gravity Surveys

Detailed Ground Gravity Surveys ("GGS") were undertaken at three sites: Kiyenzi, Murambi South and Gomvyi Centre, with the objective to identify gravity-contrast anomalies that could be associated with bastnaesite/monazite bodies (veins, dykes, sills or larger bodies) (Kubanza, 2017).

GGS were completed in 2012 over selected sites in order to establish the effectiveness of this technique in detecting REE mineralisation (Kubanza, 2012). The REE-bearing bastnaesite and monazite mineralisation is usually much denser than the host geology (gneiss, granite, aplite, laterites) and hence can result in a positive density contrast (i.e. a "high" in the gravity data). The

2012 GGS generated a series of gravity anomalies which were tested by trenching and proved to be caused by bastnaesite/monazite occurrences, notably on Gomvyi and Murambi.

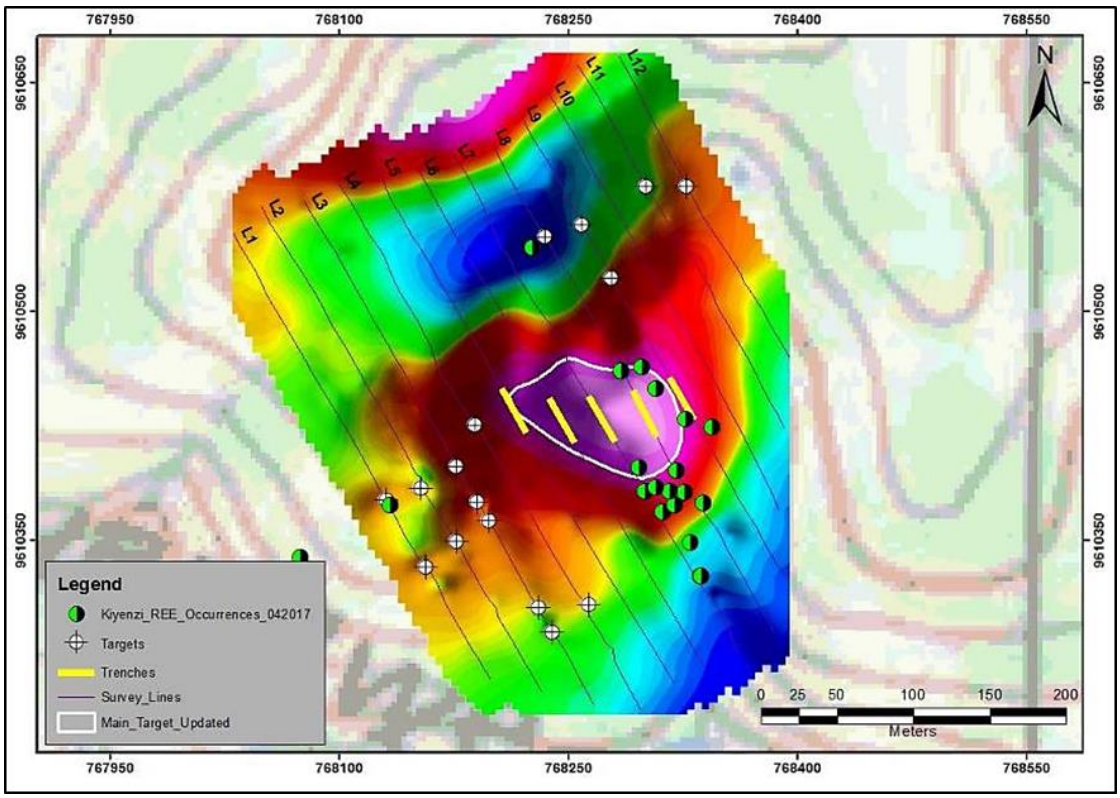
Whereas the ground gravity technique has proved to be the best geophysical tool to confirm REE occurrences (once a site is identified, i.e. not as a reconnaissance method), it remains inaccurate in certain physical situations, causing "false anomalies". Such errors could be accredited to the narrowness of the veins, which cannot always result in high density contrasts, as well as to the thickness of the overburden causing weak density contrasts and to the individual morphology of the mineralised body.

The GGS were carried out by GeoFocus Geophysical Services using a Scintrex CG5 gravimeter and a Javad DGPS for the topographic data. The surveys consisted of traverses orientated perpendicularly to the postulated REE vein directions, spaced every 25 m or 30 m with gravity readings taken every 5 m at Kiyenzi and every 1 m at Murambi and Gomvyi Centre.

9.3.1 Kiyenzi GGS

The GGS at Kiyenzi covered a block of 400 m by 250 m on which 12 lines were surveyed for a total length of 4.4 km. This survey yielded a very conspicuous elliptically-shaped gravity high anomaly (Figure 9-12), which was modelled in 2D and 3D as a broad, buried, high-density body of about 70 to 80 m wide, 200 m long and extending from 20 m to about 100 m below surface (Havemann, 2017 and 2018). The encouraging feature of this anomaly was that it appeared to coincide with the location of many REE occurrences previously discovered at the Kiyenzi prospect (Figure 9-12).

Figure 9-12
Interpretation of the line-based residual Bouguer anomaly map at Kiyenzi



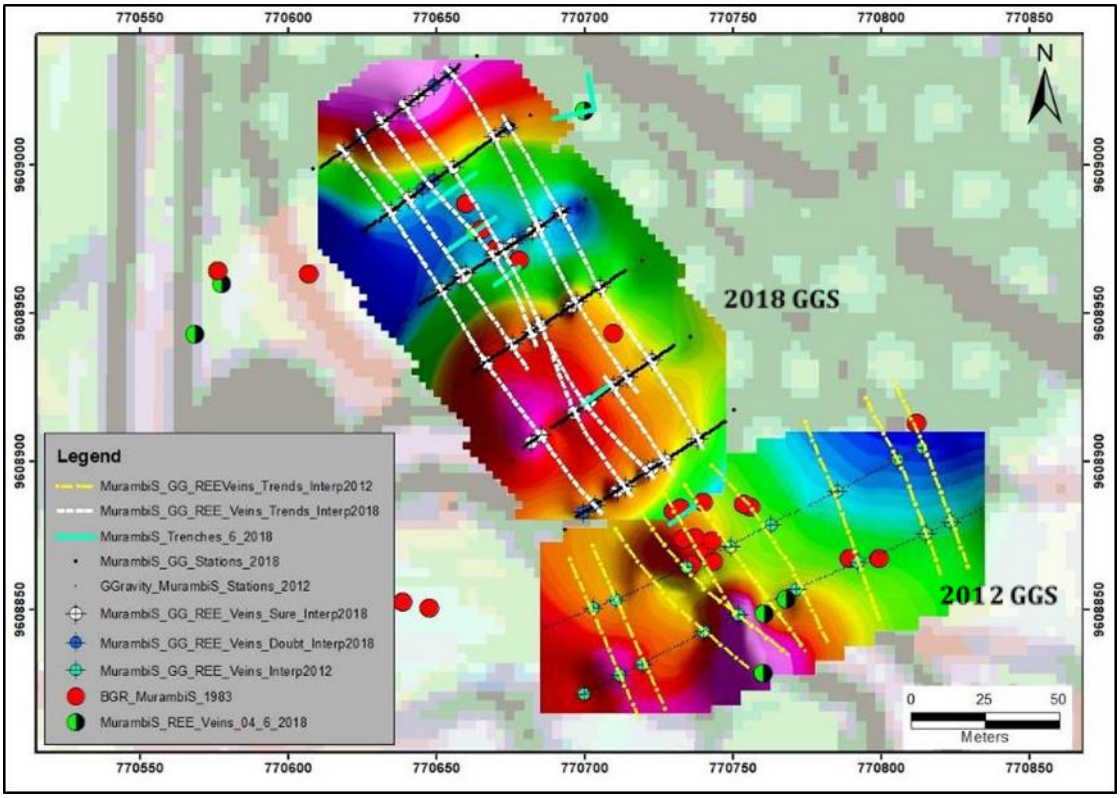
Source: *Rainbow, 2018*

The trenching and drilling that was carried out to investigate the source of the large gravity target proved "negative". Despite the intersection of several REE veins in the drill cores at different depths, these could not explain the cohesive, massive body modelled from the gravity data. Investigations on the REE intersection in the drill core in order to determine the technical factors that could explain the large semi-circular gravity target have not been completed and the causative body remains unexplained.

9.3.2 Murambi South GGS

The GGS on Murambi South covered a block of 150 m by 60 m on which six lines, 60 m long and 30 m apart, were surveyed for a total combined length of 360 m (Kubanza, 2018; Havemann, 2018). This survey yielded a series of sub-parallel gravity lineaments, generally trending NW-SE (white dash lines in Figure 9-13). Importantly, the gravity anomalies are aligned with known REE vein occurrences (most of which appear to display the same orientation) and correlate well with the lineaments interpreted from the 2012 GGS (Figure 9-13). A trenching programme was designed order to test the hypothesis that the gravity lineaments are related to bastnaesite/monazite veins; to date this has been confirmed to be the case in certain parts of the survey block. Trial mining is currently carried out at this site and a high frequency of veins in a stockwork complex has been observed at two sites.

Figure 9-13
Interpretation of thin linear gravity highs on residual gravity map at Murambi South



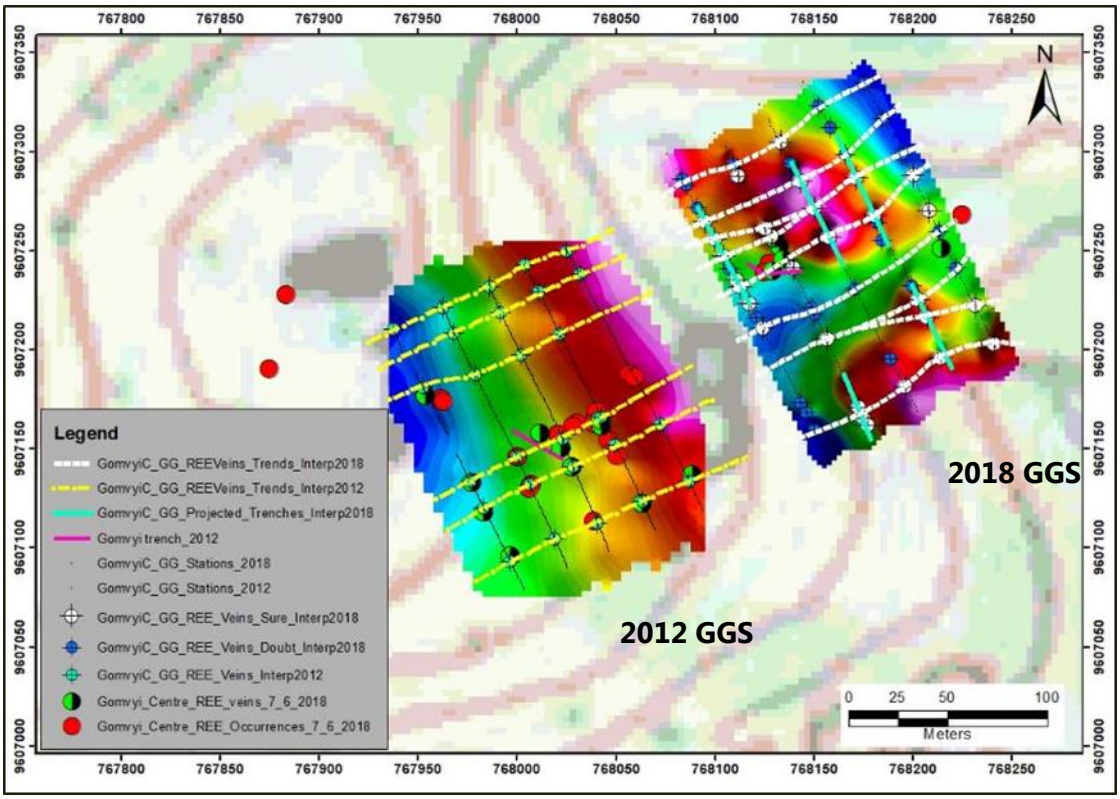
Note: *White stippled lines are from the 2018 gravity survey and yellow lines from the 2012 GGS*
Source: *Rainbow, 2018*

9.3.3 Gomvyi Centre GGS

The GGS on Gomvyi Centre covered a block of 120 m by 160 m on which five lines, 160 m long and 30 m apart, were surveyed for a total combined length of 800 m (Kubanza, 2018; Havemann, 2018). This survey yielded a series of sub-parallel gravity lineaments, generally trending SW-NE (white dash lines in Figure 9-14). Similarly to the Murambi observations, the gravity anomalies alignments correlate well with known REE vein occurrences (most of which appear to display the same orientation) and correlate well with the lineaments interpreted from the 2012 GGS (Figure 9-14).

A trenching programme was set up following the outcomes of the GGS in order to test the model that the gravity lineaments are related to bastnaesite/monazite veins. To date, only a portion of Trench 1 has been completed where a series of new REE vein were observed in the northern section of this trench. These new bastnaesite/monazite occurrences occur where the gravity data has generated a broad semi-circular gravity high (Havemann, 2018).

Figure 9-14
Interpretation of thin linear gravity highs on residual gravity map at Gomvyi Centre



Note: *White stippled lines are from the 2018 gravity survey and yellow lines from the 2012 GGS*
Source: *Rainbow, 2018*

10 DRILLING

The diamond drilling ("DD") was carried out by Rainbow between February and September 2018. This was the first drilling programme ever undertaken on the Gakara Project. The programme was divided into two phases which were aimed at achieving the following objectives:

- At the Gasagwe Mine: to test the possibility of using drilling as a method for establishing continuation of known/mined REE veins at depth.
- To investigate the sources for the magnetic and radiometric anomalies selected from the airborne geophysical survey (as reported in Section 9.2.2.1).
- To establish the source of the ground gravity anomaly at the Kiyenzi target.
- To evaluate the nature of the Kiyenzi mineralisation below surface.

The last objective was the exclusive focus of the second phase of this drilling campaign.

10.1 Drilling Techniques

Diamond (or core) drilling was the technique applied, using a combination of HQ and NQ core sizes, depending on the hole depth and hardness of the lithologies encountered down the hole. HQ size was mainly utilized in the top 50 m where the lithologies are highly fractured and the hardness ranges between soft and moderately hard. The NQ core size was utilized where drill holes exceeded 50 m depth and encountered more competent/hard rock. Standard core barrels were used for both core sizes. The cores were not oriented. The drill rig used for the two campaigns was a Discovery II Man-Portable Rig – Diamond Core Drill (Figure 10-1). The drilling contractor was ADT, a Uganda-based drilling contractor.

Figure 10-1
Discovery II diamond drill rig on the Kiyenzi target

Source: *Rainbow, 2018*

10.2 Drill Hole Information

Thirty-eight diamond holes covering a total of 2115.50 m were drilled on six different target sites. The key information about these drill holes is summarised in Table 10-1.

Table 10-1
Summary of core drilling

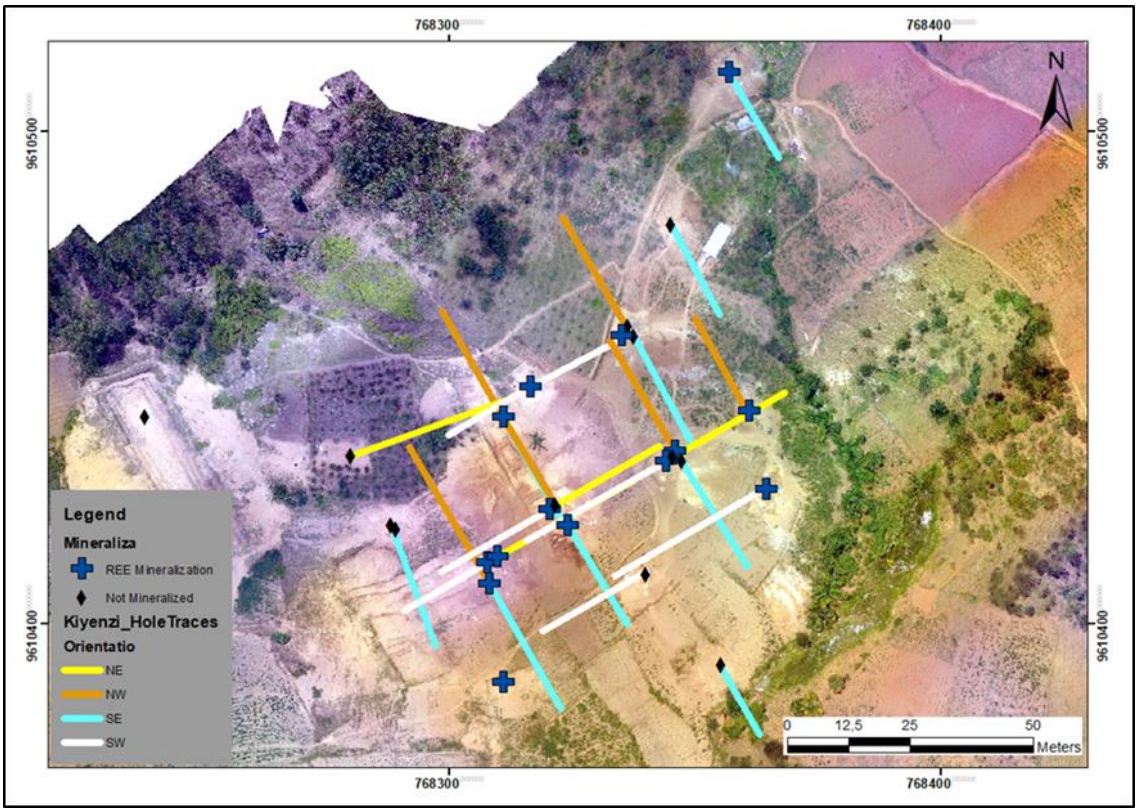
Drilling Purpose	Number of Targets Drilled	Number of Holes Drilled	Total Metres Drilled
Gasagwe: establishing depth continuation of REE veins	1	3	150.0
Airborne Magnetic Targets testing	4	4	437.0
Airborne Radiometric Targets testing	2	2	100.0
Kiyenzi: drilling of ground gravity anomaly	1	6	464.6
Kiyenzi: evaluate nature of sub-surface mineralisation	1	24	963.9
TOTAL	**9**	**38**	**2,115.5**

Source: *Rainbow, 2018*

In total, 1,428.5 m were drilled on the Kiyenzi target from 30 diamond drill holes. The drill holes were located on a spacing of between 15 m and 33 m depending on practicalities of drill pad construction on the steep slope (Figure 10-2). Except for three holes which were drilled vertically in the initial stage of the campaign, all remaining 27 holes were drilled inclined at angles of either 50°

or 60°, depending on the hill slope. The angled holes were drilled in 4 directions: NW, SE, NE and SW (Figure 10-2).

Figure 10-2
Kiyenzi drilling grid and angled hole directions



Source: *Rainbow, 2018*

10.3 Core Logging, Recovery and Rock Quality Designation Calculations

The core recovered from the core barrel was placed in metal core trays by the drill crew and wooden depth markers were inserted at the end of each core run. Once a core tray was full, it was transported to the logging bench where the geologists on site would carry out lithological logging (including radiometric detection using a handheld Polymaster) and record various measurements for each core run, including the following:

F: Depth From (m)
D: Depth To (m)
L1: Core Run i.e. Depth From – Depth To
L2: Length of Recovered Core
R: Core Recovery: L2/L1
RQD (rock quality designation): A measure of degree of jointing or fracture in a drill core run calculated was as follows:

$$RQD = \frac{\text{Sum of length of core pieces>100mm}}{Total\ core\ run} X\ 100$$

After completion of the core logging and taking of structural measurements, the core trays were photographed at the drill site (tray by tray) before being transported to the Mutambu base camp where final logging and core sampling work were undertaken.

10.4 Drill Core Sampling

Drill core sampling was only carried on positive holes, i.e. on drill holes that intersected mineralised breccias upon visual identification/logging and radiometric detection. Within such holes sampling was carried out within all lithological horizons that were deemed to have the potential to contain REE mineralisation.

Core sampling was carried out after the completion of the lithological logging and marking of sampling intervals. This work typically involved three processes:

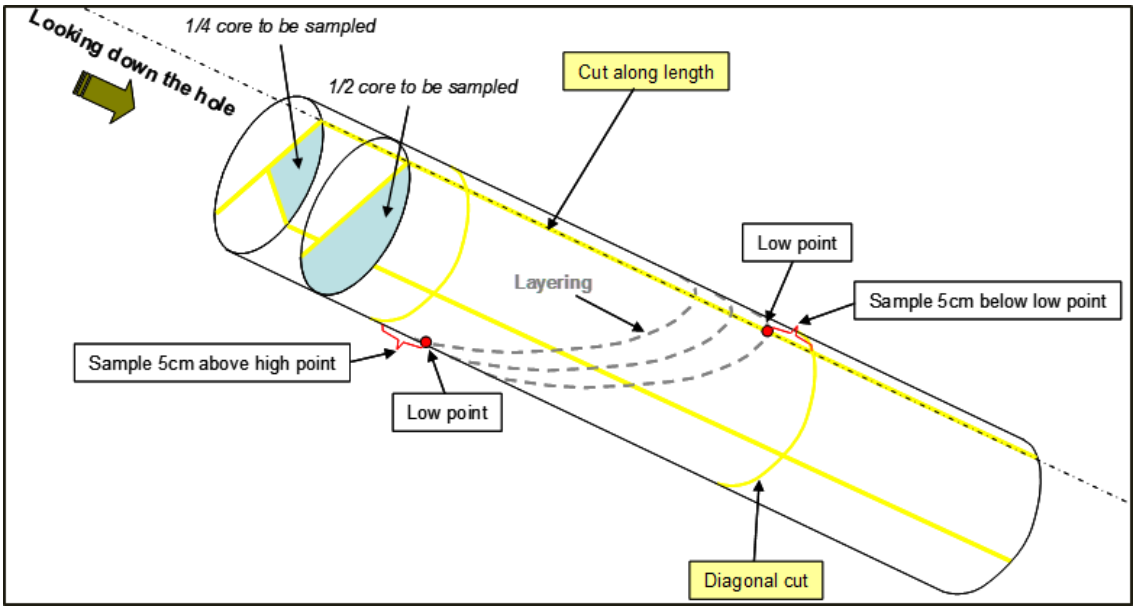
- Marking the apical trace of bedding ellipse on the core with permanent pen. Core splitting was carried out along that trace.
- Splitting the core along the marked lines
- Core sampling.

10.4.1 Core Marking and Splitting

Core marking is a process that involves drawing a straight line on the core axis along which the core is split longitudinally into two halves (Figure 10-3). This normally involves the following steps:

- Laying out the core trays either on the ground, or on the logging table in the order of drilling depth, i.e. from the top to bottom.
- Aligning the core samples such that the core axis from the top to the bottom of the hole is the same.
- Drawing a straight line down the length of the core by using a permanent marker.

Figure 10-3
Typical core marking scheme



Source: *Rainbow, 2018*

Core splitting involves cutting the core into two halves along the marked lines on the core axis. The core was cut using an electric core splitter installed at the Mutambu base camp.

10.4.2 Sampling Procedure

Core sampling was carried out as follows:

- Core trays were laid out either on the ground or on the logging table in the order of drilling depth i.e. from the top to bottom.
- Care was taken to sample the same side of the core whereas the other half was left in the core tray for future reference and analysis.
- Sampling was by lithology whenever possible. The minimum sampling interval per lithological unit was 3 cm (this is due to the nature of the mineralisation, which mainly occurs as relatively thin veins).
- Sampling intervals were marked on the core before the sample was taken.
- One half of the core within the marked intervals was placed in designated sample bags.
- Sample tickets were placed in the calico sample bags which were later sealed.
- Each sample bag was weighed.
- Sample details such as sample number, interval and weight were recorded on a customised sample data sheet.
- QAQC samples were inserted at predetermined intervals within the sample sequence.
- For duplicate samples, an empty bag with a sample ticket was inserted at predetermined intervals. Instructions were given to the laboratory on the sample dispatch form as to which samples were required to be crushed, homogenised and split into two to obtain a duplicate sample.

- The calico sample bags were placed into big bags which were sealed prior to transport by road to Bujumbura from where they were dispatched to ALS Minerals Laboratory ("ALS") in Vancouver (Canada) via courier services (generally DHL).
- All the drill core sampling data were captured in the drilling database.

10.5 Topographic and Drill Collar Survey

Drone and topographic surveys were carried out at the Gasagwe Mine site as well as the Murambi South, Kiyenzi and Gomvyi Centre targets. The surveys acquired coordinates for every channel sample cut through veins as well as for all drill collar positions. A differential GPS ("DGPS") was used, except for the drill collar positions of the 4 aeromagnetic targets which were surveyed using a standard handheld Garmin GPS.

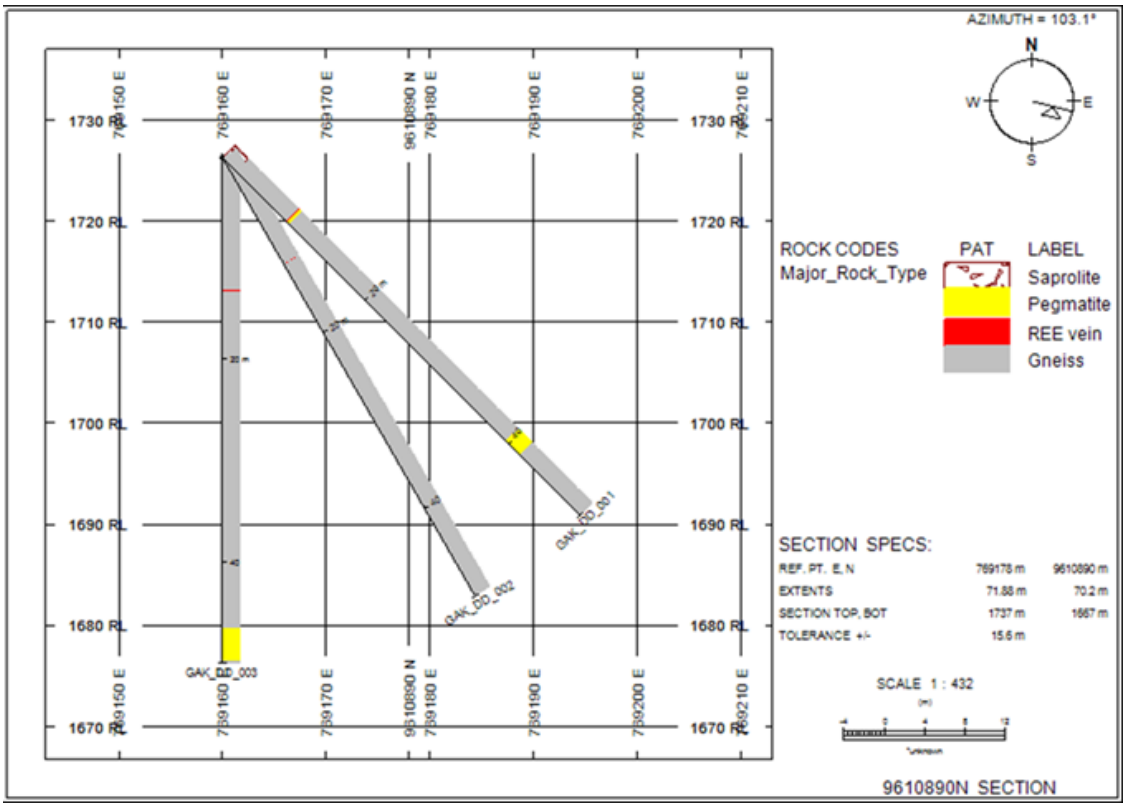
The DGPS Equipment used by the Burundian survey contractor is a Leica TS02 R500 Reflectorless w/ Bluetooth Total Station, with a precision of 1 mm.

The Drone system was a Phantom 4 equipped with a 20 MP camera. The GPS units were a Trimble R2 GNSS receiver and a Trimble R8 GNSS receiver as the base station. A Trimble TSC3 controller was used equipped with GLONASS (which includes Russian satellites for better coverage). A centimetre accuracy is achieved with this system.

10.6 Drilling at Gasagwe Mine

The three holes drilled at Gasagwe Mine (one vertical and two inclined), aimed to establish the depth continuation of the mined REE veins, confirmed the continuation of REE mineralisation up to a depth of 11 m from the mining level at the time of drilling (February 2018). REE veins with thickness ranging between 2 cm and 5 cm were encountered at downhole depths between 8.95 m and 13.27 m (Figure 10-4). Due to the highly weathered and friable nature of the bastnaesite/monazite and the incompetent saprolitic gneiss (host rock), one vein that should have been intersected close to the surface (1 m below the mining level at the time of drilling), was not observed/logged in the drill core because it was washed away during drilling. However, subsequent mining of the veins exposed this particular vein which was shown to have been pierced by the drill hole.

Figure 10-4
Cross section of the three holes drilled at Gasagwe Mine



Source: *Rainbow, 2018*

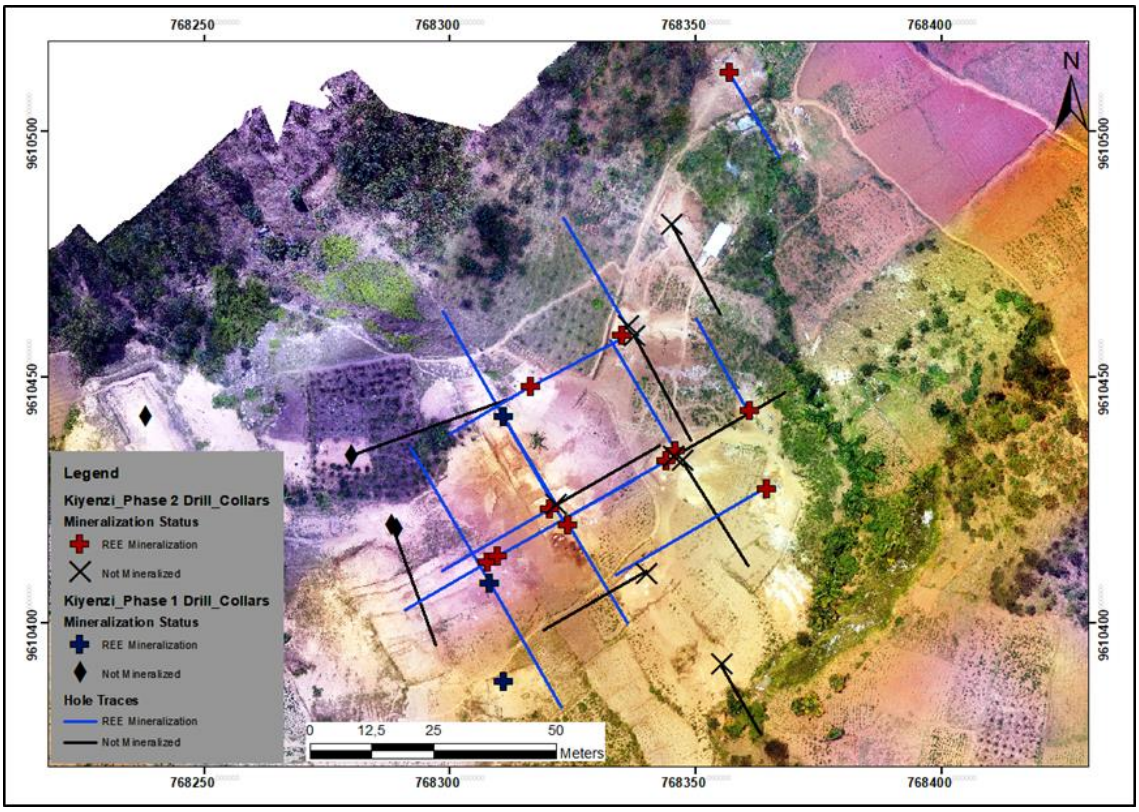
10.7 Drilling at Kiyenzi Target

Kiyenzi is considered to have high potential because of the presence of exceptionally large REE-bearing breccia boulders (tens to hundreds of kg) found strewn on the steep flanks of the Kiyenzi hill. While some veins of purer bastnaesite/monazite were found in-situ on the target, most of the boulders of the mineralised breccia type lithology were float. Rainbow therefore believed that the prospect justified a systematic drilling campaign.

Drilling of the Kiyenzi target was carried out in two phases (Figure 10-5). Phase 1, from March to June 2018, consisted of 10 holes for a total meterage of 464.6 m. Phase 2, from July to September 2018, drilled 20 holes for a total meterage of 963.9 m.

Phase 1 was initially aimed at investigating the source of the postulated, large gravity anomaly, seemingly coincident with the occurrence of the large mineralised breccia floats. A total of six holes were drilled in the central part of the elliptical anomaly in order to achieve this first objective. However, the only dense lithologies encountered from this exercise were a thin layer (<20 cm wide) of massive sulphides at a depth of 98 m and a mafic rock (also <20cm thick) at a depth of 86 m with densities of 3.2 and 3.0 respectively. These intersections could not explain the relatively large gravity anomaly.

Figure 10-5
Diamond drilling Phase 1 and Phase 2 at Kiyenzi target



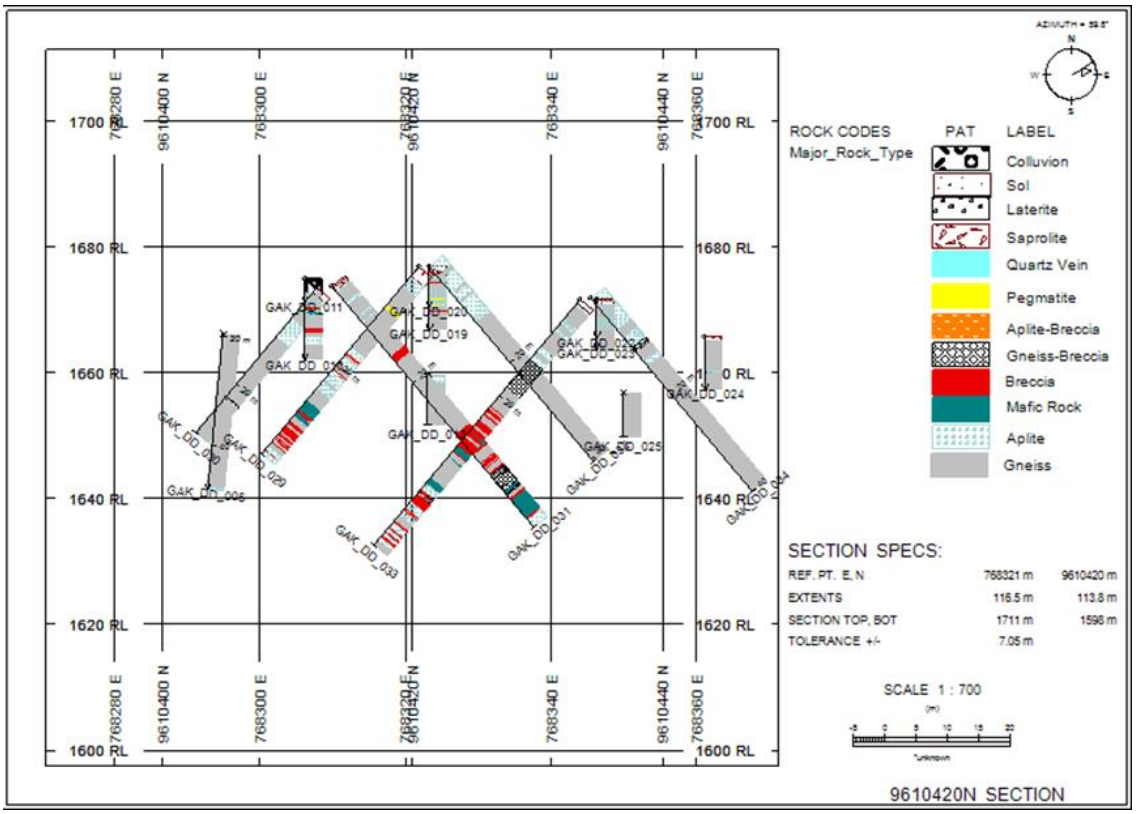
Source: *Rainbow, 2018*

Because the source of the large REE boulders remained unexplained, Rainbow decided to drill a series of inclined holes centred towards the area where the large floats occurred. This area also coincides with the Th anomaly detected from the airborne geophysical survey (DX07, see Section 9.2.2). All of these four holes intersected REE-bearing breccias often associated with a moderate to strong radiometric signature.

Following the positive intersection of mineralised breccia, the second phase of drilling was carried out with the objective of establishing the lateral and vertical extents of the REE-mineralised intersections.

A total of 20 inclined core holes were drilled in Phase 2 (Figure 10-5). Twelve of these intersected breccia type units (veins/dykes/sills) with associated radiometric signatures and often visible bastnaesite grains. The apparent thickness of these breccia units ranges between 3 cm and 1.73 m. A cross-section of the drill hole intersections is presented in Figure 10-6 which shows the complexity of the brecciated REE deposit.

Figure 10-6
Cross sction of drill holes GAK_DD_29 to GAK_DD_34



Source: *Rainbow, 2018*

10.7.1 Lithologies Intersected

The DD of the Kiyenzi target has confirmed the geological and structural complexity of this deposit, which is very different to the REE veins being mined by Rainbow at Gasagwe and the mineralisation historically mined by the Belgians from the 1940's to the 1970's.

The macroscopic descriptions of the drill cores derived from the logging, the microscopic description of petrography thin sections from selected core samples and the REE grade data obtained from the core sample assays indicate that the Kiyenzi body is composed of a massive injection of REE mineralisation into the host rocks i.e. aplites and gneisses. This magmatic or hydrothermal injection has occurred in the form of:

- Breccias, as sills, dykes or veins (some zones of which reach thicknesses of up to 2 m).
- More homogeneous REE-bearing bastnaesite/monazite (as steep or shallow dipping veins).
- Phenocrysts of bastnaesite/monazite i.e. as individual crystals formed within the aplite and gneiss.

The morphology of such a complex deposit can be described as a "breccia pipe", commonly reported in the literature as a typical form of carbonatite system (Midende, 1984, Le Bas, 1987, Hou *et al.,* 2015, Xie *et al.,* 2015).

10.7.1.1 Breccias

The breccia units typically include fragments of aplite and gneiss, quartz, and in some cases bastnaesite and monazite crystals/grains that have been remobilised. A diagnostic, common feature of the breccias are dissolution cavities, probably the result of a later diagenetic or weathering process. Three principal types of breccias have been recognised during logging:

The first type is comprised of large country rock xenoliths/fragments, mainly aplite and gneiss but occasionally could also contain mafic rocks, within a fine-grained matrix comprising of REE minerals (Figure 10-7). This type of breccia appears to be associated with lower REE grades than veins, due to the large proportion of country rock xenoliths which have a diluting effect on the TREO grades.

Figure 10-7
REE-mineralised breccia with country rock xenoliths within fine-grained REE matrix

Note *The sheared texture in the central and bottom right parts of the core sample*
Source: *Rainbow, 2018*

The second breccia type comprises of very coarse-grained bastnaesite xenocrysts with a small proportion of country rock xenoliths (Figure 10-8). The bastnaesite xenocrysts can reach lengths of up to 5 cm. This breccia type is generally characterised by relatively high REE grades.

Figure 10-8
REE-mineralised breccia with large xenocrysts and/or fragments of bastnaesite

Note: *Arrows indicate xenocrysts or fragments of bastnaesite; DC : dissolution cavity*
Source: *Rainbow, 2018*

The third type of breccia consists of almost pure bastnaesite and monazite minerals with very few country rock fragments and quartz (Figure 10-9). This type of breccia was never intersected in any the DD holes and was only encountered in the trenches excavated at surface. The TREO grades in this formation tend to be very high, as can be expected given the more homogenous nature of the REE mineralisation.

Figure 10-9
Breccia consisting mainly of bastnaesite/monazite with minor fragments of gneiss and quartz

Note: *The sample is approximately 10 cm wide*
Source: *Rainbow, 2018*

The breccias with large bastnaesite xenocrysts and/or fragments were mainly encountered beyond 20 m drill depths within a zone where a sill-like body was exposed at surface during drill platform preparation. These breccias also appear to be associated with a fine-grained mafic, metamorphic rock containing abundant secondary quartz.

10.7.1.2 Host rock lithologies: Aplite and Gneiss

Generally, the Kiyenzi cores show a large proportion of fracturing and shearing which have often caused the drilling penetration to be slow and the core recovery to be sub-optimal. During logging it was noted that the host rock lithologies, namely the gneiss and the aplite, presented two broad facies: a) a massive, pristine and solid facies and b) a fractured, folded, sheared facies, indicating intensive deformation (Figure 10-10 and Figure 10-11). The fractured/sheared facies is often associated with the contact zones with the breccias, suggesting that such fracturing and deformation could be the result of the same event that caused the brecciation and the related REE mineralisation.

The contacts between the various lithologies, especially between the breccia units and the host rocks, are difficult to identify due to the fragmented nature of these contacts (Figure 10-12). Furthermore, where contacts could be observed and measured, it was often seen that these contact angles varied widely, between upper and lower contacts, illustrating that the mineralised units

(namely the breccias) do not follow simple, predictable patterns, trends and structures on a local, metre-scale (Figure 10-13).

The REE grade assays obtained from selected core samples of the host rocks facies and also from cores for entire drill holes (GAK_DD012 and GAK_DD013) showed that the aplites and the gneiss can also be mineralised, especially in the drill sections surrounding the breccias. TREO grades of 1% to 5% in units logged as aplites as well as gneisses can only be explained if some form of bastnaesite/monazite mineralisation is present. The most likely form of such mineralisation is through veins and veinlets (sometimes at microscopic scale) formed during the brecciation event (Figure 10-13). The petrographic study of samples from selected host rocks has also shown that bastnaesite and monazite can be present in form of phenocrysts.

Figure 10-10
The two facies of gneiss at Kiyenzi: deformed and sheared (top) and undeformed (bottom)

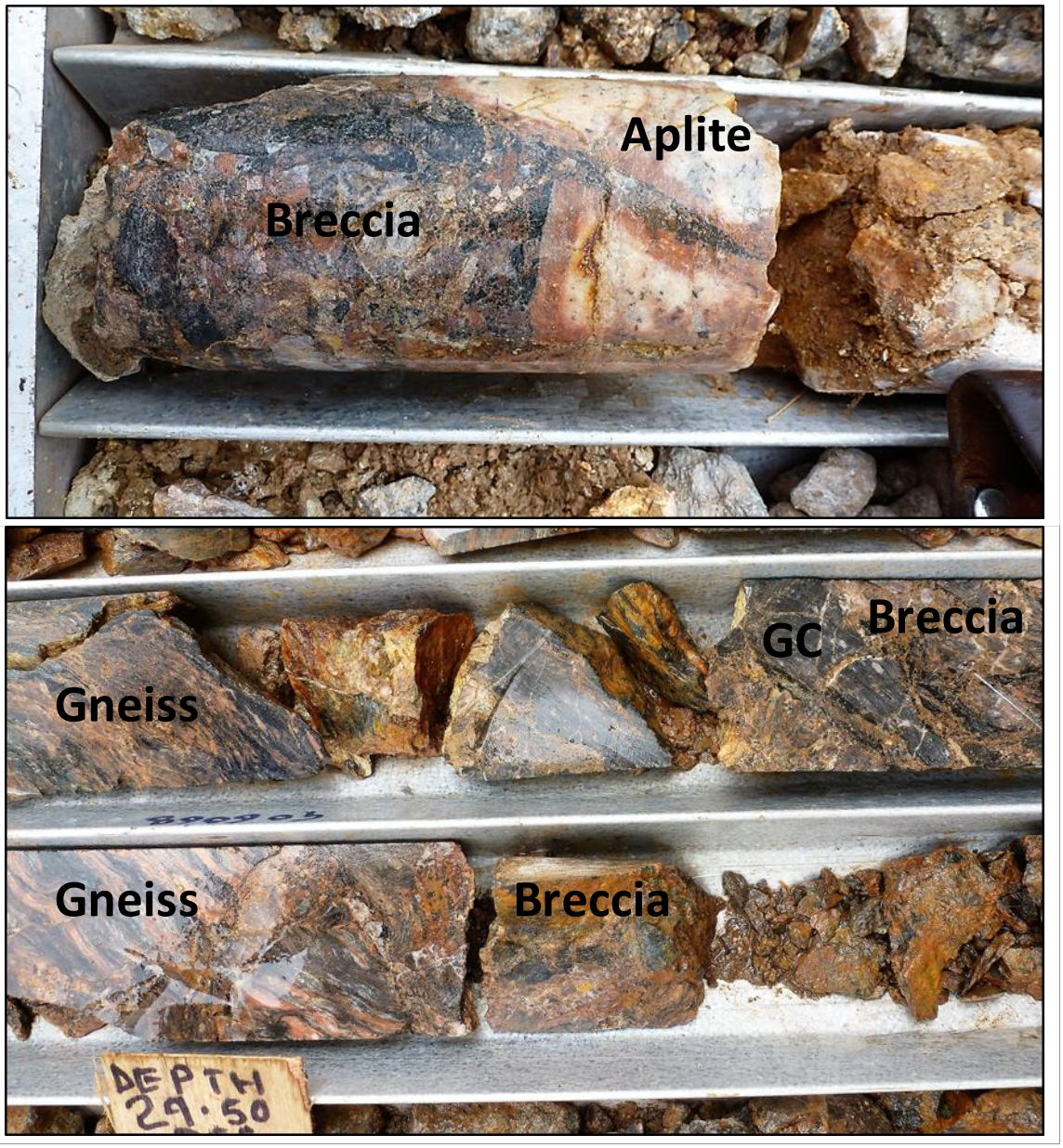
Source: *Rainbow, 2018*

Figure 10-11
The two facies of aplite at Kiyenzi: fractured (top) and undeformed (bottom)

Source: *Rainbow, 2018*

An observation made during logging of the aplites is a pale pink colouration, including numerous pink to reddish veinlets, when they occur in close proximity to REE mineralisation. It is likely that the pink colouration is the result of alteration caused by the intrusion of REE-bearing fluids/hydrothermal fluids into the aplite. This was observed in some of the drill core where the pink/red colouration was confined to a thin zone adjacent to the REE-bearing veinlets (Figure 10-12, top, and Figure 10-13). This process could have also affected the gneisses, as those gneisses occurring in close proximity to REE mineralisation also tend to be pinkish in colour.

Figure 10-12
Examples of complex contacts between breccia units and country rock (top)



Note: *Bottom tray shows breccia-gneiss with gneiss clasts (GC) inside the breccia*

Source: *Rainbow, 2018*

Figure 10-13
Contact between breccia and aplite with REE veinlets in the aplite

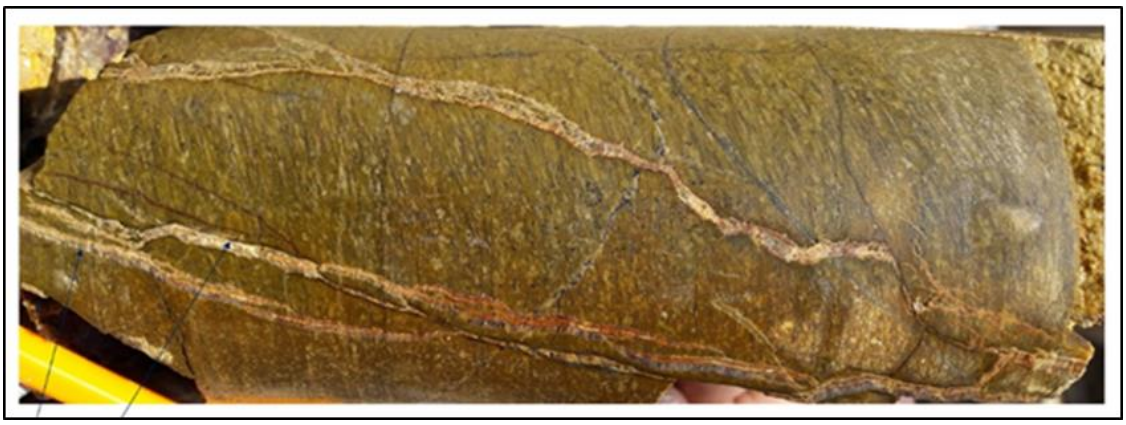
Source: *Rainbow, 2018*

10.7.1.3 Other lithologies: mafic rocks

Three types of mafic rocks were identified within the Kiyenzi target. These include dolerite which was mainly observed at surface, amphibolite and a "meta-mafic" rock. The last two were intersected during the drilling and not in outcrop.

The amphibolites encountered in the drill holes are very fine-grained and most of them are cross-cut by thin quartz veins (Figure 10-14). The "meta-mafic" rocks are also fine-grained, but they appear to contain numerous cavities filled by quartz (Figure 10-15). These rocks (meta-mafic rocks) were only encountered in very close proximity to REE mineralisation and in most cases were found to be interlayered with REE- bearing lithologies.

Figure 10-14
Amphibolite with quartz veins



Source: *Rainbow, 2018*

Figure 10-15
Metamorphosed mafic rock occurring close to REE-bearing breccia

Breccia Metamorphosed mafic rock

Note *the abundant quartz-filled pods in the metamorphosed mafic rock*
Source: *Rainbow, 2018*

10.7.1.4 Other lithologies: pegmatites and quartz

The pegmatite and quartz (vein) units were only encountered in the drill intersections where they have intruded into the other units described above. These are generally thin units with their thickness ranging between 10 cm and a few metres.

10.7.2 Mineralised REE Intersections

Four hundred and thirty-four core samples were submitted to ALS for full geochemical analyses. All drill intersections with TREO grades greater than 3% are summarised in Table 10-2.

Table 10-2
Summary of drillhole intersections with TREO greater than 3%

Hole ID	Depth From (m)	Depth To (m)	Width (m)	Lithology (basic)	TREO (%) Intersection	TREO (%) Combined Intersection
GAK_DD_010	6.05	6.62	0.57	Breccia	4.21	6.94
	7.00	7.72	0.72	Breccia + Mafic Rock	6.01	
	10.50	11.50	1.00	Breccia	8.17	
	19.00	19.12	0.12	Breccia	15.23	
GAK_DD_011	27.36	28.00	0.64	Breccia	3.28	16.3
	30.86	31.30	0.44	Breccia	35.32	
GAK_DD_012	1.97	2.20	0.23	Breccia	18.25	16.3
	12.05	12.09	0.04	Breccia	5.36	
GAK_DD_013	23.75	24.25	0.50	Breccia	30.34	27.81
	24.25	24.75	0.50	Breccia	25.28	
GAK_DD_019	0.00	1.75	1.75	Saprolite + Breccia	9.05	12.99
	9.46	9.53	0.07	Breccia	8.59	
	15.00	15.50	0.50	Breccia	27.41	
GAK_DD_020	0.00	2.05	2.05	Saprolite + Aplite	3.96	14.56
	3.47	3.70	0.23	Breccia	37.67	
	11.65	13.45	1.80	Breccia + Aplite	23.67	
GAK_DD_023	28.78	28.86	0.08	Breccia	3.30	3.3
	30.43	30.50	0.07	Breccia	3.40	
	32.11	32.14	0.03	Breccia	3.04	
GAK_DD_024	10.45	11.50	1.05	Breccia + Gneiss	17.53	16
	23.79	23.95	0.16	Breccia	5.92	
GAK_DD_027	33.90	34.60	0.70	Breccia	12.17	12.17
GAK_DD_029	17.95	18.55	0.60	Breccia + Gneiss	15.73	9.5
	20.41	20.50	0.09	Breccia	33.06	
	21.08	22.75	1.67	Breccia + Aplite	5.39	
	27.15	27.70	0.55	Gneiss	3.14	
	29.70	30.06	0.36	Breccia	3.68	
	32.06	32.66	0.60	Breccia	5.05	
	33.44	34.25	0.81	Breccia	4.51	
	34.60	35.50	0.90	Breccia + Gneiss	24.09	
	35.66	35.90	0.24	Breccia	16.16	
	36.45	36.55	0.10	Breccia	10.43	
	36.75	37.11	0.36	Gneiss	4.35	
	38.10	38.15	0.05	Breccia	14.94	
GAK_DD_030	10.18	10.22	0.04	Breccia	37.73	37.73
GAK_DD_031	30.65	32.02	1.37	Breccia	10.66	5.98
	34.83	35.05	0.22	Breccia	3.46	
	35.50	35.67	0.17	Breccia	13.62	
	35.80	35.91	0.11	Breccia	9.37	
	36.81	36.90	0.09	Breccia	7.45	
	37.10	37.70	0.60	Breccia	7.95	
	37.85	38.05	0.20	Breccia	4.42	
	44.50	48.05	3.55	Mafic Rock + Aplite	3.58	
GAK_DD_033	22.25	22.34	0.09	Breccia	4.42	7.29
	22.89	23.05	0.16	Breccia	7.75	
	23.77	23.90	0.13	Breccia	5.80	
	25.37	25.63	0.26	Breccia	11.46	
	25.85	25.98	0.13	Breccia	3.66	
	27.30	27.50	0.20	Mafic Rock	3.46	
	28.62	30.35	1.73	Breccia	8.00	
	31.60	31.63	0.03	Breccia	3.77	
	43.71	43.76	0.05	Breccia	6.66	
	49.15	49.30	0.15	Breccia	3.60	
GAK_DD_034	9.00	10.00	1.00	Brecciated Gneiss	4,55	
GAK_DD_035	17.05	17.17	0.12	Breccia	6.60	
GAK_DD_036	24.22	24.35	0.13	Breccia	3.57	3.56
	24.94	25.08	0.14	Breccia	3.55	
GAK_DD_038	38.25	39.30	1.05	Breccia	3.59	3.59

Source: *Rainbow, 2018*

A broad analysis of the grades of the 434 core samples assayed at ALS per lithology is presented in Table 10-3. It is evident, as demonstrated in previous Sections of the Report, that REE mineralisation occurs not only in the various breccia units, but also in the host rocks.

Table 10-3
Analyses of TREO grades of all lithologies intersected at Kiyenzi

Lithology	No. of samples	Average TREO (%)	Min TREO (%)	Max TREO (%)
breccia	156	7.74	0.08	45.80
aplite	87	0.75	0.02	4.99
gneiss	165	0.68	0.03	5.07
mafic rock	22	1.88	0.02	4.51
pegmatite	4	0.41	0.02	1.33

Seventeen of the 87 aplite core samples (i.e. 20%) show TREO grades greater than 1%, including four samples with values of between 3% and 5% TREO.

Thirty-six of the 165 gneiss core samples (i.e. 22%) show TREO grades >1%, including 7 samples with values of 3% to 5% TREO. The REE mineralisation event has therefore clearly penetrated the host lithologies.

It should be pointed out that Rainbow did not submit all the drill core samples for assaying, therefore the extent of the "low grade" mineralisation within the host rocks is not fully appreciated.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 Sampling Protocols

Systematic and strict sampling protocols were used by Rainbow's geologists in all their activities including trenching (channel sampling), drilling (core sampling) and mapping (rock chip sampling). These protocols have already been discussed in the sections on drilling, trenching and mapping in this Report.

11.2 Sample Security and Dispatch

All samples collected by Rainbow's geologists were kept in guarded company facilities, either at the Mutambu base camp, the Kabezi plant store, or at the Head Office in Bujumbura (Figure 11-1). The drill cores are safely kept in metal trays in an old store annexed to the base camp at the Gasenyi Catholic Mission (Figure 11-1).

Figure 11-1
Sample storage facilities at head office in Bujumbura and base camp in Mutambu

Source: *Rainbow, 2018*

Samples were delivered to commercial shipping agencies in Bujumbura (generally DHL), accompanied by a standard sample submission sheet with sample details and analytical instructions. Before any sample consignment could be exported, a written authorization had to be obtained from the authorities of the Ministry of Mines and Energy.

All samples destined for geochemical analyses were routinely sent to the ALS Minerals laboratory in Vancouver Canada ("ALS"). ALS is an independent and internationally accredited (ISO 17025) laboratory.

11.3 Quality Assurance and Quality Control

Rainbow's Quality Assurance and Quality Control ("QAQC") procedure consists of the insertion of one Certified Reference Material ("CRM"), one certified blank and one duplicate sample for every 50 samples submitted for analyses.

ALS utilises its own internal QAQC procedures which involve the insertion of CRM and blank samples as well as the analyses of duplicate samples for every batch.

432 core samples were consigned to ALS for assay. Rainbow inserted ten CRM samples, nine duplicate samples and nine blank samples, resulting in a total of 462 samples. QAQC samples accounted for 6.5% of the drill core samples submitted to ALS.

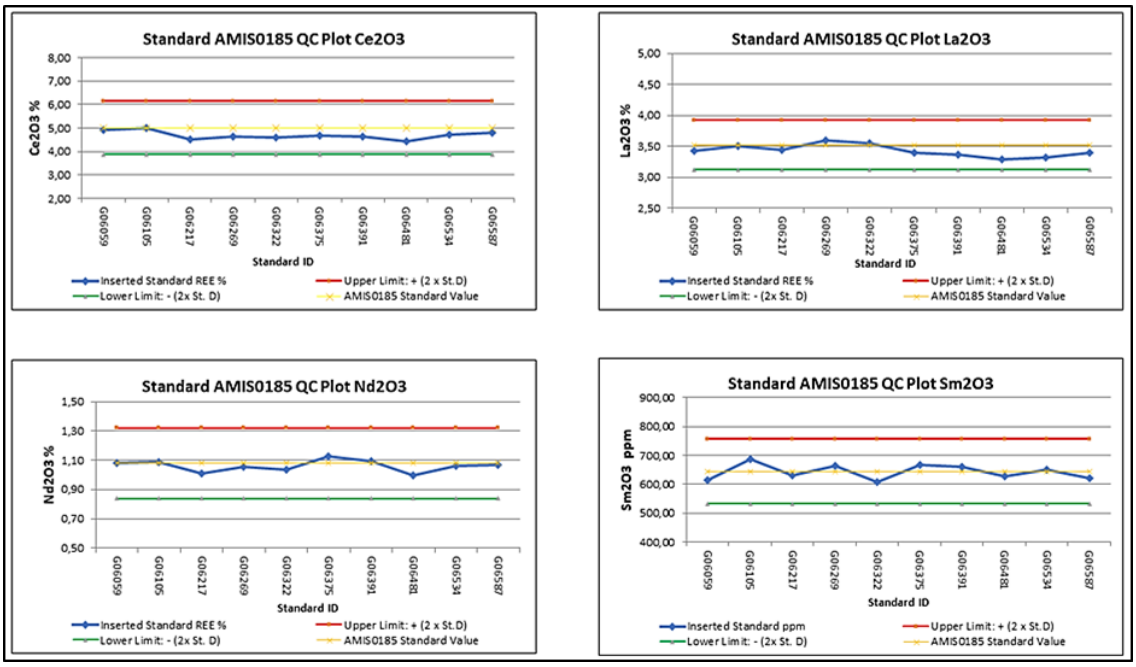
As part of ALS's internal QAQC procedures, a total of 33 CRMs (8 OREAS105, 15 OREAS146 and 10 AMIS0185), 15 duplicate and 15 blank samples were inserted in the batch of 462 samples consigned by Rainbow.

11.3.1 Standards

Certified Reference Material was used for the core samples that were assayed by ALS by ICP-AES method. The CRM samples were inserted at predetermined intervals during the sampling process. The aim of CRM analyses is to test the assaying accuracy of the laboratory.

All assay results of the inserted CRM AMIS0185 samples returned acceptable values which fall within 2 standard deviations ("SD") of the certified values (Figure 11-2). Similarly, the ALS internal CRMs returned element concentrations that are within acceptable limits of the certified values. Based on this observation, it can be concluded that the analytical results received from ALS are accurate and reliable.

Figure 11-2
Assay results for CRM AMIS0185 for the elements Ce_2O_3, La_2O_3, Nd_2O_3 and Sm_2O_3



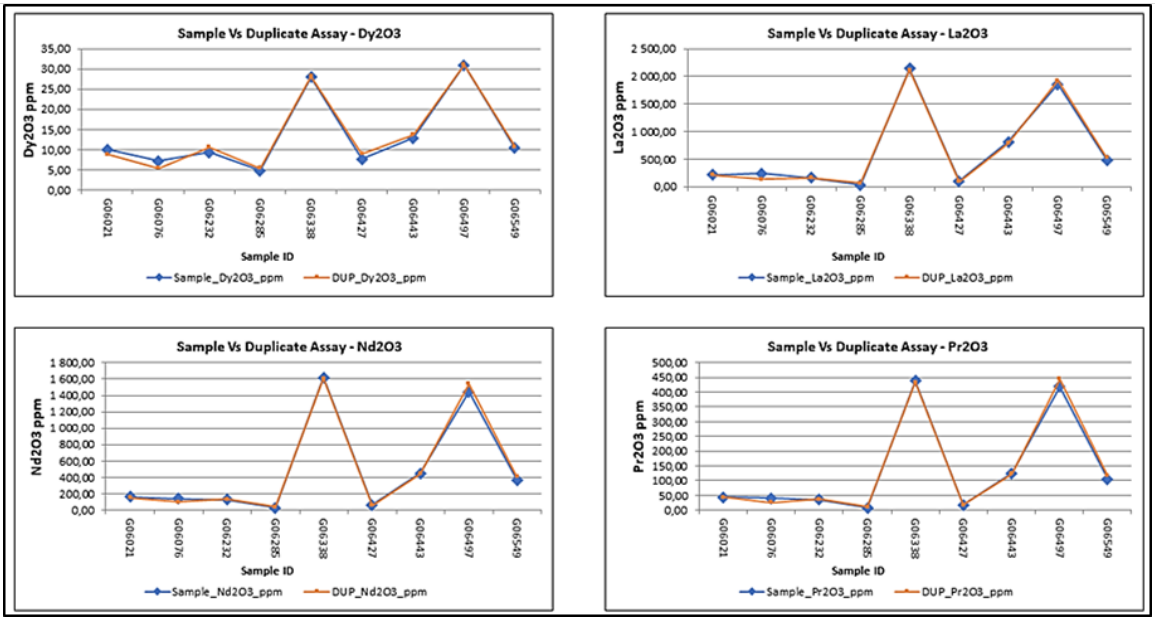
Source: *Rainbow, 2018*

11.3.2 Pulp Duplicates

Duplicate samples were created by splitting a sample after it was homogenised and assigning different sample numbers to the 2 fractions collected. The aim of this process was to test the precision of the analytical results.

A total of nine duplicates pairs were analysed. The assayed concentrations for the original sample versus duplicate sample were compared and the results show very good correlation (Figure 11-3). The ALS duplicate assays results show very good correlation for the sample pairs. This indicates that appropriate sample preparation techniques were used and that the analytical results have acceptable precision.

Figure 11-3
Original versus duplicate assay results for the elements Dy_2O_3, La_2O_3, Nd_2O_3 and Pr_2O_3



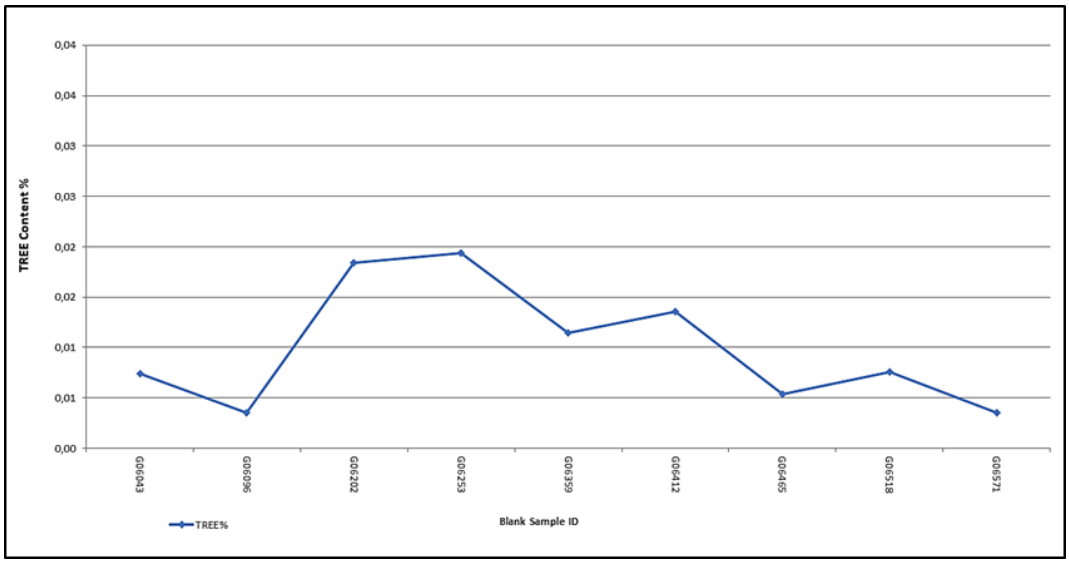
Source: *Rainbow, 2018*

11.3.3 Blanks

The blank samples contained minute concentrations of TREE but their total content was equal to or less than 0.02%. The main purpose of using blank samples is to check for contamination during the sample processing and analysing stages at the laboratory.

The nine blanks inserted by Rainbow returned very low TREE values, i.e. less than 0.02% (Figure 11-4). This indicates that no measurable contamination occurred during sample processing and analyses. It can therefore be concluded that the assay results received are acceptable and sufficiently accurate.

Figure 11-4
TREE assay results of blank samples



Source: *Rainbow, 2018*

The blank samples inserted by ALS returned either no value or very low TREE values i.e. less than 0.0004% TREE. This confirms that sample contamination at the lab was negligible.

11.4 Laboratory Sample Analyses

The sample preparation and analysis carried out by ALS are described in Table 11-1 to Table 11-3.

Table 11-1
Sample preparation procedures at ALS

SAMPLE PREP CODE	SAMPLE PREPARATION PROCESS
PREP-31D	Crush to 90% less than 2 mm, riffle split off 1 kg, pulverize to better than 85% passing 75 microns

Source: *ALS, 2018*

Table 11-2
Sample analyses procedures at ALS

SAMPLE ANALYSIS CODE	SAMPLE PREPARATION PROCESS
ME-MS81h	Elements by lithium borate fusion and ICP-MS (Inductively Coupled Plasma-Mass Spectrometry).
ME-OGREE	Over limit REE by ICPAES (Inductively Coupled Plasma-Atomic Emission Spectroscopy).

Source: *ALS, 2018*

Table 11-3
ALS analytical method ME-MS81h with elements an concentration ranges

CODE	ANALYTES & RANGES (ppm)			
ME-MS81h 0.1 g sample	Ce* 3-50,000	Ho 0.05-5,000	Rb 1-50,000	Tm 0.05-5,000
	Dy* 0.3-5,000	La* 3-50,000	Sm* 0.2-5,000	U 0.3-5,000
	Er 0.2-5,000	Lu 0.05-5,000	Sn 5-50,000	W 5-50,000
	Eu 0.2-5,000	Nb 1-5,000	Ta 0.5-5,000	Y 3-50,000
	Gd* 0.3-5000	Nd* 0.5-50,000	Tb* 0.05-5,000	Yb 0.2-5,000
	Hf 1-50,000	Pr* 0.2-5,000	Th 0.3-5,000	Zr 10-50,000

Note: *These elements may be determined up to 30% by ME-OGREE

Source: *ALS, 2018*

11.5 Specific Gravity Measurements

Specific Gravity Measurements ("SG") were carried out in the field using Archimedes principle of weight in air versus weight in water. This exercise involved the following procedure:

- Drying the sample.
- Coating the core sample with wax.
- Weighing and recording the sample dry weight.
- Weighing and recording the sample wet weight. This was achieved by suspending the core from the scale with a fine thread into the water, while not letting the core touch the bottom or sides of the container.
- The difference between the dry and wet weight is equivalent to the weight or volume of displaced water.
- The Specific Gravity was then calculated using the following formula:

$$\frac{Dry\ Weight}{Dry\ Weight - Wet\ Weight}$$

In addition to the SG measurements carried out in the field, a total of 51 breccia core samples were collected and dispatched to ALS for SG measurements. Only breccia samples were dispatched to ALS as the other lithological units show SG figures that are more constant and with smaller standard deviations.

Details regarding the ALS procedures for SG are provided in Table 11-4:

Table 11-4
Bulk density measurement procedures at ALS

CODE	DESCRIPTION	RANGE
OA-GRA09a	Bulk Density after wax coating	0.01 – 20 g/cm^3

Source: *ALS, 2018*

A total of 234 SG measurements were made for Kiyenzi lithologies. Out of these, 178 measurements were taken from various lithological units from the drill core and the remainder were from breccia

samples collected from trenches. A summary of the SG measurements by rock type is shown in Table 11-5.

Table 11-5
Summary of SG data for various lithological units at the Kiyenzi target

Lithological Unit	Number of Measurements	Average SG
Aplite	20	2.52
Breccia	104	2.89
Gneiss	97	2.58
Mafic Rock	11	2.71
Pegmatite	2	2.55
Total	**234**	

Source: *Rainbow, 2018*

The SG data for the Gasagwe and Murambi South lithologies were obtained in a series of Performance Tests completed at the Kabezi plant. The bulk density results of this test work are reported in Section 13.

11.6 Statement of Opinion on Sample Preparation, Security and Analysis

All aspects of sampling (from collection to bagging, labelling, storing and submission to the laboratories) are covered by Rainbow's standard operating procedure ("SOP") to ensure that all routine activities are conducted in a consistent manner.

No deficiencies in the sample preparation process have been observed.

The sampling and analytical procedures and number of QAQC samples inserted into the sample streams are appropriate for the current scope of the project, the type of the deposit and for the analytical techniques used. The CRMs show acceptable performance for the elements analysed and relevant for the project. The duplicates and blank sample results validate the reliability and credibility of the laboratory assays. The number of control samples i.e. CRMs, duplicates and blanks should be increased to 5% each, should the analytical data be used for a code-compliant Mineral Resource estimation. The number of samples analysed by a second (umpire) laboratory should similarly not be less than 5% of total samples submitted.

Rainbow follows an auditable chain of custody which ensures security and integrity of the results.

Based on these results, it is concluded that the quality of the sampling and assay data is acceptable.

12 VERIFICATION

The following site visits were carried out by the authors of this report:

- Dr. Friedrich Reichhardt visited the property and inspected the occurrences from the 25th to the 28th of July 2012.
- Mr Jeremy Witley visited the property on the 14th and 15th of March 2019 in order to inspect the sampling, exposures in mines and trenches, and the Kiyenzi drilling core.

Mr Jonathan Hudson visited the property on the 14th and 15th of March 2019 in order to inspect the recent mine workings and the Kabezi Plant.

Verification activities were conducted by the Competent Persons ("CP") during their respective site visits. Amongst other routine reviews, the key verifications during the site visit included:

- Inspection of the Kiyenzi cores and sample results.
- Inspection of trenching and related channel sampling.
- Inspection of REE vein exposures in the Murambi South and Gasagwe mines and the sampling thereof.
- Review of the project database for consistency, completeness and accuracy.

The database was continually validated by Rainbow's Chief Geologist, Mr Ntungwanayo on receipt of assays from the lab. All the mining and exploration data/information were entered manually into the data capture template by the geologist responsible for the specific task. This information was then sent to an independent Database and GIS Specialist (NAGC) for validation and capturing into a MS Access database.

The authors consider the data to be of reasonable quality and sufficient for reporting an Exploration Target tonnage and grade range as defined by JORC (2012).

13 MINERAL PROCESSING AND METALLURGICAL TESTING

Rainbow's processing plant was commissioned in Q1 2018 and has been in production mode since then. Up to March 2019 the plant has treated material from the Gasagwe mine and the Murambi mine, respectively 2,068 t and 310 t of ROM vein material to deliver 1,325 t of export concentrate. The plant has consistently managed to generate every month (December 2017 to March 2019) a high grade REE concentrate, grading on average 57.9% TREO.

The plant was constructed at a site near the town of Kabezi, some 15 km south of Bujumbura, situated between Lake Tanganyika to the west and the RN3 road to the east (Figure 13-1). The location near the capital city and the national road offers many, obvious logistics advantages to the operation.

Figure 13-1
Processing plant at Kabezi

Source: *Rainbow, 2018*

The plant, which has a capacity to treat 5 t per hour, produces a concentrate by separating "light" material gangue from the "heavy" REE minerals through the use of one jig and two shaking tables. Crushers, conveyor belts, filter press, pumps and tanks complete the basic equipment at the plant. Power is produced via 2 diesel generators.

Rainbow plant has also been used to carry our Performance Tests on REE mineralisation from future new mining sites, namely Murambi South and Kiyenzi. The Kabezi facility is of paramount assistance for the exploration and development of future mine sites.

Rainbow is currently also evaluating the feasibility to re-treat the tailings, which are running at grades between 10 % and 15% TREO. As at Nov 18, a total of 214,8 t of tailings (from the shaking tables) had been retreated and 17 t of concentrate were recovered at a grade of 48,2% TREO.

13.1 Metallurgical Testwork on Murambi South Mineralisation

Approximately 73 t of Murambi South vein mineralisation were collected during exploration and mine development trenching and processed at the Kabezi treatment plant. The Performance Tests ("PT") were conducted in 7 batches.

The weights of the various fractions and the grade analysis results for these 7 tests are summarised in Table 13-1. The grades, recoveries and yields are displayed in Figure 13-2. These 7 PT have resulted in an average recovery of 72.45%, and an average yield of 41.89%. The recovered grade ranged between 49.87% (PT 2) and 55.06% TREO (PT 4).

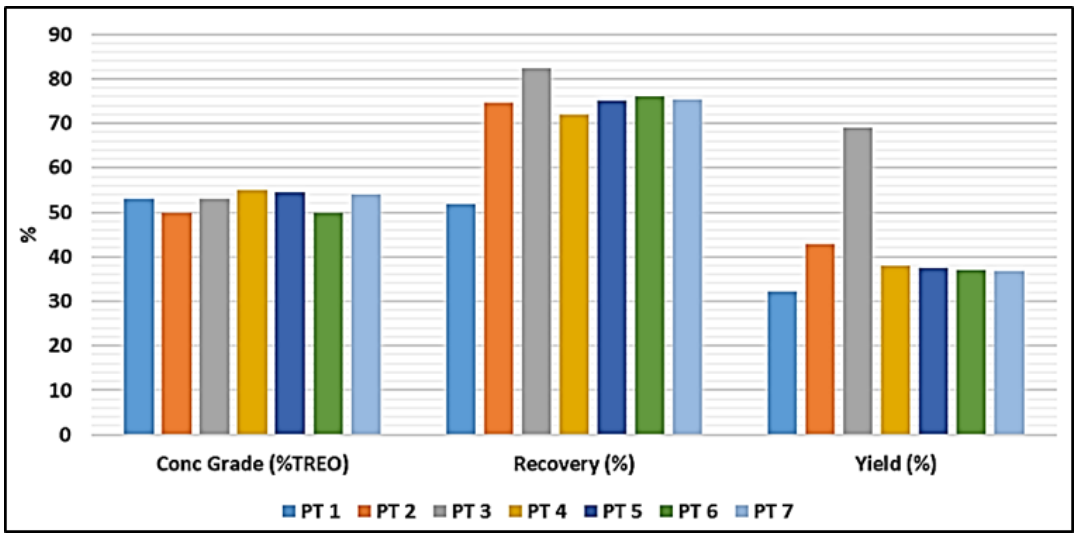
Table 13-1
Summary of results of the seven bulk sample Performance Tests on Murambi South mineralisation

Sample	Head Grade (%TREO)	Concentrate Grade (%TREO)	Recovery (%)	Yield (%)	Upgrade Ratio (UR)
PT 1	32.99	53.03	51.73	32.18	1.61
PT 2	28.67	49.87	74.56	42.86	1.74
PT 3	44.47	52.94	82.28	69.13	1.19
PT 4	28.94	55.06	72.08	37.89	1.90
PT 5	27.15	54.50	75.10	37.40	2.01
PT 6	24.37	49.96	75.98	37.07	2.05
PT 7	26.23	53.91	75.42	36.69	2.06
Averages	**30.40**	**52.75**	**72.45**	**41.89**	**1.79**

Note: *the TREO grades for PT1 are from ALS analyses. The rest of the grades were determined by Rainbow using the Niton XRF*

Source: *Rainbow, 2018*

Figure 13-2
Comparative results of the seven Performance Tests complteted on Murambi South vein material



Source: *Rainbow, 2018*

The seven Murambi South tests demonstrate how critical it is to set up the processing parameters of the jig and shaking tables for each mineralisation type, and also to determine the quality of the plant feed in advance. The results demonstrated that the more material is processed, the better the fine tuning of the plant can be carried out for specific mineralisation types such as Murambi.

13.2 Metallurgical Testwork on Kiyenzi REE mineralisation

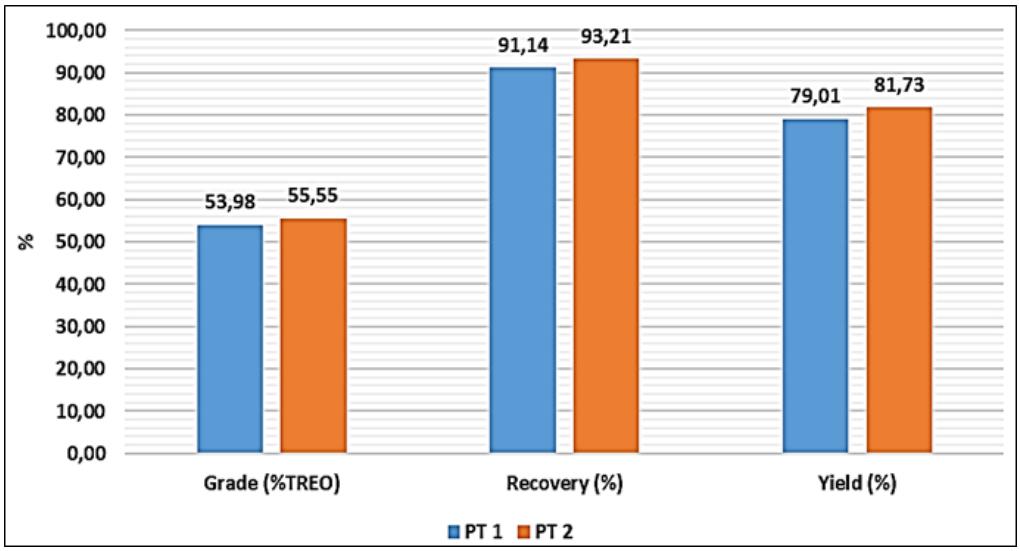
A total of 23,960 kg of Kiyenzi REE mineralisation was processed in two bulk sample Performance Tests. All the weights of the various fractions have been recorded and the results for the respective samples have been summarized in Table 13-2 and Figure 13-3. It must be noted that the TEO grade results of the second test were done with the NITON portable XRF.

Table 13-2
Summary of results of two bulk sample Performance Tests on Kiyenzi REE material

Kiyenzi PT 1: Feed & final products	Mass (kg)	Mass (%)	Grade (%TREO)	Recovery (%)
ROM ore	14600,00	100,00	46,80	100,00
Jig concentrate produced	8380,00	57,40	53,30	65,37
Shaking table concentrate produced	3156,00	21,62	55,78	25,76
Shaking table tails produced	826,00	5,66	19,14	2,31
Material in thickener	2238,00	15,33	20,00	6,55
Total concentrate	11536,00	79,01	53,98	91,14
Total tails	3064,00	20,99	19,77	8,86
	14600,00	**100,00**	**46,80**	**100,00**
Kiyenzi PT 2: Feed & final products	**Mass (kg)**	**Mass (%)**	**Grade (%TREO)**	**Recovery (%)**
ROM ore	9360,00	100,00	48,70	100,00
Jig concentrate produced	6710,00	71,69	55,72	82,02
Shaking table concentrate produced	940,00	10,04	54,29	11,19
Shaking table tails produced	700,00	7,48	29,77	4,57
Material in thickener	1010,00	10,79	10,00	2,22
Total concentrate	7650,00	81,73	55,55	93,21
Total tails	1710,00	18,27	18,09	6,79
	9360,00	**100,00**	**48,70**	**100,00**

Source: *Rainbow, 2018*

Figure 13-3
Comparative results of two Performance Tests done on Kiyenzi REE material



Source: *Rainbow, 2018*

The overall processing of the two Kiyenzi bulk samples showed quite high abrasion on the tertiary roll crusher. The primary and secondary crushers plus the screening handled the material from both tests well with an average recovery rate of 92.17% and a yield rate of 80.37%. The TREO grades of the final concentrate products also displayed good final values of 54% and 55.5% (Jankowitz, 2018).

The results of the Kiyenzi testwork demonstrate that the plant settings will have to be adjusted for each mineralisation type and have confirmed that the Kiyenzi breccia type mineralisation can be treated successfully. However, it should be stressed that the 24 t Kiyenzi sample represents the most conspicuous facies available within this resource. After grade assays were obtained for all lithologies present at Kiyenzi and after modelling such grades and the geology of the REE mineralisation, it is considered critical that the "lower grade" material be tested through the Kabezi plant. This would be one of the key factors in determining the viability of a mine at this site.

14 EXPLORATION TARGET TONNAGE AND GRADE ESTIMATES

Exploration at Gakara has been through identifying occurrences of REE mineralisation in the field, recording their locations and estimating the vein thickness at each location. The occurrences tend to occur as clusters, with each cluster being identified by a local landmark or village name. The areas are ranked according to their suitability for mining based on factors such as accessibility, population density, expected relative strip ratio, rock hardness, dip relative to topography and vein thickness.

Once suitable areas for mining have been identified, evaluation continues by trenching. Trenches across the strike of the veins are made and the extents of the veins are interpreted based on *in-situ* or float REE occurrences in the trenches.

During and shortly prior to mining, the veins are exposed and channel sampled in detail. The REE grade of the channel samples is semi-quantitatively measured using a Niton XRF. A number of channel samples from Gasagwe, Murambi and Gomvyi have been assayed at ALS Minerals laboratory in Vancouver Canada (ALS). ALS is an independent and internationally accredited (ISO 17025) laboratory. A comparison between the TREO grade of samples determined by ALS and Niton XRF shows that although there is poor correlation between the Niton and the laboratory value, the Niton serves to confirm the presence of high grade REE mineralisation in the veins.

The Kiyenzi target has been interpreted as a breccia pipe. The prospectively of this area was not assessed in the same manner as used for the narrow vein style mineralisation, and diamond drilling was used instead.

14.1 Exploration Target Tonnage and Grade Estimation Process

Given the two different styles of mineralisation and various stages in the evaluation of each target, three different methods were used by MSA to estimate the range of tonnage and TREO grade that could be expected at each location:

- Vein occurrences identified by pieces of in-situ or float vein material.
- Vein occurrences evaluated by trenching and/or mining.
- Block model estimation of the Kiyenzi breccia pipe.

It should be noted that the potential quantity and grade of the Exploration Target is conceptual in nature, there being insufficient exploration to estimate a Mineral Resource and that it is uncertain if further exploration will result in the estimation of a Mineral Resource.

The Exploration Target was estimated as a range as required by the JORC Code (2012). The Exploration Target is based on data of varying quantity and quality, although is based largely on actual Exploration Results as detailed in this report.

14.1.1 Vein occurrences identified by pieces of in-situ or float vein material

Quantification of an Exploration Target for the earlier stage areas, for which no trenching or sampling has been carried out, used the following methodology:

- The number of occurrences at each prospect was noted by Rainbow, ensuring that occurrences close to each other and likely to be from the same vein were not considered twice.

- Rainbow estimated the average vein thickness at each occurrence.
- Volumes were estimated using a strike and dip length of 20 m and 10 m respectively to determine a lower case volume estimate and a strike and dip length of 40 m and 20 m respectively to determine an upper case volume estimate.
  Prospect vein volume (m^3) = strike length (m) x dip length (m) x vein thickness (m) x number of occurrences.
- An in-situ density value of 3.5 t/m^3 was used to derive tonnage (rather than the SG of 4 used previously). The density is based on the average density measurements obtained from plant tests.
- The average TREO grade of the ALS assays from the three more advanced targets (Gasagwe, Murambi South and Gomvyi Centre) is 57.7% TREO. An upper limit of 60% TREO and a lower limit of 55% TREO was applied to the vein material.

14.1.2 Vein occurrences evaluated by trenching and/or mining

At the trenching or mine sites, the veins have been exposed, thicknesses were measured and strike lengths were measured or interpreted. This allows for a more accurate assessment of their tonnage potential. Quantification of an Exploration Target for the advanced stage areas used the following methodology for each vein:

- The average thickness of each vein was calculated from measurements in the trenches or from channel samples in exposed mining faces close to the unmined vein area.
- Volumes were estimated using the measured or interpreted strike length and a dip length of 20 m as a lower case and 40 m as an upper case. Where the strike length was less than 20 m, the strike length was used as the dip length for the lower case volume estimate and where the strike length was less than 40 m the strike length was used as the dip length for the upper case volume estimate.
- At Murambi South veins have been partially exposed and extensions to the strike length are likely in some cases. Each vein was examined on plan and the upper limit strike length was increased where the vein has potential to continue.
- Individual vein volume (m3) = strike length (m) x dip length (m) x vein thickness (m)
- An in-situ density value of 3.25 t/m^3 was used to derive tonnage for Murambi South and 3.74 t/m^3 was used for Gasagwe, based on density measurements obtained from plant tests. The average density of Gasagwe and Murambi South (3.50 t/m^3) was applied to Gomvyi Centre.
- The average assays of vein samples by ALS were applied to each area (Table 14-1):

Table 14-1
TREO grade statistics by area for sampled and assayed veins

Area	Number of Samples	Minimum (%)	Maximum (%)	Percentiles grade (%)			Mean (%)
				25%	50%	75%	
Gasagwe	94	20.3	69.9	55.7	59.6	63.4	58.9
Murambi Sth	18	48.3	63.9	54.5	56.9	59.6	57.2
Gomvyi Centre	11	27.3	71.5	48.6	61.1	67.2	56.9

- The TREO grade of the REE vein mineralisation is of low variability given the high proportion of bastnaesite and monazite in the veins. The grade is affected by minor amounts of accessory minerals, such as quartz and mica, and is not expected to vary significantly from the average for each area given the reasonable numbers of samples used to derive the average grade.

14.1.3 Block model estimation of the Kiyenzi breccia pipe

Given the complex and irregular shape of the Kiyenzi mineralisation, a high-level three-dimensional block model estimate was made with the diamond drilling data using Datamine Studio RM software, rather than using the vein estimation methods described previously.

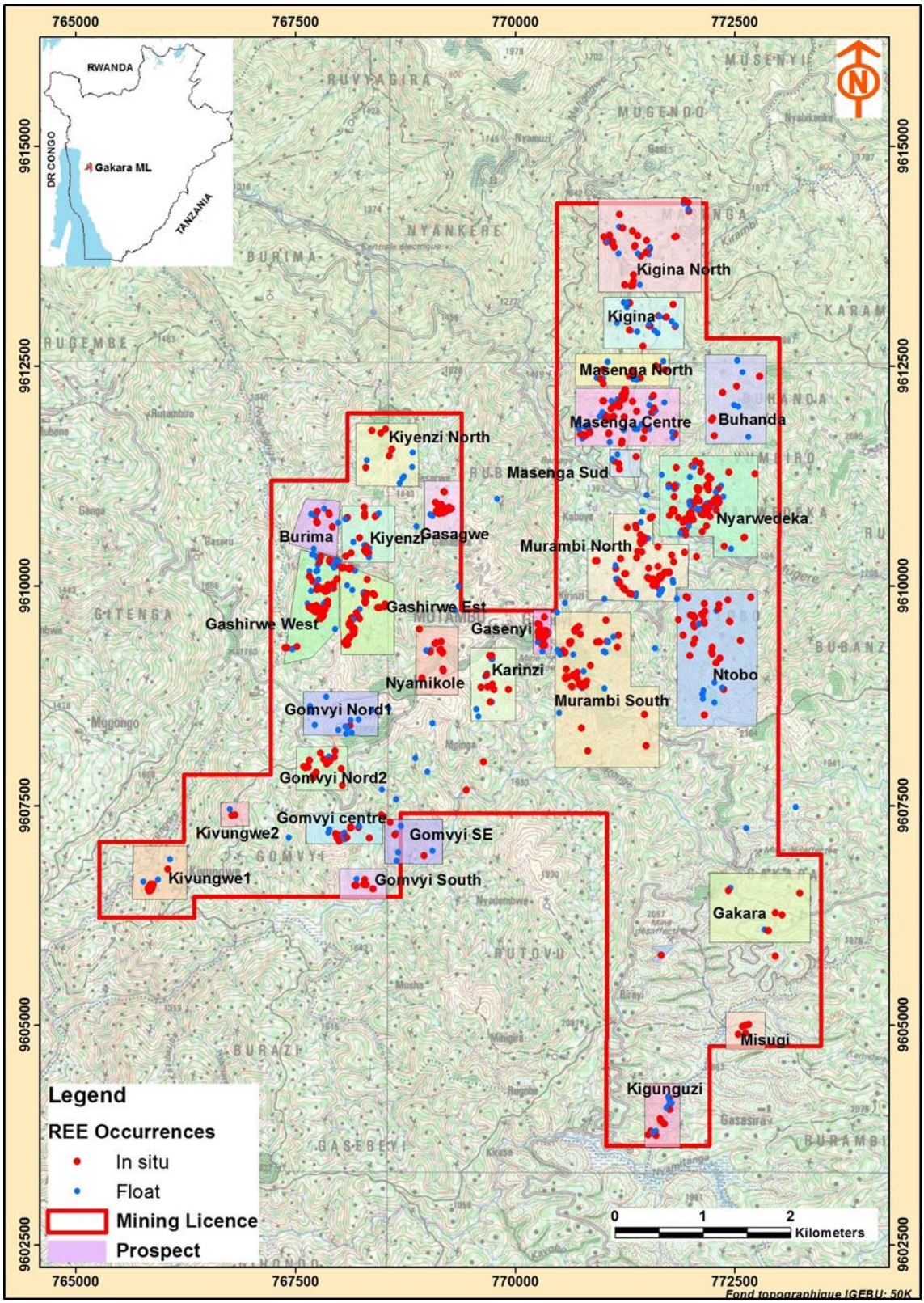
- The drillhole data were validated, de-surveyed and visualised in three dimensions. Unsampled cores were assigned a value of 0.01% for each REO.
- Sample data above a TREO grade of 0.4% were coded an indicator value of 1 and intervals that were below this threshold or not assayed were coded 0 in order to discriminate waste from mineralisation.
- The sample lengths were composited to 2 m intervals.
- A 5 mX by 5 mY by 5m RL block model was created and the indicator values were estimated into the block model using inverse distance squared. A search ellipse of 40 m vertical by 30 m strike (NW) by 20 m perpendicular to strike was used with a minimum of four and a maximum of six sample composites.
- Blocks with an indicator estimate of greater than 0.5 were deemed to be mineralised and blocks with an estimate of less than 0.5 were deemed unmineralised.
- A single structure anisotropic variogram was assigned with a range of 50 m vertical by 40 m strike (NW) by 20 m perpendicular to strike, a nugget effect of 0.2 and a total sill of 1.
- Individual REO grades were estimated using ordinary kriging into the mineralised blocks using the composite data above 0.4% TREO, and into the unmineralised blocks using the composite data below 0.4% TREO. The individual REO grades were summed to create a TREO estimate.
- A surface representing the weathered-fresh interface was created. Density was estimated by applying the average density of the samples above and below this surface.
- The resulting model was examined, and high-level limits were applied to derive a range of tonnages as an Exploration Target.

14.2 Exploration Target Tonnage and Grade Estimation Results

14.2.1 Veins outside trenched or recently mined areas

A total of 28 separate targets containing concentrations of REE occurrences were identified by the location of 1,332 REE occurrences (Figure 14-1). Four of these (Gasagwe, Murambi South, Gomvyi Centre and Kiyenzi) have been evaluated in more detail by trenching, sampling or drilling. An assessment of the Exploration Target tonnes and grade for the veins outside the trenched or mined areas (including untrenched areas of Murambi South) is shown in Table 14-2.

Figure 14-1
Location of the 28 Prospects/Targets defined by REE occurrences



Source: *Rainbow, 2018*

Table 14-2
Estimation of Exploration Target for vein occurrences identified by pieces of in-situ or float vein material

Prospect	Number of Veins	Average Thickness (m)	Strike Length (m)		Dip Length (m)		Vein Tonnes (t)		TREO (%)	
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Murambi N	48	0.058	20	40	10	20	1 949	7 795	55	60
Murambi S	12	0.034	20	40	10	20	281	1 126	55	60
Masenga N	16	0.069	20	40	10	20	773	3 091	55	60
Kivungwe 1	16	0.160	20	40	10	20	1 792	7 168	55	60
Gakara	8	0.060	20	40	10	20	336	1 344	55	60
Misugi	5	0.024	20	40	10	20	84	336	55	60
Masenga S	4	0.048	20	40	10	20	134	538	55	60
Gashirwe E	66	0.057	20	40	10	20	2 633	10 534	55	60
Gasenyi	27	0.070	20	40	10	20	1 323	5 292	55	60
Ntobo	35	0.050	20	40	10	20	1 225	4 900	55	60
Masenga C	48	0.052	20	40	10	20	1 747	6 989	55	60
Karinzi	12	0.080	20	40	10	20	672	2 688	55	60
Gashirwe W	116	0.056	20	40	10	20	4 547	18 189	55	60
Kigina	13	0.061	20	40	10	20	555	2 220	55	60
Kigunguzi	11	0.030	20	40	10	20	231	924	55	60
Buhanda	7	0.035	20	40	10	20	172	686	55	60
Gomvyi	7	0.060	20	40	10	20	294	1 176	55	60
Nyardeweka	93	0.036	20	40	10	20	2 344	9 374	55	60
Nyamikole	15	0.055	20	40	10	20	578	2 310	55	60
Gomvyi SE	3	0.036	20	40	10	20	76	302	55	60
Kivungwe 2	2	0.055	20	40	10	20	77	308	55	60
Gomvyi N1	21	0.038	20	40	10	20	559	2 234	55	60
Burima	8	0.052	20	40	10	20	291	1 165	55	60
Kigina N	29	0.031	20	40	10	20	629	2 517	55	60
Kiyenzi N	6	0.040	20	40	10	20	168	672	55	60
Total							**23 000**	**94 000**	**55**	**60**

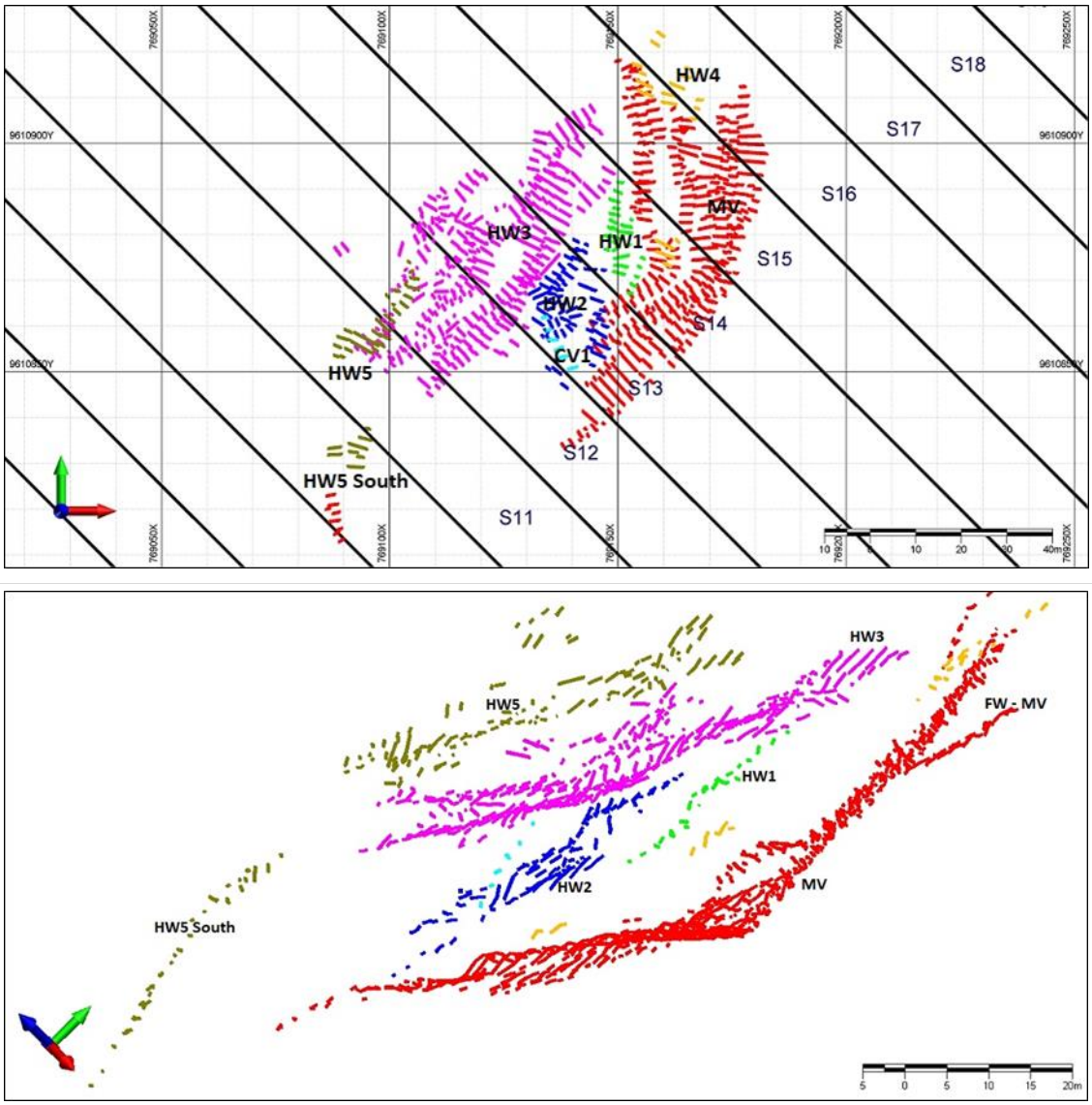
Note: *Individual areas reflect the results of the estimation methodology. Totals are rounded.*

The Exploration Target outside the mined and trenched areas comprises between 13,000 tonnes and 56,000 tonnes of TREO.

14.2.2 Gasagwe

As at the end of February 2019, five veins remained after mining and were exposed in the Gasagwe pit. These are Main Vein (MV), FW Nth (FW-MV), HW5, HW5 Sth and HW3. The locations of these veins, as well as other veins that have been mined, are shown by the detailed sampling (Figure 14-2). The potential remaining mineralisation is shown in Table 14-3.

Figure 14-2
Plan view (top) and angled view (bottom) showing the detailed configuration of the various Gasagwe REE veins in relation to each other.
The coloured segments represent actual channel samples cut on veins (as at 31-10-2018)



Source: *Rainbow, 2018*

Table 14-3
Estimation of Exploration Target for Gasagwe Mine

Vein ID	Average Thickness (m)	Strike Length (m)		Dip Length (m)		Vein Tonnes (t)		TREO (%)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Main (MV)	0.06	60	60	20	40	269	539	58.9	58.9
HW3	0.14	60	60	20	40	628	1 257	58.9	58.9
HW5	0.08	45	45	20	40	269	539	58.9	58.9
FW Nth	0.05	25	25	20	25	94	117	58.9	58.9
HW5 Sth	0.07	25	25	20	25	131	164	58.9	58.9
Total						**1 400**	**2 600**	**58.9**	**58.9**

Note: *Individual areas reflect the results of the estimation methodology. Totals are rounded.*

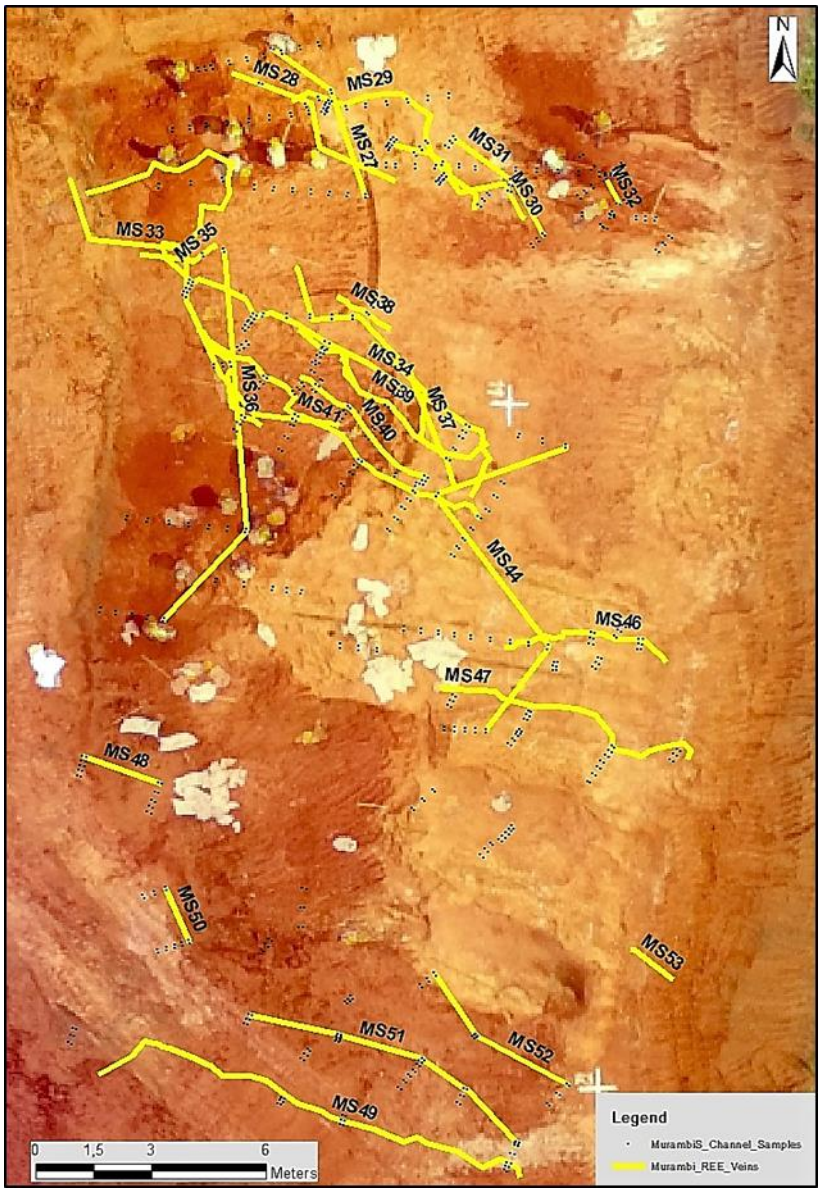
The Exploration Target at Gasagwe comprises between 800 tonnes and 1,500 tonnes of TREO.

The average proportion of each REEO is shown in Table 14-6. Minor amounts of thorium and uranium occur, which are described in Table 14-7.

14.2.3 Murambi South

As at the end of October 2018, fifty-three veins had been identified at Murambi South varying in strike length from 1 m to 42 m (an example of which is shown in Figure 14-3). The potential remaining mineralisation is shown in Table 14-4.

Figure 14-3
Vein stockwork exposed in the northern part of the Murambi South mining block



Source: *Rainbow, 2018*

The Exploration Target at Murambi South comprises between 900 tonnes and 1,400 tonnes of TREO.

The average proportion of each REEO is shown in Table 14-6. Minor amounts of thorium and uranium occur, which are described in Table 14-7.

Table 14-4
Estimation of Exploration Target for Murambi South Mine

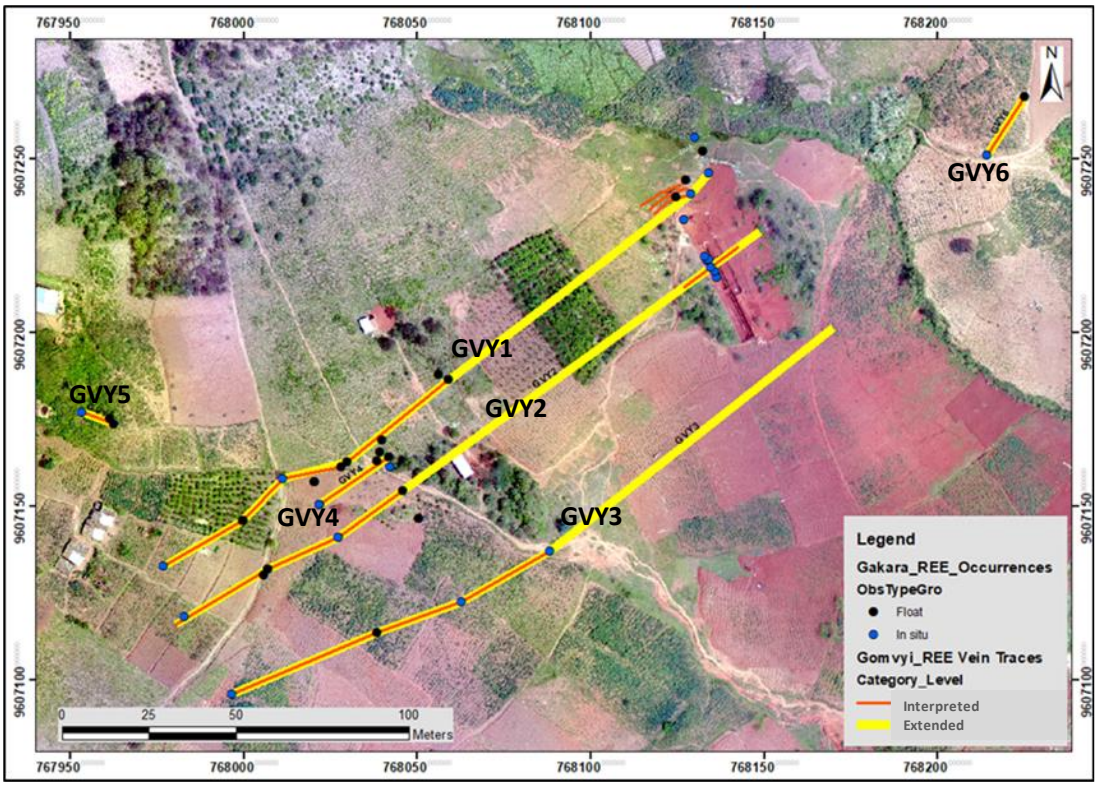
Vein ID	Average Thickness (m)	Strike Length (m)		Dip Length (m)		Vein Tonnes (t)		TREO (%)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
MS01	0.060	20	30	20	30	78	176	57.2	57.2
MS02	0.034	20	30	20	30	44	99	57.2	57.2
MS03	0.036	22	32	20	32	51	120	57.2	57.2
MS04	0.037	10	14	10	14	12	24	57.2	57.2
MS05	0.029	7	12	7	12	5	14	57.2	57.2
MS06	0.043	1	2	1	2	0	1	57.2	57.2
MS07	0.046	8	15	8	15	10	34	57.2	57.2
MS08	0.045	5	8	5	8	4	9	57.2	57.2
MS09	0.041	3	7	3	7	1	7	57.2	57.2
MS10	0.051	1	14	1	14	0	32	57.2	57.2
MS11	0.044	8	8	8	8	9	9	57.2	57.2
MS12	0.033	13	18	13	18	18	35	57.2	57.2
MS13	0.063	19	19	19	19	74	74	57.2	57.2
MS14	0.075	21	21	20	21	102	107	57.2	57.2
MS15	0.074	42	42	20	40	202	404	57.2	57.2
MS16	0.070	8	8	8	8	15	15	57.2	57.2
MS17	0.070	4	4	4	4	4	4	57.2	57.2
MS18	0.070	1.5	3	2	3	1	2	57.2	57.2
MS19	0.070	7	9	7	9	11	18	57.2	57.2
MS20	0.070	2	4	2	4	1	4	57.2	57.2
MS21	0.070	2	4	2	4	1	4	57.2	57.2
MS22	0.070	2	4	2	4	1	4	57.2	57.2
MS23	0.125	23	23	20	23	187	215	57.2	57.2
MS24	0.243	25	25	20	25	395	494	57.2	57.2
MS25	0.057	3	6	3	6	2	7	57.2	57.2
MS26	0.048	13	13	13	13	26	26	57.2	57.2
MS27	0.162	5	7	5	7	13	26	57.2	57.2
MS28	0.183	5	7	5	7	15	29	57.2	57.2
MS29	0.117	6	6	6	6	14	14	57.2	57.2
MS30	0.075	4	6	4	6	4	9	57.2	57.2
MS31	0.052	4	4	4	4	3	3	57.2	57.2
MS32	0.054	1	3	1	3	0	2	57.2	57.2
MS33	0.074	10	10	10	10	24	24	57.2	57.2
MS34	0.098	13	14	13	14	54	62	57.2	57.2
MS35	0.080	2	4	2	4	1	4	57.2	57.2
MS36	0.072	10	12	10	12	23	34	57.2	57.2
MS37	0.110	7	7	7	7	17	17	57.2	57.2
MS38	0.045	2	4	2	4	1	2	57.2	57.2
MS39	0.087	6	6	6	6	10	10	57.2	57.2
MS40	0.054	4	4	4	4	3	3	57.2	57.2
MS41	0.067	9	9	9	9	18	18	57.2	57.2
MS42	0.057	3	3	3	3	2	2	57.2	57.2
MS43	0.030	3	3	3	3	1	1	57.2	57.2
MS44	0.062	8	8	8	8	13	13	57.2	57.2
MS45	0.060	1	2	1	2	0	1	57.2	57.2
MS46	0.051	4	9	4	9	3	13	57.2	57.2
MS47	0.060	7	11	7	11	10	24	57.2	57.2
MS48	0.098	2	4	2	4	1	5	57.2	57.2
MS49	0.063	11	15	11	15	25	46	57.2	57.2
MS50	0.088	2	4	2	4	1	5	57.2	57.2
MS51	0.082	8	12	8	12	17	38	57.2	57.2
MS52	0.075	5	9	5	9	6	20	57.2	57.2
MS53	0.063	2	4	2	4	1	3	57.2	57.2
Total						**1 500**	**2 400**	**57.2**	**57.2**

Note: *Individual areas reflect the results of the estimation methodology. Totals are rounded.*

14.2.4 Gomvyi Centre

As at the end of October 2018, six veins had been interpreted at Gomvyi Centre (Figure 14-4). The veins were exposed in trenches and they were interpreted to form continuous veins with strike lengths between 10 m and 100 m. The potential mineralisation at Gomvyi Centre is shown in Table 14-5.

Figure 14-4
Interpreted vein extents at Gomvyi Centre



Source: *Modified from Rainbow, 2018 by MSA*

Table 14-5
Estimation of Exploration Target for Gomvyi Centre Prospect

Vein ID	Average Thickness (m)	Strike Length (m)		Dip Length (m)		Vein Tonnes (t)		TREO (%)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
1	0.055	100	200	20	40	385	1,540	56.9	56.9
2	0.041	100	200	20	40	287	1,148	56.9	56.9
3	0.045	100	200	20	40	315	1,260	56.9	56.9
4	0.034	25	50	20	25	60	149	56.9	56.9
5	0.003	10	50	10	10	1	5	56.9	56.9
6	0.025	20	50	20	20	35	88	56.9	56.9
Total						**1,100**	**4,200**	**56.9**	**56.9**

Note: *Individual areas reflect the results of the estimation methodology. Totals are rounded*

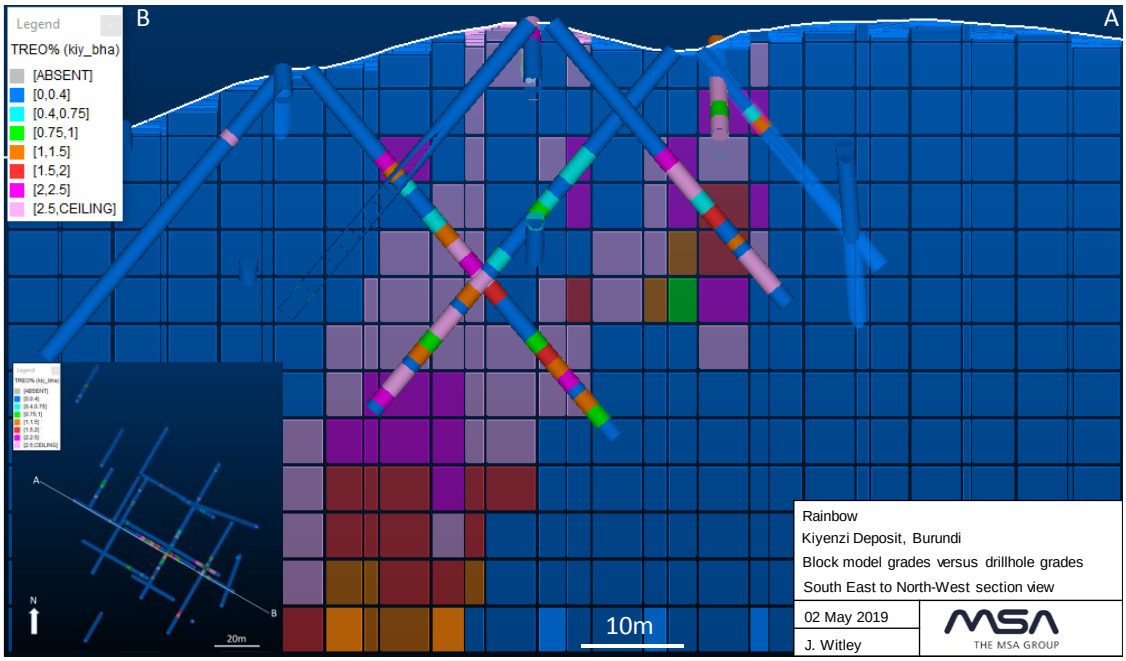
The Exploration Target at Gomvyi Centre comprises between 600 tonnes and 2,400 tonnes of TREO.

The average proportion of each REEO is shown in Table 14-6. Minor amounts of thorium and uranium occur, which are described in Table 14-7.

14.2.5 Kiyenzi

The Kiyenzi block model is shown in section through the well drilled area in Figure 14-5. The model illustrates the irregular and discontinuous nature of the high-grade mineralisation. Despite the close spaced drilling, further work will be required to accurately delineate the high-grade zones.

Figure 14-5
Section through the Kiyenzi Block Model



Source: *MSA*

At a cut-off grade of 1% TREO, MSA estimated an Exploration Target of between 50,000 tonnes and 90,000 tonnes at a TREO grade of between 2.5% and 3.0% for between 1,250 tonnes and 2,700 tonnes of *in-situ* TREO. Further exploration may result in additional mineralisation, however this has yet to be defined.

The average proportion of each REEO is shown in Table 14-6.

14.2.6 Proportion of individual REEOs in TREO

Table 14-6 shows the proportion of individual REEOs in TREO. Ce_2O_3 contributes approximately half the TREO content and approximately 95% of the TREO content is La_2O_3, Ce_2O_3 and Nd_2O_3, with Pr_2O_3 contributing approximately 4.5%.

Table 14-6
Proportion of Individual REEOs in TREO

REEO	Gasagwe	Murambi South	Gomvyi Centre	Kiyenzi
La_2O_3	30.1%	27.5%	27.6%	30.6%
Ce_2O_3	48.7%	50.3%	51.3%	45.9%
Nd_2O_3	14.6%	15.3%	14.5%	15.3%
Pr_2O_3	4.4%	4.5%	4.3%	4.4%
Sm_2O_3	1.3%	1.4%	1.3%	1.6%
Gd_2O_3	0.45%	0.53%	0.46%	0.64%
Dy_2O_3	0.05%	0.07%	0.06%	0.21%
Eu_2O_3	0.21%	0.26%	0.22%	0.29%
Y_2O_3	0.14%	0.20%	0.16%	0.76%
Tb_2O_3	0.024%	0.027%	0.026%	0.054%
Er_2O_3	0.007%	0.010%	0.009%	0.058%
Ho_2O_3	0.005%	0.008%	0.006%	0.029%
Lu_2O_3	0.000%	0.001%	0.000%	0.003%
Yb_2O_3	0.002%	0.004%	0.002%	0.023%
Tm_2O_3	0.000%	0.001%	0.001%	0.005%

14.2.7 Thorium and Uranium grades of samples

Grades of uranium and thorium in the vein samples tend to be low, however higher grades can occur in individual samples. Summary statistics for thorium and uranium are presented in Table 14-7.

Table 14-7 Concentration of Th and U in Samples							
Area	**Number of Samples**	**Minimum (ppm)**	**Maximum (ppm)**	**Percentiles grade (ppm)**			**Mean (ppm)**
				25%	**50%**	**75%**	
Thorium							
Gasagwe	93	17	4,520	25	28	39	211
Murambi Sth	18	73	2,570	111	300	658	560
Gomvyi Centre	11	31	1,420	47	111	483	301
Uranium							
Gasagwe	93	25	192	39	50	67	61
Murambi Sth	18	41	808	253	334	537	375
Gomvyi Centre	11	26	487	80	189	323	216

14.2.8 Exploration Target Tonnage and Grade Statement

The Exploration Target for the Gakara Project as at end February 2019 is shown in Table 14-8 as a range of potential grades and quantities as required by JORC (2012).

A tonnage range of 16,550 t to 64,000 t of in-situ TREO is estimated for the Property, which MSA considers to represent an Exploration Target. Excluding Kiyenzi, this equates to between 27,000 and 103,200 tonnes of vein material compared with 20,000 t to 80,000 t reported in the 2016 CPR compiled by MSA. This is primarily the result of the discovery of addition REE vein occurrences on the Property.

Table 14-8 Gakara Exploration Target as at February 28, 2019						
Area	**Tonnes (t)**		**TREO Grade (%)**		**TREO Tonnes (t)**	
	Lower	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Gasagwe	1,400	2,600	58.9	58.9	800	1,500
Murambi Sth	1,500	2,400	57.2	57.2	900	1,400
Gomvyi Centre	1,100	4,200	56.9	56.9	600	2,400
Kiyenzi	50,000	90,000	2.5	3.0	1,250	2,700
Other	23,000	94,000	55.0	60.0	13,000	56,000
Total					**16,550**	**64,000**

It should be noted that the potential quantity and grade of the Exploration Target is conceptual in nature, there being insufficient exploration to estimate a Mineral Resource, and that it is uncertain if further exploration will result in the estimation of a Mineral Resource.

The Exploration Target was estimated as a range as required by the JORC Code (2012). The Exploration Target is based on data of varying quantity and quality, although is based largely on actual Exploration Results as detailed in earlier sections of this report.

The Exploration Target estimate was completed by Mr Jeremy Witley BSC (Hons), MSc (Eng.), who is a professional geologist with more than 30 years' experience in base and precious metals exploration and mining as well as Mineral Resource evaluation and reporting. Mr Witley is a Principal Resource Consultant with MSA, a Fellow of the Geological Society of South Africa (GSSA) and a Professional Natural Scientist (Pr. Sci. Nat.) registered with the South African Council for Natural Scientific Professions (SACNASP). Mr Witley has the appropriate relevant qualifications, experience, competence and independence to be considered a "Competent Person" for the activity undertaken under the definitions provided in the JORC Code 2012 Edition.

14.3 Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Table 14-1
JORC CODE, 2012 Edition – Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling techniques	• Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling. • Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. • Aspects of the determination of mineralisation that are Material to the Public Report. • In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	• Grab samples: Individual REE veins were exposed over a strike length of a few metres. Where possible, a structural measurement of dip and strike was recorded. Between 1 kg and 3 kg of fresh material was collected per sample and transported in numbered bags to the Mutambu field office. The material was then broken into smaller chips with a geological pick and approximately 750 g was filled into cloth sacks, a sample ticket inserted and the sample number written on the bag with a permanent marker pen. Excess material was bagged in labelled sacks and transported to Rainbow's Bujumbura office were the bags are stored in a locked and secure room. • Soil samples: 591 samples weighing approximately 1 kg were bagged, numbered and transported to Rainbow's field office for temporary storage. Following completion of the sampling programme the bags were transported to the Chemical Analysis Laboratory of the Ministry of Energy and Mines in Bujumbura where they were oven-dried at 110°C, sieved to -80 mesh and 150 g to 200 g of the sieved material was filled into plastic bags together with a sample number ticket by laboratory staff. A Rainbow employee collected the samples and delivered the samples together with a standard ALSC submission sheet with sample details and analytical instructions to a local courier company Brucargo which shipped the consignment to ALSC in Johannesburg ("ALSC-SA") who in turn couriered the samples to ALSC-V in Canada for REE analysis. The excess +80 mesh material of the 591 samples was stored in numbered bags at Rainbow's Bujumbura office while samples from the detailed soil grid sampling, which were analysed with the Niton spectrometer, are stored in the Mutambu base camp. • Channel Samples: Once a REE vein is exposed by trenching, the surveyor delineates contour lines on the outcrop. A sample is then taken between two successive contour lines and given a number. The channels, which are 10 cm wide, are cut using a petrol engine rock cutter or a chisel and hammer. Two to four kg of sample are collected and put in a pre-numbered calico bag. The

Criteria	JORC Code explanation	Commentary
		distance between channels is 2 m.
Drilling techniques	• Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	• Diamond drilling • Cores were not orientated • HQ and NQ core sizes, depending on the hole depth and hardness of the lithologies encountered downhole. HQ size was mainly utilized in approximately the top 50m where the lithologies are highly fractured and with hardness ranging between soft and moderately hard. The NQ core size was utilized on drill holes that exceeded 50m depth and encountered more competent/hard rock. Standard core barrels were used in both core size.
Drill sample recovery	• Method of recording and assessing core and chip sample recoveries and results assessed. • Measures taken to maximise sample recovery and ensure representative nature of the samples. • Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	• Core recovery was measured. • No relationship between sample recovery and grade is known.
Logging	• Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. • Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography. • The total length and percentage of the relevant intersections logged.	• Lithological logging (including radiometric detection using a handheld Polymaster). • RQD Measurements made on the cores. • All cores were logged. • Logging at Kiyenzi is appropriate to support a Mineral Resource estimate once the nature of the mineralisation is better understood,
Sub-sampling techniques and sample preparation	• If core, whether cut or sawn and whether quarter, half or all core taken. • If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry. • For all sample types, the nature, quality and appropriateness of the sample preparation technique. • Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples. • Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling. • Whether sample sizes are appropriate to the grain size of the material being	• Grab samples: samples weighing between 1 kg and 3 kg of fresh material were collected and transported in numbered bags to the Mutambu field office. The material was then broken into smaller chips with a geological pick and approximately 750 g was filled into cloth sacks, a sample ticket inserted and the sample number written on the bag with a permanent marker pen. These samples were sent for analysis at ALSC in Johannesburg. On request by Rainbow ALSC insert certified reference material ("CRM") and duplicates into the batch of 150 rock grab samples for REE ICP-MS and ICP-AES analyses. In total three AMIS185, three certified blanks and six duplicates (three inserted by Rainbow and three splits by ALSC) were inserted into the sample stream and were assigned specified sample numbers, using the sample number sequence of the field samples. In addition, ALSC inserted nine AMIS185, one

Criteria	JORC Code explanation	Commentary
	sampled.	SY-4, six certified blank samples and five duplicates as part of their internal quality assurance and quality control ("QAQC") process (see Section 11.4.1). MSA considers the size and spatial distributions of REE vein grab samples representative • Soil samples: samples weighing approximately 1 kg were bagged and numbered. These were then sent to the Chemical Analysis Laboratory of the Ministry of Energy and Mines in Bujumbura where they were oven-dried at 110°C, sieved to -80 mesh and 150 g to 200 g of the sieved material was filled into bags together with a sample number ticket by lab staff. The samples were sent to ALSC Vancouver via ALSC Johannesburg (for QC see Section 11.4.2) • Channel Samples: The channel samples selected for laboratory analyses were sub-sampled using a riffle splitter to achieve a weight of approximately 500 g per sample.
Quality of assay data and laboratory tests	• The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total. • For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc. • Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	• ALSC is an independent and accredited analytical facility in accordance with the recognised international standard ISO 17025:2005 for laboratory analysis, including the management requirements of ISO 9001:2008 <u>Grab samples</u> • Rainbow instructed ALSC to insert certified reference material ("CRM") and duplicates into the batch of 150 rock grab samples for REE ICP-MS and ICP-AES analyses. In total three AMIS185, three certified blanks and six duplicates (three inserted by Rainbow and three splits by ALSC) were inserted into the sample stream and were assigned specified sample numbers, using the sample number sequence of the field samples. In addition, ALSC inserted nine AMIS185, one SY-4, six certified blank samples and five duplicates as part of their internal quality assurance and quality control ("QAQC") process. • For major element analyses by XRF, ALSC inserted five NIST 694, five STSD-4, five certified blank samples and five duplicates as part of their internal QAQC procedure. • African Mineral Standards ("AMIS") in Johannesburg, South Africa, manufactures REE standard AMIS185 which was used as CRM. A total of three AMIS185 were randomly inserted into the batch of 150 samples. The results for all relevant rare earth elements were assessed and found to be within the accuracy limits specified by AMIS. The results for the nine AMIS185 standards inserted and analysed by ALSC, as part of their internal QAQC process, show

Criteria	JORC Code explanation	Commentary
		acceptable accuracies for all relevant rare earth elements. ALSC inserted three OKA-2 and two TRLK certified standards as part of their internal QAQC procedure to monitor the accuracy of high Ce, La, Nd, Pr and Sm concentrations which were measured by ICP-AES analyses. The results for relevant rare earth elements show acceptable accuracies • The results for the three certified blank samples inserted by ALSC on behalf of Rainbow and the six blanks analysed as part of ALSC's routine QAQC procedure show no signs of contamination and the concentrations values for REE are within acceptable limits • Three field duplicates were randomly inserted by Rainbow and the sample batch. The results for all relevant REE were assessed and found to be within acceptable precision limits. The results for the three duplicate pairs created by ALSC on behalf of Rainbow and the five duplicate pairs inserted and analysed by ALSC, as part of their internal QAQC process, show acceptable precisions for relevant rare earth elements • Based on these results, it is concluded that the sampling and assay data are acceptable and sufficiently accurate. • ALSC is an independent and accredited analytical facility in accordance with the recognised international standard ISO 17025:2005 for laboratory analysis, including the management requirements of ISO 9001:2008 <u>Diamond Drilling Samples</u> • The same laboratory procedures were used for the core samples as for the grab samples. • Rainbow's QAQC procedure consists of the insertion of one Certified Reference Material ("CRM"), one certified blank and one duplicate sample for every 50 samples submitted for analyses. • ALS utilises its own internal QAQC procedures which involve the insertion of CRM and blank samples as well as the analyses of duplicate samples for every batch. • For the Kiyenzi drill core samples, a total of 10 CRMs, 11 duplicates and 9 blank samples were inserted by Rainbow into the batches of samples that were dispatched to ALS for analysis. Control samples accounted for 5.6% of the Kiyenzi drill core samples submitted to ALS. • Based on the results, it is concluded that the sampling and assay data are acceptable and sufficiently accurate.

Criteria	JORC Code explanation	Commentary
		•
Verification of sampling and assaying	• The verification of significant intersections by either independent or alternative company personnel. • The use of twinned holes. • Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols. • Discuss any adjustment to assay data.	Verification activities were conducted by the Competent Persons during the field visit and at the MSA office and included: • Inspection of selected observation and sampling points during a field visit • Cursory review of sample sheets and recorded information • Cursory review of the project database for consistency, completeness and accuracy • Review of sample submission and QA/QC protocol • Review of QA/QC assay results • Review project database against original Assay Certificates • Inspection of the Kiyenzi cores and sample results. • Inspection of trenching and related channel sampling. • Inspection of REE vein exposures in the Murambi South and Gasagwe mines and the sampling thereof. • Rainbow followed an auditable chain of custody which ensured security and integrity of the results
Location of data points	• Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation. • Specification of the grid system used. • Quality and adequacy of topographic control.	• The position of all in-situ REE veins and float occurrences were recorded with a handheld GPS • MSA considers the accuracy of a handheld GPS sufficiently accurate for the grab sampling usage. • The position of all channel samples were surveyed with a DGPS • The position of all drillhole collars were surveyed with a DGPS • No downhole surveys were completed and the collar orientation was used down the entire length of the hole. • Rainbow used UTM Zone 35S (WGS84 Datum) for all field measurements which were subsequently converted into geographic system (Long and Lat). MSA considers this approach sufficiently adequate
Data spacing and distribution	• Data spacing for reporting of Exploration Results. • Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied. • Whether sample compositing has been applied.	• Grab samples: Data points were located where fresh REE vein occurrences were present. The spacing therefore does not follow a systematic grid, but is dependent on the location of the veins. • Soil samples: were collected at three separate sampling grids at 25 m intervals along 500 m long lines which were spaced at 50 m. A 25 m sample spacing is not adequate to determine the exact location of veins and closer survey line intervals of 20 m and tighter sample spacing of 5 m or 10 m along survey lines is recommended

Criteria	JORC Code explanation	Commentary
		• Samples were not composited • Diamond Drilling at Kiyenzi: The drill holes are located on a loose grid of between 15 and 33m. • Channel samples at Gasagwe and Murami South were taken at 2 m intervals. However only a sparse number were selected for assaying by ALSC. 93 channel samples were assayed for Giyenzi, 18 at Murambi South and 11 at Gomvyi Centre. • Each channel sample represented the full thickness of the vein. • The number and distribution of channel samples at Gasagwe, Murambi South and Gomvyi Centre are sufficient to estimate an average grade and thickness for each deposit suitable for the purposes of defining an Exploration Target. • The diamond drilling at Kiyenzi Centre is sufficient to estimate an Exploration Target.
Orientation of data in relation to geological structure	• Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type. • If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	• Grab samples were taken where REE veins were exposed and the material relatively fresh (as opposed to weathered) • The grab sampling procedure did not consider the orientation of the vein, although strike and dip measurements were recorded where possible. • The channel sampling procedure ensures an unbiased sample of the vein • Diamond drilling at Kiyenzi was at irregular orientations. The understanding of the orientation of mineralisation at Kiyenzi is insufficient to understand the relationship between drilling direction and mineralisation trends.
Sample security	• The measures taken to ensure sample security.	• Standard operating procedures ("SOP") were used for the handling and transportation of samples to ensure a secure and auditable chain-of-custody from the field to the laboratory. Local sample transport was exclusively handled by Rainbow staff. A local courier company Brucargo were responsible for shipment to ALSC-SA and SGS (sample for metallurgical test work), respectively
Audits or reviews	• The results of any audits or reviews of sampling techniques and data.	• Sample collection, submission, QA/QC protocol and assay database were reviewed by MSA

14.4 Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Table 14-2
JORC CODE, 2012 Edition – Section 2 Reporting of Exploration Results

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings. • The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	• A 'Permis d'Exploitation' (Mining Licence) was lodged by RIR on 10 November 2014 and granted by the Burundi Ministries of Energy and Mining and Finance and Economic Development on 27 March 2015 and ratified by Presidential Decree No. 100/110 on 18 April 2015. A further Decree No. 100/194 was signed on 16 June 2015 stipulating that the State of Burundi has a 10 % interest in Rainbow Mining Burundi which is held 100 % by its parent company RIR. • Rainbow does not own the surface rights covered by the ML and EL but has free and unrestricted access to the Project area, following consultation with the local communities. • Rainbow submitted Environmental and Social Impact Studies to the Ministry of Environmental Affairs and obtained compliance certificates (No. 007/2015) on 4 March 2015 for the now expired EL and on 30 March 2015 (No. 010/2015) for the ML.
Exploration done by other parties	• Acknowledgment and appraisal of exploration by other parties.	1936-1957 • In 1936, SOMUKI discovered bastnaesite in alluvial deposits in the Gakara area, which was confirmed by analysis at laboratories in Entebbe (Uganda), Liverpool (England) and Leuven (Belgium). SOMUKI subsequently undertook exploration in the Heha and Gomvyi blocks between 1936 and 1939, after which work was suspended and concentrated on projects elsewhere. • From 1941 to 1942, research into the bastnaesite occurrences continued and the first mining tests were undertaken. Approximately 14 tonnes of bastnaesite material was produced from in-situ veins at Gakara. • The increase in REE prices from 1947 to 1957 resulted in renewed mining activities at the Gakara and Rusutama deposits from 1948 onwards. In total, 2,137.3 tonnes of bastnaesite was produced from these two deposits. • Thoreau et al. (1958) published an article on the Karonge deposit (Gakara) detailing results of a geological survey of the deposit. They noted that the bastnaesite mineralisation is located in a fault zone along a quartzite-schist

Criteria	JORC Code explanation	Commentary
		contact, where many veinlets were observed. Initially it was postulated that the mineralisation was only associated with the quartzites, until the excavation of the Rusutama quarry near Gakara, along strike from the Gakara mineralisation. The REE vein mineralisation at Rusutama occurs exclusively in schists. • A further two discoveries of bastnaesite mineralisation were made at Gasenyi and Murambi, in a different geological context to the initial discovery. The bastnaesite mineralisation occurs in a network of veins and stockworks (5 cm to 15 cm thick) associated with pegmatites. The mineral paragenesis is: bastnaesite, quartz, barite and sulphides (pyrite and galena). • In the late 1950s, genetic similarities between the REE mineralisation at Gakara and Mountain Pass, California, were recognised, although the absence of carbonates at Gakara and the generally more complex mineral assemblage at Mountain Pass were noted. • Some of the samples from the alteration zone at the Rusutama deposit were found to be radioactive and concentrations of up to 2.11 % ThO2 were reported and attributed to the presence of monazite. • Exploration and mining stopped in 1957, with a fall in the global REE prices. <u>1965-1978</u> • Sobumines returned to the Gakara area in 1965, by which time the general understanding of the geochemistry, mineralogy and metallurgical characteristics of REE had advanced. • From 1966 to 1969, mining of the Gakara and Rusutama deposits intensified. In 1968, exploration work and geological mapping was undertaken at Mugasenyi and several other known REE occurrences. Various types of mineralisation were noted, identifying the need for detailed studies to facilitate the treatment and purification of the material to produce the required concentrate. • Aderca and Tassel undertook detailed studies of the Gakara deposit in 1971. Their work focussed on various aspects of REE mineralisation, and mineral types and associations, from samples obtained from various operational pits. From 1972 to 1978, research was conducted by several Sobumines geologists and engineers. In excess of 30 REE occurrences were investigated as part of their exploration campaign for bastnaesite. • Exploration and mining operations were extended to the other sites including Gasenyi, Murambi, Gasagwe and Mugere. Mining operations until 1978 comprised open pits (terraces and galleries) for most deposits except for

Criteria	JORC Code explanation	Commentary
		Mugasenyi and Murambi, where underground mining was conducted due to the paucity of surface veins and the considerable thickness of overburden. • In 1978 Sobumines stopped all operations due to a fall in global REE prices which rendered mining in the Gakara area uneconomical. <u>1981-1985</u> • From 1981-1985 the Bundesanstalt für Geowissenschaften und Rohstoffe ("BGR") in Germany, undertook an exploration and evaluation programme on six selected REE-bearing sites, within a framework of bilateral cooperation with the Burundi Government. An estimated 5,000 tonnes of REE material at a grade of 50 % TREO was postulated for the six sites. The Gasagwe deposit alone was estimated by BGR to contain approximately 2,800 tonnes. • In 1985, the BGR undertook metallurgical test work on the Gakara REE mineralisation as part of their planning to resume small-scale mining at the Gakara deposit and to comply with REE concentrate specifications as required by the international market in the mid 1980's. The BGR study concluded that the tested bastnaesite/monazite mineralisation could be upgraded on site to a marketable product.
Geology	• Deposit type, geological setting and style of mineralisation.	• The Project area is situated within the northeast-trending Kibaran Fold Belt ("KB") which stretches across Burundi from the eastern Democratic Republic of Congo ("DRC") to western Tanzania. The KB in Burundi consists of a highly deformed sequence of Mesoproterozoic granites, granitoids and amphibolite-greenschist facies metasedimentary and metavolcanic rocks, referred to as the Burundi Supergroup. • The geology and tectonic framework of Burundi and neighbouring countries have been strongly influenced by repeated episodes of rifting along existing structural trends. This resulted in the emplacement of numerous carbonatites and alkaline complexes, spanning a broad range in age from Late Proterozoic to Cenozoic. • The Property geology is dominated by the Mugere granitoids which contain numerous inclusions of metasedimentary rocks such as the Karinzi and Makara "fragments" which are commonly fault bounded at the contacts with the granitoids. These granitoids are the dominant host rocks for the bastnaesite/monazite mineralisation in the Project area. • REE mineralisation is hosted within a network of bastnaesite/monazite-bearing veins and veinlets which range in thickness from a few centimetres to a few tens of centimetres. The veins exhibit variable orientations and

Criteria	JORC Code explanation	Commentary
		attitudes, although there appears to be a broad correlation with regional structures and dominant trends. • The REE mineralisation at Kiyenzi is thought to be within a breccia pipe. The mineralisation is discontinuous, and the understanding of the detailed geology is uncertain.
Drill hole Information	• A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: o easting and northing of the drill hole collar o elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar o dip and azimuth of the hole o down hole length and interception depth o hole length. • If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	• As per the main body of the report. • The collars and EOH depths for the drillholes are included in Appendix 2.
Data aggregation methods	• In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated. • Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. • The assumptions used for any reporting of metal equivalent values should be clearly stated.	• Exploration Results are reported in the form of an Exploration Target. <u>Vein occurrences identified by pieces of in-situ or float vein material</u> • The number of occurrences at each prospect was noted by Rainbow, ensuring that occurrences close to each other and likely to be from the same vein were not considered twice. • Rainbow estimated the average vein thickness at each occurrence. • Volumes were estimated using a strike and dip length of 20 m and 10 m respectively to determine a lower case volume estimate and a strike and dip length of 40 m and 20 m respectively to determine an upper case volume estimate. • Prospect vein volume (m3) = strike length (m) x dip length (m) x vein thickness (m) x number of occurrences. • An in-situ density value of 3.5 t/m3 was used to derive tonnage. The density is based on the average density measurements obtained from plant tests. • The average TREO grade of the ALS assays from the three more advanced targets (Gasagwe, Murambi South and Gomvyi Centre) is 57.7% TREO. An

Criteria	JORC Code explanation	Commentary
		upper limit of 60% TREO and a lower limit of 55% TREO was applied to the vein material. Vein occurrences evaluated by trenching and/or mining • At the trenching or mine sites, the veins have been exposed, thicknesses were measured and strike lengths were measured or interpreted. This allows for a more accurate assessment of their tonnage potential. • The average thickness of each vein was calculated from measurements in the trenches or from channel samples in exposed mining faces close to the unmined vein area. • Volumes were estimated using the measured or interpreted strike length and a dip length of 20 m as a lower case and 40 m as an upper case. Where the strike length was less than 20 m, the strike length was used as the dip length for the lower case volume estimate and where the strike length was less than 40 m the strike length was used as the dip length for the upper case volume estimate. • Individual vein volume (m3) = strike length (m) x dip length (m) x vein thickness (m) • An in-situ density value of 3.25 t/m3 was used to derive tonnage for Murambi South and 3.74 t/m3 was used for Gasagwe, based on density measurements obtained from plant tests. The average density of Gasagwe and Murambi South (3.50 t/m3) was applied to Gomvyi Centre. • The average assays of vein samples by ALS were applied to each area: Gasagwe 58.9% TREO (94 assays); Murambi South 57.2% TREO (18 assays); Gomvyi Centre56.9% TREO (11 assays). Block model estimation of the Kiyenzi breccia pipe. • Given the complex and irregular shape of the Kiyenzi mineralisation, a high-level three-dimensional block model estimate was made with the diamond drilling data using Datamine Studio RM software, rather than using the vein estimation methods described previously. • The drillhole data were validated, de-surveyed and visualised in three dimensions. Unsampled cores were assigned a value of 0.01% for each REO. • Sample data above a TREO grade of 0.4% were coded an indicator value of 1 and intervals that were below this threshold or not assayed were coded 0 in order to discriminate waste from mineralisation. • The sample lengths were composited to 2 m intervals. • A 5 mX by 5 mY by 5m RL block model was created and the indicator values were estimated into the block model using inverse distance squared. A search

Criteria	JORC Code explanation	Commentary
		ellipse of 40 m vertical by 30 m strike (NW) by 20 m perpendicular to strike was used with a minimum of four and a maximum of six sample composites. • Blocks with an indicator estimate of greater than 0.5 were deemed to be mineralised and blocks with an estimate of less than 0.5 were deemed unmineralised. • A single structure anisotropic variogram was assigned with a range of 50 m vertical by 40 m strike (NW) by 20 m perpendicular to strike, a nugget effect of 0.2 and a total sill of 1. • Individual REO grades were estimated using ordinary kriging into the mineralised blocks using the composite data above 0.4% TREO, and into the unmineralised blocks using the composite data below 0.4% TREO. The individual REO grades were summed to create a TREO estimate. • A surface representing the weathered-fresh interface was created. Density was estimated by applying the average density of the samples above and below this surface. • The resulting model was examined, and high-level limits were applied to derive a range of tonnages as an Exploration Target.
Relationship between mineralisation widths and intercept lengths	• These relationships are particularly important in the reporting of Exploration Results. • If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. • If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').	• Vein thicknesses were recorded in the field and are measured perpendicular to the plane of the vein. These represent true widths. • Grab samples of the mineralisation were taken from exposed fresh material and did not consider the orientation of the host vein. • The channel sampling procedure involves accurate measurements of the true thickness of the veins. • Diamond drilling at Kiyenzi was at irregular orientations. The understanding of the orientation of mineralisation at Kiyenzi is insufficient to understand the relationship between drilling direction and mineralisation trends.
Diagrams	• Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.	• Relevant maps and sections are provided in this document.
Balanced reporting	• Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	• Ratios of individual REEOs are reported. • Grades and thickness for the veins are not highly variable. • A block model was constructed for Kiyenzi that illustrates the grade variability.

Criteria	JORC Code explanation	Commentary
		• Upper and lower assays for U and Th are reported where available.
Other substantive exploration data	• Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	• Composite bulk sample of 125 kg was collected and submitted to SGS for mineralogical and metallurgical test work. The composite sample was crushed and screened at 11.2 mm at the Laboratory of the Ministry of Energy and Mines in Bujumbura. The sample comprised bastnaesite/monazite vein material collected from 48 individual occurrences within the Gashirwe West and East target areas; An aliquot of the sample was split by SGS and used for chemical analyses. Major elements were analysed by borate fusion X-Ray Fluorescence ("XRF"), Sulphur content was determined by Leco analysis and the Loss on Ignition ("LOI") by roasting at 700 °C. The 14 individual REE, U and Th concentrations were analysed by sodium peroxide fusion followed by Inductively Coupled Plasma Mass Spectrometry ("ICP-MS") method. • An aliquot was split by SGS from the bulk for mineralogical analysis and examined as follows: • major mineral analysis via X-Ray Diffraction ("XRD") • polished section analysis via Qualitative Evaluation of Minerals by Scanning Electron Microscopy ("QEMSCAN") Bulk Modal Analysis ("BMA"); and • Electron Microprobe Analysis on the polished sections to determine deportment, liberation, association and exposure of the REE bearing components. • The mineral abundance analysis indicated that the REE bearing components are bastnaesite and monazite while the gangue comprised mainly barite and micas • SGS Canada investigated five options for "cracking" and it was found that the strong acid agitated bake option gave the best results, with nearly all of the REE reporting to the water leach liquor • Metanza in Johannesburg was supplied with two bulk samples for jig tests, one sample was diluted with typical gangue material while the other was competent hard rock • The test on the diluted material revealed that a sinks product of 55 % can be achieved at a density of between 3.05 and 3.4 and an average recovery of 83 % was obtained. Recoveries on the competent vein mineralisation were higher ranging between 85 and 90 % • Metanza also performed combined jig and shaking table tests. These results indicated that the total rare earth oxide value of 55 % could be consistently achieved with a recovery of 83 %

Criteria	JORC Code explanation	Commentary
		• Obsideo Consulting and Metanza proposed a processing flowsheet incorporating both jigs and shaking tables based on the Metanza test work. The design is based on treating 10000 t/a run-of-mine (5.2 t/h). The product is specified as containing a minimum of 55 % total rare earth element oxides • Mining has been conducted at Gasagwe and Murambi South that confirms continuity of mineralisation along strike and down dip. • Rainbow's processing plant was commissioned in Q1 2018 and has been in production mode since then. • The plant has consistently managed to generate every month a high-grade REE concentrate, grading in average 58.2% TREO (Dec 17 to Oct 18).
Further work	• The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling). • Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	• Further evaluation of the REE occurrences through trenching is continuing as part of Rainbow's strategy to open further sites for exploitation of REEs.

15 MINING

Rainbow is using an open pit bench mining method to currently mine the deposits at Gasagwe and Murambi South. The mining method combines mobile mining equipment to strip the waste and manual mining to mine the veins thereby offering employment to the local community while providing a safe and a productive mining method. This is the proposed mining method to be used for the remaining deposits in the production plan (2019-2028). An example of the open pit mining taking place at Gasagwe and Murambi South is shown in Figure 15-1 and Figure 15-2 respectively.

Figure 15-1
Open Pit mining at Gasagwe

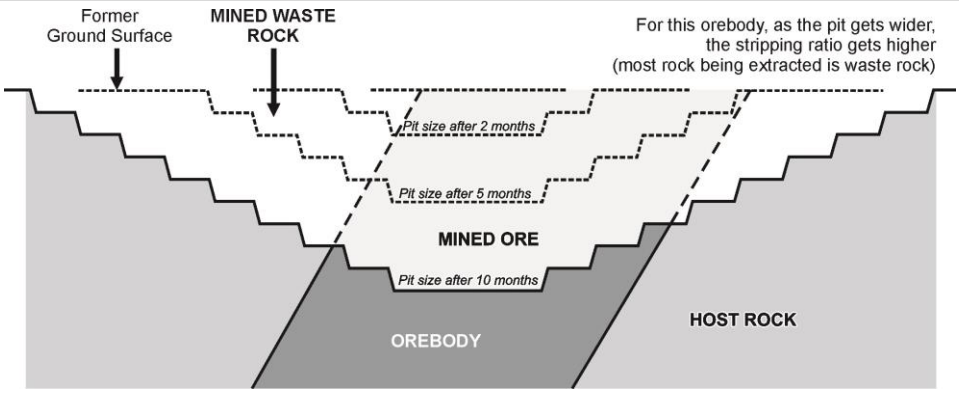
Source: *MSA (2019)*

Figure 15-2
Open Pit mining at Murambi South

Source: *MSA (2019)*

Open pit bench mining is generally the easiest form of mining for small-scale mining operations as the mineral of interest is either outcropping or is very close to surface requiring less effort and, to a certain extent, reduced risk to the mine worker. Bench mining offers a simple and safe method to exploit a deposit, but this method requires a systematic approach and for waste and mineralised material to be removed in a specific sequence. Figure 15-3 demonstrates the open pit mining method applying a sequenced approach to mining.

Figure 15-3
Schematic of open pit mining method



Source: *Hinton (unknown)*

As a rule, the lower the stripping ratio (waste to ore ratio) the greater the profits. Due to the small size of the veins, which range between 1 cm and 10 cm in thickness, the average historical stripping ratio at Gasagwe, which has been mined since August 2017, is 202:1. This is extremely high compared to conventional open pit mining. Normally when an open pit stripping ratio is in excess of 15:1, consideration is given to mining the deposit using an underground mining method. Due to the high-grade of these narrow vein deposits as well as the free-digging nature of the host rocks (at Gasagwe and Murambi South), the economics allows for a higher stripping ratio.

MSA considers that open pit bench mining is a suitable mining method for this type of deposit. Consideration should be given to using underground mining methods should the economics surrounding the high stripping ratio become unsustainable.

15.1 Geotechnical

No geotechnical work has been conducted to date. Based on on-site observations it is apparent that ground conditions are stable. Observations made by MSA at Gasagwe and Murambi South indicate that high wall stability should not be an issue with the slope of the pit based on a 3:1(V:H) slope over a 7.5 m high bench (refer to Figure 15-4).

Figure 15-4
Pit Slope Conditions at Murambi South

Source: *MSA (2019)*

15.2 Hydrological

No hydrological work has been conducted to date. The water table is generally below the mining depth. The key risk to production is the rainy season, which affects the months from September to May. The vein and waste production have been planned at 30% less from October to April than other months by Rainbow to allow for stoppages and delays due to the rain. It is important that the haul roads in and between the pits are constructed in the dry season months, with good road bed material to prevent damage to the roads affecting production during the rainy season.

15.3 Production Rate

The planned monthly production rate is 175 tonnes of ROM vein material per deposit at a high-level stripping ratio of 250:1. This is reduced to 125 tonnes of ROM vein during the rainy season months using the same stripping ratio. These production rates have been achieved historically at Gasagwe during the dry season but not during the rainy season, which has been hampered by the current mining trucks unable to cope with the wet conditions. The overall planned monthly production is dependent on mining four deposits simultaneously.

15.4 Modifying factors

Due to the narrowness of the veins (in the order of 5 cm to 10cm), the mining loss and dilution factors are difficult to determine and have not been applied. For example, 2 cm of waste is potentially equivalent to 20% dilution. MSA recommends that reconciliations are performed to better understand and manage the mining loss and the dilution factors applied to the vein material received at the processing plant. Rainbow uses Micromine mine planning software to assist with the volume estimations for the vein production. Despite mention of "ore" in the report, these figures do not constitute Ore Reserves. To date, no Ore Reserves have been estimated for the Gakara Project.

15.5 Production Plan

Figure 15-5 and Figure 15-6 illustrate the Rainbow Gakara annual production plan. The waste to ore strip ratio was based on historical waste mining at Gasagwe.

In order for Rainbow to ensure that a steady state annual ROM production target of 7,000 tonnes per annum is achieved sustainably, multiple mine sites will have to be developed and exploited at any one time. Such operation will strongly mitigate the risks that are associated with the complexity of the deposits and of the actual mining of thin veins. The Rainbow production plan allows for four mines sites being mined simultaneously. MSA recommends that additional mine sites are always available due to the unpredictable nature of the veins.

A key component of the future production plan is the “Other” category which constitutes all the remaining exploration targets. The ability to execute the production plan is dependent on multiple exploration sites being available for mining providing production flexibility. In order to bring the “Other” category into the production plan, the Rainbow management team will need to coordinate all the technical and production resources to ensure new sites are continuously available for mining.

A key constraint to mining is the amount of waste removal required to access the veins. Additional mining equipment is required to be purchased and be well maintained and utilised in order to achieve the waste production target and Rainbow production plan.

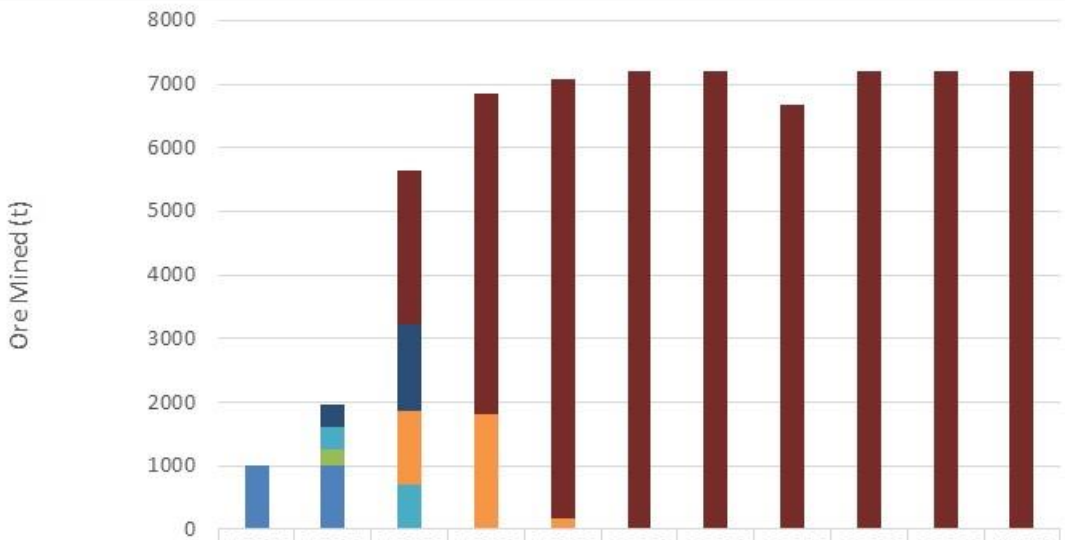
The key risk is the rainy season from (October to May) and the monthly production plan has been adjusted accordingly by Rainbow.

Figure 15-5
Gakara Ore Tonnes Mined and Waste to Ore Strip Ratio

	F2018	F2019	F2020	F2021	F2022	F2023	F2024	F2025	F2026	F2027	F2028
Plan - Sum of Ore mined		700	5650	6850	7075	7200	7200	6675	7200	7200	7200
Actual - Sum of Ore mined	1017	1267									
Actual - Strip ratio	223	200									
Plan - Strip ratio		268	235	250	250	250	250	250	250	250	250

It needs to be noted that all the charts are based on the Rainbow Financial year (July – June).

Figure 15-6
Gakara Ore Tonnes Mined and Planned by Area



	F2018	F2019	F2020	F2021	F2022	F2023	F2024	F2025	F2026	F2027	F2028
Plan - Other			2424	5050	6900	7200	7200	6675	7200	7200	7200
Plan - Murambi		350	1351	0	0	0	0				
Plan - Gomvyi			1175	1800	175						
Plan - Gasagwe		350	700								
Actual - Other											
Actual - Murambi		257									
Actual - Gomvyi											
Actual - Gasagwe	1017	1010									

15.6 Equipment Selection

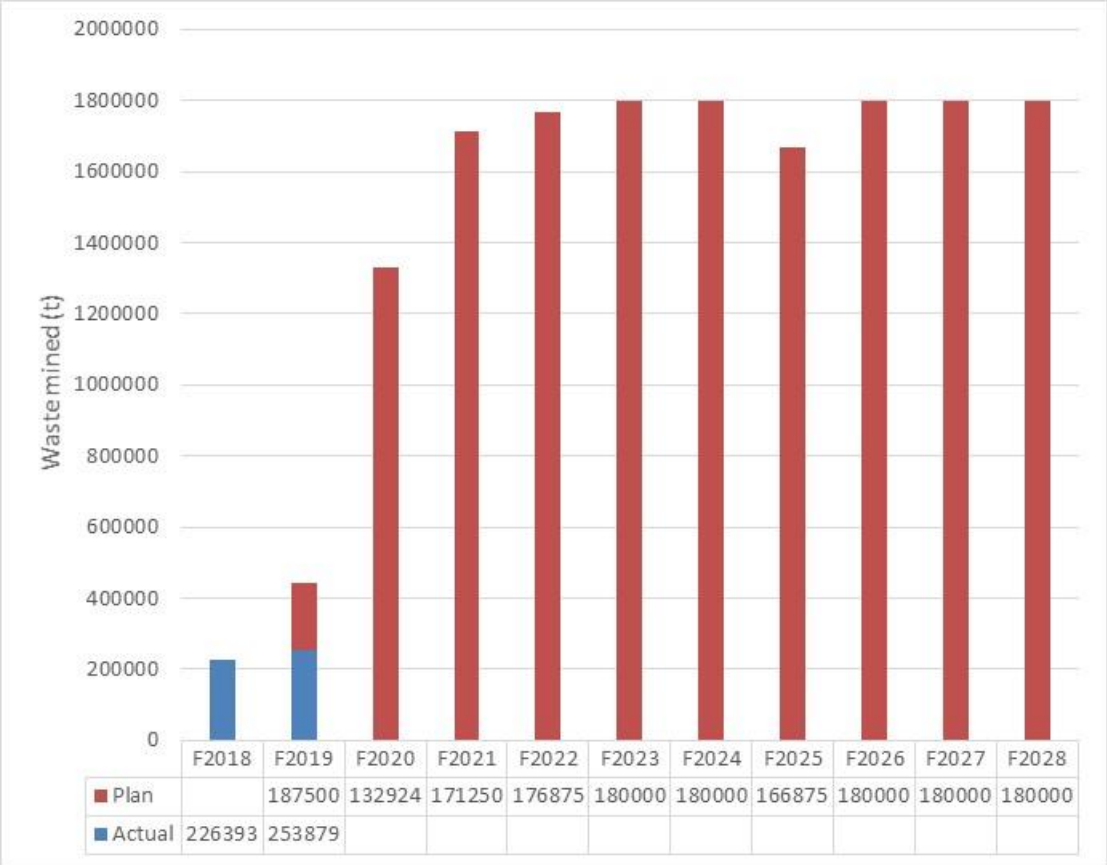
The establishment of good roads is critical for the safe transportation of mineralised material and haulage routes for the tipping of waste. The key driver of production for this mining method is dependent on the mechanised equipment to remove the waste. The capital purchase of additional mining equipment has been factored into the production plan to cater for the production from four mine sites. The planned mining fleet to meet the additional production requirements is shown in Table 15-1. Additional ancillary equipment includes a CAT D7 dozer, Grader and 14 Light Duty Vehicles (LDVs).

Table 15-1
Planned Mining Fleet

Equipment Type	Equipment Specification	Item
20t Excavator	JCB Excavator JS205	4
8t Backhoe Loader	JCB 3DX TLB	4
20t Tipper Truck	Bieben BG80 6x4	10
	TOTAL	18

Source: *Rainbow, 2019*

Figure 15-7
Rainbow Waste Tonnes Planned



15.6.1 Drilling and blasting

No drilling and blasting activities have taken place at the Gasagwe and Murambi South operations, as mining takes place from outcrops at surface in weathered saprolitic material to approximately 20 m (40m at Gasagwe, Gakara, Rusutama) below surface. An assumption has been made that all material to be mined can be mechanically or manually broken and excavated. This 'free dig' situation has been assumed for the full Rainbow production plan.

15.6.2 Load and Haul

The establishment of good roads is critical for the safe transportation of mineralised material, and haulage routes for the tipping of waste to the waste storage facility located down-dip of the mineralised zones.

The loading of mineralised and waste material is currently conducted by a combination of manual hand shovel loading and mechanised loading. The production plan includes the purchase of additional excavators and tipper trucks to mine four separate locations. Waste material will be broken and loaded using a 20 tonne JCB mechanised tracked excavator (JCB JS205) (Figure 15-8). A more versatile 8 tonne Backhoe loader (JCB 3DX), which combines the benefits of loading shovel and excavator (Figure 15-9), will be used for waste loading and exploration digging. MSA considers Articulated Dump Trucks (ADTs) to be most fit for purpose for open pit mining and removal of the

waste for this type of environment as they will cope best in the rainy season. The disadvantage of the ADTs is a higher capital and operating cost. A decision was made by Rainbow to use the Bieben 6x4 Tipper Trucks which are cheap to run and easy to maintain (Figure 15-10).

Mineralised material will be excavated using hand picks, hoes, and shovels and then loaded either by shovel into the trailer and transported to the beneficiation plant.

Figure 15-8
Tracked JCB Excavator – JS205

Source: *JCB (2019)*

Figure 15-9
JCB Backhoe and Shovel Excavator

Source: *JCB (2019)*

Figure 15-10
Bieben BG80 6x4 Tipper Truck

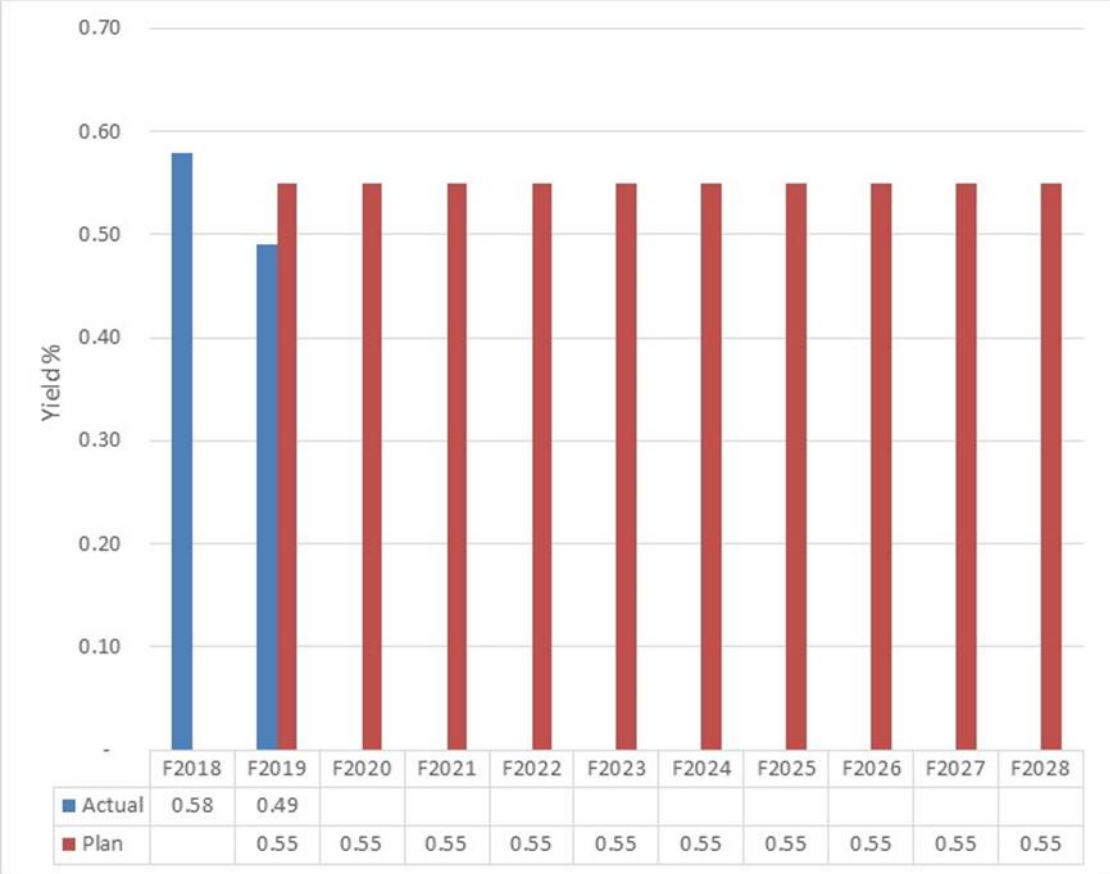
Source: *Bieben (2019)*

16 RECOVERY METHODS

The original plant was prefabricated to produce minus 2 mm product size. The product size was then adjusted to minus 1 mm based on revised client offtake specifications. A small crusher has been installed post the plant installation after the dry circuiting combined with a basic dust extraction system. Rainbow has already researched and costed options for dust extraction options. MSA recommends that the process flow sheet and design be reviewed and optimised to capture the dust and improve the overall plant efficiency.

The historical weighted yield to date from the processing plant, which is calculated by dividing the concentrate produced by the run of mine material processed, is 53%. The yield used by Rainbow in the production plan is 55% (Figure 16-1). An assumption has been made that the increased production and continuous running of the plant will improve the plant performance and yield. MSA view this as a risk and recommend that Rainbow do continuous monitoring and data analysis of the plant performance to different mine sites and combine with initiatives to ensure continuous improvement.

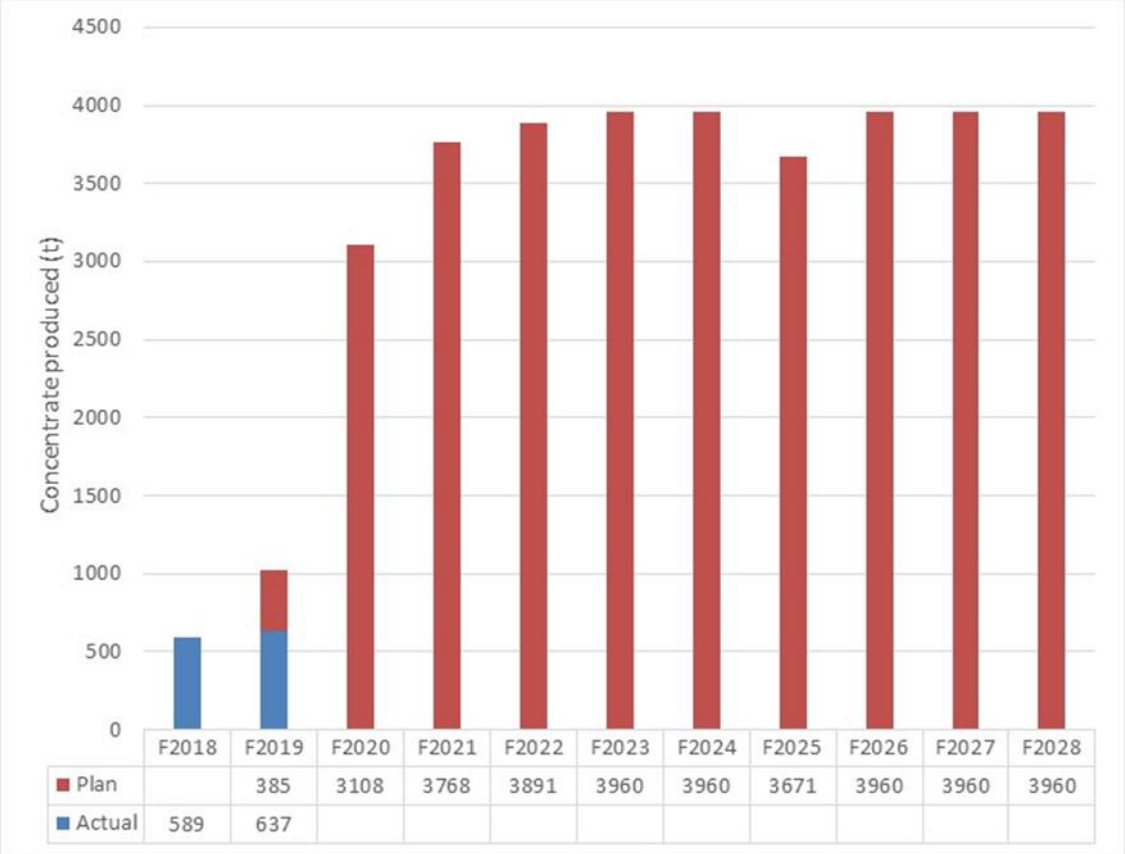
Figure 16-1
Rainbow processing yield planned



Source: *Rainbow, 2018*

The processing plant is currently underutilised and is not considered a constraint to the production plan. The mining production plan described in Section 15.5 translates to an annual production of around 4,000 tonnes of concentrate sold (Figure 16-2).

Figure 16-2
Rainbow concentrate tonnes planned



Source: *Rainbow, 2018*

17 PROJECT INFRASTRUCTURE

Rainbow has been mining the Gakara REE deposit since mid-2017. During this period, it has constructed the actual mine at the Gasagwe site (with the acquisition and renting of all the earthmoving equipment, building of infrastructure support required, construction and management of waste dumps, and compensation of local inhabitants for expropriation).

The main project infrastructure and property is the processing plant and office. Access to the Property from Bujumbura is by tarred road via the N3 in a southerly direction along the eastern coastline of Lake Tanganyika. The tarred road then connects via an all-weather dirt road to the local administrative centre of Mutambu, located in the central part of the Mining Licence, where Rainbow has established an operation base camp within the Gasenyi Catholic Mission premises, with safe accommodation, storage facilities, water, electricity and communication. The total distance by road from Bujumbura to Mutambu is approximately 40 km and takes about 90 minutes in a 4x4 vehicle.

The Project area is served by variably maintained dirt roads, which, due to the rugged terrain, become difficult to negotiate during the rainy season(s). The dirt roads or tracks usually follow local watersheds, with access to valley bottoms and/or primary and secondary drainages via local footpaths that are extensively developed throughout the Project area.

Each mine site requires a waste dump, the construction of access roads, the establishment of mining infrastructure. A workshop is required to service mining equipment and mine vehicles. The production plan is relying on the purchased mining equipment doing between 25,000 to 30,000 operating hours so planned maintenance is important to ensure the future availability of the equipment.

18 MARKET STUDIES AND CONTRACTS

Very little has changed regarding the fundamentals of the rare earth market in the past year. World demand continues to increase, particularly due to increased production of electric vehicles which require rare earth magnets. There is minimal new supply entering the market in the short term, with a large number of potential mines around the world still seeking financing (which may require a significant increase in rare earth prices), which must then be followed by construction. As an existing producer of material with rapidly increasing production levels planned in the near term, Rainbow is well positioned to benefit from any short term tightening of global supply.

Rare earth production and processing is still dominated by China, although a number of forecasts are now suggesting that China will be a net importer of rare earths material within five to seven years. Rainbow's location outside of China may also be strategically beneficial to rare earth consumers looking for alternative sources of supply, particularly if the global market in the coming years is affected by some of the trade tariffs and restrictions recently announced by the United States and China. It continues to be a part of Rainbow's core strategy to investigate the options for processing its own concentrate into higher value downstream products and the TechMet co-operation agreement announced in August 2018 will help to accelerate this objective.

19 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

The Environmental and Social aspects of the Gakara mining Project are ruled by the following Burundian laws and regulations:

- The Environmental Code of Burundi, Law No. 1/010 (dated June 2000).
- The Decree N°100/22 of 7 October 2010 pertaining to the application of the Environmental Code regarding the process to establish environmental impact studies.
- The national strategy on the environment in Burundi (2002).
- The scope of environmental and social impact assessments.
- The Mining Code of Burundi (Law No. 1/21 of October 2003) and its Regulations in respect of matters related to environment.

Rainbow submitted Environmental and Social Impact Studies ("ESIS") to the Ministry of Environmental Affairs for all its operations, namely:

- An ESIS in respect of the exploration activities in the EL and ML.
- An ESIS in respect of the development of the Gasagwe Mine site.
- An ESIS in respect of the construction of the Kabezi processing plant.
- Recently, an ESIS in respect of the development of the Murambi South Mine site.

The ESIS were compiled by BEE ("Bureau pour les Evaluations Environnementales") and/or by EGEE ("Evaluation Environnementale, Géologie, Energie et Eau"), two independent Burundian certified environmental firms. The ESIS always comprise of two statutory documents (in accordance with the Burundi Environment Code and Decree No.100/22 and its application decree):

- An environmental and social impact assessment (ESIA) *sensu strictu*.
- A social impact management plan ("Plan d'Action de Réinstallation" or "PAR").

The PAR's were completed as social and community development plans on issues such as the legal and fair compensation for the loss of goods and assets caused by the mining expropriation, as well as the economic assistance for the displacement and the improvement of social conditions of the affected local parties. The structure of the PAR includes:

- An assessment of the socio-economic condition of the area affected by mining.
- A plan to minimise expropriation, when unavoidable.
- The identification of affected parties and persons.
- An estimate of the potential losses and of the potential compensations.
- The public participation and communication strategy.
- The implementation plan of the PAR.
- The legal procedures for litigations and objections.

Rainbow has obtained the following compliance certificates from the Ministry of Environment:

- Certificate No. 007/2015 (4 March 2015) for Gasagwe Mine site.
- Certificate No. 010/2015 (30 March 2015) for the ML.
- Certificate No. 180/2017 (1 August 2017) for the Kabezi plant.
- Certificate No. 395/2018 (7 December 2018) for the mining of the Murambi South site.

The expropriation and compensation processes follow the statutory laws on these matters. A committee has been created that deals with such issues. The committee is made, besides members of Rainbow management, of the President of the Mutambu Communal Council, the Administrator of Mutambu, the Priest of the Gasenyi Catholic mission, a judge from the region and the Chiefs of the zones concerned by the mining activities. The compensation fees are calculated and paid out in strict accordance with the statutory laws on this matter.

In respect of the ESIS for the Gasagwe Mine, a large part of the mining area had already been expropriated by the Government of Burundi as "an area for public utilisation" being the area covered by the former SOBUMINES mine.

In respect of the ESIS for the Kabezi plant, special attention was given to the potential impact of such facility on the nearby Lake Tanganyika. This assessment, prepared by EGEE, was presented at a public meeting involving the Ministry of Mines and Energy and various interested parties (NGOs).

Finally, Rainbow reports annually their social and environmental impact studies, revised assessments, in their statutory reports to the Ministry of Mines and Energy, as per requirements of articles 205 and 206 of the Burundi Mining Regulations.

MSA is not aware of any additional permit requirements in order for Rainbow to continue the planned exploration and mining activities on the Gakara ML.

19.1 Uranium and Thorium

All historical reports by SOBUMINES and BGR as well as Mariano (2011) state that the Gakara REE vein mineralisation is characterised by relatively low concentrations in the radioactive elements Thorium (Th) and Uranium (U).

The geochemical analyses completed by Rainbow in 2013 on the 150 sample rock grab samples confirm that the levels of Th and U are generally low with some, sporadic exceptions, and show an average of 0.01% for U and 0.07% for Th.

Given the U and Th concentrations observed in the initial testing of the Rainbow veins, it is unlikely that the concentrate produced from the Rainbow veins would exceed this exemption level even under conservative interpretations. A five-fold increase in the U and Th concentrations would be needed to approach the exemption level. As such, there are no special requirements for the shipment of the product with respect to its radioactivity. The concentrate may be simply packaged and manifested in whatever manner is required for the chemical composition of the product.

20 CAPITAL AND OPERATING COSTS

20.1 Capital Costs

The total capital budget, including Stay in Business capital, for the 10-year production plan is shown in Table 20-1. The main capital items are to purchase and sustain the mining fleet and future exploration costs. These are critical components to the achievability and sustainability of the production plan. The other capital items are the compensation for the local villagers to enable access to mining exploration sites and construction of access roads.

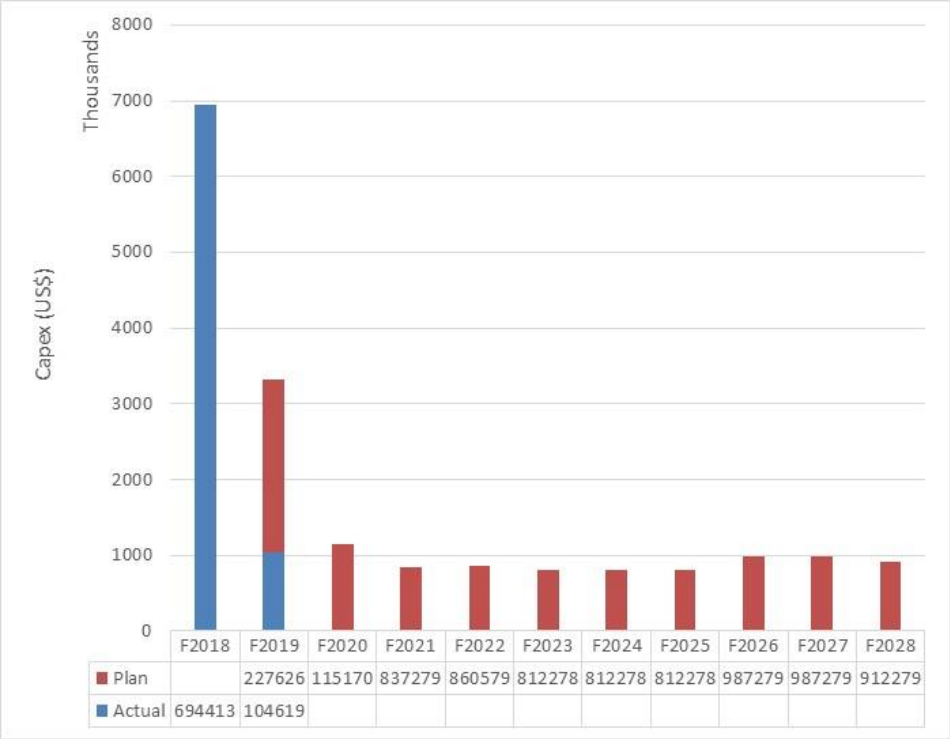
Table 20-1
Capital Budget Production Plan

Item	US$
Mining Fleet	1,660,000
Mining Fleet Sustaining Capex/ Spares	1,779,999
Site and infrastructure	34,949
Land and compensation	1,791,987
Roads	883,445
Consultants - Survey	1,323,220
Exploration Costs	2,597,895
TOTAL	**10,071,494**

Source: *Rainbow, 2019*

The historical capital expenditure in 2017 includes the purchase of the processing plant and initial mining equipment (Figure 20-1). It is noted that all the charts are based on the Rainbow Financial year (July – June) and due to timing the bulk of the capex currently reflected in F2019 for the purchase of the mining fleet is likely to fall into the F2020 budget.

Figure 20-1
Historical and Planned Capital Expenditure



Source: *Rainbow, 2019*

20.2 Operating Costs

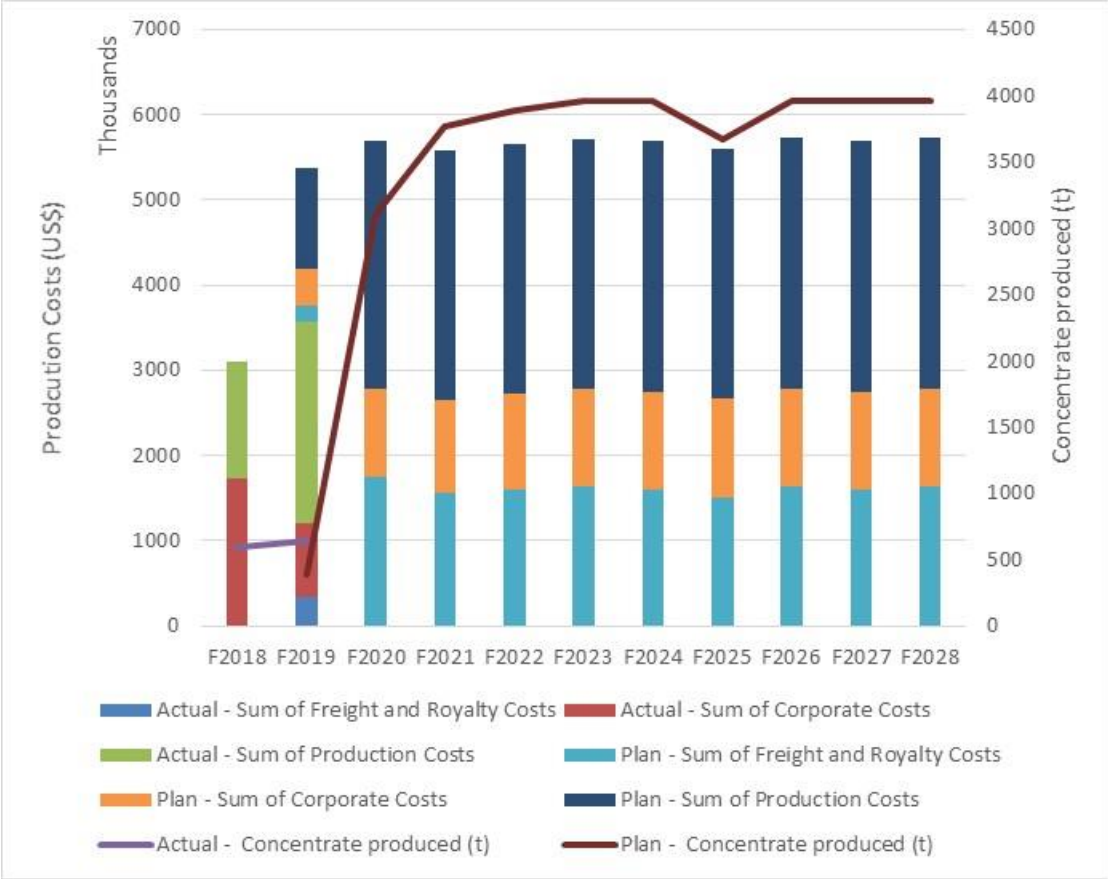
The operating costs for the Rainbow Production Plan are broken up into Corporate, Production, and Freight and Royalty Costs as shown in Table 20-2. Figure 20-2 highlights the relationship between historical and planned production and costs. It is noted by MSA that the long-term operating costs are predominantly fixed and aligned with the F2019 budget. The inference is that the operating costs are unaffected by the increased production. The historical average unit operating costs is US$ 5441/ tonne of concentrate compared to US$ 1527/ tonne in the plan. This translates to a considerable increase in operational efficiency which is primarily driven by the increased production.

Table 20-2
Operating Cost Breakdown

Item	US$	US$/ t Concentrate
Production Costs	27,575,094	796
Freight and Royalty Costs	14,693,840	424
Corporate Costs	10,582,997	306
TOTAL	**52,851,931**	**1,527**

Source: *Rainbow, 2019*

Figure 20-2
Historical and Planned Operating Costs



Source: *Rainbow, 2019*

20.2.1 Production Costs

The production costs are broken up into the following categories:

- Plant Costs
- Mining Costs
- Local Admin Costs

A breakdown of the production costs is shown in Table 20-3.

Table 20-3
Production Cost Breakdown

Item	US$	US$/ t ROM Processed
Plants Costs,	6,226,648	99
Mining Costs	10,516,076	167
Local Admin Costs	10,832,372	172
TOTAL	**27,575,094**	**438**

Source: *Rainbow, 2019*

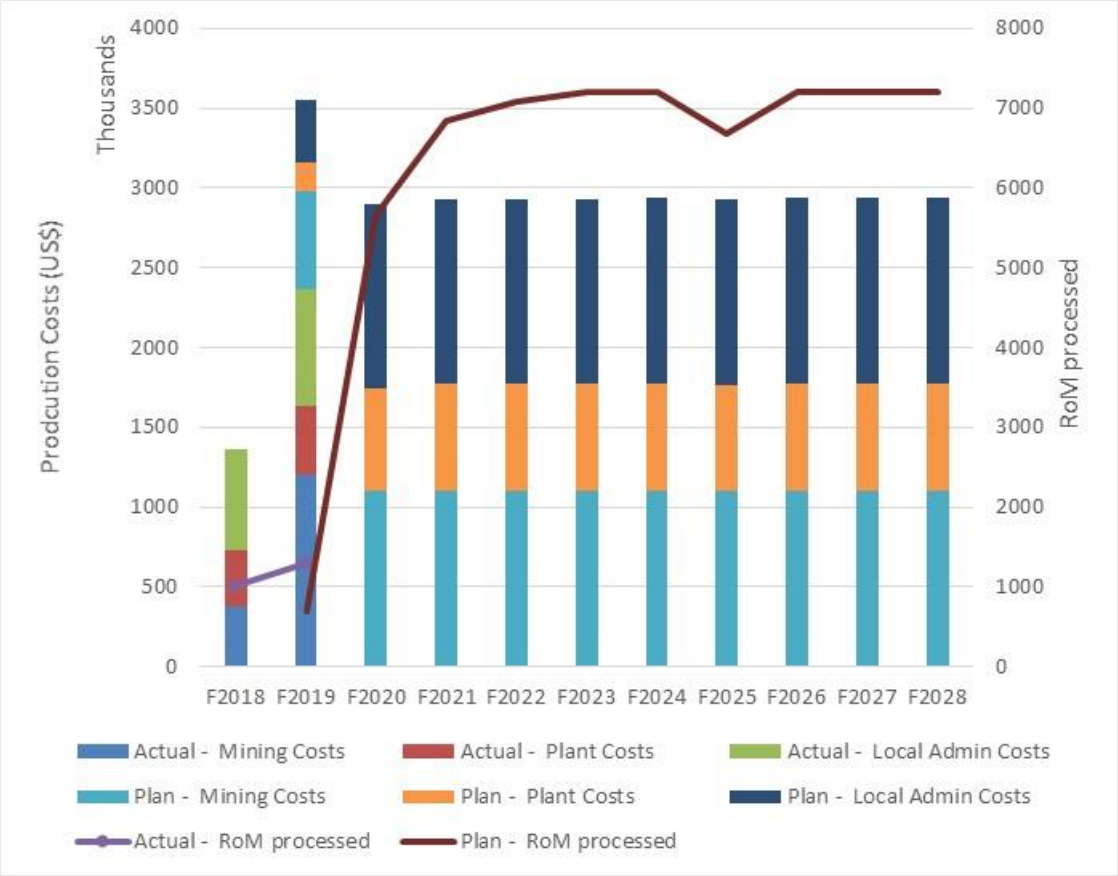
A breakdown of the Historical and Production Costs for the Rainbow production plan is shown in Figure 20-3. The historical average unit production costs is US$ 1,613/ tonne of ROM processed compared to US$ 438/ tonne in the plan.

The long-term plant costs are predominantly fixed. An increase in fuel costs to run the power diesel generator has been factored in to supplement the monthly fluctuations in production. The plant maintenance costs are assumed to be minimal by Rainbow. This would need to be monitored once the plant utilisation has increased based on increased production from mining.

The curtailing of the current mining fleet rental agreement and purchase of the new mining fleet in 2019 will bring about a reduction in mining fleet costs despite an increase in fuel costs. An assumption has been made that the current manual labour is sufficient to manage the increase in production. The operating environment for the mining equipment is harsh and remote requiring continuous road building and maintenance management systems. The MSA view is that establishment of a "fit for purpose" onsite workshop is important to ensure the mechanical availability of mining equipment. If this is not established and proper planned maintenance done the likelihood is that waste tonnes will be affected translating to a loss of production. The life of the equipment would also be affected. The mine operates in daylight hours only, so there is potential to do equipment maintenance after hours between production shifts. It needs to be noted that the mining equipment spares is part of the capital budget.

The long-term local admin costs remain fixed through the production plan.

Figure 20-3
Historical and Planned Production Costs



Source: *Rainbow,2018*

20.2.2 Freight and Royalty Costs

The rare earth concentrate is initially trucked to port on the East African coast by Rainbow. The Freight costs from port go through Thyssenkrupp Materials Trading (TK), under the terms of the company's offtake agreement, and are delivered to two cornerstone customers. Rainbow pay an additional fee to TK for this service.

Royalty payments relate to the government royalty of 4% charged on the value of exports.

20.2.3 Corporate Costs

The corporate costs are planned to decrease in the 2019 budget and are basically fixed throughout the production plan as shown in Figure 20-2.

Rainbow has a significant corporate presence in Burundi in order to meet all of its legal and social obligations. Rainbow ensures that the workforce is sourced locally, or, wherever possible, uses Burundian contracting companies for elements of construction and material transportation.

21 ECONOMIC ANALYSIS

The Rainbow Economic Analysis is based on the assumptions shown in Table 21-1. Rainbow produces rare earth mineral concentrate which is sold to TK on market price less a deduction and a discount (negotiated by TK with each end customer). Rare earth prices have been volatile in the past and the current price discount used in the economic model is 71.5%. In reality, this may vary depending on the TK negotiations with new customers or as terms are renegotiated with existing customers.

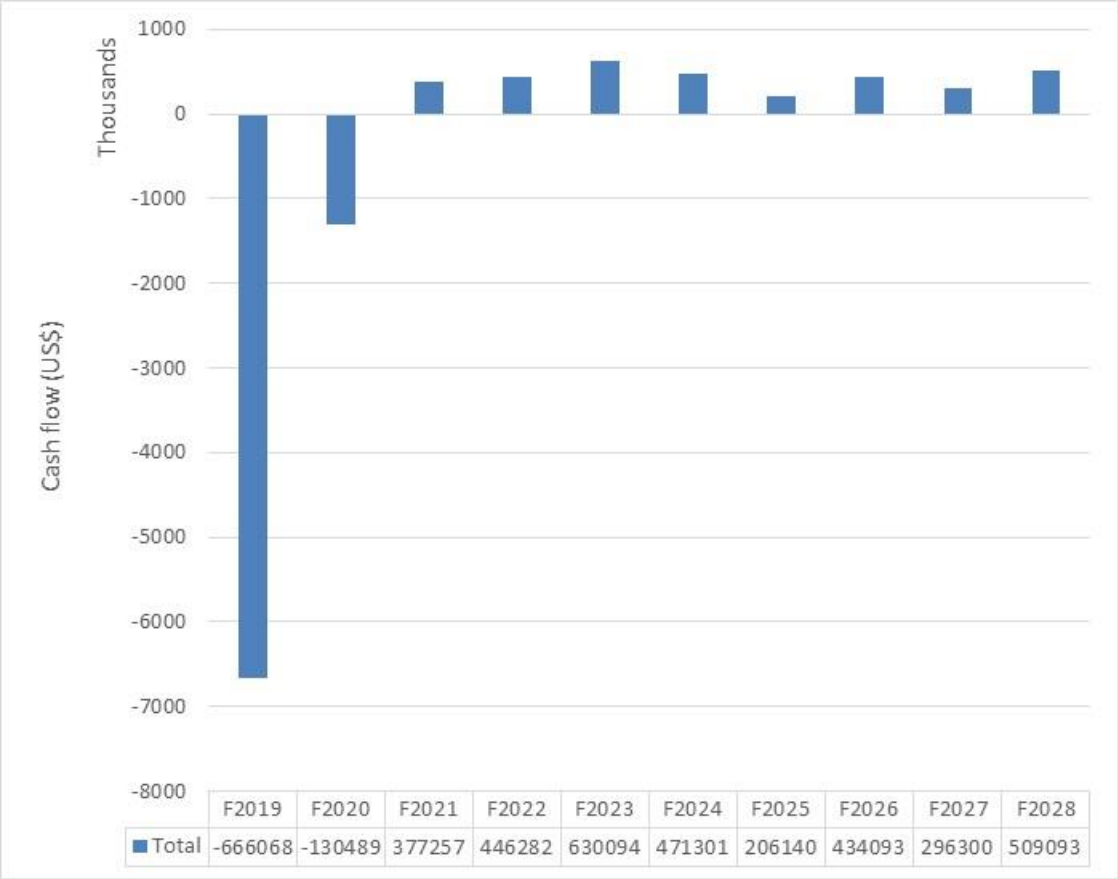
Table 21-1
Rainbow Economic Assumptions

Activity	Unit	
Forex Rate: USD/BIF		1,813
Forex Rate: USD/GBP		1.4
Basket price	US$ per tonne	11,000
Price Discount	% of Basket Price	71.5%
Concentrate Grade	%	57.0
Concentrate Price	US$ per tonne	3,135
Freight Costs (TK)	US$ per tonne	100
TK Fee	% of Revenue	3.5

Source: *Rainbow, 2019*

The resultant pre-tax cashflow is shown in Figure 21-1 which highlights profits from F2021.

Figure 21-1
Rainbow Planned Cash Flow



Source: *Rainbow, 2018*

22 INTERPRETATION AND CONCLUSIONS

Rainbow has continued to develop its understanding of the Gakara REE deposits through exposing the veins, measuring their thicknesses and carrying out initial mining. As a result, an updated Exploration Target has been estimated using methodologies suitable for the resolution of data available. In addition, an Exploration Target has been defined at Kiyenzi that offers the opportunity for larger scale, lower grade mining than at the narrow vein deposits.

The economic analysis of the Rainbow Project highlights the financial sensitivity of the Project based on current planning and economic assumptions.

It is MSA's opinion that the Rainbow production plan is dependent on the exploration team to ensure the availability of sufficient production sites for mining, as well as the ability of the mining team to remove waste to ensure continuous delivery of feed to the plant.

The equipment selection and availability will need to be monitored to ensure that the waste plan is achieved particularly during the rainy season.

Various processing and mining initiatives are under investigation by Rainbow to improve the economic potential of the Project:

- Investigation of underground mining potential as a trade off to the high waste to ore stripping ratio in the open pit.
- Improved processing recovery yield.
- Mining and processing the lower grade deposits (Kiyenzi).
- Improved product beneficiation and pricing.

23 RECOMMENDATIONS

It is recommended that Rainbow collect enough reliable data in order to be able to report Mineral Resources for the mining and near mining areas in accordance with the 2012 Edition of the JORC Code.

MSA notes that Rainbow reported a Mineral Resource for Gakara on 17 December 2018. In the CP's opinion, the sampling quality at Gasagwe and Murambi South is acceptable and there is sufficient data in order to understand vein continuity and thickness variability. However, there is a lack of correctly prepared samples from the channel sampling and subsequent independent laboratory analysis. The Rainbow Mineral Resource estimate included Niton XRF analyses on unprepared samples, which correlate poorly with laboratory analyses. In addition, there is no three-dimensional model for the veins that can be depleted with a recent topographic surface. The Rainbow volumes were estimated based on the geological knowledge and experience of Rainbow's CP derived from actual mining over the past two years, but the models are not presented spatially.

MSA reviewed the Mineral Resource model constructed for Kiyenzi and is of the opinion that it is not reliable enough to report a Mineral Resource from, as it is not based on the current geological understanding of a breccia pipe and has not taken into account the selective sampling conducted by Rainbow.

MSA recommends the following approach in order to prepare reliable geological and grade models from which Mineral Resource estimates can be confidently reported:

- For the narrow vein type deposits:
  - Continue to expose veins, accurately determine their location and measure their thickness at regular intervals. This is an ongoing process used to guide mining, reconciliation and the potential of prospects highlighted for near term mining.
  - Channel sample the exposed veins at regular intervals and send the samples to an accredited independent laboratory for preparation and analysis together with QAQC samples.
  - Model the veins and deplete with a recent topographic surface.
- For the Kiyenzi Breccia Pipe
  - Sample all the Kiyenzi core in a non-selective manner (i.e. as continuous intervals). Currently the sampling is selective and has targeted the visible higher grade zones. The complete data set will allow for better understanding of grade trends that can be used to understand the full economic potential of the Kiyenzi deposit.
  - Continue to explore the Kiyenzi deposit by additional diamond drilling in order to be able to build a more reliable geological and grade model. This may result in better definition of high-grade zones that may allow for selective mining. Stockwork type mineralisation in breccias is highly variable and requires close spaced drilling to understand confidence limits.
  - Carry out processing test-work to ensure that the current processing facilities are suitable for the mineralisation at Kiyenzi.

It is also recommended that continuous channel samples are taken between the exposed veins in order to understand if opportunities for lower grade mineralisation exist between the veins.

MSA endorses Rainbow's high-level production plan on the assumption that the risk areas mentioned in this report are addressed. It is important that mining and processing initiatives that are under investigation by Rainbow are fast tracked to offset the risks in the current production plan.

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APPENDIX 1:

Glossary of Technical Terms and Abbreviations/Acronyms

Glossary of Technical Terms and Abbreviations/Acronyms

alkaline rocks	Rocks containing an excess of sodium and or potassium.
ALS	ALS Minerals, an independent laboratory (South Africa – SA; Canada - V)
Archaean	The oldest rocks of the Precambrian era, older than about 2,500 million years
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe
basement	The igneous and metamorphic crust of the earth, underlying sedimentary deposits
brecciated	Condition applied to an intensely fractured body of rock
Cambrian	The oldest of the systems into which the Palaeozoic stratified rocks are divided, 545 to 490 million years ago
Capex	Capital Expenditure
carbonate	A rock, usually of sedimentary origin, composed primarily of calcium, magnesium or iron and CO_3.Essential component of limestones and marbles
carbonatite	An alkaline, carbonate-rich magmatic rock
cm	centimetres
Company	Rainbow Rare Earths Limited
CP	Competent Person
CPR	Competent Persons Technical Report
CRM	Certified Reference Material
DD	Diamond Drilling (also referred to as core drilling)
DEM	Digital Elevation Model
DGPS	Differential Global Position System
diatreme	A volcanic vent or pipe created by gaseous magma sourced from the mantle
dyke	A tabular body of intrusive igneous rock, crosscutting the host strata at an oblique angle
ECSA	Engineering Council of South Africa
ED	Eastern Domain
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Study
EL	Exploration Licence
g	grammes
GGS	Ground Gravity Survey(s)
gneiss	A coarse-grained, banded, high grade metamorphic rock
GPS	Global Position System
granitoid	A generic term for coarse grained felsic igneous rocks, including granite
gravity survey	Recording the specific gravity of rock masses in order to determine their distribution
ICP-AES	Inductively coupled plasma atomic emission spectroscopy
ICP-MS	Inductively coupled plasma mass spectrometry

JORC Code	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012)
KAB	Karagwe-Ankole Belt
KB	Kibaran Belt
kg	kilogrammes
km	kilometres
m	metres
Ma	Million years
mafic	Descriptive of rocks composed dominantly of magnesium and iron rock-forming silicates
mamsl	metres above mean sea level
mantle	The layer of the earth between the crust and the core.The upper mantle, which lies between depths of 50 km and 650 km beneath continents, is the principal region where diamonds are created and stored in the earth
Mesoproterozoic	Middle Proterozoic era of geological time, 1,600 to 1,000 million years ago
metamorphism	Alteration of rock and changes in mineral composition, most generally due to increase in pressure and/or temperature.
ML	Mining Licence
mm	millimetre
MPa	Megapascal
MSA	The MSA Group (Pty) Ltd
MW	Megawatt
Neoproterozoic	Late Proterozoic era of geological time, 1,000 to 545 million years ago
NRG	New Resolution Airborne Geophysics (Pty) Ltd
Opex	Operating Expenditure
P-T	Pressure-Temperature
Palaeozoic	An era of geological time between the Late Precambrian and the Mesozoic era, 545 to 251 million years ago
Precambrian	Pertaining to all rocks formed before Cambrian time (older than 545 million years)
Project	Gakara REE Project
Property	Mining Licence
Proterozoic	An era of geological time spanning the period from 2,500 to 545 million years before present
QAQC	Quality Assurance Quality Control
Rainbow	Rainbow Rare Earths Limited
REE	Rare Earth Elements
Report	Competent Persons Technical Report
RIR	Rainbow International Resources Limited
RMB	Rainbow Mining Burundi Société Mixte
ROM	Run of Mine

RQD	Rock-quality designation
SACNASP	South African Council for Natural Scientific Professions
SAIMM	South African Institute of Mining and Metallurgy
SG	Specific Gravity (or density)
SOMUKI	Société Minière de Muhinga et de Kigali
SOP	Standard Operating Procedure
Std. Dev.	Standard Deviation
t	tonnes
tectonic	Pertaining to the forces involved in, or the resulting structures of, movement in the earth's crust
TREE	Total Rare Earth Elements
TREO	Total Rare Earth Oxides
ultramafic	Igneous rocks consisting essentially of ferromagnesian minerals with trace quartz and feldspar
UNDP	United Nations Development Programme
US$	United States of America Dollar
UTM	Universal Transverse Mercator (datum/projection)
WD	Western Domain
XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence

APPENDIX 2:

Drillhole collars and depths of holes

Drillhole collars and depths

BHID	EASTING	NORTHING	RL (m)	EOH (m)	AZIMUTH	DIP
GAK_DD_004	768289	9610419	1683	92.8	0	-90
GAK_DD_005	768288	9610420	1683	52	160	-60
GAK_DD_006	768280	9610434	1686	149.8	0	-90
GAK_DD_007	768280	9610434	1686	70	70	-60
GAK_DD_008	768238	9610442	1683	50	0	-90
GAK_DD_009	768311	9610388	1667	50	0	-90
GAK_DD_010	768308	9610408	1675	50	330	-50
GAK_DD_011	768308	9610408	1675	46	150	-50
GAK_DD_012	768311	9610442	1680	40	330	-50
GAK_DD_013	768311	9610442	1680	37	150	-50
GAK_DD_019	768324	9610420	1677	40	330	-50
GAK_DD_020	768324	9610420	1677	37	150	-50
GAK_DD_021	768355	9610392	1652	31.1	150	-60
GAK_DD_022	768347	9610433	1672	38.5	150	-50
GAK_DD_023	768346	9610435	1672	40	330	-50
GAK_DD_024	768361	9610443	1666	34	330	-50
GAK_DD_025	768337	9610458	1678	37	150	-50
GAK_DD_026	768336	9610460	1678	39	330	-50
GAK_DD_027	768357	9610512	1683	39.5	150	-60
GAK_DD_028	768345	9610481	1678	40	150	-60
GAK_DD_029	768320	9610423	1677	39	240	-50
GAK_DD_030	768308	9610412	1674	30	240	-50
GAK_DD_031	768310	9610414	1674	50	60	-50
GAK_DD_032	768322	9610424	1677	40.5	60	-50
GAK_DD_033	768344	9610433	1672	51	240	-50
GAK_DD_034	768346	9610434	1672	40	60	-50
GAK_DD_035	768335	9610459	1678	35.5	240	-50
GAK_DD_036	768317	9610448	1686	37.3	240	-60
GAK_DD_037	768340	9610410	1669	35.5	240	-50
GAK_DD_038	768364	9610427	1664	56	240	-50

Source: *Rainbow 2018: RL = relative level (m above main sea level)*