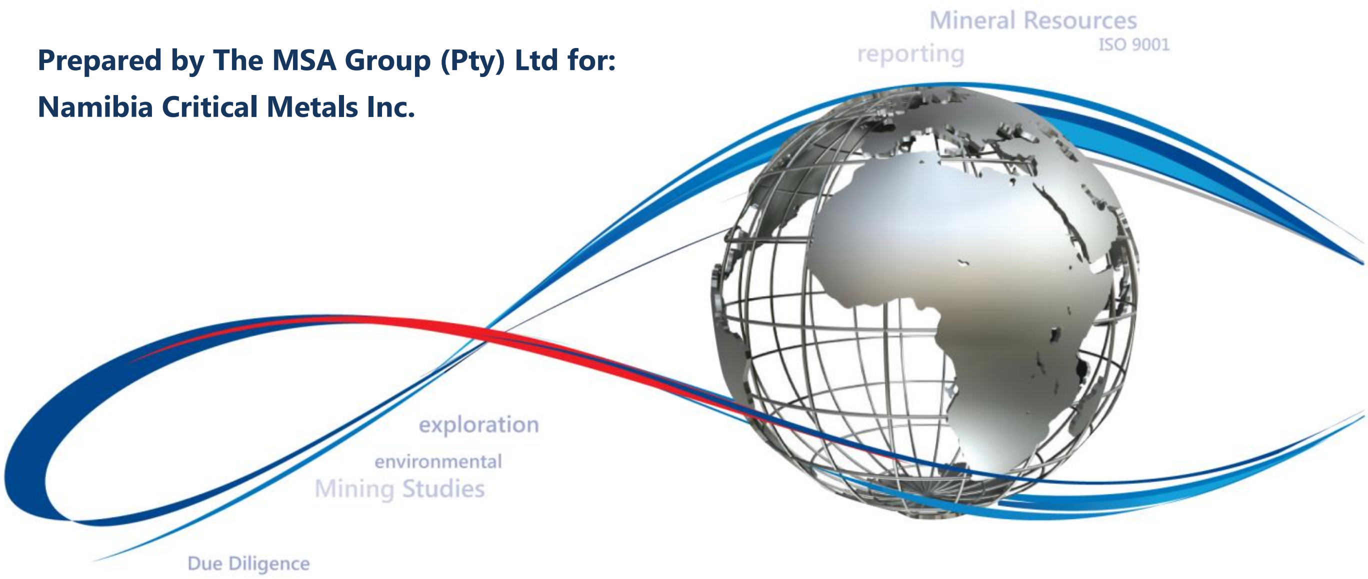
Specialist Consultants to the Mining Industry

Namibia Critical Metals Inc.
Lofdal Heavy Rare Earths Project
Namibia

NI 43-101 Technical Report – 05 April 2024 Mineral Resource Estimate

Prepared by The MSA Group (Pty) Ltd for:
Namibia Critical Metals Inc.



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IMPORTANT NOTICE

This report was prepared as a National Instrument NI 43-101 Technical Report for Namibia Critical Metals Inc. (NMI) by The MSA Group (Pty) Ltd (MSA), South Africa. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in MSA's services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This report is intended for use by NMI subject to the terms and conditions of its contract with MSA. Except for the purposes legislated under Canadian provincial securities law, any other uses of this report by any third party is at that party's sole risk.

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CERTIFICATE OF QUALIFIED PERSON

I, Jeremy Charles Witley do hereby certify that:

1. I am a Principal Mineral Resource Consultant of:
   The MSA Group (Pty) Ltd
   Henley House, Greenacres Office Park,
   Victory Park, Randburg, 2195
   South Africa.
2. This certificate applies to the technical report titled "Namibia Critical Metals Inc., Lofdal Heavy Rare Earths Project, Namibia, NI 43-101 Technical Report – 05 April 2024 Mineral Resource Estimate", that has an effective date of 05 April 2024 and a report date of 21 May 2024 (the Technical Report).
3. I graduated with a BSc (Hons) degree in Mining Geology from the University of Leicester in 1988. In addition, I obtained a Master of Science degree in Engineering from the University of Witwatersrand in 2015.
4. I am a registered Professional Natural Scientist (Geological Science) with the South African Council for Natural Scientific Professions (SACNASP) and a Fellow of the Geological Society of South Africa.
5. I have worked as a geologist for a total of 35 years. I have worked in a number of roles, including senior management, in mine geology, exploration projects and Mineral Resource management. I have conducted Mineral Resource estimates, audits and reviews for a wide range of commodities and styles of mineralization including complex mixed distribution multi element deposits. Specific REE experience includes deposits in Burundi, Mauritania, South Africa, Namibia and Malawi, as well as the Lofdal deposit in Namibia.
6. I have read the definition of "Qualified Person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "Qualified Person" for the purposes of NI 43-101.
7. I visited the Lofdal Property for three days from 28 to 30 October 2020, for one day on 10 November 2022 and for two days from 21 to 22 November 2023.
8. I am responsible for the preparation of items 1.4, 3, 10 to 12 and 14 to 23, and co-responsible for the preparation of items 1.5, 2 and 24 to 27 of the Technical Report.
9. I have not had prior involvement with the property that is the subject of the Technical Report.
10. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
11. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.
12. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.
13. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 21st day of May 2024.
"signed and stamped" (Jeremy Charles Witley, Pr. Sci. Nat)

CERTIFICATE OF QUALIFIED PERSON

I, Scott Swinden, do hereby certify that:

1. I am a Principal Geoscience Consultant of:
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224 Main St
Wolfville, Nova Scotia
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Canada

2 This certificate applies to the technical report titled "Namibia Critical Metals Inc., Lofdal Heavy Rare Earths Project, Namibia, NI 43-101 Technical Report – 05 April 2024 Mineral Resource Estimate", that has an effective date of 05 April 2024 and a report date of 21 May 2024 (the Technical Report).

3 I graduated with a BSc (Hons) degree in Geology from Dalhousie University in 1970. In addition, I obtained a Master of Science degree in Geology from Memorial University of Newfoundland and Labrador in 1975 and Ph.D. in Earth Sciences from Memorial University of Newfoundland and Labrador in 1988.

4 I am a registered Professional Geologist (P. Geo.) with the Association of Professional Engineers and Geoscientists of Nova Scotia.

5 I have worked as a geologist for a total of 45 years, including exploration for base and precious metals and rare metals (including the rare earth elements), as a research scientist for provincial and federal geological surveys, and as manager and executive for provincial geological surveys. In the latter role, I was responsible for mineral resource programs (including programs focussed on Rare Earth Elements) throughout Newfoundland and Labrador from 1988 to 1996. From 2010 to the present, I have specialized in the study and exploration of Rare Earth Deposits. I explored for REE in various parts of Namibia. I was part of the discovery team at the Lofdal deposit and led the geological mapping and geological modelling of the deposit. I have worked at a number of other REE prospects including Swarboisdrift (Kunene aea), Epembe (Ta-Nb-REE in carbonatite), Marinkas Quellen). I have taught mineral deposits including the geology of Rare Earth Deposits to 4th year undergraduates at Dalhousie and Acadia Universities. I have recently served as a member of the Expert Council for the HiTech AlkCarb project, a European Union project investigating geomodels for REE deposits. I believe my experience in operating and managing REE exploration projects, studying REE deposits and teaching about REE deposits, make me a Qualified Person for a REE project.

6 I have read the definition of "Qualified Person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "Qualified Person" for the purposes of NI 43-101.

7 I visited the Lofdal Property for 14 days from 29 May to 11 June 2014, for 1 days on July 31, 2017, and for 1 day on April 25, 2018.

8 I am responsible for the preparation of items 4 to 9 and co-responsible for, the preparation of item 1, 2 and 24 to 27 of the Technical Report.

9 I have been involved with the property that is the subject of the Technical Report as a paid, independent geoscience consultant since July 2010. All prior involvement is with the current issuer at various stages of the project for which remuneration has been received as an independent consultant that is not contingent on the outcome of the study work and did not involve management of the project.

10 I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

11 I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

12 I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

13 I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 21st Day of May 2024.
"signed and stamped" (Scott Swinden, P. Geo.)

CERTIFICATE OF AUTHOR

I, Barbara Mulcahy, Pr.Eng., C.Eng, of Johannesburg, South Africa, do hereby certify:

1. I am an Independent Consulting Process Engineer with a business address at 2154 Voltaire Place, Dainfern Valley, 2191, South Africa.
2. This certificate applies to the Technical Report entitled "Namibia Critical Metals Inc., Lofdal Heavy Rare Earths Project, Namibia, NI 43-101 Technical Report – 05 April 2024 Mineral Resource Estimate" with an effective date of 05 April 2024 and a report date of 21 May 2024 (the Technical Report).
3. I am a graduate with B.Eng (Chemical Mineral Processing) in 1994 and GDE (Extractive Metallurgy) in 1996 from the University of Stellenbosch, South Africa. I am registered as a Professional Engineer with Engineering Council of South Africa (ECSA) member No 20010377 and as a Chartered Engineer with Engineers Ireland (EI) member No 500047. I have worked as a process engineer and consultant since 1997 at Mintek, Hatch and Metallicon Process Consulting before being independent.
4. I have read the definition of Qualified Person set out in the National Instrument 43-101 (Instrument) and certify that by reason of my education, affiliation with a professional association and past relevant work experiences, I fulfil the requirement to be an independent qualified person for the purposes of NI 43-101.
5. I visited the Lofdal Rare Earth's project site near Khorixas, Namibia on 27/28 October 2021.
6. I have participated in the preparation of this Technical Report and am responsible for item 13 and co-responsible for items 24 to 27.
7. I am independent of Namibia Critical Metal as defined by Section 1.5 of the Instrument.
8. I don't have any prior involvement with the property that is the subject of the technical report.
9. I have read National Instrument 43-101. The part of the Technical Report for which I am responsible has been prepared in compliance with this Instrument;
10. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Signed and dated this 21st day of May 2024 at Johannesburg, South Africa.

"Signed and stamped" Barbara Mulcahy Pr.Eng

Barbara Mulcahy, Pr.Eng., Consulting Process Engineer.

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1 SUMMARY

1.1 Property Description and Ownership

Namibia Critical Metals (NMI) is a Canadian company listed on the TSX Venture Exchange which holds a diversified portfolio of projects within the Republic of Namibia. The company was formally known as (Namibia Rare Earths Inc.). The subject of this technical report is the Lofdal Heavy Rare Earths Project (Lofdal) which is held in a Joint Venture Agreement with Japan Oil, Gas and Metals National Corporation (JOGMEC). The Company's registered corporate office is Suite 802, Sun Tower, 1550 Bedford Highway, Halifax, Nova Scotia, NS B4A 1E6 Canada.

The Lofdal property is located within the Mining License (ML) 200 that lies approximately 25 kilometres northwest of the town of Khorixas, approximately 330 kilometres northwest of the capital, Windhoek. The ML is held by Namibia Rare Earths (Pty) Ltd. (NRE (Pty)), a wholly owned subsidiary of Namibia Critical Metals Inc. (NMI). ML 200 was granted on 15 July 2021 and is valid until 10 May 2046. ML 200 is for mineral rights only while the surface rights are communally held.

1.2 Geology and Mineralization

The Lofdal property is underlain by Paleoproterozoic metamorphic rocks of the Huab Metamorphic Complex, which outcrop as an inlier of the Congo Craton surrounded by stratified rocks of the Damaran Orogen. The metamorphic basement was intruded at ca 750 Ma by alkaline silicate rocks and carbonatites of the Lofdal Carbonatite Complex. The complex comprises an early silicate intrusive assemblage of dominantly nepheline syenite, and a later carbonatite intrusive assemblage ranging from calcitic through dolomitic and ankeritic carbonatites.

The Lofdal Carbonatite Complex comprises a central intrusive core characterized by several plugs of nepheline syenite and carbonatite with associated diatreme breccias, surrounded by a wide area of dyke intrusion and associated hydrothermal alteration. The phonolite and carbonatite dykes have exploited pre-existing structures in the basement that were re-activated during Neoproterozoic tectonism.

Rare earth element mineralization in the Lofdal Carbonatite Complex is closely associated with the carbonatite dykes and related hydrothermal alteration. These occur within an area of more than 200 km^2. The lithogeochemical database demonstrates that many of the dykes are geochemically anomalous in REE (which includes yttrium as a heavy rare earth) with a significant number being of economic interest. Of particular significance is the frequent enrichment of heavy rare earths in the dykes and in structurally controlled hydrothermal alteration zones, which trend predominantly in NE - SW and NNE - SSW directions.

The rare earth elements (REE) are subdivided into heavy rare earth elements (HREE) and light rare earth elements (LREE). Lanthanum, cerium, praseodymium, neodymium, promethium, and samarium are the LREE. Yttrium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium are the HREE. Although yttrium is lighter than the light rare earth elements, it is included in the heavy rare earth group because of its chemical and physical associations with heavy rare earths in natural deposits.

The rare earth mineralization in the Lofdal Carbonatite Complex is variable and includes both LREE and HREE enriched varieties that appear to have been introduced in separate mineralizing events. Petrographic evidence suggests that the heavy rare earth-rich mineralization resulted from a dominantly hydrothermal event that occurred relatively late in the history of carbonatite emplacement. Mineralogically, the heavy rare earth-enriched mineralization is dominated by xenotime (Y-REE phosphate), which is commonly associated with zircon, rutile, apatite and/or thorite. The mineralized hydrothermal alteration systems are continuous both along strike and at depth and produce clear geological, geochemical and radiometric signatures that are easily recognized, particularly in drillhole core.

1.3 Exploration Status

Two areas have been evaluated by the recent drilling, these being known as Area 4 and Area 2B. The first Mineral Resource estimate in accordance with NI 43-101 was reported in 2012 for Area 4 based on geochemical analyses and density measurements of core samples obtained from 93 diamond drillholes completed by NMI in 2011 and 2012. An additional 17 diamond drillholes were drilled in 2012 and 2013 and a further 56 were drilled in 2020. In 2023, an in-fill RC drilling campaign was completed for Area 4 which added an additional 44 holes to the project resulting in an increase in confidence in the estimates and extension of the Mineral Resource at depth. For Area 2B, 17 diamond drillholes were drilled in 2010 and 2011 with an additional 29 drillholes completed in 2020. An additional 12 RC holes were drilled in 2023 which extended the Mineral Resource along strike in a northeasterly direction.

Drilling was orientated in a north to north-northwest direction with inclinations from 60° to 68° for Area 2B and from 55° to 71° for Area 4. Drillhole spacing for Area 4 is variable, with holes drilled in 2011 to 2012 positioned as close as 25 m apart. The 2020 campaign extended the Mineral Resource westwards with a 50 m spaced grid near surface, widening to 100 m down-dip. The 2023 RC campaign reduced this spacing, resulting in a staggered, 70 m spaced grid. At Area 2B, drillhole spacing is predominantly 50 m, widening to 100 m in the northeast strike extension. The RC drillholes were collared 100 m apart in the northeast part of the deposit with a single line of holes spaced 50 m apart in the southeast, which targeted the shallow, mineralised zones. Drilling has demonstrated that the mineralization continues down to a vertical depth of at least 380 m for Area 4 and 230 m for Area 2B.

1.4 Mineral Resource Estimate

Lofdal was visited by Jeremy Witley, who is a Principal Mineral Resource Consultant with MSA and the Qualified Person for this Mineral Resource Estimate, from 28 to 30 October 2020 on 10 November 2022 and from 21 to 22 November 2023. The occurrences and setting of the REE mineralization were observed in the field as well as the drilling in progress at the time. The mineralization was examined in a selection of drillhole cores from the 2020, 2022 and previous drilling programs. The QP was satisfied that the procedures and protocols used in drilling are consistent with CIM Exploration Best Practices Guidelines.

The assay results received from the primary laboratory (Actlabs in Ancaster, Ontario, Canada) were subjected to a quality assurance and quality control program and the assays have been confirmed by check assays completed by a second laboratory (ALS Minerals, North Vancouver, Canada). The drilling, logging, sampling and assay data are contained in a well organised drillhole database that the QP considers to be suitable for the purposes of mineral resource estimation.

The Mineral Resource Estimate was based on sample assays and density measurements obtained from the cores of diamond drillholes completed in three phases of drilling; 2011 to 2012; 2020 and the recent 2023 RC drilling campaign.

For the purposes of creating a framework for mineral resource estimation, fifteen mineralised zones were modelled for Area 4 and nine for Area 2B using a statistically defined cut-off of 10 ppm Dy_2O_3 for Area 4 and 12 ppm Dy_2O_3 for Area 2B. The resultant vein-like bodies within each deposit tend to be orientated parallel to one another, some of which coalesce in places at depth and along strike.

Ordinary kriging was used to estimate the individual rare earth element grades into a three dimensional block model. Density was estimated into the same block model using inverse distance weighting. The Mineral Resource for Area 4 extends up to 1,600 m along strike near surface and attains a maximum depth of approximately 400 m. For Area 2B, the Mineral Resource extends for 850 m near surface and attains a maximum depth of approximately 230 m.

The Mineral Resource Estimate was completed by Mr R. Goncalves (BSc Hons, MSc (Eng.)) under the supervision of Mr J.C. Witley (BSc Hons, MSc (Eng.)).

The Mineral Resource was estimated using The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Best Practice Guidelines (2019) and is reported in accordance with the 2014 CIM Definition Standards, which have been incorporated by reference into National Instrument 43-101 – Standards of Disclosure for Mineral Projects (NI 43-101). The Mineral Resource is classified into the Measured, Indicated and Inferred categories for Area 4 (Table 1-1) and into the Indicated and Inferred categories for Area 2B (Table 1-2).

The Mineral Resource is reported from a Whittle optimised pit shell at a base case total rare earth oxide (TREO) grade of 0.10%, which the QP considers will satisfy reasonable prospects for eventual economic extraction.

Table 1-1
Area 4, Measured, Indicated and Inferred Mineral Resource Estimates above 0.1% TREO cut-off grade – 05 April 2024

Category	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO (kt)
Measured	6.6	0.21	0.14	0.07	130	13.7
Indicated	49.2	0.15	0.07	0.08	69	75.7
Measured & Indicated	**55.8**	**0.16**	**0.08**	**0.08**	**76**	**89.4**
Inferred	10.5	0.14	0.06	0.08	58	15.0

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*

2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes.*

Table 1-2
Area 2B, Indicated and Inferred Mineral Resource Estimates above 0.1% TREO cut-off grade – 05 April 2024

Category	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO (kt)
Indicated	2.7	0.16	0.09	0.07	97	4.4
Inferred	4.4	0.15	0.07	0.08	75	6.6

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes.*

1.5 Conclusion and Recommendations

On behalf of NMI, MSA has completed a Mineral Resource Estimate for Area 4 and Area 2B of the Lofdal Heavy Rare Earths Project. The Area 4 Mineral Resources have increased from the previous estimate of 12 May 2021, due to the additional drilling, which has expanded the Indicated and Inferred Mineral Resources, along with changes in the economic input parameters used to define the optimised pit-shell for determining Reasonable Prospects for Eventual Economic Extraction (RPEEE). The Area 2B Mineral Resource Estimate has increased since the previous estimate due to a combination of additional drilling, which has extended the Mineral Resource along strike, towards the northeast, and due to changes in the economic parameters for defining the portion of the deposit that has RPEEE.

2 INTRODUCTION

On behalf of Namibia Critical Metals (NMI), The MSA Group (Pty) Ltd (MSA) has completed an updated Mineral Resource estimate for the Lofdal Heavy Rare Earths Project ("Lofdal" or the "Project"). Lofdal is located in the Kunene Region in the north-western area of the Republic of Namibia (Namibia).

A Mineral Resource for both Area 4 and Area 2B was last reported with an effective date of 12 May 2021. NMI has since completed a reverse circulation (RC) campaign which added 12 holes to Area 2B and 44 holes to Area 4.

This Technical Report has been prepared to comply with disclosure and reporting requirements set forth in the Toronto Venture Exchange (TSX-V) Corporate Finance Manual, Canadian National Instrument 43-101, Companion Policy 43-101CP, Form 43-101F1, the 'Standards of Disclosure for Mineral Projects' (last amended 09 June 2023) (the Instrument) and the Mineral Resource and Reserve classifications adopted by CIM Council in May 2014.

2.1 Corporate Structure

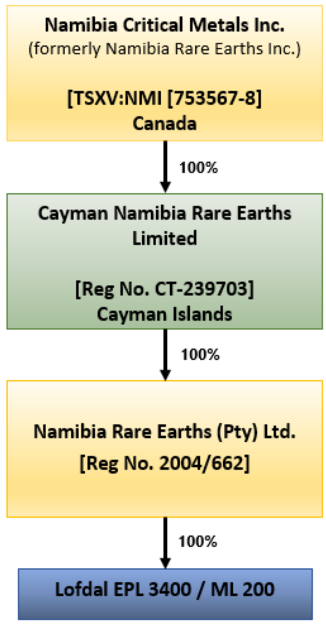
NMI was originally named Namibia Rare Earths Inc., which was incorporated in April 2010. Effective May 30, 2018, Namibia Rare Earths Inc. changed its name to Namibia Critical Metals Inc. to better reflect its newly diversified minerals project base. NMI is a Canadian exploration company, listed on the TSX Venture Exchange, holding a diversified portfolio of projects in Namibia at various stages of development, of which Lofdal is the company's most advanced.

In early 2018, the Company acquired a portfolio of projects from Gecko Namibia (Pty) Ltd. (Gecko), which expanded its interests into a variety of commodities including cobalt, copper, lithium, tantalum, niobium, vanadium, nickel and gold. The transaction also consolidated a strategic partnership with Gecko as the majority shareholder. Gecko is a private, Namibian-owned, fully integrated exploration and mining company.

In January 2020, NMI entered into a Joint Venture Agreement with JOGMEC to jointly explore, develop, exploit and distribute mineral products from Lofdal. This agreement provides JOGMEC, under three provisions, a right to earn a 50% interest in the project by funding CAD 20 000 000 in exploration activities and development up to 31 March 2028.

The corporate ownership structure is shown in Figure 2-1 as at the date of issue.

Figure 2-1
NMI Corporate Structure



Source: *NMI (2020)*

2.2 Principal Sources of Information and Terms of Reference

MSA has based the Technical Report on the Lofdal Heavy Rare Earths Project on information provided by NMI, along with technical reports by Government agencies and previous tenements holders, and other relevant published and unpublished data. A listing of the principal sources of information is included at the end of this Technical Report.

The Technical Report has been prepared on information available up to and including 05 April 2024, which is the effective date of the Mineral Resource Estimate. The data used to estimate the Lofdal Mineral Resource represents the entire database for the drilling completed and there is no relevant material data outstanding as at the effective date.

Personal inspections made by the Qualified Persons and their items of responsibility for this report are shown in Table 2-1.

Table 2-1 Details of Site Visits and Responsibilities of the Qualified Persons			
Qualified Person	**Personal Site Inspection Dates**	**Items Responsible for**	**Items Co-Responsible for**
Jeremy Witley	28 to 30 October, 2020; 10 November 2022, 21 to 22 November 2023	1.4, 3, 10 to12, 14 to 23	1.5, 2, 24 to 27
Scott Swinden	25 April 2018; 31 July 2017, 28 May to 24 July 2014	1.3, 4 to 9	1, 2, 24 to 27
Barbara Mulcahy	27 to 28 October 2021	13	1.5, 2, 24 to 27

A Preliminary Economic Assessment (PEA) on the Project was completed by SGS Canada Inc. ("SGS"), dated 14 November 2022, titled "Lofdal Heavy Rare Earths Project 2b-4 Preliminary Economic Assessment (PEA) Namibia". Information considered by the QPs to be both current and relevant was sourced from this document. The 2024 Mineral Resource Estimate reported in this current Technical Report is substantially different to that on which the 2022 PEA was completed and therefore the results of the PEA are not considered current and are no longer relevant.

The authors have endeavoured, by making all reasonable enquiries, to confirm the authenticity and completeness of the technical data upon which the Technical Report is based. A final draft of the Technical Report was also provided to NMI, along with a written request to identify any material errors or omissions prior to lodgement.

NMI's Lofdal property is considered to represent a minerals exploration project which is inherently speculative in nature. However, MSA considers that the property has been acquired and explored on the basis of sound technical merit. The property is also generally considered to be sufficiently prospective, subject to varying degrees of exploration risk, to warrant further exploration and assessment of its economic potential, consistent with the proposed program.

All monetary figures expressed in this report are in United States of America dollars (US$/USD), Namibian Dollars ($N) or South African Rands (ZAR) unless otherwise stated. The Namibian Dollar is pegged to the South African Rand at an exchange rate of 1:1.

The locations of all maps are referenced to WGS 84, UTM Zone 33S, unless otherwise stated.

2.3 Qualifications, Experience and Independence

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

The following QPs have contributed to this report:

Jeremy Witley (BSc Hons, MSc (Eng.)) is a geologist with 35 years' experience in base and precious metals exploration and mining as well as Mineral Resource evaluation and reporting. He is a Principal Mineral Resource Consultant for The MSA Group (an independent consulting company), is registered with the South African Council for Natural Scientific Professions (SACNASP) and is a Fellow of the Geological Society of South Africa (GSSA).

Scott Swinden (Ph.D. P.Geo.) is the Principal Geoscience Consultant for Swinden Geoscience Consultants Limited, a geoscientific consulting practice that has provided professional services to the mineral exploration sector since 2009. Dr Swinden has more than 45 years' experience in the minerals industry in both private sector exploration and public sector geological surveys. He has a record of exploration and geoscientific surveys in a wide variety of mineral deposit types and since 2010, has specialized in rare metal deposits related to alkaline igneous systems. He is a registered Professional Geologist in Nova Scotia, Canada, and is a fellow of the Geological Association of Canada and the Society of Economic Geologists. He is an adjunct faculty member at Dalhousie University, Halifax, Nova Scotia, and has taught senior undergraduate courses in mineral deposits at Dalhousie University and Acadia University.

Barbara Mulcahy (Pr.Eng) is an Independent Consulting Process Engineer with 26 years' experience in metallurgical projects including metallurgical testwork and flowsheet development; process engineering design and implementation; due diligence and investor reviews and economic project development. Experience in base metals, precious metals, uranium, rare earth metals, industrial minerals and chrome. She is a qualified graduate with a B. Eng (Chemical Mineral Processing) 1994 and GDE (Extractive Metallurgy) 1996 from University of Stellenbosch South Africa and is a registered Professional Engineer with Engineering Council of South Africa (ECSA) member No. 20010377 and Chartered Engineer with Engineers Ireland (EI) member No 500047.

3 RELIANCE ON OTHER EXPERTS

MSA has not independently verified, nor is it qualified to verify, the legal status of the Lofdal property. The report has been prepared on the assumption that the tenements will prove lawfully accessible for evaluation.

Neither MSA nor the authors of this report are qualified to provide extensive comment on legal issues associated with the Project (referred to in section 4.2.1). MSA has not independently verified, nor is it qualified to verify, the legal status of these concessions. The present status of tenements listed in this report is based on information and copies of documents provided by NMI, and the report has been prepared on the assumption that the tenements will prove lawfully accessible for evaluation.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Lofdal property comprises of Mining License (ML) 200 and is located approximately 25 km northwest of the town of Khorixas in the Kunene Region of northwestern Namibia (Figure 4-1). Khorixas is approximately 325 km in a straight line and 450 km by paved road northwest of the capital Windhoek.

Figure 4-1
Location of the Lofdal Property (red square NW of Khorixas)

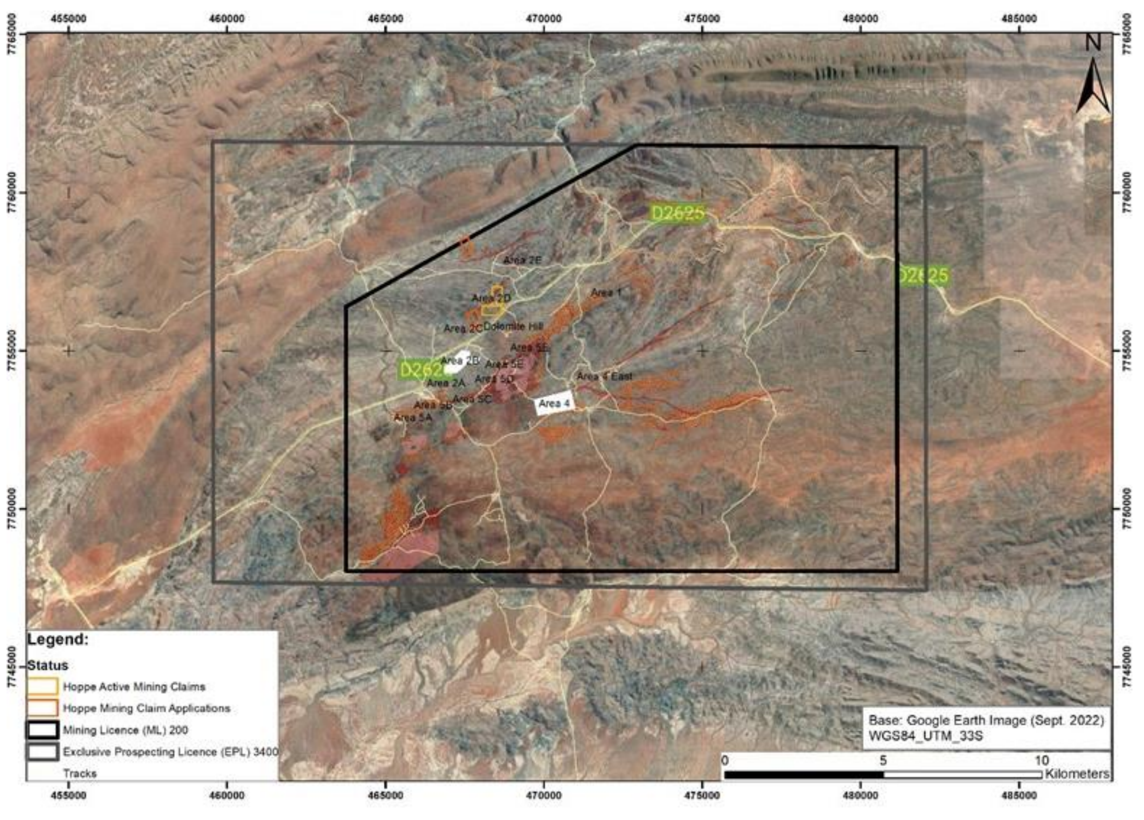
Source: *MSA (2024)*

4.2 Property Description

4.2.1 Mining License (ML) 200

The Lofdal property was originally held under Exclusive Prospecting License (EPL) 3400 granted in 2005. EPL 3400 was relinquished in November 2023 and replaced by Mining Licence 200 (ML 200). The ML 200 boundary within EPL 3400 is shown in Figure 4-2.

Figure 4-2
Location of ML 200 and the boundary of EPL3400 at the time it was relinquished showing current boundaries, roads, and the location of the Hoppe Mineral Claims and Mining License Applications



Source: *Base is September 2022 Google Earth - UTM WGS84, Zone 33S. Compiled by NRI.*

The mining licence application was lodged by Namibia Rare Earths (Pty) Ltd on November 16, 2016. Notice was received on December 22, 2020 that the Minister of Mines and Energy was prepared to grant the application for a mining licence. ML200 was granted on May 11, 2021 for a period of 25 years (expiring on 10 May, 2046) in respect of "Base and Rare Metals of Minerals" subject to certain terms and conditions (Ministry of Mines and Energy, Republic of Namibia, 2020), which are as follows:

"Part 1 - General

1. The mining licence shall endure for a period of twenty five years (25) reckoned from the date of acceptance (hereinafter "the date of issue") of the terms and conditions referred to in this notice unless it is abandoned in terms of section 54 of the Minerals (Prospecting and Mining) Act, 1993 (hereinafter "the Act") or cancelled in terms of section 55 of the Act or an application made to the Minister in terms of Section 96 of the Act, it is renewed by the Minister for any further period or periods.

2. In consideration of the rights hereby granted, the holder of the mining licence shall pay to the Commissioner for the benefit of the State Revenue Fund, such licence fee as may from time to time be prescribed in terms of section 123 of the Act, it being recorded that the annual licence fee prescribed in relation to the licence at the time of its issue shall be N$5000.00 payable annually on or before each anniversary date of the date of issue of the licence.

Part 2 – Work Program and Obligations

3. The holder of the licence shall:

3.1 commence with, and thereafter continue without undue interruption or delay, mining operations within one month of the date of issue of the licence in substantial conformity with the proposed work program, schedule and budget which accompanied the original application for the licence and which served as motivation of the granting thereof;

3.2 where any material deviation of such work program, schedule and budget is in the opinion of the holder of the licence, necessitated by the nature of the results of mining operations (but specifically excluding any circumstances of Vis Major provided for in terms of section 56 of the Act), apply in writing to the Minister for approval of the revision of such work program, schedule and budget in terms of section 99 of the Act; and

3.3 execute such additional work program and expend such additional expenditure within a specified period of time as may be imposed by the Minister from time to time.

3.4 The Minister may, in the interest of the reasonable development of the mining operations, impose from time to time such additional terms and conditions as my deem fit.

3.5A all funds raised anywhere in respect of this licence shall be committed to this licence and shall be banked at a Financial Institution in Namibia.

Part 3 – Environment

4. The holder of the mining licence shall observe any requirements, limitations or prohibitions on his or her prospecting operations as may in the interest of the environmental protection, be imposed by the Minister.

5. The holder of the Exclusive Prospecting Licence shall adhere to the terms and conditions upon which the Environmental Clearance Certificate was issued by the Ministry of Forestry Environment and Tourism.

Part 5 – Additional Conditions

6. Within 30 days of the grant of a new Mining Licence, the applicant shall submit to the Minister a declaration signed by a duly authorised director of the applicant to the effect and including:

6.1 Proof that there is a minimum 20% representation of historically disadvantaged Namibians in the management structure (including the board) of the applicant; and

6.2 Proof that at least 5% (five percent) of the principal voting shares in the applicant or at least 5% (five percent) of the holding of the Mining, Licence, as the case may be, is held by historically disadvantaged Namibians. For the purposes of this condition, the term "held" includes a holding of such principal voting shares directly or indirectly through a company, close corporation, trust, traditional authority, or other similar association, and includes ownership by entities representing Government or in which Government holds a meaningful stake.

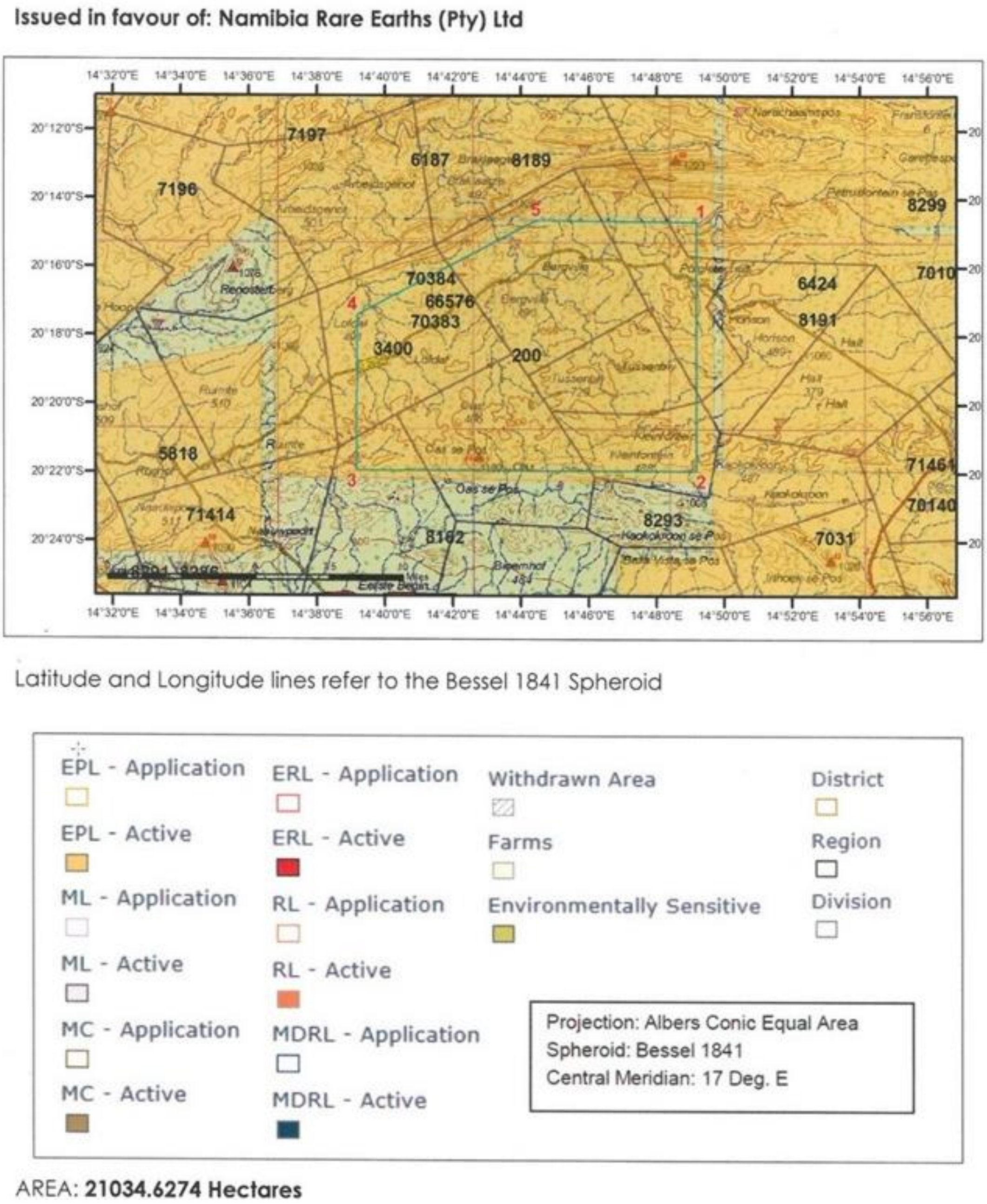
6.3 The applicants strategy for addressing the Government's objective of poverty eradication, including benefitting the Namibian youth and women form disadvantaged groups and the poorest of the poor.

7. If the applicant has been misleading in relation to declarations made under condition 13, the Minister may cancel the licence under section 55(1)(a) of the Act and the remaining provisions of section 55 will apply.

8. For the purposes of these conditions, the term "historically disadvantaged Namibians" shall mean Namibian citizens falling within the category of designated groups" as defined in the (Affirmative Action (Employment) Act, 1998)."

The Mining Licence area is shown in Figure 4-2 and Figure 4-3, and the coordinates of the boundary corners are given in Table 4-1.

Figure 4-3
Location of Mining Licence 200 (blue line). Corner numbers in red are same as Table 4-1



Source: Ministry of Mines and Energy, Republic of Namibia, 2020

Table 4-1
Coordinates of Mining Licence 200

Corner Point	Longitude (Degrees, Minutes, Seconds)	Latitude (Degrees, Minutes, Seconds)
1 (NE)	14 49 9.99 E	-20 14 40.83 S
2 (SE)	14 49 9.92 E	-20 21 56.49 S

3 (SW)	14 39 10.06 E	-20 21 55.59 S
4 (NW)	14 39 10.68 E	-20 17 23.87 S
5. (top)	14 44 26.94 E	-20 14 38.08 S

Note: *The boundaries of the ML are established by reference to latitude and longitude coordinates in reference to the Bessel 1841 Spheroid, Central Meridian 17 degrees East*

Source: *Ministry of Mines and Energy, Republic of Namibia, 2020*

Figure 4-4

Extent of Mining Licence 200 and the Former EPL 3400 in relation to the Mineral Resources of Area 4 and Area 2B

MSA has examined the documentation regarding Mining Licence 200 as supplied by NMI for review. Although MSA is not qualified to provide legal opinion, it has no reason to doubt the authenticity of the information provided.

4.2.2 General Provisions

Under the Minerals Act, 1992, and as declared in Government Gazette 45 of 2009, REE are subject to a royalty of three percent of the fair market value of minerals produced in Namibia. The property is also subject to a two percent Net Smelter Royalty (NSR) to Alberto Lobo-Guerrero Sanz, who introduced NMI to the project.

Neither the applications by NMI to acquire or renew the ML, nor the environmental contract that was agreed to by NMI and the Government of Namibia (Environmental Contract), identify any pre-existing environmental liabilities on the property and none are known to exist.

Under the provisions of the Environmental Contract, NMI is required to submit bi-annual environmental reports detailing work and potential impacts. NMI has fully complied with this provision and copies of these reports for EPL3400 and ML 200 are filed in company files which are complete and up to date. The Environmental Clearance Certificate (ECC) for EPL 3400 was issued

March 05, 2023 is valid until March 05 2026. A renewal for the ECC for ML 200 was submitted in April 2024 and is in the process of issuance.

Notifications of trenching and drilling programs are required to be filed with the Mining Commissioner, Department of Mines and Energy. Notification of drilling for all holes in the 2020 drilling campaign were filed by forms dated February 26, March 13, July 8, August 12, September 24, and November 19, 2020. Additionally, August 30, 2021, October 22, 2022 and for the 2023 RC drilling campaign on January 20, and October 23, 2023.The authors are not aware of any other permits that are required to conduct the planned work.

4.2.3 Adjacent and Overlapping EPLs

The Lofdal Carbonatite Complex is entirely contained within ML 200. As far as is known, there are no similar intrusions or potential for similar mineralization outside the ML and there is no active exploration for similar targets on nearby EPLs.

The area of the former Lofdal copper mine is held under mining claims by a Mr. Hoppe. These claims predate the EPL and take precedence over it and are indicated by the orange rectangular perimeter in Figure 4-2. The claims expired on August 27, 2019, but are still active pending renewal.

Mr. Hoppe has also applied for two mining licenses overlapping a small portion of the northern portion of ML 200 totalling approximately 28.4 Ha (red rectangles on Figure 4-2). As at the effective date of this report, these applications had not been granted.

There are no other factors or risks known to the authors that might affect NMI's right or ability to perform work on ML 200.

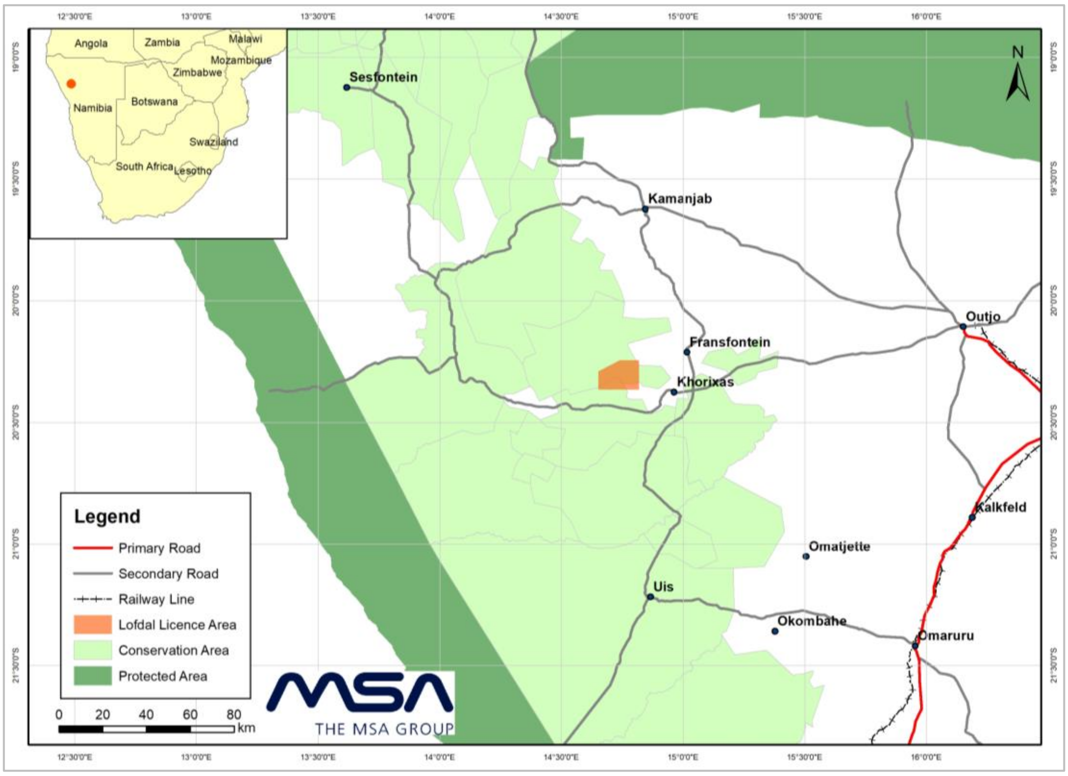
5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The town of Khorixas is connected to the capital city of Windhoek by approximately 450 km of paved road via Otjiwarongo and Outjo. Windhoek is the country's commercial and administrative centre and has international and regional airports with scheduled services to regional centres in southern Africa and Europe. Driving time from Windhoek to Khorixas is approximately 4.5 hours.

From Khorixas, the Lofdal project area can be reached via 25 km of secondary all weather gravel road (national road D2625; Figure 5-1). Bush tracks provide good access to most parts of the project area and are generally negotiable by two-wheel drive (2WD) vehicles, although four-wheel drive (4WD) is occasionally required to cross gullies or wet areas during the rainy season.

Figure 5-1
Location and road access to the Lofdal project area



Note: *Coordinate system latitude and longitude coordinates in reference to the Bessel 1841 Spheroid, Central Meridian 17 degrees East*
Source: *MSA, (2024)*

5.2 Climate

North-western Namibia is an arid to semi-arid region. Rainfall is largely confined to the summer months (November to April) and averages 150 mm to 200 mm per annum. Average daytime high temperatures range from less than 25°C in June/July to more than 35°C from October to April and locally exceed 40°C during hot spells. Night-time lows reach 5°C in winter rising to about 20°C in summer. Sunshine averages more than 11 hours per day during winter and eight to nine hours during the summer rainy season when there is frequent cloud cover. The climate is conducive to year-round operations.

The property lies within the catchment area of the Huab River and has little perennial surface water. The hydrological map of Namibia (van Wyck et al., undated) indicates that the project area is characterised by moderate to low water availability in the bedrock. Information from water boreholes in the area suggests that the water table is about 25 m below surface and comprises mainly fracture permeability in the crystalline basement rocks. Experience to date indicates that wells can supply sufficient water for the needs of exploration without compromising the requirements of local communities.

5.3 Local Resources and Infrastructure

Khorixas is a regional administrative centre. Local services include two fuel stations, hardware and general stores, a small supermarket and several convenience stores, a bank and facilities for basic vehicle servicing, welding and other trades. There is a small dirt airstrip but no scheduled air services. There are several tourist lodges in and near Khorixas offering accommodation, camping, and restaurants. NMI rents a 330 m² warehouse and a 7,600 m² surrounding yard supplied with municipal water and electricity that serves for equipment storage, local office, and drillhole core processing and storage (Figure 5-2). Core is processed at covered core logging areas at the tented field camp nearer the project area (Figure 5-3)

Figure 5-2

Facilities in Khorixas for equipment storage, core logging and storage

Source: *Witley 2023 – top left, Witley (2020) – top right and bottom*

Figure 5-3
Core processing facilities at the Lofdal Field Camp

Source: *Witley (2020)*

The nearest large centres are Outjo, a town with a population of more than 6,000 that lies 120 km east of Khorixas; and Otjiwarongo, a town of approximately 20,000 people that lies 200 km east of Khorixas. Otjiwarongo is a regional commercial and service centre for, among other things, the former Okorusu fluorspar and Okanjande graphite mines.

There are local farms in and around the project area that raise cattle, sheep, goats, donkeys and horses. These farms have wells that can supply adequate water for exploration needs and together with Khorixas, provide a stable pool of workers that can be tapped for exploration requirements.

Khorixas is connected to Namibia's land telecommunications grid and has a Telecom Namibia office. Cellular telephone services are provided by MTC and internet data services are readily available through MTC as well.

Khorixas is connected to the national power grid via a 132 kV transmission line that runs to the east of Khorixas and northwards to the town of Kamanjab.

5.4 Physiography

The project area is characterised by low, gently rolling and sparsely vegetated hills with peaks ranging up to an altitude of approximately 1,030 m (Figure 5-4). There is an overall relief throughout the project area of slightly more than 100 m.

Figure 5-4

Physiography of the project area showing typical low rolling hills and sparse vegetation

Source: *Swinden (2012)*

There is little soil, with much of the ground covered by residual gravel that closely reflects the composition of the underlying bedrock. This residuum is typically less than one metre thick on the high ground but thickens in the dry valleys. Outcrop is widespread throughout the area.

Vegetative cover includes a ubiquitous cover of native grass after the rainy season and numerous arid-adapted low shrubs. Wildlife is relatively sparse but includes springbok, kudu and gemsbok as well as baboons, elephants, zebras, leopards and various small mammals, lizards and snakes.

6 HISTORY

The definitive geological mapping of the area was carried out by Frets (1969), who set out the general stratigraphic and tectonic framework. He identified and described the basement metamorphic rocks and the overlying sedimentary and volcanic rocks of the Damara Orogen and documented the alkaline intrusive plugs in the Lofdal area. Frets (1969) recognized and described the Oas quartz syenite and the silica-undersaturated syenitic rocks of the Lofdal complex. However, he did not recognize the associated carbonatites.

Other published accounts of carbonatites in the Lofdal area are found in Diehl (1990, 1992), Verwoerd (1993), and Woolley (2001) and accounts of the geological setting of carbonatites in the Lofdal area in Niku-Paavola et al. (2001) and Wall et al. (2008), which were summarised in Swinden and Siegfried (2011).

The current published geological map of the area is the 1:250,000 Fransfontein Sheet compiled in 2006 by the Geological Survey of Namibia (GSN) but it is too large a scale to be a useful base map at the detailed map scales needed for mineral exploration.

Historically, mineral exploration activities in the area have focused on copper, gold and tantalite associated with quartz veins and/or pegmatites hosted in the metasedimentary and metavolcanic gneisses of the Huab Complex. The copper and gold mineralization was generally interpreted to be related to faults and shears (GSN, 1992).

Small scale mining by way of shallow adits is evident in at least two locations within the ML immediately north of the project area (Figure 6-1). The adits were opened in the 1950's and one is reported to have mined mineralisation grading ten percent copper (GSN, 1992).

Figure 6-1
Adit at the former Lofdal Copper Mine with copper staining around the portal

Source: *Swinden (2012)*

Exploration for copper and gold in this area was conducted by Messina (Tvl) Development Co. Ltd. from 1974 to 1976 (Davidson, 1977). The GSN (1992) reported that diamond drilling in 1974 intersected cupriferous silicified zones, the best of which assayed 1.02% and 1.51% Cu over 1.95 m and 1.2 m respectively. Davidson (1977) interpreted the deposit to possibly represent the root zone of a largely eroded deposit. Tsumeb Corporation Ltd explored for base and precious metals between 1981 and 1986.

The area was prospected for gold by Anglo American Prospecting Services Namibia (Pty) Ltd. between 1987 and 1989. Reconnaissance bulk stream sediment samples were processed and analysed for gold content. Twenty-seven anomalous areas were selected for follow-up by detailed stream sediment sampling, soil sampling, rock sampling and geological mapping. This work did not yield any significant concentrations of gold and the project was terminated in 1989 (Marsh et. Al., 1989). The presence of copper mineralization, coupled with the presence of REE-bearing carbonatite dykes, abundant iron oxide mineralization, and magnetite-cemented diatreme breccias, led Lobo-Guerrero (2005) to suggest a potential for iron oxide copper gold (IOCG) type deposits in the area, which was influential in attracting the interest of NMI to the area. NMI explored for copper and gold in the area from 2005 to 2007 but did not delineate any IOCG targets from its regional exploration work. In 2008, NMI switched its focus to the potential for REE mineralization associated with the carbonatites.

Although not extensively described in the literature, carbonatite dykes have been reported in the area of Lofdal and Bergville farms at least since the early 1980's and were the focus of an exploration program for yttrium (Y) and rare earth elements (REE) by Rouna (Pty) Ltd. (Rouna) between 1981 and 1983. Following a reconnaissance radiometric survey and some rock sampling in 1981 and 1982 (Figure 6-2), attention was focused on anomalous responses in the area of farms Lofdal 491 and Bergville 491. The preliminary work by Rouna identified the presence of yttrium hosted in the mineral xenotime (YPO_4) and demonstrated that radiometrics is an effective prospecting tool because of an association of rare earth elements with thorium. Detailed sampling in 1983 yielded ThO_2 values ranging from 0.17% to 14.4% and yttrium from 207 ppm to 6,300 ppm with one analysis of 1.01% Y. One carbonatite dyke sample yielded anomalous contents of rare earths i.e., 0.82% Ce, 1.5% La and 0.74% Nd (Barbour, 1982). There are no other analyses of REE available from this phase of exploration.

Figure 6-2
Pit sampling of a carbonatite dyke from Rouna's exploration

Source: *Swinden (2012)*

More recently, the Namibia Small Miners Assistance Centre held EPL 2821 over portions of Lofdal and Bergville farms for precious stones, semi-precious stones, precious metals, and base and rare metals from 2002 to 2004.

Mr. P. Siegfried investigated the greater Lofdal area in 1999 for Norsk Hydro ASA and in 2001 extensive sampling of the carbonatite dykes was carried out together with Dr. T. Mariano for the Canadian REE company Advanced Metals Research (AMR). REE mineralization and highly anomalous HREE were identified.

Geological investigations in the area by the GSN have been ongoing since V. Niku- Paavola began a Ph.D. research project on the carbonatites in the Lofdal area in 2004 at the Camborne School of Mines in the United Kingdom. This project was completed in 2014 (Do Cabo, 2014). Dr. R. Ellmies, previously of the GSN, has maintained an active research interest in this area and facilitated research particularly by students at the University of Namibia. Several B.Sc. theses describing aspects of the carbonatites and rare earth mineralization have been facilitated by the GSN (Ndalulilwa, 2009; Mutilifa, 2010; Shikongo, 2010). GSN's work in this area has provided significant new information on the unusual HREE enrichment at Lofdal and has yielded much detailed information about the mineralogy of the carbonatites and the related rare earth mineralization (Niku-Paavola et al., 2001: Wall et al., 2008; do Cabo and Ellmies, 2010).

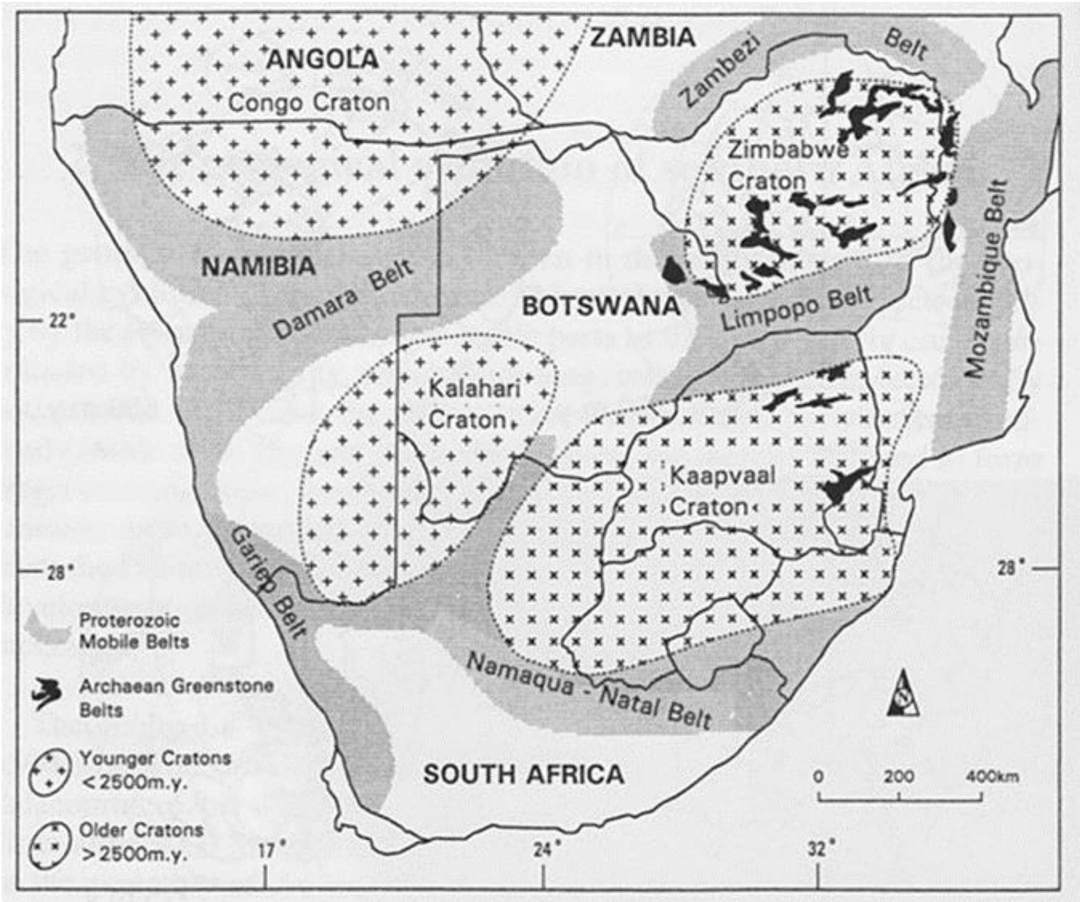
In addition to the work at the University of Namibia, NMI has sponsored student work at a number of other universities. These include four B.Sc. (Honours) theses, respectively at Acadia University (Canada) (Kaul 2010), Dalhousie University (Canada) (O'Connor, 2011; Gaudet, 2012) and Stellenbosch University South Africa) (Kruger, 2012). Two M.Sc. theses have been completed through the Camborne School of Mines (UK) (Loye, 2012, 2014). Two M.Sc. theses have been carried out on the petrology of the carbonatite intrusions, one at McGill University (Canada) (Bodeving, 2015) and a second at The University of St. Andrews (UK) (Robinson, 2020). A PhD study of the mineralized alteration zones and dykes was initiated at McGill University in 2013 but not completed. Preliminary results have been reported by Wollenberg et. al. (2016).

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The regional bedrock geology of north-western Namibia is defined by Archaean to Palaeoproterozoic cratons to the north and south, the Congo and Kalahari cratons respectively, separated by a Neoproterozoic orogenic belt of Pan African affinity termed the Damara Fold Belt or Damara Orogen (Figure 7-1).

Figure 7-1
Cratons and orogenic belts in southern Africa

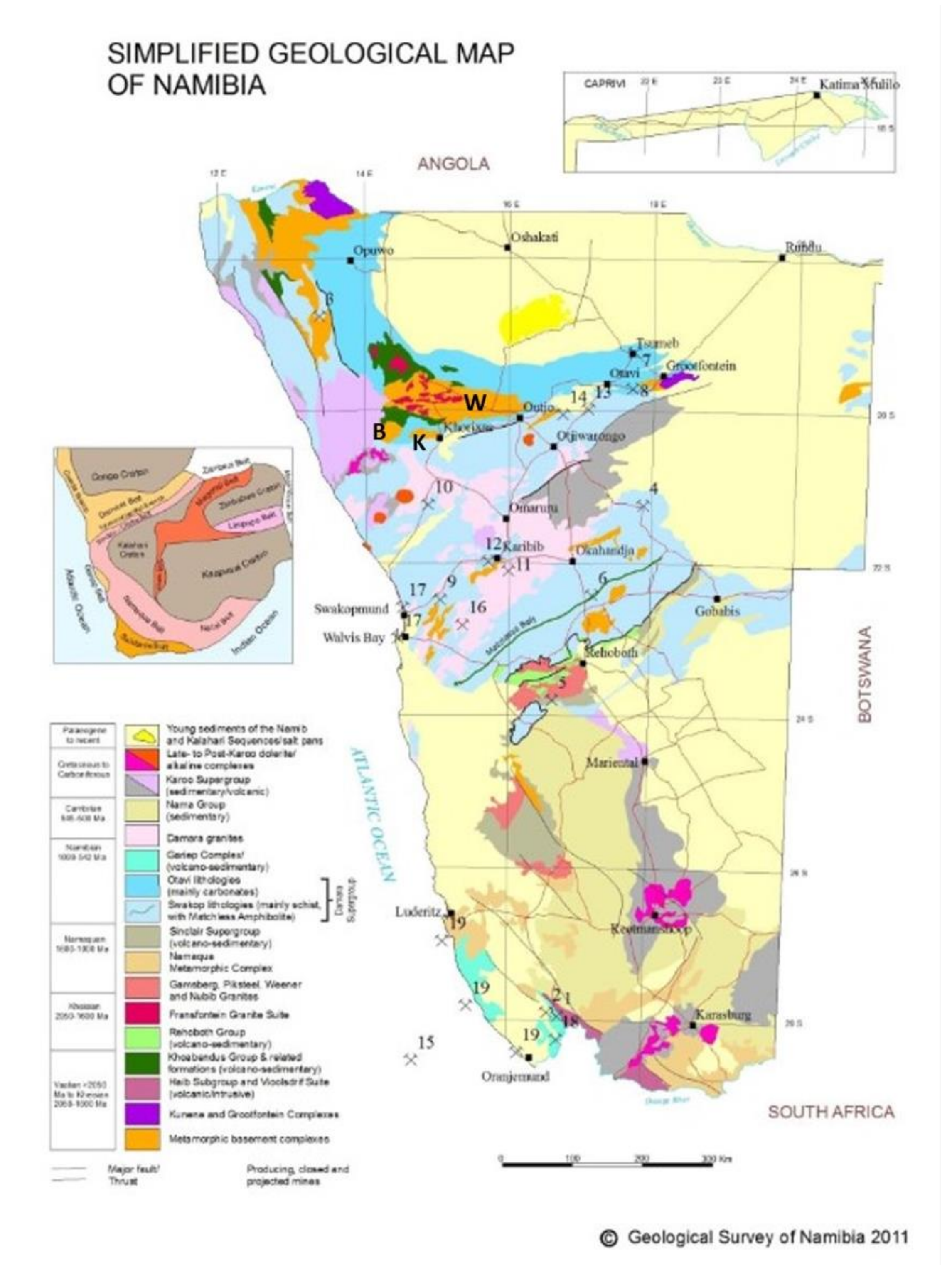


Note: *Coordinate system is latitude and longitude in reference to the Bessel 1841 Spheroid, Central Meridian 17 degrees East*
Source: *Schneider, 2008*

The southern edge of the Congo Craton is exposed in three inliers in the Khorixas – Kamanjab area, termed respectively the Kamanjab, Braklaagte and Welwitschia inliers (Figure 7-2), separated from each other by belts of younger volcanic and sedimentary rocks of the Damara Orogen.

The basement rocks in the Welwitschia Inlier were intruded post-tectonically by the Oas Syenite and the related Lofdal Carbonatite Complex, comprising syenite, nepheline syenite, phonolite and carbonatite.

Figure 7-2
General geology of Namibia



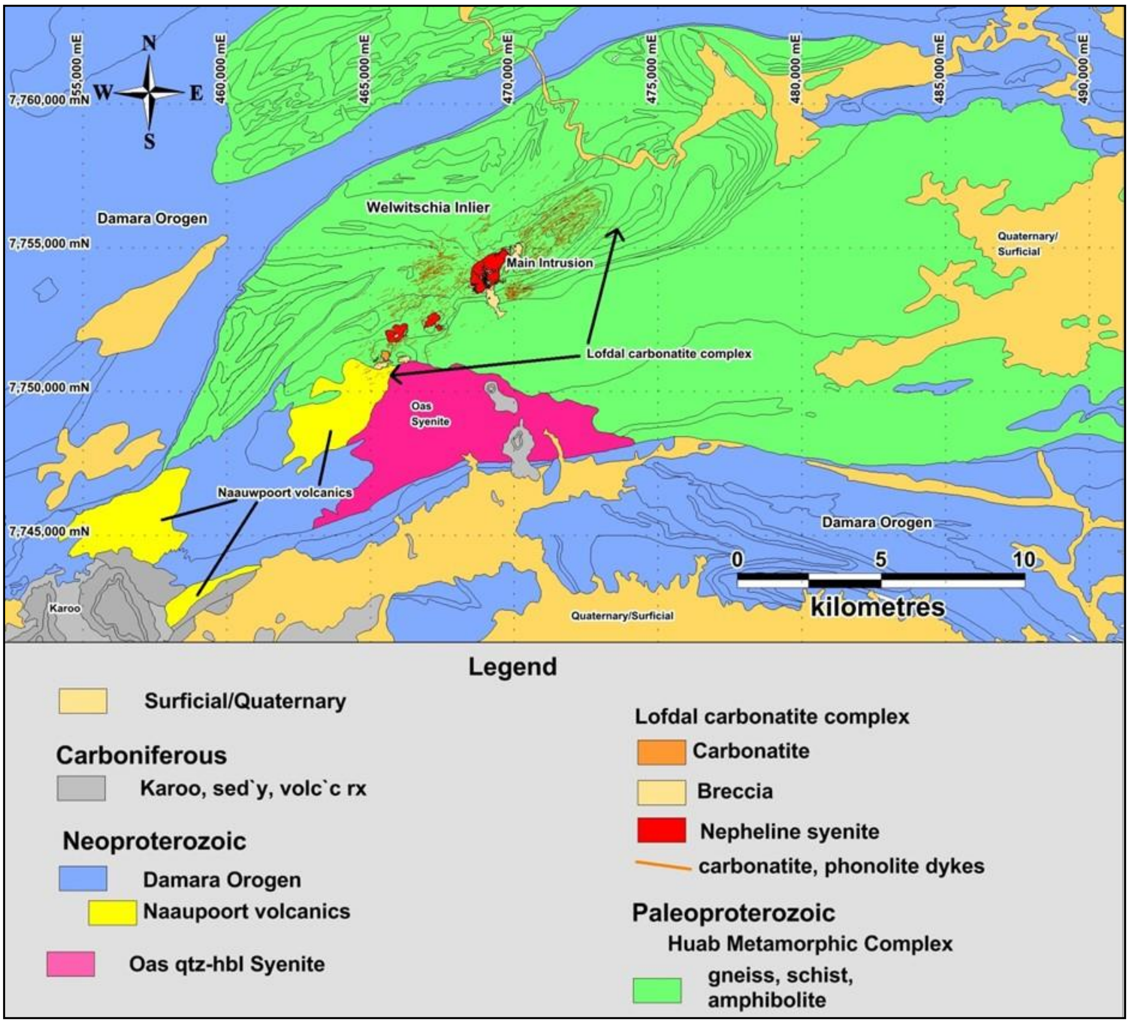
Note: *Huab Metamorphic Complex Inliers (brown) are labelled: K : Kamanjab; B : Braklaage; W : Welwitschia. Coordinate system is latitude and longitude in reference to the Bessel 1841 Spheroid, Central Meridian 17 degrees East*

Source*: (GSN, 2002)*

7.2 Local Geology

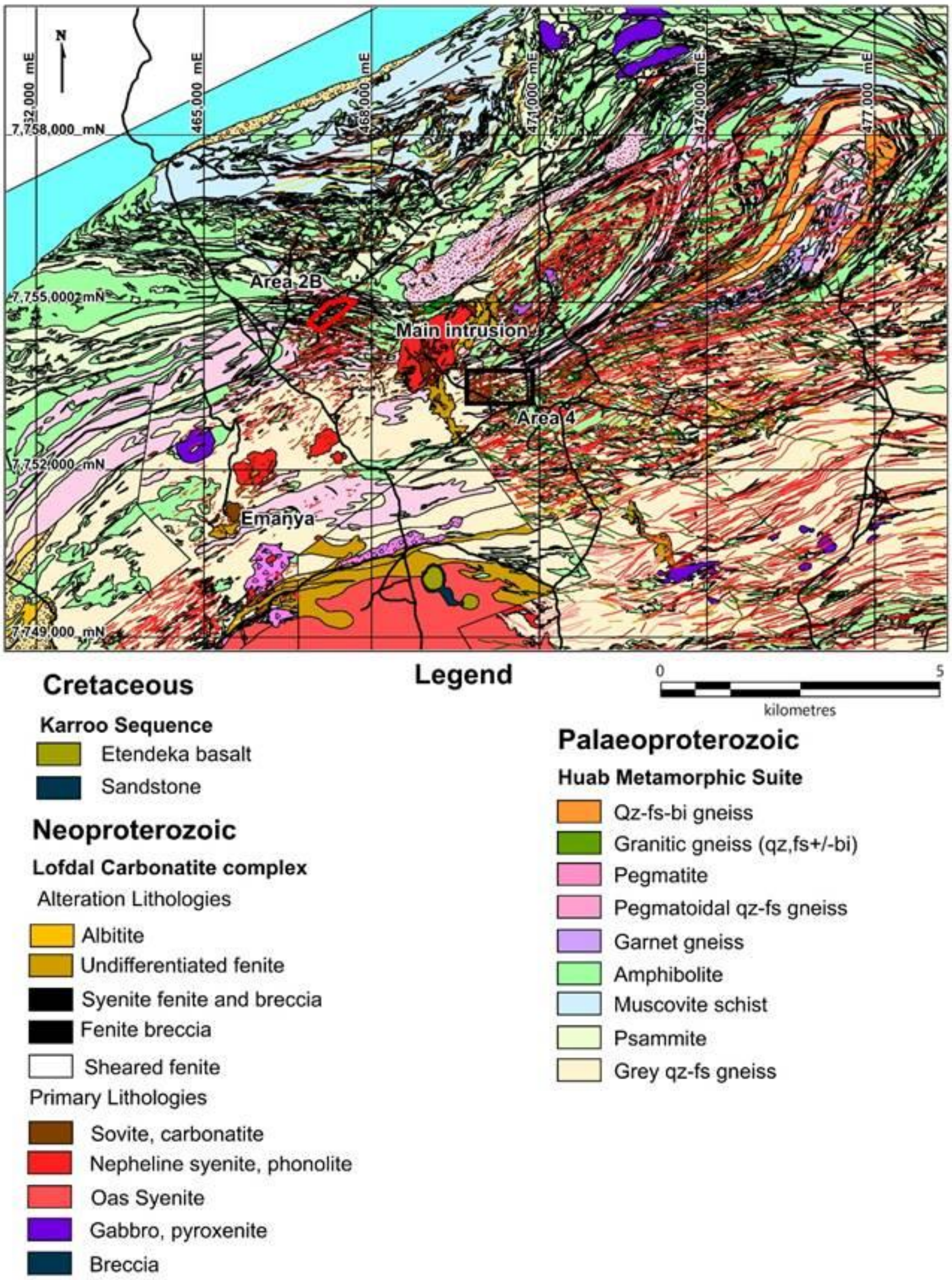
The general geology of the Welwitschia Inlier, which hosts the Lofdal Carbonatite Complex, is shown in Figure 7-3. A more detailed geology map of the Lofdal area from recent geological mapping is shown in Figure 7-4. The principal geological units are briefly described below.

Figure 7-3
General geology in the area of the Welwitschia Inlier



Source*: (GSN, 2008)*

Figure 7-4
Detailed geology of the area of the Lofdal Carbonatite complex



Note: *Detailed geology of Area 4 (black polygon) is shown in Figure 7-14 and detailed geology of Area 2B (red polygon) is shown in Figure 7-16.*
Source: *Swinden, 2014*

7.2.1 The Huab Metamorphic Complex

The oldest rocks in the inlier are leucocratic granitic gneiss, banded paragneiss and quartzite, amphibolite, and mica/chlorite schist assigned to the Huab Metamorphic Complex (Frets, 1969) (Figure 7-5). Locally, mafic sills, dykes and stocks cut the sequence. The Huab Metamorphic Complex is polydeformed, affected by at least one phase of high-temperature isoclinal folding and is locally migmatised. The Huab Metamorphic Complex has not been directly dated but is considered to be about 2.0 billion years (Ga) old as it is intruded post-tectonically by the Fransfontein Granite, which has been imprecisely dated by U/Pb with two discordia lines giving ages of 1871 ±30 million years (Ma) and 1730 ±30 Ma (Burger et al., 1976).

Figure 7-5
General topography and outcrop appearance of the Huab metamorphic Complex

Looking north across the Huab Metamorphic Complex in the Huab Welwitschia Inlier. High ground in distance is underlain by Damara Orogen sedimentary rocks.

Banded grey leucocratic granitic gneiss of the Huab Metamorphic Complex.

Source: *Swinden, 2012*

7.2.2 The Damara Orogen

The Welwitschia Inlier is overlain to the north and south by sedimentary and volcanic rocks of the Damara Orogen. To the north it is in fault contact with clastic sedimentary rocks of the Mulden Group. To the south it is unconformably and/or structurally overlain by volcanic and sedimentary rocks of the Nosib and Swakop groups.

The Damara sequences represent a Pan African orogenic belt between the Congo and Kalahari Cratons. The basal successions (Nosib Group) comprise quartzite, arkose, conglomerate and subordinate calc-silicate and limestone that were laid down in, or marginal to, the intra-continental rifts. Locally, alkaline ignimbrite and associated subvolcanic intrusions are present (Naauwpoort Formation) the basal part of which has been dated by U-Pb single zircon as 752 ±7 Ma (de Kock et al., 2000). Early rift sedimentation was followed by widespread carbonate shelf and slope deposition, which grades laterally into deep water clastic sediments with local accumulations of within-plate basic volcanic rocks (i.e., the Swakop Group). Subsequent subduction and continental collision resulted in widespread deposition of molasse (Mulden Group).

7.2.3 Early Damaran Alkaline / Carbonatitic Intrusions

At about 760 Ma, more or less contemporaneously with eruption of the early Damaran alkalic Naauwpoort Formation volcanic rocks, a suite of alkali silicate rocks and carbonatites were emplaced in the Huab Metamorphic Complex.

7.2.3.1 The Oas Syenite

The largest of these bodies is the Oas Syenite, first described by Frets (1969). It underlies approximately 20 km^2 immediately south of the Lofdal project area, and comprises a dominantly coarse grained, alkali feldspar, sodium plagioclase, hornblende and quartz syenite (Figure 7-6). Apatite and sphene are important accessory minerals (Frets, 1969).

The Oas Syenite intrudes the basement gneisses and the basal sedimentary rocks of the Naauwpoort Formation (Frets, 1969) but is apparently overlain by Damaran limestones from higher in the sequence. The Oas Syenite has been dated by U/Pb in zircon as 756 ±2 Ma (Hoffman et al., 1996) and by U/Pb in titanite as 758 ±4 Ma (Jung et al., 2007) and is therefore approximately coeval with the Naauwpoort Formation volcanic rocks.

Figure 7-6
Coarse grained Oas Syenite (alkali feldspar, amphibole and mica)

Source: *Swinden, 2012*

7.2.3.2 The Lofdal Carbonatite Complex

Frets (1969) mapped a body of nepheline syenite in the southern part of farm Lofdal 491, intruding the gneiss complex. He noted a number of smaller satellite plugs, consisting dominantly of medium to coarse-grained leucocratic nepheline syenite as well as the prevalence of calcite and siderite in cracks and marginal facies of the intrusive.

More recent work has shown that the intrusive complex at Lofdal is more complicated than envisaged by Frets (1969) and comprises an assemblage of nepheline syenite and carbonatite intrusive plugs, dykes and hydrothermal alteration with related phonolite dykes and breccias defining an intrusive complex that appears to underlie an area of more than 200 km^2.

The regional setting of the Lofdal Carbonatite Complex is shown in Figure 7-3. The most important primary lithologies are nepheline syenite, phonolite, breccias and carbonatites as described below.

Nepheline Syenite

Nepheline syenites in the Lofdal area are medium to coarse grained, locally porphyritic syenites dominated by alkali feldspar, nepheline, sericite and biotite (O'Connor, 2011) (Figure 7-7). The original syenite intrusion mapped by Frets (1969) is, in fact, composite, comprising a carapace of syenite, which is intruded from below by carbonatite (the Main intrusion, see below). This results in a surface map pattern dominated by syenite. Syenite occurs in a number of satellite intrusions where it displays a wide variety of textures including very coarse-grained pegmatitic syenite phases. The syenite intrusions are locally cut by phonolite and carbonatite dykes, and fragments of the syenite are incorporated in the Lofdal breccias. The syenites are typically undeformed but locally exhibit mild shearing, characterised by development of a cleavage and alignment of feldspar phenocrysts. The Lofdal nepheline syenite has been dated by U/Pb in magmatic titanite as 754 ±8Ma (Jung et al., 2007) and it is therefore coeval with both the Oas Syenite and the Naauwpoort Formation volcanic rocks.

Phonolite

Phonolite (nepheline, alkali feldspar) dykes are widespread in the Lofdal area. They are dominantly northeast striking with fine-grained to moderately porphyritic with locally a trachytic texture (Figure 7-7). Where phenocrysts are present, they are dominantly alkali feldspar lathes up to two mm long with lesser nepheline. Phonolite dykes have been observed to cut syenite and breccia and they are typically closely associated with carbonatite dykes throughout the area. A comparative petrographic and mineralogical study of the syenites and phonolites led O'Connor (2011) to conclude that they are likely co-magmatic.

Figure 7-7
Examples of nepheline syenite and phonolite dyke

Coarse grained porphyritic nepheline syenite.	Slightly porphyritic phonolite dyke. Phenocrysts are alkali feldspar and nepheline.

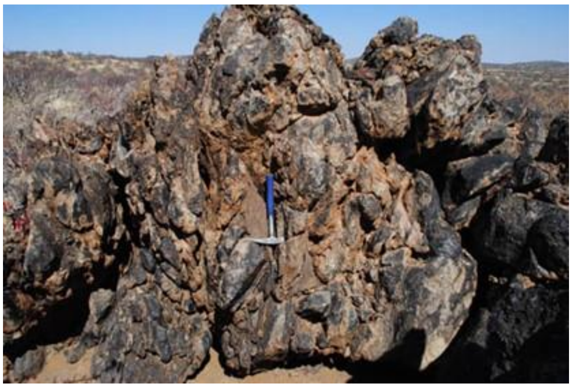
Source: *Swinden, 2012*

Lofdal Breccias

Frets (1969) first noted the presence of a very coarse breccia associated with the nepheline syenites, which he described as "closely packed angular fragments of gneiss which vary in size between one cm and 50 cm, embedded in a fine-grained, contaminated facies of the syenite". He suggested that it indicated a forceful intrusion of the syenite.

Geological mapping in the area has demonstrated that these breccias are widespread and are associated with virtually all the syenite intrusions identified. Although locally dominated by country rock fragments as described by Frets (1969), in other areas they are dominated by syenite fragments. The breccias range from polylithic (basement clasts) to monolithic (syenite clasts) and are typically unsorted, angular, and chaotic (Figure 7-8). Locally, the breccias are intruded by carbonatite and phonolite. They clearly post-date the intrusion of the syenite plugs, as the syenites form fragments in them, but they must be closely related in time as phonolite dykes are locally observed to cut the breccias. There are no carbonatite fragments in the breccias and they apparently predate the carbonatite intrusion.

Figure 7-8
Examples of Lofdal breccias

	
Coarse grained, clast-supported, unsorted syenite breccia near the Emanya intrusion with a small carbonatite dyke under the hammer	Polymictic breccia exposed in a quarry near the Main intrusion

Source: *Swinden, 2012*

Carbonatites

Carbonatite dykes have been reported in the Lofdal area for a considerable time (Barbour, 1982; Verwoerd, 1993; Miller, 2008). However, the recognition of larger, plug-like carbonatite intrusions in the area is relatively recent. The composite syenite- carbonatite plug that is now referred to as the "Main" intrusion appears on a map by Barbour (1982) but its full extent and significance was only first recognized by the GSN geologists (V. Do Cabo, pers. comm.). A second, smaller intrusion about 4.5 km to the southwest, now referred to as the "Emanya" intrusion or plug, was only discovered in 2008 (Figure 7-9). Regional geological investigations between 2008 and 2010 have shown that there are literally hundreds of carbonatite dykes and fentitised-carbonatised alteration structures over an area of about 200 km^2. Wall, et al., (2008) dated xenotime in the carbonatites by

U-Pb and obtained an age of 765 ±16 Ma, indicating that they are approximately coeval with the Oas Syenite and the Lofdal nepheline syenites.

Figure 7-9
Examples of carbonatite from the Main and Emanya intrusions

White sovite of the Main Intrusion intrudes a carapace of nepheline syenite (ledge at top of outcrop).

Dark reddish-brown carbonatite is characteristic of the Emanya intrusion.

Source: *Swinden, 2012*

The Main intrusion is the largest carbonatite body found to date in the complex. Its outcrop area forms an ovoid with long axis of about two km and an area of about 1.5 km^2 (Figure 7-4). The Main intrusion carbonatites are dominantly coarse-grained white sovite consisting mainly of calcite with lesser aegerine, apatite and magnetite, and trace feldspars, sulphide minerals and pyrochlore (Gaudet, 2013; Bodeving, 2015). The carbonatite intrudes nepheline syenite and Lofdal breccias, which form an outcrop carapace on top of the carbonatite at the present level of exposure (Figure 7-9). Because of this, syenite, and to a lesser extent breccia, dominate the outcrop pattern in the area of the intrusion and it is not surprising that previous workers mapped this body as dominantly syenite (e.g., Frets, 1969). The Main intrusion is relatively uniform geochemically, with low iron contents and exhibits a LREE-enriched rare earth element distribution that is typical of carbonatite magmas but too low in absolute REE concentration to be of economic interest.

The Emanya intrusion is located about 3.8 km southwest of the Main intrusion (Figure 7-4). It comprises a main body, roughly circular in outcrop with a diameter of approximately 350 m, as well as several smaller satellite bodies within a 450 m radius. The carbonatites in this intrusion are calcitic but contrast with the Main intrusion in that they are finer grained and dominantly brown to reddish-brown on outcrop surfaces with abundant iron oxide throughout (Kruger, 2012) (Figure 7-9). Fluorite is locally present in veinlets. On average, the Emanya carbonatites contain approximately 8.6 times more LREE and 3.6 times more HREE than the Main intrusion. The REE in Emanya are fractionated in favour of the LREE compared to the Main intrusion.

Carbonatite “dykes” have been mapped over an area of more than 200 km^2 throughout the Lofdal Carbonatite Complex. Although typically mapped and referred to as “dykes”, these appear to be dominantly hydrothermal and/or carbothermal vein systems, resulting from fluid expulsion from the magmas during crystallisation. They typically follow the structural grain of the country rocks, striking in a northeasterly direction and dipping steeply to the south. They exhibit a wide range of lithological and alteration characteristics, ranging from <10 cm to several 10's of metres wide and have a wide range of colour variation on weathered surfaces, from white and grey, through shades of brown, red and yellow (Figure 7-10). They are closely associated with phonolite dykes throughout the area, often occurring together in the same structure (with the 'dykes' always the later phase) or in closely spaced parallel dyke swarms.

There is considerable variability in the internal structure of the "dykes". Many are uniform in character, exhibiting little internal banding or colour variation. Most however, exhibit some internal structure, commonly colour- and/or compositional-banding on a scale ranging from millimetres to centimetres.

The alteration in these "dyke"" systems is variable but locally intense, characterised by an early pervasive albitisation follow by brittle fracturing and infusion of carbonate minerals and micas (see also Section 7.4.2). HREE mineralization is associated with the later stages of alteration. In some areas the alteration systems are 10's of metres wide.

Figure 7-10
Examples of brown and red to yellow carbonatite dykes

A 10 m wide massive brown carbonatite dyke

Laminated red and yellow carbonatite dyke with a band of albitite along the right side (under the hammer head).

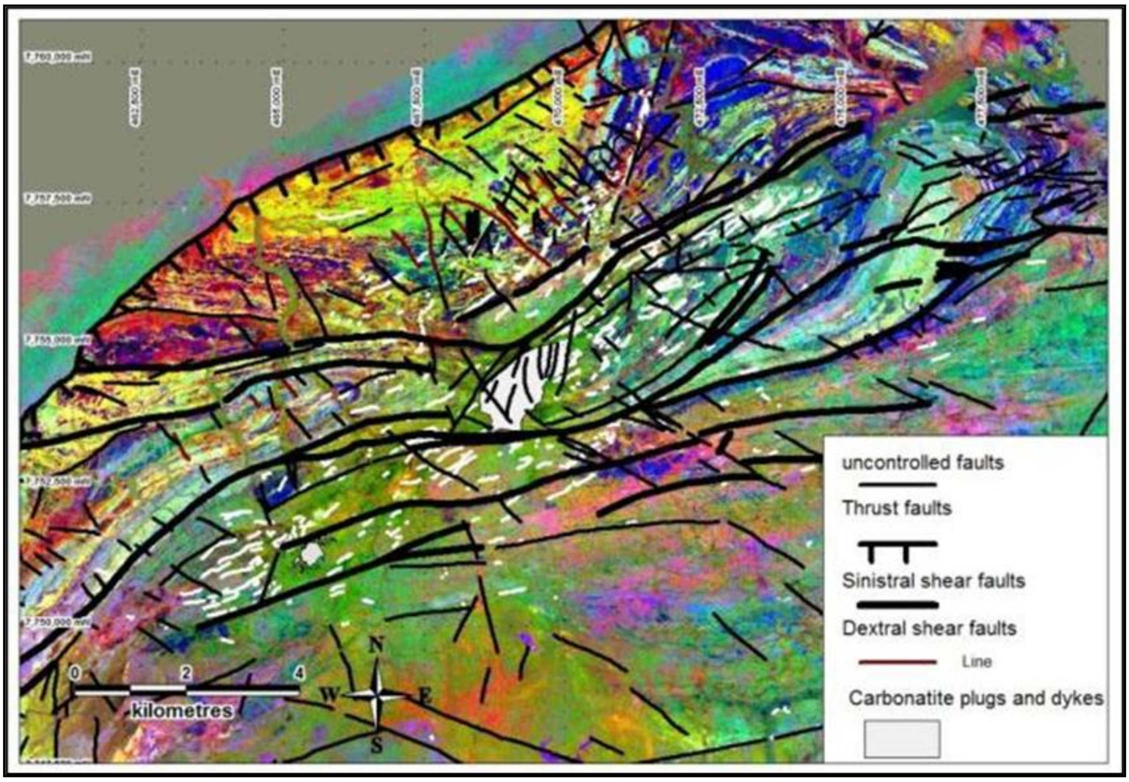
Source: *Swinden, 2012*

7.3 Structural Setting

Rocks of the Huab Metamorphic Complex were polydeformed and metamorphosed prior to intrusion of the Fransfontein Granite at about 1.7 Ga. They were subsequently affected by extensional tectonics during the rifting event that initiated the Damara Orogen at 850 Ma to 750 Ma and transpression during the orogenic events that accompanied the Damara Orogeny from 580 Ma to 500 Ma. The effects of both Neoproterozoic rifting and early Paleozoic transpression are recorded in the Lofdal carbonatites.

A comprehensive structural interpretation of the area was undertaken by NPA Fugro (2010) on behalf of NMI, integrating hyperspectral and Landsat data with all available airborne geophysical surveys as well as NMI geological and geochemical databases to produce a high level interpretation of structural features in the Welwitschia Inlier (Figure 7-11). This interpretation identifies regional structures in the basement that probably reflect the pre-Damara history of these rocks. It also identifies a series of sinuous NE-SW striking major fault structures that systematically offset the basement structures in a sinistral sense. These structures are locally offset by a series of NNE-SSW striking dextral structures and NW-SE striking structures.

Figure 7-11
Structural elements of the Lofdal area, interpreted from Landsat and hyperspectral data



Note: *Base is hyperspectral image. Main and Emanya intrusions and carbonatite dykes are shown in white.*
Source: *NPA-Fugro, 2010*

The intrusive complex at Lofdal shows a close relationship to the structural grain of the basement. The Main and Emanya intrusions are located between large sinistral structures and the phonolite and carbonatite dykes and veins in the complex are typically structurally aligned with these ENE- and NNE-trending structures (Figure 7-11). The intrusive complex seems, therefore, to have exploited regional structures during emplacement and subsequent hydrothermal alteration activity.

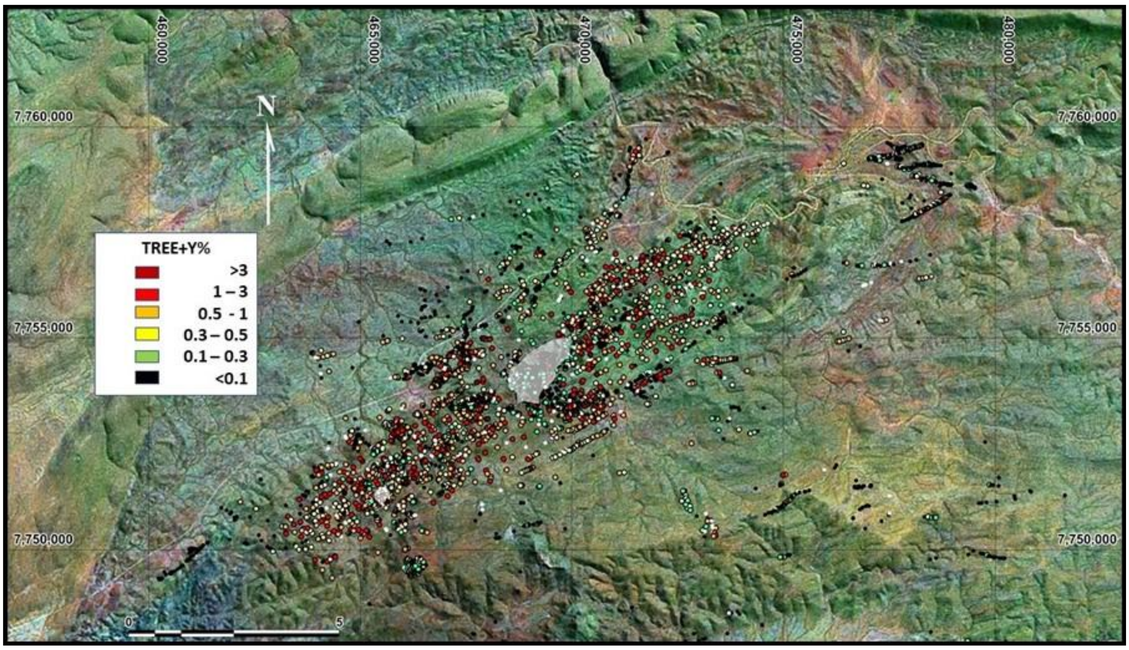
Structures within the carbonatites appear to record both extensional and transpressional events. The repeated injection of first phonolite and then several phases of carbonatite, and hydrothermal fluids into many of the structures may be the result of repeated opening of pre-existing structures during the extensional regime that prevailed at about 750 Ma. However, there is also evidence of transpressional deformation within the dykes, with minor structures (folds, shear bands) indicating transpression with the same sense of shear as is interpreted for the major structures. It may be that at least some of the deformation recorded in the dykes is Damara in age. It seems likely that the intrusions and the associated hydrothermal alteration were focused by extension faults that determined the location and orientation of the intrusions and provided pathways for the escaping hydrothermal fluids. These faults and fractures may have been reactivated during the Damara Orogeny, producing the observed structures.

7.4 REE Mineralization

7.4.1 Regional Setting

Exploration at Lofdal has demonstrated that there is widespread REE mineralization related to intrusion of the Lofdal Carbonatite Complex and that many occurrences are specifically enriched in HREE. The regional setting of REE mineralization was evaluated through an extensive regional surface grab sampling program (documented in Swinden and Siegfried, 2011), geological mapping with locally detailed lithogeochemical sampling, and core drilling. Figure 7-12 illustrates the distribution of anomalous concentrations of TREE+Y in 3,764 outcrop grab samples collected between 2008 and 2011. The REE mineralization at Lofdal occurs mainly within a NE-SW trending corridor approximately 20 km long and 5 km wide, the axis of which is occupied by the Main and Emanya intrusions. Mineralization occurs at a district scale over an area of at least 200 km^2.

Figure 7-12
Distribution of lithogeochemical grab samples in the Lofdal area



Note: *Color-coded for total REE + Y. Main intrusion is large grey body. Emanya plug (small grey body) to the southwest*
Source: *Landsat Geocover Mosaic, 2000*

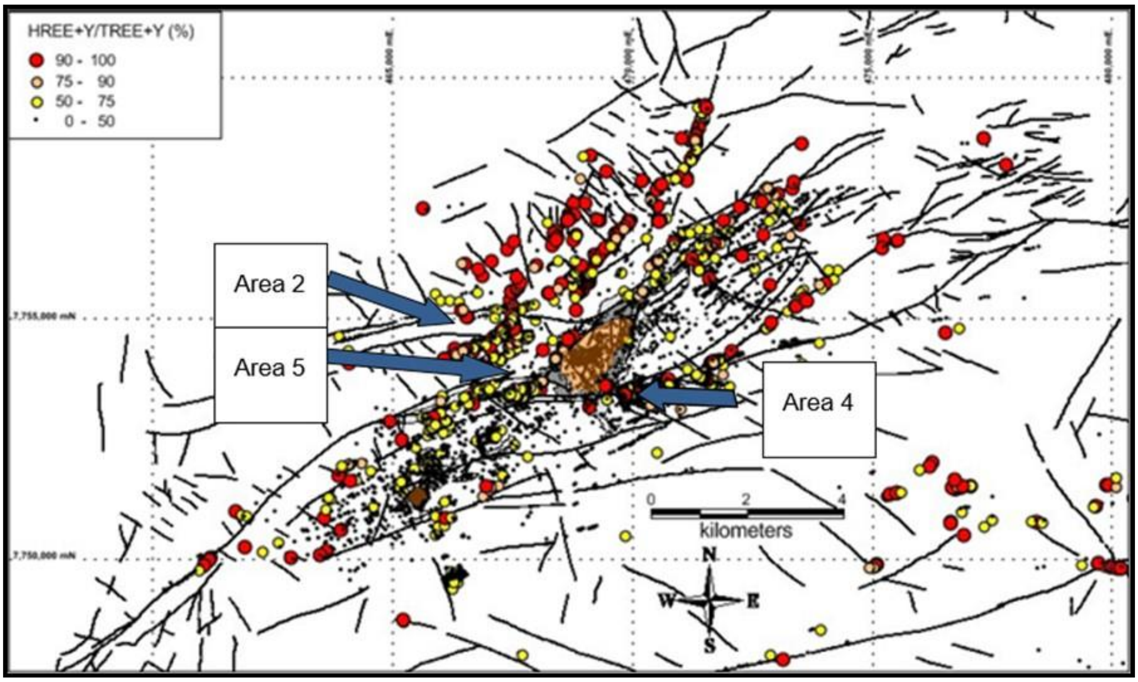
There is considerable variation in both the absolute concentrations of REE, and in the relative proportions of LREE versus HREE in mineralised samples. As a general rule, the Main intrusion shows a typical carbonatite REE profile of LREE enrichment but has very low overall concentrations of all REE.

The Emanya intrusion shows a trend towards higher TREE+Y, which is mainly a result of LREE-enrichment, with little enrichment in HREE. The dykes and related alteration lithologies show a wide variation with much stronger enrichment trends in both LREE and HREE (Swinden and Siegfried, 2011).

Studies of both surface outcrops and drillhole cores have demonstrated that the HREE-rich mineralization is not principally hosted by carbonatites, but typically occurs in hydrothermal and/or carbothermal alteration zones that are localized in key basement structures irrespective of host lithologies (do Cabo et al., 2011; Swinden and Burton, 2012; Wollenberg et 2016). The delineation core drilling for mineral resource estimation in Areas 2B and 4 shows that the HREE-rich mineralization is locally continuous in three dimensions over significant strike and dip extents.

Despite the complexity of the REE distribution overall, there is a regularity to the distribution of the most HREE-enriched samples. Figure 7-13 shows the enrichment of heavy rare earths as (HREE+Y)/(TREE+Y) expressed as percentage, irrespective of grade.

Figure 7-13
Lithogeochemical grab samples plotted on the basis of (HREE+Y)/(TREE+Y)



Note: *Most HREE-enriched samples plot along linear trends that are interpreted to reflect structures that provided fluid pathways during the hydrothermal event. Main and Emanya intrusions are shown in light brown; alteration intensity in shades of grey (see also Figure 7-15 and Figure 7-17). Black lines are structures interpreted from remote sensing and geophysical data.*
Source: *Swinden, 2011*

Figure 7-13 demonstrates a number of important distribution characteristics of the HREE-enriched mineralization:

1. The most HREE-enriched samples tend to be concentrated in linear belts, which very often coincide with the traces of fault structures interpreted from remote sensing data. These are interpreted to be the structures that provided fluid pathways or conduits for the HREE-rich hydrothermal fluids.

2. Even where overall grades are low in these structures, the HREE enrichment remains high, emphasizing the potential of these zones for concentrations of HREE-rich mineralization.

3. The drill targets in Areas 2B, 4 and 5 stand out as zones of HREE-enrichment.

7.4.2 Mineralization in Area 4

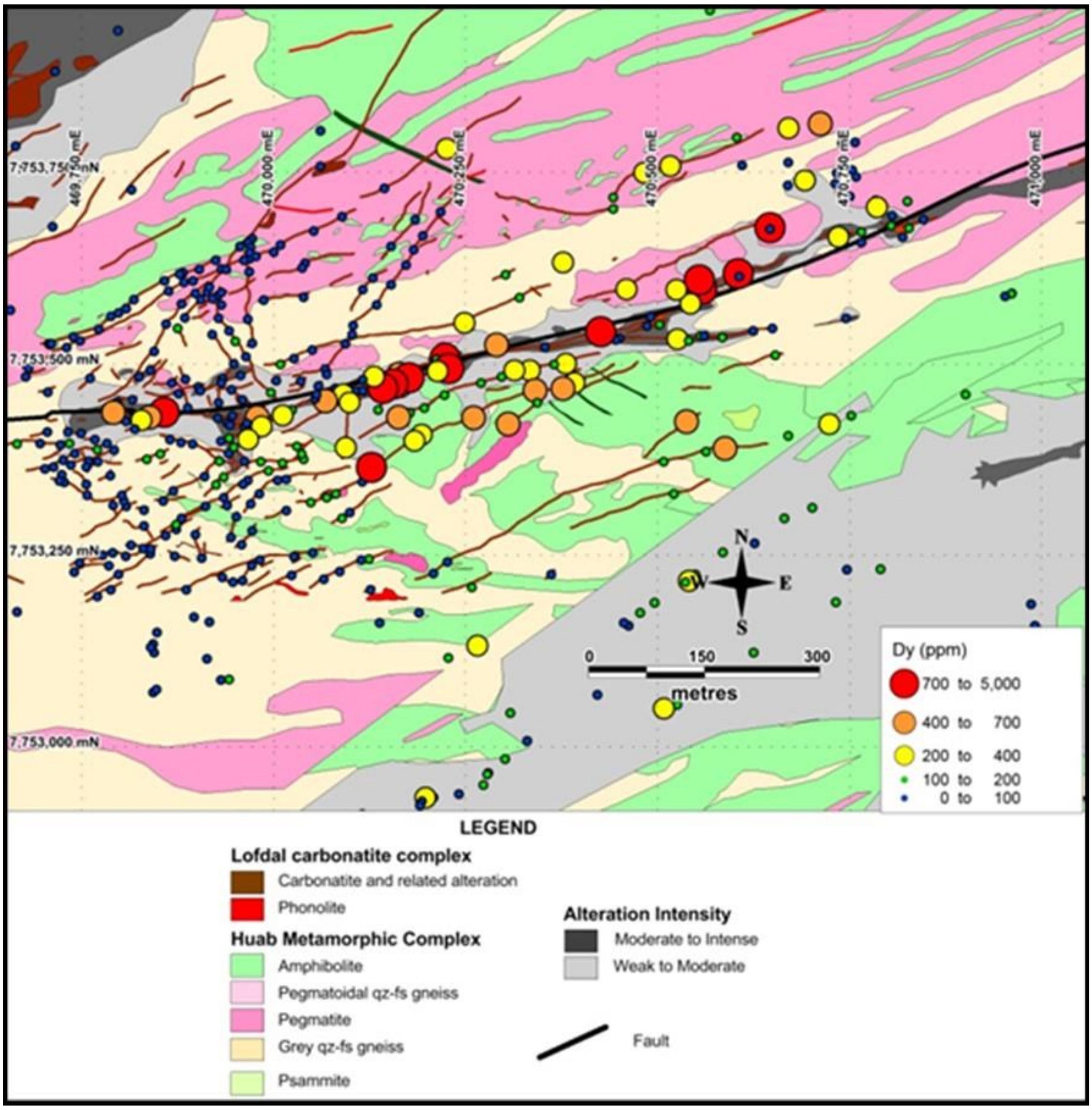
The location of Area 4 in the Lofdal Carbonatite Complex is shown in Figure 7-4 and a detailed geological map of Area 4 is shown in Figure 7-14 and Figure 7-15.

The Huab Metamorphic Complex in this area is dominated by quartzo-feldspathic gneiss and metasedimentary grey gneiss with lesser amphibolite and pegmatite. The gneisses strike approximately ENE-WSW and generally dip steeply southwards.

The geological element of principal economic interest in Area 4 is a major fault, first interpreted from remote sensing data (NPA-Fugro, 2010), that strikes ENE-WSW and dips to the south, bisecting the area. The fault can be traced for several kilometres east and west of Area 4 and the offset of geological elements interpreted from hyperspectral data indicates that it has a sinistral sense of movement. At surface, the fault system is marked by carbonate veining and extensive hydrothermal alteration, dominantly albitisation and carbonatization accompanied by biotite ± phlogopite and iron oxides. Mapping the alteration intensity associated with the structure shows that there is a core of intense alteration, within which rocks have been completely converted to albitite and are cut by carbonatite and highly carbonic alteration. In this intense alteration zone, all original textures have been destroyed and crackle breccias with altered, albitised clasts set in a matrix of carbonatite and/or iron oxides are common. Surrounding this intensely altered core is a halo of less intense alteration, in which the rocks are bleached and albitised, but retain some original textures.

The outline of the alteration zone is highly irregular at map scale (Figure 7-14). The intense alteration in the core is typically between 15 m and 30 m wide on the surface (not true width). The less intense alteration halo exhibits gradational and diffuse contacts with the wall rocks and is typically on the order of 50 m to 60 m wide at surface but can range to more than100 m wide. At the eastern side of Area 4, the fault zone bifurcates, with the main system branching in a slightly more northerly direction and a splay of the fault continuing in an ENE direction. There is alteration and mineralization associated with both splays, but the southern splay appears to decrease in intensity along strike and alteration appears to die out within a few hundred metres.

Figure 7-14
Geology of Area 4 with Dysprosium (Dy) grade in surface grab samples



Note: *The mineralised structure reports high values in both the HREE (represented by Dy in ppm) and in percentage of HREE in TREE*
Source: *Swinden, 2021*

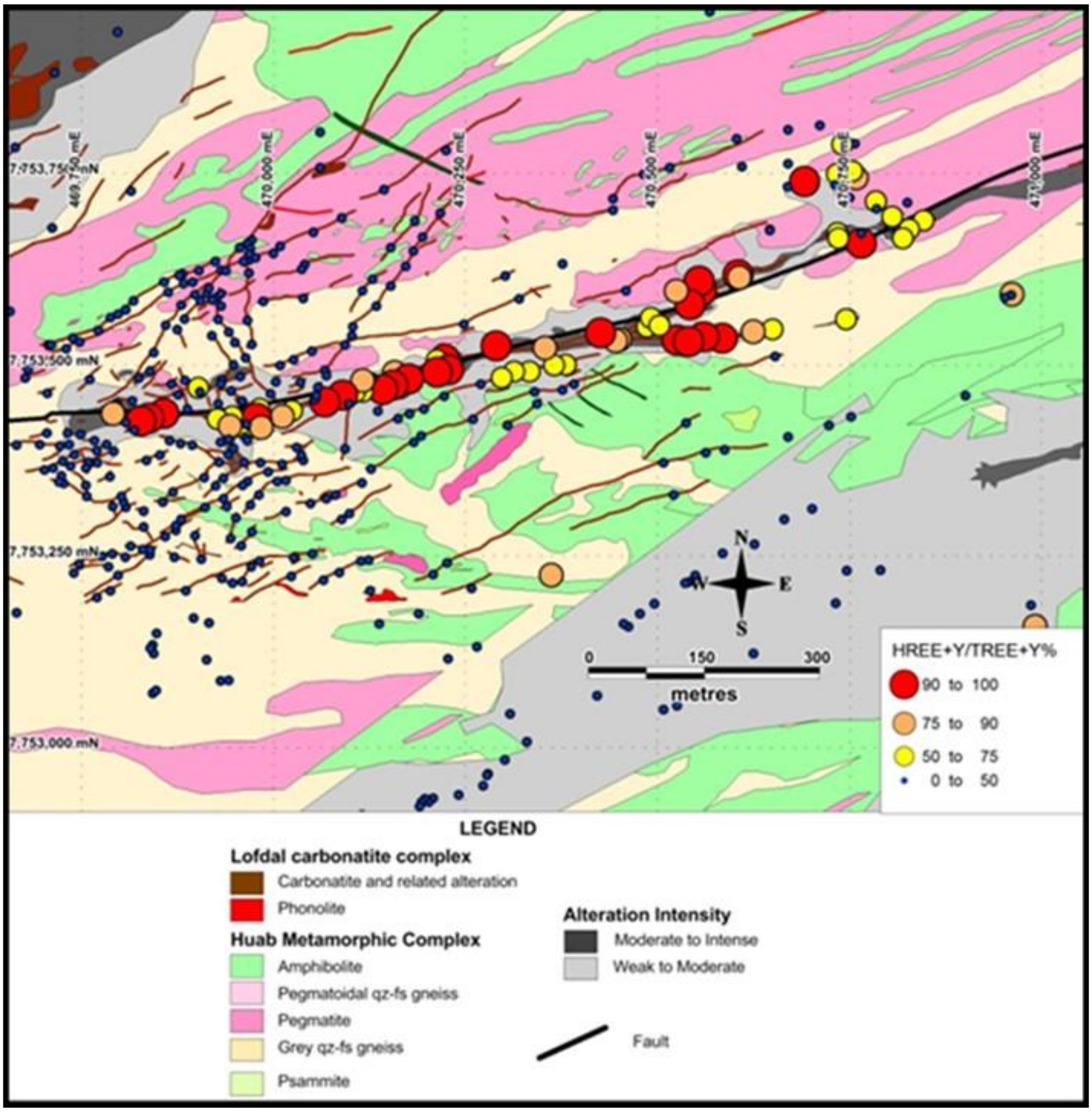
A large number of carbonatite veins and carbonatic alteration zones have been mapped in Area 4. Although strike directions are dominantly NE-SW and NNE-SSW following the dominant structural grain of the basement, other directions are locally seen. Outside the central alteration zone, carbonatite veins are thin, (<1 m wide) and do not exhibit significant alteration beyond their margins. However, within the alteration zone, they are more continuous and alteration is ubiquitous.

A more or less continuous zone of albite-carbonate alteration with significant grades of REE has been traced by mapping, trenching and drilling for more than 1,100 m along strike and regional geological mapping to the east and west indicates that it continues for several kilometres beyond

Area 4. Within this zone, the intense alteration typically thickens and thins, and locally forms lensoid bodies that can extend on surface up to about 100 m long and 10 m wide.

The mineralization in Area 4 occupies a structurally-controlled, linear alteration zone. The Area 4 alteration zone is the largest and best mineralised and is clearly manifested and easily mappable in surface outcrops by variably intense albitisation and brown carbonization with locally abundant phlogopite. Grab samples from outcrops typically return highly anomalous values of HREE (Figure 7-14) and also have a very high HREE/TREE ratio (Figure 7-15).

Figure 7-15
(HREE+Y)/(TREE+Y)% in surface grab samples in Area 4



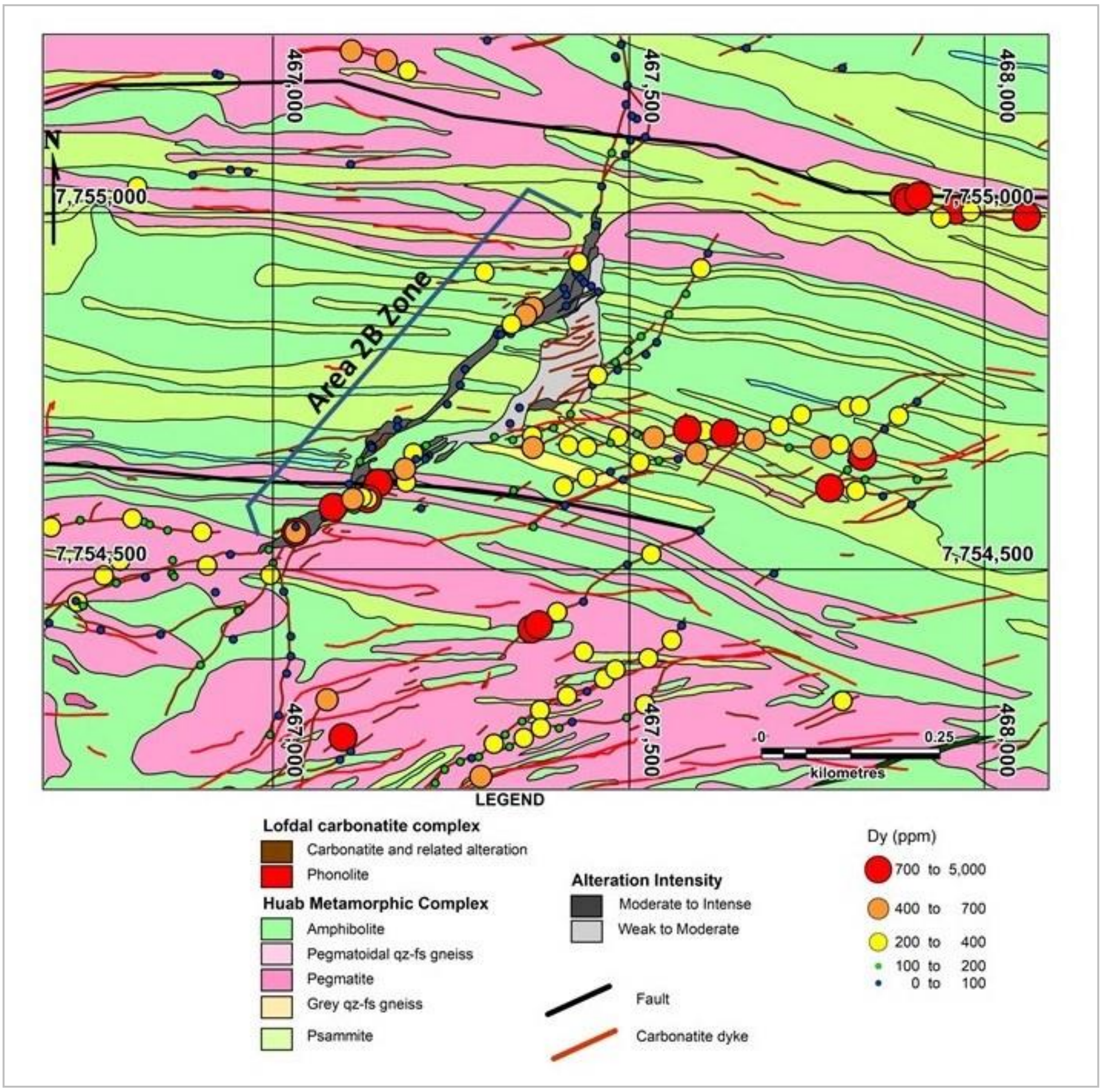
Note: *The mineralised structure returns high values in both the HREE and in percentage of HREE*
Source: *Swinden, 2021*

7.4.3 Mineralization in Area 2B

The location of Area 2B in the Lofdal Carbonatite Complex is shown in Figure 7-4 and a detailed geological map of this area is shown in Figure 7-16 and Figure 7-17.

The Huab Metamorphic Complex in Area 2 is dominated by amphibolitic schist interbanded at outcrop scale with leucocratic quartzo-feldspathic paragneiss and muscovite schist and locally intruded by coarse grained granitic pegmatites. The rocks are complexly folded on a fine scale.

Figure 7-16
Geology of Area 2B with dysprosium (Dy) grade in surface grab samples



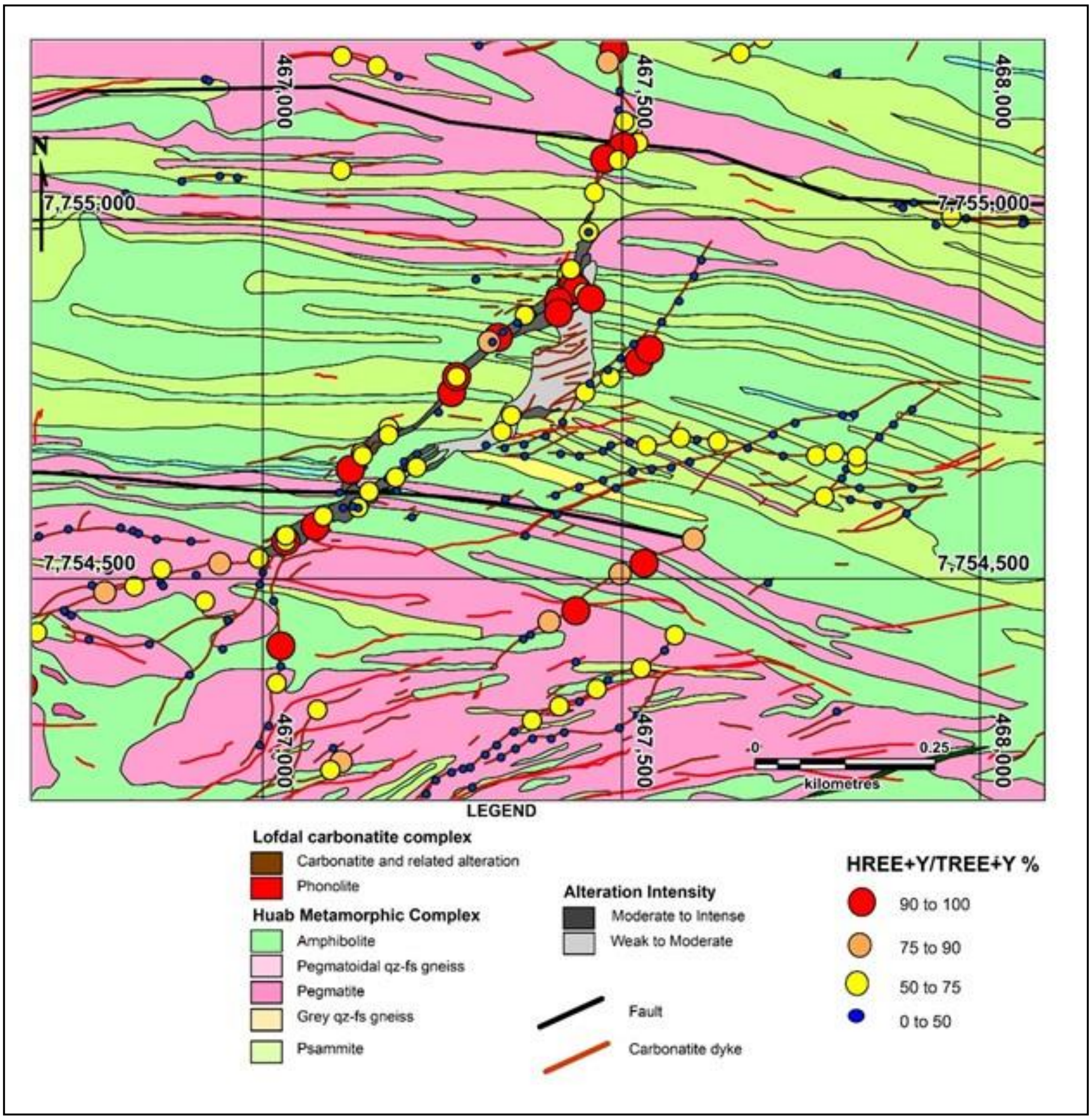
Note: *Alteration related to the Area 2B mineralization is shown in shades of grey*

Source: *Swinden, 2021*

Phonolite and carbonatite dykes and related alteration zones of variable orientation and thickness are common in the area. Carbonatite dykes average a few cm in width but carbonatitic and albititic alteration zones can range up to more than 10 metres in width in outcrop.

Dykes and alteration zones in this area dominantly trend from NE-SW to NNE-SSW and generally are at a considerable angle to the structural grain of the basement, which in this area trends from E-W to ESE-WNW. The area is bounded to the north and south by major sinistral faults interpreted from remote sensing data (Fugro, 2010) and it may be that the dominantly NE-trends of dykes and alteration zones in Area 2B reflect fracture systems related to these linked faults.

Figure 7-17
(HREE+Y)/(TREE+Y) % in surface grab samples in Area 2



Source: *Swinden, 2021*

The principal mineralization in Area 2 is the 2B zone (Figure 7-16), a wide zone of hydrothermal alteration and carbonatite intrusion. Like Area 4, the mineralization is characteristically enriched in HREE and samples throughout the alteration zone show a very high ratio of HREE to TREE (Figure 7-17). The mineralized zone has been traced in outcrop along a strike length of more than 600 m and remote sensing information and regional sampling results suggest that the zone may ultimately have a strike length of more than 3 km. The width of the zone in outcrop is variable. At its southern end, the width of the zone of alteration and carbonatization ranges from about 20 m to 35 m but thins to less than 10 m in the central section where it bifurcates into two separate zones. At the northern end, where the zone of alteration and carbonatization is again amalgamated, it is more than 60 m wide. In outcrop, it comprises a zone of massive carbonatite dykes, within a complex envelope of hydrothermal alteration and brecciation. The southern part of the zone is dominantly brown carbonatite and related alteration. Alteration zone lithologies include massive albitite, localized zones of green phlogopitic fenite, brown stained albitite breccias infused with carbonatite, as well as altered mafic schist that has been carbonatized, variably albitized, and intruded by carbonate veinlets. Although massive and continuous across strike at its southern end, the zone bifurcates at surface in its central section with a hanging wall zone of dominantly carbonatite and related alteration and a footwall zone that includes considerable altered, carbonatized schist and carbonatized stockwork.

The REE mineralization in the Area 2B zone is restricted to the zone of alteration and carbonatization. In drillhole core, the zone is seen to consist of a zone of intense brecciation and hydrothermal alteration. The best assay values are related to late veining and alteration that cuts most of the pre-existing alteration lithologies.

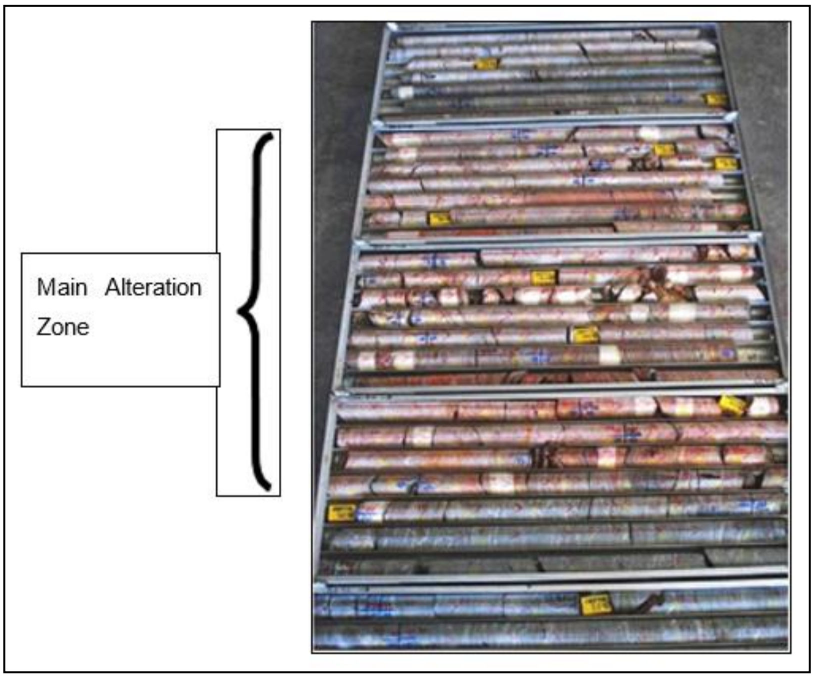
Shearing is very common in the alteration zones. In most sections, there is a prominent shear zone at or near the footwall, which is itself variably albitized and carbonatized. The shear zones range from centimetres to as much as five metres wide and the shear fabrics are cut by both albitite and carbonatite suggesting that they represent structures that pre-date the mineralization. There is a main footwall shear zone in most sections, which may be the controlling structure for much of the alteration and mineralization.

7.4.4 Nature of the Alteration

The alteration in Areas 4 and 2B is geologically and mineralogically very similar. In drillhole core, the zones are characterised visually by the bleaching and reddening that accompanies the alteration (Figure 7-18). The boundaries of the alteration zones are locally sheared and/or intensely broken, clearly indicating the structural nature of the zones. The structure is internally complex with multiple internal shears that are typically micaceous, characterised by the development of black biotite, phlogopite and chlorite as well as calcite.

The alteration and contained mineralization are characterised by both radiometric and geochemical anomalies. The presence of Th (see Section 7.4.6) results in a generally elevated radiometric signature in the alteration zones, although the Th is not always spatially associated with the REE. Geochemically, the alteration zones are characterised by elevated concentrations of the HREE, Y and P_2O_5 as well as Nb and Zr, although, as with Th, the Nb and Zr concentrations do not closely correlate with the HREE on a sample-by-sample basis (Figure 7-19). There are no correlations between the HREE and the LREE. Visual radiometric and geochemical characteristics allow the alteration zone to be readily traced between drillholes both down-section and along strike (Figure 7-20).

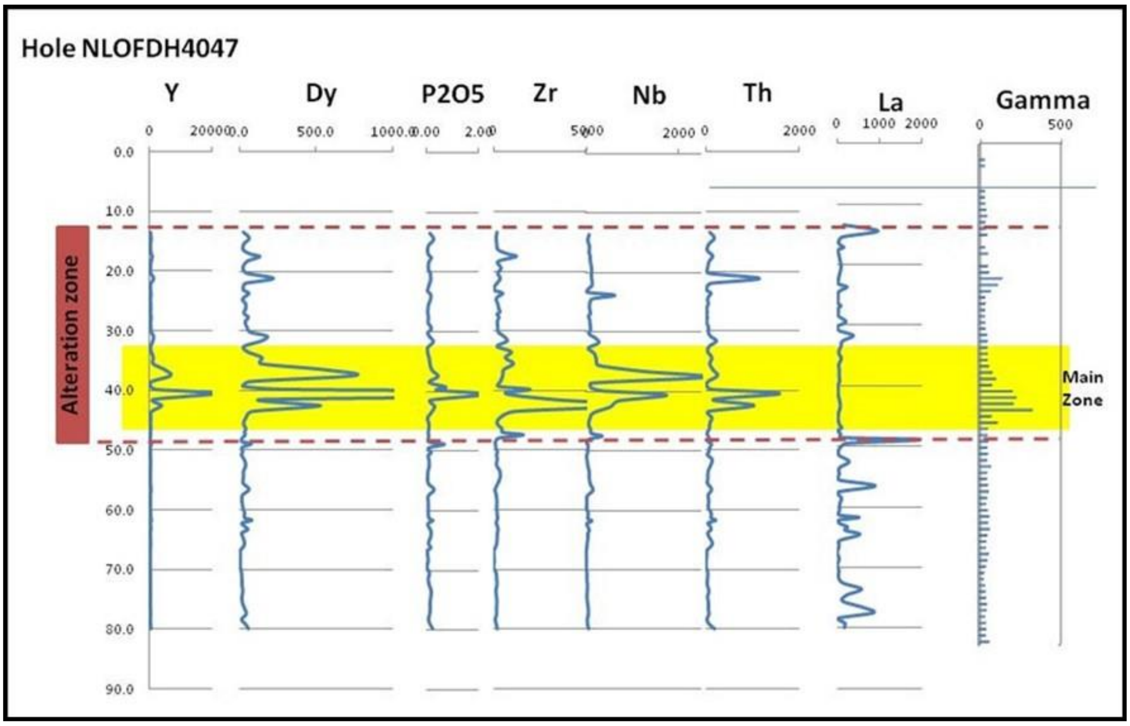
Figure 7-18
Colour anomaly in drillhole core associated with the Main zone alteration in Area 4



Source: *Swinden, 2012*

Figure 7-19

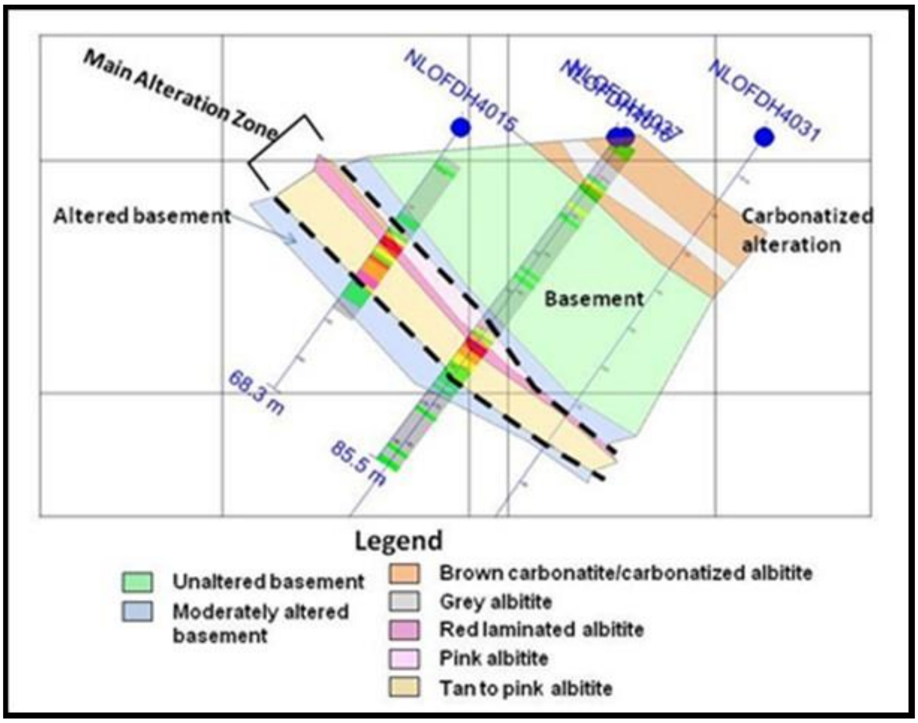
Schematic illustration of geochemical and radiometric anomalies associated with the Area 4 alteration zone in drillhole NLOFDH4047



Note: *Element concentrations in ppm except* P_2O_5 *in weight %. Depth in metres (vertical axis). Alteration zone is defined visually in drillhole core, Main zone mineralization by assays correlated with visual alteration.*

Source: *Swinden, 2014*

Figure 7-20
Schematic cross section of the upper part of the Area 4 Main alteration zone from drillhole data



Note: *Overlapping drillholes are NLOFDH4016 and 4037 which were twinned. Colour bars along drillholes represent concentrations of Y ranging from highest (red) through orange, pink, yellow and green to lowest (grey). Heavy dashed lines are structural boundaries of the Main zone.*
Source: *Swinden, 2012*

Rocks within the alteration zones are typically completely replaced by an assemblage containing variable proportions of albite, quartz, biotite/phlogopite, chlorite, calcite and iron oxides. The alteration is characterised by a pervasive background albitisation which has converted the entire rock mass to fine grained albitite. The early albitite has been brecciated and overprinted by a second generation of albite, calcite, brown calcite and dolomite, which locally form thin brown carbonatite veins, red iron oxides, and green to black biotite/phlogopite and chlorite (Figure 7-21). The alteration is typically texture-destructive and pervasive.

Figure 7-21
Typical alteration and mineralization in Area 2B

1 2 3

Note:

1. Early albite (white) brecciated and infilled by hydrothermal carbonate (brown)

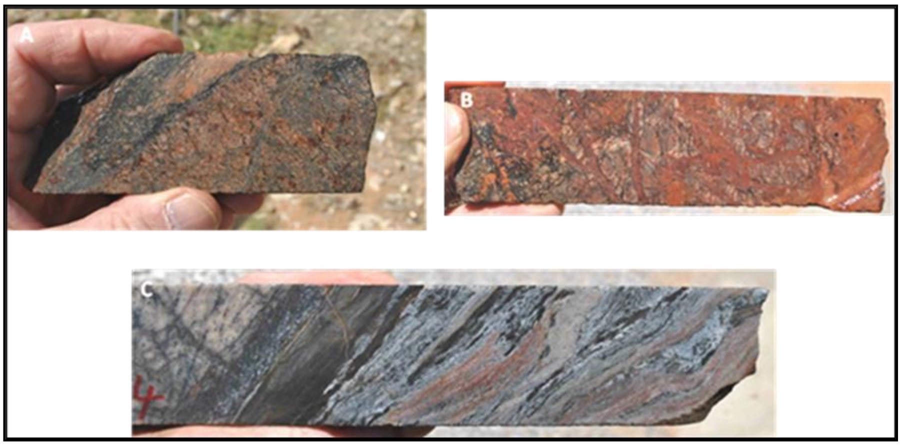
2. Alteration in drillhole core. White albitization overprinted by brown carbonate/iron oxides

3. Narrow highly mineralized iron oxide-rich vein cutting albitized, mica rich alteration

Source: *Swinden, 2010*

The alteration halo is typically broader than the mineralised intervals. Alteration relationships are complex, but there are regularities and consistencies to the distribution of mineralization. Mineralization is variously found in red to pink albite-rich veins and patches, black mica- and chlorite-rich alteration veins and shear zones, tan and silver-grey variegated albitite, white to grey dolomite, white, grey or yellow albitite, or brown carbonatite (Figure 7-22). Typically, several styles of mineralised alteration occur within the same drillhole and where the alteration is most complex; there are clear overprinting relationships between different generations of alteration. The main unifying geological characteristic of the higher-grade mineralization is the presence of complex overprinting relationships, reflecting multiple alteration events. Almost invariably, when paragenetic relationships between different generations of alteration are observed, the alteration associated with highest-grade mineralization is the latest event.

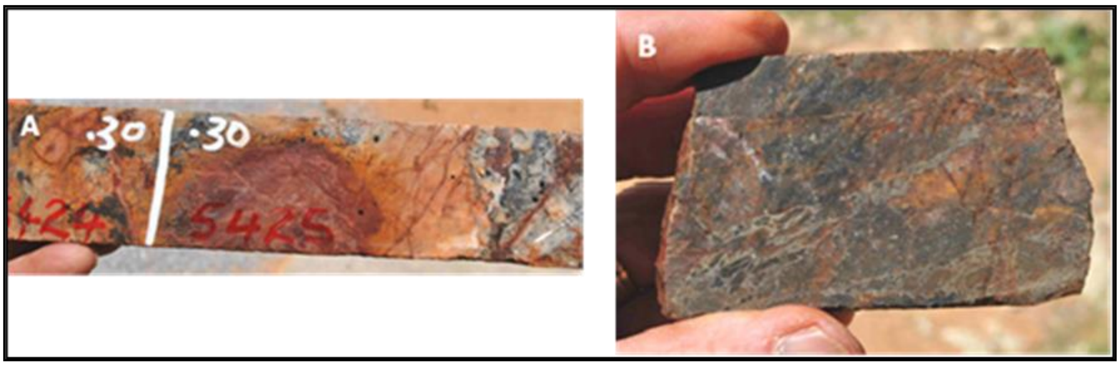
Figure 7-22
Examples of Area 4 alteration in drillhole core



Note: *A: Dark grey albite-calcite-biotite/phlogopite matrix with tan xenotime-rich alteration; B: Red vein network rich in HREE cuts a brecciated white albitite; C : HREE-rich red alteration cross-cuts shear fabric in a mica-rich shear zone*
Source: *Swinden, 2012*

In areas where significant grades and widths of HREE mineralization are intersected by drilling, the mineralised zones typically exhibit an increase in the background HREE content of more than threefold over the background in unmineralised rocks. These intervals generally contain local areas of high-grade mineralization that raise the overall grade from anomalous to economically-significant. High-grade mineralization may take various forms, the most common of which are veinlets, vein networks, alteration patches and micro-breccia veins (Figure 7-23). The higher-grade mineralization is characterised by extreme HREE enrichment ([HREE+Y]/[TREE+Y] >90%) and this enrichment typically extends beyond the boundaries of the higher grades into adjacent rocks where the overall grades are lower.

Figure 7-23
High grade mineralization in Area 4 alteration in drillhole core



Note: A : Red alteration patch in centre contains >10% Y; B : micro-breccia vein trends from lower left to upper right and matrix is rich in HREE
Source: *Swinden, 2012*

7.4.5 Mineralogy

Petrographic and scanning electron microscope (SEM) observations provide detailed information on the mineralogy of the mineralized zones. Most of the detailed work was carried out on Area 4, but regional studies in other alteration zones indicate that the mineralogical characteristics are similar throughout the property.

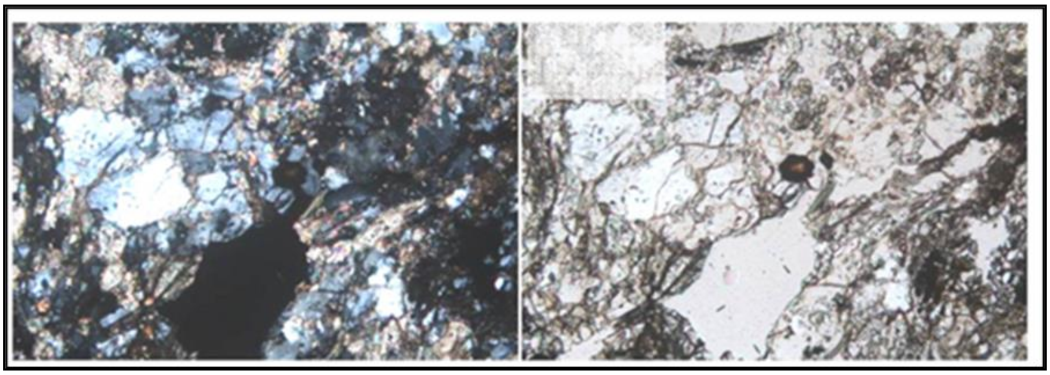
Detailed mineralogical studies of the Lofdal carbonatites and associated mineralization were first carried out by Mariano (2001) who studied a mineralised sample from a carbonatite dyke. His petrographic and cathodoluminescence studies showed the principal REE-bearing mineral to be xenotime, with associated monazite, parisite, apatite and thorite.

A petrographic study of 18 variably mineralised samples from outcrops in the Lofdal area was carried out by Schandl (2010). The principal HREE mineral identified was xenotime with minor aeschynite (Y). Minor amounts of LREE minerals were identified including bastnaesite, parisite, synchysite, monazite and a single occurrence of allanite. Schandl (2010) noted that the low Th content of most REE minerals may signal a hydrothermal origin and identified secondary albite, riebeckite and aegerine which were interpreted as evidence of sodic fenitisation.

Detailed mineralogical studies on a suite of outcrop samples by V. do Cabo of the GSN, including whole rock geochemistry and scanning electron microprobe studies, confirmed the dominance of xenotime in mineralised samples and identified a suite of accessory minerals that include zircon, monazite-(Ce), synchysite-(Ce), thorite, apatite and rutile in a calcite-albite-quartz-chlorite-Fe-oxide gangue (Wall et al., 2008).

Detailed mineralogical studies of mineralised drillhole core from Area 4 were undertaken by Dr. James Clark of Applied Petrographics (Clark, 2012). Petrographic and SEM studies show that the gangue to the mineralization comprises mainly albite, phlogopite/biotite and chlorite, calcite iron oxides and quartz. In most mineralised sections, the background lithology is albitite, dominated by coarse to fine crystals and crystal fragments of albite. The textures in the albitite indicate that it has been granulated resulting in remnant coarse albite crystals and crystal aggregates within a comminuted matrix of rock flour flooded by calcite and iron oxide (Figure 7-24).

Figure 7-24
Albitite with aggregates of xenotime and zircon



Note: *Aggregates of xenotime and zircon (high relief, examples highlighted), in association with calcite, distributed along micaceous stringers and intergranular to granulated albite. The dark brown phase near photo centre is niobian rutile. FOV=1.35 mm. Cross polars on left, plane light on right.*
Source: *Clark, 2012*

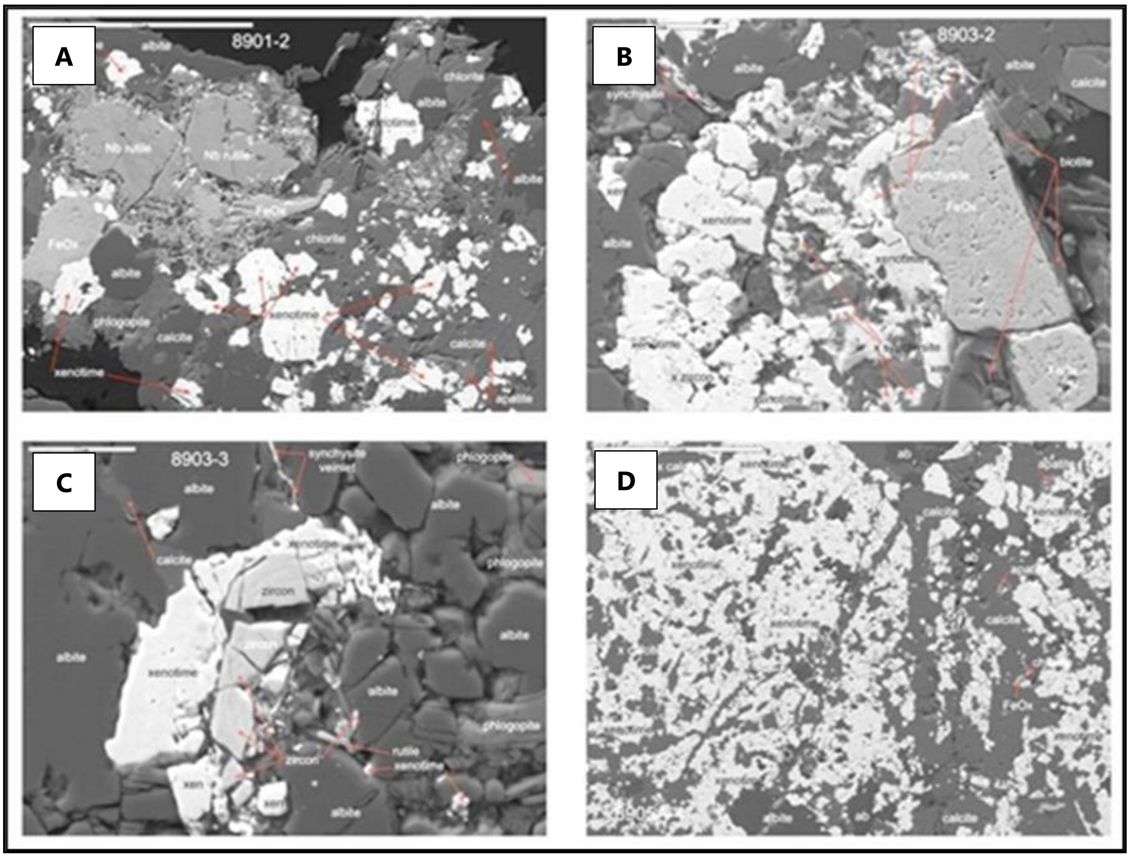
Accessory minerals, including REE-bearing phases, occur in the matrix, in hairline fractures and along shear fabrics defined by biotite/phlogopite. The working hypothesis is that pervasive albitisation was an early alteration event, and that the albitites were affected by further movement on the host structures, resulting in brecciation and the introduction of new hydrothermal fluids which resulted in overprinting alteration and mineralization.

The most abundant accessory minerals are Nb-rutile and rutile, zircon, thorite and apatite. Minor amounts of pyrite, ilmenite and galena were also identified.

The most abundant REE-bearing mineral is xenotime, which occurs in more than 80% of the samples examined from Area 4. Synchysite-(Ce) and Synchysite-(Y) are common, although minor phases, and minor amounts of monazite-(Ce), bastnaesite-(Ce), parisite-(Ce) and aeschynite-(Y) are locally present as well as a number of REE- bearing phases that have not yet been identified. SEM spectra suggest that some REE may be present in zircon and thorite.

SEM backscatter images show that the mineralization is typically fine grained. Individual grains and grain aggregates are locally >100 µm but are typically less than 50 µm. Xenotime is locally intergrown with zircon, rutile and thorite on a fine scale (Figure 7-25).

Figure 7-25
Backscatter images of Area 4 mineralization



Note:

A : Xenotime crystals and aggregates in a lens of calcite and phlogopite/chlorite. Rutile and niobian rutile are present, along with minor accessory apatite and iron oxide after sulphide. Scale bar is 200 µm;

B : Xenotime aggregates locally envelop earlier-crystallising zircon. Minor synchysite is intergranular to albite and biotite, and locally in edge contact with xenotime. Scale bar is 50 µm;

C : Xenotime deposition along a rounded edge of the zircon crystal at photo centre. Xenotime appears to nucleate on the earlier zircon. Phlogopite and granulated albite are the gangue phases. Scale bar is 20 µm;

D : Monophase xenotime aggregates. Scale bar is 200 µm.

Source: *Clark, 2012*

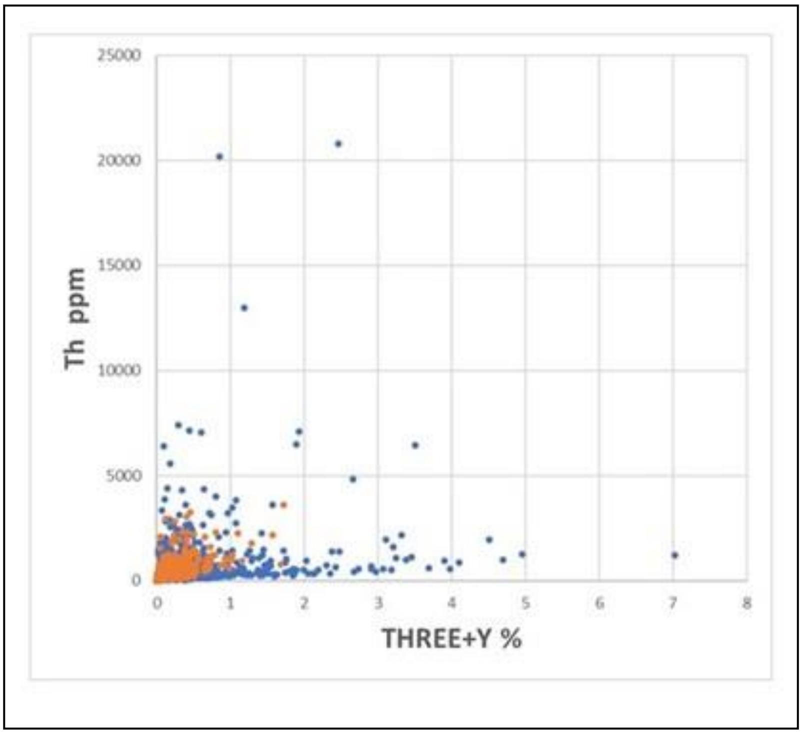
Loye (2014) carried out a detailed study of the Area 4 alteration and mineralization using observations of drillhole core, geochemistry, cathodoluminescence, SEM and microprobe data. He recognized six different modes of occurrence of xenotime and ascribed these to an extended process of HREE mineralization and remobilisation spanning the late magmatic and hydrothermal phases of the intrusions. His model involves early ground preparation of key structures by alkalic fluids expelled during crystallisation of the nepheline syenites, which resulted in pervasive and widespread albitisation. Continued movement on these structures resulted in brecciation of the brittle albitites. Fluids exsolved from carbonatite magmas utilised the fluid pathways created by the brecciation, overprinted the albitites with a complex alteration assemblage that included dolomite and ankerite, biotite/phlogopite, iron oxides and pyrite, and a variety of accessory phases, and introduced HREE rich mineralization. Early alteration was dominated by calcite and dolomite, and late alteration by ankerite. Late alteration fluids re-worked the early alteration assemblages remobilizing and redistributing previously present REE.

7.4.6 Thorium

The presence of thorium (Th) can potentially be problematic in carbonatite-associated REE deposits because of its radioactive nature. Alteration associated with REE mineralization in the Lofdal Carbonatite Complex is variably anomalous in Th, and this largely contributes to the regional Th airborne radiometric anomaly that defines the area of interest. It also provides a convenient and important prospecting and evaluation tool on the ground, as most carbonatites and their associated alteration have elevated radiometric signatures.

The alteration zones in Areas 4 and 2B typically carry anomalous concentrations of Th (approximately 2% of drill samples returned >1,000 ppm Th), and the zones give a low-level radiometric response which is generally a good guide to mineralised alteration zones. However, overall, there is not a close geochemical relationship between the HREE and Th. Figure 7-26 shows the total HREE versus Th results for 5,940 drillhole core and trench samples from Area 4 and Area 2B.

Figure 7-26
THREE versus Th in trench and drillhole core samples



Note: *Although Th is locally present in mineralised samples and radiometrics often provide a good guide to mineralization, there is no clear geochemical correlation between Th and the HREE.*
Blue dots- Area 4; orange dots-Area 2B
Source: *Swinden, 2021*

7.4.7 Mineralization Summary

Mineralization in Areas 4 and 2B is structurally controlled and hydrothermal in origin. The host structures are first- and perhaps second-order basement structures that were apparently reactivated more than once during the mineralizing event. Repeated movement promoted the introduction of several generations of hydrothermal fluids, which resulted in a complex series of overprinting alteration events. The mineralization is dominantly present in xenotime and is interpreted to be related to the waning stages of hydrothermal alteration related to carbonatite intrusion. The highest-grade mineralization does not occupy a consistent position within the structural zones. It is interpreted to occupy structures within the zone that were still open during the last phases of hydrothermal alteration. The mineralised structures can be traced from hole to hole and are variably mineralised.

8 DEPOSIT TYPES

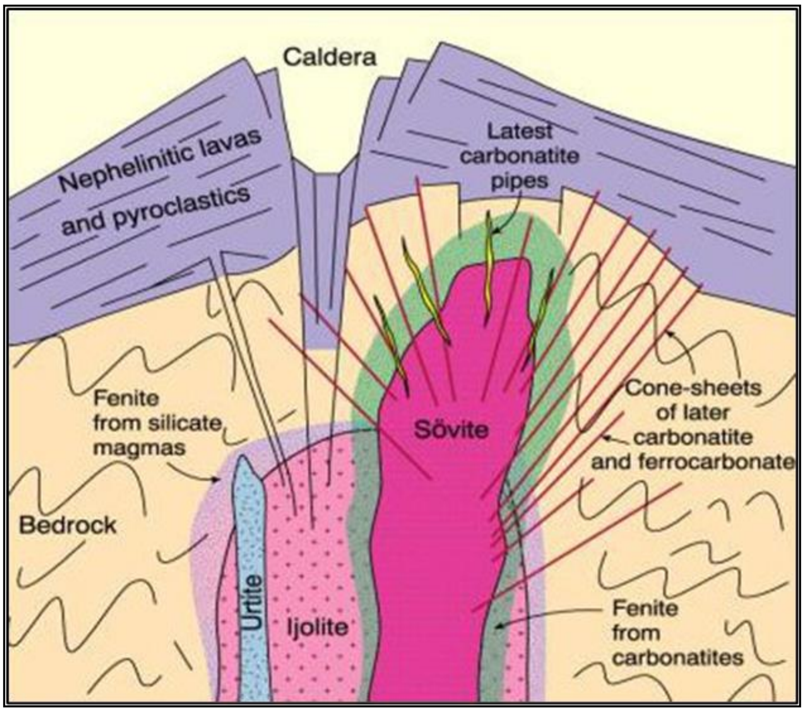
8.1 General Models for REE Mineralization in Carbonatites

Carbonatites and related, often undersaturated, silicate rocks originate in the earth's mantle through very low degrees of partial melting. They typically display geochemical enrichments in Ba, Nb, P, Fe, Ti, REE, F, Sr, Ta, Th, U and Zr. Carbonatites are important for a variety of economic mineral deposit types including REE (e.g., Bayan Obo, Mountain Pass), Nb (e.g., Araxa, Oka), Ti (e.g., Tapira), P (e.g., Araxa, Palabora), vermiculite, and fluorite (e.g., Okoruso). Carbonatite-associated deposits, including the giant Bayan Obo deposit in China, are the principal source of REE. Carbonatites are the focus of much current exploration for REE throughout the world.

A widely cited general model for the intrusion of a carbonatite complex (Le Bas, 1987) is shown in Figure 8-1. Although most complexes differ from each other in detail, this model provides a useful framework for description of observed mineralization at Lofdal. At Lofdal, the early silicate intrusions are dominantly syenite and nepheline syenite, rather than ijolite and urtite. Like the model, they are succeeded by a sovite intrusion (the Main intrusion) and by one and potentially more, subsidiary intrusive plugs, represented by the Emanya intrusion.

Similar to the model, Lofdal has abundant later stage dykes of both silicate (phonolite) and carbonatite, ranging in composition from calcitic through dolomitic and ankeritic phases. There is abundant fenitisation related to hydrothermal alteration around the margins of the intrusions and in basement structures that have served as pathways for both phonolite and carbonatite magmas and later hydrothermal fluids.

Figure 8-1
General cross-sectional model for an alkali silicate-carbonate intrusive complex (after Le Bas, 1987)



Note: *Early silicate intrusions are intruded by carbonatite intrusions, which are cut by later carbonatitic dyke complexes.*

REE, particularly the LREE, are typically significantly enriched in carbonatites over normal crustal abundances – a result of their partial melting history in the mantle, subsequent concentration through fractional crystallisation in the crust and sub-solidus hydrothermal activity accompanying the intrusion. Locally, the enrichment in REE produces deposits of economic proportions. Mariano (1989) identified three types of mineralization that might be expected in a carbonatite complex:

- Magmatic primary crystallisation of REE minerals;
- Hydrothermal concentration; and
- Supergene concentration.

The rocks at Lofdal are not deeply weathered and there is a very low likelihood of extensive supergene enrichment. However, there is significant potential for both magmatic and hydrothermal deposits.

There appear to be at least two styles of mineralization on the Lofdal property:

- Early LREE-enrichment in magmatic carbonatites, particularly the Main and Emanya intrusions: Absolute abundances in the Main intrusion do not appear to attain economically interesting grades but overall grades are higher in the Emanya intrusion. Associated sovite dykes are also significantly LREE-enriched; and

- Late hydrothermal mineralization characterised by extreme HREE enrichment: This mineralization is dominantly structurally controlled and occupies hydrothermal alteration zones within major structures. This mineralization is characteristic of Area 4 and Area 2B where diamond drilling has outlined mineral resources.

8.2 Magmatic Mineralization

It is rare to find a REE deposit that has formed through primary crystallisation from carbonatite magma. The best-known example is the Mountain Pass deposit in California where a 1.4 Ga intrusive complex consisting of a total of eight plugs, ranging in composition from shonkinite to carbonatite, intrude Precambrian basement metamorphic rocks (Castor, 2008). The deposit reportedly has "current reserves" of more than 20 million tonnes of ore with an average grade of 8.9% rare-earth oxides (Castor, 2008). The ore typically contains 10% to 15% bastnäsite-(Ce) with subsidiary monazite and apatite, and is mostly composed of calcite, dolomite and barite, with generally minor amounts of other minerals. Texture and mineral paragenesis shows that bastnaesite and parasite are primary magmatic minerals.

The Mountain Pass carbonatite plug provides an analogue for potential LREE targets at Lofdal. There is widespread LREE-rich mineralization in both intrusive plugs and carbonatite dykes, particularly in the central intrusive core of the Lofdal complex. This mineralization has not been extensively explored to date, with the exception of seven drillholes testing the Emanya intrusion. The carbonatite intrusion at Mountain Pass is comparable in size to the Emanya intrusion and there is potential for the discovery of additional plugs of similar size at Lofdal. There continues to be significant potential for LREE-rich mineralization associated with the intrusion of the Lofdal carbonatites but to date, exploration has not focused on the LREE targets.

8.3 Hydrothermal Mineralization

There is abundant evidence, both observational and theoretical, that REE minerals are precipitated from hydrothermal solutions (Williams-Jones et al., 2013) and, according to Mariano (1989), this is the origin of REE minerals in most carbonatites. REE mineralization in carbonatites may result from the breakdown of REE-bearing primary minerals such as calcite, dolomite, apatite or sulphides. The solutions become increasingly enriched in Ba, F, SO, Sr, REE and Th, and precipitate REE phosphates if phosphate is available, or carbonates if phosphate is not sufficiently abundant. The REE mineralization in these environments tends to mirror that of the original carbonatite, i.e., fractionated in favour of the LREE.

The Emanya intrusion has abundant iron oxide veining and locally fluorite, indicating that some hydrothermal alteration has occurred and its REE concentrations are significantly enriched over those in the Main intrusion, although it is still LREE-dominated. Like the Emanya intrusion, many of the carbonatite dykes are significantly enriched in REE and fractionated in favour of the LREE.

At Lofdal, in addition to the LREE-enriched carbonatite-hosted mineralization, there is a late stage, structurally-controlled hydrothermal alteration that has resulted in HREE-rich mineralization in dynamic basement structures (see Figure 7-11 and Figure 7-13). These structural zones apparently acted as fluid pathways during mineralization and late-stage alteration in these structures introduced a HREE-rich mineral assemblage dominated by xenotime, and accompanied by zircon, rutile, apatite, fluorite and thorite. This is economically significant because it is the HREE that are the most valuable of the REE.

The current working hypothesis is that this HREE-rich hydrothermal alteration resulted from some combination of extended fractional crystallisation of the carbonatite magma and/or differential transport of the REE in exsolved hydrothermal fluids. Crystallisation of LREE-rich minerals early in the fractionation history could have resulted in a HREE-rich residual fluid phase, which escaped into selected structures during the later stages of crystallisation, resulting in the HREE-rich mineralization (Swinden and Burton, 2012). Depending on the chemistry of the hydrothermal fluids, fractionation of the HREE from LREE may also have occurred as a result of hydrothermal activity.

To date, the highly anomalous HREE enrichment at Lofdal has only been observed in selected structures associated with a complex series of alteration lithologies. The origin of the HREE enrichment is still uncertain. If it represents a late-stage fluid that evolved from extended fractionation of carbonatite magma, then the possibility exists that a plug of similar enrichment may be present in the subsurface. Alternatively, this HREE event may record expulsion of late hydrothermal fluids that re-distributed HREE already present in the rocks, in which case the primary targets will continue to be in the structures.

9 EXPLORATION

- NMI began exploration on EPL 3400 in 2006. Exploration to date includes:
- Regional and detailed exploration between 2006 and 2008 for copper and gold, targeting an IOCG model.
- Regional assessment of the REE potential of the Lofdal Carbonatite Complex beginning in 2008 and continuing to the present.

9.1 Copper – Gold Exploration: 2006 – 2008

NMI was originally attracted to the Lofdal area as an IOCG target (Lobo-Guerrero, 2005). The model was predicated on the presence of copper sulphides associated with magnetite in the matrix of hydrothermal breccias and sulfidation accompanying magnetite and hematite in quartz veins possibly related to REE, Th, U and P bearing carbonatite dykes.

The IOCG exploration program consisted of:

- A comprehensive structural and satellite mapping exercise over an area of more than 10,000 km^2. The work was carried out under contract by the NPA Group of consultants, London, UK. Additional Landsat images were obtained and the Landsat thematic mapper ™ images with two spectral bands (bands 5 and 7) in the Short-Wave Infrared (SWIR) were used to identify targets/outcrops of hydrothermal alteration and to delineate major structural features.
- Targets generated by the NPA study, as well as other areas of interest, were systematically sampled by NMI personnel who collected a total of 2,371 rock grab samples. During the latter part of this phase of exploration in 2008, the first 255 samples were collected from the Lofdal Carbonatite Complex.
- Areas returning anomalous Au values were sampled further, and a program of detailed geological mapping and trenching was undertaken to assess the most prospective targets. Three of these targets were tested by reverse circulation drilling in 2008 but no significant Cu-Au mineralization was found.
- An orientation stream sediment geochemical program was undertaken by NMI personnel in the area of the former Lofdal Copper Mine but did not generate any significant targets.

Virtually all of this exploration was outside of the current area of interest for REE mineralization and few of the data are directly applicable or relevant to the current project. Where the 2006 to 2008 data are relevant to the REE exploration, they are noted in the following sections.

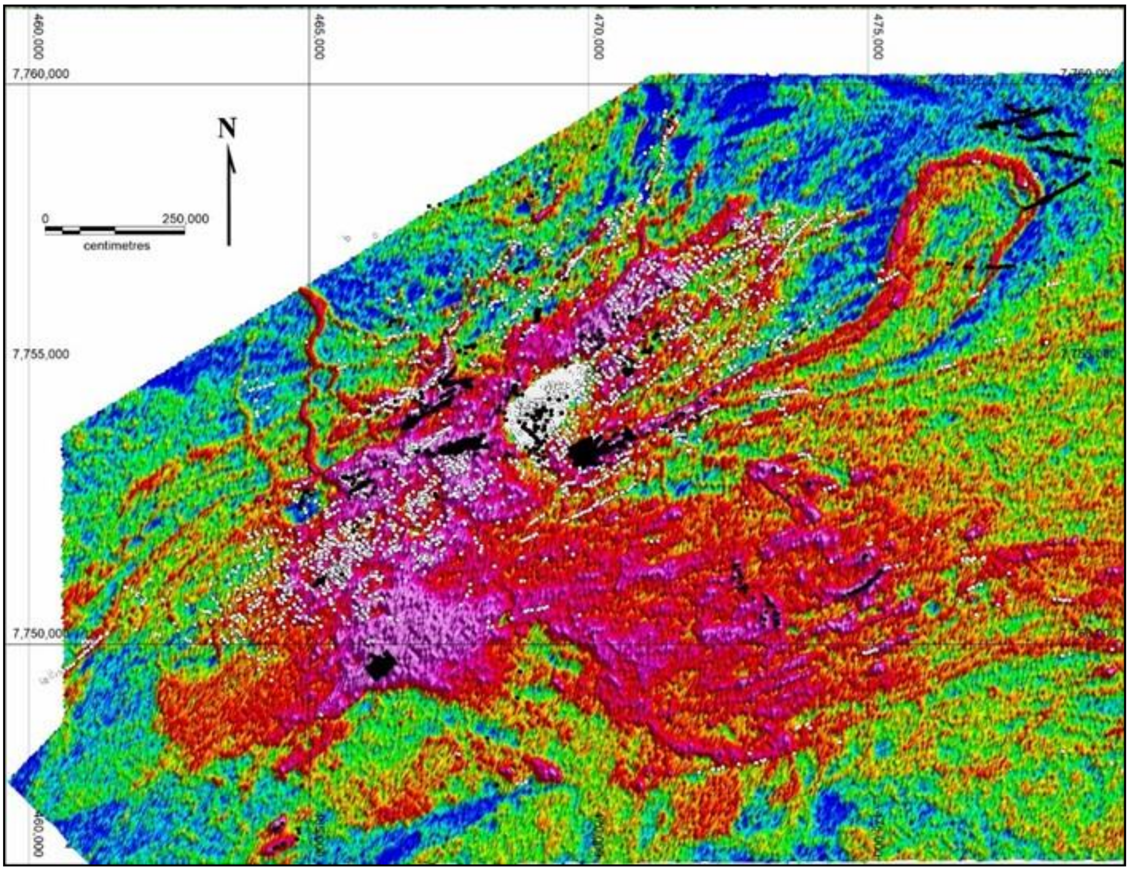
9.2 Regional Assessment of Rare Earth Element Potential

9.2.1 Geological and Lithogeochemical Survey

Lobo-Guerrero (2005) recognized and recommended to NMI the potential for REE mineralization associated with carbonatite dykes in the area. This potential was reinforced by the results of investigations by the GSN on the carbonatite. The company initiated an exploration campaign to test this potential towards the middle of 2008.

The initial regional field surveys of the Lofdal Carbonatite Complex were carried out by NMI personnel in two field campaigns from 2008 to February 2010. The aim was to systematically map and sample REE mineralization within the Lofdal Carbonatite Complex. The area of interest was defined by an airborne radiometric high (dominantly thorium) that NMI personnel interpreted to potentially define the extent of the intrusive complex. Sampling during these two campaigns covered roughly the northwestern half of the thorium anomaly, including the areas of known REE mineralization (Figure 9-1).

Figure 9-1
Distribution of regional lithogeochemical samples in the Lofdal area



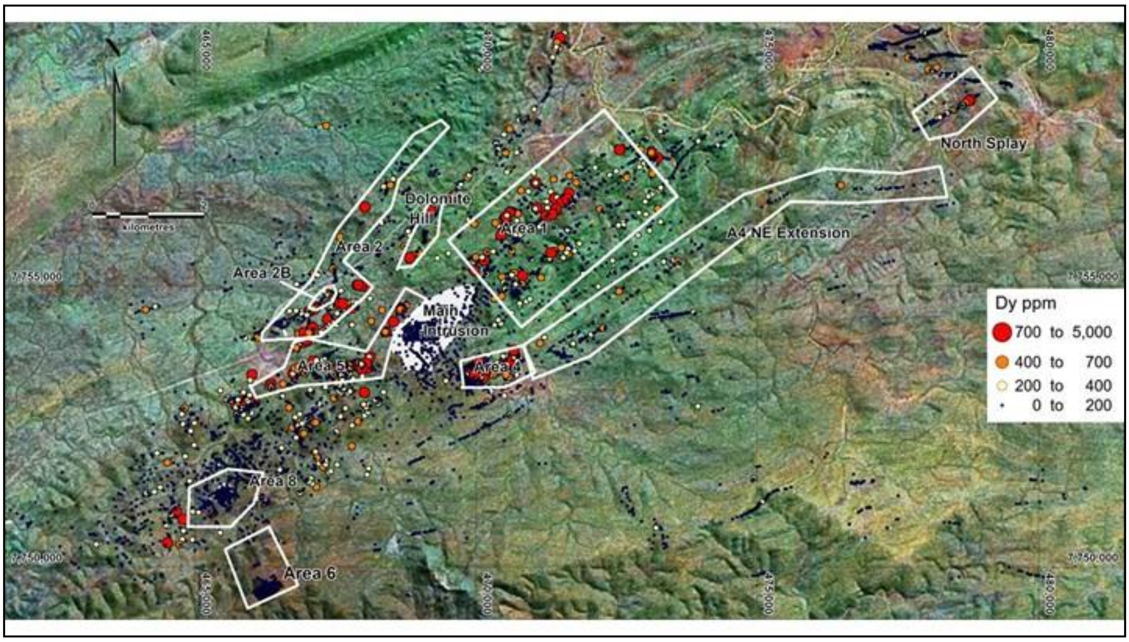
Note: *Samples taken before early 2010 are indicated by white dots, samples taken after late 2010 are indicated by black dots; Background map shows Th radiometric counts from the 2010 airborne survey; Red and purple colours represent high values and define the extent of the Th anomaly associated with the Lofdal Carbonatite Complex. Intrusion (Carbonatite) shown in grey.*
Source: *Base map from New Resolution Geophysics, 2010*

In addition to the regional traversing, detailed sampling on approximately 50 m intervals was carried out over the Emanya intrusion and portions of the Main intrusion with 217 samples collected from the Emanya intrusion and 171 from the Main intrusion. A total of 3,680 grab samples were taken during these campaigns and the results were discussed in detail by Swinden and Siegfried (2011).

Surface grab samples continued to be a principal exploration tool on the property between 2011 and 2013. Regional geological mapping, coupled with regional airborne geophysics, continued to identify new alteration zones and carbonatite dykes which were systematically sampled to test their mineralizing potential and define drill targets. Systematic surface grab sampling was carried out to better define the mineralized systems throughout the area of interest (Figure 9-1). This sampling totalled approximately 1,900 additional samples. All surface grab samples were analysed at Actlabs in Ancaster, Ontario. The grab samples were analysed for the same suite of trace elements and were subjected to the same QAQC protocols as the drillhole core samples from Area 2B (detailed in Swinden and Siegfried, 2011) and Area 4 (detailed by Siegfried and Hall, 2012).

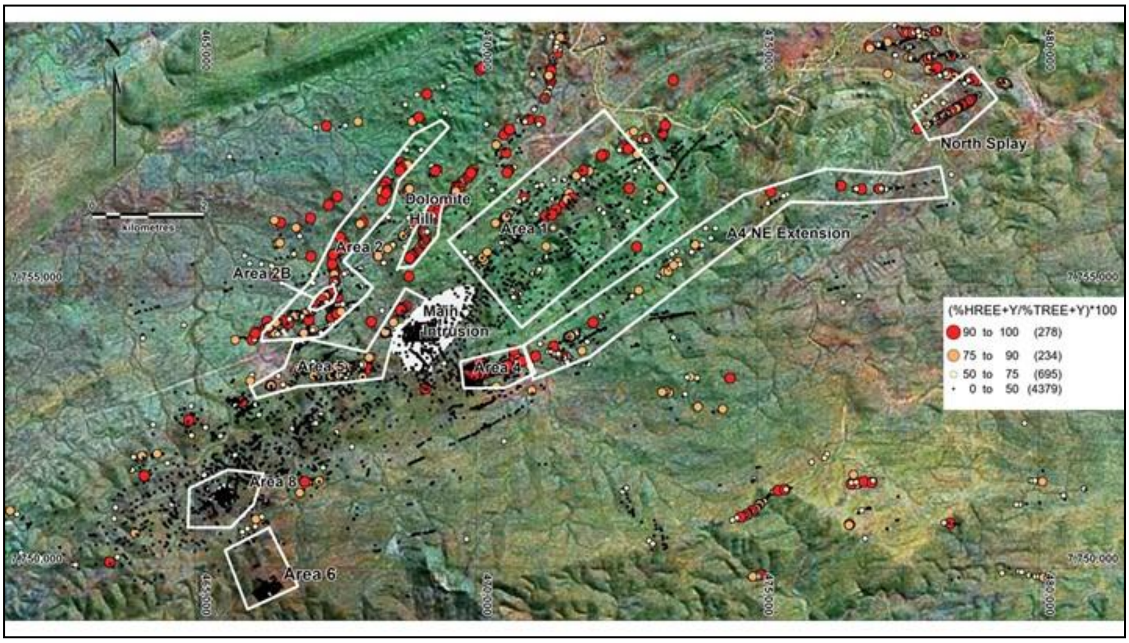
The lithogeochemical surveys outlined the distribution of the REE mineralization at a district scale. They showed that there is considerable variation in the mineralization of the alteration systems – some being well mineralized and others containing no REE. Within the REE-mineralized zones, there is considerable variation in the grade of REE mineralization at both large and small scales. Mineralization is dominantly hosted by basement structures which have been altered and mineralized by hydrothermal fluids and intruded by carbonatite dykes. The linear spatial distribution of anomalous grab samples reflects the favourable structures, provides further evidence that only certain structures on the property contain significant HREE mineralization (Figure 9-2) and allowed these structures to be traced for considerable distances along strike. The regional geochemical surveys showed that the most favourable structures are notably enriched in the HREE and integration of surface lithogeochemistry with regional geophysical and geological studies resulted in the definition of nine priority exploration areas on the property (Figure 9-2 and Figure 9-3) and were a primary tool in identifying drilling targets within these areas. Priority target areas have all been tested by drilling (see Item 10).

Figure 9-2
Priority exploration areas defined by Dy in surface lithogeochemistry samples



Source: *Base map sourced from Landsat Geocover mosaic, 2011*
Note: *Main intrusion shown in grey for reference.*

Figure 9-3
Priority exploration areas defined by HREE/TREE ratio in surface lithogeochemistry samples



Source: *Base map sourced from Landsat Geocover mosaic, 2011*
Note: *Main intrusion shown in grey for reference.*

9.2.2 Remote Sensing and Regional Geophysics

The results of the regional remote sensing and geophysical surveys were previously reported by Swinden and Siegfried (2011) and are summarized in Table 9-1. NMI has made extensive use of remote sensing data in interpreting the geological relationships on the property and identifying priority exploration targets.

Table 9-1
Summary of remote sensing and regional geophysical surveys and interpretations

Method	Contractor	Objectives	Results
HyMap data analysis – 126 bands from 0.4 to 2.5µm t 4.6m resolution	NamibGeoVista (2010)	Identify hyperspectral signatures characteristic of carbonatite dykes and plugs.	Successfully imaged larger carbonatite and phonolite dykes.
ASTER	NPA Fugro (2010)	Interpret geology, delineate carbonatite bodies.	Data reflect mineralogical characteristics of some basement lithologies. Not effective in targeting individual dykes or intrusions.
Structural interpretation using Landsat/HyMap	NPA Fugro (2010)	Identify major structural features.	Identified and mapped major first order shear zones and other second order structures, some of which are mineralized; provides a structural context for the basement and the Lofdal Carbonatite Complex intrusions.
Integration of remote sensing data with geophysics and geochemistry	NPA Fugro (2010)	Identify priority target areas.	First pass at regional target definition Primary targets identified using magnetic, calcite/iron spectral signatures, structural control, Th radiometric signature and HREE in proximity. Secondary targets as above but lacking strong magnetic signature.
High resolution airborne radiometric and magnetometer survey; helicopter-borne, 75 m line spacing, 3760 line km at 315°Az	NPA Fugro (2010)	Achieve better resolution of radiometric and magnetic features.	Confirmed the radiometric signatures of the carbonatite intrusions and dykes. Confirmed that individual dykes can be traced. Confirmed interpreted structural trends.
Regional ground radiometric, magnetic, gravity profiles (5 lines)	Greg Symons Geophysics (2010)	Test geophysical signatures of intrusions and airborne geophysical targets, test whether gravity identifies known intrusions and can identify buried bodies.	Radiometric and magnetic data respond to individual dykes, consistent with airborne results. Gravity was inconclusive regarding response of carbonatite intrusions or presence of additional carbonatite bodies at depth.

The 2010 high-resolution airborne survey provides high-resolution information that correlates well with existing geological, geophysical and lithogeochemical data for the area. In particular:

- It confirmed the contrasting radiometric signatures of the Main and Emanya intrusions.
- The resolution was sufficiently high to confirm and enhance the mapping of REE-bearing structures.
- It confirmed interpreted structural trends and allowed more detailed mapping of major structures across the area, particularly where these structures appear to have served as conduits for carbonatite intrusion and mineralization.

In summary, the regional exploration identified multiple, high quality REE target areas and demonstrated significant potential for discovery of deposits of REE associated with the Lofdal Carbonatite Complex. Key results of the regional exploration include:

- Recognition of the district scale thorium anomaly which provides a first order regional target for REE exploration in the Lofdal area.
- Dramatic expansion of the number and extent of known carbonatite dykes and related alteration zones and documentation of their geological characteristics and associated REE.
- Recognition that carbonatites and the associated rocks are extensively hydrothermally altered and variably mineralised with REE.
- Recognition that the HREE-rich mineralization is structurally controlled and that certain structures are preferentially enriched in HREE mineralization.
- Geological and geophysical characterisation of two intrusive plugs in the centre of the complex.
- High resolution geophysical characterisation of the area, interpretation of the regional structural setting of the complex, and recognition of hyperspectral and geophysical signatures that characterize carbonatite dykes and plugs.
- Identification of a number of high-priority target areas for detailed exploration with new targets being generated as field work and compilations continue.

9.2.3 Regional Geological Mapping

Published geological maps for the Lofdal area are at a scale of 1:250,000 (GSN, 2006). This is too broad a scale to be useful for property-scale investigations. Accordingly, detailed mapping of the core of the Lofdal Carbonatite Complex was initiated in 2010 and continued through the latter part of 2013. The mapping was carried out by geologists of South Africa-based Remote Exploration Services Ltd. (RES) on 100 m spaced traverse lines. Extensive use was made of hyperspectral data, which was recognized to closely reflect basement lithologies and areas of hydrothermal alteration. This allowed accurate extrapolation of rock units and alteration zones between and beyond traverse lines. The mapping began with detailed mapping in Areas 2 and 4 to support the planned trenching and drilling in 2010 and then expanded to include the area of the intrusive core of the Lofdal

Carbonatite Complex. The mapping continued in 2012 and 2013 in outlying areas of the property and by the end of 2013, the entire extent of the thorium anomaly that defines the exploration area of interest had been geologically mapped. The geological map of the property is shown in Figure 7-4.

Detailed mapping has contributed to the understanding of the geology and therefore the exploration at Lofdal in several important ways:

- Clarified the nature and distribution of basement lithologies.
- Clarified the distribution of intrusive lithologies related to the Lofdal Carbonatite Complex. It demonstrated that the Main intrusion is dominantly syenite at the current level of exposure, but, close to the contact with the underlying white calcite carbonatite, it identified and mapped the distribution of two additional nepheline syenite plugs to the southwest of the Main intrusion and mapped the extent of the Emanya carbonatite intrusion.
- Mapped the distribution and intensity of phonolite and carbonatite dykes related to the complex.
- Mapped the distribution of Lofdal breccias, showing that they are widespread along the axis of the Lofdal intrusions. The intrusive axis of the Lofdal Carbonatite Complex, as defined by nepheline syenite and carbonatite intrusions and related breccia, occupies a strike length of more than 6 km.
- Showed that most intrusions have a halo of fenitisation and that hydrothermal alteration in the form of albitisation can be mapped out along some major structures for several kilometres along strike. The combination of alteration, anomalous HREE geochemistry and radiometric anomalies related to Th have been important in identifying priority exploration targets in the complex.
- Traced hydrothermal alteration zones along strike well beyond their previously known extent and identified a number of new albitite-carbonate alteration systems, particularly in the northeast and southeastern parts of the property, that comprise exploration targets for further concentrations of HREE.

9.3 Target Exploration in Area 2B

The regional assessment of the REE potential of the Lofdal Complex led to an initial selection of Areas 2 and 4 for more detailed exploration (Figure 9-2). The areas were chosen on the basis of the presence of carbonatite dykes and albitic/carbonatitic alteration zones with significant widths in outcrop, a high relative proportion of samples with anomalous REE values (particularly high HREE/TREE ratios), and geophysical / hyperspectral signatures potentially indicating the presence of more extensive zones of carbonatite. The initial focus of this work was the prominent carbonatitic and albitic alteration zone in Area 2B. The exploration of this zone comprised detailed geological mapping, lithogeochemistry and trenching and was largely completed during 2010. This work was described in detail by Swinden and Seigfried (2011) and is summarized in the following sections:

9.3.1 Geological Mapping and Lithogeochemistry

Area 2B contains a segment of a regionally significant, ±3 km long, carbonatite dyke – alteration system in which almost 50% of surface samples contain more than 0.5% TREE and more than 25% of samples contain more than 0.1% HREE. Regional mapping defined the overall setting of the zone and detailed mapping in Area 2B defined a mineralized alteration zone that is exposed over significant widths (up to 70 m at surface) along a strike length of more than 650 m. The detailed mapping showed that the Area 2B alteration/carbonatite zone strikes approximately 060° and dips steeply to the SE, cutting the structural grain of the basement at a high angle. The basement comprises mainly interlayered amphibolite and quartzo-feldspathic gneiss, locally cut by coarse grained pegmatite. Abundant carbonatitic dykes in this area vary widely in orientation but there is a dominant northeasterly strike similar to the mineralized alteration zone.

Detailed mapping showed that the alteration is dominantly expressed as an early pervasive albitization, which has been brecciated and overprinted by an albite-carbonatite-mica assemblage. There are abundant breccias in which angular albitite fragments are surrounded by carbonatite, indicating that the alteration zone was a brittle fracture zone throughout its active history.

The zone was initially targeted by the results of regional grab sampling. A second round of more detailed surface sampling resulted in a surface suite of approximately 50 grab samples. These samples were intended to be broadly representative of the mineralized zone but were not taken on a systematic grid pattern so do not provide a complete picture of the grade distribution in the surface exposure of the alteration zone. The second round of sampling confirmed the anomalous nature of the alteration system overall and the fact that the REE are very unevenly distributed within the alteration. The five highest-grade analyses from these samples are presented in Table 9-2.

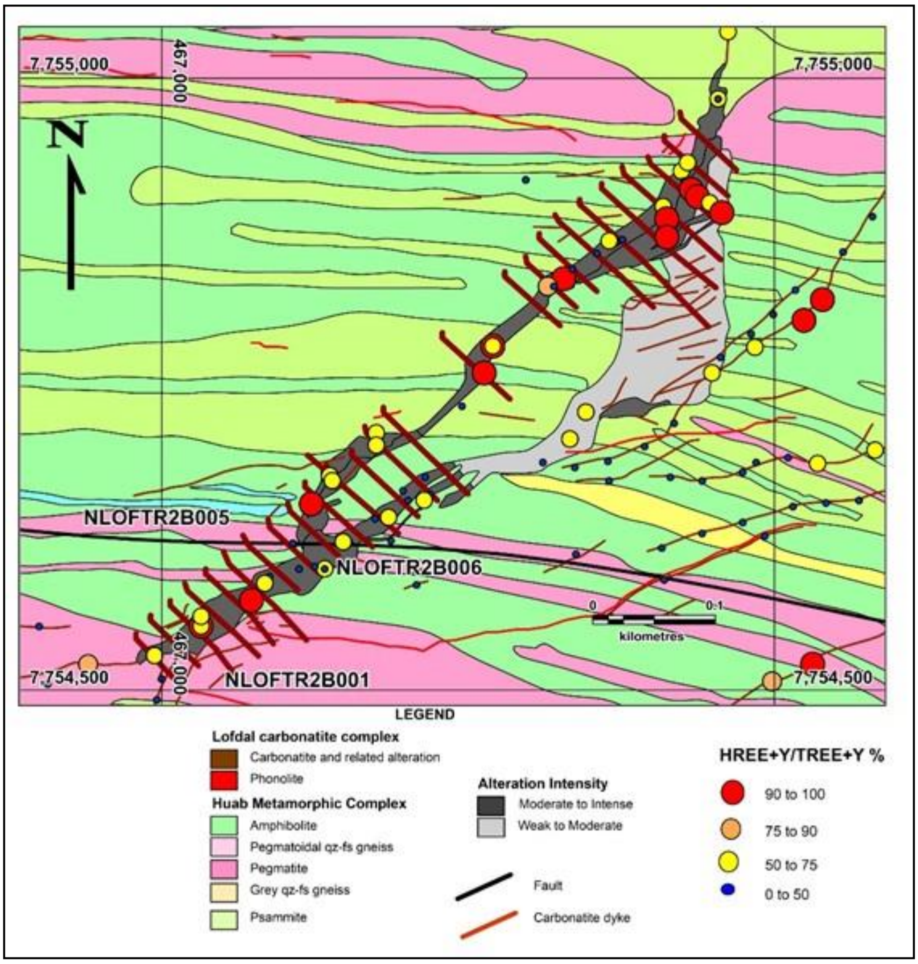
Table 9-2
Analyses of the five highest-grade surface samples in Area 2B

Sample	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Y ppm	HREE %	TREE %
NLOFR1636	1630	2560	243	1060	765	320	954	182	994	217	544	82.3	417	61.5	4840	0.86	1.48
NLOFR1653	1035	1640	149	526	301	174	648	163	945	201	469	67.1	319	43.9	4840	0.78	1.15
NLOFR1652	1640	2430	240	754	237	142	542	138	874	166	400	44.2	205	24.6	4220	0.67	1.20
ERN15349	1470	2060	186	574	254	120	392	81	529	110	321	44.4	265	35.5	3070	0.49	0.95
NLOFR1618	862	1385	163	805	764	246	730	99	456	75	211	30.0	198	27.8	2390	0.44	0.84

9.3.1.1 *Trenching*

25 trenches (Figure 9-4, Table 9-3) were dug across the Area 2B alteration zone to determine the distribution and geological setting of the REE in two dimensions. Trenching was carried out using a Bell 315J backhoe/loader (Figure 9-5). Bedrock is typically within 0.5 m of surface, although in parts of some trenches, up to 1.5 m of soil or calcrete cover was encountered. The trenches were then cleaned by hand in preparation for mapping and sampling (Figure 9-5) and metre waypoints were measured and marked by aluminium tags.

Figure 9-4
Trenches on the Area 2B Zone (heavy brown lines) – trenches listed in Table 9-4 are labelled



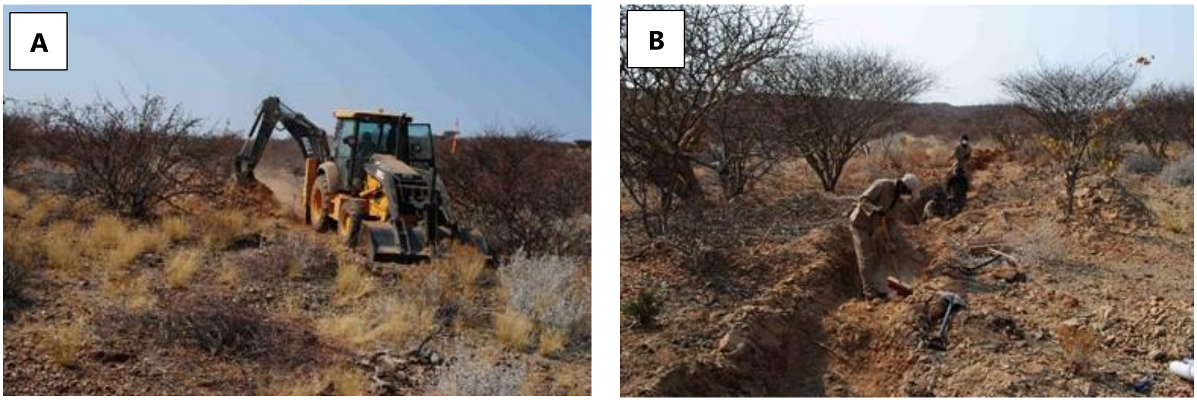
Source: *Swinden, 2020*

Table 9-3
Locational information for trenches on the 2B Zone – WGS84; UTM Zone 33S.

Trench ID	Easting (m)	Northing (m)	Elevation (m)	Azimuth (°)	Length (m)
NLOFTR2B001	467013.9	7754568.9	957.5	135	77
NLOFTR2B002	467032.8	7754582.8	957.3	135	76
NLOFTR2B003	467046.5	7754596.0	956.6	135	79
NLOFTR2B004	467063.3	7754602.5	956.4	135	87
NLOFTR2B005	467077.7	7754619.1	955.3	135	53
NLOFTR2B006	467102.3	7754628.1	955.1	135	53
NLOFTR2B007	467111.1	7754648.6	953.7	135	60
NLOFTR2B008	467121.7	7754667.5	952.4	135	74
NLOFTR2B009	467126.0	7754694.3	949.9	135	100
NLOFTR2B010	467154.2	7754698.8	949.4	135	81
NLOFTR2B011	467174.4	7754710.6	947.9	135	78
NLOFTR2B012	467189.9	7754725.0	947.2	135	92
NLOFTR2B013	467235.2	7754788.1	945.1	135	73
NLOFTR2B014	467300.3	7754827.7	949.5	135	31
NLOFTR2B015	467307.0	7754852.8	950.4	135	55
NLOFTR2B016	467317.9	7754865.5	951.4	135	58
NLOFTR2B017	467332.3	7754885.3	951.6	135	104
NLOFTR2B018	467346.3	7754895.3	952.9	135	145
NLOFTR2B019	467364.2	7754910.1	953.3	135	122
NLOFTR2B020	467382.9	7754923.9	953.7	135	105
NLOFTR2B021	467403.6	7754932.7	953.1	135	75
NLOFTR2B022	467415.3	7754953.9	951.1	135	72
NLOFTR2B023	467431.9	7754966.7	949.4	135	60
NLOFTR2B024	466982.1	7754542.0	956.7	135	53
NLOFTR2B025	466996.2	7754561.2	957.0	135	60

Figure 9-5

A – digging trenches on Area 2B with a backhoe, B – cleaning trenches in preparation for sampling and mapping



Source: *Swinden, 2010*

All trenches were geologically mapped prior to sampling and total average count radiometric readings were taken for each sample interval using a RadEye personal radiation detector (PRD). Total count K, U, and Th concentrations with a hand-held spectrometer and magnetic susceptibility readings were taken at 1 m intervals.

The trenches were sampled using a hand-held diamond saw to make two parallel cuts approximately four cm apart. Calcrete coatings were removed by hammer prior to sampling. The trenches were then continuously sampled with hammer and chisel by removing the rock between the saw cuts.

The results of trench mapping confirm the fine structure of the carbonatite/alteration system. The mineralized zone is characterised by carbonatite dykes of variable width associated with variably altered schists and gneisses. The alteration is characteristic of the mineralized zones and consists of variable, locally intense, albitization, carbonatization and local concentrations of phlogopite. Channel samples were taken throughout the entire length of the trenches to test whether mineralization is restricted to carbonatites or is related to hydrothermal alteration and occurs in other lithologies as well. The favourable zones of carbonatization, alteration, and mineralization are well outlined by both carbonatite intensity and by total count radiometric signature.

The results of channel sampling and analysis of trench samples were presented in detail by Swinden and Seigfried (2011) and the best intersections are summarized in Table 9-4. The alteration zone is generally characterized by significantly elevated REE contents as well as MnO and P_2O_5, Th, U, Ba, Nb and Zr. Similar patterns of enrichment are seen in the alteration zone in other trenches.

The alteration system and its associated radioactive and geochemical anomalies was encountered to varying degrees in all trenches in Area 2B. However, the assays show that the zone is not consistently mineralized along its length. The best mineralized intersections in terms of both grade and width were encountered in Trenches NLOFTR2B001, 005 and 006. The assay results for these mineralized zones are illustrated in Table 9-4. Quoted intervals are horizontal, not true widths. In all three trenches, REE mineralization is HREE-enriched and developed over widths of several metres.

This trench sample information contributed to the mineral resource model by providing a position to which the mineralised zone can be extended to surface from the shallowest drillholes. The grades of the samples were not used in the block model grade estimation, however, due to biases considered to be the result of very near surface enrichment with very limited vertical extent.

Table 9-4
Assays from best trench intersections -NLOFTR001, NLOFTR005 and NLOFTR006, Area 2B

Trench	From	To	Width (m)	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Y ppm	HREE %	TREE %
Trench 1	26	28	2	2338	3455	363	1758	1287	472	1574	238	1134	182	382	44	244	32	4479	0.88	1.80
	39	42	2	22	40	5	29	45	26	103	23	155	34	98	14	85	12	1177	0.17	0.19
Trench 5	33	44	11	817	1230	117	483	268	130	502	94	545	97	245	32	184	25	2676	0.45	0.74
	36	40	4	1129	1669	159	675	451	233	919	167	937	159	384	47	260	35	4295	0.74	1.15
	11	12	1	281	459	45	172	51	25	86	17	107	19	47	6	36	5	511	0.09	0.19
Trench 6	29	45	16	648	961	93	407	236	96	355	59	329	57	144	19	113	16	1595	0.28	0.51
	32	36	4	561	887	92	419	313	132	495	81	434	72	175	23	133	19	1947	0.35	0.58
	39	45	6	1236	1802	170	736	382	152	561	96	536	92	234	30	164	22	2662	0.45	0.89

9.4 Target exploration in Area 4

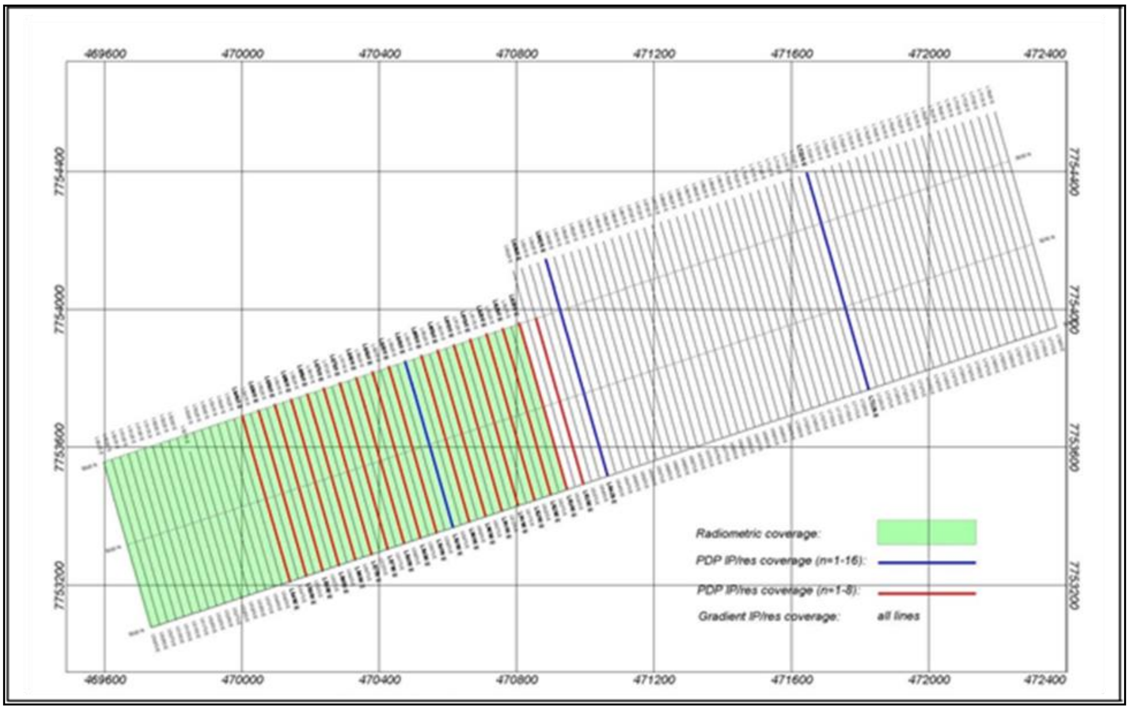
9.4.1 Geological Mapping and Surface Sampling

Geological mapping in Area 4 identified a prominent zone of carbonatization and REE mineralization trending approximately east to west across the area which is particularly enriched in HREE (Figure 7-14 and Figure 7-15). The alteration zone is readily mapped as a zone in which both carbonatites and alteration lithologies are coloured dark brown by the weathering of iron oxides. The zone has both significant width and strike length and is associated with a prominent Th radiometric anomaly. Detailed sampling reported by Swinden and Siegfried (2011) showed that a large proportion of samples from the core of the alteration zone returned very strong HREE-enrichment, and also identified an area in the southwest quadrant of the area which returned a large number of LREE-enriched samples. These samples were intended to be broadly representative of the mineralized zone but were not taken on a systematic grid pattern so do not provide a complete picture of the grade distribution in the surface exposure of the alteration zone. Assays from selected grab samples confirmed that the mineralization is unevenly distributed in the alteration zone. Samples from these two areas returned up to 4.69% TREO with 96.3% HREE enrichment (%HREE/%TREE) and 5.82% TREO with 2.8% HREE-enrichment, respectively.

9.4.2 Ground Geophysics

Ground radiometric and gradient induced polarization/resistivity surveys were carried out across the Area 4 alteration zone on 25 m spaced lines. The radiometric survey was carried out by Greg Symons Geophysics in 2010. The gradient survey was carried out by Remote Exploration Services in 2011 and extended by Greg Symons Geophysics in 2012. The results of this work were described in detail by Siegfried and Hall (2012) and are summarized in Table 9-5 and illustrated in Figure 9-6.

Figure 9-6
Area 4 grid showing ground geophysical coverage



Note: *North is upwards, grid line spacing is 400 m for scale*
Source: *RES, 2011; Symons Geophysics, 2012*

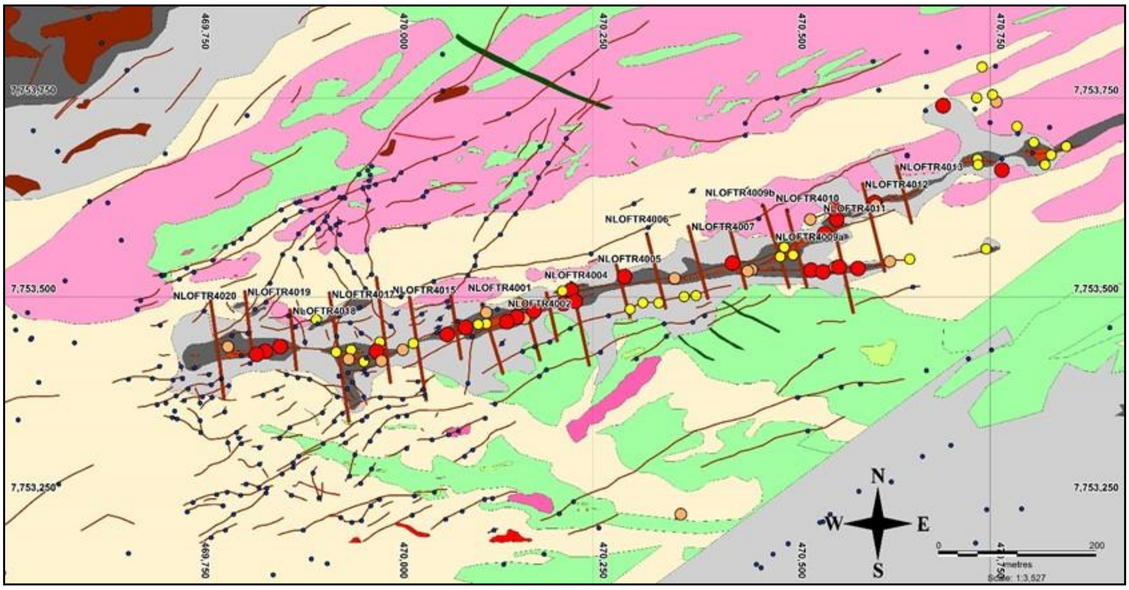
Table 9-5 Summary of geophysical surveys in Area 4		
Radiometric Survey	Continuous walking mode = station spacing ~2m	Alteration zone follows a prominent ENE-striking Th anomaly, follows 1st order sinistral shear
Gradient array induced polarization/resistivity surveys	RES- 25 m line spacing, 25m station spacing and a-spacing; GSG – 50 m linespacing, select lines of pole-dipole array with a=25m	Good agreement between resistivity and inverted 3D PDP. Central low resistivity belts coincide with alteration zone

Geophysical surveys along the Area 4 trend identified a number of priority targets for further investigation both on the central trend that is interpreted to represent the NE extension of the Area 4 fault zone, as well as off the corridor trend. The on-axis targets reflect combinations of low resistivity (suggesting fault structures, particularly cross-cutting or splay structures), strong alteration (mapped) and moderate to strong HREE enrichment in surface samples, and correlation with high Th in ground and airborne geophysics.

9.4.3 Trenching

Twenty trenches were dug across the Main zone in Area 4 to locate and sample the mineralised zone precisely at surface and examine its alteration and geological relationships to the surrounding rocks (Figure 9-7 and Table 9-6). This information contributed to the mineral resource model by providing a position to which the mineralised zone can be extended to surface from the shallowest drillholes. The grades of the samples were not used in the block model grade estimation, however, due to biases considered to be the result of very near surface enrichment with very limited vertical extent.

Figure 9-7
Location of Trenches in Area 4



***Note:** Trenches are shown with brown lines. The Area 4 alteration zone is indicated by dark grey (intense alteration) and light grey (moderate alteration). Samples are keyed to the ratio HREE/TREE. Geological and sample legends same as Figure 9-4.*
***Source:** Swinden and RES, 2012*

The trenches were dug using a JCB backhoe and the width of the trenches was determined by the excavator bucket (Figure 9-8), which was approximately 1 m. Trench endpoints and midpoints were located by GPS. Bedrock is typically within 50 cm from surface although in parts of some trenches up to 1.5 m of soil or calcrete cover was encountered. The trenches were cleaned by hand in preparation for mapping and sampling and metre waypoints were measured and marked by aluminium tags.

All trenches were geologically mapped prior to sampling and total average count radiometric readings were taken for each sample interval using a RadEye personal radiation detector (PRD). Total count K, U and Th concentration readings were taken at 1 m intervals using a hand-held spectrometer and magnetic susceptibility.

Figure 9-8
Examples of trenches in Area 4

Source: *Hall, 2012*

Table 9-6
Locational information for trenches in Area 4. WGS84, UTM Zone 33S

Trench ID	East_Start (m)	North_Start (m)	East_End (m)	North_End (m)	Length (m)
NLOFTR4001	470136	7753404	470111	7753489	88
NLOFTR4002	470183	7753421	470164	7753494	99
NLOFTR4003	470204	7753445	470192	7753506	75
NLOFTR4004	470245	7753415	470223	7753516	62
NLOFTR4005	470297	7753474	470280	7753539	104
NLOFTR4006	470342	7753486	470319	7753578	67
NLOFTR4007	470395	7753497	470371	7753589	95
NLOFTR4008a	470442	7753510	470425	7753577	95
NLOFTR4008b	470422	7753585	470421	7753592	70
NLOFTR4009a	470496	7753513	470476	7753576	7
NLOFTR4009b	470473	7753585	470465	7753614	66
NLOFTR4010	470520	7753512	470494	7753608	30
NLOFTR4011	470578	7753480	470548	7753612	135
NLOFTR4012	470618	7753532	470589	7753642	113
NLOFTR4013	470651	7753593	470633	7753664	74
NLOFTR4014	470084	7753422	470072	7753502	80

NLOFTR4015	470040	7753370	470020	7753500	131
NLOFTR4016	469996	7753391	469979	7753524	134
NLOFTR4017a	469943	7753344	469935	7753398	54
NLOFTR4017b	469934	7753412	469918	7753504	94
NLOFTR4018	469877	7753408	469869	7753483	75
NLOFTR4019	469821	7753420	469812	7753507	86
NLOFTR4020a	469785	7753373	469783	7753393	21
NLOFTR4020b	469781	7753402	469781	7753415	13
NLOFTR4020c	469778	7753426	469769	7753495	72

The trenches were sampled using a hand-held diamond saw to make two parallel cuts approximately four cm apart. Calcrete coatings were removed by hammer prior to sampling. The trenches were then continuously sampled with hammer and chisel by removing the rock between the saw cuts.

All trenches crossed the Main zone of REE mineralization and alteration, and this zone is marked in each trench by anomalous radioactivity, visible evidence of alteration and geochemical anomalies in the HREE and Y, HREE+Y/TREE+Y, and P_2O_5. In almost all cases, the geochemical and radiometric anomalies coincide closely with the mapped extent of the alteration and mineralization. Representative assays are given in Table 9-7. The detailed sampling from the trenches confirms the preliminary observations of significant grades (%TREE+Y) accompanied by very high levels of HREE-enrichment (66% to >90%) over a continuous strike length of up to 650 m.

Table 9-7

Representative analyses from trench samples, Area 4

Trench	From	To	Width (m)	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Y ppm	HREE %	TREE %
NLOFTR4001	52	54	2	67	159	22	110	67	30	110	22	141	28	77	11	64	9	939	0.14	0.19
NLOFTR4004	78	94	16	46	82	11	48	67	41	196	46	308	67	190	28	162	23	1993	0.31	0.33
	88	90	2	76	155	19	91	161	107	520	122	866	187	533	77	447	64	5573	0.85	0.90
NLOFTR4005	45	57	12	26	47	8	41	78	52	300	80	568	128	376	53	298	43	4459	0.64	0.66
	49	52	3	20	37	9	60	152	110	683	190	1379	317	938	132	738	106	11084	1.57	1.60
NLOFTR4006	39	66	27	132	232	26	101	52	31	170	47	325	76	220	33	191	28	2483	0.36	0.41
	48	49	1	295	518	58	230	183	129	714	199	1360	304	843	123	701	100	8563	1.30	1.43
	58	59	1	42	93	14	86	169	121	729	211	1520	353	1030	153	884	127	12230	1.74	1.78
NLOFTR4011	112	130	18	154	298	33	127	74	46	264	73	547	127	379	61	366	55	3765	0.57	0.64
	113	114	1	162	305	33	132	110	74	465	125	979	227	659	103	600	87	7342	1.07	1.14
	118	119	1	43	87	11	46	67	58	360	104	828	194	570	90	541	79	5594	0.84	0.87
	126	129	3	301	565	63	244	180	127	801	238	1783	420	1295	213	1279	193	12483	1.88	2.02
NLOFTR4013	35	43	8	304	508	51	176	53	24	119	30	209	47	140	22	139	21	1314	0.21	0.32
	37	38	1	180	318	36	150	99	61	376	105	765	176	513	76	468	68	5137	0.77	0.85

10 DRILLING

Several campaigns of diamond drillhole drilling were undertaken from 2010 to 2020, including detailed mineral resource drilling in Areas 2B and 4, and exploration drilling on a wide variety of targets throughout the ML. Drilling procedures and results for the earlier campaigns have previously been reported in detail (Swinden and Siegfried, 2011; Siegfried and Hall, 2012; Dodd et al., 2014).

The drilling is discussed in several sections:

- 2010 and 2011 – exploration drilling in Area 2B, which eventually contributed to the mineral resource estimate in this area;
- 2011 and 2012 – mineral resource drilling in Area 4, which led to the definition of the first mineral resource on the property;
- 2020 – mineral resource drilling in Areas 2B and 4 which defined and expanded the existing resource in Area 4 and led to the definition of the Area 2B mineral resource;
- 2010 to 2020 – exploration drilling which has tested multiple targets but has not led to definition of further mineral resources; and
- 2023 - a reverse circulation (RC) campaign undertaken as an in-fill programme and to prove extension of the mineralisation along strike and at depth.

10.1 Area 2B, 2010 and 2011 Drilling

The 2010 drilling (Holes NLOFDDH2B001 – 013) was previously reported in detail by Swinden and Seigfried (2011) and is summarized below. The initial drilling was carried out in October and November 2010 and managed by GeoAfrica Prospecting Services. Drilling procedures were governed by a Standard Operating Procedures (SOP) Manual developed for the project by GeoAfrica Prospecting Services and approved by Namibia Rare Earths Ltd. Diamond core drilling on the Area 2B target in 2010 comprised an exploratory phase of 13 drillholes totalling 154.5 m.

Table 10-1 presents a summary of information and procedures with respect to this drilling campaign. Figure 10-1 shows the location of the drillhole collars.

Table 10-1
Summary of drilling procedures for the 2010 drilling campaign in Area 2B

Purpose of Drilling	Investigate the lateral and vertical extent, geology and grade of the Area 2B alteration zone.
Drill Equipment	Two Atlas Copco Christianson CS14 diamond drill rigs.
Core diameter	NQ (47.6 mm).
Hole Characteristics	All holes drilled at 323° to 330° azimuth and at 50° to 60° degrees dip. See Table 10.1.2 for locational and directional information. The alteration zone was found to dip at ~50° to 60° and intersections were at depths of 25 m to 50 m.
Rig Set-up	Checked by geologist prior to drilling. Holes collared with HQ to about 6 m depth.
Casing	All holes cased to bedrock and casing left in holes.
Site rehabilitation	Area of holes was rehabilitated and a concrete plinth constructed showing UTM coordinates, drillhole number, hole depth, month and year. Top of casing sealed with a closed galvanized iron tube riveted to casing.
Drillhole orientation	All holes were downhole surveyed with a Reflex EZ-TRC system to determine drillhole azimuth and inclination.
Collar Locations	Collars of completed holes were DGPS surveyed by a professional surveyor (WGS84/UTM 33S).
RQD	Run by run recoveries monitored and recorded on a standard rock quality designation (RQD) sheet. RQD and recoveries were captured in the field.
Core Marking	Metre marking of core was done on site. Depth corrections were done by identifying drilling breaks and rejoining/remeasuring the core. Zones of core loss were recorded. High points of contacts/layering were used for orienting and marking the rejoined core. An orientation line was marked on the entire length of the core with arrows added frequently to indicate downhole direction
Core Handling	Core was secured in boxes and transported securely by vehicle from the drill site to the core yard in Khorixas.
Core Logging	All holes were logged and sampled by the same qualified geologist. Logging was carried out on standard company logging forms and imported into spreadsheets and a Microsoft Access database. Several holes were radiometrically logged using a RadEye PRD gamma scintillometer. All holes were photographed when wet and then marked with indelible pens for sampling.
Downhole logging contracted to Terratec Geoservices (Namibia)	Three arm caliper/gamma as an initial test for the drillhole integrity.
	Dual compensated density/gamma side walled tool which provided a measure of the density of the material surrounding the drillhole
	Magnetic susceptibility.
	Acoustic televiewer provided a 360° acoustic image of the drillhole with directional information (dip and azimuth) of fractures and layers.
	Down hole spectrometric record of the U, Th and K concentration of the rock.

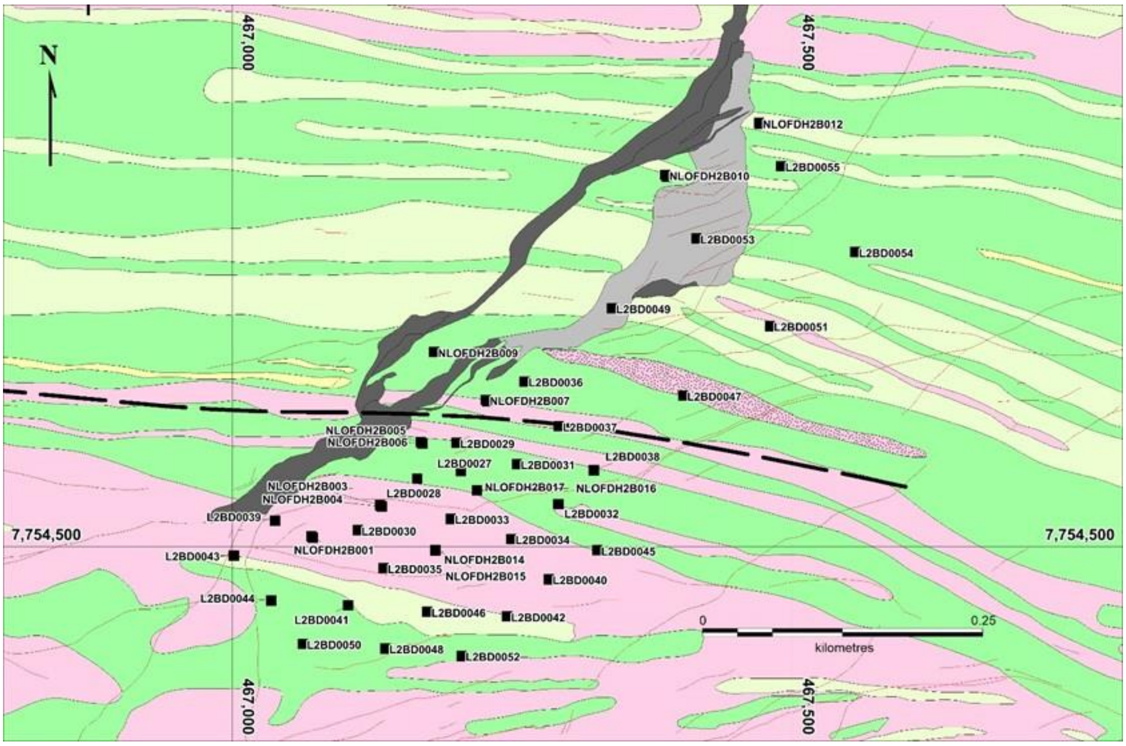
Four additional diamond drillholes were drilled in Area 2B in August 2011 (Holes NLOFDDH2B014 – 017). These holes were drilled as part of the 2011 drilling campaign that included the resource drilling in Area 4. Drilling procedures were identical to the Area 4 drilling, governed by the same SOPs, and QAQC for these holes was integrated in and accounted for by the Area 4 QAQC described by Siegfried and Hall (2012). The intention of these holes was to test a part of Area 2B that had returned the best values in the previous year. The results were not deemed to be sufficiently encouraging to continue at that time.

Additional infill sampling was undertaken in 2020 on intervals from five drillholes completed during 2010 and 2011. These samples were assayed as part of the 2020 campaign, and sampling, sampling preparation and assaying were carried out in accordance with the SOP in effect in 2020. QAQC was accounted for as part of the 2020 drilling campaign. Table 10-2 details the intervals sampled.

Table 10-2
Infill samples from 2010-2011 drillholes sampled and assayed during 2020

Hole ID	From (m)	To (m)	Number of samples
NLOFDH2B007	50.00	55.00	5
NLOFDH2B008	60.30	66.00	5
NLOFDH2B012	17.35	22.70	6
	57.00	64.00	7
NLOFDH2B013	13.00	22.00	9
	67.00	73.00	6
NLOFDH2B015	66.00	73.00	7
	145.00	149.20	5

Figure 10-1
Location of drillhole collars in Area 2B



Note: *Geological legend as for* Figure 7-4
Source: *Swinden, 2014*

10.2 Area 4 Mineral Resource Drilling, 2011 and 2012

Drilling on Area 4 started in June 2011 and continued until the end of April, 2012. The drilling was managed on-site by Remote Exploration Services (RES) of Cape Town, South Africa, under Standard Operating Procedures dated May 11, 2011 and developed for this project by RES. A total of 101 diamond drillholes were completed, of which 93 comprised a systematic grid-based assessment of alteration and mineralization in the Main zone and eight were drilled down dip on the Main zone with larger HQ diameter core to obtain material for metallurgical test work (Figure 10-2). Drilling in this campaign totalled 11,783.6 metres.

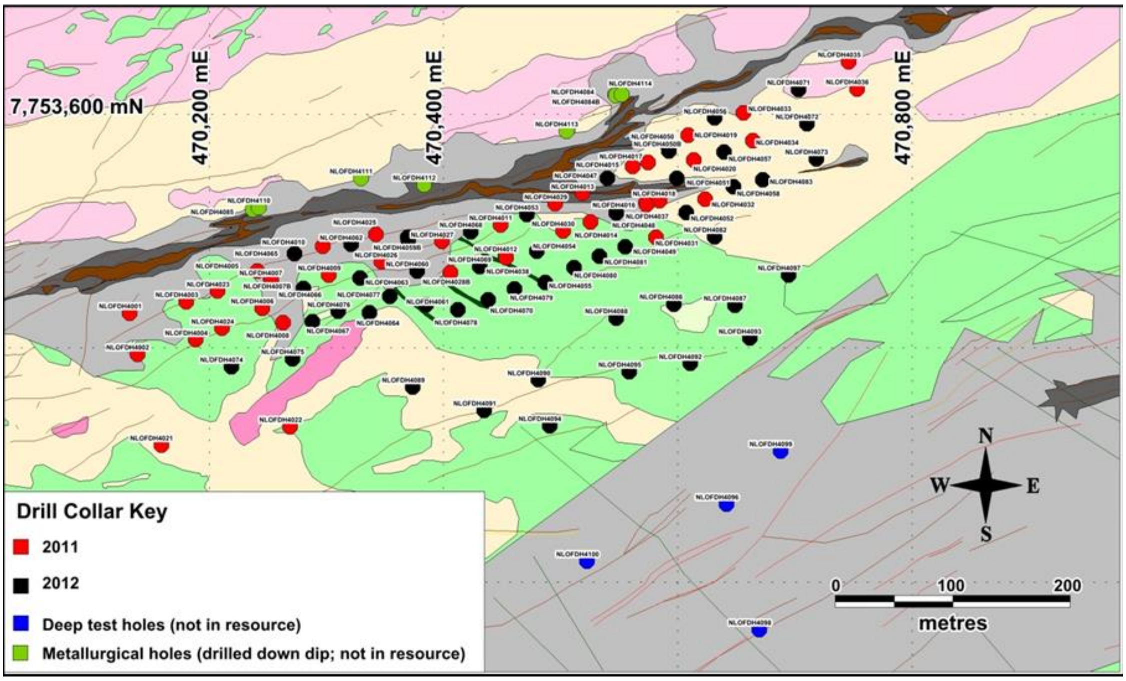
The 2011 and 2012 drilling were previously reported in detail by Siegfried and Hall (2012) and Dodd et al. (2014).

Table 10-3
Summary of drilling procedures for the 2011-2012 drilling campaign in Area 4

Purpose of Drilling	Investigate the lateral and vertical extent, geology and grade of the Area 4 alteration zone. Resource drilling and metallurgical sampling.
Drilling Contractor	JGM Drilling and Exploration Namibia.
Drill Equipment	Two CF90 platform-mounted diamond drill rigs.

Core diameter	NQ (47.6 mm). Drilling utilized standard and triple tube 4 9/16" HQ and NQ core barrels.
Hole Characteristics	All exploration and resource holes drilled at approximately 345° azimuth and at -55° dip, metallurgical holes at -40° dip. See Table 10.1.2 for locational and directional information. The alteration zone dips southerly at between 45° and 60°. The systematic grid drilling intersected mineralization to vertical depths of between 150 m and 200 m. Four deep holes intersected the zone at 250 m and 300 m vertical depth.
Rig Set-up	Location and inclination checked by geologist prior to drilling. Holes collared with HQ to about 6 m depth.
Core Recovery	>90%; Drillholes with inadequate recovery were re-drilled by the contractor with suffix "B" added to the original drillhole number.
Casing	All holes cased to bedrock and casing left in holes.
Site rehabilitation	Area of holes was rehabilitated and a concrete plinth constructed showing UTM coordinates, drillhole number, hole depth, month and year. Top of casing sealed with a closed galvanized iron tube riveted to casing.
Drillhole orientation	All holes were downhole surveyed with a Reflex EZ-Shot system to determine drillhole azimuth and inclination.
Collar Locations	The collar positions and elevation were surveyed by a professional surveyor with a real-time kinematic ("RTK") GPS. (WGS84/UTM 33S).
RQD	Run by run recoveries monitored and recorded on a standard rock quality designation (RQD) sheet. RQD and recoveries were captured in the field.
Core Marking	Metre marking of core was done on site. Depth corrections were done by identifying drilling breaks and rejoining/remeasuring the core. Zones of core loss were recorded. High points of contacts/layering were used for orientating and marking the rejoined core. An orientation line was marked on the entire length of the core with arrows added frequently to indicate downhole direction.
Core Handling	Core was transported securely from the drill site to the exploration camp on a daily basis.
Core Logging	Geological and geophysical logging was carried out by RES and NMI geologists and followed a comprehensive protocol. All holes were radiometrically logged using a RadEye PRD gamma scintillometer and magnetically logged using a hand-held magnetic susceptibility meter. All holes were photographed when wet and then marked with indelible pens for sampling.
Downhole logging contracted to Terratec Geoservices (Namibia)	Three arm caliper/gamma as an initial test for the drillhole integrity.
	Dual compensated density/gamma side walled tool which provided a measure of the density of the material surrounding the drillhole.
	Magnetic susceptibility
	Down hole spectrometric record of the U, Th and K concentration of the rock.

Figure 10-2
Plan showing collars of the 101 drillholes drilled in 2011 and 2012 in Area 4



Note: *Geological legend as in* Figure 7-4
Source: *Swinden, 2014*

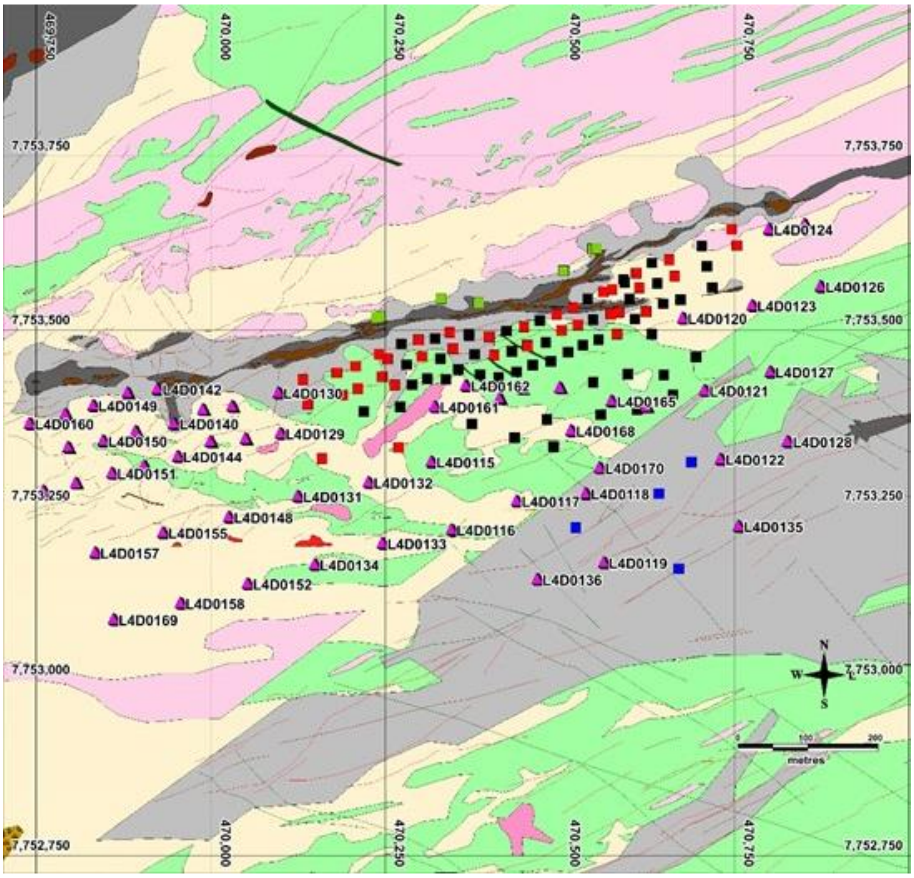
10.3 Areas 4 and 2B Mineral Resource Drilling, 2020

A campaign of drilling was undertaken on the Lofdal ML during 2020 with the objective of defining a mineral resource at Area 2B and expanding the existing mineral resource at Area 4. Gecko Exploration (Pty) Ltd was contracted to oversee and manage the drill program.

Drilling was undertaken in Area 4 between late February, 2020 and early December, 2020. The objective of this work was to extend the mineral resource in this area, particularly along strike to the west and to vertical depths of greater than 200 m. A total of 56 diamond drillholes were completed totalling 10,162.1 metres. Collar locations are shown in Figure 10-3.

Figure 10-3

Plan showing drillhole collars in Area 4



Note: *Geological legend as in* Figure 9-4*. Red, black and blue squares same as Figure 10-2. Red triangles are 2020 drilling.*

Source: *Swinden, 2014*

Drilling was also undertaken in Area 2 from August to October 2020, with the objective of expanding on the previous drilling to attempt to define a mineral resource in this area. A total of 29 diamond drillholes were completed totalling 4,400.4 m. Collar locations are shown in Figure 10-1.

10.3.1 Area 4 and 2B Diamond Drilling Procedures

Diamond drilling during 2020 was governed by Standard Operating Procedures developed for Namibia Critical Metals Inc. by Gecko Exploration (Pty) Ltd. and approved by MSA. Diamond core drilling was undertaken by Günzel Drilling of Namibia with two diamond drill rigs; an Atlas Copco CS14 and an Atlas Copco CS1000. The first three to six metres of each hole were drilled with HQ diameter (63.5 mm) effectively collaring the hole and allowing casing to be inserted. The remainder of each hole was usually completed at NQ diameter core (47.6 mm). All holes in Area 2B were drilled towards an azimuth of 310° to 315° at dips between 60° and 68°. Those in Area 4 were drilled towards an azimuth of approximately 340° at dips between 55° and 71°.

All of the 2020 diamond drillhole cores were orientated and an orientation line was marked on the core to guide structural measurements.

10.3.2 Core Recovery

The drill advance was marked by a Günzel Drilling technician on depth blocks after each drill run. Metre marking of the core as well as rock quality designation (RQD) and core recovery measurements were undertaken at the drill site by Gecko technicians. Orientation lines were drawn on the core with arrows indicating the down-dip direction (Figure 10-4). Core recovery was generally very good (>95 %). Core boxes were transported by vehicle daily from the drill site to the logging facility at the Lofdal base camp. Core was carefully loaded and ratchet strapped for transportation.

At the Lofdal camp, the core was logged radiometrically using a RadEye PRD gamma scintillometer and visibly altered sections were checked with an Olympous Delta 50 portable XRF to ensure that all mineralized sections were identified and sampled. Following geological logging, the core was sampled for assay.

Figure 10-4
Drillers' metre marks, measured metre marks and orientation lines on uncut core

Source: *Ellmies, 2020*

10.3.3 Collar and Downhole Surveys

The drillhole collar positions were pegged by a geologist using a handheld global positioning system (GPS) set within WGS84, UTM Zone 33S coordinate system. The senior geologist then verified the correct orientation and inclination of the rig derrick prior to drilling. After the completion of each hole, Günzel Drilling carried out downhole surveys using a Reflex EZ-Trac survey tool determining the downhole orientation, i.e., the dip and azimuth. The collar positions and elevation were surveyed by Greg Symonds Geophysics with a real-time kinematic (RTK) GPS. The drillhole collars were marked with a concrete beacon recording the relevant details of each hole on a metal plate (Figure 10-5).

Figure 10-5
Concrete plinth over capped diamond drillhole L4D017(left) and closed off RC hole L4R0215 (right)

Source: *Witley, 2021 (left), Witley, 2023 (right)*

All DD sites were rehabilitated by Günzel Drilling according to the site Environmental Management Plan, with foreign material removed and sumps filled and smoothed. Rehabilitation of the RC drillhole sites by Prinsloo drilling had only been partially completed at the time of the site visit as the drilling program was still in progress.

10.4 Areas 4 and 2B Reverse Circulation Drilling, 2023

A reverse circulation (RC) campaign was undertaken in 2023 at both Area 2B and Area 4 with the purpose of providing infill drilling data and to prove extension of the mineralisation both along strike and depth.

Drilling began in late January 2023, using an Atlas Copco CS 10 RC drill rig operated by Prinsloo Drilling, and continued until late November 2023. A total of 12 RC holes were collared at Area 2B, totalling 1 772 m of drilling, and 44 RC holes were completed at Area 4, totalling 9 043 m. Standard Operating Procedures were prepared by Gecko Exploration to guide the drilling and sampling activities.

Figure 10-6
RC Drilling at Area 4 (hole number L4R0218)

Source: *Witley, 2023*

The majority of the 2023 drilling at Area 4 are infill holes which have resulted in a staggered 70 m drillhole spacing in combination with the previously completed diamond drillholes. The Area 2B RC drilling was collared predominantly in the northwest portion of the deposit at 100 spacing, resulting in an extension of the mineralisation along strike. A row of four holes were drilled in the southeast however these only targeted the shallower mineralised zones down to a depth of 100 m.

Collar locations for the completed drilling campaigns are shown in Figure 10-7 for Area 4 and Figure 10-8 for Area 2B. Down-hole surveys were conducted using a north seeking gyro (Boart Longyear True Gyro).

Figure 10-7
Plan showing Area 4 drillhole collars

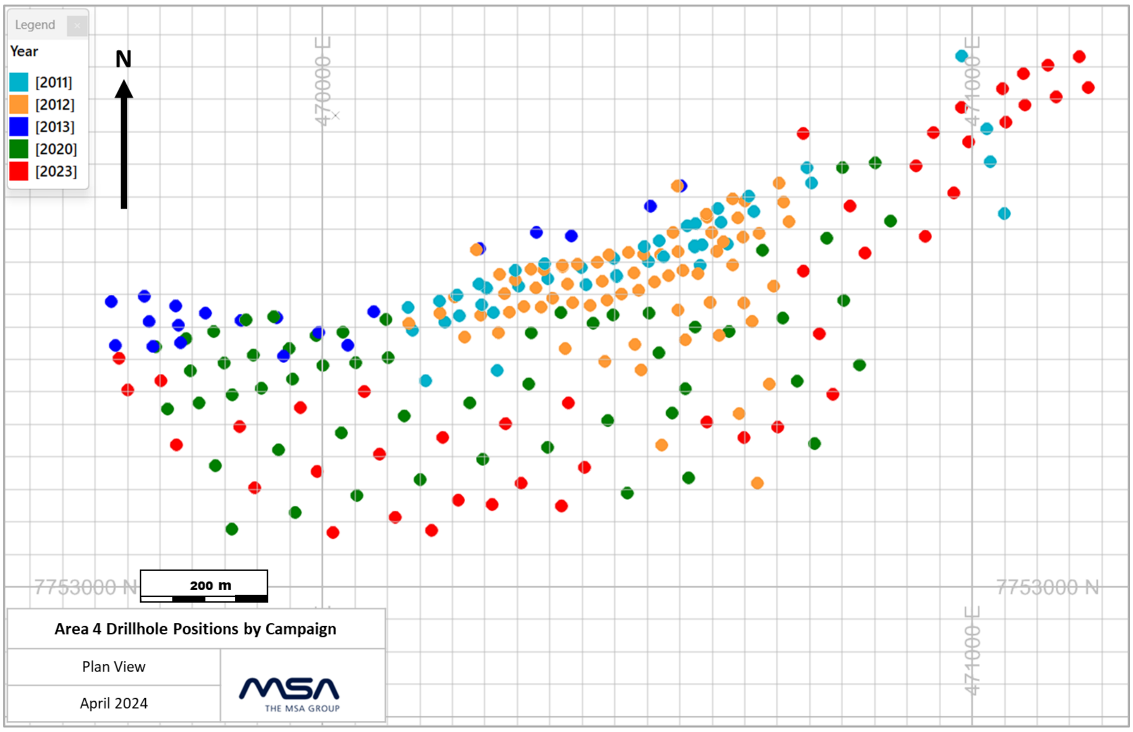
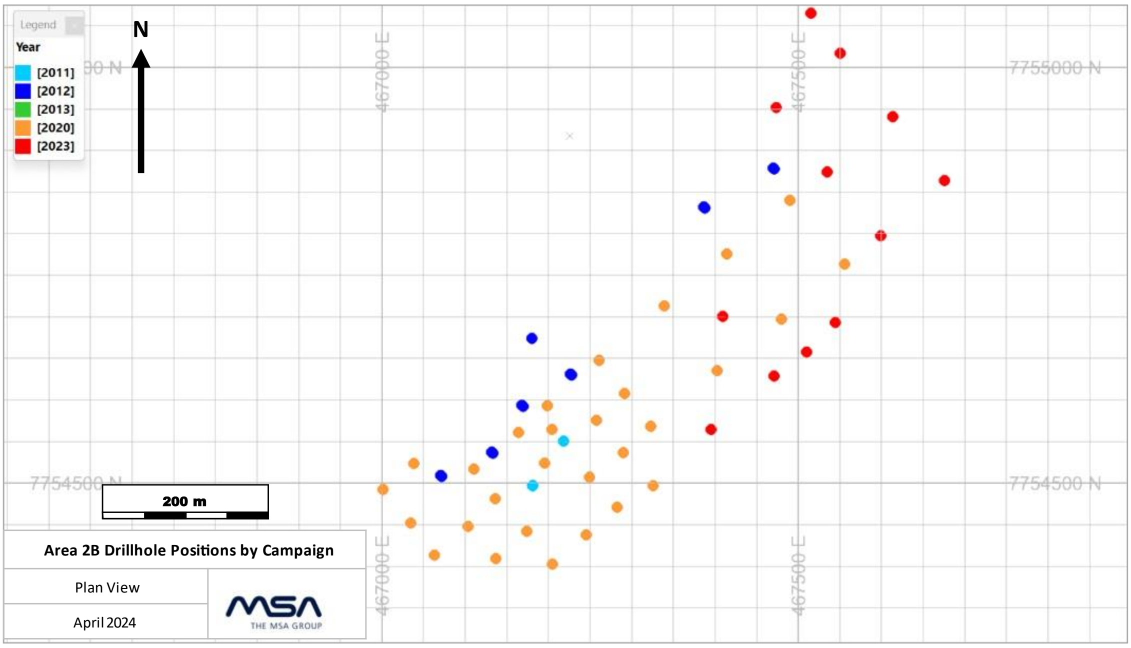


Figure 10-8
Plan showing Area 2B collars



10.5 Interpretation of Drilling Results

10.5.1 Area 4

Geological, lithogeochemical and geophysical surveys delineated an ENE-trending, REE-bearing alteration zone in Area 4. This zone was subsequently delineated by the 2011 drilling campaign to a depth of approximately 200 m. The mineralization is associated with a zone of variably intense albitisation and carbonatization that is centred along a major sinistral fault system. The 2011-2012 drilling campaign achieved a nominal drillhole spacing of 25 m for approximately 650 m along strike and demonstrated the down-dip continuity of the mineralised zone to vertical depths of more than 200 m. Four deep holes were drilled to test the continuity of the zone and it was found to be present at vertical depths of up to 300 m.

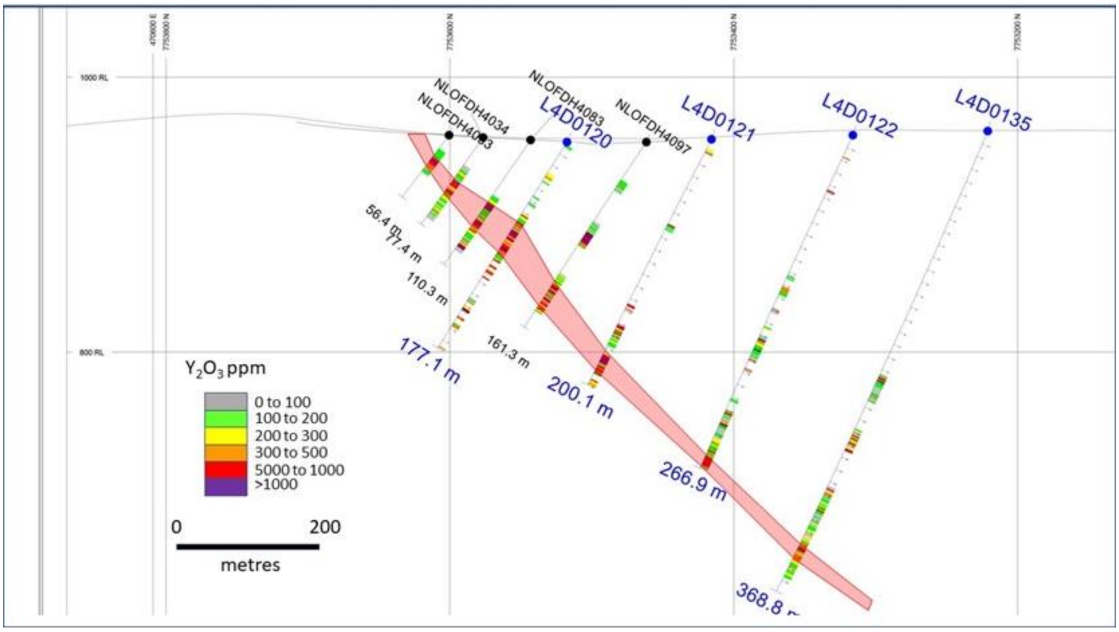
As with the 2011 drilling, the 2012 infill holes were drilled perpendicular to the strike direction and were angled between 55° and 75° to intersect the southerly dipping mineralization at approximately right angles in an attempt to obtain near true thickness intersections. Eight holes (NLOFDH4084, NLOFDH4084B NLOFDH4085, NLOFDH4010, NLOFDH4011, NLOFDH4012, NLOFDH4013, and NLOFDH4014) were drilled down dip on the mineralization to recover sufficient drillhole core material for initial metallurgical test work. The positions of the drillhole collars are illustrated in Figure 10-3. Figure 10-9 shows an example of a typical drill section through the mineral deposit. The results of these drilling campaigns resulted in the declaration of an initial mineral resource in Area 4 (Siegfried and Hall, 2012).

The 2020 drilling campaign was planned to extend the mineral resource both along strike to the west and to greater depths. The 2012 drilling included four deep holes that indicated that the mineralization was continuous to a depth of up to 300 m vertically. However, these holes were not sufficiently closely spaced to be included in the previous mineral resource.

The recent drilling has extended the drilled strike length of the Area 4 altered/mineralized zone to approximately 1.5 km and has intersected the mineralized zone in multiple drillholes below 300 m, indicating that the mineralization is continuous to at least to this depth.

The orientation of the mineralized zone in 3D is well established by multiple drill intersections on close-spaced fences. Fence drilling indicated an orientation of between 070°E and 075°E and dips between 45°S and 60°S. This implies that the bulk of the drillholes intersected the targeted mineralization close to a 90° angle and that the difference between sample length and true thickness is therefore relatively minor.

Figure 10-9
Example of a drilling section through the Main Zone mineralization at Area 4



Source: *Swinden, 2021*

Figure 10-9 illustrates that the Main Zone mineralization has variable grades of REE but consistently contains intervals with high Y concentrations (>0.1% Y).

Additional zones of REE mineralization with variable thickness occur up to 20 m to 40 m below the Main Zone and up to 25 m to 30 m above. These zones have potentially economic merit in an open-pit mining scenario.

10.5.2 Area 2B

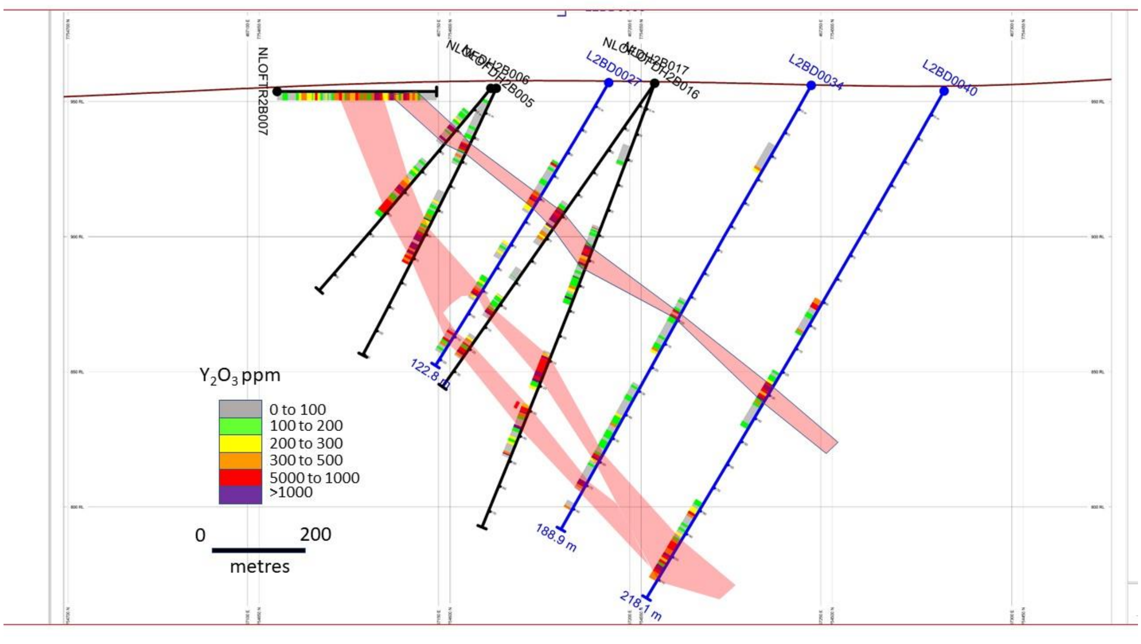
The results of the diamond drilling at Area 2B, coupled with the results of geological mapping and trenching, show that the Area 2B zone represents a portion of a rare earth mineralizing system that is structurally controlled and was formed by both hydrothermal and magmatic (intrusive) events. Significant concentrations of REE (>0.5% TREE+Y) occur in narrow (< 1 m), generally carbonatized, zones of veining, fracture fill and breccia fill related to late hydrothermal activity within broader (10 m to 30 m) zones of albitic and carbonate alteration that are characterized by anomalous concentrations of HREE and Y.

Within the broader Area 2B alteration zone, the mineralization is shown by the drilling to occur in multiple, sub-parallel zones that have been traced from surface to vertical depths of about 200 m (Figure 10-10). Multiple intersections in drilling sections demonstrate that the alteration zones generally strike at approximately 045° to 055° and dip between 45° and 60° to the southeast. All drillholes were oriented approximately perpendicular to the mineralized zone in both plan and section. Intersections are considered to approximately reflect true width.

A key result of the 2020 drilling was to demonstrate that the zone previously indicated by 2010 drilling could be followed along strike between the widely separated holes. The mineralisation is now well defined along a strike length of slightly more than 800 m and to depths of at least 150 m.

Most holes in the Area 2B zone have a prominent shear zone at or near the footwall of the alteration zone. Most of the alteration occurs in the structural hangingwall. The alteration zone is of variable intensity and is variably mineralized along the Area 2B zone. Although much of the alteration sequence in the Area 2B zone has been enriched in REE, mineralization with significant grades appears to be relatively late in the alteration sequence. The specific mineralized structures are considered to be late veinlets, fracture fill, and breccia fill, and appear to be related to late hydrothermal activity following the main episode of albitization, carbonatization and related hydrothermal alteration.

Figure 10-10
Example of drilling section through the Area 2B mineralized zone



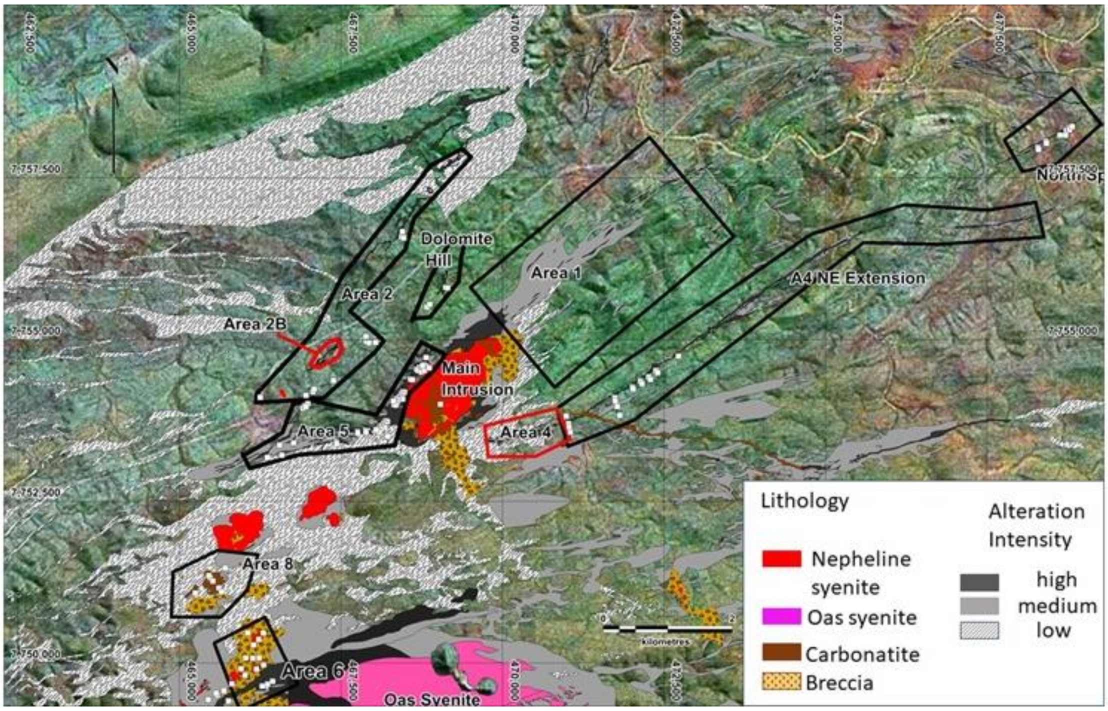
Note: *Colour bands are ppm Y_2O_3. Outline of mineralization and alteration are interpreted from assay data.*
Source: *Swinden, 2021*

10.6 Exploration Drilling Outside the Mineral Resource Areas

10.6.1 Location and Procedures

A total of 133 drillholes have been drilled on the Lofdal ML that were not part of the mineral resource drilling in Area 2B and Area 4. These holes were drilled between 2010 and 2020 on a variety of geological, lithogeochemical and radiometric targets. The location, orientation and length of these holes is given in Table 10-4 and collar locations are shown in Figure 10-11. All holes were collared using HQ followed by NQ core where competent rock was intersected. These drillholes were drilled at the same time as the resource drilling campaigns in 2010, 2011, 2012, 2014 and 2020, using contractors, equipment and Standard Operating Procedures identical to those described for the mineral resource drilling. The comprehensive QAQC program described for the mineral resource drilling was implemented for all exploration drillholes.

Figure 10-11
Location of exploration (non-resource) drillholes (white squares)



Note: *Priority exploration areas are outlined by black lines. Resource areas (drillholes not shown) outlined in red lines.*
Source: *Background is Landsat Geocover Mosiac, 2000. Swinden, 2021*

Table 10-4
Location and orientation information for exploration drillholes on the Lofdal ML. WGS84 UTM 33S

Hole ID	Area	Easting (m)	Northing (m)	Elevation (mamsl)	Azimuth (°)	Dip (°)	Depth (m)	End-Date
NLOFDH2021	Area 2	466248	7754110	950.371	330	-55	155.4	2012-11-29
NLOFDH2022	Area 2	468436	7756593	951.554	330	-55	62.3	2012-12-01
NLOFDH2023	Area 2	468451	7756670	955.749	300	-55	59.5	2012-11-30
NLOFDH2024	Area 2	468471	7756574	952.013	300	-55	83.3	2012-12-03
NLOFDH2025	Area 2	469141	7757594	933.55	320	-55	140.3	2012-12-06
NLOFDH2026	Area 2	469176	7757625	935.109	320	-55	101.3	2012-12-07
NLOFDH2A014	Area 2A	467890	7754970	947.524	10	-50	98.2	2010-10-22
NLOFDH2A015	Area 2A	467934	7754952	948.043	14	-50	80.3	2010-10-25
NLOFDH2A016	Area 2A	468033	7754959	947.326	8	-50	77.3	2010-10-27
NLOFDH2C017	Area 2C	467385	7754369	964.916	339	-50	88.2	2010-10-30
NLOFDH2C018	Area 2C	467067	7754192	986.665	337	-50	71.5	2010-10-28
NLOFDH2C019	Area 2C	467085	7754235	988.507	295	-50	170.4	2010-10-31
NLOFDH2C020	Area 2C	466959	7754140	976.524	336	-50	77.3	2010-11-03
NLOFDH4039	Area 4 NE Ext.	470984	7753817	951.566	345	-55	110.3	2011-09-08
NLOFDH4040	Area 4 NE Ext.	471736	7754103	959.319	345	-55	113.1	2011-09-09
NLOFDH4041	Area 4 NE Ext.	471023	7753704	952.819	345	-55	101.4	2011-09-10
NLOFDH4042	Area 4 NE Ext.	471775	7753965	965.661	345	-55	101.3	2011-09-11
NLOFDH4043	Area 4 NE Ext.	471050	7753574	950.024	345	-55	164.3	2011-09-12
NLOFDH4044	Area 4 NE Ext.	471818	7753832	975.461	345	-55	151.1	2011-09-13
NLOFDH4045	Area 4 NE Ext.	471028	7753654	952.216	345	-55	152.5	2011-09-14
NLOFDH4046	Area 4 NE Ext.	471746	7754055	963.953	345	-55	152.1	2011-09-15
NLOFDH4101	Area 4 NE Ext.	472008	7754265	952.729	330	-55	80.5	2012-09-07
NLOFDH4102	Area 4 NE Ext.	472133	7754360	963.786	330	-55	68.3	2012-09-12
NLOFDH4103	Area 4 NE Ext.	472263	7754426	973.797	330	-55	74.3	2012-09-11
NLOFDH4104	Area 4 NE Ext.	472376	7754525	977.995	330	-55	101.3	2012-09-10
NLOFDH4105	Area 4 NE Ext.	472399	7754487	974.818	330	-55	155.4	2012-09-14
NLOFDH4106	Area 4 NE Ext.	472023	7754237	952.787	330	-55	82.2	2012-09-15
NLOFDH4107	Area 4 NE Ext.	472158	7754317	956.442	330	-55	89.4	2012-09-18
NLOFDH4108	Area 4 NE Ext.	472289	7754386	965.731	330	-55	113.4	2012-09-19
NLOFDH4109	Area 4 NE Ext.	472724	7754747	976.635	330	-55	62.2	2012-09-21
NLOFDH5001	Area 5	468785	7754614	956.973	305	-55	80.1	2011-06-08
NLOFDH5002	Area 5	468783	7754586	957.114	305	-55	50.3	2011-06-09

Hole ID	Area	Easting (m)	Northing (m)	Elevation (mamsl)	Azimuth (°)	Dip (°)	Depth (m)	End-Date
NLOFDH5003	Area 5	468712	7754572	960.006	305	-55	68.2	2011-06-10
NLOFDH5004	Area 5	468673	7754540	962.062	305	-55	47.1	2011-06-11
NLOFDH5005	Area 5	468738	7754556	959.106	305	-55	101.2	2011-06-12
NLOFDH5006	Area 5	468576	7754390	967.638	305	-55	53.2	2011-06-13
NLOFDH5007	Area 5	468602	7754380	967.279	305	-55	84.2	2011-06-14
NLOFDH5008	Area 5	468460	7754197	967.535	305	-55	92.2	2011-06-15
NLOFDH5009	Area 5	468481	7754189	968.04	305	-55	137.2	2011-06-16
NLOFDH5010	Area 5	468430	7754162	970.155	305	-55	89.1	2011-06-17
NLOFDH5011	Area 5	468451	7754143	970.337	305	-55	150.2	2011-06-21
NLOFDH5012	Area 5	468400	7754118	972.429	305	-55	86.1	2011-06-22
NLOFDH5013	Area 5	468426	7754104	972.276	305	-55	116.3	2011-06-23
NLOFDH5014	Area 5	468195	7753748	983.625	305	-55	80.2	2011-06-24
NLOFDH5015	Area 5	468216	7753732	985.07	305	-55	104.1	2011-07-05
NLOFDH5016	Area 5	468165	7753705	983.968	305	-55	77.3	2011-07-06
NLOFDH5017	Area 5	468187	7753690	984.888	305	-55	110.3	2011-07-07
NLOFDH5018	Area 5	468128	7753670	981.441	305	-55	77.3	2011-07-08
NLOFDH5019	Area 5	468154	7753655	981.513	305	-55	89.3	2011-07-09
NLOFDH5020	Area 5	467879	7753594	983.669	345	-55	104.3	2011-07-10
NLOFDH5021	Area 5	467886	7753569	981.961	345	-55	128.3	2011-07-11
NLOFDH5022	Area 5	467754	7753578	983.777	345	-55	53.4	2011-07-14
NLOFDH5023	Area 5	467760	7753555	980.96	345	-55	77.4	2011-07-15
NLOFDH5024	Area 5	466911	7753940	962.626	305	-55	50.3	2011-07-16
NLOFDH5025	Area 5	466940	7753977	967.287	305	-55	62.4	2011-07-17
NLOFDH5026	Area 5	466987	7754009	973.681	305	-55	71.4	2011-07-18
NLOFDH5027	Area 5	466960	7753962	970.31	305	-55	86.2	2011-07-19
NLOFDH5028	Area 5	468694	7754524	961.798	305	-55	89.3	2011-07-20
NLOFDH5029	Area 5	468821	7754559	954.766	305	-55	92.3	2011-07-21
NLOFDH5030	Area 5	468820	7754593	955.399	305	-55	98.3	2011-07-22
NLOFDH5031	Area 5	468766	7754539	958.171	305	-55	137.4	2011-07-23
NLOFDH5032	Area 5	468739	7754500	959.657	305	-55	140.3	2011-07-27
NLOFDH5033	Area 5	468790	7754522	956.987	305	-55	140.3	2011-07-28
NLOFDH5034	Area 5	468866	7754565	951.044	305	-55	161.2	2011-07-29
NLOFDH5035	Area 5	468454	7754083	971.553	305	-55	191.3	2011-07-30
NLOFDH5036	Area 5	468361	7754088	973.498	305	-55	77.2	2011-07-31
NLOFDH5037	Area 5	468386	7754068	973.953	305	-55	122.4	2011-08-01

Hole ID	Area	Easting (m)	Northing (m)	Elevation (mamsl)	Azimuth (°)	Dip (°)	Depth (m)	End-Date
NLOFDH5038	Area 5	468335	7754042	974.685	292	-55	92.3	2011-08-02
NLOFDH5039	Area 5	468365	7754030	973.987	292	-55	122.3	2011-08-11
NLOFDH5040	Area 5	468321	7753996	974.764	292	-55	89.3	2011-08-12
NLOFDH5041	Area 5	468348	7753987	973.826	292	-55	131.5	2011-08-13
NLOFDH5042	Area 5	468180	7753638	980.529	305	-55	161.9	2011-08-14
NLOFDH5043	Area 5	468096	7753630	978.308	305	-55	80.5	2011-08-15
NLOFDH5044	Area 5	468120	7753614	977.561	305	-55	110.3	2011-08-16
NLOFDH5045	Area 5	468068	7753586	974.983	305	-55	71.2	2011-08-17
NLOFDH5046	Area 5	468093	7753575	975.476	305	-55	116.3	2011-08-20
NLOFDH5047	Area 5	468313	7754049	974.978	305	-55	80.4	2011-08-21
NLOFDH5048	Area 5	468763	7754600	958.037	305	-55	50.2	2011-08-22
NLOFDH5049	Area 5	468815	7754723	951.892	305	-55	53.2	2011-08-23
NLOFDH5050	Area 5	467426	7753416	980.268	345	-55	77.3	2011-08-31
NLOFDH5051	Area 5	467432	7753391	979.673	345	-55	107.4	2011-09-03
NLOFDH5052	Area 5	468043	7753607	975.263	305	-55	149.1	2011-09-16
NLOFDH5053	Area 5	468221	7753507	989.782	305	-55	110.0	2011-09-17
NLOFDH5054	Area 5	466360	7753181	963.971	330	-55	152.3	2012-11-12
NLOFDH5055	Area 5	466583	7753215	953.333	330	-55	98.2	2012-11-14
NLOFDH5056	Area 5	466546	7753371	951.566	345	-55	140.1	2012-11-28
NLOFDH5057	Area 5	466765	7753405	954.306	330	-55	215.4	2012-11-16
NLOFDH6001	Area 6	466303	7749643	1031.782	180	-55	122.3	2011-09-01
NLOFDH6002	Area 6	466337	7749643	1030.34	180	-55	122.4	2011-09-02
NLOFDH6003	Area 6	466364	7749678	1026.352	180	-55	122.3	2011-09-18
NLOFDH6004	Area 6	466279	7749644	1031.453	180	-55	122.3	2011-09-19
NLOFDH6005	Area 6	465759	7749415	967.483	330	-55	215.4	2012-09-24
NLOFDH6006	Area 6	465696	7749558	981.915	150	-55	182.4	2012-09-28
NLOFDH6007	Area 6	465688	7749575	982.414	150	-55	169.7	2012-10-04
NLOFDH6008	Area 6	465583	7749507	970.518	150	-55	145.3	2012-10-18
NLOFDH6009	Area 6	465567	7749535	976.727	150	-55	122.0	2012-10-20
NLOFDH6010	Area 6	466136	7750078	1026.085	150	-55	161.1	2012-10-25
NLOFDH6011	Area 6	466227	7750368	1053.167	150	-55	200.3	2013-06-04
NLOFDH6012	Area 6	466440	7749718	1021.493	150	-55	248.2	2013-05-04
NLOFDH6013	Area 6	466193	7749906	1035.132	150	-55	200.1	2013-05-08
NLOFDH6014	Area 6	466233	7750084	1028.034	150	-55	251.3	2013-05-12
NLOFDH6015	Area 6	466027	7750080	1010.091	150	-55	239.2	2013-05-29

Hole ID	Area	Easting (m)	Northing (m)	Elevation (mamsl)	Azimuth (°)	Dip (°)	Depth (m)	End-Date
NLOFDH6016	Area 6	466147	7750282	1044.728	330	-55	86.3	2013-05-21
NLOFDH6017	Area 6	466056	7750469	1050.965	150	-55	260.3	2013-05-25
NLOFDH6018	Area 6	466300	7750465	1034.338	150	-55	224.3	2013-06-08
NLOFDH6019	Area 6	465812	7749682	1019.716	150	-55	212.3	2013-06-14
NLOFDH6020	Area 6	465856	7749210	973.838	150	-55	167.0	2013-06-17
NLOFDH6021	Area 6	465445	7749436	979.531	150	-55	200.0	2013-06-20
NLOFDH6022	Area 6	466301	7749974	1026.312	150	-55	242.2	2013-07-06
NLOFDH6023B	Area 6	466015	7749814	1026.714	150	-55	221.0	2013-07-12
NLOFDH6024	Area 6	465954	7749914	1013.825	150	-55	257.4	2013-07-19
NLOFDH7001	Main Intrusion	469041	7754001	971.888	0	-90	239.6	2012-09-06
NLOFDH8001	Area 8	465610	7751163	998.082	315	-55	152.3	2011-07-12
NLOFDH8002	Area 8	465478	7751319	988.551	135	-55	152.3	2011-07-13
NLOFDH8003	Area 8	465708	7751470	981.675	0	-90	152.5	2011-07-24
NLOFDH8004	Area 8	465246	7751083	990.618	0	-55	80.2	2011-07-25
NLOFDH8005C	Area 8	465455	7751355	983.709	324	-55	182.1	2012-11-05
NLOFDH8006	Area 8	465516	7751270	995.812	324	-55	149.9	2012-11-07
NLOFDH8007	Area 8	465651	7751102	999.671	324	-55	152.0	2012-11-09
LDD0001	Dolomite Hill	468829	7755507	974.266	310	-60	65.6	2020-07-30
LDD0002	Dolomite Hill	468874	7755548	966.517	330	-80	53.9	2020-08-01
LDD0003	Dolomite Hill	469121	7755809	947.552	310	-55	104.4	2020-08-04
LDD0004	Dolomite Hill	469149	7755802	950.501	310	-55	152.9	2020-08-06
LND0001	North Splay	478726	7758238	943.392	330	-55	77.7	2020-06-26
LND0002	North Splay	478766	7758268	938.433	330	-55	68.7	2020-06-27
LND0003	North Splay	478777	7758247	939.553	330	-55	122.5	2020-07-08
LND0004	North Splay	478814	7758295	934.592	330	-55	83.7	2020-07-10
LND0005	North Splay	478715	7758163	937.839	330	-55	215.9	2020-07-14
LND0006	North Splay	478630	7758163	934.675	330	-55	116.8	2020-07-16
LND0007	North Splay	478409	7758063	932.468	330	-55	86.7	2020-07-18
LND0008	North Splay	478417	7758037	931.765	330	-55	143.8	2020-07-21
LND0009	North Splay	478285	7757971	938.997	330	-55	140.9	2020-07-23
LND0010	North Splay	478297	7757940	933.545	330	-55	218.9	2020-07-28

10.6.2 Exploration Drilling Results

None of the exploration drilling outside of Area 2B and Area 4 has identified mineralization of a size and grade that it could be included as part of the mineral resource, and these exploration drilling results are not considered to be material to the mineral resource on the Lofdal ML. Results are referenced to exploration priority areas shown on Figure 10-11. Assays of typical significant mineralized intersections are given in Table 10-5.

10.6.2.1 Area 2

Exploration holes were drilled in Areas 2A and 2C as part of the initial drilling campaign that defined the alteration/mineralization zone in Area 2B. These holes targeted narrow exposed carbonatite dykes that yielded individual grab samples exhibiting high grades of HREE. The objective of this drilling was to test different styles and grades of dykes as a prelude to a more comprehensive drilling program in subsequent years. The drilling demonstrated that the narrow dykes exposed at surface in Area 2 did not widen with depth and anomalous mineralization was only present over widths of less than 2 m.

In 2012, six drillholes were drilled to test the northeastern extension of the Area 2B alteration system approximately 2 km to 3 km NE of Area 2B. These holes targeted the alteration/mineralization zone beneath where the best surface grab samples were taken from this part of the zone where albitic and carbonatitic alteration were well developed. Three of these holes intersected narrow widths (3 m to 4 m) of relatively low-grade mineralization, demonstrating that although the zone was carrying REE in this area, it is relatively low grade and discontinuous.

10.6.2.2 Area 4 NE Extension

The alteration zone that hosts the Area 4 mineral resource can be traced along strike in outcrop to the northeast for almost 9 km. Surface grab sampling outlined a number of areas with anomalous REE contents (described in Dodd et al., 2014). Seventeen drillholes were drilled in this zone in 2011 and 2012 to test the width and grade of the zone within approximately 2 km of the east end of the Area 4 mineral resource. Although the alteration was intersected in most holes, REE values were uniformly low grade, and anomalous over less than 4 m of core length.

10.6.2.3 Area 5

Area 5 is an extensive alteration zone with associated REE and thorite mineralization that outcrops along the northwest side of the Main Intrusion. Outcrops at its northeast end returned good REE values and the zone returned anomalous surface grab samples along more than 3.3 km of strike length. Targets were defined by surface outcrops with anomalous grab samples and by radiometric anomalies. 53 drillholes were drilled to test this zone. Mineralization was encountered in most drillholes, but it was found to be inconsistent in grade and width. The best intersections were between 10 m and 15 m wide (not true width; the orientation of the zone is not well defined by the drilling) with moderate grades of REE. However, significant intersections could not be connected between holes on the same section or along strike.

10.6.2.4 Area 6

Area 6 is an aerially extensive zone of fenetization associated with an intense radiometric anomaly in sedimentary rocks immediately north of the Oas Syenite. Surface outcrops are generally not well mineralized and where present, form highly radioactive, very narrow veins. 24 holes were drilled in this area in an attempt to define the nature and extent of any REE mineralization. The drilling found extensive zones of relatively low grade REE over a considerable vertical extent, but no areas were identified with significant grades that could be connected by several drillholes or that would be considered of economic interest. The alteration and mineralization do not seem to occupy consistent structures and there is no indication from the drilling as to whether the mineralized widths are true widths. The alteration contrasts in mineralogy and lithology with other mineralized alteration zones at Lofdal. The REE mineralization is also different, dominated by REE silicates (britholite, allanite), rather than phosphates, and typically associated with fluorite and locally molybdenite.

10.6.2.5 Area 8

Area 8 comprises the Emanya Plug and a number of nearby carbonatite dykes. There was little indication of mineralization in this area from surface grab samples or radiometrics. Seven drillholes were completed to test the potential of this plug and only very low grade, sporadic mineralization was encountered.

10.6.2.6 Dolomite Hill

Dolomite Hill is a wide zone of alteration immediately north of the Main Intrusion that returned some relatively high grades from surface grab sampling. Four holes were drilled in 2020 to test whether the size and grade of this zone shows improvement with depth. The holes encountered only sporadic mineralization, with few consecutive samples exhibiting anomalous REE mineralisation.

10.6.2.7 North Splay

The North Splay is an outcropping albitite and carbonatite alteration system. It is the most northerly and the most distant mineralization from the Main Intrusion and Area 4. A number of anomalous grade grab surface samples resulted from sampling that occur over a strike length of approximately 1.4 km, as described by Dodd et al. (2014). Despite the fact that some alteration was encountered in the core, there were no REE values of potential economic interest in the core samples.

Table 10-5

Analyses of typical significant altered/mineralized intersections in exploration drillholes

Hole ID	From m	To m	width m	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Y ppm	THREE +Y %	TREE +Y %
NLOFDH2A014	38	39	1	493	971	97	381	109	44	158	28	167	29	83	11	75	11	1045	0.16	0.36
NLOFDH2021	105	108	3	193	366	39	160	106	47	173	35	215	37	96	13	78	11	978	0.16	0.25
NLOFDH4104	35	38	4	73	137	15	63	66	29	121	21	111	18	41	5	28	4	437	0.08	0.11
NLOFDH5051	51	62	11	899	1543	163	582	166	55	190	27	135	23	62	9	57	9	616	0.20	0.54
NLOFDH5012	46	61	15	57	117	13	57	92	53	222	43	254	48	125	17	99	14	1258	0.27	0.31
NLOFDH6008	87	94	7	596	883	83	282	96	33	116	19	113	21	59	8	47	6	632	0.24	0.44
NLOFDH8005C	129	130	6	6400	10235	948	2776	263	61	154	18	94	17	43	6	31	4	565	0.26	2.32

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

Sample preparation for the 2010 and 2011-2012 drilling campaigns and for lithogeochemical grab sampling has previously been described in detail by Swinden and Siegfried (2011) and Siegfried and Hall (2012). Each drilling campaign had its own set of Standard Operating Procedures. These were similar to those employed in the 2020 drilling and were implemented in accordance with the CIM Best Practice Exploration Guidelines (Refer to Table 10-1 and Table 10-3 for summaries of procedures during these drilling campaigns).

The standard operating procedures (SOPs) for geological and geotechnical logging, core splitting and sampling were compiled by Gecko and reviewed by MSA to ensure that the various activities were carried out in a consistent, transparent, auditable and appropriate manner in accordance with industry standards.

11.1 Diamond Drilling Procedures

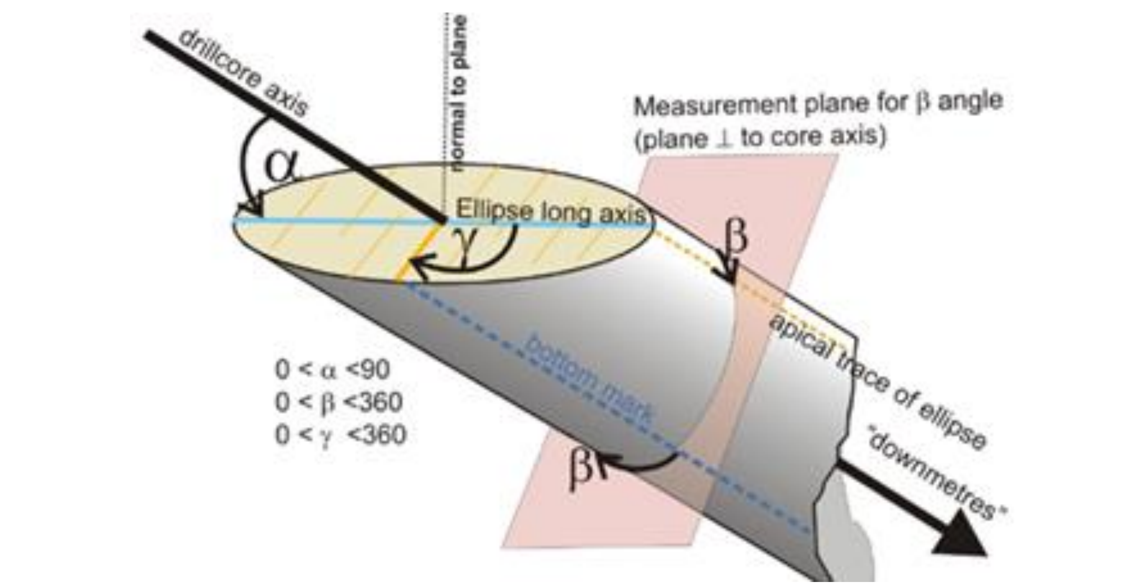
The following descriptions refer to procedures followed during the 2020 drilling.

11.1.1 Drillhole Logging

Geological and geophysical logging (Gamma logging of all core; handheld PXRF for Y on core with anomalous radiometric readings) was carried out by Gecko geo-technicians and geologists and followed a comprehensive protocol.

Structural data, alpha and beta angles (Figure 11-1), were collected on the core to determine the spatial orientation of mineralising and barren vein systems. The alpha angle is the acute angle between the core axis and the long axis of the ellipse (0°-90°; Figure 11-1). The beta angle is the angle between the orientation line marking "Top of Hole" as reference line along the core and the ellipse apical trace measured in a clockwise sense (0°-360°; Figure 11-1). Alpha and beta angles data were collected using a goniometer in all mineralised zones and other zones as deemed necessary by the logging geologist.

Figure 11-1
Illustration of the alpha, beta, and gamma angles in core



Source: *Holcombe, 2016*

The drillhole cores were logged in detail, recording lithology, alteration, intense near surface weathering / overburden and structure. The weathering at depth is visually indistinct but is evident from core recovery and geotechnical logging (RQD).

11.1.2 Sample Preparation

As mineralization is not always visually discernible, the core intervals to be sampled were determined at the discretion of the logging and sampling geologist using both logging information as well as gamma readings measured with a RadEye PRD scintillometer, and XRF analyses obtained from an Olympus Delta 50 or Olympus Vanta handheld XRF analyser (PXRF). The RadEye was used to obtain indicative gamma readings along the entire length of core while in the box and the maximum and minimum values were recorded. Where the in-box gamma values were greater than 50 the core was removed from the box and the RadEye was used to determine gamma values again. PXRF readings for Y were taken along the entire core and the values noted. Both the RadEye gamma and PXRF Y values are indicative and are used solely for the purpose of identifying areas to be sampled for laboratory analysis.

Sampling of the drillhole core was undertaken after metre marking, geological and geotechnical logging, and photographing of the core. All core cutting, sampling, bagging and dispatch procedures were undertaken at the Lofdal field camp. After this work was completed, the remaining core was transported to the warehouse in Khorixas for storage.

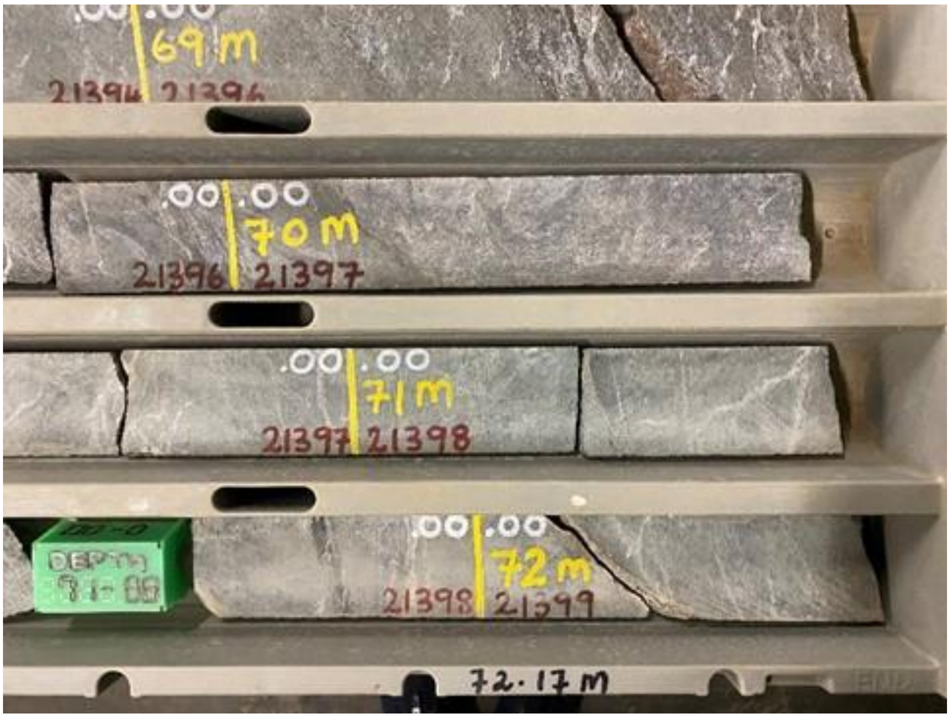
Mineralised intervals in the drillhole core were generally sampled at one metre intervals. In cases where lithological changes were observed within a one metre sampling interval, then each lithology was sampled separately, using a minimum 15 cm core length. Sampling was to at least 2 m above and below the zone identified as potentially mineralised. Narrower potentially mineralised zones away from the main zones of mineralisation were also sampled and, at the discretion of the sampling geologist, a single one metre sample was taken either side of the potentially mineralised zone.

11.1.2.1 Core marking and splitting

Prior to cutting the core, sampling intervals and unique sample numbers (sample ticket book number) were clearly marked above the core orientation line and below the core cutting line drawn on the drillhole core. In instances where the orientation of the core was unknown, then the cutting line and the orientation line were the same line. The start and end of each sample was marked with a yellow line around the core and a white dot on the core cutting line.

A designated geologist responsible for all core sampling carried out the core sampling. The colour convention of yellow (metre mark), white (sampling interval) and red (sample number) was used for all drillholes. (Figure 11-2).

Figure 11-2
Examples of drillhole core marking



Source: *Ellmies, 2020*

The core was split in half using a commercial core cutter (Figure 11-3) with a 2.2 mm wide diamond core cutting blade. The split halves were returned to the labelled core boxes between the depth blocks and correctly orientated with the aid of the downhole arrows. The logging/sampling geologist checked the core boxes to ensure that all core and core markings were correct prior to removing the sample. The upper half of the core was used for analysis and the lower half of the core was retained in the core tray for future reference or additional test work. Sample numbers were marked on each individual piece of core with a red waterproof marker and recorded in the customised sampling sheet, which was then captured in the project database.

Figure 11-3
Core cutting device

Source: *Ellmies, 2020*

11.1.2.2 Core sampling and sample dispatch

Each core sample was assigned a unique number on a wet strength, sequential sample number tag and the sample, generally representing one metre, was consistently taken from the same side of the core relative to the cutting line and placed in a thick plastic sample bag. Two sample number tags were placed in each sample bag, one inside the bag and the other clearly visible to the outside of the bag but located in the folded seal of the bag. Bags were securely sealed with staples and sequentially packed ready for dispatch. Drillhole number and sampling interval were recorded on the sampling book stub and entered into customized sampling sheets which were then digitally captured into the on-site computer. The sampling database was regularly transmitted and backed up at NMI's Windhoek office.

Gaps in the sample sequence were left for standards, blanks and duplicates during the sampling process. The standards and blanks were only packed and labelled with the assigned sample numbers after the core sampling process was completed, in order to minimise the possibility that sample numbers are inadvertently swapped between routine samples, standards or blanks.

The geologist responsible for sampling and dispatch verified the sample numbers and sequence before the samples were packaged in groups of ten into uniquely numbered heavy-duty bags, which were closed with cable ties. The bags were then re-checked against the final sample submission sheet and signed off by the geologist before being loaded and transported in a company vehicle to Actlabs Namibia (Pty) Ltd (Actlabs) in Windhoek.

The Gecko driver of the vehicle signed two copies of an acceptance/transportation sheet specifying the quantity of bags together with sample export documentation for the onward dispatch to Actlabs in Canada. The samples were dispatched to Windhoek on a weekly or fortnightly basis and all sample transport documentation is filed at the NMI offices in Windhoek.

11.1.2.3 Density measurements

Rock density measurements using the Archimedes principle (weight in air versus weight in water) were taken for a portion of each core sample, after splitting and sampling. Each density sample was between approximately 15 cm and 20 cm long. The density device comprises a 3 kg electronic scale, below which a water container was placed (Figure 11-4). A core sample holder attached to the balance was used to immerse core in water in the container. The method was as follows:

- the balance was reset to 0.00 g before each reading;
- a dry length of core was placed in the core holder and the mass of the core in air was recorded;
- the container was filled with water to submerge the sample and the mass of the core was determined in water.

The density (specific gravity or SG) was calculated using the formula:

$$SG = \frac{Mass\ in\ Air}{Mass\ in\ Air - Mass\ in\ Water} = \frac{W}{V}$$

Figure 11-4
Apparatus for measuring density (SG) by the Archimedes principle

Source: *Ellmies, 2020*

11.1.2.4 Core storage

The core trays with the unsampled intervals and remaining halves of the sampled intervals are permanently stored in a rented facility near Khorixas (Figure 11-5 and Figure 5-2). The fenced premises are locked, as is the warehouse and all storage containers. Only Gecko and NMI staff and NMI consultants have access to the building where the core is stored.

Figure 11-5
Core storage in the Khorixas warehouse and in containers in the warehouse yard

Source: *Ellmies, 2020*

11.2 Reverse Circulation Drilling Procedures

Prior to drilling, three bags were pre-labelled with a permanent marker. Drilling was undertaken at one metre intervals resulting in material consisting of rock chips and dust. These were transported to surface and channelled into a rig-mounted, three-tier riffle splitter. The riffle splitter generated an A-sample and a B-sample, weighing between 1.8 kg and 4.5 kg, and the remainder as a bulk sample with an average weight of 28 kg. Samples were weighed immediately after collection and secured with cable ties. The A-sample / B-sample bags were placed in larger polyweave bags, each containing ten sample bags.

11.2.1 Reverse Circulation Logging

A small portion of the sample was passed through a 50 µm aperture sieve to separate the coarse chips from the fines, the coarse chips were washed and collected in pre-labelled chip trays for logging purposes.

The mineralised zone was identified through gamma readings of the core chips using a "Radeye" Geiger counter by Thermo Fisher Scientific GmbH. The Radeye was placed on top of the sample bag for each drilled metre for a period of ten seconds. The average number of counts per second (cps) was recorded by the geologist and if an average of more than 50 cps was recorded, the sample bag was placed one metre away from the adjacent bags and re-analysed. This was done to confirm the gamma readings and minimise the influence from the adjacent bags. Once the mineralised zone was defined, geologists were instructed to visually re-log the chips from this zone.

The logging recorded primary and secondary lithologies, alteration, colour and visible minerals. These were captured on an NMI logging template.

The 50 µm RC fines for each drilled metre were analysed using a handheld Olympus Inno-X Delta Dynamic X-Ray Fluorescence analyser. All samples were analysed twice using the "Mining" mode for an average of 10 to 20 seconds. Zones containing samples with yttrium values greater than 100 ppm, together with the samples identified via gamma readings were selected for submission for laboratory analysis.

11.2.2 Chip sampling and sample dispatch

Sampling lists, with Quality Assurance and Quality Control (QAQC) samples were pre-populated, prior to commencement of drilling. Sampling was only undertaken once the mineralised zone was defined using the XRF and gamma logging. The A-sample derived from the riffle splitter was used for submission to the laboratory, sample tickets were stapled to these bags and QAQC samples were inserted in their pre-defined sequence. The drillhole ID number and the sample depths were removed from the bags using paint thinner. Ten samples were placed inside a polyweave bag and sealed. Any A-samples not submitted to the laboratory were stored at the NMI warehouse in Khorixas, together with the B samples.

Samples were submitted to the laboratory in batches, consisting of two drillholes per batch. The samples were transported to Actalabs Namibia by NMI or Gecko staff.

11.3 Sample Analyses

Samples for the diamond drilling and RC campaigns underwent the same sample preparation and analytical procedure.

11.3.1 Sample preparation at the laboratory

At the Actlabs preparation facility in Windhoek, the samples were laid out and checked against the NMI sample list to verify that all samples are present and correctly numbered. An internal sample tracking sheet was prepared by Actlabs to track progress of the samples through the laboratory.

Using Actlabs' sample preparation package RX1, the samples were initially crushed in a jaw crusher to 80% passing two mm and then passed through a riffle splitter to obtain a 250 g split for pulverisation. The splits were pulverized with a swing mill in hardened steel bowls to 95% passing 105 µm. Samples were then homogenized in a stainless-steel riffle splitter and a 15 g sample and duplicate were drawn from the splitter for analysis. The splits were placed in Ziploc bags and prepared for shipping to Actlabs' analytical laboratory in Canada. The duplicate pulps were stored at the Actlabs facility in Windhoek.

11.3.2 Sample analyses at the laboratory

The pulp samples were couriered by air to the Actlabs analytical facility in Ancaster, Ontario, Canada, where they were analysed for major element oxides, rare earth elements and other trace elements.

Actlabs used their Code 8, REE Assay Package which involves a lithium metaborate fusion, multi acid digestion, and Inductively Coupled Plasma Analysis – Optical Emission Spectroscopy (ICP-OES) finish for major element oxides; Sc, Be, V, Sr, Y, and Zr. An ICP-Mass Spectrometry (ICP-MS) finish was used for other trace elements including the REE. Nb_2O_5 and ZrO_2 were determined by sample fusion and standard X-ray fluorescence (XRF) method for samples with >0.3% P_2O_5.

Rare earth elements are among the most difficult elements to analyse to a high degree of analytical precision under a wide range of individual REE concentrations. The lithium metaborate fusion and ICP-MS finish is the current industry standard for high quality REE analyses.

Actlabs' quality system is accredited to international quality standards through the International Organisation for Standardisation / International Electrotechnical Commission (ISO/IEC) 17025, which includes ISO 9001 and ISO 9002 specifications, with CAN-P-1758 (Forensics), CAN-P-1579 (Mineral Analysis) and CAN-P-1585 (Environmental) for specific registered tests by the Standards Council of Canada (SCC).

11.4 Sample Security

All drillhole core handling, sampling and transportation activities were undertaken by Gecko staff. The individual procedures followed strict protocols outlined in a comprehensive SOP manual which was drafted by Gecko and reviewed by MSA. NMI's field camp has sample preparation facilities and is located in a relatively remote area to which only staff and contractors have access.

The core boxes were transported from the drilling rigs to the exploration camp on a daily basis by Gecko staff. To reduce movement of the core, the boxes were covered with foam sheets and ratchet-strapped to the loading bay of a utility vehicle for transport. Once the samples had been taken and prepared for dispatch, a Gecko staff member transported the samples in sealed bags to Actlabs' Windhoek preparation laboratory from where the material was couriered to Actlabs' Canadian facilities for sample analyses.

A "chain of custody" is maintained from the site to the laboratory via locked facilities and dispatch and receipt documentation. MSA considers that there was little or no opportunity for sample tampering by an outside agent due to the secure and auditable "chain of custody" implemented by Gecko and NMI personnel.

11.5 Quality Assurance and Quality Control

Appropriate quality assurance and quality control (QAQC) monitoring is a critical aspect of the sampling and assaying process in any exploration program. Monitoring the quality of laboratory analyses is fundamental in ensuring the highest degree of confidence in the analytical data and providing the necessary confidence to make informed decisions when interpreting all the available information. QA may be defined as information collected to demonstrate that the data used in the project are valid. QC comprises procedures designed to maintain a desired level of quality in the assay database. Effectively applied, QC leads to identification and correction of errors or changes in procedures that improve overall data quality. Appropriate documentation of QC measures and regular scrutiny of QC data are important as a safeguard for project data and form the basis for the quality assurance program implemented during exploration.

In order to ensure quality standards are met and maintained, planning and implementation of a range of external quality control measures is required. Such measures are essential for minimizing uncertainty and improving the integrity of the assay database and are aimed to provide:

- An integrity check on the reliability of the data;

- Quantification of accuracy and precision;
- Confidence in the sample and assay database;
- The necessary documentation to support database validation.

For all its drilling campaigns at Lofdal, NMI has adopted an industry standard QAQC program and inserted internal standards and certified reference material (CRM) and blanks each at a frequency of one in 20 (5%) into the batches prior to submission to Actlabs. These control samples were inserted as part of a continuous sample number sequence and the QAQC samples were not obviously different from routine samples after the pulverization process. Actlabs were requested in the sample submission sheet to split the pulp of predetermined samples (1 in 20) and insert the material in the empty and pre-numbered bags to create the required 5% duplicate samples. Actlabs in Canada was unaware which samples were QAQC samples and what their composition was. This allowed for monitoring of the sample preparation procedure as well as monitoring the accuracy and precision of analyses.

5% of the sample assayed by Actlabs were submitted to a second laboratory in Canada for check analysis. Hence the overall number of control samples constituted 20% of all samples analysed, which is in line with good practice procedures to ensure integrity of data and is independent from the internal QAQC methods applied by the laboratory itself.

11.5.1 2010, 2011 and 2012 Drilling Programme

Results of the 2010, 2011 and 2012 QAQC program were reported by Swinden and Seigfried (2011) and Seigfried and Hall (2012). The QAQC programs for these campaigns demonstrated that the analytical work was fully adequate and did not indicate any issues with the data quality.

11.5.2 2020 Drilling Programme

Data from duplicates, internal standards, CRMs and blanks were examined on a batch-by-batch basis to immediately identify any errors in the analytical data. Data from duplicate, standard and blank analyses was examined numerically and graphically to determine the repeatability of the duplicate analyses, the accuracy of the standard analyses with respect to the accepted values, and the levels of REE present in the blanks.

11.5.2.1 Blank samples

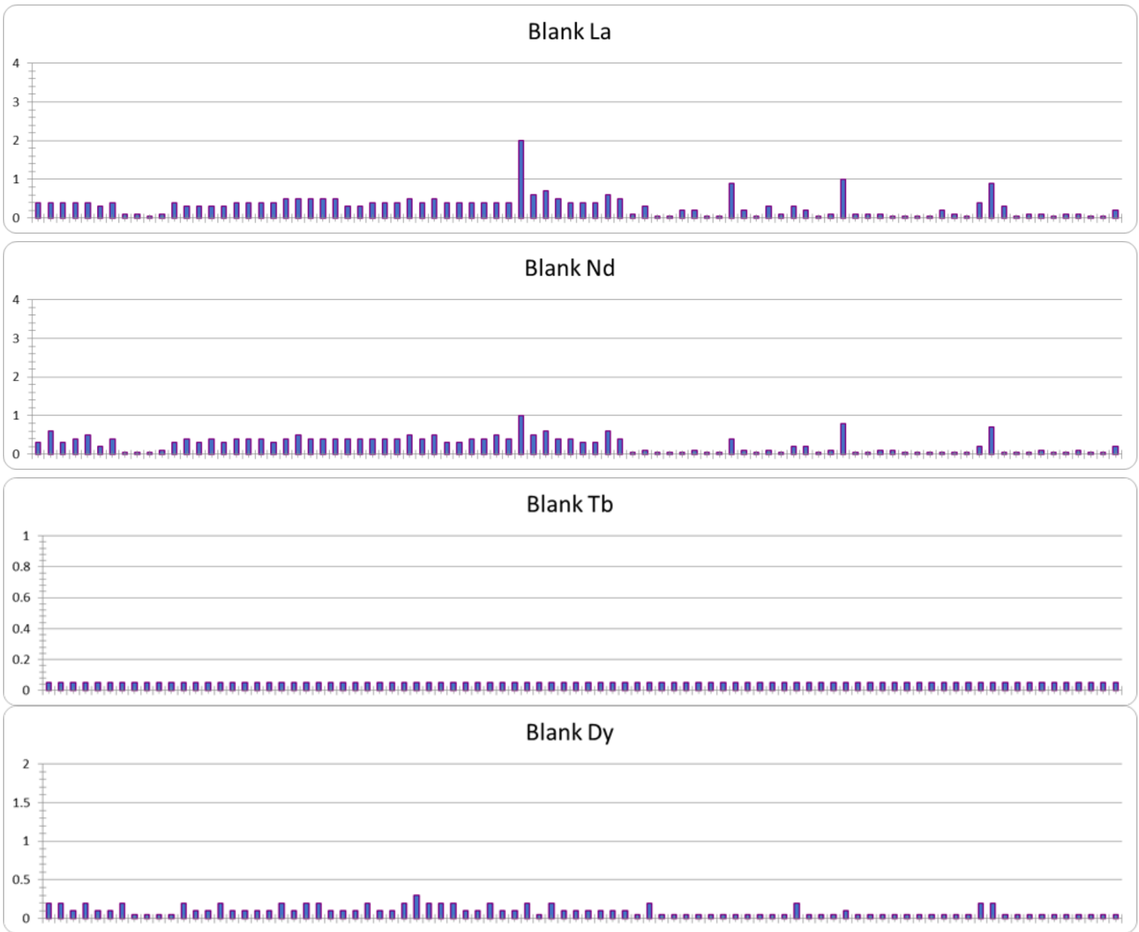
Two different blank materials were used to evaluate sample preparation:

- Quartz pebble blank sourced from Ferreiras Garden Shop in Windhoek. Used in drillholes L4D0115 through L4D00136 and in drillholes L2BD0027 through L2BD0041; and
- Dolomite sourced from Ferreiras Garden Shop in Windhoek. Used in drillholes L4D0137 through L4D00170 and in drillholes L2BD0042 through L2BD0055.

The blank materials were supplied as coarse gravel and a sample of approximately 50 g was used. The blank samples were inserted with consecutive numbers within the core sample stream and underwent the same sample preparation and analytical processes as the routine field samples. Graphical representations of blank sample results for selected REE are shown in Figure 11-6 and

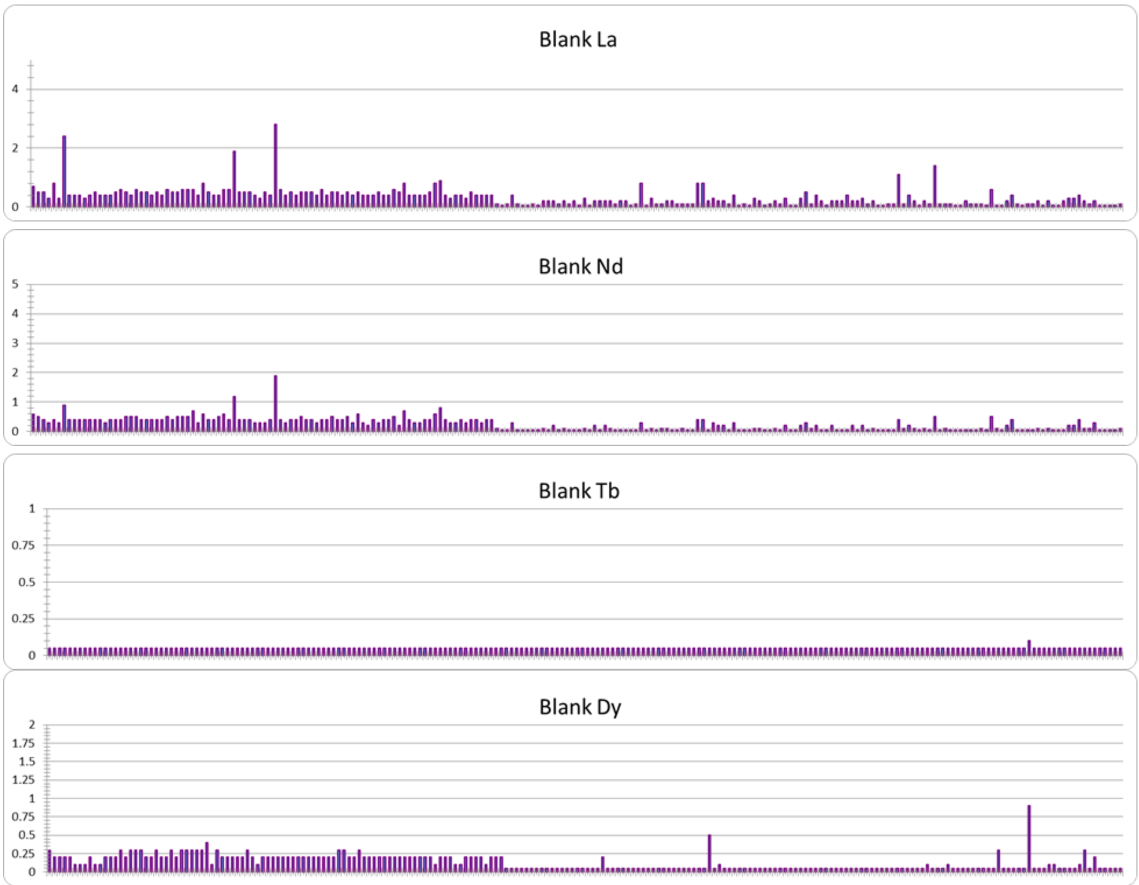
Figure 11-7 and blank sample summaries for all REEs are given in Table 11-1. Repeated analyses show that these materials are acceptable for use as blanks for carbonatite hosted REE analyses with all REE present in concentrations near or below their detection limits. Background values are slightly higher in the quartz pebble blank and this is reflected by a number of slightly anomalous and insignificant (i.e., between 1 and 3 ppm) Ce analyses in this material. There are no anomalies in the analyses that suggest anything more than normal difficulties of analysing these elements at very low concentrations. No further action was taken or required, and the results of the blank analyses indicate that there was no contamination or systematic analytical issues during the period of sample submission and analyses.

Figure 11-6
Blank analyses for selected REE from Area 2B



Note: *vertical axis in ppm*

Figure 11-7
Blank analyses for selected REE from Area 4



Note: *vertical axis in ppm*

Table 11-1
Number of blank failures (>10 times LDL*)

Number of Samples	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y
300	6	33	1	2	0	0	0	0	0	0	0	0	0	0	0

Note: **LDL=Lowest Detection Limit*

11.5.2.2 Standards

During the 2020 drilling campaign, four different standards were used. Three NMI in-house standards with varying degrees of HREE enrichment, namely STD4, STD5 and STD6, were used. All in-house standards underwent 'round robin' analyses at four independent laboratories, but are not certified. Repeated analyses of STD4 and STD6 throughout the program demonstrated a generally consistent REE composition. The use of STD5, however, was discontinued after 20 holes because of reproducibility issues, particularly with respect to Sm, Tb, Er and Tm. One commercial CRM, AMIS0185 was also used. The heavy rare earth elements Gd, Tb, Er, Yb and Lu in this CRM are neither certified nor provisional but only reported for informational purposes and were not used for the purposes of QAQC in this project. Control charts showing the assays through time of several REEs for the 2020 drilling are shown in Figure 11-8 to Figure 11-14 and the standards data for all elements is summarized in Table 11-2 and Table 11-3.

Figure 11-8
Analyses of the CRM AMIS0185 for selected REE in Area 2B

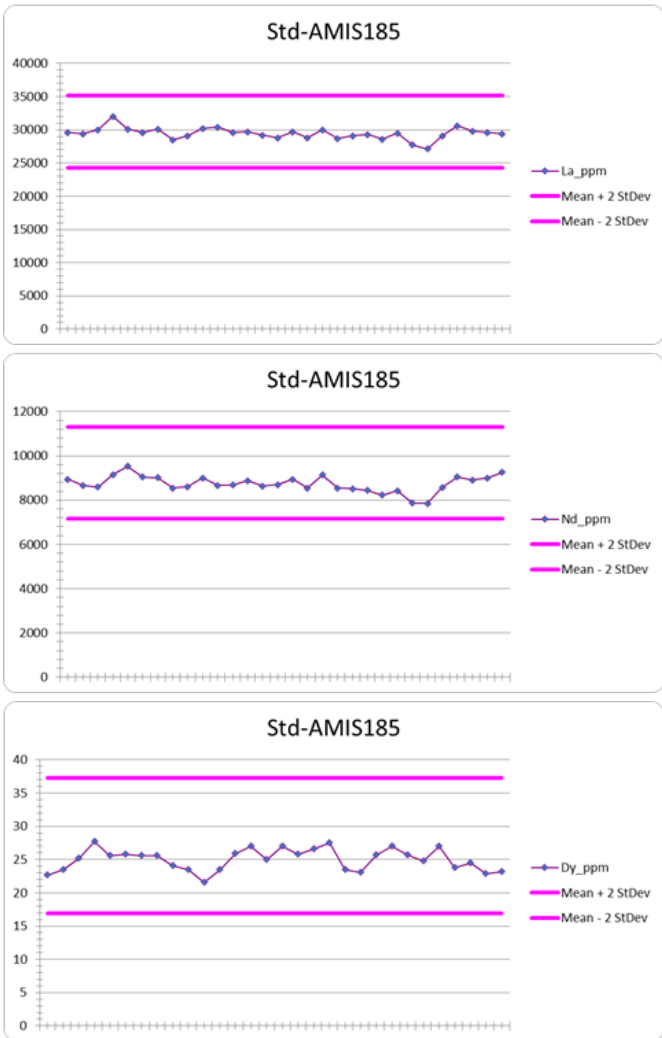


Figure 11-9
Analyses of the CRM AMIS0185 for selected REE in Area 4

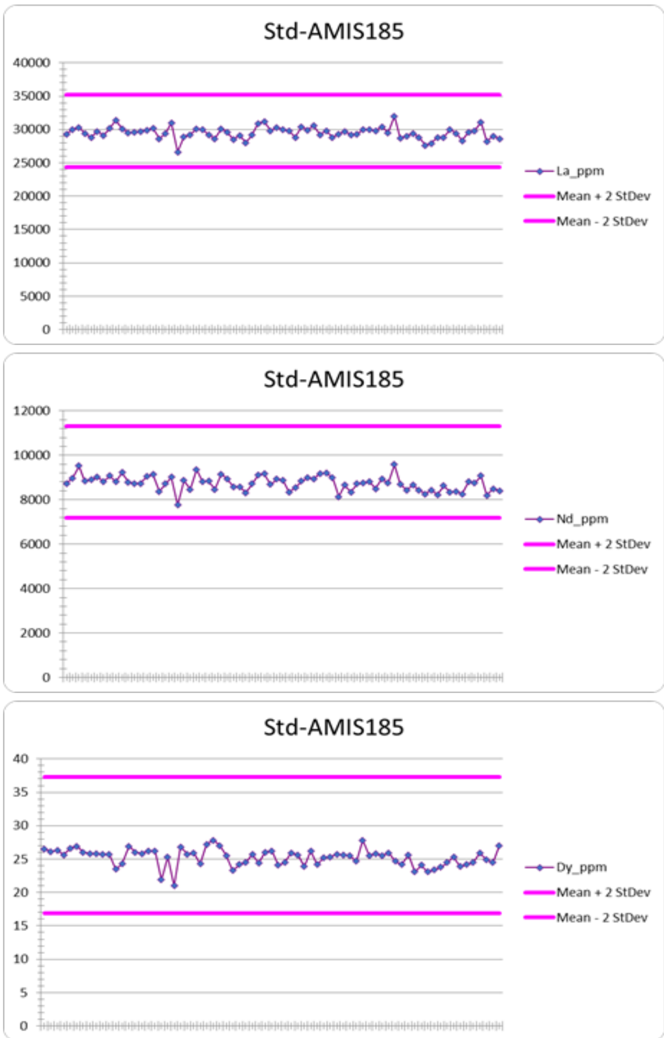


Figure 11-10
Analyses of the Standard STD4 for selected REE in Area 2B

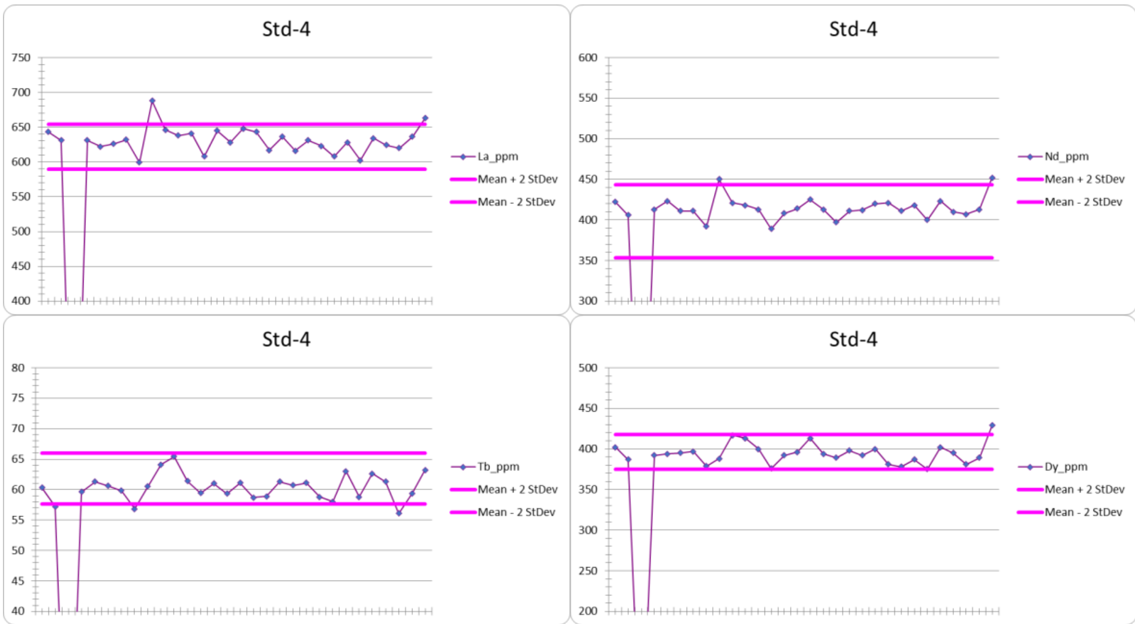


Figure 11-11
Analyses of the Standard STD4 for selected REE in Area 4

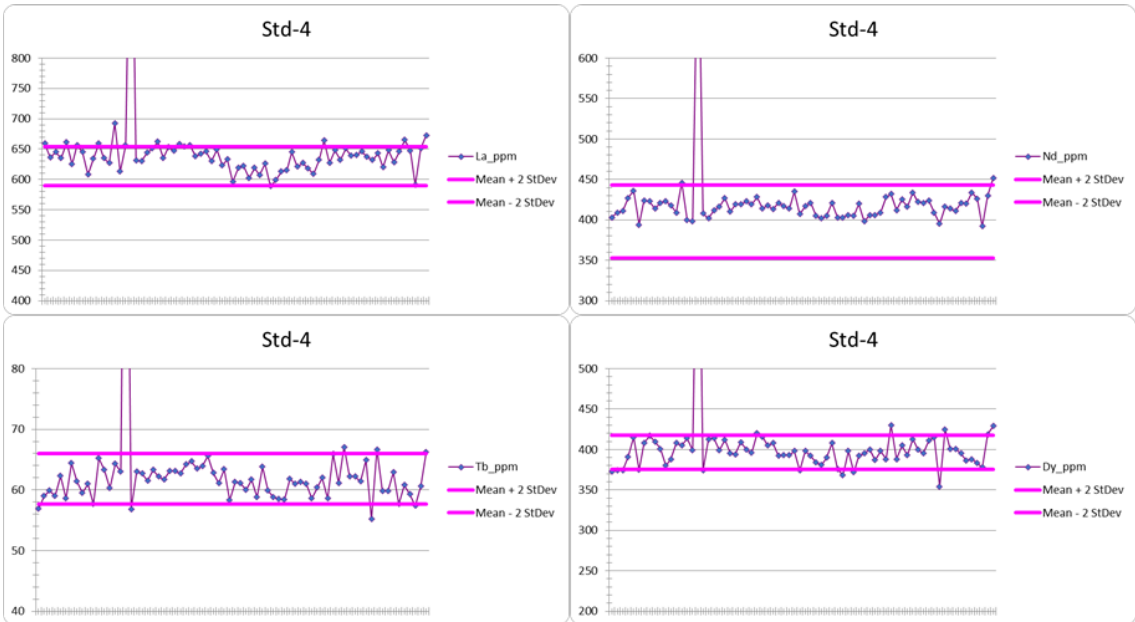


Figure 11-12
Analyses of the Standard STD5 for selected REE in Area 4

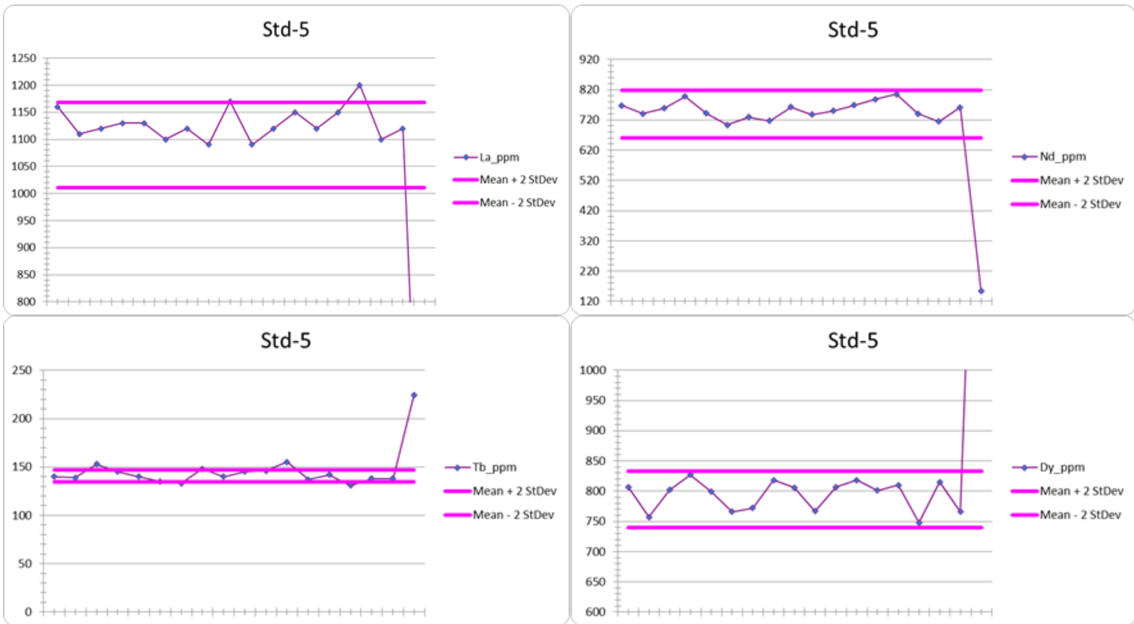


Figure 11-13
Analyses of the Standard STD6 for selected REE in Area 2B

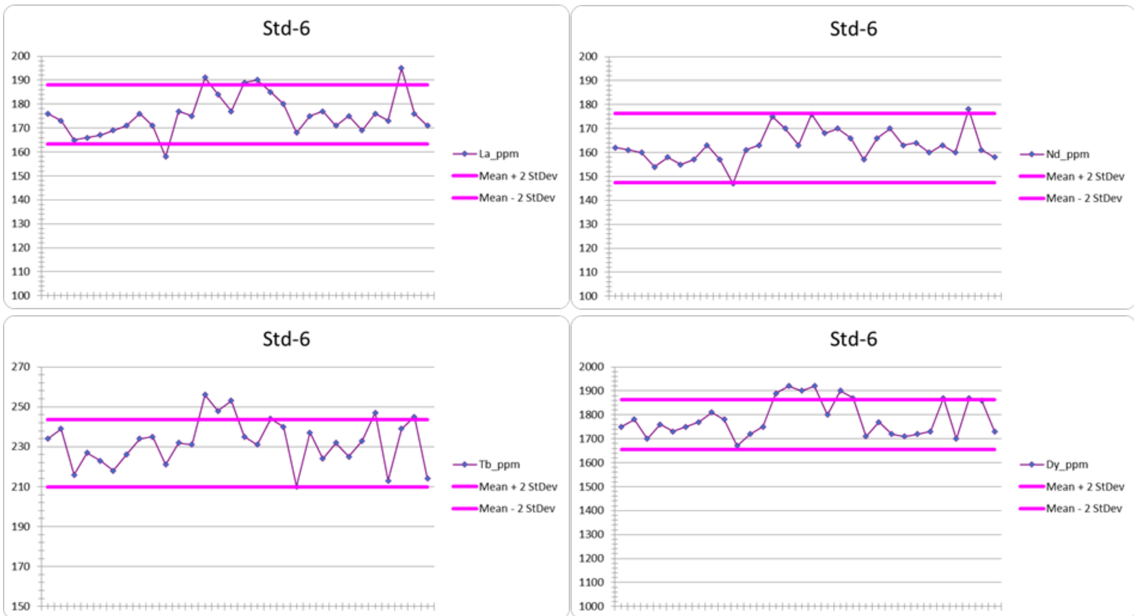


Figure 11-14

Analyses of the Standard STD6 for selected REE in Area 4

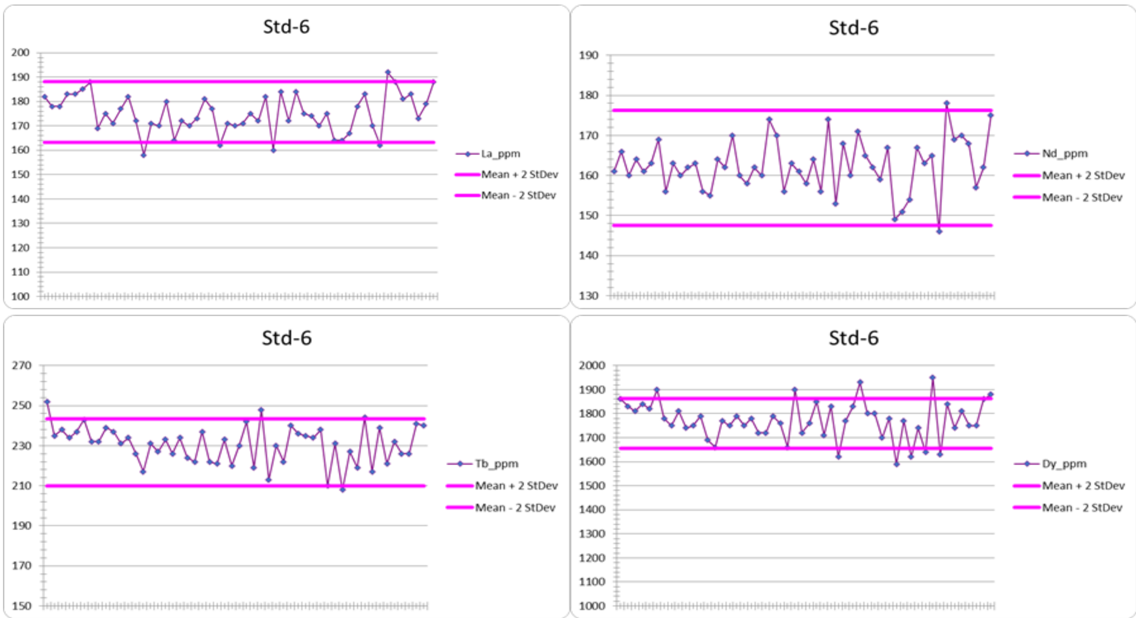


Table 11-2
Statistics for the reference materials used in the 2020 drilling program

CRM Name	Number Used	Statistic	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y
STD 4	81	Accepted Mean	622.0	990.2	102.0	398.2	179.9	76.6	300.6	16.1	396.3	81.1	227.8	33.7	210.8	30.0	2439.7
		Standard Deviation	36.9	5.6	22.6	4.6	3.3	14.0	2.1	16.1	10.6	4.4	6.6	0.9	6.5	2.2	97.9
STD 5	18	Accepted Mean	1089.3	1666.2	173.9	739.2	465.1	201.4	787.6	39.4	785.9	142.8	370.1	49.7	276.0	36.8	4126.0
		Standard Deviation	65.3	7.9	39.3	8.2	9.7	25.5	3.0	39.4	23.3	6.9	5.5	0.6	9.2	2.4	162.6
STD 6	88	Accepted Mean	175.7	331.7	38.8	161.9	178.5	137.1	804.4	6.2	1758.9	399.2	1228.2	183.7	1106.7	146.4	12659.0
		Standard Deviation	11.9	1.2	7.2	7.6	5.5	38.1	8.4	6.2	51.9	12.6	63.1	4.9	34.8	10.9	468.0
AMIS0185*	106	Accepted Mean	29760.0	40750.0	3471.0	9238.0	556.0	94.2	29760.0	2720.0	27.1	3.2	-	0.4	-	-	62.0
		Standard Deviation	4610.0	343.00	1033.0	48.00	12.10	2720.0	-	-	5.10	0.50	-	0.08	-	-	7.70

Note: ** Certified and provisional concentration only*

Table 11-3
Failure rate (outside ± 3 SD) for standards assayed by Actlabs during the 2020 drilling campaign

CRM Name	Failure Rate	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y
STD 4	Number of Samples	7	3	3	3	17	3	2	4	8	2	6	7	7	2	2
	Percentage	6.5 %	2.8 %	2.8 %	2.8 %	15.7 %	2.8 %	1.9 %	3.7 %	7.4 %	1.9 %	5.6 %	6.5 %	6.5 %	1.9 %	1.9 %
STD 5	Number of Samples	1	1	1	1	8	1	0	4	1	1	6	9	1	1	1
	Percentage	5.6 %	5.6 %	5.6 %	5.6 %	44.4 %	5.6 %	0.0 %	22.2 %	5.6 %	5.6 %	33.3 %	50.0 %	5.6 %	5.6 %	5.6 %
STD 6	Number of Samples	1	2	4	0	0	0	0	3	5	1	0	10	3	0	0
	Percentage	1.1 %	2.3 %	4.5 %	0.0 %	0.0 %	0.0 %	0.0 %	3.4 %	5.7 %	1.1 %	0.0 %	11.4 %	3.4 %	0.0 %	0.0 %
AMIS0185*	Number of Samples	0	0	0	0	0	0	-	-	0	0	-	-	-	-	1
	Percentage	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %	-	-	0.0 %	0.0 %	-	-	-	-	0.9 %

Four samples gave highly anomalous results and required further investigation as detailed in Table 11-4. Three were found to result from incorrect categorisation of the sample material, probably taking place in the core yard, and the other was due to a missing Y assay. None indicate an issue with the sample preparation or analytical procedures.

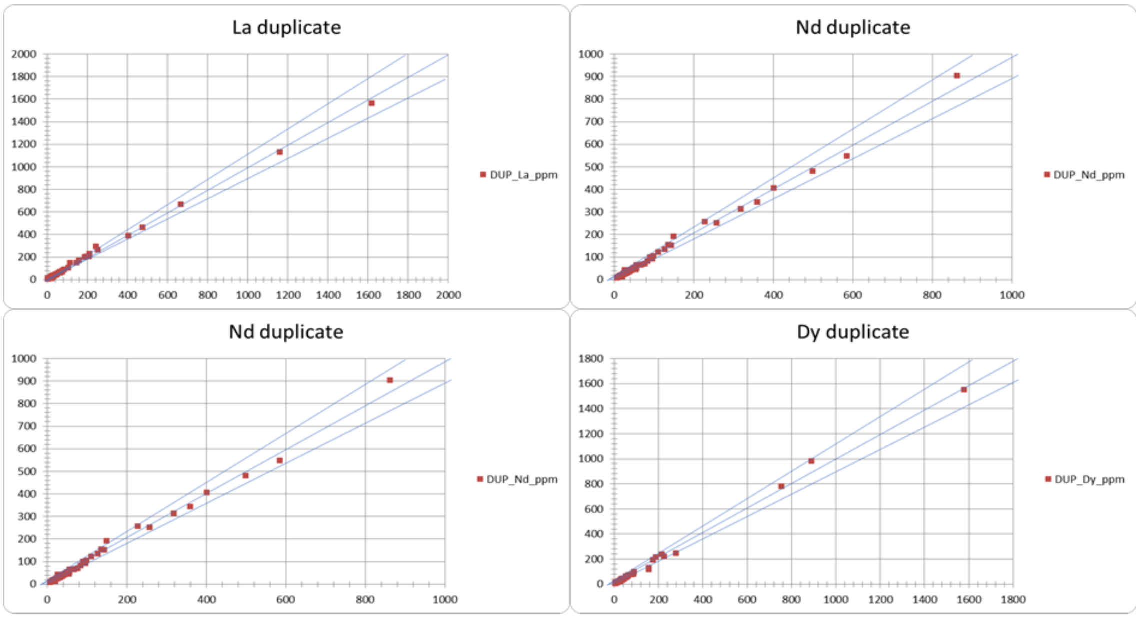
Table 11-4
Resolution of anomalous CRM analyses

Area	Standard as recorded	Elements affected	Resolution
Area 4	STD 4	All REE display a positive spike	STD5 was mistakenly inserted
Area 4	STD5	Negative spike in LREE, positive spike in HREE	STD6 was mistakenly inserted
Area 4	AMIS 185	Zero value for one Y analysis	Cell was blank on the reporting spreadsheets
Area 2B	STD4	All REE display a negative spike	A blank was mistakenly inserted

11.5.2.3 Pulp duplicates

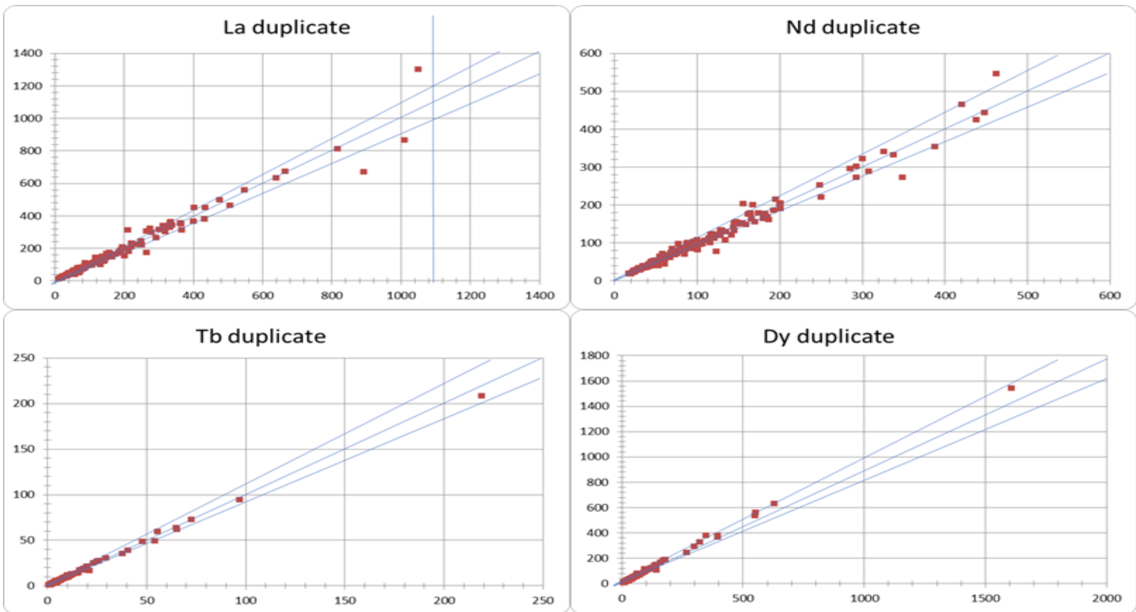
Laboratory duplicates were prepared for every 1 in 20 samples. The original and duplicate analyses were compared graphically to ensure repeatability. Where significant outliers from the expected values were observed in adjacent control samples, a subset of the batch was re-analysed. This was the case in one batch where several duplicates displayed an anomalous amount of divergence. Re-analyses produced acceptable duplicate analyses. No additional measures were taken or deemed necessary.

Figure 11-15
Analyses of laboratory duplicates for selected REE from Area 2B



Note: *Reference lines are: 1:1; +10% and -10%, values are ppm*

Figure 11-16
Analyses of laboratory duplicates for selected REE from Area 4



Note: *Reference lines are: 1:1; +10% and -10%, values are ppm*

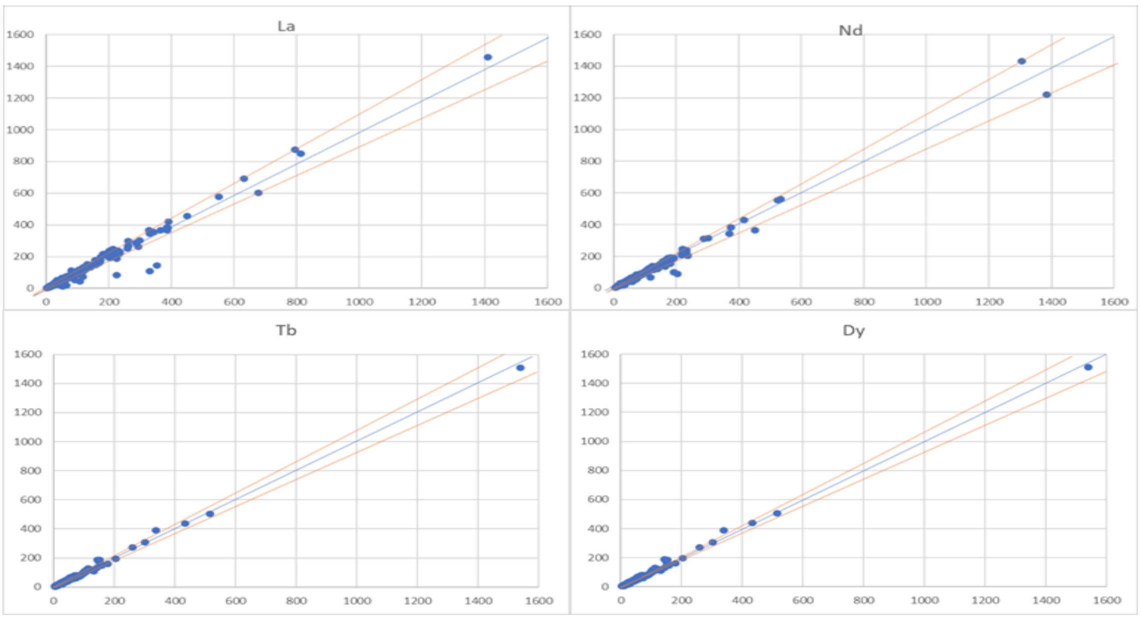
Table 11-5 Percentage of assays within mean absolute difference of 10% and 20% (above 10x LDL) – Actlabs duplicate versus original															
	La	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**	**Y**
10 %	76	77	78	82	77	80	80	79	82	81	80	79	82	80	83
20 %	94	95	95	96	97	97	97	97	96	96	97	96	96	96	96

11.5.2.4 Second laboratory duplicate assays ("Umpire laboratory")

Approximately 5% of samples were sent for check analyses at a second laboratory; ALS Minerals (ALS) in North Vancouver, Canada. Pulps were split from analytical samples at the Actlabs sample preparation facility in Windhoek and were shipped directly to ALS. The results of these analyses were plotted graphically against the original analysis. In the vast majority of duplicate sample pairs, there was less than 10% difference. The results for selected REEs are presented in Figure 11-17 and summarised for all REEs in Table 11-6.

ALS are registered to ISO 9001:2008 and have received ISO 17025 accreditation for laboratory procedures relevant for the purpose of the check assay exercise.

Figure 11-17
Scatterplot of duplicate pair data (Actlabs and the umpire lab (ALS)) for selected REES



Note: *ALS assays on horizontal axis. Actlabs on vertical axis, values in ppm*
Blue reference lines is 1:1; red lines are +10% and -10%

Table 11-6
Mean and Variance of original and duplicate data – Actlabs versus ALS

Element	Actlabs		ALS	
	Mean	Variance	Mean	Variance
La	118.6	62340.2	117.0	67455.5
Ce	221.7	203810.4	216.7	204241.6
Pr	24.5	2609.9	24.1	2611.4
Nd	99.3	70015.8	96.1	63104.1
Sm	31.9	11530.6	30.8	10166.8
Eu	10.5	820.0	10.6	850.5
Gd	41.1	9203.8	38.6	7464.5
Tb	7.2	210.3	7.2	207.9
Dy	44.9	9701.8	45.4	9591.9
Ho	9.2	455.8	9.0	471.4
Er	27.5	5527.6	26.2	4656.1
Tm	3.9	108.0	3.8	113.1
Yb	25.1	5379.7	24.0	4765.2
Lu	3.3	80.8	3.5	106.2
Y	278.5	635284.9	267.6	509003.4

11.5.3 2023 RC Programme

The QAQC for the 2023 RC drilling programme consisted of blanks, field duplicates, lab duplicates and CRMs with an average insertion rate of 1 in every 10 samples.

11.5.3.1 Blanks

A total of 284 blanks were used for the 2023 RC programme which underwent the same sample preparation and analytical process as the primary samples. MSA checked the results for the blanks samples for individual REE elements using a threshold of 10 times the lower detection limit. No significant levels of contamination were detected for the HREEs, however several LREEs reported values above the threshold of 1 ppm, with La values up to 7.4 ppm and Ce values up to 10 ppm. The blank chart for dysprosium is shown in Figure 11-18 and for cerium in Figure 11-19.

Figure 11-18

2023 RC programme blank chart for dysprosium

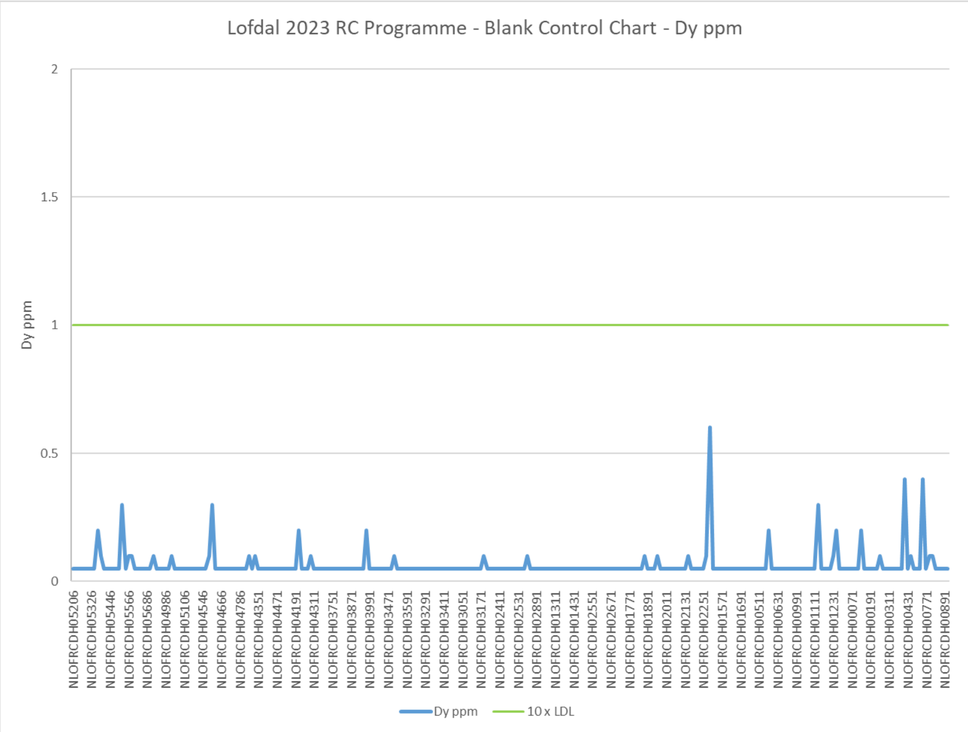
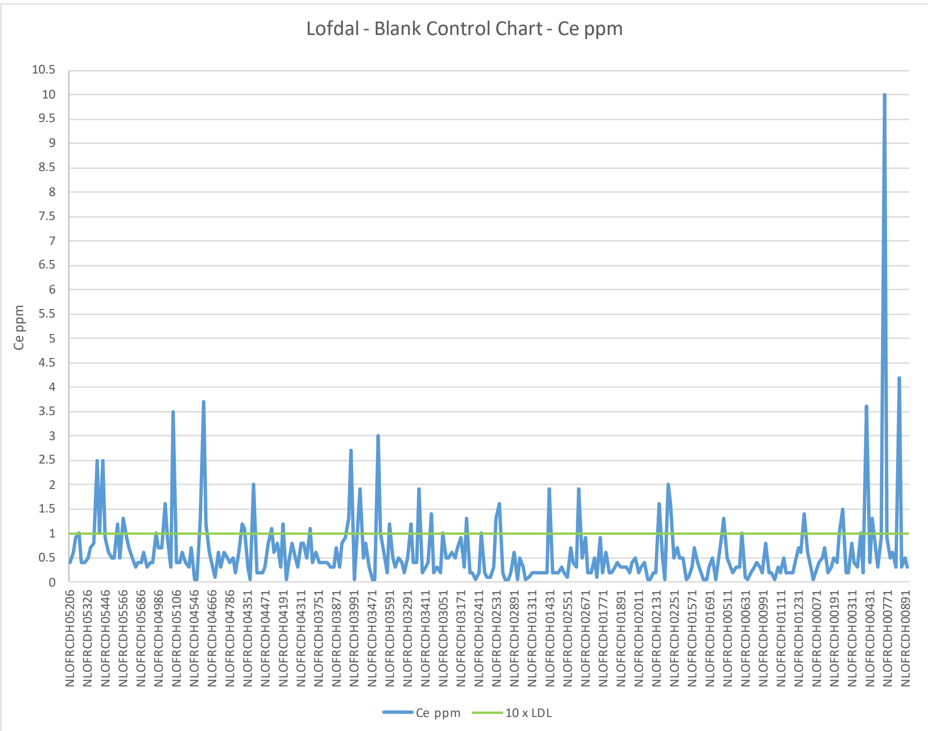


Figure 11-19

2023 RC programme blank chart for cerium



11.5.3.2 Standards

The same standards used in the diamond drilling campaigns were used for the RC drilling, namely two in-house standards Std-4 and Std-6, as well as a commercial standard, AMIS185. A total of 285 standards were analysed, 95 for each standard. The results were assessed by MSA and values above three standard deviations outside of the certified mean were considered a failure. The standard results suggest a high degree of accuracy for the individual rare earth elements, with failure rates generally below 10%, with the exception of samarium for Std-4 having a 15% failure rate and thulium for Std-6 having a failure rate of 22%.

Control charts for dysprosium assays of the standards are presented in Figure 11-20 and a summary of the number of failures and the failure rate for each standard is presented in Table 11-7.

Figure 11-20

Dysprosium standard control charts

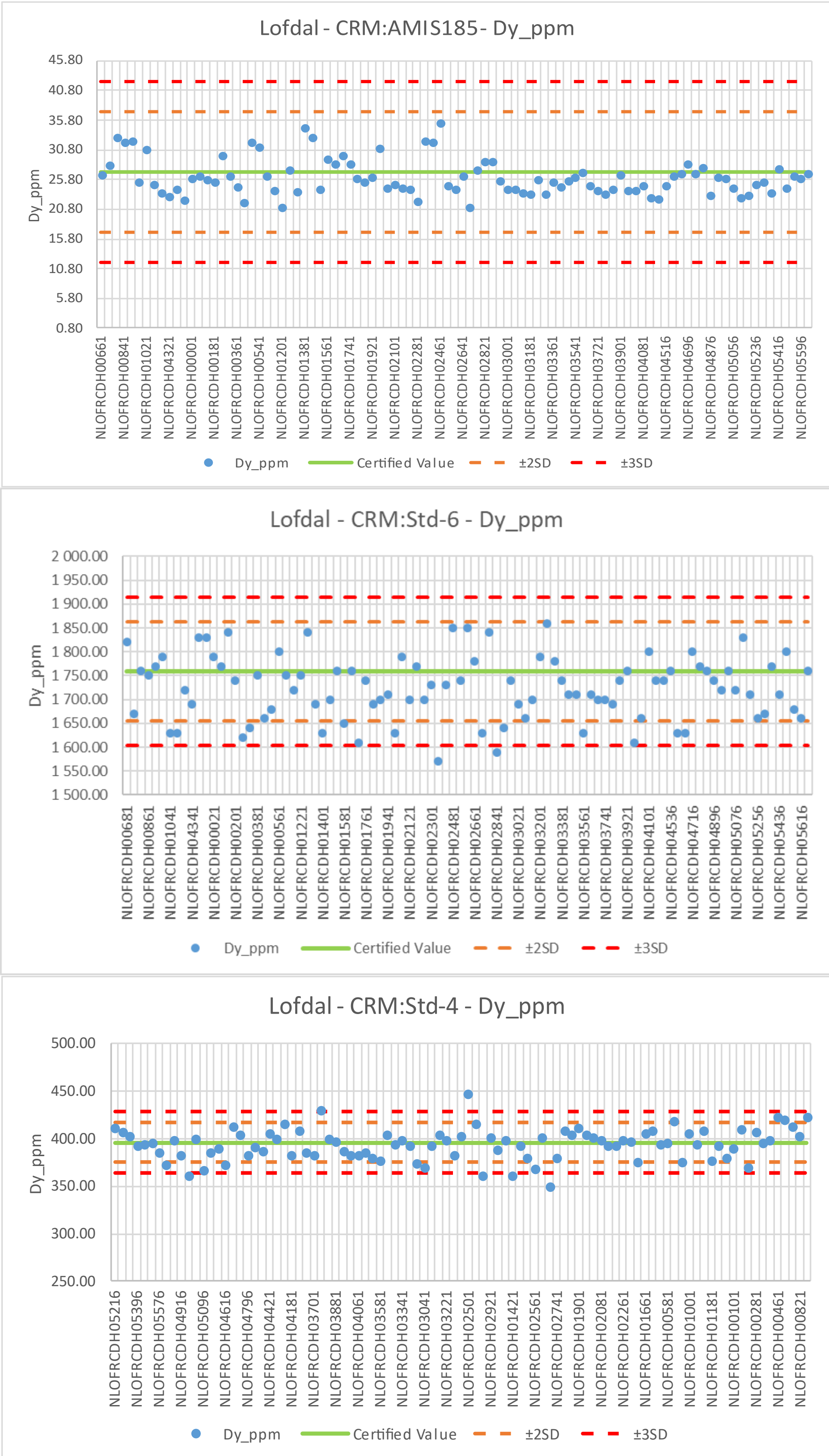


Table 11-7

Failure rate (outside ± 3 SD) for standard reference material assayed by Actlabs during the 2023 RC drilling campaign

CRM Name	Failure Rate	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y
STD 4	Number of Samples	5	0	0	2	14	0	1	7	6	0	7	9	5	0	0
	Percentage	5%	0%	0%	2%	15%	0%	1%	7%	6%	0%	7%	9%	5%	0%	0%
STD 6	Number of Samples	9	1	7	1	0	0	0	2	2	6	0	21	9	0	0
	Percentage	9%	1%	7%	1%	0%	0%	0%	2%	2%	6%	0%	22%	9%	0%	0%
AMIS0185*	Number of Samples	0	0	0	0	0	1	-	-	0	0	-	1	-	-	0
	Percentage	0%	0%	0%	0%	0%	1%	-	-	0%	0%	-	1%	-	-	0%

11.5.3.3 Pulp Duplicates

Pulp duplicates were inserted into the RC sampling stream at a rate of 1 in every 20 samples. The original and duplicates samples were compared graphically and statistically to determine the precision of the assay results. A summary of the repeatability of the pulp duplicates is presented in Table 11-8 for TREO, LREO and HREO as well as Dy_2O_3. The results show a high degree of analytical precision, with nearly 99% of the duplicate pairs reporting a HARD value of less than 10%.

Table 11-8
Summary of lab duplicate repeatability

Variable	Number of Samples	Original Mean	Duplicate Mean	Percentage Difference	HARD	
					< 10%	< 20%
TREO %	285	0.08	0.08	3%	98.9	99.6
LREO %	285	0.05	0.05	4%	98.9	100
HREO %	285	0.03	0.03	2%	98.9	99.6
Dy_2O_3 ppm	285	31.9	32.7	2%	98.6	98.6

Scatter plots comparing the original with the duplicate assays are presented in Figure 11-21 for TREO and Figure 11-22 for Dy_2O_3.

Figure 11-21
Scatterplot of TREO assays in 285 pulp duplicates

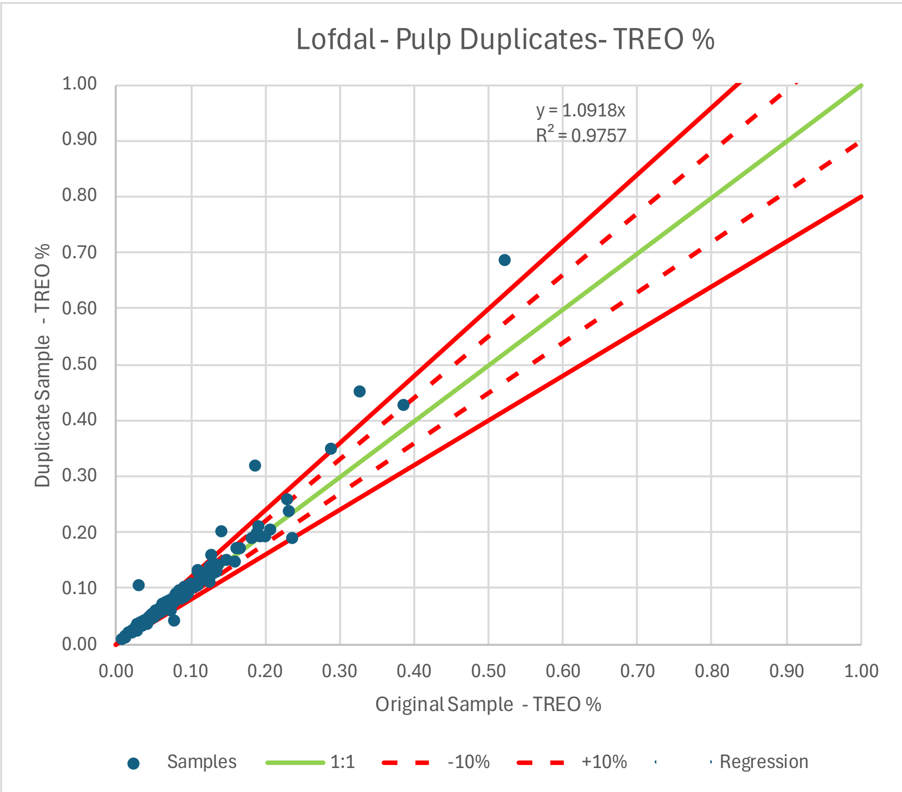
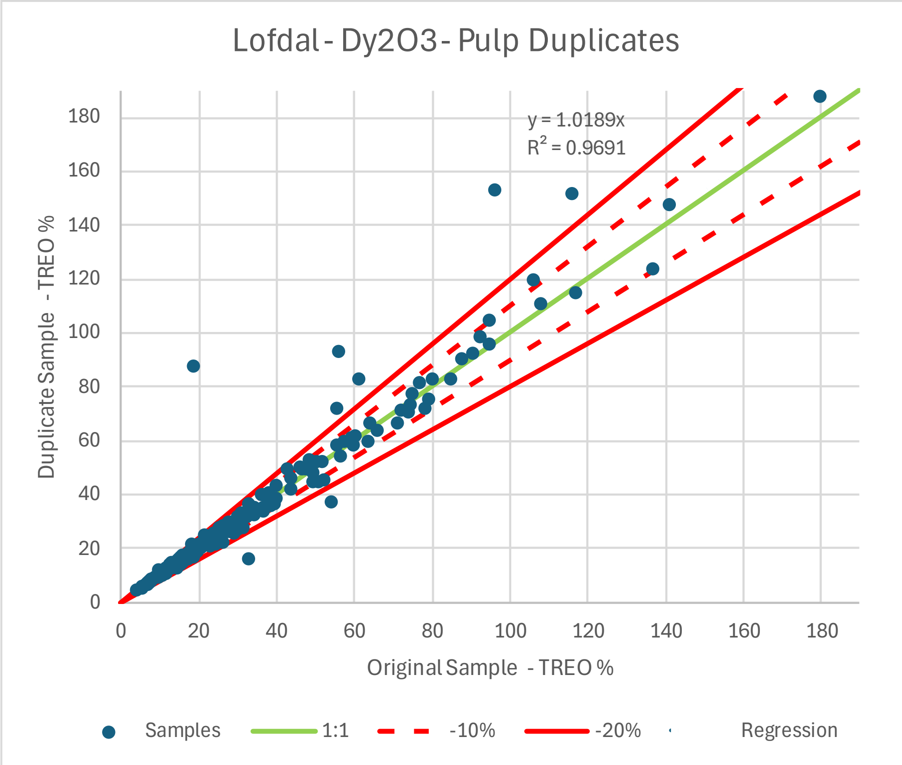


Figure 11-22
Scatterplot of Dy_2O_3 assays in 285 pulp duplicates



11.5.3.4 Field Duplicates

A total of 35 field duplicate samples were collected during the RC drilling campaign to assess the precision of the sampling process. Acceptable precision was demonstrated for TREO, LREO and HREO as well as Dy_2O_3, with over 90% of the duplicate pairs having a HARD value of <10% (Table 11-9).

Table 11-9
Summary of field duplicate repeatability

Variable	Number of Samples	Original Mean	Duplicate Mean	Percentage Difference	HARD	
					< 10%	< 20%
TREO %	35	0.24	0.24	2%	97.1	97.1
LREO %	35	0.13	0.14	3%	94.3	100
HREO %	35	0.11	0.11	1%	94.3	97.1
Dy2O3 ppm	35	110.2	107.6	-2%	97.1	97.1

Scatterplots of the field duplicate pairs for TREO and Dy_2O_3 are shown in Figure 11-23 and Figure 11-24 respectively.

Figure 11-23
Scatterplot of TREO assays for 35 field duplicates

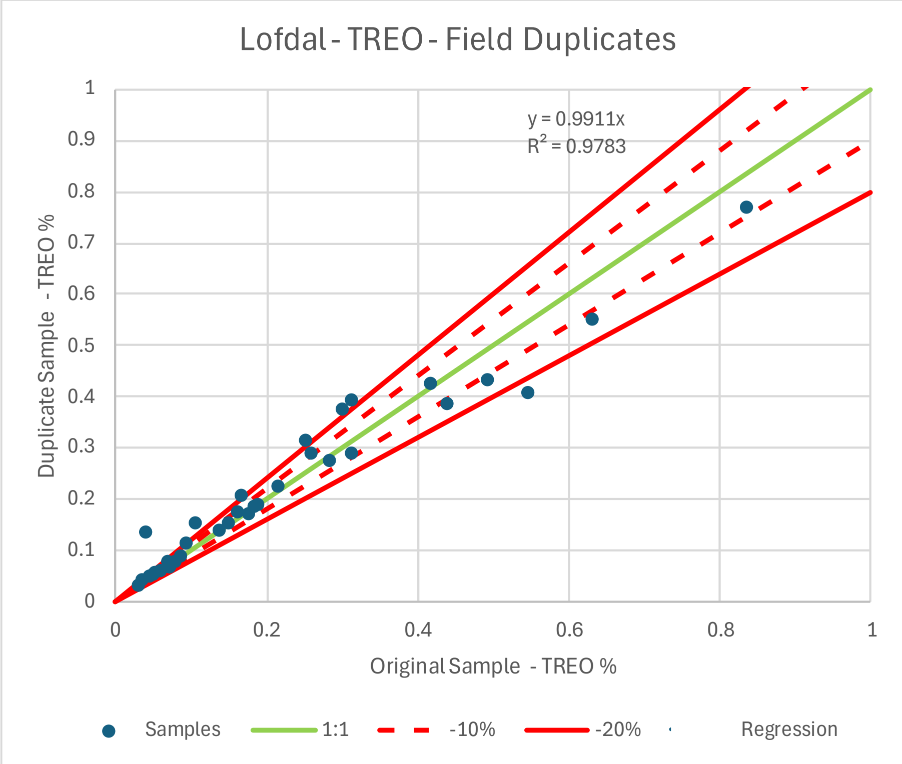
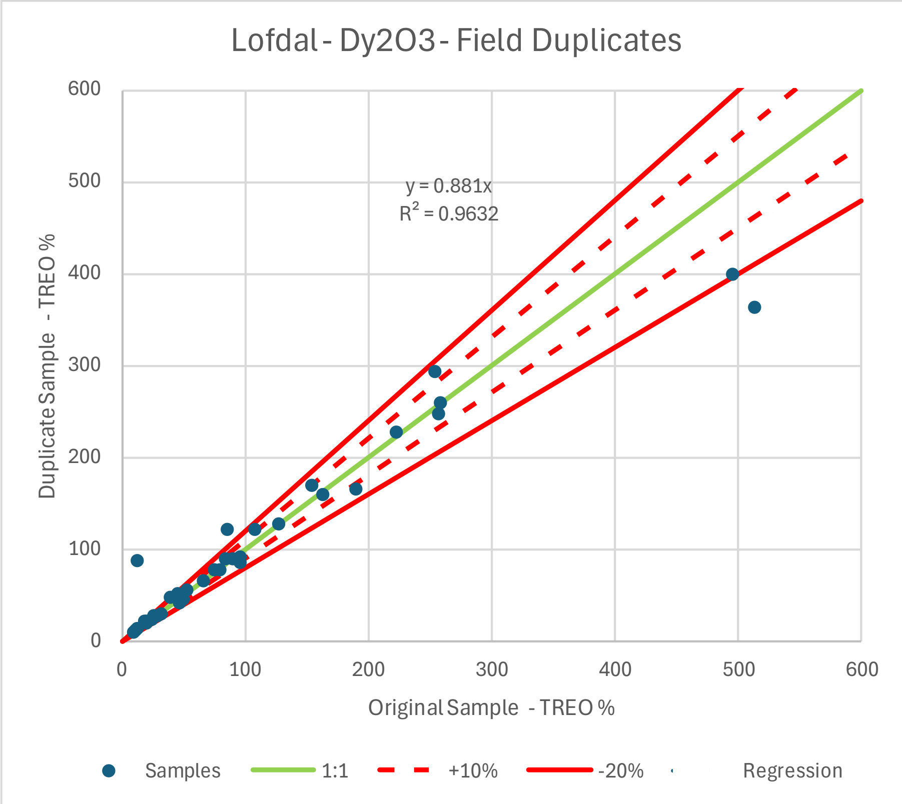


Figure 11-24
Scatterplot of TREO assays for 35 field duplicates



11.6 Adequacy of Sample Preparation, Security and Analytical Procedures

All aspects of core handling, marking, logging, cutting, bagging, labelling and sample submission to Actlabs' preparation facilities at Windhoek are covered by well-designed protocols to ensure that all routine activities are conducted with maximum consistency and followed industry standards.

Drillhole core handling and storage as well as core sampling and transport are conducted in a safe and secure manner. NMI followed an auditable chain of custody, which ensured high levels of security and integrity of the results.

The QP is of the opinion that the sampling and analytical procedures and the number of QAQC samples inserted into the sample stream are appropriate for the current level of the project, the type of the deposit and for the analytical techniques used. The blank sample, standard reference material and duplicate data show minimal contamination, acceptable accuracy and a high level of precision.

Field duplicates for the RC drilling indicate that the procedures are appropriate for the Lofdal mineralisation.

The analytical results from secondary laboratory confirm the primary laboratory results with acceptable limits.

It is the QP's opinion that the sample assay results are acceptable for use in a Mineral Resource Estimate.

12 DATA VERIFICATION

The Lofdal site was visited by the QP for the Mineral Resource (Jeremy Witley) from the 28th to the 30th of October 2020. During the site visit, the following verification work was completed:

- The exploration processes were examined, and it was found that the work is being carried out according to the Lofdal procedures, which are appropriate for the purposes of evaluating the Mineral Resource.
- The logging, sampling and assay records were examined for a selection of drillholes from both previous and 2020 drilling for Area 4 (nine pre-2020 holes and eight recent holes with ICP assay results) and Area 2B (13 recent holes, three with ICP assay results), and were verified against observations made on the cores. The logging was found to be of good quality and the higher grade REE mineralisation was observed to be associated with the lithology, alteration and structures as described in sections 7.4.2, 7.4.3 and 7.4.4 of this report.
- Ad-hoc hand-held XRF readings were taken on several cores that confirmed the presence of elevated Y. Although the results of this exercise are not definitive, it served to verify the magnitude of the assayed Y grades.
- RadEye readings were taken on the core at the drilling rigs, at the field camp and core yard, as well as on outcrops of carbonatite dykes in the field. These readings confirmed the elevated gamma readings associated with the mineralised zones.
- Cores were observed being taken from the drillholes during the drilling process for drillhole L4D0148 and L4D0151. The cores observed being removed from the holes exhibited albitisation and iron alteration in the footwall to the mineralisation at Area 4.
- The drilling locations of completed drillholes in the 2020 and previous programs were observed in the field. Handheld GPS readings of the collar positions were taken for seven of the 2020 Area 4 drillholes and eight of the 2020 Area 4 drillholes. The handheld GPS coordinates were compared with the final DGPS surveys, and no material discrepancies (>5 m) were noted.
- The general site and the carbonatite dyke outcrops were examined. The outcrops observed are generally aligned with the mapping performed by NMI and its predecessors.

The Lofdal site was again visited by the QP for the Mineral Resource (Jeremy Witley) on the 10th of November 2022. Three of the drillholes completed since the previous site visit, that were included in the 2020 Mineral Resource, were inspected as well as the bulk sampling pit from which the metallurgical samples were extracted.

Additional verification comprised:

- Spot checks of the database against the original borehole logs.
- Spots checks of database against original assay certificates.
- Examination of database used for mineral resource estimation for any errors.

The most recent personal site inspection was completed by the QP from the 21st to the 22nd of November 2023. The following work was undertaken:

- The RC drilling at Area 4 was observed for drillhole L4R0218.
- The RC drilling and sampling processes were demonstrated at the drilling rig and at the core yard.
- The drilling locations of completed RC drillholes were observed in the field. Handheld GPS readings of the collar positions were taken for eleven of the 2023 RC drillholes. The handheld GPS coordinates were compared with the final DGPS surveys, and no material discrepancies (>5 m) were noted.
- The residual RC material storage was inspected at the Lofdal storage facility at Khorixas.

In the opinion of the QP, the data verification processes completed and observations made during the site inspections demonstrate that the data collected are adequate for the purpose of Mineral Resource estimation.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Testwork Background

Testwork was historically carried out on test samples from Lofdal project during the various phases of the project development and reported in previously filed NI-43101 reports.

Scoping metallurgical testwork at Mintek, reported in 2013, demonstrated that the material could be upgraded using physical processes, but that significant optimisation work would be required. Magnetic separation was tested in further detail, with relatively low recoveries achieved. Flotation work required significant development. Fine grinds evaluated due to poor liberation of xenotime.

Testwork at Nagrom reported in 2013 showed some promise with complex flotation circuit.

Sorting testwork was carried out to discard barren gangue material using Tomra and Steinert XRT technology.

Trench bulk samples from Lofdal site in 2020 were used for a bulk sorting testwork campaign at Rados International and Steinert XRT at IMS Engineering, followed by extensive gravity and magnetic separation testing at Light Deep Earth (LDE) laboratories, where any significant upgrading was difficult without loss of xenotime recovery. Mineralogical studies showed that xenotime liberation only occurs below 45 µm and then only about 60% of the xenotime particles would be fully liberated. Magnetic separation (WHIMS) and gravity separation (shaking table) achieved between 30 to 40 % TREO recovery at a ~20% mass pull and 2 x upgrade ratio. DMS and coarse gravity separation was unable to isolate a high density fraction rich in ankerite with low levels of xenotime.

13.2 Ongoing Testwork

In early 2021, SGS Lakefield commenced testing program, focussing on flotation, on XRF and XRT sorted products from the Rados and IMS testwork in South Africa. Two ~250 kg sorted samples were received by SGS Lakefield for mineral processing flowsheet development. The objectives were:

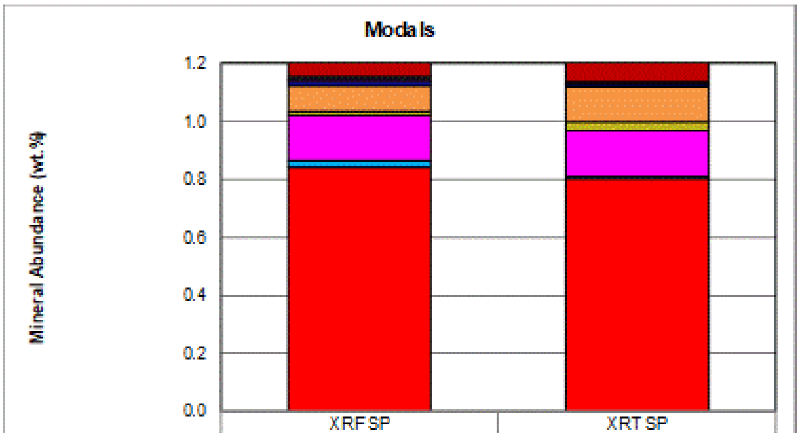
1. Simplify the flotation flowsheet developed in previous testwork, with similar or better flotation performance.
2. Evaluate the following two flowsheets a) direct flotation on the sorted product b) magnetic separation on the sorted product, followed by flotation on the magnetic separation concentrate.
3. Conduct hydrometallurgical amenability testing on concentrated product for caustic crack, acid bake and water leach, followed by impurity removal and rare earth precipitation.

Mineralogy studies were carried out as a starting point and the majority of the flowsheet development was focused on XRT sorted product. Rare earth minerals (REM) (collectively accounting for 1.15% and 1.13%) included mainly xenotime (0.84% and 0.80%), as well as trace amounts (<0.2%) of synchysite/parisite, monazite, bastnaesite, columbite/pyrochlore, and zircon (0.39% and 0.32%) (Figure 13-1).

The exposure of xenotime, calculated for the head samples, is presented in Figure 13-2. Exposure (>80%) was 27% and 29%, <80->20% was 43% and 48%, and <20% was 31% and 22%, in XRF SP and XRT SP samples, respectively.

Liberation for Thorite/Th-Y-Silicates in XRF SP and XRT SP samples was 22% and 38%, F-C-REE was 20% and 37%, ankerite was~4%, Fe-oxides was 85% and 84%, respectively (Figure 13-3).

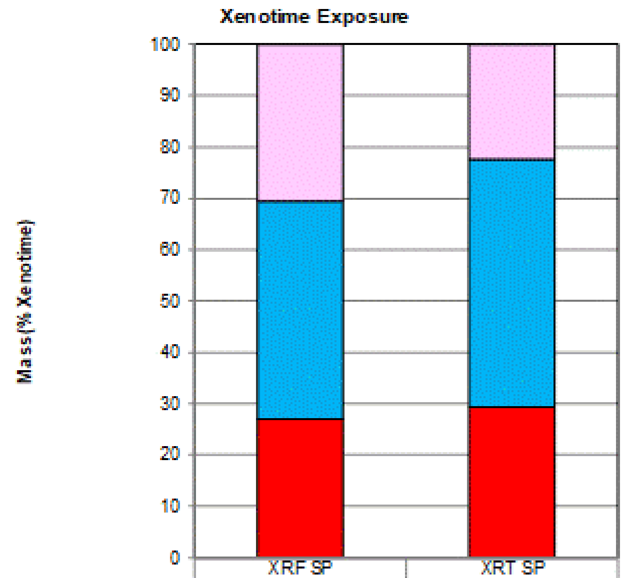
Figure 13-1
Summary of Mineral Distribution (Mass %) of REM, Zircon and Thorite for the XRF and XRT Head Samples



	XRF SP	XRT SP
Zircon	0.39	0.32
Other REE	0.01	0.00
Columbite/Pyrochlore	0.01	0.00
Monazite	0.01	0.01
Synchysite/Parisite	0.09	0.12
Bastnaesite	0.01	0.03
Th-Y-Silicate	0.16	0.16
Thorite	0.02	0.01
Xenotime	0.84	0.80

Figure 13-2

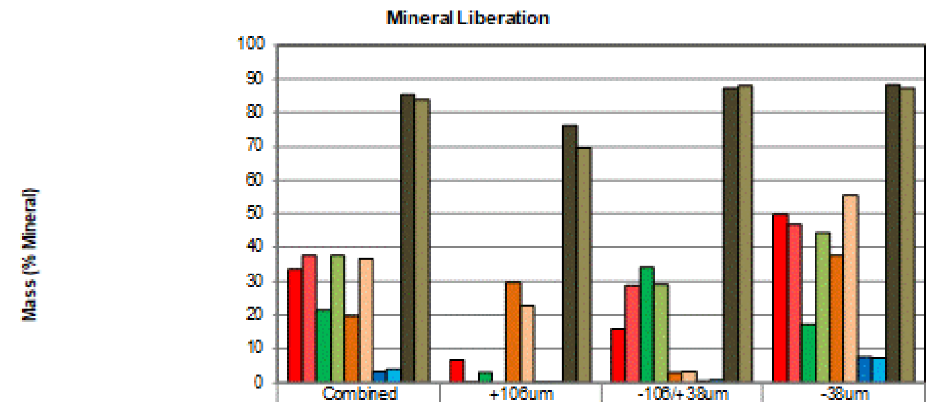
Summary of Exposure (Mass%) of Xenotime for the XRF SP and XRT SP Head Samples



	XRF SP	XRT SP
<20% Exposed	30.5	22.3
<80>20% Exposed	42.6	48.4
>80% Exposed	26.9	29.3

Figure 13-3

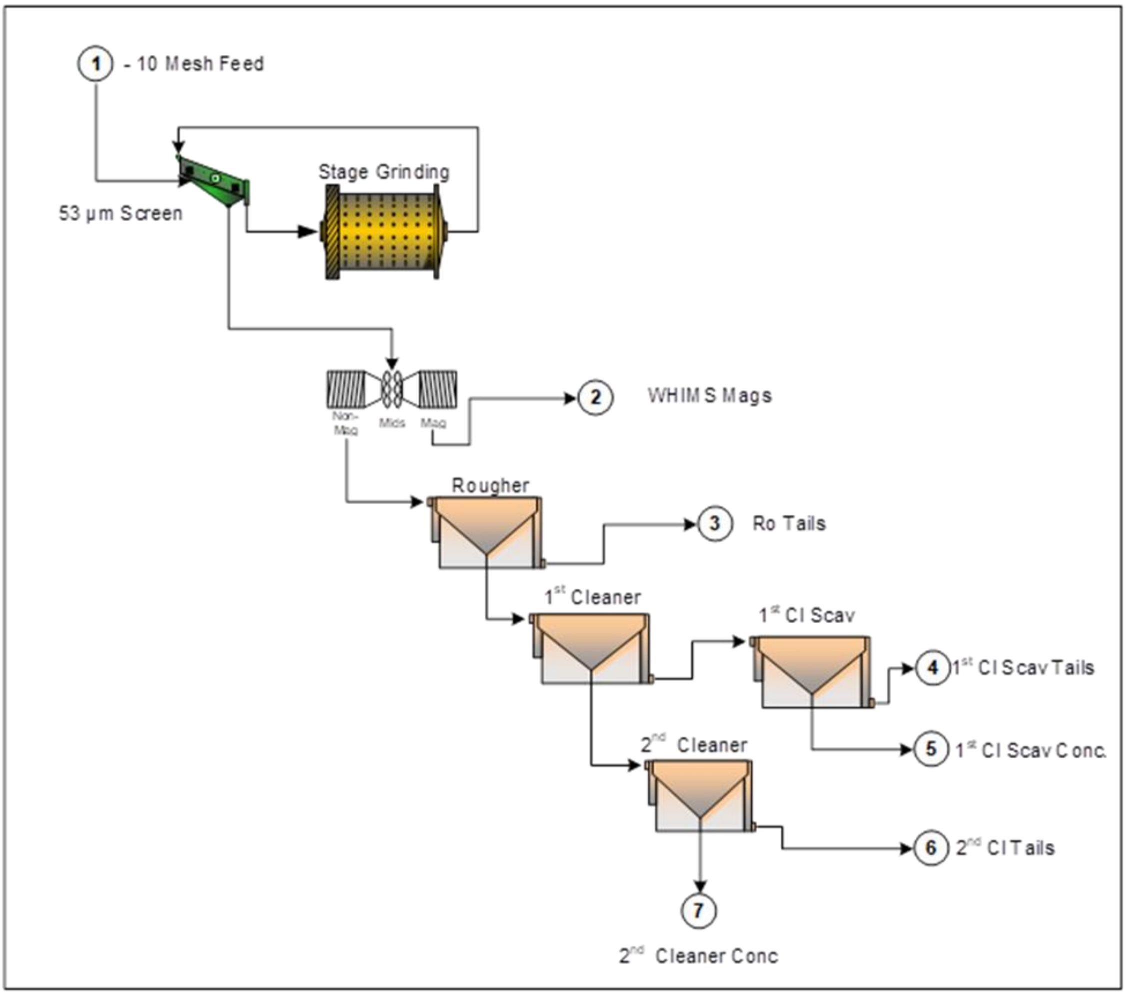
Summary of Liberation (Mass%) of Xenotime, Thorite/Th-Y-Silicates, F-C-REE, Ankerite and Fe-Oxides for the Head Samples



	Combined	+106um	-106/+38um	-38um
Xenotime - XRF SP	33.6	6.61	16.00	49.6
Xenotime - XRT SP	37.6	0.17	28.8	46.8
Thorite/Th-Y-Silicates - XRF SP	21.6	3.17	34.2	17.2
Thorite/Th-Y-Silicates - XRT SP	37.5	0.00	29.1	44.5
F-C-REE - XRF SP	19.8	29.5	2.98	37.6
F-C-REE - XRT SP	36.8	23.0	3.19	55.5
Ankerite - XRF SP	3.5	0.1	0.5	7.7
Ankerite - XRT SP	4.0	0.1	0.9	7.3
Fe-Oxides - XRF SP	85.3	76.2	87.3	88.1
Fe-Oxides- XRT SP	83.7	69.6	87.7	87.2

Flotation testwork was conducted on the XRF sorted product, blend of 75% XRT SP with 25% fines generated during sorting, and 100% fines. The flotation flowsheet was successfully simplified to REE flotation only from previously three flotation stages (sulphide flotation, carbonate flotation, and REE flotation). With testing on the selective collectors and effective depressants, in combination with an iron pre-removal, a preliminary flotation test produced a concentrate grading ~7.6% TREO (>13 times upgrade) achieving a ~70% recovery. Typical batch flotation test flowsheet shown in Figure 13-4.

Figure 13-4
Typical Batch Flotation Flowsheet



Besides, the preliminary flotation test results with the direct flotation on the sorted product (flowsheet A) demonstrating higher REO recovery with similar REO upgrade than the flotation on the magnetic concentrate (flowsheet B), other testing conditions, such as the grind size, pulp temperature, pulp density, were evaluated to further reduce flowsheet CAPEX and OPEX costs. The flotation results of the collector screening and depressant screening tests are presented in Figure 13-5 and Figure 13-6, where:

- hydroxamate collector demonstrated better yttrium flotation performance and selectivity against calcium as compared to fatty acid or phosphoric acid ester collector
- calgon performed well in improving yttrium selectivity vs calcium.

Figure 13-5
Preliminary Flotation Tests-- Collector Screening

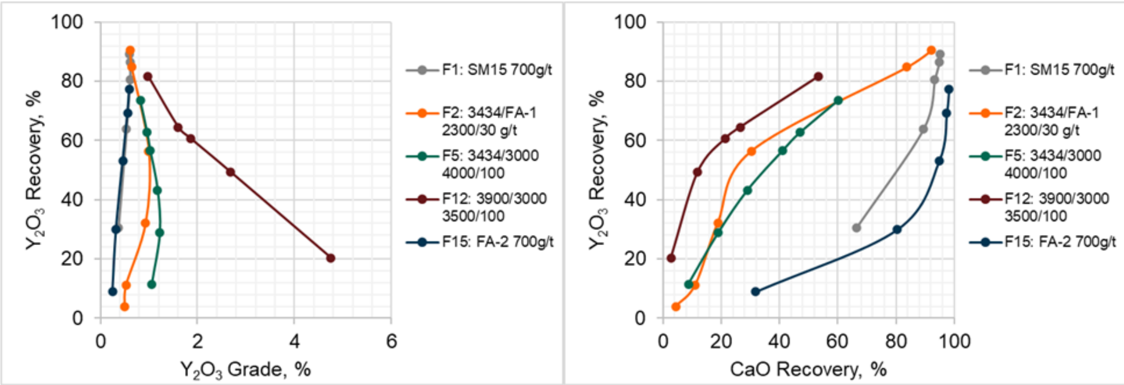
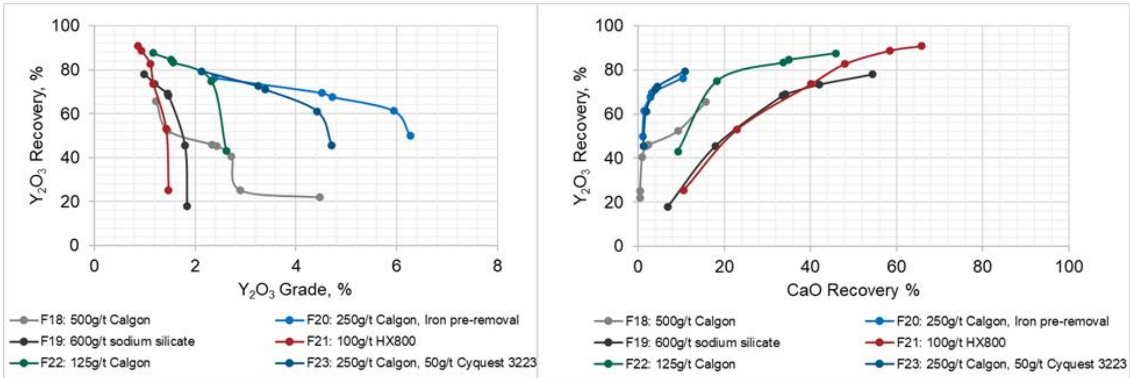


Figure 13-6
Preliminary Flotation Tests-- Depressant Screening



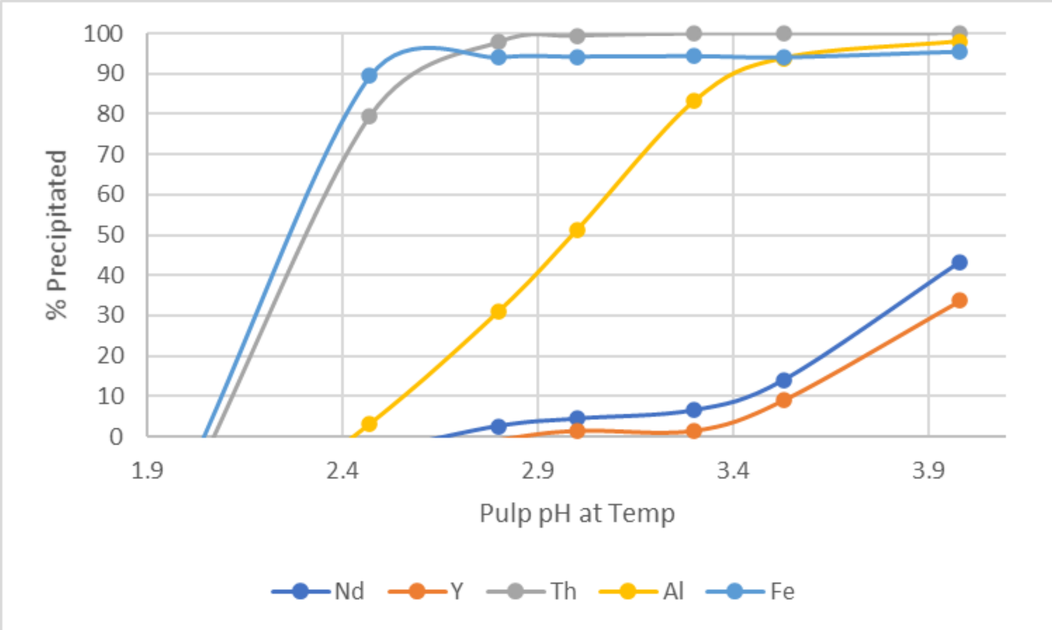
Bulk concentrates were produced for downstream hydrometallurgical testing, where concentrate at approximately 10% TREO grade and 61% recovery and 3.7% mass pull was targeted for the concentrate production.

Hydrometallurgical amenability testing on concentrates for the caustic crack process showed that this process route was not attractive as ~30% of the yttrium was in solution with 92% of the thorium and the balance of the yttrium after two cycles of caustic cracking and acid leaching remaining in the solids.

The acid bake amenability testing, however, demonstrated around 98% yttrium dissolution with water leach at 20% solids and 25°C with liquor composition of 14.2 g/L TREE (of which 8.2 g/L Y and 1170 mg/L Dy) and 37 g/L Fe in the solution. Half the concentrations at double the volumes were achieved in tests at 10% solids.

Preliminary impurity removal tests have demonstrated amenability for ~97-99% removal of thorium at pH 2.8-3.0 with less than 5% of the Nd and Y as shown in Figure 13-7.

Figure 13-7
Extent of Precipitation of Select Elements in IR-4 with Magnesium Carbonate



A total of 12 acid bake and water leach tests were completed throughout this test program to investigate the dissolution of rare earth elements (REE) and the behaviour of gangue minerals through the addition of sulphuric acid at elevated temperatures (200-300°C). Optimum results were achieved with an acid bake process using 1250 kg/t H_2SO_4 at 300°C followed by a water leach with 20% solids by weight at 25°C. At this regime the tests showed very good REE recoveries with 97-98% for yttrium, 95% for dysprosium and 94-95% for terbium.

Impurity removal testwork resulted in the preference of using magnesium carbonate for a maximum precipitation of iron and thorium from the slurry while minimizing REE co-precipitation. The final impurity removal test in this program included a stoichiometric addition of hydrogen peroxide to oxidize iron in solution in order for it to precipitate.

Crude REE precipitation generated an intermediate product assaying at 43% total REE with 1.86% Al and less than 0.5% iron, thorium, and uranium when adjusting the liquor to pH 6.5. This mixed REE precipitate contained all of the yttrium and dysprosium along with 94.5% of the terbium.

REE precipitate re-leach consisted of a two-stage sulphuric acid process wherein solids were slurried in de-ionized water and heated to 50°C followed by addition of sulphuric acid to achieve pH 1.0. Following this, additional REE precipitate was added to the slurry to increase the pH to 3.5. This step resulted in a concentrated REE liquor representing 99% of the available REE and rejected 94% of the thorium, 85% of the aluminum, and 99% of the iron.

To remove residual uranium and thorium, the re-leach liquor was contacted sequentially with Purolite A660 for two contacts and then an organic mixture of 0.5% Primene JMT, 2.5% isodecanol in Aromatic 150ND. As a result, 99.9% of the uranium was removed in the first IX contact. 94% of the thorium was also collected in the ion exchange contacts while a further 75% was removed in a solvent extraction contact. The practically thorium-free raffinate from the solvent extraction step was advanced to final REE precipitation and calcination.

The final step of this test program was the precipitation of REE with minimal impurities, primarily Na, Mg, Si, and Ca. Oxalic acid precipitation and calcination produced a final solid containing 98.1% total rare earth oxides (TREO) representing 94% of the feed rare earth elements with the full suite of assays shown in Table 13-1.

Table 13-1
Oxalic Acid Precipitate Calcination (C-RP3) Assay Summary

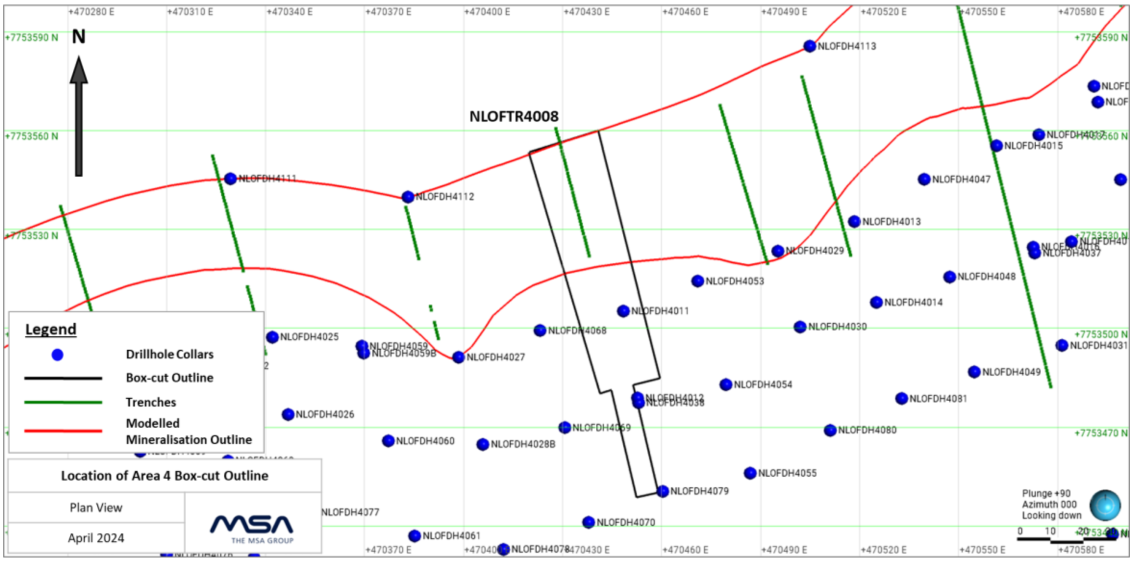
Sample & Quant.	RP-3 Precip	C-RP3 Calcine
(mL or g)	22	10
La	11002	23800
Ce	19924	43100
Pr	2094	4530
Nd	7489	16200
Sm	3467	7500
Eu	2140	4630
Gd	13961	30200
Tb	3587	7760
Dy	28985	62700
Ho	6703	14500
Y	226056	489000
Er	21404	46300
Tm	2922	6320
Yb	17243	37300
Lu	2325	5030
Sc	<12	<25
Th	0.51	1.1
U	<0.2	<0.5
Si	878	1900
Al	<23	<50
Fe	32	70
Mg	1387	3000
Ca	740	1600
Na	1433	3100
K	<37	<80
Ti	<28	<60
P	18	40
Mn	<37	<80
Zn	20	44
S (%)		0.01
TREE (%)	36.9	79.9

Add'n Elements (g/t)	
Ag	<50
As	<200
Ba	15
Be	0.90
Bi	105
Cd	<3
Co	<200
Cr	100
Li	<30
Mo	381
Nb	
Ni	99
Pb	<200
Sb	35
Se	<50
Sn	40
Sr	16.7
Ta	
Tl	<50
V	<60
Zr	
LOI (%)	0.49

13.3 Bulk Fresh Sample Testwork

A further comprehensive metallurgical test program was carried out at SGS starting in 2022 on fresh low grade feed ore sampled from a metallurgical bulk sample box-cut. This sample was sourced from the starter pit in Area 4 from September to October 2021. The box-cut is located over trench NLOFTR4008 (Figure 13-8) and transversed the main mineralised zone of Area 4.

Figure 13-8
Outline of box-cut relative to drillhole collars, trenches and mineralisation

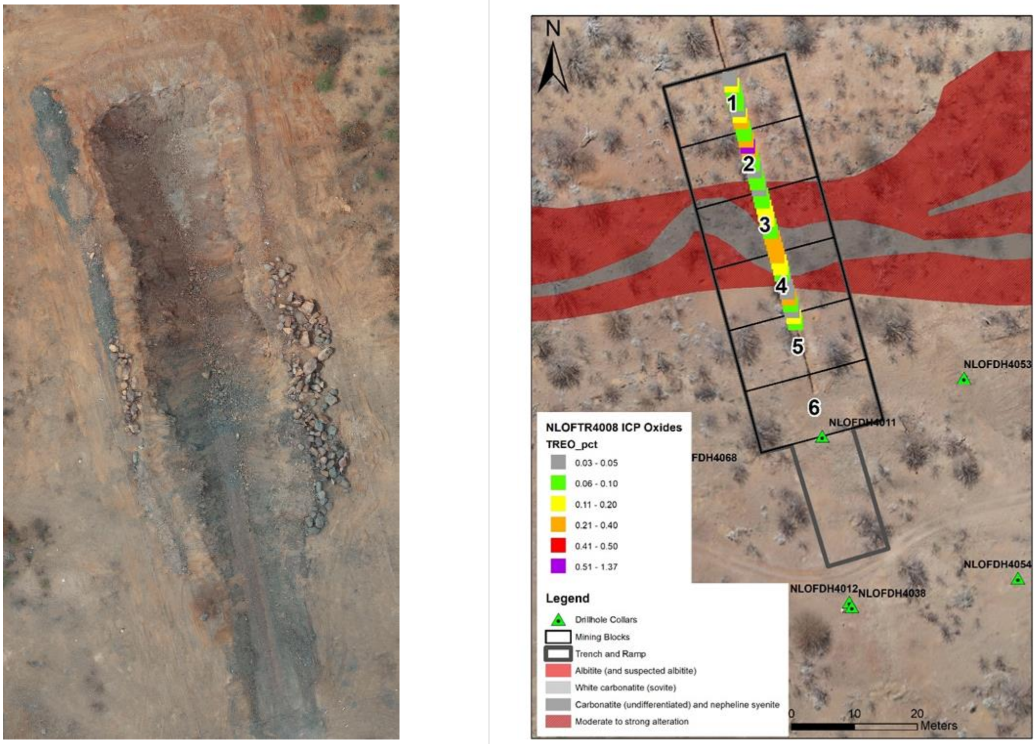


The sample collection procedure consisted of the following steps:

- Clearance of vegetation around the area that was dug as well as two areas earmarked for the stockpile of waste rock and mineralised material.
- Drilling of 250 blast holes down to an average depth of 13 m.
- Blasting created a pit 60 m long, 20 m wide and 15 m deep. Additionally, a 60 m ramp leading into the pit was excavated, resulting in a trench with a combined length of 120 m with a depth ranging from 2 m to 15 m below surface.
- Blasted material was removed and stockpiled according to the following criteria:
  - Soft (S) material corresponding to the upper 2 m.
  - Oxidised Lift 1 (OxL1), material located between 2m and 4 m below surface.
  - Oxidised Lift 2 (OxL2), material located between 4m and 8 m below surface.
  - Fresh Lift 1 (FL1), blasted material located between 8 m and 12 m below surface.
  - Fresh Lift 2 (FL2), material removed between 12 m and 15 m below surface.

Over 30 000 tonnes of material was removed by subdividing the trench into 6 blocks, guided by total rare earth oxide assay data for trench NLOFTR4008 and the adjacent drillhole NLOFDH4011(Figure 13-9).

Figure 13-9
Photo of box-cut (left) and schematic showing block divisions (right)



- Blocks 2 to 5 were equally sampled, with 136 to 138 tonnes of fresh material removed from each block to create a blended stockpile sample weighing 550.6 tonnes.
- This sample was sent to Ondoto for crushing and screening before sub-samples were distributed to Rados International for sorting testwork, after which sorted product was shipped to SGS Laboratories, Lakefield, Canada .
- The remainder of the crushed samples were stored at Okoruso (Naminia) from where an unsorted representative parent sample was shipped to SGS Laboratories, Lakefield, Canada.

The grade was lower as compared to the trench sample which had been used for the previous sorting and beneficiation testwork program - 0.19% TREO vs 0.36% TREO.

Sorting testwork both on XRF and XRT sorter techniques on the low grade fresh sample yielded Yttrium losses over the sorting step, which with the cumulative losses in the flotation stage demonstrated poor economic value. An intense machine learning program on the XRT sorting was done without adequate upside potential.

The purpose of the bulk sample metallurgical program was amended to include characterisation of the metallurgical behaviour of unsorted fresh low grade material to support early engineering design and economic evaluation of a low grade ROM process plant.

Comminution characterization testwork was carried out at Geolabs in South Africa on the fresh material samples (Low grade ROM plus sorted product with fines), which demonstrated lower ore hardnesses as compared to ore characterisation testwork having been completed historically at Mintek with BBWi of 19.2 kWh/t. The Bond Ball Milling indices on the fresh material was 13 to 18% lower than historic Mintek data.

Figure 13-10
BBWi data on Fresh Material (Geolabs SA)

	Sample ID	BWi (kWh/t)	P_{100} (µm)	F_{80} (µm)	P_{80} (µm)	Gbp (g/rev)
1	ROM no sorting	16.7	53.0	2134	39	0.82
2		16.2	75.0	2134	60	1.05
3		15.7	106.0	2133	82	1.25
4	Sorted Product & Fines	15.7	53.0	2230	39	0.89
5		14.6	75.0	2230	55	1.12
6		14.2	106.0	2230	77	1.35

Flotation testwork was carried out at SGS Canada Inc. in Lakefield, Ontario. Two samples were delivered to SGS for flotation testing for purposes to confirm and validate flotation regime from the trench sample program as well as to test potential thrifting of flotation reagent recipes from the trench sample for improved project economics. The samples included a low grade ROM ore sample from the fresh starter pit as well as an upgraded sample post XRF ore sorting.

SGS conducted over 17 flotation tests starting with the selected regime from previous program on trench material as a baseline. Alternative collectors and thrifting flotation conditions were tested going forward to determine impact.

Mineralogical characterisation was done on the low grade feed sample using the TIMA (TESCAN Integrated Mineral Analyzer). TIMA is a fully automated, high throughput, analytical scanning electron microscope for mineralogical studies including mineral liberation analysis, measuring modal abundance, size-by-size liberation and mineral association.

Key results demonstrated median xenotime grain sizes of 26 µm and 10 µm for the two sized head fractions tested (+38 µm and -38 µm) respectively. Of the xenotime in the +38 µm fraction, 32% was pure to liberated xenotime with 76% pure to liberated xenotime in the -38 µm fraction Table 13-2).

Table 13-2
Mineralogy Results Summary of Xenotime Liberation and Association

Mineral Name	LG XRF Comp	ROM Head Comb	ROM +38 um	ROM -38 um
Pure Xenotime	22.9	41.7	15.0	66.9
Free Xenotime	5.60	3.80	6.20	1.61
Lib Xenotime	9.90	9.40	11.1	7.78
Xnt: REM	0.00	0.10	0.03	0.23
Xnt: Zr Silicates	1.50	1.50	0.35	2.53
Xnt: Apatite	1.10	0.60	0.79	0.49
Xnt: Calcite/Dolomite	4.90	6.00	7.78	4.37
Xnt: Ankerite/Siderite	0.50	0.50	0.43	0.54
Xnt: Quartz/Feldspars	9.80	6.60	6.69	6.57
Xnt: Biotite/Chlorite/Muscovite	1.10	0.90	0.41	1.29
Xnt: Fe-Oxides	4.10	1.20	2.13	0.28
Xnt:Other	0.50	0.20	0.40	0.14
Complex	38.0	27.1	48.7	6.6
Total	100.0	100.0	100.0	100.0
Pure+Free + Liberated	38.4	54.9	32.3	76.3

The material performed well in flotation with upgrade ratios of between 20 and 27 times from the low grade feed material. By comparison, the sorted trench material demonstrated flotation upgrade ratios of around 10 to 13 times. The final flotation concentrate grades of slightly lower TREO grades (~6%TREO) to advance to hydrometallurgical were produced from the low feed grade as compared to the sorted trench material.

The selected Florrea reagent suite from the previous program still provided the most attractive flotation results on the low grade feed material (see Figure 13-11). Thrifting conditions were tested to test reduced depressants, reduced collector dosages (see Figure 13-12) and coarser grinds were also tested (see Figure 13-13). The impact of high intensity conditioning ahead of flotation was tested, which yielded improved flotation performance. Alternative collectors were tested. The lower calcites in the fresh feed material as compared to trench material resulted in lower depressant requirements in the flotation regime. A range of collector dosages were tested to determine the upper and lower envelopes for flotation performance.

Figure 13-11
Effect of Collectors Testing

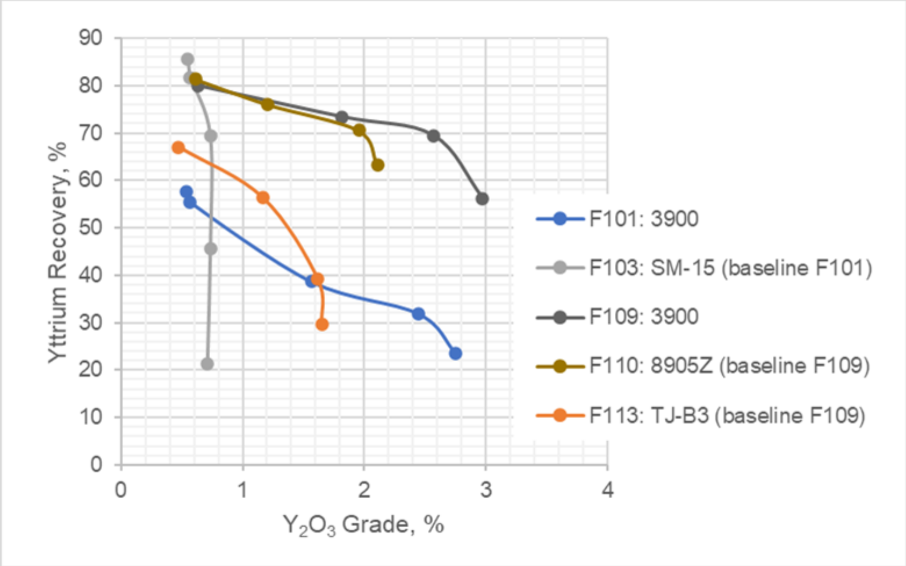


Figure 13-12
Effect of Collector Dosages

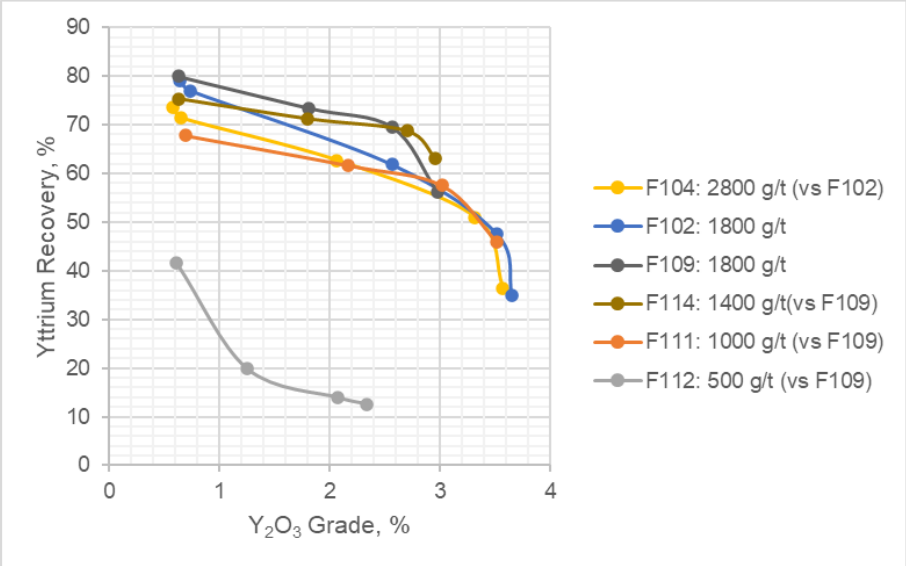
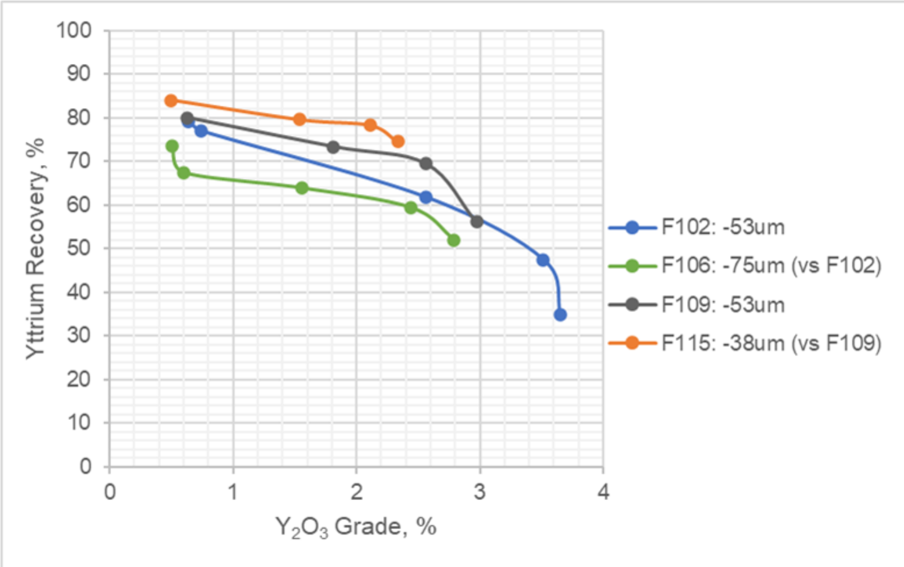


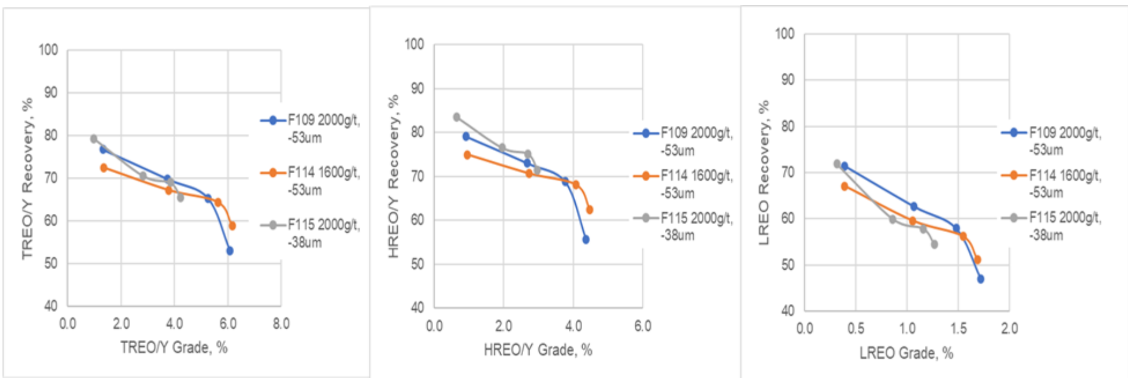
Figure 13-13
Effect of Grind



Additional thrifting testwork was done to determine flotation performance at several conditions: 1) reduced collector dosage between the selected point and the lower envelope (1000 g/t -1800 g/t); 2) effect of even finer grind to determine lower limit (P_{100}=38μm); 3) alternative collectors that may perform similar to Florrea with potential cost savings.

The recovery performance of the heavy rare earth oxides exceeded that of the light rare earth oxides (see Figure 13-14).

Figure 13-14
Flotation Results of the TREO, HREO and LREO

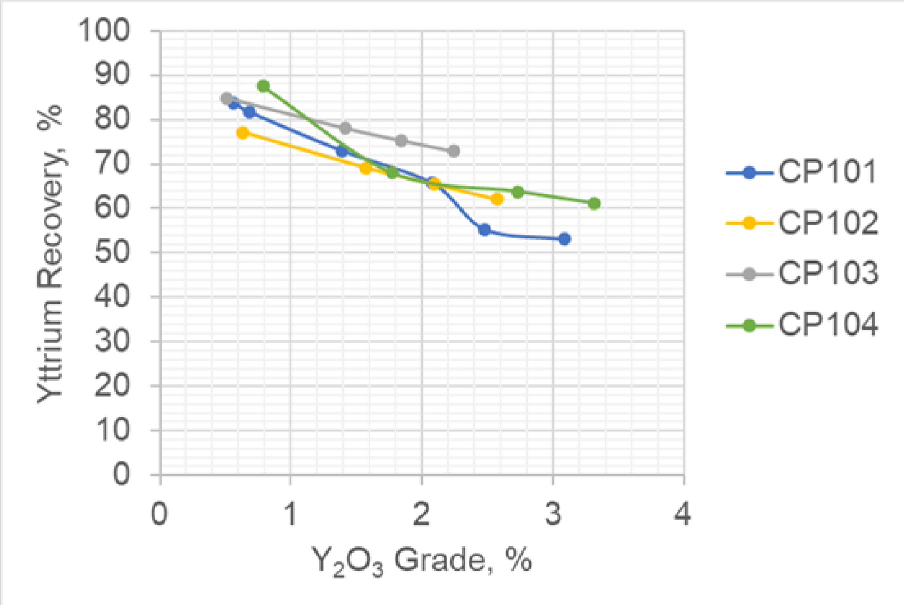


Bulk flotation tests were done in quadruplicate to produce a flotation concentrate sample for downstream amenability hydrometallurgical testing at close to optimum flotation conditions.

Iron removal steps in a WHIMS (wet high intensity magnetic separator) were done in both pre- and post-flotation configurations with similar performances and low rare earth losses (~2%).

The produced flotation concentrates demonstrated repeatable flotation performances on the low grade feed material. See Figure 13-15. The average cleaner flotation concentrate from the bulk test runs (CP101 to CP104) was produced at a mass pull of 3% with a grade of ~5.6% TREO and recovery of 67%. Upgrade ratio of 25 times from the low head grade of 0.22% TREO. CaO and Fe_2O_3 grades of ~9% and 34% respectively in the concentrate.

Figure 13-15
Flotation Results of Bulk Flotation Tests (CP101 to CP104)

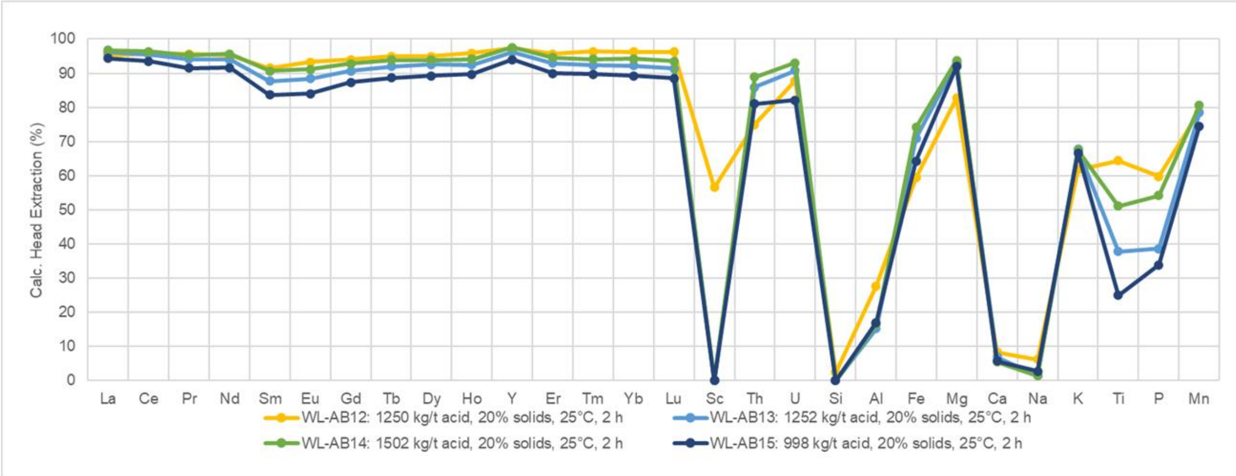


Preferential upgrading of the HREO's was demonstrated as compared to the LREO's. The recovery of HREO (Eu to Lu) was in the 64 to 72% range. However, the recovery of the light rare earth elements (La to Sm) was lower in the 56 to 58% range.

Flotation concentrate was subjected to the downstream hydrometallurgical testing for validation of process route and efficiencies as per the previous acid bake test regime, where the acid bake route is preferred due to lower reagent costs and higher recovery of the heavy rare earths compared to the caustic crack route.

A total of three acid bake and water leach tests were completed on the bulk flotation concentrate to investigate the dissolution of rare earth elements (REE) and the behaviour of gangue minerals through the addition of sulphuric acid at elevated temperatures (300°C) and at a range of acid dosages (1-1.5 t/t concentrate basis). Under previously determined optimum conditions (2021 test program at SGS Canada), these tests showed very good REE recoveries with 96% for yttrium, 95% for dysprosium and 94% for terbium. The water leach recovery of tracked elements for these three acid bake and water leach tests are shown in Figure 13-16 with a comparison to the 2021 bulk acid bake and water leach test results (WL-AB12).

Figure 13-16
Acid Bake and Water Leach Extraction



Results of the impurity removal and crude REE precipitation tests on the leached solutions corroborated chemistries with the previous test programs on the two flotation concentrates with low co-precipitation of RE's in the impurity removal stage (between 1-9% as compared to between 1-15% in previous) with similar precipitation of impurities.

While the results are positive, there remains room to optimise these processes regarding OPEX and CAPEX as well as recoveries in continuous pilot plant testing.

Further flotation testwork continued at SGS in 2023, where testing focussed on optimising flotation of the low-grade run-of mine feed samples, locked cycle flotation testing, pilot plant testing and variability testing.

The target being increased process economics for higher yields and recoveries whilst reducing operating costs. Reproducibility also a key driver for the testwork. Variability testwork continues on testing of individual samples taken from different parts of the orebody and that have different geological characteristics to evaluate the metallurgical performance from a variability perspective.

Laboratory concentrates were also produced for continued laboratory hydrometallurgical testing where higher acid bake temperatures with concomitant impurity removal stages were tested with a focus to simplify the iron removal process.

The 5 ton bulk flotation pilot plant campaign was undertaken late in 2023 in a continuous milling and flotation regime with the objective of confirming flotation and generation of 100kg concentrate for hydrometallurgical testing, which is currently on going.

13.4 Basis of Design

The mineralogy and metallurgy of this mineral resource is complex. Multiple stages in the process route have a compounding effect on overall efficiency and recovery which, despite reducing advancing tonnage or removing deleterious elements advancing down the process route, recovery of valuable metals remains one of the biggest contributors to NPV, along with metal prices.

Operating costs with reagents and power consumption being the largest portion, also contribute to project economics, thereby contributing to the flowsheet selection for process engineering and design.

The conclusion from the flotation program on the low grade run of mine sample demonstrated that the flotation mechanism on the low grade ROM ore is promising, even with full tonnage reporting to the mill and flotation plant with the downstream hydrometallurgical testing on the concentrate forming basis for process engineering design for economic evaluation.

Flotation recovery for the economic evaluation is split between the light and the heavy rare earths according to the detailed REE ICP analysis from flotation testwork.

For flotation, the LREO recovery is 56.2%; HREO recovery is 68.1% with resultant TREO recovery at 64.4% based on the laboratory testwork.

The overall hydrometallurgical section recovery for economic evaluation is 93.5%. over acid bake water leach, impurity removal and the subsequent REE precipitation and upgrading stages according to the laboratory testwork.

14 MINERAL RESOURCE ESTIMATES

On behalf of NMI, MSA completed a Mineral Resource Estimate for the Area 4 and Area 2B deposits at the Lofdal Heavy Rare Earths project.

To the best of the QP's knowledge there are currently no title, legal, taxation, marketing, permitting, socio-economic or other relevant issues that may materially affect the Mineral Resource described in this Technical Report.

The Mineral Resources presented herein, with an effective date of 5 April 2024, represent an update to the previous Mineral Resource Estimate dated 12 May 2021. Drilling data derived from the 2023 RC drilling programme together with the diamond drilling data collected from 2010 to 2020 were used to update the previous estimates. It is the QP's opinion that the drilling data were collected in accordance with The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) "Exploration Best Practices Guidelines", 2018.

The Mineral Resource was estimated using the 2019 CIM "Best Practice Guidelines for Estimation of Mineral Resources and Mineral Reserves" and classified in accordance with the "2014 CIM Definition Standards". It should be noted that Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.

The Mineral Resource estimate was conducted using Datamine Studio RM and Leapfrog Geo software, together with Microsoft Excel, JMP and Datamine Supervisor for data analysis. The Mineral Resource estimation was carried out by Mr. Rui Goncalves under the supervision of Mr. Jeremy Witley (the Qualified Person).

14.1 Mineral Resource Estimation Database

The database provided by NMI to inform the Mineral Resource Estimate consists of:

- Diamond drillhole (DD) data:
  - Collar surveys.
  - Downhole surveys.
  - Sampling and assay data.
  - Geology logs.
  - Specific gravity (SG) measurements.
  - Recovery and Rock Quality Designation (RQD) measurements.
- Reverse circulation (RC) data consisting of:
  - Collar surveys.
  - Downhole surveys.
  - Sampling and assay data.
  - Geological logs.
- Information from trench data.

- Topographic surveys were provided as contours in GIS shapefile format.

The drillhole and trench data were provided in Microsoft Excel files that were extracted from a Microsoft Access database managed by NMI. The principal sources of information used for the estimate are exploration diamond drilling programmes conducted by NMI from 2010 to 2012, 2015 and 2020, and a RC drilling programme completed in 2023. The trench data were used to guide the position of mineralised veins near surface but were not included in the grade estimation due to concerns on the representivity of the sampling in the near surface environment.

A total of 186 diamond drillholes and 44 RC drillholes were drilled and 28 trenches were dug at Area 4. One drillhole (NLOFDH4007) was excluded, due to the absence of downhole surveys. Thirteen drillholes located 800 m to the northeast of the main drilling area were too far from the main area and were excluded from the Mineral Resource. Additionally, seven holes drilled within the plane of the mineralisation at Area 4 were used in defining the mineralised wireframes but were excluded from the Mineral Resource estimate as these samples are not representative of the mineralised package. The dataset for Area 2B consists of 46 diamond drillholes, 12 RC drillholes and 25 trenches.

A summary of the drilling undertaken per project is presented in Table 14-1.

Table 14-1
Summary of Lofdal drilling campaigns

Project	Drilling Campaign	Drilling Type	Number of Drillholes	Drilled Metres (m)	Assayed Metres (m)
Area 4	2011	Diamond Drilling	47	4 190.66	1 953.13
	2012	Diamond Drilling	78	8 737.49	3 815.06
	2013	Diamond Drilling	5	709.27	669.83
	2020	Diamond Drilling	56	10 162.07	3 618.06
	2023	Reverse Circulation	44	9 043.00	4 203.00
	Total		**230**	**32 842.49**	**14 259.08**
Area 2B	2010	Diamond Drilling	13	1 547.12	462.09
	2011	Diamond Drilling	4	588.10	187.10
	2020	Diamond Drilling	29	4 400.48	1515.00
	2023	Reverse Circulation	12	1 772.00	635.00
	Total		**58**	**8 307.7**	**2 799.19**

The position of the drillhole collars for Area 4 are shown in Figure 14-1 (note that the 13 collars outside the Mineral Resource area are not shown). The collar positions for Area 2B are shown in Figure 14-2

Figure 14-1
Collar positions by campaign for Area 4

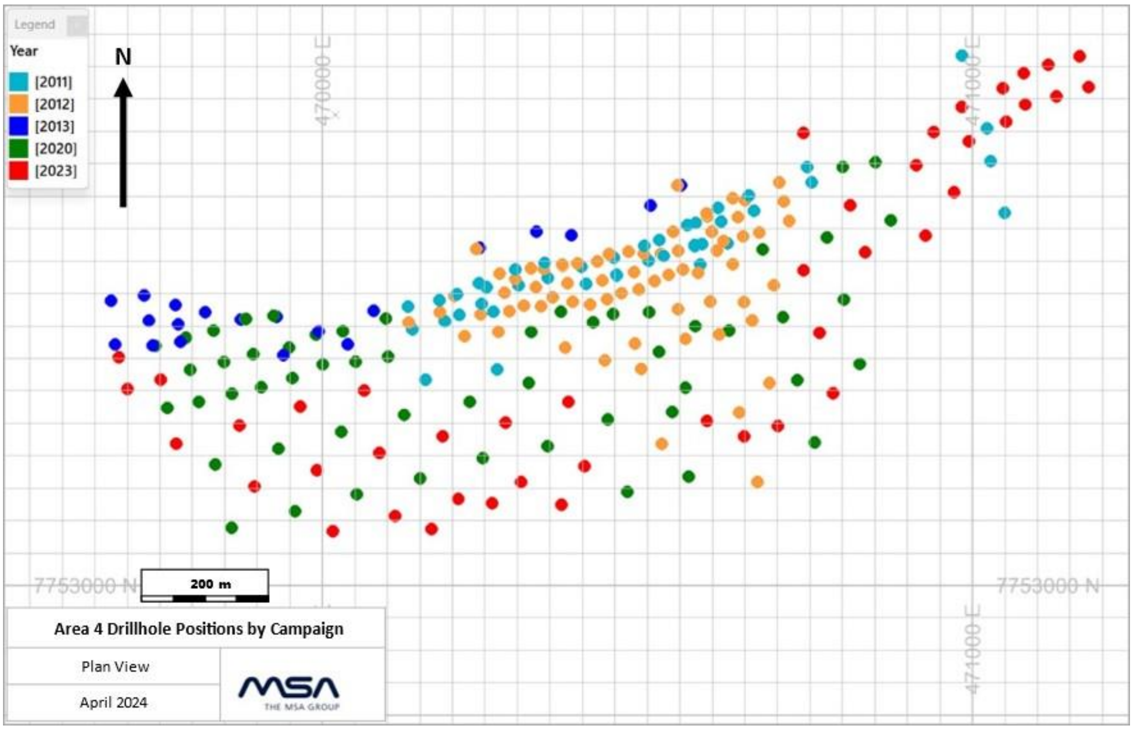
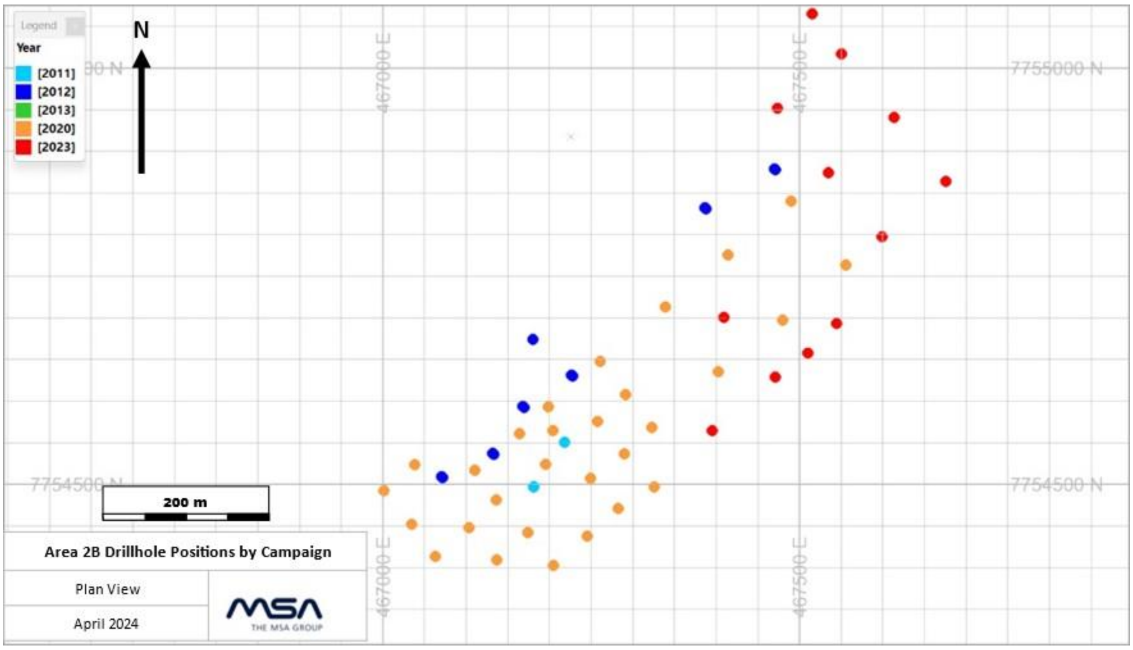


Figure 14-2
Collar positions by campaign for Area 2B



The cut-off date for inclusion of data into this estimate is 1 February 2024 at which time there was no outstanding information for Area 4 and Area 2B as the drilling was completed in 2023.

14.2 Exploratory Analysis of the Raw Data

The dataset examined consisted of sampling and logging data from diamond drillholes and RC drillholes. The following attributes are of direct relevance to the estimate:

- REE oxide grades in ppm: Lanthanum (La2O3), Cerium (C2O3), Praseodymium (Pr2O3), Neodymium (Nd2O3), Samarium (Sm2O3), Europium (Eu2O3), Gadolinium (Gd2O3), Terbium (Tb2O3), Dysprosium (Dy2O3), Holmium (Ho2O3), Erbium (Er2O3), Thulium (Tm2O3), Ytterbium (Yb2O3) and Lutetium (Lu2O3), as well as Yttrium (Y2O3).
- Specific Gravity (SG) measurements derived from diamond drill cores.
- Rock Quality Designation (RQD) measurements derived from diamond drill cores.

14.2.1 Validation of the data

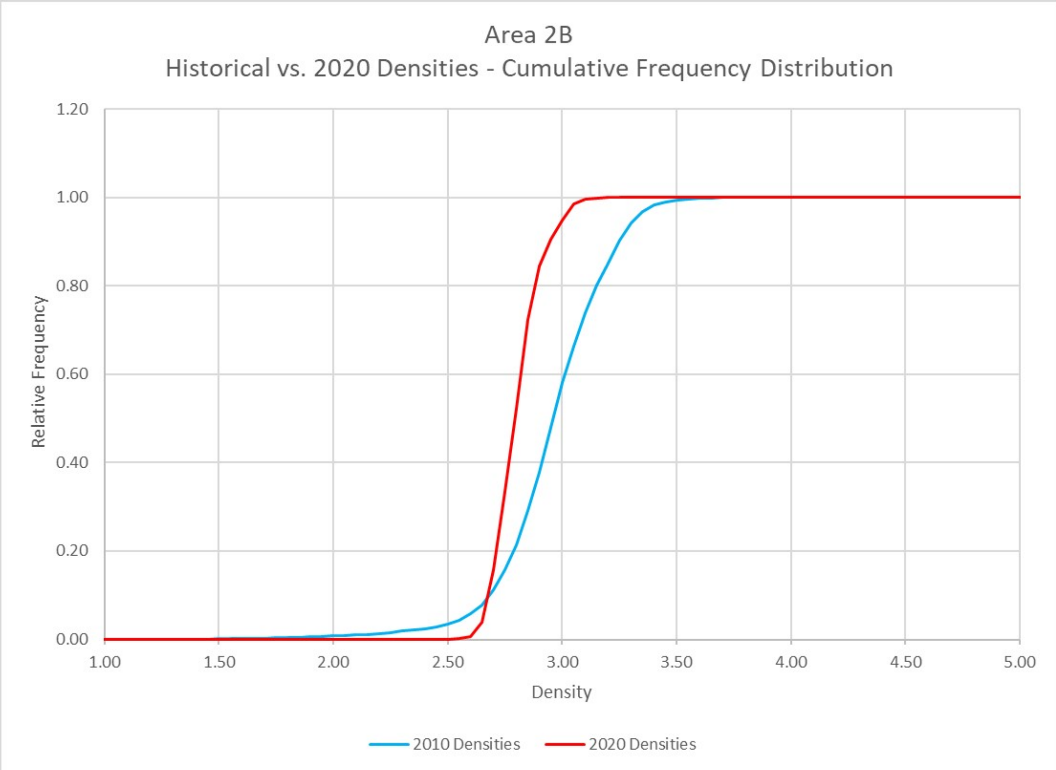
MSA undertook a high-level validation process which included the following checks:

- Examining the sample assay, collar survey, down-hole survey and geology data to ensure that the data were complete for all the drillholes,
- Examining the de-surveyed data in three dimensions to check for spatial errors,
- Examination of the assay and density data to ascertain whether they were within expected ranges,
- Checks for "FROM-TO" errors, to ensure that the sample data do not overlap one another or that there are no unexplained gaps in the sampling.

The data validation exercise revealed the following:

- There are no unresolved errors relating to missing intervals and any overlaps in the drillhole logging data. Absent assays correspond to intervals where no samples were taken.
- Examination of the drillhole data in three dimensions shows that the collars of the drillholes surveyed by DGPS plot in their expected positions relative to the topographic surface derived from the contour data.
- Extreme assays were checked, and no errors were found.
- Two methods were used to derive density measurements from the diamond drill cores. Density measurements on the drillhole data pre-dating the 2020 campaign made use of downhole geophysical probe surveys, while the 2020 campaign made use of the Archimedes principle on the drill cores. A statistical comparison for Area 2B between these two methods indicates that the downhole densities reported higher average values and are of a statistically different population (Figure 14-3). These differences were less pronounced for Area 4 but resulted in the downhole geophysical probe densities being excluded from the estimation process in favour of the Archimedes principle measurements.

Figure 14-3
Cumulative frequency distribution comparison between pre-2020 downhole probe and 2020 Archimedes densities



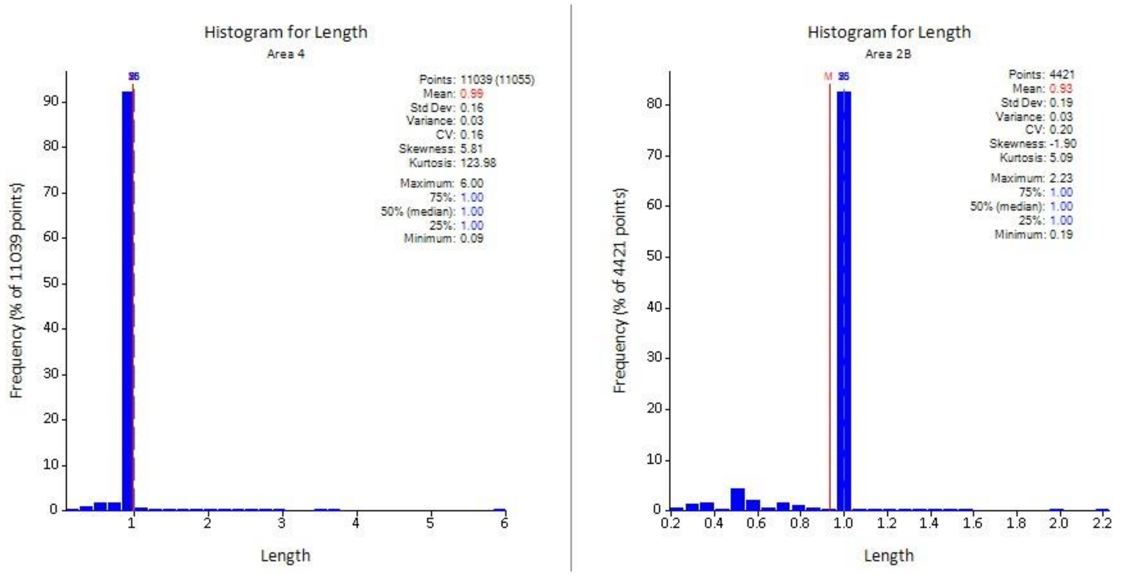
- The average sample weight of each 1 m RC Sample was 28 kg, with sample weights ranging from 3 kg to 50 kg within the mineralised zone for Area 4 and 5 kg to 39 kg for Area 2B. Anomalously heavy samples were recorded for Area 4 however these are located in the waste zone and have a minimal impact on the estimates.

14.2.2 Statistics of the Raw Sample Data

14.2.2.1 Sample lengths

Diamond drillhole sample lengths vary from 0.1 m to 6.00 m in Area 4 and 0.19 m to 2.23 m in Area 2B with the dominant sample length being 1 m for both areas as illustrated in the histograms in Figure 14-4.

Figure 14-4
Histogram of DD sample lengths for Area 4 and Area 2B

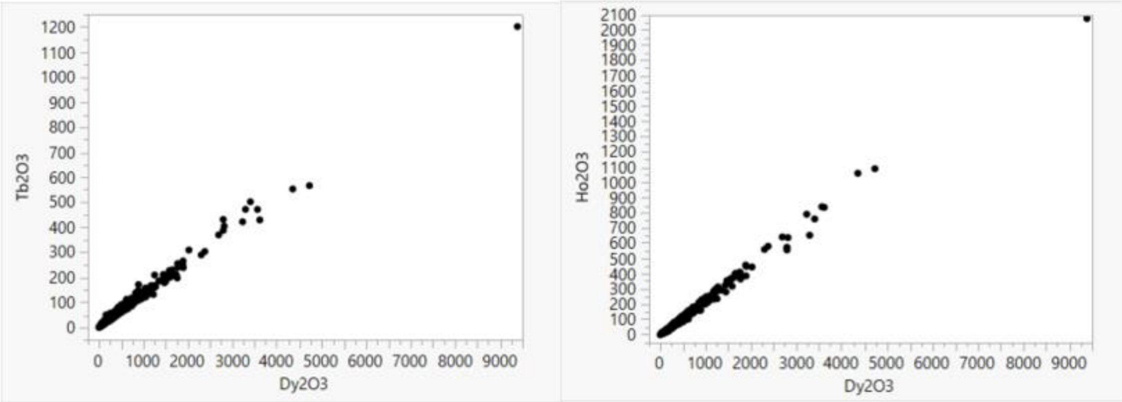


The majority of the RC samples were collected at 1 m intervals, with a small number of 0.5 m samples collected, typically at the end of a drillhole.

14.3 Bivariate Analysis

The relationships between individual rare earth oxides were studied using scatterplots to understand the existence of any correlation between variables which should be preserved in the mineral resource estimate. A strong linear relationship between the grades of certain REE exist, with some elements displaying this relationship with multiple elements. Linear relationships tend to be strongest for elements that are located adjacent to one another in the periodic table, with the exception of the Nd-Sm and Sm-Eu paired data, which marks the transition from light to heavy rare earth elements. As an example, Figure 14-5 shows the relationships of Tb_2O_3 with Dy_2O_3 and Ho_2O_3 for Area 4.

Figure 14-5
Scatter plot of sample Tb_2O_3, Dy_2O_3 and Ho_2O_3 for Area 4



14.4 Core Recovery

14.4.1 Diamond Drillholes

The average core recovery is 93% for Area 4 and 95% for Area 2B. A broad depth-core recovery relationship exists showing increasing core recovery with increasing depth (Table 14-2). There is no discernible relationship between grade and core recovery.

Table 14-2
Diamond core recovery in percent per depth interval below surface

Area	Recovery in Percent per Depth Interval (m)						
	0 – 5	5 – 10	10 – 20	20 – 30	30 – 40	40 – 50	Overall
Area 4	64.8	82.9	87.0	91.1	93.9	92.6	93.4
Area 2B	70.5	70.9	92.9	96.0	94.9	95.7	94.6

14.4.2 Reverse Circulation

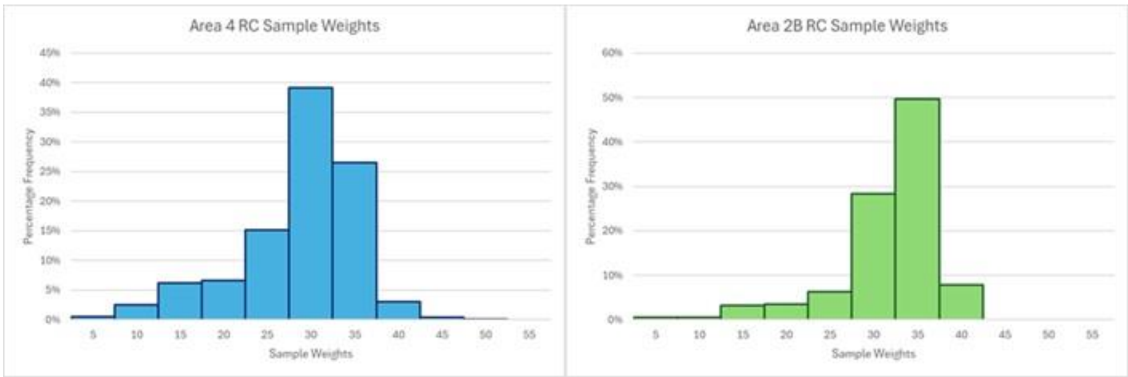
The average recovered weight for the RC samples in Area 4 ranged from 1 kg to 130 kg. There are 10 samples in Area 4 with weights above 50 kg due to over-run drilled intervals, these occur in the waste zone and therefore have a minimum impact on the Mineral Resource. Recovered sample weights for Area 2B range from 1 kg to 65kg.

Summary statistics for the samples within the mineralised zone for each zone is presented in Table 14-3.

Table 14-3 Summary statistics of RC sample weights					
Area	**Number of Samples**	**Minimum (kg)**	**Maximum (kg)**	**Mean (kg)**	**CV**
Area 4	3 473	3	50	27	0.25
Area 2B	370	5	39	30	0.19

Histograms for the recovered sample weights within the mineralised zone is presented in Figure 14-6 for Area 4.

Figure 14-6
Histogram of RC sample weights for Area 4 (left) and Area 2B (right)



No relationship between recovered sample weight and grade was observed.

14.5 Geological Modelling

Leapfrog Geo was used to generate three-dimensional volumes and surfaces representing the mineralised zones and weathering surfaces. The drilling data from the 2023 RC programme was used to update and adjust the existing geological model.

14.5.1 Topography

A topographic survey was provided by NMI which was conducted by UAS Flightec Solutions (Pty) Ltd in 2020. This survey consists of topographic contours which were used to generate a three-dimensional surface in Leapfrog Geo. As no significant mining activities have taken place since this survey, the same topographical surface was used in the update of the 2023 Mineral Resource.

The surveyed drillhole collars correspond well with the resultant topographic surface. The trench data was draped onto the topographic surface, which was used to guide the modelling of the mineralised wireframes near surface.

14.5.2 Mineralised Zones

The modelling procedure followed the same methodology applied in the 2021 estimate. The visual continuity of dysprosium oxide (Dy_2O_3) grades was examined along strike and down-dip to generate mineralised wireframes using a statistical threshold of 10 ppm Dy_2O_3 for Area 4 and 12 ppm Dy_2O_3 for Area 2B. The use of these thresholds resulted in generally continuous zones that form a suitable framework for block model grade estimation. The modelled zones (or domains) were individually coded into the drillhole data and volumes were generated using Leapfrog Geo. Where necessary, manual edits were incorporated to provide for geologically realistic shapes.

The 2023 RC data confirmed the previous interpretation, with only minor adjustments to the wireframes required. The changes largely impacted the minor mineralised zones that occur above the main zone which resulted in one additional domain modelled for Area 4, for a total of fifteen mineralised zones (Figure 14-7) and two for Area 2B, totalling nine zones (Figure 14-8).

Figure 14-7
Cross-section illustrating modelled mineralised zones for Area 4

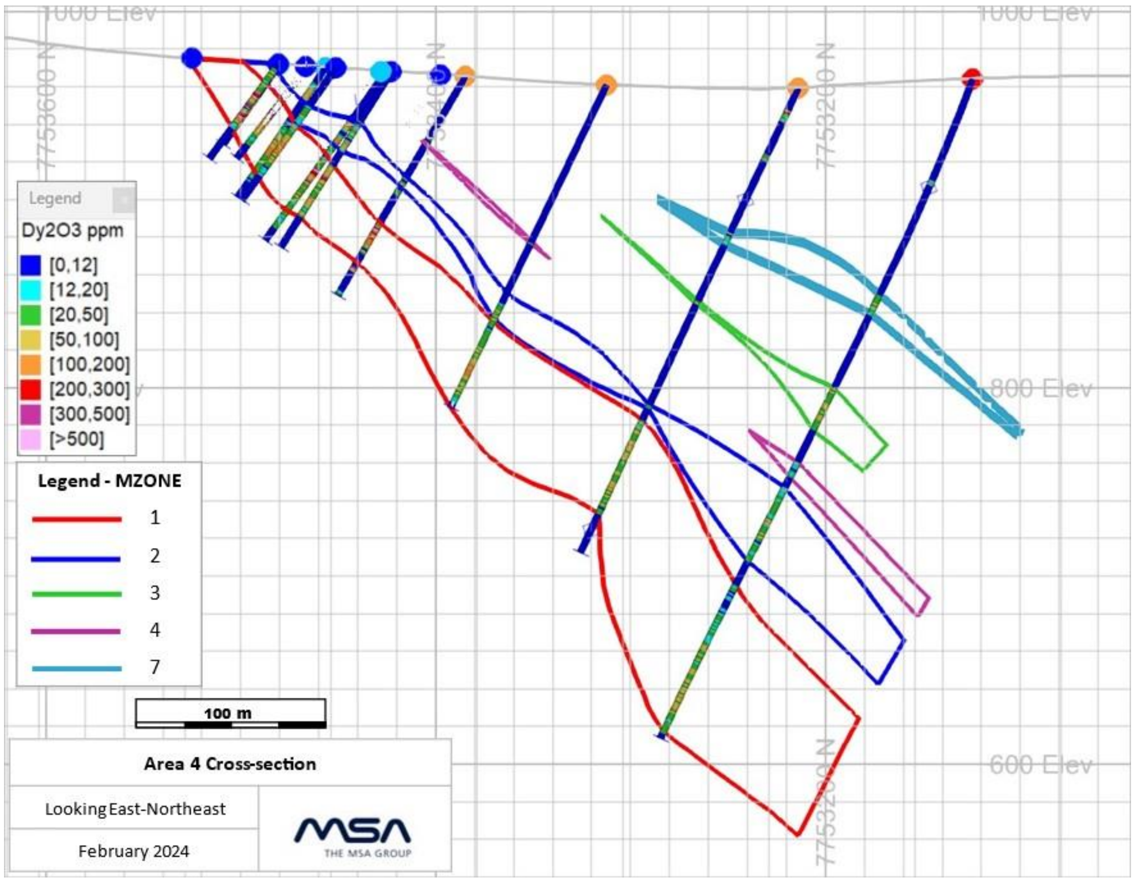
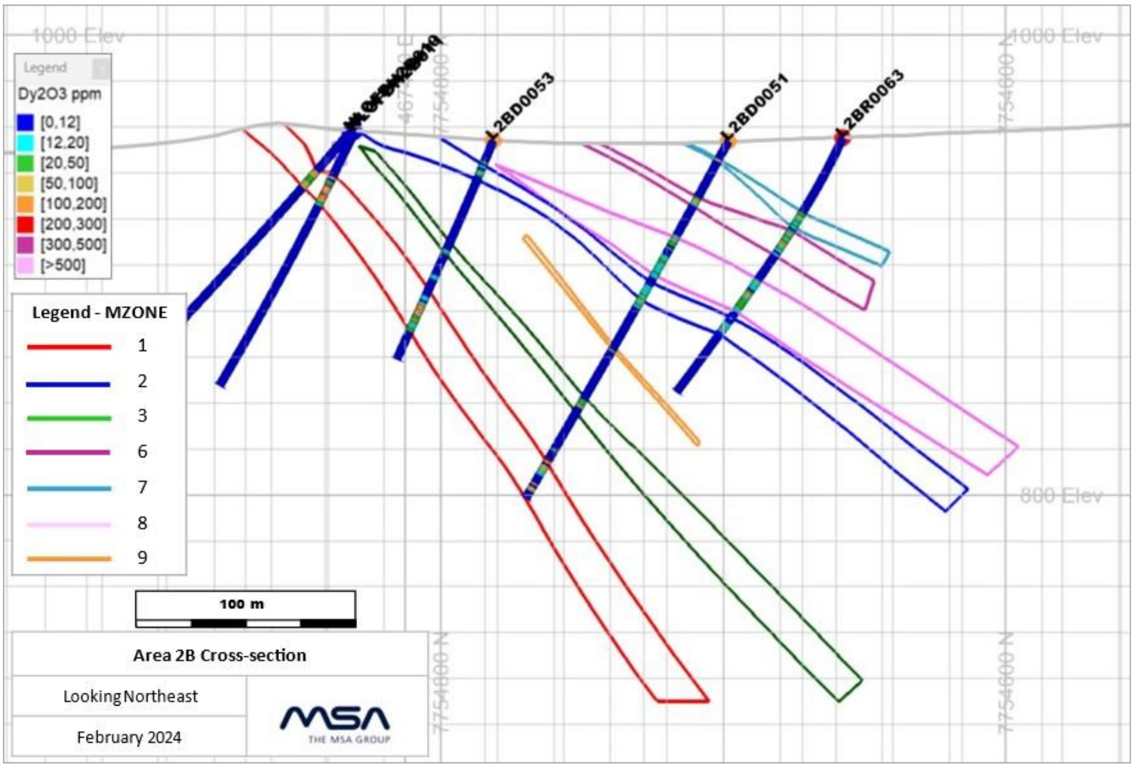


Figure 14-8
Cross-section illustrating modelled mineralised domains for Area 2B

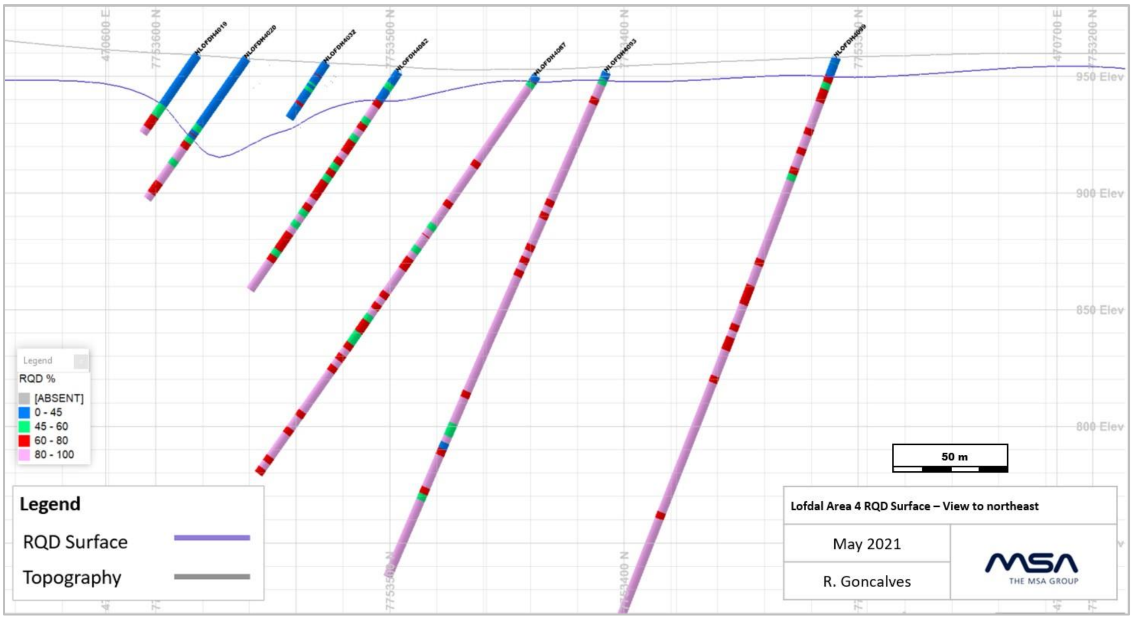


14.5.3 Oxidation/Weathering Surface

Due to the lack of detailed visual weathering logging, the rock quality designation (RQD) values from the diamond drillholes were used as a proxy for weathering. The assumption being that lower RQD values will be associated with alteration due to weathering.

Log-probability plots were used to identify a RQD threshold value of between approximately 40 % to 45 % to represent the threshold on which to base a partially weathered surface. This threshold correlates well with areas near surface and highlighted zones of deeper weathering associated with structural features (Figure 14-9).

Figure 14-9
Cross-section illustrating modelled RQD weathering surface for Area 4



14.6 Bias Test

As the quality of RC samples is more difficult to assess compared to diamond drill core and down-hole smearing can occur, a bias test between the DD and RC data was undertaken to determine the presence of any systematic differences in both grade and thickness between the two datasets. In this case, doing a global comparison is not effective as the DD data is concentrated in the high-grade zone of the deposit whereas the RC drilling targeted the lower grade peripheral areas. Therefore, a comparison was undertaken between the two closest drillhole pairs within the main mineralised zone (MZONE 1) for both deposits.

The results of the bias test show that for both deposits, grade and thickness differences show no bias to a particular drilling type (Table 14-4). Individual differences are most likely due to irregularity in the structurally hosted hydrothermal mineralisation type of deposit.

Table 14-4
Bias test on Dy2O3 for Area 2B and Area 4

Distance between RC and DD pair (m)	Diamond Drillholes			RC Holes			Difference	
	Hole ID	Dy_2O_3	Length	Hole ID	Dy_2O_3	Length	Dy_2O_3	Length
Area 4								
36	L4D0155	47	39	L4R0207	34	56	-12	17
37	L4D0135	37	74	L4R0212	42	70	4	-4

51	L4D0152	69	47	L4R0218	46	50	-24	3
53	NLOFDH4097	74	32	L4R0196	55	65	-19	33
56	NLOFDH4096	84	59	L4R0213	74	75	-9	16
56	L4D0133	46	72	L4R0199	55	56	9	-16
58	L4D0133	46	72	L4R0198	78	57	32	-15
Area 2B								
40	L2BD0051	24	21	L2BR0063	31	17	7	-4
53	L2BD0051	24	21	L2BR0060	35	37	11	16
56	L2BD0053	89	17	L2BR0061	137	12	48	-5

14.7 Statistical Analysis of the Composite Data

Samples were composited to one metre lengths based on the dominant sample interval. Compositing was carried out inside the mineralised domain and statistics were analysed for the fifteen rare earth oxides. Log histograms of the composites for total rare earth oxides (TREO %), heavy rare earth oxides (HREO %), light rare earth oxides (LREO %) and dysprosium oxide (Dy_2O_3 ppm) are shown for MZONE 1 in Figure 14-10 for Area 4 and Figure 14-11 for Area 2B.

The following observations were made:

- The distributions for the individual REO grades are positively skewed.
- The CV for TREO is similar for both deposits.
- Area 4 has a higher HREO grade than Area 2B - the average grade of Dy_2O_3 ppm in the main mineralised domain is 82 ppm for Area 4 and 67 ppm for Area 2B.
- Both deposits show similar proportions of HREO and LREO in TREO (Table 14-5).

Figure 14-10

Histograms of TREO, LREO, HREO and Dy_2O_3 ppm for MZONE 1 in Area 4

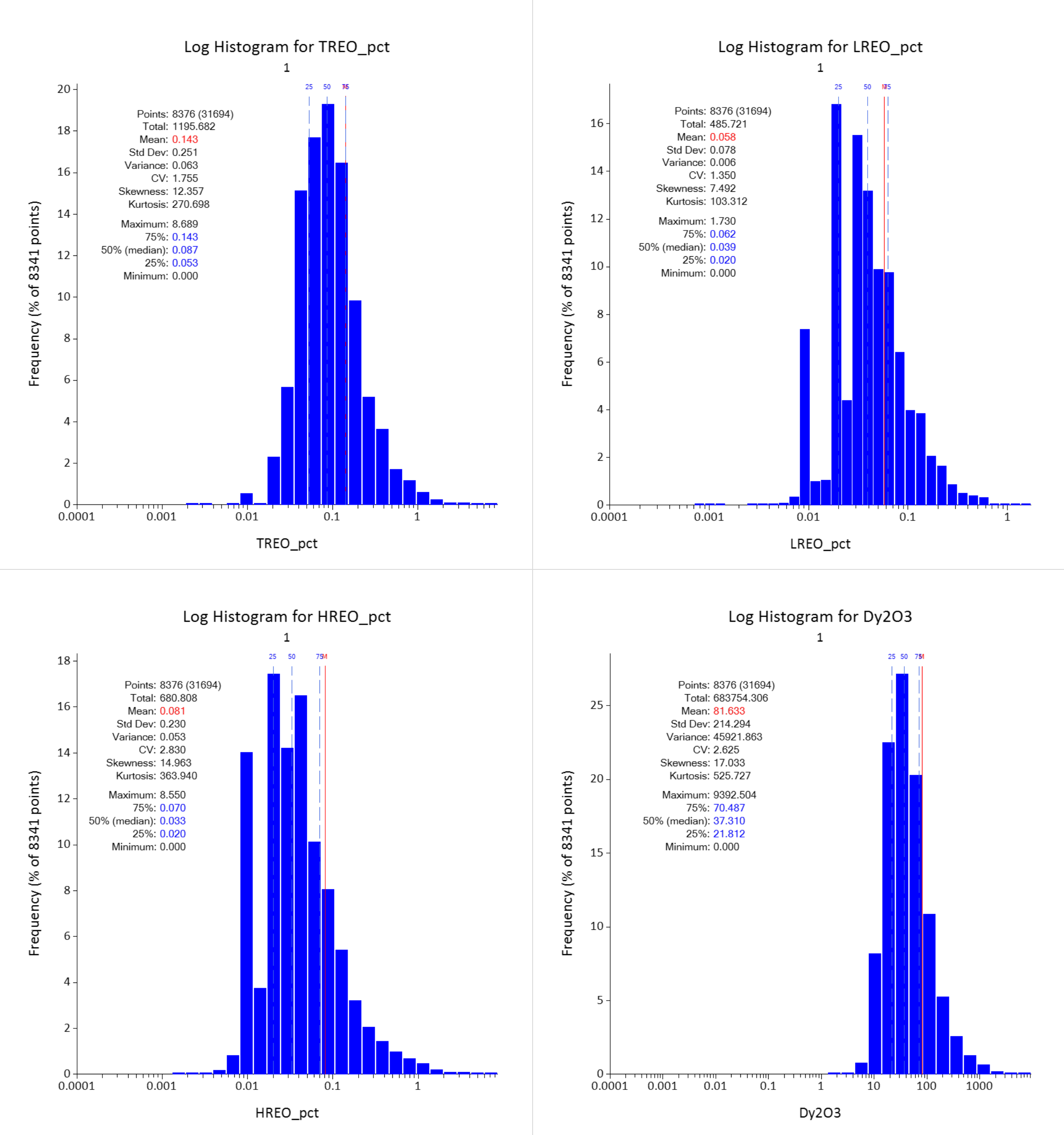


Figure 14-11

Histograms of TREO, LREO, HREO and Dy_2O_3 ppm for MZONE 1 in Area 2B

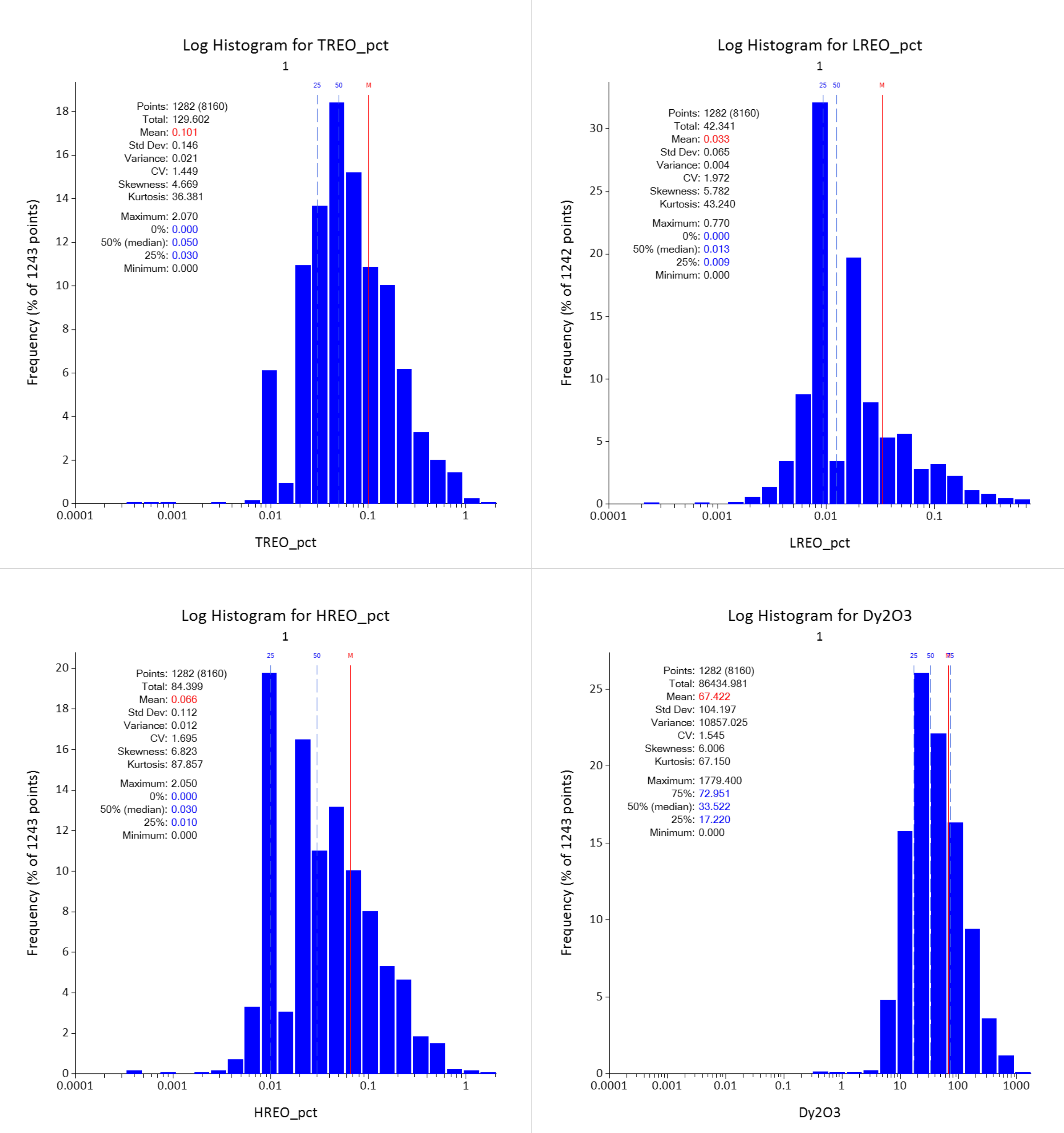


Table 14-5 Individual REO proportions for Area 4 and Area 2B		
REO	**Percentage of REO in TREO**	
	Area 4	**Area 2B**
La_2O_3	12.0%	10.8%
Ce_2O_3	21.6%	18.3%
Pr_2O_3	2.3%	2.0%
Nd_2O_3	8.4%	8.9%
Sm_2O_3	2.5%	3.9%
Total LREO	**46.8%**	**44.0%**
Eu_2O_3	0.9%	1.4%
Gd_2O_3	3.7%	4.9%
Tb_2O_3	0.8%	0.9%
Dy_2O_3	5.1%	5.6%
Ho_2O_3	1.1%	1.1%
Er_2O_3	3.1%	3.2%
Tm_2O_3	0.5%	0.5%
Yb_2O_3	2.8%	2.9%
Lu_2O_3	0.4%	0.4%
Y_2O_3	34.7%	35.1%
Total HREO	**53.2%**	**56.0%**

14.7.1 Cutting and Capping

An outlier analysis was completed on the composite data for the individual mineralised domains and capping was applied where applicable, cognisant of the bivariate relationship between rare earth oxides. The capping impacted between 1 and 15 samples in each domain for Area 4 and 1 and 19 samples for each domain Area 2B.

14.8 Geostatistical Analysis

14.8.1 Semivariograms

Experimental semivariograms were calculated on the normal scores transformed composite data for total HREO and total LREO grades using Datamine Supervisor (previously Snowden Supervisor) software. Normalised semivariograms were calculated so that the sum of the variance is equal to one.

The semivariograms for Area 4 were updated with the 2023 RC data which resulted in a shorter range for the second structure. The new data did not result in any significant changes to the Area

2B semivariograms. Due to the limited number of samples in the smaller domains, semivariograms were modelled using only the MZONE 1 composites. The same model was applied to the other domains during estimation.

Variogram maps for Area 4 showed the presence of weak anisotropy with the longest direction along strike (065°). Double structured, spherical semivariogram models were modelled for HREO while LREO grade continuity was modelled with three structures. Table 14-6 summarises the semivariogram parameters for Area 4.

Data for Area 2B did not suggest the presence of anisotropy. Single structure, spherical models were fitted to the experimental points for both HREO and LREO. Table 14-7 summarises the semivariogram parameters for Area 2B.

Semivariogram models for HREO for Area 4 are presented in Figure 14-12.

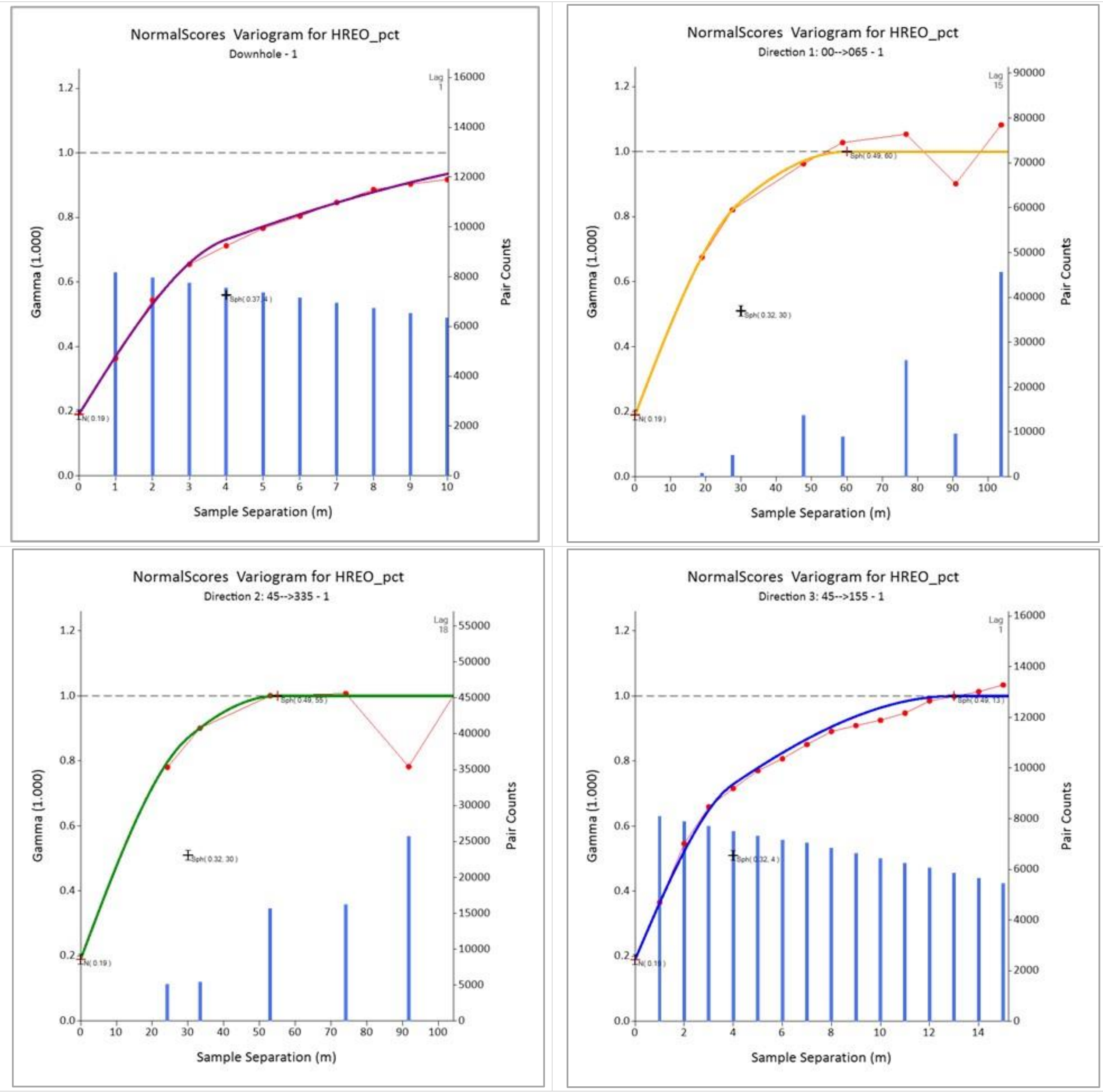
Table 14-6
Semivariogram Parameters for Area 4

Attribute	Rotation Angle			Rotation Axis			Nugget Effect (C0)	Sill 1 (C1)	Range of First Structure (m)			Sill 2 (C2)	Range of Second Structure (m)			Sill 3 (C2)	Range of Third Structure (m)		
	1	2	3	1	2	3			1	2	1		1	2	3		1	2	3
HREO	155	45	0	Z	X	Z	0.19	0.32	30	30	4	0.49	60	55	13	-	-	-	-
LREO	155	45	0	Z	X	Z	0.32	0.31	30	30	3	0.21	70	55	6	0.16	70	55	22

Table 14-7
Semivariogram Parameters for Area 2B

Attribute	Rotation Angle			Rotation Axis			Nugget Effect (C0)	Sill 1 (C1)	Range of First Structure (m)			Sill 2 (C2)	Range of Second Structure (m)			Sill 3 (C2)	Range of Third Structure (m)		
	1	2	3	1	2	3			1	2	1		1	2	3		1	2	3
HREO	140	50	0	Z	X	Z	0.21	0.79	60	55	5	-	-	-	-	-	-	-	-
LREO	140	50	0	Z	X	Z	0.31	0.69	60	55	5	-	-	-	-	-	-	-	-

Figure 14-12
Semivariogram models for HREO in MZONE 1 - Area 4



14.9 Block Modelling

Block models were generated for each project using 10 m by 10 m blocks in the X (easting) and Y (northing) direction and 5 m blocks in the Z (elevation) direction. The block model was not rotated.

Sub-celling was applied to optimally fill the modelled wireframes, resulting in minimum sub-cell of 2 m x 2 m x 1 m in X, Y and Z, respectively.

The common origins for the block models for Area 4 and Area 2B are shown Table 14-8.

Table 14-8 Block model origins Area 4 and Area 2B			
Area	**Easting (m)**	**Northing (m)**	**Elevation (m)**
Area 4	469,500	7,752,800	500
Area 2B	466,900	7,754,300	600

14.9.1 Estimation Parameters

The search distance and rotation angles were based on the semivariogram. Kriging Neighbourhood Analysis (KNA) was used to determine the minimum and maximum number of samples to be included in the search neighbourhood and the appropriate number of discretisation points to be used in a parent block. The KNA exercise looked at Kriging Efficiency as a metric of estimation quality and slope of regression was used to quantify the level of conditional bias when selecting the optimal parameters.

The search parameters are shown in Table 14-9 for Area 4 and Table 14-10 for Area 2B.

Table 14-9
Search Parameters for Area 4

Attribute	Rotation Angles			Rotation Axis			Search Distance (m)			Number of Composites	
	1	2	3	1	2	3	1	2	3	Min	Max
HREO	155	45	180	Z	X	Z	60	55	14	6	16
LREO	155	45	180	Z	X	Z	70	55	9	6	16

Table 14-10
Search Parameters for Area 2B

Attribute	Rotation Angles			Rotation Axis			Search Distance (m)			Number of Composites	
	1	2	3	1	2	3	1	2	3	Min	Max
HREO	140	50	0	Z	X	Y	60	55	5	6	18
LREO	140	50	0	Z	X	Y	60	55	5	6	18

Block grades were estimated in three passes, with the first pass using the search parameters shown in Table 14-9 and Table 14-10. The second search was expanded by a factor of 1.5 with a minimum of 6 and maximum of 16 samples included for Area 4, and a minimum of 6 and maximum of 18 for Area 2B. The third search made use of an expansion factor of 10, with a minimum of 5 and maximum of 16 samples included for Area 4 while Area 2B included a minimum of 5 and maximum of 18 samples in the search neighbourhood. Estimates using the third search parameter are of relatively low confidence with the parameters designed to estimate local average values.

Ordinary Kriging (OK) was used for the estimation of the rare earth oxides. The modelled semivariogram and search parameters were applied to the individual rare earth oxides. Estimates were completed for each individual mineralised zone comprising of fifteen zones for Area 4 and nine for Area 2B.

Density was estimated independently for each zone using inverse distance weighting and applying the same search parameters as the HREO attribute. Where blocks where not interpolated with a density estimate, the average value of the zone was assigned.

Dynamic anisotropy was used to align the search ellipsoids to account for local changes in the orientation of the mineralised zones along strike and dip. The dynamic search for each zone was orientated using trend surfaces created in Leapfrog Geo.

14.10 Validation of Estimates

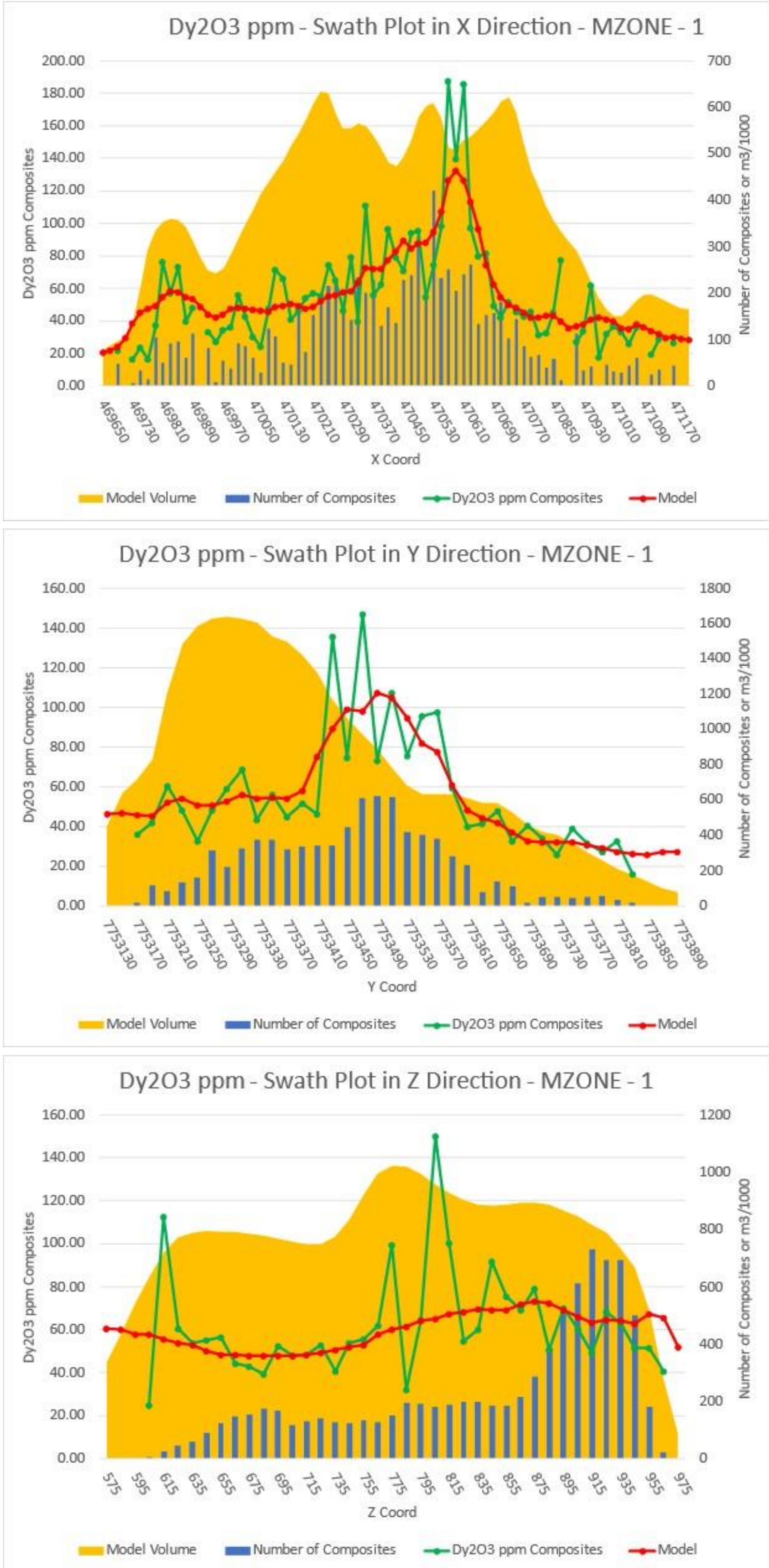
The models were validated by:

- Comparison of the global estimates against the average composite sample grades.
- Swath plot validation.
- Visual examination of the input data against the block model estimates.

The average grade of the block model for each individual zone was validated against the declustered composite grades (declustered to 100 mX by 100 mY by 20 mZ). Globally, the estimated block grades compare favourably to the input data, with relative differences of less than ten percent for the main mineralised zones. Larger percentage differences are noted for the smaller zones, which can be attributed to factors such the spatial arrangement and paucity of the data.

Swath plot validations in the X, Y and Z directions were used to locally validate the block estimates against the declustered sample composites. No material biases in the estimates of the individual elements were identified. Examples of a swath plot validation for MZONE 1 are shown for Dy_2O_3 in Figure 14-13.

Figure 14-13
Swath Plot Validation for Dy_2O_3 – Area 4 MZONE 1



The block model was examined visually to ensure that the drillhole grades were locally well represented by the model and it was found that the block grades validated reasonably well against the data. The model is less well locally representative of the data when extrapolating down dip, which was considered in the classification. Examples of this validation for Dy_2O_3ppm are illustrated for Area 4 (Figure 14-14) and Area 2 (Figure 14-15).

Figure 14-14

Area 4 block model cross-section coloured on Dy2O3

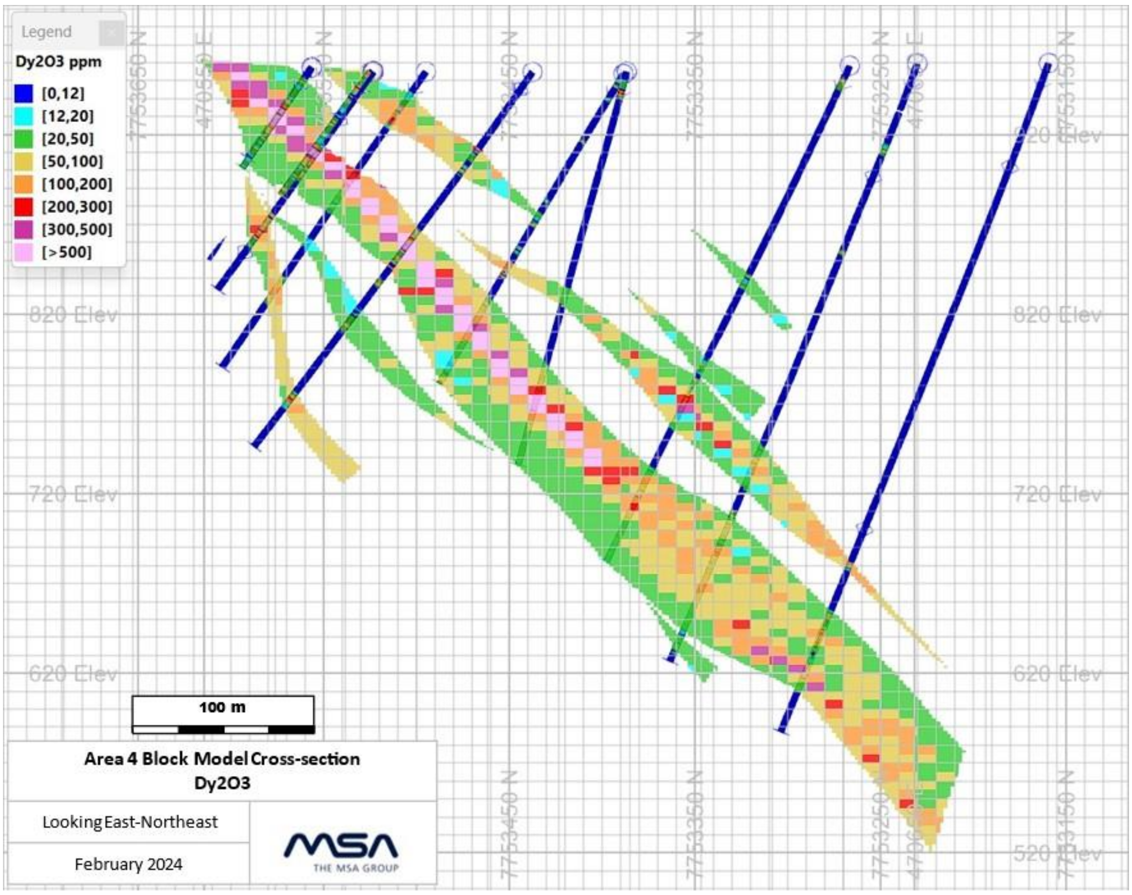
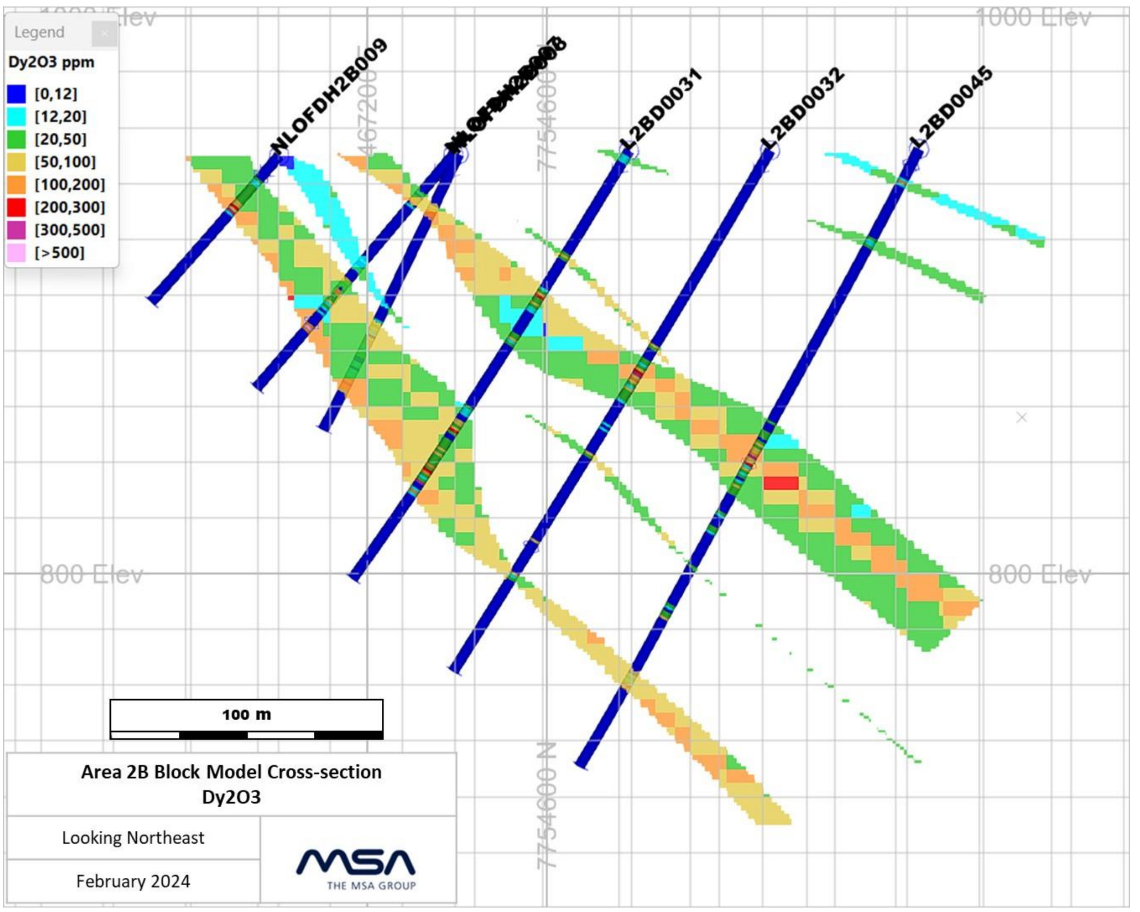


Figure 14-15
Area 2B block model cross-section coloured on Dy2O3



14.11 Mineral Resource Classification

Classification of the Area 4 and Area 2B Mineral Resources was based on the degree of geological uncertainty, grade continuity and variability, frequency of the drilling data and the confidence parameter outputs from the kriging estimates. The main considerations in the classification are as follows:

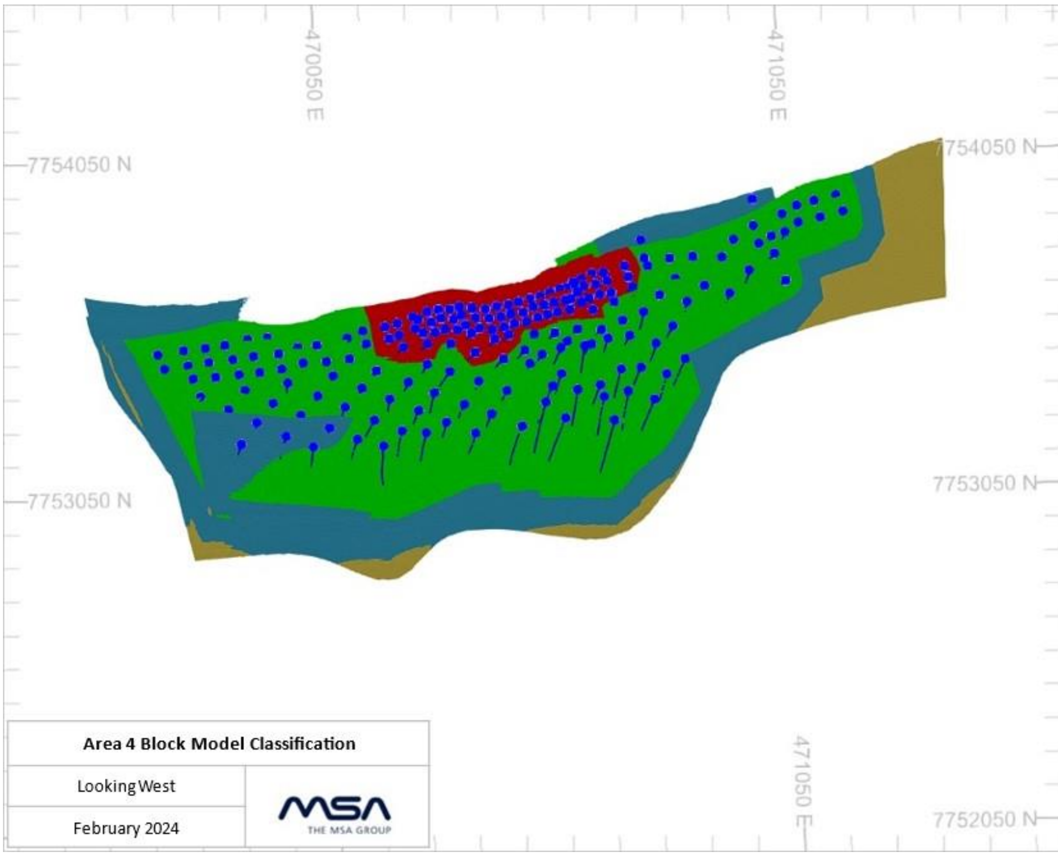
- All the data that inform the Mineral Resource have been collected by NMI, using acceptable principles and the assays passed the relevant QAQC tests.
- The geological model is robust and the grade shells exhibit good continuity with low variability within and between drilling sections.
- Semivariogram ranges for the attributes are more than the general drillhole spacing in most areas.

Given the aforementioned factors, the Mineral Resources have been classified using the following criteria:

- The Mineral Resource was classified as Measured where the level of confidence in the estimates is high. This is underpinned by data on a drilling grid of 30 m spacing or less. The kriging efficiency is between 50% and 80% and the slope of regression is higher than 0.8 for the majority of the blocks in the model.
- the Indicated Mineral Resource is underpinned by data on a drilling grid of approximately 50 m spacing. The kriging efficiency and the slope of regression are lower than for Measured and the drillhole spacing is too wide to interpolate grades to a high level of accuracy, despite drillhole spacing being within the modelled variogram range The Indicated areas are directly adjacent to the Measured areas.
- the Inferred Mineral Resource was classified where the confidence for the estimates is low. In these areas the drillholes are sparse and local estimates cannot be reliably made. The Inferred area is directly adjacent to the Indicated areas and largely occur in the deeper portions and periphery of the Mineral Resource.

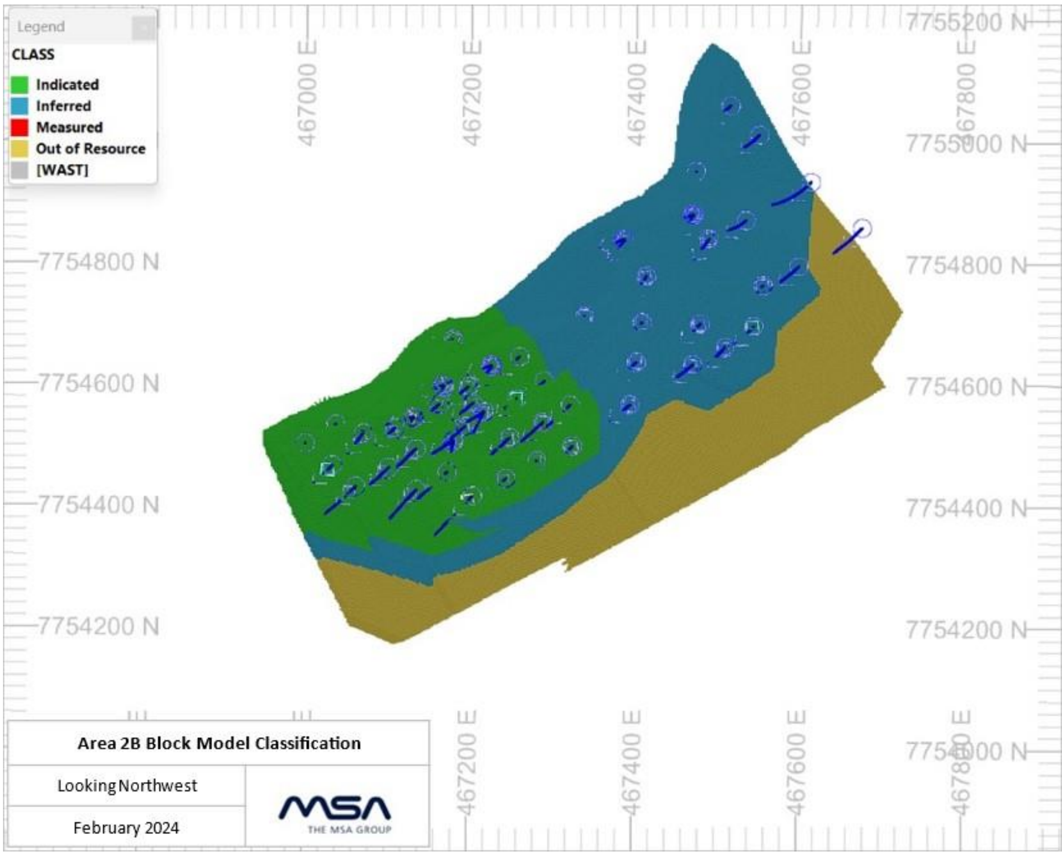
The classified block model for Area 4 is shown in Figure 14-16.

Figure 14-16
Mineral Resource classification for Area 4



Mineral Resources for Area 2B were classified as Indicated and Inferred in the same way as for Area 4. Areas that fall outside of this classification, where significant extrapolation of grades occurs beyond the data coverage, were not included in the Mineral Resource and were assigned a code of OOR (out of resource) in the model (Figure 14-17).

Figure 14-17
Mineral Resource classification for Area 2B



The Mineral Resources could be affected by further infill drilling, which may result in increases or decreases in subsequent Mineral Resource estimates. Inferred Mineral Resources are high-risk estimates that may change significantly with additional data. It cannot be assumed that all or part of an Inferred Mineral Resource will necessarily be upgraded to an Indicated Mineral Resource due to continued exploration. The Mineral Resources may also be affected by subsequent assessments of mining, environmental, processing, permitting, taxation, socio-economic and other factors.

14.12 Mineral Resource Statement

The Mineral Resource estimate as of 5 April 2024 is presented in Table 14-11 for Area 4 and Table 14-12 for Area 2B. The Mineral Resource is stated at a cut-off grade of 0.10% total rare earth oxides (TREO) and reported from within a Whittle optimised pit-shell.

In the QP's opinion, the Mineral Resources reported herein at the selected cut-off grade have "reasonable prospects for eventual economic extraction", taking into consideration mining and processing assumptions (refer to 14.13).

Table 14-11
Area 4, Measured, Indicated and Inferred Mineral Resource Estimates above 0.1% TREO cut-off grade – 5 April 2024

Category	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO (Kt)
Measured	6.6	0.21	0.14	0.07	130	13.7
Indicated	49.2	0.15	0.07	0.08	69	75.7
Measured & Indicated	**55.8**	**0.16**	**0.08**	**0.08**	**76**	**89.4**
Inferred	10.5	0.14	0.06	0.08	58	15.0

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes.*

Table 14-12
Area 2B, Indicated and Inferred Mineral Resource Estimates above 0.1% TREO cut-off grade – 5 April 2024

Category	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO (kt)
Indicated	2.7	0.16	0.09	0.07	97	4.4
Inferred	4.4	0.15	0.07	0.08	75	6.6

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes,.*

The Mineral Resource for Area 4 is presented at a variety of cut-off grades as shown in Table 14-13 for the combined Measured and Indicated Resources and Table 14-14 for the Inferred Mineral Resource.

Table 14-13
Area 4, Measured and Indicated Mineral Resource grade-tonnage table – 5 April 2024

Cut-off TREO%	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO* (kt)
0.10	**55.8**	**0.16**	**0.08**	**0.08**	**76**	**89.4**
0.15	20.4	0.23	0.13	0.10	120	46.5
0.20	8.4	0.31	0.20	0.11	186	26.0
0.25	4.2	0.40	0.29	0.11	262	16.8
0.30	2.6	0.48	0.38	0.10	333	12.4

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Total Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Total Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes*

Table 14-14
Area 4, Inferred Mineral Resources grade-tonnage table – 5 April 2024

Cut-off TREO%	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO* (kt)
0.10	**10.5**	**0.14**	**0.06**	**0.08**	**58**	**15.0**
0.15	3.4	0.18	0.08	0.11	76	6.3
0.20	0.7	0.24	0.12	0.12	118	1.7
0.25	0.2	0.30	0.20	0.09	193	0.6

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
4. ***HREO = Total Heavy Rare Earth Oxides and includes Y_2O_3*
5. ****LREO = Total Light Rare Earth Oxides*
6. *Mt = Million tonnes, kt = Thousand tonnes.*

The Mineral Resource for Area 2B is presented at a variety of cut-off grades in Table 14-15 for the Inferred Mineral Resource and Table 14-16 for the Indicated Mineral Resource.

Table 14-15
Area 2B, Indicated Resources grade-tonnage table – 5 April 2024

Cut-off TREO%	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO* (kt)
0.10	**2.7**	**0.16**	**0.09**	**0.07**	**97**	**4.4**

0.15	1.3	0.21	0.11	0.10	117	2.7
0.20	0.6	0.25	0.12	0.13	133	1.5
0.25	0.3	0.29	0.14	0.15	150	0.8

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes* Y_2O_3
5. ***HREO = Total Heavy Rare Earth Oxides and includes* Y_2O_3
6. ****LREO = Total Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes.*

Table 14-16

Area 2B, Inferred Resources grade-tonnage table – 5 April 2024

Cut-off TREO%	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO* (kt)
0.10	**4.4**	**0.15**	**0.07**	**0.08**	**75**	**6.6**
0.15	1.6	0.20	0.09	0.11	96	3.3
0.20	0.6	0.25	0.10	0.15	111	1.6
0.25	0.2	0.31	0.10	0.20	115	0.8

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes* Y_2O_3
5. ***HREO = Total Heavy Rare Earth Oxides and includes* Y_2O_3
6. ****LREO = Total Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes*

The grades for the individual REE for each class are shown for Area 4 in Table 14-17 and in Table 14-18 for Area 2B.

Table 14-17

Area 4, Individual REO Measured, Indicated and Inferred Mineral Resources above 0.1% TREO cut-off grade – 5 April 2024

Class	Tonnes Mt	TREO* %	La_2O_3 ppm	CeO_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Ho_2O_3 ppm	Er_2O_3 ppm	Tm_2O_3 ppm	Yb_2O_3 ppm	Lu_2O_3 ppm	Y_2O_3 ppm
Measured	6.6	0.21	173	313	34	124	42	18	81	19	130	28	83	12	76	11	935
Indicated	49.2	0.15	217	383	40	145	40	14	55	11	69	14	41	6	36	5	463
M&I	**55.8**	**0.16**	**211**	**374**	**39**	**142**	**40**	**15**	**58**	**12**	**76**	**16**	**46**	**7**	**41**	**6**	**519**
Inferred	10.5	0.14	217	389	42	150	40	13	49	9	58	12	34	5	30	4	369

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. *Mt = Million tonnes, M&I is the summation of Measured and Indicated.*

Table 14-18

Area 2B, Individual REO Measured, Indicated and Inferred Mineral Resources above 0.1% TREO grade – 5 April 2024

Class	Tonnes Mt	TREO* %	La_2O_3 ppm	CeO_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Ho_2O_3 ppm	Er_2O_3 ppm	Tm_2O_3 ppm	Yb_2O_3 ppm	Lu_2O_3 ppm	Y_2O_3 ppm
Indicated	2.7	0.16	187	303	32	126	51	20	73	15	97	19	55	8	51	7	596
Inferred	4.4	0.15	196	320	36	160	76	25	80	13	75	14	40	6	36	5	440

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. *Mt = Million tonnes.*

14.13 Assessment of Reasonable Prospects for Eventual Economic Extraction (RPEEE)

In assessing "reasonable prospects for eventual economic extraction" (RPEEE) the Mineral Resource was reported from within a Whittle optimised pit shell using the following assumed parameters and a cut-off grade of 0.1% TREO.

- Mining will be by open-pit methods:
- 55° slope angle in the partially weathered rock and 63° slope angle in the fresh rock
- 3% mining dilution
- 3% mining loss
- 10 m bench height
- Ore production rate of 2.0 million tonnes per annum.
- 65% final metallurgical recovery of TREO
- Costs were assumed as follows:
- Mining cost for drill and blast: USD 2.65 / tonne mined.
- Processing costs: USD 32 / tonne milled
- G&A cost: USD 1.41 / tonne milled
- Transport cost: USD 36.31 /tonne concentrate
- Offshore treatment cost and shipment priced in discounted basket price.
- NMI price USD 91.64 per Kg TREO+Y_2O_3 (based on the 2022 PEA) (Table 14-19).

Table 14-19
Distribution of TREO in Concentrate

REO	Pricing per REE	Distribution of individual REO in TREO % (concentrate values)
La_2O_3	$-	9.2%
CeO_2	$-	16.0%
Pr_6O_{11}	$201.00	1.7%
Nd_2O_3	$212.00	6.3%
Sm_2O_3	$5.00	2.2%
Eu_2O_3	$36.00	1.1%
Gd_2O_3	$109.00	4.3%
Tb_4O_7	$2 493.00	0.9%
Dy_2O_3	$587.00	6.2%
Ho_2O_3	$290.00	1.3%
Er_2O_3	$64.00	3.8%
Tm_2O_3	$20.00	3.5%
Yb_2O_3	$947.00	0.5%
Lu_2O_3	$17.00	42.4%
Y_2O_3	$500.00	0.6%

A plan showing the extents of the block model in relation to the conceptual pit shell boundaries is shown in Figure 14-18 for Area 4 and Figure 14-20 for Area 2B and a section through the deepest part of the modelled pit shell is shown in Figure 14-19 for Area 4 and Figure 14-21 for Area 2B. The pit shell covers the majority of the Area 4 grade block model both aerially and at depth, however the narrower mineralisation at Area 2B resulted in the mineral resource being constrained at depth by the limits of the pit shell. The modelled pit shell areas lie entirely within ML 200 and the nearest boundary of the licence is approximately 6 km to the north and 9 km to the east. The two pits are far enough away from each other to be operated as separate pits, although close enough so that ore will be transported to a central facility for processing. There is no infrastructure, such as major roads, power lines, water courses or settlements, within or within the immediate vicinity of the pit shell outline.

The reader is advised that the assessment of economic potential that is incorporated in the Mineral Resource is solely for the purpose of reporting Mineral Resources and does not represent an attempt to estimate Mineral Reserves.

Figure 14-18
Area 4 – plan showing block model relative to pit shell extents

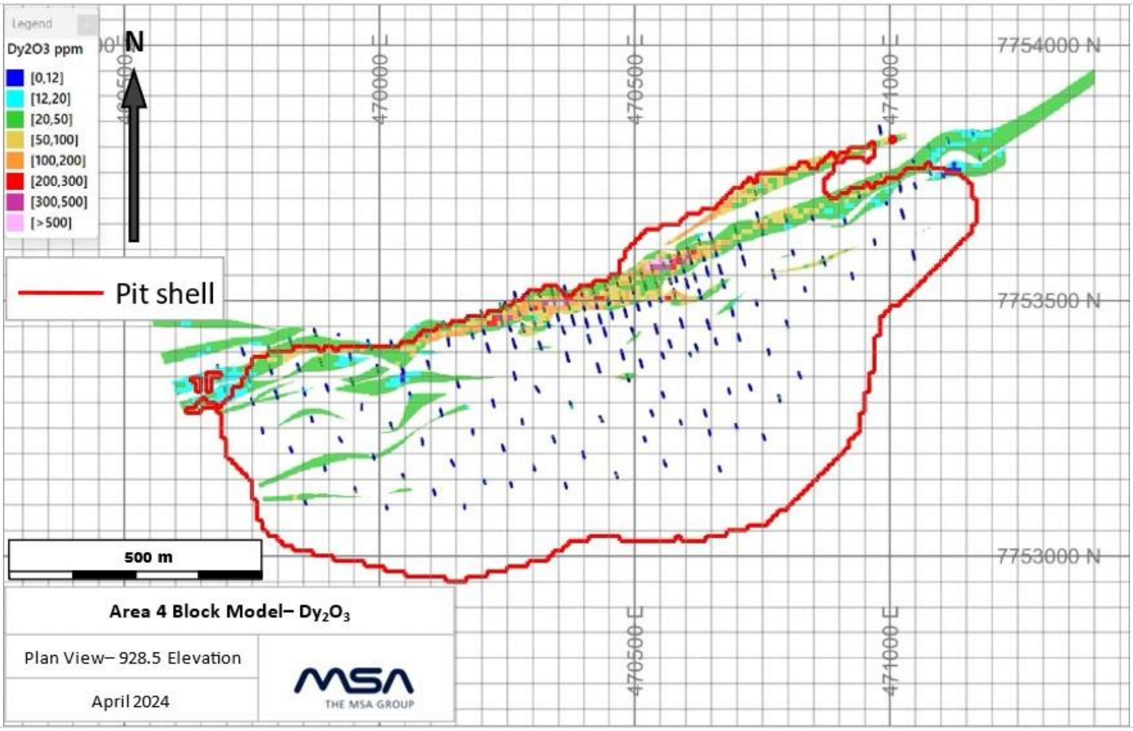


Figure 14-19

Area 4 section looking northeast showing block model relative to pit shell extents and topography

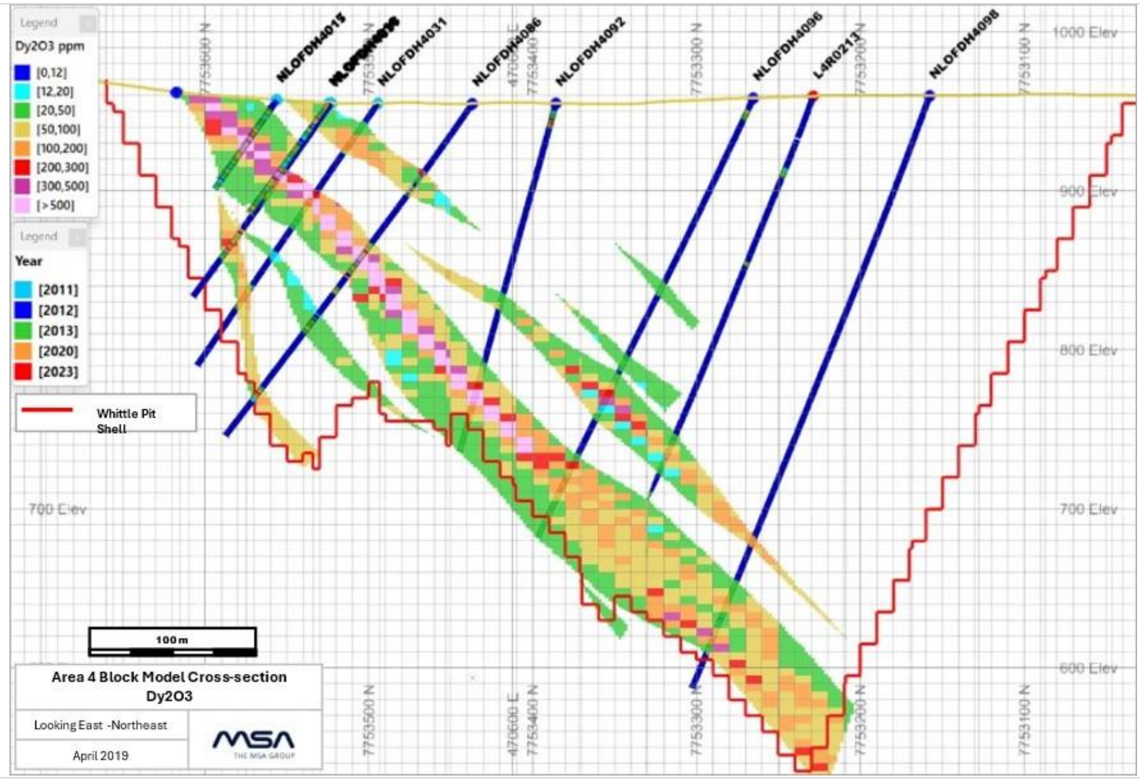


Figure 14-20

Area 2 – plan showing block model relative to pit shell extents

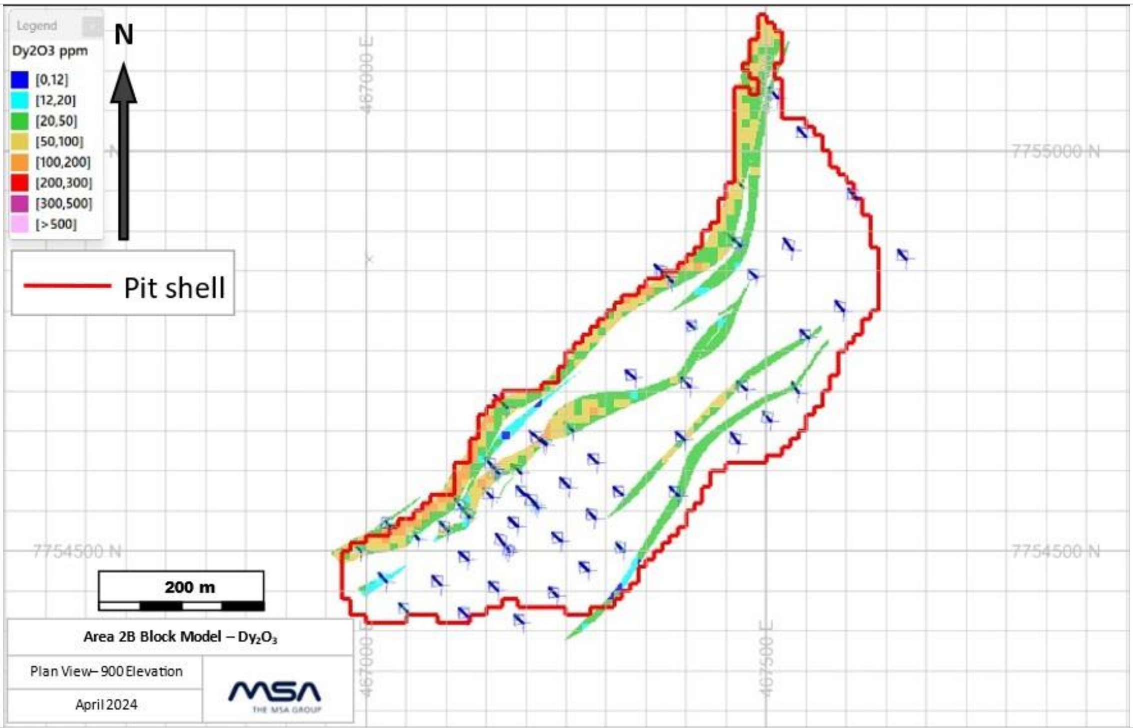
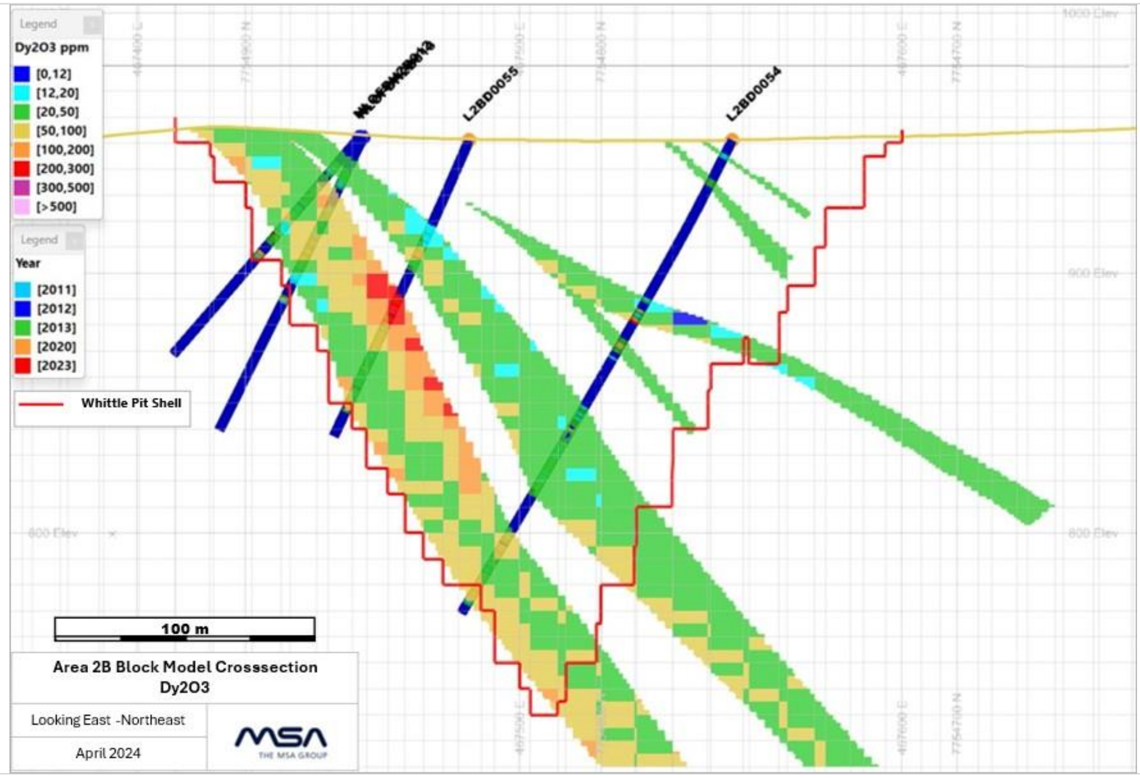


Figure 14-21
Area 2 section looking northeast showing block model relative to pit shell extents and topography



14.14 Comparison with Previous Estimate

The Mineral Resource estimate detailed in this report represents the third Mineral Resource Estimate reported for Area 4 and the second Mineral Resource for Area 2B. A comparison between the previous estimate for Area 4, with an effective date 12 May 2021, and the current estimate is shown in Table 14-20 at a 0.10% TREO cut-off.

The total Mineral Resource for Area 4 increased from May 2021 to February 2024 as a result of the additional drilling which expanded the extent of the Mineral Resource along strike and down-dip from the previously defined area.

Table 14-20
Area 4 – 12 May 2021 Mineral Resource Estimate compared with 5 April 2024 Mineral Resource Estimate

Classification	12 May 2021			5 April 2024		
	Tonnes (Mt)	TREO* %	TREO (kt)	Tonnes (Mt)	TREO* %	TREO (kt)
Measured	5.93	0.21	12.71	6.57	0.21	13.7
Indicated	36.63	0.16	59.97	49.22	0.15	75.7
M&I	**42.57**	**0.17**	**72.68**	**55.79**	**0.16**	**89.4**
Inferred	6.09	0.17	10.12	10.52	0.14	15.0

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
4. *Mt = Million tonnes, kt = Thousand tonnes, M&I is the summation of Measured and Indicated.*

The Indicated Mineral Resource for Area 2B increased from May 2021 to February 2024 due to changes to the criteria used to determine optimised pit shell. The Inferred Mineral Resources increased due to additional drilling which expanded the Mineral Resource northeast along strike and down-dip.

Table 14-21
Area 2B – 12 May 2021 Mineral Resource Estimate compared with 5 April 2024 Mineral Resource Estimate

Classification	12 May 2021			5 April 2024		
	Tonnes (Mt)	TREO* %	TREO (kt)	Tonnes (Mt)	TREO* %	TREO (kt)
Indicated	2.20	0.19	4.3	2.65	0.16	4.4
Inferred	2.58	0.19	4.8	4.37	0.15	6.6

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
4. *Mt = Million tonnes, kt = Thousand tonnes, M&I is the summation of Measured and Indicated.*

The reader is advised that the 12 May 2021 Mineral Resource estimates have been superseded by that of 5 April 2024 and is presented purely for comparative purposes.

15 MINERAL RESERVE ESTIMATES

Not applicable.

16 MINING METHODS

Not applicable.

17 RECOVERY METHODS

Not applicable.

18 PROJECT INFRASTRUCTURE

Not applicable.

19 MARKET STUDIES AND CONTRACTS

Not applicable.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Not applicable.

21 CAPITAL AND OPERATING COSTS

Not applicable.

22 ECONOMIC ANALYSIS

Not applicable.

23 ADJACENT PROPERTIES

There are no adjacent properties of relevance to this report.

24 OTHER RELEVANT DATA AND INFORMATION

No other relevant data and information to report

25 INTERPRETATION AND CONCLUSIONS

On behalf of NMI, MSA has completed an update to the Mineral Resource estimates for Area 4 and Area 2B of the Lofdal Heavy Rare Earths Project.

The Mineral Resource is reported as Measured, Indicated and Inferred Mineral Resources as shown in Table 25-1 for Area 4 and Table 25-2 for Area 2B. The Mineral Resource was estimated using The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Best Practice Guidelines (2019) and is reported in accordance with the 2014 CIM Definition Standards, which have been incorporated by reference into National Instrument 43-101 – Standards of Disclosure for Mineral Projects (NI 43-101).

In the QP's opinion, the Mineral Resources reported herein at the selected cut-off grade have "reasonable prospects for eventual economic extraction", taking into consideration mining and processing assumptions (refer to 14.13). The Mineral Resource was reported from within a Whittle optimised pit shell at a cut-off grade of 0.10% TREO.

Table 25-1
Area 4 Mineral Resources above a 0.1% TREO cut-off grade – 5 April 2024

Category	Tonnes (Mt)	TREO* %	HREO** %	LREO*** %	Dy_2O_3 ppm	TREO (Kt)
Measured	6.6	0.21	0.14	0.07	130	13.7
Indicated	49.2	0.15	0.07	0.08	69	75.7
Measured & Indicated	**55.8**	**0.16**	**0.08**	**0.08**	**76**	**89.4**
Inferred	10.5	0.14	0.06	0.08	58	15.0

Notes:
1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes.*

Table 25-2 Area 2B Mineral Resources above a 0.1% TREO cut-off grade – 5 April 2024						
Category	**Tonnes (Mt)**	**TREO* %**	**HREO** %**	**LREO*** %**	**Dy_2O_3 ppm**	**TREO (kt)**
Indicated	2.7	0.16	0.09	0.07	97	4.4
Inferred	4.4	0.15	0.07	0.08	75	6.6

Notes:

1. *All tabulated data have been rounded and as a result minor computational errors may occur.*
2. *Mineral Resources, which are not Mineral Reserves, have no demonstrated economic viability.*
3. *Quantities reported are the total quantities for the project regardless of ownership.*
4. **TREO = Total Rare Earth Oxides and includes Y_2O_3*
5. ***HREO = Heavy Rare Earth Oxides and includes Y_2O_3*
6. ****LREO = Light Rare Earth Oxides*
7. *Mt = Million tonnes, kt = Thousand tonnes,.*

The Area 4 Mineral Resource Estimate has increased from the previous estimate of 12 May 2021, largely due changes to the input parameters used to generate the optimised shell which differ to those used in the previous Mineral Resource estimate. The Area 2B Indicated Mineral Resource has seen a slight increase in tonnages due to changes to the input parameters for the optimised pit shell. The Inferred Mineral Resources have increased in tonnages due to the additional RC drilling which has extended the Mineral Resource in a northeasterly direction along strike.

26 RECOMMENDATIONS

The QPs considers that additional technical work to support a Definitive Economic Assessment (DFS) is warranted for the Lofdal Project.

The Lofdal property remains prospective and the opportunity remains to expand the Mineral Resource inventory for Area 4 and Area 2B. A proposed drilling programme two areas has been budgeted at a cost of 968 000 Canadian Dollars (CAD) as detailed in Table 26-1.

Table 26-1
Proposed additional drilling for Area 4 and Area 2B

Item	Quantity	Total Cost (CAD)
Drilling	7 100 metres	710,000
Assays	90 samples	55,000
Contingencies	20 %	153,000
Consulting Services		50,000
Total		**968,000**

Further metallurgical test work recommendations have been budgeted with a combined cost of 3,200,000 CAD which includes:

1. Expand test work for upgrading of low-grade material and rejection of carbonate lithologies by x-ray transmission sorting (XRT). Approximate budget CAD 200 000
2. Flotation and hydrometallurgical variability test work – a preliminary programme is underway on drill core material. An additional programme for larger scale and locked cycle testing with production of variable concentrate for hydrometallurgical testing is recommended. Approximate budget of CAD 2m.
3. Physical testing for materials handling, rheology, pumping, solid liquid separation, filtration, geotechnical and geochemical testing for firmed up design criteria for process engineering design. Approximate budget CAD1m.

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