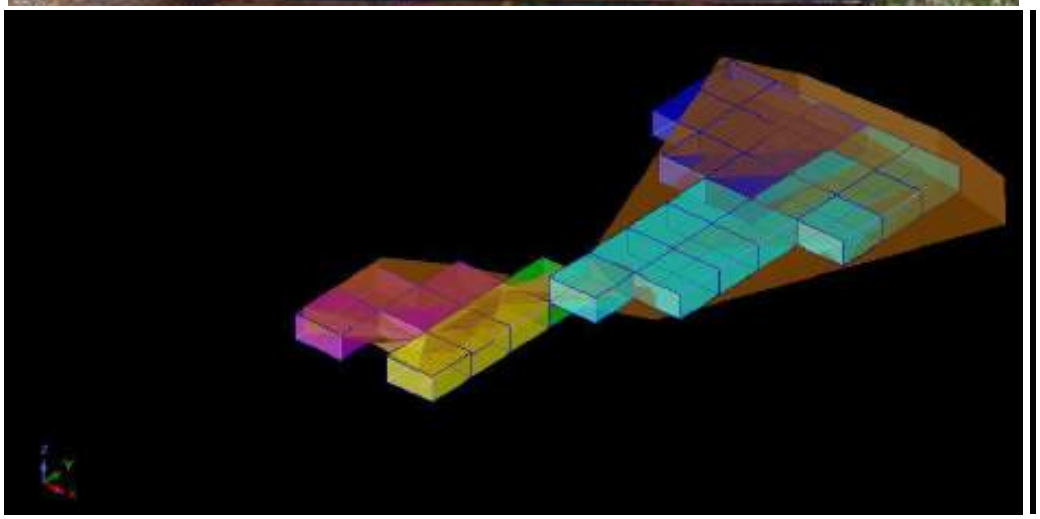
KWAMSISI GRAPHITE PROJECT

FEASIBILITY REPORT

at

KWAMSISI VILLAGES IN KWAMSISI WARD, HANDENI DISTRICT, TANGA REGION.

坦嘎，汉得尼区，KWAMSISI村庄，KWAMSISI石墨项目可行性报告



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致谢：

这是对在坦桑尼亚联合共和国坦嘎地区汉德尼区拟议的夸米西西石墨项目地质勘探工作中提供支持和援助的所有个人和组织的致谢。

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EXECUTIVE SUMMARY 执行摘要

The proposed Project is located in Handeni District, eastern portion of Tanzania, about 245 Kilometres North West of Dar es Salaam City. It is situated around 180 south west of Tanga (the regional headquarter of the Tanga Region). The proposed Project fall under the jurisdiction of Handeni District, Kwamsisi Ward, Kwamsisi Villages (Figure 1.3).

该项目位于坦桑尼亚东部的汉得尼区，距达累斯萨拉姆市西北约245公里。它位于坦嘎西南180左右(坦嘎市区)。拟议项目由汉得尼区、Kwamsisi区、Kwamsisi村管辖(图1.3)。

At Kwamsisi Graphite Project contained 42 primary mining licences (PML), Graphitic mineralisation is hosted within a graphitic gneissic unit along the NNE-SSW approximately 1.8 kms strike length continuity within the licenses area and width of around 70m to 100m and the average graphite mineralised thickness of 20m. The graphite's is characteristics principally flake size graphite available on a consistent basis in the outcrop and 13 trenches exposure at numerous locations within the licenses area and at various drill cores.

在Kwamsisi石墨项目，有42个初级采矿许可证，石墨矿化分布在北北东-南南西沿线的一个石墨片麻岩单元内，在许可区域内约1.8公里的连续走向中，宽度约为70 - 100米，平均石墨矿化厚度20米。石墨的特征主要是鳞片大小的石墨，暴露在露头和13个坑槽以及许可证区域内的许多地点和不同的钻芯中。

The Resource was calculated with a 5% Fixed Carbon cut-off grade and the average grade of 8 % Fixed carbon. The average bulk density values for both ligolith and rock that were 2.3, and the average bulk density of the excavated material was used as 1.8, the total resource resources is 5,796,000 tons and the total minable ore is 2,576,000 tons. The mining operation is expected for 300days/year with daily mining capacity 1,800tons which will produce 100.8 graphite tons per day and annual mining capacity of 540,000 tons of graphite ore. The annual graphite production will be 32,400 tons. The expected mining life is 9 years but during mining operation the drilling operation will be continuing in order to update the graphite resources into graphite reserve, hence it is estimated the mining life will reach 15 years.

资源是以 5%的固定碳截止品位和 8%的平均固定碳品位计算的。ligolith 和岩石的平均容积密度值均为 2.3，挖出物的容积密度值为 1.8，资源总量为 579.6 万吨，可采矿石总量为 257.6 万吨。预计开采 300 天/年，日开采能力 1800 吨，每天可生产 100.8 吨石墨，年开采能力 54 万吨石墨矿石，石墨年产量将达到 3.24 万吨。预计开采寿命为 9 年，但在开采过程中，钻井作业将继续进行，以将石墨资源更新为石墨储备，因此估计开采寿命将达到 15 年。

No of PML	Length-m 长	Width-m 宽	Thickness-m 厚	Total Volume (m^3)体积	Specific Gravity (g/cm3 比重)	Tonnage (tons)吨	Avarage Grade-%平均品位	TGC 总碳量
Graphite Resource 石墨资源	1,800	70	20	2,520,000	2.3	5,796,000	8	463,680

Graphite Reserve 石墨资源	800	70	20	1,120,000	2.3	2,576,000	8	206,080

Access to the Project from Dar es Salaam is via the Dar es Salaam-Bagamoyo -Msata-Mkata on s tarmac Road, approximately 215 km North West of Dar es Salaam. The access road from the Tanga Port is Tanga-Muheza-Mkata approximately 140km south west of Tanga city. The access road to the site from Mkata is rough gravel road, approximately 55 kms south east of Mkata. The access road from Mkata to the site is accessible throught the year.

从达累斯萨拉姆进入该项目的途径是达累斯萨拉姆-巴加莫约-姆萨塔-姆塔塔的柏油路，位于达累斯萨拉姆西北约215公里处。从坦嘎港出发的通道是坦嘎-穆赫泽-姆卡塔，位于坦嘎市西南约140公里处。从Mkata通往工地的道路是粗糙的砾石路，位于Mkata东南约55公里处。从Mkata到基地的道路全年都可通行。

The project area is within the eastern boundary of the Neoproterozoic of Mozambique Belt, characterized by the rocks of Proterozoic age dated 1.9 Ga. These rocks are of the composite metamorphic crustal domain with undifferentiated meta-igneous and sedimentary rocks of variable ages and origins including the Neoarchaean, Paleoproterozoic, Mesoproterozoic (source) and Neoproterozoic protolith reworked during the Neoproterozoic tectothermal events

项目区位于莫桑比克带新元古代东部边界内，以1.9 Ga**元古代岩石**为特征。这些岩石属于复合变质地壳域，具有不同年龄和来源的未分化变质火成岩和沉积岩，包括新元古代、古元古代、中元古代(**源岩**)**和在新元古代构造**热事件中改造的新元古代原岩。

The Mozambique Belt system of Proterozoic age consists of metamorphic rocks, mainly granulites, hornblende and biotitic gneisses, Mg-rich crystalline marbles and graphitic schists and gneisses and quartzites. Kyanite-chlorite schists are also present. This rock system contains a fairly wide variety of economic minerals; the majorities are of which rock are forming minerals produced during metamorphism. These rocks are commonly intruded by pegmatite dykes and quartz veins containing variety of minerals including gemstones (graphite, ruby, sapphire, tanzanite, apatite, garnet, aquamarine tourmaline, kyanite, alexandrite or chrysobery etc.), gold and other non-metallic minerals

元古代莫桑比克带系统由变质岩组成，主要为麻粒岩、角闪岩和生物质片麻岩、富镁结晶大理岩和石墨片岩、片麻岩和石英岩。蓝晶石-绿泥石片岩也存在。这种岩石系统含有相当广泛的经济矿物;**大多数岩石是在**变质作用中形成的矿物。这些岩石通常被伟晶岩脉和石英脉侵入，其中含有各种矿物，包括宝石(**石墨**、红宝石、蓝宝石、坦桑石、磷灰石、石榴石、海蓝宝石电气石、蓝晶石、翠绿石或金石等)、**金和其他非金属**矿物。

Drilling programmes were carried out in the area specifically by Azustone Resources in the late 2022. The results of the drilling programmes were compiled by the project and then a geological profile was prepared. Based on the results of the drilling programme, a summary of the geological structure in the individual boreholes was prepared. The interpretation of the data was also given by considering the structure of the surroundings of the level samples and the composite samples, and petrographic analyses.

Azustone Resources于2022年底在该地区开展了钻孔项目。该项目编制了钻孔方案的结果，然后编制了地质剖面。根据钻孔方案的结果，编制了单个钻孔的地质结构概要。结合地层样品和复合样品的周围结构，结合岩相分析，对资料进行了解释。

The core samples drilled was logged for both geological, geotechnical and structural and sampled in order to gain insight into the variation of grades of graphite mineralization with depth. Each core box produced 2 to 3 sample of the core. In addition to logging of the cores in, field sampling was conducted on site and it was carried out in two stages. Stage I field activities included bulk sampling of rocks by the composite sampling method for some selected zones based on the old data. Rock hand specimens for geological studies were also collected at this stage. Stage II field activities included sampling of rocks through trenching on the selected location for trenching method. The rock samples collected in stages I and II were surface materials. The principal aim of the sampling work was to provide suitable and representative samples of graphite that would increase confidence for the probability for the availability for continuing graphite mineralization. All the samples were sent to GST geochemical laboratory at every exploration stage and the results was verry encouraging.

钻探的岩芯样品进行了地质、岩土和构造测井，并进行了取样，以了解石墨矿化等级随深度的变化。每个芯盒生产2 - 3个芯样。除岩心测井外，还在现场进行了现场采样，并分两个阶段进行。第一阶段的实地活动包括根据旧数据对一些选定的区域采用复合抽样方法对岩石进行大量抽样。这一阶段还收集了用于地质研究的岩石手标本。第二阶段的实地活动包括在选定的地点用挖沟法进行岩石取样。第一阶段和第二阶段收集的岩石样品为地面材料。取样工作的主要目的是提供合适和有代表性的石墨样品，以增加人们对继续进行石墨矿化可能性的信心。在每个勘探阶段，所有样品都被送往GST化探实验室，结果非常令人鼓舞.

Modelling of the Kwamsisi graphite resource began with the establishment of a topographic map of the area, which encompassed surrounding villages, communities Kwedikabo the residential areas etc. Data from past geological studies which included borehole information from various past drilling programs were identified and interpreted to incorporate them in a geological model for better view of the mineralization of the area. A total of 9 boreholes whose information was available were interpreted and entered into a geological model of the deposit. Geological modelling was conducted using Surpac program to enable a three-dimensional view of the deposit to be constructed.

石墨资源的建模始于建立该地区的地形图，其中包括周围的村庄、社区、Kwedikabo和居民区等。来自过去地质研究的数据，包括过去各种钻孔计划的钻孔信息，被识别和解释，以将其纳入地质模型，以便更好地了解该地区的矿化情况。对可获得信息的9个钻孔进行了解释，并将其输入到矿床地质模型中。使用Surpac程序进行地质建模，以构建矿床的三维视图。

A geological model was produced by first generating a topographic map of the Kwamsisi area and incorporating all boreholes showing the graphite grade profile and borehole collars. Profiles (sections) were then generated from the boreholes which were approximately aligned in a local grid. Polygons were generated from a number of boreholes logged, with each borehole information influencing the area taken up by the polygon. Based on the generated polygons, ten (5m) metre benches across the depth of the mineralization were then produced.

首先生成了Kwamsisi地区的地形图，并纳入了所有显示石墨级剖面和钻孔项圈的钻孔，从而生成了地质模型。然后从近似在局部网格中对齐的孔中生成剖面(截面)。多边形是由许多钻孔记录生成的，每个孔信息都会影响多边形所占的面积。基于生成的多边形，然后在矿化深度上生成10米(5米)长的阶梯。

Based on the geological model presented, the economic analysis, topography of the area and the physical features, open pit mining method was found more economical compared to underground mining. A sequence of benches from the highest level to the bottom most level for an ore with cut-off grade of 5% TGC has been worked out. Based on the topography of Kwamsisi graphite Project and the geometry of the orebody, it is logical to work out a deposit from the highest level downwards. Sequence of mining will be in such a way that, the highest bench is mined first followed by successive down ward benches which meet a criteria of having ore above the cut-off grade of 5% TGC The mineralised area is a small hilly. It is therefore planned for the haulage road to start from the location of the processing plant, which is located west of the deposit on a gentle area climbing gently to the top benches in Museum zone where the first production will start. Based on the production figure of 1,800 tons/day, mining equipment, sizing and their costs were determined for the operation of the processing plant for 300 days per year.

在建立地质模型的基础上，结合经济分析、矿区地形和地质特征，认为露天开采比地下开采更经济。确定了某矿石截止品位为5% TGC时，从最高一级到最低一级的分段顺序。根据夸米西西石墨项目的地形和矿体的几何形状，从最高向下推断矿床是合乎逻辑的。采矿顺序将以这样的方式进行，首先开采最高的台阶，然后依次向下开采，这些台阶符合矿石品位高于5% TGC的标准。矿化区是一个小丘陵地区。因此，计划从加工厂的位置开始运输，该工厂位于矿床西部的一个平缓区域，轻轻地爬到馆区的顶部阶梯，在那里将开始第一次生产。根据1800吨/天的生产，确定加工厂每年运行300天的采矿设备、规模及其成本。

The mined ore, which will have an average grade of 8% TGC, will be separated from the gangue and concentrated by two-stages of flotation, preceded by comminution and followed. A number of reagents will be used in the concentration process in order to bring about selective and high recovery of the target mineral, graphite. By and large, these will act to change the nature of the surface of the various mineral phases through the formation of extremely thin (molecular dimensions) surface layers. Therefore, the quantities employed, will be extremely low, a fact that reduces the hazard to the environment.

采出的矿石平均 TGC 品位为 8%，将与脉石分离，经过两个阶段的浮选，先粉碎后浓缩。为了使目标矿物石墨具有选择性和高回收率，将在浓缩过程中使用多种试剂。总的来说，这些将通过形成极薄(分子尺寸)的表面层来改变各种矿物相的表面性质。因此，使用的数量将非常低，这一事实减少了对环境的危害

The economic analysis of the project has been carried out after determining the requirements for operating, development, capital and working capital costs. The operating costs were determined for the individual sections including the mine, processing, engineering and administration. The development cost items are the infrastructural developments which are necessary to support the project to make it start operating. Such infrastructural developments include; power transmission and distribution lines, access roads construction, tailings dam

construction, fresh water system construction, office buildings, workshops and fuel bays, crusher and mill foundations, etc. The capital costs have been calculated as those costs spent on purchasing the mining equipment and plant machinery including other fixed assets which are necessary to be used to operate the mine and the processing plant. The depreciation schedules for the assets are also shown and the time at which some of the depreciated mining equipment will have to be replaced is also determined. The working capital is estimated as the amount required to keep the operations running for at least 3 months before the first revenues are generated to keep the operations running. Revenues are estimated based on the amount of total graphic carbon concentrates to be produced. The average feed grade of the ore from the mine has been estimated to be 8% TGC. The ore is planned to be concentrated into 95% TGC, which is a saleable product to an international market. The recovery of the plant is taken to be 70% and it will operate for 300 days in a year to produce a total of 30,240 tonnes of concentrate saleable to the international market.

在确定了运营、开发、资本和流动资金成本的要求后，对项目进行了经济分析。为包括采矿、加工、设计和行政在内的各个部门确定了业务费用。开发成本项目是支持项目开始运作所必需的基础设施开发。这种基础设施发展包括;输配电线路、出入口道路建设、尾矿坝建设、淡水系统建设、办公楼、车间、燃料舱、破碎机、磨机基础等。资本成本是指用于购买采矿设备和工厂机械的成本，包括经营矿山和加工厂所需的其他固定资产。还列出了资产的折旧表，并确定了必须更换一些已折旧的采矿设备的时间。流动资金估计是在产生第一笔收入以维持业务运行之前，维持业务运行至少3个月所需的数额。收入是根据生产的碳精矿总量来估算的。该矿矿石的平均进料品位估计为8% TGC。计划将矿石浓缩成95%的TGC，该产品可销往国际市场。该工厂的回收率为70%，每年将运行300天，共生产30,240吨精矿，销往国际市场。

Revenues and cost estimates which are based on the proposed schedule of operations were evaluated and a cash flow analysis was generated to determine the Net Present Value (NPV) of the project. The analysis was carried out based on the following assumed financial parameters:

- Mine life of 9 years;
- Income Tax rate of 30% applicable for Tanzania;
- An eight-year investment tax credit has been considered under existing Tanzanian tax rules;
- Tax exemption on fuel, oils, and other imported supplies has not been incorporated in the study though the project qualifies under existing tax incentives accorded to mine development projects in Tanzania. When these incentives are incorporated, it will greatly boost the cash flow of the project.

评估了基于拟议的运营计划的收入和成本估算，并生成了现金流分析，以确定项目的净现值(NPV)。分析基于以下假定的财务参数:

- 1.矿山寿命 9 年;
- 2.坦桑尼亚所得税税率为 30%;

- 3.根据坦桑尼亚现有的税收规则，已经考虑了一项为期 8 年的投资税收抵免;
- 虽然该项目符合坦桑尼亚矿山开发项目现有的税收优惠政策，但燃料、石油和其他进口物资的免税并未纳入研究。当这些激励措施被纳入，它将大大提高项目的现金流

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ABBREVIATIONS 缩写

amsl	Average Mean See Level 平均海平面
APT	Appropriate Processing Technologies 适当的加工技术
BH	Borehole 钻孔
bgl	Below ground level 地面以下
FS	Feasibility Study 可行性研究
BCOG	Break-Even Cut-off Grade 保底截止品位
E	East 东
ESIA	Environmental and Social Impact Assessment 环境和社会影响评估
ESMP	Environmental and Social Management Plan 环境和社会管理计划
DW	Domestic Water 生活用水
GST	Geological Survey of Tanzania 坦桑尼亚地质调查局
GW	Ground Water 地下水
GIS	Geographical Information System 地理信息系统
IBCOG	Incremental Break -Even Cut-off-Grade in Pit 矿坑增量盈亏平衡截断品位
IW	Industrial water 工业用水
FeO	Iron Oxide 氧化铁
GPS	Global Positioning System 全球定位系统
KVA	Kilovolt-Ampere 千伏安-安培
MOM	Ministry of Mineral 矿产部
MCOG	Mill Cut-off Grade 研磨截止品位
PL	Prospecting Licence 勘探许可证
RMO	Resident Mine Officer 驻地矿产部主任
VEO	Village Executive Officer 乡村行政主任
WEO	Ward Executive Officer 区行政主任
W	West 西
PL	Prospecting Licence 勘探许可证
PML	Primary Mining Licence 初级采矿许可证
ppm	Part per million 百万分比
S	South 南
PPE	Personal Processing Equipment 个人加工设备
SE	South East 东南
PW	Portable water 饮料水
SW	South west 西南
QAQC	Quality Assurance Quality Control 质量保证和质量控制
RBCOG	Resource Break-Even Cut-off grade 矿坑资源增量截止品位
RICOG	Resource Incremental Cut-off Grade in Pit 矿坑资源增量截止品位
RMCOG	Resource Mill Cut-off Grade 资源研磨截止品位
ROM	Run of mine 矿山运转
RW	Raw Water 生水
RL	Reduced Level 折合水准
SG	Specific Gravity 比重
SOP	Standard Operating Procedures 标准操作程序
N	North 北
TANESCO	Tanzania electrical supply Company 坦桑供电公司
TGC	Total Graphitic Carbon 总石墨碳量
USD	United State Dollar 美金

NE	North East 东北
W	Watt 瓦
NPV	Net Present Value 净现值
NW	North West 西北
TGC	Total Graphite Carbon 总石墨碳量
%	Percentage 百分比
NNE	North North East 北北东
SSW	South South West 南南西

1.0 INTRODUCTION 简介

1.1 Introduction 简介

Leijin Mining Company Limited has an interest of developing the Graphite Mine located in Handeni District, Kwamsisi Ward, Kwamsisi Village of the Tanga Region of the united republic of Tanzania.

In order to carry on with Graphite mining activities at this 42 PML's, Leijin Mining Company Limited Mining ltd undertake an investigation to characterize the potentiality of the PML's to host economic graphite mineralization in September, 2022

Ability to reliably distinguish between uneconomic mineral deposits and economic mineralization is one of the major problems of mineral exploration. Due to deceptive nature of ore bodies and varied controls of mineralization, techniques used for mineral exploration also vary and therefore an integrated approach was adopted. Such approach leads to a structural and resource model of the deposit which has immense implications while evaluation of these resources.

磊金矿业有限公司有兴趣开发位于坦桑尼亚联合共和国坦嘎，汉得尼地区Kwamsisi村 Kwamsisi 的石墨矿。

为了在这42个PML进行石墨开采活动，磊金矿业有限公司矿业有限公司在2022年9月进行了一项调查，以确定勘探许可证和初级采矿许可证区域经济石墨矿化的潜力。

能否可靠区分非经济型矿床和经济型矿床是矿产勘查的主要问题之一。由于矿体的迷惑性和对矿化的各种控制，用于矿产勘探的技术也各不相同，因此必须采用综合方法。该方法建立了矿床的结构和资源模型，对资源评价具有重要意义。

The Tanzanian graphite mines is hosted within a quartz-feldspar-carbonate graphitic schist, which is part of a Neoproterozoic metasediment package, including marble and gneissic units.

Azustone Resources Limited carried out a ground magnetic geophysical survey, sampling, mapping and drilling program to determine the size of the mineralized zone. The results of the exploration program confirmed the presence of graphite economically minable graphite resources.

After drilling works, it was reviled that, the graphite mineralization found at the Property is best categorized as a disseminated flake graphite deposit. The graphite mineralization on the Property is particularly amenable to extraction by quarry methods as it is lying at the shallow depth from the surface and offers the benefits of a low stripping ratio. The Deposit has road access and is located in an area of excellent infrastructure and resources.

坦桑尼亚的石墨矿位于石英-长石-碳酸盐石墨片岩中，它是新元古代变质沉积包的一部分，包括大理石和片麻岩单元。

Azustone Mining Limited进行了地面磁地球物理调查、采样和绘图程序，以确定矿化带的大小。勘探结果证实了2.5 km 北北东-南南西方向上存在石墨。

钻探工作结束后，有人说，在该地产发现的石墨矿化最好归类为浸染状鳞片石墨矿床。该矿区的石墨矿化特别适合采石场开采，因为它位于离地表较浅的深度，具有低剥离比的优点。该矿床有道路通道，位于基础设施和资源良好的地区。

The Resource was calculated with a 5% Fixed Carbon cut-off grade and the average grade of 8 % Fixed carbon. The average bulk density values for both ligolith and rock that were 2.3, and the average bulk density of the excavated material was used as 1.8, the total resource resources is 5,796,000 tons and the total minable ore is 2,576,000 tons. The mining operation is expected for 300days/year with daily mining capacity 1,800tons which will produce 100.8 graphite tons per day and annual mining capacity of 540,000 tons of graphite ore. The annual graphite production will be 32,400 tons. The expected mining life is 9 years but during mining operation the drilling operation will be continuing in order to update the graphite resources into graphite reserve, hence it is estimated the mining life will reach 15 years.

资源是以 5%的固定碳截止品位和 8%的平均固定碳品位计算的。ligolith 和岩石的平均容积密度值均为 2.3，挖出物的容积密度值为 1.8，资源总量为 579.6 万吨，可采矿石总量为 257.6 万吨。预计开采 300 天/年，日开采能力 1800 吨，每天可生产 100.8 吨石墨，年开采能力 54 万吨石墨矿石，石墨年产量将达到 3.24 万吨。预计开采寿命为 9 年，但在开采过程中，钻井作业将继续进行，以将石墨资源更新为石墨储备，因此估计开采寿命将达到 15 年。

At Kwamsisi Graphite Project, Graphitic mineralisation is hosted within a graphitic gneissic and crystalline rock unit along the NNE-SSW approximately 2kms strike length continuity within the licenses area at the average width of 70m to 100m and average thickness of 20m thick. The graphite's is characteristics principally flake size graphite available on a consistent basis in the outcrop and 13 trenches exposure at numerous locations within the licenses area, figure 1.1

在Kwamsisi石墨项目中，石墨矿化位于许可区域内北北东-南南西沿线的一个石墨片麻岩单元内，其走向长度约为2公里，宽度70-100米，平均厚度20米。石墨的特征主要是鳞片大小的石墨，在露头的基础上是一致的，暴露在13个沟槽和在许可区域内的许多地点，图1.1。

A graphite flake is a naturally occurring type of graphite mineral consisting of carbon that has a distinctly flaky morphology and is typically found as discrete flakes. This type of graphite corrodes faster than other forms. Graphite flakes are used as an additive in lubricants and fire-retardant coatings and manufacture of new technology lithium-carbon battery.

石墨鳞片是一种天然存在的石墨矿物，由碳组成，具有明显的片状形态，通常是离散的薄片。这种石墨比其他形式的石墨腐蚀得快。石墨鳞片被用作润滑剂和耐火涂料的添加剂，以及新技术锂碳电池的制造

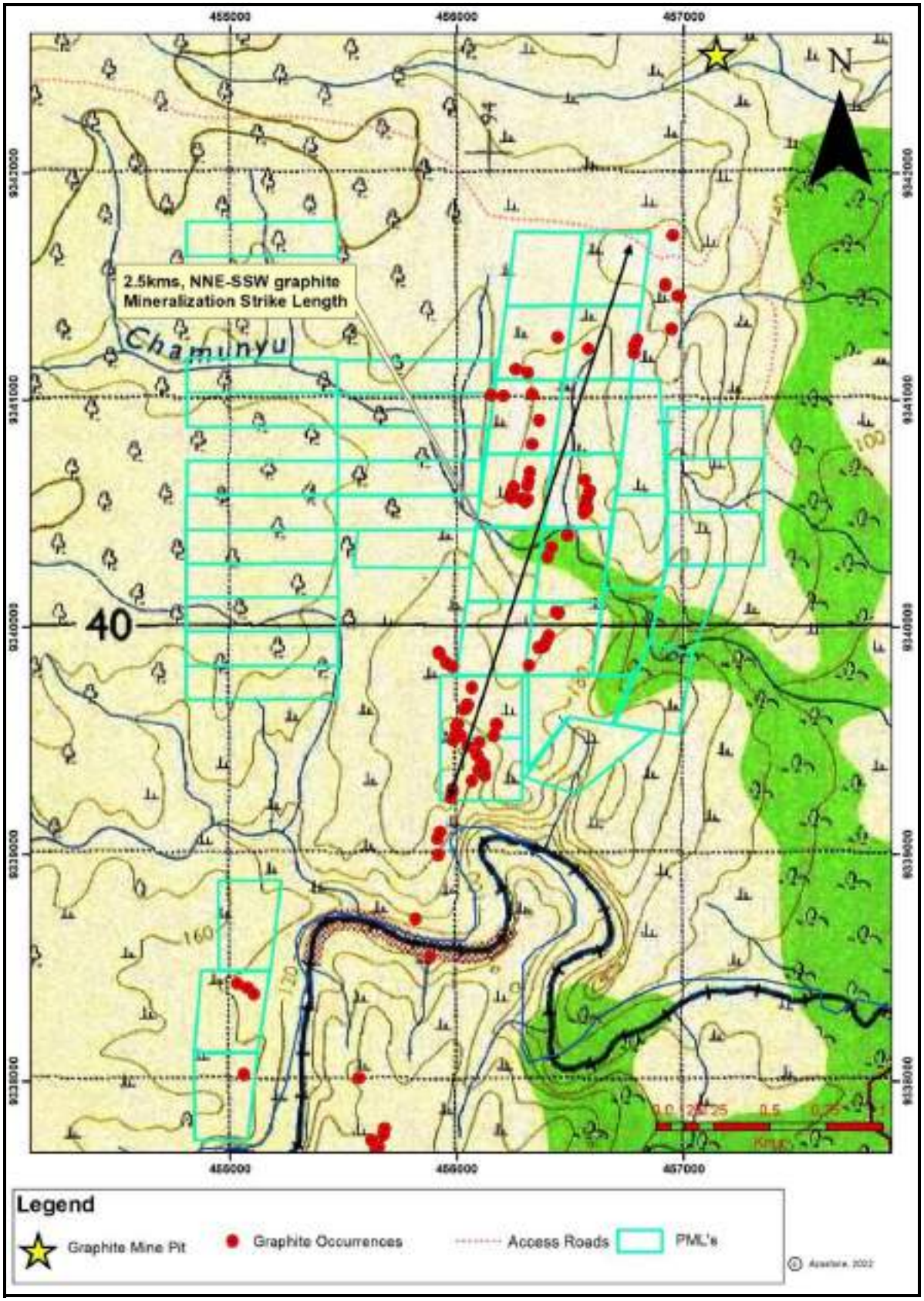


Figure 1.1: Graphite Occurrence at Kwamsisi PML's, Kwamsisi Graphite Project, Handeni.

Source: (Azustone Resources Tanzania Ltd, 2020)

1.2 Topography 地貌

Topography use contour lines to determine elevations of mountains and flat areas. The closer together the lines are, the steeper the slope. Contour elevation numbers indicate the direction of elevation by always reading (pointing) uphill.

The Project area lies at an altitude of approximately 130 m above mean sea level (amsl) at the valley bottoms and 200 m amsl at the highest point. The area has a series of hilly-like terrain, with abruptly elevated hills to the central parts of the Project area.

The Project is located close to Mlingaji River that ultimately flows into Wami river located approximately southern portion of the Project.

The local terrain is dominated by a rocky ridge (the Project ridge) that trends in a north-NE-SW direction through the Project Area at an elevation in excess of 200 metres above sea level (amsl). Steep-sided, narrow valleys are present on both flanks of the Project ridge.

The Project ridge comprises a sequence of steeply dipping, layered rocks that include crystalline limestones and few gneiss outcrops. The crystalline limestone comprises the high ground along the Project ridges, Figure 1.2.

地形学使用等高线来确定山脉和平原地区的高度。两条线越近，斜率就越陡。等高线标高数字通过始终显示(**指向**)**上坡来指示**标高方向。

项目区位于山谷底部海拔约130**米**，**最高点海拔**约200**米**。该地区有一系列丘陵状的地形，在项目区域的中部有陡然升高的山丘。

该项目位于Mlingaji**河附近**，该河最终流入位于项目南部的Wami**河**。

当地地形以岩石山脊(项目山脊)为主，沿北-东北-**西南方向穿**过项目区，海拔超过200**米**。项目山脊两侧都有陡峭狭窄的山谷。

项目山脊由一系列陡峭倾斜的层状岩石组成，其中包括结晶石灰石和少量片麻岩露头。结晶石灰石包括沿工程脊的高地，见图 1.2

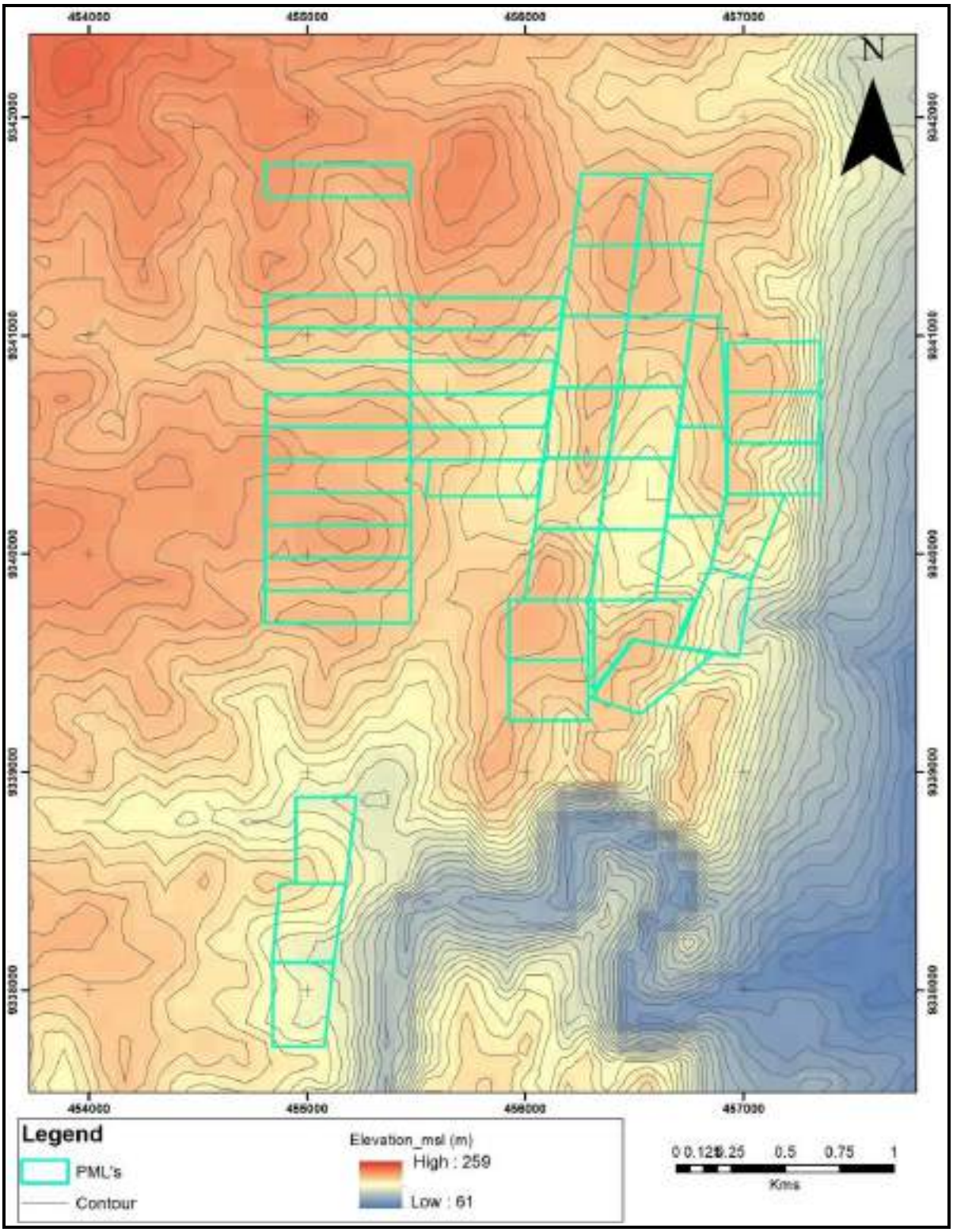


Figure 1.2: Topography of Kwamsisi PML's, Kwamsisi Graphite Project, Handeni.

Source: (Azustone Resources Tanzania Ltd, 2020

1.3 The Project Location 项目位置

The proposed Project is located in Handeni District, eastern portion of Tanzania, about 245 Kilometres North West of Dar es Salaam City. It is situated around 180 south west of Tanga (the regional headquarter of the Tanga Region). The proposed Project fall under the jurisdiction of Handeni District, Kwamsisi Ward, Kwamsisi Villages (Figure 1.3).

At Kwamsisi Graphite Project, Graphitic mineralisation is hosted within a graphitic gneissic and crystalline limestone rock units along the NNE-SSW approximately 2.5kms strike length continuity within the licenses area. The graphite's is characteristics principally flake size graphite available on a consistent basis in the outcrop and 13 trenches exposure at numerous locations within the licenses area, figure 1.3 below

该项目位于坦桑尼亚东部的汉得尼区，距达累斯萨拉姆市西北约245公里。它位于坦嘎西南180左右(坦嘎地区市区)。拟议项目由汉得尼区、Kwamsisi区、Kwamsisi村管辖(图1.3)。

在 Kwamsisi 石墨项目中，石墨矿化位于许可区域内北北东-南南西沿线的一个石墨片麻岩单元内，其走向长度约为 2.5 公里。石墨的特征主要是鳞片大小的石墨，在露头和 13 个沟槽基础上保持一致，暴露在许可区域内的许多地点，如下图 1.3 所示

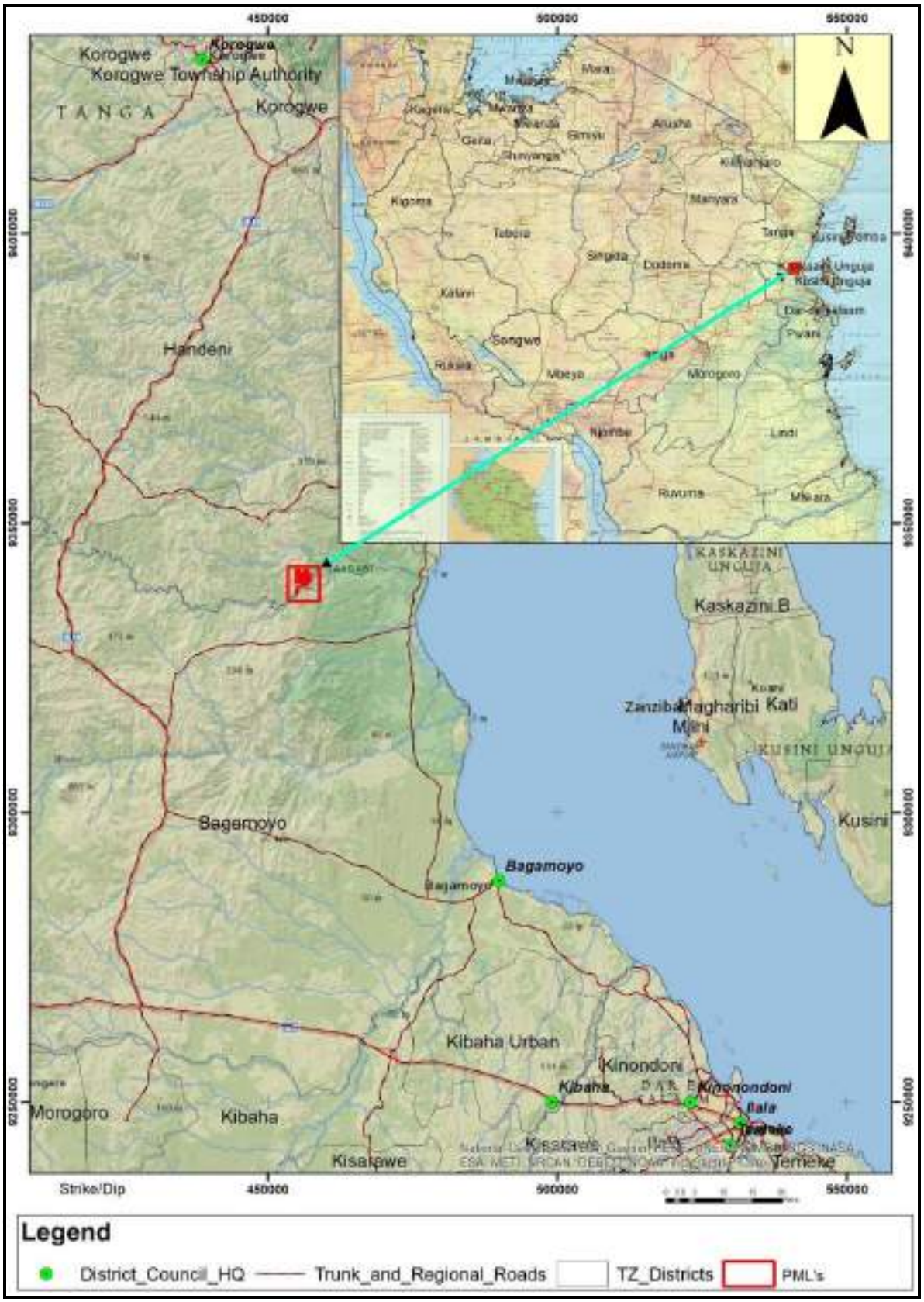


Figure 1.3: Project Locations Map, Kwamsisi Graphite Project, Handeni, Tanzania.
Source: (Azustone Mining Ltd, 2020)

1.4 Site Accessibility 场地通达度

Access to the Project from Dar es Salaam is via the Dar es Salaam-Bagamoyo -Msata-Mkata on s tarmac Road, approximately 215 km North West of Dar es Salaam. The access road from the Tanga Port is Tanga-Muheza-Mkata approximately 140kk South west of Tanga city. The access road to the site from Mkata is rough gravel road, approximately 55 kms south east of Msata. The access road from Mkata to the site is accessible throught the year (Figure 1.4)

该项目位于坦桑尼亚东部的汉得尼区，距达累斯萨拉姆市西北约245公里。它位于坦嘎西南180左右(坦嘎地区市区)。拟议项目由汉得尼区、Kwamsisi区、Kwamsisi村管辖(图1.3)。

在 Kwamsisi 石墨项目中，石墨矿化位于许可区域内北北东-南南西沿线的一个石墨片麻岩单元内，其走向长度约为 2.5 公里。石墨的特征主要是鳞片大小的石墨，在露头和 13 个沟槽基础上保持一致，暴露在许可区域内的许多地点，如下图 1.3 所示

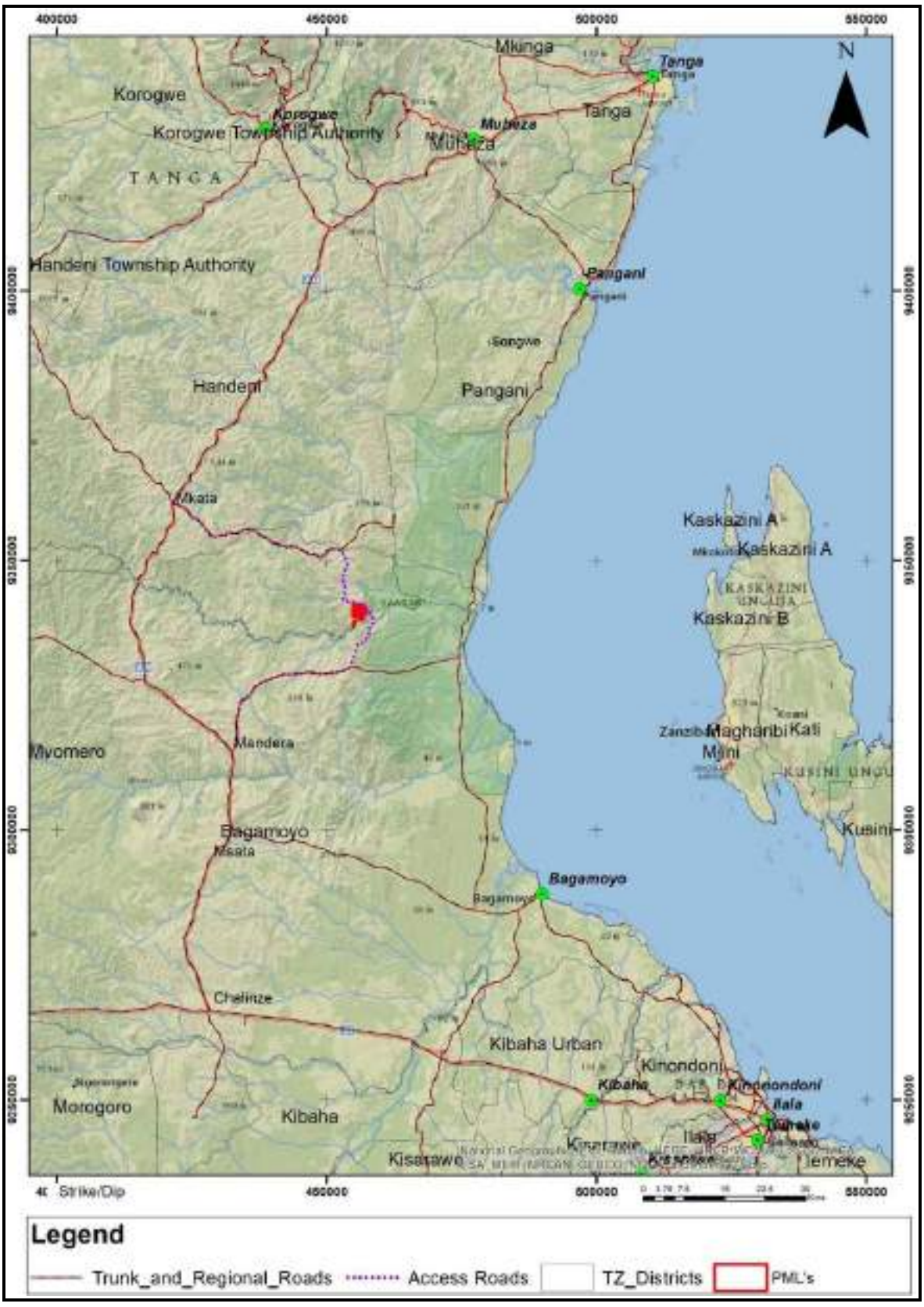


Figure 1.4: Kwamsisi Graphite Project Accessibility Map, Handeni, Tanzania.

(Source: Azustone Resources Tanzania Ltd, 2022)

1.5 Climate 气候

There are four main climatic zones in Tanzania: the coastal area where conditions are tropical; the central plateau, which is hot and dry; the semi-temperate highland areas; and the high moist lake regions. There are two rainy seasons in the coast, from November to December and from March through May. In the south there is mainly two rainy season, from October to December and From January to May. The average annual temperature varies between 24ºC on the mountains to 40ºC. In most parts of the region, the average temperatures are almost uniform at 28ºC. In general the hot season runs from September to May.

坦桑尼亚有四个主要的气候带:热带沿海地区;中部高原，炎热干燥;半温带高原地区;还有高潮湿的湖区。沿海地区有两个雨季，从 11 月到 12 月，从 3 月到 5 月。南部主要有两个雨季，10 月至 12 月和 1 月至 5 月。山上的年平均气温在 24 摄氏度到 40 摄氏度之间变化。在该地区的大部分地区，平均气温几乎一致，为 28º C。一般来说，炎热的季节从九月持续到五月

1.5.1 Temperature 气温

The climate is broadly described as tropical with marked seasonal and altitudinal temperature variations, and sharply defined dry and rainy seasons. The situation is prevailing in different geographical areas relative to elevation and seasonal variations.

Tanzania has a predominantly tropical climate with the coastal regions being particularly warm and humid while highland areas are more temperate. Temperatures do not fluctuate substantially through out the year, though they dip slightly in the coolest months (June through September).

In Handeni, the wet season is humid and overcast, the dry season is windy and partly cloudy, and it is hot year round. Over the course of the year, the temperature typically varies from 18°C to 31.4°C and is rarely below 14.5°C figure 1.5.

气候大体上被描述为热带气候，有明显的季节性和海拔变化，有明显的旱季和雨季。相对于海拔和季节变化，这种情况在不同的地理区域普遍存在。

坦桑尼亚的气候主要是热带气候，沿海地区特别温暖和潮湿，而高原地区则比较温和。全年气温波动不大，但在最冷的月份(6月至9月)气温略有下降。

在Handeni，湿润的季节是潮湿和阴天，干燥的季节是多风和部分多云，全年都很热。全年气温一般在18°C至31.4°C之间变化，很少低于14.5°C(图1.5)。

1.5.2 Rainfall 降雨

The rainy period of the year lasts for 8 months, from October 1 to May 1.The month with the most rain in Handeni is March, with an average rainfall of 176 mm.

The rainless period of the year lasts for 4 months, from May 30 to September 1. The month with the least rain in Handeni is June to August, with an average 15mm, figure 1.6

一年中雨季持续8个月，从10月1日到5月1日。汉德尼降雨量最多的月份是3月，平均降雨量为176毫米。

全年无雨期为 4 个月，从 5 月 30 日至 9 月 1 日。汉得尼降雨量最少的月份是 6 月至 8 月，平均降雨量为 15 毫米（图 1.6）

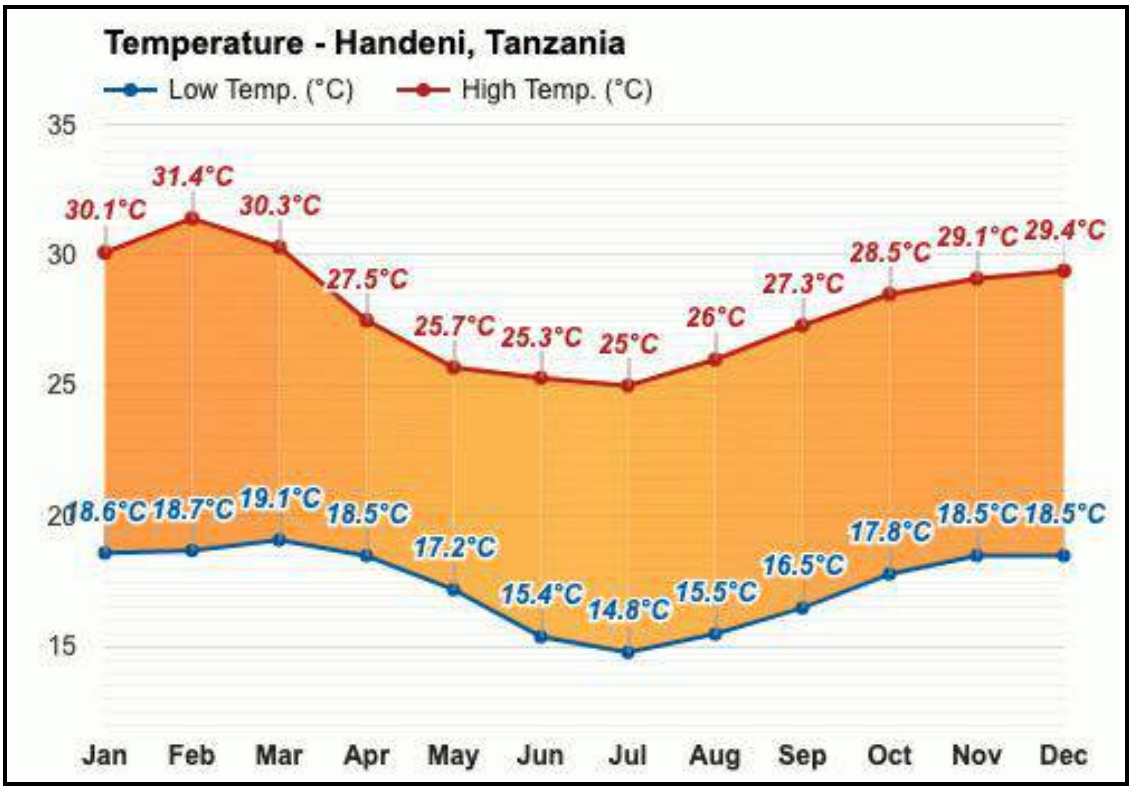


Figure 1.5: Kwamsisi Average Temperature, Handeni, Tanzania.

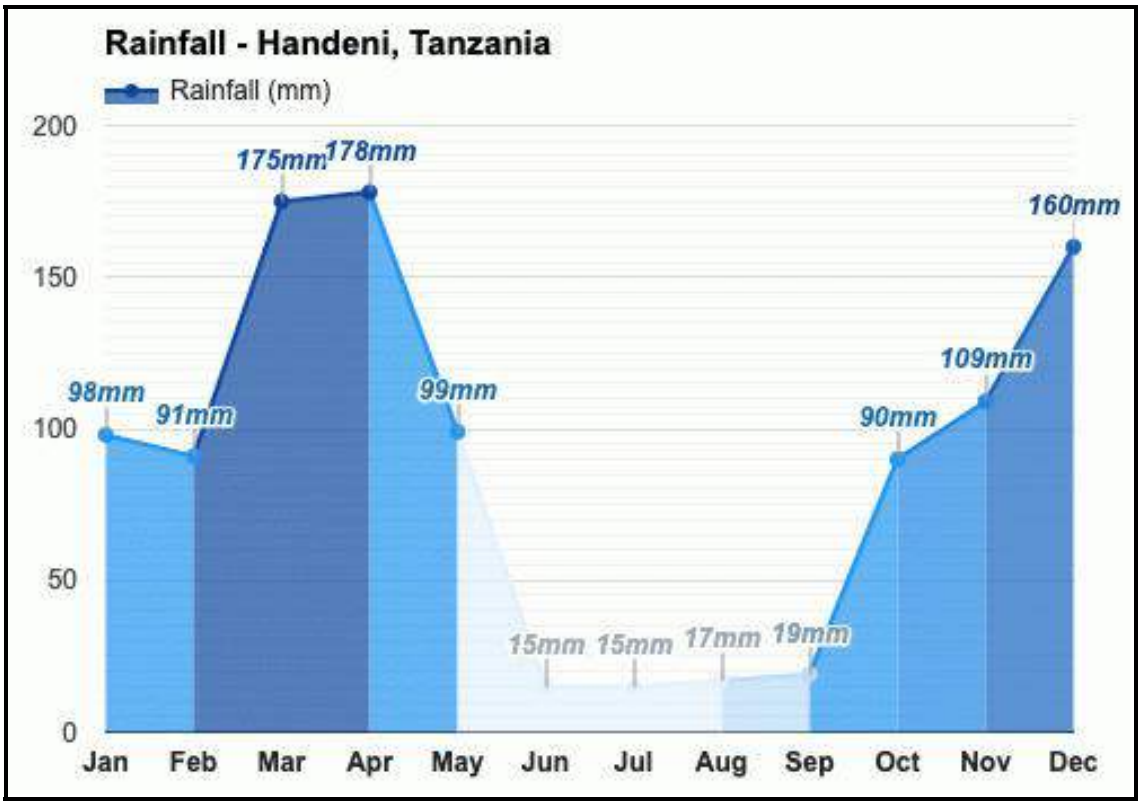


Figure 1.6: Kwamsisi Average Rainfall, Handeni, Tanzania.

2.0. GEOLOGICAL SETTING ASSESSMENT 地质背景评估

2.1 Regional Geology 区域地质

The viable economic world-class deposits of graphite are from the two geological settings, which are either Archean or Neoproterozoic metamorphic belts. There are reported occurrences of graphite in the vast Neoproterozoic Mozambique Mobile Belt of Tanzania stretching from North to South in the eastern side of the country, including the Kwamsisi graphite. Though there are many occurrences of graphite in the country, so far, there is no significant production of this mineral.

The property is geologically located within the high-grade metamorphic rocks ranging in Amphibolite to Granulites facies of the Neoproterozoic metamorphic Belt. Regional mapping indicates that the property lies within crystalline limestone and gneissic terrains described as granitic and sedimentary gneiss (dominantly kyanite graphitic gneisses). Other existing lithologies include quartzo-feldspathic gneiss, marble, biotite gneiss and patches of amphibolite gneiss being associated with hornblende and garnet. Crystalline limestone of different variety and quartzite also exist in the area. Most rocks in the area are characterized by NE-SW striking foliations.

Regionally, the project area is within the eastern boundary of the Neoproterozoic of Mozambique Belt, characterized by the rocks of Proterozoic age dated 1.9 Ga. These rocks are of the composite metamorphic crustal domain with undifferentiated meta-igneous and sedimentary rocks of variable ages and origins including the Neoarchaean, Paleoproterozoic, Mesoproterozoic (source) and Neoproterozoic protolith reworked during the Neoproterozoic tectothermal events (Groves, 2010).

The Mozambique Belt system of Proterozoic age consists of metamorphic rocks, mainly granulites, hornblende and biotitic gneisses, Mg-rich crystalline marbles and graphitic schists and gneisses and quartzites. Kyanite-chlorite schists are also present. This rock system contains a fairly wide variety of economic minerals; the majorities are of which rock are forming minerals produced during metamorphism. These rocks are commonly intruded by pegmatite dykes and quartz veins containing variety of minerals including gemstones (graphite, ruby, sapphire, tanzanite, apatite, garnet, aquamarine tourmaline, kyanite, alexandrite or chrysobery etc.), gold and other non-metallic minerals (Pinna et al, 2004).

具有经济价值的世界级石墨矿床来自太古宙和新元古代变质带两种地质环境。据报道，在坦桑尼亚东部从北向南延伸的广阔的新元古代莫桑比克移动带中发现了石墨，包括Kwamsisi石墨。尽管这个国家有很多石墨矿，但到目前为止，这种矿物的产量还不高。

该属性在地质上位于新元古代变质带角闪岩-麻粒岩相的高级变质岩中。区域测绘表明，该属性位于结晶石灰岩和片麻岩地形中，被描述为花岗质和沉积片麻岩(主要是蓝晶石石墨片麻岩)。其他现存的岩性包括石英长石片麻岩、大理石、黑云母片麻岩和与角闪石和石榴石有关的角闪石片麻岩。该地区还存在不同种类的结晶灰岩和石英岩。该地区大部分岩石东北-西南走向的层理为特征。

从区域上看，项目区位于莫桑比克带新元古代的东部边界内，以1.9 Ga的元古代岩石为特征。这些岩石属于复合变质地壳域，具有不同年龄和来源的未分化变质火成岩和沉积岩，包括新元古代、古元古代、中元古代(来源)和新元古代构造热事件中改造的原岩(Groves, 2010)。

元古代莫桑比克带系统由变质岩组成，主要为麻粒岩、角闪岩和生物质片麻岩、富镁结晶大理岩和石墨片岩、片麻岩和石英岩。蓝晶石-绿泥石片岩也存在。这种岩石系统含有相当广泛的经济矿物;大多数岩石是在变质作用中形成的矿物。这些岩石通常被伟晶岩脉和石英脉侵入，其中含有各种矿

物，包括宝石(石墨、红宝石、蓝宝石、坦桑石、磷灰石、石榴石、海蓝宝石电气石、蓝晶石、翠绿石或金绿石等)、金和其他非金属矿物(Pinna etal, 2004)

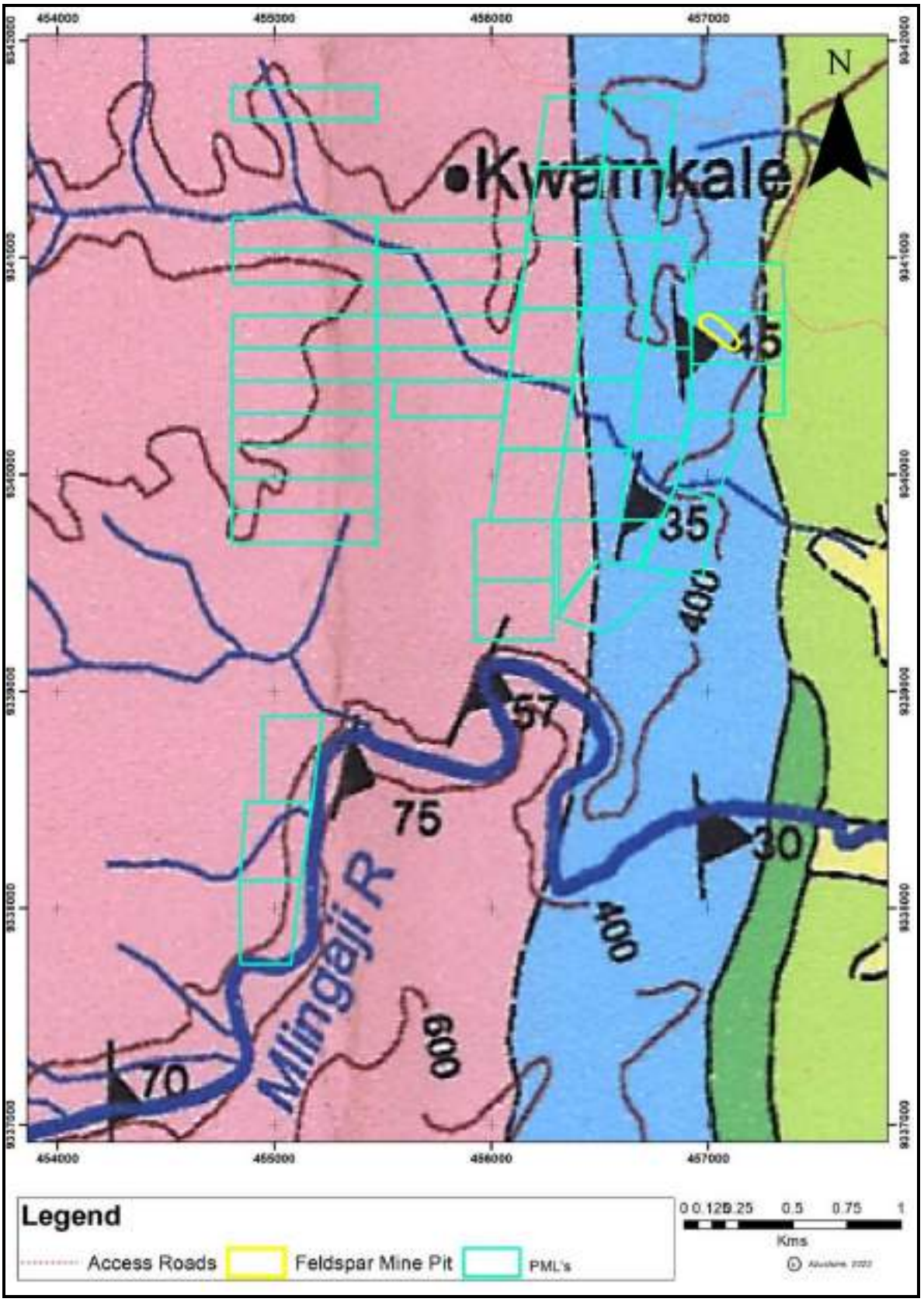


Figure 2.1: Reginal Geological Map, Handeni, Tanzania 区域地质图，汉德尼，坦桑尼亚

(Source: GST, QDS 149. 2006)

2.2 Exploration Works 勘探工作

All exploration to date has been conducted by Leijin Mining Company Limited by Contracted Azustone Resources Tanzania Limited, a Tanzanian Geological Professional Firm, registered in Tanzania. The Azustone Resources Tanzania Limited conducted geological mapping, grab sampling, trenching and ground magnetic survey. As follows-

迄今为止，所有勘探工作均由磊金矿业有限公司和坦桑尼亚Azustone Resources有限公司(坦桑尼亚地质专业公司，在坦桑尼亚注册)进行。Azustone Resources坦桑尼亚有限公司进行了地质测绘、抓取采样、挖沟和地面磁测。如下所示,

2.2.1 Geological Mapping 地质测绘

The mapping traverse were made crossing the strike of the lithologies/outcrops by documenting all the rocks types, grain sizes, colour, geological structures, locating the graphite occurrences and also examined the regolith/ soil to identify the graphite stains at locations under lain by graphitic gneisses.

通过记录所有岩石类型、粒度、颜色、地质结构，确定石墨产状，并检查了风化层/土壤，以确定石墨片麻岩下位置的石墨渍，进行了穿越岩性/露头走向的测绘

2.2.2 Rock Sampling (Grab) 岩石采样

Rock samples (grab) are collected along areas of exposed potential graphite mineralized horizons, Grab samples are a locally representative sample of rock mineralization, and cannot be representatively tied to a dimension or thickness interval.

Four (4) samples were collected by using the pick of the hammer and sent to the SGS Geochemical laboratory for graphite analysis ie Total Graphitic Carbon, Ash Content, Volatile Matter and Moisture Content.

岩石采样(抓取)是沿着暴露的潜在石墨矿化层位收集的，抓取样本是局部具有代表性的岩石矿化样本，不能代表某个尺寸或厚度区间。

使用锤子的镐头采集了 4 个样品，并送到 SGS 地球化学实验室进行石墨分析，即石墨碳总量、灰分含量、挥发物和水分含量

2.2.3 Ground Magnetic Geophysical Survey 地面磁地球物理测量

A ground Magnetic Survey team was consisted of a Mag technician; base station personnel, a magnetometer carrier and a line clearance person. Except a Mag technician, all other persons in this team were trainee from Kwamsisi village. Two GEM 19W magnetometers were used which are a field magnetometer and a base station magnetometer. The field magnetometer used a WalkMag mode that recorded magnetic intensity measurements continuously whilst walking, while the base station magnetometer recorded magnetic intensities whilst the survey was in progress. The base station magnetometer was set up in an area free of cultural/man made features. The magnetometers were equipped with built-in Global Positioning System (GPS), receivers for location and coordinated universal time (UTC) readings. Both magnetometers were synchronized to the same UTC. During the survey work, the operators used only non-magnetic clothing. The surveyed lines each of was 10 lines each

of 700m long, 10 lines each of 520m long and 6 lines each of 370m long were made at an interval of 100m in the entire graphite mineralized envelop of the all PMLs Figure 3.2. The acquired data were loaded in the laptop by GemLink V5.3 software for applicability in the processing stage. The acquired and loaded ground Magnetic data file with their geographic coordinates were then delivered to Magnetic data processing unit as point data in CSV format for further processing.

地面磁场测量小组由一名 Mag 技术人员组成;基站人员，磁力计载体和线路清理人员。除了一名 Mag 技术人员外，该队所有其他人员都是来自夸米西西村的学员。使用了两个 GEM 19W 磁力计，一个是场磁力计，一个是基站磁力计。现场磁力计使用 WalkMag 模式，在行走时连续记录磁强度测量，而基站磁力计在测量进行时记录磁强度。基站磁力计设置在一个没有文化/人为特征的地区。磁力计装有内置的全球定位系统(GPS)、定位接收器和协调世界时(UTC)读数。两个磁力计同步到相同的 UTC。在勘测工作中，作业人员只穿了无磁性的衣服。在所有初级采矿许可证的整个石墨矿化包膜中，以 100m 为间隔，每条测量线分别为 700m 长 10 条、520m 长 10 条、370m 长 6 条。采集的数据通过 GemLink V5.3 软件加载到笔记本电脑中，用于处理阶段的适用性采集并加载的地面磁数据文件及其地理坐标，作为点数据以 CSV 格式传送到磁数据处理单元进行进一步处理

After the data get received into Magnetic data processing unit in CSV format, the data were loaded in the Oasis Montaj Geosoft and transformed to the projected format of Arc 1960 zone 37s for easy processing. When Profile plots Encom software and test grid was done, it indicated natural variation of magnetic intensity but there are some highs and lows resolutions contributed by artificial objects during data acquisition. The base maps of the survey were presented in the form of colour shaded maps The gridding and enhancement of magnetic data was done using Oasis Montaj program version 9.7, Magmap extension and GIS software (Arc GIS). It consisted of filtering, visualization, and modelling extensions.

数据以CSV格式接收到Magnetic数据处理单元后，加载到Oasis Montaj Geosoft中，转换为Arc 1960 zone 37s投影格式，便于处理。利用Encom软件和测试网格绘制的剖面图显示磁场强度的自然变化，但在数据采集过程中存在一些人为物体造成的高分辨率和低分辨率。调查的基本地图以彩色阴影地图的形式呈现。磁数据的网格化和增强使用Oasis Montaj 9.7版程序、Magmap扩展和GIS软件(Arc GIS)完成。它由过滤、可视化和建模扩展组成。

数据以 2500 万像素大小进行网格划分，使用最小 culvaturel 网格划分方法，该方法估计粗网格节点上的网格值(通常是最终网格单元大小的 8 倍)。双向网格法，即沿原始测量线和交叉线方向进行插值。获得总磁强(TMI)，并对其进行倾斜导数和向下连续网格等不同的滤波，以消除长波长噪声对测量线的非地质影响，从而简化解释

The data were gridded at 25m pixel size using Minimum culvaturel gridding method which estimates grid value at the nodes of a coarse grid (Usually 8 times the final grid cell size). Bi-directional gridding method which interpolates along the original survey lines and the cross-line direction. The total magnetic intensity (TMI) was obtained and subjected to different filters such as Tilt derivative and down continued grid in order to remove non-geological effects caused by long-wavelength noise along survey lines so as to simplify interpretation.

A total of 12,200m E-W ground magnetic survey line was done across the entire length of the graphite mineralization corridor, the spacing between the line was 100m. The data was then downloaded, cleared, processed and filtered by using different techniques.

Processing of potential field data entails the application of various filters to the data in order to accentuate certain chosen features as an aid in the interpretation of the data.

The process of quantitative interpretation of magnetic anomalies endeavours to determine a source distribution whose anomalous field matches as closely as possible the actual field on the surface of measurement. The non-uniqueness of the potential field problem results in the introduction of constraints in the form of simplification of geometry, limits to size or depth, range limits on susceptibility, or whatever other parameters may seem justified in the context of what is known or can be reasonably inferred about the geologic environment.

Various filters used in the processing of the magnetic data used in this project are as follows.

在整个石墨矿化走廊长度上共做了12200m东西向地磁测量线，线间距为100m。然后使用不同的技术下载、清除、处理和过滤数据。

势场数据的处理需要对数据应用各种过滤器，以便突出某些选定的特征，以帮助解释数据。

磁异常的定量解释过程努力确定一个源分布，其异常场尽可能接近测量表面的实际场。势场问题的非唯一性导致引入几何简化形式的约束、大小或深度的限制、易感性的范围限制，或任何其他在已知或可以合理推断的地质环境背景下似乎合理的参数。

在本项目中使用的磁数据处理中使用的各种滤波器如下

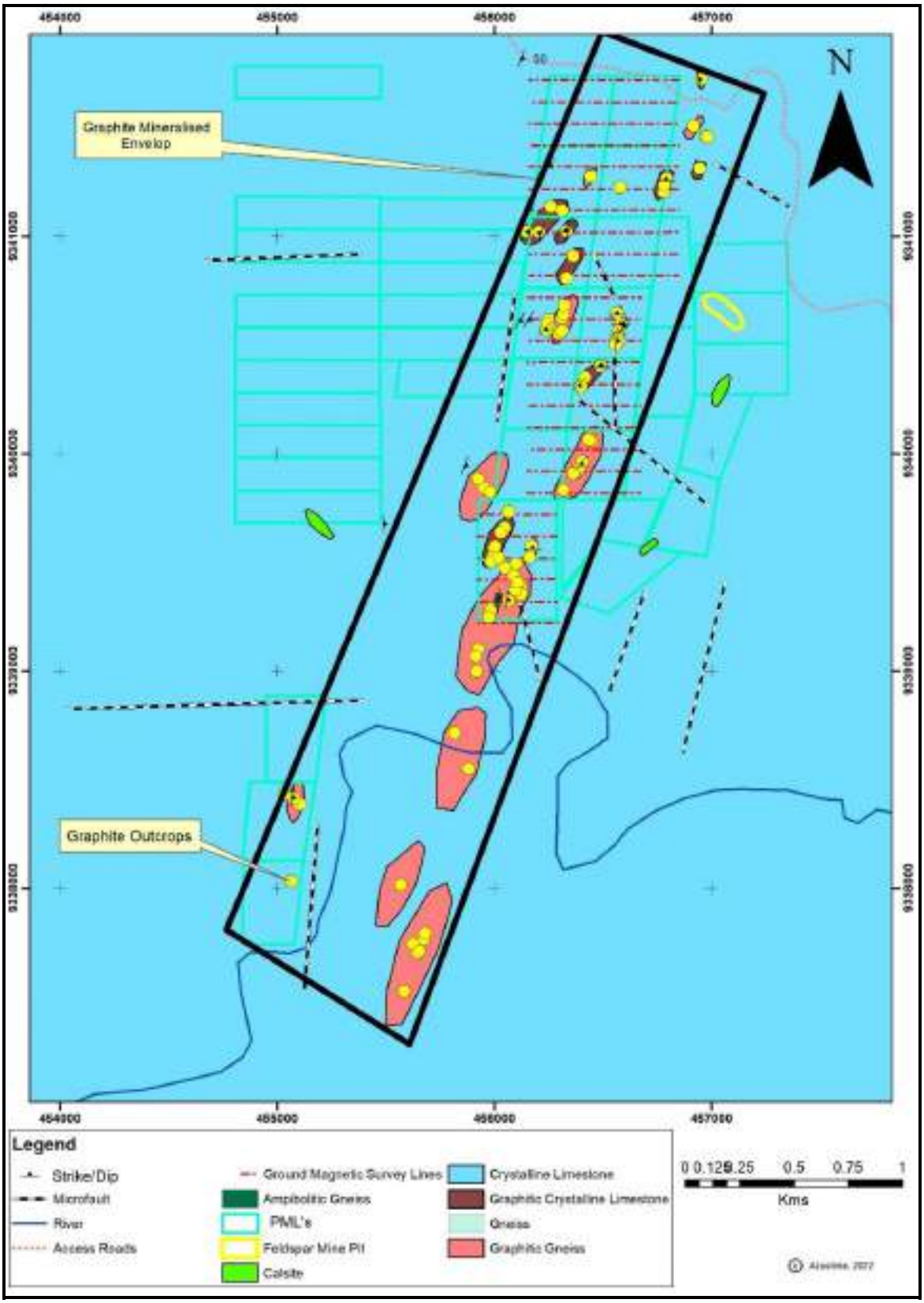


Figure 2.2: Ground magnetic survey line crossing different lithologies, Kwamsisi Graphite project, Handeni 穿越不同岩性的地面磁测线，Kwamsisi 石墨项目

(Source: Azustone Resources Tanzania Ltd, 2022)

2.2.3.1 Total magnetic intensity (TMI) 总磁场强度

It gives the vector sum of all components of the magnetic field. The total field magnetic reveals the magnetic characteristics of the various lithological units in the study area. Unfortunately, the nature of a magnetic anomaly is a function of the strike of the body. The total field magnetic contour map is consequently primarily used to identify various lithologies.

The coloured magnetic map of the total magnetic anomaly field indicates high magnetic anomalies trending NNE-SSW following the graphite mineralization trend as observe during geological mapping work. The strong NNE – SSW trend of structures appears to dominate on the central part of the area which shows a pattern of positive structures (Figure 3.3). The area seems to have dominant two units of lithology of which to the central part have high amplitude dipole anomalies, the southern part of the area have low magnetic amplitude which may indicate weak lithological structures. The south-eastern corner of the area shows smooth low magnetic anomalies.

Based on the data presented on the Total magnetic Intensity bellow, it concludes that; The high magnetic signature associated in the central part of the PML's is due to the ferromagnesium minerals associated by the presense of near surface graphitic gneisses or gneisses running NNE-SSW as observed on the total field map

它给出了磁场所有分量的矢量和。总磁场揭示了研究区各岩性单元的磁性特征。

不幸的是，磁异常的性质是主体走向的一个功能。因此，总磁场等高线图主要用于识别各种岩性。总磁异常场的彩色磁图显示了地质填图中观测到的沿石墨矿化趋势北北东-南南西走向的高磁异常。区域中部构造呈强烈的北北东 - 南南西走向，呈正构造格局(图3.3)。该区似乎以两个岩性单元为主，其中中部为高振幅偶极异常，南部为低振幅异常，可能指示岩性结构较弱。该地区的东南角显示出平滑的低磁异常。

根据总磁强波纹管给出的数据，得出结论:在初级采矿许可证的中心部分相关的高磁特征是由于铁镁矿物的存在与近地表的石墨质片麻岩或北北东-南南西的片麻岩有关，这可以在总场图上观察到

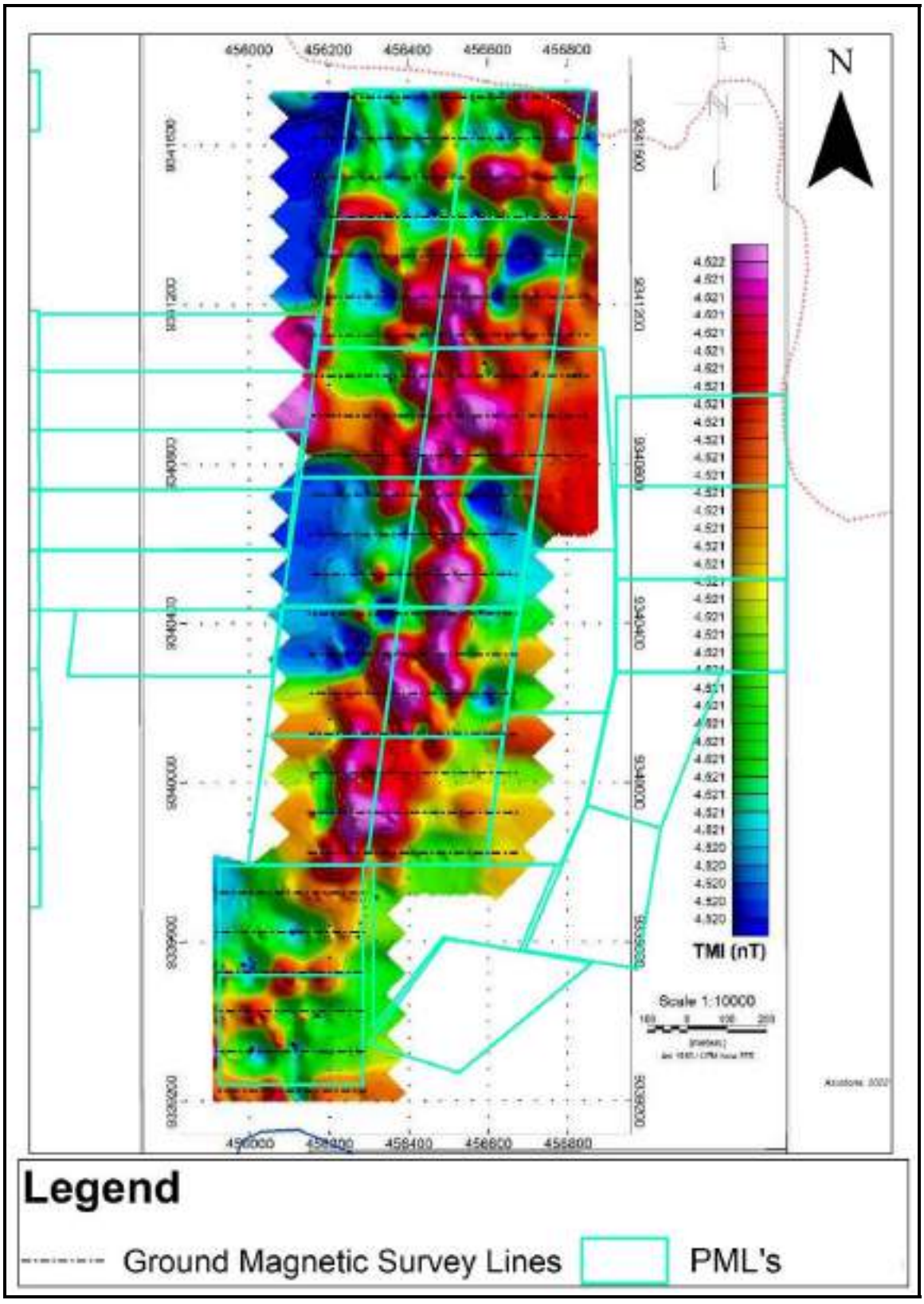


Figure 2.3: Total Magnetic Intensity Map, Kwamsisi graphite Project 总磁强度图，夸米西西石墨项目

(Source: Azustone Resources Tanzania Ltd, 2022)

2.2.3.2 Tilt Derivative 倾斜导数

Tilt derivative shows a marked increase in 'visibility' of structural features, especially in the southern part of the PMLs where by before this filtering method the magnetic anomalies were not well visible.

Processing of potential field data entails the application of various filters to the data in order to accentuate certain chosen features as an aid in the interpretation of the data. The process of quantitative interpretation of magnetic anomalies endeavors to determine a source distribution whose anomalous field matches as closely as possible the actual field on the surface of measurement. Derivatives tend to sharpen the edges of anomalies and enhance shallow features.

The vertical derivative is much more responsive to local influences than to broad or regional effects and therefore tends to give sharper picture than the map of the total field intensity. Thus the smaller anomalies are more readily apparent in area of strong regional disturbances. The enhanced magnetic anomaly on figure 3.4

Magnetic derivatives can help define/estimate the physical properties of the source structure causing the anomaly. Combination of the tilt Derivative and its total horizontal derivative are highly suitable for mapping shallow basement structure and mineral exploration targets and that they have distinct advantages over many conventional derivatives. The structural features of the area have been identified after enhancement of the processed data. A combination of uncertainty and number properties used to isolate and pick important features and structures of interest. Result of the survey shows anomalies of interest.

Several linear features have been mapped whose trends are almost similar to those computed under TMI as indicated by black dotted lines. There are few structural linear trending NW-SE direction seems to be older compared to that of NNE-SSW structures. Two structures are observed on the central part of the area where undefined structural pattern was obscured. These could be the potential structure in the area.

倾斜导数显示出构造特征的“能见度”显著增加，特别是在初级采矿许可证的南部，在这种滤波方法之前，那里的磁异常不太明显。

势场数据的处理需要对数据应用各种过滤器，以便突出某些选定的特征，以帮助解释数据。磁异常的定量解释过程努力确定一个源分布，其异常场尽可能接近测量表面的实际场。衍生品倾向于锐化异常的边缘并增强浅层特征。

垂直导数对局部影响比对广泛或区域影响反应更灵敏，因此往往比总场强图提供更清晰的图像。因此，较小的异常更容易在强烈的区域扰动地区出现。增强磁异常见图3.4。

磁导数可以帮助定义/估计导致异常的源结构的物理性质。倾斜导数及其总水平导数的组合非常适合于浅层基底构造和矿产勘查目标的测绘，与许多常规导数相比具有明显的优势。对处理后的资料进行增强处理后，确定了该地区的构造特征。不确定性和数字特性的结合，用于分离和挑选感兴趣的重要特征和结构。调查结果显示了令人感兴趣的异常情况。

一些线性特征已被映射，其趋势几乎类似于在 TMI 下计算的黑色虚线。与北北东-南南西构造相比，西北-西南方向的构造线性趋势较少，似乎更古老。在该区域的中心部分观察到两个结构，未定义的结构模式被遮挡。这些可能是该地区的潜在构造

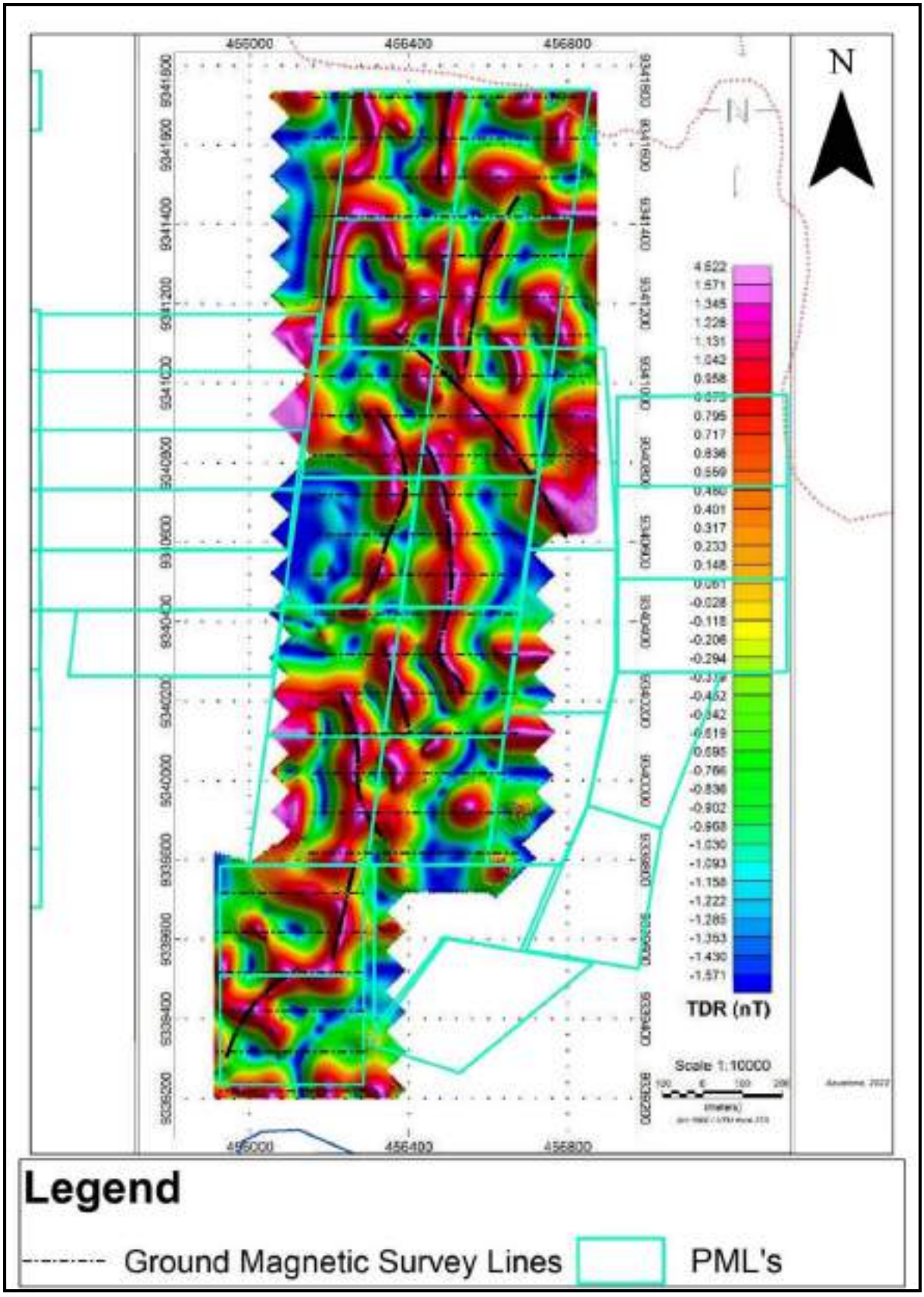


Figure 2.4: Tilt Derivative Map, Kwamsisi graphite Project 倾斜导数图

(Source: Azustone Resources Tanzania Ltd, 2022)

2.2.3.3 Downward continuation 向下延拓

Downward continuation is used to enhance features at a specified depth/elevation, lower than the acquisition level. This procedure accentuates near surface anomalies and can be used as an interpretation tool to determine the depth to a causative body. The filter can be 48 applied to magnetic

The colored magnetic map of the down continued grid indicates high magnetic anomalies trending NNE-SSW following the graphite mineralization trend as observe during geological mapping work. The strong NNE – SSW trend of structures appears to dominate on the central part of the area which shows a pattern of positive structures which implies that there is a shallow seated magnetic anomalous body in this port of the PML's (Figure 3.5 below).

向下延续用于增强指定深度/仰角处的特征，低于采集水平。这种方法突出了近地表异常，可作为解释工具来确定成因体的深度。该过滤器可应用于磁性。

下延格网的彩色磁图显示出地质填图时观测到的石墨矿化趋势为北北东-南南西方向的高磁异常。强烈的北北东 - 南南西构造趋势似乎在该区域的中心部分占主导地位，显示出正构造模式，这意味着在初级采矿许可证的这个端口有一个浅位磁异常体(下图 3.5)

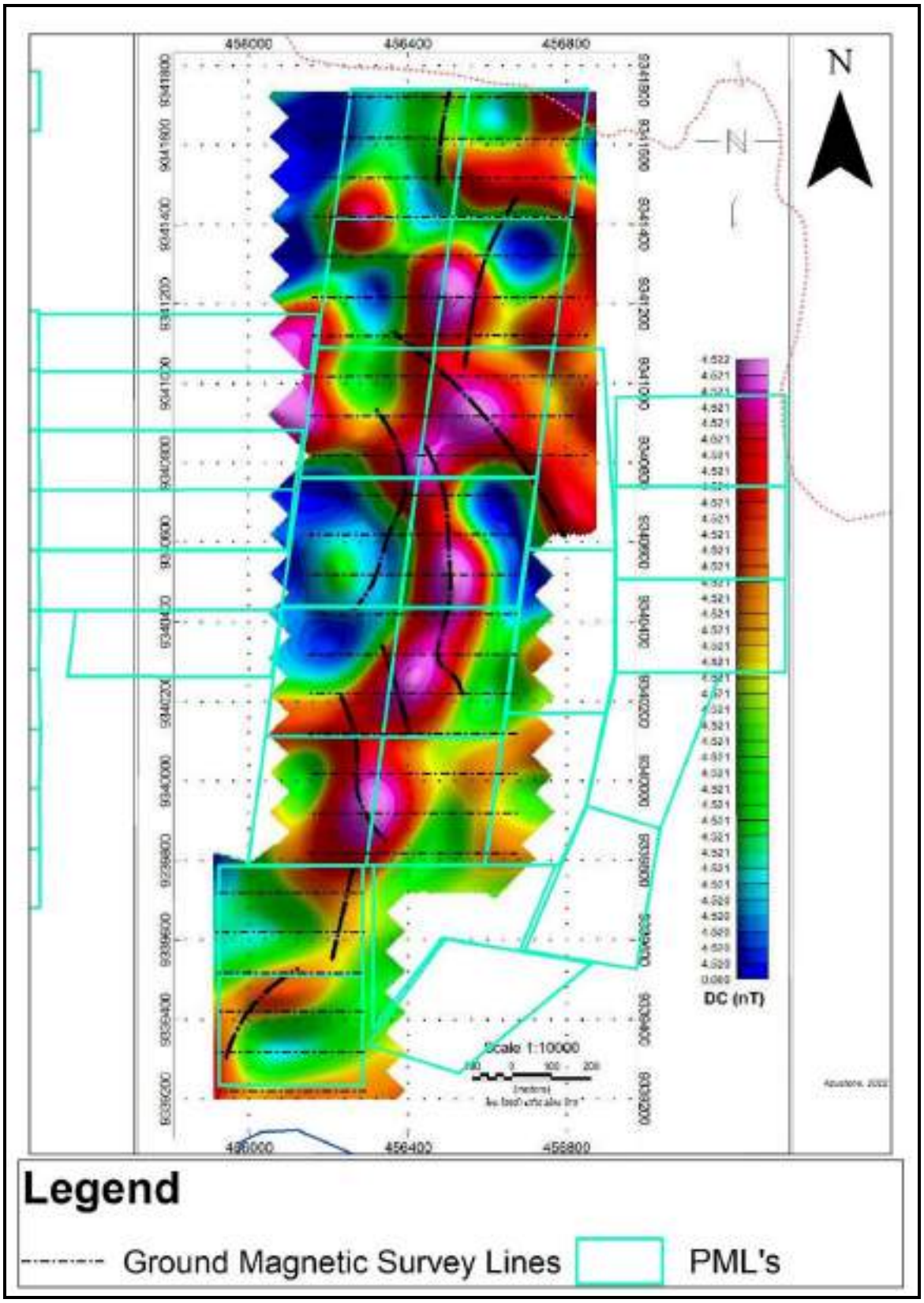


Figure 2.5: Down Continued Grid Map, Kwamsisi graphite Project 向下连续网格地图

(Source: Azustone Resources Tanzania Ltd, 2022)

2.2.3.4 Trenching 槽探

Trenching works was done after identifying key locations underlain by graphitic gneiss by using the data obtained from geological mapping and confirming with the data obtained from ground magnetic survey. It was revealed that there are two dominant lithologies across the entire PML's area. The crystalline Limestone overlying the graphitic gneiss. Due to magnetic contrast between these lithologies it was easier to establish the trenching location where by near surface graphite bearing rocks could be intersected. A total of 13 trenches were dug across the PML's area, figure 3.6 and 3.7.

Seventeen (17) samples were collected from 13 trenches and sent to the GST Geochemical laboratory for graphite analysis ie Total Graphitic Carbon, Ash Content, Volatile Matter and Moisture Content.

The trenches were 1m wide, approximately 1.50 to 2.0 m deep and 8-10 meters long. The trenches were excavated by hand and composite samples were collected from the base of trenches. Luckily due to the application of the geological and geophysical data all trenches intersected graphite bearing rocks and we hope it will return with significant results from the geochemical laboratory.

利用地质填图资料，确定了石墨片麻岩下伏的关键位置，并与地面磁测资料进行了确认，进行了挖沟工作。结果显示，在整个初级采矿许可证地区有两种主要的岩性。水晶石灰岩覆盖在石墨片麻岩上。由于这些岩性之间的磁对比，更容易确定沟槽的位置，近地表的含石墨岩石可以相交。在初级采矿许可证地区共挖了13条沟槽，见图3.6和3.7

从13个沟渠中收集了17个样品，并送往GST地球化学实验室进行石墨分析，即总石墨碳，灰分含量，挥发性物质和水分含量。

沟槽宽 1 米，深约 1.50 ~ 2.0 米，长 8 ~ 10 米。采用手工开挖的方法，在基坑底部采集复合样品。幸运的是，由于地质和地球物理数据的应用，所有的沟槽都与含石墨的岩石相交，我们希望地球化学实验室能得出重要的结果

Plate 2.1: Trench Number 2 (TR02), crosscutting slightly weathered graphite mineralised gneissic rock, Kwamsisi Graphite Project, Handeni. 2 号沟(TR02)，横切略风化的石墨矿化片麻岩

(Source: Azustone Resources Tanzania Ltd, 2022)

Plate 2.2: Trench Number 9 (TR09), crosscutting weathered graphite mineralised gneissic rock, Kwamsisi Graphite Project, Handeni. 9 号沟(TR09)，横切风化石墨矿化片麻岩

(Source: Azustone Resources Tanzania Ltd, 2022)

Plate 2.3: Trench Number 5 (TR05), crosscutting graphite mineralised weathered crystalline limestone, Kwamsisi Graphite Project, Handeni. 横切风化石墨矿化片麻岩

(Source: Azustone Resources Tanzania Ltd, 2022)

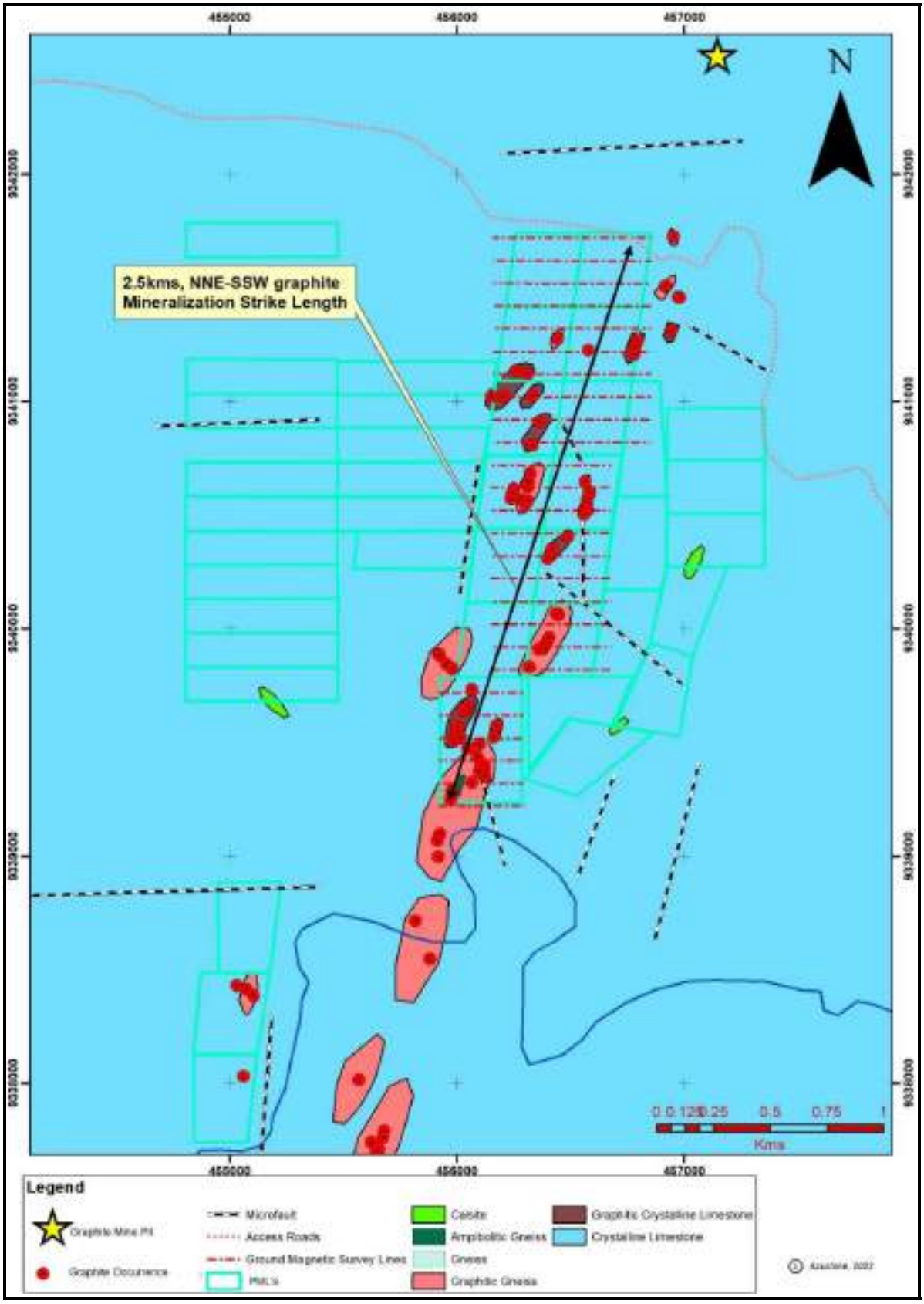


Figure 2.6: Trenches location VS Geological Map, Kwamsisi Graphite Project, Handeni

沟位置 VS 地质地图

(Source: Azustone Resources Tanzania Ltd, 2022)

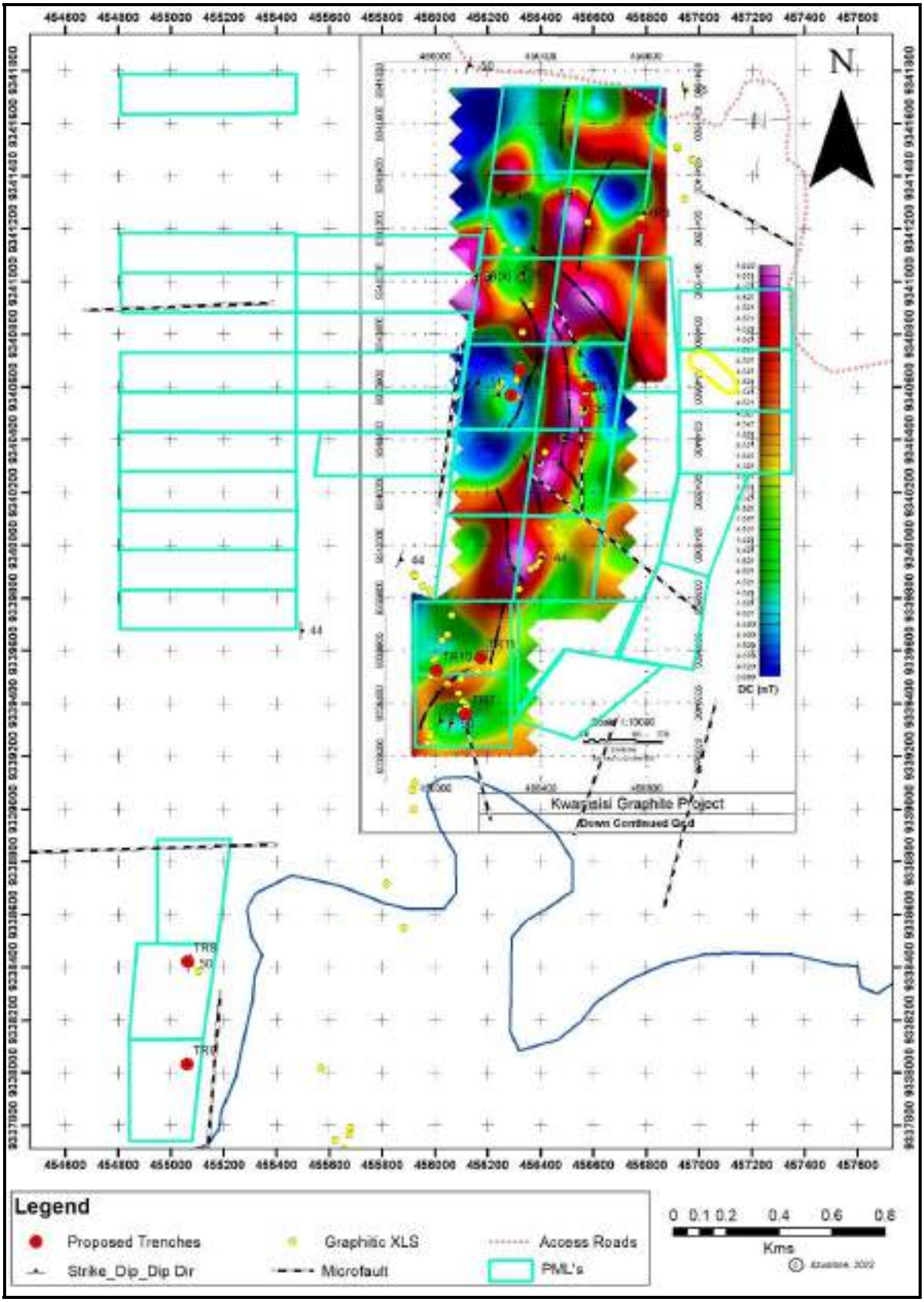


Figure 2.7: Trenches location VS Total Magnetic Intensity Map, Kwamsisi Graphite Project 沟位置 VS 总磁场强度图

(Source: Azustone Resources Tanzania Ltd, 2022)

2.2.3.5 Drilling work 钻探

Drilling was contracted by Azustone Resources Ltd, using XY3 Diamond drilling rig. The holes were all drilled at 0° azimuth and a dip of -90° from the horizontal. Drill hole parameters for all drill programs are given in Table 4.1

In total, 9 HQ diamond drill holes were drilled. The holes were broadly spaced, with the aim of determining structural continuity. Graphite was encountered at depth and along structures considered to be continuous. Graphite grades from both the regolith and underlying graphitic crystalline limestone and graphitic gneiss rocks were confirmed, and consistent with previous work.

钻孔由Azustone Resources Ltd承包，使用XY3 Diamond钻机。所有孔均以0°方位角和水平倾角-90°进行钻孔。所有钻孔方案的钻孔参数见表4.1

总共钻了 9 个 HQ 金刚石孔。孔洞间隔很宽，目的是确定结构的连续性。石墨是在深度和沿被认为是连续的结构遇到的。从风化层和下覆的石墨晶灰岩和石墨片麻岩中均确认了石墨品位，并与之前的工作一致

2.3. Local Geology 地区地质学

The Kwamsisi Project is located in the area characterized by hilly like terrain, shallow valleys and flat lands with trees and tall grasses. The good surface exposure of outcrops are evident at elevated areas within the property being characterized by light forest and dark brown soil covers at elevated places and black soil covers in valleys. Graphite stains/marks on soil are evident at some locations of the project and have been used on understanding the locations underlain by graphitic gneisses. The dominant lithology identified in the project are crystalline limestone, graphitic crystalline limestone, gneiss, graphitic gneiss/schists and ampibolitic gneiss. Small units of quartzofeldispathic gneisses, feldspar and calcite were also documented at some locations especially in the eastern and western parts of the project area. The field observation found that this rock is associated with hornblende, garnet and minor biotite. In general, the rock varieties in the project area ranges from high metamorphic grade from amphibolite to granulite facies of sedimentary origin and sediments. The rocks are generally highly fractured and foliated.

At Kwamsisi Graphite Project, Graphitic mineralisation is hosted within a graphitic gneissic unit along the NNE-SSW approximately 2.5kms strike length continuity within the licenses area. The graphite's is characteristics principally flake size graphite available on a consistent basis in the outcrop and 13 trenches exposures at numerous locations within the licenses area, figure 3.8

The graphite is coarse, fully ordered, crystalline and flaky. Grades up to 40.65% TGC were found. Gangue minerals in the ore are quartz, plagioclase, Kfeldspar, biotite and amphiboles. It is believed that the graphitic gneiss were originally sediments rich in organic matter which wase converted to graphite during granulite-facies metamorphism.

More than 50 graphite occurrence locations variable were discovered and some 13 trenches were dug for sampling. The underground extensions of the selected orebodies were studied by using the ground magnetic survey to identify the sub-surface structures, faults and the trend of the graphitic gneiss and the most promising anomalies was drilled The graphite-bearing bodies occur as elongated lenses and following the dominating folds, which trend NNE-SSW in the area.

A good locality illustrating the geological setting of the graphite mineralisation can be seen at the trenches and core tray photographies. The lithologies identified in the trenches including the crystalline limestone on the top and the graphitic gneiss at the bottom.

Kwamsisi项目位于以**丘陵地形、浅山谷和有**树木和高草的平坦土地为特征的地区。在该地区的高架地区露头地表暴露良好，其特点是高架地区有浅森林和深棕色土壤覆盖，山谷有黑色土壤覆盖。在项目的一些地点，土壤上的石墨渍/标记很明显，并已用于了解石墨片麻岩下的位置。该项目确定的主要岩性为结晶灰岩、石墨晶灰岩、片麻岩、石墨片麻岩/**片岩和双橄**榄岩片麻岩。在一些地方，特别是在项目地区的东部和西部，还发现了小单位的石英片麻岩、长石和方解石。野外观测发现该岩与角闪石、石榴石和小黑云母伴生。总体而言，项目区岩石品种从高变质程**度的角**闪岩到沉积成因和沉积物的**麻粒岩相。岩石通常高度破碎和叶状。**

在Kwamsisi**石墨**项目中，石墨矿化位于许可区域内北北东-**南南西沿**线的一个石墨片麻岩单元内，其走向长度约为2.5**公里。石墨的主要特征是**鳞片大小的石墨在露头和13**个沟槽中具有一致性，暴露在**许可区域内的许多位置，图3.8。

石墨粗糙、有序、结晶、片状。TGC等级高达40.65%。矿石中的脉石矿物有石英、斜长石、钾长石、黑云母和角闪石。认为石墨片麻岩是富含有机质的沉积物，在麻粒岩相变质过程中转变为石墨。

发现了50多个石墨赋存地点变量，并挖了13条沟进行采样。利用地面磁测对选定矿体的地下延伸进行了研究，确定了石墨片麻岩的结构、断层和走向，并将钻探最有希望的异常(共1000 m钻芯)。含石墨体呈细长透镜状，沿主要褶皱发育，呈北北东-南南西方向。

在沟槽照片中可以很好地说明石墨矿化的地质背景。在沟槽中确定的岩性包括顶部的结晶石灰岩和底部的石墨片麻岩

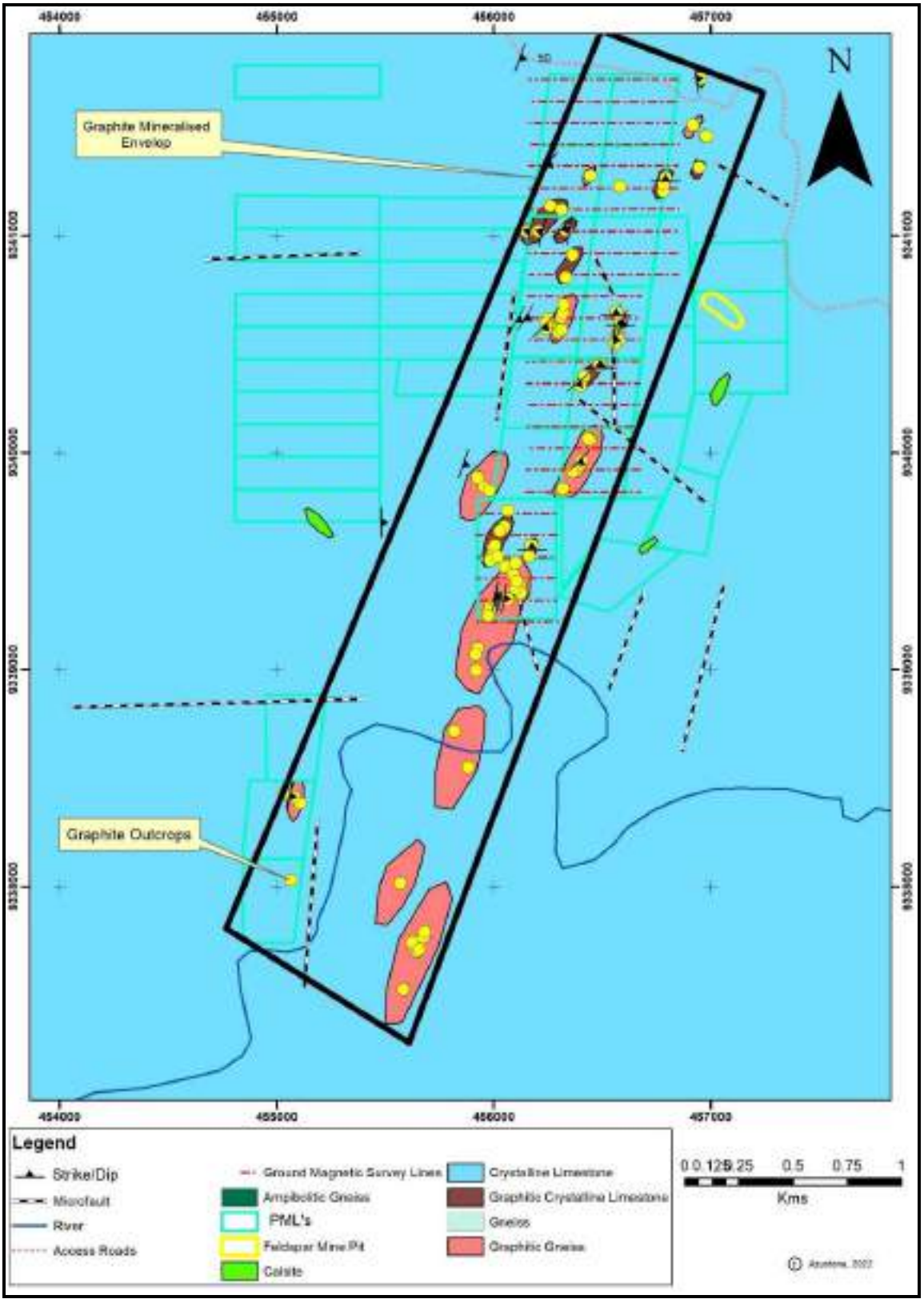


Figure 2.8: Kwamsisi Local Geological Map, Handeni, Tanzania 夸米西西地区地质图

(Source: Azustone Resources Tanzania Ltd, 2022)

Plate 2.4: Highly weathered graphite mineralised graphitic gneiss outcrop, Kwamsisi Graphite Project, Handeni 高度风化的石墨矿化石墨片麻岩露头

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.5: Graphitic gneiss outcrop near trench no 13, Kwamsisi Graphite Project, Handeni13 号沟附近石墨片麻岩露头

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.6: Portion of Trench number 2 exposing weathered graphitic gneiss, Kwamsisi Graphite Project, Handeni2 号沟的一部分暴露出风化的石墨片**麻岩**

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.7: Weathered graphitic gneiss from trench number 02 Kwamsisi Graphite Project, Handeni02 号沟的风化石墨片麻岩

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.8 Weathered graphitic gneiss exposed from trench number 09, Kwamsisi Graphite Project, Handeni 风化石墨片麻岩从 09 号沟中暴露出来

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.9: Weathered graphitic gneiss from trench number 09, Kwamsisi Graphite Project, Handeni09 号沟的风化石墨片麻岩

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.10: Slightly graphite mineralised crystalline limestone, Kwamsisi Graphite Project, Handeni 轻微石墨矿化的结晶石灰石

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.11: Rarely fine-grained graphite mineralised crystalline limestone, Kwamsisi Graphite Project, Handeni 很少有细粒石墨矿化的结晶石灰岩

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.12: Coarse grained flake graphite in weathered crystalline limestone, Kwamsisi Graphite Project, Handeni 风化结晶石灰石中的粗粒片状石墨

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.13: Low grade, coarse flake graphite mineralised in crystalline limestone Kwamsisi Graphite Project, Handeni 在结晶石灰石中矿化的低品位、粗片状石墨

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.14: Verry coarse flake graphite from slightly weathered crystalline limestone, Kwamsisi Graphite Project, Handeni 由轻微风化的结晶石灰石中产生的非常粗糙的鳞片石墨

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.15: High grade, coarse flake graphite from slightly weathered crystalline limestone, Kwamsisi Graphite Project, Handeni 从轻微风化的结晶石灰石中提取的高品位、粗片状石墨

(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.16: Foliated biotite gneiss, Kwamsisi Graphite Project, Handeni 叶状黑云母片麻岩
(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.17: Calsite, Kwamsisi Graphite Project, Handeni.
(Source: Azustone Resources (T) Ltd, field work, 2022)

Plate 2.18: BHDD06 showing lithological alterations, Kwamsisi Graphite Project, Handeni.
(Source: Azustone Resources (T) Ltd, field work, 2022)

2.4 Mineralization 矿化

Graphitic mineralisation is hosted within a graphitic gneissic unit along the NNE-SSW approximately 2.5kms strike length continuity within the licenses area. The graphite's is characteristics principally flake size graphite available on a consistent basis in the outcrop and 14 trenches exposure at numerous locations within the licenses area.

There are three forms of graphite which are amorphous graphite, flake graphite and crystalline vein graphite at Kwamsisi graphite project the dominant form of graphite is flake graphite.

Graphite occurs in metamorphic rocks as a result of the reduction of sedimentary carbon compounds during metamorphism. It also occurs in igneous rocks and in meteorites. Minerals associated with graphite include quartz, calcite, micas and tourmaline.

At Kwamsisi the graphite mineralization is classified as syngenetic type. Syngenetic results in two categories of graphite, namely crystalline flake graphite and microcrystalline or amorphous graphite. For syngenetic graphite, the crystallinity increases with metamorphic temperatures, hence the quality in terms of flake size and crystallinity depends on the grade of metamorphism.

Crystalline Limestone units overlay the older lithologies such as ampibolitic gneiss, gneiss and graphitic gneiss. Graphite flakes form lineation at the outcrop scale within crystalline limestone units but not exceeding 3 vol.% TGC grades based on the field observations. Graphitic gneisses are striking parallel with the rest of the lithologies that are striking NNE-SSW (except few locations). The extensions of graphitic gneisses along the strike length are in order of hundred metres to few kilometres, although there are variations of thickness along the same strike length. Most of the surface graphitic gneisses are weathered and/or altered to oxides and hydroxides of

iron, commonly hematite and limonite. Weathering and alteration make these rocks soft and easy to break by hands; however, the graphite flakes remained un-weathered.

Field observations coupled with ground magnetic survey indicate that the graphite mineralization at Kwamsisi area is crystalline flake type with a flake size ranging from medium to coarse. This represents syngenetic rather than epigenetic type of mineralization with no evidence for the existence of amorphous graphite. As a result, this graphite mineralization in the study area points to metasedimentary origin with maximum grade of 40.65 wt.%, that occurs as disseminated flakes in the graphitic gneiss host rocks. The host lithology to graphite mineralization is concordant with the rest of lithologies at the area and they both have a general trend of NNE-SSW with few exceptions. Mineralized zones occur within biotite gneiss and its extension, grade and flakes size qualifies the study area for the economic viability of graphite mineralization. However, further studies on the tonnage for the graphite reserve through drilling is required.

石墨矿化分布在北北东-南南西沿线的一个石墨片麻岩单元内，在许可区域内约2.5公里的连续走向中。石墨的特征主要是鳞片大小的石墨，在露头和14个沟槽中的基础上是一致的，暴露在许可证区域内的许多地点。

在夸米西西石墨项目中，石墨有三种形式，即无定形石墨、片状石墨和晶脉石墨，主要形式是鳞片状石墨。

石墨存在于变质岩中，是变质过程中沉积碳化合物减少的结果。它也存在于火成岩和陨石中。与石墨有关的矿物包括石英、方解石、云母和电气石。

夸密西西的石墨矿化属于同生型。共生形成两类石墨，即晶片状石墨和微晶或非晶石墨。同生石墨的结晶度随着变质温度的升高而增加，因此鳞片大小和结晶度的质量取决于变质程度。

结晶灰岩单元覆盖了较老的岩性，如双橄榄片麻岩、片麻岩和石墨片麻岩。在结晶石灰石单元的露头尺度上，石墨薄片形成线状，但根据现场观察，不超过3 vol.% TGC等级。

石墨片麻岩与北北东-南南西方向的其他岩性(少数位置除外)显著平行。石墨片麻岩沿走向长度的延伸范围在几百米到几公里之间，但沿同一走向长度的厚度有所变化。大多数表面石墨质片麻岩风化和/或改变为铁的氧化物和氢氧化物，通常是赤铁矿和褐铁矿。风化和蚀变使这些岩石变软，容易用手打碎;然而，石墨鳞片仍然没有风化。

野外观测结合地面磁测结果表明，夸米西西地区石墨矿化为晶片型，鳞片大小从中到粗不等。这代表了同生而非表观遗传类型的矿化，没有证据表明存在无定形石墨。结果表明，研究区石墨矿化为变质沉积成因，最大品位为 40.65 wt.%，以浸染片状形式出现在石墨片麻岩主岩中。石墨矿化的主岩性与本区其他岩性基本一致，总体呈北北东-南南西走向，鲜有例外。矿化带出现在黑云母片麻岩中，其延伸、品位和鳞片大小决定了研究区具有石墨矿化的经济可行性。但是，钻孔开采石墨储量的吨位还有待进一步研究

3.0 DRILLING WORK, SAMPLES COLLECTION AND LABORATORY RESULTS 钻孔工作样品收集和实验室结果

3.1 Drilling work 钻探

Drilling was contracted to Azustone Resources Ltd, using XY3 Diamond drilling rig. The holes were all drilled at 0° azimuth and a dip of -90° from the horizontal. Drill hole parameters for all drill programs are given in Table 4.1.

钻孔工作由Azustone Resources Ltd承包，使用XY3 Diamond钻机。所有孔均以0°方位角和水平倾角-90°进行钻孔。所有钻孔方案的钻孔参数见表4.1。

Table 3.1 Drill Hole Parameters 钻孔参数

Hole_ID	Y-Arc1960	X-Arc1960	RL-m	MAX_DEPH_m	HOLE_TYPE	Azimuth	Dip
BHDD01	9341220	456430	182	0	DD	0	-90
BHDD02	9341220	456580	180	0	DD	0	-90
BHDD03	9341220	456730	185	20	DD	0	-90
BHDD03B	9341220	456770	186	11.5	DD	0	-90
BHDD04	9340920	456360	170	13	DD	0	-90
BHDD05	9340920	456510	168	23.5	DD	0	-90
BHDD06	9340920	456660	175	50	DD	0	-90
BHDD07	9340608	456520	158	0	DD	0	-90
BHDD08	9340608	456585	163	34.5	DD	0	-90
BHDD09	9340520	456490	148	0	DD	0	-90
BHDD10	9340518	456565	153	0	DD	0	-90
BHDD11	9340432	456458	148	29	DD	0	-90
BHDD12	9340431	456516	147	31.6	DD	0	-90
BHDD12B	9340431	456586	148	20.5	DD	0	-90
BHDD13	9340064	456285	168	0	DD	0	-90
BHDD14	9340064	456436	162	0	DD	0	-90
BHDD15	9339960	456263	169	0	DD	0	-90
BHDD16	9339960	456400	164	0	DD	0	-90
BHDD17	9339851	456238	165	0	DD	0	-90
BHDD18	9339851	456320	170	0	DD	0	-90
BHDD19	9339519	456085	174	0	DD	0	-90
BHDD20	9339520	456193	185	0	DD	0	-90
BHDD21	9339360	456070	163	0	DD	0	-90

(Source: Azustone Resources (T) Ltd, field work, 2023)

In total, 9 HQ diamond drill holes were drilled. The holes were broadly spaced, with the aim of determining structural continuity. Graphite was encountered at depth and along structures considered to be continuous. Graphite grades from both the regolith and underlying graphitic crystalline limestone and graphitic gneiss rocks were confirmed, and consistent with previous work.

总共钻了9个HQ金刚石孔。孔洞间隔很宽，目的是确定结构的连续性。石墨是在深度和沿被认为是连续的结构遇到的。从风化层和下覆的石墨晶灰岩和石墨片麻岩中均确认了石墨品位，**并与之前的工作一致**。

Table 3.2 Significant Drill Intercepts – 2022 Drill Program 重要钻孔截距

BH_ID	From_m	To_m	Width
BHDD05	0.00	23.50	23.50
BHDD06	0.00	48.00	48.00
BHDD08	0.00	34.50	34.50
BHDD11	0.00	29.00	29.00
BHDD12	0.00	31.60	31.60

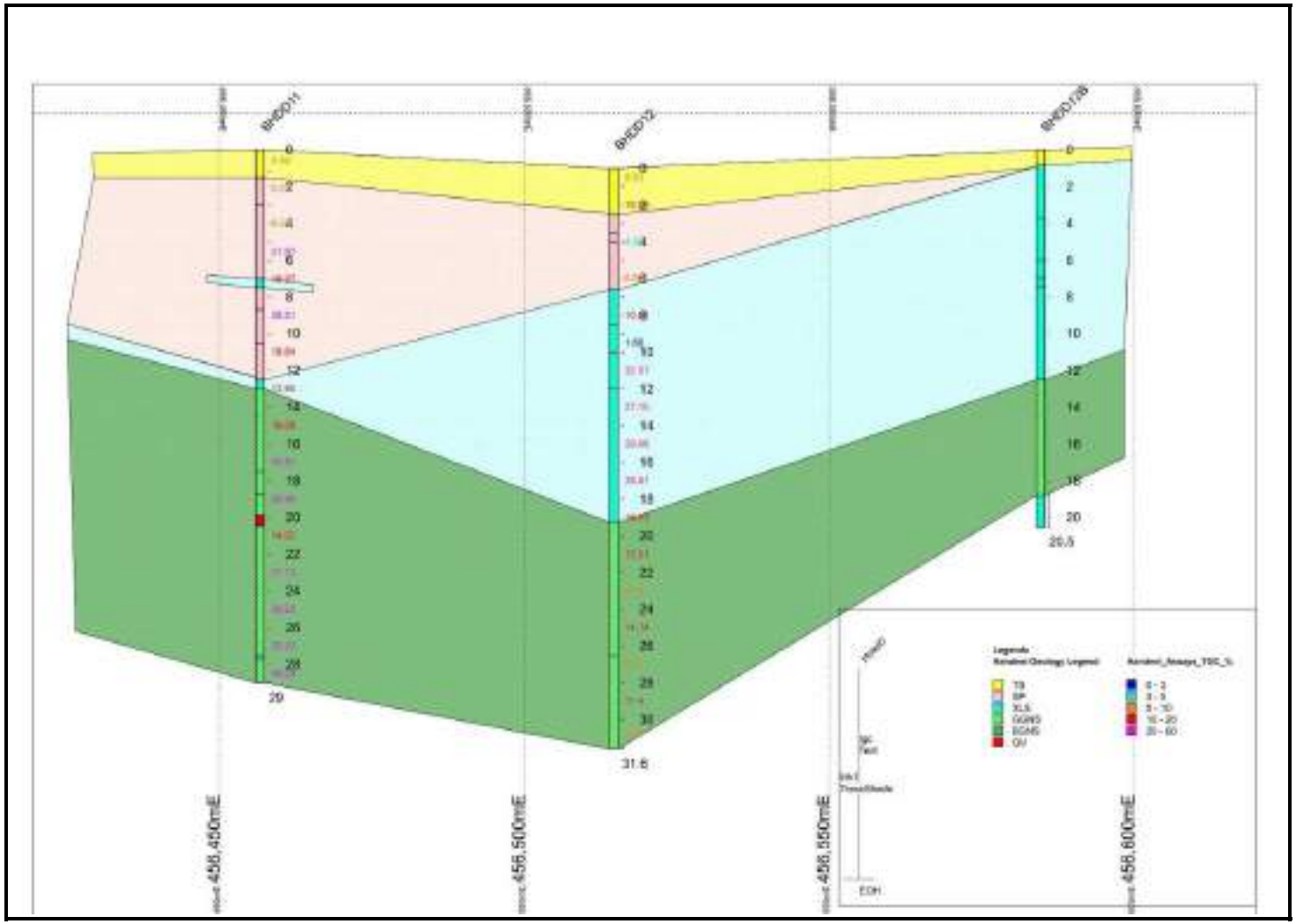


Figure 3.1: Section 9340430, Handeni, Tanzania.

(Source: Azustone Resources Tanzania Ltd, 2022)

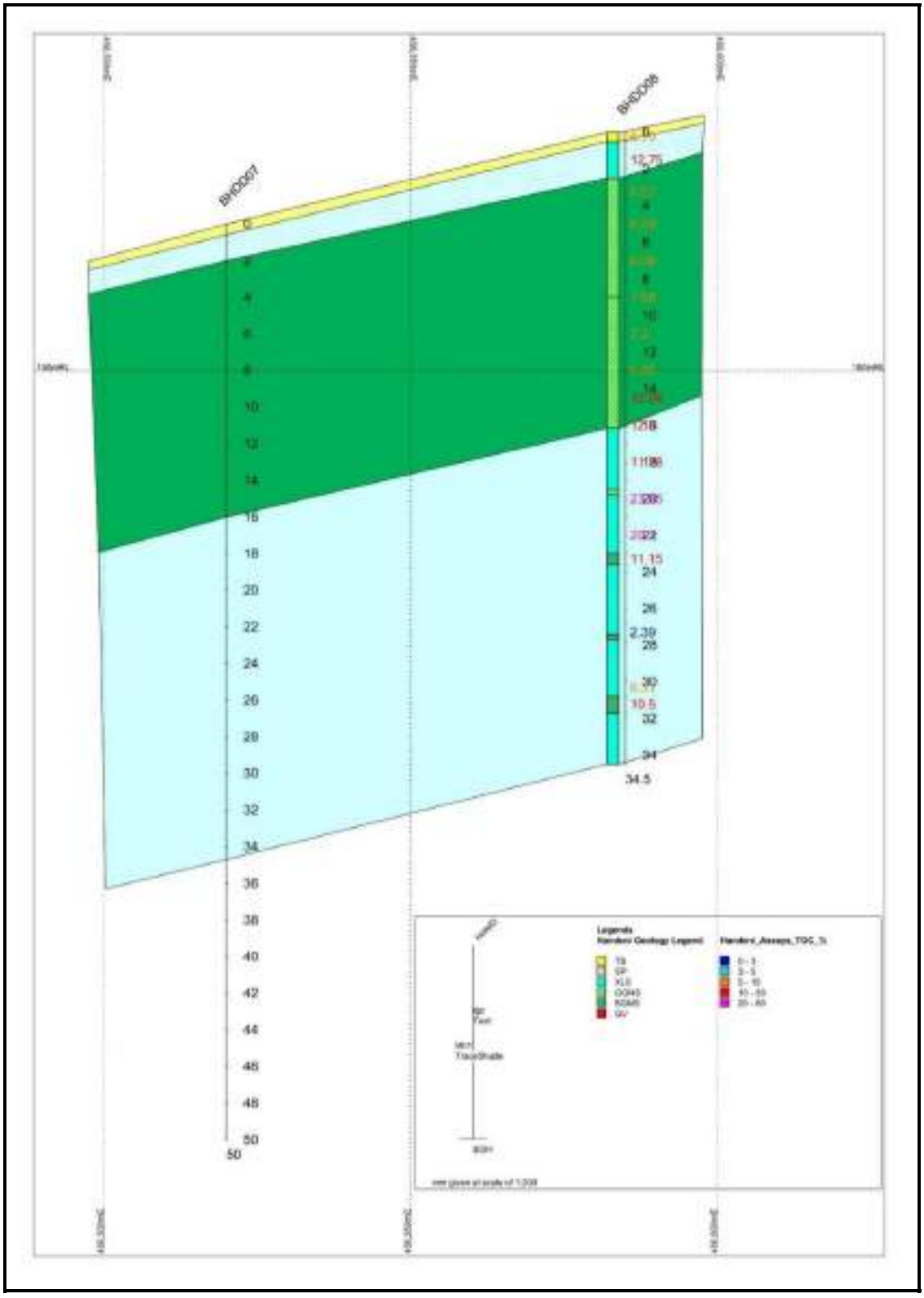


Figure 3.2: Section 9340608, Handeni, Tanzania.

(Source: Azustone Resources Tanzania Ltd, 2022)

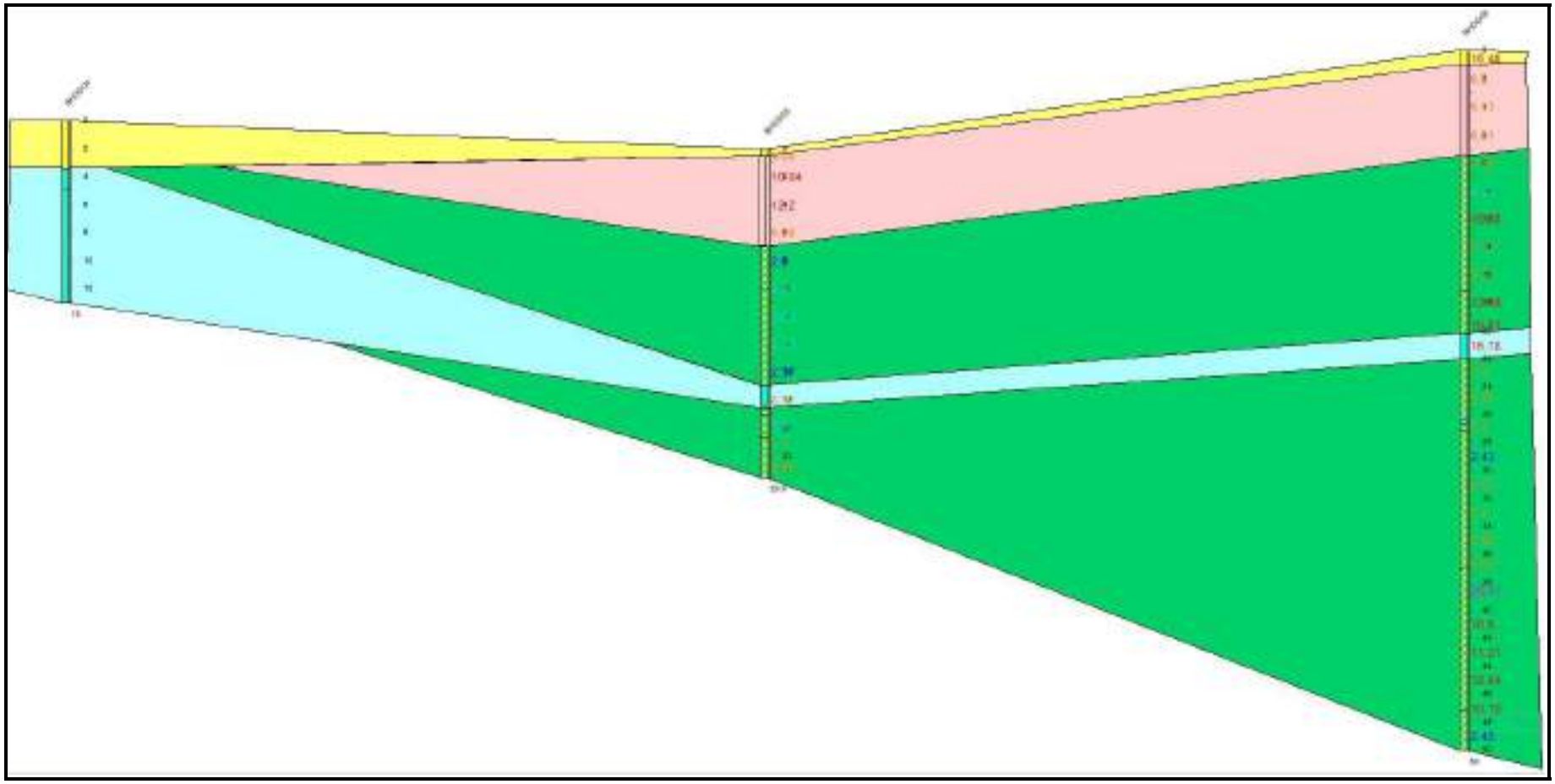


Figure 3.3: Section 934092, Handeni, Tanzania.

(Source: Azustone Resources Tanzania Ltd, 2022)

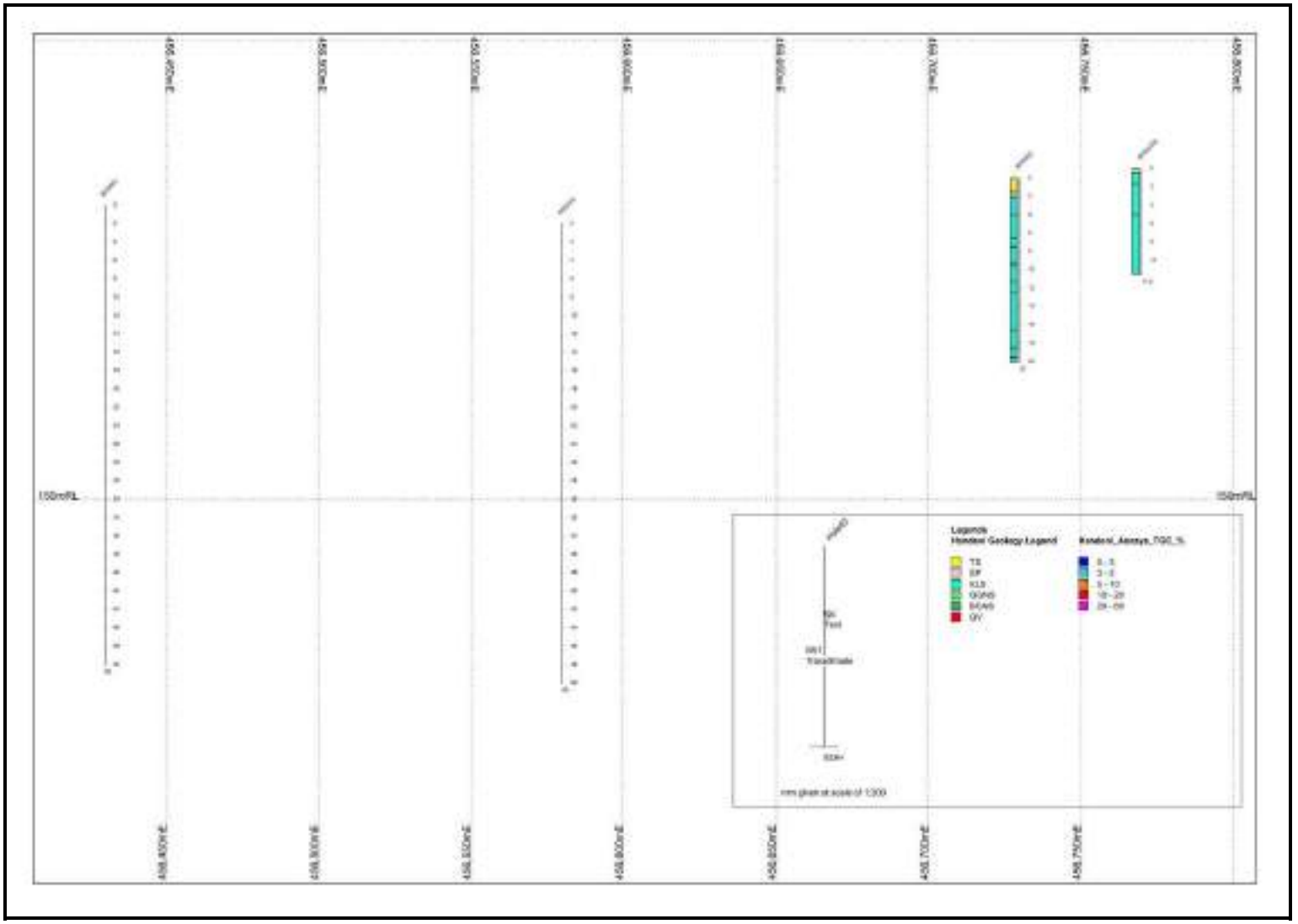


Figure 3.4: Section 934092, Handeni, Tanzania.

(Source: Azustone Resources Tanzania Ltd, 2022)

3.2 Sample Preparation, Analysis and Security 样品制备，分析和安全

3.2.1 Sample Preparation 样品制备

A total of 95 drilling core sample was collected, including 3 pulp and 3 duplicate samples in order to control laboratory functionality. The sample preparation procedures presented below focus on the work done in 2022. Drill core was transported by company personnel to core logging facility, located within the PML; s boundary, where geotechnical logging, geological logging, core splitting and sampling were done. Geotechnical procedures included recording core recovery, rock quality determination (RQD), joint number (Jn), joint alteration (Ja), joint roughness (Jr) and stress reduction factor (SRF). After geological logging, the core was sampled, split and bagged, and photographed. The core was stored on core boxes located within the PML's boundaries. Core was generally sampled in 2-metre intervals in the year 2022 drill program, with 1-metre intervals given for lithology changes. Core splitting was done using diamond bladed rock saws operated by Azustone Resources personnel. Quarter the core was sent for analysis; the other three quarters was returned to the core box as a permanent record.

These samples were sent to Geological Survey of Tanzania (GST) geochemical laboratory for analysis. This laboratory is an independent lab that is ISO GST/QFA7.8.2 certified for Competence in Testing.

为了控制实验室功能，共采集了95个钻孔岩心样本，包括3个浆体和3个重复样本。下面介绍的样品制备程序主要集中在2022年所做的工作。钻孔岩心由公司人员运送到位于初级采矿许可证内的岩心测井设备;S边界，进行岩土测井、地质测井、岩心劈裂和取样。岩土工程程序包括记录岩心回收率、岩石质量测定(RQD)、节理数(Jn)、节理蚀变(Ja)、节理粗糙度(Jr)和应力减小因子(SRF)。地质测井后，对岩心进行取样、分割和装袋，并拍照。核心存储在位于初级采矿许可证边界内的核心盒中。在2022年的钻探计划中，岩心取样间隔通常为2米，岩性变化间隔为1米。在Azustone Resources人员的操作下，使用金刚石刃岩锯进行岩心劈裂。四分之一的岩心被送去分析;其他四分之三的硬币被放回核心盒作为永久记录。

这些样品被送往坦桑尼亚地质调查局(GST)地球化学实验室进行分析。本实验室是一个独立的实验室，通过了ISO GST/QFA7.8.2的测试能力认证。

3.2.2 Sample Analysis 样品分析

Drill Core Samples Sample preparation involved drying the samples, followed by crushing in a jaw crusher to produce a -6-mesh product. It was then riffle-split to produce a 200-gram ("g") sample, which was pulverized in a ring-and-puck pulverizer to produce a -150-mesh pulp. The crusher and pulverizer were cleaned with quartz sand between samples to prevent cross contamination. A pulp sample having a mass from 0.01 to 0.25 g was placed in a LECO crucible, accurately weighed, followed by immersion in a dilute hydrochloric acid leach solution to remove any inorganic carbon present in the form of carbonate. The crucible was placed in a suction apparatus and the resulting chloride residue inside the crucible was removed with de-ionized

water. The sample was then dried, leaving behind the leached graphite sample. The crucible plus sample was placed in a LECO 200 analyser, where it was vaporized in a high-frequency induction furnace at temperatures approaching 1,500°C. A stream of oxygen was introduced, allowing for combustion of the sample. The gases produced were then passed directly into a cell through which infrared (IR) energy was transmitted, where the amount of carbon dioxide produced from the sample combustion was measured.

The absorption at the precise wavelength for carbon dioxide is related to the total FC content of the sample, and % FC can be determined. The quantity of FC represents the amount of graphite in a sample. The LECO analytical procedure is the industry standard method for the analysis of graphite. It is an indirect method of analyses; no direct method exists. The method assumes that the carbon-bearing minerals in the sample occur either as graphite, a form of organic carbon, or as carbonates. Any carbonate mineral in the sample is removed by the acid-washing procedure, leaving behind solely organic carbon in the form of graphite, which is then analysed. However, carbonate minerals encased within graphite grains would not be removed by acid washing as they would not be exposed to the acid medium, and would end up reported as graphitic carbon.

样品制备包括干燥样品，然后在颚式破碎机中破碎，以产生-6目产品。然后用来复枪分离出200克(“g”)样品，然后用环-球粉碎机将其粉碎，以产生-150目的纸浆。破碎机和粉碎机在样品之间用石英砂清洗，防止交叉污染。将质量从0.01到0.25 g的纸浆样品放入LECO坩埚中，精确称重，然后浸泡在稀盐酸浸出溶液中，以碳酸盐形式去除任何无机碳。坩埚被放置在吸力装置中，坩埚内产生的氯化物残渣被去离子水除去。然后将样品烘干，留下浸出的石墨样品。将坩埚和样品放在LECO 200分析仪中，在接近1500°C的高频感应炉中蒸发。引入一股氧气，使样品燃烧。然后，产生的气体直接进入一个单元，通过该单元红外(IR)能量被传输，在该单元中，样品燃烧产生的二氧化碳量被测量。

在精确波长下对二氧化碳的吸收与样品的总 FC 含量有关，可以测定% FC。FC 的数量表示样品中石墨的数量。LECO 分析程序是石墨分析的工业标准方法。这是一种间接的分析方法;没有直接的方法。该方法假设样品中的含碳矿物以石墨(有机碳的一种形式)或碳酸盐的形式存在。样品中的任何碳酸盐矿物都要通过酸洗程序去除，只留下石墨形式的有机碳，然后进行分析。然而，包裹在石墨颗粒中的碳酸盐矿物不会被酸洗除去，因为它们不会暴露在酸性介质中，最终会以石墨碳的形式报告。其次，其他有机碳的存在，如植物或土壤，会导致错误的更高的分析结果。提交分析样品时必须注意不含植物或土壤物质

3.2.3 Sample Security 样品安全

During the 2022 drill programs, drill core was transported by Azustone personnel to the core logging yard, where geotechnical procedures and geological core sampling was carried out. Core was again stored in racks at the storage yard. All drill core was placed in secure storage facilities for future reference.

在 2022 年的钻孔项目中，钻孔岩芯由 Azustone 人员运送到岩芯测井场，在那里进行岩土工程程序和地质岩芯采样。钻芯再次被储存在堆场的架子上。所有的钻芯都被放置在安全的存储设施中，以备将来参考。

3.2.4 Quality Control and Quality Assurance Program 质量控制和质量保证程序

Quality Control and Quality Assurance ("QC/QA") work was only instituted during the 2022 exploration program. In total, 3 pulp samples of known value were sent for analysis to SGS Geochemical laboratory. The original samples had been previously prepared and/or analysed at same laboratory. 3 duplicate samples were also submitted to SGS Geochemical laboratory. This laboratory is an independent lab that is ISO GST/QFA7.8.2 certified for Competence in Testing It is the authors' opinion that the analytical results from the certified laboratory cited above is accurate and that the data can be relied upon.

质量控制和质量保证(“QC/QA”)工作仅在 2022 年勘探计划期间启动。总共有 3 个已知价值的纸浆样品送到 SGS 化探实验室进行分析。原始样品之前已在同一实验室制备和/或分析。3 份重复样品提交 SGS 化探实验室。本实验室是一个独立的实验室，通过了 ISO GST/QFA7.8.2 的测试能力认证。作者认为，上述认证实验室的分析结果是准确的，数据是可以信赖的

3.3 Laboratory work and laboratory results Discussion 实验室工作及结果讨论

The laboratory analysis results were aimed at deciphering the information regarding the quality of the graphite mineralization present within the PMLs on various locations.

The average percentage for the samples that come out with anomalous value is over 10% TGC, the sample results ranges from 1.68 %TGC to 55.51% TGC. The high value come from the BHDD11, HDD028 with the average total graphitic content calculated being 8 TGC, *appendix E.*

实验室分析结果的目的是破译关于存在于不同位置的pml中的石墨矿化质量的信息。

样品异常值百分比大于 10%，样品结果在 1.68% ~ 55.51% TGC 之间。高值来自 BHDD11, HDD028，平均总石墨含量计算为 8TGC，附录 E

4.0 ORE COMPOSITING, STATISTICS and GEOSTATISTICS, AND BLOCK MODDELLING 矿石合成，统计学和地质统计学，以及块体建模

4.1 Ore Compositing 矿石合成

Ore compositing classifies assay data into “ore” and “waste” categories, taking into account grade thresholds, mining dimensions and allowable internal dilution. The result is an interval table with a column of ore/waste category data and a column of composited interval values, plus some additional columns showing the length, linear grade, included dilution length, included dilution grade and the percentage of the composite that is based on missing (and then filled) interval data.

Compositing is primarily an input into the modelling of geometry rather than the modelling of grade. Whereas numeric compositing transforms variable length assay intervals into consistent intervals with a common support length, composite intervals can be of any length, with the composited lengths always coinciding with the end of an assay interval. One common use for compositing is to generate a reasonable mineralised envelope from “ore” intervals, which has the benefit of being built on both mineability parameters and cut-off grade.

Economic compositing is based on a set cut-off grade, such that values that are greater than or equal to the cut-off value are considered “Ore” and values below are considered “Waste”. Adjacent intervals on the same side of the cut-off grade are concatenated, producing a series of alternating ore and waste segments. The alternating waste and ore segments are then composited, with the segments being considered for incremental addition to an ore composite sequentially down each drillhole.

矿石合成将化验数据分为“矿石”和“废料”两类，考虑到品位阈值、采矿尺寸和允许的内部贫化。结果是一个区间表，其中一列是矿石/废物类别数据，一列是综合区间值，另外一些列显示长度、线性等级、包括稀释长度、包括稀释等级和基于缺失(然后填充)区间数据的综合百分比。

合成主要是几何建模的输入，而不是等级建模。数值合成将可变长度的检测间隔转换为具有共同支持长度的一致间隔，而复合间隔可以是任何长度，复合长度总是与检测间隔的结束一致。合成的一个常见用途是从“矿石”层段生成合理的矿化层，其好处是建立在可采矿性参数和截止品位的基础上。

经济合成是基于一个设定的分界点，因此大于或等于分界点的值被认为是“矿石”，低于分界点的值被认为是“废料”。在边界品位同一侧的相邻段级联，产生一系列交替的矿石和废料段。然后将交替的废料和矿石分段进行合成，并考虑将这些分段按顺序沿着每个钻孔添加到矿石复合材料中

Table 4.1 Significant Drill Intercepts – 2022 Drill Program

BH_ID	From_m	To_m	Width
BHDD05	0.00	23.50	23.50
BHDD06	0.00	48.00	48.00
BHDD08	0.00	34.50	34.50
BHDD11	0.00	29.00	29.00
BHDD12	0.00	31.60	31.60

(Source: Azustone Resources (T) Ltd, field work, 2023)

Table 4.2 Ore Solids Total Volume and Area – 2022 Drill Program 矿石固体，总体积和面积

```
SOLID MODELLING OBJECT REPORT
Layer Name: ore_solid.dtm

Object: 1
Trisolation: 1
Validated = true
Status = solid

Trisolation Extents
X Minimum: 456410.291 X Maximum: 456551.316
Y Minimum: 9340400.000 Y Maximum: 9340600.000
Z Minimum: 115.400 Z Maximum: 150.883
Surface area: 47949
Volume : 451992


Object: 1
Trisolation: 2
Validated = true
Status = solid

Trisolation Extents
X Minimum: 456439.984 X Maximum: 456750.050
Y Minimum: 9340531.000 Y Maximum: 9340920.000
Z Minimum: 127.000 Z Maximum: 175.179
Surface area: 165664
Volume : 1925858


Totals - Object: 1
Surface area: 213613
Volume : 2377849
```

(Source: Azustone Resources (T) Ltd, field work, 2023)

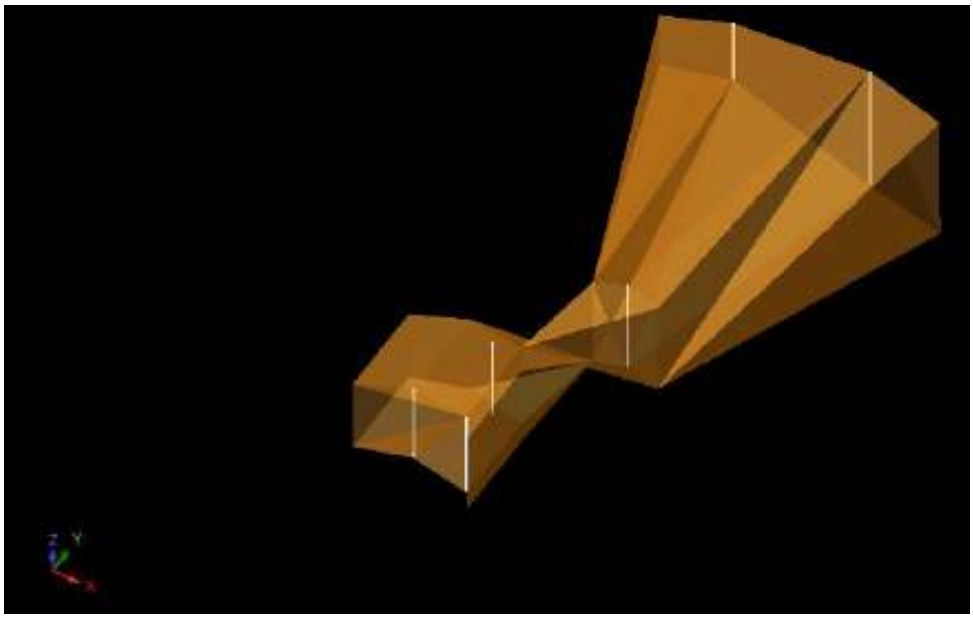


Figure 4.1: Graphite Intersection, Handeni Graphite Project 石墨相交
(Source: Azustone Resources (T) Ltd, field work, 2023)

4.2 Statistics and Geostatistics 统计学和地质统计学

4.2.1 Statistics 统计学

Statistics is the collection, organization, analysis, interpretation, and presentation of data One of the important preliminary steps in performing geostatistical evaluation is to understand the statistical property of the data. Two characteristics which can potentially reduce the quality of the estimations are bimodalism and outliers. All bimodalism and outliers was taken into consideration during data evaluation.

统计学是对数据的收集、组织、分析、解释和表示。进行地质统计评价的一个重要的初步步骤是了解资料的统计性质。可能降低估计质量的两个特征是双峰性和异常值。在数据评估过程中考虑了所有的双峰性和异常值

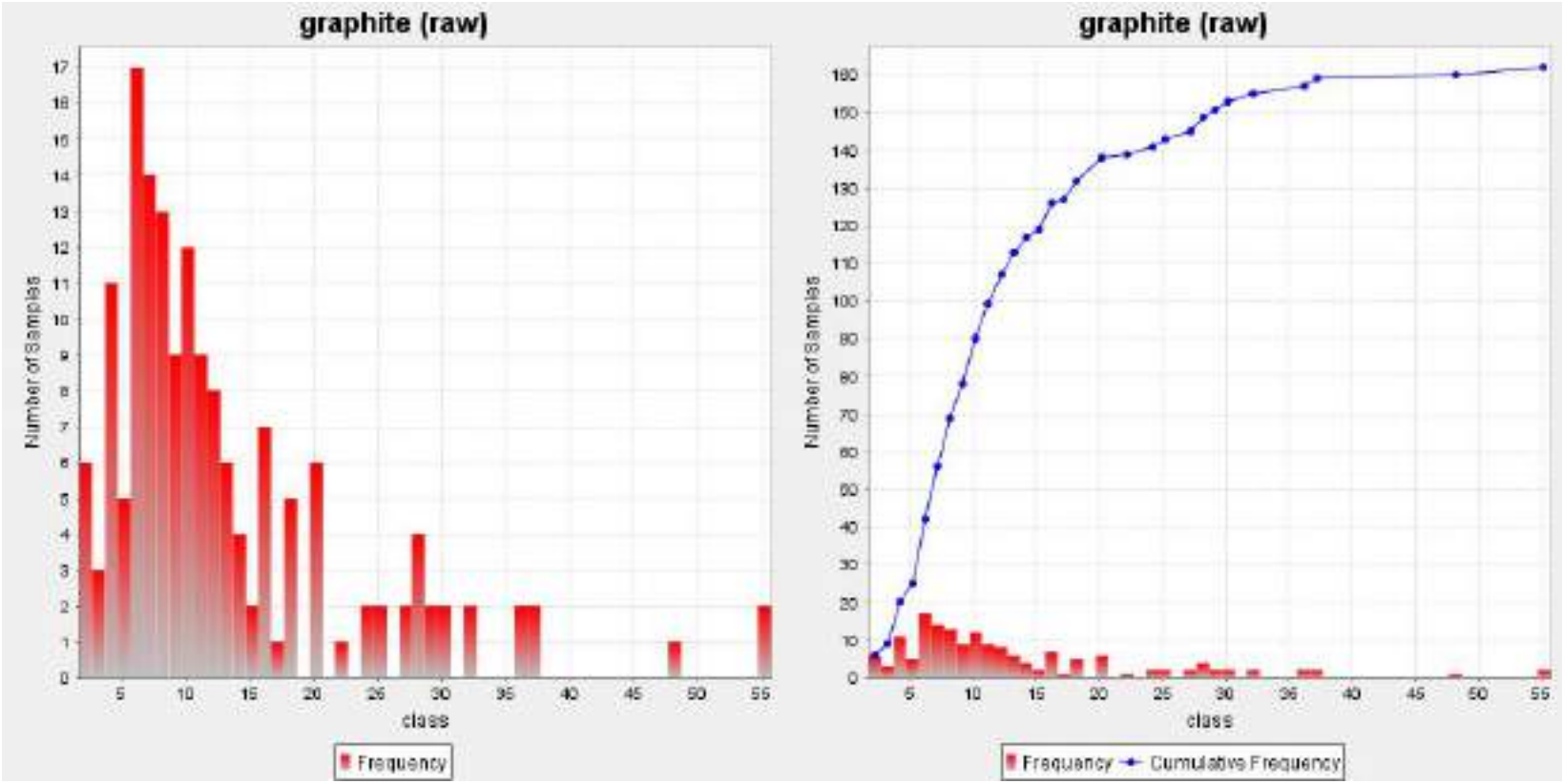


Figure 4.2: Graphite Grade Histogram and Cumulative Frequency before outliers treated 石墨品位直方图和异常值处理前的累积频率

(Source: Azustone Resources (T) Ltd, field work, 2023)

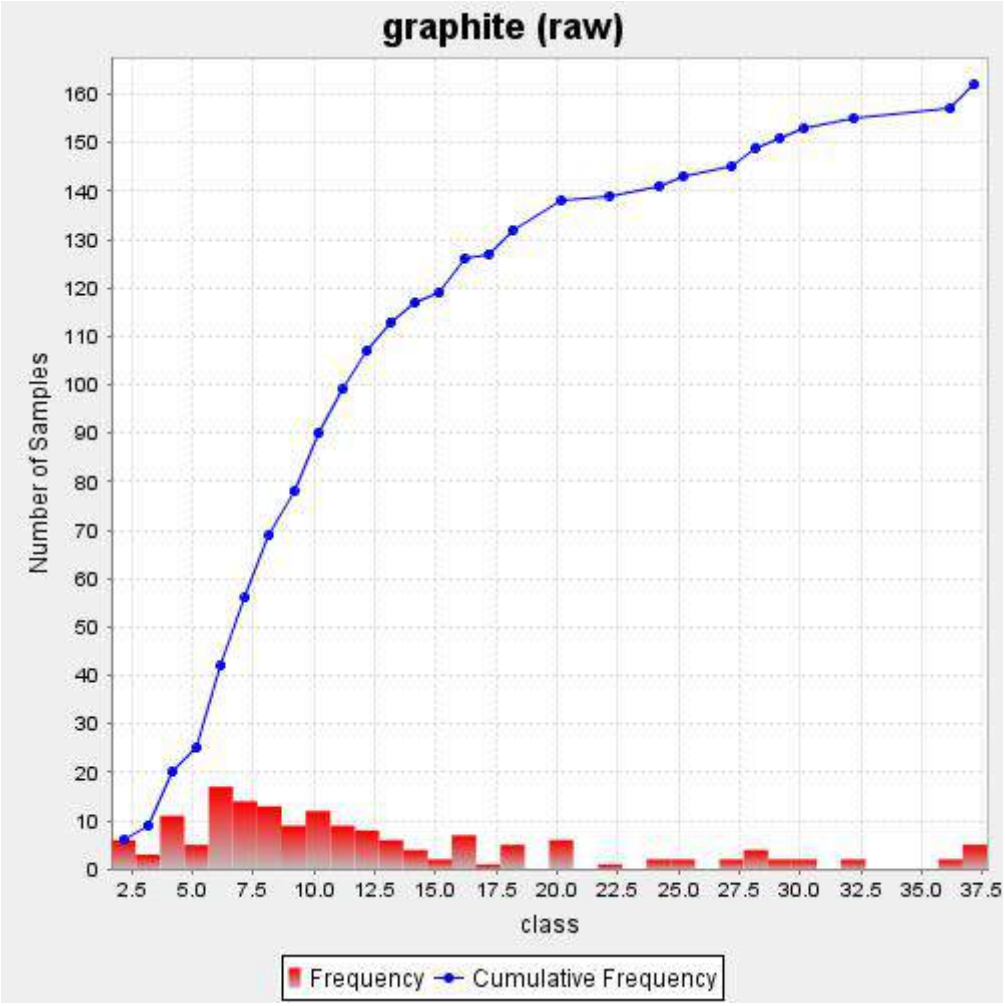


Figure 4.3: Cumulative frequency after treating outliers 处理异常值后的累计频率

(Source: Azustone Resources (T) Ltd, field work, 2023)

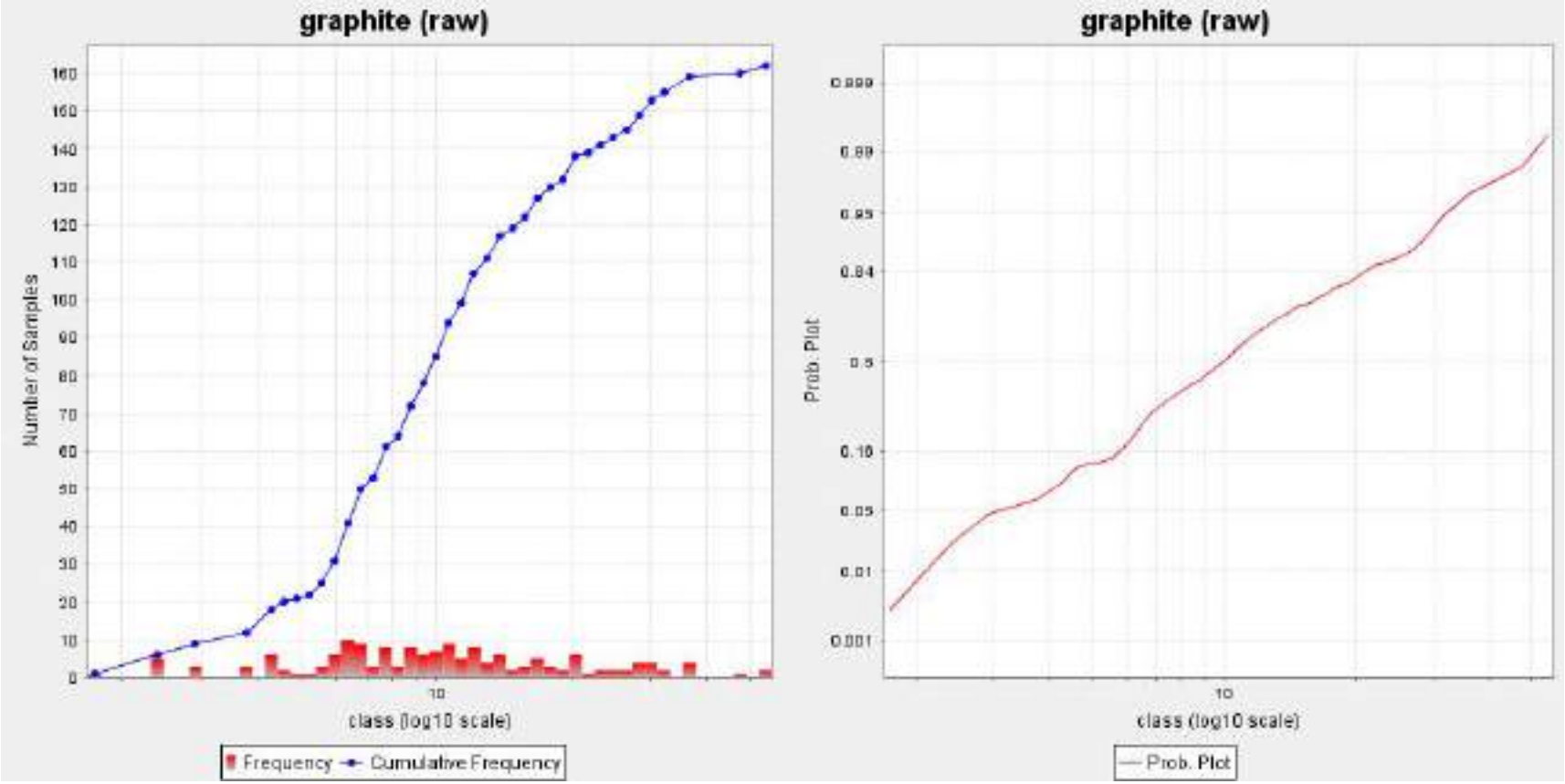


Figure 4.4: Class (log 10 scale) probability curve 类(log 10 标度)概率曲线

(Source: Azustone Resources (T) Ltd, field work, 2023)

File	Composite Ore2001.str
String range	All
Variable	graphite
Number of samples	162
Minimum value	1.680000
Maximum value	55.510000
	Ungrouped Data
Mean	12.932208
Median	9.885000
Geometric Mean	10.228755
Variance	95.224686
Standard Deviation	9.758314
Coefficient of variation	0.754574
Moment 1 About Arithmetic Mean	0.000000
Moment 2 About Arithmetic Mean	95.224686
Moment 3 About Arithmetic Mean	1764.142437
Moment 4 About Arithmetic Mean	65665.745107
Skewness	1.898494
Kurtosis	7.241688
Natural Log Mean	2.325203
Log Variance	0.464882
10.0 Percentile	4.365000
20.0 Percentile	6.219001
30.0 Percentile	6.980000
40.0 Percentile	8.530000
50.0 Percentile (median)	9.885000
60.0 Percentile	11.305000
70.0 Percentile	13.720001
80.0 Percentile	18.527000
90.0 Percentile	28.330000
95.0 Percentile	32.070000
97.5 Percentile	37.130000
Trimean	10.537500
Biweight	10.216517
MAD	3.866517
Alpha	-1.663200
Sichel-t	12.882669

Table 4.3 Statistical Report before topcut – 2022 Drill Program 顶切前的统计报告

(Source: Azustone Resources (T) Ltd, field work, 2023)

File	Composite Ore Topcut2001.str
String range	All
Variable	graphite
Number of samples	162
Minimum value	1.680000
Maximum value	37.000000
	Ungrouped Data
Mean	12.632455
Median	9.885000
Geometric Mean	10.160514
Variance	75.690535
Standard Deviation	8.700031
Coefficient of variation	0.688705
Moment 1 About Arithmetic Mean	0.000000
Moment 2 About Arithmetic Mean	75.690535
Moment 3 About Arithmetic Mean	862.039833
Moment 4 About Arithmetic Mean	22571.212077
Skewness	1.309076
Kurtosis	3.939778
Natural Log Mean	2.318509
Log Variance	0.445156
10.0 Percentile	4.365000
20.0 Percentile	6.219001
30.0 Percentile	6.980000
40.0 Percentile	8.530000
50.0 Percentile (median)	9.885000
60.0 Percentile	11.305000
70.0 Percentile	13.720001
80.0 Percentile	18.527000
90.0 Percentile	28.330000
95.0 Percentile	32.070000
97.5 Percentile	37.000000
Trimean	10.537500
Biweight	10.219975
MAD	3.869975
Alpha	-1.663200
Sichel-t	12.672242

Table 4.4 Statistical Report After topcut – 2022 Drill Program 顶切后统计报告

(Source: Azustone Resources (T) Ltd, field work, 2023)

4.2.2 Geostatistics 地质统计学

Geostatistics is a class of statistics used to analyze and predict the values associated with spatial or spatiotemporal phenomena. It incorporates the spatial (and in some cases temporal) coordinates of the data within the analyses.

Geostatistics is a branch of statistics focusing on spatial or spatiotemporal datasets. Developed originally to predict probability distributions of ore grades for mining operations. Geostatistical algorithms are incorporated in many places, including geographic information systems (GIS).

Geostatistics is a subdiscipline of spatial statistics. It includes a set of statistical methods that concern random variables with spatial and/or temporal variability (random fields). These variables represent physical quantities with economic or environmental importance. The methods are based on the assumption that the spatiotemporal variability includes a random component that has space–time correlation. Therefore, statistical measures such as mean value, variance, standard deviation, spatiotemporal dependence, etc., are used to extract any useful information from the available data. Geostatistics deals with distributions in which the spatial and/or temporal dependence is the primary characteristic. Geostatistical analysis aims to estimate the statistical parameters that determine the spatial and/or and dependence of the relevant variables. These parameters are used to estimate (interpolate) the variables at desired spatiotemporal locations where no measurements are available.

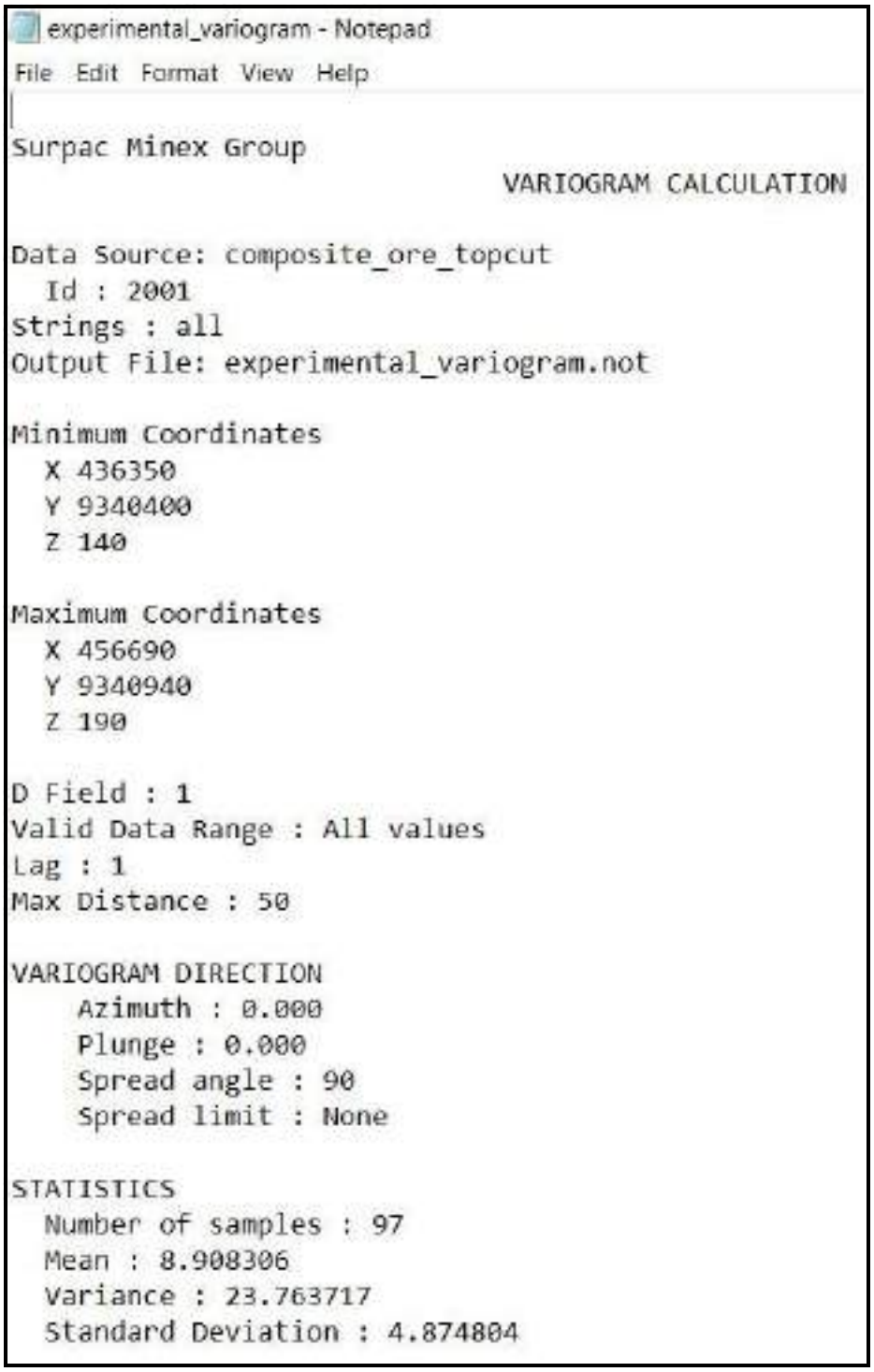
A variogram is an effective tool for describing the behavior of non-stationary, spatial random processes. It is used primarily in spatial statistics, geostatistics, and statistical design; In geostatistics, it is an “essential step” for analyzing spatial variability.

地质统计学是用于分析和预测与空间或时空现象相关的数值的一类统计学。它在分析中包含数据的空间坐标(在某些情况下是时间坐标)。

地质统计学是专注于空间或时空数据集的统计学的一个分支。最初用于预测采矿作业中矿石品位的概率分布。地质统计算法被纳入许多地方，包括地理信息系统(GIS)。

地质统计学是空间统计学的一个分支学科。它包括一套统计方法，涉及随机变量与空间和/或时间可变性(随机场)。这些变量代表具有经济或环境重要性的物理量。该方法基于时空变异性包含具有时空相关性的随机分量的假设。因此，使用均值、方差、标准差、时空相关性等统计方法，从现有数据中提取有用信息。地质统计学研究以空间和/或时间相关性为主要特征的分布。地质统计分析的目的是估计统计参数，这些参数决定了相关变量的空间和/或依赖性。这些参数用于估计(插值)在没有测量可用的所需时空位置的变量。

变异函数是描述非平稳、空间随机过程行为的有效工具。它主要用于空间统计学、地质统计学和统计设计;在地质统计学中，它是分析空间变异性的“必要步骤”



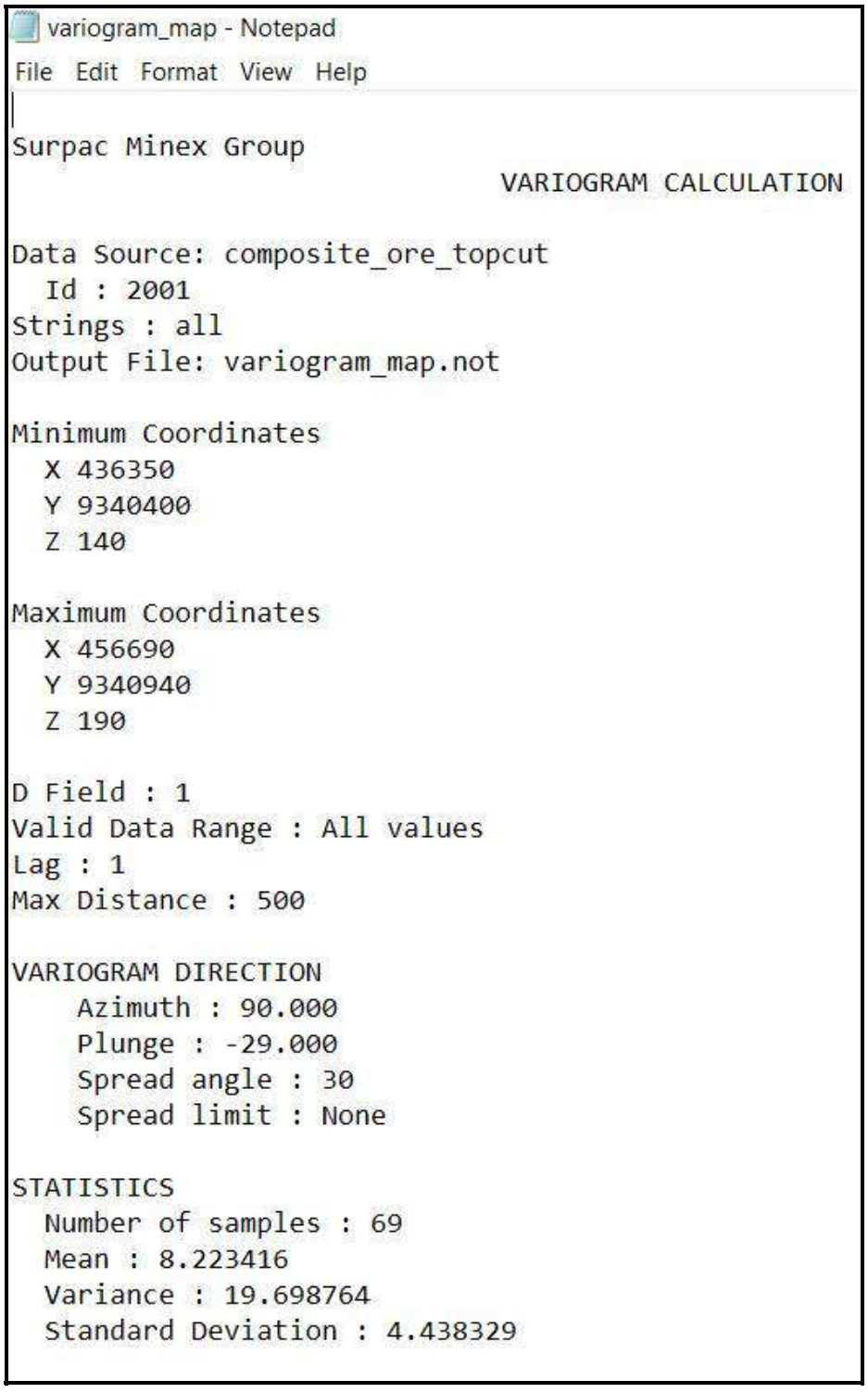
experimental_variogram - Notepad

File Edit Format View Help

```
Surpac Minex Group
                                        VARIOGRAM CALCULATION

Data Source: composite_ore_topcut
  Id : 2001
Strings : all
Output File: experimental_variogram.not

Minimum Coordinates
  X 436350
  Y 9340400
  Z 140

Maximum Coordinates
  X 456690
  Y 9340940
  Z 190

D Field : 1
Valid Data Range : All values
Lag : 1
Max Distance : 50

VARIOGRAM DIRECTION
    Azimuth : 0.000
    Plunge : 0.000
    Spread angle : 90
    Spread limit : None

STATISTICS
  Number of samples : 97
  Mean : 8.908306
  Variance : 23.763717
  Standard Deviation : 4.874804
```

Table 4.5 Experimental Variogram Report – 2022 Drill Program 实验变异函数报告

(Source: Azustone Resources (T) Ltd, field work, 2023)



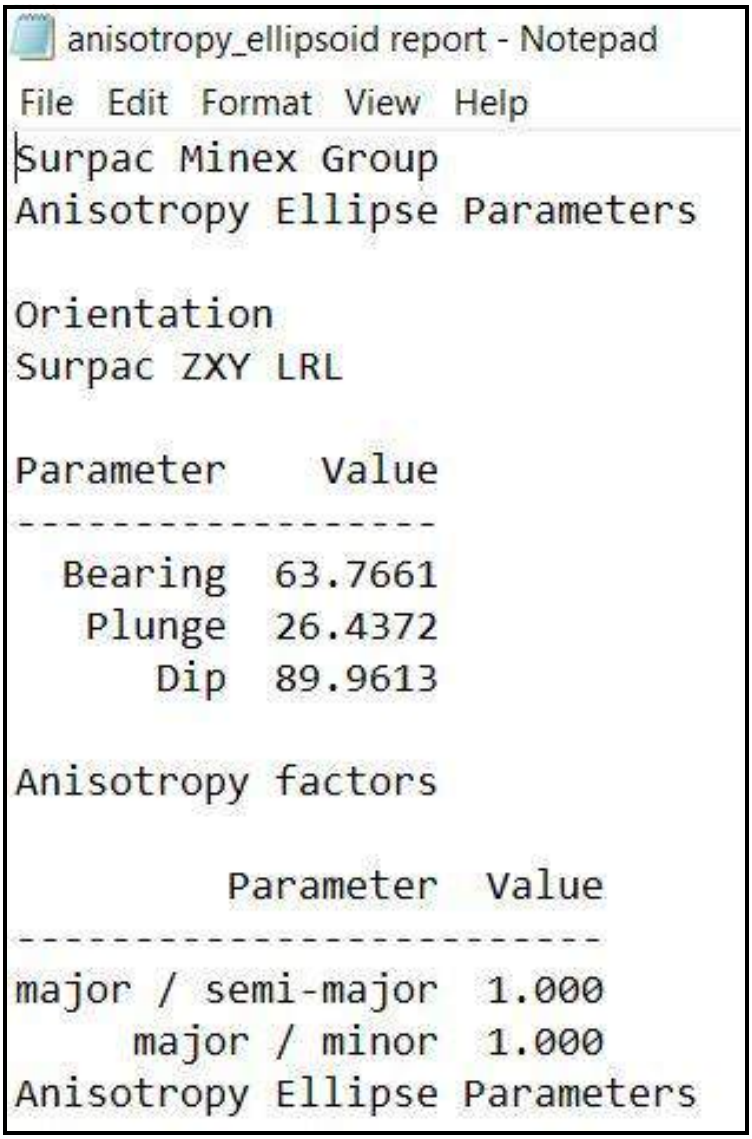
variogram_map - Notepad

File Edit Format View Help

```
Surpac Minex Group
                                    VARIOGRAM CALCULATION

Data Source: composite_ore_topcut
  Id : 2001
Strings : all
Output File: variogram_map.not

Minimum Coordinates
  X 436350
  Y 9340400
  Z 140

Maximum Coordinates
  X 456690
  Y 9340940
  Z 190

D Field : 1
Valid Data Range : All values
Lag : 1
Max Distance : 500

VARIOGRAM DIRECTION
    Azimuth : 90.000
    Plunge : -29.000
    Spread angle : 30
    Spread limit : None

STATISTICS
  Number of samples : 69
  Mean : 8.223416
  Variance : 19.698764
  Standard Deviation : 4.438329
```

Table 4.6 Variogram Map report – 2022 Drill Program 变异函数图报告

(Source: Azustone Resources (T) Ltd, field work, 2023)



anisotropy_ellipsoid report - Notepad

File Edit Format View Help

```
Surpac Minex Group
Anisotropy Ellipse Parameters

Orientation
Surpac ZXY LRL

Parameter    Value
------------------
  Bearing  63.7661
   Plunge  26.4372
      Dip  89.9613

Anisotropy factors

         Parameter  Value
--------------------------
major / semi-major  1.000
     major / minor  1.000
Anisotropy Ellipse Parameters
```

Table 4.7 Anisotropy ellipsoid Report – 2022 Drill Program 各向异性椭球报告

(Source: Azustone Resources (T) Ltd, field work, 2023)

4.3 Block Modelling 块建模

In mining, the geological block model is the foundation of any mining project as it contains all the grade and material information for the mining deposit. The success and failure of a mining operation can rest largely on how the block model is used to evaluate mineral assets.

In 2023, Azustone Resources (T) ltd calculated a mineral resource estimate ("Resource") on the Deposit for total graphitic carbon, based on the interpretation from the assays and drilling data.

Estimates were made from 3D block models utilizing commercial mine planning software (Surpac®). The Handeni Graphite project exists in a single geologic block model. Cell size was 50m east x 50m north x 25m high. The assays were composited into 2m down-hole composites, reflecting the predominant assay sample length. The compositing honored the modelling domain codes by breaking the composites on the domain code values.

Various coding was done for the block model in preparation for grade interpolation. Modelling consisted of grade interpolation by Inverse distance (OK). Nearest neighbor (NN) grades were also determined for validation purposes. The grade interpolation used an ellipsoidal search of 150 m x 150 m x 10 to 20 m in an NS-EW trending, westerly dipping ellipse. These parameters were based on the geological interpretation and variogram analysis. The number of composites used in estimating a model block grade followed a strategy that matched composite values and model blocks sharing the same ore code or domain. The first pass allowed composites from only one drill hole to be used (longer search distances) and the second pass, run at the shorter search distances, ensured that composites from at least two drill holes were used.

The graphite mineralization is found in both unconsolidated material (regolith) and in hard rock (crystalline limestone and graphitic gneiss). Data analysis demonstrated that the regolith and hard rocks should be treated as separate domains for the purposes of resource modelling. However, the two rock units (Crystalline limestone and Graphitic gneiss) were not distinguished from each other. The data comprised samples and geological information from 9 drill holes, which were used for the Resource calculations; trenches were not included during resources calculation. The mineral resource calculations for the Regolith and the rocks Resources, are as shown on Table 4.8 below.

在采矿中，地质块体模型是任何采矿项目的基础，因为它包含了采矿矿床的所有品位和物质信息。采矿作业的成败在很大程度上取决于如何使用区块模型来评估矿产资产。

2023年，Azustone Resources (T) ltd根据分析和钻孔数据的解释，对该矿床的总石墨碳进行了矿产资源估算(“资源”)。

利用商业矿山规划软件(Surpac®)通过3D区块模型进行估算。汉得尼石墨项目存在于单一地质块模型中。单元大小为东50米×北50米×高25米。分析被合成为2m的井下复合材料，反映了主导地位的分析样本长度。影像合成通过在域码值上打破合成来实现建模域码。

对块模型进行了各种编码，为品位插值做准备。建模包括用逆距离进行等级插值(OK)。为了验证目的，还确定了最近邻(NN)品位。坡度插值采用150m x 150m x 10 - 20 m椭球搜索，呈南北-东西向，偏西倾斜椭圆。这些参数基于地质解释和变异函数分析。用于估算模型块级的复合材料数量遵循一种策略，即使复合材料值与共享相同矿石代码或域的模型块相匹配。第一次测试只允许使用来自一个钻孔的(更长的搜索距离)，而第二次测试的搜索距离更短，确保至少使用来自两个钻孔的复合材料。

石墨矿化既存在于疏松物质(风化层)中，也存在于坚硬岩石(结晶石灰石和石墨片麻岩)中。数据分析表明，为了资源建模的目的，应将风化层和硬岩石视为单独的领域。然而，这两种岩石单元(晶状石灰岩和石墨片麻岩)并没有相互区分。数据包括来自 9 个钻孔的样品和地质信息，用于资源计算;在资源计算中没有计算沟槽。风化层和岩石资源的矿产资源计算如下表 4.8 所示

grade_tonnage - Notepad

File Edit Format View Help

Semcom Software International

Block model report

Constraints used

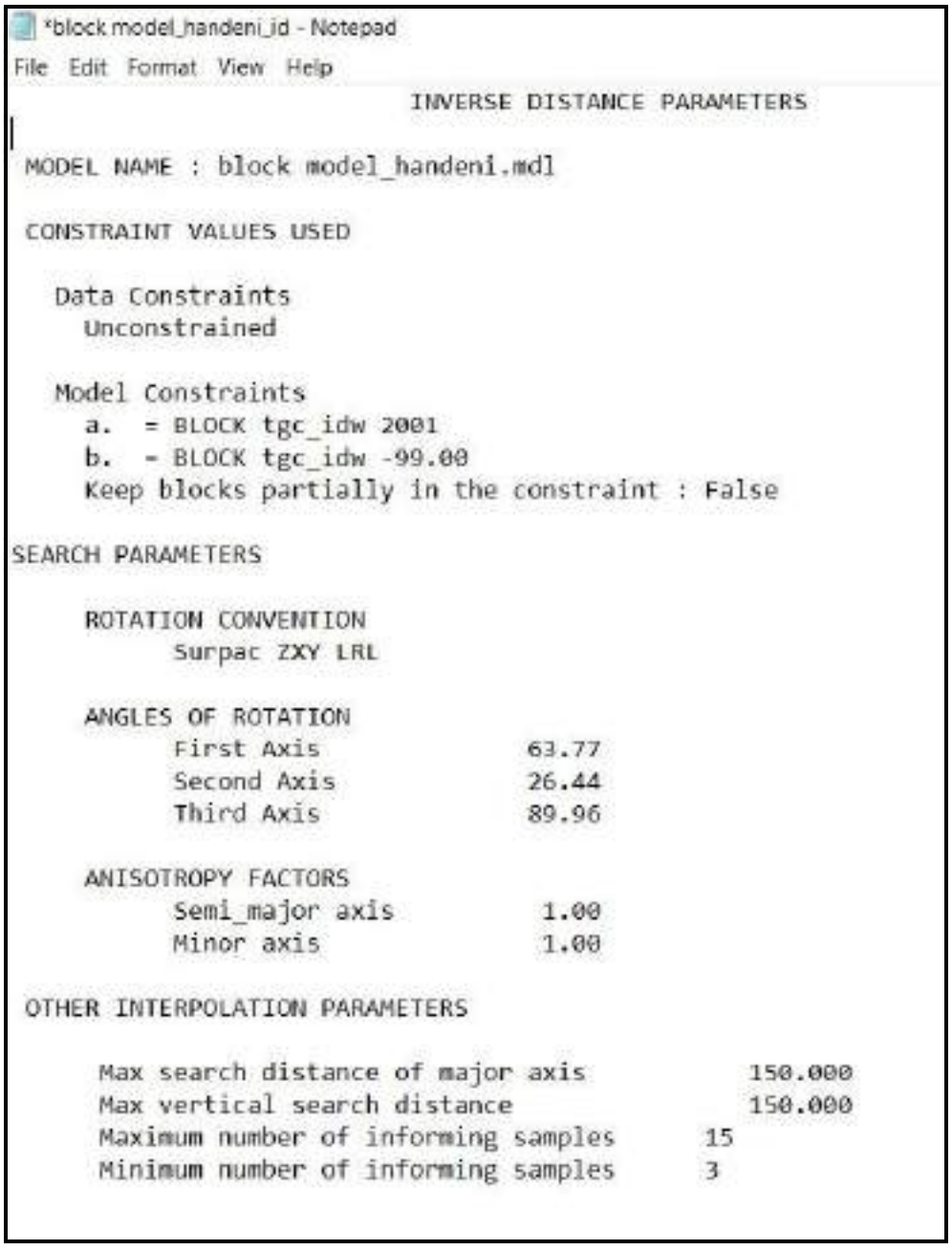
a. - BLOCK domain 2001

Keep blocks partially in the constraint : False

Tgc Idw	Volume	Tonnes	Tgc Idw
0.0 -> 1.0	0.00	0.00	0.00
1.0 -> 2.0	0.00	0.00	0.00
2.0 -> 3.0	0.00	0.00	0.00
3.0 -> 4.0	0.00	0.00	0.00
4.0 -> 5.0	0.00	0.00	0.00
5.0 -> 6.0	437500.00	1137500.00	5.20
6.0 -> 7.0	0.00	0.00	0.00
7.0 -> 8.0	0.00	0.00	0.00
8.0 -> 9.0	437500.00	1137500.00	8.21
9.0 -> 10.0	375000.00	975000.00	9.56
10.0 -> 9999.0	500000.00	1300000.00	23.49
Grand Total	1750000.00	4550000.00	12.11

Table 4.8 Grade Tonnage Report – 2022 Drill Program 品位吨位报告

(Source: Azustone Resources (T) Ltd, field work, 2023)



*block model_handeni_id - Notepad

File Edit Format View Help

```
                          INVERSE DISTANCE PARAMETERS

MODEL NAME : block model_handeni.mdl

CONSTRAINT VALUES USED

  Data Constraints
    Unconstrained

  Model Constraints
    a.  = BLOCK tgc_idw 2001
    b.  - BLOCK tgc_idw -99.00
    Keep blocks partially in the constraint : False

SEARCH PARAMETERS

    ROTATION CONVENTION
          Surpac ZXY LRL

    ANGLES OF ROTATION
          First Axis              63.77
          Second Axis             26.44
          Third Axis              89.96

    ANISOTROPY FACTORS
          Semi_major axis          1.00
          Minor axis               1.00

OTHER INTERPOLATION PARAMETERS

     Max search distance of major axis          150.000
     Max vertical search distance               150.000
     Maximum number of informing samples     15
     Minimum number of informing samples     3
```

Table 4.9 Inverse Distance Parameters– 2022 Drill Program 逆距离参数

(Source: Azustone Resources (T) Ltd, field work, 2023)

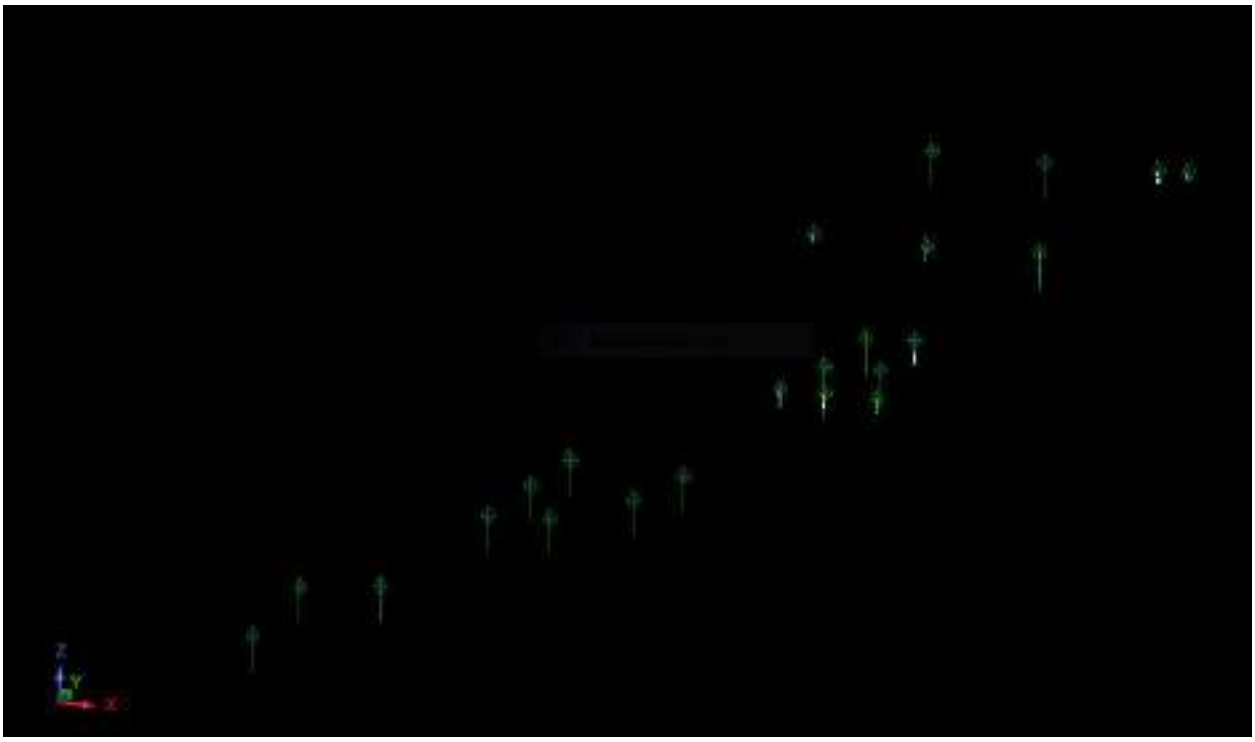


Figure 4.5: Boreholes in Oblique View, Handeni Graphite Project 斜视图钻孔

(Source: Azustone Resources (T) Ltd, field work, 2023)

Figure 4.6: BHDD05 and BHDD06 Crosection5 号孔和 6 号孔横截面

(Source: Azustone Resources (T) Ltd, field work, 2023)

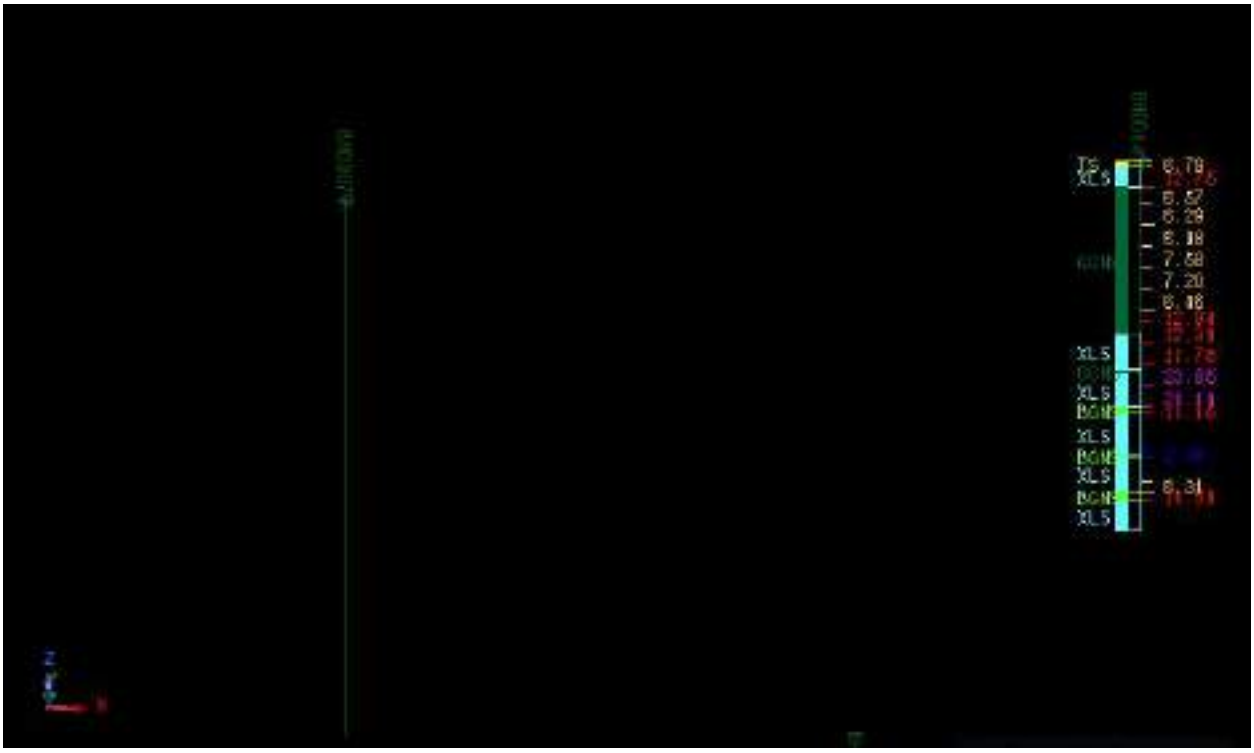


Figure 4.7: BHDD07 and BHDD08 Crossection, Handeni Graphite Project7 号和 8 号孔横截面

(Source: Azustone Resources (T) Ltd, field work, 2023)

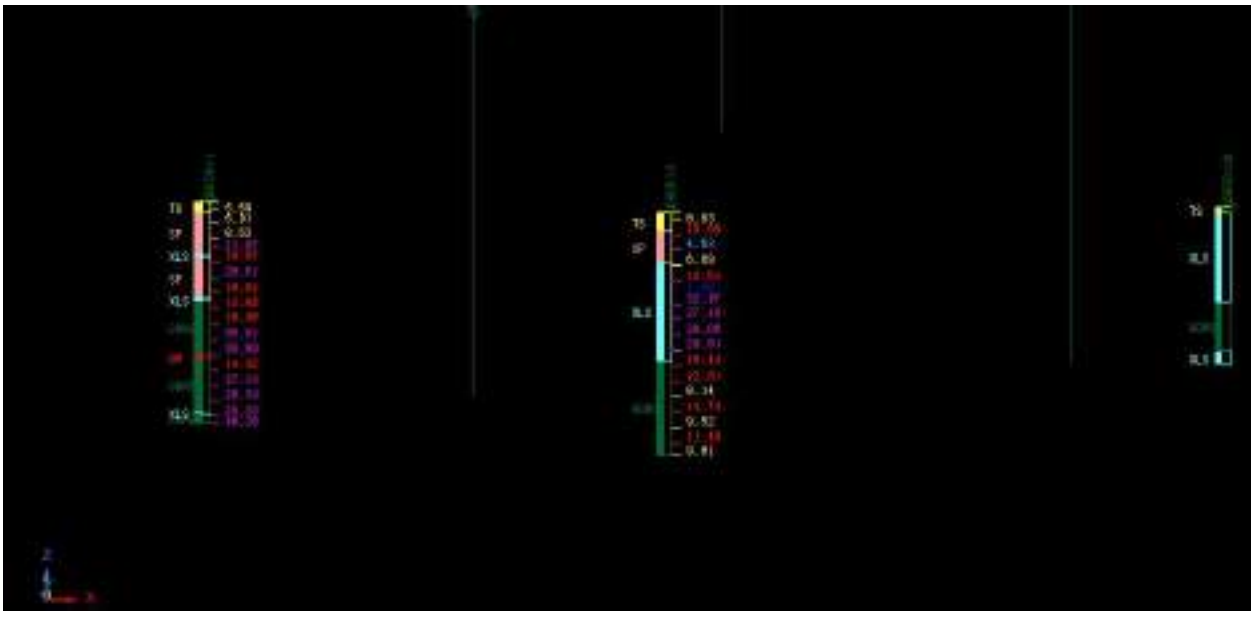


Figure 4.8: BHDD11, BHDD12 and BHDD12B, Crosection, Handeni Graphite Project11 号和 12 号，12B 横截面.

(Source: Azustone Resources (T) Ltd, field work, 2023)

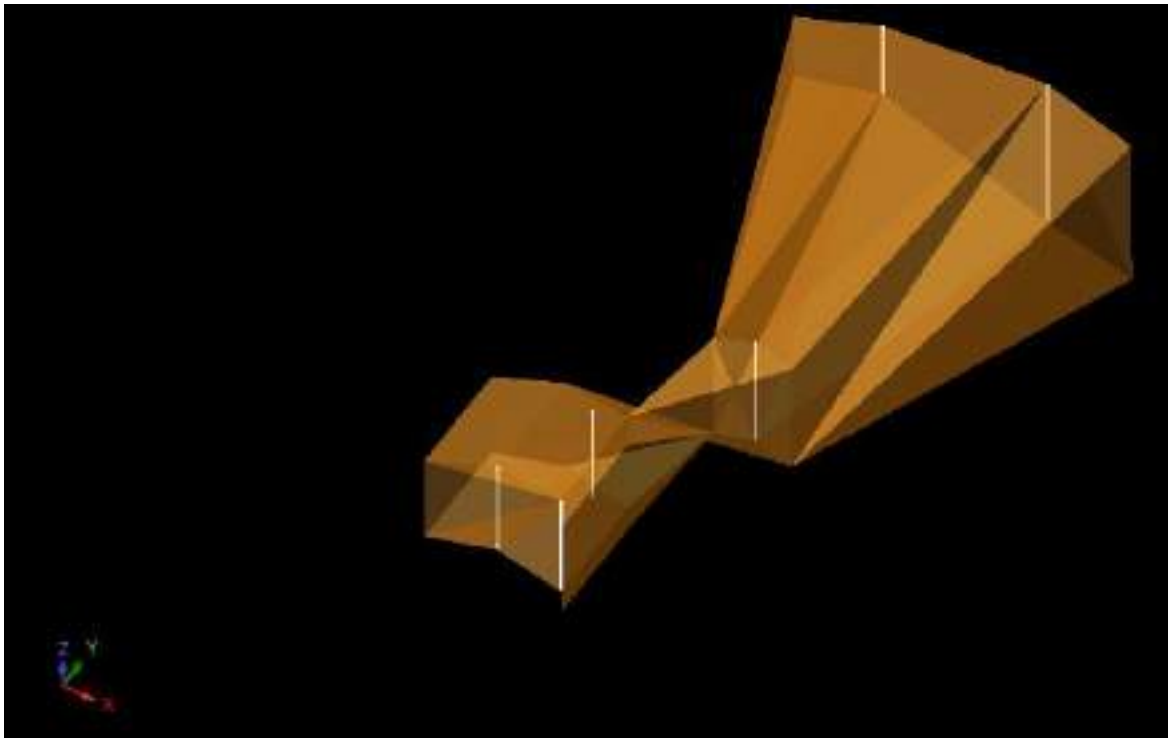


Figure 4.9: Ore Solid Intersection, Handeni graphite Project 矿石固体交叉.

(Source: Azustone Resources (T) Ltd, field work, 2023)

Figure 4.10: Solid Orebody, Handeni Graphite Project 矿石实体模型

(Source: Azustone Resources (T) Ltd, field work, 2023)

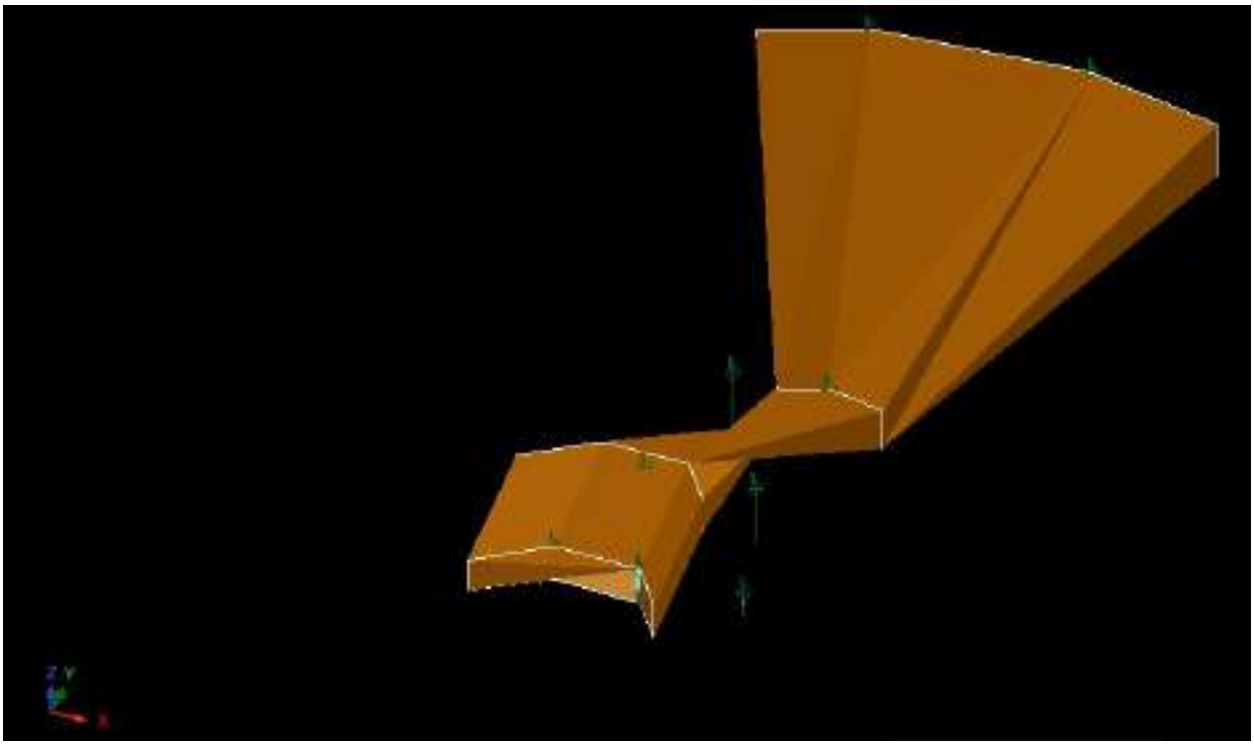


Figure 4.11: Solid Orebody, Handeni Graphite Project (Zoomed In) 矿石实体模型

(Source: Azustone Resources (T) Ltd, field work, 2023)

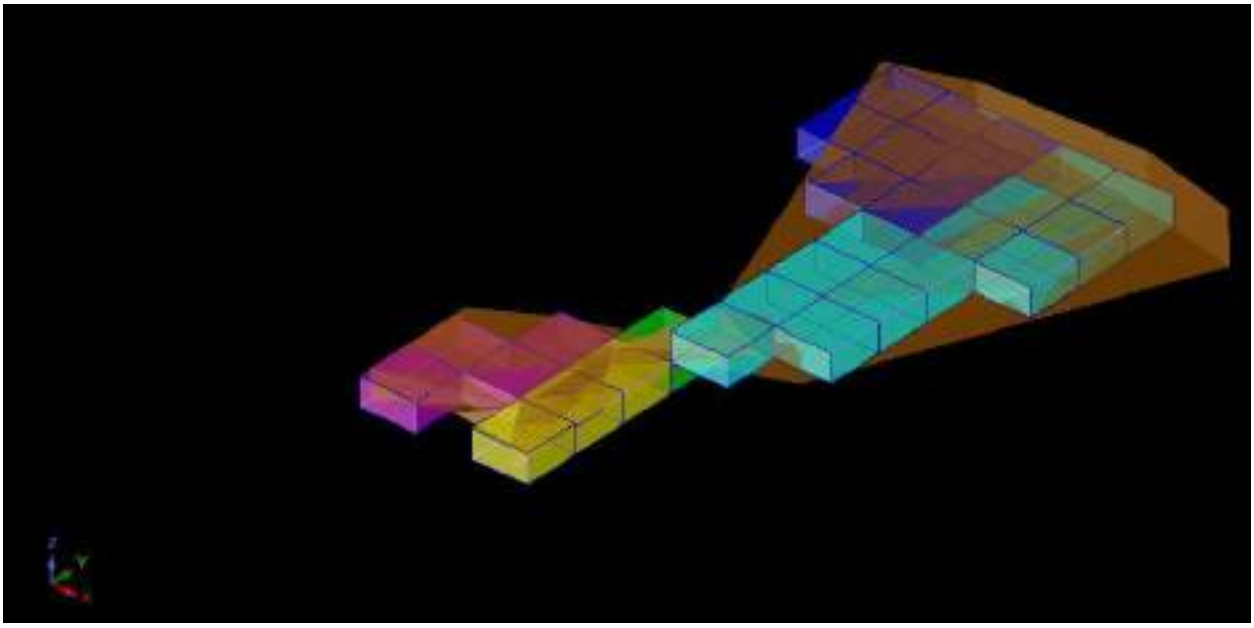


Figure 4.12: Final Ore Block Model, Handeni Graphite Project (Zoomed In) 最终矿石实体模型

(Source: Azustone Resources (T) Ltd, field work, 2023)

4.4 Handeni Graphite Resource Classifications 汉得尼石墨资源分类

The terms Mineral Resource, Measured Mineral Resource, Indicated Mineral Resource, and Inferred Mineral Resource and their usage have the meaning ascribed by both the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") Standards on Mineral Resources and Reserves Definitions and Guidelines adopted by CIM Council on May 10, 2014 and Australasian Institute of Mining and Metallurgy "The JORC Code' the austalasian Code for reporting of Exploration results, Mineral resources and Ore reserves-2004

矿产资源、测量矿产资源、显示矿产资源和推断矿产资源及其用法具有加拿大矿业、冶金和石油协会(CIM) 2014年5月10日理事会通过的《矿产资源和储量定义及指南标准》和澳大拉西亚矿业和冶金协会"JORC规范"(澳大拉西亚勘探结果报告规范)所定义的含义。矿产资源和矿石储量——2004年

4.4.1 Inferred Resource 推断资源

- Low Level of confidence
- Information of limited or of uncertain quality; and
- Assumed geological and/or grade continuity

4.4.2 Indicated Resource 显示资源

- Reasonable Level of confidence
- Information gathered using appropriate techniques; and
- Assumed geological and/or grade continuity

4.4.3 Measured Resource 测定资源

- High Level of confidence;
- Detailed and reliable information gathered using appropriate techniques
- Confirmed geological and/or grade continuity; and
- Any potential for variation would be unlikely to materially affect economic viability.

4.4.1 推断资源

-缺乏自信；

-有限信息或不确定的质量;

-假定地质和/或品位连续性

4.4.2 显示资源

-合理的信心水平；

-使用适当技术收集的信息;

-假定地质和/品位级连续性

4.4.3测定资源

-高度自信;

-使用适当的技术收集详细和可靠的信息；

-确认地质和/或品位连续性;

-任何潜在的变化都不太可能对经济生存能力产生实质性影响。

Note: The Resource was calculated with a 5% Fixed Carbon cut-off grade and an average grade of 8%. The average bulk density that were= 2.3

注:该资源是以 5%的固定碳截止品位计算，平均品位为 8%。I 和岩石的平均容积密度值均为= 2.3

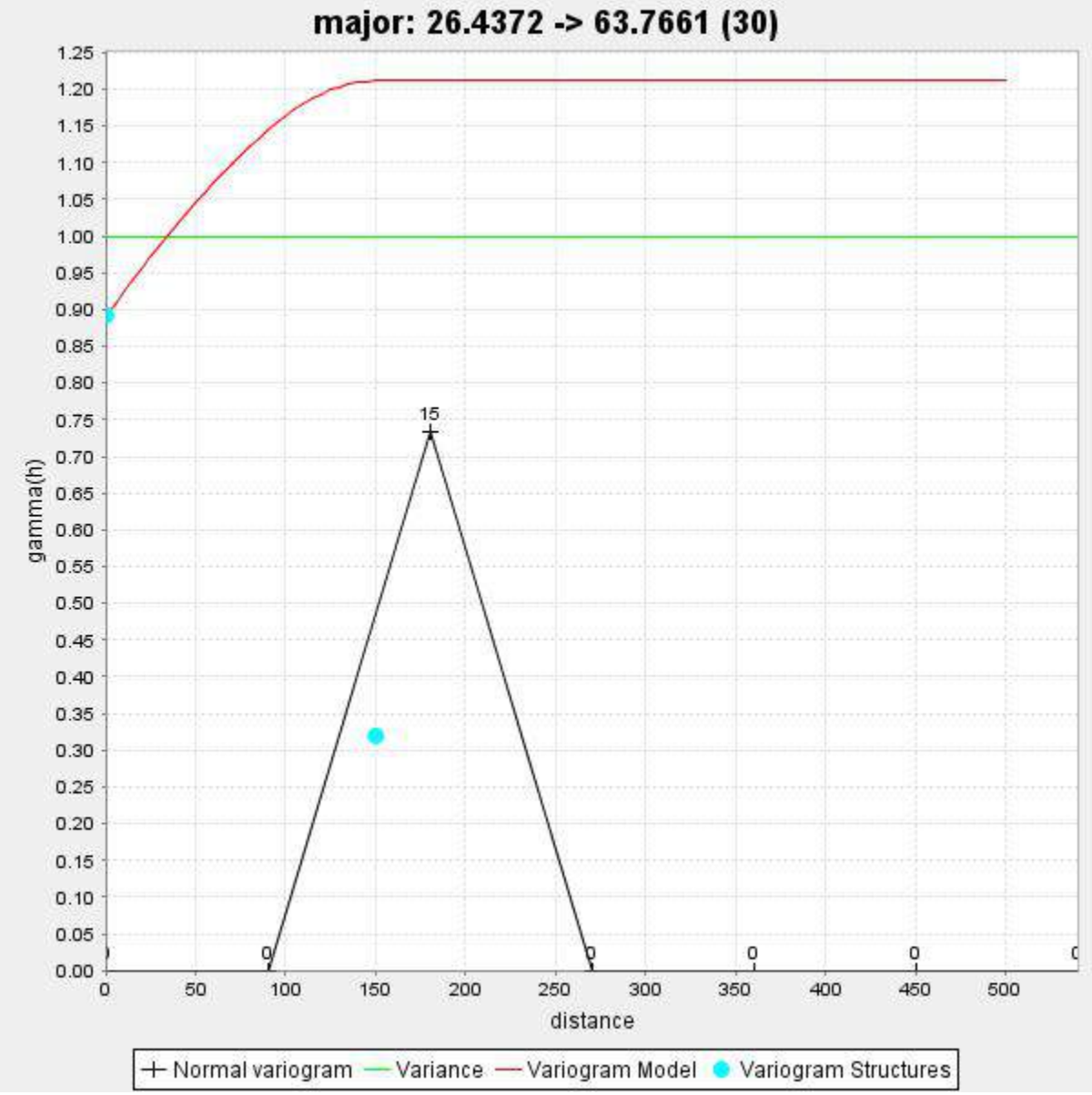


Figure 4.13: Major directional variogram calculated from the Data 主要方向变异函数由数据计算

(Source: Azustone Resources (T) Ltd, field work, 2023)

From the major directional variogram calculated from the data as shown on the diagram above. The long range is at 150m distance. Based on variogram, drilling spacing and experience we classify the material as indicated resources, inferred resources and measured resource. These guidelines assume all other criteria of the reporting codes are met and will require downgrading if there are risk in other areas. Hence it is considered as 43% indicated resource and 57% as measured resource, Table 4.10.

从上图所示的数据计算出的主要方向变异函数。长范围为 150 米。根据变异函数、钻孔间距和经验，我们将材料分为表明资源和推断资源。这些准则假定报告准则的所有其他标准都得到满足，如果在其他领域存在风险，则需要降级。你使用 57%的门槛来定义表明的资源，其余的将被归类为推断

Table 4.10: Resource Estimation and Categorization 资源估计和分类

Resource Category	Total Tonnes总吨数 4,550,000	TGC (Tons)含碳量吨数
Indicated (43%) 推断	1,974,000	157,920
Measured (57%)测量	2,576,000	206,080
TOTAL总计	2,576,000	364,000

(Source: Azustone Resources (T) Ltd, field work, 2023)

4.5 Handeni Graphite Reserve Estimation 汉得尼石墨储量估算

Graphite reserve estimates include graphite ore with the grade greater or egual to 5% as a cut off grade depth.

石墨储量估算包括品位大于或等于 5%的石墨矿石作为截止品位深度。

4.5.1 Reserve Calculation Consideration for Kwamsisi Graphite Project 夸米西西石墨项目储量计算考虑

- Average Thickness of graphite ore =20m 平均石墨厚度
- Length of the Drilled Area (measured) =800m 钻探区域脉长
- Length of the graphite resources = 1,800 石墨脉长
- Avarage width of the mineralized Area =70m 平均矿化宽度
- Specific Gravity of the graphite ore = 2.3 石墨矿石比重

The Resource was calculated with a 5% Fixed Carbon cut-off grade and the average grade of 8 % Fixed carbon. The average bulk density values for graphite ore is 2.3, and the average bulk density of the excavated material was used as 1.8, the total resource resources is 5,796,000 tons and the total minable ore is 2,576,000 tons. The mining operation is expected for 300days/year with daily mining capacity 1,800tons which will produce 100.8 graphite tons per day and annual mining capacity of 540,000 tons of graphite ore. The annual graphite production will be 32,400 tons. The expected mining life is 9 years but during mining operation the drilling operation will be continuing in order to update the graphite resources into graphite reserve, hence it is estimated the mining life will reach 15 years., table 4.11 bellow

资源是以 5%的固定碳截止品位和 8%的平均固定碳品位计算的。ligolith 和岩石的平均容积密度值均为 2.3，挖出物的容积密度值为 1.8，资源总量为 579.6 万吨，可采矿石总量为 257.6 万吨。预计开采 300 天/年，日开采能力 1800 吨，每天可生产 100.8 吨石墨，年开采能力 54 万吨石墨矿石，石墨年产量将达到 3.24 万吨。预计开采寿命为 9 年，但在开采过程中，钻井作业将继续进行，以将石墨资源更新为石墨储备，因此估计开采寿命将达到 15 年。如下表格 4.11

Table 4.11: Reserve Estimation Calculation 储量估算计算

No of PML	Length -m 长	Width -m 宽	Thickness -m 厚	Total Volume (m^3)体积	Specific Gravity (g/cm3) 比重	Tonnage (tons)吨	Avarage Grade-%平均品位	TGC 总碳含量
Graphite Resource 石墨资源	1,800	70	20	2,520,000	2.3	5,796,000	8	463,680
Graphite Reserve 石墨储量	800	70	20	1,120,000	2.3	2,576,000	8	206,080

5.0 MINING OPERATIONS 采矿作业

5.1 Mining Method Selection 采矿方法选择

At Kwamsisi area, exploration carried out so far has defined one major zones that hosts graphitic gneiss and graphitic crystalline limestone that can be commercially concentrated using physical methods, whose resources has been indicated in Table 4.10 above This zone hosts the high-grade graphite which have already been tested for physical concentration and proved successful.

在Kwamsisi地区，迄今为止进行的勘探已经确定了一个主要的区域，该区域含有石墨片麻岩和石墨结晶石灰石，可以使用物理方法进行商业浓缩，其资源已在上面的表4.10中列出。该区域含有优质石墨，已经进行了物理浓缩测试，并证明是成功的

Based on the metallurgical results obtained through a series of pilot plant tests and diamond drilling programs carried out, it is therefore, concluded that the mineable ore reserve so far defined is present.

因此，根据通过一系列中试试验和金刚石钻探方案获得的冶金结果，得出的结论是，目前确定的可开采矿石储量是存在的。

Whereas drill holes defined mineralization to a depth of 50m, it is therefore at this stage the mineable reserve is at maximum 25m below the ground surface.

虽然钻孔将矿化深度定义为 50m，但因此在这一阶段可开采储量最大在地表以下 50m

Based on the above information, there are two technically sound alternatives of exploiting the ore deposit; that is “Open Pit Mining”, and “Underground Mining”. However, underground mining will be excluded from further consideration because it will demand more resources and long lead times to develop the openings and facilities for mining and handling the ore. Whereas with surface mining, little development will be needed as high-grade ore is already available close to the ground surface which will require minimum development works to be completed before full production of the graphite commences.

根据上述资料，开采该矿床有两种技术上可靠的替代方案;即“露天采矿”和“地下采矿”。但是，地下采矿将被排除在进一步的考虑之外，因为它将需要更多的资源和较长的交货时间来开发开采和处理矿石的开口和设施。而在地表开采时，几乎不需要进行开发，因为接近地表的地方已经有高品位的矿石，在开始全面生产石墨之前，只需要完成最低限度的开发工作。

5.2 Open Pit Mining 露天开采

Open pit mining is a mining method in which the sought minerals are exploited from the surface downward after stripping out the top-soil which may not be part of the useful mineral. The

method utilizes heavy-duty equipment such as bulldozers, loading shovels, rear dump trucks, drilling rigs, etc., to recover the ore from the ground before sending it to the processing plant for beneficiation. The minerals are mined in sequence of benches, which are staged to conform to schedules of exploitation and to the general layout of the mineral deposit.

露天采矿是一种采矿方法，在剥离可能不是有用矿物的表层土壤后，从地表向下开采所寻找的矿物。该方法利用重型设备，如推土机、装填铲、后倾自卸车、钻机等，将矿石从地面回收，然后送到加工厂进行选矿。矿物是按台阶顺序开采的，按开采计划和矿床的总布局分阶段进行

Based on the geological model presented, a sequence of benches from the highest level to the bottom most level for an ore with cut-off grade of 5% TGC has been worked out. Based on the topography of Kwamsisi Graphite Project and the geometry of the orebody, it is logical to work out a deposit from the highest level downwards. Sequence of mining will be in such a way that, the highest bench is mined first followed by successive down ward benches which meet a criteria of having ore above the cut-off grade of 5% TGC.

根据所建立的地质模型，计算出了某矿石临界品位为5% TGC时，从最高到最底端的分段顺序。根据夸米西西石墨项目的地形和矿体的几何形状，从最高向下推断矿床是合乎逻辑的。采矿顺序将以这样的方式进行:**首先开采最高的**层，然后依次开采符合5% TGC临界值以上矿石标准的向下层。

Figure 3.1 shows the sequence of benches as seen from south to north of the Kwamsisi graphite mineralized zone.

图 3.1 显示了 Kwamsisi 石墨矿化带从南到北的台阶顺序

Figure 5.1: Cross section view of the Kwamsisi Benches as seen south to north (Red colour) 从南向北看夸米西西台阶的剖面图(红色)

The selected pit shell that best estimated the economic mining limit was used as the basis for final pits design

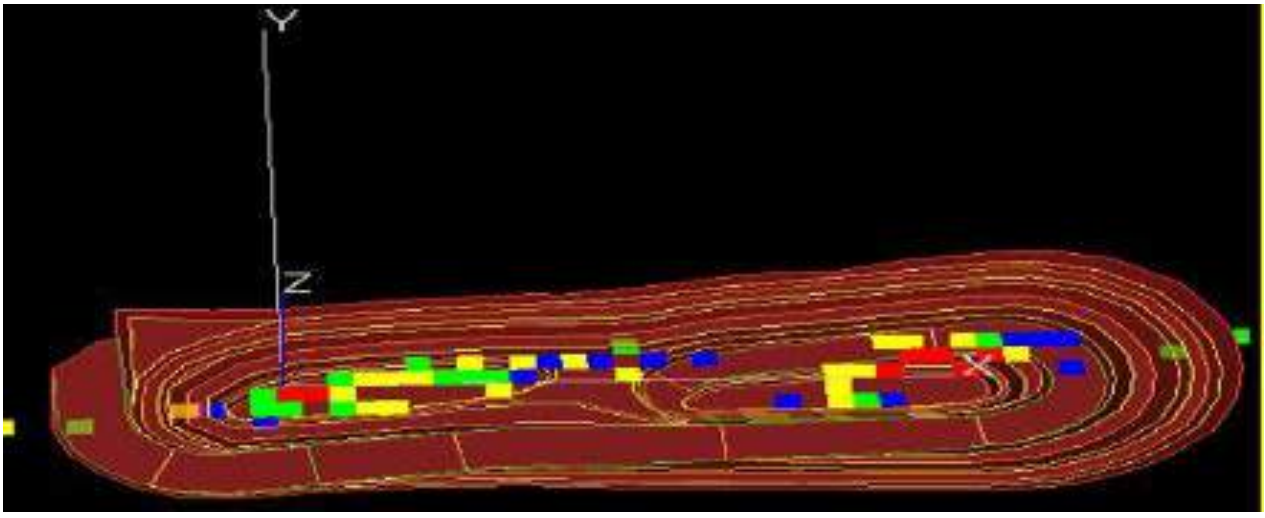


Figure 5.2: Final pit design, Kwamsisi graphite Project. 最终矿井设计

5.3 General Physical Conditions 总体实际条件

The Project area lies at an altitude of approximately 145 m above mean sea level (amsl) at the valley bottoms and 185 m amsl at the highest point. The area has a series of hilly-like terrain, with abruptly elevated hills to the central parts of the Project area.

项目区位于山谷底部海拔约130米，最高点海拔约200米。该地区有一系列丘陵状的地形，在项目区域的中部有陡然升高的山丘

The Project is located close to Mlingaji River that ultimately flows into Wami river located approximately southern portion of the Project.

该项目位于 Mlingaji 河附近，该河最终流入位于项目南部的 Wami 河

The local terrain is dominated by a rocky ridge (the Project ridge) that trends in a north-NE-SW direction through the Project Area at an elevation in excess of 185 metres above sea level (amsl). Steep-sided, narrow valleys are present on both flanks of the Project ridge.

当地地形以岩石山脊(项目山脊)为主，沿北-东北-西南方向穿过项目区域，海拔超过200米。项目山脊两侧都有陡峭狭窄的山谷。

The Project ridge comprises a sequence of steeply dipping, layered rocks that include crystalline limestones and few gneiss outcrops. The crystalline limestone comprises the high ground along the Project ridges, Figure 5.2.

项目山脊由一系列陡峭倾斜的层状岩石组成，其中包括结晶石灰石和少量片麻岩露头。结晶石灰石包括沿着工程山脊的高地，如图5.2所示。

Favourable location of the processing plant site with Kwamsisi Graphite Project being on the left is shown in Figure 5.3.

加工厂的有利位置如图 5.2 所示，Kwamsisi 石墨项目位于左侧

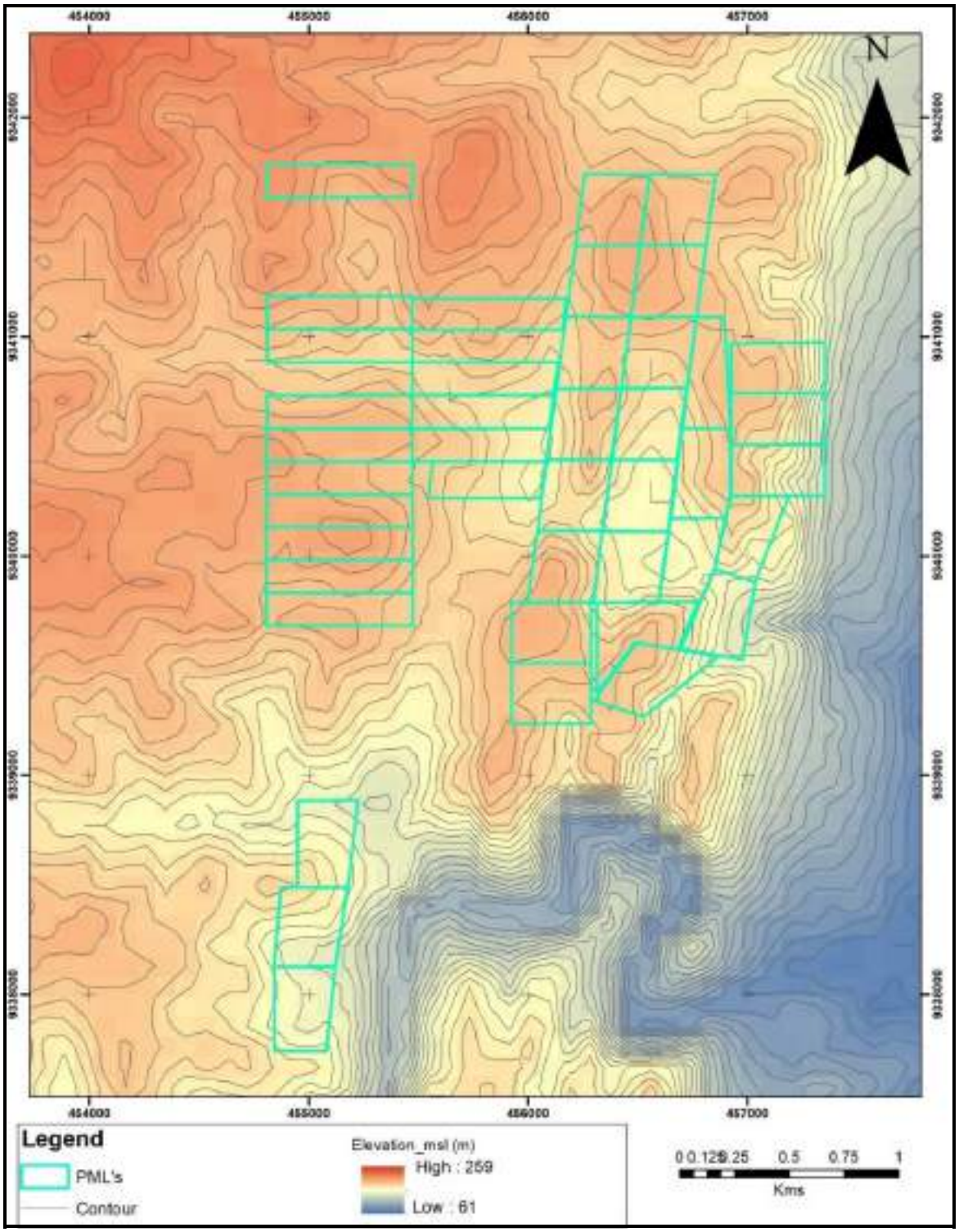


Figure 5.3: Topography of Kwamsisi PML's, Kwamsisi Graphite Project, Handeni 采矿方法选择夸米西西 PML 的地形，夸米西西石墨项目

Source: (Azustone Resources Tanzania Ltd, 2020

5.4 Mine Equipment Selection and Sizing 矿山设备选型

5.4.1 Mine Parameters 矿山参数

The open pit to be opened at Kwamsisi Graphite Project will conform to parameters identified in the geological model to be able to recover the valuable minerals with minimal dilution and according to a planned schedule.

将在 Kwamsisi 石墨项目开掘的露天矿坑将符合地质模型中确定的参数，以便能够按照计划的时间表以最小的稀释程度回收有价值的矿物。

The following parameters will therefore be applied at Kwamsisi Graphite deposit:因此，下列参数将适用于 Kwamsisi 石墨矿床:

(i) Technically the bench height will be fixed to 5m to conform with the geological model constructed for this deposit. The model used 5m benches to define the deposit over a 50m depth. Since bench heights are dictated by the size of the loading and transport equipment, loading equipment to work over a 5m bench will be large for the size of the mining operations planned for the Kwamsisi graphite project. Normally, 5m benches are worked by shovels with bucket capacities of 10 cum. In this Kwamsisi graphite Project case one 5-m benches will be worked successively with a 5m berm..从技术上讲，工作台高度将固定为 5 米，以符合为该矿床构建的地质模型。该模型使用 5 米长的工作台来定义 50 米深的沉积物。由于工作台的高度由装载和运输设备的大小决定，在 5 米工作台上工作的装载设备对于计划用于 Kwamsisi 石墨项目的采矿作业的规模来说是很大的。通常情况下，5 米长的工作台是用铲斗容量为 10 厘米的铁铲进行作业的。在 Kwamsisi 石墨项目案例中，一个 5 米长的长凳将与一个 5 米长的护堤一起连续工作。

(ii) Bench width will be variable but not less than 3m.工作台宽度可变，但不小于 3 米

(iii) The overall pit slope will be approximately 65-80 degrees depending on how competent an individual sector of the pit is. The rock is relatively stable and high walls can withstand blast vibration 整个矿坑的坡度大约为 65-80 度，这取决于矿坑的各个部分的能力。岩石相对稳定，高墙可以承受爆破振动

(iv) The thickness of the top soil (waste) to be stripped out before mining of the fresh ore rock is estimated to be less than 1.00m 在开采新矿岩之前要剥离的表土(废料)厚度估计小于 1.00 米

(v) Since bench heights are based on 5m lifts, drilling depth will therefore be 6m to account for sub-drill to avoid hard toe when the excavator digs the blasted material.由于工作台高度以 5 米升降机为基础，因此钻孔深度将为 6 米，以考虑到副钻，以避免挖掘机挖掘爆破材料时硬趾。

(vi) The mining area is considered to be well drained and hence there will be no mine drainage costs in this study.本研究认为矿区排水良好，因此不存在矿井排水成本

(vii) The specific gravity of graphite ore is at an average of 2.3 whereas the loose bulk density is 1.8 tonnes/cum.原位岩石的比重平均为 2.5，而疏松体密度为 1.8 吨/cum。

(viii) The life of the mine has been calculated in as 9 years based on the quantities of the resource available at Kwamsisi Graphite Project. However, since economic projections of more than 10 year are normally unreliable due to the fast changes in technology worldwide, which is what is creating demand for the valuable minerals at Kwamsisi (Graphite), a mine life of 15 years has been assumed in this study.根据 Kwamsisi 石墨项目的可用资源数量，该矿山的寿命计算为 9 年。然而，由于全球技术的快速变化，超过 10 年的经济预测通常是不可靠的，这是对 Kwamsisi(石墨)有价值矿物的需求，因此本研究假设矿山寿命为 15 年。

(ix) The cut-off grade of the graphite is 5%TGC and daily material requirement for feeding the processing plant is 1,800t/d. The average feed grade of the material is taken as 8% TGC 石墨的截止品位为 5%TGC，加工厂日进料量为 1800t /d。原料的平均进料品位为 8%

5.4.2 Mine Operational Schedules 矿山作业时间表

Scheduling of the mining operation has taken into account the following factors:采矿作业的时序安排已考虑到下列因素:

(i) The climatic conditions of Handeni area, in which three months of February, March, and April are wet months. Minimal open pit mine activities will be taking place.汉得尼地区的气候条件，其中 2 月、3 月和 4 月的三个月是潮湿的月份。将进行最低限度的露天采矿活动。

(ii) Provision of time for service and maintenance for the mining equipment and the crushing plant.为采矿设备和破碎设备提供维修和保养的时间。

(iii) The processing plant will work for 1 shifts of 9 hours each for seven days a week for 50 weeks in a year. Two weeks in a year will be for major service of the processing plant. Minor services and repairs will be undertaken in between shifts. There will be a total of 300 working days for the processing plant.加工厂实行每班 9 小时，每周 7 天，一年工作 50 周。一年中的两个星期将用于加工厂的主要维修。小的维修和保养将在轮班之间进行。加工厂总共需要 300 个工作日。

(iv) The mine will be operating for one shift of 10 hours from Monday to Saturday with Sundays being days off. Sundays have been considered days off. The 12 days of public holidays per year will be compensated during the three months of closure of the mine due to wet weather condition. The three months of heavy downpour have been taken out of schedules for production. The total number of working days is therefore 300 Days/year 该矿将从周一到周六每班工作 10 小时，周日休息。星期天被认为是休息日。在矿山因天气潮湿而关闭的三个月期间，每年 12 天的公众假期将得到补偿。三个月的暴雨已经从生产计划中去除了。因此总工作天数为 300 天/年

5.4.3 Equipment Selection and Sizing 设备选型

Mine equipment selection and sizing are necessary to ensure the quantities of ore planned for the project are delivered to the processing plant in time taking into account schedules of maintenance and compatibility between equipment and machinery. Similarly, support equipment has to be identified and sized to ensure the conditions of roads, the pit and other operating environment do not prevent the key equipment from performing to their expected efficiency.矿山设备的选择和尺寸是必要的，以确保项目计划的矿石数量及时交付到加工厂，同时考虑到维护计划和设备与机械之间的兼容性。同样，必须确定辅助设备的大小，以确保道路、矿井和其他运行环境的条件不会妨碍关键设备发挥预期的效率。

5.4.4 Stripping Equipment Capacity 剥离设备能力

Stripping of topsoil and overburden is normally undertaken by the bulldozers. This equipment can easily negotiate steep slopes at easy and are quite robust and stronger enough to strip out waste material without requiring drilling and blasting of the waste cover. For the Kwamsisi Graphite resource, the graphitic gneiss and graphitic crystalline limestone is outcropping requiring minimal waste cover stripping. It is however assumed that a less than 1.00 m soil material may have been accumulated during the long time of in activity in the area.剥离表土和覆盖层通常由推土机进行。这些设备可以轻松通过陡峭的斜坡，而且相当坚固，足以剥离废料，而不需要钻孔和爆破废料盖。对于 Kwamsisi 石墨资源，石墨片麻岩和石墨结晶石灰石露头，只需要很少的废物覆盖层剥离。然而，假定在该地区长期的活动中可能积累了小于 1.00 米的土壤物质。

- ◊ A bulldozer of similar size and capacity to the CATD8N with single shank rippers and rakes blade type for uprooting trees and vegetation is chosen.选择与 CATD8N 推土机尺寸和容量相似的推土机，采用单柄开刀和耙式刀片，用于连根拔起树木和植被。
- ◊ Initially, since the work of clearing the area for road construction, plant site, stockpiles areas, etc., additional bulldozers will be hired.首先，在清理道路建设、厂址、库存等地区时，将追加使用推土机。
- ◊ One permanent bulldozer of same type and size will be purchased to work at the mine for several clean up duties on benches, etc., and to work on stockpiles at the processing plant and for raising embankments of a tailings dam.将购置一台相同型号和尺寸的永久性推土机，在矿山进行几次工作台清理工作，并在加工厂进行储存工作和提高尾矿坝的堤防。

5.4.5 Drilling Equipment Capacity 钻机设备能力

Drilling will be undertaken using a drill rig similar in size to that of Atlas Copco Rockdrill ROC 742 HC01, with dust collector, 170Hp, 2150 rpm and feed force of 20KN. Figure 5.2 shows an example of a mobile rock drill for Kwamsisi Graphite project. Diameter of holes to be drilled is taken as 48 mm. There will be approximately 1 airleg hand held jackhammers for use in secondary blasting of oversize boulders.钻机将使用与阿特拉斯 • Copco Rockdrill ROC 742 HC01 尺寸相似的钻机进行，并配有集尘器，170Hp, 2150 rpm，进给力为 20KN。图 5.2 显示了

Kwamsisi Graphite 项目的一个移动凿岩机示例。钻孔直径按 48mm 计算。将有大约 4 台气腿手持式手提手提钻用于超大卵石的二次爆破。

Plate 5.1: Example of a Mobile rock drill for Kwamsisi Graphite Project

The aim of drilling is to break the in-situ rock into sizable boulders, which can easily pass through the mouth (gape) of the primary crusher. Too much of the oversize boulders will increase the costs of secondary drilling & blasting and also slow the rate of production. Similarly, over-drilling and blasting will produce much fines which will be costly in terms of explosive costs and also will reduce the effective load required to be fed to the crusher.钻孔的目的是将原位岩石打碎成相当大的巨石，这些巨石可以很容易地通过主破碎机的口。过多的超大型砾石会增加二次钻爆成本，也会减慢生产速度。同样，过度钻孔和爆破会产生大量的细粉，这在炸药成本方面将是昂贵的，也会降低需要馈送到破碎机的有效载荷。

5.5 Drilling Pattern Design 钻孔模式设计

Conditions:

- Bench height: K = 5 m
- Width of round: w = 5 m
- Blasthole diameter: d = 48 mm
- Rock constant: c = 0.4
- Hole inclination: 3:1
- Explosive: Emulite 150 in 40 mm Plastic pipes dropped into hole
- Charging condition: Dry holes
- Charge concentration: l_b = 2.3 kg/m

➢ Maximum Burden: B_{max} = 1.45 x [Sqrt(l_b)]

= 1.45 x [Sqrt(2.3)] = 2.2 m

- Subdrilling: U = $0.3 \times B_{max}$

  = $0.3 \times 2.2 = 0.66$ m
- Depth of Blasthole: H = $1.05 \times [K + U]$

  = $1.05 \times [5 + 0.66]$ = 5.99 m
- Error in Drilling: E = $d/1000 + 0.03 \times H$

  = $48/1000 + 0.03 \times 5.99$ = 0.23 m
- Practical Burden: B = $B_{max} - E$

  = $2.2 - 0.23$ = 1.97 m
- Practical Spacing: S = $1.25 \times B$

  = 1.25×1.97 = 2.46 m
- Adjustment for width of the round:

  W / S = 30.0/2.46 = 12.2 = 12 spaces

  Sadj = width / [No. of spaces or row}

  = 30.0 / 12 = 2.5 m (n = 12 + 1)

Note that the number of holes in a row is the number of spaces + 1.

- Specific drilling:

  b = [n x H] / [B x K x w]

  = [13 x 5.99] / [1.97 x 5.0 x 30]

  = 77.87 / 295.5

  = 0.26 m/cum

  - This therefore, means that for every cubic meter of rock, 0.26 m of drilling has to be completed.

  - **A drilling pattern will be 2.5 m spacing x 1.97 m burden for 5.99 m holes. This can simply be put as [2.5 m x 2.0 m] for 6.0 m holes.**

  - Based on the Specific drilling of 0.26 m/cum, total amount of drilling to be undertaken per year to obtain a tonnage of 1,800 per day for 300 days in a year will be:
    - Tonnage per year = 1,800 t/d x 300 days = 540,000 t/yr
    - For specific gravity of rock of 2.3 corresponding volume of rock will be 207,692 cubic metres of rock.
    - Amount of drilling will therefore be 0.26 m/cum x 207,692 cum = 54,000 m per year
    - **For 6m holes, a total of 54,000/6 = 9,000 holes will be drilled per year.**

5.5.1 Drilling Rig working capacity 钻机工作能力

- For the number of days scheduled to operate the mine, 300 days/year, it is required to drill approximately:

  = 9,000 holes/ 300days/year = 30 holes/day

- Capacity for the Rig to drill:
  - ◊ An approximate penetration rate for a rock with uniaxial compressive strength of between 5,000 and 15,000 in which graphite lies, for 100 rpm, is approximately 40 ft/hour or (12.8m/hr). (Bauer & Calder, 1967 – Surface Mining, B.A. Kennedy, 1990, pg. 530)
  - ◊ Assuming that the Atlas Copco drill available will operate on the same rate, then we get the following:
  - ◊ Drilling time for the 6m hole = 6/12.8 = 28 min.
  - ◊ Manoeuvre time from one hole to the next = 5 min.
  - ◊ Cycle time = 28 + 5 = 33 min.
  - ◊ Number of holes to be drilled for a 10hr shift = 10 x 60/33 = 18 holes/shift

- This indicates that one drill rig will cope with the work load. In this case, one similar sized drill rigs will be able to drill at least 18 holes/day less than the required 30 holes/day to be able to match with the loading & haulage schedules.
- Two drilling rigs will therefore be purchased to cope with the required production.
- One air leg hand held jackhammers will also be acquired for secondary blasting, preferably Atlas Copco BBC16W
- Portable air compressor for use with air leg jackhammers for other general plant and workshop usage.

5.5.2 Loading Equipment Capacity 装载设备能力

There is a wide range of loading equipment type that can be purchased from the market depending on characteristics of the mine to which they will be operating. Loaders can either load from the top downwards with trucks parking on the lower bench (Backhoe excavators) or stay on the same bench where the truck is parked and load from there upwards (Shovels/excavators).根据将要作业的矿山的特点，可以从市场上购买各种类型的装填设备。装载机可以从顶部向下装载，卡车停放在较低的工作台上(反铲挖掘机)，也可以停留在卡车停放的同一工作台上，从那里向上装载(铲车/挖掘机)。

Bench heights of 5m are quite high to allow a backhoe to operate efficiently and safely loading a truck parked on the lower bench. Similarly, sighting problems will often arise as the operator of the loading equipment will be somehow out of sight from the truck driver.5 米的工作台高度相当

高，可以让反铲挖掘机有效和安全地操作，装载停在较低的工作台上的卡车。同样，由于装载设备的操作人员在卡车司机的视线之外，经常会出现视线问题。

A loading shovel is therefore selected in this case to allow efficient loading of the trucks.因此，在这种情况下，选择装载铲车，以便有效地卡车装载

- **If CAT 5080 Front Shovel** is selected, it can meet most of the conditions of the pit, since it has the following characteristics::如果选用 CAT 5080 型前铲，它可以满足矿坑的大部分条件，因为它具有以下特点:
    - ◊ A maximum reach of 9.53m,
    - ◊ Minimum reach of 5.59m,
    - ◊ Truck loading dump height of 5.64m
    - ◊ Bucket capacity of 4.2 cum. of rock loading
    - ◊ 40 seconds per cycle, with 90 cycles per hour.
    - ◊ Can therefore load approximately 4.2 x 90 = 378 m^3 per hour of loose material
    - ◊ For a loose density of 1.8 tonnes/m^3, approximately 378 x 1.8 = 680.4 tonnes per hour can be loaded assuming constant loading. For a 10-hour shift, a total of 6,804 tonnes can be loaded per day which is more than the required 540,000 tonnes per year/ 300 days/year, from the mine.
    - ◊ The planned annual production is at 540,000 therefore one front shovel loader will be sufficient enough.

    - Two-wheel loaders, one for stockpile management and for feeding the crusher, and the second one for auxiliary duties such as tailings management, etc. Size and types similar to CAT966F, with 220Hp,

5.5.3 Haulage Equipment Capacity 运输设备能力

- ◊ Haulage equipment which are common and efficient for the case of Kwamsisi graphite project are mainly rear dump trucks. Considering that shovels of 4.2 m3 bucket capacity have been selected, trucks must be compatible with this type of loading equipment.
- ◊ Rule of Thumb require that for compatibility between trucks and shovels to exist, a shovel should be able to load a truck in five to six cycles. Therefore, 4.2m3 x 3.25 = 13.25 x 1.8 (loose density) = 24.57 tonnes.
- ◊ Hence 25-tonne trucks are chosen.
- ◊ The haul distance to the stockpile near the processing plant and back is approximately 30 minutes for a route of approximately 2 km long.
- ◊ For a 10 hour shift, the number of cycles to be made assuming availability factor of 75%, and a lunch time of 1 hour will be [10-1 hrs x 60minutes/30minutes] x 75% = 13 trips which is approximately 13 trips x 25t/trip = 325 tonnes/day

- For a target of 1,800 tonnes per day, number of trucks will be 1,800 t/ 325 = 6 trucks.

- IF the truck with loading capacity less than 25 tons will be used, the number of trucks should be increases.
- Any shortfall in production can be compensated with working in the dry days during the wet weather condition.

1)对于夸米西西石墨项目来说，常用且高效的运输设备主要是后倾自卸车。考虑到选用的铲斗容量为 4.2 m3，卡车必须与此类装车设备兼容。

2)根据经验法则，为了保证卡车和铲子之间的兼容性，铲子应该能够在 5 到 6 个循环内装载一辆卡车。因此，4.2m3 x 3.25 = 24.57 吨。

3)因此选择 25 吨的卡车。

4)2 公里左右的路线，从工厂附近的仓库到仓库的往返距离约为 30 分钟

5)对于 10 小时轮班，假设可用性系数为 75%，1 小时的午餐时间为[10-1 小时 x 60 分钟/30 分钟]x 75% = 13 次往返，大约是 13 次往返 x 25 吨/次= 325 吨/天

6)对于每天 1800 吨的目标，卡车数量将是 1800 吨/ 325= 6 辆卡车。

7)如使用载重低于 25 吨的卡车，应增加卡车数量。

8)任何产量上的不足都可以在潮湿的天气条件下在干燥的日子里工作来弥补。

5.5.4 Mine Service Equipment Capacity

Important mine service equipment to be purchased by the company include the following:

Table 5.1: Mining Equipment Fleet 采矿设备清单

SN	EQUIPMENT TYPE	NO. OF UNITS
1.	Bulldozer ripper, CATD8N with shank ripper 推土机	1 units
2.	Rock drill, model ROC 742 HC01 钻机	1 units
3.	Air leg jackhammers, type BBC16W	1 units
4.	Portable Air Compressor, Atlas Copco XA175 空气压缩机	1 unit
5.	Front Shovel, Model CAT5080, 4.2m^3 bucket 前铲	1 units
6.	Wheel loader, Model CAT966F 装载机	2 units
7.	Haulage trucks, SHACMAN, 25 tonne capacity 卡车	6 units
10.	Water Bouser, 20 tonne capacity	1 unit

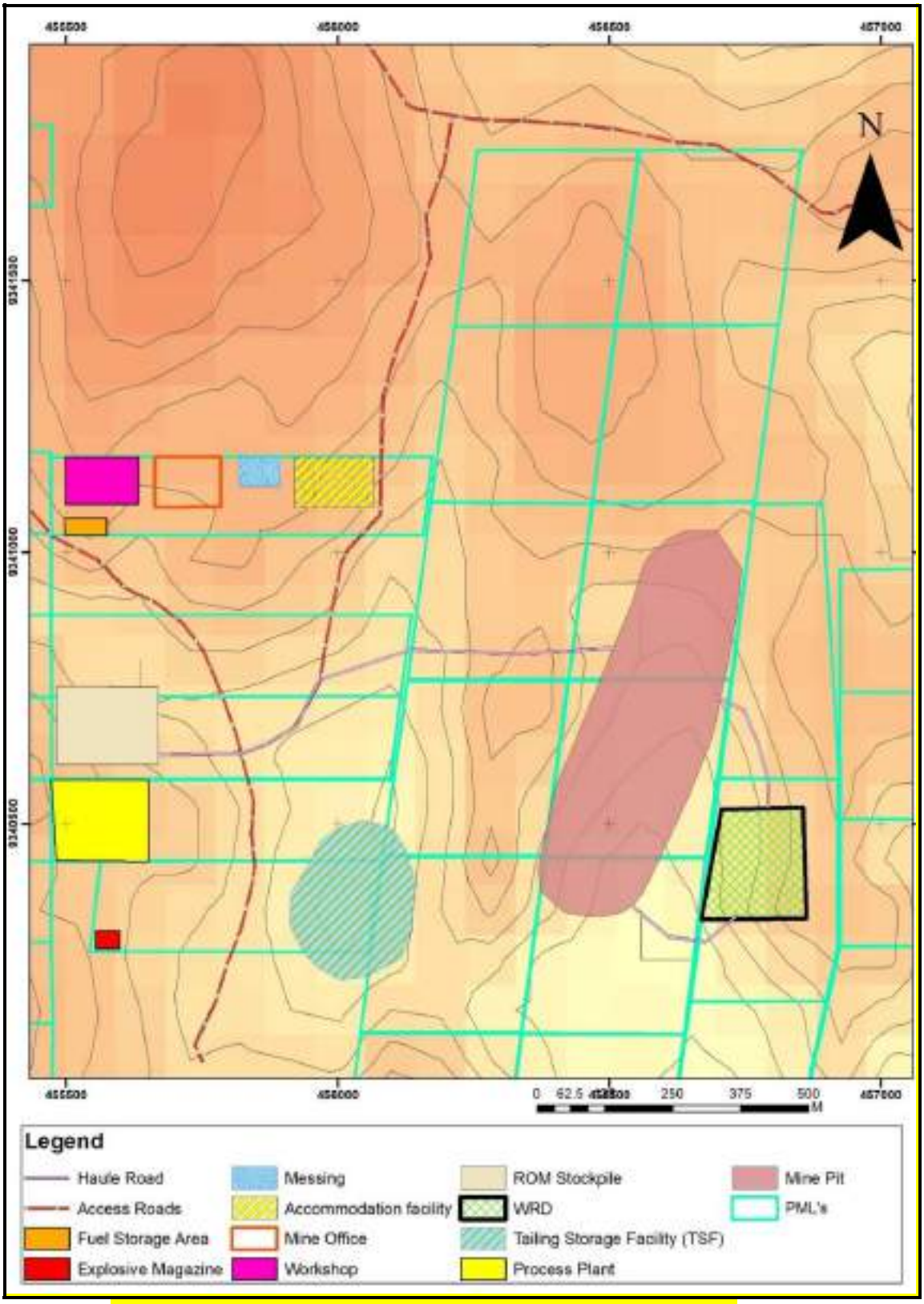


Figure 5.3: Site Layout view, Kwamsisi Graphite Project.

6. GRAPHITE ORE PROCESSING 石墨矿石加工

The commercial objective of the Kwamsisi Graphite Project operation is to market a merchant grade (>5% TGC) concentrate of graphite ore containing with high recovery.

石墨项目运营的商业目标是销售一种商业级(5% TGC)高回收率石墨精矿。

6.1 Graphite Processing 石墨加工

Graphite ore include amorphous graphite and flaky graphite. Amorphous graphite also calls cryptocrystalline graphite. This ore has small graphite crystal and generally have high grade, general but its floatability is bad. After flotation, the grade has no remarkable increase. The feature of Kwamsisi graphite is the graphite present as flaky or foliated, raw ore grade is around 1.6 to 55% TGC with the average grade of 8% TGC. This graphite ore has good floatability and grade can up to 95% after flotation. So, raw ore grade with 5% can be mined. Flaky graphite has good performance and can be used to make advanced carbon product.

石墨矿石包括无定形石墨和片状石墨。非晶石墨又称隐晶石墨。该矿石石墨晶体小，品位一般较高，但可浮性较差。浮选后品位无明显提高。Kwamsisi石墨的特点是石墨呈片状或叶状，原矿品位为1.6 ~ 55% TGC，平均品位为8% TGC。该石墨矿石可浮性好，浮选后品位可达95%以上。因此，原矿品位为5%可开采。片状石墨具有良好的性能，可用于制造高级碳素制品。

Flaky graphite has good floatability, so mostly use flotation to select. In China, they generally use the kerosene or diesel as collector, oil or new flotation oil as foaming agent. After many years production practice oil are considered as ideal foaming agent for graphite.

片状石墨具有良好的可浮性，所以多采用浮选法进行选择。国内一般采用煤油或柴油作为捕收剂，油或新型浮选油作为发泡剂。经过多年的生产实践，油被认为是理想的石墨发泡剂。

Generally, cryptocrystalline graphite associate with mica etc silicate minerals. When flotation, can use starch, dextrin, organic glue, cellulose, etc agent to control the silicate minerals, for example, if the pyrite content is high, add lime and oxide.

隐晶石墨一般与云母等硅酸盐矿物有关。浮选时，可采用淀粉、糊精、有机胶、纤维素等药剂控制硅酸盐矿物，如黄铁矿含量较高，可加入石灰和氧化物

6.1.1 Multistage grinding multistage flotation 多级磨矿多级浮选

To prevent graphite flakes from breaking, multistage grinding multistage flotation process will be used. After multi grinding and flotation, the concentrated graphite will meet the requirements.

为防止石墨薄片破碎，采用多级研磨多级浮选工艺。经过多次研磨和浮选，浓缩石墨达到要求。

6.1.2 Gravity and flotation united process 重力与浮选联合工艺

For graphite associated with heavy mineral, generally use gravity and flotation united process to select, that use gravity separation to separate heavy mineral firstly, then use flotation to process the light mineral.

对于伴生重矿物的石墨，一般采用重浮选联合工艺进行筛选，即先采用重选分离重矿物，再采用浮选处理轻矿物。

6.1.3 Detailed crystalloid graphite mineral processing flowsheet 详细的晶体石墨选矿流程.

Generally, graphite ore's hardness is medium hard or medium hard soft, grade is between 2-10%, crushing process is simple, use three-stage open circuit, two-stage open circuit or one-stage crushing flowsheet. Flotation processes include multistage grinding, multistage selection, middling's return in order or concentrated. Multistage process has three forms, that is concentrate regrinding, middling's regrinding, tailings regrinding. Crystalloid graphite most use concentrate regrinding process, normally, the recovery ratio can up to around 95%.

一般石墨矿石的硬度为中硬或中硬软，品位在2- 10%之间，破碎工艺简单，采用三级开路、两级开路或一级破碎流程。浮选工艺包括多级磨矿、多级选矿、中矿有序或集中回矿。多级工艺有精矿再磨、中矿再磨、尾矿再磨三种形式。晶体石墨多采用精矿再磨工艺，一般回收率可达90%左右。

For further purification of a graphite concentrate to natural high purity graphite products with carbon contents of up to 99,99 wt.-% advanced chemical and thermal processes have to be applied.

为了进一步将石墨精矿提纯为碳含量高达 99.99 wt -%的天然高纯石墨产品，必须采用先进的化学和热工艺

Several procedures for purification of graphite concentrates are available. A basic process is thermal treatment in the presence of caustic reagents to dissolve siliceous impurities such as quartz, feldspar or mica. The graphite flotation concentrate is mixed with caustic reagent and baked at elevated temperatures. After baking the graphite is leached with water to wash away dissolved impurities.

提纯石墨精矿有几种方法。一种基本的工艺是在腐蚀性试剂的存在下进行热处理，以溶解硅质杂质，如石英、长石或云母。将石墨浮选精矿与苛性试剂混合，在高温下焙烧。烘烤后，石墨用水浸出以洗去溶解的杂质。

In case ultimate purity levels are targeted, the more finely intergrown mineral phases residing in between the graphite layers, have to be removed. Typically, an additional one or multi-stage

如果最终纯度水平的目标，更精细的共生矿物相居住在石墨层之间，必须被去除。通常，使用不同的酸或其组合进行额外的一段或多段酸洗，以去除在碱性条件下不溶的杂质。

最佳的反应条件和试剂使用必须考虑到各自石墨精矿中存在的杂质的类型和水平、目标产品质量、市场以及最终的工艺经济

acid washing with different acids or combinations thereof to remove impurities that are insoluble at alkaline conditions, is applied.

Optimal reaction conditions and reagent uses have to be matched by considering type and level of impurities present in the respective graphite concentrate, targeted product quality, markets and finally economics of the process.

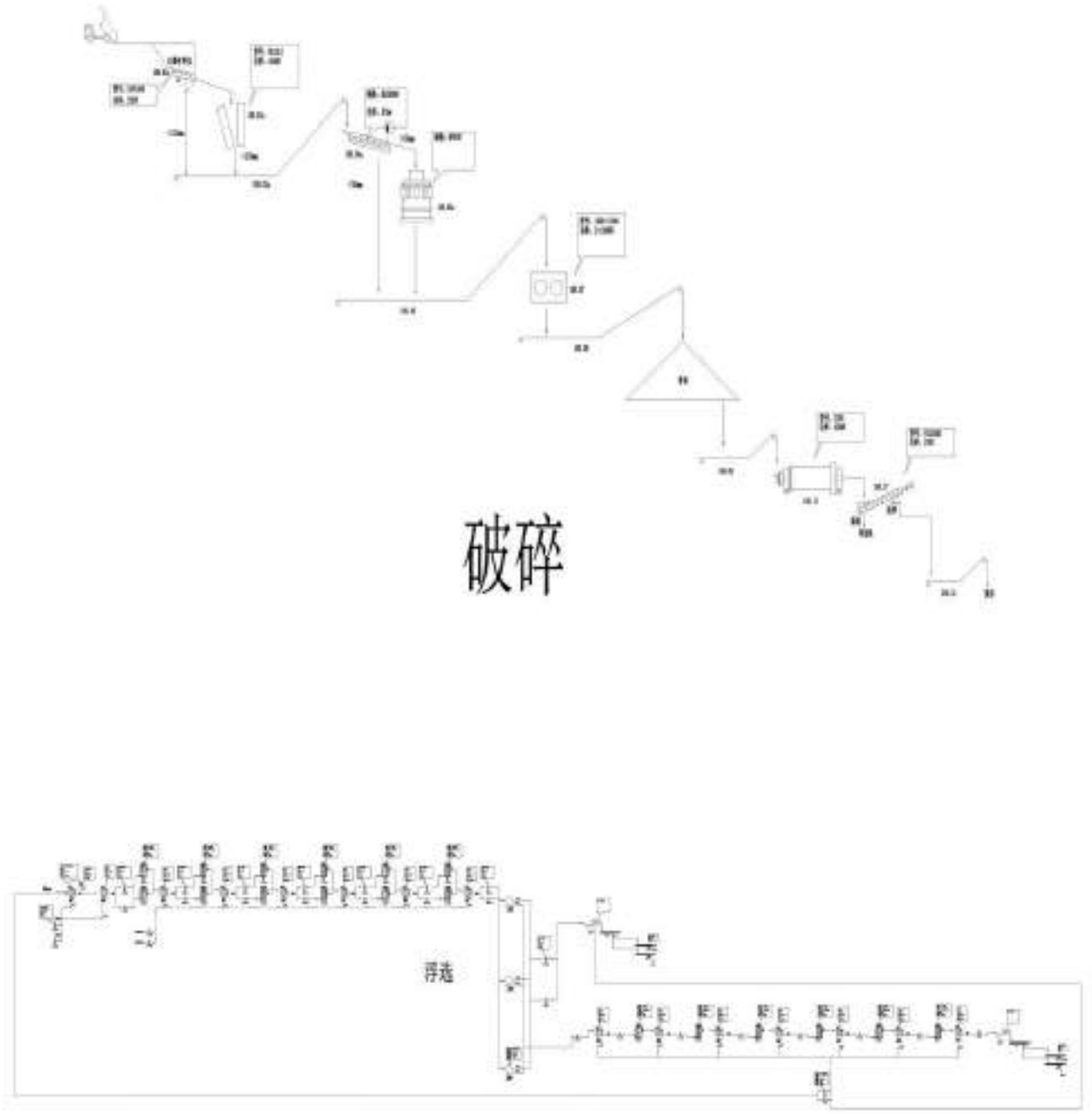


Figure 6.1: Typical Graphite Processing Circuit 典型石墨加工环线

Figure 6.2: Typical Graphite Flotation Machine 典型石墨浮选设备

6.1.4 Reagents 试剂

A number of reagents are used in the concentration process in order to bring about selective and high recovery of the target mineral, graphite. By and large, these act to change the nature of the surface of the various mineral phases through the formation of extremely thin (molecular dimensions) surface layers. Therefore, the quantities employed, are extremely low, a fact that reduces the hazard to the environment.

在浓缩过程中使用了许多试剂，以实现对目标矿物石墨的选择性和高回收率。总的来说，这些作用通过形成极薄(分子尺寸)的表面层来改变各种矿物相的表面性质。因此，使用的数量极低，这一事实减少了对环境的危害。

Several procedures for purification of graphite concentrates are available. A basic process that will be used is the application of thermal treatment in the presence of caustic reagents to dissolve siliceous impurities such as quartz, feldspar or mica. The graphite flotation concentrate is mixed with caustic reagent and baked at elevated temperatures. After baking the graphite is leached with water to wash away dissolved impurities.

提纯石墨精矿有几种方法。将使用的基本工艺是在腐蚀性试剂的存在下进行热处理，以溶解石英、长石或云母等硅质杂质。将石墨浮选精矿与苛性试剂混合，在高温下焙烧。烘烤后，石墨用水浸出以洗去溶解的杂质

The reagents will be applied as relatively dilute solution. These will be prepared in a specially designed reagent preparation room by appropriately trained personnel. In this way, any hazard associated with the use of the reagents will be minimized and confined.

试剂将作为相对稀释的溶液使用。这些试剂将由经过适当培训的人员在专门设计的试剂制备室进行制备。这样，与试剂使用相关的任何危险将被最小化和限制。

6.1.5 Tailings Disposal Facility 尾矿处理设备

Tailings disposal facility will be required for storage of tailings from the processing plant. The size determination of the tailings disposal facility (TDF) at Kwamsisi Graphite Project is controlled by the topography.

将需要尾矿处理设施来储存加工厂的尾矿。夸米西西石墨项目尾矿处理设施(TDF)的尺寸决定受地形控制。

The total area of the pond and the linear feet of the dam were estimated as follows

The designed cross-sectional area of the tailings dam is 5 hectare with the height from 2m high

The total cost is the cost of preparing the tailings pond plus the cost of construction of impoundment dam around it.

池塘的总面积和大坝的线性英尺估计如下 尾矿坝设计截面积为5公顷，高2m起 总成本为尾矿库的准备成本加上尾矿库周围大坝的建设成本

6.2 Process Waste disposal 加工废物处理

6.2.1 Solids 固体

More than 87% of the mined ore reports to waste. The waste solids consist of extremely stable minerals, calcite, dolomite, apatite, and iron oxide minerals. They might also contain a small amount (about 0.1%) of pyrite. If this oxidizes, the resulting acid and soluble iron will be neutralized and precipitated by the associated calcium minerals.

The solids, together with an appropriate quantity of the accompanying solution will be directed to a TSF dam. The volume of solids accumulated each year will depend on the grade of the ore mined. A conservative (maximum) estimate is 300,000 m3 per annum.

据报道，超过 87%的开采矿石被浪费了。废固体由极其稳定的矿物，方解石，白云石，磷灰石和氧化铁矿物组成。它们也可能含有少量(约 0.1%)的黄铁矿。如果它氧化，产生的酸和可溶性铁将中和和沉淀相关的钙矿物

6.2.2 Liquids 液体

The plant will use about 2 tons of water per ton of ore processed. The majority of this water will be recycled. Some of the solutions will be recycled within the flotation stages, as a way of economizing on the addition of reagents. Some of the liquid, which is used in transporting waste solids to the tailings impoundment, will recovered there and returned to the process.

该厂每加工一吨矿石将消耗2吨水。大部分的水将被循环利用。一些溶液将在浮选阶段回收，作为一种节省添加试剂的方法。一些用于将废固体运输到尾矿库的液体将在那里回收并返回到该工艺中。

Any water that is discharged from the plant will contain small amounts of the organic chemicals used in the flotation process. These are all thought to be biodegradable. It is

not expected that the effluent will contain troublesome concentrations of toxic heavy metals.

从工厂排出的任何水都会含有少量浮选过程中使用的有机化学物质。这些都被认为是可生物降解的。预计废水中不会含有高浓度有毒重金属。

The tailings impoundment (slimes dam) will be provided with an impervious bottom to prevent soluble components of the solution from seeping into the ground water. The quality of the ground water will be monitored through sampling wells to detect whether contamination occurs in practice.

尾矿库(矿泥坝)将设置不透水的底部，以防止溶液中的可溶性成分渗入地下水。地下水质量将通过取样井进行监测，以检测实际是否发生污染.

6.3 Processing Plant Operating Costs 加工设备运营成本

Processing plant operating costs (excluding labour) will mostly involve reagents, power to run the processing plant and repair & maintenance of the various machineries. Table 6.1 provides a breakdown of the various operating costs for the processing plant.

加工厂的运营成本(不包括人工)主要包括试剂、运行加工厂的电力以及各种机器的维修和维护。表 6.1 列出了加工厂各项业务费用的细目

Table 6.1: Processing Plant Operating Costs per Year 每年加工厂的运营成本

S/N	描述Description	Amount (US $)金额
1.	矿山开采(包含爆破、燃料等)Mining (including explosive and fuel etc)	3,494,118
2.	试剂Reagents	469,118
3.	电力Power	5,217,647
4.	工厂机器、维护、保养费用Plant machinery, service and maintenance costs	523,529
5.	人员工资Personnel salary	345,600
6.	尾矿管理费用Tailings management expense	50,000
7.	水费water bills	100,000
8.	烘干费用drying expenses	1,173,529
9	其他杂费other incidental expenses	98,529
10	钢球损耗steel ball consumption	352,94
11	陶瓷球损耗ceramic ball consumption	198,529
	总计Total	**12,023,541**

6.4 Contents of Plant Construction 厂房建设内容

In accordance with the production scale of annual output of 30,000 tons of graphite concentrate and the requirements of the relevant national design specifications, build the main crushing workshop, grinding and floating workshop, filter press workshop, drying workshop, packaging workshop and finished products warehouse, It should be accompanied by office buildings , staff dormitories, canteen and bathrooms, health and epidemic prevention and other office and living rooms, in addition, also including silo, pool, belt corridor and other structures. The total floor area is 128,250m2, and the total construction area is（ ） m2. Each sub-structure, building details as following.

依照年产 3 万吨石墨精矿的生产规模和国家有关设计规范要求，基建工程主要破碎车间、磨浮车间、压滤车间、烘干车间、包装车间和成品库等，与之配套的还应有办公楼、职工宿舍、食堂浴室、卫生防疫等办公生活用房，另外，还包括料仓、水池、皮带廊等构筑物。总占地面积 128250m2，总建筑面积为 m2。各子构、建筑物详细情况见表。

Table 6.2: The Sub-building and Structures List

子建、构筑物名称及主要要求一览表

	名称Name	占地面积(m2) Floor space	建筑面积(m2) Building area	建筑层数 Building Stories	层高(m)Story height	结构形式 Structure	备 注Remark
1	破碎车间crushing workshop					框架结构 franme structure	
2	磨浮车间 grinding and floating workshop					框架结构 franme structure	
3	压滤车间filter press workshop					框架结构 franme structure	
4	烘干车间drying workshop					轻钢结构 light steel structure	
5	成品库finished products warehouse					轻钢结构 light steel structure	
6	workshop power distriution NO 1,车间变配电1					框架结构 franme structure	
7	Workshop power distriution NO 2 车间变配电2					框架结构 franme structure	
8	Workshop power distriution NO 3 车间变配电3					框架结构 franme structure	
9	Workshop power distriution NO 4					框架结构 franme	

	名称Name	占地面积(m2) Floor space	建筑面积(m2) Building area	建筑层数 Building Stories	层高(m)Story height	结构形式 Structure	备 注Remark
	车间变配电4					structure	
10	生活区变电所 Living area substation					框架结构 franme structure	
11	材料库material warehouse					轻钢结构 light steel structure	
12	机修车间repair shop					轻钢结构 light steel structure	
13	药剂库Pharmacy shop					轻钢结构 light steel structure	
14	门卫1/NO1 guard room					框架结构 frame structure	
15	门卫2/NO2 guard room					框架结构 frame structure	
16	新鲜水池fresh pool						
17	回水池water recycling tank						
18	加压泵房booster pump chamber						
19	办公楼office building					框架结构 frame structure	
20	食堂浴室canteen and bathroom					框架结构 frame structure	
合计in total		128,250					

质量等级

①火灾危险性类别为丁类，耐火等级二级；

② 抗震类别为标准设防（丙）类，抗震设防烈度为6度；

各建筑主体结构耐久年限30年，围护结构耐久年限25年。

④ 各子项建筑平面布局、生产设施的建筑根据工艺流程布置，满足工艺流程及使用的要求。

⑤ 立面设计不仅满足景观要求，同时为该建筑作为展示企业形象的象征，其中生产设施部分的车间立面造型采用简洁的现代风格，整体设计立面造型简洁，使建筑具有现代气息与新颖性。

⑥ 主要建筑构造特征

设计中遵循优先选用当地地方建筑材料的原则，并以当地工程建设标准设计相关图集作为设计选用建筑材料做法的依据。同时根据工程中各子项功能使用要求合理地选择建筑材料，以达到工程建设投资经济性的目标。

外墙体：240厚混凝土砌块墙，双层压型钢板复合保温墙体。

内墙体：240厚混凝土砌块墙。

屋 面：框架结构屋面采用结构找坡。彩钢板屋面防水等级为Ⅱ级，采用玻璃棉做保温层，坡屋面坡度为1:20。

地 面：水泥地面。

楼 面：水泥楼面。

门 窗：外门窗为铝合金门窗。

油 漆：聚氨脂无光漆、醇苯磁漆面。

卫生洁具：国产中档洁具。

⑦ 建筑结构可靠度设计标准

本工程拟建建筑物的安全等级均为二级。屋面荷载按建筑结构荷载规范取值。本工程所有建筑物的设计使用年限均为30年，待建建筑物基础设计等级均为丙级。

⑧ 设计荷载（可变荷载标准值）

楼面荷载和地面荷载均根据工艺资料取值。其余各处活荷载按如下取值：

楼 面 2.0kN/m2加1.0 kN/ m2（灵活隔断）；

会议室 2.0 kN/ m2；

卫生间 4.0 kN/ m2；

楼 梯 2.0 kN/ m2；

疏散楼梯 3.5 kN/ m2；

外挑阳台 2.5 kN/ m2；

筋砼屋面 a. 上人屋面2.0 kN/ m2； b. 不上人屋面0.5 kN/ m2；

屋面设备荷载按实计算；

基本风压0.7kN/ m2；

基本雪压: 本地区不考虑雪压。

⑨ 材料

混凝土 ；基础采用C30混凝土。基础垫层C15级。

钢 材：采用国家标准热轧钢筋HRB400。埋件钢板采用Q235钢、Q345钢，吊钩用HPB300。钢材连接所用焊条及方式按相应标准及规范要求。

隔墙、围护墙：框架结构的填充墙采用符合环保和节能要求的砌体材料（混凝土砌块），材料强度均应符合GB50003-2001规范要求。

⑩ 地基基础

矿权区工程地质条件较好，暂定基础型式为柱下独立基础。

二、土建规划总平面布置图

总平面布置由采矿场、排土场、工业场地、选矿厂、尾矿干堆场、矿山道路等几部分组成。详见总平面布置图。

6.4.1 Quality grade

i. The fire risk category is Class D and the fire resistance grade is 2;

ii. The seismic category is standard fortification (C) class, and the seismic fortification intensity is 6 degrees;
iii. The durability of the main structure of each building is 30 years, and the durability of the envelope is 25 years;
iv. The layout of each subitem and the construction of production facilities shall be arranged according to the technological process to meet the requirements of the technological process and use;
v. The facade design not only meets the landscape requirements, but also serves as a symbol for the building to display the corporate image. The facade of the workshop of the production facilities adopts simple modern style, and the facade of the overall design is simple, so that the building has modern flavor and novelty.

6.4.2 Main architectural structure features

The design follows the principle of giving priority to the selection of local construction materials, and the relevant atlas of local engineering construction standards is taken as the basis for the selection of construction materials. At the same time, construction materials can be selected reasonably according to the functional requirements of each sub-item in the project, so as to achieve the goal of economic investment in the project construction.

i External wall: 240 thick concrete block wall, double laminated steel insulation wall;
ii Interior wall: 240 thick concrete block wall;
iii Roof: Frame structure roof adopts structural slope finding. Color steel roof waterproof grade is Ⅱ, glass wool insulation layer, slope roof slope is 1:20;
iv Floor: Concrete floor;
v Building surface: Concrete floor;
vi Doors and Windows: Aluminum alloy doors and Windows;
vii Paint: polyurethane matte paint, alcohol benzene enamel finish;
viii Sanitary ware: domestic medium sanitary ware.

6.4.3 Design standard for reliability of building structure

The safety level of the proposed buildings in this project is two. The roof load is calculated according to the load specification of the building structure. The design life of all the buildings in this project is 30 years, and the foundation design grade of the buildings to be built is Class C.

- Design load (standard value of variable load);
- Floor load and ground load are calculated according to process data. The values of live loads for other places are as follows:

- Floor: 2.0kN/m2 plus 1.0kN /m2 (flexible partition);
- Meeting room: 2.0kN/m2;
- Toilet: 4.0kN/m2;
- Stairs: 2.0kN/m2;
- Evacuation stairs: 3.5kN/m2;

- Outboard balcony: 2.5kN/m2;
- Reinforced concrete roof: a. upper roof 2.0kN/m2; b. Roof 0.5kN/m2 not occupied;
- The load of the roof equipment is calculated according to the actual calculation;

- Basic wind pressure: 0.7kN/ m2;

Basic snow pressure: Snow pressure is not considered in this area.

6.4.4 Material

Concrete; The foundation is made of C30 concrete. Foundation cushion C15 grade.

Steel material: Adopt the national standard hot rolled steel HRB400. The embedded steel plate is made of Q235 steel and Q345 steel, and the hook is made of HPB300. The welding rod and method used for steel connection shall be in accordance with the corresponding standards and specifications.

Partition wall and enclosure wall: the filling wall of the frame structure shall adopt masonry materials (concrete blocks) that meet the requirements of environmental protection and energy saving, and the material strength shall meet the requirements of GB50003-2001.

6.4.5 Foundation

The engineering geological condition of the mining right area is good, and the tentative foundation type is independent foundation under column.

6.4.6 General layout of civil engineering plan

The general layout is composed of several parts, such as quarries, dumps, industrial sites, concentrators, tailings dry storage yards and mine roads. See general layout plan for details

7 ENVIRONMENTAL CONSIDERATIONS 环境因素

7.1 Environmental and Social Assessment 环境和社会评估

Environmental and Social Impact Assessment will be undertaken to 将对以下进行环境和社会影响评估

- Identify and predict the impact on the environment and on community health and well-being by the proposed graphite project, policies, programs and operational procedures, and to interpret and communicate information about their mitigation
  确定并预测拟议的石墨项目、政策、计划和操作程序对环境、社区健康和福祉的影响，并解释和沟通有关缓解这些影响的信息
- Assess the character of the receiving environment, the potential impact of the project and confidence of predicting impacts, the resilience of the environment to cope with change, the technology to be used, the plans, policies or procedures which influence land use changes and the degree of public interest (i.e. concerns of the general public);
  评估接受环境的性质、项目的潜在影响和预测影响的信心、环境应对变化的弹性、将使用的技术、影响土地使用变化的计划、政策或程序以及公众利益的程度(即公众关注的问题);

In the process of undertaking this ESIA, all possible impacts will be identified. Ultimately, the assessment will propose mitigation measures and an Environmental Management Plan, to avoid, compensate or reduce adverse environmental effects and to maximize positive impacts resulting from the project implementation.

在开展ESIA的过程中，将确定所有可能的影响。最后，评估将提出缓解措施和环境管理计划，以避免、补偿或减少不利的环境影响，并最大限度地扩大项目实施所产生的积极影响。

7.2 Strategic Environmental Measures 策略性环保措施

The following measures will be undertaken by project owner for environmental protection:

项目业主将采取以下措施保护环境:

- Identify all environment impacts as a result of operations
- Develop and apply an Environmental Management System to mitigate all impacts identified
- Perform periodic audits of the Environmental Management System and transparently communicate audit results to interested parties
- Use audit results for continual improvement of work methods
- Train employees to improve their skills supporting their duties in implementing environmental management and monitoring
- •识别所有作业对环境的影响
- 制定并应用环境管理体系以减轻所有已确定的影响
- 对环境管理体系进行定期审核，并将审核结果透明地传达给相关方
- 利用审核结果对工作方法进行持续改进
- 培训员工提高技能，以支持他们在实施环境管理和监测方面的职责
-

7.3 Environmental Management Plan 环境管理计划

Detail of the potential project impacts and mitigation measures will be presented from ESIA

将详细介绍项目的潜在影响和缓解措施

7.4 Environmental Monitoring 环境监控

The Environmental Monitoring System will be implemented as a complimentary to the Environmental Management Plan to monitor the impacts of the proposed project and the mitigatory measures and to provide a permanent record of such monitoring.

环境监察系统将作为环境管理计划的补充实施，以监察拟议工程项目的影响

和缓解措施，并提供有关监察的永久记录。

The objectives of the Monitoring System are to:

- Provide a permanent record of compliance with ESMP against the present and future legislation;
- Control risks and (significant) environmental impacts;
- Control and improve the project on the basis of the operational information gathered;
- Monitor continuous improvement of the environmental and social management system;
- Provide a simple framework to improve the level of environmental management and compliance;
- Co-ordinate and integrate the tasks of the project proponent and those of the governmental agencies involved in the project implementation;
- Integrate present and future environmental and social monitoring activities.
- Periodic Reporting
- Investigation of environmental incidents and reporting damage to the environment
- Inspection and remedy of environmental damage affecting the local community
- 根据当前和未来的法规，提供符合 ESMP 的永久记录;
- 控制风险和(重大)环境影响
- 根据收集到的运营信息对项目进行控制和改进;
- 监督环境和社会管理体系的持续改进;
- 提供一个简单的框架，以提高环境管理和合规水平;
- 协调和整合项目发起人和参与项目实施的政府机构的任务;
- 整合当前和未来的环境和社会监测活动。
- 定期报告
- 调查环境事件并报告对环境造成的损害
- 对影响当地社区的环境损害进行检查和补救

7.5 Environmental Costs 环境成本

The environmental costs have been presented as part of the Environmental Management Plan (EMP) and is presented in terms of annual costs for land management, water management, pollution control, conservation, community plan and monitoring activities. Also presented as part of the EMP are the costs for mine closure which will be incurred through continuous rehabilitation during the operations and at the end of the project in order to meet the closure regulatory requirement. A summary of the environmental costs are summarized in Table 7.1 below:

环境费用已作为环境管理计划的一部分提出，并以土地管理、水管理、污染控制、养护、社区计划和监测活动的年度费用的形式提出。作为环境管理计划的一部分，还提出了关闭矿山的费用，这些费用是在作业期间和在项目结束时为满足关闭管制要求而不断进行修复而产生的。环境成本的摘要载于下表7.1:

Table 7.1 Environmental Management Costs 环境管理成本

Environmental management Activity环境管理活动	Annual Cost (US $)金额
Land Management土地管理	22,500.00
Water Management水管理	20,000.00
Pollution Control污染管理	12,000.00
Conservation保护	5,500.00
Community Plan社区规划	9,000.00
Monitoring监控	17,100.00
Closure plan关闭规划	30,000.00*
Total总计	**116,100.00**

1

[1] Closure plan cost is for the activities to be carried at the end of the operations. The continuous rehabilitation costs are included as part of the other environmental management activities.

关闭计划成本是指在作业结束时进行的活动。持续的修复费用已列入其他环境管理活动的一部分

8 ANCILLARY SITE FACILITIES AND INFRASTRUCTURE 附属场地设施及基础设施

8.1 Site 现场

8.1.1 Location 位置

The proposed Project is located in Handeni District, eastern portion of Tanzania, about 245 Kilometres North West of Dar es Salaam City. It is situated around 180 south west of Tanga (the regional headquarter of the Tanga Region). The proposed Project fall under the jurisdiction of Handeni District, Kwamsisi Ward, Kwamsisi Villages (Figure 1.3).

该项目位于坦桑尼亚东部的Handeni区，距达累斯萨拉姆市西北约245公里。它位于Tanga西南180左右(Tanga地区的地区总部)。拟议项目由Handeni区、Kwamsisi区、Kwamsisi村管辖(图1.3).

The location for the processing plant and ancillary facilities have been done by taking into consideration the following considerations: 加工厂及其附属设施的选址考虑了以下因素:

- Relatively good geotechnical and hydrotechnical conditions in view of the small hilly terrain and valleys that dominate the topography in the area;
- Relatively good drainage characteristics, safe distance from nearby River and its tributaries;
- Safe distance from the Tanzania Railway corporation (TRC) line installations and in line with the requirements of the Mining Act, 1998.
- Good accessibility from the mining pits and from the main access road that joins the project area to the main trunk road (Dar es salaam- Arusha Road); and
- Capability for future expansion.
- 考虑到该地区的丘陵地形和山谷占主导地位，相对良好的岩土和水力条件;
- 排水特性较好，与周边河流及支流距离安全;
- 与坦桑尼亚铁路公司(TRC)线路设施保持安全距离，并符合 1998 年《采矿法》的要求。
- 从矿坑和连接项目区的主要通道到主要干道(达累斯萨拉姆-阿鲁沙公路)的可达性良好;
- 未来扩展的能力。

8.1.2 Site Layout and Security 现场布局和安全

The location of the mining area within the licence area is dictated by the geology and the selected mining method and has been done by considering critically both economic and safety factors.

矿区在许可区域内的位置由地质情况和所选采矿方法决定，并严格考虑了经济和安全因素

The area earmarked for mining is located to the central of the licences area. This area can be easily accessed through the existing earth road connecting the project area to the Dar es Salaam-Arusha highway.

指定用于采矿的区域位于许可证区域的中央。通过连接项目区和达累斯萨拉姆-阿鲁沙高速公路的现有土路，可以很容易地进入该地区。

Access to the Project from Dar es Salaam is via the Dar es Salaam-Bagamoyo -Msata-Mkata on s tarmac Road, approximately 215 km North West of Dar es Salaam. The access road from the Tanga Port is Tanga-Muheza-Mkata approximately 140kk South west of Tanga city. The access road to the site from Mkata is rough gravel road, approximately 55 kms south east of Msata. The access road from Mkata to the site is accessible throught the year (Figure 1.4).

从达累斯萨拉姆进入该项目的途径是达累斯萨拉姆-巴加莫约-姆萨塔-姆塔塔的柏油路，位于达累斯萨拉姆西北约215公里处。从坦加港出发的通道是坦加-穆赫泽-姆卡塔，位于坦加市西南约140公里处。姆萨塔通往工地的道路是粗糙的砾石路，位于姆萨塔东南约55公里处。从Mkata通往工地的道路全年均可通行(图1.4)

8.2 Surface Buildings 地面建筑

8.2.1 Administration and Changehouse 行政和工作间

There will be an administration block which shall contain offices for general, administration and management personnel. Mine technical personnel, clerical, receptionists, secretarial and other personnel will be allocated offices within this block.

将有一个行政大楼，其中包括一般、行政和管理人员的办公室。矿山技术人员、文书、接待员、秘书和其他人员将在该区块内分配办公室

A changehouse that will cater for the mining personnel will be located adjacent to the administration block. Smaller changehouses for dedicated personnel, e.g., processing, workshops and others will be located within their working areas.

为采矿人员提供服务的工作间将位于行政大楼附近。专门人员的较小的转换室，例如加工、车间和其他将位于他们的工作区域内

8.2.2 Workshops and warehouses 车间和仓库

The main workshop will be located close to the processing plant and will contain four bays for washing, small vehicle repairs, mobile equipment repairs, tire repair) and will be serviced by an overhead crane. Within the main workshop, space will be allocated for a machine shop, an electrical and instrumentation shop, welding, hydraulics and fabrication shop. It is also planned to establish a small workshop within the plant to handle smaller repairs within the pit so as to minimize equipment downtime. This workshop will be a mobile one which will be moved as the pit advances but kept at a distance safe from blasting damage.

主车间将位于加工厂附近，将包含四个用于清洗、小型车辆维修、移动设备维修、轮胎维修的隔间，并将由一台架空起重机进行维修。在主车间内，空间将分配给机械车间、电气和仪表车间、焊接、液压和制造车间。还计划在工厂内建立一个小车间，在坑内处理较小的维修，以尽量减少设备停机时间。该车间将是一个可移动的车间，它将随着坑的推进而移动，但要保持安全的距离，以免爆破破坏

The warehouse for storing maintenance spares and other supplies will be located in close proximity to the processing plant and the main workshop. Bulk materials that can be kept in the open will be stored within a partially roofed and fence outside area. Separate warehouses for chemicals and reagents, oils and greases will be constructed separately. Storage of explosives

and the associated ingredients will be located and constructed in accordance to the requirements of the Explosives Act. Prior to utilization of the explosive's magazine, an application for licence and hence inspection by the Chief Inspector will be initiated.

储存维修备件和其他用品的仓库将设在靠近加工厂和主车间的地方。可以放在露天的散装材料将被存储在部分有屋顶和围栏的室外区域。化学品和试剂、油和润滑脂的单独仓库将分别建造。炸药和相关成分的储存将按照《爆炸物法》的要求进行选址和建造。在使用该炸药匣前，须先申请许可证，并由检查主任进行检查。

8.2.3 Site Medical Facilities 现场医疗设施

A medical clinic staffed with a qualified medical assistant and nurses will be constructed on site to cater medical emergencies and illnesses that can be handled at site. Complicated cases will either be referred to Tanga or Muhimbili (in Dar-es-Salaam) referral hospitals.

将在现场建造一个医务室，配备一名合格的医务助理和护士，以应付现场可以处理的医疗紧急情况和疾病。复杂病例将转诊到 Tanga 或 Muhimbili(达累斯萨拉姆)转诊医院.

8.2.4 Site Camp 现场营地

A construction camp that will be used during the mine and plant construction is planned to be erected on the Project site. The camp will be located north of the site identified for plant construction The construction camp will be constructed using prefabricated, modular air-conditioned units. The camp will consist of bedrooms, washrooms, laundry facilities, kitchen, lunch/dinner room, recreation facilities and a first aid building. Supervisory and skilled workers will be housed in the camp while unskilled workers will be expected to be accommodated in the surrounding community.

计划在项目现场建立一个用于矿山和工厂建设的施工营地。营地将位于工厂建设用地的北部。施工营地将使用预制、模块化的空调单元建造。营地将包括卧室、卫生间、洗衣设施、厨房、午餐/晚餐室、娱乐设施和一个急救大楼。管理和技术工人将住在营地，而非技术工人预计将住在周围社区

After the construction stage, the camp will be converted for use by the operations management, supervisors and skilled workers during the operations stage.

在施工阶段结束后，营地将被转换为供运营阶段的运营管理人员、主管和技术工人使用。

8.3 Power Supply 供电

Within the project area, there is electricity supply from the National Grid and is already connected to the one graphite mine in the area, located almost 2km away from the project site. The mine is connected via a 33 kV line from Handeni.

在项目区域内，电力供应来自国家电网，并已连接到该地区距离项目现场近 2 公里的一个石墨矿。该矿通过一条 33 千伏的电线从汉得尼连接过来

Once power supply has been availed to site, power to different facilities will be distributed by underground feeders, cable tray systems and overhead lines for distant locations. Local distribution transformers will be used to provide power at the desired voltage. Standby power to cater for emergencies during power cuts will be provided by diesel generators that will be chosen to meet the minimum requirements for running the mine and processing operations. The

generators will be housed in well-ventilated and roofed shed located south but close to the processing plant.

一旦现场有电力供应，不同设施的电力将由地下馈线、电缆桥架系统和远距离架空线路分配。本地配电变压器将被用来提供所需电压的电力。柴油发电机将提供备用电力，以应付停电期间的紧急情况，这些发电机将被选择来满足矿山和加工作业的最低要求。发电机将被安置在通风良好、有屋顶的棚子内，位于南部，但靠近加工厂

8.4 Site Services 现场维修

8.4.1 Fuel Storage 燃油储存

Fuel stocks required for running the standby generators, mobile equipment (mine trucks, construction equipment), light vehicles and other fuel operated equipment will be stored on site. Storage facilities will have the capacity to cater for at least one months supply. The storage tanks will be located close to the workshop which will be located north of the processing plant. As an environmental management good practice, the steel fuel storage tanks will be erected with a concrete bunding containment with the capacity to accommodate 110% of the capacity of the tanks. Fuel unloading stations will be provided at both locations and truck refueling will be provided near the main workshop.

备用发电机、移动设备(矿车、建筑设备)、轻型车辆和其他燃料操作设备所需的燃料储存将储存在现场。储存设施将有能力满足至少一个月的供应。储罐将位于加工厂北部的车间附近。作为一项良好的环境管理措施，这些钢制燃料储存罐将采用混凝土围护结构，其容量为储存罐容量的110%。两个地点都将提供卸油站，并在主车间附近提供卡车加油。

8.4.2 Water Supply 供水

During construction and at the start of the operations water supply to the site will be abstracted from underground which according the hydrogeological study conducted by the other graphite mine near our site, has enough water to cater for the current users and the mining operations.

在施工期间和作业开始时，将从地下抽取供水，根据我们场地附近的另一个石墨矿进行的水文地质研究，有足够的水满足当前用户和采矿作业的需要.

On the long-term, however, the mine plans to harvest and dam rain water by taking advantage of the hilly topography in the area. Selection of the site for the dam will be done carefully to ensure minimum interruption with the natural drainage system and hence minimize impacts to downstream users. In addition, it is expected that the plant will use about 2 tons of water per ton of ore processed. As the processing wastes are pumped to the tailing's facility, the water will be collected at one end of the facility with sediments allowed to settle and allow clean water to be recycled back to the plant. Calculated according to the annual output of 30,000 tons, the production water consumption is about 150t/h, and the production return water is about 50%. When the drilling depth is 300 meters, the water inflow is about 20m³/h, so as to prevent the production from being affected in the dry season, it is necessary to set up 5 to 10 Wells for backup, and the drilling cost is 147.06 USD/m, totaling 44,118 USD.

但是，从长远来看，该矿山计划利用该地区的丘陵地形，收集雨水并将其筑坝。大坝选址将谨慎进行，以确保对自然排水系统的干扰最小化，从而最大限度地减少对下游用户的影响。此外，预计该厂每加工一吨矿石将消耗约2吨水。当加工废料被泵入尾矿设施时，水将被收集在设施的一端，允许沉积物沉淀，并允许清洁水循环回工厂。按照3万吨年产量来计算，生产用水量约为150t/h，生产回水约为50%左右，在钻深300米时涌水量约20m³/h，防止在枯水期影响生产，需配备5-10口井备用，打井造价为147.06美元/米，合计44118美元。

8.4.3 Fire Protection 防火

The fire protection will be supplied from the fresh water storage pond which will contain a fire reserve equivalent to 2 hours retention at maximum flow. The line supplying water from well will be used to provide backup water if needed. An electric powered fire pump will be provided to automatically supply water through a buried water distribution system.

消防设施将由淡水储存池提供，该储存池将包含相当于最大流量保持 2 小时的消防储备。如有需要，将使用从井中供水的管道提供备用水。消防局会提供一台电动消防泵，透过地埋式配水系统自动供水

Strategically located fire hydrants and hose stations will be located near main buildings around the site. All high risk areas will also be equipped with automatic sprinkler system and portable fire extinguisher units. The start-up of the fire pump will automatically activate the alarms which can also be turned on manually.

消防栓和软管站将策略性地布置在工地周围的主要建筑物附近。所有高风险区域也将配备自动喷水灭火系统和便携式灭火器。消防泵的启动将自动启动警报，也可以手动打开警报。

A 3m firebreak will be constructed around the lease area borders and signs warning against starting of fires will be posted around the area. This measure will aim at controlling the start of fires that are known to be started by pastoralists in a bid to reactivate grass growth for their animals.

在租赁区域的边界周围将建造一个3米长的防火带，并在该区域周围张贴警告火灾的标志。这项措施的目的是控制火灾的发生，众所周知，牧民是为了让他们的动物重新生长草而引起的火灾。

8.4.4 Water Distribution and Sewage Disposal 供水及污水排放

Storage of fresh water for use in the processing plant, the mine, fire and other uses will be done through a constructed pond with capacity for nearly two months requirements. The pond will be located close to the processing plant which will be the biggest fresh water consumer.

淡水的储存将用于加工厂、矿山、消防和其他用途，将通过一个可满足近两个月需求的池塘来完成。该池塘将位于处理厂附近，处理厂将是最大的淡水消费用户。

Sewage from the mine site will be collected by a gravity sewer network through buried PVC plastic pipes to sewage treatment ponds. The sewage treatment ponds will be located east of the processing plant. A set of three ponds will be constructed to allow serial movement of effluents

from the intake pond to the discharge pond. It is envisaged that well maintained and functioning ponds will allow the last pond to discharge clean water. The water will be monitored regularly to ensure that no polluted water is discharged into the environment.

矿区的污水将由重力式污水管网通过埋地 PVC 塑料管收集到污水处理池。污水处理池将位于处理厂的东部。将建造一组三个池塘，使污水连续从进水塘流向排放水塘。据设想，维护良好和运转良好的池塘将使最后一个池塘排出干净的水。水质将定期监测，以确保没有污水排放到环境中.

8.4.5 Communications 通讯

Within the project site, mobile telephone services from Halotel and Airtel can be easily accessed. Discussions will be carried out with the Tanzania Telecommunications Company Ltd, TTCL to enable the extension of the existing communication lines to reach the project area.

在项目现场，可以方便地使用Halotel和Airtel的移动电话服务。将与坦桑尼亚电信有限公司(TTCL)进行商讨，以便将现有通信线路延伸至项目地区。

8.4.6 Mobile Equipment 流动设备

The project will maintain a fleet of mobile equipment for the maintenance of access and haulage roads and other surface areas of the project site. The fleet of mobile equipment will include a dozer, dump trucks, wheel loaders, mobile crane, pickups, vans and buses.

该项目将维持一队流动设备，以维护项目场址的进出和运输道路及其他地面区域。移动设备将包括推土机、自卸卡车、轮式装载机、移动起重机、皮卡、货车和公共汽车

8.5 Transportation and Logistics 运输和物流

8.5.1 The Port 港口

All imports and exports by sea will have to be shipped through the port of Dar-es-Salaam which is well connected to the project area by both rail and road transport. The Dar-es-Salaam port has ample facilities for handling the project needs. The port has eight deep water berths for general cargo, and three container berths. The container berths have been privatized and is run by a private operator which has increased the efficiency and hence cutting down the time for goods clearing. Form the port of Dar-es-Salaam there two major alternatives for transporting goods to the project mainly by railway and road transport. Both road and railway transport have direct connections into the port.

所有海运进出口都必须通过达累斯萨拉姆港运输，该港口通过铁路和公路运输与项目区相连。达累斯萨拉姆港有充足的设施满足项目需求。该港口有8个普通货物深水泊位和3个集装箱泊位。集装箱泊位已私有化，由私营经营者经营，这提高了效率，从而缩短了货物清关的时间。达累斯萨拉姆港有两种主要的货物运输方式，主要是铁路和公路运输。公路和铁路运输都与港口有直接联系。

8.6 Community Support 社区支持

The community surrounding the project area at the moment depend on the public services for some basic services, e.g., access to a clinic, school, transport, access to market for their agricultural produces and others. Most villagers around the area farm in valleys and have to move their produce long distances in order to access the markets or reliable transport. The Kwamsisi Village clinic is small one catering mainly for the villagers. Despite a number of rivers in the area,

villagers have no tap water and it normally not treated. These and many other issues that face the surrounding communities determine their quality of life.

项目周围的社区目前依赖公共服务提供一些基本服务，如诊所、学校、交通、农产品市场等。该地区的大多数村民都在山谷里务农，为了进入市场或可靠的交通工具，他们不得不长途运输他们的产品。夸米西西村的诊所很小，主要为村民提供服务。尽管该地区有多条河流，但村民们没有自来水，通常也没有经过处理。这些以及周围社区面临的许多其他问题决定了他们的生活质量。

Based on identified priority issues by the local Government and those that can be supported within the Company budget constraints, a plan for implementation will be worked out and agreed between the two parties. In order to implement these, the Company will each year set aside a budget that is in line with its business plans.

根据当地政府确定的优先事项以及在公司预算限制范围内能够得到支持的事项，双方将制定并商定实施计划。为了实现这些目标，本公司将每年留出与其业务计划相一致的预算

9 MANPOWER REQUIREMENTS 人力需求

9.1 Introduction 简介

The staffing requirements for the project will be determined in accordance to the specialized sections of the project. The main areas include, Mining, Processing Engineering, Administration (general administration, personnel, finance, stores, health, transport, etc), Environment, Health and Safety (HSE). Each of these areas will determine the staff requirements in line with the production schedules. In general, the project will aim at employing locals and only use expatriates where local expertise is not available.

项目所需的人员编制将根据项目的专门部分来确定。主要领域包括:采矿、加工工程、行政(综合行政、人事、财务、仓储、卫生、运输等)、环境、健康和安全(HSE)。这些领域中的每一个都将根据生产计划确定人员需求。总的来说，该项目将以雇用当地人为目标，在没有当地专业知识的地方只使用外籍人员。

The tables below summarize the initial estimates of the personnel that will be engaged during the operations. 下表概述了运营期间将参与的人员的初步估计数。

9.2 Technical Staff Requirements 技术人员要求

9.2.1 Processing Personnel 加工人员

The processing of the ore to recover graphite concentrate will consist mainly of comminution which will aim at size reduction of the mined ore to produce a minus 0.5 inches product. The crushed product will then be wet ground to a minus 65 mesh before being fed to the floatation circuit. The material will then be fed into a three-stage floatation circuit the output of which will be the desired graphite. In order to meet the processing requirements of the plant, it is envisaged that the plant will operate through three 10-hour shifts and seven days a week. The estimated number of personnel required to meet these requirements include:

回收石墨精矿的矿石加工将主要包括粉碎，目的是将开采出的矿石粒度缩小，以生产- 0.5英寸的产品。粉碎后的产品将被湿磨至负65目，然后被送入浮选线路。然后，材料将被送入三级浮选线路，其输出将是所需的石墨。为了满足该厂的加工要求，预计该厂将实行每周三次10小时轮班制，每周7天。

为满足这些要求所需的人员估计数包括:

Table 9.1: Processing Personnel 加工人员

Position 职位	Number 数量	Remarks
破碎机操作员 Crusher operator	1	
球磨机操作员 Ball Mill Operator	1	
浮选操作员 Flotation operator	1	
	3	

9.2.2 Engineering Personnel 工程人员

The engineering department will be responsible for the maintenance of all mining, processing and service equipment. In addition to maintenance, the department will also maintain the houses, roads, communication and electrical installations. Fabrication of various components that will be required from time to time to meet production needs will also be the responsibility of the engineering department.

工程部将负责所有采矿、加工和服务设备的维修。除维修外，该部门还将维修房屋、道路、通讯和电力设施。为满足生产需要而不时需要的各种部件的制造也将由工程部门负责

Table 9.2: Engineering Personnel 工程人员

Position	Number	Remarks
机械工程师 Mechanical Engineer	1	
电气工程师 Electrical Engineer	1	
焊工 Welders	1	
	3	

9.2.3 Administration Personnel 行政人员

The administration department incorporates all personnel for the general and personnel administration, finance, stores, transport, general workers health, community development.

行政部门包括一般和人事管理、财务、储存、运输**的所有人**员

Table 9.3: Administration Personnel 行政人员

Position	Number	Remarks
项目经理 Project Manager	1	
财务 Finance	1	
仓库采购 Warehouse purchase	1	
翻译 Translator	1	
	4	

9.3 Training 培训

A training programme for all employees will be put in place and will include several approaches including on-the-job training, short courses on and off-site, seminars and other forms of training. On the job-training will utilize experienced personnel to train the less experienced ones. All expatriate personnel will be required, as part of the employment contract, to train a local person who shall finally be able to replace him/her.

将为所有雇员制定一项培训方案，其中包括若干办法，包括在职培训、现场和场外短期课程、研讨会和其他形式的培训。在职培训将利用有经验的人员来培训缺乏经验的人员。作为雇佣合同的一部分，所有外派人员都必须培训一名当地人员，以便最终能够取代他/她

All training programmes will be the responsibility of the Administration Department under the supervision of the personnel officer who shall be responsible for developing and ensuring delivery of the training. All equipment and service providers on the mine will be required by their contracts to provide training on the efficient and appropriate use of their equipment and services. On the job training will be supplemented by off-site training, both locally and abroad, through specialized institutions, equipment and service providers. Selection of such training will be in accordance to an

approved training programme aimed at addressing the needs of the employees and those of the Company. On a case by case basis, individual employees will also be considered for postgraduate university training to meet their respective needs.

所有培训方案将由行政部负责，在人事干事的监督下，人事干事应负责拟订和确保培训的实施。矿内所有设备和服务提供者的合同将要求他们提供关于有效和适当使用其设备和服务的培训。在职培训将由通过专门机构、设备和服务提供者在当地和国外进行的非现场培训加以补充。此类培训的选择应符合已批准的培训计划，该计划旨在满足员工和公司的需求。根据个别情况，我们亦会考虑个别雇员接受大学研究生培训，以满足他们各自的需要。

While training of local employees on the English language will be encourage, expatriates will also be provided with opportunities to learn Kiswahili as a way of promoting easy communication and interaction amongst all employees. Training on the local cultural values will also be organized for foreign employees.

在鼓励对当地员工进行英语培训的同时，也将为外派人员提供学习斯瓦西里语的机会，以促进所有员工之间的轻松沟通和互动。此外，还将为外籍员工举办有关当地文化价值观的培训.

9.4 Personnel Costs 人事成本

The personnel costs are estimated based on the numbers presented in the specific sections above. The monthly wages are based on the current figures used in the mining industry and takes into consideration the competitiveness of the job market. In additional, it assumed that 95% of the workforce will be local with only 5% being expatriates.

人事费用是根据上面具体各节中提出的数字估计的。每月工资是根据采矿业目前使用的数字计算的，并考虑到就业市场的竞争力。此外，它假设95%的劳动力将是本地人，只有5%是外籍员工。

Table 9.4: Personnel Cost 人事成本

职位	Number 数量	Monthly wage ($) 工资	Total monthly ($) 总计	Annual Cost ($) 年
项目经理Project manager	1	4300	4300	51600
财务Finance	1	2100	2100	25200
仓库采购warehouse purchase	1	2100	2100	25200
翻译translator	1	2100	2100	25200
机械工程师Mechanical engineer	1	2400	2400	28800
电气工程师electrical engineer	1	2400	2400	28800
焊工welder	1	1850	1850	22200
破碎机操作员operator of crusher	1	1850	1850	22200
球磨机操作员operator of ball mill	1	1850	1850	22200
浮选机操作operator of flotation	1	1850	1850	22200
当地操作工local operators	20	150	3000	36000
当地辅助工local auxiliary workers	20	150	3000	36000
	50		**28,800**	**345,600**

10 DEVELOPMENT AND CAPITAL COST ESTIMATES 开发和资金成本估算

Development and capital cost estimates were estimated based on the 2004/205 market survey of the specified equipment from various sources including manufacturers of the equipment.

开发和资金成本估算是根据2004/205年对指定设备的各种来源(包括设备制造商)的市场调查进行的。

10.1 Development Costs 开发成本

Development cost items are the infrastructural developments which are necessary to support the project to make it start operating. Examples of such infrastructural developments include; power transmission and distribution lines, access roads construction, tailings dam construction, fresh water system construction, office buildings, workshops and fuel bays, crusher and mill foundations, etc.

开发成本项目是支持项目开始运作所必需的基础设施开发。种基础设施发展的例子包括;输配电线路、出入口道路建设、尾矿坝建设、淡水系统建设、办公楼、车间、燃料舱、破碎机、磨机基础等

Table 10.1 Development Cost 开发成本

设施Infrastructure	(US$)估算成本 Estimated cost	备注Remark
尾矿设施tailings facility	100,000.00	
淡水系统freshwater system	100,000.00	包括储存和管道include storage and pipelines
办公楼和工作间office building and workshop	100,000.00	
车间设施和燃油储存workshop facility and fuel storage	3000,000.00	包括分配include distribution
输配电power transmission and distribution	200,000.00	
通往道路和排水系统access road and drainage system	150,000.00	运输道路收费hauling road charge
设备地基equipments foundation	300,000.00	设备单独收费Separate charge for equipment
总计Total	**3,950,000.00**	

10.2 Capital Costs 资金成本

Capital costs are those costs spent on purchasing the mining equipment and plant machinery including other fixed assets which are necessary to be used to operate the mine and the processing plant.

资本成本是指用于购买采矿设备和工厂机械的成本，包括经营矿山和加工厂所需的其他固定资产

Table 10.2 Capital Cost 资金成本

编号 NO	项目 item	名称Name	单位 Unit	数量 amount	单价/万 Unit price/10K	总价/万Total price /10 K	
1	破碎 Crushing	振动给料机Vibrating Feeder	台unit	1	2.56	2.56	
		颚式破碎机jaw crusher	台unit	1	13.18	13.18	
		波辊筛Roller screen	台unit	1	3.53	3.53	
		多缸圆锥破Multi cylinder cone break	台unit	1	14.23	14.23	
		格子型球磨机grate ball mill	台unit	1	14.54	14.54	
		螺旋分级机spiral classifier	台unit	1	6.78	6.78	
2	浮选 Flotation	罗茨风机Roots blower	台unit	1	1.95	1.95	
		浮选机flotation machine	台unit	1	13.65	13.65	
		浮选机flotation machine	台unit	1	6.49	6.49	
		立磨vertical mill	台unit	18	1.14	20.60	
		浮选机flotation machine	台unit	6	4.42	26.54	
		浮选机flotation machine	台unit	7	2.31	16.14	
		滚筒筛trommel screen	台unit	4	1.41	4.24	
		精矿泵（柱塞泵）Concentrate pump (plunger pump)	台unit	24	0.52	11.91	
		中矿泵（卧式渣浆泵）Medium mine pump (horizontal slurry pump)	台unit	4	0.44	1.74	
		尾矿泵（卧式渣浆泵）Tailings pump (horizontal slurry pump)	台unit	2	1.56	3.12	
		压滤机（正目）pressure filter(positive mesh)	台unit	1	12.94	12.94	
		压滤机（负目）pressure filter(negative mesh)	台unit	1	12.94	12.94	
3	烘干 Drying	螺旋烘干机Spiral dryer	台unit	2	12.42	24.85	
		螺旋输送机spiral conveyer	台unit	2	0.32	0.64	

		螺旋输送机spiral conveyer	台unit	2	1.07	2.14	
		螺旋输送机spiral conveyer	台unit	2	0.52	1.04	
		螺旋输送机spiral conveyer	台unit	2	0.32	0.64	
		螺旋输送机spiral conveyer	台unit	1	0.38	0.38	
		袋式收尘器bag type dust collector	台unit	1	5.88	5.88	
		收尘风机dust-collecting fan	台	1	1.29	1.29	
		旋风收尘器 rotoclone collector	台	1	0.88	0.88	
		烟气引风机Flue gas induced draft fan	台	1	2.00	2.00	
		烘干炉助燃风机Drying furnace combustion fan	台	1	0.71	0.71	
		插板阀Gate Valve	批	1	0.47	0.47	
		斗提skip winder	台	2	1.18	2.35	
		烘干炉drying oven	台	1	2.35	2.35	
4	输送 Conveying	皮带机 belt conveyor	台	1	10.78	10.78	
		皮带机 belt conveyor	台	1	15.88	15.88	
		埋地皮带机 burying belt conveyor	台	1	16.35	16.35	
		皮带机 belt conveyor	台	1	37.18	37.18	
		输煤皮带机 coal belt conveyor	台	1	2.96	2.96	
		皮带机钢结构立柱 conveyor steel column	批 batch	1	20.00	20.00	
5	开采 Mining	履带式潜孔钻Crawler type drill	台	1	14.82	14.82	
		液压挖机Hydraulic excavator	台	1	62.51	62.51	
		装载机loader	台	2	6.12	12.24	
		自卸车dumper	台	6	6.12	36.71	
6	供水供气	清水供水泵clean water supply pump	台	1	0.43	0.43	

		浮选设备永磁电机冷却用水泵Flotation permanent magnet motor cooling water pump	台	1	0.12	0.12	
		破碎设备永磁电机、烘干机轴承座冷却用水泵Crusher permanent magnet motor, dryer bearing housing cooling water pump	台	4	0.03	0.10	
		空压机air compressor	台	1	0.49	0.49	
		空压机管路、储气罐、冷干机Air compressor pipeline, air storage tank, cold drying machine	套set	1	3.53	3.53	
		管道、阀门等pipelines and valves etc	套set	1	11.76	11.76	
7	厂房 Plant	1800 square meters	M2	2	56.47	112.94	
		行吊crane	台	4	1.36	5.46	
8	检验 Inspect	化验设备Laboratory equipment	套set	1	2.53	2.53	
9	非标 Non-standard		批 batch	1	23.53	23.53	
10	消耗品 Consumables	钢球steel balls	批 batch	27	0.20	5.40	
		陶瓷球ceramic balls	批 batch	24.5	0.31	7.49	
11	电气 Electrical	永磁电机permanent magnet motor	批 batch	1	94.12	94.12	
		电控electrical control	batch	1	105.88	105.88	
总计（万）：Total			**8,532,600USD**				

经计算，矿山总投资金额为：开发成本+资金成本=总投资（美元）

3950000+8532600=12482600（美元）

After calculation, the total investment amount of the mine: development cost plus capital cost=total investment (USD)

3950000+8532600=12482600 USD

10.3 Project Revenue Estimates 项目收益估算

Revenues are estimated based on the amount of graphite to be produced. The average feed grade of the ore from the mine has been estimated to be 8% TGC. The ore is planned to be concentrated into 95%TGC, which is a saleable product to an international market.

收入是根据生产的石墨量来估算的。该矿矿石的平均进料品位估计为 8% TGC。计划将矿石浓缩成 95%TGC，该产品可销往国际市场

- If a plant recovery of 70% is taken, for every tonne of ore, only 8% x 70% = 5.6% will be recovered in the concentrates;
- At a feeding rate of 120 tons /h and working 15 hours a day, 120*5.6% *15= 100.8 tons of raw ore will be produced every day;
- For 300 days in a year, a total of 100.8 x 300 = 30,240 tonnes of concentrates will be produced.
- 1）如果采用 70%的选矿回收率，则每吨矿石的精矿回收率仅为 8% x 70% = 5.6%。
- 2）以 120 吨/h 的投料速度，每天工作 15 小时计算，每天将生产 120*5.6% *15= 100.8 吨原矿。
- 3) 每年 300 天，总共将生产 100.8 x 300 = 30240 吨精矿。
- 4）1 吨浓缩石墨的价格为 680 美元。对于 30240 吨，收入将为:= 30240 x680 =每年 20563200 美元。
- 残值，即项目寿命结束后资产的市场价格，在本研究中假设为零

- Price of 1 tonne of graphite Concentrate is sold at USD 680. For 30,240 tonnes, revenues will be:
  = 30,240 x 680 = **$20,563,200 per year.**

Salvage value, which is the market price of the assets after the project life has come to an end is assumed to be zero in this study.

11.1 酸性岩石排水和排污场建设

1. PAF材料将被分离并放置在垃圾场的下部，但由于结晶石灰石的存在，预计PAF将自动中和。

2. PAF材料采用NAF材料封装，尽可能封装深度至少5米。

3.一旦排土场达到最终高度，将在表面尚未压实的区域进行轨道滚动，以最大限度地减少表土扩散前的水渗透。

4. 在非活动倾卸区，将铺开安全围堤和围成圆形的倾倒浪头。

对垃圾堆积场的径流进行控制，将其引入沉降池，并设置石灰点和 pH 监测点，以确保合规

11 HEALTH AND SAFETY 健康和安全

Health, Safety and Environment regulations for mining operations provides explanation and guidance on the health and safety of mining including the following:

采矿作业健康、安全和环境条例对采矿的健康和安全作出了解释和指导，包括以下内容:

1. Every Mining activity, based on the amount of employees and/or the characteristic of the working area, are required to create a unit for handling health and safety under the supervision of the Health and Safety Manager. 根据员工数量和/或工作区域的特点，每项采矿活动都需要在健康和安全经理的监督下建立一个处理健康和安全的单位。

2. The (Health and Safety) unit supervised by the Health and Safety Manager are responsible for: 由健康和安全经理监督的(健康和安全)单位负责:

    a. Collecting data and recording every incident, the conditions before the incident, cause of the incident, analysis of the incident and identification and implementation of controls to prevent of the incident in the future. 收集数据并记录每一个事件，事件发生前的情况，事件的原因，事件的分析和识别和实施控制，以防止将来发生事件。

    b. Collecting data related to the area and activities that need extra supervision in order to give advice to the Technical Head. This could include advice about the working bench, mining machinery and how to use detection and protective equipment. .收集与需要额外监督的领域和活动相关的数据，以便向技术主管提供建议。这可能包括关于工作台、采矿机械以及如何使用检测和保护设备的建议。

    c. Give explanation and guidance about Health and Safety to all mining employees by organising meetings, speeches, discussions, using film, publication, etc. 通过组织会议、演讲、讨论、使用电影、出版物等方式，向所有矿工提供有关健康和安全的解释和指导。

    d. If needed, building and training the mining rescue team. 必要时，组建和培训矿山救援队伍

    e. Compiling statistical incident data. 汇编统计事件数据

    f. Evaluating Health and Safety. 评估健康和安全

3. Creating Health and Safety committee within the organisation with the following duties: 在组织内部设立健康与安全委员会，履行以下职责:

    a. Doing regular inspections of all Health and Safety aspects and problems which are found in the mine and provide action items to eliminate problems, and

    b. Arrange all inspections and record of the mine working area.

    a.定期检查矿山所有健康和安全方面以及发现的问题，并提供消除问题的活动项目

    b.安排对矿区的所有检查和记录。

c.

11.1 General health and Safety Obligations 般健康和安全义务

The project owner has the following general Health and Safety obligations: 项目所有者负有下列一般健康和安全义务:

Production must follow the Production Targets with minimum incidents.

1. Safety is everyone's responsibility.
2. Every employee must obey safety rules.
3. A Technical Head must be appointed as the representative who has the responsibility of all Health and Safety aspects. The Technical Head is also responsible for the Management of the Health, safety and environment Department.
4. Develop an effective and efficient Health and Safety organisation structure that includes owner operators, contractors and sub contractors as members.
5. Standardised SOPs (Safe Operating Procedure) must be developed for all contractors and sub-contractors that work in this site.
6. Every employee and every person inside the mining activity area must use PPE (Personal Protective Equipment).
7. The Company must provide PPE free of charge to employees.
8. All employees must know their working procedures:
    a. Understand and know their job
    b. Know the hazards of their job
    c. Check that their working conditions are safe
    d. Check that tools and equipment are in a safe condition
    e. Wear PPE

Everyone must work to minimise hazardous incidents by strictly implementing Health and Safety Rules, and every effort must be utilised to reduce incidents by conducting yearly Training Programs, developed by the Safety Committee for all staff, contractors, and sub-contractors.

1. 生产必须遵循生产目标，事故最少。
2. 安全是每个人的责任。
3. 每个雇员都必须遵守安全规则。
4. 必须任命一名技术主管作为代表，负责所有健康和安全方面的工作。技术主管还负责健康、安全和环境部门的管理。
5. 建立有效和高效的健康和安全组织结构，包括业主、运营商、承包商和分包商为成员。

5. 必须为在本工地工作的所有承包商和分包商制定标准化的sop(安全操作程序)。

7. 每个员工和采矿活动区域内的每个人都必须使用PPE(个人防护装备)。

6. 公司必须免费为员工提供个人防护用品。

9. 所有员工必须了解他们的工作流程:

a.理解并了解自己的工作

b.了解他们工作的危险

c.检查工作环境是否安全

d.检查工具、设备是否安全e.穿戴防护装备

每个人都必须严格执行健康和安全规则，尽量减少危险事故，并通过安全委员会为所有员工、承包商和分包商制定的年度培训计划，尽一切努力减少事故

11.2 Operational procedures 操作程序

The Technical head is responsible for developing a Work Program for Health and Safety every year. It will include: 技术主管负责制定每年的健康和安全工作计划。它将包括:

1. Identification and assessment of hazards and risks in all work areas.
2. Developing Standard Operating Procedures (SOP) for all activities which involve significant risk.
3. Ensure routine medical check-ups for employees who operate equipment.
4. A quick check of health for heavy equipment operators and drivers before they start their shift.
5. 24 hour supervision of high risk areas.
6. Disciplinary action for those who violate any SOPs for Health and Safety.
7. 1. 识别和评估所有工作领域的危害和风险。
8. 2. 为所有涉及重大风险的活动制定标准操作程序。
9. 3.确保对操作设备的员工进行例行体检。
10. 4. 在重型设备操作员和司机开始轮班前，对他们的健康状况进行快速检查。
11. 5. 高风险区域 24 小时监控。
12. 6. 对违反健康和安全标准操作规程的人员给予纪律处分

All Standard Operating Procedures will be controlled documents, and a register will be kept and maintained by the safety department. Development of standard operating procedures for the use and storage of explosives is particularly important as these activities are closely regulated.

所有的标准操作程序都是受控文件，并由安全部门保存和维护一个登记册。制订使用和储存爆炸物的标准作业程序特别重要，因为这些活动受到严格管制。

11.3 Safety Equipment 安全设备

A variety of equipment will be provided depending on the location and function of the work being performed. The company will provide such PPE as required to protect from injury. 将根据所进行工作的地点和功能提供各种设备。公司将提供所需的个人防护用品以防止受伤。

The following items shall be provided:

- Safety Shoes
- Safety Glasses
- Reflector Vests
- Ear Plugs
- Dust Masks
- Hand Gloves
- Safety Helmets
- 应提供下列项目:
- •安全鞋
- •安全眼镜
- •反光背心
- •耳塞
- •防尘口罩
- •手套
- •安全头盔

12.0 COMMUNITY RELATIONS 社区关系

Corporate social responsibility requires the company to develop community programs in coordination with the local government. The nature and type of the community programs will depend on the needs of the local communities affected by the mining operations, and close consultation with the local government and local community leaders is required to determine how to maximise the value of these programs in the community.

企业的社会责任要求公司与当地政府协调发展社区项目。社区项目的性质和类型将取决于受采矿作业影响的当地社区的需求，需要与当地政府和当地社区领导人密切协商，以确定如何使这些项目在社区中的价值最大化。

Community programs generally fall into the following categories:

- Provision of infrastructure and services to the community, such as construction of schools and the provision of medical services
- Provision of training and skills development in the community to prepare them for employment in the mining operations
- Assistance in the development of other business and economic activities independent of the mine so that the community can be self-sustaining after mining activities are finished
- 社区项目一般分为以下几类:
- 向社区提供基础设施和服务，如建造学校和提供医疗服务
- 在社区提供培训和技能开发，为他们在采矿作业中就业做好准备
- 协助发展独立于矿山的其他商业和经济活动，使社区在采矿活动结束后能够自我维持

Building a common understanding and relationship can be difficult with remote communities due to social and cultural barriers, and it is common for problems to occur due to the wrong assumptions about what the community really needs. A competent and experienced community services department will be recruited to assist with management of these issues.

Compensation for land is also a key community issue and one where care and judgement will be exercised to prevent conflict with members of the community. It is common that records of land ownership are not clear, and for overlapping land claims to be made. The project owner will work closely with the, government, local community leaders to ensure that the process is fair and transparent, and detailed records will be kept of all land payments, including surveys of the compensated area. All payments will be recorded with signed records and photographs of the persons being compensated to avoid future conflicts.

由于社会和文化障碍，与偏远社区建立共同的理解和关系可能很困难，而且由于对社区真正需要的错误假设而出现问题是很常见的。将招聘一个有能力和有经验的社区服务部门来协助管理这些问题。

土地补偿也是一个关键的社区问题，在这个问题上必须谨慎和判断，以防止与社区成员发生冲突。土地所有权记录不清晰，土地所有权要求重叠是很常见的。项目业主将与政府、当地社区领导人密

切合作，确保这一过程公平透明，并保存所有土地付款的详细记录，包括对补偿区域的调查。所有付款都将记录有签名记录和被补偿人员的照片，以避免将来发生冲突

13 ECONOMIC ANALYSIS 经济分析

13.1 Revenue Estimates 收益估算

The following main technical parameters are considered in the estimation of the Kwamsisi Graphite Project financial analysis:

在Kwamsisi石墨项目财务分析的估计中考虑了以下主要技术参数:

Table 13.1: Input Data for the Project Financial Appraisal 项目财务评估的输入数据

Zone	Volume体积	Tonnages吨	Average grade (%)平均品位
rt	矿床储量总吨数Total tonnage of deposit reserves	5,796,000	8
rf	回收率Recovery rate	0.70	
dpy	每年运行天数Days of operation per year	300	days
T	可开采吨数mining tonnages	4,550,000	tonnes
L	矿山寿命mine life	9	yrs
COP	生产能力/天production capacity/day	100.8	tonne
DMC	日开采能力mining capacity/day	1800	tonne
AP	年生产量annual production capacity	30240	tpa
	估计品位范围estimated grade range	5 – 8	% TGC
	石墨销售价格Graphite sales price	680.00	$/t

13.2 Cash Flow Analysis 现金流分析

Revenues and cost estimates made in sections 5 to 10, which are based on the proposed schedule of operations were evaluated and a cash flow analysis was generated to determine the Net Present Value (NPV) . Table 12.2 is a cash flow analysis of the project and presents a picture of the schedules of costs and revenues, based on the following assumed financial parameters:

对第5至10节中根据拟议的作业进度所作的收入和费用估计进行了评价，并进行了现金流动分析，以确定净现值。表12.2是该项目的现金流动分析，并根据下列假定的财务参数列出费用和收入表:

- Mine life of 9 years;
- Income Tax rate of 30% applicable for Tanzania;
- Government Loyalty

- A nine-year investment tax credit has been considered under existing Tanzanian tax rules;
- Tax exemption on fuel, oils, and other imported supplies has not been incorporated in the study though the project qualifies under existing tax incentives accorded to mine development projects in Tanzania. When these incentives are incorporated, it will greatly boost the cash flow of the project.

Based on the above parameters the project has shown to have good potential to generate cash as summarized in some of the important economic indicators shown in Table 13.2.

口矿山寿命9年;

口坦桑尼亚所得税税率为30%;

口政府优惠

口根据现有的坦桑尼亚税收规则，已经考虑了一项为期五年的投资税收抵免;

口虽然该项目符合坦桑尼亚矿山开发项目现有的税收优惠政策，但燃料、油和其他进口用品的免税并未纳入研究。当这些激励措施被纳入，它将大大提高项目的现金流。

根据上述参数，该项目显示出产生现金的良好潜力，如表14.1所示的一些重要经济指标所总结。

Assumptions 假设

Graphite price will remain at USD $680/ton over LOM, 在 LOM 上，石墨价格将保持在 680 美元/吨

Table 13.2: Estimated Annual NPV for 100% graphite Production for the First year 第一年 100%石墨生产的估计年度净现值

Entity个体	Amount (USD)金额
年收入生产(0.7回收系数)Annual revenue (recovery rate 0.7)	**20,563,200.00**
运输费用transportation expenses	1,150,000.00
年环境管理成本Annual environmental management cost	116,100.00
营运资金operation cost	12,023,541.18
30% 所得税30%income tax	2,182,067.65
0.03% 服务税0.03% service tax	8,526.60
Total总计	15,480,235.42
每年净利润Annual net profit	**5,082,964.58**

Remark：

The current calculation model is calculated according to the ideal product selling price, which is only an expected income of both parties. The expected income is related to the operating cost, the selling price of goods and the local tax policy. The production is tentatively set at 30,000 tons, and the operating cost is fixed , the higher the selling price, the more taxes need to be paid, which can be appropriately reduced through the Subsidiary sales company model .

Both parties may have different opinions on the selling price, or they can distribute the total production amount according to the contract proportion, control the selling price by themselves, and increase the profits of both parties.

当前计算模式按照理想的产品售价进行核算，只是合作双方一种预期收入，预期收**入与运**营成本和货物售价以及当地税收政策相关联，产量暂定 3 **万吨**，**运**营成本一定，售价越高，需要交纳的税收就越多，可通过二级销售公司模式适当降低税赋，

双方也可能存在对售价意见不统一，也可按照生产总量根据合同比例进行分配，自行掌握售价，提高合作双方的利润。

14 CONCLUSION AND RECCOMMENDATION 结论和建议

14.1 Conclusion 结论

The graphite mineralization found at the Property is best categorized as a disseminated flake graphite deposit. The graphite mineralization on the Property is particularly amenable to extraction by quarry methods as it is lying at the shallow depth from the surface and offers the benefits of a low stripping ratio. The Deposit has road access and is located in an area of excellent infrastructure and resources.

在该矿区发现的石墨矿化最好归类为浸染状鳞片石墨矿床。该矿区的石墨矿化特别适合采石场开采，因为它位于离地表较浅的深度，具有低剥离比的优点。该矿床有道路通道，位于基础设施和资源良好的地区

The Resource was calculated with a 5% Fixed Carbon cut-off grade and the average grade of 8 % Fixed carbon. The average bulk density values for graphite ore is 2.3, and the average bulk density of the excavated material was used as 1.8, the total resource resources is 5,796,000 tons and the total minable ore is 2,576,000 tons. The mining operation is expected for 300days/year with daily mining capacity 1,800tons which will produce 100.8 graphite tons per day and annual mining capacity of 540,000 tons of graphite ore. The annual graphite production will be 32,400 tons. The expected mining life is 9 years but during mining operation the drilling operation will be continuing in order to update the graphite resources into graphite reserve, hence it is estimated the mining life will reach 15 years.

资源是以 5%的固定碳截止品位和 8%的平均固定碳品位计算的。ligolith 和岩石的平均容积密度值均为 2.3，挖出物的容积密度值为 1.8，资源总量为 579.6 万吨，可采矿石总量为 257.6 万吨。预计开采 300 天/年，日开采能力 1800 吨，每天可生产 100.8 吨石墨，年开采能力 54 万吨石墨矿石，石墨年产量将达到 3.24 万吨。预计开采寿命为 9 年，但在开采过程中，钻井作业将继续进行，以将石墨资源更新为石墨储备，因此估计开采寿命将达到 15 年。

The graphite mineralization at Kwamsisi property seems to be lithological controlled, mainly concentrated in graphitic gneiss and crystalline limestone which is associated with biotite and muscovite. All samples collected from graphitic gneiss has shown good grade of graphitic carbon ranging from 1.63% to 55% and average of 8%TGC which is an economic grade

Kwamsisi矿区的石墨矿化受岩性控制，主要集中在石墨片麻岩和结晶灰岩中，与黑云母和白云母有关。石墨片麻岩样品的石墨碳品位为1.63% ~ 55%，平均tgc为8%，属于经济品位

14.2 Recommendation 建议

Contingent on the successful completion of the phase i program, additional drilling would likely be required to provide sufficient data for an updated resource estimate. in addition to new drilling sampling of drill core would be necessary to conform with industry-accepted QA/QC procedures.

Conduct an environmental and social impact assessment study in the area in order to get the certificate which is a key document for application of the mining license (ML)

根据第一阶段项目的成功完成，可能需要进行额外的钻探，以提供足够的数据进行更新的资源估算。此外，为了符合行业认可的质量保证和质量控制程序，还需要对钻芯进行取样

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APPENDICES 附件

APPENDIX A: List of Primary Mining Licenses covering the PML's Area Subject of the Geological Exploration 初级采矿许可证列表

S/N	LICENCE	LOCATION	REGISTERED OWNER	MINERAL	SIZE OF AREA COVERAGE
1	1374TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.28 Hectares
2	1375TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
3	1381TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.9 Hectares
4	1379TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99 Hectares
5	1380TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.98 Hectares
6	1349TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
7	1348TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
8	1353TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
9	1346TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99 Hectares
10	1444TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99 Hectares
11	1342TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.98 Hectares
12	0068TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	9.95 Hectares
13	1195TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.70 Hectares
14	1194TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.71 Hectares
15	1196TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.69 Hectares
16	1199TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	8.74 Hectares
17	1206TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.93 Hectares

S/N	LICENCE	LOCATION	REGISTERED OWNER	MINERAL	SIZE OF AREA COVERAGE
18	1205TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.63 Hectares
19	1204TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.66 Hectares
20	1200TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.69 Hectares
21	1207TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.63hectares
22	0067TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	8.96 Hectares
23	0066TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	8.50 Hectares
24	0065TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	10.00 Hectares
25	0064TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	10.00 Hectares
26	0063TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Feldspar	9.69 Hectares
27	1452TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99 Hctares
28	1202TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.60 Hectares
29	1203TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.67 Hectares
30	1208TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.70 Hectares
31	1201TNG	Kwedikabu-Handeni	Mohamed §Zahor Mohamed	Graphite	9.63hectares
32	1197TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	9.76 Hectares
33	1198TNG	Kwedikabu-Handeni	Mohamed Zahor Mohamed	Graphite	8.77 Hectares
34	1345TNG	Kwedikabu-Bagamoyo	Kusini Gateway Industrial Park Limited	Graphite	9.98 Hectares
35	1456TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
36	1454TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares
37	1405TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99 Hectares
38	1453TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park	Graphite	9.84hectares

S/N	LICENCE	LOCATION	REGISTERED OWNER	MINERAL	SIZE OF AREA COVERAGE
			Limited		
39	1455TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.54 Hectares
40	1450TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99hectares
41	1401TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	9.99hectares
42	1347TNG	Kwedikabu-Handeni	Kusini Gateway Industrial Park Limited	Graphite	10.00 Hectares

Appendix B: Drill holes Locations 钻孔位置坐标

Hole_ID	X_Arc1960	Y_Arc1960	z_m	WGS84_X	WGS84_Y	Planned Depth_m	E.O.H_m
BHDD01	456430	9341220	182	38° 36' 25.8804"	-5° 57' 45.1764"	50	0.00
BHDD02	456580	9341220	180	38° 36' 30.7584"	-5° 57' 45.18"	50	0.00
BHDD03	456730	9341220	185	38° 36' 35.64"	-5° 57' 45.1836"	50	20.00
BHDD03B	456770	9341220	186	38° 36' 36.90"	-5° 57' 45.1836"	50	11.50
BHDD04	456360	9340920	170	38° 36' 23.598"	-5° 57' 54.9468"	50	13.00
BHDD05	456510	9340920	172	38° 36' 28.476"	-5° 57' 54.9504"	50	23.50
BHDD06	456660	9340920	178	38° 36' 33.354"	-5° 57' 54.954"	50	50.00
BHDD07	456520	9340608	158	38° 36' 28.7928"	-5° 58' 5.1096"	50	0.00
BHDD08	456585	9340608	170	38° 36' 30.9096"	-5° 58' 5.1132"	50	34.50
BHDD09	456490	9340520	149	38° 36' 27.8172"	-5° 58' 7.9752"	50	0.00
BHDD10	456565	9340518	160	38° 36' 30.2544"	-5° 58' 8.0436"	50	0.00
BHDD11	456458	9340432	148	38° 36' 26.7732"	-5° 58' 10.8408	50	29.00
BHDD12	456516	9340431	148	38° 36' 28.6596"	-5° 58' 10.8768"	50	31.60
BHDD12B	456584	9340610	179	38° 36' 28.1"	-5° 58' 10.8768"	50	20.50
BHDD13	456285	9340064	168	38° 36' 21.1392"	-5° 58' 22.8216"	50	0.00
BHDD14	456436	9340064	162	38° 36' 26.0496"	-5° 58' 22.8252"	50	0.00
BHDD15	456263	9339960	169	38° 36' 20.4192"	-5° 58' 26.2056"	50	0.00
BHDD16	456400	9339960	164	38° 36' 24.876"	-5° 58' 26.2092"	50	0.00
BHDD17	456238	9339851	165	38° 36' 19.6056"	-5° 58' 29.7552"	50	0.00
BHDD18	456320	9339851	170	38° 36' 22.2696"	-5° 58' 29.7588"	50	0.00
BHDD19	456085	9339519	174	38° 36' 14.6196"	-5° 58' 40.566"	50	0.00
BHDD20	456193	9339520	185	38° 36' 18.1332"	-5° 58' 40.5336"	50	0.00
BHDD21	456070	9339360	163	38° 36' 14.1264"	-5° 58' 45.7428"	50	0.00

Appendix C: Trenches Locations 沟槽位置坐标

WP	Arc1960_X	Arc1960_Y	Elev_m	WGS84_X	WGS84_Y
TR1	456442	9341282	184	38° 36' 26.2728"	-5° 57' 43.1568"
TR2	456582	9340602	178	38° 36' 30.8088"	-5° 58' 5.3076"
TR3	456780	9341207	188	38° 36' 37.2636"	-5° 57' 45.6084"
TR4	456288	9340571	172	38° 36' 21.2472"	-5° 58' 6.312"
TR5	456570	9340546	168	38° 36' 30.42"	-5° 58' 7.1328"
TR6	456322	9340666	167	38° 36' 22.356"	-5° 58' 3.216"
TR7	456116	9339362	167	38° 36' 15.624"	-5° 58' 45.678"
TR8	455062	9338423	141	38° 35' 41.316"	-5° 59' 16.2312"
TR9	455061	9338033	158	38° 35' 41.2728"	-5° 59' 28.932"
TR10	456004	9339526	172	38° 36' 11.9844"	-5° 58' 40.3356"
TR11	456174	9339575	185	38° 36' 17.5176"	-5° 58' 38.7408"
TR12	456314	9339838	186 m	38° 36' 22.0752"	-5° 58' 30.18"
TR13	456439	9340065	178 m	38° 36' 26.1468"	-5° 58' 22.7928"

Appendix D: Laboratory Results_Grab and Trenching Work 槽探实验室样品结果

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TEST-5 0043

GST/QAF 7.8.2
Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab ref: 2022-23EX 969
Submitted by: AZUSTONE RESOURCES (T) LTD
Received date: 08/11/2022
Reported date: 10/11/2022
#Samples: 22
Pages: 2
Type of Samples: ROCK
Address: PO BOX 68163, DAR ES SALAAM

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Notes

Management Signatory

Technical Signatory

BUNANZE SHIJA
DELIPHINA ALEX
RIZIKI WILLIAM

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Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2022-23EX 969
Submitted by: AZUSTONE RESOURCES (T) LTD
Received date: 08/11/2022
Reported date: 10/11/2022
Type of Samples: ROCK
Sample condition: ACCEPTABLE
Analysis Type: Proximate
Samples: 22

Sample ID	Total graphitic carbon (By Calculation)	Ash (DB)	Moisture Content (ADB)	Volatile Matter (DB)
TR01	13.28	82.73	0.46	3.53
TR02A	25.30	69.69	0.29	4.72
TR02B	18.01	77.18	0.78	4.03
TR03	30.74	64.8	0.60	3.86
TR04	29.08	65.96	0.05	4.91
TR05A	35.59	59.56	0.76	4.09
TR05B	31.42	62.99	0.61	4.98
TR06	15.98	80.48	0.31	3.23
TR07	9.87	85.64	0.46	4.03
TR08	9.58	85.95	0.41	4.06
TR09A	15.43	79.95	0.84	3.78
TR09B	16.44	78.56	0.99	4.01
TR10	34.17	60.84	0.06	4.93
TR11	13.26	82.45	0.71	3.58
TR12	17.99	76.67	0.96	4.38
TR13	11.33	83.61	0.28	4.78
TR014	20.1	75.50	0.39	4.01
KDG01	21.72	73.11	0.96	4.21
KDG02	12.05	84.63	0.54	2.78
KDG03	27.02	68.85	0.41	3.72
KDG04	35.38	59.45	0.96	4.21
KDG05	40.65	54.69	0.03	4.63
METHOD	***ASTM D3172***	***GST***	***ASTM D3302***	***ASTM D3175***

- not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

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Appendix E: Laboratory Results_Drilling Work　钻探样品实验室结果

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Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
#Samples: 95
Pages: 6
Type of Samples: DRILL CORE
Address: P. O. BOX 68163, DAR ES SALAAM.

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Notes

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RIZIKI WILIAM
BUNANZE SHIJA
DELIFINA ALEX

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Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
Type of Samples: DRILL CORE
Sample condition: ACCEPTABLE
Samples: 95

S/N	Sample ID	Total Graphitic Carbon (Calculated)	Ash (ADB)	Volatile Matter (ADB)	Moistre Content (ADB)
1	HDD001	6.79	91.93	1.27	0.01
2	HDD002	12.75	82.82	4.35	0.08
3	HDD003	6.57	91.42	1.76	0.25
4	HDD004	6.29	90.38	3.23	0.10
5	HDD005	6.08	91.23	2.53	0.16
6	HDD006	7.58	90.71	1.50	0.21
7	HDD007	7.20	90.48	1.96	0.36
8	HDD008	6.46	91.09	2.04	0.41
9	HDD009	12.94	84.65	2.37	0.04
10	HDD010	12.30	85.80	1.82	0.08
11	HDD011	11.78	85.93	1.68	0.61
12	HDD012	23.83	70.87	4.57	0.73
13	HDD013	20.10	75.55	4.33	0.02
14	HDD014	11.15	86.24	2.55	0.06
15	HDD015	2.39	94.89	2.49	0.23
16	HDD016	6.31	91.13	2.10	0.46
17	HDD017	10.50	87.92	1.51	0.07
18	HDD018	5.59	92.54	1.28	0.59
19	HDD019	5.01	92.66	1.34	0.99
20	HDD020	8.53	88.07	3.20	0.20
21	HDD021	21.97	73.57	4.31	0.15
22	HDD022	19.97	76.30	3.72	0.01
Units		%	%	%	%
METHOD		*ASTM D3172*	*GST*	*ASTM D3302*	*ASTM D3175*

- not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

Management Signatory

Technical Signatory

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TEST-5 0043

GST/QAF 7.8.2
Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
Type of Samples: DRILL CORE
Sample condition: ACCEPTABLE
Samples: 95

S/N	Sample ID	Total Graphitic Carbon (Calculated)	Ash (ADB)	Volatile Matter (ADB)	Moistre Content (ADB)
23	HDD023	28.51	68.86	2.61	0.02
24	HDD024	18.64	76.65	4.30	0.41
25	HDD025	10.77	86.66	2.11	0.46
26	HDD026	13.95	82.83	3.01	0.21
27	HDD027	18.08	77.15	4.28	0.49
28	HDD028	55.51	40.80	3.61	0.08
29	HDD029	35.99	60.83	3.09	0.09
30	HDD030	6.88	92.72	0.39	0.01
31	HDD031	14.02	81.64	4.31	0.03
32	HDD032	37.13	58.13	4.70	0.04
33	HDD033	28.33	70.51	1.01	0.15
34	HDD034	25.33	69.61	4.72	0.34
35	HDD035	48.28	47.54	3.92	0.26
36	HDD036	16.46	79.18	3.58	0.78
37	HDD037	6.50	90.84	2.13	0.53
38	HDD038	6.13	90.96	2.01	0.90
39	HDD039	6.81	92.10	0.71	0.38
40	HDD040	6.39	89.08	3.62	0.91
41	HDD041	4.42	94.12	1.21	0.25
42	HDD042	15.88	82.49	1.28	0.35
43	HDD043	6.72	88.55	4.30	0.43
44	HDD044	9.21	85.35	4.81	0.63
Units		%	%	%	%
METHOD		*ASTM D3172*	*GST*	*ASTM D3302*	*ASTM D3175*

- not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

Management Signatory

Technical Signatory

SADCAS

TEST-5 0043

GST/QAF 7.8.2
Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
Type of Samples: DRILL CORE
Sample condition: ACCEPTABLE
Samples: 95

S/N	Sample ID	Total Graphitic Carbon (Calculated)	Ash (ADB)	Volatile Matter (ADB)	Moistre Content (ADB)
45	HDD045	13.49	81.99	4.23	0.29
46	HDD046	15.81	80.67	3.13	0.39
47	HDD047	16.78	78.66	4.10	0.46
48	HDD048	7.90	87.58	4.28	0.24
49	HDD049	8.33	88.61	2.85	0.21
50	HDD050	5.53	90.64	3.51	0.32
51	HDD051	5.90	90.31	3.44	0.35
52	HDD052	2.43	93.71	3.46	0.40
53	HDD053	8.57	89.77	1.30	0.36
54	HDD054	7.80	88.50	3.47	0.23
55	HDD055	5.44	91.60	2.05	0.91
56	HDD056	9.63	88.34	1.80	0.23
57	HDD057	20.61	74.46	4.79	0.14
58	HDD058	10.90	84.69	4.13	0.28
59	HDD059	11.21	83.81	4.54	0.44
60	HDD060	9.32	89.81	0.44	0.43
61	HDD061	12.94	82.78	3.70	0.58
62	HDD062	10.79	83.92	4.80	0.49
63	HDD063	2.45	95.89	1.02	0.64
64	HDD064	8.63	89.40	1.79	0.18
65	HDD065	10.66	84.16	4.27	0.91
66	HDD066	4.63	91.97	2.46	0.94
Units		%	%	%	%
METHOD		*ASTM D3172*	*GST*	*ASTM D3302*	*ASTM D3175*

- not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

Management Signatory

Technical Signatory

SADCAS

TEST-5 0043

GST/QAF 7.8.2
Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
Type of Samples: DRILL CORE
Sample condition: ACCEPTABLE
Samples: 95

S/N	Sample ID	Total Graphitic Carbon (Calculated)	Ash (ADB)	Volatile Matter (ADB)	Moistre Content (ADB)
67	HDD067	6.69	90.91	1.92	0.48
68	HDD068	10.61	84.74	4.08	0.57
69	HDD069	1.68	96.81	1.15	0.36
70	HDD070	32.07	63.58	4.15	0.20
71	HDD071	27.15	68.88	3.67	0.30
72	HDD072	29.66	66.68	3.01	0.65
73	HDD073	29.81	65.23	4.92	0.04
74	HDD074	16.43	78.98	4.56	0.03
75	HDD075	17.49	78.63	3.82	0.06
76	HDD076	12.51	85.90	1.28	0.31
77	HDD077	8.14	89.98	1.83	0.05
78	HDD078	14.74	83.14	1.82	0.30
79	HDD079	9.52	88.88	1.52	0.08
80	HDD080	11.40	86.55	2.02	0.03
81	HDD081	9.81	88.71	1.46	0.02
82	HDD082	9.04	87.35	2.54	0.07
83	HDD083	10.04	86.99	2.45	0.52
84	HDD084	12.20	86.45	1.28	0.07
85	HDD085	6.98	88.89	3.35	0.78
86	HDD086	2.90	95.48	0.73	0.89
87	HDD087	4.31	94.94	0.34	0.41
88	HDD088	3.69	95.24	0.71	0.36
	Units	%	%	%	%
	METHOD	*ASTM D3172*	*GST*	*ASTM D3302*	*ASTM D3175*

- not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

Management Signatory

Technical Signatory

SADCAS

TEST-5 0043

GST/QAF 7.8.2
Effective Date: 15 Nov 2021

ANALYTICAL REPORT

Lab Ref: 2021-22 EX1441
Submitted by: BROAD RESOURCES(SINGAPORE) & AZUSTONE RESOURCES(T) LTD
Received date: 27/12/2022
Reported date: 05/01/2023
Type of Samples: DRILL CORE
Sample condition: ACCEPTABLE
Samples: 95

S/N	Sample ID	Total Graphitic Carbon (Calculated)	Ash (ADB)	Volatile Matter (ADB)	Moistre Content (ADB)
89	HDD089	4.26	95.15	0.43	0.16
90	HDD090	10.11	89.17	0.45	0.27
91	HDD091	2.37	96.28	0.84	0.51
92	HDD092	8.77	88.14	2.92	0.17
93	HDD093	3.82	95.28	0.35	0.55
94	HDD094	7.70	88.87	3.38	0.05
95	HDD095	9.96	89.54	0.49	0.01
Units		%	%	%	%
METHOD		*ASTM D3172*	*GST*	*ASTM D3302*	*ASTM D3175*

- not analysed | — element not determined | I.S. insufficient sample | L.N.R. listed not received | * Accredited

Management Signatory

Technical Signatory

Appendix F: Petrographic Samples Analysis fo Determination of Flake Graphite
鳞片尺寸分析报告（之前已经单独翻译）

LABORATORY REPORT

Client's Name: Broad Resources(Singapore)& Azurastone Resources(T) Ltd
Address: P.O.BOX 68163,DSM
Laboratory Ref: 2022-23EX 1442
Received Date: 27/12/2022
Study Date: 09/01/2023
Reported Date: 11/01/2023
 # Samples: 11
 # Pages: 27
Type of Samples: ROCK
Sample Condition: DRY
Method: ***XLOI, PETROGRAPHIC STUDY***

Copy

Management Signatory

Name: .....

Signature: .....

Analyst

Name: .....

Signature: .....

Supervisor

Name: .....

Signature: .....

Geological Survey of Tanzania
Kilimo Avenue 01, Dodoma, P.O. Box 903, Dodoma, Tanzania
T +255 (0)26 232 3000 F +255 (0) 26 232 3020 www.gst.go.tz

Page 1 of 27

LABORATORY REPORT

GST/QAF 7.8.1(PM/MP)
Effective date: 20-12-2018

Laboratory Ref: 2022-23EX 1442
Received Date: 27/12/2022
Reported Date: 11/01/2023
Total Samples: 11
Type of Samples: ROCK
Sample Condition: DRY

PETROGRAPHIC ANALYSIS REPORT

Eleven(11) rock samples submitted at GST Laboratory for petrographic study, polished thin sections were studied using a routine petrographic method and the results are here below:

Sample Id: HDD 010

Mineral composition

(a) Primary minerals

1.Orthoclase - 44%
2.Pyroxene - 38%
3.Calcite - 9%
4.Quartz - 4%
5.Biotite - 3%
6.Plagioclase(Albite) - 2%

Rock name: Syenite Porphyry

Description

The sample is of fine to medium grained size,anhedral to subhedral in crystal outline, the sample is slightly weathered and moderately fractured.

Orthoclase - are of medium grained size,anhedral to subhedral in crystal form, granular in habit.

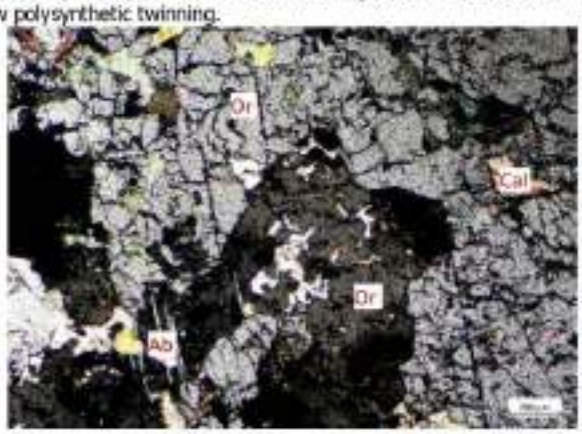
Pyroxene - are of fine to medium grained size, anhedral to subhedral in crystal form and granular in habit.

Calcite - are of fine to medium grained size,anhedral to subhedral in crystal form, with pinkish-green tint,some occur as infill along fractures.

Quartz - are of fine to medium grained size, anhedral in crystal form, granular in habit, some grains tends to show undulatory extinction.

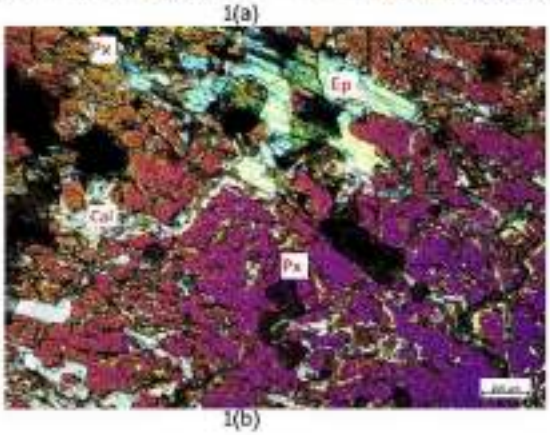
Biotite - are of medium grained size, subhedral in crystal form,some grains tends to show basal cleavage, some grains have altered to form Epidote mineral.

Plagioclase(**albite**) - are of fine to medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.



1(a)

Fig.1:Microphotograph (1a) showing Calcite(Cal),Orthoclase (Or) and Albite (Ab) under Cross Polarised Light(XPL) at 5X magnification objective.

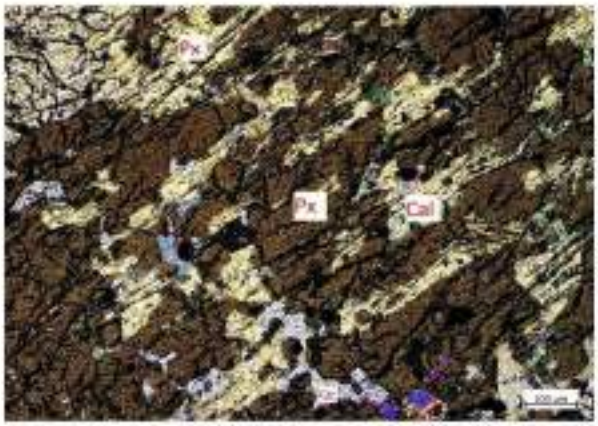


1(b)

Fig.1:Microphotograph(1b) showing Pyroxene(Px),Epidote(Ep and Calcite(Cal) under Cross Polarized Light(XPL) at 5X magnification objective.

LABORATORY REPORT

GST/QAT 7.8.2(FM/MP)
Effective date : 20-12-2019



1©

Fig.1:Microphotograph (1c) showing Pyroxene(Px) and Calcite (Cal) under Cross Polarised Light (XPL) at 5X magnification objective.

Sample Id: HDD 011

Mineral composition

(a) Primary minerals

1.Orthoclase - 49%
2.Pyroxene - 22%
3.Calcite - 19%
4.Biotite - 5%
5.Plagioclase(Albite) - 5%

Rock name: Syenite Porphyry

Description

The sample is of fine to coarse grained size,anhedral to subhedral in crystal outline, the sample is slightly weathered and fractured.

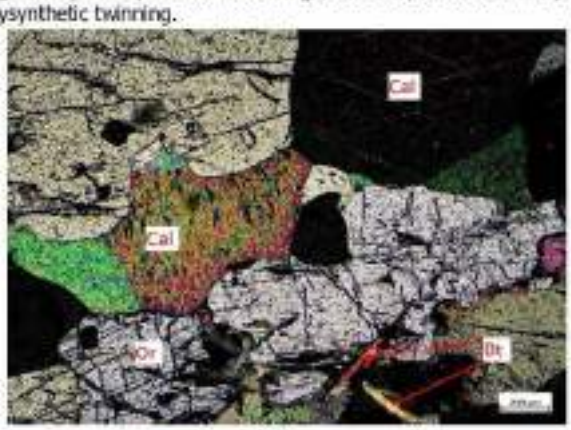
Orthoclase - are of fine to coarse grained size,anhedral to subhedral in crystal form, granular in habit.

Pyroxene - are of fine to coarse grained size, anhedral to subhedral in crystal form and granular in habit.

Calcite - are of medium grained size,anhedral to subhedral in crystal form, with pinkish-green tint.

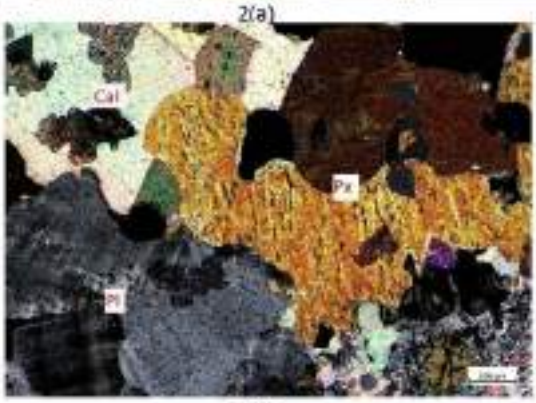
Biotite - are of medium grained size, subhedral in crystal form,some tabular in habit, some grains have altered to form Epidote and Muscovite minerals.

Plagioclase(**albite**) - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.



2(a)

Fig.2:Microphotograph (2a) showing Biotite(Bo), Calcite(Cal) and Orthoclase(Or) under Cross Polarised Light(XPL) at 5X magnification objective.



2(b)

Fig.2:Microphotograph (2b) showing Calcite(Cal), Pyroxene (Px),Plagioclase(Pl) under Cross Polarised Light(XPL) at 5X magnification objective.

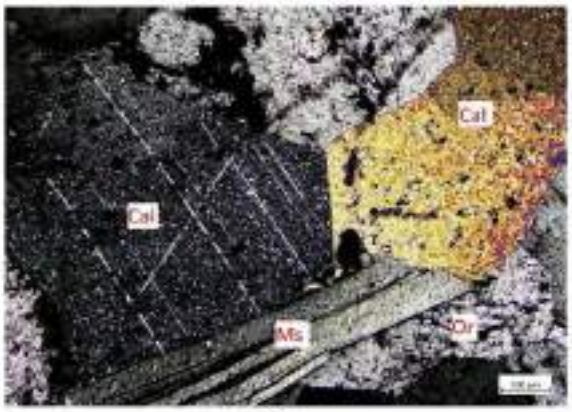


Fig.2:Microphotograph (2c) showing Muscovite(Ms), Calcite (Cal) and Orthoclase(Or) under Cross Polarised Light(XPL) at 10X magnification objective.

2©

Sample Id: HDD 032

Mineral composition

(a) Primary minerals

1.Quartz - 30%
2.Graphite - 19%
3.Calcite - 18%
4.Pyrite - 12%
5.Biotite - 7%
6.Olivine - 6%
7.Plagioclase(Albite) - 5%
8.Hornblende - 3%

Rock name: Graphitic-Granite

Description

The sample is of fine to coarse grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of fine to medium grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

Calcite - are of fine to medium grained size,subhedral in crystal form, with pinkish-green tint.

Pyroxene - are of fine to coarse grained size, anhedral to subhedral in crystal form and granular in habit.

Graphite - are of fine to coarse grained size, subhedral to euhedral in crystal form and fibrous in habit. Approximately average Flake size is 1.55mm.

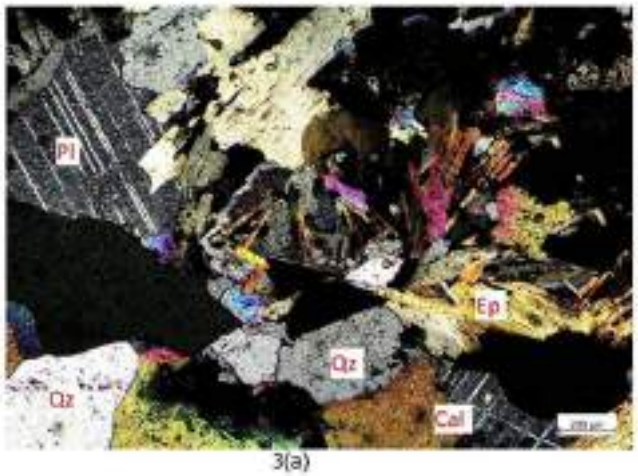
Pyrite - are of medium grained size, subhedral to euhedral in crystal form and some cubic in habit.

Biotite - are of medium grained size, subhedral in crystal form,some tabular in habit, some grains show perfect basal cleavage,some grains have altered to form Epidote mineral.

Plagioclase(**albite**) - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

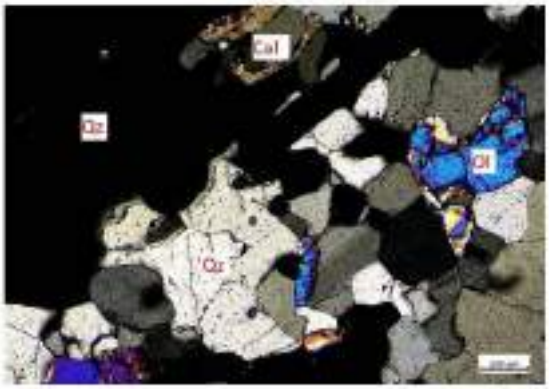
Olivine - are of medium to coarse grained size,anhedral to subhedral in crystal form, granular in habit, high interfearance colour.

Hornblende - are of fine to coarse grained size,anhedral to subhedral in crystal form, granular.



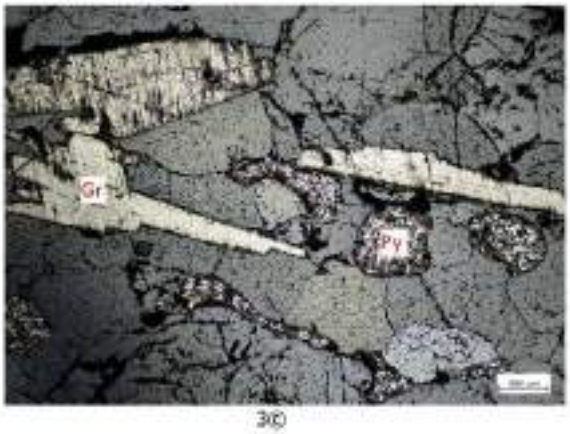
3(a)

Fig.3:Microphotograph (3a) showing Quartz(Qz),Plagioclase (Pl) ,Calcite(Cal) and Epidote(Ep) under Cross Polarised Light(XPL) at 5X magnification objective.



3(b)

Fig.3:Microphotograph (3b) showing Quartz(Qz),Olivine(Ol) and Calcite(Cal) under Cross Polarised Light(XPL) at 5X magnification objective.



3(c)

Fig.3:Microphotograph (3c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

LABORATORY REPORT

GST/QAF 7.6.2(PMMP)
Effective date: 20-12-2018

Sample Id: HDD 033

Mineral composition

(a) Primary minerals

1.Quartz - 34%
2.Graphite - 31%
3.Biotite - 9%
4.Calcite - 8%
5.Olivine - 6%
6.Pyrite - 5%
7.Plagioclase - 5%
8.Hornblende - 2%

Rock name: Graphitic-Granite

Description

The sample is of fine to coarse grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of medium grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

Calcite - are of fine to medium grained size,subhedral in crystal form, with pinkish-green tint.

Pyroxene - are of fine to coarse grained size, anhedral to subhedral in crystal form and granular in habit.

Graphite - are of fine to medium grained size, subhedral to euhedral in crystal form and fibrous in habit. Approximately average Flake size is 1.13mm.

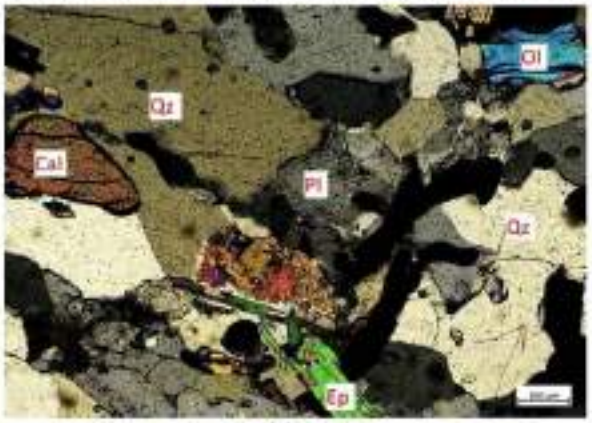
Pyrite - are of fine to medium grained size, subhedral to euhedral in crystal form and some cubic in habit.

Biotite - are of medium grained size, subhedral in crystal form,some tabular in habit, some grains show perfect basal cleavage, many grains have altered to form Epidote mineral.

Plagioclase - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

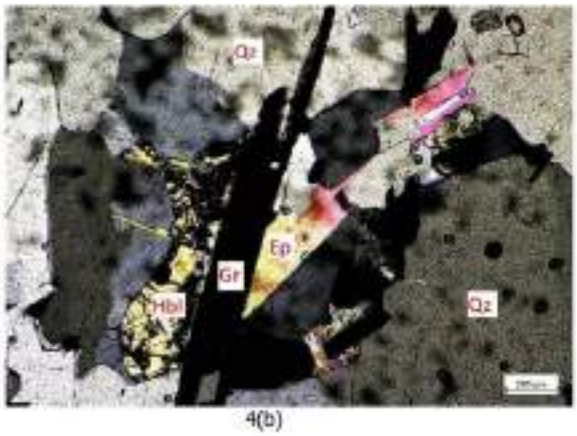
Olivine - are of medium grained size,anhedral to subhedral in crystal form, granular in habit, high interfearance colour.

Hornblende - are of medium grained size,anhedral to subhedral in crystal form, granular.



4(a)

Fig.4:Microphotograph (4a) showing Quartz(Qz),Olivine(Ol) Plagioclase(Pl), Epidote(Ep) and Calcite(Cal) under Cross Polarised Light(XPL) at 5X magnification objective.



4(b)

Fig.4:Microphotograph (4b) showing Quartz(Qz),Graphite(Gr) Epidote(Ep) and Hornblende(Hbl) under Cross Polarised Light (XPL) at 5X magnification objective.

Fig.4:Microphotograph (4c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

4(c)

Sample Id: HDD 051

Mineral composition

(a) Primary minerals

1.Hornblende - 28%
2.Calcite - 19%
3.Graphite - 17%
4.Plagioclase - 12%
4.Quartz - 15%
6.Pyrite - 7%
7.Biotite - 2%

Rock name: Graphitic-Quartz Diorite

Description

The sample is of fine to coarse grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Hornblende - are of medium to coarse grained size,anhedral to subhedral in crystal form, granular.

Calcite - are of medium to coarse grained size,subhedral in crystal form, with pinkish-green tint.

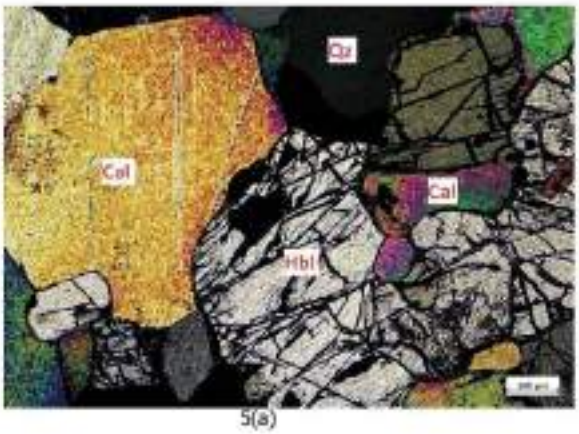
Graphite - are of fine to coarse grained size, subhedral to euhedral in crystal form and fibrous in habit. Approximately average Flake size is 0.97mm.

Quartz - are of fine to coarse grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

Plagioclase - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

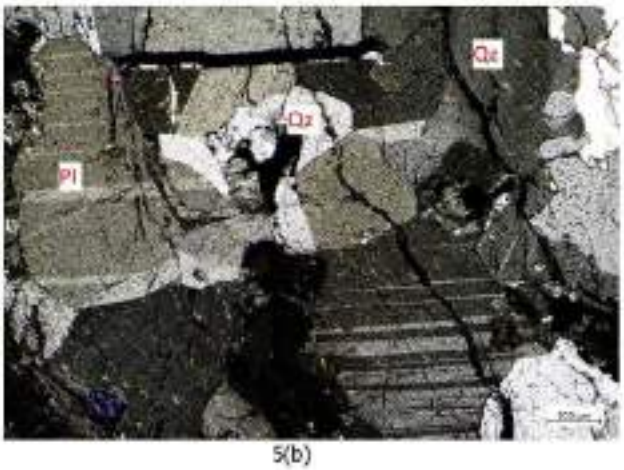
Pyrite - are of fine to medium grained size, subhedral to euhedral in crystal form and some cubic in habit.

Biotite - are of medium grained size, subhedral in crystal form, some grains have altered to form Epidote mineral.



5(a)

Fig.5:Microphotograph (5a) showing Quartz(Qz),Calcite(Cal) and Hornblende(Hbl) under Cross Polarised Light (XPL) at 5X magnification objective.



5(b)

Fig.5:Microphotograph (5b) showing Quartz(Qz) and Plagioclase(Pl) under Cross Polarised Light (XPL) at 5X magnification objective.

5(c)

Fig.5:Microphotograph (5c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

LABORATORY REPORT

GSS/QAS 7.8.2(PMMP)
Effective date: 20-12-2019

Sample Id: HDD 052

Mineral composition
(a) Primary minerals
1.Quartz - 25%
2.Calcite - 21%
3.Olivine - 22%
4.Graphite - 17%
5.Pyrite - 10%
6.Plagioclase(Albite) - 5%

Rock name: Graphitic-Diabase

Description
The sample is of fine to medium grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of fine to medium grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

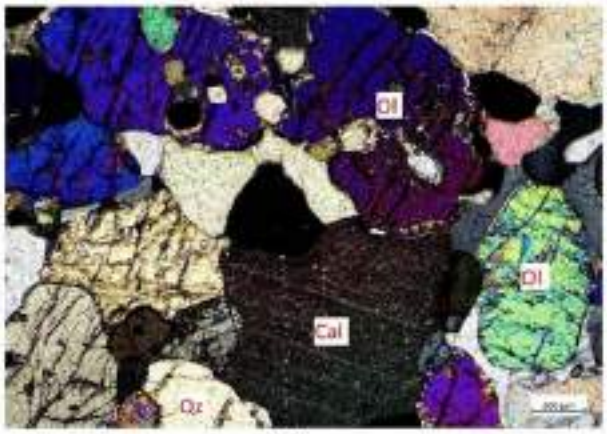
Calcite - are of medium grained size,subhedral in crystal form, with pinkish-green tint.

Graphite - are of fine to medium grained size, subhedral to euhedral in crystal form and fibrous in habit. Approximately average Flake size is 0.93mm.

Olivine - are of medium grained size, subhedral in crystal form,showing high interfearance color.

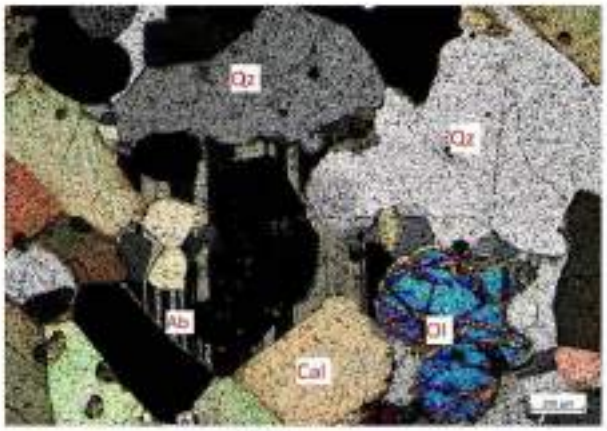
Plagioclase**(Albite)** - are of fine to medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

Pyrite - are of fine to medium grained size, subhedral to euhedral in crystal form and some cubic in habit.



6(a)

Fig.6:Microphotograph (6a) showing Quartz(Qz),Calcite(Cal) and Olivine(Ol) under Cross Polarised Light (XPL) at 5X magnification objective.



6(b)

Fig.6:Microphotograph (6b) showing Quartz(Qz),Calcite(Cal) Albite(Ab) and Olivine(Ol) under Cross Polarised Light (XPL) at 5X magnification objective.

6©

Fig.6:Microphotograph (6c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

Sample Id: HDD 053

Mineral composition

(a) Primary minerals

1.Plagioclase - 23%
2.Quartz - 20%
3.Graphite - 18%
4.Calcite - 11%
5.Olivine - 12%
6.Biotite - 9%
7.Pyrite - 4%
8.Hornblende - 3%

Rock name: Graphitic-Diabase

Description

The sample is of fine to medium grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Plagioclase**(Albite)** - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

Graphite - are of fine to medium grained size, subhedral to euhedral in crystal form and fibrous in habit. Approximately average Flake size is 0.86mm.

Quartz - are of fine to medium grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

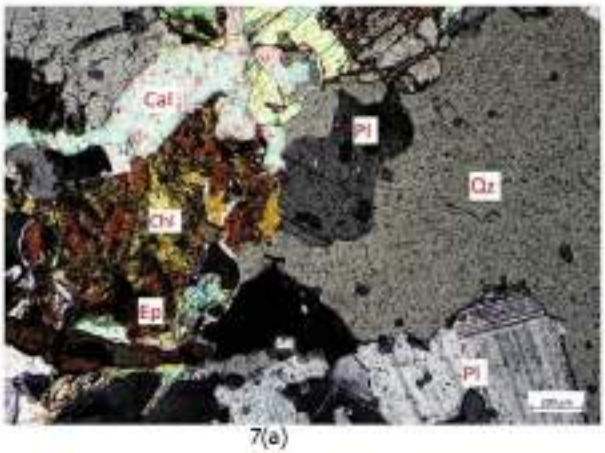
Olivine - are of fine to medium grained size, anhedral to subhedral in crystal form, shows high interfearance color.

Calcite - are of medium to coarse grained size,subhedral in crystal form, with pinkish-green tint.

Biotite - are of medium grained size, subhedral in crystal form, some grains have altered to form Chlorite and Epidote mineral.

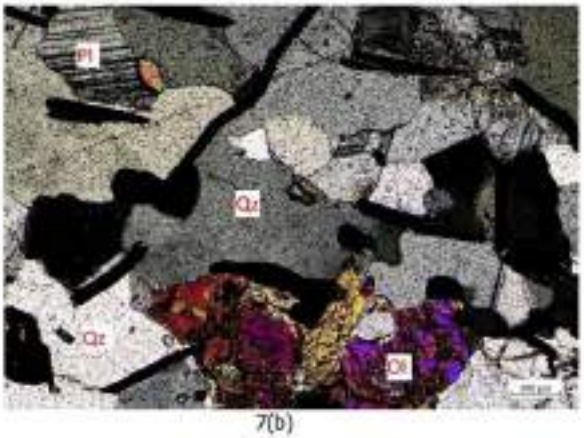
Hornblende - are of medium grained size,anhedral to subhedral in crystal form, granular.

Pyrite - are of fine to medium grained size, subhedral to euhedral in crystal form and some cubic in habit.



7(a)

Fig.7:Microphotograph (7a) showing Quartz(Qz),Calcite(Cal) Plagioclase(Pl),Chlorite and Epidote(Ep) under Cross Polarised Light (XPL) at 5X magnification objective.



7(b)

Fig.7:Microphotograph (7b) showing Quartz(Qz), Plagioclase(Pl) and Olivine(Ol) under Cross Polarised Light (XPL) at 5X magnification objective.

7©

Fig.7:Microphotograph (7c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

LABORATORY REPORT

GST/QAF 7.8.2(PM/MP)
Effective date: 20-12-2019

Sample Id: HDD 054

Mineral composition

(a) Primary minerals

1.Quartz - 28%
2.Plagioclase(Albite), Microline - 11%
3.Graphite - 23%
4.Calcite - 10%
5.Olivine - 17%
6.Biotite - 3%
7.Pyrite - 8%

Rock name: Graphitic-Diabase

Description

The sample is of fine to course grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of fine to coarse grained size,anhedral in crystal form, granular in habit,show undulatory extinction.

Graphite - are of fine to medium grained size, subhedral in crystal form and fibrous in habit. Approximately average Flake size is 2.10 mm.

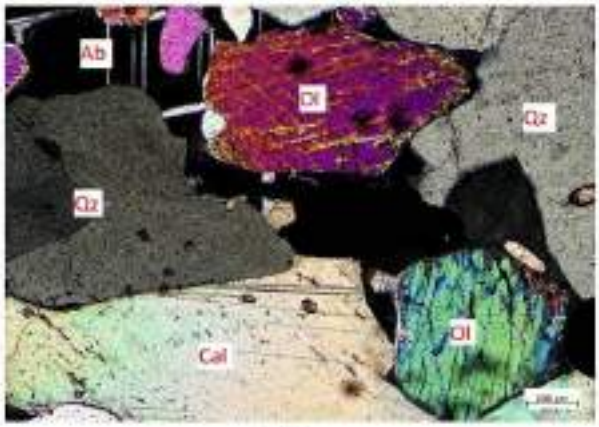
Olivine - are of fine to coarse grained size, anhedral to subhedral in crystal form, shows high interfearance color.

Plagioclase**(Albite),Microcline** - are of medium grained size, subhedral in crystal form, Albite tend to show polysynthetic twinning, while **microcline** show cross hatched twin.

Calcite - are of medium grained size,subhedral in crystal form, with pinkish-green tint.

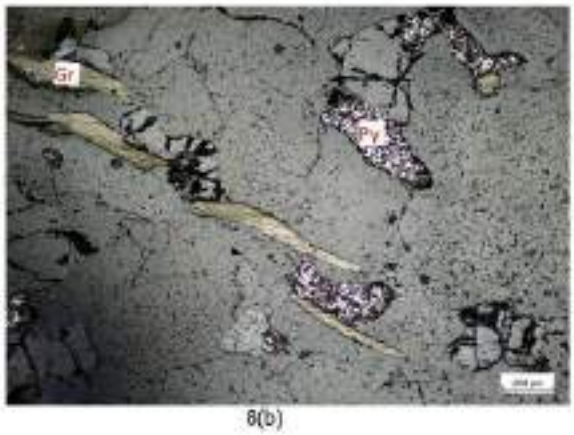
Pyrite - are of medium grained size, subhedral in crystal form and some cubic in habit.

Biotite - are of medium grained size, subhedral in crystal form, some grains have altered to form Epidote mineral.



8(a)

Fig.8:Microphotograph (8a) showing Quartz(Qz),Calcite(Cal) Albite(Ab) and Olivine(Ol) under Cross Polarised Light (XPL) at 5X magnification objective.



8(b)

Fig.8:Microphotograph (8b) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

LABORATORY REPORT

GST/QAF 7.8.2(PMMP)
Effective date: 29-12-2019

Sample Id: HDD 076

Mineral composition

(a) Primary minerals

1.Orthoclase - 24%
2.Graphite - 22%
3.Biotite - 10%
4.Olivine - 14%
5.Pyroxene - 9%
6.Plagioclase(Albite) - 9%
7.Calcite - 7%
8.Pyrite - 5%

Rock name: Graphitic-Granite Porphyry

Description

The sample is of fine to course grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured. Graphite observed in handspecimen.

Orthoclase - are of fine to coarse grained size,anhedral to subhedral in crystal form, granular in habit.

Biotite - are of medium grained size, subhedral in crystal form, some grains tends to have perfect basal cleavage, some grains have altered to form Epidote mineral.

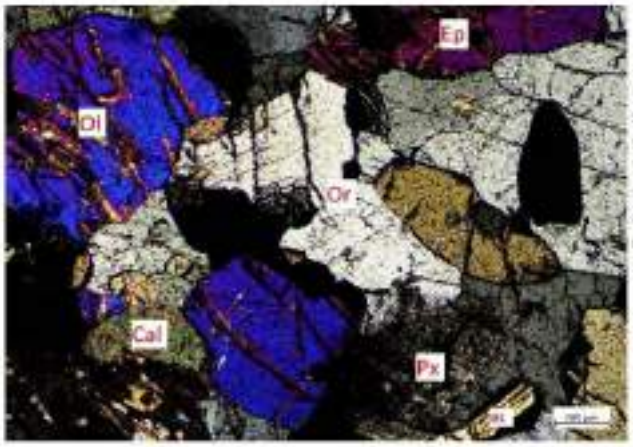
Olivine - are of fine to coarse grained size, anhedral to subhedral in crystal form, shows high interfearance color.

Pyroxene - are of fine to coarse grained size, anhedral in crystal form, granular in habit.

Plagioclase**(Albite)** - are of medium grained size, subhedral in crystal form, Albite tends to show polysynthetic twinning.

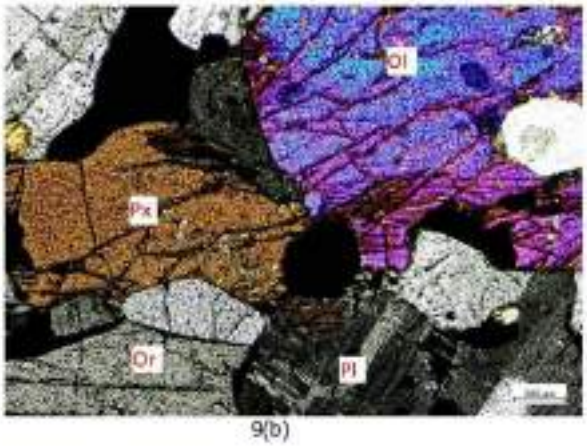
Calcite - are of fine to coarse grained size,anhedral to subhedral in crystal form,with pinkish-green tint.

Pyrite - are of fine to medium grained size, subhedral in crystal form and some cubic in habit.



9(a)

Fig.9:Microphotograph (9a) showing Orthoclase(Or),Calcite (Cal),Pyroxene(Px),Epidote(Ep), Biotite(Bt) and Olivine(Ol) under Cross Polarised Light (XPL) at 5X magnification objective.



9(b)

Fig.9:Microphotograph (9b) showing Pyroxene(Px), Olivine(Ol),Plagioclase(Pl) and Orthoclase(Or) under Cross Polarised Light (XPL) at 5X magnification objective.

LABORATORY REPORT

GST/QAF 7.8.2(PMMP)
Effective date: 20-12-2013

Sample Id: HDD 077

Mineral composition
(a) Primary minerals
1.Quartz - 34%
2.Graphite - 29%
3.Garnet - 19%
4.Olivine - 7%
5.Pyrite - 6%
6.Calcite - 3%
7.Biotite - 2%

Rock name: Graphitic-Granite Porphyry

Description
The sample is of fine to course grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of fine to coarse grained size,anhedral in crystal form, granular in habit,shows undulatory extinction.

Graphite - are of medium grained size, subhedral in crystal form and fibrous in habit. Approximately average Flake size is 0.71mm.

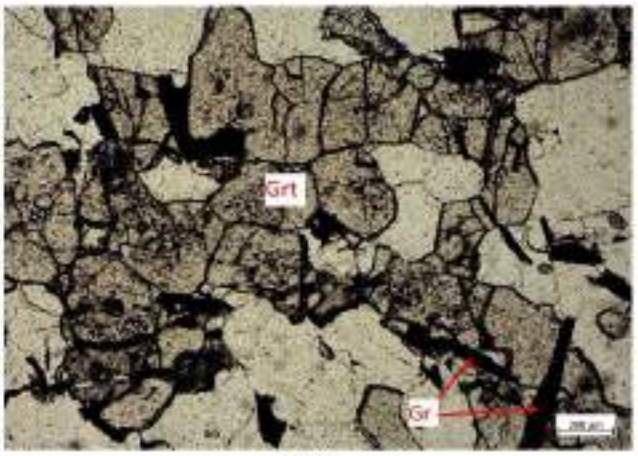
Garnet - are of fine to coarse grained size, anhedral to subhedral in crystal form, granular in habit, with irregular fractures.

Olivine - are of fine to coarse grained size, anhedral to subhedral in crystal form, shows high interfearance color.

Pyrite - are of medium grained size, subhedral in crystal form and some cubic in habit.

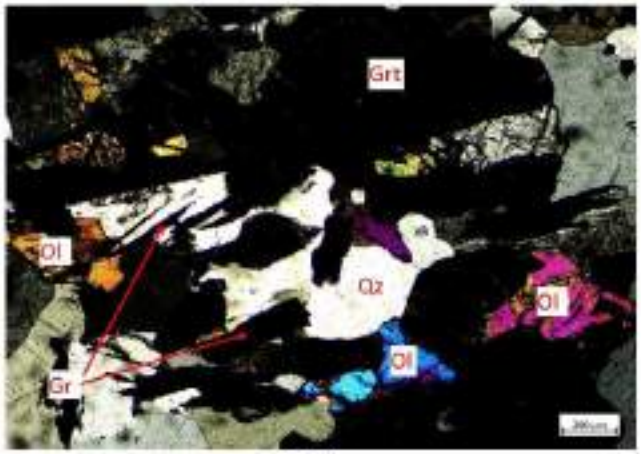
Calcite - are of fine to coarse grained size,anhedral to subhedral in crystal form,with pinkish-green tint.

Biotite - are of medium grained size, subhedral in crystal form, some grains have altered to form Epidote mineral.



10(a)

Fig.10: Microphotograph (10a) showing Garnet(Grt),Graphite (Gr) under Plane Polarised Light (PPL) at 5X magnification objective.



10(b)

Fig.10: Microphotograph (10b) showing Garnet (Grt), Olivine(Ol),Quartz(Qz) and Graphite(Gr) under Cross Polarised Light (XPL) at 5X magnification objective.

Fig.10:Microphotograph (10c) showing Graphite(Gr) under Reflected Light (RL) at 5X magnification objective.

10(c)

Sample Id: HDD 078

Mineral composition

(a) Primary minerals

1.Quartz - 37%
2.Graphite - 17%
3.Garnet - 11%
4.Plagioclase(Albite) - 10%
5.Biotite - 9%
6.Pyrite - 7%
7.Olivine - 5%
8.Calcite - 4%

Rock name: Graphitic-Granite Porphyry

Description

The sample is of fine to course grained size,anhedral to euhedral in crystal outline, the sample is slightly weathered and fractured.

Quartz - are of fine to coarse grained size,anhedral in crystal form, granular in habit,shows undulatory extinction.

Graphite - are of fine to medium grained size, subhedral in crystal form and fibrous in habit. Approximately verage Flake size is 1.08mm.

Garnet - are of medium grained size, anhedral to subhedral in crystal form, granular in habit, with irregular fractures.

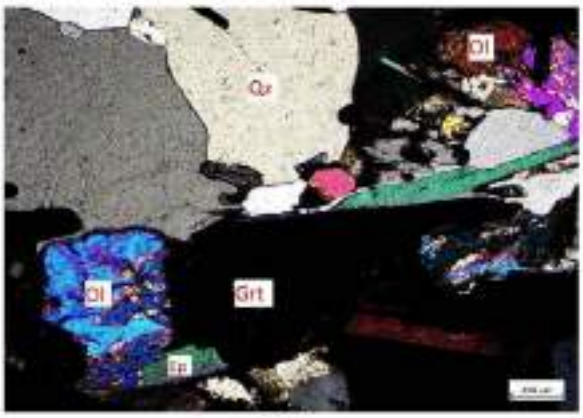
Plagioclase - are of medium grained size, subhedral in crystal form, some grains tabular in habit, showing polysynthetic twinning.

Biotite - are of medium grained size, subhedral in crystal form, some grains show perfect basal cleavage,many grains have altered to form Epidote mineral.

Pyrite - are of medium grained size, subhedral to euhedral in crystal form and some cubic in habit.

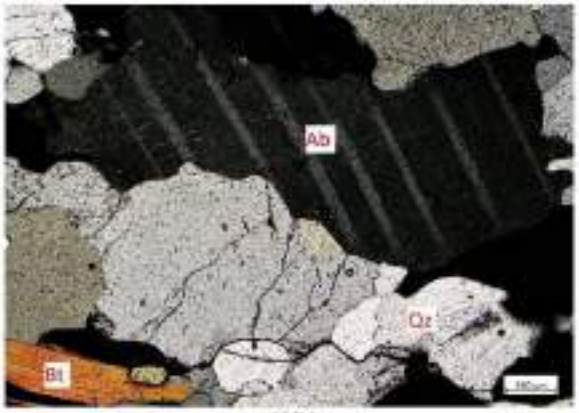
Olivine - are of medium grained size, anhedral to subhedral in crystal form,granular in habit, shows high interfearance color.

Calcite - are of fine to coarse grained size,anhedral to subhedral in crystal form,with pinkish-green tint.



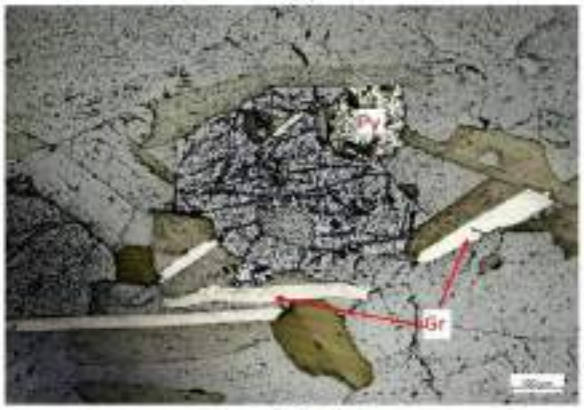
11(a)

Fig.11: Microphotograph (11a) showing Garnet (Grt), Olivine(Ol),Quartz(Qz) and Epidote(Ep) under Cross Polarised Light (XPL) at 5X magnification objective.



11(b)

Fig.11: Microphotograph (11b) showing Albite (Ab), Quartz(Qz) and Biotite(Bt) under Cross Polarised Light (XPL) at 5X magnification objective.



11©

Fig.11: Microphotograph (11c) showing Graphite(Gr) and Pyrite(Py) under Reflected Light (RL) at 5X magnification objective.

Management Signatory
Signature: .....

Analyst
Signature: .....

Supervisor
Signature: .....

Appendix G: Sample List, Sampling Interval and Assay Results 样品清单，采样间隔和检验结果

HOLE_ID	Sample_No	mFrom	mTo	Sample Inteerval_m	TGC_%	Ash_%	VM_%	MC_%	QC_Catergory
BHDD08	HDD001	0.00	0.50	0.50	6.79	91.93	1.27	0.01	
BHDD08	HDD002	0.50	2.50	2.00	12.75	82.82	4.35	0.08	
BHDD08	HDD003	2.50	4.00	1.50	6.57	91.42	1.76	0.25	
BHDD08	HDD004	4.00	6.00	2.00	6.29	90.38	3.23	0.10	
BHDD08	HDD005	6.00	8.00	2.00	6.08	91.23	2.53	0.16	
BHDD08	HDD006	8.00	10.00	2.00	7.58	90.71	1.50	0.21	
BHDD08	HDD007	10.00	12.00	2.00	7.20	90.48	1.96	0,36	
BHDD08	HDD008	12.00	14.00	2.00	6.46	91.09	2.04	0.41	
BHDD08	HDD009	14.00	15.00	1.00	12.94	84.65	2.37	0.04	
BHDD08	HDD010	15.00	17.00	2.00	12.30	85.80	1.82	0.08	
BHDD08	HDD011	17.00	19.00	2.00	11.78	85.93	1.68	0.61	
BHDD08	HDD012	19.00	21.00	2.00	23.85	70.87	4.57	0.73	
BHDD08	HDD013	21.00	23.00	2.00	20.10	75.55	4.33	0.02	
BHDD08	HDD014	23.00	23.60	0.60	11.15	86.24	2.55	0.06	
BHDD08	HDD015	26.80	27.80	1.00	2.39	94.89	2.49	0.23	
BHDD08	HDD016	29.85	30.80	0.95	6.31	91.13	2.10	0.46	
BHDD08	HDD017	30.80	31.65	0.85	10.50	87.92	1.51	0.07	
BHDD11	HDD018	0.00	1.20	1.20	5.59	92.54	1.28	0.59	
BHDD11	HDD019	1.20	3.00	1.80	5.01	92.66	1.34	0.99	
BHDD11	HDD020	3.00	5.00	2.00	8.53	88.07	3.20	0.20	
BHDD11	HDD021	5.00	6.10	1.10	21.97	73.57	4.31	0.15	
BHDD11	HDD022	6.10	8.00	1.90	19.97	76.30	3.72	0.01	
BHDD11	HDD023	8.00	10.00	2.00	28.51	68.86	2.61	0.02	
BHDD11	HDD024	10.00	12.00	2.00	18.64	76.65	4.30	0.41	Original
BHDD11	HDD025	10.00	12.00	2.00	10.77	86.66	2.11	0.46	Duplicate
BHDD11	HDD026	12.00	14.00	2.00	13.95	82.83	3.01	0.21	
BHDD11	HDD027	14.00	16.00	2.00	18.08	77.15	4.28	0.49	
BHDD11	HDD028	16.00	18.00	2.00	55.51	40.80	3.61	0.08	
BHDD11	HDD029	18.00	20.00	2.00	35.99	60.83	3.09	0.09	
	HDD030				6.88	92.72	0.39	0.01	RSP/PULP
BHDD11	HDD031	20.00	22.00	2.00	14.02	81.64	4.31	0.03	
BHDD11	HDD032	22.00	24.00	2.00	37.13	58.13	4.70	0.04	
BHDD11	HDD033	24.00	26.00	2.00	28.33	70.51	1.01	0.15	
BHDD11	HDD034	26.00	28.00	1.00	25.33	69.61	4.72	0.34	
BHDD11	HDD035	28.00	29.00	1.00	48.28	47.54	3.92	0.26	
BHDD06	HDD036	0.00	1.00	1.00	16.46	79.18	3.58	0.78	
BHDD06	HDD037	1.00	3.00	2.00	6.50	90.84	2.13	0.53	
BHDD06	HDD038	3.00	5.00	2.00	6.13	90.96	2.01	0.90	
BHDD06	HDD039	5.00	7.00	2.00	6.81	92.10	0.71	0.38	
BHDD06	HDD040	7.00	9.00	2.00	6.39	89.08	3.62	0.91	
BHDD06	HDD041	9.00	11.00	2.00	4.42	94.12	1.21	0.25	
BHDD06	HDD042	11.00	13.00	2.00	15.88	82.49	1.28	0.35	
BHDD06	HDD043	13.00	15.00	2.00	6.72	88.55	4.30	0.43	
BHDD06	HDD044	15.00	17.00	2.00	9.21	85.35	4.81	0.63	
BHDD06	HDD045	17.00	19.00	2.00	13.49	81.99	4.23	0.29	
BHDD06	HDD046	19.00	20.20	1.20	15.81	80.67	3.13	0.39	
BHDD06	HDD047	20.20	22.00	1.80	16.78	78.66	4.10	0.46	
BHDD06	HDD048	22.00	24.00	2.00	7.90	87.58	4.28	0.24	
BHDD06	HDD049	24.00	25.50	1.50	8.33	88.61	2.85	0.21	Original

HOLE_ID	Sample_No	mFrom	mTo	Sample Inteerval_m	TGC_%	Ash_%	VM_%	MC_%	QC_Catergory
BHDD06	HDD050	24.00	25.50	1.50	5.53	90.64	3.51	0.32	Duplicate
BHDD06	HDD051	25.80	28.00	2.20	5.90	90.31	3.44	0.35	
BHDD06	HDD052	28.00	30.00	2.00	2.43	93.71	3.46	0.40	
BHDD06	HDD053	30.00	32.00	2.00	8.57	89.77	1.30	0.36	
BHDD06	HDD054	32.00	34.00	2.00	7.80	88.50	3.47	0.24	
BHDD06	HDD055	34.00	36.00	2.00	5.44	91.60	2.05	0.91	
BHDD06	HDD056	36.00	37.20	1.20	9.63	88.34	1.80	0.23	
BHDD06	HDD057	37.20	40.00	2.80	20.61	74.46	4.79	0.14	
BHDD06	HDD058	40.00	42.00	2.00	10.90	84.69	4.13	0.28	
BHDD06	HDD059	42.00	44.00	2.00	11.21	83.81	4.54	0.44	
	HDD060				9.32	89.81	0.44	0.43	RSP/PULP
BHDD06	HDD061	44.00	46.00	2.00	12.94	82.78	3.70	0.58	
BHDD06	HDD062	46.00	48.00	2.00	10.79	83.92	4.80	0.49	
BHDD06	HDD063	48.00	50.00	2.00	2.45	95.89	1.02	0.64	
BHDD12	HDD064	0.00	1.00	1.00	8.63	89.40	1.79	0.18	
BHDD12	HDD065	1.00	3.00	2.00	10.66	84.16	4.27	0.91	
BHDD12	HDD066	3.00	5.00	2.00	4.63	91.97	2.46	0.94	
BHDD12	HDD067	5.00	7.00	2.00	6.69	90.91	1.92	0.48	
BHDD12	HDD068	7.00	9.00	2.00	10.61	84.74	4.08	0.57	
BHDD12	HDD069	9.00	10.00	1.00	1.68	96.81	1.15	0.36	
BHDD12	HDD070	10.00	12.00	2.00	32.07	63.58	4.15	0.20	
BHDD12	HDD071	12.00	14.00	2.00	27.15	68.88	3.67	0.30	
BHDD12	HDD072	14.00	16.00	2.00	29.66	66.68	3.01	0.65	
BHDD12	HDD073	16.00	18.00	2.00	29.81	65.23	4.92	0.04	
BHDD12	HDD074	18.00	20.00	2.00	16.43	78.98	4.56	0.03	ORIG
BHDD12	HDD075	18.00	20.00	2.00	17.49	78.63	3.82	0.06	Duplicate
BHDD12	HDD076	20.00	22.00	2.00	12.51	85.90	1.28	0.31	
BHDD12	HDD077	22.00	24.00	2.00	8.14	89.98	1.83	0.05	
BHDD12	HDD078	24.00	26.00	2.00	14.74	83.14	1.82	0.30	
BHDD12	HDD079	26.00	28.00	2.00	9.52	88.88	1.52	0.08	
BHDD12	HDD080	28.00	30.00	2.00	11.40	86.55	2.02	0.03	
BHDD12	HDD081	30.00	31.60	1.60	9.81	88.71	1.46	0.02	
BHDD05	HDD082	0.00	1.00	1.00	9.04	87.35	2.54	0.07	
BHDD05	HDD083	1.00	3.00	2.00	10.04	86.99	2.45	0.52	
BHDD05	HDD084	3.00	5.00	2.00	12.20	86.45	1..28	0.07	
BHDD05	HDD085	5.00	7.00	2.00	6.98	88.89	3.35	0.78	
BHDD05	HDD086	7.00	9.00	2.00	2.90	95.48	0.73	0.89	
BHDD05	HDD087	9.00	11.00	2.00	4.31	94.94	0.34	0.41	
BHDD05	HDD088	11.00	13.00	2.00	3.69	95.24	0.71	0.36	
BHDD05	HDD089	13.00	15.00	2.00	4.26	95.15	0.43	0.16	
	HDD090				10.11	89.17	0.43	0.16	RSP/PULP
BHDD05	HDD091	15.00	16.90	1.90	2.37	96.28	0.84	0.51	
BHDD05	HDD092	16.90	19.00	2.10	8.77	88.14	2.92	0.17	
BHDD05	HDD093	19.00	20.40	1.40	3.82	95.28	0.35	0.55	
BHDD05	HDD094	20.40	22.00	1.60	7.70	88.87	3.38	0.05	
BHDD05	HDD095	22.00	23.50	1.50	9.96	89.54	0.49	0.01	