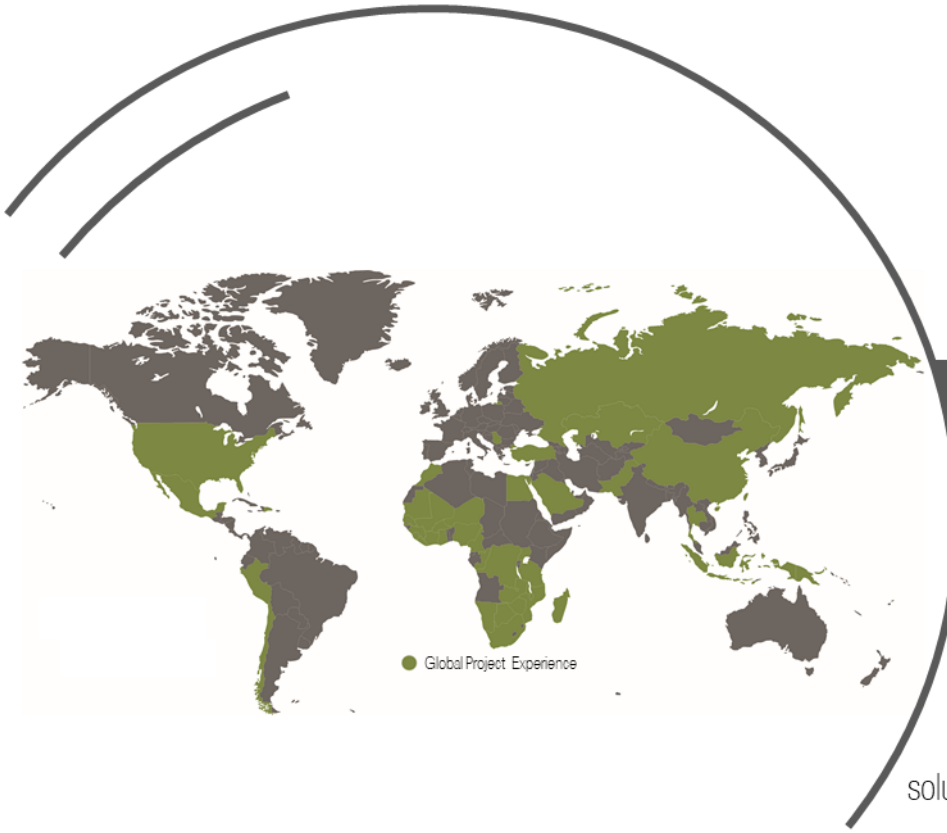

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Basic Assessment Process for the Closure of the Cooke Underground Operations

Geochemical Assessment and Waste Classification Report

Prepared for:
Sibanye Gold Limited

Project Number:
SIB6297

September 2020

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Report Type:	Geochemical Assessment and Waste Classification Report
Project Name:	Basic Assessment Process for the Closure of the Cooke Underground Operations
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Name	Responsibility	Signature	Date
Kgaugelo Thobejane	Data processing and interpretation		August 2020
André van Coller	Reporting		September 2020
Graham Trusler	Review		September 2020

DETAILS AND DECLARATION OF THE SPECIALIST

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Experience (years):	12 years

I, André van Coller, declare that: –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
    - I declare that there are no circumstances that may compromise my objectivity in performing such work;
    - I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

17/09/2020

Signature of the Specialist *Date*

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EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) was appointed by Sibanye Gold Ltd (a subsidiary of Sibanye-Stillwater Ltd., hereafter Sibanye), owners of Rand Uranium (Pty) Ltd. (hereafter Rand Uranium), to undertake the closure and rehabilitation studies in support of the environmental regulatory process to authorise the decommissioning, rehabilitation and ultimate closure of the Cooke No. 1, 2 and 3 Shafts. Underground mining activities associated with these shafts are authorised under Mining Right (GP) 30/5/1/2/2 (07) MR (hereinafter referred to as the Cooke Underground Operations).

The Cooke Operations also comprise the Cooke Surface Operations which entail hydraulic reclamation of historic Tailings Storages Facilities (TSFs) for gold recovery. This is authorised under a separate converted Mining Right ((GP) 30/5/1/2/2 (173) MR) which is adjacent to the Cooke Underground Operations. Concurrent rehabilitation activities of mine affected water resources through treatment and discharge are proposed for the Cooke Surface Operation which will be undertaken concurrently with the activities associated with the closure of the Cooke Underground Operations.

In addition, the mine has an approval for in-pit deposition of waste materials without a liner as outlined in the Pit Deposition EMP Addendum as approved by the DMRE on the 25th of August 2010.

This report constitutes the Geochemistry and Waste Classification Assessment undertaken in accordance with the provisions under the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA).

Sampling focussed on disturbed areas in which sediment accumulation occurred in the past and which are situated in downstream positions of mining activities, such as TSF's, waste dumps and shaft areas across the Cooke Surface and Underground Operations' landscape. The targeted areas included the following disturbed landscapes, streams, wetlands and other surface water features:

- Historically impacted wetlands across the Mining Right Area;
- Wonderfonteinspruit Riverbed;
- Cooke No.1 and 2 Shaft areas (including settled solids material from water treatment);
- Treated effluent discharge points downgradient of the Cooke No.1 and 2 Shaft areas;
- Magazine Pan; and
- Millsite TSF Complex – Downstream Wetland Area.

It should be noted that the impacts, on the surface water features in particular, experience inputs and impacts from multiple land and water users and cannot be solely attributed to the Rand Uranium activities. The underground workings and their management were looked at in the Groundwater Impact Assessment (van Biljon, 2020).

Purpose of this Report

The purpose and aim of this waste classification and geochemical characterisation are:

- To characterise the soils, sediments and tailings material geochemically;
- Determine the risk the material poses to the receiving environment upon closure and the cessation of pumping to determine the need for removal and further rehabilitation; and
- To classify this material into waste types to determine whether the material is considered hazardous and consequently recommend appropriate removal and disposal approaches in line with existing waste management and rehabilitation practices at the Rand Uranium Operations.

Correlation between sources and the sampled material has been made to indicate the potential of contamination.

Methodology

Based on site background information and discussions between Digby Wells and the client the final sample locations and number of samples were determined. 34 samples were collected on-site and submitted for the following laboratory tests:

- X-Ray Diffraction (XRD);
- X-Ray Fluorescence (XRF);
- Acid-Base Accounting (ABA);
- Net Acid Generation (NAG);
- Sulphur-Speciation (SS%) tests;
- Aqua regia digestion to determine total concentrations; and
- Distilled (DI) water leachate tests.

Outcomes of the Assessment

Minerology

All samples indicated mineral content that correlate with the geological setting and weathering products of the various formations in the area (mainly sedimentary formations). The main minerals found in all samples were quartz, pyrophyllite and kaolinite. Smaller and trace amounts of goethite, hematite, chlorite and jarosite were also present in some of the samples. These minerals are associated with the area's geology and related weathering processes.

Varying amounts of calcite and dolomite were found in some of the samples collected at the Cooke Shaft No. 1 and 2 areas (at both the silt dam areas as well as the treated effluent discharge points). This is likely as a direct result of lime addition during water treatment. The presence of jarosite, found in the Cooke Shaft No. 1 and 2 sediment samples, is likely a result of the precipitation of metals during the water treatment process. High sulphate concentrations

at the discharge points are likely related to the presence of gold ore in the host rock containing sulphur minerals (such as pyrite).

Although some of the samples collected showed the potential to form acidic leachates in the short term, there was not enough mineralogical evidence or high sulphide sulphur content in the samples to conclusively indicate any potential long-term AMD issues. In addition, the sampling points for which short term acid leachate potential was indicated are upstream of the Rand Uranium activities, and samples taken downstream of the Cooke Operations did not indicate short term acid generating capacity. These sediment samples and soils appear to have been weathered and oxidised already if the ability to form AMD had existed.

Total and Leachable Concentration Results:

The total concentration results for all samples across all sampling areas, for locations upstream as well as downstream of Rand Uranium's activities, consistently showed elevated concentrations i.e. above the NEM:WA Waste Classification Total Concentration Threshold (TCT0) limits) for Arsenic (As), Barium (Ba), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni), Lead (Pb) and Zinc (Zn).

As is an element commonly associated with gold bearing ores and lithologies in the form of trace amounts of pyrite and arsenopyrite, and for this reason can be naturally enriched in the on-site soil and sediment profiles. The As total concentrations are similar throughout the catchment for points upstream as well as downstream of any Rand Uranium impacts (such as the Donaldson Dam). Therefore, elevated As concentrations cannot solely be attributed to the Rand Uranium activities.

Cu is a metal associated with gold mining in terms of the geological setting. Therefore, the elevated Cu can potentially be an indication of natural weathering processes or could have been introduced as a result of copper sulphate reagents added to the gold processing circuit. However, elevated Cu concentrations are highest upstream of the Rand Uranium operations (including the Cooke Plant) and are therefore more likely to be related to mining activities from other operations upstream of the Rand Uranium activities.

Mn is one of the most common metals in the earth's crust and is associated with the sedimentary geology of the region. Manganese oxides can be found in the dolomite and a chert base layer (consisting of layers of chert and manganese-rich bands) of the Monte Christo Formation. During dissolution of the dolomite, carbonate is removed and residues including manganese oxides and hydroxides (referred to as WAD) remain present. Elevated manganese concentrations were also evident from the groundwater quality results in the Groundwater Impact Assessment (van Biljon, 2020) and, together with the regional geology, indicate manganese is naturally occurring. In addition, manganese can be bound to organic matter and clay particles, and as these can accumulate in wetland systems, and to a lesser extent in water courses, this could also contribute to elevated manganese concentrations in the sediments.

With no direct correlation to the geology of the region, the elevated concentrations of Pb are a concern. However, as for Cu, elevated Pb concentrations are observed throughout the catchment.

The leachable concentrations for all samples, however, indicate low levels of leachability that can potentially indicate these silts and sediments have been weathered already and that their leachability is low. This is also backed by the higher leachability of the impacted soils that would have accumulated any contamination from the silt dams and operations in the area.

A contaminated land/soil assessment will be required to further assess the sources and levels of contamination particularly subsequent to the removal of pollution sources identified through this study.

Waste Classification

The Groundwater Impact Assessment Report (van Biljon, 2020) included waste classification work completed on the Cooke and Millsite TSFs as well as Waste Rock Dumps (WRDs), sludge ponds and return water dams located in the shaft complexes. The tailings materials and waste rock mineralogy and chemical compositions will be similar to various other operations in the area due to similar geological setting and gold ore being mined. As a result, it can be assumed that various mine pollution sources in the area will have similar chemical characteristics.

In the waste classification as part of the Groundwater Impact Assessment (van Biljon, 2020), the Leachable Concentration Threshold (LCT) results for tailings and waste rock materials showed Mn, Ni, Pb, and As above the prescribed limits which correlates with the results for the silts and impacted sediments sampled as part of this study. The Total Concentration results in the Groundwater Impact Assessment correlate with the results of this assessment and showed Cu, Ni, As, Ba, Pb and B exceed the TCT0 limits.

Therefore, elevated Total Concentrations of As, Pb, Ni, Cu and Ba in the silts and impacted sediments can be expected for this area and could potentially indicate an impact by mining activities within the catchment in which the Cooke mine is situated. It is noted that the level of contamination and extent needs to be assessed and quantified through a contaminated land/ soil assessment.

Groundwater Impact Assessment included sampling of both groundwater and underground mine water of the Cooke mining complex. Cooke mine water samples did show elevated U concentrations but the leachate results from the sediment and silt samples however showed no elevated leachable concentrations. All samples showed leachable U concentrations below detection (<0.004 mg/L) excluding one sample (MP1) taken from Magazine Pan that had a U concentration of 0.006 mg/L but still well below the SANS guideline limits. Based on the leachate test results uranium does not pose a significant risk in the sediments and silts studied. This can potentially be due to most of the U already mobilised in the past and the current remaining concentrations not being in soluble forms.

Based on the various LCT and TCT results the sediments and material from the various sampled areas the materials are classified and can be disposed of as per the Pit Deposition EMP Addendum as approved by the DMRE on the 25th of August 2010, as per the table below.

Area/Material	**Waste Type**	**Disposal allowed to align with current processing and backfilling of materials into pits**
Historically Impacted Wetland Sediments	Type 3	Allowed
Wonderfonteinspruit Sediments	Type 3	Allowed
Cooke Shaft 1 and 2 Area Silt Material and Impacted Sediments	Type 3	Allowed
Cooke Shaft 1 and 2 Discharge Area Sediments	Type 3	Allowed
Magazine Pan Sediments	Type 3	Allowed
Millsite TSF Downstream Wetland Sediments	Type 3	Allowed

Conclusion

Based on the TCT and LCT results, it is determined that the contaminated sediments and silt material found at the Cooke No. 1 and 2 Shaft Areas will require removal as the material is high in metal content and will pose a risk, particularly once the catchment has re-watered and surface water management infrastructure has been removed. Sibanye intends to reprocess this material together with the tailings from the Millsite TSF, Lindum Dump, Dump 20 and other ad hoc sources. This is supported and more sustainable than stripping and discarding the material which would merely move the contaminant source from one area to the next.

However, the material in the historically impacted wetlands, the Wonderfonteinspruit, Magazine Pan and wetland downstream of the Millsite TSF is in wetland and stream systems that have already developed aquatic ecosystems, despite potentially being contaminated.

Based on the results above, the low levels of contamination do not justify the removal of the material but would rather require further investigation to confirm the results of this study and require mitigation measures to limit or reduce current sources of pollution. The option of removal of sediments accumulated in the wetlands downstream of the Millsite (as this area is

relatively dry) and the Magazine Pan (upon cessation of discharge) could be further investigated.

The following recommendations are made:

- Dust suppression and runoff capture/clean water diversion during the ongoing reclamation and rehabilitation activities at the Lindum TSF, Cooke Gold Plant area, Cooke TSF and return water dams, Millsite TSF and the Cooke No. 1 and 2 Shaft areas is recommended to prevent further spread of materials and/or dust/sediments;
- Discharge of treated water to the Magazine Pan should be halted as soon as possible;
- Continued surface water quality monitoring is recommended for the historically impacted wetlands and associated watercourses, the Millsite TSF Complex and the current monitoring points in the Wonderfonteinspruit River;
- In addition, a borehole located between the Cooke TSF and the Wonderfonteinspruit (refer to the recommendations as part of the Groundwater Impact Assessment) should be monitored once drilled and constructed to detect any seepage from the Cooke TSF flowing towards the Wonderfonteinspruit;
- The reprocessing of sediments and silt material from the Cooke Shaft 1 and 2 areas is supported and more sustainable than stripping and discarding the material which will just move the contaminant source from one area to the next. The reprocessing may have a potentially positive effect on the composition and leachability of these materials, as the pH will be more neutral and metals concentrations could be reduced. Reprocessed materials will be sampled to confirm the average composition before backfilling and can confirm the positive effect, if any;
- Waste classification on additional sediment samples along the eastern bank of the Wonderfonteinspruit Riverbed is recommended, including just upstream of the Donaldson Dam to confirm the current results and allow comparison with Wonderfontein River water quality results as these should reflect the sediment sample results. In addition, sediment sampling after cessation of any discharges would be recommended to enable access to currently flooded areas and to assess the sediment quality post-discharge cessation;
- The sediments have accumulated in the historically impacted wetlands and associated streams, Wonderfonteinspruit, Magazine Pan and wetland downstream of the Millsite TSF complex in which aquatic ecosystems have developed despite any potentially negative impacts from these sediments. It is likely that the accumulated sediments were fully weathered and may have developed different characteristics under the waterlogged conditions of the wetland and stream systems. In addition, the impacts of the disturbance of these sediments and of the established ecosystems during any removal of sediments will likely do more harm than any potential impact from the observed, low levels of leachable constituents. The following future studies on these above-mentioned areas are recommended:

- Additional sampling in a grid format of specifically the areas in which sediments have accumulated in the historically impacted wetlands/streams, the Wonderfonteinspruit (including the reach between Cooke 1 shaft discharge point and location of Donaldson dam), the Magazine Pan and the wetland downstream of the Millsite TSF complex. Specific grid spacing and sampling locations to be confirmed prior to the additional sampling;
- Enough sample material from these sites be taken to do additional waste classification work to determine if materials could aid land amelioration, or indicate if there is any need for sediments to be removed and disposed of, although as stated above this would be discouraged;
- Wetland, hydropedology, aquatic ecology and surface water impact assessments should be consulted before any stream or wetland material is removed and/or rehabilitated.

- If any material is stripped/excavated for the purpose of disposal it should be handled and disposed of in accordance with the disposal methods as currently in place on-site.

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1. Introduction

Digby Wells Environmental (hereafter Digby Wells) was appointed by Sibanye Gold Ltd (a subsidiary of Sibanye-Stillwater Ltd., hereinafter Sibanye), owners of Rand Uranium (Pty) Ltd (hereafter Rand Uranium), to undertake the closure and rehabilitation studies in support of the environmental regulatory process to authorise the decommissioning, rehabilitation and ultimate closure of the Cooke 1, 2 and 3 Shafts. Underground mining activities associated with these shafts are authorised under Mining Right (GP) 30/5/1/2/2 (07) MR (hereinafter referred to as the Cooke Underground Operations).

The Cooke Operations also comprise the Cooke Surface Operations which entail hydraulic reclamation of historic Tailings Storages Facilities (TSFs) for gold recovery. This is authorised under a separate converted Mining Right ((GP) 30/5/1/2/2 (173) MR) which is adjacent to the Cooke Underground Operations. Concurrent rehabilitation activities of mine affected water resources are proposed for the Cooke Surface Operation which will be undertaken concurrently with the activities associated with the closure of the Cooke Underground Operations.

A Basic Assessment Process has been undertaken in terms of the EIA Regulations, 2014 (GN R326 of 7 April 2017), as amended, promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). It is noted that the environmental regulatory process also includes an application for a Water Use Licence (WUL) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

This report constitutes the Geochemistry and Waste Classification Assessment undertaken in accordance with the provisions under the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA). The aim of this assessment was to classify accumulated sediment material across the Cooke Operations resulting from current and historic mining activities, as well as characterise the chemical composition of this material to inform sustainable management or disposal practices.

1.1. Battery Limits and Aim of this Study

The purpose of this waste classification and geochemical characterisation are stated below:

- The geochemical tests performed as part of this study were done for the purpose of characterising the soils, sediments and tailings material geochemically, and to classify them into waste types to determine whether the material is hazardous and the recommended removal and disposal approach (landfill type/facility liner design), if any;
- With conducting this study, it is already assumed that all material sampled is a waste material and as such needs to be classified as hazardous or non-hazardous;
- Digby Wells completed the work on the samples as a waste classification in line with the applicable legislation, and the study should not be seen and/or interpreted as a Land/ Soil Contamination Assessment. It is recommended that further studies be conducted, and that the extent of contamination be mapped;

- Detailed recommendations on further studies are made in Section 5 of this report to further support this study and inform gaps relating to land contamination; and
- A geochemical and waste classification study provides a description of a potential contaminant source but does not evaluate pathways or receptors. The geochemistry data feeds into other specialist studies like surface water and groundwater studies where the impacts can be quantified and assessed. For this reason, this report does not include an impact assessment.

1.2. Assumptions, Limitations and Exclusions

The following assumptions, limitations and exclusions are applicable to this assessment:

- Laboratory tests simulates worst case scenarios and results can potentially be skewed. However, the test methods used are in line with international and national guidelines with the Department of Water and Sanitation (DWS) and NEM: WA test methodologies and approaches to interpretations;
- Samples were taken at selected areas only and spot samples were taken and analysed. The targeted areas were selected by the client and coordinates were provided to Digby Wells accordingly;
- The samples were taken at depths of between 300 and 500 mm in the soil/ sediment profile. At the time of sampling and this assessment, a contaminated land assessment had not completed and as such the exact depth of possible contamination and proposed stripping/rehabilitation depths were not known. However, it is likely that only the top 500 mm of material will be removed (excluding the Millsite Tailings Storage Facility (TSF) material that will all be removed as part of the ongoing reclamation activities);
- The mineral names in this report may not reflect the specific mineral identified, but rather the mineral group; and
- Amorphous phases, if present, were not taken into account during quantification.

1.3. Project Description

Rand Uranium is the holder of a converted Mining Right for the Cooke Underground Operations which are located within the West Rand District Municipality, approximately 10 kilometres (km) south-east of the town Randfontein (Figure 1-1 and Figure 1-2).

The operations comprise three underground mine shaft complexes, namely: Cooke No. 1, No. 2 and No. 3 Shafts. The underground workings are accessible through vertical shafts at each of these complexes. Infrastructure in the underground workings includes water pumping and treatment systems including clarifiers, attenuation and settling dams as well as storage areas, underground walkways and conveyors. Ancillary surface infrastructure including administrative and workshop buildings water management structures (e.g. water storage infrastructure, trenches, berms etc.) are also in place at each of the complexes.

Underground mining at all three shafts ceased in May 2018. Sibanye has maintained an extensive groundwater pumping and treatment scheme to keep the underground workings dry in case of the recommencement of mining in future. Following extensive investigations, no sustainable mining plans were found to be feasible and as such, a permanent closure solution is now being sought.

The Cooke Operations also comprise the Cooke Surface Operations which entail hydraulic reclamation of historic TSFs for gold recovery. This is authorised under a separate converted Mining Right ((GP) 30/5/1/2/2 (173) MR) which is adjacent to the Cooke Underground Operations. These activities are ongoing and will be maintained, however, Sibanye intends to undertake concurrent rehabilitation activities to impacted water resources as part of this application.

The scope of final decommissioning, rehabilitation and closure activities being applied for by Rand Uranium are described below.

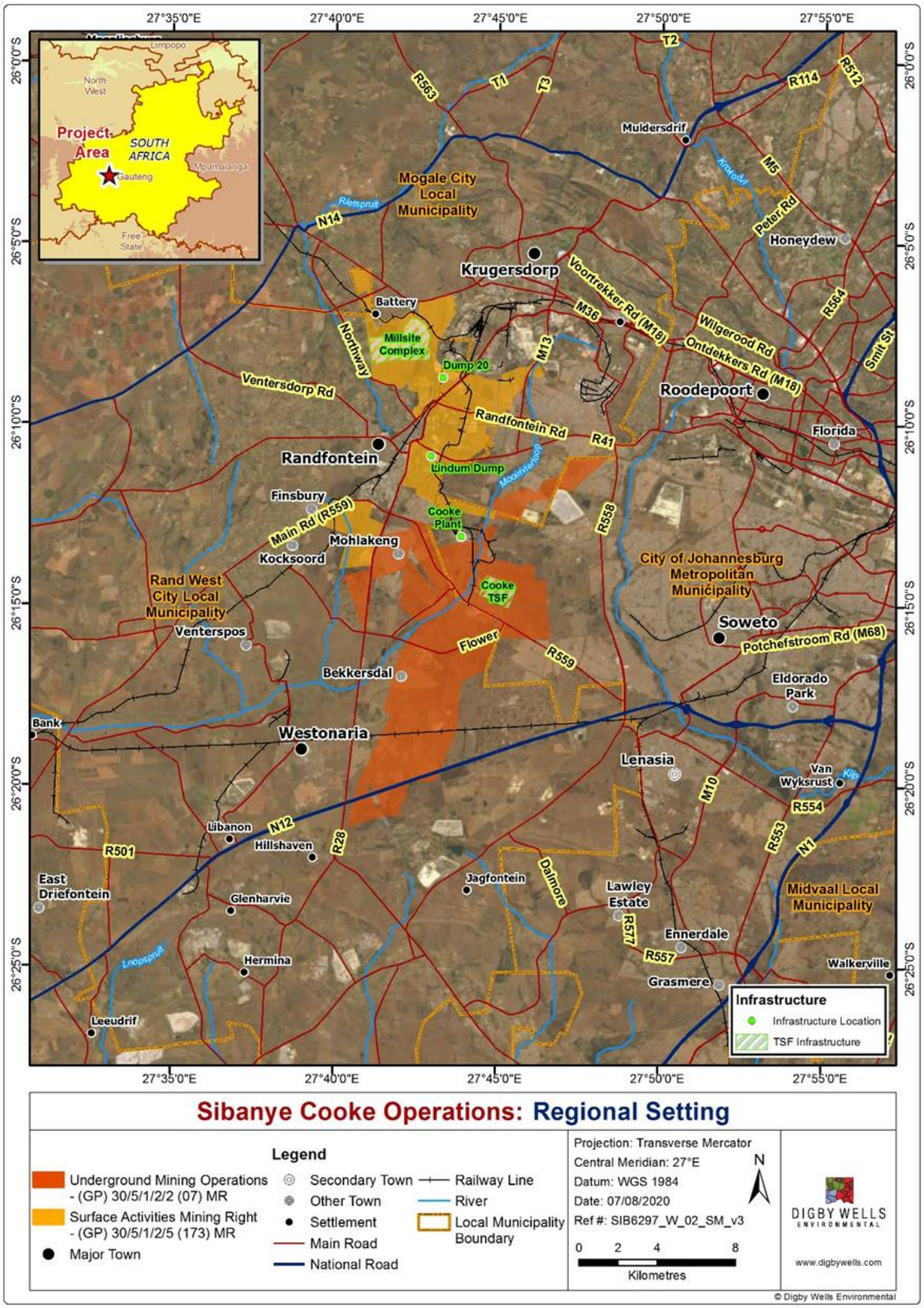

Figure 1-1: Regional Setting

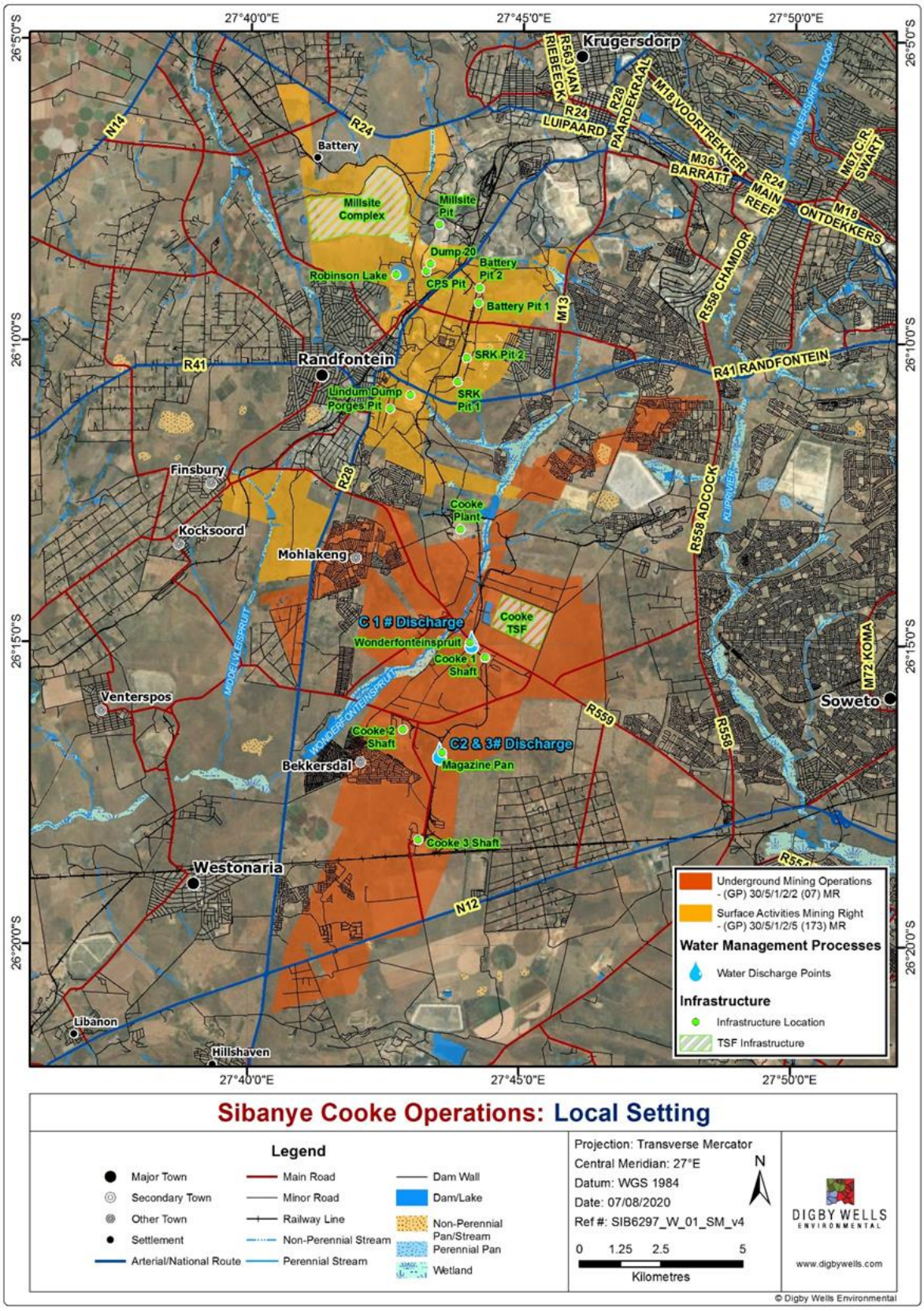

Figure 1-2: Local Setting

1.3.1. Cessation of Underground Water Pumping- and Discharge Regime

Rand Uranium maintained an extensive groundwater pumping and treatment scheme to continue access to the underground mine workings through the prevention of the flooding of mining areas due to groundwater ingress. Extraneous water collected from underground is/was treated in a series of settlers after which it is transported to surface for further settlement, evaporation and discharge to the environment.

An overview of the process is described in Table 1-1 and depicted in Figure 1-3 below.

Table 1-1: Water Management Process at the Cooke Shaft Complexes

Process step	Cooke 1 Shaft	Cooke 2 and 3 Shafts
Collection and treatment of extraneous underground water	• Underground water from Cooke 1 Shaft is pumped to and treated through a series of settlers and stored in underground dams located at Cooke 1 Shaft.	• Underground water from Cooke 3 Shaft is pumped and gravitated to Cooke 2 Shaft. • The underground water is treated through a series of settlers and stored in underground dams located at Cooke 2 Shaft.
Surface treatment	• From the underground dams, water is pumped to surface for settling of suspended solids as well as for attenuation purposes.	• From the underground dams, water is pumped to surface for settling of suspended solids as well as for attenuation purposes.
Transport and end-destination	• Water is discharged by means of a concrete canal into the Wonderfonteinspruit at a discharge point located below Cooke 1 Shaft.	• Water is discharged through a short pipeline and a concrete channel into the Magazine Pan, an artificial depression wetland where there is evaporation and recharge to underground aquifers.
Sediment disposal	• The settled solids are disposed of in paddocks on surface at the shaft.	• The settled solids are disposed of in paddocks on surface at the shaft.

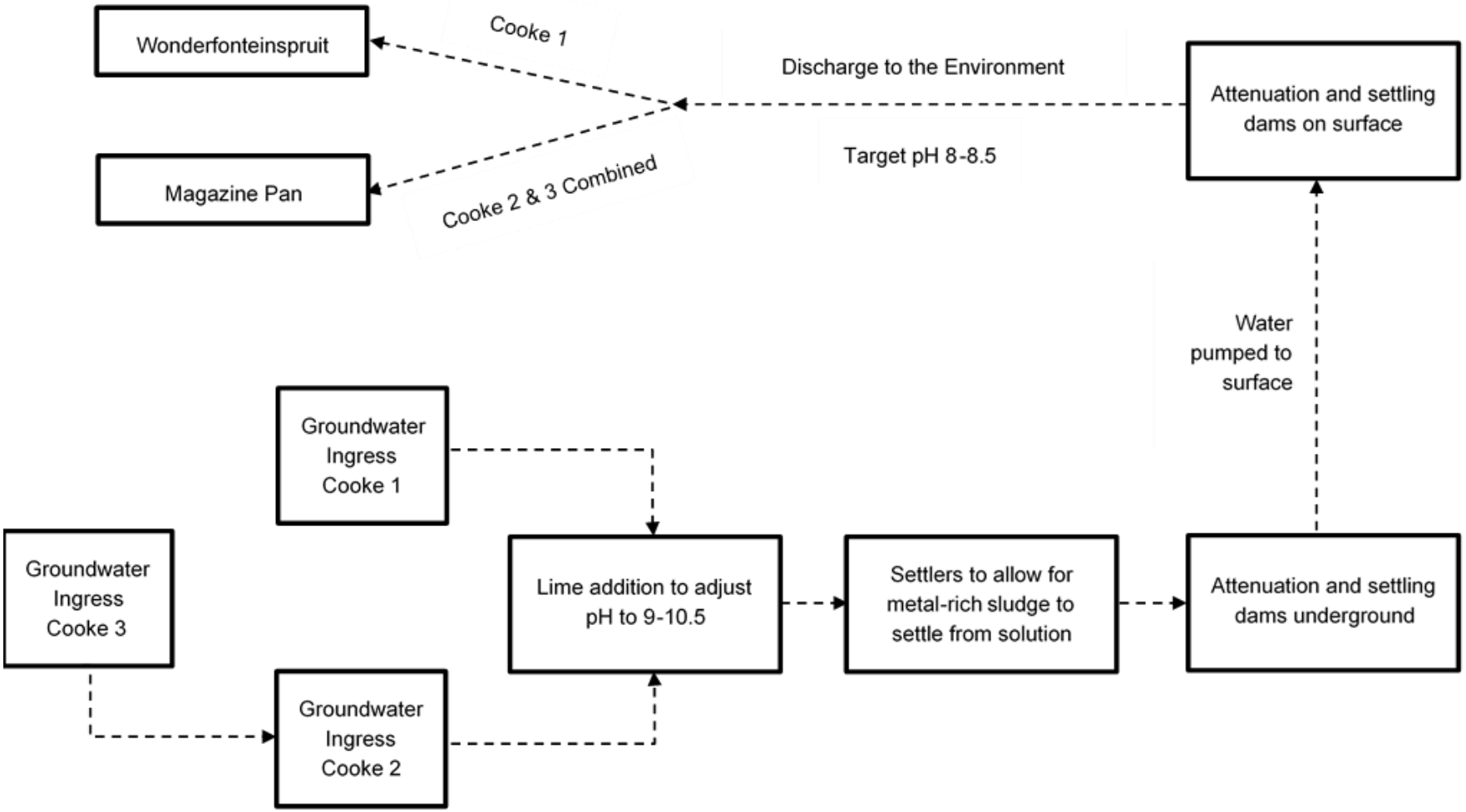

Figure 1-3: Water Management Process

The scope of decommissioning, rehabilitation and closure activities to be undertaken as a result of the cessation of underground water pumping- and discharge regime include:

- Removal and decontamination of underground infrastructure containing hydrocarbons and other contaminants from the Cooke 1, 2 and 3 underground workings;
- Refurbishment of plugs between Cooke 3 and Cooke 4 Shafts, as well as between Cooke 1 and Doornkop Mine;
- Rewatering of underground workings;
- Potential capping of the shaft barrel below the dolomitic aquifer, dependent on specialist studies regarding the groundwater quality;
- Decommissioning of surface dams and rehabilitation of dam footprints;
- Removal of settled solids from surface paddocks and mud ponds for processing through the Plant and/or disposal into the Pits;
- Rehabilitation of surface paddocks and mud ponds;
- Decommissioning and rehabilitation of concrete channels; and
- Rehabilitation of Magazine Pan, an artificial pan used for water management.

1.3.2. Removal of Shaft Infrastructure

The scope of decommissioning, rehabilitation and closure activities for shaft infrastructure at Cooke 1, 2 and 3 Shafts include:

- Decommissioning of shaft headgear and surface infrastructure;
- Capping of shafts;
- Sale of salvageable items;
- Disposal of waste; and
- Rehabilitation of infrastructure footprints.

It is proposed to remove all surface infrastructure to reduce the risk of vandalization and theft by illegal activities prevalent in the area. The shafts will be capped, and potentially backfilled (tailings, rock and/or rubble, to make the area safe and prevent access to underground workings, which will be rewatered at closure.

1.3.3. Additional Rehabilitation Activities

In addition to the activities proposed for the permanent closure of the Cooke Underground Operation, Sibanye also intends to undertake closure planning rehabilitation activities of wetlands located at its Cooke Surface Operations, under (GP) 30/5/1/2/5 (173) MR), which have been affected by current and historic legal and illegal mining activities, these activities were not necessarily associated with the Sibanye-Stillwater activities.

The wetlands include:

- Three contaminated wetlands near Lindum Dump;
- Contaminated wetland near Millsite TSF;
- Robinson Lake; and
- Tiger Mills wetland area.

1.3.4. Alternatives Considered

Rand Uranium has maintained an extensive groundwater pumping, treating and discharge regime at the Cooke Underground Operations while investigating alternatives for the continuation of the operation. No sustainable mining plans were found to be feasible and as such, a permanent closure solution is now being sought out. The decommissioning, rehabilitation and closure activities discussed above are the only way to achieve sustainable closure.

1.4. Relevant Legislation

On 2 June 2014, the National Environmental Management: Waste Amendment Act (NEM:WA), 2014 (Act No. 26 of 2014) was published, which for the first time included “residue deposits” and “residue stockpiles” under the environmental waste legislation (previously mining residue was covered under the MPRDA). Mine wastes are listed under Schedule 3, under the category “Hazardous Waste”, therefore the understanding is that mine wastes are considered to be hazardous unless the applicant can prove that the waste is non-hazardous.

As residue deposits and residue stockpiles are considered to be waste, they are regulated by the following regulations, both promulgated on 23 August 2013 in the amended NEM: WA guidelines:

- R635 – National norms and standards for assessment of waste for landfill disposal; and
- R636 – National norms and standards for the disposal of waste to landfill.

According to these regulations, waste that is generated must be classified in accordance with SANS 10234 within 180 days of generation. Waste that has already been generated, but not previously classified must be classified within 18 months of the date of commencement of the regulations. The norms and standards specify the waste classification methodologies for determining the waste category, and the specifications for pollution control barrier systems (liners) for each of the waste categories.

The Department of Environmental Affairs (DEA) has published the following regulations:

- R632 – Regulations regarding the planning and management of residue stockpiles and residue deposits; and

- GN715 – Regulations regarding the exclusion of a waste stream or a portion of a waste stream from the definition of waste.

In terms of waste classification, these regulations state that residue stockpiles and residue deposits must be characterised to identify any potential risk to health or safety and environmental impact in terms of physical characteristics, chemical characteristics (toxicity, propensity to oxidise and decompose, propensity to undergo spontaneous combustion, pH and chemical composition of the water separated from the solids, stability and reactivity and the rate thereof, neutralising potential and concentration of volatile organic compounds), and mineral content.

2. Methodology

2.1. Sampling Description

Sampling focussed on disturbed areas in which sediment accumulation occurred in the past and which are situated in downstream positions of mining activities, such as TSF's, waste dumps and shaft areas across the Cooke Surface and Underground Operations' landscape. The targeted areas included the following disturbed landscapes, streams, wetlands and other surface water features:

- Historically impacted wetlands across the Mining Right Areas;
- Wonderfonteinspruit River bed;
- Cooke No.1 and 2 Shaft areas (including slimes material from settled and dried underground solid material);
- Downgradient of the treated effluent discharge points from the Cooke No.1 and 2 Shaft areas;
- Magazine Pan; and
- Millsite TSF Complex – Downstream Wetland Area.

Representative sampling was conducted by Digby Wells between 26 May and 4 June 2020. Based on site background information and discussions between Digby Wells and the client the final sample locations and number of samples were determined. It was originally planned to sample a total of fifty-five locations. However, due to restrictive site conditions and on-site safety risks identified during the sampling activities, thirty-four samples were collected. The sampling locations are shown in Figure 2-1 with field photographs included in Appendix A.

Samples were taken using a shovel. Prior to collection, the shovel was cleared of any residue from previous locations to ensure no cross contamination. The samples were taken at depths of between 300 and 500 mm in the soil/sediment profile. At the time of sampling and this assessment, a Soil/ Land Contamination Assessment was not completed, and the exact depth of contamination and proposed stripping/ rehabilitation depths were not known. However, it is

likely that only the top 500 mm of material will be removed (excluding the Millsite TSF Complex material that will all be removed as part of the ongoing reclamation activities).

Samples were sealed in sample bags and kept out of direct sunlight during storage and transfer to the laboratory. Individual samples per location were taken and no composite samples were taken or made (i.e. the laboratory tested individual samples without compositing any of the samples). Samples were dried and milled by the laboratory in line with test guidelines and standards before test work started.

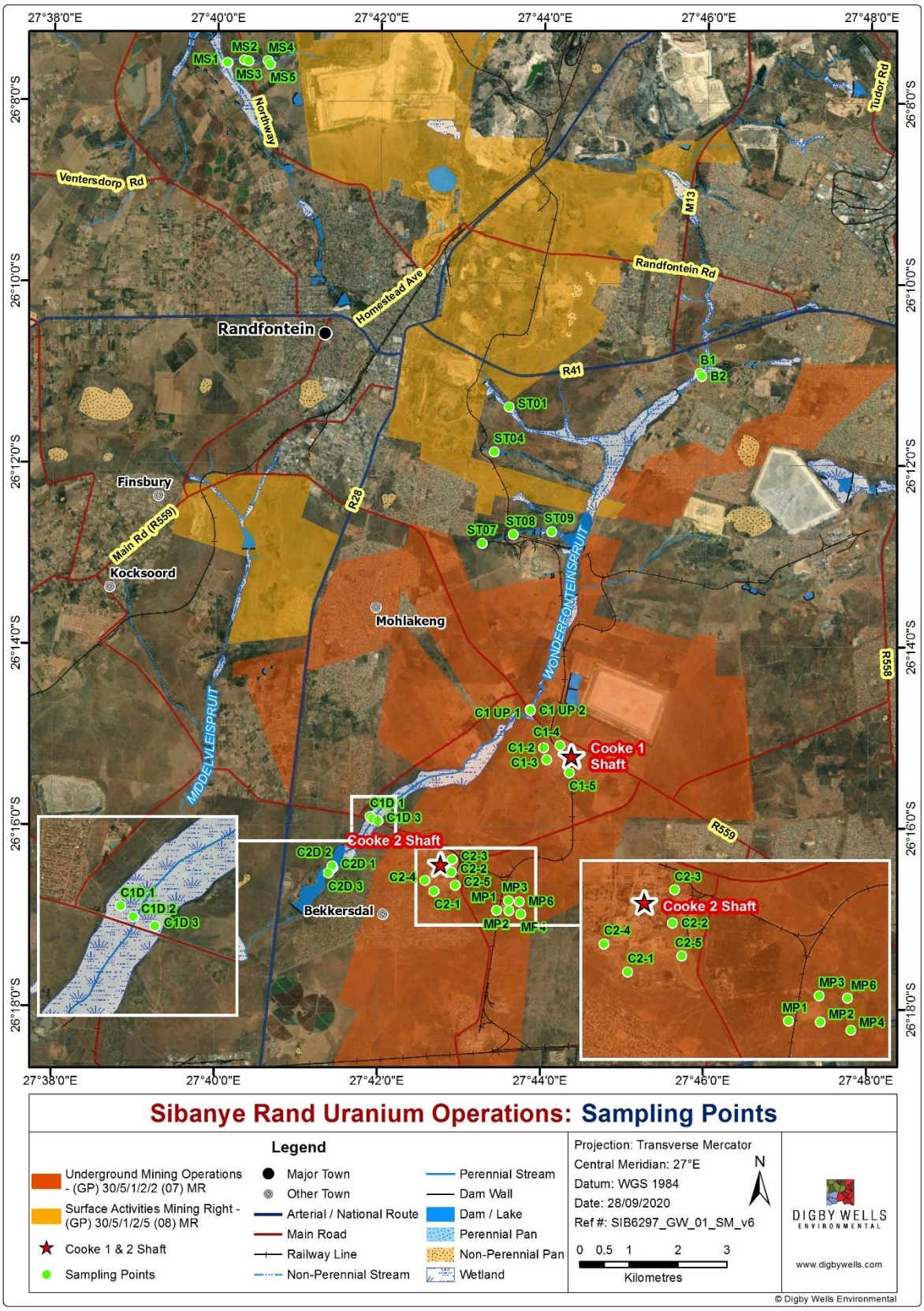

Figure 2-1: Sampling Points

2.2. Laboratory Test Description

Static testing was carried out to determine the composition of the materials and the potential of these materials to produce acid as well as the leachability (metal leach) of the material under different conditions. Static tests are relatively simple, inexpensive and rapid and enable initial screening of waste material in terms of the potential to produce acid and the parameters that may leach from a sample. Samples were submitted to Inspectorate M and L (Pty) Ltd. laboratory, which is SANS accredited.

From all the tests, information is accumulated on the chemical composition and behaviour of the materials. A total of thirty-four samples, each weighing at least 1 kg, were sent to the laboratory. The samples were submitted for the following laboratory test work:

- X-Ray Diffraction (XRD);
- X-Ray Fluorescence (XRF);
- Acid-Base Accounting (ABA);
- Net Acid Generation (NAG);
- Sulphur-Speciation (SS%) tests;
- Aqua regia digestion to determine total concentrations; and
- Distilled (DI) water leachate tests.

2.2.1. XRD and XRF

XRD allows for the measurement of the crystal structures within a sample to determine the mineralogical composition of the material that allows the specialist to determine whether any reactive solids will lead to environmental risks through the study of the various minerals. XRF is an X-ray method used to determine the elemental composition of a material that allows for the evaluation of a materials chemical compound distribution, as well as the various trace element concentrations.

The following pertains to the XRD method used:

- The samples were prepared for XRD analysis using a back-loading preparation method. They were analysed with a PANalytical Empyrean diffractometer with X'Celerator detector and fixed receiving slits with Cu-Kα radiation. The phases were identified using X'Pert Highscore plus software;
- Trace minerals at concentrations below ± 1% are often not detected using XRD testing on whole-rock samples as the error might become larger than the analyses reported; and
- The weight percentages of the minerals were determined using the Rietveld method (Autoquan Program).

The following pertains to the XRF method and the Loss-On-Ignition (LOI) used:

- Samples were analysed using pressed powder pellets;
- Analyses were performed using the fusion technique with a Rigaku Supermini 200 with SC and F-PC detectors and fixed receiving slits with Zr of Al filtered Pd-K radiation. The elements were identified using ZSX software; and
- LOI was then determined by placing samples in weighed crucibles which is then weighed. Weight loss is measured after heating at 750ºC overnight to remove water, organic matter and carbonates. After heating, the firebrick holding crucibles is allowed to cool completely in the oven or furnace before weighing.

2.2.2. Acid Base Accounting (ABA) and Net Acid Generation (NAG)

ABA is a first-order classification procedure whereby the acid-neutralising potential and acid-generating potential of rock samples are determined, and the difference Net Neutralising Potential (NNP) is calculated. This procedure includes NAG tests that evaluate the Net Acid Generation and neutralising potential of the material to evaluate the potential of the material to counter acid production. The NNP, and/or the ratio of neutralising potential to acid-generation potential, is compared with a predetermined value, or set of values, to divide samples into categories that either require or do not require further determinative acid potential generation test work.

The Acid-Mine-Drainage (AMD) potential for classification of the material the ABA results could be screened in terms of Net Neutralising Potential (NNP), Sulphur Speciation (SS, in %) and Neutralising Potential, Acid Producing Potential (NP:AP) ratio is as follows:

- Acid drainage from rocks can theoretically occur when the NNP < 0 kg $CaCO_3$/t while neutral drainage occurs when NNP > 0 kg $CaCO_3$/t. Carbonate and sulphide mineral reactions are complex. Research has indicated that a range from -20 kg $CaCO_3$/t to 20 kg $CaCO_3$/t is referred to as an area of uncertainty to establish if there is a net acid generation or neutralisation potential of a rock. Material with an NNP above this range is normally considered not to be a problem in terms of AMD. To classify the materials the NP:AP ratio is used in addition to the NNP. The classification of the materials is shown in Table 2-1.
- Soregaroli and Lawrence (1998) further state that samples with less than 0.3% sulphide-sulphur are regarded as having insufficient oxidisable sulphides to sustain long term acid generation. Anything above the 0.3% mark indicates a potential of AMD formation including other supporting factors demonstrated in
- Table 2-2 updated from Price (Draft Guidelines for metal leaching and acid rock drainage at mine sites in British Columbia, 1997).
- The NAG test is a static test that is used to determine the formation of ARD by reacting a sample with hydrogen peroxide, which accelerates the oxidation of sulphide minerals in the sample. During the test, acid generation and acid neutralization reactions can

occur simultaneously, end-result representing a direct measurement of the net amount of acid generated by the sample and the pH. The test does not estimate the neutralisation potential hence it needs to be performed with the ABA test (Smart, et al., 2002).

Table 2-1: Criteria for interpreting ABA results updated from Price (Draft Guidelines for metal leaching and acid rock drainage at mine sites in British Columbia, 1997) and Soregaroly and Lawrence (Update on waste characterization studies, 1998)

Potential for AMD	Criterion	S^{2-}-S%	Comments
Sediment Type I: Likely	NPR<1	>0.3	Potentially acid generating, unless sulphide minerals are non-reactive
Sediment Type II: Possible	1<NPR<2	0.2-0.3	Possibly acid-generating if NP is insufficiently reactive or is depleted at a rate faster than sulphides
Sediment Type III: Low	2<NPR<4	0.1-0.2	Not potentially acid-generating unless significant preferential exposure of sulphide
Sediment Type IV: None	NPR>4	<0.1	Non-acid generating

Table 2-2: A classification system based on Paste-pH and NAG-pH edited from Miller et al. (1997)

Acid Forming Potential	Test Criteria	NAG Value (H_2SO_4 kg/t)	NNP ($CaCO_3$ kg/t)
Sediment Type Ia. PAF High Risk	Paste-pH < 4.0 NAG-pH < 4	>10	Negative
Sediment Type Ib. PAF Medium Risk	Paste-pH 4.0 – 6 NAG-pH < 4	≤10	-
PAF – Lag to ARD	Paste-pH >6.0 NAG-pH < 4		
Uncertain, possibly Sediment Type Ib	NAG-pH < 4	>10	Positive
Uncertain	NAG-pH ≥4.5	0	Negative (reassess mineralogy)
Rock Type IV: NAF	Paste-pH >6 NAG-pH >4	0	Positive

2.2.3. Waste Classification Tests

Leachate tests are done to simulate the heavy metal and anion leachate potential of soils, waste material and wastewater left in-situ under the expected conditions, with the solution type and pH determined based on guidelines or the expected conditions on-site. These tests simulate and evaluate the potential of any heavy metal or ion from the waste material to produce contamination.

The leachate tests are then used to evaluate the leachability of material that will be mono- or co-disposed. In the case of this study, mono-disposal testing was conducted, as it is intended that the samples will be disposed of in respective facilities such as Waste Rock Dumps (WRDs), TSFs or in-pit deposition.

Total Concentration (TC) values in mg/kg were determined by *aqua regia* digestion and analysis with ICP methods by Waterlab Laboratory in Gauteng Province. This was done to determine the complete chemical make-up of the material before being leached or altered.

Total Concentration Threshold (TCT) limits are subdivided into three categories as indicated in Table 2-4, as outlined in the Norms and Standards for the Assessment of Waste for Disposal, and is summarised as follows:

- TCT0 limits based on screening values for the protection of water resources, as contained in the Framework for the Management of Contaminated Land (DEA, March 2010);
- TCT1 limits derived from land remediation values for commercial/industrial land (DEA, March 2010); and
- TCT2 limits derived by multiplying the TCT1 values by a factor of 4, as used by the Environmental Protection Agency, Australian State of Victoria.

Leachable Concentration (LC) was determined by following the Australian Standard Leaching Procedure for Wastes, Sediments and Contaminated Soils (AS 4439.3-1997), as specified in the NEM: WA Norms and Standards for the Assessment of Waste for Disposal (2013). The procedure recommends the use of distilled (DI) Water to detect the metals that are present on the surface exterior.

Leachable Concentration Threshold (LCT) limits are subdivided into four categories as follows:

- LCT0 limits derived from human health effect values for drinking water, as published by the DWS, SANS, WHO or the United States Environmental Protection Agency (USEPA);
- LCT1 limits derived by multiplying LCT0 values by a Dilution Attenuation Factor (DAF) of 50, as proposed by the Australian State of Victoria;
- LCT2 limits derived by multiplying LCT1 values by a factor of 2; and
- LCT3 limits derived by multiplying the LCT2 values by a factor of 4.

2.3. Waste Classification Criteria

Waste is classified by comparison of the total and leachable concentration of elements and chemical substances in the waste material according to SANS 10234 and the Global Harmonised System for Classification and Labelling of Chemicals Management (GHS). Landfill assessment of the waste is linked to the TCT and LCT limits as specified in the National Norms and Standards for Waste Classification and the National Norms and Standards for Disposal to Landfill as per Table 2-3. Based on these limits the waste can then be classified into a waste type determining which landfill (landfill class) the type of waste can be disposed to.

Table 2-3: Waste Classification Criteria

Waste Type	Element or chemical substance concentration	Disposal
0	LC > LCT3 **OR** TC > TCT2	Not allowed
1	LCT2 < LC ≤ LCT3 **OR** TCT1 < TC ≤ TCT2	Class A or Hh:HH landfill
2	LCT1 < LC ≤ LCT2 **AND** TC ≤ TCT1	Class B or GLB+ landfill
3	LCT0 < LC ≤ LCT1 **AND** TC ≤ TCT1	Class C or GLB- landfill
4	LC ≤ LCT0 **AND** TC ≤ TCT0 for metal ions and inorganic anions **AND** all chemical substances are below the total concentration limits provided for organics and pesticides listed	Class D or GLB- landfill

Table 2-4: Total and Leachable Concentration Threshold Limits

Parameter	Unit	TCT0	TCT1	TCT2	Unit	LCT0	LCT1	LCT2	LCT3
As, Arsenic	mg/kg	**5,8**	**500**	**2000**	mg/l	**0.01**	**0.5**	**1**	**4**
B, Boron	mg/kg	**150**	**15000**	**60000**	mg/l	**0.5**	**25**	**50**	**200**
Ba, Barium	mg/kg	**62,5**	**6250**	**25000**	mg/l	**0.7**	**35**	**70**	**280**
Cd, Cadmium	mg/kg	**7,5**	**260**	**1040**	mg/l	**0.003**	**0.15**	**0,3**	**1,2**
Co, Cobalt	mg/kg	**50**	**5000**	**20000**	mg/l	**0.5**	**25**	**50**	**200**
Cr total	mg/kg	**46000**	**800000**	**N/A**	mg/l	**0.1**	**5**	**10**	**40**
Cr (IV), Chromium (IV)	mg/kg	**6,5**	**500**	**2000**	mg/l	**0.05**	**2.5**	**5**	**20**
Cu, Copper	mg/kg	**16**	**19500**	**78000**	mg/l	**2**	**100**	**200**	**800**
Hg, Mercury	mg/kg	**0,93**	**160**	**640**	mg/l	**0.006**	**0.3**	**0,6**	**2,4**
Mn, Manganese	mg/kg	**1000**	**25000**	**100000**	mg/l	**0.5**	**25**	**50**	**200**
Mo, Molybdenum	mg/kg	**40**	**1000**	**4000**	mg/l	**0.07**	**3.5**	**7**	**28**
Ni, Nickel	mg/kg	**91**	**10600**	**42400**	mg/l	**0.07**	**3.5**	**7**	**28**
Pb, Lead	mg/kg	**20**	**1900**	**7600**	mg/l	**0.01**	**0.5**	**1**	**4**
Sb, Antimony	mg/kg	**10**	**75**	**300**	mg/l	**0.02**	**1**	**2**	**8**
Se, Selenium	mg/kg	**10**	**50**	**200**	mg/l	**0.01**	**0.5**	**1**	**4**
V, Vanadium	mg/kg	**150**	**2680**	**10720**	mg/l	**0.2**	**10**	**20**	**80**
Zn, Zinc	mg/kg	**240**	**160000**	**640000**	mg/l	**5**	**250**	**500**	**2000**
Chloride as Cl	mg/kg	**n/a**	**n/a**	**n/a**	**mg/l**	**300**	**15000**	**30000**	**120000**
Sulphate as SO_4	mg/kg	**n/a**	**n/a**	**n/a**	**mg/l**	**250**	**12500**	**25000**	**100000**
Nitrate as N	mg/kg	**n/a**	**n/a**	**n/a**	**mg/l**	**11**	**550**	**1100**	**4400**
F, Fluoride	mg/kg	**100**	**10000**	**40000**	**mg/l**	**1.5**	**75**	**150**	**600**
CN total, Cyanide total	mg/kg	**14**	**10500**	**42000**	**mg/l**	**0.07**	**3.5**	**7**	**28**

3. Results Summary

The laboratory certificates are provided in Appendix B. To keep interpretations and discussion in this summary section to the point, tables and figures were included only if directly linked to the classification of the material. Please refer to Appendix B for the full data sets applicable to the assessment.

3.1. Historically Impacted Wetlands

Five sediment samples (ST01, ST04, ST07, ST08 and ST09) were collected from the historically impacted wetlands from surface infrastructure and mine water discharge and submitted for the test work described in Section 2.2 above. Refer to Figure 2-1 above for the sampling points.

The XRD results show the dominant minerals to be quartz and kaolinite present in all 5 samples. Quartz is the most dominant mineral in the earth's crust, therefore the presence of quartz in the samples is directly linked to the physical weathering of the areas' geological units over time and potentially from mineral processing like milling, crushing and extraction. Kaolinite is a common clay mineral found in most weathered soil/sediment formations and is associated with the chemical and mechanical weathering processes breaking down feldspar and plagioclase minerals.

Smaller and trace concentrations of goethite, chlorite, muscovite, plagioclase and microcline was also found in the samples. Clay minerals (chlorite, pyrophyllite and muscovite) are directly linked the geology of the area and the breakdown of silicate minerals. Goethite is a weathering product of iron rich minerals through oxidation reactions. Plagioclase and microcline are hard, silicate minerals, resistant to weathering, that are still in their original form and has not been weathered down into secondary minerals.

The XRF results confirmed the XRD results with Silicon Dioxide (SiO_2), Aluminium Oxide (Al_2O_3) and Iron Oxide (Fe_2O_3) being the main oxides. The presence of these oxides in high concentrations confirms the mineralogy being dominated by silicate (quartz, plagioclase, microcline) and chain silicate (clay) minerals.

The ABA, NAG and sulphur speciation results indicated the following:

- All samples had a sulphide sulphur and total sulphur content below 0.3% indicating a low potential of acid formation based only on sulphur content;
- All samples had a NAG pH below neutral. However, soils are commonly slightly acidic, and this is not an indication of any long-term acid generation potential;
- The NNP for all samples were positive excluding sample ST01 that showed a slightly negative NNP. This was also confirmed by the neutralising potential ratio of all samples being above 2 excluding ST01 and ST09 as indicated in Figure 3-1 below; and

- For both the above-mentioned samples the neutralising potential and acid producing potential of the material was slightly out of balance. However, any acid producing potential is only short term due to the low sulphide sulphur content.

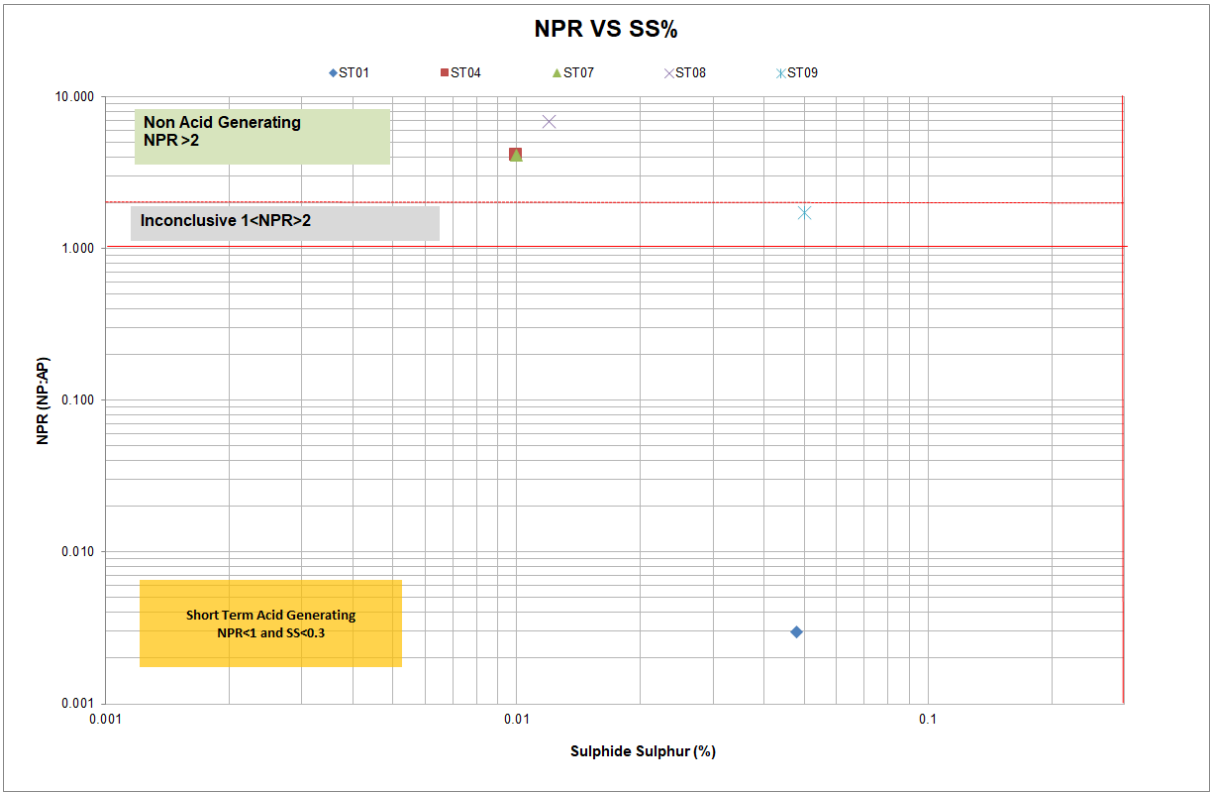

Figure 3-1: Historically Impacted Wetlands – NPR vs SS%

The TC results were compared against the NEM: WA Waste Classification TCT as indicated in Table 3-1 with the following results:

- The results for ST01 exceeded the TCT0 limits for arsenic (As) and barium (Ba) but were below the TCT1 limits. All other parameter concentrations in sample ST01 was were below the TCT0 limits. As is an element commonly associated with gold bearing ore and geologies in the form of trace amount in pyrite and arsenopyrite and for this reason can be enriched naturally in the soil and sediment profile;
- ST07 exceeded the TCT0 limit concentration for copper (Cu) but was below the TCT0 limits for all other parameters. Cu is a metal associated with gold mining in both in terms of the geological setting as well as the processing methods in the surrounding mining operations. The Cu can potentially be an indication of natural weathering processes or has been introduced as a result of copper sulphate reagents added to the gold processing circuit and dispersing from surface waste facilities like tailings dams or slimes dams in the upstream catchment. A contaminated land/soil assessment will be required to further assess the source and level of contamination particularly subsequent to the removal of pollution sources identified through this study;

- ST08 exceeded the TCT0 limit concentration for As, Ba, Cu and manganese (Mn) but were below the TCT1 limits. All other parameters were below the TCT0 limits. Manganese is one of the most common metals in the earths curst and is associated with the gold bearing geology of the region. This is also evident in the groundwater quality results as discussed in the Groundwater Impact Assessment (van Biljon, 2020). In addition, manganese can be bound to organic matter and clay particles, and as these can accumulate in wetland systems this could also contribute to elevated manganese concentrations in the sediments;
- ST09 exceeded the theTCT0 limits for Ba, Cu, nickel (Ni) and lead (Pb) but were below the TCT1 limits. Ni is commonly associated with mineral processing and is included as trace amounts in silicate and clay minerals associated with the gold bearing geology. Pb is not commonly found and this can be an indication of contamination from a different source than that of mining processes; and
- ST04 exceeded the TCT0 limits only for B.

The LC results from the distilled water leachate tests were compared against the NEM: WA Waste Classification LCT as indicated in Table 3-2 with the following results:

- ST01 exceeded the LCT0 limits for Mn, Ni and pH. The Mn and Ni concentrations will be directly as a result of the dissolution of the total concentrations of these elements. The low pH is commonly found in soils and sediments but can also be related to the oxidation of the high metal content in the material leading to lower pH levels;
- ST09 exceeded the LCT0 limits for Mn, Ni, nitrate (NO_3) and pH. The NO_3 can potentially be as a result of blasting where explosives contain high levels of nitrates. Agricultural and industrial practices as well as sewage from communities discharging into the streams in the area upstream of the mines can also potentially contribute to the NO_3 concentrations; and
- All other samples indicated LC levels below the LCT0 limits.

Table 3-1: Total Concentration Threshold (TCT) for historically impacted wetland sediment samples in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TCT0	5,8	150	62,5	7,5	50	46000	16	0,93	1000	40	91	20	10	10	150	240
TCT1	500	15000	6250	260	5000	800000	19500	160	25000	1000	10600	1900	75	50	2680	160000
TCT2	2000	60000	25000	1040	20000	N/A	78000	640	100000	4000	42400	7600	300	200	10720	640000
ST01	41	26	63	0.25	7.62	96	33	<0.10	148	0.46	38	9.44	<1.0	<3.0	35	32
ST04	<2.0	207	14.9	<0.050	19.3	309	1.28	<0.10	113	<0.10	27	11.37	<1.0	<3.0	76	14.41
ST07	3.92	34	25	<0.050	12.58	120	16.26	<0.10	196	<0.10	19.65	9.12	<1.0	<3.0	78	6.43
ST08	3	61	229	0.072	17.63	233	21	<0.10	1785	<0.10	27	15.24	<1.0	<3.0	69	35
ST09	9.84	51	64	0.08	11.46	226	38	<0.10	144	<0.10	96	22	<1.0	<3.0	40	46

Table 3-2: Leachable Concentration Threshold (LCT) for historically impacted wetland sediment samples DI Leach results in mg/L

Parameter	As	Ba	Cd	Cr	Cu	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mS/m**	**mg/L**	**mg/L**	**mg/L**	
LCT0	**0.01**	**0.7**	**0.003**	**0.1**	**2**	**0.5**	**0.07**	**0.07**	**0.01**	**0.2**	**5**	**300**	**170**	**250**	**11**	**1.5**	**5-9.7**
LCT1	**0.5**	**35**	**0.15**	**5**	**100**	**25**	**3.5**	**3.5**	**0.5**	**10**	**250**	**15000**		**12500**	**550**	**75**	
LCT2	**1**	**70**	**0.3**	**10**	**200**	**50**	**7**	**7**	**1**	**20**	**500**	**30000**		**25000**	**1100**	**150**	
LCT3	**4**	**280**	**1.2**	**40**	**800**	**200**	**28**	**28**	**4**	**80**	**2000**	**120000**		**100000**	**4400**	**600**	
ST01	<0.02	0.11	0.002	<0.003	0.02	1.34	<0.001	0.37	<0.01	0.01	0.38	2.58	29.00	143.60	4.50	0.19	4.61
ST07	<0.02	0.03	<0.001	0.03	0.01	0.01	0.002	0.02	<0.01	<0.002	0.03	2.70	1.99	4.22	5.40	<0.1	6.73
ST08	<0.02	0.10	<0.001	0.04	0.01	0.18	0.002	0.02	<0.01	0.01	0.61	3.48	2.78	9.37	5.80	<0.1	6.00
ST09	<0.02	0.20	<0.001	0.004	0.03	2.09	0.001	0.38	<0.01	0.004	0.27	1.74	25.00	49.02	55.50	0.10	4.19
ST04	<0.02	0.02	<0.001	<0.003	0.004	0.09	0.001	0.003	<0.01	<0.002	0.03	1.29	1.24	0.88	6.20	<0.1	6.25

3.2. Upstream and Downstream Wonderfonteinspruit River Sediments

A total of four samples (B1, B2, C1 UP1 and C1 UP2) were taken representing upstream and downstream locations in the Wonderfonteinspruit in relation to the historically impacted wetlands discussed in Section 3.1 (refer to Figure 2-1 above for the sampling points). All 4 samples are upstream of the Cooke No. 1 and 2 Shaft Areas. Samples B1 and B2 are located upstream of the confluence with the streams representing ST01, ST04, ST07, ST08 and ST09, whereas C1 UP1 and C1 UP2 are downstream of these confluences and the Cooke TSF.

The XRD results showed similar mineralogy to that observed in the historically impacted wetland samples, with quartz being the dominant mineral with lesser amounts of goethite, pyrophyllite, muscovite, kaolinite and chlorite present. All these minerals would have the same origin as that described in Section 3.1. The only additional mineral in all 4 samples that was not present in the historically impacted wetland samples was hematite. Hematite is however an iron oxide similar to goethite and forms under the same conditions. The XRF results confirmed the XRD mineralogy with high silica and aluminium oxide.

The ABA, NAG and sulphur speciation results indicated the following:

- The NAG pH was above 5.5 for all samples excluding B2 which was acidic at a NAG paste pH of 3.95;
- Sulphide sulphur for all samples were below 0.3%;
- The NPP and NPR for samples B2 and C1-UP2 indicate the potential to generate acid in the short term;
- Figure 3-2 indicates the relationship between the sulphide sulphur and NPR for each sample. Due to the low sulphide sulphur in the B2 and C1-UP2 samples any acid forming potential will only be for a short period; and
- B2 and C1-UP2 was sampled closer to the middle of the stream bed and this can explain a higher level of potential contamination.

The TC results were compared against the NEM: WA Waste Classification total TCT as indicated in Table 3-3 with the following results:

- Sample B1 exceeded the TCT0 limits for As, Ba, Co, Cu, Mn, Ni, Pb and Zn, but concentrations were below the TCT1 limits. All these metals are associated with the geology of the area and are also naturally occurring in soil profiles;
- Sample B2 exceeded the TCT0 limits for As, Cu and Pb;
- Sample C1-UP1 exceeded the TCT0 limits for As;
- Sample C1-UP2 exceeded the TCT0 limits for As and Pb; and
- All other elements for all samples were below the TCT0 limits.

The LC results from the distilled water leachate tests were compared against the NEM: WA Waste Classification LCT as indicated in

Table 3-4 with the following results:

- Sample B1 exceeded none of the LCT limits for any of the parameters;
- Sample B2 exceeded the LCT0 limits for Mn only;
- Sample C1-UP1 exceeded the LCT0 limits for As and Ni but for none of the other parameters;
- Sample C1-UP2 exceeded the LCT0 limits for Cd, Mn, Ni, SO_4 and pH.

From the above results samples B2 and C1-UP2 that were sampled closer to the main river stream/channel indicated higher levels of potential contamination.

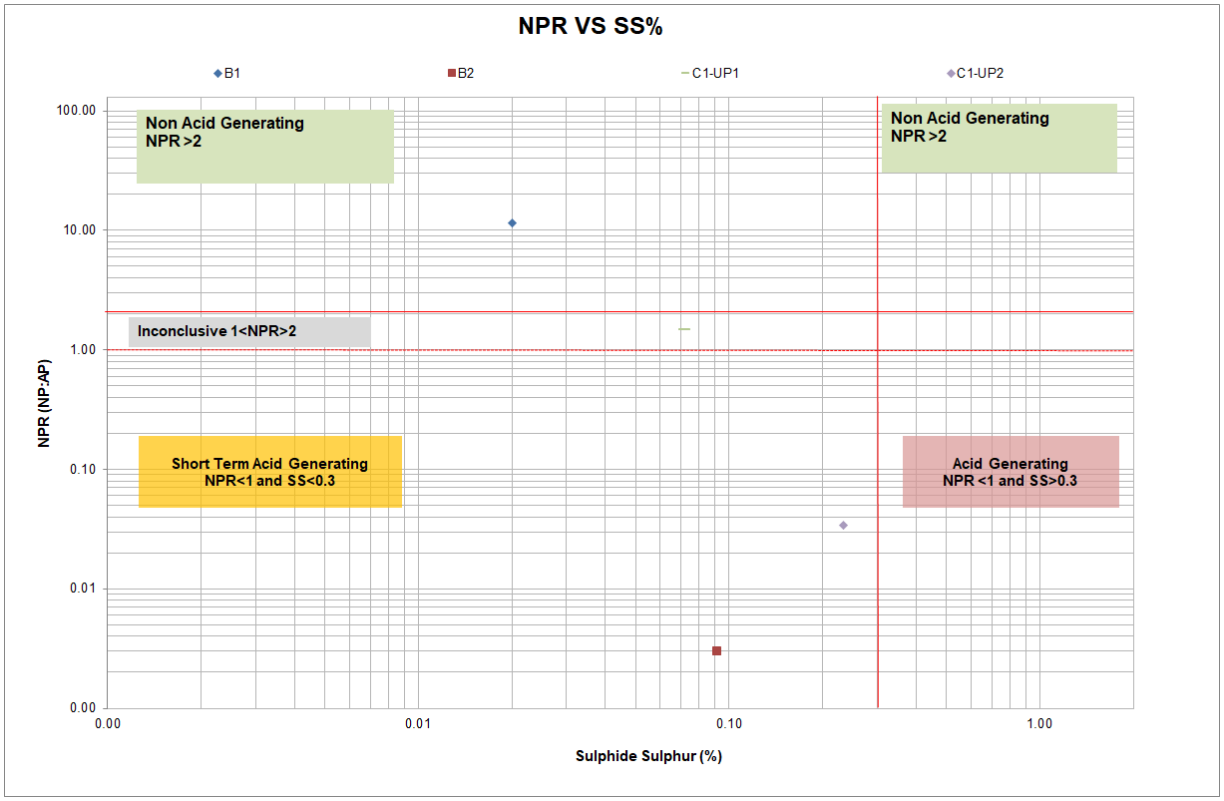

Figure 3-2: Upstream and Downstream Wonderfonteinspruit Sample NPR vs SS%

Table 3-3: Total Concentration Threshold (TCT) for up- and downstream Wonderfonteinspruit samples in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TCT0	5,8	150	62,5	7,5	50	46000	16	0,93	1000	40	91	20	10	10	150	240
TCT1	500	15000	6250	260	5000	800000	19500	160	25000	1000	10600	1900	75	50	2680	160000
TCT2	2000	60000	25000	1040	20000	N/A	78000	640	100000	4000	42400	7600	300	200	10720	640000
B1	14.98	85	173	0.77	89	243	86	<0.10	5784	<0.10	282	37	<1.0	<3.0	75	535
B2	52	25	23	<0.050	17.61	121	29	<0.10	120	0.82	52	39	<1.0	<3.0	26	74
C1-UP1	10.47	29	34	<0.050	15.11	48	3.22	<0.10	742	<0.10	35	8.9	<1.0	<3.0	17.18	31
C1-UP2	14.75	53	59	0.17	15.54	99	13.71	<0.10	973	<0.10	43	32	<1.0	<3.0	34	90

Table 3-4: Leachable Concentration Threshold (LCT) for up- and downstream Wonderfonteinspruit samples DI Leach results in mg/L

Parameter	As	Ba	Cd	Cr	Cu	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mS/m	mg/L	mg/L	mg/L	
LCT0	0.01	0.7	0.003	0.1	2	0.5	0.07	0.07	0.01	0.2	5	300	170	250	11	1.5	5-9.7
LCT1	0.5	35	0.15	5	100	25	3.5	3.5	0.5	10	250	15000		12500	550	75	
LCT2	1	70	0.3	10	200	50	7	7	1	20	500	30000		25000	1100	150	
LCT3	4	280	1.2	40	800	200	28	28	4	80	2000	120000		100000	4400	600	
B1	<0.02	0.09	<0.001	0.01	0.02	0.01	0.002	0.01	<0.01	0.01	0.03	2.13	18.02	50.80	6.50	0.25	9.45
B2	<0.02	0.18	<0.001	0.004	0.01	1.76	<0.001	0.02	<0.01	<0.002	0.06	1.29	17.82	64.76	4.40	<0.1	6.33
C1-UP1	0.02	0.07	<0.001	0.09	0.01	0.41	<0.001	0.11	0.01	0.05	0.12	8.40	8.44	46.41	6.50	0.33	6.91
C1-UP2	<0.02	0.08	0.01	0.004	0.02	3.35	<0.001	0.38	<0.01	0.02	0.85	3.49	141.00	911.60	8.20	0.20	4.29

3.3. Cooke Shaft Areas 1 and 2

Impacted sediment and silt samples around Cooke No.1 and 2 Shafts were sampled and analysed. A total of nine samples were collected between the two shaft areas as follows (refer to Figure 2-1 above for the sampling points):

- At the Cooke No.1 Shaft area, two types of samples were collected, namely:
  - Two silt dam samples (C1-3 and C1-4); and
  - Two impacted sediment samples (C1-2 and C1-5);
- At the Cooke No.2 Shaft area, a total of five samples were collected, namely:
  - Two silt dam samples (C2-2 and C2-3); and
  - Three impacted sediment samples (C2-1, C2-4 and C2-5).

The mineralogy (XRD results) for all samples again showed material mainly made up of quartz pyrophyllite, muscovite, chlorite, hematite and goethite. Trace amounts of gibbsite and jarosite was also found in samples C2-4 and C2-5 respectively. Gibbsite forms from weathering of many aluminous and aluminosilicate minerals under intense weathering conditions while jarosite normally forms in acid mine drainage environments, during the oxidation of sulphide minerals (Herbert, 1997). Sample C1-4 was however an anomaly with very high calcite content. C1-4 is a silt sample and the high calcite can be due to the addition of lime to the system during operation to buffer any acidic reactions and allow $CaSO_4$ (gypsum) and other elements to settle/precipitate out of solution. Calcite was however only detected in 2 other samples, C2-3 and C2-5. The presence of jarosite can however also indicate the impact of lime addition to AMD water.

The AMD test results only highlighted samples C1-2, C1-3, C1-5, and C2-5 as material with a potential to generate acid in the short term due to the low NP vs AP ratio (NPR) as indicated in Figure 3-3. However, none of these samples had sulphide sulphur above the guideline value of 0.3% with sulphate sulphur dominating the total sulphur content of the material. It is thus highly unlikely that any significant AMD potential still exists in these samples. The higher sulphate sulphur content does however indicate the origin of the samples which is the by-product of mining (silt) which would have contained high sulphate concentrations.

The TC results were compared against the waste classification TCT as indicated in Table 3-5 with the following results:

- The silt samples from both areas showed TC concentrations above the TCT0 limits for As, Ba, Co, Cu, Mn, Ni, Pb and Zn; only C2-2 of the silt samples showed an As concentration above the TCT1 limit;
- The impacted sediment samples showed similar chemistry but at lower concentration with only As, Ba, Co, Cu, Mn, Ni and Pb above TCT0 limits; only C2-4 of the impacted sediment samples showed an Mn concentration above the TCT1 limit;

- Zn was only detected in the silt samples; and
- Vanadium (V) which can be a common trace element in mining areas was picked up above the TCT0 limit in sediment sample C2-4.

The LC results from the distilled water leachate tests were compared against the waste classification LCT as indicated in Table 3-6 with the following results:

- Sample C1-3 (silt dam sample) had elevated Ni above the LCT0 limit;
- Sample C2-3 (sediment sample) indicated SO_4 concentrations above the LCT0 limit;
- Sample C2-5 (sediment sample) indicated Mn, Ni and SO_4 above the LCT0 limits;
- All other elements for the above-mentioned samples were below the LCT0 limits; and
- All other samples from these areas had all parameters below the LCT0 limits.

The mineralogy and TCT results for tested materials from the Cooke No. 1 and 2 Shaft areas shows that impacted sediments have similar mineralogical and elemental characteristics to the silt samples and indicate contamination from mining activities and in particular from the silt dams. However, only two exceedances over the TCT1 limit (once for As and once for Mn) were detected. The leachable concentrations do indicate low levels of leachability (mainly below LCT0 with exception of 5 LCT0 exceedances) that could potentially indicate that these silts and sediments have been highly weathered, and that the leachability of constituents is low. Based on no exceedances of the LTC1 as per the above results the silts and impacted sediments can still be classified as a type 3 waste.

Therefore, the expected quality of the materials upon removal and disposal of settled solids, waste rock and sources from the Cooke Shaft Areas 1 and 2 should conform to a type 3 waste as the area is treated as a single waste source. These will thus be managed as composites of different materials, as it would be impractical or even impossible to separate materials from these areas during rehabilitation.

Sibanye intends to reprocess the materials mentioned above together with the tailings from the Millsite TSF, Lindum Dump, Dump 20 and other ad hoc sources. This is supported and more sustainable than stripping and discarding the material which would merely move the contaminant source from one area to the next. In addition, this processing is expected to further reduce the leachable and total concentrations.

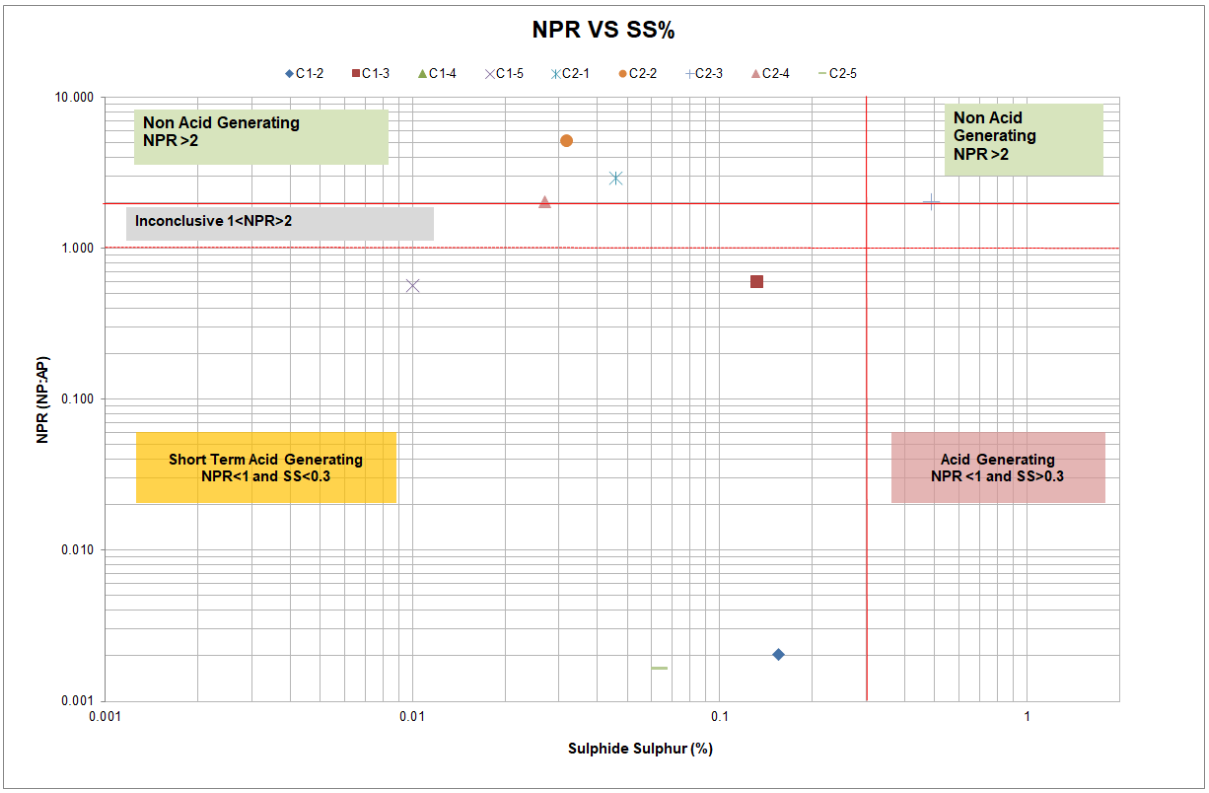

Figure 3-3: Cooke Shaft Areas 1 and 2 Sediment and Silt NPR vs SS%

Table 3-5: Total Concentration Threshold (TCT) for Cooke Shaft Areas 1 and 2 samples in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TCT0	5,8	150	62,5	7,5	50	46000	16	0,93	1000	40	91	20	10	10	150	240
TCT1	500	15000	6250	260	5000	800000	19500	160	25000	1000	10600	1900	75	50	2680	160000
TCT2	2000	60000	25000	1040	20000	N/A	78000	640	100000	4000	42400	7600	300	200	10720	640000
C1-2	37	13.93	16.87	<0.050	7.59	61	26	<0.10	51	1.45	10.58	28	<1.0	<3.0	11.38	19.16
C1-3	<2.0	123	67	<0.050	9.85	184	4.87	<0.10	300	<0.10	33	7.02	<1.0	<3.0	54	17.52
C1-4	87	82	18.59	10.64	728	280	308	<0.10	8878	0.23	2062	18.08	<1.0	<3.0	19.13	4568
C1-5	9.55	68	110	<0.050	12.33	363	37	<0.10	484	<0.10	37	35	<1.0	<3.0	95	43
C2-1	38	69	327	0.45	29	264	61	<0.10	1603	<0.10	73	76	<1.0	<3.0	77	174
C2-2	762	105	147	6.54	1042	574	405	<0.10	3195	8.12	2642	75	1.39	<3.0	45	4002
C2-3	192	26	37	0.92	176	98	71	<0.10	667	0.54	490	127	<1.0	<3.0	18.4	584
C2-4	26	282	3237	0.14	150	768	108	<0.10	29600	<0.10	199	118	<1.0	<3.0	362	57
C2-5	22	9.34	24	<0.050	4.59	31	10.07	<0.10	331	0.82	10.85	22	<1.0	<3.0	8.42	5.97

Table 3-6: Leachable Concentration Threshold (LCT) for Cooke Shaft Areas 1 and 2 samples DI Leach results in mg/L

Parameter	As	Ba	Cd	Cr	Fe	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mS/m	mg/L	mg/L	mg/L	
LCT0	0.01	0.7	0.003	0.1		0.5	0.07	0.07	0.01	0.2	5	300	170	250	11	1.5	5-9.7
LCT1	0.5	35	0.15	5		25	3.5	3.5	0.5	10	250	15000		12500	550	75	
LCT2	1	70	0.3	10		50	7	7	1	20	500	30000		25000	1100	150	
LCT3	4	280	1.2	40		200	28	28	4	80	2000	120000		100000	4400	600	
C1-2	<0.02	0.06	<0.001	<0.003	0.02	0.04	<0.001	0.01	<0.01	0.003	0.08	1.17	4.63	13.90	3.90	<0.1	4.66
C1-3	<0.02	0.19	0.002	<0.003	0.01	0.15	<0.001	0.18	<0.01	0.004	0.37	1.19	3.58	9.98	4.10	0.10	5.04
C1-4	<0.02	0.06	<0.001	0.02	<0.001	0.002	<0.001	<0.003	<0.01	0.05	<0.005	10.68	43.00	178.90	4.20	<0.1	8.34
C1-5	<0.02	0.23	<0.001	0.02	5.20	0.27	<0.001	0.06	<0.01	0.01	0.19	2.19	4.39	15.00	4.30	<0.1	6.13
C2-1	<0.02	0.12	<0.001	0.01	1.66	0.03	0.002	0.02	<0.01	0.00	0.07	2.00	7.27	22.87	6.70	0.11	6.80
C2-2	<0.02	0.09	<0.001	0.004	0.00	0.01	0.01	0.01	<0.01	0.03	0.02	5.37	44.00	201.40	5.50	0.73	7.64
C2-3	<0.02	0.09	<0.001	<0.003	0.00	0.004	0.002	0.01	<0.01	0.05	0.02	1.16	66.00	293.30	6.20	0.35	8.86
C2-4	<0.02	0.13	<0.001	<0.003	0.19	0.25	<0.001	0.03	<0.01	<0.002	0.08	1.32	5.05	16.30	5.40	<0.1	6.24
C2-5	<0.02	0.07	<0.001	0.01	0.63	11.52	0.00	0.36	<0.01	0.01	0.40	1.54	52.00	254.40	9.80	<0.1	4.21

3.4. Cooke 1 and 2 Shaft Area Discharge Points

Six sediment samples were collected from the Cooke No.1 and 2 Shaft area discharge points namely C1-D1, C1-D2, C1-D3, C2-D1, C2-D2 and C2-D3 (refer to Figure 2-1 above for the sampling points).

The XRD results for the above samples indicated the following:

- Quartz is the dominant mineral in all samples ranging between 61.6 and 90.4 wt. %. Followed by the alternation of pyrophyllite and kaolinite. In C1-D1, C1-D2 pyrophyllite is second dominant while in C1-D3, C2-D1, C2-D2 and C2-D3 kaolinite is dominant;
- Goethite is detected in all samples ranging between 1 and 3 wt. %;
- In samples C1-D1, C2-D1 and C2-D2 acid neutralising mineral calcite is detected at 1.4, 0.9 and 1.1 wt. % respectively while dolomite is detected in C1-D3 and C2-D1 at 5 and 1.1 wt. %. Both calcite and dolomite can be as a result of the lime addition in the treatment process; and
- Acid-forming mineral pyrite was detected in sample C2-D2 at 2.3 wt. %.

The above XRD results correlate with the other contaminated areas.

The AMD test results for all the Cooke 1 and 2 shaft discharge point samples indicated no acid forming material with low sulphide sulphur content, and high NPR values as shown in Figure 3-4.

The TC results were compared against the waste classification TCT as indicated in Table 3-7 with the following results:

- In all the Cooke No.1 and 2 Shaft area discharge point samples the concentrations for As, Ba, Cu, Mn and Pb exceeded the TCT0 limits; and
- Samples C1-D2, C1-D3, C2-D2 and C2-D3 also exceeded the TCT0 limits for elevated Co, Ni and Zn.

The LC results from the distilled water leachate tests were compared against the waste classification LCT as indicated in Table 3-8 with the following results:

- Sample C1-D2 had leachable concentrations of Cr, Mn and Ni above LCT0;
- Sample C1-D3 had leachable concentrations of Mn and Ni above LCT0; and
- All other samples had no exceedances of any LCT limits.

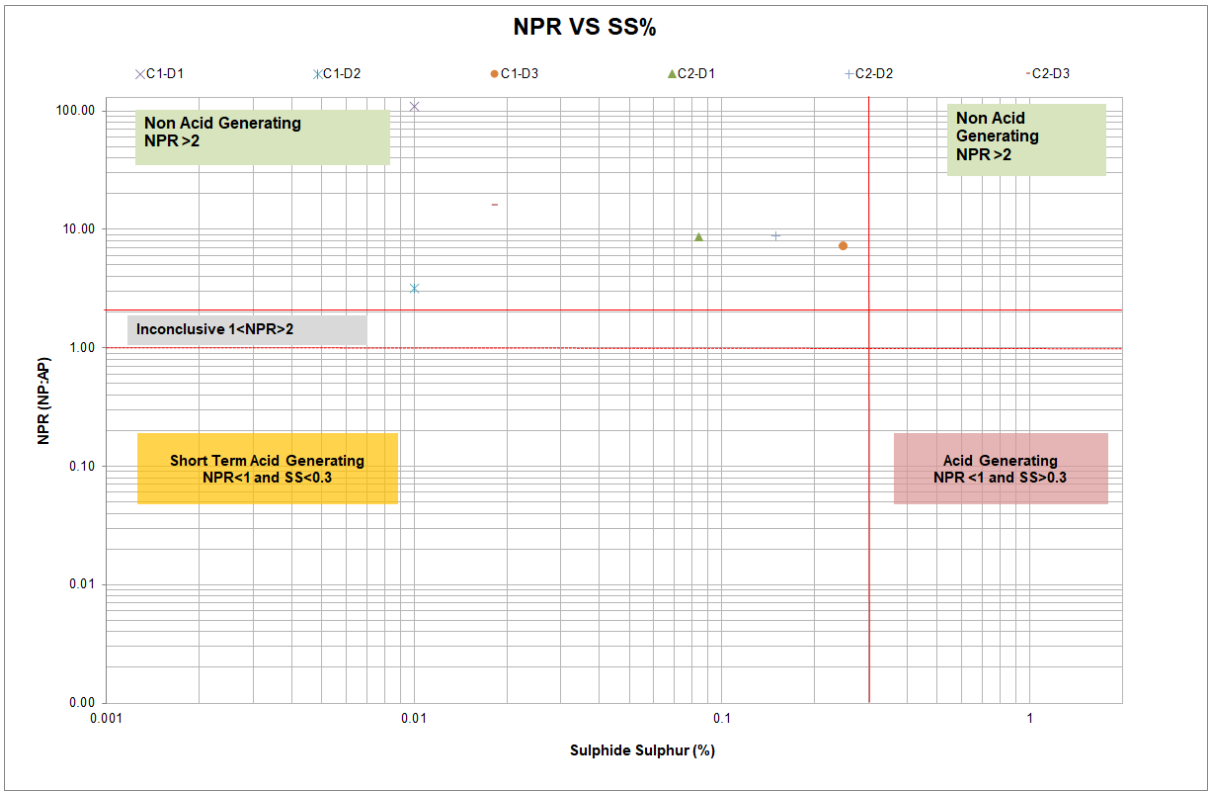

Figure 3-4: Cooke 1 and 2 Shaft Discharge Area Samples NPR vs SS%

Table 3-7: Total Concentration Threshold (TCT) for Cooke Shaft 1 and 2 Discharge Area samples in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
TCT0	**5,8**	**150**	**62,5**	**7,5**	**50**	**46000**	**16**	**0,93**	**1000**	**40**	**91**	**20**	**10**	**10**	**150**	**240**
TCT1	**500**	**15000**	**6250**	**260**	**5000**	**800000**	**19500**	**160**	**25000**	**1000**	**10600**	**1900**	**75**	**50**	**2680**	**160000**
TCT2	**2000**	**60000**	**25000**	**1040**	**20000**	**N/A**	**78000**	**640**	**100000**	**4000**	**42400**	**7600**	**300**	**200**	**10720**	**640000**
C1-D1	14.44	112	592	0.14	47	298	45	<0.10	4875	<0.10	67	46	<1.0	<3.0	131	110
C1-D2	8.95	99	588	0.11	54	434	37	<0.10	3974	<0.10	64	63	<1.0	<3.0	126	134
C1-D3	59	58	359	0.37	124	94	62	<0.10	21798	<0.10	222	59	<1.0	5.9	39	252
C2-D1	8.79	45	250	0.24	41	141	22	<0.10	6784	<0.10	64	20	<1.0	<3.0	49	107
C2-D2	15.12	117	874	0.55	96	270	63	<0.10	16114	<0.10	137	55	<1.0	<3.0	124	279
C2-D3	7.15	97	500	0.37	36	256	37	<0.10	3481	<0.10	49	58	<1.0	<3.0	112	283

Table 3-8: Leachable Concentration Threshold (LCT) for Cooke Shaft 1 and 2 Discharge Area samples in mg/L

Parameter	As	Ba	Cd	Cr	Cu	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mS/m**	**mg/L**	**mg/L**	**mg/L**	
LCT0	**0.01**	**0.7**	**0.003**	**0.1**	**2**	**0.5**	**0.07**	**0.07**	**0.01**	**0.2**	**5**	**300**	**170**	**250**	**11**	**1.5**	**5-9.7**
LCT1	**0.5**	**35**	**0.15**	**5**	**100**	**25**	**3.5**	**3.5**	**0.5**	**10**	**250**	**15000**		**12500**	**550**	**75**	
LCT2	**1**	**70**	**0.3**	**10**	**200**	**50**	**7**	**7**	**1**	**20**	**500**	**30000**		**25000**	**1100**	**150**	
LCT3	**4**	**280**	**1.2**	**40**	**800**	**200**	**28**	**28**	**4**	**80**	**2000**	**120000**		**100000**	**4400**	**600**	
C1-D1	<0.02	0.19	<0.001	0.04	0.02	0.15	0.002	0.03	<0.01	0.04	0.05	6.88	17.19	15.90	4.20	0.45	8.38
C1-D2	<0.02	0.20	<0.001	0.10	0.04	0.74	<0.001	0.09	0.02	0.08	0.18	10.52	6.51	38.80	8.90	0.14	6.36
C1-D3	<0.02	0.25	<0.001	0.01	0.01	15.84	<0.001	0.09	<0.01	0.01	0.07	4.77	32.00	89.47	4.50	0.12	7.57
C2-D1	<0.02	0.18	<0.001	0.004	0.01	0.83	<0.001	0.03	<0.01	0.02	0.03	2.48	32.00	74.55	4.00	<0.1	7.87
C2-D2	<0.02	0.15	<0.001	0.003	0.01	0.02	<0.001	0.01	<0.01	0.02	0.02	5.56	40.00	80.04	5.80	0.38	8.45
C2-D3	<0.02	0.37	<0.001	0.09	0.03	0.32	<0.001	0.06	0.02	0.07	0.20	10.04	13.28	34.15	4.20	0.30	7.50

3.5. Magazine Pan

Five sediment samples (MP1, MP2, MP3, MP4 and MP6) were collected from the Magazine Pan (refer to Figure 2-1 above for the sampling points).

The Magazine Pan samples again showed the same mineral content as for the other assumed contaminated sites. Quartz, Pyrophyllite and kaolinite was again the dominant minerals with traces of hematite, goethite and muscovite. The XRF results confirmed the mineralogy with high SiO_4, Al_2O_3 and Fe_2O_3 content.

Figure 3-5 indicates the NPR vs Sulphide Sulphur breakdown of the Magazine pan samples. The sulphide sulphur content in all five samples was below 0.3%. A positive NNP in all samples excluding MP4 that had higher sulphide sulphur content than the other samples indicate a low possibility of AMD formation. MP4 did show a potential to generate acid in the short term but this is likely due to secondary sulphate content and does not pose a significant risk in terms of AMD in the long term.

The TC results were compared against the waste classification TCT as indicated in Table 3-9 with the following results:

- All samples exceeded the TCT0 limits for As;
- All samples excluding MP6 exceeded the TCT0 limits for Ba, Cu and Pb;
- MP2 and MP3 exceeded the TCT0 limit for Co and Ni;
- MP2 also exceeded the TCT0 limit for Zn; and
- Sample MP6 only exceeded the TCT limit for one parameter - As.

The LC results from the distilled water leachate tests were compared against the NEM: WA Waste Classification LCT as indicated in Table 3-10 with the following results:

- Sample MP1 exceeded the LCT0 limit for Mn;
- Sample MP3 exceeded the LCT0 limit for Cr, Mn, Ni and Pb;
- Sample MP4 exceeded the LCT0 limit for Ni; and
- Sample MP2 and MP6 did not exceed any of the LCT limits.

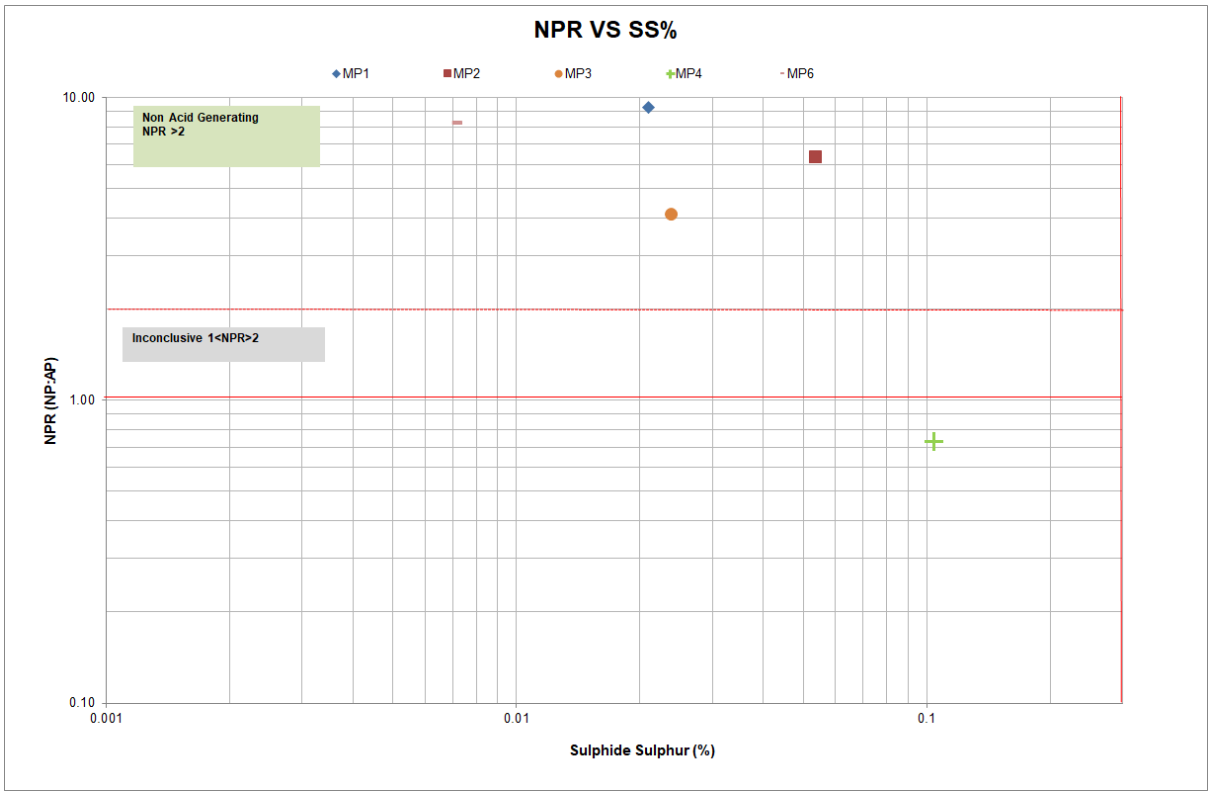

Figure 3-5: Magazine Pan Sediment Sample NPR vs SS%

Table 3-9: Total Concentration Threshold (TCT) results for Magazine Pan sediments in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
TCT0	**5,8**	**150**	**62,5**	**7,5**	**50**	**46000**	**16**	**0,93**	**1000**	**40**	**91**	**20**	**10**	**10**	**150**	**240**
TCT1	**500**	**15000**	**6250**	**260**	**5000**	**800000**	**19500**	**160**	**25000**	**1000**	**10600**	**1900**	**75**	**50**	**2680**	**160000**
TCT2	**2000**	**60000**	**25000**	**1040**	**20000**	**N/A**	**78000**	**640**	**100000**	**4000**	**42400**	**7600**	**300**	**200**	**10720**	**640000**
MP1	6.77	95	1309	0.21	39	362	38	<0.10	16299	<0.10	56	35	<1.0	<3.0	119	30
MP2	228	129	1619	2.7	446	524	193	<0.10	16329	0.25	1122	77	<1.0	<3.0	134	1439
MP3	6.13	82	425	<0.050	32	368	24	<0.10	4405	<0.10	54	45	<1.0	<3.0	95	34
MP4	35	73	68	0.26	60	247	44	<0.10	490	<0.10	203	33	<1.0	<3.0	100	201
MP6	9.85	47	32	0.065	14.99	297	14.47	<0.10	345	<0.10	53	12.39	<1.0	<3.0	62	37

Table 3-10: Magazine Pan Sediment DI Leach and SPLP (LCT) Test Results in mg/L

Parameter	As	Ba	Cd	Cr	Cu	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mS/m**	**mg/L**	**mg/L**	**mg/L**	
LCT0	**0.01**	**0.7**	**0.003**	**0.1**	**2**	**0.5**	**0.07**	**0.07**	**0.01**	**0.2**	**5**	**300**	**170**	**250**	**11**	**1.5**	**5-9.7**
LCT1	**0.5**	**35**	**0.15**	**5**	**100**	**25**	**3.5**	**3.5**	**0.5**	**10**	**250**	**15000**		**12500**	**550**	**75**	
LCT2	**1**	**70**	**0.3**	**10**	**200**	**50**	**7**	**7**	**1**	**20**	**500**	**30000**		**25000**	**1100**	**150**	
LCT3	**4**	**280**	**1.2**	**40**	**800**	**200**	**28**	**28**	**4**	**80**	**2000**	**120000**		**100000**	**4400**	**600**	
MP1	<0.02	0.13	<0.001	0.05	0.022	0.98	<0.001	0.04	<0.01	0.049	0.077	7.3	2.58	12.83	5.4	0.14	6.73
MP2	<0.02	<0.001	<0.001	<0.003	0.014	0.007	0.005	0.003	<0.01	0.032	0.019	2.82	37	157.3	4.8	0.81	8.14
MP3	<0.02	0.29	<0.001	0.12	0.031	0.85	0.003	0.12	0.042	0.11	0.12	15.51	4.98	43.98	4.7	0.53	6.68
MP4	<0.02	0.12	<0.001	<0.003	0.014	0.24	<0.001	0.085	<0.01	0.031	0.1	1.64	43	214.8	4.2	0.12	6.14
MP6	<0.02	0.10	<0.001	0.04	0.02	0.18	0.003	0.06	<0.01	0.04	0.06	6.14	4.12	15.95	5.80	0.39	6.77

3.6. Millsite TSF Complex – Downstream Wetland

Five sediment samples (MS1, MS2, MS3, MS4 and MS5) were collected from a wetland downstream of the Millsite TSF Complex to see if there is any impacts from the complex and the waste facility (refer to Figure 2-1 above for the sampling points).

The XRD results confirmed the same mineralogy as the other sites. Quartz, Pyrophyllite and kaolinite was again the dominant minerals with traces of hematite, goethite and muscovite. The XRF results confirmed the mineralogy with high SiO_4, Al_2O_3 and Fe_2O_3 content.

From the AMD test results all samples were found to have low sulphide sulphur content with positive NNP values. Only sample MS5 indicated an uncertainty around acid producing potential due to a low NPR. However, if any acid formation does occur it will be of short duration and no significant AMD potential is observed in the Millsite Downstream wetland samples.

Based on the TC (Table 3-11) all samples indicate As, Ba, Cu, Mn and Pb above the TCT0 limit while for Co sample MS1 is the only sample that is below the TCT0 limit.

The LC results from the distilled water leachate tests were compared against the NEM: WA Waste Classification LCT as indicated in Table 3-10 with the following results:

- MS3, MS4 and MS5 exceeded the LCT0 limits for Mn and Ni;
- MS4 also exceeded the LCT0 limits for NO_3 and had a pH below the recommended range;
- MS2 only exceeded the LCT0 limits for one parameter – Ni; and
- Sample MS1 exceeded none of the LCT limits.

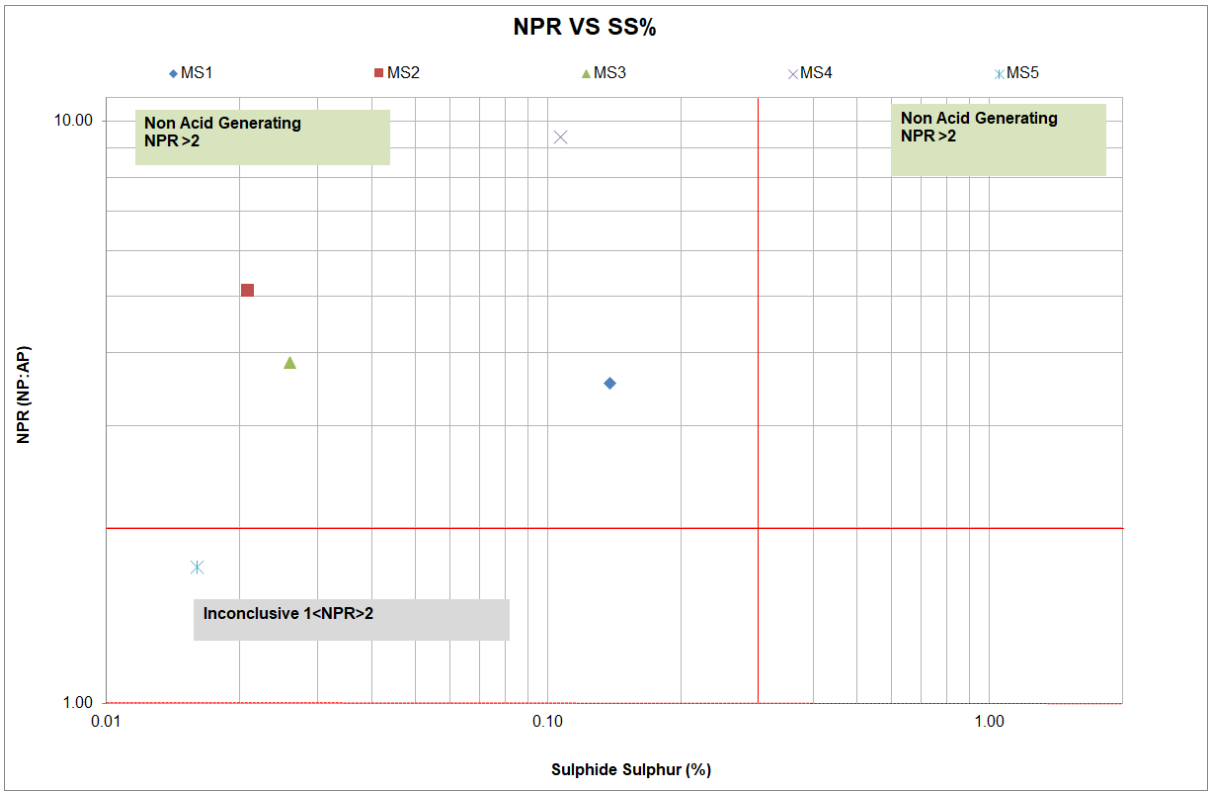

Figure 3-6: Millsite TSF Downstream Wetland Samples NPR vs SS%

Table 3-11: Total Concentration Threshold (TCT) sediment results of Millsite area in mg/kg

Parameter	As	B	Ba	Cd	Co	Cr	Cu	Hg	Mn	Mo	Ni	Pb	Sb	Se	V	Zn
Unit	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
TCT0	**5,8**	**150**	**62,5**	**7,5**	**50**	**46000**	**16**	**0,93**	**1000**	**40**	**91**	**20**	**10**	**10**	**150**	**240**
TCT1	**500**	**15000**	**6250**	**260**	**5000**	**800000**	**19500**	**160**	**25000**	**1000**	**10600**	**1900**	**75**	**50**	**2680**	**160000**
TCT2	**2000**	**60000**	**25000**	**1040**	**20000**	**N/A**	**78000**	**640**	**100000**	**4000**	**42400**	**7600**	**300**	**200**	**10720**	**640000**
MS1	6.95	16.71	131	0.24	13.47	176	45	<0.10	1555	<0.10	82	24	<1.0	<3.0	93	64
MS2	5.9	22	170	<0.050	51	153	46	<0.10	4521	<0.10	59	26	<1.0	<3.0	50	29
MS3	37	27	155	<0.050	60	125	61	<0.10	4042	<0.10	48	26	<1.0	<3.0	35	31
MS4	80	95	1259	<0.050	114	173	55	<0.10	16567	<0.10	71	100	<1.0	<3.0	99	77
MS5	81	99	1418	<0.050	119	174	56	<0.10	17951	<0.10	70	105	<1.0	<3.0	102	79

Table 3-12: Millsite sediment DI Leach and SPLP (LCT) Test Results in mg/L

Parameter	As	Ba	Cd	Cr	Cu	Mn	Mo	Ni	Pb	V	Zn	Cl	Conductivity	SO_4	Nitrate as N	F	pH
Unit	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mS/m**	**mg/L**	**mg/L**	**mg/L**	
LCT0	**0.01**	**0.7**	**0.003**	**0.1**	**2**	**0.5**	**0.07**	**0.07**	**0.01**	**0.2**	**5**	**300**	**170**	**250**	**11**	**1.5**	**5-9.7**
LCT1	**0.5**	**35**	**0.15**	**5**	**100**	**25**	**3.5**	**3.5**	**0.5**	**10**	**250**	**15000**		**12500**	**550**	**75**	
LCT2	**1**	**70**	**0.3**	**10**	**200**	**50**	**7**	**7**	**1**	**20**	**500**	**30000**		**25000**	**1100**	**150**	
LCT3	**4**	**280**	**1.2**	**40**	**800**	**200**	**28**	**28**	**4**	**80**	**2000**	**120000**		**100000**	**4400**	**600**	
MS1	<0.02	0.04	<0.001	0.02	0.01	0.09	<0.001	0.02	<0.01	0.01	0.04	5.59	8.29	14.65	9.90	<0.1	6.96
MS2	<0.02	0.29	<0.001	0.03	0.02	0.58	<0.001	0.07	<0.01	0.02	0.17	4.57	16.31	57.33	6.50	<0.1	6.30
MS3	<0.02	0.15	<0.001	0.004	0.02	1.61	<0.001	0.17	<0.01	0.01	0.16	2.04	22.00	83.66	5.00	<0.1	5.42
MS4	<0.02	0.16	<0.001	0.01	0.02	14.69	0.004	0.14	<0.01	<0.002	0.19	1.32	11.66	36.51	12.20	<0.1	4.89
MS5	<0.02	0.14	<0.001	<0.003	0.01	4.68	0.002	0.18	<0.01	<0.002	0.15	2.25	11.44	40.46	5.30	<0.1	5.02

3.7. Uranium

Uranium does not from part of the NEM: WA waste classification process but was included in the leachate test analysis due to uranium being associated with the gold mineralisation in the Cooke area.

In the Cooke area uranium (U) has been associated with mining and found in high concentrations. The U is associated with the gold mineralisation and formed through the same geological processes. As a result, traces of U are found throughout the mining areas in the water produced through mining as well as at naturally elevated levels in the groundwater. The Groundwater Impact Assessment (van Biljon, 2020) sampled both the groundwater and underground mine water of the Cooke mining complex. The underground water samples showed elevated U concentration between 0.98 and 4.1 mg/L and the groundwater samples ranged between 0.001 to 0.021 mg/L. The SANS 241 limit for uranium in drinking water is 0.03 mg/L.

Although the Cooke mine water samples did show elevated U concentrations the leachate results from the sediment and silt samples showed no elevated leachable concentrations. All samples showed leachable U concentrations below detection (<0.004 mg/L) excluding one sample (MP1) taken from Magazine Pan that had a U concentration of 0.006 mg/L but still well below the SANS guideline limits. Based on the leachate test results uranium does not pose a significant risk in the sediments and silts studied. This can potentially be due to most of the U already mobilised in the past and the current remaining concentrations not being in soluble forms.

4. Conclusions and Classification

All samples indicate mineral content that correlate with the geological setting and weathering products of the various formations in the area. The main minerals found in all samples were quartz, pyrophyllite and kaolinite. Smaller and trace amounts of goethite, hematite, chlorite and jarosite was also present in some of the samples.

Quartz is the most dominant mineral in the earth's crust; therefore, the presence of quartz will be directly as a result of physical weathering of the areas geology over time and potentially from mineral processing processes like milling, crushing and extraction. Kaolinite is a common clay mineral found in most weathered soil/sediment formations and is associated with the chemical and mechanical weathering processes breaking down feldspar and plagioclase minerals that are associated with the area's geology.

Clay minerals (chlorite, pyrophyllite and muscovite) are directly linked the geology of the area and the breakdown of silicate minerals. Goethite is a weathering product of iron rich minerals through oxidation reactions. Plagioclase and microcline that was found in the historically impacted wetland samples, are hard, resistant to weathering, silicate minerals that are still in their original form and has not been weathered down into secondary minerals.

There were varying amounts of calcite and dolomite found in some of the Cooke Shaft 1 and 2 areas (at both the silt dam areas as well as the discharge points) which will directly be as a results of lime addition during the treatment process and activities during operation. Jarosite found in the Cooke Shaft 1 and 2 samples will also be as a result of neutralisation of the AMD. High sulphate concentrations at the discharge points is likely as a result of mining and the AMD formation associated with the areas mining.

Although some of the samples showed the potential to form acid in the short term, not enough significant mineral evidence or high sulphide sulphur content was detected in the samples to conclusively indicate any potential long-term AMD issues. These sediment samples and soils would have been washed out and the release of any mobile metals and acid forming reaction would already have taken place, if at all.

The total concentration results for all samples across all areas consistently showed elevated concentrations of As, Ba, Co, Cu, Mn, Ni, Pb and Zn above the TCT0 limits outlined in the waste classification guidelines.

As is an element commonly associated with gold bearing ores and lithologies in the form of trace amounts of pyrite and arsenopyrite, and for this reason can be naturally enriched in the on-site soil and sediment profiles. The As total concentrations are similar throughout the catchment for points upstream as well as downstream of any Rand Uranium impacts (such as the Donaldson Dam, and therefore elevated As concentrations cannot solely be attributed to the Rand Uranium activities.

Cu is a metal associated with gold mining in terms of the geological setting. Therefore, the elevated Cu can potentially be an indication of natural weathering processes or has been introduced as a result of Copper Sulphate reagents added to the gold processing circuit. However, elevated Cu concentrations are highest upstream of the Rand Uranium operations (including the Cooke Plant) and are therefore more likely to be related to mining activities from other operations upstream of the Rand Uranium activities.

Mn is one of the most common metals in the earth's crust and is associated with the sedimentary geology of the region. Manganese oxides can be found in the dolomite and a chert base layer (consisting of layers of chert and manganese-rich bands) of the Monte Christo Formation. During dissolution of the dolomite, carbonate is removed and residues such as silica, iron and manganese oxides and hydroxides (referred to as WAD) remain present. Elevated manganese concentrations were also evident from the groundwater quality results in the Groundwater Impact Assessment (van Biljon, 2020) and, together with the regional geology, indicate manganese is naturally occurring. In addition, manganese can be bound to organic matter and clay particles, and as these can accumulate in wetland systems, this can also contribute to elevated manganese concentrations in the sediments.

With no direct correlation to the geology of the region, the elevated concentrations of Pb are a concern. However, as for Cu, the elevated concentrations are observed throughout the catchment.

The mineralogy and TCT results for the Cooke Shaft 1 and 2 areas shows contamination from the mining activities and in particular the presence of the silt dams in the area. The contaminated sediments show the same mineralogical and elemental characteristics as the silt samples and these sediments require rehabilitation.

The leachable concentrations however do indicate lower levels of leachability that can potentially mean that these silts and sediments have been weathered already and that leachability is low. This is supported by the higher leachability of the impacted soils that would have accumulated any contamination from the silt dams and operations in the area.

The sediments and material from these two areas discussed above will be reprocessed together with material from Millsite and Dump 20. This is supported and more sustainable than stripping and discarding the material which will just move the contaminant source from one area to the next.

The Groundwater Impact Assessment Report (van Biljon, 2020) included waste classification work completed on the Cooke and Mill site tailings and waste rock materials as well as sludge ponds and return water dams. These tailings materials and waste rock will be similar to various operations in the area due to similar geological setting and gold ore being mined and it can be assumed that various mine pollution sources in the area will have similar chemical characteristics. In the van Biljon (2020) Waste Classification, the LCT results showed Mn, Ni, Pb, As above the guideline limits which correlate with the results observed in the sediments sampled in this report.

Similarly, the TCT results from the van Biljon (2020) report also correlated with the sediment results in this assessment and showed Cu, Ni, As, Ba, Pb and B to exceed the TCT0 limits. Thus, it can be concluded that the mining activities and waste facilities, in particular the TSFs and WRDs is the source of high concentrations of As, Pb, Ni, Cu, Ba and Mn The level of contamination and extent does however need to be assessed and quantified through a contaminated land and soil assessment particularly subsequent to the removal of pollution sources identified through this study.

The Groundwater Impact Assessment (van Biljon, 2020) sampled both the groundwater and underground mine water of the Cooke mining complex. Cooke mine water samples did show elevated U concentrations the leachate results from the sediment and silt samples however showed no elevated leachable concentrations. All samples showed leachable U concentrations below detection (<0.004 mg/L) excluding one sample (MP1) taken from Magazine Pan that had a U concentration of 0.006 mg/L but still well below the SANS guideline limits. Based on the leachate test results uranium does not pose a significant risk in the sediments and silts studied.

The Cooke Shaft 1 and 2 Areas contaminated sediments, silt material and discharge location sediments require removal and rehabilitation due to the high metal content. It is advised that they be reprocessed with the other material from various sources associated with the Cooke Surface Operations as currently being planned. The material sampled in the historically impacted wetlands, Wonderfonteinspruit, Magazine Pan and wetland downstream of the

Millsite TSF complex is in wetland and stream systems that have already developed aquatic ecosystems despite potentially being contaminated. It is noted that the removal of the sediments from these systems will have a bigger impact on the downstream environment than leaving them in place.

Based on the various LCT and TCT results the sediments and material from the various sampled areas the materials are classified and can be disposed of as per the Pit Deposition EMP Addendum as approved by the DMRE on the 25th of August 2010, as per the table below:

Table 4-1: Waste Classification

Area/Material	Waste Type	Disposal allowed to align with current processing and backfilling of materials into pits
Historically Impacted Wetland Sediments	Type 3	Allowed
Wonderfonteinspruit Sediments	Type 3	Allowed
Cooke Shaft 1 and 2 Area Silt Material and Impacted Sediments	Type 3	Allowed
Cooke Shaft 1 and 2 Discharge Area Sediments	Type 3	Allowed
Magazine Pan Sediments	Type 3	Allowed
Millsite TSF Downstream Wetland Sediments	Type 3	Allowed

5. Recommendations

Based on the results discussed in this report the following recommendations are made:

- Dust suppression and runoff capture/clean water diversion during the ongoing reclamation and rehabilitation activities at the Lindum TSF, Cooke Gold Plant area, Cooke TSF and return water dams, Millsite TSF and the Cooke No. 1 and 2 Shaft areas is recommended to prevent further spread of materials and/or dust/sediments;
- Discharge of treated water to the Magazine Pan should be halted as soon as possible;
- Continued surface water quality monitoring is recommended for the historically impacted wetlands and associated watercourses, the Millsite TSF Complex and the current monitoring points in the Wonderfonteinspruit River;
- In addition, a borehole located between the Cooke TSF and the Wonderfonteinspruit (refer to the recommendations as part of the Groundwater Impact Assessment) should be monitored once drilled and constructed to detect any seepage from the Cooke TSF flowing towards the Wonderfonteinspruit;

- The reprocessing of sediments and silt material from the Cooke Shaft 1 and 2 areas is supported and more sustainable than stripping and discarding the material which will just move the contaminant source from one area to the next. The reprocessing may have a potentially positive effect on the composition and leachability of these materials, as the pH will be more neutral and metals concentrations could be reduced. Reprocessed materials will be sampled to confirm the average composition before backfilling and can confirm the positive effect, if any;
- Waste classification on additional sediment samples along the eastern bank of the Wonderfonteinspruit Riverbed is recommended, including just upstream of the Donaldson Dam to confirm the current results and allow comparison with Wonderfontein River water quality results as these should reflect the sediment sample results. In addition, sediment sampling after cessation of any discharges would be recommended to enable access to currently flooded areas and to assess the sediment quality post-discharge cessation;
- The sediments have accumulated in the historically impacted wetlands and associated streams, Wonderfonteinspruit, Magazine Pan and wetland downstream of the Millsite TSF complex in which aquatic ecosystems have developed despite any potentially negative impacts from these sediments. It is likely that the accumulated sediments were fully weathered and may have developed different characteristics under the waterlogged conditions of the wetland and stream systems. In addition, the impacts of the disturbance of these sediments and of the established ecosystems during any removal of sediments will likely do more harm than any potential impact from the observed, low levels of leachable constituents. The following future studies on these above-mentioned areas are recommended:
    - Additional sampling in a grid format of specifically the areas in which sediments have accumulated in the historically impacted wetlands/streams, the Wonderfonteinspruit (including the reach between Cooke 1 shaft discharge point and location of Donaldson dam), the Magazine Pan and the wetland downstream of the Millsite TSF complex. Specific grid spacing and sampling locations to be confirmed prior to the additional sampling;
    - Enough sample material from these sites be taken to do additional waste classification work to determine if materials could aid land amelioration, or indicate if there is any need for sediments to be removed and disposed of, although as stated above this would be discouraged;
    - Wetland, hydropedology, aquatic ecology and surface water impact assessments should be consulted before any stream or wetland material is removed and/or rehabilitated.
- If any material is stripped/excavated for the purpose of disposal it should be handled and disposed of in accordance with the disposal methods as currently in place on-site.

6. References

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ENVIRONMENTAL

Appendix A: Field Photographs

B1: Located in the upstream of Wonderfonteinspruits

-26.183091°, 27.765270°

B2: Located in the upstream of Wonderfonteinspruits

-26.183623°, 27.765615°

C1UP1

26.245160°, 27.730974°

C1UP2

-26.245306°, 27.731039°

C1D1

-26.264955°, 27.698362°

C1D2

-26.265395°, 27.698936°

C1D3

-26.265772°, 27.699930°

C2D1

-26.274397°, 27.690778°

C2D3

-26.275427°, 27.689850°

ST09: Located NE of Luipaardsvlein dam

-26.212362°, 27.735154°

ST01: Located upstream Wonderfonteinspruit and SE of Lindum TSF

-26.189463°, 27.726364°

MS1: located NE of Millsite TSF Complex

-26.126295°, 27.668494°

MS2: located NW of Millsite TSF Complex

-26.125828°, 27.671896°

MS3: located NW of Millsite TSF Complex

-26.126050°, 27.672739°

MS4 located NW of Millsite TSF Complex

-26.125945°, 27.676769°

MS5: located NW of Millsite TSF Complex

-26.126645°, 27.677161°

MP1: Magazine Pan

-26.282127°, 27.724318°

MP2: Magazine Pan

-26.282193°, 27.726862°

MP3: Magazine Pan located close to C2 and C3 discharge point

-26.280314°, 27.726757°

C1-1-concrete slab

-26.254537°, 27.739690°

C1-2: Around Cooke Shaft 1

-26.252132°, 27.733775°

C1-3:

-26.254305°, 27.734405°

C1-4: Slime dam around Cooke Shaft 1 area

-26.251698°, 27.737120

C1-5: Located next to a trench in Cooke Shaft 1 area

C2-1: South of Cooke Shaft 2

C2-2: Slime dam located in Cooke Shaft 2 area

-26.275161°, 27.715074°

C2-3: Located east of a settling dam in Cooke Shaft 2 area

-26.272794°, 27.715218°

C2-4:

-26.276683°, 27.709650°

C2-5

-26.277526°, 27.715826°

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Appendix B: Laboratory Results

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M&L LABS

Ref.No. : 11101481

Issued at : Johannesburg

Date : 24/07/2020

Certificate/Report

RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

COMPANY NAME	: DIGBY WELLS & ASSOCIATES (SA) PTY LTD
ADDRESS	: PRIVATE BAG X10046
SUBJECT	: ANALYSIS OF 34 SOLID SAMPLES
MARKED	: AS BELOW
INSTRUCTED BY	: KGAUGELO
ORDER NO.	: SAS6132
RECEIVED ON	: 04/06/2020
LAB NO(S)	: E024281-E024313 & E024315
DATE ANALYSED	: 14/07/2020

ACID-BASE ACCOUNTING

Analysis on the dried and milled samples

SAMPLE MARKS:	LAB NO:	Total Sulphur, S %	Total Acidity Potential as $CaCO_3$ kg/ton	Gross Neutralisation Potential as $CaCO_3$ kg/ton	Net Neutralisation Potential as $CaCO_3$ kg/ton (By Difference)
MP1	E024281	0.021	0.66	6.10	5.44
MP2	E024282	0.238	7.43	47.0	39.6
MP3	E024283	0.024	0.75	4.83	4.08
MP4	E024284	0.167	5.21	3.81	-1.40
ST01	E024285	0.108	3.37	<0.01	-3.37
C1-2	E024286	0.156	4.87	<0.01	-4.87
C1-3	E024287	0.166	5.18	3.05	-2.13
C1-4	E024288	1.130	35.3	694	659
C1-5	E024289	0.015	0.44	0.25	-0.19
C2-D1	E024290	0.111	3.46	30.0	26.5
C2-D2	E024291	0.223	6.96	61.0	54.0
C2-D3	E024292	0.031	0.97	15.5	14.5
C1-D1	E024293	0.012	0.31	34.0	33.7
C1D2	E024294	0.071	2.22	7.11	4.89
C1D3	E024295	0.252	7.87	56.0	48.1
C1VP1	E024296	0.072	2.25	3.30	1.05
C1VP2	E024297	0.234	7.30	0.25	-7.05
MS1	E024298	0.16	4.93	17.5	12.6

Authorised Signature (original blue ink)

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RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

SAMPLE MARKS:	LAB NO:	Total Sulphur, S %	Total Acidity Potential as $CaCO_3$ kg/ton	Gross Neutralisation Potential as $CaCO_3$ kg/ton	Net Neutralisation Potential as $CaCO_3$ kg/ton (By Difference)
MS2	E024299	0.051	1.59	8.13	6.54
MS3	E024300	0.053	1.65	6.35	4.70
MS4	E024301	0.204	6.37	60.0	53.6
MS5	E024302	0.119	3.71	6.35	2.64
B1	E024303	0.073	2.28	26.0	23.7
B2	E024304	0.109	3.40	<0.01	-3.40
C2-1	E024305	0.056	1.75	5.08	3.33
C2-2	E024306	1.150	35.9	182	146
C2-3	E024307	0.487	15.2	31.0	15.8
C2-4	E024308	0.084	2.62	5.34	2.72
MP6	E024309	0.007	<0.31	2.54	2.32
ST07	E024310	0.000	<0.31	1.27	1.27
ST08	E024311	0.012	0.37	2.54	2.17
ST09	E024312	0.08	2.50	4.32	1.82
ST04	E024313	0.010	0.31	1.27	0.96
C2-5	E024315	0.198	6.18	<0.01	-6.18

Method Reference:

Lawrence, R.W., Polling, G.P. and Marchant, P.B., 1989. Investigation of predictive techniques or acid mine drainage, Report on DSS Contract No. 23440-7-9178/01-SQ, Energy Mines and Resources, Canada, MEND Report 1.16.1(a).Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M., 1978. Field and Laboratory Methods Applicable to Overburden and Mine soils, EPA 600/2-78-054, 203 pp.

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M&L LABS

Certificate/Report

RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

Analysis on the dried and milled samples:

SAMPLE MARKS:	LAB NO:	Total Sulphur, S %	Sulphate Sulphur, S %	Sulphide Sulphur as S % (by calculation)
MP1	E024281	0.021	<0.01	0.021
MP2	E024282	0.238	0.184	0.054
MP3	E024283	0.024	<0.01	0.024
MP4	E024284	0.167	0.063	0.104
ST01	E024285	0.108	0.060	0.048
C1-2	E024286	0.156	<0.01	0.156
C1-3	E024287	0.166	0.033	0.133
C1-4	E024288	1.130	1.078	0.052
C1-5	E024289	0.015	0.015	<0.01
C2-D1	E024290	0.111	0.027	0.084
C2-D2	E024291	0.223	0.073	0.150
C2-D3	E024292	0.031	0.013	0.018
C1-D1	E024293	0.012	0.012	<0.01
C1D2	E024294	0.071	0.070	<0.01
C1D3	E024295	0.252	<0.01	0.249
C1VP1	E024296	0.072	<0.01	0.072
C1VP2	E024297	0.234	<0.01	0.234
MS1	E024298	0.16	0.020	0.138
MS2	E024299	0.051	0.030	0.021
MS3	E024300	0.053	0.027	0.026
MS4	E024301	0.204	0.097	0.107
MS5	E024302	0.119	0.103	0.016
B1	E024303	0.073	0.053	0.020
B2	E024304	0.109	0.017	0.092
C2-1	E024305	0.056	0.010	0.046
C2-2	E024306	1.150	1.118	0.032
C2-3	E024307	0.487	<0.01	0.487
C2-4	E024308	0.084	0.057	0.027
MP6	E024309	0.007	<0.01	<0.01
ST07	E024310	<0.01	<0.01	<0.01

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SAMPLE MARKS:	LAB NO:	Total Sulphur, S %	Sulphate Sulphur, S %	Sulphide Sulphur as S % (by calculation)
ST08	E024311	0.012	<0.01	0.012
ST09	E024312	0.08	0.030	0.050
ST04	E024313	0.010	<0.01	0.010
C2-5	E024315	0.198	0.134	0.064

Note:
The Sulphate content was determined by a Wet Chemical procedure.

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Analysis on the dried and milled samples:

SAMPLE MARKS:	LAB NO:	NAG pH @25°C	NET ACID GENERATION AS H_2SO Kg/tonne
MP1	E024281	6.09	<1
MP2	E024282	7.48	<1
MP3	E024283	6.27	<1
MP4	E024284	6.62	<1
ST01	E024285	6.40	<1
C1-2	E024286	5.00	<1
C1-3	E024287	5.97	<1
C1-4	E024288	8.66	<1
C1-5	E024289	6.29	<1
C2-D1	E024290	6.46	<1
C2-D2	E024291	6.31	<1
C2-D3	E024292	6.16	<1
C1-D1	E024293	6.55	<1
C1D2	E024294	6.21	<1
C1D3	E024295	6.04	<1
C1VP1	E024296	6.13	<1
C1VP2	E024297	5.71	<1
MS1	E024298	6.33	<1
MS2	E024299	6.17	<1
MS3	E024300	6.10	<1
MS4	E024301	6.66	<1
MS5	E024302	5.80	<1
B1	E024303	6.31	<1
B2	E024304	3.95	<1
C2-1	E024305	6.27	<1
C2-2	E024306	7.71	<1
C2-3	E024307	8.20	<1
C2-4	E024308	5.84	<1
MP6	E024309	6.06	<1
ST07	E024310	5.33	<1
ST08	E024311	6.08	<1
ST09	E024312	5.52	<1
ST04	E024313	6.32	<1
C2-5	E024315	3.85	<1
MP1	E024281	6.09	<1

Method Reference:

Miller, S., Robertson, A. and Donohue, T. (1997). Advances in Acid Drainage Prediction. Prediction using The Net Acid Generation (NAG) Test. Report on Acid Mine Drainage published in Vancouver, BC., Canada.

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Certificate/Report

COMPANY NAME	: DIGBY WELLS & ASSOCIATES
ADDRESS	: PRIVATE BAG X10046 RANDBURG
SUBJECT	: ANALYSIS OF 34 SOIL SAMPLES
PROJECT REFERENCE	: SOIL SAMPLES 04/06/2020
INSTRUCTED BY	: KGAUGELO THOBEJANE
ORDER NUMBER	: SAS6132
RECEIVED ON	: 04/06/2020
ANALYSIS COMPLETED	: 24/07/2020
DATE ANALYSED	: 04/6/2020 - 14/07/2020

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Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	5.4	4.8	4.7
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	0.16
pH value @ 25°C*	W044-27-O		6.73	8.14	6.68
Conductivity mS/m @25°C*	W044-27-O	1.0	2.58	37	4.98
Chloride,Cl(mg/l)*	W044-50-W	0.1	7.30	2.82	15.51
Total Alkalinity*	W044-50-W	0.01	7.83	32	6.12
Fluoride, F(mg/l)*	W044-50-W	0.1	0.14	0.81	0.53
Total dissolved solids, TDS(mg/l)	W044-03-W	1	26	236	60
Sulphate as SO_4(mg/l)*			12.83	157.30	43.98

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Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	4.2	4.5	3.9
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		6.14	4.61	4.66
Conductivity mS/m @25°C*	W044-27-O	1.0	43	29	4.63
Chloride,Cl(mg/l)*	W044-50-W	0.1	1.64	2.58	1.17
Total Alkalinity*	W044-50-W	0.01	4.46	2.52	1.97
Fluoride, F(mg/l)*	W044-50-W	0.1	0.12	0.19	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	322	212	6.00
Sulphate as SO_4(mg/l)*			214.80	143.60	13.90

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Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	4.1	4.2	4.3
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		5.04	8.34	6.13
Conductivity mS/m @25°C*	W044-27-O	1.0	3.58	43	4.39
Chloride,Cl(mg/l)*	W044-50-W	0.1	1.19	10.68	2.19
Total Alkalinity*	W044-50-W	0.01	3.40	22	4.41
Fluoride, F(mg/l)*	W044-50-W	0.1	0.10	<0.1	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	14.00	274	24
Sulphate as SO_4(mg/l)*			9.98	178.90	15.00

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Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	4.0	5.8	4.2
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	0.10
pH value @ 25°C*	W044-27-O		7.87	8.45	7.50
Conductivity mS/m @25°C*	W044-27-O	1.0	32	40	13.28
Chloride,Cl(mg/l)*	W044-50-W	0.1	2.48	5.56	10.04
Total Alkalinity*	W044-50-W	0.01	65	98	6.70
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1	0.38	0.30
Total dissolved solids, TDS(mg/l)	W044-03-W	1	214	278	92
Sulphate as SO_4(mg/l)*			74.55	80.04	34.15

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Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	4.2	8.9	4.5
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	0.14	<0.1
pH value @ 25°C*	W044-27-O		8.38	6.36	7.57
Conductivity mS/m @25°C*	W044-27-O	1.0	17.19	6.51	32
Chloride,Cl(mg/l)*	W044-50-W	0.1	6.88	10.52	4.77
Total Alkalinity*	W044-50-W	0.01	62	6.75	31
Fluoride, F(mg/l)*	W044-50-W	0.1	0.45	0.14	0.12
Total dissolved solids, TDS(mg/l)	W044-03-W	1	80	30	208
Sulphate as SO_4(mg/l)*			15.90	38.80	89.47

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Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	6.5	8.2	9.9
Nitrite as NO2(mg/l)*	W044-50-W	0.1	0.14	<0.1	<0.1
pH value @ 25°C*	W044-27-O		6.91	4.29	6.96
Conductivity mS/m @25°C*	W044-27-O	1.0	8.44	141	8.29
Chloride,Cl(mg/l)*	W044-50-W	0.1	8.40	3.49	5.59
Total Alkalinity*	W044-50-W	0.01	13.31	0.84	2.60
Fluoride, F(mg/l)*	W044-50-W	0.1	0.33	0.20	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	16.00	1284	60
Sulphate as SO_4(mg/l)*			46.41	911.60	14.65

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Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	6.5	5.0	12.2
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		6.30	5.42	4.89
Conductivity mS/m @25°C*	W044-27-O	1.0	16.31	22	11.66
Chloride,Cl(mg/l)*	W044-50-W	0.1	4.57	2.04	1.32
Total Alkalinity*	W044-50-W	0.01	6.40	3.40	2.68
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	92	154	74
Sulphate as SO_4(mg/l)*			57.33	83.66	36.51

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Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	5.3	6.5	4.4
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		5.02	9.45	6.33
Conductivity mS/m @25°C*	W044-27-O	1.0	11.44	18.02	17.82
Chloride,Cl(mg/l)*	W044-50-W	0.1	2.25	2.13	1.29
Total Alkalinity*	W044-50-W	0.01	2.73	8.20	4.43
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1	0.25	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	56	114	130
Sulphate as SO_4(mg/l)*			40.46	50.80	64.76

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Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	6.7	5.5	6.2
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		6.80	7.64	8.86
Conductivity mS/m @25°C*	W044-27-O	1.0	7.27	44	66
Chloride,Cl(mg/l)*	W044-50-W	0.1	2.00	5.37	1.16
Total Alkalinity*	W044-50-W	0.01	6.67	2.30	28
Fluoride, F(mg/l)*	W044-50-W	0.1	0.11	0.73	0.35
Total dissolved solids, TDS(mg/l)	W044-03-W	1	68	294	482
Sulphate as SO_4(mg/l)*			22.87	201.40	293.30

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Mulalo Mhlanga

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Certificate/Report

Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	5.4	5.8	5.4
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	0.10	<0.1
pH value @ 25°C*	W044-27-O		6.24	6.77	6.73
Conductivity mS/m @25°C*	W044-27-O	1.0	5.05	4.12	1.99
Chloride,Cl(mg/l)*	W044-50-W	0.1	1.32	6.14	2.70
Total Alkalinity*	W044-50-W	0.01	3.64	7.99	6.57
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1	0.39	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	92	6.00	34
Sulphate as SO_4(mg/l)*			16.30	15.95	4.22

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED					
Nitrate as NO3(mg/l)*	W044-50-W	0.1	5.8	55.5	6.2
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1
pH value @ 25°C*	W044-27-O		6.00	4.19	6.25
Conductivity mS/m @25°C*	W044-27-O	1.0	2.78	25	1.24
Chloride,Cl(mg/l)*	W044-50-W	0.1	3.48	1.74	1.29
Total Alkalinity*	W044-50-W	0.01	3.94	<0.01	5.36
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1	0.10	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	36	118	2.00
Sulphate as SO_4(mg/l)*			9.37	49.02	0.88

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Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
ANALYSIS WERE CARRIED OUT ON 25% AQUEOUS EXTRACTS OF A SAMPLE AS RECEIVED			
Nitrate as NO3(mg/l)*	W044-50-W	0.1	9.8
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1
pH value @ 25°C*	W044-27-O		4.21
Conductivity mS/m @25°C*	W044-27-O	1.0	52
Chloride,Cl(mg/l)*	W044-50-W	0.1	1.54
Total Alkalinity*	W044-50-W	0.01	0.57
Fluoride, F(mg/l)*	W044-50-W	0.1	<0.1
Total dissolved solids, TDS(mg/l)	W044-03-W	1	370
Sulphate as SO_4(mg/l)*			254.40

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Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	32	0.23	79
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.22	0.12	0.22
Barium as Ba(mg/l)*	W044-28-O	0.001	0.13	<0.001	0.29
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	1.55	39	4.28
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.009	0.002	0.015
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.050	<0.003	0.12
Copper as Cu(mg/l)*	W044-28-O	0.002	0.022	0.014	0.031
Iros as Fe(mg/l)*	W044-28-O	0.001	26	0.060	55
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.22	0.88	3.98
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.94	22	1.82
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.98	0.007	0.85
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	0.005	0.003
Sodium as Na(mg/l)*	W044-28-O	0.02	3.34	9.52	4.34
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.040	0.003	0.12
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.18	<0.04	0.34
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	0.042
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	34	0.92	79
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	0.022	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.006	0.16	0.10
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.89	0.003	1.93
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	0.006	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.049	0.032	0.11
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.077	0.019	0.12
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.028	0.002	0.057

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.11	0.60	<0.003
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.11	0.091	0.074
Barium as Ba(mg/l)*	W044-28-O	0.001	0.12	0.11	0.057
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	62	49	4.04
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	0.002	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.039	0.094	0.004
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	<0.003	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.014	0.020	0.017
Iros as Fe(mg/l)*	W044-28-O	0.001	0.048	0.081	0.018
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.54	1.50	0.92
Magnesium as Mg(mg/l)*	W044-28-O	0.01	19.48	3.61	0.17
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.24	1.34	0.043
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	6.64	4.39	1.58
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.085	0.37	0.009
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	2.21	1.04	0.94
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.20	0.15	0.097
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.002	0.004	0.001
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.031	0.008	0.003
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.10	0.38	0.080
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.002	0.002	0.002

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Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	<0.003	<0.003	7.43
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.069	0.13	0.12
Barium as Ba(mg/l)*	W044-28-O	0.001	0.19	0.058	0.23
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	0.009
Calcium as Ca(mg/l)*	W044-28-O	0.05	1.88	15.33	3.25
Cadmium as Cd(mg/l)*	W044-28-O	0.001	0.002	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.064	0.006	0.020
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.022	0.015
Copper as Cu(mg/l)*	W044-28-O	0.002	0.023	0.021	0.016
Iros as Fe(mg/l)*	W044-28-O	0.001	0.012	<0.001	5.20
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.95	1.25	2.18
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.56	36	0.85
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.15	0.002	0.27
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	1.41	21	1.75
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.18	<0.003	0.055
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	0.93	1.62	8.54
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.10	0.19	0.10
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	<0.001	<0.001	0.23
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.004	0.046	0.014
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.37	<0.005	0.19
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.002	0.002	0.009

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Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	1.06	0.68	52
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.11	0.085	0.17
Barium as Ba(mg/l)*	W044-28-O	0.001	0.18	0.15	0.37
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	58	60	15.85
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.002	0.001	0.014
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.004	0.003	0.093
Copper as Cu(mg/l)*	W044-28-O	0.002	0.010	0.010	0.026
Iros as Fe(mg/l)*	W044-28-O	0.001	0.77	0.52	32
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.93	2.97	3.48
Magnesium as Mg(mg/l)*	W044-28-O	0.01	6.26	10.41	3.87
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.83	0.016	0.32
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	6.24	18.88	8.70
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.026	0.009	0.057
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.092	<0.04	0.49
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	0.018
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	3.98	3.02	56
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.21	0.24	0.14
Thorium as Th(mg/l)*	W044-28-O	0.002	0.006	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.032	0.026	1.17
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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BDL - Below Detection Limit

*** Denotes test method not accredited to ISO 17025**

 # Denotes test method is outsourced

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.016	0.019	0.072
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.034	0.021	0.20
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.004	0.003	0.040

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Ref. No. : ML-2020-25989
Issued at. : Johannesburg
Date : 24/07/2020
Contract No. : 11101481

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Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	21	51	0.35
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.091	0.21	0.16
Barium as Ba(mg/l)*	W044-28-O	0.001	0.19	0.20	0.25
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	18.45	4.72	32
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.007	0.023	0.021
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.038	0.099	0.006
Copper as Cu(mg/l)*	W044-28-O	0.002	0.015	0.035	0.012
Iros as Fe(mg/l)*	W044-28-O	0.001	12.94	38	0.89
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	5.64	4.79	6.09
Magnesium as Mg(mg/l)*	W044-28-O	0.01	4.68	1.52	8.52
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.15	0.74	15.84
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.002	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	11.31	4.22	10.76
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.027	0.087	0.088
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.10	0.32	0.13
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	0.022	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	25	52	31
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.13	0.097	0.24
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.47	1.34	0.017
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	0.010	0.028
Uranium as U(mg/l)*	W044-28-O	0.004	0.004	<0.004	<0.004

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BDL - Below Detection Limit

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Certificate/Report

Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.035	0.076	0.012
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.051	0.18	0.071
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.017	0.044	0.003

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	21	1.49	6.79
Arsenic as As(mg/l)*	W044-28-O	0.02	0.023	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.17	0.071	0.11
Barium as Ba(mg/l)*	W044-28-O	0.001	0.071	0.084	0.039
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	10.17	354	2.69
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	0.005	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.022	0.047	0.002
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.093	0.004	0.015
Copper as Cu(mg/l)*	W044-28-O	0.002	0.009	0.021	0.009
Iros as Fe(mg/l)*	W044-28-O	0.001	63	0.026	1.64
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.27	1.66	1.88
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.68	10.48	1.22
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.41	3.35	0.089
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	3.51	12.10	11.44
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.11	0.38	0.016
Phosphorus as P(mg/l)*	W044-28-O	0.04	1.50	<0.04	0.076
Lead as Pb(mg/l)*	W044-28-O	0.01	0.010	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	25	1.20	8.80
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.10	0.37	0.096
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.52	<0.001	0.18
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.046	0.015	0.014
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.12	0.85	0.043
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.021	0.002	0.008

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	14.89	0.84	0.091
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.16	0.092	0.16
Barium as Ba(mg/l)*	W044-28-O	0.001	0.29	0.15	0.16
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	13.62	23	3.07
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.007	0.010	0.076
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.029	0.004	0.005
Copper as Cu(mg/l)*	W044-28-O	0.002	0.020	0.017	0.018
Iros as Fe(mg/l)*	W044-28-O	0.001	1.43	0.15	0.14
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	4.62	1.63	3.68
Magnesium as Mg(mg/l)*	W044-28-O	0.01	5.47	8.70	0.61
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.58	1.61	14.69
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	0.004
Sodium as Na(mg/l)*	W044-28-O	0.02	5.66	4.77	1.89
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.068	0.17	0.14
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	16.54	2.53	3.03
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.12	0.12	0.10
Thorium as Th(mg/l)*	W044-28-O	0.002	0.003	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.39	0.026	0.009
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.020	0.013	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.17	0.16	0.19
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.015	0.003	0.004

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Date : 24/07/2020
Contract No. : 11101481

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	<0.003	1.12	0.76
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.092	0.090	0.088
Barium as Ba(mg/l)*	W044-28-O	0.001	0.14	0.088	0.18
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	7.63	21	27
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.15	0.006	0.012
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.007	0.004
Copper as Cu(mg/l)*	W044-28-O	0.002	0.013	0.015	0.007
Iros as Fe(mg/l)*	W044-28-O	0.001	0.045	0.72	1.00
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.50	0.49	0.28
Magnesium as Mg(mg/l)*	W044-28-O	0.01	2.50	2.69	1.99
Manganese as Mn(mg/l)*	W044-28-O	0.001	4.68	0.014	1.76
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.002	0.002	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	3.23	5.98	2.53
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.18	0.014	0.023
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	2.62	4.30	4.13
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.11	0.13	0.12
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.002	0.034	0.020
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	0.006	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.15	0.034	0.055
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.002	0.006	0.003

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	2.29	<0.003	<0.003
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.099	0.085	0.10
Barium as Ba(mg/l)*	W044-28-O	0.001	0.12	0.093	0.090
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	6.33	41	83
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.005	0.003	0.008
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.006	0.004	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.016	0.019	0.028
Iros as Fe(mg/l)*	W044-28-O	0.001	1.66	0.001	0.004
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	1.04	1.00	0.79
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.24	23	43
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.030	0.005	0.004
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.002	0.007	0.002
Sodium as Na(mg/l)*	W044-28-O	0.02	4.67	15.18	2.88
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.021	0.006	0.006
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.086	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	3.95	0.53	1.37
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	0.021	0.044
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.10	0.17	0.20
Thorium as Th(mg/l)*	W044-28-O	0.002	0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.066	<0.001	<0.001
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

Ndileka Bangani

BDL - Below Detection Limit

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.004	0.028	0.050
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.068	0.017	0.015
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.005	0.003	0.003

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Issued at. : Johannesburg
Date : 24/07/2020
Contract No. : 11101481

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Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.062	29	16.04
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.070	0.14	0.096
Barium as Ba(mg/l)*	W044-28-O	0.001	0.13	0.10	0.026
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	2.77	3.06	0.93
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.002	0.012	0.004
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.041	0.032
Copper as Cu(mg/l)*	W044-28-O	0.002	0.006	0.024	0.010
Iros as Fe(mg/l)*	W044-28-O	0.001	0.19	17.12	4.05
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	5.41	1.65	0.92
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.59	1.51	0.23
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.25	0.18	0.012
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	0.003	0.002
Sodium as Na(mg/l)*	W044-28-O	0.02	1.32	2.13	3.87
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.027	0.059	0.020
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	0.11	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	1.24	29	17.36
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.097	0.098	0.099
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.009	0.78	0.38
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	0.035	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.075	0.061	0.027
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.002	0.025	0.015

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	15.75	0.074	<0.003
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.12	0.10	0.059
Barium as Ba(mg/l)*	W044-28-O	0.001	0.098	0.20	0.021
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	0.53	20	0.30
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.006	0.15	0.001
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.035	0.004	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.014	0.025	0.004
Iros as Fe(mg/l)*	W044-28-O	0.001	8.80	0.071	0.026
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	3.23	0.87	0.52
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.43	7.28	<0.01
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.18	2.09	0.088
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.002	0.001	0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	2.40	6.96	1.29
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.022	0.38	0.003
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	16.61	1.40	0.83
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.094	0.14	0.090
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.43	0.008	0.001
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

Ndileka Bangani

BDL - Below Detection Limit

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.014	0.004	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.61	0.27	0.025
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.017	0.002	0.002

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Certificate/Report

Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS			
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	4.04
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.077
Barium as Ba(mg/l)*	W044-28-O	0.001	0.067
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	82
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001
Cobalt as Co(mg/l)*	W044-28-O	0.001	0.18
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.005
Copper as Cu(mg/l)*	W044-28-O	0.002	0.12
Iros as Fe(mg/l)*	W044-28-O	0.001	0.63
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.58
Magnesium as Mg(mg/l)*	W044-28-O	0.01	10.18
Manganese as Mn(mg/l)*	W044-28-O	0.001	11.52
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	2.34
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.36
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	0.66
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.094
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.009
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004

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Certificate/Report

Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% AQUEOUS EXTRACTION OF A SAMPLE METALS			
Vanadium as V(mg/l)*	W044-28-O	0.002	0.008
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.40
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.003

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Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.1	7.6	6.2
Conductivity mS/m @25°C*			2.77	21.54	5.01
Fluoride as F(mg/l)*			0.3	0.7	0.7
Nitrate as NO_3(mg/l)*		0.1	2.0	1.2	2.9
Sulphate as SO_4(mg/l)*			34.78	64.36	56.19
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	<10	25	<10
Chloride as Cl(mg/l)*			14.37	0.47	37.91
Nitrite as NO2(mg/l)*	W044-50-W	0.1	0.1	<0.1	0.3

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Mulalo Mhlanga

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			5.6	4.4	4.6
Conductivity mS/m @25°C*			41.3	46.3	4.77
Fluoride as F(mg/l)*			0.2	0.3	0.0
Nitrate as NO_3(mg/l)*		0.1	1.1	2.2	0.8
Sulphate as SO_4(mg/l)*			204.96	222.56	11.36
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	<10	<10	<10
Chloride as Cl(mg/l)*			0.47	1.23	0.07
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Mulalo Mhlanga

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Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			5.0	7.8	6.2
Conductivity mS/m @25°C*			4.2	41.7	4.06
Fluoride as F(mg/l)*			0.1	0.1	0.2
Nitrate as NO_3(mg/l)*		0.1	1.0	1.0	0.8
Sulphate as SO_4(mg/l)*			10.95	166.54	11.22
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	<10	28	<10
Chloride as Cl(mg/l)*			0.15	9.55	0.83
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Mulalo Mhlanga

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			7.6	8.2	7.2
Conductivity mS/m @25°C*			26.29	42.5	12.24
Fluoride as F(mg/l)*			0.1	0.3	0.3
Nitrate as NO_3(mg/l)*		0.1	0.6	0.7	0.6
Sulphate as SO_4(mg/l)*			66.29	81.18	33.84
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	37	99	52
Chloride as Cl(mg/l)*			1.36	4.51	10.90
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	0.1

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Mulalo Mhlanga

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Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			8.3	6.5	7.0
Conductivity mS/m @25°C*			15.74	6.9	32.8
Fluoride as F(mg/l)*			0.5	0.1	0.1
Nitrate as NO_3(mg/l)*		0.1	0.3	6.5	1.1
Sulphate as SO_4(mg/l)*			14.38	18.02	96.20
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	110	59	83
Chloride as Cl(mg/l)*			5.85	4.17	3.71
Nitrite as NO2(mg/l)*	W044-50-W	0.1	0.1	<0.1	<0.1

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Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.7	4.5	6.6
Conductivity mS/m @25°C*			7.81	75.3	7.51
Fluoride as F(mg/l)*			0.1	0.2	0.1
Nitrate as NO_3(mg/l)*		0.1	1.6	3.5	6.9
Sulphate as SO_4(mg/l)*			21.23	348.56	13.42
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	55	61	64
Chloride as Cl(mg/l)*			1.49	2.36	3.47
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.0	5.7	4.6
Conductivity mS/m @25°C*			13.57	14.84	12.13
Fluoride as F(mg/l)*			0.0	0.0	0.0
Nitrate as NO_3(mg/l)*		0.1	3.2	0.8	7.4
Sulphate as SO_4(mg/l)*			40.86	50.34	35.13
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	54	61	58
Chloride as Cl(mg/l)*			3.13	0.99	0.13
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			4.8	7.0	5.7
Conductivity mS/m @25°C*			12.3	17.46	19.93
Fluoride as F(mg/l)*			0.0	0.2	0.0
Nitrate as NO_3(mg/l)*		0.1	0.7	2.5	0.2
Sulphate as SO_4(mg/l)*			41.23	52.64	69.66
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	59	68	58
Chloride as Cl(mg/l)*			1.11	1.12	0.35
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.2	7.3	7.5
Conductivity mS/m @25°C*			6.82	37.7	54.4
Fluoride as F(mg/l)*			0.1	0.8	0.3
Nitrate as NO_3(mg/l)*		0.1	2.1	0.6	0.6
Sulphate as SO_4(mg/l)*			19.15	169.96	251.96
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	58	71	78
Chloride as Cl(mg/l)*			1.30	3.27	0.27
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.3	6.6	6.7
Conductivity mS/m @25°C*			5.03	5.29	1.76
Fluoride as F(mg/l)*			0.0	0.3	0.1
Nitrate as NO_3(mg/l)*		0.1	0.9	0.5	0.7
Sulphate as SO_4(mg/l)*			13.66	15.56	0.87
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	53	37	50
Chloride as Cl(mg/l)*			0.31	3.78	0.98
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:					
pH Value @19°C*			6.0	4.6	6.9
Conductivity mS/m @25°C*			2.97	21.73	3.02
Fluoride as F(mg/l)*			0.0	0.1	0.0
Nitrate as NO_3(mg/l)*		0.1	0.7	39.2	0.3
Sulphate as SO_4(mg/l)*			7.97	39.73	0.38
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	34	58	63
Chloride as Cl(mg/l)*			2.14	0.55	0.40
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1	<0.1	<0.1

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Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A 25% SPLP EXTRACT OF THE SAMPLE AS RECEIVED:			
pH Value @19°C*			4.2
Conductivity mS/m @25°C*			49.7
Fluoride as F(mg/l)*			0.0
Nitrate as NO_3(mg/l)*		0.1	8.7
Sulphate as SO_4(mg/l)*			227.56
Total Alkalinity as CaCO3(mg/l)*	W044-50-W	1	<10
Chloride as Cl(mg/l)*			0.36
Nitrite as NO2(mg/l)*	W044-50-W	0.1	<0.1

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Certificate/Report

Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	10310	32060	11473
Arsenic as As(mg/kg)*	W044-28-O	2.0	6.77	228	6.13
Boron as B(mg/kg)*	W044-28-O	0.6	95	129	82
Barium as Ba(mg/kg)*	W044-28-O	0.10	1309	1619	425
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	813	3078	654
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.21	2.70	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	39	446	32
Chromium as Cr(mg/kg)*	W044-28-O	0.30	362	524	368
Copper as Cu(mg/kg)*	W044-28-O	0.20	38	193	24
Iron as Fe(mg/kg)*	W044-28-O	0.10	70630	89570	55680
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	570	606	475
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	535	7973	225
Manganese as Mn(mg/kg)*	W044-28-O	0.10	16299	16329	4405
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	0.25	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	44	152	87
Nickel as Ni(mg/kg)*	W044-28-O	0.30	56	1122	54
Phosphorus as P(mg/kg)*	W044-28-O	4.0	284	340	283
Lead as Pb(mg/kg)*	W044-28-O	0.050	35	77	45
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	16.00	26	4.02
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	260	244	194
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	119	134	95

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Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	30	1439	34
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	4.60	12.69	1.84

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Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	21520	12500	2992
Arsenic as As(mg/kg)*	W044-28-O	2.0	35	41	37
Boron as B(mg/kg)*	W044-28-O	0.6	73	26	13.93
Barium as Ba(mg/kg)*	W044-28-O	0.10	68	63	16.87
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	1985	1250	171
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.26	0.25	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	60	7.62	7.59
Chromium as Cr(mg/kg)*	W044-28-O	0.30	247	96	61
Copper as Cu(mg/kg)*	W044-28-O	0.20	44	33	26
Iron as Fe(mg/kg)*	W044-28-O	0.10	48940	18470	10027
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	596	449	291
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	1146	363	1386
Manganese as Mn(mg/kg)*	W044-28-O	0.10	490	148	51
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	0.46	1.45
Sodium as Na(mg/kg)*	W044-28-O	2.0	130	129	422
Nickel as Ni(mg/kg)*	W044-28-O	0.30	203	38	10.58
Phosphorus as P(mg/kg)*	W044-28-O	4.0	523	251	66
Lead as Pb(mg/kg)*	W044-28-O	0.050	33	9.44	28
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	3.72	4.31	5.04
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	7.75
Titanium as Ti(mg/kg)*	W044-28-O	0.10	234	97	22
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	5.61
Vanadium as V(mg/kg)*	W044-28-O	0.20	100	35	11.38

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Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	201	32	19.16
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	2.87	0.89	3.33

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Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	11758	29040	11097
Arsenic as As(mg/kg)*	W044-28-O	2.0	<2.0	87	9.55
Boron as B(mg/kg)*	W044-28-O	0.6	123	82	68
Barium as Ba(mg/kg)*	W044-28-O	0.10	67	18.59	110
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	1445	187200	457
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	<0.050	10.64	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	9.85	728	12.33
Chromium as Cr(mg/kg)*	W044-28-O	0.30	184	280	363
Copper as Cu(mg/kg)*	W044-28-O	0.20	4.87	308	37
Iron as Fe(mg/kg)*	W044-28-O	0.10	92470	23222	49700
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	220	258	360
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	224	79640	544
Manganese as Mn(mg/kg)*	W044-28-O	0.10	300	8878	484
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	0.23	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	47	1404	62
Nickel as Ni(mg/kg)*	W044-28-O	0.30	33	2062	37
Phosphorus as P(mg/kg)*	W044-28-O	4.0	340	92	208
Lead as Pb(mg/kg)*	W044-28-O	0.050	7.02	18.08	35
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	<0.10	215	2.26
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	82	51	249
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	54	19.13	95

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Certificate/Report

Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	17.52	4568	43
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	3.32	5.08	3.91

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	5218	13974	17520
Arsenic as As(mg/kg)*	W044-28-O	2.0	8.79	15.12	7.15
Boron as B(mg/kg)*	W044-28-O	0.6	45	117	97
Barium as Ba(mg/kg)*	W044-28-O	0.10	250	874	500
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	8558	14130	3455
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.24	0.55	0.37
Cobalt as Co(mg/kg)*	W044-28-O	0.10	41	96	36
Chromium as Cr(mg/kg)*	W044-28-O	0.30	141	270	256
Copper as Cu(mg/kg)*	W044-28-O	0.20	22	63	37
Iron as Fe(mg/kg)*	W044-28-O	0.10	32200	81650	68290
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	372	832	624
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	572	1369	731
Manganese as Mn(mg/kg)*	W044-28-O	0.10	6784	16114	3481
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	184	744	264
Nickel as Ni(mg/kg)*	W044-28-O	0.30	64	137	49
Phosphorus as P(mg/kg)*	W044-28-O	4.0	684	1071	976
Lead as Pb(mg/kg)*	W044-28-O	0.050	20	55	58
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	22	59	26
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	122	219	251
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	49	124	112

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	107	279	283
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	0.66	2.75	3.63

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Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	13900	11200	5925
Arsenic as As(mg/kg)*	W044-28-O	2.0	14.44	8.95	59
Boron as B(mg/kg)*	W044-28-O	0.6	112	99	58
Barium as Ba(mg/kg)*	W044-28-O	0.10	592	588	359
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	9775	1107	8369
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.14	0.11	0.37
Cobalt as Co(mg/kg)*	W044-28-O	0.10	47	54	124
Chromium as Cr(mg/kg)*	W044-28-O	0.30	298	434	94
Copper as Cu(mg/kg)*	W044-28-O	0.20	45	37	62
Iron as Fe(mg/kg)*	W044-28-O	0.10	80940	73870	34730
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	896	513	636
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	1290	595	1202
Manganese as Mn(mg/kg)*	W044-28-O	0.10	4875	3974	21798
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	377	87	417
Nickel as Ni(mg/kg)*	W044-28-O	0.30	67	64	222
Phosphorus as P(mg/kg)*	W044-28-O	4.0	573	421	1939
Lead as Pb(mg/kg)*	W044-28-O	0.050	46	63	59
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	5.90
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	24	3.13	56
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	274	249	74
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	131	126	39

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Certificate/Report

Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	110	134	252
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	4.81	4.12	0.60

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	2970	6740	26330
Arsenic as As(mg/kg)*	W044-28-O	2.0	10.47	14.75	6.95
Boron as B(mg/kg)*	W044-28-O	0.6	29	53	16.71
Barium as Ba(mg/kg)*	W044-28-O	0.10	34	59	131
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	785	2136	6375
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	<0.050	0.17	0.24
Cobalt as Co(mg/kg)*	W044-28-O	0.10	15.11	15.54	13.47
Chromium as Cr(mg/kg)*	W044-28-O	0.30	48	99	176
Copper as Cu(mg/kg)*	W044-28-O	0.20	3.22	13.71	45
Iron as Fe(mg/kg)*	W044-28-O	0.10	20180	37650	13430
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	213	299	599
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	234	387	1257
Manganese as Mn(mg/kg)*	W044-28-O	0.10	742	973	1555
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	77	209	410
Nickel as Ni(mg/kg)*	W044-28-O	0.30	35	43	82
Phosphorus as P(mg/kg)*	W044-28-O	4.0	404	312	1133
Lead as Pb(mg/kg)*	W044-28-O	0.050	8.90	32	24
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	2.22	3.52	19.41
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	40	25	54
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	17.18	34	93

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	31	90	64
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	2.61	1.87	1.48

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	13450	10405	15122
Arsenic as As(mg/kg)*	W044-28-O	2.0	5.90	37	80
Boron as B(mg/kg)*	W044-28-O	0.6	22	27	95
Barium as Ba(mg/kg)*	W044-28-O	0.10	170	155	1259
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	1035	773	478
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	<0.050	<0.050	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	51	60	114
Chromium as Cr(mg/kg)*	W044-28-O	0.30	153	125	173
Copper as Cu(mg/kg)*	W044-28-O	0.20	46	61	55
Iron as Fe(mg/kg)*	W044-28-O	0.10	16110	17465	64750
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	646	389	1066
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	556	576	733
Manganese as Mn(mg/kg)*	W044-28-O	0.10	4521	4042	16567
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	100	77	160
Nickel as Ni(mg/kg)*	W044-28-O	0.30	59	48	71
Phosphorus as P(mg/kg)*	W044-28-O	4.0	139	149	208
Lead as Pb(mg/kg)*	W044-28-O	0.050	26	26	100
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	6.04	4.37	27
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	44	30	325
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	50	35	99

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Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	29	31	77
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	2.28	1.11	8.22

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Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	8541	22334	3604
Arsenic as As(mg/kg)*	W044-28-O	2.0	81	14.98	52
Boron as B(mg/kg)*	W044-28-O	0.6	99	85	25
Barium as Ba(mg/kg)*	W044-28-O	0.10	1418	173	23
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	438	5351	215
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	<0.050	0.77	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	119	89	17.61
Chromium as Cr(mg/kg)*	W044-28-O	0.30	174	243	121
Copper as Cu(mg/kg)*	W044-28-O	0.20	56	86	29
Iron as Fe(mg/kg)*	W044-28-O	0.10	67270	60220	17630
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	920	534	183
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	594	1083	1110
Manganese as Mn(mg/kg)*	W044-28-O	0.10	17951	5784	120
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	0.82
Sodium as Na(mg/kg)*	W044-28-O	2.0	144	183	84
Nickel as Ni(mg/kg)*	W044-28-O	0.30	70	282	52
Phosphorus as P(mg/kg)*	W044-28-O	4.0	198	1966	97
Lead as Pb(mg/kg)*	W044-28-O	0.050	105	37	39
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	29	19.83	1.84
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	170	87	60
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	102	75	26

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	79	535	74
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	9.04	189	4.07

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	7229	64138	8463
Arsenic as As(mg/kg)*	W044-28-O	2.0	38	762	192
Boron as B(mg/kg)*	W044-28-O	0.6	69	105	26
Barium as Ba(mg/kg)*	W044-28-O	0.10	327	147	37
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	1206	9131	5224
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.45	6.54	0.92
Cobalt as Co(mg/kg)*	W044-28-O	0.10	29	1042	176
Chromium as Cr(mg/kg)*	W044-28-O	0.30	264	574	98
Copper as Cu(mg/kg)*	W044-28-O	0.20	61	405	71
Iron as Fe(mg/kg)*	W044-28-O	0.10	48930	64170	17710
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	339	692	449
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	948	32330	6918
Manganese as Mn(mg/kg)*	W044-28-O	0.10	1603	3195	667
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	8.12	0.54
Sodium as Na(mg/kg)*	W044-28-O	2.0	127	888	152
Nickel as Ni(mg/kg)*	W044-28-O	0.30	73	2642	490
Phosphorus as P(mg/kg)*	W044-28-O	4.0	554	305	96
Lead as Pb(mg/kg)*	W044-28-O	0.050	76	75	127
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	1.39	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	10.74	5.58
Strontium as Sr(mg/kg)*	W044-28-O	0.10	11.13	29	11.82
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	134	82	29
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	77	45	18.40

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	174	4002	584
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	1.86	14.18	7.12

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Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	24000	10000	8756
Arsenic as As(mg/kg)*	W044-28-O	2.0	26	9.85	3.92
Boron as B(mg/kg)*	W044-28-O	0.6	282	47	34
Barium as Ba(mg/kg)*	W044-28-O	0.10	3237	32	25
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	344	704	161
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.14	0.065	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	150	14.99	12.58
Chromium as Cr(mg/kg)*	W044-28-O	0.30	768	297	120
Copper as Cu(mg/kg)*	W044-28-O	0.20	108	14.47	16.26
Iron as Fe(mg/kg)*	W044-28-O	0.10	219400	33270	22790
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	926	345	262
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	412	317	257
Manganese as Mn(mg/kg)*	W044-28-O	0.10	29600	345	196
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	62	47	56
Nickel as Ni(mg/kg)*	W044-28-O	0.30	199	53	19.65
Phosphorus as P(mg/kg)*	W044-28-O	4.0	399	299	127
Lead as Pb(mg/kg)*	W044-28-O	0.050	118	12.39	9.12
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	<2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	38	1.21	0.38
Thorium as Th(mg/kg)*	W044-28-O	0.20	28	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	581	156	75
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	362	62	78

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Certificate/Report

Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	57	37	6.43
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	12.16	2.83	4.50

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	8999	12430	12340
Arsenic as As(mg/kg)*	W044-28-O	2.0	3.00	9.84	<2.0
Boron as B(mg/kg)*	W044-28-O	0.6	61	51	207
Barium as Ba(mg/kg)*	W044-28-O	0.10	229	64	14.90
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50	<0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	154	780	92
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	0.072	0.080	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	17.63	11.46	19.30
Chromium as Cr(mg/kg)*	W044-28-O	0.30	233	226	309
Copper as Cu(mg/kg)*	W044-28-O	0.20	21	38	1.28
Iron as Fe(mg/kg)*	W044-28-O	0.10	43940	35300	153500
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10	<0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	527	802	151
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	206	3131	37
Manganese as Mn(mg/kg)*	W044-28-O	0.10	1785	144	113
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	<0.10	<0.10	<0.10
Sodium as Na(mg/kg)*	W044-28-O	2.0	42	127	17.25
Nickel as Ni(mg/kg)*	W044-28-O	0.30	27	96	27
Phosphorus as P(mg/kg)*	W044-28-O	4.0	171	926	309
Lead as Pb(mg/kg)*	W044-28-O	0.050	15.24	22	11.37
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0	<1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0	<3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0	2.29	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	0.82	2.65	<0.10
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20	<0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	108	31	127
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90	<0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40	<0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	69	40	76

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED					
Zinc as Zn(mg/kg)*	W044-28-O	0.50	35	46	14.41
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	3.55	4.34	7.53

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Certificate/Report

Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED			
Silver as Ag(mg/kg)*	W044-28-O	0.40	<0.40
Aluminium as Al(mg/kg)*	W044-28-O	0.30	1672
Arsenic as As(mg/kg)*	W044-28-O	2.0	22
Boron as B(mg/kg)*	W044-28-O	0.6	9.34
Barium as Ba(mg/kg)*	W044-28-O	0.10	24
Beryllium as Be(mg/kg)*	W044-28-O	0.20	<0.20
Bismuth as Bi(mg/kg)*	W044-28-O	0.50	<0.50
Calcium as Ca(mg/kg)*	W044-28-O	5.0	701
Cadmium as Cd(mg/kg)*	W044-28-O	0.050	<0.050
Cobalt as Co(mg/kg)*	W044-28-O	0.10	4.59
Chromium as Cr(mg/kg)*	W044-28-O	0.30	31
Copper as Cu(mg/kg)*	W044-28-O	0.20	10.07
Iron as Fe(mg/kg)*	W044-28-O	0.10	8098
Mercury as Hg(mg/kg)*	W044-30-C	0.10	<0.10
Potassium as K(mg/kg)*	W044-28-O	0.50	192
Magnesium as Mg(mg/kg)*	W044-28-O	1.0	612
Manganese as Mn(mg/kg)*	W044-28-O	0.10	331
Molybdenum as Mo(mg/kg)*	W044-28-O	0.10	0.82
Sodium as Na(mg/kg)*	W044-28-O	2.0	97
Nickel as Ni(mg/kg)*	W044-28-O	0.30	10.85
Phosphorus as P(mg/kg)*	W044-28-O	4.0	47
Lead as Pb(mg/kg)*	W044-28-O	0.050	22
Antimony as Sb(mg/kg)*	W044-28-O	1.0	<1.0
Selenium as Se(mg/kg)*	W044-28-O	3.0	<3.0
Tin as Sn(mg/kg)*	W044-28-O	2.0	<2.0
Strontium as Sr(mg/kg)*	W044-28-O	0.10	2.40
Thorium as Th(mg/kg)*	W044-28-O	0.20	<0.20
Titanium as Ti(mg/kg)*	W044-28-O	0.10	52
Thallium as Tl(mg/kg)*	W044-28-O	0.90	<0.90
Uranium as U(mg/kg)*	W044-28-O	0.40	<0.40
Vanadium as V(mg/kg)*	W044-28-O	0.20	8.42

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Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON ACID DISSOLUTION OF A SAMPLE AS RECEIVED			
Zinc as Zn(mg/kg)*	W044-28-O	0.50	5.97
Zirconium as Zr(mg/kg)*	W044-28-O	0.10	2.79

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Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	82	0.26	184
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	0.024
Boron as B(mg/l)*	W044-28-O	0.006	0.14	0.023	0.26
Barium as Ba(mg/l)*	W044-28-O	0.001	0.15	0.099	0.49
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	2.80	20	5.63
Cadmium as Cd(mg/l)*	W044-28-O	0.001	0.002	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.020	0.002	0.038
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.12	<0.003	0.28
Copper as Cu(mg/l)*	W044-28-O	0.002	0.033	0.008	0.077
Iron as Fe(mg/l)*	W044-28-O	0.001	50	0.12	117
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	4.90	0.69	8.89
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.52	12.05	3.37
Manganese as Mn(mg/l)*	W044-28-O	0.001	2.31	0.003	2.30
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.002	0.004	0.008
Sodium as Na(mg/l)*	W044-28-O	0.02	1.68	4.75	3.33
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.098	0.003	0.26
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.59	<0.04	1.19
Lead as Pb(mg/l)*	W044-28-O	0.01	0.017	<0.01	0.12
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	83	0.42	151
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.019	0.051	0.022
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	1.99	0.004	4.27
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

Ndileka Bangani

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Issued at. : Johannesburg
Date : 24/07/2020
Contract No. : 11101481

Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts
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Certificate/Report

Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.11	0.013	0.12
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.087	<0.005	0.19
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.058	0.001	0.12

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.11	1.78	0.075
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.017	<0.006	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.090	0.076	0.049
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	59	86	3.41
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.057	0.10	0.004
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.003	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.009	0.013	0.013
Iron as Fe(mg/l)*	W044-28-O	0.001	0.022	0.19	0.095
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.38	0.97	0.79
Magnesium as Mg(mg/l)*	W044-28-O	0.01	14.74	3.40	0.27
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.27	1.24	0.048
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	4.83	3.65	1.00
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.13	0.46	0.010
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	0.046
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	1.80	1.24	0.90
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.12	0.099	0.009
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.001	0.011	0.002
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

Ndileka Bangani

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.017	0.002	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.15	0.36	0.057
Zirconium as Zr(mg/l)*	W044-28-O	0.001	<0.001	0.001	0.001

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Certificate/Report

Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.22	0.013	3.98
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006	0.038	0.020
Barium as Ba(mg/l)*	W044-28-O	0.001	0.15	0.061	0.19
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	2.19	14.37	2.99
Cadmium as Cd(mg/l)*	W044-28-O	0.001	0.002	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.086	0.005	0.015
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.018	0.008
Copper as Cu(mg/l)*	W044-28-O	0.002	0.027	0.018	0.012
Iron as Fe(mg/l)*	W044-28-O	0.001	0.029	0.012	2.43
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.74	0.90	1.64
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.77	31	0.72
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.20	<0.001	0.23
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	0.88	19.58	1.04
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.23	<0.003	0.042
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	0.042	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	1.00	1.07	4.33
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.014	0.11	0.018
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.002	<0.001	0.11
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Issued at. : Johannesburg
Date : 24/07/2020
Contract No. : 11101481

Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts
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Certificate/Report

Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	0.038	0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.47	<0.005	0.16
Zirconium as Zr(mg/l)*	W044-28-O	0.001	<0.001	<0.001	0.004

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	1.20	0.82	65
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.012	0.10	0.070
Barium as Ba(mg/l)*	W044-28-O	0.001	0.17	0.14	0.36
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	39	58	14.37
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.004	0.001	0.017
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	<0.003	0.11
Copper as Cu(mg/l)*	W044-28-O	0.002	0.005	0.010	0.030
Iron as Fe(mg/l)*	W044-28-O	0.001	0.74	0.41	35
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.10	2.83	3.61
Magnesium as Mg(mg/l)*	W044-28-O	0.01	4.53	10.96	3.68
Manganese as Mn(mg/l)*	W044-28-O	0.001	1.96	0.010	0.40
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	4.40	18.31	7.19
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.023	0.009	0.070
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.16	0.10	0.70
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	0.024
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	2.85	2.81	69
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.100	0.18	0.063
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.035	0.023	1.49
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.007	0.014	0.075
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.015	<0.005	0.22
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.002	0.001	0.047

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Certificate/Report

Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	24	19.62	0.27
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.006	0.053	0.076
Barium as Ba(mg/l)*	W044-28-O	0.001	0.19	0.15	0.17
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	15.25	4.25	27
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.006	0.008	0.021
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.041	0.037	0.007
Copper as Cu(mg/l)*	W044-28-O	0.002	0.014	0.012	0.008
Iron as Fe(mg/l)*	W044-28-O	0.001	12.79	12.56	0.35
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	5.14	4.64	6.35
Magnesium as Mg(mg/l)*	W044-28-O	0.01	3.63	1.30	7.70
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.16	0.24	17.98
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	9.84	3.15	9.22
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.029	0.040	0.085
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.20	0.21	0.16
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	0.010	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	26	19.79	29
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.041	0.009	0.14
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.51	0.50	0.007
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.028	0.079	0.015
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.034	0.13	0.076
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.018	0.016	<0.001

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	4.00	0.58	2.76
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.016	<0.006	0.052
Barium as Ba(mg/l)*	W044-28-O	0.001	0.063	0.12	0.096
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	8.19	133	1.97
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.004	0.018	0.002
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.016	<0.003	0.006
Copper as Cu(mg/l)*	W044-28-O	0.002	0.003	0.014	0.004
Iron as Fe(mg/l)*	W044-28-O	0.001	7.66	0.015	0.64
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	1.17	1.30	0.74
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.28	9.27	0.95
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.095	3.21	0.045
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	2.56	11.12	10.91
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.024	0.35	0.007
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.71	<0.04	0.063
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	5.68	0.89	3.89
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.017	0.16	0.007
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.095	<0.001	0.067
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.005	0.009	0.003
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.020	1.00	0.039
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.003	0.001	0.006

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	15.78	3.83	0.24
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	0.049	0.022	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.20	0.18	0.084
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	14.43	14.51	2.52
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.005	0.007	0.082
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.029	0.008	0.005
Copper as Cu(mg/l)*	W044-28-O	0.002	0.012	0.010	0.008
Iron as Fe(mg/l)*	W044-28-O	0.001	1.66	0.60	0.062
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	3.12	1.09	2.67
Magnesium as Mg(mg/l)*	W044-28-O	0.01	4.26	4.66	0.56
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.42	1.11	15.45
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	3.69	3.46	0.87
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.059	0.099	0.13
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	<0.04	0.067
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	16.33	5.18	2.44
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.055	0.046	0.012
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.40	0.10	0.005
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.010	0.003	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.11	0.11	0.14
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.013	0.004	<0.001

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.068	1.01	0.14
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006	<0.006	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.13	0.14	0.11
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	7.64	22	29
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.14	0.005	0.023
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.005	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.012	0.008	0.023
Iron as Fe(mg/l)*	W044-28-O	0.001	0.022	0.53	0.14
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	1.90	0.11	0.49
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.90	3.10	1.82
Manganese as Mn(mg/l)*	W044-28-O	0.001	4.85	0.006	3.04
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	2.66	6.03	1.38
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.18	0.008	0.033
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	0.084	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	2.04	3.62	2.32
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.022	0.082	0.083
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.001	0.024	0.003
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.21	0.026	0.022
Zirconium as Zr(mg/l)*	W044-28-O	0.001	<0.001	0.004	0.001

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	2.79	0.15	0.084
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006	<0.006	0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.071	0.072	0.055
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	4.86	31	49
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.002	0.002	0.004
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.006	<0.003	<0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.008	0.013	0.021
Iron as Fe(mg/l)*	W044-28-O	0.001	1.75	0.007	0.027
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.91	0.40	0.25
Magnesium as Mg(mg/l)*	W044-28-O	0.01	1.06	19.05	39
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.024	0.016	0.003
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	0.003	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	3.58	11.14	2.00
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.015	0.004	0.005
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.095	<0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	3.93	0.17	0.82
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.016	0.074	0.085
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.066	<0.001	0.001
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	0.028	0.039
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.062	<0.005	<0.005
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.003	0.001	<0.001

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Certificate/Report

Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	0.30	29	7.65
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006	0.059	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.10	0.11	0.011
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	2.44	3.80	0.081
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.002	0.011	0.001
Chromium as Cr(mg/l)*	W044-28-O	0.003	<0.003	0.042	0.013
Copper as Cu(mg/l)*	W044-28-O	0.002	<0.002	0.017	<0.002
Iron as Fe(mg/l)*	W044-28-O	0.001	0.18	17.25	1.34
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	4.60	1.60	0.15
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.66	1.87	0.11
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.23	0.19	0.004
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	0.71	1.60	2.41
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.021	0.057	0.008
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04	0.25	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	0.79	29	8.32
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.007	0.013	<0.001
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.008	0.77	0.18
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	<0.002	0.040	0.014
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.045	0.042	<0.005
Zirconium as Zr(mg/l)*	W044-28-O	0.001	<0.001	0.023	0.006

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	13.71	0.24	1.06
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006	0.010	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.053	0.19	0.054
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005	<0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	0.46	16.91	3.17
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.005	0.091	0.001
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.029	<0.003	0.003
Copper as Cu(mg/l)*	W044-28-O	0.002	0.014	0.013	<0.002
Iron as Fe(mg/l)*	W044-28-O	0.001	7.90	0.078	1.38
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001	<0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	2.94	0.37	0.075
Magnesium as Mg(mg/l)*	W044-28-O	0.01	0.42	5.57	0.22
Manganese as Mn(mg/l)*	W044-28-O	0.001	0.15	1.60	0.061
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001	<0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	1.23	5.57	0.77
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.018	0.24	<0.003
Phosphorus as P(mg/l)*	W044-28-O	0.04	0.096	<0.04	0.057
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01	<0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03	<0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	14.21	1.03	1.42
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02	<0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.002	0.049	0.008
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002	<0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	0.36	0.008	0.024
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009	<0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004	<0.004	<0.004

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Certificate/Report

Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED					
Vanadium as V(mg/l)*	W044-28-O	0.002	0.020	0.010	<0.002
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.022	0.16	<0.005
Zirconium as Zr(mg/l)*	W044-28-O	0.001	0.013	0.001	0.001

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Certificate/Report

Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED			
Silver as Ag(mg/l)*	W044-28-O	0.004	<0.004
Aluminium as Al(mg/l)*	W044-28-O	0.003	3.58
Arsenic as As(mg/l)*	W044-28-O	0.02	<0.02
Boron as B(mg/l)*	W044-28-O	0.006	<0.006
Barium as Ba(mg/l)*	W044-28-O	0.001	0.073
Beryllium as Be(mg/l)*	W044-28-O	0.002	<0.002
Bismuth as Bi(mg/l)*	W044-28-O	0.005	<0.005
Calcium as Ca(mg/l)*	W044-28-O	0.05	66
Cadmium as Cd(mg/l)*	W044-28-O	0.001	<0.001
Cobalt as Co(mg/l)*	W044-30-O	0.001	0.16
Chromium as Cr(mg/l)*	W044-28-O	0.003	0.004
Copper as Cu(mg/l)*	W044-28-O	0.002	0.098
Iron as Fe(mg/l)*	W044-28-O	0.001	0.011
Mercury as Hg(mg/l)*	W044-30-C	0.001	<0.001
Potassium as K(mg/l)*	W044-28-O	0.005	0.073
Magnesium as Mg(mg/l)*	W044-28-O	0.01	8.96
Manganese as Mn(mg/l)*	W044-28-O	0.001	10.23
Molybdenum as Mo(mg/l)*	W044-28-O	0.001	<0.001
Sodium as Na(mg/l)*	W044-28-O	0.02	1.65
Nickel as Ni(mg/l)*	W044-28-O	0.003	0.31
Phosphorus as P(mg/l)*	W044-28-O	0.04	<0.04
Lead as Pb(mg/l)*	W044-28-O	0.01	<0.01
Antimony as Sb(mg/l)*	W044-28-O	0.01	<0.01
Selenium as Se(mg/l)*	W044-28-O	0.03	<0.03
Silicon as Si(mg/l)*	W044-28-O	0.007	0.13
Tin as Sn(mg/l)*	W044-28-O	0.02	<0.02
Strontium as Sr(mg/l)*	W044-28-O	0.001	0.008
Thorium as Th(mg/l)*	W044-28-O	0.002	<0.002
Titanium as Ti(mg/l)*	W044-28-O	0.001	<0.001
Thallium as Tl(mg/l)*	W044-28-O	0.009	<0.009
Uranium as U(mg/l)*	W044-28-O	0.004	<0.004

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BDL - Below Detection Limit

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Certificate/Report

Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WAS CARRIED OUT ON 25% SPLP EXTRACT OF A SAMPLE AS RECEIVED			
Vanadium as V(mg/l)*	W044-28-O	0.002	0.012
Zinc as Zn(mg/l)*	W044-28-O	0.005	0.35
Zirconium as Zr(mg/l)*	W044-28-O	0.001	<0.001

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Certificate/Report

Laboratory Number			E024281	E024282	E024283
Sampled Date					
Sample Marks			MP1	MP2	MP3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	<0.01	0.55	<0.01

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Certificate/Report

Laboratory Number			E024284	E024285	E024286
Sampled Date					
Sample Marks			MP4	ST01	C1-2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.19	0.18	<0.01

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Certificate/Report

Laboratory Number			E024287	E024288	E024289
Sampled Date					
Sample Marks			C1-3	C1-4	C1-5
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.10	3.23	0.05

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Certificate/Report

Laboratory Number			E024290	E024291	E024292
Sampled Date					
Sample Marks			C2D1	C2D2	C2D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.08	0.22	0.04

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Certificate/Report

Laboratory Number			E024293	E024294	E024295
Sampled Date					
Sample Marks			C1D1	C1D2	C1D3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.04	0.21	0.01

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Certificate/Report

Laboratory Number			E024296	E024297	E024298
Sampled Date					
Sample Marks			C1VP1	C1VP2	MS1
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	<0.01	<0.01	0.06

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Certificate/Report

Laboratory Number			E024299	E024300	E024301
Sampled Date					
Sample Marks			MS2	MS3	MS4
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.09	0.08	0.29

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Certificate/Report

Laboratory Number			E024302	E024303	E024304
Sampled Date					
Sample Marks			MS5	B1	B2
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.31	0.16	0.05

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Certificate/Report

Laboratory Number			E024305	E024306	E024307
Sampled Date					
Sample Marks			C2-1	C2-2	C2-3
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.03	3.35	<0.01

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Laboratory Number			E024308	E024309	E024310
Sampled Date					
Sample Marks			C2-4	MP6	ST07
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.17	<0.01	<0.01

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Laboratory Number			E024311	E024312	E024313
Sampled Date					
Sample Marks			ST08	ST09	ST04
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	<0.01	0.09	<0.01

Ndileka Bangani

Mulalo Mhlanga

BDL - Below Detection Limit
*** Denotes test method not accredited to ISO 17025**
 # Denotes test method is outsourced

sanas
T0040

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Ref. No. : ML-2020-25989
Issued at. : Johannesburg
Date : 24/07/2020
Contract No. : 11101481

Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts
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Laboratory Number			E024315
Sampled Date			
Sample Marks			C2-5
Determinand	**Method References**	**Detection Limit**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE			
Sulfate, SO4(%)*	GRAVIMETRIC	0.01	0.40

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RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

Ref.No. : 11101481

Issued at : Johannesburg

Date : 24/07/2020

COMPANY NAME	: DIGBY WELLS & ASSOCIATES (SA) PTY LTD
ADDRESS	: PRIVATE BAG X10046
SUBJECT	: ANALYSIS OF 34 SOLID SAMPLES
MARKED	: AS BELOW
INSTRUCTED BY	: KGAUGELO THOBEJANE
ORDER NO.	: SAS6132
RECEIVED ON	: 04/06/2020
LAB NO(S)	:E024281-E024313 & E024315
DATE ANALYSED	: 14/07/2020

ANALYSIS

- Qualitative and Quantitative XRD (mineralogy)

- The samples were prepared according to the standardized Panalytical backloading system, which provides nearly random distribution of the particles.
- The samples were analyzed using a PANalytical Aeris powder diffractometer in θ–θ configuration with an X'Celerator detector and fixed divergence- and receiving slits with Fe filtered Co-Kα radiation (λ=1.789Å). The phases were identified using X'Pert Highscore plus software.

- The relative phase amounts (weight %) were estimated using the Rietveld method (Autoquan Program). The quantitative results are listed below.

Lab Number	E024281	E024282	E024283	E024284	E024285	E024286	E024287
Sample Marks	MP 1	MP 2	MP 3	MP 4	ST 01	C1-2	C1-3
	wt%	wt%	wt%	wt%	wt%	wt%	wt%
Chlorite	-	-	-	-	-	3.1	-
Goethite	1.	1.7	1.7	-	-	-	3.6
Hematite	0.	1.2	1.5	1.5	-	-	1.4
Kaolinite	9.	9.6	9.1	20.6	8.4	-	5.3
Muscovite	1.	3.6	4.3	7.5	4.3	2.9	-
Pyrophyllite	11.1	13.2	-	-	9.8	19.5	-
Quartz	76.1	70.7	83.4	70.4	77.5	74.5	89.8

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Lab Number	E024288	E024289	E024290	E024291	E024292	E024293	E024294
Sample Marks	C1-4	C1-5	C2D1	C2D2	C2D3	C1D1	C1D2
	wt%	wt%	wt%	wt%	wt%	wt%	wt%
Calcite	82.2	-	0.9	1.1	-	1.4	-
Dolomite	-	-	1.1	-	-	-	-
Goethite	-	2.1	1.1	2.6	2.2	2.7	3.0
Hematite	-	-	1.0	-	-	1.0	2.0
Kaolinite	-	5.2	3.9	14.6	22.9	13.1	10.0
Muscovite	-	-	1.6	8.9	6.3	2.5	3.0
Pyrophyllite	7.	10.9	-	-	-	17.7	11.4
Quartz	10.6	81.8	90.4	72.7	68.5	61.6	70.7
Lab Number	E024295	E024296	E024297	E024298	E024299	E024300	E024301
Sample Marks	C1D3	C1VP1	C1VP2	MS 1	MS 2	MS 3	MS 4
	wt%	wt%	wt%	wt%	wt%	wt%	wt%
Calcite	-	-	-	-	0	-	-
Dolomite	5.	-	-	-	-	-	-
Goethite	1.	-	0.9	-	-	-	-
Hematite	1.	0.7	0.7	1.3	0.4	0.8	0.3
Kaolinite	10.0	-	4.9	29.3	18.3	11.8	-
Muscovite	6.	2.0	2.1	5.2	5.8	2.0	1.4
Pyrophyllite	7.	-	5.1	-	8.4	5.8	16.1
Quartz	68.1	97.3	86.4	64.1	67.1	79.7	82.2
Lab Number	E024302	E024303	E024304	E024305	E024306	E024307	E024308
Sample Marks	MS 5	B1	B2	C2-1	C2-2	C2-3	C2-4
	wt%	wt%	wt%	wt%	wt%	wt%	wt%
Calcite	-	-	-	-	-	1.4	-
Chlorite	-	-	3.3	5.2	-	2.9	-
Gibbsite	-	-	-	-	-	-	2
Goethite	2.	2.2	0.8	1.4	-	-	30
Hematite	2.	1.3	0.6	-	-	0.5	-
Kaolinite	20.6	23.1	-	-	4.6	-	16
Muscovite	5.	10.2	3.8	2.8	9.9	5.1	-
Pyrite	-	-	-	-	2.3	-	-
Pyrophyllite	12.5	14.8	14.4	20.7	10.3	9.8	15
Quartz	56.6	48.5	77.2	69.9	73.0	80.3	38

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Lab Number	E024309	E024310	E024311	E024312	E024313	E024315	
Sample Marks	MP 6	ST07	ST08	ST09	ST04	C2-5	
	wt%	wt%	wt%	wt%	wt%	wt%	
Calcite	-	-	-	-	-	1.3	
Chlorite	-	-	-	6.8	-	-	
Goethite	0.7	2.1	-	-	30.9	-	
Hematite	1.8	-	-	-	-	-	
Jarosite	-	-	-	-	-	2.4	
Kaolinite	10.8	14.5	10.0	17.4	10.0	1.7	
Microcline	-	-	-	4.3	-	-	
Muscovite	-	-	4.8	10.0	-	1.7	
Plagioclase	-	-	-	10.9	-	-	
Pyrophyllite	-	-	-	-	-	10.0	
Quartz	86.8	83.4	85.3	50.6	59.1	82.9	

Mineral	General Formula
Calcite	Ca(CO3)
Chlorite	(Mg,Fe)5Al(AlSi3O10)(OH)8
Dolomite	CaMg(CO3)2
Gibbsite	Al(OH)3
Goethite	Fe2O3.H2O
Hematite	Fe2O3
Jarosite	KFe3(SO4)2(OH)6
Kaolinite	Al2Si2O5(OH)4
Microcline	KAlSi3O8
Muscovite	KAl2((OH)2AlSi3O10)
Plagioclase	(Na,Ca)(Si,Al)4O8
Pyrite	FeS2
Pyrophyllite	Al(Si2O5)(OH)
Quartz	SiO2

The results were supplied by a sub contracted laboratory

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RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

-	LAB NUMBER	E024281	E024282	E024283	E024284
ANALYTE	SAMPLE MARKS	MP 1	MP 2	MP 3	MP 4
SiO2	%	72.62	59.04	78.65	67.85
TiO2	%	0.31	0.39	0.36	0.67
Al2O3	%	7.28	11.55	6.65	12.56
Fe2O3	%	9.40	11.40	7.17	6.76
MnO	%	2.44	2.38	0.52	0.08
MgO	%	0.37	1.80	0.24	0.48
CaO	%	0.19	0.47	0.10	0.31
Na2O	%	0.05	*<0,01*	0.04	0.09
K2O	%	0.47	0.52	0.42	0.58
P2O5	%	0.11	0.11	0.09	0.20
Cr2O3	%	0.06	0.09	0.06	0.04
CuO	%	0.01	0.02	*<0,01*	0.01
NiO	%	0.01	0.16	0.01	0.03
V2O5	%	0.02	0.02	0.01	0.02
ZrO2	%	0.06	0.05	0.07	0.10
BaO	%	0.80	1.09	0.44	0.25
U3O8	%	*<0,01*	0.27	0.01	0.08
Co3O4	%	0.01	0.08	0.01	0.01
ZnO	%	0.01	0.18	0.01	0.03
SO3	%	*<0,01*	0.01	*<0,01*	*<0,01*
As2O3	%	*<0,01*	0.02	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	0.01	0.01	0.01
SrO	%	0.01	0.01	*<0,01*	*<0,01*
ZrO2	%	0.06	0.05	0.07	0.10
Nb2O5	%	0.02	0.01	0.02	0.02
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	*<0,01*	*<0,01*	0.04
TeO2	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	0.03	0.05	0.03	0.03
LOI	%	5.68	10.15	5.08	9.73
Total	%	100.00	99.94	100.06	100.07

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	LAB NUMBER	E024285	E024286	E024287	E024288
ANALYTE	SAMPLE MARKS	ST01	C1-2	C1-3	C1-4
SiO2	%	76.56	85.37	73.47	15.47
TiO2	%	0.42	0.17	0.38	0.02
Al2O3	%	8.89	8.33	5.81	7.11
Fe2O3	%	2.71	1.43	11.62	3.34
MnO	%	0.02	0.01	0.05	1.32
MgO	%	0.22	0.51	0.21	14.97
CaO	%	0.20	0.07	0.22	22.38
Na2O	%	0.18	0.12	0.04	0.06
K2O	%	0.39	0.22	0.25	0.03
P2O5	%	0.10	0.02	0.11	0.03
Cr2O3	%	0.03	0.04	0.03	0.05
CuO	%	*<0,01*	*<0,01*	*<0,01*	0.03
NiO	%	0.01	*<0,01*	*<0,01*	0.30
V2O5	%	0.01	*<0,01*	0.01	*<0,01*
ZrO2	%	0.09	0.07	0.08	0.01
BaO	%	0.32	0.26	0.35	0.22
U3O8	%	*<0,01*	*<0,01*	*<0,01*	0.16
Co3O4	%	*<0,01*	*<0,01*	0.01	0.11
ZnO	%	0.01	*<0,01*	*<0,01*	0.58
SO3	%	*<0,01*	*<0,01*	*<0,01*	2.28
As2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
SrO	%	0.01	*<0,01*	*<0,01*	0.03
ZrO2	%	0.09	0.07	0.08	0.01
Nb2O5	%	0.02	0.02	0.01	0.01
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	*<0,01*	0.03	*<0,01*
TeO2	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	0.01	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	0.03	0.03	*<0,01*	0.03
LOI	%	9.76	3.30	7.29	31.37
Total	%	100.06	100.03	100.05	99.94

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-	LAB NUMBER	E024289	E024290	E024291	E024292
ANALYTE	SAMPLE MARKS	C1-5	C2-D1	C2D2	C2D3
SiO2	%	78.60	80.56	53.16	60.90
TiO2	%	0.35	0.21	0.39	0.58
Al2O3	%	7.47	3.74	9.34	12.32
Fe2O3	%	6.46	4.20	10.35	9.90
MnO	%	0.06	0.86	2.11	0.53
MgO	%	0.26	0.25	0.47	0.39
CaO	%	0.08	1.11	1.80	0.58
Na2O	%	0.11	0.08	0.21	0.14
K2O	%	0.28	0.19	0.50	0.55
P2O5	%	0.06	0.22	0.37	0.37
Cr2O3	%	0.07	0.03	0.05	0.05
CuO	%	0.00	*<0,01*	0.01	0.01
NiO	%	0.01	0.01	0.02	0.01
V2O5	%	0.01	*<0,01*	0.02	0.02
ZrO2	%	0.09	0.05	0.05	0.07
BaO	%	0.36	0.34	0.68	0.49
U3O8	%	0.01	*<0,01*	*<0,01*	*<0,01*
Co3O4	%	0.01	0.01	0.02	0.01
ZnO	%	0.01	0.01	0.03	0.04
SO3	%	*<0,01*	0.03	0.01	0.01
As2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	*<0,01*	*<0,01*	0.01
SrO	%	*<0,01*	0.01	0.01	0.01
ZrO2	%	0.09	0.05	0.05	0.07
Nb2O5	%	0.02	*<0,01*	0.01	0.01
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	*<0,01*	0.02	0.03
TeO2	%	*<0,01*	0.06	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	0.03	*<0,01*	0.01	*<0,01*
LOI	%	5.63	8.02	20.37	12.96
Total	%	100.06	100.02	100.04	100.06

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-	LAB NUMBER	E024293	E024294	E024295
ANALYTE	SAMPLE MARKS	C1D1	C1D2	C1D3
SiO2	%	59.04	71.83	54.12
TiO2	%	0.53	0.39	0.27
Al2O3	%	10.94	8.31	7.81
Fe2O3	%	10.25	8.89	5.20
MnO	%	0.69	0.52	2.96
MgO	%	0.47	0.31	0.49
CaO	%	1.35	0.19	1.12
Na2O	%	0.11	0.12	0.23
K2O	%	0.55	0.34	0.35
P2O5	%	0.21	0.15	0.71
Cr2O3	%	0.06	0.08	0.06
CuO	%	0.01	0.00	0.01
NiO	%	0.01	0.01	0.04
V2O5	%	0.02	0.02	0.01
ZrO2	%	0.09	0.08	0.06
BaO	%	0.57	0.44	0.43
U3O8	%	*<0,01*	*<0,01*	*<0,01*
Co3O4	%	0.02	0.01	0.02
ZnO	%	0.01	0.02	0.04
SO3	%	0.01	0.01	0.01
As2O3	%	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	0.01	*<0,01*	*<0,01*
SrO	%	0.01	*<0,01*	0.01
ZrO2	%	0.09	0.08	0.06
Nb2O5	%	0.01	0.02	0.01
MoO3	%	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	0.02	*<0,01*	0.02
TeO2	%	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*
ThO2	%	*<0,01*	0.03	*<0,01*
LOI	%	15.00	8.21	26.03
Total	%	100.07	100.06	100.04

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-	LAB NUMBER	E024296	E024297	E024298	E024299
ANALYTE	SAMPLE MARKS	C1VP1	C1VP2	MS1	MS2
SiO2	%	91.75	81.22	51.30	71.53
TiO2	%	0.20	0.30	0.46	0.58
Al2O3	%	1.92	4.83	12.97	12.54
Fe2O3	%	2.84	5.06	2.32	2.73
MnO	%	0.11	0.13	0.21	0.62
MgO	%	0.19	0.25	0.51	0.40
CaO	%	0.14	0.30	0.88	0.19
Na2O	%	0.13	0.11	0.19	0.15
K2O	%	0.15	0.25	0.43	0.62
P2O5	%	0.13	0.11	0.46	0.08
Cr2O3	%	0.01	0.04	0.04	0.04
CuO	%	*<0,01*	*<0,01*	0.01	0.01
NiO	%	*<0,01*	0.01	0.01	0.01
V2O5	%	*<0,01*	*<0,01*	0.02	0.01
ZrO2	%	0.07	0.08	0.07	0.10
BaO	%	0.24	0.32	0.25	0.35
U3O8	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Co3O4	%	*<0,01*	0.01	*<0,01*	0.01
ZnO	%	*<0,01*	0.01	0.01	0.01
SO3	%	0.01	0.01	*<0,01*	0.01
As2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	*<0,01*	*<0,01*	0.01
SrO	%	*<0,01*	*<0,01*	0.01	*<0,01*
Y2O3	%	*<0,01*	*<0,01*	0.01	0.02
Nb2O5	%	*<0,01*	0.01	0.02	0.03
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	0.02	*<0,01*	*<0,01*	0.02
TeO2	%	*<0,01*	*<0,01*	0.05	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	*<0,01*	*<0,01*	0.02	0.03
LOI	%	2.08	6.95	29.75	9.90
Total	%	99.97	99.99	99.98	99.98

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RESULTS REPORTED RELATED ONLY TO ITEMS TESTED

-	LAB NUMBER	E024300	E024301	E024302	E024303
ANALYTE	SAMPLE MARKS	MS3	MS4	MS5	B1
SiO2	%	76.13	54.36	57.92	50.87
TiO2	%	0.46	0.21	0.53	0.65
Al2O3	%	10.11	4.47	16.91	16.42
Fe2O3	%	2.99	7.17	9.63	9.46
MnO	%	0.56	13.35	2.69	0.87
MgO	%	0.38	0.22	0.47	0.58
CaO	%	0.13	0.07	0.10	0.88
Na2O	%	0.05	0.07	0.14	0.20
K2O	%	0.46	0.38	0.93	0.85
P2O5	%	0.08	0.18	0.08	0.80
Cr2O3	%	0.03	0.02	0.05	0.08
CuO	%	0.01	0.02	0.01	0.01
NiO	%	0.01	*<0,01*	0.01	0.05
V2O5	%	0.01	*<0,01*	0.01	0.02
ZrO2	%	0.07	0.04	0.09	0.49
BaO	%	*<0,01*	0.41	0.82	0.40
U3O8	%	*<0,01*	0.01	*<0,01*	*<0,01*
Co3O4	%	0.01	0.35	0.03	0.02
ZnO	%	0.01	0.01	0.01	0.08
SO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
As2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	*<0,01*	0.01	*<0,01*
SrO	%	*<0,01*	*<0,01*	0.01	0.01
Y2O3	%	0.01	0.02	0.02	0.02
Nb2O5	%	*<0,01*	0.01	0.02	0.02
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	0.02	0.03	0.03
TeO2	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	0.03	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	0.04	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	0.01	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	0.02	*<0,01*	*<0,01*
ThO2	%	*<0,01*	*<0,01*	0.02	0.03
LOI	%	8.45	18.48	9.42	17.14
Total	%	99.96	99.98	99.95	99.98

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-	LAB NUMBER	E024304	E024305	E024306	E024307
ANALYTE	SAMPLE MARKS	B2	C2-1	C2-2	C2-3
SiO2	%	85.76	72.25	43.95	81.79
TiO2	%	0.17	0.30	0.21	0.24
Al2O3	%	6.65	10.70	17.45	7.32
Fe2O3	%	2.72	6.73	9.13	2.92
MnO	%	0.02	0.23	0.44	0.10
MgO	%	0.49	0.46	5.76	1.57
CaO	%	0.09	0.23	1.34	0.74
Na2O	%	0.15	0.15	0.38	0.13
K2O	%	0.25	0.43	0.58	0.50
P2O5	%	0.03	0.20	0.10	0.04
Cr2O3	%	0.05	0.07	0.10	0.04
CuO	%	*<0,01*	0.01	0.05	0.01
NiO	%	0.01	0.01	0.39	0.07
V2O5	%	*<0,01*	0.01	*<0,01*	*<0,01*
ZrO2	%	0.05	0.07	0.05	0.07
BaO	%	0.23	0.46	0.26	0.22
U3O8	%	0.01	*<0,01*	0.89	0.13
Co3O4	%	*<0,01*	0.01	0.17	0.03
ZnO	%	0.01	0.02	0.52	0.07
SO3	%	*<0,01*	*<0,01*	0.05	0.01
As2O3	%	*<0,01*	*<0,01*	0.06	0.03
Rb2O	%	*<0,01*	*<0,01*	0.02	*<0,01*
SrO	%	*<0,01*	0.01	0.01	0.01
Y2O3	%	*<0,01*	0.01	0.13	0.02
Nb2O5	%	*<0,01*	0.02	*<0,01*	0.02
MoO3	%	*<0,01*	*<0,01*	0.06	*<0,01*
Ag2O	%	0.02	*<0,01*	0.02	*<0,01*
TeO2	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	0.01	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	*<0,01*	0.03	0.09	0.04
LOI	%	3.23	7.55	17.74	3.86
Total	%	99.94	99.97	99.93	99.98

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-	LAB NUMBER	E024308	E024309	E024310
ANALYTE	SAMPLE MARKS	C2-4	MP6	ST07
SiO2	%	40.49	84.12	84.08
TiO2	%	0.49	0.29	0.40
Al2O3	%	14.99	5.85	7.37
Fe2O3	%	25.75	4.17	3.54
MnO	%	4.37	0.05	0.03
MgO	%	0.31	0.24	0.22
CaO	%	0.09	0.11	0.04
Na2O	%	0.06	0.05	<2e
K2O	%	0.49	0.26	0.30
P2O5	%	0.11	0.09	0.03
Cr2O3	%	0.12	0.04	0.03
CuO	%	0.02	<2e	*<0,01*
NiO	%	0.03	0.01	*<0,01*
V2O5	%	0.06	0.01	0.01
ZrO2	%	0.05	0.06	0.07
BaO	%	1.51	0.34	0.24
U3O8	%	0.01	0.05	*<0,01*
Co3O4	%	0.04	0.01	*<0,01*
ZnO	%	0.01	0.01	*<0,01*
SO3	%	*<0,01*	*<0,01*	*<0,01*
As2O3	%	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	*<0,01*	*<0,01*
SrO	%	0.01	*<0,01*	*<0,01*
Y2O3	%	0.01	*<0,01*	*<0,01*
Nb2O5	%	0.01	0.02	*<0,01*
MoO3	%	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	*<0,01*	*<0,01*
TeO2	%	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*
ThO2	%	0.02	0.03	*<0,01*
LOI	%	10.89	4.19	3.60
Total	%	99.95	99.98	99.95

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-	LAB NUMBER	E024311	E024312	E024313	E024315
ANALYTE	SAMPLE MARKS	ST08	ST09	ST04	C2-5
SiO2	%	81.19	69.80	68.17	90.72
TiO2	%	0.40	0.64	0.33	0.14
Al2O3	%	7.11	12.83	6.25	4.61
Fe2O3	%	5.69	5.49	17.94	1.22
MnO	%	0.24	0.03	0.02	0.04
MgO	%	0.29	1.04	0.18	0.29
CaO	%	0.05	0.16	0.03	0.15
Na2O	%	0.11	0.96	<2e	0.14
K2O	%	0.54	1.31	0.24	0.23
P2O5	%	0.07	0.29	0.08	0.01
Cr2O3	%	0.04	0.07	0.06	0.03
CuO	%	*<0,01*	0.01	*<0,01*	*<0,01*
NiO	%	*<0,01*	0.02	*<0,01*	*<0,01*
V2O5	%	0.01	0.01	0.01	*<0,01*
ZrO2	%	0.08	0.11	0.06	0.05
BaO	%	0.23	0.35	0.27	0.29
U3O8	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Co3O4	%	0.01	0.01	0.02	*<0,01*
ZnO	%	0.01	0.01	*<0,01*	*<0,01*
SO3	%	*<0,01*	0.01	0.02	*<0,01*
As2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Rb2O	%	*<0,01*	0.01	*<0,01*	*<0,01*
SrO	%	*<0,01*	0.01	*<0,01*	*<0,01*
Y2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Nb2O5	%	0.01	0.01	0.02	*<0,01*
MoO3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Ag2O	%	*<0,01*	0.02	*<0,01*	*<0,01*
TeO2	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Sm2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Eu2O3	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
Gd2O3	%	*<0,01*	*<0,01*	0.01	*<0,01*
Tb4O7	%	*<0,01*	*<0,01*	*<0,01*	*<0,01*
ThO2	%	*<0,01*	*<0,01*	0.03	*<0,01*
LOI	%	3.90	6.78	6.24	2.06
Total	%	99.96	99.97	99.98	99.98

ANALYSIS:

The samples were prepared as pressed powders. 10-30g powdered sample, mixed with 20 drops Moviol (PVA), pressed to 10 tons.
The Thermo Fisher ARL Perform'X Sequential XRF instrument with Uniquant software was used for analyses.
The software analyse for all elements in the periodic table between Na and U, but only elements found above the detection limits were reported.
The values were normalised, as no LOI was done to determine crystal water and oxidation state changes.

**The results were supplied by a sub contracted laboratory

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