

TECHNICAL REPORT

Erosion measurement and modelling

Mt. Rawdon Operations

Prepared for: Evolution Mining



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1 Introduction

The Mt Rawdon Operation (MRO) is located 75km south-west of Bundaberg, Queensland. Evolution Mining has owned and operated MRO since November 2011 and has a long history of reliable production with over 2.0 million ounces of gold produced to date.

RGS Environmental Consultants Pty Ltd (RGS) contributed to development of a conceptual soil cover system for the TSF in 2016 and has developed a soil capping system for the NWRD to conform with PRCP requirements in 2022.

The RGS scope of work presented in this **factual technical report** included:

- identifying sampling locations to obtain bulk samples
- measuring soil quality, geochemical and physical properties of each sample
- measuring, assessing, and modelling soil erosion of the
 - internal layers of the NWRD soil cover system
 - external layer of the NWRD soil cover system.

This erosion assessment builds on previous work completed by RGS that verifies:

- how the NWRD landform will be developed as the mine transitions from operations to closure using a Deswik landform haulage schedule (LHS)
- that there is sufficient material available to build all constructed landforms including proposed cover systems for the NWRD and TSF
- cover design modelling using SEEPW that verifies how the proposed cover system on the NWRD is likely to perform in terms of the soil - plant - water balance.

With the completion of the completed work and the erosion assessment in this report RGS consider the soil cover system design to be at a feasibility study level of design.

1.1 Purpose of this work

The purpose of this factual technical report is to conform with PRCP requirements relating to assessing landform and cover design stability. Specifically, to quantify probable erosion rates from available borrow materials at MRO that are proposed to be used to construct a soil cover system on the top tier of the NWRD. The results of this work are also applicable to the TSF cover system, as the proposed slope angles and material types are the same for both sites.

1.2 Objectives of the work

Provide suitable sample locations to enable MRO to collect 5 x 1m³ bulk samples from probable borrow locations at the mine.

- The samples included pedolith (topsoil and subsoil) and saprolith (saprolite and saprock).
- Submit representative splits of each sample for static analyses to document the material properties.

Use the 3m x 1m RGS rainfall and erosion simulator (RaE_{SIM}) method to obtain the following data under defined slopes and under defined rainfall intensity and frequency events.

- Quantify surface water chemistry – filtered and unfiltered parameters
- Measure erosion rates and erosion mass
- Calculate the soil erodibility k-factor
- Use the k-factor in M-ULSE, WEPP and MinErosion to derive the probable range of erosion rates of, as-placed soil and capping materials, compacted materials,
- Use MinErosion to model probable erosion rates for the cover systems as it matures .

1.3 Numerical modelling methods

Soil erosion is affected by soil properties (erodibility), rainfall (erosivity), topography (slope gradient, slope length, and catchment shape), vegetative cover, and the management practices. Erosion (and deposition) in the natural environment is certain, dynamic, kinetic, and everchanging, conversely laboratory conditions are deterministic, static, and predictable.

- The **first stage** of erosion measurement uses small (~ 5 g to 1,000 g) samples of < 2.36 mm particle size distribution (PSD) samples and static analytical methods such as cation exchange capacity, exchangeable sodium percentage, soil water matric potential, mineralogy, Emerson aggregate stability, and pin hole dispersion (**Section 3.1**).
- The **second stage** of erosion measurement is the RGS RaE_{SIM} process that provides *measurable data* from bulk samples inclusive of < 150 mm particle size distribution material (**Section 3.2**). The bulk samples provide a far more reliable assessment of how these materials are likely to behave under field conditions.
- The **third stage** of work is to use measured data and numerical erosion modelling methods such as MinErosion to quantify a *range of probable erosion rates* under different rainfall events and slope angles (**Section 0**) to develop and design targeted field trials. RGS believe that numerical modelling methods should:
 - be based on measured data wherever possible
 - utilise measured data from samples with the same properties that occur in the field (to the extent possible)
 - be staged to move progressively from a wide range of potential outcomes and uncertainty to probable outcomes with tolerable uncertainty
 - limit (to the extent possible) unfounded assumptions
 - be simple and robust and enable rapid assessment of *probable* outcomes.

RGS has the capability to use RUSLE, WEPP, MINEROSION, for erosion modelling. SIBERIA and CAESAR_{LISFLOOD} are used by RGS for landform evolution modelling, but only when the extensive data requirements required for these models is available.

- The **fourth stage** is to implement field trials to verify how the landforms and cover systems will perform in the field and verify what designs will be adopted for full scale rehabilitation work.

The numerical modelling methods that are used to model erosion are described in this section of the report. Each approach has advantages and limitations, and a description of the erosion modelling methods is provided below.

1.3.1 RUSLE

The revised universal loss equation (RUSLE) model is a modified version of the original universal loss equation (USLE). RUSLE has the same governing equation taken from its predecessor **USLE**; however, the algorithms used to compute the individual factors have been modified based on experimental data, research, and theoretical interpretations. RUSLE incorporates four physical parameters associated with erosion by water including rainfall erosivity, soil erodibility, topography, and land use management. The RUSLE model extended the USLE model to deal with crop situations which could not be properly dealt by the conventional USLE approach. Further, the RUSLE introduced an ability to deal more effectively with slopes that were not completely uniform like concave and convex slopes (Mello et al., 2016). Kumar et al. (2022) state that RUSLE is still the most frequently used erosion simulation model despite its numerous deficiencies, weaknesses, and limitations.

1.3.2 WEPP and GeoWEPP

The WEPP model was developed by the United States Department of Agriculture (USDA) (Flanagan and Nearing, 1995b) to substitute the USLE family models. The developers hoped that the model would increase the capabilities of erosion prediction in a variety of landscapes (multi-scales) and conditions. The WEPP model has been developed at two levels of applications: hillslope application and watershed application. The hillslope

profile applications compute inter-rill and rill erosion and deposition along selected landscape profiles, whereas the watershed applications also estimate channel erosion and deposition, and deposition in impoundments. The model procedures do not consider typical gully erosion. Originally WEPP was created for agricultural modelling, but it is now widely used in the USA in for forestry, fisheries, rangeland and mining studies and projects. The major challenge with WEPP is its over-parameterisation.

Practically, the WEPP computer model needs four input data files: climate, soil, slope, and management files. In addition to the erosion components, WEPP also contains a climate component, which uses a stochastic generator to provide daily weather information, a hydrology component that is based on a modified Green-Ampt infiltration equation and solutions of the kinematic wave equations, a daily water balance component, a plant growth, and residue decomposition component, and an irrigation component. Climate files include daily maximum and minimum temperatures, solar radiation and rainfall (amount and distribution parameters). Soil files take utilise soil parameters such as soil albedo, initial soil water content, soil textures, percent rocks, porosity, bulk density, infiltration, and soil cation exchange capacity (CEC). The WEPP model is very sensitive to the input value for the soil erodibility parameters; the user must input a value for the baseline inter-rill erodibility, which represents the erodibility of a freshly tilled soil. There are a set of equations available to estimate soil parameters (erodibility) using soil texture, cation exchange capacity (CEC), and organic matter content in the WEPP user guide (Flanagan and Nearing, 1995a). The slope file includes the land physical features such as slope length, slope steepness, and aspect. The geo-spatial interface for WEPP (GeoWEPP) (Renschler, 2003) was developed to utilise digital geo-referenced information such as digital elevation models (DEM) and topographical maps to derive and prepare valid WEPP model input parameters (slope file). It is a tool that connects and integrates the original WEPP model to different GIS commercial packages (ESRI ArcGIS and QGIS) to easily calculate the required hydrological parameters for any catchment from its DEM. The management file gives plant and management information for different land uses (crop, range, or forest). For each land use, information about particular management practices are required (Flanagan and Nearing, 1995b).

In conclusion, WEPP computes spatial and temporal distributions of soil loss and deposition and gives estimates of when and where in a watershed or on a hillslope erosion will happen so that conservation plans and strategies can be developed to effectively control soil loss and sediment yield. WEPP is currently the most supported erosion model in the USA. Many efforts have been given to develop the governor equations, embedded database, validate the model, and to integrate it with GIS and other modern techniques. However, the main problem with it is over parameterization and the huge amount of data required, which is generally unavailable especially outside the USA. Yu et al. (2000) affirmed that to run the WEPP model you need daily input climate variables, 31 parameters for each crop, 12 for each tillage operation (soil disturbance), and 10 for each soil and 22 entries to specify the initial conditions.

1.3.3 MINERosion

MINERosion was developed by So et al, (2004), Khalifa (2010) and So et al, (2018) to accurately predict potential erosion rates from laboratory measured parameters using a tilting flume-rainfall simulator (RaE_{SIM}) to simulate key design criteria (slope gradient, slope length and vegetation cover) for the construction of post-mining landscapes that will result in an acceptable erosion rate.

MINERosion can be used to model:

- erosion from slopes (erosion modelling) or
- erosion and sediment deposition from landforms (landform evolution modelling).

Development of MINERosion commenced in 1999 (So and Sheridan, 1999) using a spreadsheet-based modelling method and laboratory data from 16 coal mines in Queensland. Updates to the model were funded by ACARP from 2005 to 2010 and included using BOM IFD or IE30 climate data and environmental factors to evaluate the effect of pedogenic development the rehabilitated soil profile (e.g. consolidation) and the effect of vegetation (So, Khalifa and Carrol, 2010). ACARP funding continued from 2010 with model development until 2015. MINERosion was validated against 15 years of laboratory scale (3 m flume), field scale (12 m flume) and three instrumented catchments (up to 0.91 ha in size) on the Curragh mine site in Central Queensland. The agreement between predicted (Y) and measured (X) values were very good with the regression equation of $Y=0.92X$ and an R^2 value of 0.81 for individual storm events, and $Y=1.473X$ and an R^2 value of 0.726 for the average annual soil loss (Khalifa, 2010).

MINErosion can simulate potential erosion rates using (i) an internal database (ii) soil properties to calculate erodibility and erosion rates or (iii) data derived from rainfall simulation, for:

- discrete storm events (e.g. 1 in 10-year event with 30 mm of rain in a 60-minute event)
- annual erosion rates
- long term erosion rates.

User defined inputs to determine k-rill and k-inter-rill factors include:

- Organic carbon
- pH
- density
- % of 0.02 to 1 mm soil fraction
- % clay
- D20% range
- ESP
- EC.

Additional user defined inputs include:

- Soil infiltration rate
- Rainfall intensity
- Rainfall duration
- EI_{30}
- Rainfall erosivity (R-factor)
- Slope %
- Slope length
- Duration of soil settlement, consolidation and cohesion
- Type of vegetation cover
- % of vegetation cover

Generated data include:

- K-MUSLE (the erodibility
- LS
- Erosivity (R)
- Cover factor derived from X, Y, Z and Z
- Slope factor derived by MINErosion from X, Y, Z and Z or using WEPP
- Soil erodibility values derived from the RaESIM erosion measurement
- K-rill erosion
- K-inter-rill erosion
- Total erosion

Selected MINErosion outputs include the:

- relationship between the slope length and rill and inter-rill erosion rates that demonstrates the slope length has no effect on the inter-rill erosion rate but its impact on rill erosion rate is usually very substantial
- effect of slope length with different slope percentages on the predicted soil loss (ton/ha)
- event-based soil loss
- annual soil loss under the effect of
- time of consolidation
- vegetation cover type and percentage.

When MINEROSION is applied to vegetated and consolidated soil/spoil, the soil erodibility KMUSLE is modified by the empirically determined consolidation factor. Fundamentally, the soils susceptibility to erosion or the erodibility factor should be the same for both USLE/RUSLE and MUSLE equations. The difference between the two equations is in the erosivity values used. Therefore, in MINEROSION, KMUSLE is used for both the MUSLE and RUSLE equations. MINEROSION has four sub-routines:

- terrain analysis and derivation of catchment hydrological parameters including slope, flow direction, flow length, and flow accumulation.
- derivation of rainfall erosivity and storm data using BOM derived data including mm/hr, rainfall duration, average recurrence interval, infiltration rates and EI30 data (Khalifa, 2010).
- derivation of soil erodibility, which could be obtained by one of the following methods:
 - built-in database merged inside MINEROSION model software based on data analyses for soil and spoil from 32 Queensland mines (Khalifa, 2010)
 - rainfall simulator/flume measured data
 - a set of predictive equations (Sheridan, 2002) that utilise laboratory measured soil and spoil properties to estimate the values of rill and interrill erodibilities
- environmental factors sub-routine including
 - infiltration rate
 - vegetation type
 - % cover
 - settlement, consolidation, and cohesion effects.

These sub-routines are processed in parallel to generate suitable model parameters and the intermediate steps that generate the model outputs. The required time to run the numerical model and complete the whole calculations is dependent on the catchment area, it may take around 15-20 minutes for small catchments (10,000 grid cell with 10 m resolution) and 8-10 hours for the larger landscape (over 100,000 grid cell and above). MINEROSION models sediment transport using overland flow that takes place when the sediment load is less than the sediment transport capacity, and deposition (of excess sediment) occurs when sediment load is greater than the transport capacity. This principle was applied to both single storm event erosion and mean annual erosion rates. For storm event erosion, the transport equation of Beasley et al. (1980) for laminar and turbulent flow conditions is used to calculate the transport capacity in overland and channel processes. For mean annual erosion, the transport equation of Van Rompaey et al. (2001) is used. The sediment carried by the flow is then routed in the direction of the catchment outlet. Surface runoff and sediment flow was routed through each cell using the single-flow-direction D8 method (O'Callaghan and Mark, 1984) after filling the internal depressions using ArcGIS spatial analyst® routines. ArcGIS was then used to present the outcomes of the grid-cell rasters as maps.

1.3.4 SIBERIA

SIBERIA is a sophisticated mathematical model that simulates the geomorphic evolution of landforms subjected to fluvial and diffusive erosion and mass transport processes. It calculates soil erosion and deposition rates of the selected site using the DEM as a starting point, where the annual soil erosion/deposition values

are calculated for each point on the grid, then each point should be raised or lowered in the level based on its situation to the calculated erosion/deposition pattern. The model is a useful tool to identify the characteristics on the landform that cause or may become a point of erosional instability over the time (100 years for example). SIBERIA is a complex model that requires extensive parameterisation (Willgoose et al., 1991). Parameterisation of the model requires the use of separate hydrology and sediment transport models to derive a discharge/area relationship, long-term sediment loss and a sediment transport rate. Whereas CAESAR_{LISFLOOD} can simulate individual rainfall events with a greater emphasis on fluvial processes, SIBERIA does not simulate single rainfall events but averages erosion rates across annual time scales. That gives the SIBERIA the advantage of less computation time but does prevent it from evaluating single-event scenarios.

1.3.5 CAESAR_{LISFLOOD}

The CAESAR_{LISFLOOD} landscape evolution model (Coulthard et al., 2013) was originally developed to analyse the geomorphic development of river basins over long time periods and large space scales (100s–1000s of years, 100s of km²), and to study the movement of contaminated river sediments. The current version of the model combines the Lisflood-FP 2d hydrodynamic flow model (Bates et al., 2010) with the CAESAR geomorphic model (Coulthard et al., 2000) to simulate erosion and deposition in river catchments and reaches over time scales from hours to 1000's of years. CAESAR_{LISFLOOD} has been widely adapted to examine the evolution of proposed rehabilitated mine landforms (Temme et al., 2017, Lowry et al., 2013, Lowry and Saynor, 2019). The erosion mathematical model component of CAESAR_{LISFLOOD} is adapted from the Hairsine and Rose (1992) model, which is completely physically based and much more complicated than RUSLE, WEPP or MINEROSION for most users. Moreover, the selected spatial resolution of the DEM which will be used by the model must be fine enough to adequately represent the features of the landform cover material, natural soils in the surrounding catchments, and construction materials. The selection of rainfall pattern applied to the LEM is also critical. The rainfall pattern must be selected to address the objectives of the study and must have a sufficiently small temporal resolution to include periods of high intensity.

The main advantages of CAESAR_{LISFLOOD} are:

- The model can be used over range of spatial and temporal scales.
- The outputs are both graphical and numerical.
- The main input the model uses to characterise the materials is the grain size distribution, which is a measurable and well-understood parameter.
- Different rainfall datasets can be modelled (i.e., single storm events as well as long-term simulations) at different time intervals. This provides a means of exploring climate change implications as part of landform evolution modelling

The disadvantage of the CAESAR model is that the model is computationally intensive which can result in long model run times.

1.4 Modelling approach

Since the late 1990s, mine sites in Australia have increasingly relied on some form of erosion prediction to design waste landform batter profiles that, once rehabilitated, will erode at a rate less than some designated threshold rate (Howard and Lock, 2019). This approach has been publicly presented and discussed in public forums and within peer-reviewed conference and journal papers over many years (Loch 1997; Loch & Willgoose 2000a, 2000b; Hancock et al. 2003; Hancock 2004; Loch & Lowe 2008; Loch 2010; Howard et al. 2011; Braun et al. 2018, So et al, 2018).

Numerical modelling methods, can be simple or complex, may utilise estimated and/or measured data, and may also require several to many dozens of data inputs. Numerical modelling methods can provide reliable forecasts under field conditions provided the input parameters used are accurate (Howard and Lock, 2019). Regardless of what numerical model is used the underlying uncertainty in any erosion model that strives to quantify erosion occurring over time is climate data, and all practitioners are acutely aware of the uncertainty we face in determining weather patterns, in the short (weekly), medium (monthly) or long-term (annual), and the increasing uncertainty we face with defining probable climate variability and climate change.

While it is possible to undertake complex numerical modelling using SIBERIA or CAESAR_{LISFLOOD} for an EIS, or coupled PFS or FS study, to do so without having measured data and detailed constructed mine landform designs is considered by RGS to be a flawed numerical approach.

This is because at EIS, PFS, or even at FS level, there is unlikely to be detailed and reliable:

1. stratigraphic or block model data, with associated chemical and physical properties, to define where each:
 - i. topsoil and subsoil unit (block) in the pedolith is, before it is mined,
 - ii. block of saprolite and saprock in the regolith is, before it is mined
 - iii. block of mine waste is within the WRSF and at the base of what will become the cover system.
2. designs for each constructed mine landform (e.g. waste rock storage facility (WRSF)), that verify the location, distribution, and chemical and physical properties of the:
 - i. waste rock units in the landform,
 - ii. the saprolite and saprock that may have been used for final construction of the WRSF before the cover is placed on it,
 - iii. subsoil, topsoil, and any associated competent NAF rock that may be placed into the final cover system.

RGS is of the opinion that it makes far more sense, and is far more defensible, for projects to move through a staged approach to evaluate and predict erosion and landform stability (**Section 1.3**), than it is to jump straight into complex numerical modelling methods that contain very little factual data.

2 Sample preparation

Five pedolith and saprolith samples were identified by RGS and collected by MRO. The materials are sourced from areas identified for construction of soil cover systems on the TSF and NWRD. The movement of material from the borrow areas has been included in the Deswik.LHS scheduling. The samples include the following.

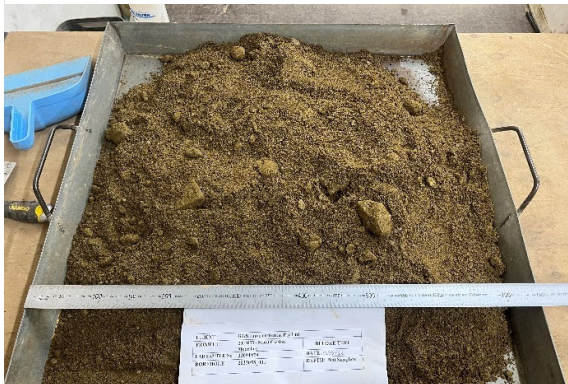
- Sample # 1: 1 x 1 m³ of topsoil recovered from an existing stockpile.
- Sample # 2: 1 x 1 m³ of topsoil (0 to 1 m bgl) recovered from a potential borrow area to the northwest of the TSF.
- Sample # 3: 1 x 1 m³ of topsoil (0 to 1 m bgl) recovered from the West Hill between West Dam and the Open Pit.
- Sample # 4: 1 x 1 m³ of saprolite (1 to 2 m bgl) recovered from the West Hill between West Dam and the Open Pit.
- Sample # 5: 1 x 1 m³ of saprock recovered from exposed material on the access track of West Hill between West Dam and the Open Pit.

Each as-received sample was removed from the IBC and the volume of > 150 mm PSD and 150 mm PSD to 75 mm PSD rock was estimated (**Figure 2-1**). Splits of each sample (< 75 mm PSD) (**Figure 2-2**) were prepared so they could be sent to laboratories for a suite of static soil quality, geochemical and physical analyses to derive measured material properties.



Figure 2-1: As-received Sample # 1 to Sample # 5

MRO Sample # 1



MRO Sample # 2



MRO Sample # 3



MRO Sample # 4



Figure 2-2: < 75 mm PSD MRO RaE_{sim} samples being analysed for ALS, TRILAB, SWC and Levay and Co.

3 Analytical program

The RaE_{SIM} approach is an accelerated laboratory method that is used to quantify soil and capping material surface water quality and soil erodibility from bulk samples on a 3 m x 1 m flume.

- The **first stage** of erosion measurement uses < 2.36 mm particle size distribution samples and static analytical methods such as cation exchange capacity, exchangeable sodium percentage, Emerson aggregate stability, and pin hole dispersion (**Section 3.1**).
- The **second stage** is the RGS RaE_{SIM} process that provides *measurable data* from bulk samples inclusive of < 150 mm particle size distribution material (**Section 3.2**).
- The **third stage** of work is to use measured data and numerical erosion modelling methods such as MinErosion to quantify a range of probable erosion rates under a different rainfall events and slope angles (**Section 7**).

Erosion measurement and erosion modelling is a precursor to landform evolution modelling using software such as SIBERIA and CAESAR_{LISFLOOD}.

The advantage of MinErosion is that it uses a range of measured data as inputs and requires less estimated values than SIBERIA and CAESAR_{LISFLOOD}.

3.1 Pedolith and saprolith material properties

The < 75 mm sample splits (**Figure 2-2**) are being analysed using the methods in Table 3-1 and

Table 3-2. The results are being provided iteratively by ALS, TRILAB, SWC and Levay and Co. from Q4 2022 to Q1 2023: a final report will be issued to MRO when all results have been provided.

Table 3-1: Soil quality and geochemical analyses

ALS Code	Method Code
IN-4S: pH and EC (at 1:5 w/v) (Includes EA002 and EA010)	APHA 4500 H+ - B and APHA 2510 B
ED002: Exchangeable Soil Acids	Baumann Gully DIN 4030 Part 2
ED006: Exchangeable Cations (pH > 7.3)	Soil Survey Test Method C5
ED007: Exchangeable Cations (Ca, Mg, Na, K) plus ECEC & ESP on Soils (pH < 7.3 and EC < 300µm) NOTE: If pH < 6.0 ECEC includes ED005 - Exchange Acidity (includes Exchangeable Aluminium)	Rayment & Lyons 2011 15A1ED005: Rayment & Lyons 2011 15G10.1
ED008: Exchangeable Cations with pre-treatment - default parameters	Rayment & Lyons 2011 15A1 ED005 - Rayment & Lyons 2011 15G1
EK067G: Total Phosphorus as P by Discrete Analyser	APHA 4500-P
EK074: Fluoride Extractable Phosphorus (Bray)	Rayment & Lyons 2011 9E1
EP004: Organic Matter Content plus Organic Carbon by Calc' (Walkley Black)	AS 1289.4.1.1-1997/ NEPM
EP003: Total Organic Carbon (TOC) in soil	
AG-1: (IN-4S plus Exchangeable Cations m ECEC, ESP)	APHA 4500-NH ₃ B, APHA 4500 NO ₃ - B, APHA 4500 NO ₃ - - I/NO ₂ - -B, Thermo Scientific Method D08727 and NEMI: 9171, APHA 4500 Norg - D,
AG-2: AG-1 plus NT8S Nutrients (TN, TP, TKN, NO ₂ , NO ₃ , NH ₃ and NO _x)	
AG-3: AG2 + Chloride (1:5), pH (CaCl ₂) Colwell P and K, DTPA extractable Fe, Cu, Zn and Mn, Organic Matter and Organic Carbon by Walkley Black	APHA 4500-NH ₃ B, APHA 4500 NO ₃ - B, APHA 4500 NO ₃ - - I/NO ₂ - -B, Thermo Scientific Method D08727 and NEMI: 9171, APHA 4500 Norg - D,
ASS-1: NAPP (includes drying and pulverising, ANC, total S)	III. Coastech Research (Canada)

Table 3-2: Physical analyses

Physical analyses
Sample preparation and sample storage allowing 3-month analytical program
Grading - with Hydrometer (includes Particle Density) Fine grain material / Coarse grain material
Emerson Class No. (Please report sub classes)
Soil water characteristic curves

3.2 RaE_{SIM} measurement

3.2.1 Assumptions and limitations

There are numerous methods that can be used to measure erosion, even with the RGS RaE_{SIM} approach. For example:

- Use 450 L of sample to place one loose sample into the flume and submit that single sample to one slope (e.g. 5%) and one rainfall event (e.g. 30 mm/hr).
- Use 1,350 L of sample for 3 x 450 L samples to measure erosion from a 5% slope for 30 mm/hr, 60 mm/hr and 90 mm/hr rainfall events
- Use 4,050 L of sample if the intent is to measure 3 slopes and 3 rainfall intensity events using new fresh sample for each run: this may be considered to present an optimal approach to measuring erosion from a sample, but it only address erosion from an as-placed sample. In reality a sample placed on a rehabilitated surface will be exposed to highly uncertain and highly variable conditions, and it simply is not possible to account for all conditions and assess them under laboratory conditions.

Providing over 4 tonnes of sample for each material type is impractical for most clients, and would require a significant investment in sampling, transport, logistics and the analysis of many samples. Even with a diligent approach like this there would still be inherent uncertainty in the results.

The primary assumptions used by RGS for this assessment are that samples are:

- placed and evaluated as loose (as placed) or compacted conditions.
- “placed onto a rehabilitated area of land” and are subjected to iterative conditions whereby the sample is subjected to:
 - 1 in 1-year common rainfall event followed by a
 - 1 in 10-year not uncommon rainfall event followed by a progressively worse and uncommon
 - 1 in 100-year rainfall event under successive conditions occurring within one week.

These conditions obviously present a highly unlikely outcome and a worst-case scenario in terms of probable erosion on a rehabilitated surface before vegetation has been able to establish and before the as placed unconsolidated and non-cohesive soil particles have had the chance to reconstitute themselves into soil peds via pedogenic reformation.

3.2.2 General approach

The RGS RaE_{SIM} is a pressurised rainfall simulator. Before the analysis of the samples it was calibrated for: rainfall intensity, the uniformity of rainfall over the flume area (spatial distribution), drop size distribution, the droplets terminal velocity, and kinetic energy. The RaE_{SIM} design, calibrations methods and operation are based on the methods developed by RGS under a series of ACARP funded research projects from 2000 to 2015 at more than 20 mines in Queensland at laboratory scale (3 m flume), small field scale (12 m flume) and small catchment scale at three mines (Khalifa, 2010).

Before erosion measurement the infiltration rate (cm/hr) of the sample in the flume was measured using a small double ring infiltrometer. The infiltration rate is greatly affected by the initial soil water content, it was considered that all the samples were around the field capacity point at the time of infiltration rate measured. Permeability is affected by porosity, the shape and size of pores, and properties that affect porosity like organic matter levels, aggregation, shrinking and swelling of clay particles, and dispersion caused by low calcium levels versus sodium and magnesium. Infiltration rate values are crucial values for numerical erosion models including MINEROSION; however, the term hydraulic conductivity should not be confused with infiltration rate

(Kirkham, 2005). Soil density core were obtained from each sample in the flume (as-placed and compacted) to verify the in-situ density of the samples before erosion measurement.

The RaE_{SIM} was used to measure the soil erodibility for the bulk soil samples. The soil erodibility factor (K-factor) is a quantitative description of the inherent erodibility of a particular soil; it is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. For a particular soil, the soil erodibility factor is the rate of erosion per unit erosion index from a standard plot. The factor reflects the fact that different soils erode at different rates when the other factors that affect erosion (e.g., infiltration rate, permeability, total water capacity, dispersion, rain splash, and abrasion) are the same. Texture is the principal factor affecting K_{fact} , but structure, organic matter, and permeability also contribute.

The soil erosion experiment was designed to measure the soil erodibilities (M-USLE & WEPP) under three different rainfall intensities (30, 60, and 90 mm/hr) on a 5% slope. A 5% slope was used as this is the same slope used in the NWRD landform and cover design assessment using SEEP/W numerical model.

The RaE_{SIM} process for Sample # 1 to Sample # 4 was to:

- Place 15 cm of < 75 mm PSD material into the 3 m x 1 m flume (**Figure 3-1**) on Day 1.
- Collect samples from the flume to measure as-placed density and measure soil infiltration rate using small double ring infiltration method (**Figure 3-1**).
- Set the RaE_{SIM} slope to 5%.
- Simulate rainfall storms on the sample using equivalent 90 mm/hr, 60 mm/hr and 30 mm/hr rainfall events on Day 2, 3 and 4: the sample is allowed to free drain and regain cohesive properties between simulation events.
- Let the sample drain and air-dry Day 5 to Day 7.
- Hand compact the loose placed samples on Day 8.
- Collect soil cores of the samples to measure as-placed density and measure the infiltration rate using a small double ring infiltration method.
- Expose the sample to the simulated rainfall storms using 90 mm/hr, 60 mm/hr and 30 mm/hr rainfall events on Day 9, 10 and 11.
- Dispose of the sample.

The RaE_{SIM} process for Sample #5, included packing the flume with competent NAF rock (**Figure 3-2** left) and then filling the voids in the rock with soil: this is the proposed cover configuration for the surface of the NWRD (**Figure 3-2** right).

The RaE_{SIM} measurements were completed on 5th November 2022.

For each RaE_{SIM} run, surface water samples are collected in 5-minute intervals over the ½ hour rainfall event. Water samples are analysed for pH, EC, major cations and anions, acidity, alkalinity, and a full suite of 0.45 µm filtered and unfiltered metal(loids).

The rainfall erosivity values were calculated accurately, using a slope length (3 metre) and slope gradient (5%), the total sediment values then can be used to calculate soil erodibilities values. During the 30-minute period of the simulated rainfall event, runoff was collected at 5-minute intervals for one minute in glass beakers. The steady state rate (Q) is calculated from the average values of the flow/minute. The amount of sediment collected in each beaker calculated by drying the water in an oven. The sediment mass was used to quantify the rate of soil erosion and thus soil erodibilities can be precisely calculated.



Figure 3-1: MRO RaESIM Sample # 1 to Sample # 4



Figure 3-2: MRO RaE_{SIM} Sample # 5 (West Hill saprock) + West Hill topsoil representing the proposed NWRD cover system

3.3 Erosion modelling inputs

3.3.1 Material specification

The measured soil quality, geochemical and physical properties of the materials (material specifications) being used to create stable landforms are critical data to obtain reliable outputs from erosion and landform evolution models (**Section 4 and 5**).

3.3.2 Landform specification

If the modelling process aims to look at long term (e.g. > 100 year) forecasts of erosion there has to be a detailed 3D DEM that provides the material properties of not only the top of the rehabilitated landform, but also underlying layers below the surface and the mine waste in the landforms that could be exposed by erosion that develops in gullies. There are challenges obtaining this type of data from a proposed WRSF landform or cover, or a TSF cover, when the project is at EIS level or FS level. Furthermore, the actual soil quality, geochemical and physical properties of the mined materials that will be placed within these landforms is highly variable and uncertain. Longer term modelling also requires reliable climate forecasts that consider climate variability and climate change and there is inherent variability and uncertainty in this core model input that obviously has significant effects on erosion.

3.3.3 Rainfall erosivity factor (R-factor)

The rainfall erosivity (R-factor) is a multi-annual average index that measures rainfall's kinetic energy and intensity to describe the effect of rainfall on sheet and rill erosion. The R-factor is one of the crucial factors in any erosion model (Liu et al., 2015). Among the factors used within erosion models, rainfall erosivity is of high importance as precipitation is the driving force of erosion and has a direct impact on the detachment of soil particles, the breakdown of aggregates, and the transport of eroded particles via runoff. A precise assessment

of rainfall erosivity for any specific site requires recordings of precipitation at short time intervals for a period of at least 50-100 years. Many erosion models frequently utilise the IFDs (Intensity-Frequency-Duration) data sets to calculate the long-term rainfall erosivity for a specific site.

The process of estimating IFDs, known as frequency analysis, is an important part of hydrological design procedures. An analysis of rainfall data from a single station is often unreliable; not temporally or spatially consistent; and should generally not be used for design purposes. Instead, a set of accurate, consistent IFD data have been derived for the whole of Australia. This work was carried out by the Bureau of Meteorology as part of the revision of Australian Rainfall and Runoff (Institute of Engineers Australia, 1987). The variables used to calculate IFDs are stored on a 0.025° latitude by 0.025° longitude grid (approx. 2.5km by 2.5km) covering Australia. Using the BoM website, when a set of coordinates is entered this system returns the IFD results for the nearest grid-point.

The IFD table (**Table 3-3**) and IFD BOM data for Mt. Rawdon were used to select a reasonable range of rainfall IFD events for the erosion measurement and was used to build the required IFD data set for MINEROSION model to run the modelling scenarios.

For the estimation of annual soil loss, MINEROSION uses the annual EI_{30} values for the nearest Australian city following Lu and Yu (2002). For storm event erosion rates estimation the Australian IFD rainfall database (Canterford et al., 1987) was used to build an average recurrence interval (ARI) database file for Central Queensland. The model then read the rainfall duration (D) associated with 100 mm/hr rainfall intensity I (default intensity) for the selected ARI. The model then calculates the EI_{30} for the selected ARI and utilise that value to estimate the soil loss for that event is estimated with the relevant L and S factors using the MUSLE equation.

This calculation is repeated using various rainfall intensities and durations and the resulting erosion rates plotted against recurrence intervals. The default calculation is done for a bare, unconsolidated soil/spoil under 100 mm/h rainstorm intensity and repeated for selected periods of consolidation and degree of vegetation cover, although any rainfall value can be used. The output can be presented as graphs and can be printed as either graphs or tables, or both. The mean annual soil loss was computed using the RUSLE, and a relationship between the average annual soil loss rate and slope length is generated for various slope gradients.

The mean annual EI_{30} is computed using the long-term average rainfall pattern for the selected location (Mt. Perry near Mt. Rawdon). The default calculation is for a bare, unconsolidated soil. Computation is repeated for soil/spoil that has been consolidated for various periods and degrees of vegetation cover for selected combinations of slope lengths and slope gradients. Mean annual soil loss rates are then plotted against slope length for selected slope gradients.

As the slope gradient, slope length and vegetation cover are the three landscape factors relevant for design and construction of post-mining landscapes that will result in acceptable (annual) erosion rates, these graphs can readily be used to derive suitable landscape design factors. It is noteworthy that MINEROSION model is still primarily using ARI concept to express the rarity of a rainfall event. BoM recently has changed its approach to preferring the use the term annual exceedance probability (AEP) instead of the ARI.

While the EI_{30} calculation method in MINEROSION model is based on a database file of durations and intensities of 1 in 2, 5, 10, 20, and 50-years ARI, extracted from the Australian IFD, and processing these EI_{30} values to calculate R factor for a specific location; Khalifa (2010) has delivered a set of GIS layers for the R-factor and 1 in 2, 5, 10, 20, and 50-year rainfall erosivity for the whole Bowen basin area at 0.05 degree resolution. Using this data the R-factor value for Mt. Rawdon mine-site is equal to 3206.5 and was used with IFD data to increase the accuracy of erosion modelling for this project.

Table 3-3: Rainfall intensity in mm/hr for various durations and return periods - Mt. Rawdon mining area.

Duration	Duration (minute)	RETURN PERIOD (YEARS)						
		1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
5 mins	5	106	137	175	199	231	275	310
6 mins	6	99	128	163	185	215	256	289
10 mins	10	81	105	134	152	176	209	236
20 mins	20	61	78	99	112	130	154	173
30 mins	30	50	64	81	91	105	125	140

Duration	Duration (minute)	RETURN PERIOD (YEARS)						
		1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
1 hour	60	33	43	54	61	70	84	94
2 hours	120	20	26	34	38	44	53	59
3 hours	180	15	19	25	28	33	40	45
6 hours	360	9	11	15	17	20	24	27
12 hours	720	5	7	9	10	12	15	17
24 hours	1440	3	4	6	7	8	10	11
48 hours	2880	2	3	3	4	5	6	7
72 hours	4320	1	2	3	3	4	5	5

3.3.4 Soil erodibility factor (K)

The soil erodibility is estimated from soil loss data measured from laboratory scale (e.g. 3 m flume), field scale (e.g. 12 m flume) or long-term catchment field plots. For this project the RGS RaE_{SIM} was used to collect measured data to calculate the erodibility factors for the MRO samples. The inter-rill erodibility values were calculated using the following formula:

$$K_i = \frac{E_i}{I \cdot Q \cdot S_f \cdot C_f}$$

where K_i (kg.s/m⁴) is an interrill erodibility coefficient related to soil properties (unknown), E_i (kg/m².s) is the interrill erosion rate (driven from the total sediment load collected from each run with 5-minute intervals), I (m/s) is the steady-state rainfall Intensity (controlled by RaE_{SIM} operator), Q (m/s) is the steady-state runoff rate (measured during the simulated rainfall events), and S_f and C_f are non-dimensional slope and cover adjustment factors, respectively, and may be calculated from (NSERL 1995):

$$S_f = 1.05 - 0.85 \exp(-4 \sin(S_2))$$

$$C_f = e^{-2.5C}$$

where S_2 is the slope in radians, and c is assigned a value equal to the rock content (fraction by volume > 2mm of the media).

The rill erodibility coefficient (K_{r3}) values were calculated using the following formula:

$$K_{r3} = \frac{E_r}{q_r^{1.6} \cdot S_3^{2.4}}$$

where E_r (g/s) is the sediment delivery rate per rill, q_r (L/min) is the flow rate per rill, and S_3 (fraction) is the rill slope.

Table 3-4: Inter-rill and rill erodibility values measured using RaE_{SIM}

Sample ID	Measured/calculated value					
	E_i (kg/m ² .s)	Rock content (%)	C_f	$10^{-6} \times K_i$ (kg.s/m ⁴)	** K_i (kg.s/m ⁴)	K_{r3}
MRO Sample #1	4.513374486E-05	13	0.7225274	926181.3	0.93	21.74
MRO Sample #1 Compacted	1.969986772E-04			2906422.2	2.91	14.13
MRO Sample #2	1.854252401E-05	8	0.818731	350905.4	0.35	23.46
MRO Sample #2 Compacted	3.706230159E-05			1067223.4	1.07	15.84
MRO Sample #3	1.503095238E-04	26	0.5220458	2380391.3	2.38	12.28
MRO Sample #3 Compacted	2.382658730E-04			5193840.4	5.19	6.19
MRO Sample #4	1.120952381E-04	23	0.5627049	2958873.2	2.96	16.44
MRO Sample #4 Compacted	1.740892857E-04			4007962.0	4.01	10.35
MRO Sample #5	2.913888889E-05	75	0.153355	595927.8	0.60	6.812

** 5% slope, $S_f = 0.353905$

The data collected from the rainfall simulation/erosion experiments (take place between 12th September to 5th of November 2022) and the calculated interrill and rill erodibilities are presented in Table 3-4 ; the interrill erodibility values [$10^{-6} \times K_i$ (kg.s/m⁴)] for MRO samples No 1, 2, 3 and 4 are 0.93, 0.35, 2.38, and 2.96 respectively. These values increased with compaction to be 2.91, 1.07, 5.19, 4.01.

The value of the interrill erodibility for sample No.5 experiment (NAF rocks cover with a thin layer of topsoil) is equal to 0.60 ($10^{-6} \times K_i = 0.01$ kg.s/m⁴), with most of the rainwater came out as a seepage water from the bottom of the flume, and minimum amount of runoff.

These values were used to calculate the erodibility values (MUSLE) for erosion modelling using MINErosion 3 & 4 (Khalifa, 2010).

MINErosion 3.4 was developed by So et al, (2004), Khalifa (2010) and So et al, (2018); the model can accurately predict potential erosion rates from laboratory parameters measured using a tilting flume-rainfall simulator facility and be used to select key design criteria (slope gradient, slope length and vegetation cover required) for the construction of post-mining landscapes that will result in acceptable erosion rates.

4 Pedolith and saprolith results

4.1 Particle size, density, porosity

Dry grading was done on the samples (**Figure 4-1**) prior to sieving to obtain < 2.36 mm PSD samples for the soil quality, geochemical and physical analyses. Dry grading results verify the as-provided samples of topsoil and subsoil are dominated by < 63 mm PSD material.

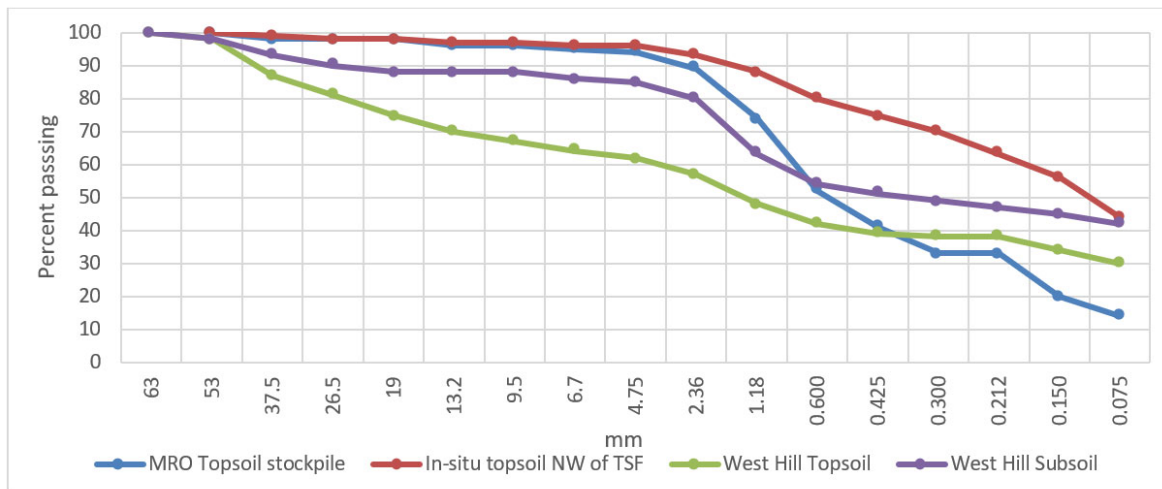


Figure 4-1: Dry grading results

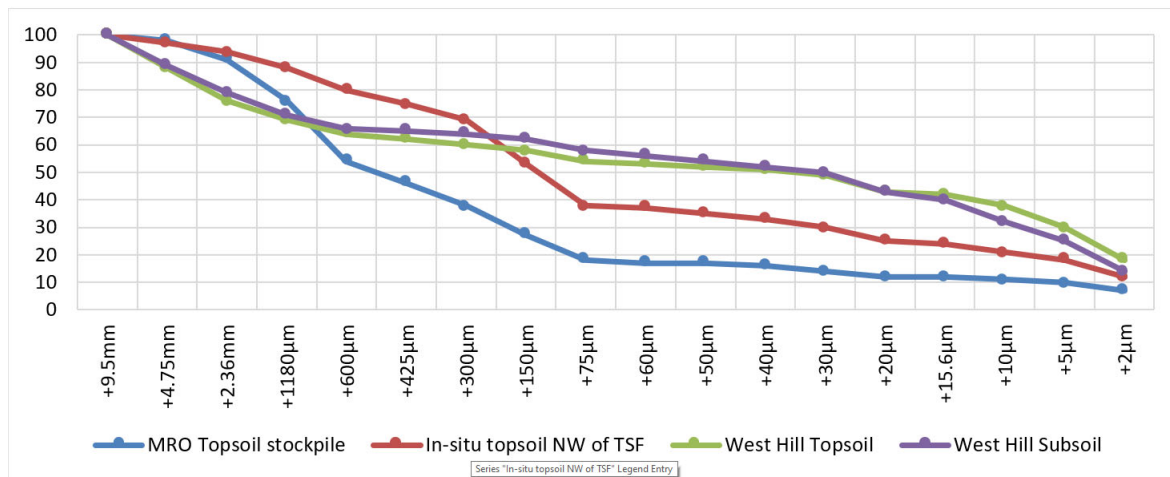


Figure 4-2: Wet grading and hydrometer results

The process of soil erosion involves three main steps or sub-processes: soil particle detachment, transportation, and deposition. The detachment of soil particles decreases as particle size either decreases or increases beyond the range of 20–200 μm (Ampontuah et al., 2006, Di Stefano and Ferro, 2002, Yang et al., 2018). Above this range, it is more difficult to detach and transport particles because of the particle mass, and below this range, cohesive forces counter particle detachment. Soil erodibility is low for clay-rich soils with a low shrink-swell capacity, because clay particles mass together and form large aggregates that resist detachment and transport processes (Belasri et al., 2017). Therefore, the average soil loss is negatively correlated with clay content but positively correlated with very fine sand and silt plus very fine sand contents.

Consequently, soil particles with diameters in the size fractions of silt, fine and very fine sand are more easily eroded. Therefore, we will find that the values of soil erodibilities for samples # 3 & 4 (Loam and Silt Loam) are higher than these values for samples # 1 & 2 (Loamy Sand and Sandy Loam).

Table 4-1: Physical results

Soil Properties / Analyte grouping/Analyte	Sample_01 Topsoil stockpile	Sample_02 NW TSF In-situ soil	Sample_03 West Hill Soil	Sample_04 West Hill Saprolite
Clay%	7	12	18	14
Silt%	10	25	35	42
Sand%	70	55	21	21
Gravel %	13	8	26	23
Texture Class	Loamy Sand	Sandy Loam	Loam	Silt Loam
Particle Density (g/cm ³)	2.7	2.5	2.47	2.4
Bulk Density (g/cm ³) – loose as-placed	1.56	1.38	1.14	1.16
Bulk Density (g/cm ³) – compacted samples	1.88	1.80	1.51	1.32
Soil Porosity for loose samples (%)	42	44	53	51
Soil Porosity for compacted samples (%)	30	28	38	45

* These values measured using the double ring infiltrometer on the soil loaded on the RGS – RaE_{SiM} flume/specimen container for the normally packed samples and compacted samples.

4.2 Laser sizing

Laser sizing was done on water samples from the RaE_{SiM} measurement to quantify the PSD of the fines in solution. Results verify distinct distributions of clay particles in the samples and an increase in the proportion of fines for the stockpiled soil when it is compacted (**Figure 4-4**): this is due to the breakdown of the soil peds enabling the mobilisation of the clay and silt fractions. Full results are in the **Attachment 11.3.4**.

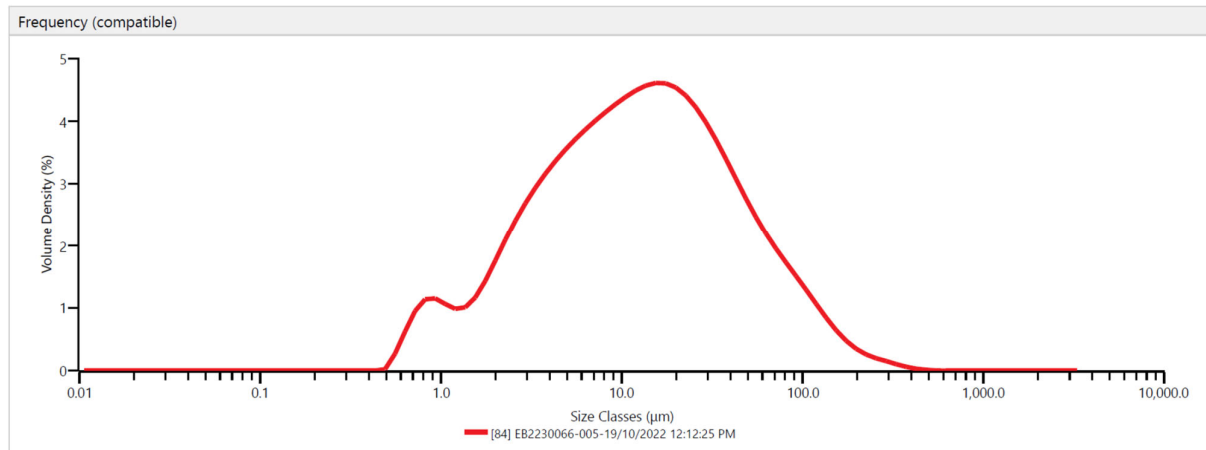


Figure 4-3: Stockpiled soil (Sample #1) laser sizing as-placed 30 mm/hr

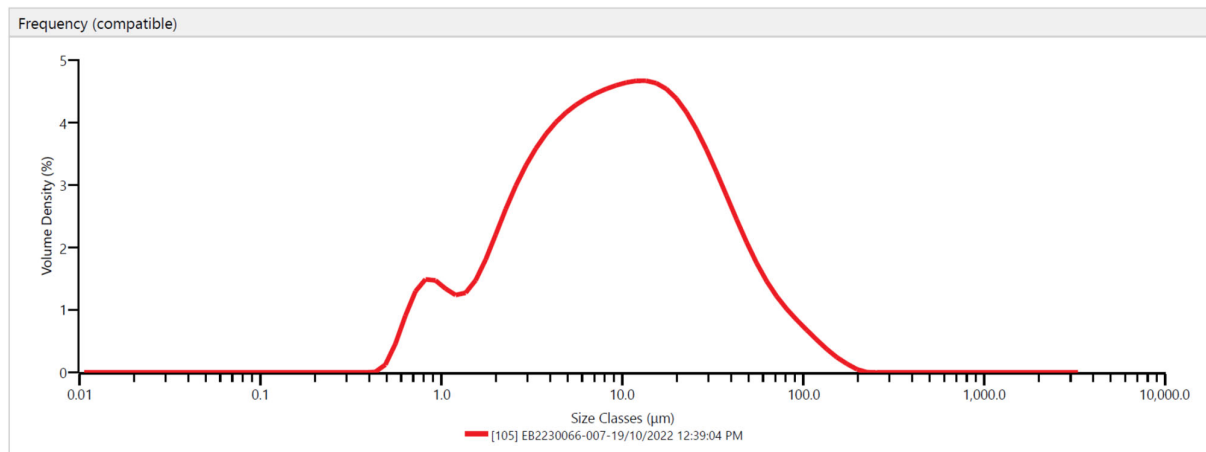


Figure 4-4: Stockpiled soil (Sample #1) laser sizing compacted 30 mm/hr

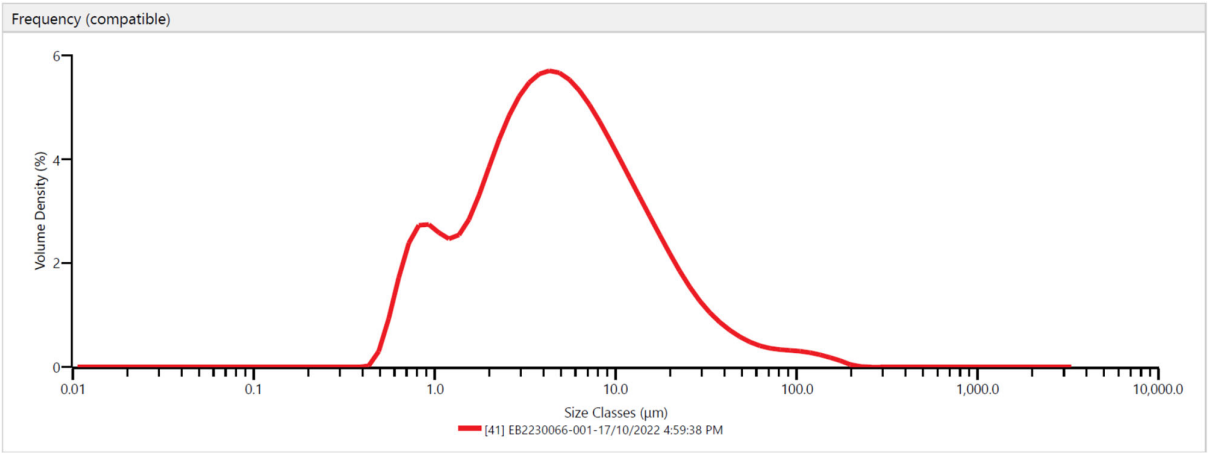


Figure 4-5: In-situ soil (Sample #2) laser sizing as-placed 30 mm/hr

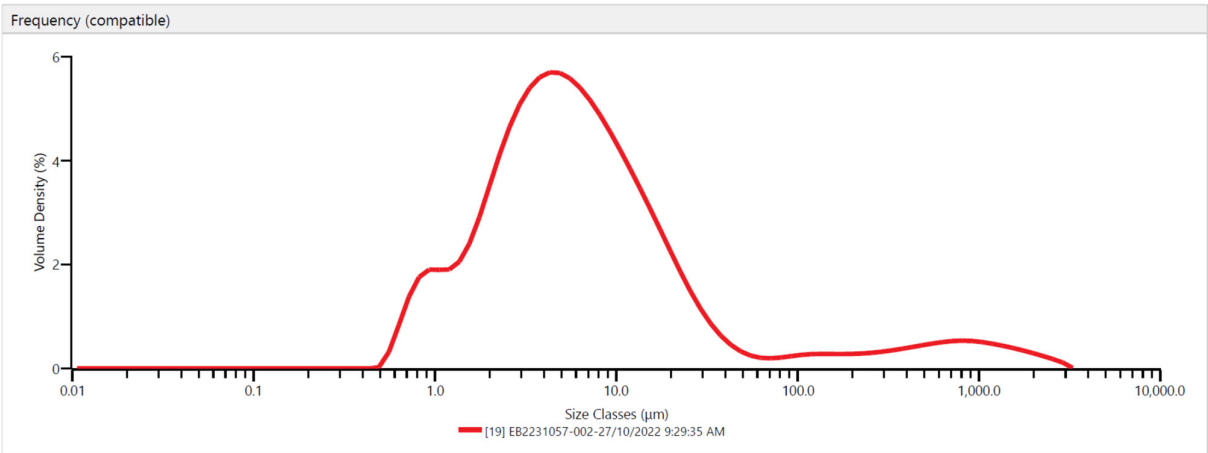


Figure 4-6: West Hill soil (Sample #3) laser sizing as-placed sample 30mm/hr

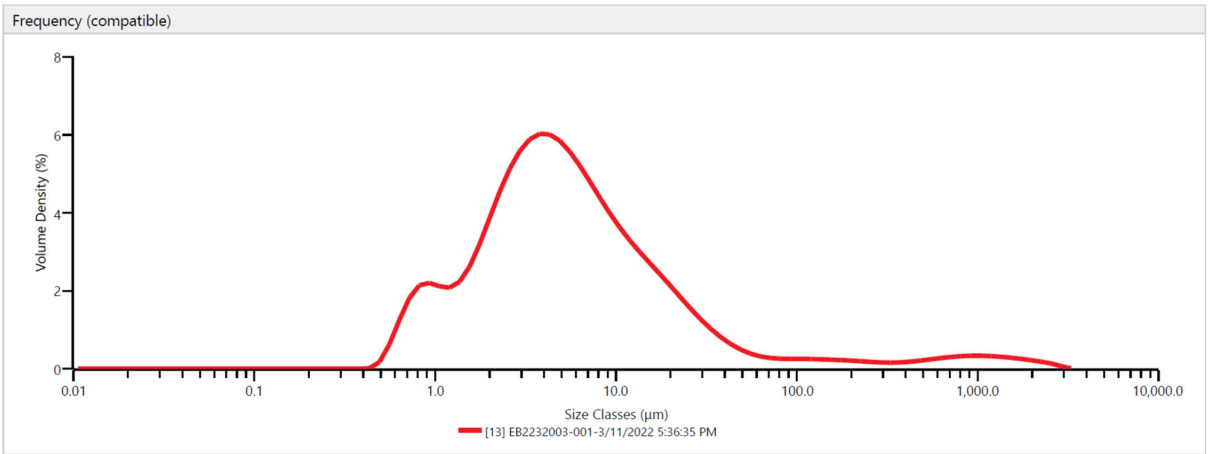


Figure 4-7: West Hill saprolite (Sample #4) laser sizing as-placed sample

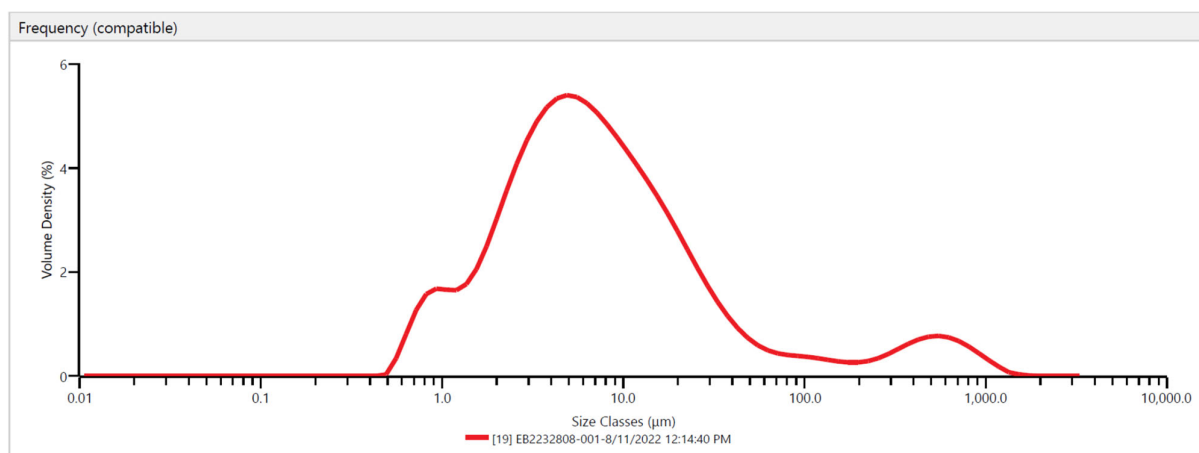


Figure 4-8: West Hill saprock and West Hill soil (Sample #5) laser sizing as-placed sample 30 mm/hr

4.3 Permeability

The effect of the compaction process is obvious on diminishing the infiltration rate for each sample in a significant way (**Figure 4-9**). Connections between soil erosion and infiltration processes have been discussed in several previous studies (Agassi et al., 1994, Wang et al., 2013, Yu et al., 2006), soil with high permeability (Infiltration rate) is linked to reduced runoff and soil loss. MINEROSION model is using the rational method (1908) for its run-off generation module.

Table 4-2: Infiltration rate (cm/hr) measured using the double ring infiltrometer for MRO samples

Sample No.	Infiltration Rate (cm/hr)	Rating
Topsoil stockpile Sample # 1	2.5	Moderate
Topsoil stockpile Sample # 1 Compacted	1.8	Moderately Slow
Sample # 2	2.7	Moderate
Sample # 2 Compacted	1.1	Moderately Slow
Sample # 3	5.3	Moderate
Sample # 3 Compacted	2.8	Moderate
Sample # 4	6.0	Moderate
Sample # 4 Compacted	2.7	Moderate



4.4 Soil water characteristic curves

Soil water characteristics quantify a soils potential to store, retain moisture and release. These values are used in cover design assessment using models such as SEEP/W. Volumetric water content and derived Van-Genuchten parameters were obtained for the < 2 mm PSD soil, saprolite and saprock samples. Full results from SWC are in **Attachment 11.5.1**.

Table 4-3: Volumetric water content

Client ID	Volumetric Moisture Content (%; v/v)					Derived van Genuchten Parameters			
	0 kPa	10 kPa	33 kPa	100 kPa	1,500 kPa	a (1/cm)	N (-)	qs (cm ³ /cm ³)	qr (cm ³ /cm ³)
Sample #1	34.86	21.18	18.37	15.03	8.94	0.165	1.168	0.3489	0.0000
Sample #2	35.53	20.77	17.29	13.24	6.66	0.099	1.218	0.3554	0.0000
Sample #3	35.11	32.74	28.16	25.04	20.03	0.017	1.142	0.3534	0.0643
Sample #4	38.40	32.37	29.92	25.60	18.12	0.025	1.124	0.3830	0.0000

4.5 Emerson classification

Soil samples analysed for the Emerson Aggregate test (EAT) were described as clayey to silty clay. The samples are distributed among Emerson classes from Class 2 (slaking, some dispersion) for sample 1 & 2 to Class 6 (Complete flocculation) for sample 3 & 4.

Table 4-4: Emerson class results

Soil Properties / Analyte grouping/Analyte	Sample_01 Topsoil stockpile	Sample_02 NW TSF In-situ soil	Sample_03 West Hill Soil	Sample_04 West Hill Saprolite
Emerson class	2	2	6	6
Emerson aggregate class description	Slaking, some dispersion	Slaking, some dispersion	Complete flocculation	Complete flocculation

4.6 Column settlement test

Column settlement tests were undertaken by collecting 200 mL of water at 1, 5, 10, 15, 25 and 30 minutes. These samples were mixed and poured into a 1 L volumetric cylinders with photos taken at 0, 1, 2, 3, 4, 5, 6, 24 and 48 hours to document the rate of bedload and suspended sediment settlement and water clarity.

Column settlement results for Stockpiled Topsoil (Sample #1), In-situ Soil NW of the TSF (Sample 2), West Hill Soil (Sample #3) and West Hill Saprolite (Sample #4) and West Hill Saprock (Sample #5) verify:

- rapid settlement of Sample #1 (clarity in 24 hours) (**Figure 4-9**) even though the ESP results are > 30%
- moderate settlement of Sample #3 and Sample #5 (reasonable clarity at 24 hours) (**Figure 4-11** and **Figure 4-13**)
- low settlement in Sample #2 and Sample #4 (no clarity at 48 hours) (**Figure 4-10** and **Figure 4-12**).

Table 4-5: Sodic soil assessment

Sodic soil assessment	Sample_01 Topsoil stockpile	Sample_02 NW TSF In-situ soil	Sample_03 West Hill Soil	Sample_04 West Hill Saprolite
Sample Colour (Munsell)	Olive Brown (2.5Y 4/3)	Dark Gray (2.5Y 4/1)	Dark Greyish Brown (10YR 4/2)	Very Dark Greyish Brown (10YR 3/2)
Texture Class	Loamy Sand	Sandy Loam	Loam	Silt Loam
Emerson class	2	2	6	6
Emerson aggregate class description	Slaking, some dispersion	Slaking, some dispersion	Complete flocculation	Complete flocculation
% Clay	7	12	18	14
EC in 1:5 _{Water} $\mu\text{S}/\text{cm}$	177	50	50	36
Exchangeable sodium percentage	33.9	12.2	<0.2	1.0
Column settlement	< 24 hours	> 48 hours	< 48 hours	> 48 hours

Reliable evaluation of erosion due to the sodic and saline potential of a sample is an inexact science and requires the data from a wide range of chemical and physical analytical methods to draw reasonable conclusions (**Table 4-5**).

The column settlement analyses have verified that the clay fraction in the soil to the NW of the TSF (Sample #2) is prone to dispersive behaviour and remains in solution for > 48 hours.



Figure 4-9: Suspended sediment settlement columns at 0 hours to 48 hours for MRO Sample #1.



Figure 4-10: Suspended sediment settlement columns at 0 hours to 48 hours for MRO Sample #2.



Figure 4-11: Suspended sediment settlement columns at 0 hours to 48 hours for MRO Sample #3.



Figure 4-12: Suspended sediment settlement columns at 0 hours to 48 hours for MRO Sample #4.



Figure 4-13: Suspended sediment settlement columns at 0 hours to 48 hours for MRO Sample #5.

4.7 Soil quality

A summary of soil chemical and fertility analyses is in **Table 4-6** and full results from ALS are in **Attachment 11.3.1**. The results verify the soil types have different quality and this may become significant during detail design of the cover systems. None of the samples analysed are unsuitable for rehabilitation of the TSF or NWRD. Samples #1, #3 and #4 have neutral CaCl_2 pH values: Sample #2 has mildly acid pH that is due to the presence of organic acid and soluble or exchangeable aluminium. All samples have low EC ($< 177 \mu\text{S/cm}$).

The stockpiled soil (Sample #1) is nitrogen, potassium, organic matter, and organic carbon deficient, but phosphorous rich compared with the In-situ soil (Sample #2) and soil from West Hill (Sample #3).

The stockpiled soil (Sample #1) has the highest ESP (33.9%) but does not display dispersive behaviour in the column settlement analysis (**Figure 4-9**). The In-situ soil (Sample #2) only has 0.5 meq/100g exchangeable sodium, but due because it is deficient in calcium and magnesium it still has an ESP of 12.2% and does remain dispersive for over 48 hours (**Figure 4-10**). The West Hill soil and saprolite samples have very low exchangeable sodium and high exchangeable calcium that contributes to very low ESP. The column settlement analyses are consistent and non-dispersive in Sample #3 and Sample #5 but are dispersive in Sample #4.

Table 4-6: MRO soil quality results samples analyses

Soil Properties / Analyte grouping/Analyte	Sample_01 Stockpiled soil	Sample_02 In-situ soil NW of TSF	Sample_03 West Hill soil	Sample_04 West Hill saprolite
Initial Moisture Content (%)	5.8	9.6	11.9	10.2
Sample Colour (Munsell)	Olive Brown (2.5Y 4/3)	Dark Gray (2.5Y 4/1)	Dark Greyish Brown (10YR 4/2)	Very Dark Greyish Brown (10YR 3/2)
pH in 1:5 _{Water}	9.0	5.9	8.0	6.7
pH 0.01M CaCl_2 extract	7.5	4.7	7.2	6.0
EC in 1:5 _{Water} $\mu\text{S/cm}$	177	50	50	36
Chloride (mg/kg)	140	20	<10	<10
Exchangeable Calcium (meq/100g)	2.7	1.6	8.8	7.2
Exchangeable Magnesium (meq/100g)	5.3	1.7	3.0	3.8
Exchangeable Potassium (meq/100g)	<0.2	<0.1	<0.2	0.2
Exchangeable Sodium (meq/100g)	4.1	0.5	<0.2	0.1
Cation Exchange Capacity (meq/100g)	12.1	4.1	12.0	11.3
Exchangeable Sodium Per- cent (%)	33.9	12.2	<0.2	1.0
Calcium/Magnesium Ratio	0.5	0.9	2.9	1.9
Magnesium/Potassium Ratio	----	----	----	19.6
Organic Matter (%)	<0.5	1.1	1.5	2.5
Total Organic Carbon (%)	<0.5	0.6	0.8	1.4
Soil Fertility				
Ammonia as N (mg/kg)	<20	<20	<20	<20
Nitrite as N (Sol.) (mg/kg)	<0.1	<0.1	<0.1	<0.1
Nitrate as N (Sol.) (mg/kg)	0.7	18.1	3.2	7.0
Nitrite + Nitrate as N (Sol.) (mg/kg)	0.7	18.1	3.2	7.0
Total Kjeldahl Nitrogen as N (mg/kg)	<20	370	380	980
Total Nitrogen as N (mg/kg)	<20	390	380	990
Total Phosphorus as P (mg/kg)	404	92	158	216
Bicarbonate Ext. P (Colwell) (mg/kg)	12	<5	<5	<5
Bicarbonate Extractable K (Colwell) (mg/kg)	<100	<100	183	227

ED092: DTPA Extractable Metals				
Copper (mg/kg)	<1	<1	<1	1
Iron (mg/kg)	11	78	14	33
Manganese (mg/kg)	<1	14	30	26
Zinc (mg/kg)	<1	<1	2	5

** Exchangeable Cations were measured by ED006: Exchangeable Cations on Alkaline Soils method for Sample No. 1 and Sample No 3; While ED007: Exchangeable Cations method was used for Samples 2 & 4.

5 Water quality results

For this project RGS collected water samples during erosion measurements to quantify the quality and volume of the water that will flow off the surface and the water that may flow laterally through the sample. Lateral flow is dependent on the properties of the material being analysed and typically increases with particle size, porosity, and permeability.

The water quality results can be utilised to update surface water source terms for the MRO water balance and water quality model (**Attachment 11.2**). The measured data can also be used to quantify surface runoff quality to establish appropriate water quality objectives for post closure performance monitoring and environmental compliance.

Water quality flowing from rehabilitated land is the primary outcome that qualifies if the rehabilitation work has been successful. The surface water quality data verify which elements will be present and the concentrations they are likely to be at, and therefore whether the surface runoff will comply with livestock, irrigation or freshwater aquatic ecosystem guidelines.

For Sample #1 (Topsoil stockpile) and Sample #2 (In-situ soil NW of TSF) 2 x 1 L surface water samples were collected at 5-minute intervals to quantify changes in water quality within a 30-minute storm event at 30, 60 and 90 mm/hr intensity. The pH, EC, and turbidity were measured in each 1 L sample, and splits from each sample were combined for the column settlement analysis (**Figure 4-9** and **Figure 4-10**). Each sample was analysed for pH, EC, TDS, TSS, major ions, and 38 unfiltered and filtered metal(loids).

For Sample #3 (West Hill soil) and Sample #4 (West Hill saprolite) surface water samples were collected at 5-minute intervals to quantify changes in water quality within a 30-minute storm event at 30, 60 and 90 mm/hr intensity. The pH, EC, and turbidity were measured in each 1 L sample. Splits from each sample were combined for the column settlement analysis (**Figure 4-11** and **Figure 4-12**) and the water quality analyses that included pH, EC, TDS, TSS, major ions, and 38 unfiltered and filtered metal(loids).

For Sample #5 (West Hill saprock and West Hill soil) surface water samples were collected at 5-minute intervals to quantify changes in water quality within a 30-minute storm event at 30, 60 and 90 mm/hr intensity. The pH, EC, and turbidity were measured in each 1 L sample. Splits from each sample were combined for the column settlement analysis (**Figure 4-13**) and the water quality analyses that included pH, EC, TDS, TSS, major ions, and 38 unfiltered and filtered metal(loids).

Full RaESIM water quality results from ALS are in **Attachment 11.3.3**.

5.1 0.45 µm filtered major ions

Major ions concentrations for Sample #1 (**Table 5-1**) and Sample#2 (**Table 5-2**) are summarised as minimum, average and maximum values for all (5-minute interval) samples for the 30 60 and 90 mm/hr events. All water quality results verify neutral to mildly alkaline pH and low to moderate EC (366 to 1,620µS/cm).

In Sample #1 and Sample #3 and #4 from the West Hill the salinity is distributed amongst all major ions. In contrast, Sample #2 is dominated by sodium chloride and sulfate supporting its dispersive nature (**Figure 4-10**).

Table 5-1: Topsoil stockpile Sample #1

Topsoil stockpile_Sample #1	Unit	Minimum	Average	Maximum
pH	pH Unit	8.0	8.0	8.3
Electrical Conductivity @ 25°C	µS/cm	384.0	440.4	631.0
Total Solids	mg/L	830.0	3717.1	17600.0
Bicarbonate Alkalinity as CaCO ₃	mg/L	60.0	71.1	89.0
Total Alkalinity as CaCO ₃	mg/L	60.0	71.1	89.0
Acidity as CaCO ₃	mg/L	11.0	7.4	41.0
Sulfate as SO ₄ - Turbidimetric	mg/L	47.0	54.2	68.0
Chloride	mg/L	37.0	54.4	109.0
Calcium	mg/L	12.0	11.8	67.0
Magnesium	mg/L	16.0	20.8	192.0
Sodium	mg/L	51.0	77.9	160.0
Potassium	mg/L	6.0	9.1	83.0
Fluoride	mg/L	0.9	1.0	1.5

Table 5-2: In-situ topsoil NW of TSF_Sample #2

In-situ topsoil NW of TSF_Sample #2		Minimum	Average	Maximum
pH Value	pH Unit	6.7	7.5	7.8
Electrical Conductivity @ 25°C	µS/cm	366.0	379.4	417.0
Total Solids	mg/L	2370.0	6262.5	22500.0
Bicarbonate Alkalinity as CaCO ₃	mg/L	25.0	47.3	69.0
Total Alkalinity as CaCO ₃	mg/L	25.0	47.3	69.0
Acidity as CaCO ₃	mg/L	3.0	6.9	21.0
Sulfate as SO ₄ - Turbidimetric	mg/L	44.0	46.9	51.0
Chloride	mg/L	47.0	52.1	57.0
Calcium	mg/L	6.0	13.2	20.0
Magnesium	mg/L	7.0	9.8	12.0
Sodium	mg/L	42.0	47.6	64.0
Potassium	mg/L	2.0	2.6	4.0
Fluoride	mg/L	0.2	0.5	0.6

Table 5-3: West Hill Soil Sample #3

West Hill Soil_Sample#3		Average		
		30 mm/hr	60 mm/hr	90 mm/hr
pH Value	pH Unit	8.02	8.02	8
Electrical Conductivity @ 25°C	µS/cm	628	689	737
Total Solids	mg/L	2050	2490	1810
Bicarbonate Alkalinity as CaCO ₃	mg/L	80	82	86
Total Alkalinity as CaCO ₃	mg/L	80	82	86
Acidity as CaCO ₃	mg/L	3	3	3
Sulfate as SO ₄ - Turbidimetric	mg/L	66	68	70
Chloride	mg/L	96	113	124
Calcium	mg/L	43	49	49
Magnesium	mg/L	31	29	30
Sodium	mg/L	59	65	73
Potassium	mg/L	4	5	6
Fluoride	mg/L	0.2	0.2	0.2

Table 5-4: West Hill Saprolite Sample #4

West Hill Saprolite_Sample #4		Average	Average	Average
		30 mm/hr	30 mm/hr	30 mm/hr
pH Value	pH Unit	7.85	7.78	7.83
Electrical Conductivity @ 25°C	µS/cm	498	396	407
Total Solids	mg/L	2190	2130	1620
Bicarbonate Alkalinity as CaCO ₃	mg/L	66	56	54
Total Alkalinity as CaCO ₃	mg/L	66	56	54
Acidity as CaCO ₃	mg/L	4	4	5
Sulfate as SO ₄ - Turbidimetric	mg/L	63	63	62
Chloride	mg/L	63	38	41
Calcium	mg/L	33	28	24
Magnesium	mg/L	25	24	19
Sodium	mg/L	56	44	45
Potassium	mg/L	4	4	3
Fluoride	mg/L	<0.1	<0.1	<0.1

5.2 0.45 µm filtered metal(oids)

The 0.45 µm filterable metal(loid) fraction is applicable to the evaluation of freshwater and marine ecosystems (and other) beneficial uses including potable water, irrigation, or stock watering.

Metal(loids) are often discussed in terms of being soluble or dissolved. This is technically incorrect and refers to metal(loid) concentrations that have been measured using a 0.45 µm filter, or 0.1 µm filter: these metals(loids) are the filterable fraction. Some metal(loids) may also have different chemical species e.g. Arsenic III and Arsenic V or Chromium III and Chromium VI.

The 0.45µm fraction in all samples is limited to small list of elements including aluminium, barium, copper, rubidium, manganese, molybdenum, and strontium. All elements are present at low ppb concentrations. Strontium is consistently the highest filtered metal(loid) at up to 0.337 mg/L.

The filterable concentrations for both surface runoff and seepage can be used to update future iterations of the MRO final void water balance and water quality model (**Attachment B in Section 11.2**).

5.3 Total (unfiltered) metal(loids)

Total unfiltered metal(loids) include the filterable fraction and the solid phase where the metal(loids) are present as exchangeable, carbonate, oxide, sulfide, or silicate fractions.

The interpretation of the unfiltered fraction of metal(loids) in water may become significant if sediment laden water is being consumed by livestock or the water is being transferred from a dam to farmland.

The results for Sample #1 and #2 using 5-minute interval samples verify that the total unfiltered metal(loid) concentrations are correlated with the total sediment concentration (TSC) i.e. when the TSC is higher so are concentrations of metal(loids). This is because the metal(loids) are present on, and within the;

- clay / silt particle size fractions within the suspended sediment
- the silt / sand size fractions within the denser suspended/bedload sediment mass.

Stockpiled Topsoil Sample #1 was analysed for 38 metal(loids). 27 of these elements are present at trace concentrations < 1.0 mg/L and 11 were present at > 1.0 mg/L (Al, Ba, Ce, Fe, La, Mn, Ne, Ti, V, Yt and Zn). The highest concentrations were 138 to 376 mg/L and 232 to 653 mg/L for Al and Fe from first flush events decreasing to 22 to 30 mg/L and 39 to 57 mg/L for Al and Fe at the end of each run. The analytical results for total (unfiltered) metal(loids) are in **Section 11.2.1**.

In-situ soil NW of TSF Sample #2 were analysed for 38 metal(loids). 31 of these elements are present at trace concentrations < 1.0 mg/L and 6 were present at > 1.0 mg/L (Al, Ba, Ce, Fe, Mn and Ti). The highest concentrations were 61 to 276 mg/L and 69 to 301 mg/L for Al and Fe from first flush events decreasing to 23 to 26 mg/L and 27 to 46 mg/L for Al and Fe at the end of each run. The analytical results for total (unfiltered) metal(loids) are in **Section 11.2.2**

West Hill soil, saprolite and saprock Sample #3, #4 and #5

For these samples a composite water sample was analysed for 38 metal(loids). 35 of these elements are present at trace concentrations < 1.0 mg/L and 3 were present at > 1.0 mg/L (Al, Fe and Mn). The highest concentrations were 118 mg/L and 136 mg/L for Al and Fe and from first flush events and 5.7 mg/L for manganese. The analytical results for total (unfiltered) metal(loids) are in **Section 11.2.3**.

6 Measured RaE_{SIM} erosion rates

The RaE_{SIM} analyses provide:

- measured erosion rates over time
- total peak erosion mass measured using oven dried water samples (RGS)
- total peak erosion mass measured using total sediment (ALS)
- data to derive the soil erodibility factor
- surface water quality
- seepage water quality.

One litre (1 L) surface water samples are collected at defined times over the duration of each RaE_{SIM} run. The time to fill a 1 L beaker is recorded and the sample is then oven dried to drive off the water so the sediment mass can be measured. Using this method peak storm event erosion mass and peak cumulative erosion mass from back-to-back storm events can be defined. Peak erosion measurements reflect actual erosion from a sample under laboratory conditions with defined slopes and rainfall intensity and duration. The results provide one set of data that is used collectively to provide modelled erosion rates over time.

The 30 mm/hr rainfall event (**Figure 6-1**) on:

- as placed in-situ soil from NW of the TSF (Sample #2) lost the equivalent of 0.53 t/ha,
- as placed soil and saprolite (Sample #1, 3, and 4) lost the equivalent of 0.18 t/ha to 0.37 t/ha,
- the proposed as placed West Hill saprock and West Hill soil cover lost the equivalent of 0.15 t/ha.

The 60 mm/hr rainfall event (**Figure 6-1**) on:

- as placed in-situ soil from NW of the TSF (Sample #2) lost the equivalent of 1.3 t/ha,
- as placed soil and saprolite (Sample #1, 3, and 4) lost the equivalent of 0.37 t/ha to 0.61 t/ha,
- the proposed as placed West Hill saprock and West Hill soil cover lost the equivalent of 0.45 t/ha.

The 90 mm/hr rainfall event (**Figure 6-1**) on:

- as placed in-situ soil from NW of the TSF (Sample #2) lost the equivalent of 0.5 t/ha,
- as placed soil and saprolite (Sample #1, 3, and 4) lost the equivalent of 0.45 t/ha to 1.63 t/ha,
- the proposed as placed West Hill saprock and West Hill soil cover lost the equivalent of 0.66 t/ha.

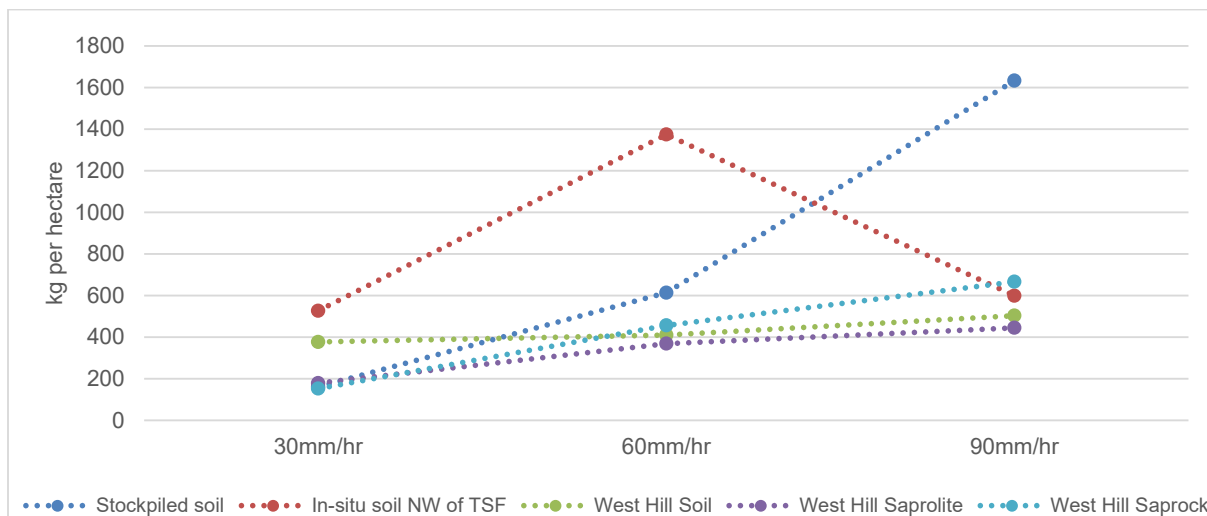


Figure 6-1: Discrete event erosion measurement

The cumulative measured peak soil loss (**Figure 6-2**) for three subsequent back-to-back storm events (30 mm/hr, 60 mm/hr and then a 90 mm/hr event) conducted over 5 days was:

- 0.99 tonnes for the West Hill saprolite (**Figure 3-1**),
- 1.27 tonnes for the West Hill saprock and West Hill soil cover (**Figure 3-2**),
- 1.29 tonnes for the West Hill soil (**Figure 3-1**),
- 2.40 tonnes of for Stockpiled soil (**Figure 3-1**) and,
- 2.50 tonnes for the In-situ soil from NW of TSF (**Figure 3-1**).

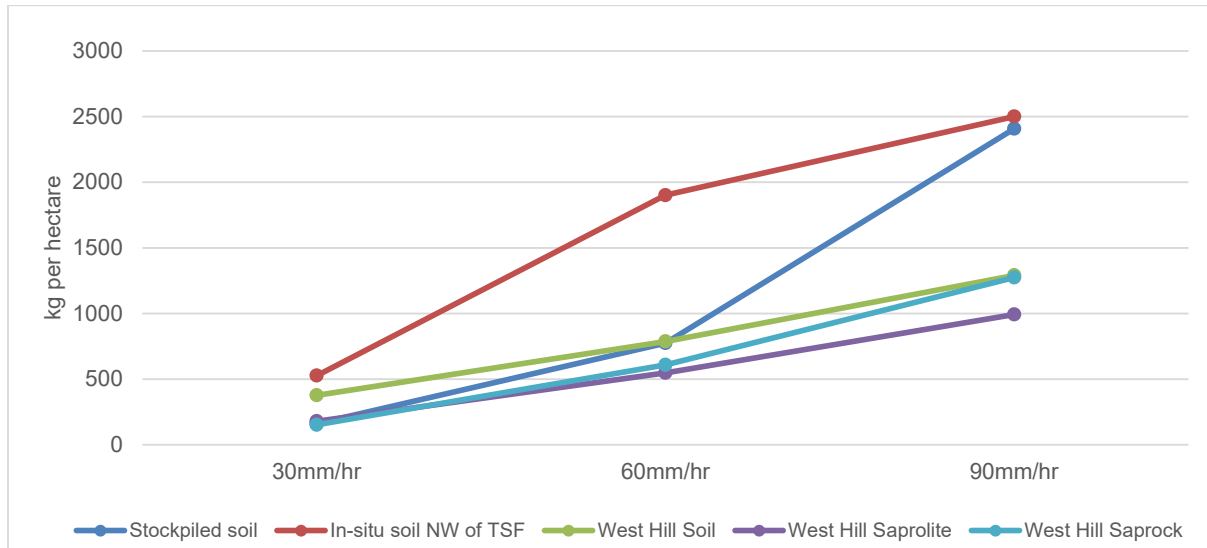


Figure 6-2: Cumulative erosion measurement

7 MINErosion modelling results

The erosion rates discussed in this section of the report apply to the use of a 5% slope that is proposed as the upper slope of the soil cover system proposed to be constructed on the top tier of the NWRD. The data from this study can also be applied to the TSF cover system that is proposed to be built on the tailings beach.

Soil cover systems are not proposed to be developed on the angle of repose NAF rock armoured slopes or the final TSF embankments.

7.1 Event-based soil loss (t/ha) prediction using MINErosion model

For the estimation of event-based erosion rates MINErosion utilises the relationship between the recurrence interval of rainstorm intensity (probability of occurrence) and the rate of erosion. For any given rainfall intensity storm duration and its recurrence interval can be estimated using the IFD (intensity-frequency-duration) curve for the location.

Event-based erosion rates are done using MINErosion by selecting rainfall intensity from 30 mm / hr to 100 mm/hr events and rainfall duration from 20 to 100 minutes and applying intensity and duration to slope angle (0 to 60%) and slope length (1 to 130 m).

BOM data and or Storm EI_{30} is calculated for the storm of a given intensity, duration, and recurrence interval. Soil loss for that event is estimated with the relevant length (L) and slope (S) factors using the MUSLE equation. This calculation is repeated using various rainfall intensities and durations and the resulting erosion rates plotted against recurrence intervals.

A selection of predicted event-based soil loss (t/ha) for MRO Samples #1 to #5 using a 5% slope were done for 1 to 50 ARI, 100 and 60 mm events using the following scenarios.

- Scenario 1: Bare Unconsolidated as-placed soil
- Scenario 2: 10% Veg. cover (Stoloniferous grass) & 1 Year Consolidation time
- Scenario 3: 20% Veg. cover (Stoloniferous grass) & 2 Year Consolidation time
- Scenario 4: 30% Veg. cover (Stoloniferous grass) & 5 Year Consolidation time
- Scenario 5: 10% Veg. cover (Tussocky grass) & 1 Year Consolidation time
- Scenario 6: 20% Veg. cover (Tussocky grass) & 2 Year Consolidation time
- Scenario 7: 30% Veg. cover (Tussocky grass) & 5 Year Consolidation time

Modelled event-based erosion rates for discrete storm events (**Table 7-2** and **Table 7-1**) on:

- as-placed stockpiled soil (Sample #1) were;
 - 0.4 to 3.1 t/ha for a 100 mm/hr event,
 - 0.2 to 1.6 t/ha for a 60 mm/hr event,
- in-situ soil NW of the TSF (Sample #2) were;
 - 0.4 to 3.1 t/ha for a 100 mm/hr event,
 - 0.2 to 1.5 t/ha for a 60 mm/hr event,
- the proposed West Hill saprock and West Hill soil cover system had erosion rates of;
 - 0.2 to 1.6 t/ha for a 100 mm/hr event,
 - 0.2 to 0.8 t/ha for a 60 mm/hr event.

The results for the 50 year ARI events for each sample and each scenario document the effect that time (resulting in increasing soil cohesion and the reformation of soil peds) and increasing vegetation cover is likely to have on increasing soil stability and reducing erosion (**Figure 7-1** and **Figure 7-2**).

Table 7-1: MINErosion event-based soil erosion modelling results for 1 x 100 mm rainfall event occurring

	ARI (Year)	Duration (minutes)	Event-based Soil loss (ton/ha)						
			Scenario 1 Bare Unconsolidated soil	Scenario 2 10% Veg. cover (Stoloniferous grass) & 1 Year Consolidation time	Scenario 3 20% Veg. cover (Stoloniferous grass) & 2 Year Consolidation time	Scenario 4 30% Veg. cover (Stoloniferous grass) & 5 Year Consolidation time	Scenario 6 10% Veg. cover (Tussocky grass) & 1 Year Consolidation time	Scenario 6 20% Veg. cover (Tussocky grass) & 2 Year Consolidation time	Scenario 7 30% Veg. cover (Tussocky grass) & 5 Year Consolidation time
Sample#1 As-placed stockpiled top-soil	1	5.8	0.397	0.116	0.055	0.020	0.174	0.095	0.035
	2	12.0	0.822	0.239	0.113	0.042	0.360	0.198	0.073
	5	19.5	1.335	0.389	0.184	0.068	0.584	0.321	0.119
	10	25.0	1.712	0.499	0.235	0.087	0.749	0.412	0.153
	20	34.0	2.329	0.678	0.320	0.118	1.019	0.560	0.208
	50	46.0	3.150	0.917	0.433	0.159	1.378	0.758	0.281
Sample #1 Compacted stockpiled top-soil	1	5.8	0.452	0.132	0.062	0.023	0.198	0.109	0.040
	2	12.0	0.936	0.273	0.129	0.047	0.409	0.225	0.084
	5	19.5	1.521	0.443	0.209	0.077	0.665	0.366	0.136
	10	25.0	1.950	0.568	0.268	0.099	0.853	0.469	0.174
	20	34.0	2.652	0.772	0.365	0.134	1.116	0.638	0.237
	50	46.0	3.588	1.045	0.493	0.182	1.570	0.863	0.320
Sample #2 As-placed in-situ soil NW of TSF	1	5.8	0.394	0.115	0.054	0.020	0.172	0.095	0.035
	2	12.0	0.815	0.237	0.112	0.041	0.357	0.196	0.073
	5	19.5	1.324	0.386	0.182	0.067	0.579	0.318	0.118
	10	25.0	1.698	0.494	0.233	0.086	0.743	0.408	0.152
	20	34.0	2.309	0.672	0.317	0.117	1.010	0.555	0.206
	50	46.0	3.124	0.910	0.430	0.158	1.367	0.751	0.279
Sample #2 Compacted in-situ soil NW of TSF	1	5.8	0.431	0.126	0.059	0.022	0.189	0.104	0.038
	2	12.0	0.892	0.260	0.123	0.045	0.390	0.215	0.080
	5	19.5	1.450	0.422	0.199	0.073	0.634	0.349	0.129
	10	25.0	1.859	0.541	0.256	0.094	0.813	0.447	0.166
	20	34.0	2.528	0.736	0.348	0.128	1.106	0.608	0.226
	50	46.0	3.421	0.996	0.470	0.173	1.497	0.823	0.305
Sample #3 West Hill as-placed soil	1	5.8	0.340	0.112	0.047	0.017	0.149	0.082	0.030
	2	12.0	0.703	0.232	0.097	0.036	0.308	0.169	0.063
	5	19.5	1.142	0.376	0.157	0.058	0.500	0.275	0.102
	10	25.0	1.465	0.483	0.201	0.074	0.641	0.352	0.131
	20	34.0	1.992	0.656	0.274	0.101	0.871	0.479	0.178
	50	46.0	2.695	0.888	0.371	0.136	1.179	0.648	0.241
Sample #3 West Hill compacted soil	1	5.8	0.363	0.106	0.050	0.018	0.159	0.087	0.032
	2	12.0	0.752	0.219	0.103	0.038	0.329	0.181	0.067
	5	19.5	1.221	0.356	0.168	0.062	0.534	0.294	0.109
	10	25.0	1.566	0.456	0.215	0.079	0.685	0.377	0.140
	20	34.0	2.130	0.620	0.293	0.108	0.932	0.512	0.190
	50	46.0	2.881	0.839	0.396	0.146	1.260	0.693	0.257
Sample #4 West Hill as-placed saprolite	1	5.8	0.272	0.079	0.037	0.014	0.119	0.065	0.024
	2	12.0	0.562	0.165	0.077	0.028	0.246	0.135	0.050
	5	19.5	0.913	0.266	0.126	0.046	0.399	0.220	0.081
	10	25.0	1.171	0.341	0.161	0.059	0.512	0.282	0.105
	20	34.0	1.592	0.464	0.219	0.081	0.696	0.383	0.142
	50	46.0	2.154	0.627	0.296	0.109	0.942	0.518	0.192
MRO Sample #4 West Hill compacted saprolite	1	5.8	0.298	0.087	0.041	0.015	0.130	0.072	0.027
	2	12.0	0.616	0.179	0.085	0.031	0.269	0.148	0.055
	5	19.5	1.001	0.291	0.138	0.051	0.438	0.241	0.089

	ARI (Year)	Duration (minutes)	Event-based Soil loss (ton/ha)						
			Scenario 1 Bare Unconsolidated soil	Scenario 2 10% Veg. cover (Stoloniferous grass) & 1 Year Consolidation time	Scenario 3 20% Veg. cover (Stoloniferous grass) & 2 Year Consolidation time	Scenario 4 30% Veg. cover (Stoloniferous grass) & 5 Year Consolidation time	Scenario 6 10% Veg. cover (Tussocky grass) & 1 Year Consolidation time	Scenario 6 20% Veg. cover (Tussocky grass) & 2 Year Consolidation time	Scenario 7 30% Veg. cover (Tussocky grass) & 5 Year Consolidation time
Sample #5 Wet Hill saprock and West Hill soil	10	25.0	1.284	0.374	0.177	0.065	0.562	0.309	0.115
	20	34.0	1.746	0.508	0.240	0.088	0.764	0.420	0.156
	50	46.0	2.362	0.688	0.325	0.120	1.033	0.568	0.211
	1	5.8	0.204	0.059	0.028	0.010	0.089	0.049	0.018
	2	12.0	0.421	0.123	0.058	0.021	0.184	0.101	0.038
	5	19.5	0.685	0.199	0.094	0.035	0.300	0.165	0.061
	10	25.0	0.878	0.256	0.121	0.440	0.384	0.211	0.078
	20	34.0	1.194	0.348	0.164	0.060	0.522	0.287	0.107
	50	46.0	1.615	0.470	0.222	0.082	0.707	0.388	0.144

Table 7-2: Event-based soil erosion modelling results for 1 x 60 mm rainfall event

	ARI (Year)	Duration	Event-based Soil loss (ton/ha)						
			Scenario 1 Bare Unconsolidated soil	Scenario 2 10% Veg. cover (Stoloniferous grass) & 1 Year Consolidation time	Scenario 3 20% Veg. cover (Stoloniferous grass) & 2 Year Consolidation time	Scenario 4 30% Veg. cover (Stoloniferous grass) & 5 Year Consolidation time	Scenario 6 10% Veg. cover (Tussocky grass) & 1 Year Consolidation time	Scenario 6 20% Veg. cover (Tussocky grass) & 2 Year Consolidation time	Scenario 7 30% Veg. cover (Tussocky grass) & 5 Year Consolidation time
Sample#1 As-placed stockpiled topsoil	1	5.8	0.201	0.059	0.028	0.01	0.088	0.048	0.018
	2	12	0.415	0.121	0.057	0.021	0.182	0.1	0.037
	5	19.5	0.675	0.197	0.093	0.034	0.295	0.162	0.06
	10	25	0.865	0.252	0.119	0.044	0.378	0.208	0.077
	20	34	1.176	0.342	0.162	0.06	0.514	0.283	0.105
	50	46	1.592	0.464	0.219	0.081	0.696	0.383	0.142
Sample #1 Compacted stockpiled topsoil	1	5.8	0.281	0.082	0.039	0.014	0.123	0.068	0.025
	2	12	0.582	0.169	0.08	0.029	0.255	0.14	0.52
	5	19.5	0.945	0.275	0.13	0.048	0.413	0.227	0.084
	10	25	1.211	0.353	0.167	0.061	0.53	0.291	0.108
	20	34	1.648	0.48	0.227	0.083	0.721	0.396	0.147
	50	46	2.229	0.649	0.306	0.113	0.975	0.536	0.199
Sample #2 As-placed in-situ soil NW of TSF	1	5.8	0.188	0.055	0.026	0.01	0.082	0.045	0.017
	2	12	0.389	0.113	0.053	0.02	0.17	0.094	0.035
	5	19.5	0.632	0.184	0.087	0.032	0.276	0.152	0.056
	10	25	0.810	0.236	0.111	0.01	0.354	0.195	0.072
	20	34	1.102	0.321	0.152	0.056	0.482	0.265	0.098
	50	46	1.491	0.434	0.205	0.075	0.652	0.359	0.133
Sample #2 Compacted in-situ soil NW of TSF	1	5.8	0.229	0.067	0.031	0.012	0.1	0.055	0.02
	2	12	0.473	0.138	0.065	0.024	0.207	0.114	0.042
	5	19.5	0.768	0.224	0.106	0.039	0.336	0.185	0.069
	10	25	0.985	0.287	0.135	0.05	0.431	0.237	0.088
	20	34	1.340	0.39	0.184	0.068	0.586	0.322	0.12
	50	46	1.812	0.528	0.249	0.092	0.793	0.436	0.162
Sample #3 West Hill as-placed soil	1	5.8	0.203	0.059	0.028	0.01	0.09	0.049	0.018
	2	12	0.420	0.122	0.058	0.021	0.184	0.101	0.037
	5	19.5	0.682	0.199	0.094	0.035	0.298	0.164	0.061
	10	25	0.875	0.255	0.12	0.044	0.383	0.21	0.078
	20	34	1.190	0.347	0.164	0.06	0.521	0.286	0.106
	50	46	1.610	0.469	0.221	0.081	0.704	0.387	0.144
Sample #3	1	5.8	0.266	0.077	0.037	0.013	0.116	0.064	0.024

	ARI (Year)	Duration	Event-based Soil loss (ton/ha)						
			Scenario 1 Bare Unconsolidated soil	Scenario 2 10% Veg. cover (Stolon- iferous grass) & 1 Year Consolidation time	Scenario 3 20% Veg. cover (Stolonif- erous grass) & 2 Year Consolidation time	Scenario 4 30% Veg. cover (Stoloniferous grass) & 5 Year Consol- idation time	Scenario 6 10% Veg. cover (Tus- socky grass) & 1 Year Consolidation time	Scenario 6 20% Veg. cover (Tus- socky grass) & 2 Year Consolidation time	Scenario 7 30% Veg. cover (Tus- socky grass) & 5 Year Consolidation time
West Hill com- pacted soil	2	12	0.55	0.16	0.076	0.028	0.241	0.132	0.049
	5	19.5	0.894	0.26	0.123	0.045	0.391	0.215	0.08
	10	25	1.146	0.334	0.158	0.058	0.501	0.276	0.102
	20	34	1.559	0.454	0.214	0.079	0.682	0.375	0.139
	50	46	2.109	0.614	0.29	0.107	0.923	0.507	0.188
Sample #4 West Hill as- placed saprolite	1	5.8	0.244	0.071	0.034	0.012	0.107	0.059	0.022
	2	12	0.506	0.147	0.07	0.026	0.221	0.122	0.045
	5	19.5	0.822	0.239	0.113	0.042	0.36	0.198	0.073
	10	25	1.054	0.307	0.145	0.053	0.461	0.253	0.094
	20	34	1.433	0.417	0.197	0.073	0.627	0.345	0.128
MRO Sample #4 West Hill com- pacted saprolite	50	46	1.939	0.565	0.267	0.098	0.848	0.466	0.173
	1	5.8	0.267	0.078	0.037	0.014	0.117	0.064	0.024
	2	12	0.553	0.161	0.076	0.028	0.242	0.133	0.049
	5	19.5	0.899	0.262	0.124	0.045	0.393	0.216	0.08
	10	25	1.152	0.335	0.158	0.058	0.504	0.277	0.103
Sample #5 Wet Hill saprock and West Hill soil	20	34	1.567	0.456	0.215	0.079	0.686	0.377	0.14
	50	46	2.120	0.617	0.292	0.107	0.927	0.51	0.189
	1	5.8	0.110	0.032	0.015	0.006	0.048	0.026	0.01
	2	12	0.227	0.066	0.031	0.011	0.099	0.055	0.02
	5	19.5	0.370	0.108	0.051	0.019	0.162	0.089	0.033
	10	25	0.474	0.138	0.065	0.024	0.207	0.114	0.042
	20	34	0.645	0.188	0.089	0.033	0.282	0.155	0.058
	50	46	0.872	0.254	0.12	0.044	0.381	0.21	0.078

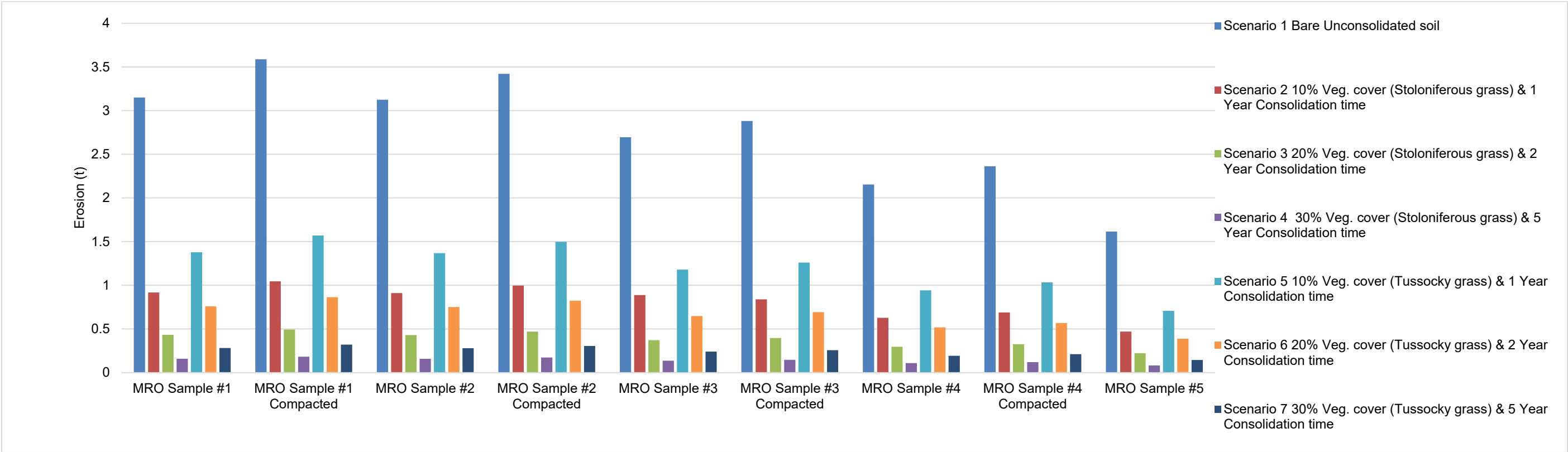


Figure 7-1: Predicted event-based soil loss (t/ha) for a storm event equal to 100 mm event.

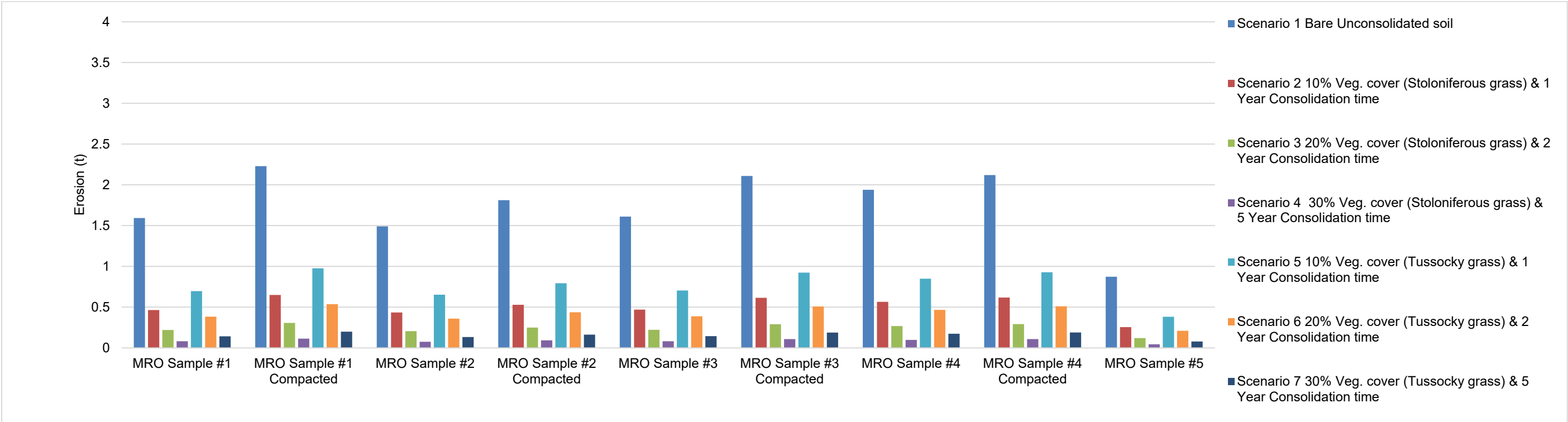


Figure 7-2: Predicted event-based soil loss (t/ha) for a storm event equal to 60 mm event

7.2 Annual soil loss (t/ha) prediction using MINErosion

An extensive list of erosion modelling outcomes can be provided using MINErosion.

In **Table 7-3** annual erosion rates are provided for as-placed and compacted samples:

- using a 5 % slope angle,
- slope lengths of 10, 20, 40 and 80 m, and
- 10%, 20% and 30% vegetation cover (with stoloniferous or tussock grass) at 1-year, 2-years, and 5-years.

The results for a 5% slope angle with 10 m and 80 m slope lengths in **Figure 7-3** and **Figure 7-4** verify that increases in slope length will contribute to increasing erosion rates.

- The as-placed soil and saprolite samples (Sample #1, 2, 3 and 4) had calculated annual erosion at 4.1 to 7.0 t/ha with a 10 m slope, increasing to 19.3 to 23.5 t/ha/yr with an 80 m slope.
- The effect of 5-Years of pedolith development with 30% vegetation cover on as-placed soil and saprolite samples (Sample #1, 2, 3 and 4) on an 80 m slope length was calculated to reduce annual erosion rates from 19.3 to 23.5 t/ha/yr to 0.2 to 1.1 t/ha.

The results for the proposed soil cover system on the top tier of the NWRD comprising rock filled with soil from the West Hill (**Figure 3-2**) on a 5% slope with slope lengths of 10 m to 80 m were in the range of:

- 1.6 to 6.5 t/ha/yr after placement (**Table 7-3**)
- 0.4 to 2.8 t/ha/yr with 10 % vegetation cover at Year 1
- 0.08 to 0.59 t/ha/yr with 30% vegetation cover at Year 5.

The low erosion rates are attributed to the low slope angle and physical properties of the cover system proposed for the top tier of the NWRD (and potentially the cover over the TSF beach).

Table 7-3: Estimated annual soil loss for MRO samples #1 to #5 using a 5% slope and results calculated using WEPP, RUSLE and MINerosion

Sample ID	Slope Length (m)	Annual soil loss WEPP erosion rate Bare unconsolidated soil			K _{MUSLE} (bare soil)	Annual Soil Loss RUSLE2: Scenario #1 Bare unconsolidated soil (tonne/ha)	Type of grass	Annual Soil Loss MINerosion Scenario #2 10% Vegetation cover & 1-year consolidation time.			Annual Soil Loss MINerosion Scenario #3 20% Vegetation cover & 2-year consolidation time.			Annual Soil Loss MINerosion Scenario #4: 30% Vegetation cover & 5-year consolidation time.		
		Interrill erosion (tonne/ha)	Rill Erosion (tonne/ha)	Total Erosion				Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)	Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)	Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)
Sample #1 As-placed stockpiled top- soil	10	7.103	1.679	8.782	0.00545	5.337	Stoloniferous	10	1	1.544	20	2	0.707	30	5	0.255
							Tussocky			2.329			1.282			0.478
	20	7.103	2.545	9.648	0.00599	8.296	Stoloniferous			2.040			1.099			0.360
							Tussocky			3.620			1.992			0.742
	40	7.103	3.858	10.961	0.0068	13.319	Stoloniferous			3.854			1.764			0.636
							Tussocky			5.812			3.199			1.192
	80	7.103	5.847	12.95	0.00804	22.27	Stoloniferous			6.444			2.950			1.063
							Tussocky			9.718			5.348			1.993
Sample #1 Compacted stockpiled top- soil	10	11.718	1.258	12.976	0.00731	7.159	Stoloniferous	10	1	2.072	20	2	0.948	30	5	0.342
							Tussocky			3.124			1.719			0.641
	20	11.718	1.907	13.625	0.00768	10.636	Stoloniferous			3.078			1.409			0.508
							Tussocky			4.641			2.554			0.952
	40	11.718	2.89	14.608	0.00823	16.119	Stoloniferous			4.665			2.136			0.769
							Tussocky			7.034			3.871			1.442
	80	11.718	4.381	16.099	0.00907	25.123	Stoloniferous			7.270			3.328			1.199
							Tussocky			10.963			6.034			2.248
Sample #2 As-placed in- situ soil NW of TSF	10	4.849	1.735	6.584	0.00421	4.123	Stoloniferous	10	1	1.193	20	2	0.546	30	5	0.197
							Tussocky			1.799			0.990			0.369
	20	4.849	2.63	7.479	0.00478	6.62	Stoloniferous			1.916			0.877			0.316
							Tussocky			2.889			1.590			0.592
	40	4.849	3.987	8.836	0.00564	11.047	Stoloniferous			3.197			1.463			0.527
							Tussocky			4.820			2.653			0.988
	80	4.849	6.043	10.892	0.00696	19.278	Stoloniferous			5.579			2.554			0.920
							Tussocky			8.412			4.630			1.725
Sample #2 Compacted in- situ soil NW of TSF	10	9.046	1.609	10.655	0.00549	5.376	Stoloniferous	10	1	1.556	20	2	0.712	30	5	0.257
							Tussocky			2.346			1.291			0.481
	20	9.046	2.439	11.485	0.00591	8.185	Stoloniferous			2.369			1.084			0.391
							Tussocky			3.572			1.966			0.732
	40	9.046	3.696	12.742	0.00656	12.849	Stoloniferous			3.718			1.702			0.613
							Tussocky			5.607			3.086			1.150
	80	9.046	5.603	14.649	0.00754	20.885	Stoloniferous			6.044			2.767			0.997
							Tussocky			9.113			5.016			1.869
Sample #3 West Hill as- placed soil	10	5.501	0.449	5.95	0.00588	5.758	Stoloniferous	10	1	1.666	20	2	0.763	30	5	0.275
							Tussocky			2.513			1.383			0.515
	20	5.501	0.681	6.182	0.00611	8.462	Stoloniferous			2.449			1.121			0.404
							Tussocky			3.692			2.032			0.757
	40	5.501	1.032	6.533	0.00646	12.653	Stoloniferous			3.661			1.676			0.604
							Tussocky			5.521			3.039			1.132
	80	5.501	1.564	7.065	0.00698	19.334	Stoloniferous			5.595			2.561			0.923
							Tussocky			8.436			4.643			1.730
Sample #3 West Hill com- pacted soil	10	11.307	0.448	11.755	0.00762	7.462	Stoloniferous	10	1	2.159	20	2	0.989	30	5	0.356
							Tussocky			3.256			1.792			0.668
	20	11.307	0.679	11.986	0.00777	10.761	Stoloniferous			3.114			1.426			0.514
							Tussocky			4.696			2.584			0.963

Sample ID	Slope Length (m)	Annual soil loss WEPP erosion rate Bare unconsolidated soil			K _{MUSLE} (bare soil)	Annual Soil Loss RUSLE2: Scenario #1 Bare unconsolidated soil (tonne/ha)	Type of grass	Annual Soil Loss MINerosion Scenario #2 10% Vegetation cover & 1-year consolidation time.			Annual Soil Loss MINerosion Scenario #3 20% Vegetation cover & 2-year consolidation time.			Annual Soil Loss MINerosion Scenario #4: 30% Vegetation cover & 5-year consolidation time.		
		Interrill erosion (tonne/ha)	Rill Erosion (tonne/ha)	Total Erosion				Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)	Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)	Veg %	Consolidation (Year)	Total Soil Loss (tonne/ha)
	40	11.307	1.029	12.336	0.008	15.669	Stoloniferous			4.534			2.076			0.748
							Tussocky			6.837			3.763			1.402
	80	11.307	1.56	12.867	0.00834	23.101	Stoloniferous			6.685			3.060			1.102
							Tussocky			10.080			5.548			2.067
Sample #4 West Hill as- placed sapro- lite	10	5.819	0.464	6.283	0.00716	7.012	Stoloniferous	10	1	2.029	20	2	0.929	30	5	0.335
							Tussocky			3.060			1.684			0.627
	20	5.819	0.704	6.523	0.00744	10.304	Stoloniferous			2.982			1.365			0.492
							Tussocky			4.496			2.475			0.922
	40	5.819	10.67	16.489	0.00785	15.375	Stoloniferous			4.449			2.037			0.734
							Tussocky			6.709			3.693			1.376
	80	5.819	1.617	7.436	0.00848	23.489	Stoloniferous			6.797			3.112			1.121
							Tussocky			10.250			5.641			2.102
MRO Sample #4 West Hill com- pacted sapro- lite	10	10.797	0.766	11.563	0.00739	7.237	Stoloniferous	10	1	2.094	20	2	0.959	30	5	0.345
							Tussocky			3.158			1.738			0.648
	20	10.797	1.116	11.913	0.00764	10.581	Stoloniferous			3.062			1.402			0.505
							Tussocky			4.617			2.541			0.947
	40	10.797	1.759	12.556	0.00802	15.708	Stoloniferous			4.546			2.081			0.750
							Tussocky			6.854			3.773			1.406
	80	10.797	2.666	13.463	0.0086	23.821	Stoloniferous			6.893			3.156			1.137
							Tussocky			10.395			5.721			2.132
Sample #5 Wet Hill sap- rock and West Hill soil	10	1.172	0.261	1.433	0.00163	1.596	Stoloniferous	10	1	0.462	20	2	0.211	30	5	0.076
							Tussocky			0.697			0.383			0.143
	20	1.172	0.395	1.567	0.00179	2.479	Stoloniferous			0.717			0.328			0.118
							Tussocky			1.082			0.595			0.222
	40	1.172	0.599	1.771	0.00202	3.956	Stoloniferous			1.145			0.524			0.189
							Tussocky			1.726			0.950			0.354
	80	1.172	0.908	2.08	0.00237	6.565	Stoloniferous			1.900			0.870			0.313
							Tussocky			2.865			1.577			0.587

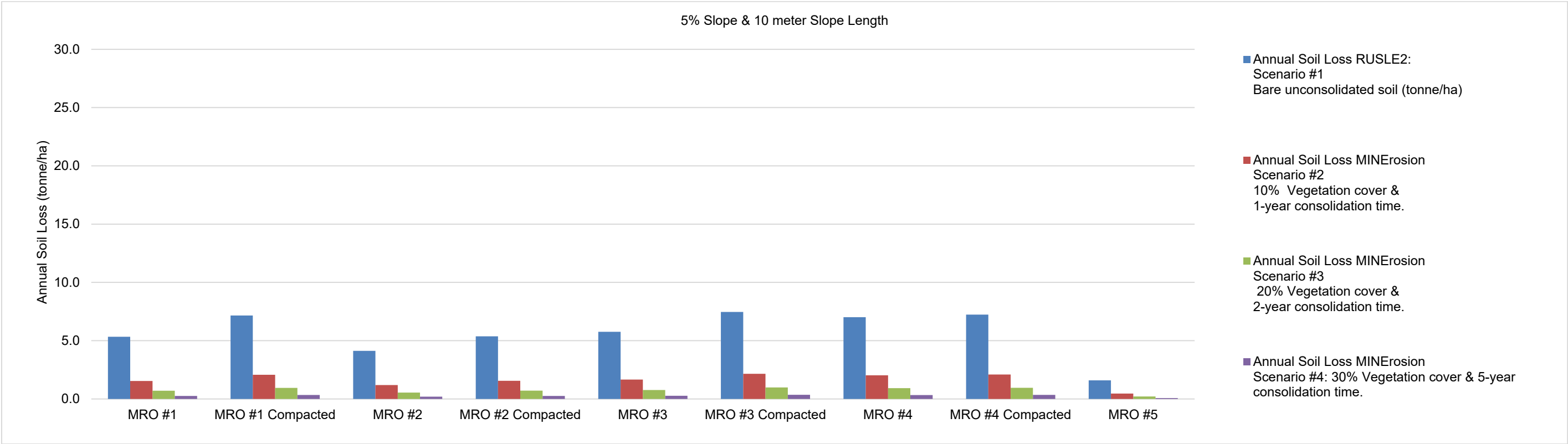


Figure 7-3: Modelled annual erosion rates for four scenarios with a 5% slope angle and 10 m slope length

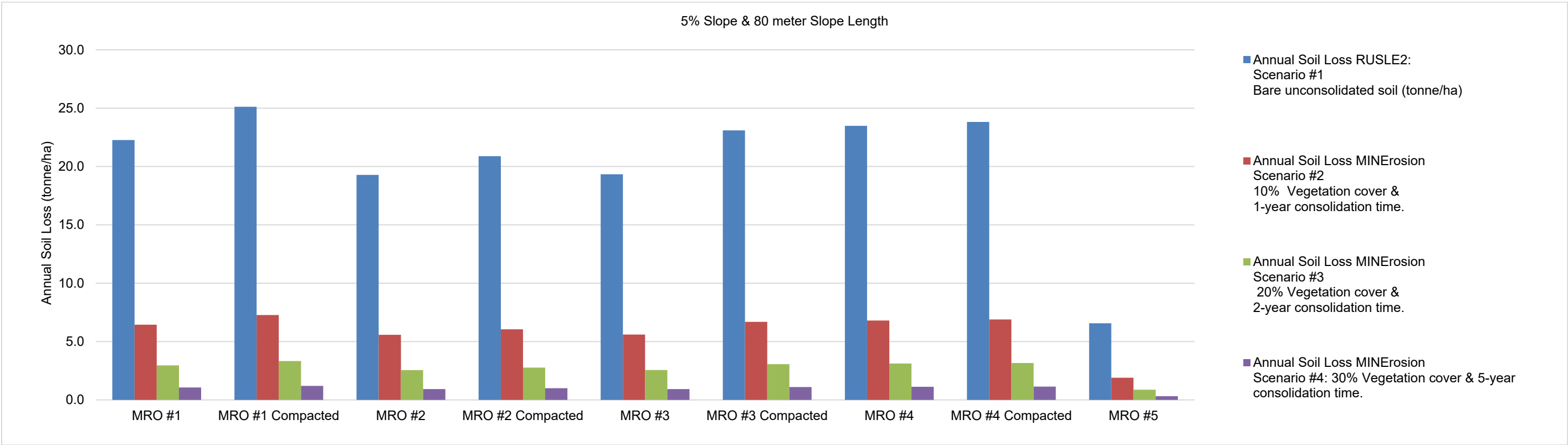


Figure 7-4: Modelled annual erosion rates for four scenarios with a 5% slope angle and 80 m slope length

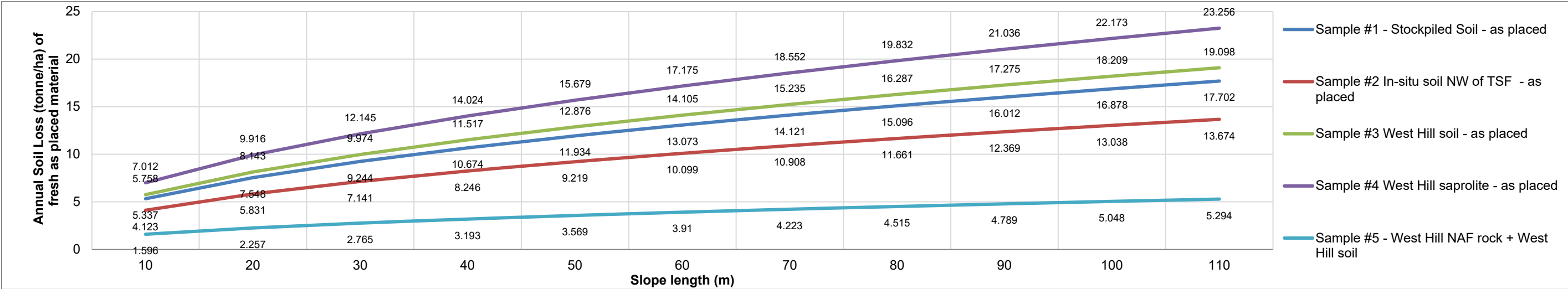


Figure 7-5: Modelled annual erosion rates for as-placed material with a 5% slope angle and slope lengths from 10 m to 110 m

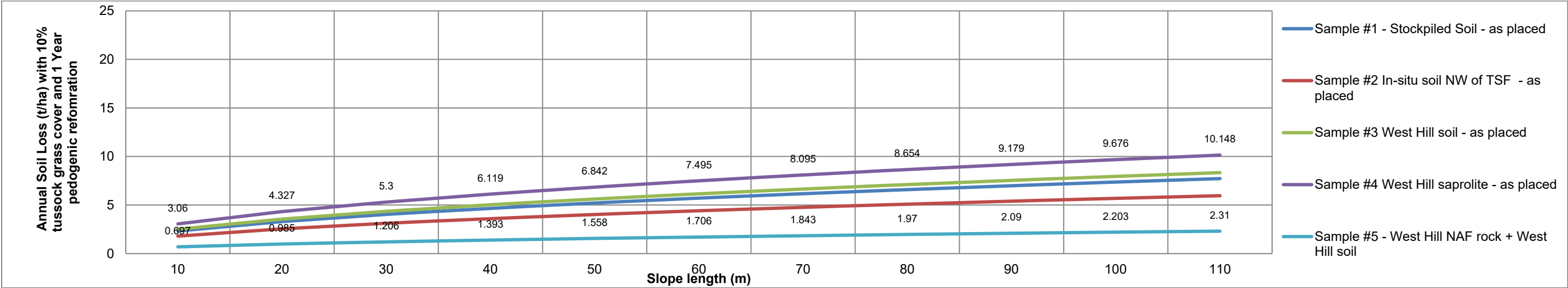


Figure 7-6: Modelled annual erosion rates for material with a 5% slope angle, 10% tussock grass cover at Year 1, and slope lengths from 10 m to 110 m

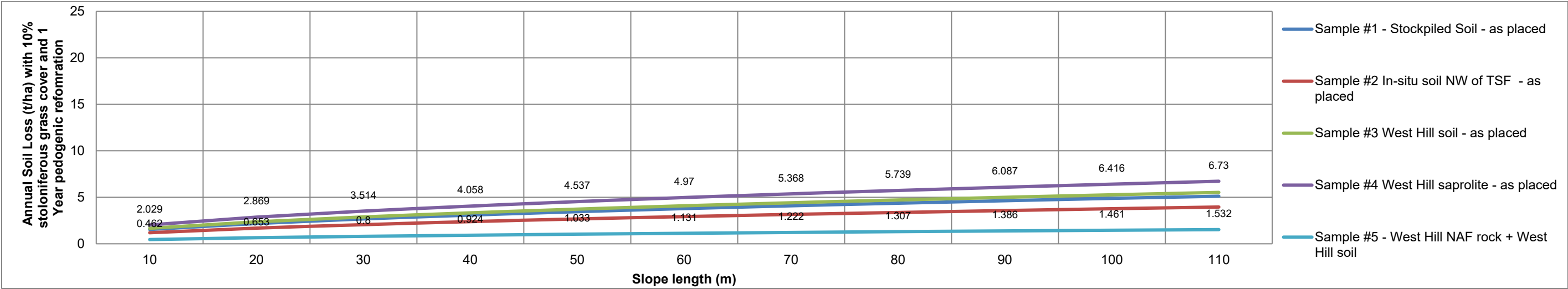


Figure 7-7: Modelled annual erosion rates for material with a 5% slope angle, 10% stoloniferous grass cover at Year 1, and slope lengths from 10 m to 110 m

8 Conclusions

Erosion and deposition of suspended and bedload sediment in the natural environment is certain, dynamic, kinetic, and everchanging. Conversely, laboratory conditions are deterministic, static, and predictable.

Laboratory measurements are used to provide measured data under specific conditions and provide an indication of what may occur in the field, under field conditions. Evaluating the full range of erosion outcomes that will occur under field conditions in a laboratory is possible, but not feasible. This same fact applies to all geo-environmental analyses used by geotechnical or geochemical engineers and soil scientists that utilise samples that do not retain the same physical attributes as the in-situ material e.g. most soil analyses use material that has been sieved to < 2 mm PSD.

The purpose of laboratory analyses using the RaE_{SIM} approach is to build on the highly uncertain knowledge base defined by static methods used to infer the potential for soil sodicity and stability such as cation exchange capacity, exchangeable sodium percentage, aggregate stability, pin hole dispersion and shrink swell behaviour (**Section 4**). Utilising as-received samples with < 150 mm PSD achieves this to provide outcomes for as-placed rehabilitation materials or compacted materials under three consecutive rainfall events (30, 60 and 90 mm/hr events) that cumulatively represent a highly improbable climatic event.

The analyses for this project included hand compaction of as-placed materials to evaluate how traffic compaction may affect erosion. The measured erosion data verified that compaction of the as-placed soil and saprolite increases erosion rates and mass because the mechanical action breaks up soil peds, increases the mass of fines in the material, and also decreases permeability which increases runoff rates relative to infiltration.

The **first stage** of assessments of soil sodicity and soil stability of cover design included the following.

- Static laboratory analyses have been completed for topsoil, subsoil, saprolite and saprock samples in this assessment and in previous work by RGS in 2016 and 2022.
- The results of the static analyses were used to evaluate the soil – plant - water cover system performance using SEEPW by RGS in 2022.
- The static analyses and measured water data were used in GoldSim water balance and water quality modelling for the final void assessment by RGS in 2022.

The **second stage** of analysis has been completed in this report using as-received bulk samples from MRO borrow areas to provide measured data from the RaE_{SIM} analyses.

The **third stage** of assessment including **erosion measurement** has been completed and verifies that measured data from the RaE_{SIM} assessment are consistent with measured results. The proposed soil cover system for the NWRD has low rates of erosion that has been verified with measured data and modelled projections. The erosion modelling results can be used to provide measured unfiltered and filtered source terms for future water quality modelling and modelled projections of erosion from bare, or maturing soil profiles on constructed cover systems.

The MRO erosion results are based on a defined set of RaE_{SIM} runs that evaluated:

- the effect of a:
 - 1:1-year 30 mm/hr rainfall event with a 24 hour pause, followed by
 - 1:10-year 60 mm/hr rainfall event with a 24 hour pause, followed by the equivalent of a
 - 1 in 100-year 90 mm/hr rainfall event
- runoff from a slope of 5% that is the upper slope that may be applied to the soil cover systems that may be constructed on the NWRD and TSF
- erosion of as-placed material and compacted materials.

The measured and modelled erosion results provide a range of potential outcomes that are likely to occur for these samples when they are applied under the simulated conditions.

Measured erosion rates for discrete storm events were:

- 0.15 to 0.38 t/ha for the 30 mm/hr event on the soil and saprolite samples (Sample #1, 2, 3 and 4) using an oven dried water sample (RGS)
- 0.37 to 0.61 t/ha for the 60 mm/hr event on the soil and saprolite samples (Sample #1, 2, 3 and 4) using an oven dried water sample (RGS)
- 0.45 to 1.64 t/ha for the 90 mm/hr event on the soil and saprolite samples (Sample #1, 2, 3 and 4) using an oven dried water sample (RGS)
- 0.15 to 0.66 t/ha for the 30 to 90 mm/hr for the proposed West Hill saprock and West Hill soil cover using an oven dried water sample (RGS).

Cumulative measured erosion rates for three subsequent back-to-back storm events (30 mm/hr, 60 mm/hr and then a 90 mm/hr event) conducted over 5 days was:

- 0.99 tonnes for the West Hill saprolite (**Figure 3-1**),
- 1.27 tonnes for the West Hill saprock and West Hill soil cover (**Figure 3-2**),
- 1.29 tonnes for the West Hill soil (**Figure 3-1**),
- 2.40 tonnes of for Stockpiled soil (**Figure 3-1**) and,
- 2.50 tonnes for the In-situ soil from NW of TSF (**Figure 3-1**).

Modelled erosion rates for discrete storm events were 0.3 to 3.1 t/ha for a 100 mm/hr event and 0.2 to 2.3 t/ha for a 60 mm/hr event on as-placed soil and saprolite samples (**Table 7-1**).

Annual modelled erosion rates for the **as-placed** soil and saprolite samples with a 5% slope angle was 4.1 to 7.0 t/ha/yr with a 10 m slope length, increasing to 19.3 to 23.5 t/ha with an 80 m slope.

Longer term modelled erosion rates verify the effect of 5-Years of pedolith development with 30% vegetation cover on an 80 m slope length was calculated to reduce annual erosion rates from 19.3 to 23.5 t/ha to 0.2 to 1.1 t/ha **Figure 7-3** and **Figure 7-4**.

Decreasing erosion rates are due to inferred effects such as pedogenic reformation that includes (i) cohesion of soil particle into soil peds (ii) settlement and consolidation and (iii) binding of the soil profile by plant roots. Under these conditions MINErosion projected that the annual erosion loss for the soil and saprolite samples may be in the order of 0.8 to 1.5 t/ha after two years with 20 % cover of stoloniferous grass. There are no limitations to using the materials analysed in this assessment for cover system construction for the low angle slopes proposed to be applied to the top of the TSF and top of the NWRD. RGS assume that the sides of the TSF and rock armoured slopes of the NWRD would not be rehabilitated with soil covers. The erosion rates are considered by RGS to provide viable outcomes for construction of cover systems on the NWRD and TSF at slopes of < 5%. Differences in the Stockpiled Soil and In-situ Soil to the NW of the TSF and West Hill soil were documented and can be used to subsequent stages of the rehabilitation and cover design process to optimise rehabilitation outcomes. For example, the chemical and physical properties of the In-situ Soil to the NW of the TSF may provide justification for using this material as a subsoil unit, with the Stockpiled Soil and West Soil being reserved for surface cover. The water quality results verify that the metal(loid) concentrations are correlated with sediment mass and that the soils and saprolite contain > 30 trace, minor and major elements. For most samples the unfiltered concentrations are < 1 mg/L but several elements are at concentrations of > 1 mg/L. The unfiltered (total) concentrations in the surface water runoff decrease rapidly over the duration of a rainfall event (**Figure 11-1**). Whereas the suite of elements in the unfiltered soils is very broad the filtered (soluble) suite of elements is much smaller and typically includes elements such as Ba, Cu, Li, Mn, Mo and Sr that are at < 0.1 mg/L. Lateral seepage is collected from the RaE_{SIM} samples (when it is present), and it typically a low proportion of the overall water volume, the seepage quality in these samples was similar to the surface runoff, although in some cases the concentrations in the seepage were higher than the surface runoff due mostly to differences in the solid:water ratio. The proposed soil cover system for the NWRD that comprises a “rock cobble and soil composite cover”, does have a larger proportion of lateral seepage, as would be expected, although when the soil beds down into the rock the lateral flow rates will dissipate and a larger proportion of surface flow across the armoured surface would occur. The storm event, annual and mature erosion analyses verify that erosion rates are lower than all other cover materials and justifies this as a probable viable cover option for the NWRD and for drainage lines within the cover system.

9 Recommendations

The **fourth stage** of landform and cover design recommended for MRO is to utilise the data from the previous assessments and the erosion measurement and modelling in this report to design and then implement field scale cover trials to verify that the proposed rehabilitation plans and cover designs will meet regulatory goals and objectives.

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11 Attachments

11.1 Attachment A: Column settlement results

Table 11-1: Turbidity (NTU) measured during column settlement

Hours	Intensity	0	1	2	3	4	5	6	7	24	48	72
Topsoil_001	30	1714	1664	769	471	418	387	328	–	80	55	41
	60	2985	2093	1092	771	678	614	555	–	110	82	58
	90	668	676	455	345	302	288	255	–	45	36	24
Topsoil_001_Compacted	30	2991	1040	612	2612	1806	1576	1220	–	263	179	155
	60	1793	1642	893	596	563	506	466	–	114	84	64
	90	1557	681	448	348	325	313	287	–	67	42	155
Topsoil_002	30	2944	1292	1582	1162	937	977	760	–	3142	2176	391
	60	1968	1352	1735	907	1551	1063	1510	–	1359	2954	566
	90	648	668	735	3016	2942	3211	2745	–	1508	1232	343
Topsoil_002_Compacted	30	2247	–	–	–	–	871	737	–	1757	1015	614
	60	2297	3246	–	905	925	1158	776	–	1236	616	3150
	90	3034	1157	1081	1457	818	761	1558	–	1170	–	2712
West Hill Soil_003	30	1783	1242	641	430	370	311	261	320	70	35	–
	60	2648	1038	559	375	296	271	255	239	69	33	–
	90	1669	904	544	353	304	278	267	269	57	27	–
West Hill Soil_003_Compacted	30	1829	937	536	363	281	255	264	228	53	31	–
	60	2692	1054	611	339	289	292	283	268	47	24	–
	90	–	983	581	384	285	265	250	215	33	19	–
West Hill Saprolite_004	30	–	2967	2081	1663	1363	1250	1497	802	752	401	–
	60	3263	2933	1693	2294	1746	1884	1914	1999	891	691	–
	90	–	1477	1449	957	1316	930	1003	1333	591	436	–
West Hill Saprolite_004_Compacted	30	1772	1347	1644	851	–	–	–	1551	1562	903	–
	60	1868	–	3255	2170	2187	1619	–	1290	1078	657	–
	90	–	3260	3228	3145	2583	1850	2511	1248	1140	827	–
West Hill Saprock_005	30	1652	1162	874	728	649	399	389	368	129	85	52
	60	1746	970	749	721	629	417	429	500	173	93	64
	90	940	833	563	43	497	412	447	354	154	96	70

Table 11-2: pH measured during column settlement

Hours	Intensity	0	1	2	3	4	5	6	7	24	48	72
West Hill SAprock_003	30	6.77	6.78	6.64	7.34	7.48	8.13	7.53	7.62	7.88	7.48	–
	60	7.5	7.16	7.26	7.47	7.63	8.05	7.75	6.87	7.88	7.7	–
	90	7.7	7.38	7.35	7.51	7.77	8.06	7.88	7.88	7.84	7.76	–
West Hill Soil_003_ Compacted	30	7.63	7.56	7.5	7.56	7.54	7.65	7.63	7.63	7.74	7.79	–
	60	7.54	7.68	7.62	7.63	7.65	7.68	7.67	7.7	7.75	7.82	–
	90	7.55	7.82	7.8	7.8	7.82	7.81	7.82	7.82	7.89	7.97	–
West Hill Saprolite_004	30	7.64	7.78	7.56	7.62	7.78	7.69	7.7	7.47	7.8	7.76	–
	60	7.52	7.63	7.53	7.56	7.61	7.61	7.61	7.4	7.55	7.68	–
	90	7.55	7.56	7.51	7.54	7.56	7.56	7.57	7.45	7.61	7.68	–
West Hill Saprolite_004_Compacted	30	7.79	7.4	7.55	7.4	7.35	7.44	7.5	7.77	7.64	7.59	–
	60	7.53	7.41	7.42	7.41	7.4	7.43	7.43	7.62	7.5	7.58	–
	90	7.44	7.4	7.4	7.43	7.42	7.44	7.44	7.58	7.5	7.57	–
West Hill Saprock_005	30	7.73	7.75	6.67	5.44	6.41	7.66	7.88	6.13	7.85	5.97	7.54
	60	7.79	7.8	7.07	6.31	7.57	7.74	7.84	6.87	7.9	6.71	7.6
	90	7.86	7.86	7.29	6.84	7.65	7.85	7.92	7.24	7.9	7.16	7.67

Table 11-3: EC (µS/cm) measured during column settlement

Hours	Intensity	0	1	2	3	4	5	6	7	24	48	72
West Hill SAprock_003	30	644	656	646	644	646	648	655	656	646	656	–
	60	712	715	713	713	722	708	706	710	709	719	–
	90	759	762	7.55	755	771	75	756	761	756	748	–
West Hill Soil_003_ Compacted	30	762	772	770	776	771	773	770	775	782	777	–
	60	561	814	814	815	817	815	812	814	821	823	–
	90	458	824	823	822	824	814	825	824	825	828	–
West Hill Saprolite_004	30	804	527	522	526	540	525	531	460	533	529	–
	60	411	414	416	417	416	419	423	477	414	421	–
	90	758	416	416	417	417	418	415	485	417	421	–
West Hill Saprolite_004_Compacted	30	808	451	455	455	452	456	458	541	461	460	–
	60	415	480	483	481	481	481	483	424	482	485	–
	90	471	468	471	471	470	471	471	422	473	475	–
West Hill Saprock_005	30	539	540	538	538	526	545	542	538	542	569	561
	60	539	541	540	541	532	545	543	539	543	542	546
	90	537	536	535	536	532	542	541	535	541	534	546

11.2 Attachment B: RaESIM water quality summary results

11.2.1 Attachment B1: Topsoil stock results

Table 2-3: Topsoil Stockpile as-placed unfiltered trace and minor elements < 1mg/L in surface water

Stockpile topsoil																						
Water type		Surface runoff																				
Material placement		As-placed																				
Rainfall mm/hr eqv.		30 mm /yr								60 mm /yr								90 mm /yr				
Sample interval (minutes)		0	5	10	15	20	25	30	0	5	10	15	20	25	30	0	5	10	15	20	25	30
Arsenic	mg/L	0.017	0.016	0.007	0.005	0.004	0.004	0.003	0.044	0.013	0.006	0.005	0.004	0.004	0.003	0.036	0.005	0.004	0.003	0.003	0.003	0.003
Beryllium	mg/L	0.009	0.006	0.003	0.002	0.001	0.001	0.001	0.021	0.006	0.002	0.002	0.002	0.002	0.001	0.019	0.002	0.001	0.001	0.001	0.001	0.001
Cadmium	mg/L	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Caesium	mg/L	0.047	0.034	0.021	0.014	0.010	0.008	0.007	0.124	0.039	0.019	0.018	0.016	0.015	0.012	0.092	0.022	0.014	0.012	0.012	0.009	0.008
Chromium	mg/L	0.044	0.031	0.018	0.012	0.009	0.008	0.007	0.107	0.033	0.014	0.013	0.013	0.012	0.010	0.079	0.015	0.010	0.009	0.008	0.007	0.006
Cobalt	mg/L	0.159	0.119	0.065	0.043	0.032	0.025	0.024	0.539	0.134	0.058	0.049	0.048	0.043	0.031	0.455	0.060	0.039	0.032	0.031	0.026	0.024
Copper	mg/L	0.126	0.097	0.060	0.044	0.037	0.035	0.030	0.350	0.099	0.048	0.046	0.045	0.040	0.035	0.244	0.061	0.046	0.041	0.037	0.033	0.031
Dysprosium	mg/L	0.120	0.080	0.046	0.029	0.019	0.015	0.014	0.345	0.086	0.039	0.029	0.028	0.026	0.016	0.274	0.034	0.020	0.016	0.015	0.012	0.012
Erbium	mg/L	0.073	0.048	0.027	0.017	0.012	0.009	0.009	0.191	0.052	0.024	0.017	0.017	0.016	0.010	0.165	0.020	0.012	0.010	0.009	0.007	0.007
Europium	mg/L	0.022	0.014	0.008	0.005	0.004	0.003	0.003	0.056	0.015	0.007	0.005	0.005	0.005	0.003	0.048	0.006	0.004	0.003	0.003	0.002	0.002
Gadolinium	mg/L	0.123	0.081	0.045	0.029	0.019	0.015	0.015	0.326	0.086	0.041	0.028	0.028	0.027	0.016	0.281	0.034	0.020	0.016	0.015	0.012	0.012
Gallium	mg/L	0.083	0.060	0.034	0.022	0.017	0.015	0.012	0.227	0.064	0.027	0.026	0.024	0.021	0.016	0.171	0.029	0.019	0.016	0.016	0.012	0.011
Holmium	mg/L	0.022	0.014	0.008	0.005	0.004	0.003	0.002	0.057	0.015	0.007	0.005	0.005	0.005	0.003	0.050	0.006	0.004	0.003	0.002	0.002	0.002
Lead	mg/L	0.148	0.096	0.055	0.034	0.023	0.020	0.018	0.408	0.102	0.047	0.036	0.035	0.032	0.022	0.331	0.045	0.026	0.022	0.021	0.016	0.016
Lithium	mg/L	0.126	0.094	0.041	0.028	0.021	0.018	0.016	0.366	0.099	0.037	0.035	0.033	0.030	0.024	0.316	0.043	0.028	0.025	0.026	0.021	0.016
Lutetium	mg/L	0.010	0.007	0.004	0.002	0.002	0.001	0.001	0.027	0.007	0.003	0.002	0.002	0.002	0.001	0.023	0.003	0.002	0.001	0.001	0.001	0.001
Nickel	mg/L	0.063	0.046	0.022	0.015	0.011	0.010	0.008	0.160	0.047	0.018	0.017	0.016	0.015	0.011	0.127	0.021	0.013	0.012	0.012	0.009	0.008
Praseodymium	mg/L	0.152	0.084	0.047	0.030	0.020	0.016	0.015	0.392	0.088	0.042	0.029	0.029	0.027	0.017	0.339	0.036	0.021	0.017	0.015	0.012	0.012
Rubidium	mg/L	0.289	0.213	0.110	0.077	0.060	0.048	0.043	0.996	0.261	0.102	0.105	0.093	0.084	0.070	0.626	0.129	0.086	0.073	0.074	0.061	0.048
Samarium	mg/L	0.115	0.077	0.043	0.027	0.018	0.014	0.013	0.296	0.082	0.038	0.028	0.026	0.025	0.015	0.258	0.033	0.019	0.015	0.014	0.011	0.011
Strontium	mg/L	0.333	0.249	0.127	0.106	0.095	0.091	0.094	0.938	0.268	0.127	0.117	0.116	0.111	0.105	0.734	0.125	0.108	0.107	0.110	0.109	0.101
Terbium	mg/L	0.017	0.011	0.006	0.004	0.003	0.002	0.002	0.045	0.012	0.006	0.004	0.004	0.004	0.002	0.038	0.005	0.003	0.002	0.002	0.002	0.002
Thallium	mg/L	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.006	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001
Thorium	mg/L	0.100	0.060	0.037	0.023	0.016	0.013	0.011	0.271	0.064	0.033	0.024	0.023	0.022	0.014	0.220	0.032	0.017	0.015	0.014	0.010	0.010
Thulium	mg/L	0.010	0.007	0.004	0.002	0.002	0.001	0.001	0.027	0.007	0.003	0.002	0.002	0.002	0.001	0.024	0.003	0.002	0.001	0.001	0.001	0.001
Uranium	mg/L	0.009	0.006	0.004	0.002	0.002	0.001	0.001	0.024	0.006	0.003	0.002	0.002	0.002	0.001	0.020	0.003	0.002	0.001	0.001	0.001	0.001
Ytterbium	mg/L	0.070	0.047	0.026	0.017	0.011	0.009	0.008	0.184	0.050	0.023	0.016	0.016	0.016	0.009	0.160	0.019	0.012	0.009	0.008	0.007	0.007

Table 11-4: Topsoil Stockpile unfiltered major elements > 1mg/L in surface water quality

Aluminium	mg/L	138.000	103.000	59.800	39.000	30.600	27.000	22.200	376.000	110.000	46.100	45.200	44.500	38.600	30.400	290.000	53.300	33.800	30.000	29.100	24.300	22.000
Barium	mg/L	1.780	1.210	0.645	0.405	0.279	0.223	0.211	6.120	1.400	0.631	0.474	0.452	0.423	0.287	5.140	0.625	0.357	0.302	0.335	0.244	0.214
Cerium	mg/L	1.290	0.870	0.495	0.316	0.209	0.164	0.160	3.350	0.904	0.433	0.304	0.298	0.289	0.178	2.820	0.371	0.218	0.176	0.163	0.128	0.129
Iron	mg/L	232.000	171.000	105.000	68.400	54.600	51.200	39.200	653.000	188.000	78.200	81.500	78.200	69.200	57.100	470.000	95.300	63.300	56.400	52.900	44.200	40.100
Lanthanum	mg/L	0.642	0.423	0.242	0.153	0.086	0.068	0.063	1.680	0.446	0.213	0.149	0.142	0.136	0.072	1.430	0.182	0.090	0.072	0.066	0.052	0.053
Manganese	mg/L	6.910	5.020	2.500	1.640	1.180	0.956	0.891	19.800	5.610	2.160	1.820	1.780	1.630	1.180	16.100	2.260	1.460	1.230	1.220	0.976	0.783
Neodymium	mg/L	0.642	0.364	0.202	0.129	0.086	0.067	0.064	1.660	0.384	0.177	0.126	0.125	0.117	0.072	1.420	0.154	0.088	0.071	0.066	0.052	0.053
Titanium	mg/L	7.720	2.910	2.350	1.740	1.750	2.230	1.460	10.600	3.220	1.680	2.660	2.470	2.240	2.640	6.540	3.010	2.390	2.530	2.260	2.070	1.940
Vanadium	mg/L	0.920	0.650	0.310	0.210	0.170	0.150	0.120	2.450	0.720	0.250	0.250	0.230	0.210	0.170	1.790	0.290	0.190	0.170	0.160	0.130	0.130
Yttrium	mg/L	0.814	0.546	0.247	0.142	0.099	0.077	0.074	2.180	0.590	0.184	0.136	0.137	0.124	0.080	1.820	0.156	0.098	0.079	0.074	0.060	0.062
Zinc	mg/L	0.608	0.437	0.223	0.153	0.118	0.095	0.085	1.560	0.467	0.190	0.173	0.173	0.145	0.121	1.270	0.213	0.140	0.120	0.119	0.099	0.086

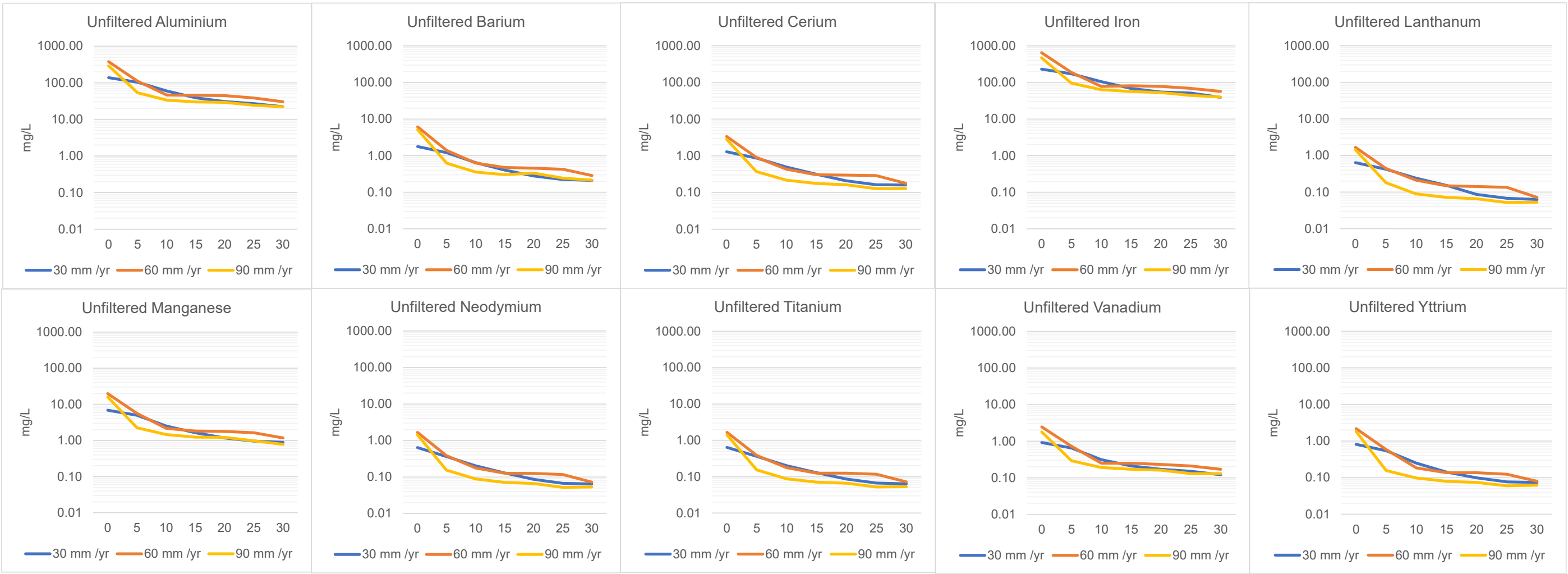


Figure 11-1: Unfiltered major elements > 1mg/L in Sample #1 for 30mm/hr, 60mm/hr and 90mm/hr events at 5-minute intervals

Table 11-5: Topsoil Stockpile as-placed 0.45 µm filtered surface water quality – relevant minor and trace elements

Topsoil stockpile_001																			
Water type		Surface water																	
Material placement		As-placed						As-placed						As-placed					
Rainfall mm/hr eqv.		30						60						90					
Sample interval (minutes)		5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
pH Value	pH Unit	8.2	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.1
Electrical Conductivity @ 25°C	µS/cm	452	422	402	394	390	387	451	409	395	399	395	384	407	395	392	397	395	395
Total Solids	mg/L	3660	2230	1560	1030	830	920	4520	2310	1640	1500	1560	1140	2030	1390	1130	1050	960	860
Bicarbonate Alkalinity as CaCO3	mg/L	66	65	66	64	66	62	67	63	64	68	70	62	65	60	62	62	62	62
Total Alkalinity as CaCO3	mg/L	66	65	66	64	66	62	67	63	64	68	70	62	65	60	62	62	62	62
Acidity as CaCO3	mg/L	11	12	12	13	12	13	12	13	13	13	13	14	14	15	0.5	41	29	26
Sulfate as SO4 - Turbidimetric	mg/L	48	47	47	48	47	48	51	48	48	49	49	47	52	51	52	52	47	52
Chloride	mg/L	50.0	44.0	42.0	40.0	40.0	38.0	51.0	43.0	42.0	42.0	42.0	40.0	41.0	38.0	38.0	38.0	38.0	37.0
Calcium	mg/L	26.0	14.0	13.0	12.0	12.0	12.0	27.0	15.0	15.0	14.0	13.0	14.0	15.0	14.0	15.0	15.0	14.0	14.0
Magnesium	mg/L	55.0	30.0	23.0	18.0	16.0	16.0	60.0	28.0	26.0	26.0	24.0	21.0	31.0	23.0	21.0	22.0	20.0	18.0
Sodium	mg/L	87.0	60.0	61.0	59.0	57.0	57.0	89.0	60.0	57.0	58.0	57.0	51.0	60.0	57.0	55.0	52.0	52.0	53.0
Potassium	mg/L	21.0	13.0	9.0	8.0	7.0	6.0	26.0	12.0	13.0	12.0	11.0	10.0	16.0	11.0	10.0	11.0	9.0	7.0
Fluoride	mg/L	1.2	1.0	1.0	0.9	0.9	0.9	1.1	1.0	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9
Filtered (0.45µm filter) Metals by ICP-MS																			
Barium	mg/L	0.005	0.008	0.009	0.010	0.012	0.011	0.007	0.009	0.010	0.009	0.011	0.009	0.007	0.010	0.008	0.008	0.008	0.009
Molybdenum	mg/L	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Strontium	mg/L	0.030	0.034	0.041	0.048	0.058	0.061	0.029	0.044	0.052	0.054	0.054	0.069	0.046	0.059	0.068	0.075	0.080	0.075

Table 11-6: Topsoil Stockpile as-placed 0.45 µm filtered seepage water quality – relevant minor and trace elements

Topsoil stockpile_001																			
Water type		Seepage																	
Material placement		As-placed						As-placed						As-placed					
Rainfall mm/hr eqv.		30						60						90					
Sample interval (minutes)		5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
pH Value	pH Unit	8.20	7.99	7.90	7.92	7.82	7.85	7.96	7.84	7.82	7.85	8.10	8.10	8.15	8.13	8.13	8.11	8.13	8.13
Electrical Conductivity @ 25°C	µS/cm	557	416	410	412	395	389	503	432	412	417	410	395	432	408	404	408	400	398
Total Solids	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	mg/L	113	92	84	84	82	80	94	82	79	80	66	64	70	65	64	65	63	65
Total Alkalinity as CaCO3	mg/L	113	92	84	84	82	80	94	82	79	80	66	64	70	65	64	65	63	65
Acidity as CaCO3	mg/L	51	0.5	21	51	34	36	51	33	33	43	15	15	27	31	34	37	37	41
Sulfate as SO4 - Turbidimetric	mg/L	95	46	45	45	47	48	54	54	47	47	50	48	52	51	53	54	54	54
Chloride	mg/L	141.00	54.00	52.00	50.00	51.00	45.00	77.00	64.00	54.00	54.00	45.00	42.00	43.00	40.00	39.00	40.00	39.00	38.00
Calcium	mg/L	45.00	19.00	16.00	15.00	13.00	12.00	32.00	14.00	13.00	13.00	12.00	13.00	15.00	14.00	15.00	15.00	14.00	14.00
Magnesium	mg/L	130.00	48.00	36.00	37.00	28.00	23.00	75.00	30.00	23.00	25.00	20.00	18.00	27.00	22.00	20.00	23.00	19.00	19.00
Sodium	mg/L	148.00	67.00	67.00	65.00	64.00	61.00	108.00	68.00	65.00	64.00	64.00	58.00	65.00	59.00	58.00	57.00	55.00	54.00
Potassium	mg/L	51.00	22.00	16.00	17.00	12.00	10.00	29.00	12.00	10.00	10.00	8.00	7.00	11.00	10.00	9.00	9.00	8.00	8.00
Fluoride	mg/L	1.40	1.10	1.00	1.00	0.90	0.90	1.10	1.00	0.90	0.90	0.90	0.90	1.00	1.00	0.90	0.90	0.90	0.90
Filtered (0.45µm filter) Metals by ICP-MS																			
Barium	mg/L	0.004	0.005	0.007	0.006	0.009	0.011	0.008	0.010	0.012	0.013	0.012	0.013	0.009	0.008	0.010	0.011	0.009	0.010
Copper	mg/L	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Lithium	mg/L	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Manganese	mg/L	0.001	0.001	0.005	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001
Molybdenum	mg/L	0.004	0.002	0.003	0.002	0.002	0.001	0.004	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Strontium	mg/L	0.008	0.015	0.024	0.024	0.033	0.039	0.022	0.037	0.047	0.043	0.048	0.058	0.046	0.058	0.066	0.065	0.075	0.075

11.2.2 Attachment B2: In-situ topsoil NW of TSF results

Table 11-7: In-situ Topsoil NW of TSF as-placed unfiltered trace and minor elements < 1mg/L in surface water

Sample ID		In-situ Topsoil_ NW of TSF																		
Water type		Run-off					Run-off							Run-off						
Material placement		As-placed					As-placed							As-placed						
Rainfall mm/hr eqv.		30					60							90						
Sample interval		10	15	20	25	30	0	5	10	15	20	25	30	0	5	10	15	20	25	30
Arsenic	mg/L	0.0120	0.0100	0.0080	0.0080	0.0070	0.0190	0.0120	0.0160	0.0080	0.0080	0.0090	0.0040	0.0130	0.0080	0.0050	0.0050	0.0040	0.0040	0.0040
Beryllium	mg/L	0.0050	0.0040	0.0030	0.0030	0.0030	0.0160	0.0050	0.0070	0.0040	0.0030	0.0030	0.0005	0.0050	0.0030	0.0020	0.0020	0.0020	0.0020	0.0020
Bismuth	mg/L	0.0030	0.0030	0.0020	0.0020	0.0010	0.0050	0.0030	0.0040	0.0020	0.0020	0.0020	0.0005	0.0020	0.0010	0.0005	0.0005	0.0005	0.0005	0.0005
Cadmium	mg/L	0.0005	0.0004	0.0003	0.0002	0.0002	0.0024	0.0004	0.0004	0.0002	0.0002	0.0002	0.0005	0.0004	0.0002	0.0002	0.0001	0.0001	0.0002	0.0001
Caesium	mg/L	0.0260	0.0230	0.0160	0.0150	0.0110	0.0320	0.0260	0.0270	0.0130	0.0150	0.0140	0.0060	0.0190	0.0110	0.0080	0.0080	0.0070	0.0060	0.0070
Chromium	mg/L	0.0920	0.0830	0.0620	0.0610	0.0470	0.1050	0.0900	0.1240	0.0520	0.0600	0.0680	0.0280	0.0680	0.0420	0.0270	0.0320	0.0260	0.0230	0.0260
Cobalt	mg/L	0.0600	0.0470	0.0390	0.0350	0.0300	0.1370	0.0500	0.0730	0.0340	0.0320	0.0310	0.0130	0.0520	0.0360	0.0240	0.0240	0.0220	0.0190	0.0220
Copper	mg/L	0.0720	0.0650	0.0560	0.0520	0.0460	0.1250	0.0650	0.0870	0.0500	0.0490	0.0510	0.0280	0.0610	0.0470	0.0360	0.0380	0.0360	0.0320	0.0340
Dysprosium	mg/L	0.0320	0.0240	0.0200	0.0180	0.0140	0.0960	0.0280	0.0280	0.0180	0.0160	0.0120	0.0050	0.0300	0.0180	0.0120	0.0120	0.0110	0.0090	0.0100
Erbium	mg/L	0.0170	0.0120	0.0100	0.0090	0.0080	0.0510	0.0140	0.0150	0.0100	0.0080	0.0060	0.0030	0.0160	0.0090	0.0060	0.0060	0.0060	0.0050	0.0050
Europium	mg/L	0.0090	0.0070	0.0060	0.0050	0.0040	0.0280	0.0080	0.0080	0.0050	0.0040	0.0040	0.0020	0.0090	0.0050	0.0030	0.0030	0.0030	0.0020	0.0030
Gadolinium	mg/L	0.0380	0.0290	0.0230	0.0210	0.0170	0.1140	0.0320	0.0330	0.0220	0.0180	0.0150	0.0060	0.0360	0.0210	0.0140	0.0140	0.0120	0.0100	0.0120
Gallium	mg/L	0.0320	0.0280	0.0210	0.0210	0.0160	0.0440	0.0310	0.0410	0.0190	0.0210	0.0220	0.0120	0.0270	0.0170	0.0110	0.0120	0.0100	0.0090	0.0100
Holmium	mg/L	0.0060	0.0040	0.0040	0.0030	0.0030	0.0180	0.0050	0.0050	0.0030	0.0030	0.0020	0.0005	0.0060	0.0030	0.0020	0.0020	0.0020	0.0020	0.0020
Lanthanum	mg/L	0.1880	0.1410	0.1060	0.0950	0.0790	0.5290	0.1590	0.1620	0.0980	0.0860	0.0660	0.0300	0.1670	0.1000	0.0610	0.0610	0.0520	0.0440	0.0520
Lead	mg/L	0.1630	0.1200	0.0920	0.0860	0.0700	0.3810	0.1350	0.1570	0.0810	0.0800	0.0700	0.0260	0.1340	0.0840	0.0480	0.0490	0.0400	0.0350	0.0410
Lithium	mg/L	0.0340	0.0300	0.0220	0.0220	0.0170	0.0450	0.0340	0.0500	0.0190	0.0200	0.0260	0.0080	0.0300	0.0180	0.0110	0.0130	0.0100	0.0090	0.0100
Lutetium	mg/L	0.0020	0.0010	0.0010	0.0005	0.0005	0.0050	0.0020	0.0020	0.0005	0.0005	0.0005	0.0005	0.0020	0.0010	0.0005	0.0005	0.0005	0.0005	0.0005
Neodymium	mg/L	0.1860	0.1390	0.1130	0.1000	0.0830	0.5360	0.1590	0.1670	0.1040	0.0910	0.0720	0.0300	0.1730	0.1040	0.0680	0.0680	0.0590	0.0500	0.0590
Nickel	mg/L	0.0440	0.0380	0.0300	0.0280	0.0230	0.0780	0.0410	0.0570	0.0260	0.0270	0.0290	0.0130	0.0360	0.0230	0.0160	0.0170	0.0150	0.0130	0.0150
Praseodymium	mg/L	0.0470	0.0340	0.0280	0.0250	0.0210	0.1370	0.0400	0.0410	0.0260	0.0230	0.0170	0.0080	0.0430	0.0260	0.0170	0.0170	0.0150	0.0120	0.0150
Rubidium	mg/L	0.1630	0.1440	0.1060	0.1000	0.0780	0.1920	0.1660	0.2170	0.0860	0.0990	0.1090	0.0460	0.1550	0.0950	0.0660	0.0690	0.0580	0.0510	0.0570
Samarium	mg/L	0.0400	0.0300	0.0250	0.0220	0.0180	0.1150	0.0350	0.0360	0.0220	0.0200	0.0160	0.0060	0.0380	0.0220	0.0150	0.0140	0.0130	0.0110	0.0120
Strontium	mg/L	0.2710	0.2390	0.2320	0.2190	0.2090	0.5820	0.2450	0.3320	0.2230	0.2130	0.2200	0.1880	0.2700	0.2240	0.2040	0.2070	0.2040	0.1970	0.2040
Terbium	mg/L	0.0050	0.0040	0.0030	0.0030	0.0020	0.0160	0.0050	0.0050	0.0030	0.0030	0.0020	0.0005	0.0050	0.0030	0.0020	0.0020	0.0020	0.0010	0.0020
Thallium	mg/L	0.0010	0.0010	0.0005	0.0005	0.0005	0.0020	0.0020	0.0020	0.0005	0.0005	0.0005	0.0005	0.0010	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Thorium	mg/L	0.0390	0.0330	0.0230	0.0220	0.0170	0.0520	0.0380	0.0380	0.0190	0.0220	0.0190	0.0080	0.0250	0.0120	0.0070	0.0080	0.0060	0.0050	0.0060
Thulium	mg/L	0.0020	0.0020	0.0010	0.0010	0.0005	0.0060	0.0020	0.0020	0.0010	0.0010	0.0005	0.0005	0.0020	0.0010	0.0005	0.0005	0.0005	0.0005	0.0005
Uranium	mg/L	0.0060	0.0050	0.0040	0.0030	0.0030	0.0150	0.0050	0.0050	0.0030	0.0030	0.0020	0.0010	0.0060	0.0030	0.0020	0.0020	0.0020	0.0010	0.0020
Vanadium	mg/L	0.2200	0.1900	0.1500	0.1400	0.1200	0.2900	0.2200	0.3000	0.1300	0.1400	0.1500	0.0600	0.1800	0.1100	0.0800	0.0800	0.0700	0.0600	0.0700
Ytterbium	mg/L	0.0140	0.0100	0.0090	0.0080	0.0060	0.0390	0.0120	0.0120	0.0080	0.0070	0.0050	0.0020	0.0130	0.0080	0.0050	0.0050	0.0050	0.0040	0.0040
Yttrium	mg/L	0.1240	0.0940	0.0820	0.0720	0.0620	0.3520	0.1060	0.1470	0.0760	0.0660	0.0600	0.0240	0.1240	0.0810	0.0550	0.0560	0.0490	0.0420	0.0490
Zinc	mg/L	0.2190	0.1760	0.1380	0.1290	0.1070	0.3700	0.1960	0.2500	0.1180	0.1210	0.1320	0.0740	0.1850	0.1180	0.0780	0.0880	0.0780	0.0700	0.0780

Table 11-8: In-situ Topsoil NW of TSF unfiltered major elements > 1mg/L in surface water quality

Aluminium	mg/L	88.200	80.400	60.600	60.100	48.000	116.000	89.600	123.000	53.800	60.400	71.400	26.700	61.000	37.000	23.900	28.200	22.900	20.800	23.200
Barium	mg/L	1.3800	1.0600	0.8860	0.8030	0.6960	3.7200	1.2400	1.3000	0.8250	0.7670	0.6330	0.2860	1.1800	0.7400	0.5160	0.5220	0.4670	0.4100	0.4660
Cerium	mg/L	0.4300	0.3270	0.2650	0.2360	0.1990	1.1700	0.3580	0.3760	0.2380	0.2130	0.1690	0.0660	0.3640	0.2230	0.1480	0.1500	0.1280	0.1100	0.1260
Iron	mg/L	90.500	80.300	61.200	58.800	46.800	108.000	89.200	122.000	52.900	60.000	63.800	27.100	69.200	43.700	28.900	33.400	27.600	25.000	27.900
Manganese	mg/L	2.3700	1.7700	1.5300	1.3500	1.2000	6.1800	1.8900	2.7600	1.3300	1.2000	1.0900	0.4550	2.3400	1.6000	1.0300	1.0400	0.9350	0.8100	0.9350
Titanium	mg/L	1.1900	1.1000	0.9200	0.9100	0.7500	1.1800	1.1800	1.5600	0.7800	0.9100	1.0200	0.4500	0.5600	0.3400	0.2400	0.3500	0.2500	0.2500	0.2800

Table 11-9: In-situ Topsoil NW of TSF – as placed and compacted samples with 0.45 µm filtered major elements and metal(oids) in surface runoff and seepage

In-situ Topsoil NW of TSF – as placed																						
Intensity		30					60							90								
Type		Run-off					Run-off							Seepage	Run-off							Seepage
Interval(Minutes)		10	15	20	25	30	0	5	10	15	20	25	30	30	0	5	10	15	20	25	30	30
pH Value	pH Unit	7.37	7.48	7.54	7.59	7.65	6.88	7.27	7.27	7.43	7.53	7.53	7.64	7.86	7.21	7.51	7.64	7.66	7.74	7.76	7.67	7.95
Electrical Conductivity @ 25°C	µS/cm	388	384	380	381	380	385	380	366	370	372	370	372	425	389	373	375	375	376	375	380	423
Total Solids	mg/L	6880	5520	4920	4370	4020	16300	7580	8180	5310	4230	4280	3400	970	8780	4820	3500	3140	2720	2370	2430	490
Bicarbonate Alkalinity as CaCO3	mg/L	45	47	51	69	52	31	41	40	47	48	53	50	61	36	44	52	52	53	55	55	65
Total Alkalinity as CaCO3	mg/L	45	47	51	69	52	31	41	40	47	48	53	50	61	36	44	52	52	53	55	55	65
Acidity as CaCO3	mg/L	8	8	4	5	4	16	8	8	6	7	5	5	3	8	4	4	4	3	3	6	4
Sulfate as SO4 - Turbidimetric	mg/L	50	49	48	48	47	48	46	46	46	46	46	45	48	47	46	44	46	47	46	45	48
Chloride	mg/L	57	56	56	55	53	55	52	50	47	49	49	48	53	53	49	49	52	53	54	53	59
Calcium	mg/L	12	13	14	15	14	8	12	11	14	14	15	20	20	10	12	14	13	15	17	15	18
Magnesium	mg/L	10	10	10	10	10	8	9	10	11	10	10	11	11	8	9	10	10	10	12	10	10
Sodium	mg/L	47	45	44	50	42	52	46	48	51	46	44	46	46	55	46	44	45	45	47	44	47
Potassium	mg/L	4	3	3	2	3	2	2	3	3	3	3	3	3	2	2	2	2	2	3	3	3
Fluoride	mg/L	0.4	0.5	0.5	0.5	0.6	0.2	0.4	0.4	0.5	0.5	0.5	0.6	0.7	0.3	0.5	0.5	0.6	0.6	0.6	0.6	0.7
Filtered (0.45µm filter) Metals by ICP-MS																						
Aluminium	mg/L	0.160	0.130	0.110	0.130	0.100	0.440	0.170	0.220	0.130	0.140	0.150	0.190	0.190	0.020	0.005	0.010	0.010	0.005	0.010	0.010	0.030
Barium	mg/L	0.073	0.070	0.068	0.067	0.067	0.069	0.069	0.065	0.064	0.068	0.066	0.049	0.049	0.055	0.057	0.048	0.053	0.052	0.062	0.047	0.039
Copper	mg/L	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.004	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003
Manganese	mg/L	0.005	0.012	0.010	0.008	0.005	0.012	0.004	0.008	0.010	0.008	0.007	0.029	0.032	0.002	0.003	0.004	0.005	0.004	0.140	0.003	0.032
Molybdenum	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.004	0.005	0.004	0.005	0.003	0.004	0.004
Rubidium	mg/L	0.004	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Strontium	mg/L	0.128	0.133	0.136	0.125	0.136	0.095	0.122	0.114	0.120	0.122	0.131	0.145	0.143	0.099	0.116	0.120	0.127	0.126	0.143	0.129	0.134
Iron	mg/L	0.150	0.120	0.110	0.110	0.100	0.390	0.160	0.200	0.110	0.120	0.140	0.120	0.120	0.060	0.025	0.050	0.050	0.050	0.300	0.080	0.060
In-situ Topsoil NW of TSF - compacted																						
Intensity		30					60							90								
Type		Run-off					Run-off							Run-off								
Interval(Minutes)		0	5	10	15	20	25	30	0	5	10	15	20	25	30	0	5	10	15	20	25	30
pH Value	pH Unit	6.7	7.11	7.36	7.4	7.46	7.57	7.58	6.74	7.19	7.33	7.45	7.54	7.55	7.55	6.84	7.26	7.44	7.43	7.48	7.52	7.56
Electrical Conductivity @ 25°C	µS/cm	417	364	369	372	371	371	371	360	353	355	364	367	366	366	355	353	358	358	363	363	371
Total Solids	mg/L	22500	11200	7480	5560	4880	4280	3820	26000	9310	7110	4660	4210	3560	3680	22400	8520	6110	6240	6260	4180	3230
Bicarbonate Alkalinity as CaCO3	mg/L	25	36	46	48	52	51	53	27	37	48	51	51	48	57	30	66	47	48	54	52	60
Total Alkalinity as CaCO3	mg/L	25	36	46	48	52	51	53	27	37	48	51	51	48	57	30	66	47	48	54	52	60
Acidity as CaCO3	mg/L	21	14	7	6	6	5	5	19	11	10	7	7	4	4	17	8	8	8	8	7	5
Sulfate as SO4 - Turbidimetric	mg/L	51	50	48	49	48	48	47	49	47	49	46	48	48	48	48	49	47	48	48	48	48
Chloride	mg/L	52	44	43	43	42	41	39	44	41	41	41	41	41	41	44	41	38	40	39	39	40
Calcium	mg/L	6	9	12	13	13	13	15	7	10	11	11	13	13	13	7	10	12	12	12	14	15
Magnesium	mg/L	7	8	9	9	9	10	10	6	8	9	9	9	10	10	7	9	10	9	10	10	10
Sodium	mg/L	64	50	47	45	44	43	44	55	48	45	46	42	44	43	52	43	44	44	45	43	42
Potassium	mg/L	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2
Fluoride	mg/L	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.2	0.4	0.4	0.5	0.5	0.6	0.6	0.2	0.4	0.5	0.5	0.5	0.6	0.6
Filtered (0.45µm filter) Metals by ICP-MS																						
Aluminium	mg/L	0.010	0.010	0.010	0.010	0.005	0.010	0.005	0.010	0.010	0.005	0.005	0.010	0.010	0.010	0.010	0.010	0.010	0.005	0.005	0.010	0.005
Barium	mg/L	0.055	0.060	0.058	0.058	0.057	0.057	0.059	0.049	0.058	0.057	0.058	0.052	0.052	0.052	0.053	0.058	0.059	0.058	0.055	0.053	0.044
Molybdenum	mg/L	0.005	0.005	0.006	0.005	0.006	0.005	0.004	0.006	0.005	0.007	0.005	0.007	0.007	0.008	0.007	0.005	0.005	0.007	0.005	0.007	0.006
Rubidium	mg/L	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.002	0.002	0.002
Strontium	mg/L	0.082	0.091	0.112	0.114	0.118	0.121	0.127	0.075	0.100	0.110	0.114	0.121	0.125	0.121	0.081	0.110	0.121	0.117	0.120	0.122	0.123
Iron	mg/L	0.050	0.070	0.060	0.050	0.050	0.060	0.025	0.025	0.025	0.025	0.025	0.070	0.070	0.070	0.070	0.060	0.070	0.080	0.060	0.060	0.025

11.2.3 Attachment B3: West Hill soil, saprolite and saprock results

Table 11-10: Sample #3, #4 and #5 West Hill unfiltered trace and minor elements in surface water

Sample ID		2022055_003 West Hill Soil						2022055_004 West Hill Saprolite						2022055_005 Saprock		
Water type								Runoff								
Material placement		As-placed			Compacted			As-placed			Compacted			As-placed		
Rainfall mm/hr eqv.		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90
Sample interval		Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average
<i>Un-filtered Metals</i>																
Antimony	mg/L	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.007	0.012	0.012	0.026	0.014	0.012	0.012	0.015	0.011	0.017	0.009	0.010	0.009	0.007	0.006
Beryllium	mg/L	0.002	0.001	0.001	0.004	0.003	0.002	0.001	0.002	0.001	0.003	0.002	0.002	0.001	0.001	0.001
Barium	mg/L	0.270	0.250	0.255	0.846	0.572	0.290	0.286	0.324	0.215	0.670	0.420	0.322	0.213	0.193	0.156
Bismuth	mg/L	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Cadmium	mg/L	0.001	0.001	0.001	0.002	0.002	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.0004	0.0002	0.0003
Cerium	mg/L	0.058	0.052	0.054	0.187	0.143	0.056	0.078	0.098	0.058	0.200	0.118	0.092	0.066	0.053	0.042
Caesium	mg/L	0.004	0.006	0.006	0.013	0.007	0.006	0.002	0.003	0.002	0.004	0.002	0.002	0.003	0.002	0.002
Chromium	mg/L	0.044	0.050	0.052	0.158	0.106	0.053	0.050	0.061	0.041	0.094	0.047	0.049	0.032	0.028	0.021
Cobalt	mg/L	0.025	0.021	0.022	0.073	0.053	0.023	0.020	0.022	0.013	0.047	0.028	0.023	0.014	0.013	0.01
Copper	mg/L	0.058	0.053	0.060	0.141	0.108	0.064	0.054	0.054	0.042	0.102	0.076	0.071	0.043	0.038	0.04
Dysprosium	mg/L	0.005	0.005	0.005	0.018	0.012	0.005	0.004	0.004	0.003	0.011	0.005	0.004	0.004	0.003	0.002
Erbium	mg/L	0.002	0.002	0.002	0.008	0.006	0.002	0.002	0.002	0.001	0.005	0.003	0.002	0.002	0.002	0.001
Europium	mg/L	0.002	0.002	0.002	0.007	0.005	0.002	0.002	0.002	0.001	0.004	0.002	0.002	0.001	0.001	0.001
Gadolinium	mg/L	0.007	0.006	0.006	0.024	0.016	0.007	0.005	0.006	0.004	0.013	0.007	0.005	0.004	0.004	0.003
Gallium	mg/L	0.010	0.014	0.013	0.041	0.023	0.014	0.009	0.011	0.007	0.023	0.009	0.008	0.01	0.007	0.006
Lanthanum	mg/L	0.032	0.029	0.029	0.108	0.075	0.033	0.029	0.035	0.021	0.077	0.041	0.030	0.025	0.02	0.016
Lead	mg/L	0.346	0.266	0.285	0.978	0.657	0.297	0.088	0.096	0.058	0.202	0.120	0.092	0.048	0.043	0.036
Lithium	mg/L	0.028	0.029	0.031	0.088	0.055	0.030	0.026	0.032	0.020	0.053	0.027	0.026	0.016	0.013	0.01
Neodymium	mg/L	0.035	0.032	0.033	0.120	0.082	0.037	0.029	0.034	0.020	0.078	0.043	0.032	0.024	0.019	0.015
Nickel	mg/L	0.037	0.034	0.036	0.109	0.080	0.036	0.033	0.040	0.025	0.071	0.041	0.039	0.021	0.018	0.014
Praseodymium	mg/L	0.009	0.008	0.008	0.029	0.020	0.009	0.007	0.009	0.005	0.020	0.010	0.008	0.006	0.005	0.004
Rubidium	mg/L	0.017	0.024	0.025	0.056	0.030	0.024	0.021	0.025	0.018	0.040	0.021	0.020	0.025	0.02	0.016
Samarium	mg/L	0.007	0.006	0.007	0.025	0.017	0.008	0.006	0.006	0.004	0.014	0.008	0.006	0.005	0.004	0.003
Selenium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Silver	mg/L	0.001	0.001	0.001	0.005	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Strontium	mg/L	0.298	0.314	0.324	0.494	0.406	0.358	0.279	0.241	0.210	0.396	0.338	0.296	0.222	0.224	0.214
Terbium	mg/L	0.001	0.001	0.001	0.003	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Thorium	mg/L	0.003	0.004	0.004	0.011	0.008	0.004	0.003	0.004	0.002	0.006	0.002	0.002	0.005	0.003	0.002
Titanium	mg/L	0.060	0.160	0.150	0.180	0.090	0.130	0.050	0.070	0.060	0.070	0.020	0.020	0.34	0.2	0.17
Uranium	mg/L	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Vanadium	mg/L	0.070	0.080	0.080	0.250	0.160	0.090	0.070	0.080	0.050	0.100	0.050	0.060	0.07	0.06	0.04
Ytterbium	mg/L	0.002	0.002	0.002	0.006	0.004	0.002	0.001	0.001	0.001	0.004	0.002	0.001	0.002	0.001	0.001
Yttrium	mg/L	0.024	0.021	0.021	0.077	0.053	0.024	0.018	0.020	0.012	0.046	0.025	0.019	0.021	0.015	0.012
Zinc	mg/L	0.289	0.286	0.304	0.930	0.636	0.303	0.227	0.246	0.156	0.525	0.299	0.268	0.131	0.113	0.095

Table 11-11: Sample #3, #4 and #5 West Hill unfiltered major elements in surface water quality

Sample ID		2022055_003 West Hill Soil						2022055_004 West Hill Saprolite						2022055_005 Saprock		
Water type								Surface runoff								
Material placement		As-placed			Compacted			As-placed			Compacted			As-placed		
Rainfall mm/hr eqv.		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90
Sample interval		Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average
<i>Un-filtered Metals</i>																
Aluminium	mg/L	34.100	42.200	42.700	118.000	81.000	44.400	30.000	36.600	24.400	57.700	24.000	23.300	24.400	19.000	14.200
Iron	mg/L	37.700	43.700	45.200	136.000	89.900	46.600	34.200	40.000	27.100	56.800	27.800	29.800	28.600	22.600	17.400
Manganese	mg/L	2.260	1.830	2.080	5.700	4.500	1.840	1.120	1.230	0.749	2.530	1.490	1.230	0.631	0.605	0.482

Table 11-12: Sample #3, #4 and #5 West Hill 0.45 µm filtered major elements and metal(oids) in surface runoff and seepage

Sample ID		2022055_003 West Hill Soil												2022055_004 West Hill Saprolite								2022055_005 West Hill Saprock							
Material placement		Loose						Compacted						Loose				Compacted				Rock + West Hill Soil							
Rainfall mm/hr eqv.		30	60	90	30	60	90	30	60	90	30	60	90	30	60	90	60	90	30	60	90	30	60	90	30	60	90		
Water type		Run-off			Seepage			Run-off			Seepage			Runoff			Seepage			Runoff			Run-off			Seepage			
pH Value	pH Unit	8.02	8.02	8	7.91	7.99	8.08	8	8.07	8.02	8.18	7.95	8.24	7.85	7.78	7.83	7.66	7.75	7.68	7.74	7.83	7.94	7.97	8.02	7.75	7.91	8		
Electrical Conductivity @ 25°C	µS/cm	628	689	737	572	648	666	756	792	802	800	775	808	498	396	407	530	476	446	463	474	536	542	536	659	567	584		
Total Solids	mg/L	2050	2490	1810	----	----	----	5890	4160	2290	----	----	----	2190	2130	1620	----	----	4800	3120	2090	1340	1340	1250	----	----	----		
Bicarbonate Alkalinity as CaCO3	mg/L	80	82	86	63		96	84	94	96	112	100	120	66	56	54	47	58	51	59	60	75	78	79	56	67	75		
Total Alkalinity as CaCO3	mg/L	80	82	86	63	92	96	84	94	96	112	100	120	66	56	54	47	58	51	59	60	75	78	79	56	67	75		
Acidity as CaCO3	mg/L	3	3	3	2	3	3	3	3	2	0.5	4	0.5	4	4	5	6	4	7	6	5	5	5	4	7	5	5		
Filtered (45µm) Major ions by ICP-MS																													
Sulfate as SO4 - Turbidimetric	mg/L	66	68	70	59	61	60	70	69	68	69	71	68	63	63	62	80	73	74	79	80	79	77	79	122	91	88		
Chloride	mg/L	96	113	124	87	111	112	133	141	141	152	149	154	63	38	41	53	47	54	54	55	69	68	67	84	73	76		
Calcium	mg/L	43	49	49	47	52	56	68	55	54	51	59	52	33	28	24	35	30	41	38	35	28	30	30	25	25	26		
Magnesium	mg/L	31	29	30	22	25	25	54	50	34	40	49	44	25	24	19	22	20	35	26	24	20	20	19	20	18	18		
Sodium	mg/L	59	65	73	33	42	38	69	73	79	76	65	76	56	44	45	39	41	43	59	62	64	60	61	86	70	72		
Potassium	mg/L	4	5	6	2	2	2	8	6	6	5	6	6	4	4	3	3	3	5	4	4	6	6	5	3	4	4		
Fluoride	mg/L	0.200	0.200	0.200	0.300	0.200	0.200	0.200	0.200	0.050	0.100	0.200	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050		
Filtered (45µm) Metals by ICP-MS																													
Aluminium	mg/L	0.020	0.005	0.010	0.030	0.020	0.020	0.010	0.005	0.005	0.020	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Barium	mg/L	0.042	0.049	0.048	0.041	0.050	0.052	0.049	0.037	0.048	0.051	0.046	0.050	0.039	0.032	0.027	0.048	0.034	0.039	0.037	0.036	0.026	0.027	0.029	0.037	0.031	0.028		
Copper	mg/L	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002		
Rubidium	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.001	0.001	0.001	0.001	0.002	0.001		
Strontium	mg/L	0.240	0.260	0.269	0.280	0.316	0.337	0.290	0.286	0.284	0.289	0.309	0.292	0.210	0.166	0.162	0.292	0.229	0.202	0.193	0.183	0.178	0.184	0.177	0.196	0.191	0.187		

11.3 Attachment C: ALS Laboratory results

11.3.1 Attachment C1_AG3

CERTIFICATE OF ANALYSIS

Work Order : **EB2232609**
Client : **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**
Contact : ASHRAF KHALIFA
Address : 3/30 LENSWORTH STREET
 COOPERS PLAINS 4108
Telephone : ----
Project : 2022055 MRO EROSION Modelling
Order number : ----
C-O-C number : ----
Sampler : PRIYA RAJENDRAN
Site : ----
Quote number : EN/222
No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 5
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 02-Nov-2022 13:50
Date Analysis Commenced : 04-Nov-2022
Issue Date : 14-Nov-2022 17:24



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Layla Hafner	Acid Sulphate Soils - Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA150H: Soil particle density results fell outside the scope of AS1289.3.6.3. Results should be scrutinised accordingly.
- ALS is not NATA accredited for the analysis of Exchangeable Aluminium and Exchange Acidity in soils when performed under ALS Method ED005.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- EK067G (Total Phosphorus): Sample EB2232609_002 (2022055_002) Shows poor matrix spike recovery due to sample heterogeneity. Confirmed by visual analysis.
- ED007 (Exchangeable Cations): Unable to calculate Magnesium/Potassium Ratio result as required Exchangeable Potassium results are less than the limit of reporting.
- ED006 (Exchangeable Cations on Alkaline Soils): Unable to calculate Magnesium/Potassium Ratio results for some samples as required Exchangeable Potassium results are less than the limit of reporting.
- EA058 Emerson: V. = Very, D. = Dark, L. = Light, VD. = Very Dark
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity ($H^+ + Al^{3+}$).



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				2022055_001 Topsoil Stockpile	2022055_002 Topsoil	2022055_003 West Hill Soil	2022055_004 West Hill saprolite	----
Sampling date / time				29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit	EB2232609-001	EB2232609-002	EB2232609-003	EB2232609-004	-----
				Result	Result	Result	Result	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl ₂)	----	0.1	pH Unit	7.5	4.7	7.2	6.0	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.0	5.9	8.0	6.7	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	177	50	50	36	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	5.8	9.6	11.9	10.2	----
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Olive Brown (2.5Y 4/3)	Dark Gray (2.5Y 4/1)	Dark Grayish Brown (10YR 4/2)	Very Dark Grayish Brown (10YR 3/2)	----
Texture	----	-	-	Sandy Clay Loam	Sandy Clay Loam	Light Clay	Light Medium Clay	----
Emerson Class Number	EC/TC	-	-	2	2	6	6	----
EA150: Particle Sizing								
Ø +2µm	----	1	%	93	88	82	86	----
Ø +5µm	----	1	%	90	82	70	75	----
Ø +10µm	----	1	%	89	79	62	68	----
Ø +15.6µm	----	1	%	88	76	58	60	----
Ø +20µm	----	1	%	88	75	57	57	----
Ø +30µm	----	1	%	86	70	51	50	----
Ø +40µm	----	1	%	84	67	49	48	----
Ø +50µm	----	1	%	83	65	48	46	----
Ø +60µm	----	1	%	83	63	47	44	----
+75µm	----	1	%	82	62	46	42	----
+150µm	----	1	%	73	47	42	38	----
+300µm	----	1	%	62	31	40	36	----
+425µm	----	1	%	54	25	38	35	----
+600µm	----	1	%	46	20	36	34	----
+1180µm	----	1	%	24	12	31	29	----
+2.36mm	----	1	%	9	6	24	21	----
+4.75mm	----	1	%	2	3	12	11	----
+9.5mm	----	1	%	<1	<1	<1	<1	----
+19.0mm	----	1	%	<1	<1	<1	<1	----
+37.5mm	----	1	%	<1	<1	<1	<1	----
+75.0mm	----	1	%	<1	<1	<1	<1	----



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				2022055_001 Topsoil Stockpile	2022055_002 Topsoil	2022055_003 West Hill Soil	2022055_004 West Hill saprolite	----
Sampling date / time				29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit	EB2232609-001	EB2232609-002	EB2232609-003	EB2232609-004	-----
				Result	Result	Result	Result	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	7	12	18	14	----
Silt (2-60 µm)	----	1	%	10	25	35	42	----
Sand (0.06-2.00 mm)	----	1	%	70	55	21	21	----
Gravel (>2mm)	----	1	%	13	8	26	23	----
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.71	2.50	2.47	2.40	----
ED005: Exchange Acidity								
Ø Exchange Acidity	----	0.1	meq/100g	----	0.2	----	----	----
Ø Exchangeable Aluminium	----	0.1	meq/100g	----	<0.1	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Ø Exchangeable Calcium	----	0.2	meq/100g	2.7	----	8.8	----	----
Ø Exchangeable Magnesium	----	0.2	meq/100g	5.3	----	3.0	----	----
Ø Exchangeable Potassium	----	0.2	meq/100g	<0.2	----	<0.2	----	----
Ø Exchangeable Sodium	----	0.2	meq/100g	4.1	----	<0.2	----	----
Ø Cation Exchange Capacity	----	0.2	meq/100g	12.1	----	12.0	----	----
Ø Exchangeable Sodium Percent	----	0.2	%	33.9	----	<0.2	----	----
Ø Calcium/Magnesium Ratio	----	0.2	-	0.5	----	2.9	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	1.6	----	7.2	----
Exchangeable Magnesium	----	0.1	meq/100g	----	1.7	----	3.8	----
Exchangeable Potassium	----	0.1	meq/100g	----	<0.1	----	0.2	----
Exchangeable Sodium	----	0.1	meq/100g	----	0.5	----	0.1	----
Cation Exchange Capacity	----	0.1	meq/100g	----	4.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	11.3	----
Exchangeable Sodium Percent	----	0.1	%	----	12.2	----	1.0	----
Calcium/Magnesium Ratio	----	0.1	-	----	0.9	----	1.9	----
Magnesium/Potassium Ratio	----	0.1	-	----	----	----	19.6	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	100	mg/kg	<100	<100	183	227	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	140	20	<10	<10	----
ED092: DTPA Extractable Metals								
Ø Copper	7440-50-8	1	mg/kg	<1	<1	<1	1	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	2022055_001 Topsoil Stockpile	2022055_002 Topsoil	2022055_003 West Hill Soil	2022055_004 West Hill saprolite	----
Sampling date / time					29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	29-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit		EB2232609-001	EB2232609-002	EB2232609-003	EB2232609-004	-----
					Result	Result	Result	Result	----
ED092: DTPA Extractable Metals - Continued									
Ø Iron	7439-89-6	1	mg/kg		11	78	14	33	----
Ø Manganese	7439-96-5	1	mg/kg		<1	14	30	26	----
Ø Zinc	7440-66-6	1	mg/kg		<1	<1	2	5	----
EK055: Ammonia as N									
Ammonia as N	7664-41-7	20	mg/kg		<20	<20	<20	<20	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		0.7	18.1	3.2	7.0	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		0.7	18.1	3.2	7.0	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		<20	370	380	980	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		<20	390	380	990	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		404	92	158	216	----
EK080: Bicarbonate Extractable Phosphorus (Colwell)									
Bicarbonate Ext. P (Colwell)	----	5	mg/kg		12	<5	<5	<5	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	1.1	1.5	2.5	----
Total Organic Carbon	----	0.5	%		<0.5	0.6	0.8	1.4	----

11.3.2 Attachment C2_ALS Dry grading and wet PSD

Certificate of Analysis

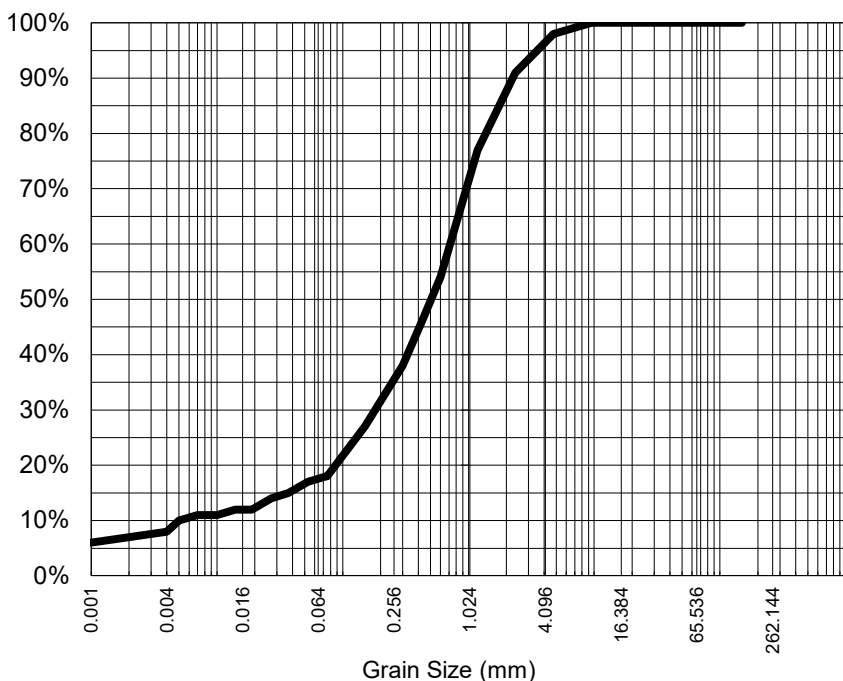
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: ASHRAF KHALIFA **DATE REPORTED:** 8-Nov-2022
COMPANY: RGS ENVIRONMENTAL **DATE RECEIVED:** 2-Nov-2022
CONSULTANTS PTY LTD
ADDRESS: 3/30 Lensworth Street **REPORT NO:** EB2232609-001 / PSD
Coopers Plains
PROJECT: 2022055 MRO EROSION **SAMPLE ID:** 2022055_001
Modelling

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	98%
2.36	91%
1.18	77%
0.600	54%
0.425	46%
0.300	38%
0.150	27%
0.075	18%
Particle Size (microns)	
53	17%
37	15%
27	14%
19	12%
14	12%
10	11%
7	11%
5	10%
1	6%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.513
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 5-Nov-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.71

Satish Trivedi
Soil Senior Chemist
Authorised Signatory

NATA Accreditation: 825 Site: Brisbane
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Certificate of Analysis

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Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

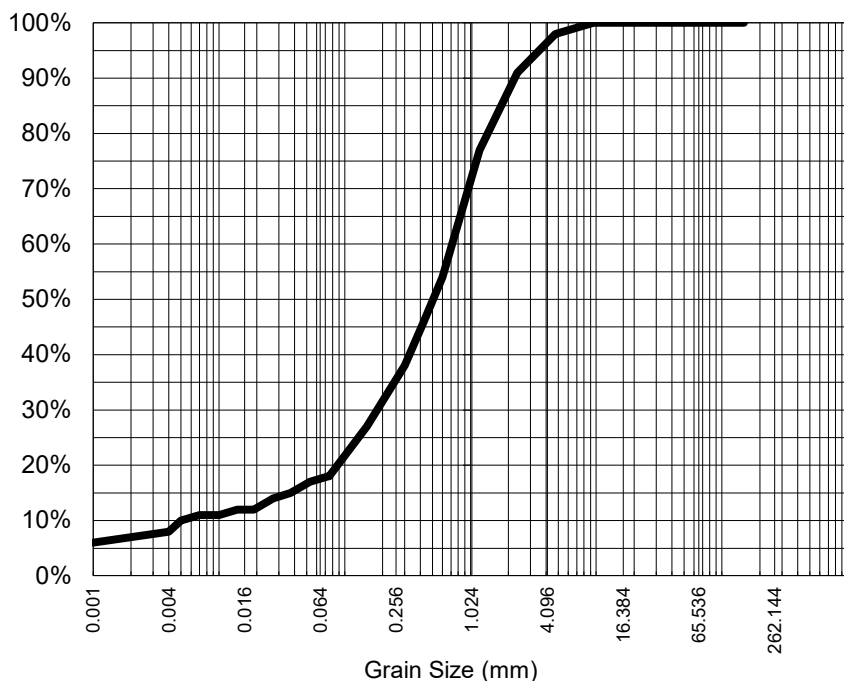
ALS Environmental
Brisbane QLD



CLIENT: ASHRAF KHALIFA
COMPANY: RGS ENVIRONMENTAL
CONSULTANTS PTY LTD
ADDRESS: 3/30 Lensworth Street
Coopers Plains
PROJECT: 2022055 MRO EROSION
Modelling

DATE REPORTED: 8-Nov-2022
DATE RECEIVED: 2-Nov-2022
REPORT NO: EB2232609-001DUP / PSD
SAMPLE ID: 2022055_001

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	98%
2.36	91%
1.18	77%
0.600	54%
0.425	46%
0.300	38%
0.150	27%
0.075	18%
Particle Size (microns)	
53	17%
37	15%
27	14%
19	12%
14	12%
10	11%
7	11%
5	10%
1	6%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.513
----------------------------	-------

Sample Comments:

Analysed: 5-Nov-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.71

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Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

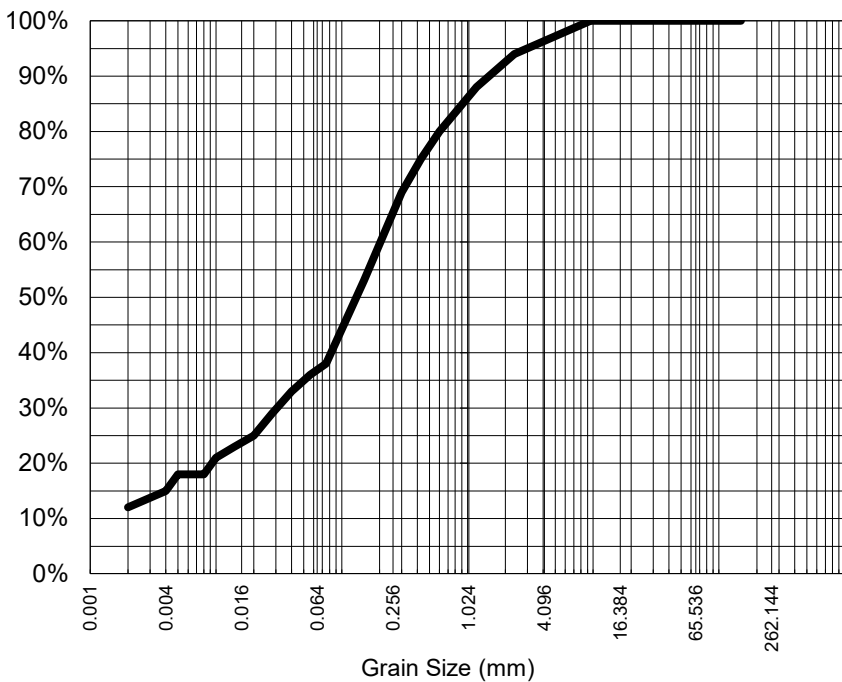
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: ASHRAF KHALIFA **DATE REPORTED:** 8-Nov-2022
COMPANY: RGS ENVIRONMENTAL **DATE RECEIVED:** 2-Nov-2022
CONSULTANTS PTY LTD
ADDRESS: 3/30 Lensworth Street **REPORT NO:** EB2232609-002 / PSD
Coopers Plains
PROJECT: 2022055 MRO EROSION **SAMPLE ID:** 2022055_002
Modelling

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	97%
2.36	94%
1.18	88%
0.600	80%
0.425	75%
0.300	69%
0.150	53%
0.075	38%
Particle Size (microns)	
56	36%
40	33%
28	29%
20	25%
14	23%
10	21%
8	18%
5	18%
2	12%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.135
----------------------------	-------

Sample Comments:

Analysed: 5-Nov-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.5

NATA Accreditation: 825 Site: Brisbane

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Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

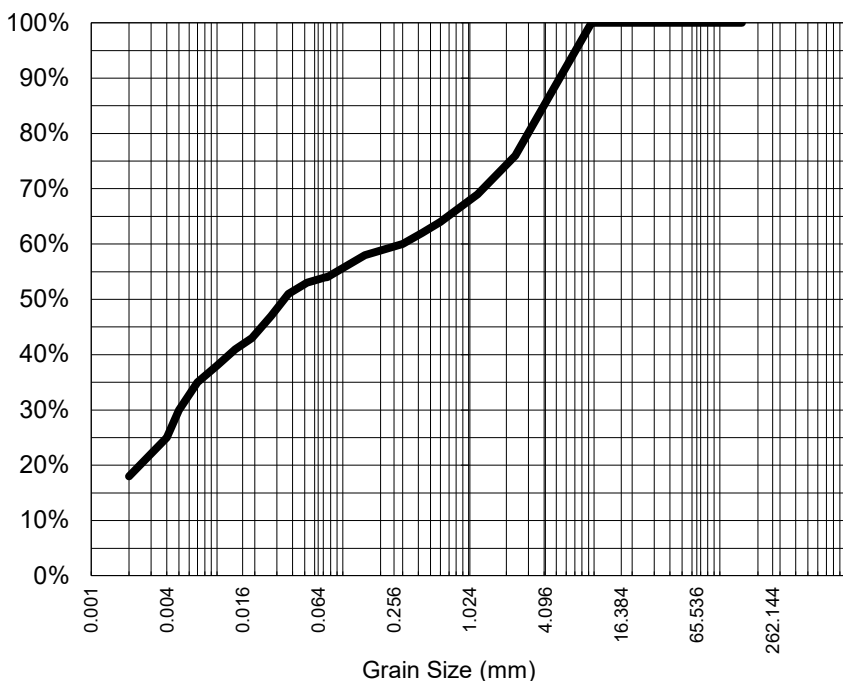
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: ASHRAF KHALIFA
DATE REPORTED: 8-Nov-2022
COMPANY: RGS ENVIRONMENTAL CONSULTANTS PTY LTD
DATE RECEIVED: 2-Nov-2022
ADDRESS: 3/30 Lensworth Street
REPORT NO: EB2232609-003 / PSD
Coopers Plains
PROJECT: 2022055 MRO EROSION
SAMPLE ID: 2022055_003
Modelling

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
9.50	100%
4.75	88%
2.36	76%
1.18	69%
0.600	64%
0.425	62%
0.300	60%
0.150	58%
0.075	54%
Particle Size (microns)	
52	53%
37	51%
27	47%
19	43%
14	41%
10	38%
7	35%
5	30%
2	18%

Median Particle Size (mm)*	0.035
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.47

Analysed: 5-Nov-22

Limit of Reporting: 1%

Dispersion Method Shaker

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Soil Senior Chemist
Authorised Signatory

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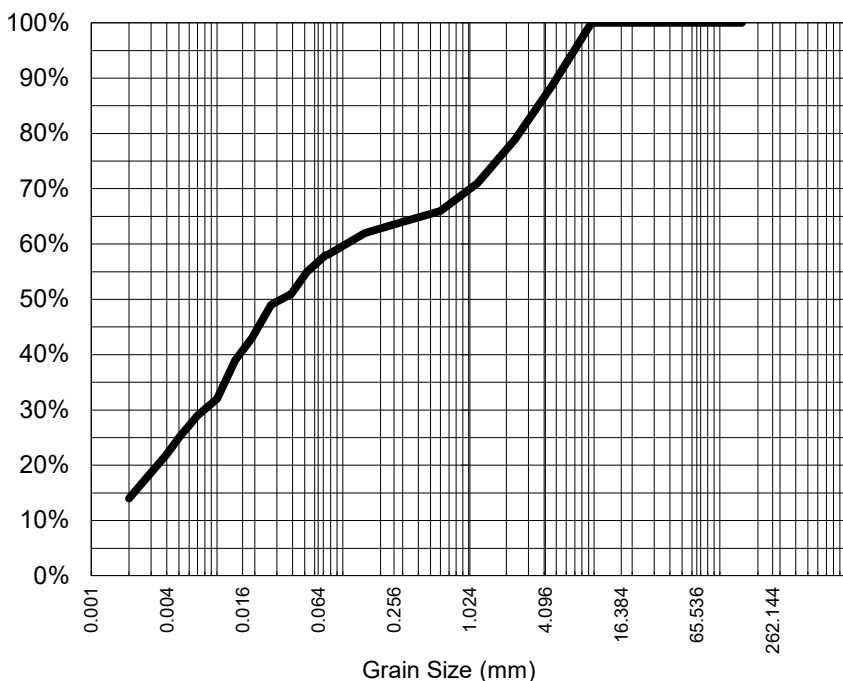
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: ASHRAF KHALIFA
DATE REPORTED: 8-Nov-2022
COMPANY: RGS ENVIRONMENTAL CONSULTANTS PTY LTD
DATE RECEIVED: 2-Nov-2022
ADDRESS: 3/30 Lensworth Street
Coopers Plains
REPORT NO: EB2232609-004 / PSD
PROJECT: 2022055 MRO EROSION Modelling
SAMPLE ID: 2022055_004

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	89%
2.36	79%
1.18	71%
0.600	66%
0.425	65%
0.300	64%
0.150	62%
0.075	58%
Particle Size (microns)	
52	55%
39	51%
27	49%
19	43%
14	39%
10	32%
7	29%
5	25%
2	14%

Analysis Notes

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.033
----------------------------	-------

Sample Comments:

Analysed: 5-Nov-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.4 (2.45)*

NATA Accreditation: 825 Site: Brisbane
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Satish Trivedi
Soil Senior Chemist
Authorised Signatory

11.3.3 Attachment C3_RaeSIM water results

CERTIFICATE OF ANALYSIS

Work Order : **EB2227890**
Client : **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**
Contact : **ASHRAF KHALIFA**
Address : **3/30 LENSWORTH STREET**
COOPERS PLAINS 4108
Telephone : **----**
Project : **2022055 MRO EROSION Modelling**
Order number : **----**
C-O-C number : **----**
Sampler : **PRIYA RAJENDRAN**
Site : **----**
Quote number : **EN/222**
No. of samples received : **39**
No. of samples analysed : **39**

Page : 1 of 32
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 21-Sep-2022 16:15
Date Analysis Commenced : 24-Sep-2022
Issue Date : 29-Sep-2022 18:43



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG020-T (Total Metals by ICP-MS): Sample 30Topsoil1_5 min (EB227890-002) shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EG035T (Total Mercury): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EG020T (Total Metals by ICP-MS): Aluminium method blank is above the limit of reporting but are not considered significant compared to the analyte levels in the sample.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS): The high failing laboratory control standards for Hafnium and Thallium are deemed acceptable as all results are less than the limit of reporting.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30Topsoil1_0 min	30Topsoil1_5 min	30Topsoil1_10 min	30Topsoil1_15 min	30Topsoil1_20 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-001	EB2227890-002	EB2227890-003	EB2227890-004	EB2227890-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.14	8.15	8.00	8.06	8.09
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		484	452	422	402	394
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		5900	3660	2230	1560	1030
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		68	66	65	66	64
Total Alkalinity as CaCO ₃	----	1	mg/L		68	66	65	66	64
ED038: Acidity									
Acidity as CaCO ₃	----	1	mg/L		23	11	12	12	13
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		52	48	47	47	48
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		57	50	44	42	40
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		34	26	14	13	12
Magnesium	7439-95-4	1	mg/L		75	55	30	23	18
Sodium	7440-23-5	1	mg/L		93	87	60	61	59
Potassium	7440-09-7	1	mg/L		29	21	13	9	8
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.03	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.030	0.030	0.034	0.041	0.048
Barium	7440-39-3	0.001	mg/L		0.008	0.005	0.008	0.009	0.010
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Topsoil1_0 min	30Topsoil1_5 min	30Topsoil1_10 min	30Topsoil1_15 min	30Topsoil1_20 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-001	EB2227890-002	EB2227890-003	EB2227890-004	EB2227890-005
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.001	0.001	0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.003	0.002	0.002	0.001	0.002
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				30Topsoil1_0 min	30Topsoil1_5 min	30Topsoil1_10 min	30Topsoil1_15 min	30Topsoil1_20 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-001	EB2227890-002	EB2227890-003	EB2227890-004	EB2227890-005
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

EG020T: Total Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	138	103	59.8	39.0	30.6
Dysprosium	7429-91-6	0.001	mg/L	0.120	0.080	0.046	0.029	0.019
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.017	0.016	0.007	0.005	0.004
Bismuth	7440-69-9	0.001	mg/L	0.002	0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	0.073	0.048	0.027	0.017	0.012
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.022	0.014	0.008	0.005	0.004
Strontium	7440-24-6	0.001	mg/L	0.333	0.249	0.127	0.106	0.095
Barium	7440-39-3	0.001	mg/L	1.78	1.21	0.645	0.405	0.279
Gadolinium	7440-54-2	0.001	mg/L	0.123	0.081	0.045	0.029	0.019
Titanium	7440-32-6	0.01	mg/L	7.72	2.91	2.35	1.74	1.75
Beryllium	7440-41-7	0.001	mg/L	0.009	0.006	0.003	0.002	0.001
Gallium	7440-55-3	0.001	mg/L	0.083	0.060	0.034	0.022	0.017
Cadmium	7440-43-9	0.0001	mg/L	0.0016	0.0008	0.0004	0.0003	0.0002
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.159	0.119	0.065	0.043	0.032
Holmium	7440-60-0	0.001	mg/L	0.022	0.014	0.008	0.005	0.004
Uranium	7440-61-1	0.001	mg/L	0.009	0.006	0.004	0.002	0.002
Caesium	7440-46-2	0.001	mg/L	0.047	0.034	0.021	0.014	0.010
Chromium	7440-47-3	0.001	mg/L	0.044	0.031	0.018	0.012	0.009
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.126	0.097	0.060	0.044	0.037
Lanthanum	7439-91-0	0.001	mg/L	0.642	0.423	0.242	0.153	0.086
Rubidium	7440-17-7	0.001	mg/L	0.289	0.213	0.110	0.077	0.060
Lithium	7439-93-2	0.001	mg/L	0.126	0.094	0.041	0.028	0.021
Lutetium	7439-94-3	0.001	mg/L	0.010	0.007	0.004	0.002	0.002
Thorium	7440-29-1	0.001	mg/L	0.100	0.060	0.037	0.023	0.016
Cerium	7440-45-1	0.001	mg/L	1.29	0.870	0.495	0.316	0.209
Manganese	7439-96-5	0.001	mg/L	6.91	5.02	2.50	1.64	1.18
Neodymium	7440-00-8	0.001	mg/L	0.642	0.364	0.202	0.129	0.086



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				30Topsoil1_0 min	30Topsoil1_5 min	30Topsoil1_10 min	30Topsoil1_15 min	30Topsoil1_20 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-001	EB2227890-002	EB2227890-003	EB2227890-004	EB2227890-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.152	0.084	0.047	0.030	0.020
Nickel	7440-02-0	0.001	mg/L	0.063	0.046	0.022	0.015	0.011
Samarium	7440-19-9	0.001	mg/L	0.115	0.077	0.043	0.027	0.018
Lead	7439-92-1	0.001	mg/L	0.148	0.096	0.055	0.034	0.023
Terbium	7440-27-9	0.001	mg/L	0.017	0.011	0.006	0.004	0.003
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	0.010	0.007	0.004	0.002	0.002
Selenium	7782-49-2	0.01	mg/L	0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.070	0.047	0.026	0.017	0.011
Tin	7440-31-5	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.814	0.546	0.247	0.142	0.099
Thallium	7440-28-0	0.001	mg/L	0.002	0.002	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	0.008	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.92	0.65	0.31	0.21	0.17
Zinc	7440-66-6	0.005	mg/L	0.608	0.437	0.223	0.153	0.118
Iron	7439-89-6	0.05	mg/L	232	171	105	68.4	54.6
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	1.3	1.2	1.0	1.0	0.9



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30Topsoil1_25 min	30Topsoil1_30 min	30Topsoil1_S5 min	30Topsoil1_S10 min	30Topsoil1_S15 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-006	EB2227890-007	EB2227890-008	EB2227890-009	EB2227890-010
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.08	8.07	8.20	7.99	7.90
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		390	387	557	416	410
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		830	920	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		66	62	113	92	84
Total Alkalinity as CaCO ₃	----	1	mg/L		66	62	113	92	84
ED038: Acidity									
Acidity as CaCO ₃	----	1	mg/L		12	13	51	<1	21
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		47	48	95	46	45
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		40	38	141	54	52
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		12	12	45	19	16
Magnesium	7439-95-4	1	mg/L		16	16	130	48	36
Sodium	7440-23-5	1	mg/L		57	57	148	67	67
Potassium	7440-09-7	1	mg/L		7	6	51	22	16
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.058	0.061	0.008	0.015	0.024
Barium	7440-39-3	0.001	mg/L		0.012	0.011	0.004	0.005	0.007
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	0.02	0.02	0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Topsoil1_25 min	30Topsoil1_30 min	30Topsoil1_S5 min	30Topsoil1_S10 min	30Topsoil1_S15 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-006	EB2227890-007	EB2227890-008	EB2227890-009	EB2227890-010
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.002	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	0.002	0.001	0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	0.001	0.005
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.001	0.004	0.002	0.003
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.02	0.01	<0.01



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				30Topsoil1_25 min	30Topsoil1_30 min	30Topsoil1_S5 min	30Topsoil1_S10 min	30Topsoil1_S15 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-006	EB2227890-007	EB2227890-008	EB2227890-009	EB2227890-010
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0.11

EG020T: Total Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	27.0	22.2	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	0.015	0.014	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.004	0.003	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	0.009	0.009	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	0.003	0.003	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.091	0.094	----	----	----
Barium	7440-39-3	0.001	mg/L	0.223	0.211	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	0.015	0.015	----	----	----
Titanium	7440-32-6	0.01	mg/L	2.23	1.46	----	----	----
Beryllium	7440-41-7	0.001	mg/L	0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	0.015	0.012	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.025	0.024	----	----	----
Holmium	7440-60-0	0.001	mg/L	0.003	0.002	----	----	----
Uranium	7440-61-1	0.001	mg/L	0.001	0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L	0.008	0.007	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.008	0.007	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	0.035	0.030	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	0.068	0.063	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.048	0.043	----	----	----
Lithium	7439-93-2	0.001	mg/L	0.018	0.016	----	----	----
Lutetium	7439-94-3	0.001	mg/L	0.001	0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	0.013	0.011	----	----	----
Cerium	7440-45-1	0.001	mg/L	0.164	0.160	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.956	0.891	----	----	----
Neodymium	7440-00-8	0.001	mg/L	0.067	0.064	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30Topsoil1_25 min	30Topsoil1_30 min	30Topsoil1_S5 min	30Topsoil1_S10 min	30Topsoil1_S15 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-006	EB2227890-007	EB2227890-008	EB2227890-009	EB2227890-010
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	----	----	----
Praseodymium	7440-10-0	0.001	mg/L		0.016	0.015	----	----	----
Nickel	7440-02-0	0.001	mg/L		0.010	0.008	----	----	----
Samarium	7440-19-9	0.001	mg/L		0.014	0.013	----	----	----
Lead	7439-92-1	0.001	mg/L		0.020	0.018	----	----	----
Terbium	7440-27-9	0.001	mg/L		0.002	0.002	----	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L		0.001	0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L		0.009	0.008	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L		0.077	0.074	----	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	----	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L		0.15	0.12	----	----	----
Zinc	7440-66-6	0.005	mg/L		0.095	0.085	----	----	----
Iron	7439-89-6	0.05	mg/L		51.2	39.2	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0005	<0.0005	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.9	0.9	1.4	1.1	1.0



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30Topsoil1_S20 min	30Topsoil1_S25 min	30Topsoil1_S30 min	60Topsoil1_0 min	60Topsoil1_5 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-011	EB2227890-012	EB2227890-013	EB2227890-014	EB2227890-015
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.92	7.82	7.85	8.29	8.14
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		412	395	389	601	451
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		----	----	----	15400	4520
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		84	82	80	83	67
Total Alkalinity as CaCO3	----	1	mg/L		84	82	80	83	67
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		51	34	36	11	12
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		45	47	48	59	51
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		50	51	45	83	51
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		15	13	12	67	27
Magnesium	7439-95-4	1	mg/L		37	28	23	192	60
Sodium	7440-23-5	1	mg/L		65	64	61	160	89
Potassium	7440-09-7	1	mg/L		17	12	10	83	26
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.024	0.033	0.039	0.012	0.029
Barium	7440-39-3	0.001	mg/L		0.006	0.009	0.011	0.004	0.007
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Topsoil1_S20 min	30Topsoil1_S25 min	30Topsoil1_S30 min	60Topsoil1_0 min	60Topsoil1_5 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-011	EB2227890-012	EB2227890-013	EB2227890-014	EB2227890-015
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.001	0.001	<0.001	0.002	0.002
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.002	0.001	0.004	0.002
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	0.02	0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Topsoil1_S20 min	30Topsoil1_S25 min	30Topsoil1_S30 min	60Topsoil1_0 min	60Topsoil1_5 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-011	EB2227890-012	EB2227890-013	EB2227890-014	EB2227890-015
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

EG020T: Total Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	----	----	----	376	110
Dysprosium	7429-91-6	0.001	mg/L	----	----	----	0.345	0.086
Silver	7440-22-4	0.001	mg/L	----	----	----	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	----	----	----	0.044	0.013
Bismuth	7440-69-9	0.001	mg/L	----	----	----	0.004	0.001
Erbium	7440-52-0	0.001	mg/L	----	----	----	0.191	0.052
Boron	7440-42-8	0.05	mg/L	----	----	----	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	----	----	----	0.056	0.015
Strontium	7440-24-6	0.001	mg/L	----	----	----	0.938	0.268
Barium	7440-39-3	0.001	mg/L	----	----	----	6.12	1.40
Gadolinium	7440-54-2	0.001	mg/L	----	----	----	0.326	0.086
Titanium	7440-32-6	0.01	mg/L	----	----	----	10.6	3.22
Beryllium	7440-41-7	0.001	mg/L	----	----	----	0.021	0.006
Gallium	7440-55-3	0.001	mg/L	----	----	----	0.227	0.064
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	0.0021	0.0006
Hafnium	7440-58-6	0.01	mg/L	----	----	----	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	----	----	----	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	----	----	----	0.539	0.134
Holmium	7440-60-0	0.001	mg/L	----	----	----	0.057	0.015
Uranium	7440-61-1	0.001	mg/L	----	----	----	0.024	0.006
Caesium	7440-46-2	0.001	mg/L	----	----	----	0.124	0.039
Chromium	7440-47-3	0.001	mg/L	----	----	----	0.107	0.033
Indium	7440-74-6	0.001	mg/L	----	----	----	0.001	<0.001
Copper	7440-50-8	0.001	mg/L	----	----	----	0.350	0.099
Lanthanum	7439-91-0	0.001	mg/L	----	----	----	1.68	0.446
Rubidium	7440-17-7	0.001	mg/L	----	----	----	0.996	0.261
Lithium	7439-93-2	0.001	mg/L	----	----	----	0.366	0.099
Lutetium	7439-94-3	0.001	mg/L	----	----	----	0.027	0.007
Thorium	7440-29-1	0.001	mg/L	----	----	----	0.271	0.064
Cerium	7440-45-1	0.001	mg/L	----	----	----	3.35	0.904
Manganese	7439-96-5	0.001	mg/L	----	----	----	19.8	5.61
Neodymium	7440-00-8	0.001	mg/L	----	----	----	1.66	0.384



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				30Topsoil1_S20 min	30Topsoil1_S25 min	30Topsoil1_S30 min	60Topsoil1_0 min	60Topsoil1_5 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-011	EB2227890-012	EB2227890-013	EB2227890-014	EB2227890-015
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Molybdenum	7439-98-7	0.001	mg/L	----	----	----	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	----	----	----	0.392	0.088
Nickel	7440-02-0	0.001	mg/L	----	----	----	0.160	0.047
Samarium	7440-19-9	0.001	mg/L	----	----	----	0.296	0.082
Lead	7439-92-1	0.001	mg/L	----	----	----	0.408	0.102
Terbium	7440-27-9	0.001	mg/L	----	----	----	0.045	0.012
Antimony	7440-36-0	0.001	mg/L	----	----	----	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	----	----	----	0.027	0.007
Selenium	7782-49-2	0.01	mg/L	----	----	----	0.04	0.01
Ytterbium	7440-64-4	0.001	mg/L	----	----	----	0.184	0.050
Tin	7440-31-5	0.001	mg/L	----	----	----	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	----	----	----	2.18	0.590
Thallium	7440-28-0	0.001	mg/L	----	----	----	0.006	0.002
Zirconium	7440-67-7	0.005	mg/L	----	----	----	0.008	<0.005
Vanadium	7440-62-2	0.01	mg/L	----	----	----	2.45	0.72
Zinc	7440-66-6	0.005	mg/L	----	----	----	1.56	0.467
Iron	7439-89-6	0.05	mg/L	----	----	----	653	188
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	1.0	0.9	0.9	1.5	1.1



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Topsoil1_10 min	60Topsoil1_15 min	60Topsoil1_20 min	60Topsoil1_25 min	60Topsoil1_30 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-016	EB2227890-017	EB2227890-018	EB2227890-019	EB2227890-020
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.10	8.08	8.09	8.10	8.07
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		409	395	399	395	384
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		2310	1640	1500	1560	1140
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		63	64	68	70	62
Total Alkalinity as CaCO ₃	----	1	mg/L		63	64	68	70	62
ED038: Acidity									
Acidity as CaCO ₃	----	1	mg/L		13	13	13	13	14
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		48	48	49	49	47
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		43	42	42	42	40
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		15	15	14	13	14
Magnesium	7439-95-4	1	mg/L		28	26	26	24	21
Sodium	7440-23-5	1	mg/L		60	57	58	57	51
Potassium	7440-09-7	1	mg/L		12	13	12	11	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.044	0.052	0.054	0.054	0.069
Barium	7440-39-3	0.001	mg/L		0.009	0.010	0.009	0.011	0.009
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Topsoil1_10 min	60Topsoil1_15 min	60Topsoil1_20 min	60Topsoil1_25 min	60Topsoil1_30 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-016	EB2227890-017	EB2227890-018	EB2227890-019	EB2227890-020
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.001	0.001	0.001	0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.001	0.002	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Topsoil1_10 min	60Topsoil1_15 min	60Topsoil1_20 min	60Topsoil1_25 min	60Topsoil1_30 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-016	EB2227890-017	EB2227890-018	EB2227890-019	EB2227890-020
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	46.1	45.2	44.5	38.6	30.4
Dysprosium	7429-91-6	0.001	mg/L	0.039	0.029	0.028	0.026	0.016
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.006	0.005	0.004	0.004	0.003
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	0.024	0.017	0.017	0.016	0.010
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.007	0.005	0.005	0.005	0.003
Strontium	7440-24-6	0.001	mg/L	0.127	0.117	0.116	0.111	0.105
Barium	7440-39-3	0.001	mg/L	0.631	0.474	0.452	0.423	0.287
Gadolinium	7440-54-2	0.001	mg/L	0.041	0.028	0.028	0.027	0.016
Titanium	7440-32-6	0.01	mg/L	1.68	2.66	2.47	2.24	2.64
Beryllium	7440-41-7	0.001	mg/L	0.002	0.002	0.002	0.002	0.001
Gallium	7440-55-3	0.001	mg/L	0.027	0.026	0.024	0.021	0.016
Cadmium	7440-43-9	0.0001	mg/L	0.0003	0.0003	0.0002	0.0002	0.0002
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.058	0.049	0.048	0.043	0.031
Holmium	7440-60-0	0.001	mg/L	0.007	0.005	0.005	0.005	0.003
Uranium	7440-61-1	0.001	mg/L	0.003	0.002	0.002	0.002	0.001
Caesium	7440-46-2	0.001	mg/L	0.019	0.018	0.016	0.015	0.012
Chromium	7440-47-3	0.001	mg/L	0.014	0.013	0.013	0.012	0.010
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.048	0.046	0.045	0.040	0.035
Lanthanum	7439-91-0	0.001	mg/L	0.213	0.149	0.142	0.136	0.072
Rubidium	7440-17-7	0.001	mg/L	0.102	0.105	0.093	0.084	0.070
Lithium	7439-93-2	0.001	mg/L	0.037	0.035	0.033	0.030	0.024
Lutetium	7439-94-3	0.001	mg/L	0.003	0.002	0.002	0.002	0.001
Thorium	7440-29-1	0.001	mg/L	0.033	0.024	0.023	0.022	0.014
Cerium	7440-45-1	0.001	mg/L	0.433	0.304	0.298	0.289	0.178
Manganese	7439-96-5	0.001	mg/L	2.16	1.82	1.78	1.63	1.18
Neodymium	7440-00-8	0.001	mg/L	0.177	0.126	0.125	0.117	0.072



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				60Topsoil1_10 min	60Topsoil1_15 min	60Topsoil1_20 min	60Topsoil1_25 min	60Topsoil1_30 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-016	EB2227890-017	EB2227890-018	EB2227890-019	EB2227890-020
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.042	0.029	0.029	0.027	0.017
Nickel	7440-02-0	0.001	mg/L	0.018	0.017	0.016	0.015	0.011
Samarium	7440-19-9	0.001	mg/L	0.038	0.028	0.026	0.025	0.015
Lead	7439-92-1	0.001	mg/L	0.047	0.036	0.035	0.032	0.022
Terbium	7440-27-9	0.001	mg/L	0.006	0.004	0.004	0.004	0.002
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	0.003	0.002	0.002	0.002	0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.023	0.016	0.016	0.016	0.009
Tin	7440-31-5	0.001	mg/L	<0.001	0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.184	0.136	0.137	0.124	0.080
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.25	0.25	0.23	0.21	0.17
Zinc	7440-66-6	0.005	mg/L	0.190	0.173	0.173	0.145	0.121
Iron	7439-89-6	0.05	mg/L	78.2	81.5	78.2	69.2	57.1
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	1.0	0.9	0.9	0.9	0.9



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Topsoil1_S5 min	60Topsoil1_S10 min	60Topsoil1_S15 min	60Topsoil1_S20 min	60Topsoil1_S25 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-021	EB2227890-022	EB2227890-023	EB2227890-024	EB2227890-025
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.96	7.84	7.82	7.85	8.10
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	503	432	412	417	410
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	94	82	79	80	66
Total Alkalinity as CaCO3	----	1	mg/L	94	82	79	80	66
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	51	33	33	43	15
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	54	54	47	47	50
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	77	64	54	54	45
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	32	14	13	13	12
Magnesium	7439-95-4	1	mg/L	75	30	23	25	20
Sodium	7440-23-5	1	mg/L	108	68	65	64	64
Potassium	7440-09-7	1	mg/L	29	12	10	10	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.022	0.037	0.047	0.043	0.048
Barium	7440-39-3	0.001	mg/L	0.008	0.010	0.012	0.013	0.012
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	0.03	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Topsoil1_S5 min	60Topsoil1_S10 min	60Topsoil1_S15 min	60Topsoil1_S20 min	60Topsoil1_S25 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-021	EB2227890-022	EB2227890-023	EB2227890-024	EB2227890-025
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	0.002	0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.004	0.002	0.001	0.001	0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	0.06	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Topsoil1_S5 min	60Topsoil1_S10 min	60Topsoil1_S15 min	60Topsoil1_S20 min	60Topsoil1_S25 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-021	EB2227890-022	EB2227890-023	EB2227890-024	EB2227890-025
				Result	Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		1.1	1.0	0.9	0.9	0.9



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Topsoil1_S30 min	90Topsoil1_0 min	90Topsoil1_5 min	90Topsoil1_10 min	90Topsoil1_15 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-026	EB2227890-027	EB2227890-028	EB2227890-029	EB2227890-030
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.10	8.16	8.11	8.10	8.10
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		395	628	407	395	392
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		----	13300	2030	1390	1130
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		64	72	65	60	62
Total Alkalinity as CaCO3	----	1	mg/L		64	72	65	60	62
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		15	13	14	15	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		48	66	52	51	52
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		42	90	41	38	38
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		13	59	15	14	15
Magnesium	7439-95-4	1	mg/L		18	160	31	23	21
Sodium	7440-23-5	1	mg/L		58	160	60	57	55
Potassium	7440-09-7	1	mg/L		7	61	16	11	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.058	0.015	0.046	0.059	0.068
Barium	7440-39-3	0.001	mg/L		0.013	0.004	0.007	0.010	0.008
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Topsoil1_S30 min	90Topsoil1_0 min	90Topsoil1_5 min	90Topsoil1_10 min	90Topsoil1_15 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-026	EB2227890-027	EB2227890-028	EB2227890-029	EB2227890-030
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	0.001	0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	<0.001	0.002	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.001	0.004	0.002	<0.001	0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	0.02	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Topsoil1_S30 min	90Topsoil1_0 min	90Topsoil1_5 min	90Topsoil1_10 min	90Topsoil1_15 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-026	EB2227890-027	EB2227890-028	EB2227890-029	EB2227890-030
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	290	53.3	33.8	30.0
Dysprosium	7429-91-6	0.001	mg/L		----	0.274	0.034	0.020	0.016
Silver	7440-22-4	0.001	mg/L		----	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		----	0.036	0.005	0.004	0.003
Bismuth	7440-69-9	0.001	mg/L		----	0.003	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		----	0.165	0.020	0.012	0.010
Boron	7440-42-8	0.05	mg/L		----	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		----	0.048	0.006	0.004	0.003
Strontium	7440-24-6	0.001	mg/L		----	0.734	0.125	0.108	0.107
Barium	7440-39-3	0.001	mg/L		----	5.14	0.625	0.357	0.302
Gadolinium	7440-54-2	0.001	mg/L		----	0.281	0.034	0.020	0.016
Titanium	7440-32-6	0.01	mg/L		----	6.54	3.01	2.39	2.53
Beryllium	7440-41-7	0.001	mg/L		----	0.019	0.002	0.001	0.001
Gallium	7440-55-3	0.001	mg/L		----	0.171	0.029	0.019	0.016
Cadmium	7440-43-9	0.0001	mg/L		----	0.0018	0.0003	0.0002	0.0002
Hafnium	7440-58-6	0.01	mg/L		----	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		----	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		----	0.455	0.060	0.039	0.032
Holmium	7440-60-0	0.001	mg/L		----	0.050	0.006	0.004	0.003
Uranium	7440-61-1	0.001	mg/L		----	0.020	0.003	0.002	0.001
Caesium	7440-46-2	0.001	mg/L		----	0.092	0.022	0.014	0.012
Chromium	7440-47-3	0.001	mg/L		----	0.079	0.015	0.010	0.009
Indium	7440-74-6	0.001	mg/L		----	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		----	0.244	0.061	0.046	0.041
Lanthanum	7439-91-0	0.001	mg/L		----	1.43	0.182	0.090	0.072
Rubidium	7440-17-7	0.001	mg/L		----	0.626	0.129	0.086	0.073
Lithium	7439-93-2	0.001	mg/L		----	0.316	0.043	0.028	0.025
Lutetium	7439-94-3	0.001	mg/L		----	0.023	0.003	0.002	0.001
Thorium	7440-29-1	0.001	mg/L		----	0.220	0.032	0.017	0.015
Cerium	7440-45-1	0.001	mg/L		----	2.82	0.371	0.218	0.176
Manganese	7439-96-5	0.001	mg/L		----	16.1	2.26	1.46	1.23
Neodymium	7440-00-8	0.001	mg/L		----	1.42	0.154	0.088	0.071



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				60Topsoil1_S30 min	90Topsoil1_0 min	90Topsoil1_5 min	90Topsoil1_10 min	90Topsoil1_15 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-026	EB2227890-027	EB2227890-028	EB2227890-029	EB2227890-030
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Molybdenum	7439-98-7	0.001	mg/L	----	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	----	0.339	0.036	0.021	0.017
Nickel	7440-02-0	0.001	mg/L	----	0.127	0.021	0.013	0.012
Samarium	7440-19-9	0.001	mg/L	----	0.258	0.033	0.019	0.015
Lead	7439-92-1	0.001	mg/L	----	0.331	0.045	0.026	0.022
Terbium	7440-27-9	0.001	mg/L	----	0.038	0.005	0.003	0.002
Antimony	7440-36-0	0.001	mg/L	----	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	----	0.024	0.003	0.002	0.001
Selenium	7782-49-2	0.01	mg/L	----	0.03	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	----	0.160	0.019	0.012	0.009
Tin	7440-31-5	0.001	mg/L	----	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	----	1.82	0.156	0.098	0.079
Thallium	7440-28-0	0.001	mg/L	----	0.004	0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	----	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	----	1.79	0.29	0.19	0.17
Zinc	7440-66-6	0.005	mg/L	----	1.27	0.213	0.140	0.120
Iron	7439-89-6	0.05	mg/L	----	470	95.3	63.3	56.4
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	<0.0005	<0.0005	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.9	1.5	1.0	0.9	0.9



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	90Topsoil1_20 min	90Topsoil1_25 min	90Topsoil1_30 min	90Topsoil1_S5 min	90Topsoil1_S10 min
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227890-031	EB2227890-032	EB2227890-033	EB2227890-034	EB2227890-035
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.02	8.10	8.08	8.15	8.13
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		397	395	395	432	408
EA030: Total Solids dried at 104 ± 2°C									
Total Solids	----	10	mg/L		1050	960	860	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		62	62	62	70	65
Total Alkalinity as CaCO ₃	----	1	mg/L		62	62	62	70	65
ED038: Acidity									
Acidity as CaCO ₃	----	1	mg/L		41	29	26	27	31
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		52	47	52	52	51
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		38	38	37	43	40
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		15	14	14	15	14
Magnesium	7439-95-4	1	mg/L		22	20	18	27	22
Sodium	7440-23-5	1	mg/L		52	52	53	65	59
Potassium	7440-09-7	1	mg/L		11	9	7	11	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		0.075	0.080	0.075	0.046	0.058
Barium	7440-39-3	0.001	mg/L		0.008	0.008	0.009	0.009	0.008
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Topsoil1_20 min	90Topsoil1_25 min	90Topsoil1_30 min	90Topsoil1_S5 min	90Topsoil1_S10 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-031	EB2227890-032	EB2227890-033	EB2227890-034	EB2227890-035
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.001	0.001	<0.001	0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.001	<0.001	0.002	0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Topsoil1_20 min	90Topsoil1_25 min	90Topsoil1_30 min	90Topsoil1_S5 min	90Topsoil1_S10 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-031	EB2227890-032	EB2227890-033	EB2227890-034	EB2227890-035
				Result	Result	Result	Result	Result

EG020F: Dissolved Metals by ICP-MS - Continued

Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

EG020T: Total Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	29.1	24.3	22.0	----	----
Dysprosium	7429-91-6	0.001	mg/L	0.015	0.012	0.012	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.003	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Erbium	7440-52-0	0.001	mg/L	0.009	0.007	0.007	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Europium	7440-53-1	0.001	mg/L	0.003	0.002	0.002	----	----
Strontium	7440-24-6	0.001	mg/L	0.110	0.109	0.101	----	----
Barium	7440-39-3	0.001	mg/L	0.335	0.244	0.214	----	----
Gadolinium	7440-54-2	0.001	mg/L	0.015	0.012	0.012	----	----
Titanium	7440-32-6	0.01	mg/L	2.26	2.07	1.94	----	----
Beryllium	7440-41-7	0.001	mg/L	0.001	<0.001	<0.001	----	----
Gallium	7440-55-3	0.001	mg/L	0.016	0.012	0.011	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0001	0.0001	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Cobalt	7440-48-4	0.001	mg/L	0.031	0.026	0.024	----	----
Holmium	7440-60-0	0.001	mg/L	0.002	0.002	0.002	----	----
Uranium	7440-61-1	0.001	mg/L	0.001	<0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	0.012	0.009	0.008	----	----
Chromium	7440-47-3	0.001	mg/L	0.008	0.007	0.006	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.037	0.033	0.031	----	----
Lanthanum	7439-91-0	0.001	mg/L	0.066	0.052	0.053	----	----
Rubidium	7440-17-7	0.001	mg/L	0.074	0.061	0.048	----	----
Lithium	7439-93-2	0.001	mg/L	0.026	0.021	0.016	----	----
Lutetium	7439-94-3	0.001	mg/L	0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	0.014	0.010	0.010	----	----
Cerium	7440-45-1	0.001	mg/L	0.163	0.128	0.129	----	----
Manganese	7439-96-5	0.001	mg/L	1.22	0.976	0.783	----	----
Neodymium	7440-00-8	0.001	mg/L	0.066	0.052	0.053	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90Topsoil1_20 min	90Topsoil1_25 min	90Topsoil1_30 min	90Topsoil1_S5 min	90Topsoil1_S10 min
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227890-031	EB2227890-032	EB2227890-033	EB2227890-034	EB2227890-035
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	0.015	0.012	0.012	----	----
Nickel	7440-02-0	0.001	mg/L	0.012	0.009	0.008	----	----
Samarium	7440-19-9	0.001	mg/L	0.014	0.011	0.011	----	----
Lead	7439-92-1	0.001	mg/L	0.021	0.016	0.016	----	----
Terbium	7440-27-9	0.001	mg/L	0.002	0.002	0.002	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Ytterbium	7440-64-4	0.001	mg/L	0.008	0.007	0.007	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	0.074	0.060	0.062	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Vanadium	7440-62-2	0.01	mg/L	0.16	0.13	0.13	----	----
Zinc	7440-66-6	0.005	mg/L	0.119	0.099	0.086	----	----
Iron	7439-89-6	0.05	mg/L	52.9	44.2	40.1	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	<0.0005	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.9	0.9	0.9	1.0	1.0



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	90Topsoil1_S15 min	90Topsoil1_S20 min	90Topsoil1_S25 min	90Topsoil1_S30 min	----
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit		EB2227890-036	EB2227890-037	EB2227890-038	EB2227890-039	-----
				Result	Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.13	8.11	8.13	8.13	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		404	408	400	398	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		64	65	63	65	----
Total Alkalinity as CaCO3	----	1	mg/L		64	65	63	65	----
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		34	37	37	41	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		53	54	54	54	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		39	40	39	38	----
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		15	15	14	14	----
Magnesium	7439-95-4	1	mg/L		20	23	19	19	----
Sodium	7440-23-5	1	mg/L		58	57	55	54	----
Potassium	7440-09-7	1	mg/L		9	9	8	8	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		0.066	0.065	0.075	0.075	----
Barium	7440-39-3	0.001	mg/L		0.010	0.011	0.009	0.010	----
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Topsoil1_S15 min	90Topsoil1_S20 min	90Topsoil1_S25 min	90Topsoil1_S30 min	----
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit	EB2227890-036	EB2227890-037	EB2227890-038	EB2227890-039	-----
				Result	Result	Result	Result	----

EG020F: Dissolved Metals by ICP-MS - Continued

Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Rubidium	7440-17-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	0.001	0.001	0.001	<0.001	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	90Topsoil1_S15 min	90Topsoil1_S20 min	90Topsoil1_S25 min	90Topsoil1_S30 min	----
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit		EB2227890-036	EB2227890-037	EB2227890-038	EB2227890-039	-----
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.9	0.9	0.9	0.9	----

CERTIFICATE OF ANALYSIS

Work Order	: EB2227745	Page	: 1 of 25
Amendment	: 1		
Client	: RGS ENVIRONMENTAL CONSULTANTS PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: ASHRAF KHALIFA	Contact	: Customer Services EB
Address	: 3/30 LENSWORTH STREET COOPERS PLAINS 4108	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: 2022055 MRO EROSION Modelling	Date Samples Received	: 20-Sep-2022 15:45
Order number	: ----	Date Analysis Commenced	: 21-Sep-2022
C-O-C number	: ----	Issue Date	: 05-Dec-2022 17:35
Sampler	: PRIYA RAJENDRAN		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 21		
No. of samples analysed	: 21		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- Ionic Balance out of acceptable limits for some samples due to analytes not quantified in this report.
- Amendment (05/12/2022): This report has been amended and re-released to allow the reporting of additional analytical data, specifically method NT-1T (total cations) for all sample submitted for this work order.
- EG035T (Total Mercury): Positive mercury results have been confirmed by re-extraction and re-analysis.
- EG035T (Total Mercury): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EG020T-Total Metals by ICP-MS: High LCS recovery deemed acceptable as all associated analyte results are less than limit of reporting.
- It is recognised that EG020T (Total Metals by ICP-MS) is less than EG020F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- It is recognised that ED093T (Major Cations - Total) is less than ED093F (Major Cations - Dissolved) for some samples. However, the difference is within experimental variation of the methods.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Runoff__10 min Topsoil_002	30Runoff__15 min Topsoil_002	30Runoff__20 min Topsoil_002	30Runoff__25 min Topsoil_002	30Runoff__30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-001	EB2227745-002	EB2227745-003	EB2227745-004	EB2227745-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.37	7.48	7.54	7.59	7.65
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	388	384	380	381	380
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	6880	5520	4920	4370	4020
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	45	47	51	69	52
Total Alkalinity as CaCO3	----	1	mg/L	45	47	51	69	52
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	8	8	4	5	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	50	49	48	48	47
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	57	56	56	55	53
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	12	13	14	15	14
Magnesium	7439-95-4	1	mg/L	10	10	10	10	10
Sodium	7440-23-5	1	mg/L	47	45	44	50	42
Potassium	7440-09-7	1	mg/L	4	3	3	2	3
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	25	23	21	22	22
Magnesium	7439-95-4	1	mg/L	27	24	20	21	19
Sodium	7440-23-5	1	mg/L	46	44	41	44	45
Potassium	7440-09-7	1	mg/L	10	9	7	8	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.16	0.13	0.11	0.13	0.10
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Runoff__10 min Topsoil_002	30Runoff__15 min Topsoil_002	30Runoff__20 min Topsoil_002	30Runoff__25 min Topsoil_002	30Runoff__30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-001	EB2227745-002	EB2227745-003	EB2227745-004	EB2227745-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.128	0.133	0.136	0.125	0.136
Barium	7440-39-3	0.001	mg/L	0.073	0.070	0.068	0.067	0.067
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.002	0.001	0.002
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.004	0.003	0.003	0.003	0.003
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.005	0.012	0.010	0.008	0.005
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Runoff__10 min Topsoil_002	30Runoff__15 min Topsoil_002	30Runoff__20 min Topsoil_002	30Runoff__25 min Topsoil_002	30Runoff__30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-001	EB2227745-002	EB2227745-003	EB2227745-004	EB2227745-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	0.15	0.12	0.11	0.11	0.10
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	88.2	80.4	60.6	60.1	48.0
Dysprosium	7429-91-6	0.001	mg/L	0.032	0.024	0.020	0.018	0.014
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.012	0.010	0.008	0.008	0.007
Bismuth	7440-69-9	0.001	mg/L	0.003	0.003	0.002	0.002	0.001
Erbium	7440-52-0	0.001	mg/L	0.017	0.012	0.010	0.009	0.008
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.009	0.007	0.006	0.005	0.004
Strontium	7440-24-6	0.001	mg/L	0.271	0.239	0.232	0.219	0.209
Barium	7440-39-3	0.001	mg/L	1.38	1.06	0.886	0.803	0.696
Gadolinium	7440-54-2	0.001	mg/L	0.038	0.029	0.023	0.021	0.017
Titanium	7440-32-6	0.01	mg/L	1.19	1.10	0.92	0.91	0.75
Beryllium	7440-41-7	0.001	mg/L	0.005	0.004	0.003	0.003	0.003
Gallium	7440-55-3	0.001	mg/L	0.032	0.028	0.021	0.021	0.016
Cadmium	7440-43-9	0.0001	mg/L	0.0005	0.0004	0.0003	0.0002	0.0002
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.060	0.047	0.039	0.035	0.030
Holmium	7440-60-0	0.001	mg/L	0.006	0.004	0.004	0.003	0.003
Uranium	7440-61-1	0.001	mg/L	0.006	0.005	0.004	0.003	0.003
Caesium	7440-46-2	0.001	mg/L	0.026	0.023	0.016	0.015	0.011
Chromium	7440-47-3	0.001	mg/L	0.092	0.083	0.062	0.061	0.047
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.072	0.065	0.056	0.052	0.046



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30Runoff__10 min Topsoil_002	30Runoff__15 min Topsoil_002	30Runoff__20 min Topsoil_002	30Runoff__25 min Topsoil_002	30Runoff__30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-001	EB2227745-002	EB2227745-003	EB2227745-004	EB2227745-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Lanthanum	7439-91-0	0.001	mg/L	0.188	0.141	0.106	0.095	0.079
Rubidium	7440-17-7	0.001	mg/L	0.163	0.144	0.106	0.100	0.078
Lithium	7439-93-2	0.001	mg/L	0.034	0.030	0.022	0.022	0.017
Lutetium	7439-94-3	0.001	mg/L	0.002	0.001	0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	0.039	0.033	0.023	0.022	0.017
Cerium	7440-45-1	0.001	mg/L	0.430	0.327	0.265	0.236	0.199
Manganese	7439-96-5	0.001	mg/L	2.37	1.77	1.53	1.35	1.20
Neodymium	7440-00-8	0.001	mg/L	0.186	0.139	0.113	0.100	0.083
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.047	0.034	0.028	0.025	0.021
Nickel	7440-02-0	0.001	mg/L	0.044	0.038	0.030	0.028	0.023
Samarium	7440-19-9	0.001	mg/L	0.040	0.030	0.025	0.022	0.018
Lead	7439-92-1	0.001	mg/L	0.163	0.120	0.092	0.086	0.070
Terbium	7440-27-9	0.001	mg/L	0.005	0.004	0.003	0.003	0.002
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	0.002	0.002	0.001	0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.014	0.010	0.009	0.008	0.006
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.124	0.094	0.082	0.072	0.062
Thallium	7440-28-0	0.001	mg/L	0.001	0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.22	0.19	0.15	0.14	0.12
Zinc	7440-66-6	0.005	mg/L	0.219	0.176	0.138	0.129	0.107
Iron	7439-89-6	0.05	mg/L	90.5	80.3	61.2	58.8	46.8
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.5	0.5	0.5	0.6
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.55	3.54	3.60	3.93	3.51
∅ Total Cations	----	0.01	meq/L	3.57	3.50	3.51	3.80	3.42



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30Runoff__10 min Topsoil_002	30Runoff__15 min Topsoil_002	30Runoff__20 min Topsoil_002	30Runoff__25 min Topsoil_002	30Runoff__30 min Topsoil_002
Sampling date / time					20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227745-001	EB2227745-002	EB2227745-003	EB2227745-004	EB2227745-005
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
Ø Ionic Balance	----	0.01	%		0.29	0.47	1.21	1.71	1.26



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__0 min Topsoil_002	60Runoff__5 min Topsoil_002	60Runoff__10 min Topsoil_002	60Runoff__15 min Topsoil_002	60Runoff__20 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-006	EB2227745-007	EB2227745-008	EB2227745-009	EB2227745-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.88	7.27	7.27	7.43	7.53
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	385	380	366	370	372
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	16300	7580	8180	5310	4230
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	31	41	40	47	48
Total Alkalinity as CaCO3	----	1	mg/L	31	41	40	47	48
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	16	8	8	6	7
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	48	46	46	46	46
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	55	52	50	47	49
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	8	12	11	14	14
Magnesium	7439-95-4	1	mg/L	8	9	10	11	10
Sodium	7440-23-5	1	mg/L	52	46	48	51	46
Potassium	7440-09-7	1	mg/L	2	2	3	3	3
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	61	22	25	22	20
Magnesium	7439-95-4	1	mg/L	56	24	29	20	20
Sodium	7440-23-5	1	mg/L	65	44	50	43	41
Potassium	7440-09-7	1	mg/L	16	10	12	7	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.44	0.17	0.22	0.13	0.14
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__0 min Topsoil_002	60Runoff__5 min Topsoil_002	60Runoff__10 min Topsoil_002	60Runoff__15 min Topsoil_002	60Runoff__20 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-006	EB2227745-007	EB2227745-008	EB2227745-009	EB2227745-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.095	0.122	0.114	0.120	0.122
Barium	7440-39-3	0.001	mg/L	0.069	0.069	0.065	0.064	0.068
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.001	0.001	0.002
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.004	0.003	0.003	0.003	0.003
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	0.003	0.001	0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.012	0.004	0.008	0.010	0.008
Neodymium	7440-00-8	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__0 min Topsoil_002	60Runoff__5 min Topsoil_002	60Runoff__10 min Topsoil_002	60Runoff__15 min Topsoil_002	60Runoff__20 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-006	EB2227745-007	EB2227745-008	EB2227745-009	EB2227745-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	0.39	0.16	0.20	0.11	0.12
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	116	89.6	123	53.8	60.4
Dysprosium	7429-91-6	0.001	mg/L	0.096	0.028	0.028	0.018	0.016
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.019	0.012	0.016	0.008	0.008
Bismuth	7440-69-9	0.001	mg/L	0.005	0.003	0.004	0.002	0.002
Erbium	7440-52-0	0.001	mg/L	0.051	0.014	0.015	0.010	0.008
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.028	0.008	0.008	0.005	0.004
Strontium	7440-24-6	0.001	mg/L	0.582	0.245	0.332	0.223	0.213
Barium	7440-39-3	0.001	mg/L	3.72	1.24	1.30	0.825	0.767
Gadolinium	7440-54-2	0.001	mg/L	0.114	0.032	0.033	0.022	0.018
Titanium	7440-32-6	0.01	mg/L	1.18	1.18	1.56	0.78	0.91
Beryllium	7440-41-7	0.001	mg/L	0.016	0.005	0.007	0.004	0.003
Gallium	7440-55-3	0.001	mg/L	0.044	0.031	0.041	0.019	0.021
Cadmium	7440-43-9	0.0001	mg/L	0.0024	0.0004	0.0004	0.0002	0.0002
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.137	0.050	0.073	0.034	0.032
Holmium	7440-60-0	0.001	mg/L	0.018	0.005	0.005	0.003	0.003
Uranium	7440-61-1	0.001	mg/L	0.015	0.005	0.005	0.003	0.003
Caesium	7440-46-2	0.001	mg/L	0.032	0.026	0.027	0.013	0.015
Chromium	7440-47-3	0.001	mg/L	0.105	0.090	0.124	0.052	0.060
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.125	0.065	0.087	0.050	0.049



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__0 min Topsoil_002	60Runoff__5 min Topsoil_002	60Runoff__10 min Topsoil_002	60Runoff__15 min Topsoil_002	60Runoff__20 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-006	EB2227745-007	EB2227745-008	EB2227745-009	EB2227745-010
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Lanthanum	7439-91-0	0.001	mg/L	0.529	0.159	0.162	0.098	0.086
Rubidium	7440-17-7	0.001	mg/L	0.192	0.166	0.217	0.086	0.099
Lithium	7439-93-2	0.001	mg/L	0.045	0.034	0.050	0.019	0.020
Lutetium	7439-94-3	0.001	mg/L	0.005	0.002	0.002	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	0.052	0.038	0.038	0.019	0.022
Cerium	7440-45-1	0.001	mg/L	1.17	0.358	0.376	0.238	0.213
Manganese	7439-96-5	0.001	mg/L	6.18	1.89	2.76	1.33	1.20
Neodymium	7440-00-8	0.001	mg/L	0.536	0.159	0.167	0.104	0.091
Molybdenum	7439-98-7	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.137	0.040	0.041	0.026	0.023
Nickel	7440-02-0	0.001	mg/L	0.078	0.041	0.057	0.026	0.027
Samarium	7440-19-9	0.001	mg/L	0.115	0.035	0.036	0.022	0.020
Lead	7439-92-1	0.001	mg/L	0.381	0.135	0.157	0.081	0.080
Terbium	7440-27-9	0.001	mg/L	0.016	0.005	0.005	0.003	0.003
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	0.006	0.002	0.002	0.001	0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.039	0.012	0.012	0.008	0.007
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.352	0.106	0.147	0.076	0.066
Thallium	7440-28-0	0.001	mg/L	0.002	0.002	0.002	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.29	0.22	0.30	0.13	0.14
Zinc	7440-66-6	0.005	mg/L	0.370	0.196	0.250	0.118	0.121
Iron	7439-89-6	0.05	mg/L	108	89.2	122	52.9	60.0
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.4	0.4	0.5	0.5
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.17	3.24	3.17	3.22	3.30
∅ Total Cations	----	0.01	meq/L	3.37	3.39	3.54	3.90	3.60



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Runoff__0 min Topsoil_002	60Runoff__5 min Topsoil_002	60Runoff__10 min Topsoil_002	60Runoff__15 min Topsoil_002	60Runoff__20 min Topsoil_002
Sampling date / time					20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227745-006	EB2227745-007	EB2227745-008	EB2227745-009	EB2227745-010
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
Ø Ionic Balance	----	0.01	%		3.06	2.23	5.51	9.50	4.35



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff_25 min Topsoil_002	60Runoff_30 min Topsoil_002	60Seepage_30 min Topsoil_002	90Runoff_0 min Topsoil_002	90Runoff_5 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-011	EB2227745-012	EB2227745-013	EB2227745-014	EB2227745-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.53	7.64	7.86	7.21	7.51
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	370	372	425	389	373
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	4280	3400	970	8780	4820
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	53	50	61	36	44
Total Alkalinity as CaCO3	----	1	mg/L	53	50	61	36	44
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	5	5	3	8	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	46	45	48	47	46
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	49	48	53	53	49
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	15	20	20	10	12
Magnesium	7439-95-4	1	mg/L	10	11	11	8	9
Sodium	7440-23-5	1	mg/L	44	46	46	55	46
Potassium	7440-09-7	1	mg/L	3	3	3	2	2
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	21	22	----	----	20
Magnesium	7439-95-4	1	mg/L	19	14	----	----	17
Sodium	7440-23-5	1	mg/L	46	47	----	----	40
Potassium	7440-09-7	1	mg/L	8	5	----	----	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.15	0.19	0.19	0.02	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__25 min Topsoil_002	60Runoff__30 min Topsoil_002	60Seepage__30 min Topsoil_002	90Runoff_0 min Topsoil_002	90Runoff_5 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-011	EB2227745-012	EB2227745-013	EB2227745-014	EB2227745-015
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.131	0.145	0.143	0.099	0.116
Barium	7440-39-3	0.001	mg/L	0.066	0.049	0.049	0.055	0.057
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.004	0.004	<0.001	<0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.003	0.002	0.002	0.003	0.002
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.007	0.029	0.032	0.002	0.003
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	0.005	0.004
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__25 min Topsoil_002	60Runoff__30 min Topsoil_002	60Seepage__30 min Topsoil_002	90Runoff__0 min Topsoil_002	90Runoff__5 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-011	EB2227745-012	EB2227745-013	EB2227745-014	EB2227745-015
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	0.14	0.12	0.12	0.06	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	71.4	26.7	----	61.0	37.0
Dysprosium	7429-91-6	0.001	mg/L	0.012	0.005	----	0.030	0.018
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.009	0.004	----	0.013	0.008
Bismuth	7440-69-9	0.001	mg/L	0.002	<0.001	----	0.002	0.001
Erbium	7440-52-0	0.001	mg/L	0.006	0.003	----	0.016	0.009
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.004	0.002	----	0.009	0.005
Strontium	7440-24-6	0.001	mg/L	0.220	0.188	----	0.270	0.224
Barium	7440-39-3	0.001	mg/L	0.633	0.286	----	1.18	0.740
Gadolinium	7440-54-2	0.001	mg/L	0.015	0.006	----	0.036	0.021
Titanium	7440-32-6	0.01	mg/L	1.02	0.45	----	0.56	0.34
Beryllium	7440-41-7	0.001	mg/L	0.003	<0.001	----	0.005	0.003
Gallium	7440-55-3	0.001	mg/L	0.022	0.012	----	0.027	0.017
Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0005	----	0.0004	0.0002
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.031	0.013	----	0.052	0.036
Holmium	7440-60-0	0.001	mg/L	0.002	<0.001	----	0.006	0.003
Uranium	7440-61-1	0.001	mg/L	0.002	0.001	----	0.006	0.003
Caesium	7440-46-2	0.001	mg/L	0.014	0.006	----	0.019	0.011
Chromium	7440-47-3	0.001	mg/L	0.068	0.028	----	0.068	0.042
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.051	0.028	----	0.061	0.047



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60Runoff__25 min Topsoil_002	60Runoff__30 min Topsoil_002	60Seepage__30 min Topsoil_002	90Runoff_0 min Topsoil_002	90Runoff_5 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-011	EB2227745-012	EB2227745-013	EB2227745-014	EB2227745-015
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Lanthanum	7439-91-0	0.001	mg/L	0.066	0.030	----	0.167	0.100
Rubidium	7440-17-7	0.001	mg/L	0.109	0.046	----	0.155	0.095
Lithium	7439-93-2	0.001	mg/L	0.026	0.008	----	0.030	0.018
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	0.002	0.001
Thorium	7440-29-1	0.001	mg/L	0.019	0.008	----	0.025	0.012
Cerium	7440-45-1	0.001	mg/L	0.169	0.066	----	0.364	0.223
Manganese	7439-96-5	0.001	mg/L	1.09	0.455	----	2.34	1.60
Neodymium	7440-00-8	0.001	mg/L	0.072	0.030	----	0.173	0.104
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.017	0.008	----	0.043	0.026
Nickel	7440-02-0	0.001	mg/L	0.029	0.013	----	0.036	0.023
Samarium	7440-19-9	0.001	mg/L	0.016	0.006	----	0.038	0.022
Lead	7439-92-1	0.001	mg/L	0.070	0.026	----	0.134	0.084
Terbium	7440-27-9	0.001	mg/L	0.002	<0.001	----	0.005	0.003
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	0.002	0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.005	0.002	----	0.013	0.008
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.060	0.024	----	0.124	0.081
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.15	0.06	----	0.18	0.11
Zinc	7440-66-6	0.005	mg/L	0.132	0.074	----	0.185	0.118
Iron	7439-89-6	0.05	mg/L	63.8	27.1	----	69.2	43.7
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.5	0.6	0.7	0.3	0.5
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.40	3.29	3.71	3.19	3.22
∅ Total Cations	----	0.01	meq/L	3.56	3.98	3.98	3.60	3.39



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	60Runoff__25 min Topsoil_002	60Runoff__30 min Topsoil_002	60Seepage__30 min Topsoil_002	90Runoff_0 min Topsoil_002	90Runoff_5 min Topsoil_002
Sampling date / time					20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227745-011	EB2227745-012	EB2227745-013	EB2227745-014	EB2227745-015
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
Ø Ionic Balance	----	0.01	%		2.34	9.50	3.48	6.00	2.61



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Runoff_10 min Topsoil_002	90Runoff_15 min Topsoil_002	90Runoff_20 min Topsoil_002	90Runoff_25 min Topsoil_002	90Runoff_30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-016	EB2227745-017	EB2227745-018	EB2227745-019	EB2227745-020
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.64	7.66	7.74	7.76	7.67
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	375	375	376	375	380
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	3500	3140	2720	2370	2430
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	52	52	53	55	55
Total Alkalinity as CaCO3	----	1	mg/L	52	52	53	55	55
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	4	4	3	3	6
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	44	46	47	46	45
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	49	52	53	54	53
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	14	13	15	17	15
Magnesium	7439-95-4	1	mg/L	10	10	10	12	10
Sodium	7440-23-5	1	mg/L	44	45	45	47	44
Potassium	7440-09-7	1	mg/L	2	2	2	3	3
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	19	20	20	----	21
Magnesium	7439-95-4	1	mg/L	15	15	15	----	15
Sodium	7440-23-5	1	mg/L	39	39	39	----	39
Potassium	7440-09-7	1	mg/L	5	5	5	----	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.01	0.01	<0.01	1.10	0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Runoff_10 min Topsoil_002	90Runoff_15 min Topsoil_002	90Runoff_20 min Topsoil_002	90Runoff_25 min Topsoil_002	90Runoff_30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-016	EB2227745-017	EB2227745-018	EB2227745-019	EB2227745-020
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.120	0.127	0.126	0.143	0.129
Barium	7440-39-3	0.001	mg/L	0.048	0.053	0.052	0.062	0.047
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.003	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	<0.001	0.001	0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.004	0.005	0.004	0.140	0.003
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.005	0.004	0.005	0.003	0.004
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Runoff_10 min Topsoil_002	90Runoff_15 min Topsoil_002	90Runoff_20 min Topsoil_002	90Runoff_25 min Topsoil_002	90Runoff_30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-016	EB2227745-017	EB2227745-018	EB2227745-019	EB2227745-020
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	0.002	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.045	<0.005
Iron	7439-89-6	0.05	mg/L	0.05	0.05	0.05	0.30	0.08
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	23.9	28.2	22.9	20.8	23.2
Dysprosium	7429-91-6	0.001	mg/L	0.012	0.012	0.011	0.009	0.010
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.005	0.005	0.004	0.004	0.004
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	0.006	0.006	0.006	0.005	0.005
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.003	0.003	0.003	0.002	0.003
Strontium	7440-24-6	0.001	mg/L	0.204	0.207	0.204	0.197	0.204
Barium	7440-39-3	0.001	mg/L	0.516	0.522	0.467	0.410	0.466
Gadolinium	7440-54-2	0.001	mg/L	0.014	0.014	0.012	0.010	0.012
Titanium	7440-32-6	0.01	mg/L	0.24	0.35	0.25	0.25	0.28
Beryllium	7440-41-7	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Gallium	7440-55-3	0.001	mg/L	0.011	0.012	0.010	0.009	0.010
Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0001	0.0001	0.0002	0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.024	0.024	0.022	0.019	0.022
Holmium	7440-60-0	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Uranium	7440-61-1	0.001	mg/L	0.002	0.002	0.002	0.001	0.002
Caesium	7440-46-2	0.001	mg/L	0.008	0.008	0.007	0.006	0.007
Chromium	7440-47-3	0.001	mg/L	0.027	0.032	0.026	0.023	0.026
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.036	0.038	0.036	0.032	0.034



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90Runoff_10 min Topsoil_002	90Runoff_15 min Topsoil_002	90Runoff_20 min Topsoil_002	90Runoff_25 min Topsoil_002	90Runoff_30 min Topsoil_002
Sampling date / time				20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EB2227745-016	EB2227745-017	EB2227745-018	EB2227745-019	EB2227745-020
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Lanthanum	7439-91-0	0.001	mg/L	0.061	0.061	0.052	0.044	0.052
Rubidium	7440-17-7	0.001	mg/L	0.066	0.069	0.058	0.051	0.057
Lithium	7439-93-2	0.001	mg/L	0.011	0.013	0.010	0.009	0.010
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	0.007	0.008	0.006	0.005	0.006
Cerium	7440-45-1	0.001	mg/L	0.148	0.150	0.128	0.110	0.126
Manganese	7439-96-5	0.001	mg/L	1.03	1.04	0.935	0.810	0.935
Neodymium	7440-00-8	0.001	mg/L	0.068	0.068	0.059	0.050	0.059
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.017	0.017	0.015	0.012	0.015
Nickel	7440-02-0	0.001	mg/L	0.016	0.017	0.015	0.013	0.015
Samarium	7440-19-9	0.001	mg/L	0.015	0.014	0.013	0.011	0.012
Lead	7439-92-1	0.001	mg/L	0.048	0.049	0.040	0.035	0.041
Terbium	7440-27-9	0.001	mg/L	0.002	0.002	0.002	0.001	0.002
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.005	0.005	0.005	0.004	0.004
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	0.055	0.056	0.049	0.042	0.049
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.08	0.08	0.07	0.06	0.07
Zinc	7440-66-6	0.005	mg/L	0.078	0.088	0.078	0.070	0.078
Iron	7439-89-6	0.05	mg/L	28.9	33.4	27.6	25.0	27.9
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.5	0.6	0.6	0.6	0.6
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.34	3.46	3.53	3.58	3.53
∅ Total Cations	----	0.01	meq/L	3.49	3.48	3.58	3.96	3.56



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	90Runoff_10 min Topsoil_002	90Runoff_15 min Topsoil_002	90Runoff_20 min Topsoil_002	90Runoff_25 min Topsoil_002	90Runoff_30 min Topsoil_002
Sampling date / time					20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00	20-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EB2227745-016	EB2227745-017	EB2227745-018	EB2227745-019	EB2227745-020
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
Ø Ionic Balance	----	0.01	%		2.19	0.24	0.67	5.00	0.44



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90Seepage_30 min Topsoil_002	----	----	----	----
Sampling date / time				20-Sep-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2227745-021	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.95	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	423	----	----	----	----
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	490	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	65	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	65	----	----	----	----
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	4	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	48	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	59	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	18	----	----	----	----
Magnesium	7439-95-4	1	mg/L	10	----	----	----	----
Sodium	7440-23-5	1	mg/L	47	----	----	----	----
Potassium	7440-09-7	1	mg/L	3	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.03	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.134	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.039	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90Seepage_30 min Topsoil_002	----	----	----	----
				20-Sep-2022 00:00	----	----	----	----
<i>Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>	EB2227745-021	-----	-----	-----	-----
				Result	----	----	----	----

EG020F: Dissolved Metals by ICP-MS - Continued

Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.003	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.002	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.032	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.004	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90Seepage_30 min Topsoil_002	----	----	----	----
Sampling date / time				20-Sep-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2227745-021	-----	-----	-----	-----
Result					----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.022	----	----	----	----
Iron	7439-89-6	0.05	mg/L	0.06	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.7	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.96	----	----	----	----
∅ Total Cations	----	0.01	meq/L	3.84	----	----	----	----
∅ Ionic Balance	----	0.01	%	1.54	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EB2231057**
Client : **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**
Contact : ASHRAF KHALIFA
Address : 3/30 LENSWORTH STREET
 COOPERS PLAINS 4108
Telephone : ----
Project : 2022055 MRO EROSION Modelling
Order number : ----
C-O-C number : ----
Sampler : PRIYA RAJENDRAN
Site : ----
Quote number : EN/222
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 15
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 20-Oct-2022 15:41
Date Analysis Commenced : 21-Oct-2022
Issue Date : 28-Oct-2022 13:52



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Vincent Emerton-Bell	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Vincent Muller		Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA154: ALS does not hold NATA accreditation for Laser Particle Sizing.
- EG020T (Total Metals by ICP-MS): The high failing laboratory control standard is deemed acceptable as all results are less than the limit of reporting.
- It is recognised that EG020T (Total Metals by ICP-MS) is less than EG020F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30WHSoil_003_Runoff 2022055_003West Hill Soil	60WHSoil_003_Runoff 2022055_003West Hill Soil	90WHSoil_003_Runoff 2022055_003West Hill Soil	30WHSoil_003C_Runoff 2022055_003West Hill Soil	60WHSoil_003C_Runoff 2022055_003West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-001	EB2231057-002	EB2231057-003	EB2231057-004	EB2231057-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.02	8.02	8.00	8.00	8.07
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	628	689	737	756	792
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	2050	2490	1810	5890	4160
EA150: Particle Sizing								
ø +75µm	----	1	%	----	See Attached	See Attached	See Attached	See Attached
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	80	82	86	84	94
Total Alkalinity as CaCO3	----	1	mg/L	80	82	86	84	94
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	3	3	3	3	3
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	66	68	70	70	69
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	96	113	124	133	141
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	43	49	49	68	55
Magnesium	7439-95-4	1	mg/L	31	29	30	54	50
Sodium	7440-23-5	1	mg/L	59	65	73	69	73
Potassium	7440-09-7	1	mg/L	4	5	6	8	6
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	<0.01	0.01	0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30WHSoil_003_Runoff 2022055_003West Hill Soil	60WHSoil_003_Runoff 2022055_003West Hill Soil	90WHSoil_003_Runoff 2022055_003West Hill Soil	30WHSoil_003C_Runoff 2022055_003West Hill Soil	60WHSoil_003C_Runoff 2022055_003West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-001	EB2231057-002	EB2231057-003	EB2231057-004	EB2231057-005	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS - Continued									
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	0.240	0.260	0.269	0.290	0.286	
Barium	7440-39-3	0.001	mg/L	0.042	0.049	0.048	0.049	0.037	
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.003	0.002	0.002	0.002	0.001	
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Rubidium	7440-17-7	0.001	mg/L	0.001	0.001	0.001	0.001	<0.001	
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.066	<0.001	<0.001	
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30WHSoil_003_Runoff 2022055_003West Hill Soil	60WHSoil_003_Runoff 2022055_003West Hill Soil	90WHSoil_003_Runoff 2022055_003West Hill Soil	30WHSoil_003C_Runoff 2022055_003West Hill Soil	60WHSoil_003C_Runoff 2022055_003West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-001	EB2231057-002	EB2231057-003	EB2231057-004	EB2231057-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	34.1	42.2	42.7	118	81.0
Dysprosium	7429-91-6	0.001	mg/L	0.005	0.005	0.005	0.018	0.012
Silver	7440-22-4	0.001	mg/L	<0.001	0.001	0.001	0.005	0.002
Arsenic	7440-38-2	0.001	mg/L	0.007	0.012	0.012	0.026	0.014
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	0.002	0.002
Erbium	7440-52-0	0.001	mg/L	0.002	0.002	0.002	0.008	0.006
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Europium	7440-53-1	0.001	mg/L	0.002	0.002	0.002	0.007	0.005
Strontium	7440-24-6	0.001	mg/L	0.298	0.314	0.324	0.494	0.406
Barium	7440-39-3	0.001	mg/L	0.270	0.250	0.255	0.846	0.572
Gadolinium	7440-54-2	0.001	mg/L	0.007	0.006	0.006	0.024	0.016
Titanium	7440-32-6	0.01	mg/L	0.06	0.16	0.15	0.18	0.09
Beryllium	7440-41-7	0.001	mg/L	0.002	0.001	0.001	0.004	0.003
Gallium	7440-55-3	0.001	mg/L	0.010	0.014	0.013	0.041	0.023
Cadmium	7440-43-9	0.0001	mg/L	0.0008	0.0007	0.0009	0.0024	0.0018
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	0.025	0.021	0.022	0.073	0.053
Holmium	7440-60-0	0.001	mg/L	0.001	<0.001	<0.001	0.003	0.002
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	0.002	<0.001
Caesium	7440-46-2	0.001	mg/L	0.004	0.006	0.006	0.013	0.007



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30WHSoil_003_Runoff 2022055_003West Hill Soil	60WHSoil_003_Runoff 2022055_003West Hill Soil	90WHSoil_003_Runoff 2022055_003West Hill Soil	30WHSoil_003C_Runoff 2022055_003West Hill Soil	60WHSoil_003C_Runoff 2022055_003West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-001	EB2231057-002	EB2231057-003	EB2231057-004	EB2231057-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	0.044	0.050	0.052	0.158	0.106
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.058	0.053	0.060	0.141	0.108
Lanthanum	7439-91-0	0.001	mg/L	0.032	0.029	0.029	0.108	0.075
Rubidium	7440-17-7	0.001	mg/L	0.017	0.024	0.025	0.056	0.030
Lithium	7439-93-2	0.001	mg/L	0.028	0.029	0.031	0.088	0.055
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	0.003	0.004	0.004	0.011	0.008
Cerium	7440-45-1	0.001	mg/L	0.058	0.052	0.054	0.187	0.143
Manganese	7439-96-5	0.001	mg/L	2.26	1.83	2.08	5.70	4.50
Neodymium	7440-00-8	0.001	mg/L	0.035	0.032	0.033	0.120	0.082
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	0.009	0.008	0.008	0.029	0.020
Nickel	7440-02-0	0.001	mg/L	0.037	0.034	0.036	0.109	0.080
Samarium	7440-19-9	0.001	mg/L	0.007	0.006	0.007	0.025	0.017
Lead	7439-92-1	0.001	mg/L	0.346	0.266	0.285	0.978	0.657
Terbium	7440-27-9	0.001	mg/L	0.001	<0.001	<0.001	0.003	0.002
Antimony	7440-36-0	0.001	mg/L	0.002	<0.001	<0.001	<0.001	0.001
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	0.002	0.002	0.002	0.006	0.004
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Yttrium	7440-65-5	0.001	mg/L	0.024	0.021	0.021	0.077	0.053
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	0.07	0.08	0.08	0.25	0.16
Zinc	7440-66-6	0.005	mg/L	0.289	0.286	0.304	0.930	0.636
Iron	7439-89-6	0.05	mg/L	37.7	43.7	45.2	136	89.9
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001



Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30WHSoil_003_Runoff 2022055_003West Hill Soil	60WHSoil_003_Runoff 2022055_003West Hill Soil	90WHSoil_003_Runoff 2022055_003West Hill Soil	30WHSoil_003C_Runoff 2022055_003West Hill Soil	60WHSoil_003C_Runoff 2022055_003West Hill Soil
Sampling date / time					20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-001	EB2231057-002	EB2231057-003	EB2231057-004	EB2231057-005	
				Result	Result	Result	Result	Result	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.2	0.2	0.2	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90WHSoil_003C_Runoff 2022055_003West Hill Soil	30WHSoil_003_Seepage 2022055_004West Hill Soil	60WHSoil_003_Seepage 2022055_005West Hill Soil	90WHSoil_003_Seepage 2022055_006West Hill Soil	30WHSoil_003C_Seepage 2022055_007West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-006	EB2231057-007	EB2231057-008	EB2231057-009	EB2231057-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.02	7.91	7.99	8.08	8.18
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	802	572	648	666	800
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	2290	----	----	----	----
EA150: Particle Sizing								
ø +75µm	----	1	%	See Attached	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	96	63	92	96	112
Total Alkalinity as CaCO3	----	1	mg/L	96	63	92	96	112
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	2	2	3	3	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	68	59	61	60	69
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	141	87	111	112	152
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	54	47	52	56	51
Magnesium	7439-95-4	1	mg/L	34	22	25	25	40
Sodium	7440-23-5	1	mg/L	79	33	42	38	76
Potassium	7440-09-7	1	mg/L	6	2	2	2	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.03	0.02	0.02	0.02
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	0.05	<0.05	<0.05	<0.05	<0.05

Sub-Matrix: **WATER**
(Matrix: **WATER**)

90WHSoil_003C_Runoff	30WHSoil_003_Seepage	60WHSoil_003_Seepage	90WHSoil_003_Seepage	30WHSoil_003C_Seepage
2022055_003West Hill Soil	2022055_004West Hill Soil	2022055_005West Hill Soil	2022055_006West Hill Soil	2022055_007West Hill Soil

				USEPA Method 1631: Metals in Water by ICP-MS				
Compound	CAS Number	LOR	Unit	Sampling date / time				
				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
				EB2231057-006	EB2231057-007	EB2231057-008	EB2231057-009	EB2231057-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.284	0.280	0.316	0.337	0.289
Barium	7440-39-3	0.001	mg/L	0.048	0.041	0.050	0.052	0.051
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.003	0.003	0.002
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.001	<0.001	<0.001	<0.001	0.002
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.028	0.045	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90WHSoil_003C_Runoff 2022055_003West Hill Soil	30WHSoil_003_Seepage 2022055_004West Hill Soil	60WHSoil_003_Seepage 2022055_005West Hill Soil	90WHSoil_003_Seepage 2022055_006West Hill Soil	30WHSoil_003C_Seepage 2022055_007West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-006	EB2231057-007	EB2231057-008	EB2231057-009	EB2231057-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.037	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	44.4	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	0.005	----	----	----	----
Silver	7440-22-4	0.001	mg/L	0.002	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.012	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	0.002	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Europium	7440-53-1	0.001	mg/L	0.002	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.358	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.290	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	0.007	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	0.13	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	0.002	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	0.014	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0008	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.023	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	0.006	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				90WHSoil_003C_Runoff 2022055_003West Hill Soil	30WHSoil_003_Seepage 2022055_004West Hill Soil	60WHSoil_003_Seepage 2022055_005West Hill Soil	90WHSoil_003_Seepage 2022055_006West Hill Soil	30WHSoil_003C_Seepage 2022055_007West Hill Soil
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-006	EB2231057-007	EB2231057-008	EB2231057-009	EB2231057-010
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	0.053	----	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.064	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	0.033	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.024	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	0.030	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	0.004	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	0.056	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	1.84	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	0.037	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	0.009	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.036	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	0.008	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.297	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	0.002	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	0.024	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	0.09	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.303	----	----	----	----
Iron	7439-89-6	0.05	mg/L	46.6	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----



Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	90WHSoil_003C_Runoff 2022055_003West Hill Soil	30WHSoil_003_Seepage 2022055_004West Hill Soil	60WHSoil_003_Seepage 2022055_005West Hill Soil	90WHSoil_003_Seepage 2022055_006West Hill Soil	30WHSoil_003C_Seepage 2022055_007West Hill Soil
Sampling date / time					20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00	20-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231057-006	EB2231057-007	EB2231057-008	EB2231057-009	EB2231057-010	
				Result	Result	Result	Result	Result	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	<0.1	0.3	0.2	0.2	0.1	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60WHSoil_003C_Seep age 2022055_008West Hill Soil	90WHSoil_003C_Seep age 2022055_009West Hill Soil	----	----	----
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2231057-011	EB2231057-012	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.95	8.24	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	775	808	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	100	120	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	100	120	----	----	----
ED038: Acidity								
Acidity as CaCO ₃	----	1	mg/L	4	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	71	68	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	149	154	----	----	----
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	59	52	----	----	----
Magnesium	7439-95-4	1	mg/L	49	44	----	----	----
Sodium	7440-23-5	1	mg/L	65	76	----	----	----
Potassium	7440-09-7	1	mg/L	6	6	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.309	0.292	----	----	----
Barium	7440-39-3	0.001	mg/L	0.046	0.050	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				60WHSoil_003C_Seep age 2022055_008West Hill Soil	90WHSoil_003C_Seep age 2022055_009West Hill Soil	----	----	----
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2231057-011	EB2231057-012	-----	-----	-----
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	0.002	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.001	0.001	----	----	----
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	0.019	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				60WHSoil_003C_Seep age 2022055_008West Hill Soil	90WHSoil_003C_Seep age 2022055_009West Hill Soil	----	----	----
Sampling date / time				20-Oct-2022 00:00	20-Oct-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2231057-011	EB2231057-012	-----	-----	-----
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	<0.1	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA150: Particle Sizing

CERTIFICATE OF ANALYSIS

Work Order : **EB2231482**
Client : **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**
Contact : ASHRAF KHALIFA
Address : 3/30 LENSWORTH STREET
 COOPERS PLAINS 4108
Telephone : ----
Project : 2022055 MRO EROSION Modelling
Order number : ----
C-O-C number : ----
Sampler : PRIYA RAJENDRAN
Site : ----
Quote number : EN/222
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 7
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 25-Oct-2022 16:23
Date Analysis Commenced : 26-Oct-2022
Issue Date : 02-Nov-2022 16:22



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA154: ALS does not hold NATA accreditation for Laser Particle Sizing.
- EG020T (Total Metals by ICP-MS): The high failing laboratory control standard for hafnium is deemed acceptable as all results are less than the limit of reporting.



Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Sample ID

				30_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Runoff 2022055_004 West Hill Saprolite	90_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Seepag e 2022055_004 West Hill Saprolite	90_WHS_004_Seepag e 2022055_004 West Hill Saprolite
Sampling date / time				25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231482-001	EB2231482-002	EB2231482-003	EB2231482-004	EB2231482-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.85	7.78	7.83	7.66	7.75
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	498	396	407	530	476
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	2190	2130	1620	----	----
EA150: Particle Sizing								
ø +75µm	----	1	%	See Attached	See Attached	See Attached	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	66	56	54	47	58
Total Alkalinity as CaCO3	----	1	mg/L	66	56	54	47	58
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	4	4	5	6	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	63	63	62	80	73
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	63	38	41	53	47
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	33	28	24	35	30
Magnesium	7439-95-4	1	mg/L	25	24	19	22	20
Sodium	7440-23-5	1	mg/L	56	44	45	39	41
Potassium	7440-09-7	1	mg/L	4	4	3	3	3
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Runoff 2022055_004 West Hill Saprolite	90_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Seepag e 2022055_004 West Hill Saprolite	90_WHS_004_Seepag e 2022055_004 West Hill Saprolite
Sampling date / time				25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231482-001	EB2231482-002	EB2231482-003	EB2231482-004	EB2231482-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.210	0.166	0.162	0.292	0.229
Barium	7440-39-3	0.001	mg/L	0.039	0.032	0.027	0.048	0.034
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.001	0.001	0.001
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Runoff 2022055_004 West Hill Saprolite	90_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Seepag e 2022055_004 West Hill Saprolite	90_WHS_004_Seepag e 2022055_004 West Hill Saprolite
Sampling date / time				25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231482-001	EB2231482-002	EB2231482-003	EB2231482-004	EB2231482-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.010	0.017
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	30.0	36.6	24.4	----	----
Dysprosium	7429-91-6	0.001	mg/L	0.004	0.004	0.003	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	0.012	0.015	0.011	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	0.001	<0.001	----	----
Erbium	7440-52-0	0.001	mg/L	0.002	0.002	0.001	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Europium	7440-53-1	0.001	mg/L	0.002	0.002	0.001	----	----
Strontium	7440-24-6	0.001	mg/L	0.279	0.241	0.210	----	----
Barium	7440-39-3	0.001	mg/L	0.286	0.324	0.215	----	----
Gadolinium	7440-54-2	0.001	mg/L	0.005	0.006	0.004	----	----
Titanium	7440-32-6	0.01	mg/L	0.05	0.07	0.06	----	----
Beryllium	7440-41-7	0.001	mg/L	0.001	0.002	0.001	----	----
Gallium	7440-55-3	0.001	mg/L	0.009	0.011	0.007	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0004	0.0004	0.0002	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Cobalt	7440-48-4	0.001	mg/L	0.020	0.022	0.013	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	0.002	0.003	0.002	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Runoff 2022055_004 West Hill Saprolite	90_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Seepag e 2022055_004 West Hill Saprolite	90_WHS_004_Seepag e 2022055_004 West Hill Saprolite
Sampling date / time				25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231482-001	EB2231482-002	EB2231482-003	EB2231482-004	EB2231482-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	0.050	0.061	0.041	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.054	0.054	0.042	----	----
Lanthanum	7439-91-0	0.001	mg/L	0.029	0.035	0.021	----	----
Rubidium	7440-17-7	0.001	mg/L	0.021	0.025	0.018	----	----
Lithium	7439-93-2	0.001	mg/L	0.026	0.032	0.020	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	0.003	0.004	0.002	----	----
Cerium	7440-45-1	0.001	mg/L	0.078	0.098	0.058	----	----
Manganese	7439-96-5	0.001	mg/L	1.12	1.23	0.749	----	----
Neodymium	7440-00-8	0.001	mg/L	0.029	0.034	0.020	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	0.007	0.009	0.005	----	----
Nickel	7440-02-0	0.001	mg/L	0.033	0.040	0.025	----	----
Samarium	7440-19-9	0.001	mg/L	0.006	0.006	0.004	----	----
Lead	7439-92-1	0.001	mg/L	0.088	0.096	0.058	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Ytterbium	7440-64-4	0.001	mg/L	0.001	0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	0.018	0.020	0.012	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Vanadium	7440-62-2	0.01	mg/L	0.07	0.08	0.05	----	----
Zinc	7440-66-6	0.005	mg/L	0.227	0.246	0.156	----	----
Iron	7439-89-6	0.05	mg/L	34.2	40.0	27.1	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Runoff 2022055_004 West Hill Saprolite	90_WHS_004_Runoff 2022055_004 West Hill Saprolite	60_WHS_004_Seepag e 2022055_004 West Hill Saprolite	90_WHS_004_Seepag e 2022055_004 West Hill Saprolite
Sampling date / time					25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00	25-Oct-2022 00:00
Compound	CAS Number	LOR	Unit	EB2231482-001	EB2231482-002	EB2231482-003	EB2231482-004	EB2231482-005	
				Result	Result	Result	Result	Result	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA150: Particle Sizing

CERTIFICATE OF ANALYSIS

Work Order : **EB2232808**
Client : **RGS ENVIRONMENTAL CONSULTANTS PTY LTD**
Contact : **ASHRAF KHALIFA**
Address : **3/30 LENSWORTH STREET**
COOPERS PLAINS 4108
Telephone : **----**
Project : **2022055 - MRO EROSION Modeling**
Order number : **----**
C-O-C number : **----**
Sampler : **PRIYA RAJENDRAN**
Site : **----**
Quote number : **EN/222**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 10
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 04-Nov-2022 15:58
Date Analysis Commenced : 05-Nov-2022
Issue Date : 16-Nov-2022 14:55



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- It is recognised that EG020T (Total Metals by ICP-MS) is less than EG020F (Dissolved Metals by ICP-MS) for '30_WHS_005_Runoff' (EB2232808-001). However, the difference is within experimental variation of the methods.
- EA154: ALS does not hold NATA accreditation for Laser Particle Sizing.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_005_Runoff 2022055_005 West Hill Saprock	60_WHS_005_Runoff 2022055_005 West Hill Saprock	90_WHS_005_Runoff 2022055_005 West Hill Saprock	30_WHS_005_Seepag e 2022055_005 West Hill Saprock	60_WHS_005_Seepag e 2022055_005 West Hill Saprock
Sampling date / time				04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EB2232808-001	EB2232808-002	EB2232808-003	EB2232808-004	EB2232808-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.94	7.97	8.02	7.75	7.91
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	536	542	536	659	567
EA030: Total Solids dried at 104 ± 2°C								
Total Solids	----	10	mg/L	1340	1340	1250	----	----
EA150: Particle Sizing								
ø +75µm	----	1	%	See Attached	See Attached	See Attached	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	75	78	79	56	67
Total Alkalinity as CaCO3	----	1	mg/L	75	78	79	56	67
ED038: Acidity								
Acidity as CaCO3	----	1	mg/L	5	5	4	7	5
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	79	77	79	122	91
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	69	68	67	84	73
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	28	30	30	25	25
Magnesium	7439-95-4	1	mg/L	20	20	19	20	18
Sodium	7440-23-5	1	mg/L	64	60	61	86	70
Potassium	7440-09-7	1	mg/L	6	6	5	3	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_005_Runoff 2022055_005 West Hill Saprock	60_WHS_005_Runoff 2022055_005 West Hill Saprock	90_WHS_005_Runoff 2022055_005 West Hill Saprock	30_WHS_005_Seepag e 2022055_005 West Hill Saprock	60_WHS_005_Seepag e 2022055_005 West Hill Saprock
Sampling date / time				04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EB2232808-001	EB2232808-002	EB2232808-003	EB2232808-004	EB2232808-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.178	0.184	0.177	0.196	0.191
Barium	7440-39-3	0.001	mg/L	0.026	0.027	0.029	0.037	0.031
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Caesium	7440-46-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.002	0.002	0.002
Lanthanum	7439-91-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.001	0.001	0.001	0.001	0.002
Lithium	7439-93-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Neodymium	7440-00-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L	0.002	<0.001	<0.001	0.004	0.002
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_005_Runoff 2022055_005 West Hill Saprock	60_WHS_005_Runoff 2022055_005 West Hill Saprock	90_WHS_005_Runoff 2022055_005 West Hill Saprock	30_WHS_005_Seepag e 2022055_005 West Hill Saprock	60_WHS_005_Seepag e 2022055_005 West Hill Saprock
Sampling date / time				04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EB2232808-001	EB2232808-002	EB2232808-003	EB2232808-004	EB2232808-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	24.4	19.0	14.2	----	----
Dysprosium	7429-91-6	0.001	mg/L	0.004	0.003	0.002	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	0.009	0.007	0.006	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Erbium	7440-52-0	0.001	mg/L	0.002	0.002	0.001	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
Europium	7440-53-1	0.001	mg/L	0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	0.222	0.224	0.214	----	----
Barium	7440-39-3	0.001	mg/L	0.213	0.193	0.156	----	----
Gadolinium	7440-54-2	0.001	mg/L	0.004	0.004	0.003	----	----
Titanium	7440-32-6	0.01	mg/L	0.34	0.20	0.17	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Gallium	7440-55-3	0.001	mg/L	0.010	0.007	0.006	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0004	0.0002	0.0003	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Cobalt	7440-48-4	0.001	mg/L	0.014	0.013	0.010	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L	0.003	0.002	0.002	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				30_WHS_005_Runoff 2022055_005 West Hill Saprock	60_WHS_005_Runoff 2022055_005 West Hill Saprock	90_WHS_005_Runoff 2022055_005 West Hill Saprock	30_WHS_005_Seepag e 2022055_005 West Hill Saprock	60_WHS_005_Seepag e 2022055_005 West Hill Saprock
Sampling date / time				04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EB2232808-001	EB2232808-002	EB2232808-003	EB2232808-004	EB2232808-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Chromium	7440-47-3	0.001	mg/L	0.032	0.028	0.021	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.043	0.038	0.040	----	----
Lanthanum	7439-91-0	0.001	mg/L	0.025	0.020	0.016	----	----
Rubidium	7440-17-7	0.001	mg/L	0.025	0.020	0.016	----	----
Lithium	7439-93-2	0.001	mg/L	0.016	0.013	0.010	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L	0.005	0.003	0.002	----	----
Cerium	7440-45-1	0.001	mg/L	0.066	0.053	0.042	----	----
Manganese	7439-96-5	0.001	mg/L	0.631	0.605	0.482	----	----
Neodymium	7440-00-8	0.001	mg/L	0.024	0.019	0.015	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L	0.006	0.005	0.004	----	----
Nickel	7440-02-0	0.001	mg/L	0.021	0.018	0.014	----	----
Samarium	7440-19-9	0.001	mg/L	0.005	0.004	0.003	----	----
Lead	7439-92-1	0.001	mg/L	0.048	0.043	0.036	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Ytterbium	7440-64-4	0.001	mg/L	0.002	0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L	0.021	0.015	0.012	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Vanadium	7440-62-2	0.01	mg/L	0.07	0.06	0.04	----	----
Zinc	7440-66-6	0.005	mg/L	0.131	0.113	0.095	----	----
Iron	7439-89-6	0.05	mg/L	28.6	22.6	17.4	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----



Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	30_WHS_005_Runoff 2022055_005 West Hill Saprock	60_WHS_005_Runoff 2022055_005 West Hill Saprock	90_WHS_005_Runoff 2022055_005 West Hill Saprock	30_WHS_005_Seepag e 2022055_005 West Hill Saprock	60_WHS_005_Seepag e 2022055_005 West Hill Saprock
Sampling date / time					04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00	04-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EB2232808-001	EB2232808-002	EB2232808-003	EB2232808-004	EB2232808-005
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	<0.1	<0.1	0.3	0.2



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90_WHS_005_Seepage 2022055_005 West Hill Saprock	----	----	----	----
Sampling date / time				04-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2232808-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.00	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	584	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	75	----	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	75	----	----	----	----
ED038: Acidity								
Acidity as CaCO ₃	----	1	mg/L	5	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	88	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	76	----	----	----	----
ED093T: Total Major Cations								
Calcium	7440-70-2	1	mg/L	26	----	----	----	----
Magnesium	7439-95-4	1	mg/L	18	----	----	----	----
Sodium	7440-23-5	1	mg/L	72	----	----	----	----
Potassium	7440-09-7	1	mg/L	4	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	----	----	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	0.187	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.028	----	----	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	----	----	----	----
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90_WHS_005_Seepag e 2022055_005 West Hill Saprock	----	----	----	----
Sampling date / time				04-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2232808-006	-----	-----	-----	-----
Result					----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Gallium	7440-55-3	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Hafnium	7440-58-6	0.01	mg/L	<0.01	----	----	----	----
Tellurium	22541-49-7	0.005	mg/L	<0.005	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Holmium	7440-60-0	0.001	mg/L	<0.001	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Indium	7440-74-6	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.002	----	----	----	----
Lanthanum	7439-91-0	0.001	mg/L	<0.001	----	----	----	----
Rubidium	7440-17-7	0.001	mg/L	0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	<0.001	----	----	----	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----
Cerium	7440-45-1	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Neodymium	7440-00-8	0.001	mg/L	<0.001	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.002	----	----	----	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Samarium	7440-19-9	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Terbium	7440-27-9	0.001	mg/L	<0.001	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Thulium	7440-30-4	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----
Yttrium	7440-65-5	0.001	mg/L	<0.001	----	----	----	----
Thallium	7440-28-0	0.001	mg/L	<0.001	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				90_WHS_005_Seepage	----	----	----	----
				2022055_005 West Hill Saprock				
Sampling date / time				04-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2232808-006	-----	-----	-----	-----
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Zirconium	7440-67-7	0.005	mg/L	<0.005	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA150: Particle Sizing

11.3.4 Attachment C4_Laser PSD results



Environmental Division

Work Order: EB2230066
Client: RGS ENVIRONMENTAL
CONSULTANTS PTY LTD
Address: 3/30 LENS WORTH STREET
COOPERS PLAINS 4108
Contact: ASHRAF KHALIFA
Project: 2022055 MRO EROSION Modelling
Report Date: 19/10/2022
Samples Submitted: 12/10/2022

Report:

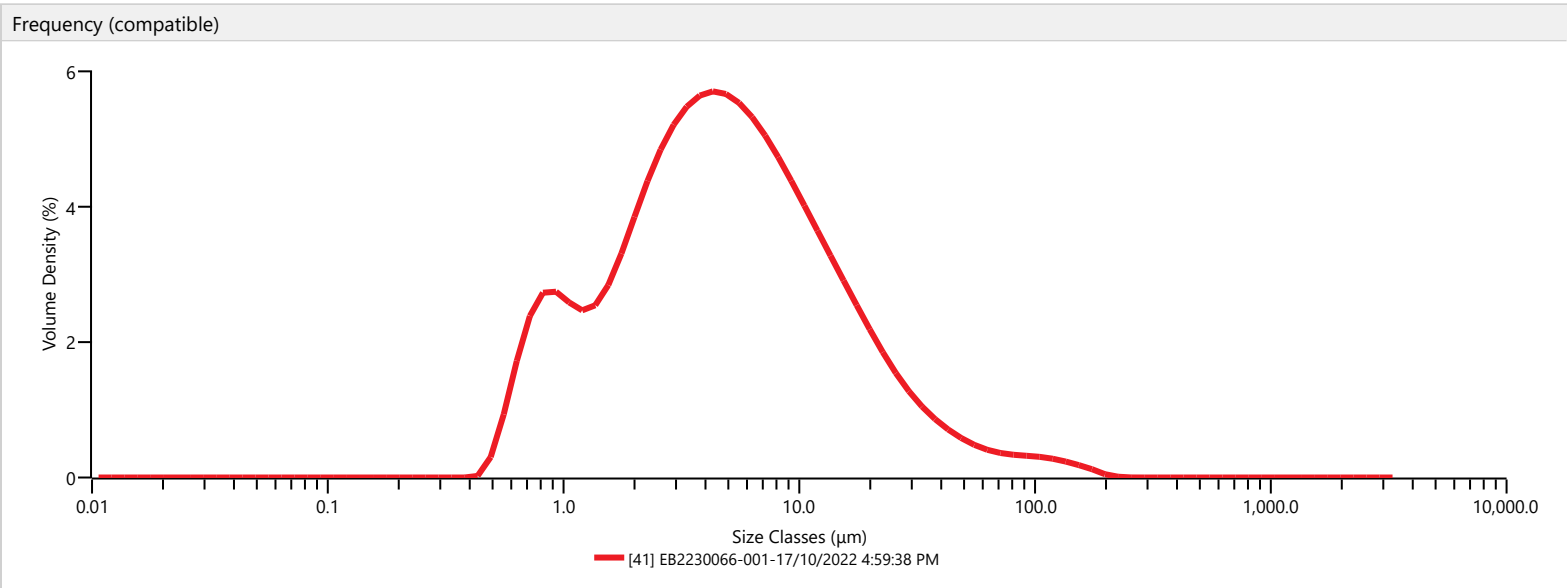
The particle size distribution of these samples was determined by Light-Scattering using a Mastersizer 3000 instrument.

Lab ID	Client ID
EB2230066-001	30Topsoil2C - 2022055_002
EB2230066-002	60Topsoil2C - 2022055_002
EB2230066-003	90Topsoil2C - 2022055_002
EB2230066-004	30Topsoil1 - 2022055_001
EB2230066-005	60Topsoil1 - 2022055_001
EB2230066-006	90Topsoil1 - 2022055_001
EB2230066-007	30Topsoil1C - 2022055_001
EB2230066-008	60Topsoil1C - 2022055_001
EB2230066-009	90Topsoil1C - 2022055_001

A detailed report for each sample is attached.
Sampled by PRIYA RAJENDRAN; analysed as received.

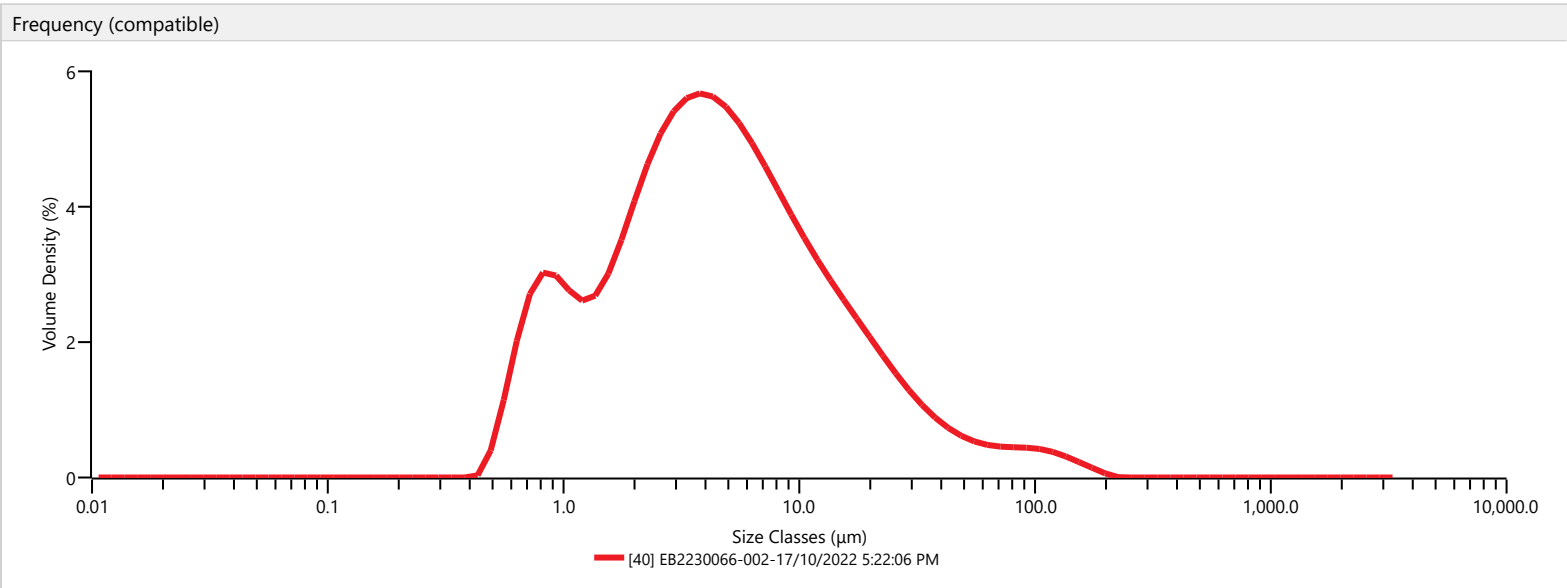
Aleksandar Vujkovic
Laboratory Analyst
Soils and Sizing.

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 17/10/2022 4:59:38 PM
Sample Name EB2230066-001	Measurement Date Time 17/10/2022 4:59:38 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0059 %
Particle Refractive Index 1.550	Span 4.097
Particle Absorption Index 0.100	Uniformity 1.568
Dispersant Name Water	Specific Surface Area 2157 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 2.78 µm
Scattering Model Mie	D [4,3] 9.54 µm
Analysis Model General Purpose	Dv (10) 1.05 µm
Weighted Residual 1.26 %	Dv (50) 4.61 µm
Laser Obscuration 14.87 %	Dv (90) 19.9 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	23.68	12.7	81.78	76.0	98.47	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	27.33	14.5	84.51	86.4	98.74	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	31.38	16.4	86.93	98.1	99.01	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.23	3.12	35.73	18.7	89.05	111	99.27	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.99	3.55	40.30	21.2	90.88	127	99.50	756	100.00
0.0189	0.00	0.113	0.00	0.675	2.44	4.03	45.01	24.1	92.42	144	99.70	859	100.00
0.0215	0.00	0.128	0.00	0.767	4.45	4.58	49.78	27.4	93.70	163	99.85	976	100.00
0.0244	0.00	0.146	0.00	0.872	6.75	5.21	54.51	31.1	94.76	186	99.95	1110	100.00
0.0278	0.00	0.166	0.00	0.991	9.05	5.92	59.13	35.3	95.63	211	99.99	1260	100.00
0.0315	0.00	0.188	0.00	1.13	11.21	6.72	63.57	40.1	96.35	240	100.00	1430	100.00
0.0358	0.00	0.214	0.00	1.28	13.25	7.64	67.78	45.6	96.94	272	100.00	1630	100.00
0.0407	0.00	0.243	0.00	1.45	15.36	8.68	71.73	51.8	97.43	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	17.71	9.86	75.39	58.9	97.83	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	20.47	11.2	78.74	66.9	98.16	400	100.00	2390	100.00

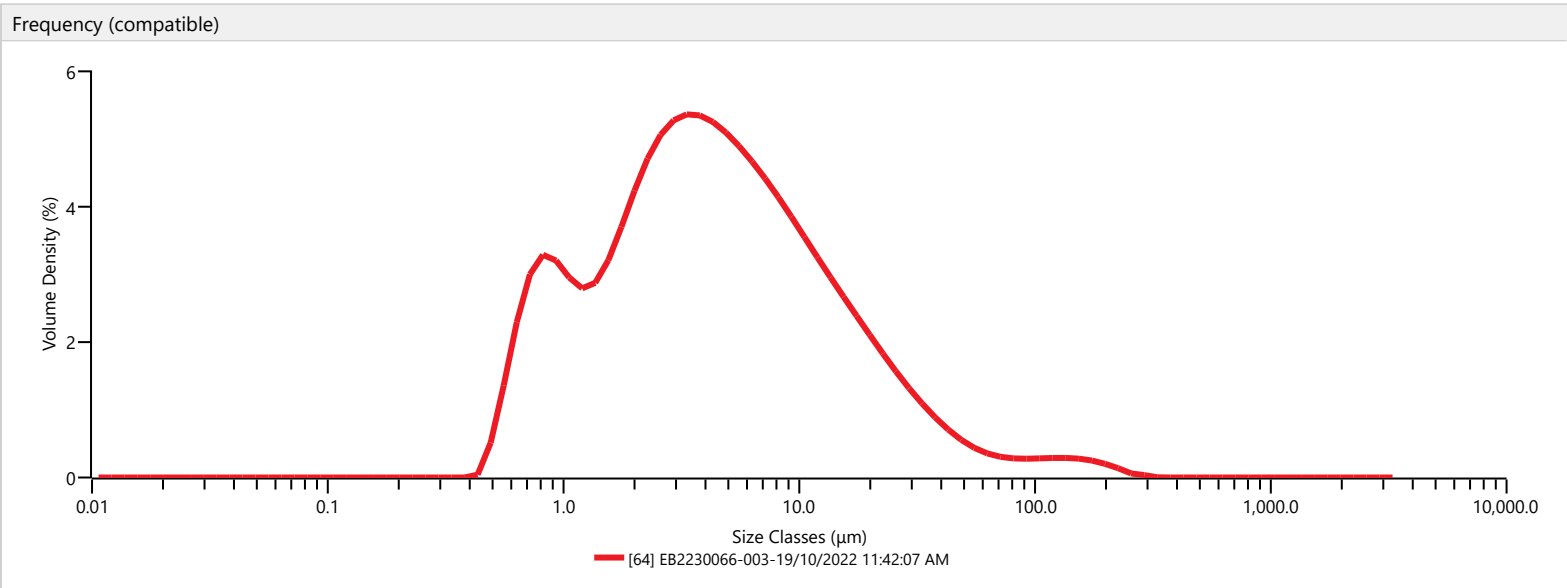
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 17/10/2022 5:22:06 PM
Sample Name EB2230066-002	Measurement Date Time 17/10/2022 5:22:06 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0049 %
Particle Refractive Index 1.550	Span 4.679
Particle Absorption Index 0.100	Uniformity 1.819
Dispersant Name Water	Specific Surface Area 2292 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 2.62 µm
Scattering Model Mie	D [4,3] 9.93 µm
Analysis Model General Purpose	Dv (10) 0.976 µm
Weighted Residual 1.32 %	Dv (50) 4.28 µm
Laser Obscuration 13.08 %	Dv (90) 21.0 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	25.79	12.7	81.83	76.0	97.97	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	29.66	14.5	84.26	86.4	98.34	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	33.90	16.4	86.45	98.1	98.71	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.31	3.12	38.42	18.7	88.41	111	99.06	666	100.00
0.0167	0.00	0.0995	0.00	0.594	1.25	3.55	43.10	21.2	90.14	127	99.38	756	100.00
0.0189	0.00	0.113	0.00	0.675	2.95	4.03	47.84	24.1	91.64	144	99.64	859	100.00
0.0215	0.00	0.128	0.00	0.767	5.24	4.58	52.54	27.4	92.92	163	99.83	976	100.00
0.0244	0.00	0.146	0.00	0.872	7.79	5.21	57.11	31.1	93.99	186	99.95	1110	100.00
0.0278	0.00	0.166	0.00	0.991	10.28	5.92	61.48	35.3	94.89	211	100.00	1260	100.00
0.0315	0.00	0.188	0.00	1.13	12.59	6.72	65.60	40.1	95.62	240	100.00	1430	100.00
0.0358	0.00	0.214	0.00	1.28	14.75	7.64	69.44	45.6	96.23	272	100.00	1630	100.00
0.0407	0.00	0.243	0.00	1.45	16.97	8.68	72.97	51.8	96.74	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	19.47	9.86	76.21	58.9	97.19	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	22.39	11.2	79.15	66.9	97.59	400	100.00	2390	100.00

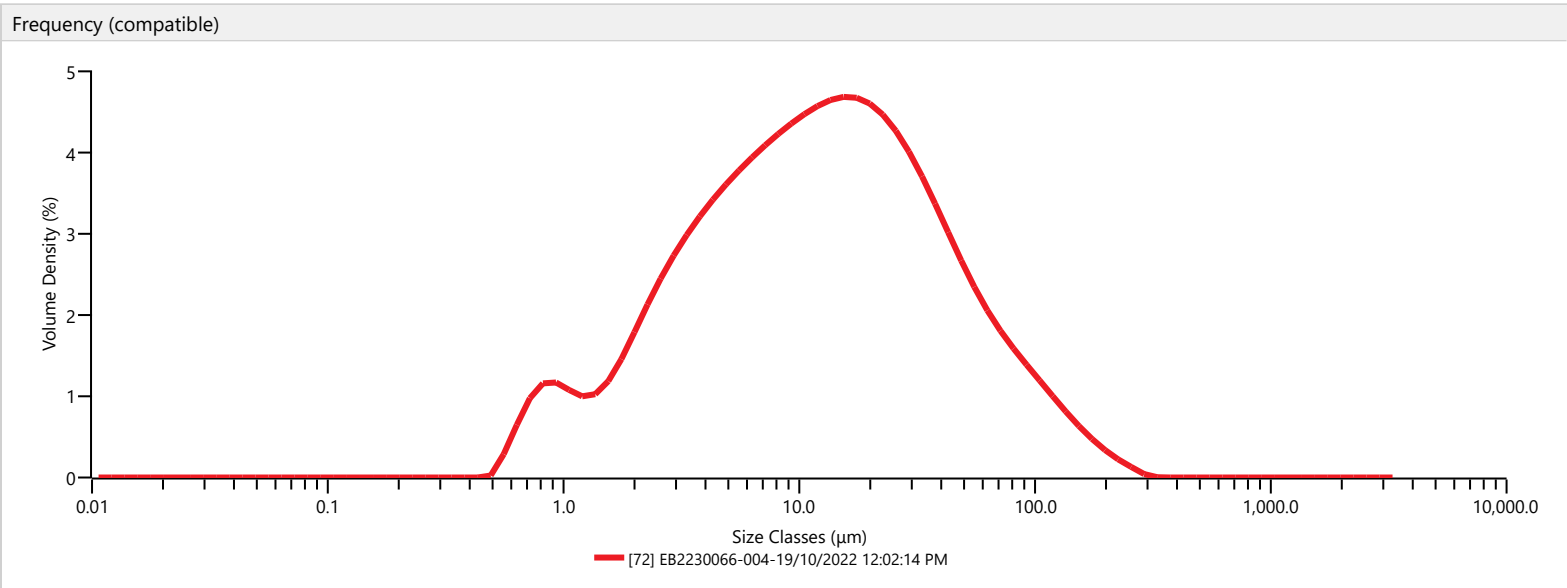
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 11:42:07 AM
Sample Name EB2230066-003	Measurement Date Time 19/10/2022 11:42:07 AM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0045 %
Particle Refractive Index 1.550	Span 4.769
Particle Absorption Index 0.100	Uniformity 1.974
Dispersant Name Water	Specific Surface Area 2409 m²/kg
Dispersant Refractive Index 1.330	D [3,2] 2.49 µm
Scattering Model Mie	D [4,3] 10.1 µm
Analysis Model General Purpose	Dv (10) 0.925 µm
Weighted Residual 1.32 %	Dv (50) 4.11 µm
Laser Obscuration 12.71 %	Dv (90) 20.5 µm



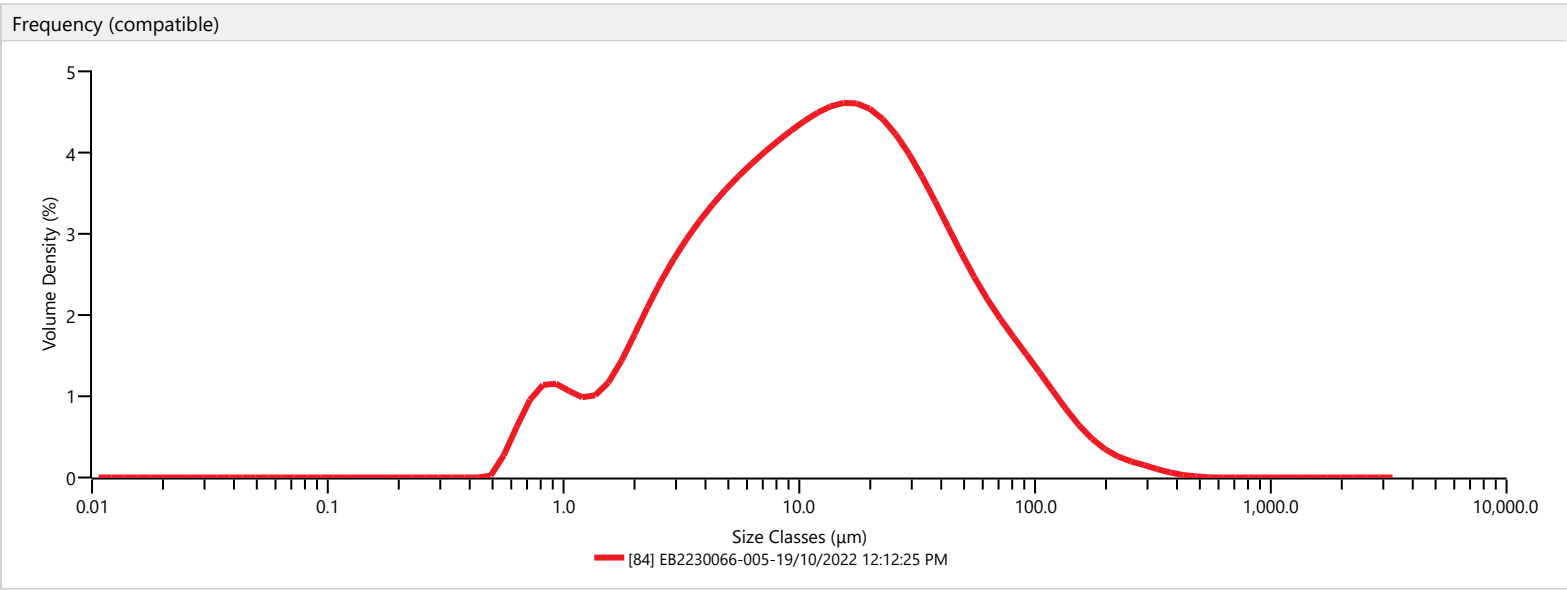
Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	27.88	12.7	82.03	76.0	98.01	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	31.81	14.5	84.49	86.4	98.24	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	36.04	16.4	86.72	98.1	98.47	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.40	3.12	40.45	18.7	88.71	111	98.71	666	100.00
0.0167	0.00	0.0995	0.00	0.594	1.53	3.55	44.93	21.2	90.46	127	98.95	756	100.00
0.0189	0.00	0.113	0.00	0.675	3.46	4.03	49.39	24.1	91.99	144	99.19	859	100.00
0.0215	0.00	0.128	0.00	0.767	5.99	4.58	53.78	27.4	93.30	163	99.43	976	100.00
0.0244	0.00	0.146	0.00	0.872	8.76	5.21	58.03	31.1	94.40	186	99.64	1110	100.00
0.0278	0.00	0.166	0.00	0.991	11.45	5.92	62.11	35.3	95.31	211	99.81	1260	100.00
0.0315	0.00	0.188	0.00	1.13	13.90	6.72	66.00	40.1	96.05	240	99.92	1430	100.00
0.0358	0.00	0.214	0.00	1.28	16.22	7.64	69.69	45.6	96.64	272	99.97	1630	100.00
0.0407	0.00	0.243	0.00	1.45	18.60	8.68	73.14	51.8	97.10	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	21.26	9.86	76.36	58.9	97.46	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	24.34	11.2	79.32	66.9	97.76	400	100.00	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 12:02:14 PM
Sample Name EB2230066-004	Measurement Date Time 19/10/2022 12:02:14 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0063 %
Particle Refractive Index 1.550	Span 4.603
Particle Absorption Index 0.100	Uniformity 1.507
Dispersant Name Water	Specific Surface Area 1131 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 5.31 μm
Scattering Model Mie	D [4,3] 23.5 μm
Analysis Model General Purpose	Dv (10) 2.16 μm
Weighted Residual 0.82 %	Dv (50) 12.1 μm
Laser Obscuration 8.82 %	Dv (90) 57.9 μm



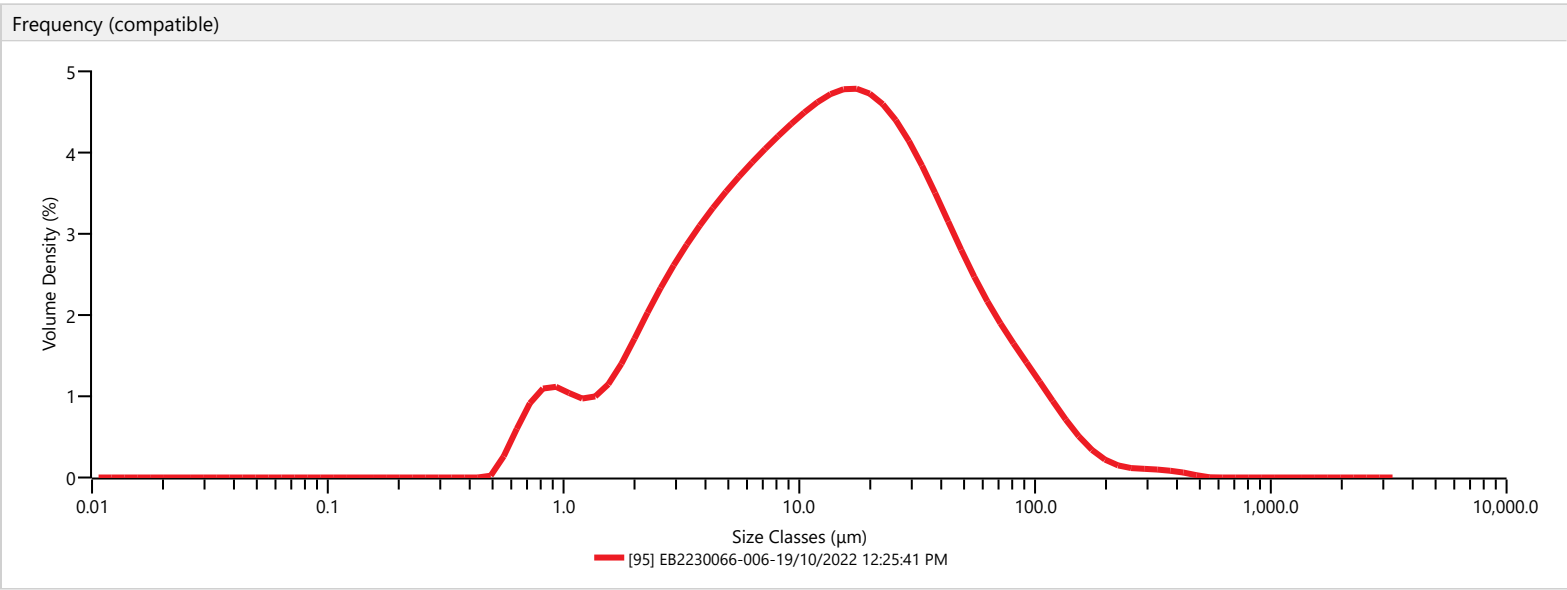
Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	9.81	12.7	51.50	76.0	93.48	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	11.59	14.5	55.38	86.4	94.81	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	13.64	16.4	59.29	98.1	95.96	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	15.92	18.7	63.19	111	96.96	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.23	3.55	18.41	21.2	67.03	127	97.79	756	100.00
0.0189	0.00	0.113	0.00	0.675	0.78	4.03	21.09	24.1	70.76	144	98.47	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.60	4.58	23.94	27.4	74.32	163	99.00	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.58	5.21	26.95	31.1	77.67	186	99.39	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.56	5.92	30.10	35.3	80.76	211	99.67	1260	100.00
0.0315	0.00	0.188	0.00	1.13	4.46	6.72	33.39	40.1	83.57	240	99.86	1430	100.00
0.0358	0.00	0.214	0.00	1.28	5.29	7.64	36.80	45.6	86.09	272	99.97	1630	100.00
0.0407	0.00	0.243	0.00	1.45	6.13	8.68	40.32	51.8	88.31	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	7.11	9.86	43.96	58.9	90.27	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	8.32	11.2	47.69	66.9	91.98	400	100.00	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 12:12:25 PM
Sample Name EB2230066-005	Measurement Date Time 19/10/2022 12:12:25 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0053 %
Particle Refractive Index 1.550	Span 4.793
Particle Absorption Index 0.100	Uniformity 1.589
Dispersant Name Water	Specific Surface Area 1112 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 5.40 μm
Scattering Model Mie	D [4,3] 25.2 μm
Analysis Model General Purpose	Dv (10) 2.19 μm
Weighted Residual 0.82 %	Dv (50) 12.5 μm
Laser Obscuration 7.42 %	Dv (90) 61.9 μm



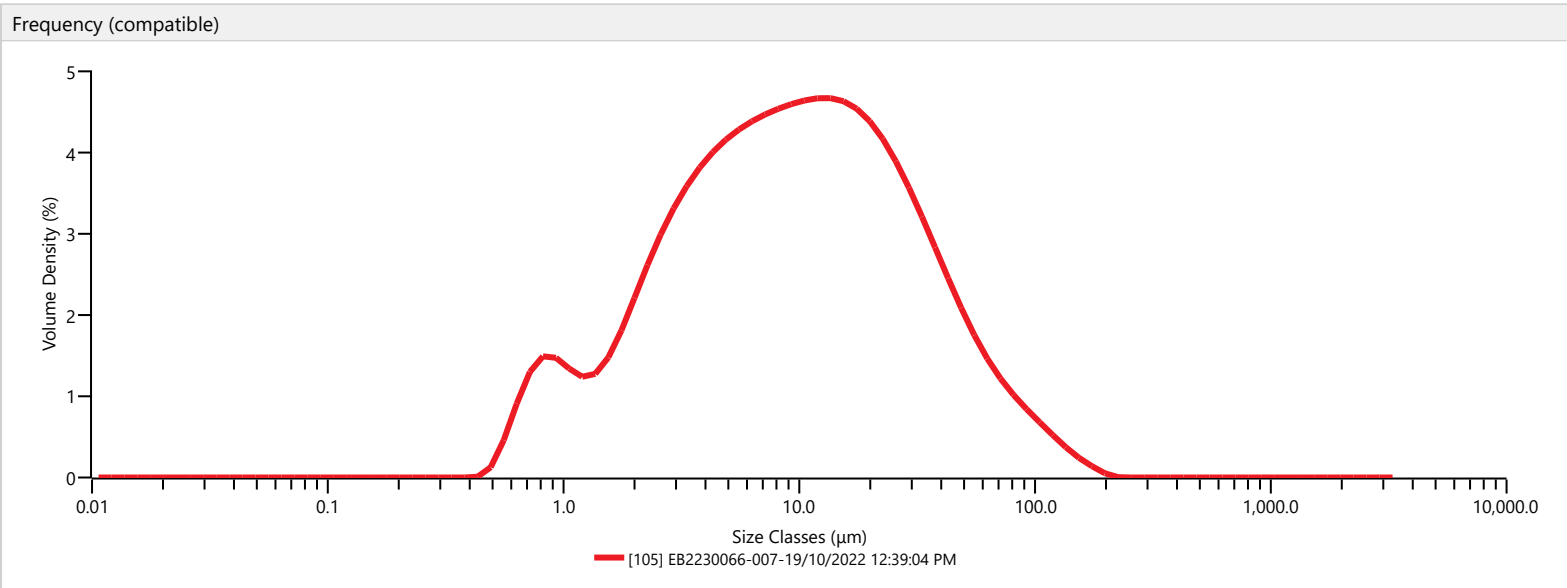
Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	9.65	12.7	50.60	76.0	92.73	454	99.99
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	11.40	14.5	54.41	86.4	94.17	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	13.41	16.4	58.26	98.1	95.43	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	15.65	18.7	62.10	111	96.51	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.22	3.55	18.10	21.2	65.89	127	97.40	756	100.00
0.0189	0.00	0.113	0.00	0.675	0.75	4.03	20.74	24.1	69.58	144	98.10	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.55	4.58	23.55	27.4	73.10	163	98.64	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.52	5.21	26.51	31.1	76.42	186	99.04	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.48	5.92	29.61	35.3	79.52	211	99.32	1260	100.00
0.0315	0.00	0.188	0.00	1.13	4.37	6.72	32.83	40.1	82.35	240	99.54	1430	100.00
0.0358	0.00	0.214	0.00	1.28	5.19	7.64	36.18	45.6	84.92	272	99.70	1630	100.00
0.0407	0.00	0.243	0.00	1.45	6.02	8.68	39.64	51.8	87.22	310	99.83	1850	100.00
0.0463	0.00	0.276	0.00	1.65	6.99	9.86	43.20	58.9	89.28	352	99.91	2100	100.00
0.0526	0.00	0.314	0.00	1.88	8.18	11.2	46.86	66.9	91.10	400	99.96	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 12:25:41 PM
Sample Name EB2230066-006	Measurement Date Time 19/10/2022 12:25:41 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0112 %
Particle Refractive Index 1.550	Span 4.416
Particle Absorption Index 0.100	Uniformity 1.480
Dispersant Name Water	Specific Surface Area 1094 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 5.48 μm
Scattering Model Mie	D [4,3] 24.2 μm
Analysis Model General Purpose	Dv (10) 2.23 μm
Weighted Residual 0.75 %	Dv (50) 12.6 μm
Laser Obscuration 14.78 %	Dv (90) 57.9 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	9.38	12.7	50.31	76.0	93.67	454	99.98
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	11.07	14.5	54.25	86.4	95.04	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	13.02	16.4	58.24	98.1	96.22	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	15.20	18.7	62.23	111	97.21	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.21	3.55	17.59	21.2	66.18	127	97.99	756	100.00
0.0189	0.00	0.113	0.00	0.675	0.71	4.03	20.18	24.1	70.01	144	98.59	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.49	4.58	22.94	27.4	73.68	163	99.01	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.41	5.21	25.88	31.1	77.14	186	99.29	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.35	5.92	28.96	35.3	80.34	211	99.47	1260	100.00
0.0315	0.00	0.188	0.00	1.13	4.21	6.72	32.20	40.1	83.26	240	99.59	1430	100.00
0.0358	0.00	0.214	0.00	1.28	5.02	7.64	35.57	45.6	85.89	272	99.68	1630	100.00
0.0407	0.00	0.243	0.00	1.45	5.84	8.68	39.08	51.8	88.23	310	99.77	1850	100.00
0.0463	0.00	0.276	0.00	1.65	6.79	9.86	42.71	58.9	90.28	352	99.85	2100	100.00
0.0526	0.00	0.314	0.00	1.88	7.95	11.2	46.46	66.9	92.09	400	99.92	2390	100.00

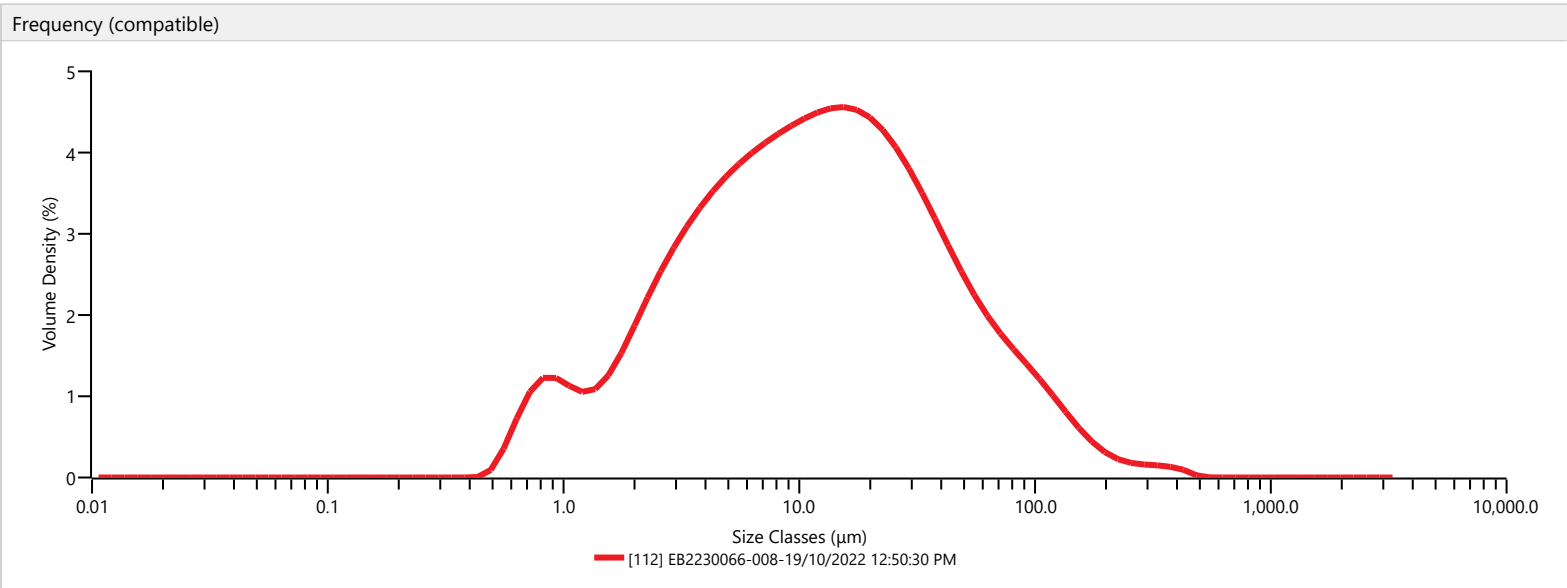
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 12:39:04 PM
Sample Name EB2230066-007	Measurement Date Time 19/10/2022 12:39:04 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0069 %
Particle Refractive Index 1.550	Span 4.294
Particle Absorption Index 0.100	Uniformity 1.409
Dispersant Name Water	Specific Surface Area 1366 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 4.39 μm
Scattering Model Mie	D [4,3] 17.4 μm
Analysis Model General Purpose	Dv (10) 1.76 μm
Weighted Residual 0.91 %	Dv (50) 9.35 μm
Laser Obscuration 11.46 %	Dv (90) 41.9 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	12.58	12.7	59.36	76.0	96.78	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	14.77	14.5	63.26	86.4	97.63	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	17.26	16.4	67.12	98.1	98.33	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.09	3.12	20.03	18.7	70.91	111	98.90	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.46	3.55	23.02	21.2	74.57	127	99.33	756	100.00
0.0189	0.00	0.113	0.00	0.675	1.23	4.03	26.21	24.1	78.05	144	99.64	859	100.00
0.0215	0.00	0.128	0.00	0.767	2.33	4.58	29.55	27.4	81.30	163	99.84	976	100.00
0.0244	0.00	0.146	0.00	0.872	3.59	5.21	33.02	31.1	84.28	186	99.96	1110	100.00
0.0278	0.00	0.166	0.00	0.991	4.82	5.92	36.59	35.3	86.95	211	100.00	1260	100.00
0.0315	0.00	0.188	0.00	1.13	5.94	6.72	40.25	40.1	89.31	240	100.00	1430	100.00
0.0358	0.00	0.214	0.00	1.28	6.96	7.64	43.98	45.6	91.36	272	100.00	1630	100.00
0.0407	0.00	0.243	0.00	1.45	8.01	8.68	47.76	51.8	93.09	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	9.24	9.86	51.60	58.9	94.55	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	10.74	11.2	55.47	66.9	95.77	400	100.00	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 12:50:30 PM
Sample Name EB2230066-008	Measurement Date Time 19/10/2022 12:50:30 PM
SOP File Name HydroLV.cfg	Result Source Averaged

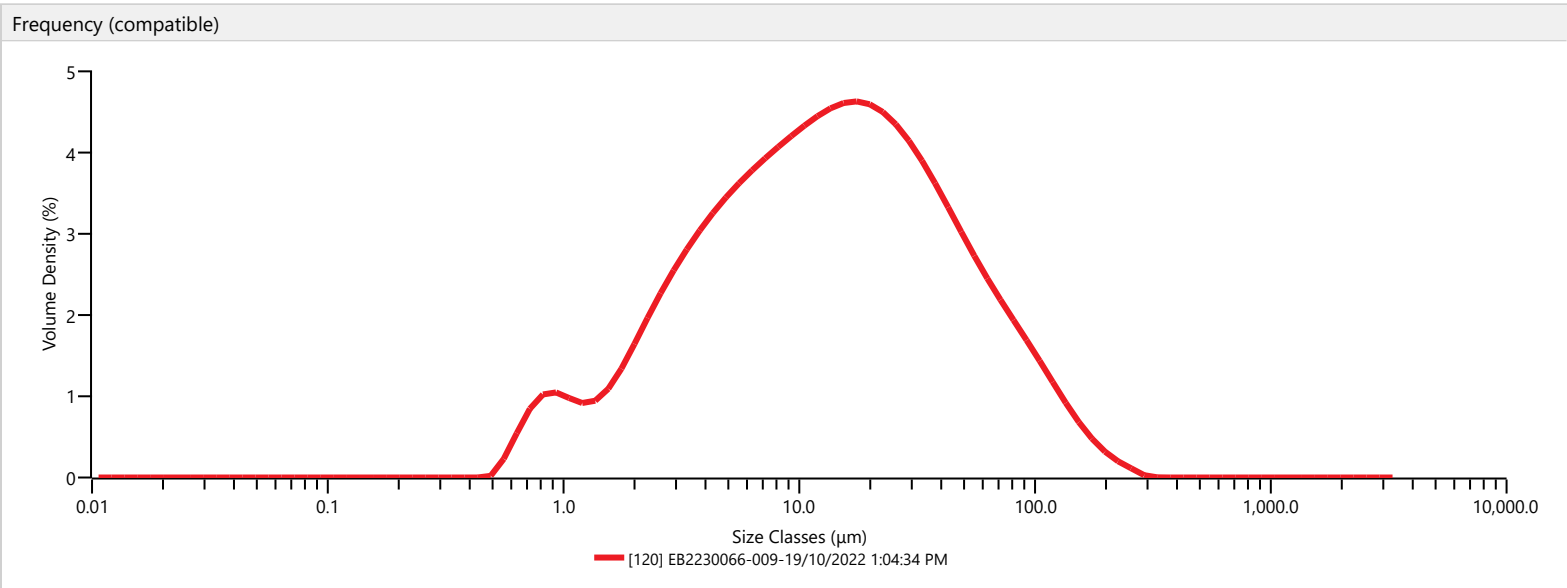
Analysis	Result
Particle Name ALS	Concentration 0.0125 %
Particle Refractive Index 1.550	Span 4.938
Particle Absorption Index 0.100	Uniformity 1.687
Dispersant Name Water	Specific Surface Area 1184 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 5.07 µm
Scattering Model Mie	D [4,3] 24.6 µm
Analysis Model General Purpose	Dv (10) 2.04 µm
Weighted Residual 0.77 %	Dv (50) 11.6 µm
Laser Obscuration 17.45 %	Dv (90) 59.2 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	10.50	12.7	52.76	76.0	93.06	454	99.98
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	12.35	14.5	56.55	86.4	94.37	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	14.47	16.4	60.36	98.1	95.54	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.06	3.12	16.83	18.7	64.14	111	96.55	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.35	3.55	19.40	21.2	67.84	127	97.39	756	100.00
0.0189	0.00	0.113	0.00	0.675	0.96	4.03	22.17	24.1	71.41	144	98.07	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.86	4.58	25.11	27.4	74.80	163	98.57	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.89	5.21	28.20	31.1	77.97	186	98.94	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.92	5.92	31.42	35.3	80.90	211	99.20	1260	100.00
0.0315	0.00	0.188	0.00	1.13	4.86	6.72	34.76	40.1	83.55	240	99.38	1430	100.00
0.0358	0.00	0.214	0.00	1.28	5.73	7.64	38.19	45.6	85.93	272	99.53	1630	100.00
0.0407	0.00	0.243	0.00	1.45	6.63	8.68	41.72	51.8	88.05	310	99.66	1850	100.00
0.0463	0.00	0.276	0.00	1.65	7.67	9.86	45.33	58.9	89.92	352	99.79	2100	100.00
0.0526	0.00	0.314	0.00	1.88	8.94	11.2	49.02	66.9	91.58	400	99.90	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 19/10/2022 1:04:34 PM
Sample Name EB2230066-009	Measurement Date Time 19/10/2022 1:04:34 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0114 %
Particle Refractive Index 1.550	Span 4.630
Particle Absorption Index 0.100	Uniformity 1.466
Dispersant Name Water	Specific Surface Area 1049 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 5.72 μm
Scattering Model Mie	D [4,3] 25.3 μm
Analysis Model General Purpose	Dv (10) 2.33 μm
Weighted Residual 0.74 %	Dv (50) 13.3 μm
Laser Obscuration 14.59 %	Dv (90) 64.0 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	8.84	12.7	48.64	76.0	92.53	454	100.00
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	10.48	14.5	52.43	86.4	94.14	516	100.00
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	12.37	16.4	56.28	98.1	95.55	586	100.00
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	14.50	18.7	60.14	111	96.75	666	100.00
0.0167	0.00	0.0995	0.00	0.594	0.19	3.55	16.84	21.2	63.98	127	97.73	756	100.00
0.0189	0.00	0.113	0.00	0.675	0.64	4.03	19.38	24.1	67.73	144	98.50	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.36	4.58	22.09	27.4	71.36	163	99.06	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.22	5.21	24.97	31.1	74.82	186	99.46	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.10	5.92	27.99	35.3	78.07	211	99.72	1260	100.00
0.0315	0.00	0.188	0.00	1.13	3.92	6.72	31.14	40.1	81.09	240	99.89	1430	100.00
0.0358	0.00	0.214	0.00	1.28	4.67	7.64	34.42	45.6	83.87	272	99.98	1630	100.00
0.0407	0.00	0.243	0.00	1.45	5.45	8.68	37.81	51.8	86.39	310	100.00	1850	100.00
0.0463	0.00	0.276	0.00	1.65	6.36	9.86	41.32	58.9	88.66	352	100.00	2100	100.00
0.0526	0.00	0.314	0.00	1.88	7.47	11.2	44.93	66.9	90.70	400	100.00	2390	100.00



Environmental Division

Work Order: EB2231057
Client: RGS ENVIRONMENTAL
CONSULTANTS PTY LTD
Contact: ASHRAF KHALIFA
Address: 3/30 LENS WORTH STREET
COOPERS PLAINS 4108
Project: 2022055 MRO EROSION Modelling
Report Date: 27/10/2022
Samples Submitted: 20/10/2022

Report: Address:

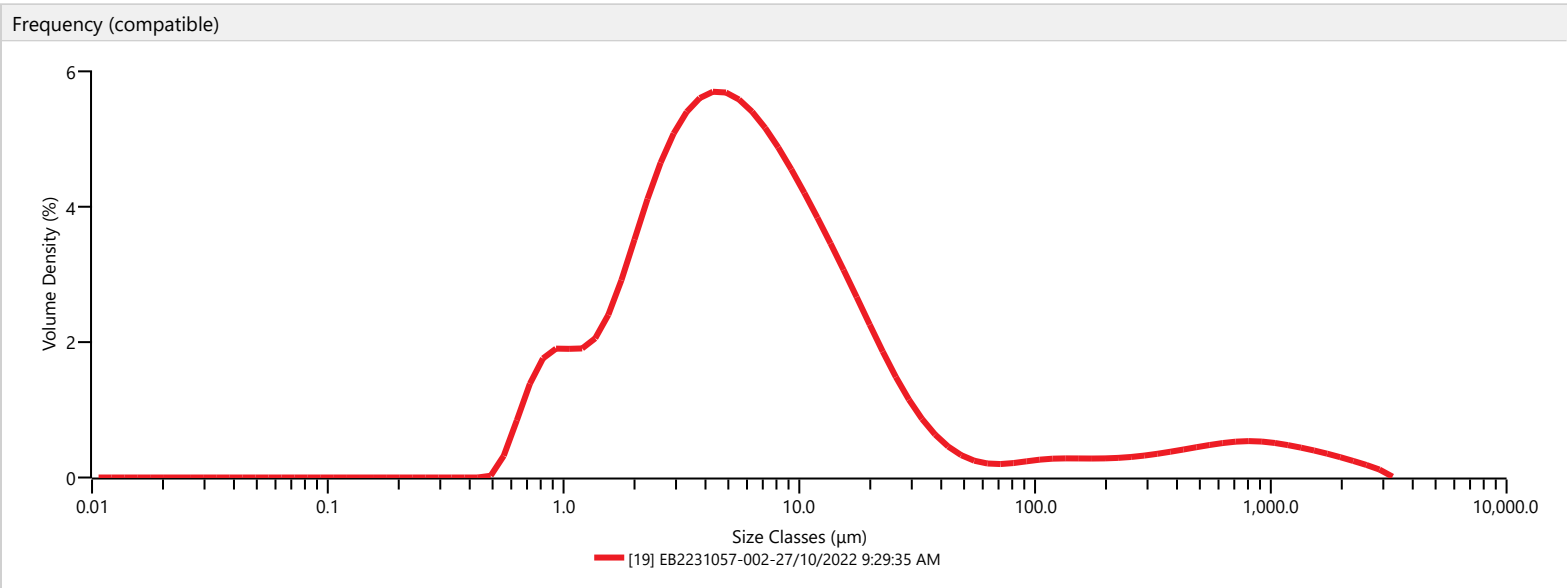
The particle size distribution of these samples was determined by Light-Scattering using a Mastersizer 3000 instrument.

Lab ID	Client ID
EB2231057-002	60WHSoil_003_Runoff - 2022055_003West Hill Soil
EB2231057-003	90WHSoil_003_Runoff - 2022055_003West Hill Soil
EB2231057-004	30WHSoil_003C_Runoff - 2022055_003West Hill Soil
EB2231057-005	60WHSoil_003C_Runoff - 2022055_003West Hill Soil
EB2231057-006	90WHSoil_003C_Runoff - 2022055_003West Hill Soil

A detailed report for each sample is attached.
Sampled by PRIYA RAJENDRAN; analysed as received.

VINCENT EMERTON-BELL
Laboratory Analyst
Soils and Sizing.

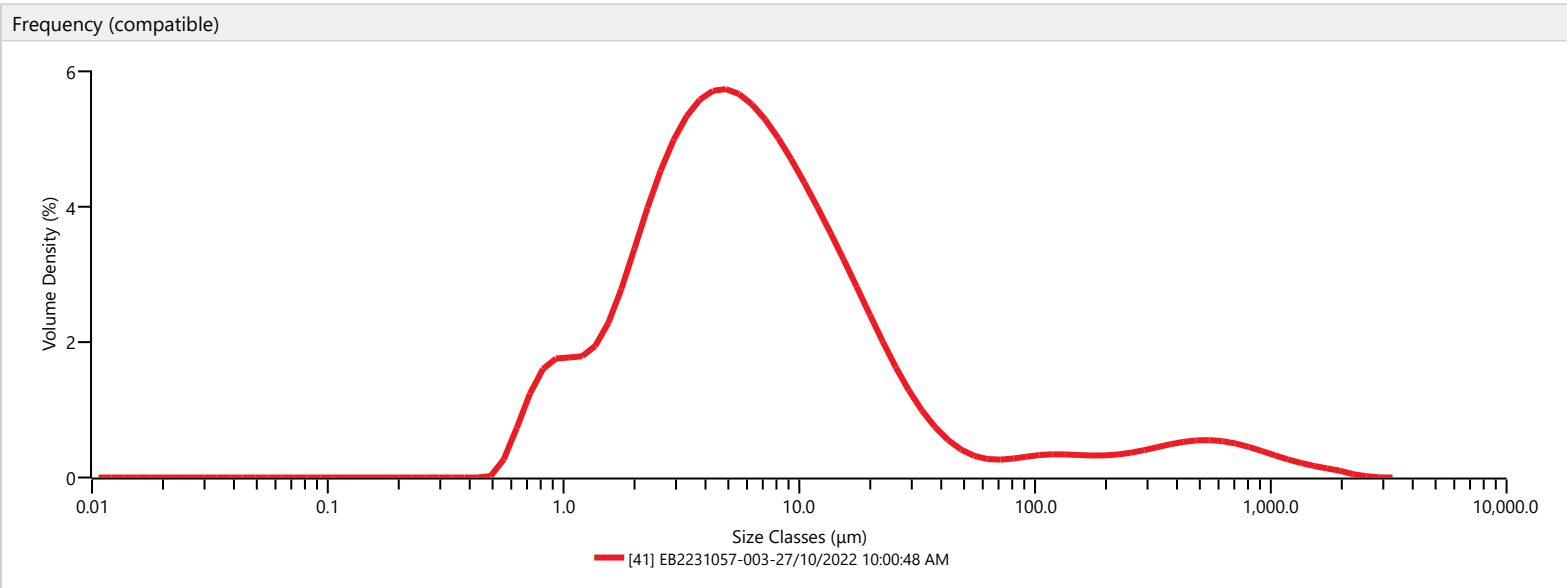
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 27/10/2022 9:29:35 AM
Sample Name EB2231057-002	Measurement Date Time 27/10/2022 9:29:35 AM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0073 %
Particle Refractive Index 1.550	Span 6.539
Particle Absorption Index 0.100	Uniformity 12.708
Dispersant Name Water	Specific Surface Area 1713 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.50 µm
Scattering Model Mie	D [4,3] 73.4 µm
Analysis Model General Purpose	Dv (10) 1.45 µm
Weighted Residual 1.19 %	Dv (50) 5.55 µm
Laser Obscuration 15.21 %	Dv (90) 37.7 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	17.41	12.7	75.73	76.0	91.44	454	94.93
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	20.85	14.5	78.61	86.4	91.62	516	95.30
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	24.73	16.4	81.17	98.1	91.82	586	95.71
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	28.98	18.7	83.39	111	92.04	666	96.13
0.0167	0.00	0.0995	0.00	0.594	0.25	3.55	33.49	21.2	85.27	127	92.27	756	96.57
0.0189	0.00	0.113	0.00	0.675	0.95	4.03	38.17	24.1	86.82	144	92.51	859	97.02
0.0215	0.00	0.128	0.00	0.767	2.12	4.58	42.93	27.4	88.06	163	92.75	976	97.47
0.0244	0.00	0.146	0.00	0.872	3.61	5.21	47.68	31.1	89.01	186	92.98	1110	97.89
0.0278	0.00	0.166	0.00	0.991	5.20	5.92	52.34	35.3	89.73	211	93.21	1260	98.29
0.0315	0.00	0.188	0.00	1.13	6.79	6.72	56.85	40.1	90.26	240	93.46	1430	98.66
0.0358	0.00	0.214	0.00	1.28	8.37	7.64	61.15	45.6	90.63	272	93.71	1630	98.99
0.0407	0.00	0.243	0.00	1.45	10.07	8.68	65.22	51.8	90.91	310	93.98	1850	99.29
0.0463	0.00	0.276	0.00	1.65	12.06	9.86	69.02	58.9	91.11	352	94.27	2100	99.54
0.0526	0.00	0.314	0.00	1.88	14.48	11.2	72.53	66.9	91.28	400	94.59	2390	99.74

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 27/10/2022 10:00:48 AM
Sample Name EB2231057-003	Measurement Date Time 27/10/2022 10:00:48 AM
SOP File Name HydroLV.cfg	Result Source Averaged

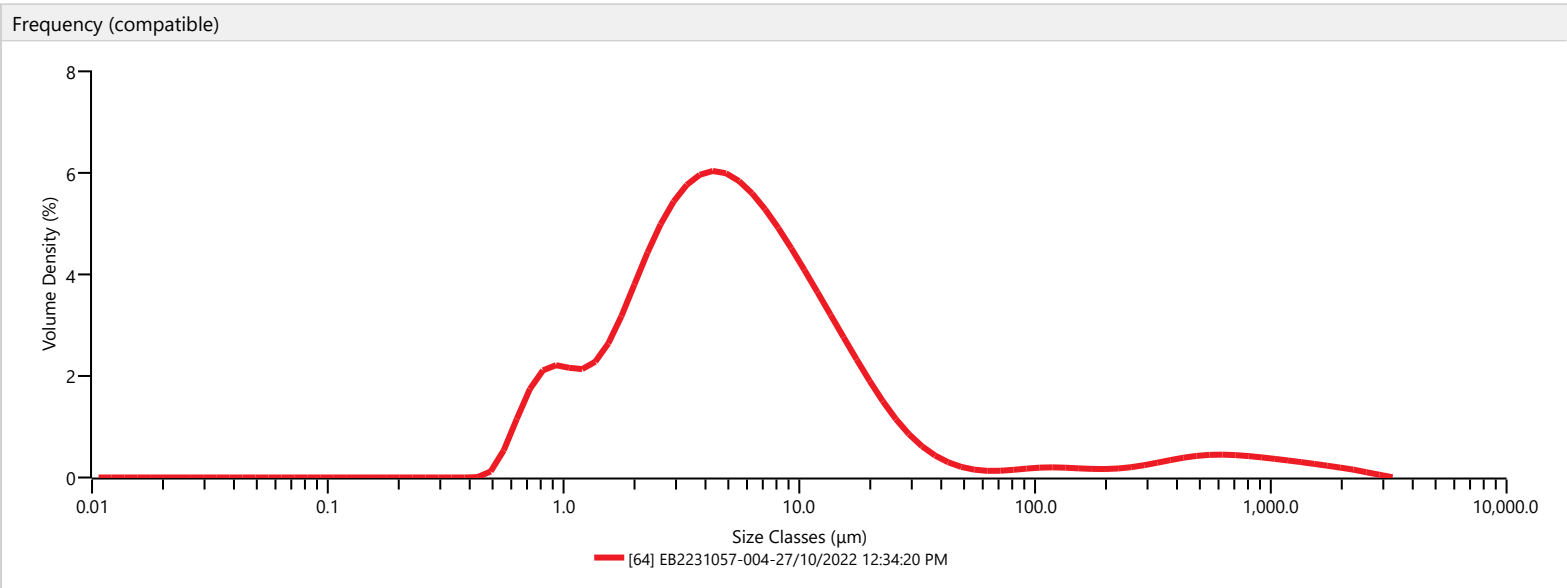
Analysis	Result
Particle Name ALS	Concentration 0.0067 %
Particle Refractive Index 1.550	Span 5.854
Particle Absorption Index 0.100	Uniformity 7.984
Dispersant Name Water	Specific Surface Area 1647 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.64 μm
Scattering Model Mie	D [4,3] 49.0 μm
Analysis Model General Purpose	Dv (10) 1.53 μm
Weighted Residual 1.16 %	Dv (50) 5.76 μm
Laser Obscuration 13.68 %	Dv (90) 35.3 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	16.28	12.7	75.04	76.0	92.13	454	96.44
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	19.61	14.5	78.05	86.4	92.37	516	96.90
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	23.39	16.4	80.74	98.1	92.63	586	97.36
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	27.56	18.7	83.09	111	92.90	666	97.81
0.0167	0.00	0.0995	0.00	0.594	0.21	3.55	32.02	21.2	85.10	127	93.19	756	98.23
0.0189	0.00	0.113	0.00	0.675	0.82	4.03	36.68	24.1	86.77	144	93.47	859	98.61
0.0215	0.00	0.128	0.00	0.767	1.86	4.58	41.45	27.4	88.12	163	93.75	976	98.94
0.0244	0.00	0.146	0.00	0.872	3.21	5.21	46.24	31.1	89.19	186	94.02	1110	99.21
0.0278	0.00	0.166	0.00	0.991	4.69	5.92	50.97	35.3	90.01	211	94.29	1260	99.43
0.0315	0.00	0.188	0.00	1.13	6.16	6.72	55.57	40.1	90.63	240	94.58	1430	99.61
0.0358	0.00	0.214	0.00	1.28	7.65	7.64	59.98	45.6	91.09	272	94.88	1630	99.75
0.0407	0.00	0.243	0.00	1.45	9.25	8.68	64.16	51.8	91.43	310	95.22	1850	99.86
0.0463	0.00	0.276	0.00	1.65	11.15	9.86	68.08	58.9	91.69	352	95.59	2100	99.95
0.0526	0.00	0.314	0.00	1.88	13.46	11.2	71.71	66.9	91.92	400	96.00	2390	99.98

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 27/10/2022 12:34:20 PM
Sample Name EB2231057-004	Measurement Date Time 27/10/2022 12:34:20 PM
SOP File Name HydroLV.cfg	Result Source Averaged

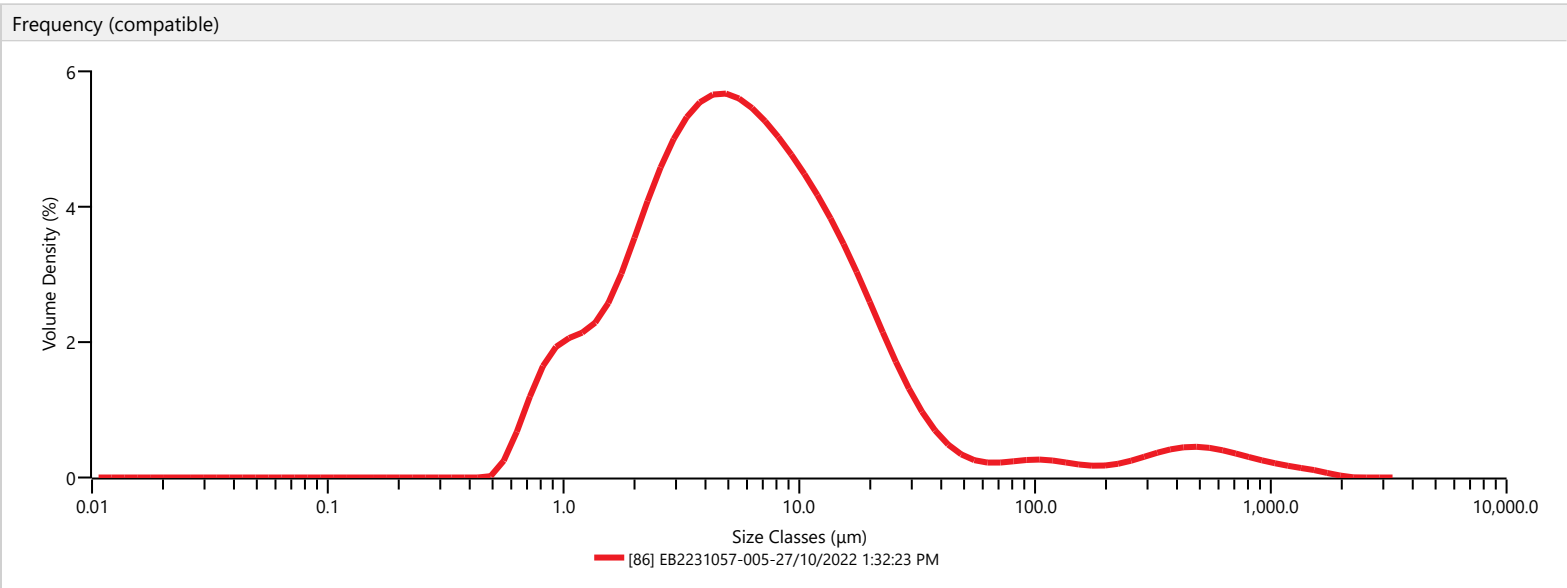
Analysis	Result
Particle Name ALS	Concentration 0.0084 %
Particle Refractive Index 1.550	Span 4.499
Particle Absorption Index 0.100	Uniformity 10.397
Dispersant Name Water	Specific Surface Area 1915 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.13 μm
Scattering Model Mie	D [4,3] 53.6 μm
Analysis Model General Purpose	Dv (10) 1.27 μm
Weighted Residual 1.23 %	Dv (50) 4.91 μm
Laser Obscuration 18.92 %	Dv (90) 23.4 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	20.03	12.7	80.55	76.0	93.59	454	96.16
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	23.73	14.5	83.23	86.4	93.72	516	96.52
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	27.90	16.4	85.53	98.1	93.87	586	96.89
0.0147	0.00	0.0876	0.00	0.523	0.08	3.12	32.44	18.7	87.47	111	94.03	666	97.27
0.0167	0.00	0.0995	0.00	0.594	0.51	3.55	37.25	21.2	89.05	127	94.20	756	97.63
0.0189	0.00	0.113	0.00	0.675	1.47	4.03	42.23	24.1	90.30	144	94.36	859	97.99
0.0215	0.00	0.128	0.00	0.767	2.94	4.58	47.28	27.4	91.25	163	94.51	976	98.32
0.0244	0.00	0.146	0.00	0.872	4.72	5.21	52.28	31.1	91.96	186	94.65	1110	98.62
0.0278	0.00	0.166	0.00	0.991	6.58	5.92	57.15	35.3	92.47	211	94.79	1260	98.90
0.0315	0.00	0.188	0.00	1.13	8.38	6.72	61.82	40.1	92.83	240	94.93	1430	99.16
0.0358	0.00	0.214	0.00	1.28	10.15	7.64	66.23	45.6	93.08	272	95.10	1630	99.38
0.0407	0.00	0.243	0.00	1.45	12.03	8.68	70.33	51.8	93.25	310	95.30	1850	99.57
0.0463	0.00	0.276	0.00	1.65	14.22	9.86	74.10	58.9	93.38	352	95.55	2100	99.74
0.0526	0.00	0.314	0.00	1.88	16.86	11.2	77.51	66.9	93.48	400	95.83	2390	99.87

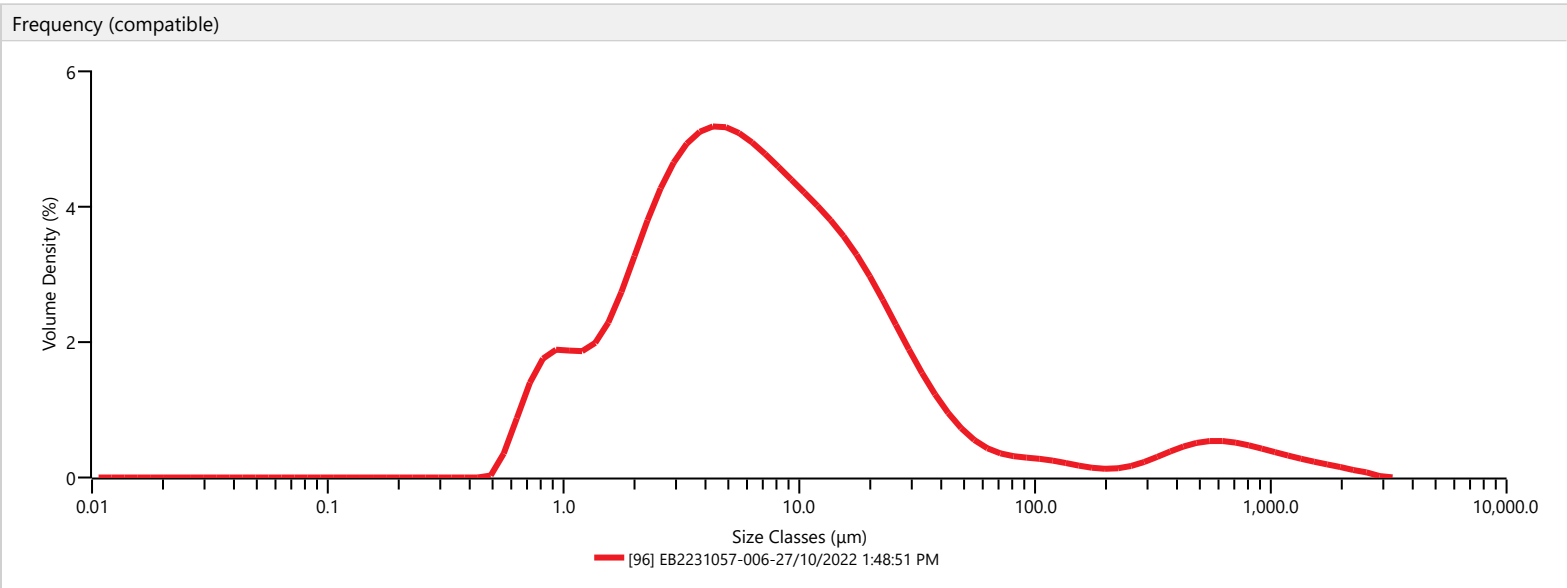
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 27/10/2022 1:32:23 PM
Sample Name EB2231057-005	Measurement Date Time 27/10/2022 1:32:23 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0060 %
Particle Refractive Index 1.550	Span 4.384
Particle Absorption Index 0.100	Uniformity 5.810
Dispersant Name Water	Specific Surface Area 1714 m²/kg
Dispersant Refractive Index 1.330	D [3,2] 3.50 µm
Scattering Model Mie	D [4,3] 35.1 µm
Analysis Model General Purpose	Dv (10) 1.44 µm
Weighted Residual 1.11 %	Dv (50) 5.55 µm
Laser Obscuration 12.87 %	Dv (90) 25.8 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	17.75	12.7	76.70	76.0	94.41	454	97.55
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	21.15	14.5	79.89	86.4	94.61	516	97.93
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	24.98	16.4	82.77	98.1	94.82	586	98.29
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	29.15	18.7	85.30	111	95.05	666	98.63
0.0167	0.00	0.0995	0.00	0.594	0.19	3.55	33.60	21.2	87.47	127	95.26	756	98.93
0.0189	0.00	0.113	0.00	0.675	0.75	4.03	38.23	24.1	89.26	144	95.44	859	99.18
0.0215	0.00	0.128	0.00	0.767	1.75	4.58	42.95	27.4	90.68	163	95.60	976	99.39
0.0244	0.00	0.146	0.00	0.872	3.14	5.21	47.69	31.1	91.77	186	95.75	1110	99.57
0.0278	0.00	0.166	0.00	0.991	4.76	5.92	52.36	35.3	92.57	211	95.89	1260	99.71
0.0315	0.00	0.188	0.00	1.13	6.48	6.72	56.91	40.1	93.15	240	96.06	1430	99.83
0.0358	0.00	0.214	0.00	1.28	8.26	7.64	61.30	45.6	93.55	272	96.27	1630	99.92
0.0407	0.00	0.243	0.00	1.45	10.15	8.68	65.50	51.8	93.83	310	96.52	1850	99.98
0.0463	0.00	0.276	0.00	1.65	12.29	9.86	69.48	58.9	94.04	352	96.83	2100	100.00
0.0526	0.00	0.314	0.00	1.88	14.80	11.2	73.22	66.9	94.23	400	97.17	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 27/10/2022 1:48:51 PM
Sample Name EB2231057-006	Measurement Date Time 27/10/2022 1:48:51 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0090 %
Particle Refractive Index 1.550	Span 5.824
Particle Absorption Index 0.100	Uniformity 8.374
Dispersant Name Water	Specific Surface Area 1654 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.63 μm
Scattering Model Mie	D [4,3] 54.4 μm
Analysis Model General Purpose	Dv (10) 1.45 μm
Weighted Residual 1.10 %	Dv (50) 6.14 μm
Laser Obscuration 17.89 %	Dv (90) 37.2 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	16.91	12.7	71.29	76.0	93.12	454	96.01
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	20.09	14.5	74.46	86.4	93.38	516	96.44
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	23.65	16.4	77.43	98.1	93.63	586	96.89
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	27.54	18.7	80.18	111	93.86	666	97.34
0.0167	0.00	0.0995	0.00	0.594	0.28	3.55	31.66	21.2	82.66	127	94.06	756	97.78
0.0189	0.00	0.113	0.00	0.675	1.01	4.03	35.92	24.1	84.85	144	94.24	859	98.17
0.0215	0.00	0.128	0.00	0.767	2.19	4.58	40.25	27.4	86.73	163	94.39	976	98.53
0.0244	0.00	0.146	0.00	0.872	3.67	5.21	44.57	31.1	88.31	186	94.51	1110	98.84
0.0278	0.00	0.166	0.00	0.991	5.26	5.92	48.82	35.3	89.59	211	94.61	1260	99.11
0.0315	0.00	0.188	0.00	1.13	6.82	6.72	52.95	40.1	90.61	240	94.73	1430	99.34
0.0358	0.00	0.214	0.00	1.28	8.37	7.64	56.93	45.6	91.40	272	94.87	1630	99.54
0.0407	0.00	0.243	0.00	1.45	10.01	8.68	60.76	51.8	92.01	310	95.06	1850	99.70
0.0463	0.00	0.276	0.00	1.65	11.91	9.86	64.43	58.9	92.47	352	95.31	2100	99.83
0.0526	0.00	0.314	0.00	1.88	14.19	11.2	67.94	66.9	92.82	400	95.63	2390	99.92



Environmental Division

Work Order: EB2232003
Client: RGS ENVIRONMENTAL
CONSULTANTS PTY LTD
Address: 3/30 LENSWORTH STREET
COOPERS PLAINS 4108
Contact: ASHRAF KHALIFA
Project: 2022055 MRO EROSION Modelling
Report Date: 8/11/2022
Samples Submitted: 28/10/2022

Report:

The particle size distribution of these samples was determined by Light-Scattering using a Mastersizer 3000 instrument.

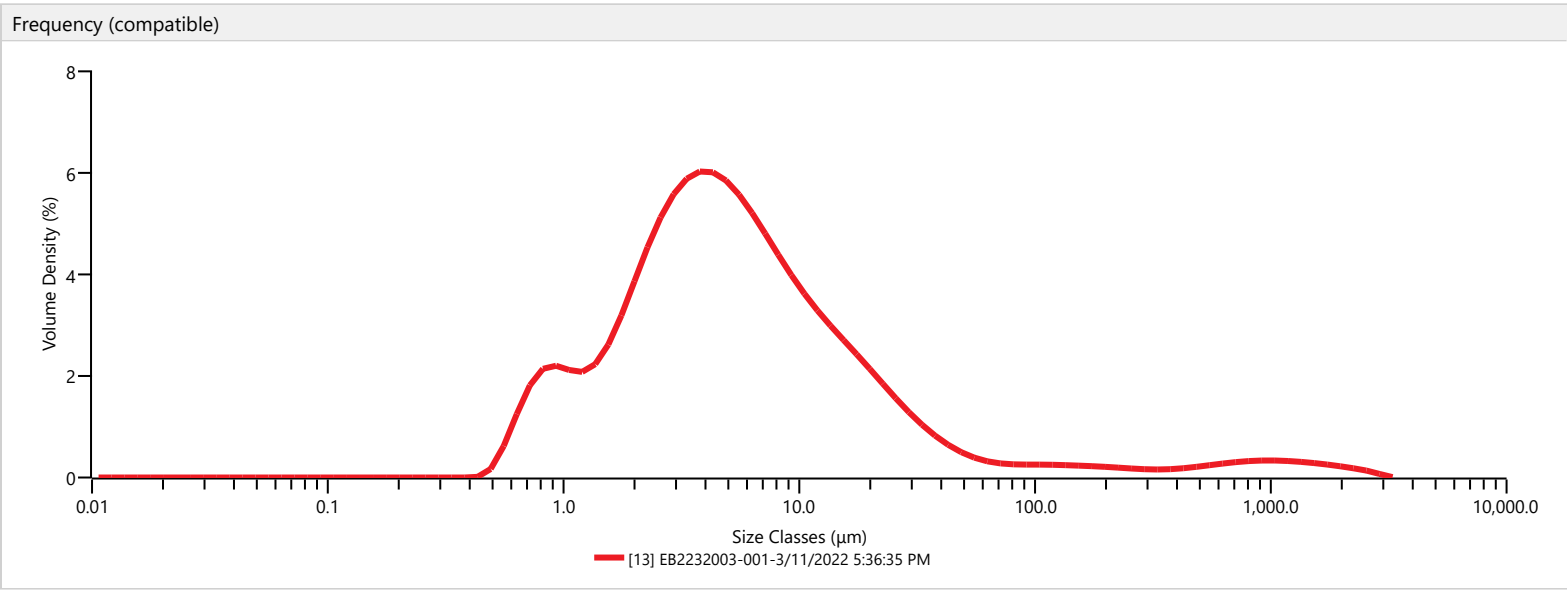
Lab ID	Client ID
EB2232003-001	30_WHS_004C_Runoff - 2022055_004 West Hill Saprolite
EB2232003-002	60_WHS_004C_Runoff - 2022055_004 West Hill Saprolite
EB2232003-003	90_WHS_004C_Runoff - 2022055_004 West Hill Saprolite

A detailed report for each sample is attached.
Sampled by PRIYA RAJENDRAN; analysed as received.

Aleksandar Vujkovic
Laboratory Analyst
Soils and Sizing.

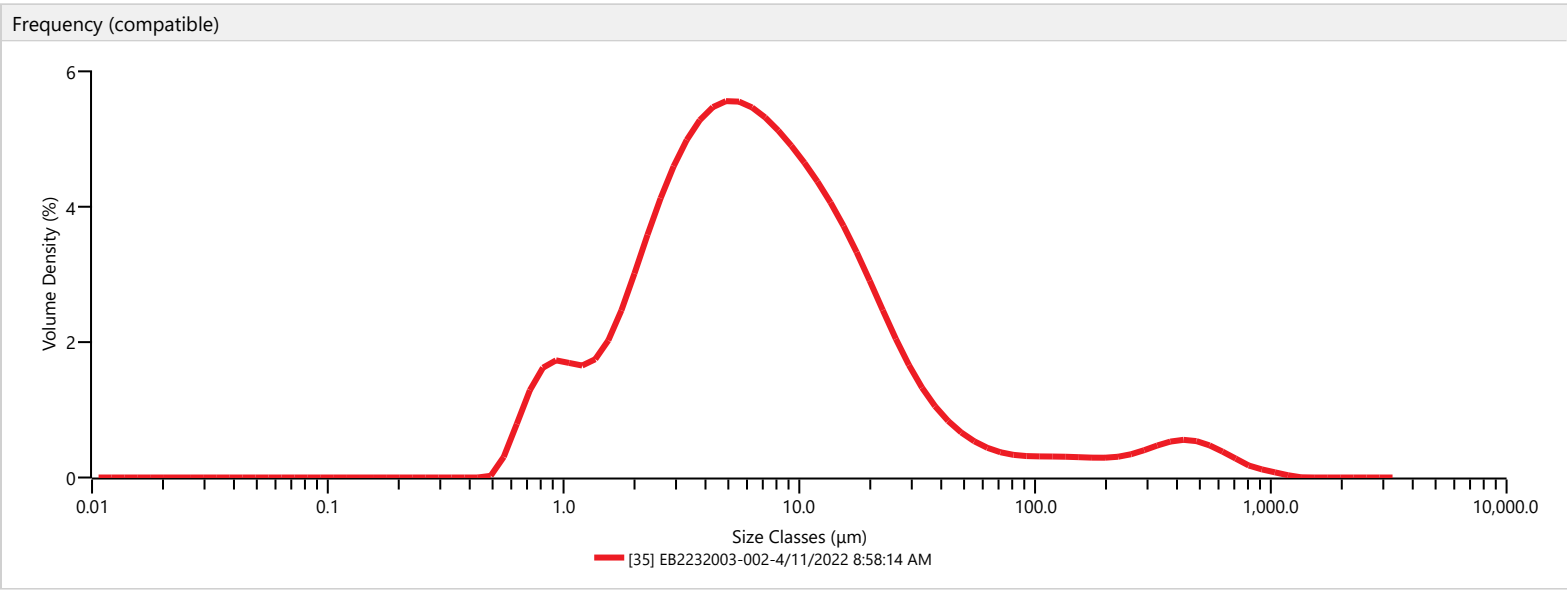
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 3/11/2022 5:36:35 PM
Sample Name EB2232003-001	Measurement Date Time 3/11/2022 5:36:35 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0060 %
Particle Refractive Index 1.550	Span 5.430
Particle Absorption Index 0.100	Uniformity 9.965
Dispersant Name Water	Specific Surface Area 1932 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.11 μm
Scattering Model Mie	D [4,3] 50.7 μm
Analysis Model General Purpose	Dv (10) 1.25 μm
Weighted Residual 1.17 %	Dv (50) 4.84 μm
Laser Obscuration 14.08 %	Dv (90) 27.5 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	20.23	12.7	78.56	76.0	94.34	454	96.82
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	24.01	14.5	81.05	86.4	94.56	516	96.99
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	28.29	16.4	83.31	98.1	94.77	586	97.19
0.0147	0.00	0.0876	0.00	0.523	0.12	3.12	32.96	18.7	85.33	111	94.98	666	97.42
0.0167	0.00	0.0995	0.00	0.594	0.62	3.55	37.87	21.2	87.12	127	95.19	756	97.68
0.0189	0.00	0.113	0.00	0.675	1.67	4.03	42.91	24.1	88.66	144	95.39	859	97.95
0.0215	0.00	0.128	0.00	0.767	3.20	4.58	47.93	27.4	89.96	163	95.59	976	98.23
0.0244	0.00	0.146	0.00	0.872	5.01	5.21	52.82	31.1	91.03	186	95.78	1110	98.51
0.0278	0.00	0.166	0.00	0.991	6.85	5.92	57.47	35.3	91.89	211	95.95	1260	98.78
0.0315	0.00	0.188	0.00	1.13	8.62	6.72	61.82	40.1	92.58	240	96.11	1430	99.04
0.0358	0.00	0.214	0.00	1.28	10.34	7.64	65.82	45.6	93.11	272	96.26	1630	99.27
0.0407	0.00	0.243	0.00	1.45	12.18	8.68	69.48	51.8	93.53	310	96.40	1850	99.49
0.0463	0.00	0.276	0.00	1.65	14.35	9.86	72.80	58.9	93.85	352	96.53	2100	99.67
0.0526	0.00	0.314	0.00	1.88	17.00	11.2	75.82	66.9	94.11	400	96.67	2390	99.82

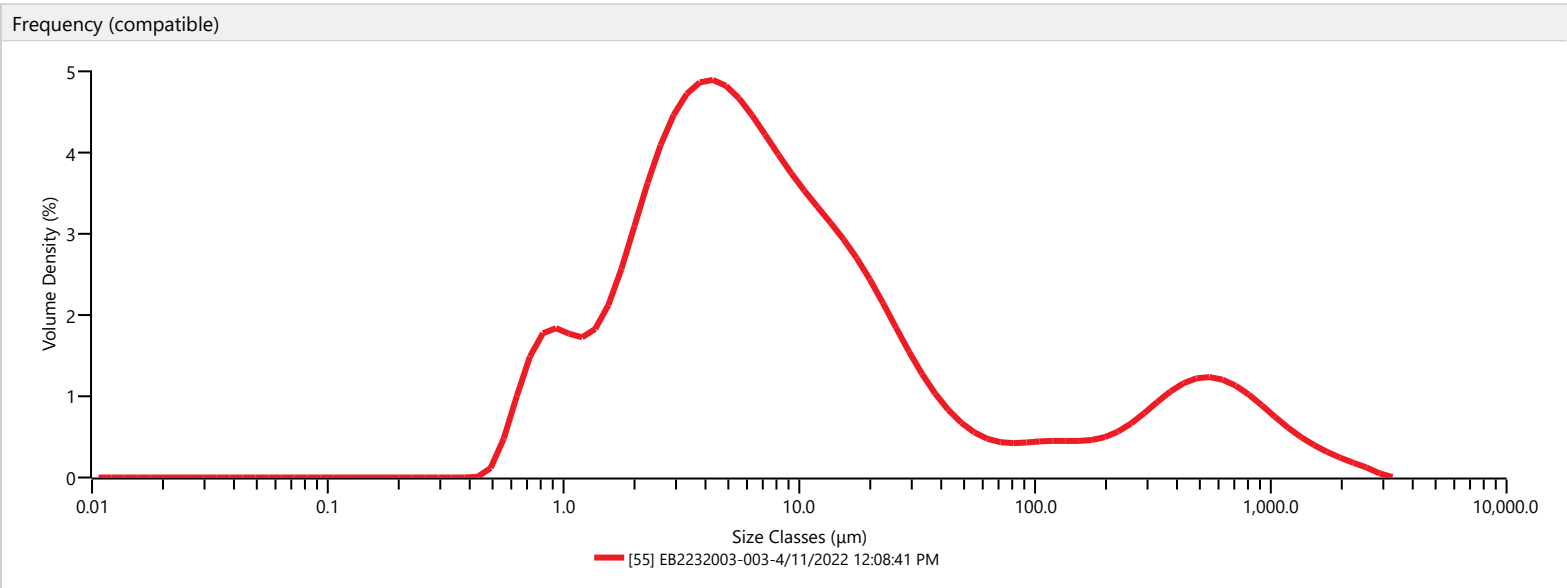
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 4/11/2022 8:58:14 AM
Sample Name EB2232003-002	Measurement Date Time 4/11/2022 8:58:14 AM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0035 %
Particle Refractive Index 1.550	Span 4.898
Particle Absorption Index 0.100	Uniformity 4.253
Dispersant Name Water	Specific Surface Area 1592 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.77 µm
Scattering Model Mie	D [4,3] 29.8 µm
Analysis Model General Purpose	Dv (10) 1.56 µm
Weighted Residual 1.08 %	Dv (50) 6.26 µm
Laser Obscuration 7.14 %	Dv (90) 32.2 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	15.27	12.7	72.85	76.0	94.03	454	98.26
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	18.26	14.5	76.24	86.4	94.31	516	98.71
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	21.71	16.4	79.34	98.1	94.57	586	99.11
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	25.55	18.7	82.12	111	94.83	666	99.43
0.0167	0.00	0.0995	0.00	0.594	0.24	3.55	29.71	21.2	84.54	127	95.09	756	99.66
0.0189	0.00	0.113	0.00	0.675	0.90	4.03	34.12	24.1	86.60	144	95.34	859	99.81
0.0215	0.00	0.128	0.00	0.767	1.99	4.58	38.69	27.4	88.31	163	95.59	976	99.91
0.0244	0.00	0.146	0.00	0.872	3.36	5.21	43.33	31.1	89.69	186	95.84	1110	99.97
0.0278	0.00	0.166	0.00	0.991	4.81	5.92	47.97	35.3	90.79	211	96.08	1260	100.00
0.0315	0.00	0.188	0.00	1.13	6.22	6.72	52.53	40.1	91.67	240	96.33	1430	100.00
0.0358	0.00	0.214	0.00	1.28	7.59	7.64	56.96	45.6	92.36	272	96.62	1630	100.00
0.0407	0.00	0.243	0.00	1.45	9.03	8.68	61.24	51.8	92.91	310	96.96	1850	100.00
0.0463	0.00	0.276	0.00	1.65	10.71	9.86	65.33	58.9	93.35	352	97.35	2100	100.00
0.0526	0.00	0.314	0.00	1.88	12.76	11.2	69.21	66.9	93.72	400	97.80	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 4/11/2022 12:08:41 PM
Sample Name EB2232003-003	Measurement Date Time 4/11/2022 12:08:41 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0054 %
Particle Refractive Index 1.550	Span 53.551
Particle Absorption Index 0.100	Uniformity 14.967
Dispersant Name Water	Specific Surface Area 1600 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.75 µm
Scattering Model Mie	D [4,3] 102 µm
Analysis Model General Purpose	Dv (10) 1.45 µm
Weighted Residual 1.08 %	Dv (50) 6.63 µm
Laser Obscuration 10.59 %	Dv (90) 357 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	16.49	12.7	66.07	76.0	84.44	454	91.76
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	19.51	14.5	68.69	86.4	84.79	516	92.78
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	22.93	16.4	71.13	98.1	85.15	586	93.81
0.0147	0.00	0.0876	0.00	0.523	0.08	3.12	26.66	18.7	73.39	111	85.52	666	94.82
0.0167	0.00	0.0995	0.00	0.594	0.47	3.55	30.60	21.2	75.42	127	85.90	756	95.77
0.0189	0.00	0.113	0.00	0.675	1.31	4.03	34.67	24.1	77.22	144	86.28	859	96.62
0.0215	0.00	0.128	0.00	0.767	2.56	4.58	38.76	27.4	78.76	163	86.65	976	97.36
0.0244	0.00	0.146	0.00	0.872	4.06	5.21	42.78	31.1	80.05	186	87.03	1110	97.98
0.0278	0.00	0.166	0.00	0.991	5.60	5.92	46.68	35.3	81.11	211	87.45	1260	98.49
0.0315	0.00	0.188	0.00	1.13	7.07	6.72	50.40	40.1	81.97	240	87.92	1430	98.91
0.0358	0.00	0.214	0.00	1.28	8.50	7.64	53.91	45.6	82.67	272	88.47	1630	99.24
0.0407	0.00	0.243	0.00	1.45	10.01	8.68	57.23	51.8	83.23	310	89.13	1850	99.50
0.0463	0.00	0.276	0.00	1.65	11.77	9.86	60.35	58.9	83.69	352	89.90	2100	99.70
0.0526	0.00	0.314	0.00	1.88	13.91	11.2	63.29	66.9	84.08	400	90.79	2390	99.85



Environmental Division

Work Order: EB2232808
Client: RGS ENVIRONMENTAL
CONSULTANTS PTY LTD
Address: 3/30 LENSWORTH STREET
COOPERS PLAINS 4108
Contact: ASHRAF KHALIFA
Project: 2022055 - MRO EROSION Modeling
Report Date: 10/11/2022
Samples Submitted: 4/11/2022

Report:

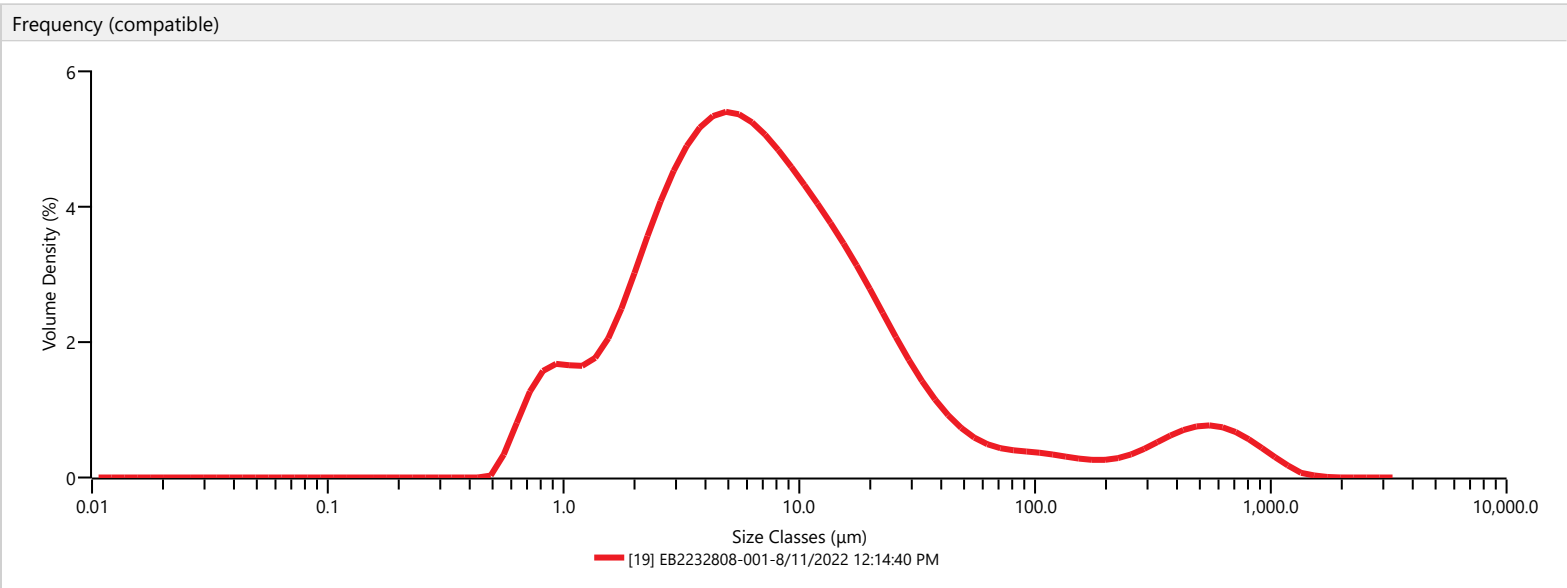
The particle size distribution of these samples was determined by Light-Scattering using a Mastersizer 3000 instrument.

Lab ID	Client ID
EB2232808-001	30_WHS_005_Runoff - 2022055_005 West Hill Saprock
EB2232808-002	60_WHS_005_Runoff - 2022055_005 West Hill Saprock
EB2232808-003	90_WHS_005_Runoff - 2022055_005 West Hill Saprock

A detailed report for each sample is attached.
Sampled by PRIYA RAJENDRAN; analysed as received.

Aleksandar Vujkovic
Laboratory Analyst
Soils and Sizing.

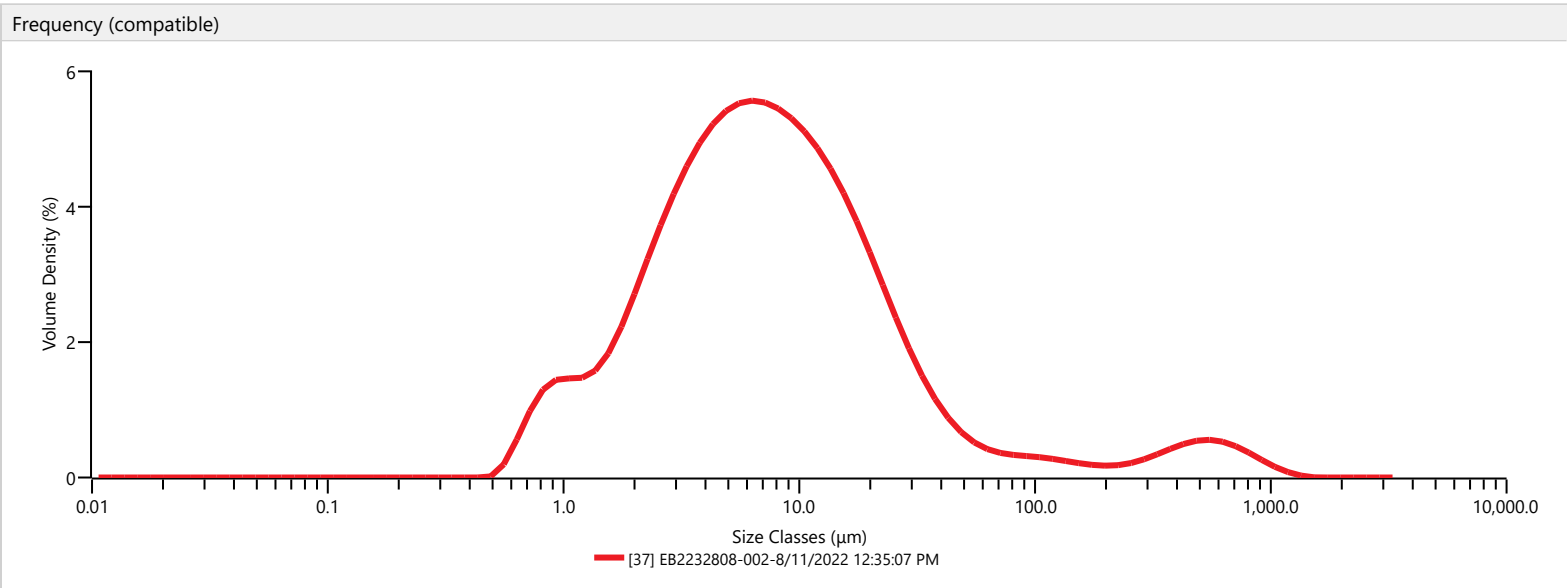
Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 8/11/2022 12:14:40 PM
Sample Name EB2232808-001	Measurement Date Time 8/11/2022 12:14:40 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Concentration 0.0112 %
Particle Refractive Index 1.550	Span 7.208
Particle Absorption Index 0.100	Uniformity 6.804
Dispersant Name Water	Specific Surface Area 1569 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 3.82 μm
Scattering Model Mie	D [4,3] 46.8 μm
Analysis Model General Purpose	Dv (10) 1.57 μm
Weighted Residual 0.98 %	Dv (50) 6.41 μm
Laser Obscuration 20.79 %	Dv (90) 47.7 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	15.26	12.7	70.72	76.0	91.65	454	96.22
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	18.23	14.5	73.85	86.4	91.98	516	96.85
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	21.64	16.4	76.74	98.1	92.30	586	97.50
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	25.42	18.7	79.35	111	92.61	666	98.12
0.0167	0.00	0.0995	0.00	0.594	0.27	3.55	29.51	21.2	81.68	127	92.89	756	98.68
0.0189	0.00	0.113	0.00	0.675	0.95	4.03	33.83	24.1	83.70	144	93.15	859	99.16
0.0215	0.00	0.128	0.00	0.767	2.02	4.58	38.29	27.4	85.43	163	93.38	976	99.52
0.0244	0.00	0.146	0.00	0.872	3.34	5.21	42.80	31.1	86.87	186	93.60	1110	99.77
0.0278	0.00	0.166	0.00	0.991	4.75	5.92	47.27	35.3	88.06	211	93.81	1260	99.92
0.0315	0.00	0.188	0.00	1.13	6.13	6.72	51.65	40.1	89.02	240	94.05	1430	99.97
0.0358	0.00	0.214	0.00	1.28	7.50	7.64	55.88	45.6	89.78	272	94.33	1630	99.99
0.0407	0.00	0.243	0.00	1.45	8.96	8.68	59.91	51.8	90.39	310	94.68	1850	100.00
0.0463	0.00	0.276	0.00	1.65	10.67	9.86	63.74	58.9	90.88	352	95.12	2100	100.00
0.0526	0.00	0.314	0.00	1.88	12.74	11.2	67.34	66.9	91.29	400	95.63	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 8/11/2022 12:35:07 PM
Sample Name EB2232808-002	Measurement Date Time 8/11/2022 12:35:07 PM
SOP File Name HydroLV.cfg	Result Source Averaged

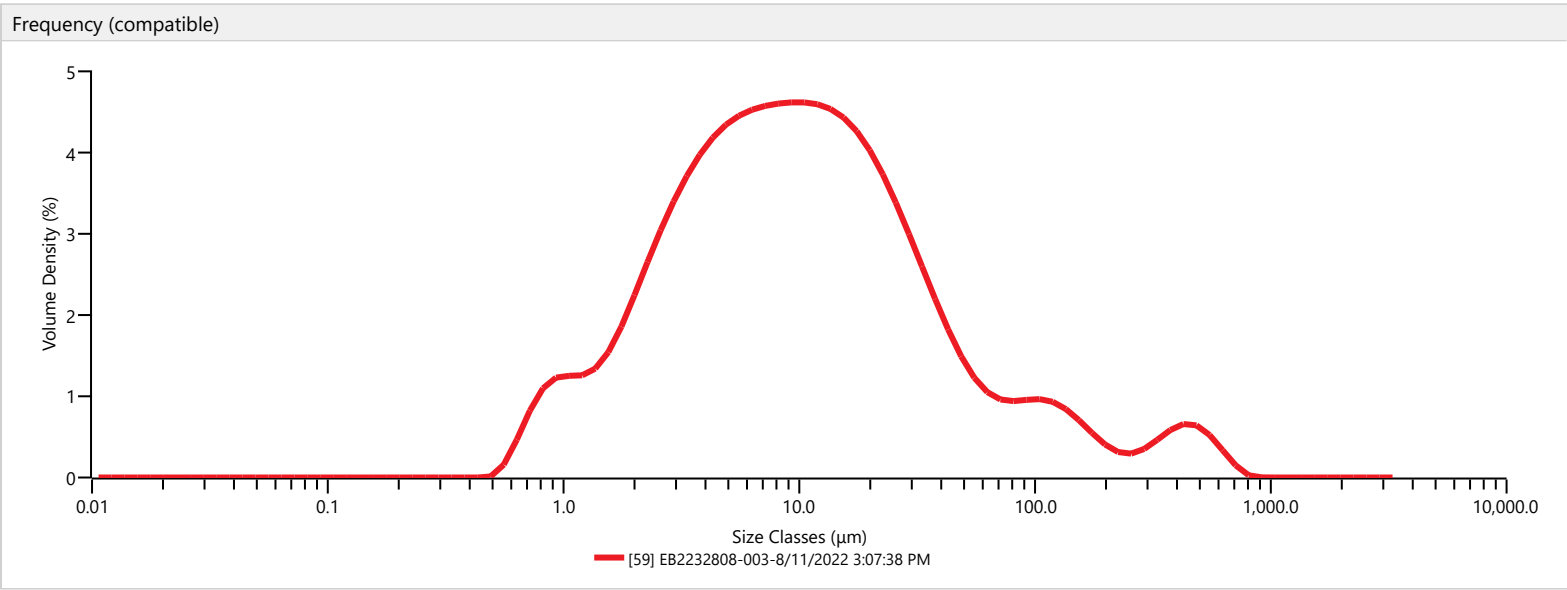
Analysis	Result
Particle Name ALS	Concentration 0.0071 %
Particle Refractive Index 1.550	Span 4.363
Particle Absorption Index 0.100	Uniformity 4.374
Dispersant Name Water	Specific Surface Area 1443 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 4.16 μm
Scattering Model Mie	D [4,3] 34.2 μm
Analysis Model General Purpose	Dv (10) 1.77 μm
Weighted Residual 0.99 %	Dv (50) 7.00 μm
Laser Obscuration 12.88 %	Dv (90) 32.3 μm



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	13.12	12.7	70.45	76.0	94.20	454	97.50
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	15.82	14.5	74.26	86.4	94.48	516	97.96
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	18.93	16.4	77.76	98.1	94.74	586	98.43
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	22.42	18.7	80.92	111	94.99	666	98.87
0.0167	0.00	0.0995	0.00	0.594	0.15	3.55	26.26	21.2	83.70	127	95.22	756	99.26
0.0189	0.00	0.113	0.00	0.675	0.61	4.03	30.39	24.1	86.07	144	95.43	859	99.57
0.0215	0.00	0.128	0.00	0.767	1.44	4.58	34.74	27.4	88.04	163	95.60	976	99.78
0.0244	0.00	0.146	0.00	0.872	2.53	5.21	39.26	31.1	89.62	186	95.76	1110	99.91
0.0278	0.00	0.166	0.00	0.991	3.75	5.92	43.88	35.3	90.87	211	95.90	1260	99.98
0.0315	0.00	0.188	0.00	1.13	4.97	6.72	48.52	40.1	91.84	240	96.05	1430	100.00
0.0358	0.00	0.214	0.00	1.28	6.19	7.64	53.15	45.6	92.57	272	96.23	1630	100.00
0.0407	0.00	0.243	0.00	1.45	7.50	8.68	57.69	51.8	93.12	310	96.45	1850	100.00
0.0463	0.00	0.276	0.00	1.65	9.01	9.86	62.12	58.9	93.55	352	96.74	2100	100.00
0.0526	0.00	0.314	0.00	1.88	10.87	11.2	66.39	66.9	93.90	400	97.09	2390	100.00

Measurement Details	Measurement Details
Operator Name vincent.emertonbell	Analysis Date Time 8/11/2022 3:07:38 PM
Sample Name EB2232808-003	Measurement Date Time 8/11/2022 3:07:38 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Concentration 0.0080 %
Particle Refractive Index 1.550	Span 6.511
Particle Absorption Index 0.100	Uniformity 3.101
Dispersant Name Water	Specific Surface Area 1230 m ² /kg
Dispersant Refractive Index 1.330	D [3,2] 4.88 µm
Scattering Model Mie	D [4,3] 33.8 µm
Analysis Model General Purpose	Dv (10) 1.98 µm
Weighted Residual 0.93 %	Dv (50) 9.49 µm
Laser Obscuration 12.37 %	Dv (90) 63.8 µm



Result													
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0597	0.00	0.357	0.00	2.13	11.05	12.7	58.84	76.0	91.12	454	98.60
0.0114	0.00	0.0679	0.00	0.405	0.00	2.42	13.26	14.5	62.63	86.4	91.91	516	99.14
0.0129	0.00	0.0771	0.00	0.460	0.00	2.75	15.80	16.4	66.33	98.1	92.70	586	99.58
0.0147	0.00	0.0876	0.00	0.523	0.00	3.12	18.63	18.7	69.89	111	93.51	666	99.86
0.0167	0.00	0.0995	0.00	0.594	0.12	3.55	21.73	21.2	73.25	127	94.29	756	99.98
0.0189	0.00	0.113	0.00	0.675	0.51	4.03	25.05	24.1	76.36	144	95.00	859	100.00
0.0215	0.00	0.128	0.00	0.767	1.20	4.58	28.54	27.4	79.19	163	95.59	976	100.00
0.0244	0.00	0.146	0.00	0.872	2.12	5.21	32.16	31.1	81.69	186	96.05	1110	100.00
0.0278	0.00	0.166	0.00	0.991	3.16	5.92	35.88	35.3	83.85	211	96.38	1260	100.00
0.0315	0.00	0.188	0.00	1.13	4.20	6.72	39.66	40.1	85.69	240	96.64	1430	100.00
0.0358	0.00	0.214	0.00	1.28	5.25	7.64	43.47	45.6	87.20	272	96.88	1630	100.00
0.0407	0.00	0.243	0.00	1.45	6.35	8.68	47.31	51.8	88.44	310	97.17	1850	100.00
0.0463	0.00	0.276	0.00	1.65	7.63	9.86	51.16	58.9	89.46	352	97.55	2100	100.00
0.0526	0.00	0.314	0.00	1.88	9.18	11.2	55.01	66.9	90.33	400	98.04	2390	100.00

11.4 Attachment D: Trilab Laboratory results

11.4.1 Attachment D1_Point load

POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	RGS Environmental Pty Ltd	Report No.	22091974-PL
		Workorder No.	0010315
Address	PO Box 3091, Sunnybank South QLD 4109	Test Date	14/10/2022
		Report Date	17/10/2022
Project	2022055 - MRO Erosion Modelling		

Sample No.	22091974						
Client ID	2022055_005						
Depth (m)	Not Supplied						
Is (MPa)	5.38						
Is(50) (MPa)	6.16						
Load Direction	Irregular Lump						

Sample No.							
Client ID							
Depth (m)							
Is (MPa)							
Is(50) (MPa)							
Load Direction							

NOTES/REMARKS: Tested as received + Irregular Lump

Sample/s supplied by the client

Page 1 of 1 REP02102

Accredited for compliance with ISO/IEC 17025 - Testing

*NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates

Tested at Trilab Brisbane Laboratory

Authorised Signatory



C. Channon



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
 Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

11.4.2 Attachment D2_Particle size distribution

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	RGS Environmental Pty Ltd	Report No.	22091970-G
Address	PO Box 3091, Sunnybank South QLD 4109	Workorder No.	10315
		Report Date	25/10/2022

Project 2022055 - MRO Erosion Modelling

Sample No.	22091970	22091971	22091972	22091973			
Test Date	10/10/2022	10/10/2022	10/10/2022	10/10/2022			
Client ID	2022055_00 1	2022055_00 2	2022055_00 3	2022055_00 4			
Depth (m)	Not Supplied	Not Supplied	Not Supplied	Not Supplied			
Moisture (%)	7.4	12.5	14.1	13.6			
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
63			100	100			
53	100	100	98	98			
37.5	98	99	87	93			
26.5	98	98	81	90			
19	98	98	75	88			
13.2	96	97	70	88			
9.5	96	97	67	88			
6.7	95	96	64	86			
4.75	94	96	62	85			
2.36	89	93	57	80			
1.18	74	88	48	63			
0.600	52	80	42	54			
0.425	41	75	39	51			
0.300	33	70	38	49			
0.212	33	63	38	47			
0.150	20	56	34	45			
0.075	14	44	30	42			

NOTES/REMARKS:

Sample/s supplied by the client

Page 1 of 1 REP01104

Accredited for compliance with ISO/IEC 17025 - Testing

*NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates

Tested at Trilab Brisbane Laboratory

Authorised Signatory



Joshua Hawley



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

11.4.3 Attachment D3_Los Angeles Abrasion

LOS ANGELES ABRASION

Client:	Trilab Pty Ltd	Report Number:	1730/R/17583-1
Client Address:	346a Bilsen Rd, Geebung	Project Number:	1730/P/65
Project:	Tested As Received	Lot Number:	22091974
Location:	Geebung	Internal Test Request:	1730/T/5665
Supplied To:	n/a	Client Reference/s:	2022055 MRO Erosion Modelling
Area Description:		Report Date / Page:	28/10/2022 Page 1 of 1

Test Procedures:	AS1141.23		
Sample Number	1730/S/19009	Sample Location	
Sampling Method	Tested As Received	Location	2022055_005
Date Sampled	26/10/2022		West Hill Saprock
Sampled By	Client Sampled		
Date Tested	27/10/2022		
Material Source	Not Supplied	Material Type	Not Supplied (Not Supplied)

Test Grading	B - Preferred
--------------	---------------

Los Angeles Value**19**

Remarks	Results apply to the sample/s as received., Results Applied To Sample As Recieved.
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		Accredited for compliance with ISO/IEC 17025 – Testing			
Accreditation Number:		1986			
Corporate Site Number:		1730			
					Approved Signatory: Lee Naylor
					Form ID: W47Rep Rev 1

11.5 Attachment E: Soil Water Consultants Laboratory results

11.5.1 Attachment E1_SWCC

SOIL WATER ANALYSIS

TEST REPORT

Client: RGS Environmental Consultants
Client Contact: Priyadharshini Rajendran
Project: MRO Erosion Modelling
Client Project #:: 2022055
SWA Job No.: JN0819
Date of Analysis: 5th - 20th December 2022
No. Samples Submitted: 4



45 Gladstone St
East Perth WA 6006
(08) 9228 3060
(08) 9228 3210
admin@soilwatergroup.com
www.soilwatergroup.com

Method:

- Pressure plate method used in accordance with McKenzie, N., Coughlan, K. and Cresswell, H. (2002). Soil Physical Measurement and Interpretation for Land Evaluation, CSIRO Publishing.
- Samples packed to a bulk density of 1.60 g/cm^3 on the pressure plates.
- Samples equilibrated for a 2 week period.

TEST RESULTS

SWA ID	Client ID	Volumetric Moisture Content (%; v/v)					Derived van Genuchten Parameters			
		0 kPa	10 kPa	33 kPa	100 kPa	1,500 kPa	α (1/cm)	N (-)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)
819-01	2022055_001	34.86	21.18	18.37	15.03	8.94	0.165	1.168	0.3489	0.0000
819-02	2022055_002	35.53	20.77	17.29	13.24	6.66	0.099	1.218	0.3554	0.0000
819-03	2022055_003	35.11	32.74	28.16	25.04	20.03	0.017	1.142	0.3534	0.0643
819-04	2022055_004	38.40	32.37	29.92	25.60	18.12	0.025	1.124	0.3830	0.0000

APPROVED SIGNATURE FOR

A handwritten signature in black ink, appearing to read "Adam Pratt".

Adam Pratt
Operations Manager

RGGS



MINE WASTE AND
WATER MANAGEMENT