Prepared for
Arrow Energy Pty Ltd
ABN: 73078521936

# Wells and Gathering Construction

## Phase 2 Soil Assessment

22-Jun-2021

**Commercial-in-Confidence**

# Wells and Gathering Construction

## Phase 2 Soil Assessment

## Client: Arrow Energy Pty Ltd

ABN: 73078521936

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# 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was appointed by Arrow Energy Pty Ltd (Arrow) to undertake a Phase 2 soil survey for the proposed development of new wells and gathering infrastructure (herein referred to as the 'Project'). The Phase 2 soil survey has been undertaken to validate existing soils mapping, which will be used to support Arrow's future applications under the *Regional Planning Interests Act 2014* (RPI Act). The Phase 2 soil survey will inform the preparation of the separate Land Suitability Assessment, to be submitted as part of the Regional Interests Development Approval (RIDA) application.

The proposed Project is located approximately 15 km south-west of Dalby along the Moonie Highway, shown in **Figure 1**. Further details of the Project, including construction methodology specifics and proposed soil disturbance areas are provided in **Section 2.1**.

## 1.1 Objective

The primary objective of the Phase 2 soil survey was to ground truth the existing mapped soil boundaries identified during the Phase 1 Desktop Assessment (AECOM, 2021a).

Specific objectives of the Phase 2 soil survey include:

- Assess soil type and land use along the alignment.
- Infer key potential constraints including soil degradation, loss of productivity and subsidence related to the identified soil types.
- Provide management strategies to help mitigate identified potential soil constraints during construction.

## 1.2 Legislation and Guidelines

This Phase 2 soil survey has been prepared with consideration of the following documents:

- RPI Act, Statutory Guideline 02/14, *Carrying out resource activities in a Priority Agricultural Area* (DSDMIP, 2019a).
- RPI Act, Statutory Guideline 03/14*, Carrying out resource activities in a Strategic Cropping Area* (DSDMIP, 2019b).
- Environmental Authority, *EPPG00972513,* dated 14 January 2021.
- *Arrow Land Disturbance Procedures* (ORG-ARW-HSM-PRO-00146).
- *Guidelines for Soil Survey along Linear Features* (Soil Science Australia [SSA], 2015).
- Australian Soil and Land Survey Handbook Series, in particular:
    - *Australian Soil and Land Survey Field Handbook* (The National Committee on Soil and Terrain, [NCST, 2009]).
    - *Guidelines for Surveying Soil and Land Resources* (Mckenzie et al., 2008).
    - *Soil Chemical Methods – Australasia (Rayment and Lyons, 2011).*
    - *The Australian Soil Classification* (Isbell & NCST, 2009).

## 1.3 Areas of Regional Interest

The RPI Act is administered by the Department of Infrastructure, Local Government and Planning (DILGP) and identifies four Areas of Regional Interest (ARIs): Priority Agricultural Area (PAA); Priority Living Area (PLA); Strategic Cropping Area (SCA); and Strategic Environmental Area (SEA).

Where a resource or regulated activity intersects one or more ARIs and is not exempt from the provisions of the RPI Act, a RIDA is required.

The Project area (the resource activity) intersects PAA and SCA as presented in Figure 1.

- PAA: an area which includes one or more areas used for a priority agricultural land use (PALU), identified in the relevant regional plan. PALUs may include certain types of agriculture, plantations, and/or intensive horticulture. In the case of the Project, the PALUs are identified in the Darling Downs Regional Plan as presented in in Figure 1.
- SCA: defined as an area mapped as potential Strategic Cropping Land (SCL) on the Department of Natural Resources, Mines and Energy (DNRME) Trigger Map. The SCL has been inferred by DNRME to be likely to be highly suitable for cropping due to a combination of the soil, climate, and landscape features.

Validation, impact assessment and mitigation strategies for working in both the PALU and SCA will be required as part of the Project approvals.

# 2.0 Site Description

The impacted land parcels and approximate disturbance areas for the proposed Gas field development are summarised in **Table 1.** The linear disturbance is approximately 13.6 km across these lots:

**Table 1 Project disturbance area**

| Land parcel | Whole/Part | Area of Surface Disturbance (Ha) | | Parcel Size (Ha) |
|---|---|---|---|---|
| | | PAA | SCA | |
| 2RP85916 | Part | 1.54 | 1.54 | 46.58 |
| 12SP193328 | Part | 1.93 | 1.93 | 66.23 |
| 57SP193329 | Part | 4.71 | 4.71 | 306.20 |
| 36DY45 | Part | 2.66 | 2.66 | 89.02 |
| 1RL2451 | Part | 0.00 | 0.00 | 12.62 |
| 1DY931 | Part | 3.74 | 3.74 | 241.04 |
| 70DY138 | Part | 3.68 | 3.68 | 258.86 |
| 1RP154777 | Part | 0.11 | 0.11 | 245.70 |
| 1DY787 | Part | 6.77 | 6.77 | 266.40 |
| 60DY802 | Part | 2.14 | 2.14 | 129.18 |
| 2RP106958 | Part | 0.83 | 0.83 | 127.99 |
| 2RP99387 | Part | 3.07 | 3.07 | 202.82 |
| 2DY787 | Part | 4.66 | 4.66 | 132.64 |
| Totals | | **35.83 ha** | **35.83 ha** | **2125.28 ha** |

A discussion of the proposed disturbance footprints is included in **Sections 2.1.1** and **2.1.2**.

## 2.1 Proposed Disturbance

The two main components of the Project are the well pads and the associated gathering pipelines and other supporting infrastructure. A generalised disturbance overview of these components is given below.

### 2.1.1 Well Pads

In general, the sizes of the well pads can be managed so that the maximum level of overall disturbance is consistent with the existing Environmental Authority (EA) intensity of impact (1 ha per well for a single well pad to 0.3 ha per well for up to eight well pads).

The size of well pads is determined by several factors, including:

- the number of wells
- the type of wells
- the type and manoeuvrability of drill rigs
- the terrain which determines whether cut and fill earthworks are required
- whether the area is cleared or supports vegetation
- the existing land use
- the equipment stored temporarily on the pad
- the area required for offices, light vehicle parking, equipment and supplies deliveries

- the required separation distance between wells and the area required to complete drilling operations safely.

In some cases, additional area may be required for areas with higher slope, heavy vegetation and/or to provide sufficient room for cut and fill earthworks batters, diversion drainage and additional erosion and sediment controls. The total disturbance area is approximately 1 ha for single well pads, 1.15 ha (2-well pad), 1.3 ha (3-well pad and 1.45 ha for 4-well multi-well pad).

Well locations will be determined following consultation with the landholder to manage impacts to their operations and land use. As such, well sites are located in areas that reduce impact on farming where possible, such as:

- on the fringes of Intensively Farmed Land (IFL)
- in corners of paddocks
- or areas of land unsuitable for farming
- on or near access tracks, easements and road reserves
- within designated Right of Ways (ROW).

Key steps in well pad construction include:

- Clearing of the area (vegetation may have already been cleared by agricultural activities), including stripping and stockpiling of topsoil. To minimise disturbance at some well pads, under some circumstances, the topsoil will be left in place.
- Laying and levelling the well pad foundations to provide a stable platform for the drilling rig.
- Carrying out site preparation works using earthmoving equipment such as graders, excavators and bulldozers. Where the subgrade material is deemed to be inadequate and unsuitable for heavy vehicle access or where all weather access is required, consideration shall be given to:
    - Amendment of soil (using additives and / or dynamic compaction); or
    - Use of technologies (rig mats, tracked vehicles, roll-out sheets, etc.); or
    - Clear, grub and remove unsuitable material and replace with more suitable material such as gravel.

For this Project, a total of five well pads are being proposed, including one minimal disturbance well pad.

### 2.1.2 Gathering and Pipelines

The main disturbance area will be a common easement, containing water/gas pipelines and fibre optic/power cables within an approximately 30 m wide ROW for gathering on these properties. (**Plate 1**).

Conventional trenching for pipeline installation involves an open trench between 1-2 m wide and approximately 2.0 m deep to install, inspect or maintain piping, conduits or cables. After installation, the trench is backfilled with the original material and the surface is restored.

Where the pipelines are required to be installed below existing roads or infrastructure, other trenchless technologies such as thrustbore may be used.

The key steps in the pipeline construction are given below:

- Detailed survey of the ROW and construction areas.
- Establishing temporary access tracks if necessary.
- Installing temporary gates and fences as required.
- Clearing vegetation, where required, and grading the ROW to prepare a safe construction working area (on average the ROW will be 30 m in width).
- Separating and stockpiling topsoil and subsoil to protect and preserve topsoil.

- Crossing watercourses, roads and existing buried pipelines by open cut, boring or alternate trenchless technology (e.g. Horizontal Directional Drilling [HDD] methods) depending upon the type and nature of the crossing.
- Delivering pipe sections along the ROW.
- Welding the low-pressure high-density polyethylene (HDPE) pipe sections together to form ‘a string’.
- Creating a trench in which to lay the pipeline. The trench is excavated by a trenching machine and may include the use of rock saws, excavators, rock hammers or blasting in hard rock terrain.
- Lowering the pipeline strings into the trench and placing padding (e.g. screened trench subsoil) around the pipe to protect the pipe from external damage.
- Returning the subsoil and topsoil to their original horizons.
- Testing the integrity of the pipeline by pneumatic testing or filling it with water and pressurising it to above the maximum allowable operating pressure (i.e. hydrostatic pressure testing).
- Cleaning up, restoring and progressively rehabilitating the construction ROW and all temporary and permanent tracks, gates and fences.

Installation of multiple pipelines in a single ROW is sequential. The first pipeline is installed, and the trench backfilled before the next pipeline installation commences.

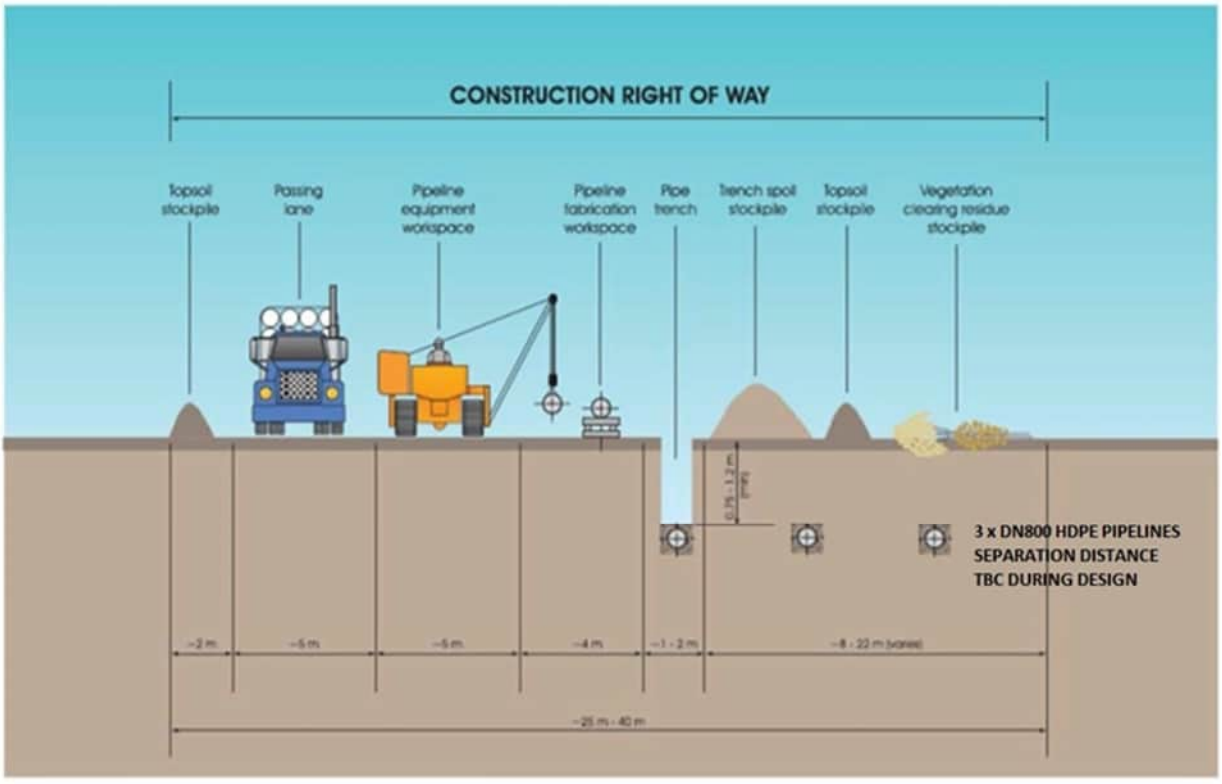
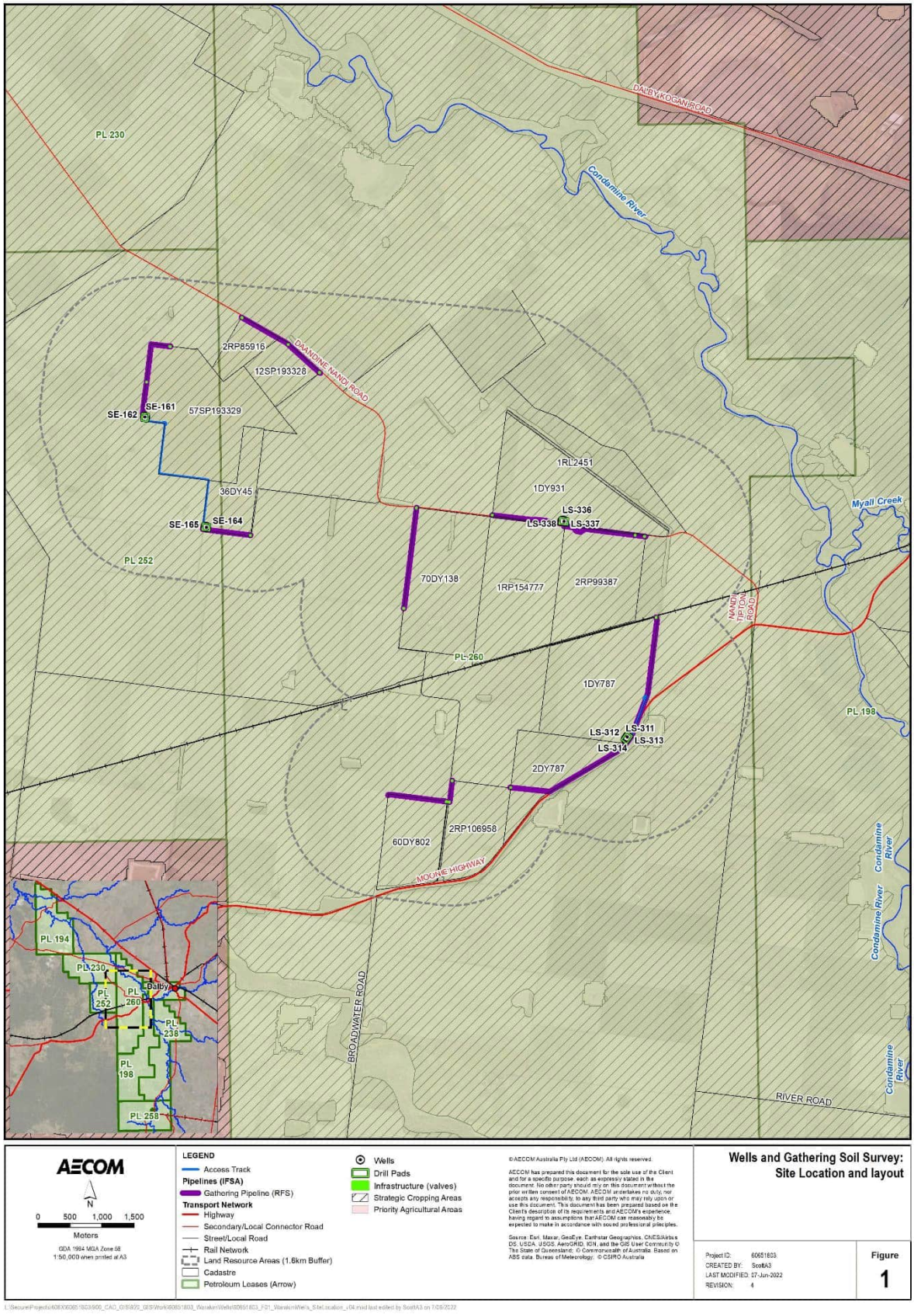



**Plate 1 Typical Pipeline ROW Layout**

**Figure 1 Project Site Location**



# 3.0 Phase 1: Desktop Assessment

## 3.1 Regional Physiography

The Project area is located wholly within the Condamine Central Lowlands physiographic region (**Figure 2**). The region is described as a low-lying area of undulating siltstone hills with alluvial sediments on the floodplains of the Condamine River and highly weather bedrock on the slopes (CSIRO, 2011).

## 3.2 Topography

Regionally, there is a north-south topographic high of the Taroom Hills and an east-west topographic high of the Great Dividing Range. Two major drainage systems separate these topographic highs: the Condamine River and Wilkie Creek, both draining towards the north-west (**Figure 1**).

The surface elevation across the Project area is relatively flat at 330 m Australian Height Datum (mAHD), which is consistent with the area being located on the Condamine Lowlands and floodplains of the Condamine River (**Figure 2**) (State of Queensland, 2021).

The digital elevation model (DEM) for the Project area is presented in **Figure 3**[1], and was used to calculate the slope of the surrounding landscape. Based on the calculations, the slope within majority of the Project area range from near level (<1%) to 3%.

## 3.3 Surface Geology

Based on the Queensland detailed surface geology (presented in **Figure 4**) the Project area is a part of the extensive Surat and Clarence Moreton Basins, including a sequency of sedimentary rocks (Kumbarilla Beds [JKk] and Springbok Sandstone [Jis]) overlain by surficial Cenozoic sediments (undifferentiated alluvium and the Condamine Alluvium) (DNRME, 2018). These alluvium units are described as unconsolidated [Qs], poorly consolidated [TQ] and semi-consolidated [Qa] sediments typically comprised of sand, silt and clay (DNRME, 2019).

Shallow soils likely to be disturbed in the Project area are expected to be dominated by the Condamine Alluvium, which is an extensive accumulation of Tertiary to Quaternary age alluvial sediments, forming a broad (greater than 20 km wide) alluvial plain, extending from Millmerran to Chinchilla. The thickness ranges from less than 10 m to more than 120 m in the floodplain near Dalby (DNRME, 2019). The sediments are dominated by coarse grained gravels and sands, interbedded with clays. The coarse-grained alluvium is associated with higher transmissibility and are the primary source of groundwater.

[1] The DEM for the Project area was sourced from the 1 second Shuttle Radar Topographic Mission (SRTM) DEM-S (smoothed) v1.0 (Geoscience Australia, 2021).

**Figure 2 Regional Physiography- Central Lowlands Province**

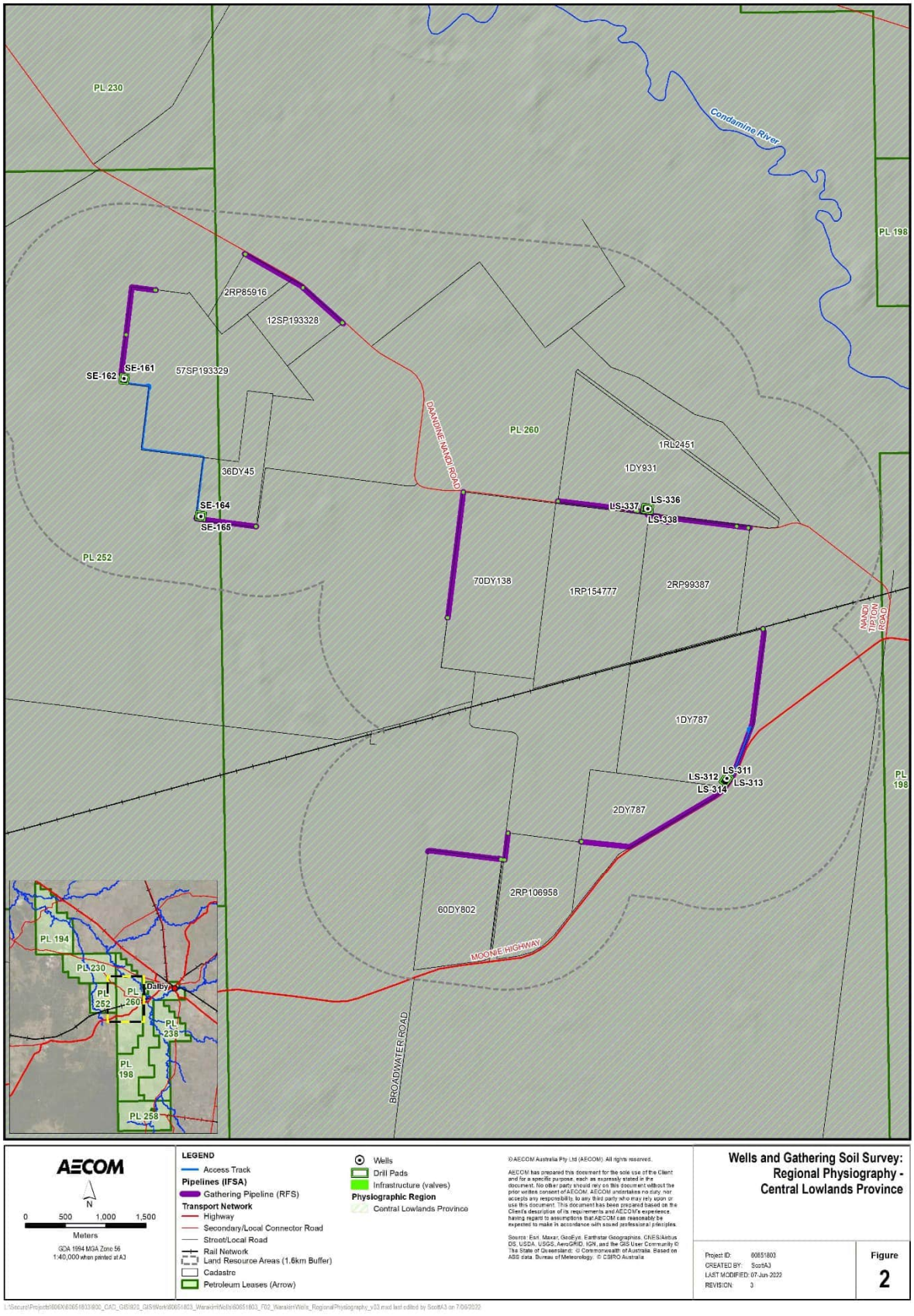


**Figure 3 Slope Class and Slope Range (%)**

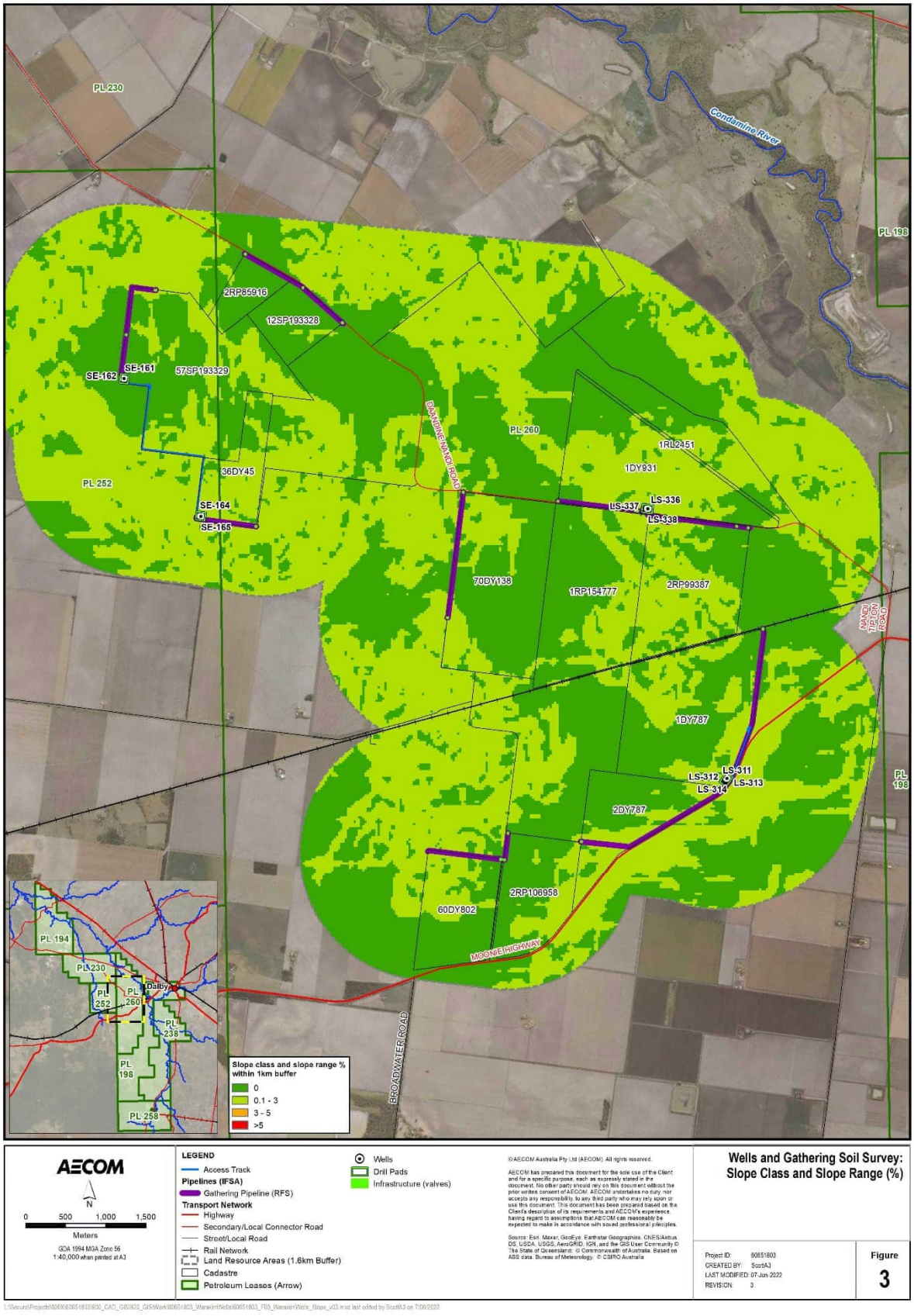
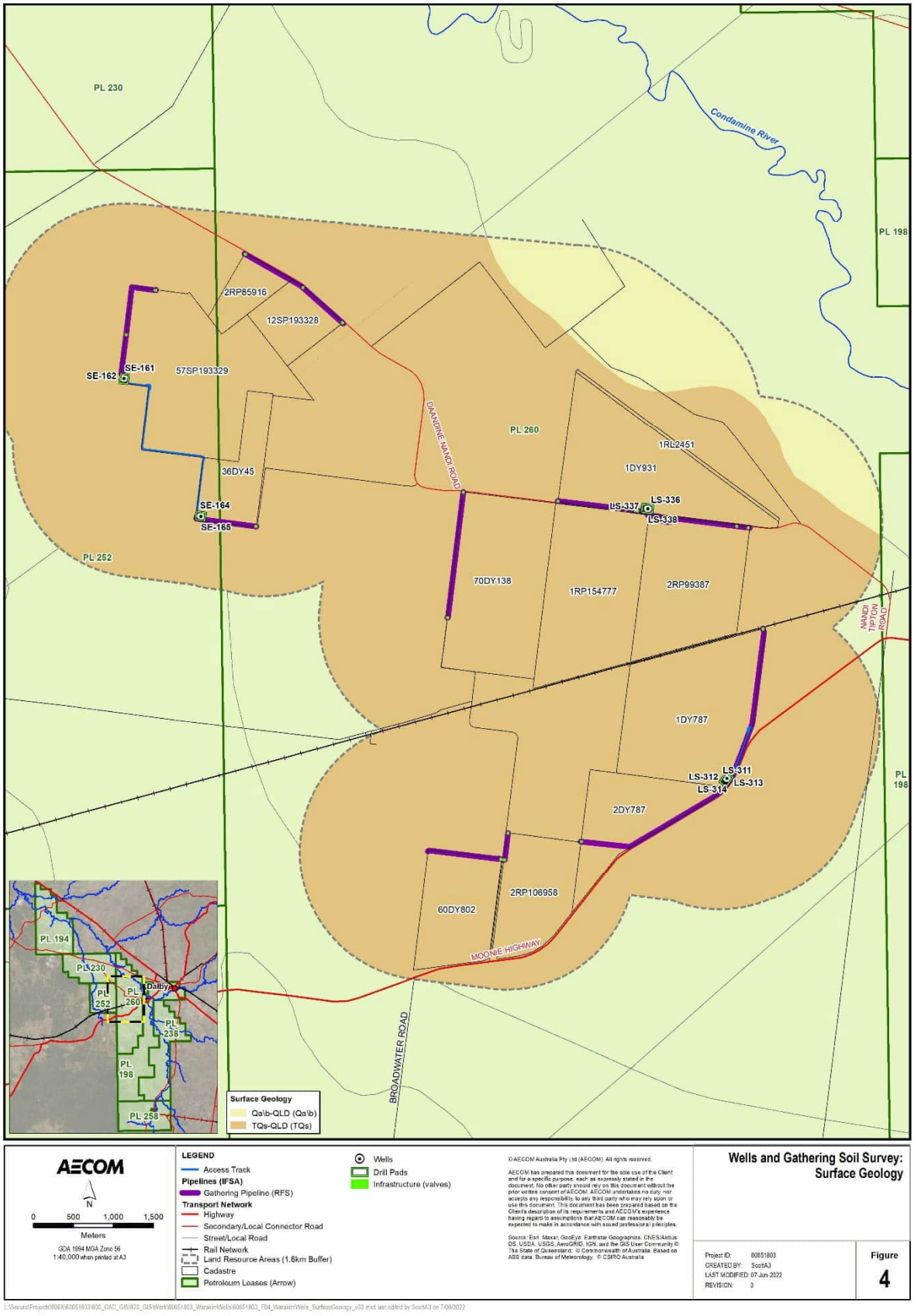


**Figure 4 Surface Geology**



## 3.4 Existing Mapping

Based on a review of available mapping for the region from the Australian Soil Resource Information System (ASRIS): Atlas of Australia Soil (ASRIS, 2011) and Central Darling Downs Land Management Manual (Harris *et al.*, 1999), the Phase 1 Desktop Assessment (AECOM, 2021a) identified a total of two soil landscape units (SLU) and land resource areas (LRA) likely to be intersected by the Project.

The land resource areas and soil landscape units are summarised in **Table 2** , and presented in **Figure 5**.

Maps at these scales are recommended to be used to gain an overview of land resources, and as a general prediction of land resources (Mckenzie *et al.*, 2008). Therefore, to refine and ground-truth mapped soils along the Project area and aid in the development of suitable control measures, a Phase 2 soil survey was undertaken along the alignment.

### 3.4.1 Summary

A summary of identified LRA within the Central Darling Downs Land Management Manual (Harris *et al.*, 1999, map scale 1:250,000), cross-referenced with the Atlas (map scale 1:2,000,000) soil landscape units and associated ASC soil classification is presented in **Table 2**.

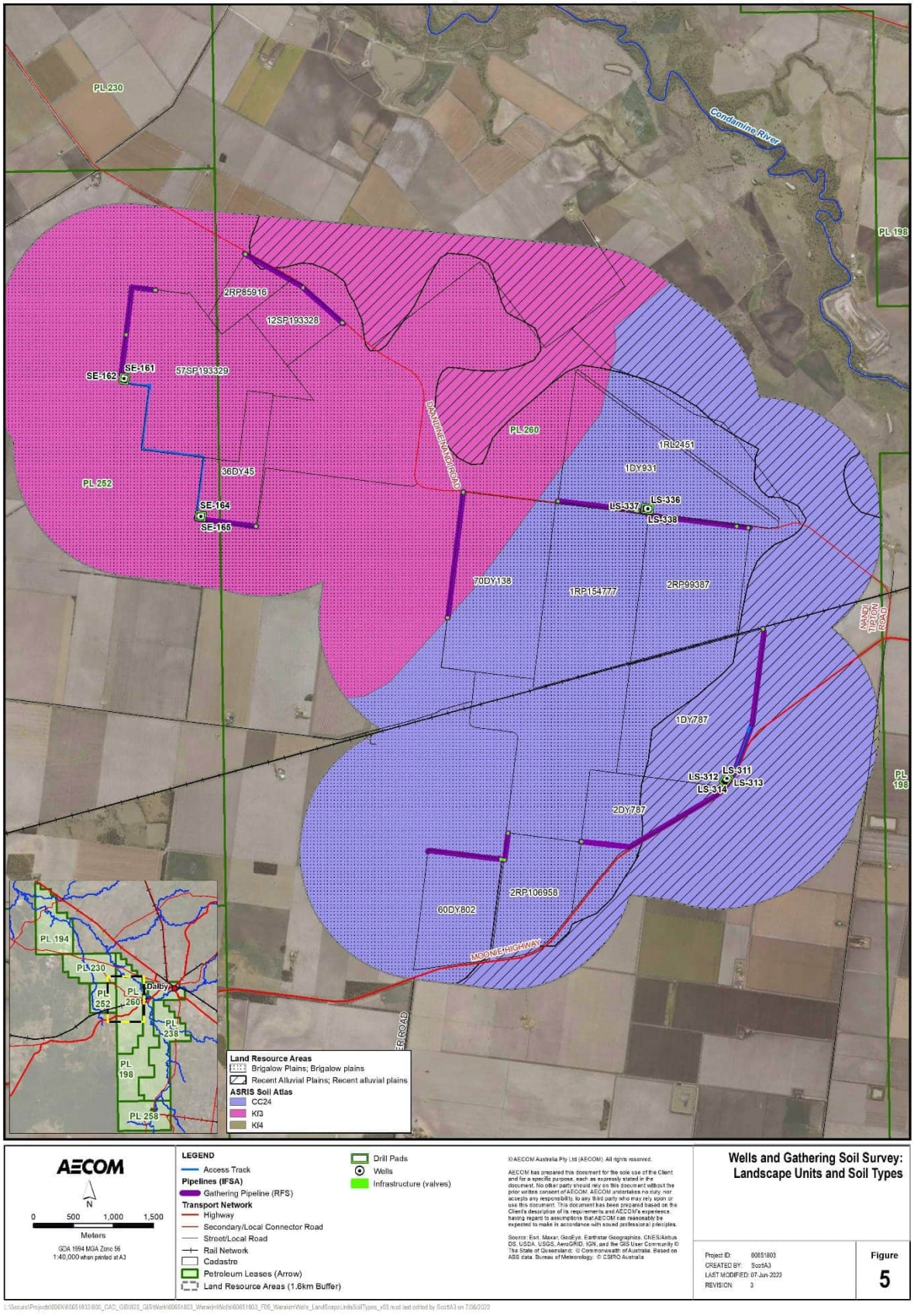
**Table 2 Summary of the Project soil units and LRA**

| LRA (Harris *et al*) | Soil landscape units (ASRIS) | Dominant ASC | Land parcels | Approximate disturbance area (ha) | % of total Project area |
|---|---|---|---|---|---|
| Recent alluvial plains (1a) | CC24 | Vertosol | Lot 1 of DY787 | 6.77 | 19% |
| | Kf3 | Vertosol | - | 0 | 0% |
| Brigalow plains (5a/5b) | CC24 | Vertosol | Lot1 of DY787<br>Lot 2 of DY787<br>Lot 1 of DY931<br>Lot 1 of RP154777<br>Lot 2 of RP99387<br>Lot 60 of DY802<br>Lot 70 of DY138 | 18.22 | 51% |
| | Kf3 | Vertosol | Lot 2 of RP85916<br>Lot12 of SP193328<br>Lot 57 of SP193329<br>Lot 36 of DY45 | 10.84 | 30% |

Based on the available Atlas and LRA mapping, the soils within the Project are expected to be dominated by self-mulching cracking clays/Vertosols of alluvial origins. Harris *et al.*, 1999 identified three soils types (including: Kupunn, Mywybilla and Anchorfield) which aligned with the common soils listed in the Central Darling Downs Land Management Manual. These soils are described as self-mulching, well-structured cracking clays (such as Vertosols) on the brigalow clay sheet or alluvial plains of mixed origin. These soils are typically good quality, have high fertility and highly valued as agricultural soils. These soils are distributed throughout both LRAs and are likely present within the Project area.

Both mapped LRAs are similar from a management sense and are described as having alkaline upper subsoils (pH 8.0 to 9.0). The soils are also expected to be sodic or strongly sodic and have medium to very high levels of salinity in the subsoil. Levels of sodicity and salinity are generally expected to be lower in surface soils, increasing with depths in the soil profile.

**Figure 5 Existing Mapping**



# 4.0 Soil Survey Design

## 4.1 Free Survey Method

The methodology adopted for the Phase 2 soil survey was based on a free survey approach, a conventional form of soil survey where the intensity and placement of sampling sites can vary with the complexity of the landscape (Mckenzie *et al.,* 2008).

This form of survey is suitable for soil landscapes where there is significant existing knowledge, data and baseline understanding of the stratigraphy. Free surveys are appropriate for map scales from 1:25,000 to 1:100,000 or smaller (SSA, 2015).

## 4.2 Sampling Intensity and Scale

The sampling intensity and frequency was selected for the Phase 2 soil survey was based on the following guidelines for spatial and linear infrastructure:

- *Guidelines for Soil Survey along Linear Features* (SSA, 2015).
- *Guidelines for Surveying Soil and Land Resources* (Mckenzie *et al.,* 2008).
- *Queensland Land Resources Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science (DES) and Department of Resources [DOR], June 2021).
- *Queensland Land Resources Assessment Guidelines, Volume 2: Field Tests, October 2020* Department of Environment and Science (DES) and Department of Natural Resources, Mines and Energy (DNRME).

A risk-based approach was adapted for selecting sample locations as follows:

- As per the guidelines, the Project was considered as disturbance in non-urban areas with significant distance from (>500 m) sensitive receivers.
- The desktop assessment indicated presence of uniform landscapes and topography (almost flat with slope <3%) across the Project area, (**Section 3.2**).
- The desktop assessment indicated presence of a flat, uniform landscape with a single soil type (Vertosols) across the Project area.
- The entire Project is within cropping paddocks and/or cleared grazing land with previous knowledge of soil types.
- There was limited access to the cropped paddocks due to restrictions from private landholders and/or due to wet weather conditions.

In accordance with SSA, 2015 guidelines (Table 1 and Table 2), a total of 14 sampling locations/sites were proposed along the linear disturbance area of the Project of approximately 14 km and the project ROW width of 50 m, corresponding approximately to a medium intensity and 1:50,000 scale. For a spatial disturbance of 36 ha, the recommended sampling intensity is eight observations per sites (corresponding to a 1:25,000 scale).

A Sampling Analysis and Quality Plan (AECOM, 2021b) was prepared, including the different types of observations as:

- Detailed sites: Seven detailed soil profile descriptions to 2.0 m (equal to the proposed excavation depth of the alignment) of all soil types intersected by the alignment.
    - Representative sites: three detailed sites (subset) selected for laboratory analysis.
- Surface (less detailed) sites: Four surface sites to a sufficient depth (0.3 m) to identify soil type and correlate to soils already described in the area.

- Check sites: Three check sites to confirm surface features (such as, colour, texture, cracking) in large uniform areas and to establish map unit boundaries.

The chosen site intensity complied with the adopted guidelines (SSA, 2015), as summarised in **Table 3**.

**Table 3 Sampling intensity compliance**

| Item | Recommendation | | Actual sites | Compliance |
|---|---|---|---|---|
| | % | Number | | |
| Detailed sites | 25-50% | 4-7 | 7 | Yes |
| Representative sites | 5-10% | 2 | 3 | Yes |
| Surface sites | 20-50% | 3-7 | 4 | Yes |
| Check sites | Up to 20% | 3 | 3 | Yes |
| Total number of sites | 100% | 14 | 14 | Yes |

The sample sites and targeted mapped soil type (as per desktop assessment) are summarised in **Table 4**.

**Table 4 Sampling locations and mapped soil**

| LRA | Mapped ASC | Mapped Project length (km) | Sampling locations | | |
|---|---|---|---|---|---|
| | | | Detailed site | Surface site | Check site |
| Recent alluvial plains (1a) | CC24 (Vertosol) | 3 | **DS07** | SS04, SS03 | CS02 |
| Brigalow plains (5a/5b) | CC24 (Vertosol) | 5 | DS03, **DS04,** DS05, DS06 | SS02 | CS03 |
| | Kf3 (Vertosol) | 6 | **DS01**, DS02 | SS01, | CS01 |
| **Total** | | **14** | **7** | **4** | **3** |

**Note**: sites in **bold** were also as selected for laboratory analysis as representative sites. Additional laboratory analysis was undertaken on all surface sites

## 4.3 Field Methodology

The field methodology adopted by AECOM for the soil survey is based on Mackenzie (2008) and is summarised in **Table 5**.

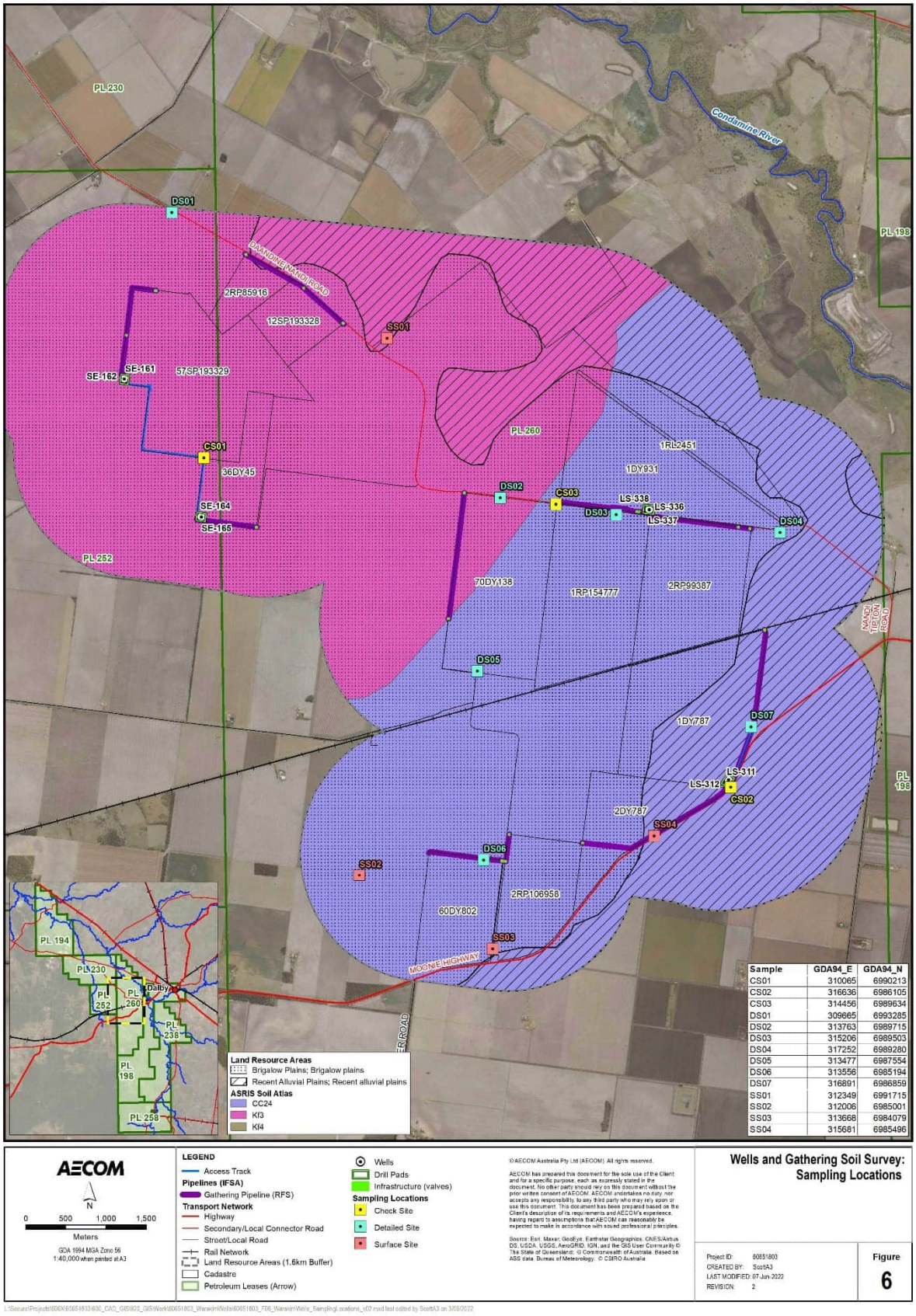
**Table 5 Field methodology**

| Activity | Methodology |
|---|---|
| Site selection | • Sites were predetermined based on existing soil mapping identified during Phase 1 (AECOM, 2021a) to target all identified soil types and landscape features. A predetermined approach was necessary in order to obtain the relevant permits for land access.<br>• In the field, site locations were preferentially located within the ROW; however, a number of sites were off set from the actual Project disturbance due to limited assess (land access), vehicle restrictions (boggy conditions), or to confirm soil mapping unit boundaries.<br>• The coordinates of each site were recorded using a global positioning system (GPS) with an accuracy of ±3-5 m. |
| Soil logging | • All soils were described in accordance with the *Australian Soil and Land Survey Field Handbook* (NCST, 2009), classified according to *The Australian Soil Classification* (Isbell & NCST, 2009) with soil colour recorded as per *Munsell Soil Colour Charts* (2009). |

| Activity | Methodology |
|---|---|
| | • Site morphological (surface) features (such as, slope, rockiness, gilgai microrelief, landform, major vegetation, and disturbance) were determined in the field through observations, descriptions, and interpretation, in accordance with NCST 2009.<br>• Soil physical properties (such as permeability and drainage) were inferred from the identification of concretions, depth to rock, observed plant rooting depth, colour and presence of mottling in each soil. |
| Detailed sites | The detailed sites were advanced as follows<br>• Seven detailed sites (DS01 to DS07) were advanced by Arrow contractor DIH Contracting Pty Ltd with a 4WD mounted drill rig equipped with an auger attachment from surface to 2.0 mbgl.<br>• The use of push-tubes and hand auger is a suitable method for sampling in accordance with the *Guidelines for Surveying Soil and Land Resources* (Mckenzie *et al.,* 2008).<br>• The ability of auguring to indicate lateral changes in soils is also noted to be a limiting factor of this technique as compared to advancing test pits.<br>• Sample locations were backfilled with cuttings or surrounding topsoil.<br>• The data collected at detailed sites (as per NCST 2009) included<br>- Current land use<br>- Farming practice e.g. cropped or vacant, type of crop at the time of survey<br>- Landform (slope, visual observations only)<br>- Horizon depth<br>- Surface characteristics (boundary distinctions, rockiness, Gilgai etc)<br>- Surface horizon characteristics<br>- Any impacts to soil (evidence of sheet, gully erosion etc)<br>- Vegetation stress (thickness of vegetation, groundcover, weeds etc).<br>• Field pH and Electrical Conductivity (EC) were recorded for all the depths for the detailed sites using 1:5 aqueous method using deionised water and a field pH and EC probe. |
| Representative sites | • Soil samples were collected directly from the drill auger attachment.<br>• All samples were transferred into laboratory supplied sample containers and held in chilled conditions pending and during transport to the analytical laboratories under chain-of-custody protocols.<br>• Sample depth intervals generally included: 0-0.0.1 m, 0.2-0.3 m, 0.5-0.6 m, 0.8-0.9 m, 1.1-1.2 m, 1.5-1.6 m and 1.9-2.0 m. Care was taken to not sample across horizonal boundaries.<br>• Sample locations were backfilled with cuttings or surrounding topsoil. |
| Surface sites | • Each surface site was advanced using hand tools to 0.3 m. This depth was considered sufficient to identify the soil type and correlate to soils already described in the area.<br>• The data collected at surface sites (as per NCST, 2008) included<br>- Current land use<br>- Farming practice e.g. cropped or vacant, type of crop at the time of survey<br>- Landform (slope, visual observations only)<br>- Horizon depth (A horizon only)<br>- Surface characteristics (boundary distinctions, rockiness, Gilgai etc)<br>- Surface horizon characteristics<br>- Any impacts to soil (evidence of sheet, gully erosion etc)<br>- Vegetation stress (thickness of vegetation, groundcover, weeds etc).<br>• A composite sample (0.0-0.3 m) was collected for laboratory analysis from the exposed soil face using a clean pair of disposable nitrile gloves.<br>• All samples were transferred into laboratory supplied sample containers and held in chilled conditions pending and during transport to the analytical laboratories under chain-of-custody protocols. |
| Check sites | • Each check site involved recording of surface features (such as colour, texture, cracking) to establish map boundaries.<br>• Minimum data included location, landform, vegetation, surface and horizon characterises, and correlated/classified soil type. |

| Activity | Methodology |
|---|---|
| | • No soil samples were collected from check sites. |
| Laboratory analysis | • All samples were submitted to Australian Laboratory Services Pty Ltd (ALS) a National Association of Authorities (NATA) accredited for laboratory analytical methods for the tests required. Testing was conducted in accordance with chemical methods outlined in Rayment and Lyons (2011)<br>• The laboratory analytical schedule (for) included as following:<br><u>All topsoil samples and (including representative sites and surface sites)</u><br>- Particle size analysis (PSA)<br><u>All topsoil and select subsoil samples (including representative sites and surface sites)</u><br>- pH 1:5, electrical conductivity (EC) 1:5<br>- Cation Exchange Capacity (CEC), exchangeable cations (calcium, potassium, magnesium and sodium) and Exchangeable Sodium Percentage (ESP).<br>- Soluble major ions (Na, Ca, Mg, K], and chloride, sulfate ($SO_4$), carbonate, bicarbonate and total alkalinity.<br>- Clay content and Emerson aggregate test.<br>- Organic carbon, total nitrogen (Total Kjeldahl Nitrogen [organic nitrogen plus ammonia] and organic nitrogen) and available phosphorus.<br>- Micro-nutrients (boron [B] copper [Cu], iron [Fe], manganese [Mn], zinc [Zn]) extractable metals.<br>- Moisture content (including at field capacity and wilting point).<br>- Phosphorus buffering index. |
| Soil Criteria Guidelines | An explanation of the guidelines used for the interpretation of the laboratory data presented are summarised in **Appendix B.** |

**Figure 6 Survey locations**



## 4.4 Field Program

The soil survey was completed between 22 and 24 March 2022 in general accordance with the SAQP (AECOM, 2021b). The soil survey design initially proposed in the SAQP (AECOM, 2021b) was altered slightly due to adverse weather conditions and access constraints, with a summary of completed works and change documented in **Table 6**. Actual survey locations are shown on **Figure 6**.

**Table 6 Summary of works completed**

| Activity | | Date | Comment |
|---|---|---|---|
| Property access | | 21 March 2022 | • Access to private landholder properties was arranged by Arrow, with Conduct and Compensation Agreements (CCA), Entry Notices and weed and seed requirements in place prior to the commencement of the soil survey.<br>• Due to a rainfall event recorded in the previous weeks, some sections of the Project area were unable to be accessed as part of the soil survey. Alternative sample locations were selected that were still considered representative of the targeted landscape. |
| Service Identification and Clearance (SIC) Procedure | | 17 March 2022 | • AECOM obtained Dial-Before-You-Dig plans from utility companies for services within the vicinity of the proposed Project area within 28 days of the planned ground disturbance, in accordance with AECOM's *SIC Checklist* (S4AN-331-FM1).<br>• An AECOM SIC Variation (S4AN-331-FM2) was approved for locations to be advanced without the area first being cleared by an independent service locator. |
| Arrow Permit to Work (PTW) | | 22 and 23 March 2022 | • Arrow directly engaged DIH Contracting Pty Ltd to be the Permit Holders under Arrow's PTW system for the excavation works of the detailed sites (involved penetration into a ground surface greater than 300 mm), in accordance with Arrow's *Excavation Procedure* (ORG-ARW-HSM-PRO-00039). |
| Soil survey | Detailed sites | 22 and 23 March 2022 | • Soil logging at seven detailed sites along the Project area<br>• Collection of soil sample for laboratory analysis at three detailed sites (DS01, DS04 and DS07) from the following depth intervals: 0-0. m, 0.2-0.3 m, 0.5-0.6 m, 0.8-0.9 m, 1.1-1.2 m, 1.5-1.6 m and 1.9-2.0 m. Care was taken to not sample across horizonal boundaries. |
| | Surface sites | 23 March 2022 | • Soil logging at four surface sites along the Project area (SS001 to SS04).<br>• The following locations were moved due to poor access or site observations: SS01 and SS03.<br>• Collection of one composite sample (0.0-0.3 m) for laboratory analysis from each surface site. |
| | Check sites | 23 March 2022 | • Soil logging at three check sites along the Project area (CS01 to CS03).<br>• CS02 and CS03 were moved due to poor access or site observations |

# 5.0 Soil Mapping Units

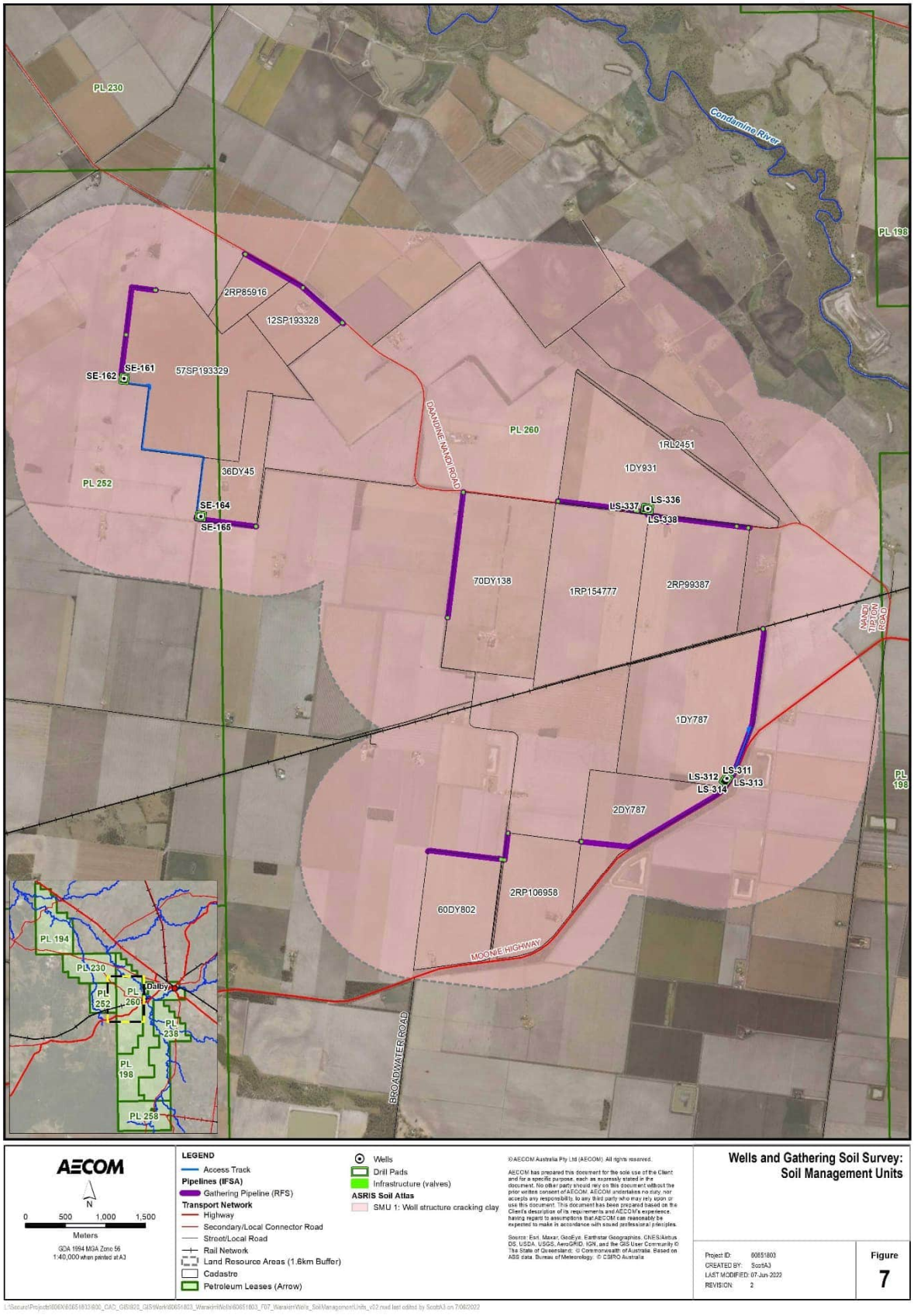
The soil mapping units (SMU) boundaries were predicted from digital terrain images, existing topographic land systems maps and refined after the interpretation of identifiable landscape features and analytical results of samples from representative and surface sites. SMU may consist of one of more ASC soil orders. For soils intersected by this Project, the two soil types encountered were, based on their lithologic and construction management similarities, grouped as one SMU.

The inferred spatial distribution of the SMU is shown in **Figure 7** and a summary presented in **Table 7**. A representative summery of the soil landscape, profile morphology, chemistry for each SMU is provided in the following subsections.

**Table 7 Identified SMU**

| SMU | Soil type | ASC | Observations | # of sites |
|---|---|---|---|---|
| 1 | Well-structured cracking clay | Vertosol | DS01 to DS07 | 12 |
| | | | SS01 to SS04 | 6 |
| | | | CS01 to CS03 | 8 |

**Figure 7 Soil Management Units**



### 5.1.1 Well Structured Cracking Clay Soils

Based on the soil survey observations, surface mulching and small cracks were widely observed uniformly for the SMU. However, majority of the Project area is extensively cropped, with alterations to the landscape topography making features such as gilgai (often associated with, but not exclusively with Vertosols) difficult to detect. Other distinctive soil properties of these soils are slickensides, which were difficult to confirm due to the high moisture status and extensive tillage of the soils at the time of the soil survey.

An example soil landscape summary and soil profile description are presented in **Table 8** and **Table 9**, respectively. Soil logging sheets for each site/observation are presented in **Appendix A**. Three representative sites (DS01, DS04 and DS07) were selected for laboratory analysis, with a summary of analytical results for DS01 presented in **Table 10**.

Complete tabulated data analytical table with an explanation of the guidelines used for the interpretation of the laboratory data presented are summarised in **Appendix B** and copies of the laboratory reports are presented in **Appendix C**.

**Table 8 SMU soil landscape summary**

| Item | Description | | |
|---|---|---|---|
| **Representative Site ID** | DS01 | | |
| **Site photographs** |  | | |
| **Location** | 309629 m E, 6985359 m N | **Disturbance** | Cultivation, irrigated, past or present |
| **Current land use** | Cultivation, in-fallow | **Vegetation** | Extensively cleared land, isolated stands of Brigalow nearby |
| **Landform element/pattern** | Flat, level plain | **Slope (%)** | <1% |
| **Microrelief** | Nil | **Erosion** | Nil erosion |
| **Surface condition** | Cracking clay, some coarse fragments | **Drainage** | Poorly drained |
| **General comments** | Slightly alkaline to alkaline pH at depth, very low salinity surface soils trending to moderately saline around 2.0 m | | |

**Table 9 SMU soil profile morphology summary**

| Horizon Depth (m) | Field texture | Strength/ structure | Inclusions/ segregations | Colour/ mottles | Moisture | Roots | pH/EC |
|---|---|---|---|---|---|---|---|
| **A1**<br>0.0 to 0.2<br>Clear | Sandy Clay to Clay Loam | Massive apedal | 5% organic, calcareous, fragments | 2.5 Y 5/2 | Moist | Few fine roots | 7.7/ 74 µS/cm |
| **B1**<br>0.2 to 1.1<br>Gradual | Medium Clay | Moderate to strong blocky/polyhedral | 2-5% calcareous, fragments | 2.5 Y 3/1 | Moist | None observed | 8.3-8.7 171 to 369 µS/cm |
| **B2**<br>1.1 to 2.0 | Heavy Clay | Strong blocky/polyhedral | 2-5% calcareous, fragments | 2.5 Y 4/1 | Moderately moist | None observed | 8.3-8.6 353 to 1170 µS/cm |
| **Field Photos** |   | | | | | | |
| **ASC Mapping** | | Vertosol | **ASC Soil Survey** | | Vertosol | | |

**Table 10 SMU soil chemistry results for DS01**

| Analysis | Sample Depth | | | | | | |
|---|---|---|---|---|---|---|---|
| Units | 0.0-0.1 | 0.2-0.3 | 0.5-0.6 | 0.8-0.9 | 1.1-1.2 | 1.5-1.6 | 1.9-2.0 |
| Soil pH | 7.7 | 8.6 | 8.7 | 8.3 | 8.6 | 8.4 | 8.3 |
| Soil EC (µS/cm) | 74 | 220 | 369 | 171 | 559 | 353 | 1170 |
| PSA-Sand (0.06-2m%) | 26 | - | - | - | - | - | - |
| PSA- Silt (2-60µm%) | 24 | - | - | - | - | - | - |
| PSA-Clay (<µm%) | 49 | 69 | 68 | 51 | 69 | 68 | 77 |
| Moisture content FC (%) | 45.6 | 46.2 | 43.3 | - | 43.0 | - | 47.9 |
| Moisture content WP (%) | 19.8 | 23.1 | 22.0 | - | 23.0 | - | 23.9 |
| CEC (meq/L) | 31.6 | 36.8 | 35.6 | 31.1 | 35.3 | 34.2 | 37.8 |
| Phosphate Buffering Index | 60 | 102 | 93 | - | 81 | - | 55 |
| Ca/Mg (ratio) | 4.4 | 2.7 | 1.4 | 3.8 | 1.4 | 1.8 | 0.9 |
| ESP (%NaCEC) | 0.7 | 4.1 | 9.7 | 1.7 | 11.1 | 8 | 13.2 |

A summary of all the laboratory results and observations for soils within the SMU is given below:

**Topsoil**

The topsoils are approximately 0.1 m to 0.3 m in thickness. They consist of very dark greyish brown (2.5 YR 5/2) to very dark grey clay loam to light clays, with a moderate (2 mm to 10 mm thick), self-mulching surface. Structure is predominantly medium to strong subangular block to polyhedral (50 mm to 100 mm) towards the surface, with the clay content ranging between 49 % and 69 %. The total sand content in the topsoils ranged from 11 % to 26 %, with up to 3 % gravel in some profiles. The pH ranged from 6.5 (near neutral) to 8.8 (strongly alkaline). The presence of roots ranged from few to common.

The capacity of these soils to store nutrients is very high, with total CEC ranging from 29.1 milliequivalents per 100 grams (meq/100 g) to 38.5 meq/100 g, while organic matter levels were moderate, with values ranging from 1.6 % to 2.6 %. Total nitrogen levels in topsoil were reported as low, with values between 450 mg/kg N to 1350 mg/kg N. Soil phosphorus levels are typically very low to medium high, with high calcium and magnesium levels Topsoil potassium levels are moderate to high, with values ranging between 0.2 meq/100 g and 1.4 meq/100 g.

Topsoil salinity (EC 1:5) is very low to low, with levels ranging from 47 microsiemens per centimetre (µS/cm) to 220 µS/cm. The topsoil is non-sodic to slightly sodic and does not need any gypsum ameliorations, with the ESP ranging from 0.7 % to 9.2 %, while the Emerson Aggregate Test class ranged between 2 and 4 for this soil, indicating that this soil is aggregated and has a low dispersion risk. This is also consistent with the presence of the logged calcareous inclusions.

**Subsoil**

The subsoil depth typically ranged from 0.3 m to 2.0m and consisted of a very dark grey (2.5 YR 3/1) medium clay B21 horizon, over a brown (2.5 YR 4/1) medium heavy clay B22 horizon with a C horizon at select locations. The B21 horizon displayed a weak to moderate sub-angular blocky to polyhedral structure (50 mm to 150 mm), grading into a moderate angular blocky B22 horizon at 1.0 m to 2.0 m below the surface. The CECs are very high, while subsoil pH ranged from 6.8 (near neutral) to 8.7 (strongly alkaline) in the lower subsoil.

Subsoil salinity (EC 1:5) levels are very low, with an average EC of 644 µS/cm , while chloride levels range from 100 milligrams per kilogram (mg/kg) to 1780 mg/kg in the lower subsoil. Subsoil ESP ranged from being non sodic to slightly sodic (1.7 % to 13.2 %) in the upper subsoil, to marginally sodic in some profiles. The subsoils are stable, with the Emerson Aggregate Test class ratings of 2 to 4, consistent with the presence of natural calcareous inclusions. Roots are common. Based on the data,

the calculated average gypsum application rates for the samples collected from subsoils of SMU is 0.8 tonnes/ha.

# 6.0 Soil Disturbance Management Strategies

## 6.1 Rehabilitation Considerations

The well-structured cracking clays are generally stable and non-sodic throughout the profile and would not require any additional specific management practices if disturbed.

The surface soil (0.0 m to 0.3 m) is highly suitable for stripping and stockpiling as a primary growth media and suited as secondary growth media (lower-most soil layer placed directly in contact with over burden or other spoil material) in the re-establishment of vegetation, due to sufficient nutrient load, non-dispersive and non-sodic properties and moderate alkalinity.

The B1 horizon or upper subsoil (0.2 m to 0.6 m) and B2 horizon or lower subsoil are also suited as secondary growth media. The mixing of heavy textured material with lighter textured sandy material will improve the physical properties and workability of these clays and make them more suitable as growth media for use in rehabilitation (Elliott and Veness, 1981).

## 6.2 Topsoil Suitability and Management

Topsoil refers to the upper soil layers (A horizons) of soil profiles. The A horizons contain more suitable growth media (seed stock, biota, organic matter and nutrients) which typically decreases with soil profile depth. In some situations, the upper portion of the subsoil (B21 horizon) maybe also provide suitable growth media.

Laboratory soil analysis data (**Appendix B**), and field data was used in conjunction with criteria outlined in the *Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley* (Elliott and Veness, 1981) to determine the suitability of available soil material for recovery and use as either primary (the upper most layer placed over a rehabilitation layer or secondary growth media (the lower most layer of soil, placed directly in contact with overburden or other spoil material).

The suitability of soil within SMU 1 for reuse as topsoil has been determined by reviewing the soil properties, such as salinity, permeability if subsoils, plant available nutrients and effective rooting depth, against the criteria set out in *Interpreting Soil Test Results* (Hazelton & Murphy, 2007).

Additionally, topsoil management should be undertaken in line with the requirements listed in Arrow's *Land Disturbance Procedure* (ORG-ARW-HSM-PRO-000146).

The soils included within the SMU primarily intersect areas of current cultivation across the entire Project area. Native vegetation has been mostly cleared, except for fringing woodland to open forests along lot/plan boundaries or road reserves. The major land disturbance is considered to occur during excavation works for the proposed well heads, pipeline, and access road construction.

Given the agricultural potential of soils within this SMU, topsoil management is a key consideration for maintaining surface soil stability and supporting revegetation success post disturbance.

The recommended stripping depths for topsoils within SMU 1 is 0.3 m, with consideration of the below:

- Soil moisture content should be reviewed prior to handling or traversing with heavy vehicles.
- Workability can be improved by adding a sandier textured material.
- Depth to saline soils are variable across the alignment.

Topsoil management should be undertaken in line with the requirements listed in Arrow's *Land Disturbance Procedure* (ORG-ARW-HSM-PRO-000146).

It should be noted that the depth of topsoil reinstatement within the SMU will vary across the Project area with consideration for current/future land use and revegetation requirements. In areas of cultivation or cropping, topsoils should be reinstated to the pre-disturbance thickness or a thickness large enough to avoid mixing with deeper soil material (which can be sodic and saline at depths ~1.5 m).

## 6.3 Stripping, Stockpiling and Handling

Prior to disturbance, any trees (along road reserves) permitted for clearing may be reused, if suitable, as sawn timber, fence posts or firewood. In areas where there is a shortage of topsoiling material and to improve the physical properties of sandy material, woody vegetation can be chipped to provide a mulch and for soil amendment in rehabilitation areas.

Suitable growth media must be stripped to depths outlined in **Section 6.1.** Marker pegs should be used to outline and indicate the required stripping depths for machinery operators. This is especially important when stripping soils are within dispersive subsoil horizons. Stripping of excessively wet soils is not recommended as the soil workability and handling of the heavier textured soils can lead to excessive compaction if trafficked when wet.

During excavation of soils in the SMU intersected by the ROW, it is important to separately stockpile material and avoid mixing of growth media (topsoil) and subsoil.

Stockpiles must not exceed 3 m in height, to reduce physical, biological and chemical degradation occurring in the stored material. Periods of stockpiling should not exceed 6 to 12 months and preferably not extend over a wet season. Where this is unavoidable vegetation should be introduced to allow stabilisation. Quick establishing pasture species and mulches are recommended to manage surface erosion.

Stockpiles are to be located in areas that are outside of drainage lines and drainage from upslope positions must be diverted to prevent stockpile erosion. Appropriate sediment control measures should be installed downstream of the stockpiles to reduce runoff and trap sediment. The majority of the Project area is in a flat landscape (slope <3%) as such presents a low risk of surface runoff and erosion.

Stockpiles need to be clearly sign-posted for easy identification to facilitate the correct future reuse of material. Establishment of weeds on the stockpiles must also be monitored and controlled.

## 6.4 Topsoil Reuse

Excavated soils should be returned to the trench in the pre-disturbance soil profile. Topsoil that has been stripped can be re-spread as part of stabilisation and rehabilitation activities.

The following recommendations are included for topsoil reuse:

- Compacted surface layers of disturbed areas should be deep ripped along the contour prior to the re-spreading of re-growth media to improve the water infiltration capacity and aeration.
- Mechanical or chemical weed management should be carried out on stockpiles (if required) prior to use to reduce weed infestation.
- Growth media should be spread in the reverse order to stripping and ameliorants added in the same operation (0.1 to 0.3 m for primary growth media).
- The deep ripping of the spread material along the contour will aid in ‘keying’ of this material into the underlying layers.
- Further ‘roughening up’ of the spread layer using a disc harrow will help reduce runoff, increase infiltration and improve seedling germination.

### 6.4.1 Compaction Strategies

The backfilling and compaction of the pipeline trench is also dependant on the use of appropriate equipment suited for compacting soil in trenches, ensuring the soil is moisture conditioned (i.e. if the soil is too wet or dry to compact) adding moisture based on the inherent moisture content. The soils are generally placed in thin layers (approximately 300 to 400 mm), adding moisture conditioning, if needed, followed by thorough tamping with the bucket (or a roller attachment for the excavator). The site-specific compaction strategies are informed by the geotechnical assessment and pipeline construction design.

Compaction of surface layers within the ROW disturbance areas should be undertaken in a way to improve the water infiltration capacity and aeration along the contour, prior to the re-shaping and re-spreading of topsoil and revegetation.

## 6.5 Soil Erosion

The soils within the SMU are located on agricultural land, identified as flat level plains with slopes of <3%. While the potential for erosion is less of a concern with this SMU, appropriate erosion and sediment control measures should be documented prior to works commencing to consider drainage flow directions and diversions required to prevent erosion.

Generally, the following recommendations are included to prevent soil erosion:

- Rehabilitation methodologies must aim to create a stable, non-polluting landform capable of achieving the desired post construction land use.
- Minimising the amount of land clearing to essential areas during the construction of the pipeline.
- Minimising the duration of reused or disturbed soil exposure.
- Directing runoff from undisturbed areas in engineered waterways away from disturbed areas and topsoil stockpiles for the safe downslope disposal into existing watercourses.
- Sediment control dams are used to capture sediment laden runoff prior to off-site release. Treatment with lime, gypsum or bentonite may be required for highly dispersive soils.
- Restricting traffic and grazing, in the cultivated area especially in wet season should be considered in order to generate effective vegetation cover.
- Disturbed areas should be stripped to the recommended depths **Section 6.1** and suitable material stockpiled. Stockpiles that are required for periods longer than six months or a growing season should be ripped and seeded to limit erosion.
- Topsoil replacement should be completed as close as possible to the anticipated sowing date which should be completed during the most favourable climatic conditions to maximise vegetative ground cover.

## 6.6 Construction Inspection and Maintenance Regimes

The disturbance area should continue to be visually monitored until such time that the site is considered effectively stabilised or rehabilitated, in line with Arrow's rehabilitation criteria. To help in adequate rehabilitation, the quantity of ameliorants needed (if any) for topsoil and subsoil based on pre-construction land use are generally calculated based on site specific laboratory analysis.

After completion of pipeline installation, cropped areas should be stabilised to combat erodible / dispersive surface soils (below topsoil) and then topped with a topsoil dressing to match the thickness and quality of the surrounding topsoils of undisturbed areas, as a minimum. Ideally, topsoils stripped during pipeline installation would have been stockpiled and reused in the same location and to the same thicknesses to match the original soil profile as closely as was practical. Inspection and maintenance should include assessment of surface stabilisation (e.g. – lack of erosion of the topsoil / crop-supporting layer and the health of surface vegetation) in accordance with Arrow's rehabilitation criteria.

Waterway crossings might require specific inspection and maintenance regimes, which should be considered at the time of conceptualising and designing each crossing.

# 7.0 Conclusions

The well and gathering Project intersects two ARIs, PAA (PALU) and SCA, and as such requires a RIDA application to be submitted under the RPI Act.

Based on a review of existing available soil mapping for the region, two landscape units and two LRAs were identified to likely be intersected by the Project. Identified soils include self-mulching cracking clays/ vertosols, typical of the Central Darling Downs region

Based on the cartographic scale of the available soil mapping (between 1:250,000 and 1:2,000,000), a soil survey was undertaken along the Project area to refine mapped soils and aid in the development of suitable construction management measures.

The soil survey used a free survey approach, with a target mapping scale of 1:50,000 corresponding to 14 observations sites along the alignment. A total of seven detailed sites (sub-set of three representative sites selected for laboratory analysis), four surface sites and three check sites were made across the alignment.

Based on the soil survey observations and analytical results of samples from representative and surface sites, the soils across the Project area were considered to be consistent as a single SMU and classified as well-structured cracking clay soils. The soils included within the SMU primarily intersect areas of current cultivation or cropping along with some area along the existing road reserve.

Given the agricultural potential of soils within the SMU, topsoil management is a key consideration for maintaining surface soil stability across the Project area and supporting revegetation success post disturbance. The recommended stripping depths for topsoils (0.0 – 0.3 m) was identified depending on the soil properties identified during the soil survey, such as salinity, subsoil permeability, plant available nutrients and effective rooting depth. Topsoil management should be undertaken in line with the requirements listed in Arrow's *Land Disturbance Procedure* (ORG-ARW-HSM-PRO-000146).

Engineering and design practices will be required to manage infrastructure, foundations, and buried conduit in the soils identified along the Project. Appropriate erosion and sediment control measures and application of appropriate spoil ameliorants (gypsum and organic matter) should be documented prior to works commencing to prevent erosion. Site-specific compaction strategies should also be informed by the geotechnical assessment and pipeline construction design.

The ROW disturbance area within the Project area should continue to be visually monitored until such time it is considered effectively stabilised or rehabilitated, in line with Arrow's rehabilitation criteria (i.e. presence of erosion and/or health of surface vegetation).

# 8.0 References

AECOM, 2021a. Surat Low Pressure Header (LPH) Pipeline: Soil Assessment. 25 March 2021.

AECOM, 2021b. Surat LPH Pipeline: Sampling Analysis Quality Plan (SQAP). 25 June 2021.

Arrow, 2020. Land Rehabilitation Plan. ORG-ARW-HSM-PLA-00064. Version 5. November 2020.

Arrow, 2020. Land Disturbance Procedures. ORG-ARW-HSM-PRO-00146.

Ashton LJ and McKenzie NJ, 2001. Conversion of the Atlas of Australian Soils to the Australian Soil Classification, CSIRO Land and Water (unpublished).

Harris PS, Biggs, AJW and Stone, BJ (eds), 1999. Central Darling Downs Land Management Manual. Department of Natural Resources, Queensland. DNRQ990102.

CSIRO, 2011. Physiographic Regions of Australia. Bioregional Assessment Source Dataset. Viewed 19 July 2021. http://data.bioregionalassessments.gov.au/dataset/a0f3edb6-6afd-4eb9-a9be-e815f8ec4eab

Department of Environment and Science (DES), 2021. Environmental Authority EPPG00972513. Dated 5 February 2021.

DES, 2021. Environmental Authority EA0002659. Dated 14 January 2021.

Department of Natural Resources and Mines (DNRME), 2018. Detailed surface geology – Queensland. MERLIN Database. Accessed 19 July 2021.

DNRME, 2019. Office for Groundwater Impact Assessment (OGIA): Updated Geology and Geological Model for the Surat Cumulative Management Area.

Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP, 2019. RPI Act Statutory Guideline 02/14: Carrying out resource activities in a Priority Agricultural Area. State of Queensland. August 2019.

DSDMIP, 2019. RPI Act Statutory Guideline 03/14: Carrying out resource activities in a Strategic Cropping Area. State of Queensland. August 2019.

Elliot, GL and Vaness, RA (1981) Selection of topdressing material for rehabilitation of disturbed areas in the Hunter valley, Journal of the Soil Conservation Service of NSW 37-40.

*Guidelines for Growth Media Management* (EHP, 1995)

Geoscience Australia, 2021, SRTM-derived 1 Second Digital Elevation Models Version 1.0, Commonwealth of Australia. Accessed 19 July 2021.

Isbell RF, 2002. The Australian Soil Classification. Revised Edition. CSIRO Publishing, Melbourne.

Rayment, GE and Lyons, DL, 2011. Soil Chemical Methods – Australasia. CSIRO Publishing, Melbourne.

Soil Science Australia, 2015. Guidelines for Soil Survey along Linear Features.

State of Queensland, 2021. Queensland Globe https://qldglobe.information.qld.gov.au/

The National Committee on Soil and Terrain (NCST), 2009. *Australian Soil and Land Survey Field Handbook*. CSIRO Publishing.

# 9.0 Limitations

AECOM Australia Pty Ltd (AECOM) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Arrow Energy Pty Ltd (Arrow) and only those third parties who have been authorised in writing by AECOM to rely on this soil assessment (report).

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

It is prepared in accordance with the scope of work and for the purpose outlined in the professional services agreement (10315CNT) and Call-off-Order (COO) dated 25 November 2020.

Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

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Any estimates of potential costs which have been provided are presented as estimates only as at the date of the report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

# Appendix A

## Soil Logging Sheets

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS01**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Detailed Site | **Date:** 23 March 2022 |
| **Easting / Northing:** 309665 / 6993285 | **Topography:** Flat, level plain |
| **Drainage:** Poorly drained | **Disturbance:** 1 |
| **Land use:** Cultivation | **Surface condition:** Cracked, self mulched and tilled |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Depth** | **Boundary** | | | | | | | | | | |
| O | 0.0-0.01 | Clear | 2.5Y 5/2 | none | Clayey Sand | Moist | Massive | 5-10% | 5% very fine calcareous, gypseous and organic concretions | Few roots | 7.7 | 74 |
| A | 0.01-0.2 | Gradual | 2.5Y 3/1 | none | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 0.05 | 2% very fine calcareous and organic concretions | Few roots | 8.6 | 220 |
| B1 | 0.2-1.1 | Gradual | 2.5Y 3/1 | none | Medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-2% | 2% fine calcareousand organic concretions | - | 8.7 | 369 |
| B2 | 1.1-1.5 | Gradual | 2.5Y 4/1 | Common medium mottles | Heavy Clay | Moderately moist | Strong, medium sized, subangular blocky to polyhedral | 0.05 | 1% fine calcareous concretions | - | 8.6 | 559 |
| B22 | 1.5-2.0 | Gradual | 2.5Y 4/1 | Few fine mottles | Heavy Clay | Moderately moist | Strong, medium sized, subangular blocky to polyhedral | 1-5% | 5% fine calcareous concretions | - | 8.3 | 1170 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Adjacent cropping paddock and access track.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS02**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Detailed Site | **Date:** 22 March 2022 |
| **Easting / Northing:** 313763 / 6989715 | **Topography:** Flat, level plain |
| **Drainage:** Poorly/Moderately drained | **Disturbance:** 1 |
| **Land use:** Cultivation | **Surface condition:** Cracked, self mulched and tilled |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Depth** | **Boundary** | | | | | | | | | | |
| A1 | 0.0-0.2 | Gradual | 2.5Y 3/1 | none | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 5-10% | 10% organic and root linings, concretions and fragments | Few very fine roots | 8.4 | 50 |
| B1 | 0.2-0.5 | Gradual to clear | 2.5Y 3/2 | none | Light Clay | Moist | Moderate, medium sized, subangular blocky to polyhedral | 5-10% | 5% ferromanganiferous, and manganiferous concretions and nodules | Few fine roots | 8.7 | 40 |
| B2 | 0.5-1.7 | Gradual | 2.5Y 3/2 | none | Medium Clay | Moist | Strong, medium sized, subangular blocky to polyhedral | 1-5% | 5% fine organic root linings | Few fine roots | 8.7 | 40 |
| B22 | 1.7-1.9 | Gradual | 2.5Y 3/2 | None | Medium Clay | Moist | Strong, medium sized, subangular blocky to polyhedral | 1-5% | 2% medium calcareous concretions | - | 9.3 | 297 |
| C1 | 1.9-2.2 | Clear | 10YR 5/4 | Few fine grey-black mottles | Heavy Clay | Moderately moist | Strong, medium sized, subangular blocky to polyhedral | <5% | 1-5% fine ferruginous-organic and ferromanganiferous concretions | - | 8.5 | 269 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Cropping paddock next to access track. At 1.5 increase in segregations, greyish gypsum/limestone.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS03**

**Project:** WWG
**Project No:** 60651803
**Observation Type:** Detailed Site
**Date:** 22 March 2022
**Easting / Northing:** 315206 / 6989503
**Topography:** Flat, level plain
**Drainage:** Poorly drained
**Disturbance:** 1
**Land use:** Cultivation
**Surface condition:** Cracked, self mulched and tilled

| Horizon Type | Depth | Boundary | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 0.0-0.2 | Clear | 10YR 3/1 | Many fine mechanical mixing patterns | Clay Loam | Moist | Weak, medium sized, subangular blocky to polyhedral | 5-10% | 5% fine ferromanganiferous, manganiferous, organic soft segregations and root linings | Few roots | - | - |
| B1 | 0.2-1.2 | Gradual | 2.5Y 3/2 | none | Light medium Clay | Moist | Strong, medium sized, subangular blocky to polyhedral | 1-5% | 2% very fine ferromanganiferous and manganiferous soft segregations | Few roots | - | - |
| B2 | 1.2-1.6 | Gradual | 2.5Y 3/2 | Very few mottles | Light medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-2% | 2% very fine calcareous and ferruginous-organic soft segregations | Few fine roots | - | - |
| B2 | 1.6-2.0 | Clear | 10YR 3/3 | Common medium mottles | Medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-5% | 1% medium calcareous concretions and soft segregations | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Cropped paddock next to farm shed. At 1.6 reddish greyish gravel mixed with clay (Gravelly/Bedrock)

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS04**

**Project:** WWG
**Project No:** 60651803
**Observation Type:** Detailed Site
**Date:** 23 March 2022
**Easting / Northing:** 317252 / 6989280
**Topography:** Flat, level plain
**Drainage:** Moderately drained
**Disturbance:** 1
**Land use:** Cultivation
**Surface condition:** Cracked, self mulched and tilled

| Horizon Type | Depth | Boundary | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O | 0.0-0.03 | Clear | 2.5Y 5/2 | none | Loamy Sand | Wet | Massive | 5-10% | 5% very fine organic root linings and soft segregations | Few roots | 6.8 | 72 |
| A | 0.05-0.3 | Gradual | 2.5Y 3/2 | none | Clay Loam | Wet | Weak, fine, subangular blocky to polyhedral | 1-5% | 5% very fine organic, manganiferous, ferromanganiferous, ferruginous concretions and root linings | Few roots | 7.3 | 83 |
| B1 | 0.3-0.8 | Gradual | 2.5Y 3/1 | none | Light medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-5% | 5% very fine organic, manganiferous, ferromanganiferous, ferruginous concretions and root linings | Few fine roots | 7.7 | 512 |
| B22 | 0.8-1.5 | Gradual | 2.5Y 3/1 | None | Medium Clay | Moist | Strong , medium sized, subangular blocky to polyhedral | 1-5% | 5% very fine organic, manganiferous, ferromanganiferous, ferruginous concretions and root linings | - | 8.1 | 694 |
| B23 | 1.5-2.0 | Gradual | 2.5Y 5/1 | Common mottles | Medium Clay | Moist | Strong, medium sized, subangular blocky to polyhedral | 0.01 | 1% fine calcareous concretions | - | 8.3 | 927 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Adjacent cropping paddock and access road. At 1.5 inclusions of greyish platy mottles along with gravels (10-20%).

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS05**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Detailed Site | **Date:** 22 March 2022 |
| **Easting / Northing:** 313477 / 6987554 | **Topography:** Flat, level plain |
| **Drainage:** Poorly drained | **Disturbance:** 1 |
| **Land use:** Cultivation | **Surface condition:** Cracked, self mulched and tilled |

| Horizon Type | Depth | Boundary | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 0.0-0.1 | Clear | 7.5YR 4/3 | Many fine mechanical mixing patterns | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 5-10% | 5% very fine calcareous, gypseous and manganiferous concretions, nodules and root linings | Few | 7.7 | 53 |
| A | 0.1-0.3 | Clear to Gradual | 10YR 4/1 | none | Light Clay | Moist | Weak, fine, subangular blocky to polyhedral | 5-10% | 2-10% fine ferromanganiferous and organic segregations | Few roots | 8.1 | 210 |
| B1 | 0.3-1.2 | Gradual | 10YR 3/1 | none | Medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-5% | 1% fine calcareous concretions | - | 8.5 | 370 |
| B2 | 1.2-1.8 | Gradual | 10YR 3/1 | Very few fine mottles | Medium Clay | Moist | Moderate, medium sized, subangular blocky to polyhedral | 1-5% | 1-5% fine manganiferous and ferromanganiferous concretions | - | 8.3 | 200 |
| C1 | 1.8-2.0 | Gradual | 10YR 3/1 | Very few fine mottles | Heavy Clay | Moderately moist | Moderate to strong, medium sized, polyhedral | 0.05 | 2% fine ferruginous and calcareous concretions | - | 9.1 | 488 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Cropping paddock next to access track. From 0.1-0.3 grey gravelly saturated segregations. From 1.8-2.0 increase in grey gravelly segregations.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**DS06**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Detailed Site | **Date:** 22 March 2022 |
| **Easting / Northing:** 313556 / 6985194 | **Topography:** Flat, level plain |
| **Drainage:** Poorly/Moderately drained | **Disturbance:** 1 |
| **Land use:** Cultivation, cotton | **Surface condition:** Cracked, self mulched and tilled |

| Horizon Type | Depth | Boundary | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O | 0.0-0.05 | Clear | 5Y 3/1 | none | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 5-10% | 5% very fine manganiferous and ferromanganiferous concretions | Few roots | 8.3 | 180 |
| A | 0.05-0.5 | Gradual | 5Y 3/1 | none | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 0.05 | 2% very fine manganiferous and ferromanganiferous concretions | Few roots | 8.1 | 76 |
| B2 | 0.5-1.2 | Gradual | 5Y 3/1 | none | Medium clay | Moist | Moderate, medium sized, subangular blocky to polyhedral | 1-5% | 5% medium calcareous, manganiferous and ferromanganiferous concretions | Few roots | 8 | 244 |
| B22 | 1.2-1.4 | Gradual | 5Y 3/1 | None | Medium clay | Moist | Moderate, medium sized, subangular blocky to polyhedral | 1-5% | 1% medium calcareous concretions | Few roots | 8.5 | 157 |
| B23 | 1.4-2.0 | Gradual | 5Y 5/1 | none | Medium Clay | Moderately moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-5% | 1% medium calcareous concretions | Few roots | 8.5 | 157 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Cropping paddock. Cotton in the field next to crop. From 1.2 - 1.4 there is an increase in grey gravelly segregations which then remains consistent from 1.5-2.0.

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# SOIL LOGGING SHEET

**DS07**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Detailed Site | **Date:** 22 March 2022 |
| **Easting / Northing:** 316891 / 6986859 | **Topography:** Flat, level plain |
| **Drainage:** Poorly drained | **Disturbance:** 1 |
| **Land use:** Cultivation | **Surface condition:** Cracked, self mulched and tilled |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Depth** | **Boundary** | | | | | | | | | | |
| A1 | 0.0-0.1 | Clear to Gradual | 5Y 3/1 | none | Clay Loam | Moist | Weak, fine, subangular blocky to polyhedral | 5-10% | 5% fine calcareous, ferruginous, gypseous concretions | Few roots | 6.9 | 47 |
| B1 | 0.1-0.5 | Gradual | 5Y 3/1 | none | Medium Clay | Moist | Moderate, medium sized, subangular blocky to polyhedral | 0.05 | 2% fine calcareous, ferruginous concretions | Few roots | 6.5 | 190 |
| B2 | 0.5-1.2 | Gradual | 5Y 3/1 | none | Medium clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-2% | 2% fine calcareous, ferruginous concretions | - | 6.8 | 361 |
| B22 | 1.2-1.8 | Gradual | 5Y 3/1 | None | Medium clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 0.05 | 5% fine calcareous, ferruginous concretions | - | 7.7 | 583 |
| C1 | 1.8-2.0 | Gradual | 5Y 3/1 | none | Medium Clay | Moist | Moderate to strong, medium sized, subangular blocky to polyhedral | 1-2% | 1% fine to medium calcareous concretions | - | 8.4 | 850 |

**Existing soil mapping:**
Vertosol

**Soil survey:**
Well-Structured Cracking clay soils

**Remarks:**
Cropping paddock next to track. Some grey gravelly segregation in C1

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# SOIL LOGGING SHEET

**SS01**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Surface Site | **Date:** 23 March 2022 |
| **Easting / Northing:** 312349 / 6991715 | **Topography:** Flat, level plain |
| **Drainage:** Poorly to moderatly drained | **Disturbance:** Cultivation |
| **Land use:** Cultivation | **Surface condition:** Tilled, cracked and self mulched |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Depth** | **Boundary** | | | | | | | | | | |
| A | 0.0-0.3 | not measured | 10YR 3/1 | none | Clay loam and light clay | Moist | Weak, fine, sub angular blocky to polyhedral | 5-10% | 5-10% very fine ferruginous, manganiferous and ferromanganiferous concreations | Few roots | 7.80 | 52 |

**Existing soil mapping:**
Vertosol

**Soil Survey:**
Well structured cracking clays

**Remarks:**
Next to cropping paddock and access track.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**SS02**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Surface Site | **Date:** 23 March 2022 |
| **Easting / Northing:** 312006 / 6985001 | **Topography:** Flat, level plain |
| **Drainage:** Poorly to moderatly drained | **Disturbance:** Cultivation |
| **Land use:** Cultivation | **Surface condition:** Tilled, cracked and self mulched |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Depth** | **Boundary** | | | | | | | | | | |
| A | 0.0-0.3 | not measured | 2.5Y 5/2 | none | Sandy clay loam | Moderately moist | Weak, fine, sub angular blocky to polyhedral | 5-10% | 10-15% coarse ferruginous, manganiferous and ferromanganiferous concreations | Few roots | 8.80 | 162 |

**Existing soil mapping:**
Vertosol

**Soil Survey:**
Well structured cracking clays

**Remarks:**
Cropping paddock, fallow at the time of sampling.

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# SOIL LOGGING SHEET

**SS03**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Surface Site | **Date:** 23 March 2022 |
| **Easting / Northing:** 313668 / 6984079 | **Topography:** Flat, level plain |
| **Drainage:** Poorly to moderatly drained | **Disturbance:** Cultivation |
| **Land use:** Cultivation | **Surface condition:** Tilled, cracked and self mulched |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Depth | Boundary | | | | | | | | | | |
| A | 0.0-0.3 | not measured | 2.5Y 5/2 | none | Sandy clay loam | Moderately moist | Weak, fine, sub angular blocky to polyhedral | 5% | 15% very fine manganiferous, ferromanganiferous, calcareous concreations | Common roots | 7.00 | 63 |

**Existing soil mapping:**
Vertosol

**Soil Survey:**
Well structured cracking clays

**Remarks:**
Cropping paddock, fallow at the time of sampling.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**SS04**

| | |
|---|---|
| **Project:** WWG | **Project No:** 60651803 |
| **Observation Type:** Surface Site | **Date:** 23 March 2022 |
| **Easting / Northing:** 315681 / 6985496 | **Topography:** Flat, level plain |
| **Drainage:** Poorly to moderatly drained | **Disturbance:** Cultivation |
| **Land use:** Cultivation, Fallow | **Surface condition:** Tilled, cracked and self mulched |

| Horizon | | | Colour | Mottles | Texture | Moisture | Structure | Coarse Fragments | Segregations/ Inclusions | Roots | pH | EC (µS/cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Depth | Boundary | | | | | | | | | | |
| A | 0.0-0.3 | not measured | 2.5Y 3/1 | none | Clay loam | Moist | Weak, fine, sub angular blocky to polyhedral | 5% | 5-10% very fine calcareous and organic concreations | Few roots | 8.30 | 100 |

**Existing soil mapping:**
Vertosol

**Soil Survey:**
Well structured cracking clays

**Remarks:**
Cropping paddock, fallow at the time of sampling.

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**CS01**

| | |
|---|---|
| **Project:**<br>WWG | **Project No:**<br>60651803 |
| **Observation Type:**<br>Check Site | **Date:**<br>23 March 2022 |
| **Easting / Northing:**<br>310065 / 6990213 | **Topography:**<br>Flat, level plain |
| **Drainage:**<br>Moderatley drained | **Disturbance:**<br>Cultivation, past or present |
| **Land use:**<br>Cultivation, Present Cotton | **Surface condition:**<br>Tilled, cracked self mulched |

**Remarks:**
Black self mulching clays, evidence of cracks on surface, middle of cotton cropped paddock and a water drain. Water drain is to allow for access of run off water. Evidence of run off gravels (red-brown).

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**CS02**

| | |
|---|---|
| **Project:**<br>WWG | **Project No:**<br>60651803 |
| **Observation Type:**<br>Check Site | **Date:**<br>23 March 2022 |
| **Easting / Northing:**<br>316636 / 6986105 | **Topography:**<br>Flat, level plain |
| **Drainage:**<br>Poorly to moderatley drained | **Disturbance:**<br>Road reserve |
| **Land use:**<br>Road reserve | **Surface condition:**<br>Tilled, cracked self mulched |

**Remarks:**
Black clays on West side of highway. Tree line along the highway

AECOM Imagine it. Delivered.

# SOIL LOGGING SHEET

**CS03**

| | |
|---|---|
| **Project:**<br>WWG | **Project No:**<br>60651803 |
| **Observation Type:**<br>Check Site | **Date:**<br>23 March 2022 |
| **Easting / Northing:**<br>314456 / 6989634 | **Topography:**<br>Flat, level plain |
| **Drainage:**<br>Moderatley drained | **Disturbance:**<br>Cultivation, past or present |
| **Land use:**<br>Cultivation, Past Wheat/Barley | **Surface condition:**<br>Eroded, evidence of flooding |

**Remarks:**
Cropping paddock, nothing growing. Evidence of historical/pre-season wheat/barley crop.

# Appendix B

## Analytical Tables

# Appendix B Analytical Tables

## TEST SIGNIFICANCE AND TYPICAL VALUES

### *Particle Size Analysis*

Particle size analysis measures the size of the soil particles in terms of grainsize fractions and expresses the proportions of these fractions as a percentage of the sample. The grainsize fractions are:

- clay (<0.002 mm)
- silt (0.002 mm to 0.02 mm)
- fine sand (0.02 mm to 0.2 mm)
- medium and coarse sand (0.2 mm to 2 mm)

Particles greater than 2 mm, that is gravel and coarser material, are not included in the analysis.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Dispersion Percentage*

Dispersion percentage is a measure of soil dispersibility representing the proportion of clay plus fine silt (<0.005 mm approximately) in a soil which is dispersible and is expressed as a percentage. The following rankings of dispersion percentage are applicable:

| | |
|---|---|
| 0 % to 30 % | low |
| 30 % to 50 % | moderate |
| 50 % to 65 % | high |
| 65 % to 100 % | very high |

*Reference: Ritchie JA (1963) Earthwork Tunnelling and the Application of Soil Testing Procedures, Journal of Soil Conservation Service of NSW 19, pp 111-129*

### *Emerson Aggregate Test*

Emerson aggregate test measures the susceptibility to dispersion of the soil in water. Dispersion describes the tendency for the clay fraction of a soil to go into colloidal suspension in water. The test indicates the credibility and structural stability of the soil and its susceptibility to surface sealing under irrigation and rainfall. Soils are divided into eight classes on the basis of the coherence of soil aggregates in water. The eight classes and their properties are:

- Class 1 - very dispersible soils with high tunnel erosion susceptibility.
- Class 2 - moderately dispersible soils with some degree of tunnel erosion susceptibility.
- Class 3 - slightly or non-dispersible soils which are generally stable and suitable for soil conservation earthworks.
- Class 4-6 - more highly aggregated materials which are less likely to hold water. Special compactive efforts are required in the construction of earthworks.
- Class 7-8 - highly aggregated materials exhibiting low dispersion characteristics.

The following subdivisions within Emerson classes may be applied:

(1): slight milkiness, immediately adjacent to the aggregate

(2): obvious milkiness, less than 50 % of the aggregate affected

(3): obvious milkiness, more than 50 % of the aggregate affected

(4): total dispersion, leaving only sand grains.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Sodicity*

The exchangeable sodium percentage (ESP) is determined by measuring the concentration of all the exchangeable cations in the soil and expressing the amount of exchangeable sodium as a proportion of the sum of all exchangeable cations (known as the cation exchange capacity (CEC). Three categories of sodicity corresponding to different ESPs are shown:

| Sodicity Rating | ESPs proposed for Australian Soils (Northcote and Skene 1972) |
|---|---|
| Non-sodic | 0-6 |
| Marginally sodic to sodic | 6-14 |
| Strongly sodic | >14 |

### *Electrical Conductivity/Salinity*

Salinity is measured as electrical conductivity on a 1:5 soil:water suspension to give EC (1:5). The effects of salinity levels expressed as EC at 25$^{o}$C (µS/cm), on plants are:

0 - 1000 very low salinity, effects on plants mostly negligible.

1000 - 2000 low salinity, only yields of very sensitive crops are restricted.

> 2000 saline soils, yields of many crops restricted.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *pH*

The pH is a measure of acidity and alkalinity. For 1:5 soil:water suspensions, soils having pH values less than 4.5 are regarded as strongly acid, 4.5 to 5.0 moderately acidic, and values greater than 7.0 are regarded as alkaline. Most plants grow best in slightly acidic soils.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Phosphorus*

Phosphorus is an important soil component indicating a main limiting growth factor. The phosphorus that is available to the plant is only a small fraction of the total amount of phosphorus in the soil. Extractable phosphorus was determined by the Bray No. 2 test.

Available phosphorus at 5 ppm is considered the deficiency limit whereas levels greater than 25 ppm are very high.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Phosphorus Sorption*

Phosphorus sorption relates to the ability of a soil to remove phosphorus from solution and assimilate it within the soil matrix. Sorption index ratings are:

0 – 3 low

3 – 4.5 moderate

4.5 – 6 high

>6 very high

*Reference – Abott TS, BCRI Soil Testing Methods 1987*

### *Nitrogen*

Nitrogen is another important component of soil indicating a main limiting growth factor. The total amount of nitrogen in the soil was determined by the Kjeldahl method, which is essentially a wet-oxidation procedure.

The total nitrogen of soils ranges from less than 0.2 per cent in subsoils to greater than 2.5 per cent in peats. The surface layer of most cultivated soils contains between 0.06 to 0.5% N. 1% is same as 10,000 mg/kg. As a guide, the following figures for total nitrogen may be used:

- less than 1000 mg/kg N low
- 1000mg/kg to 2000 mg/kg N medium
- more than 2000 mg/kg N high

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Cation Exchange Capacity and Exchangeable Cations*

The concentration of cations is expressed as milli-equivalents (me)/100 g or mmol/kg. This takes account of their different valencies and atomic weights. The total quantities of cations that a soil can hold is called the cation exchange capacity (CEC), also expressed as me/100g.

The five most abundant cations in soils are calcium (Ca2+), magnesium (Mg2+), potassium (K+), sodium (Na+) and in strongly acid soils, aluminum (Al3+). The cations manganese (Mn2+), iron (Fe2+), copper (Cu2+) and zinc (Zn2+) are usually in amounts that do not contribute significantly to the cation complement. The following rankings are applicable:

| Cation (me/100g) | Ranking | | | | |
|---|---|---|---|---|---|
| | Very low | Low | Moderate | High | Very High |
| CEC | <5 | 5-10 | 10-15 | 15-35 | >35 |
| Na | <0.1 | 0.1-0.3 | 0.3-0.7 | 0.7-2.0 | >2.0 |
| K | <0.2 | 0.2-0.4 | 0.4-0.7 | 0.7-2.0 | >2.0 |
| Ca | <2 | 2.0-5.0 | 5-10 | 10-20 | >20 |
| Mg | <0.3 | 0.3-1.0 | 1.0-3.0 | 3.0-8.0 | >8.0 |

Soils or substrates having values of exchangeable sodium percentage (ESP) exceeding 5 me% are described as sodic, and greater than 15 me% as strongly sodic. The clay particles in such soils are liable to disperse on wetting, causing structure to deteriorate and surface sealing to occur.

*Reference: Bond R, Craze B, Rayment G and Higginson, Australia Soil and Land Survey Laboratory Handbook 1990*

### *Organic Carbon*

Organic Carbon content can be directly related to the levels of soil organic matter and is based on the (Walkley – Black) chromic acid method. Percentage organic matter can be obtained by multiplying percentage organic carbon by 1.72. This factor is based on the assumption that organic matter in the soil has a constant carbon composition of 58 per cent.

The following rankings of organic carbon are applicable:

- 0 %to 0.5% very low
- 0.5 % to 1.5% low
- 1.5 %to 2.5% moderate
- 2.5 % to 5.0% high

*Reference: Allison LE et al, Methods of Soil Analysis, 1965*

| | | | | Physical Parameters | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Emerson Class Number | Laboratory Munsell Colour | Texture | Clay (<2 µm) | Silt (2-60 µm) | Sand (0.06-2.00 mm) | Gravel (>2mm) | Cobbles (>6cm) | +1.180µm | +150µm | +19.0mm | +2.36mm | +300µm | +37.5mm | +4.75mm | +425µm | +600µm | +75.0mm | +75µm |
| | | | | - | - | - | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| | | | | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Location | Field_ID | Sample_Depth | Date_Time | | | | | | | | | | | | | | | | | | | |
| DS01 | DS01_0.0-0.1 | 0-0.1 | 23/03/2022 | 4 | Black (N 2.5/ ) | Medium Clay | 49 | 24 | 26 | 1 | <1 | 2 | 19 | <1 | <1 | 11 | <1 | <1 | 7 | 5 | <1 | 26 |
| DS01 | DS01_0.2-0.3 | 0.2-0.3 | 23/03/2022 | 4 | Very Dark Gray (N 3/ ) | Medium Clay | 69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS01 | DS01_0.5-0.6 | 0.5-0.6 | 23/03/2022 | 4 | Very Dark Gray (N 3/ ) | Light Medium Clay | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS01 | DS01_0.8-0.9 | 0.8-0.9 | 23/03/2022 | 4 | Very Dark Gray (N 3/ ) | Medium Clay | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS01 | DS01_1.1-1.2 | 1.1-1.2 | 23/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Clay | 69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS01 | DS01_1.5-1.6 | 1.5-1.6 | 23/03/2022 | 4 | Black (N 2.5/ ) | Medium Clay | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS01 | DS01_1.9-2.0 | 1.9-2 | 23/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Clay | 77 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_0.0-0.1 | 0-0.1 | 23/03/2022 | 3 | Black (N 2.5/ ) | Medium Heavy Clay | 53 | 25 | 20 | 2 | <1 | 2 | 15 | <1 | 1 | 10 | <1 | <1 | 7 | 5 | <1 | 21 |
| DS04 | DS04_0.2-0.3 | 0.2-0.3 | 23/03/2022 | 2 | Black (N 2.5/ ) | Medium Heavy Clay | 64 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_0.5-0.6 | 0.5-0.6 | 23/03/2022 | 2 | Black (N 2.5/ ) | Medium Clay | 78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_0.8-0.9 | 0.8-0.9 | 23/03/2022 | 2 | Black (N 2.5/ ) | Medium Heavy Clay | 80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_1.1-1.2 | 1.1-1.2 | 23/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Heavy Clay | 73 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_1.5-1.6 | 1.5-1.6 | 23/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Heavy Clay | 81 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS04 | DS04_1.9-2.0 | 1.9-2 | 23/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Heavy Clay | 82 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS07 | DS07_0.0-0.1 | 0-0.1 | 22/03/2022 | 2 | Black (N 2.5/ ) | Medium Clay | 52 | 27 | 20 | 1 | <1 | 2 | 18 | <1 | <1 | 12 | <1 | <1 | 8 | 5 | <1 | 21 |
| DS07 | DS07_0.2-0.3 | 0.2-0.3 | 22/03/2022 | 2 | Black (N 2.5/ ) | Medium Clay | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS07 | DS07_0.5-0.6 | 0.5-0.6 | 22/03/2022 | 2 | Black (N 2.5/ ) | Medium Heavy Clay | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS07 | DS07_0.8-0.9 | 0.8-0.9 | 22/03/2022 | 2 | Black (N 2.5/ ) | Medium Clay | 69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS07 | DS07_1.1-1.2 | 1.1-1.2 | 22/03/2022 | 2 | Black (N 2.5/ ) | Medium Heavy Clay | 75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| | | | | | | | | | | Physical Parameters | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Emerson Class Number | Laboratory Munsell Colour | Texture | Clay (<2 µm) | Silt (2-60 µm) | Sand (0.06-2.00 mm) | Gravel (>2mm) | Cobbles (>6cm) | +1180µm | +150µm | +19.0mm | +2.36mm | +300µm | +37.5mm | +4.75mm | +425µm | +600µm | +75.0mm | +75µm |
| | | | | - | - | - | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| | | | | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Location** | **Field_ID** | **Sample_Depth** | **Date_Time** | | | | | | | | | | | | | | | | | | | |
| DS07 | DS07_1.5-1.6 | 1.5-1.6 | 22/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Clay | 74 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DS07 | DS07_1.9-2.0 | 1.9-2 | 22/03/2022 | 2 | Very Dark Gray (N 3/ ) | Medium Heavy Clay | 75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SS01 | SS01_0.0-0.3 | 0-0.3 | 23/03/2022 | 3 | Black (N 2.5/ ) | Medium Heavy Clay | 54 | 23 | 20 | 3 | <1 | 4 | 18 | <1 | 3 | 11 | <1 | 2 | 8 | 6 | <1 | 22 |
| SS02 | SS02_0.0-0.3 | 0-0.3 | 23/03/2022 | 3 | Black (N 2.5/ ) | Medium Clay | 52 | 27 | 20 | 1 | <1 | 1 | 15 | <1 | <1 | 8 | <1 | <1 | 5 | 4 | <1 | 21 |
| SS03 | SS03_0.0-0.3 | 0-0.3 | 23/03/2022 | 2 | Very Dark Gray (5Y 3/1) | Medium Heavy Clay | 56 | 25 | 19 | <1 | <1 | <1 | 14 | <1 | <1 | 7 | <1 | <1 | 5 | 3 | <1 | 18 |
| SS04 | SS04_0.0-0.3 | 0-0.3 | 23/03/2022 | 4 | Very Dark Gray (5Y 3/1) | Medium Heavy Clay | 68 | 21 | 11 | <1 | <1 | <1 | 7 | <1 | <1 | 3 | <1 | <1 | 2 | 1 | <1 | 10 |
| | **Statistical Summary** | | | | | | | | | | | | | | | | | | | | | |
| | Number of Results | | | 25 | | | 25 | 7 | 7 | 5 | 0 | 5 | 7 | 0 | 2 | 7 | 0 | 1 | 7 | 7 | 0 | 7 |
| | Maximum Concentration | | | 4 | | | 82 | 27 | 26 | 3 | 0 | 4 | 19 | 0 | 3 | 12 | 0 | 2 | 8 | 6 | 0 | 26 |
| | Minimum Concentration | | | 2 | | | 49 | 21 | 11 | 1 | 0 | 1 | 7 | 0 | 1 | 3 | 0 | 2 | 2 | 1 | 0 | 10 |
| | Average Concentration | | | 2.6 | | | 66.3 | 24.6 | 19.4 | 1.6 | | 2.2 | 15.1 | | 2.0 | 8.9 | | 2.0 | 6.0 | 4.1 | 0 | 19.9 |
| | Median Concentration | | | 2 | | | 68 | 25 | 20 | 1 | | 2 | 15 | | 2 | 10 | | 2 | 7 | 5 | 0 | 21 |
| | Standard Deviation | | | 0.866 | | | 10.506 | 2.1492 | 4.39155 | 0.8944 | | 1.0954 | 4.05909 | | 1.4142 | 3.132 | | | 2.1602 | 1.6762 | 0 | 4.94734 |

| | | | | | Chemical Parameters | | | | | | | | Nutrients | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | +9.5mm | pH (Lab) | Electrical conductivity (lab) | Moisture Content | Bulk Density | Moisture content at FC (10 kPa) | Moisture content at WP (1500 kPa) | Available Water % | Bicarbonate Ext. P (Colwell) | Colwell P (Biotrack) | Colwell P Assessment | Phosphate Buffer Index (PBI) | PBI Ranking | Organic Matter | OrganicCarbon | Total Kjeldahl Nitrogen | Nitrite + Nitrate as N | Total Nitrogen (as N) | Calcium | Magnesium |
| | | | | % | pH Units | µS/cm | % | Kg/L | % | % | % | mg/kg | mg p/kg | - | - | - | % | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| | | | | 1 | 0.1 | 1 | 0.1 | 0.1 | - | - | - | 5 | | - | - | - | 0.5 | 1.5 | 20 | 0.1 | 20 | 10 | 10 |
| **Location** | **Field_ID** | **Sample_Depth** | **Date_Time** | | | | | | | | | | | | | | | | | | | | |
| DS01 | DS01_0.0-0.1 | 0-0.1 | 23/03/2022 | <1 | 7.7 | 74 | 13.6 | 1.0 | 45.6 | 19.8 | 25.8 | 67 | 90 | Medium-high | 60 | Very Low | 2.5 | 1.4 | 1230 | 19.6 | 1250 | 30 | <10 |
| DS01 | DS01_0.2-0.3 | 0.2-0.3 | 23/03/2022 | - | 8.6 | 220 | 23.7 | 1.0 | 46.2 | 23.1 | 23.1 | <5 | 12 | Very Low | 102 | Low | 2.5 | 1.4 | 960 | 32.8 | 990 | 60 | 20 |
| DS01 | DS01_0.5-0.6 | 0.5-0.6 | 23/03/2022 | - | 8.7 | 369 | 23.3 | 1.1 | 43.3 | 22.0 | 21.3 | <5 | <2 | Very Low | 93 | Low | 2 | 1.2 | 670 | 60.8 | 730 | 40 | 20 |
| DS01 | DS01_0.8-0.9 | 0.8-0.9 | 23/03/2022 | - | 8.3 | 171 | 21.7 | - | - | - | - | - | - | - | - | | 2.9 | 1.7 | 1310 | 20.2 | 1330 | 80 | 20 |
| DS01 | DS01_1.1-1.2 | 1.1-1.2 | 23/03/2022 | - | 8.6 | 559 | 21.1 | 1.1 | 43.0 | 23.0 | 20.0 | 8 | <2 | Very Low | 81 | Low | 1.6 | 1 | 760 | 50.4 | 810 | 60 | 30 |
| DS01 | DS01_1.5-1.6 | 1.5-1.6 | 23/03/2022 | - | 8.4 | 353 | 20.1 | - | - | - | - | - | - | - | - | | 2.6 | 1.5 | 930 | 28.3 | 960 | 90 | 30 |
| DS01 | DS01_1.9-2.0 | 1.9-2 | 23/03/2022 | - | 8.3 | 1170 | 21.9 | 1.0 | 47.9 | 23.9 | 24.0 | <5 | <2 | Very Low | 55 | Very Low | 1.5 | 0.8 | 90 | 23.1 | 110 | 100 | 90 |
| DS04 | DS04_0.0-0.1 | 0-0.1 | 23/03/2022 | <1 | 6.8 | 72 | 20 | 1.0 | 46.6 | 28.0 | 18.6 | 58 | 78 | Medium-high | 101 | Low | 2.6 | 1.5 | 690 | 19.9 | 710 | <10 | <10 |
| DS04 | DS04_0.2-0.3 | 0.2-0.3 | 23/03/2022 | - | 7.3 | 83 | 25.7 | 1.0 | 49.7 | 26.7 | 23.0 | 30 | 50 | Moderate | 93 | Low | 2.2 | 1.3 | 700 | 2.6 | 700 | <10 | <10 |
| DS04 | DS04_0.5-0.6 | 0.5-0.6 | 23/03/2022 | - | 7.7 | 512 | 27.8 | 1.0 | 54.1 | 31.8 | 22.3 | 25 | 28 | Low | 68 | Very Low | 2.4 | 1.4 | 740 | 3 | 740 | 20 | 20 |
| DS04 | DS04_0.8-0.9 | 0.8-0.9 | 23/03/2022 | - | 8.1 | 694 | 26.8 | - | - | - | - | - | - | - | - | | 2 | 1.1 | 210 | 17 | 230 | 50 | 50 |
| DS04 | DS04_1.1-1.2 | 1.1-1.2 | 23/03/2022 | - | 8 | 825 | 26.2 | 1.0 | 49.0 | 31.1 | 17.9 | 34 | 23 | Low | 101 | Low | 1.2 | 0.7 | 560 | 4.9 | 560 | 90 | 80 |
| DS04 | DS04_1.5-1.6 | 1.5-1.6 | 23/03/2022 | - | 8.1 | 1020 | 26.5 | - | - | - | - | - | - | - | - | | 1.3 | 0.8 | 230 | 5.4 | 240 | 130 | 120 |
| DS04 | DS04_1.9-2.0 | 1.9-2 | 23/03/2022 | - | 8.3 | 927 | 22 | 1.0 | 52.8 | 31.3 | 21.5 | 8 | <2 | Very Low | 93 | Low | 1 | 0.6 | 100 | 1.1 | 100 | 80 | 80 |
| DS07 | DS07_0.0-0.1 | 0-0.1 | 22/03/2022 | <1 | 6.9 | 47 | 26.9 | 1.1 | 42.9 | 17.6 | 25.3 | 11 | 42 | Moderate | 74 | Low | 1.6 | 1 | 460 | 6.6 | 470 | <10 | <10 |
| DS07 | DS07_0.2-0.3 | 0.2-0.3 | 22/03/2022 | - | 6.5 | 190 | 24.1 | 1.1 | 46.3 | 22.7 | 23.6 | <5 | <2 | Very Low | 75 | Low | 1.9 | 1.1 | 440 | 21.3 | 460 | <10 | <10 |
| DS07 | DS07_0.5-0.6 | 0.5-0.6 | 22/03/2022 | - | 6.8 | 361 | 21.8 | 1.1 | 47.3 | 22.7 | 24.6 | <5 | <2 | Very Low | 55 | Very Low | 1.2 | 0.7 | 360 | 37 | 400 | <10 | <10 |
| DS07 | DS07_0.8-0.9 | 0.8-0.9 | 22/03/2022 | - | 7.7 | 583 | 22.2 | - | - | - | - | - | - | - | - | | 1.4 | 0.8 | 280 | 30.4 | 310 | 30 | 30 |
| DS07 | DS07_1.1-1.2 | 1.1-1.2 | 22/03/2022 | - | 7.4 | 525 | 20.4 | 1.1 | 47.2 | 26.6 | 20.6 | <5 | <2 | Very Low | 64 | Very Low | 1.6 | 0.9 | 270 | 29.2 | 300 | 30 | 30 |

| | | | | | Chemical Parameters | | | | | | | | Nutrients | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | +9.5mm | pH (Lab) | Electrical conductivity (lab) | Moisture Content | Bulk Density | Moisture content at FC (10 kPa) | Moisture content at WP (1500 kPa) | Available Water % | Bicarbonate Ext. P (Colwell) | Colwell P (Biotrack) | Colwell P Assessment | Phosphate Buffer Index (PBI) | PBI Ranking | Organic Matter | OrganicCarbon | Total Kjeldahl Nitrogen | Nitrite + Nitrate as N | Total Nitrogen (as N) | Calcium | Magnesium |
| | | | | % | pH Units | µS/cm | % | Kg/L | % | % | % | mg/kg | mg p/kg | - | - | - | % | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| | | | | 1 | 0.1 | 1 | 0.1 | 0.1 | - | - | - | 5 | | - | - | - | 0.5 | 1.5 | 20 | 0.1 | 20 | 10 | 10 |
| **Location** | **Field_ID** | **Sample_Depth** | **Date_Time** | | | | | | | | | | | | | | | | | | | | |
| DS07 | DS07_1.5-1.6 | 1.5-1.6 | 22/03/2022 | - | 8.2 | 741 | 19.8 | - | - | - | - | - | - | - | - | | <0.5 | 0.5 | 130 | 17.9 | 150 | 50 | 60 |
| DS07 | DS07_1.9-2.0 | 1.9-2 | 22/03/2022 | - | 8.4 | 850 | 22 | 1.1 | 50.5 | 25.1 | 25.4 | <5 | <2 | Very Low | 75 | Low | <0.5 | 0.5 | 90 | 6 | 100 | 60 | 70 |
| SS01 | SS01_0.0-0.3 | 0-0.3 | 23/03/2022 | <1 | 7.8 | 52 | 20.5 | 1.1 | 44.9 | 20.6 | 24.3 | 70 | 32 | Moderate | 90 | Low | 1.6 | 1 | 920 | 7.9 | 930 | <10 | <10 |
| SS02 | SS02_0.0-0.3 | 0-0.3 | 23/03/2022 | <1 | 8.8 | 162 | 19.4 | 1.1 | 44.2 | 20.3 | 23.9 | 39 | 20 | Low | 85 | Low | 1.8 | 1 | 1310 | 38 | 1350 | 20 | <10 |
| SS03 | SS03_0.0-0.3 | 0-0.3 | 23/03/2022 | <1 | 7 | 63 | 19.1 | 1.1 | 44.3 | 18.4 | 25.9 | 17 | 16 | Very Low | 90 | Low | 1.6 | 0.9 | 430 | 17.3 | 450 | <10 | <10 |
| SS04 | SS04_0.0-0.3 | 0-0.3 | 23/03/2022 | <1 | 8.3 | 100 | 27.9 | 1.0 | 50.6 | 27.9 | 22.7 | 24 | 21 | Low | 128 | Low | 1.7 | 1 | 540 | 5.9 | 540 | 10 | <10 |
| | **Statistical Summary** | | | | | | | | | | | | | | | | | | | | | | |
| | Number of Results | | | 0 | 25 | 25 | 25 | 19 | 19 | 19 | 19 | 12 | 11 | 0 | 19 | 0 | 23 | 25 | 25 | 25 | 25 | 18 | 15 |
| | Maximum Concentration | | | 0 | 8.8 | 1170 | 27.9 | 1.1 | 54.1 | 31.8 | 25.9 | 70 | 90 | 0 | 128 | 0 | 2.9 | 1.7 | 1310 | 60.8 | 1350 | 130 | 120 |
| | Minimum Concentration | | | 0 | 6.5 | 47 | 13.6 | 1 | 42.9 | 17.6 | 17.9 | 8 | 12 | 0 | 55 | 0 | 1 | 0.5 | 90 | 1.1 | 100 | 10 | 20 |
| | Average Concentration | | | | 7.9 | 428.9 | 22.6 | 1.1 | 47.2 | 24.3 | 22.8 | 32.6 | 37.5 | | 83.3 | | 1.9 | 1.0 | 576.4 | 20.3 | 596.8 | 57.2 | 50.0 |
| | Median Concentration | | | | 8.1 | 361 | 22 | 1.1 | 46.6 | 23.1 | 23.1 | 27.5 | 28 | | 85 | | 1.7 | 1 | 540 | 19.6 | 540 | 55 | 30 |
| | Standard Deviation | | | | 0.6663 | 345.254 | 3.36427 | 0.0513 | 3.2504 | 4.302 | 2.3457 | 22.0102 | 25.68 | | 18.753 | | 0.5256 | 0.3275 | 377.9647 | 15.50365 | 381.791 | 32.5044 | 31.6228 |

| | | | | Major Ions | | | | Exchangeable Cations | | | | | | | | Metals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Potassium | Sodium | Chloride | Sulfate as SO4 | Calcium/Magnesium Ratio | Cation Exchange Capacity | Exchangeable Calcium | Exchangeable Magnesium | Exchangeable Potassium | Exchangeable Sodium | Exchangeable Sodium Percent | Magnesium/Potassium Ratio | Boron | Copper | Iron | Manganese | Zinc |
| | | | | mg/kg | mg/kg | mg/kg | mg/kg | - | meq/100g | meq/100g | meq/100g | meq/100g | meq/100g | % | - | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| | | | | 10 | 10 | 10 | 10 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 1 | 1 | 1 | 1 |
| **Location** | **Field_ID** | **Sample_Depth** | **Date_Time** | | | | | | | | | | | | | | | | | |
| DS01 | DS01_0.0-0.1 | 0-0.1 | 23/03/2022 | 20 | 30 | <10 | 10 | 4.4 | 31.6 | 24.5 | 5.6 | 1.2 | 0.2 | 0.7 | 4.4 | 0.3 | <1 | 9.23 | 10.4 | 1.14 |
| DS01 | DS01_0.2-0.3 | 0.2-0.3 | 23/03/2022 | <10 | 200 | 30 | 100 | 2.7 | 36.8 | 25.6 | 9.4 | 0.2 | 1.5 | 4.1 | 39.7 | 0.4 | <1 | 9.98 | 4.39 | <1 |
| DS01 | DS01_0.5-0.6 | 0.5-0.6 | 23/03/2022 | <10 | 380 | 100 | 180 | 1.4 | 35.6 | 18.5 | 13 | 0.6 | 3.4 | 9.7 | 20.4 | 1 | <1 | 12.6 | 6.67 | <1 |
| DS01 | DS01_0.8-0.9 | 0.8-0.9 | 23/03/2022 | 10 | 80 | <10 | 30 | 3.8 | 31.1 | 23.6 | 6.2 | 0.8 | 0.5 | 1.7 | 8 | - | - | - | - | - |
| DS01 | DS01_1.1-1.2 | 1.1-1.2 | 23/03/2022 | <10 | 560 | 340 | 440 | 1.4 | 35.3 | 17.9 | 13.1 | 0.4 | 3.9 | 11.1 | 34.7 | 0.9 | <1 | 8.74 | 5.74 | <1 |
| DS01 | DS01_1.5-1.6 | 1.5-1.6 | 23/03/2022 | <10 | 260 | 220 | 170 | 1.8 | 34.2 | 20.1 | 10.8 | 0.5 | 2.7 | 8 | 21.9 | - | - | - | - | - |
| DS01 | DS01_1.9-2.0 | 1.9-2 | 23/03/2022 | <10 | 1130 | 1780 | 680 | 0.9 | 37.8 | 15.6 | 16.9 | 0.4 | 5 | 13.2 | 47.2 | 0.6 | <1 | 5.76 | 4.08 | <1 |
| DS04 | DS04_0.0-0.1 | 0-0.1 | 23/03/2022 | 10 | 70 | 20 | 40 | 1.3 | 33.8 | 18 | 13.4 | 1.4 | 1.1 | 3.1 | 9.8 | 0.2 | 1.72 | 50.9 | 21.3 | <1 |
| DS04 | DS04_0.2-0.3 | 0.2-0.3 | 23/03/2022 | <10 | 100 | 30 | 130 | 1.2 | 36.4 | 18.1 | 15.4 | 0.8 | 2.1 | 5.8 | 20 | 0.3 | 1.47 | 23.6 | 17.3 | <1 |
| DS04 | DS04_0.5-0.6 | 0.5-0.6 | 23/03/2022 | <10 | 570 | 400 | 730 | 1 | 42.3 | 18.7 | 18 | 1 | 4.5 | 10.7 | 17.7 | 0.6 | 1.57 | 13 | 18.6 | <1 |
| DS04 | DS04_0.8-0.9 | 0.8-0.9 | 23/03/2022 | <10 | 710 | 690 | 880 | 1 | 42.2 | 18.1 | 18.4 | 0.9 | 4.7 | 11.2 | 19.7 | - | - | - | - | - |
| DS04 | DS04_1.1-1.2 | 1.1-1.2 | 23/03/2022 | <10 | 810 | 1100 | 870 | 1.1 | 40.3 | 18.3 | 17 | 1.3 | 3.6 | 9 | 12.8 | 0.8 | 1.26 | 23.5 | 8.87 | <1 |
| DS04 | DS04_1.5-1.6 | 1.5-1.6 | 23/03/2022 | <10 | 960 | 1400 | 1020 | 0.9 | 44.6 | 18.5 | 20.1 | 1.3 | 4.6 | 10.4 | 15.6 | - | - | - | - | - |
| DS04 | DS04_1.9-2.0 | 1.9-2 | 23/03/2022 | <10 | 860 | 1050 | 840 | 0.8 | 43.4 | 17.1 | 20.2 | 1.3 | 4.8 | 11.1 | 15.8 | 0.8 | 1.04 | 11.9 | 4.12 | <1 |
| DS07 | DS07_0.0-0.1 | 0-0.1 | 22/03/2022 | <10 | 50 | 20 | 20 | 1.2 | 30.3 | 15.1 | 13 | 0.5 | 1.6 | 5.3 | 24.1 | <0.2 | 1.38 | 19.9 | 11.1 | <1 |
| DS07 | DS07_0.2-0.3 | 0.2-0.3 | 22/03/2022 | <10 | 200 | 160 | 80 | 1 | 32.8 | 14.6 | 14.7 | 0.4 | 3 | 9.2 | 34.7 | <0.2 | 2 | 38.8 | 2.88 | <1 |
| DS07 | DS07_0.5-0.6 | 0.5-0.6 | 22/03/2022 | <10 | 350 | 380 | 160 | 0.8 | 32.3 | 13.2 | 16.5 | 0.4 | 2.1 | 6.4 | 42.3 | 0.2 | 1.61 | 17.9 | 17.6 | <1 |
| DS07 | DS07_0.8-0.9 | 0.8-0.9 | 22/03/2022 | <10 | 590 | 700 | 410 | 0.8 | 34.6 | 13.8 | 16.3 | 0.5 | 4 | 11.5 | 35.1 | - | - | - | - | - |
| DS07 | DS07_1.1-1.2 | 1.1-1.2 | 22/03/2022 | <10 | 540 | 660 | 330 | 0.8 | 35.6 | 14.2 | 16.9 | 0.5 | 4 | 11.1 | 31.4 | 0.5 | <1 | 6.79 | 3.7 | <1 |

| | | | | Major Ions | | | | Exchangeable Cations | | | | | | | | Metals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Potassium | Sodium | Chloride | Sulfate as SO4 | Calcium/Magnesium Ratio | Cation Exchange Capacity | Exchangeable Calcium | Exchangeable Magnesium | Exchangeable Potassium | Exchangeable Sodium | Exchangeable Sodium Percent | Magnesium/Potassium Ratio | Boron | Copper | Iron | Manganese | Zinc |
| | | | | mg/kg | mg/kg | mg/kg | mg/kg | - | meq/100g | meq/100g | meq/100g | meq/100g | meq/100g | % | - | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| | | | | 10 | 10 | 10 | 10 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 1 | 1 | 1 | 1 |
| **Location** | **Field_ID** | **Sample_Depth** | **Date_Time** | | | | | | | | | | | | | | | | | |
| DS07 | DS07_1.5-1.6 | 1.5-1.6 | 22/03/2022 | <10 | 710 | 930 | 500 | 0.8 | 35.8 | 13.5 | 17.8 | 0.6 | 4 | 11 | 32.2 | - | - | - | - | - |
| DS07 | DS07_1.9-2.0 | 1.9-2 | 22/03/2022 | <10 | 820 | 1200 | 450 | 0.7 | 38.9 | 14.1 | 19.7 | 0.7 | 4.4 | 11.3 | 29.7 | 0.6 | <1 | 8.57 | 3.16 | <1 |
| SS01 | SS01_0.0-0.3 | 0-0.3 | 23/03/2022 | <10 | 50 | <10 | 10 | 1.8 | 29.1 | 17.6 | 9.7 | 1.4 | 0.4 | 1.6 | 6.9 | <0.2 | 1.32 | 23.6 | 14.7 | <1 |
| SS02 | SS02_0.0-0.3 | 0-0.3 | 23/03/2022 | 10 | 170 | 30 | 30 | 4 | 31.4 | 22.9 | 5.7 | 1.3 | 1.3 | 4.2 | 4.3 | 0.4 | <1 | 7.92 | 4.79 | <1 |
| SS03 | SS03_0.0-0.3 | 0-0.3 | 23/03/2022 | <10 | 70 | 40 | 10 | 1.4 | 30.7 | 16.3 | 11.8 | 0.6 | 2 | 6.5 | 20 | 0.3 | 1.28 | 19.3 | 23 | <1 |
| SS04 | SS04_0.0-0.3 | 0-0.3 | 23/03/2022 | <10 | 130 | <10 | 10 | 1.3 | 38.5 | 20.7 | 15.5 | 1 | 1.3 | 3.4 | 15.2 | 0.3 | 1.25 | 19.3 | 22.5 | <1 |
| | **Statistical Summary** | | | | | | | | | | | | | | | | | | | |
| | Number of Results | | | 4 | 25 | 21 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 16 | 11 | 19 | 19 | 1 |
| | Maximum Concentration | | | 20 | 1130 | 1780 | 1020 | 4.4 | 44.6 | 25.6 | 20.2 | 1.4 | 5 | 13.2 | 47.2 | 1 | 2 | 50.9 | 23 | 1.14 |
| | Minimum Concentration | | | 10 | 30 | 20 | 10 | 0.7 | 29.1 | 13.2 | 5.6 | 0.2 | 0.2 | 0.7 | 4.3 | 0.2 | 1.04 | 5.76 | 2.88 | 1.14 |
| | Average Concentration | | | 12.5 | 416.0 | 537.1 | 325.2 | 1.5 | 35.8 | 17.9 | 14.2 | 0.8 | 2.8 | 7.7 | 22.5 | 0.5 | 1.4 | 17.4 | 10.8 | 1.1 |
| | Median Concentration | | | 10 | 350 | 380 | 170 | 1.2 | 35.6 | 18 | 15.4 | 0.7 | 3 | 9 | 20 | 0.45 | 1.38 | 13 | 8.87 | 1.14 |
| | Standard Deviation | | | 5 | 336.5883 | 529.0382 | 333.9301 | 1.0519 | 4.33366 | 3.46579 | 4.36439 | 0.3797 | 1.5499 | 3.76 | 12.1515 | 0.2553 | 0.2665 | 11.531 | 7.24816 | #DIV/0! |

# Appendix C

## Laboratory Reports

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PROJECT:** | | | **ALS QUOTE NO.:** | BN/081/21 V2 | | **COC SEQUENCE NUMBER (Circle)** | | | | | | | Free ice / frozen ice brick receipt? | | |
| **PROJECT NUMBER:** | 60651803 | | **TASK NUMBER:** | 60651803 5.2 | | COC: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Random Sample Tempe | |
| **PROJECT MANAGER:** | Navjot Kaur | | **CONTACT PH:** | 0448901428 | | OF: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Other comment: | |
| **SAMPLER:** | | | **SAMPLER MOBILE:** | 0448901428 | **RELINQUISHED BY:** | **RECEIVED BY:** | | | | | | | | **RELINQUISHED BY:** | |
| **COC emailed to ALS? ( YES / NO)** | Yes | | **EDD FORMAT (or default):** | | | | | | | | | | | | |
| **Email Reports to** (will default to PM if no other addresses are listed): | | | | | DATE/TIME: | DATE/TIME: | | | | | | | | DATE/TIME: | |
| **Email Invoice to** (will default to PM if no other addresses are listed): | | | | | | | | | | | | | | | |

**COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:**

Environmental Division Brisbane
Work Order Reference
EB2208583

Telephone : +61-7-3243 7222

| ALS USE ONLY | SAMPLE DETAILS MATRIX: Solid(S) Water(W) | | | CONTAINER INFORMATION | | ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite. Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle require | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAB ID | SAMPLE ID | DATE / TIME | MATRIX | TYPE & PRESERVATIVE *(refer to codes below)* | TOTAL BOTTLES | Hydrometer EA150H- | Hydrometer EA150H-C, EA058 | AG - 1, NT-1S and NT-2S | ED005, ED006, EA006 | EP004, EK062, | EK080/EK081, ED091, ED092 | Moisture content at Field capacity (0.3 bar) and At Wilting Point (15 bar) | Phosphorus Buffering Index | Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. |
| 1 | DS07_0.0-0.1 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 2 | DS07_0.2-0.3 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 3 | DS07_0.5-0.6 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 4 | DS07_0.8-0.9 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |
| 5 | DS07_1.1-1.2 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 6 | DS07_1.5-1.6 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |
| 7 | DS07_1.9-2.0 | 22/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 8 | DS01_0.0-0.1 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 9 | DS01_0.2-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 10 | DS01_0.5-0.6 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 11 | DS01_0.8-0.9 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |
| 12 | DS01_1.1-1.2 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 13 | DS01_1.5-1.6 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |
| 14 | DS01_1.9-2.0 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 15 | DS04_0.0-0.1 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 16 | DS04_0.2-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 17 | DS04_0.5-0.6 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 18 | DS04_0.8-0.9 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | DS04_1.1-1.2 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 20 | DS04_1.5-1.6 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | | | | |
| 21 | DS04_1.9-2.0 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 22 | SS01_0.0-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 23 | SS02_0.0-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 24 | SS03_0.0-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 25 | SS04_0.0-0.3 | 23/03/2022 | S | Plastic bags and Glass jars | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 26 | DS03_0.0-0.1 | 22/03/2022 | S | Plastic bags and Glass jars | 1 | | | | | | | | | on Hold |
| | | | | | | | | | | | | | | |
| | | | | TOTAL | | 6 | 18 | 18 | 18 | 18 | 14 | 14 | 14 | |

***Water Container Codes:*** P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

# CHAIN OF CUSTODY

*ALS Laboratory:* ***please tick →***


☐ **Sydney**: 277 Woodpark Rd, Smithfield NSW 2176
Ph: 02 8784 8555 E:samples.sydney@alsenviro.com

☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304
Ph:02 4968 9433 E:samples.newcastle@alsenviro.com

☐ **Brisbane**: 32 Shand St, Stafford QLD 4053
Ph:07 3243 7222 E:samples.brisbane@alsenviro.com

☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
Ph:07 4796 0600 E: townsville.environmental@alsenviro.com

☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171
Ph:03 8549 9600 E: samples.melbourne@alsenviro.com

☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0890 E:adelaide@alsenviro.com

☐ **Perth**: 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com

☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com


| | | | | |
|---|---|---|---|---|
| **CLIENT:** | **AECOM** | **TURNAROUND REQUIREMENTS :** | ☐ Standard TAT **(List due date):** | **FOR LABORATORY USE ONLY (Circle)** |
| **OFFICE:** | | (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) | ☐ Non Standard or urgent TAT **(List due date):** | Custody Seal Intact? Yes No N/A |

# SAMPLE RECEIPT NOTIFICATION (SRN)

**Work Order** : **EB2208583**

| | | | |
|---|---|---|---|
| Client | : **AECOM AUSTRALIA PTY LTD** | Laboratory | : Environmental Division Brisbane |
| Contact | : MS NAVJOT KAUR | Contact | : Carsten Emrich |
| Address | : PO BOX 1307<br>FORTITUDE VALLEY QLD, AUSTRALIA 4006 | Address | : 2 Byth Street Stafford QLD Australia 4053 |
| E-mail | : navjot.kaur@aecom.com | E-mail | : carsten.emrich@alsglobal.com |
| Telephone | : +61 07 3553 2000 | Telephone | : +61 7 3552 8616 |
| Facsimile | : +61 07 3553 2050 | Facsimile | : +61-7-3243 7218 |
| Project | : 60651803 5.2 | Page | : 1 of 4 |
| Order number | : 60651803 5.2 | Quote number | : EB2021AECOMAU0002 (BN/081/21 V2) |
| C-O-C number | : ---- | QC Level | : NEPM 2013 B3 & ALS QC Standard |
| Site | : ---- | | |
| Sampler | : NAVJOT KAUR | | |

## Dates

| | | | |
|---|---|---|---|
| Date Samples Received | : 24-Mar-2022 13:15 | Issue Date | : 30-Mar-2022 |
| Client Requested Due Date | : 21-Apr-2022 | Scheduled Reporting Date | : **21-Apr-2022** |

## Delivery Details

| | | | |
|---|---|---|---|
| Mode of Delivery | : Client Drop Off | Security Seal | : Not Available |
| No. of coolers/boxes | : 11 | Temperature | : 29.0°C, 29.3°C, AMBIENT |
| Receipt Detail | : MEDIUM ESKY/BAGS | No. of samples received / analysed | : 26 / 25 |

## General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Moisture content at Field Capacity (0.3 bar), Moisture content at Wilting Point (15 bar) and Phosphorous Buffering Index testing will be subcontracted to Biotrack. Subcontracting laboratory will advise due date for results**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

## Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

## Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

| Laboratory sample ID | Sampling date / time | Sample ID | SOIL - AG-1 EB Only Agricultural Soil Suite 1 EB Only | SOIL - EA055-103 Moisture Content | SOIL - EA058 Emerson Aggregate Test | SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle | SOIL - EK062G (Solids) Total Nitrogen as N (TKN + NOx) By Discrete | SOIL - NT-1S Major Cations (Ca, Mg, Na, K) | SOIL - NT-2S Major Anions (Cl, SO4) |
|---|---|---|---|---|---|---|---|---|---|
| EB2208583-001 | 22-Mar-2022 00:00 | DS07_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-002 | 22-Mar-2022 00:00 | DS07_0.2-0.3 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-003 | 22-Mar-2022 00:00 | DS07_0.5-0.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-004 | 22-Mar-2022 00:00 | DS07_0.8-0.9 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-005 | 22-Mar-2022 00:00 | DS07_1.1-1.2 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-006 | 22-Mar-2022 00:00 | DS07_1.5-1.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-007 | 22-Mar-2022 00:00 | DS07_1.9-2.0 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-008 | 23-Mar-2022 00:00 | DS01_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-009 | 23-Mar-2022 00:00 | DS01_0.2-0.3 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-010 | 23-Mar-2022 00:00 | DS01_0.5-0.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-011 | 23-Mar-2022 00:00 | DS01_0.8-0.9 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-012 | 23-Mar-2022 00:00 | DS01_1.1-1.2 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-013 | 23-Mar-2022 00:00 | DS01_1.5-1.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-014 | 23-Mar-2022 00:00 | DS01_1.9-2.0 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-015 | 23-Mar-2022 00:00 | DS04_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-016 | 23-Mar-2022 00:00 | DS04_0.2-0.3 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-017 | 23-Mar-2022 00:00 | DS04_0.5-0.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-018 | 23-Mar-2022 00:00 | DS04_0.8-0.9 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-019 | 23-Mar-2022 00:00 | DS04_1.1-1.2 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-020 | 23-Mar-2022 00:00 | DS04_1.5-1.6 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-021 | 23-Mar-2022 00:00 | DS04_1.9-2.0 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| EB2208583-022 | 23-Mar-2022 00:00 | SS01_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-023 | 23-Mar-2022 00:00 | SS02_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-024 | 23-Mar-2022 00:00 | SS03_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-025 | 23-Mar-2022 00:00 | SS04_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Matrix: **SOIL**

| Laboratory sample ID | Sampling date / time | Sample ID | SOIL - ED091 Calcium Chloride Extractable Boron | SOIL - ED092 DTPA Extractable Metals | SOIL - EK080 Bicarbonate Extractable P (Colwell) | SOIL - EK081 Bicarbonate Extractable P (Olsen) | SOIL - EP004 (Carbon) Organic Matter & Total Organic Carbon (Calc.) | SOIL - MIS-BIOTRACK Subcontracted Tests to Biotrack | SOIL - MOI-SOL 1/3 & 15 Bar Moisture (Solid) |
|---|---|---|---|---|---|---|---|---|---|
| EB2208583-001 | 22-Mar-2022 00:00 | DS07_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-002 | 22-Mar-2022 00:00 | DS07_0.2-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-003 | 22-Mar-2022 00:00 | DS07_0.5-0.6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-004 | 22-Mar-2022 00:00 | DS07_0.8-0.9 | | | | | ✓ | | |
| EB2208583-005 | 22-Mar-2022 00:00 | DS07_1.1-1.2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-006 | 22-Mar-2022 00:00 | DS07_1.5-1.6 | | | | | ✓ | | |
| EB2208583-007 | 22-Mar-2022 00:00 | DS07_1.9-2.0 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-008 | 23-Mar-2022 00:00 | DS01_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-009 | 23-Mar-2022 00:00 | DS01_0.2-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-010 | 23-Mar-2022 00:00 | DS01_0.5-0.6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-011 | 23-Mar-2022 00:00 | DS01_0.8-0.9 | | | | | ✓ | | |
| EB2208583-012 | 23-Mar-2022 00:00 | DS01_1.1-1.2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-013 | 23-Mar-2022 00:00 | DS01_1.5-1.6 | | | | | ✓ | | |
| EB2208583-014 | 23-Mar-2022 00:00 | DS01_1.9-2.0 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-015 | 23-Mar-2022 00:00 | DS04_0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-016 | 23-Mar-2022 00:00 | DS04_0.2-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-017 | 23-Mar-2022 00:00 | DS04_0.5-0.6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-018 | 23-Mar-2022 00:00 | DS04_0.8-0.9 | | | | | ✓ | | |
| EB2208583-019 | 23-Mar-2022 00:00 | DS04_1.1-1.2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-020 | 23-Mar-2022 00:00 | DS04_1.5-1.6 | | | | | ✓ | | |
| EB2208583-021 | 23-Mar-2022 00:00 | DS04_1.9-2.0 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-022 | 23-Mar-2022 00:00 | SS01_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-023 | 23-Mar-2022 00:00 | SS02_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-024 | 23-Mar-2022 00:00 | SS03_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EB2208583-025 | 23-Mar-2022 00:00 | SS04_0.0-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Matrix: **SOIL**

| Laboratory sample ID | Sampling date / time | Sample ID | (On Hold) SOIL No analysis requested | SOIL - EA150H-C Clay Content by Hydrometer |
|---|---|---|---|---|
| EB2208583-002 | 22-Mar-2022 00:00 | DS07_0.2-0.3 | | ✓ |
| EB2208583-003 | 22-Mar-2022 00:00 | DS07_0.5-0.6 | | ✓ |
| EB2208583-004 | 22-Mar-2022 00:00 | DS07_0.8-0.9 | | ✓ |
| EB2208583-005 | 22-Mar-2022 00:00 | DS07_1.1-1.2 | | ✓ |
| EB2208583-006 | 22-Mar-2022 00:00 | DS07_1.5-1.6 | | ✓ |

| | | | (On Hold) SOIL No analysis requested | SOIL - EA150H-C Clay Content by Hydrometer |
|---|---|---|---|---|
| EB2208583-007 | 22-Mar-2022 00:00 | DS07_1.9-2.0 | | ✓ |
| EB2208583-009 | 23-Mar-2022 00:00 | DS01_0.2-0.3 | | ✓ |
| EB2208583-010 | 23-Mar-2022 00:00 | DS01_0.5-0.6 | | ✓ |
| EB2208583-011 | 23-Mar-2022 00:00 | DS01_0.8-0.9 | | ✓ |
| EB2208583-012 | 23-Mar-2022 00:00 | DS01_1.1-1.2 | | ✓ |
| EB2208583-013 | 23-Mar-2022 00:00 | DS01_1.5-1.6 | | ✓ |
| EB2208583-014 | 23-Mar-2022 00:00 | DS01_1.9-2.0 | | ✓ |
| EB2208583-016 | 23-Mar-2022 00:00 | DS04_0.2-0.3 | | ✓ |
| EB2208583-017 | 23-Mar-2022 00:00 | DS04_0.5-0.6 | | ✓ |
| EB2208583-018 | 23-Mar-2022 00:00 | DS04_0.8-0.9 | | ✓ |
| EB2208583-019 | 23-Mar-2022 00:00 | DS04_1.1-1.2 | | ✓ |
| EB2208583-020 | 23-Mar-2022 00:00 | DS04_1.5-1.6 | | ✓ |
| EB2208583-021 | 23-Mar-2022 00:00 | DS04_1.9-2.0 | | ✓ |
| EB2208583-026 | 22-Mar-2022 00:00 | DS03_0.0-0.1 | ✓ | |

## Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

## Requested Deliverables

**ACCOUNTS PAYABLE**

| | | |
|---|---|---|
| - A4 - AU Tax Invoice (INV) | Email | AP_CustomerService.ANZ@aecom.com |

**NAVJOT KAUR**

| | | |
|---|---|---|
| - *AU Certificate of Analysis - NATA (COA) | Email | navjot.kaur@aecom.com |
| - *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) | Email | navjot.kaur@aecom.com |
| - *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) | Email | navjot.kaur@aecom.com |
| - A4 - AU Sample Receipt Notification - Environmental HT (SRN) | Email | navjot.kaur@aecom.com |
| - A4 - AU Tax Invoice (INV) | Email | navjot.kaur@aecom.com |
| - Attachment - Report (SUBCO) | Email | navjot.kaur@aecom.com |
| - Chain of Custody (CoC) (COC) | Email | navjot.kaur@aecom.com |
| - EDI Format - ENMRG (ENMRG) | Email | navjot.kaur@aecom.com |
| - EDI Format - ESDAT (ESDAT) | Email | navjot.kaur@aecom.com |

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **EB2208583** | Page | : 1 of 16 |
| Client | : **AECOM AUSTRALIA PTY LTD** | Laboratory | : Environmental Division Brisbane |
| Contact | : MS NAVJOT KAUR | Contact | : Carsten Emrich |
| Address | : PO BOX 1307<br>FORTITUDE VALLEY QLD, AUSTRALIA 4006 | Address | : 2 Byth Street Stafford QLD Australia 4053 |
| Telephone | : +61 07 3553 2000 | Telephone | : +61 7 3552 8616 |
| Project | : 60651803 5.2 | Date Samples Received | : 24-Mar-2022 13:15 |
| Order number | : 60651803 5.2 | Date Analysis Commenced | : 30-Mar-2022 |
| C-O-C number | : ---- | Issue Date | : 21-Apr-2022 17:30 |
| Sampler | : NAVJOT KAUR | | |
| Site | : ---- | | |
| Quote number | : BN/081/21 V2 | | |
| No. of samples received | : 26 | | |
| No. of samples analysed | : 25 | | |

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* |
|---|---|---|
| Ben Felgendrejeris | Senior Acid Sulfate Soil Chemist | Brisbane Acid Sulphate Soils, Stafford, QLD |
| Ben Felgendrejeris | Senior Acid Sulfate Soil Chemist | Brisbane Inorganics, Stafford, QLD |
| Mark Hallas | Senior Inorganic Chemist | Brisbane Acid Sulphate Soils, 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 Contact 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.

- 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.
- EK061G (Total Kjeldahl Nitrogen as N): Sample EB2208583-022 (SS01_0.0-0.3) shows poor matrix spike recovery due to sample heterogeneity. Confirmed by visual inspection.
- EK081 (Bicarbonate Extractable Phosphorus): Insufficient sample has been provided for standard analysis on sample DS07_0.2-0.3 (EB2208583-002). The limit of reporting has been adjusted accordingly.
- 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+ + Al3+).

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS07_0.0-0.1 | DS07_0.2-0.3 | DS07_0.5-0.6 | DS07_0.8-0.9 | DS07_1.1-1.2 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-001 | EB2208583-002 | EB2208583-003 | EB2208583-004 | EB2208583-005 |
| | | | | Result | Result | Result | Result | Result |
| **EA002: pH 1:5 (Soils)** | | | | | | | | |
| pH Value | ---- | 0.1 | pH Unit | 6.9 | 6.5 | 6.8 | 7.7 | 7.4 |
| **EA010: Conductivity (1:5)** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 47 | 190 | 361 | 583 | 525 |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | | |
| Moisture Content | ---- | 1.0 | % | 26.9 | 24.1 | 21.8 | 22.2 | 20.4 |
| **EA058: Emerson Aggregate Test** | | | | | | | | |
| Color (Munsell) | ---- | - | - | Black (N 2.5/ ) | Black (N 2.5/ ) | Black (N 2.5/ ) | Black (N 2.5/ ) | Black (N 2.5/ ) |
| Texture | ---- | - | - | Medium Clay | Medium Clay | Medium Heavy Clay | Medium Clay | Medium Heavy Clay |
| Emerson Class Number | EC/TC | - | - | 2 | 2 | 2 | 2 | 2 |
| **EA150: Particle Sizing** | | | | | | | | |
| +75µm | ---- | 1 | % | 21 | ---- | ---- | ---- | ---- |
| +150µm | ---- | 1 | % | 18 | ---- | ---- | ---- | ---- |
| +300µm | ---- | 1 | % | 12 | ---- | ---- | ---- | ---- |
| +425µm | ---- | 1 | % | 8 | ---- | ---- | ---- | ---- |
| +600µm | ---- | 1 | % | 5 | ---- | ---- | ---- | ---- |
| +1180µm | ---- | 1 | % | 2 | ---- | ---- | ---- | ---- |
| +2.36mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| +4.75mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| +9.5mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| +19.0mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| +37.5mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| +75.0mm | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| **EA150: Soil Classification based on Particle Size** | | | | | | | | |
| Clay (<2 µm) | ---- | 1 | % | 52 | 60 | 60 | 69 | 75 |
| Silt (2-60 µm) | ---- | 1 | % | 27 | ---- | ---- | ---- | ---- |
| Sand (0.06-2.00 mm) | ---- | 1 | % | 20 | ---- | ---- | ---- | ---- |
| Gravel (>2mm) | ---- | 1 | % | 1 | ---- | ---- | ---- | ---- |
| Cobbles (>6cm) | ---- | 1 | % | <1 | ---- | ---- | ---- | ---- |
| **EA152: Soil Particle Density** | | | | | | | | |
| Soil Particle Density (Clay/Silt/Sand) | ---- | 0.01 | g/cm3 | 2.71 | 2.70 | 2.64 | 2.70 | 2.70 |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | | |
| ø Exchangeable Calcium | ---- | 0.2 | meq/100g | ---- | ---- | ---- | 13.8 | 14.2 |
| ø Exchangeable Magnesium | ---- | 0.2 | meq/100g | ---- | ---- | ---- | 16.3 | 16.9 |
| ø Exchangeable Potassium | ---- | 0.2 | meq/100g | ---- | ---- | ---- | 0.5 | 0.5 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS07_0.0-0.1 | DS07_0.2-0.3 | DS07_0.5-0.6 | DS07_0.8-0.9 | DS07_1.1-1.2 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-001 | EB2208583-002 | EB2208583-003 | EB2208583-004 | EB2208583-005 |
| | | | | Result | Result | Result | Result | Result |
| **ED006: Exchangeable Cations on Alkaline Soils - Continued** | | | | | | | | |
| ø Exchangeable Sodium | ---- | 0.2 | meq/100g | ---- | ---- | ---- | 4.0 | 4.0 |
| ø Cation Exchange Capacity | ---- | 0.2 | meq/100g | ---- | ---- | ---- | 34.6 | 35.6 |
| ø Exchangeable Sodium Percent | ---- | 0.2 | % | ---- | ---- | ---- | 11.5 | 11.1 |
| ø Calcium/Magnesium Ratio | ---- | 0.2 | - | ---- | ---- | ---- | 0.8 | 0.8 |
| ø Magnesium/Potassium Ratio | ---- | 0.2 | - | ---- | ---- | ---- | 35.1 | 31.4 |
| **ED007: Exchangeable Cations** | | | | | | | | |
| Exchangeable Calcium | ---- | 0.1 | meq/100g | 15.1 | 14.6 | ---- | ---- | ---- |
| Exchangeable Magnesium | ---- | 0.1 | meq/100g | 13.0 | 14.7 | ---- | ---- | ---- |
| Exchangeable Potassium | ---- | 0.1 | meq/100g | 0.5 | 0.4 | ---- | ---- | ---- |
| Exchangeable Sodium | ---- | 0.1 | meq/100g | 1.6 | 3.0 | ---- | ---- | ---- |
| Cation Exchange Capacity | ---- | 0.1 | meq/100g | 30.3 | 32.8 | ---- | ---- | ---- |
| Exchangeable Sodium Percent | ---- | 0.1 | % | 5.3 | 9.2 | ---- | ---- | ---- |
| Calcium/Magnesium Ratio | ---- | 0.1 | - | 1.2 | 1.0 | ---- | ---- | ---- |
| Magnesium/Potassium Ratio | ---- | 0.1 | - | 24.1 | 34.7 | ---- | ---- | ---- |
| **ED008: Exchangeable Cations** | | | | | | | | |
| Exchangeable Calcium | ---- | 0.1 | meq/100g | ---- | ---- | 13.2 | ---- | ---- |
| Exchangeable Magnesium | ---- | 0.1 | meq/100g | ---- | ---- | 16.5 | ---- | ---- |
| Exchangeable Potassium | ---- | 0.1 | meq/100g | ---- | ---- | 0.4 | ---- | ---- |
| Exchangeable Sodium | ---- | 0.1 | meq/100g | ---- | ---- | 2.1 | ---- | ---- |
| Cation Exchange Capacity | ---- | 0.1 | meq/100g | ---- | ---- | 32.3 | ---- | ---- |
| Exchangeable Sodium Percent | ---- | 0.1 | % | ---- | ---- | 6.4 | ---- | ---- |
| Calcium/Magnesium Ratio | ---- | 0.1 | - | ---- | ---- | 0.8 | ---- | ---- |
| Magnesium/Potassium Ratio | ---- | 0.1 | - | ---- | ---- | 42.3 | ---- | ---- |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | | |
| Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 20 | 80 | 160 | 410 | 330 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 10 | mg/kg | 20 | 160 | 380 | 700 | 660 |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | | |
| ø Boron | 7440-42-8 | 0.2 | mg/kg | <0.2 | <0.2 | 0.2 | ---- | 0.5 |
| **ED092: DTPA Extractable Metals** | | | | | | | | |
| ø Copper | 7440-50-8 | 1.00 | mg/kg | 1.38 | 2.00 | 1.61 | ---- | <1.00 |
| ø Iron | 7439-89-6 | 1.00 | mg/kg | 19.9 | 38.8 | 17.9 | ---- | 6.79 |
| ø Manganese | 7439-96-5 | 1.00 | mg/kg | 11.1 | 2.88 | 17.6 | ---- | 3.70 |
| ø Zinc | 7440-66-6 | 1.00 | mg/kg | <1.00 | <1.00 | <1.00 | ---- | <1.00 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Sample ID | DS07_0.0-0.1 | DS07_0.2-0.3 | DS07_0.5-0.6 | DS07_0.8-0.9 | DS07_1.1-1.2 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | | EB2208583-001 | EB2208583-002 | EB2208583-003 | EB2208583-004 | EB2208583-005 |
| | | | | | Result | Result | Result | Result | Result |
| **ED093S: Soluble Major Cations** | | | | | | | | | |
| Calcium | 7440-70-2 | 10 | mg/kg | | <10 | <10 | <10 | 30 | 30 |
| Magnesium | 7439-95-4 | 10 | mg/kg | | <10 | <10 | <10 | 30 | 30 |
| Sodium | 7440-23-5 | 10 | mg/kg | | 50 | 200 | 350 | 590 | 540 |
| Potassium | 7440-09-7 | 10 | mg/kg | | <10 | <10 | <10 | <10 | <10 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | | |
| Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | | 6.6 | 21.3 | 37.0 | 30.4 | 29.2 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | | 460 | 440 | 360 | 280 | 270 |
| **EK062: Total Nitrogen as N (TKN + NOx)** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 20 | mg/kg | | 470 | 460 | 400 | 310 | 300 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | | | |
| Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | | 11 | <5 | <5 | ---- | <5 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | | | |
| Bicarbonate Extractable P (Olsen) | ---- | 1.0 | mg/kg | | 5.2 | <2.0 | <1.0 | ---- | <1.0 |
| **EP004: Organic Matter** | | | | | | | | | |
| Organic Matter | ---- | 0.5 | % | | 1.6 | 1.9 | 1.2 | 1.4 | 1.6 |
| Total Organic Carbon | ---- | 0.5 | % | | 1.0 | 1.1 | 0.7 | 0.8 | 0.9 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS07_1.5-1.6 | DS07_1.9-2.0 | DS01_0.0-0.1 | DS01_0.2-0.3 | DS01_0.5-0.6 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-006 | EB2208583-007 | EB2208583-008 | EB2208583-009 | EB2208583-010 |
| | | | | Result | Result | Result | Result | Result |
| **EA002: pH 1:5 (Soils)** | | | | | | | | |
| pH Value | ---- | 0.1 | pH Unit | 8.2 | 8.4 | 7.7 | 8.6 | 8.7 |
| **EA010: Conductivity (1:5)** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 741 | 850 | 74 | 220 | 369 |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | | |
| Moisture Content | ---- | 1.0 | % | 19.8 | 22.0 | 13.6 | 23.7 | 23.3 |
| **EA058: Emerson Aggregate Test** | | | | | | | | |
| Color (Munsell) | ---- | - | - | Very Dark Gray (N 3/ ) | Very Dark Gray (N 3/ ) | Black (N 2.5/ ) | Very Dark Gray (N 3/ ) | Very Dark Gray (N 3/ ) |
| Texture | ---- | - | - | Medium Clay | Medium Heavy Clay | Medium Clay | Medium Clay | Light Medium Clay |
| Emerson Class Number | EC/TC | - | - | 2 | 2 | 4 | 4 | 4 |
| **EA150: Particle Sizing** | | | | | | | | |
| +75µm | ---- | 1 | % | ---- | ---- | 26 | ---- | ---- |
| +150µm | ---- | 1 | % | ---- | ---- | 19 | ---- | ---- |
| +300µm | ---- | 1 | % | ---- | ---- | 11 | ---- | ---- |
| +425µm | ---- | 1 | % | ---- | ---- | 7 | ---- | ---- |
| +600µm | ---- | 1 | % | ---- | ---- | 5 | ---- | ---- |
| +1180µm | ---- | 1 | % | ---- | ---- | 2 | ---- | ---- |
| +2.36mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| +4.75mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| +9.5mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| +19.0mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| +37.5mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| +75.0mm | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| **EA150: Soil Classification based on Particle Size** | | | | | | | | |
| Clay (<2 µm) | ---- | 1 | % | 74 | 75 | 49 | 69 | 68 |
| Silt (2-60 µm) | ---- | 1 | % | ---- | ---- | 24 | ---- | ---- |
| Sand (0.06-2.00 mm) | ---- | 1 | % | ---- | ---- | 26 | ---- | ---- |
| Gravel (>2mm) | ---- | 1 | % | ---- | ---- | 1 | ---- | ---- |
| Cobbles (>6cm) | ---- | 1 | % | ---- | ---- | <1 | ---- | ---- |
| **EA152: Soil Particle Density** | | | | | | | | |
| Soil Particle Density (Clay/Silt/Sand) | ---- | 0.01 | g/cm3 | 2.71 | 2.74 | 2.61 | 2.59 | 2.62 |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | | |
| ø Exchangeable Calcium | ---- | 0.2 | meq/100g | 13.5 | 14.1 | 24.5 | 25.6 | 18.5 |
| ø Exchangeable Magnesium | ---- | 0.2 | meq/100g | 17.8 | 19.7 | 5.6 | 9.4 | 13.0 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS07_1.5-1.6 | DS07_1.9-2.0 | DS01_0.0-0.1 | DS01_0.2-0.3 | DS01_0.5-0.6 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-006 | EB2208583-007 | EB2208583-008 | EB2208583-009 | EB2208583-010 |
| | | | | Result | Result | Result | Result | Result |
| **ED006: Exchangeable Cations on Alkaline Soils - Continued** | | | | | | | | |
| ø Exchangeable Potassium | ---- | 0.2 | meq/100g | 0.6 | 0.7 | 1.2 | 0.2 | 0.6 |
| ø Exchangeable Sodium | ---- | 0.2 | meq/100g | 4.0 | 4.4 | 0.2 | 1.5 | 3.4 |
| ø Cation Exchange Capacity | ---- | 0.2 | meq/100g | 35.8 | 38.9 | 31.6 | 36.8 | 35.6 |
| ø Exchangeable Sodium Percent | ---- | 0.2 | % | 11.0 | 11.3 | 0.7 | 4.1 | 9.7 |
| ø Calcium/Magnesium Ratio | ---- | 0.2 | - | 0.8 | 0.7 | 4.4 | 2.7 | 1.4 |
| ø Magnesium/Potassium Ratio | ---- | 0.2 | - | 32.2 | 29.7 | 4.4 | 39.7 | 20.4 |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | | |
| Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 500 | 450 | 10 | 100 | 180 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 10 | mg/kg | 930 | 1200 | <10 | 30 | 100 |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | | |
| ø Boron | 7440-42-8 | 0.2 | mg/kg | ---- | 0.6 | 0.3 | 0.4 | 1.0 |
| **ED092: DTPA Extractable Metals** | | | | | | | | |
| ø Copper | 7440-50-8 | 1.00 | mg/kg | ---- | <1.00 | <1.00 | <1.00 | <1.00 |
| ø Iron | 7439-89-6 | 1.00 | mg/kg | ---- | 8.57 | 9.23 | 9.98 | 12.6 |
| ø Manganese | 7439-96-5 | 1.00 | mg/kg | ---- | 3.16 | 10.4 | 4.39 | 6.67 |
| ø Zinc | 7440-66-6 | 1.00 | mg/kg | ---- | <1.00 | 1.14 | <1.00 | <1.00 |
| **ED093S: Soluble Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 10 | mg/kg | 50 | 60 | 30 | 60 | 40 |
| Magnesium | 7439-95-4 | 10 | mg/kg | 60 | 70 | <10 | 20 | 20 |
| Sodium | 7440-23-5 | 10 | mg/kg | 710 | 820 | 30 | 200 | 380 |
| Potassium | 7440-09-7 | 10 | mg/kg | <10 | <10 | 20 | <10 | <10 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 17.9 | 6.0 | 19.6 | 32.8 | 60.8 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 130 | 90 | 1230 | 960 | 670 |
| **EK062: Total Nitrogen as N (TKN + NOx)** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 20 | mg/kg | 150 | 100 | 1250 | 990 | 730 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | | |
| Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | ---- | <5 | 67 | <5 | <5 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | | |
| Bicarbonate Extractable P (Olsen) | ---- | 1.0 | mg/kg | ---- | <1.0 | 29.4 | 1.2 | 1.4 |
| **EP004: Organic Matter** | | | | | | | | |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Sample ID | DS07_1.5-1.6 | DS07_1.9-2.0 | DS01_0.0-0.1 | DS01_0.2-0.3 | DS01_0.5-0.6 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 22-Mar-2022 00:00 | 22-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | | EB2208583-006 | EB2208583-007 | EB2208583-008 | EB2208583-009 | EB2208583-010 |
| | | | | | Result | Result | Result | Result | Result |
| **EP004: Organic Matter - Continued** | | | | | | | | | |
| **Organic Matter** | ---- | 0.5 | % | | <0.5 | <0.5 | **2.5** | **2.5** | **2.0** |
| **Total Organic Carbon** | ---- | 0.5 | % | | <0.5 | <0.5 | **1.4** | **1.4** | **1.2** |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS01_0.8-0.9 | DS01_1.1-1.2 | DS01_1.5-1.6 | DS01_1.9-2.0 | DS04_0.0-0.1 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-011 | EB2208583-012 | EB2208583-013 | EB2208583-014 | EB2208583-015 |
| | | | | Result | Result | Result | Result | Result |
| **EA002: pH 1:5 (Soils)** | | | | | | | | |
| pH Value | ---- | 0.1 | pH Unit | 8.3 | 8.6 | 8.4 | 8.3 | 6.8 |
| **EA010: Conductivity (1:5)** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 171 | 559 | 353 | 1170 | 72 |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | | |
| Moisture Content | ---- | 1.0 | % | 21.7 | 21.1 | 20.1 | 21.9 | 20.0 |
| **EA058: Emerson Aggregate Test** | | | | | | | | |
| Color (Munsell) | ---- | - | - | Very Dark Gray (N 3/ ) | Very Dark Gray (N 3/ ) | Black (N 2.5/ ) | Very Dark Gray (N 3/ ) | Black (N 2.5/ ) |
| Texture | ---- | - | - | Medium Clay | Medium Clay | Medium Clay | Medium Clay | Medium Heavy Clay |
| Emerson Class Number | EC/TC | - | - | 4 | 2 | 4 | 2 | 3 |
| **EA150: Particle Sizing** | | | | | | | | |
| +75µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 21 |
| +150µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 15 |
| +300µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 10 |
| +425µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 7 |
| +600µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 5 |
| +1180µm | ---- | 1 | % | ---- | ---- | ---- | ---- | 2 |
| +2.36mm | ---- | 1 | % | ---- | ---- | ---- | ---- | 1 |
| +4.75mm | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| +9.5mm | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| +19.0mm | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| +37.5mm | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| +75.0mm | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| **EA150: Soil Classification based on Particle Size** | | | | | | | | |
| Clay (<2 µm) | ---- | 1 | % | 51 | 69 | 68 | 77 | 53 |
| Silt (2-60 µm) | ---- | 1 | % | ---- | ---- | ---- | ---- | 25 |
| Sand (0.06-2.00 mm) | ---- | 1 | % | ---- | ---- | ---- | ---- | 20 |
| Gravel (>2mm) | ---- | 1 | % | ---- | ---- | ---- | ---- | 2 |
| Cobbles (>6cm) | ---- | 1 | % | ---- | ---- | ---- | ---- | <1 |
| **EA152: Soil Particle Density** | | | | | | | | |
| Soil Particle Density (Clay/Silt/Sand) | ---- | 0.01 | g/cm3 | 2.63 | 2.65 | 2.73 | 2.80 | 2.64 |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | | |
| ø Exchangeable Calcium | ---- | 0.2 | meq/100g | 23.6 | 17.9 | 20.1 | 15.6 | ---- |
| ø Exchangeable Magnesium | ---- | 0.2 | meq/100g | 6.2 | 13.1 | 10.8 | 16.9 | ---- |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS01_0.8-0.9 | DS01_1.1-1.2 | DS01_1.5-1.6 | DS01_1.9-2.0 | DS04_0.0-0.1 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-011 | EB2208583-012 | EB2208583-013 | EB2208583-014 | EB2208583-015 |
| | | | | Result | Result | Result | Result | Result |
| **ED006: Exchangeable Cations on Alkaline Soils - Continued** | | | | | | | | |
| ø Exchangeable Potassium | ---- | 0.2 | meq/100g | 0.8 | 0.4 | 0.5 | 0.4 | ---- |
| ø Exchangeable Sodium | ---- | 0.2 | meq/100g | 0.5 | 3.9 | 2.7 | 5.0 | ---- |
| ø Cation Exchange Capacity | ---- | 0.2 | meq/100g | 31.1 | 35.3 | 34.2 | 37.8 | ---- |
| ø Exchangeable Sodium Percent | ---- | 0.2 | % | 1.7 | 11.1 | 8.0 | 13.2 | ---- |
| ø Calcium/Magnesium Ratio | ---- | 0.2 | - | 3.8 | 1.4 | 1.8 | 0.9 | ---- |
| ø Magnesium/Potassium Ratio | ---- | 0.2 | - | 8.0 | 34.7 | 21.9 | 47.2 | ---- |
| **ED007: Exchangeable Cations** | | | | | | | | |
| Exchangeable Calcium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | ---- | 18.0 |
| Exchangeable Magnesium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | ---- | 13.4 |
| Exchangeable Potassium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | ---- | 1.4 |
| Exchangeable Sodium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | ---- | 1.1 |
| Cation Exchange Capacity | ---- | 0.1 | meq/100g | ---- | ---- | ---- | ---- | 33.8 |
| Exchangeable Sodium Percent | ---- | 0.1 | % | ---- | ---- | ---- | ---- | 3.1 |
| Calcium/Magnesium Ratio | ---- | 0.1 | - | ---- | ---- | ---- | ---- | 1.3 |
| Magnesium/Potassium Ratio | ---- | 0.1 | - | ---- | ---- | ---- | ---- | 9.8 |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | | |
| Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 30 | 440 | 170 | 680 | 40 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 10 | mg/kg | <10 | 340 | 220 | 1780 | 20 |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | | |
| ø Boron | 7440-42-8 | 0.2 | mg/kg | ---- | 0.9 | ---- | 0.6 | 0.2 |
| **ED092: DTPA Extractable Metals** | | | | | | | | |
| ø Copper | 7440-50-8 | 1.00 | mg/kg | ---- | <1.00 | ---- | <1.00 | 1.72 |
| ø Iron | 7439-89-6 | 1.00 | mg/kg | ---- | 8.74 | ---- | 5.76 | 50.9 |
| ø Manganese | 7439-96-5 | 1.00 | mg/kg | ---- | 5.74 | ---- | 4.08 | 21.3 |
| ø Zinc | 7440-66-6 | 1.00 | mg/kg | ---- | <1.00 | ---- | <1.00 | <1.00 |
| **ED093S: Soluble Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 10 | mg/kg | 80 | 60 | 90 | 100 | <10 |
| Magnesium | 7439-95-4 | 10 | mg/kg | 20 | 30 | 30 | 90 | <10 |
| Sodium | 7440-23-5 | 10 | mg/kg | 80 | 560 | 260 | 1130 | 70 |
| Potassium | 7440-09-7 | 10 | mg/kg | 10 | <10 | <10 | <10 | 10 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 20.2 | 50.4 | 28.3 | 23.1 | 19.9 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Sample ID | DS01_0.8-0.9 | DS01_1.1-1.2 | DS01_1.5-1.6 | DS01_1.9-2.0 | DS04_0.0-0.1 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | | EB2208583-011 | EB2208583-012 | EB2208583-013 | EB2208583-014 | EB2208583-015 |
| | | | | | Result | Result | Result | Result | Result |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | | 1310 | 760 | 930 | 90 | 690 |
| **EK062: Total Nitrogen as N (TKN + NOx)** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 20 | mg/kg | | 1330 | 810 | 960 | 110 | 710 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | | | |
| Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | | ---- | 8 | ---- | <5 | 58 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | | | |
| Bicarbonate Extractable P (Olsen) | ---- | 1.0 | mg/kg | | ---- | 3.4 | ---- | <1.0 | 19.8 |
| **EP004: Organic Matter** | | | | | | | | | |
| Organic Matter | ---- | 0.5 | % | | 2.9 | 1.6 | 2.6 | 1.5 | 2.6 |
| Total Organic Carbon | ---- | 0.5 | % | | 1.7 | 1.0 | 1.5 | 0.8 | 1.5 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS04_0.2-0.3 | DS04_0.5-0.6 | DS04_0.8-0.9 | DS04_1.1-1.2 | DS04_1.5-1.6 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-016 | EB2208583-017 | EB2208583-018 | EB2208583-019 | EB2208583-020 |
| | | | | Result | Result | Result | Result | Result |
| **EA002: pH 1:5 (Soils)** | | | | | | | | |
| pH Value | ---- | 0.1 | pH Unit | 7.3 | 7.7 | 8.1 | 8.0 | 8.1 |
| **EA010: Conductivity (1:5)** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 83 | 512 | 694 | 825 | 1020 |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | | |
| Moisture Content | ---- | 1.0 | % | 25.7 | 27.8 | 26.8 | 26.2 | 26.5 |
| **EA058: Emerson Aggregate Test** | | | | | | | | |
| Color (Munsell) | ---- | - | - | Black (N 2.5/ ) | Black (N 2.5/ ) | Black (N 2.5/ ) | Very Dark Gray (N 3/ ) | Very Dark Gray (N 3/ ) |
| Texture | ---- | - | - | Medium Heavy Clay | Medium Clay | Medium Heavy Clay | Medium Heavy Clay | Medium Heavy Clay |
| Emerson Class Number | EC/TC | - | - | 2 | 2 | 2 | 2 | 2 |
| **EA150: Soil Classification based on Particle Size** | | | | | | | | |
| Clay (<2 µm) | ---- | 1 | % | 64 | 78 | 80 | 73 | 81 |
| **EA152: Soil Particle Density** | | | | | | | | |
| Soil Particle Density (Clay/Silt/Sand) | ---- | 0.01 | g/cm3 | 2.68 | 2.73 | 2.73 | 2.77 | 2.70 |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | | |
| ø Exchangeable Calcium | ---- | 0.2 | meq/100g | ---- | 18.7 | 18.1 | 18.3 | 18.5 |
| ø Exchangeable Magnesium | ---- | 0.2 | meq/100g | ---- | 18.0 | 18.4 | 17.0 | 20.1 |
| ø Exchangeable Potassium | ---- | 0.2 | meq/100g | ---- | 1.0 | 0.9 | 1.3 | 1.3 |
| ø Exchangeable Sodium | ---- | 0.2 | meq/100g | ---- | 4.5 | 4.7 | 3.6 | 4.6 |
| ø Cation Exchange Capacity | ---- | 0.2 | meq/100g | ---- | 42.3 | 42.2 | 40.3 | 44.6 |
| ø Exchangeable Sodium Percent | ---- | 0.2 | % | ---- | 10.7 | 11.2 | 9.0 | 10.4 |
| ø Calcium/Magnesium Ratio | ---- | 0.2 | - | ---- | 1.0 | 1.0 | 1.1 | 0.9 |
| ø Magnesium/Potassium Ratio | ---- | 0.2 | - | ---- | 17.7 | 19.7 | 12.8 | 15.6 |
| **ED007: Exchangeable Cations** | | | | | | | | |
| Exchangeable Calcium | ---- | 0.1 | meq/100g | 18.1 | ---- | ---- | ---- | ---- |
| Exchangeable Magnesium | ---- | 0.1 | meq/100g | 15.4 | ---- | ---- | ---- | ---- |
| Exchangeable Potassium | ---- | 0.1 | meq/100g | 0.8 | ---- | ---- | ---- | ---- |
| Exchangeable Sodium | ---- | 0.1 | meq/100g | 2.1 | ---- | ---- | ---- | ---- |
| Cation Exchange Capacity | ---- | 0.1 | meq/100g | 36.4 | ---- | ---- | ---- | ---- |
| Exchangeable Sodium Percent | ---- | 0.1 | % | 5.8 | ---- | ---- | ---- | ---- |
| Calcium/Magnesium Ratio | ---- | 0.1 | - | 1.2 | ---- | ---- | ---- | ---- |
| Magnesium/Potassium Ratio | ---- | 0.1 | - | 20.0 | ---- | ---- | ---- | ---- |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | | |
| Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 130 | 730 | 880 | 870 | 1020 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS04_0.2-0.3 | DS04_0.5-0.6 | DS04_0.8-0.9 | DS04_1.1-1.2 | DS04_1.5-1.6 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-016 | EB2208583-017 | EB2208583-018 | EB2208583-019 | EB2208583-020 |
| | | | | Result | Result | Result | Result | Result |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 10 | mg/kg | 30 | 400 | 690 | 1100 | 1400 |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | | |
| ø Boron | 7440-42-8 | 0.2 | mg/kg | 0.3 | 0.6 | ---- | 0.8 | ---- |
| **ED092: DTPA Extractable Metals** | | | | | | | | |
| ø Copper | 7440-50-8 | 1.00 | mg/kg | 1.47 | 1.57 | ---- | 1.26 | ---- |
| ø Iron | 7439-89-6 | 1.00 | mg/kg | 23.6 | 13.0 | ---- | 23.5 | ---- |
| ø Manganese | 7439-96-5 | 1.00 | mg/kg | 17.3 | 18.6 | ---- | 8.87 | ---- |
| ø Zinc | 7440-66-6 | 1.00 | mg/kg | <1.00 | <1.00 | ---- | <1.00 | ---- |
| **ED093S: Soluble Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 10 | mg/kg | <10 | 20 | 50 | 90 | 130 |
| Magnesium | 7439-95-4 | 10 | mg/kg | <10 | 20 | 50 | 80 | 120 |
| Sodium | 7440-23-5 | 10 | mg/kg | 100 | 570 | 710 | 810 | 960 |
| Potassium | 7440-09-7 | 10 | mg/kg | <10 | <10 | <10 | <10 | <10 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 2.6 | 3.0 | 17.0 | 4.9 | 5.4 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 700 | 740 | 210 | 560 | 230 |
| **EK062: Total Nitrogen as N (TKN + NOx)** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 20 | mg/kg | 700 | 740 | 230 | 560 | 240 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | | |
| Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | 30 | 25 | ---- | 34 | ---- |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | | |
| Bicarbonate Extractable P (Olsen) | ---- | 1.0 | mg/kg | 11.2 | 10.5 | ---- | 12.6 | ---- |
| **EP004: Organic Matter** | | | | | | | | |
| Organic Matter | ---- | 0.5 | % | 2.2 | 2.4 | 2.0 | 1.2 | 1.3 |
| Total Organic Carbon | ---- | 0.5 | % | 1.3 | 1.4 | 1.1 | 0.7 | 0.8 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS04_1.9-2.0 | SS01_0.0-0.3 | SS02_0.0-0.3 | SS03_0.0-0.3 | SS04_0.0-0.3 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-021 | EB2208583-022 | EB2208583-023 | EB2208583-024 | EB2208583-025 |
| | | | | Result | Result | Result | Result | Result |
| **EA002: pH 1:5 (Soils)** | | | | | | | | |
| pH Value | ---- | 0.1 | pH Unit | 8.3 | 7.8 | 8.8 | 7.0 | 8.3 |
| **EA010: Conductivity (1:5)** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 927 | 52 | 162 | 63 | 100 |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | | |
| Moisture Content | ---- | 1.0 | % | 22.0 | 20.5 | 19.4 | 19.1 | 27.9 |
| **EA058: Emerson Aggregate Test** | | | | | | | | |
| Color (Munsell) | ---- | - | - | Very Dark Gray (N 3/ ) | Black (N 2.5/ ) | Black (N 2.5/ ) | Very Dark Gray (5Y 3/1) | Very Dark Gray (5Y 3/1) |
| Texture | ---- | - | - | Medium Heavy Clay | Medium Heavy Clay | Medium Clay | Medium Heavy Clay | Medium Heavy Clay |
| Emerson Class Number | EC/TC | - | - | 2 | 3 | 3 | 2 | 4 |
| **EA150: Particle Sizing** | | | | | | | | |
| +75µm | ---- | 1 | % | ---- | 22 | 21 | 18 | 10 |
| +150µm | ---- | 1 | % | ---- | 18 | 15 | 14 | 7 |
| +300µm | ---- | 1 | % | ---- | 11 | 8 | 7 | 3 |
| +425µm | ---- | 1 | % | ---- | 8 | 5 | 5 | 2 |
| +600µm | ---- | 1 | % | ---- | 6 | 4 | 3 | 1 |
| +1180µm | ---- | 1 | % | ---- | 4 | 1 | <1 | <1 |
| +2.36mm | ---- | 1 | % | ---- | 3 | <1 | <1 | <1 |
| +4.75mm | ---- | 1 | % | ---- | 2 | <1 | <1 | <1 |
| +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 |
| **EA150: Soil Classification based on Particle Size** | | | | | | | | |
| Clay (<2 µm) | ---- | 1 | % | 82 | 54 | 52 | 56 | 68 |
| Silt (2-60 µm) | ---- | 1 | % | ---- | 23 | 27 | 25 | 21 |
| Sand (0.06-2.00 mm) | ---- | 1 | % | ---- | 20 | 20 | 19 | 11 |
| Gravel (>2mm) | ---- | 1 | % | ---- | 3 | 1 | <1 | <1 |
| Cobbles (>6cm) | ---- | 1 | % | ---- | <1 | <1 | <1 | <1 |
| **EA152: Soil Particle Density** | | | | | | | | |
| Soil Particle Density (Clay/Silt/Sand) | ---- | 0.01 | g/cm3 | 2.66 | 2.83 | 2.71 | 2.62 | 2.56 |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | | |
| ø Exchangeable Calcium | ---- | 0.2 | meq/100g | 17.1 | 17.6 | 22.9 | ---- | 20.7 |
| ø Exchangeable Magnesium | ---- | 0.2 | meq/100g | 20.2 | 9.7 | 5.7 | ---- | 15.5 |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Sample ID | DS04_1.9-2.0 | SS01_0.0-0.3 | SS02_0.0-0.3 | SS03_0.0-0.3 | SS04_0.0-0.3 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | EB2208583-021 | EB2208583-022 | EB2208583-023 | EB2208583-024 | EB2208583-025 |
| | | | | Result | Result | Result | Result | Result |
| **ED006: Exchangeable Cations on Alkaline Soils - Continued** | | | | | | | | |
| ø Exchangeable Potassium | ---- | 0.2 | meq/100g | 1.3 | 1.4 | 1.3 | ---- | 1.0 |
| ø Exchangeable Sodium | ---- | 0.2 | meq/100g | 4.8 | 0.4 | 1.3 | ---- | 1.3 |
| ø Cation Exchange Capacity | ---- | 0.2 | meq/100g | 43.4 | 29.1 | 31.4 | ---- | 38.5 |
| ø Exchangeable Sodium Percent | ---- | 0.2 | % | 11.1 | 1.6 | 4.2 | ---- | 3.4 |
| ø Calcium/Magnesium Ratio | ---- | 0.2 | - | 0.8 | 1.8 | 4.0 | ---- | 1.3 |
| ø Magnesium/Potassium Ratio | ---- | 0.2 | - | 15.8 | 6.9 | 4.3 | ---- | 15.2 |
| **ED007: Exchangeable Cations** | | | | | | | | |
| Exchangeable Calcium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | 16.3 | ---- |
| Exchangeable Magnesium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | 11.8 | ---- |
| Exchangeable Potassium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | 0.6 | ---- |
| Exchangeable Sodium | ---- | 0.1 | meq/100g | ---- | ---- | ---- | 2.0 | ---- |
| Cation Exchange Capacity | ---- | 0.1 | meq/100g | ---- | ---- | ---- | 30.7 | ---- |
| Exchangeable Sodium Percent | ---- | 0.1 | % | ---- | ---- | ---- | 6.5 | ---- |
| Calcium/Magnesium Ratio | ---- | 0.1 | - | ---- | ---- | ---- | 1.4 | ---- |
| Magnesium/Potassium Ratio | ---- | 0.1 | - | ---- | ---- | ---- | 20.0 | ---- |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | | |
| Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 840 | 10 | 30 | 10 | 10 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 10 | mg/kg | 1050 | <10 | 30 | 40 | <10 |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | | |
| ø Boron | 7440-42-8 | 0.2 | mg/kg | 0.8 | <0.2 | 0.4 | 0.3 | 0.3 |
| **ED092: DTPA Extractable Metals** | | | | | | | | |
| ø Copper | 7440-50-8 | 1.00 | mg/kg | 1.04 | 1.32 | <1.00 | 1.28 | 1.25 |
| ø Iron | 7439-89-6 | 1.00 | mg/kg | 11.9 | 23.6 | 7.92 | 19.3 | 19.3 |
| ø Manganese | 7439-96-5 | 1.00 | mg/kg | 4.12 | 14.7 | 4.79 | 23.0 | 22.5 |
| ø Zinc | 7440-66-6 | 1.00 | mg/kg | <1.00 | <1.00 | <1.00 | <1.00 | <1.00 |
| **ED093S: Soluble Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 10 | mg/kg | 80 | <10 | 20 | <10 | 10 |
| Magnesium | 7439-95-4 | 10 | mg/kg | 80 | <10 | <10 | <10 | <10 |
| Sodium | 7440-23-5 | 10 | mg/kg | 860 | 50 | 170 | 70 | 130 |
| Potassium | 7440-09-7 | 10 | mg/kg | <10 | <10 | 10 | <10 | <10 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 1.1 | 7.9 | 38.0 | 17.3 | 5.9 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Sample ID | DS04_1.9-2.0 | SS01_0.0-0.3 | SS02_0.0-0.3 | SS03_0.0-0.3 | SS04_0.0-0.3 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 | 23-Mar-2022 00:00 |
| Compound | CAS Number | LOR | Unit | | EB2208583-021 | EB2208583-022 | EB2208583-023 | EB2208583-024 | EB2208583-025 |
| | | | | | Result | Result | Result | Result | Result |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | | 100 | 920 | 1310 | 430 | 540 |
| **EK062: Total Nitrogen as N (TKN + NOx)** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 20 | mg/kg | | 100 | 930 | 1350 | 450 | 540 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | | | |
| Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | | 8 | 70 | 39 | 17 | 24 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | | | |
| Bicarbonate Extractable P (Olsen) | ---- | 1.0 | mg/kg | | 3.6 | 28.0 | 17.7 | 7.3 | 10.5 |
| **EP004: Organic Matter** | | | | | | | | | |
| Organic Matter | ---- | 0.5 | % | | 1.0 | 1.6 | 1.8 | 1.6 | 1.7 |
| Total Organic Carbon | ---- | 0.5 | % | | 0.6 | 1.0 | 1.0 | 0.9 | 1.0 |

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| **Test Code/Name** | **[75] Water Holding Capacity** | | |
|---|---|---|---|
| **Lab Reference (LR)** | **040422.634** | Client Name | ALS |
| **SampleID(s)** | **(As Listed)** | Client Contact | SUB RESULTS |
| | | Project Name | PBI + Moisture Content Testing |
| Report Date | 19/04/2022 | Job Number | ALS Batch# EB2208583 |
| Sample Received Date | 4/04/2022 | Order Number | 507624 |
| Sample Disposal Date | 3/06/2022 | Chain of Custody | |
| Sample Packaging | Plastic Bag | Client Email | |
| Temperature | Ambient | Client Address | 2 Byth St Stafford Brisbane Queensland |

**Moisture Content at Field Capacity and Wilting Point calculated using Moisture Tension Plate.**
**Reported density is dry density of sample at Field Capacity.**

***NM = not measured**

| | | Field Capacity | | | |
|---|---|---|---|---|---|
| **S#** | **SampleID** | **Bulk Density kg/L** | **MC% Grav. Field Capacity 10 kPa** | **MC% Grav. Wilting Point 1500 kPa** | **Available Water % Grav.** |
| 1 | DS01_0.0-0.1 | 1.0 | 45.6 | 19.8 | 25.8 |
| 2 | DS01_0.2-0.3 | 1.0 | 46.2 | 23.1 | 23.1 |
| 3 | DS01_0.5-0.6 | 1.1 | 43.3 | 22.0 | 21.2 |
| 4 | DS01_1.1-1.2 | 1.1 | 43.0 | 23.0 | 20.0 |
| 5 | DS01_1.9-2.0 | 1.0 | 47.9 | 23.9 | 24.0 |
| 6 | DS04_0.0-0.1 | 1.0 | 46.6 | 28.0 | 18.5 |
| 7 | DS04_0.2-0.3 | 1.0 | 49.7 | 26.7 | 22.9 |
| 8 | DS04_0.5-0.6 | 1.0 | 54.1 | 31.8 | 22.3 |
| 9 | DS04_1.1-1.2 | 1.0 | 49.0 | 31.1 | 17.9 |
| 10 | DS04_1.9-2.0 | 1.0 | 52.8 | 31.3 | 21.5 |
| 11 | DS07_0.0-0.1 | 1.1 | 42.9 | 17.6 | 25.3 |
| 12 | DS07_0.2-0.3 | 1.1 | 46.3 | 22.7 | 23.5 |
| 13 | DS07_0.5-0.6 | 1.1 | 47.3 | 22.7 | 24.6 |
| 14 | DS07_1.1-1.2 | 1.1 | 47.2 | 26.6 | 20.5 |
| 15 | DS07_1.9-2.0 | 1.1 | 50.5 | 25.1 | 25.3 |
| 16 | SS01_0.0-0.3 | 1.1 | 44.9 | 20.6 | 24.3 |
| 17 | SS02_0.0-0.3 | 1.1 | 44.2 | 20.3 | 23.9 |
| 18 | SS03_0.0-0.3 | 1.1 | 44.3 | 18.4 | 26.0 |
| 19 | SS04_0.0-0.3 | 1.0 | 50.6 | 27.9 | 22.7 |

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# Certificate of Analysis

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| **Test Code/Name** | **[372] Phosphorus-PBI-Colwell** | | |
|---|---|---|---|
| **Lab Reference (LR)** | **040422.635** | Client Name | ALS |
| **SampleID** | **(As Listed)** | Client Contact | SUB RESULTS |
| | | Project Name | PBI + Moisture Content Testing |
| Report Date | | Job Number | ALS Batch# EB2208583 |
| Sample Received Date | 4/04/2022 | Order Number | 507624 |
| Sample Disposal Date | 3/06/2022 | Chain of Custody | |
| Sample Packaging | Plastic Bag | Client Email | subresults.bri@alsglobal.com |
| Temperature | Ambient | Client Address | 2 Byth St Stafford Brisbane Queensland |

**Analytical Method:** As per 912b P Buffer Index - PBI +ColP - ICPAES, Soil Chemical Methods - Australasia, Raymont & Lyons, 2001.

**PBI+ColP =** $\frac{[Ps(mg\ P/kg) + ColwellP(mg/kg)]}{c(mg\ P/L)}$

**where:**
Ps = freshly sorbed P (mg P/kg); and
c = final solution P concentration (mg P/L)

| S# | SampleID | Phosphate Buffer Index | PERI | Colwell P mg P/kg | PERI Ranking | PBI Ranking | Colwell P Assessment | Phosphorus Environmental Risk Index |
|---|---|---|---|---|---|---|---|---|
| 1 | DS01_0.0-0.1 | 60 | 1.5 | 90 | Moderate Leaching | Very low | Medium-high. Most plants and crops will perform well, possible problems for P sensitive species on sandy soil. | 1.5 |
| 2 | DS01_0.2-0.3 | 102 | 0.1 | 12 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.1 |
| 3 | DS01_0.5-0.6 | 93 | 0.0 | <2 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 4 | DS01_1.1-1.2 | 81 | 0.0 | <2 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 5 | DS01_1.9-2.0 | 55 | 0.0 | <2 | Minimal Leaching | Very low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 6 | DS04_0.0-0.1 | 101 | 0.8 | 78 | Minimal Leaching | Low | Medium-high. Most plants and crops will perform well, possible problems for P sensitive species on sandy soil. | 0.8 |
| 7 | DS04_0.2-0.3 | 93 | 0.5 | 50 | Minimal Leaching | Low | Moderate. For most soil, low for iron rich (red) soil and medium to heavy clay, possible problems for P sensitive species on sandy soil. | 0.5 |
| 8 | DS04_0.5-0.6 | 68 | 0.4 | 28 | Minimal Leaching | Very low | Low. Common for silty, sandy soil, leached and for sandstone and metamorphic parent material | 0.4 |
| 9 | DS04_1.1-1.2 | 101 | 0.2 | 23 | Minimal Leaching | Low | Low. Common for silty, sandy soil, leached and for sandstone and metamorphic parent material | 0.2 |
| 10 | DS04_1.9-2.0 | 93 | 0.0 | <2 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 11 | DS07_0.0-0.1 | 74 | 0.6 | 42 | Minimal Leaching | Low | Moderate. For most soil, low for iron rich (red) soil and medium to heavy clay, possible problems for P sensitive species on sandy soil. | 0.6 |
| 12 | DS07_0.2-0.3 | 75 | 0.0 | <2 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |

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| **Test Code/Name** | **[372] Phosphorus-PBI-Colwell** | | |
|---|---|---|---|
| **Lab Reference (LR)** | **040422.635** | Client Name | ALS |
| **SampleID** | **(As Listed)** | Client Contact | SUB RESULTS |
| | | Project Name | PBI + Moisture Content Testing |
| Report Date | | Job Number | ALS Batch# EB2208583 |
| Sample Received Date | 4/04/2022 | Order Number | 507624 |
| Sample Disposal Date | 3/06/2022 | Chain of Custody | |
| Sample Packaging | Plastic Bag | Client Email | subresults.bri@alsglobal.com |
| Temperature | Ambient | Client Address | 2 Byth St Stafford Brisbane Queensland |

**Analytical Method:** As per 912b P Buffer Index - PBI +ColP - ICPAES, Soil Chemical Methods - Australasia, Raymont & Lyons, 2001.

**PBI+ColP =** $\frac{[Ps(mg\ P/kg) + ColwellP(mg/kg)]}{c(mg\ P/L)}$

**where:**
Ps = freshly sorbed P (mg P/kg); and
c = final solution P concentration (mg P/L)

| S# | SampleID | Phosphate Buffer Index | PERI | Colwell P mg P/kg | PERI Ranking | PBI Ranking | Colwell P Assessment | Phosphorus Environmental Risk Index |
|---|---|---|---|---|---|---|---|---|
| 13 | DS07_0.5-0.6 | 55 | 0.0 | <2 | Minimal Leaching | Very low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 14 | DS07_1.1-1.2 | 64 | 0.0 | <2 | Minimal Leaching | Very low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 15 | DS07_1.9-2.0 | 75 | 0.0 | <2 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0.0 |
| 16 | SS01_0.0-0.3 | 90 | 0.4 | 32 | Minimal Leaching | Low | Moderate. For most soil, low for iron rich (red) soil and medium to heavy clay, possible problems for P sensitive species on sandy soil. | 0.4 |
| 17 | SS02_0.0-0.3 | 85 | 0.2 | 20 | Minimal Leaching | Low | Low. Common for silty, sandy soil, leached and for sandstone and metamorphic parent material | 0.2 |
| 18 | SS03_0.0-0.3 | 90 | 0.2 | 16 | Minimal Leaching | Low | Very low. Common for leached sandy soil, for dune, sandy alluvium and for sandstone and metamorphic parent materials | 0 |
| 19 | SS04_0.0-0.3 | 128 | 0.2 | 21 | Minimal Leaching | Low | Low. Common for silty, sandy soil, leached and for sandstone and metamorphic parent material | 0 |

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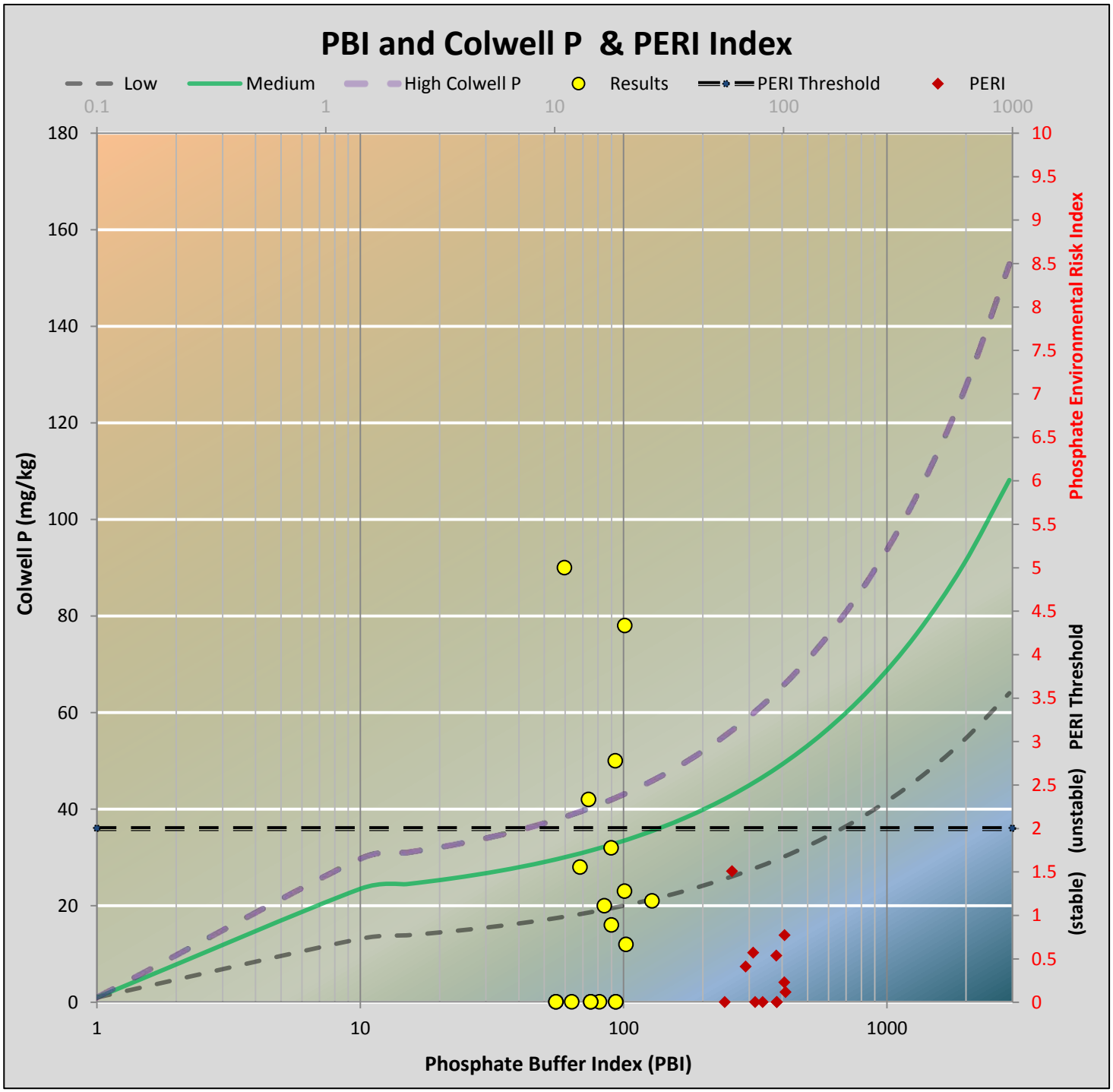
| Test Code/Name | [372] Phosphorus-PBI-Colwell | | |
|---|---|---|---|
| **Lab Reference (LR)** | **040422.635** | Client Name | ALS |
| **SampleID** | **(As Listed)** | Client Contact | SUB RESULTS |
| | | Project Name | PBI + Moisture Content Testing |
| Report Date | 21/04/2022 | Job Number | ALS Batch# EB2208583 |
| Sample Received Date | 4/04/2022 | Order Number | 507624 |
| Sample Disposal Date | 3/06/2022 | Chain of Custody | |
| Sample Packaging | Plastic Bag | Client Email | subresults.bri@alsglobal.com |
| Temperature | Ambient | Client Address | 2 Byth St Stafford Brisbane Queensland |




**PBI Interpretation Reference:** "Making Better Fertiliser Decisions for Grazed Pastures in Australia", Published by the Victorian Government Department of Primary Industries © The State of Victoria, Department of Primary Industries, June 2007.

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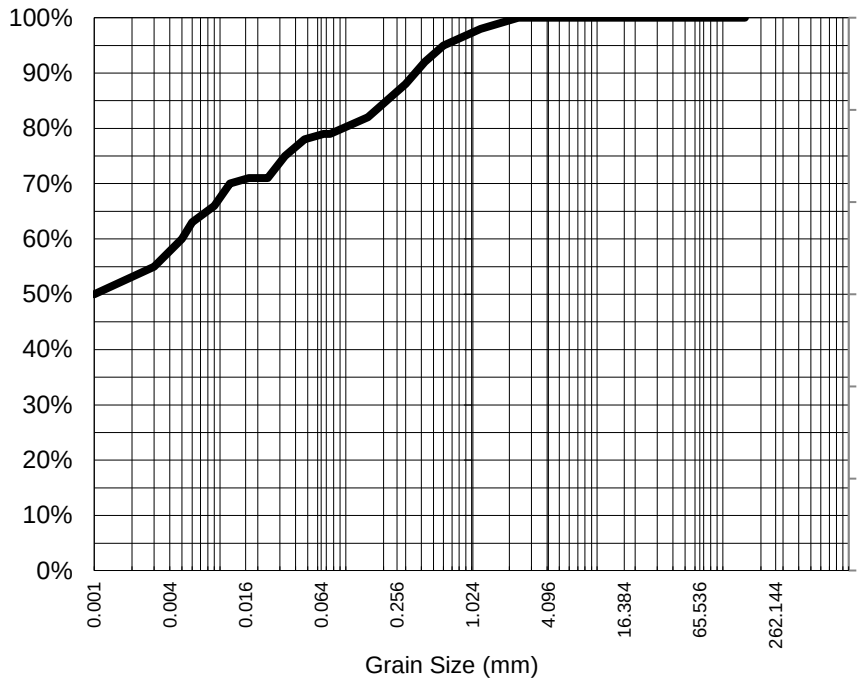
**Stafford, QLD 4053**
**pH 07 3243 7222**
**samples.brisbane@alsenviro.com**

## ALS Environmental

### Brisbane QLD

| | | | |
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-001 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_0.0-0.1 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 92% |
| 0.300 | 88% |
| 0.150 | 82% |
| 0.075 | 79% |
| Particle Size (microns) | |
| 47 | 78% |
| 33 | 75% |
| 24 | 71% |
| 17 | 71% |
| 12 | 70% |
| 9 | 66% |
| 6 | 63% |
| 5 | 60% |
| 1 | 50% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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

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

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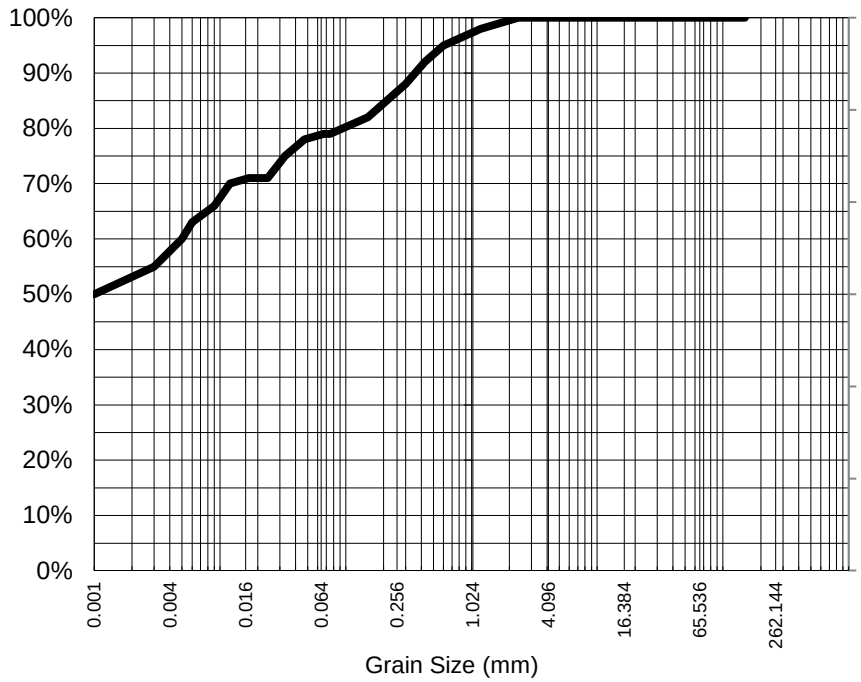
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-001DUP / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_0.0-0.1 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 92% |
| 0.300 | 88% |
| 0.150 | 82% |
| 0.075 | 79% |
| Particle Size (microns) | |
| 47 | 78% |
| 33 | 75% |
| 24 | 71% |
| 17 | 71% |
| 12 | 70% |
| 9 | 66% |
| 6 | 63% |
| 5 | 60% |
| 1 | 50% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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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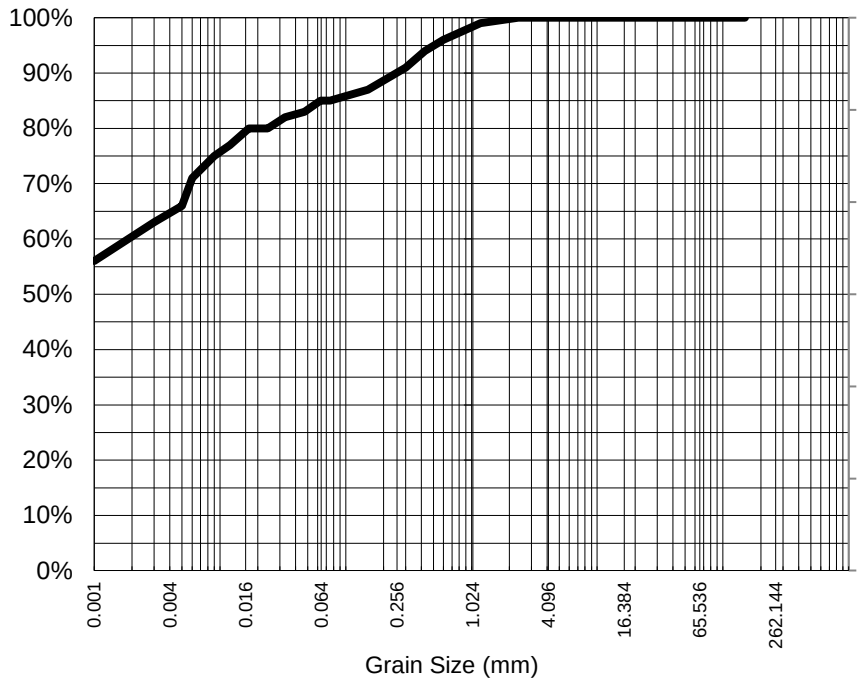
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-002 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_0.2-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 91% |
| 0.150 | 87% |
| 0.075 | 85% |
| Particle Size (microns) | |
| 47 | 83% |
| 33 | 82% |
| 24 | 80% |
| 17 | 80% |
| 12 | 77% |
| 9 | 75% |
| 6 | 71% |
| 5 | 66% |
| 1 | 56% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.7

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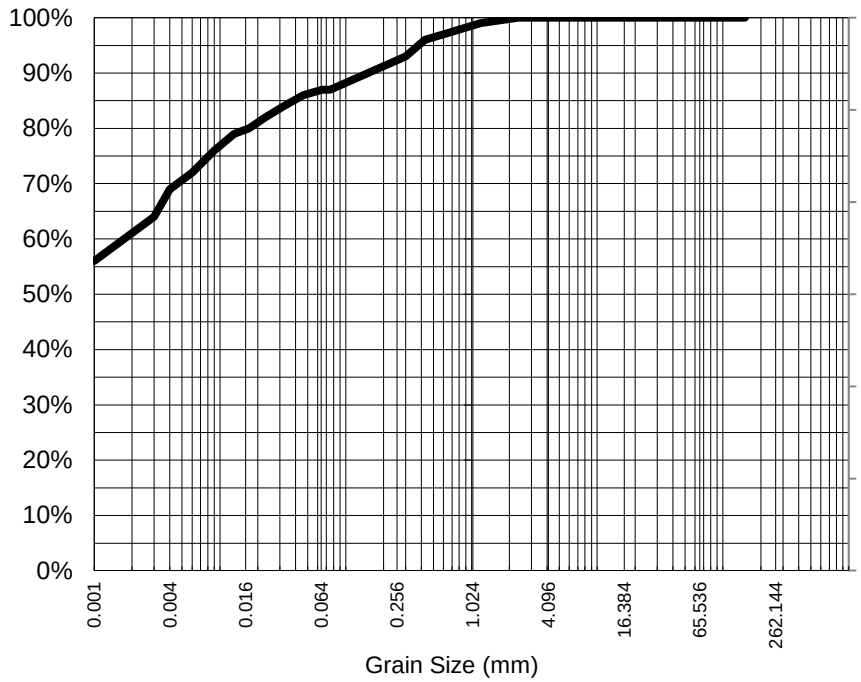
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-003 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_0.5-0.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 93% |
| 0.150 | 90% |
| 0.075 | 87% |
| Particle Size (microns) | |
| 46 | 86% |
| 32 | 84% |
| 23 | 82% |
| 17 | 80% |
| 13 | 79% |
| 9 | 76% |
| 6 | 72% |
| 4 | 69% |
| 1 | 56% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.64

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Soil Senior Chemist
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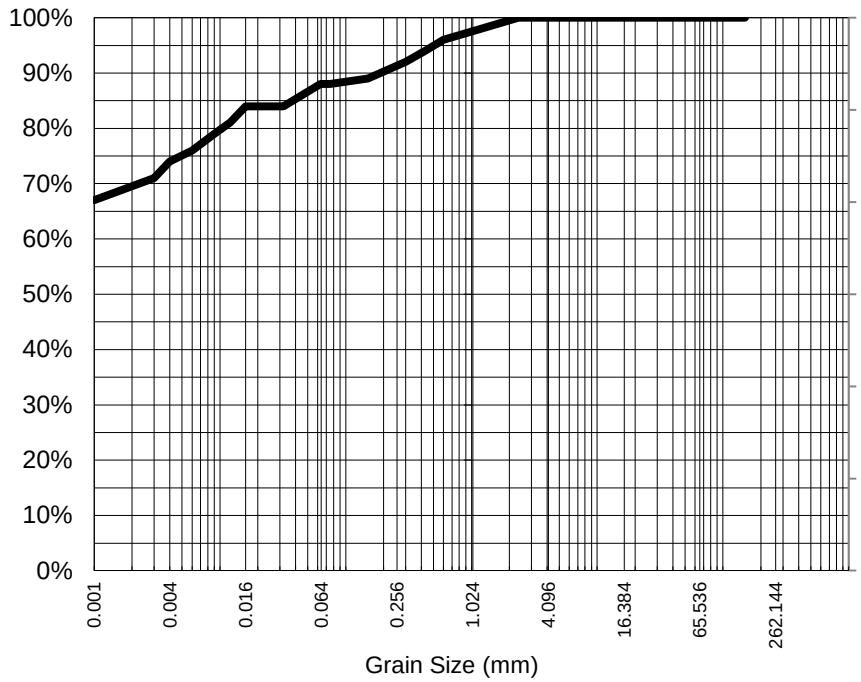
**Stafford, QLD 4053**
**pH 07 3243 7222**
**samples.brisbane@alsenviro.com**

## ALS Environmental

### Brisbane QLD

| | | | |
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-004 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_0.8-0.9 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 92% |
| 0.150 | 89% |
| 0.075 | 88% |
| Particle Size (microns) | |
| 45 | 86% |
| 32 | 84% |
| 22 | 84% |
| 16 | 84% |
| 12 | 81% |
| 9 | 79% |
| 6 | 76% |
| 4 | 74% |
| 1 | 67% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.7

**NATA Accreditation: 825 Site: Brisbane**
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**Satish Trivedi**
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**

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### Brisbane QLD

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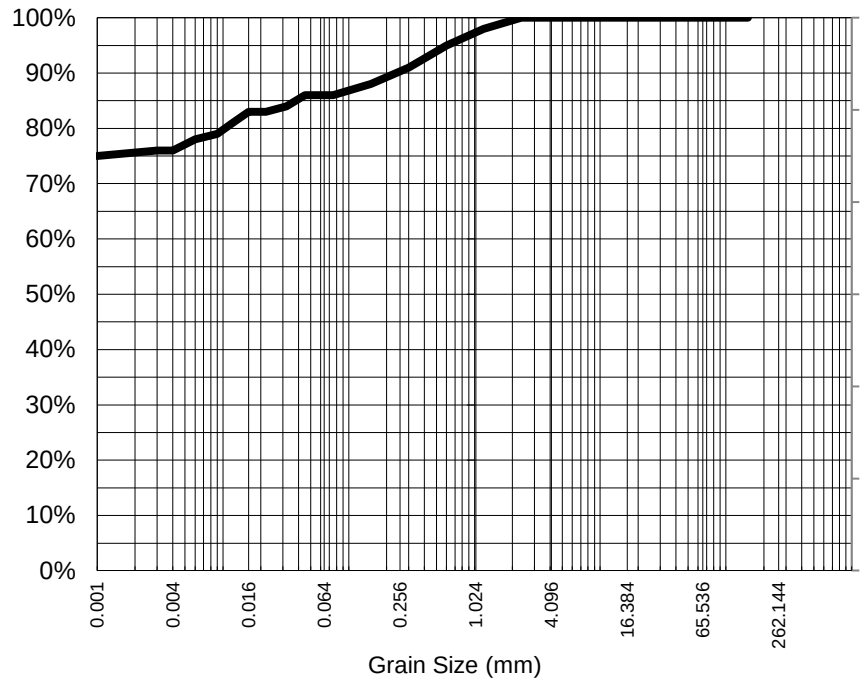
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-005 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_1.1-1.2 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 93% |
| 0.300 | 91% |
| 0.150 | 88% |
| 0.075 | 86% |
| Particle Size (microns) | |
| 45 | 86% |
| 32 | 84% |
| 22 | 83% |
| 16 | 83% |
| 12 | 81% |
| 9 | 79% |
| 6 | 78% |
| 4 | 76% |
| 1 | 75% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.7

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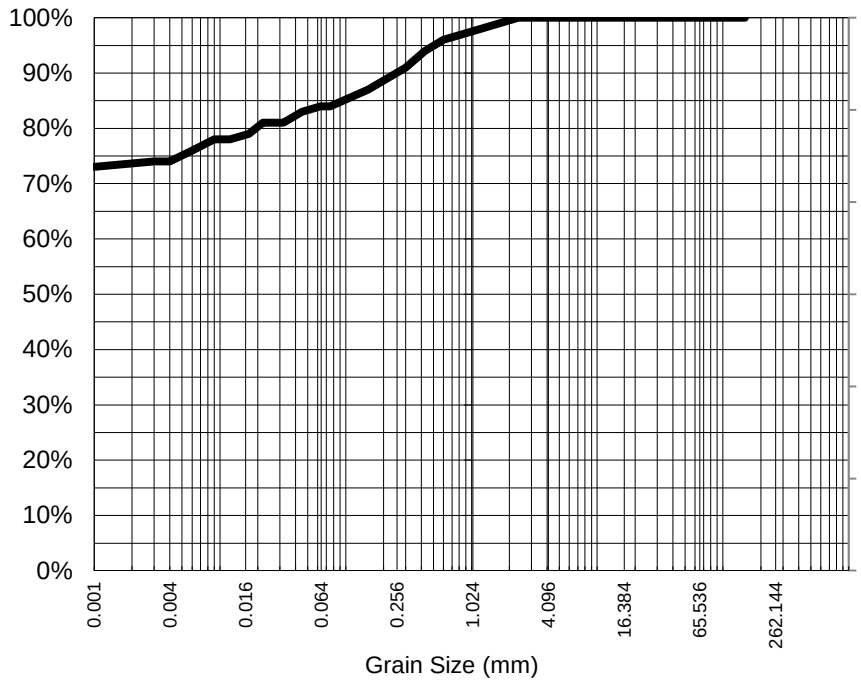
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-006 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_1.5-1.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 91% |
| 0.150 | 87% |
| 0.075 | 84% |
| Particle Size (microns) | |
| 45 | 83% |
| 32 | 81% |
| 22 | 81% |
| 17 | 79% |
| 12 | 78% |
| 9 | 78% |
| 6 | 76% |
| 4 | 74% |
| 1 | 73% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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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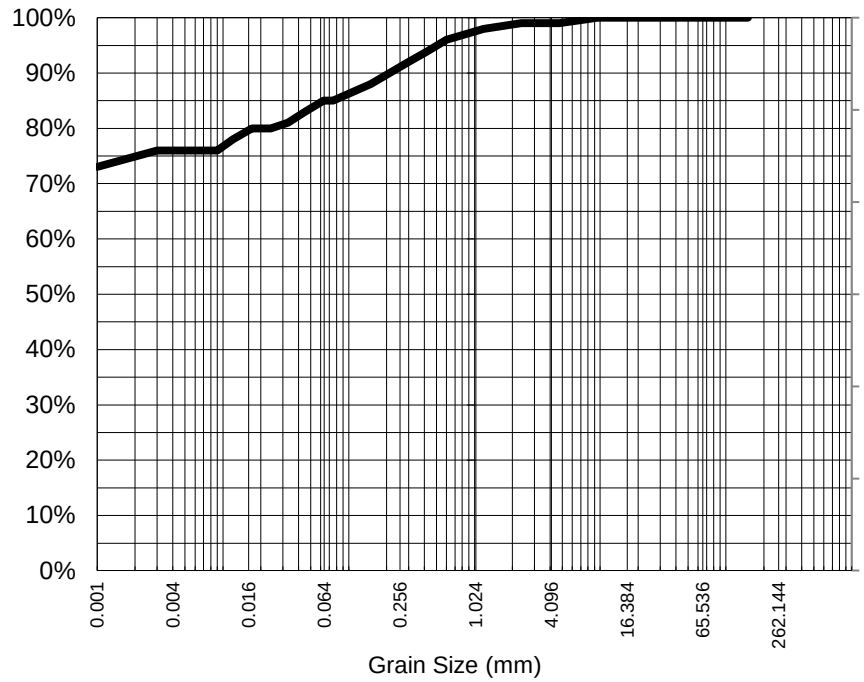
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-007 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS07_1.9-2.0 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| 9.50 | 100% |
| 4.75 | 99% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 92% |
| 0.150 | 88% |
| 0.075 | 85% |
| Particle Size (microns) | |
| 45 | 83% |
| 33 | 81% |
| 24 | 80% |
| 17 | 80% |
| 12 | 78% |
| 9 | 76% |
| 6 | 76% |
| 4 | 76% |
| 1 | 73% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.74

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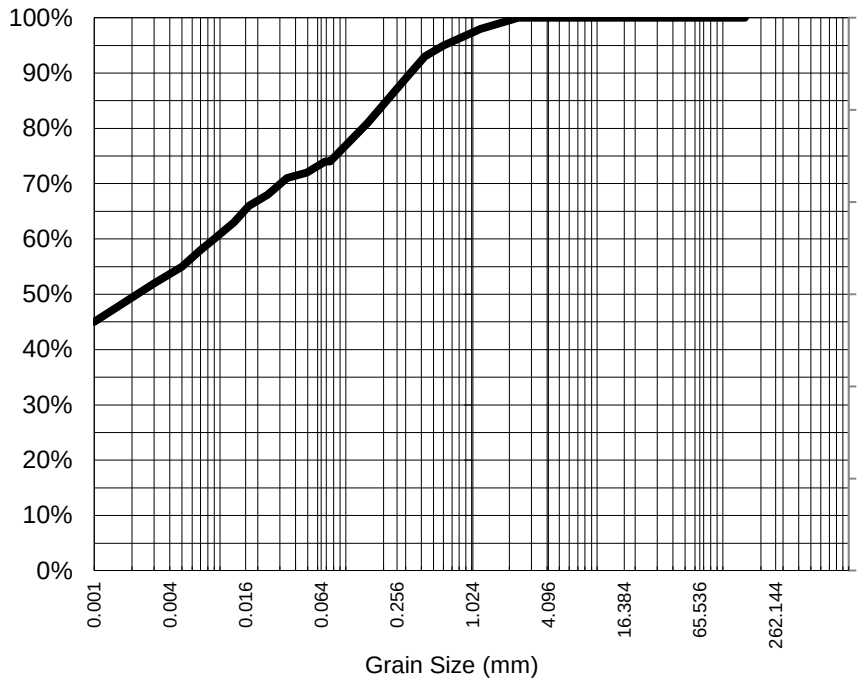
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-008 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_0.0-0.1 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 93% |
| 0.300 | 89% |
| 0.150 | 81% |
| 0.075 | 74% |
| Particle Size (microns) | |
| 49 | 72% |
| 34 | 71% |
| 24 | 68% |
| 17 | 66% |
| 13 | 63% |
| 9 | 60% |
| 7 | 58% |
| 5 | 55% |
| 1 | 45% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.007 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.61

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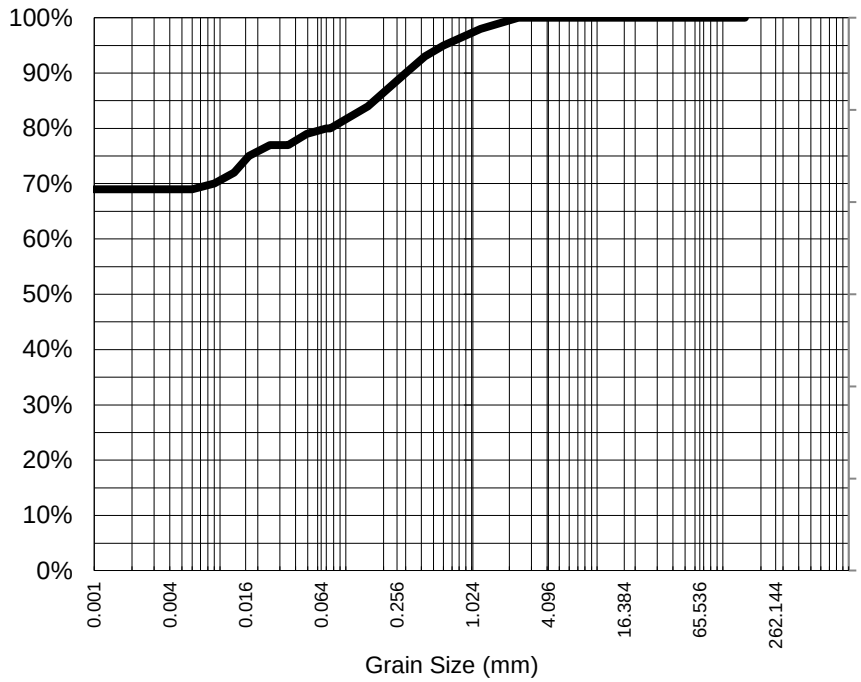
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-009 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_0.2-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 93% |
| 0.300 | 90% |
| 0.150 | 84% |
| 0.075 | 80% |
| Particle Size (microns) | |
| 49 | 79% |
| 35 | 77% |
| 25 | 77% |
| 17 | 75% |
| 13 | 72% |
| 9 | 70% |
| 6 | 69% |
| 5 | 69% |
| 1 | 69% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.59

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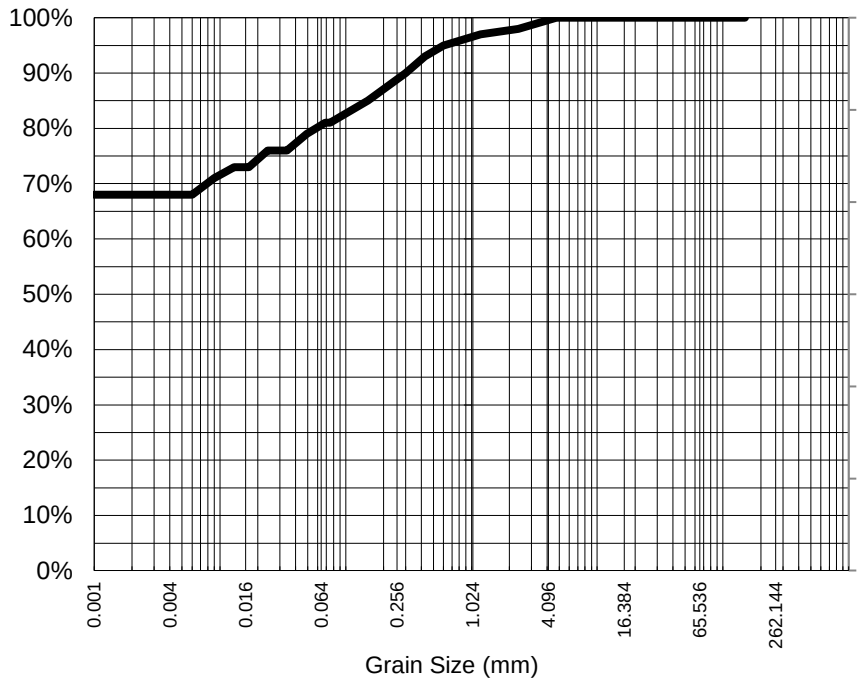
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-010 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_0.5-0.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 98% |
| 1.18 | 97% |
| 0.600 | 95% |
| 0.425 | 93% |
| 0.300 | 90% |
| 0.150 | 85% |
| 0.075 | 81% |
| Particle Size (microns) | |
| 49 | 79% |
| 34 | 76% |
| 24 | 76% |
| 17 | 73% |
| 13 | 73% |
| 9 | 71% |
| 6 | 68% |
| 4 | 68% |
| 1 | 68% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.62

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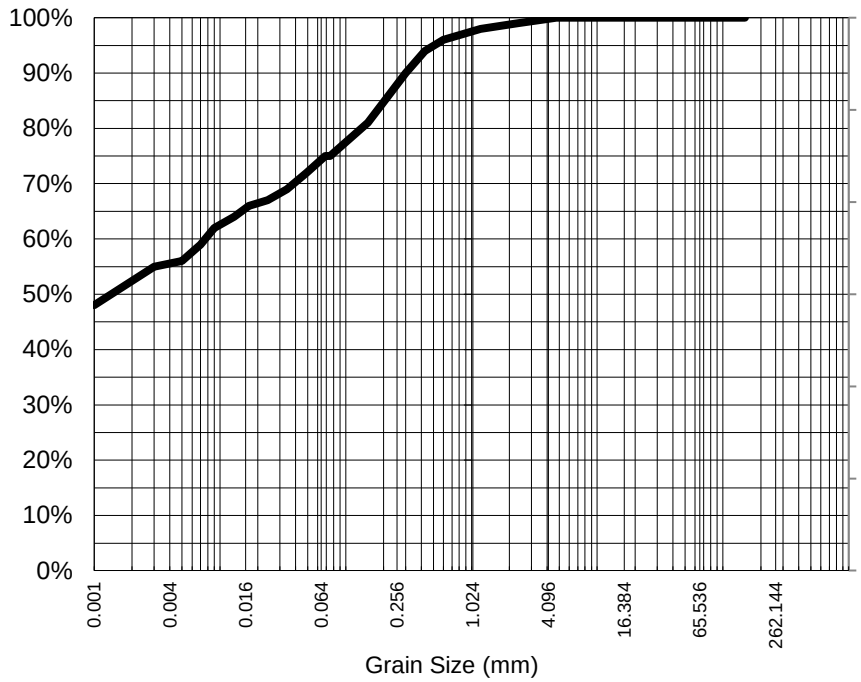
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-011 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_0.8-0.9 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 90% |
| 0.150 | 81% |
| 0.075 | 75% |
| Particle Size (microns) | |
| 49 | 72% |
| 34 | 69% |
| 24 | 67% |
| 17 | 66% |
| 13 | 64% |
| 9 | 62% |
| 7 | 59% |
| 5 | 56% |
| 1 | 48% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.007 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.63

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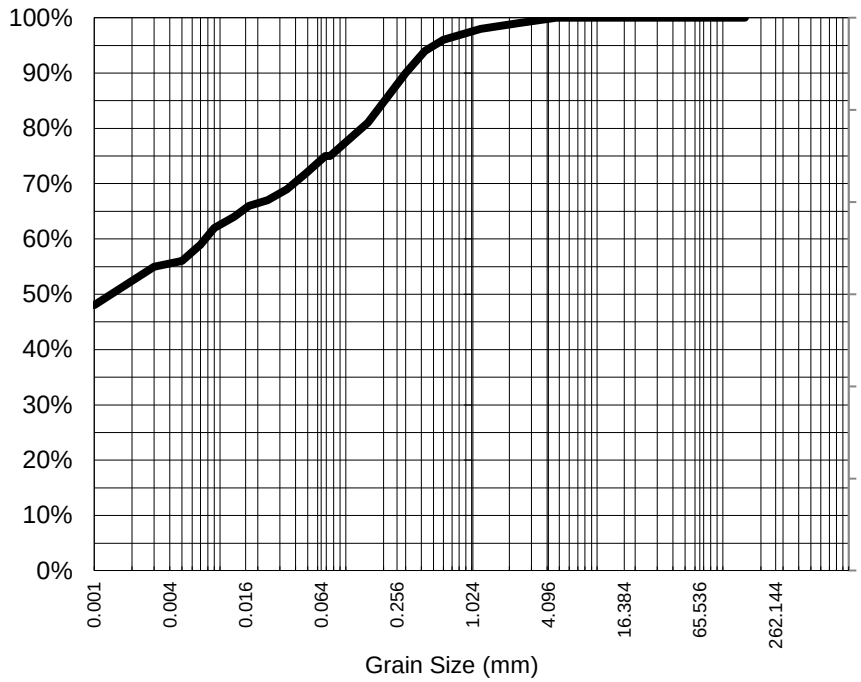
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-011DUP / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_0.8-0.9 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 90% |
| 0.150 | 81% |
| 0.075 | 75% |
| Particle Size (microns) | |
| 49 | 72% |
| 34 | 69% |
| 24 | 67% |
| 17 | 66% |
| 13 | 64% |
| 9 | 62% |
| 7 | 59% |
| 5 | 56% |
| 1 | 48% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.007 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.63

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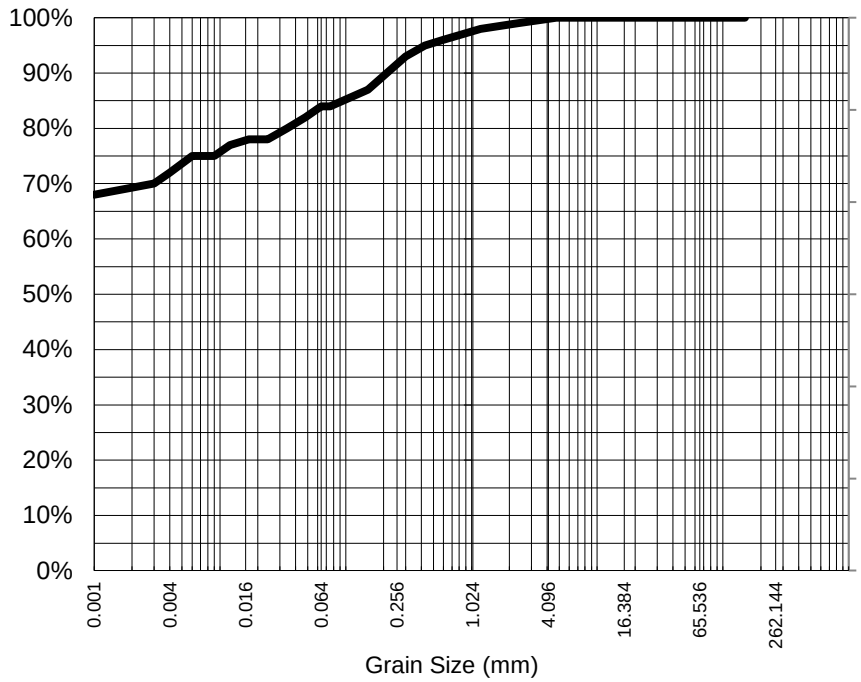
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-012 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_1.1-1.2 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 95% |
| 0.300 | 93% |
| 0.150 | 87% |
| 0.075 | 84% |
| Particle Size (microns) | |
| 48 | 82% |
| 34 | 80% |
| 24 | 78% |
| 17 | 78% |
| 12 | 77% |
| 9 | 75% |
| 6 | 75% |
| 4 | 72% |
| 1 | 68% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.65

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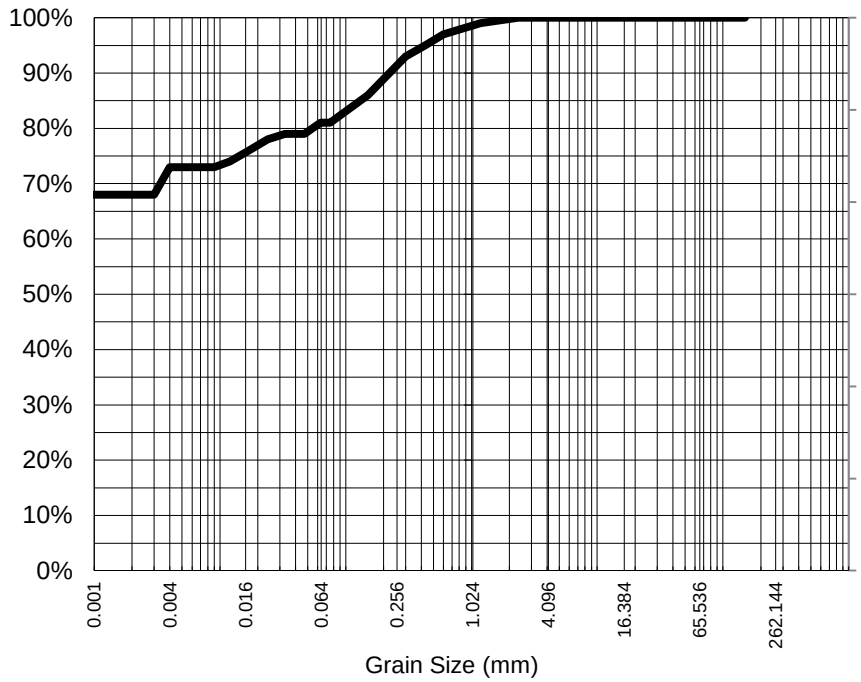
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-013 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_1.5-1.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 95% |
| 0.300 | 93% |
| 0.150 | 86% |
| 0.075 | 81% |
| Particle Size (microns) | |
| 47 | 79% |
| 33 | 79% |
| 24 | 78% |
| 17 | 76% |
| 12 | 74% |
| 9 | 73% |
| 6 | 73% |
| 4 | 73% |
| 1 | 68% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.73

**NATA Accreditation: 825 Site: Brisbane**
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**Satish Trivedi**
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**

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### Brisbane QLD

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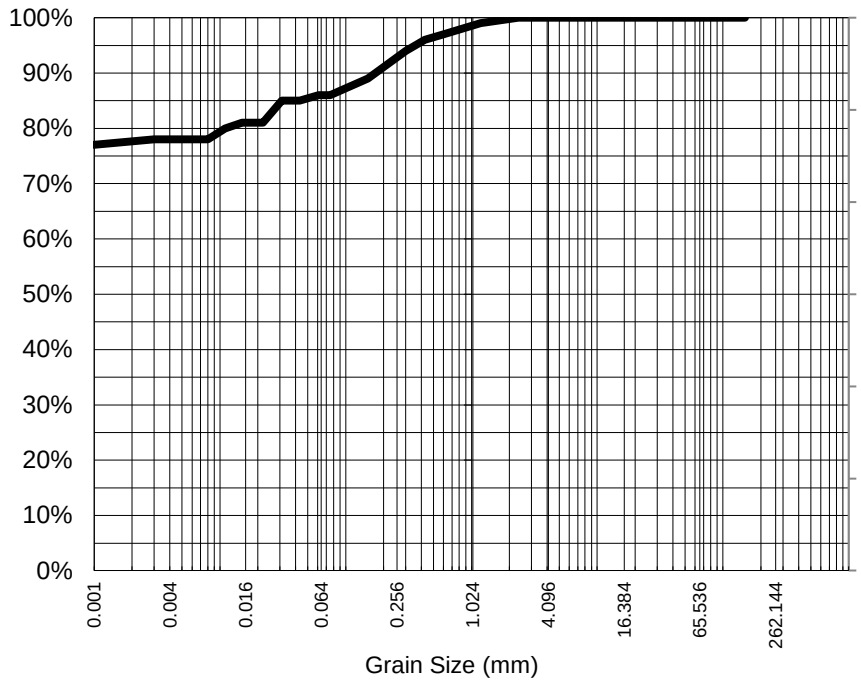
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-014 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS01_1.9-2.0 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 94% |
| 0.150 | 89% |
| 0.075 | 86% |
| Particle Size (microns) | |
| 43 | 85% |
| 31 | 85% |
| 22 | 81% |
| 15 | 81% |
| 11 | 80% |
| 8 | 78% |
| 6 | 78% |
| 4 | 78% |
| 1 | 77% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.8

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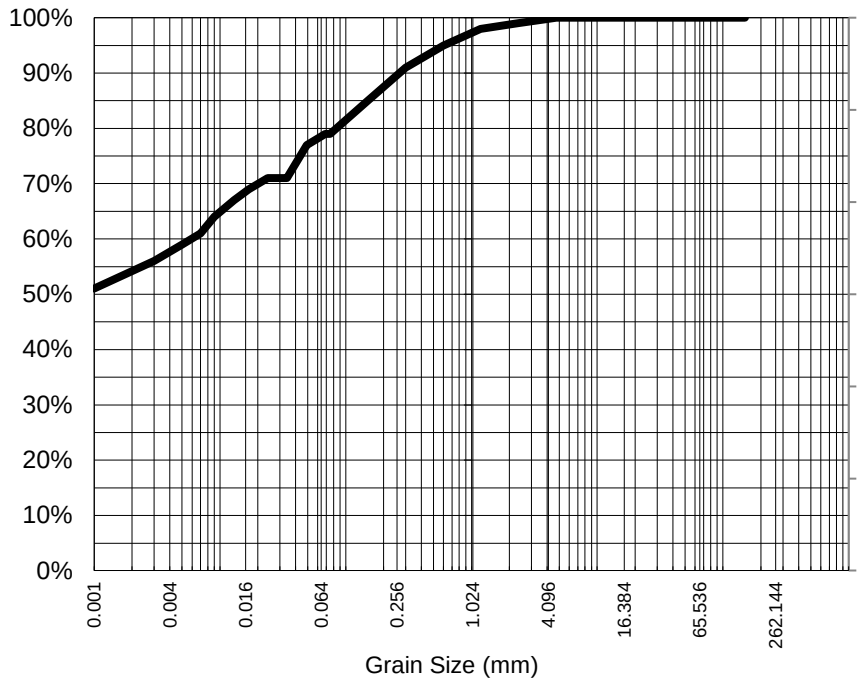
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-015 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_0.0-0.1 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 95% |
| 0.425 | 93% |
| 0.300 | 91% |
| 0.150 | 85% |
| 0.075 | 79% |
| Particle Size (microns) | |
| 49 | 77% |
| 34 | 71% |
| 24 | 71% |
| 17 | 69% |
| 13 | 67% |
| 9 | 64% |
| 7 | 61% |
| 5 | 59% |
| 1 | 51% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.007 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.64

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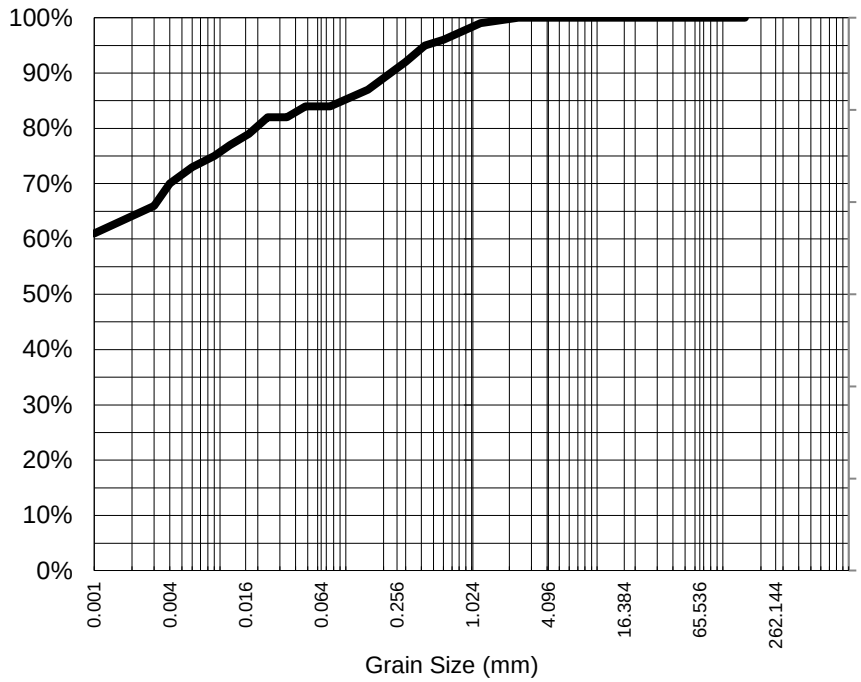
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-016 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_0.2-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 96% |
| 0.425 | 95% |
| 0.300 | 92% |
| 0.150 | 87% |
| 0.075 | 84% |
| Particle Size (microns) | |
| 48 | 84% |
| 34 | 82% |
| 24 | 82% |
| 17 | 79% |
| 12 | 77% |
| 9 | 75% |
| 6 | 73% |
| 4 | 70% |
| 1 | 61% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.68

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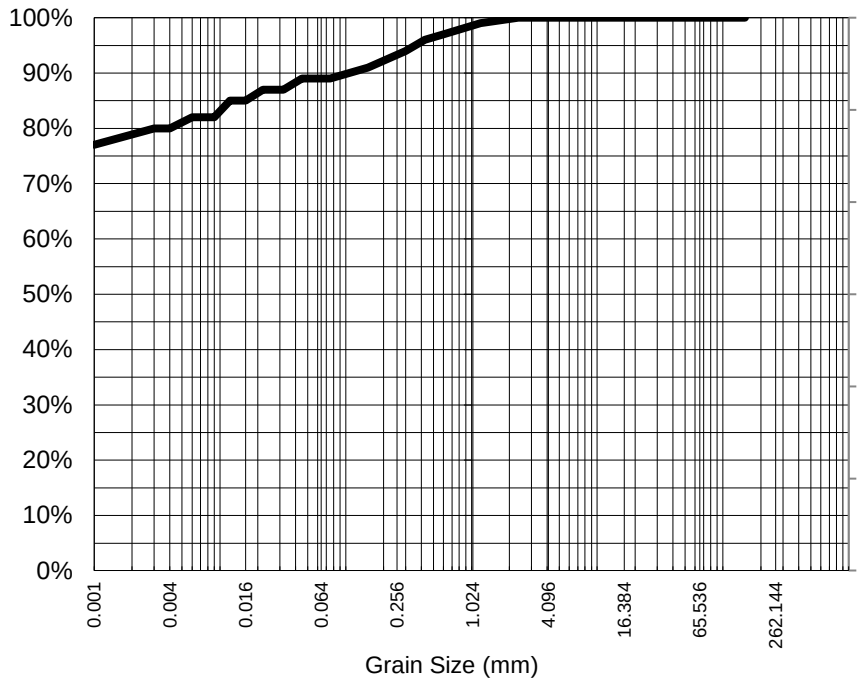
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-017 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_0.5-0.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 94% |
| 0.150 | 91% |
| 0.075 | 89% |
| Particle Size (microns) | |
| 45 | 89% |
| 32 | 87% |
| 22 | 87% |
| 16 | 85% |
| 12 | 85% |
| 9 | 82% |
| 6 | 82% |
| 4 | 80% |
| 1 | 77% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.73

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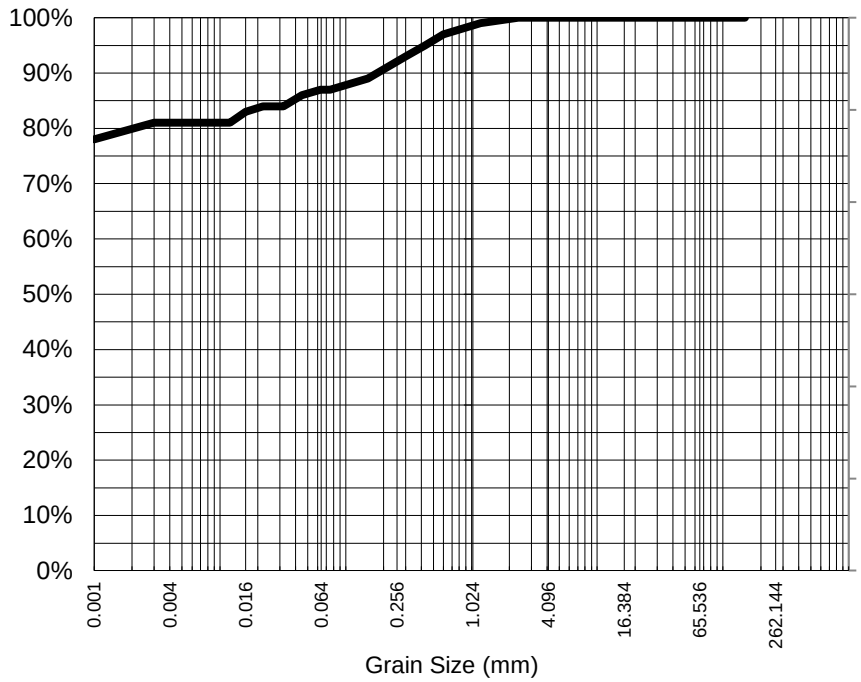
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-018 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_0.8-0.9 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 95% |
| 0.300 | 93% |
| 0.150 | 89% |
| 0.075 | 87% |
| Particle Size (microns) | |
| 45 | 86% |
| 32 | 84% |
| 22 | 84% |
| 16 | 83% |
| 12 | 81% |
| 8 | 81% |
| 6 | 81% |
| 4 | 81% |
| 1 | 78% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.73

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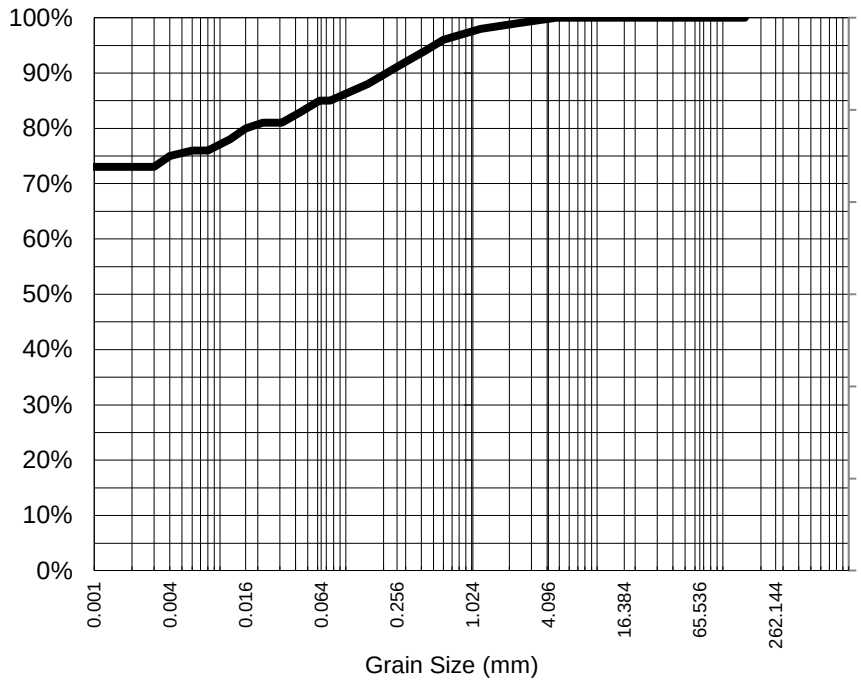
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-019 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_1.1-1.2 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 96% |
| 0.425 | 94% |
| 0.300 | 92% |
| 0.150 | 88% |
| 0.075 | 85% |
| Particle Size (microns) | |
| 44 | 83% |
| 31 | 81% |
| 22 | 81% |
| 16 | 80% |
| 12 | 78% |
| 8 | 76% |
| 6 | 76% |
| 4 | 75% |
| 1 | 73% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.77

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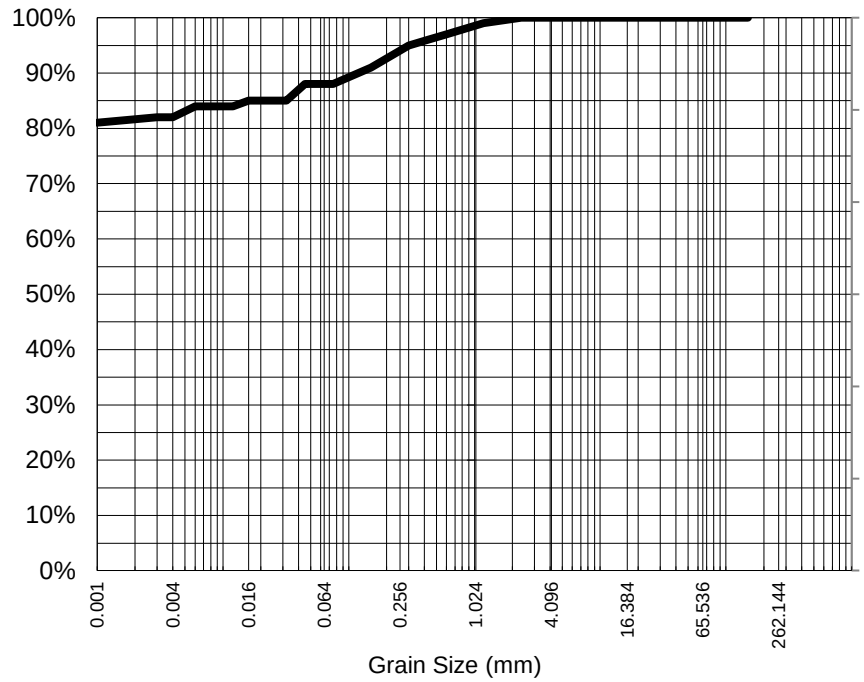
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-020 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_1.5-1.6 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 95% |
| 0.150 | 91% |
| 0.075 | 88% |
| Particle Size (microns) | |
| 45 | 88% |
| 32 | 85% |
| 22 | 85% |
| 16 | 85% |
| 12 | 84% |
| 8 | 84% |
| 6 | 84% |
| 4 | 82% |
| 1 | 81% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.7

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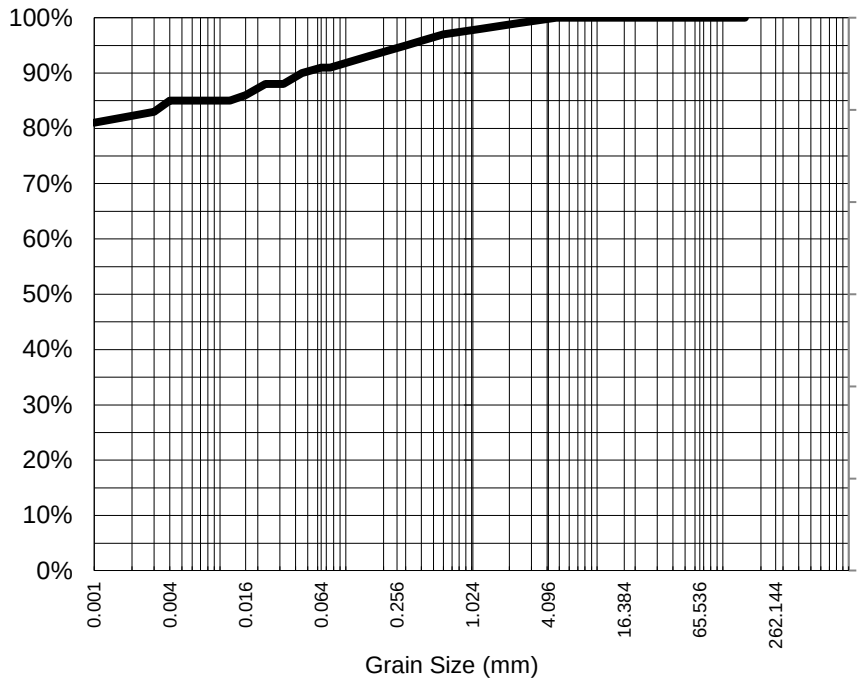
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-021 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_1.9-2.0 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 95% |
| 0.150 | 93% |
| 0.075 | 91% |
| Particle Size (microns) | |
| 45 | 90% |
| 32 | 88% |
| 23 | 88% |
| 16 | 86% |
| 12 | 85% |
| 8 | 85% |
| 6 | 85% |
| 4 | 85% |
| 1 | 81% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.66 (2.65)*

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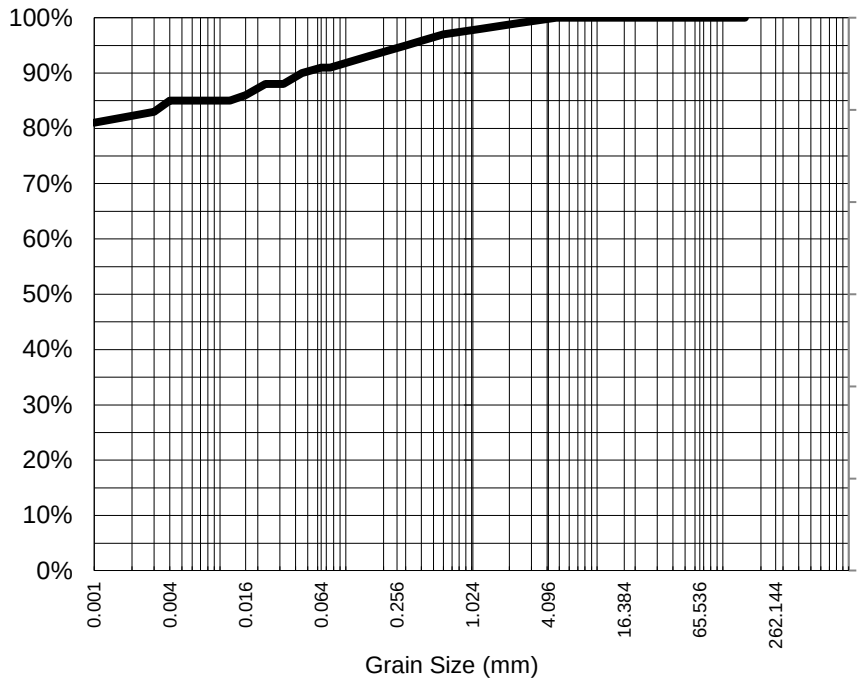
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-021DUP / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | DS04_1.9-2.0 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| 4.75 | 100% |
| 2.36 | 99% |
| 1.18 | 98% |
| 0.600 | 97% |
| 0.425 | 96% |
| 0.300 | 95% |
| 0.150 | 93% |
| 0.075 | 91% |
| Particle Size (microns) | |
| 45 | 90% |
| 32 | 88% |
| 23 | 88% |
| 16 | 86% |
| 12 | 85% |
| 8 | 85% |
| 6 | 85% |
| 4 | 85% |
| 1 | 81% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.66 (2.65)*

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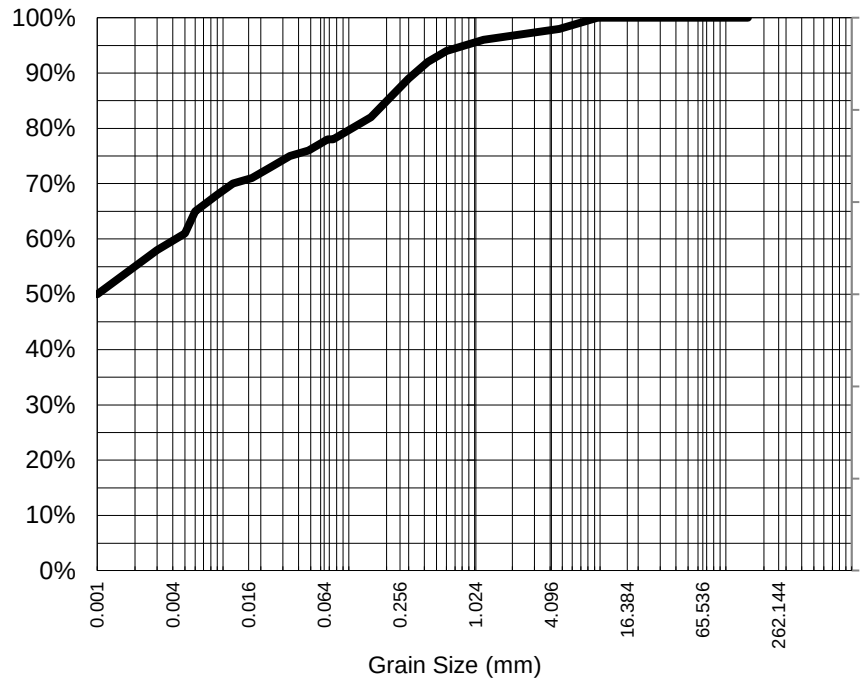
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-022 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | SS01_0.0-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| 9.50 | 100% |
| 4.75 | 98% |
| 2.36 | 97% |
| 1.18 | 96% |
| 0.600 | 94% |
| 0.425 | 92% |
| 0.300 | 89% |
| 0.150 | 82% |
| 0.075 | 78% |
| Particle Size (microns) | |
| 48 | 76% |
| 34 | 75% |
| 24 | 73% |
| 17 | 71% |
| 12 | 70% |
| 9 | 68% |
| 6 | 65% |
| 5 | 61% |
| 1 | 50% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.83 (2.65)*

**NATA Accreditation: 825 Site: Brisbane**
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NATA
WORLD RECOGNISED ACCREDITATION

**Satish Trivedi**
Soil Senior Chemist
***Authorised Signatory***

# Certificate of Analysis

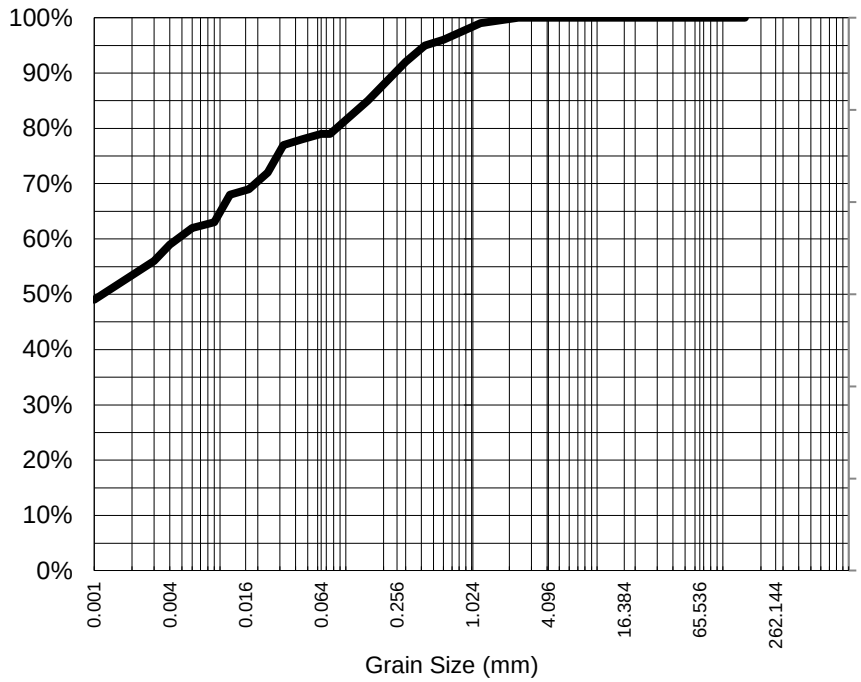
**ALS Laboratory Group Pty Ltd**
**2 Byth Street**
**Stafford, QLD 4053**
**pH 07 3243 7222**
**samples.brisbane@alsenviro.com**

## ALS Environmental

### Brisbane QLD

| | | | |
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-023 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | SS02_0.0-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 96% |
| 0.425 | 95% |
| 0.300 | 92% |
| 0.150 | 85% |
| 0.075 | 79% |
| Particle Size (microns) | |
| 45 | 78% |
| 32 | 77% |
| 24 | 72% |
| 17 | 69% |
| 12 | 68% |
| 9 | 63% |
| 6 | 62% |
| 4 | 59% |
| 1 | 49% |

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

**Analysis Notes**

*Samples analysed as received.*

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

**Sample Comments:**

**Analysed:** 13-Apr-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 (2.65)*

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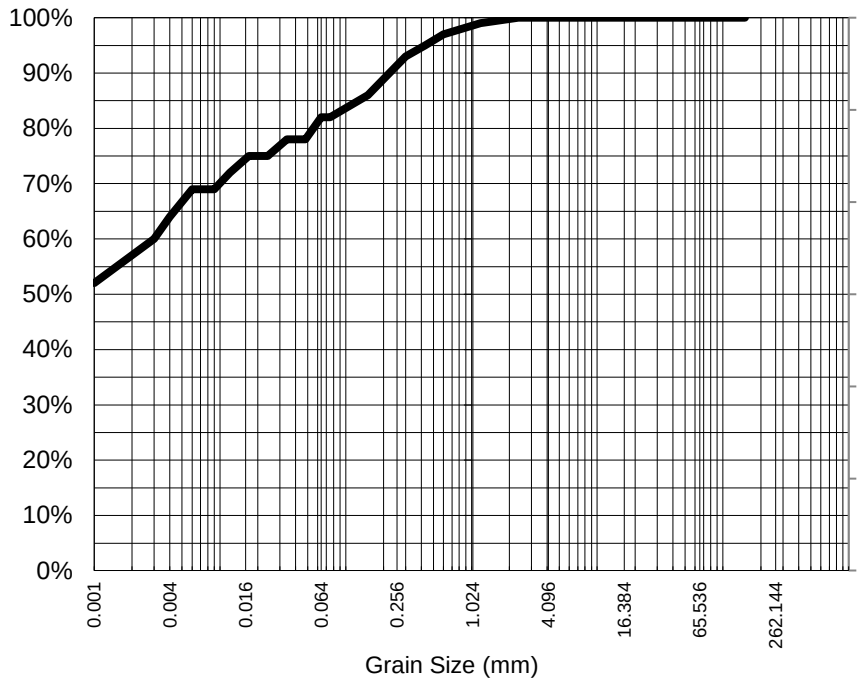
**pH 07 3243 7222**
**samples.brisbane@alsenviro.com**

## ALS Environmental

### Brisbane QLD

| | | | |
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-024 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | SS03_0.0-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 97% |
| 0.425 | 95% |
| 0.300 | 93% |
| 0.150 | 86% |
| 0.075 | 82% |
| Particle Size (microns) | |
| 48 | 78% |
| 34 | 78% |
| 24 | 75% |
| 17 | 75% |
| 12 | 72% |
| 9 | 69% |
| 6 | 69% |
| 4 | 64% |
| 1 | 52% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.62 (2.65)*

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Soil Senior Chemist
***Authorised Signatory***

# Certificate of Analysis

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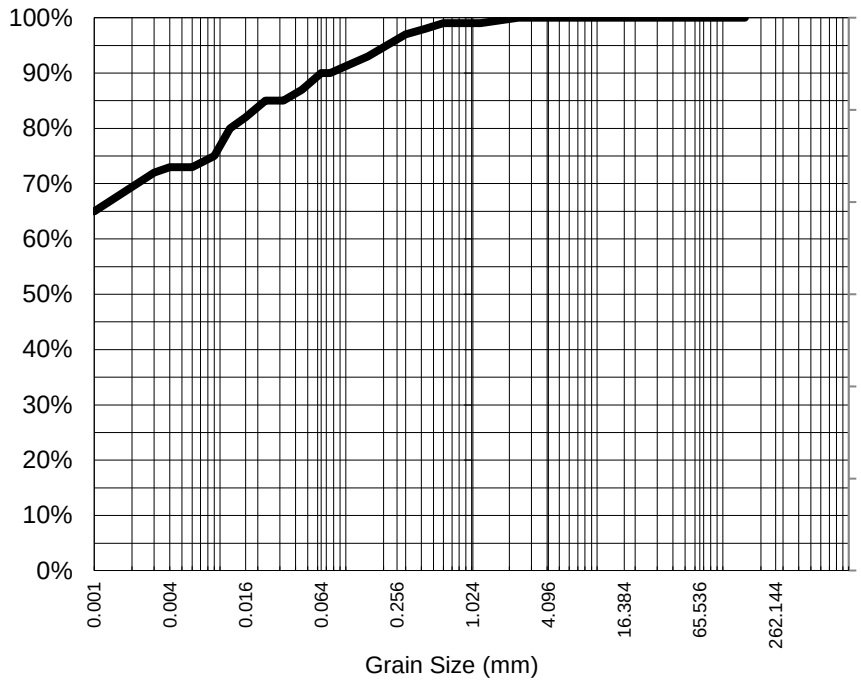
**2 Byth Street**
**Stafford, QLD 4053**
**pH 07 3243 7222**
**samples.brisbane@alsenviro.com**

## ALS Environmental

### Brisbane QLD

| | | | |
|---|---|---|---|
| **CLIENT:** | NAVJOT KAUR | **DATE REPORTED:** | 21-Apr-2022 |
| **COMPANY:** | AECOM AUSTRALIA PTY LTD | **DATE RECEIVED:** | 24-Mar-2022 |
| **ADDRESS:** | Po Box 1307<br>Fortitude Valley<br>Qld, Australia | **REPORT NO:** | EB2208583-025 / PSD |
| **PROJECT:** | 60651803 5.2 | **SAMPLE ID:** | SS04_0.0-0.3 |

**Particle Size Distribution**




| Particle Size (mm) | % Passing |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| 2.36 | 100% |
| 1.18 | 99% |
| 0.600 | 99% |
| 0.425 | 98% |
| 0.300 | 97% |
| 0.150 | 93% |
| 0.075 | 90% |
| Particle Size (microns) | |
| 45 | 87% |
| 32 | 85% |
| 23 | 85% |
| 16 | 82% |
| 12 | 80% |
| 9 | 75% |
| 6 | 73% |
| 4 | 73% |
| 1 | 65% |

**Analysis Notes**

*Samples analysed as received.*

| | |
|---|---|
| Median Particle Size (mm)* | <0.006 |

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

**Sample Comments:**

**Analysed:** 13-Apr-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)** 2.56 (2.65)*

**NATA Accreditation: 825 Site: Brisbane**
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NATA
WORLD RECOGNISED ACCREDITATION

**Satish Trivedi**
Soil Senior Chemist
***Authorised Signatory***

ALS Environmental

# QUALITY CONTROL REPORT

| | | | |
|---|---|---|---|
| **Work Order** | : **EB2208583** | Page | : 1 of 8 |
| Client | : **AECOM AUSTRALIA PTY LTD** | Laboratory | : Environmental Division Brisbane |
| Contact | : MS NAVJOT KAUR | Contact | : Carsten Emrich |
| Address | : PO BOX 1307<br>FORTITUDE VALLEY QLD, AUSTRALIA 4006 | Address | : 2 Byth Street Stafford QLD Australia 4053 |
| Telephone | : +61 07 3553 2000 | Telephone | : +61 7 3552 8616 |
| Project | : 60651803 5.2 | Date Samples Received | : 24-Mar-2022 |
| Order number | : 60651803 5.2 | Date Analysis Commenced | : 30-Mar-2022 |
| C-O-C number | : ---- | Issue Date | : 21-Apr-2022 |
| Sampler | : NAVJOT KAUR | | |
| Site | : ---- | | |
| Quote number | : BN/081/21 V2 | | |
| No. of samples received | : 26 | | |
| No. of samples analysed | : 25 | | |

ilac-MRA NATA
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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

## *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* |
|---|---|---|
| Ben Felgendrejeris | Senior Acid Sulfate Soil Chemist | Brisbane Acid Sulphate Soils, Stafford, QLD |
| Ben Felgendrejeris | Senior Acid Sulfate Soil Chemist | Brisbane Inorganics, Stafford, QLD |
| Mark Hallas | Senior Inorganic Chemist | Brisbane Acid Sulphate Soils, 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

## Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Laboratory sample ID | Sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Acceptable RPD (%) |
| **EA002: pH 1:5 (Soils) (QC Lot: 4258395)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EA002: pH Value | ---- | 0.1 | pH Unit | 6.9 | 6.9 | 0.0 | 0% - 20% |
| EB2208583-011 | DS01_0.8-0.9 | EA002: pH Value | ---- | 0.1 | pH Unit | 8.3 | 8.3 | 0.0 | 0% - 20% |
| **EA002: pH 1:5 (Soils) (QC Lot: 4258402)** | | | | | | | | | |
| EB2208599-006 | Anonymous | EA002: pH Value | ---- | 0.1 | pH Unit | 8.2 | 8.2 | 0.0 | 0% - 20% |
| EB2208583-021 | DS04_1.9-2.0 | EA002: pH Value | ---- | 0.1 | pH Unit | 8.3 | 8.2 | 0.0 | 0% - 20% |
| **EA010: Conductivity (1:5) (QC Lot: 4258396)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 47 | 43 | 8.8 | 0% - 20% |
| EB2208583-011 | DS01_0.8-0.9 | EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 171 | 155 | 9.8 | 0% - 20% |
| **EA010: Conductivity (1:5) (QC Lot: 4258403)** | | | | | | | | | |
| EB2208599-006 | Anonymous | EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 276 | 260 | 6.0 | 0% - 20% |
| EB2208583-021 | DS04_1.9-2.0 | EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 927 | 892 | 3.9 | 0% - 20% |
| **EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4258408)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EA055: Moisture Content | ---- | 0.1 | % | 26.9 | 26.2 | 2.8 | 0% - 20% |
| EB2208583-011 | DS01_0.8-0.9 | EA055: Moisture Content | ---- | 0.1 | % | 21.7 | 22.0 | 1.1 | 0% - 20% |
| **EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4258409)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | EA055: Moisture Content | ---- | 0.1 | % | 22.0 | 21.8 | 1.0 | 0% - 20% |
| EB2208599-006 | Anonymous | EA055: Moisture Content | ---- | 0.1 | % | 25.1 | 25.9 | 3.2 | 0% - 20% |
| **ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 4281890)** | | | | | | | | | |
| EB2208583-004 | DS07_0.8-0.9 | ED006: Exchangeable Calcium | ---- | 0.2 | meq/100g | 13.8 | 13.1 | 5.7 | 0% - 20% |
| | | ED006: Exchangeable Magnesium | ---- | 0.2 | meq/100g | 16.3 | 15.5 | 4.9 | 0% - 20% |
| | | ED006: Exchangeable Potassium | ---- | 0.2 | meq/100g | 0.5 | 0.4 | 0.0 | No Limit |
| | | ED006: Exchangeable Sodium | ---- | 0.2 | meq/100g | 4.0 | 3.5 | 12.2 | 0% - 50% |
| | | ED006: Cation Exchange Capacity | ---- | 0.2 | meq/100g | 34.6 | 32.5 | 6.2 | 0% - 20% |

Sub-Matrix: **SOIL**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD (%)* | *Acceptable RPD (%)* |
| **ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 4281890) - continued** | | | | | | | | | |
| EB2208583-014 | DS01_1.9-2.0 | ED006: Exchangeable Calcium | ---- | 0.2 | meq/100g | 15.6 | 15.4 | 1.5 | 0% - 20% |
| | | ED006: Exchangeable Magnesium | ---- | 0.2 | meq/100g | 16.9 | 16.8 | 0.0 | 0% - 20% |
| | | ED006: Exchangeable Potassium | ---- | 0.2 | meq/100g | 0.4 | 0.4 | 0.0 | No Limit |
| | | ED006: Exchangeable Sodium | ---- | 0.2 | meq/100g | 5.0 | 4.8 | 3.1 | 0% - 20% |
| | | ED006: Cation Exchange Capacity | ---- | 0.2 | meq/100g | 37.8 | 37.4 | 1.1 | 0% - 20% |
| **ED007: Exchangeable Cations (QC Lot: 4281952)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED007: Exchangeable Calcium | ---- | 0.1 | meq/100g | 15.1 | 14.8 | 2.1 | 0% - 20% |
| | | ED007: Exchangeable Magnesium | ---- | 0.1 | meq/100g | 13.0 | 13.7 | 5.9 | 0% - 20% |
| | | ED007: Exchangeable Potassium | ---- | 0.1 | meq/100g | 0.5 | 0.6 | 0.0 | No Limit |
| | | ED007: Exchangeable Sodium | ---- | 0.1 | meq/100g | 1.6 | 1.5 | 8.5 | 0% - 50% |
| **ED008: Exchangeable Cations (QC Lot: 4281958)** | | | | | | | | | |
| EB2208580-036 | Anonymous | ED008: Exchangeable Calcium | ---- | 0.1 | meq/100g | 6.8 | 6.7 | 0.0 | 0% - 20% |
| | | ED008: Exchangeable Magnesium | ---- | 0.1 | meq/100g | 10.3 | 10.5 | 1.9 | 0% - 20% |
| | | ED008: Exchangeable Potassium | ---- | 0.1 | meq/100g | <0.1 | <0.1 | 0.0 | No Limit |
| | | ED008: Exchangeable Sodium | ---- | 0.1 | meq/100g | 3.8 | 3.9 | 0.0 | 0% - 20% |
| **ED040S: Soluble Major Anions (QC Lot: 4258394)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED040S: Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 20 | 10 | 0.0 | No Limit |
| EB2208583-011 | DS01_0.8-0.9 | ED040S: Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 30 | 30 | 0.0 | No Limit |
| **ED040S: Soluble Major Anions (QC Lot: 4258401)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | ED040S: Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | 840 | 830 | 0.0 | 0% - 20% |
| **ED045G: Chloride by Discrete Analyser (QC Lot: 4258397)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED045G: Chloride | 16887-00-6 | 10 | mg/kg | 20 | 20 | 0.0 | No Limit |
| EB2208583-011 | DS01_0.8-0.9 | ED045G: Chloride | 16887-00-6 | 10 | mg/kg | <10 | <10 | 0.0 | No Limit |
| **ED045G: Chloride by Discrete Analyser (QC Lot: 4258400)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | ED045G: Chloride | 16887-00-6 | 10 | mg/kg | 1050 | 1110 | 5.5 | 0% - 20% |
| **ED091 : Calcium Chloride Extractable Boron (QC Lot: 4263325)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED091: Boron | 7440-42-8 | 0.2 | mg/kg | <0.2 | <0.2 | 0.0 | No Limit |
| EB2208583-014 | DS01_1.9-2.0 | ED091: Boron | 7440-42-8 | 0.2 | mg/kg | 0.6 | 0.6 | 0.0 | No Limit |
| **ED092: DTPA Extractable Metals (QC Lot: 4263324)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED092: Copper | 7440-50-8 | 1 | mg/kg | 1.38 | 1.41 | 2.7 | No Limit |
| | | ED092: Iron | 7439-89-6 | 1 | mg/kg | 19.9 | 20.0 | 0.4 | 0% - 20% |
| | | ED092: Manganese | 7439-96-5 | 1 | mg/kg | 11.1 | 11.9 | 6.8 | 0% - 50% |
| | | ED092: Zinc | 7440-66-6 | 1 | mg/kg | <1.00 | <1.00 | 0.0 | No Limit |
| EB2208583-014 | DS01_1.9-2.0 | ED092: Copper | 7440-50-8 | 1 | mg/kg | <1.00 | <1.00 | 0.0 | No Limit |
| | | ED092: Iron | 7439-89-6 | 1 | mg/kg | 5.76 | 5.67 | 1.6 | No Limit |
| | | ED092: Manganese | 7439-96-5 | 1 | mg/kg | 4.08 | 3.90 | 4.7 | No Limit |
| | | ED092: Zinc | 7440-66-6 | 1 | mg/kg | <1.00 | <1.00 | 0.0 | No Limit |
| **ED093S: Soluble Major Cations (QC Lot: 4258393)** | | | | | | | | | |

Sub-Matrix: **SOIL**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD (%)* | *Acceptable RPD (%)* |
| **ED093S: Soluble Major Cations (QC Lot: 4258393) - continued** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | ED093S: Calcium | 7440-70-2 | 10 | mg/kg | <10 | <10 | 0.0 | No Limit |
| | | ED093S: Magnesium | 7439-95-4 | 10 | mg/kg | <10 | <10 | 0.0 | No Limit |
| | | ED093S: Sodium | 7440-23-5 | 10 | mg/kg | 50 | 50 | 0.0 | No Limit |
| | | ED093S: Potassium | 7440-09-7 | 10 | mg/kg | <10 | <10 | 0.0 | No Limit |
| EB2208583-011 | DS01_0.8-0.9 | ED093S: Calcium | 7440-70-2 | 10 | mg/kg | 80 | 70 | 0.0 | No Limit |
| | | ED093S: Magnesium | 7439-95-4 | 10 | mg/kg | 20 | 20 | 0.0 | No Limit |
| | | ED093S: Sodium | 7440-23-5 | 10 | mg/kg | 80 | 80 | 0.0 | No Limit |
| | | ED093S: Potassium | 7440-09-7 | 10 | mg/kg | 10 | <10 | 0.0 | No Limit |
| **ED093S: Soluble Major Cations (QC Lot: 4258399)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | ED093S: Calcium | 7440-70-2 | 10 | mg/kg | 80 | 80 | 0.0 | No Limit |
| | | ED093S: Magnesium | 7439-95-4 | 10 | mg/kg | 80 | 80 | 0.0 | No Limit |
| | | ED093S: Sodium | 7440-23-5 | 10 | mg/kg | 860 | 850 | 0.0 | 0% - 20% |
| | | ED093S: Potassium | 7440-09-7 | 10 | mg/kg | <10 | <10 | 0.0 | No Limit |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4258398)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 6.6 | 6.7 | 2.3 | 0% - 20% |
| EB2208583-011 | DS01_0.8-0.9 | EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 20.2 | 20.2 | 0.0 | 0% - 20% |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4258404)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | 1.1 | 1.2 | 0.0 | 0% - 50% |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4258405)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 460 | 410 | 10.6 | 0% - 20% |
| EB2208583-011 | DS01_0.8-0.9 | EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 1310 | 1300 | 0.0 | 0% - 20% |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4258406)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 100 | 100 | 0.0 | No Limit |
| EB2208599-006 | Anonymous | EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | 590 | 720 | 19.7 | 0% - 20% |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell) (QC Lot: 4263323)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EK080: Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | 11 | 12 | 0.0 | No Limit |
| EB2208583-015 | DS04_0.0-0.1 | EK080: Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | 58 | 57 | 0.0 | 0% - 50% |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen) (QC Lot: 4280198)** | | | | | | | | | |
| EB2208583-005 | DS07_1.1-1.2 | EK081: Bicarbonate Extractable P (Olsen) | ---- | 1 | mg/kg | <1.0 | <1.0 | 0.0 | No Limit |
| EB2208583-015 | DS04_0.0-0.1 | EK081: Bicarbonate Extractable P (Olsen) | ---- | 1 | mg/kg | 19.8 | 21.0 | 5.8 | 0% - 20% |
| **EP004: Organic Matter (QC Lot: 4260564)** | | | | | | | | | |
| EB2208583-001 | DS07_0.0-0.1 | EP004: Organic Matter | ---- | 0.5 | % | 1.6 | 1.6 | 0.0 | No Limit |
| | | EP004: Total Organic Carbon | ---- | 0.5 | % | 1.0 | 0.9 | 0.0 | No Limit |
| EB2208583-010 | DS01_0.5-0.6 | EP004: Organic Matter | ---- | 0.5 | % | 2.0 | 2.0 | 0.0 | No Limit |
| | | EP004: Total Organic Carbon | ---- | 0.5 | % | 1.2 | 1.2 | 0.0 | No Limit |
| **EP004: Organic Matter (QC Lot: 4260565)** | | | | | | | | | |
| EB2208583-021 | DS04_1.9-2.0 | EP004: Organic Matter | ---- | 0.5 | % | 1.0 | 1.0 | 0.0 | No Limit |
| | | EP004: Total Organic Carbon | ---- | 0.5 | % | 0.6 | 0.5 | 0.0 | No Limit |

## Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

| | | | | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Acceptable Limits (%) | |
| Method: Compound | CAS Number | LOR | Unit | Result | Concentration | LCS | Low | High |
| **EA002: pH 1:5 (Soils) (QCLot: 4258395)** | | | | | | | | |
| EA002: pH Value | ---- | ---- | pH Unit | ---- | 4 pH Unit | 100 | 98.0 | 102 |
| | | | | ---- | 7 pH Unit | 100 | 98.0 | 102 |
| **EA002: pH 1:5 (Soils) (QCLot: 4258402)** | | | | | | | | |
| EA002: pH Value | ---- | ---- | pH Unit | ---- | 4 pH Unit | 100 | 98.0 | 102 |
| | | | | ---- | 7 pH Unit | 100 | 98.0 | 102 |
| **EA010: Conductivity (1:5) (QCLot: 4258396)** | | | | | | | | |
| EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | <1 | 1412 µS/cm | 98.8 | 97.0 | 103 |
| **EA010: Conductivity (1:5) (QCLot: 4258403)** | | | | | | | | |
| EA010: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | <1 | 1412 µS/cm | 98.8 | 97.0 | 103 |
| **EA152: Soil Particle Density (QCLot: 4259479)** | | | | | | | | |
| EA152: Soil Particle Density (Clay/Silt/Sand) | ---- | ---- | g/cm3 | ---- | 2.68 g/cm3 | 100 | 80.0 | 120 |
| **EA152: Soil Particle Density (QCLot: 4259481)** | | | | | | | | |
| EA152: Soil Particle Density (Clay/Silt/Sand) | ---- | ---- | g/cm3 | ---- | 2.68 g/cm3 | 100 | 80.0 | 120 |
| **ED006: Exchangeable Cations on Alkaline Soils (QCLot: 4281890)** | | | | | | | | |
| ED006: Exchangeable Calcium | ---- | 0.2 | meq/100g | <0.2 | 6.708 meq/100g | 119 | 70.0 | 130 |
| ED006: Exchangeable Magnesium | ---- | 0.2 | meq/100g | <0.2 | 5.0353 meq/100g | 112 | 70.0 | 130 |
| ED006: Exchangeable Potassium | ---- | 0.2 | meq/100g | <0.2 | 1.0556 meq/100g | 127 | 70.0 | 130 |
| ED006: Exchangeable Sodium | ---- | 0.2 | meq/100g | <0.2 | 1.7599 meq/100g | 125 | 70.0 | 130 |
| ED006: Cation Exchange Capacity | ---- | 0.2 | meq/100g | <0.2 | 14.5588 meq/100g | 118 | 70.0 | 130 |
| **ED007: Exchangeable Cations (QCLot: 4281952)** | | | | | | | | |
| ED007: Exchangeable Calcium | ---- | 0.1 | meq/100g | <0.1 | 6.5 meq/100g | 89.9 | 79.0 | 113 |
| ED007: Exchangeable Magnesium | ---- | 0.1 | meq/100g | <0.1 | 8.6 meq/100g | 91.7 | 85.0 | 115 |
| ED007: Exchangeable Potassium | ---- | 0.1 | meq/100g | <0.1 | 1.6 meq/100g | 91.3 | 70.0 | 122 |
| ED007: Exchangeable Sodium | ---- | 0.1 | meq/100g | <0.1 | 1.8 meq/100g | 91.4 | 76.0 | 112 |
| ED007: Cation Exchange Capacity | ---- | 0.1 | meq/100g | <0.1 | 18.5 meq/100g | 91.0 | 82.0 | 112 |
| **ED008: Exchangeable Cations (QCLot: 4281958)** | | | | | | | | |
| ED008: Exchangeable Calcium | ---- | 0.1 | meq/100g | <0.1 | 5.6 meq/100g | 99.3 | 91.0 | 109 |
| ED008: Exchangeable Magnesium | ---- | 0.1 | meq/100g | <0.1 | 6.9 meq/100g | 103 | 89.0 | 111 |
| ED008: Exchangeable Potassium | ---- | 0.1 | meq/100g | <0.1 | 1.3 meq/100g | 94.9 | 79.0 | 116 |
| ED008: Exchangeable Sodium | ---- | 0.1 | meq/100g | <0.1 | 0.7 meq/100g | 90.0 | 75.0 | 118 |
| ED008: Cation Exchange Capacity | ---- | 0.1 | meq/100g | <0.1 | 14.5 meq/100g | 100 | 88.0 | 110 |
| **ED040S: Soluble Major Anions (QCLot: 4258394)** | | | | | | | | |
| ED040S: Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | <10 | 750 mg/kg | 103 | 90.0 | 114 |

Sub-Matrix: **SOIL**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Acceptable Limits (%) | |
| | | | | Result | Concentration | LCS | Low | High |
| **ED040S: Soluble Major Anions (QCLot: 4258401)** | | | | | | | | |
| ED040S: Sulfate as SO4 2- | 14808-79-8 | 10 | mg/kg | <10 | 750 mg/kg | 101 | 90.0 | 114 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 4258397)** | | | | | | | | |
| ED045G: Chloride | 16887-00-6 | 10 | mg/kg | <10 | 50 mg/kg | 99.9 | 83.0 | 119 |
| | | | | <10 | 5000 mg/kg | 104 | 83.0 | 119 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 4258400)** | | | | | | | | |
| ED045G: Chloride | 16887-00-6 | 10 | mg/kg | <10 | 50 mg/kg | 101 | 83.0 | 119 |
| | | | | <10 | 5000 mg/kg | 104 | 83.0 | 119 |
| **ED091 : Calcium Chloride Extractable Boron (QCLot: 4263325)** | | | | | | | | |
| ED091: Boron | 7440-42-8 | 0.2 | mg/kg | <0.2 | 100 mg/kg | 99.2 | 85.0 | 117 |
| **ED092: DTPA Extractable Metals (QCLot: 4263324)** | | | | | | | | |
| ED092: Copper | 7440-50-8 | 1 | mg/kg | <1.00 | 1.5 mg/kg | 100.0 | 84.0 | 122 |
| ED092: Iron | 7439-89-6 | 1 | mg/kg | <1.00 | 68 mg/kg | 106 | 70.0 | 130 |
| ED092: Manganese | 7439-96-5 | 1 | mg/kg | <1.00 | 9.38 mg/kg | 126 | 70.0 | 130 |
| ED092: Zinc | 7440-66-6 | 1 | mg/kg | <1.00 | 7.81 mg/kg | 97.1 | 79.0 | 122 |
| **ED093S: Soluble Major Cations (QCLot: 4258393)** | | | | | | | | |
| ED093S: Calcium | 7440-70-2 | 10 | mg/kg | <10 | 250 mg/kg | 97.9 | 80.0 | 120 |
| ED093S: Magnesium | 7439-95-4 | 10 | mg/kg | <10 | 250 mg/kg | 102 | 80.0 | 120 |
| ED093S: Sodium | 7440-23-5 | 10 | mg/kg | <10 | 250 mg/kg | 101 | 80.0 | 120 |
| ED093S: Potassium | 7440-09-7 | 10 | mg/kg | <10 | 250 mg/kg | 101 | 80.0 | 120 |
| **ED093S: Soluble Major Cations (QCLot: 4258399)** | | | | | | | | |
| ED093S: Calcium | 7440-70-2 | 10 | mg/kg | <10 | 250 mg/kg | 95.8 | 80.0 | 120 |
| ED093S: Magnesium | 7439-95-4 | 10 | mg/kg | <10 | 250 mg/kg | 100 | 80.0 | 120 |
| ED093S: Sodium | 7440-23-5 | 10 | mg/kg | <10 | 250 mg/kg | 101 | 80.0 | 120 |
| ED093S: Potassium | 7440-09-7 | 10 | mg/kg | <10 | 250 mg/kg | 99.2 | 80.0 | 120 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4258398)** | | | | | | | | |
| EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | <0.1 | 2.5 mg/kg | 90.7 | 83.2 | 111 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4258404)** | | | | | | | | |
| EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 0.1 | mg/kg | <0.1 | 2.5 mg/kg | 94.7 | 83.2 | 111 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4258405)** | | | | | | | | |
| EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | <20 | 306 mg/kg | 107 | 70.0 | 130 |
| | | | | <20 | 2180 mg/kg | 98.0 | 72.0 | 128 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4258406)** | | | | | | | | |
| EK061G: Total Kjeldahl Nitrogen as N | ---- | 20 | mg/kg | <20 | 306 mg/kg | 107 | 70.0 | 130 |
| | | | | <20 | 2180 mg/kg | 97.4 | 72.0 | 128 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 4263323)** | | | | | | | | |

Sub-Matrix: **SOIL**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report: Result | Laboratory Control Spike (LCS) Report: Spike Concentration | Spike Recovery (%): LCS | Acceptable Limits (%): Low | Acceptable Limits (%): High |
|---|---|---|---|---|---|---|---|---|
| **EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 4263323) - continued** | | | | | | | | |
| EK080: Bicarbonate Ext. P (Colwell) | ---- | 5 | mg/kg | <5 | 100 mg/kg | 99.5 | 75.0 | 112 |
| | | | | <5 | 22 mg/kg | 100 | 70.0 | 130 |
| | | | | <5 | 155 mg/kg | 100 | 80.0 | 120 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen) (QCLot: 4280198)** | | | | | | | | |
| EK081: Bicarbonate Extractable P (Olsen) | ---- | 1 | mg/kg | <1.0 | 20 mg/kg | 98.2 | 84.0 | 115 |
| | | | | <1.0 | 9.05 mg/kg | 115 | 82.0 | 118 |
| | | | | <1.0 | 43 mg/kg | 84.2 | 77.0 | 123 |
| **EP004: Organic Matter (QCLot: 4260564)** | | | | | | | | |
| EP004: Organic Matter | ---- | 0.5 | % | <0.5 | 80 % | 95.0 | 83.0 | 115 |
| EP004: Total Organic Carbon | ---- | 0.5 | % | <0.5 | 46.4 % | 95.0 | 85.0 | 115 |
| **EP004: Organic Matter (QCLot: 4260565)** | | | | | | | | |
| EP004: Organic Matter | ---- | 0.5 | % | <0.5 | 80 % | 95.0 | 83.0 | 115 |
| EP004: Total Organic Carbon | ---- | 0.5 | % | <0.5 | 46.4 % | 95.0 | 85.0 | 115 |

## Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

| Laboratory sample ID | Sample ID | Method: Compound | CAS Number | Matrix Spike (MS) Report: Spike Concentration | SpikeRecovery(%): MS | Acceptable Limits (%): Low | Acceptable Limits (%): High |
|---|---|---|---|---|---|---|---|
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4258398)** | | | | | | | |
| EB2208583-002 | DS07_0.2-0.3 | EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 2 mg/kg | # Not Determined | 70.0 | 130 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4258404)** | | | | | | | |
| EB2208583-022 | SS01_0.0-0.3 | EK059G: Nitrite + Nitrate as N (Sol.) | ---- | 2 mg/kg | 78.8 | 70.0 | 130 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4258405)** | | | | | | | |
| EB2208583-002 | DS07_0.2-0.3 | EK061G: Total Kjeldahl Nitrogen as N | ---- | 500 mg/kg | 88.0 | 70.0 | 130 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4258406)** | | | | | | | |
| EB2208583-022 | SS01_0.0-0.3 | EK061G: Total Kjeldahl Nitrogen as N | ---- | 500 mg/kg | # 69.3 | 70.0 | 130 |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell) (QCLot: 4263323)** | | | | | | | |
| EB2208583-002 | DS07_0.2-0.3 | EK080: Bicarbonate Ext. P (Colwell) | ---- | 40 mg/kg | 98.8 | 70.0 | 130 |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen) (QCLot: 4280198)** | | | | | | | |
| EB2208583-007 | DS07_1.9-2.0 | EK081: Bicarbonate Extractable P (Olsen) | ---- | 20 mg/kg | 97.5 | 70.0 | 130 |
| **EP004: Organic Matter (QCLot: 4260564)** | | | | | | | |
| EB2208583-002 | DS07_0.2-0.3 | EP004: Organic Matter | ---- | 4 % | 93.0 | 70.0 | 130 |

Sub-Matrix: **SOIL**

| | | | | Matrix Spike (MS) Report | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spike | SpikeRecovery(%) | Acceptable Limits (%) | |
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *Concentration* | *MS* | *Low* | *High* |
| **EP004: Organic Matter (QCLot: 4260564) - continued** | | | | | | | |
| EB2208583-002 | DS07_0.2-0.3 | EP004: Total Organic Carbon | ---- | 2.32 % | 93.0 | 70.0 | 130 |
| **EP004: Organic Matter (QCLot: 4260565)** | | | | | | | |
| EB2208583-022 | SS01_0.0-0.3 | EP004: Organic Matter | ---- | 4 % | 93.2 | 70.0 | 130 |
| | | EP004: Total Organic Carbon | ---- | 2.32 % | 93.2 | 70.0 | 130 |

ALS Environmental

# QA/QC Compliance Assessment to assist with Quality Review

| | | | |
|---|---|---|---|
| **Work Order** | : **EB2208583** | Page | : 1 of 17 |
| Client | : **AECOM AUSTRALIA PTY LTD** | Laboratory | : Environmental Division Brisbane |
| Contact | : MS NAVJOT KAUR | Telephone | : +61 7 3552 8616 |
| Project | : 60651803 5.2 | Date Samples Received | : 24-Mar-2022 |
| Site | : ---- | Issue Date | : 21-Apr-2022 |
| Sampler | : NAVJOT KAUR | No. of samples received | : 26 |
| Order number | : 60651803 5.2 | No. of samples analysed | : 25 |

**This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.**

Brief method summaries and references are also provided to assist in traceability.

## Summary of Outliers

### Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

### Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

### Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

## Outliers : Quality Control Samples

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **SOIL**

| Compound Group Name | Laboratory Sample ID | Client Sample ID | Analyte | CAS Number | Data | Limits | Comment |
|---|---|---|---|---|---|---|---|
| **Matrix Spike (MS) Recoveries** | | | | | | | |
| EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar | EB2208583--002 | DS07_0.2-0.3 | **Nitrite + Nitrate as N (Sol.)** | ---- | Not Determined | ---- | **MS recovery not determined, background level greater than or equal to 4x spike level.** |
| EK061G: Total Kjeldahl Nitrogen By Discrete Analyser | EB2208583--022 | SS01_0.0-0.3 | **Total Kjeldahl Nitrogen as N** | ---- | 69.3 % | 70.0-130% | **Recovery less than lower data quality objective** |

## Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

| Method / Container / Client Sample ID(s) | | Extraction / Preparation: Date extracted | Extraction / Preparation: Due for extraction | Extraction / Preparation: Days overdue | Analysis: Date analysed | Analysis: Due for analysis | Analysis: Days overdue |
|---|---|---|---|---|---|---|---|
| **EA002: pH 1:5 (Soils)** | | | | | | | |
| **Snap Lock Bag** | | | | | | | |
| DS01_0.0-0.1, | DS01_0.2-0.3, | 07-Apr-2022 | 30-Mar-2022 | **8** | ---- | ---- | ---- |
| DS01_0.5-0.6, | DS01_0.8-0.9, | | | | | | |
| DS01_1.1-1.2, | DS01_1.5-1.6, | | | | | | |
| DS01_1.9-2.0, | DS04_0.0-0.1, | | | | | | |
| DS04_0.2-0.3, | DS04_0.5-0.6, | | | | | | |
| DS04_0.8-0.9, | DS04_1.1-1.2, | | | | | | |
| DS04_1.5-1.6, | DS04_1.9-2.0 | | | | | | |
| **Soil Glass Jar - Unpreserved** | | | | | | | |
| DS07_0.0-0.1, | DS07_0.2-0.3, | 07-Apr-2022 | 29-Mar-2022 | **9** | ---- | ---- | ---- |
| DS07_0.5-0.6, | DS07_0.8-0.9, | | | | | | |
| DS07_1.1-1.2, | DS07_1.5-1.6, | | | | | | |
| DS07_1.9-2.0 | | | | | | | |
| **Soil Glass Jar - Unpreserved** | | | | | | | |
| SS01_0.0-0.3, | SS02_0.0-0.3, | 07-Apr-2022 | 30-Mar-2022 | **8** | ---- | ---- | ---- |
| SS03_0.0-0.3, | SS04_0.0-0.3 | | | | | | |
| **EA010: Conductivity (1:5)** | | | | | | | |
| **Snap Lock Bag** | | | | | | | |
| DS01_0.0-0.1, | DS01_0.2-0.3, | 07-Apr-2022 | 30-Mar-2022 | **8** | ---- | ---- | ---- |
| DS01_0.5-0.6, | DS01_0.8-0.9, | | | | | | |
| DS01_1.1-1.2, | DS01_1.5-1.6, | | | | | | |
| DS01_1.9-2.0, | DS04_0.0-0.1, | | | | | | |
| DS04_0.2-0.3, | DS04_0.5-0.6, | | | | | | |
| DS04_0.8-0.9, | DS04_1.1-1.2, | | | | | | |
| DS04_1.5-1.6, | DS04_1.9-2.0 | | | | | | |

Matrix: **SOIL**

| Method / Container / Client Sample ID(s) | Extraction / Preparation: Date extracted | Due for extraction | Days overdue | Analysis: Date analysed | Due for analysis | Days overdue |
|---|---|---|---|---|---|---|
| **EA010: Conductivity (1:5) - Analysis Holding Time Compliance** | | | | | | |
| **Soil Glass Jar - Unpreserved** | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | 07-Apr-2022 | 29-Mar-2022 | **9** | ---- | ---- | ---- |
| **Soil Glass Jar - Unpreserved** | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | 07-Apr-2022 | 30-Mar-2022 | **8** | ---- | ---- | ---- |
| **EP004: Organic Matter** | | | | | | |
| **Snap Lock Bag** | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | 08-Apr-2022 | 30-Mar-2022 | **9** | ---- | ---- | ---- |

## *Outliers : Frequency of Quality Control Samples*

Matrix: **SOIL**

| Quality Control Sample Type / Method | Count: QC | Regular | Rate (%): Actual | Expected | Quality Control Specification |
|---|---|---|---|---|---|
| Laboratory Duplicates (DUP) | | | | | |
| Chloride Soluble By Discrete Analyser | 3 | 34 | 8.82 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | 3 | 34 | 8.82 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| Soil Particle Density | 0 | 25 | 0.00 | 10.00 | NEPM 2013 B3 & ALS QC Standard |

# *Analysis Holding Time Compliance*

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation: Date extracted | Due for extraction | Evaluation | Analysis: Date analysed | Due for analysis | Evaluation |
|---|---|---|---|---|---|---|---|

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EA002: pH 1:5 (Soils)** | | | | | | | |
| **Snap Lock Bag (EA002)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 30-Mar-2022 | × | **07-Apr-2022** | 07-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA002)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 29-Mar-2022 | × | **07-Apr-2022** | 07-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA002)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 30-Mar-2022 | × | **07-Apr-2022** | 07-Apr-2022 | ✓ |
| **EA010: Conductivity (1:5)** | | | | | | | |
| **Snap Lock Bag (EA010)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 30-Mar-2022 | × | **07-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA010)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 29-Mar-2022 | × | **07-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA010)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 30-Mar-2022 | × | **07-Apr-2022** | 05-May-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EA055: Moisture Content (Dried @ 105-110°C)** | | | | | | | |
| **Snap Lock Bag (EA055)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **----** | ---- | ---- | **30-Mar-2022** | 06-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA055)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **----** | ---- | ---- | **30-Mar-2022** | 05-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EA055)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **----** | ---- | ---- | **30-Mar-2022** | 06-Apr-2022 | ✓ |
| **EA058: Emerson Aggregate Test** | | | | | | | |
| **Snap Lock Bag (EA058)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **----** | ---- | ---- | **30-Mar-2022** | 18-Sep-2022 | ✓ |
| **Snap Lock Bag (EA058)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0, SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **----** | ---- | ---- | **30-Mar-2022** | 19-Sep-2022 | ✓ |
| **EA150: Particle Sizing** | | | | | | | |
| **Snap Lock Bag (EA150H)** | | | | | | | |
| DS07_0.0-0.1 | **22-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 18-Sep-2022 | ✓ |
| **Snap Lock Bag (EA150H)** | | | | | | | |
| DS01_0.0-0.1, DS04_0.0-0.1, SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 19-Sep-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EA150: Soil Classification based on Particle Size** | | | | | | | |
| **Snap Lock Bag (EA150H)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 18-Sep-2022 | ✓ |
| **Snap Lock Bag (EA150H)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0, SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 19-Sep-2022 | ✓ |
| **EA152: Soil Particle Density** | | | | | | | |
| **Snap Lock Bag (EA152)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 18-Sep-2022 | ✓ |
| **Snap Lock Bag (EA152)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0, SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **----** | ---- | ---- | **21-Apr-2022** | 19-Sep-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED005: Exchange Acidity** | | | | | | | |
| **Snap Lock Bag (ED005)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED005)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **12-Apr-2022** | 19-Apr-2022 | ✓ | **12-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED005)** | | | | | | | |
| DS07_0.5-0.6 | **22-Mar-2022** | **13-Apr-2022** | 19-Apr-2022 | ✓ | **13-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED005)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **ED006: Exchangeable Cations on Alkaline Soils** | | | | | | | |
| **Snap Lock Bag (ED006)** | | | | | | | |
| DS04_0.0-0.1, DS04_0.2-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **Snap Lock Bag (ED006)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **13-Apr-2022** | 20-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED006)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6 | **22-Mar-2022** | **12-Apr-2022** | 19-Apr-2022 | ✓ | **12-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED006)** | | | | | | | |
| DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **12-Apr-2022** | 19-Apr-2022 | ✓ | **13-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED006)** | | | | | | | |
| SS03_0.0-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED006)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **13-Apr-2022** | 20-Apr-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED007: Exchangeable Cations** | | | | | | | |
| **Snap Lock Bag (ED007)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED007)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **12-Apr-2022** | 19-Apr-2022 | ✓ | **12-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED007)** | | | | | | | |
| DS07_0.5-0.6 | **22-Mar-2022** | **13-Apr-2022** | 19-Apr-2022 | ✓ | **13-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED007)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **ED008: Exchangeable Cations** | | | | | | | |
| **Snap Lock Bag (ED008)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED008)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **12-Apr-2022** | 19-Apr-2022 | ✓ | **12-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED008)** | | | | | | | |
| DS07_0.5-0.6 | **22-Mar-2022** | **13-Apr-2022** | 19-Apr-2022 | ✓ | **13-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED008)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **12-Apr-2022** | 20-Apr-2022 | ✓ | **12-Apr-2022** | 20-Apr-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED040S : Soluble Sulfate by ICPAES** | | | | | | | |
| **Snap Lock Bag (ED040S)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **13-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED040S)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 19-Apr-2022 | ✓ | **13-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED040S)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **13-Apr-2022** | 05-May-2022 | ✓ |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | |
| **Snap Lock Bag (ED045G)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **07-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED045G)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 19-Apr-2022 | ✓ | **07-Apr-2022** | 05-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED045G)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **07-Apr-2022** | 05-May-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED091 : Calcium Chloride Extractable Boron** | | | | | | | |
| **Snap Lock Bag (ED091)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_1.1-1.2, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_1.1-1.2, DS04_1.9-2.0 | **23-Mar-2022** | **08-Apr-2022** | 19-Sep-2022 | ✓ | **08-Apr-2022** | 19-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED091)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_1.1-1.2, DS07_1.9-2.0 | **22-Mar-2022** | **08-Apr-2022** | 18-Sep-2022 | ✓ | **08-Apr-2022** | 18-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED091)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **08-Apr-2022** | 19-Sep-2022 | ✓ | **08-Apr-2022** | 19-Sep-2022 | ✓ |
| **ED092: DTPA Extractable Metals** | | | | | | | |
| **Snap Lock Bag (ED092)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_1.1-1.2, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_1.1-1.2, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 19-Sep-2022 | ✓ | **12-Apr-2022** | 19-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED092)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_1.1-1.2, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 18-Sep-2022 | ✓ | **12-Apr-2022** | 18-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED092)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 19-Sep-2022 | ✓ | **12-Apr-2022** | 19-Sep-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED093S: Soluble Major Cations** | | | | | | | |
| **Snap Lock Bag (ED093S)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 19-Sep-2022 | ✓ | **13-Apr-2022** | 19-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED093S)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 18-Sep-2022 | ✓ | **13-Apr-2022** | 18-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (ED093S)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 19-Sep-2022 | ✓ | **13-Apr-2022** | 19-Sep-2022 | ✓ |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | |
| **Snap Lock Bag (EK059G)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **07-Apr-2022** | 09-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK059G)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **07-Apr-2022** | 19-Apr-2022 | ✓ | **07-Apr-2022** | 09-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK059G)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **07-Apr-2022** | 20-Apr-2022 | ✓ | **07-Apr-2022** | 09-Apr-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | |
| **Snap Lock Bag (EK061G)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **05-Apr-2022** | 20-Apr-2022 | ✓ | **08-Apr-2022** | 03-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK061G)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **05-Apr-2022** | 19-Apr-2022 | ✓ | **08-Apr-2022** | 03-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK061G)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **05-Apr-2022** | 20-Apr-2022 | ✓ | **08-Apr-2022** | 03-May-2022 | ✓ |
| **EK080: Bicarbonate Extractable Phosphorus (Colwell)** | | | | | | | |
| **Snap Lock Bag (EK080)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_1.1-1.2, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_1.1-1.2, DS04_1.9-2.0 | **23-Mar-2022** | **08-Apr-2022** | 19-Sep-2022 | ✓ | **20-Apr-2022** | 19-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK080)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_1.1-1.2, DS07_1.9-2.0 | **22-Mar-2022** | **08-Apr-2022** | 18-Sep-2022 | ✓ | **20-Apr-2022** | 18-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK080)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **08-Apr-2022** | 19-Sep-2022 | ✓ | **20-Apr-2022** | 19-Sep-2022 | ✓ |

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EK081: Bicarbonate Extractable Phosphorus (Olsen)** | | | | | | | |
| **Snap Lock Bag (EK081)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_1.1-1.2, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_1.1-1.2, DS04_1.9-2.0 | **23-Mar-2022** | **13-Apr-2022** | 19-Sep-2022 | ✓ | **19-Apr-2022** | 19-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK081)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_1.1-1.2, DS07_1.9-2.0 | **22-Mar-2022** | **13-Apr-2022** | 18-Sep-2022 | ✓ | **19-Apr-2022** | 18-Sep-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EK081)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **13-Apr-2022** | 19-Sep-2022 | ✓ | **19-Apr-2022** | 19-Sep-2022 | ✓ |
| **EP004: Organic Matter** | | | | | | | |
| **Snap Lock Bag (EP004)** | | | | | | | |
| DS01_0.0-0.1, DS01_0.2-0.3, DS01_0.5-0.6, DS01_0.8-0.9, DS01_1.1-1.2, DS01_1.5-1.6, DS01_1.9-2.0, DS04_0.0-0.1, DS04_0.2-0.3, DS04_0.5-0.6, DS04_0.8-0.9, DS04_1.1-1.2, DS04_1.5-1.6, DS04_1.9-2.0 | **23-Mar-2022** | **08-Apr-2022** | 30-Mar-2022 | × | **14-Apr-2022** | 06-May-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EP004)** | | | | | | | |
| DS07_0.0-0.1, DS07_0.2-0.3, DS07_0.5-0.6, DS07_0.8-0.9, DS07_1.1-1.2, DS07_1.5-1.6, DS07_1.9-2.0 | **22-Mar-2022** | **08-Apr-2022** | 19-Apr-2022 | ✓ | **14-Apr-2022** | 19-Apr-2022 | ✓ |
| **Soil Glass Jar - Unpreserved (EP004)** | | | | | | | |
| SS01_0.0-0.3, SS02_0.0-0.3, SS03_0.0-0.3, SS04_0.0-0.3 | **23-Mar-2022** | **08-Apr-2022** | 20-Apr-2022 | ✓ | **14-Apr-2022** | 20-Apr-2022 | ✓ |

# Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Laboratory Duplicates (DUP)** | | | | | | | |
| Bicarbonate Extractable P (Colwell) | EK080 | 2 | 19 | **10.53** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Bicarbonate Extractable P (Olsen) | EK081 | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Calcium Chloride Extractable Boron | ED091 | 2 | 19 | **10.53** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Cations - soluble by ICP-AES | ED093S | 3 | 25 | **12.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride Soluble By Discrete Analyser | ED045G | 3 | 34 | **8.82** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| DTPA Extractable Metals | ED092 | 2 | 19 | **10.53** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Electrical Conductivity (1:5) | EA010 | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations | ED007 | 1 | 5 | **20.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations on Alkaline Soils | ED006 | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations with pre-treatment | ED008 | 1 | 5 | **20.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Anions - Soluble | ED040S | 3 | 25 | **12.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Moisture Content | EA055 | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | EK059G | 3 | 34 | **8.82** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Organic Matter | EP004 | 3 | 25 | **12.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| pH (1:5) | EA002 | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Soil Particle Density | EA152 | 0 | 25 | **0.00** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| TKN as N By Discrete Analyser | EK061G | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Laboratory Control Samples (LCS)** | | | | | | | |
| Bicarbonate Extractable P (Colwell) | EK080 | 3 | 19 | **15.79** | **15.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Bicarbonate Extractable P (Olsen) | EK081 | 3 | 20 | **15.00** | **15.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Calcium Chloride Extractable Boron | ED091 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Cations - soluble by ICP-AES | ED093S | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride Soluble By Discrete Analyser | ED045G | 4 | 34 | **11.76** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| DTPA Extractable Metals | ED092 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Electrical Conductivity (1:5) | EA010 | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations | ED007 | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations on Alkaline Soils | ED006 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations with pre-treatment | ED008 | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Anions - Soluble | ED040S | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | EK059G | 2 | 34 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Organic Matter | EP004 | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| pH (1:5) | EA002 | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Soil Particle Density | EA152 | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TKN as N By Discrete Analyser | EK061G | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Method Blanks (MB)** | | | | | | | |
| Bicarbonate Extractable P (Colwell) | EK080 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Bicarbonate Extractable P (Olsen) | EK081 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Calcium Chloride Extractable Boron | ED091 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Cations - soluble by ICP-AES | ED093S | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride Soluble By Discrete Analyser | ED045G | 2 | 34 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| DTPA Extractable Metals | ED092 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Electrical Conductivity (1:5) | EA010 | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations | ED007 | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations on Alkaline Soils | ED006 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Exchangeable Cations with pre-treatment | ED008 | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Anions - Soluble | ED040S | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | EK059G | 2 | 34 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Organic Matter | EP004 | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TKN as N By Discrete Analyser | EK061G | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Matrix Spikes (MS)** | | | | | | | |
| Bicarbonate Extractable P (Colwell) | EK080 | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Bicarbonate Extractable P (Olsen) | EK081 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | EK059G | 2 | 34 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Organic Matter | EP004 | 2 | 25 | **8.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TKN as N By Discrete Analyser | EK061G | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

## Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| pH (1:5) | EA002 | SOIL | In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3). |
| Electrical Conductivity (1:5) | EA010 | SOIL | In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3). |
| Moisture Content | EA055 | SOIL | In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3). |
| Emerson Aggregate Test | EA058 | SOIL | In house: Referenced to AS1289.3.8.1. Testing is performed only on soils with suitable aggregates; sands and gravels are usually unsuitable for this test. The test classifies the behaviour of soil aggregates, when immersed, on their coherence in water. |
| Particle Size Analysis by Hydrometer | EA150H | SOIL | Particle Size Analysis by Hydrometer according to AS1289.3.6.3 |
| Soil Particle Density | EA152 | SOIL | Soil Particle Density by AS 1289.3.5.1: Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method |
| Exchange Acidity by 1M Potassium Chloride | * ED005 | SOIL | In house: referenced to Rayment and Lyons, method 15G1. This method is unsuitable for near neutral and alkaline soils. NATA accreditation does not cover performance of this service. |
| Exchangeable Cations on Alkaline Soils | * ED006 | SOIL | In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. |
| Exchangeable Cations | ED007 | SOIL | In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3). |
| Exchangeable Cations with pre-treatment | ED008 | SOIL | In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3). |
| Major Anions - Soluble | ED040S | SOIL | In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES. |
| Chloride Soluble By Discrete Analyser | ED045G | SOIL | In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate. |
| Calcium Chloride Extractable Boron | * ED091 | SOIL | In house: Referenced to Rayment & Lyons method 12C2. Soil is extracted with hot 0.01M CaCl2 solution at a 1:2 ratio. Extracts can be run on ICP. |
| DTPA Extractable Metals | * ED092 | SOIL | In house: Referenced to Rayment and Lyons 12A1 |
| Cations - soluble by ICP-AES | ED093S | SOIL | In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3). |

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser | EK059G | SOIL | In house: Thermo Scientific Method D08727 and NEMI (National Environmental Method Index) Method ID: 9171. This method covers the determination of total oxidised nitrogen (NOx-N) and nitrate (NO3-N) by calculation, Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by direct colourimetry by Discrete Analyser. |
| TKN as N By Discrete Analyser | EK061G | SOIL | In house: Referenced to APHA 4500-Norg-D Soil samples are digested using Kjeldahl digestion followed by determination by Discrete Analyser. |
| Total Nitrogen as N (TKN + NOx) By Discrete Analyser | EK062G | SOIL | In house: Referenced to APHA 4500 Norg/NO3- Total Nitrogen is determined as the sum of TKN and Oxidised Nitrrogen, each determined seperately as N. |
| Bicarbonate Extractable P (Colwell) | EK080 | SOIL | In house: Referenced to Rayment & Lyons Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:100 soil:solution ratio and determined by FIA. |
| Bicarbonate Extractable P (Olsen) | EK081 | SOIL | In house: Referenced to Rayment and Lyons 9C1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:20 soil:solution ratio over 30 minutes and determined by FIA. |
| Organic Matter | EP004 | SOIL | In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3) |

| Preparation Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Exchangeable Cations Preparation Method (Alkaline Soils) | ED006PR | SOIL | In house: Referenced to Rayment and Lyons method 15C1. |
| Exchangeable Cations Preparation Method | ED007PR | SOIL | In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations. |
| Hot Water CaCl2 Extraction for Boron | ED091PR | SOIL | In house: Referenced to Rayment & Lyons method 12C2. Soil is extracted with hot 0.01M CaCl2 solution at a 1:2 ratio. Extracts can be run on ICP. |
| DTPA Extraction for Cu, Zn, Mn, Fe (2 hour leach) | ED092PR | SOIL | In house: Referenced to Rayment & Lyons Method 12A1 2 hour end over end tumbler extraction with 0.005M DTPA at a ratio of 1:2. Extracts can be run by ICP for metals. |
| TKN/TP Digestion | EK061/EK067 | SOIL | In house: Referenced to APHA 4500 Norg- D; APHA 4500 P - H. Macro Kjeldahl digestion. |
| Sample Preparation for Bicarbonate Extractable P (Colwell) | EK080-PR | SOIL | In house: Referenced to Rayment & Lyons Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:100 soil:solution ratio. |
| Sample Preparation for Bicarbonate Extractable P (Olsen) | EK081-PR | SOIL | In house: Referenced to Rayment and Lyons 9C1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:20 soil:solution ratio over 30 minutes. |
| 1:5 solid / water leach for soluble analytes | EN34 | SOIL | 10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis. |
| Organic Matter | EP004-PR | SOIL | In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3). |