24th January 2020

Piers Goodman
Environmental Manager
Venturex Resources Limited
Level 2, 91 Havelock Street
West Perth WA 6005

Attention: Piers Goodman

RE: Sulphur Springs Tailings Storage Facility – High Level Geotechnical Location Review

Dear Piers,

Venturex Resources Limited requested Entech Pty Ltd to provide a high-level geotechnical overview of the potential relocation site of the Sulphur Springs tailings storage facility (TSF). The author (Tom Parrott – Principal Geotechnical Engineer) of this overview is familiar with the project area having undertaken detailed geotechnical investigation, design and analysis studies of the nearby Sulphur Springs Open Pit and Underground Mine. This letter only intends to infer the likely geotechnical environment beneath the proposed TSF based on conditions encountered during studies undertaken at the Sulphur Springs open pit.

INTRODUCTION

Venturex Resources Limited (VXR) owns the Sulphur Springs Project located in the Pilbara region of Western Australia, 144km to the south east of Port Hedland and approximately 60km west of Marble Bar. Sulphur Springs is a copper-zinc sulphide deposit with outcrop at surface. The Sulphur Springs deposit sits within a 27km long trend termed the Panorama Trend which contains six advanced targets that have returned intersections of commercially feasible grades of copper and zinc.

Topography undulates sharply over short distances, with outcrop largely consisting of rock or rock-like material with a very poorly developed soil and weathering horizon.

Venturex has proposed a change in location of the tailings storage facility (TSF), to the south-east of the proposal Sulphur Springs open pit mine (see Figure 1). The proposed TSF:

- Utilises the presence of a valley developed within the topography which strikes roughly in a N-NW to S-SE direction.
- Consists of two major retention structures (one to the north and one to the south of the valley).
- Contains some minor retention structures along the western margin.
- Will utilise multiple lift dam wall construction.
- Likely to be staged along the length of its ultimate footprint.
- Is situated upstream of the proposed open pit in the local catchment area.

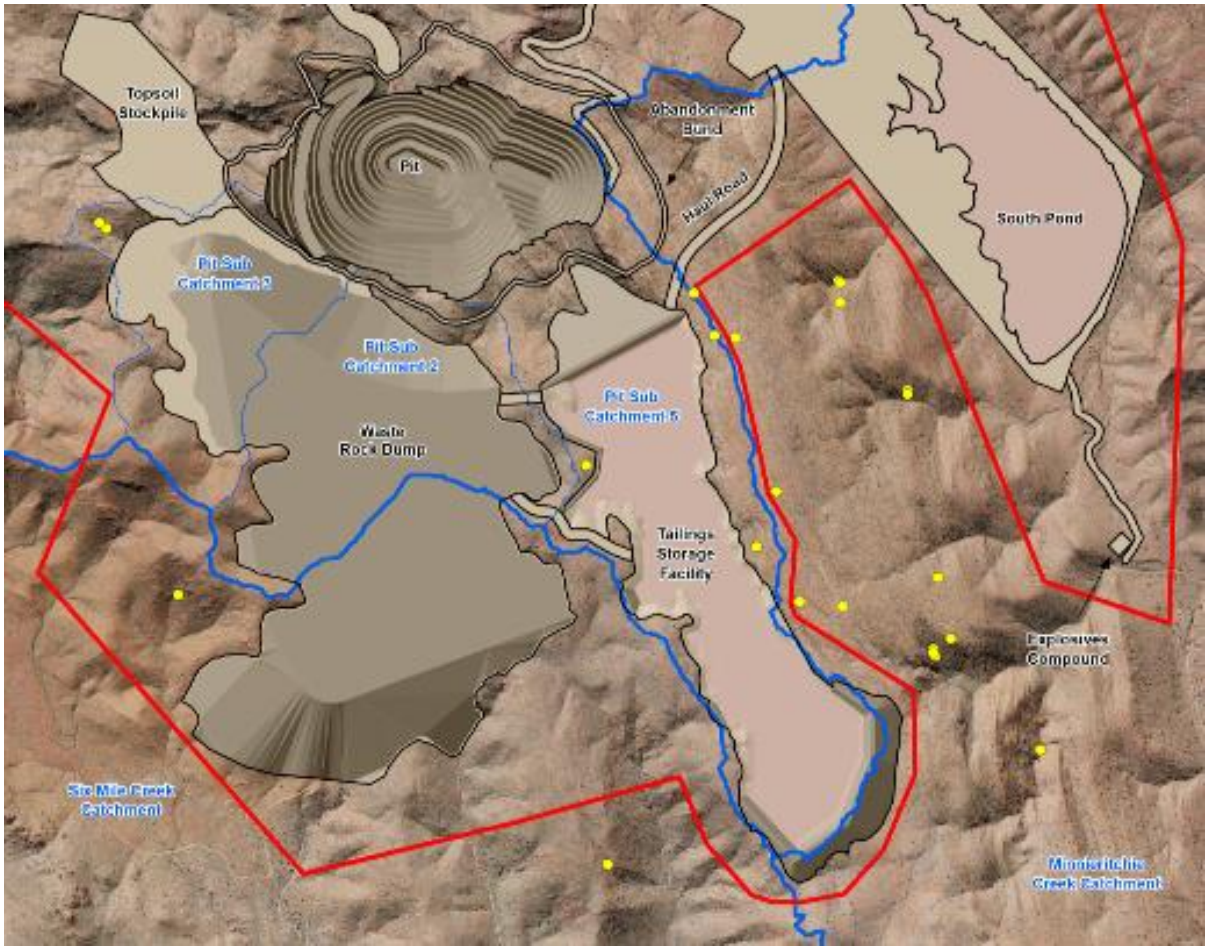

Figure 1. Site layout of the Sulphur Springs project showing the open pit, waste dump and tailings storage facility.

REGIONAL GEOLOGY

The Sulphur Springs VMS mineralisation occurs as a strata bound massive sulphide orebody lying close to the top of the Kangaroo Caves Formation (see Figure 2). More locally the sulphide mineralisation is observed to occur below (and in some places marginally within) the Marker Chert. At a regional scale, the Marker Chert is observed as overlying the Kangaroo Caves Formation. At the Sulphur Springs deposit, the Marker Chert is overlain with a polymict breccia unit and Upper Chert sequence.

The Kangaroo Caves formation is underlain by a felsic volcanic sequence containing a lower basalt-andesite unit and an upper dacite-rhyodacite unit. The dacite/rhyodacite unit is interpreted as a sub-volcanic intrusive sill which intruded between the volcanic pile and the overlying volcano-clastic sediments.

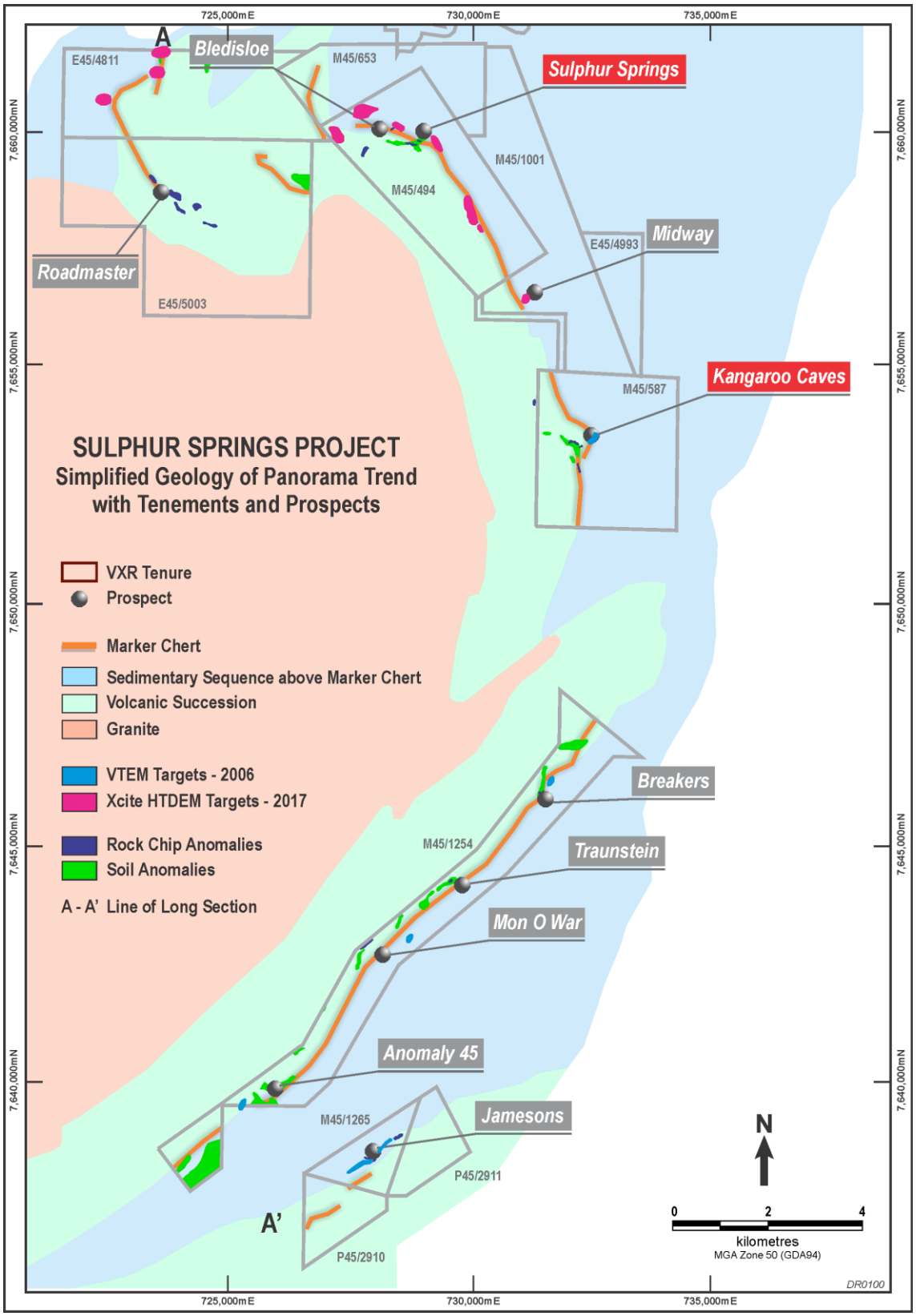

Figure 2. Simplified geology of the Panorama Trend hosting the Sulphur Springs Project (source: http://www.venturexresources.com/sulphur-springs-project/)

LOCAL GEOLOGY

The Sulphur Springs deposits is characterised as showing typical Volcano-genic Massive Sulphide (VMS) morphology with a copper-zinc rich massive sulphide lens that is underlain by a copper-rich stringer zone. The massive sulphide zone ranges up to 50m in thickness in places. The stratigraphy of the Sulphur Springs deposit decreases in age from footwall to hangingwall, and the presence of the Marker Chert (a highly silicified chert unit) is a characteristic marker horizon present on the immediate hangingwall of the massive sulphide mineralisation. The marker chert ranges in thickness up to 40m, forming a distinct ridge line through the deposit (i.e. outcropping is dominated by silicified packages which are resistant to weathering). The lack of feldspathic minerals and high silica content as resulted in a hard, mostly fresh rock unit.

The immediate footwall of the marker chert is characterised by the presence of rocks of dacitic felsic composition and volcanic rhyodacites, some of which are interpreted as being intrusive. These rocks are inter-fingered with the marker chert in places. The dacitic rocks underly the rhyodacites, and the dacites also contain some stock work and contains Cu-rich minerals.

The hangingwall of the Sulphur Springs deposit consists of a thick unit of polymict breccia, the composition of which varies greatly and contains a mixture of volcaniclastics, siltstones and sandstones. The composition and nature of the polymict changes frequently, with the individual horizons unable to be modelled separately. The polymict breccia ranges in thickness up to ~500m in places and will form the northern wall of the proposed open pit mine.

Surface geological mapping was overlain the proposed TSF, to understand the underlying geology; Figure 3 represents this. It can be summarised that:

- The northern TSF retention structure is underlain principally by a dacitic rockmass, and to lesser extents the marker chert, polymict breccia and quartzites.
- The southern TSF retention structure is underlain principally by dacitic rock mass, and minor amounts of marker chert and quartzites.
- The body of the TSF fill mass will principally be underlain by a dacitic rockmass.

The lithologies encountered within surface geological mapping at the proposed TSF location have mostly been encountered within diamond drill core at the open pit project.

Figure 3. Plan view of the propose TSF structure overlain by surface geological mapping.

WEATHERING

The weathering profile at the Sulphur Springs deposit can be described as generally shallow, and poorly developed. The outcrop at Sulphur Springs is dominated by silicified packages which are resistant to weathering i.e. marker chert. Cherts are by nature consistently nearly all siliceous material, weathering is generally absent, other than iron oxide staining on joint surfaces.

Rocks affected by the carbonate and chlorite alteration phases are more prone to weathering. Moderate to weak weathering is also observed within the footwall volcanics (dacites and rhyodacites) but typically transitions to fresh rock within 5-10m from surface. This is a localised observation. The younger, hangingwall rocks tend to have slightly deeper and more pronounced weathering, however, still generally transition to fresh rocks within ~15m from ground surface.

GEOTECHNICAL ROCK MASS PROPERTIES

Entech has previously summarised rock properties test results for the rock units encountered at the Sulphur Springs deposit. The following is a summary of the type and number of rock properties test work Entech oversaw in 2018:

- 15 x Unconfined Compressive Strength (UCS).
- 15 x Youngs Modulus and Poisson's Ratio.
- 16 x Brazilian Indirect Tensile Strength.
- 6 x Hoek Triaxial testing (multi-stage testing).
- 1 x Undrained Triaxial Testing, and
- 5 x Direct Shear testing of natural defects.

A total of 30 UCS with Elastic Properties tests have been undertaken historically and reviewed (prior to Entech, 2018). Table 1 provides a summary of UCS test results for the major rock types expected to be encountered beneath the proposed TSF location.

Table 1. Summary of UCS test results for rock types at Sulphur Springs.

Rock Type	No. Tests	UCS_{Min} (MPa)	UCS_{Avg} (MPa)	UCS_{Max} (MPa)	UCS_{SD} (MPa)
Breccia (Polymict)	4	43.1	105.7	149.8	47
Chert	11	37.2	179.7	389.5	121
Dacite	13	8.28	98.4	308.3	81.6
Felsic Volcanics	9	15.2	127.9	323	104.2

The various rock types encountered can be classified as generally Strong to Extremely Strong.

Rock mass classification has previously been undertaken (Entech, 2018) and is summarised the major rock types (see Figures 4-7).

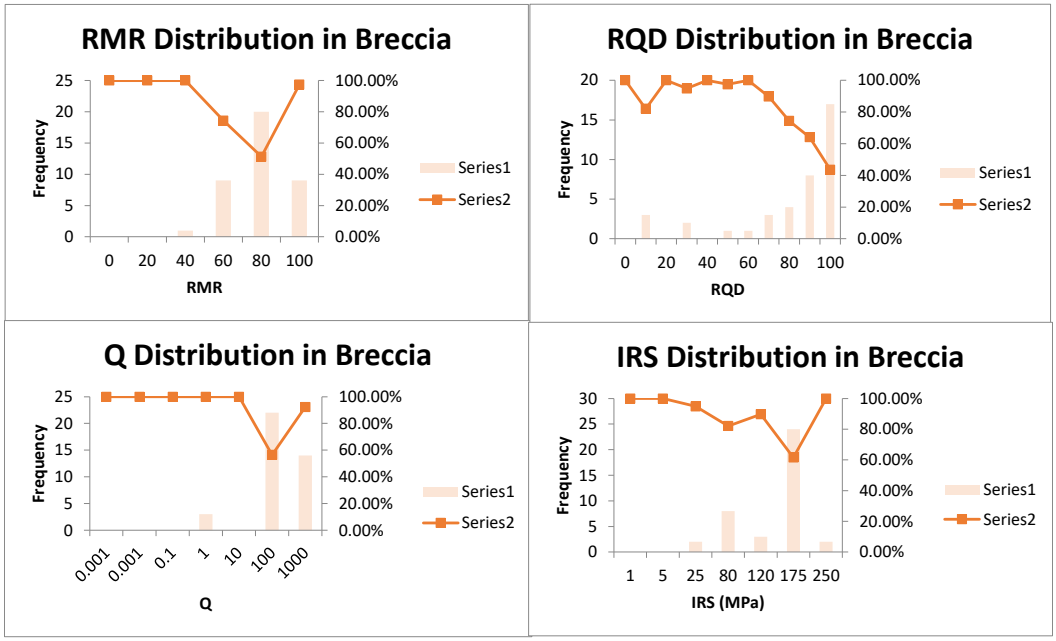

Figure 4. Rock mass summaries for Polymict Breccia

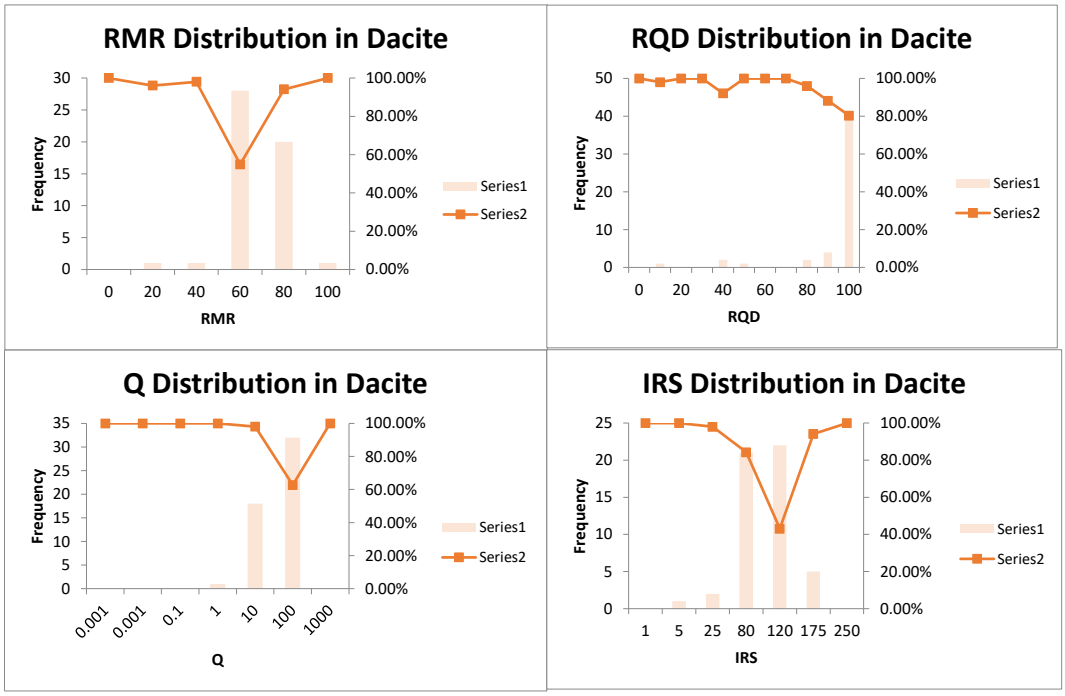

Figure 5. Rock mass summaries for Dacite

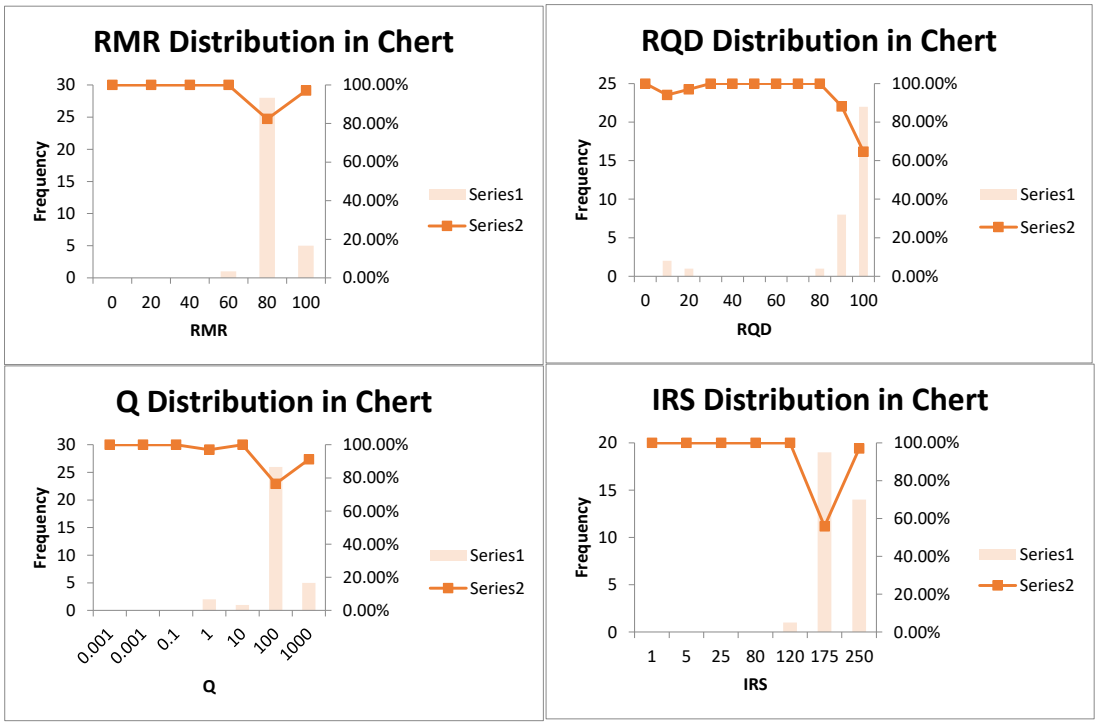

Figure 6. Rock mass summaries for Chert

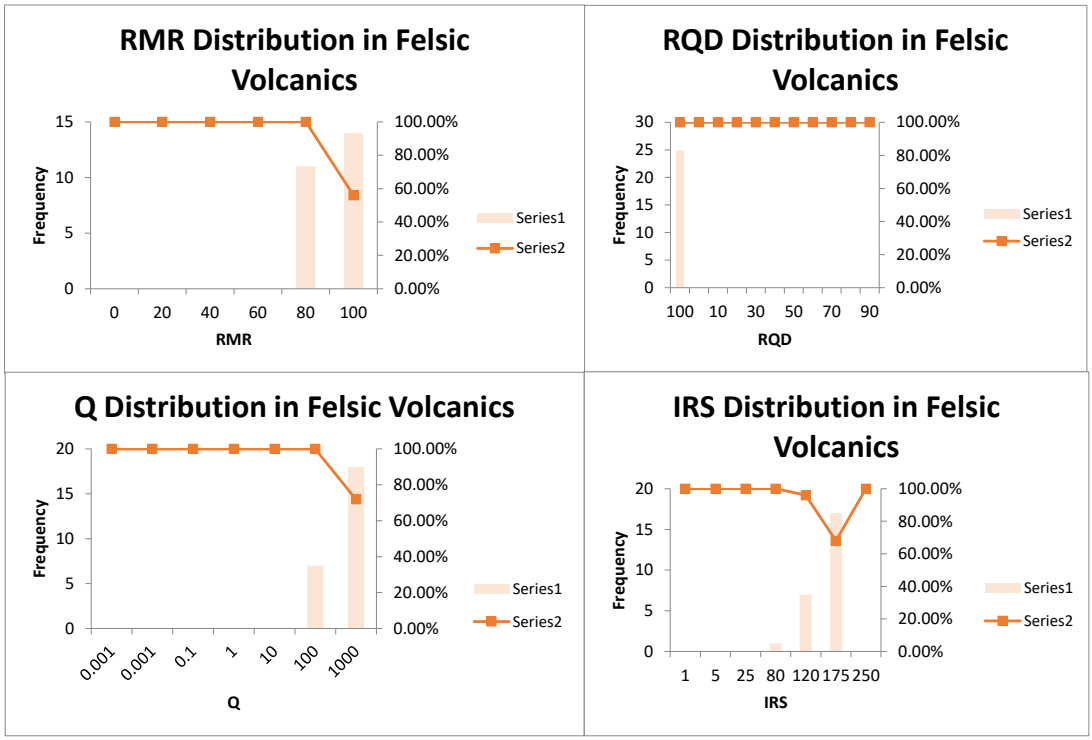

Figure 7. Rock mass summaries for Felsic Volcanics

CONCLUSIONS

While Entech is not qualified to comment on the type and nature of a TSF construction at the Sulphur Springs project, we are able to comment on the type of sub-surface ground conditions encountered to date at the project. If similar conditions were to be encountered beneath the proposed TSF location as has been encountered at the nearby proposed Sulphur Springs Open Pit, then it could be expected that:

- Little to no weathering of the near-surface rocks can be expected.
- Rock mass conditions are generally strong to very strong, and good to very good.

These characteristics are generally associated with stable, competent and erosion resistant rock formations. It is understood that the in-situ conditions will be confirmed by a investigative drilling program.

We make no comment relating to surface hydrology and ground hydrogeology, or the type and method of TSF retainment construction. We expected that a fully engineered TSF will be carried out in

accordance and at the direction of a suitably qualified engineering and design firm specialising in tailings dam design and construction.

Location of the proposed TSF upstream of the open pit will also require the development and implementation of industry best-practices for monitoring and mitigation measures against the unlikely event of an embankment failure.

If you have any questions regarding the review, then please do not hesitate to ask.

Signed for and on behalf of Entech Pty Ltd,

Tom Parrott MIEAust CPEng NER
Principal Geotechnical Consultant

Distribution:

Original held by:	Entech Pty Ltd
electronic transmission	Venturex Pty Ltd