

Technical Memorandum

To:	Chris Davidson	Date:	02/11/2023
cc:	Alan Tandy	From:	Carel van der Westhuizen
Subject:	GNA Soils Characterisation	Project:	PES23038

Introduction

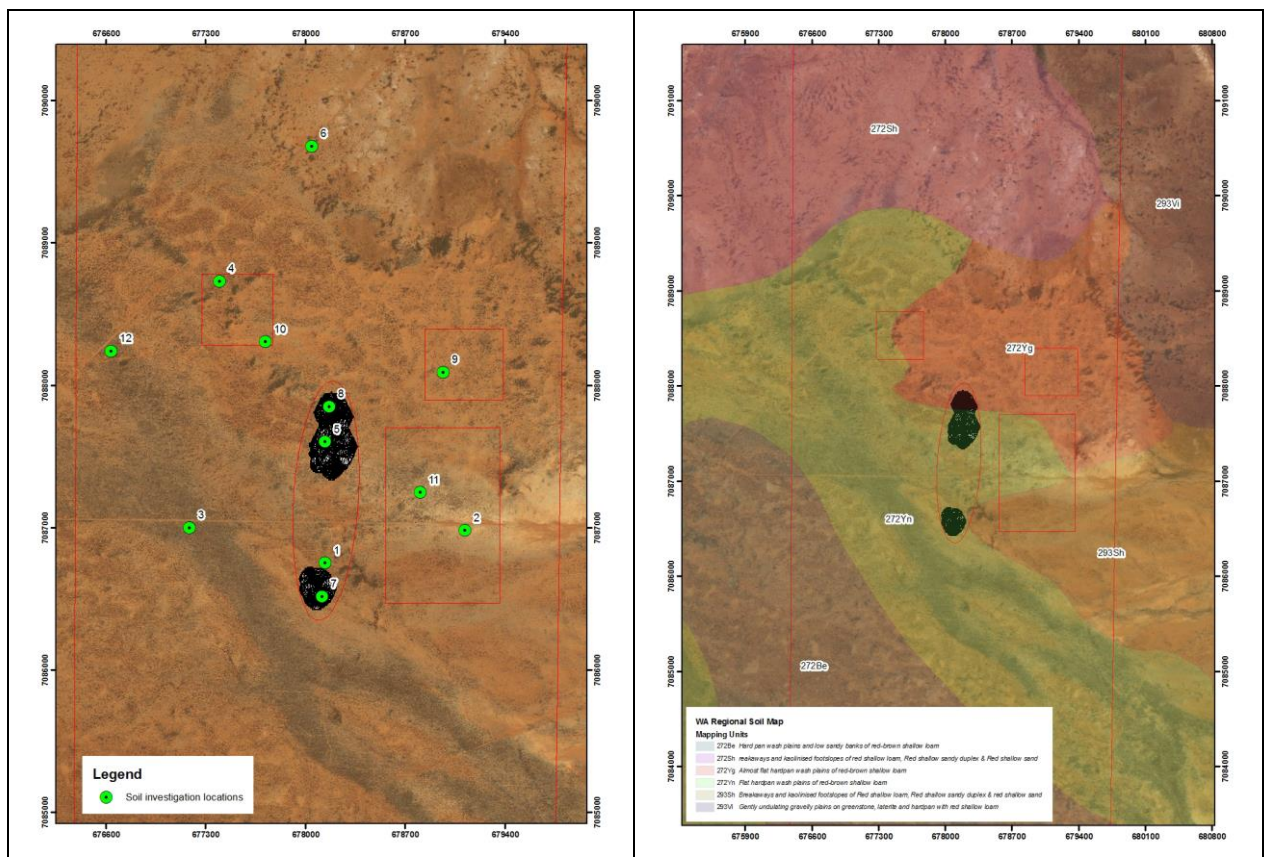
This memorandum details a technical review of the document: Soilwater Consultants, 2017: Gnaweeda Deposit Soil Characterisation, a report prepared for Doray Minerals Ltd as per your request:

We want to ensure that the entire development envelope, including both the North Turnberry and St Annes areas, is adequately surveyed. We need a short memo explaining your review and the disturbance envelope and that we can extrapolate that the soils in the areas investigate are widespread.

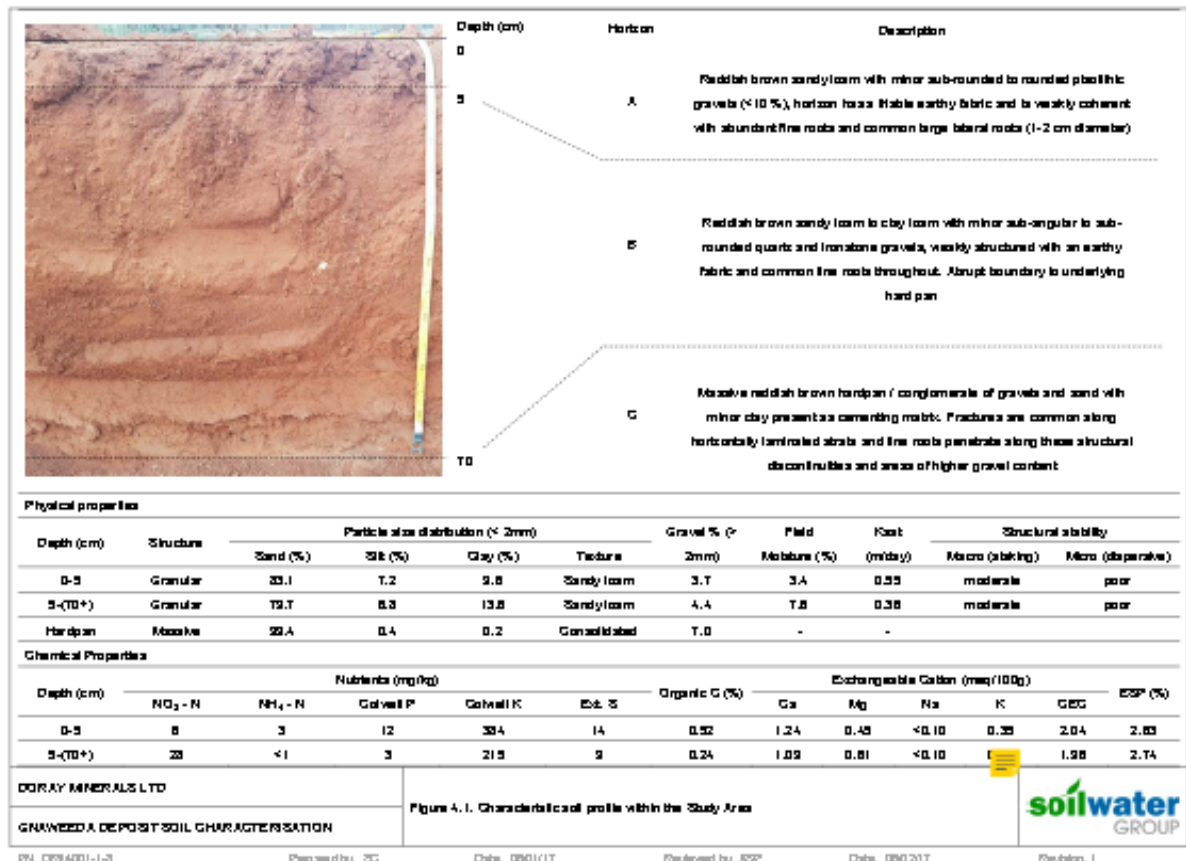
Findings of the Review

The following salient findings are relevant:

- The soil investigation and assessment cover the entire development envelope and include both the North Turnberry and St Annes deposits with samples taken at both the open pits and mine infrastructure.



- Soilwater identified only one distinct Soil Mapping Unit (SMU) and indicated that the soils encountered were generally uniform across the larger potential disturbance area (Figure 4.1: Characteristic Soil Profile), consisting predominately of a reddish-brown loam between 0.4m and 1.0m over a consolidated hardpan layer. Soilwater also noted that the *key aspect of the soils throughout the area is their shallow nature with an underlying hardpan being prevalent over the entirety of the area.*



- The report contains a few minor errors i.e. on page 23: soils are dominated by calcium and not sodium as stated in the report.
- The report also states that: *the exchangeable cation results show that all soil sampled within the soil profile are non-sodic, with ESP levels < 6 % but that they still are potentially dispersive due to their generally low salinity, as shown in Figure 4.6. The deeper soils are generally not dispersive as their higher EC acts to flocculate soil particles which are in solution, lowering dispersion rates and increasing the expected stability of these soils. Therefore, there are no expected stability issues when utilising these soils.*

The shallow soils at the site may be described as a sandy loam which is non-sodic (ESP between 1.6 and 3.4, averaging 2.8), non-saline (EC predominantly <200mS/m) and with an average sand:silt:clay ratio at 81.4%:7.0%:11.6%. The Electrochemical Stability Index, ESI (the index was developed to describe the relationship between salinity and dispersion as $ESI = EC_{1.5}/ESP$) at a value below 5 (using a salinity of 30mS/m and an ESP of 6) is considered the tipping point at which dispersion may become a potential risk. Consequently, soils with very low salinity levels (<30mS/m) and an ESP <6, as is the case with the shallow soils across the area, may be considered potentially dispersive. However, it should be noted that this criterion was developed for cotton soils in the eastern states and models that use ESP and EC only may not explain all dispersive behaviour, hence it should be used as a guide only taking due

cognisance that dispersive soils are generally sodic.

Conclusions and Recommendations

The uniform soil profile, coupled with the physical and chemical characteristics of the shallow soils, imply relative low risk to mining and soil management. In addition to the recommendations made by Soilwater, the mine should consider undertaking trials to ensure that safe, stable, non-polluting and sustainable post-mining landforms and use can be achieved.

If possible, the laboratory analytical certificates should be obtained to verify the analytical presentations in the Soilwater report.

References

Soilwater Consultants, 2017: Gnaweeda Deposit Soil Characterisation, unpublished report prepared for Doray Minerals Ltd.