Central Queensland Coal Project

Appendix 6h – Cross Sections of Regolith

Central Queensland Coal

CQC SEIS, Version 3

October 2020

Memorandum

To: Richard Cresswell, Miles Yeates

Cc: Natasha McIntosh; Marc Walker; Kate McBean

From: Michael McShane; John Bernal

Date: 24 of July 2020

Re: Cross Sections of Regolith in Tooloombah Creek and Deep Creek – Central Queensland Coal

Background

28 Boreholes were HQ cored along transects at various locations near Tooloombah Creek and Deep Creek. (Figure 1) The objective was to characterise the regolith to contribute to investigations into surface-groundwater interactions, for Central Queensland Coal Pty Ltd (CQC)

The 64 mm diameter core was logged using the CoalLog logging system and photographed. 67 samples were dispatched for particle-size analysis, salinity and moisture content. The average depth of the boreholes drilled is 20m.

Borehole collars were surveyed using DGPS. Holes were generally 40 metres apart along each transect line, depending on accessibility for the drilling rig.

A field trip was completed in order to collect information from the outcrops along the creeks and to correlate that information with the drilling data in areas in Tooloombah Creek where drilling was not possible due to access restrictions (bed of the creek and western bank). This information helped to confirm and improve the interpretation.

Plotting Downhole Data

The base-depth of the field geologist's coded descriptions were plotted as points at their respective locations on the transects. Polygons representing the rocktype were drawn as rectangles two metres wide to the 'left' of the actual trace of each hole.

Individual field log descriptions were frequently joined in the downhole plots on the cross sections, for example, changes in grain size in multiple adjacent entries of sandstone were depicted on the sections as one entry only. Distinction between weathered and unweathered rock of some rocktypes was made for visual clarity. The cross sections are therefore somewhat compromised in detail. Only the 'English' logs contain the full detail.

Interpretation

The plotted drilling data was interpreted by two CQC geologists using historical information, photographs of the core and geological descriptions. In addition, a field trip was completed to the area to collect outcropping information were the access for drilling was not possible and to correlate the drilling with this outcropping data.

Expected regolith types included: Holocene alluvium (Qa), Pleistocene alluvium (Qpa) and weathered Cretaceous Styx Coal Measures (Kx). Permian Back Creek Group (Pb) was intersected in three holes on the eastern side of Deep Creek North transect, demonstrating the location of a major north-south trending fault, known to occur at the eastern boundary of the Styx Coal Measures.

During the interpretation exercise, the following ideas were considered: -

Holocene alluvium (Qa), being relatively young, is unlikely to have a developed lateritic profile. Colours would likely be uniform or have a gradual change in colour. Induration of the sediment is likely to be limited, and the degree of cohesion generally low and controlled by clay content. Sandy layers would be weak, non-indurated and gravels loose.

Pleistocene alluvium (Qpa) is likely to have a developed lateritic profile, having been in situ for much longer and existing through various relative sea level changes. The colours would be darker, multi-coloured, layered and/or mottled variations of typical laterite colours.

Weathered Styx Coal Measures (Kx) would be quite shallow, particularly near Tooloombah Creek, where the coal measures outcrop in the creek base. The weathering characteristics of coal seams are that they are gradually replaced by clay and become highly plastic clays with very rich brown and red-brown colours. Relict rock texture would probably be visible in samples from the weathered sapropelic zone at the top of the coal measures.

Substantial core loss occurred in nearly all holes. The actual rock type that was being drilled cannot be known for certain. It is thought to be gravel mainly, which is common in the regolith. It is so loose it is impossible to retrieve as core, falling out of the core barrel upon retraction. The gravel that has fallen back into the hole is driven into the borehole wall or pushed into the core barrel when the core barrel is returned to the hole. Other loses, if any, are likely to be non-indurated sand. The driller advised that the clay was easily retrieved by the core barrel catcher.

Table 1. Hole Locations and Depths

Hole	Easting	Northing	Elevation	Total Depth
RDK01	774902.72	7485786.81	25.83	6.30
RDK02	774926.48	7485734.19	32.72	12.30
RDK03	774949.83	7485698.85	33.14	15.20
RDK04	774869.6	7485832.63	29.69	15.10
RDK05	774841.08	7485874.01	31.42	21.75
RDK07	775940.59	7486726.74	28.93	21.75
RDK08	775913.66	7486724.29	29.31	20.49
RDK09	775884.82	7486726.06	29.35	20.77
RDK10	776005.81	7486722.51	25.04	21.44
RDK11	776041	7486729	27.22	18.22

RDK12	776075.07	7486743.27	27.5	18.22
RTK01	772194.59	7489111.57	21.81	12.20
RTK02	772182.91	7489092.9	22.15	14.47
RTK03	772184.65	7489040.68	29.61	24.39
RTK04	772187	7488976	29.48	21.30
RTK05	772902.25	7490359.74	22.76	18.20
RTK06	772961	7490239	27.12	18.30
RTK07	772974.98	7490233.11	27.16	18.20
RTK08	772787.12	7489716.18	21.92	18.20
RTK09	772781.94	7489566.78	28.21	21.24
RTK10	772818.76	7489456.71	28.46	24.20
RTK11	770005.07	7488123.03	33.77	24.20
RTK12	770069.66	7488107.36	33.81	24.20
RTK13	770117.34	7488093.31	33.78	24.20
WMP28B	772192	7489099	21.91	9.00
WMP33B	772905	7490363	22.29	20.00
WMP33	772900	7490364	22.79	10.00
WMP06D	770039	7488119	34.06	47.00

The following lists the types of information provided to facilitate the regolith analysis:

For each hole: -

- Hole Locations & depths
- English Log
- DXF graphics file
- Standing water levels
- Sample numbers and depths (as parts of the above files)
- Results of sample analysis (particle size distribution, moisture content & TDS) Lab Refs EB2014000 & EB2016654

For each transect: -

- Interpreted Cross Section, as either vertically exaggerated x1 or x2 (Figures 2 to 10)

Table 2. Samples Analysed, Laboratory Reference EB2014000

100204	147707	100414	147748
100205	147732	100415	147741
100206	147736	100417	147744
100208	147727	147721	147737
100150	100403	147723	100301
100201	100404	147742	100302
100202	100406	147725	100303
147701	100409	147716	100304
147702	100410	147720	100305
147703	100412	147746	
147705	100413	147747	

Table 3. Samples Analysed, Laboratory Reference EB2016654

Laboratory Reference EB2016654			
100375	100389	100351	100322
100377	100390	100353	100323
100379	100373	100356	100327
100382	100374	100358	100330
100383	100364	100309	
100385	100368	100314	
100387	100369	100319	

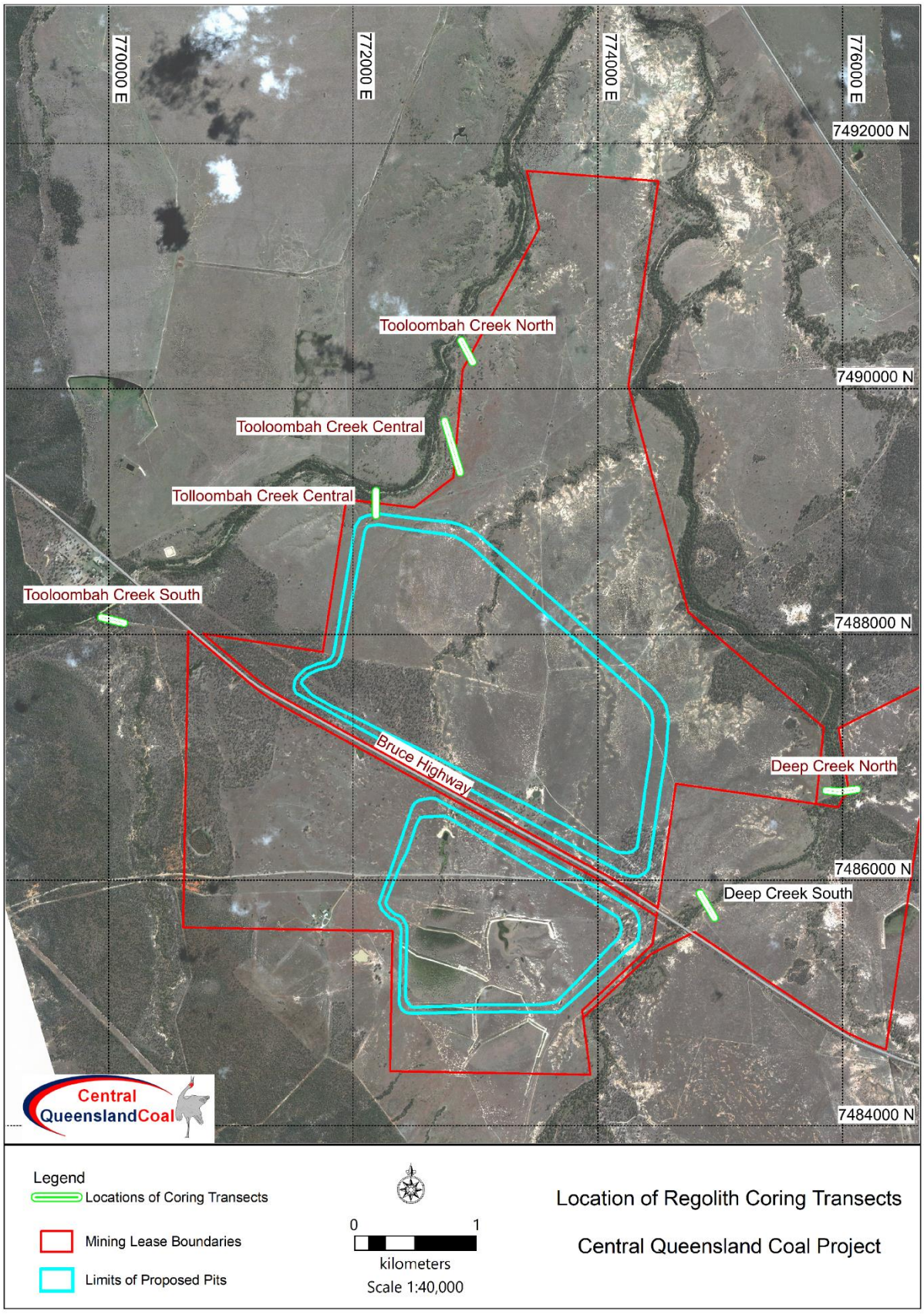


Figure 1. Location of the Regolith Drilling Transects

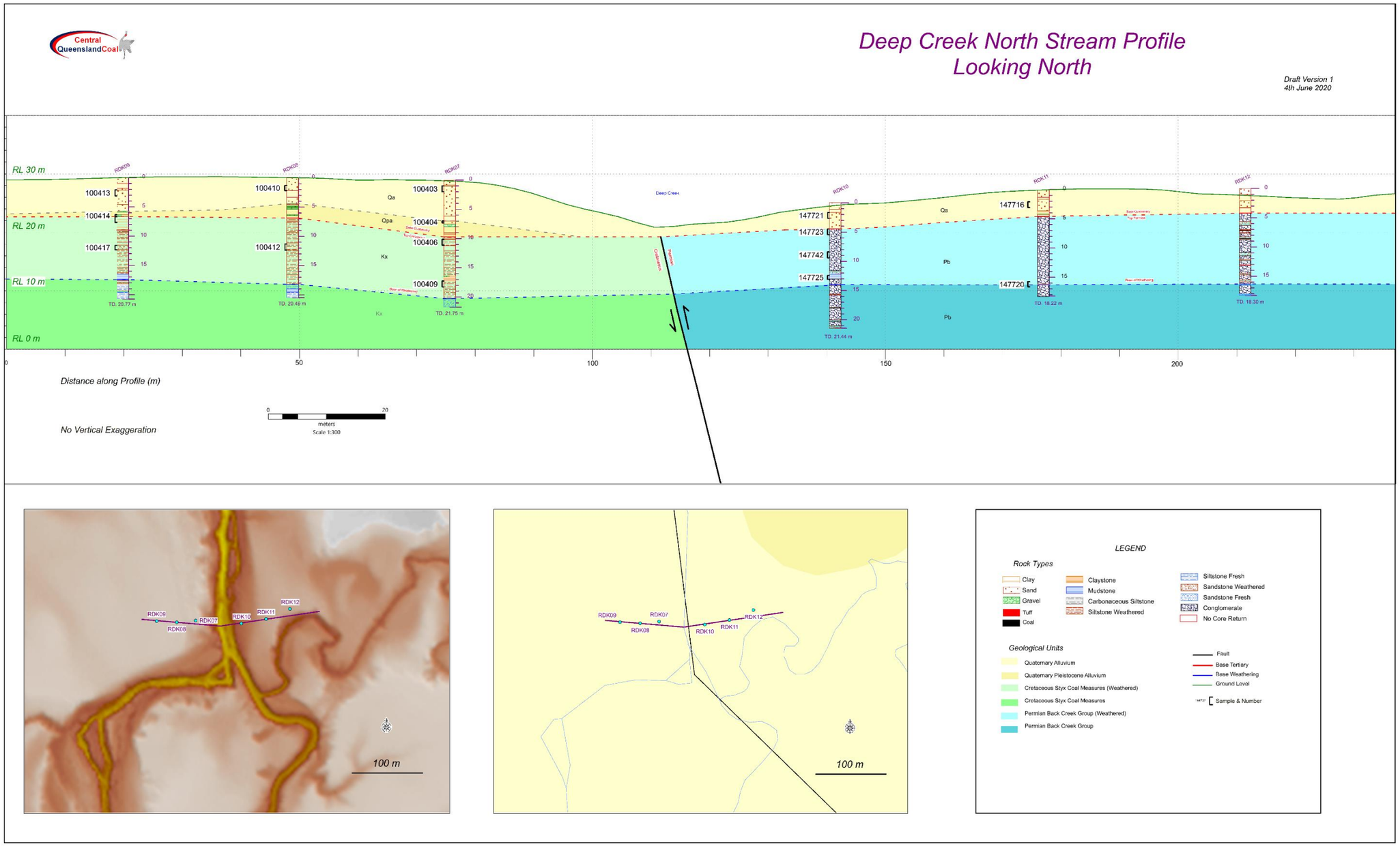


Figure 2. Deep Creek North – Cross Section

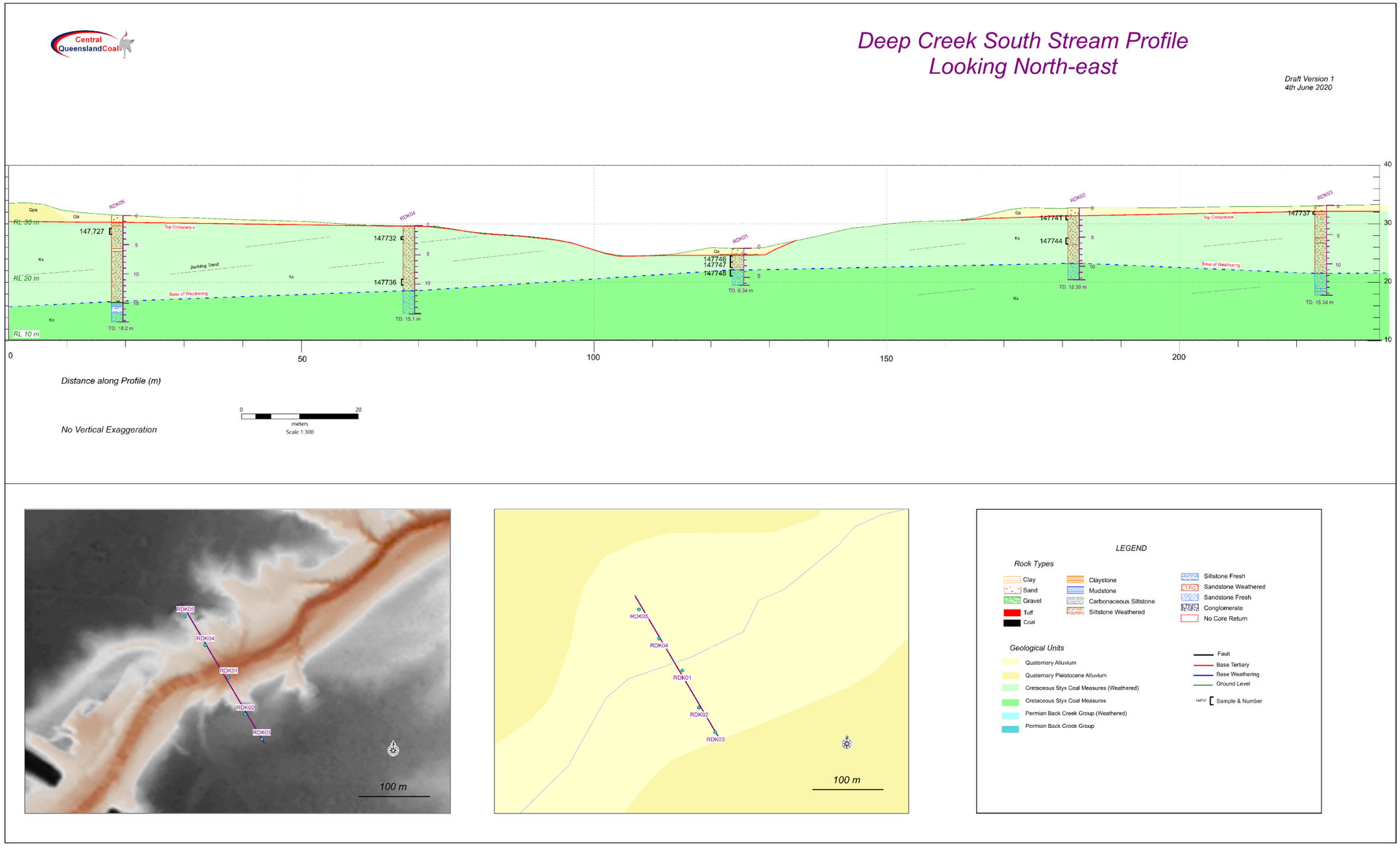


Figure 3. Deep Creek South – Cross Section

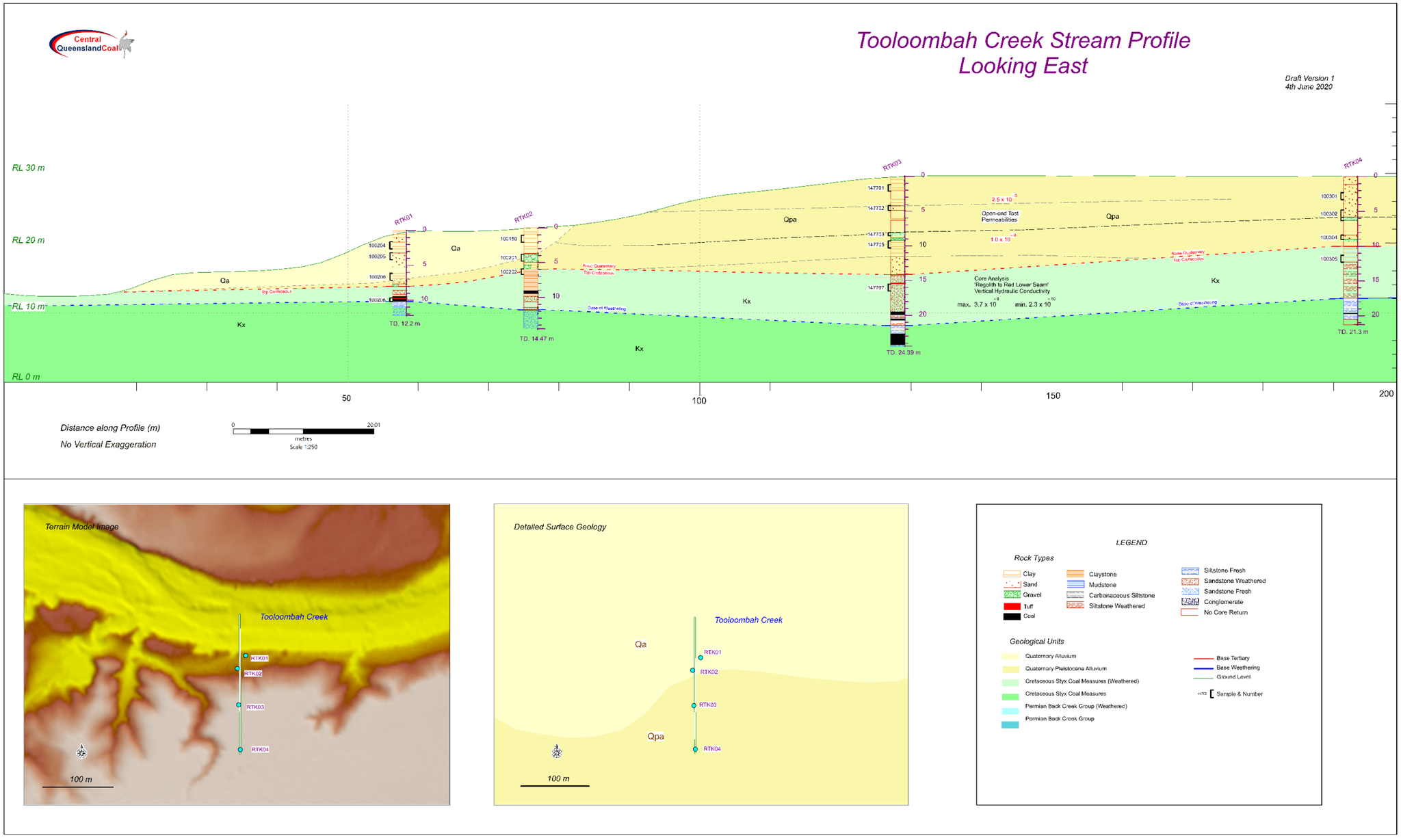
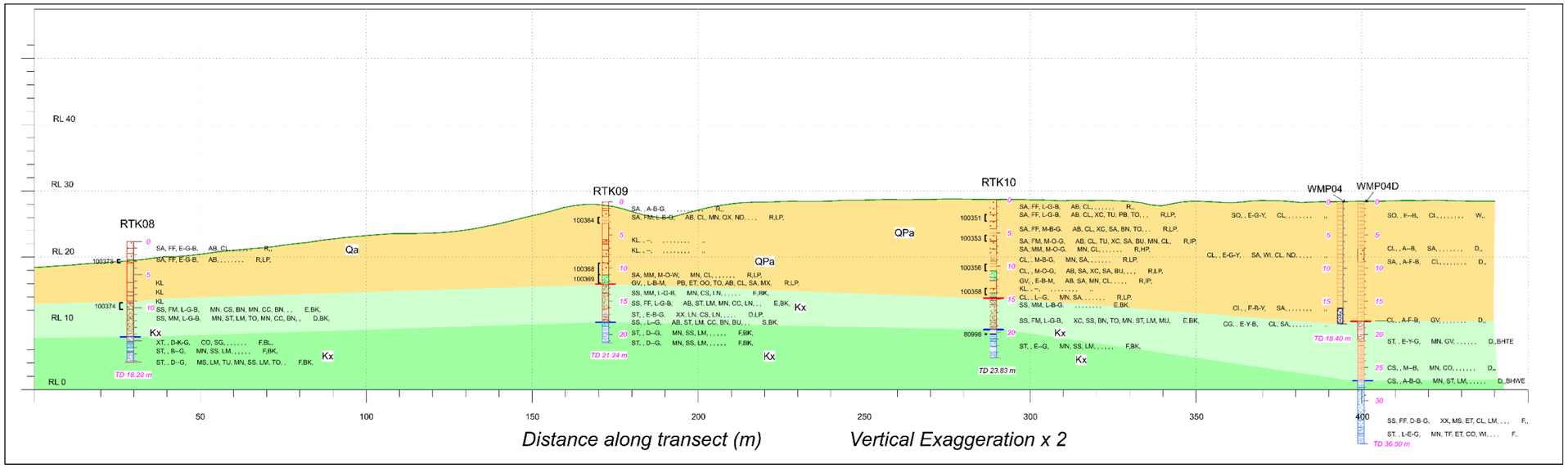
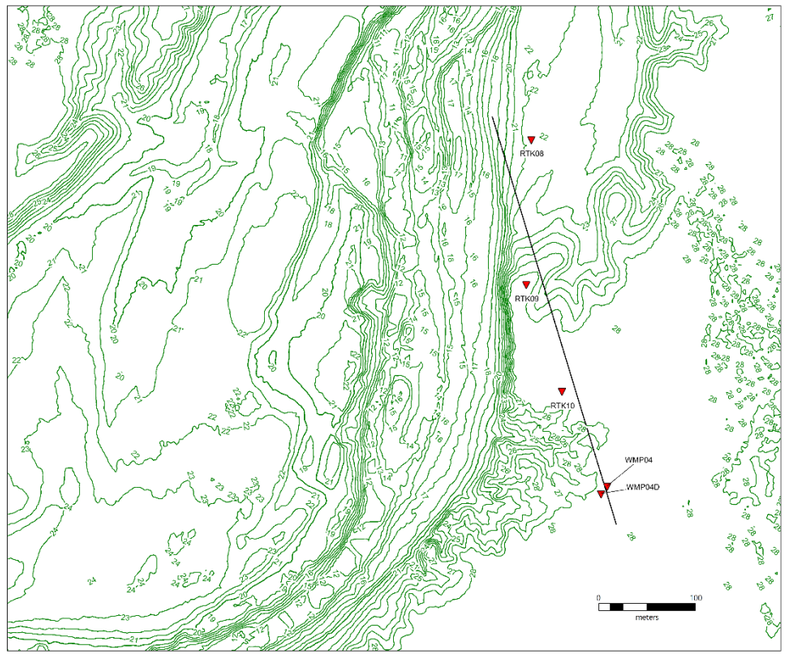


Figure 4. Tooloombah Creek Central 1 – Cross Section





Abbreviations:

Grain Size, Colour, Adjectives, Weathering, Mechanical State

Rocktype — SA, FM, L-C-B, — AB, CL, ... — R,HP,

Refer to English log for full uncoded description

LEGEND

Rock Types

- Clay
- Sand
- Gravel
- Tuff
- Coal
- Claystone
- Mudstone
- Siltstone Carbonaceous
- Siltstone Weathered
- Siltstone Fresh
- Calcrete
- Sandstone Weathered
- Sandstone Fresh
- Sandstone Carbonaceous
- Conglomerate
- No Core Return

Geological Units

- Quaternary Holocene Alluvium
- Quaternary Pleistocene Alluvium
- Cretaceous Styx Coal Measures (Weathered)
- Cretaceous Styx Coal Measures
- Permian Back Creek Group (Weathered)
- Permian Back Creek Group
- Fault
- Top Cretaceous / Base Tertiary
- Base Weathering
- Ground Level
- 144702 [Sample & Number

Tooloombah Creek Central Drilling Transect

Figure 5. Tooloombah Creek Central 2 – Cross Section

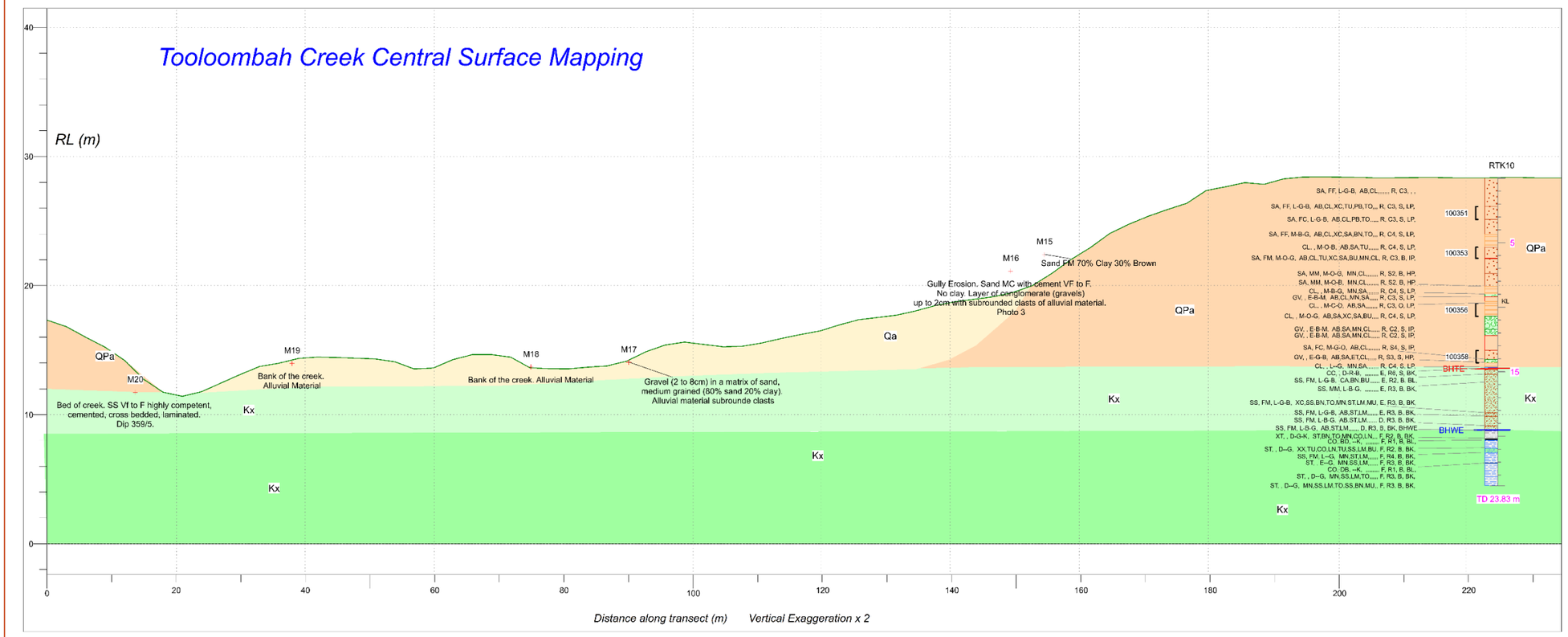
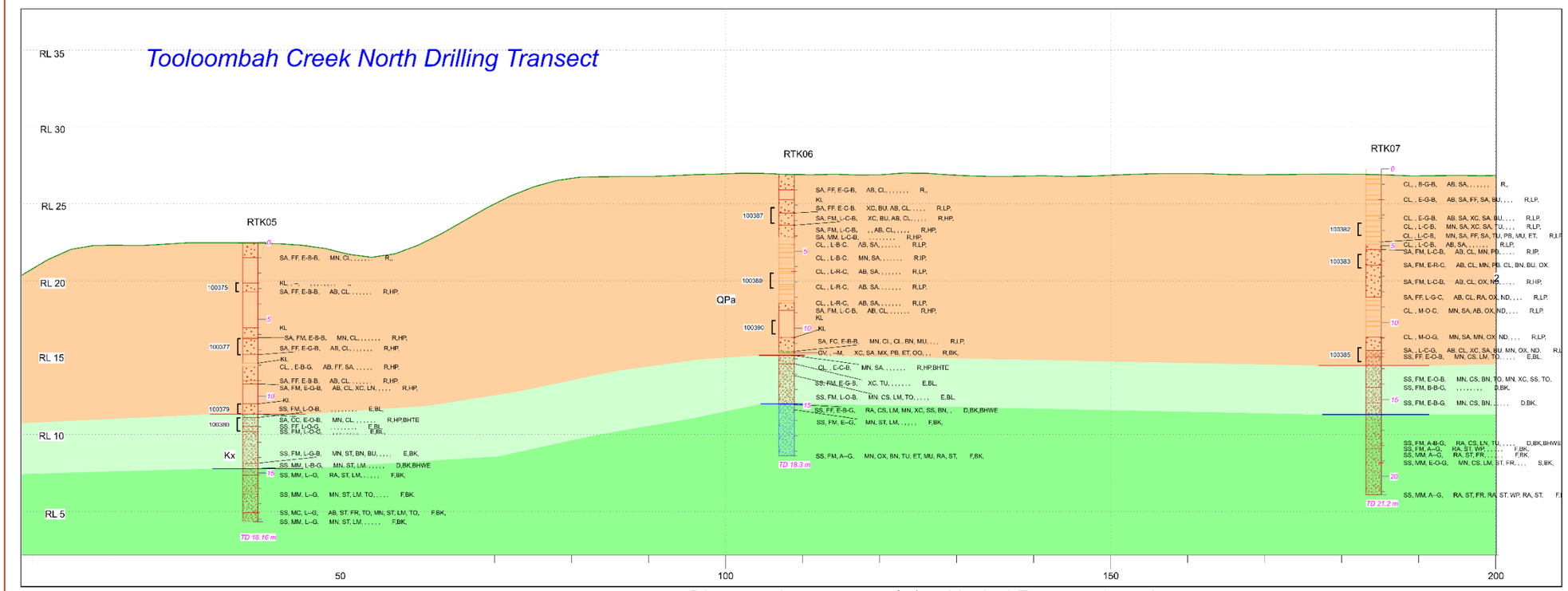
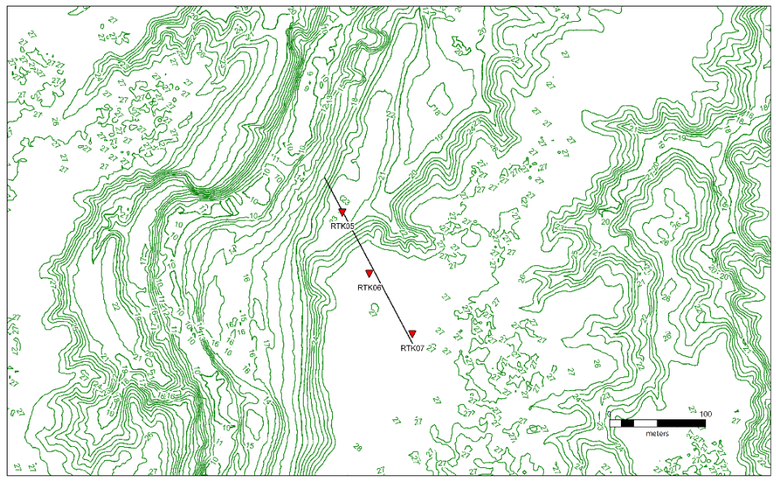


Figure 6. Tooloombah Creek Central 2 – Cross Section Surface mapping



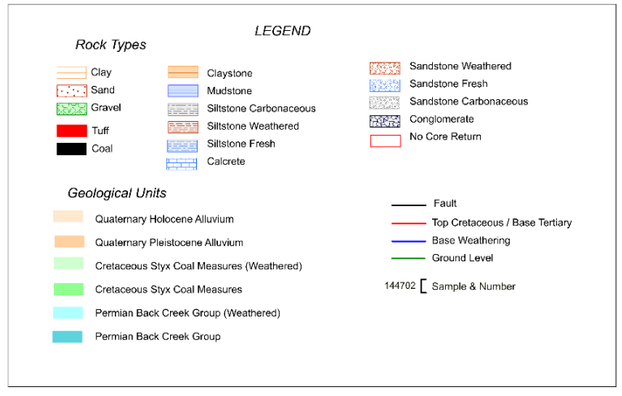


Abbreviations:

Colour, Adjectives, Weathering, Grain Size, Mechanical State

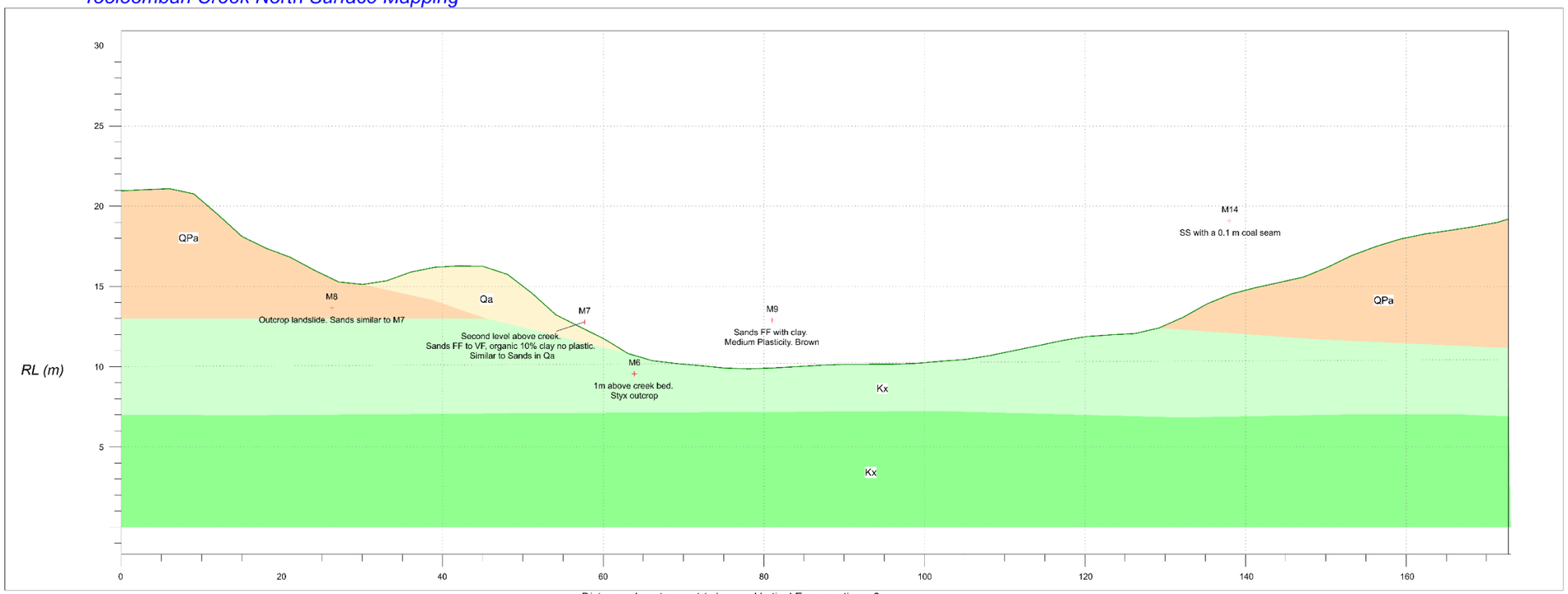
Rocktype — SA, FM, L-C-B, AB, CL, , , , , , , R,HP,

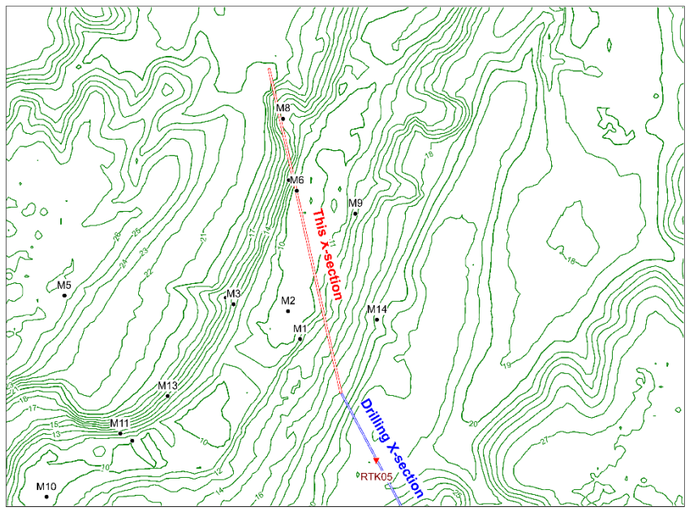
Refer to English log for full uncoded description



Tooloombah Creek North Drilling Transect

Figure 7. Tooloombah Creek North – Cross Section

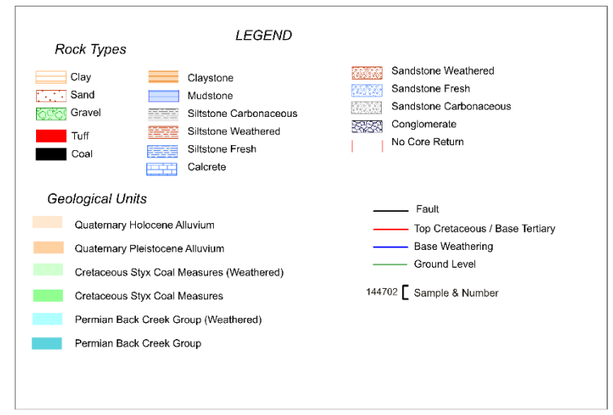




Abbreviations:

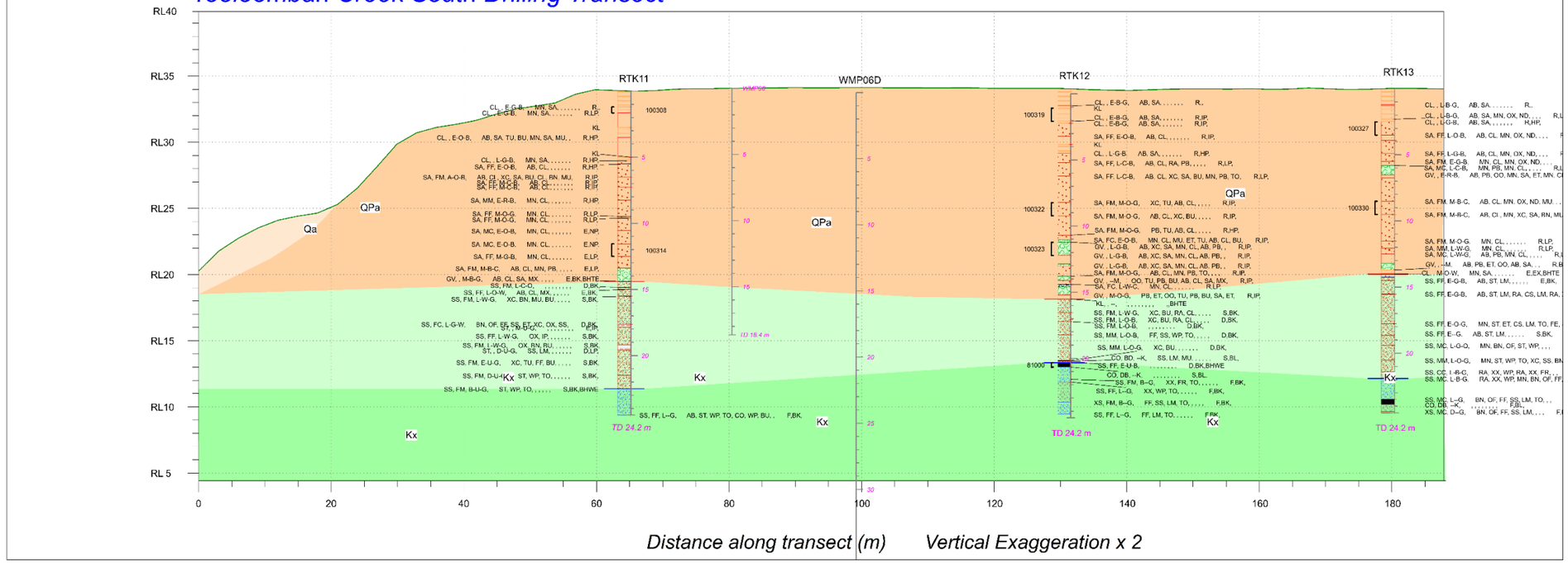
Rocktype	Grain Size	Colour	Adjectives	Weathering	Mechanical State
SA, FM, L-C-B,			AB, CL, , , , , ,	R,HP,	

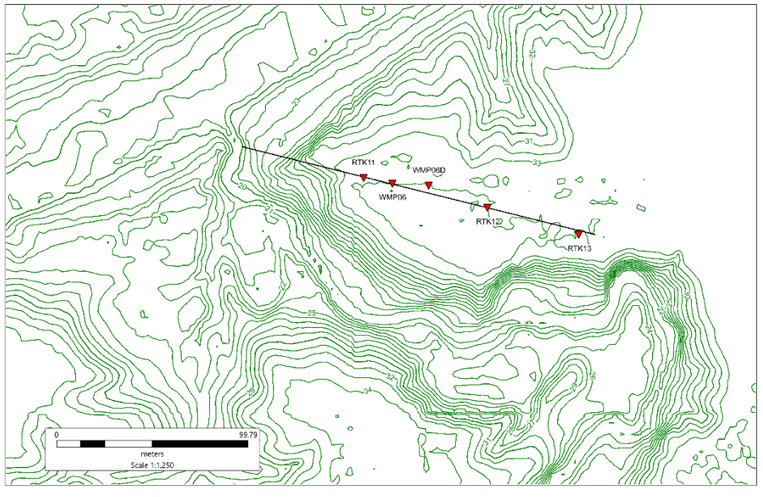
Refer to English log for full uncoded description



Tooloombah Creek North Surface Mapping

Figure 8. Tooloombah Creek North – Cross Section Surface mapping

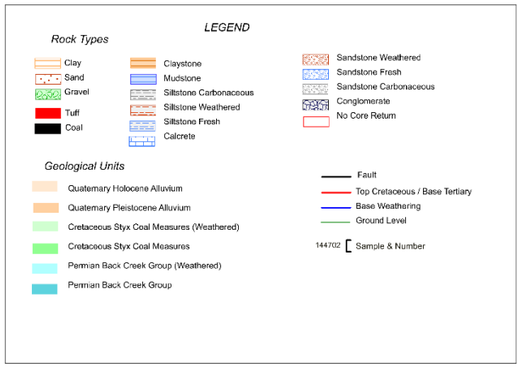




Abbreviations:

Colour
Adjectives
Weathering
Grain Size
Mechanical State
Rocktype — SA, FM, L-C-B, — AB, CL, , , , , , — R,HP,

Refer to English log for full uncoded description



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Tooloombah Creek South Drilling Transect

Figure 9. Tooloombah Creek South – Cross Section

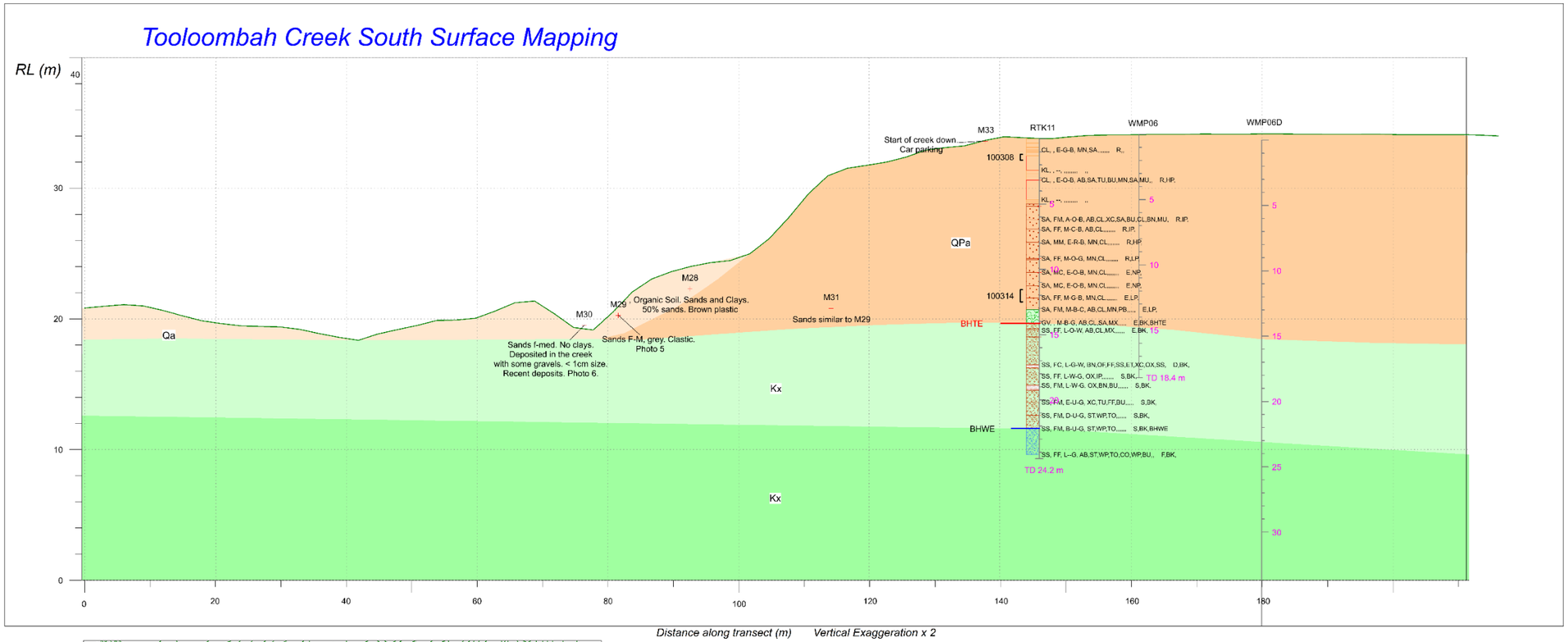

Figure 10. Tooloombah Creek South – Cross Section Surface mapping