

Dingo West - DW7293GT Box 1 - 4 ( of 55)

0m



16.07m



16.07m



34.07m



34.07m



50.41m



50.41m



66.74m



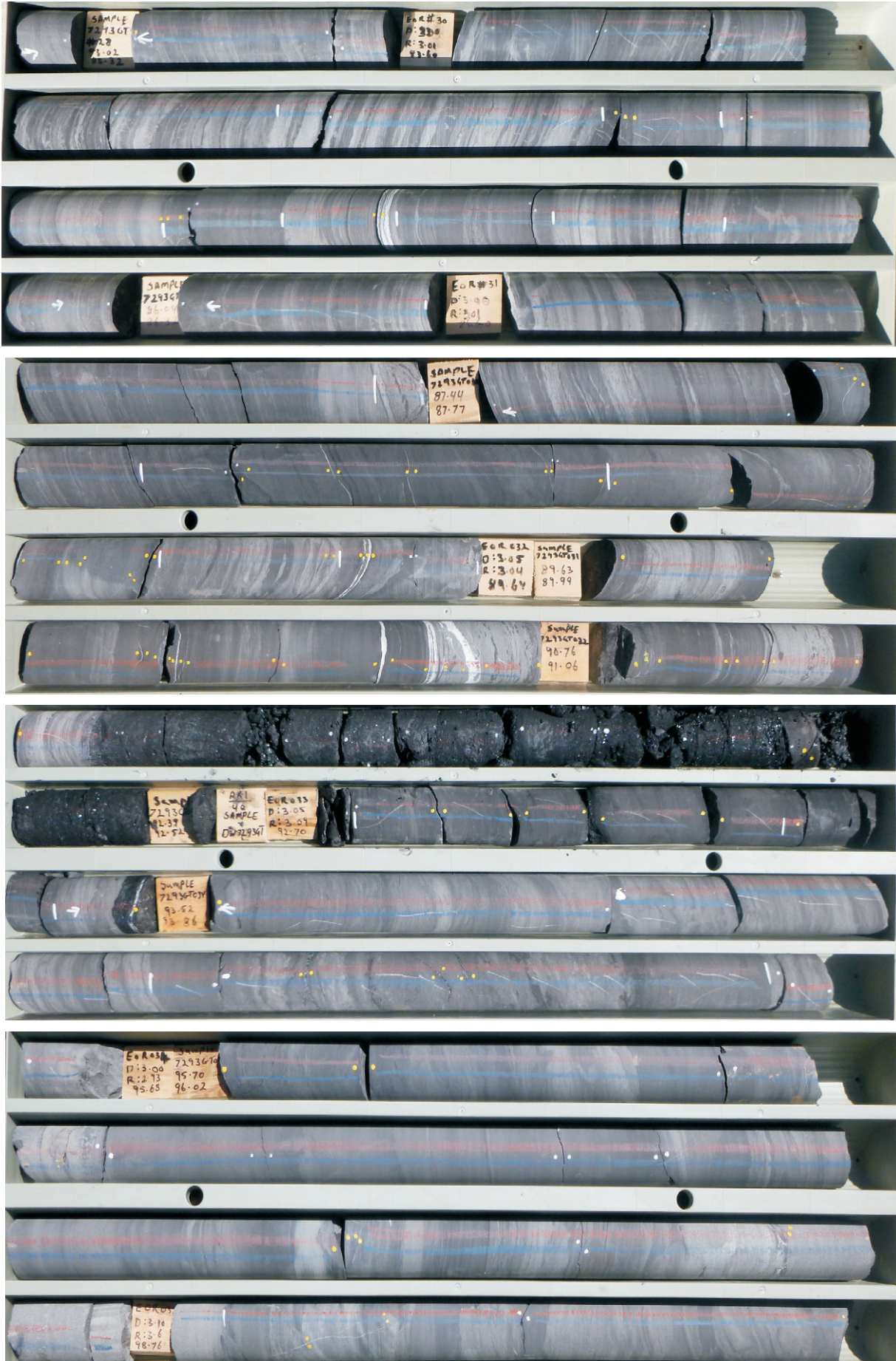
66.74m



82.97m



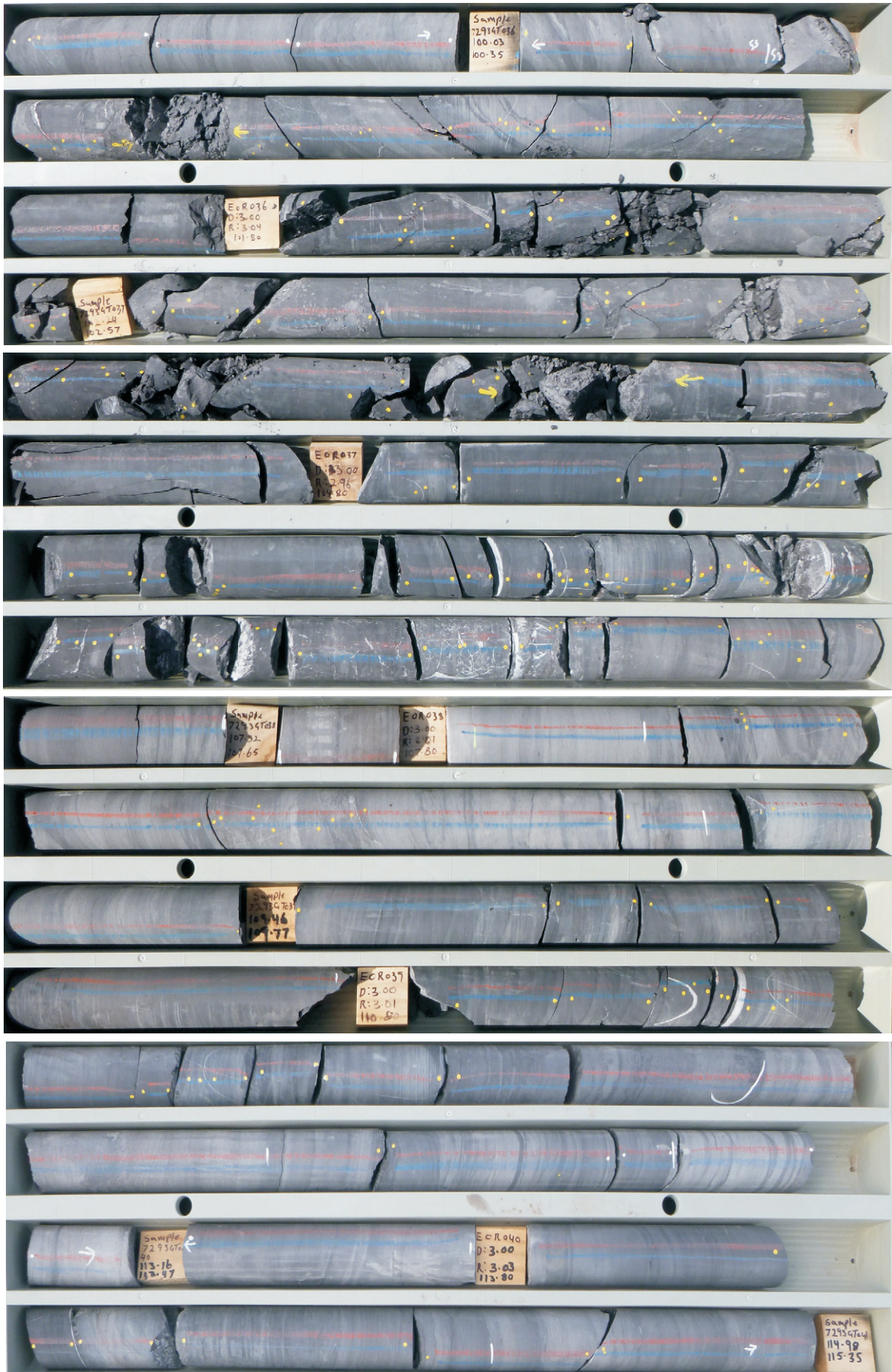
82.97m



99.53m



99.53m



115.35m



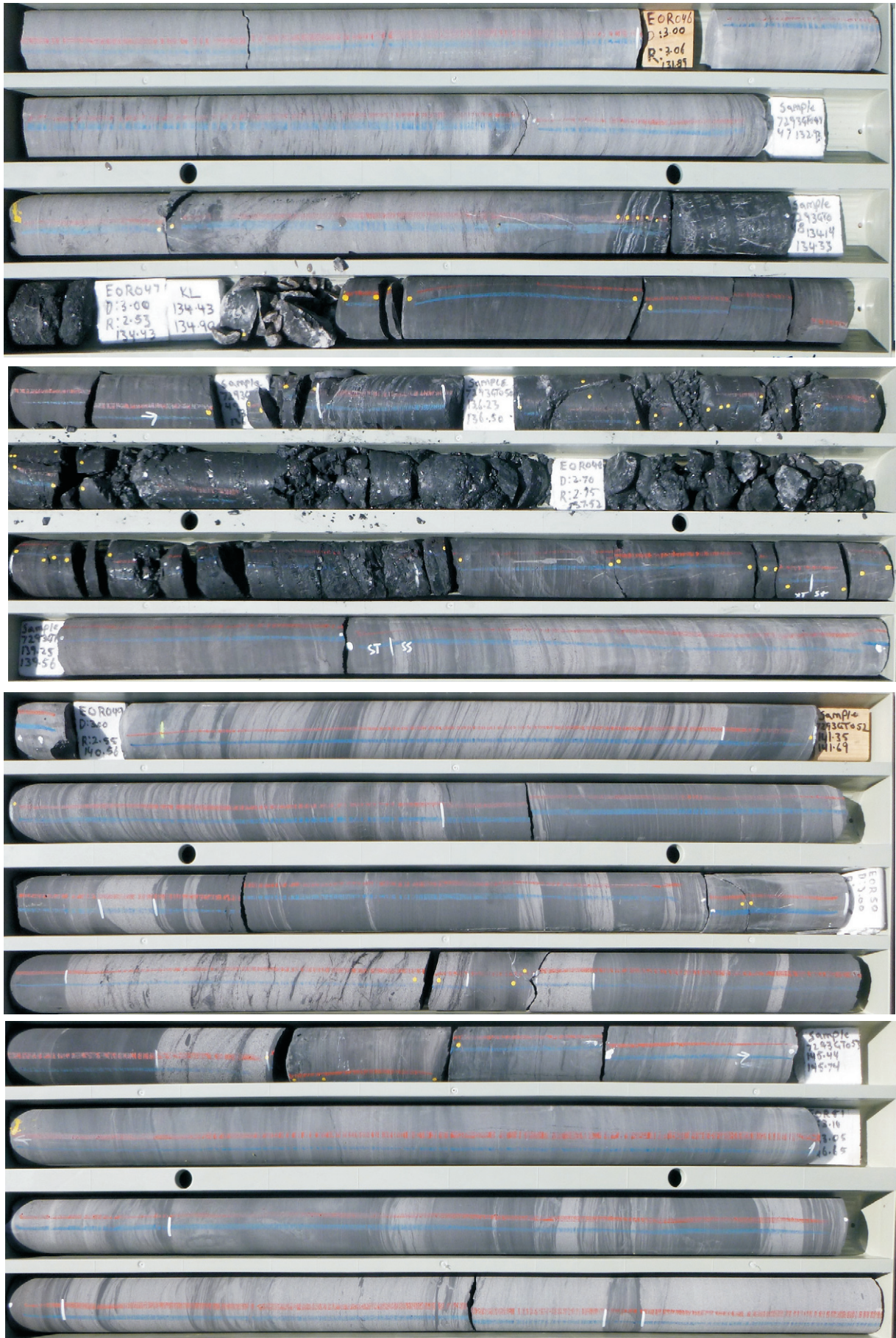
115.35m



131.18m



131.18m



148.60m



148.60m



148.60m



Dingo West - DW7293GT Box 41 - 44 ( of 55)

164.78m



182.28m



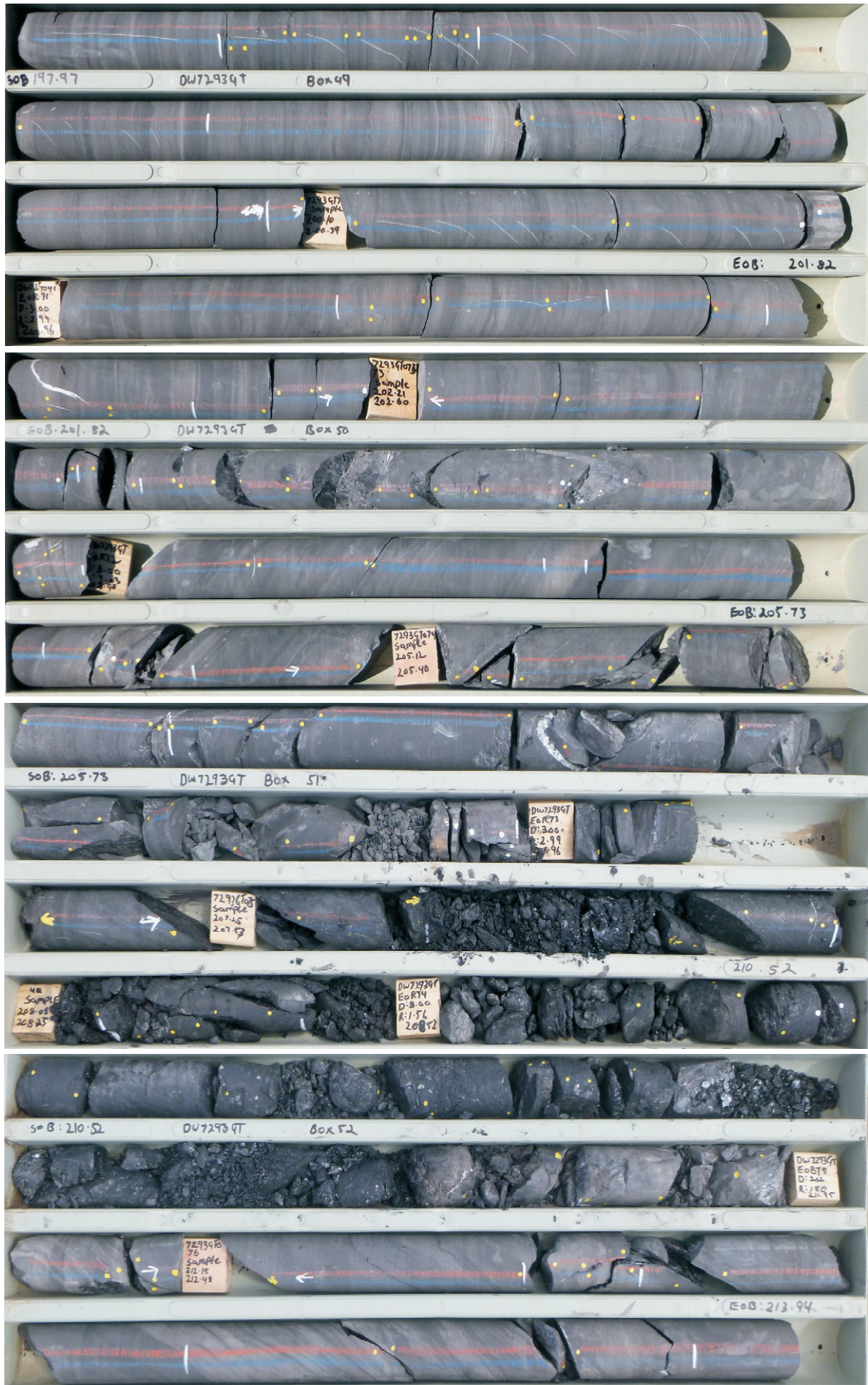
182.28m



197.97m



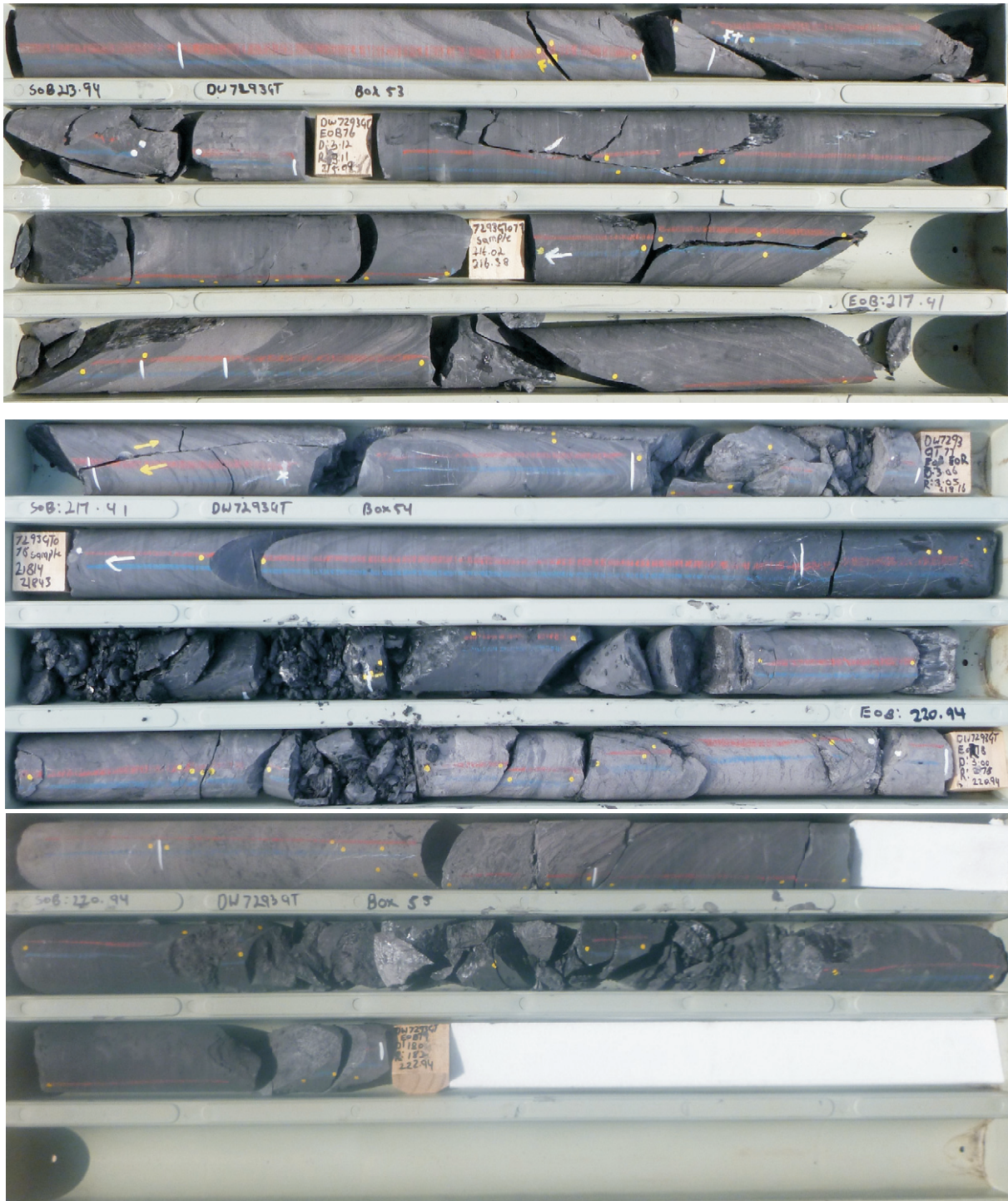
197.97m



213.94m



213.94m



TD 222.94m



Dingo West - DW7294GT Box 1 - 4 ( of 21)

0m



16.43m



Dingo West - DW7294GT Box 5 - 8 ( of 21)

16.43m



31.78m



31.78m



47.07m



Dingo West - DW7294GT Box 13 - 16 ( of 21)

47.07m



62.74m



62.74m

Dingo West - DW7294GT Box 17 - 21 ( of 21)



80.96m



Dingo West - DW7295GT Box 1 - 4 ( of 31)

0m



16.32m



16.32m



32.90m



32.90m



52.47m



52.47m



69.64m



69.64m



86.05m



## 86.05m



103.01m



103.01m



119.90m



119.90m



TD = 129.20



17.21m



17.21m



37.94m



37.94m



55.48m



55.48m



72.00m







88.50m



105.00m



105.00m



121.41m



121.41m



138.02m



138.02m



154.80m



154.80m



171.00m



171.00m

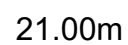
Dingo West - DW7296GT Box 41 - 45 ( of 45)



TD 190.50m



## 0m





21.00m



36.91m



36.91m



54.38m



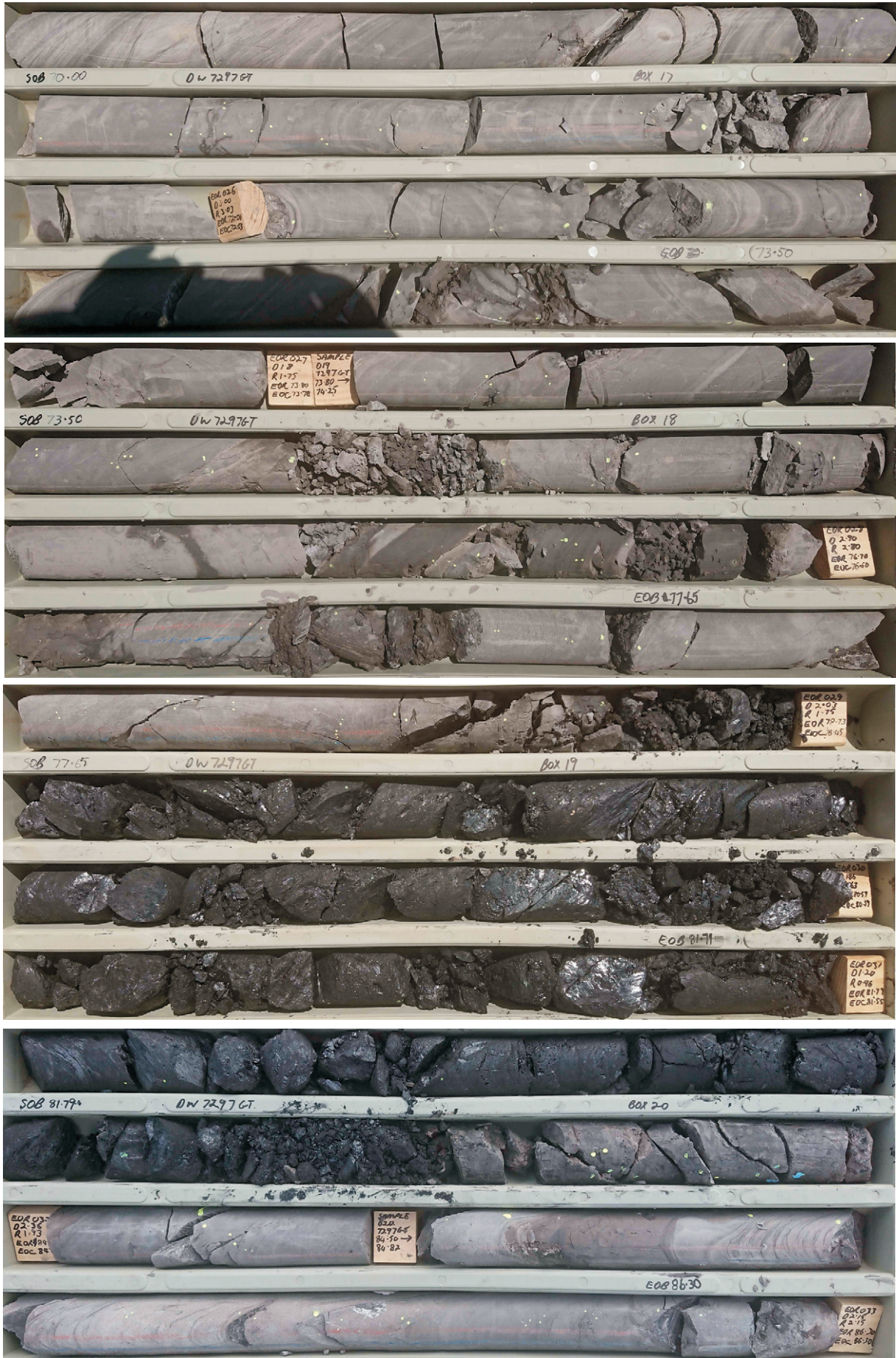
54.38m



70.00m



70.00m



86.30m



86.30m



101.27m



101.27m



118.82m



117.82m



TD 133.27m



Dingo West - DW7298GT Box 1 - 4 ( of 23)

0m



20.60m



20.60m



37.71m



37.71m



58.09m





74.57m



74.57m



93.55m



93.55m



TD 105.20m





**HOLE: DW7293GT**

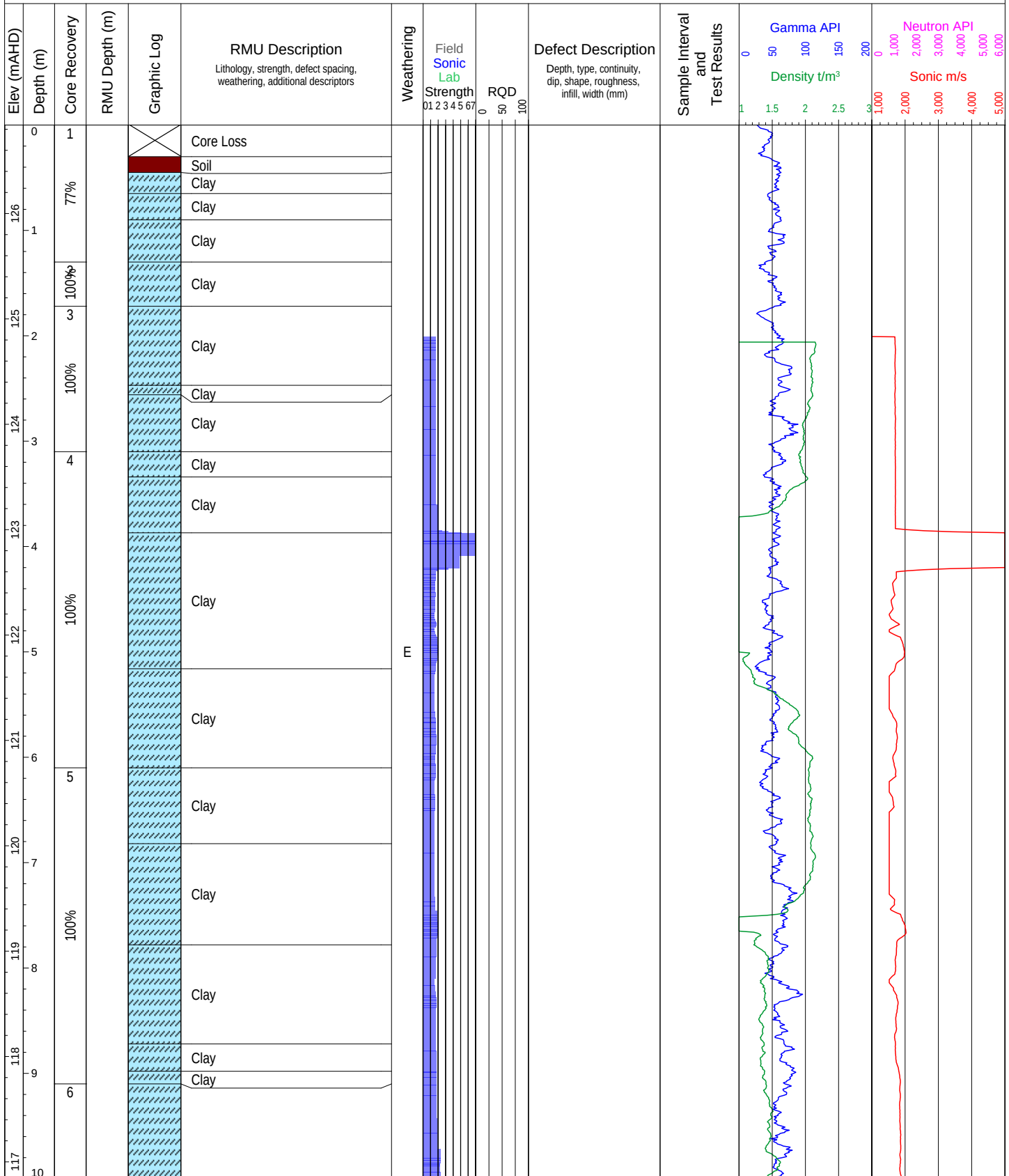
**START:** 43700

**FINISH:** 43708

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<10 MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
**RED** = Field Rock Strength; **Blue** = Sonar-Derived Rock Strength; **Green** = Laboratory (UCS) Rock Strength  
**Qty:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** 0-20 mm = Fragmented; 20-60 mm = Highly Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Silicified; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** Ca = Calcite; Cl = Clay; Co = Coal; Cr = Crushed Rock; Di = Dike; Io = Iron Oxide; Ka = Kaolinite; Mi = Mica; Pf = Plant Fragments; Py = Pyrite; Qz = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACAPR Col-2012\_V2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



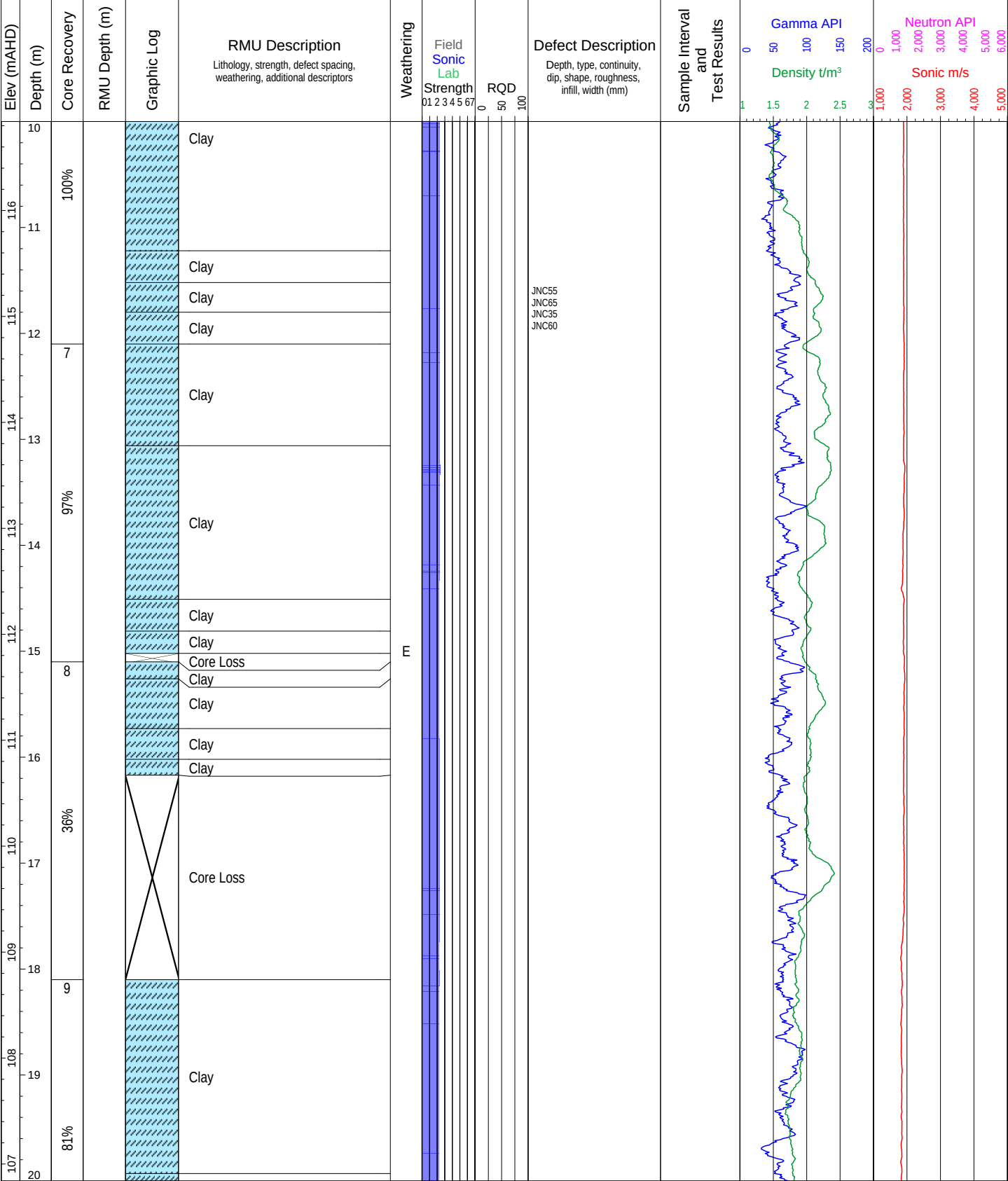


GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



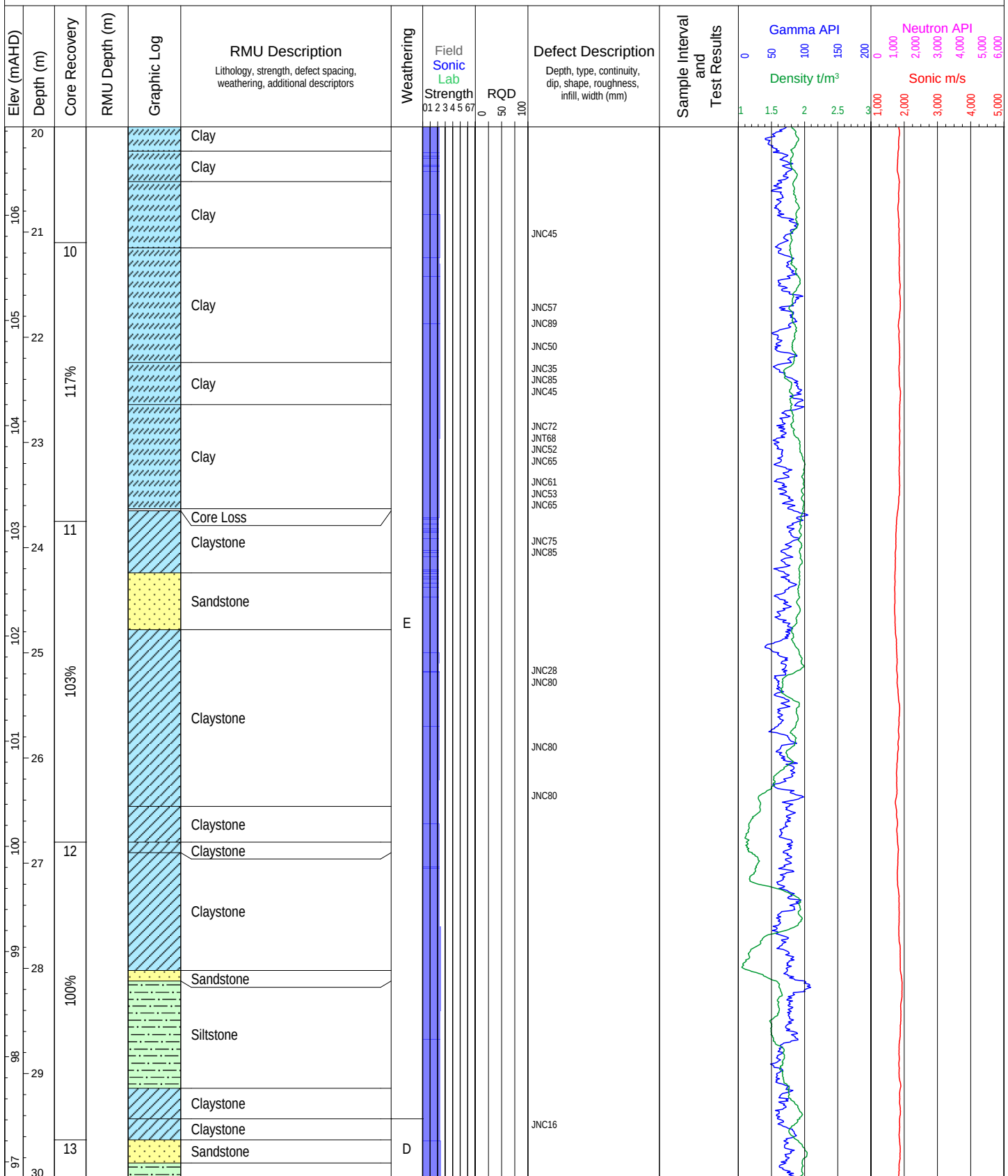


# GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
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**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discontinuity; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



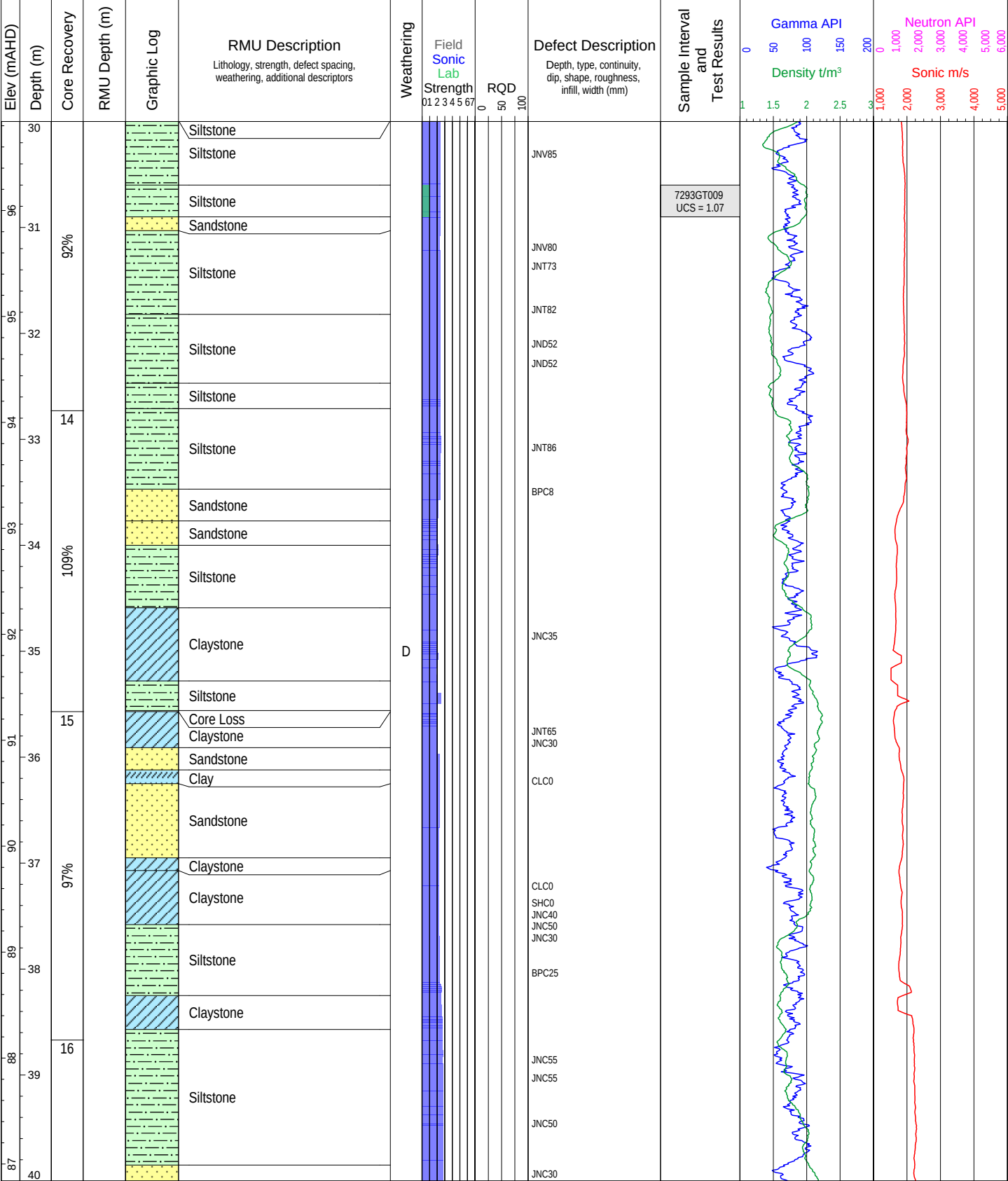


GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



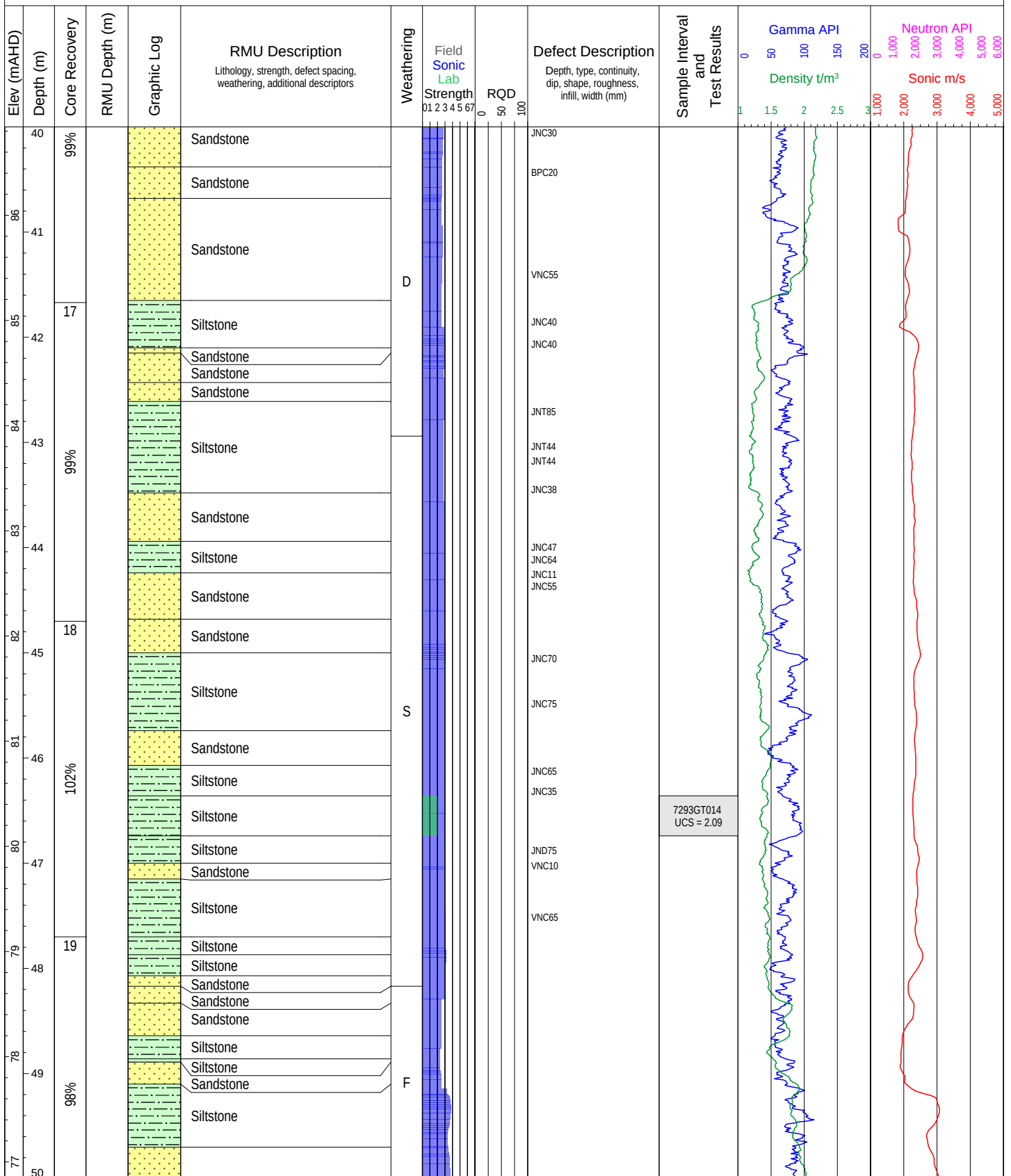


# GEOTECHNICAL LOG

HOLE: DW7293GT

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CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



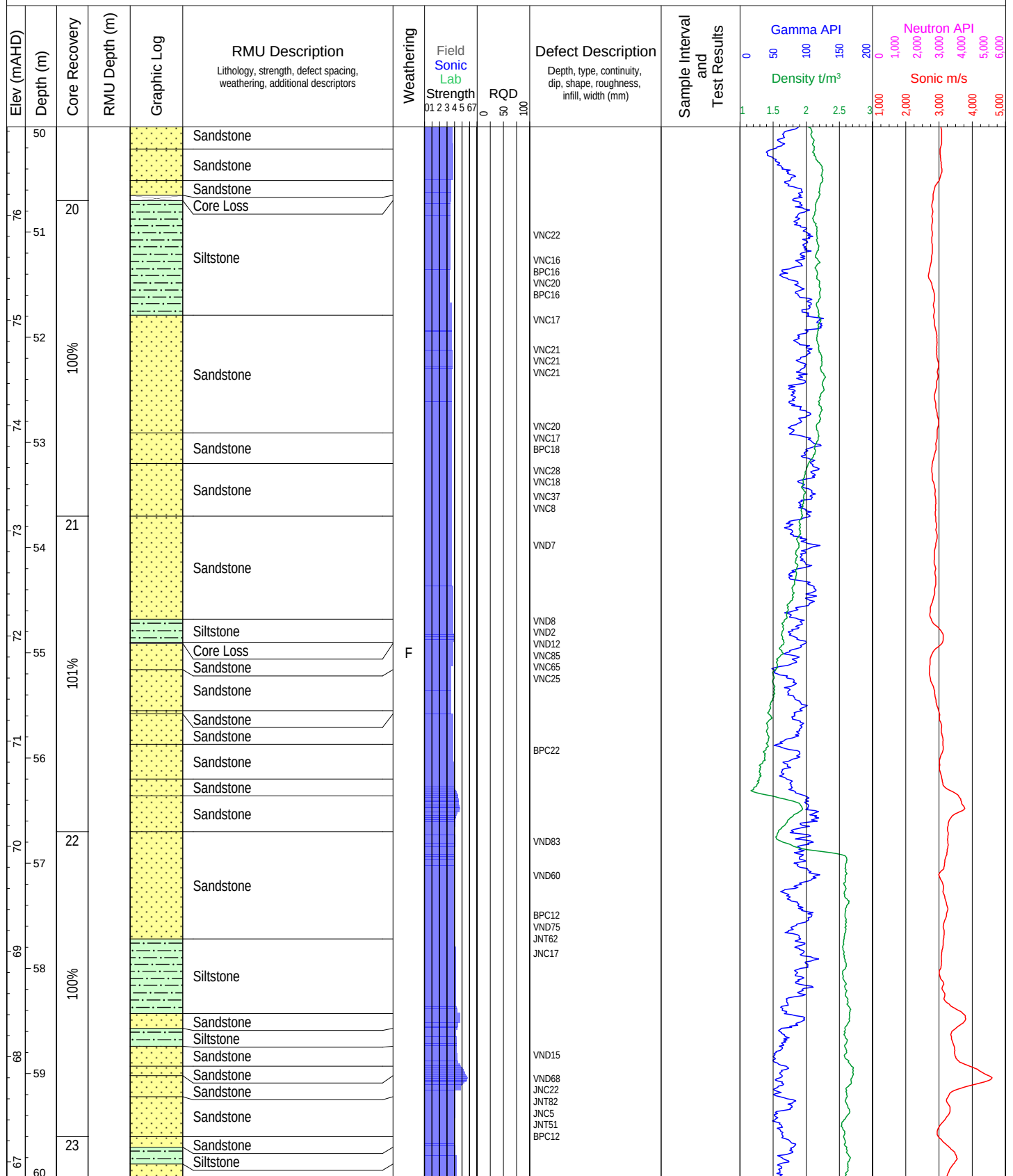


# GEOTECHNICAL LOG

HOLE: DW7293GT

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CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



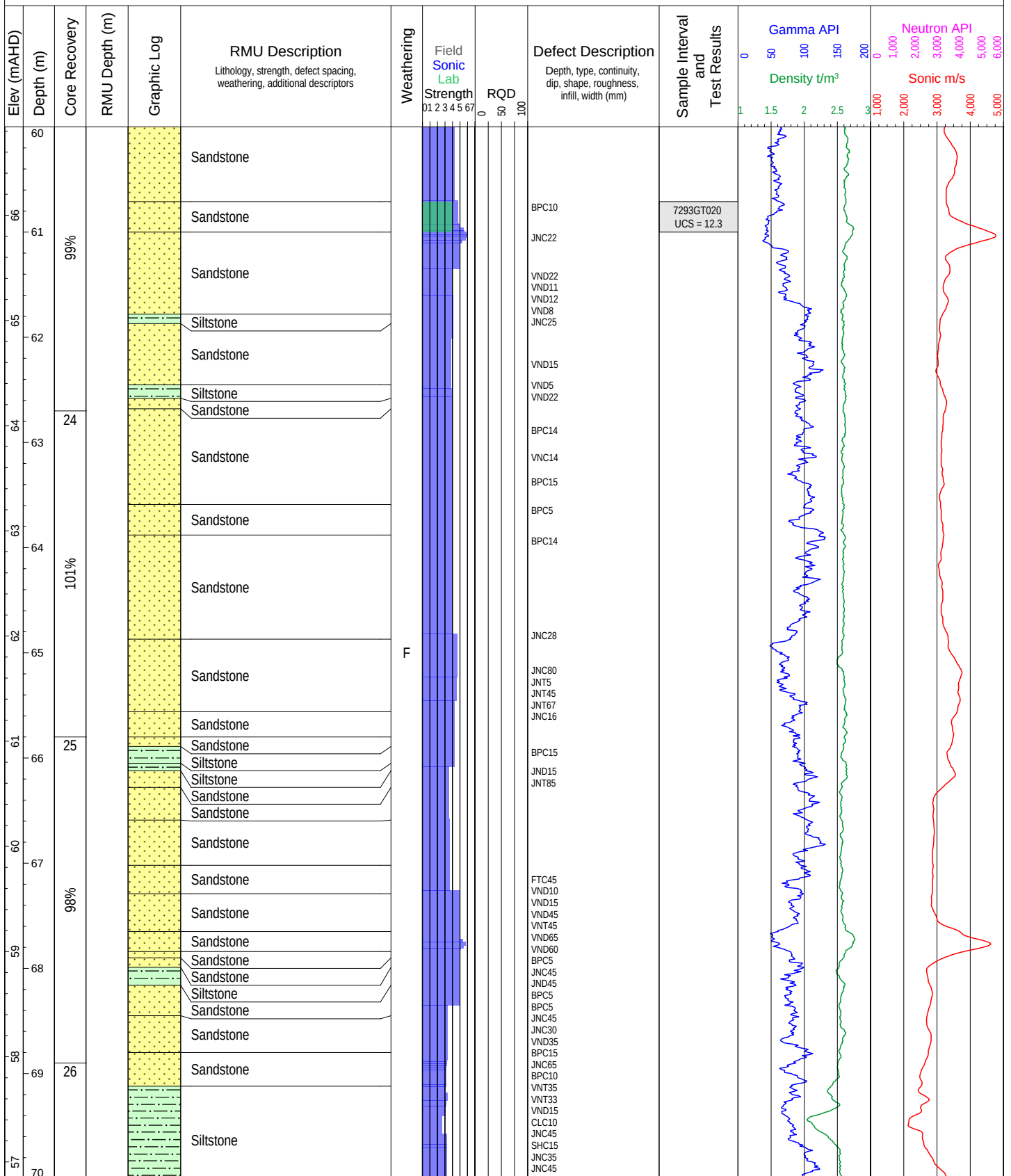


# GEOTECHNICAL LOG

HOLE: DW7293GT

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**CLIENT:** JT BOYD **EASTING:** 731220.78 **DRILLER:** Hodge **START:** 43700  
**PROJECT:** Dingo West **NORTHING:** 7381837.01 **DRILL RIG:** 6\_U10 **FINISH:** 43708  
**LOCATION:** Bowen Basin **ELEV:** 126.84 **CORE SIZE:** HQ Full Core **GEOLOGY:** John Irvine  
**TENEMENT:** EPC881 **INC/AZI:** -90/0 **CASING:** 56 **GEOTECH:**  
**PROJECT NO:** DW\_2020 **DATUM:** GDA94 Z55 **DEPTH:** 223.1 **GEOPHYS:** Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



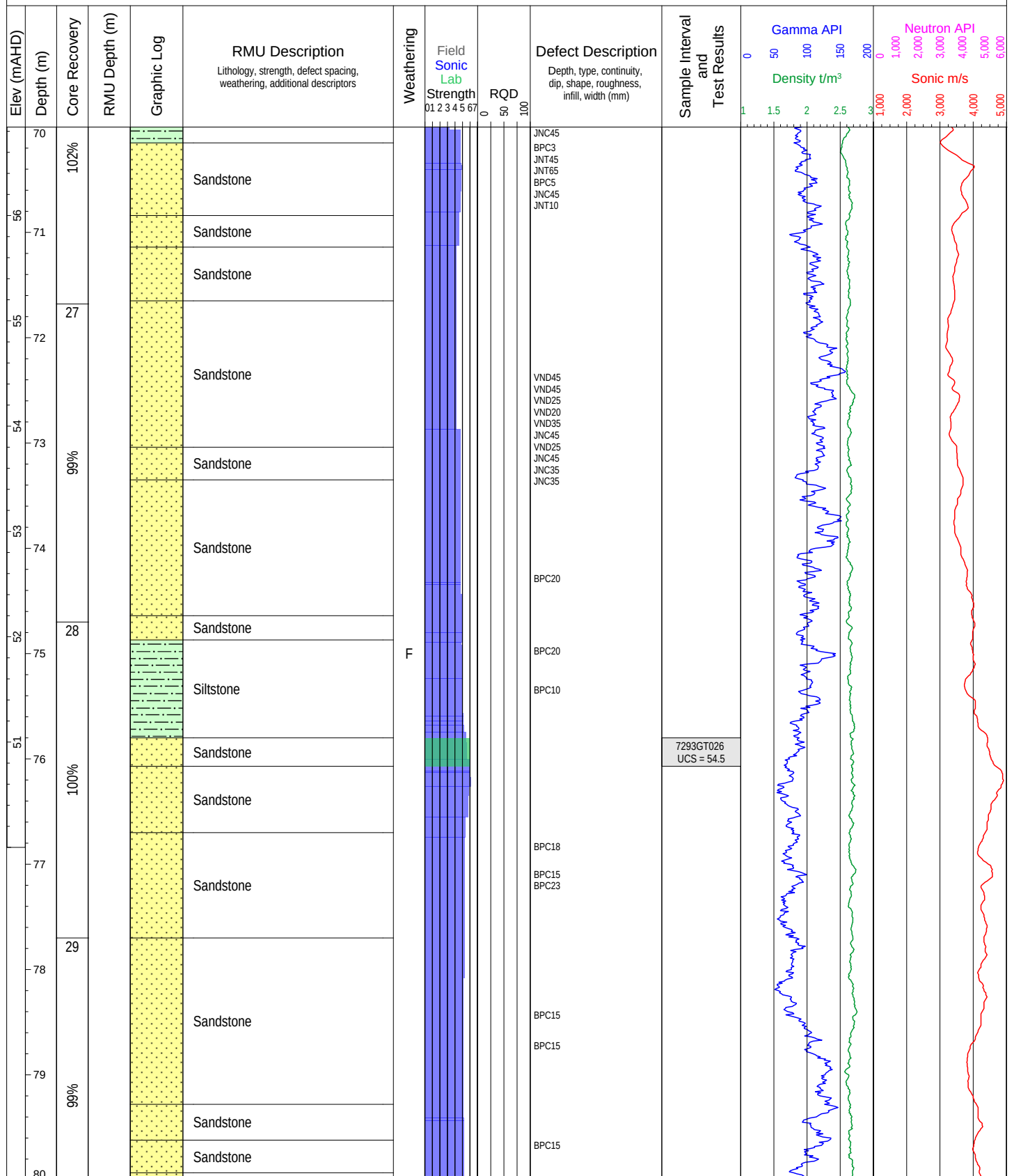


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 8 of 23

**CLIENT:** JT BOYD **EASTING:** 731220.78 **DRILLER:** Hodge **START:** 43700  
**PROJECT:** Dingo West **NORTHING:** 7381837.01 **DRILL RIG:** 6\_U10 **FINISH:** 43708  
**LOCATION:** Bowen Basin **ELEV:** 126.84 **CORE SIZE:** HQ Full Core **GEOLOGY:** John Irvine  
**TENEMENT:** EPC881 **INC/AZI:** -90/0 **CASING:** 56 **GEOTECH:**  
**PROJECT NO:** DW\_2020 **DATUM:** GDA94 Z55 **DEPTH:** 223.1 **GEOPHYS:** Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



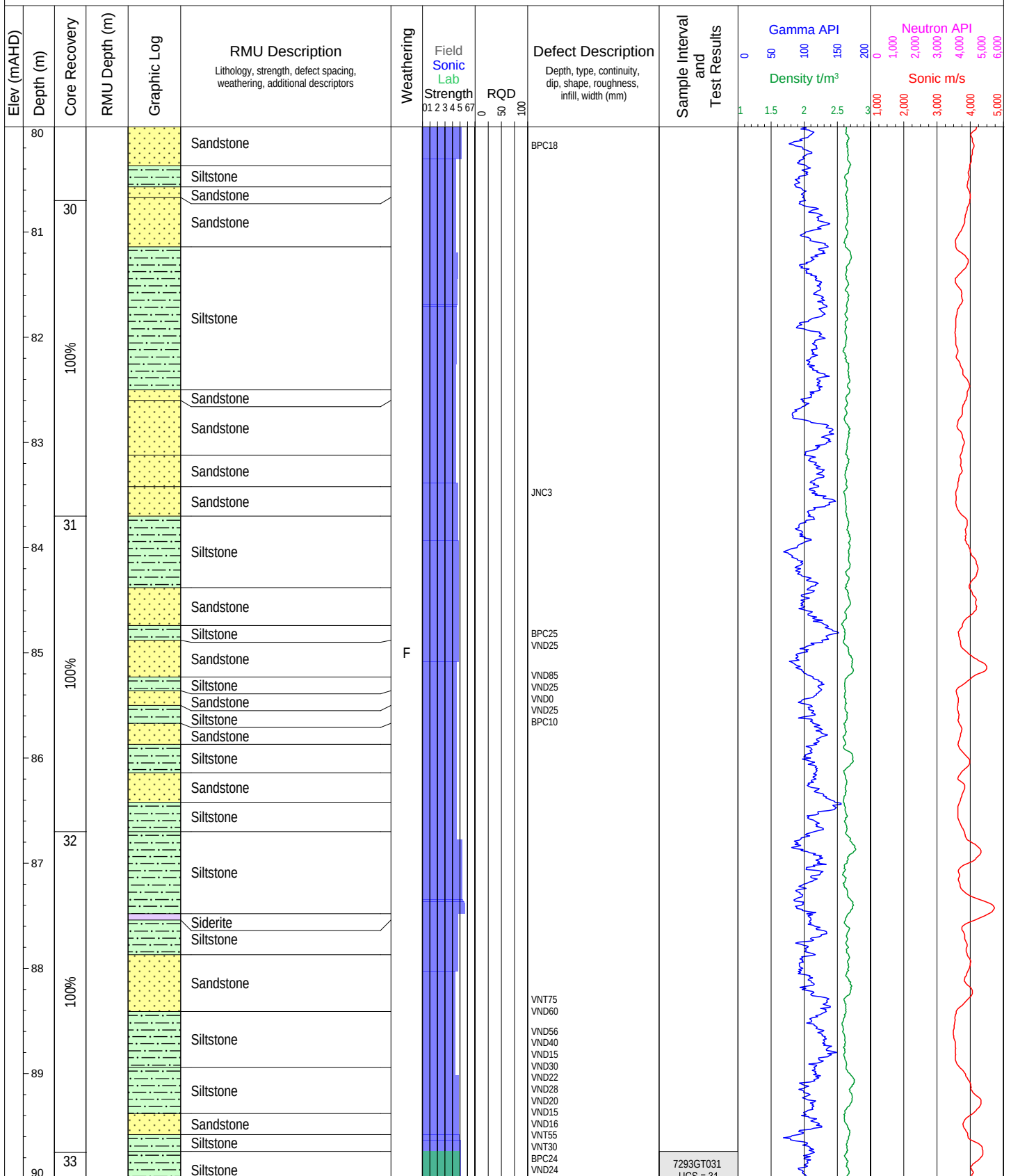


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 9 of 23

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |







**HOLE: DW7293GT**

**START:** 43700

**FINISH:** 43708

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<1 MPa); R2 = Very Low (1-5 MPa; 1500-2345 mPa); R3 = Low (5-10 MPa; 2345-2700 mPa); R4 = Medium (10-25 MPa; 2700-3300 mPa); R5 = High (25-50 MPa; 3300-3900 mPa); R6 = Very High (50-100 MPa; 3900-4550 mPa); R7 = Extremely High (>100 MPa; >4550 mPa)  
**Grey = Field Rock Strength; Blue = Sonar-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength**  
**Rock:** D =25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** C = concave/Concave; Fractured: 0-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Disicing; DB = Drilling Induced Breck; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Concave; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Silkeness; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CO = Coal; CL = Clay; CR = Crystalline Rock; DI = Dioxide; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACAPR CoalLog v2. Defect depths measured perpendicular to core log axis.





**HOLE: DW7293GT**

**START:** 43700

**FINISH:** 43708

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<1 MPa); R2 = Very Low (1-5 MPa); R3 = Low (5-10 MPa); R4 = Medium (10-25 MPa); R5 = High (25-50 MPa); R6 = Very High (50-100 MPa); R7 = Extremely High (>100 MPa); >4550 m/s)  
**FIELD STRENGTH:** Blue = Sonary Green = Laboratory (UCS) Rock Strength  
 Q2: 25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Diclite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coalg2 V2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



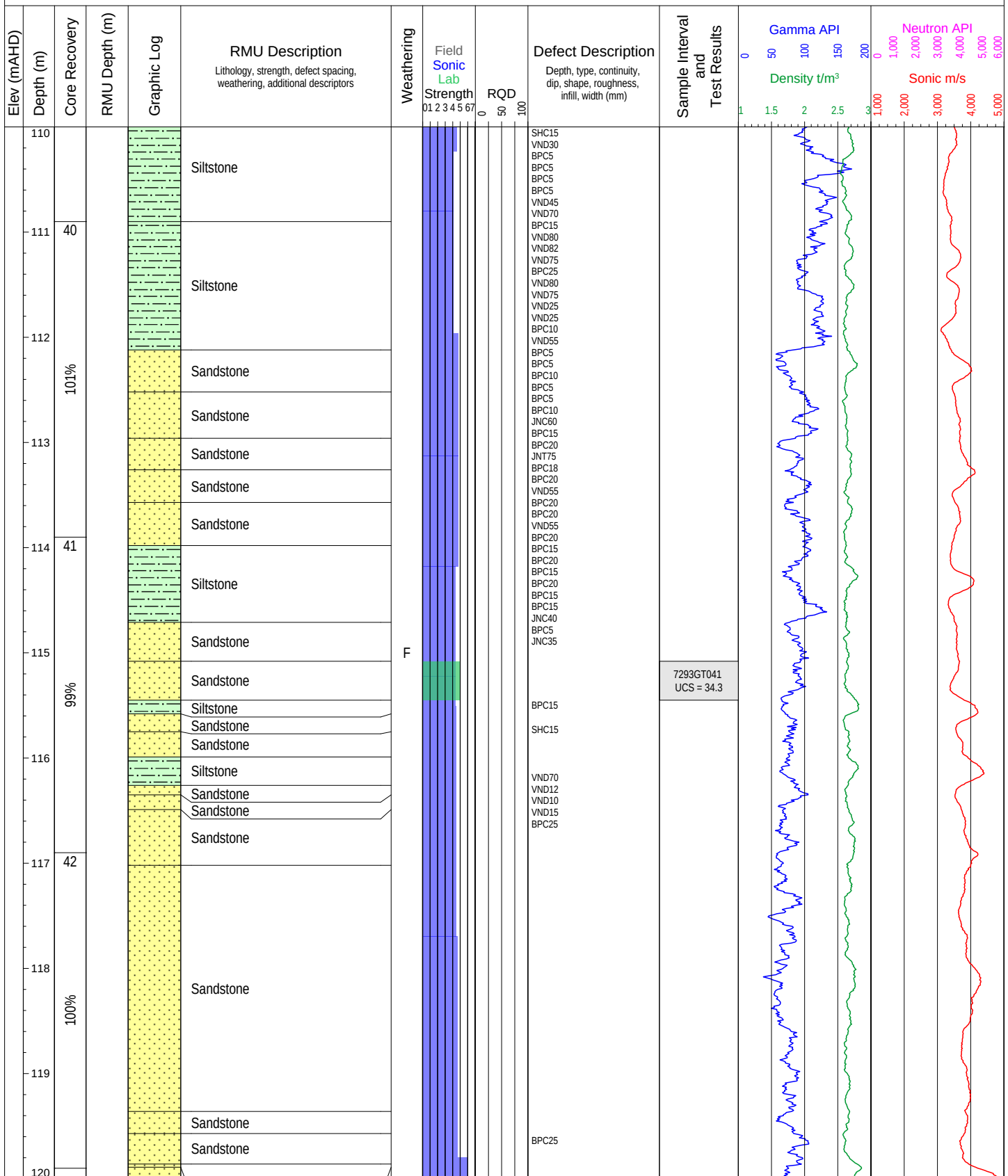


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 12 of 23

CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
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DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



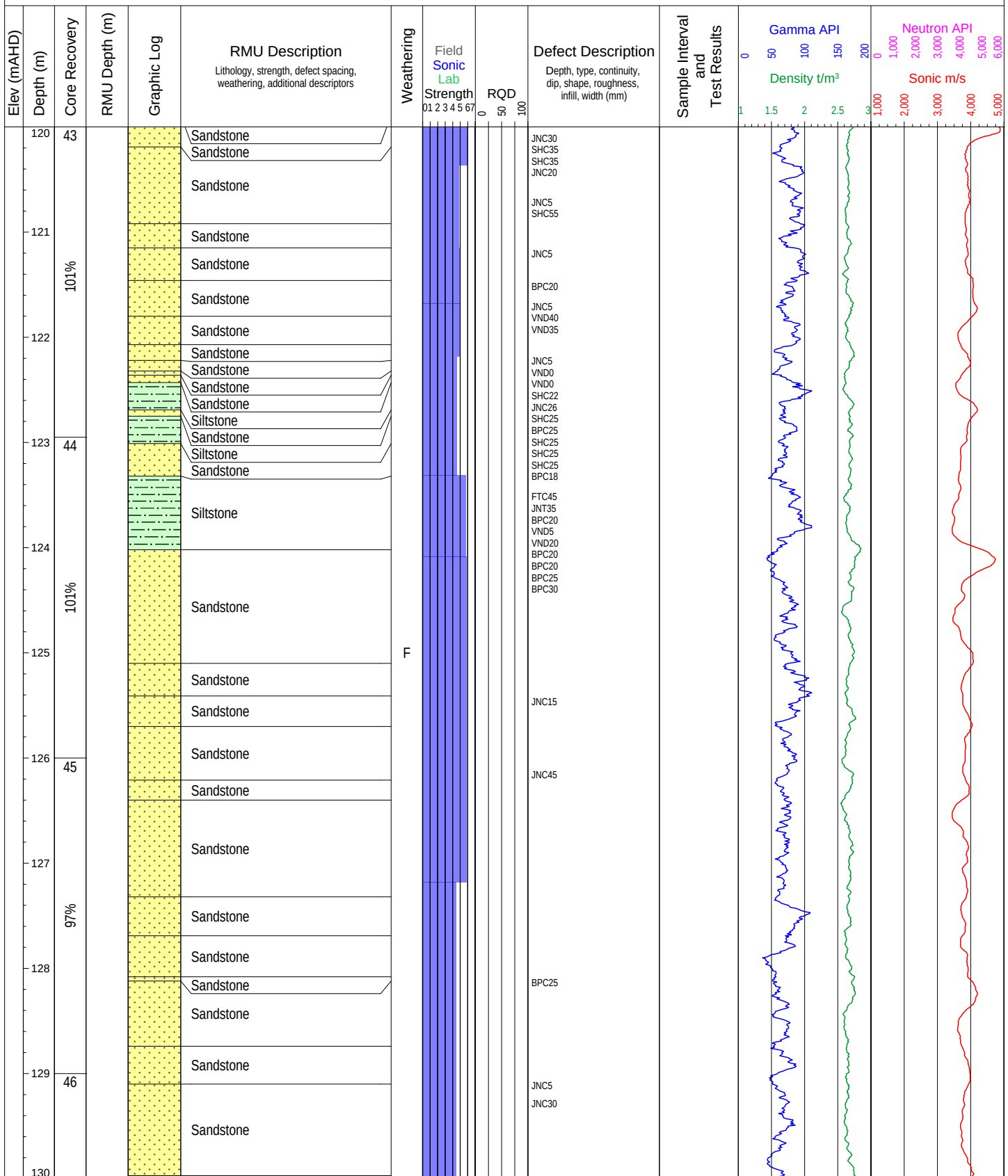


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 13 of 23

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
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**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



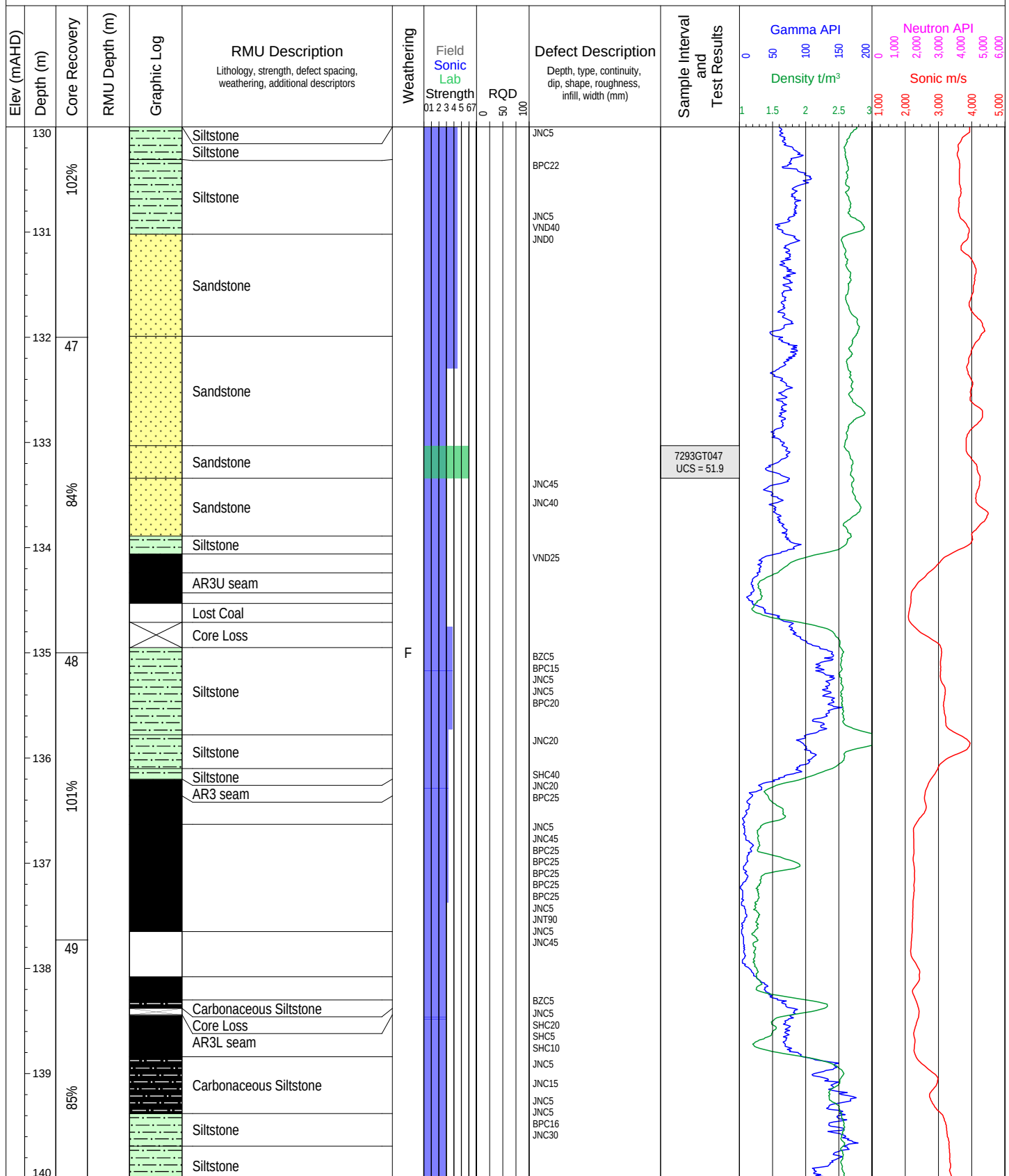


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 14 of 23

CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



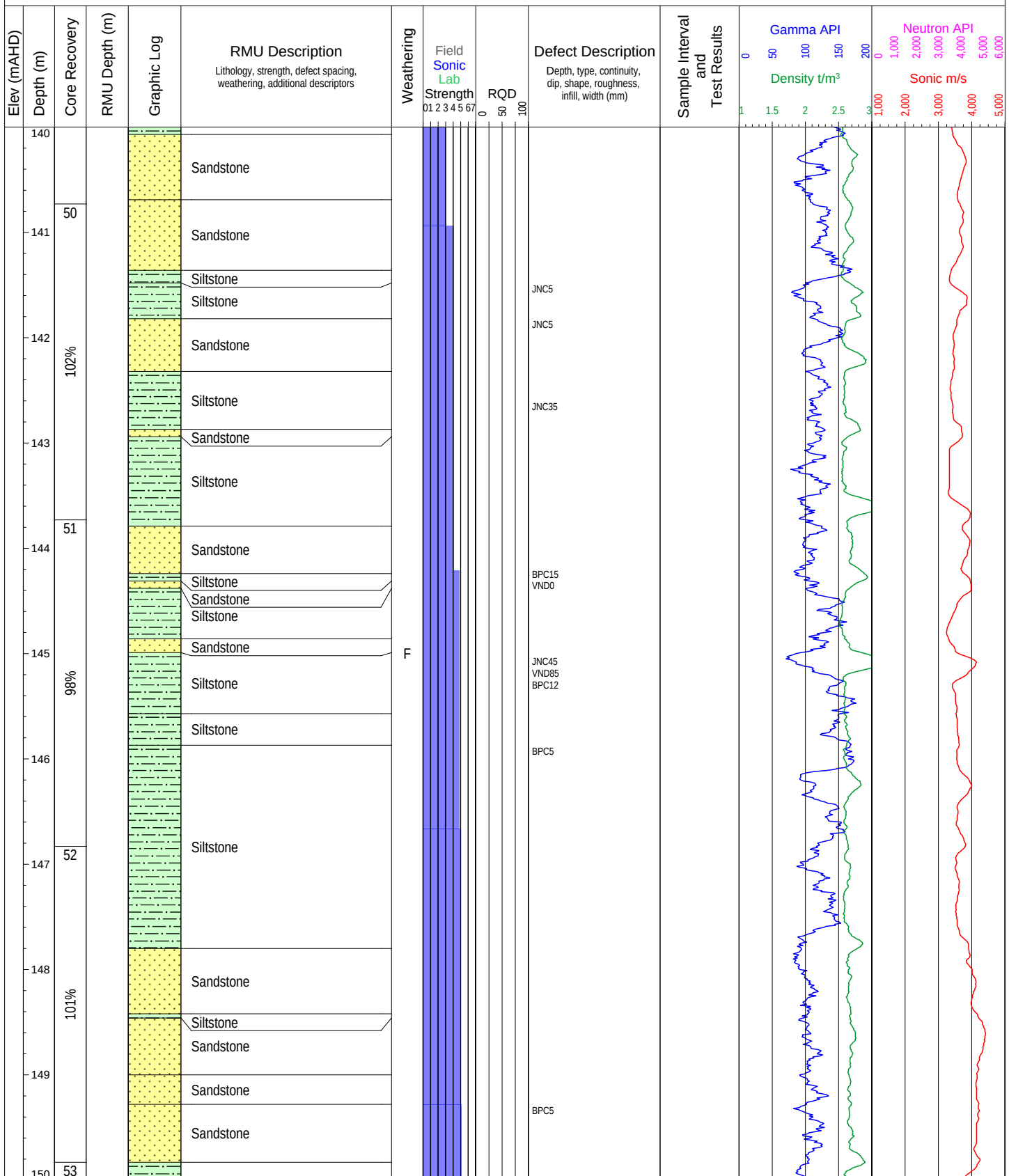


# GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



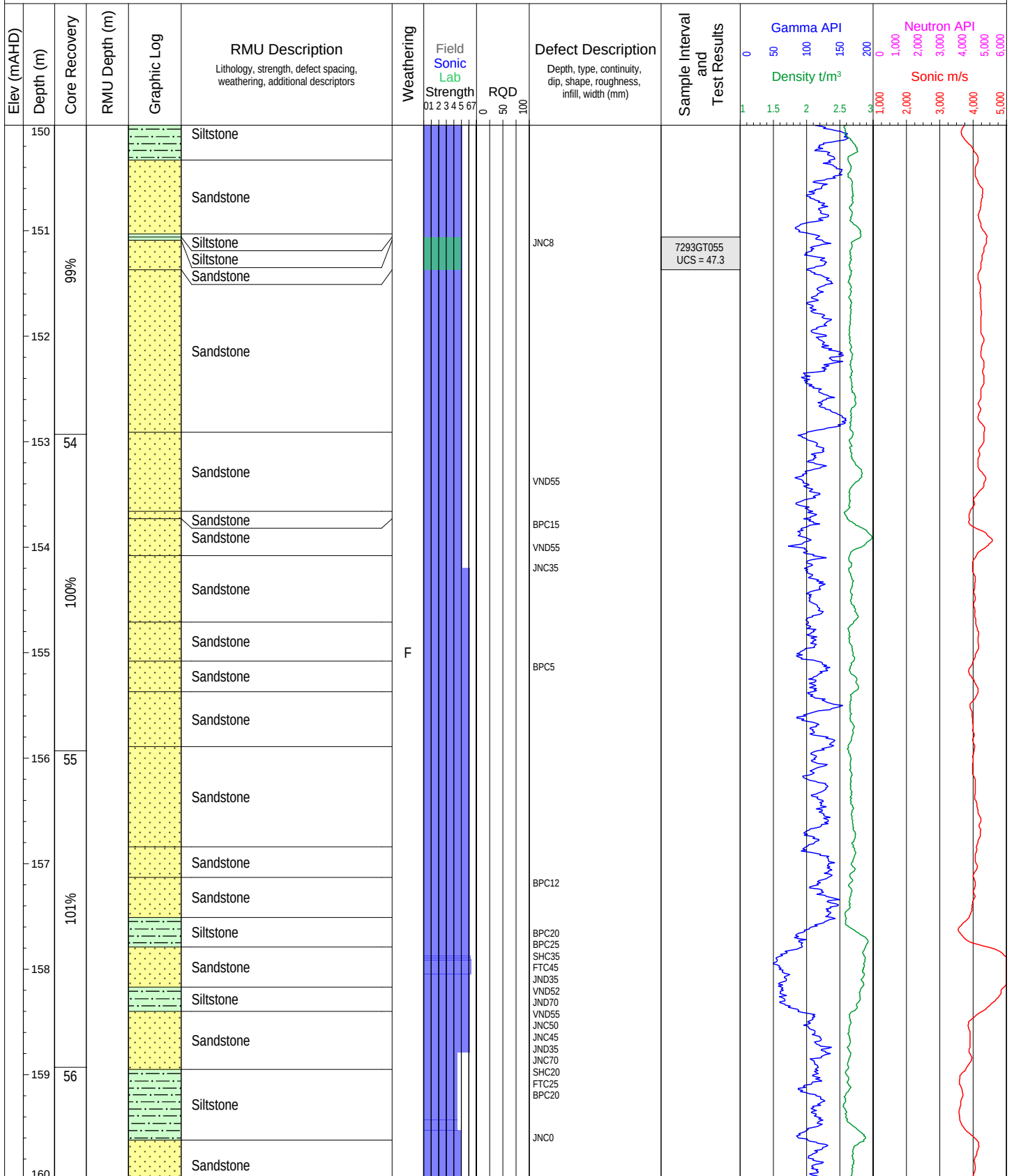


# GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



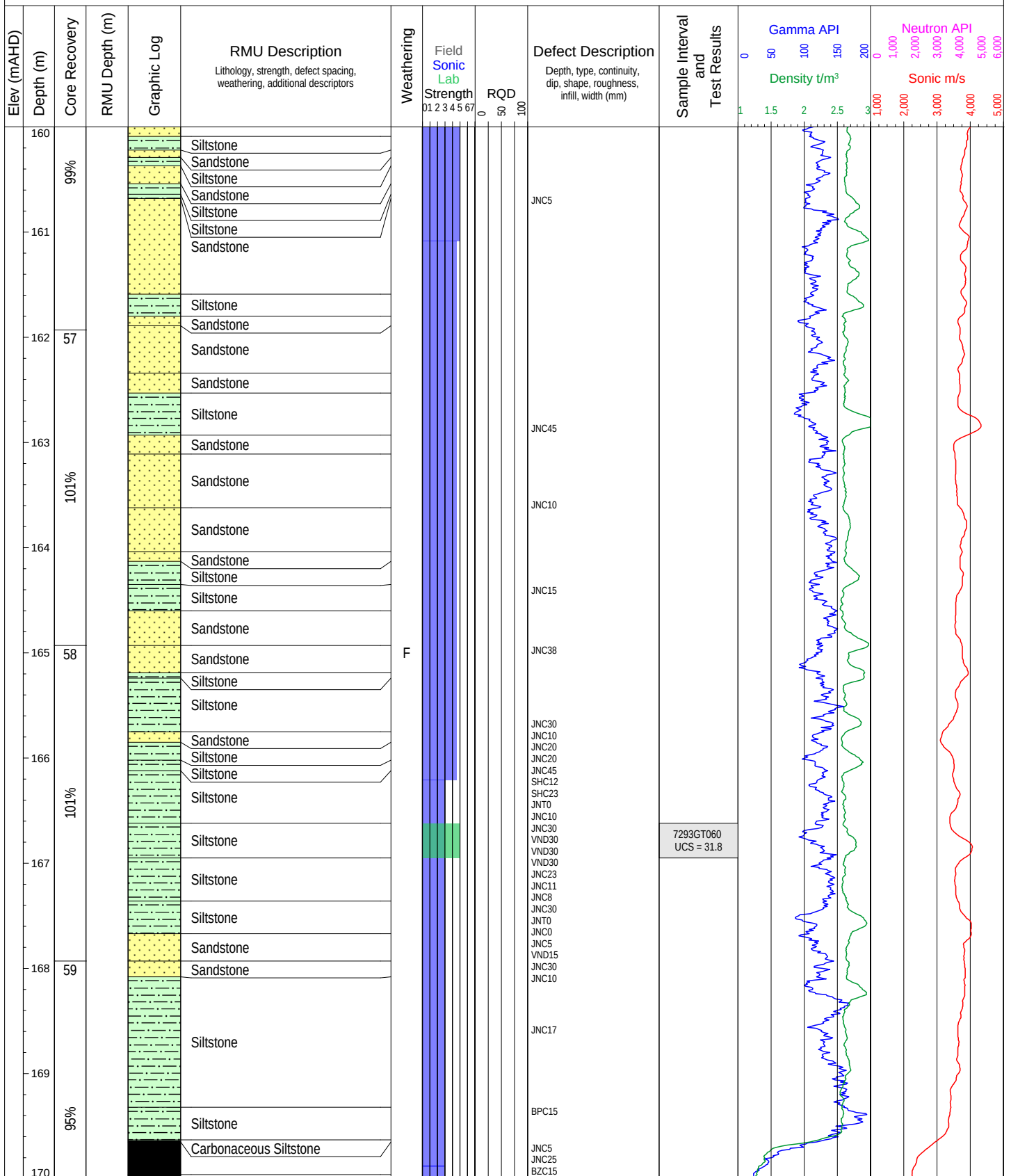


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 17 of 23

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





**HOLE: DW7293GT**

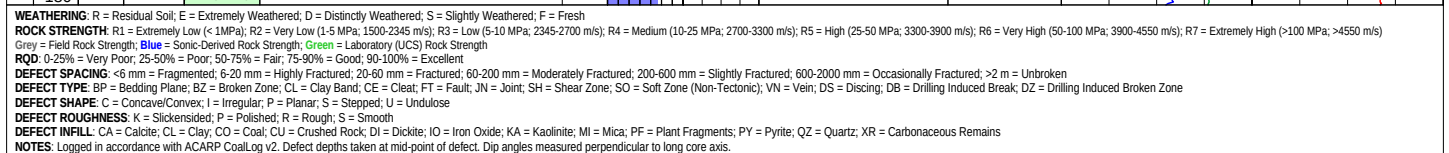
**START:** 43700

**FINISH:** 43708

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords





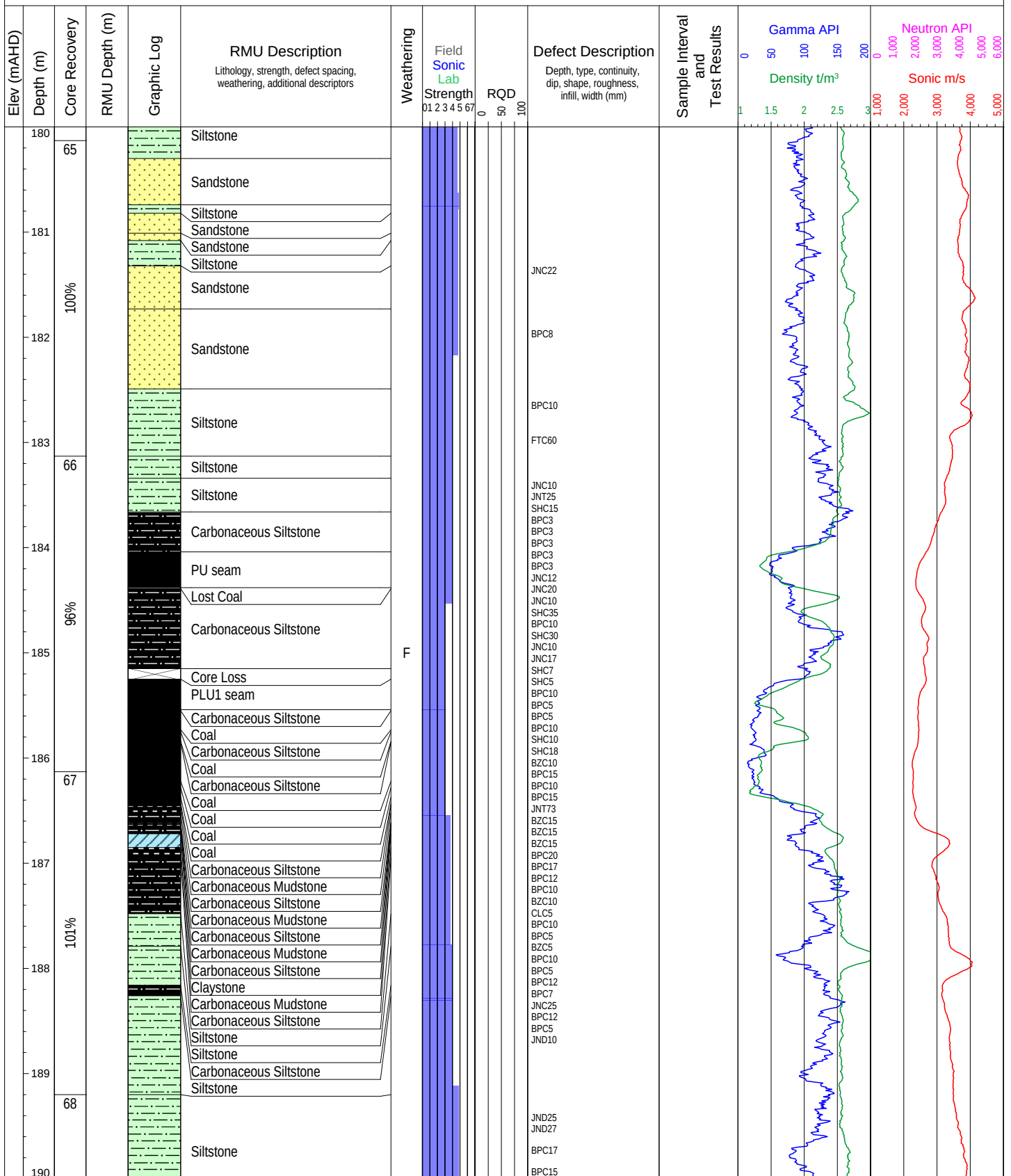


# GEOTECHNICAL LOG

HOLE: DW7293GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 20 of 23

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 190         |           | 100%          |               |             | Sandstone                                                                                  |            |                                                    |                 | BPC15                                                                                    |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | SHC11                                                                                    |                                  |                                                                            |                                                                                              |
| 191         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | SHC30                                                                                    | 7293GT069<br>UCS = 19.8          |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | SHC27                                                                                    |                                  |                                                                            |                                                                                              |
| 192         |           | 69            |               |             | Sandstone                                                                                  |            |                                                    |                 | JNC14<br>VND19<br>VND0<br>VND0<br>JNC35<br>VND30<br>JNC10<br>BPC10                       |                                  |                                                                            |                                                                                              |
| 193         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | BPC12<br>BPC15                                                                           |                                  |                                                                            |                                                                                              |
| 194         |           | 101%          |               |             | Sandstone                                                                                  |            |                                                    |                 | BPC15<br>JND25                                                                           |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | JNC5                                                                                     |                                  |                                                                            |                                                                                              |
| 195         |           |               |               |             | Sandstone                                                                                  | F          |                                                    |                 | BPC25                                                                                    |                                  |                                                                            |                                                                                              |
|             |           | 70            |               |             | Sandstone                                                                                  |            |                                                    |                 | BPC12                                                                                    |                                  |                                                                            |                                                                                              |
| 196         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | SHC12<br>BPC8<br>BPC8                                                                    |                                  |                                                                            |                                                                                              |
| 197         |           | 100%          |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 198         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | JND15<br>JND5<br>BPC5<br>BPC5<br>BPC8<br>BPC3<br>BPC5                                    |                                  |                                                                            |                                                                                              |
| 199         |           |               |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
|             |           | 100%          |               |             | Siltstone                                                                                  |            |                                                    |                 | JNC10<br>BPC3<br>BPC3                                                                    |                                  |                                                                            |                                                                                              |
| 200         |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



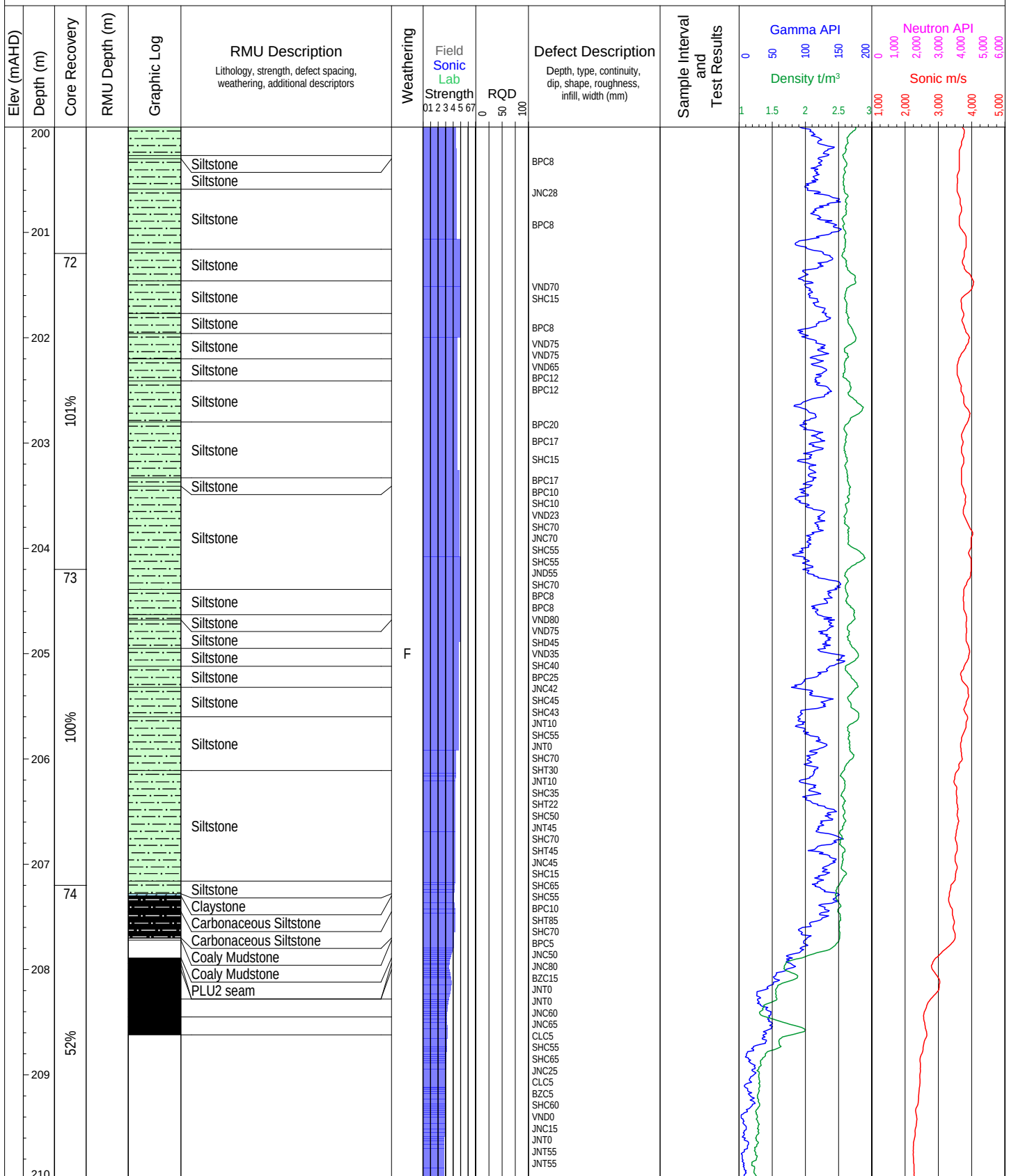


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 21 of 23

CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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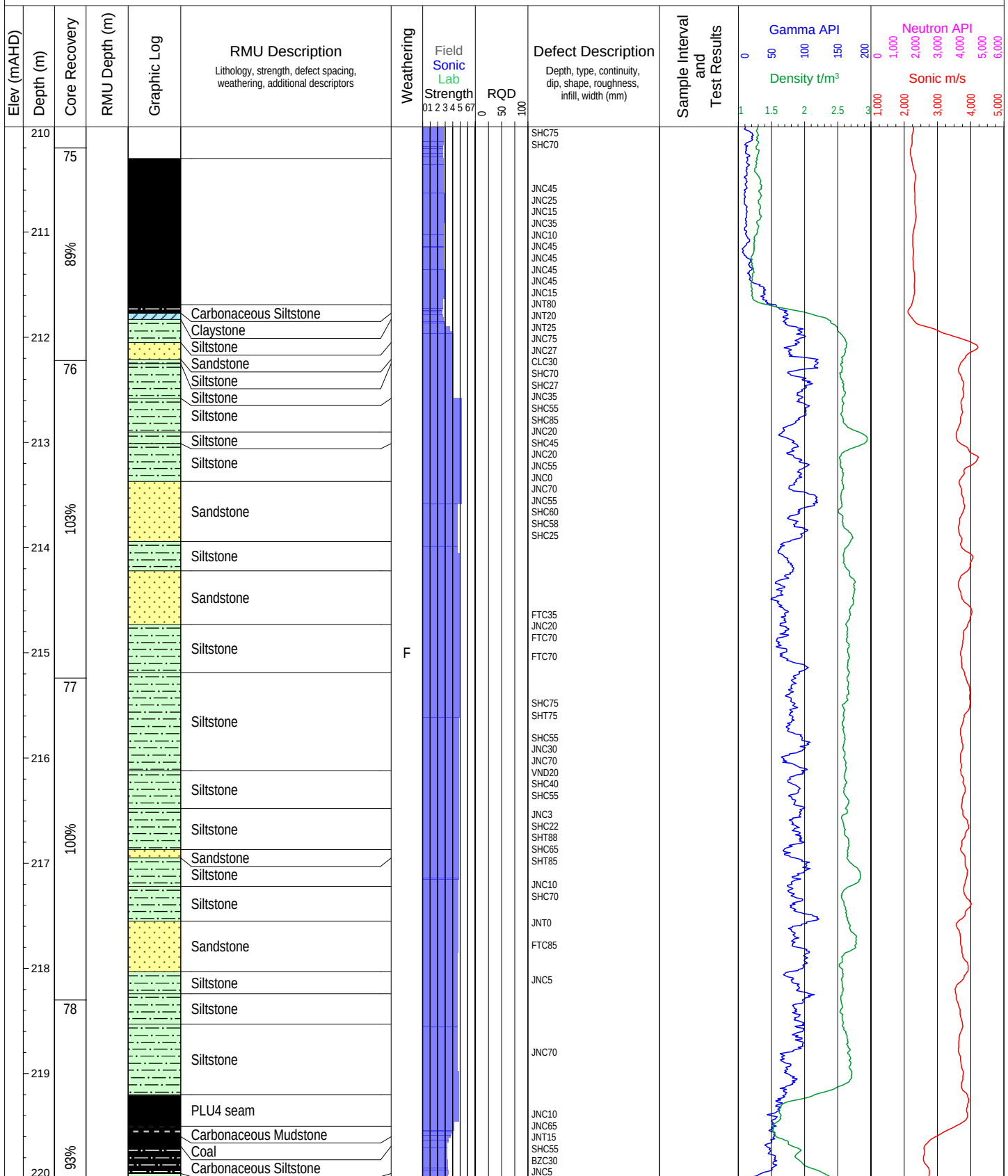


# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 22 of 23

CLIENT: JT BOYD EASTING: 731220.78 DRILLER: Hodge START: 43700  
PROJECT: Dingo West NORTHING: 7381837.01 DRILL RIG: 6\_U10 FINISH: 43708  
LOCATION: Bowen Basin ELEV: 126.84 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 56 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 223.1 GEOPHYS: Weatherfords



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# GEOTECHNICAL LOG

HOLE: DW7293GT

PAGE: 23 of 23

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731220.78  | DRILLER:   | Hodge        | START:   | 43700        |
| PROJECT:    | Dingo West  | NORTHING: | 7381837.01 | DRILL RIG: | 6_U10        | FINISH:  | 43708        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.84     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 56           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 223.1        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm)                                                                                                                                                               | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 220         |           |               |               |             | Siltstone                                                                                  |            |                                                    |                 | SHC70<br>JNC55<br>SHC30<br>SHC55<br>JNC5<br>JNT45<br>SHC35<br>SHC20<br>SHC25<br>SHC35<br>SHC25<br>JND0<br>JND60<br>JNC50<br>VND28<br>VND45<br>VNT88<br>JNC25<br>JNC30<br>SHC34<br>SHC20<br>SHC15<br>SHC60<br>SHC60<br>JNC30<br>SHC35<br>SHC60<br>SHC70 |                                  |                                                                |                                                                                              |
| 221         |           | 79            |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                                                                                                                                                                                        |                                  |                                                                |                                                                                              |
| 222         |           | 101%          |               |             | Sandstone                                                                                  | F          |                                                    |                 |                                                                                                                                                                                                                                                        |                                  |                                                                |                                                                                              |
| 223         |           |               |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                                                                                                                                                                                        |                                  |                                                                |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                  |            |                                                    |                 | JNC30<br>SHC65<br>SHC65                                                                                                                                                                                                                                |                                  |                                                                |                                                                                              |

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**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





**HOLE: DW7294GT**

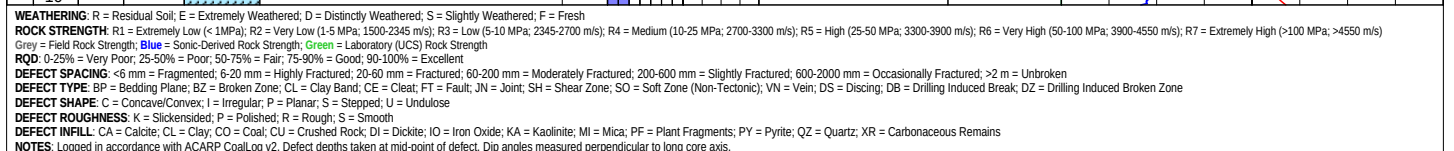
**START:** 43709

**FINISH:** 43711

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords





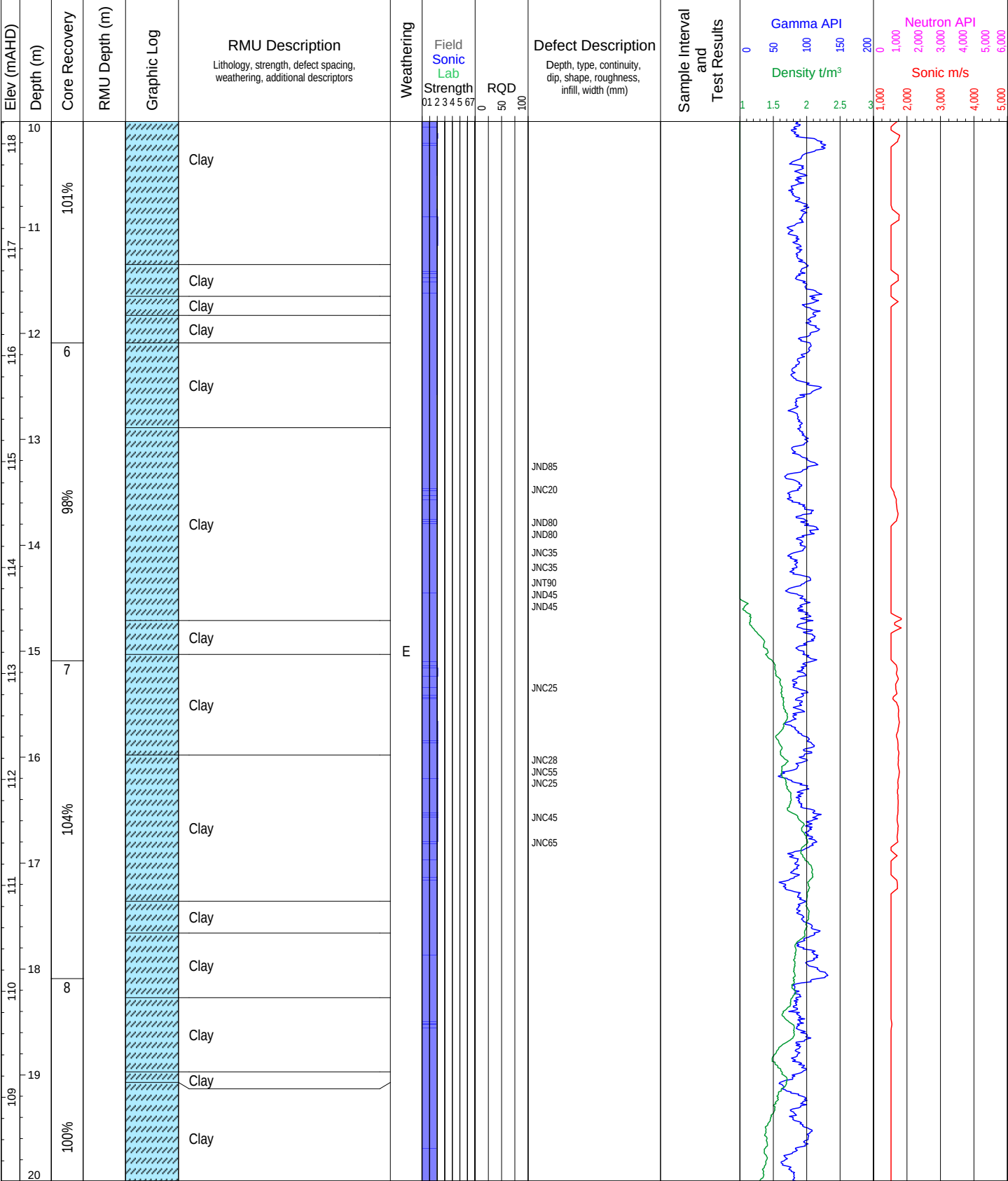


GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 2 of 9

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731418.08  | DRILLER:   | Hodge        | START:   | 43709        |
| PROJECT:    | Dingo West  | NORTHING: | 7382277.91 | DRILL RIG: | 6_U10        | FINISH:  | 43711        |
| LOCATION:   | Bowen Basin | ELEV:     | 128.21     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 44           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 81.05        | GEOPHYS: | Weatherfords |



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ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 3 of 9

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731418.08  | DRILLER:   | Hodge        | START:   | 43709        |
| PROJECT:    | Dingo West  | NORTHING: | 7382277.91 | DRILL RIG: | 6_U10        | FINISH:  | 43711        |
| LOCATION:   | Bowen Basin | ELEV:     | 128.21     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 44           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 81.05        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|------------------------------------------------|--------------------------------------------|
| 108         | 20        |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 107         | 21        | 9             |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 106         | 22        | 100%          |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 105         | 23        |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 104         | 24        | 10            |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 103         | 25        | 101%          |               |             | Clay                                                                                       | E          |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNT75                                                                                    |                                  |                               |                                           |                                                |                                            |
| 102         | 26        |               |               |             | Ferricrete                                                                                 |            |                                                    |                 | JNC55                                                                                    |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNC55                                                                                    |                                  |                               |                                           |                                                |                                            |
| 101         | 27        | 11            |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 100         | 28        | 101%          |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
| 99          | 29        |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          | 7294GT011<br>UCS = 0.39          |                               |                                           |                                                |                                            |
| 30          |           |               |               |             | Clay                                                                                       |            |                                                    |                 | JND20                                                                                    |                                  |                               |                                           |                                                |                                            |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



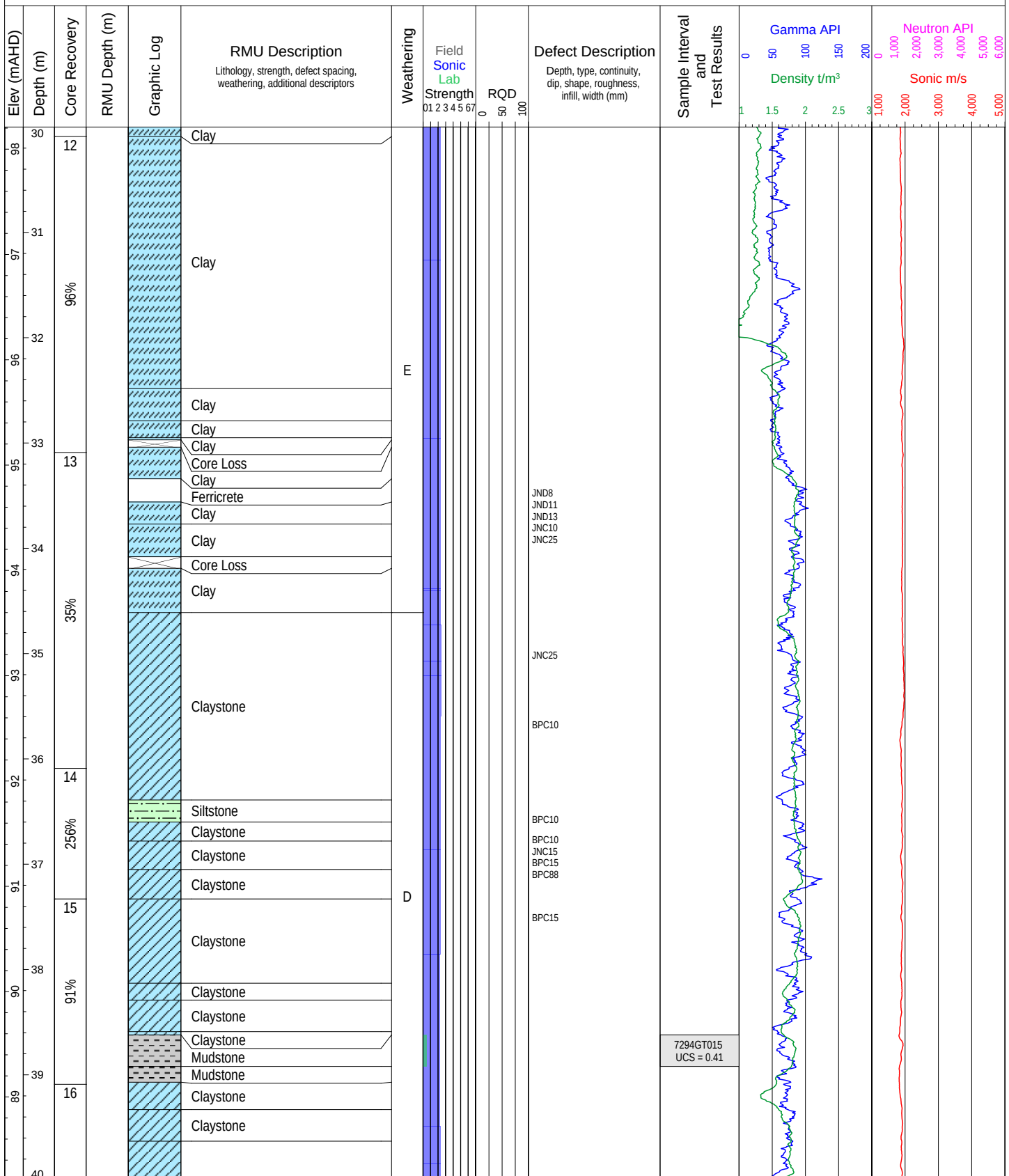


# GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 4 of 9

CLIENT: JT BOYD EASTING: 731418.08 DRILLER: Hodge START: 43709  
PROJECT: Dingo West NORTHING: 7382277.91 DRILL RIG: 6\_U10 FINISH: 43711  
LOCATION: Bowen Basin ELEV: 128.21 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 44 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 81.05 GEOPHYS: Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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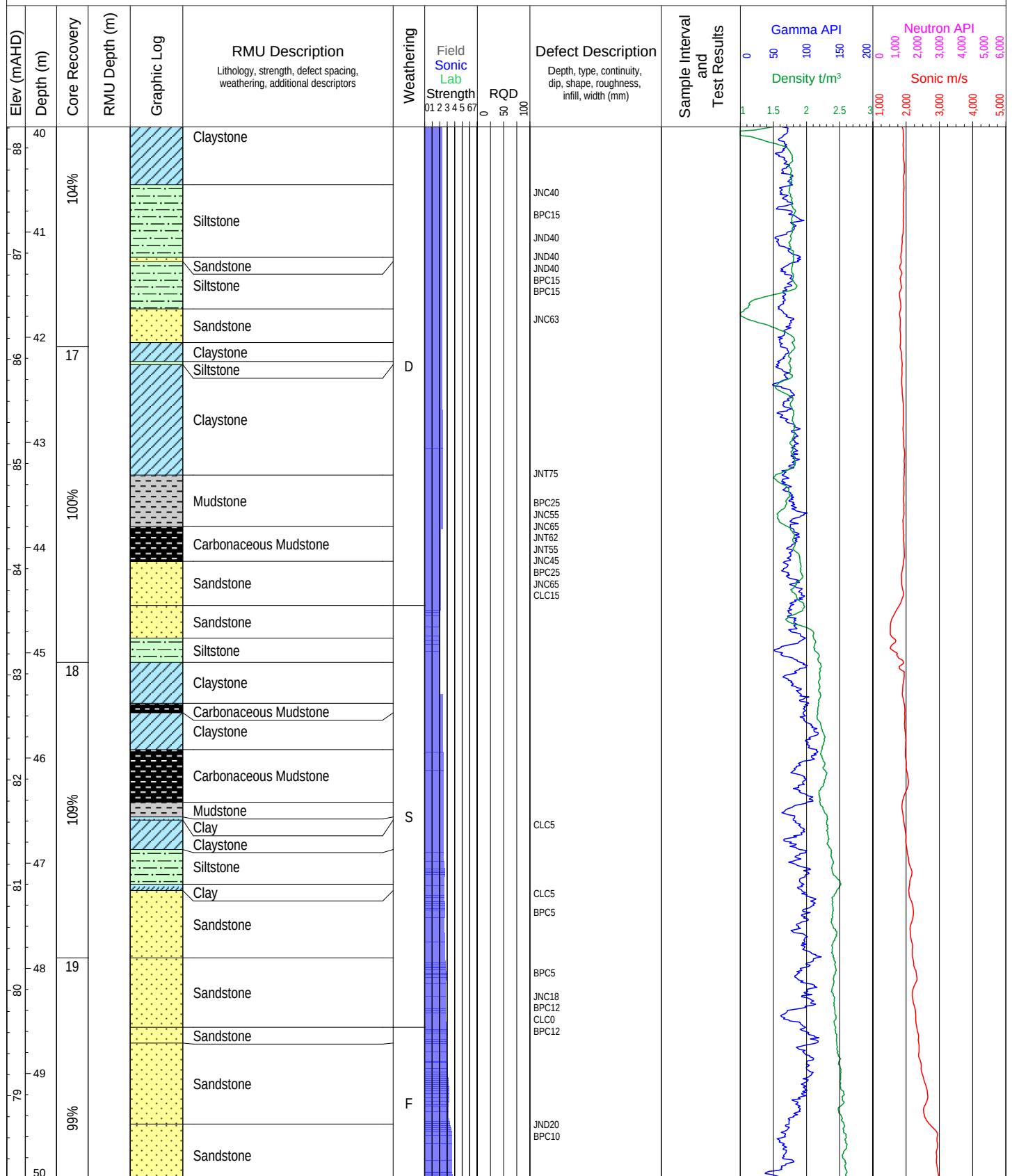


# GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 5 of 9

CLIENT: JT BOYD EASTING: 731418.08 DRILLER: Hodge START: 43709  
PROJECT: Dingo West NORTHING: 7382277.91 DRILL RIG: 6\_U10 FINISH: 43711  
LOCATION: Bowen Basin ELEV: 128.21 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 44 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 81.05 GEOPHYS: Weatherfords



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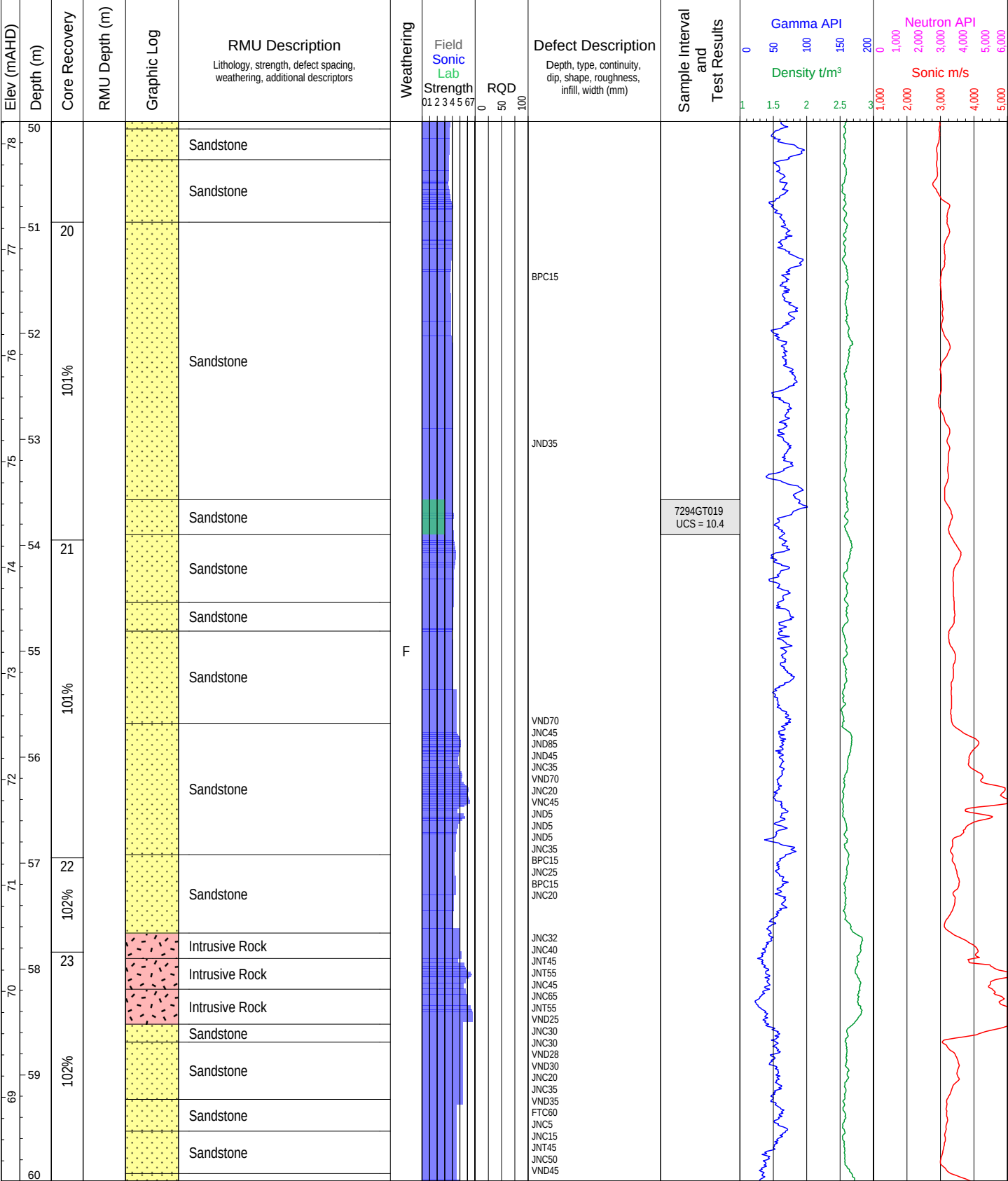


GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 6 of 9

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731418.08  | DRILLER:   | Hodge        | START:   | 43709        |
| PROJECT:    | Dingo West  | NORTHING: | 7382277.91 | DRILL RIG: | 6_U10        | FINISH:  | 43711        |
| LOCATION:   | Bowen Basin | ELEV:     | 128.21     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 44           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 81.05        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**HOLE: DW7294GT**

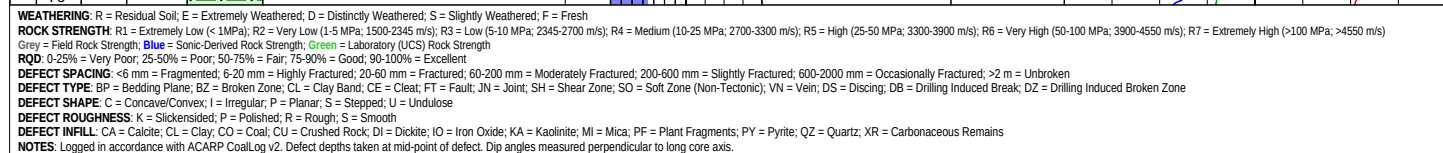
**START:** 43709

**FINISH:** 43711

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords





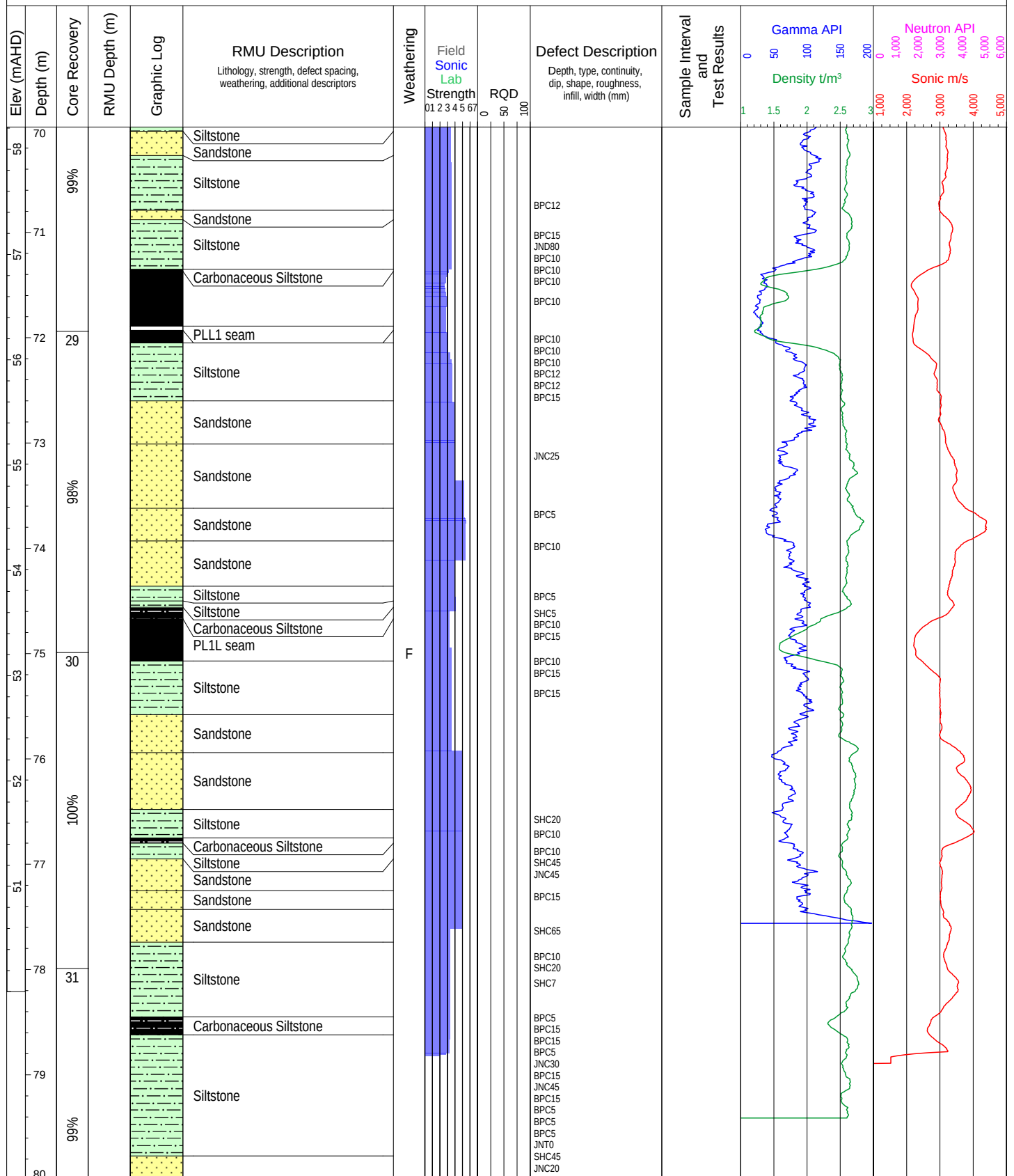


# GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 8 of 9

CLIENT: JT BOYD EASTING: 731418.08 DRILLER: Hodge START: 43709  
PROJECT: Dingo West NORTHING: 7382277.91 DRILL RIG: 6\_U10 FINISH: 43711  
LOCATION: Bowen Basin ELEV: 128.21 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 44 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 81.05 GEOPHYS: Weatherfords



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GEOTECHNICAL LOG

HOLE: DW7294GT

PAGE: 9 of 9

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731418.08  | DRILLER:   | Hodge        | START:   | 43709        |
| PROJECT:    | Dingo West  | NORTHING: | 7382277.91 | DRILL RIG: | 6_U10        | FINISH:  | 43711        |
| LOCATION:   | Bowen Basin | ELEV:     | 128.21     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 44           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 81.05        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|------------------------------------------------------|--------------------------------------------|
| 80          |           |               |               |             | Sandstone                                                                                  | F          |                                                     |                 | JNC5                                                                                     | 7294GT031<br>UCS = 19.1          |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | SHC45                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | SHC60                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | SHC20                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC0                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | BPC10                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 81          |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 | JND30                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC                                                                                      |                                  |                               |                                           |                                                      |                                            |

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GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 1 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731263.38  | DRILLER:   | Hodge        | START:   | 43713        |
| PROJECT:    | Dingo West  | NORTHING: | 7382090.56 | DRILL RIG: | 6_U10        | FINISH:  | 43717        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.81     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 50           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------|------------------------------------------------------|--------------------------------------------|
| 0           | 0         | 1             |               |             | Soil                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 126         | 1         | 97%           |               |             | Soil                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 125         | 2         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 124         | 3         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 123         | 4         | 103%          |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 122         | 5         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 121         | 6         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 120         | 7         | 99%           |               |             | Clay                                                                                       |            |                                                     |                 | JNC84                                                                                    |                                  |                               |                               |                                                      |                                            |
| 119         | 8         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 118         | 9         |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |
| 117         | 10        | 4             |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                               |                                                      |                                            |

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GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 2 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731263.38  | DRILLER:   | Hodge        | START:   | 43713        |
| PROJECT:    | Dingo West  | NORTHING: | 7382090.56 | DRILL RIG: | 6_U10        | FINISH:  | 43717        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.81     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 50           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 10          |           | 101%          |               |             | Clay                                                                                       |            |                                                     |                 | JNC<br>BZC                                                                               |                                  |                                                                            |                                                                                              |
| 11          |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 12          |           | 5             |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 13          |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 14          |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 15          |           | 6             |               |             | Clay                                                                                       | E          |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 16          |           |               |               |             | Ferricrete                                                                                 |            |                                                     |                 | JNC4<br>JNC35                                                                            |                                  |                                                                            |                                                                                              |
| 17          |           | 96%           |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 18          |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 19          |           | 7             |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 20          |           | 31%           |               |             | Sand                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                            |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 3 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731263.38  | DRILLER:   | Hodge        | START:   | 43713        |
| PROJECT:    | Dingo West  | NORTHING: | 7382090.56 | DRILL RIG: | 6_U10        | FINISH:  | 43717        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.81     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 50           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 20          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 106         |           |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 21          |           | 8             |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 105         |           | 270%          |               |             | Core Loss                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 22          |           |               | 9             |             | Clay                                                                                          |            |                                                     |                 | JNC60                                                                                          |                                        |                                                                            |                                                                                              |
| 104         |           | 100%          |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 23          |           |               |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 103         |           |               |               |             | Siderite                                                                                      |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 24          |           |               | 10            |             | Sand<br>Clay                                                                                  |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 102         |           | 100%          |               |             | Silcrete                                                                                      |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 25          |           |               |               |             | Clay                                                                                          | E          |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 101         |           |               |               |             | Siderite                                                                                      |            |                                                     |                 | JNC5                                                                                           | 7295GT008<br>UCS = 4.29                |                                                                            |                                                                                              |
| 26          |           | 100%          |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 100         |           |               | 12            |             | Silcrete<br>Silcrete                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 27          |           | 55%           |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 99          |           |               | 13            |             | Core Loss                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 28          |           |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC5<br>JNC30<br>JNC30<br>JNC3<br>BZC                                                          |                                        |                                                                            |                                                                                              |
| 98          |           | 102%          |               |             | Ferricrete                                                                                    |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 29          |           |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 97          |           |               | 14            |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 30          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |

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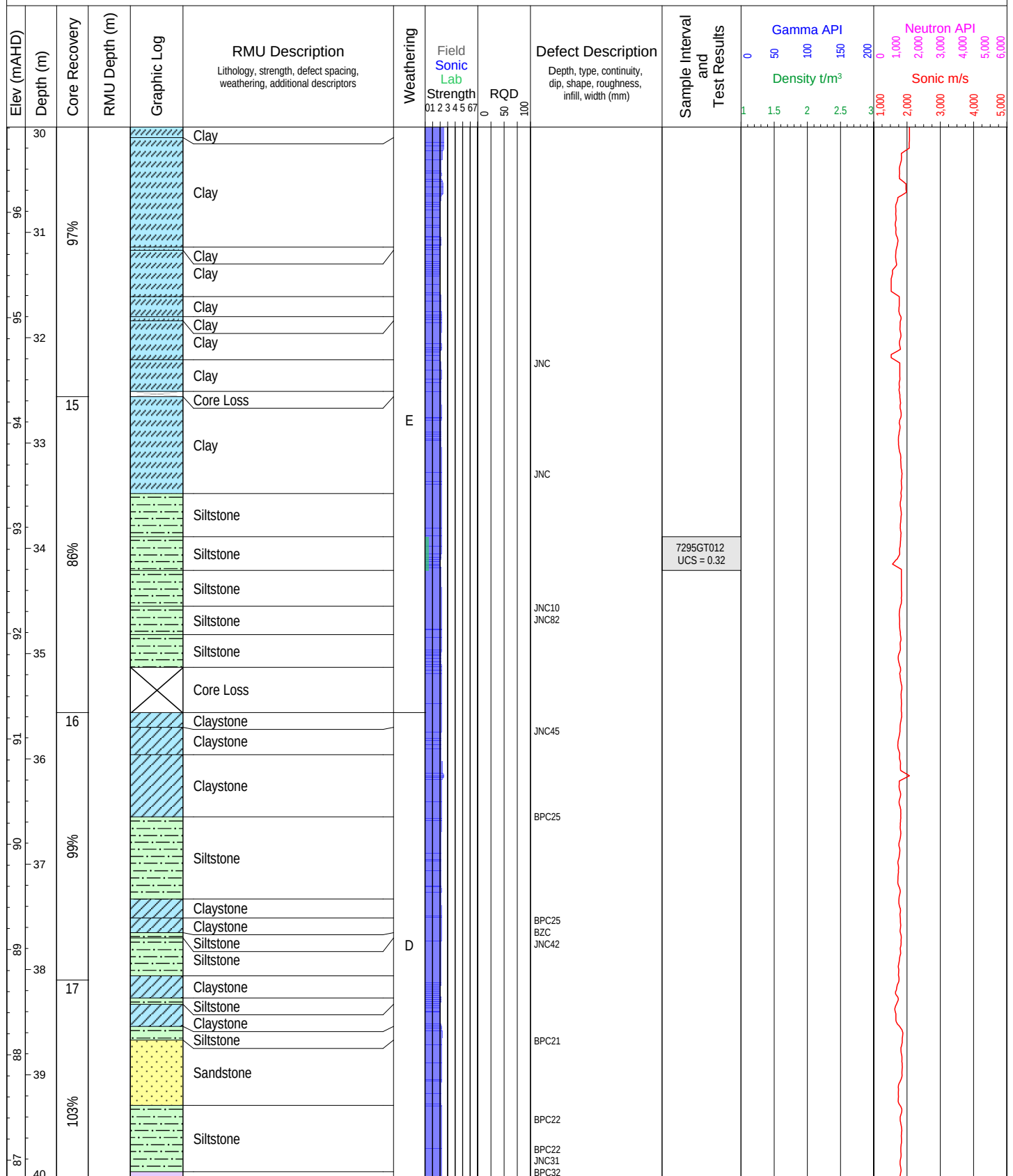


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 4 of 13

CLIENT: JT BOYD EASTING: 731263.38 DRILLER: Hodge START: 43713  
PROJECT: Dingo West NORTHING: 7382090.56 DRILL RIG: 6\_U10 FINISH: 43717  
LOCATION: Bowen Basin ELEV: 126.81 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 50 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords



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# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 5 of 13

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PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 40          |           |               |               |             | Siderite                                                                                      | S          |                                                     |                 | BPC27                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | BPC24                                                                                          |                                        |                                                                            |                                                                                              |
|             |           | 18            |               |             | Carbonaceous Siltstone                                                                        | S          |                                                     |                 | JNC20                                                                                          |                                        |                                                                            |                                                                                              |
| 86          |           |               |               |             | Carbonaceous Siltstone                                                                        |            |                                                     |                 | JNC26                                                                                          |                                        |                                                                            |                                                                                              |
| 41          |           |               |               |             | sooty Slightly weathered                                                                      |            |                                                     |                 | BPC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | AR3U seam                                                                                     |            |                                                     |                 | JNC41                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Carbonaceous Siltstone                                                                        |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 85          |           | 86%           |               |             | Siltstone                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | BPC28                                                                                          |                                        |                                                                            |                                                                                              |
| 84          |           |               |               |             | Carbonaceous Mudstone                                                                         |            |                                                     |                 | BPC21                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Lost Coal                                                                                     |            |                                                     |                 | CEC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | AR3 seam                                                                                      |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 83          |           | 19            |               |             | Coal                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Coal                                                                                          |            |                                                     |                 | CEC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Coal                                                                                          |            |                                                     |                 | BPC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 82          |           | 32%           |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 81          |           | 20            |               |             |                                                                                               | F          |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Coaly Mudstone                                                                                |            |                                                     |                 | JNC37                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Carbonaceous Mudstone                                                                         |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           | 78%           |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC22                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Carbonaceous Siltstone                                                                        |            |                                                     |                 | BPC43                                                                                          |                                        |                                                                            |                                                                                              |
| 80          |           |               |               |             | AR3L seam                                                                                     |            |                                                     |                 | JNC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Lost Coal                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JND0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC26                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BPD15                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BPC17                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC22                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
| 77          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 50          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |

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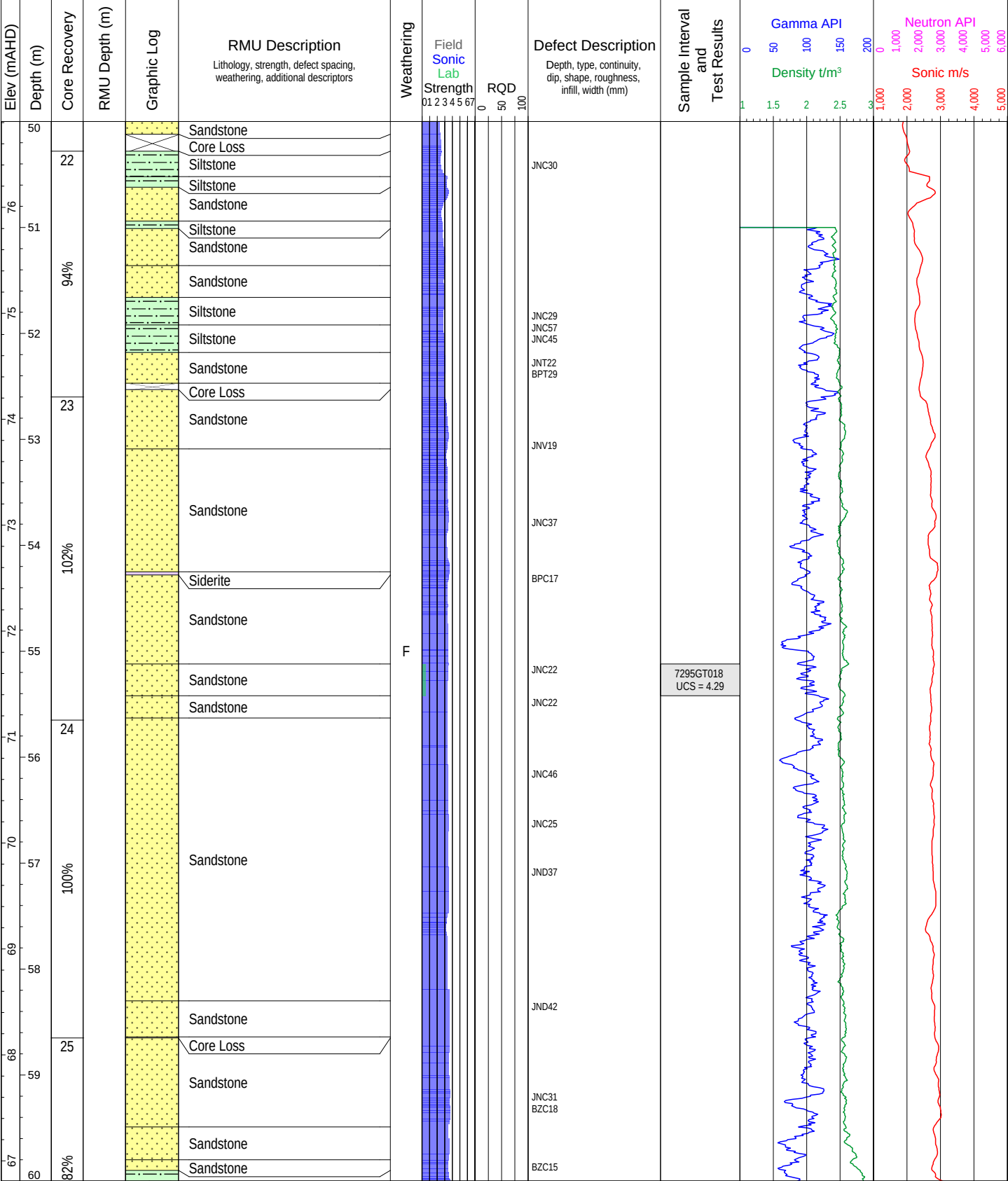


GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 6 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
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| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



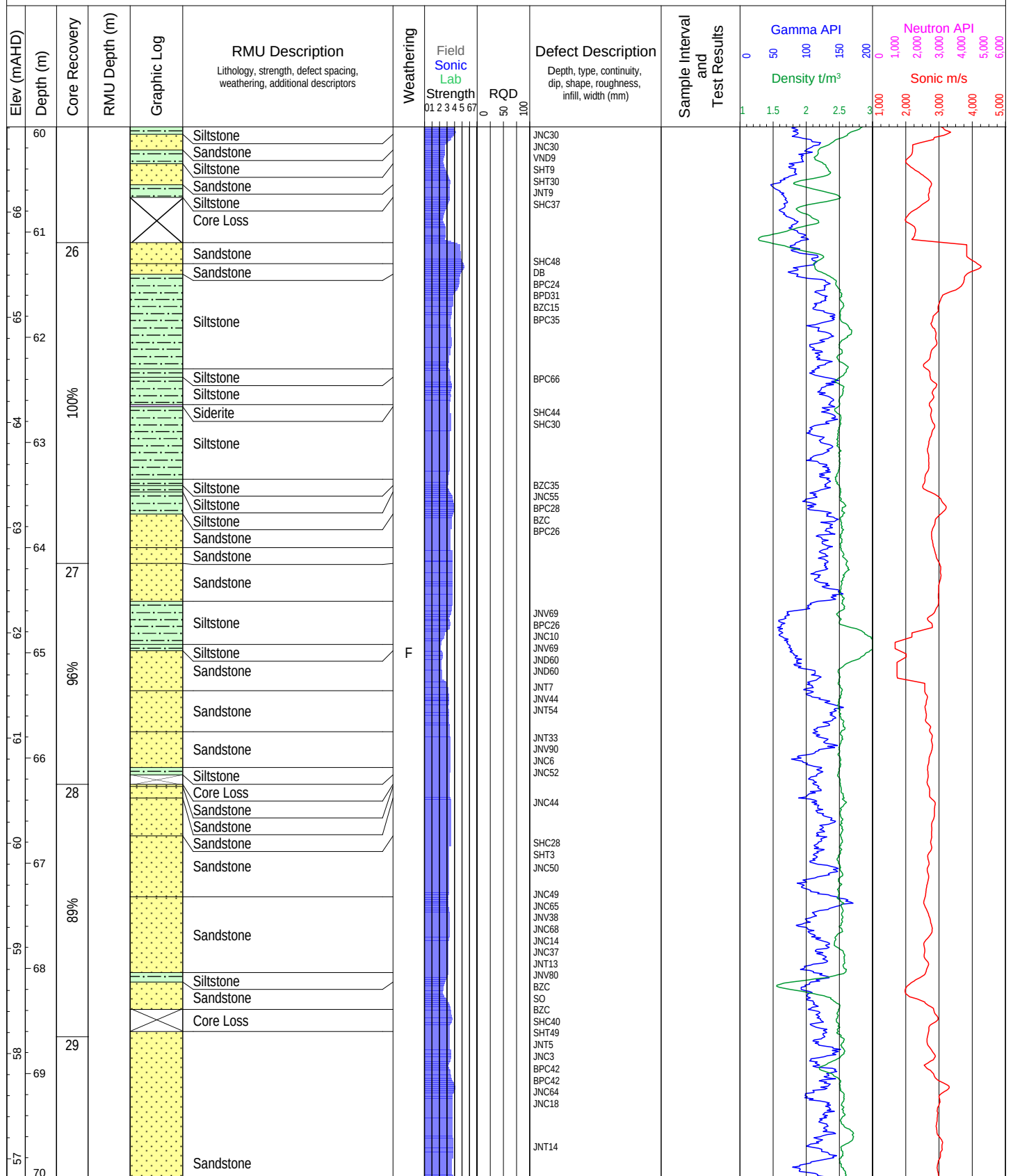


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 7 of 13

CLIENT: JT BOYD EASTING: 731263.38 DRILLER: Hodge START: 43713  
PROJECT: Dingo West NORTHING: 7382090.56 DRILL RIG: 6\_U10 FINISH: 43717  
LOCATION: Bowen Basin ELEV: 126.81 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 50 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
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DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



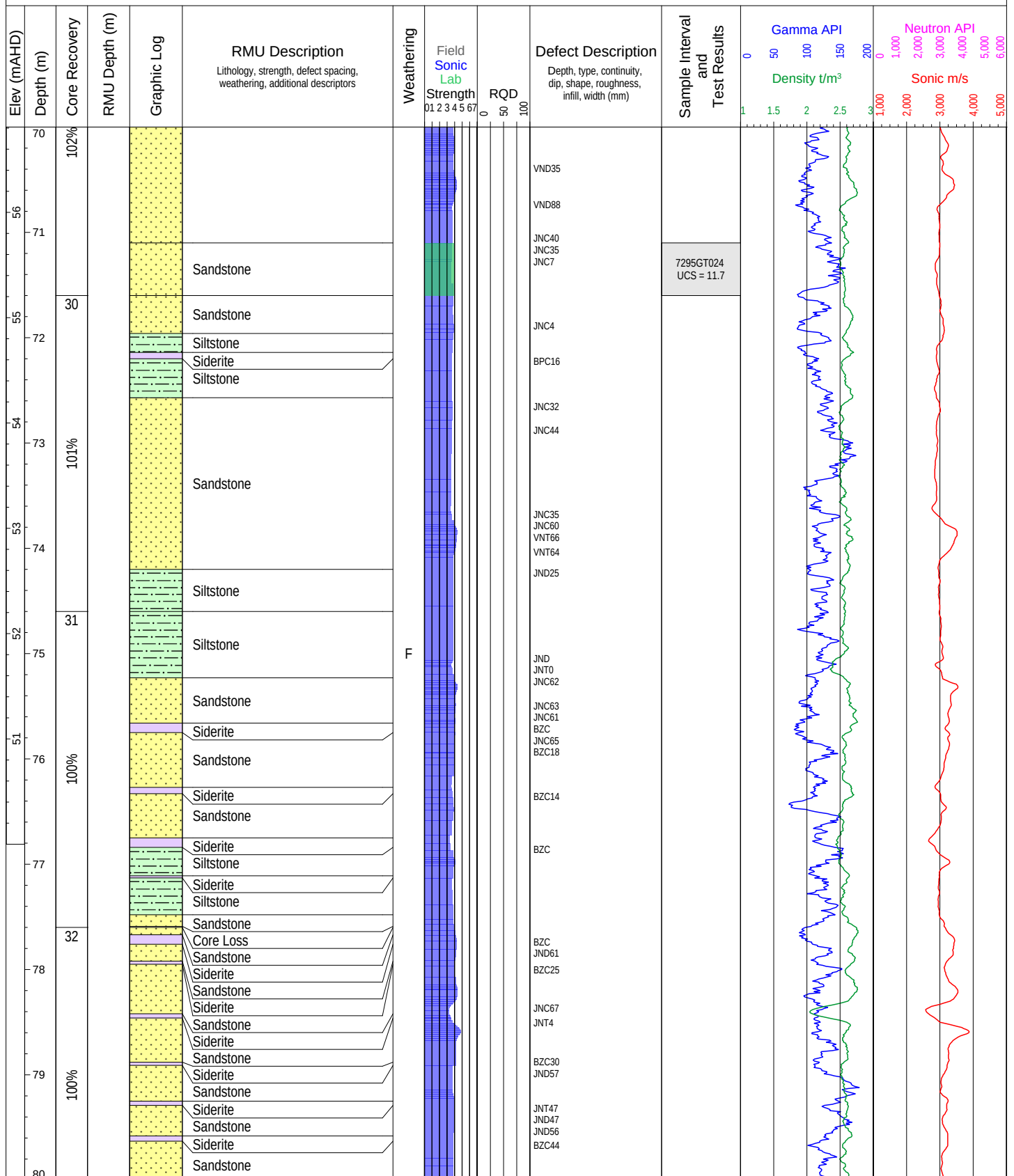


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 8 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731263.38  | DRILLER:   | Hodge        | START:   | 43713        |
| PROJECT:    | Dingo West  | NORTHING: | 7382090.56 | DRILL RIG: | 6_U10        | FINISH:  | 43717        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.81     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 50           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
**Grey** = Field Rock Strength; **Blue** = Sonic-Derived Rock Strength; **Green** = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
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**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



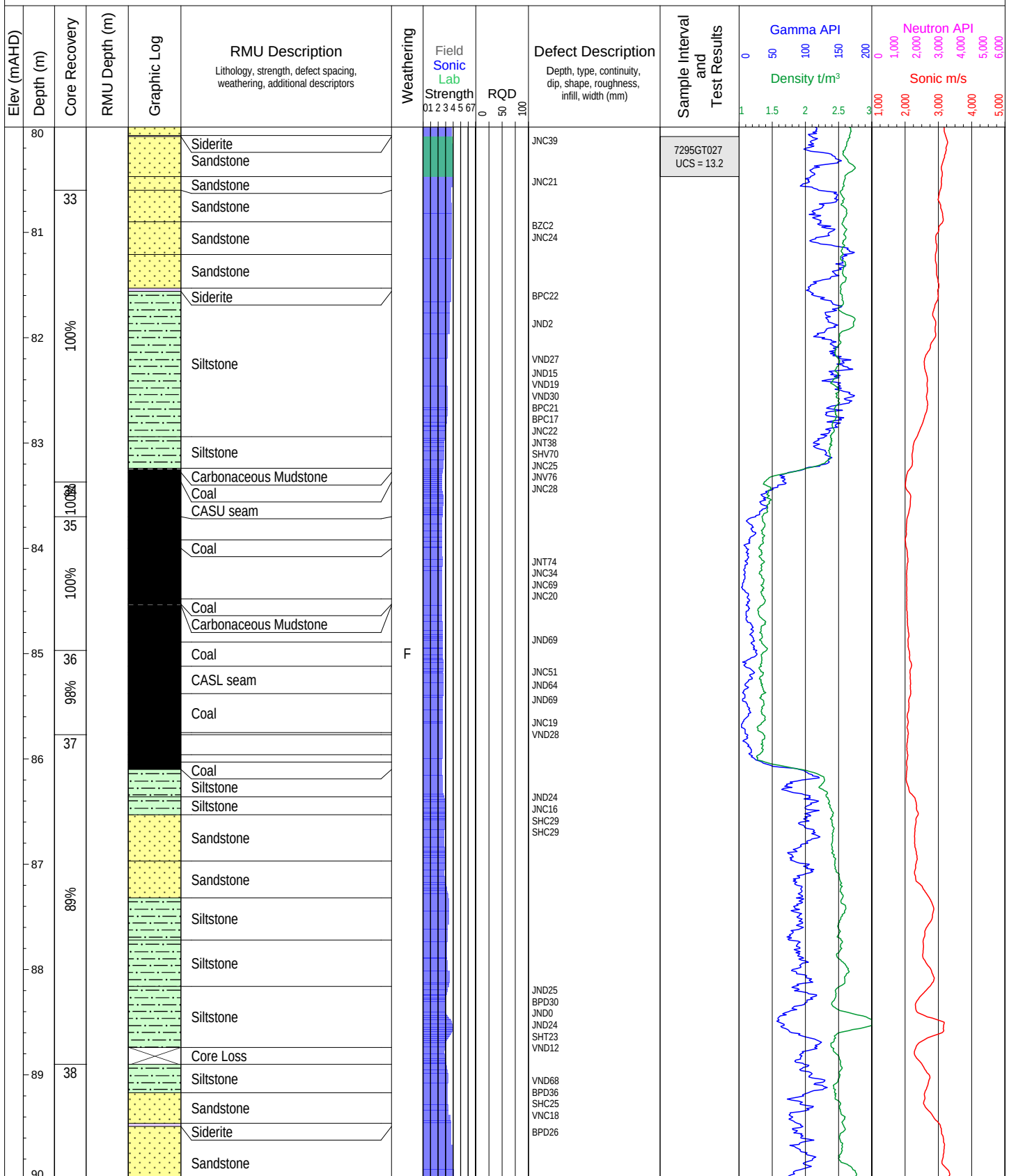


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 9 of 13

CLIENT: JT BOYD EASTING: 731263.38 DRILLER: Hodge START: 43713  
PROJECT: Dingo West NORTHING: 7382090.56 DRILL RIG: 6\_U10 FINISH: 43717  
LOCATION: Bowen Basin ELEV: 126.81 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 50 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



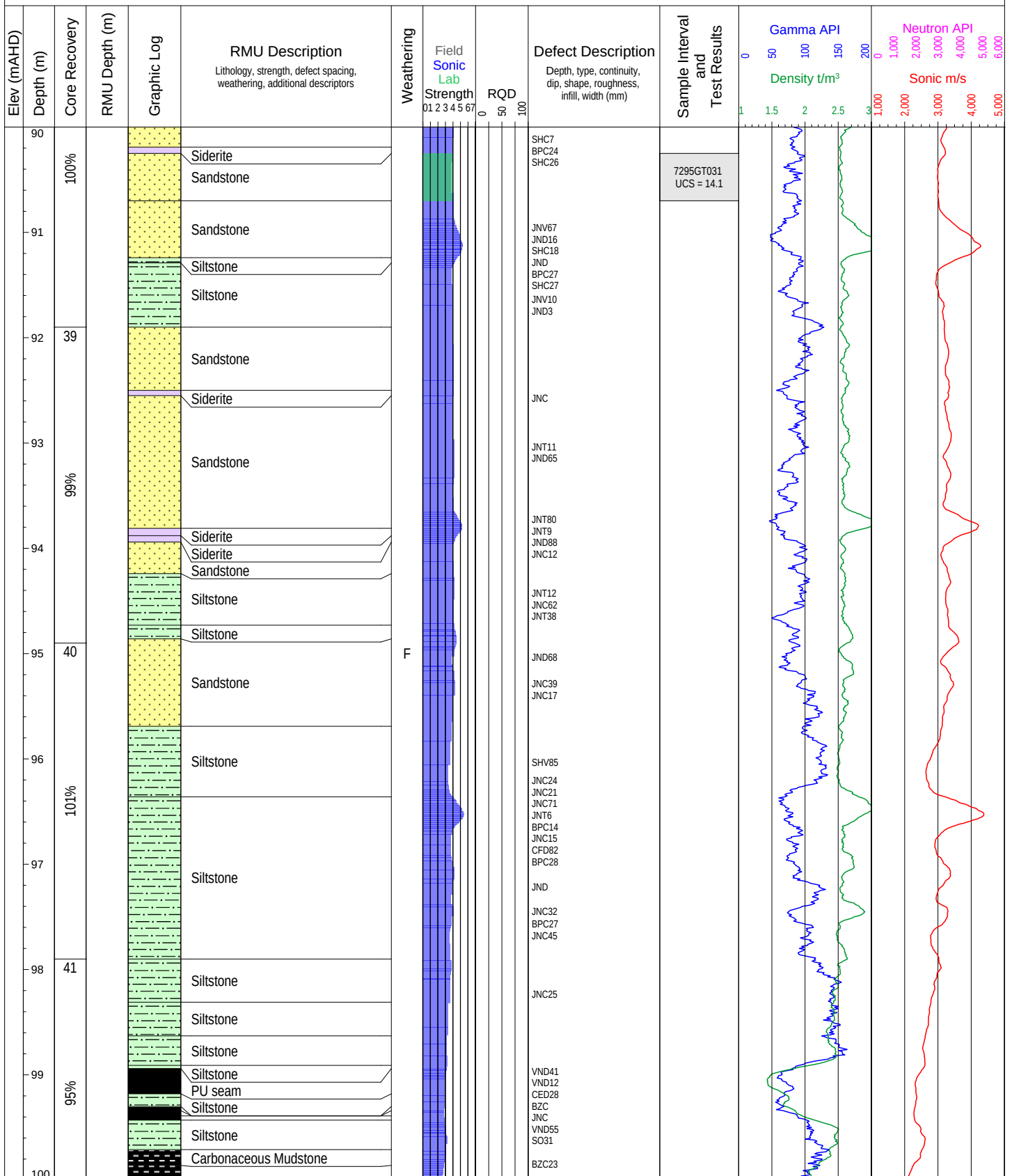


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 10 of 13

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731263.38  | DRILLER:   | Hodge        | START:   | 43713        |
| PROJECT:    | Dingo West  | NORTHING: | 7382090.56 | DRILL RIG: | 6_U10        | FINISH:  | 43717        |
| LOCATION:   | Bowen Basin | ELEV:     | 126.81     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 50           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 129.3        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
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**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
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**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.

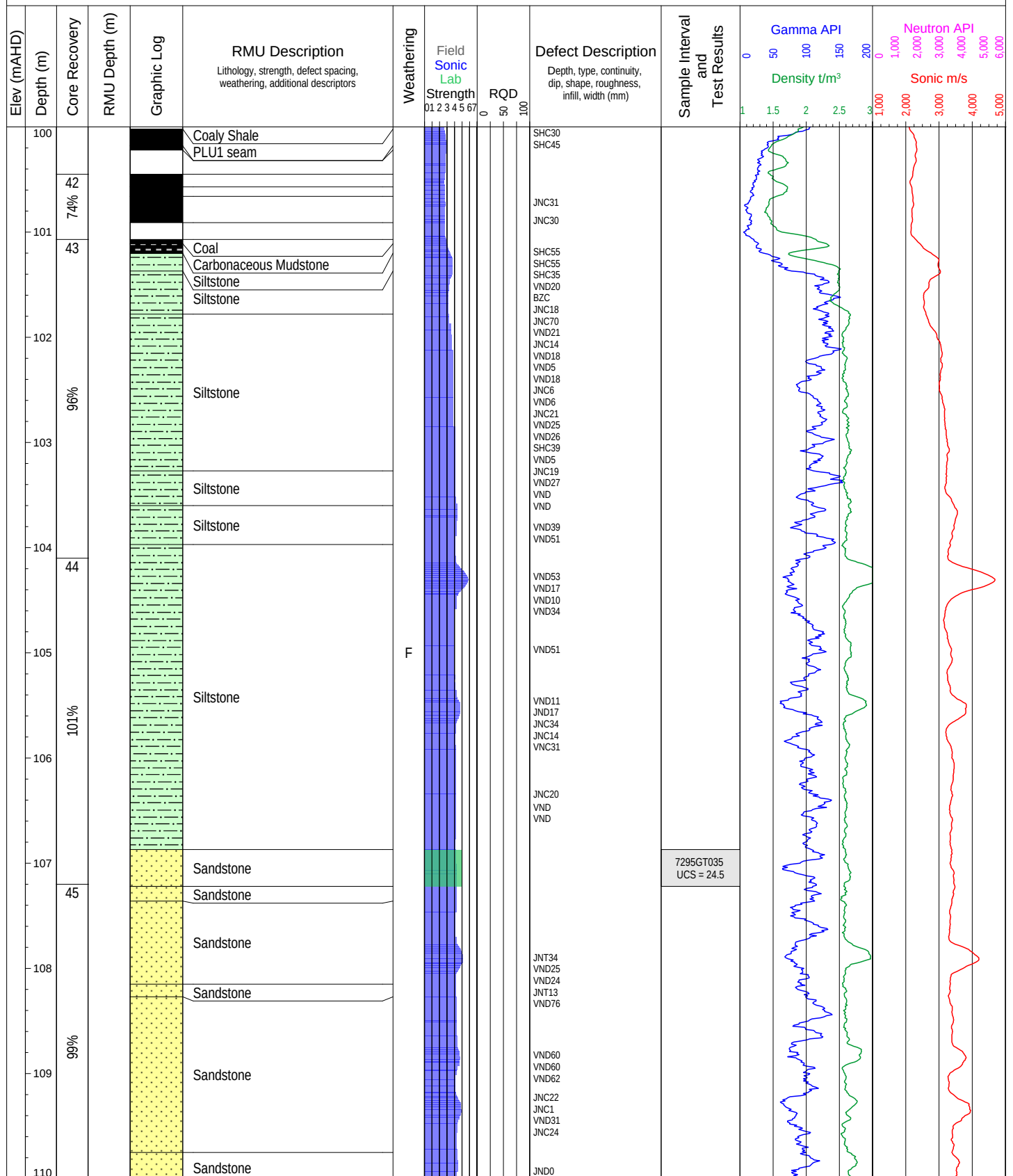


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 11 of 13

CLIENT: JT BOYD EASTING: 731263.38 DRILLER: Hodge START: 43713  
PROJECT: Dingo West NORTHING: 7382090.56 DRILL RIG: 6\_U10 FINISH: 43717  
LOCATION: Bowen Basin ELEV: 126.81 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 50 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





**HOLE: DW7295GT**

|                    |             |                  |            |                   |              |                 |              |
|--------------------|-------------|------------------|------------|-------------------|--------------|-----------------|--------------|
| <b>CLIENT:</b>     | JT BOYD     | <b>EASTING:</b>  | 731263.38  | <b>DRILLER:</b>   | Hodge        | <b>START:</b>   | 43713        |
| <b>PROJECT:</b>    | Dingo West  | <b>NORTHING:</b> | 7382090.56 | <b>DRILL RIG:</b> | 6_U10        | <b>FINISH:</b>  | 43717        |
| <b>LOCATION:</b>   | Bowen Basin | <b>ELEV:</b>     | 126.81     | <b>CORE SIZE:</b> | HQ Full Core | <b>GEOLOGY:</b> | John Irvine  |
| <b>TENEMENT:</b>   | EPC881      | <b>INC/AZI:</b>  | -90/0      | <b>CASING:</b>    | 50           | <b>GEOTECH:</b> |              |
| <b>PROJECT NO:</b> | DW_2020     | <b>DATUM:</b>    | GDA94 Z55  | <b>DEPTH:</b>     | 129.3        | <b>GEOPHYS:</b> | Weatherfords |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<1 MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
**Color = Field Strength** Blue = Strongly Stained Rock Strength Green = Laboratory (JCS) Rock Strength  
**QD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
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**NOTES:** Logged in accordance with ACARP CoLog v2. Defect depths measured perpendicular to long core axis.

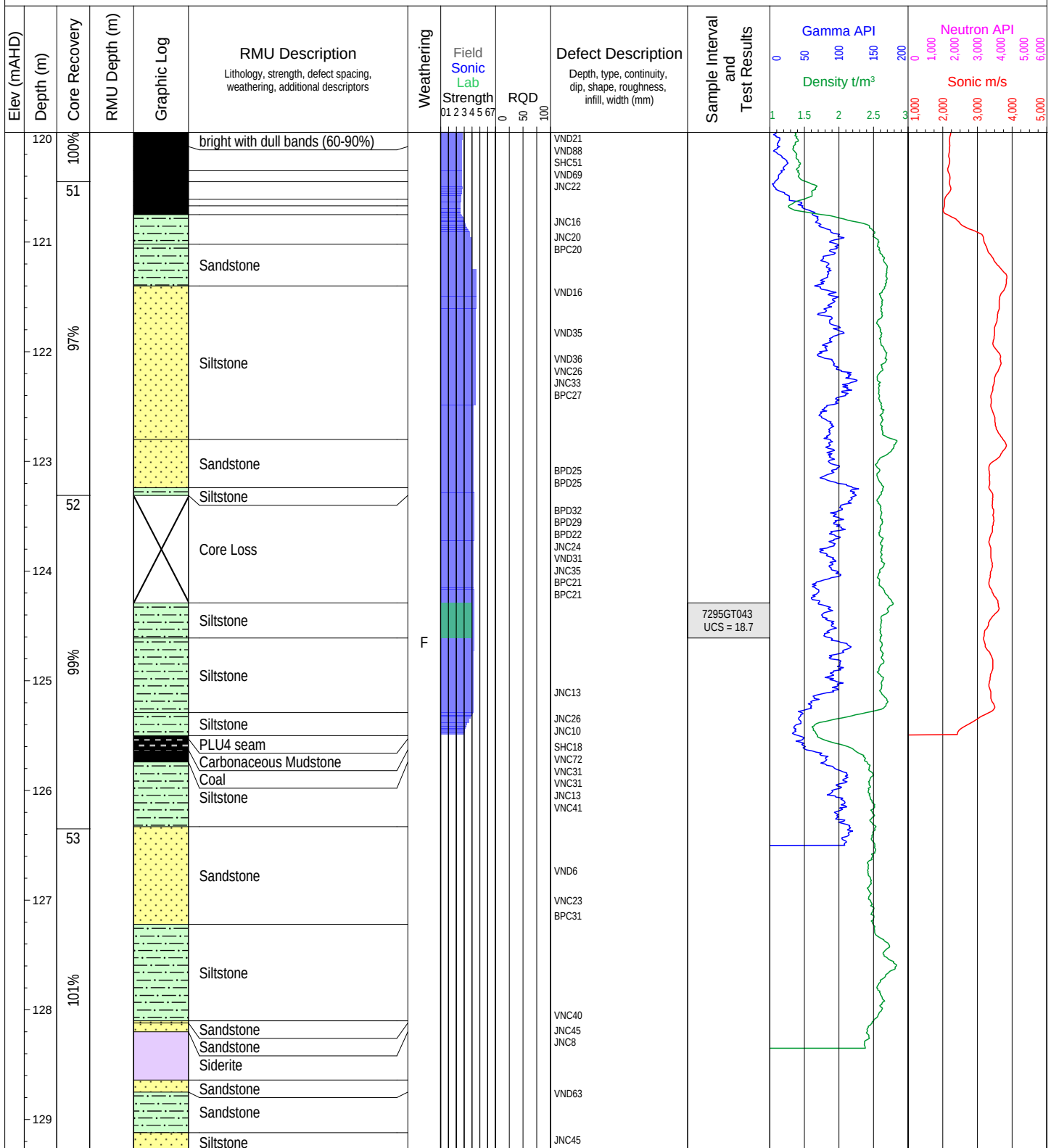


# GEOTECHNICAL LOG

HOLE: DW7295GT

PAGE: 13 of 13

CLIENT: JT BOYD EASTING: 731263.38 DRILLER: Hodge START: 43713  
PROJECT: Dingo West NORTHING: 7382090.56 DRILL RIG: 6\_U10 FINISH: 43717  
LOCATION: Bowen Basin ELEV: 126.81 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 50 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 129.3 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



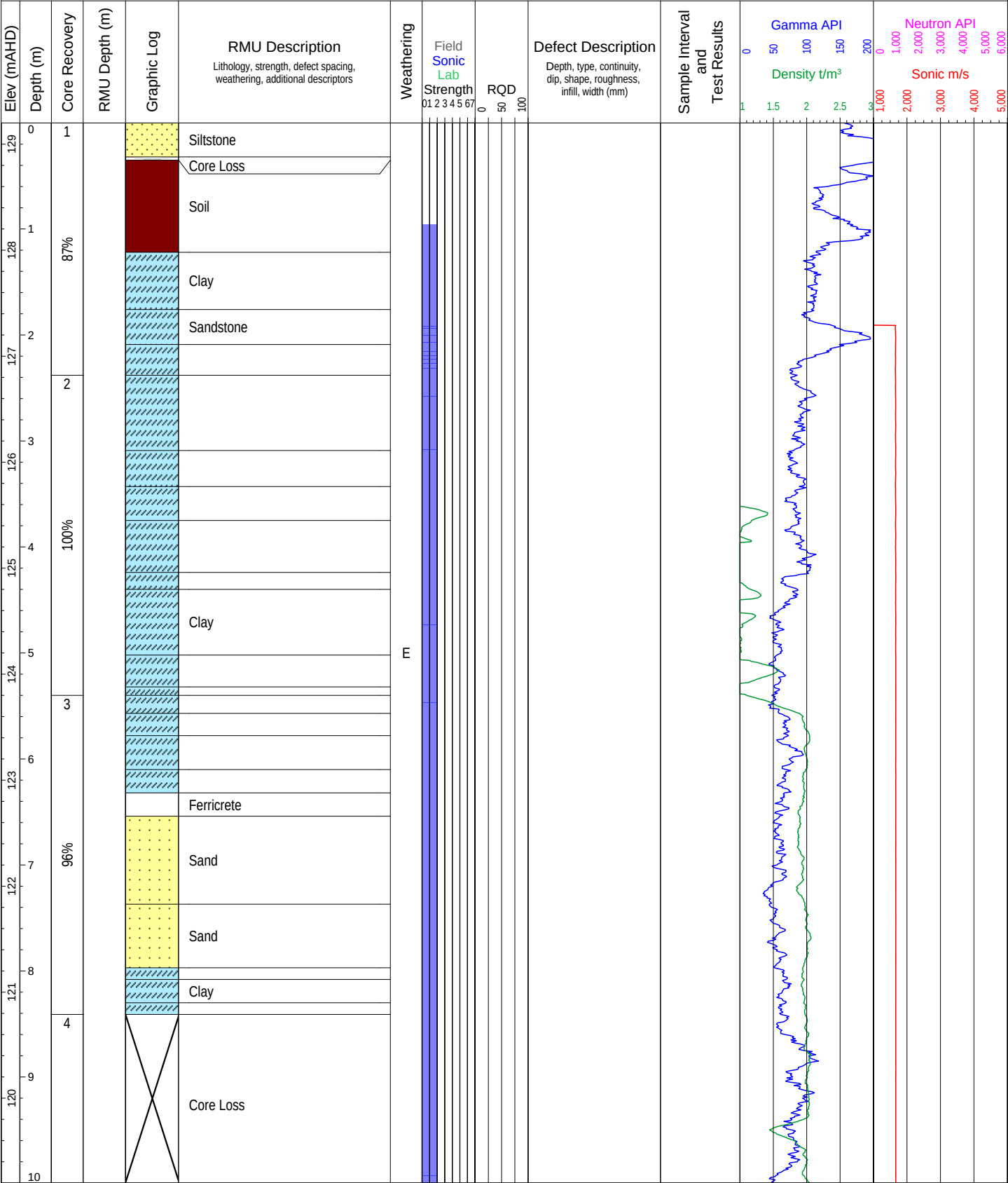


GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 1 of 20

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731062.89  | DRILLER:   | Hodge        | START:   | 43687        |
| PROJECT:    | Dingo West  | NORTHING: | 7382087.34 | DRILL RIG: | 6_U10        | FINISH:  | 43704        |
| LOCATION:   | Bowen Basin | ELEV:     | 129.2      | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 51           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 191          | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.

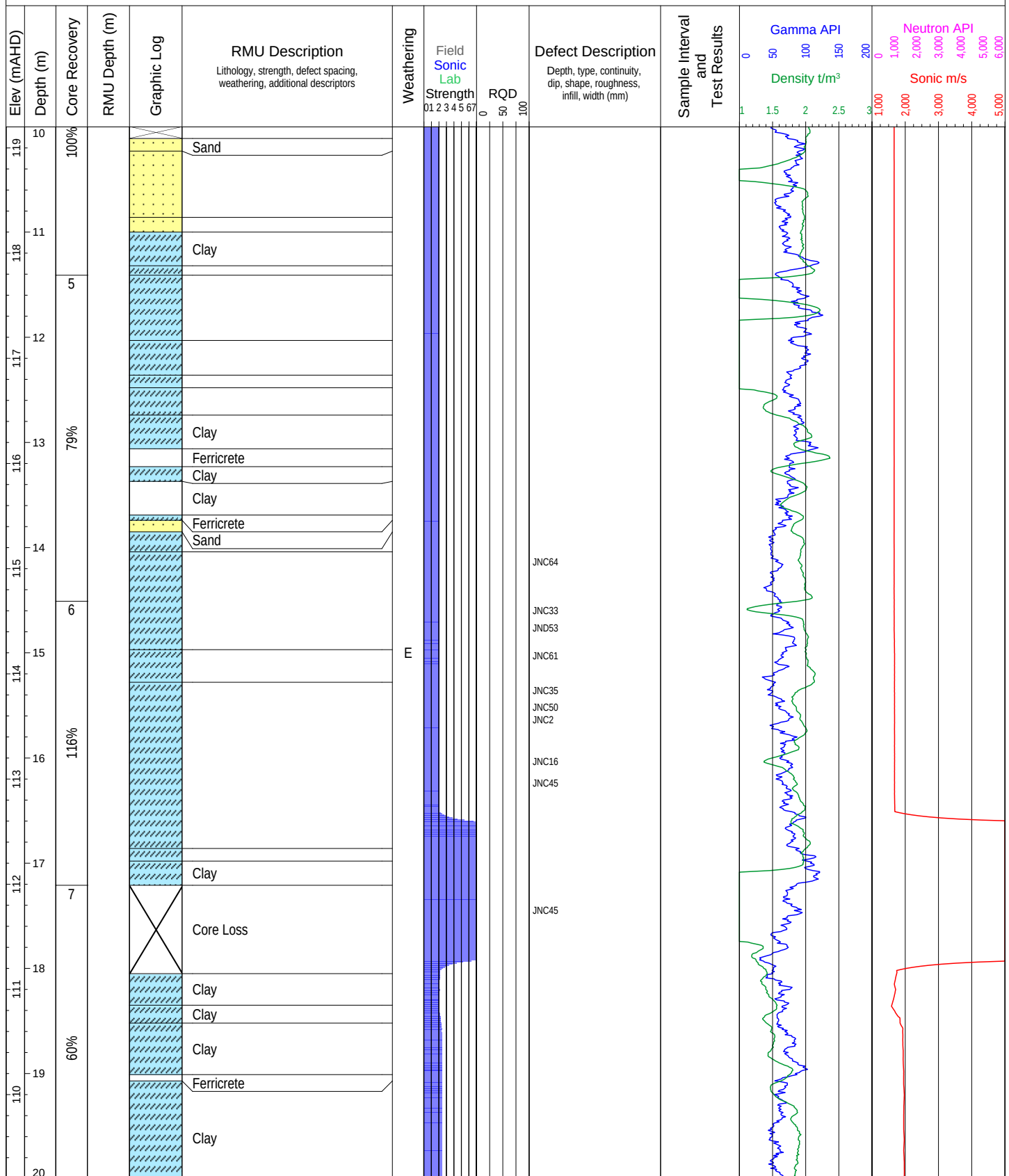


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 2 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



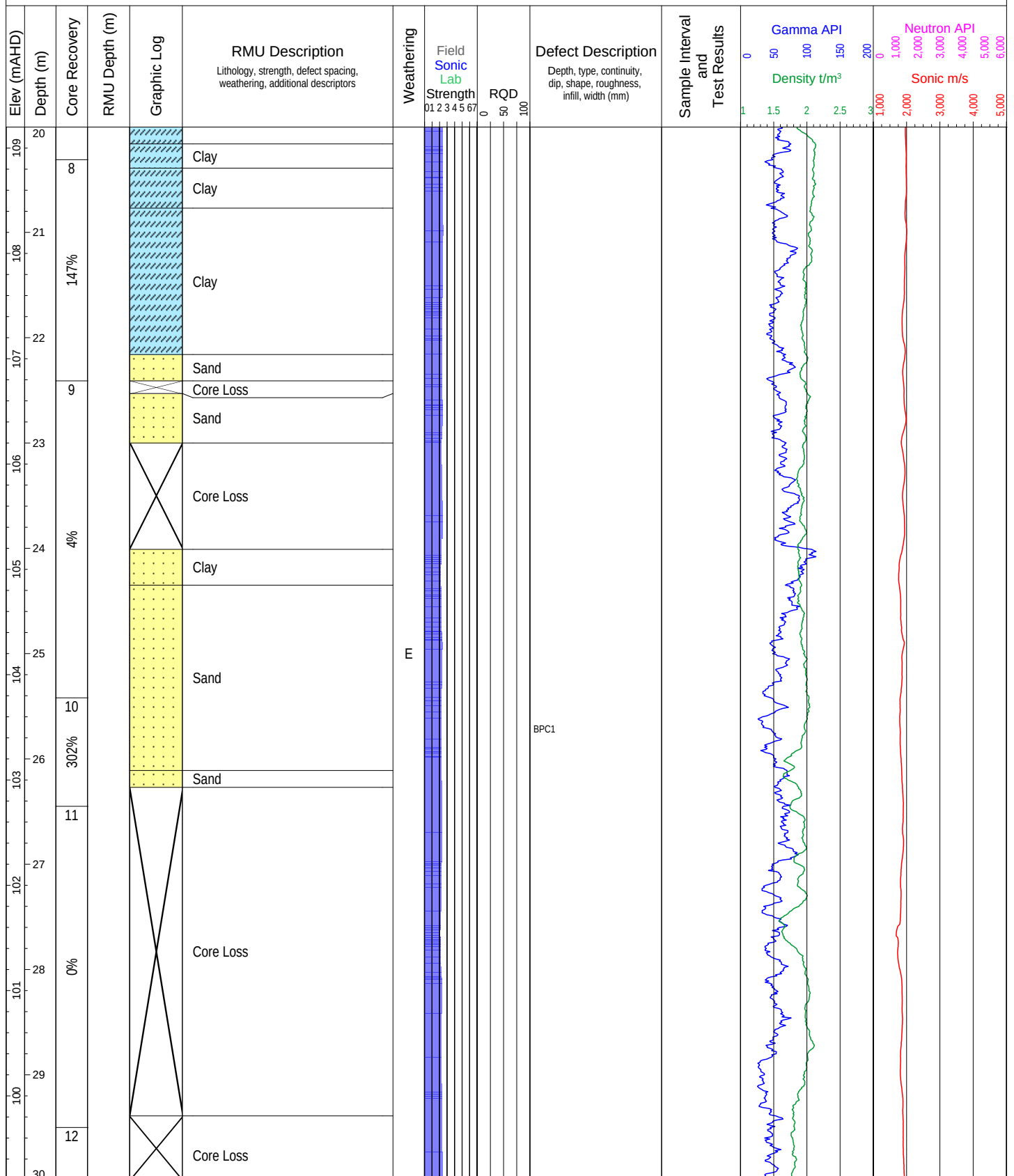


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 3 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.

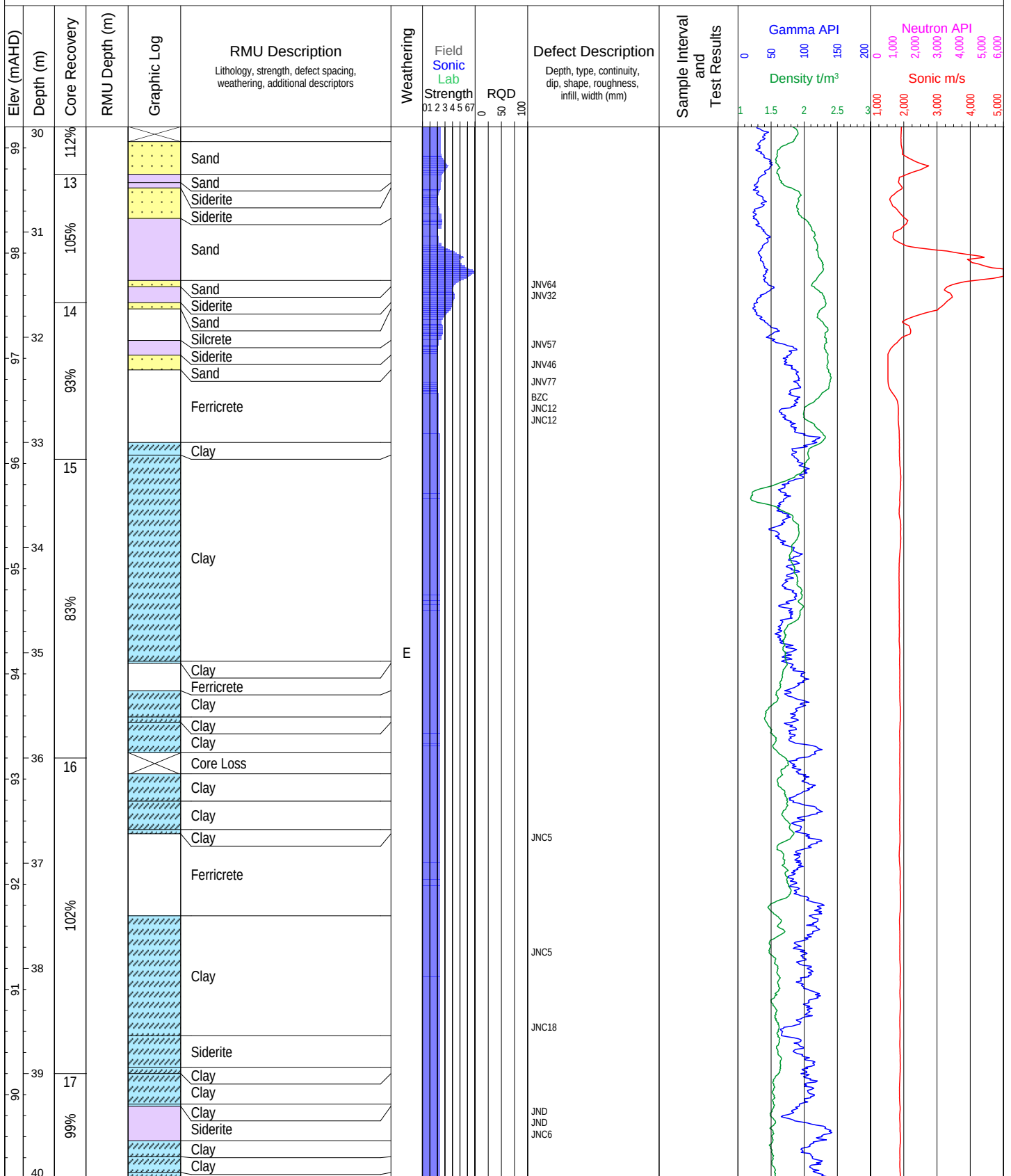


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 4 of 20

**CLIENT:** JT BOYD **EASTING:** 731062.89 **DRILLER:** Hodge **START:** 43687  
**PROJECT:** Dingo West **NORTHING:** 7382087.34 **DRILL RIG:** 6\_U10 **FINISH:** 43704  
**LOCATION:** Bowen Basin **ELEV:** 129.2 **CORE SIZE:** HQ Full Core **GEOLOGY:** John Irvine  
**TENEMENT:** EPC881 **INC/AZI:** -90/0 **CASING:** 51 **GEOTECH:**  
**PROJECT NO:** DW\_2020 **DATUM:** GDA94 Z55 **DEPTH:** 191 **GEOPHYS:** Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
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**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



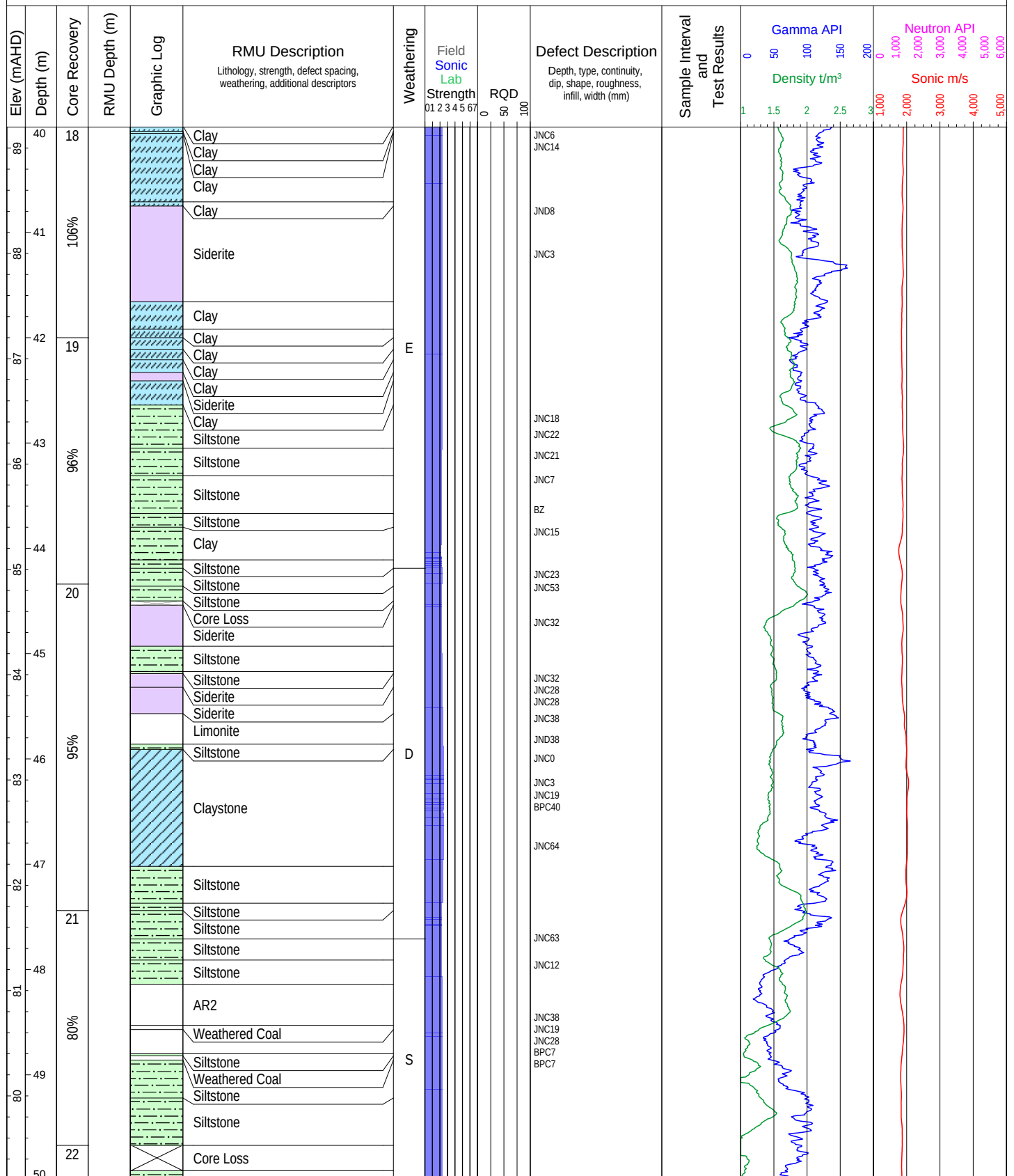


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 5 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
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**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



**HOLE: DW7296GT**

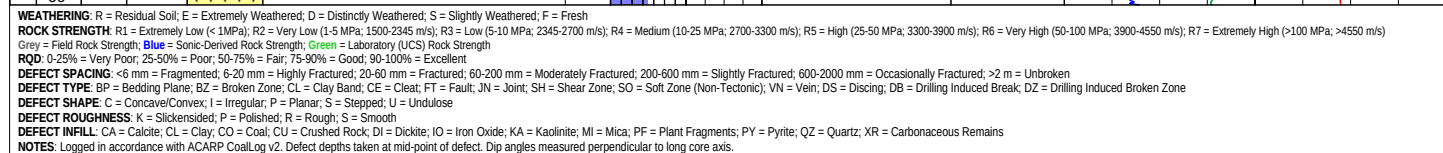
**START:** 43687

**FINISH:** 43704

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords





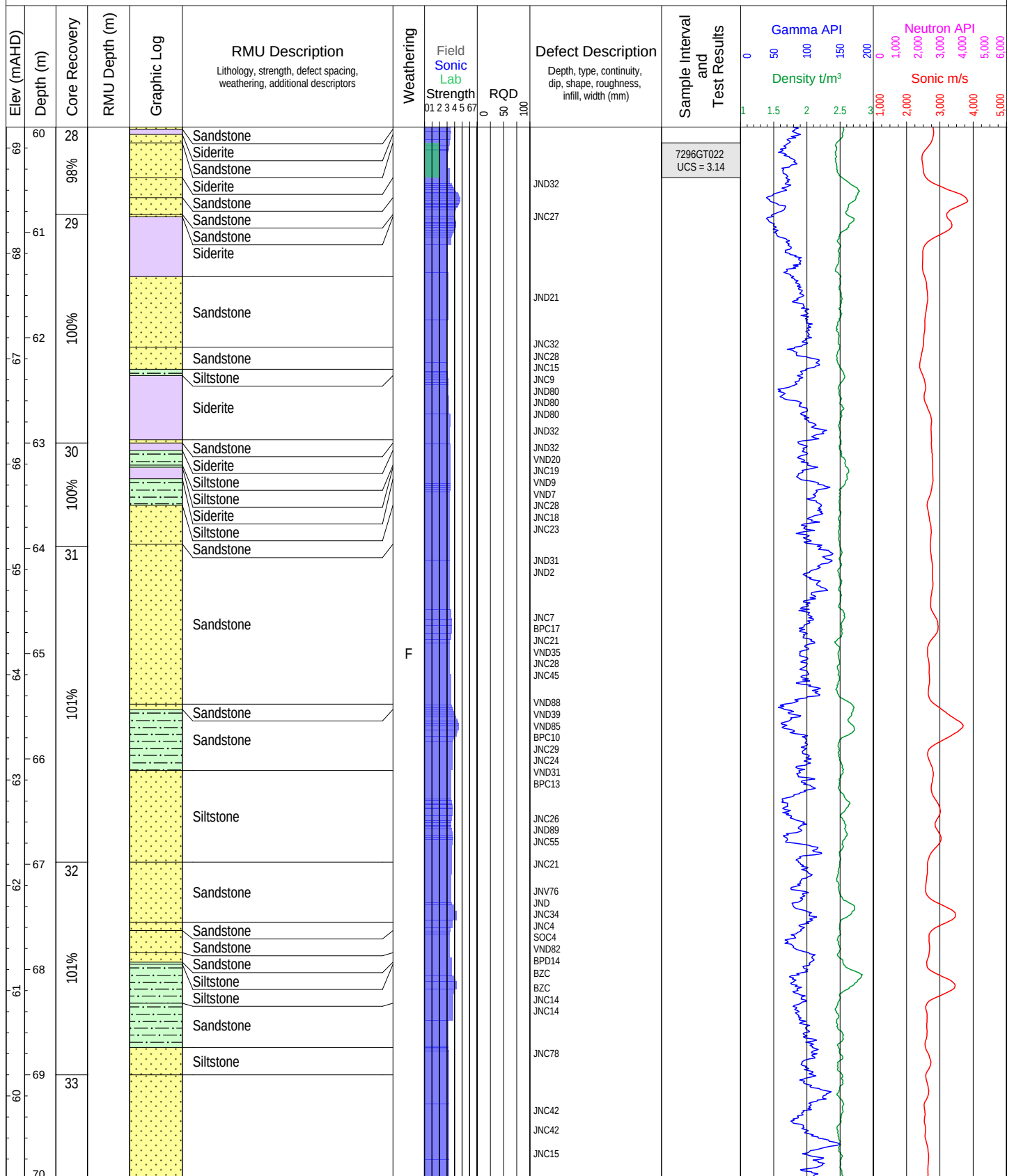


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 7 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191  
GEOLOGY: John Irvine  
GEOTECH:  
GEOPHYS: Weatherfords



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
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**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



**HOLE: DW7296GT**

**START:** 43687

**FINISH:** 43704

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 mts); R3 = Low (5-10 MPa; 2345-2700 mts); R4 = Medium (10-25 MPa; 2700-3300 mts); R5 = High (25-50 MPa; 3300-3900 mts); R6 = Very High (50-100 MPa; 3900-4550 mts); R7 = Extremely High (>100 MPa; >4550 mts)  
**Grey = Field Rock Strength; Blue = Sonar-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength**  
**Q:** Q1 = 25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** C = concave/convex; 6-20 mm = Highly Fractured; 20-60 mm = Moderately Fractured; 60-200 mm = Slightly Fractured; 200-600 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BR = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Silkened; P = Polished; R = Rough; S = Smooth  
**DEFECT INFLL:** CA = Calcite; CO = Coal; CL = Clay; CR = Crust Rock; DI = Dioxide; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACAPR CoalLog v2. Defect depths measured perpendicular to core log axis.



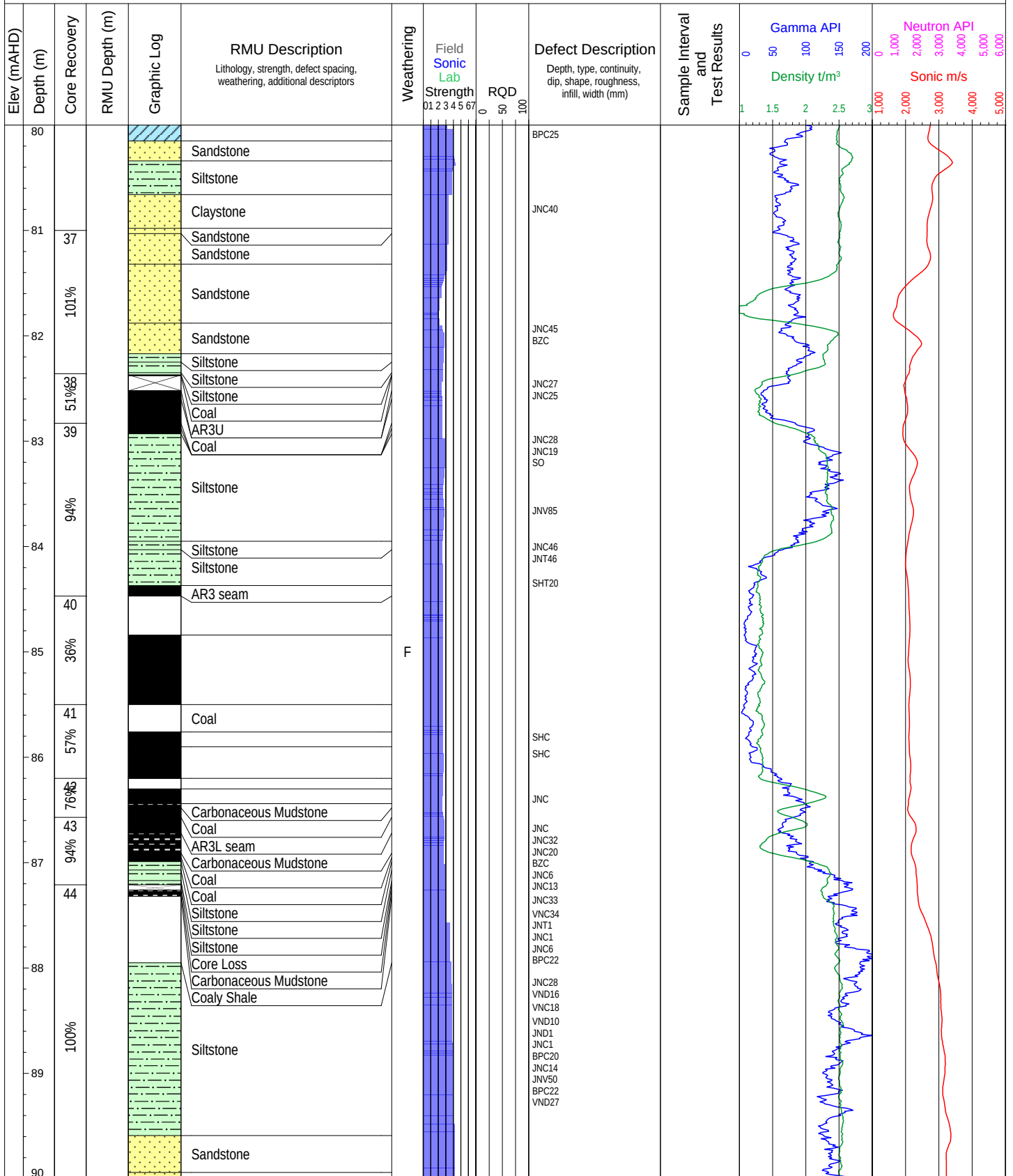


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 9 of 20

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731062.89  | DRILLER:   | Hodge        | START:   | 43687        |
| PROJECT:    | Dingo West  | NORTHING: | 7382087.34 | DRILL RIG: | 6_U10        | FINISH:  | 43704        |
| LOCATION:   | Bowen Basin | ELEV:     | 129.2      | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 51           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 191          | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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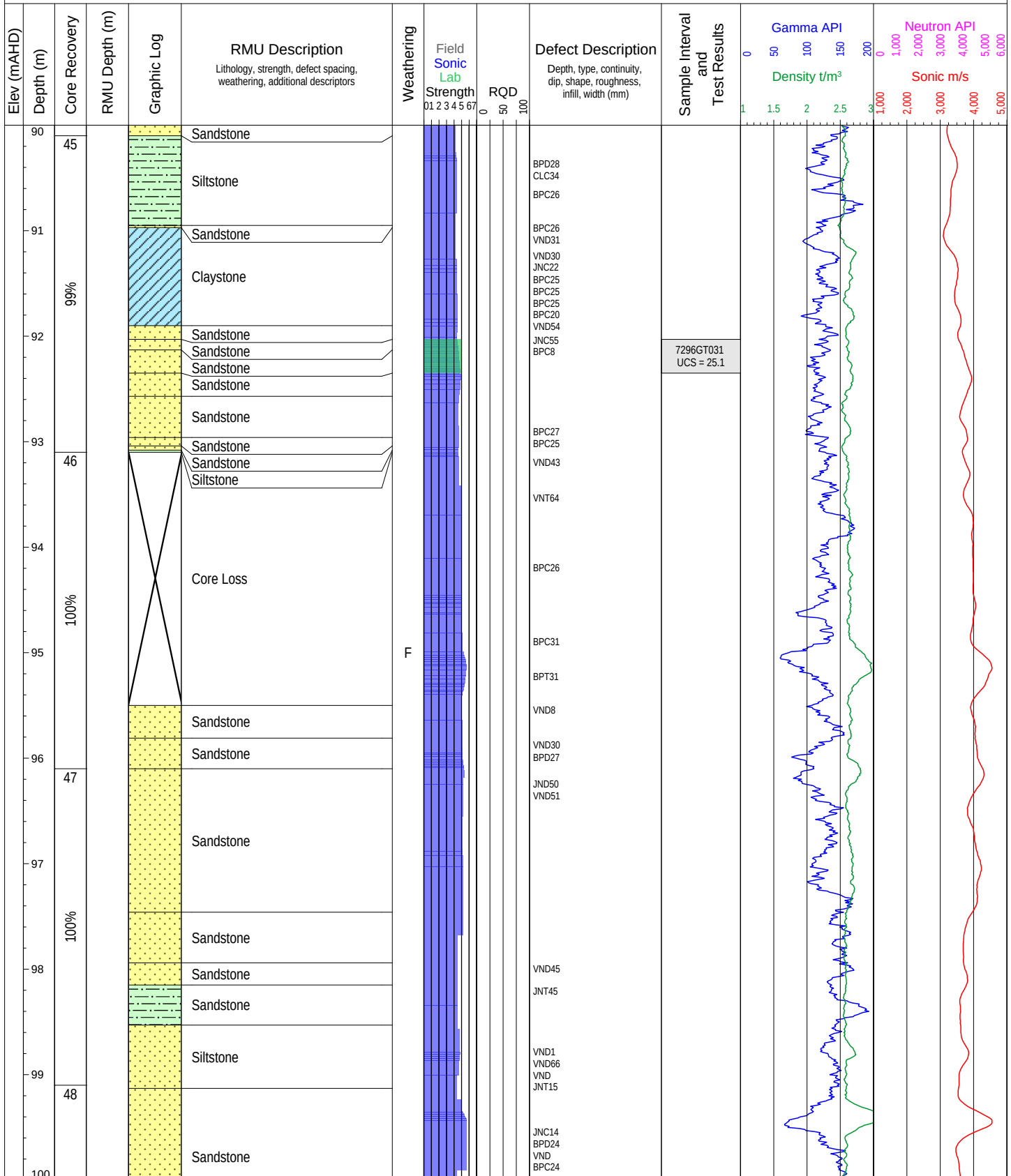


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 10 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



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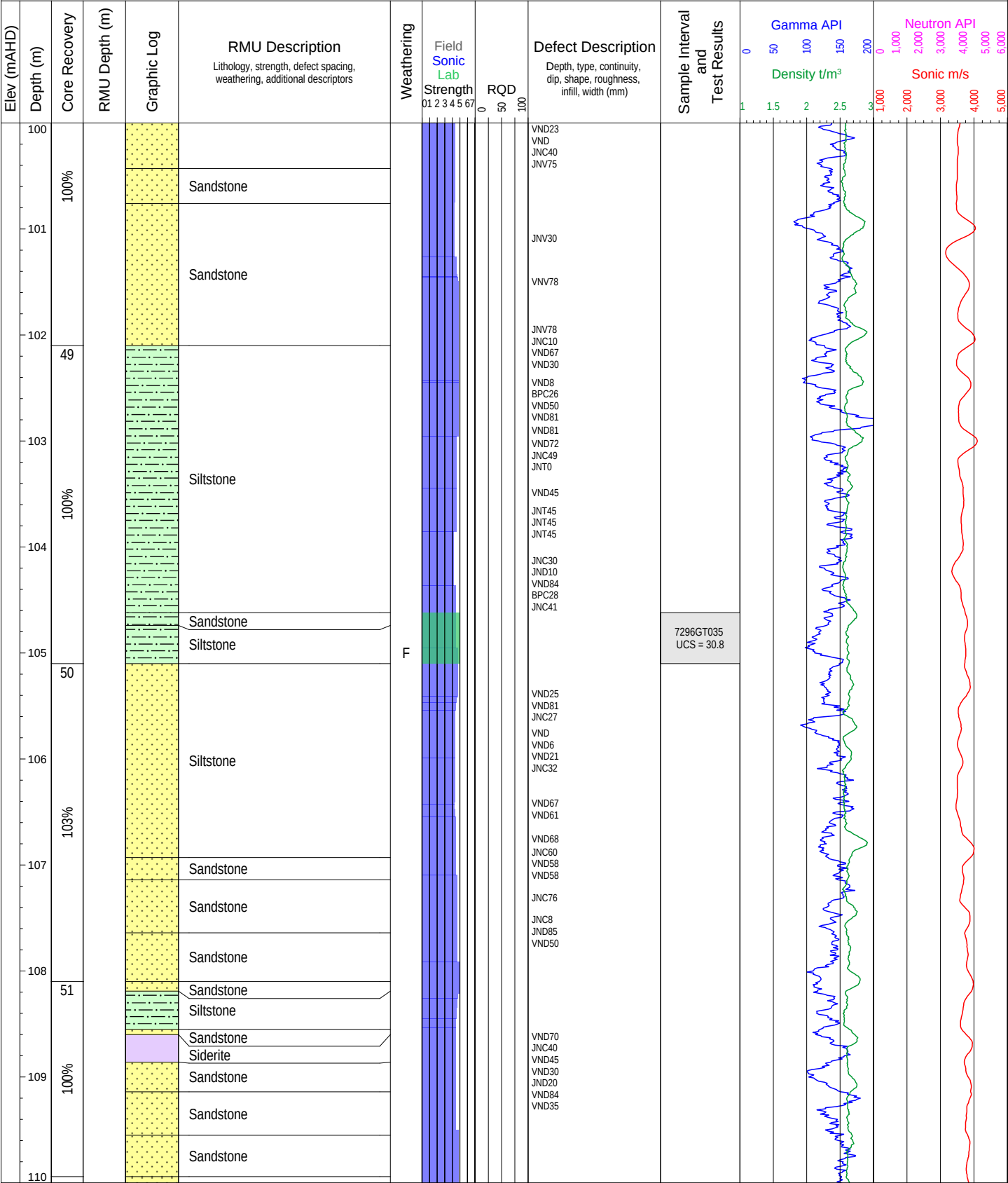


GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 11 of 20

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731062.89  | DRILLER:   | Hodge        | START:   | 43687        |
| PROJECT:    | Dingo West  | NORTHING: | 7382087.34 | DRILL RIG: | 6_U10        | FINISH:  | 43704        |
| LOCATION:   | Bowen Basin | ELEV:     | 129.2      | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 51           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 191          | GEOPHYS: | Weatherfords |



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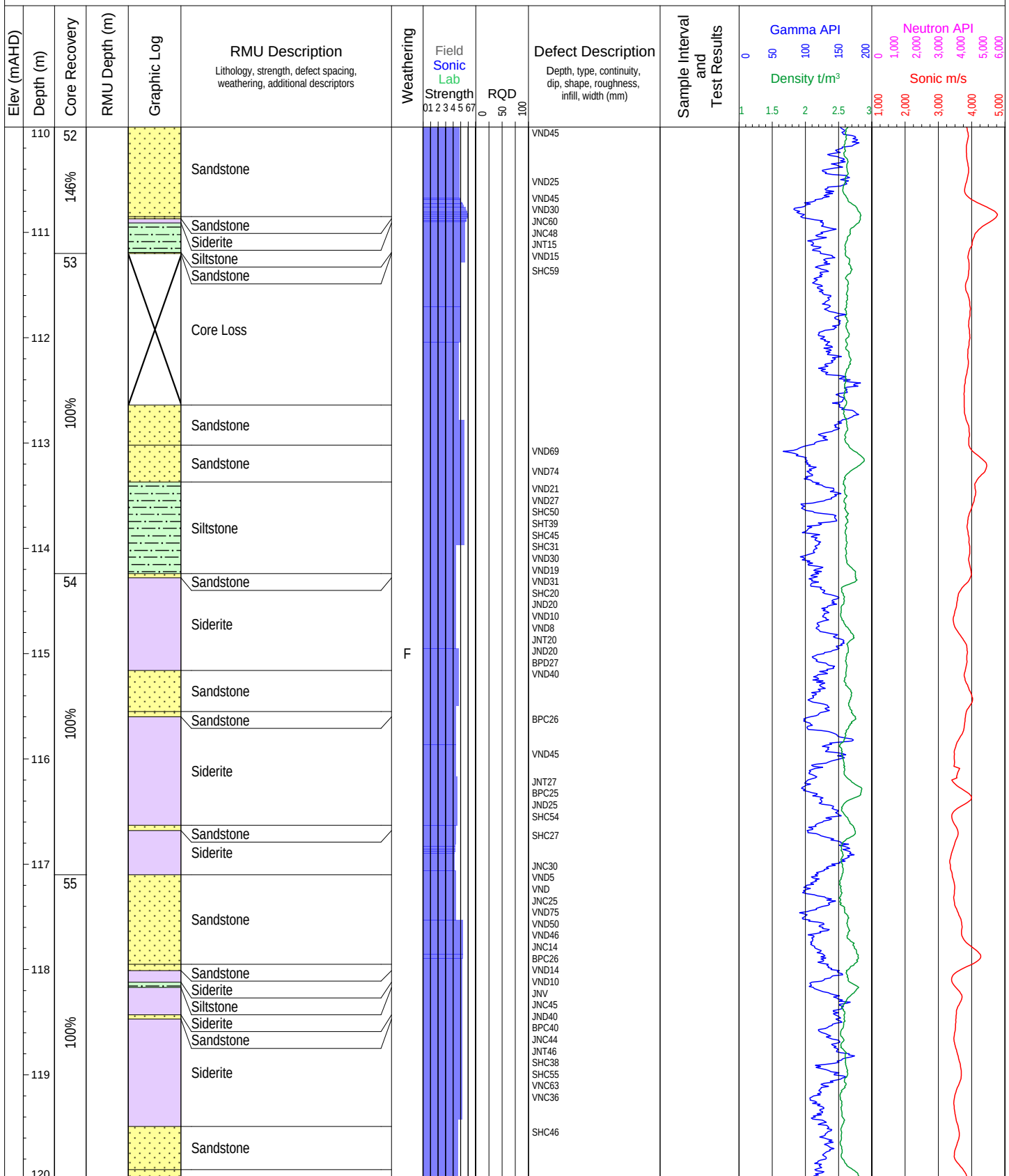


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 12 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



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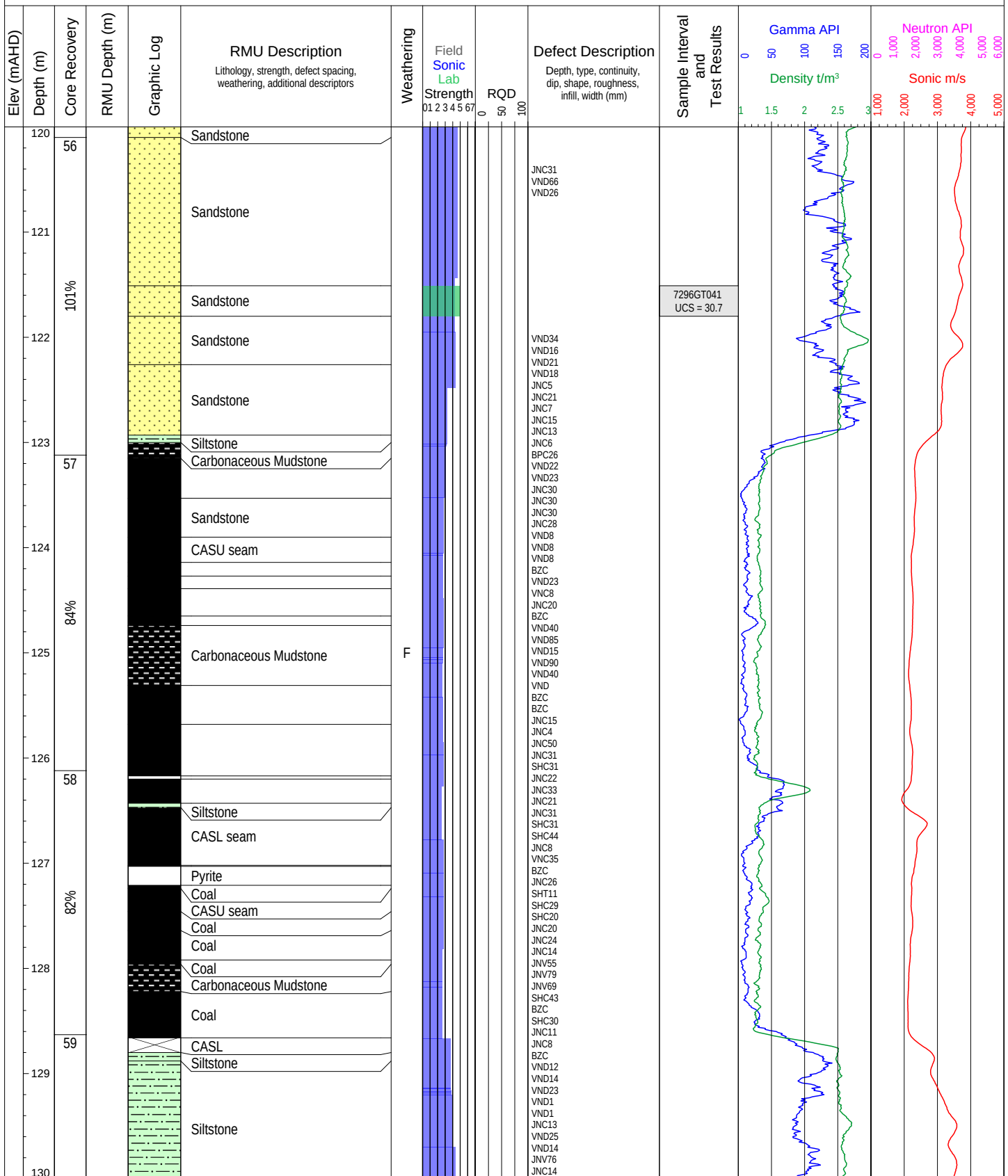


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 13 of 20

CLIENT: JT BOYD EASTING: 731062.89 DRILLER: Hodge START: 43687  
PROJECT: Dingo West NORTHING: 7382087.34 DRILL RIG: 6\_U10 FINISH: 43704  
LOCATION: Bowen Basin ELEV: 129.2 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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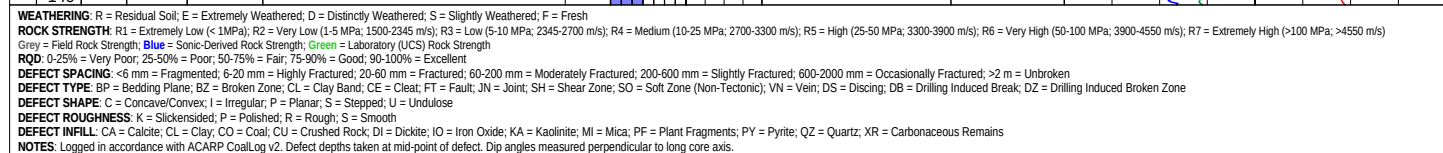
**START:** 43687

**FINISH:** 43704

**GEOLOGY:** John Irvine

**GEOTECH:**

**GEOPHYS:** Weatherfords







# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 15 of 20

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TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 191 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors                                                                                                                                                                                                         | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100                                                                                        | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm)              | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 140         |           | 100%          |               |             | Siltstone<br>Carbonaceous Mudstone<br>Siltstone<br>Carbonaceous Mudstone<br>PLU1 seam<br>Coal<br>Siltstone<br>Coal<br>Coal<br>Coal<br>Lost Coal<br>Coal<br>Siltstone<br>Carbonaceous Mudstone<br>Carbonaceous Mudstone<br>Siltstone<br>Carbonaceous Mudstone<br>Siltstone<br>Carbonaceous Mudstone |            |                                                    | BPC25<br>VND9<br>VND16<br>VND62<br>VND58<br>JNC10<br>JNC10<br>JNC10<br>BZC<br>VND24<br>SHC30<br>BZC    |                                                                                                       |                                  |                                                                            |                                                                                              |
| 141         |           | 65            |               |             | Coal<br>Coal<br>Coal<br>Coal<br>Lost Coal<br>Coal<br>Coal<br>Siltstone<br>Carbonaceous Mudstone<br>Carbonaceous Mudstone<br>Siltstone<br>Carbonaceous Mudstone                                                                                                                                     |            |                                                    | SHC26<br>BPC24<br>VND25<br>SHC26<br>SHC28<br>VND36<br>JNC35<br>JNV80<br>VND79<br>VND37<br>VND41<br>VND |                                                                                                       |                                  |                                                                            |                                                                                              |
| 142         |           |               | 91%           |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | JND11<br>SHC24<br>VND25                                                                               |                                  |                                                                            |                                                                                              |
| 143         |           |               |               |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | VND30<br>VND5                                                                                         |                                  |                                                                            |                                                                                              |
| 144         |           | 66            |               |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | VND31<br>VND14<br>VND27<br>JNC37<br>VND85<br>VND82<br>VND24<br>VND34<br>JNC5<br>VND5<br>VND45<br>VND4 |                                  |                                                                            |                                                                                              |
| 145         |           |               | 99%           |             | Siltstone                                                                                                                                                                                                                                                                                          | F          |                                                    |                                                                                                        | VND4<br>BPC17<br>SHC44<br>VNC44<br>VND85                                                              | 7296GT048<br>UCS = 51.6          |                                                                            |                                                                                              |
| 146         |           |               |               |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | VND5<br>BPC32<br>VND1                                                                                 |                                  |                                                                            |                                                                                              |
| 147         |           | 67            |               |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | VND11<br>VND5<br>JNT16<br>VND77<br>JNC32<br>VNC49<br>CLC15                                            |                                  |                                                                            |                                                                                              |
| 148         |           |               | 100%          |             | Siltstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | VNC21                                                                                                 |                                  |                                                                            |                                                                                              |
| 149         |           |               |               |             | Sandstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        | BPC21                                                                                                 |                                  |                                                                            |                                                                                              |
| 150         |           |               |               |             | Sandstone                                                                                                                                                                                                                                                                                          |            |                                                    |                                                                                                        |                                                                                                       |                                  |                                                                            |                                                                                              |

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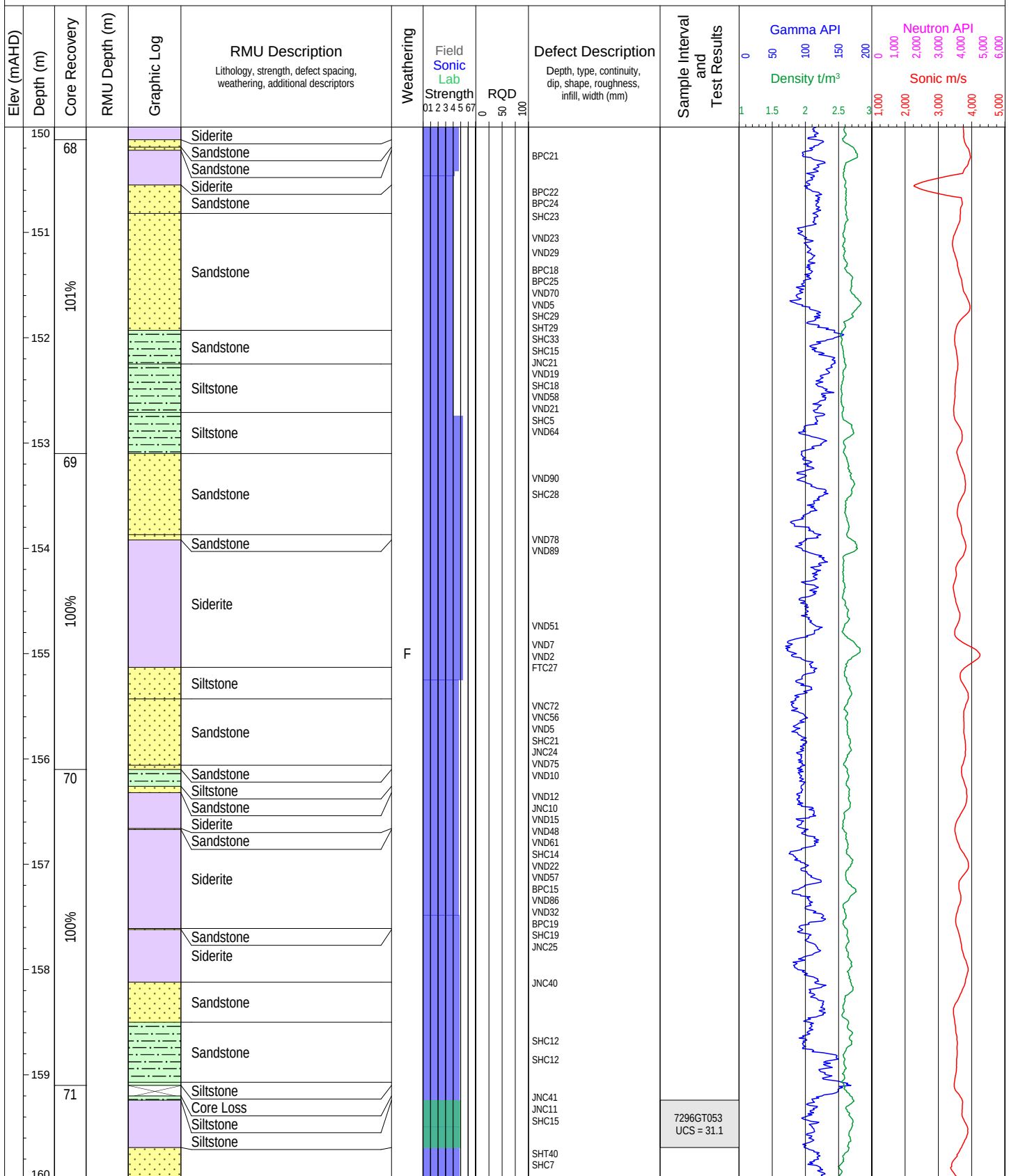


# GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 16 of 20

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TENEMENT: EPC881 INC/AZI: -90/0 CASING: 51 GEOTECH:  
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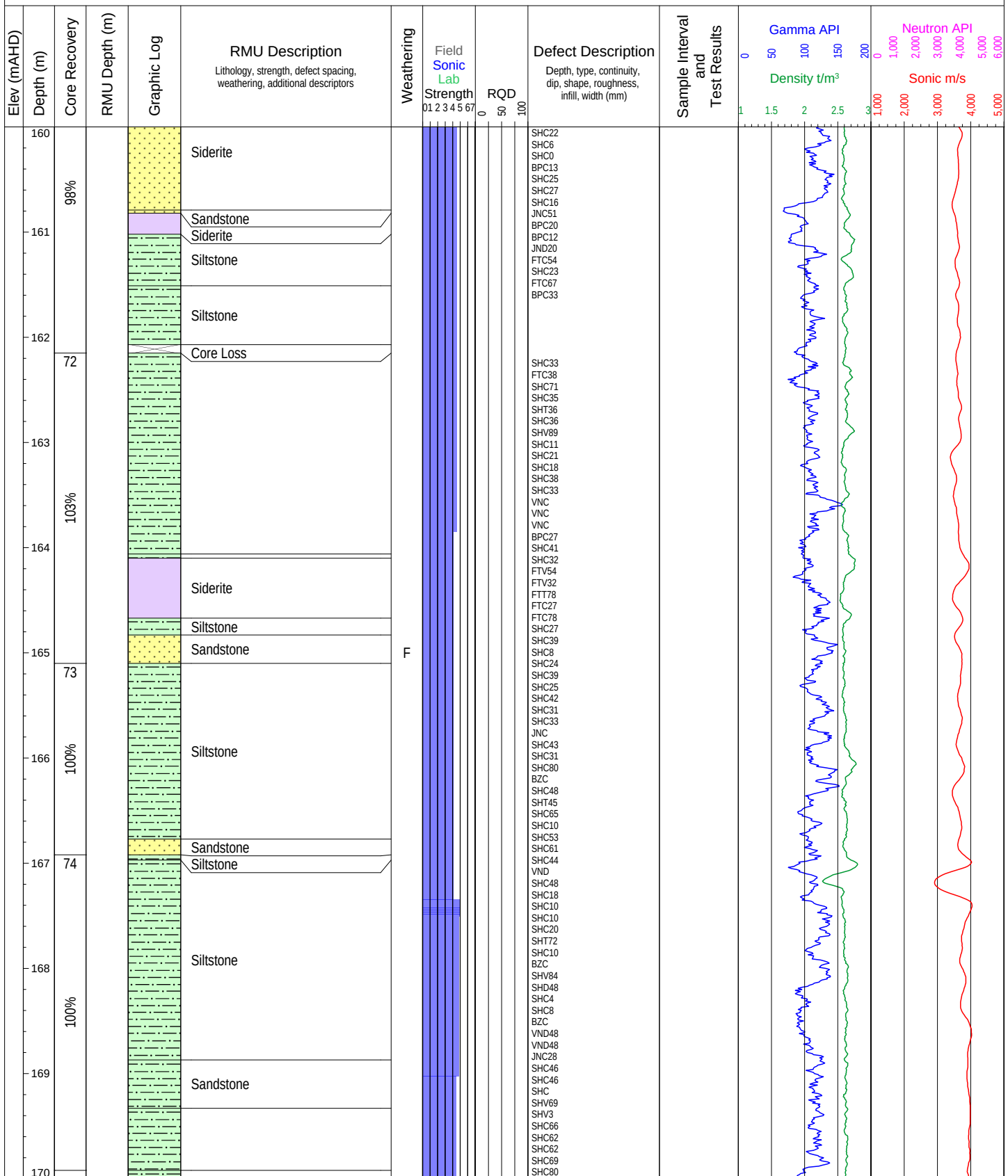


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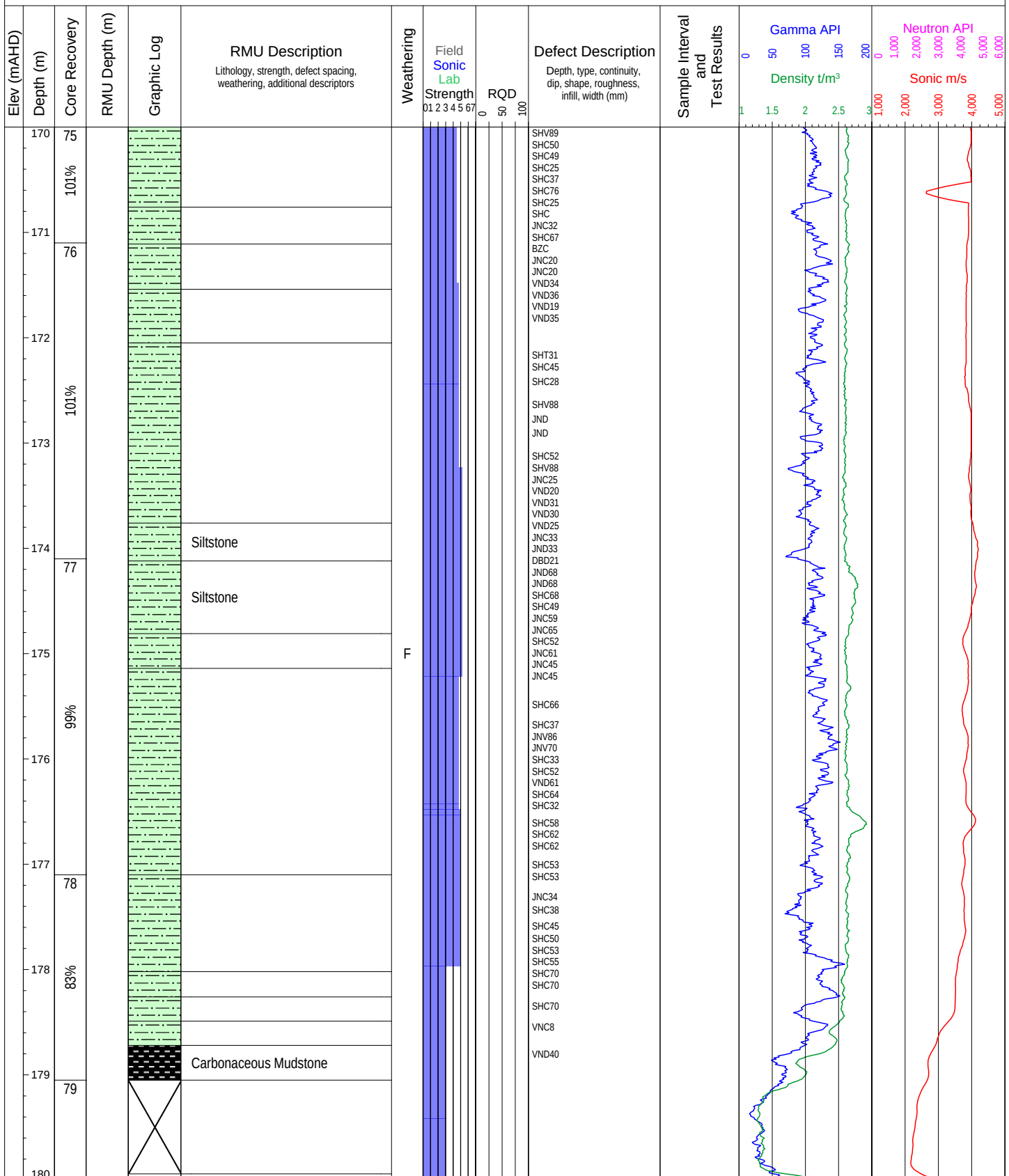


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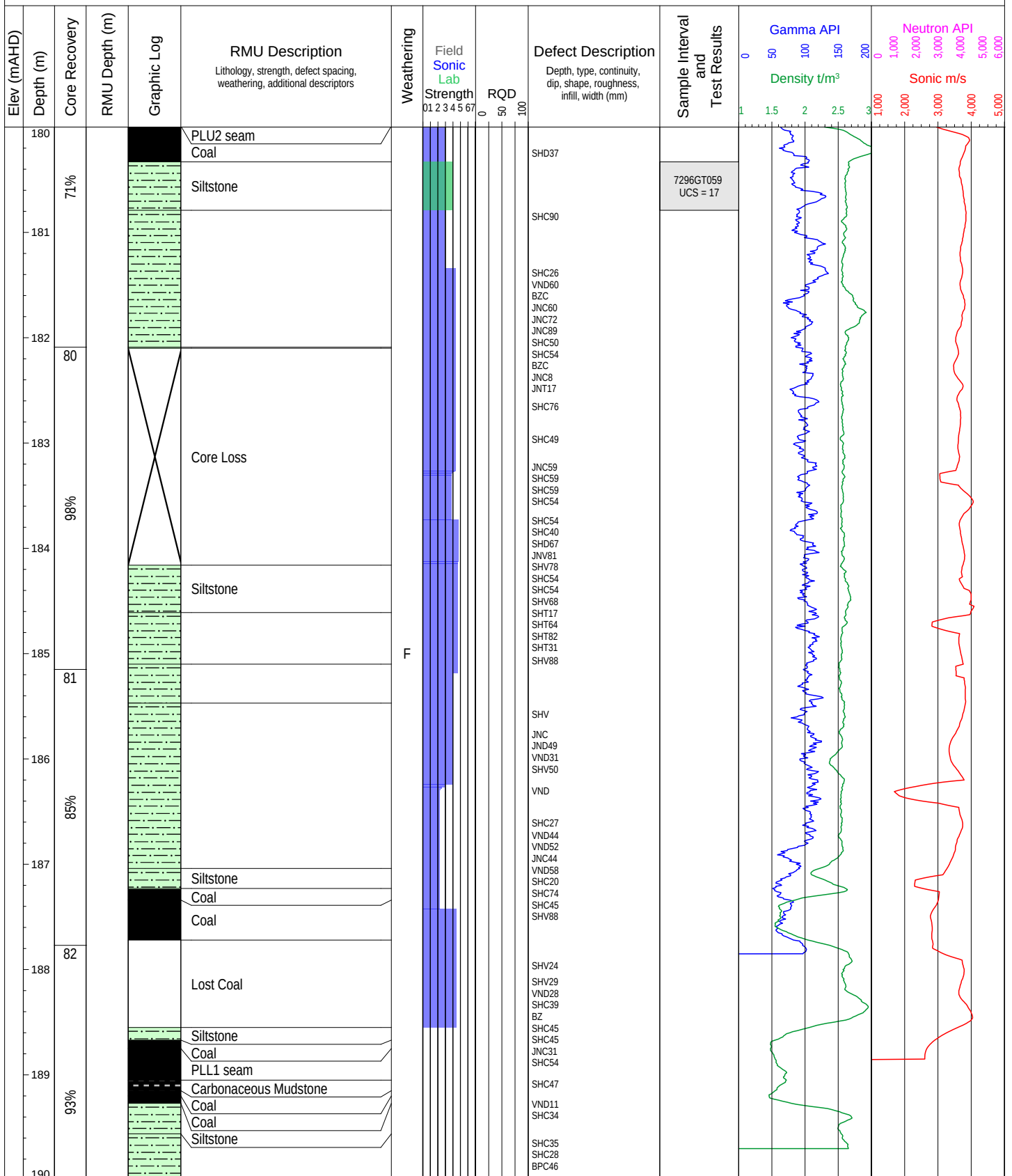


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GEOTECHNICAL LOG

HOLE: DW7296GT

PAGE: 20 of 20

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|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731062.89  | DRILLER:   | Hodge        | START:   | 43687        |
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|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 190         |           |               |               |             | Siltstone                                                                                  | F          |                                                    |                 | SHC49                                                                                    |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNV85                                                                                    |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | SOC                                                                                      |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNC5                                                                                     |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNC35                                                                                    |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 | JNC25                                                                                    |                                  |                                                                |                                                                                                    |
| 191         |           | -%            |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |

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**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoaLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



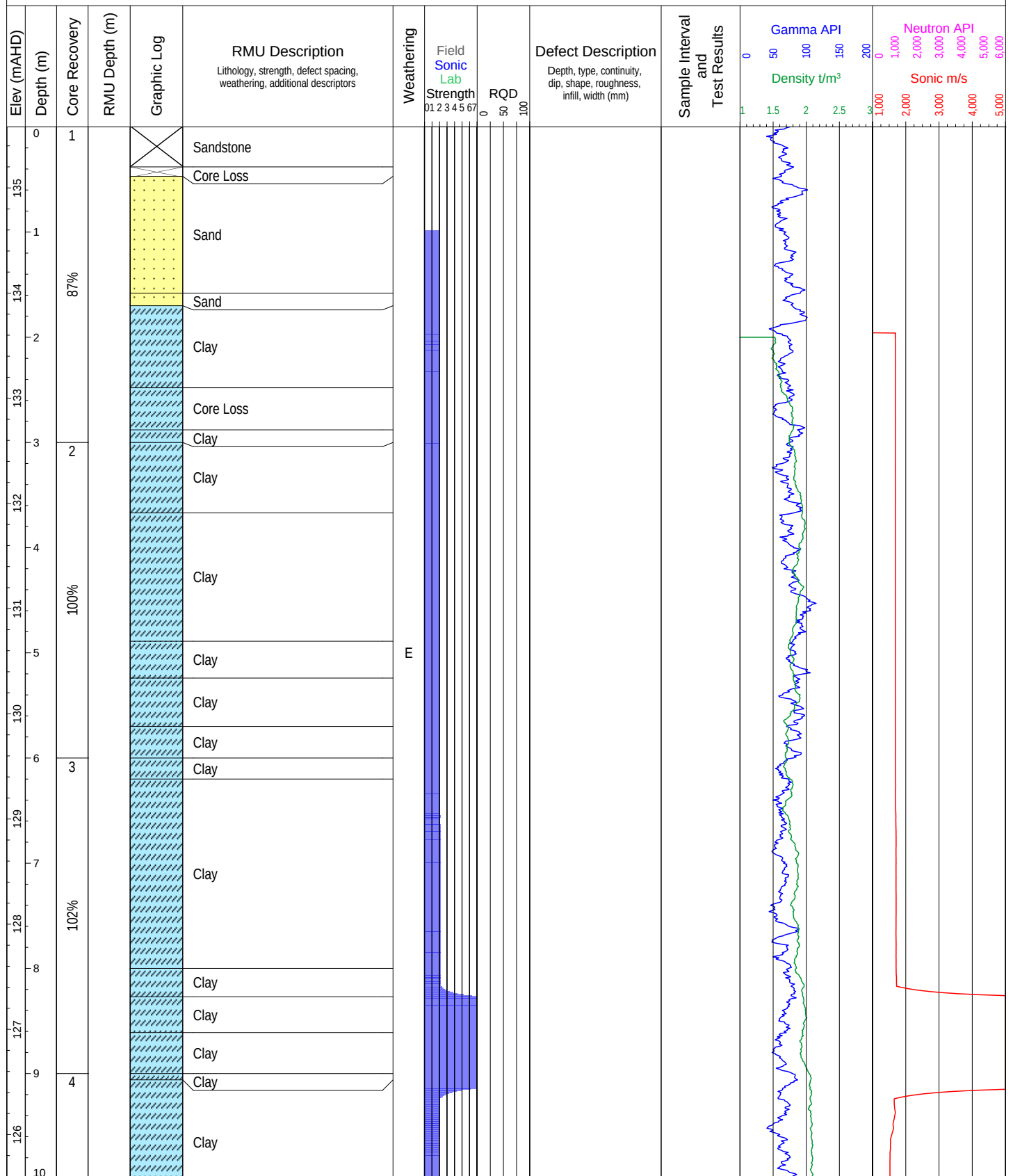


# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 1 of 14

CLIENT: JT BOYD EASTING: 730919.58 DRILLER: Hodge START: 43704  
PROJECT: Dingo West NORTHING: 7382299.68 DRILL RIG: 6\_U10 FINISH: 43739  
LOCATION: Bowen Basin ELEV: 135.58 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 60 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 133.3 GEOPHYS: Weatherfords



WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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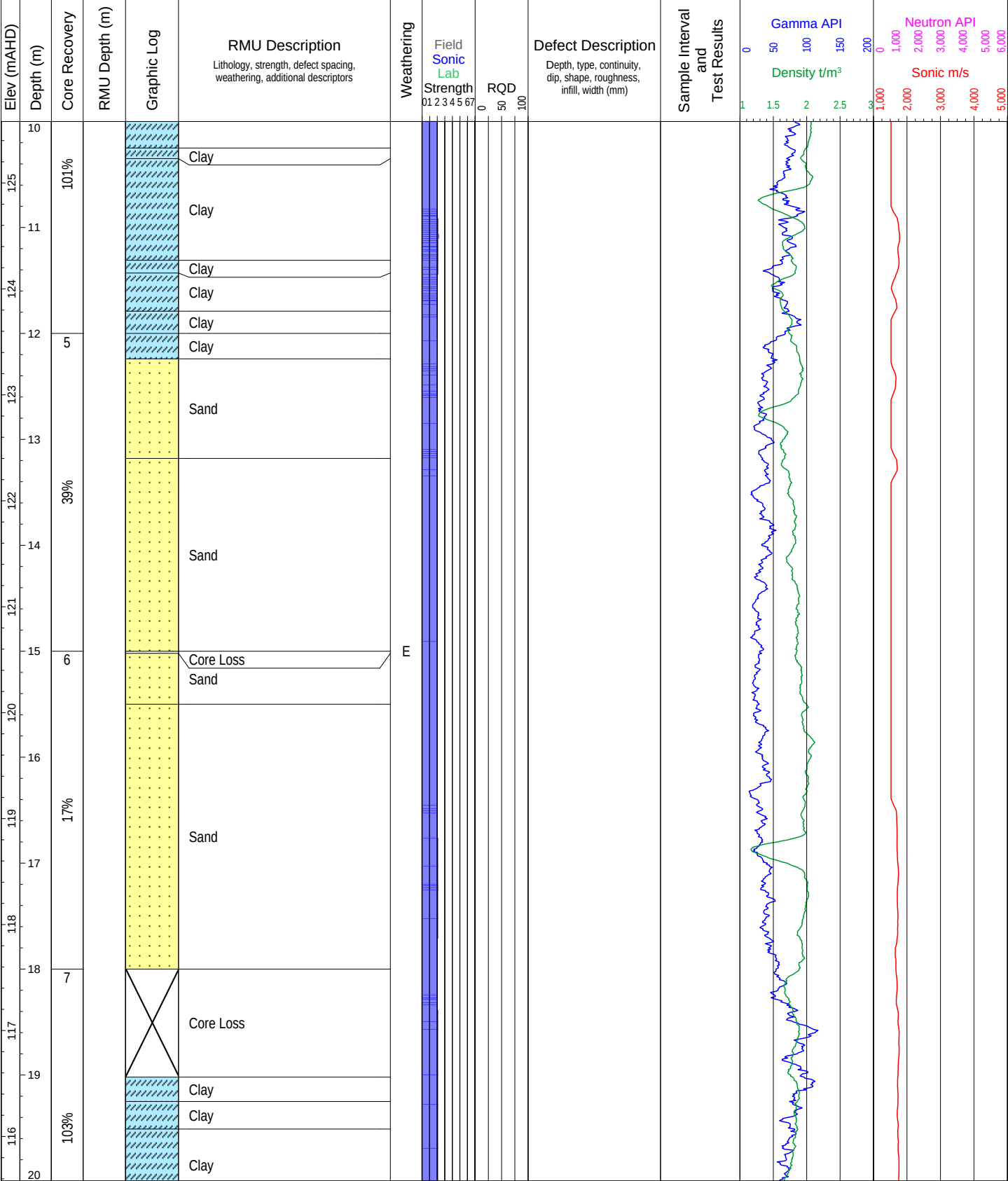


GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 2 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |



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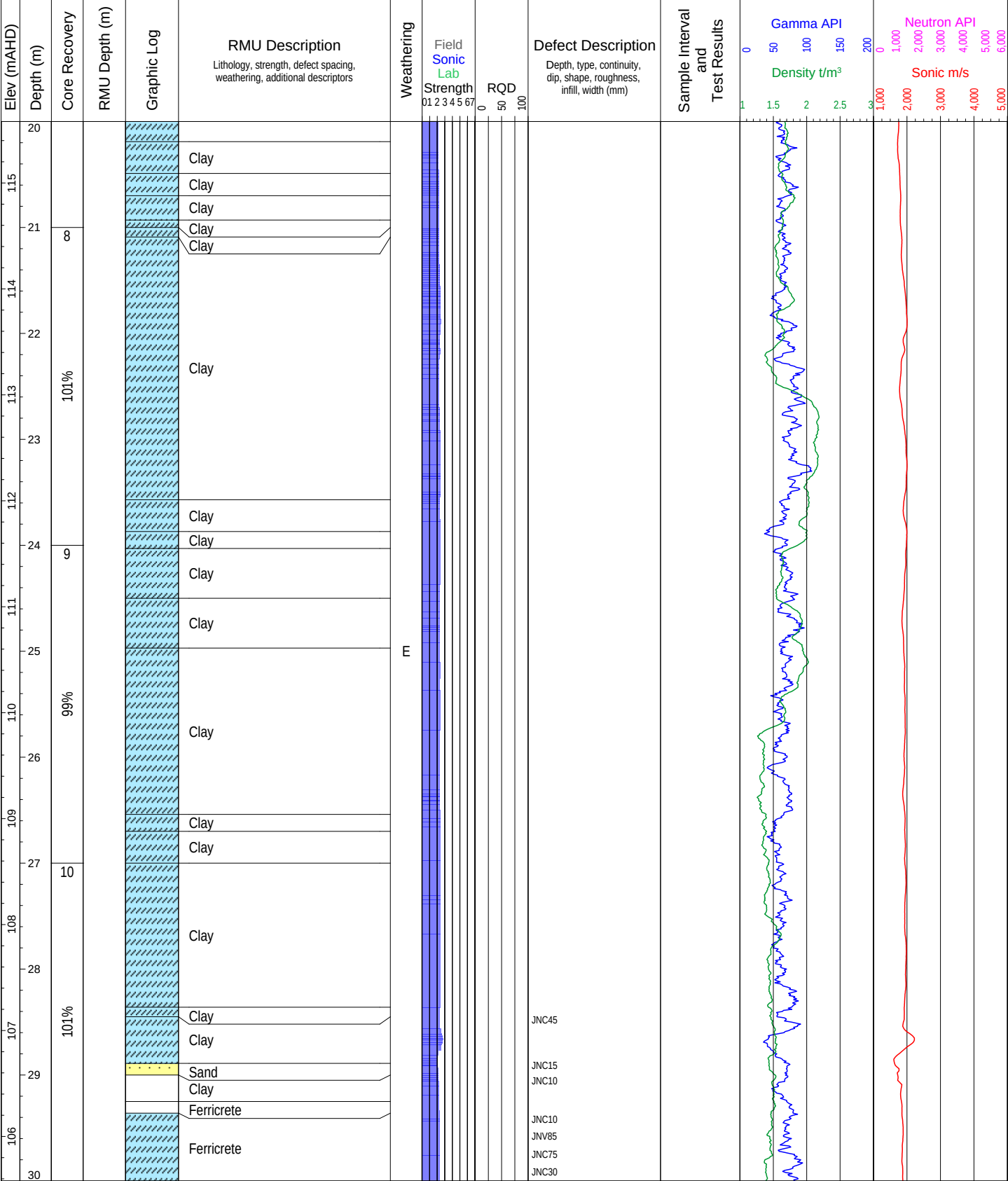


# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 3 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |



**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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**NOTES:** Logged in accordance with ACARP CoalLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 4 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 30          |           | 11            |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 105         |           |               |               |             | Clay                                                                                       |            |                                                    |                 | JNC50<br>JNV85                                                                           |                                  |                                                                            |                                                                                              |
| 31          |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 104         |           | 99%           |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 32          |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 103         |           |               |               |             | Sand                                                                                       |            |                                                    |                 | JNV85                                                                                    |                                  |                                                                            |                                                                                              |
| 33          |           | 12            |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 102         |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 34          |           |               |               |             | Sand                                                                                       |            |                                                    |                 | SOC<br>JNC20                                                                             |                                  |                                                                            |                                                                                              |
| 101         |           | 100%          |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 35          |           |               |               |             |                                                                                            | E          |                                                    |                 | JNC50                                                                                    |                                  |                                                                            |                                                                                              |
| 100         |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 36          |           | 13            |               |             | Sand                                                                                       |            |                                                    |                 | JNC40                                                                                    |                                  |                                                                            |                                                                                              |
| 99          |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 37          |           |               |               |             | Sand                                                                                       |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 98          |           | 100%          |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 38          |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 97          |           |               |               |             | Clay                                                                                       |            |                                                    |                 | JNC50<br>JNC40<br>SOC                                                                    |                                  |                                                                            |                                                                                              |
| 39          |           | 14            |               |             | Sand<br>Sand                                                                               |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |
| 96          |           |               |               |             | Clay                                                                                       |            |                                                    |                 | JNC10                                                                                    |                                  |                                                                            |                                                                                              |
| 40          |           |               |               |             | Ferricrete                                                                                 |            |                                                    |                 |                                                                                          |                                  |                                                                            |                                                                                              |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 5 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 40          |           | 100%          |               |             | Clay                                                                                          |            |                                                    |                 | JNC0<br>JNC10<br>JNC10<br>JNC5                                                                 |                                        |                                                                            |                                                                                                    |
| 95          |           |               |               |             | Ferricrete                                                                                    |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 41          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
|             |           |               |               |             | Ferricrete                                                                                    |            |                                                    |                 | JNC15                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |             | Sand                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 94          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 42          |           | 15%           |               |             | Clay                                                                                          |            |                                                    |                 | JNC60<br>JNC85                                                                                 |                                        |                                                                            |                                                                                                    |
| 93          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 43          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 92          |           | 97%           |               |             | Clay                                                                                          |            |                                                    |                 | JNC5<br>JNC5<br>JNC5                                                                           |                                        |                                                                            |                                                                                                    |
| 44          |           |               |               |             | Clay                                                                                          |            |                                                    |                 | JNC5<br>SHC26<br>SOC30<br>JND5                                                                 |                                        |                                                                            |                                                                                                    |
| 91          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 45          |           | 16%           |               |             | Clay                                                                                          | E          |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 90          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 46          |           |               |               |             | Clay                                                                                          |            |                                                    |                 | JND5                                                                                           |                                        |                                                                            |                                                                                                    |
| 89          |           | 68%           |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 47          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 88          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 48          |           | 17%           |               |             | Clay                                                                                          |            |                                                    |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                                    |
| 87          |           |               |               |             | Sand                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 49          |           | 96%           |               |             | Clay                                                                                          |            |                                                    |                 | JNC75                                                                                          |                                        |                                                                            |                                                                                                    |
| 86          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 50          |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |

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**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 6 of 14

**CLIENT:** JT BOYD **EASTING:** 730919.58 **DRILLER:** Hodge **START:** 43704  
**PROJECT:** Dingo West **NORTHING:** 7382299.68 **DRILL RIG:** 6\_U10 **FINISH:** 43739  
**LOCATION:** Bowen Basin **ELEV:** 135.58 **CORE SIZE:** HQ Full Core **GEOLOGY:** John Irvine  
**TENEMENT:** EPC881 **INC/AZI:** -90/0 **CASING:** 60 **GEOTECH:**  
**PROJECT NO:** DW\_2020 **DATUM:** GDA94 Z55 **DEPTH:** 133.3 **GEOPHYS:** Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 50          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                |                                                                                              |
| 85          |           |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC40                                                                                          |                                        |                                                                |                                                                                              |
| 51          |           | 18            |               |             | Clay                                                                                          |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC8                                                                                           |                                        |                                                                |                                                                                              |
| 84          |           |               |               |             | Core Loss                                                                                     | E          |                                                     |                 | JNV20                                                                                          |                                        |                                                                |                                                                                              |
| 52          |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BPC10                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND30                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC35                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BPC5                                                                                           |                                        |                                                                |                                                                                              |
| 83          |           | 103%          |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC40                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                     |                 |                                                                                                |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC25                                                                                          |                                        |                                                                |                                                                                              |
| 53          |           |               |               |             | Claystone                                                                                     |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                |                                                                                              |
| 82          |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                |                                                                                              |
| 54          |           | 19            |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     | D          |                                                     |                 | JNC20                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
| 81          |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC20                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC40                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Claystone                                                                                     |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
| 55          |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND                                                                                            |                                        |                                                                |                                                                                              |
| 80          |           | 100%          |               |             | Siltstone                                                                                     |            |                                                     |                 | BPC15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                |                                                                                              |
| 56          |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC35                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC15                                                                                          |                                        |                                                                |                                                                                              |
| 79          |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNT20                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                |                                                                                              |
| 57          |           | 20            |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BPC10                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                |                                                                                              |
| 78          |           |               |               |             |                                                                                               |            |                                                     |                 | SHT15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                     |                 | SHT15                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND25                                                                                          |                                        |                                                                |                                                                                              |
| 58          |           |               |               |             |                                                                                               | S          |                                                     |                 | JNC20                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Claystone                                                                                     |            |                                                     |                 | JNC                                                                                            |                                        |                                                                |                                                                                              |
| 77          |           | 100%          |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC                                                                                            |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC10                                                                                          |                                        |                                                                |                                                                                              |
| 59          |           |               |               |             |                                                                                               |            |                                                     |                 | SHC10                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC30                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC30                                                                                          |                                        |                                                                |                                                                                              |
| 76          |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SOC                                                                                            |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNV80                                                                                          |                                        |                                                                |                                                                                              |
| 60          |           |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh

ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)

Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength

RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent

DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken

DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone

DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose

DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth

DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains

NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 7 of 14

CLIENT: JT BOYD EASTING: 730919.58 DRILLER: Hodge  
PROJECT: Dingo West NORTHING: 7382299.68 DRILL RIG: 6\_U10  
LOCATION: Bowen Basin ELEV: 135.58 CORE SIZE: HQ Full Core  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 60  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 133.3

START: 43704  
FINISH: 43739  
GEOLOGY: John Irvine  
GEOTECH:  
GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 60          | 21        |               |               |             | Sandstone                                                                                     |            |                                                    |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JND35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Claystone                                                                                     | S          |                                                    |                 | BPC40                                                                                          |                                        |                                                                            |                                                                                              |
| 75          | 121%      |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
| 61          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JND30                                                                                          |                                        |                                                                            |                                                                                              |
| 74          | 22        |               |               |             | Siltstone                                                                                     |            |                                                    |                 | VND25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 62          |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VND35                                                                                          |                                        |                                                                            |                                                                                              |
|             | 100%      |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VND25                                                                                          |                                        |                                                                            |                                                                                              |
| 73          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JND                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | VND45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNV80                                                                                          |                                        |                                                                            |                                                                                              |
| 63          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
| 72          | 99%       |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VND50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VND10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | VND0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JND5                                                                                           |                                        |                                                                            |                                                                                              |
| 64          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JND0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC18                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VNC5                                                                                           |                                        |                                                                            |                                                                                              |
| 71          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JND40                                                                                          |                                        |                                                                            |                                                                                              |
| 65          |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNT60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JND45                                                                                          |                                        |                                                                            |                                                                                              |
| 70          | 103%      |               |               |             | Sandstone                                                                                     | F          |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JND40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHT50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHT                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
| 69          |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
| 67          |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
| 68          |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC85                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC75                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | JND20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                    |                 | VND25                                                                                          |                                        |                                                                            |                                                                                              |
| 69          |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | SHC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
| 70          |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC35                                                                                          |                                        |                                                                            |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 8 of 14

CLIENT: JT BOYD EASTING: 730919.58 DRILLER: Hodge  
PROJECT: Dingo West NORTHING: 7382299.68 DRILL RIG: 6\_U10  
LOCATION: Bowen Basin ELEV: 135.58 CORE SIZE: HQ Full Core  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 60  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 133.3

GEOLOGY: John Irvine  
GEOTECH:  
GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 70          |           | 68%           |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                      |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND65                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC15                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC55                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNT25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNV80                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHT65                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND85                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND0                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | FTC55                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC15                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | CL                                                                                             |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | CL                                                                                             |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JND70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | VND75                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JND45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | FTC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SOC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC20                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC75                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC70                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHT45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7297GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 80          |           |               |               |             | Coal                                                                                          |            |                                                    |                 | SHC45                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Coal                                                                                          |            |                                                    |                 | SHC70                                                                                          |                                        |                                                                |                                                                                                    |
| 55          |           | 31            |               |             | Coal                                                                                          |            |                                                    |                 | JND20                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Coal                                                                                          |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
| 81          |           |               | 80%           |             | Coal                                                                                          |            |                                                    |                 | SHC40                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Coal                                                                                          |            |                                                    |                 | JNC50                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHC20                                                                                          |                                        |                                                                |                                                                                                    |
| 54          |           |               |               |             | CASL seam                                                                                     |            |                                                    |                 | JNC85                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC75                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC20                                                                                          |                                        |                                                                |                                                                                                    |
| 82          |           | 32            |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
| 53          |           |               |               |             |                                                                                               |            |                                                    |                 | SHC45                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
| 83          |           |               | 82%           |             |                                                                                               |            |                                                    |                 | SHC75                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC15                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC35                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC55                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC25                                                                                          |                                        |                                                                |                                                                                                    |
| 52          |           |               |               |             |                                                                                               |            |                                                    |                 | SHC50                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC40                                                                                          |                                        |                                                                |                                                                                                    |
| 84          |           |               |               |             | Coal                                                                                          |            |                                                    |                 | SHC55                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC45                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNC55                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND10                                                                                          |                                        |                                                                |                                                                                                    |
| 51          |           | 33            |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC15                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC70                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | CL                                                                                             |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC70                                                                                          |                                        |                                                                |                                                                                                    |
| 85          |           |               | 100%          |             |                                                                                               |            |                                                    |                 | JND70                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JND55                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC78                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND30                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JND50                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND50                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND30                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHT45                                                                                          |                                        |                                                                |                                                                                                    |
| 86          |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | VND38                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC52                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNT64                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNC32                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC66                                                                                          |                                        |                                                                |                                                                                                    |
|             |           | 34            |               |             | Siltstone                                                                                     |            |                                                    |                 | JND68                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNT69                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC63                                                                                          |                                        |                                                                |                                                                                                    |
| 87          |           |               |               |             |                                                                                               |            |                                                    |                 | VND83                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND67                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND69                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | SHC65                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC68                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JND40                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND5                                                                                           |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND83                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | VND89                                                                                          |                                        |                                                                |                                                                                                    |
| 88          |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | VND85                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHD40                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC45                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHT7                                                                                           |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC70                                                                                          |                                        |                                                                |                                                                                                    |
| 89          |           |               |               |             |                                                                                               |            |                                                    |                 | BZC                                                                                            |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC66                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC60                                                                                          |                                        |                                                                |                                                                                                    |
|             |           | 35            |               |             |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHT10                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC71                                                                                          |                                        |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC60                                                                                          |                                        |                                                                |                                                                                                    |
| 90          |           |               |               |             |                                                                                               |            |                                                    |                 | JNC80                                                                                          |                                        |                                                                |                                                                                                    |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Broken Zone; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 10 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm)                                                                                                                                                                                                                                                                                                                                                                                                | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 90          |           | 98%           |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                  |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                  |                                                                            |                                                                                              |
| 91          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | VND41<br>JND20<br>BPC30<br>JND76                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                  |                                                                            |                                                                                              |
| 92          |           |               |               |             |                                                                                            |            |                                                     |                 | SHC77<br>SHC77<br>JNC78<br>SHC46<br>SHC26                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  |                                                                            |                                                                                              |
|             |           | 36            |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC25<br>JNC44<br>JNC43<br>BZC<br>JND65<br>SHV84<br>BZC<br>BZC<br>SHC62<br>JNC15<br>SHC45<br>SHC18<br>JNC30                                                                                                                                                                                                                                                                                                                                                                             |                                  |                                                                            |                                                                                              |
| 93          |           | 100%          |               |             | Core Loss                                                                                  |            |                                                     |                 | JNC12<br>JNC20<br>JNC31<br>JNC42<br>SHT65<br>SHT50<br>BZC<br>SHT72<br>SHC3<br>SHC30<br>SHC56<br>SHC56<br>SHC56<br>SHC6<br>JND27<br>VND5<br>SOD<br>JNC31<br>SHC71<br>JNC71<br>JNC18<br>SHC41<br>SHC36<br>JNC36<br>SHT61<br>SHC20<br>SHC16<br>SHD84<br>SOC<br>SHC40<br>SHC28<br>SHC60<br>VND89<br>VND63<br>SHC58<br>JNT63<br>JND55<br>JND26<br>SHC38<br>SHC48<br>SHC32<br>SHT43<br>JND60<br>SHC34<br>SHT45<br>SHC59<br>JNC22<br>VND50<br>JND15<br>JNC30<br>SHC65<br>SHC30<br>VND62<br>BZC |                                  |                                                                            |                                                                                              |
| 94          |           |               |               |             |                                                                                            |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 95          |           | 37            |               |             | Siltstone<br>Siderite<br>Siltstone                                                         | F          |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 96          |           | 95%           |               |             |                                                                                            |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 97          |           | 38            |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                  |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 98          |           | 95%           |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                   |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 99          |           | 39            |               |             | Siltstone<br>Carbonaceous Mudstone<br>PU seam                                              |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Carbonaceous Mudstone                                                                      |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
|             |           | 93%           |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
|             |           |               |               |             | Siderite                                                                                   |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |
| 100         |           |               |               |             |                                                                                            |            |                                                     |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                            |                                                                                              |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
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Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
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**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
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**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 11 of 14

CLIENT: JT BOYD EASTING: 730919.58 DRILLER: Hodge START: 43704  
PROJECT: Dingo West NORTHING: 7382299.68 DRILL RIG: 6\_U10 FINISH: 43739  
LOCATION: Bowen Basin ELEV: 135.58 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 60 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 133.3 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 100         | 40        |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHV85                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHT60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                     |            |                                                     |                 | SHC66                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC66                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | PUR seam                                                                                      |            |                                                     |                 | SOC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC28                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC6                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC6                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | JNC27                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC26                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC27                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC21                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC21                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC48                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHC27                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | SHV78                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | VND63                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                     |                 | VND63                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Core Loss                                                                                     |            |                                                     |                 | SHT64                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Carbonaceous Mudstone                                                                         |            |                                                     |                 | SHC6                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC64                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC66                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC56                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC3                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VND35                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHT45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC51                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC52                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC48                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC55                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC3                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC73                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VND30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC59                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC53                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC66                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC58                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC60                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC12                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHV85                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC12                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC49                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC49                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC52                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC61                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VND12                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC41                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHT50                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC15                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC15                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JNC18                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC                                                                                            |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VNC3                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC5                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | BZC40                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC37                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC24                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VNC65                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC31                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JND25                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | JND32                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC32                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | VND26                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC29                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC34                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHC46                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                     |                 | SHT50                                                                                          |                                        |                                                                            |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



**HOLE: DW7297GT**

**CLIENT:** JT BOYD

**PROJECT:** Dingo West

**EASTING:** 730919.58  
**NORTHING:** 7382299.68

**DRILLER:** Hodge  
**DRILL RIG:** 6\_U10  
**CORE SIZE:** HQ Full Core

**START:** 43704  
**FINISH:** 43739  
**GEOLOGY:** John Irvine

**TENEMENT:** EPC881  
**PROJECT NO:** DW 2020

**INC/AZI:** -90/0

**DATUM:** GDA94 Z55

**CASING:** 60

**DEPTH:** 133.3

**GEOTECH:**

**GEOPHYS:** Weatherfords

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<10 MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
 Grey = Field Rock Strength; **Blue** = Sonar-Derived Rock Strength; **Green** = Laboratory (UCS) Rock Strength  
**QID:** Q25% = Very Poor; 50-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <5 m = Severely Fractured; 5-20 m = Highly Fractured; 20-60 m = Moderately Fractured; 60-200 m = Moderately Fractured; 200-600 m = Slightly Fractured; 600-2000 m = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Dipping; DB = Drilling Induced Broken; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Silkened; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CR = Crystalline Rock; D = Dioxide; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACAPR CoalLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to log core axis.





**HOLE: DW7297GT**

|                    |             |                  |            |                   |              |                 |              |
|--------------------|-------------|------------------|------------|-------------------|--------------|-----------------|--------------|
| <b>CLIENT:</b>     | JT BOYD     | <b>EASTING:</b>  | 730919.58  | <b>DRILLER:</b>   | Hodge        | <b>START:</b>   | 43704        |
| <b>PROJECT:</b>    | Dingo West  | <b>NORTHING:</b> | 7382299.68 | <b>DRILL RIG:</b> | 6_U10        | <b>FINISH:</b>  | 43739        |
| <b>LOCATION:</b>   | Bowen Basin | <b>ELEV:</b>     | 135.58     | <b>CORE SIZE:</b> | HQ Full Core | <b>GEOLOGY:</b> | John Irvine  |
| <b>TENEMENT:</b>   | EPC881      | <b>INC/AZI:</b>  | -90/0      | <b>CASING:</b>    | 60           | <b>GEOTECH:</b> |              |
| <b>PROJECT NO:</b> | DW_2020     | <b>DATUM:</b>    | GDA94 Z55  | <b>DEPTH:</b>     | 133.3        | <b>GEOPHYS:</b> | Weatherfords |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (<1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
**Grout:** Field Rock Strength: **Blue** = Sonar-Derived Rock Strength; **Green** = Laboratory (UCS) Rock Strength  
**ROD:** 05-25% = Very Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**Fracture Spacing:** <8 mm = Fragmented; 8-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Silken/smooth; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dike; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACAPAR CoalLog\_V2. Defect depths marked at mid-point of defect. Dip angles measured perpendicular to long core axis



GEOTECHNICAL LOG

HOLE: DW7297GT

PAGE: 14 of 14

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 730919.58  | DRILLER:   | Hodge        | START:   | 43704        |
| PROJECT:    | Dingo West  | NORTHING: | 7382299.68 | DRILL RIG: | 6_U10        | FINISH:  | 43739        |
| LOCATION:   | Bowen Basin | ELEV:     | 135.58     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 60           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 133.3        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm)                                                                                                                                        | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 130         |           |               |               |             |                                                                                            |            |                                                    |                 | SHC26<br>SHC22<br>SHC22<br>VND5<br>VND36<br>BPC28<br>JNV74<br>VND64<br>SHC67<br>BPC24<br>JNC8<br>BPC28<br>JNC18<br>JNC3<br>JNV80<br>JNV69<br>BPC18<br>BPC13<br>SHC26<br>JND<br>JNC5<br>SHC66<br>JNC35<br>JNC46<br>JNC8<br>JNC15 |                                  |                                                                |                                                                                                    |
| 131         |           | 56            |               | Sandstone   |                                                                                            | F          |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
|             |           |               |               | Siltstone   |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
|             |           |               |               | Siltstone   |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
| 132         |           | 97%           |               | Siltstone   |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
|             |           |               |               | Sandstone   |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
|             |           |               |               | Siderite    |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |
| 133         |           |               |               | Sandstone   |                                                                                            |            |                                                    |                 |                                                                                                                                                                                                                                 |                                  |                                                                |                                                                                                    |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 1 of 11

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|------------------------------------------------------|--------------------------------------------|
| 0           | 0         | 1             |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 130         | 1         | 72%           |               |             | Core Loss                                                                                  |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 129         | 2         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 128         | 3         |               |               |             | Core Loss                                                                                  |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 2             |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 127         | 4         |               |               |             | Sand                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 103%          |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 126         | 5         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Ferricrete                                                                                 | E          |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 125         | 6         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 3             |               |             | Ferricrete                                                                                 |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 124         | 7         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 56%           |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 123         | 8         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 122         | 9         |               |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 121         | 10        | 4             |               |             | Clay                                                                                       |            |                                                    |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP CoalLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 2 of 11

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 10          |           | 0%            |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 120         | 11        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 5             |               |             | Core Loss                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 119         | 12        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 99%           |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 118         | 13        |               |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 6             |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 117         | 14        |               |               |             | Core Loss                                                                                     |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 116         | 15        |               |               |             | Clay                                                                                          | E          |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 100%          |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
| 115         | 16        |               |               |             | Ferricrete                                                                                    |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 7             |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 114         | 17        |               |               |             | Clay                                                                                          |            |                                                     |                 | JNC34                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | SHC49                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC59                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC51                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC29                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNV85                                                                                          |                                        |                                                                            |                                                                                              |
| 113         | 18        |               |               |             |                                                                                               |            |                                                     |                 | JNT76                                                                                          |                                        |                                                                            |                                                                                              |
|             |           | 100%          |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 112         | 19        |               |               |             | Clay                                                                                          |            |                                                     |                 | JNT71                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNV88                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC6                                                                                           |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC5                                                                                           |                                        |                                                                            |                                                                                              |
| 111         | 20        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |

**WEATHERING:** R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
**FIELD ROCK STRENGTH:** Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
**RQD:** 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
**DEFECT SPACING:** <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Moderately Fractured; 60-200 mm = Slightly Fractured; 200-600 mm = Occasionally Fractured; >2 m = Unbroken  
**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
**DEFECT SHAPE:** C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
**DEFECT INFILL:** CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
**NOTES:** Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





GEOTECHNICAL LOG

HOLE: DW7298GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 20          |           |               |               |             | Clay                                                                                       |            |                                                     |                 | JNC11<br>JNV58                                                                           |                                  |                                                                |                                                                                                    |
| 110         | 21        | 96%           |               |             |                                                                                            |            |                                                     |                 | JNV86<br>JNV89                                                                           |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC16                                                                                    |                                  |                                                                |                                                                                                    |
| 109         | 22        |               |               |             | Clay                                                                                       |            |                                                     |                 | JNC82<br>JNC55<br>JNV82                                                                  |                                  |                                                                |                                                                                                    |
| 108         | 23        | 9             |               |             | Ferricrete                                                                                 |            |                                                     |                 | JNV79<br>JNC11                                                                           |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Core Loss                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Sand                                                                                       |            |                                                     |                 | JNV90<br>JNV90<br>JNT5                                                                   |                                  |                                                                |                                                                                                    |
| 107         | 24        | 100%          |               |             | Ferricrete                                                                                 |            |                                                     |                 | JNV82<br>JNC10<br>JNC3                                                                   |                                  |                                                                |                                                                                                    |
| 106         | 25        |               |               |             | Clay                                                                                       | E          |                                                     |                 | BZC<br>JNC63<br>JNC45<br>JNC6<br>JNT8<br>JNC31<br>JN<br>JNV50                            |                                  |                                                                |                                                                                                    |
| 105         | 26        | 10            |               |             | Clay                                                                                       |            |                                                     |                 | JNV18<br>BZC<br>JNC54                                                                    |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Ferricrete                                                                                 |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 104         | 27        | 77%           |               |             | Ferricrete                                                                                 |            |                                                     |                 | JNC30<br>JNC55<br>BZC<br>JNC12                                                           |                                  |                                                                |                                                                                                    |
| 103         | 28        |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 102         | 29        | 11            |               |             | Core Loss                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Clay                                                                                       |            |                                                     |                 | JNV88<br>JNC5<br>JND6                                                                    |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 101         | 30        |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7298GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 30          |           | 121%          |               |             | Clay                                                                                          |            |                                                     |                 | JNV76                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Ferricrete                                                                                    |            |                                                     |                 | JNV85<br>JNC25                                                                                 |                                        |                                                                            |                                                                                              |
| 100         | 31        |               |               |             | Ferricrete                                                                                    |            |                                                     |                 | BPC4<br>JNC5                                                                                   |                                        |                                                                            |                                                                                              |
|             |           | 12            |               |             | Clay                                                                                          |            |                                                     |                 | JNC21                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 | JNC74                                                                                          |                                        |                                                                            |                                                                                              |
| 99          | 32        |               |               |             | Clay                                                                                          |            |                                                     |                 | JND70<br>JNC36                                                                                 |                                        |                                                                            |                                                                                              |
|             |           | 85%           |               |             | Clay                                                                                          |            |                                                     |                 | JNC5<br>BZC4                                                                                   |                                        |                                                                            |                                                                                              |
| 98          | 33        |               |               |             | Sand                                                                                          |            |                                                     |                 | JNC5<br>JND15                                                                                  |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 97          | 34        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 13            |               |             | Core Loss                                                                                     | E          |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 96          | 35        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 76%           |               |             | Sand                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 95          | 36        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 94          | 37        |               |               |             | Core Loss                                                                                     |            |                                                     |                 | JNC30                                                                                          |                                        |                                                                            |                                                                                              |
|             |           | 104%          |               |             |                                                                                               |            |                                                     |                 | JNC26                                                                                          |                                        |                                                                            |                                                                                              |
| 93          | 38        |               |               |             |                                                                                               |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 92          | 39        |               |               |             | Clay                                                                                          |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           | 15            |               |             | Ferricrete                                                                                    |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Ferricrete                                                                                    |            |                                                     |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 91          | 40        |               |               |             |                                                                                               |            |                                                     |                 | JNC54<br>JNC9                                                                                  |                                        |                                                                            |                                                                                              |

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**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
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**DEFECT TYPE:** BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
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**DEFECT ROUGHNESS:** K = Slickensided; P = Polished; R = Rough; S = Smooth  
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**NOTES:** Logged in accordance with ACARP CoalLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





GEOTECHNICAL LOG

HOLE: DW7298GT

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|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|------------------------------------------------------|--------------------------------------------|
| 40          |           | 65%           |               |             | Clay                                                                                       |            |                                                     |                 | JNV89                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 90          | 41        |               |               |             | Clay                                                                                       |            |                                                     |                 | BZC4                                                                                     |                                  |                               |                                           |                                                      |                                            |
| 89          | 42        | 16            |               |             | Sand                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Core Loss                                                                                  |            |                                                     |                 | JNC24                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 88          | 43        |               |               |             | Sand                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 101%          |               |             | Clay                                                                                       |            |                                                     |                 | JNC52                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 87          | 44        |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Clay                                                                                       |            |                                                     |                 |                                                                                          | 7298GT010<br>UCS = 0.03          |                               |                                           |                                                      |                                            |
| 86          | 45        | 17            |               |             | Sand                                                                                       | E          |                                                     |                 | JNC28                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sand                                                                                       |            |                                                     |                 | JNC35<br>JNC27<br>JNC7                                                                   |                                  |                               |                                           |                                                      |                                            |
| 85          | 46        | 26%           |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 84          | 47        |               |               |             | Sand                                                                                       |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           | 81%           |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
| 83          | 48        | 18            |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Core Loss                                                                                  |            |                                                     |                 | JNC39<br>JNC46                                                                           |                                  |                               |                                           |                                                      |                                            |
| 82          | 49        |               |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sand                                                                                       |            |                                                     |                 | SHC25<br>JNC31<br>JNC29                                                                  |                                  |                               |                                           |                                                      |                                            |
| 81          | 50        |               |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |

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ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7298GT

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CLIENT: JT BOYD EASTING: 731142.41 DRILLER: Hodge START: 43741  
PROJECT: Dingo West NORTHING: 7382319.94 DRILL RIG: 6\_U10 FINISH: 43743  
LOCATION: Bowen Basin ELEV: 130.96 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 55 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 105.2 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm)                                                                                 | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 50          |           |               |               |             | Clay                                                                                          | E          |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Mudstone                                                                                      |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Clay                                                                                          |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Weathered Coal                                                                                |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | PLU2 seam                                                                                     |            |                                                    |                 | JNC16                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC15                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Limonite                                                                                      |            |                                                    |                 | JNC15<br>SHC28                                                                                                                                                                 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     | D          |                                                    |                 | SHV35                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Mudstone                                                                                      |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC4<br>SHC12<br>JNC4<br>JNT74                                                                                                                                                 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHT60<br>SHC20<br>SHC21                                                                                                                                                        |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Limonite                                                                                      |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | SHC18<br>JNV6                                                                                                                                                                  |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | SHC64<br>JNC21<br>SHC12<br>JNC15                                                                                                                                               |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC<br>JNC8                                                                                                                                                                    |                                        |                                                                            |                                                                                              |
|             |           |               |               |             |                                                                                               |            |                                                    |                 | JNC33<br>JNC10                                                                                                                                                                 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     | S          |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | PLU4 seam                                                                                     |            |                                                    |                 | JNC15<br>JNC20                                                                                                                                                                 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC15                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC15                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNC23                                                                                                                                                                          |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | BZC25<br>JNC23                                                                                                                                                                 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Siltstone                                                                                     |            |                                                    |                 | JNC24<br>BPC7<br>JNC6<br>JNC69<br>JNC28<br>JNC14<br>JNC15<br>JNC26<br>JNC24<br>SHC47<br>JNV83<br>BZC13<br>JNC19<br>JNC41<br>JNV88<br>BPC18<br>JNC10<br>JNC22<br>JNT36<br>JNC42 |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |
|             |           |               |               |             | Sandstone                                                                                     |            |                                                    |                 |                                                                                                                                                                                |                                        |                                                                            |                                                                                              |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
RQD: 0-25% = Very Poor; 25-50% = Poor; 50-75% = Fair; 75-90% = Good; 90-100% = Excellent  
DEFECT SPACING: <6 mm = Fragmented; 6-20 mm = Highly Fractured; 20-60 mm = Fractured; 60-200 mm = Moderately Fractured; 200-600 mm = Slightly Fractured; 600-2000 mm = Occasionally Fractured; >2 m = Unbroken  
DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discing; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 7 of 11

CLIENT: JT BOYD EASTING: 731142.41 DRILLER: Hodge START: 43741  
PROJECT: Dingo West NORTHING: 7382319.94 DRILL RIG: 6\_U10 FINISH: 43743  
LOCATION: Bowen Basin ELEV: 130.96 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 55 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 105.2 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log            | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|------------------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 60          | 22        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC51                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC19                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Sandstone              |                                                                                               |            |                                                    |                 | CLC21                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Sandstone              |                                                                                               |            |                                                    |                 | JNC52                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Sandstone              |                                                                                               |            |                                                    |                 | CLC21                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | BPC29                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JND                                                                                            |                                        |                                                                            |                                                                                                    |
| 70          | 61        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNT59                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | BPC22                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Claystone              |                                                                                               |            |                                                    |                 | JNC18                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC82                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC3                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC11                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC8                                                                                           |                                        |                                                                            |                                                                                                    |
| 69          | 62        |               |               | Claystone              |                                                                                               |            |                                                    |                 | BPC10                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT40                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC3                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JND26                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JND60                                                                                          |                                        |                                                                            |                                                                                                    |
| 68          | 63        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JND57                                                                                          |                                        |                                                                            |                                                                                                    |
|             | 23        |               |               | Sandstone              |                                                                                               |            |                                                    |                 | JND58                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC48                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC58                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC20                                                                                          |                                        |                                                                            |                                                                                                    |
| 67          | 64        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC71                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT58                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT17                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC8                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPD21                                                                                          |                                        |                                                                            |                                                                                                    |
| 66          | 65        |               |               | Sandstone              |                                                                                               |            |                                                    |                 | BPC20                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC                                                                                            |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siderite               |                                                                                               |            |                                                    |                 | JND21                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC26                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC25                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNV26                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | VND54                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC62                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | VND58                                                                                          |                                        |                                                                            |                                                                                                    |
| 65          | 66        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNT23                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siderite               |                                                                                               |            |                                                    |                 | JNT47                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC35                                                                                          |                                        |                                                                            |                                                                                                    |
|             | 24        |               |               | Core Loss              |                                                                                               |            |                                                    |                 | VNC48                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNT52                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                                    |
| 64          | 67        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC46                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC26                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC21                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC22                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT37                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC45                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC52                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC24                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC29                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT85                                                                                          |                                        |                                                                            |                                                                                                    |
| 63          | 68        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC17                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Carbonaceous Siltstone |                                                                                               |            |                                                    |                 | JNC50                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Siltstone              |                                                                                               |            |                                                    |                 | BPC27                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Carbonaceous Siltstone |                                                                                               |            |                                                    |                 | JNC14                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               | Sandstone              |                                                                                               |            |                                                    |                 | BZC                                                                                            |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC10                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | VND15                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC40                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC49                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC9                                                                                           |                                        |                                                                            |                                                                                                    |
| 62          | 69        |               |               | Siltstone              |                                                                                               |            |                                                    |                 | JNC4                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JND2                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BPC19                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNT69                                                                                          |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | SOC                                                                                            |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | BZC9                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | JNC8                                                                                           |                                        |                                                                            |                                                                                                    |
|             |           |               |               |                        |                                                                                               |            |                                                    |                 | SOC20                                                                                          |                                        |                                                                            |                                                                                                    |
| 61          | 70        |               |               |                        |                                                                                               |            |                                                    |                 | JNC8                                                                                           |                                        |                                                                            |                                                                                                    |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
Grey = Field Rock Strength; Blue = Sonic-Derived Rock Strength; Green = Laboratory (UCS) Rock Strength  
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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 8 of 11

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200 | Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000 | Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------------------------------------|------------------------------------------------------|--------------------------------------------|
| 70          |           | 100%          |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC19                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | JNC2                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | VNC2                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC20                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC20                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | SOC                                                                                      |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC15                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | JNC17                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 71          |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC6                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC16                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC15                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC15                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           | 26            |               |             | Siltstone                                                                                  |            |                                                     |                 | JNV83                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC11                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC14                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | VND6                                                                                     |                                  |                               |                                           |                                                      |                                            |
| 72          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | BPC19                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC8                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | VND8                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC8                                                                                     |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC19                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 73          |           | 99%           |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC21                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 74          |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 | JNC20                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | VND28                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           | 27            |               |             | Sandstone                                                                                  |            |                                                     |                 | JNC14                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 75          |           |               |               |             | Core Loss                                                                                  | F          |                                                     |                 | BPC26                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 | BPC27                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 76          |           | 99%           |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | BPC22                                                                                    |                                  |                               |                                           |                                                      |                                            |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | VND5                                                                                     |                                  |                               |                                           |                                                      |                                            |
| 77          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          | 7298GT020<br>UCS = 23.7          |                               |                                           |                                                      |                                            |
| 78          |           | 28            |               |             |                                                                                            |            |                                                     |                 | VND5                                                                                     |                                  |                               |                                           |                                                      |                                            |
| 79          |           | 99%           |               |             | Sandstone                                                                                  |            |                                                     |                 | JNC46                                                                                    |                                  |                               |                                           |                                                      |                                            |
| 80          |           |               |               |             |                                                                                            |            |                                                     |                 | VND20                                                                                    |                                  |                               |                                           |                                                      |                                            |

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DEFECT TYPE: BP = Bedding Plane; BZ = Broken Zone; CL = Clay Band; CE = Cleat; FT = Fault; JN = Joint; SH = Shear Zone; SO = Soft Zone (Non-Tectonic); VN = Vein; DS = Discontinuity; DB = Drilling Induced Break; DZ = Drilling Induced Broken Zone  
DEFECT SHAPE: C = Concave/Convex; I = Irregular; P = Planar; S = Stepped; U = Undulose  
DEFECT ROUGHNESS: K = Slickensided; P = Polished; R = Rough; S = Smooth  
DEFECT INFILL: CA = Calcite; CL = Clay; CO = Coal; CU = Crushed Rock; DI = Dickite; IO = Iron Oxide; KA = Kaolinite; MI = Mica; PF = Plant Fragments; PY = Pyrite; QZ = Quartz; XR = Carbonaceous Remains  
NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 9 of 11

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 6 7 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|-----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 80          |           |               |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           | 29            |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 81          |           |               |               |             |                                                                                            |            |                                                     |                 | VND80                                                                                    |                                  |                                                                |                                                                                                    |
| 82          |           | 80%           |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                     |                 | VND82<br>VND75                                                                           |                                  |                                                                |                                                                                                    |
| 83          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 84          |           | 30            |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 85          |           |               |               |             | Sandstone                                                                                  | F          |                                                     |                 | BPC17<br>BPC13                                                                           |                                  |                                                                |                                                                                                    |
|             |           | 125%          |               |             |                                                                                            |            |                                                     |                 | VND13<br>JNV25                                                                           |                                  |                                                                |                                                                                                    |
| 86          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          | 7298GT023<br>UCS = 42.7          |                                                                |                                                                                                    |
|             |           | 31            |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 87          |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 88          |           | 47%           |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 89          |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 90          |           | 32            |               |             | Core Loss                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           | 75%           |               |             | Sandstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Siltstone                                                                                  |            |                                                     |                 |                                                                                          |                                  |                                                                |                                                                                                    |

WEATHERING: R = Residual Soil; E = Extremely Weathered; D = Distinctly Weathered; S = Slightly Weathered; F = Fresh  
ROCK STRENGTH: R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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NOTES: Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.



# GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 10 of 11

CLIENT: JT BOYD EASTING: 731142.41 DRILLER: Hodge START: 43741  
PROJECT: Dingo West NORTHING: 7382319.94 DRILL RIG: 6\_U10 FINISH: 43743  
LOCATION: Bowen Basin ELEV: 130.96 CORE SIZE: HQ Full Core GEOLOGY: John Irvine  
TENEMENT: EPC881 INC/AZI: -90/0 CASING: 55 GEOTECH:  
PROJECT NO: DW\_2020 DATUM: GDA94 Z55 DEPTH: 105.2 GEOPHYS: Weatherfords

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing,<br>weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity,<br>dip, shape, roughness,<br>infill, width (mm) | Sample Interval<br>and<br>Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m <sup>3</sup><br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|-----------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 90          | 33        |               |               |             | Sandstone<br>Core Loss                                                                        |            |                                                    |                 | BPC20<br>BPC20<br>BPC15<br>BPC15                                                               |                                        |                                                                            |                                                                                              |
| 91          | 104%      |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNV89<br>JNV20<br>VND38                                                                        |                                        |                                                                            |                                                                                              |
| 93          | 34        |               |               |             | Siltstone<br>Sandstone                                                                        |            |                                                    |                 | VND22<br>VND69                                                                                 |                                        |                                                                            |                                                                                              |
| 94          | 101%      |               |               |             | Sandstone                                                                                     |            |                                                    |                 | JNT75<br>VND15                                                                                 |                                        |                                                                            |                                                                                              |
| 95          |           |               |               |             | Sandstone                                                                                     | F          |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 96          | 35        |               |               |             | Siltstone<br>Carbonaceous Siltstone<br>PLL1 seam<br>Coal<br>Siltstone<br>Sandstone            |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                              |
| 97          | 49%       |               |               |             | Coal<br>Siltstone                                                                             |            |                                                    |                 | VND59<br>BPD20<br>JND50                                                                        |                                        |                                                                            |                                                                                              |
| 98          |           |               |               |             | Core Loss                                                                                     |            |                                                    |                 | VND42<br>VND17<br>VND20<br>VND20<br>VND22<br>VND28<br>VND23<br>BPC22<br>VNC21<br>BPC29         |                                        |                                                                            |                                                                                              |
| 99          | 285/65    |               |               |             | Sandstone<br>Siltstone<br>Sandstone<br>Siltstone                                              |            |                                                    |                 | JNC29<br>VNC21<br>JNC9<br>JNC26                                                                |                                        |                                                                            |                                                                                              |
| 100         | 37        |               |               |             | PL1L seam<br>Coal<br>Siltstone                                                                |            |                                                    |                 |                                                                                                |                                        |                                                                            |                                                                                              |

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NOTES: Logged in accordance with ACARP Coallog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.





# GEOTECHNICAL LOG

HOLE: DW7298GT

PAGE: 11 of 11

|             |             |           |            |            |              |          |              |
|-------------|-------------|-----------|------------|------------|--------------|----------|--------------|
| CLIENT:     | JT BOYD     | EASTING:  | 731142.41  | DRILLER:   | Hodge        | START:   | 43741        |
| PROJECT:    | Dingo West  | NORTHING: | 7382319.94 | DRILL RIG: | 6_U10        | FINISH:  | 43743        |
| LOCATION:   | Bowen Basin | ELEV:     | 130.96     | CORE SIZE: | HQ Full Core | GEOLOGY: | John Irvine  |
| TENEMENT:   | EPC881      | INC/AZI:  | -90/0      | CASING:    | 55           | GEOTECH: |              |
| PROJECT NO: | DW_2020     | DATUM:    | GDA94 Z55  | DEPTH:     | 105.2        | GEOPHYS: | Weatherfords |

| Elev (mAHD) | Depth (m) | Core Recovery | RMU Depth (m) | Graphic Log | RMU Description<br>Lithology, strength, defect spacing, weathering, additional descriptors | Weathering | Field<br>Sonic<br>Lab<br>Strength<br>01 2 3 4 5 67 | RQD<br>0 50 100 | Defect Description<br>Depth, type, continuity, dip, shape, roughness, infill, width (mm) | Sample Interval and Test Results | Gamma API<br>0 50 100 150 200<br>Density t/m³<br>1 1.5 2 2.5 3 | Neutron API<br>0 1,000 2,000 3,000 4,000 5,000 6,000<br>Sonic m/s<br>1,000 2,000 3,000 4,000 5,000 |
|-------------|-----------|---------------|---------------|-------------|--------------------------------------------------------------------------------------------|------------|----------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 100         |           | 100%          |               |             | Siltstone                                                                                  |            |                                                    |                 | JNC15<br>JNT81<br>JNT23<br>VND26<br>JNC24<br>JNC24                                       |                                  |                                                                |                                                                                                    |
| 101         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 | VND83<br>VND60<br>JNC24<br>VNC55<br>JNC15                                                |                                  |                                                                |                                                                                                    |
| 102         |           |               |               |             |                                                                                            |            |                                                    |                 | JND<br>VNC12                                                                             |                                  |                                                                |                                                                                                    |
|             |           | 38            |               |             | Core Loss                                                                                  | F          |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 103         |           |               |               |             | Siderite                                                                                   |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           | 100%          |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             | Carbonaceous Mudstone                                                                      |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 104         |           |               |               |             | Sandstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
|             |           |               |               |             |                                                                                            |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |
| 105         |           |               |               |             | Siltstone                                                                                  |            |                                                    |                 |                                                                                          |                                  |                                                                |                                                                                                    |

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**ROCK STRENGTH:** R1 = Extremely Low (< 1MPa); R2 = Very Low (1-5 MPa; 1500-2345 m/s); R3 = Low (5-10 MPa; 2345-2700 m/s); R4 = Medium (10-25 MPa; 2700-3300 m/s); R5 = High (25-50 MPa; 3300-3900 m/s); R6 = Very High (50-100 MPa; 3900-4550 m/s); R7 = Extremely High (>100 MPa; >4550 m/s)  
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**NOTES:** Logged in accordance with ACARP CoallLog v2. Defect depths taken at mid-point of defect. Dip angles measured perpendicular to long core axis.

## **APPENDIX C: ATV Data and Structural Map**



**DW\_7293\_GT      DIPS analysis notes**

Hole deviation at 1.7m to the north is negligible and likely drilling induced at the start of HQ coring.

A major structural change is interpreted to reside at 203.72m depth (70.5° dip / 305 strike (NW), forming the primary displacement point and a fault zone parallel to the regional NW fault fabric. From 200m to total depth, “fabric” (interp as bedding) dips are in the 55° – 75° range.

Due to this major structural change, analysis has focused on the 50m to 200m interval.

- Structure from 50-200m displays:
- joint set (primary) striking 325° (NW)
- joint set (secondary) striking 260° (EW).
- 3 fractures (blue) striking 15° (NNE), potential splay faults off the main NW fault.

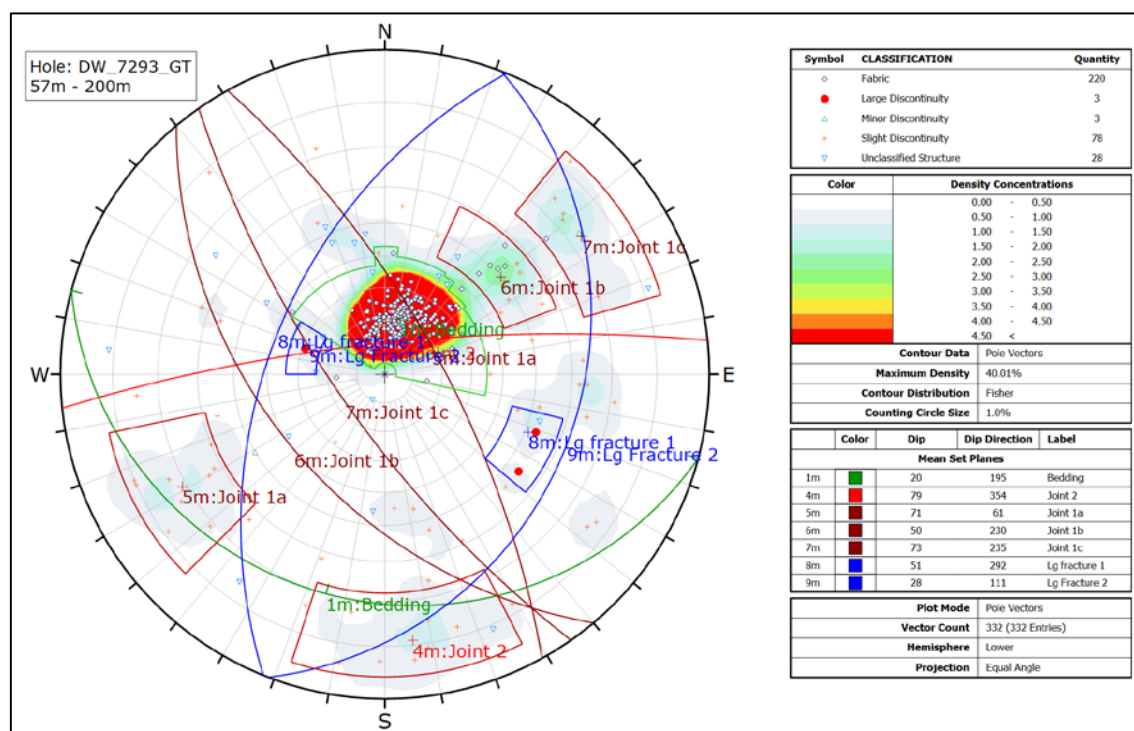


Figure A 1. Stereoplot DW7293GT

Bedding dip in the ATV interpretation data appears to be over stated

- ATV fabric bedding dip of 20° towards 195° (SSW)
- Geotech log (0-120m) bedding dip averages 15° (5° – 35°)

**DW\_7294\_GT      DIPS analysis notes**

Hole deviation at 0.61m to the north is negligible and likely drilling induced at the start of HQ coring.

Structure displays:

- joint set (primary) striking 323° (NW)
- joint set (secondary) striking 235° (EW).
- joint set (tertiary) striking 5° (N).
- 3 fractures sub-parallel with the joint sets and bedding.

Bedding dip in the ATV interpretation data appears to be over stated

- ATV fabric bedding dip of 19° towards 122° (SE)
- Geotech log bedding dip averages 11° (range 5° – 25°)

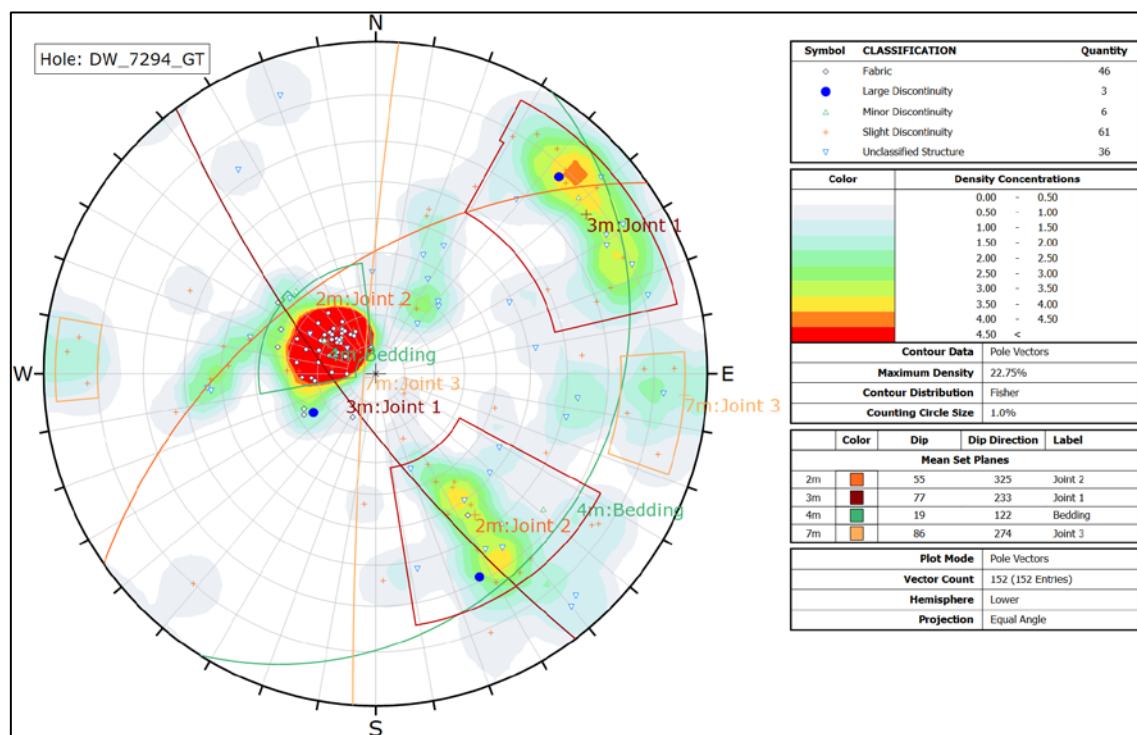


Figure A 2. Stereoplot DW7294GT



**DW\_7295\_GT     DIPS analysis notes**

Hole deviation at 1.26m to the south-west is negligible and likely drilling induced at the start of HQ coring.

Note: Bedding rotation – Dipping North.

Structure displays:

- joint set (primary) striking 312° (NW)
- joint set (secondary) striking 267° (EW).
- 4 fractures striking sub-parallel with the secondary joint set

Bedding dip

- ATV fabric bedding dip of 29° towards 11° (N)
- Geotech log bedding dip averages 27° (range 14° – 43°)

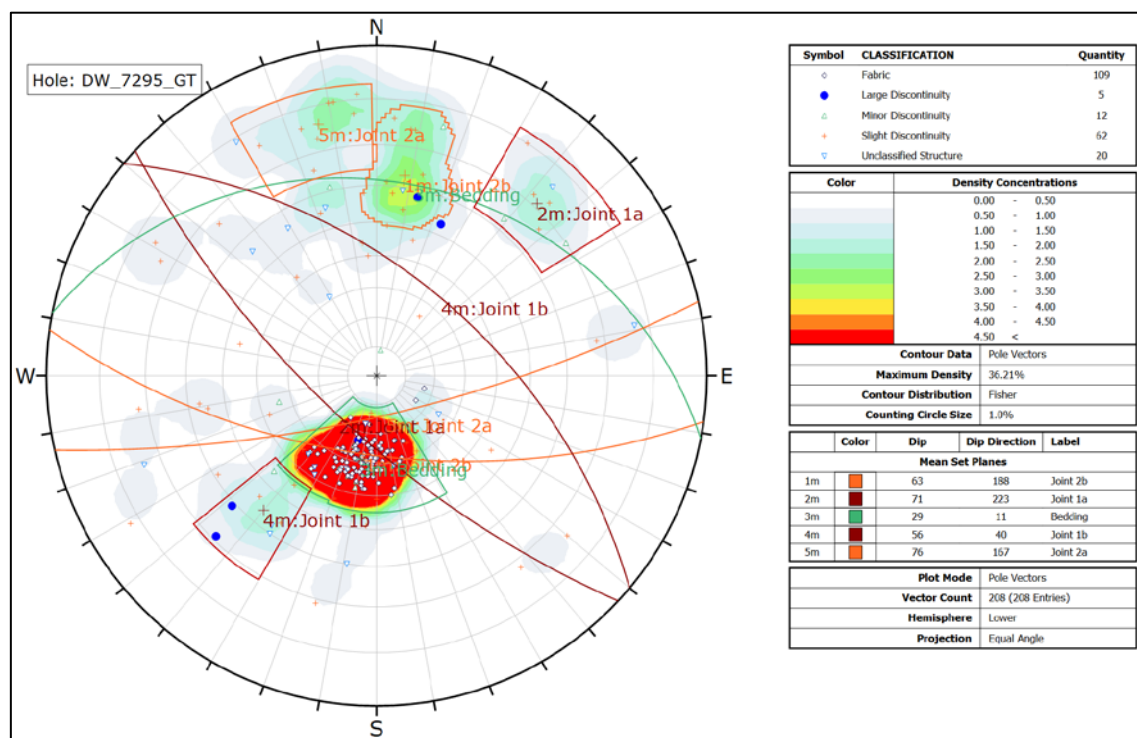


Figure A 3. Stereoplot DW7295GT

**DW\_7296\_GT      DIPS analysis notes**

Hole deviation at 3.35m to the east is minor and likely drilling induced at the start of HQ coring. A major structural change is interpreted to reside at 167.5m depth (24.5° dip / 250° strike (NW), forming the primary displacement point and a fault zone parallel to the regional NW fault fabric. From 167m to total depth, bedding dips are in the 45° – 70° range. Due to this major structural change, analysis has focused on the 50m to 167m interval, to extract data relevant to this study.

Structure displays:

- joint set (primary) striking 315° (NW)
- joint set (secondary) striking 272° (EW).
- joint set (tertiary) striking 25° (NNE).
- 1 fracture dipping and striking sub-parallel to bedding
  - o fractures striking sub-parallel with the primary joint set

Bedding dip

- ATV fabric bedding dip of 26°, towards 201° (SW)
- Geotech log bedding dip averages 23° (range 5° – 46°)

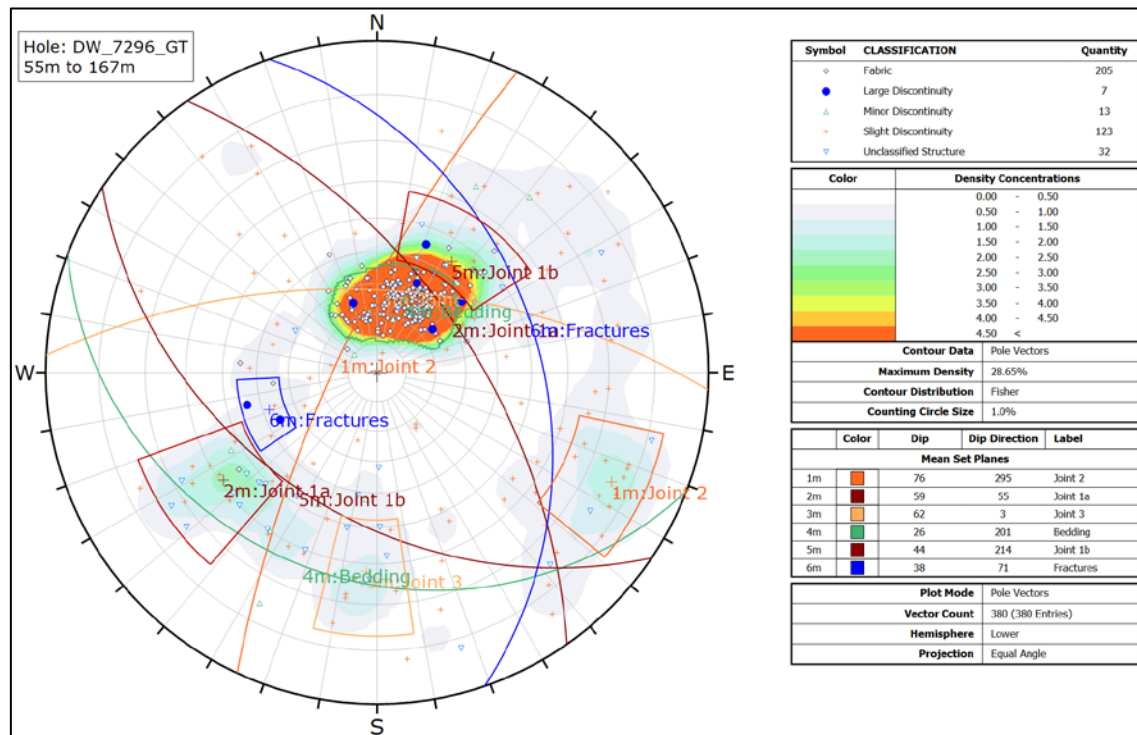


Figure A 4. Stereoplot DW7296GT



**DW\_7297\_GT DIPS analysis notes**

Hole deviation at 0.50m to the east is minor and likely drilling induced at the start of HQ coring. Some minor deviations at 90m related to structure.

Complex structure in this ATV log. Bedding has been subdivided according to depth (Figure A 5)

| Depth range       | Unit      | ATV Dip | Geotech log Dip | Direction      |
|-------------------|-----------|---------|-----------------|----------------|
| 52.82m – 57.65m   |           |         | 10° - 15°       |                |
| 61.66m – 85.09m   | Bedding 1 | 44°     | 30° - 40°       | 207 south-west |
| 86.32m – 91.52m   | Bedding 2 | 74°     |                 | 244 south-west |
| 97.64m – 109.25m  | Bedding 3 | 56°     |                 | 234 south-west |
| 116.71m – 130.65m | Bedding 4 | 28°     |                 | 222 south-west |

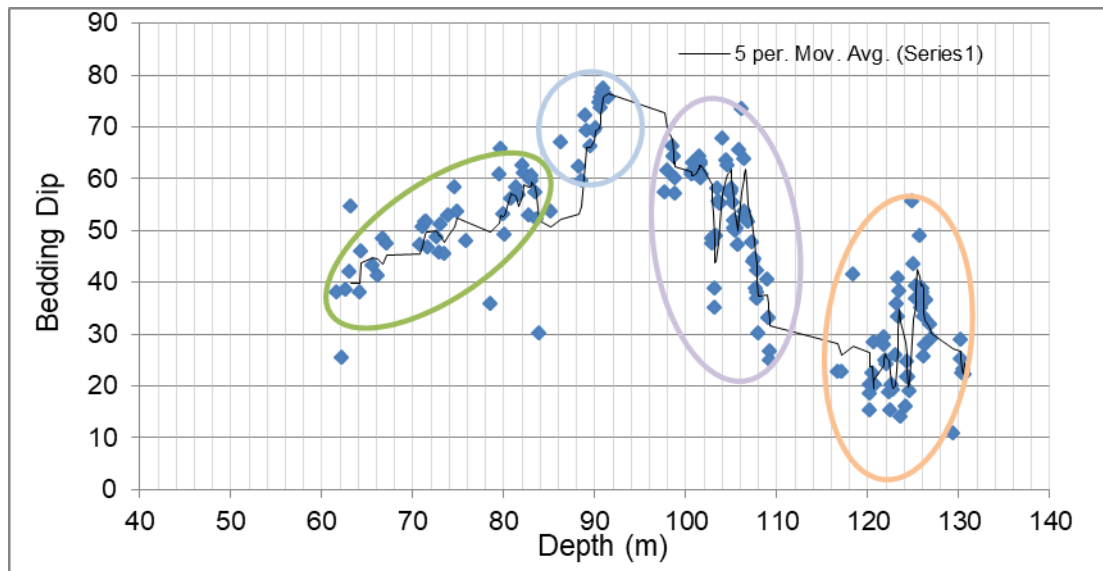


Figure A 5. DW7297, 4 bedding dip domains identified with depth

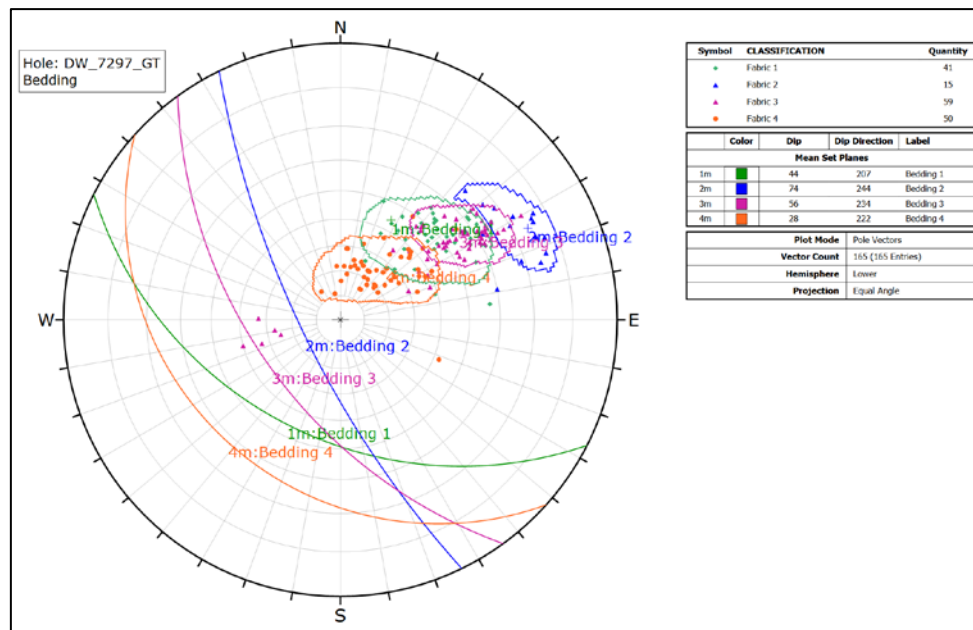


Figure A 6. Stereoplot of Bedding DW7297GT

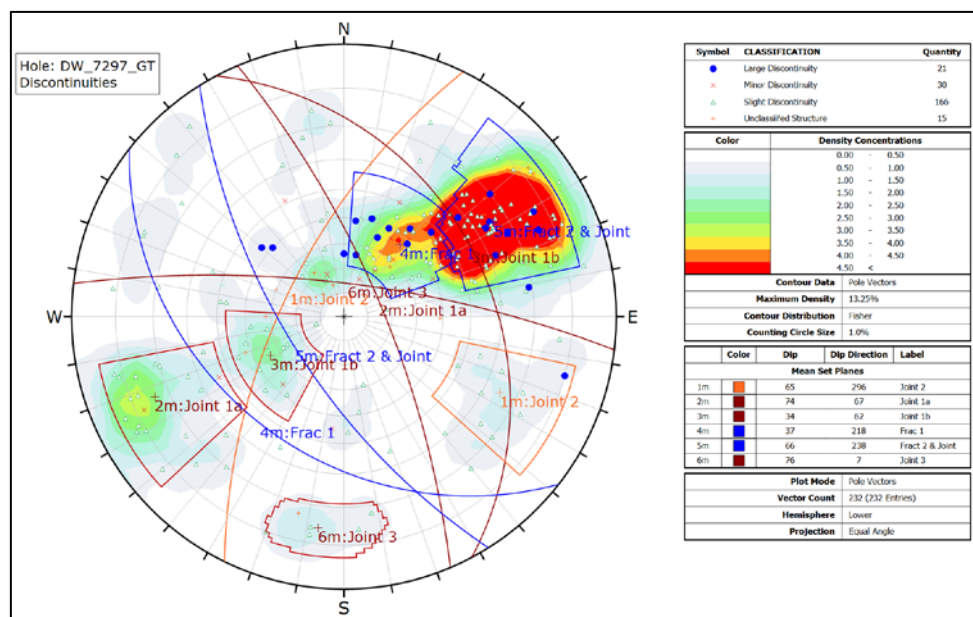


Figure A 7. Stereoplot of structure DW7297GT

Structure displays:

- joint set (primary) striking 335° (NW)
- joint set (secondary) striking 278° (EW).
- joint set (tertiary) striking 25° (NNE).
- Numerous large fractures dipping and striking sub-parallel to bedding and striking sub-parallel with the primary and secondary joint sets
- Fault zone at 84m – 87.2m (Frac 2)



**DW\_7298\_GT      DIPS analysis notes**

Hole deviation at 0.50 m to the south-west is negligible and likely drilling induced at the start of HQ coring.

Structure displays:

- bedding dip of 22° towards 203° (S)
- joint set (primary) striking 299° (NW)
- joint set (secondary) not present.
- joint set (tertiary) striking 19° (NNE).
- 3 fractures dipping and striking sub-parallel with bedding

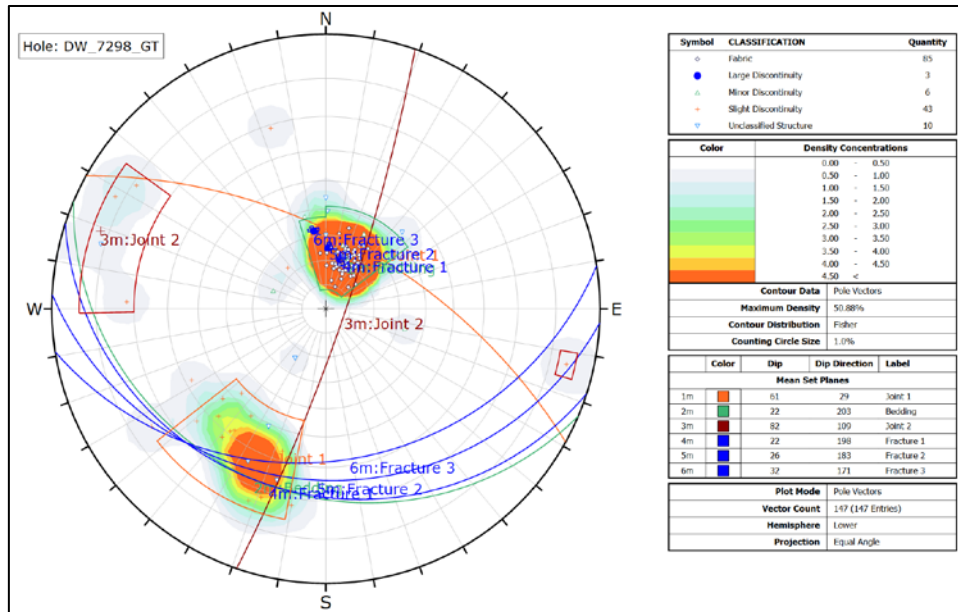


Figure A 8. Stereoplot DW7298GT

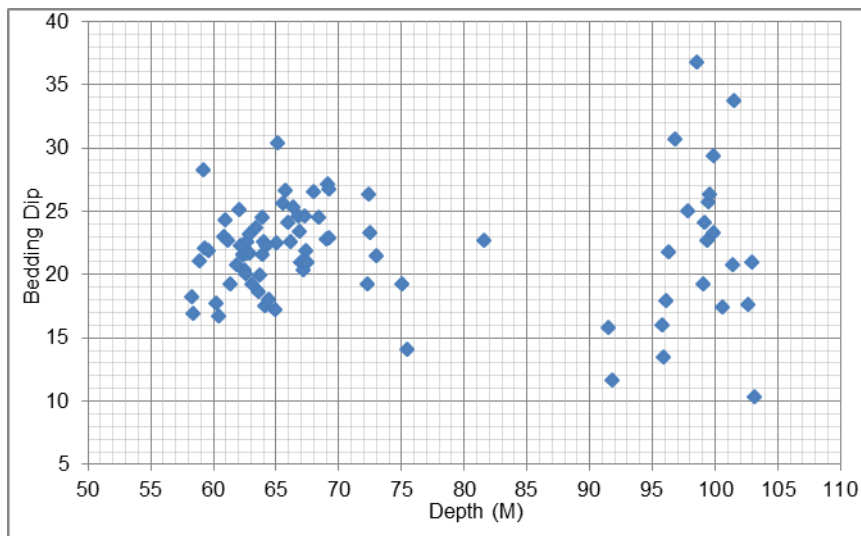


Figure A 9. DW7298GT Bedding dip versus depth

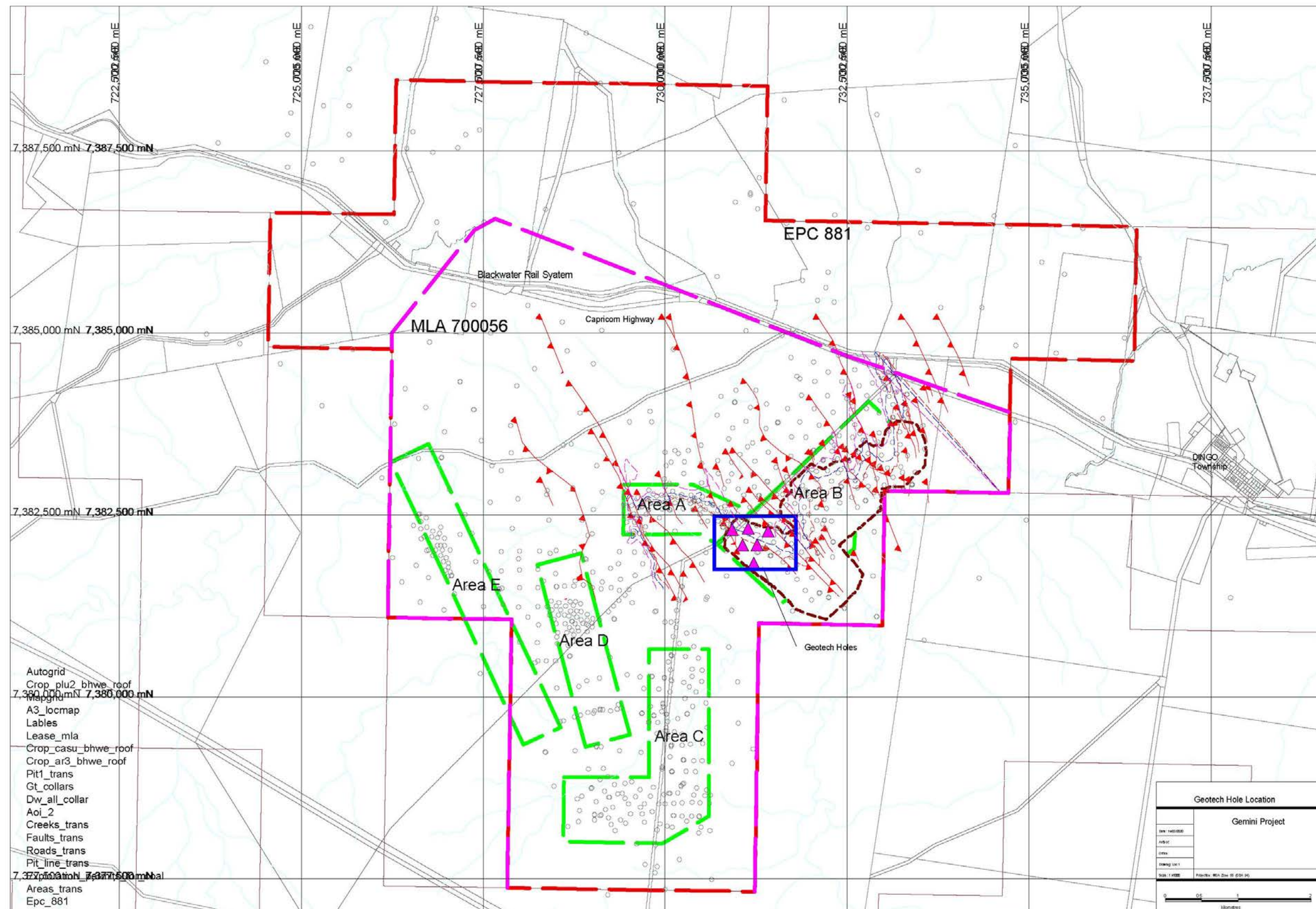
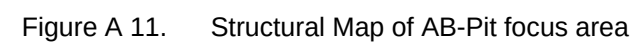


Figure A 10. Location Plan – Blue area – see detail in Fig A11.









## ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

|                |                             |                      |              |
|----------------|-----------------------------|----------------------|--------------|
| <b>Client</b>  | Geotek Solutions Pty Ltd    | <b>Report No.</b>    | P19110013-AL |
|                |                             | <b>Workorder No.</b> | 0020111      |
| <b>Address</b> | PO Box 1404 Milton QLD 4064 | <b>Report Date</b>   | 03/12/2019   |
| <b>Project</b> | RFA Dingo West Project      |                      |              |

|                             |                 |                 |                 |                |                |                |
|-----------------------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| <b>Sample No.</b>           | 19110013        | 19110014        | 19110015        | 19110030       | 19110031       | 19110032       |
| <b>Test Date</b>            | 29/11/2019      | 29/11/2019      | 29/11/2019      | 29/11/2019     | 29/11/2019     | 29/11/2019     |
| <b>Client ID</b>            | DW7293GT0<br>01 | DW7293GT0<br>03 | DW7293GT0<br>05 | DW7294GT0<br>2 | DW7294GT0<br>3 | DW7294GT0<br>6 |
| <b>Depth (m)</b>            | 0.65-0.90       | 8.72-8.98       | 14.51-14.81     | 2.67-2.97      | 5.75-6.05      | 11.35-11.65    |
| <b>Liquid Limit (%)</b>     | 28              | 37              | 49              | 38             | 32             | 50             |
| <b>Plastic Limit (%)</b>    | 12              | 19              | 20              | 16             | 13             | 17             |
| <b>Plasticity Index (%)</b> | 16              | 18              | 29              | 22             | 19             | 33             |
| <b>Linear Shrinkage (%)</b> | 9.0             | 7.0             | 12.5            | 9.0            | 9.5            | 12.5 +         |
| <b>Moisture Content (%)</b> | 17.3            | 15.6            | 14.8            | 10.3           | 7.4            | 14.2           |

|                             |                 |                 |                 |                 |                 |                 |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <b>Sample No.</b>           | 19110040        | 19110041        | 19110042        | 19110043        | 19110056        | 19110057        |
| <b>Test Date</b>            | 29/11/2019      | 29/11/2019      | 29/11/2019      | 02/12/2019      | 02/12/2019      | 02/12/2019      |
| <b>Client ID</b>            | DW7295GT0<br>01 | DW7295GT0<br>03 | DW7295GT0<br>05 | DW7295GT0<br>07 | DW7296GT0<br>01 | DW7296GT0<br>03 |
| <b>Depth (m)</b>            | 2.72-3.02       | 8.83-9.13       | 14.85-15.15     | 22.94-23.24     | 1.76-2.09       | 7.97-8.30       |
| <b>Liquid Limit (%)</b>     | 44              | 47              | 66              | 41              | 42              | 53              |
| <b>Plastic Limit (%)</b>    | 18              | 18              | 24              | 18              | 15              | 17              |
| <b>Plasticity Index (%)</b> | 26              | 29              | 42              | 23              | 27              | 36              |
| <b>Linear Shrinkage (%)</b> | 11.5            | 12.5            | 15.0 +          | 8.5             | 11.5 +          | 15.0            |
| <b>Moisture Content (%)</b> | 12.5            | 12.7            | 20.0            | 11.0            | 12.6            | 12.6            |

**NOTES/REMARKS:** The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client \* Cracking occurred + Curling occurred

Page 1 of 1 REP00102

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Authorised Signatory

  
 G. Creely



Laboratory No. 9926

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## SLAKING & DISPERSION POTENTIALS TEST REPORT

Test Method: As supplied

|                |                             |                      |               |
|----------------|-----------------------------|----------------------|---------------|
| <b>Client</b>  | Geotek Solutions Pty Ltd    | <b>Report No.</b>    | P19110013-SDP |
| <b>Address</b> | PO Box 1404 Milton QLD 4064 | <b>Workorder No.</b> | 0020111       |
| <b>Project</b> | RFA Dingo West Project      | <b>Test Date</b>     | 28/11/2019    |
|                |                             | <b>Report Date</b>   | 06/12/2019    |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110013    |          |        |         |          |
| <b>Client ID</b>      | DW7293GT001 |          |        |         |          |
| <b>Depth (m)</b>      | 0.65-0.90   |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | B21      | B21    | C23     | D23      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110014    |          |        |         |          |
| <b>Client ID</b>      | DW7293GT003 |          |        |         |          |
| <b>Depth (m)</b>      | 8.72-8.98   |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | B11      | C11    | C11     | C11      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110015    |          |        |         |          |
| <b>Client ID</b>      | DW7293GT005 |          |        |         |          |
| <b>Depth (m)</b>      | 14.51-14.81 |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | B11      | C21    | C21     | E21      |

|                       |            |          |        |         |          |
|-----------------------|------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110030   |          |        |         |          |
| <b>Client ID</b>      | DW7294GT02 |          |        |         |          |
| <b>Depth (m)</b>      | 2.67-2.97  |          |        |         |          |
| <b>Description</b>    | -          |          |        |         |          |
| <b>Time</b>           | 1 (min)    | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | D11        | D11      | D12    | D13     | E13      |

**NOTES/REMARKS:** Tested as received with distilled water

Sample/s supplied by the client

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110016-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 28/11/2019    |
| <b>Client ID</b>   | DW7293GT009                          | <b>Report Date</b>  | 06/12/2019    |
| <b>Description</b> | Siltstone 100%                       |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 1.07 MPa**

### Young's Modulus

Tangent 0.098 GPa

Secant 0.083 GPa

### Poisson Ratio

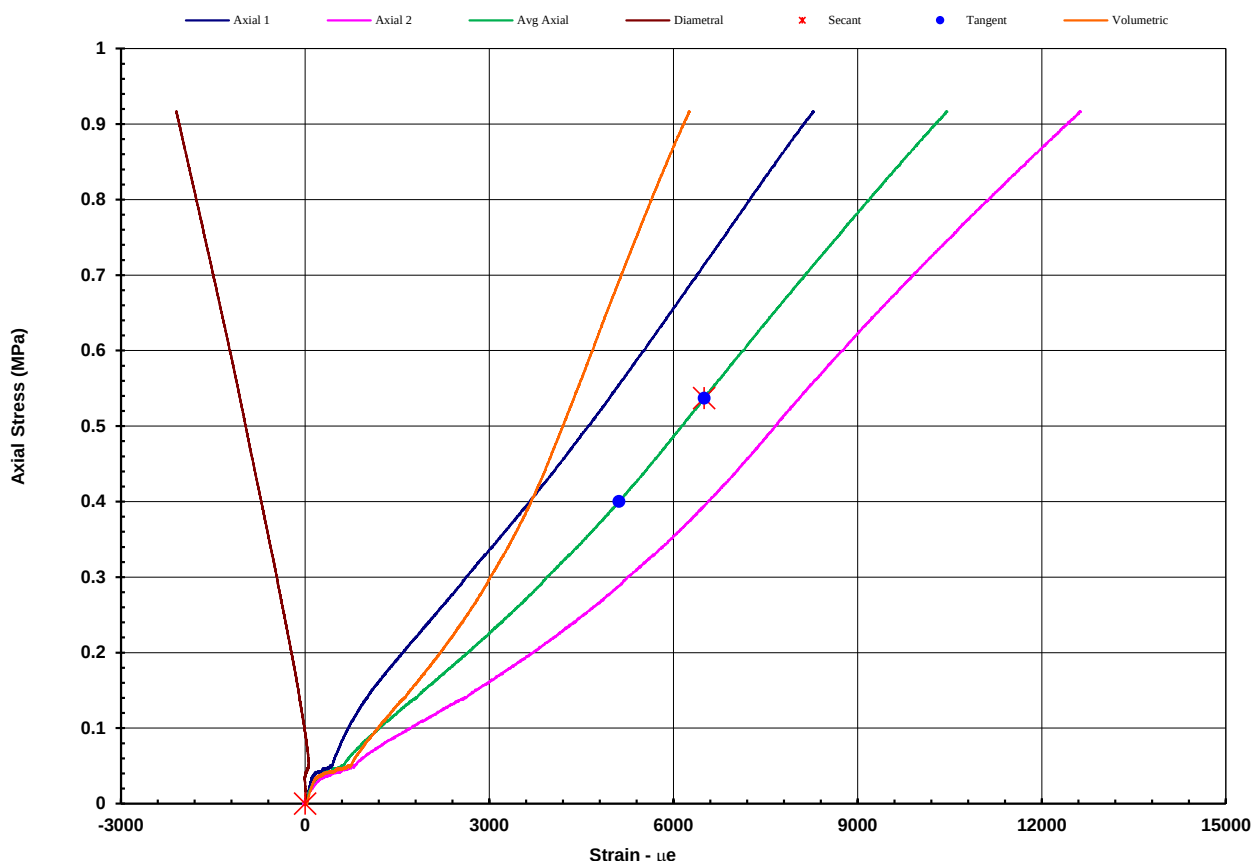
0.163

0.163

from 37 % to 50 % of Max UCS

from 0 % to 50 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP13402

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                               |                          |                                 |                           |
|-------------------------------|--------------------------|---------------------------------|---------------------------|
| <b>Client</b>                 | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110016-MOD             |
| Average Sample Diameter (mm)  | 61.0                     | Moisture Content (%)            | 16.2                      |
| Sample Height (mm)            | 175.3                    | Wet Density (t/m <sup>3</sup> ) | 2.21                      |
| Duration of Test (min)        | 36.83                    | Dry Density (t/m <sup>3</sup> ) | 1.90                      |
| Rate of Displacement (mm/min) | 0.10                     | Bedding (°)                     | 30                        |
| Mode of Failure               | Axial Splitting          | Test Apparatus                  | 100kN Compression Machine |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

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Page 2 of 2 REP13402

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.2 & AS 4133.1.1.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110017-UCS |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 28/11/2019    |
| <b>Client ID</b>   | DW7293GT014                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b> | Siltstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

### TEST DETAILS

|                               |                 |                                 |                                  |
|-------------------------------|-----------------|---------------------------------|----------------------------------|
| Average Sample Diameter (mm)  | 61.0            | Moisture Content (%)            | 10.7                             |
| Sample Height (mm)            | 171.1           | Wet Density (t/m <sup>3</sup> ) | 2.30                             |
| Duration of Test (min)        | 2:00            | Dry Density (t/m <sup>3</sup> ) | 2.08                             |
| Rate of Displacement (mm/min) | 0.10            | Bedding (°)                     | N/A                              |
| Mode of Failure               | Axial Splitting | Test Apparatus                  | Avery 2600kN Compression Machine |
| Rupture Angle (°)             | N/A             |                                 |                                  |

**UCS (MPa)      2.09**

### Before and After Photo's

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>        |
| <b>LAB SAMPLE No.</b> | 19110017                 | <b>DATE:</b> 28/11/19     |
| <b>BOREHOLE:</b>      | DW7293GT014              | <b>DEPTH:</b> 46.36-46.74 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>AFTER TEST</b>         |
| <b>LAB SAMPLE No.</b> | 19110017                 | <b>DATE:</b> 28/11/19     |
| <b>BOREHOLE:</b>      | DW7293GT014              | <b>DEPTH:</b> 46.36-46.74 |



#### NOTES/REMARKS:

Stored and tested as received  
 Sample/s supplied by the client

Photo's not to scale

Page: 1 of 1    REP13302

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110020-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 29/11/2019    |
| <b>Client ID</b>   | DW7293GT026                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 54.5 MPa**

### Young's Modulus

Tangent 34.7 GPa

Secant 38.0 GPa

### Poisson Ratio

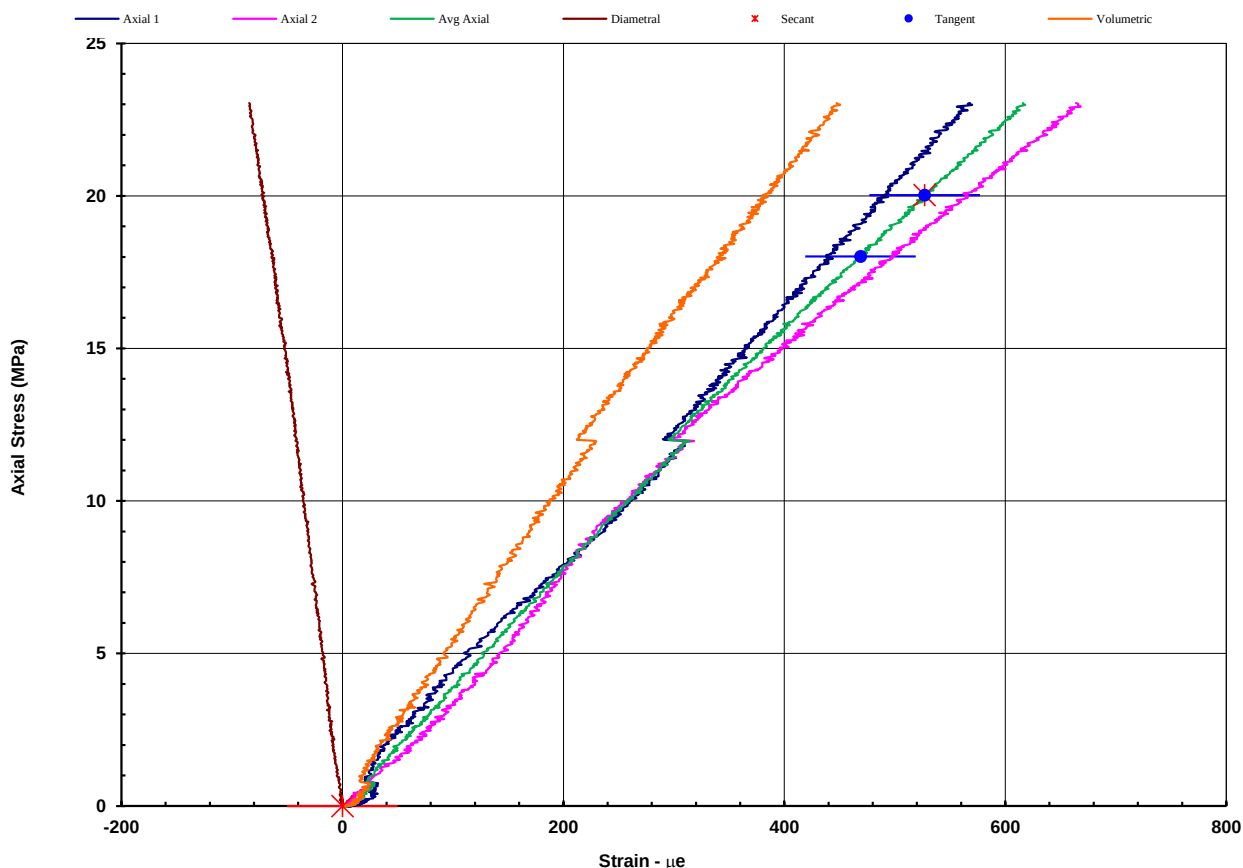
0.139

0.139

from 33 % to 37 % of Max UCS

from 0 % to 37 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

**Client** Geotek Solutions Pty Ltd

**Report No.** P19110020-MOD

|                              |         |                                 |                        |
|------------------------------|---------|---------------------------------|------------------------|
| Average Sample Diameter (mm) | 61.0    | Moisture Content (%)            | 1.3                    |
| Sample Height (mm)           | 174.8   | Wet Density (t/m <sup>3</sup> ) | 2.64                   |
| Duration of Test (min)       | 11.40   | Dry Density (t/m <sup>3</sup> ) | 2.61                   |
| Rate of Loading (MPa/min)    | 4.78    | Bedding (°)                     | N/A                    |
| Mode of Failure              | Conical | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd | <b>BEFORE TEST</b>        |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110020                 | <b>DATE:</b> 29.11.19     |
| <b>BOREHOLE:</b>      | DW7293GT026              | <b>DEPTH:</b> 75.80-76.07 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd | <b>AFTER TEST</b>         |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110020                 | <b>DATE:</b>              |
| <b>BOREHOLE:</b>      | DW7293GT026              | <b>DEPTH:</b> 75.80-76.07 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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Page 2 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                                               |                                      |                      |               |
|-----------------------------------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>                                 | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110026-MOD |
| <b>Address</b>                                | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>                                | RFA Dingo West Project               | <b>Test Date</b>     | 26/11/2019    |
| <b>Client ID</b>                              | DW7293GT047                          | <b>Report Date</b>   | 27/11/2019    |
| <b>Description</b>                            | Sandstone 100%                       |                      |               |
| <b>Sample Type</b>                            | Single Individual Rock Core Specimen |                      |               |
| <b>Uniaxial Compressive Strength 51.9 MPa</b> |                                      |                      |               |

### Young's Modulus

Tangent 21.9 GPa

Secant 24.2 GPa

### Poisson Ratio

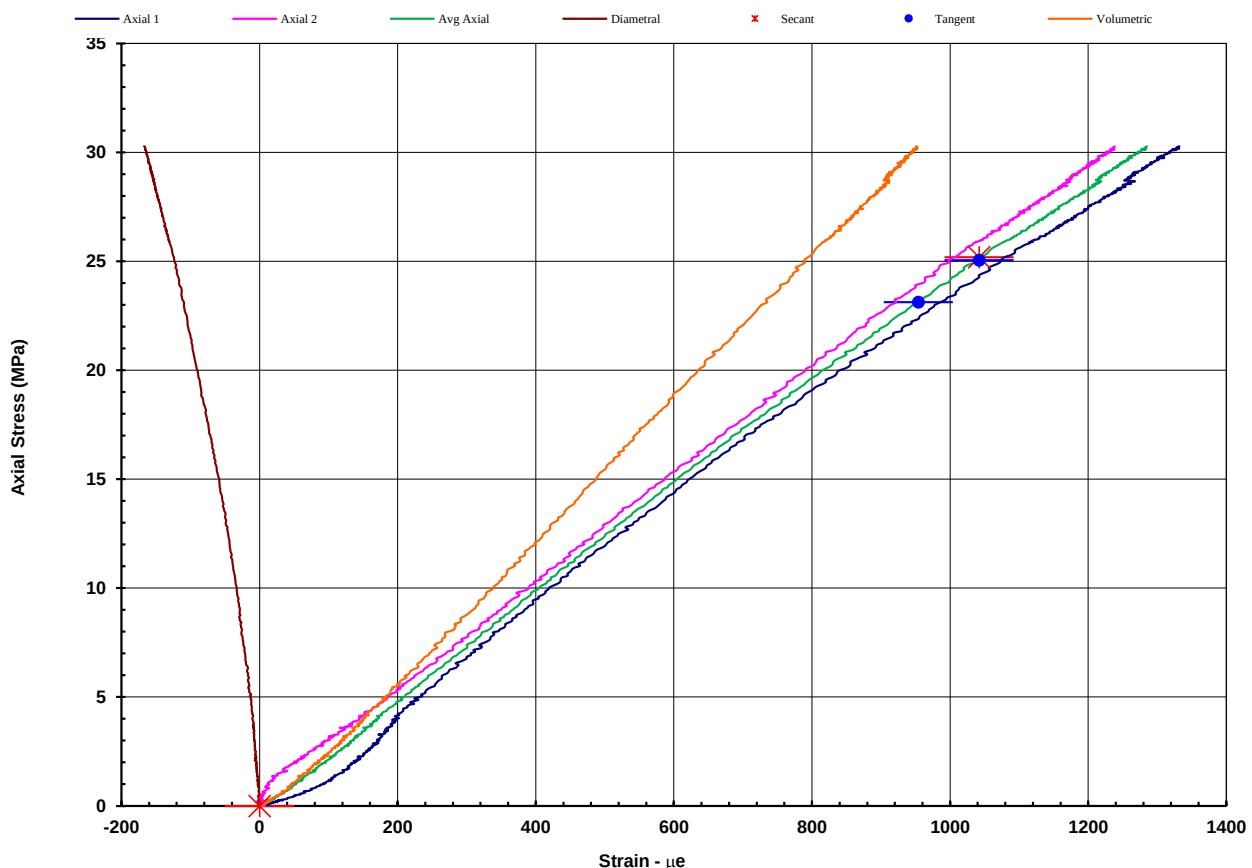
0.119

0.119

from 44 % to 48 % of Max UCS

from 0 % to 48 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

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Trilab Pty Ltd

ABN 25 065 630 506

**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

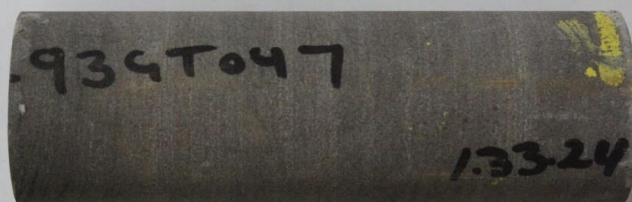


## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110026-MOD          |
| Average Sample Diameter (mm) | 60.9                     | Moisture Content (%)            | 1.6                    |
| Sample Height (mm)           | 174.4                    | Wet Density (t/m <sup>3</sup> ) | 2.67                   |
| Duration of Test (min)       | 7.57                     | Dry Density (t/m <sup>3</sup> ) | 2.62                   |
| Rate of Loading (MPa/min)    | 6.86                     | Bedding (°)                     | 25                     |
| Mode of Failure              | Conical                  | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                             |
|-----------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd    |
| <b>PROJECT:</b>       | RFA Dingo West Project      |
| <b>LAB SAMPLE No.</b> | 19110026                    |
| <b>BOREHOLE:</b>      | DW7293GT047                 |
| <b>BEFORE TEST</b>    | <b>DATE:</b> 27-11-19       |
|                       | <b>DEPTH:</b> 133.03-133.34 |



|                       |                             |
|-----------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd    |
| <b>PROJECT:</b>       | RFA Dingo West Project      |
| <b>LAB SAMPLE No.</b> | 19110026                    |
| <b>BOREHOLE:</b>      | DW7293GT047                 |
| <b>AFTER TEST</b>     | <b>DATE:</b> 27-11-19       |
|                       | <b>DEPTH:</b> 133.03-133.34 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 2 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110027-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 27/11/2019    |
| <b>Client ID</b>   | DW7293GT055                          | <b>Report Date</b>   | 28/11/2019    |
| <b>Description</b> | Sandstone 90% Siltstone 10%          |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 47.3 MPa**

### Young's Modulus

Tangent 18.1 GPa

Secant 19.8 GPa

### Poisson Ratio

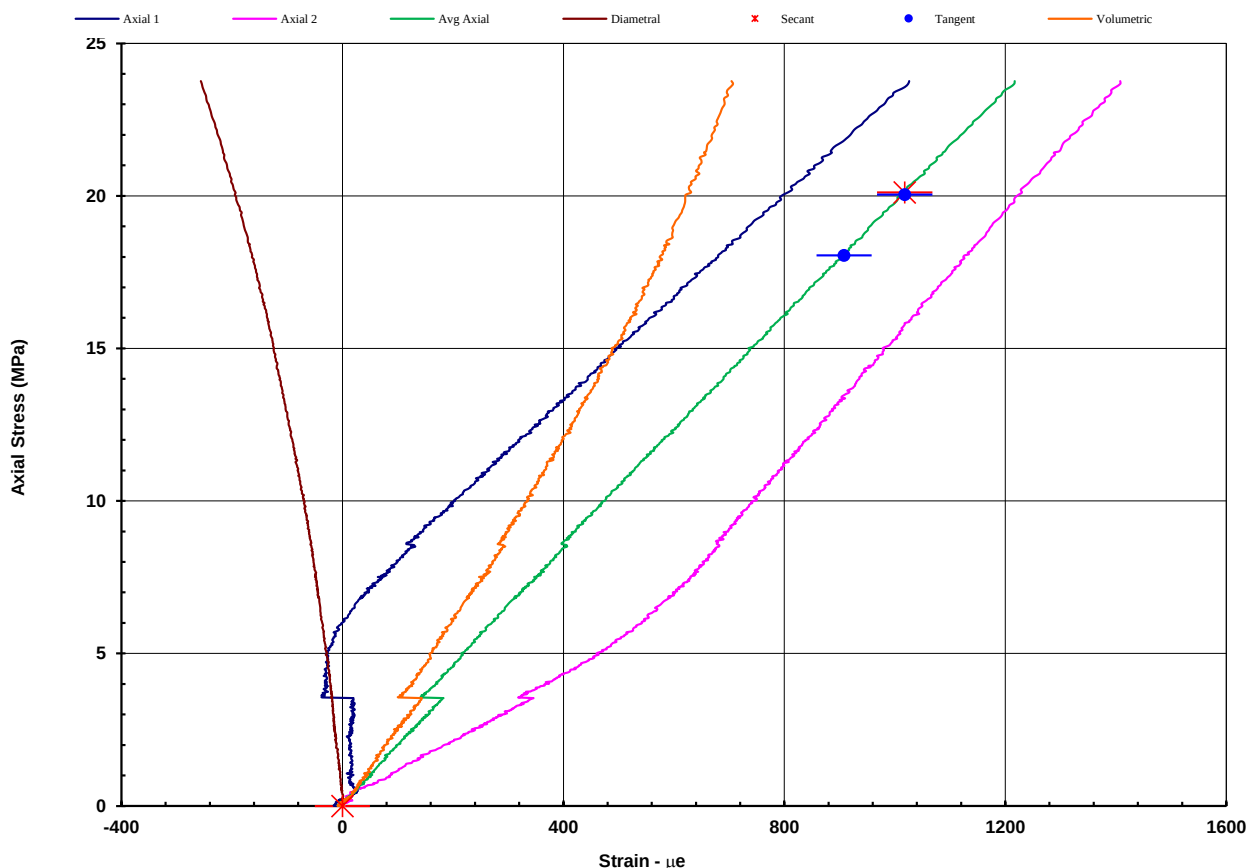
0.190

0.191

from 38 % to 42 % of Max UCS

from 0 % to 42 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110027-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 1.7                    |
| Sample Height (mm)           | 172.3                    | Wet Density (t/m <sup>3</sup> ) | 2.61                   |
| Duration of Test (min)       | 8.05                     | Dry Density (t/m <sup>3</sup> ) | 2.56                   |
| Rate of Loading (MPa/min)    | 5.87                     | Bedding (°)                     | N/A                    |
| Mode of Failure              | Shear                    | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>          |
| <b>LAB SAMPLE No.</b> | 19110027                 | <b>DATE:</b> 27-11-17       |
| <b>BOREHOLE:</b>      | DW7293GT055              | <b>DEPTH:</b> 151.06-151.37 |



|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>AFTER TEST</b>           |
| <b>LAB SAMPLE No.</b> | 19110027                 | <b>DATE:</b> 27-11-17       |
| <b>BOREHOLE:</b>      | DW7293GT055              | <b>DEPTH:</b> 151.06-151.37 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110028-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 26/11/2019    |
| <b>Client ID</b>   | DW7293GT060                          | <b>Report Date</b>   | 27/11/2019    |
| <b>Description</b> | Siltstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 31.8 MPa**

### Young's Modulus

Tangent 11.8 GPa

Secant 11.6 GPa

### Poisson Ratio

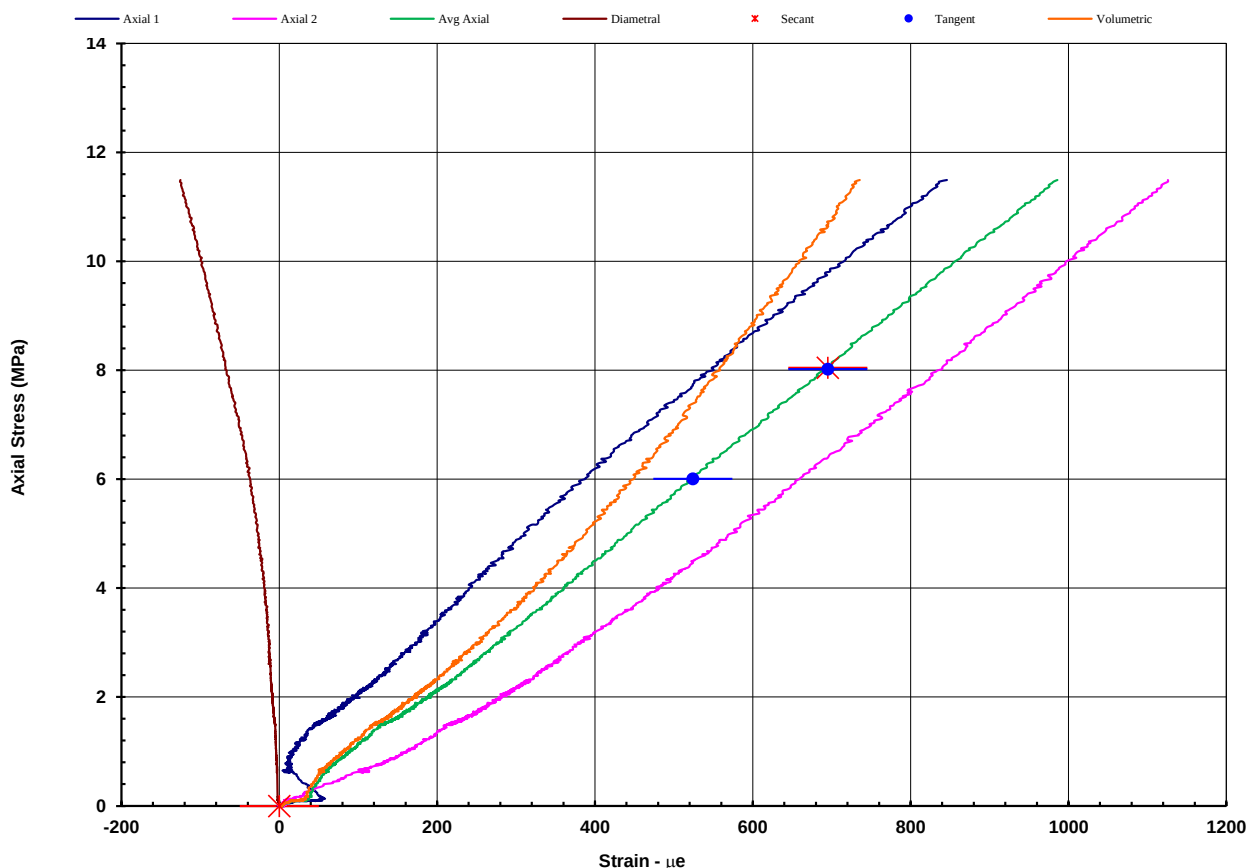
0.098

0.099

from 19 % to 25 % of Max UCS

from 0 % to 25 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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Page 1 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110028-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 2.6                    |
| Sample Height (mm)           | 175.2                    | Wet Density (t/m <sup>3</sup> ) | 2.57                   |
| Duration of Test (min)       | 13.70                    | Dry Density (t/m <sup>3</sup> ) | 2.51                   |
| Rate of Loading (MPa/min)    | 2.32                     | Bedding (°)                     | 2                      |
| Mode of Failure              | Axial Splitting          | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110028                 |
| <b>BOREHOLE:</b>      | DW7293GT060              |
| <b>DATE:</b>          | 26-11-19                 |
| <b>DEPTH:</b>         | 166.62-166.95            |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110028                 |
| <b>BOREHOLE:</b>      | DW7293GT060              |
| <b>DATE:</b>          | 26-11-19                 |
| <b>DEPTH:</b>         | 166.62-166.95            |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110029-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 22/11/2019    |
| <b>Client ID</b>   | DW7293GT069                          | <b>Report Date</b>   | 25/11/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 19.8 MPa**

### Young's Modulus

Tangent 14.9 GPa

Secant 16.6 GPa

### Poisson Ratio

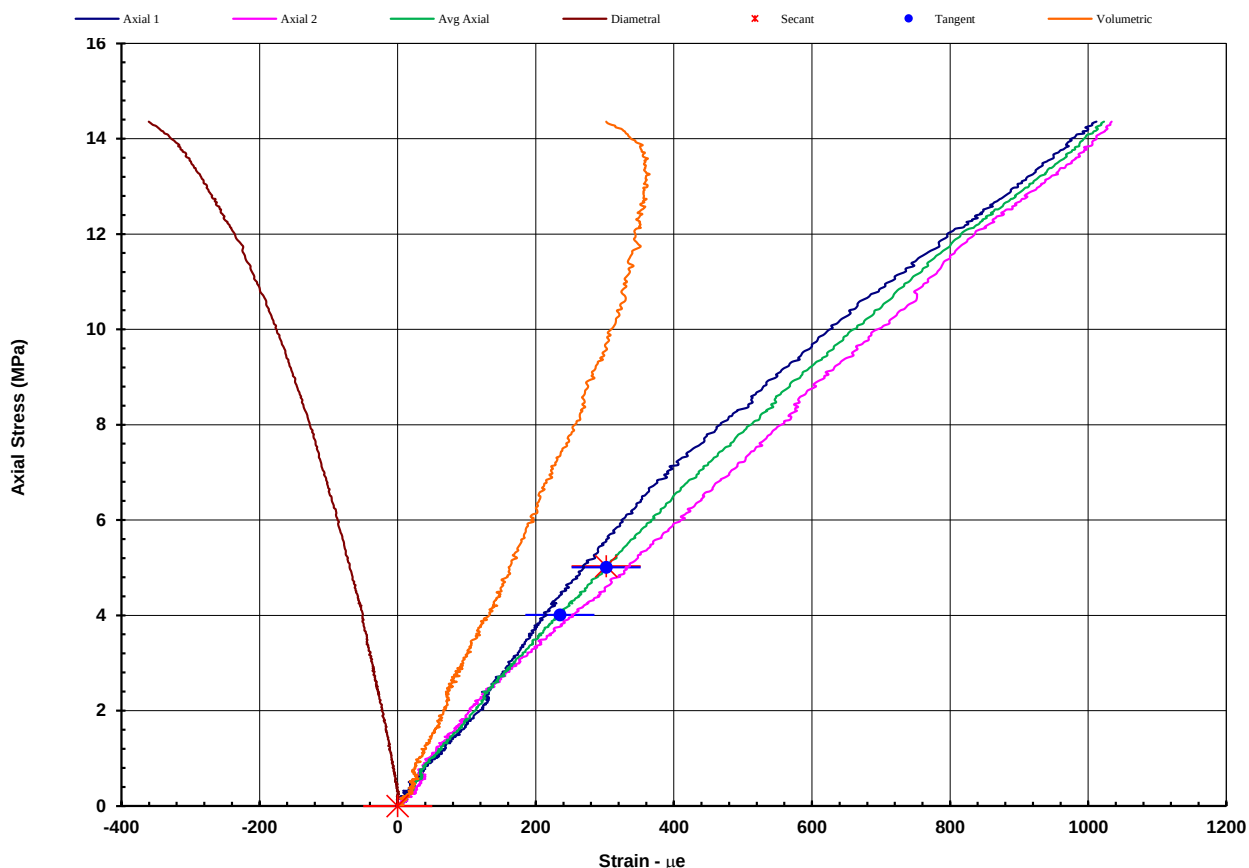
0.231

0.231

from 20 % to 25 % of Max UCS

from 0 % to 25 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

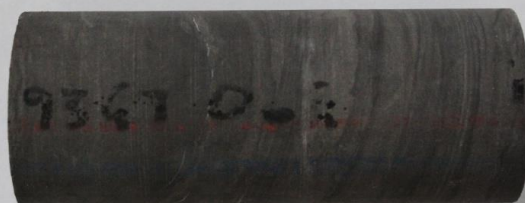


## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

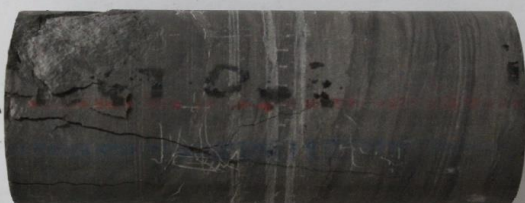
Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110029-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 3.2                    |
| Sample Height (mm)           | 170.2                    | Wet Density (t/m <sup>3</sup> ) | 2.58                   |
| Duration of Test (min)       | 6.60                     | Dry Density (t/m <sup>3</sup> ) | 2.50                   |
| Rate of Loading (MPa/min)    | 3.00                     | Bedding (°)                     | 10                     |
| Mode of Failure              | Axial Splitting          | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110029                 |
| <b>BOREHOLE:</b>      | DW7293GT069              |
| <b>BEFORE TEST</b>    |                          |
| <b>DATE:</b>          | 22-11-19                 |
| <b>DEPTH:</b>         | 191.47-191.76            |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110029                 |
| <b>BOREHOLE:</b>      | DW7293GT069              |
| <b>AFTER TEST</b>     |                          |
| <b>DATE:</b>          | 22-11-19                 |
| <b>DEPTH:</b>         | 191.47-191.76            |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

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ABN 25 065 630 506

**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## SLAKING & DISPERSION POTENTIALS TEST REPORT

Test Method: As supplied

|                |                             |                      |               |
|----------------|-----------------------------|----------------------|---------------|
| <b>Client</b>  | Geotek Solutions Pty Ltd    | <b>Report No.</b>    | P19110031-SDP |
|                |                             | <b>Workorder No.</b> | 0020111       |
| <b>Address</b> | PO Box 1404 Milton QLD 4064 | <b>Test Date</b>     | 28/11/2019    |
|                |                             | <b>Report Date</b>   | 06/12/2019    |
| <b>Project</b> | RFA Dingo West Project      |                      |               |

|                       |            |          |        |         |          |
|-----------------------|------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110031   |          |        |         |          |
| <b>Client ID</b>      | DW7294GT03 |          |        |         |          |
| <b>Depth (m)</b>      | 5.75-6.05  |          |        |         |          |
| <b>Description</b>    | -          |          |        |         |          |
| <b>Time</b>           | 1 (min)    | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | C12        | C22      | C23    | C23     | E23      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110032    |          |        |         |          |
| <b>Client ID</b>      | DW7294GT06  |          |        |         |          |
| <b>Depth (m)</b>      | 11.35-11.65 |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | C11      | C21    | D22     | E23      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110040    |          |        |         |          |
| <b>Client ID</b>      | DW7295GT001 |          |        |         |          |
| <b>Depth (m)</b>      | 2.72-3.02   |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | B11      | C12    | D12     | E12      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110041    |          |        |         |          |
| <b>Client ID</b>      | DW7295GT003 |          |        |         |          |
| <b>Depth (m)</b>      | 8.83-9.13   |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | C12         | C22      | D22    | D22     | E32      |

**NOTES/REMARKS:** Tested as received with distilled water

Sample/s supplied by the client

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Authorised Signatory

  
 G. Creely

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110033-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 28/11/2019    |
| <b>Client ID</b>   | DW7294GT011                          | <b>Report Date</b>  | 29/11/2019    |
| <b>Description</b> | Clay 100%                            |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 0.385 MPa**

### Young's Modulus

Tangent 0.011 GPa

Secant 0.017 GPa

### Poisson Ratio

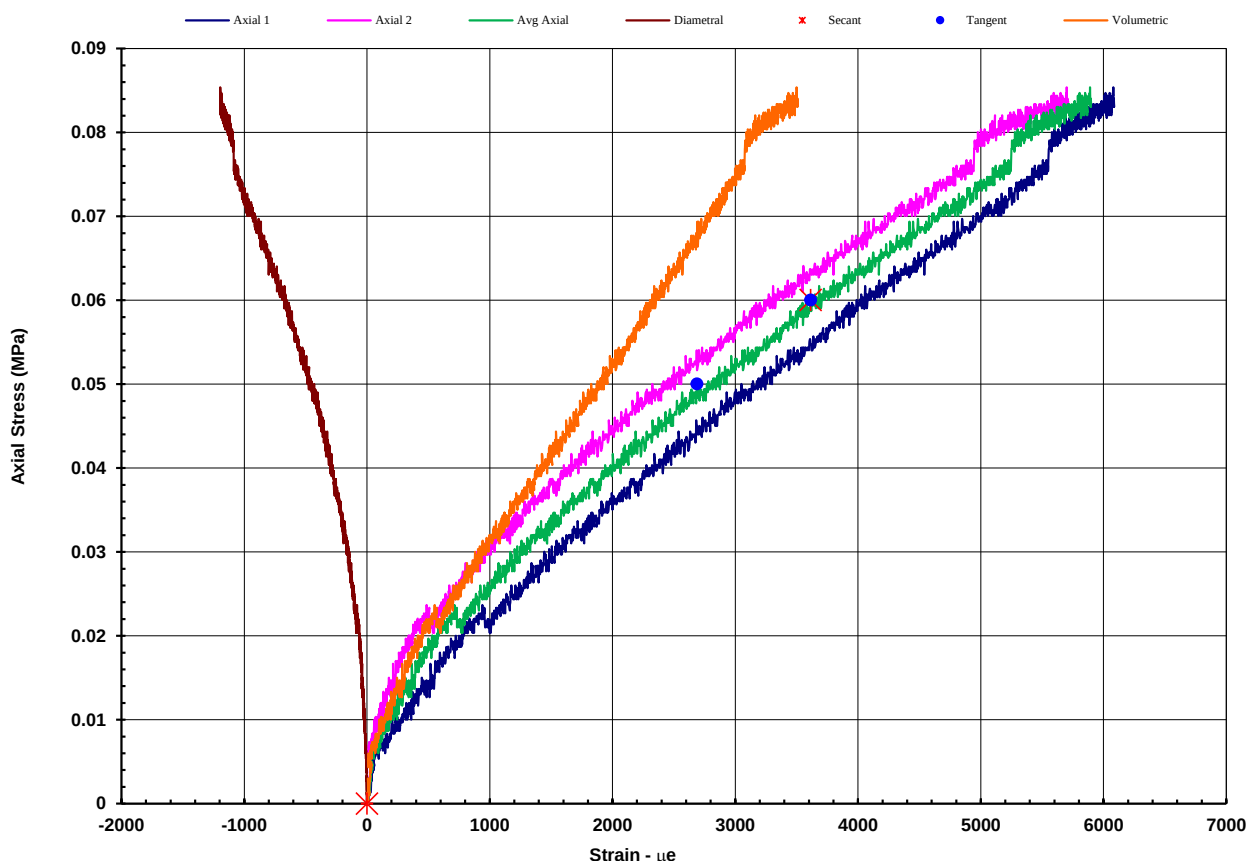
0.181

0.181

from 13 % to 16 % of Max UCS

from 0 % to 16 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

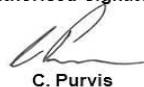
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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

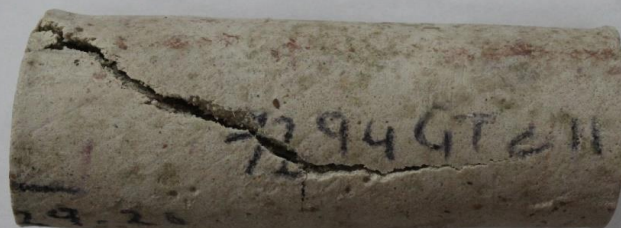
Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                               |                          |                                 |                           |
|-------------------------------|--------------------------|---------------------------------|---------------------------|
| <b>Client</b>                 | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110033-MOD             |
| Average Sample Diameter (mm)  | 61.8                     | Moisture Content (%)            | 10.0                      |
| Sample Height (mm)            | 174.9                    | Wet Density (t/m <sup>3</sup> ) | 2.25                      |
| Duration of Test (min)        | 62.30                    | Dry Density (t/m <sup>3</sup> ) | 2.04                      |
| Rate of Displacement (mm/min) | 0.10                     | Bedding (°)                     | N/A                       |
| Mode of Failure               | Conical                  | Test Apparatus                  | 100kN Compression Machine |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110033                 |
| <b>BOREHOLE:</b>      | DW7294GT011              |
| <b>DATE:</b>          |                          |
| <b>DEPTH:</b>         | 29.25-29.56              |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110033                 |
| <b>BOREHOLE:</b>      | DW7294GT011              |
| <b>DATE:</b>          | 28-11-19                 |
| <b>DEPTH:</b>         | 29.25-29.56              |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110034-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 29/11/2013    |
| <b>Client ID</b>   | DW7294GT015                          | <b>Report Date</b>  | 03/12/2019    |
| <b>Description</b> | Mudstone 100%                        |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 0.412 MPa**

### Young's Modulus

Tangent 0.045 GPa

Secant 0.072 GPa

### Poisson Ratio

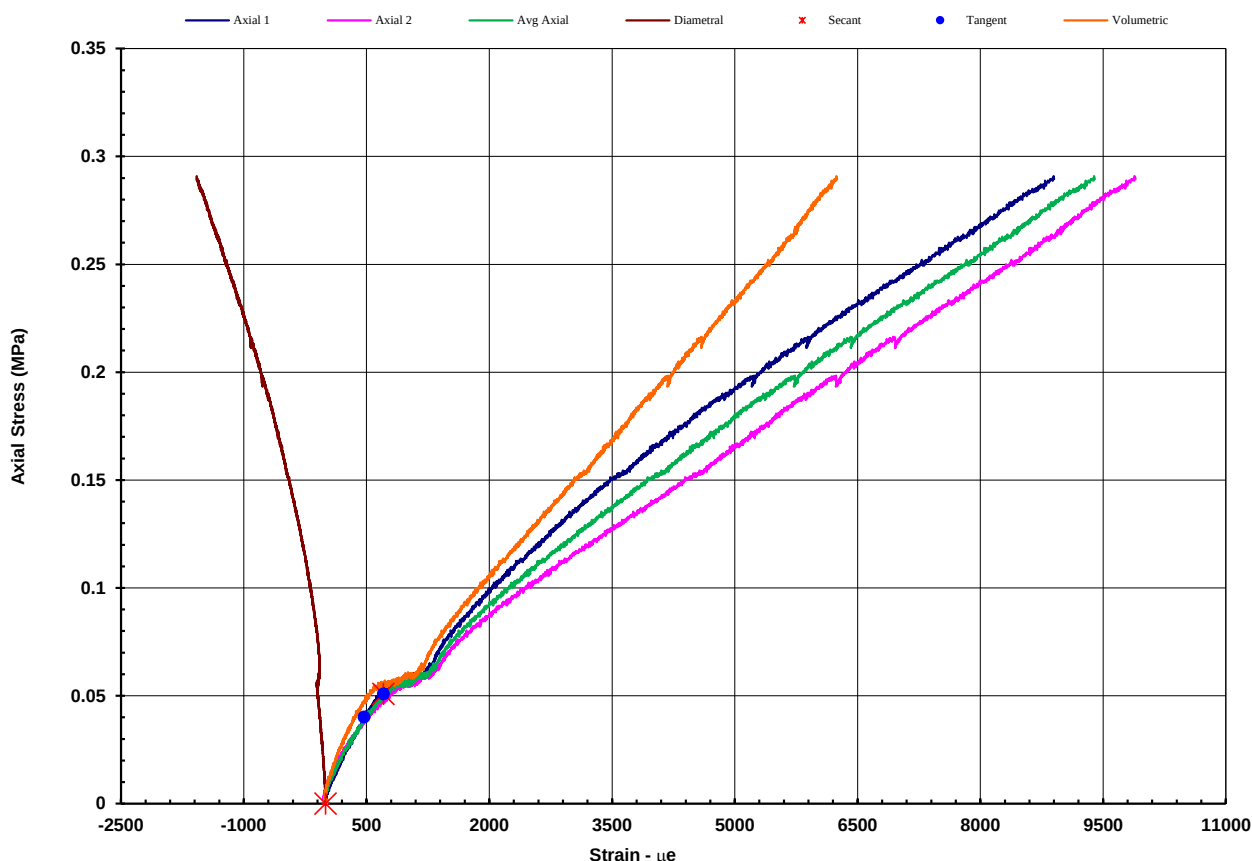
0.137

0.137

from 10 % to 12 % of Max UCS

from 0 % to 12 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

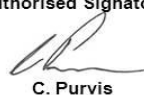
Tested as received.

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Authorised Signatory

  
C. Purvis



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ABN 25 065 630 506

**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                               |                          |                                 |                           |
|-------------------------------|--------------------------|---------------------------------|---------------------------|
| <b>Client</b>                 | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110034-MOD             |
| Average Sample Diameter (mm)  | 60.6                     | Moisture Content (%)            | 23.7                      |
| Sample Height (mm)            | 172.3                    | Wet Density (t/m <sup>3</sup> ) | 2.04                      |
| Duration of Test (min)        | 46.87                    | Dry Density (t/m <sup>3</sup> ) | 1.65                      |
| Rate of Displacement (mm/min) | 0.10                     | Bedding (°)                     | 15                        |
| Mode of Failure               | Conical                  | Test Apparatus                  | 100kN Compression Machine |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd | <b>BEFORE TEST</b>        |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110034                 |                           |
| <b>BOREHOLE:</b>      | DW7294GT015              |                           |
|                       |                          | <b>DATE:</b> 29.11.19     |
|                       |                          | <b>DEPTH:</b> 38.62-38.92 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd | <b>AFTER TEST</b>         |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110034                 |                           |
| <b>BOREHOLE:</b>      | DW7294GT015              |                           |
|                       |                          | <b>DATE:</b> 29.11.19     |
|                       |                          | <b>DEPTH:</b> 38.62-38.92 |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110035-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 29/11/2019    |
| <b>Client ID</b>   | DW7294GT019                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 10.4 MPa**

### Young's Modulus

Tangent 1.23 GPa

Secant 1.24 GPa

### Poisson Ratio

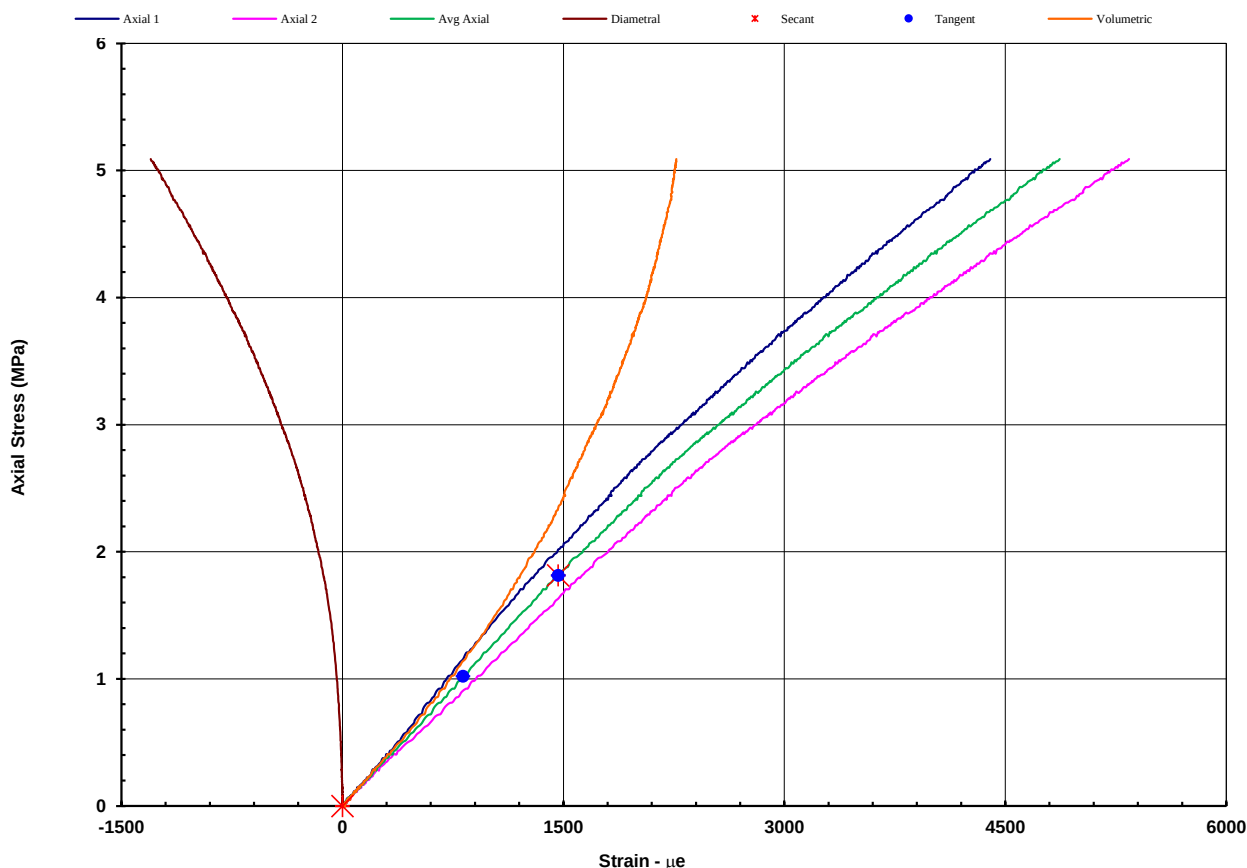
0.088

0.088

from 10 % to 17 % of Max UCS

from 0 % to 17 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                                        |               |                                 |                        |
|----------------------------------------|---------------|---------------------------------|------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |               | <b>Report No.</b> P19110035-MOD |                        |
| Average Sample Diameter (mm)           | 61.2          | Moisture Content (%)            | 4.2                    |
| Sample Height (mm)                     | 174.4         | Wet Density (t/m <sup>3</sup> ) | 2.53                   |
| Duration of Test (min)                 | 8.68          | Dry Density (t/m <sup>3</sup> ) | 2.43                   |
| Rate of Loading (MPa/min)              | 1.19          | Bedding (°)                     | 5                      |
| Mode of Failure                        | End Splitting | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110035                 | <b>BEFORE TEST</b>        |
| <b>BOREHOLE:</b>      | DW7294GT019              | <b>DATE:</b> 27.11.19     |
|                       |                          | <b>DEPTH:</b> 53.57-53.90 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110035                 | <b>AFTER TEST</b>         |
| <b>BOREHOLE:</b>      | DW7294GT019              | <b>DATE:</b> 27.11.19     |
|                       |                          | <b>DEPTH:</b> 53.57-53.90 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110038-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 26/11/2019    |
| <b>Client ID</b>   | DW7294GT026                          | <b>Report Date</b>   | 27/11/2019    |
| <b>Description</b> | Siltstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 12.8 MPa**

### Young's Modulus

Tangent 2.84 GPa

Secant 3.04 GPa

### Poisson Ratio

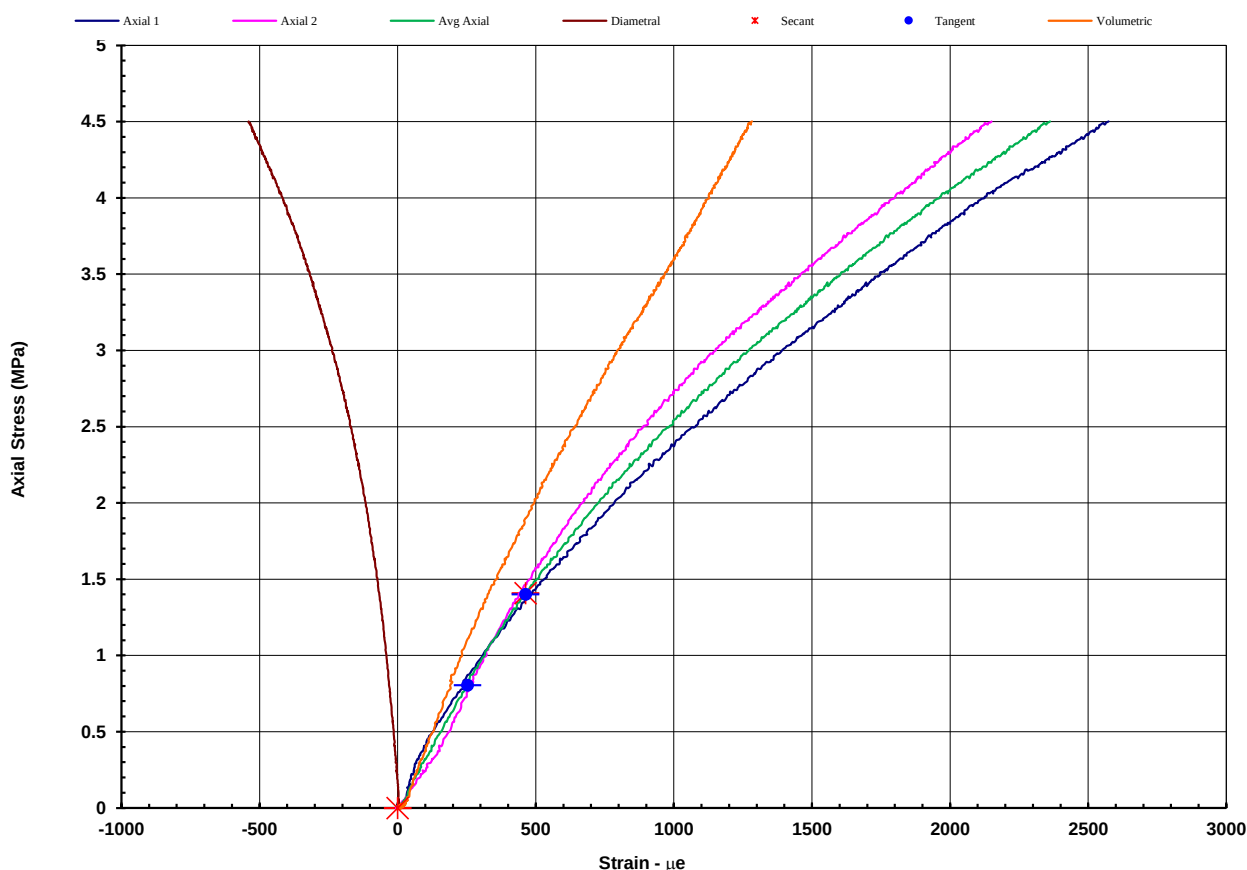
0.144

0.144

from 6 % to 11 % of Max UCS

from 0 % to 11 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110038-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 4.9                    |
| Sample Height (mm)           | 173.7                    | Wet Density (t/m <sup>3</sup> ) | 2.49                   |
| Duration of Test (min)       | 11.18                    | Dry Density (t/m <sup>3</sup> ) | 2.38                   |
| Rate of Loading (MPa/min)    | 1.15                     | Bedding (°)                     | 10                     |
| Mode of Failure              | Axial Splitting          | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110038                 |
| <b>BOREHOLE:</b>      | DW7294GT026              |
| <b>BEFORE TEST</b>    |                          |
| <b>DATE:</b>          | 26-11-19                 |
| <b>DEPTH:</b>         | 64.52-64.83              |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110038                 |
| <b>BOREHOLE:</b>      | DW7294GT026              |
| <b>AFTER TEST</b>     |                          |
| <b>DATE:</b>          | 26-11-19                 |
| <b>DEPTH:</b>         | 64.52-64.83              |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110039-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 21/11/2019    |
| <b>Client ID</b>   | DW7294GT031                          | <b>Report Date</b>   | 22/11/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 19.1 MPa**

### Young's Modulus

Tangent 7.71 GPa

Secant 8.55 GPa

### Poisson Ratio

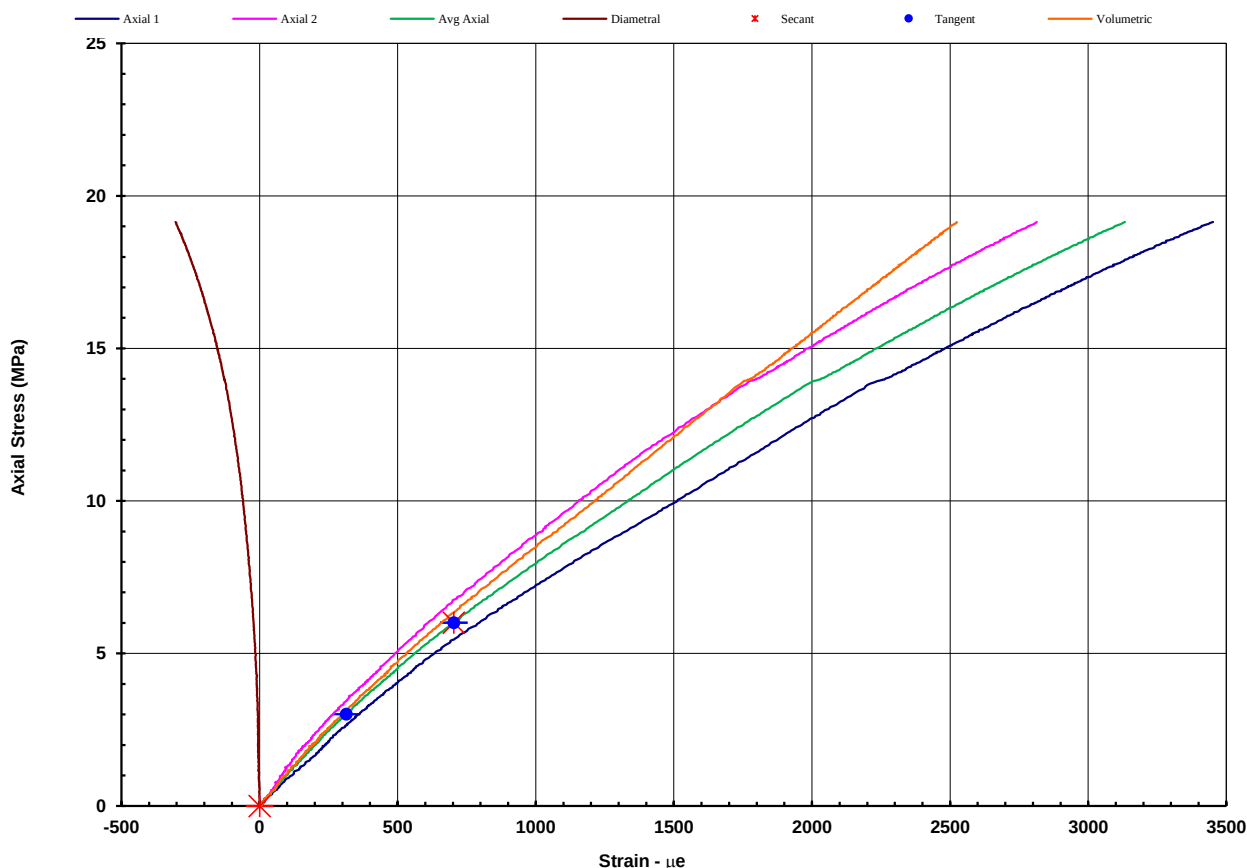
0.031

0.031

from 16 % to 31 % of Max UCS

from 0 % to 31 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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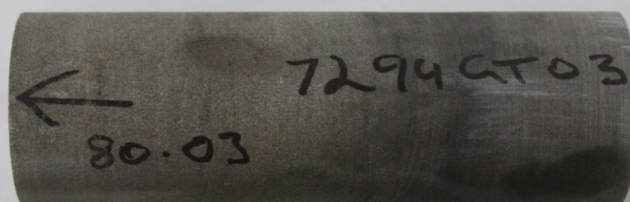
**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

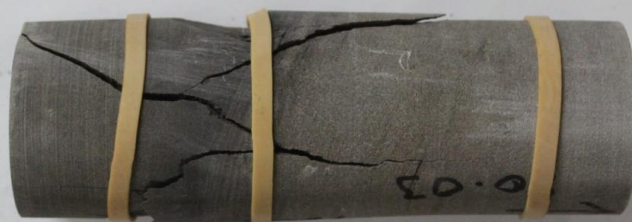
Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110039-MOD          |
| Average Sample Diameter (mm) | 61.1                     | Moisture Content (%)            | 2.3                    |
| Sample Height (mm)           | 173.9                    | Wet Density (t/m <sup>3</sup> ) | 2.66                   |
| Duration of Test (min)       | 5.27                     | Dry Density (t/m <sup>3</sup> ) | 2.60                   |
| Rate of Loading (MPa/min)    | 3.63                     | Bedding (°)                     | 20                     |
| Mode of Failure              | Conical                  | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                           |
|-----------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd  |
| <b>PROJECT:</b>       | RFA Dingo West Project    |
| <b>LAB SAMPLE No.</b> | 19110039                  |
| <b>BOREHOLE:</b>      | DW7294GT031               |
| <b>BEFORE TEST</b>    | <b>DATE:</b> 21-11-19     |
|                       | <b>DEPTH:</b> 80.09-80.41 |



|                       |                           |
|-----------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd  |
| <b>PROJECT:</b>       | RFA Dingo West Project    |
| <b>LAB SAMPLE No.</b> | 19110039                  |
| <b>BOREHOLE:</b>      | DW7294GT031               |
| <b>AFTER TEST</b>     | <b>DATE:</b> 21-11-19     |
|                       | <b>DEPTH:</b> 80.09-80.41 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## SLAKING & DISPERSION POTENTIALS TEST REPORT

Test Method: As supplied

|                |                             |                      |               |
|----------------|-----------------------------|----------------------|---------------|
| <b>Client</b>  | Geotek Solutions Pty Ltd    | <b>Report No.</b>    | P19110042-SDP |
| <b>Address</b> | PO Box 1404 Milton QLD 4064 | <b>Workorder No.</b> | 0020111       |
| <b>Project</b> | RFA Dingo West Project      | <b>Test Date</b>     | 28/11/2019    |
|                |                             | <b>Report Date</b>   | 06/12/2019    |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110042    |          |        |         |          |
| <b>Client ID</b>      | DW7295GT005 |          |        |         |          |
| <b>Depth (m)</b>      | 14.85-15.15 |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | B11         | B11      | C21    | C21     | E21      |

|                       |             |          |        |         |          |
|-----------------------|-------------|----------|--------|---------|----------|
| <b>Sample No.</b>     | 19110043    |          |        |         |          |
| <b>Client ID</b>      | DW7295GT007 |          |        |         |          |
| <b>Depth (m)</b>      | 22.94-23.24 |          |        |         |          |
| <b>Description</b>    | -           |          |        |         |          |
| <b>Time</b>           | 1 (min)     | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> | A11         | B11      | B11    | B11     | B11      |

|                       |         |          |        |         |          |
|-----------------------|---------|----------|--------|---------|----------|
| <b>Sample No.</b>     |         |          |        |         |          |
| <b>Client ID</b>      |         |          |        |         |          |
| <b>Depth (m)</b>      |         |          |        |         |          |
| <b>Description</b>    |         |          |        |         |          |
| <b>Time</b>           | 1 (min) | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> |         |          |        |         |          |

|                       |         |          |        |         |          |
|-----------------------|---------|----------|--------|---------|----------|
| <b>Sample No.</b>     |         |          |        |         |          |
| <b>Client ID</b>      |         |          |        |         |          |
| <b>Depth (m)</b>      |         |          |        |         |          |
| <b>Description</b>    |         |          |        |         |          |
| <b>Time</b>           | 1 (min) | 10 (min) | 1 (Hr) | 5 (Hrs) | 24 (Hrs) |
| <b>Condition Code</b> |         |          |        |         |          |

**NOTES/REMARKS:** Tested as received with distilled water

Sample/s supplied by the client

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 G. Creely

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110045-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 29/11/2019    |
| <b>Client ID</b>   | DW7295GT012                          | <b>Report Date</b>  | 03/12/2019    |
| <b>Description</b> | Siltstone 100%                       |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 0.316 MPa**

### Young's Modulus

Tangent 0.020 GPa

Secant 0.021 GPa

### Poisson Ratio

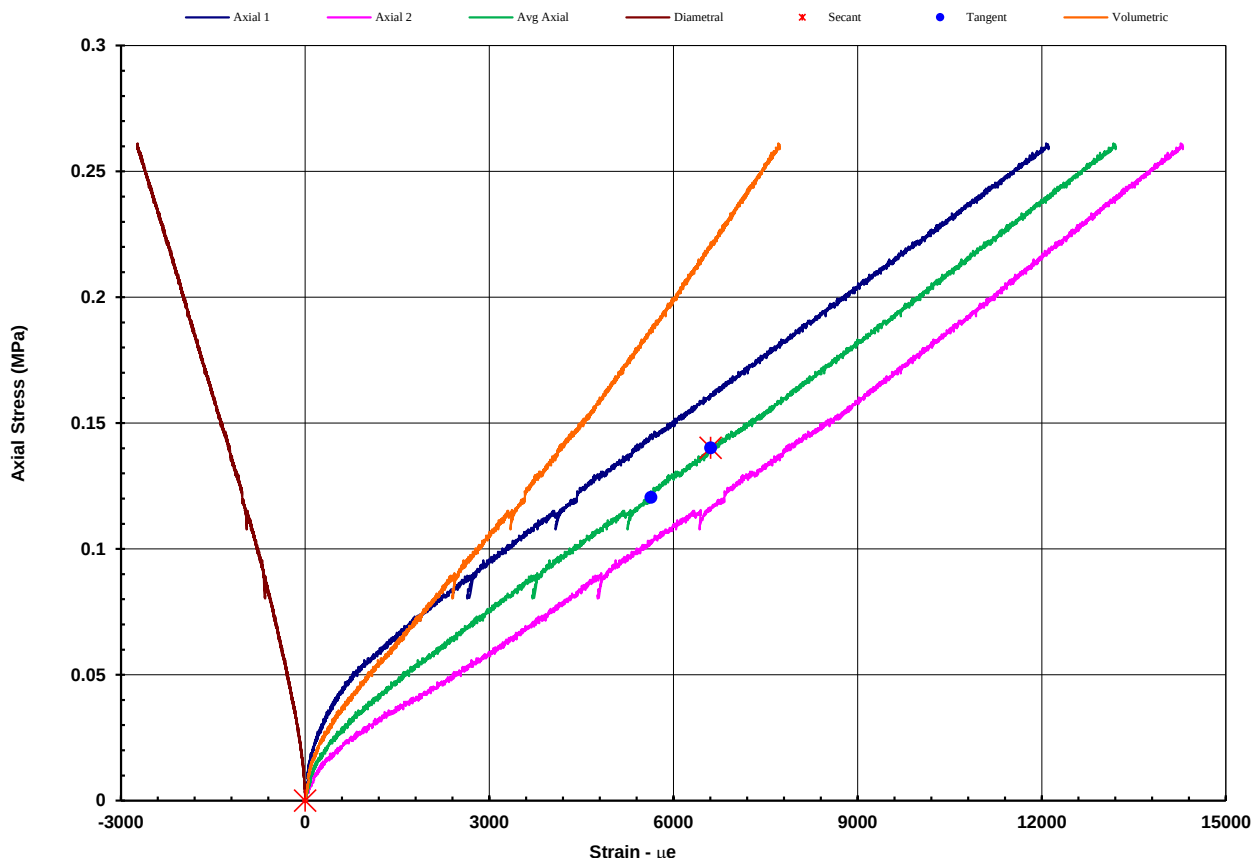
0.187

0.187

from 38 % to 44 % of Max UCS

from 0 % to 44 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

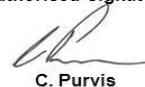
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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                                        |         |                                 |                           |
|----------------------------------------|---------|---------------------------------|---------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |         | <b>Report No.</b> P19110045-MOD |                           |
| Average Sample Diameter (mm)           | 61.3    | Moisture Content (%)            | 21.3                      |
| Sample Height (mm)                     | 156.9   | Wet Density (t/m <sup>3</sup> ) | 2.12                      |
| Duration of Test (min)                 | 45.42   | Dry Density (t/m <sup>3</sup> ) | 1.74                      |
| Rate of Displacement (mm/min)          | 0.10    | Bedding (°)                     | N/A                       |
| Mode of Failure                        | Conical | Test Apparatus                  | 100kN Compression Machine |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110048-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 02/12/2019    |
| <b>Client ID</b>   | DW7295GT024                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 11.7 MPa**

### Young's Modulus

Tangent 4.51 GPa

Secant 4.37 GPa

### Poisson Ratio

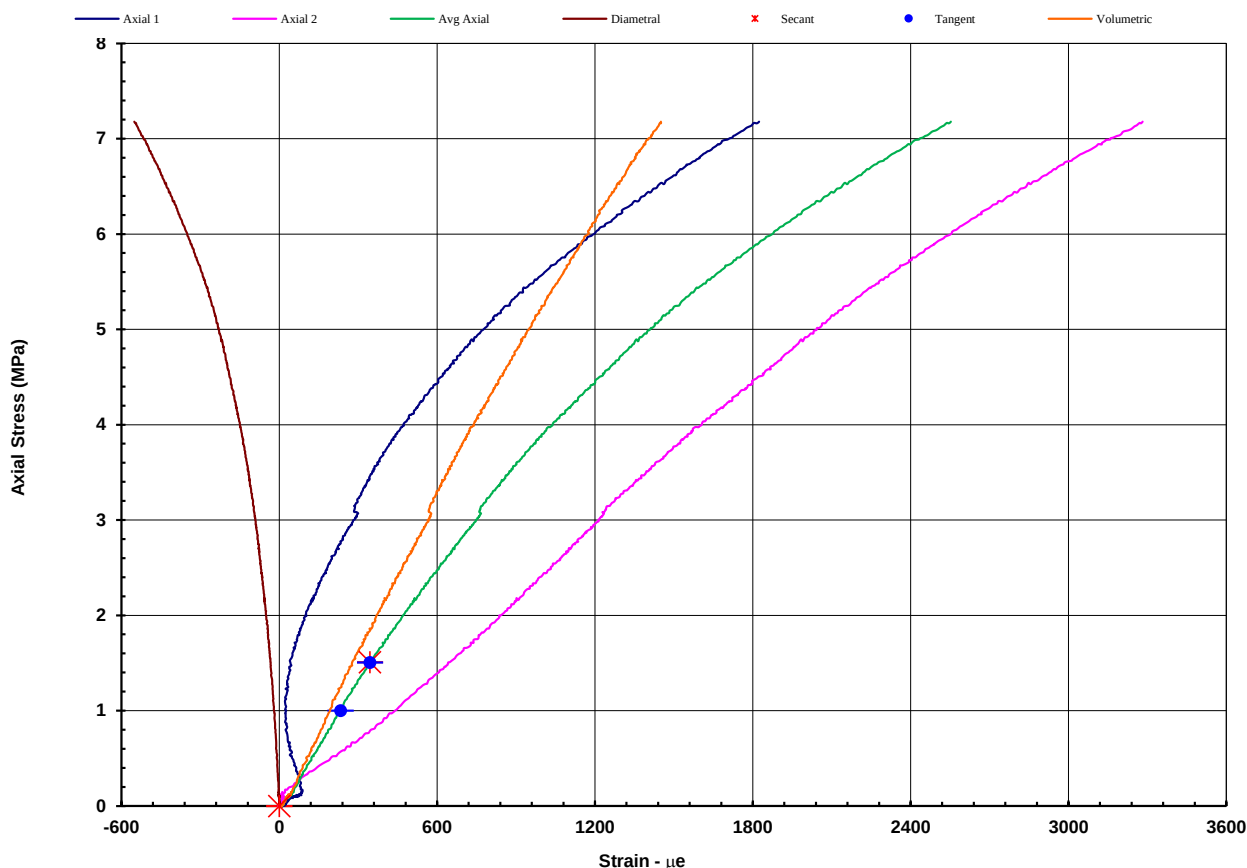
0.095

0.098

from 9 % to 13 % of Max UCS

from 0 % to 13 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP03603

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Authorised Signatory

  
C. Purvis



Laboratory No. 9926

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Trilab Pty Ltd

ABN 25 065 630 506

**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                                        |         |                                       |
|----------------------------------------|---------|---------------------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |         | <b>Report No.</b> P19110048-MOD       |
| Average Sample Diameter (mm)           | 61.1    | Moisture Content (%) 5.7              |
| Sample Height (mm)                     | 173.4   | Wet Density (t/m <sup>3</sup> ) 2.45  |
| Duration of Test (min)                 | 7.60    | Dry Density (t/m <sup>3</sup> ) 2.32  |
| Rate of Loading (MPa/min)              | 1.54    | Bedding (°) 10                        |
| Mode of Failure                        | Conical | Test Apparatus Kelba 1000kN Load Cell |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110048                 | <b>BEFORE TEST</b>        |
| <b>BOREHOLE:</b>      | DW7295GT024              | <b>DATE:</b> 2.12.19      |
|                       |                          | <b>DEPTH:</b> 71.10-71.60 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   |                           |
| <b>LAB SAMPLE No.</b> | 19110048                 | <b>AFTER TEST</b>         |
| <b>BOREHOLE:</b>      | DW7295GT024              | <b>DATE:</b> 2.12.19      |
|                       |                          | <b>DEPTH:</b> 71.10-71.60 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110061-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 02/12/2019    |
| <b>Client ID</b>   | DW7296GT031                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 25.1 MPa**

### Young's Modulus

Tangent 6.39 GPa

Secant 7.40 GPa

### Poisson Ratio

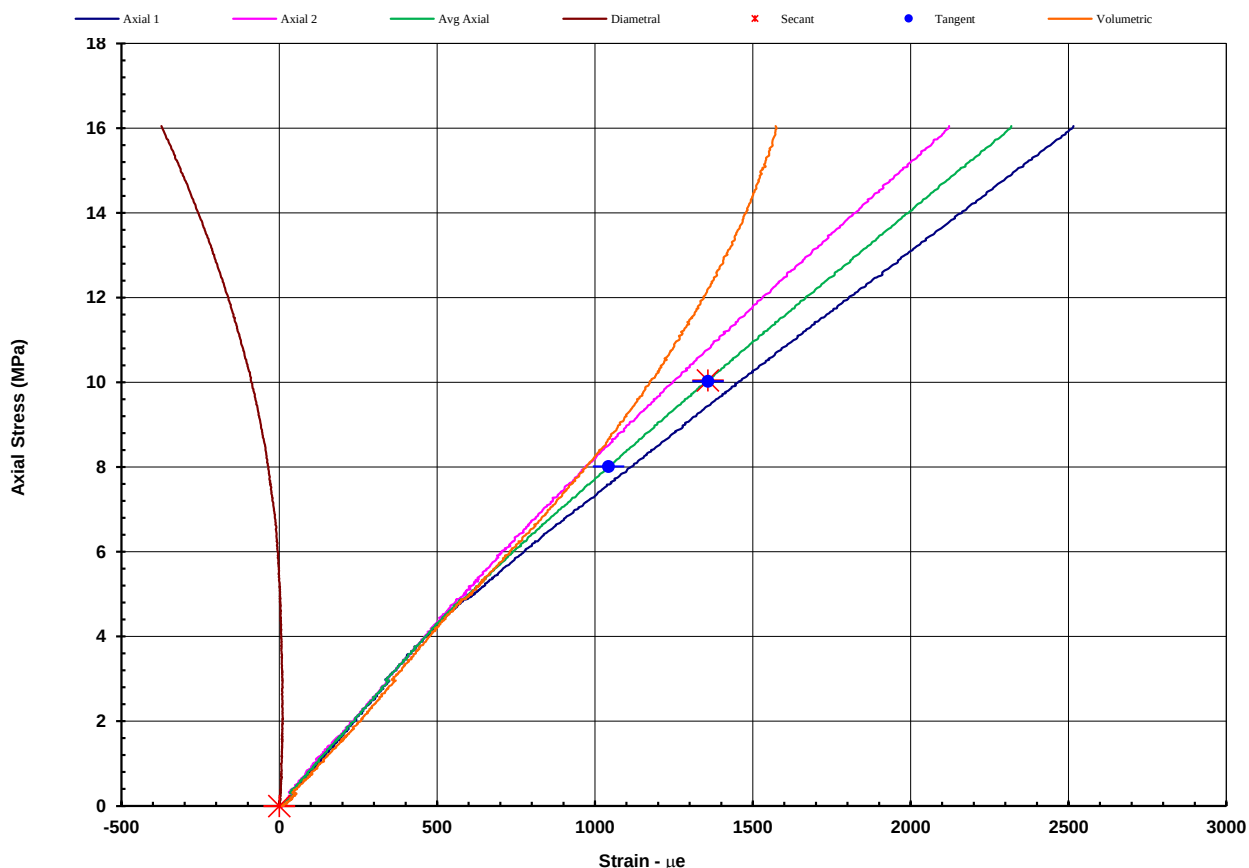
0.066

0.066

from 32 % to 40 % of Max UCS

from 0 % to 40 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                                        |       |                                 |                        |
|----------------------------------------|-------|---------------------------------|------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |       | <b>Report No.</b> P19110061-MOD |                        |
| Average Sample Diameter (mm)           | 61.0  | Moisture Content (%)            | 2.6                    |
| Sample Height (mm)                     | 157.2 | Wet Density (t/m <sup>3</sup> ) | 2.58                   |
| Duration of Test (min)                 | 9.33  | Dry Density (t/m <sup>3</sup> ) | 2.51                   |
| Rate of Loading (MPa/min)              | 2.69  | Bedding (°)                     | 30                     |
| Mode of Failure                        | Shear | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>        |
| <b>LAB SAMPLE No.</b> | 19110061                 | <b>DATE:</b> 2.12.19      |
| <b>BOREHOLE:</b>      | DW7296GT031              | <b>DEPTH:</b> 92.03-92.35 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>AFTER TEST</b>         |
| <b>LAB SAMPLE No.</b> | 19110061                 | <b>DATE:</b> 2.12.19      |
| <b>BOREHOLE:</b>      | DW7296GT031              | <b>DEPTH:</b> 92.03-92.35 |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110066-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 26/11/2019    |
| <b>Client ID</b>   | DW7296GT053                          | <b>Report Date</b>   | 27/11/2019    |
| <b>Description</b> | Sandstone 100%                       |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

**Uniaxial Compressive Strength 31.1 MPa**

### Young's Modulus

Tangent 13.0 GPa

Secant 13.2 GPa

### Poisson Ratio

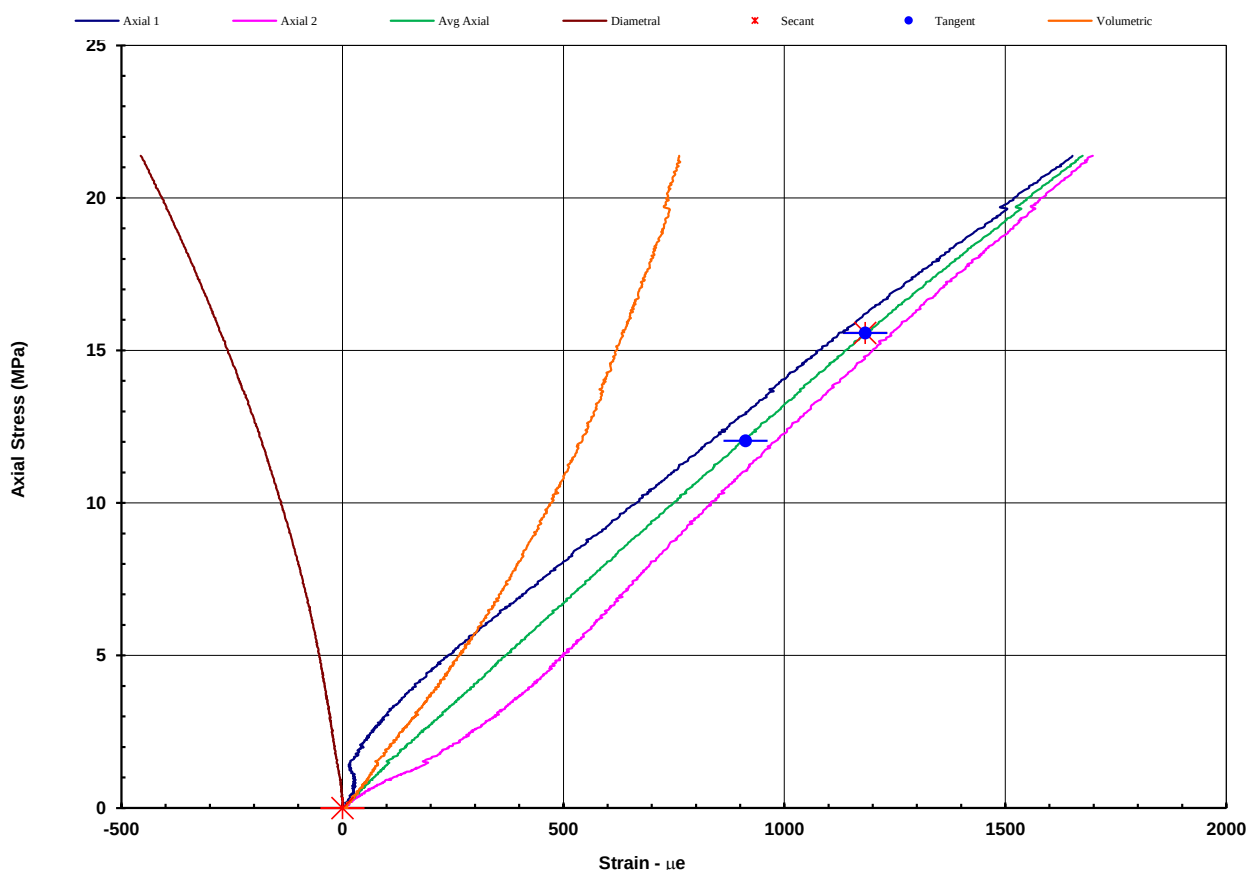
0.233

0.233

from 39 % to 50 % of Max UCS

from 0 % to 50 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP03603

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110066-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 2.8                    |
| Sample Height (mm)           | 174.3                    | Wet Density (t/m <sup>3</sup> ) | 2.62                   |
| Duration of Test (min)       | 9.62                     | Dry Density (t/m <sup>3</sup> ) | 2.55                   |
| Rate of Loading (MPa/min)    | 3.23                     | Bedding (°)                     | 20                     |
| Mode of Failure              | Axial Splitting          | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110066                 |
| <b>BOREHOLE:</b>      | DW7296GT053              |
| <b>BEFORE TEST</b>    |                          |
| <b>DATE:</b>          | 26.11.19                 |
| <b>DEPTH:</b>         | 159.24-159.69            |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110066                 |
| <b>BOREHOLE:</b>      | DW7296GT053              |
| <b>AFTER TEST</b>     |                          |
| <b>DATE:</b>          | 26.11.19                 |
| <b>DEPTH:</b>         | 159.24-159.69            |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110067-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 25/11/2019    |
| <b>Client ID</b>   | DW7296GT059                          | <b>Report Date</b>  | 26/11/2019    |
| <b>Depth (m)</b>   | 180.33-180.79                        |                     |               |
| <b>Description</b> | Siltstone 100%                       |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 17.0 MPa**

### Young's Modulus

Tangent 10.1 GPa

Secant 10.9 GPa

### Poisson Ratio

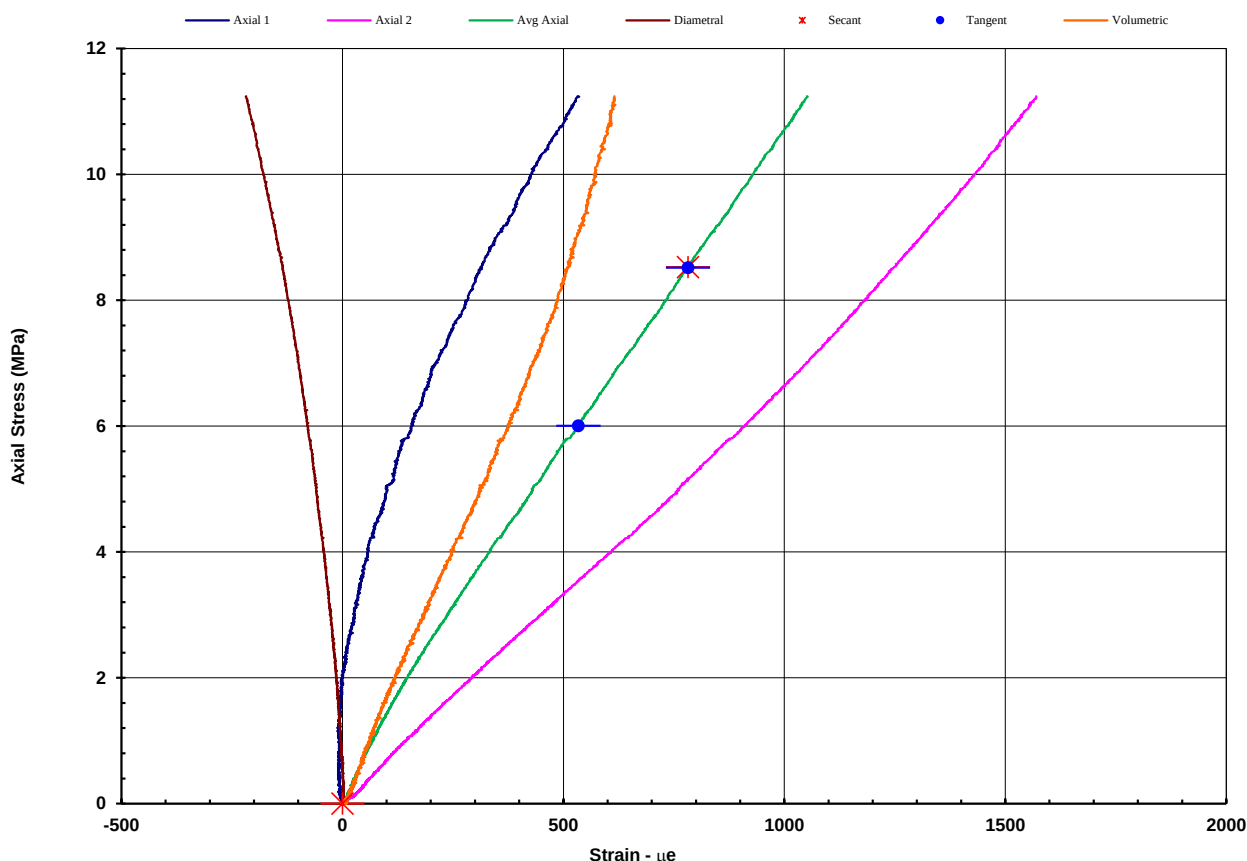
0.173

0.174

from 35 % to 50 % of Max UCS

from 0 % to 50 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

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Page 1 of 2 REP13402

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                                        |               |                                 |                           |
|----------------------------------------|---------------|---------------------------------|---------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |               | <b>Report No.</b> P19110067-MOD |                           |
| Average Sample Diameter (mm)           | 61.0          | Moisture Content (%)            | 2.5                       |
| Sample Height (mm)                     | 175.3         | Wet Density (t/m <sup>3</sup> ) | 2.56                      |
| Duration of Test (min)                 | 28.50         | Dry Density (t/m <sup>3</sup> ) | 2.50                      |
| Rate of Displacement (mm/min)          | 0.10          | Bedding (°)                     | NA                        |
| Mode of Failure                        | End Splitting | Test Apparatus                  | 100kN Compression Machine |

|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>          |
| <b>LAB SAMPLE No.</b> | 19110067                 | <b>DATE:</b> 25-11-19       |
| <b>BOREHOLE:</b>      | DW7296GT059              | <b>DEPTH:</b> 180.33-180.79 |



|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>AFTER TEST</b>           |
| <b>LAB SAMPLE No.</b> | 19110067                 | <b>DATE:</b> 25-11-19       |
| <b>BOREHOLE:</b>      | DW7296GT059              | <b>DEPTH:</b> 180.33-180.79 |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

|                |                             |                      |              |
|----------------|-----------------------------|----------------------|--------------|
| <b>Client</b>  | Geotek Solutions Pty Ltd    | <b>Report No.</b>    | P19110068-AL |
|                |                             | <b>Workorder No.</b> | 0020111      |
| <b>Address</b> | PO Box 1404 Milton QLD 4064 | <b>Report Date</b>   | 03/12/2019   |
| <b>Project</b> | RFA Dingo West Project      |                      |              |

|                             |                 |                 |                 |                 |  |  |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|--|--|
| <b>Sample No.</b>           | 19110068        | 19110069        | 19110078        | 19110079        |  |  |
| <b>Test Date</b>            | 02/12/2019      | 02/12/2019      | 02/12/2019      | 02/12/2019      |  |  |
| <b>Client ID</b>            | DW7297GT0<br>01 | DW7297GT0<br>02 | DW7298GT0<br>01 | DW7298GT0<br>02 |  |  |
| <b>Depth (m)</b>            | 2.48-2.88       | 4.89-5.24       | 2.60-2.90       | 5.05-5.43       |  |  |
| <b>Liquid Limit (%)</b>     | 43              | 53              | 35              | 49              |  |  |
| <b>Plastic Limit (%)</b>    | 15              | 16              | 14              | 15              |  |  |
| <b>Plasticity Index (%)</b> | 28              | 37              | 21              | 34              |  |  |
| <b>Linear Shrinkage (%)</b> | 17.0 +          | 16.5 +          | 11.0            | 15.5            |  |  |
| <b>Moisture Content (%)</b> | 13.3            | 13.4            | 11.9            | 11.4            |  |  |

|                             |  |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|--|
| <b>Sample No.</b>           |  |  |  |  |  |  |
| <b>Test Date</b>            |  |  |  |  |  |  |
| <b>Client ID</b>            |  |  |  |  |  |  |
| <b>Depth (m)</b>            |  |  |  |  |  |  |
| <b>Liquid Limit (%)</b>     |  |  |  |  |  |  |
| <b>Plastic Limit (%)</b>    |  |  |  |  |  |  |
| <b>Plasticity Index (%)</b> |  |  |  |  |  |  |
| <b>Linear Shrinkage (%)</b> |  |  |  |  |  |  |
| <b>Moisture Content (%)</b> |  |  |  |  |  |  |

**NOTES/REMARKS:** The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client \* Cracking occurred + Curling occurred

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**





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WA 6107  
Ph: +61 8 9258 8323

## MISSING / NOT TESTABLE SHEET

[illegible]

General Comments:

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                                               |                                      |                      |               |
|-----------------------------------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>                                 | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110071-MOD |
| <b>Address</b>                                | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>                                | RFA Dingo West Project               | <b>Test Date</b>     | 02/12/2019    |
| <b>Client ID</b>                              | DW7297GT016                          | <b>Report Date</b>   | 03/12/2019    |
| <b>Description</b>                            | Sandstone 100%                       |                      |               |
| <b>Sample Type</b>                            | Single Individual Rock Core Specimen |                      |               |
| <b>Uniaxial Compressive Strength 12.5 MPa</b> |                                      |                      |               |

### Young's Modulus

Tangent 3.38 GPa

Secant 3.95 GPa

### Poisson Ratio

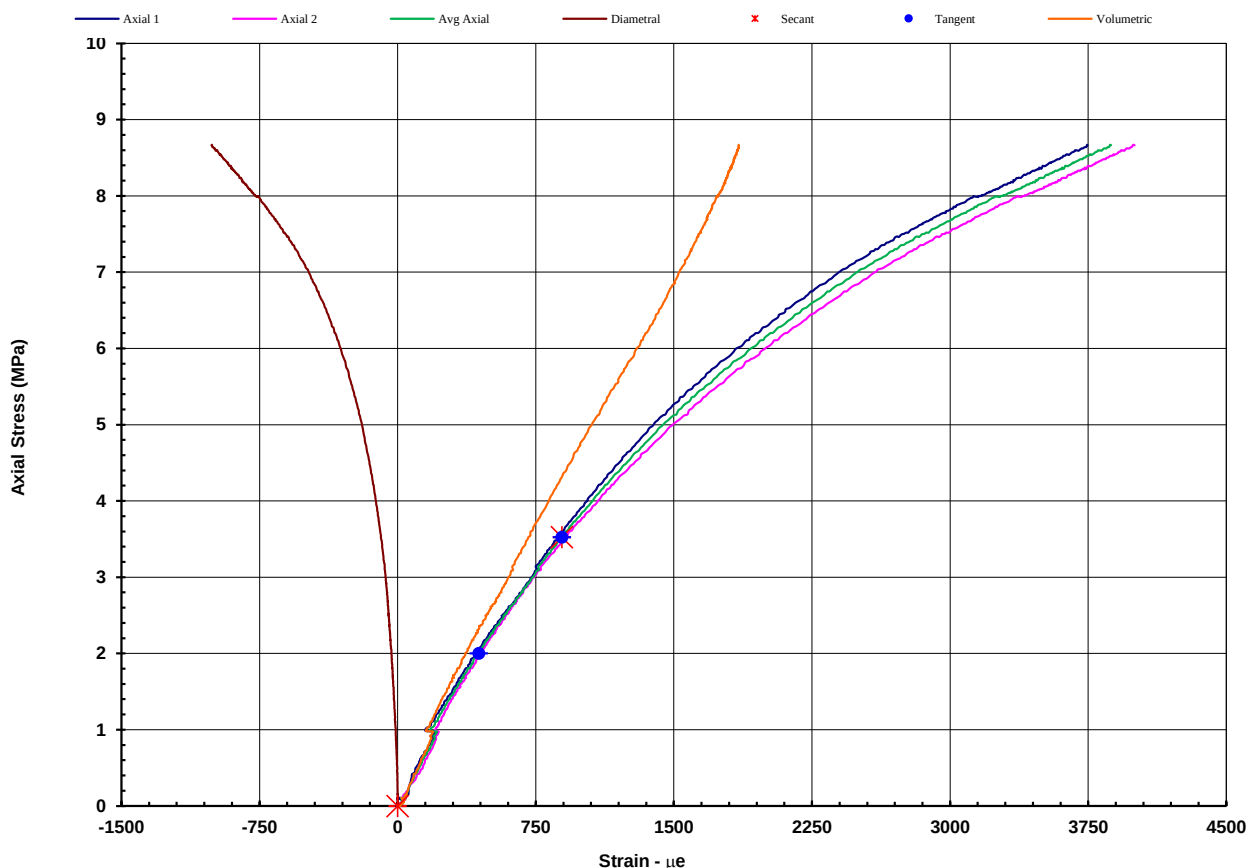
0.102

0.102

from 16 % to 28 % of Max UCS

from 0 % to 28 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.1

|                              |                          |                                 |                        |
|------------------------------|--------------------------|---------------------------------|------------------------|
| <b>Client</b>                | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110071-MOD          |
| Average Sample Diameter (mm) | 61.0                     | Moisture Content (%)            | 5.5                    |
| Sample Height (mm)           | 171.5                    | Wet Density (t/m <sup>3</sup> ) | 2.46                   |
| Duration of Test (min)       | 7.63                     | Dry Density (t/m <sup>3</sup> ) | 2.33                   |
| Rate of Loading (MPa/min)    | 1.64                     | Bedding (°)                     | 40                     |
| Mode of Failure              | Conical                  | Test Apparatus                  | Kelba 1000kN Load Cell |

|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110071                 |
| <b>BOREHOLE:</b>      | DW7297GT016              |
| <b>BEFORE TEST</b>    |                          |
| <b>DATE:</b>          | 2-12-17                  |
| <b>DEPTH:</b>         | 63.99-64.44              |



|                       |                          |
|-----------------------|--------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |
| <b>PROJECT:</b>       | RFA Dingo West Project   |
| <b>LAB SAMPLE No.</b> | 19110071                 |
| <b>BOREHOLE:</b>      | DW7297GT016              |
| <b>AFTER TEST</b>     |                          |
| <b>DATE:</b>          | 2-12-19                  |
| <b>DEPTH:</b>         | 63.99-64.44              |



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

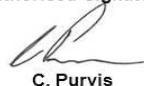
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Trilab Pty Ltd

ABN 25 065 630 506

**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110077-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 26/11/2019    |
| <b>Client ID</b>   | DW7297GT027                          | <b>Report Date</b>  | 27/11/2019    |
| <b>Description</b> | Siltstone 100%                       |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 12.0 MPa**

### Young's Modulus

Tangent 4.46 GPa

Secant 4.12 GPa

### Poisson Ratio

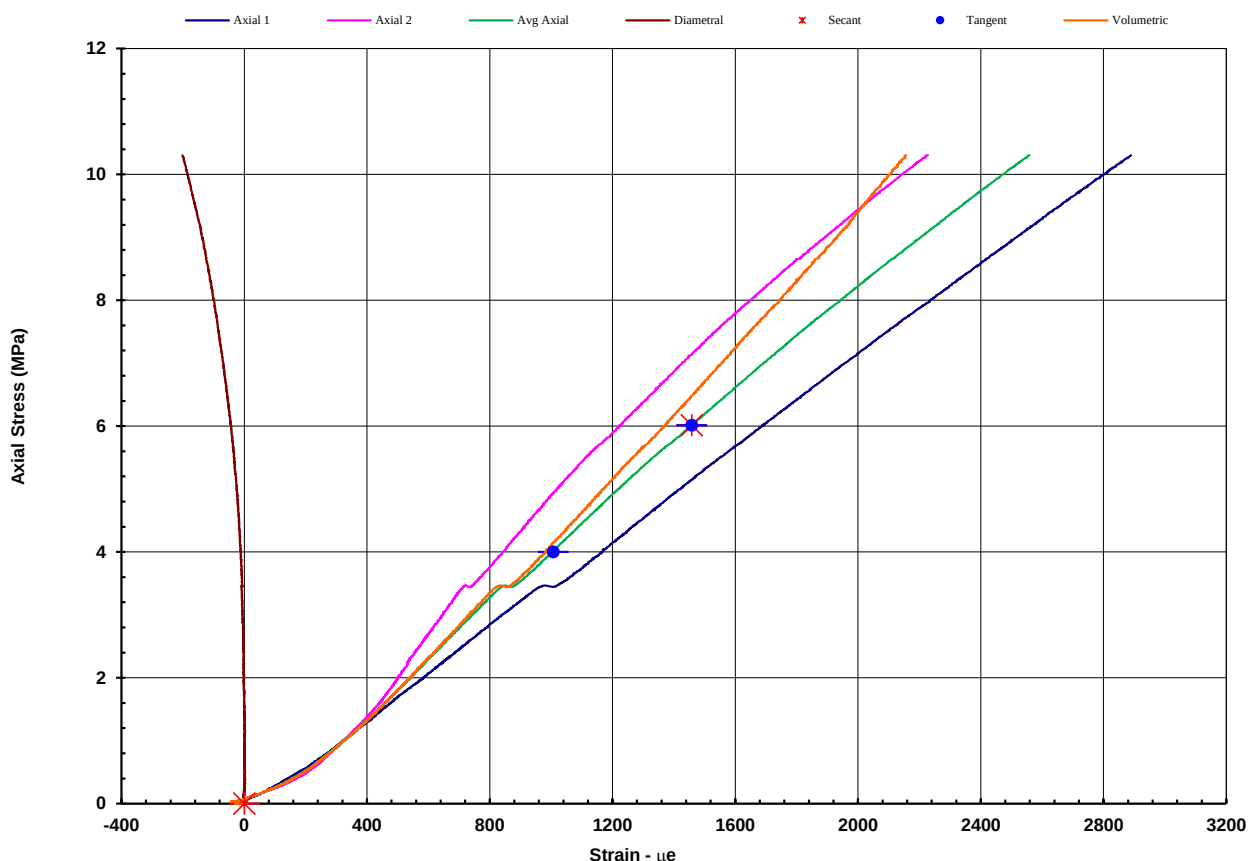
0.030

0.030

from 33 % to 50 % of Max UCS

from 0 % to 50 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

The length to diameter ratio falls outside the test method limits of 2.5:1 to 3.0:1.

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP13402

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## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                                        |       |                                 |                           |
|----------------------------------------|-------|---------------------------------|---------------------------|
| <b>Client</b> Geotek Solutions Pty Ltd |       | <b>Report No.</b> P19110077-MOD |                           |
| Average Sample Diameter (mm)           | 61.1  | Moisture Content (%)            | 3.7                       |
| Sample Height (mm)                     | 145.5 | Wet Density (t/m <sup>3</sup> ) | 2.47                      |
| Duration of Test (min)                 | 26.78 | Dry Density (t/m <sup>3</sup> ) | 2.39                      |
| Rate of Displacement (mm/min)          | 0.10  | Bedding (°)                     | 25                        |
| Mode of Failure                        | Shear | Test Apparatus                  | 100kN Compression Machine |

|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>          |
| <b>LAB SAMPLE No.</b> | 19110077                 | <b>DATE:</b> 26.11.19       |
| <b>BOREHOLE:</b>      | DW7297GT027              | <b>DEPTH:</b> 127.82-128.16 |



|                       |                          |                             |
|-----------------------|--------------------------|-----------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                             |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>AFTER TEST</b>           |
| <b>LAB SAMPLE No.</b> | 19110077                 | <b>DATE:</b> 26.11.19       |
| <b>BOREHOLE:</b>      | DW7297GT027              | <b>DEPTH:</b> 127.82-128.16 |



### Notes/Remarks:

The length to diameter ratio falls outside the test method limits of 2.5:1 to 3.0:1.

Sample/s supplied by client

Photo not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.2 & AS 4133.1.1.1

|                    |                                      |                      |               |
|--------------------|--------------------------------------|----------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>    | P19110080-UCS |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No.</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>     | 25/11/2019    |
| <b>Client ID</b>   | DW7298GT010                          | <b>Report Date</b>   | 26/11/2019    |
| <b>Description</b> | Clay 100%                            |                      |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                      |               |

### TEST DETAILS

|                               |         |                                 |                                         |
|-------------------------------|---------|---------------------------------|-----------------------------------------|
| Average Sample Diameter (mm)  | 58.9    | Moisture Content (%)            | 17.0                                    |
| Sample Height (mm)            | 174.8   | Wet Density (t/m <sup>3</sup> ) | 2.12                                    |
| Duration of Test (min)        | 2:00    | Dry Density (t/m <sup>3</sup> ) | 1.81                                    |
| Rate of Displacement (mm/min) | 0.10    | Bedding (°)                     | NA                                      |
| Mode of Failure               | Conical | Test Apparatus                  | 100 kN Load Cell in Compression Machine |
| Rupture Angle (°)             | N/A     |                                 |                                         |

**UCS (MPa)      0.025**

### Before and After Photo's

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>        |
| <b>LAB SAMPLE No.</b> | 19110080                 | <b>DATE:</b> 25.11.19     |
| <b>BOREHOLE:</b>      | DW7298GT010              | <b>DEPTH:</b> 44.17-44.51 |



**NOTES/REMARKS:** Unable to obtain elastic properties due to sandy nature or specimen.  
 Stored and tested as received  
 Sample/s supplied by the client

Photo's not to scale

Page: 1 of 1 REP13302

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**



## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                    |                                      |                     |               |
|--------------------|--------------------------------------|---------------------|---------------|
| <b>Client</b>      | Geotek Solutions Pty Ltd             | <b>Report No.</b>   | P19110081-MOD |
| <b>Address</b>     | PO Box 1404 Milton QLD 4064          | <b>Workorder No</b> | 0020111       |
| <b>Project</b>     | RFA Dingo West Project               | <b>Test Date</b>    | 25/11/2019    |
| <b>Client ID</b>   | DW7298GT013                          | <b>Report Date</b>  | 26/11/2019    |
| <b>Description</b> | Siltstone 100%                       |                     |               |
| <b>Sample Type</b> | Single Individual Rock Core Specimen |                     |               |

**Uniaxial Compressive Strength 0.104 MPa**

### Young's Modulus

Tangent 0.062 GPa

Secant 0.061 GPa

### Poisson Ratio

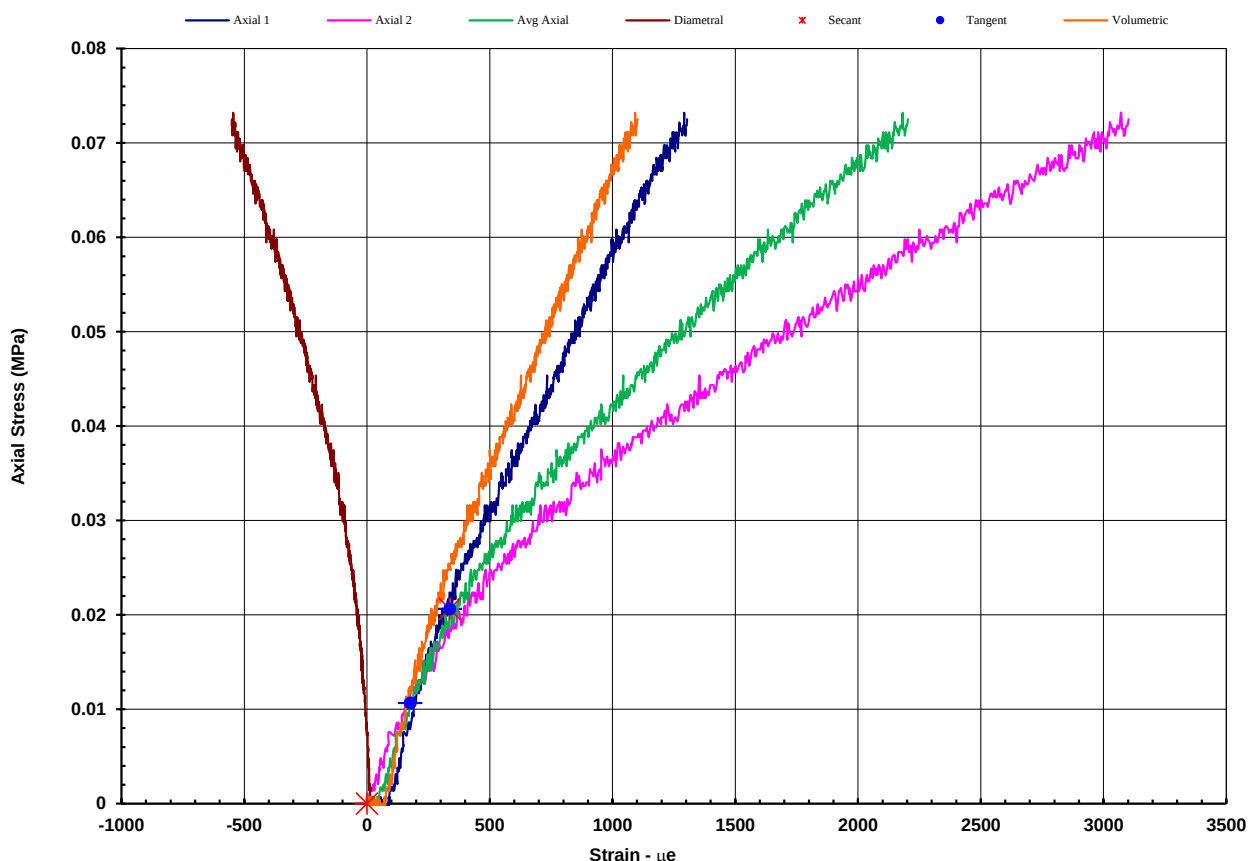
0.112

0.112

from 10 % to 19 % of Max UCS

from 0 % to 19 % of Max UCS

### Axial Stress vs Strain Plots



### Notes/Remarks:

Sample/s supplied by client

Graph not to scale

Tested as received.

Page 1 of 2 REP13402

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## UNIAXIAL COMPRESSIVE STRENGTH & DEFORMATION TEST REPORT

Test Method: AS 4133.4.3.2 & AS 4133.1.1.1

|                               |                          |                                 |                           |
|-------------------------------|--------------------------|---------------------------------|---------------------------|
| <b>Client</b>                 | Geotek Solutions Pty Ltd | <b>Report No.</b>               | P19110081-MOD             |
| Average Sample Diameter (mm)  | 60.9                     | Moisture Content (%)            | 23.7                      |
| Sample Height (mm)            | 176.3                    | Wet Density (t/m <sup>3</sup> ) | 2.04                      |
| Duration of Test (min)        | 16.17                    | Dry Density (t/m <sup>3</sup> ) | 1.65                      |
| Rate of Displacement (mm/min) | 0.10                     | Bedding (°)                     | 10                        |
| Mode of Failure               | Shear                    | Test Apparatus                  | 100kN Compression Machine |

|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>        |
| <b>LAB SAMPLE No.</b> | 19110081                 | <b>DATE:</b> 25.11.19     |
| <b>BOREHOLE:</b>      | DW7298GT013              | <b>DEPTH:</b> 52.57-52.94 |



|                       |                          |                           |
|-----------------------|--------------------------|---------------------------|
| <b>CLIENT:</b>        | Geotek Solutions Pty Ltd |                           |
| <b>PROJECT:</b>       | RFA Dingo West Project   | <b>BEFORE TEST</b>        |
| <b>LAB SAMPLE No.</b> | 19110081                 | <b>DATE:</b> 25.11.19     |
| <b>BOREHOLE:</b>      | DW7298GT013              | <b>DEPTH:</b> 52.57-52.94 |



### Notes/Remarks:

Sample/s supplied by client

Photo not to scale

Tested as received.

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**ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING**

## APPENDIX E

### BMA SPOIL CATEGORISATION NOTES

An example of each spoil category in the BMA spoil classification system is shown in Figure 1 (Simmons and Fityus 2016). Shear strength values for each of the categories are shown in Table 2.

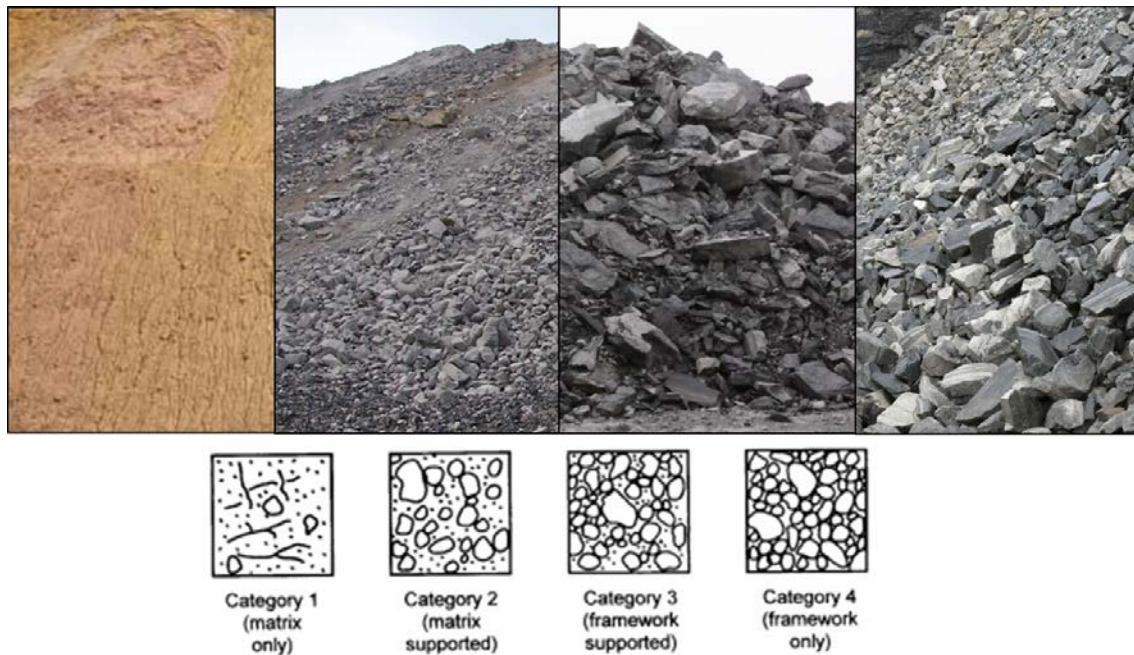


Figure 1. Examples of BMA Coal spoil (left to right Categories 1 to 4 respectively) and key explaining the framework support attribute, one of five attributes used in the categorisation process (photos: S Fityus).

Table 1. Shear strength parameters for categories and mobilisation modes.

(Parameter standard deviations in italicised parentheses)

| Category | Unsaturated                      |               |                  | Saturated                        |               |                  | Remoulded                   |
|----------|----------------------------------|---------------|------------------|----------------------------------|---------------|------------------|-----------------------------|
|          | $\gamma$<br>(kN/m <sup>3</sup> ) | $c'$<br>(kPa) | $\phi'$<br>(deg) | $\gamma$<br>(kN/m <sup>3</sup> ) | $c'$<br>(kPa) | $\phi'$<br>(deg) | $c'=0$ kPa<br>$\phi'$ (deg) |
| 1        | 18<br>(1)                        | 20<br>(10)    | 25<br>(2.5)      | 20<br>(1)                        | 0<br>(0)      | 18<br>(3)        | 18<br>(1.5)                 |
| 2        | 18<br>(1)                        | 30<br>(15)    | 28<br>(3)        | 20<br>(1)                        | 15<br>(7.5)   | 23<br>(2.5)      | 18<br>(1.5)                 |
| 3        | 15<br>(1)                        | 50<br>(15)    | 30<br>(2)        | 20<br>(1)                        | 20<br>(10)    | 25<br>(2.5)      | 18<br>(1.5)                 |
| 4        | 18<br>(1)                        | 50<br>(15)    | 35<br>(2.5)      | 20<br>(1)                        | 0<br>(0)      | 30<br>(1.5)      | 28<br>(2)                   |

From Simmons and McManus (2004).



## COFFEY SLAKE TEST

### STATIC TEST FOR FIELD DETERMINATION OF SLAKING AND DISPERSION POTENTIALS

Empirical test to evaluate slaking, swelling and dispersion potentials of transitional materials which exhibit properties intermediate between those of soils and rocks.

1. A. 10mm thick disc of core, or a single fragment should be placed in a sealed glass/Perspex 600 or 1000 ml container.
2. Fill the container to a height of 50mm with distilled water in order to provide 20mm sample cover. The use of distilled water serves as a standard. Additional testing using ground water, surface water or a solution of known salinity can also be utilized.
3. Visual assessments of the specimen condition are made at elapsed times of 1 min, 10 min, 1 hour, 5 hours and 24 hours. The specimen condition is reported as a letter/number code in accordance with Table 1. Note: testing containers should not be disturbed during the 24 hour period. No mechanical abrasion is involved.

TABLE 1  
SLAKING AND DISPERSION POTENTIAL – SPECIMEN CONDITION

| SLAKING |                                                                             | SWELLING |                                                       | DISPERSION |                           |
|---------|-----------------------------------------------------------------------------|----------|-------------------------------------------------------|------------|---------------------------|
| CODE    | DESCRIPTION                                                                 | CODE     | DESCRIPTION                                           | CODE       | DESCRIPTION               |
| A       | NO DETERIORATION                                                            | 1        | NO SWELLING                                           | 1          | WATER CLEAR               |
|         | SLIGHT DETERIORATION<br>minor flecks and fragments                          | 2        | SLIGHT SWELLING<br>volume increase 0-20%              | 2          | WATER SLIGHTLY<br>MUDDY   |
| C       | MEDIUM DETERIORATION<br>shape largely the same,<br>surface deteriorated     | 3        | MEDIUM TO HIGH<br>SWELLING volume<br>increase 20-100% | 3          | WATER COMPLETELY<br>MUDDY |
| D       | HIGH DETERIORATION<br>shape largely completely<br>destroyed, many fragments |          |                                                       |            |                           |
| E       | TOTAL DISINTEGRATION                                                        | 4        | VERY HIGH SWELLING<br>volume increase >100%           |            |                           |

Example: A mudstone exhibiting slight deterioration, high swelling, and with clear water is defined B 3 1 potential. (refer to Table 2)

TABLE 2  
SLAKING AND DISPERSION POTENTIAL – EXAMPLES

| SPECIMEN     |     | SPECIMEN CONDITION CODE |        |        |        |         |
|--------------|-----|-------------------------|--------|--------|--------|---------|
|              |     | 1 min                   | 10 min | 1 hour | 5 hour | 24 hour |
| Mudstone     | 10m | A11                     | B21    | B31    | B31    | B31     |
| Clayey Shale | 20m | B31                     | C32    | C32    | C32    | D32     |
| Claystone    | 30m | C32                     | D32    | E32    | E42    | E43     |

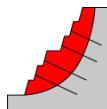
## 1 REFERENCES

1. Simmons, J.V. and Fityus, S.G., 2016. The Stability of Very High Spoil Piles. Report No.: C20019 ACARP
2. Simmons, J.V. and McManus, D.A., 2004. *Shear Strength Framework for Design of Dumped Spoil Slopes for Open Pit Coal Mines*. In: Advances in Geotechnical Engineering. Imperial College, London: Thomas Telford.
- 3 Coffey and Partners, 2016. Cited in Simmons, J.V. and Fityus, S.G., 2016. The Stability of Very High Spoil Piles. Report No.: C20019 ACARP

**GEOTECHNICAL ASSESSMENT  
FOR THE  
GEMINI OPEN CUT COAL PROJECT**

**Report No. gts-gem-013-20-1**

**July 2020**



**GeoTek Solutions Pty Ltd**  
ABN 84 090 367 409



**GEOTECHNICAL ASSESSMENT FOR**

**GEMINI OPEN CUT COAL PROJECT**

**GeoTek Solutions Pty Ltd**  
**Report No. gts-gem-013-20-1**  
**July 2020**

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| Final | 14/07/20 | M Winsley | A P Maconochie | BOYD         | Reviewed by BOYD |

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- B – GEOTECHNICAL LOGS
- C – ATV DATA – *Dips* ANALYSIS AND STRUCTURE MAP
- D – LABORATORY TEST CERTIFICATES
- E – SPOIL CATEGORISATION NOTES

Table 1.1. Acronyms and Abbreviations.

| Code        | Description                                                            |
|-------------|------------------------------------------------------------------------|
| ACARP       | Australian Coal Association Research Program                           |
| AS          | Australian Standard                                                    |
| BHWE        | Base of weathering                                                     |
| BOYD        | J T Boyd Company                                                       |
| BUTE        | Base of Tertiary                                                       |
| $c', \phi'$ | Mohr-Coulomb effective shear strength parameters cohesion and friction |
| Cz          | Cenozoic (Geological era that includes the Quaternary and Tertiary)    |
| D           | Blast disturbance factor (in Hoek-Brown analysis)                      |
| DES         | Queensland Department of Environment and Science                       |
| DSS         | Direct shear strength                                                  |
| EPC         | Exploration Permit for Coal                                            |
| FCCM        | Fort Cooper Coal Measures                                              |
| FOS         | Factor of safety                                                       |
| GTS         | GeoTek Solutions Pty Ltd                                               |
| ITS         | Indirect Tensile Strength (Brazilian)                                  |
| JBT         | JBT Consulting Pty Ltd                                                 |
| mbgl        | Metres below ground level                                              |
| MLA         | Mining Lease Application                                               |
| NATA        | National Association of Testing Authorities                            |
| Pm          | Permian                                                                |
| RCM         | Rangal Coal Measures                                                   |
| UCS         | Unconfined compressive strength                                        |

## 1. INTRODUCTION

This report presents a geotechnical assessment as requested by John T. Boyd Company (BOYD), on behalf of Magnetic South Pty Ltd in relation to proposed open cut mining, of the Gemini coal deposit, located approximately 8 km west of the township of Dingo in Central Queensland, as shown in Figure 1.1. The Capricorn Highway cuts across EPC 881 and current plans show that all of the proposed mining will take place on the southern side of the highway.

A truck shovel operation in multiple pits is planned for this project. Owing to the likely steepness of floor dips, a terrace mining method will be employed. This assessment provides pit wall and dump design parameters for pre-feasibility design purposes.

The assessment is based on provided information and site-specific geotechnical data has been collected for 6 fully cored holes (HQ3, 61.1 mm diameter core).

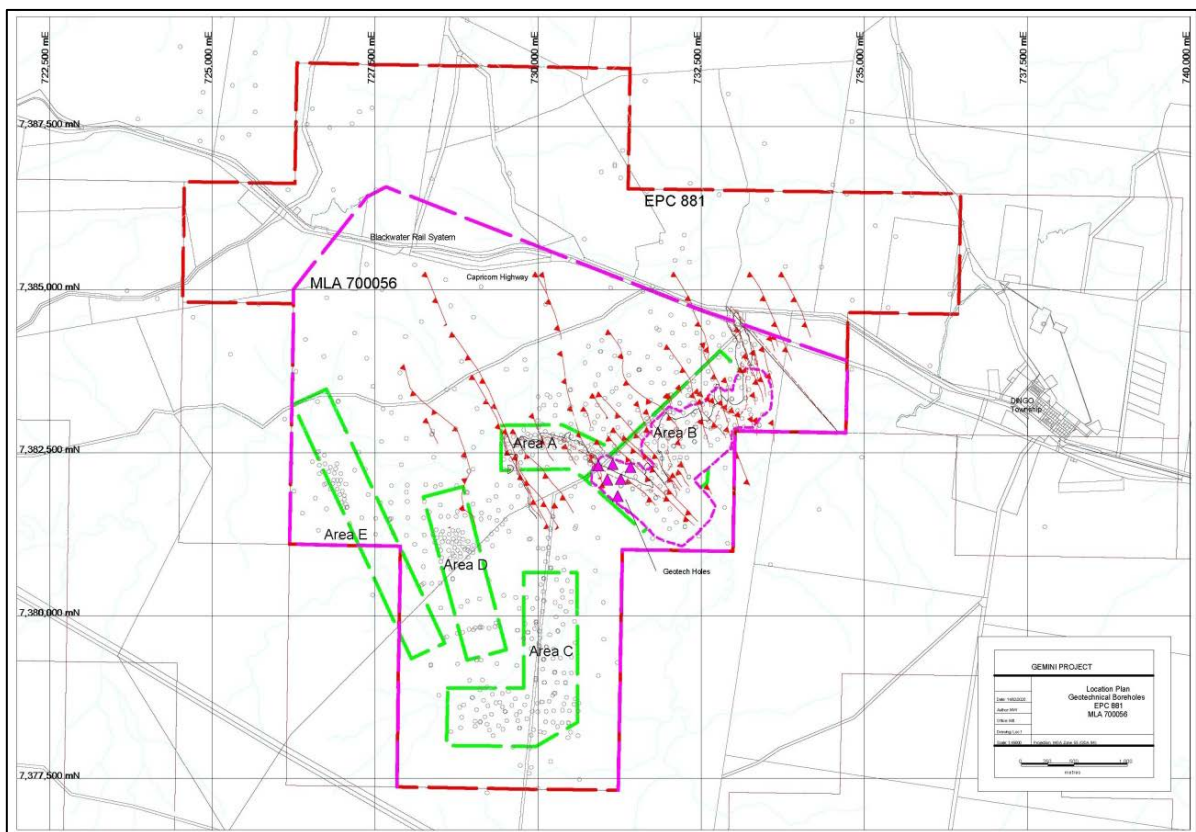


Figure 1.1. Gemini Project location plan supplied by BOYD (GDA94z55).



## 2. SUPPORTING DATA

### 2.1 Supplied Data

The associated geotechnical models and assessment is based on the following information that was provided in electronic format by John T. Boyd Company (BOYD).

- 2019 (Draft) JORC Resource report
- Mapping data, fault lines and fold structures as DXF files
- Groundwater Impact Assessment (JBT)
- Current pit design files, including initial pit outline and sequence.
- The latest Vulcan fault strings
- Sub-crop lines for Aries, Castor and Pollux seams
- The latest Vulcan surface grids for:
  - Topo (Dgwtopo\_881.tp)
  - Base of Tertiary (BHTE)
  - Base of Weathering (BHWE)
  - Aries, Castor and Pollux coal ply roof and floor surfaces
- Lease boundaries (EPCs and MLA)
- Area polygons for: A, B, C, D and E areas of interest.
- Cadastral information including roads and rail, creeks and dams, and topographic contours (5m)
- Acoustic scanning data and interpretation by Borehole Wireline Pty Ltd.

### 2.2 Geotechnical Drilling

Magnetic South Pty Ltd commissioned J C Irvine Pty Ltd in Q4 2019 to supervise the drilling of 6 fully cored geotechnical boreholes and geotechnically log in accordance with the ACARP CoalLog Guidelines. Samples were taken for laboratory testing. All of the bores were logged geophysically using the gamma, neutron, density, caliper, velocity tools and, acoustic scanner (ATV) to measure defect orientation and frequency.

### 2.3 Assumptions

The following data are assumed or extrapolated:

- All data provided is accurate at the time of writing
- All survey data are referenced to GDA94 zone 55
- The generic and widely accepted Bowen Basin Material Properties were used for the component materials in stability analyses.

### 3. TOPOGRAPHY

The topography within the project area is relatively flat, mostly ranging in elevation from 110 to 160 metres. However, the ground rises to the south-west towards the Dawson Range and Blackdown Tableland. The Blackdown Tableland reaches a maximum height of approximately 850 m.

Charlevue Creek is the main waterway traversing the Project. It flows towards the north-east eventually draining into the Fitzroy River system. The creek emerges from the Dawson Range, where it appears to have created an erosion bowl some 400 m deep. The erosion probably took place during wetter climates in the Tertiary. It is assumed that the rock that has been eroded is the main source of the blanket of Cenozoic soil that is up to 50 m deep in places across the Project.

### 4. GEOLOGY

The coal seams of economic interest are found within the Rangal Coal Measures which developed during the Late Permian period. The Rangal Coal Measures are widespread throughout the Bowen Basin and range in thickness from 100 m to 300 m. They include the Aries, Castor, Pollux, Orion and Pisces Upper seams.

The base of the RCM is marked by the pervasive Yarrabee Tuff which occurs between the Pisces Upper and Pisces Lower seams. This marker horizon has been associated with many geotechnical failures across the Basin. It is not expected that mining will extend down to the Pisces Lower Seam so issues that might arise due to the Yarrabee Tuff are not considered any further.

Current understanding indicates that the Rangal Coal Measures subcrop across the width of EPC 881, a distance of more than 10 km. The coal measures dip predominantly between a southwest and southeast direction, although fault block rotation has resulted in localised variations in the dip and dip direction.

The Burngrove Formation underlies the Rangal Coal Measures. The Burngrove Formation contains the Pisces Lower, Virgo and Leo seams, mining of these units is unlikely. They are intercalated with lithic, volcanic and volcanoclastic sediments. The seams are poorly developed and difficult to trace over any extended distance.

The Permian coal measures are overlain by sandstone belonging to the Rewan Group. This unit is characterised by an absence of carbonaceous material reflecting extreme climatic conditions and the Great Extinction that occurred at the end of the Permian.

A veneer of poorly consolidated Cenozoic sediments unconformably overly all other units in the area.

#### 4.1 Stratigraphic Summary

A simplified stratigraphy is shown in Figure 4.1, and the correlation to geotechnical borehole DW7293GT

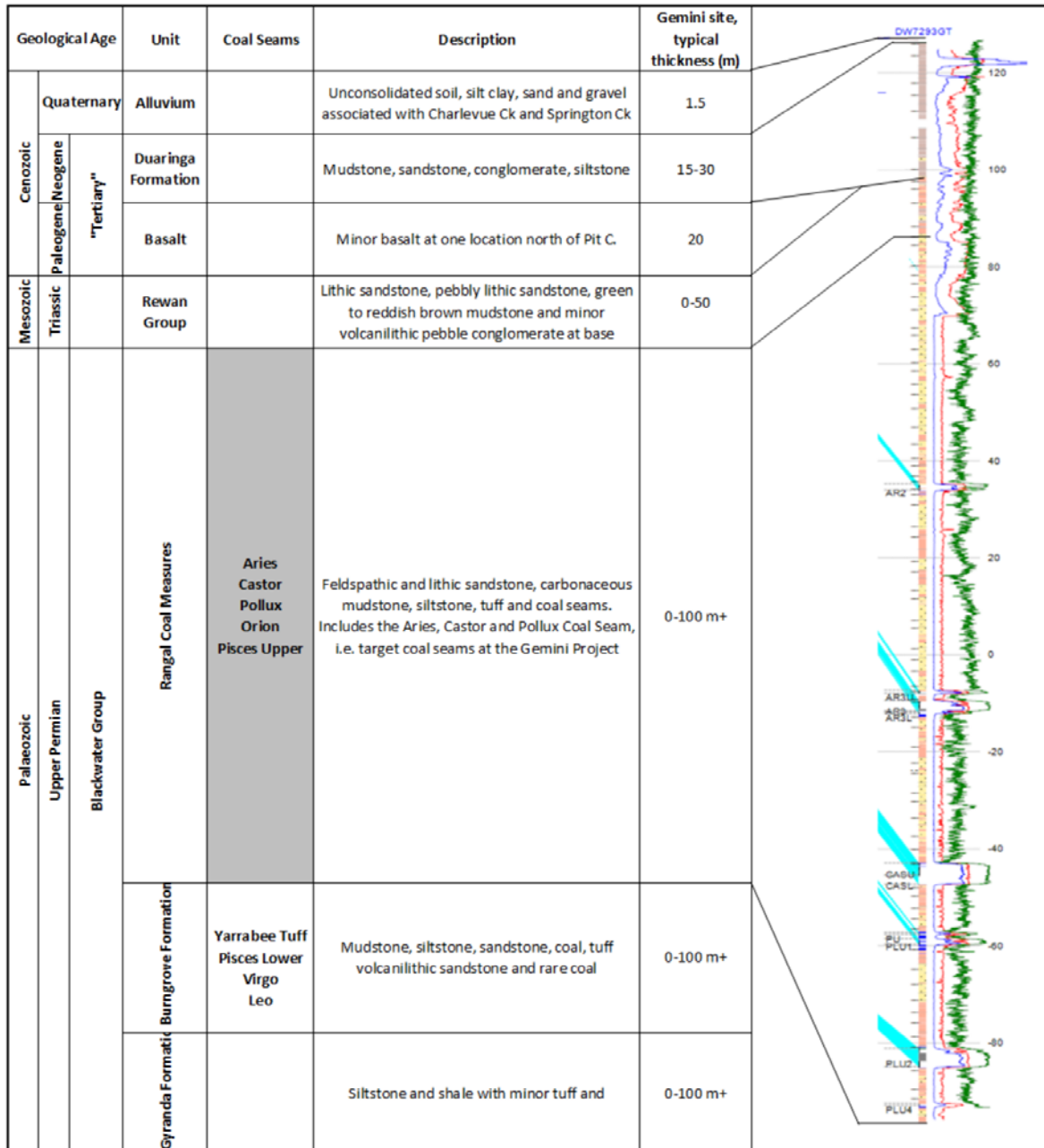


Figure 4.1. Stratigraphy for Gemini Project.



## 4.2 Depth of Weathering

The depth of weathering across the Gemini Project is generally deep, ranging from 17 m to 77 m, with an average of 43 m. This is largely dictated by the thickness of Cenozoic sediments that overlie the coal measures. The thickness of the weathered zone below the alluvial sediments is generally less than 15 m. Weathering is deepest in Area A where thick accumulations of Tertiary sediments are present.

## 4.3 Cenozoic Sediments

Cenozoic sediments encompass Tertiary and Quaternary age strata. Although “Tertiary” is not a formally recognised geological age nevertheless it is commonly used for the older clays and sands that lie between the surficial, often alluvial, sediments and the underlying Triassic age Rewan Group strata. Boundary depths and material descriptions are often poorly defined as drillers drill through the upper horizons quickly, using non-core techniques because these strata are of little interest to most exploration campaigns.

There is a surficial layer of unconsolidated Quaternary age sediments which range in thickness, where recorded, from 0.9–5.5 m. Thickness is typically less than 1.5 m in Areas A, B and C. Thicknesses of 2 m are typically encountered close to the Charlevue Creek system.

Tertiary age sediments are prevalent in the region and have been recorded in almost all boreholes. The depth to the base of Tertiary is greatest in Area A and extending northeast into Area B where it is up to 50 m. The depth rapidly decreases to the southeast of Area B. The depth to the base of Tertiary in Area C is typically 25 m, with a general trend of increasing depth to the southeast.

## 4.4 Igneous Rocks and Intrusions

Minor surface Tertiary basalt is present in the Project area. North of Area C a 20 m thick Tertiary basalt flow has been intersected in drill holes within an area 600 m long and 200 m wide. The basalt has been interpreted as a small paleo channel infill. Extensive drilling across the area shows little other evidence of intrusions in the deposit.

## 5. STRUCTURE

### 5.1 Regional Structure

Structurally, the Gemini Project is located within a major regional thrust system, the Yarrabee Thrust Zone (YTZ).

The compressive stress was predominantly NE-SW. The system was active during the late Permian to Triassic. Structures that may be generated by such a system are shown in the stress ellipse diagram in Figure 5.1.

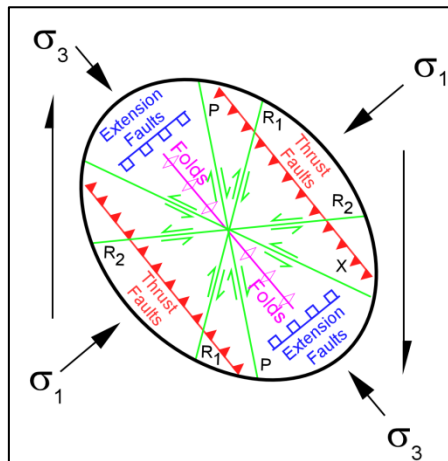


Figure 5.1. Stress ellipse diagram showing the approximate direction of maximum stress expected at Gemini and the kinds of structures that might develop (after McLay 1987).

Subsequent to the major late Permian-Triassic compressional phase, there were 3 other active tectonic phases:

- A tensional phase associated with the rifting of Gondwanaland occurred in the late Jurassic to early Cretaceous. This phase resulted in steep normal faults and dykes throughout the Bowen Basin.
- A tensional phase during the Cretaceous produced the opening up of the Coral Sea and additional tensional structures in parts of the Bowen Basin.
- Finally, since the Tertiary, there has been another compressive phase associated with collision of the northwards moving Australasian Plate with the Pacific Plate. This is most obviously seen by the formation of the New Guinea Highlands. However, effects have extended into Queensland and locally, small tear-apart basins formed in this phase.

This complicated geological history will be reflected in the structures that are encountered at the Gemini project. Regional domains are illustrated in Figure 5.2 and summarised in Table 5.1.

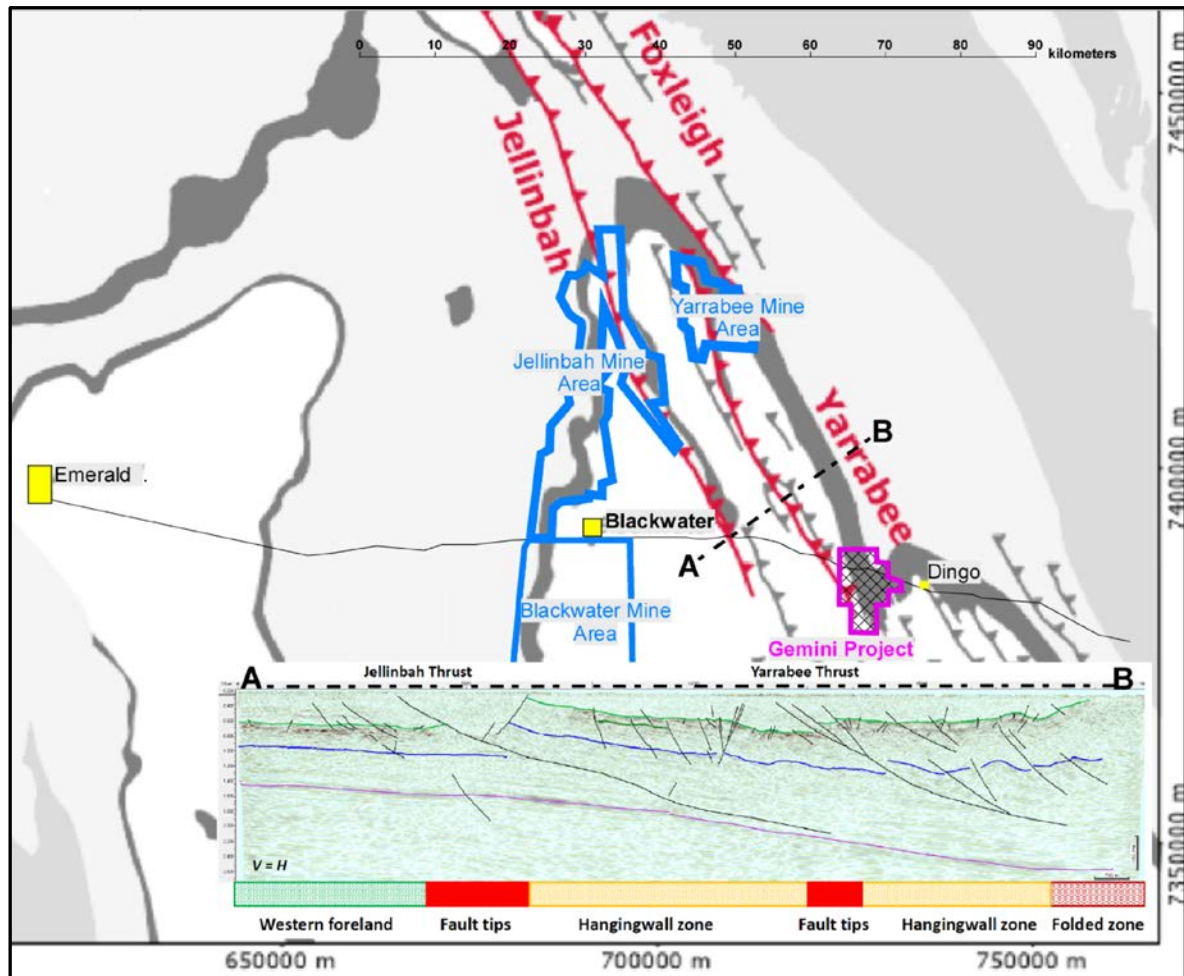


Figure 5.2. Regional structural geology (after Silwa et al. 2017).

Table 5.1. Regional structural domain characteristics (Silwa et al. 2017).

| Domain            | Characteristics                                                                                  | Mines and Prospects                                 |
|-------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Western foreland  | Bedding dips < 6° short disconnected thrusts, <30m throw folds open warps, variable axial trends | MCM: Wards Well to Kestrel RCM: Curragh, Blackwater |
| Fault tips        | Leading edge of major thrusts, complex deformation thrust stacks doming and accommodation        | Jellinbah, Yarrabee, parts of other RCM mines       |
| Hanging wall zone | Area above detachment gentle folds & faults, back thrusts common, structure less predictable     | Most other RCM mines                                |
| Folded zone       | Folds dominate, thrusts difficult to map, deformation variable                                   | Baralaba,                                           |



## 5.2 Local Structure

The Gemini Project is located in the same structural corridor as the Yarrabee Coal Mine complex. It is expected that conditions will be similar to those at Yarrabee which has been operating successfully for a number of years despite the challenges of operating a mine within a thrust environment.

Current understanding indicates that the Rangal Coal Measures subcrop across the width of EPC 881, a distance of more than 10 km. The coal measures dip predominantly between a southwest and southeast direction, although fault block rotation has resulted in localised variations in the dip and dip direction.

The thrust faults strike in a north-northwest/south-southeast direction. Multiple structures with throws in excess of 100 m are present in the area. Between major faults, blocks with relatively low levels of structural deformation have been identified by drilling. Blocks between faults are typically 300 m to 600 m wide and show typical anticlinal and synclinal folding.

A number of minor reverse faults have also been identified by seam duplication in individual boreholes. The fault interpretation developed by BOYD is shown in Figure 5.3.

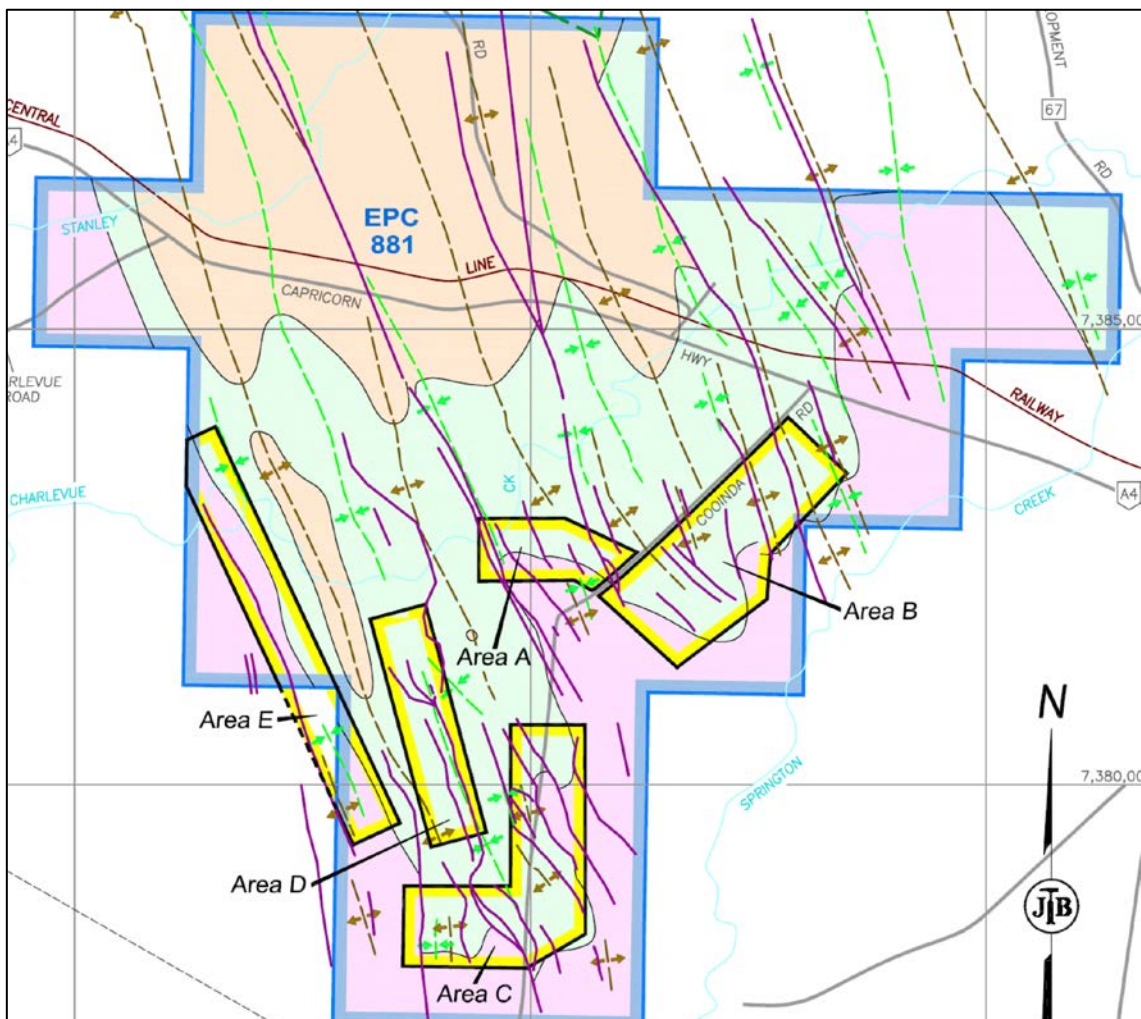


Figure 5.3. Structural interpretation map (after 2019 JORC resource report).

## 6. GROUNDWATER

Typically, in the Bowen Basin, groundwater levels are between 15 to 30 m below natural ground surface. Once mining starts it is found that the rate of depletion of groundwater matches the rate of mining and groundwater is not normally a problem for highwall stability.

A Groundwater Impact Assessment (GIA) for the Gemini Project, by JBT Consulting (Oct 2019) Relevant points from the summary (p57) include:

- Groundwater occurs within three main groundwater units at site, including:  
Quaternary alluvium associated with Charlevue Creek and Springton Creek  
Tertiary sediments of the Duaringa Formation; and,  
The Permian Rangel Coal Measures, where groundwater occurs preferentially within the coal seams.
- The fault zones may provide localised increases in hydraulic conductivity and storage that is associated with the shear zones of each fault
- The faults may act as barriers to groundwater flow at locations where the faults disrupt individual coal seams, which are the main conduits for groundwater flow, especially at locations where the entire thickness of coal is displaced so that the coal seam terminates against lower-permeability interburden.
- Groundwater level data at site are summarised as:  
The water level within the alluvium ranges from 8.77 to 11.19 m below ground level for bores adjacent to the creek channels;  
The water level with the Tertiary sediments ranges from dry (5 bores, ranging in depth from 14 to 23 m) to 15.38-44.74 mbgl (where water is present). The presence of water within the Tertiary sediments is related to the RL of the base of Tertiary and from review of available data it is assessed that it is probable that the Tertiary sediments are dry above 120 mAHD and likely dry above 110 mAHD; and,  
The water level in the coal measures ranges from 16.91 to 46.62 mbgl for bore depths of between 38.4 and 136.7 m, with one bore dry at a depth of 31.59 m. The groundwater flow direction for groundwater within the coal measures is from southwest to northeast and from northwest to southeast, towards a depression that is centred on the area where the AB Pit is proposed to be developed.
- Hydraulic conductivity (Sec4.4 - GIA) decreases with depth  
For all coal seams (17 data points), the hydraulic conductivity (K) ranges from 0.002 to 5.4 m/day, with a geometric mean of 0.13 m/day  
For coal seam bores that are screened above 80 m below ground level (mbgl) (11 data points) K ranges from 0.012 to 5.4 m/day, with a geometric mean of 0.37 m/day.  
For coal seam bores that are screened below 80 mbgl (6 data points) the K range is from 0.002 to 0.24 m/day, with a geometric mean of 0.02 m/day.
- The recharge rate to the groundwater units at site, which has been calculated via the chloride mass balance method, indicates an extremely low recharge rate of less than 1 mm/year for each groundwater unit. The low rate of calculated recharge is consistent with the observation of highly saline groundwater at site, which is present for even the shallow alluvial units.
- The observation of a low recharge rate for groundwater suggests that, even though relatively high rates of groundwater inflow may be observed from faults/shear zones as mining progresses, especially for the zone above 80 mbgl, the inflow rates are likely to be of short duration due to the relatively low volume that can be stored within

fractures/faults and the very low rates of recharge observed at site (i.e. once the fault storage is depleted the faults are unlikely to be recharged).

- Because the faults may act as conduits for groundwater movement, the control of surface water around the site will be of particular importance (i.e. water that ponds at surface may recharge the underlying sediments and report as seepage to the pits via movement along faults/fractures). This mode of inflow would represent infiltrated surface water rather than groundwater from the formations.



## 7. GEOTECHNICAL DOMAINS

Geotechnical domains are defined as sections of a mining area that have similar rock mass characteristics, rock structure and lithology, that are expected to behave in a similar fashion at similar pit wall orientations.

The Geotechnical drilling for this study has focused on Area A and B, (the AB Pit see Figure 7.1 and Figure 7.2) hence formal domains for the whole of the Project have not been defined yet.

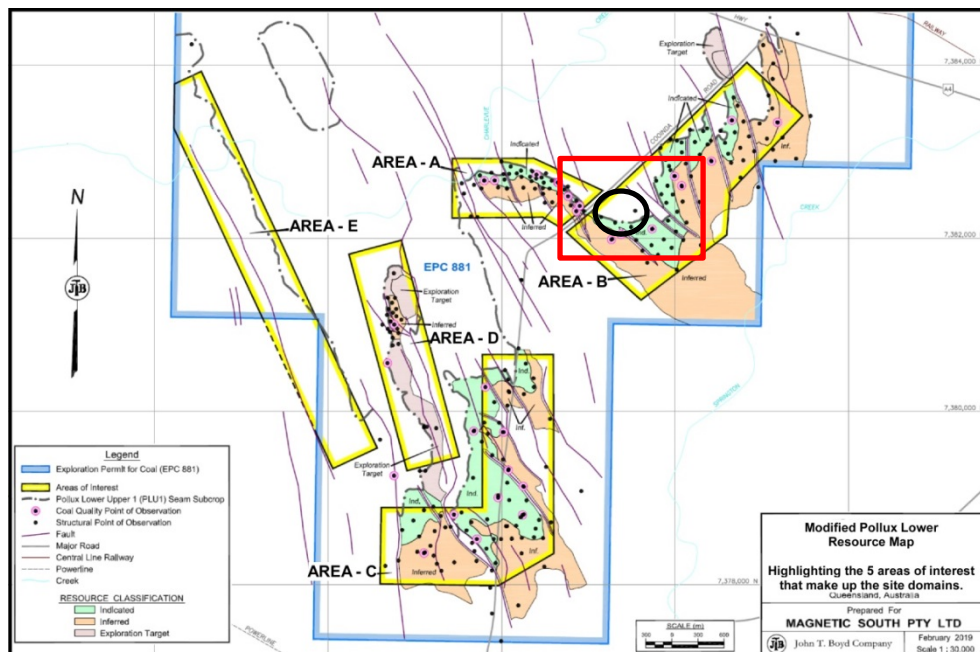


Figure 7.1. Mining areas (Boyd 2019), geotechnical study area in red.

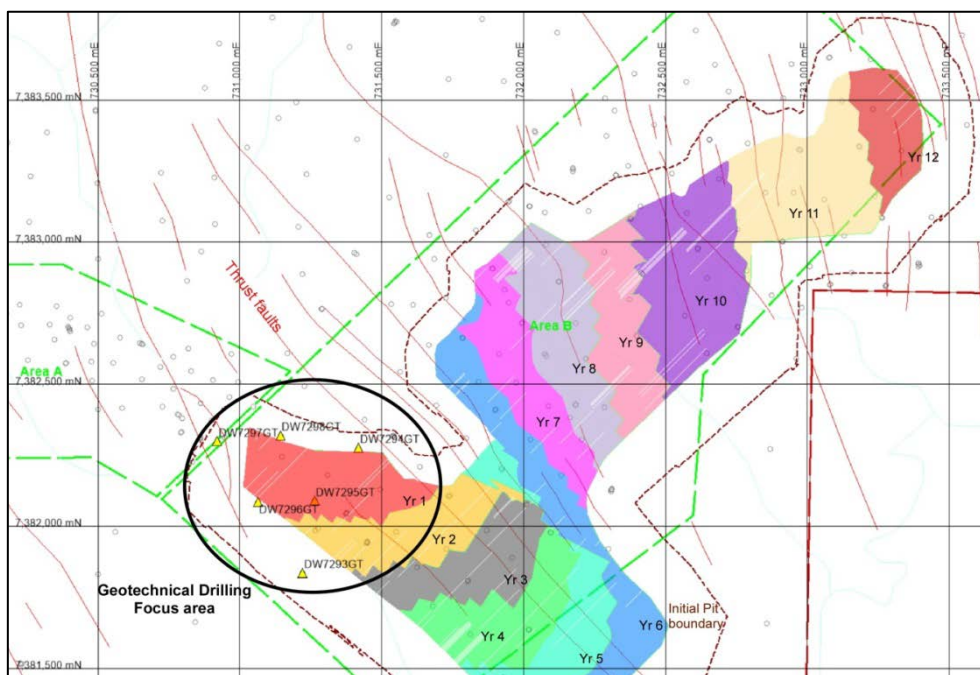


Figure 7.2. Location of geotechnical boreholes and the planned mining sequence.

## 8. GEOTECHNICAL BOREHOLE DATA

Detailed geotechnical data is appended to this report as follows:

- A – Core Box Photographs
- B – Geotechnical Logs
- C – ATV data – dips analysis and structure map
- D – Laboratory test certificates
- E – Spoil categorisation notes

### 8.1 Drilling Results

Table 8.1 summarises collar information for the fully cored boreholes that were drilled as part of the current investigation. As shown in Figure 7.2, the boreholes were focussed on AB-Pit where it is planned to start mining.

Table 8.2 summarises the key lithology intersections and Figure 8.1 and Figure 8.2 present the summary graphically.

Table 8.1. List of boreholes drilled for the geotechnical investigation.

| Borehole | Date Finished | Easting (mE) | Northing (mN) | Elevation (m AHD) | Depth (m) |
|----------|---------------|--------------|---------------|-------------------|-----------|
| DW7293GT | 31/08/2019    | 731220.78    | 7381837.01    | 126.840           | 223.10    |
| DW7294GT | 03/09/2019    | 731418.08    | 7382277.91    | 128.210           | 81.05     |
| DW7295GT | 09/09/2019    | 731263.38    | 7382090.56    | 126.810           | 129.300   |
| DW7296GT | 27/08/2019    | 731062.89    | 7382087.34    | 129.200           | 191.000   |
| DW7297GT | 01/10/2019    | 730919.58    | 7382299.68    | 135.580           | 133.30    |
| DW7298GT | 05/10/2019    | 731142.41    | 7382319.94    | 130.960           | 105.20    |

Table 8.2. Lithology intersection depth for each borehole.

| Intersected Unit | Boreholes |          |          |          |          |          |
|------------------|-----------|----------|----------|----------|----------|----------|
|                  | DW7293GT  | DW7294GT | DW7295GT | DW7296GT | DW7297GT | DW7298GT |
| SWL (Geophys)    | 3         | 3        | 38       | 13       | 7        | 26       |
| BUTE             | 23.63     | 34.61    | 33.48    | 42.64    | 51.05    | 50.26    |
| BHWE             | 48.17     | 48.56    | 41.62    | 52.13    | 60.84    | 57.62    |
| AR2_Roof         | 91.50     | -        | -        | 47.91    | -        | -        |
| AR2_Floor        | 92.80     | -        | -        | 48.57    | -        | -        |
| AR3U_Roof        | 134.06    | -        | 41.07    | 82.35    | -        | -        |
| AR3U_Floor       | 134.71    | -        | 41.62    | 82.88    | -        | -        |
| AR3_Roof         | 136.20    | -        | 43.40    | 84.03    | -        | -        |
| AR3_Floor        | 138.30    | -        | 45.85    | 86.30    | -        | -        |
| AR3L_Roof        | 138.44    | -        | 46.76    | 86.72    | -        | -        |
| AR3L_Floor       | 138.84    | -        | 47.26    | 86.95    | -        | -        |
| CASU_Roof        | 169.65    | -        | 83.28    | 123.00   | 78.50    | -        |
| CASU_Floor       | 172.16    | -        | 84.54    | 126.20   | 81.01    | -        |
| CASL_Roof        | 172.16    | -        | 84.54    | 126.43   | 81.01    | -        |
| CASL_Floor       | 174.05    | -        | 86.10    | 128.66   | 83.70    | -        |
| PU_Roof          | 184.04    | -        | 98.94    | 138.80   | 98.45    | -        |
| PU_Floor         | 184.39    | -        | 99.43    | 139.82   | 98.91    | -        |
| PUR_Roof         | -         | -        | -        | -        | 100.66   | -        |
| PUR_Floor        | -         | -        | -        | -        | 101.50   | -        |
| PLU1_Roof        | 185.25    | -        | 100.02   | 140.55   | 103.20   | -        |
| PLU1_Floor       | 186.43    | -        | 101.11   | 141.71   | 107.21   | -        |
| PUR_Roof         | -         | -        | -        | -        | 120.05   | -        |
| PUR_Floor        | -         | -        | -        | -        | 120.55   | -        |
| PLU1R_Roof       | -         | -        | -        | -        | 121.60   | -        |
| PLU1R_Floor      | -         | -        | -        | -        | 125.10   | -        |
| PLU2T_Roof       | -         | -        | 118.85   | -        | -        | -        |
| PLU2T_Floor      | -         | -        | 119.05   | -        | -        | -        |
| PLU2_Roof        | 207.89    | -        | 119.05   | 179.05   | -        | 50.61    |
| PLU2_Floor       | 211.69    | -        | 120.75   | 179.99   | -        | 50.98    |
| PLU4_Roof        | 219.20    | -        | 125.29   | -        | -        | 55.67    |
| PLU4_Floor       | 219.69    | -        | 125.63   | -        | -        | 55.93    |
| PLL1_Roof        | -         | 71.37    | -        | 188.55   | -        | 95.65    |
| PLL1_Floor       | -         | 72.05    | -        | 189.20   | -        | 96.20    |
| PL1L_Roof        | -         | 74.67    | -        | -        | -        | 99.05    |
| PL1L_Floor       | -         | 75.07    | -        | -        | -        | 99.44    |



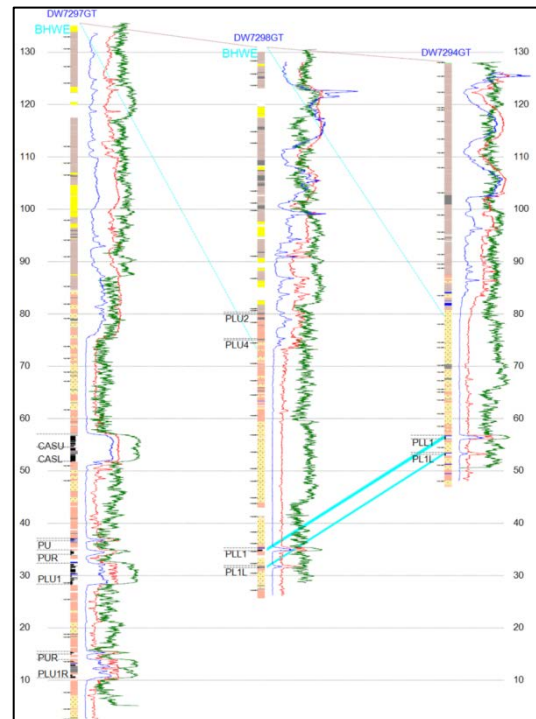
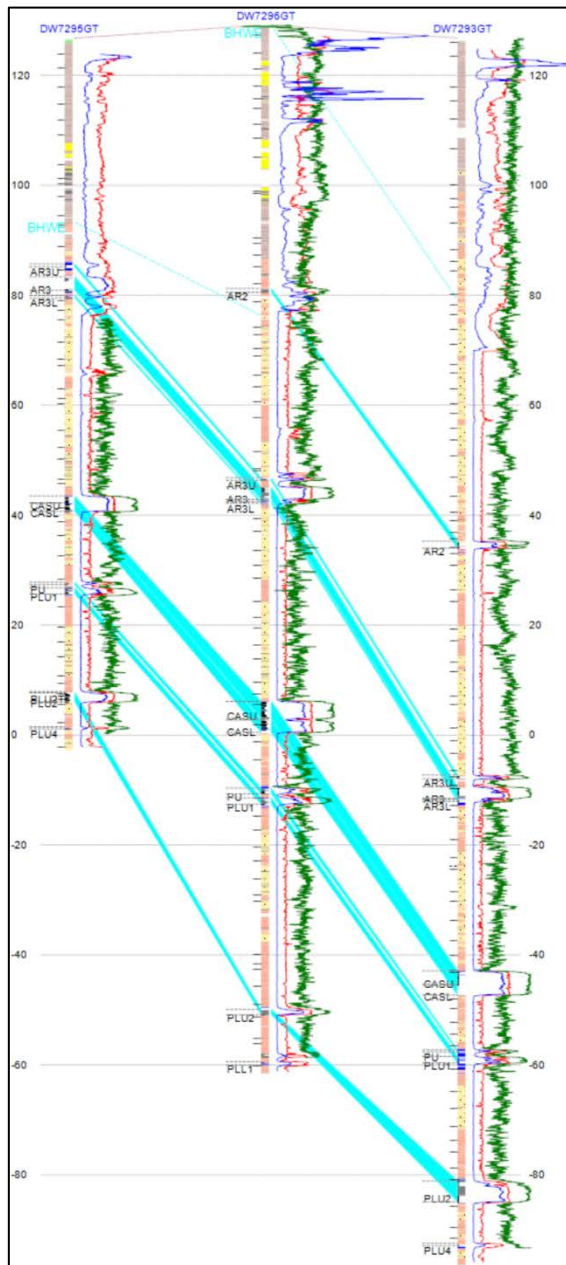


Figure 8.2. Borehole Graphic DW7297GT, DW7298GT & DW7294

Figure 8.1. Borehole Graphic DW7295GT, DW7296GT & DW7293GT.

## 8.2 Geotechnical Logging

### 8.2.1 Field Logging

The field logging was undertaken by J.C. Irvine Pty Ltd geologists. GTS converted the coded sheets into graphical geotechnical logs which are presented in Appendix B. The core box photos are presented in Appendix A.

### 8.2.2 Geophysical Logging

The geotechnical boreholes were surveyed using a suite of downhole geophysical instruments. The gamma, caliper, density, sonic velocity channels and the Acoustic Televiewer (ATV) are particularly useful for geotechnical characterisation.

The ATV data interpretation was conducted by Borehole Wireline Pty Ltd. Interpreted structures were reviewed in the stereo plotting program *Dips* and reconciled against the field data. The results of the downhole surveys have been incorporated into the structural interpretation and geotechnical design recommendations.

### 8.2.3 Interpretation

The ATV transmits a 500kHz sonic pulse at the borehole wall and a receiver measures the time and amplitude of the reflected wave. The signal is directed towards the borehole wall by a rotating concave sonic mirror and the process is repeated all the time the sonde is being moved along the hole. This results in helical logs of reflected time and amplitude which become orientated maps of the borehole wall which allow the identification and orientating of structural defects within the walls of a borehole. However, it is not always possible to identify the nature of a discontinuity, hence, the use of generic terms such as “major or minor discontinuity” and the term “fabric” as opposed to bedding. Similarly bedding dips may be overstated if the picking of sinusoidal waves is biased.

Nevertheless, a trend in the orientations of structures provides a good indication of slope direction especially when reconciled against the field logging measurements and photos. A base structural interpretation plan is shown in Figure 8.3 and additional data is shown in Appendix C. An absence of structures shown dipping at 80° to 90° is because the boreholes were vertical and this is the blind zone for vertical boreholes.

The principal interpreted features are:

- All holes present similar conjugate joint sets (primary and secondary) as expected in this compressional terrain.
- All holes, except DW7294GT and DW7295GT, show strata dipping to the South West (Figure 8.3).
- DW7294GT intersects the axis of a plunging anticlinal fold, and presents the shallowest dip of 11° towards the South East.
- In DW7295GT the strata dip at 27° towards the North. The reason for this is not known. However, possible reason include: a drag fold affected by the proximity to a thrust fault plane or a rotated block between two thrust zones. As the project develops this will require further investigation.

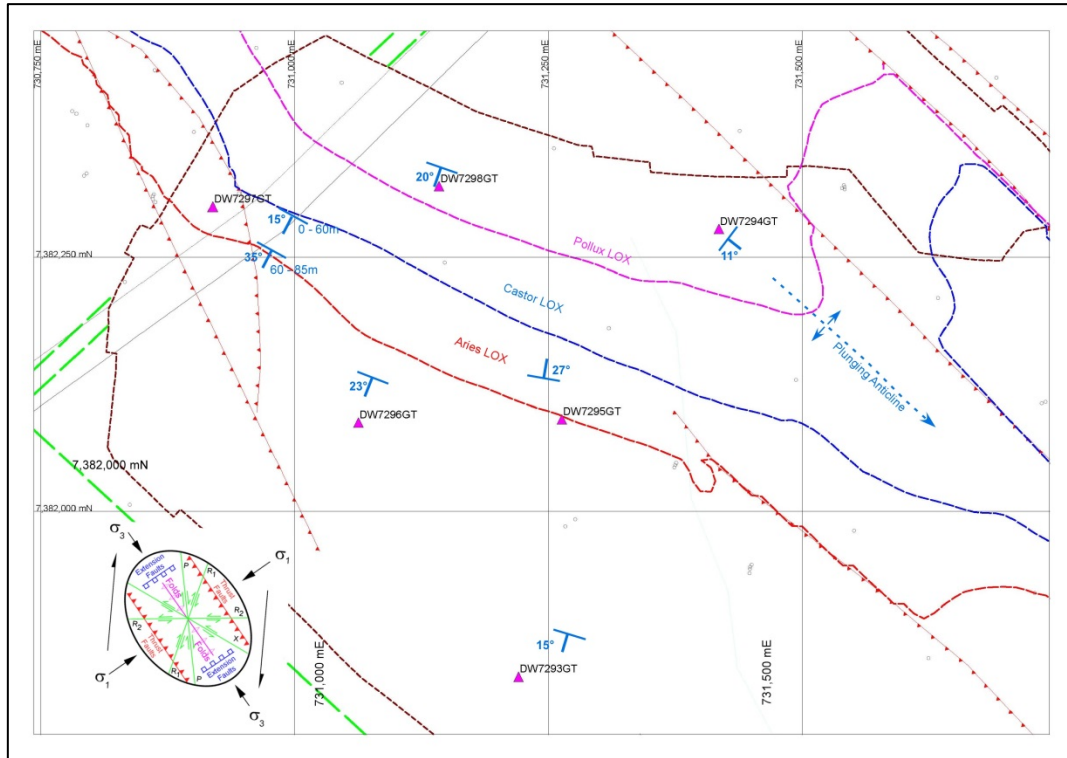


Figure 8.3. Base structure map with geotechnical holes and bedding dip notation.

In summary, the rock mass is characterised as comprised of a mostly low and medium-strength rock mass that has fold and thrust features resulting in the development of multiple weak defects cutting through the rock mass. The measured defect orientations have numerous interfaces sub-parallel with bedding.

The interpreted structures are typical of complex deformation, with ramps or stacked thrusts associated with accommodation of flexural slip. An illustration of the flexural slip model is shown in Figure 8.4. Abundant bedding plane slips with steep lineation's, thrust stacks/seam thickening, folding and doming are expected in this structural terrain.

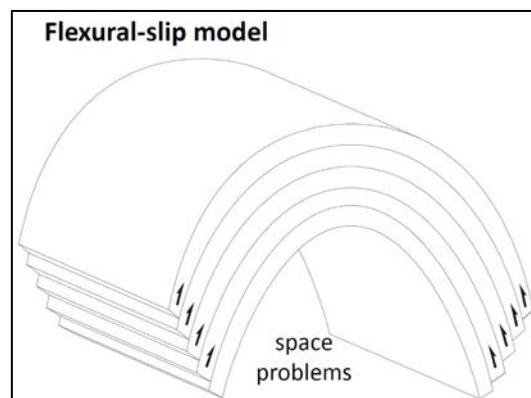


Figure 8.4. Flexural Slip model (from Silwa 2017)



## 9. LABORATORY TESTING

Laboratory tests were carried out by Trilab Pty Ltd, a NATA registered laboratory that is located in Brisbane.

The following tests were carried out:

- 16 Atterberg Limits tests on Tertiary clays
- 44 Unconfined compressive strength
- 15 Brazilian tensile strength
- 10 Slake tests.

Test certificates are provided in Appendix D.

### 9.1 Atterberg Limits

Atterberg Limits tests were carried out on 16 samples taken from the Cenozoic horizon. The results are listed in Table 9.1 shown graphically in Figure 9.1.

Table 9.1. Atterberg Limits tests results.

| ID         | Sample No. | Test Date  | Depth (m)   | Moisture Content (%) | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Linear Shrinkage (%) |
|------------|------------|------------|-------------|----------------------|------------------|-------------------|----------------------|----------------------|
| DW7295GT01 | 19110040   | 29/11/2019 | 2.72-3.02   | 12.5                 | 44               | 18                | 26                   | 11.5                 |
| DW7295GT03 | 19110041   | 29/11/2019 | 8.83-9.13   | 12.7                 | 47               | 18                | 29                   | 12.5                 |
| DW7295GT05 | 19110042   | 29/11/2019 | 14.85-15.15 | 20                   | 66               | 24                | 42                   | 15                   |
| DW7295GT07 | 19110043   | 2/12/2019  | 22.94-23.24 | 11                   | 41               | 18                | 23                   | 8.5                  |
| DW7296GT01 | 19110056   | 2/12/2019  | 1.76-2.09   | 12.6                 | 42               | 15                | 27                   | 11.5                 |
| DW7296GT03 | 19110057   | 2/12/2019  | 7.97-8.30   | 12.6                 | 53               | 17                | 36                   | 15                   |
| DW7293GT01 | 19110013   | 29/11/2019 | 0.65-0.90   | 17.3                 | 28               | 12                | 16                   | 9                    |
| DW7293GT03 | 19110014   | 29/11/2019 | 8.72-8.98   | 15.6                 | 37               | 19                | 18                   | 7                    |
| DW7293GT05 | 19110015   | 29/11/2019 | 14.51-14.81 | 14.8                 | 49               | 20                | 29                   | 12.5                 |
| DW7294GT02 | 19110030   | 29/11/2019 | 2.67-2.97   | 10.3                 | 38               | 16                | 22                   | 9                    |
| DW7294GT03 | 19110031   | 29/11/2019 | 5.75-6.05   | 7.4                  | 32               | 13                | 19                   | 9.5                  |
| DW7294GT06 | 19110032   | 29/11/2019 | 11.35-11.65 | 14.2                 | 50               | 17                | 33                   | 12.5                 |
| DW7297GT01 | 19110068   | 2/12/2019  | 2.48-2.88   | 13.3                 | 43               | 15                | 28                   | 17                   |
| DW7297GT02 | 19110069   | 2/12/2019  | 4.89-5.24   | 13.4                 | 53               | 16                | 37                   | 16.5                 |
| DW7298GT01 | 19110078   | 2/12/2019  | 2.60-2.90   | 11.9                 | 35               | 14                | 21                   | 11                   |
| DW7298GT02 | 19110079   | 2/12/2019  | 5.05-5.43   | 11.4                 | 49               | 15                | 34                   | 15.5                 |

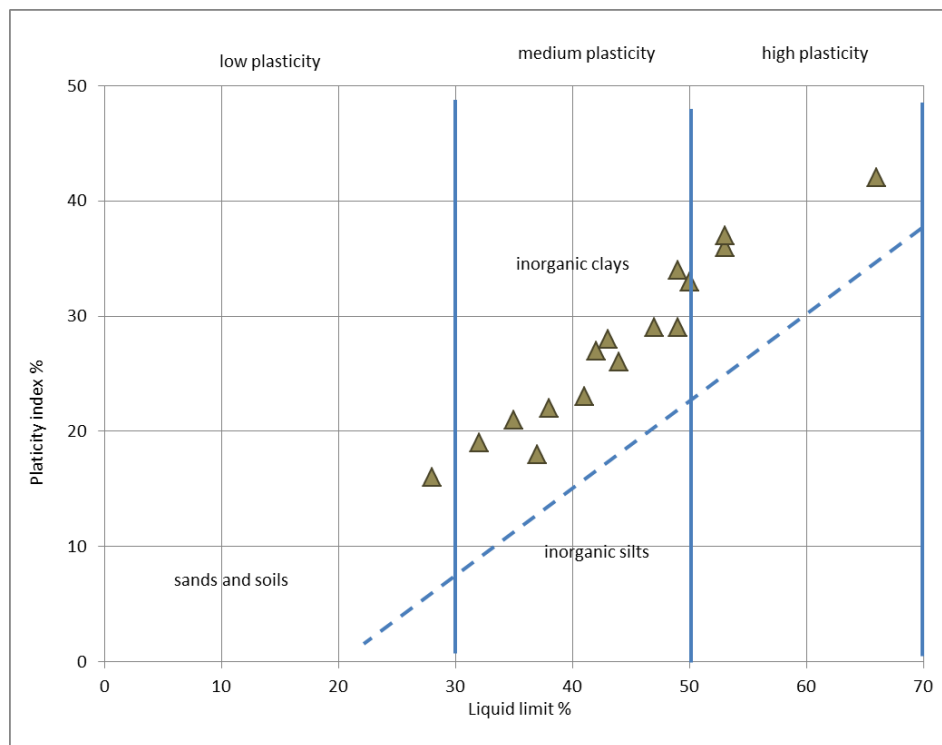


Figure 9.1. Atterberg Limits test results plasticity chart.

The results show that the clays are mostly of medium plasticity; they will deform when wet but there is nothing particularly unusual about them.

3 of the samples returned results that categorise them as high plasticity. Such clays are often associated with weathered basalts and have very low shear strength when they are saturated.

High plasticity clays are unsuitable for use as the foundation for waste dumps and should be selectively placed so that they are within the body of the spoil and not on the floor.

## 9.2 Unconfined Compressive Strength

44 UCS tests were carried out and test certificates are provided in Appendix D.

Most of the tested samples were sandstone or sandstone interbedded with siltstone, reflecting the predominant composition of the interburden rocks.

In addition to determining the UCS for slope stability purposes, Poisson's Ratio and Young's Modulus were also measured. These data are required as input to blast design software and there is rarely the opportunity to obtain samples once production has commenced so the opportunity was taken to test for these parameters as part of this assessment. Obtaining these parameter values, simply involves gluing strain gauges to the UCS samples and measuring the specimen strain as the load is applied.

Results of the UCS versus depth are shown in Figure 9.2. Most fresh coal measures rock has strengths in the range of 15 to 35 MPa. There is a general trend of increasing strength with depth but there is a wide scatter in the strength test results which is not unusual. The scatter may be due to: natural material variability, the limited number of tests or, micro-scale damage to the rock substance as a result of the tectonic stresses experienced in the development of the Yarrabee Thrust and associated fold zone.

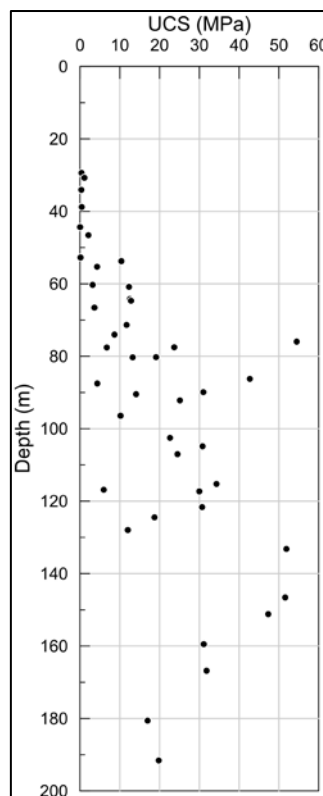


Figure 9.2. UCS versus Depth.

A whisker plot highlighting the mean, minimum and maximum UCS values for each rock type in stratigraphic sequence is presented in Figure 9.3 and the rock strengths by stratigraphy are summarised in Table 9.2.



Table 9.2. UCS by Stratigraphy.

| Stratigraphic Unit   | UCS (MPa) |         |         |
|----------------------|-----------|---------|---------|
|                      | Average   | Maximum | Minimum |
| Tertiary             | 0.20      | 0.39    | 0.03    |
| Weathered Permian    | 0.97      | 2.09    | 0.10    |
| Fresh AR2 overburden | 32.60     | 54.50   | 12.30   |
| <i>AR2 seam</i>      |           |         |         |
| Fresh interburden    | 23.73     | 51.90   | 3.14    |
| <i>AR3 seam</i>      |           |         |         |
| Fresh interburden    | 21.60     | 47.30   | 4.29    |
| <i>Castor seam</i>   |           |         |         |
| Fresh interburden    | 9.21      | 14.10   | 4.31    |
| <i>PU seam</i>       |           |         |         |
| Fresh interburden    | 27.25     | 30.00   | 24.50   |
| <i>PLU1 seam</i>     |           |         |         |
| Fresh interburden    | 24.09     | 51.60   | 5.94    |
| <i>PLU2</i>          |           |         |         |
| Fresh interburden    | 18.42     | 42.70   | 3.62    |
| <i>PLL1</i>          |           |         |         |
| Floor                | 14.65     | 19.10   | 10.20   |

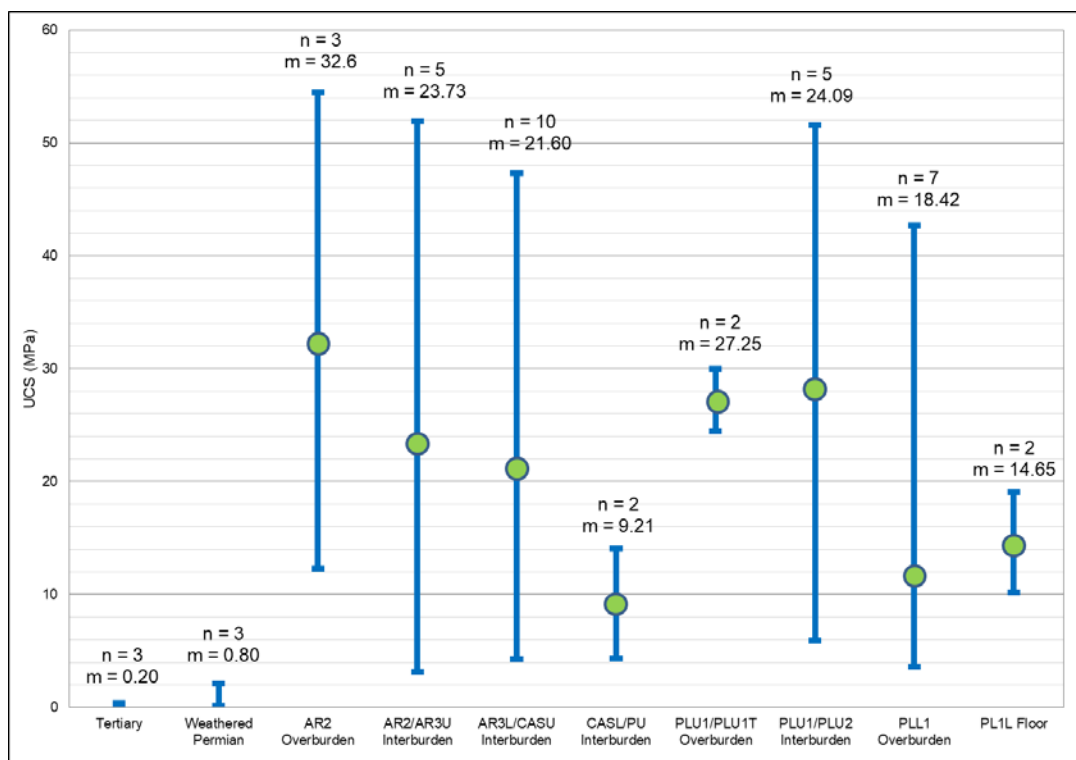


Figure 9.3. Whisker plot of mean, minimum and maximum UCS by stratigraphy.

### 9.3 Poisson's Ratio

Poisson's ratio was measured as part of the UCS tests in order to provide information for blast design. Test certificates for these results are provided in Appendix D. A plot of UCS versus Tangent Poisson's Ratio is shown in Figure 9.4.

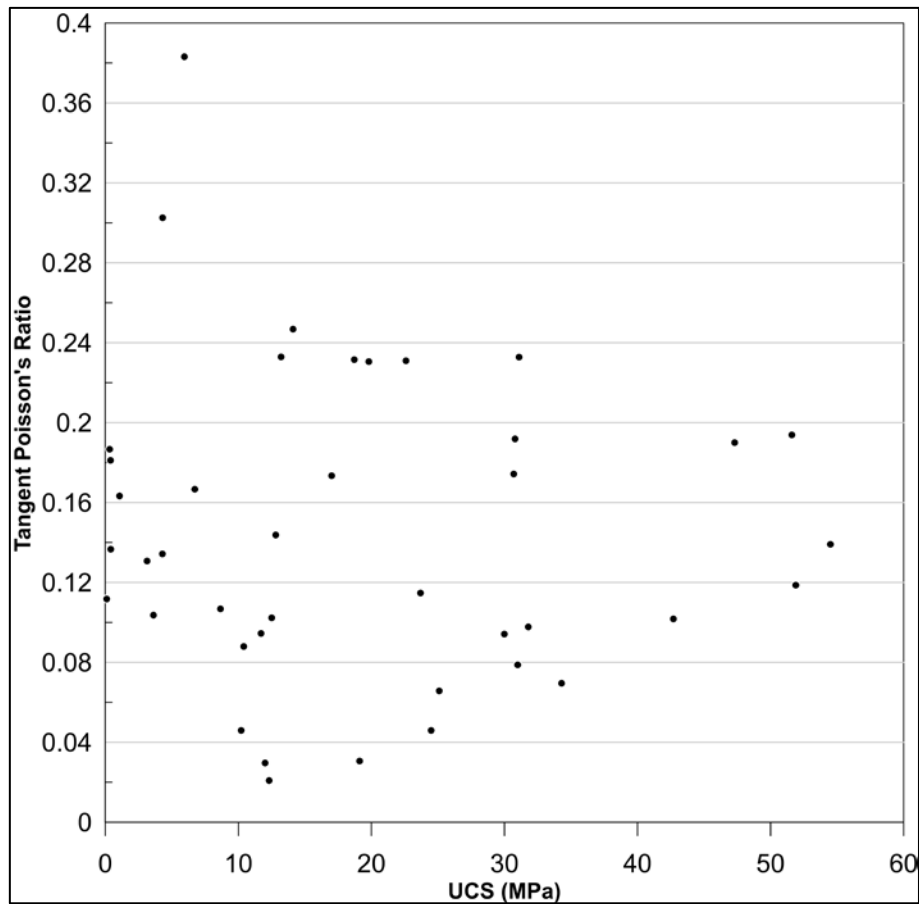


Figure 9.4. UCS versus Poisson's Ratio.

## 9.4 Young's Modulus

Young's Modulus was measured as part of the UCS tests in order to provide information for blast design. Test certificates for these results are provided in Appendix D. A plot of UCS versus Tangent Young's Modulus is shown in Figure 9.4. As a rule of thumb the Modulus is about 400 times the UCS (note the units are different on each of the axes).

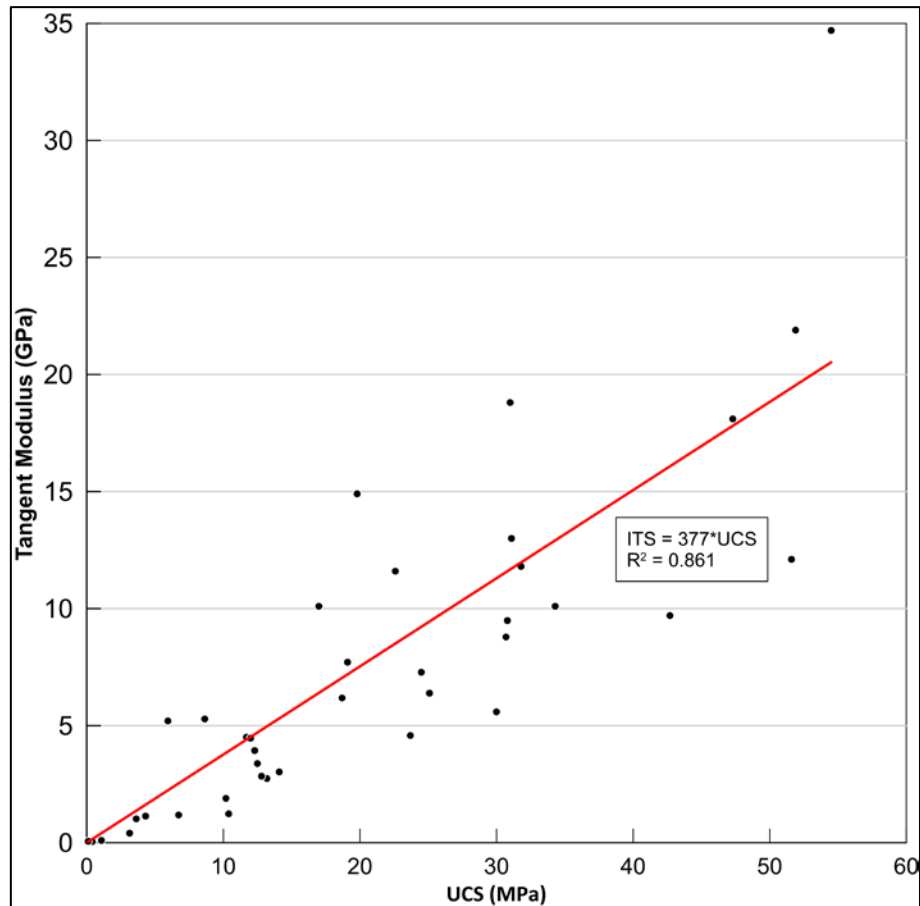


Figure 9.5. UCS versus tangent Young's Modulus.



## 9.5 Correlation between UCS and Sonic Velocity

Sonic velocity can be used as an analogue for strength, and more specifically, UCS. There are many correlations available and because they are based on curve fitting of an exponential function they are very sensitive to end-member points. The data plot from which the local correlation has been obtained is shown in Figure 9.6. The coefficient of correlation,  $R^2 = 0.8011$ , is at the high end of correlations values for these data type of data. And even so it can be seen there is significant scatter in the data making forward prediction of UCS, particularly for higher velocities, problematical. More testing could improve the correlation.

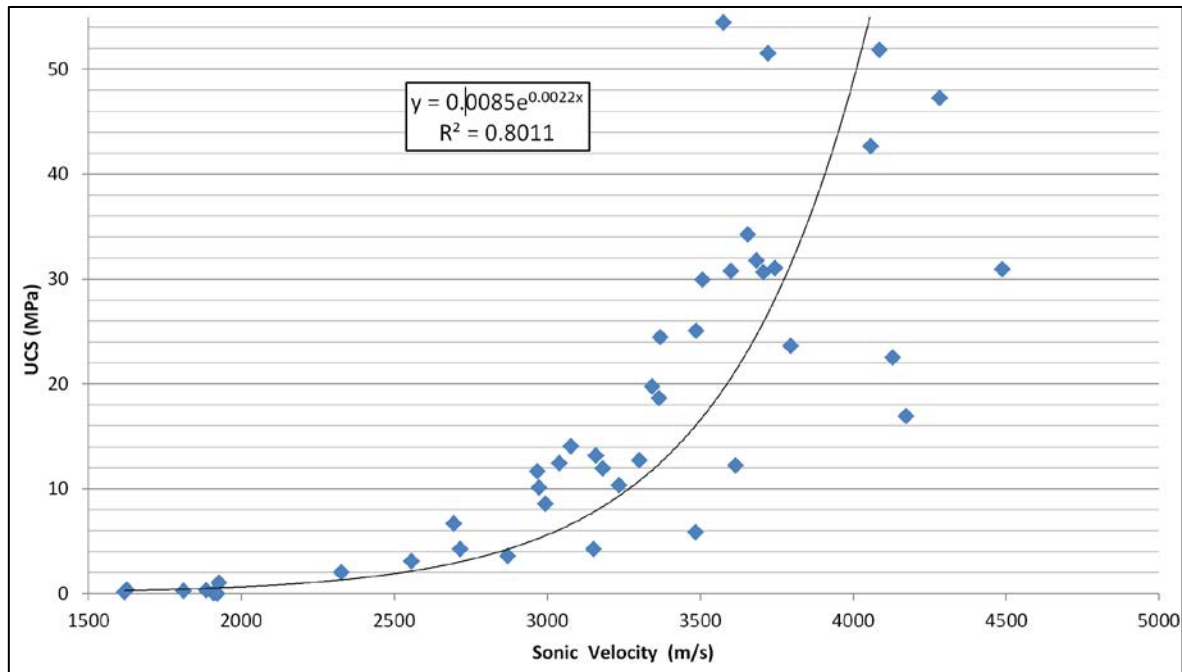


Figure 9.6. Project specific UCS-sonic velocity correlation.

## 9.6 Indirect Tensile Strength

15 ITS tests were carried out and test certificates are provided in Appendix D.

These data are required as input to blast design software. All samples, except for one, consisted of fresh sandstone or siltstone overburden. The exception was a single, slightly weathered sample from a depth of 48.5 m that returned an ITS value of 0.28 MPa.

The test results are in the range of 0.28 to 3.05 MPa. As shown in Figure 9.7, the results indicate that the ITS is approximately 10% of the UCS and this is consistent with experience across a variety of rock types.

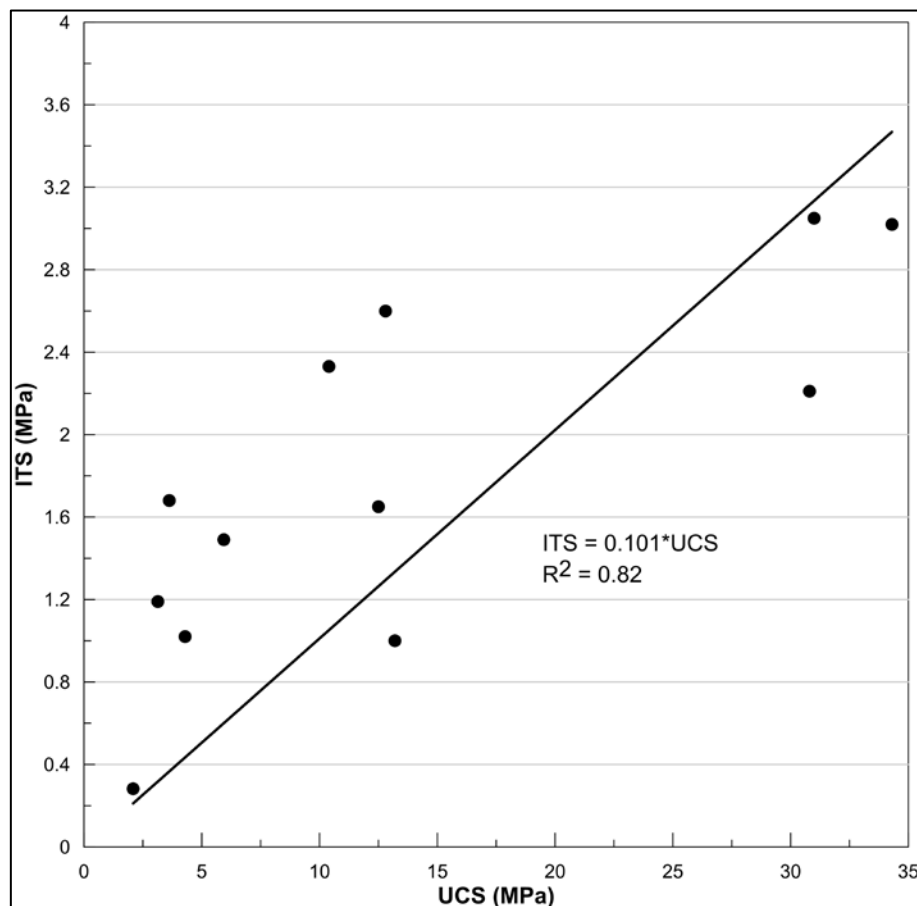


Figure 9.7. USC versus ITS.

## 9.7 Slaking Tests

Slaking tests were carried out on 10 samples, comprising weathered clays, which had been recovered from depths of less than 24 metres from surface level. The laboratory test certificates are contained in Appendix D.

The results indicate that clay samples are prone to slaking and, typically will completely deteriorate (Figure 9.8), with little swelling and minor dispersion within a few minutes to a few hours. In practice, this means that the clays will be susceptible to consolidation when subject to saturation in spoil dumps. It also means that when they are wet they will be readily remoulded with the potential to result in very low post-peak strength properties, particularly for high plasticity clays.

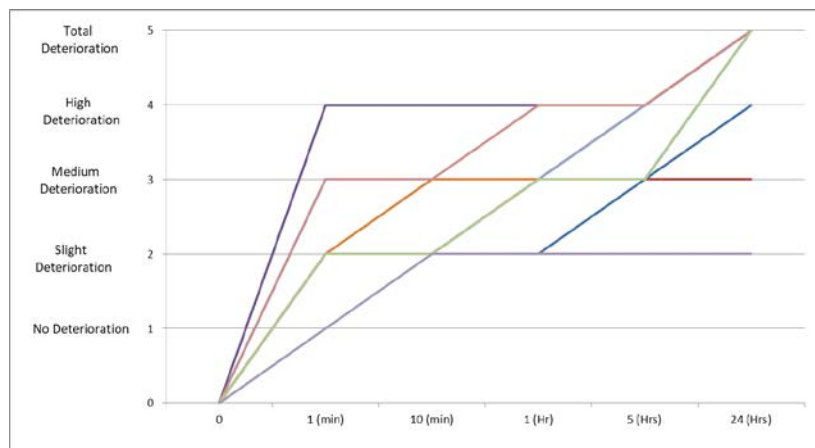


Figure 9.8. Slake durability test results.



## 10. GEOTECHNICAL ENVIRONMENT

### 10.1 Introduction

This section provides a broad outline of the geotechnical environment that will be encountered in developing the Project. This description provides context for the recommendations that are made in Section 11

### 10.2 Tertiary

Tertiary material is typically 30–40 m thick in the AB-Pit area and has a significant clay content. Consequently, it is expected that batters in the range of 12–18 m in height will be able to stand quite steeply for short periods, typically, weeks to months. However, because of the clay content, the material will have a tendency to shrink and swell in response to rain and sun and will deteriorate, sometimes as large columns of clay dropping out of a batter, at other times as more generalised slumping. In addition, should water pond on any poorly graded bench then it is likely that failure will occur through the development of excess pore pressures or piping through the clay. The overall slope will need to be managed in either to maintain stability or to allow them to deform in a controlled manner until such time as in-pit dumps have been established.

The Tertiary layer is potentially a free dig horizon. This assumes that there are no hard, lateritised zones present.

No basalt material is anticipated in AB-Pit area, if basalt flows are encountered while mining they can have adverse effects. Basalts generally flowed along former creek beds trapping unconsolidated creek bed deposits between the base of the basalt and the old channel floor. When these palaeochannels are exposed in pit walls their floors can be unstable and a source of significant volumes of groundwater. However, the groundwater investigation for the EIS (JBT, 2019) indicates that they are dry at the Gemini Project. Clays derived from basalt can be problematic as they often have high plasticity and low shear strength.

### 10.3 Geological Structure

Geological structure is likely to be the most significant factor in geotechnical stability. However, as noted previously, existing mines situated within the Yarrabee Thrust Zone are able to operate successfully.

Four main impacts of geological structure in a thrust environment are:

- Increased fracture frequency resulting in a lower overall rock mass strength
- Wedge, planar and toppling type failures
- Faults following immediate roof and floor and exaggerating any weaknesses at these locations
- The potential for steeply dipping strata.

In thrust and fold terranes it is inevitable that there will be zones of more intense fracturing. This weakens the overall rock mass strength and may require implementation of a soft highwall design. It may also weaken the floor and require design modifications to ensure stable in-pit dumps particularly on steeply dipping floors.

Highwall instability is most likely to occur when a thrust that strikes subparallel with the wall daylight in the wall or is located just behind it. To this end it is recommended that highwall and endwall designs should avoid alignment in this NW direction. In fresh rock that is not affected by faulting, the ground conditions will be suitable for conventional highwall designs.

Structures associated with faulting are also likely to result in an increased incidence of wedge, planar and toppling failures which are dealt with routinely during production using geotechnical management plans and TARPs. As an example, in DW7295GT a dip reversal has been identified that would result in a dip out of the wall and consequently, an increased likelihood of instability should this coincide with a highwall.

Low angle thrust faults are likely to follow the immediate roof and floor of coal seams and create very low strength sheared surfaces. In highwalls this can create a particularly low strength zone immediately above the coal roof that, when it is uncovered, allows wedges or blocks of rock to fall, suddenly, out of the wall.

Boxcut lowwall stability will be affected by two main conditions: floor strength and dip angle. Steep floor will undercut conventionally designed 45° lowwall boxcut batters. As a rule of thumb, a drained lowwall slope where the bedding is steeper than 25° will have a factor of safety less than 1.2.

Boxcut lowwall failures, should they occur, will tend to be gradual, moving slowly down dip, particularly in response to rainfall events. And management of large, slow-moving failures is an alternative to designing lowwall boxcuts that are stable but then are buried by in-pit spoils within a relatively short time after being exposed.

A final impact of the geotechnical conditions that occur at the Gemini Project is the increased likelihood of floor heave due to the weight of spoil on steep and/or weak floor. Provided the dumps are constructed in accordance with recommendations given below this is a low likelihood but could occur under special conditions such as over-steepened dumps, saturated floor or a thrust located within one or two metres of the floor. For this reason test pits to check floor conditions should be routinely carried out.

When mining, allowance should be made to undertake regular geological mapping in order to understand orientation and to manage the elevated risk of structurally based failures.

## 11. DESIGN RECOMMENDATIONS

### 11.1 Introduction

The following tables give suggested slope design parameters for conceptual planning. They are based on the recent drilling, analysis and experience gained from other Bowen Basin mines within the Rangal Coal Measures. In each case it is assumed that, in accordance with industry practice, the target factor of safety (FS) is a minimum of 1.2. It has been assumed that there are no unusual groundwater conditions and that groundwater pressures will progressively reduce as the project is developed. It is possible that groundwater is trapped behind impermeable faults and causes a rise in porewater pressures which may cause local adverse impacts on stability.

### 11.2 Excavated Walls

There are four important issues for the proposed AB-Pit pit excavated pit slopes:

- Steep dips, bedding plane shears and faults into the pit from the western lowwall
- Steep joints/faults and rolled bedding into the eastern highwall
- Groundwater
- Weak floor (also an issue for in-pit spoil stability).

To establish design recommendations, stability analyses have been undertaken on conceptual designs using the currently available geological model and pit shell. The fault model was still under development at the time of this report. It is recommended that further stability analyses be carried out when both of these aspects have been firmed up.

Table 11.1 summarises the design recommendations for endwall and highwall faces.

Table 11.1. Design parameters for excavated endwalls and highwalls.

| Material           |                                 | Design Recommendation                                                                          |
|--------------------|---------------------------------|------------------------------------------------------------------------------------------------|
| Cenozoic           |                                 | 37° overall where floor dips $\leq 18^\circ$ , max batter height 15m                           |
|                    |                                 | 30° overall where floor dips $> 18^\circ$ , max batter height 15m                              |
| Coal Measure Rocks | Weathered                       | 45° overall, 10m catch bench at BOW or top of hard                                             |
|                    | Fresh-fractured or rotated dips | 45° softwall batters, max batter height 55m, 10m min bench width or to suit drilling geometry. |
|                    | Fresh, Intact                   | 65° batters, 50m max batter height, 10m min bench width or to suit drilling geometry.          |



### 11.2.1 Western Lowwall

The western lowwall will follow the Pisces Lower floor. The average wall angle will be around  $30^\circ$  but may range from  $11^\circ$  to  $45^\circ$ . A terrace mining method is proposed and this will result in a series of stepped, horizontal working surfaces. Typical bench heights are around 15 m in order to provide a safe working area and to minimise dilution due to overburden falling onto the coal surface. Figure 11.1(e) illustrates such an arrangement.

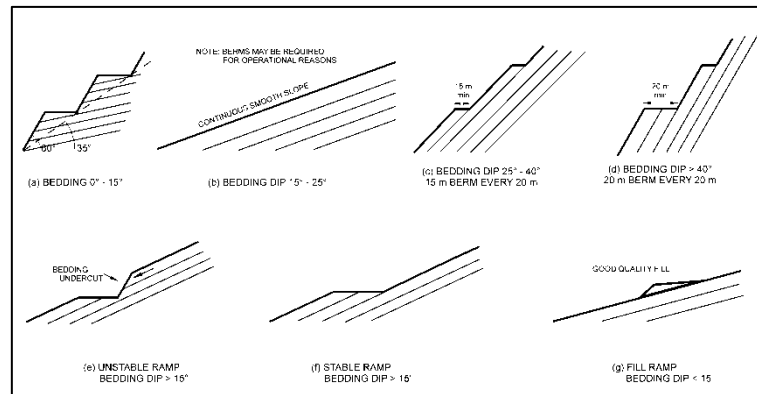


Figure 11.1. Generic solutions for mining steeply dipping strata.

Figure 11.2 shows a conceptual lowwall design. The recommended overall angle for the Cenozoic and weathered Permian is  $30^\circ$ . This can be achieved with two  $45^\circ$  batters separated by a 20 m wide bench. However, if the operators over-dig the Tertiary horizon, as often occurs, then it will be necessary to limit the batter to height to around 18 m to prevent damaging collapse on to the equipment.

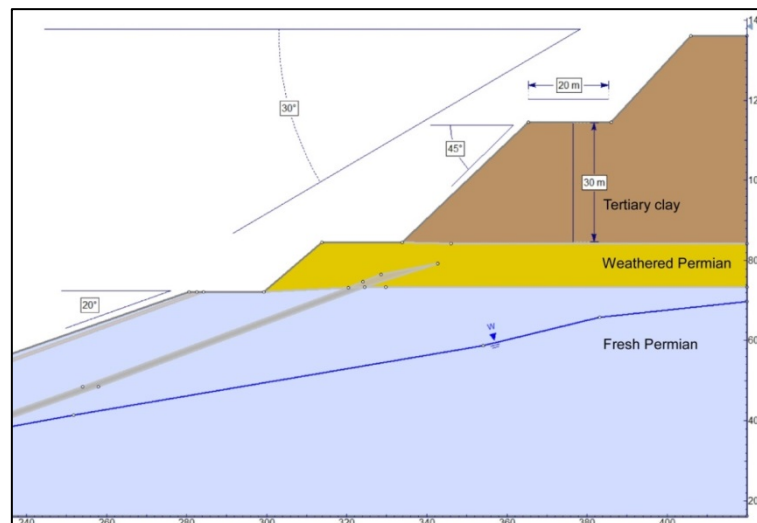


Figure 11.2. Conceptual lowwall design.

As mining proceeds down dip after the initial box cut, the batter height in each flitch should be restricted to 15m in order to manage back-break and rock sliding out of the batters. Even with careful mining it is envisaged that there will be significant deterioration of the batters, and for that reason 20 m wide intermediate benches are recommended.

### 11.2.2 Eastern Highwall

The highwall performance will be a function of two opposing processes. The bedding-dip into the wall will tend to enhance wall stability, while the steeply dipping imbricate faults will tend to de-stabilise the wall in the mode of toppling-type failure. For these reasons, slightly flatter than normal highwall slopes are recommended (Figure 11.2) as follows:

- 45° batters in Cenozoic soil/distinctly weathered Permian to a depth of approximately 20 m. A 15 m wide catch bench is required at the base of this horizon.
- 65° batters in slightly weathered/fresh coal measures. A 15 m catch bench is required every 50 m.

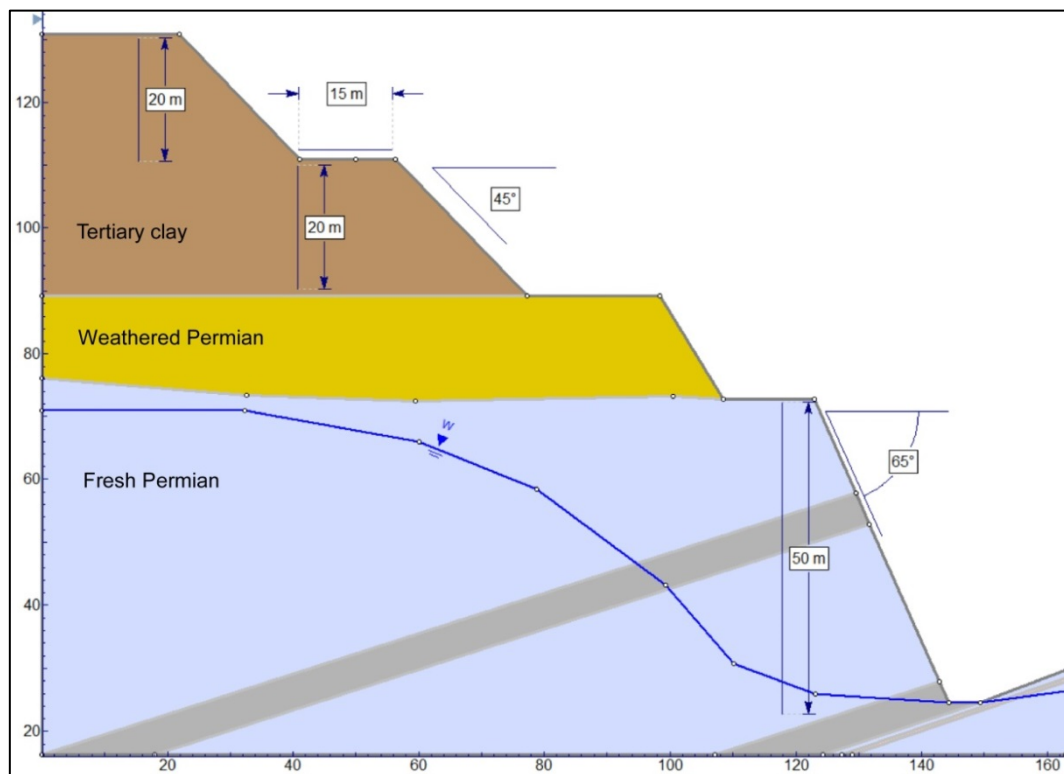


Figure 11.3. Conceptual highwall design.

### 11.2.3 Endwalls

The same design is recommended for the endwalls as for the highwall (i.e. Figure 11.2). The endwalls are likely to be damaged as a result of faulting. However, there should not be any major structures dipping out of the endwalls in an unfavourable orientation. The likely mode of failure from the endwalls is fretting and undercutting. Again, the slightly flatter than normal endwall slopes are designed to reduce the risk of endwall failures.

#### 11.2.4 Groundwater and Excavated Walls

The current groundwater table is 17 to 45 m below natural ground surface (JBT, 2019 p57). It has been assumed that pore pressure dissipation will occur at a similar rate as mining, and that the pit walls will not be adversely affected by excess pressure.

That assumption could be challenged by:

- Impermeable faults trapping water behind them
- Pressure unable to dissipate from the lowwall.

Elsewhere in the Bowen Basin where faults behave as aquitards effect are mostly quite localised.

Ponded water, behind the crests of excavated walls, has been a major contributing factor in a number of Bowen Basin slope failures. The surface water has drained into jointed strata creating a significant water pressure immediately behind the wall resulting in instability. In these circumstances it is the pressure, not the volume of water that is significant. In the case where there is a layer of thick Cenozoic strata, ponding must be prevented in order to minimise the risk of piping which may lead to large scale slumping in the Cenozoic horizon. Care will need to be taken with surface water management to minimise the risk of this happening at the Project.

It is possible that low bedding-normal permeability combined with high bedding-parallel permeability could result in excess pore pressures developing in the lowwall. This could be an issue if the lowwall remains exposed for an extended period. Once the lowwall is buttressed with in-pit spoil, there should not be an issue for lowwall stability.

### 11.3 Excavation Characteristics

It is expected that free dig will be possible down to the base of Tertiary provided there are no indurated layers. No hard laterite or silcrete was encountered during the investigation drilling but in areas of deep weathering within the Bowen Basin these indurated materials are sometimes encountered as patchy occurrences and require localised blasting. The Tertiary layer is up to 40 m thick although more typically is 10 to 20 m thick in the AB-Pit area and this is likely to be the limit of free dig using heavy excavators. Thereafter, the weathered and fresh strata, which extend to depths of up to 50 m, will need to be loosened by blasting in order to obtain satisfactory productivity.

### 11.4 Blasting

The fresh interburden strata have UCS values typically in the range 9 to 32 MPa, but up to 52 MPa.

It may be possible to slightly reduce powder factors in the fractured rock, subject to experimentation. Care will be required to minimise wall damage, lipping, back-breaks, and overhangs given the extent of faults, joints and bedding plane defects.

While it is assumed that the pit will be effectively drained for stability purposes, some seepage is likely to occur and therefore waterproof explosives may be required.



## 11.5 Waste Dumps

### 11.5.1 Introduction

The standard geotechnical classification of coal mine spoil used in the Bowen Basin is the BMA classification (Simmons and McManus, 2004). Spoils are categorised based on visual tactile properties, shown in Table 11.2 additional information is provided in Appendix E. Each category has been assigned shear strength parameter values that are used in stability calculations.

Table 11.2. Spoil classification scheme.

| <b>BMA Category</b> | <b>Description</b>                                                                            |
|---------------------|-----------------------------------------------------------------------------------------------|
| Cat 1               | Matrix only, i.e. fine-grained material (high plasticity clay and silt) in continuous contact |
| Cat 2               | Matrix supported, i.e. blocky rock separated by fine-grained, low plasticity material         |
| Cat 3               | Framework supported, i.e. blocky rock in continuous contact with low plasticity, fine matrix  |
| Cat 4               | Framework only, i.e. blocky rock that is only slightly slaking with minor fines               |

For the Gemini Project, Cenozoic alluvium and clay, at normal moisture contents, would be classified as BMA Category 2 material and fresh coal measures rock would qualify as between Cat 2 and Cat 3, referred to as Cat 2.5 material.

### 11.5.2 Out-of-Pit Dumps

Out-of-pit dumps are not expected to encounter unusual conditions. An out-of-pit waste dump is proposed on the western side of AB-Pit, with an expected maximum height of 30 m above natural ground. The initial lifts will consist mainly of Tertiary strata which is classified as Cat 2 material.

No particular problems are anticipated in constructing out of pit dumps. Table 11.3 provides design parameters for dumps up to 100 m in height. It is recommended to set back any the toe of any dump at least 30 m from any lowwall in order to avoid loading the crest and to allow sufficient room for adequate drainage. The recommendation assumes that any dumps are adequately drained and wet or sloppy material is excluded from active faces or other locations where they may have an adverse impact.

Table 11.3. Design parameters for drained out-of-pit dumps up to 100 m high.

| <b>Material</b> | <b>Lift</b> | <b>Bench</b> |
|-----------------|-------------|--------------|
| BMA Cat 1       | 10 m        | 10 m         |
| BMA Cat 2       | 20 m        | 10 m         |
| BMA Cat 3       | 30 m        | 10 m         |
| BMA Cat 4       | 40 m        | 10 m         |

While Table 11.3 provides design parameters for dumps with adequate FS, if the dump has to be re-shaped for a final landform with an overall slope angle on the order of 15% or 8.5° then spoil should be placed in layers with sufficient setbacks to minimise rehandle, as illustrated in Figure 11.3.

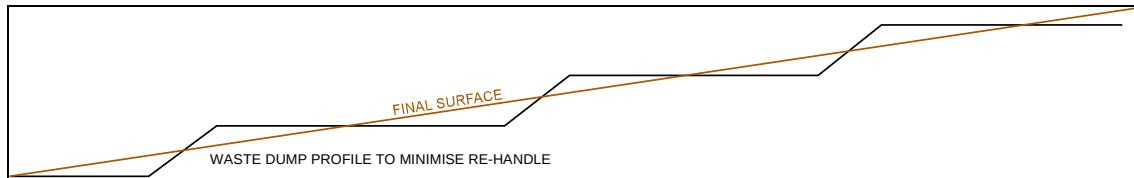


Figure 11.4. Suggested generic ex-pit dump profile to minimise rehandle.

### 11.5.3 In-pit Dumps

In pit dumping will begin once there is a sufficiently large void. Various mining proposals are still under consideration. They will need to take into account steep floor dips. There are two basic scenarios for dumping:

1. Dumping against the lowwall as soon as possible while continuing to mine down-dip
2. Leaving the pit open until dumping can be scheduled so that the waste is supported by the final highwall.

In scenario 1, in order to achieve a satisfactory factor of safety for the dump, the overall slope would need to be less than 27°-30° for the anticipated floor dips. This would mean that only a relatively small volume of spoil could be accommodated in-pit. If the spoil overall angle were to be increased, there would be a significant risk of failure. In any case, there would need to be extensive floor preparation in order to key the waste into the floor.

Scenario 2 is a much lower risk approach for waste management, as the waste is continually buttressed against the highwall. There would be no need for floor treatment and weak sheared floor is no longer an issue. Once buttressed, the spoil could be constructed in accordance with Table 11.3. There are two significant risks for Scenario 2. The first is that the final highwall has to be known at the outset of mining since it will be backfilled. The second is that the lowwall has to remain open for at least 2 years.

Towards the centre of AB-Pit the floor becomes flatter. And if required, more traditional spoil dumps can be constructed in accordance with Table 11.4.

Table 11.4. Design parameters for in-pit Cat 2.5 dumps on strong floors dipping  $\leq 15^\circ$ .

| Material  | Max Overall Angle | Rill Angle | Lift Height | Bench Width |
|-----------|-------------------|------------|-------------|-------------|
| BMA Cat 1 | 24°               | 37°        | 10 m        | 10 m        |
| BMA Cat 2 | 29°               | 37°        | 20 m        | 10 m        |
| BMA Cat 3 | 32°               | 37°        | 30 m        | 10 m        |
| BMA Cat 4 | 35°               | 37°        | 40 m        | 10 m        |

There are many design permutations that will satisfy the required target FS of 1.2. Figure 11.4 shows the FS for various overall slopes and floor dips for a 100 m high dump consisting of Cat 2.5 spoil. The stability analysis that was undertaken is based on a simplified model for a spoil dump shown in the inserted image. In essence it is for a dump consisting of Cat 2.5 drained spoil underlain by an interface of saturated material immediately above a strong floor.

An overall angle of 30° is equivalent to a 100 m high dump built from 20 m high 37° batters with 10 m benches. An overall angle of 32° is equivalent to a 100 m high dump built from 30 m high 37° batters with 10 m benches.

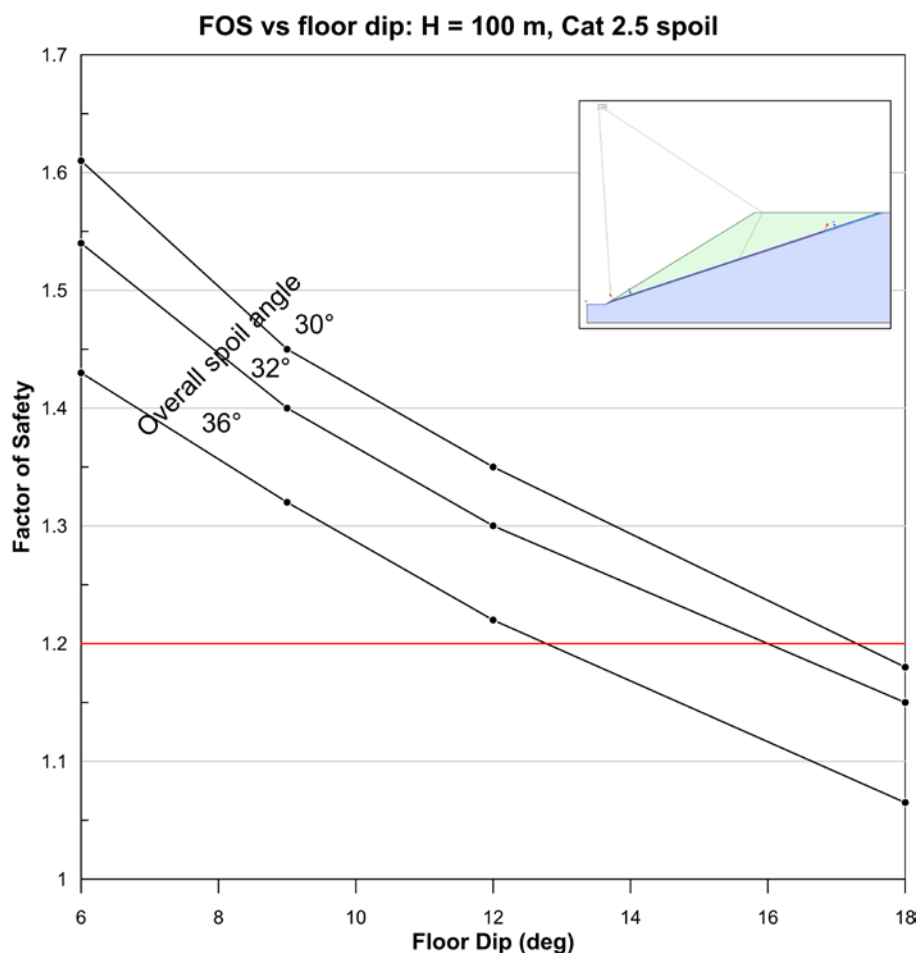


Figure 11.5. FOS vs floor dip for typical spoil designs on strong floor.

When floor dips exceed 9° it may be that the geological processes that caused the deformation may also have caused floor shearing resulting in a weak floor and this should be investigated by test pits dug after decoaling has been completed.

If floor dips exceed 15° geotechnical advice should be sought at the time of production.

If the floors are sheared or otherwise weak, floor treatment will be necessary in order to create a foundation of adequate strength. Table 11.5 provides guidelines for the treatment of weak floors.



Table 11.5. Guidelines for treating weak floors.

| Floor Dip | Floor Treatment       |
|-----------|-----------------------|
| 0 – 6°    | None                  |
| 6 – 9°    | 50% rip               |
| 9 – 12°   | 100% rip              |
| 12 - 18°  | Trenching or blasting |

### 11.6 Regulated Structures – Levees etc

Diversion structures, flood protection levees and certain water storage dams need to be built in accordance with Queensland Department of Environment and Science (DES) requirements for regulated structures. They would require design, construction, and construction supervision to a level that a statutory sign-off can be provided by an authorised person when construction has been completed. This requires a much higher level of engineering input and a longer lead time than is usual for most mine site earthworks.

## 12. FURTHER INVESTIGATION

This assessment is based on six fully cored boreholes, associated laboratory testing and the current geological model (2020 draft JORC Vulcan Model) with a focus on AB-Pit.

Assuming the geological model is updated with new information before the start of mining, more faults are likely to be identified than in the current model. This may have an impact on the mine design, and the geotechnical design parameters should be reassessed at that time.

The following actions are recommended for future studies:

- Obtain structural and fracture frequency data using an acoustic scanning tool or equivalent in the vicinity of the lowwall, ideally all holes (open and core) should have the ATV run as part of the standard geophysical suite.
- Carry out an appropriate seismic survey to better delineate faults
- Include, within the EIS groundwater studies, an assessment of likely groundwater pressure change as mining proceeds,
- Carry out sufficiently detailed investigation to satisfy DES in relation to potentially referable (Dam and Levee) structures.

Once mining begins, ground conditions will be encountered for which further geotechnical input will be required in order to minimise risks due to geotechnical hazards. These issues are usually managed through a program of routine, regular regime of geotechnical inspections.



Mark Winsley CP Geo,  
Geologist



Paul Maconochie RPEQ 5828  
Geotechnical Engineer

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### 14. APPENDICES

- A – CORE BOX PHOTOGRAPHS
- B – GEOTECHNICAL LOGS
- C – ATV DATA – *Dips* ANALYSIS AND STRUCTURE MAP
- D – LABORATORY TEST CERTIFICATES
- E – SPOIL CATEGORISATION NOTES

## **APPENDIX A: CORE BOX PHOTOGRAPHS**



## **APPENDIX B: GEOTECHNICAL LOGS**

## **APPENDIX C: ATV data – *Dips* ANALYSIS AND STRUCTURE MAP**

## **APPENDIX D: LABORATORY TEST CERTIFICATES**



## **APPENDIX E SPOIL CATEGORISATION NOTES**

May 10, 2021

**Lloyd Jensen**

Principal Consultant  
John T Boyd  
Levell 11/388 Queen St  
Brisbane, QLD, 4000

Dear Lloyd,

**GEMINI MINE FEASIBILITY STUDY  
STABILITY ANALYSIS OF FINAL VOID SEDIMENTARY SEQUENCE FOR RESPONSE TO DES**

**INTRODUCTION**

Following a Magnetic South and Cartledge Mining and Geotechnics (CM&G) meeting, Magnetic South requested that CM&G prepare a response to the Department of Environment and Science's (DES) query relating to the stability of the Final Void shell for their Gemini Project. The Gemini Project is located in the Bowen Basin in Central Queensland. Magnetic South completed a Feasibility Study for the project in 2020 and is currently responding to DES's queries to progress the project to the next stage of development.

The query from DES concerns the geotechnical stability of the Cenozoic sediments for the final void. Maconochie (2020) indicates that the Cenozoic sediments comprise a surficial layer (up to about 5 m in thickness) of Quaternary aged sandy alluvium underlain by up to 50 m of Tertiary aged clays and sandy units. The current design adopts an overall slope angle for these soils of 22°. CM&G are to provide a stability assessment of this unit within the final void shell. If the design does not satisfy the Factor of Safety (FoS) requirement of 1.5 for long-term slopes, then CM&G will provide alternative options to achieve the required FoS.

**Purpose**

The purpose of this letter is to provide advice regarding the long-term stability of the Cenozoic sediments within the final void footprint to support Magnetic South's response to DES concerning their Feasibility Study.

**Information Provided**

The following information was provided to CM&G and utilised in this study:

- 5171.004 Magnetic South\_Coal Resource Project\_Gemini Project\_FINAL 10072...
- gts-gem-013-20-1 – FINAL
- DW\_Pits.dwg

## METHODOLOGY

Limit equilibrium analysis was completed using the proprietary software Slide2 v9.008 by Rocscience Pty Ltd. One (No.) cross-section was cut through the proposed final void where the inferred maximum depth of Cenozoic soils occurred (i.e. worst-case scenario), see Figure 1.

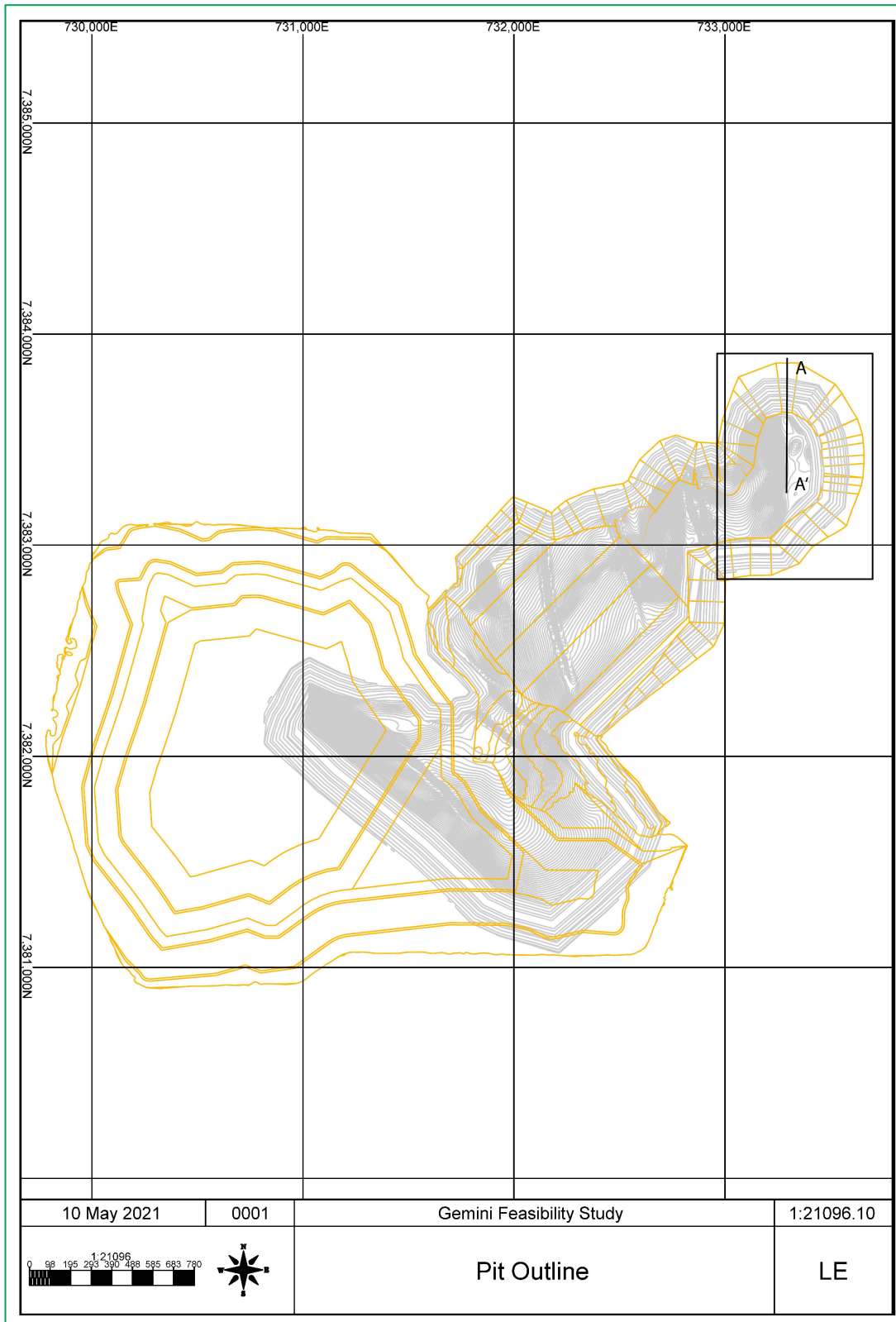
Stability analyses were conducted on the cross-section, and where the required FoS could not be achieved, alternative concept designs were developed and analysed to achieve the required FoS.

Maconochie (2020) adopted typical material properties for the Bowen Basin in their study. To improve the veracity of these analyses, CM&G adopted material parameters for the soils from experience at similar sites within the Bowen Basin. To do this, CM&G compared the results of the Atterberg Limits tests presented in Maconochie (2020) against those for similar sites. The results for both sites were comparable with the average Plastic Limit (PL) for the Gemini Project; 27.5 versus 29 for similar sites. CM&G adopted the following non-linear strength envelopes for the analyses after Mesri (1993, 2003):

- Peak strength
- Fully softened strength

The subsurface stratigraphic profile and groundwater conditions were inferred based on information provided in Maconochie (2020). No geological structure was considered in this stability assessment.



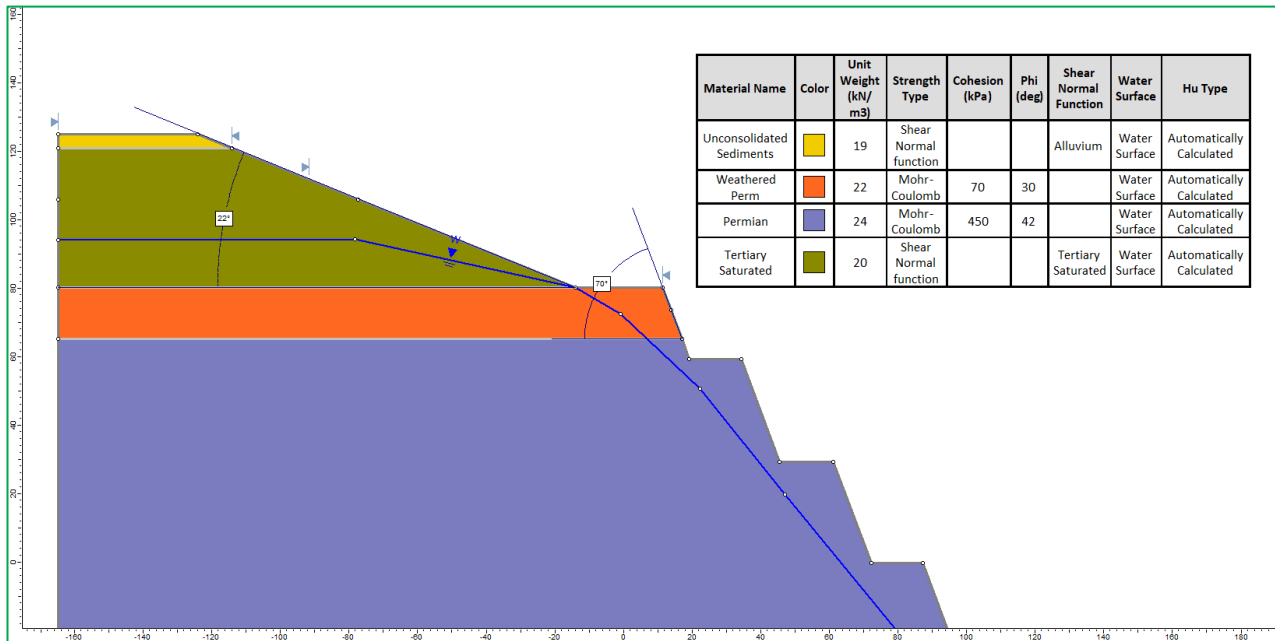


**Figure 1. Location of area of interest for stability analysis.**

## STABILITY ANALYSIS

The Spencer and GLE-Morgenstern Price methods of limit equilibrium analysis were adopted after Sloan (2013). A non-circular failure path utilising the Cuckoo Search method was adopted. A copy of the typical cross-section analysed, and the material properties, is presented in Figure 2.

A minimum required FoS of 1.5 was adopted for long-term stability.



**Figure 2. A screenshot of cross-section analysed for Base Case scenario.**

Where the results of the stability analyses did not achieve the required FoS, the following alternative concept options were analysed to achieve the required FoS:

- Reduce the overall slope angle
- Construct a rockfill buttress at the slope toe

## Analysis Assumptions

The following assumptions were adopted as part of this analysis:

- The base case analyses assumed the groundwater depth is 30 metres below ground level (mbgl)
- The depth of alluvium is 4 m
- The thickness of Tertiary clays is 40 m
- The initial slope geometry for the soil profile was 22°
- Typically adopted Bowen Basin parameters for Weathered and Fresh Permian
- Stability analyses were conducted on the soil profile only
- A minimum failure depth of 15 m was adopted to ignore surficial sloughing failures. These failure types are discussed in more detail in Surface Water Management.

- No seismic loads or any other transient loads were considered in this analysis. Transient loading is not considered critical to long-term stability of this slope as they are expected to have a nominal impact on slope stability.
- The rockfill buttress is constructed out of Fresh Permian and has the following material strength parameters: unit weight = 19 kN/m<sup>3</sup>, frictional angle = 40°, cohesion = 0 kPa.
- The batter angle for the rockfill buttress is 37°

## Analysis Results

The results for the Base Case scenario returned a FoS of 1.3, refer to Figure 3. The results for the concept options that achieved a FoS of 1.5 were:

- Reduce overall slope angle – 18°
- Minimum buttress dimensions - 20 m wide at the toe and 20 m vertical height

Schematics showing the concept option dimensions are provided in Figure 4 and Figure 5 and a copy of results outputs are attached.

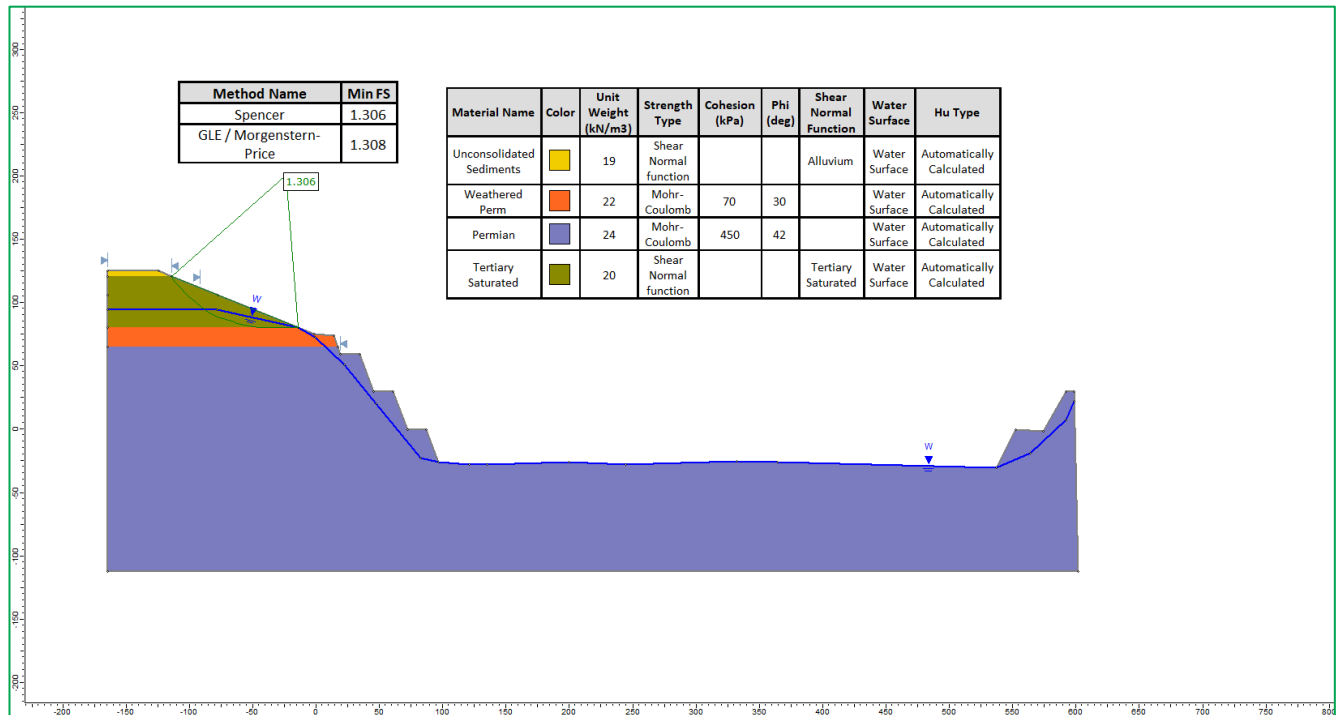


Figure 3. Stability analysis for the base case scenario (slope angle = 22°).



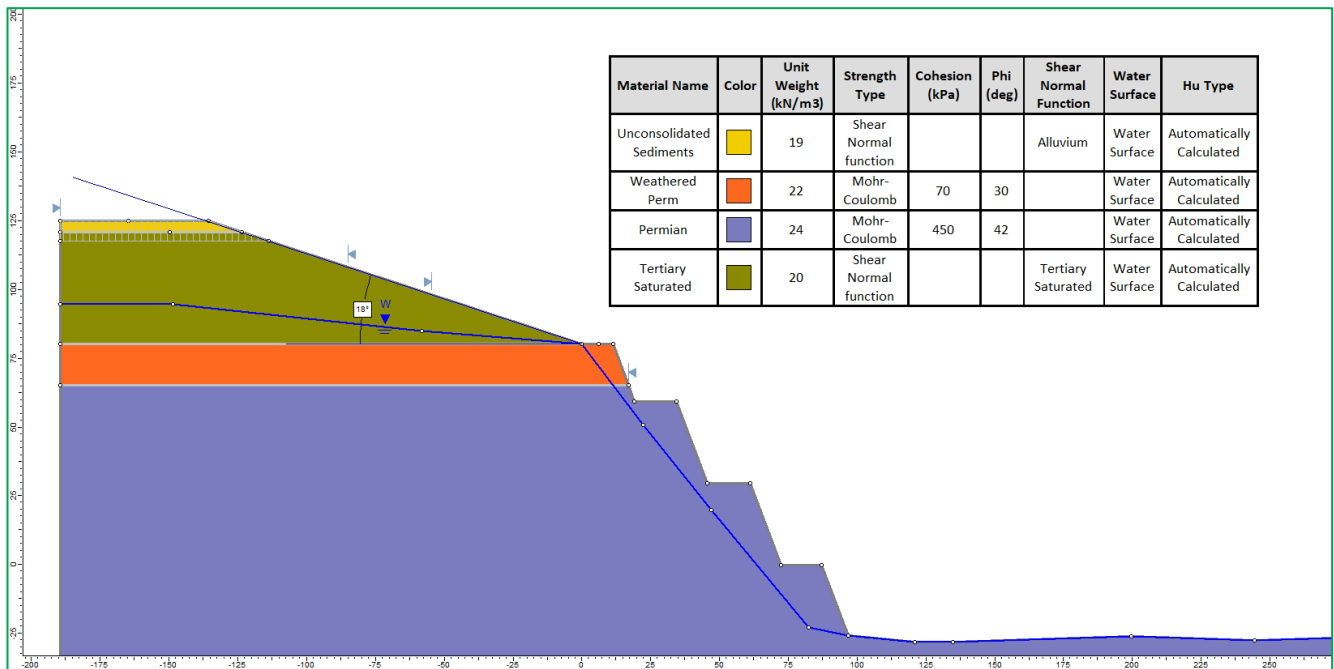


Figure 4. A schematic diagram to show an 18° slope angle.

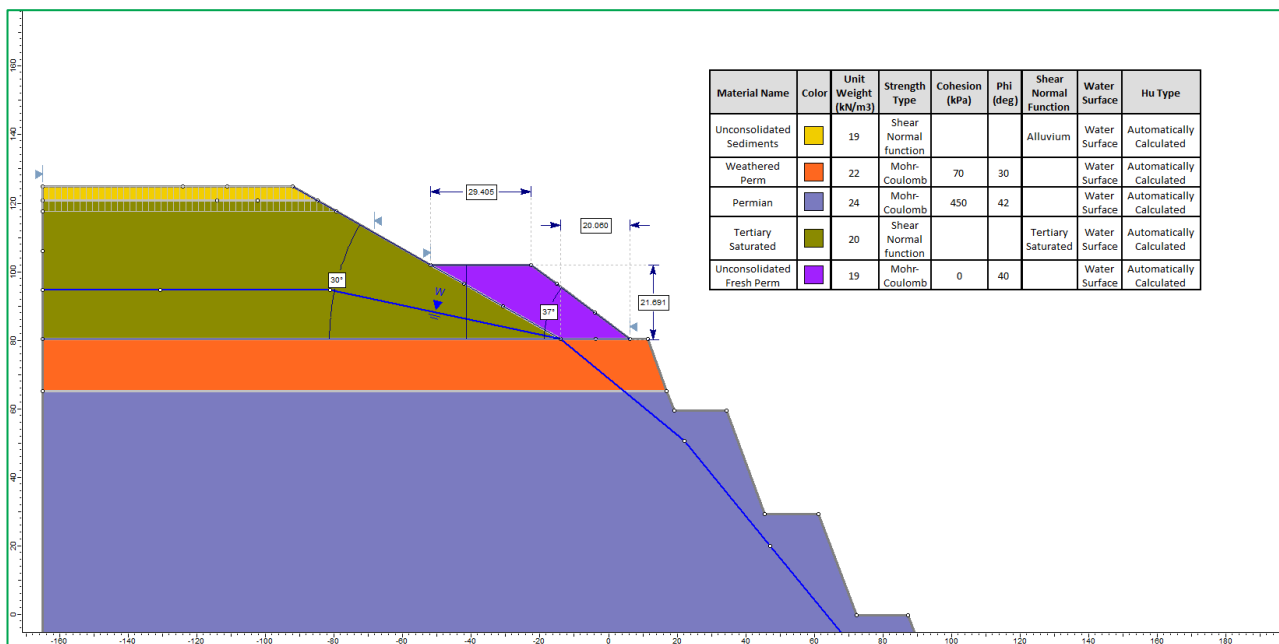


Figure 5. A schematic diagram to show a 30° slope angle of the tertiary material with a rockfill buttress at the toe.

## MINE PLANNING IMPLICATIONS

Due to the depth of alluvium at this site, the initially adopted overall slope angle for this unit is not suitable for long-term stability for the final void provided. Alternative options considered to obtain the required FoS returned the following geometries:

- Reduce the overall slope angle to 18°

- Do not modify the original soil profile and construct a rockfill buttress to the geometry shown in Figure 5

Due to the limited availability of data at this stage of the project, it is recommended that the slope design for the final void soil profile be reviewed as additional data becomes available.

## Surface Water Management

Management of surface water is critical in preventing ponding water near slope crests. Ponding facilitates the infiltration of meteoric waters into the subsurface, resulting in slope instability due to the temporary reduction of shear strength of the critical unit.

Sloughing failures are shallow surficial failures caused by saturation of these layers due to rainfall. Construction of surface water drainage is critical to reducing the likelihood that such failures will occur by reducing the volume of water moving across the slopes.

Surface water management is critical to ensure the long-term stability of the soil slope and minimisation of erosion and deterioration of the slope condition.

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## CLOSURE

I trust that the information provided above satisfies your requirements and if you have any questions or comments regarding the contents of this letter, please contact the undersigned.

Yours sincerely,



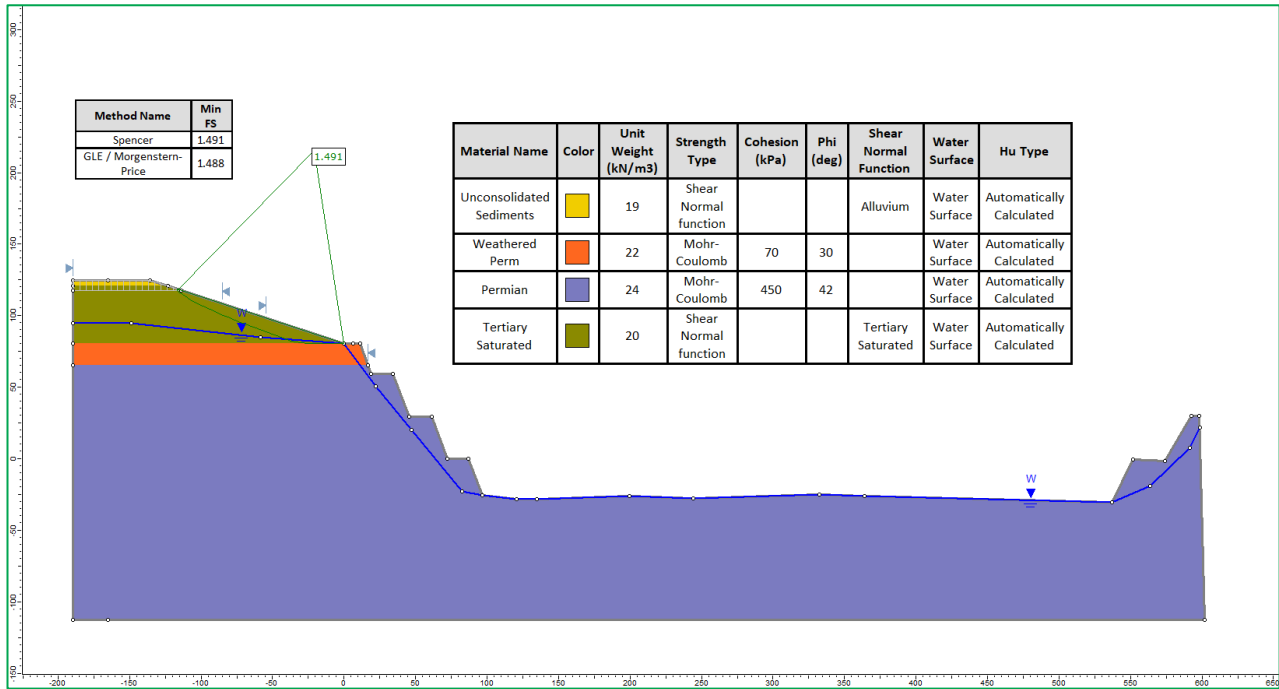
**Timothy Cartledge**

PRINCIPAL CONSULTANT (RPEQ 16952)

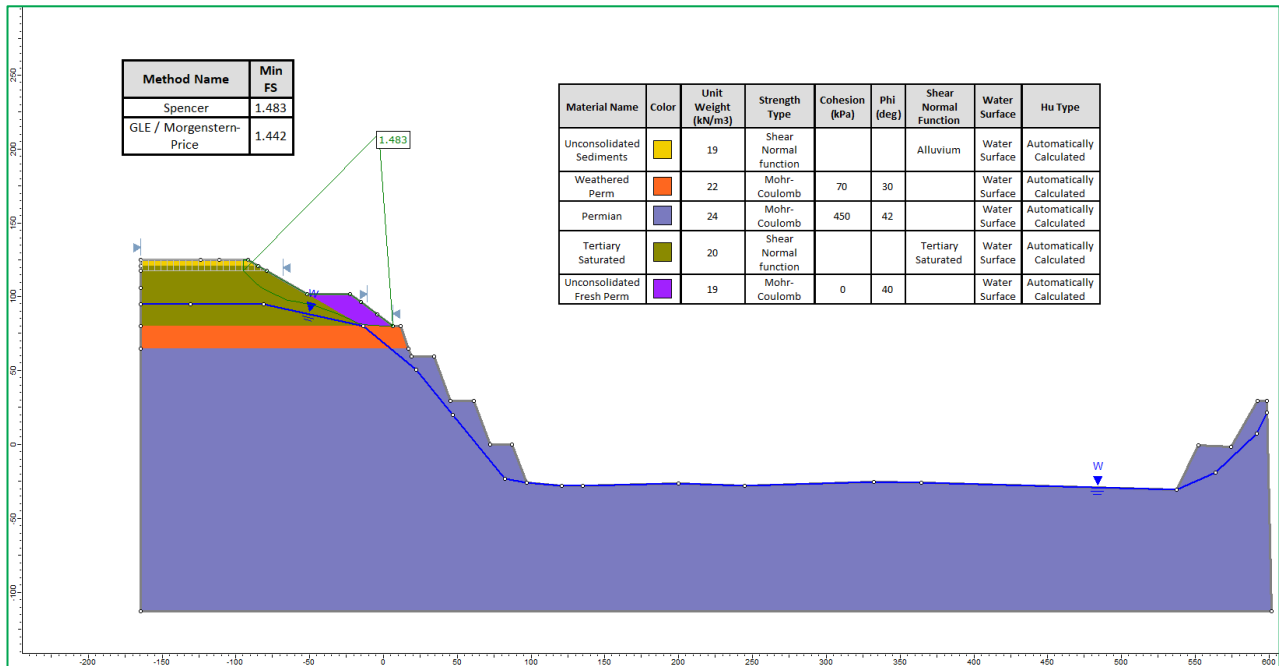
CP, CPEng, RPEQ (Civil, Geotechnical-Mining)

NER, APEC Engineer, IntPE(Aus)

## ATTACHMENTS



1. Stability analysis results for a reduction of the overall slope angle to 18°.



2. Stability analysis results for a rockfill buttress 20 m high and 20 m wide at the toe.



# **Gemini Project – Groundwater Dependent Ecosystem Assessment**

**Prepared by 3d Environmental**

*for*

**Magnetic South Pty Ltd  
V2\_ 25 November 2020**

**Project No.** 2020\_253

**Project Manager:** David Stanton

**Client:** Magnetic South Pty Ltd

**Purpose:** Groundwater dependent ecosystem assessment for the Gemini Project, Magnetic South Pty Ltd.

| <b>Draft</b> | <b>Date Issued</b> | <b>Issued By.</b> | <b>Purpose</b>                                                 |
|--------------|--------------------|-------------------|----------------------------------------------------------------|
| Revision 1   | 13 November 2020   | David Stanton     | First Draft GDE Assessment Report                              |
| Revision 2   | 25 November 2020   | David Stanton     | Second Draft following comments by G Brampston / Heath Carney. |
|              |                    |                   |                                                                |
|              |                    |                   |                                                                |
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|              |                    |                   |                                                                |

#### **NOTICE TO USERS OF THIS REPORT**

**Purpose of the report:** 3D Environmental has produced this report in its capacity as consultant for and on the request of Magnetic South Pty Ltd (the "Client"). The information and any recommendations in this report are particular to the Specified Purpose and are based on facts, matters and circumstances particular to the subject matter of the report and the specified purpose (GDE Assessment) at the time of production. This report is not to be used, nor is it suitable, for any purpose other than the Specified Purpose. 3D Environmental disclaims all liability for any loss and/or damage whatsoever arising either directly or indirectly as a result of any application, use or reliance upon the report for any purpose other than the Specified Purpose.

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## **Executive Summary**

Magnetic South Pty Ltd (the 'Proponent') proposes to develop the Gemini Project, 110 km east of Emerald and 125 km west of Rockhampton, within the Bowen Basin, Central Queensland. The project centres on Mining Lease application 700056 and will mine metallurgical coal using open cut mining methods, with the operational footprint including both mining pits and associated infrastructure. An assessment of the presence of GDEs within the Project area is presented in this document as a component of the approval process.

To complete the GDE assessment, multiple lines of evidence including measurement of leaf water potential, soil moisture potential and analysis of stable isotopes from various sources were applied to assess the dependence of vegetation in the Gemini Project area on groundwater. Based on a targeted survey effort, two areas of likely groundwater dependence, and hence GDEs, were recognised in the Project area being:

1. Charlevue Creek Area 1, being an area identified as a terrestrial GDE on Charlevue Creek, to the west and upstream of the mine infrastructure area.
2. Springton Tributary Area 1, being a terrestrial GDE associated with an ephemeral drainage system, currently located within the footprint of the mine infrastructure area.

The study confirmed that the Charlevue Creek GDE area is hosted in an area of recent river alluvium which forms a flood terrace that is dissected by the channel of Charlevue Creek and traversed by a series of flood overflow channels. The GDE area is supported by an unconfined, fresh and seasonal alluvial aquifer that is perched above the regional groundwater table associated with Tertiary, Permian and older alluvial sediments. The supporting perched aquifer is conceptualised to be seasonally recharged during surface flows including flood events and associated rainfall. Based on salinity data and stable isotope comparisons between twig xylem and groundwater samples, it is inferred that the perched aquifer is hydraulically disconnected from the regional Tertiary and alluvial aquifers which hold groundwater with salinity values that range from mildly to highly toxic to trees. Based on stable isotope data, there is no indication that trees at this site, nor any tree sampled during the GDE assessment is utilising groundwater associated with the regional Tertiary, alluvial or Permian coal seam aquifers to any significant degree.

The Springton Tributary Area 1 GDE system is supported by a seasonally variable perched aquifer system that is hosted in a thick, coarse sand horizon developed below the flood plain of the minor tributary. The strong iron staining associated with the sandy aquifer material provides evidence for considerable seasonal fluctuation in groundwater levels, which are inferred to recharge and drain rapidly in response to rainfall and surface flows. Similar to the Charlevue Creek GDE system, the Springton Tributary system is perched above the regional Tertiary groundwater table and trees at the site, based on evidence from stable isotope analysis, show no evidence for utilisation of the deeper groundwater system.

The Springton Tributary GDE system covers an area of 5.54 hectares and is located entirely within the mine infrastructure area, which necessitates clearing and unavoidable direct impact. The environmental values and impacts associated with direct clearing of vegetation on are discussed in the Terrestrial Flora and Fauna Report (AARC 2020).



The Charlevue Creek GDE system is supported by an alluvial aquifer that is conceptualised to be perched above, and hydraulically disconnected from the deeper regional aquifers associated with the Tertiary sediments, older alluvial systems, and the Permian coal seams. Groundwater drawdown associated with mining void development is modelled to impact the regional groundwater table below the Charlevue Creek GDE system. Due to limited connectivity between the perched alluvium and deeper groundwater systems, it is anticipated that these impacts will not be propagated into the perched aquifer system. Furthermore, the perched aquifer that supports the Charlevue Creek GDE system is recharged by surface water flows, flooding and seasonal rainfall events which will not be altered by mining development.

Mitigations to prevent impact to the Charlevue Creek system include general operational measures associated with project approval conditions which include development of the Mine WMS and ESCP. With these routine mitigations, in conjunction with ongoing groundwater sampling of the existing groundwater monitoring network to be completed as part of the ongoing groundwater monitoring program, it is considered that the risk to the Charlevue Creek GDE system posed by mine development is negligible.

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## Glossary

|                                        |                                                                                                                                                                                                                                                                             |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alluvial aquifer                       | An aquifer comprising unconsolidated sediments deposited by flowing water usually occurring beneath or adjacent to the channel of a river.                                                                                                                                  |
| Aquifer                                | A geological formation or structure that stores or transmits water to wells or springs. Aquifers typically supply economic volumes of groundwater                                                                                                                           |
| Aquatic GDE                            | Vegetation supported by surface expression of groundwater (e.g. spring fed watercourses and associated fringing vegetation).                                                                                                                                                |
| Base flow                              | Streamflow derived from groundwater seepage into a stream.                                                                                                                                                                                                                  |
| Capillary fringe                       | The unsaturated zone above the water table containing water in direct contact with the water table though at pressures that are less than atmospheric. Water is usually held by soil pores against gravity by capillary tension.                                            |
| Confined aquifer                       | A layer of soil or rock below the land surface that is saturated with water with impermeable material above and below providing confining layers with the water in the aquifer under pressure.                                                                              |
| Perched groundwater system             | A groundwater system or aquifer that sit above the regional aquifer due to a capture of infiltrating moisture on a discontinuous aquitard.                                                                                                                                  |
| Phreatic zone                          | The zone of sub-surface saturation separated from the unsaturated zone in unconfined aquifers by the water table.                                                                                                                                                           |
| Phreatophyte                           | Plants whose roots extend downward to the water table to obtain groundwater or water within the capillary fringe                                                                                                                                                            |
| Obligate phreatophyte                  | A plant that is completely dependent on access to groundwater for survival                                                                                                                                                                                                  |
| Edaphic                                | Relating to properties of soil or substrate including its physical and chemical properties and controls those factors impose on living organisms.                                                                                                                           |
| Evapotranspiration                     | The movement of water from the landscape to the atmosphere including the sum of evaporation from the land surface and transpiration from vegetation through stomata                                                                                                         |
| Facultative phreatophyte               | A plant that occasionally or seasonally utilises groundwater to maintain high transpiration rates, usually when other water sources aren't available.                                                                                                                       |
| Fractured rock aquifer                 | An aquifer in which water flows through and is stored in fractures in the rock caused by folding and faulting.                                                                                                                                                              |
| Fluvial                                | Relating to processes produced by or found in rivers                                                                                                                                                                                                                        |
| Groundwater                            | Those areas in the sub-surface where all soil or rock interstitial porosity is saturated with water. Includes the saturated zone and the capillary fringe.                                                                                                                  |
| Water table                            | The upper surface of the saturated zone in the ground, where all the pore space is filled with water.                                                                                                                                                                       |
| Groundwater dependent ecosystems (GDE) | Natural ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson et al. 2011) |



|                                  |                                                                                                                                                                                                                                                                                                       |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Infiltration                     | Passage of water into the soil by forces of gravity and capillarity, dependent on the properties of the soil and moisture content.                                                                                                                                                                    |
| Leaf water potential (LWP)       | The total potential for water in a leaf, consisting of the balance between osmotic potential (exerted from solutes), turgor pressure (hydrostatic pressure) and matric potential (the pressure exerted by the walls of capillaries and colloids in the cell wall).                                    |
| Leaf area index (LAI)            | The ratio of total one-sided area of leaves on a plant divided by the area of the canopy when projected vertically on to the ground.                                                                                                                                                                  |
| Local Meteoric Water Line (LMWL) | Describes the relationship between hydrogen and oxygen isotope (Oxygen-18 and Deuterium) ratios in local natural meteoric waters. LMWL is usually developed from precipitation data collected from either a single location or a set of locations within a “localised” area of interest (USGS, 2018). |
| Percolation                      | The downward movement of water through the soil due to gravity and hydraulic forces.                                                                                                                                                                                                                  |
| Permeability                     | A materials ability to allow a substance to pass through it, such as the ability of soil or rocks to conduct water under the influence of gravity and hydraulic forces.                                                                                                                               |
| Permanent wilting point          | The water content of the soil at which a plant can no longer extract water and leaves will wilt and die. Usually -1.5 Mpa (-217 psi). Generally applied to crops although Australian flora typically have much larger stress thresholds.                                                              |
| Piston flow                      | The movement of a water front through the soil uniformly downwards to the aquifer, with the same velocity, negligible dispersion, pushing older water deeper into the soil profile.                                                                                                                   |
| Preferential flow                | Movement of surface water rapidly from surface to aquifer along preferential flow paths, bypassing older moisture in the upper soil profile.                                                                                                                                                          |
| Unconfined aquifer               | An aquifer whose upper surface is at atmospheric pressure, producing a water table, which can rise and fall in response to recharge by rainfall                                                                                                                                                       |
| Soil water potential             | A measure of the difference between the free energy state of soil water and that of pure water. Essentially a measure of the energy required to extract moisture from soil.                                                                                                                           |
| Stable isotope                   | An isotope that does not undergo radioactive decay.                                                                                                                                                                                                                                                   |
| Standard Wilting Point           | The minimum LWP or corresponding soil moisture potential that can be tolerated before a plant wilts in response to negative water supply. This is accepted at -15 bars or -1.5 MPa (or -217.55 PSI)                                                                                                   |
| Specific Yield                   | The ratio of the volume of water that a saturated rock or soil will yield by gravity to the total volume of the rock or soil.                                                                                                                                                                         |
| Surface water                    | Movement of water above the earths’ surface as runoff or in streams                                                                                                                                                                                                                                   |
| Transpiration                    | The process of water loss from leaves, through stomata, to the atmosphere.                                                                                                                                                                                                                            |
| Terrestrial GDE                  | Terrestrial vegetation supported by sub-surface expression of groundwater (i.e. tree has roots in the capillary fringe of groundwater table).                                                                                                                                                         |
| Vadose zone                      | The unsaturated zone, above the water table in unconfined aquifers                                                                                                                                                                                                                                    |

|                 |                                                                                                                   |
|-----------------|-------------------------------------------------------------------------------------------------------------------|
| Water Potential | The free energy potential of water as applied to soils, leaves plants and the atmosphere.                         |
| Wetting front   | The boundary of soil wet by water from rainfall and dry soil as the water moves downward in the unsaturated zone. |

## 1.0 Introduction

Magnetic South Pty Ltd (Magnetic South) (the 'Proponent') proposes to develop the Gemini Project located approximately 110 km east of Emerald and 125 km west of Rockhampton, within the Bowen Basin, Central Queensland, herein referred to as 'the Project' (**Figure 1**). The project centres on Mining Lease Application (MLA 7000556) and will mine metallurgical coal using open cut mining methods, with the operational footprint including both mining pits and associated infrastructure.

Coal mining developments have potential to alter natural groundwater regimes or groundwater quality and may therefore impact on ecosystems that are reliant on a groundwater resource. These ecosystems are captured under the general term of groundwater dependent ecosystems (GDEs). This report provides an assessment of the presence of GDEs within the Project area and includes an assessment of potential project related impacts to GDEs.

### 1.1 Project Background

The main activities associated with the Project include:

- Exploration activities continuing to support mine planning.
- Development of a Mine Infrastructure Area (MIA) including mine offices, bathhouse, crib rooms, warehouse/stores, workshop, fuel storage, refuelling facilities, explosives magazine and sewage, effluent and liquid waste storage.
- Construction and operation of a facilities specific to coal handling including Run-of-Mine (ROM) coal, product stockpiles and rejects bin/overflow.
- Construction and operation of a surface conveyor including rail loading facilities connecting to coal terminals at Gladstone for export.
- Construction of access roads from the Capricorn Highway to the MIA. Development of internal roads and mine haul roads will be ongoing including a causeway over Charlevue Creek.
- Installation of a raw water supply pipelines, 66 kV transmission line and substation.
- Development of mine areas (open cut pits) and out-of-pit waste rock emplacements as well as drilling and blasting of competent waste material.
- Mine operations using conventional surface mining equipment (excavators, front end loaders, rear dump trucks, dozers) and progressive placement of waste rock in emplacements adjacent to and near the open cut voids.
- Progressive establishment of soil stockpiles, laydown area and borrow pits (for road base and civil works) with material sourced from quarries where required.
- Development of water storage dams and sediment dams, and the installation of pumps, pipelines, and other water management equipment and structures including temporary levees, diversions, and drains.

Mining will extract up to 1.9 Million tonnes per annum (Mtpa) ROM Coal, with an average 1.8 Mtpa for a construction/production period of approximately 20 years. The project footprint is shown in **Figure 1**.



## 1.2 Project Objectives

Objectives of GDE assessment are to:

- Identify if vegetation within and surrounding the Project area accesses and utilises groundwater for transpiration, either permanently or intermittently, consistent with classification of a GDE.
- Determine the source and nature of aquifers utilised by GDEs, if any.
- Identify the degree of dependence of vegetation communities on groundwater for survival and sustenance through periods of drought.
- Provide an assessment of potential mining impacts on identified GDEs extending throughout the life of the mine.

## 1.3 Relevant Legislation

**Environmental Protection Act 1994:** Under regulatory provisions of the Environmental Protection Act 1994 (EP Act), a site-specific Environmental Authority (EA) is required under Section 125 of the EP Act. A component of the EA will be requirement is to address impacts to GDEs, and this report has been prepared in response to an information request requiring further assessment of the potential for impact to GDEs.

## 1.4 GDE Definition Used for Assessment

The definition of a GDE applied to this assessment is consistent with the definition provided in the guidance document *Modelling water-related ecological responses to coal seam gas extraction and coal mining* prepared by Commonwealth of Australia (2015) on the advice from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) and IESC 2018a. This definition is described below:

*Groundwater dependent ecosystems (GDEs): Natural ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson et al. 2011). The broad types of GDE are (from Eamus et al. 2006a and 2006b):*

- Ecosystems dependent on surface expression of groundwater (springs).
- Ecosystems dependent on subsurface presence of groundwater (terrestrial GDEs).
- Subterranean ecosystems (caves).

Ecosystems dependent on surface expression of groundwater are extended to spring fed streams and rivers, otherwise defined as aquatic GDE's.

## 1.5 Groundwater Definition Used in this Assessment

Eamus (2006a) defines groundwater (when related to GDEs) as;

*'all water in the saturated sub-surface; water that flows or seeps downwards and saturates soil or rock, supplying springs and wells, water stored underground in rock crevices and in the pores of material'.*

For this assessment of GDEs, the term groundwater refers to those areas in the sub-surface where all soil or rock interstitial porosity is saturated with water including the associated capillary fringe. It is assumed that in the overlying unsaturated zone, water may be present in varying amounts over time although saturation is rarely reached during infiltration or percolation of rainfall, stream water or other surface sources of groundwater recharge moving under gravity. The definition of groundwater excludes wetting fronts, being the transitional zone between wet and dry soil that surrounds a water body; and ephemeral zones of saturation that result from rapid infiltration of surface water, whereby the down-gradient migration of infiltrating water is merely slowed rather than halted.

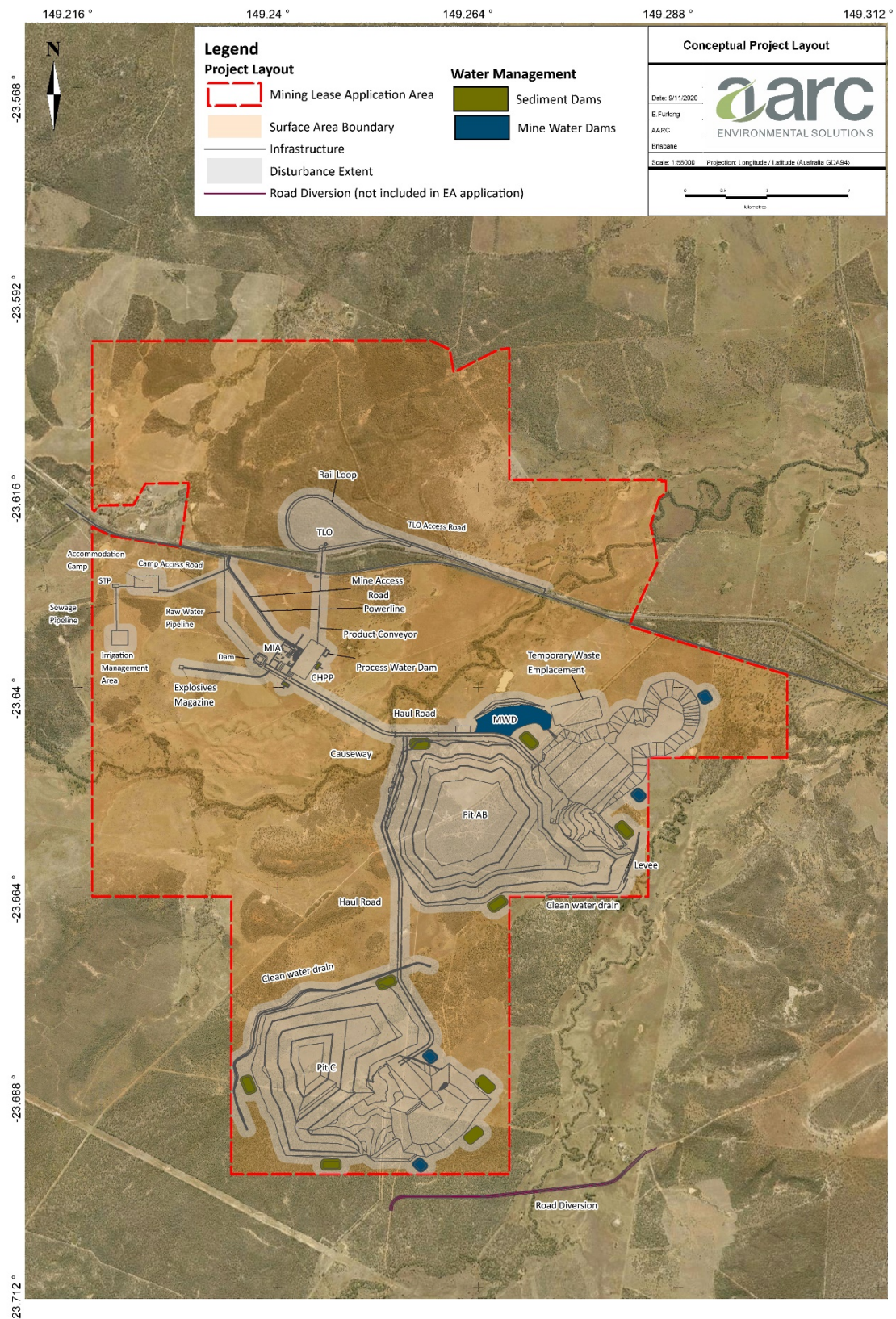
## 1.6 Climatic Considerations

The annual rainfall at Duaringa Post Office (25km to the east) for January 2019 to June 2020, being the nearest reliable recording station to the Project, is presented in **Figure 2**. The data indicates below average rainfall for nearly all months through 2019 with a total rainfall of 321.3mm for the year, being half the long-term annual average of 704.3mm (BOM 2020a). February 2020, four months preceding the survey, was extremely wet with 346.7mm falling for the month compared to the long-term monthly average of 115.3mm. Following this intense period of precipitation, rainfall for the four months preceding the survey (March to June 2020) was dry with below average rainfall recorded across all months. There was no rainfall recorded at Duaringa for two weeks preceding the survey which was completed across 6 days from 27<sup>th</sup> June 2020 to 2<sup>nd</sup> July 2020.

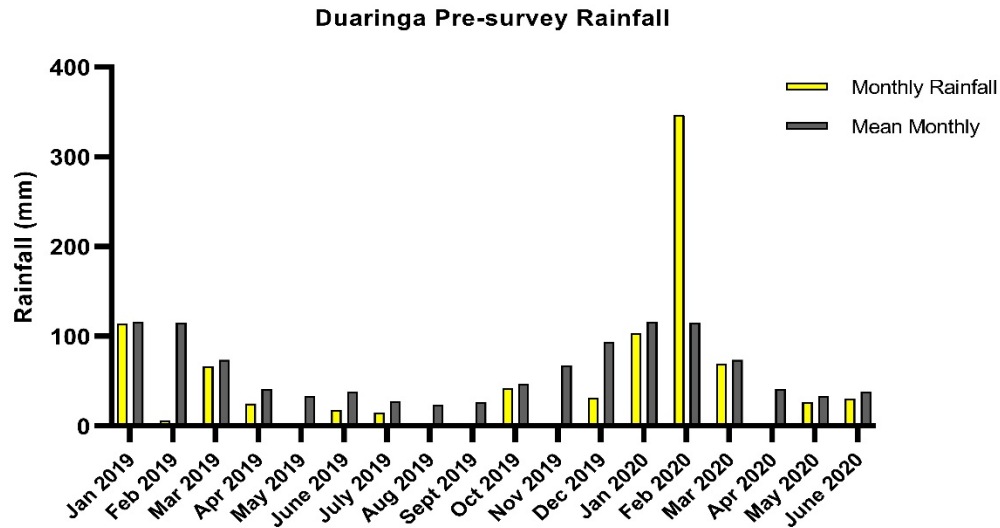
Plant growth in the region is strongly limited by moisture rather than temperature (Hutchinson et al. 1992) which is reflected in the evapotranspiration rates at the Duaringa Post Office for the 2019 – 2020 period, with data for all months indicating evapotranspiration as being considerably higher than rainfall except in February 2020. Annual evapotranspiration rates tend to peak in January and are typically at their lowest in June / July (**Figure 3**) (BOM 2020a).

The region has experienced several significant drought events, many of which have resulted in tree dieback. The early to mid-1990's drought, the worst on record for central and north Queensland, and the millennium drought from 2000 through to 2007 both resulted in substantial dieback of native woodland habitats, typically affecting ironbark woodlands and most severely on basaltic substrates (Fensham and Holman 1999; Fensham et al 2009). **Figure 4** demonstrates the major climatic cycles in terms of Cumulative Rainfall Departure (CRD) (Weber and Stewart 2004), representing a cumulative departure of monthly rainfall from the long-term mean monthly rainfall (1990 to 2020) from point data at Dingo (SILO 2020). Strongly decreasing rainfall trends between 1990 to 1996; and 2000 to 2007 representing major drought periods are strongly evident. Following a period of relatively stable / average rainfall conditions occurring between 2013 to 2017, the current trend is for decreasing rainfall with below average conditions experienced post 2017 indicating a longer-term regime of ecological water deficit preceded the assessment. The analysis of cumulative rainfall departure is relevant to this assessment as shallow water tables generally follow similar trends, with rising water tables during upward precipitation trends.

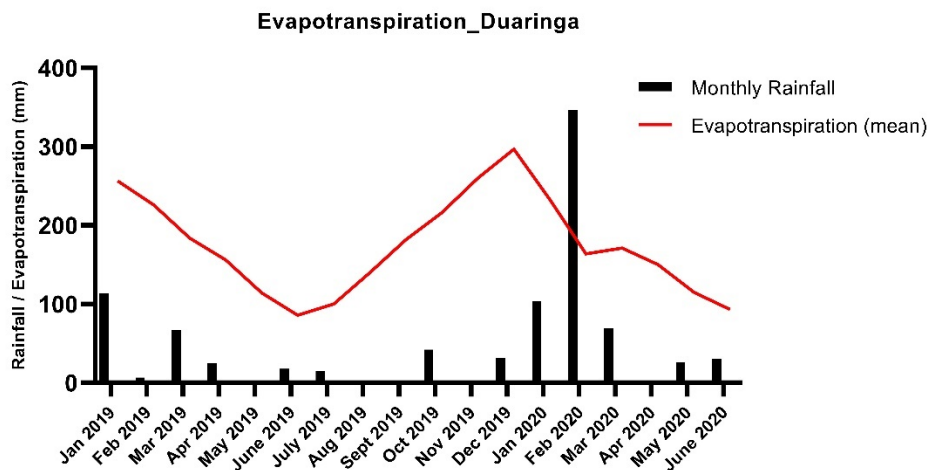




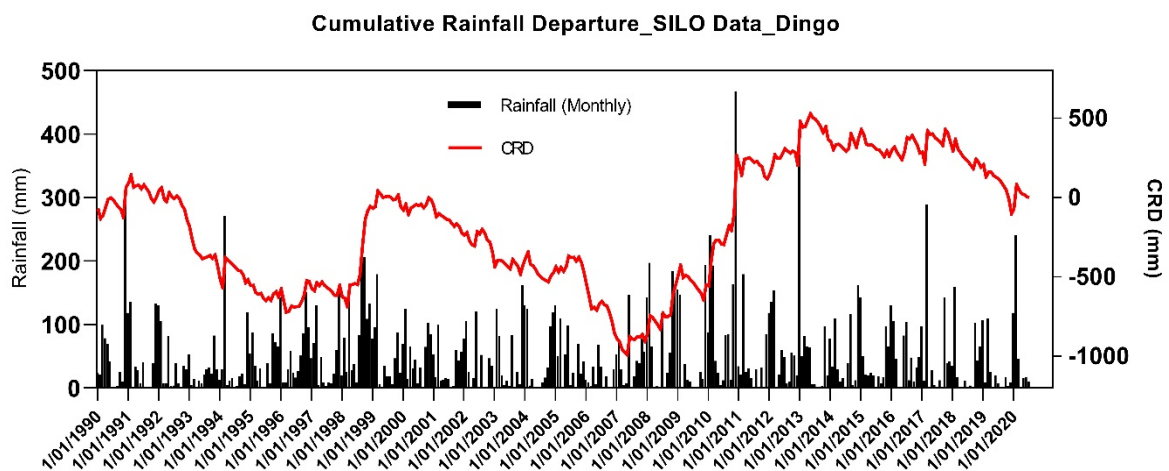
**Figure 1.** Project location and facilities.



**Figure 2.** Rainfall for the period from January 2019 to June 2020 from the Duaringa Post Office recording station.



**Figure 3.** Evapotranspiration compared to rainfall for January 2019 to March 2020 from the Moranbah Airport.



**Figure 4.** Cumulative Rainfall Departure calculated for Dingo from SILO (2020) indicating a drying climatic cycle leading up to the survey in June 2020.



## 2.0 Ecohydrological Setting

As GDEs define a continuum between groundwater, soils and surface ecology, this section provides a description of both biotic factors and abiotic controls, enabling linkages to be drawn between groundwater and terrestrial ecology within impact assessment sections.

### 2.1 Ecological Characteristics of GDE Species and Communities

#### 2.1.1 Regional Ecosystems

Regional ecosystem (RE) mapping completed by AARC (2020), provided in **Figure 5**, for the Project defines broad number of regional ecosystems, typically dominated by eucalypt woodland and open forest habitats. This includes:

- RE 11.3.25, dominated by forest red gum (*Eucalyptus tereticornis*) and river red gum (*Eucalyptus camaldulensis*) with scattered Moreton Bay ash (*Corymbia tessellaris*), Clarkson's bloodwood (*Corymbia clarksoniana*) and river oak (*Casuarina cunninghamia*) is the dominant regional ecosystem associated with major watercourses and drainage lines in the Project area.
- RE 11.3.2, dominated by poplar box (*Eucalyptus populnea*) associated with loamy flood plain areas on older, higher alluvial terraces. RE11.3.2 is typically mapped as a terrestrial GDE in BOM GDE mapping databases (BOM 2020b).
- RE11.5.2, typically dominated by narrow leaf ironbark (*Eucalyptus crebra*) with scattered poplar box occurring on older residual sands and gravels above flood level.
- 11.7.2 dominated by lancewood (*Acacia shirleyi*) on residual jump ups.

The dominant species within these regional ecosystems and their potential capacity to utilise groundwater are discussed in **Section 2.1.3**.

#### 2.1.2 Mapped Groundwater Dependent Ecosystems

The mapping of GDEs has been completed at a national level by the Bureau of Meteorology which has produced the GDE Atlas (BOM 2020b) which identifies the following GDEs types, consistent with the definition of a GDE applied in this assessment.

- **Aquatic** ecosystems that rely on the surface expression of groundwater—this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands, and springs. Marine and estuarine ecosystems can also be groundwater dependent, but these are not mapped in the Atlas.
- **Terrestrial** ecosystems that rely on the subsurface presence of groundwater—this includes all vegetation ecosystems.
- **Subterranean** ecosystems—this includes cave and aquifer ecosystems.

The BOM GDE layer has been compiled with national scale datasets and rules to describe the potential for groundwater interaction, and within the assessment area corresponds directly with GDE and potential aquifer mapping produced by DES (2018). Due to the limited ground verification, the dataset is considered unsuitable for site specific GDE assessment. The mapping of GDEs over the Project Area and surrounds, as produced by BOM (2020b) is provided in **Figure 6**. In general, this



assessment shows 'Low Potential' for 'Terrestrial' GDEs associated with riparian vegetation and watercourses. It is noted that an area mapped as a 'High Ecological Significance' wetland is also indicated on **Figure 6**, which in prior versions of the GDE Atlas was mapped as a 'Low Potential Aquatic GDE' (refer to Terrestrial Ecology Assessment prepared by AARC 2019). Updates to the GDE Atlas incorporated in August 2020 no longer consider this wetland area to represent a GDE, either terrestrial or aquatic.

### **2.1.3 Groundwater Dependent Species**

**Eucalypts:** The GDE investigation area and surrounds are characterised by the presence of both river red gum (*Eucalyptus camaldulensis*) and forest red gum (*Eucalyptus tereticornis*) which typically form the upper canopy of the riparian ecosystem RE11.3.25. Moreton Bay ash (*Corymbia tessellaris*) and minor Clarkson's bloodwood (*Corymbia clarksoniana*) are found in some localities, more typically in elevated positions on the riverbank. Poplar box (*Eucalyptus populnea*) is more typically found on elevated upper terraces at greatest distance and elevation from the stream channel.

River red gum is a well-studied species known to have deep sinker roots, hypothesised to grow down towards zones of higher water supply (Bren et al., 1986) and the species mixes with forest red gum along the river frontage. For this assessment, the physiological attributes of river red gum and forest red gum are assumed to be similar as the species can inhabit and mix within a similar ecological niche. Forest red gum is however a more adaptable species, occupying dry hill slopes in some localities and it would be expected to be more tolerant of changes to hydrological regime than *Eucalyptus camaldulensis* which is a riparian specialist. Malik and Sharma (2004) found that *Eucalyptus tereticornis* also has a strong capacity to extract moisture from the shallow soil profile (0 – 150cm). Therefore, attributing forest red gum with the ecological characteristics of the more specialised river red gum is prudent from a risk management perspective, because it adopts the attributes of the species with the highest sensitivity.

River red gum is adapted to arid and semi-arid environments and will go through alternate phases of shedding and regaining its crown, depending on the availability of water and it is adapted to do so and over time and across the flood frequency classes, having capacity to self-regulate and adjust their transpiration rates to match the average flood return interval (Collof 2014) while the species maintain a strong capacity for genetic selection to increase capacity for the species to survive drought stress. Trees less able to survive drought tend to die off, hence the genes that are associated with drought tolerance traits become more common in the remaining population.

The species is considered opportunistic in its water use, sourcing water according to osmotic and matric water potential and source reliability (Thorburn et al., 1993; Mensforth et al., 1994; Holland et al., 2006; Doody et al., 2009) with the water requirements obtained from three main sources being groundwater, rainfall, and river flooding. Flooding enables the species to survive in semi-arid areas (ANBG 2004) where stands are intimately associated with the surface-flooding regime of watercourses and related groundwater flow. River red gum are considered a facultative phreatophyte, shifting between a combination of surface soil moisture and groundwater during periods of high rainfall, then shifting to exclusive use of groundwater during drier periods. They are likely to achieve this shift through inactivation of surface roots during drier periods with increased reliance on deeper tap roots when surface water is unavailable. River red gum will often use saline

groundwater in preference to fresh surface water, probably because it represents a more reliable supply (Colloff 2014). Doody et al. (2015) demonstrated that soil moisture alone can sustain the health of *Eucalyptus camaldulensis* through periods of drought up to six years before significant decline in tree health is noted.

The maximum potential rooting depth of river red gum is subject to considerable conjecture in current literature, although it is widely accepted that the species has capacity to access deep groundwater sources (Eamus et al 2006a). Horner et al. (2009) found rooting depths at 12–15 mbgl based on observed mortality in plantation river red gum forests on the Murray River Floodplain. From excavations in 20 year-old plantation forests of *Eucalyptus tereticornis*, Kallarackal and Somen (1998) found that roots were traceable to depths of 9.3 mbgl and Jones et al (2020) found maximum rooting depths of 8.1 mbgl in river red gum in a broad study area in the Great Artesian Basin. In conclusion, maximum rooting depth of red gum is likely to be variable, dependent on-site geology and depth to saturation with the capillary fringe being the general depth at which root penetration will be arrested (Eamus et al 2006b).

All eucalyptus species are potential users of groundwater (Cook et al 2007) although few studies demonstrating this dependence exist. Fensham and Fairfax (2007) consider both poplar box and narrow-leaved ironbark to possess a shallow rooting system with limited investment in deep root architecture, rendering them susceptible to droughting. Poplar box is more typically associated with upper terraces that are elevated above the river channel requiring a deeper rooting system to access groundwater. Narrow leaf ironbark generally occupies more elevated portions of the landscape, away from drainage lines where depth to groundwater would be greatest. For the remaining species, O’Grady et al (2006b) concluded the following when studying groundwater usage of trees on a tropical floodplain savannah:

1. Clarkson’s bloodwood utilised groundwater when the water table was at 10 mbgl indicating the potential for the species to develop a deep sinker root. Clarkson’s bloodwood should be considered a facultative phreatophyte. It is likely that Clarkson’s bloodwood occurring on the banks of ephemeral watercourses will utilise groundwater if it is within reach of rooting depth and not saline.
2. Moreton Bay ash demonstrated groundwater usage when the water table was at 4 mbgl, although it is not known whether the species has capacity to utilise deeper groundwater sources. Moreton Bay ash should be considered a facultative phreatophyte.

Both Moreton Bay ash and Clarkson’s bloodwood are scattered throughout the frontages of Springton and Charlevue Creek’s within RE11.3.25, generally occupying lower terraces where depth to groundwater decreases.

**River oak:** The water use strategy of river oak (*Casuarina cunninghamiana*) appears dependent on its position relative to a watercourse. O’Grady et al (2006b) determined river oak mainly utilised river water when adjacent to a stream channel, which is its most common topographic position. There has been no demonstration that river oak has capacity to utilise deeper groundwater sources. River Oak is not considered to be groundwater dependent in the Project area.

**Lancewood:** The acacia's, in particular lancewood, are considered shallow rooted species and based on their ecological preference for elevated portions of the landscape, are considered unlikely to utilise groundwater to any degree.

## 2.2 Hydrogeological Setting

The project mining area is in the north-west extent of the Bowen Basin, a broad sedimentary basin formed in the Permian / Triassic period with a variable cover of Tertiary period sediment and basic volcanic rocks (basalts). The surface geology is summarised from DNRM (2018) as below:

- Quaternary age alluvial deposits are associated with the major drainage features of Charlevue and Springton Creek's which occur to the west and east of the proposed mining area respectively.
- The Tertiary age Duaringa Formation dominates the surface geology providing exposures of weathered mudstone, sandstone, siltstone and conglomerate.
- Residual ferricrete occurs as scattered surficial deposits throughout the landscape.
- Permian period sedimentary rocks of the Rangal Coal Measures (Rr) which includes the economic seams to be mined, though are not exposed at the surface within the area of development (see **Figure 7**).

JBT Consulting (2020) describes the hydrogeological regimes associated with the various lithologies in the assessment area. Information from this assessment, coupled with more recent ground water quality data, is summarised below:

- Recharge of the alluvium is via direct rainfall with the water level ranging from 8.77 m to 11.19 mbgl for bores adjacent to the creek channels. The EC at bore DW7076W (Charlevue Creek alluvium) ranges from 14,439  $\mu\text{S}/\text{cm}$  to 17,106  $\mu\text{S}/\text{cm}$ . Field value from bore DW7292W1 (Springton Creek alluvium) range from 1669 - 5948  $\mu\text{S}/\text{cm}$ . Hydraulic conductivity (K value) measured in the alluvium from a single monitoring bore is 0.097 m/day, with rates calculated by chloride mass balance to range from 0.4 to 0.8 mm/year indicative of extremely low rates of infiltration.
- The Tertiary sediments of the Duaringa formation are variably saturated with the elevation of the base of Tertiary being a control on the occurrence of water within the sediments. The water level with the Tertiary sediments ranges from dry (5 bores, ranging in depth from 14 to 23 m) to 15.38-44.74 mbgl (where water is present). Recharge of the Tertiary sediments is via direct rainfall calculated by chloride mass balance to range from 0.4 to 0.8 mm/year. The salinity of groundwater in the Tertiary sediments ranges from 1, 439 (DW7220W1) to 26, 831  $\mu\text{S}/\text{cm}$  (DW7282W1) indicative of a low rate of recharge as well as a long residence time for groundwater.
- Groundwater in the Permian sediments occurs preferentially in the coal seams due to the open nature of the cleats, providing a conduit for infiltrating rainfall. Standing water level (SWL) in the coal seam ranges from 16.91 to 46.62 mbgl. Interburden is hydraulically tight with (K = 0.001 to 0.002 m/day) compared to the coal seams where hydraulic conductivity is typically much higher, ranging from 0.002 to 5.387 m/day. Salinity of groundwater in coal seams ranges from 984  $\mu\text{S}/\text{cm}$  (DW7105W2 in the Pollux lower to upper seam) to 33,343  $\mu\text{S}/\text{cm}$ .



While direct infiltration of rainfall will be the predominant source of groundwater recharge over much of the Project area, surface flows and seasonal flooding on drainage lines will provide a significant localised source of recharge for alluvial sediments, particularly along the major watercourses of Charlevue and Springton Creeks .

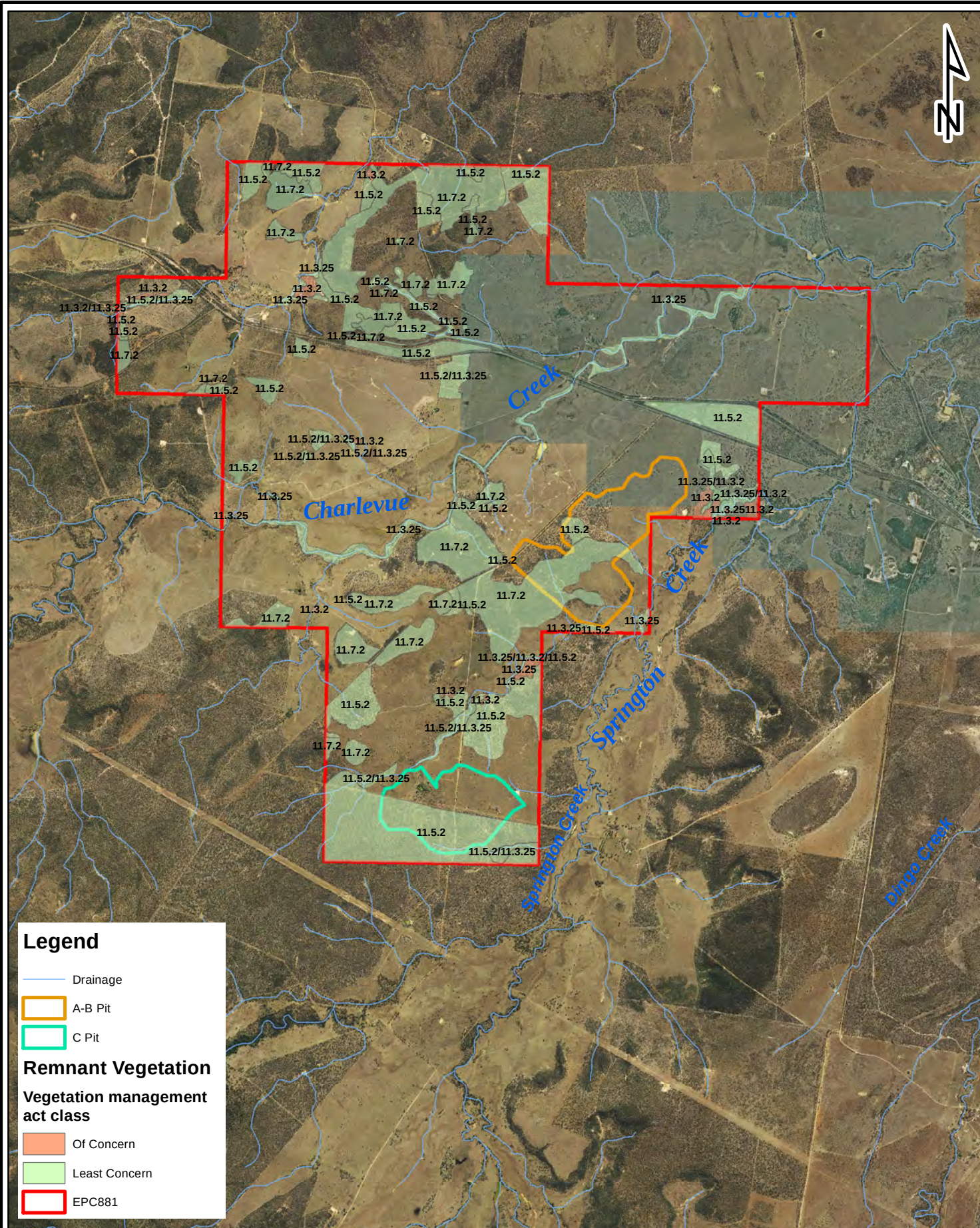
A summary of groundwater monitoring bores used to inform the assessment of GDEs, including target unit, standing water level (SWL), salinity (EC) is provided in **Table 1** summarised from the hydrogeology report produced by JBT (2020) and groundwater monitoring data collected in May to September 2020. The location of groundwater monitoring bores is shown in **Figure 8**.

**Table 1.** Details of groundwater monitoring bores used to inform assessment.

| Hole            | Groundwater Unit            | SWL (mbgl)* | Field Salinity Range (µS/cm)** |
|-----------------|-----------------------------|-------------|--------------------------------|
| DW7076W         | Alluvium                    | 8.77        | 14439 – 17106                  |
| <b>DW7292W1</b> | Alluvium                    | 11.19       | 1669 - 5948                    |
| <b>DW7220W1</b> | Tertiary                    | 15.38       | 1439 - 1757                    |
| <b>DW7225W1</b> | Tertiary                    | 32.37       | 9425 – 10348                   |
| <b>DW7282W1</b> | Tertiary                    | 26.25       | 22483 - 26831                  |
| <b>DW7033W1</b> | Tertiary                    | 29.94       | 7001 - 7748                    |
| DW7220W2        | Permian Coal (Castor)       | 19.25       | 1594 - 1799                    |
| <b>DW7082W1</b> | Permian Coal (Castor Lower) | 17.99       | 11115 - 12779                  |
| <b>DW7035W3</b> | Permian Coal (Orion 1)      | 21.75       | 13516- 14400                   |
| <b>DW7221W1</b> | Permian Coal (AR3)          | 20.50       | 3325 - 3977                    |
| <b>DW7178W2</b> | Permian Coal (PLU2)         | 38.45       | 24933 - 26921                  |
| <b>DW7082W2</b> | Permian Coal (Pollux Upper) | 17.04       | 13317 - 14100                  |
| <b>DW7105W2</b> | Permian Coal (PLU1)         | 31.18       | 984 - 1326                     |
| DW7221W2        | Permian Coal (Castor)       | 20.50       | 7851 - 14661                   |
| <b>DW7033W2</b> | Permian Coal (Orion 5)      | 29.01       | 14393 - 15733                  |
| <b>DW7220W3</b> | Permian Coal (PLU1)         | 19.04       | 17398 - 20041                  |
| <b>DW7225W2</b> | Permian Coal (AR3)          | 32.10       | 14691 - 15585                  |
| <b>DW7093W1</b> | Permian Coal (Pollux 2)     | 28.44       | 13310 - 15868                  |
| <b>DW7282W2</b> | Permian Coal (AR3)          | 32.10       | 30478 - 33343                  |
| <b>DW7264W2</b> | Permian Coal (AR1)          | 21.59       | 20756 - 23690                  |
| <b>DW7225W3</b> | Permian Coal (Castor)       | 31.60       | 15202 - 16333                  |
| <b>DW7093W3</b> | Permian Coal (PLL2)         | 28.46       | 17043 - 18467                  |
| <b>DW7264W3</b> | Permian Coal (AR3)          | 21.58       | 17757 - 19307                  |
| <b>DW7033W3</b> | Permian Interburden         | 28.93       | 12973 - 15280                  |
| <b>DW7093W2</b> | Permian Interburden         | 28.45       | 13699 - 16117                  |

\*Date of measurement between 19 May 2020 and 25 September 2020; \*\*Date of measurement range from 25 Sept 2019 to 17 July 2020; **Bold** = specimen submitted for stable isotope sampling.



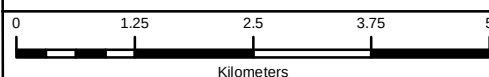


Source: AARC (2019)

**Figure 5. Field verified regional ecosystem mapping.**

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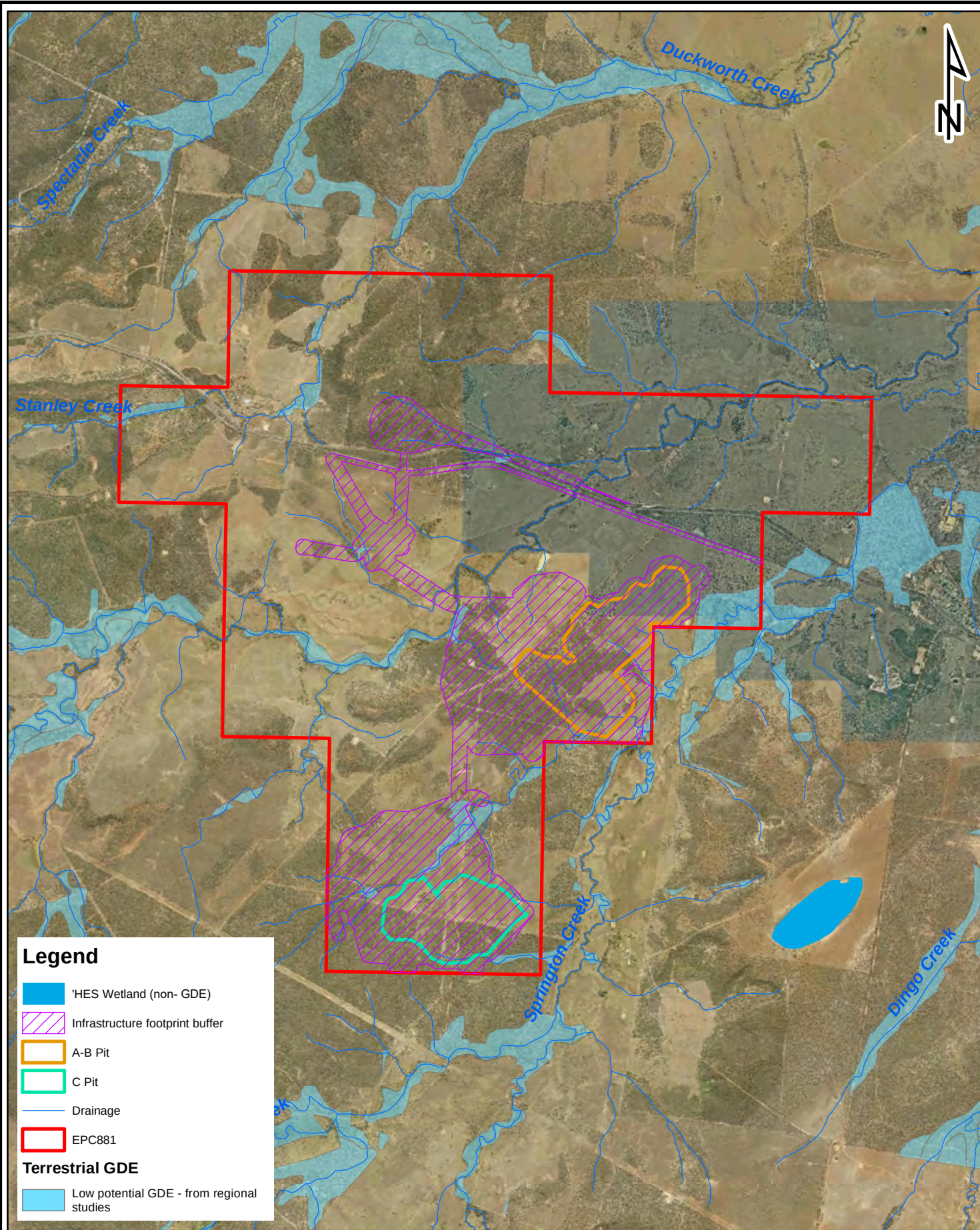
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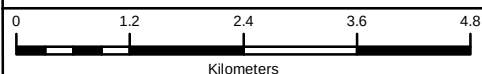


Source: BOM GDE Atlas (2020).

**Figure 6. Groundwater Dependent Ecosystems in the assessment area**

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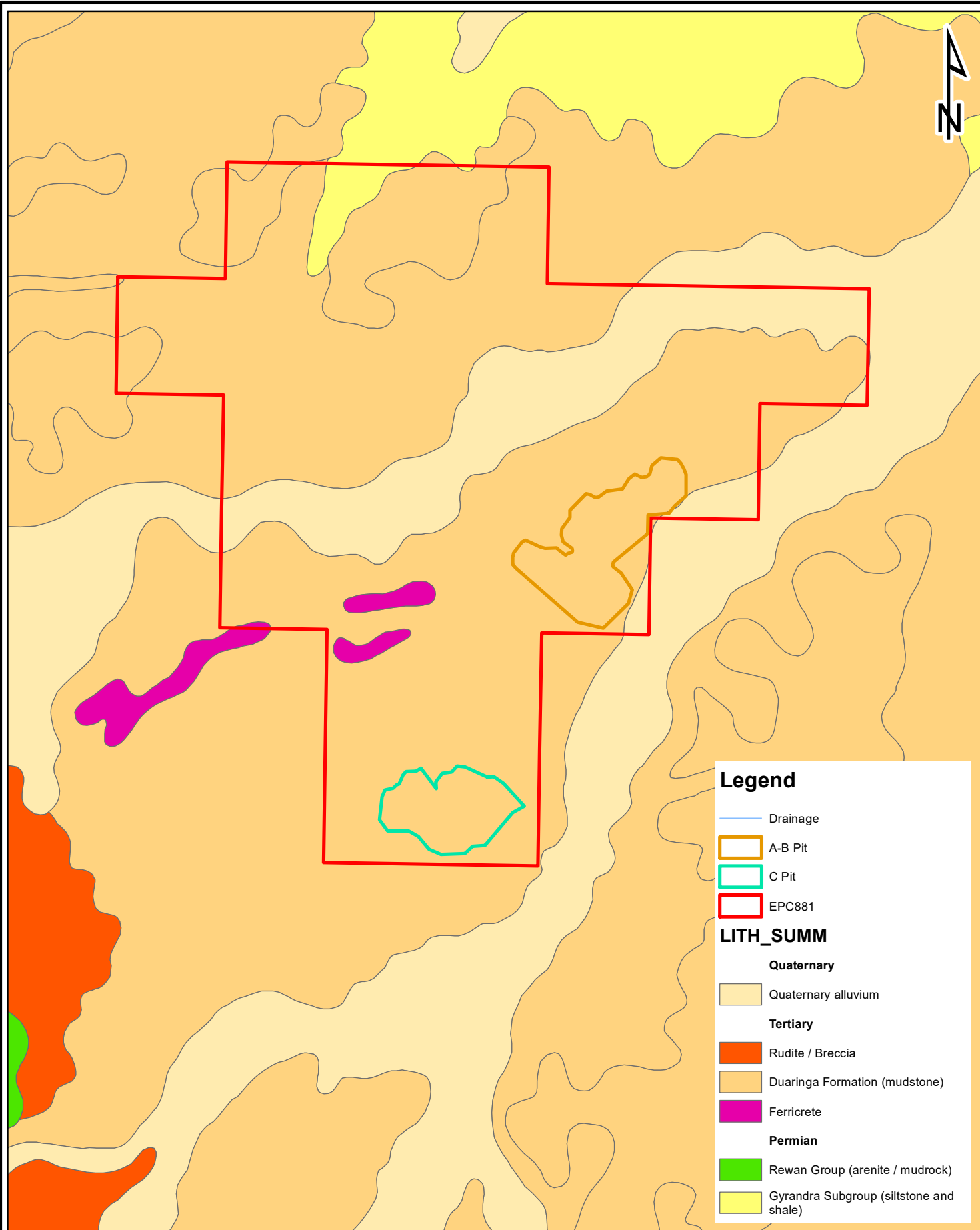
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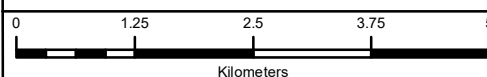


Source: Detailed Surface Geology Queensland (DNRM 2018)

**Figure 7. Surface geology in the Project area**

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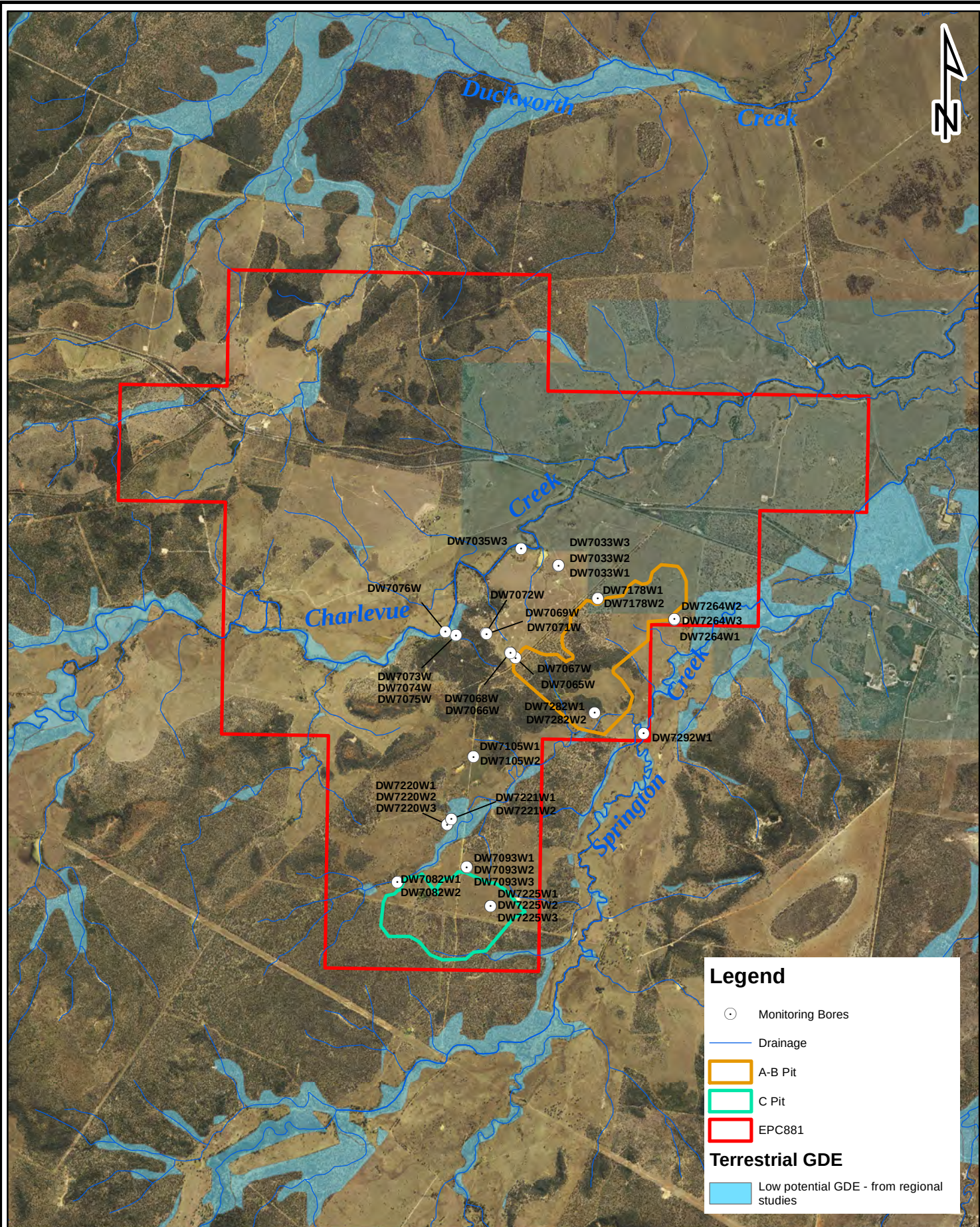
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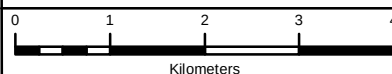


Source: BOM GDE Atlas (2020).

**Figure 8.** Groundwater monitoring bores in the Project area against mapped GDEs.

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### 3.0 Methods

The following section provides an overview of methods used to assess groundwater dependence of vegetation within the Project Area and surrounds. It describes site selection, use of shallow hand auger holes, assessment of leaf water potential (LWP), soil moisture potential (SMP) and analysis of stable isotope composition in a manner that is consistent with Jones et al (2020) and supplemented with methodology from Richardson et al (2011), IESC (2018b) and Eamus (2009).

Field assessment was completed over a six-day period from the 27<sup>th</sup> June 2020 to 2<sup>nd</sup> July 2020. In prior reference to **Figure 3**, Weather conditions during the survey were mild to warm, with an estimated maximum daily temperature from 26°C to 30°C.

#### 3.1 Site Selection

The survey focused on areas mapped as potential GDEs in BOM (2020b) with additional sites identified where vegetation characteristics were otherwise indicative of potential groundwater dependence. Assessment sites were generally confined to drainage lines including the larger systems of Springton and Charlevue Creek. In total, four broad areas were targeted for assessment (as per **Figure 9**) being:

1. Charlevue Creek Area1 providing representation of a reach of Charlevue Creek where riparian vegetation is well developed and preserved within a broad alluvial flood plain. Vegetation in this area is mapped as RE11.3.25 in AARC (2020) and the area is considered representative of the best developed and preserved riparian vegetation within the Project area. This area was targeted in Sites M7, M8 and M9. Charlevue Creek in this area is incised into a broad alluvial flood plain to a depth of approximately 6m with a sandy channel floor (see **Figure 9**).
2. Charlevue Creek Area 2 provides representation of a more disturbed reach of Charlevue Creek where riparian vegetation has been reduced to a thin strip within the confines of the river channel and immediate stream banks. This area is similar to Charlevue Creek Area 1 though vegetation is not as well preserved, and the area is not recognised as a potential GDE in the GDE Atlas (BOM 2020b). Charlevue Creek Area 2 was sampled in Sites M10 and M12.
3. Springton Creek Area 1 provides a representation of the riparian vegetation fringing Springton Creek which is in closest proximity to the proposed AB Pit. Vegetation on this reach is mapped as RE11.3.25 in AARC (2020) with flood plain vegetation, represented by RE11.3.2, extending for several hundred metres on either side of the flood channel in some localities. All fringing vegetation is mapped as a 'low potential' terrestrial GDE in the GDE Atlas (BOM 2020b). Springton Creek Area 1 was sampled at Sites M5, M6 and M14. Site M14 was specifically targeted within the road reserve as a representation of RE11.3.2 (*Eucalyptus populnea* dominant woodland), an ecosystem which could not be sampled elsewhere within the EPC Area due to land access restrictions.
4. Springton Creek Tributary Area 1, provided representation of a larger ephemeral tributary of Springton Creek which is closest to C Pit. Vegetation is mapped as a 'low potential' terrestrial GDE in the GDE Atlas (BOM 2020b). The area was assessed with Site M1 and M4.

Other more discrete targets were chosen to test for groundwater dependence in other areas including:



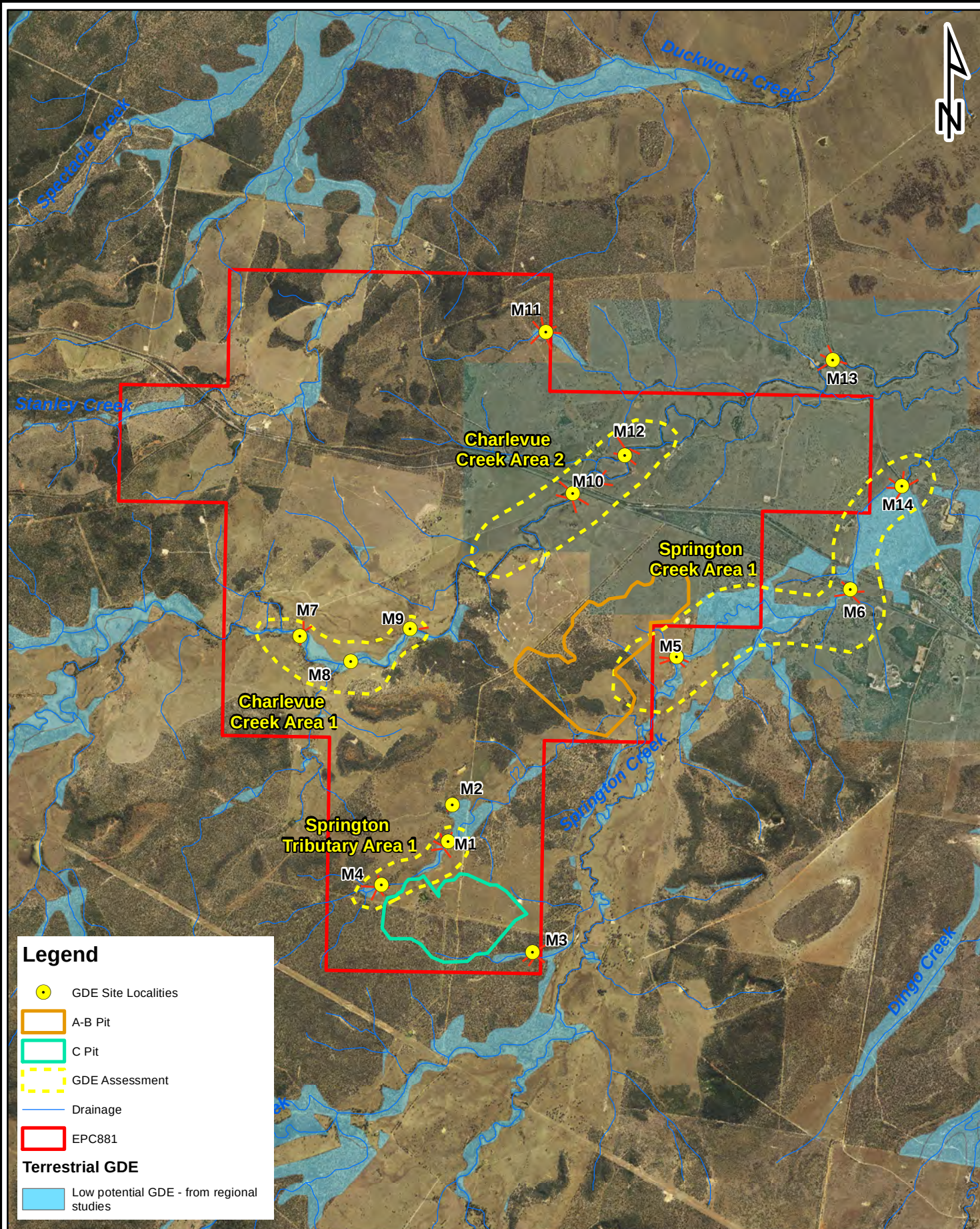
1. Site M2, targeting an area mapped as a 'low potential' GDE that was mapped as RE11.5.2 in vegetation mapping completed by AARC.
2. Site M3, targeting a mapped 'low potential' GDE within a minor depression that drains into Springton Creek.
3. Site M11, targeting another area mapped as a 'low potential' GDE within a minor depression that drains into Charlevue Creek. Vegetation is mapped as RE11.5.2 in the terrestrial ecology report prepared by AARC (2020).
4. Site M13, targeting the riparian fringe of Charlevue Creek in an off-tenure location, within an area not recognised as a potential GDE (BOM 2020b).

The HES Wetland mapped to the east of the assessment area (see **Figure 6**) was also observed from the road edge during field inspection, though could not be accessed on foot due to entrance restriction imposed by the landowner. The location of all GDE assessment localities is shown in **Figure 10**.



**Figure 9.** Sandy channel bed of Charlevue Creek at Site M7.





## Legend

- GDE Site Localities
- A-B Pit
- C Pit
- GDE Assessment
- Drainage
- EPC881

## Terrestrial GDE

- Low potential GDE - from regional studies

**Figure 10.** The location of GDE assessment sites and areas.

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### 3.2 Hand Auger Sampling

Where practical, a hand auger placed to a maximum depth of 2.35m was utilised to sample shallow soil and sub-soil and collect samples at varying depths in the soil profile. Hand auger placement was limited by substrate and the auger could not penetrate deeply in some localities due to hard substrates, or refusal occurred at relatively shallow depths in the soil profile due to the presence root material. In total, 19 auger holes were placed across the 14 GDE assessment sites. Within each auger hole, the following observations were made at regular depth intervals:

1. Soil structure, colour, and texture.
2. Presence of root matter.
3. Soil moisture / water and depth to saturation.

Soil sampling was undertaken at regular intervals (generally 0.2m with following samples taken every 0.5m) down the soil profile for analysis of stable isotopes of oxygen ( $\delta^{18}\text{O}$ ) and deuterium ( $\delta^2\text{H}$ ). Duplicate samples were retained for analysis of soil moisture potential (SMP). The location of hand auger samples is shown in figures relevant to each GDE assessment site (see **Section 4.0**).

### 3.3 Leaf Water Potential

Leaf Water Potential (LWP) is defined as the amount of work that must be done per unit quantity of water to transport that water from the moisture held in soil to leaf stomata. LWP consists of the balance between osmotic potential, turgor pressure and matric potential. It is defined as the amount of work that must be done per unit quantity of water to transport that water from the moisture held in soil to leaf stomata. It is a function of soil water availability, evaporative demand, and soil conductivity.

LWP was measured pre-dawn (prior to sunrise) as per standard protocol. Due to a lack of transpiration, LWP will equilibrate with the wettest portion of the soil that contains a significant amount of root material. Pre-dawn LWP will shift to a lower status as soil dries out on a seasonal basis (Eamus 2006a). Measurement pre-dawn LWP thus gives an indication of the water availability to trees at each assessment site and provides an indication as to whether trees are tapping saturated zones of the soil profile where water is freely accessible, or utilising moisture that is more tightly bound to soil particles.

Survey localities were visited pre-dawn (first light to pre-sunrise) and leaves were collected from the canopy with the aid of a 7.5m extension pole fitted with a lopping head. Leaves were collected from three to six mature canopy trees at each site with 66 trees sampled in total across all assessment areas. Collected samples were double bagged in black plastic to avoid moisture loss and sun exposure and LWP was measured on-site within half an hour of harvest. Suitable leaf material was trimmed with a fine blade and inserted into an appropriate grommet for sealing within a Model 3115 Plant Water Status Console (Soil Moisture Equipment Corp, 2007). The chamber was sealed and gradually pressurised with nitrogen until the first drop of leaf water emerged from the petiole. Two reading readings were taken at each GDE site to calculate an average with a third taken where significant differences between reading was noted. Readings were taken in pounds per square inch (PSI) which is converted to a negative value in millipascals (MPa) for direct comparison to SMP



measurements. The location of trees sampled for LWP relative to GDE assessment areas is shown in provided in **Section 4.0**.

### **3.4 Soil Moisture Potential**

Duplicate samples collected during soil augering were subject to analysis of SMP (SMP) at regular intervals with an aim to collect samples at 0.2 mbgl, 0.5 mbgl and at 0.5 to 1.0m intervals to the end of hole. As samples were collected, they were immediately sealed in airtight plastic vials and placed on ice. For each interval sampled, one sample was dispatched to the Australian National University (ANU) Stable Isotope Laboratory (Farquhar Laboratory) for the analysis of the naturally occurring stable isotopes of hydrogen and oxygen within soil moisture (see **Section 3.6.1**). The second sample was retained for the measurement of laboratory tested SMP.

SMP, which includes the matric (dryness) and osmotic (saltiness) potential, is a measure of the energy required to extract moisture from soil. Water only has capacity to move down a hydraulic gradient from soil to root (Gardner 1960) and only areas in the soil profile that have a SMP that is less negative than measured pre-dawn LWP will be accessible as a source of moisture. It is widely agreed in ecohydrology and plant physiology fields, that large, mature trees are unable to extract moisture from regions in the soil profile where the total SMP is significantly below LWP measured in pre-dawn leaf material (Feikema et al. 2010, Lamontagne et al. 2005, Thorburn et al. 1994, Mensforth et al. 1994, Holland et al 2009 and Doody et al. 2015).

For crops, the maximum suction roots can apply to a soil/rock before a plant wilts due to negative water supply is approximately -15 bars or -1.5 MPa (or -217.55 psi). This wilting point is considered relatively consistent between all plant species (Mackenzie et al, 2004), although many Australian plants have adapted to conditions of low water availability and can persist strongly in soil conditions where soils moisture potential is below standard wilting point (Eamus 2006a). As a general measure however, where measured LWP is below standard wilting point, it indicates plant water deficit, and the tree is unlikely to be supported by a saturated water source unless highly saline.

The measurement of SMP was completed in the laboratory by a portable Dew Point Potentiometer (WP4C) (Meter Group Inc, 2017). The WP4C meter uses the chilled mirror dew point technique with the sample equilibrated within the headspace of a sealed chamber that contains a mirror and a means of detecting condensation on the mirror. Soil moisture potential samples were measured in megapascal pressure units (MPa). A single 7 ml soil sample was inserted into the WP4C meter using a plastic measuring tray with a stainless-steel base.

### **3.5 Stable Isotope Sampling and Analyses**

Trees may utilise water from a range of sources including the phreatic zone (saturated zone), the vadose zone (unsaturated zone) and surface water. The stable isotopes of water, oxygen 18 (<sup>18</sup>O) and deuterium (<sup>2</sup>H) are useful tools to help define the predominant source of water used by terrestrial vegetation. The method relies on a comparison between the stable isotope ratios of water contained in plant xylem (from a twig or xylem core) with stable isotope ratios found in the various sources of water including a shallow groundwater table, potential sub-artesian aquifer water sources or shallow soil moisture. Methods used to assess stable isotopes are detailed below.

### **3.5.1 Soil moisture isotopes**

Sampling was undertaken at regular intervals in auger holes to capture isotopic signatures from a range of potential plant moisture sources from the upper soil surface to the top of the phreatic zone in shallow water tables. The sampling intervals for soil moisture isotope analyses was dependent on auger yield and soil variation although in general, the initial soil sample taken within the top 20cm of the soil profile and subsequent samples taken at 0.5m intervals down the soil profile to the end of hole. Approximately 200mg of soil was collected for isotope analysis, sealed in airtight plastic sampling containers, double sleeved in click-seal plastic bags and placed on ice for storage prior to dispatch to ANU Stable Isotope Laboratory for analysis where they were snap frozen until analysis was complete.

### **3.5.2 Xylem water isotopes**

Twigs were collected from the outer canopy branches of target trees used to sample LWP. The following sampling procedure was applied:

1. Outer branches of trees of the GDE target tree were harvested for twig material. Two duplicate samples were prepared from each branch for analysis.
2. The position of trees subject to assessment were marked with a GPS and structural measurements were recorded including height and diameter at breast height (dbh).
3. Outer branches from each tree were harvested with an extendable aluminium pole.
4. Stem material equivalent approximately 5cm in length was sourced using clean stainless-steel secateurs.
5. Bark was immediately removed, and stems were sealed in wide mouth sample containers with leakproof polypropylene closure (approx. 125ml volume) and immediately labelled with the tree number and placed in an iced storage vessel prior to dispatch to the ANU Stable Isotope Laboratory.
6. Upon receipt of samples at the ANU Stable Isotope Laboratory, samples were snap frozen (-18°C) until analysis.
7. For all twigs, samples were taken from xylem as close to the centre of twig as possible. For both xylem and soil samples, extracted water was analysed using a Picarro L2140i cavity ring-down spectrometer.

For xylem water analysis, multiple samples were taken from a single branch sample at all sampling localities. From each branch sampled, the twig samples retaining the lowest degree of isotopic enrichment was used as the reference. This is because there may be considerable partitioning of isotope ratios across a twig cross-section (moving from the xylem to phloem) and it is not always possible to sample the same region of a twig consistently when multiple samples are submitted for analysis. There is also potential for fractionation of stable isotope values, particularly  $2H$ , during movement of water through the xylem from roots to leaves (Evaristo et al 2017, Petit and Froend 2018). As fractionation will likely result in isotopic enrichment rather than depletion, the least enriched sample from each tree is considered most likely to be representative of the soil moisture or groundwater source.

### **3.5.3 Groundwater monitoring bore sampling**

To compare the isotopic signature of groundwater to that of vegetation, groundwater samples from developed monitoring wells were collected which were despatched to Australian National University (ANU) for analysis of stable isotopes of oxygen and deuterium. Monitoring wells where groundwater was sampled for stable isotope analysis have been indicated in **Table 1 (Section 2.2)**.

### **3.5.4 Data reconciliation and interpretation**

Data interpretation followed a structured approach in which multiple lines of evidence were filtered to provide an assessment of groundwater dependence. The biophysical measurement of LWP formed the primary assessment, followed by the adjunct comparison with SMP, with stable isotope data used to provide supplementary evidence where ambiguity remained. Further context to the approach is provided below.

**Step 1. LWP:** An initial comparison was undertaken to identify individual trees with LWP measurements within the expected range for known terrestrial GDEs subject to various salinity regimes. This data is drawn from a range of published sources including Jones et al (2020), Holland et al (2006) and Mensforth et al (1994) and values are conservatively applied against laboratory calculated values for water at various salinity levels (Meter Group Inc, 2017):

- Expected LWP for trees in equilibrium with a fresh to brackish saturated source of moisture ( $EC < 1500 \mu S/cm$ ) =  $> -0.2 MPa$ .
- Expected LWP for trees in equilibrium with a moderately saline soil moisture source ( $EC > 1500$  to  $10\ 000 \mu S/cm$ ) =  $< -0.2 MPa$  to  $> -0.55 MPa$ .
- Expected LWP for trees in equilibrium with a saline soil moisture source ( $EC > 10\ 000$  to  $17\ 000 \mu S/cm$ ) =  $< -0.55 MPa$  to  $> -0.9 MPa$ .

Trees that demonstrate LWP values that are more negative than expected ranges for the local groundwater salinity regime are assessed to not be groundwater dependent and not subject to additional scrutiny, other than for comparative purposes. A value of  $17\ 000 \mu S/cm$  was chosen as a reference as this represents the upper levels of salinity measured in the alluvium at Springton monitoring bore DW7076W (**see Table 1**).

**Step 2. SMP:** For trees where LWP was within the expected range of values for GDE's under specific local salinity regimes, an assessment of SMP from the auger profile was undertaken to identify the likelihood that moisture for transpiration was being supplied from the upper soil profile, or whether deeper sources of moisture must be inferred. As described in **Section 3.4**, water only has capacity to move down a hydraulic gradient from soil to root meaning that only those portions of the soil profile that have a SMP that is less negative than measured pre-dawn LWP will be accessible as a source of moisture (Gardner 1960). This does not provide an absolute assessment of groundwater dependence though identifies potential sources of moisture to provide context to assessment of stable isotopes (Step 3).

**Step 3. Stable Isotope Signatures:** For trees that demonstrate potential groundwater dependence from LWP measurements, stable isotope signatures from the xylem samples were compared to signatures from the upper 2m of the soil profile, groundwater, and surface water from pools in creek lines to provide a fingerprint for the source of moisture being utilised.



Where three lines of evidence indicated utilisation of a groundwater source, the tree was generally accepted as being groundwater dependent. Where ambiguity remained in the assessment, additional features were considered including site specific geology, geomorphology, soil physical properties and depth to water table at the location were utilised to inform the final assessment of groundwater dependence for any tree or site.

### **3.6 Limitations and Other Information Relevant to the Assessment**

This assessment provides a snapshot of eco-hydrological process at each of the four GDE assessment localities identified during pre-survey desktop assessment and field reconnaissance. Specific limitations include:

1. Climatic conditions preceding the assessment were dry, although preceding wet season rainfall events (in February 2020) would have saturated shallow portions of the soil profile with residual wetness being present in some soil horizons. Where ambiguity in biophysical measurements were apparent, stable isotope signatures were relied upon to differentiate groundwater from other soil moisture sources.
2. Access was limited in some localities due to landowner / site access restrictions. Sampling localities were modified prior to the assessment to allow sampling to be completed within the constraints of pre-dawn survey requirements. It is not anticipated that changes to original survey plans has negatively influenced or compromised the outcomes of the assessment.
3. Due to the intensive nature of the data collection, representative areas were chosen for GDE sampling which were used as a basis for extrapolation over broader areas considered to present similar ecohydrological function. The data collection process aimed to inform conceptualisation of the types of GDEs present on the site and their general distribution, so an informed risk assessment could be completed.
4. The ecological processes and hydrogeological conditions encountered within the Project area are complex and transient. Interpretations and conceptualisations presented here are based upon multiple lines of evidence and represent what the author considers is the most appropriate interpretation of the data. However continued refinement of the presented conceptual models may result from further data collection.

## 4.0 Results

Survey results are divided into individual sections which apply to each of the assessment methods employed including, LWP, SMP and assessment of stable isotopes. For data interpretation and discussion, presented in **Section 5.0**, these data form multiple lines of evidence which are the basis for identification and characterisation of GDEs throughout the Project area.

### 4.1 Leaf Water Potential Measurements

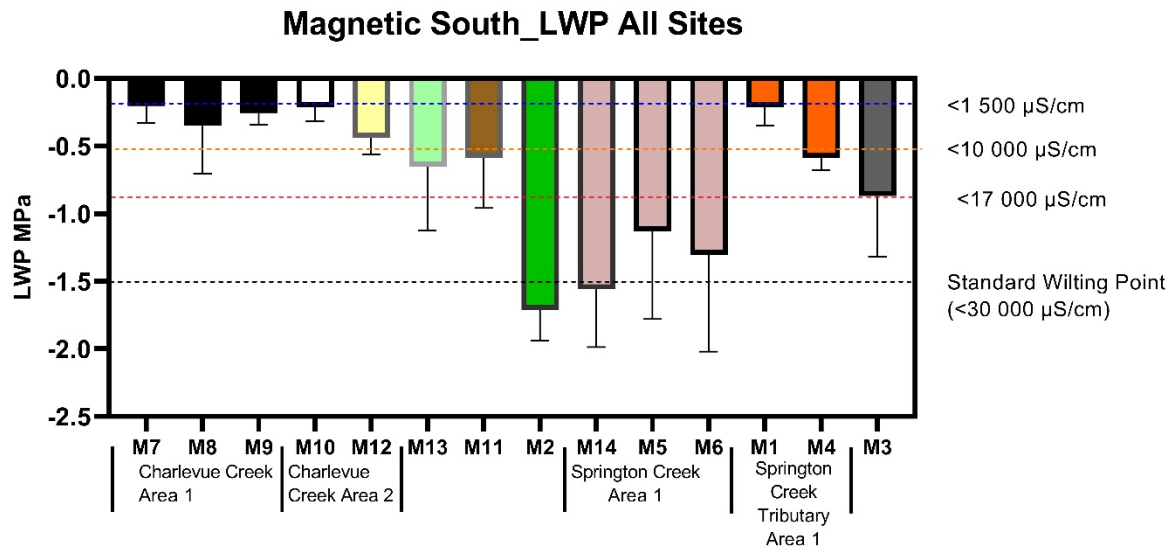
A summary of LWP sampling results for all trees, including locations of sampled trees relative to the watercourse is provided in **Appendix A**. Representation of average LWP results within the four broad assessment areas, including the 14 assessment sites is provided in **Figure 11** with spatial representation of average water availability per site provided in **Figure 12**. The results indicate:

1. The following sites demonstrate average LWP that is consistent with utilisation of a saturated low salinity (<1500  $\mu\text{S}/\text{cm}$ ) source of moisture, possibly groundwater, or near saturated portions of the soil profile:
  - a. Charlevue Creek Area 1 (Sites M7, M8<sup>1</sup> and M9) and Site M10 at Charlevue Creek Area 2.
  - b. Site M1 in Springton Tributary Area 1.
2. The following sites demonstrate average LWP values that suggest utilisation of a non-saturated source of readily available soil moisture in the vadose zone, or utilisation of a saline groundwater source with a salinity not greater than 10 000  $\mu\text{S}/\text{cm}$ .
  - a. Site M4 in Springton Tributary Area 1
  - b. Site M12 in Charlevue Creek Area 2.
  - c. Site M11 and Site M13.
3. The following sites demonstrate average LWP results indicative of moisture utilisation from a dry portion of the soil profile in the vadose zone.
  - a. All sites associated with Springton Creek Assessment Area 1 (Site M5, Site M6 and Site M14).
  - b. Site M2 and Site M3.

For point 3, the results of LWP analysis are more negative than would be imparted by use of saline groundwater in the alluvium, attributed with a maximum salinity of 17 000  $\mu\text{S}/\text{cm}$  (based on monitoring bore DW7076W on Springton Creek). Based on these results, all sites associated with Springton Creek Assessment Area 1, Site M2 and Site M3 are unlikely to represent terrestrial GDEs with trees sourcing moisture from dry portions of the soil profile / vadose zone. Further analysis of assessment sites listed against Point 1 and Point 2 are provided in the following sections for SMP and stable isotopes. A more comprehensive analysis of LWP data for individual trees is provided in **Figure 13**, which indicates levels of water availability for different species sampled across all sites.

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<sup>1</sup> Note average LWP results are inflated through inclusion of Tree 5, which is a *Eucalyptus populnea* on the margins of the flood plain.

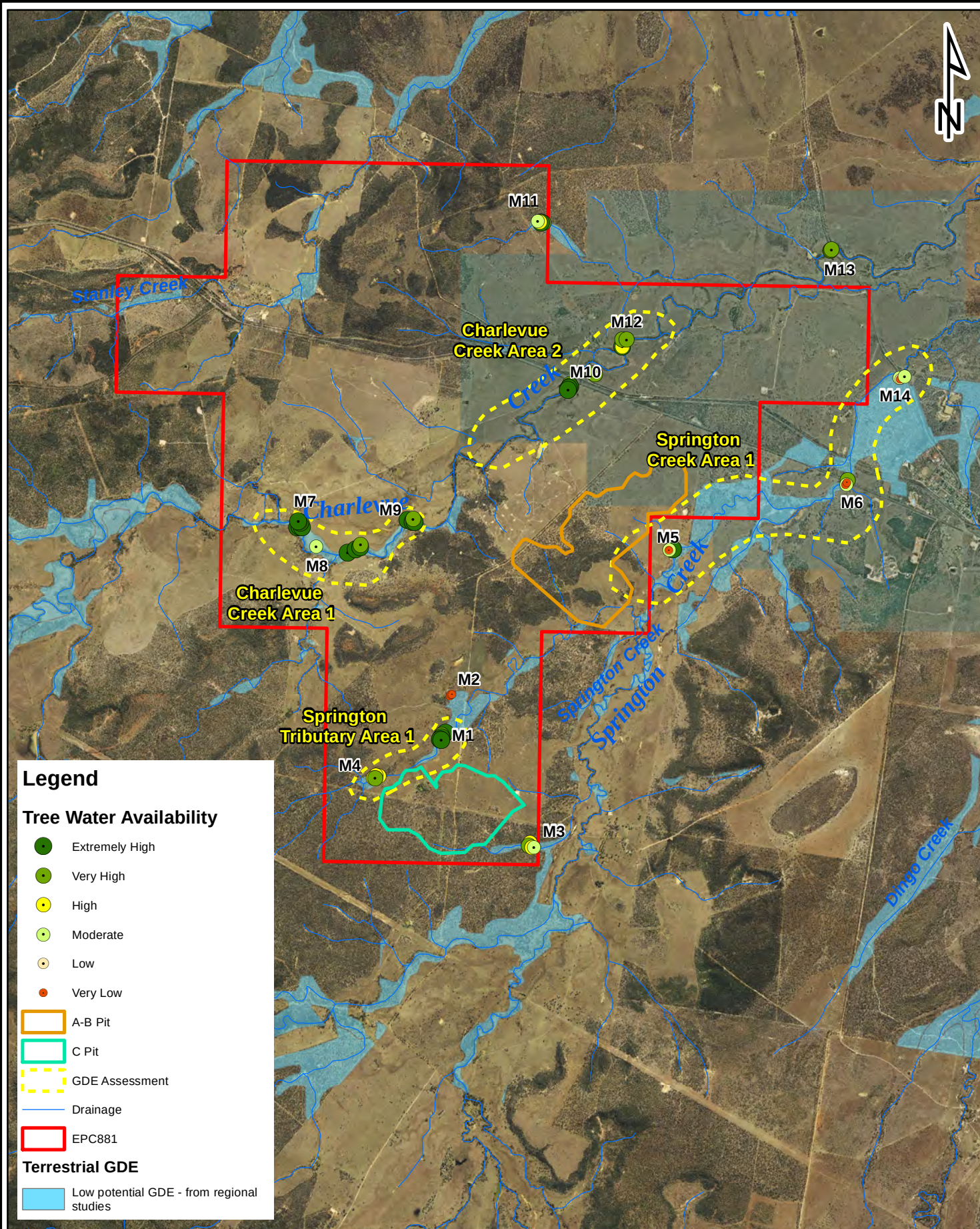


**Figure 11.** Average LWP readings for all GDE Assessment Areas. The blue line ( $>-0.2\text{MPa}$ ) indicates typical LWPs for trees in equilibrium with a non-saline saturated source of soil moisture; the orange line ( $>-0.55\text{MPa}$ ) indicating typical values for trees in equilibrium with a moderately saline soil moisture source ( $\text{EC } 10\,000\ \mu\text{S/cm}$ ) and the red line indicative of trees in equilibrium with saline source of moisture at  $17000\ \mu\text{S/cm}$ . Standard Wilting Point ( $<-1.5\text{MPa}$ ) is also indicated.

**Figure 13** shows that LWPs for both *Eucalyptus tereticornis* and *Eucalyptus camaldulensis* vary considerably across the survey area with trees at Site M1, M7, M8 and M9 demonstrate extremely high water availability ( $>-0.2\text{MPa}$ ). In comparison, *Eucalyptus camaldulensis* at Site M5 and M6 (Springton Creek) demonstrate LWP indicative of extreme moisture deficit ( $<-2.0\text{MPa}$  in some cases). This highlights the ability of both species to adapt to extremely dry conditions.

Both *Eucalyptus populnea* (Site M8, M2 and M14) and *Eucalyptus crebra* (Site M2) demonstrate high levels of water deficit at all sites (LWP values from  $-0.9\text{MPa}$  to  $-2.0\text{MPa}$ ) consistent with the findings of Fensham and Fairfax (2007) that these species have limited investment in deep root architecture and are not adept at utilising deeper sources of soil moisture or groundwater. Similarly, the single coolabah (*Eucalyptus coolabah*) measured at Site M13 is suffering considerable water deficit, which would be expected considering the propensity of the species to occupy heavy clay soils which hold on to water very tightly when dry, and also provide an impediment to deeper root penetration. A spatial representation of water availability for individual trees measured at each assessment site is provided in **Figure 14** to **Figure 18**.



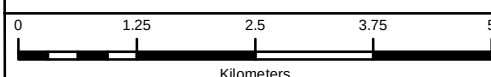


Source: BOM GDE Atlas (2020).

**Figure 12.** Average tree water availability per assessment site.

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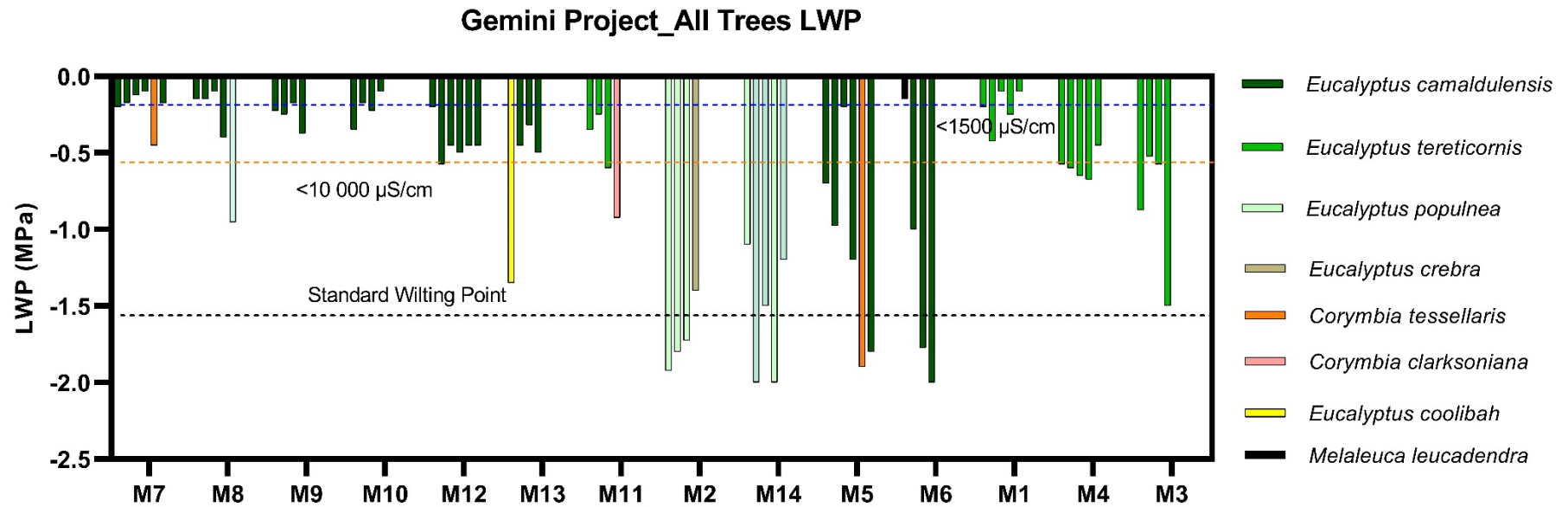
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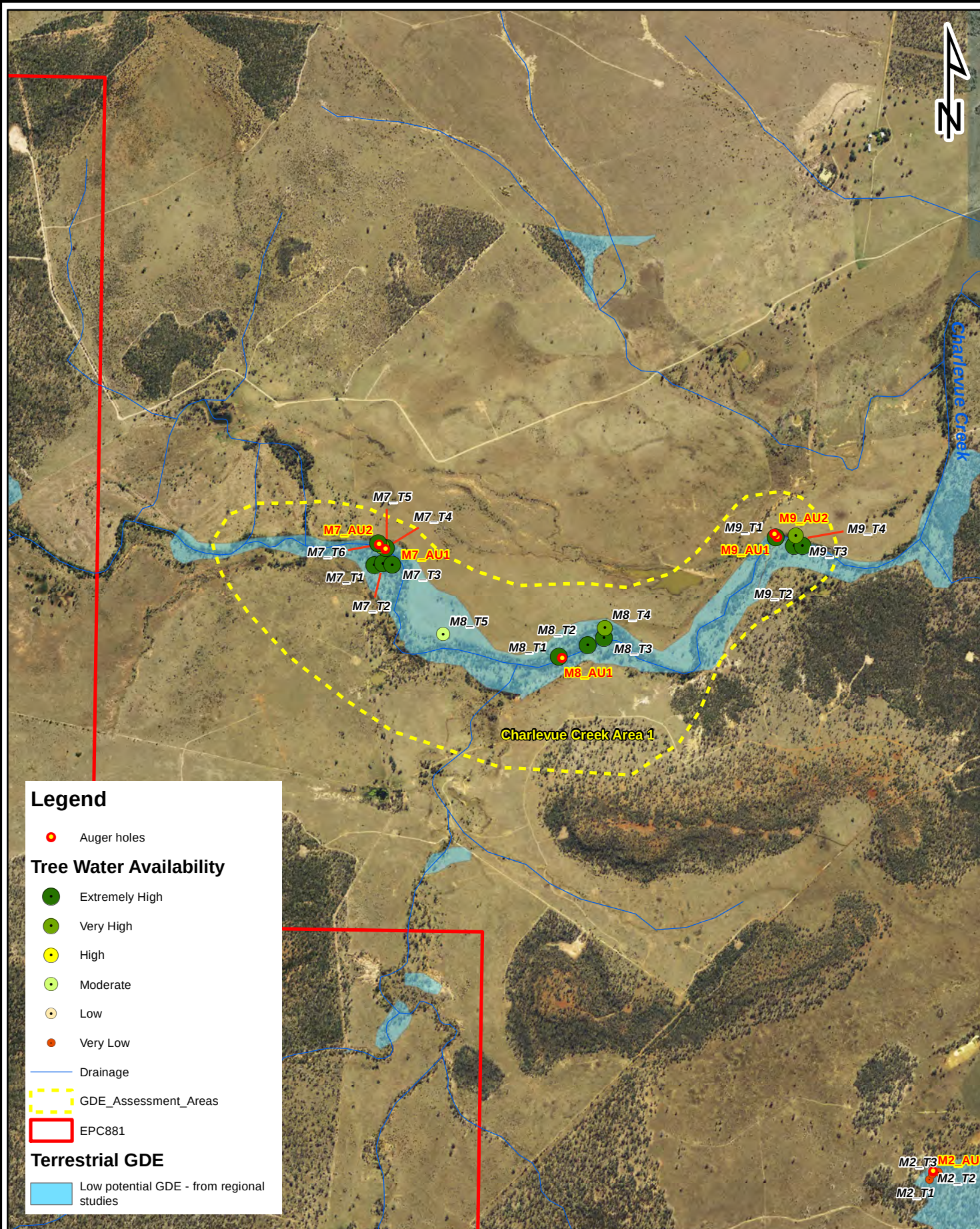




**Figure 13.** LWP measurement for all trees and species at all sites assessed during the GDE survey.



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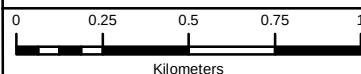


Source: BOM GDE Atlas (2020).

**Figure 14. Tree Water Availability in Charlevue Creek Area 1**

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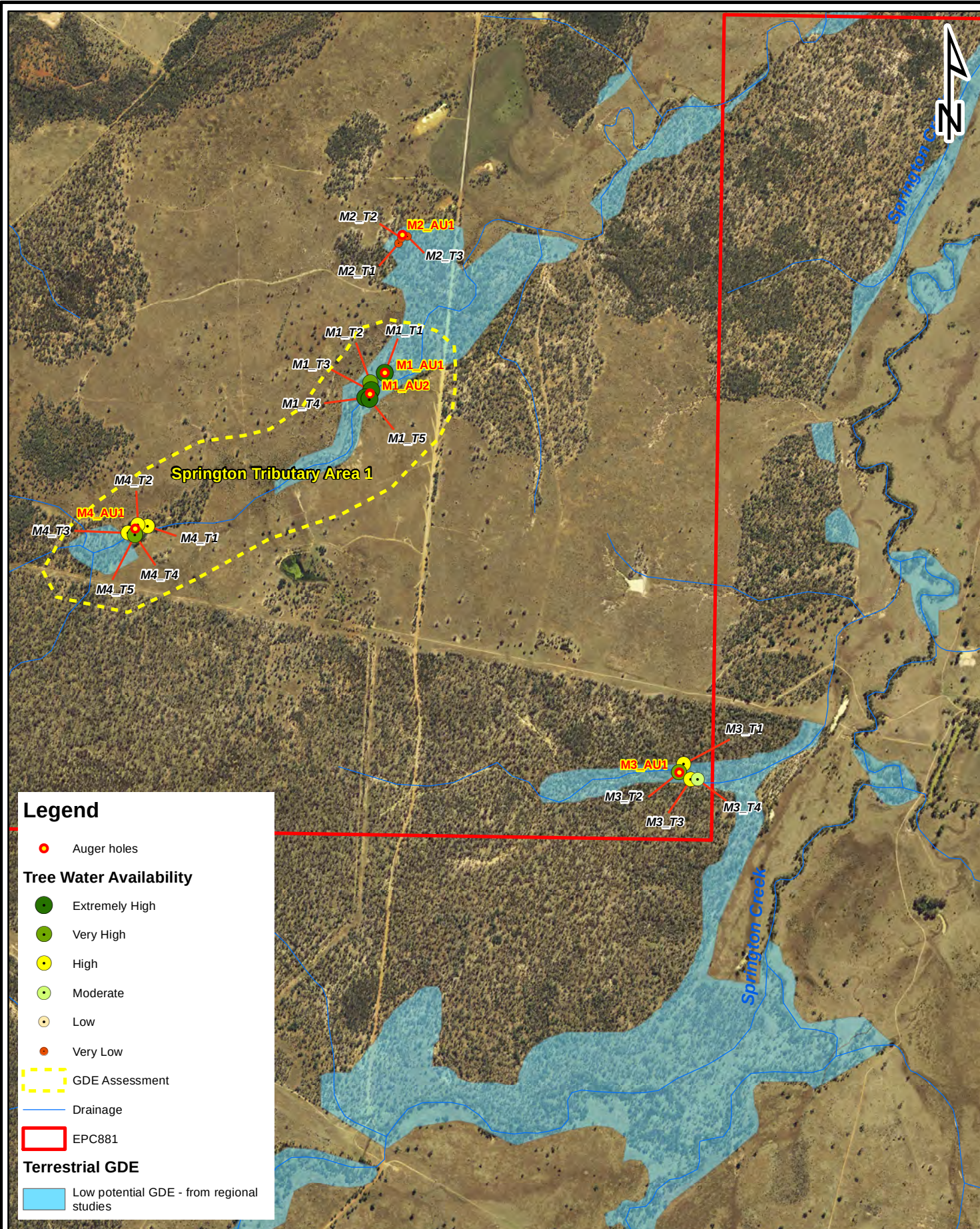
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## Legend

● Auger holes

### Tree Water Availability

● Extremely High

● Very High

● High

● Moderate

● Low

● Very Low

--- GDE Assessment

--- Drainage

□ EPC881

### Terrestrial GDE

□ Low potential GDE - from regional studies

Source: BOM GDE Atlas (2020).

**Figure 15. Tree Water Availability in Springton Tributary Area 1 and Site M3**

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Scale 1:22,553

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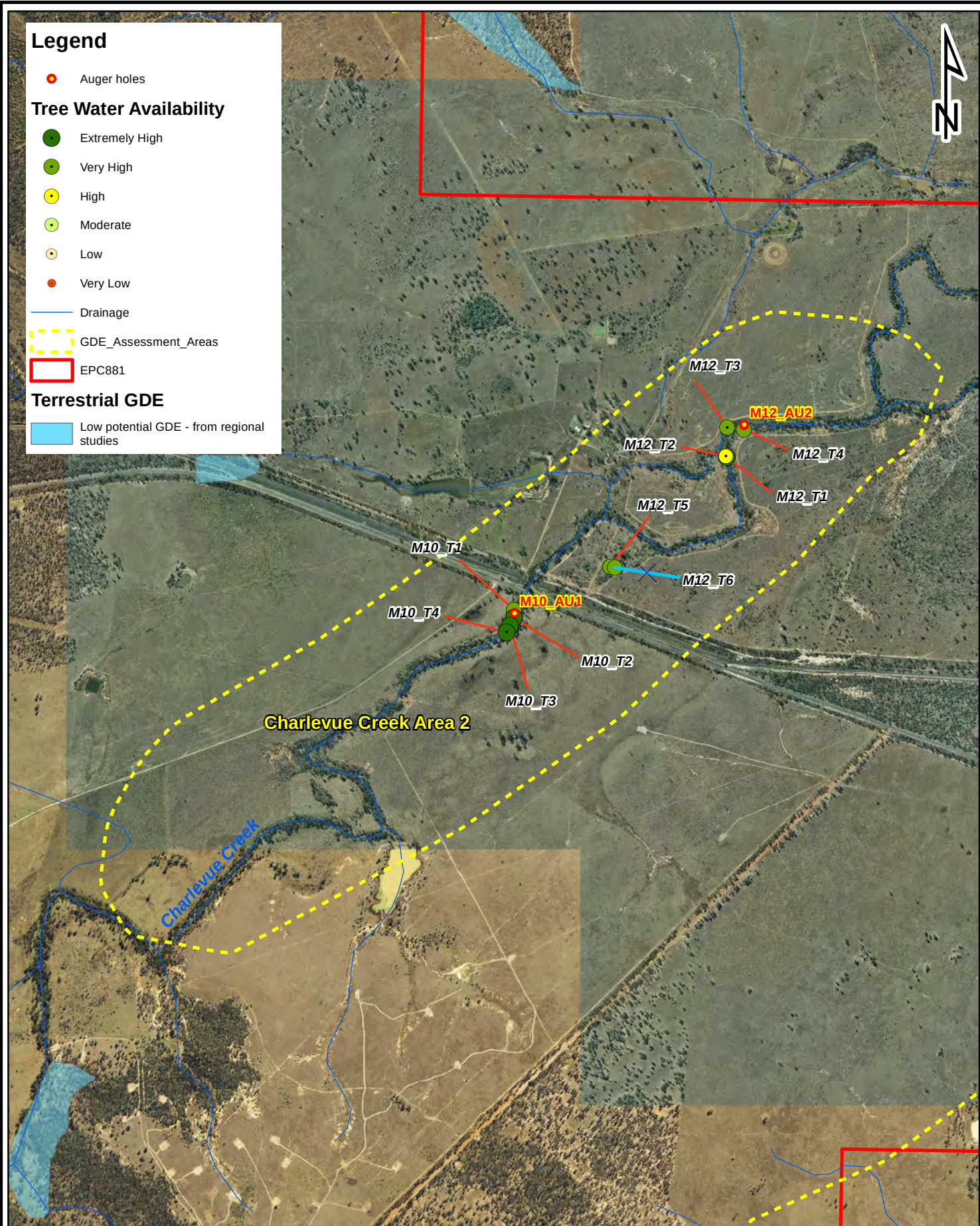
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Source: BOM GDE Atlas (2020).

**Figure 16. Tree Water Availability in Charlevue Creek Area 2**

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Scale 1:19,574

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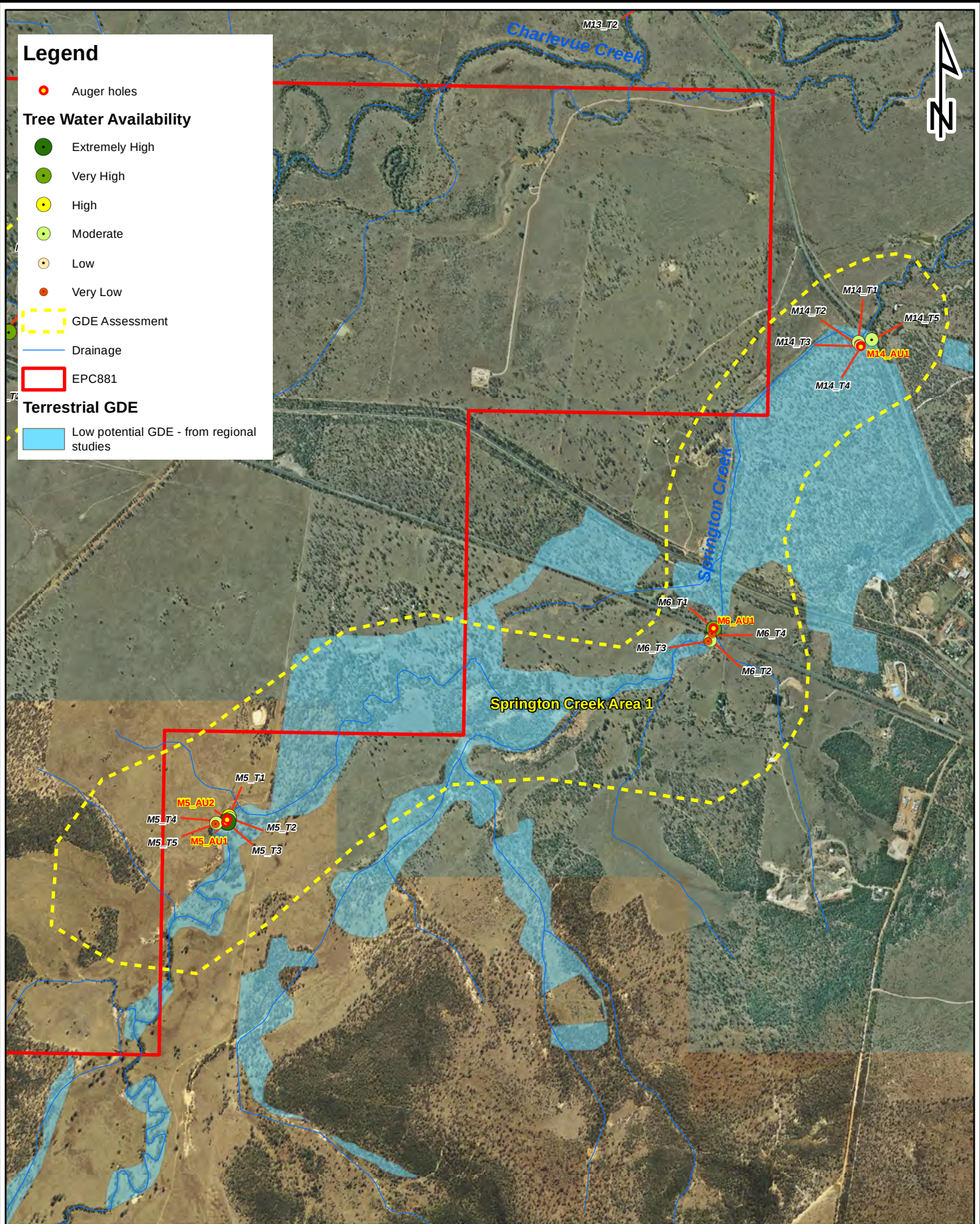
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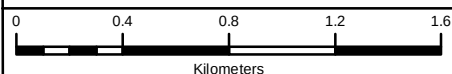


Source: BOM GDE Atlas (2020).

**Figure 17. Tree Water Availability  
in Spring Creek Area 1**

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**Magnetic South Pty Ltd**



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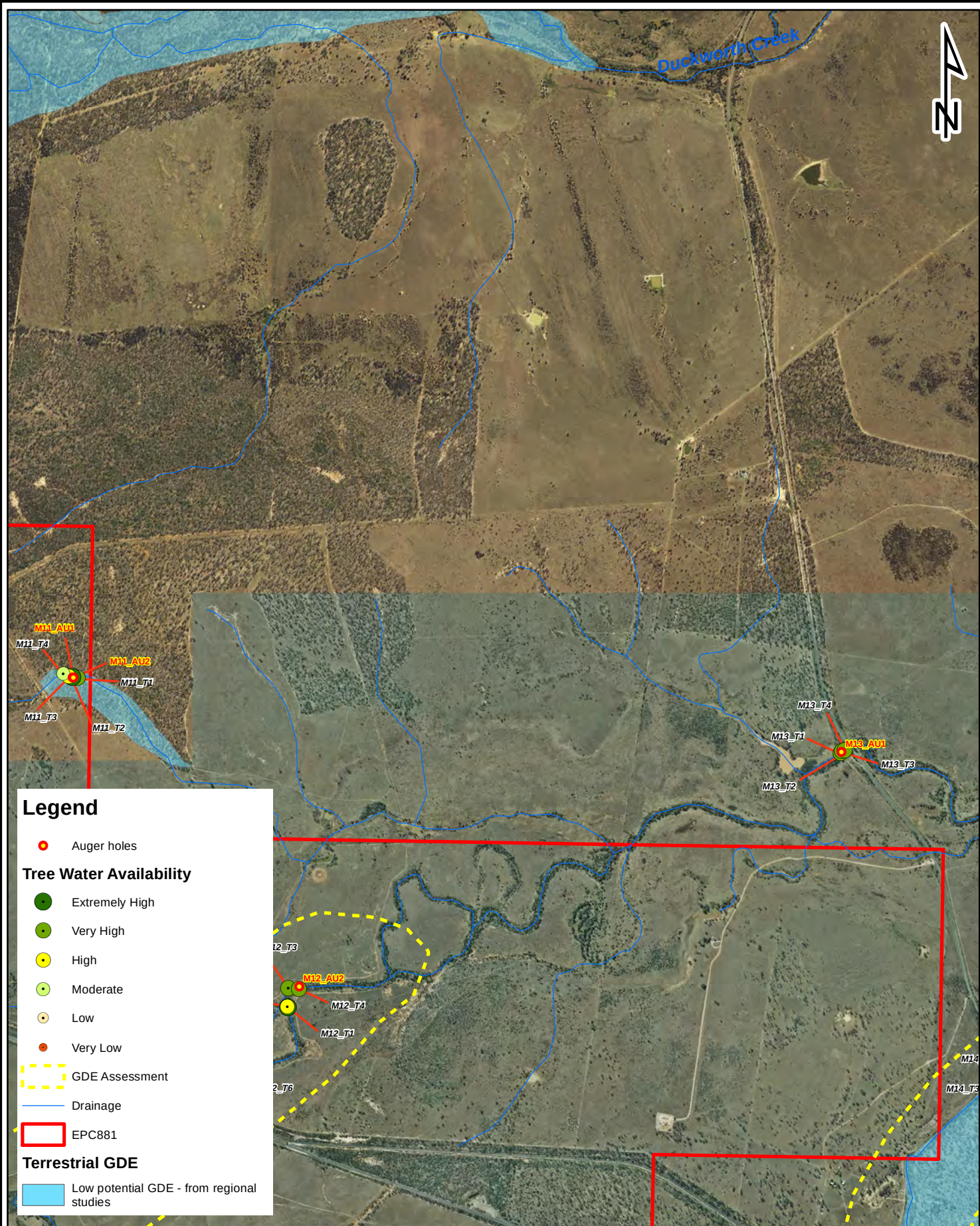
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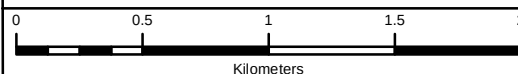




**Figure 18. Tree water availability at Site M11 and M13 on Charlevue Creek and minor tributary**

Client

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Scale 1:30,000

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## 4.2 Hand Auger Profiling and Soil Moisture Potential

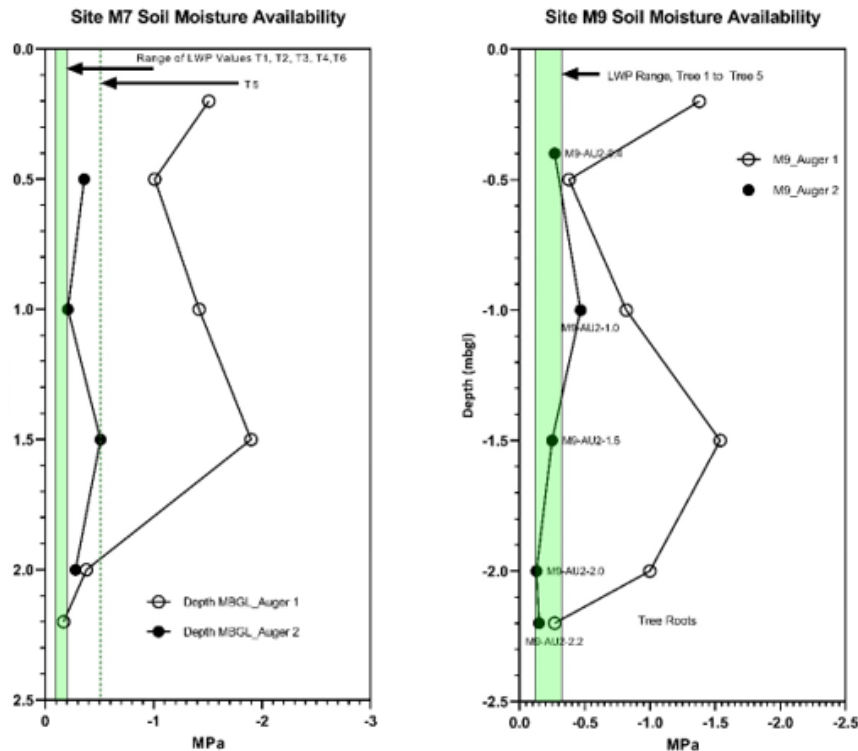
Summary profiles from hand auger holes for site where an auger was completed are provided in **Appendix B** which provide an indication of soil structure, texture and moisture content. As per **Section 3.5.4**, the purpose of the SMP testing is to identify, for those trees where LWP measurement indicate potential groundwater dependence, whether sufficient moisture is available in the upper unsaturated portion of the soil profile (i.e vadose zone) to explain LWP measurements that may be indicative of groundwater usage, either saline or otherwise. From **Section 4.1**, this includes the following:

1. All trees in Charlevue Creek Area 1 (except for Tree 5 at Site M8 being *Eucalyptus populnea*).
2. Trees in Charlevue Creek Area 2 (including Site M10 and M12)
3. All trees in Springton Creek Tributary Area 1 (Site M1 and M4).
4. Tree 2, Tree 3 and Tree 4 at Charlevue Creek Site M13.
5. Tree 1, Tree 2 and Tree 3 at Site M11.

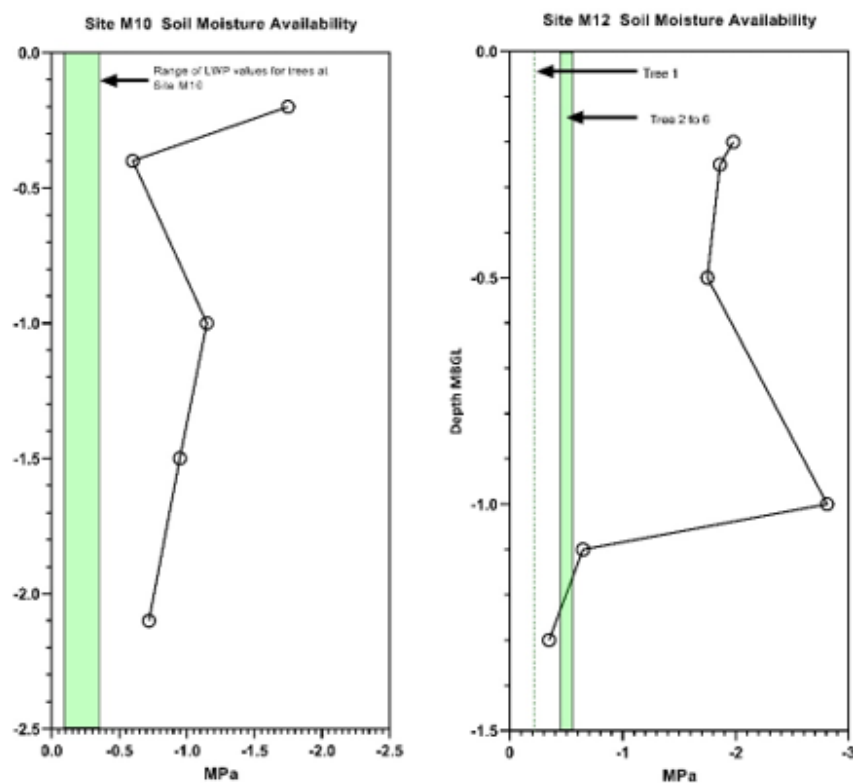
Where collected, data from other sites including Springton Creek Area 1, are also presented for comparative purposes. Penetration of the auger at Site M11 was arrested at a shallow depth (0.35 mbgl) due to intersection of basement rock, and at Site M6 where the alluvial soil profile was cemented. Auger profiles are not provided for these sites although soil samples were extracted from the stream bank for analysis of SMP and stable isotopes.

**Charlevue Creek Area 1:** Two auger holes were placed at both Site M7 and Site M9 to depths of 2.2mbgl with one auger hole placed on the terrace, and a second auger hole placed in the floor of the sandy creek channel. Details of auger holes (M7\_AU1, M7\_AU2 and M9\_AU1 and M9\_AU2) are provided in **Appendix B**. Additional auger holes were placed at Site M8 for the purpose of collecting samples for stable isotope analysis. Downhole SMP profiles for Site M7 and M9 are presented in **Figure 19a** and **Figure 19b** demonstrating that moisture availability generally increases with depth down the auger hole. For auger holes placed in the stream channel (M7\_AU2 and M9\_AU3), SMP was  $> -0.02\text{MPa}$  down most of the profile, corresponding with the LWP for most trees. This suggests that free water is available for tree uptake throughout most of the sandy soil profile. For augers placed on higher alluvial terraces, SMP increased significantly at depths below 1.5mbgl, and generally matched measured LWPs at depths of 2.2mbgl. This indicates moisture at, or deeper than this depth, is available for moisture uptake by trees.

**Charlevue Creek Area 2:** Single auger holes were placed at both Site M10 and Site M12 with M10\_AU1 placed on the upper terrace (5m from top of bank) while M12\_AU1 was placed in the channel floor, 5m below the terrace. For M10\_AU1, SMP to depths of 2.2 mbgl was significantly more negative than LWP of trees sampled at the site (**Figure 20a**), indicating trees are sourcing moisture from regions of the soil profile that are deeper than 2 mbgl. For M12\_AU1 (Site M12) SMP at depths below 1 mbgl matched measured LWP for trees at the site indicating that soil moisture within the profile below these depths is available for uptake by trees (**Figure 20b**). Auger M12\_AU1 was completed at 1.2 mbgl due to a high density of tree root material which arrested deeper penetration of the auger.



**Figure 19.** Downhole SMP for auger holes placed at Site M7 (19a) and Site M9 (19b on left) indicating increasing water availability at depths >2mbgl. The green shading indicates the range of LWPs measured in trees at these sites.



**Figure 20.** Downhole SMP for auger holes placed at Site M10 (20a) and Site M12 (20b on right) indicating increasing water availability at depths >2mbgl. The green shading indicates the range of LWPs measured in trees at these sites.

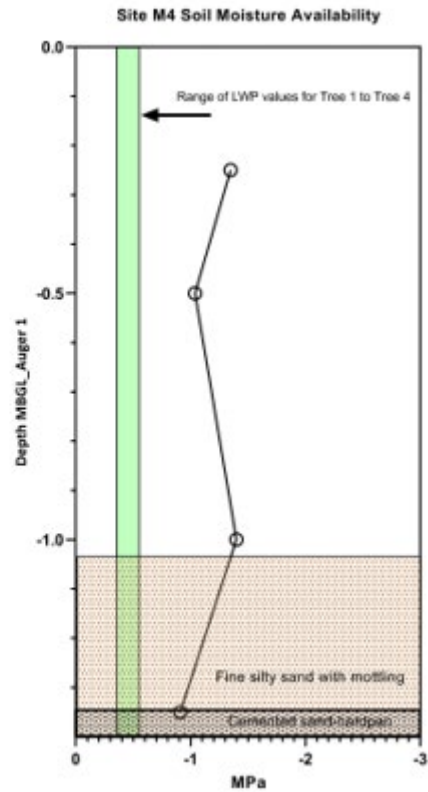
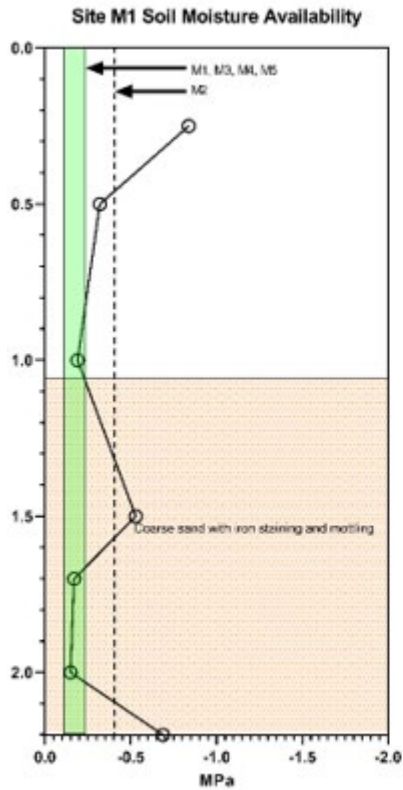


**Springton Tributary Area 1:** Single auger holes were placed at Site M1 and Site M4 at Springton Tributary Area 1. Site M1 was installed to a depth of 2.2m, with a coarse sand layer intersected between 1.5m and the end of hole (**Figure 21a**). The sand was strongly mottled with iron staining suggesting the sand formed a seasonal aquifer with strongly fluctuating water levels. While no free water was intersected in the auger, it is expected that saturation would occur rapidly after rainfall, and that free water may have been available deeper in the sandy profile. At 2.2 mbgl, a coarse gravel band was intersected which arrested deeper auger penetration and it is possible that free water may have been present at deeper levels in the soil profile. Downhole SMP does indicate high levels of moisture availability in the sand, matching LWP for trees measured at the site, and moisture would be available for uptake between 1.7 and 2.0 mbgl. For Site M4 (see **Figure 21b**), a fine silty sand was intersected between 1.0 and 1.3 mbgl with a hardpan at the base which arrested deeper auger penetration. The entire hole was dry with SMP that was considerably lower than LWP for trees recorded at the site, indicating that trees are most likely accessing soil moisture from deeper regions of the soil profile.

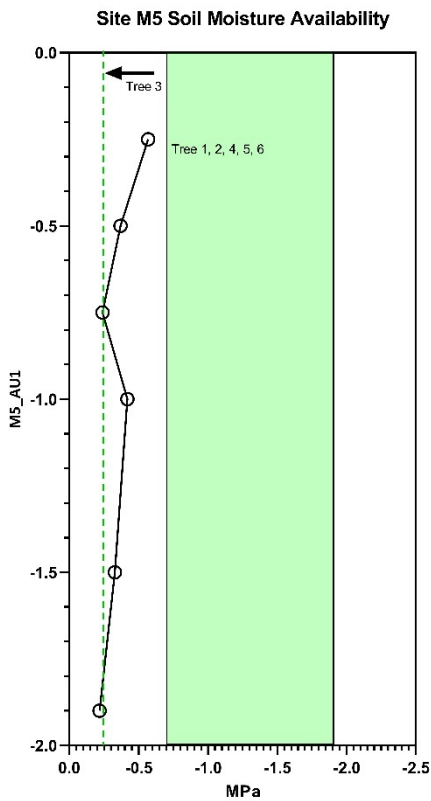
**Springton Creek Area 1:** There were severe difficulties installing auger holes into any of the three Springton Creek sites (M5, M6 and M14) due to the compacted nature of the soils, and basement rock outcrop in some localities. Auger penetration was arrested at Site M6 at 0.35 mbgl due to a cemented soil horizon and at M14, penetration was arrested at 1.2mbgl due to compacted soils. SMP measurements for Auger M14\_AU1 ranged from -1.1 to -3.5 MPa, which corresponded to the low LWP measurements recorded in poplar box at the site ( -1.1 to -2.0 MPa) suggesting that trees may be extracting moisture from the shallow soil profile in this locality.

A single auger hole was installed into the channel of Springton Creek at Site M5, to a depth of 1.9 mbgl. The hole was placed below Tree 3, which was the only tree at the site to demonstrate a high LWP (>-0.2 MPa) indicative of high moisture availability in the soil profile (see **Figure 13**). The results indicate SMP in the soil profile below the channel sufficiently explains the high LWP recorded in Tree 3, with moisture between 0.75 and 1.9 mbgl available for tree uptake (see **Figure 22**). Other trees (Tree 1, Tree 2, Tree 4, Tree 5 and Tree 6) all demonstrate significant water deficit indicating trees are accessing moisture from a much drier soil profile in those locations.

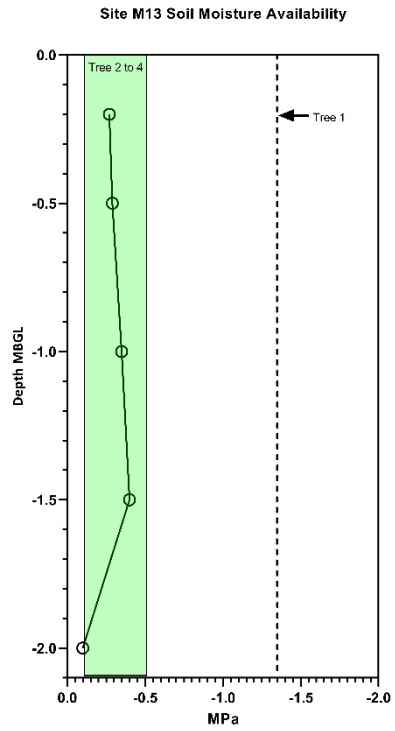
**Site M13 (Charlevue Creek):** Auger M13\_AU1 was installed in the road reserve within the creek channel, encountering 2m of moist heavy clay. **Figure 23** demonstrates Tree 1 (*Eucalyptus coolabah*), which was located on the upper terrace 10 from the top of bank, was sourcing moisture from an extremely dry portion of the soil profile, and moist soil conditions were largely restricted to the channel where other trees were sampled. SMP in auger M13\_AU1 is extremely high from surface down to 2.0 mbgl, accounting for the high LWP recorded in Tree 2 to Tree 4. The moist conditions recorded in the auger hole are likely to represent a wetting front below the stream channel, although no free water was intersected.



**Figure 21.** Downhole SMP for Site M1 (Figure 21a) and Site M4 (Figure 21b right) at the Springton Creek Tributary Area 1.



**Figure 22.** Soil moisture availability at site M5, Springton Creek Area 1.



**Figure 23.** Soil moisture availability at Site M13, Charlevue Creek.



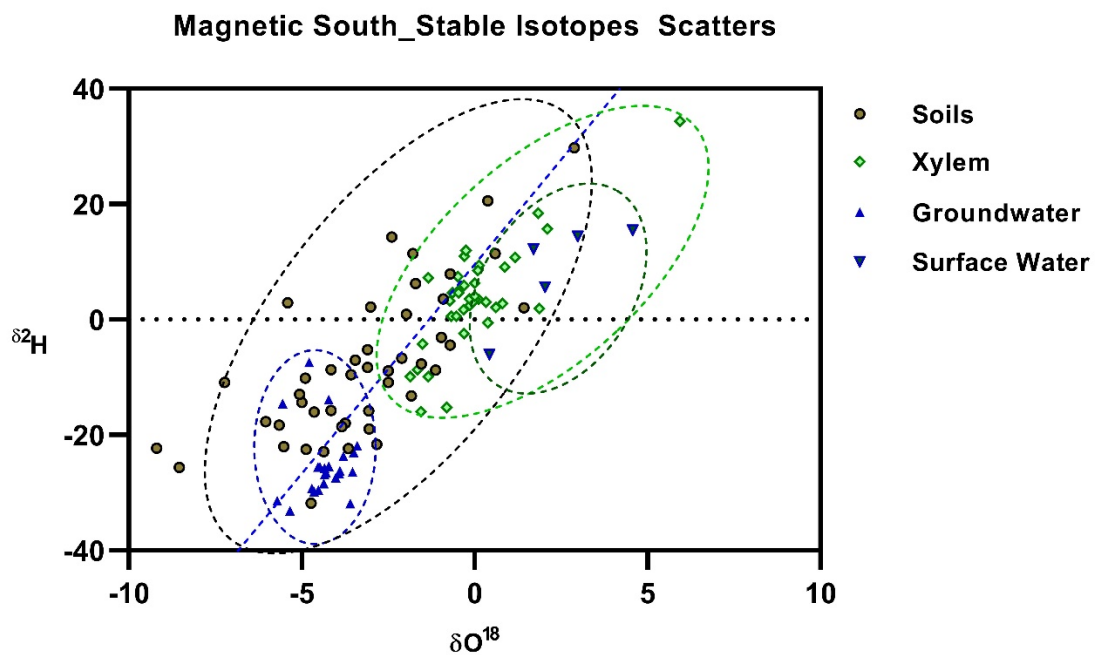
### 4.3 Stable Isotope Sampling and Analyses

**Figure 24** shows stable isotope values ( $\delta^{18}\text{O}$  and  $\delta^2\text{H}$ ) for all values including soil, surface water (from stream pools), groundwater and twig xylem water analysed during the assessment. The main groupings have been circled to better indicate the inter-relationship between the groups and highlight areas of dataset overlap. The scatter shows:

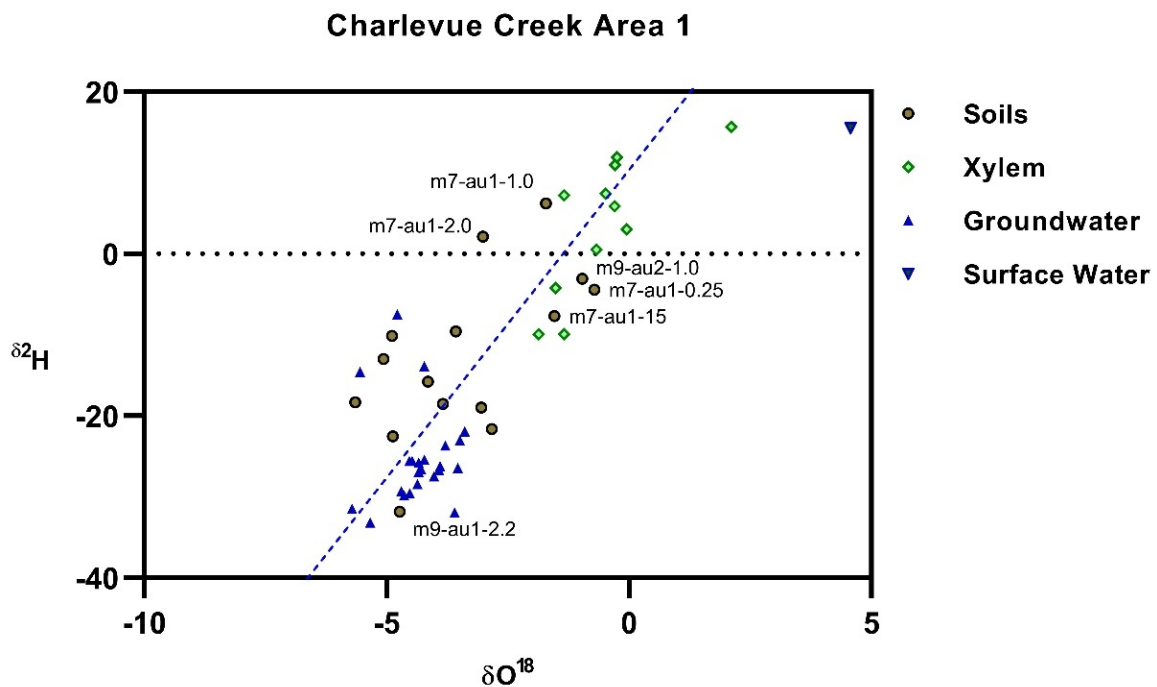
1. Broad isotopic overlap between soil and all other sample types, with soil presenting the greatest spread of isotopic values. Twig xylems samples were generally enriched above the soil and groundwater with some overlap between soil and groundwater.
2. Twig (xylem) samples and groundwater samples do not demonstrate any overlap with groundwater demonstrating much more depleted isotopic values, although twig samples overlap with isotopic values of surface waters.
3. There is no overlap between surface water samples and groundwater, the latter being subject to significant evaporative enrichment.

The broad scatter of isotopic values in the soil samples is expected, as this would be imparted by infiltration of surface water with varying degrees of isotopic enrichment including direct infiltration of unfractionated rainfall or infiltration of evaporatively enriched surface waters. The most significant feature is however the complete lack of overlap between twig samples (which are relatively isotopically enriched) and groundwater samples (isotopically depleted) indicating trees are not utilising groundwater in the regional Tertiary or alluvial aquifers to any degree, even when groundwater would be within reach of maximum rooting depth (e.g. SWL at 8.7 mbgl in alluvium at DW7076W and 11.19 mbgl at DW7292W1). This is not unexpected due to the salinity of groundwater that is typical of the regional aquifer systems. The results imply that any groundwater usage by trees on the Project site is from fresh perched aquifers that are recharged through infiltration of evaporatively enriched surface water and are disconnected from the regional aquifer. Note all stable isotope biplots include the Local Meteoric Water Line (LMWL) for Rockhampton from Crosbie et al (2012) which provides a reference to identify evaporative trends. Raw data for all isotopic samples is provided in **Appendix D**. Stable isotope results for individual sites are briefly discussed below:

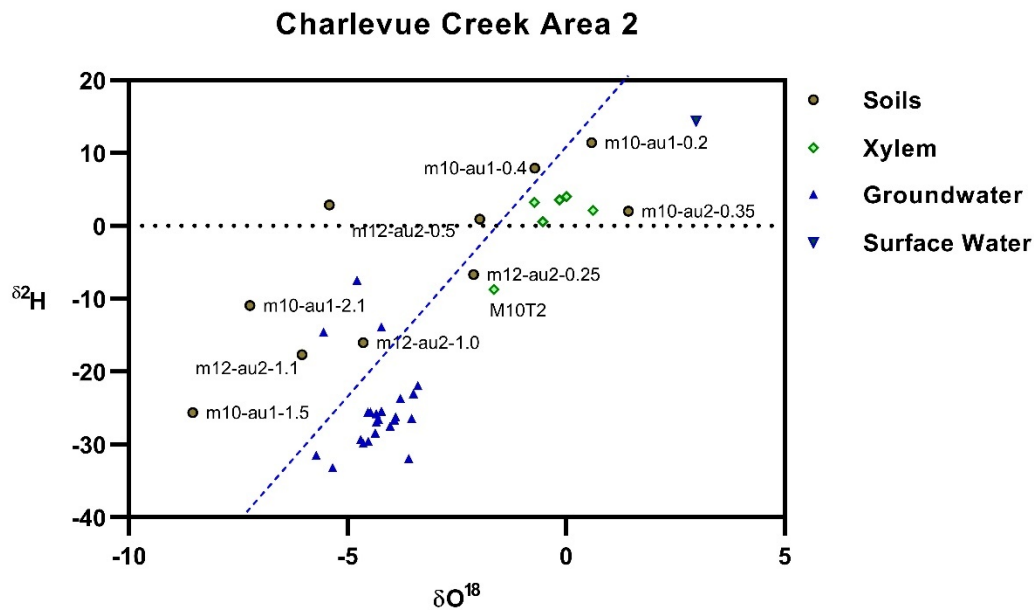
**Charlevue Creek Area 1 and Charlevue Creek Area 2:** Biplots showing the isotopic composition of soils, twigs, groundwater, and surface water from Charlevue Creek Area 1 is shown in **Figure 25** and Charlevue Creek Area 2 in **Figure 26**. For both areas, the results highlight the strong differentiation between isotopic composition of twig samples and groundwater, indicating the regional groundwater table is not being utilised by trees to any degree. There is also no consistent pattern in the soil samples with isotopic enrichment being evident at various depths, where they match the isotopic compositions of twig samples (e.g. M7 Au1\_2.0m; M7 AU1\_1.15m at Charlevue Creek Area 1) indicating possible utilisation of moisture from those depths in the soil profile. Surface water samples were collected from an overflow channel at Site M8 for Area 1 and from a residual pool at M10 for Area 2, and both are isotopically enriched above all other samples, indicative of exposure to evaporative processes.



**Figure 24.** Stable isotope scatters for all data with LMWL for Rockhampton indicated in by the blue line after Crosbie et al (2012) shown as reference. The circles delineate the sample groupings of soils, xylem, groundwater and surface water.



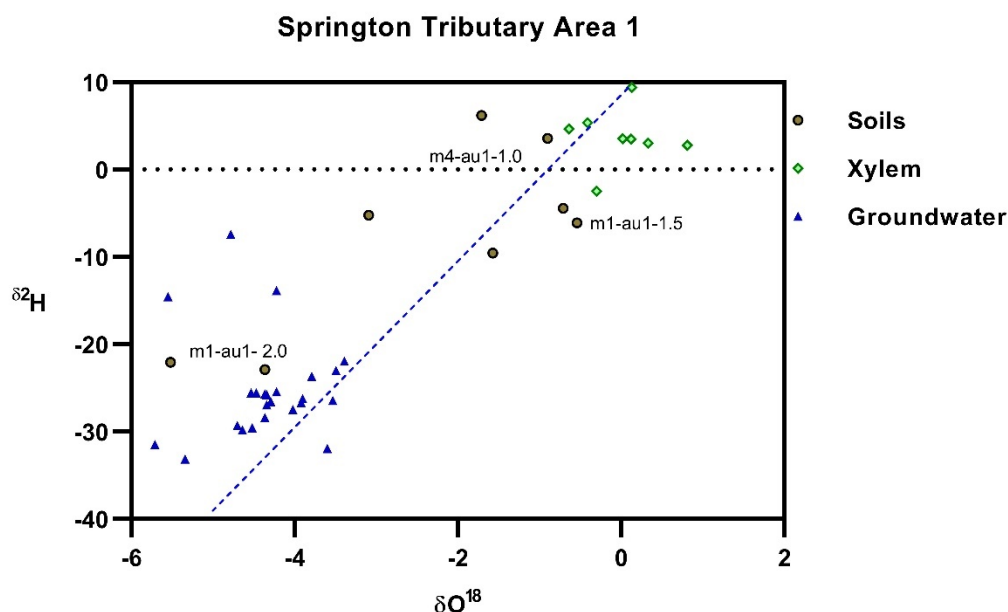
**Figure 25.** Stable isotope biplot for Charlevue Creek Area 1 with the LMWL shown in blue dashed line.



**Figure 26.** Stable isotope biplot for Charlevue Creek Area 2 with the LMWL shown in blue dashed line.

**Springton Tributary Area 1:** Biplots showing the isotopic composition of soils, twigs, and groundwater from Springton Tributary Area 1 (Site M1 and M4) is shown in **Figure 27**. Like Charlevue Creek Area 1 and Area 2, the results highlight the strong differentiation between isotopic composition of twig samples and groundwater, indicating the regional groundwater table is not being utilised by trees to any significant degree. There is overlap between twig samples and SMP from some soil samples (particularly M1\_AU1\_1.5) indicating moisture is being source from these regions by some trees. The enrichment of stable isotope values from twig samples indicates trees are utilising an evaporatively enriched source of moisture, most likely from zones that are deeper in the soil profile, where infiltrated surface water has been able to penetrate.

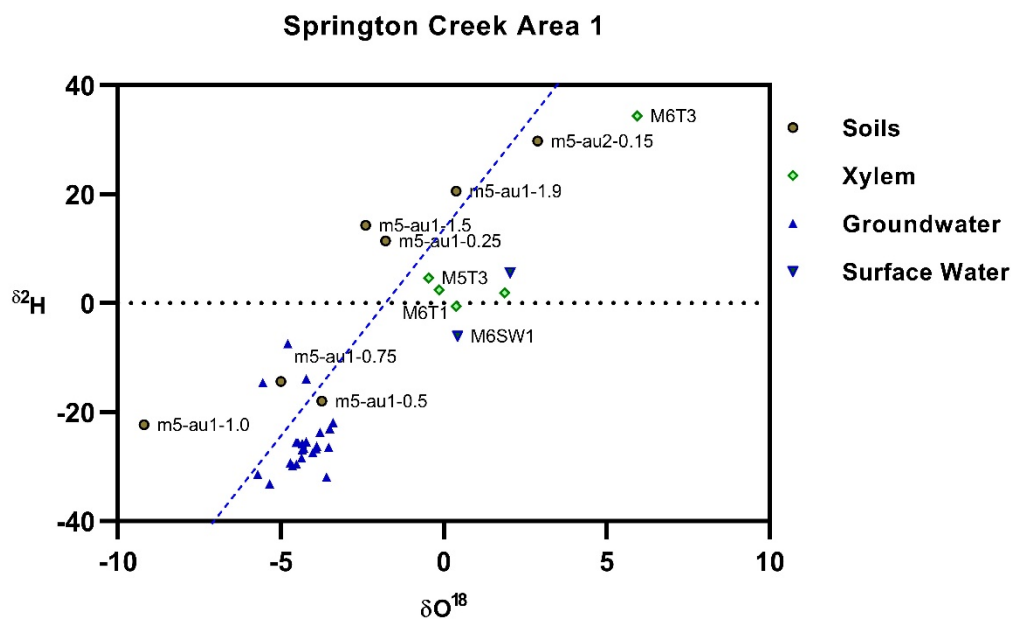




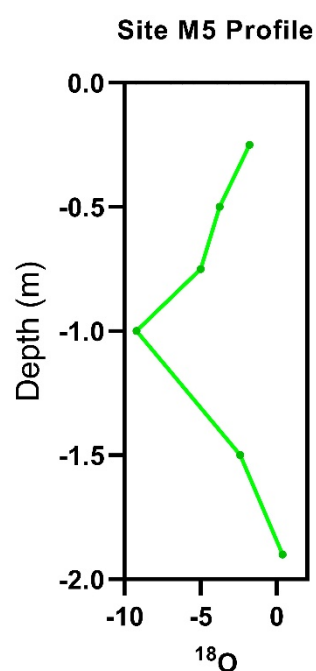
**Figure 27.** Stable isotope biplot for Springton Tributary Area 1 with the LMWL shown in blue dashed line.

**Springton Creek Area 1:** Biplots showing the isotopic composition of soils, twigs, groundwater and surface water from Springton Creek Area 1 (Site M5, M6 and M14) are shown in **Figure 28**. As per previous assessment areas, there is a strong differentiation between isotopic composition of twig samples and groundwater, indicating the regional groundwater table is not being utilised by trees to any degree. Soil samples are generally isotopically enriched over twig samples however, in auger sample M5\_AU1, isotopic enrichment increases with depth in the soil profile (see **Figure 29**). This effect strongly suggests that Tree 3 at M5 (being the only tree with high LWP from Site M5) is utilising moisture at depth underneath the stream channel, where it is sourcing infiltrated surface flows that have been subject to evaporative enrichment.

Tree 1 at Site M6, a *Melaleuca leucadendra* on the margins of a semi-permanent waterhole, similarly demonstrates high LWP (see **Figure 13**). Isotopic analysis indicates this tree is utilising moisture directly from the surface water body as indicated by isotopic overlap with the surface water sample from this site (M6SW1 compared to M6\_T1). The isotopic values of other trees generally overlap with the isotopic composition of soil moisture from deeper portions of the soil profile. From **Section 4.2 (Figure 22)**, this moisture is from a dry portion of the soil profile which is likely to be below the total depth of the auger profile at M5\_AU1.

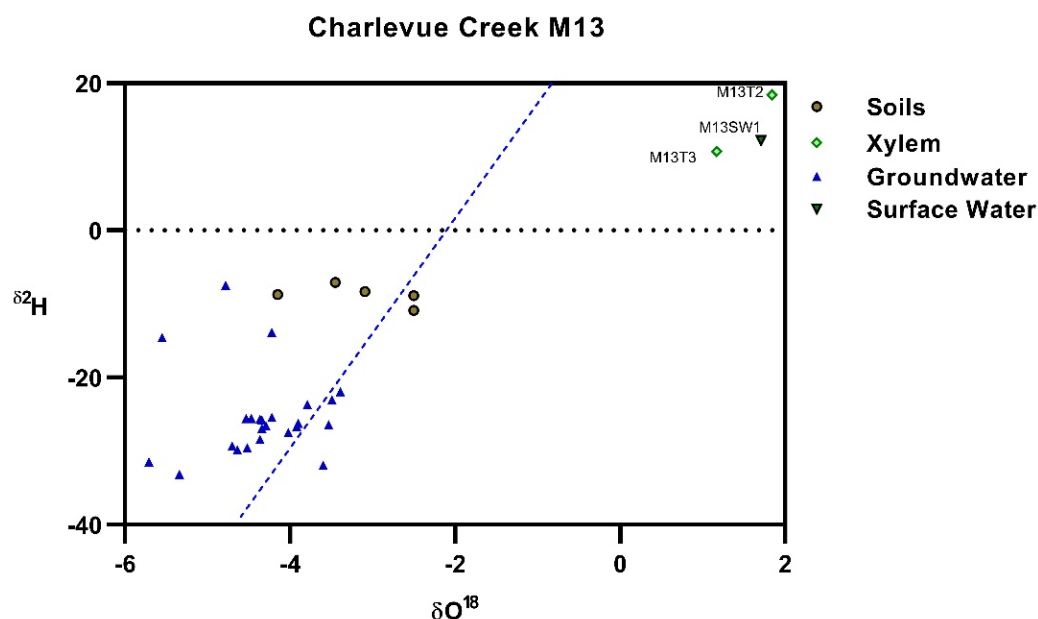


**Figure 28.** Stable isotope biplot for Springton Creek Area 1 with the LMWL shown in blue dashed line.



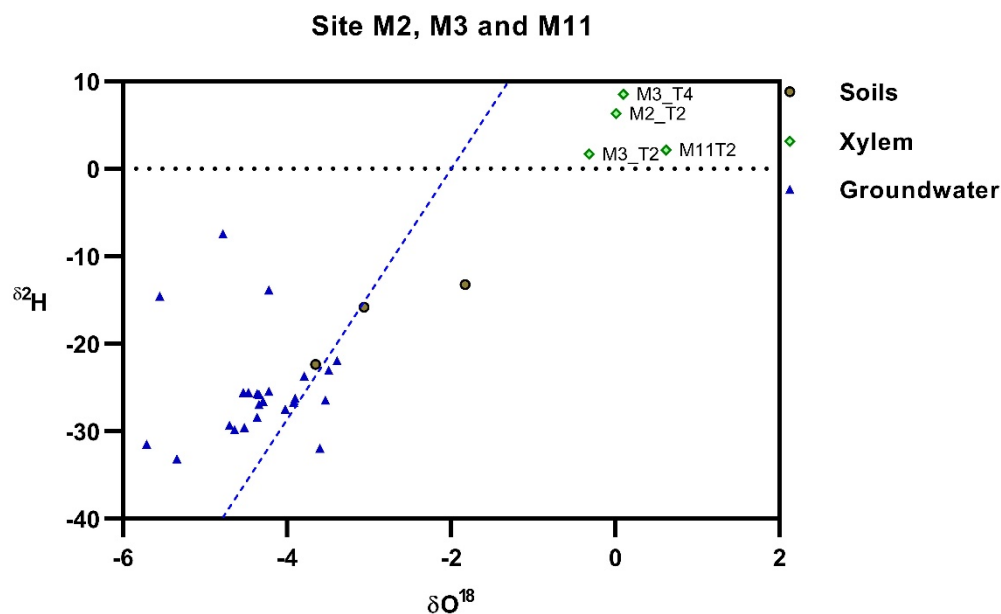
**Figure 29.** Isotopic profile downhole in Site M5 (M5\_AU1) indicating increasing isotopic enrichment below 1 mbgl.

**Site M13 (Charlevue Creek):** A biplot showing the isotopic composition of soils, twigs, surface water and groundwater from Site M13 at Charlevue Creek is shown in **Figure 30**. The differentiation between isotopic composition of groundwater and twig samples is highly apparent. Twig samples overlap with the isotopic composition of the surface water sample collected at the site (M13SW1). This strongly suggests that trees at Site M13 are utilising water from the wetting front below the creek channel, in moist clays, which is consistent with the high LWP recorded from most trees at the locality (see Figure 13).



**Figure 30.** Stable isotope biplot for Charlevue Creek Site M13, demonstrating strong differentiation between groundwater and twig xylem.

**Other Sites (M2, M3, M11):** The remaining sites all demonstrate strong differentiation between groundwater samples and twig xylem, indicating that groundwater is not being utilised by trees at these localities to any significant degree (see **Figure 31**).



**Figure 31.** Stable isotope biplot for Charlevue Creek Site M2, Site M3 and Site M11, demonstrating strong differentiation between groundwater and twig xylem.



## 5.0 Discussion and Conceptual Site Models (CSMs)

### 5.1 Suitability of Groundwater Resources to Support GDEs

Groundwater may be hosted in nearly all geologies in some form and an assessment of its utility to support GDEs is required. The Permian Sediments (Rewan Group and Rangal Coal Measures) are low permeability units that are generally considered aquitards. Groundwater occurs in fracture zones and the degree of permeability is constrained by the degree of fracturing and the low primary porosity of the sediments. Coal seams are the primary aquifers in the Permian sediments and the upper units subcrop into the Tertiary sediments where there may be some leakage and exchange of groundwater between the two geological units. The shallowest recorded groundwater levels in the coal seams are from Pollox Upper Seam (17.04 mbgl) which is close to the inferred threshold depth beyond which tree roots / groundwater interaction is unlikely to occur (DNRM 2013). Similarly, the shallowest groundwater in the Tertiary sediments was recorded in DW7220W1 at 15.35 mbgl which is also at the inferred threshold for tree root penetration, while the groundwater in the alluvium may be considerably shallower (8.77 mbgl in DW7076) suggesting that it may be physically accessible to tree roots.

While physical accessibility provides one controlling factor, salinity also plays a significant role in determining the suitability of groundwater to support ecological processes, including its capacity to support terrestrial GDEs. A lower osmotic potential will be associated / measurable in the leaves of trees exposed to saline soils or groundwater, which will be reflected in a lower total LWP. Eamus et al (2006b) identifies river red gum as being a relatively salt-tolerant species, growing well in groundwater salinities of almost 1,500  $\mu\text{S}/\text{cm}$ . In addition, Mensforth et al. (1994) identified that river red gum will continue to utilise groundwater with salinity as high as 40,000  $\mu\text{S}/\text{cm}$  in the absence of a fresh source of soil moisture, although higher levels of tree stress will be apparent. Measured groundwater salinity in the alluvial and Tertiary sediments ranges from 1 439  $\mu\text{S}/\text{cm}$  to 26 831  $\mu\text{S}/\text{cm}$ , which would be in the mildly to highly toxic range for river red gum. Trees may prefer not to utilise brackish to saline groundwater if more suitable fresh water sources, including infiltrating rainfall and surface water, are available. Based on relatively unambiguous data from comparison of stable isotope signatures between twigs and groundwater, there is no indication that groundwater in even the shallowest regional aquifers within the physical reach of tree roots is being utilised by trees to any significant degree. Where LWP measurements indicate the likelihood that trees are utilising a saturated groundwater source, the stable isotope signatures from twigs indicate this groundwater must be from a perched source of fresh water that is disconnected from the regional groundwater table. Two areas where utilisation of a source of perched groundwater is indicated are identified on Charlevue Creek (particularly Charlevue Creek Area 1) and Springton Tributary Area 1, which are discussed in the following sections, with the location of these areas, relative to infrastructure areas shown in **Figure 32**. There is no evidence for trees associated with the main channel of Springton Creek, including the floodplain areas occupied by RE11.3.2 (*Eucalyptus populnea* dominant) are utilising groundwater from the regional alluvial or Tertiary aquifers.

### 5.2 Ecohydrological Function of the HES Wetland

The HES wetland feature is an internally drained clay pan with no external connections to watercourses or other wetland areas. Despite an extremely wet February four months prior to the

field inspection, there was no indication of any surface water associated with this feature. This suggests that there is no baseflow into the system, which would be expected if the wetland was linked to a semi-confined aquifer that is recharged directly by rainfall. Pondered surface water in the system clearly evaporates quickly, in conjunction with associated infiltration into the clay subsoil.

The HES wetland was observed from the roadside to comprise a low woodland with a predominant canopy of *Melaleuca nervosa* and emergent forest red gum (*Eucalyptus tereticornis*). Neither of these species are obligate phreatophytes, having capacity to survive in situations where considerable water deficit may occur, such as clay pans and dry hillslopes. While there is a possibility that the HES wetland is supported by a shallow fresh perched water table that is recharged directly by rainfall, there is no suggestion that the feature is supported by a deeper confined aquifer system that is linked to the coal seams proposed for mining. The feature is therefore not considered a concern for this assessment because:

1. The wetland is nourished by surface water flows from within its own internal catchment which does not form part of the mining footprint.
2. There is no indication of baseflow into the system, or inputs from groundwater linked to aquifers in the coal seams.

This is supported by information contained in both national (BOM 2020) and state (DES 2018) GDE mapping databases which do not support this feature as being a GDE.

### 5.3 Conceptual Site Models / Cross Sections.

Conceptual Site Models (CSMs) illustrating the conceptualised interaction between groundwater and terrestrial ecology have been developed for two likely GDEs in this section. The location of these cross sections is shown on **Figure 32**, being a north south block section through Charlevue Creek Area 1, and an east west cross section through Springton Creek Area 1. The purpose of the CSMs is to illustrate the interaction between terrestrial vegetation and sources of soil moisture for transpiration as they interact and vary on a seasonal basis. CSMs presented in this section are not drawn to scale and are intended to represent soil / moisture and tree relations diagrammatically. It is also noted that these areas provide the most extensive interpreted GDE areas within the Project site and provide a firm basis for conceptualisation of impacts. It is not possible however to exclude other areas where there may be minor or highly seasonal groundwater usage that is similar to what is conceptualised in the models, most likely on Charlevue Creek.

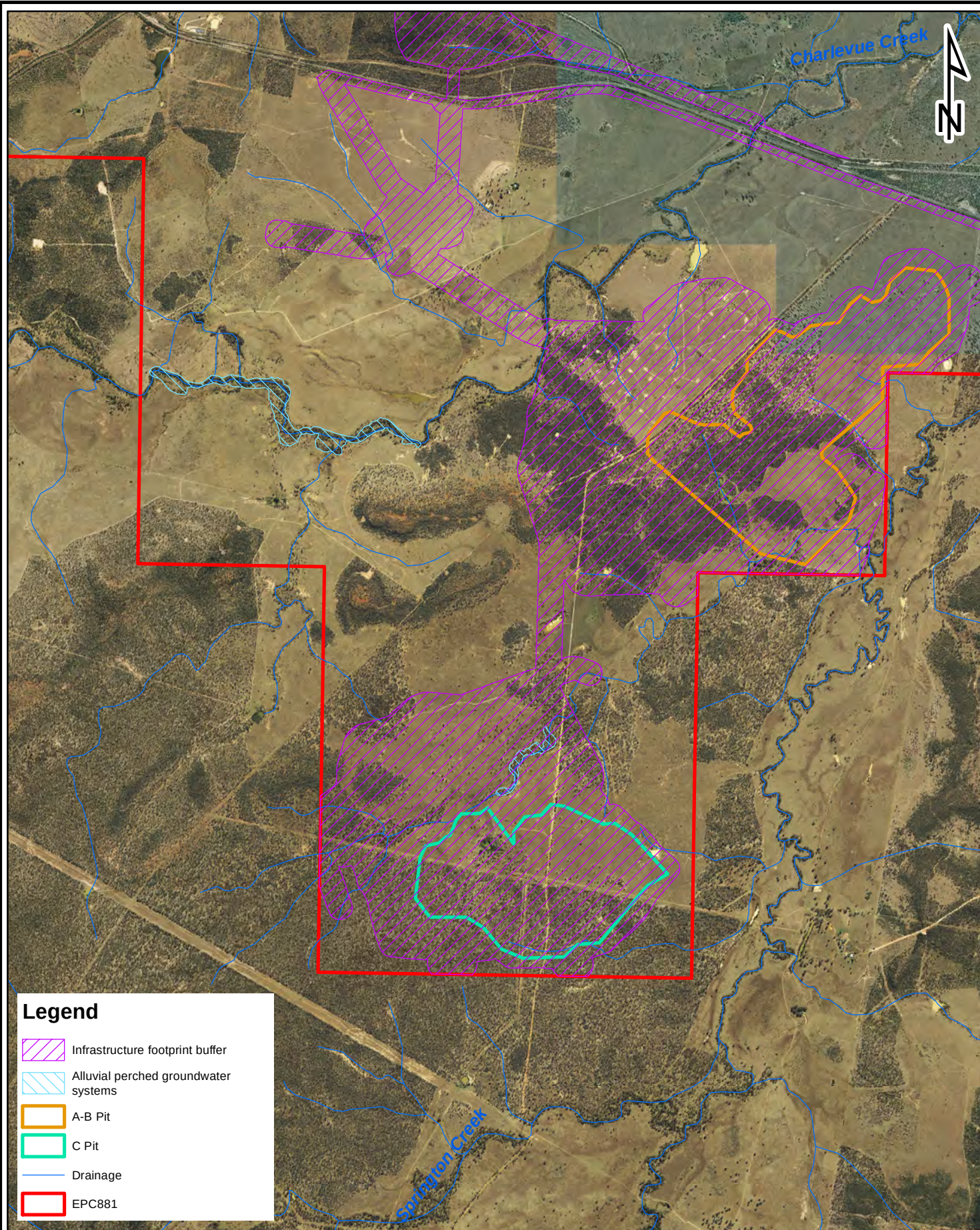
#### 5.3.1 Charlevue Creek Area 1.

Figure 33 defines a N/S section through Charlevue Creek at the approximate location of **Cross Section A**, extending for approximately 500m to the south of the channel and 100m to the north. **Figure 33a** illustrates a dry season scenario where a shallow fresh water aquifer occurs at the base of recent flood plain sediments. The flood plain defines a broad 'flood terrace' that is confined between gentle Tertiary rises and is inferred to be a more recent alluvial feature than areas associated with Charlevue Creek that are otherwise mapped as alluvium. The flood terrace is strongly incised by the main channel of Charlevue Creek to depths of up to six metres and traversed by shallow overflow channels which are activated during periods of overbank flow. Water is held at depth in the dry

sandy creek bed, where residual, isotopically enriched surface water from prior flows remains hydraulically connected to alluvial aquifer. This connection may be broken during extended drought periods with evapotranspiration depleting the alluvial aquifer and, in this sense,, the alluvial aquifer is considered a seasonal feature. The shallow alluvial aquifer is also disconnected from the deeper, brackish to saline Tertiary aquifer that lies at the interface between Tertiary and weathered Permian sediments. While there is some diffuse leakage indicated from the perched into the Tertiary aquifer, this leakage is relatively minor, evidenced from the generally high and temporally consistent salinity of the Tertiary aquifer.

In **Figure 33b**, a flood scenario is indicated where overbank flow activates overflow channels, greatly enhancing recharge of the perched aquifer. The alluvial water table bulges due to bank recharge adjacent to the stream channel, and the watercourse loses surface flow into the alluvial sediments in a typical 'losing stream' scenario. Lateral infiltration of surface flows into the stream channel continues until the level of the surface water drops below the level of the recharged alluvial water table, as shown in the post flooding scenario (**Figure 33c**). In the post flooding scenario, baseflow from the alluvial water table back into the stream channel may occur, acting to sustain surface flows for a short period following flooding. It is noted that during flooding, the perched alluvial aquifer remains hydraulically disconnected from the Tertiary aquifer with only minor leakage through the Tertiary sediments. The salinity of the Tertiary system suggests that recharge through the Tertiary sediments occurs via diffuse 'piston flow' where the movement of a water front occurs through the soil uniformly downwards to the aquifer, pushing older water deeper into the soil profile. Preferential flow, where water migrates through the substrate rapidly via preferential flow paths is not anticipated as this would rapidly and permanently dilute the salinity of the Tertiary aquifer. Preferential flow would also create pathways for tree root penetration into the Tertiary groundwater system, for which there is no evidence.





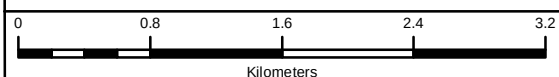
## Legend

- Infrastructure footprint buffer
- Alluvial perched groundwater systems
- A-B Pit
- C Pit
- Drainage
- EPC881

**Figure 32.** Location of confirmed terrestrial GDE areas

Client

**Magnetic South Pty Ltd**



Scale 1:45,957

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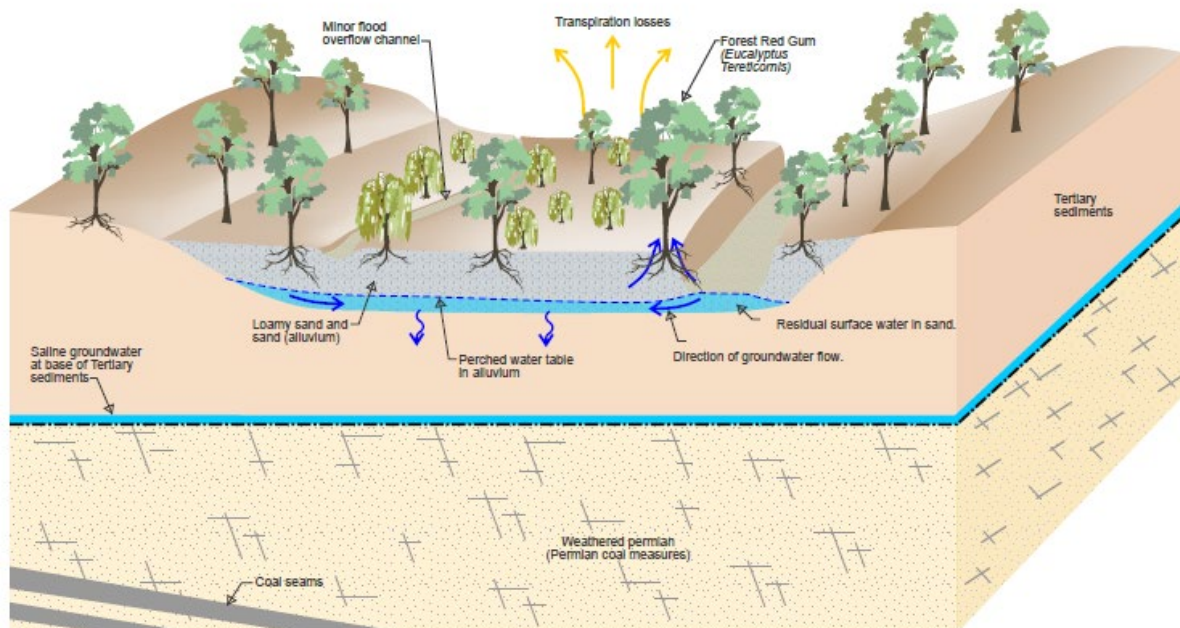
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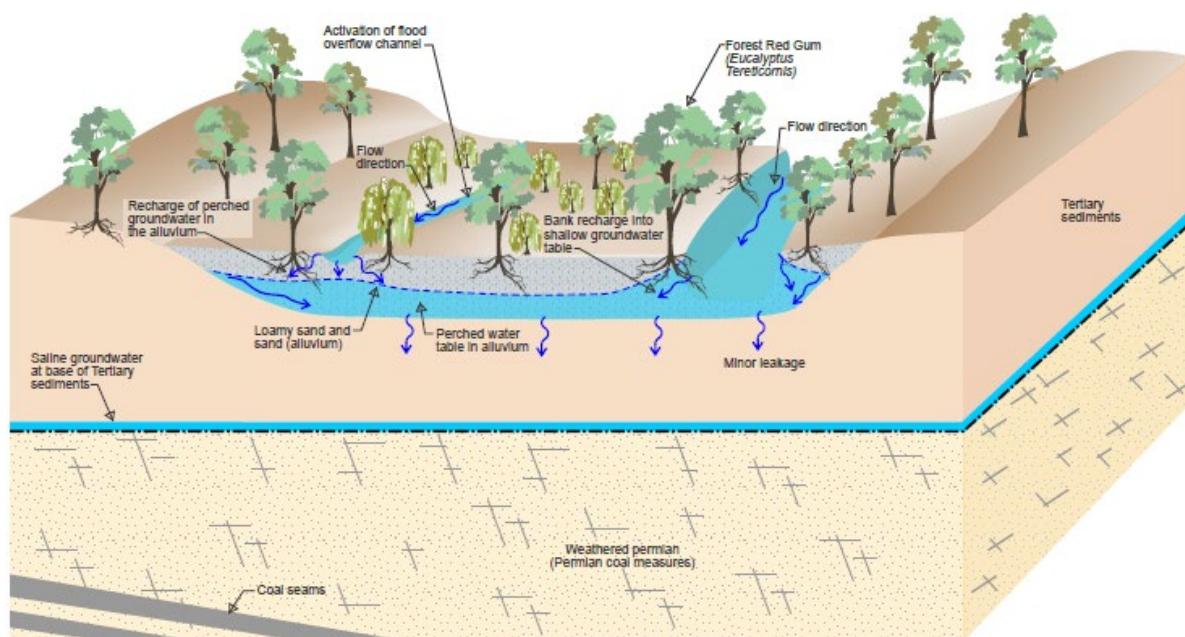
P. O. Box 959  
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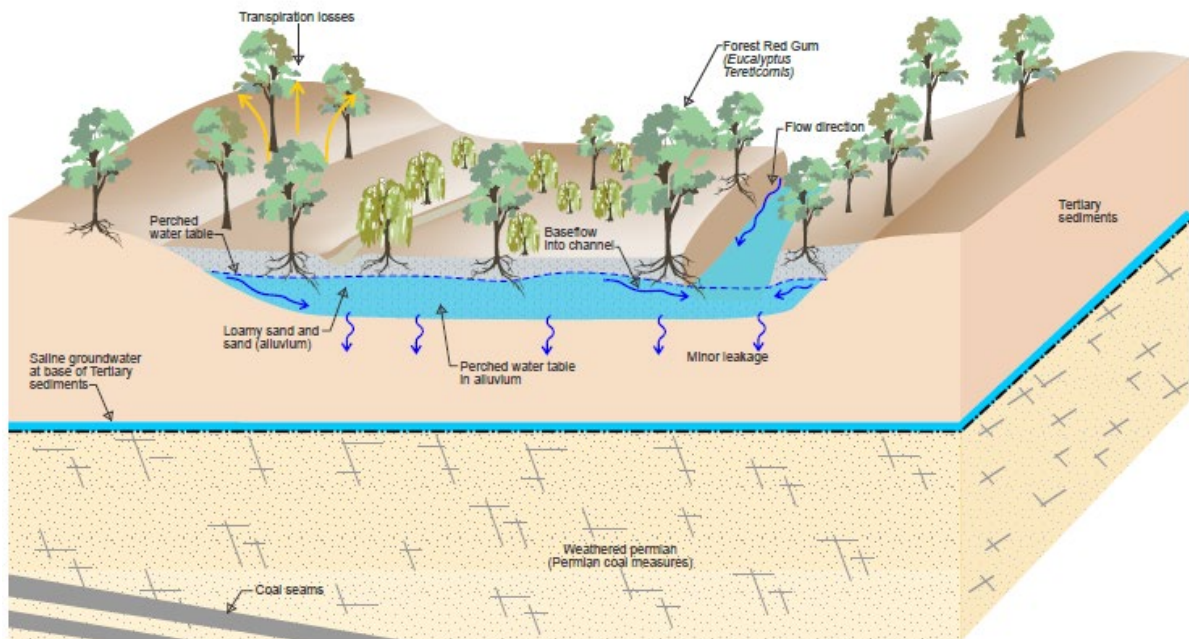
**Figure 33a. Charlevue Creek Area 1- Dry Season Regime**



**Figure 33b. Charlevue Creek Area 1- Flood Regime**



**Figure 33c. Charlevue Creek Area 1- Post Flooding (Baseflow)**



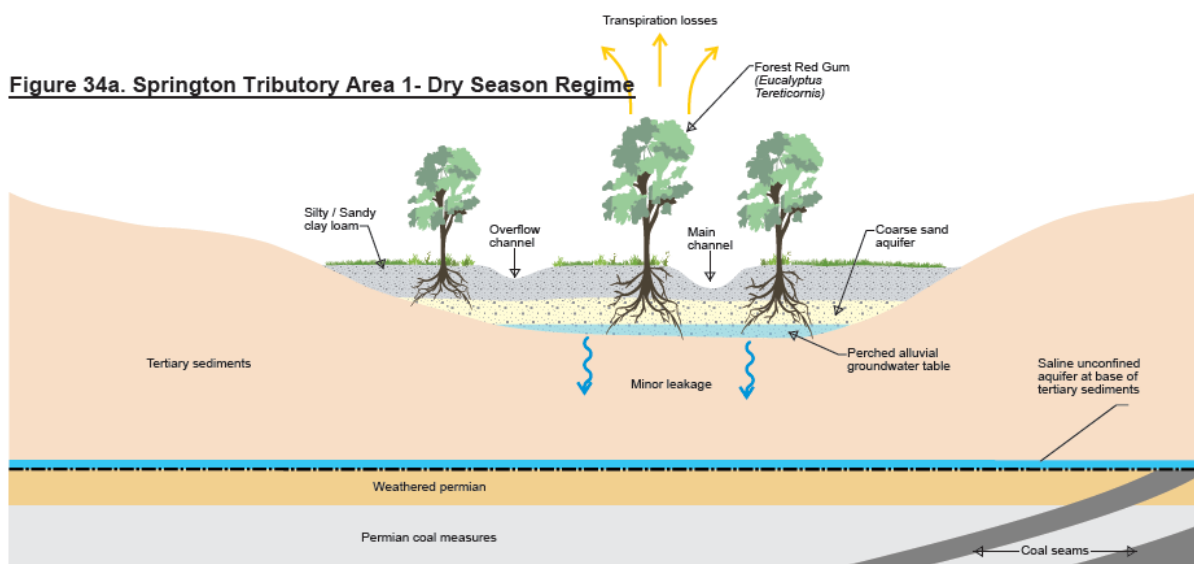
**Figure 33.** Conceptual model of the Charlevue Creek GDE system showing dry season scenario (33a), flooding scenario (losing system) (33b) and post flooding / baseflow scenario (33c).



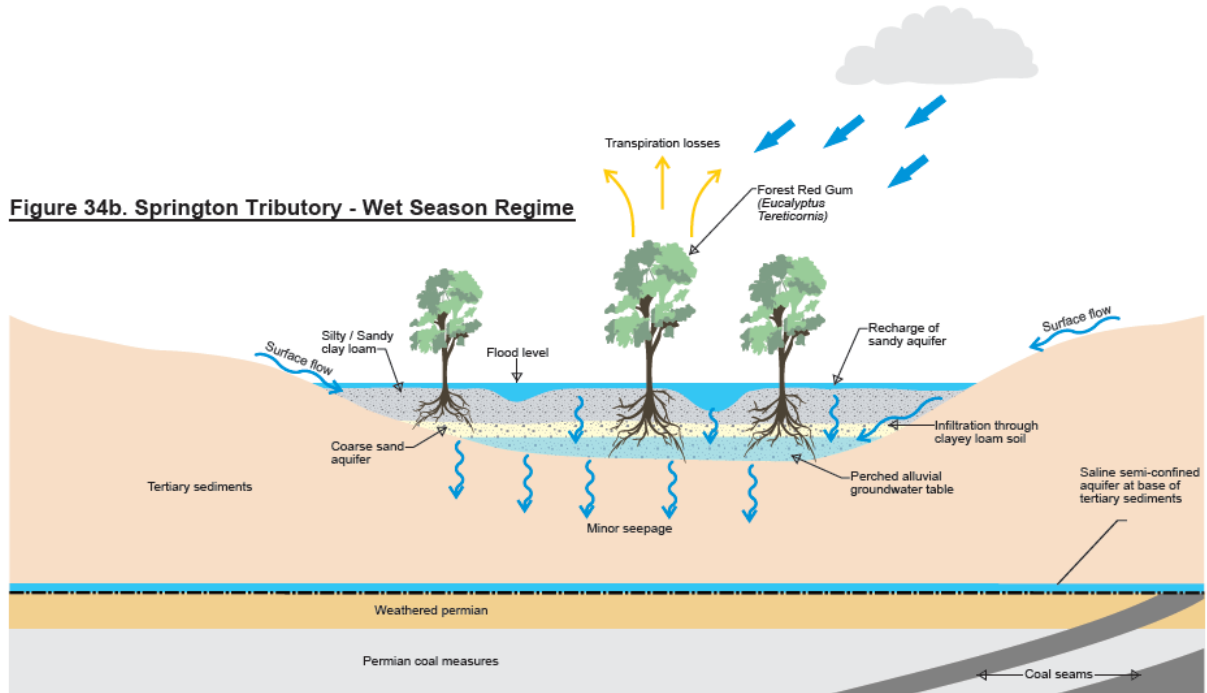
### 5.3.2 Springton Tributary Area 1

The thick interval of coarse sand intersected in Auger holes (see profile for M1\_AU1 in **Appendix B**) in this locality provides excellent aquifer material, and the presence of strong iron staining and mottling indicates that the sandy interval hosts a fluctuating perched seasonal aquifer that fills and drains rapidly in response to surface flows and seasonal rainfall. During the dry season, the perched aquifer is depleted rapidly through transpiration, with only minor leakage inferred into the underlying Tertiary sediments and groundwater table as shown in **Figure 34a**. Tree roots from the dominant red gum are inferred from stable isotope analysis to be utilising isotopically enriched moisture from the saturated portion of the sandy soil profile, with some shallow anchorage in the Tertiary sediments expected.

In the wet season (**Figure 34b**), the aquifer recharges rapidly through infiltration of surface water, which is enhanced by activation of numerous overflow channels, and drainage flows from the surface of the Tertiary system. The period that the aquifer material remains saturated will depend on follow up recharge and climatic factors, with greatest depletion occurring during periods of high evapotranspiration. Similar to the Charlevue Creek CSM, the salinity of the Tertiary system suggests that recharge through the Tertiary sediments occurs via diffuse 'piston flow' where the movement of a water front through the soil uniformly downwards to the aquifer occurs. While some leakage from the perched into the deeper Permian / Tertiary aquifer is expected, it is not considered to be a significant input into the deeper aquifer systems, as evidenced by their high, and relatively stable levels of groundwater salinity. Due to the low hydraulic conductivity of the Tertiary sediments, there is no capacity to sustain baseflow back into the drainage feature. Based on field evidence, the GDE system relies on its own local catchment and surface flows to replenish the perched groundwater system.



**Figure 34b. Springton Tributary - Wet Season Regime**



**Figure 34.** Cross section model of the Springton Tributary Area 1 perched aquifer system in the dry season (Figure 34a) and wet season (Figure 34b).

## 6.0 Assessment of Impacts to GDEs

**Section 6.1** provides a summary of findings for the Charlevue Creek Area 1 and Springton Tributary Area 1 GDE areas, with potential impact mechanisms and their relevance to GDEs within the Gemini project area, discussed in **Section 6.4**. Potential measures for impact mitigation are provided in **Section 6.3** and a risk assessment has been undertaken in **Section 6.5** consistent with the approach identified in the IESC summary guide – assessing groundwater dependent ecosystems (IESC 2018c).

### 6.1 Summary of Findings Relevant to Impact Assessment

The assessment of impacts to GDEs is based on the findings of the extent and distribution of GDEs identified in this report, and the groundwater impact assessment report (JBT 2020). In summary:

#### ***Charlevue Creek Area 1 GDE System:***

1. Charlevue Creek is an ephemeral watercourse system defined by an incised channel, up to six metres deep and up to 15 m wide. In this locality, the flood plain widens to form a broad flood terrace that is up to 200m wide, formed from well drained recent alluvial silts and sands.
2. The stream channel has a sandy floor that holds residual water from surface flows for an extended period into the dry season. Water held in the channel sands is conceptualised to have hydraulic linkage with a localised perched groundwater system, which becomes gradually depleted through transpiration into the dry season.
3. The depth of the perched aquifer would fluctuate seasonally with the likelihood that brief periods of baseflow are associated with retreating channel flows. For most of an annual seasonal cycle, the creek channel would be losing water into the alluvial sediments and perched groundwater table.
4. The hydraulic connectivity between the perched groundwater system and the deeper groundwater in the Tertiary sediments is insignificant although there may be minor leakage of groundwater from the perched groundwater system into the Tertiary sediments.
5. The observed good health of mature forest red gum in the Charlevue Creek system, coupled with the extremely high LWP measured during field assessment suggests that trees are not utilising saline groundwater from the Tertiary sediments to any degree, a statement which is strongly supported by analysis of stable isotope compositions from twigs and groundwater.

#### ***Springton Gully Area 1 GDE System***

1. The Springton Tributary system is an ephemeral watercourse defined by a flat, weakly incised flood plain that has numerous overflow channels that are activated during flooding.
2. A seasonal aquifer is associated with a coarse sand interval intersected below the flood plain and main creek channel. The aquifer is conceptualised as being perched above the regional Tertiary aquifer and fluctuates seasonally dependant of surface flow inputs, with complete saturation potentially occurring during sustained flood events.
3. The hydraulic connectivity between the perched groundwater system and the deeper groundwater in the Tertiary sediments is predicted to be insignificant although there may be



minor leakage of water from the perched system into the Tertiary sediments. This is supported by the high, and relatively stable salinity levels reported from groundwater associated with the Tertiary system.

4. Red gum at this locality are conceptualised to be utilising the perched groundwater system to sustain transpiration into the dry season, though the perched aquifer will likely become depleted during extended periods without recharge.

## 6.2 Potential Impacts to GDEs

The GDE Toolbox (Richardson et al 2011), provides a starting point for investigating potential impacts on GDEs exposed to threat through the following impact mechanisms:

1. A total or partial loss or reduction in the volume or pressure of the aquifer being utilised by GDEs.
2. A change in the magnitude and timing of volume fluctuations in the aquifer being utilised by GDEs.
3. Changes to the interaction between surface flows and aquifers being utilised by a GDE.
4. Change in chemical composition of an aquifer detrimentally impacting the health of a GDE.

These potential changes can result in:

1. Loss of canopy vigour leading to senescence of groundwater dependent vegetation.
2. Changes to sub-canopy and groundcover because of increased light penetration through the canopy of senescing vegetation
3. Change in species composition with replacement of species not adapted to changing ecological parameters with species that have greater capacity to absorb change.

Direct clearing of a GDE system is also an additional impact which needs to be considered in the context of the Project.

### 6.2.1 Direct clearing

Vegetation clearing will result in direct impact to 5.54 ha of riparian vegetation (RE11.3.25) which is recognised as a GDE in the Springton Tributary Area 1 GDE system. This clearing action will result in direct removal of the area mapped as Springton Tributary Area 1 GDE system. The extent of clearing has been shown in **Figure 32** with further information on direct impacts is provided in the Terrestrial Ecology Assessment Report (AARC 2019). As this GDE system has been identified to be cleared, it is not considered further in the risk assessment which focuses on the GDEs associated with Charlevue Creek.

### 6.2.2 Partial or total loss or reduction in pressure of the aquifer being utilised by GDEs.

**Charlevue Creek Area 1:** The predicted water table drawdown (from JBT 2020) associated with development of mining voids is shown in **Figure 35**. Excluding the GDE area proposed for clearing, Charlevue Creek Area 1 is intersected by both the 2m and 5m drawdown contours which reflects drawdown in the water table associated with mining, affecting groundwater in the Tertiary and alluvial sediments. The alluvial landform associated with the Charlevue Creek GDE system supports a seasonal perched Aquifer. Based on salinity and stable isotope data collected from groundwater and

twigs, the perched aquifer is not considered to be hydraulically connected to the regional groundwater system associated within the Tertiary and older alluvial sediments. Furthermore, considering the perched groundwater system is not in hydraulic connection with regional groundwater table, this unit is not predicted to be subject to drawdown and no impact to groundwater dependent vegetation associated with Charlevue Creek will be incurred.

**6.2.3 *Change in the magnitude and timing of volume fluctuations in the aquifer being utilised by GDEs.***

Volume fluctuations in the perched groundwater system associated with Charlevue Creek are regulated by surface flows rather than upward propagation of deeper regional groundwater tables. The interaction between surface flows and the perched groundwater system is elaborated further in **Section 6.2.4.**

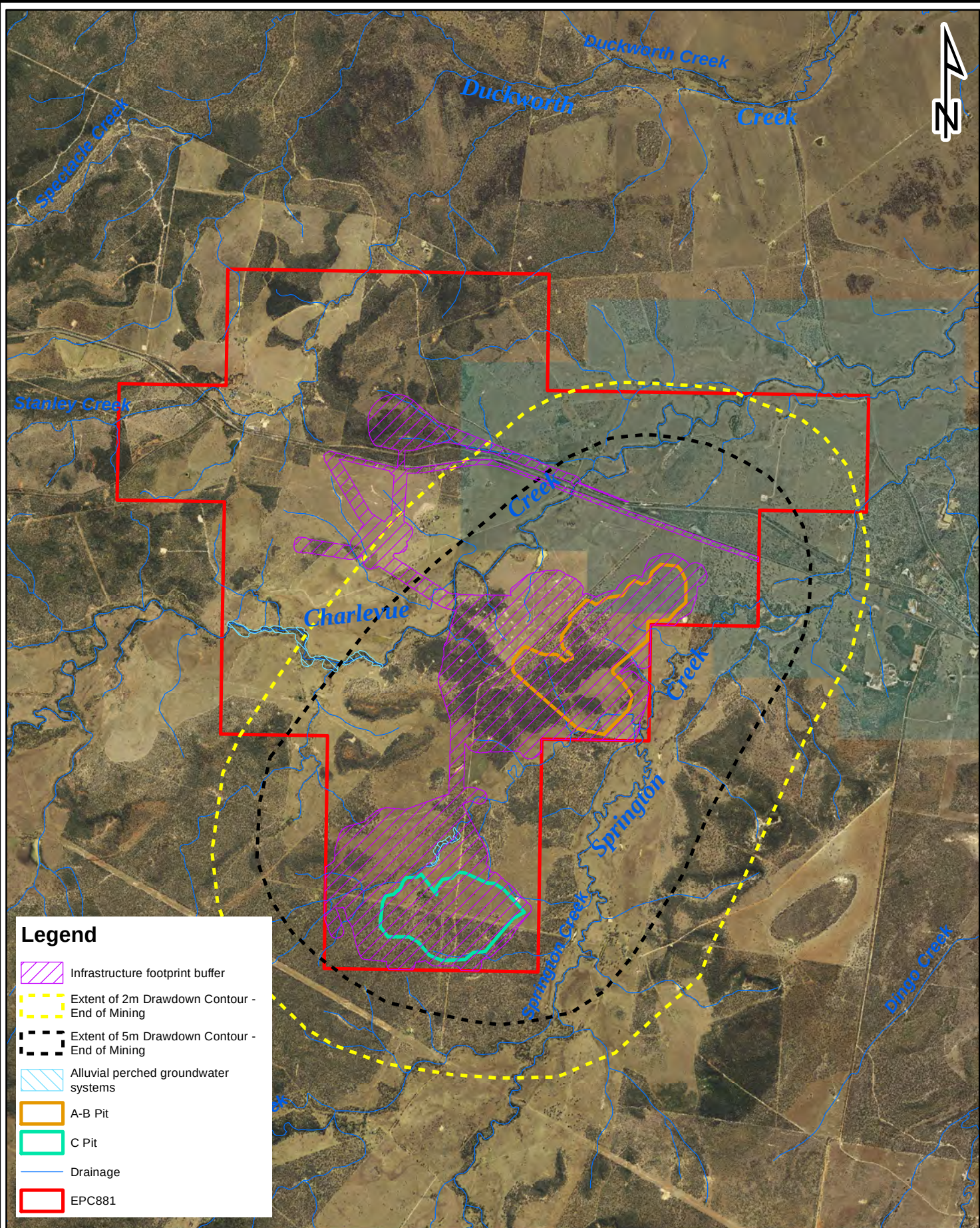
**6.2.4 *Changes to the interaction between surface flows and aquifers being utilised by a GDE.***

Streams in the Project area are ephemeral and based on the observed behaviour of other streams in the region, streamflow mostly occurs shortly after rainfall between September and April. The proposed mine operations and associated infrastructure footprint (MIA) are largely located outside of the Charlevue Creek and Springton Creek flood inundation areas (WRM 2019). The Charlevue Creek GDE system is located upstream from the proposed mining voids and there will be no loss of catchment area due to mining development that could potentially reduce upstream surface flows. Therefore, surface flow behaviour in the area upstream from the GDE area will be unaffected and similarly, there should be no change to either flood frequency, duration, or intensity that might impact recharge of the perched aquifer.

WRM (2019) report minor increases in flood level immediately upstream from the proposed haul road crossing with increases of 0.01 to 0.05m propagating upstream into the Charlevue GDE Area. These changes to flood intensity are considered insignificant in terms of recharge to the perched alluvial groundwater system.

The assessment of changes in flows, and changes in flood levels and velocities (WRM, 2019) demonstrates that the development of the mining operation will not result in a significant impact on the hydrology of Charlevue Creek to a degree that it would affect the recharge of the perched alluvial groundwater system that supports the GDE.





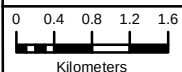
## Legend

- Infrastructure footprint buffer
- Extent of 2m Drawdown Contour - End of Mining
- Extent of 5m Drawdown Contour - End of Mining
- Alluvial perched groundwater systems
- A-B Pit
- C Pit
- Drainage
- EPC881

**Figure 35.** Identified GDE systems in relation to MIA and modelled groundwater drawdown.

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### **6.2.5 Change in chemical composition of an aquifer detrimentally impacting the health of a GDE**

The perched groundwater system supporting GDEs on Charlevue Creek is underlain by an unconfined brackish to saline groundwater system in the Tertiary sediments and Permian coal seams. The potential for saline water from these groundwater units to contaminate the fresh perched groundwater system is negligible as upward propagation of saline water under hydrostatic pressure will not occur.

Other potential sources of water quality contamination would be from:

1. discharge of saline mine affected water, or saline leachate into the environs of Charlevue Creek, upstream from or potentially into the Charlevue GDE system. This could potentially increase the salinity of the perched groundwater system and impact GDE health.
2. Discharge of saline water from sediment dams upstream from, or into the Charlevue GDE system, potentially increasing the salinity of the perched groundwater system and impacting GDE health.

Water captured in sediment dams is expected to have low salinity and coarse sediments will settle out, such that any impacts to downstream water quality associated with discharge are expected to be minor (WRM 2019). The management of mine affected water is dealt with in **Section 6.4.1**, although WRM (2019) concludes that any unplanned overflows from the Mine Water Dam, would overflow to the mine pit with the only potential mine water release points being the Mining Infrastructure Area Dam spillways. These dams will be operated in such a way that the risk of release is small.

The groundwater impact assessment (JBT 2020) also concluded that there is no potential pathway for mine pit water from either the AB Pit, or the C Pit, via the base of the Tertiary sediments to migrate into sensitive ecological receptors and there is low risk that water from the mining void will contaminate surrounding groundwater systems.

## **6.3 Cumulative Impacts**

JBT (2020) concluded that there are no existing mining operations within the zone of predicted groundwater drawdown from mining at the Project site, and therefore there are no cumulative impacts to assess.

## **6.4 Mitigation and Management Measures**

It should be noted that the GDE assessment identified a GDE system that is subject to clearing impacts, which will need to be considered in the overall ecological offsets package. Apart from direct clearing impacts, **Section 6.2** identifies that in the absence of mitigation, the risk of impact to GDEs is considered low on account of the hydraulic disconnect between the aquifers supporting GDEs and the regional water table subject to potential impact during mining. While risk assessment is dealt with more comprehensively in **Section 6.5**, general operation measures that will minimise risk of impact to GDEs are provided in **Section 6.4.1**.

#### **6.4.1 General operational measures**

Under a project Environmental Authority, a water management system, whose primary objective is to minimise environmental harm, will need to be developed. Any Implemented site Water Management System (WMS) and associated Erosion and Sediment Control Plan (ESCP) will be directly applicable to management of potential impacts to GDEs.

**WMS:** Specific objectives under a WMS that are relevant to the management of impact to GDEs are:

- Mine affected water:
  - Ensure any controlled releases of mine affected water prevents environmental harm.
  - Minimise uncontrolled discharges in wet periods.
  - Understand, manage, and minimise the potential impact of the water management system on the regional groundwater system.
- Sediment water: Maintain the quality of water discharging from Erosion and Sediment Control (ESC) structures to as close to background levels as reasonably possible.
- Clean water: Separate from the mine affected and sediment water systems as much as practicable and allow it to pass uninterrupted through the catchment.
- Water from the mine Infrastructure area (MIA) (e.g. from fuel storage area): Ensure full separation from other water sources and manage under the specifications of AS1940 - Storage and Handling of Flammable and Combustible Liquids (WRM 2019).

**ESCP:** Sediment water containment (runoff from spoil and incomplete rehabilitated areas) is managed in accordance with a site ESCP. The ESCP adopts the three cornerstones of erosion and sediment control.

- Drainage control – prevention or reduction of soil erosion caused by concentrated flows and appropriate management and separation of the movement of diverted and surface water through the area of concern.
- Erosion control – prevention or minimisation of soil erosion (from dispersive, non-dispersive or competent material) caused by rain drop impact and exacerbated overland flow on disturbed surfaces.
- Sediment control – trapping or retention of sediment either moving along the land surface, contained within runoff (i.e. from up-slope erosion) or from windborne particles.

#### **6.4.2 Groundwater monitoring**

A comprehensive groundwater monitoring network will need to be maintained for the duration of the mining venture, extending into post closure periods. The purpose of the groundwater monitoring network will be to:

1. Assess the effects of extraction of authorised groundwater including the monitoring of:
  - impacts on any watercourses dependent on groundwater flow
  - impacts of other groundwater users
  - groundwater level in all identified geological units across and adjacent to mining infrastructure and voids.

- groundwater inflows and discharges from mine workings
- 2. To further refine and validate the groundwater flow model used to assess impacts to groundwater; and
- 3. To consider requirements of any regional groundwater monitoring and assessment program developed to address potential cumulative impacts.



## 6.5 Risk Assessment

Drawing on information on GDE presence and function from previous sections, a risk assessment has been prepared which presents the likelihood of an impact occurring and the consequence associated with that impact. The significance of the risks is described below:

- **High significance:** Complete destruction of a GDE in terms of complete loss of keystone species and conversion to an alternate degraded ecological state. Impacts are irreversible and the only feasible option for mitigation is an environmental offset under relevant environmental policy.
- **Moderate significance:** Degradation of a GDE to an extent that 25% or more keystone species are affected by the action. Impacts will be reversible only with mitigation.
- **Low significance:** Impacts are short in duration and reversible without mitigation required.
- **Insignificant:** Impacts are undetectable when assessed against a relevant ecological baseline.

The ranking applied to the assessment of likelihood including descriptor is provided in **Table 2**, descriptions of magnitude are applied in **Table 3** and the derived risk matrix is provided in **Table 4**. A list of applicable mitigations is provided in **Table 5**. The constructed risk assessment with a residual risk score is provided in **Table 6**.

**Table 2.** Descriptors and ranking for the likelihood of impact occurring.

| Rank | Likelihood      | Description                                                                                                                             |
|------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Highly unlikely | There is no precedent for this event in the industry and similar events have not previously occurred.                                   |
| 2    | Unlikely        | Impacts have been associated with previous industry actions although similar impact pathways are not identified for the Gemini project. |
| 3    | Possible        | Impact pathways are not clearly understood and impacts have been previously associated with a similar industry action                   |
| 4    | Likely          | Impacts have previously been associated with the industry and a clear impact pathway exists.                                            |
| 5    | Highly likely   | A common event that is consistently associated with a similar industry action/ of an action that is proposed to occur.                  |

**Table 3.** Descriptors of Impact Magnitude applied in the risk assessment.

| Magnitude  | Description                                                                                                                                                                                                                                                                                                                                     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Negligible | No impact identifiable above baseline ecological conditions                                                                                                                                                                                                                                                                                     |
| Low        | Plant stress linked to mining activity that results in the reduction in volume and duration of groundwater supporting a GDE system that does not result in more than 5% dieback of mature canopy trees (defined as a canopy tree with DBH >60cm). Impact localised and reversible with mitigation.                                              |
| Moderate   | Plant stress linked to mining activity that results in the reduction in volume and duration of groundwater supporting a GDE system that does not result in more than 25% dieback of mature canopy trees (defined as a canopy tree with DBH >60cm). Impact is reversible with mitigation.                                                        |
| High       | Significant harm (loss of 25 to 50% of mature canopy trees). Impact is reversible although a significant lag in return to pre-disturbance condition occurs (lag>20yrs). Vegetation is converted from remnant to non-remnant status and significant impacts to habitat for protected fauna species occurs. Biodiversity offsets may be required. |
| Severe     | Irreversible impact to > 50% mature trees that cannot be mitigated. Vegetation is converted from remnant to non-remnant status and significant impacts to habitat for protected fauna species occurs. Biodiversity offsets will be required.                                                                                                    |

**Table 4.** Matrix applied in the risk assessment.

| Consequence |            | Likelihood          |               |               |               |                   |
|-------------|------------|---------------------|---------------|---------------|---------------|-------------------|
|             |            | Highly Unlikely (1) | Unlikely (2)  | Possible (3)  | Likely (4)    | Highly Likely (5) |
|             | Severe     | Insignificant       | Low           | High          | High          | High              |
|             | High       | Insignificant       | Low           | Moderate      | High          | High              |
|             | Moderate   | Insignificant       | Low           | Moderate      | Moderate      | Moderate          |
|             | Low        | Insignificant       | Low           | Low           | Low           | Low               |
|             | Negligible | Insignificant       | Insignificant | Insignificant | Insignificant | Insignificant     |

**Table 5.** List of relevant mitigations

| Mitigation No | Mitigation                                                                                       |
|---------------|--------------------------------------------------------------------------------------------------|
| 1             | GDE Avoidance                                                                                    |
| 2             | Water Management System                                                                          |
| 3             | Erosion and Sediment Control Plan                                                                |
| 4             | Groundwater Monitoring (including construction of additional monitoring bores where applicable). |
| 5             | Environmental Offsets                                                                            |

**Table 6.** Risk assessment for potential impacts.

| Impact Pathway                                                                                                      | Pre-mitigated Risk |             |               | Comments                                                                                                                                                                                         | Mitigation Measures | Residual Risk Ranking |             |               |
|---------------------------------------------------------------------------------------------------------------------|--------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|-------------|---------------|
|                                                                                                                     | Likelihood         | Consequence | Risk          |                                                                                                                                                                                                  |                     | Likelihood            | Consequence | Risk          |
| Springton Tributary Area 1 GDE System                                                                               |                    |             |               |                                                                                                                                                                                                  |                     |                       |             |               |
| 1. Direct Clearing of a GDE System.                                                                                 |                    |             |               | 5.54 hectares of a GDE is proposed to be cleared during development of the infrastructure footprint.                                                                                             |                     |                       |             |               |
| 2. A total or partial loss or reduction in the volume or pressure of the aquifer being utilised by GDEs.            | 5                  | Severe      | High          |                                                                                                                                                                                                  | 5                   | 5                     | Moderate    | Moderate      |
| 3. A change in the magnitude and timing of volume fluctuations in the aquifer being utilised by GDEs.               | NA                 | NA          | NA            |                                                                                                                                                                                                  | NA                  | NA                    | NA          | NA            |
| 4. Changes to the interaction between surface flows and aquifers being utilised by a GDE.                           | NA                 | NA          | NA            |                                                                                                                                                                                                  | NA                  | NA                    | NA          | NA            |
| 5. Change in chemical composition of an aquifer detrimentally impacting the health of a GDE <sup>1</sup> .          | NA                 | NA          | NA            |                                                                                                                                                                                                  | NA                  | NA                    | NA          | NA            |
| Charlevue Creek GDE System                                                                                          |                    |             |               |                                                                                                                                                                                                  |                     |                       |             |               |
| 1. Direct clearing of a GDE                                                                                         | 1                  | Negligible  | Insignificant | Mine and infrastructure footprint is located entirely outside the GDE area.                                                                                                                      | 1                   | 1                     | Negligible  | Insignificant |
| 2. A total or partial loss or reduction in the volume or pressure of the aquifer being utilised by GDEs.            | 2                  | Negligible  | Insignificant | Perched groundwater system supporting GDE and underlying groundwater system in Tertiary sediments are not considered to have a significant hydraulic linkage.                                    | 4                   | 1                     | Negligible  | Insignificant |
| 3. A change in the magnitude and timing of volume fluctuations in the aquifer being utilised by GDEs <sup>1</sup> . | 2                  | Negligible  | Insignificant | Volume fluctuations in the perched groundwater system are regulated by surface flows, which will have very minor change due to lack of interruption to upstream hydrology or catchment excision. | 4                   | 1                     | Negligible  | Insignificant |
| 4. Changes to the interaction between surface flows and                                                             | 2                  | Low         | Low           | Flooding volume and frequency will not be                                                                                                                                                        | 2, 3, 4             | 1                     | Low         | Insignificant |



| Impact Pathway                                                                                             | Pre-mitigated Risk |             |      | Comments                                                                                                                                                                           | Mitigation Measures | Residual Risk Ranking |             |               |
|------------------------------------------------------------------------------------------------------------|--------------------|-------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|-------------|---------------|
|                                                                                                            | Likelihood         | Consequence | Risk |                                                                                                                                                                                    |                     | Likelihood            | Consequence | Risk          |
| aquifers being utilised by a GDE.                                                                          |                    |             |      | significantly impacted by the Gemini development.                                                                                                                                  |                     |                       |             |               |
| 5. Change in chemical composition of an aquifer detrimentally impacting the health of a GDE <sup>1</sup> . | 2                  | Low         | Low  | No controlled releases of mine water planned for either Charlevue Creek or Springton Creek. Uncontrolled releases of mine water are not predicted throughout the life of the mine. | 2, 3, 4             | 1                     | Low         | Insignificant |

<sup>1</sup>. Assumes freshwater aquifers / groundwater with EC<1500 µS/cm. Withdrawal of saline aquifers / groundwater may have a positive impact on vegetation / habitat condition of a GDE

## 7.0 Conclusions

Multiple lines of evidence including measurement of LWP, SMP, stable isotopes and physical observation have been applied to assess the dependence of vegetation in the Gemini Project area on groundwater. Based on an initial round of field survey, two areas of likely groundwater dependence are recognised being:

3. Charlevue Creek Area 1, being an area identified as a terrestrial GDE on Charlevue Creek, to the west and upstream of the MIA.
4. Springton Tributary Area 1, being a terrestrial GDE associated with an ephemeral drainage system, currently located within the footprint of the MIA.

The Charlevue Creek GDE area is hosted in an area of recent river alluvium, forming a flood terrace which is dissected by the channel of Charlevue Creek and traversed by a series of flood overflow channels. The GDE area is supported by an unconfined, fresh alluvial aquifer that is perched above the regional groundwater table associated with Tertiary, Permian and older alluvial sediments, and is seasonally recharged during surface flows including flood events and associated rainfall. Based on salinity data and stable isotope comparisons between twig xylem and groundwater samples, it is inferred that the perched aquifer is hydraulically disconnected from the regional Tertiary and alluvial aquifers which host groundwater with salinity values that range from mildly to highly toxic to trees. Based on stable isotope data, there is no indication that trees at this site, nor any tree sampled during the GDE assessment is using groundwater associated with the regional Tertiary, alluvial or Permian coal seam aquifers to any significant degree.

The Springton Tributary Area 1 GDE system is supported by a seasonally variable perched aquifer system that is hosted in a thick, coarse sand horizon developed below the flood plain of the minor tributary. The strong iron staining associated with the sandy aquifer material provides evidence for considerable seasonal fluctuation in groundwater levels, which are inferred to recharge and drain rapidly in response to rainfall and surface flows. Similar to the Charlevue Creek GDE system, the Springton Tributary system is perched above the regional Tertiary groundwater table and trees at the site, based on evidence from stable isotope analysis, show no evidence for utilisation of the deeper groundwater system.

The Springton Tributary GDE system, covering an area of 5.54 hectares is located within the MIA and is proposed for direct clearing impacts. As GDEs are considered a MNES and regulated under the EPBC Act, environmental offsets will be required as the only viable mitigation. The area requiring offset is currently captured within offsets proposed for impacts to other significant terrestrial ecology values.

The Charlevue Creek GDE system is supported by an alluvial aquifer that is perched above, and hydraulically disconnected from the deeper regional aquifers associated with the Tertiary, older alluvium, and Permian coal seams. Groundwater drawdown associated with mining void development is modelled to impact the regional groundwater table below the Charlevue Creek system. However, it is not anticipated that these impacts will not be propagated into the perched

aquifer due to limited hydraulic connectivity between the perched and deeper aquifer systems that will be impacted by groundwater drawdown. The Charlevue Creek GDE system is recharged by surface water flows, flooding and seasonal rainfall which will not be altered by mining development.

Mitigations to prevent impact to the Charlevue Creek system include general operational measures associated with project approval conditions which may include development of the Mine WMS and ESCP. Based on these mitigations, it is considered that the risk to the GDE system posed by mine development is negligible.



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## Appendices

## Appendix A – Tree LWP Measurements and Details

| Site No | Tree No | Y         | X         | Species                 | DBH cm | Height m | Geomorphic position                                                                                             | LWP1 Mpa | LWP2 Mpa | LWP3 Mpa | Average two lowest | Tree Water availability |
|---------|---------|-----------|-----------|-------------------------|--------|----------|-----------------------------------------------------------------------------------------------------------------|----------|----------|----------|--------------------|-------------------------|
| M3      | T1      | -23.69539 | 149.26649 | Eucalyptus tereticornis | 46     | 18       | Broad colluvial surface with 0.5m of colluvial sand / silt over sandstone basement. 30m from drainage incision. | -0.9     | -0.85    | -        | 0.875              | High                    |
| M3      | T2      | -23.69573 | 149.2663  | Eucalyptus tereticornis | 47     | 20       | Broad colluvial surface with 1m of colluvial sand / silt over sandstone basement. On broad drainage incision    | -0.55    | -0.5     | -        | -0.525             | Very High               |
| M3      | T3      | -23.696   | 149.26682 | Eucalyptus tereticornis | 62.5   | 20       | Broad colluvial surface with 1m of colluvial sand / silt over sandstone basement. On broad drainage incision    | -0.55    | -0.6     | -        | -0.575             | High                    |
| M3      | T4      | -23.69599 | 149.26712 | Eucalyptus tereticornis | 60     | 22       | Broad colluvial surface with 1m of colluvial sand / silt over sandstone basement. On broad drainage incision    | -1.5     | -1.5     | -        | -1.5               | Moderate                |
| M2      | T1      | -23.67454 | 149.25365 | Eucalyptus populnea     | 49     | 22       | Residual silty sand. No drainage feature                                                                        | -1.85    | -2       | -        | -1.925             | Very Low                |
| M2      | T2      | -23.67432 | 149.25378 | Eucalyptus populnea     | 58     | 25       | Residual silty sand. No drainage feature                                                                        | -1.7     | -1.9     | -1.9     | -1.8               | Very Low                |
| M2      | T3      | -23.67425 | 149.25403 | Eucalyptus populnea     | 31     | 15       | Residual silty sand. No drainage feature                                                                        | -1.65    | -1.7     |          | -1.725             | Very Low                |
| M2      | T4      | -23.67403 | 149.25404 | Eucalyptus crebra       | 45     | 20       | Residual silty sand. No drainage feature                                                                        | -1.4     | -1.4     |          | -1.4               | Low                     |
| M1      | T1      | -23.67978 | 149.25313 | Eucalyptus tereticornis | 67     | 23       | Broad flood plain with anastomosing channel incisions.                                                          | -0.2     | -0.2     |          | -0.2               | Extremely High          |
| M1      | T2      | -23.68018 | 149.2525  | Eucalyptus tereticornis | 32     | 22.5     | Broad flood plain with anastomosing channel incisions. 10m from main drainage channel                           | -0.4     | -0.45    |          | -0.425             | Very High               |
| M1      | T3      | -23.6805  | 149.25255 | Eucalyptus tereticornis | 57     | 22       | Directly adjacent to overflow drainage channel. Low rise on broad flood plain                                   | -0.1     | -0.1     |          | -0.1               | Extremely High          |
| M1      | T4      | -23.6808  | 149.25229 | Eucalyptus tereticornis | 83     | 20       | Broad flood plain. 5m from overflow drainage channel                                                            | -0.25    | -0.25    |          | -0.25              | Extremely High          |
| M1      | T5      | -23.68085 | 149.25249 | Eucalyptus tereticornis | 78     | 23       | Directly adjacent to overflow drainage channel. Broadly incised to depth of 1m.                                 | -0.1     | -0.1     |          | -0.1               | Extremely High          |
| M4      | T1      | -23.68612 | 149.24285 | Eucalyptus tereticornis | 64     | 18       | Broad flood plain / drainage depression. Tree 25m from weakly incised drainage channel                          | -0.6     | -0.55    |          | -0.575             | High                    |
| M4      | T2      | -23.68608 | 149.24242 | Eucalyptus tereticornis | 65     | 20       | Broad flood plain / drainage depression. Tree on margins of ephemeral waterhole                                 | -0.6     | -0.6     |          | -0.6               | High                    |
| M4      | T3      | -23.6864  | 149.24198 | Eucalyptus tereticornis | 41     | 20       | Broad flood plain / drainage depression. Tree 25m from weakly incised drainage channel                          | -0.65    | -0.65    |          | -0.65              | High                    |
| M4      | T4      | -23.68644 | 149.24231 | Eucalyptus tereticornis | 62     | 20       | Broad flood plain / drainage depression. Tree on margins of weakly incised drainage channel                     | -0.65    | -0.7     |          | -0.675             | High                    |
| M4      | T5      | -23.68648 | 149.24229 | Eucalyptus tereticornis | 60     | 20       | Broad flood plain / drainage depression. Tree on margins of weakly incised drainage channel                     | -0.45    | -0.45    |          | -0.45              | Very High               |
| M5      | T1      | -23.65281 | 149.28809 | Eucalyptus tereticornis | 71     | 26       | 15m from margins of the flood channel on margins of T1 terrace.                                                 | -0.7     | -0.7     |          | -0.7               | High                    |
| M5      | T2      | -23.65288 | 149.28814 | Eucalyptus tereticornis | 100    | 26       | On margins of drainage channel. Located directly on the upper bank                                              | -1       | -0.95    |          | -0.976             | Moderate                |



| Site No | Tree No | Y         | X         | Species                 | DBH cm | Height m | Geomorphic position                                                                                                                                 | LWP1 Mpa | LWP2 Mpa | LWP3 Mpa | Average two lowest | Tree Water availability |
|---------|---------|-----------|-----------|-------------------------|--------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|--------------------|-------------------------|
| M5      | T3      | -23.65308 | 149.28803 | Eucalyptus tereticornis | 100    | 25       | On margins of drainage channel. Located mid-way on the inner bank, 1m above channel floor. Moist clays in channel floor.                            | -0.2     | -0.2     |          | -0.2               | Extremely High          |
| M5      | T4      | -23.65313 | 149.28740 | Eucalyptus tereticornis | 100    | 26       | On margins of drainage channel, on loamy soils directly above a weathered sandstone bench.                                                          | -1.2     | -1.2     |          | -1.2               | Moderate                |
| M5      | T5      | -23.6531  | 149.28734 | Corymbia tessellaris    | 24     | 15       | 5m from margins of drainage channel, growing into fractures in a weathered sandstone bench.                                                         | -1.9     | -1.9     |          | -1.9               | Very Low                |
| M5      | T6      | 23.65337  | 149.28712 | Eucalyptus tereticornis | 45     | 17       | Top of cutaway bank, on loamy soils, 6m above channel floor.                                                                                        | -1.8     | -1.8     |          | -1.8               | Very Low                |
| M6      | T1      | -23.6427  | 149.31495 | Melaleuca leucadendra   | 35     | 18       | Directly adjacent to waterhole on lower terrace. At waterline                                                                                       | -0.3     | -0.45    |          | -0.45              | Very High               |
| M6      | T2      | -23.64333 | 149.31476 | Eucalyptus tereticornis | 48     | 15       | On upper terrace, 15m from drainage channel and 6m above channel floor. Loamy soils, very dry.                                                      | -1       | -1       |          | -1                 | Moderate                |
| M6      | T3      | -23.64340 | 149.31465 | Eucalyptus tereticornis | 48     | 19       | On upper terrace, at top of bank directly above drainage channel. 5m above from drainage channel and 6m above channel floor. Loamy soils, very dry. | -1.75    | -1.8     |          | -1.775             | Very Low                |
| M6      | T4      | -23.64304 | 149.31484 | Eucalyptus tereticornis | 50     | 22       | On upper terrace, 10m from drainage channel and 6m above channel floor. Loamy soils, very dry.                                                      | -2       | -2       |          | -2                 | Very Low                |
| M7      | T1      | -23.6507  | 149.22957 | Eucalyptus tereticornis | 110    | 30       | Outer margins of flood plain on shallow overflow. 125m from main drainage channel                                                                   | -0.2     | -0.2     |          | -0.2               | Extremely High          |
| M7      | T2      | -23.65068 | 149.22994 | Eucalyptus tereticornis | 50     | 20       | Central portion of flood plain loamy soils. 70m from main drainage channel.                                                                         | -0.2     | -0.15    |          | -0.175             | Extremely High          |
| M7      | T3      | -23.65073 | 149.23034 | Eucalyptus tereticornis | 82     | 28       | Central portion of flood plain loamy soils. 25m from main drainage channel and 5m above channel floor.                                              | -0.1     | -0.15    |          | -0.125             | Extremely High          |
| M7      | T4      | -23.65008 | 149.23005 | Eucalyptus tereticornis | 85     | 25       | Margins of flood channel on upper terrace. Loamy soils 5m above channel floor.                                                                      | -0.1     | -0.1     |          | -0.1               | Extremely High          |
| M7      | T5      | -23.65001 | 149.22987 | Corymbia tessellaris    | 50     | 20       | Margins of flood channel on upper terrace. Loamy soils 5m above channel floor.                                                                      | -0.45    | -0.45    |          | -0.45              | Very High               |
| M7      | T6      | -23.64989 | 149.22971 | Eucalyptus tereticornis | 90     | 30       | 4m above drainage channel on inner bench. Loamy soils above sandy channel.                                                                          | -0.2     | -0.15    |          | -0.175             | Extremely High          |
| M8      | T1      | -23.65424 | 149.23750 | Eucalyptus tereticornis | 100    | 26       | T1 Terrace 5m from top of bank                                                                                                                      | -0.35    | -0.15    | -0.15    | -0.15              | Extremely High          |
| M8      | T2      | -23.65375 | 149.23872 | Eucalyptus tereticornis | 70     | 25       | Top of T1 terrace 20m from channel                                                                                                                  | -0.15    | -0.15    | -        | -0.15              | Extremely High          |
| M8      | T3      | -23.65347 | 149.23941 | Eucalyptus tereticornis | 100    | 26       | T1 terrace at top of bank                                                                                                                           | -0.1     | -0.1     |          | -0.1               | Extremely High          |
| M8      | T4      | -23.65308 | 149.23944 | Eucalyptus tereticornis | 95     | 25       | Inner bench 3m above channel floor                                                                                                                  | -0.35    | -0.45    | -0.4     | -0.4               | Very High               |
| M8      | T5      | -23.65342 | 149.23254 | Eucalyptus populnea     | 74.5   | 28       | Upper terrace 100m from stream channel                                                                                                              | -0.9     | -1.3     | -1.05    | -0.9525            | Moderate                |
| M9      | T1      | -23.64942 | 149.24666 | Eucalyptus tereticornis | 80     | 25       | T1 Terrace 5m from top of bank                                                                                                                      | -0.2     | -0.25    |          | -0.225             | Extremely High          |

| Site No | Tree No | Y         | X         | Species                 | DBH cm | Height m | Geomorphic position                                         | LWP1 Mpa | LWP2 Mpa | LWP3 Mpa | Average two lowest | Tree Water availability |
|---------|---------|-----------|-----------|-------------------------|--------|----------|-------------------------------------------------------------|----------|----------|----------|--------------------|-------------------------|
| M9      | T2      | -23.6497  | 149.24745 | Eucalyptus tereticornis | 120    | 30       | T2 terrace 25m from top of ban                              | -0.25    | -0.25    |          | -0.25              | Extremely High          |
| M9      | T3      | -23.64973 | 149.24781 | Eucalyptus tereticornis | 120    | 30       | T1 Terrace 5m from top of bank                              | -0.2     | -0.15    |          | -0.175             | Extremely High          |
| M9      | T4      | -23.64933 | 149.24752 | Eucalyptus tereticornis | 50     | 18       | Mid bench 2m above channel floor                            | -0.35    | -0.4     |          | -0.375             | Very High               |
| M10     | T1      | -23.62964 | 149.27157 | Eucalyptus tereticornis | 129    | 30       | Top of T1 terrace at top of bank                            | -0.4     | -0.3     |          | -0.35              | Very High               |
| M10     | T2      | -23.62993 | 149.27158 | Eucalyptus tereticornis | 70     | 18       | Top of T1 terrace at top of bank                            | -0.15    | -0.2     |          | -0.175             | Extremely High          |
| M10     | T3      | -23.63022 | 149.27144 | Eucalyptus tereticornis | 35     | 18       | Top of T1 terrace above waterhole                           | -0.25    | -0.2     |          | -0.225             | Extremely High          |
| M10     | T4      | -23.63043 | 149.27132 | Eucalyptus tereticornis | 65     | 23       | Top of T1 terrace at top of bank                            | -0.2     | -0.1     | -0.1     | -0.1               | Extremely High          |
| M11     | T1      | -23.6066  | 149.26703 | Eucalyptus tereticornis | 48     | 20       | Margin of shallow drainage channel on sand                  | -0.4     | -0.3     |          | -0.35              | Very High               |
| M11     | T2      | -23.60658 | 149.26671 | Eucalyptus tereticornis | 50     | 20       | Margin of shallow drainage channel - 1m above sandy channel | -0.25    | -0.25    |          | -0.25              | Extremely High          |
| M11     | T3      | -23.60653 | 149.26649 | Eucalyptus tereticornis | 38     | 21       | Margin of shallow drainage channel - 1m above sandy channel | -0.6     | -0.6     |          | -0.6               | High                    |
| M11     | T4      | -23.60639 | 149.26616 | Corymbia clarksoniana   | 34     | 18       | 5m from margins of drainage channel on sandy loam           | -1.1     | -0.85    |          | -0.925             | Moderate                |
| M12     | T1      | -23.62416 | 149.27960 | Eucalyptus tereticornis | 90     | 25       | In channel                                                  | -0.25    | -0.2     |          | -0.2               | Extremely High          |
| M12     | T2      | -23.62413 | 149.27958 | Eucalyptus tereticornis | 100    | 25       | Within channel banks 2m above channel floor                 | -0.55    | -0.6     |          | -0.575             | High                    |
| M12     | T3      | -23.62312 | 149.27961 | Eucalyptus tereticornis | 100    | 24       | Mid way up inner bench 4m above channel                     | -0.45    | -0.45    |          | -0.45              | Very High               |
| M12     | T4      | -23.62316 | 149.28024 | Eucalyptus tereticornis | 100    | 22       | Top of bank 5m above T1 terrace                             | -0.5     | -0.5     |          | -0.5               | Very High               |
| M12     | T5      | -23.62807 | 149.27524 | Eucalyptus tereticornis | 90     | 29       | Overflow drainage depression 200m from flood channel        | -0.45    | -0.45    |          | -0.45              | Very High               |
| M12     | T6      | -23.62811 | 149.27540 | Eucalyptus tereticornis | 100    | 30       | Overflow drainage depression 200m from flood channel        | -0.45    | -0.45    |          | -0.45              | Very High               |
| M13     | T1      | -23.60996 | 149.31163 | Eucalyptus coolibah     | 60     | 20       | T2 terrace 15m from top of bank                             | -1.4     | -1.35    |          | -1.35              | Low                     |
| M13     | T2      | -23.60999 | 149.31166 | Eucalyptus tereticornis | 55     | 22       | Top of bank 6m above channel                                | -0.5     | -0.4     |          | -0.45              | Very High               |
| M13     | T3      | -23.60988 | 149.31172 | Eucalyptus tereticornis | 35     | 16       | Top of bank on side channel 3m above channel floor          | -0.2     | -0.2     |          | -0.32              | Very High               |
| M13     | T4      | -23.60983 | 149.31187 | Eucalyptus tereticornis | 50     | 25       | Top of bank 5m above channel floor                          | -0.5     | -0.5     |          | -0.5               | Very High               |

| Site No | Tree No | Y         | X         | Species             | DBH cm | Height m | Geomorphic position                 | LWP1 Mpa | LWP2 Mpa | LWP3 Mpa | Average two lowest | Tree Water availability |
|---------|---------|-----------|-----------|---------------------|--------|----------|-------------------------------------|----------|----------|----------|--------------------|-------------------------|
| M14     | T1      | -23.62793 | 149.32273 | Eucalyptus populnea | 50     | 17       | T2 Terrace away from stream channel | -1.1     | -1.1     |          | -1.1               | Moderate                |
| M14     | T2      | -23.62800 | 149.32277 | Eucalyptus populnea | 50     | 16       | T2 Terrace away from stream channel | -2       | -2       |          | -2                 | Very Low                |
| M14     | T3      | -23.62811 | 149.32284 | Eucalyptus populnea | 40     | 15       | T2 Terrace away from stream channel | -1.5     | -1.5     |          | -1.5               | Low                     |
| M14     | T4      | -23.62813 | 149.32288 | Eucalyptus populnea | 40     | 16       | T2 Terrace away from stream channel | -2       | -2.05    |          | -2                 | Very Low                |
| M14     | T5      | -23.62779 | 149.32351 | Eucalyptus populnea | 65     | 15       | T2 Terrace away from stream channel | -1.2     | -1.2     |          | -1.2               | Moderate                |



## Appendix B – Auger Hole Logs

| Site No | Auger No | Y            | X          | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Position                                                                                                | Special features / Tree roots                                                                              | Depth metres |
|---------|----------|--------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------|
| M3      | AU1      | -23.69573    | 149.26631  | 0-0.25m - fine sand, yellow grey, moist; 0.25 - 0.5m - fine silty sand, moist and yellow with abundant tree roots; 0.5 - 0.75m fine silty sand, moist yellow. EOH at 0.75m on indurated sandstone.                                                                                                                                                                                                                                                                                                                                                                   | In base of drainage depression                                                                          | 0.5 with abundant fine tree roots                                                                          | 0.75         |
| M2      | AU1      | -23.67421    | 149.2538   | 0-0.75m - dry hard setting silty clay loam, grey brown. EOH @ 0.75m due to density of substrate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Loamy plain with no distinctive features                                                                | 0                                                                                                          | 0.75         |
| M1      | AU1      | -23.67978    | 149.25313  | 0-0.25 - Grey yellow silty loam, dry to moist with tree roots; 0.35m abundant ironstone mottles; 0.25 - 0.5m -Loamy sand, yellow with iron staining and orange / brown mottles; 0.5 - 1.2m - yellow to orange loamy sand becoming coarse loamy sand, moist with strong iron mottling and staining; 1.2 - 1.5m - coarse sand merging on gravel with strong iron mottling, strong yellow to orange iron staining (moist to wet); 1.5 - 1.7 - yellow orange clayey sand with abundant mottling; 1.75- sand with iron cement, strong yellow to orange staining. EOH 1.8m | In base of channel overflow, 2m from base of Tree 3.                                                    | Dense tree roots at 0.25m depth                                                                            | 1.8          |
| M1      | AU2      | -23.68063    | 149.2525   | 0-0.5 - Grey yellow silty loam, dry to moist with tree roots; 0.5 - 1m - fine loamy sand with minor clay nodule. Moist, yellow brown; 1 - 1.25m - Fine, moist yellow brown clayey sand with abundant ironstone staining and mottles; 1.25 - 1.5m - ironstained clayey fine sand to medium sand, yellow, moist to very moist; 1.5 - 2.0m - moist orange clayey sand with abundant iron mottling and staining; 2.0 - 2.2m - Moist orange clayey sand with some coarse sand layers, ,minor gravel fragments. EOH 2.2m                                                   | In base of channel overflow, 2m from base of Tree 5.                                                    | Dense tree roots at 0.25 to 0.5m depth                                                                     | 2.2          |
| M4      | AU1      | -23.68622    | 149.2423   | 0-0.25 - Silty loam, dry, brown-grey with weak iron mottling and nodules; 0.25 - 1m, orange brown silty loam, slightly moist with week iron mottling and staining; 1- 1.35m, fine silty sand, grey brown with abundant iron staining and mottling, slightly moist to moist; 1.4m EOH in cemented sand, hardpan layer with ironstone gravel.                                                                                                                                                                                                                          | Broad poorly defined drainage depression / flood plain, located near weakly incised drainage depression |                                                                                                            | 1.4          |
| M5      | AU1      | -23.65310404 | 149.287946 | 0-0.5m, silty coarse sand and gravel, moist red brown; 0.5m - 0.75m, grey brown fine clayey sand, moist with abundant fibrous tree roots; 0.75m - 1.0m, clayey sand, moist, red brown with ironstone mottling; 1.0 - 1.5m - clayey sand, moist, grey brown with abundant mottling and iron staining; 1.5 - 1.9 - yellow brown silty sand and gravel, moist with cemented hardpan / sandstone at 1.9m EOH.                                                                                                                                                            | Placed in stream channel at base of channel floor.                                                      | Abundant fibrous tree roots at 0.5m                                                                        | 1.9          |
| M5      | AU2      | -23.65296    | 149.28802  | Base of channel in grey brown silty / sandy loam. Minor seepage into creek channel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Base of bank adjacent to channel floor.                                                                 |                                                                                                            | 0.2          |
| M6      | AU1      | -23.642758   | 149.314953 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |                                                                                                            | 0.2          |
| M7      | AU1      | -23.65010901 | 149.230038 | 0-0.35m - fine loamy sand, moist to wet, red brown; 0.35 - 1.0m - fine loamy sand, red brown, moist to wet; 1.0 - 2.2m - uniform moist to wet, red brown sandy loam. Fine tree roots dispersed throughout soil profile.                                                                                                                                                                                                                                                                                                                                              | River flood plain 5m from top of bank.                                                                  | Dense tree roots at 0.5m; Fine tree root recorded at 1.0 to end of hole dispersed throughout soil profile. | 2.2          |
| M7      | AU2      | -23.649934   | 149.229753 | 0 - 0.3, coarse brown sand, dry; 0.3 - 0.5 - moist clayey sand, red brown; 0.5 - 1.0 - Coarse river sand with some clay bands and charcoal, red brown to brown, wet to moist. EOH in wet sand at 2.0m.                                                                                                                                                                                                                                                                                                                                                               | Base of sandy channel                                                                                   |                                                                                                            | 2            |
| M8      | AU1      | -23.65427197 | 149.237651 | 0 - 1.0, coarse brown sand, with some clay nodules and charcoal, wet to moist. EOH in wet sand at 2.0m; 1.0 - 1.2m, coarse clayey sand with charcoal, moist to wet. EOH at gravel bed with tree roots immediately above gravel.                                                                                                                                                                                                                                                                                                                                      | Base of sandy channel                                                                                   | 1.2m at interface of sand and gravel. Tree roots to 0.25cm, scattered.                                     | 1.2          |

| Site No | Auger No | Y            | X          | Summary                                                                                                                                                                                                                                                                                                                                                                                   | Position                                                                                                      | Special features / Tree roots                        | Depth metres |
|---------|----------|--------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------|
| M9      | AU1      | -23.64940401 | 149.246728 | 0 - 0.25, fine, dry sandy loam, red brown; 0.25 - 0.5m, sandy loam, red brown, abundance of fine tree roots; 0.5 - 1.0m, red brown moist sandy loam, abundant fine tree roots. 1.0 - 1.5m, red brown moist sandy loam, no tree roots; 1.5 - 2.2m, uniform red brown sandy loam, dry with no tree roots.                                                                                   | Top of bank, 4m from edge of channel incision                                                                 | Fine tree roots to 1.0m.                             | 2.2          |
| M9      | AU2      | -23.64929304 | 149.246615 | 0 - 0.4m, moist, medium to coarse sand, grey brown; 0.4 - 1.0m, medium coarse, grey brown sand to clay sand with charcoal fragments. Moist to wet; 1.0 - 1.5m, medium to coarse fluvial sand, clayey nodules and charcoal, wet to saturated; 1.5 - 2.2, medium to coarse clay sand, clay nodules and charcoal that is wet to very wet. Matted red-gum tree roots at 2.2m at base of sand. | Base of sandy channel                                                                                         | Fine tree roots (red gum) to 25mm recorded at EOH.   | 2.2          |
| M10     | AU1      | -23.629771   | 149.271611 | 0-0.5m, Red brown silty loam, dry with fine tree roots; 0.5 to 1.5m, red brown silty clay loam, uniform texture becoming moister toward base of hole; 1.5 - 2.1m, friable silty / sandy loam, red brown becoming moist. Abundant tree roots at base of hole.                                                                                                                              | Upper terrace 5m from top of bank.                                                                            | Fine tree roots (red gum) to 25mm recorded at EOH.   | 2.1          |
| M11     | AU1      | -23.60657701 | 149.266711 | Fine to medim dry sand from surfance to end of hole.                                                                                                                                                                                                                                                                                                                                      | Margins of sandy channel                                                                                      |                                                      | 0.25         |
| M11     | AU2      | -23.60659302 | 149.266782 | Sand in creek bank, in tree root zone, above base of sandstone basement.                                                                                                                                                                                                                                                                                                                  | In creek bank                                                                                                 |                                                      | 0.5          |
| M12     | AU2      | -23.62301339 | 149.280268 | 0- 0.5, clayey sand, dry, grey brown with abundant fine tree roots; 0.5 - 0.75, clayey sand, grey brown, dry to moist; 0.75 - 1.2, heavy clay, dry, orange brown with charcoal. EOH at 1.2m due to tree roots                                                                                                                                                                             | Base of incised channel into clay basement                                                                    | Refusal at end of hole due to dense tree roots.      | 1.2          |
| M13     | AU1      | -23.60993698 | 149.311725 | 0 - 1.5m, silty clay loam to silty clay, grey brown, with charcoal fragments, moist. Fine tree roots dispersed throughout clay; 1.5 -2m, loamy clay, grey brown with minor iron mottling, dense and moist. EOH at 2.0m due to extreme clay plasticity.                                                                                                                                    | In stream channel, at base of floor, auger hole penetrated to depths > 1.5m below depth of the surface water. | Dispersed throughout soil profile, to 25mm diameter. | 2            |
| M14     | AU1      | -23.62814499 | 149.322902 | 0- 1.2, Silty clay loam, grey brown, dry. Uniform from top of hole to base.                                                                                                                                                                                                                                                                                                               | Flood plain surface, 25m from drainage channel.                                                               |                                                      | 1.2          |

## Appendix C – Soil Moisture Potential Raw Data

| Specimen Number | Type | Date Collected | SMP (Mpa) |
|-----------------|------|----------------|-----------|
| M10-AU1-0.2     | Soil | 2-Jun-20       | -1.75     |
| M10-AU1-0.4     | Soil | 2-Jun-20       | -0.6      |
| M10-AU1-1.0     | Soil | 2-Jun-20       | -1.15     |
| M10-AU1-1.5     | Soil | 2-Jun-20       | -0.95     |
| M10-AU1-2.1     | Soil | 2-Jun-20       | -0.72     |
| M10-AU2-0.35    | Soil | 2-Jun-20       | -0.01     |
| M11_AU2-0.35    | Soil | 2-Jun-20       | -18.55    |
| M11-AU1-0.20    | Soil | 2-Jun-20       | -25.41    |
| M11-CB          | Soil | 2-Jun-20       | -4.4      |
| M12-AU1-0.2     | Soil | 2-Jun-20       | -1.98     |
| M12-AU2-0.25    | Soil | 2-Jun-20       | -1.86     |
| M12-AU2-0.5     | Soil | 2-Jun-20       | -1.75     |
| M12-AU2-1.0     | Soil | 2-Jun-20       | -2.81     |
| M12-AU2-1.1     | Soil | 2-Jun-20       | -0.65     |
| M12-AU2-1.3     | Soil | 2-Jun-20       | -0.35     |
| M13-AU1-0.2     | Soil | 3-Jun-20       | -0.27     |
| M13-AU1-0.5     | Soil | 3-Jun-20       | -0.29     |
| M13-AU1-1.0     | Soil | 3-Jun-20       | -0.35     |
| M13-AU1-1.5     | Soil | 3-Jun-20       | -0.4      |
| M13-AU1-2.0     | Soil | 3-Jun-20       | -0.1      |
| M14-AU1-0.20    | Soil | 3-Jun-20       | -1.11     |
| M14-AU1-0.5     | Soil | 3-Jun-20       | -3.09     |
| M14-AU1-1.0     | Soil | 3-Jun-20       | -1.35     |
| M14AU1-1.2      | soil | 3-Jun-20       | -3.59     |
| M1-AU1-0.2      | Soil | 30-May-20      | -0.7      |
| M1-AU1-1.2      | Soil | 30-May-20      | -0.14     |
| M1-AU1-1.5      | Soil | 30-May-20      | -0.16     |
| M1-AU2-0.25     | Soil | 30-May-20      | -0.84     |
| M1-AU2-0.5      | Soil | 30-May-20      | -0.32     |
| M1-AU2-1.0      | Soil | 30-May-20      | -0.19     |
| M1-AU2-1.5      | Soil | 30-May-20      | -0.53     |
| M1-AU2-1.7      | Soil | 30-May-20      | -0.17     |
| M1-AU2-2.0      | Soil | 30-May-20      | -0.15     |
| M1-AU2-2.2      | Soil | 30-May-20      | -0.69     |
| M2-AU1-0.25     | Soil | 30-May-20      | -2.9      |
| M2-AU1-0.5      | Soil | 30-May-20      | -12.39    |
| M3-AU1-0.25     | Soil | 30-May-20      | -0.46     |
| M3-AU1-0.5      | Soil | 30-May-20      | -1.16     |
| M3-AU1-0.75     | Soil | 30-May-20      | -5.42     |
| M4-AU1-0.25     | Soil | 30-May-20      | -1.35     |
| M4-AU1-0.5      | Soil | 30-May-20      | -1.04     |



| Specimen Number | Type | Date Collected | SMP (Mpa)    |
|-----------------|------|----------------|--------------|
| M4-AU1-1.0      | Soil | 30-May-20      | <b>-1.4</b>  |
| M4-AU1-1.35     | Soil | 30-May-20      | <b>-0.91</b> |
| M5-AU1-0.25     | Soil | 31-May-20      | -0.57        |
| M5-AU1-0.5      | Soil | 31-May-20      | <b>-0.37</b> |
| M5-AU1-0.75     | Soil | 31-May-20      | -0.28        |
| M5-AU1-1.0      | Soil | 31-May-20      | <b>-0.42</b> |
| M5-AU1-1.5      | Soil | 31-May-20      | <b>-0.33</b> |
| M5-AU1-1.9      | Soil | 31-May-20      | <b>-0.26</b> |
| M5-AU2-0.25     | Soil | 31-May-20      | <b>-0.15</b> |
| M6-AU1-0.1      | Soil | 1-Jun-20       | -0.15        |
| M7-AU1-0.2      | Soil | 1-Jun-20       | -1.51        |
| M7-AU1-0.5      | Soil | 1-Jun-20       | -1.01        |
| M7-AU1-1.0      | Soil | 1-Jun-20       | <b>-1.42</b> |
| M7-AU1-1.5      | Soil | 1-Jun-20       | <b>-1.9</b>  |
| M7-AU1-2.0      | Soil | 1-Jun-20       | <b>-0.38</b> |
| M7-AU1-2.2      | Soil | 1-Jun-20       | -0.17        |
| M7-AU2-0.5      | Soil | 1-Jun-20       | <b>-0.51</b> |
| M7-AU2-1.0      | Soil | 1-Jun-20       | -0.36        |
| M7-AU2-1.5      | Soil | 1-Jun-20       | <b>-0.21</b> |
| M7-AU2-2.0      | Soil | 1-Jun-20       | -0.28        |
| M8-AU1-0.5      | Soil | 1-Jun-20       | -2.42        |
| M8-AU1-1.0      | Soil | 1-Jun-20       | -0.66        |
| M8-AU1-1.2      | Soil | 1-Jun-20       | -0.07        |
| M8-AU2-1.0      | Soil | 1-Jun-20       | -1.27        |
| M9-AU1-0.2      | Soil | 1-Jun-20       | <b>-1.38</b> |
| M9-AU1-0.5      | Soil | 1-Jun-20       | -0.38        |
| M9-AU1-1.0      | Soil | 1-Jun-20       | <b>-0.82</b> |
| M9-AU1-1.5      | Soil | 1-Jun-20       | <b>-1.54</b> |
| M9-AU1-2.0      | Soil | 1-Jun-20       | <b>-1</b>    |
| M9-AU1-2.2      | Soil | 1-Jun-20       | -0.27        |
| M9-AU2-0.4      | Soil | 1-Jun-20       | <b>-0.27</b> |
| M9-AU2-1.0      | Soil | 1-Jun-20       | <b>-0.47</b> |
| M9-AU2-1.5      | Soil | 1-Jun-20       | -0.25        |
| M9-AU2-2.0      | Soil | 1-Jun-20       | -0.13        |
| M9-AU2-2.2      | Soil | 1-Jun-20       | -0.15        |

## Appendix D – Stable Isotope Analytical Results

| Sample | Type        | $\delta^2\text{H}$ | $\delta^{18}\text{O}$ |
|--------|-------------|--------------------|-----------------------|
| M13T2  | Twig        | 18.40              | 1.84                  |
| M13T3  | Twig        | 10.74              | 1.17                  |
| M14T1  | Twig        | -15.25             | -0.81                 |
| M14T1  | Twig        | -15.98             | -1.55                 |
| M14T5  | Twig        | 9.12               | 0.87                  |
| m1t1   | Twig        | 5.34               | -0.41                 |
| m1t2   | Twig        | 3.00               | 0.33                  |
| m1t3   | Twig        | 4.65               | -0.64                 |
| m1t4   | Twig        | 9.38               | 0.13                  |
| m1t5   | Twig        | -2.46              | -0.30                 |
| m2t2   | Twig        | 6.33               | 0.01                  |
| m3t2   | Twig        | 1.70               | -0.32                 |
| m3t4   | Twig        | 8.50               | 0.10                  |
| M4T1   | Twig        | 2.76               | 0.81                  |
| M4T4   | Twig        | 3.49               | 0.12                  |
| M4T5   | Twig        | 3.50               | 0.02                  |
| M5T1   | Twig        | 1.92               | 1.87                  |
| M5T2   | Twig        | 2.41               | -0.14                 |
| M5T3   | Twig        | 4.64               | -0.46                 |
| M6T1   | Twig        | -0.56              | 0.38                  |
| M6T3   | Twig        | 34.38              | 5.94                  |
| M7T1   | Twig        | 10.96              | -0.29                 |
| M7T3   | Twig        | 3.05               | -0.05                 |
| M7T4   | Twig        | -4.24              | -1.51                 |
| M7T6   | Twig        | 7.23               | -1.34                 |
| M8T1   | Twig        | 11.94              | -0.25                 |
| M8T2   | Twig        | 5.87               | -0.30                 |
| M8T3   | Twig        | 15.67              | 2.11                  |
| M8T4   | Twig        | 7.44               | -0.48                 |
| M9T1   | Twig        | -9.92              | -1.34                 |
| M9T2   | Twig        | -9.92              | -1.86                 |
| M9T3   | Twig        | 0.54               | -0.67                 |
| 7220W3 | Groundwater | -23.70             | -3.79                 |
| 7093W3 | Groundwater | -26.21             | -3.90                 |
| 7178W2 | Groundwater | -23.02             | -3.49                 |
| 7033W1 | Groundwater | -26.45             | -3.53                 |
| 7225W3 | Groundwater | -29.81             | -4.64                 |
| 7221W1 | Groundwater | -14.58             | -5.55                 |
| 7093W1 | Groundwater | -29.56             | -4.52                 |
| 7082W2 | Groundwater | -25.79             | -4.34                 |

| Sample        | Type          | $\delta^2\text{H}$ | $\delta^{18}\text{O}$ |
|---------------|---------------|--------------------|-----------------------|
| 7033W2        | Groundwater   | -26.57             | -4.29                 |
| DW7292W1      | Groundwater   | -14.66             | -4.53                 |
| 7033W3        | Groundwater   | -28.41             | -4.36                 |
| 7220W1        | Groundwater   | -33.16             | -5.34                 |
| 7264W2        | Groundwater   | -27.46             | -4.02                 |
| 7105W2        | Groundwater   | -26.68             | -3.92                 |
| 7035W3        | Groundwater   | -26.93             | -4.34                 |
| 7282W2        | Groundwater   | -13.87             | -4.22                 |
| 7093W2        | Groundwater   | -7.45              | -4.78                 |
| 7220W1        | Groundwater   | -31.46             | -5.71                 |
| 7178W1        | Groundwater   | -21.93             | -3.39                 |
| 7225W2        | Groundwater   | -25.45             | -4.22                 |
| 7225W1        | Groundwater   | -29.32             | -4.70                 |
| 7082W1        | Groundwater   | -25.68             | -4.36                 |
| 7282W1cracked | Groundwater   | 31.93              | -3.60                 |
| 7264W3        | Groundwater   | -25.57             | -4.47                 |
| M5SW1         | Surface Water | 5.61               | 2.04                  |
| M6SW1         | Surface Water | -6.02              | 0.43                  |
| M8SW1         | Surface Water | 15.52              | 4.57                  |
| M10SW1        | Surface Water | 14.43              | 2.98                  |
| M13SW1        | Surface Water | 12.21              | 1.71                  |
| m10-au1-0.2   | Soil          | 11.40              | 0.59                  |
| m10-au1-0.4   | Soil          | 7.92               | -0.71                 |
| m10-au1-1.0   | Soil          | 2.90               | -5.41                 |
| m10-au1-1.5   | Soil          | -25.63             | -8.54                 |
| m10-au1-2.1   | Soil          | -10.91             | -7.23                 |
| m10-au2-0.35  | Soil          | 2.05               | 1.43                  |
| m11-au2-0.35  | Soil          | -8.80              | -1.13                 |
| m11-cb        | Soil          | -22.35             | -3.65                 |
| m12-au2-0.25  | Soil          | -6.68              | -2.11                 |
| m12-au2-0.5   | Soil          | 0.91               | -1.97                 |
| m12-au2-1.0   | Soil          | -16.03             | -4.64                 |
| m12-au2-1.1   | Soil          | -17.67             | -6.04                 |
| m13-au1-0.2   | Soil          | -10.89             | -2.50                 |
| m13-au1-0.5   | Soil          | -8.89              | -2.50                 |
| m13-au1-1.0   | Soil          | -8.32              | -3.09                 |
| m13-au1-1.5   | Soil          | -7.06              | -3.45                 |
| m13-au1-2.0   | Soil          | -8.71              | -4.15                 |
| m1-au2-2.0    | Soil          | -22.90             | -4.36                 |
| m3-au1-0.75   | Soil          | -13.24             | -1.83                 |
| m3-au2-0.5    | Soil          | -15.83             | -3.06                 |
| m4-au1-0.5    | Soil          | -5.24              | -3.09                 |



| Sample      | Type | $\delta^2\text{H}$ | $\delta^{18}\text{O}$ |
|-------------|------|--------------------|-----------------------|
| m4-au1-1.0  | Soil | 3.58               | -0.90                 |
| m4-au1-1.35 | Soil | -22.06             | -5.52                 |
| m5-au1-0.25 | Soil | 11.40              | -1.78                 |
| m5-au1-0.5  | Soil | -18.00             | -3.74                 |
| m5-au1-0.75 | Soil | -14.37             | -4.99                 |
| m5-au1-1.0  | Soil | -22.31             | -9.20                 |
| m5-au1-1.5  | Soil | 14.33              | -2.39                 |
| m5-au1-1.9  | Soil | 20.54              | 0.38                  |
| m5-au2-0.15 | Soil | 29.75              | 2.88                  |
| m7-au1-0.25 | Soil | -4.43              | -0.71                 |
| m7-au1-0.5  | Soil | -9.58              | -3.57                 |
| m7-au1-1.0  | Soil | 6.20               | -1.71                 |
| m7-au1-1.5  | Soil | -7.69              | -1.54                 |
| m7-au1-2.0  | Soil | 2.14               | -3.01                 |
| m7-au1-2.2  | Soil | -10.14             | -4.89                 |
| m7-au2-0.2  | Soil | -21.64             | -2.83                 |
| m7-au2-2.0  | Soil | -18.96             | -3.05                 |
| m8-au1-0.5  | Soil | -15.79             | -4.15                 |
| m9-au1-2.0  | Soil | -18.32             | -5.65                 |
| m9-au1-2.2  | Soil | -31.80             | -4.73                 |
| m9-au2-0.4  | Soil | -12.98             | -5.06                 |
| m9-au2-1.0  | Soil | -3.08              | -0.96                 |
| m9-au2-1.5  | Soil | -22.51             | -4.87                 |
| m9-au2-2.0  | Soil | -18.54             | -3.84                 |