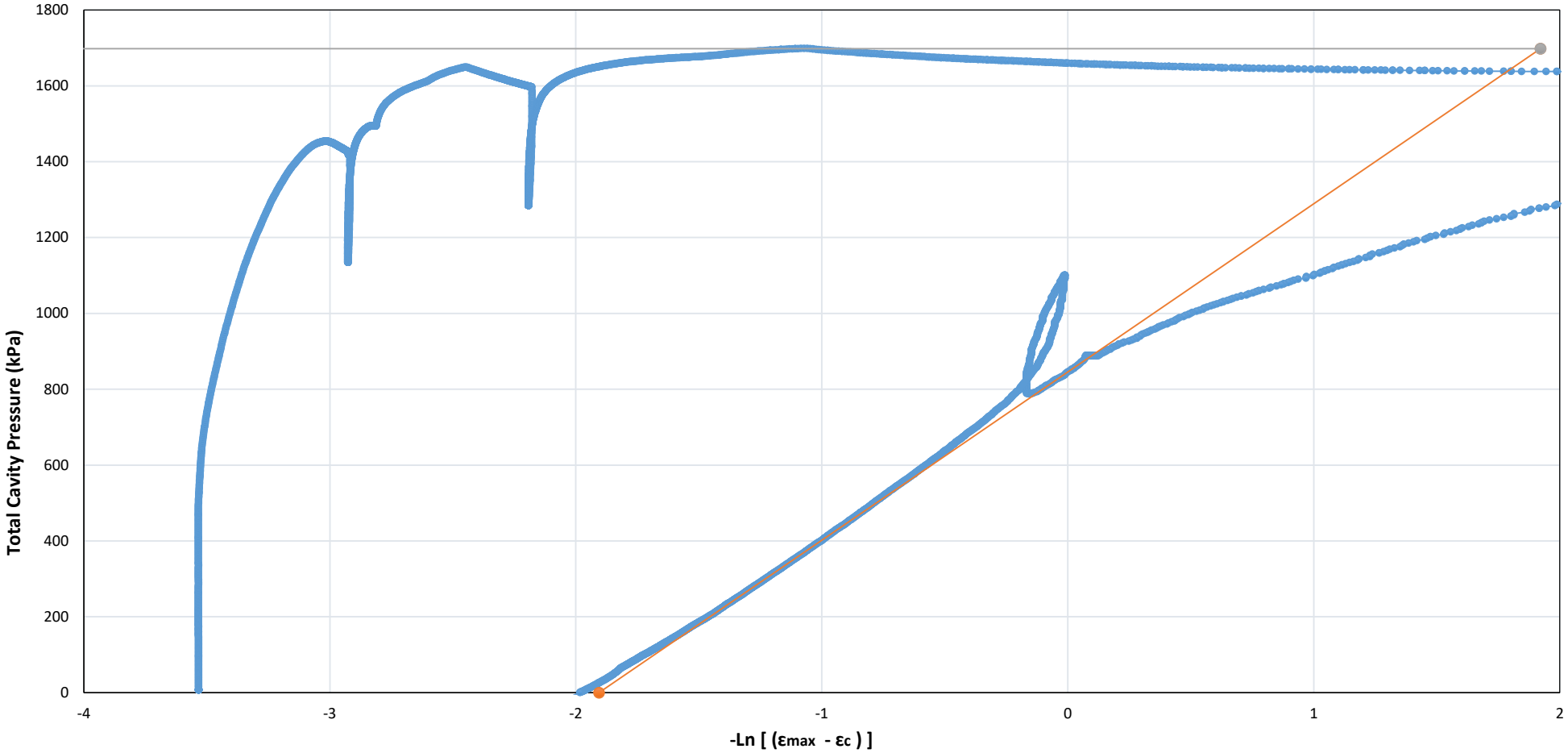
OMEGA ZONE 8, ST HELENS

Omega St Helens Ltd / T J Morris Ltd

Ground Investigation Report
& Remediation Strategy
Appendix D Part 14
OPP DOC. 2.18

Houlsby & Withers (1988) Undrained Shear Strength Analysis



Project Ref:	107284	**Shear strength Su:**	222 kPa	**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Drainage behaviour:**	Undrained	**Depth:**	**2.75 m**
Client Ref:				**Comments:**	
Location:	Warrington, UK				

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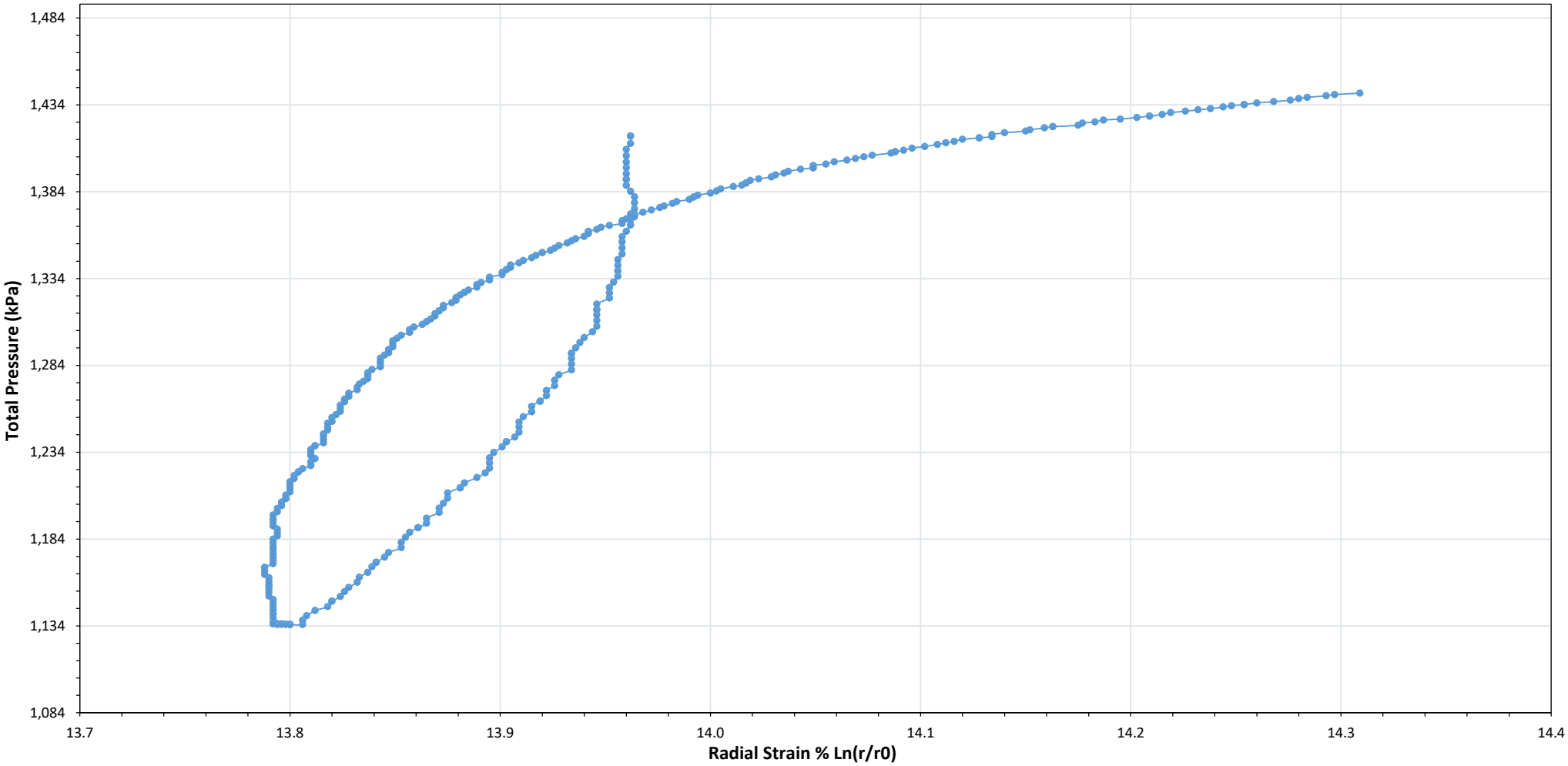
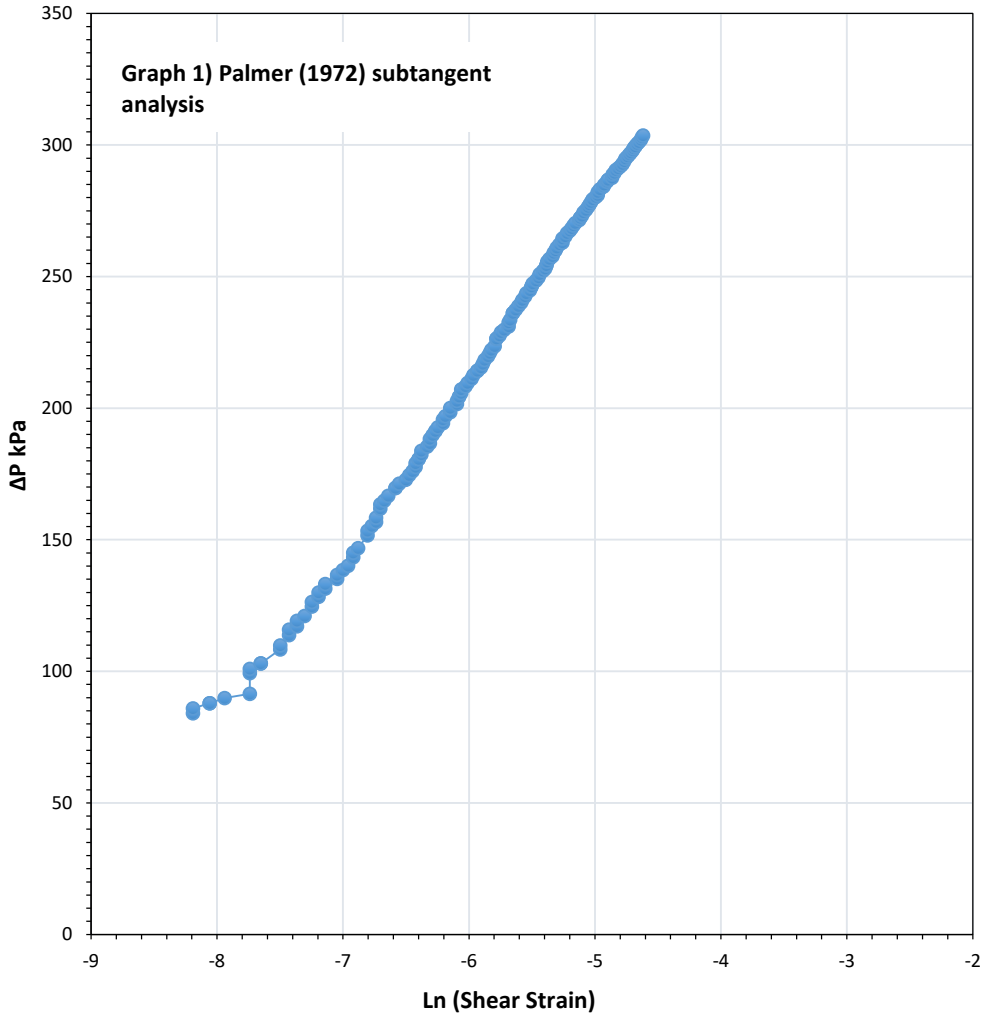
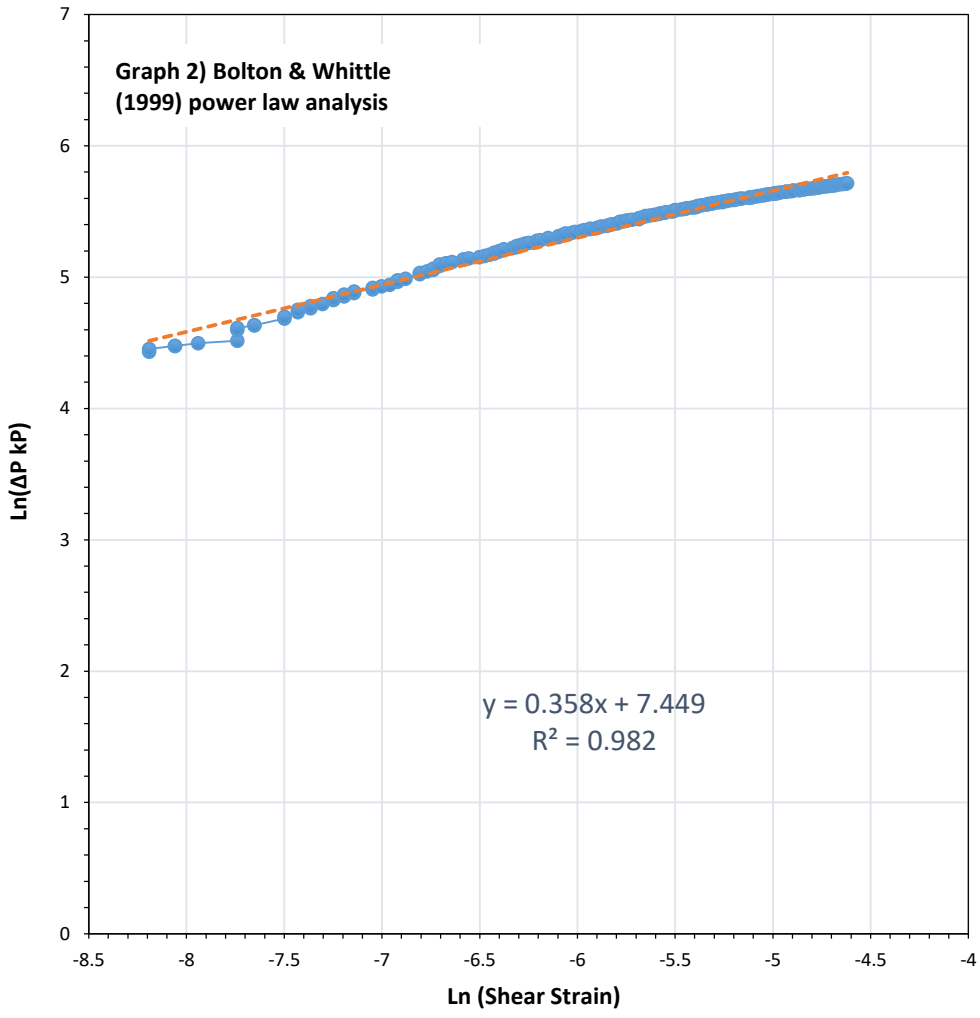
Loop 1 Total Pressure with Radial Cavity Strain



Project Ref:	107284	**Drainage behaviour:**	Undrained	**Shear modulus Gur:**	6779.8 MPa	**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Test type:**	FDPM	**Cavity strain range:**	0.09 %	**Depth:**	**2.75 m**
Client Ref:		**Loop duration:**	5.8 mins			**Comments:**	
Location:	Warrington, UK						

Loop 1 Non-Linear Stress-Strain Analysis





Project Ref:	107284	**Obtained Power Law Parameters (right hand side graph)**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β) (gradient):**	0.358	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	1.718 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α (β*η):**	0.615 MPa		

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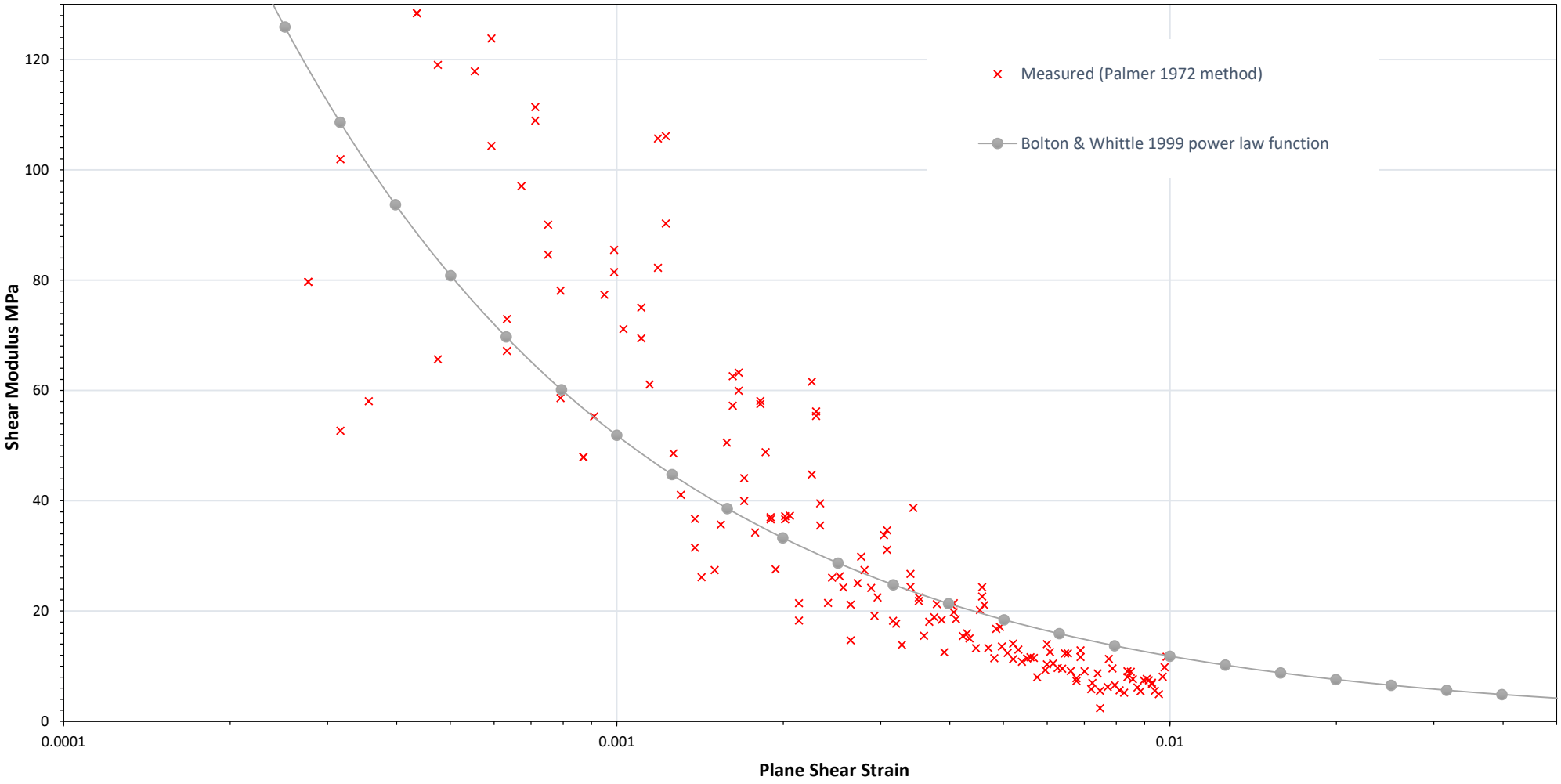
Loop 1 Non-Linear Analysis - Secant Shear Modulus with Plane Shear Strain



Project Ref:	107284	**Bolton & Whittle 1999 power law parameters applied**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β):**	0.358	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	1.718 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α = (β*η):**	0.615 MPa		

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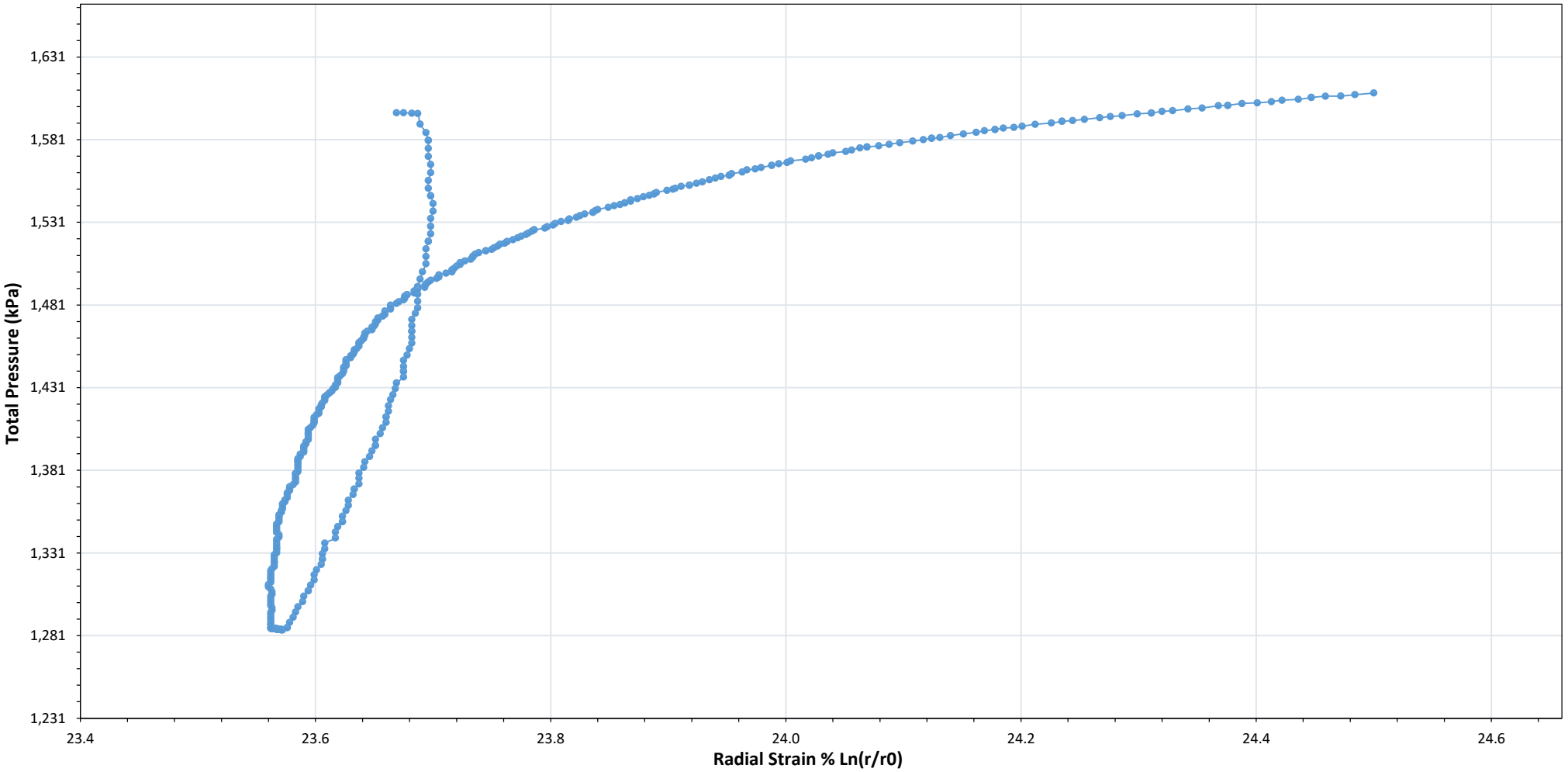
Loop 2 Total Pressure with Radial Cavity Strain



Project Ref:	107284	**Drainage behaviour:**	Undrained	**Shear modulus Gur:**	8612.2 MPa	**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Test type:**	FDPM	**Cavity strain range:**	0.07 %	**Depth:**	**2.75 m**
Client Ref:		**Loop duration:**	7.5 mins			**Comments:**	
Location:	Warrington, UK						

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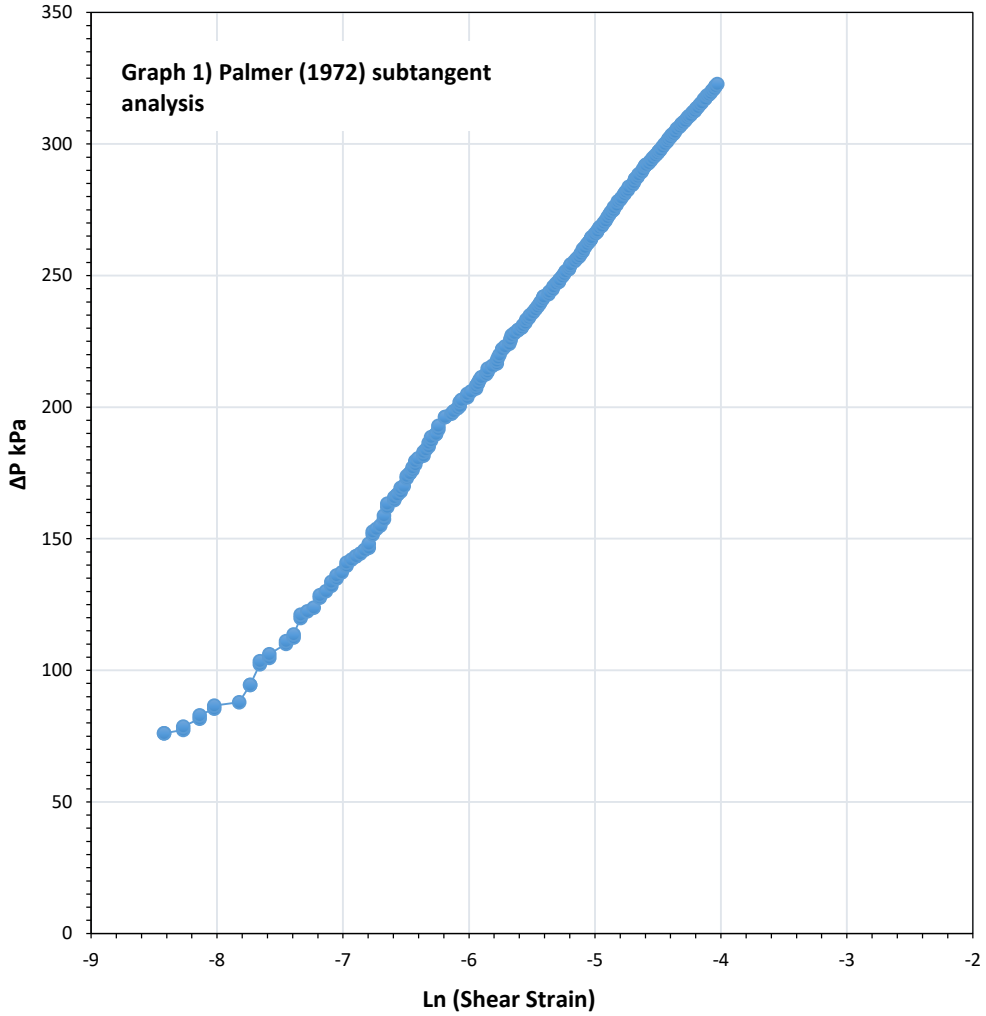
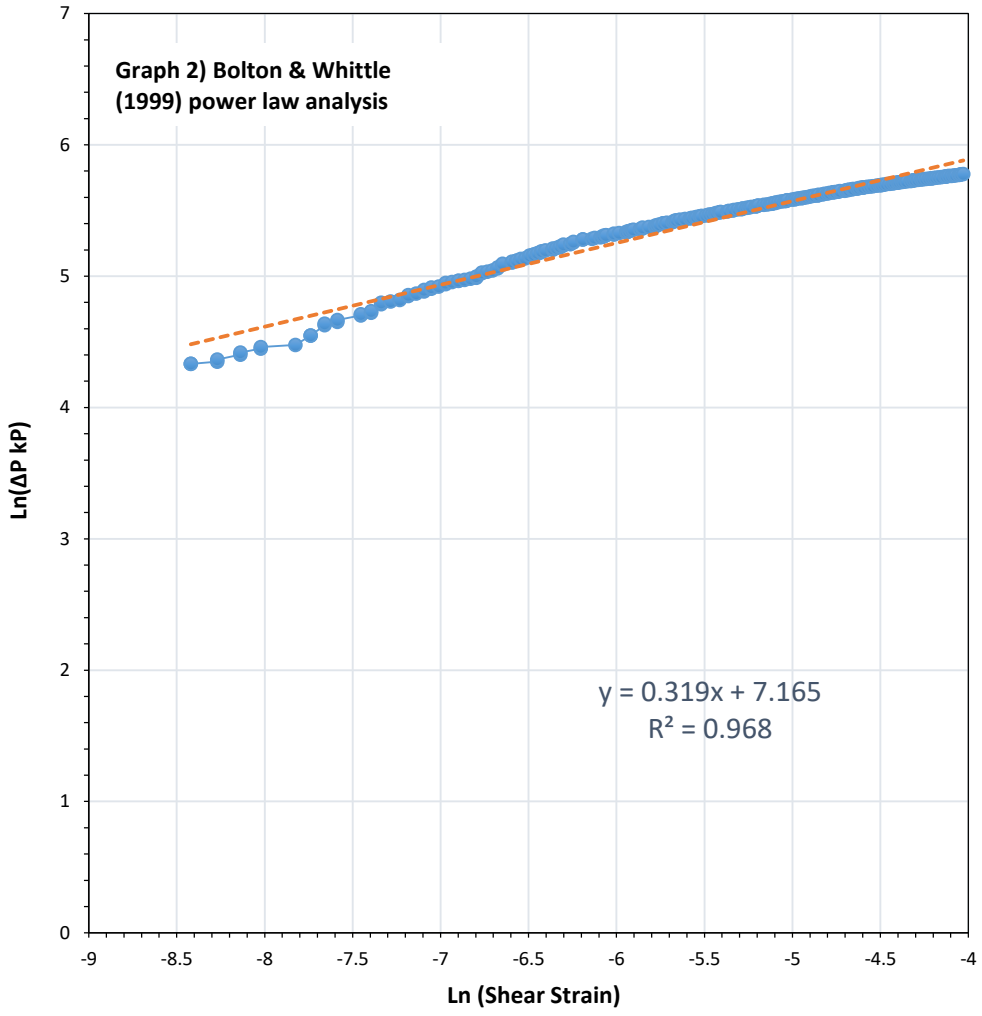
Loop 2 Non-Linear Stress-Strain Analysis





Project Ref:	107284	**Obtained Power Law Parameters (right hand side graph)**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β) (gradient):**	0.319	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	1.293 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α (β*η):**	0.412 MPa		

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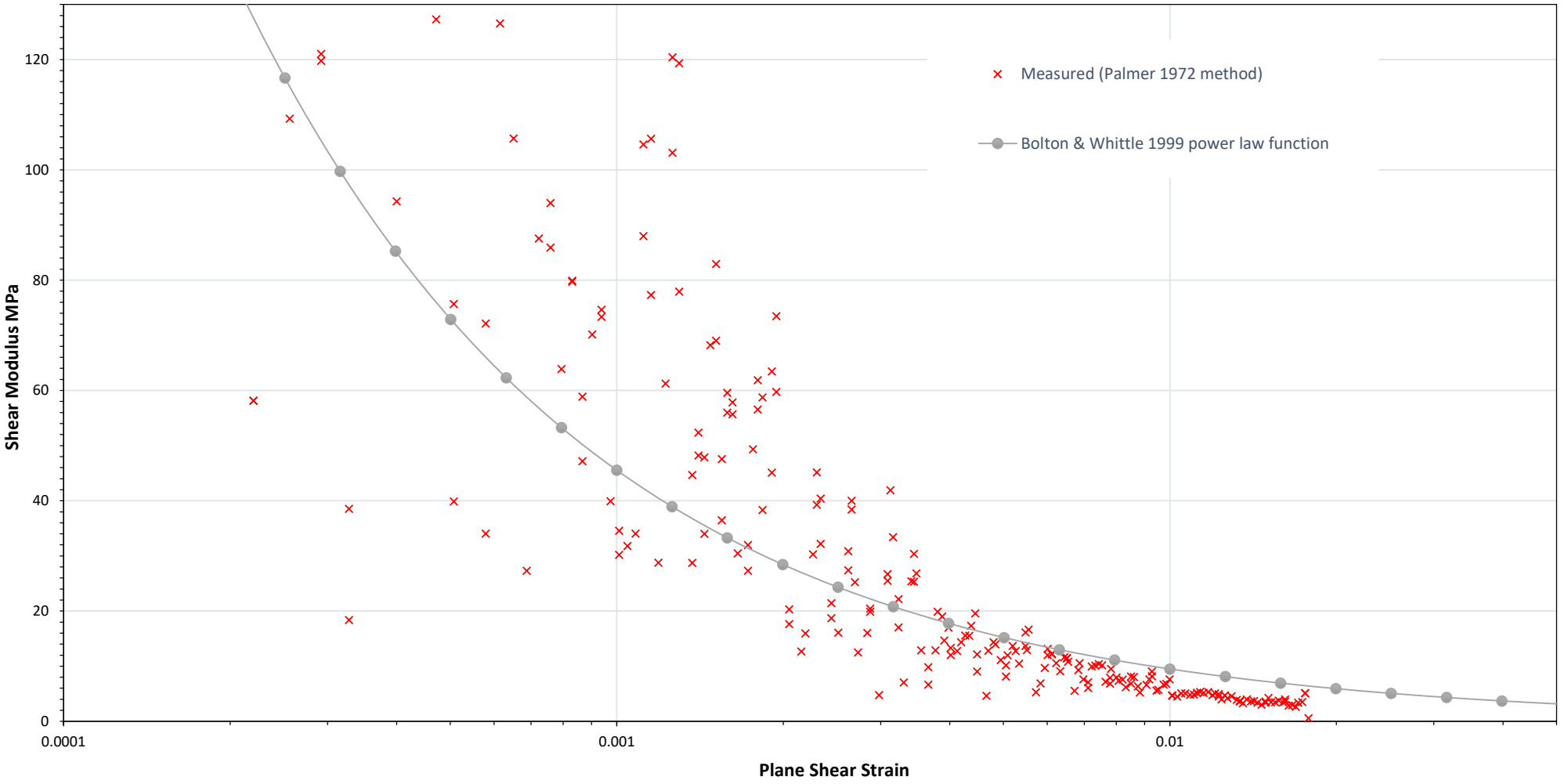
Loop 2 Non-Linear Analysis - Secant Shear Modulus with Plane Shear Strain



Project Ref:	107284	**Bolton & Whittle 1999 power law parameters applied**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β):**	0.319	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	1.293 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α = (β*η):**	0.412 MPa		

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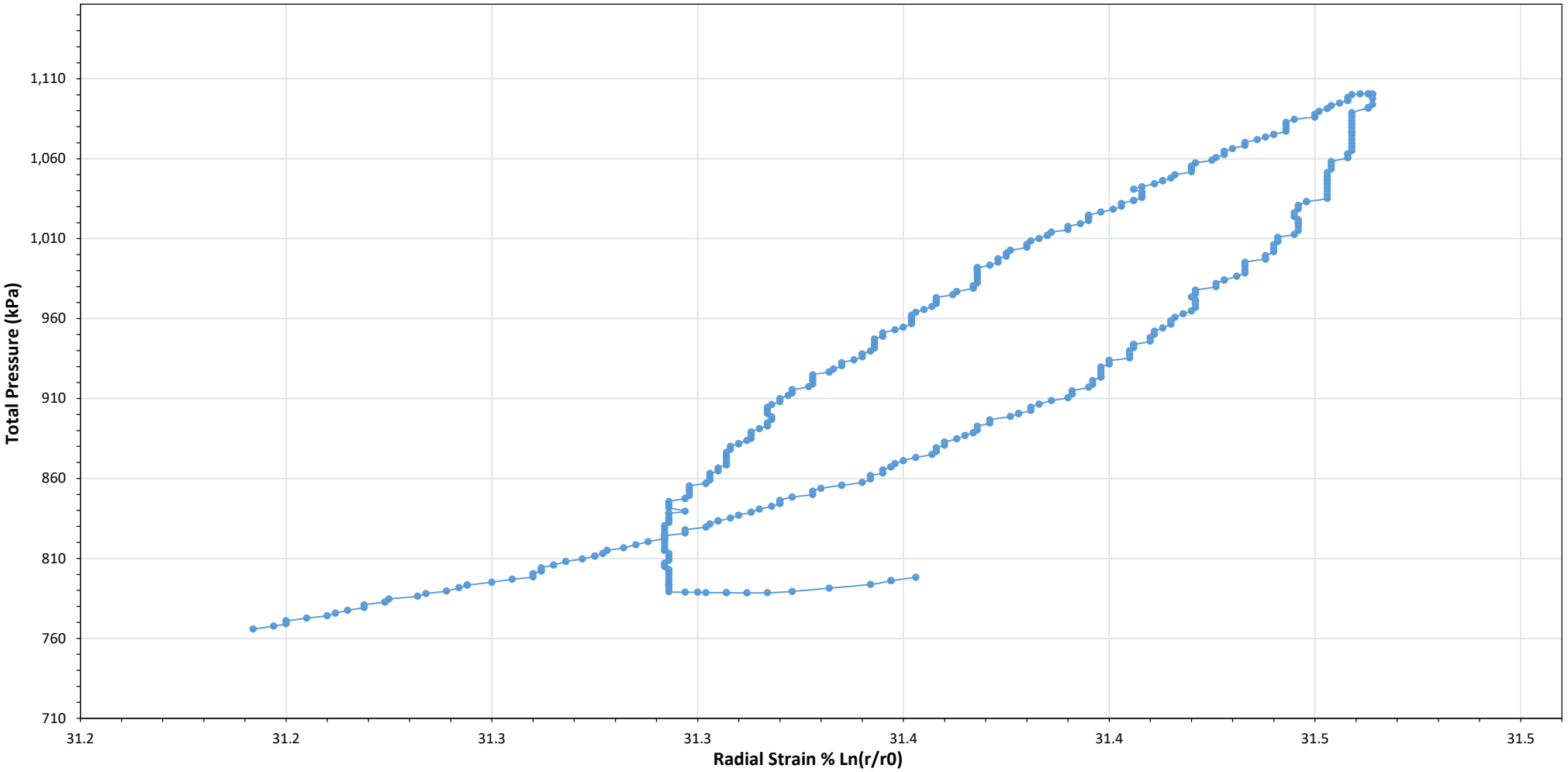
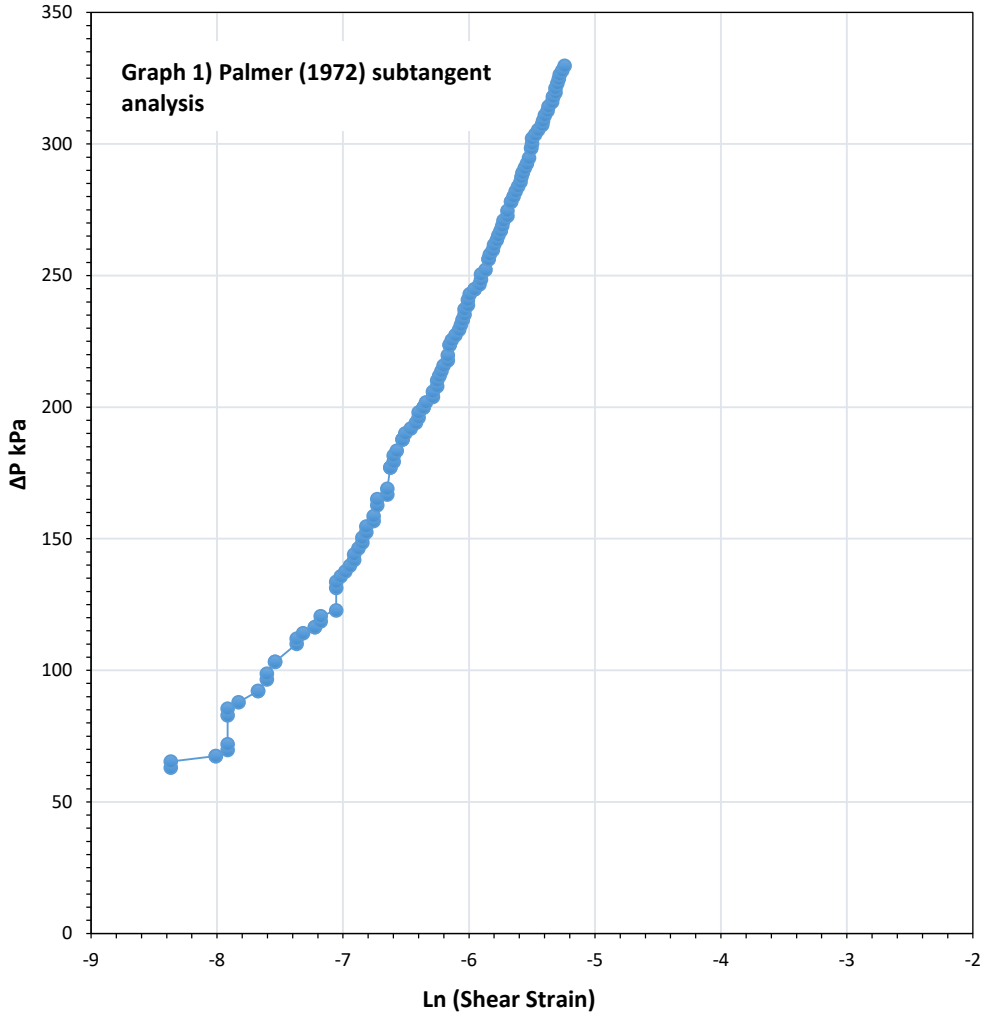
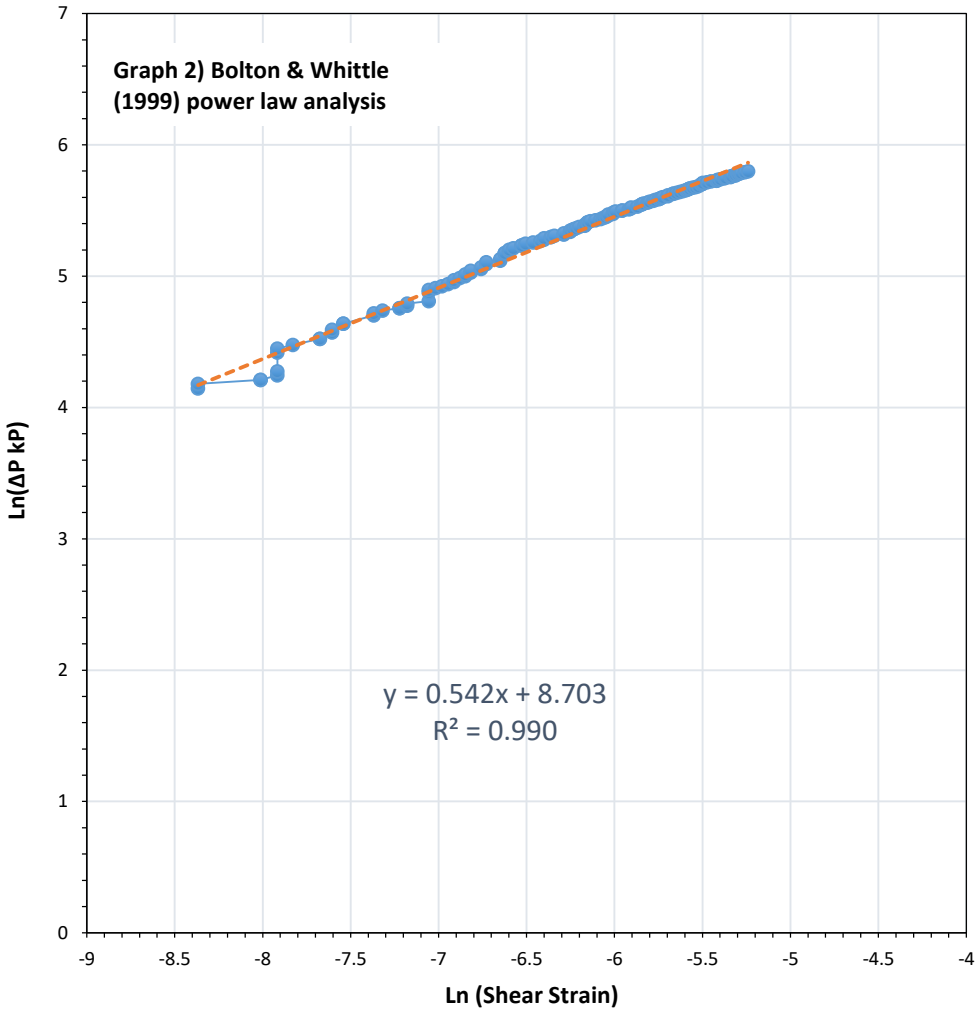
Loop 3 Total Pressure with Radial Cavity Strain



Project Ref:	107284	**Drainage behaviour:**	Undrained	**Shear modulus Gur:**	7852.3 MPa	**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Test type:**	FDPM	**Cavity strain range:**	0.1 %	**Depth:**	**2.75 m**
Client Ref:		**Loop duration:**	6.4 mins			**Comments:**	
Location:	Warrington, UK						

Loop 3 Non-Linear Stress-Strain Analysis





Project Ref:	107284	**Obtained Power Law Parameters (right hand side graph)**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β) (gradient):**	0.542	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	6.02 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α (β*η):**	3.263 MPa		

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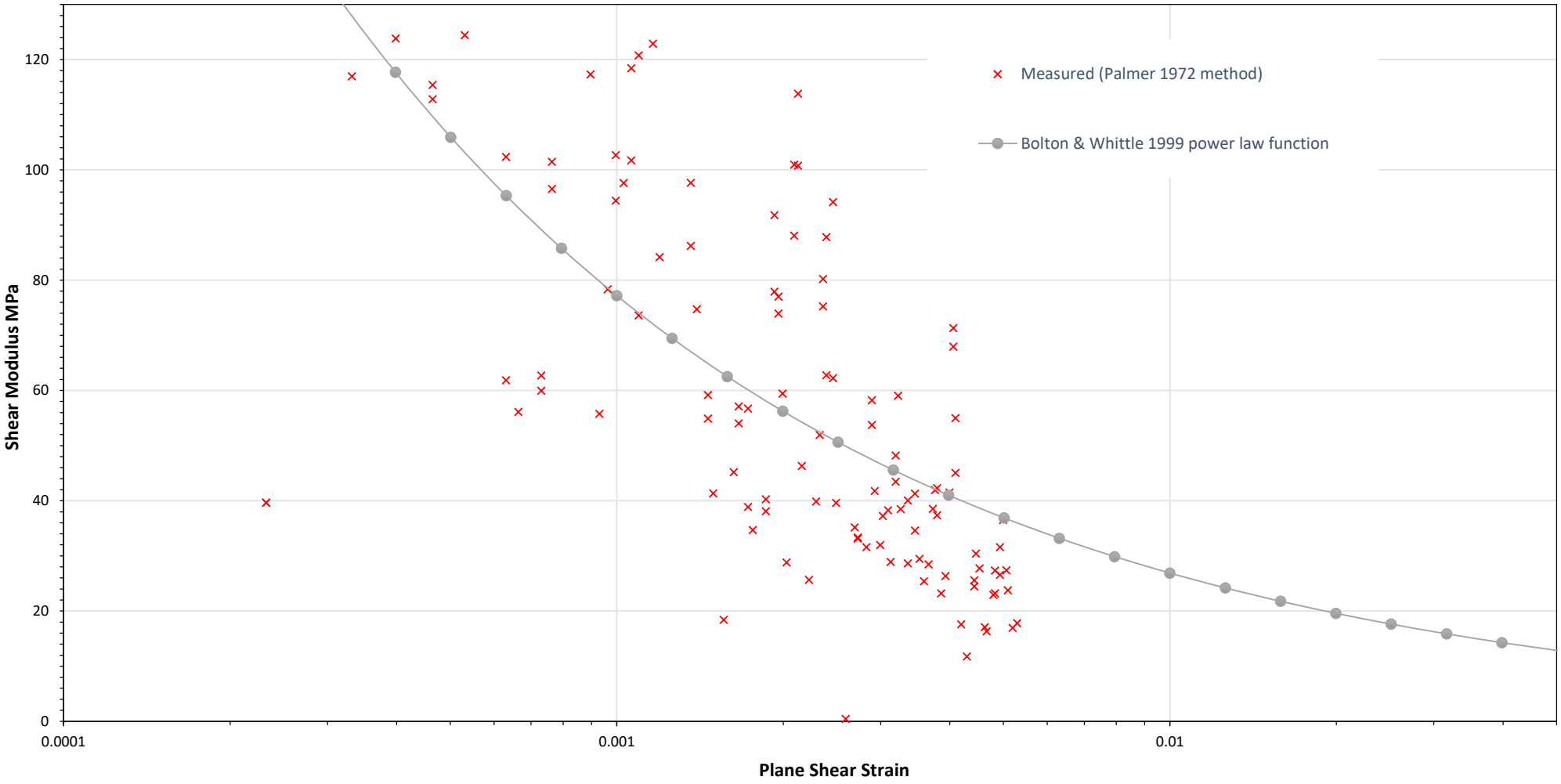
Loop 3 Non-Linear Analysis - Secant Shear Modulus with Plane Shear Strain



Project Ref:	107284	**Bolton & Whittle 1999 power law parameters applied**		**Location ID:**	**CPTP8B01**
Client:	Geotechnics	**Non-linearity exponent (β):**	0.542	**Depth:**	**2.75 m**
Client Ref:		**Intercept (η):**	6.02 MPa	**Comments:**	
Location:	Warrington, UK	**Shear stress constant α = (β*η):**	3.263 MPa		