Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Excavation Log

Excavation No: PSM TP02

Sheet: 1 of 1

Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~46 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302900 m
		Northing:	6239219 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			1.0		ML	SILT; red brown, trace gravel and rootlets	D	VST		Topsoil
							CL	CLAY; medium plasticity, red and grey, trace gravel (ironstone)	M	H	>>X	
								SHALE; moderately weathered, red and grey, laminated	D	R1		
					2.0			Practical refusal of excavator at 1.3 m				
					3.0							
					4.0							

Sketch:

File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Rock-Soil-Water

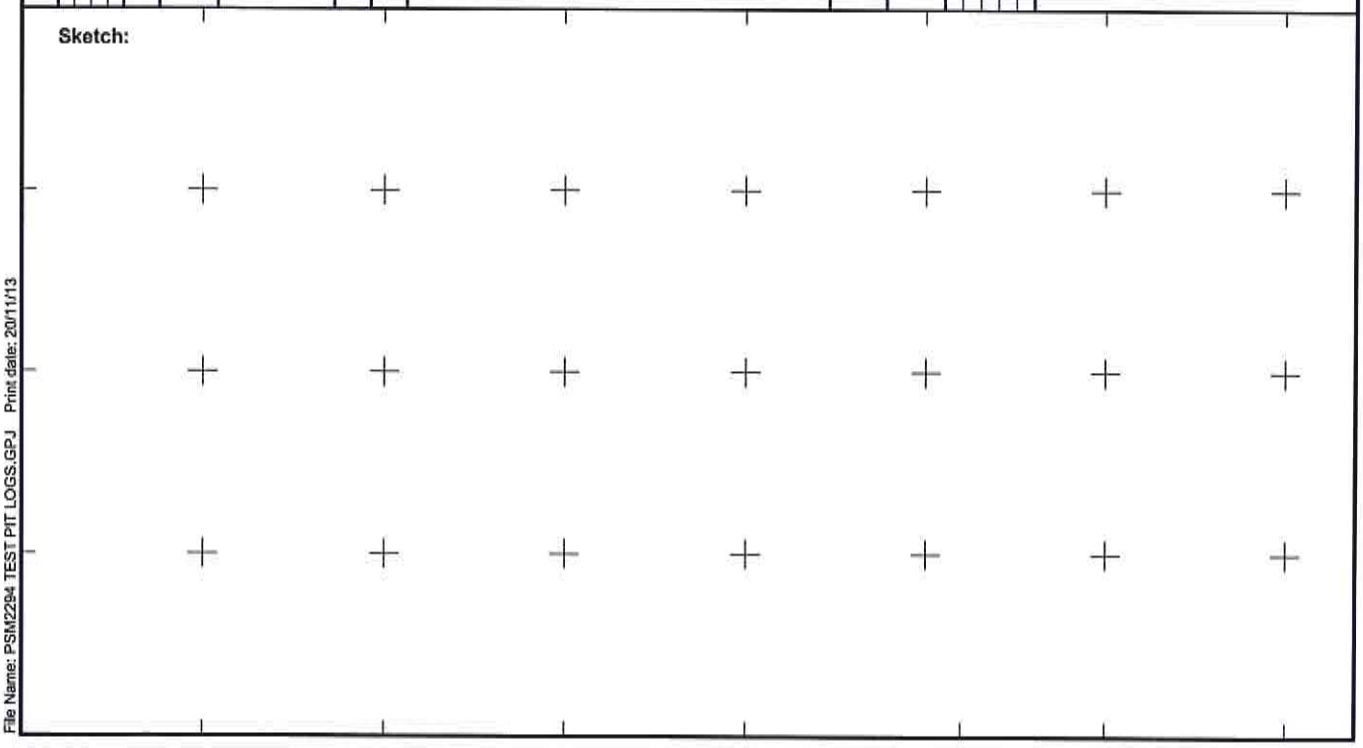
Excavation Log

Excavation No: PSM TP03
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~44.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302947 m
		Northing:	6239230 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		SM	Silty SAND; medium grained, red, with some gravel, trace rootlets	D	L		Topsoil
							CL	CLAY; medium plasticity, red and grey, occasional ironstone bands (R0), trace roots	M	H		Inferred residual
					1.0			SHALE; highly weathered, red and grey and dark grey, laminated	D	R1		Inferred bedrock
								Practical refusal of excavator at 1.4 m				
					2.0							
					3.0							
					4.0							

Sketch:



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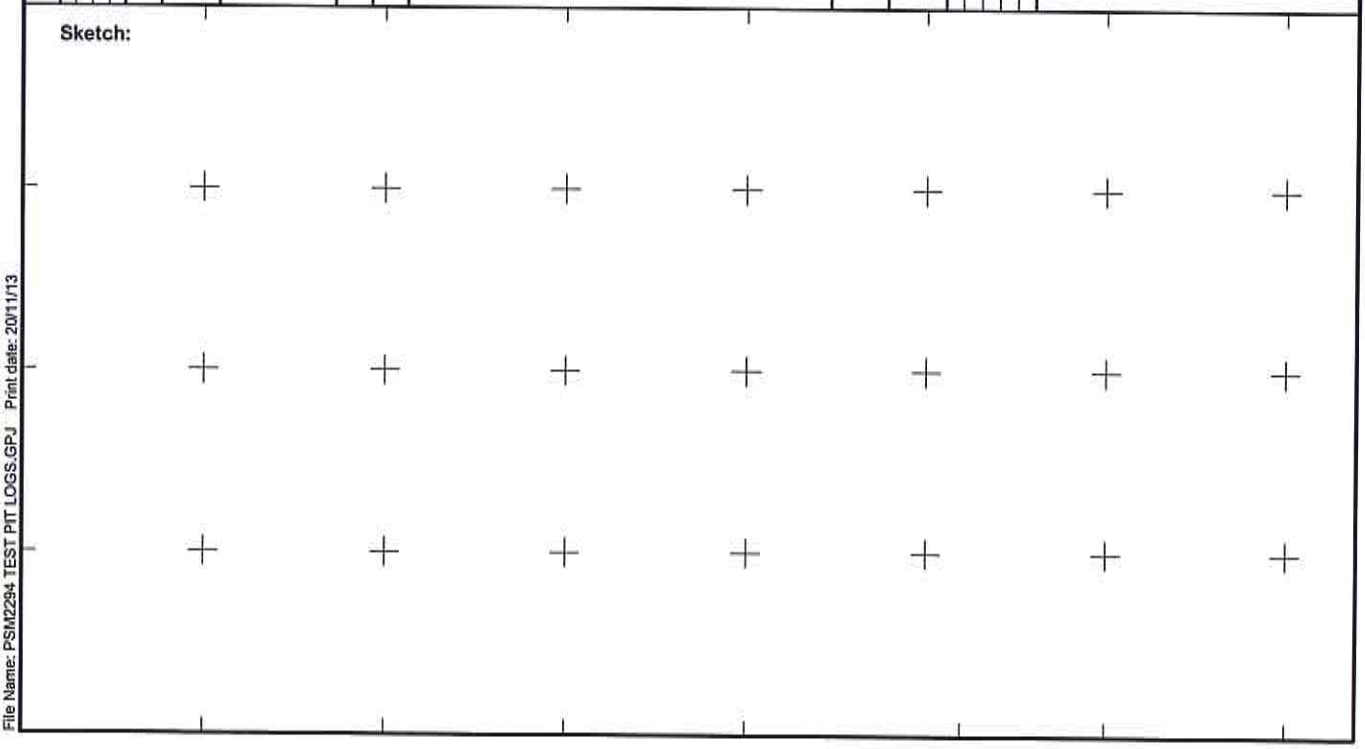
Excavation Log

Excavation No: PSM TP04
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~44 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302939 m
		Northing:	6239255 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1–2–3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed			0.0		SM	Silty SAND; fine grained, red brown, trace gravel and rootlets	D	L		Topsoil
							CL	CLAY; medium plasticity, red and brown	M	ST	300	Inferred residual
					1.0					H	500	
								SHALE; highly weathered, red and grey and brown, laminated	D	R1		Inferred bedrock
								Practical refusal of excavator at 1.4 m				
					2.0							
					3.0							
					4.0							

Sketch:



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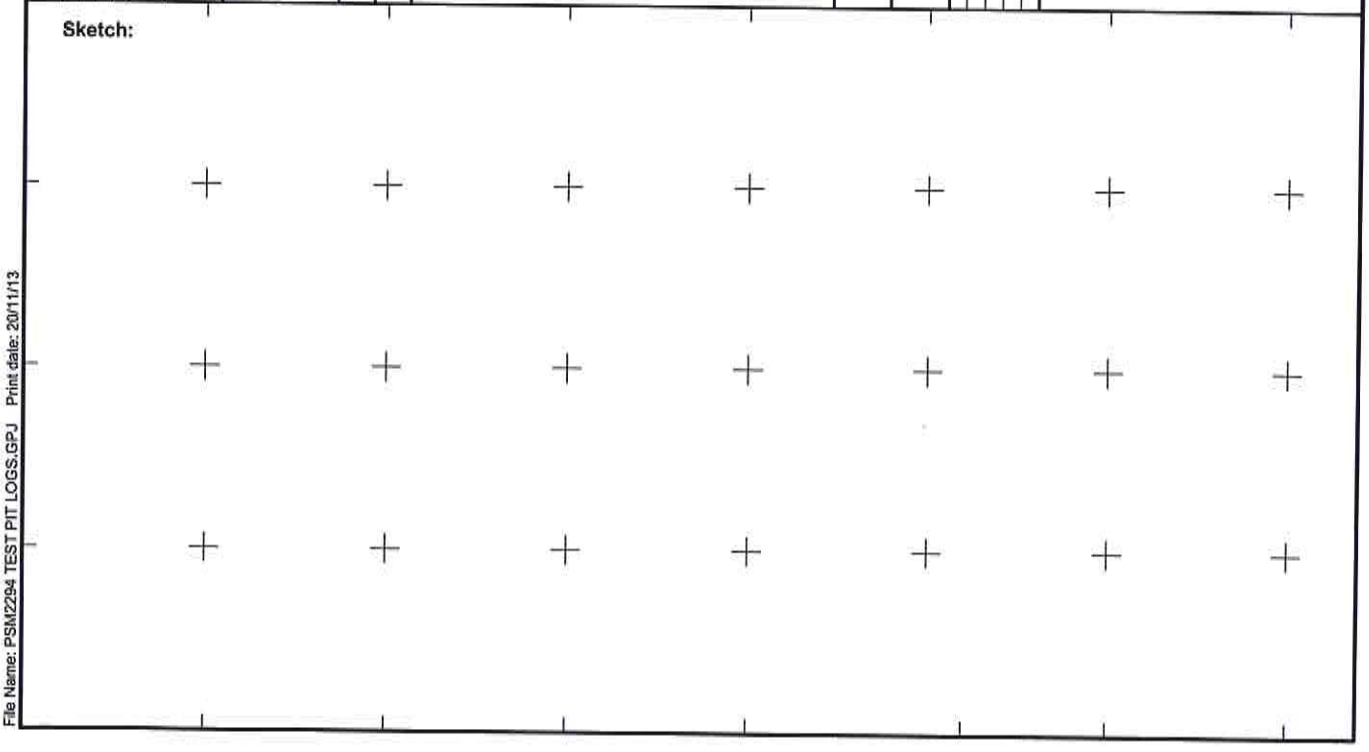
Excavation Log

Excavation No: PSM TP05
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~45 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302901 m
		Northing:	6239247 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration 1 2 3	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; red brown, trace sand, gravel and rootlets	D			Topsoil
							CL	CLAY; medium plasticity, red and grey, trace gravel (ironstone) and rootlets	M	VST	400	Inferred residual
					1.0			SHALE; highly weathered, dark grey, grey and orange bands, laminated	D	R0		Inferred bedrock
					2.0			Practical refusal of excavator at 2.0 m		R1		
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Excavation Log

Excavation No: PSM TP06

Sheet: 1 of 1

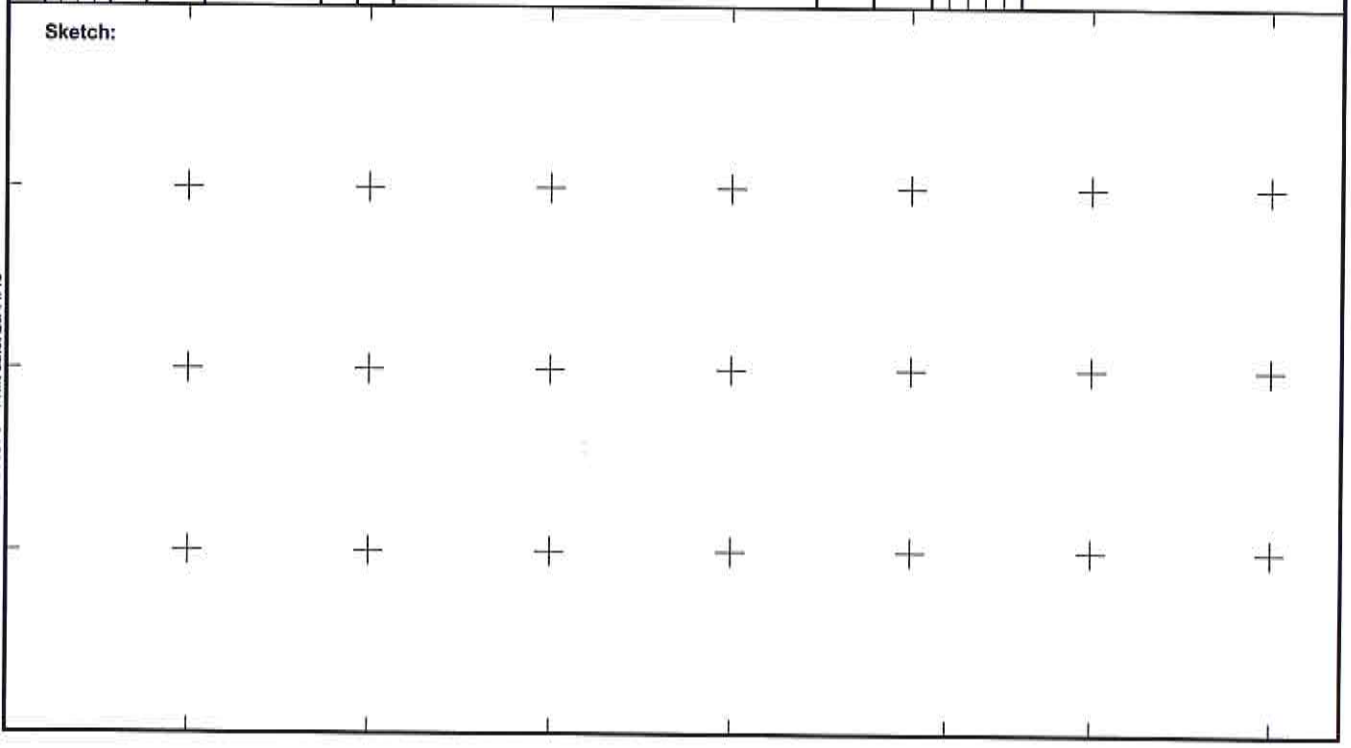
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS

Equipment type:	CAT 20t Excavator	**R.L. surface:**	~45 m	**Vertical datum:**	AHD
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302870 m	**Horizontal datum:**	MGA
		Northing:	6239255 m		

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed					ML	SILT; red brown, trace sand, gravel and rootlets	D			Topsoil
							CL	CLAY; medium plasticity, grey and red, trace gravel (ironstone) and rootlets	M	H		Inferred residual
					1.0			SHALE; highly weathered, dark grey, grey and orange bands, laminated	D	R1		Inferred bedrock
								Practical refusal of excavator at 1.2 m				
					2.0							
					3.0							
					4.0							

Sketch:



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Excavation Log

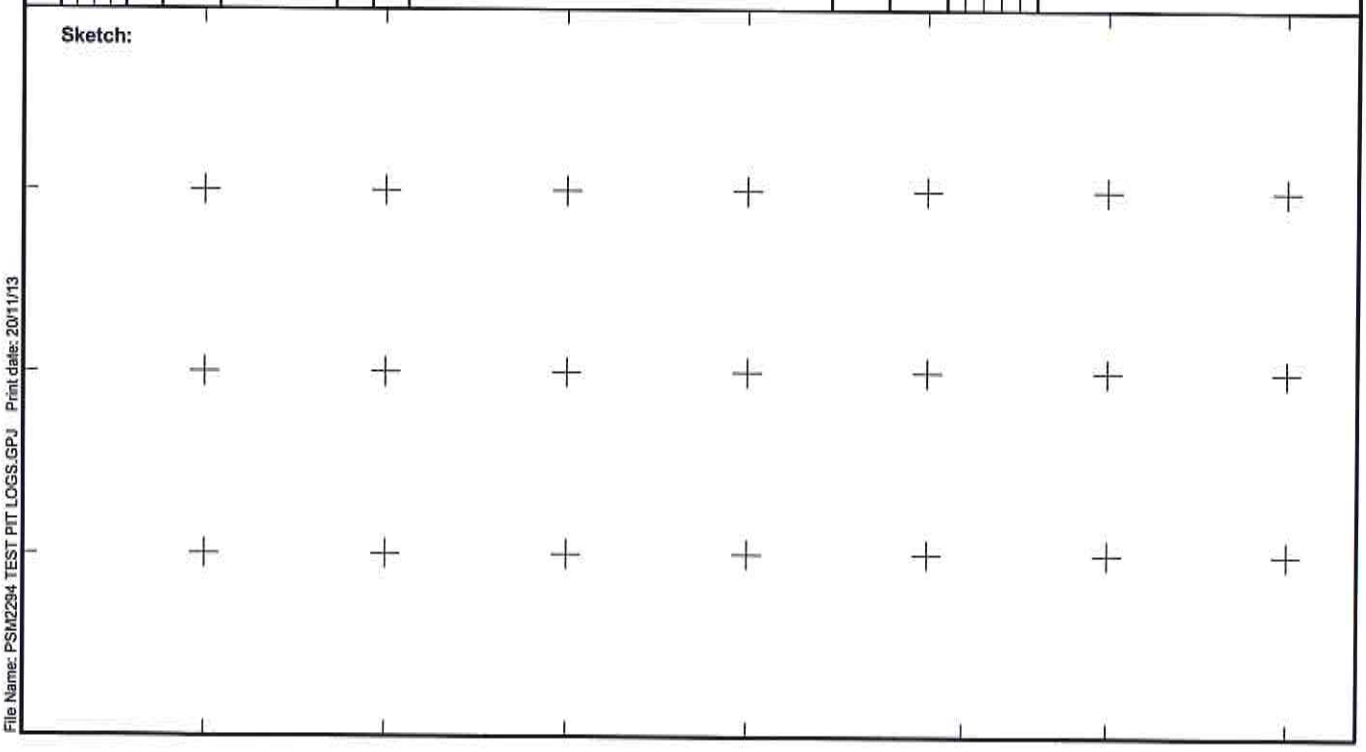
Excavation No: TP01
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS

Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m	**Vertical datum:**	AHD
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303034 m	**Horizontal datum:**	MGA
		Northing:	6239381 m		

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0			SILT; brown, trace gravel and rootlets	D	ST		Topsoil
							ML	SILT; brown				Inferred fill trace of building rubble
					1.0							
							CL	CLAY; medium plasticity, orange and grey	M	H		Inferred residual
					2.0							
					3.0							
					4.0			End of test pit at 3.7 m				

Sketch:



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Excavation Log

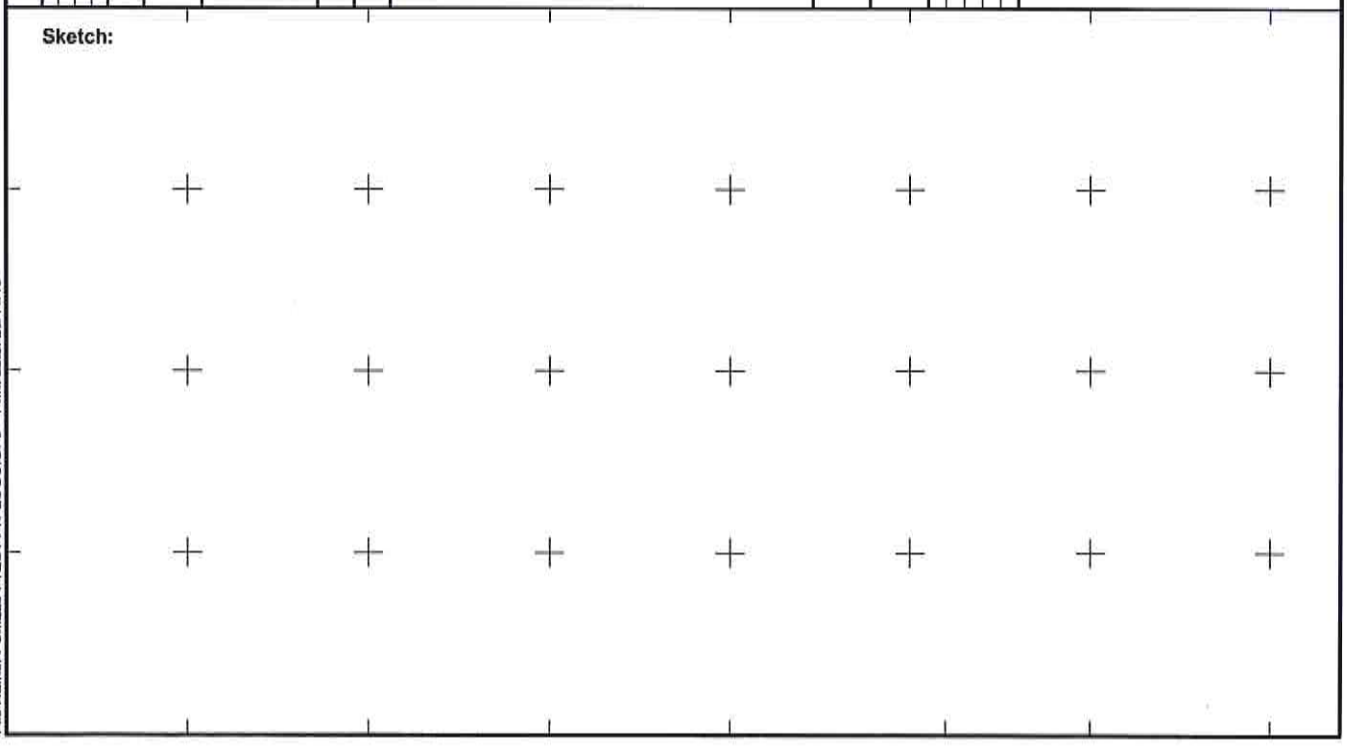
Excavation No: TP02
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS

Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m	**Vertical datum:**	AHD
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303063 m	**Horizontal datum:**	MGA
		Northing:	6239370 m		

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0			SILT; brown, with some gravel, trace rootlets		ST		Topsoil
							ML	SILT; brown				Inferred fill
					1.0			CLAY; medium plasticity, orange and grey	M	H		Inferred residual
					2.0		CL					
					3.0			SHALE; extremely weathered, grey red and orange		R0		Inferred bedrock
					4.0			End of test pit at 3.5 m				

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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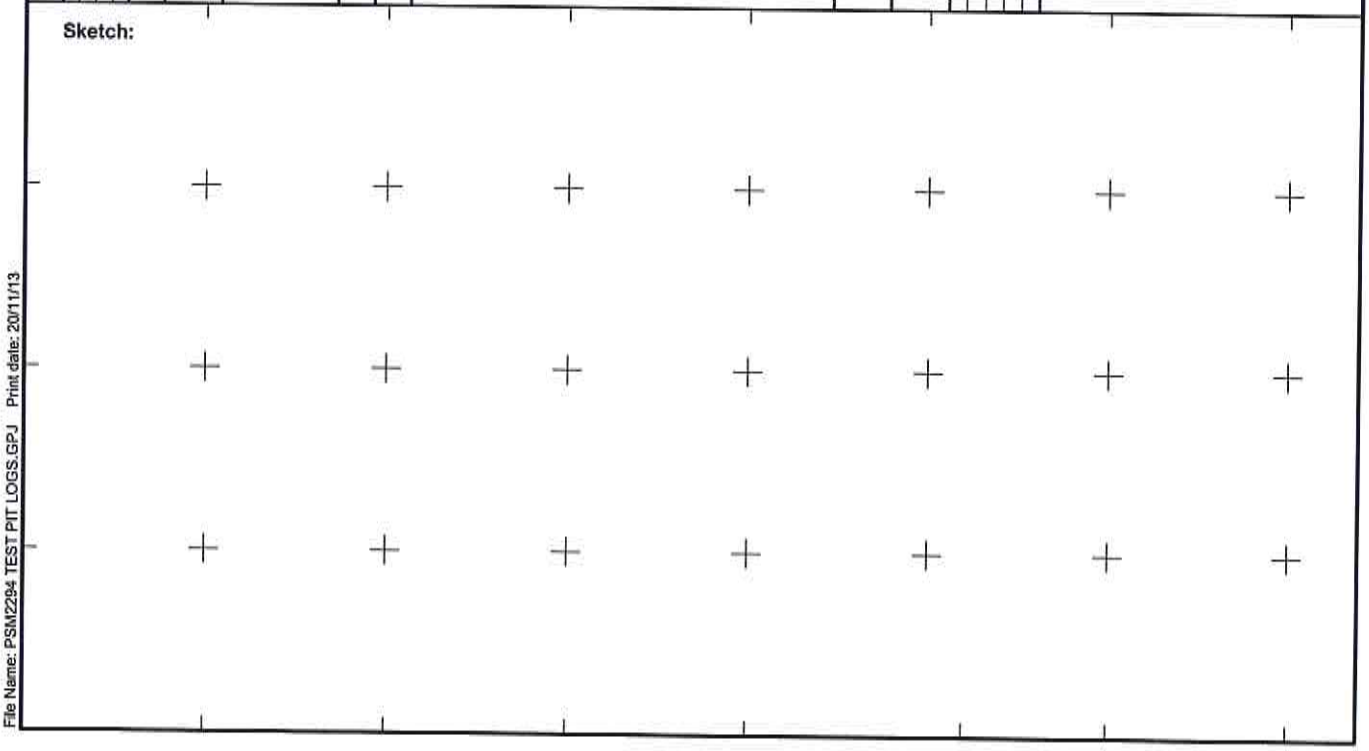
Excavation Log

Excavation No: TP03
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303098 m
		Northing:	6239363 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; brown, trace gravel and rootlets	D	VST	500	Topsoil
								SILT; brown			500	Inferred fill
					1.0		CL	CLAY; medium plasticity, orange and grey	M	H		Inferred residual
					3.0			SHALE; extremely weathered, grey red and orange		R0		Inferred bedrock
					4.0			End of test pit at 4.3 m				

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Rock-Soil-Water

Excavation Log

Excavation No: TP04
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303119 m
		Northing:	6239381 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed			0.0			SILT; brown, travel gravel and rootlets	D		500	Topsoil
							ML	SILT; brown		VST		Inferred fill trace refuse (building rubble)
					1.0			Colour change to dark brown			50	
								CLAY; medium plasticity, orange and grey				Inferred residual
					2.0		CL		M	H		Minor seepage from pond
			Bs		3.0							
								SHALE; extremely weathered, grey red and orange		R0		Inferred bedrock
					4.0			End of test pit at 3.7 m				

Sketch:

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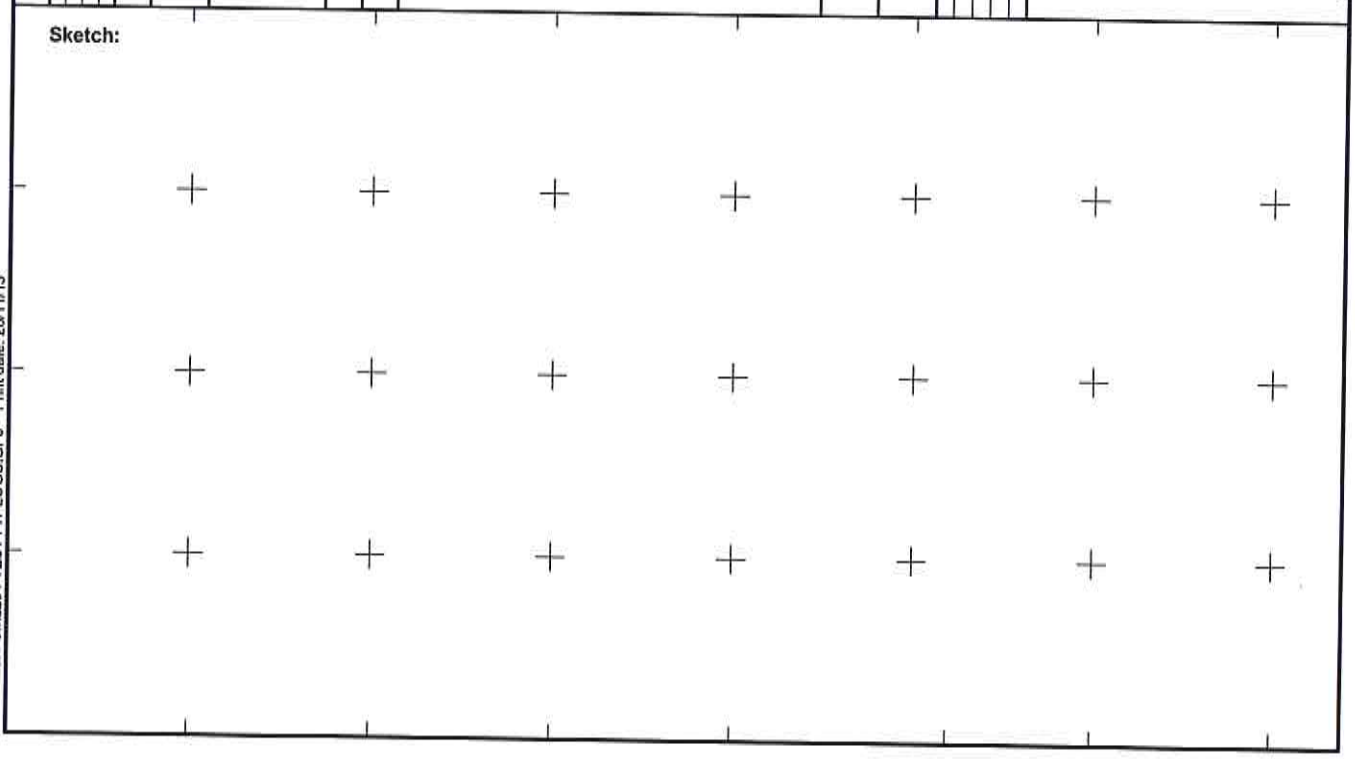
Excavation Log

Excavation No: TP05
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303127 m
		Northing:	6239414 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed	Bs		1.0		ML	SILT; brown, trace gravel and rootlets	D			Topsoil
								CLAY; high plasticity, red, trace gravel		VST	450	Inferred fill trace refuse (building rubble)
								CLAY; medium plasticity, dark brown				
								CLAY; medium plasticity, grey and orange		ST	150	Inferred residual
					2.0		CL		M	H		
					3.0							
								SHALE; extremely weathered, grey red and orange		R0		Inferred bedrock
					4.0			End of test pit at 4.0 m				

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Engineering Consultants
Rock-Soil-Water

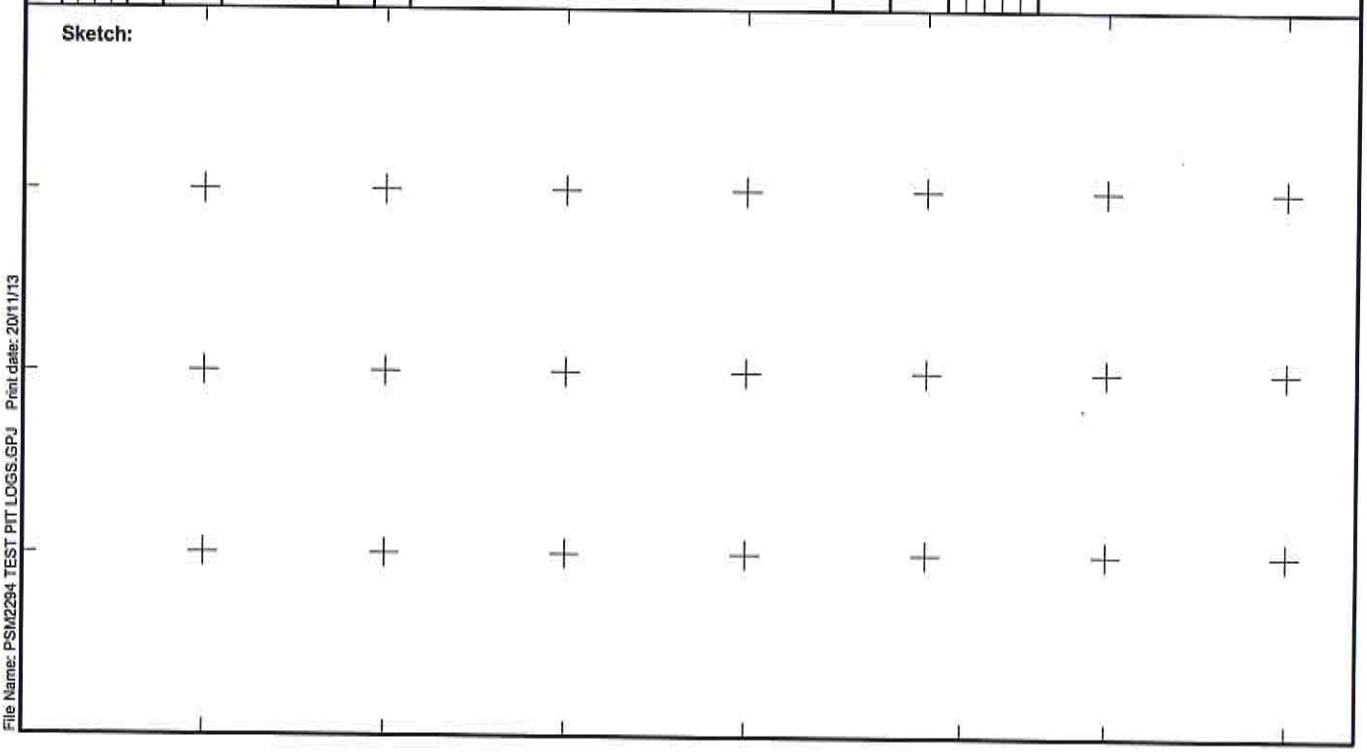
Excavation Log

Excavation No: TP06
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303103 m
		Northing:	6239428 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration 1 2 3	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; brown, with some gravel, trace rootlets				Topsoil
								SILT; brown, trace rootlets	D	VST	>>	Inferred fill
					1.0		CL	CLAY; medium plasticity, orange grey and red	M	H	>>	Inferred residual
					2.0							
					3.0			End of test pit at 2.5 m				
					4.0							

Sketch:



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Engineering Consultants
Rock-Soil-Water

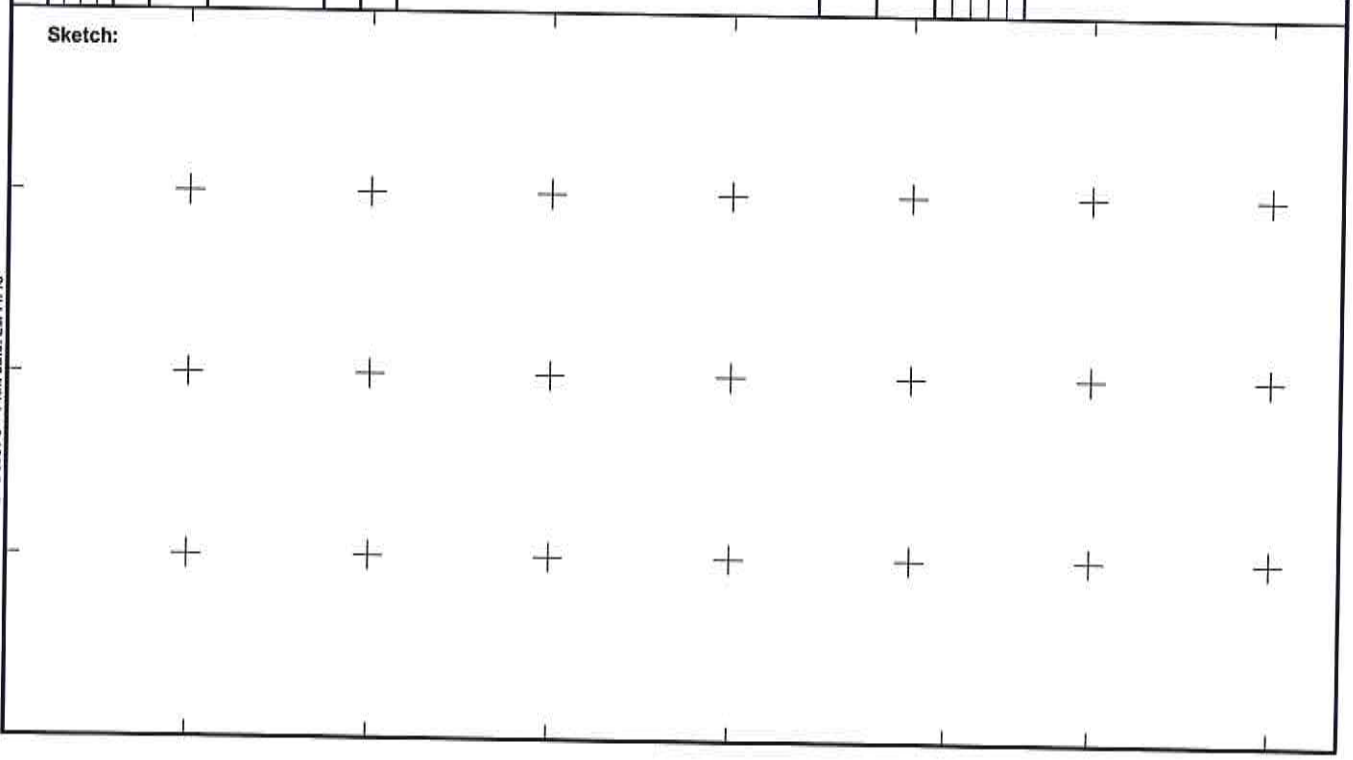
Excavation Log

Excavation No: TP07
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~42.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	303068 m
		Northing:	6239423 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) (100 200 300 400)	Structure and Additional Observations
Excavator		None observed			1.0		ML	SILT; brown, with some gravel, trace rootlets	D	VST		Topsoil
								SILT; red brown				Inferred fill
					2.0		CL	CLAY; medium plasticity, red grey and orange, trace gravel (ironstone)		H		Inferred residual
								Increased red colour	M			
					3.0			SHALE; extremely weathered, red grey and orange		R0		Inferred bedrock
					4.0			End of test pit at 3.7 m				

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Engineering Consultants
Rock-Soil-Water

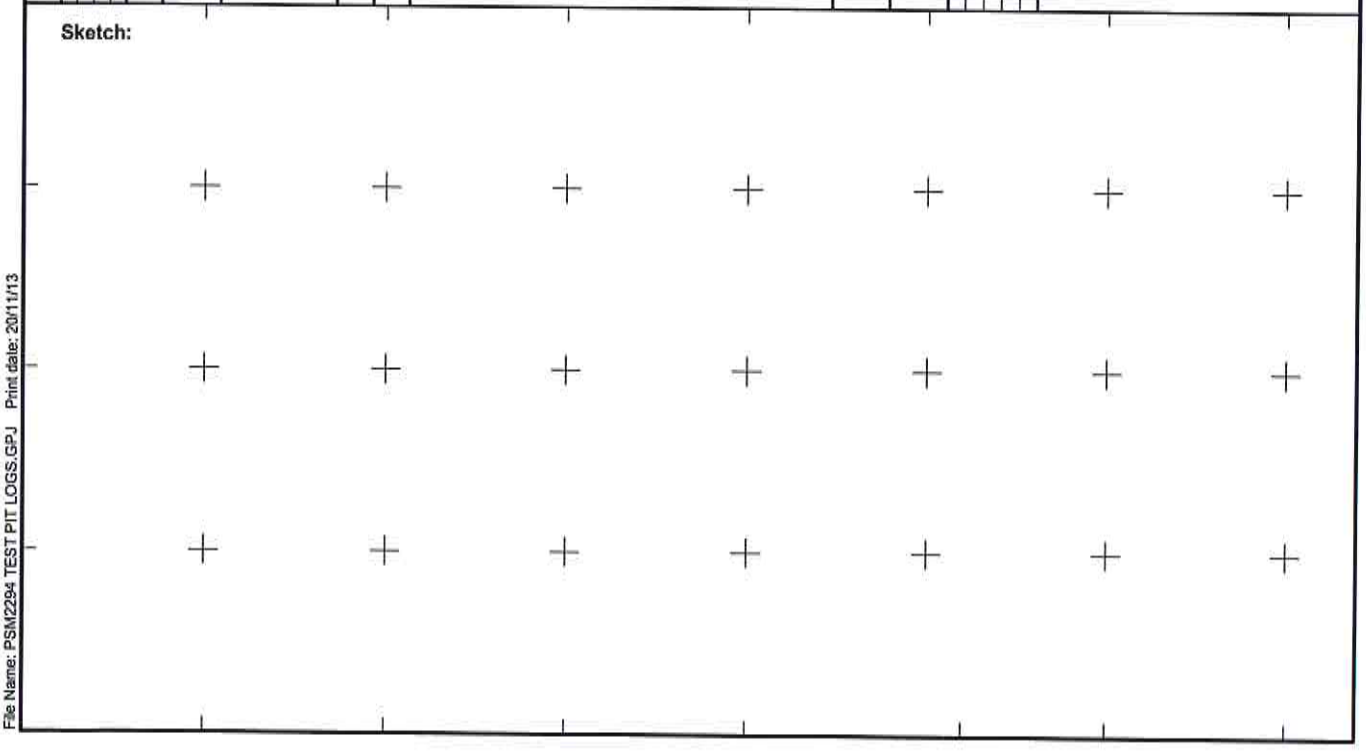
Excavation Log

Excavation No: TP08
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~48 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302830 m
		Northing:	6239179 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		SM	Silty SAND; fine grained, brown, trace gravel and rootlets	D	L		Topsoil
								CLAY; medium plasticity, red, trace rootlets				Inferred residual
					1.0		CL	Colour change to grey and red	M	H		
					2.0			SHALE; highly weathered, grey and red, laminated, with some ironstone	D	R1		Inferred bedrock
								Colour change to grey				
								End of test pit at 2.4 m				
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Rock-Soil-Water

Excavation Log

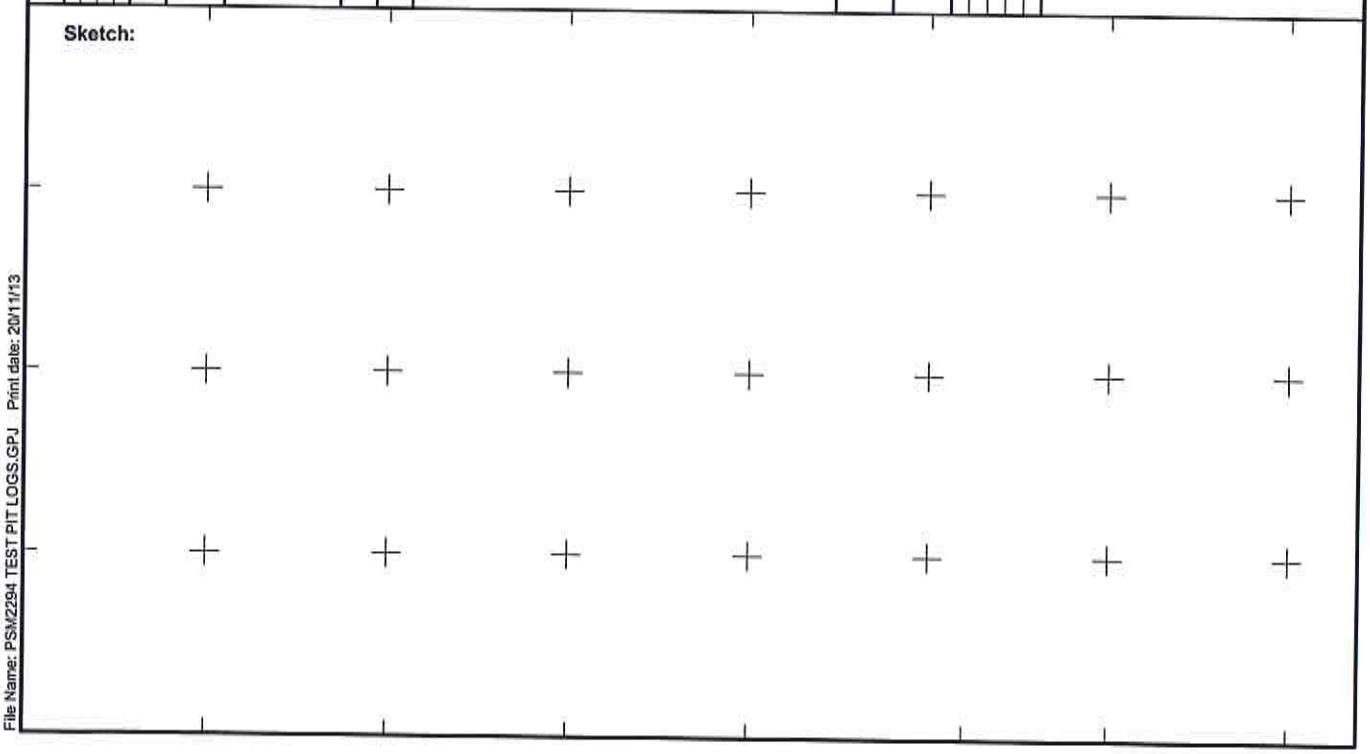
Excavation No: TP10
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS

Equipment type:	CAT 20t Excavator	**R.L. surface:**	~47.5 m	**Vertical datum:**	AHD
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302816 m	**Horizontal datum:**	MGA
		Northing:	6239193 m		

Method	Penetration 1 2 3	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; brown, with some sand, trace rootlets		ST	400	Topsoil
								CLAY; medium plasticity, red, trace rootlets				Inferred residual
					1.0		CL	Colour change to grey	M	VST	400	
					2.0			SHALE; highly weathered, red and grey, laminated, with some ironstone	D	R1		Inferred bedrock
								Practical refusal of excavator at 2.4 m				
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Excavation Log

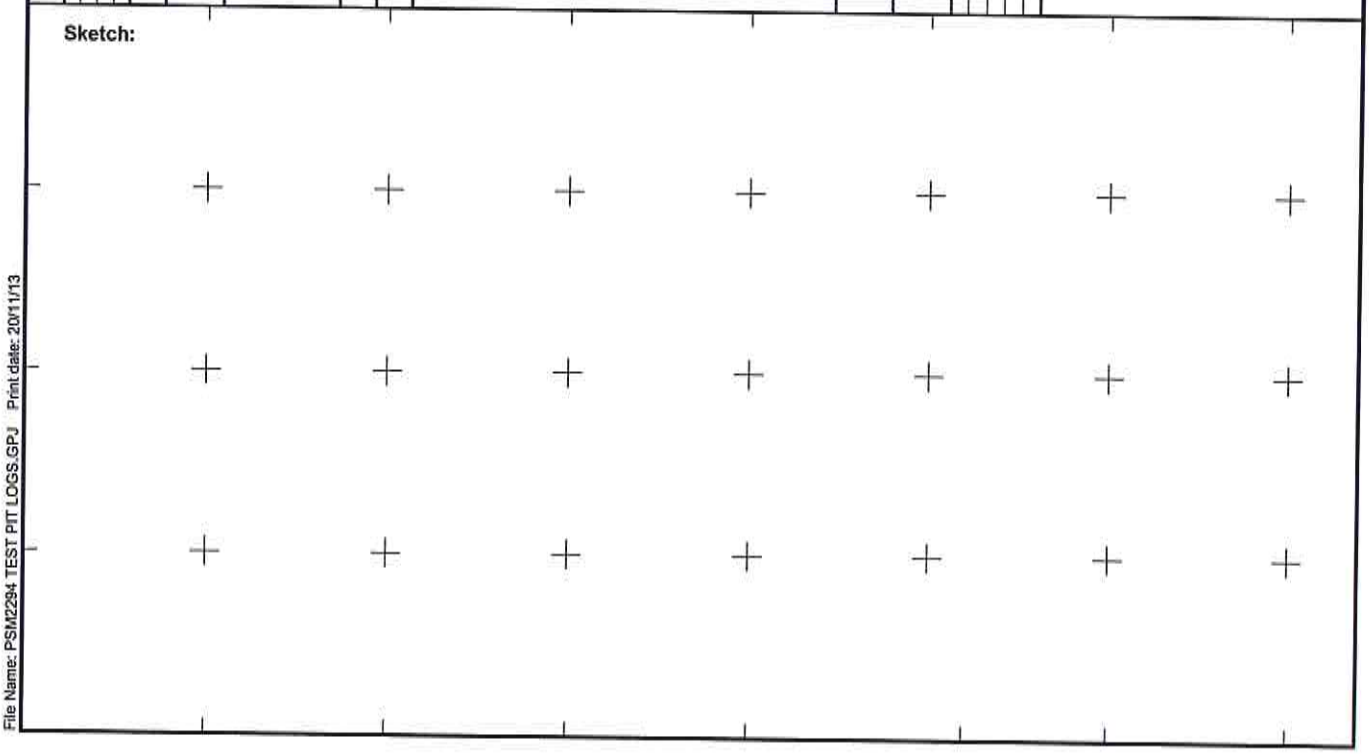
Excavation No: TP11
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	30/10/2013
Principal:		**Date completed:**	30/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS

Equipment type:	CAT 20t Excavator	**R.L. surface:**	~47 m	**Vertical datum:**	AHD
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302803 m	**Horizontal datum:**	MGA
		Northing:	6239202 m		

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed	Bs				SM	Silty SAND; fine grained, brown, trace rootlets	D	L		Topsoil
							CL	CLAY; medium plasticity, red, trace rootlets			450 X	Inferred residual
					1.0			Colour change to grey	M	H	450 X	
					2.0			SHALE; highly weathered, red and grey, laminated, with some ironstone	D	R1		Inferred bedrock
								Practical refusal of excavator at 2.1 m				
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

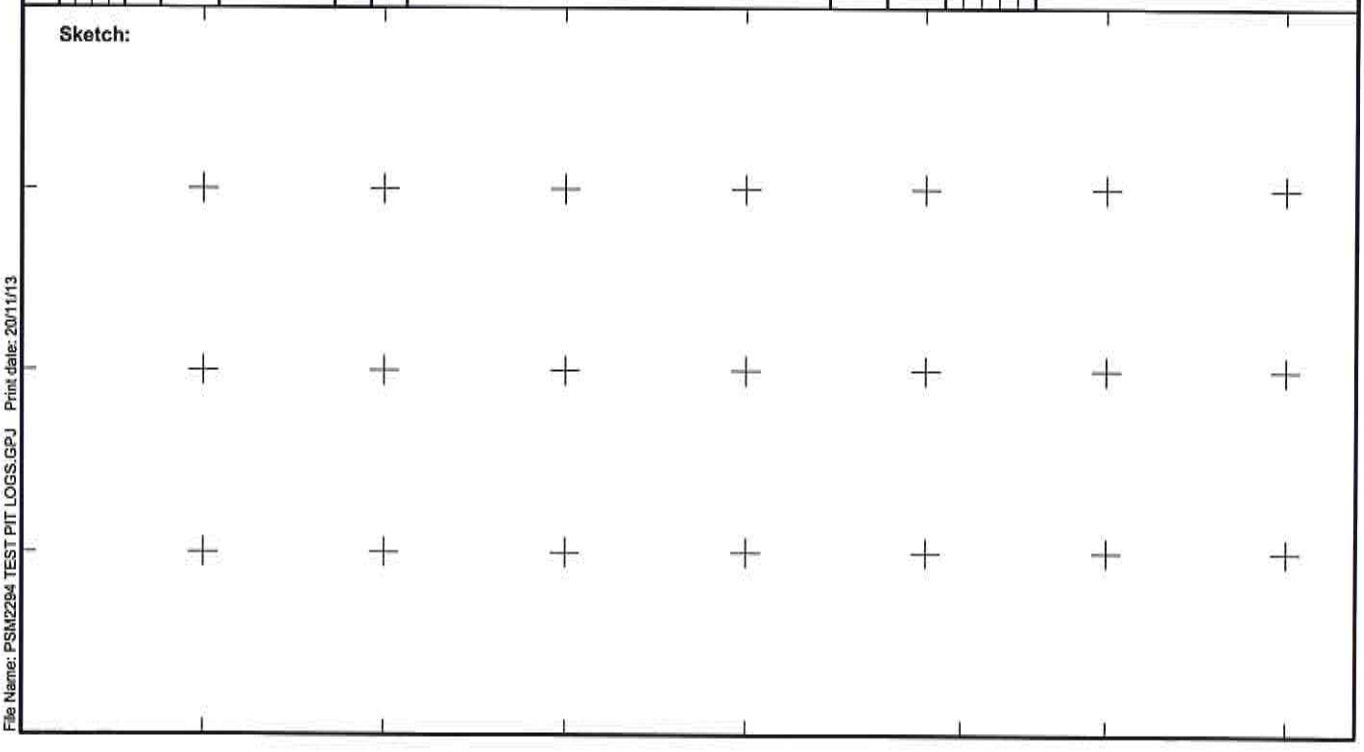
Excavation Log

Excavation No: TP12
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~47.5 m
Excavation dimensions:	1 m wide x 4 m long approx.	**Easting:**	302772 m
		Northing:	6239187 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			1.0		ML	SILT; brown, with some sand, trace gravel and rootlets	D	F		Topsoil
							CL	CLAY; medium plasticity, red and grey, trace gravel (ironstone) and rootlets	M	H		Inferred residual
								SHALE; highly weathered, red and grey, laminated, with some ironstone	D	R1		Inferred bedrock
					2.0			Practical refusal of excavator at 1.4 m				
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Rock-Soil-Water

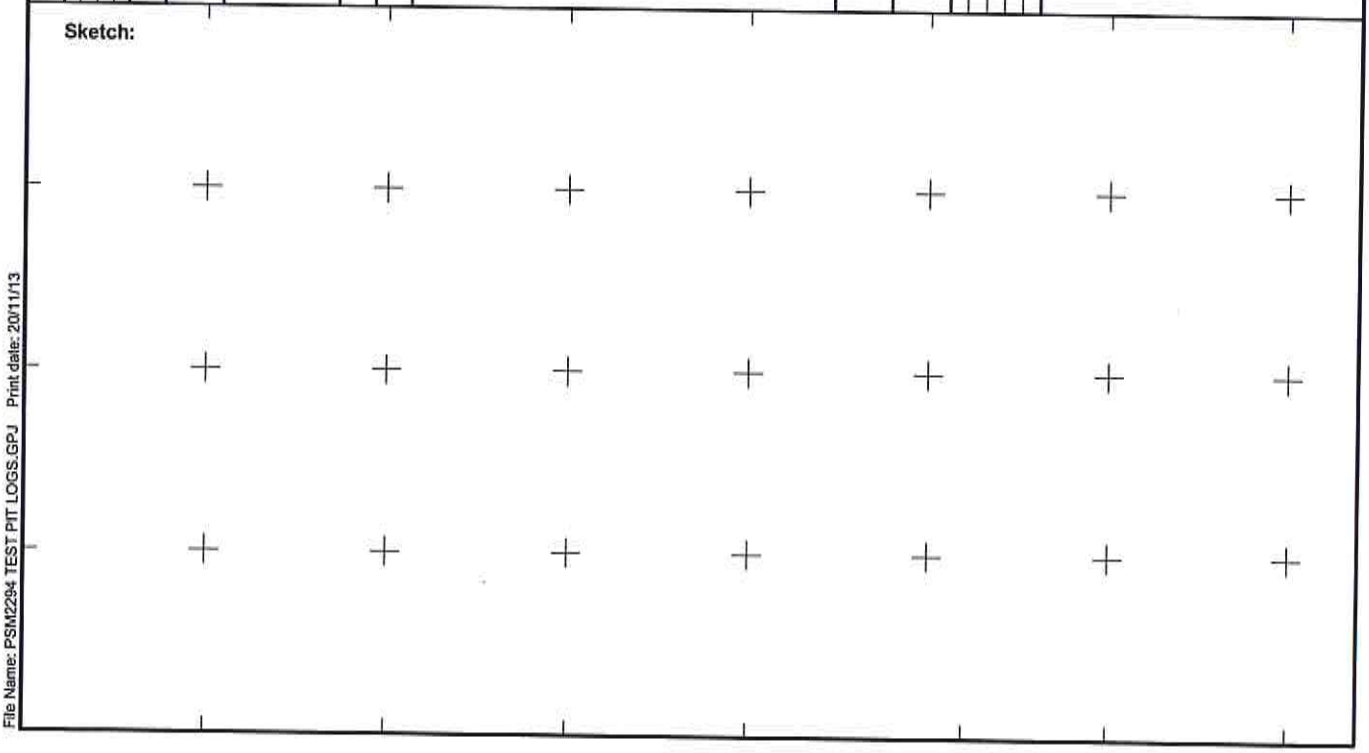
Excavation Log

Excavation No: TP13
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~45.5 m
Excavation dimensions:	1 m wide x 4 m long approx	**Easting:**	302776 m
		Northing:	6239243 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration 1 2 3	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material: SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa) 100 200 300 400	Structure and Additional Observations
Excavator		None observed			0.0		ML	Gravelly SILT; brown, gravel is subangular, trace of sand and rootlets	D			Topsoil
							CL	CLAY; medium plasticity, grey and red, occasional ironstone banding	M	VST	300 450	Inferred residual
					1.0							
					2.0			SHALE; highly weathered, red and grey and dark grey, laminated, occasional ironstone banding	D	R1		Inferred bedrock
								Practical refusal of excavator at 2.3 m				
					3.0							
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

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Rock-Soil-Water

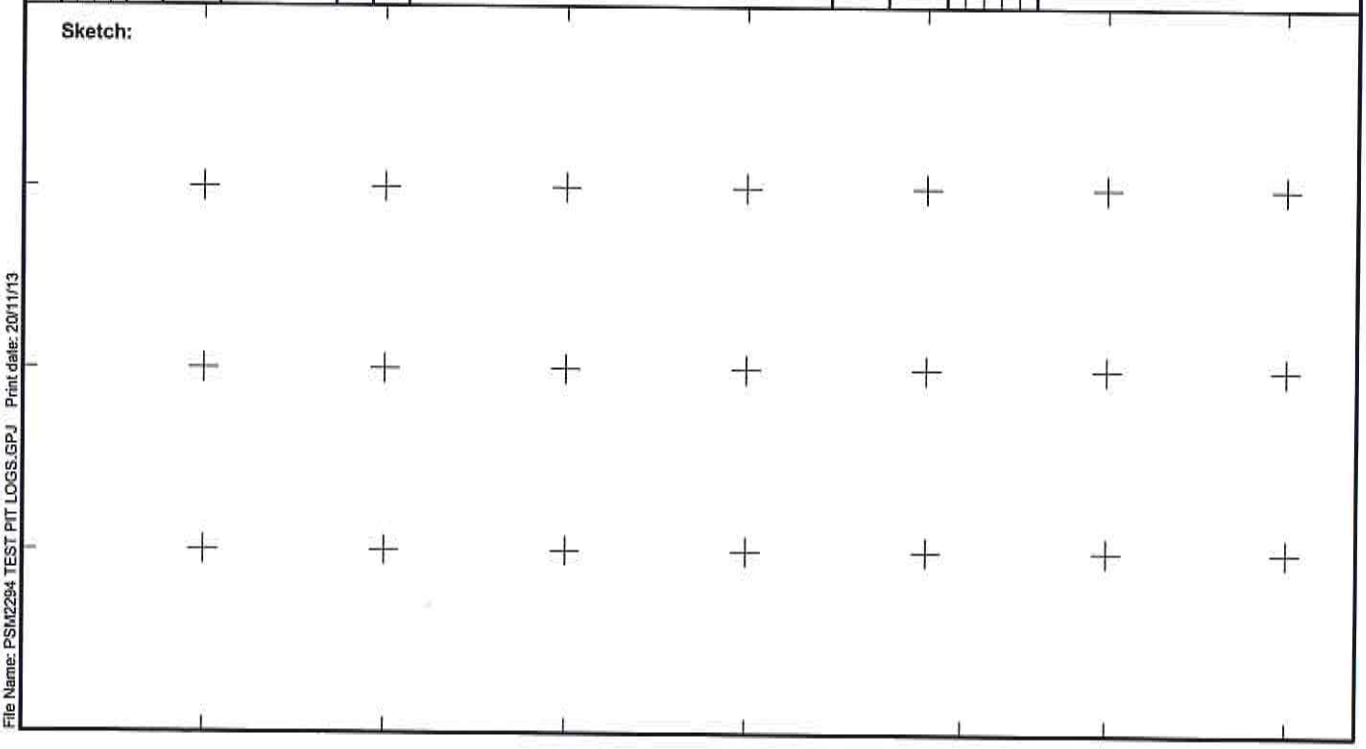
Excavation Log

Excavation No: TP14
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~45.5 m
Excavation dimensions:	1 m wide x 4 m long approx	**Easting:**	302797 m
		Northing:	6239241 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; red brown, trace gravel and rootlets	D	ST		Topsoil
							CL	CLAY; medium plasticity, red grey, occasional ironstone banding	M	VST	100 200 250 300 400 450	Inferred residual
					1.0							
					2.0			SHALE; highly weathered, grey red, laminated with occasional ironstone banding	D	R1		Inferred bedrock
					3.0			Practical refusal of excavator at 2.7 m				
					4.0							

Sketch:



File Name: PSM2294 TEST PIT LOGS.GPJ Print date: 20/11/13

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Excavation Log

Excavation No: TP16
Sheet: 1 of 1
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Equipment type:	CAT 20t Excavator	**R.L. surface:**	~47 m
Excavation dimensions:	1 m wide x 4 m long approx	**Easting:**	302827 m
		Northing:	6239218 m
		Vertical datum:	AHD
		Horizontal datum:	MGA

Method	Penetration (1 2 3)	Water	Samples	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Pocket Penetrometer (kPa)	Structure and Additional Observations
Excavator		None observed			0.0		ML	SILT; brown, trace gravel and rootlets				Topsoil
								CLAY; low plasticity, brown, trace rootlets	D	VST	350	Inferred fill
					1.0		CL	CLAY; medium plasticity, red and grey	M		300	Inferred residual
					2.0			Occasional ironstone banding		H	>400	
								SHALE; highly weathered, red and grey and dark grey, laminated	D	R1		Inferred bedrock
					3.0			Practical refusal of excavator at 2.8 m				
					4.0							

Sketch:

EXPLANATION SHEET
BOREHOLE LOG

GENERAL

Method

Non-Cored Borehole
Auger
Hand Auger
Diamond Rotary
Percussion
Other

Coring Size

Cored Borehole	Nominal Core Diameter (mm)
NMLC	51.9
BQ	36.5
BQ3	33.5
NQ	47.6
NQ3	45.1
HQ	63.5
HQ3	61.1
PQ	85
PQ3	83.1
Diatube	Variable
Other	-

Testing

Symbol	Description
UCS	Uniaxial Compressive Strength
TXL	Triaxial Test
BT	Brazilian Test
DT	Direct Tensile
SD	Slake Durability
Packer	Rock Mass Permeability

Samples

Symbol	Description
U50	50 mm undisturbed tube sample
D	Disturbed sample
Bs	Bulk sample

Water

Symbol	Description
	Water level
	Water inflow
	Complete water loss
	Partial water loss

SOIL DESCRIPTIONS

Unified Soil Classification System (USCS)

Major Divisions			Symbol	Typical Names
Coarse-Grained Soils More than 50% coarser than 0.075mm	Gravels (more than 50% coarser than 2mm)	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels. gravel-sand-clay mixtures.
	Sands (more than 50% of coarse fraction finer than 2mm)	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines.
			SP	Poorly graded sands and gravelly sands, little or no fines.
		Sand With Fines	SM	Silty sands, sand-silt mixture.
			SC	Clayey sands, sand-clay mixtures.
Fine-Grained Soils 50% or more finer than 0.075mm	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour silty or clayey fine sands.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and silty clays of low plasticity.
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity.
Highly Organic Soils			PT	Peat etc.

Moisture Condition

Term	Symbol
Dry	D
Moist	M
Wet	W
Wet at Plastic Limit	WP
Wet at Liquid Limit	WL

Strength

COHESIVE SOILS are described in terms of undrained shear strength, colour and structure with comments on minor constituents or apparent special features. Undrained shear strength is measured by hand penetrometer or determined by laboratory testing or estimated from experience. Classification in terms of undrained shear strength is as follows:

Term	Symbol	Description for Field Estimation	Shear Strength (kPa)	UCS (kPa)
Very Soft	VS	Easily penetrated several centimetres by fist.	<12	<25
Soft	S	Easily penetrated several centimetres by thumb. Can be moulded by light finger pressure.	12-25	25-50
Firm	F	Can be penetrated by thumb with moderate effort. Can be moulded by strong finger pressure.	25-50	50-100
Stiff	ST	Readily indented by thumb.	50-100	100-200
Very Stiff	VST	Readily indented by thumbnail.	100-200	200-400
Hard	H	Indented with difficulty by thumbnail	>200	>400

NON-COHESIVE SOILS are described in terms of density, colour, with comments on minor constituents or special features. Density (density index) is generally based on standard penetration testing (AS1289 Method 6.3.1), or other forms of penetration testing. Terms used in describing density are set out below:

Term	Symbol	Density Index	SPT N Values
Very Loose	VL	<15%	<5
Loose	L	15-35 %	5-10
Medium Dense	MD	35-65 %	10-30
Dense	D	65-85 %	30-50
Very Dense	VD	>85 %	>50

ROCK DESCRIPTIONS

Weathering

Term	Symbol	Description
Fresh	FR	Rock substance unaffected by weathering.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Moderately Weathered	MW	Rock substance affected by weathering to the extent staining extends throughout whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and signs of chemical or physical decomposition of individual minerals are usually evident. Porosity and strength may be increased or decreased when compared to the fresh rock substance, usually as a result of the leaching or deposition of iron. The colour and strength of the original fresh rock substance is no longer recognisable.
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Soil Classification System, but the texture of the original rock is still evident.

Strength

Term	Symbol	Description for Field Estimation	UCS (MPa)
Extremely Low	R0	Thumbnail easily scratches; gentle blow with geological pick leaves deep impression.	0.7-1.5
Very Low	R1	Can be peeled by a pocket knife. Crumbles under firm blows with geological pick.	1.5-3.0
Low	R2	Can be peeled by a pocket knife with difficulty; shallow indentation made by firm blow of geological pick.	3.0-10
Medium	R3	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with single firm blow of hammer end of geological pick.	10-25
High	R4	Specimen requires more than one blow with hammer end of geological pick to fracture.	25-80
Very High	R5	Specimen requires many blows of hammer end of geological pick to fracture.	>80

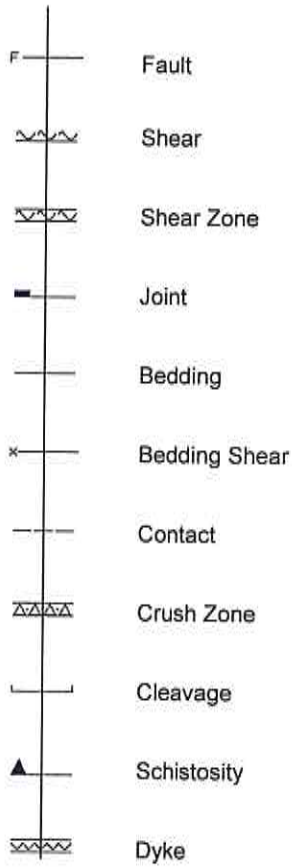
Defect Description

Order of description: type, inclination, shape, roughness, infill type, infill thickness, number

Defect Type

Symbol	Description
CL	Clay Seam
FL	Fault - fracture along which displacement is recognisable.
SR	Shear - a fracture along which movement has taken place but no displacement is recognisable. Evidence for movement may be slickensides, polishing and/or clay gouge.
SH	Sheared Zone - zone of multiple closely spaced fracture planes with roughly parallel planar boundaries usually forming blocks of lenticular or wedge shaped intact material. Fractures are typically smooth, polished or slickensided; and curved.
BG	Bedding parting - arrangement in layers of mineral grains or crystals parallel to surface of deposition along which a continuous observable parting occurs.
BSH	Bedding plane shear - a shear formed along a bedding plane
JN	Joint - a single fracture across which rock has little or no tensile strength and is not obviously related to rock fabric.
CN	Contact - surface between two lithologies.
SC	Schistosity - plane formed by the preferred orientation of the constituent minerals in a parallel arrangement in a coarse grained rock which has undergone regional metamorphism (schist).
CV	Cleavage - plane of mechanical fracture in a rock normally sufficiently closely spaced to form parallel-sided slices.
FO	Foliation
CZ	Crushed Zone - zone with roughly parallel, planar boundaries (commonly slickensided) containing disoriented usually angular rock fragments of variable size often in a soil matrix.
VN	Vein - fracture in which a tabular or sheet-like body of minerals have been intruded.
DK	Dyke - Igneous intrusion - often weathered and altered to a clay like substance.
DZ	Decomposed Zone - zone of any shape but commonly with parallel planar boundaries containing moderately to gradational boundaries into fresher rock.
FZ	Fractured Zone - a zone of closely spaced defects (mainly joints, bedding, cleavage and/or schistosity) comprised of core lengths in the order of 50 mm or less.

Standard Defect Symbols



Roughness Colour Code (for summary log)

Ro1
Ro2
Ro3
Ro4
Ro4

Shape

Term	Symbol	Description
Planar	PL	Forms a continuous plane without variation in orientation.
Curved	CU	Has a gradual change in orientation.
Undulating	UN	Has a wavy surface shape.
Stepped	ST	Has one or more well defined steps
Irregular	IR	Many changes of orientation.

Roughness

Term	Symbol	Description
Slickensided or polished	Ro1	Very smooth, reflects light.
Smooth	Ro2	Roughness not detected with finger.
Defined ridges	Ro3	Sandpaper feel (fine to medium sandpaper).
Small steps	Ro4	Sandpaper feel (medium to coarse sandpaper).
Very rough	Ro5	Very well defined ridges and/or steps.

Infill Type

Symbol	Description
KL	Clean
CA	Calcite
CB	Carbonaceous
CHL	Chlorite
FE	Iron oxide
QZ	Quartz
MG	Manganese
SU	Sulphides
SE	Sericite
RF	Rock fragments
G	Gravel
S	Sand
Z	Silt
CL	Clay

Infill Thickness

Where infilling is present, the thickness of infill is recorded using the following convention:

ST Iron oxide staining of less than 1 mm
VN Veneer coating of less than 1 mm

If the infilling is greater than 1 mm, the actual thickness of infill is recorded in millimeters.

If infill is not present, a dash (-) is recorded

Number

Number of defects with similar characteristics.

Miscellaneous

CATACLASTIC – FAULT GOUGE: soft puggy, possibly foliated fault infill

CAVITY: cavity – as indicated by driller

NO_CORE: No Core

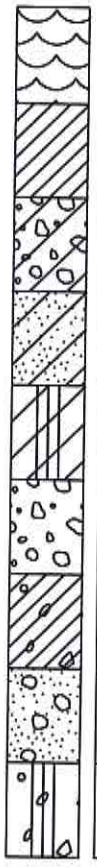
Man-Made

MAN-MADE – CONCRETE/ASPHALT: man-made surface paving

MAN-MADE – FILL: Fill (made ground)

MAN-MADE TOPSOIL: Topsoil

Soil



SOIL – ALLUVIUM: reworked material deposited by water in the past

SOIL – CLAY: Clay

SOIL – CLAYEY GRAVEL: Clayey Gravel

SOIL – CLAYEY SAND: Clayey Sand

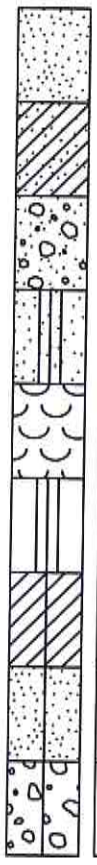
SOIL – CLAYEY SILT: Clayey Silt

SOIL – GRAVEL: Gravel

SOIL – GRAVELLY CLAY: Gravelly Clay

SOIL – GRAVELLY SAND: Gravelly Sand

SOIL – GRAVELLY SILT: Gravelly Silt



SOIL – SAND: Sand

SOIL – SANDY CLAY: Sandy Clay

SOIL – SANDY GRAVEL: Sandy Gravel

SOIL – SANDY SILT: Sandy Silt

SOIL – SHELLS: unconsolidated marine material

SOIL – SILT: Silt

SOIL – SILTY CLAY: Silty Clay

SOIL – SILTY SAND: Silty Sand

SOIL – SILTY GRAVEL: Silty Gravel

PSM

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LITHOLOGY GRAPHIC SYMBOLS
SOIL, MAN-MADE & MISCELLANEOUS

Igneous

IGNEOUS – ANDESITE: mid range mafic to felsic igneous fine grained rock (moderate in quartz and in colour)

IGNEOUS – BASALT (MAFIC): mafic igneous fine grained rock (dark in colour)

IGNEOUS – DIORITE: mid range felsic to mafic igneous coarse grained rock (moderate quartz)

IGNEOUS – DOLERITE: dolerite

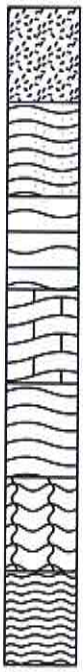
IGNEOUS – GABBRO (MAFIC): mafic igneous coarse grained rock (low quartz, dark in colour)

IGNEOUS – GRANITE (FELSIC): felsic igneous coarse grained rock (light in colour)

IGNEOUS – RHYOLITE (FELSIC): felsic igneous fine grained rock (light in colour)

IGNEOUS – TUFF/IGNIMBRITE: extremely fine grained air fall volcanic

Metamorphic



METAMORPHIC – AMPHIBOLITE: non-foliated metamorphic rock formed by regional metamorphism of mafic igneous rocks

METAMORPHIC – GNEISS: a foliated high grade metamorphic rock

METAMORPHIC – HORNFELS: contact metamorphic rock

METAMORPHIC – MARBLE: metamorphosed limestone

METAMORPHIC – SCHIST: a foliated high grade metamorphic rock

METAMORPHIC – SKARN: contact metamorphosed carbonate body

METAMORPHIC – SLATE/PHYLLITE: low grade regionally metamorphosed rock

Sedimentary

SEDIMENTARY – BRECCIA: consolidated clastic rock made up of angular clasts

SEDIMENTARY – CALCRETE/SILCRETE: Calcrete or silcrete

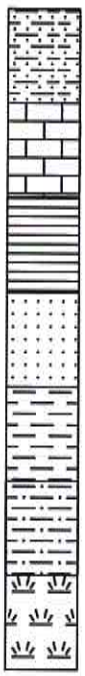
SEDIMENTARY – CHERT: chert/quartz

SEDIMENTARY – COAL: Coal

SEDIMENTARY – CONGLOMERATE: consolidated rounded clastic material

SEDIMENTARY – DOLOMITE: Dolomite

SEDIMENTARY – IRONSTONE: hard iron enriched layer



SEDIMENTARY – LAMINITE: interbedded sandstone and siltstone

SEDIMENTARY – LIMESTONE: Limestone

SEDIMENTARY – MUDSTONE: Mudstone

SEDIMENTARY – SANDSTONE: Sandstone

SEDIMENTARY – SHALE: Shale

SEDIMENTARY – SILTSTONE: Siltstone

SEDIMENTARY – SWAMP/PEAT: Peat (Swamp Symbol)

PSM

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Geotechnical Logging

LITHOLOGY GRAPHIC SYMBOLS
IGNEOUS, METMORPHIC & SEDIMENTARY

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Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH19
Sheet: 1 of 2
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Drilling contractor:	Terratest	**R.L. surface:**	~42.5 m
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	303033
		Northing:	6239409
		Vertical datum:	AHD
		Horizontal datum:	PSM2294
		Inclination / azimuth:	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger		Seepage from treatment pond		0.0			SILT; brown, trace gravel, sand and rootlets	D	F	Topsoil
						ML	SILT; brown, with some gravel			Inferred fill trace refuse
				1.0			CLAY; medium plasticity, orange grey and red	M	ST	Inferred residual
	U50									
	SPT: 4,4,4 N=8			2.0		CL				
				3.0			Colour change to red and grey	W	F	
	SPT: 4,3,2 N=5			4.0						
							SHALE; extremely weathered, red and grey		R1	Inferred bedrock

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH19
Sheet: 2 of 2
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	Sewage Pond	**Checked by:**	AS
Drilling contractor:	Terratest	**R.L. surface:**	~42.5 m
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	303033
		Northing:	6239409
		Vertical datum:	AHD
		Horizontal datum:	PSM2294
		Inclination / azimuth:	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger				6.0			Becomes highly weathered	W	R1	
							Becomes moderately weathered, colour change to dark grey		R2	
									R3	
				7.0			End of borehole at 6.7 m			
				8.0						
				9.0						

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH30

Sheet: 1 of 2

Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	DS
Site location:	STP	**Checked by:**	AS

Drilling contractor:	Terratest	**R.L. surface:**	~46 m	**Vertical datum:**	AHD
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	302819	**Horizontal datum:**	PSM2294
		Northing:	6239234	**Inclination / azimuth:**	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger	SPT: 5/5/5 N=10						CLAY; medium plasticity, brown, trace gravel and rootlets			Topsoil
							CLAY; medium plasticity, red brown, trace gravel and rootlets			Inferred fill
							CLAY; high plasticity, red, trace rootlets			Inferred residual
	U50			1.0		CL		M	ST	
				2.0			Colour change to grey			
							SHALE; highly weathered, red and grey			Inferred bedrock
				3.0			Moderately weathered, colour change to dark grey	D	R1	
									R2	
				4.0			Slightly weathered		R3	

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH30

Sheet: 2 of 2

Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	DS
Site location:	STP	**Checked by:**	AS
Drilling contractor:	Terratest	**R.L. surface:**	~46 m
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	302819
		Northing:	6239234
		Vertical datum:	AHD
		Horizontal datum:	PSM2294
		Inclination / azimuth:	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger				6.0				D	R3	
				7.0						
				8.0			End of borehole at 8.0 m			
				9.0						

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH31
Sheet: 1 of 2
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS

Drilling contractor:	Terratest	**R.L. surface:**	~46.5 m	**Vertical datum:**	AHD
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	302762	**Horizontal datum:**	PSM2294
		Northing:	6239225	**Inclination / azimuth:**	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger						ML	SILT; brown, trace gravel and rootlets	D	F	Topsoil
							CLAY; medium plasticity, red			Inferred residual
						CL				
				1.0						
	SPT: 9/18/15 N=33						With some gravel (ironstone)	M	H	
							Colour change to red and grey			
						GC				
				2.0			SHALE; highly weathered, red and grey			Inferred bedrock
									R1	
							Becomes moderately weathered, colour change to dark grey			
				3.0				D		
							Becomes slightly weathered		R2	
				4.0						

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: BH31
Sheet: 2 of 2
Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	31/10/2013
Principal:		**Date completed:**	31/10/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	STP	**Checked by:**	AS
Drilling contractor:	Terratest	**R.L. surface:**	~46.5 m
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	302762
		Northing:	6239225
		Vertical datum:	AHD
		Horizontal datum:	PSM2294
		Inclination / azimuth:	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger				6.0				D	R2	
				7.0					R3	
							End of borehole at 7.5 m			
				8.0						
				9.0						

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: PSM BH01
Sheet: 1 of 2
Job No: PSM2294

Client: JBS&G (Aust) Pty Limited
Principal:
Project: Edmondson Park Sewer Treatment Plant Geotechnical Investigation
Site location: East of STP

Date commenced: 01/11/2013
Date completed: 01/11/2013
Logged by: AI/DS
Checked by: AS

Drilling contractor: Terratest
Equipment type: Hydrapower Scout 20 t Truck Mounted

R.L. surface: ~45.5 m
Easting: 302853
Northing: 6239230

Vertical datum: AHD
Horizontal datum: PSM2294
Inclination / azimuth: -90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger		None observed				ML	Gravelly SILT; brown, gravel is subangular, with some sand, trace rootlets	D	VST	Topsoil
							CLAY; medium plasticity, red brown, trace gravel (ironstone) and rootlets			Inferred residual
	U50					CL		M	H	
	SPT: 3/6/15 N=21			1.0						
							SHALE; highly weathered, red and grey, laminated			Inferred bedrock
							Becomes moderately weathered, colour change to grey		R1	
				2.0						
							Becomes slightly weathered, colour change to dark grey	D		
				3.0					R2	
				4.0					R3	

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

Pells Sullivan Meynink

Engineering Consultants
Rock-Soil-Water

Borehole Log

Borehole No: PSM BH01

Sheet: 2 of 2

Job No: PSM2294

Client:	JBS&G (Aust) Pty Limited	**Date commenced:**	01/11/2013
Principal:		**Date completed:**	01/11/2013
Project:	Edmondson Park Sewer Treatment Plant Geotechnical Investigation	**Logged by:**	AI/DS
Site location:	East of STP	**Checked by:**	AS
Drilling contractor:	Terratest	**R.L. surface:**	~45.5 m
Equipment type:	Hydrapower Scout 20 t Truck Mounted	**Easting:**	302853
		Northing:	6239230
		Vertical datum:	AHD
		Horizontal datum:	PSM2294
		Inclination / azimuth:	-90 / -

Method	Samples	Water	R.L. (m)	Depth (m)	Graphic Log	USCS Symbol	Material (SOIL TYPE; plasticity or particle characteristics, colour, secondary and minor components / ROCK TYPE; weathering, particle characteristics, colour, secondary and minor components)	Moisture Condition	Estimated Strength	Structure and Additional Observations
Auger		None observed					End of borehole at 5.2 m	D	R3	

6.0
7.0
8.0
9.0

File Name: PSM2294 BH LOGS.GPJ Print Date: 20/11/13

Refer to Explanation Sheets Attached for Classification Systems

APPENDIX B

PHOTOS

Photo 1: TP01

Photo 2: TP02

Photo 3: TP03

Photo 4: TP04

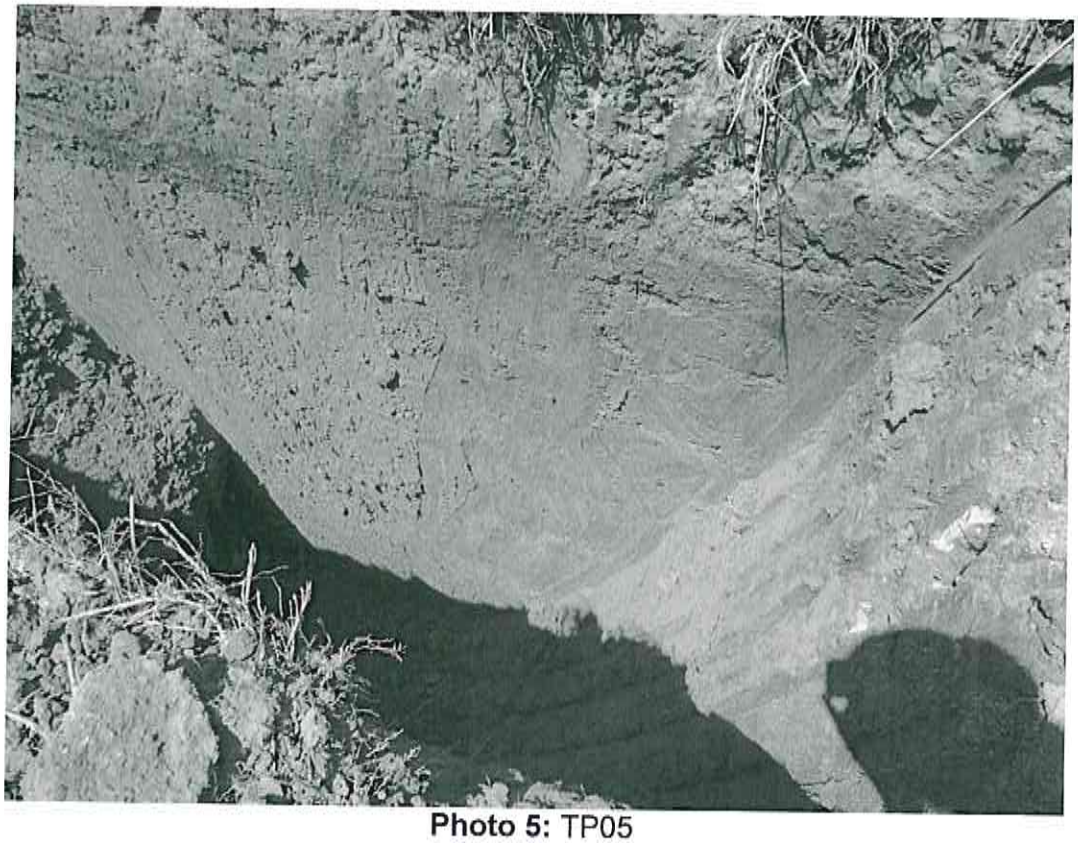


Photo 5: TP05

Photo 6: TP06

Photo 7: TP07

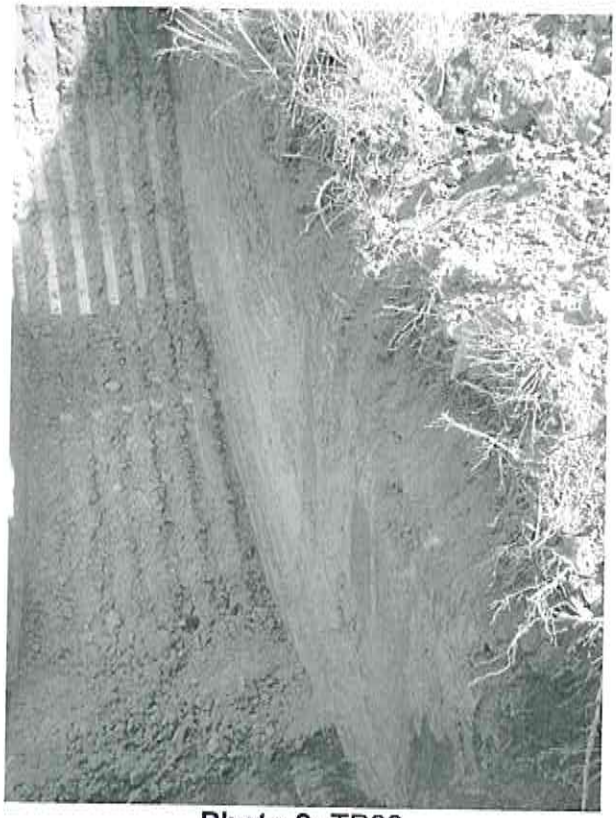


Photo 8: TP08

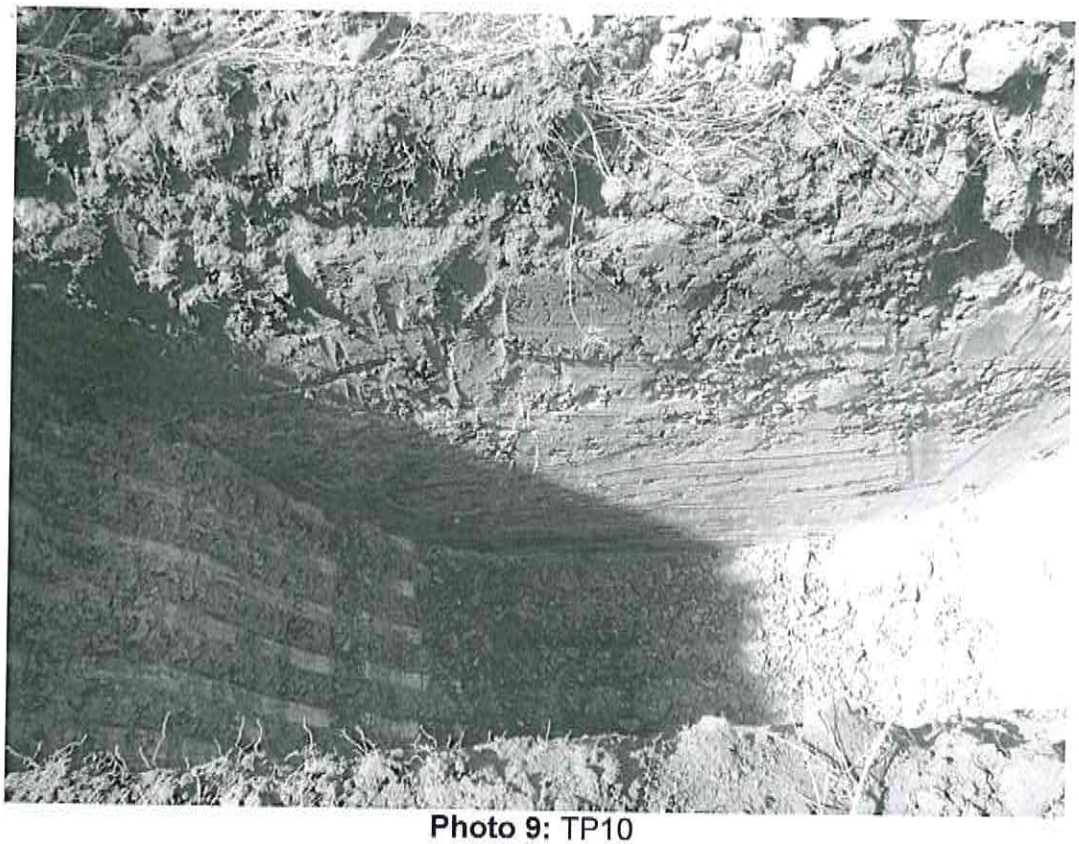


Photo 9: TP10

Photo 10: TP11

Photo 11: TP12

Photo 12: TP13

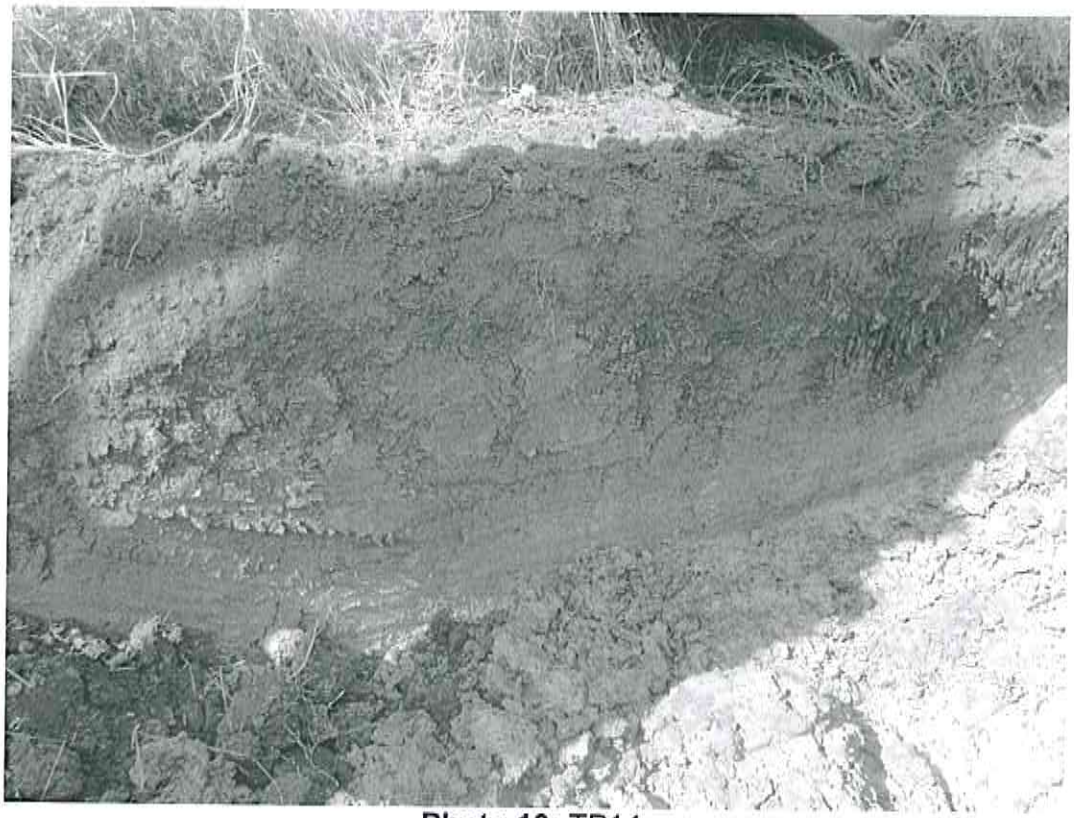


Photo 13: TP14

Photo 14: TP16

Photo 15: PSM TP01

Photo 16: PSM TP02

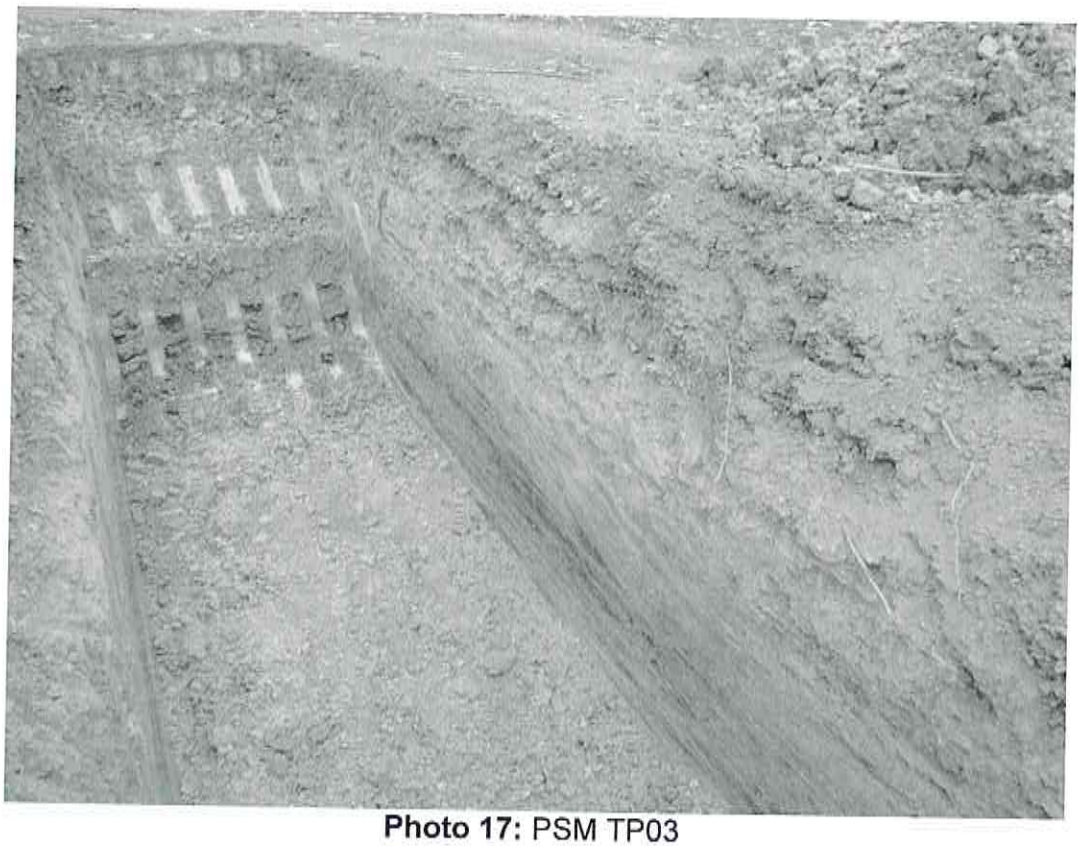


Photo 17: PSM TP03

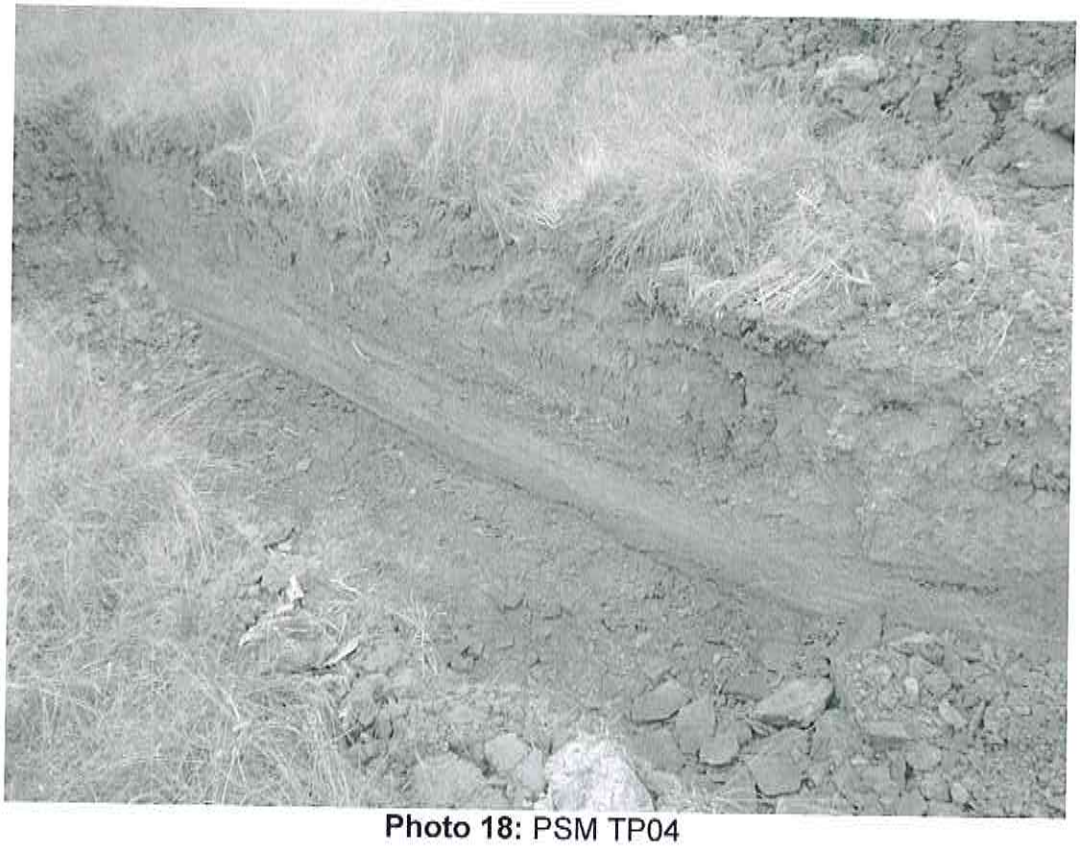


Photo 18: PSM TP04

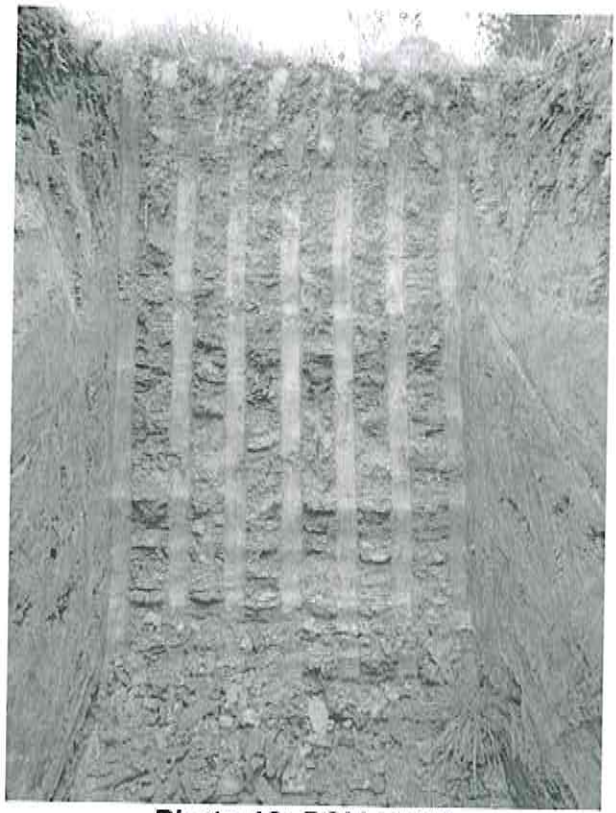


Photo 19: PSM TP05

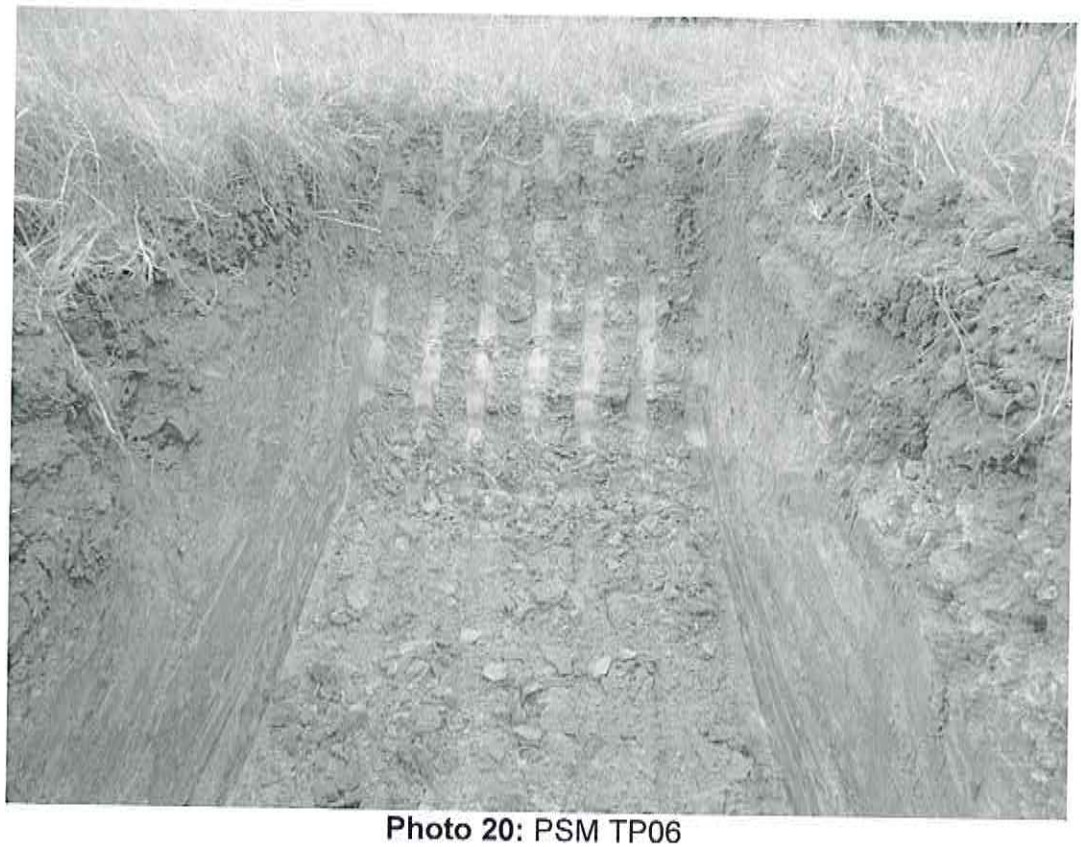


Photo 20: PSM TP06

Photo 21: Eastern Sewage Treatment Pond, looking west

Photo 22: Eastern Sewage Treatment Pond, looking east at northern embankment

Photo 23: Western Sewage Treatment Pond, looking west

Photo 24: Open area east of Sewage Treatment Plant (PSM TP's 01- 06)

Photo 25: Sewage Treatment Plant, looking south at western fence

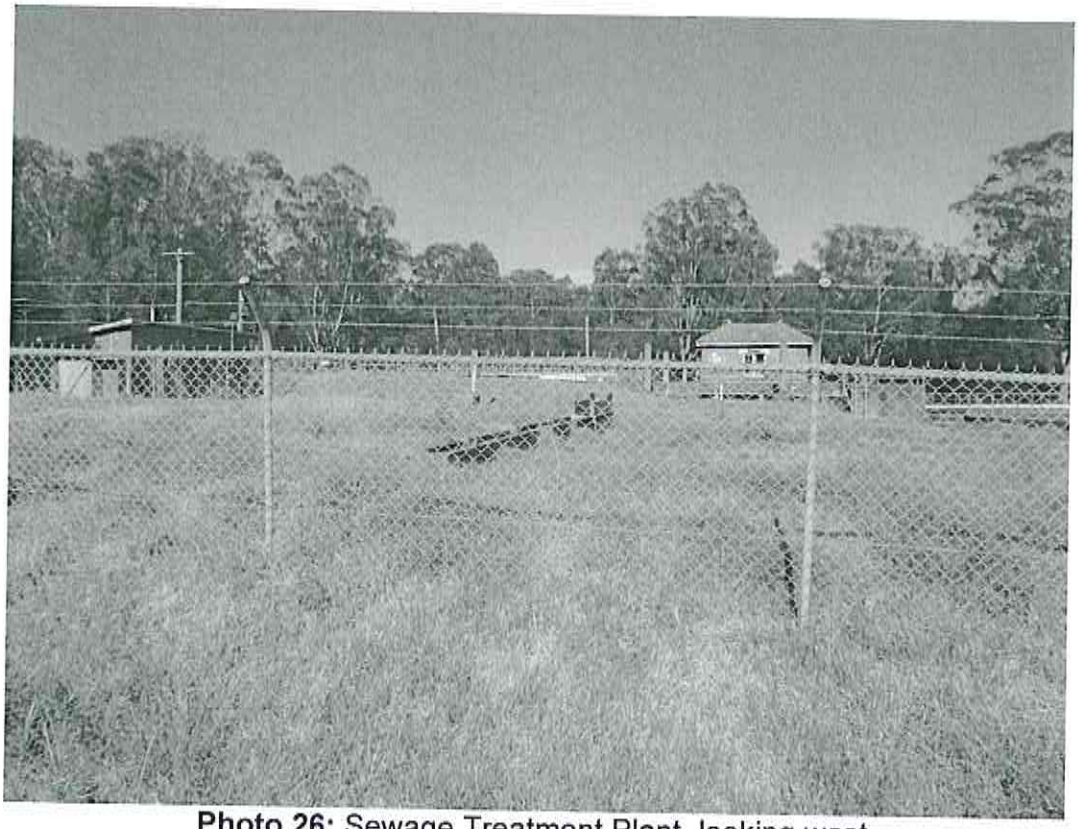


Photo 26: Sewage Treatment Plant, looking west

APPENDIX C

GEOTECHNICAL LABORATORY TEST RESULT

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client: Pells Sulivan Meynink Pty Ltd
Project Number: PSM2294-002L

Ref No: L3537E
Report: 1A
Report Date: 19/11/2013
Page 1 of 1

AS 1289	TEST METHOD	3.1.2	3.2.1	3.3.1	3.4.1
SAMPLE NUMBER	DEPTH m	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %
BH19	1.50	37	15	22	8.0
BH30	1.00	50	17	33	10.0

Notes:

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- BH2: Silty Clay, grey-brown.
- BH30: Silty Clay, grey-brown.
- Date of receipt of sample: 04/11/2013
- This report supersedes the previously issued report L3537E-1.

NATA Accredited Laboratory Number:1327

Authorised Signature / Date
(D. Treweek)

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

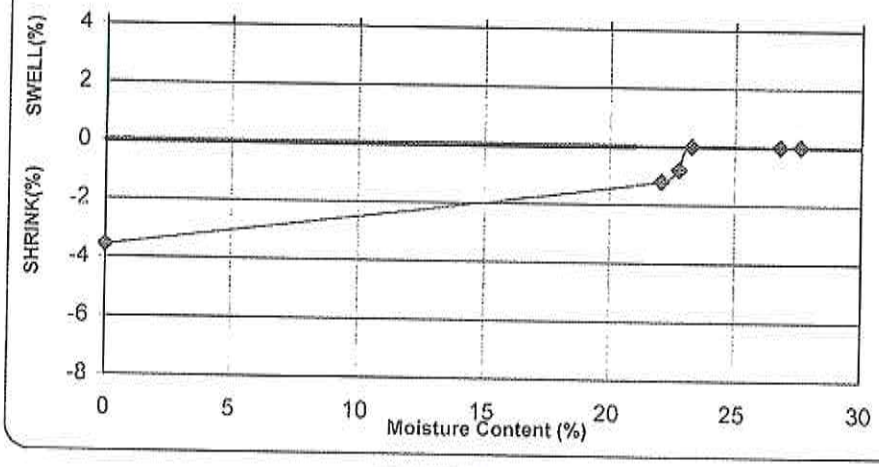
SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: Pells Sulivan Meynink Pty Ltd
Project Number: PSM2294-002L

Ref No: L3537E
Report: 2A
Report Date: 20/11/13

BOREHOLE NUMBER: 19		DEPTH: 1.50m	
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH	
BEFORE TEST	AFTER TEST	BEFORE TEST	AFTER TEST
26.8%	27.6%	30, 60, 90 kPa	70, 65, 65 kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION	SWELL ON SATURATION	SHRINKAGE
25 kPa	0.0%	0.0%	3.6%

SHRINK SWELL GRAPH



SHRINK SWELL INDEX
1.98%/pF

Notes: This report supersedes the previously issued report L3537E-2.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Refer to borehole log for soil descriptions
- Inert Inclusions= < 5%
- Shrinkage Cracking = Slight
- Soil Crumbling = Slight
- Date of receipt of sample: 04/11/13
- This report supersedes the previously issued report L3537E-2

NATA Accredited Laboratory Number:1327

Authorised Signature / Date (D. Troweek) 20/11/13

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

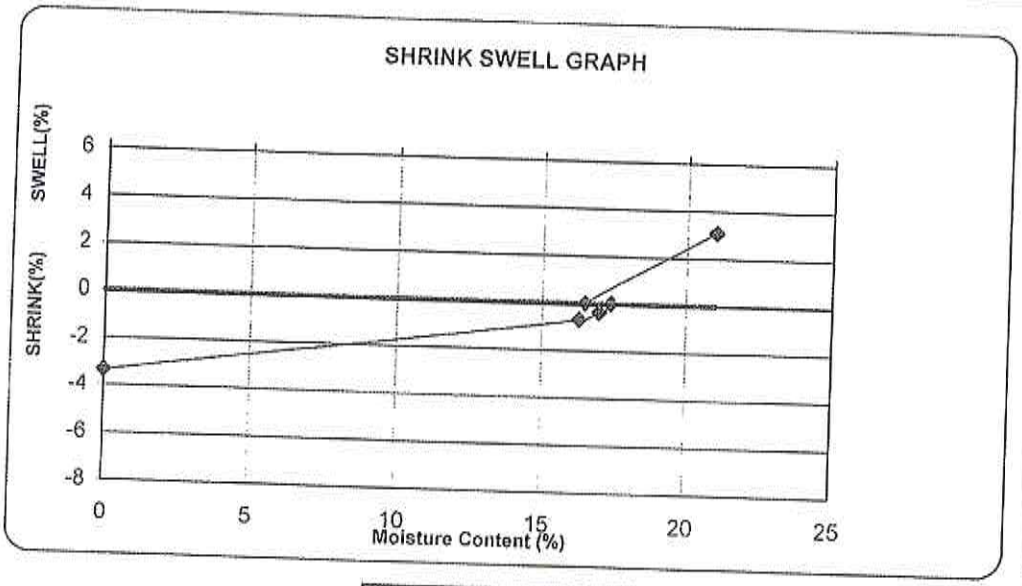
ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink Pty Ltd
Project Number: PSM2294-002L

Ref No: L3537E
Report: 2A
Report Date: 20/11/13

BOREHOLE NUMBER: 30		DEPTH: 1.00m	
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH	
BEFORE TEST	AFTER TEST	BEFORE TEST	AFTER TEST
14.6%	21.0%	370, 410, 420 kPa	235, 245, 255 kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION	SWELL ON SATURATION	SHRINKAGE
25 kPa	0.0%	3.1%	3.4%



SHRINK SWELL INDEX
2.72%/pF

Notes: This report supersedes the previously issued report L3537E-2.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Refer to borehole log for soil descriptions
- Inert Inclusions= less than 5%
- Shrinkage Cracking = Heavy
- Soil Crumbling = Slight
- Date of receipt of sample: 04/11/13
- This report supersedes the previously issued report L3537E-2

NATA Accredited Laboratory Number:1327

Authorised Signature / Date
(D. Troweek)
20/11/13

Appendix B: WorkCover NSW (2011) Code of Practice: *How to safely remove asbestos*

HOW TO SAFELY REMOVE ASBESTOS

Code of Practice

safe work australia

safe work australia

Safe Work Australia is an Australian Government statutory agency established in 2009. Safe Work Australia consists of representatives of the Commonwealth, state and territory governments, the Australian Council of Trade Unions, the Australian Chamber of Commerce and Industry and the Australian Industry Group.

Safe Work Australia works with the Commonwealth, state and territory governments to improve work health and safety and workers' compensation arrangements. Safe Work Australia is a national policy body, not a regulator of work health and safety. The Commonwealth, states and territories have responsibility for regulating and enforcing work health and safety laws in their jurisdiction.

ISBN 978-0-642-33317-9 [PDF]
ISBN 978-0-642-33318-6 [RTF]

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Website: www.safeworkaustralia.gov.au

safe work australia
Australian Government Comcare
ACT Government Justice and Community Safety
WORKSAFE ACT
WorkCover New South Wales
Workplace Standards Tasmanian Government
NTWorkSafe
Government of South Australia SafeWork SA
WORKSAFE Western Australia
Queensland Government

TABLE OF CONTENTS

FOREWORD

This Code of Practice on how to safely remove asbestos is an approved code of practice under section 274 of the *Work Health and Safety Act* (the WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations).

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and Regulations. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

The WHS Act and Regulations may be complied with by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

This Code of Practice has been developed by Safe Work Australia as a model code of practice under the Council of Australian Governments' *Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety* for adoption by the Commonwealth, state and territory governments.

A draft of this Code of Practice was released for public consultation on 7 December 2010 and was endorsed by the Workplace Relations Ministers' Council on 10 August 2011.

SCOPE AND APPLICATION

This Code provides practical guidance for persons conducting a business or undertaking who have duties under the WHS Act and WHS Regulations to safely remove asbestos from all workplaces including structures, plant and equipment.

A person conducting a business or undertaking may be an asbestos removalist who may carry out asbestos removal work that does not require a licence, Class A asbestos removal work or Class B asbestos removal work. This could include both asbestos removal companies and those persons who may carry out small asbestos removal jobs and may not have an asbestos licence, for example tradespersons.

It is recommended that other persons with responsibility—for example, a person conducting a business or undertaking who commissions asbestos removal work at a workplace (person who commissions removal work)—should read this Code to ensure they are aware of mandatory requirements.

This Code may also be used by workers and their health and safety representatives and other persons affected by asbestos removal work, for example neighbours.

It is important to read the *Code of Practice: How to Manage and Control Asbestos in the Workplace,* as it provides specific guidance on identifying asbestos or ACM in the workplace, determining whether removal is the best control option and implementing other control measures if removing asbestos is not the most appropriate action to take.

Some chapters of this Code will apply to asbestos that is present in domestic premises where the premises becomes a workplace.

HOW TO USE THIS CODE OF PRACTICE

In providing guidance, the word 'should' is used in this Code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This Code also includes various references to provisions of the WHS Act and Regulations to provide context with legal requirements. These references are not exhaustive. The words 'must', 'requires' or 'mandatory' indicate that these legal requirements exist and must be complied with.

1. INTRODUCTION

1.1 Who has health and safety duties when removing asbestos?

The WHS Act requires all persons who conduct a business or undertaking to ensure, so far as is reasonably practicable, that workers and other persons are not put at risk from work carried out as part of the business or undertaking.

The person conducting a business or undertaking must also ensure so far as is reasonably practicable that exposure of a person at the workplace to airborne asbestos is eliminated. If this is not reasonably practicable, the exposure must be minimised so far as is reasonably practicable. The exposure standard for asbestos must not be exceeded.

The WHS Regulations include specific obligations for a number of duty holders in relation to safely removing asbestos. These duties are summarised in Chapters 2 and 3 of this Code.

Officers, such as company directors, have a duty to exercise due diligence to ensure that the business or undertaking complies with the WHS Act and WHS Regulations. This includes taking reasonable steps to ensure that the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks associated with asbestos.

Workers have a duty to take reasonable care for their own health and safety and that they do not adversely affect the health and safety of other persons. They must comply with any reasonable instruction and cooperate with any reasonable policy or procedure relating to health and safety at the workplace. If PPE is provided by the person conducting the business or undertaking, the worker must use it in accordance with information, instruction and training provided on their use.

CONSULTATION

There are a number of specific duties in both the WHS Act and WHS Regulations that require consultation with others throughout the asbestos removal process. Communicating and consulting with a range of people helps to increase the awareness of the potential health and safety risks of asbestos.

An asbestos removalist must consult with persons that may be affected by the asbestos removal work, as well as other responsible persons at the workplace, to eliminate or minimise the exposure to the risks associated with asbestos, for example site management or the project manager, workers, health and safety representatives, contractors, building occupants and others. This also includes speaking with neighbours and other businesses where the asbestos removal work is occurring at domestic premises.

Further guidance on consultation is available in the *Code of Practice: Work Health and Safety Consultation, Cooperation and Coordination.*

1.2 The meaning of key terms

Airborne asbestos means any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only respirable fibres are counted.

Asbestos means the asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock forming minerals, including actinolite asbestos, grunerite (or amosite) asbestos (brown), anthophyllite asbestos, chrysotile asbestos (white), crocidolite asbestos (blue) and tremolite asbestos or a mixture of any of these.

Asbestos containing material (ACM) means any material or thing that, as part of its design, contains asbestos.

Asbestos-contaminated dust or debris (ACD) means dust or debris that has settled within a workplace and is (or is assumed to be) contaminated with asbestos.

Asbestos-related work means work involving asbestos (other than asbestos removal work to which Part 8.7 of the WHS Regulations applies) that is permitted under the exceptions set out in regulation 419(3), (4) and (5).

Asbestos removalist means a person conducting a business or undertaking who carries out asbestos removal work.

Asbestos removal work means:

- work involving the removal of asbestos or ACM
- Class A asbestos removal work or Class B asbestos removal work as outlined in Part 8.10 of the WHS Regulations.

Competent person in relation to carrying out clearance inspections under regulation 473 means a person who has acquired through training or experience the knowledge and skills of relevant asbestos removal industry practice and holds a certification in relation to the specified VET course for asbestos assessor work or a tertiary qualification in occupational health and safety, occupational hygiene, science, building, construction or environmental health. For all other purposes, competent person means a person who has acquired through training, qualification or experience, the knowledge and skills to carry out the task.

Exposure standard for asbestos is a respirable fibre level of 0.1 fibres/ml of air measured in a person's breathing zone and expressed as a time weighted average fibre concentration calculated over an eight-hour working day and measured over a minimum period of four hours in accordance with:

- the Membrane Filter Method
- a method determined by the relevant regulator.

Friable asbestos means material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos.

GHS means *Globally Harmonised System of Classification and Labelling of Chemicals.*

Licensed asbestos assessor means a person who holds an asbestos assessor licence.

Licensed asbestos removalist means a person conducting a business or undertaking who is licensed under the WHS Regulations to carry out class A or class B asbestos removal work.

Naturally occurring asbestos (NOA) means the natural geological occurrence of asbestos minerals found in association with geological deposits including rock, sediment or soil.

Non-friable asbestos means material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound.

Respirable asbestos means an asbestos fibre that:

- is less than 3 micronmetres (μm) wide
- more than 5 micronmetres (μm) long
- has a length to width ratio of more than 3:1.

1.3 Licence requirements for asbestos removal work

Regulation **458**

A person conducting a business or undertaking who commissions the removal of asbestos at the workplace must ensure asbestos removal work is carried out only by a licensed asbestos removalist who is appropriately licensed to carry out the work, unless specified in the WHS Regulations that a licence is not required.

There are two types of licences: Class A and Class B. The type of licence required will depend on the type and quantity of asbestos or ACM that is being removed at a workplace.

Type of licence	What asbestos can be removed?
Class A	Can remove any amount or quantity of asbestos or ACM, including: ■ any amount of friable asbestos or ACM ■ any amount of ACD ■ any amount of non-friable asbestos or ACM.
Class B	Can remove: ■ any amount of non-friable asbestos or ACM Note: A Class B licence is required for removal of more than 10 m2 (square metres) of non friable asbestos or ACM but the licence holder can also remove up to 10 m2 of non-friable asbestos or ACM. ■ ACD associated with the removal of non-friable asbestos or ACM. Note: A Class B licence is required for removal of ACD associated with the removal of more than 10 m^2 of non-friable asbestos or ACM but the licence holder can also remove ACD associated with removal of up to 10m^2 of non friable asbestos or ACM.

No licence required	Can remove:
	■ up to 10 m^2 of non-friable asbestos or ACM
	■ ACD that is:
	  ■ associated with the removal of less than 10 m^2 of non-friable asbestos or ACM
	  ■ not associated with the removal of friable or non-friable asbestos and is only a minor contamination.

EXAMPLES WHERE A LICENCE IS NOT REQUIRED TO PERFORM ASBESTOS REMOVAL WORK

- A single asbestos cement sheet must be removed to install an air conditioner. The sheet is two m2 in total. This job may be performed by a company that is not a licensed asbestos removalist, observing the requirements outlined in Chapter 2.
- A self-employed person is required to remove an asbestos cement eave to enable access for pipes. The asbestos cement eave is 1.6m2 in total. This job may be performed by the self-employed person who is not a licensed asbestos removalist, observing the requirements outlined in Chapter 2.

EXAMPLES OF CLASS A OR B LICENSED ASBESTOS REMOVAL WORK

- A person is engaged to remove asbestos cement sheets from a factory toilet block. The material to be removed is non-friable asbestos. The area to be removed is 12 m^2 in total so the person must be a licensed asbestos removalist and the material to be removed is non-friable so the work can be done by a Class A or Class B licensed asbestos removalist.
- A company is required to remove 0.5 m^3 (cubic metres) of asbestos lagging from a pipe in order to carry out maintenance work. This involves the removal of friable asbestos. A Class A licensed asbestos removalist is required to do this work.

LICENSED ASBESTOS ASSESSOR

The WHS Regulations require that a person must hold an asbestos assessor licence to conduct the following:

- air monitoring for Class A asbestos removal work
- clearance inspections for Class A asbestos removal work
- issuing clearance certificates in relation to Class A asbestos removal work.

A licensed assessor can also carry out a number of other tasks including identifying asbestos, carrying out a risk assessment or reviewing an asbestos register.

1.4 Health monitoring duties

Regulation **435-444**

A person conducting a business or undertaking to ensure health monitoring is provided to a worker if they are carrying out licensed asbestos removal work, other ongoing asbestos removal work or asbestos-related work and is at risk of exposure to asbestos when carrying out the work.

Health monitoring includes a medical examination to provide an initial baseline medical assessment.

Health monitoring must include the following (unless another form of health monitoring is recommended by a registered medical practitioner):

- consideration of the worker's demographic, medical and occupational history
- consideration of records of the worker's personal exposure
- a physical examination of the worker with emphasis on the respiratory system, including standardised respiratory function tests, unless another form of health monitoring is recommended by a registered medical practitioner.

Workers must be informed of any health monitoring requirements before the worker carries out work that may expose them to asbestos.

WHEN SHOULD HEALTH MONITORING OCCUR?

Where a worker is at risk of exposure to asbestos due to work other than licensed asbestos removal, health monitoring must also be undertaken. Examples of work where there is a risk of exposure include ongoing unlicensed removal work, undertaking maintenance work on ACM regularly as part of another job (for instance, electricians or building maintenance staff in older buildings) and carrying out asbestos-related work. The need for health monitoring for these workers should be determined on the basis of:

- the potential for exposure
- the frequency of potential exposure
- the duration of the work being undertaken.

If a worker is carrying out licensed asbestos removal work, the health monitoring must be conducted prior to the worker commencing the work. Health monitoring should also be provided to the worker at regular intervals after commencing the asbestos-related work but at least once every two years.

WHO CAN CARRY OUT HEALTH MONITORING?

Health monitoring must be carried out under the supervision of a registered medical practitioner with the relevant competencies. Prior to deciding who the registered medical practitioner will be, the person conducting a business or undertaking must consult the worker.

WHO PAYS FOR HEALTH MONITORING?

The person conducting a business or undertaking must pay all expenses relating to health monitoring.

Where there are two or more persons that have a duty to provide health monitoring to a worker, they may choose that one person organises health monitoring (known as the person who commissions the health monitoring), however the costs must be shared equally between each person unless they agree otherwise.

WHAT INFORMATION MUST BE PROVIDED TO THE REGISTER MEDICAL PRACTITIONER?

The person who commissions health monitoring must provide the following information to the registered medical practitioner:

- their name and address
- the name and date of birth of the worker
- a description of the work the worker is, or will be, carrying out that has triggered the requirement for health monitoring
- whether the worker has started the work or, if the worker has commenced carrying out the work, how long this has been for.

HEALTH MONITORING REPORT

A person who commissions health monitoring must take all reasonable steps to obtain a report from the registered medical practitioner as soon as practicable after the monitoring is carried out.

The health monitoring report must include the following information:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- the name and address of the person conducting the business or undertaking who commissioned the health monitoring
- the date of the health monitoring
- any advice that test results indicate the worker may have contracted a disease, injury or illness as a result of carrying out the work that triggered the need for health monitoring
- any recommended remedial measures, including whether the worker can continue to carry out the work
- whether medical counselling is required for the worker.

That person must also give a copy of the report, as soon as reasonably possibly after obtaining it from the medical practitioner, to:

- the worker
- the regulator, if the report contains:
  - any test results that indicate the worker may have contracted a disease, injury or illness as a result of the work that triggered the need for health monitoring
  - any recommended remedial measures, including whether the worker can continue to carry out the work
- all other persons conducting a business or undertaking who have a duty to provide health monitoring for that worker.

Reports must be kept as a confidential record for at least 40 years after the record is made and identified as a formal record for the particular worker. The report and results must not be disclosed to anyone unless the worker has provided their written consent. However, if the person was releasing the record under a duty of professional confidentiality, the worker's written consent is not required.

2. DUTIES FOR REMOVAL WORK THAT DOES NOT REQUIRE A LICENCE

Removal of asbestos by a person who does not hold a Class A or Class B asbestos removal licence is permitted if the asbestos being removed is:

- 10 m^2 or less of non-friable asbestos (approximately the size of a small bathroom)
- ACD that is not more than a minor contamination and is associated with the removal of 10 m^2 or less of non-friable asbestos.

Friable asbestos materials must not be removed by a person who does not have a Class A asbestos licence.

A worker carrying out asbestos removal work, including a self-employed person conducting a business or undertaking, must be trained in the identification and safe handling of asbestos prior to carrying out asbestos removal work without a licence. An asbestos awareness course or the non-friable removal unit of competency would be considered appropriate training.

This allows a person (for example, a plumber) to remove small amounts of non-friable asbestos and replace it with non-asbestos alternatives if they come across it during renovations, refurbishments, or service and maintenance work. However, this person must still use safe working methods to ensure the work is not creating a risk to the health and safety of persons at the workplace.

The WHS Regulations require a person who is carrying out asbestos removal work without a licence to comply with the duties outlined in Chapter 4 of this Code and also with some of the duties in Chapter 3 of this Code. These duties are summarised below:

- obtain a copy of the asbestos register for a workplace unless the work is being carried out at a domestic premises (refer to Section 3.4)
- identity hazards at the workplace (refer to Section 4.1)
- ensure signs and barricades are erected to indicate and delineate the asbestos work area (refer to Sections 3.7 and 4.2)
- use the wet method to removal asbestos where reasonably practicable (refer to Section 4.3)
- ensure the correct tools, equipment and PPE is used (refer to Sections 4.4 and 4.5)
- ensure decontamination facilities are available (refer to Sections 3.8 and 4.6)
- contain and label asbestos waste and dispose of it as soon as reasonably practicable (refer to Sections 3.9 and 4.8)
- ensure that PPE and clothing used in asbestos removal work and contaminated with asbestos is handled in accordance with the WHS Regulations (refer to Sections 3.9, 4.5 and 4.6)

Although it is not mandatory for the person to prepare an asbestos removal control plan for this type of asbestos removal work, it may be beneficial to do so to ensure the work is being carried out safely. Refer to Section 3.5 for further information on an asbestos removal control plan.

It is also not mandatory to conduct air monitoring, however, an independent licensed asbestos assessor or competent person can carry out it out in these situations. Refer to Section 3.11 for further information on air monitoring.

2.1 Training workers about asbestos or ACM

Regulation **39**

A person conducting a business or undertaking must ensure that information, training and instruction provided to a worker is suitable and adequate, having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time the information, training or instruction is provided, and
- the control measures implemented.

The person must, so far as is reasonably practicable, ensure that the information, training and instruction is provided in a way that is readily understandable by any person to whom it is provided.

Regulation **445**

A person conducting a business or undertaking must ensure workers who they reasonably believe may be involved in asbestos removal work in the workplace or the carrying out of asbestos-related work are trained in the identification, safe handling and suitable control measures for asbestos and ACM.

This training may include the following topics:

- purpose of the training
- health risks of asbestos
- types, uses and likely presence of asbestos in the workplace
- persons conducting a business or undertaking and the worker's roles and responsibilities under the asbestos management plan
- where the asbestos register is located, how it can be accessed and how to understand the information contained in it
- processes and safe work procedures to be followed to prevent exposure, including exposure from any accidental release of airborne asbestos
- where applicable, the correct use of PPE including respiratory protective equipment (RPE)
- the implementation of control measures and safe work methods to eliminate or minimise the risks associated with asbestos to limit the exposure to workers and other persons
- exposure standard and control levels for asbestos
- purpose of any exposure monitoring or health monitoring that may occur.

This training is more general than the training that a worker undertaking licensed asbestos removal work would receive. Workers who are undertaking licensed asbestos removal work are required to complete specific units of competency. Refer to Section 3.2 for further information.

Records of all training must be kept while the worker is carrying out the work and for five years after the day the worker stops carrying out the work. These records must also be available for inspection by the regulator.

3. DUTIES FOR LICENSED ASBESTOS REMOVAL WORK

Licensed asbestos removal work can differ greatly depending on the type, quantity and condition of the asbestos or ACM being removed. There are a number of duties in the WHS Regulations to ensure licensed asbestos work is carried out safely and without releasing airborne asbestos and exposing workers and other persons.

A summary of the specific duties in the WHS Regulations are:

- ensuring an asbestos removalist supervisor is readily available or present when the work is being carried out **(R.459)**
- providing appropriate training and ensuring the asbestos removal worker has undertaken the relevant units of competencies associated with the asbestos removal **(R.460-461)**
- telling various parties about the asbestos removal and providing them with appropriate information **(R.462 and R.467-468)**
- obtaining the workplace's asbestos register **(R.463)**
- preparing an asbestos removal control plan **(R.464-465)**
- notifying the regulator about the work before it starts **(R.466)**
- displaying signs and labels in the asbestos work area **(R.469)**
- limiting access to the asbestos work area **(R.470)**
- ensuring appropriate decontamination facilities are in place **(R.471)**
- ensuring waste containment and disposal procedures are in place **(R.472)**
- ensuring clearance inspections are conducted and issuing clearance certificates **(R.473-474)**
- ensuring air monitoring is conducted, where appropriate **(R.475-477)**.

These requirements apply to a number of duty holders including the licensed asbestos removalist, the person who commissioned the asbestos removal work, and the person with management and control of the workplace. The duties are explained further below.

3.1 Asbestos removalist supervisor to be present or readily available

When licensed asbestos removal work is being carried out at a workplace, an asbestos removal supervisor must oversee the work. The licensed asbestos supervisor must have a certification appropriate to the type of licensed asbestos removal work.

If the asbestos removal work requires a Class A licence, for example removing friable asbestos, the asbestos removal supervisor must be present at the asbestos removal area whenever the work is being carried out.

However, if the asbestos removal work requires a Class B licence, for example non-friable asbestos that is more than 10 m^2, then the asbestos removal supervisor must be readily available to a worker who is carrying out the work whenever it is being carried out. For example, if the supervisor is contactable by phone and able to arrive at the workplace within 20 minutes, this would be regarded as accessible.

Where the asbestos removal work requires a Class B licence and it is being carried out by a self-employed person working alone, for example a plumber removing more than 10 m^2 of AC sheeting, the person must hold the competency of a worker for non-friable asbestos removal and the competency of a supervisor for non-friable asbestos removal.

3.2 Certification and training

CERTIFICATION

A licensed asbestos removalist must not direct or allow a worker to carry out licensed asbestos removal work unless they are satisfied the worker holds a certification that is relevant to the class of licensed asbestos removal work they will be carrying out.

Workers (including the asbestos removal supervisors) who are carrying out licensed asbestos removal work are required to acquire a certification by completing units of competencies to show they have the relevant training to be able to remove asbestos. The units of competency completed by the person will determine what type of asbestos work they can carry out. Asbestos removal supervisors will have additional units of competency to complete.

Registered training organisations conduct training and education for the specific unit of competency for both Class A and Class B asbestos removal work as well as the asbestos removal supervisor certification. The Class B removal unit of competency must be completed before the Class A removal unit of competency.

TRAINING

A licensed asbestos removalist must provide appropriate training to a worker carrying out licensed asbestos removal work at the workplace to ensure the work is carried out in accordance with the asbestos removal control plan for the workplace.

This is additional training to the general training that is provided on the identification and safe handling of asbestos and the appropriate controls referred to in section 6.3 of the *Code of Practice: How to Manage and Control Asbestos in the Workplace.*

A worker who is carrying out licensed asbestos removal work must receive training that is designed specifically for the workplace where the work is being or is to be carried out. This should occur before the commencement of each asbestos removal job. The training should include:

- the nature of the hazards and risks
- how asbestos can affect a person's health
- the risk from exposure to airborne asbestos
- the control measures in place and maintenance of the asbestos removal control plan for that job
- the methods and equipment that will be used to do the job properly
- choosing, using and caring for PPE and RPE
- decontamination procedures
- waste disposal procedures
- emergency procedures
- any other legal requirements (for example, contaminated sites).

If the worker is required to hold other licences for the particular task, for example a demolition licence, additional training may be provided to cover this type of work.

The licensed asbestos removalist must keep a record of all training undertaken by a worker who is carrying out licensed asbestos removal work:

- while the worker is carrying out licensed asbestos removal work
- for five years after the day the worker stopped carrying out licensed asbestos removal work for the removalist.

The training record must be readily accessible at the asbestos removal area and available for inspection under the WHS Act.

3.3 Informing parties of the licensed asbestos removal

Prior to any licensed asbestos removal work being carried out at a workplace, the licensed asbestos removalist must inform the person with management or control of the workplace about the work and the date it is to commence.

The person with management or control of the workplace must then ensure the following persons are told that the asbestos removal work is to be carried out and when the work is to commence:

- the person's workers and any other persons at the workplace
- the person who commissioned the asbestos removal work
- anyone conducting a business or undertaking at or in the vicinity of the workplace
- anyone occupying premises in the immediate vicinity of the workplace.

If the workplace is a domestic premises, the licensed asbestos removalist must, so far as is reasonably practicable, before commencing the licensed asbestos removal work tell the following people about the asbestos removal work and when it will commence:

- the person who commissioned the asbestos removal work
- a person conducting a business or undertaking at the workplace
- the occupier of the domestic premises
- the owner of the domestic premises
- anyone occupying premises in the immediate vicinity of the workplace.

PROVIDING INFORMATION TO PERSONS THAT MAY CARRY OUT LICENSED ASBESTOS WORK

A licensed asbestos removalist must provide the following information to a person who is likely to be engaged to carry out the work:

- the health risks and health effects associated with exposure to asbestos
- the need for and details of health monitoring of a worker carrying out licensed asbestos removal work. Section 1.4 of this Code provides more specific details on health monitoring.

3.4 Obtaining the asbestos register

Before commencing the licensed asbestos removal work, the licensed asbestos removalist must obtain a copy of the asbestos register for the workplace from the person with management or control of the workplace.

This provision does not apply if the work is being carried out at a domestic premise.

3.5 Preparing an asbestos removal control plan

A licensed asbestos removalist must prepare an asbestos removal control plan for any licensed asbestos removal work they are commissioned to undertake.

WHAT IS THE PURPOSE OF AN ASBESTOS REMOVAL CONTROL PLAN?

An asbestos removal control plan is a document that identifies the specific control measures a licence holder will use to ensure workers and other persons are not at risk when asbestos removal work is being conducted. It is similar to a job safety analysis (JSA) but is focused on the specific control measures necessary to minimise any risk from exposure to asbestos.

An asbestos removal control plan helps ensure the asbestos removal is well planned and carried out in a safe manner. An asbestos removal control plan is only required to be prepared for licensed asbestos removal work. However, one can be prepared to assist when planning asbestos removal work that does not require a licence.

The licensed asbestos removalist must also take into account any asbestos register relevant to the asbestos to be removed and the area to be worked on. The structure of the asbestos removal control plan may be generic but each plan must address the specific situation and requirements for each job.

WHEN IS AN ASBESTOS CONTROL REMOVAL PLAN REQUIRED TO BE PREPARED?

The asbestos removal control plan must be prepared before the licensed asbestos removal work commences.

WHAT IS CONTAINED IN AN ASBESTOS REMOVAL CONTROL PLAN?

The asbestos removal control plan must include details of:

- how the asbestos removal will be carried out, including the method, tools, equipment and PPE to be used
- the asbestos to be removed, including the location, type and condition of the asbestos.

Specifications or drawings that are relevant to the asbestos removal can also be attached to the asbestos removal control plan to provide additional information about the asbestos. Appendix A provides further detail of what can be in a comprehensive asbestos removal control plan.

PREPARING THE ASBESTOS REMOVAL CONTROL PLAN

When preparing the asbestos removal control plan, the licensed asbestos removalist should consult with the person who commissioned the work, the person with management or control of the workplace (if not the same person), workers and their health and safety representatives.

For the same reasons, if licensed asbestos removal work is being carried out at domestic premises, the licensed asbestos removalist should consult with the person who commissioned the removal work, the owner or the occupier (if not the same person).

ACCESS TO THE ASBESTOS REMOVAL CONTROL PLAN

Once the asbestos removal control plan is prepared, a copy must be:

- given to the person who commissioned the licensed asbestos removal work
- readily accessible on-site for the duration of the licensed asbestos removal work to:
  - a person conducting a business or undertaking at the workplace
  - workers and their health and safety representatives
  - the occupants of the premises (if domestic premises).

The asbestos removal control plan must also be made available for inspection under the WHS Act.

3.6 Notifying the regulator of the licensed asbestos removal work

A licensed asbestos removalist must notify the regulator in writing at least five days before the licensed asbestos removal work commences.

The following information must be included in the notification:

- name, registered business name, Australian Business Number, licence number and business contact details of the licensed asbestos removalist
- name and business contact details of the supervisor who will oversee the removal work
- name of the licensed assessor or competent person engaged to undertake air monitoring and to issue the clearance certificate
- client name and contact details
- name, including registered business or corporate name, of the person with management or control of the workplace
- address of the workplace, including the specific location if it is a large workplace
- kind of workplace where the removal work will be performed (for example, whether it is an office building or construction site and the type of work that is carried out there, if any)
- date of notification
- the start date of the removal work and an estimation of how long it will take
- whether the asbestos to be removed is friable or non-friable
- the type of the asbestos (for example, AC sheeting, vinyl tiles, lagging, gaskets)
- if the asbestos is friable, the way the removal area will be enclosed
- estimated quantity of asbestos to be removed
- number of workers who will perform the removal work and details of their competency to carry out removal work.

It may not be possible to provide five days notice, and removal work may commence immediately in the following limited circumstances:

- a sudden expected event that may lead to a situation where there is a risk of exposure, for example a burst pipe that was lagged with asbestos or a forklift crashing into an asbestos cement sheet wall
- an unexpected breakdown of an essential service that requires immediate rectification, for example gas, water, sewerage or telecommunications services.

If this is the case, the licensed asbestos removalist must notify the regulator immediately by telephone and in writing within 24 hours after the notice provided over the telephone.

3.7 Limiting access, displaying signs and installing barricades

A person who is carrying out licensed asbestos removal work must ensure that signs indicate where the asbestos removal work is being carried out and barricades are erected to delineate the asbestos area. This will assist in limiting access to the asbestos removal work area.

If the person who commissions the licensed asbestos removal work and the person with management or control of the workplace (if not the same person) is aware that licensed asbestos removal work is being carried out, they must ensure that access to the removal area is limited to the following people:

- workers who are engaged to carry out the removal work
- other people who are associated with the removal work
- people who are allowed under the WHS Regulations or another law to be in the asbestos removal area (for example, inspector, emergency service workers).

A combination of using signs and barricades may be necessary to limit access to the asbestos removal area, for example installing a fence and signs may be used as a method to inform people that it is the asbestos removal area. Using locking access doors may be appropriate as long it does not create an evacuation hazard.

All people who have access to the removal area should comply with any direction given by the licensed asbestos removalist.

Section 4.2 of this Code provides further detail on the type of signs and barricades that should be used at a workplace.

3.8 Decontamination

When carrying out licensed asbestos removal work, the licensed asbestos removalist must ensure decontamination facilities are available for the asbestos removal work area, any plant used in that area and workers carrying out the asbestos removal work.

Section 4.6 of this Code outlines decontamination procedures that can be put in place at the workplace.

3.9 Waste containment and disposal

When carrying out licensed asbestos removal work, the licensed asbestos removalist must ensure that asbestos waste is contained and labelled in accordance with the GHS before the waste is removed from the asbestos removal area. It must be disposed of as soon as is practicable at a site authorised to accept asbestos waste.

PPE

Disposable PPE that has been used in the asbestos work area and is contaminated with asbestos must be sealed and labelled in a container and disposed of upon completion of the asbestos removal work.

In some cases, it may not be reasonably practicable to dispose of PPE that is clothing. In this case, the clothing must be laundered at a laundry that is equipped to launder asbestos-contaminated clothing. If this cannot be done, the clothing must be sealed in a container until is reused for asbestos removal purposes.

It may also not be reasonably practicable to dispose of PPE that is not clothing. If this is the case, the clothing must be decontaminated prior to it being removed from the asbestos removal area. If this cannot be done, the PPE must be sealed in a container until it is reused for asbestos removal purposes.

Where a sealed container has been used, it must be decontaminated and labelled in accordance with the GHS prior to it being removed from the asbestos removal area to indicate that it contains asbestos.

Section 4.5 of this Code provides guidance on the type of PPE that can be used. Section 4.8 of this Code outlines waste containment and disposal procedures that can be implemented at the workplace.

3.10 Clearance inspection

A person commissioning licensed asbestos removal work must ensure that, once the licensed asbestos removal work has been completed, a clearance inspection is carried out and a clearance certificate is issued before the workplace can be re-occupied by:

- an independent licensed asbestos assessor, for work that must be carried out by a Class A licensed asbestos removalist (for example, if the removal work involved friable asbestos)
- an independent competent person, for asbestos work that is not required to be carried out by a Class A licensed asbestos removalist (for example, if removal work involved more than 10 m^2 of non-friable asbestos).

This also includes where the work is being carried out at domestic premises.

To be independent, the licensed asbestos assessor or competent person must not be involved in the removal of asbestos for that specific job and is not involved in a business or undertaking involved in the removal of the asbestos for that specific job.

In some cases, it may not be reasonably practicable for the licensed asbestos assessor or competent person to be independent from the person who carried out the asbestos removal work. If this is the case, the person commissioning the work can apply to the regulator for an exemption from this requirement under Part 10.3 of the WHS Regulations.

The independent licensed assessor or competent person must not issue a clearance certificate unless they are satisfied that the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination. To do this, they can conduct a visual inspection for evidence of dust and debris. If air monitoring was also conducted, the results of that test must show that asbestos is below 0.01 fibres/ml.

If a clearance certificate has not been obtained, the asbestos removal area must not be re-occupied for normal use or other work activities. A clearance certificate must be issued before the area can be re-occupied for demolition or other work.

Unauthorised persons cannot enter the asbestos removal work area prior to a clearance certificate being issued and any protective barricades should remain in place until the completion of all licensed asbestos removal work and the final clearance certificate is issued.

Appendix C provides an example of a clearance certificate.

3.11 Air monitoring

Air monitoring involves sampling airborne asbestos fibres to assist in assessing exposure to asbestos and the effectiveness of implemented control measures. It must be conducted in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust*, 2nd Edition [NOHSC: 3003 (2005)].

WHEN IS AIR MONITORING REQUIRED?

Air monitoring requirements will vary depending on the type of asbestos being removed, the location and position of the asbestos, if an enclosure is used and whether the asbestos removal work is within a building or outside.

- **Friable asbestos removal** – Air monitoring is mandatory for all friable asbestos removal. This includes prior to dismantling an enclosure and for the purposes of the clearance inspection.
- **More than 10 m² of non-friable asbestos removal** – Air monitoring is not required but may be considered to be carried out by an independent licensed asbestos assessor or competent person to ensure compliance with the duty to eliminate or minimise exposure to airborne asbestos and to ensure the exposure standard is not exceeded.
- **Public Location** – Air monitoring should be considered where the asbestos removal work is being undertaken in or next to a public location.
- **Exposure air monitoring** – Air monitoring should be carried out at other times to determine a worker's exposure to airborne asbestos if, based on reasonable grounds, there is uncertainty as to whether the exposure standard may be exceeded and a risk assessment by a competent person indicates it is necessary. Since most uses of asbestos are prohibited, exposure monitoring should not be required frequently.

Air monitoring may be required when:

- it is not clear whether new or existing control measures are effective
- there is evidence (for example, dust deposits are outside the enclosure) the control measures have deteriorated as a result of poor maintenance
- modifications or changes in safe work methods have occurred that may adversely affect worker exposure
- there has been an uncontrolled disturbance of asbestos at the workplace.

WHEN MUST THE AIR MONITORING BE CARRIED OUT?

The air monitoring must be conducted before and during Class A asbestos removal work. However, it is not required before friable asbestos removal work commences when the glove bag removal technique is used. Air monitoring must be carried out as part of the clearance inspection, for instance at the conclusion of the asbestos removal work.

WHO MUST CONDUCT AIR MONITORING?

A person who commissions asbestos removal work that requires a Class A licence must ensure that an independent licensed asbestos assessor undertakes air monitoring of the asbestos removal area at the workplace.

In relation to asbestos removal work requiring a licence:

- **Friable asbestos removal** – An independent licensed asbestos assessor must be engaged to carry out air monitoring when it is required.
- **Non-friable asbestos removal (more than 10 m^2)** – An independent licensed asbestos assessor or competent person must be engaged to carry out air monitoring when it is required.

Where air monitoring is otherwise required, for instance to determine whether the exposure standard has been exceeded following an uncontrolled disturbance or release of asbestos at the workplace, an independent licensed asbestos assessor or competent person may carry it out. However, if the release involves friable asbestos, only an independent licensed asbestos assessor can carry out the air monitoring.

RESULTS OF THE AIR MONITORING

Once the results of the air monitoring are received, the licensed asbestos removalist must take action depending on the respirable fibre level. Where the results show that respirable asbestos fibre levels exceed the action levels outlined in Table 1, action must be taken immediately.

Action level	Control	Action
Less than 0.01 fibres/ml	No new control measures are necessary	Continue with control measures
At 0.01 fibres/ml or more than 0.01 fibres/ml but less than or equal to 0.02 fibres/ml	1. Review	Review control measures
	2. Investigate	Investigate the cause
	3. Implement	Implement controls to eliminate or minimise exposure and prevent further release
More than 0.02 fibres/ml	1. Stop removal work	Stop removal work
	2. Notify regulator	Notify the relevant regulator by phone followed by fax or written statement that work has ceased and the results of the air monitoring
	3. Investigate the cause	Conduct a thorough visual inspection of the enclosure (if used) and associated equipment in consultation with all workers involved with the removal work

More than 0.02 fibres/ml	4. Implement controls to eliminate or minimise exposure and prevent further release	Extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable (until fibre levels are at or below 0.01 fibres/ml, wet wipe and vacuum the surrounding area, seal any identified leaks (e.g. with expandable foam or tape) and smoke test the enclosure until it is satisfactorily sealed.
	5. Do not recommence removal work until further air monitoring is conducted	■ Do not recommence until fibre levels are at or below 0.01 fibres/ml

Table 1: Air monitoring action levels.

Any information that is gathered from these actions can be referred to during future asbestos removal jobs (where applicable).

COMMUNICATING THE RESULTS OF THE AIR MONITORING

The person who commissions the licensed asbestos removal work must ensure the results of the air monitoring are given to the following persons:

- workers at the workplace
- health and safety representatives for the workplace
- persons conducting businesses or undertakings at the workplace
- other persons at the workplace.

If the workplace is domestic premises, the licensed asbestos removalist must ensure the results are given to the following persons:

- the person who commissioned the work
- workers at the workplace
- health and safety representatives for the workplace
- persons conducting businesses or undertakings at the workplace
- the occupier of the domestic premises
- the owner of the domestic premises
- other persons at the workplace.

3.12 Removing friable asbestos

When a licensed asbestos removalist is removing friable asbestos (requiring a Class A licence), the following must occur, so far as is reasonably practicable:

- the asbestos removal area is enclosed to prevent the release of respirable asbestos fibres
- negative pressure is used, provided the enclosure being used has been tested for leaks
- the wet method of asbestos removal is used

- the asbestos removal work area does not commence until the air monitoring is started by an independent licensed asbestos assessor, provided the enclosure has been tested for leaks
- air monitoring is undertaken during the asbestos removal work at times decided by the independent licensed assessor undertaking the monitoring
- any glove bag used to enclose the asbestos removal area is dismantled and disposed of safely.

However, if the glove bag methord is used, negative pressure and conducting air monitoring prior to the work commencing are not required.

The enclosure must not be dismantled until the results are received from:

- if the friable asbestos is removed from a domestic premises – the licensed asbestos assessor who undertook the air monitoring
- in any other case – the person who commissioned the Class A asbestos removal work.

The results must show that the respirable asbestos fibre level is below 0.01 fibres/ml.

The enclosure must be decontaminated prior to dismantling it to minimise, so far as is reasonably practicable, the release of respirable asbestos fibres. The person who commissions the removal of the friable asbestos must obtain a clearance certificate from the licensed asbestos assessor after the enclosure has been dismantled.

Chapter 6 provides further detail on enclosures. Section 4.3 provides further detail on the wet method. Section 7.2 provides further detail on the glove bag method.

4. CONTROLS APPLICABLE TO ALL TYPES OF ASBESTOS REMOVAL

Note: This chapter applies to all asbestos removal work i.e. Class A and Class B licensed asbestos removal work and asbestos removal work that does not require a licence.

4.1 Identifying hazards

An asbestos removalist should consider not only the direct hazards that are associated with the asbestos removal work but also those hazards related to the work activity and the work environment (for example, demolition or construction).

CONFINED SPACES

Removing asbestos in a confined space should only be undertaken where it is not possible to avoid doing work in that space. A safe system of work should be developed for inclusion in the asbestos management plan or asbestos removal control plan.

Friable asbestos removal requires the use of enclosures that are designed to eliminate or minimise the release of airborne asbestos spreading from the asbestos removal work area. Depending on the conditions inside the enclosure, an asbestos enclosure may also become a confined space.

Further information is available in the *Code of Practice: Confined Spaces*.

FALLS

Work at heights should not be undertaken if the task can be performed on the ground. If asbestos removal work must be undertaken at height, then the WHS Regulations apply. Further information is available in the *Code of Practice: How to Prevent Falls at Workplaces*.

HEAT STRESS

Heat-related hazards can be created from working in enclosures or confined spaces or using PPE. The factors that can lead to heat stress should be considered, including temperature, humidity, air movement, exposure to a heat source, work activities and demands, how long the PPE must be worn and individual physical factors.

Control measures include:

- selection of appropriate PPE fitted to reduce the build-up of heat
- adequate number of extraction units in enclosures
- cool cotton underclothing
- scheduling appropriate work breaks
- job rotation
- cool drinks readily available
- providing a cool, shaded rest area
- educating workers about heat stress risks and controls.

Further information is available in the *Code of Practice: Managing the Work Environment and Facilities.*

ELECTRICAL EQUIPMENT

When undertaking asbestos removal work, the risk associated with electrical equipment should be controlled by following the procedures set out below.

- De-energisation and removal from the asbestos removal work area. If the electrical equipment cannot be disconnected and removed they must be de-energised. The de-energised equipment must be secured so it cannot be inadvertently re-energised.
- Any electrical cabling or equipment remaining in the asbestos removal area must be labelled and protected from mechanical damage or the ingress of water in accordance with *AS/NZ3000:2000 Wiring rules*.
- A licensed electrician must safely remove and reinstall electrical cables and equipment.
- For electrical equipment such as fire detectors, smoke detectors and thermal detectors, only a person able to remove and isolate the circuits and heads as required prior to the asbestos removal work should be engaged to do that.
- Upon completion of the asbestos removal work, a person should replace, reactivate and test the system, prepare a certificate stating that the heads are operational and forward to the asbestos removalist.

All portable electrical tools and equipment, including flexible leads and any electrical installations utilised by workers during asbestos removal, should comply with *AS/NZS 3012:2003* Electrical installations – construction and demolition sites.

Further information is available in the *Code of Practice: Managing Risks with Electrical Work*.

4.2 Indicating the asbestos removal areas

The asbestos removalist must use signs and barricades to clearly indicate the area where the asbestos removal work is being performed. Signs must be placed in positions so that people are aware of where the asbestos removal work area is and should remain in place until removal is completed and clearance to reoccupy has been granted. Responsibilities for the security and safety of the asbestos removal site and removal work area should be specified in the asbestos removal control plan (where required). This includes inaccessible areas that are likely to contain asbestos.

WARNING SIGNS

Warning signs must be placed so they inform all people nearby that asbestos removal work is taking place in the area. Signs should be placed at all of the main entry points to the asbestos removal work area where asbestos is present.

These signs should be weatherproof, constructed of light-weight material and adequately secured so they remain in prominent locations. The signs should be in accordance with AS 1319-1994 *Safety signs for the occupational environment* for size, illumination, location and maintenance.

BARRICADES

The use of barricades assists with traffic control and prevents access to the asbestos removal site and removal work area.

The purpose of barricades is to delineate and isolate the asbestos removal area with appropriately placed barricades. Barricades can take various forms, from tape to solid hoarding. The type of barricading should reflect the level of risk. For friable asbestos removal work, solid barricades should be used. Tape may be appropriate for non-friable asbestos removal work of short duration.

The location of barricades will depend on the physical environment and the level of risk. An assessment of the asbestos removal work site should determine the appropriate placement of barricades.

For example, a non-friable asbestos cement removal job where the asbestos cement is in good condition may use a wall located three metres from the asbestos removal area as the barrier. A friable sprayed asbestos removal job being performed dry due to electrical restrictions may require a barricade 15 metres from the asbestos removal area.

In determining the distance between barriers and the asbestos removal area, the following should be considered:

- whether the asbestos is friable or non-friable
- activity around the asbestos removal area (for example, other workers, visitors, neighbours, the public) to determine the risk of exposure to other people
- the method of asbestos removal
- any existing barriers (walls, doors)
- the quantity of asbestos to be removed
- the type of barrier used (for example, hoarding or tape).

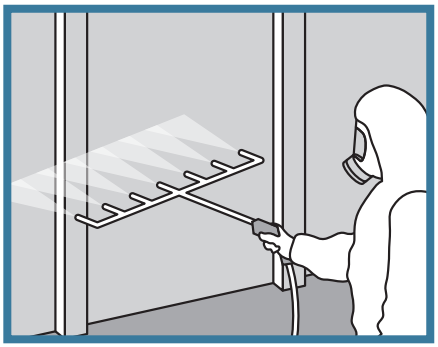
4.3 Wet and dry methods

An asbestos removalist must use techniques to eliminate or minimise the generation of asbestos fibres so far as is reasonably practicable. They must choose the method of asbestos removal that is most effective at minimising fibre release at the source. The removal methods are listed in preferred order:

- **Wet spray method** - asbestos fibres are significantly suppressed; however, they are not entirely eliminated so the use of RPE is as essential.
- **Saturation and water injection method** – used during friable removal.
- **Dry method** - can only be used if the wet spray method is not suitable, for example if there are live electrical conductors or if equipment could be permanently damaged or made dangerous by contact with water.

WET SPRAY METHOD

The wet spray method is the preferred asbestos removal method and should be used for the removal of asbestos from structures and plant. The wet spray method requires the use of a constant low-pressure water supply for wetting down asbestos and related items to suppress asbestos fibres. This can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel (for example, a pump-up garden sprayer) may be used.



The design of the spraying equipment will depend on the availability of a water supply and access to the area to be sprayed.

The wet spray method involves applying a fine water spray to the asbestos in a manner that ensures the entire surface of the asbestos is saturated and the run-off is minimised. The asbestos should be maintained in a wet condition throughout the removal.

A wetting agent (surfactant), for example detergent, may be added to the water to facilitate more rapid wetting of the asbestos. A manually controlled, consistent low-pressure, fine spray (for example, from an adjustable pistol-grip garden hose) is recommended.

For very small areas, a small spray water bottle may be sufficient. In all cases, the use of water should be in the form of a mist to minimise the potential to generate respirable dust.

The asbestos should be wetted through to its full depth and the water spray should be directed at the site of the cut. The wetted material should be removed as the cut is progressed.

Immediately after the asbestos is removed from its fixed or installed position, spray should be directed on sides previously not exposed.

The wet friable asbestos removed in sections should immediately be placed in suitably labelled asbestos waste containers and properly sealed along with any small sections dislodged as the asbestos is cut.

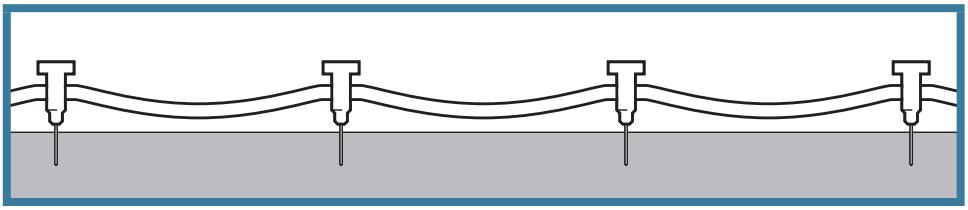
Wherever reasonably practicable, a HEPA-fitted vacuum cleaner should be used in conjunction with the wet spray method. The HEPA vacuum cleaner should be used prior to spraying asbestos with water and for the collection of any dust spread over a large area.

Airborne asbestos fibres are significantly suppressed when the wet spray method is used; however, they are not entirely eliminated so effective PPE including RPE is also essential. Refer to Section 4.5 of this Code for information on RPE.

Consideration should be given to applying a PVA emulsion as it may be more effective than water (with a wetting agent) in minimising fibre release. For example, PVA can be applied and allowed to dry on AC roofing prior to its removal as an alternative method to prevent slip hazards.

SATURATION AND WATER INJECTION METHOD

The soaking method with total saturation should be used if the asbestos is so thick that the spray method will not suppress the asbestos significantly. This method involves injecting water or a water-based solution directly into friable asbestos. It is a process that requires specific training in relation to the use of the equipment and the process.



The asbestos is soaked by the introduction of water or other wetting agents through an appropriate applicator that consists of an injection head with numerous side holes or outlets through which the water or wetting agent is fed to the asbestos.

To facilitate more rapid wetting of the asbestos, holes or cuts should be made in the outer covering to enable the water or wetting agent to be injected in such a manner as to ensure that the asbestos is saturated but not just washed out through a liquid passage.

The soaking should be done before removal. The quantity of water or wetting agent and the time to soak will depend on the thickness of the asbestos, access to the asbestos and location of the holes.

The saturated asbestos should then be removed in sections, placed in a properly labelled container, sealed and disposed of as with the spray method.

DRY METHOD

The dry method is not preferred as there is a much greater potential for airborne asbestos fibres to be generated. The dry removal method can only be used if the wet spray or soaking methods are not suitable, for example if there are live electrical conductors or if major electrical equipment could be permanently damaged or made dangerous by contact with water.

If the dry removal method is used, the following controls should be implemented:

- **Non-friable removal** – Enclose the asbestos removal work area as far as is reasonably practicable.
- **Friable removal** – Fully enclose the asbestos removal work area with plastic sheeting (a minimum 200 μm thick) and maintain at a negative pressure (at least 12 Pa water gauge). Ensure all workers involved in the removal operation wear full-face positive-pressure supplied air-line respirators.
- **Friable and non-friable removal** – The asbestos should be removed in small, pre-cut sections with minimal disturbance to minimise the generation of airborne asbestos fibres as much as possible. Wherever reasonably practicable, a HEPA-fitted vacuum cleaner should be used.
- All waste material should be immediately placed in appropriate wet containers which are wetting to suppress creation of dust and airborne fibres.

4.4 Tools and equipment

Tools and equipment that can be used during asbestos removal work include asbestos vacuum cleaners, manually operated hand tools and equipment—other than compressed air or high pressure water spray—that have been designed to capture or suppress respirable dust or are used in a way that is designed to capture or suppress respirable dust.

In addition to any equipment required to complete a particular task, the following equipment may be required on-site before the work begins:

- disposable cleaning rags
- bucket of water and/or a misting spray bottle
- sealant
- suitable asbestos waste container
- warning signs and/or barrier tape.

PROHIBITED TOOLS AND EQUIPMENT

Tools and equipment that generate dust must not be used on asbestos. These include:

- high-speed abrasive power and pneumatic tools, for example angle grinders, sanders, saws and high-speed drills
- brooms and brushes (unless brushes are used for sealing)
- high-pressure water spray, jets, power or similar tools and instruments on asbestos in the workplace
- compressed air.

The use of tools and equipment that cause the release of asbestos, including power tools and brooms, may be used on asbestos if the equipment is enclosed and/or designed to capture or suppress asbestos fibres and/or the equipment is used in a way that is designed to capture or suppress asbestos fibres safely, for example:

- enclosing the tool or instrument
- engineering controls such as extraction ventilation
- using the tools and instruments within an enclosed removal area (for example, full enclosure or small enclosure).

Controls are assumed to be effective if exposure monitoring results are less than 0.05 f/ml or control monitoring results are less than 0.01 f/ml. Should either of these values be exceeded during monitoring, work must cease and the control measures that are in place reviewed or improved to ensure the levels of airborne asbestos do not exceed these levels.

INSPECTION AND MAINTENANCE OF EQUIPMENT

After the asbestos removal work is completed, tools must be decontaminated (refer to Section 4.6).

All equipment used for the removal of asbestos should be inspected before the commencement of the asbestos removal work, after any repairs and at least once every seven days when it is continually being used. A register with the details of these inspections, the state of the equipment and any repair details should be maintained.

ASBESTOS VACUUM CLEANERS

Asbestos vacuum cleaners should comply with the Class H requirements in Australian Standard *AS/NZS 60335.2.69 Industrial vacuum cleaners* or its equivalent. Asbestos vacuum cleaners should not be used on wet materials or surfaces. Attachments with brushes should not be used as they are difficult to decontaminate.

Filters for these vacuum cleaners should conform to the requirements of AS 4260-1997 *High efficiency particulate air (HEPA) filters – Classification, construction and performance* or its equivalent.

Household vacuum cleaners must never be used where asbestos is or may be present, even if they have a HEPA filter.

Asbestos vacuum cleaners can only be used for collecting small pieces of asbestos dust and debris. Larger pieces should be picked up and placed in suitable waste containers and should never be broken into smaller sizes for vacuuming.

The asbestos removalist should ensure that procedures are established for the general maintenance, including emptying, of asbestos vacuum cleaners in a controlled environment.

They should be cleaned externally with a wet cloth after each task, the hose and attachments should be stored in a labelled impervious bag, and a cap should be placed over the opening to the asbestos vacuum cleaner when the attachments are removed.

PPE should be worn whenever an asbestos vacuum cleaner is opened to change the bag or filter or to perform other maintenance.

The emptying of asbestos vacuum cleaners can be hazardous if the correct procedures are not followed. Asbestos vacuum cleaners should only be emptied by a competent person with the correct PPE, in a controlled environment and in compliance with the manufacturer's instructions.

Whenever possible, asbestos vacuum cleaners should not be hired, as they can be difficult to fully decontaminate.

Hiring may be more viable in some instances if they are completely decontaminated, such as when a one-off maintenance task is required for asbestos. Asbestos vacuum cleaners should be hired only from organisations that provide vacuum cleaners specifically for work involving asbestos and the asbestos vacuum cleaner has been previously decontaminated. If hired, the asbestos vacuum cleaner should be decontaminated before it is returned.

Alternatively, the hire organisation may undertake the decontamination and maintenance of the filters and bags of the asbestos vacuum cleaner itself. In these cases, the asbestos vacuum cleaner should be hired out in a sealed storage container, with instructions that it may be removed from the container only when it is inside the asbestos removal work area and users are wearing appropriate PPE. When the minor maintenance work is completed the asbestos vacuum cleaner should be resealed in the storage container provided, and the sealed storage container should then be decontaminated by wet wiping before it is removed from the asbestos removal work area and returned to the hire organisation for decontamination and maintenance.

Organisations that hire out asbestos vacuum cleaners should ensure all their asbestos vacuum cleaners are decontaminated, maintained in good working order and the hirers are competent in their safe use. It is suggested that asbestos vacuum cleaners are only hired out to asbestos removal supervisors or licence holders.

At the completion of the asbestos removal work, the tools and equipment must be decontaminated, placed in sealed, labelled containers and if necessary, disposed of as asbestos waste. The asbestos vacuum cleaner and attachments must also be decontaminated. The bag and filter must be removed in accordance with the manufacturer's instructions and disposed of as asbestos waste.

SPRAY EQUIPMENT

Spray equipment includes wet sprays with water mist or wetting solution. A constant low-pressure water supply is required for wetting down asbestos and related items to suppress airborne asbestos fibres.

Wet spray can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel (such as a pump-up garden sprayer) may be used. For very small areas, a small spray water bottle may be sufficient. In all cases, the use of water should be in the form of a mist to minimise the potential to generate airborne dust.

4.5 Personal protective equipment

An asbestos removalist must provide all workers with PPE that is suitable for asbestos removal work. Workers must also use the PPE given to them by the asbestos removalists. PPE must be worn at all times during the work in the asbestos removal area. PPE includes clothing, for example coveralls, gloves and safety footwear, as well as RPE. The appropriate PPE can be determined by conducting a risk assessment.

Personal protective clothing should be made from materials that provide protection against fibre penetration and not from wool or other materials that attract fibrous dusts.

All equipment used for the removal of asbestos should be inspected before the commencement of the asbestos removal work, after any repairs and at least once every seven days when it is continually being used. A register with the details of these inspections, the state of the equipment and any repair details should be maintained.

At the end of the asbestos removal work and upon leaving the asbestos removal work area, all PPE must be disposed of as asbestos waste or decontaminated and stored in sealed double bags before being removed from the asbestos removal site to be laundered by a laundry with facilities for laundering asbestos-contaminated materials. PPE should be thoroughly wet before being placed in bags.

COVERALLS

Disposable coveralls should be provided wherever reasonably practicable and should be:

- of a suitable standard to prevent tearing or penetration of asbestos fibres so far as is practicable. Disposable coveralls rated type 5, category 3 (prEN ISO 13982–1) or equivalent would meet this standard
- one size too big, as this will help prevent ripping at the seams
- fitted with hood and cuffs, ensuring that:
  - if cuffs are loose, they are sealed with tape
  - coverall legs are worn over footwear as tucking them in lets the dust in
  - the fitted hood is worn over the respirator straps.

Coveralls should:

- not be made of material that is easily torn or have external pockets or velcro fastenings because these are easily contaminated and difficult to decontaminate
- never be taken home
- never be reused
- be disposed of as asbestos waste after a single use.

If it is not reasonably practicable to provide coveralls that can be disposed of after a single use, the coveralls may be laundered at a commercial laundry equipped to launder asbestos-contaminated clothing by prior arrangement. The coveralls must be sealed in a decontaminated container before they are removed from the asbestos removal work area. However, laundering of asbestos-contaminated protective clothing is not recommended because decontamination cannot be guaranteed. It is recommended that such re-usable coveralls should only be used in limited instances, for example in emergency services where the coveralls must be inflammable to protect against fire hazards and continual disposal and replacement is not practicable. Refer to Section 4.8 for more information on laundering of contaminated clothing.

In some cases (particularly dusty jobs) double coveralls should be used, with the outer coverall being removed a predetermined distance from the final decontamination area. Disposable coveralls should be wrapped in a double layer of plastic before disposal as asbestos-contaminated waste after the removal task is completed.

GLOVES

If significant quantities of asbestos fibres may be present, single-use disposable gloves should be worn. If latex gloves must be used, low protein (powder free) gloves should be used. If latex gloves are not available, disposable nitrile gloves can be used as an alternative.

Gloves used for asbestos removal work should be disposed of as asbestos waste and the workers should clean their hands and fingernails thoroughly whenever leaving the asbestos removal work area. However, as with coveralls, if it is not reasonably practicable to use disposable gloves, they may be laundered appropriately in limited circumstances.

FOOTWEAR

Safety footwear (for example, steel-capped, rubber-soled work shoes or gumboots) should be provided for all workers removing asbestos. Footwear should be laceless, as laces and eyelets can be contaminated and are difficult to clean. It should remain inside the barricaded area or dirty decontamination area for the duration of the asbestos removal work and should not be shared for hygiene reasons. Disposable overshoes should be avoided unless they are of a design that has an anti-slip sole.

When safety footwear is not in use, it should be stored upside down to minimise asbestos contamination inside the footwear. Storage facilities should be provided to allow for storage of the shoes. At the end of the removal work and each time the worker leaves the asbestos removal work area, safety footwear must be:

- decontaminated
- sealed in double bags for use on the next asbestos removal site (but not for any other type of work)
- disposed as asbestos waste.

RESPIRATORY PROTECTIVE EQUIPMENT (RPE)

All workers engaged in asbestos removal work must wear RPE conforming to the requirements of AS/NZS 1716:2009 *Selection, Use and Maintenance of Respiratory Protective Devices* or its equivalent.

The level of respiratory protection and supplied air respirators should be determined by a competent person. The selection of suitable RPE depends on the nature of the asbestos removal work, the probable maximum concentrations of asbestos fibres expected and any personal characteristics of the wearer that may affect the facial fit of the respirator (for example, facial hair and glasses).

Disposable RPE is not preferred, however if selected, it should be stored in a suitable and clean location before use and disposed of after a single use.

A competent person may change the level of RPE at any stage during the removal job following an assessment of the asbestos fibre levels experienced inside the asbestos removal work area. For example, this may occur during the final clean-up after the removal of friable asbestos when the use of air-lines is no longer considered necessary.

If a medical condition precludes the use of negative pressure respirators, workers should be provided with a continuous-flow, positive pressure respirator wherever possible.

At every asbestos removal job, the workers should be reinstructed in the necessity to wear RPE correctly to guard against complacency.

A fit test should be performed to ensure the RPE fits the individual and provides a good face seal between the worker's skin and the face piece. Fit tests should be repeated when changing from different models of RPE or a different sized face piece.

Appendix B provides more information on selecting suitable RPE and fit tests.

USING AND MAINTAINING RPE

RPE must be worn at all times in the asbestos removal area and until the appropriate stage of personal decontamination.

Asbestos removalists or asbestos removal supervisors must ensure all workers undertaking any asbestos removal work receive instruction and training in:

- fit testing/checking
- the importance of a correct facial fit
- the correct method of using their respirators
- the procedures for regular cleaning, inspection and maintenance of respirators before use
- when to stop asbestos removal work and leave the area if they think their RPE is not working properly.

The respirator must be worn in accordance with the manufacturer's instructions and the coverall hood must go over the respirator straps. It should be examined in accordance with the manufacturer's instructions before use to ensure that it is not damaged and is in good working order. Respirator defects should be reported immediately to the asbestos removal supervisor. The pre-use examination should include an inspection of:

- the condition of the straps and face piece, including the seal and the nose piece
- the condition of the exhalation valve
- a fit check.

Non-disposable respirators should be cleaned, disinfected and stored in a safe place away from the asbestos-contaminated removal area.

The length of time a particulate filter can be used for the asbestos removal work depends on the resistance to breathing and damage to the filter. The filter should be replaced if damaged or when resistance increases. A damaged filter must be replaced before resistance begins to increase. The replacement should be according to the manufacturer's instructions.

Certain brands of filters may not be usable after being exposed to certain conditions such as a full decontamination shower. Specific advice should be sought from the supplier regarding the effectiveness of a filter after being subjected to certain conditions.

All parts, including filters, valves and seals, should be inspected before and after each use. Respirator defects should be reported immediately to the supervisor for repair or replacement.

A system of regular cleaning, inspection and maintenance of non-disposable respirators should be in place to ensure they are clean and in a safe working condition.

Records of all respirator issues, uses and maintenance should be kept up-to-date.

At the end of a shift or at a break, as part of the decontamination process, ensure the respirator is taken off last.

AIR-LINE RESPIRATORS

Air-line respirators are used when the asbestos being removed is friable. When in use, the air-line should incorporate a belt-mounted back-up filter. If a failure of the air supply system occurs, workers should leave the asbestos removal work area using normal decontamination procedures; the use of a back-up belt-mounted filter device allows for adequate respiratory protection during this process.

If the number of workers wearing air-line respirators inside an enclosure is likely to result in the tangling of air lines, manifolds should be provided to minimise this tangling and assist workers in moving around the enclosure.

The capacity of the compressor should be adequate for the number of air-lines, and the location of the compressor's air intake should be assessed to ensure appropriate air quality and avoid contamination. Air from a compressor must be filtered before supply to a respirator.

4.6 Decontamination

Decontamination for the work area, workers, PPE and tools used in asbestos removal work is an important process in eliminating or minimising exposure to airborne asbestos fibres, particularly to persons outside the asbestos removal work area.

To determine the appropriate decontamination procedure, the risks of each individual asbestos removal job should be assessed.

DECONTAMINATION OF THE REMOVAL WORK AREA

There are two types of decontamination processes:

- Wet decontamination, or wet wiping, involves the use of damp rags to wipe down contaminated areas. Rags should only be used once, although they may be refolded to expose a clean surface. The rags should be used flat and should not be wadded. If a bucket of water is used, the rags should not be re-wetted in the bucket as this will contaminate the water. If the water is contaminated, it must be treated as asbestos waste. Care should be taken to avoid any potential electrical hazards when using this procedure.
- Dry decontamination involves carefully rolling or folding up and sealing plastic sheeting and/or vacuuming the asbestos removal area with an asbestos vacuum cleaner. Dry decontamination should only be used where the wet method is not suitable or poses a risk because of other hazards such as electricity or slipping.

Contaminated items, tools, equipment and clothing must not be removed from the removal work area unless they have been decontaminated or contained.

If an item is not able to be decontaminated, or is not suitable for decontamination, it should be placed in a sealed container and disposed of in accordance with the WHS Regulations. The sealed container must be decontaminated before it is removed from the asbestos removal work area.

If asbestos removal work involves friable asbestos, the decontamination procedures must include decontamination units. Glove bag and wrap and cut methods are exceptions where personal decontamination procedures are likely to be satisfactory and units are not necessary. Mini-enclosure removals may require a combination of personal decontamination and decontamination units.

DECONTAMINATION OF TOOLS

All tools used during asbestos removal work should be fully dismantled (where appropriate), cleaned under controlled conditions and decontaminated using either the wet or dry decontamination procedures described above before they are removed from the removal work area. The method chosen will depend on its practicality, the level of contamination and the presence of any electrical hazards.

If tools cannot be decontaminated in the asbestos removal work area, or are to be reused at another asbestos removal work area, they should be:

- tagged to indicate asbestos contamination
- double bagged in asbestos labelled bags before removing from the asbestos removal work area.

The bags containing the tools must remain sealed until decontamination or the commencement of the next asbestos maintenance or service task where the equipment can be taken into the removal work area and reused under full control conditions.

PPE should be worn when opening the bag to clean or reuse the equipment or tools, and decontamination should only be performed in a controlled environment.

In some circumstances it may be better to dispose of contaminated tools and equipment, depending on the level of contamination and the ease of replacement.

PERSONAL DECONTAMINATION PROCEDURES

Personal decontamination involves the removal of all visible asbestos dust/residue from PPE and RPE. Personal decontamination must be undertaken each time a worker leaves the asbestos removal work area and at the completion of the asbestos maintenance or service work. Personal decontamination should be done within the asbestos removal work area to avoid recontamination. Personal decontamination should be carried out where a decontamination unit is not necessary such as during minor or small scale removal and maintenance work.

Asbestos-contaminated PPE must not be transported outside the asbestos removal work area except for disposal purposes. Before work clothes and footwear worn during asbestos removal work are removed from the asbestos removal work area for any reason, they should be thoroughly vacuumed with an asbestos vacuum cleaner to remove any asbestos fibres and the footwear should also be wet wiped.

RPE should be used until all contaminated disposable coveralls and clothing has been vacuum cleaned and/or removed and bagged for disposal and personal washing has been completed. Any PPE used while carrying out asbestos removal work must not be taken home by a worker.

Personal hygiene and careful washing are essential. Particular attention should be paid to the hands, fingernails, face and head.

PERSONAL DECONTAMINATION

NEVER LEAVE THE ASBESTOS REMOVAL WORK AREA UNTIL DECONTAMINATION IS COMPLETE.

- Remove any visible asbestos dust/residue from protective clothing using an asbestos vacuum cleaner or wiping down with damp cloths. Do not reuse or resoak damp cloths.
- Carefully remove disposable protective clothing and place into bags (RPE must still be worn).
- Place cloths into disposal plastic bags (200 µm thick).
- Take disposable coveralls off and place into disposal bags (RPE must still be worn).
- Use damp cloths to wipe down footwear and place cloths into disposal bag.
- Seal all plastic bags with duct tape and place each into a second plastic bag.
- Seal this second plastic bag and label/mark as 'Asbestos Waste'.
- Use damp rags to wipe external surfaces of the disposal bags to remove any dust before it is removed from the asbestos removal work area.
- Remove PPE and double bag, seal with duct tape and mark as 'Asbestos Waste'.
- Remove non-disposable PPE and place in container labelled as containing asbestos.
- Remove RPE and double bag, seal with duct tape and mark as 'Asbestos Waste'.
- Ensure the outside of the bags are decontaminated by using a damp cloth.
- Place the damp cloth into disposable bags.
- Dispose of asbestos waste at the appropriate waste facility.

SETTING UP PERSONAL DECONTAMINATION AREAS OUTSIDE THE REMOVAL WORK AREA

The asbestos removalist must ensure particular areas are set up for people to personally decontaminate themselves and any tools and equipment when they are entering and leaving the asbestos removal work area to eliminate or minimise airborne asbestos from being released from the asbestos removal work area.

These areas are:

- a dirty decontamination area that includes:
  - a suitable rack for air-lines to be stored on at the entrance of the area
  - equipment for vacuum cleaning or hosing down (by use of a fine mist) contaminated clothing and footwear
  - storage for contaminated clothing and footwear
  - labelled waste bags/bins for disposing of protective clothing
  - shower area with an adequate supply of hot and cold water and toiletries

- a clean decontamination area that includes:
  - storage for individual RPE in containers or lockers
  - airflow towards the dirty decontamination area
  - shower area with an adequate supply of hot and cold water and toiletries
- a clean changing area that includes:
  - storage for clean clothing
  - separate storage for clean and dirty towels
  - airflow towards the clean decontamination area.

Below is an example of how a person would enter and leave a removal work area.

ENTERING THE REMOVAL AREA

- **Clean change area:** Change into clean work clothes and put on clean protective clothing. Store any removed clothing in a dust-proof container. Move into clean decontamination area.
- **Clean decontamination area:** Put on RPE. Check that it is working properly and there is a good facial seal such as, fit check. Move to the dirty decontamination area.
- **Dirty decontamination area:** Put on any additional PPE that has been stored in the dirty decontamination area such as footwear. Connect to the RPE air supply if required. Move from the decontamination unit to the removal work area.

LEAVING THE REMOVAL AREA

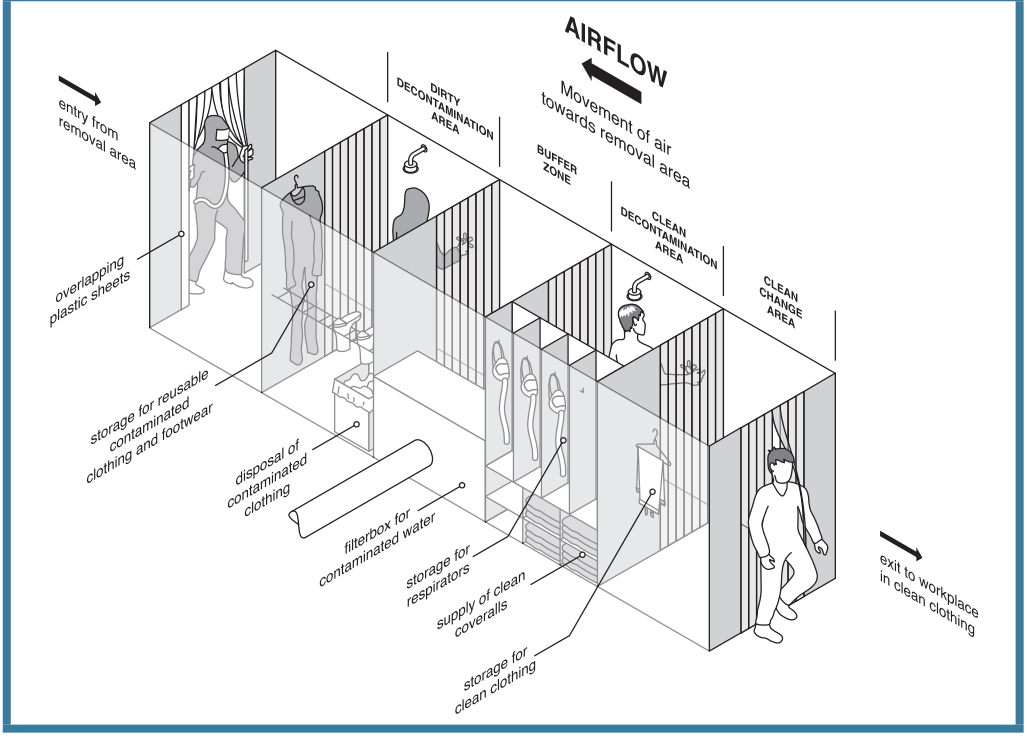
- **Asbestos removal area:** Use an asbestos vacuum cleaner to remove any obvious signs of asbestos dust from protective clothing. Remove footwear and leave shoes/boots inside the asbestos removal area next to the decontamination unit (footwear should be stored upside down to minimise further contamination). Proceed into the dirty decontamination area.
- **Dirty decontamination area:** If shoes/boots have not already been removed, remove them and store upside-down within the dirty decontamination area. Disconnect air-line respirator if being used. Shower while wearing protective clothing and RPE. Leaving RPE on, remove protective clothing and place in labelled waste bags. Remove wet underclothing, such as t shirts or shorts, while showering and place in the storage unit provided within the dirty decontamination area. Pass through the airlock into the clean decontamination area.
- **Clean decontamination area:** Shower and remove RPE. Thoroughly wash hands, fingernails, face, head and respirator. Store RPE in a suitable container within the clean decontamination area. Move to the clean change area.
- **Clean change area:** Change into clean clothing.

DECONTAMINATION UNITS ATTACHED TO AN ENCLOSURE

A risk assessment should be conducted to determine the number of units required based on the number of workers in the asbestos removal work area. As a guide, one decontamination unit should be provided for every six workers in the asbestos removal work area.

Where men and women are required to use the same decontamination unit, a system of work needs to be implemented to enable them to access the unit separately. In many instances, the only satisfactory way of providing appropriate changing facilities is to provide a mobile or specially constructed on-site decontamination unit.

FIGURE 1: Decontamination unit.



The decontamination unit should be immediately adjacent to and directly connected with the enclosed removal work area. It should be located as far away as practicable from workplace facilities such as and lunch rooms

The decontamination unit should include a dirty decontamination area, a clean decontamination area and a clean changing area. These areas need to:

- be large enough to enable workers to adequately decontaminate themselves
- be separated by suitable airlocks or buffer zones
- have doors with large openings with a hinged flap operating as a one-way valve to ensure there is sufficient airflow through the decontamination unit.

Towels and soap should be provided to allow workers to appropriately decontaminate themselves.

All water from the decontamination facility should pass through a particulate filter or other trap before it passes into sewer mains. The filter or trap should be capable of capturing particles down to 5 μm.

Workers should not smoke, eat or drink in any part of the decontamination unit.

The asbestos removalist may want to have a worker stationed outside an enclosure for the duration of the asbestos removal work to liaise with the project supervisor, communicate with personnel inside the work enclosure and instigate emergency/evacuation procedures if necessary.

Records about these activities should be kept on a daily basis.

REMOTE DECONTAMINATION UNITS FOR FRIABLE ASBESTOS REMOVAL

Remote decontamination units are decontamination units not attached to an enclosure when friable asbestos is being removed. Remote units are not located next to the asbestos removal work area and can only be used if a decontamination unit cannot be located immediately adjacent to the asbestos removal work area.

When a remote decontamination unit is to be used, the asbestos removalist would need to implement additional transiting procedures to minimise asbestos contamination of pathways leading from the enclosure to the decontamination unit. These procedures are longer and more complex than non-transiting. This involves the use of transiting PPE and additional facilities to enable the worker to carry out preliminary decontamination before travelling to the decontamination unit for full decontamination.

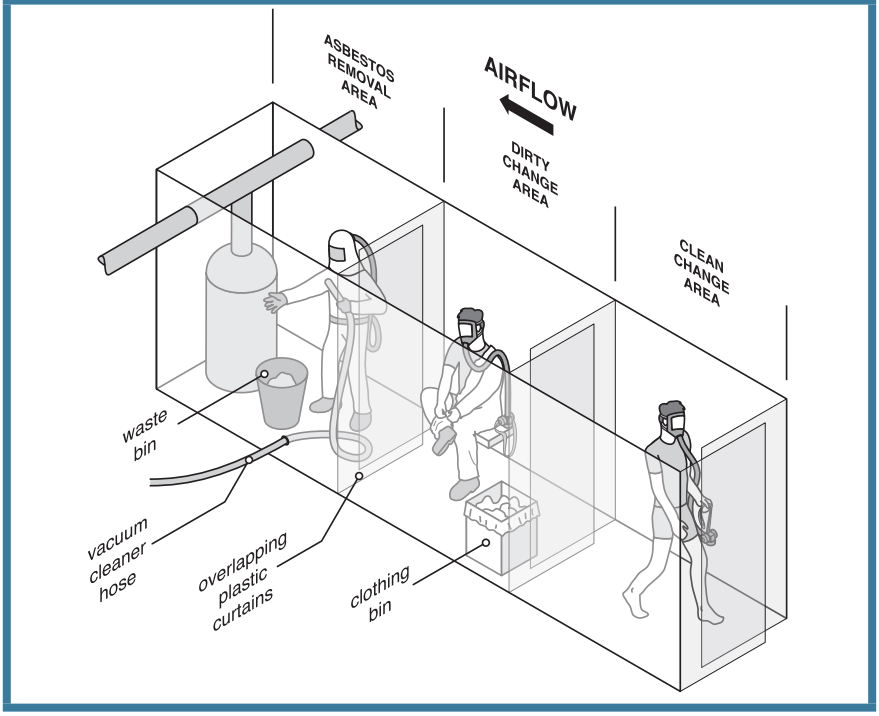
This may include a three-stage airlock isolated changing area, which should be specially constructed and made of 200 µm thick polythene sheeting. The area should be attached to the enclosure and should comprise three compartments separated by weighted sheets to minimise the spread of dust between the compartments.

Before workers enter this changing area, all obvious signs of asbestos dust need to be removed from their protective clothing using an asbestos vacuum cleaner. The isolated changing area is then used to discard outer garments, including coveralls and overshoes, before workers can put on fresh outer/protective clothing for the journey to the decontamination unit. RPE should be worn until the appropriate phase of the decontamination procedure within the remote decontamination unit.

The route of access from the asbestos removal area to the decontamination unit should be suitably signposted and barricaded to restrict public access.

Air monitoring must be conducted in the immediate vicinity of this access route and at other suitable locations outside the asbestos removal area.

FIGURE 2: Decontamination area.



4.7 Laundering clothing

Disposable coveralls should be used as protective clothing unless it is not reasonably practicable to do so. When non-disposable protective clothing is used, the contaminated clothing must be laundered in a suitable laundering facility that is equipped to launder asbestos-contaminated clothing. Contaminated protective clothing must not be laundered in homes. Any clothing worn under coveralls must be disposed of or suitably bagged for laundering as asbestos-contaminated clothing.

The laundering facility that is equipped to launder asbestos-contaminated clothing:

- should be informed of the asbestos contamination
- should have a management plan in place to control the release of respirable fibres
- should be constructed of smooth surfaces that are able to be lined with polythene sheeting or easily wiped clean
- may use conventional washing machines provided they are not used for other clothing
- may need to have a laundry room that is under negative pressure to eliminate or minimise the release of airborne asbestos fibres during the laundering process – this can be determined during the risk assessment
- should have procedures established for cleaning up spills and for the prevention of flooding of neighbouring areas.

The contaminated clothing should:

- be removed damp and thoroughly wet, then placed in impermeable containers or bags the outside of which are decontaminated and labelled to indicate the presence of asbestos before being sent to the commercial laundering facility
- not be allowed to dry out before washing.

At the laundry facility:

- the containers and bags holding the asbestos-contaminated clothing should be opened in the washing machine while being further saturated. As a minimum, P1 respiratory protection must be worn while unloading clothes into the washing machine
- the empty containers or bags should be disposed of as asbestos waste. Waste water must be filtered and the filtering medium disposed of as asbestos waste.

4.8 Waste containment and disposal

An asbestos removalist should design the route for removal of the asbestos waste bags or containers through the asbestos removal work area prior to commencement of the asbestos removal work. Only unused bags and heavy-duty 200 μm (minimum thickness) polythene sheeting can be used. Bags labelled for asbestos waste should not be used for any other purpose.

When developing a waste disposal program, the following should be taken into account:

- the containment of waste so as to eliminate the release of airborne asbestos fibres
- details of any asbestos or ACM to be left in-situ
- the types of fittings and supports and whether removal and disposal of these items is part of the work specifications

- the location and security of waste storage on site
- the transport of waste within the site and off site
- the location of the waste disposal site
- ensure that the proposed location for the storage and asbestos removal work area and the surrounding area will be unoccupied for the duration of the removal
- approvals needed from the relevant local disposal authority
- any local disposal authority requirements that may apply to the amount and dimensions of asbestos waste.

The development of the waste disposal program and methods used to transport waste through a building needs to be determined by a competent person (usually the asbestos removal supervisor) following discussions with the person with management or control at the workplce. In occupied workplaces, all movement of waste containers through a building should take place outside normal working hours.

REMOVAL WORK AREA WASTE CONTAINMENT

The waste disposal program should be included in the asbestos removal control plan and specify the method of transport and routes to be used for removing waste from the asbestos removal area before the commencement of each removal.

Loose asbestos waste must not accumulate within the asbestos removal work area by containing the waste in labelled asbestos waste bags or wrapped in plastic. Once the asbestos waste has been removed from the asbestos removal area, it should either be placed in a solid waste drum, bin or skip for secure storage and eventual disposal, or removed immediately from the site by an environmental protection agency (EPA) approved/licensed carrier for disposal.

The asbestos waste must be disposed of at a licensed asbestos waste disposal site. The disposal process must be in a manner that eliminates the release of airborne asbestos fibres by ensuring:

- bagged asbestos waste is securely packaged in labelled containers
- waste containers are secure during transport
- the method of unloading the waste is according to waste disposal procedures so that tearing of the plastic lining at the landfill site is prevented.

The asbestos waste must be disposed of as soon as reasonably practicable, whether that is:

- at the end of the removal job
- when the waste containers are full
- at the end of each day if the asbestos waste cannot be secured at the removal site.

ASBESTOS WASTE BAGS

All asbestos waste, friable asbestos and small pieces of non-friable asbestos must be contained to prevent exposure to airborne asbestos fibres. Containment is to be in new heavy-duty 200 μm (minimum thickness) polythene bags that are no more than 1200 mm long and 900mm wide to prevent manual task injuries.

Controlled wetting of the asbestos waste should be carried out to minimise asbestos dust emissions during bag/polythene sealing or any subsequent rupture of the bag or wrapped bundles. The bags must be twisted tightly and have the neck folded over and secured with adhesive tape (referred to as goose-necking).

To minimise the risk of a bag tearing or splitting and to assist in manual handling, asbestos waste bags should not be filled more than half full (depending on the weight of the items) and excess air should be gently evacuated from the waste bag in a way that does not cause the release of dust.

The bags should be labelled with appropriate signage stating that they contain asbestos and that dust creation and inhalation should be avoided.

The external surface of each bag should be cleaned to remove any adhering dust before the bag is removed from the asbestos removal work area and double bagged outside the asbestos removal areas immediately following the decontamination process.

Polythene sheeting for containing asbestos waste

Asbestos sheeting and redundant asbestos-lagged pipes and equipment should be contained in heavy-duty 200 µm (minimum thickness) polythene sheeting.

Polythene sheeting should be new (not recycled) as recycled sheeting can have flaws in it. Once wrapped in plastic, the bundles need to be labelled to indicate they contain asbestos so they can be treated appropriately.

Asbestos sheeting and redundant asbestos-lagged pipes and equipment should be double wrapped in the polythene sheeting and adhesive tape applied to the entire length of every overlap to secure the bundles to minimise the risk of the polythene sheeting tearing or splitting.

Removing waste from the removal work area

Once the waste has been removed from the asbestos removal work area, it should either be:

- placed in a solid waste drum, bin or skip for secure storage and eventual disposal
- immediately removed from the site by the relevant EPA approved/licensed carrier for disposal.

Labels for waste containers and drums

All containers containing a hazardous chemical such as asbestos must comply with to the labelling elements of the GHS. The waste drums or bins should be lined with plastic (minimum 200 µm thickness), and labels warning of the asbestos waste should be placed on the top and side of each drum or bin with the words, 'Danger: Asbestos Do not break seal' or a similar warning.

Examples of labels are included below.

LABEL 1: Sample asbestos waste bag.

SIGN 1: Sample asbestos removal area.

ASBESTOS WASTE DRUMS OR BINS

All drums or bins used for the storage and disposal of asbestos waste should be in good condition with lids and rims in good working order and free of hazardous residue.

The drums or bins should:

- be placed in the asbestos removal work area or located as close to the asbestos removal work area as possible before removal work commences
- be lined with plastic (minimum 200 μm thickness) and labels warning of the asbestos waste must be placed on the exterior of each drum or bin
- have their rims sealed and their outer surfaces wet-wiped and inspected before they are removed from the asbestos removal work area.

Controlled wetting of the waste during drum or bin filling should be carried out to minimise asbestos dust emissions.

Drums or bins used to store asbestos waste must be stored in a secure location when they are not in use. They should not be moved manually once they have been filled. Trolleys or drum lifters should be used.

If the drum or bin is to be reused, the asbestos waste should be packed and sealed so that when the drum or bin is emptied there is no residual asbestos contamination. The drum or bin should be inspected after use to ensure there is no asbestos residue.

ASBESTOS WASTE SKIPS, VEHICLE TRAYS AND SIMILAR CONTAINERS

If the volume or size of the asbestos waste cannot be contained in asbestos waste bags, drums or bins, a waste skip, vehicle tray or similar container in good condition should be used.

The asbestos should be sealed in double-lined, heavy-duty plastic sheeting or double bagged before it is placed in the skip. However, non-friable asbestos waste may be placed directly into a skip or vehicle tray that has been double-lined with heavy-duty plastic sheeting (200 μm minimum thickness) provided it is kept damp to minimise the generation of airborne asbestos.

Once the skip is full, its contents should be completely sealed with the plastic sheeting. If the skip is emptied at a waste disposal site, procedures for containment of the plastic lining to prevent tearing should be developed.

If asbestos waste cannot be disposed of immediately, the skip may be used for storing the asbestos waste on site over a period of time provided that the contents are secured (for example, using a lockable lid or locating the skip in a secure area) to prevent unauthorised access.

TRANSPORT AND DISPOSAL OF ASBESTOS WASTE

Disposal of asbestos waste is the final step in the process of asbestos removal work. It is therefore the last point at which the exposure to risks associated with asbestos is likely to occur. The asbestos waste must be disposed of as soon as is practicable at a licensed asbestos disposal site.

The transport of commercial asbestos waste is covered under EPA legislation. Disposal sites are regulated by the EPA and local government regulations.

5. USING AN ENCLOSURE DURING LARGE SCALE REMOVAL WORK

Large scale asbestos removal includes removal that occurs on a frequent basis, is generally of a longer duration, usually generates a significant amount of airborne asbestos fibres and may pose a serious risk both to workers and others.

Where friable asbestos is removed, a licensed asbestos removalist that holds a Class A licence must remove the asbestos. The licensed asbestos removalist must ensure, so far as is reasonably practicable, the asbestos removal work area is enclosed (sometimes referred to as the 'bubble') to eliminate or minimise the release of airborne asbestos fibres.

When large scale friable asbestos removal work is being undertaken, the asbestos removal work areas should be enclosed and under 'negative pressure' with the use of negative air pressure units.

The use of enclosures in large scale non-friable asbestos removal requiring a Class B licence should be determined on the basis of a risk assessment. Factors such as proximity to other work areas, weather conditions if outdoors, and the amount of material to be removed should be considered.

5.1 Designing and installing an enclosure

The design and installation of the enclosure should consider:

- methods used to contain the asbestos removal work area
- provision and locations of decontamination/changing facilities and negative pressure exhaust units
- precautions to be implemented to eliminate or minimise the spread of asbestos contamination outside the asbestos removal work area
- air quality within the enclosure
- types of lighting, whether natural or artificial
- temperature within the enclosure to avoid heat stress
- any other hazards in the enclosure (these must be identified and the risks controlled before any asbestos removal work commences).

The enclosure should:

- be constructed of heavy-duty plastic sheeting (200 μm minimum thickness) and enclose all the walls, windows and doors. Wooden cleats may be used to anchor the plastic sheeting to walls. Re-milled plastic sheeting should not be used
- have viewing panels placed in appropriate locations so that the asbestos removal work area can be seen from outside the enclosure
- have adequate lighting within the enclosure, either:
  - naturally, using clear plastic or perspex panels in the enclosure walls
  - artificially, preferably from outside the enclosure using clear plastic or perspex panels.

During the masking up and later removal of the sheeting, all persons must wear appropriate PPE, for example coveralls, and as a minimum a half-face respirator with P1 filters.

Where the asbestos removal work area connects either to the outside environment or to the rest of the building, it should be enclosed so that an airtight seal is maintained for the duration of the asbestos removal work (for example, windows, ducts, wall cavities and lift entrances).

All movable items should be removed from the asbestos removal area. If this is not possible, move the items from the immediate asbestos removal work area and cover with two layers of plastic sheeting with a minimum overlap of 300 mm between the layers. Both layers should be double taped.

All non-movable items such as fixtures and fittings should be covered with plastic sheeting and the joints sealed.

Airlocks should be placed at the entry points to the change area and constructed using double sets of overlapping plastic with suitable provisions for ensuring a seal.

All floors should be protected with at least one layer of woven plastic to prevent penetration during the asbestos removal work. The joints should be lapped 300 mm and sealed with double-sided tape and duct tape.

If the asbestos removal area is next to areas occupied by unprotected persons, priority should be given to:

- performing the asbestos removal work during periods when these areas are unoccupied
- greater isolation of the asbestos removal area. This is the preferable option.

Consideration should be given to the use of hoarding to form a barrier between the asbestos removal work area and the adjoining occupied areas. A plastic-lined barrier should be erected within this hoarding and a buffer area should be reserved between the hoarding and occupied areas.

Platforms and fixed scaffolding should be erected during the early stages of the work. These structures should ideally be erected on the outside of the enclosed area. Any platforms or fixed scaffolding within the enclosed area must be decontaminated and visually inspected at the end of the asbestos removal work.

All tools and equipment used for asbestos removal work, including asbestos vacuum cleaners, must remain within the asbestos removal work area until the completion of the job.

All the plastic and tape used for the enclosure must be disposed of as asbestos waste. Any temporary structures must be disposed of as asbestos waste if they cannot be decontaminated. An inspection by a competent person will confirm if the structures are free of any visible asbestos.

Work methods should be adapted for the work environment within the enclosure. For example, rest breaks need to be based on a risk assessment taking into account factors such as the weather and heating/cooling requirements.

5.2 Testing an enclosure

Prior to the asbestos removal work commencing, the licensed asbestos removalist should ensure the enclosure is tested by a independent licensed asbestos assessor.

A independent licensed asbestos assessor should visually inspect, test and smoke the enclosure prior to commencement of the asbestos removal work.

- While smoke is generated within the enclosure, a worker should be outside the enclosure to check for leaks.
- Only smoke-generating devices incorporating non-oil-based, non-toxic smoke fluids can be used. Flares should not be used.

- Smoke (fire) detection devices in the immediate vicinity of the asbestos removal area should be isolated for the duration of the smoke test.
- The results of the smoke test should be documented and a copy provided to the licensed asbestos removalist.

Negative pressure exhaust units should not be used while the smoke test is being conducted.

The effectiveness of the enclosure should be regularly monitored while asbestos removal work is underway (for example, a visual examination, air-monitoring results and negative pressure readings).

If leaks or deficiencies are found during the initial testing of the enclosure, these must be rectified (an expandable foam sealant, tape or equivalent may be used) and another smoke test performed until no leaks or deficiencies are identified.

Following a visual examination of the enclosure and surrounding area, if a leak of asbestos (more than 0.02 fibres/ml) is detected:

- the asbestos removal work must stop until any defects have been rectified
- before work recommences, it is essential to:
  - identify the source of the leak/s
  - eliminate or minimise further release of airborne asbestos fibres
  - seal the leaks in the enclosure
  - re-test the enclosure by smoke testing until the enclosure is effective again
  - clean any contaminated areas
  - conduct visual inspections
  - conduct an air monitoring test specific to the incident (air monitoring)
  - notify the relevant authority where applicable
  - re-assess the boundaries of the asbestos removal work area and site

A supply of expandable foam sealant, polyester insulation or equivalent should be kept on site for sealing leaks.

5.3 Information on pressure exhaust units (negative units)

To prevent the escape of airborne asbestos fibers from an enclosed removal work area, an exhaust extraction fan should be installed so as to create a ‘negative’ air pressure of approximately 12 Pa (water gauge) within the enclosed removal work area.

An exhaust extraction fan should be installed in the enclosure to create a ‘negative’ air pressure of approximately 12 Pa (water gauge) within the enclosed asbestos removal work area. This may require the use of more than one negative pressure exhaust unit.

Units should incorporate warning devices for filter integrity/overload and power failure, and should have a manometer or magnohelic gauge and an audible and visual alarm system.

The negative pressure exhaust unit should be positioned opposite the decontamination unit to enable laminar (smooth) air flow.

- The air entering the asbestos removal work area passes through the decontamination unit or point-of-entry while the air extracted passes through a HEPA filter to remove any asbestos before it is discharged to the outside.
- If this is not possible, consideration should be given to how to set up the enclosure, decontamination unit and negative pressure exhaust unit to enable optimum smooth flow of air through the enclosure so as to minimise dead air pockets. Discharge of the air from the enclosure should be at a location away from other working areas, air-conditioning inlets or breathing air compressors.

The HEPA filter must comply with *AS 4260:1997 High efficiency particulate air (HEPA) filters – Classification, construction and performance* or its equivalent.

- A coarse pre-filter should be installed on the air intake side of the negative air unit to prolong the useful life of the HEPA filter.
- These pre-filters may need to be changed once per work shift or more frequently depending on dust loads.
- Used pre-filters must be disposed of as asbestos waste.
- A process of regular inspection of the integrity of the HEPA filter and seal fittings in conjunction with a static pressure alarm should indicate failures in the system.

The negative air units should operate continuously (24 hours a day) until all asbestos removal work and decontamination within the enclosure has been completed, a clearance certificate issued and the enclosure dismantled. If the units stop during removal work, the licensed asbestos removalist must ensure all removal work ceases immediately until the problem is rectified and the required number of units are in operation. To minimise the risk of airborne asbestos fibres escaping the enclosure, the delay should be as short as possible to avoid interruption. Consideration should be given to backup negative pressure exhaust units and the use of a generator.

Maintenance work on these units should only be performed after they have been thoroughly decontaminated, or the work may be carried out under controlled conditions, such as in an asbestos removal enclosure while wearing appropriate PPE.

BULK STRIPPING AND CLEANING WITHIN AN ENCLOSURE

Sprayed asbestos insulations need to be wet thoroughly using a fine water spray. Aim to achieve maximum saturation with minimum run-off to minimise any subsequent clean-up and slip hazards.

Wetting, scraping and vacuuming methods need to be used wherever reasonably practicable. Where the asbestos ACM is covered with cloth, metal cladding or wire reinforcing, it should be wet thoroughly during the removal process.

Once a competent person has determined the removal area is clean, the licensed asbestos removalist should, wherever reasonably practicable, spray clean surfaces within the removal area with tinted PVA or a similar acrylic emulsion using airless spraying equipment. This includes any layer of plastic forming the inner surface of the enclosure to ensure any loose asbestos fibres on the plastic are firmly adhered to prior to its dismantling.

After the PVA has dried and sufficient time has elapsed for it to dissipate, air (clearance) monitoring should take place, where required. The plastic enclosure must not be dismantled until a satisfactory visual inspection and monitoring has taken place.

DISMANTLING AN ASBESTOS REMOVAL ENCLOSURE

The licensed asbestos removalist should only dismantle a structure used to enclose an asbestos removal area once all of the following are done:

- asbestos removal work has been completed
- visual inspection by an independent competent person is satisfactory
- air monitoring, in the case of friable asbestos removal, is found to be less than 0.01 fibres/ml.

The plastic that formed the enclosure must be disposed of as asbestos waste, along with any other contaminated material that assisted in forming the enclosure. In some cases, structures used in building the enclosure (other than the plastic that formed the enclosure) may be wrapped and sealed in plastic and not opened until in a similar controlled environment, such as another asbestos removal enclosure (for example, collapsible rods used to form the enclosure frame).

The area from which the enclosure was dismantled must be thoroughly cleaned and inspected. This should be followed by further air monitoring demonstrating the levels are below 0.01 fibres/ml.

Ropes, warning signs and protective plastic isolating public areas should not be removed until:

- the enclosure has been dismantled and removed as asbestos waste
- satisfactory air monitoring results have been achieved
- the asbestos removal area and its surrounds have been visually inspected by an independent competent person and found to be satisfactory for reoccupation.

SECURITY AND CHECKS WHEN USING AN ENCLOSURE

The licensed asbestos removalist should ensure an employee is stationed outside the asbestos work area for the duration of the asbestos removal work to:

- liaise with the project supervisor
- check and maintain negative air units, compressor units, decontamination units and hot water service
- ensure security of the area is maintained
- communicate with personnel inside the work enclosure
- instigate emergency or evacuation procedures if necessary.

Records of these checks should be made on a daily basis and kept.

6. METHODS FOR SMALL SCALE REMOVAL WORK

Small scale friable asbestos removal work usually generates enough airborne asbestos fibres to require the use of PPE and generally is carried out only in short periods, for example minor maintenance work. Small scale removal work involves using mini-enclosures, 'glove bag' and 'wrap and cut' techniques.

6.1 Mini-enclosure

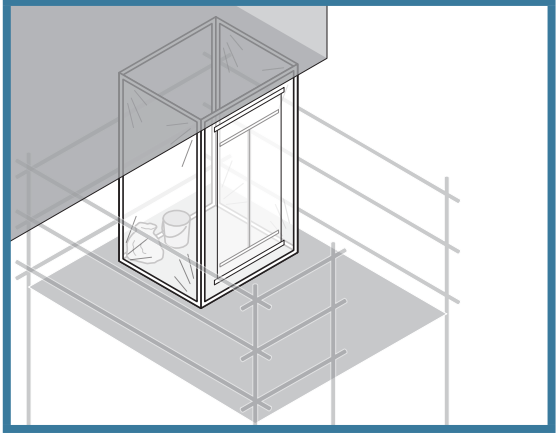
Mini-enclosures are suitable for asbestos removal work in areas with restricted access, such as ceiling spaces, and for emergency asbestos removals. Hazards and work procedures that should be considered for large enclosures should also be considered for mini-enclosures.

BUILDING THE MINI-ENCLOSURE

To build a mini-enclosure, the below process should be followed:

- Off-the-shelf mini-enclosures can be used or alternatively timber or other materials can be used to build a frame. The frame of a mini-enclosure can be made from a variety of materials, but has to be strong enough to support the plastic sheeting that forms the enclosure.
- Heavy-duty plastic sheeting (200 μm minimum thickness) should be used for making the enclosure. Do not use recycled or re-milled plastic.
- Make the enclosure large enough to do the work safely, allowing for movement inside the enclosure and all the equipment needed for the removal work such as tools for the task including a bucket of water, rags, sprayer, vacuum cleaner nozzle and hose.
- Machinery that emits exhaust fumes should not be placed in a mini-enclosure.
- Attach the polythene sheeting inside the frame with duct tape.
- Attach the polythene sheeting to the ceiling with masking tape only. Attach it to non-asbestos surfaces with duct tape. The tape used to connect the plastic to the frame should be strong enough to securely hold the plastic to the frame.
- Make an entry slit in one wall of the enclosure and reinforce this with duct tape from inside the enclosure. Attach a polythene sheet above the entry slit to cover it.
- Check all seals inside the enclosures for leaks with a smoke test using smoke tubes for mini-enclosures. The competent person, (usually the licensed asbestos supervisor,) outside the enclosure should check for leaks outside the enclosure and seals all leaks.

FIGURE 3: Building and using the enclosure.



DISMANTLING THE MINI-ENCLOSURE

To eliminate or minimise airborne asbestos fibres escaping when dismantling the mini-enclosure, the below process should be followed:

- Put the asbestos waste in a clear bag with an asbestos warning sign or label to indicate the presence of asbestos.
- Clean the enclosed area with an asbestos vacuum cleaner.
- Clean the equipment and polythene sheeting with damp rags.
- Workers leaving a mini-enclosure must follow personal decontamination procedures.
- Inspect the enclosure visually for cleanliness.
- Ensure that a clearance inspection is conducted by an independent licensed asbestos assessor or competent person and a clearance certificate is issued.
- Spray the polythene sheeting with PVA sealant.
- Remove the sheeting from the framework and put it in the labelled asbestos waste container.
- Remove PPE and put it in the labelled asbestos waste container, taping the container closed.
- If the framework was fully protected and had been decontaminated and inspected by the asbestos removalist, it can be reused.

6.2 Glove bag asbestos removal work

The glove bag removal technique is suitable for the removal of asbestos lagging from individual valves, joints and piping. Glove bags:

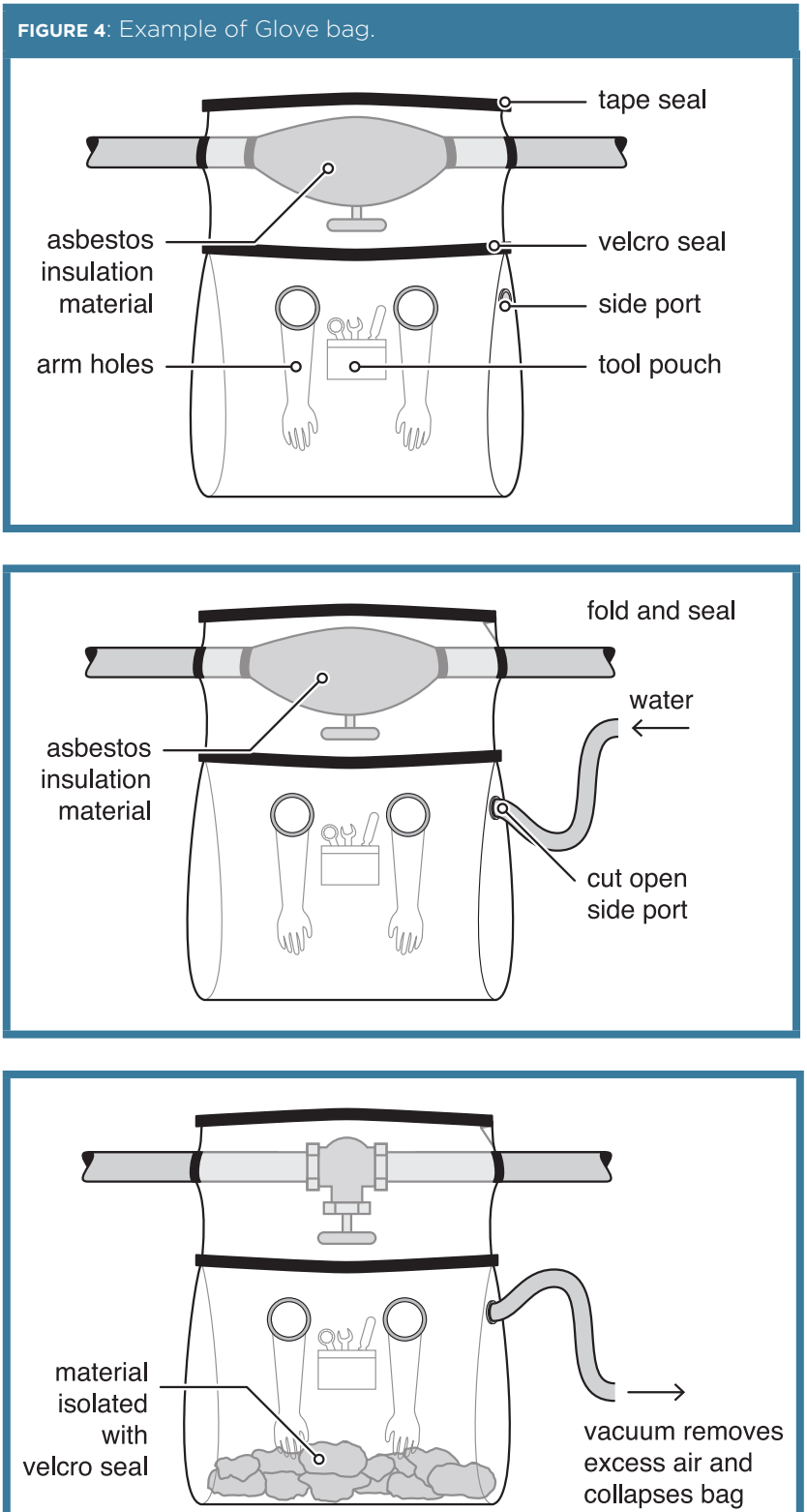
- are designed to isolate small removal jobs from the general working environment and provide a flexible, easily-installed and quickly-dismantled temporary enclosure for small removal work
- are single-use bags constructed from transparent, heavy-duty polyethylene with built-in arms and access ports. Glove bags are about one metre wide and 1.5 metres deep
- contain all waste and contamination within them, eliminating the need for extensive PPE and decontamination. A limitation in using glove bags is the volume of waste material they are able to contain. Care should be taken to prevent overfilling the bag with waste
- should not be used for hot pipe work due to difficulties in sealing the glove bag to the pipe or maintaining a seal.

The below process should be followed when using the glove bag removal technique:

- Equipment and removal tools for the asbestos removal work should be placed into the glove bag at the start of the job. The tools used to remove the asbestos depend on the nature of the material to be removed.
- A P1 filtered respirator and disposable coveralls need to be worn as a minimum while using glove bags in case a bag ruptures or leaks.
- The glove bag should completely cover the pipe or object. The lagging on either side of the bag should be sound enough to support the weight of the bag and its wet contents.
- Cut the sides of the glove bag to fit the size of the pipe from which asbestos is to be removed. Attach the glove bag to the pipe by folding the open edges together and securely sealing them with duct tape or an equivalent.

- Seal all openings in the glove bag with the tape, including the bottom and side seams to prevent any leakage if there is a defect in a seam.
- Saturate the asbestos with a wetting agent and then remove it from the pipe, beam or other surface. The wetting agent should be applied with an airless sprayer through a pre-cut port, as provided in most glove bags, or through a small hole cut in the bag. Asbestos that has fallen into the bag should be thoroughly saturated.
- Asbestos or ACM is generally covered with painted canvas and/or wire. Any canvas should be cut and peeled away from underneath. If the asbestos or ACM is dry, it should be re-sprayed with the wetting agent before it is removed.
- Clean the pipe or surface once the asbestos has been removed using a wire brush or similar tool and wet-wipe it until no traces of the asbestos can be seen. Wash down the upper section of the bag to remove any adhering asbestos.
- Seal edges of asbestos exposed by the removal or by maintenance activity to ensure the edges do not release respirable asbestos fibres after the glove bag is removed.
- When the asbestos has been removed and sealed, insert a vacuum hose from an asbestos vacuum cleaner into the glove bag through the access port to remove any air in the bag that might contain respirable asbestos fibres. When the bag has been evacuated, squeeze it tightly (as close to the top as possible) and twist and seal it with tape, keeping the asbestos safely in the bottom of the bag.
- Remove the vacuum line from the bag and then remove the glove bag from the workplace for disposal as asbestos waste.
- When the removal is complete, the worker must follow the procedures to personally decontaminate and decontaminate tools according to the decontamination requirements. The asbestos waste in the bag should be sealed and disposed of according to the waste disposal procedures.

FIGURE 4: Example of Glove bag.



6.3 Wrap and cut asbestos removal method

The 'wrap and cut' technique of removal produces the lowest levels of respirable asbestos fibres and is used instead of full containment procedures when the asbestos is a small amount of non-friable asbestos in good condition and not damaged. This method is most appropriate when the entire component is to be removed, such as redundant plant and equipment covered with lagging. If lagging has to be removed to allow a pipe to be cut, the glove bag removal method may be used to expose the metal at the point to be cut and for a sufficient length on either side. The pipe should be cut at the centre of the exposed section.

The below process should be followed when using the wrap and cut removal technique:

- The plant or equipment to be removed should be vacuumed with a HEPA-fitted vacuum cleaner and/or wiped with damp rags (which should be disposed of as asbestos waste).
- The plant or equipment should be double wrapped with 200 μm thick plastic and taped so that the asbestos is totally sealed within the plastic. The wrapped plant or equipment is cut from the rest of the plant and equipment using mechanical shears or oxy-cutting tools.
- Only exposed metal can be cut and care should be taken to ensure the plastic wrapping is not punctured or melted. The cut section is then removed as asbestos waste.
- If lagging has to be removed to allow a pipe to be cut, the glove bag removal method may be used to expose the metal at the point to be cut and for a sufficient length on either side. The pipe is then cut at the centre of the exposed section.
- A P1 filtered respirator and disposable coveralls should be worn as a minimum while doing wrap and cut removal work. If the lagging is in very poor condition, such that significant airborne asbestos fibres may be generated, a higher level of respiratory protection may be required or the method of asbestos removal reconsidered.
- On completion of the removal, workers need to follow the personal decontamination procedures and dispose of asbestos waste.

7. CONTROLS FOR SPECIFIC ASBESTOS REMOVAL WORK

Appendix D provides some additional examples of asbestos removal work.

7.1 Removing asbestos-contaminated soil

Asbestos-contaminated soil comprises non-attached pieces of asbestos cement products and other material containing asbestos uncovered in soil during other work activities. Contamination can be detected during building and road construction and excavation, waste disposal, damage following a severe weather event such as a hail storm, weathering over time, or when asbestos is poorly handled or damaged during removal jobs.

A risk assessment by an independent licensed asbestos assessor or competent person, including contaminated site assessment practitioners, should determine the most appropriate control measures and remediation strategies.

Asbestos-contaminated soil is also subject to requirements of other regulatory agencies such as the EPA, Pubic Health and local governments. Where guidance on the assessment and remediation of contaminated sites is sought, the Assessment of Contaminated Sites National Environmental Protection Measure (NEPM) should be referred to. The contaminated sites NEPM is published by the Environmental Protection Heritage Council (EPHC).

Removal of asbestos from contaminated soil will require a Class A licensed asbestos removalist for any friable asbestos to be removed, or a Class B licensed asbestos removalist if more than 10 m^2 of non-friable asbestos is to be removed. A person who does not have a licence can remove 10 m^2 or less of non-friable asbestos. Where there is uncertainty as to whether the amount of non-friable asbestos is more or less than 10 m^2, a Class A or Class B licensed asbestos removalist should be engaged.

For all asbestos removal requiring a Class A asbestos removal licence, an air monitoring program must be implemented to ensure the control measures do not release airborne asbestos fibre. When all visible asbestos has been removed, and the air monitoring program indicates that the level of respirable asbestos fibres does not exceed 0.01 f/mL (10 per cent of the asbestos exposure standard), the independent licensed asbestos assessor must complete the clearance certificate.

All asbestos and any contaminated soil removed must be disposed of as asbestos waste according to the EPA and the requirements of the local licensed waste disposal facility.

IMMEDIATE ACTION
If the soil is suspected of containing asbestos, the person with management or control of the workplace must assume the soil contains asbestos and cease work immediately. A competent person should take samples of the material for analysis to confirm or refute that assumption.

If confirmed, the person with management or control of the workplace must ensure control measures are implemented to minimise the release of airborne asbestos. The control measures include:

- preparation of an asbestos management plan for the site
- setting the boundaries of the contamination as determined by an independent licensed asbestos assessor or competent person
- ensuring there is minimal disturbance of the contaminated soil until the asbestos management procedures have been implemented
- isolating and securing the removal work site using signs and barriers
- controlling dust with dust suppression techniques (such as water and wetting agents)

- providing PPE based on the level of contamination and the control measures implemented
- sampling and/or air monitoring
- providing education and training for workers on hazards and safe work practices to minimise airborne dust exposure
- implementing decontamination procedures for the workers and the equipment.

7.2 Removing friable asbestos from hot surfaces

Friable asbestos in or on hot metal or machinery presents one of the worst conditions for removal, as airborne asbestos fibres can spread on convection currents in the air and the potential for burns is high.

Removal of work from hot surfaces should be avoided. If possible, the removal should be scheduled and planned around shutdowns, with sufficient time being allowed for the metal or machinery to cool down before removal is attempted. Hot metal removal should be used only in emergency situations and where the use of water sprays may create steam, making the removal task unsafe or more difficult.

In the limited circumstances where the dry removal of asbestos from hot surfaces is the only option (for instance, emergency situations), particular care should be taken in the selection of dust extraction equipment to cope with the convection currents involved, and the selection of appropriate PPE also becomes even more important.

Heat stress should be considered when preparing the asbestos removal control plan, particularly in the selection of PPE and the design of the work program.

Arrangements for the removal of asbestos from hot plant and equipment should be factored into the asbestos management plan for the workplace. This should include cooling requirements and/or the shutdown periods required to achieve adequate cooling.

7.3 Removing asbestos in plant and pipes or pits

Asbestos products include gaskets reinforced with asbestos that are used in plant and equipment between flanges on pipes to control the temperature and pressure. Asbestos rope was used for lagging pipes and valves and for sealing hatches. Asbestos is also found in friction products such as brake linings and cylinders.

It is likely that the asbestos in gaskets and rope and friction products will be friable. This type of plant and equipment is subject to the removal of friable asbestos and may be removed using the ‘glove bag’ or ‘wrap and cut’ method. If the plant contains non-friable asbestos, a Class B licensed asbestos removalist can conduct the removal (which could also be removed by an asbestos removalist that does not have a licence).

In the past, telecommunication pits were constructed using asbestos and at the access points there is potential for exposure to airborne asbestos fibres when accessing these pits.

Work installing or modifying telecommunication lines in these pits may require cutting and removal. Where no other asbestos-related removal work is required and the asbestos is non-friable, a Class B licensed asbestos removalist can remove the asbestos; however, a Class A licensed asbestos removalist may also carry out the removal work. If the amount of non-friable asbestos to be removed is less than 10 m^2, it may be removed by a person who does not have a licence.

APPENDIX A – ASBESTOS REMOVAL CONTROL PLAN CONTENTS

	Building & structures		Plant & equipment	
	Friable	Non-Friable	Friable	Non-Friable
Notification				
Notification requirements have been met and required documentation will be on site (e.g. removal licence, control plan, training records)	Yes	Yes	Yes	Yes
Identification				
Details of asbestos to be removed (e.g. the locations, whether asbestos is friable/ non-friable, its type, condition and quantity being removed)	Yes	Yes	Yes	Yes
Preparation				
Consult with relevant parties (health and safety representative; workers; person who commissioned the removal work, licensed asbestos assessors)	Yes	Yes	Yes	Yes
Assigned responsibilities for the removal	Yes	Yes	Yes	Yes
Program commencement and completion dates	Yes	Yes	Yes	Yes
Emergency plans	Yes	Yes	Yes	Yes
Asbestos removal boundaries, including the type and extent of isolation required and the location of any signs and barriers	Yes	Yes	Yes	Yes
Control of other hazards including electrical and lighting installations	Yes	Yes	Yes	Yes
PPE to be used including RPE	Yes	Yes	Yes	Yes
Removal				
Details of air-monitoring program Control and clearance	Yes	No	Yes	No
Waste storage and disposal program	Yes	Yes	Yes	Yes
Method for removing the asbestos (wet and dry methods)	Yes	Yes	Yes	Yes
Asbestos removal equipment (e.g. spray equipment, asbestos vacuum cleaners, cutting tools)	Yes	Yes	Yes	Yes
Details of required enclosures, including their size, shape, structure etc, smoke testing enclosures and the location of negative pressure exhaust units	Yes	No	Yes	No

Details on temporary buildings required by the asbestos removalist (e.g. decontamination units) including details on water, lighting and power requirements, negative pressure exhaust units and the locations of decontamination units	Yes	May be required depending on the job	Yes	May be required depending on the job
Other risk control measures to prevent the release of airborne asbestos fibres from the area where asbestos removal is undertaken	Yes	Yes	Yes	Yes
Decontamination				
Detailed procedures for workplace decontamination, the decontamination of tools and equipment, personal decontamination and the decontamination of non-disposable PPE and RPE	Yes	Yes	Yes	Yes
Waste Disposal				
Method of disposing of asbestos waste, including details on:	Yes	Yes	Yes	Yes
■ the disposal of protective clothing ■ the structures used to enclose the asbestos removal area	Yes	Yes	No	Yes
Clearance and air monitoring				
Name of the independent licensed asbestos assessor or competent person engaged to conduct air monitoring (if any)	Yes	No	Yes	No
Consultation				
Consult with any people who may be affected by the removal work, including neighbours	Yes	Yes	Yes	Yes

APPENDIX B - RESPIRATORY PROTECTIVE EQUIPMENT

When selecting RPE, you should also refer to the AS/NZS 1715:1994 *Selection, Use and Maintenance of Respiratory Protective Devices and AS1716:2003 Respiratory Protective Devices.*

The figures below provide examples of some respirators that can be used. The protection afforded by each device depends not only on the design and fit of the respirator but also upon the efficiency of the filters (for instance, P1, P2 or P3). These figures are indicative only. In order to show the correct respirator fit, they do not show the use of hoods. Respirators must always be worn under a hood.

FIGURE 5: Disposable, half-face particulate respirator.

FIGURE 6: Half-face, particulate filter (cartridge) respirator.

FIGURE 7: Powered, air-purifying, ventilated respirator.

FIGURE 8: Full-face, particulate filter (cartridge) respirator.

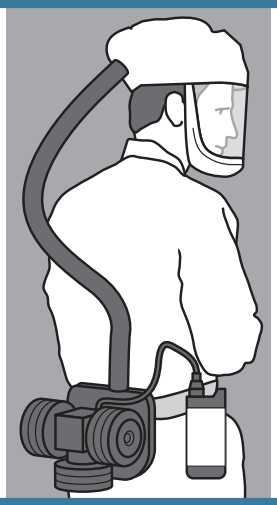


FIGURE 9: Full-face, powered air-purifying particulate respirator.

FIGURE 10: Full-face, positive pressure demand air-line respirator.

SELECTION OF RPE

The most efficient respirator and filter for the task should be used. Proper fit is critical; a disposable half-face respirator is especially difficult. Consideration should be given to upgrading to a non-disposable half-face respirator.

Table 2 provides guidance for the selection of appropriate respiratory protection for different tasks, assuming the correct work procedures are being followed. This table does not take into account personal features including facial hair or where glasses are worn. Full protection cannot be achieved if either of these factors interferes with the face seal.

Workers should be consulted on the selection of RPE to ensure individual fit and medical factors have been considered.

Work Procedure	Required respirator	Filter type
Simple enclosure erection for containing undamaged asbestos materials to prevent damage – no direct handling but possible disturbance of asbestos	Disposable, half-face particulate respirators OR Half-face, particulate filter (cartridge) respirator	P1 or P2
Inspection of the condition of any installed friable asbestos, which appears in poor condition or has been disturbed	Disposable, half-face particulate respirators OR Half-face, particulate filter (cartridge) respirator	P1 or P2
Sampling material for the purpose of identifying asbestos	Disposable, half-face particulate respirators OR Half-face, particulate filter (cartridge) respirator	P1 or P2
Removal of non-friable asbestos (e.g. asbestos cement sheets, ceiling tiles and vinyl tiles)	Disposable, half-face particulate respirators OR Half-face, particulate filter (cartridge) respirator	P1 or P2
Half-face, particulate filter (cartridge) respirator	P1 or P2	
Extensive sample operations on friable asbestos	Full-face, particulate, filter (cartridge) respirator	P3
Maintenance work involving the removal of small quantities of friable asbestos (e.g. replacement of friable asbestos gaskets and insulation)	Full-face, particulate, filter (cartridge) respirator	P3
Certain forms of wet stripping in which wetting is prolonged and effective, and certain small-scale dry stripping operations	Full-face, powered air-purifying particulate respirator OR Full-face, positive pressure demand air-line respirator	P3

Certain forms of dry stripping and ineffective wet stripping (light wetting, no time given to saturate)	Full-face, powered air-purifying particulate respirator OR Full-face, positive pressure demand air-line respirator No lesser respirator will suffice	P3
Dry stripping in confined areas	Full suit or hood, positive pressure demand continuous flow air-line respirator No lesser respirator will suffice	P3 only as a backup

Table 2: Selecting RPE.

FIT TESTING OF FACE PIECES

The fit of a negative-pressure respirator to a worker's face is critical. A fit test, in accordance with *AS/NZS 1715:2009 Selection, Use and Maintenance of Respiratory Protective Devices* and the manufacturer's instructions, should be performed to assist in determining the best fit respirator for the individual worker immediately before commencing work and a fit check performed each time the respirator is to be used.

The performance of RPE depends on a good contact between the wearer's skin and the face seal of the mask so that the mask is a tight-fitting face piece or full mask. A good face seal can only be achieved if the wearer is clean-shaven in the region of the seal and the face piece is the correct size and shape to fit the wearer's face.

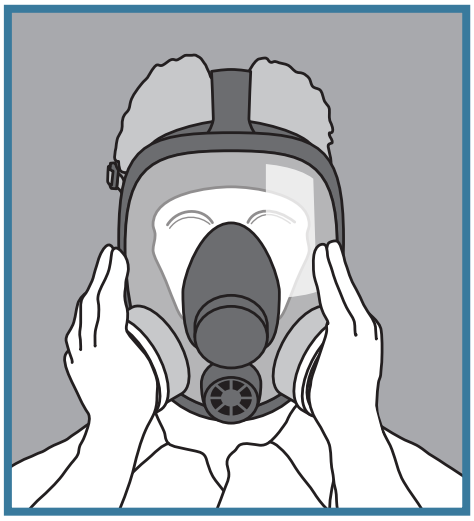
Workers using negative-pressure respirators should also be clean-shaven to ensure a good face seal. Workers with beards, stubble or facial hair should use a continuous-flow positive pressure respirator.

Workers wearing prescription glasses with side arms may not be able to use full-face respirators because of the loss of seal around the spectacle arms. If their glasses cannot be modified so they do not need the support of the ears, these workers should not use full-face respirators and should wear air supply hoods instead. Ensure that these hoods will provide a sufficient level of protection.

Where the half-face respirator has been selected as providing the most appropriate protection and a seal or fit is not achievable from non-disposable respirators, a disposable respirator may be used.

To conduct a full- or half-face respirator fit check:

- close off inlet to filter
- inhale gently
- hold for 10 seconds
- check that the face piece remains slightly collapsed, as it should.



APPENDIX C - EXAMPLE OF A CLEARANCE CERTIFICATE

SECTION A – CLEARANCE INSPECTION DETAILS

Note: Where asbestos removal work requires a Class A licence, an independent licensed asbestos assessor must carry out the clearance inspection and complete an asbestos removal clearance certificate if satisfied that the area is safe to reoccupy.

Client details	
Name of client:	
Client contact details:	
Removal work details	
Date removal work carried out:	
Site address where removal work is being carried out:	
Details of the specific asbestos removal work area(s):	
Name of licensed asbestos removalist:	
Name and contact details of licensed asbestos removalist supervisor (if different to removalist):	
Inspection details	
Date of clearance inspection:	
Time of clearance inspection:	

SECTION B – ASBESTOS REMOVAL WORK PAPERWORK

	Yes	No
Do you have a copy of the asbestos removal control plan		
Do you have a copy of the notification form?		
Is the removal work consistent with the control plan and the notification form? (e.g. use of enclosures, decontamination facilities, waste facilities)		

SECTION C – ASBESTOS REMOVAL WORK AREA

1. VISUAL INSPECTION

	Yes	No
Inspection of the specific area detailed in Section A found no visible asbestos remaining as a result of the asbestos removal work carried out.		
Is air monitoring required (if no, proceed to Section E)		
Can the area be reoccupied?		
Has additional information been attached? (e.g. photos, drawings, plans)		

2. AIR MONITORING

	Yes	No
Air monitoring was carried out as part of the clearance inspection. The result was below 0.01 f/ml.		
Has the air monitoring sample been analysed by a NATA-accredited laboratory?		
Is the air monitoring report attached?		
Can the area be reoccupied?		

SECTION D – ENCLOSURES

1. PRIOR TO DISMANTLING THE ENCLOSURE

	Yes	No
The area within the enclosure and the area immediately surrounding the enclosure was inspected and no visible asbestos was found.		
Air monitoring was carried out as part of the clearance inspection. The result was below 0.01f/ml.		
Is the air monitoring report attached?		
Can the enclosure be dismantled?		

Number of samples collected:_____

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
RESULTS					

2. AFTER THE ENCLOSURE WAS DISMANTLED AND REMOVED

	Yes	No
An inspection of the area in which the enclosure was erected and the area immediately surrounding the area where the enclosure was erected was inspected and no visible asbestos was found.		
Air monitoring was carried out as part of the clearance inspection. The result was below 0.01f/ml.		
Is the air monitoring report attached?		
Can the area be reoccupied?		

Number of samples collected:_____

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
RESULTS					

SECTION E – CLEARANCE DECLARATION

I declare that:

- the former enclosure, asbestos removal work area and the surrounding area are free from any visible asbestos
- the transit route and waste routes are free from any asbestos,
- all asbestos in the scope of the removal work has been removed and any known asbestos is intact.

....

Signature of licensed asbestos assessor/competent person Assessor licence number (if applicable)

.....

Name of licensed asbestos assessor /competent person

APPENDIX D – EXAMPLES OF ASBESTOS REMOVAL WORK

This appendix does not address other hazards that may be present at a workplace, for example falls from heights or electrical hazards. These hazards must also be identified and the associated risks controlled.

This appendix provides guidance on how to perform a specific task associated with asbestos removal work. With all tasks, some general requirements include the following:

- Obtain the asbestos register prior to commencing asbestos removal work.
- Depending on the type of asbestos removal work, follow the requirements outlined in Chapters 2–4 of this Code (for example, laying plastic sheeting, isolating the work areas, signs and barricades, PPE, cleaning up site decontamination).

ASBESTOS CEMENT PRODUCTS

Asbestos cement products consist of approximately 15 per cent asbestos fibres by weight. A wide range of products have been commonly found—including roofing, shingles, exterior cladding on industrial, public and some domestic premises, corrugated/profile sheets as well as flat sheets—that have been used for exterior flexible building boards.

If possible, you should remove the asbestos cement products whole. If some sections have been damaged prior to removal, these may be strengthened by applying duct tape.

Identify the method in which the asbestos cement product is held in place, then use a method that would minimise airborne dust generation in removing the product. For example:

- fasteners: dampen then carefully remove using a chisel
- bolts: dampen then use bolt cutters (or an oxy torch) – do not use an angle grinder
- screws: dampen then carefully unscrew with a screwdriver
- nails: dampen then carefully lever the panel or punch through if absolutely necessary.

Avoid breaking the asbestos cement products. If breakage is absolutely necessary to remove/dislodge the product, dampen the material and minimise breakage.

Remove the asbestos cement product wet/damp by applying a fine water spray, unless this creates an electrical risk.

Once removed from its position, spray the back of the product with a fine water spray. Frequent application of a fine water spray may be required depending on the circumstances (for example, a very hot day) but be careful not to create a slip hazard.

Personal decontamination must be carried out in accordance with the WHS Regulations and this Code.

ASBESTOS CEMENT ROOF SHEETING

Asbestos cement can become brittle with age, so any removal work on roofs should address the risk of fall hazards. If lichen is encountered on roof sheeting, caution should be exercised in the use of water and the choice of workers' footwear because lichen can be slippery, especially when it is wet.

The removal of asbestos cement roofing must be performed in accordance with the WHS Regulations.

Angle grinders should not be used because of the potential for damage to the asbestos cement and subsequent fibre release. Anchoring screws/bolts should be removed from the roofing sheets using an oxy torch or another suitable device that will not significantly damage the sheet.

If the system of removal involves walking on the roof to remove roof sheeting (this should be the last option when choosing a method to remove roof sheeting), spray the asbestos cement roof sheeting with a PVA solution prior to removal. Ensure the PVA is dry before removing it so as to avoid a slip hazard. Once removed, spray the back (underside) of the asbestos cement with either a fine water spray or the PVA solution.

Where the asbestos cement product requires lowering to the ground, ensure this is done in a manner that will minimise the generation of respirable dust. Do not use chutes, ramps or similar gravity dependent devices. Examples of appropriate lowering methods for roof sheeting include:

- by hand, over short distances
- loading the wrapped sheets on to a cradle for support
- using scissor lifts or similar devices
- using scaffolds.

You should follow the cleaning, decontamination, waste removal and disposal procedures in this Code once the asbestos sheeting has been removed.

Where the area to be removed is greater than the size of an average domestic house or where considerable dust will be generated, you should use a full decontamination unit.

Ensure that clearance of the area has been completed and a clearance certificate has been issued prior to reoccupation of the area.

Personal decontamination must be carried out in accordance with the WHS Regulations and this Code.

REMOVAL OF FLOOR TILES

Flooring products such as Polyvinyl chloride (PVC or vinyl) tiles often contain a few per cent (5–7 per cent) of very fine chrysotile. Black and brown thermoplastic tiles containing larger amounts and often visible clumps of chrysotile were also produced. Sheet floor coverings were sometimes backed with a thin layer of chrysotile paper. Some underfelts, such as hessian underlays for carpets and linoleum, were also manufactured containing asbestos. The mastics which were used to bond the floor covering to the surface could also contain asbestos. Some hard-wearing composite floors (for example, magnesium oxychloride) also contain about 2 per cent of mineral fibres, which could be asbestos.

Place a tool (such as a scraper or wide blade) between the tiles and lift the tile away from the floor, being careful to minimise breakage. A hammer or mallet can be used to tap the tool under firmly-adhered tiles to assist separating the tiles from the floor.

Minimise dust by spraying fine water mist under tiles as they are lifted.

Place the tiles into a 200 µm plastic waste bag or suitable alternate waste container dedicated for asbestos waste that is clearly labelled with an appropriate warning sign indicating asbestos waste.

Use the scraper to remove any adhesive that is left adhered to the floor after each tile has been removed and place this waste into the asbestos waste bag or suitable waste container.

The vinyl can be cut into strips prior to its removal to facilitate bagging, or it can be rolled into one roll and wrapped securely with plastic, making sure it is totally sealed.

If a heat source is used to soften the adhesive beneath a vinyl tile, care should be taken not to scorch or burn the tile. Burning or scorching vinyl tiles can result in the release of toxic decomposition products and generate a fire hazard. In some cases, the adhesive may contain asbestos.

Follow the cleaning, decontamination, waste removal and disposal procedures once the tiles have been removed.

Ensure that clearance of the area has been completed prior to reoccupation of the area.

Personal decontamination must be carried out in accordance with the WHS Regulations and this Code.

REMOVING BITUMINOUS (MALTHOID) PRODUCTS

This material is generally regarded as non-friable and includes bitumen products such as roofing felts and damp-proof courses that have been widely reinforced by the addition of asbestos, usually in the form of chrysotile paper. Bitumen-based wall and floor coverings were also produced.

Some mastics used to stick the bitumen products commonly had asbestos added to them for flexibility. Other sealants also had asbestos added to improve the performance of the product. When removing bituminous products:

- seal access points (for example, skylights) with material such as 200 μm plastic sheeting and duct tape
- where there are exhaust vents from gas fired equipment in the area, it is dangerous to seal over them. Turn the gas off if possible
- cut and remove manageable sections. Place cut pieces in a lined skip or wrap in plastic sheeting
- remove adhering material by dampening and gently scraping. Consider using an industrial vacuum cleaner fitted with a HEPA filter while scraping
- remember that mastics are flexible and may require removal by using scraping and chipping tools. The pieces removed should be kept as intact as possible
- if heating is used to soften the material to enable the material to be peeled, it is important not to burn the material, as this can release respirable asbestos fibres. Excessive heating is also likely to generate toxic fumes and gases and generate a fire hazard
- collect all debris and dispose of waste according to the waste disposal procedures.

Personal decontamination must be carried out in accordance with the WHS Regulations and this Code.

REMOVAL OF CEILING TILES

False ceiling tiles or suspended ceilings sometimes need to be removed so maintenance work can be performed. If asbestos has been used on structural materials above a false ceiling there could be contamination on the upper surface of the tiles.

The minimum RPE suitable for this operation is a P1 or P2 filter with a half-face piece respirator. If considerable amounts of asbestos dust or debris are likely to be involved, full-face air-purifying positive pressure respirators should be worn.

Any surface below the tiles that might be contaminated should be covered with plastic sheeting.

The first tile should be lifted carefully to minimise the disturbance of any asbestos fibres. The top of each tile should be thoroughly vacuumed and wet wiped, where possible, prior to removing subsequent tiles.

Where non-asbestos ceiling tiles are to be reused, they should be covered with plastic as they are removed from the ceiling to prevent further dust settling on them.

Wrap the asbestos ceiling tiles in a double layer of heavy-duty, 200 μm thick plastic sheeting.

Waste containment, disposal and clearance must be carried out in accordance with the WHS Regulations and this Code.

Personal decontamination must be carried out in accordance with the WHS Regulations and this Code.

Removal of gaskets and rope seals

This material is generally regarded as friable. If there is any doubt, advice should be sought from a person with knowledge and experience in dealing with asbestos.

Gaskets reinforced with asbestos were once used extensively in plant and equipment exposed to high temperatures and/or pressures. These gaskets were typically used between the flanges of pipes.

Asbestos rope was often used for lagging pipes and valves and for sealing hatches. It is likely that the asbestos in gaskets and rope from plant and equipment will be friable. When removing gaskets and rope seals:

- ensure the plant or equipment is shut down and isolated
- dismantle the equipment carefully. Protect any other components with plastic sheeting
- ensure the plant and equipment has been made safe (pipework emptied, electrical supply isolated and equipment shutdown, etc.)
- unbolt or unscrew the flange or dismantle the equipment
- once accessible, dampen the asbestos with a fine water mist or similar. Continue dampening the asbestos as more of it is exposed/accessible

- ease the gasket or rope seal away with the scraper and place into the waste container positioned directly beside/beneath it. Keep the area damp and scrape away any residue
- consider using an industrial vacuum cleaner fitted with a HEPA filter while scraping.

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Removal of pipe lagging using a glove bag (small section)

ASBESTOS WAS WIDELY USED TO INSULATE PIPES, BOILERS AND HEAT EXCHANGERS.
There are several types and forms of insulation, often with multi-layer construction. Pre-formed sections of asbestos insulation were made to fit the diameter of the pipe. These would be strapped on and calico-wrapped and sometimes painted (for example, 'Decadex' finish) or sealed with a hard plaster (often asbestos-containing) to protect against knocks and abrasion. Other types of asbestos-containing felts, blankets, tapes, ropes and corrugated papers were also used. For bends and joins, ensure the plant and equipment has been made safe (for example, pipework emptied, electrical supply isolated and equipment shut down).

Set-up/attach the glove bag and perform the removal work as described in this Code. Remove and dispose of waste according to the relevant sections of this Code.

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FIRE RETARDANT MATERIAL
These are normally homogeneous coatings sprayed or trowelled onto reinforced concrete or steel columns or beams as fireproofing. Sprays were also commonly used on the underside of ceilings for fireproofing and sound and thermal insulation in many high-rise premises. Warehouses and factories commonly had sprayed asbestos applied to walls, ceilings and metal support structures for fireproofing.

Some fire doors contained loose asbestos insulation sandwiched between the wooden or metal facings to give them the appropriate fire rating. Loose asbestos was also packed around electrical cables, sometimes using chicken wire to contain it.

Mattresses containing loose asbestos were widely manufactured for thermal insulation. Acoustic insulation has been provided between floors by the use of loose asbestos in paper bags, and in some areas near removal works it is known that loose asbestos has been used as a readily available form of loft insulation.

Asbestos textiles were manufactured for primary heat (for example, insulation tapes and ropes) or fire protection uses (for example, fire blankets, fire curtains and fire-resistant clothing). Textiles were also used widely as a reinforcing material in friction products/ composites.

It will depend on where the fire retardant material is located and the quantity of the material as to how the removal process is conducted, however the asbestos is friable and a Class A licensed asbestos removalist must perform the asbestos removal work.

An asbestos removal control plan must be developed.

- Establish the extent of the removal area and move all items out of the area or cover them with 200 μm plastic sheeting if they could be contaminated during the removal work.
- Develop an enclosure that allows smooth flow of air from the decontamination unit to the negative air units. In constructing the enclosure, pay particular attention to penetrations through the floor and ceiling/roof. Set up the enclosure and decontamination unit, and remove and dispose of asbestos.
- Ensure all air-conditioning equipment has been shut and isolated/blanked from this area.
- Maintain regular checks on the negative air unit and decontamination unit. An independent licensed asbestos assessor must conduct/control air monitoring throughout the asbestos removal work.
- Clearance monitoring by a independent licensed asbestos assessor and the issue of a clearance certificate is required before re-entry into the removal work area.

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REMOVAL OF ASBESTOS-BACKED VINYL AND MILLBOARD FROM BENEATH A VINYL FLOOR

As asbestos millboard is typically 100 per cent asbestos and very friable. A full enclosure with negative air extraction units must be used for this type of asbestos removal work.

The asbestos millboard should be wetted down as the vinyl is peeled from the floor, preferably with the millboard attached. The vinyl can be cut into strips prior to its removal to facilitate bagging, or it can be rolled into one roll and wrapped securely with plastic, making sure it is totally sealed. If the vinyl sheeting cannot be removed without leaving some of the asbestos millboard on the floor surface, the remaining asbestos millboard should be wetted down and, when thoroughly soaked, scraped off the floor surface.

Sufficient water should be used to dampen the asbestos millboard, but not so much that run-off or pools of contaminated water will occur.

If a heat source is used to soften the adhesive beneath a vinyl tile, care should be taken not to scorch or burn the tile. Burning or scorching vinyl tiles can result in the release of toxic decomposition products and generate a fire hazard.

Alternative removal methods should only be used if they do not result in excessive fibre release from the asbestos millboard and do not result in any additional hazard.

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THIS CODE PROVIDES PRACTICAL GUIDANCE ON HOW TO SAFELY REMOVE ASBESTOS.

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