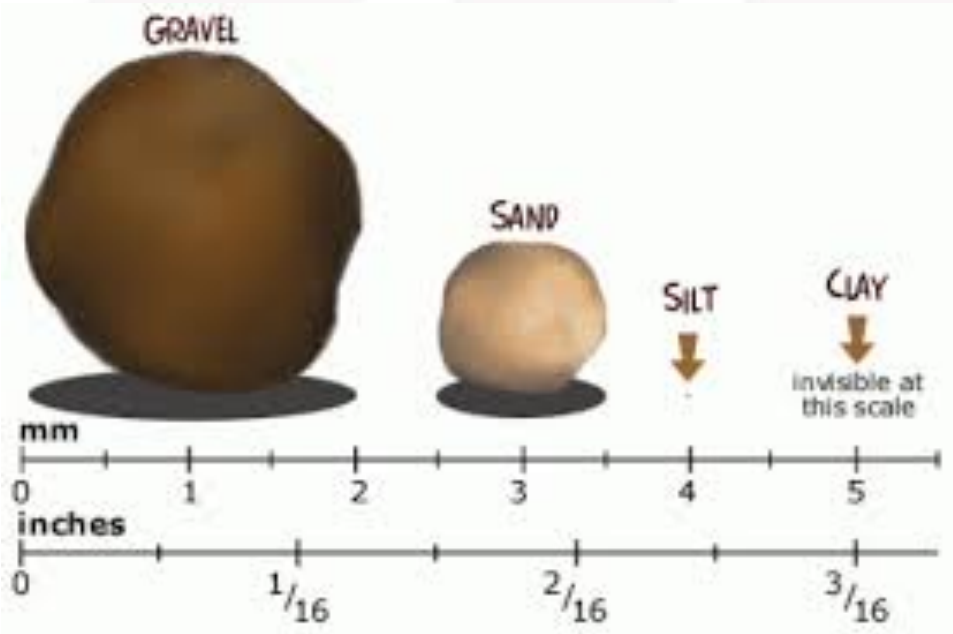
AS 1726:2017
Geotechnical Site Investigations



Michael Gawn – Principal (Newcastle)

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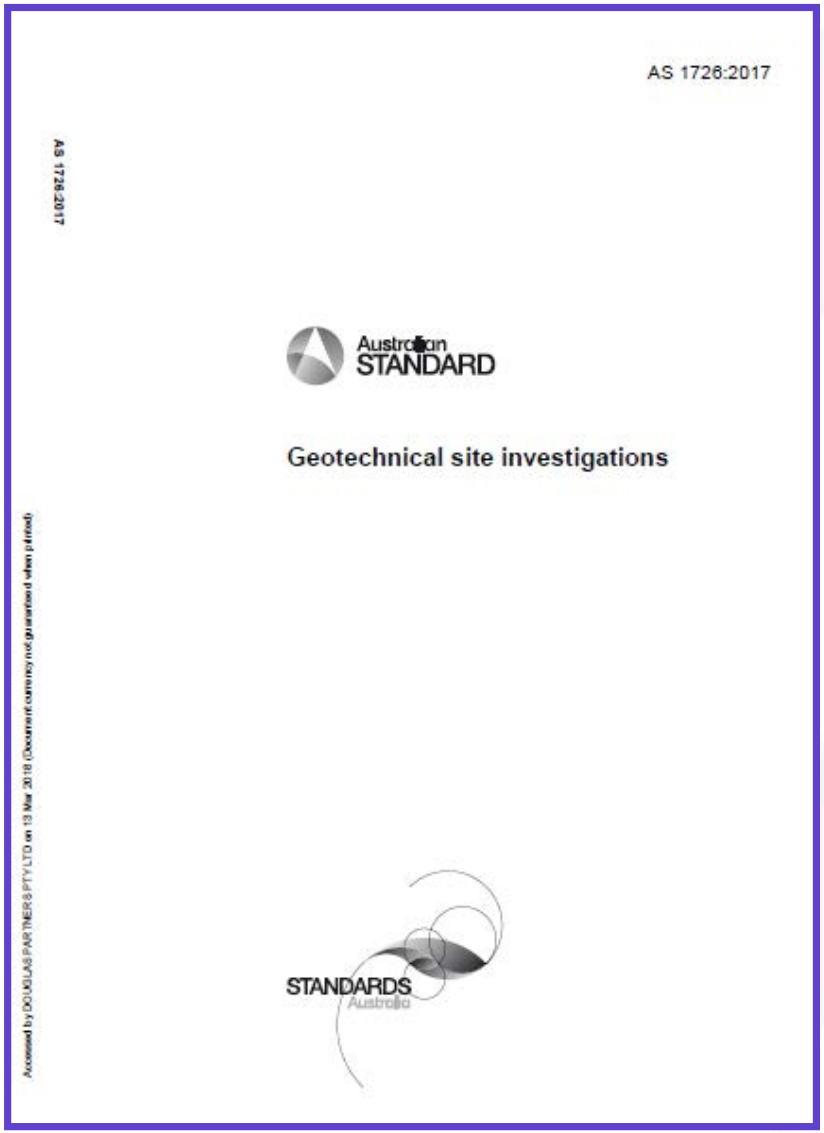
New Standard



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AS 1726:2017 Geotechnical Site Investigations

- Contents of Presentation
  - So What's Different
  - Changes to DP Logging
  - Review of Universal Classification System
  - Rock Logging
  - Additional Logging Changes
  - Implications for Reporting
  - Other important changes to AS1726
  - Useful Spreadsheets for Logging
  - Take Home Message

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So what's different?

- **Previous revision 1993**
- Previously the delineation between a coarse material (sand,gravel) and a fine material (clay, silt) was based on the majority rule (ie. If more than 50% above 75 micron = coarse soil)
- Now new boundaries, as follows
  - **>65% above 75 micron** **Sand or gravel**
  - **>35% below 75 micron** **Clay or silt**

Why? It only takes a relatively small amount of fines to alter the behaviour of the soil

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How does this differ from DP Logging?

No difference to boundaries from previously but slight difference to subdivision for sand

Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

Fraction	Components	Subdivision	Size* mm
Oversize	BOULDERS		>200
	COBBLES		63–200
Coarse grained soil	GRAVEL	Coarse	19–63
		Medium	6.7–19
		Fine	2.36–6.7
	SAND	Coarse	0.6–2.36
		Medium	0.21–0.6
		Fine	0.075–0.21
Fine grained soil	SILT		0.002–0.075
	CLAY		<0.002

* These sizes correspond approximately to standard sieve sizes.

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Secondary Constituents and Naming

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

DP Notes

Different thresholds for terminology

DP notes being changed to reflect new code

AS 1726:2017

TABLE 2

DESCRIPTIVE TERMS FOR ACCESSORY (SECONDARY AND MINOR) SOIL COMPONENTS

	In coarse grained soils				In fine grained soils	
	% Fines	Terminology	% Accessory coarse fraction	Terminology	% Sand/ gravel	Terminology
Minor	≤5	Add 'trace clay/silt' to description, as applicable	≤15	Add 'trace sand/gravel' to description, as applicable	≤15	Use 'trace'
	>5, ≤12	Add 'with clay/silt' to description, as applicable	>15, ≤30	Add 'with sand/gravel' to description, as applicable	>15, ≤30	Add 'with sand/gravel' to description, as applicable
Secondary	>12	Prefix soil name as 'silty' or 'clayey', as applicable	>30	Prefix soil name with 'sandy' or 'gravelly', as applicable	>30	Prefix soil name with 'sandy' or 'gravelly', as applicable

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Secondary Constituents and Naming

- Previously a soil would become “clayey sand“ for instance with 20% to 35% clay. Now only 12% clay is required to be a “clayey sand”
- Now if a soil has greater than 35% fines it is a fine soil
  - Therefore, a soil with 64% sand and 36% clay is a sandy CLAY not a clayey SAND.
  - This is to try to convey the behaviour of the soil (i.e that amount of clay is going to make it behave like a clay).

Secondary Constituents and Naming

Note: Different thresholds for secondary constituents in coarse as opposed to fine soils.

TABLE 2

DESCRIPTIVE TERMS FOR ACCESSORY (SECONDARY AND MINOR) SOIL COMPONENTS

Designation of components	In coarse grained soils				In fine grained soils	
	% Fines	Terminology	% Accessory coarse fraction	Terminology	% Sand/ gravel	Terminology
Minor	≤5	Add 'trace clay/silt' to description, as applicable	≤15	Add 'trace sand/gravel' to description, as applicable	≤15	Use 'trace'
	>5, ≤12	Add 'with clay/silt' to description, as applicable	>15, ≤30	Add 'with sand/gravel' to description, as applicable	>15, ≤30	Add 'with sand/gravel' to description, as applicable
Secondary	>12	Prefix soil name as 'silty' or 'clayey', as applicable	>30	Prefix soil name with 'sandy' or 'gravelly', as applicable	>30	Prefix soil name with 'sandy' or 'gravelly', as applicable

This reflects that it takes a lot more coarse material to change the behaviour of the soil (30% v 12%).

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Minor Soil Components

- Terms used is as follows:
- Trace (<5% fines) or (<15% coarse)
- With (>5% to 12% fines) or (>15% to 30% coarse)
- Adjective modifier (eg sandy)

  (>12% fines) or (>30% coarse)

No use of “slightly” or “some”

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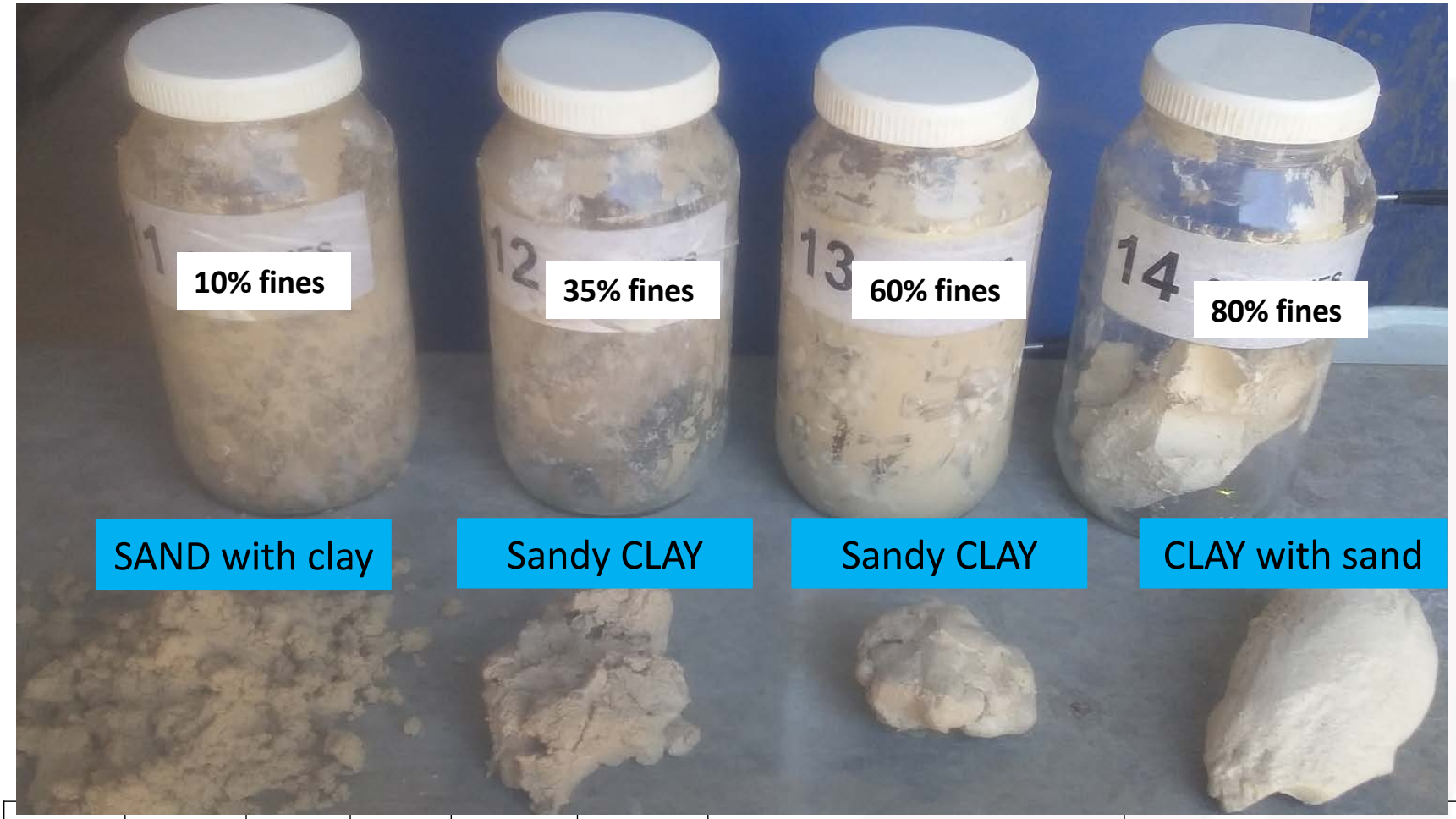

Bore/ Pit	%Silt and clay	%Clay	%silt	%Sand	%Gravel	Description to AS1726:2017	Classification
Sample 11	10%	10%	0%	90%	0%	SAND with clay	SP/SC
Sample 12	35%	35%	0%	65%	0%	Sandy CLAY	CL,CI or CH
Sample 13	60%	50%	10%	40%	0%	Sandy Clay with silt	CL,CI or CH -see note 2
Sample 14	80%	80%	0%	20%	0%	CLAY with sand	CL, CI, CH, ML or MH

Naming

- Primary Component in BLOCK LETTERS
- Secondary component included in name if over secondary threshold
- Minor components added after name
  - Eg Clayey SAND with trace gravel

Determining Fine Content

- If hydrometers done then use them
- If Atterberg done use the following rule
  - Above A line clay
  - Below A line silt
- If neither done then use tactile assessment for clay/silt – use water!

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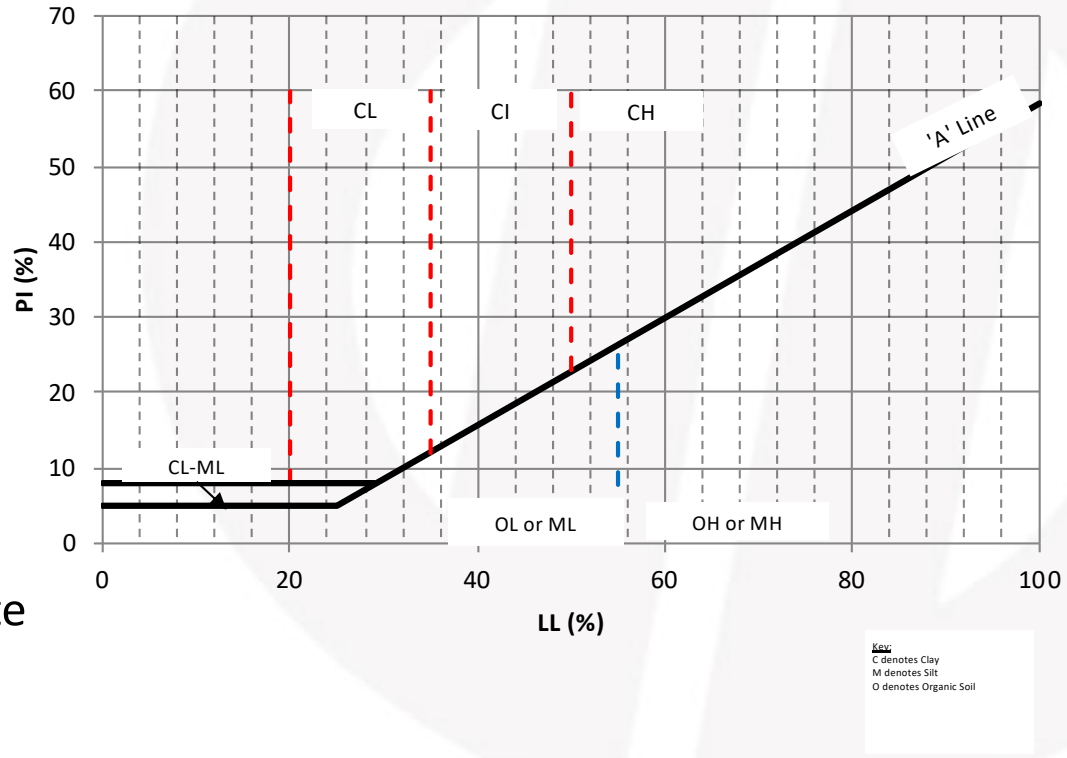
Plasticity

- Terms
  - Non plastic
  - Low plasticity
  - Medium plasticity
  - High plasticity



Note: Medium not Intermediate

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Moisture Condition

- **Coarse Soils**
  - Only three terms used, as follows:
    - Dry
    - Moist
    - Wet
  - No use of “humid” or “saturated”
- **Fine Soils**
  - Moist, dry of plastic limit (w<PL)
  - Moist, near plastic limit (w≈PL)
  - Moist, wet of plastic limit (w>PL)
  - Wet, near liquid limit (w ≈LL)
  - Wet, wet of liquid limit (w>LL)

DP will use description in brackets only

- Use textural test in the field (i.e roll a 7 mm long thread)

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Group Symbol Classifications

- Two characters system
- Primary Classifier (i.e. first letter)
  - (G,S,M or C for Gravel, Sand, Silt or Clay)
- Secondary Classifier (i.e. second letter)
  - (Coarse Soils)
    - Reflect grading (W or P for well or poorly graded)
    - Or Fine content (C, M or O for clay, silt or organic)
- Secondary Classifier (i.e. second letter)
  - (Fine Soils)
    - Reflect plasticity (L, I or H for low, intermediate or high)
    - Note silt only uses L or H (no I)

Classifications Coarse Soils

TABLE 9

CLASSIFICATION OF COARSE GRAINED SOILS

Major divisions		Group symbol	Typical names	Field classification of sand and gravel	Laboratory classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075 mm)	GRAVEL (more than half of coarse fraction is larger than 2.36 mm)	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36 mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥12% fines, fines are silty	
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥12% fines, fines are clayey	

NOTE: Where the grading is determined from laboratory tests, it is defined by coefficients of curvature and uniformity C_u derived from the particle size distribution curve, as specified in Clause 6.1.4.11.

For fines contents between 5% and 12%, the soil shall be given a dual classification comprising the two group symbols separated by a dash, e.g. for a gravel with between 5% and 12% silt fines, the classification is GP-GM.

Soils that are dominated by boulders, cobbles or peat (Pt) are described separately and are not classified.

Gravel Dominated Soils
GW – well graded gravel
GP – poorly graded gravel
GM – gravel-silt mixture
GC – gravel-clay mixture

Sand Dominated Soils
SW – well graded sand
SP – poorly graded sand
SM – sand-silt mixture
SC – sand-clay mixture

Note: Fines contents between 5% and 12% to have dual classification – eg GP-GM

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Classifications Fine Soils

CLASSIFICATION OF FINE GRAINED SOILS

Major divisions		Group symbol	Typical names	Field classification of silt and clay			Laboratory classification
				Dry strength	Dilatancy	Toughness	% < 0.075 mm
Fine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075 mm)	SILT and CLAY (low to medium plasticity, %)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	—	—	—	—

Silt Dominated Soils
ML – low plasticity silt
MH – high plasticity silt
OH – organic silt

Clay Dominated Soils
CL – low plasticity clay
CI – medium plasticity clay
CH – high plasticity clay
OH – organic clay of medium to high plasticity

Pt – peat

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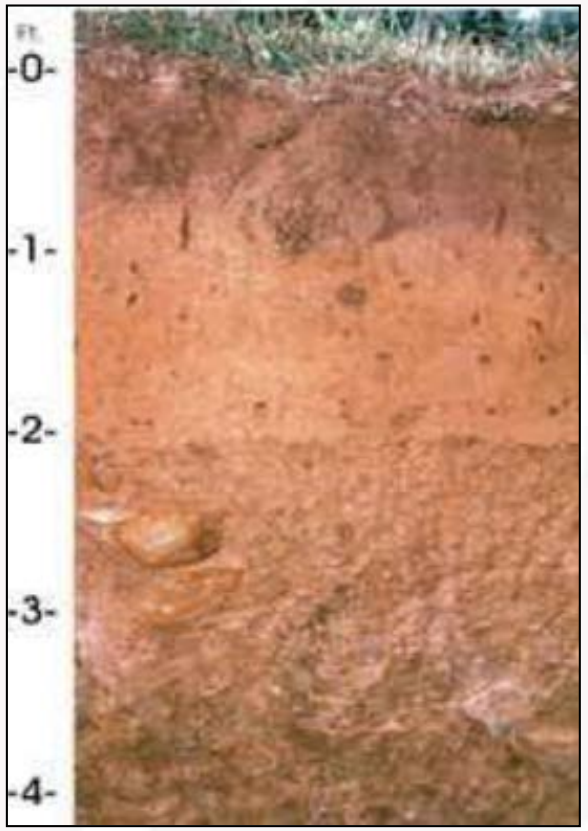
Rock Classification

- Changes in strength characterisation
  - Removal of extremely low strength
  - Material with a strength less than very low should be described as a soil but any rock structure noted.
  - UCS categories included (using a ratio of 20:1 with point load index)
- Classification Symbols – same as used by DP (without EL)



Rock Weathering

CLASSIFICATION OF MATERIAL WEATHERING

Term		Abbreviation		Definition
Residual Soil (Note 1)		RS		Material is weathered to such an extent that it has soil properties. Mass struc and fabric of original rock the soil has not been signi
Extremely Weathered (Note 1)		XW		Material is weathered to s soil properties. Mass struc and fabric of original rock
Highly Weathered (Note 2)	Distinctly Weathered (Note 2)	HW	DW	The whole of the rock mat usually by iron staining or that the colour of the origi recognizable. Rock streng changed by weathering. S have weathered to clay mi increased by leaching, or deposition of weathering p
Moderately Weathered (Note 2)		MW		The whole of the rock mat usually by iron staining or that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

REMEMBER: RMS (NSW) has its own weathering classification system

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Rock Strength

ROCK MATERIAL STRENGTH CLASSIFICATION

Term	Abbreviation	Uniaxial compressive strength (see Note 1 and Note 2) MPa	Guide to strength: Point load strength index $I_{s(50)}$ (see Note 3) MPa	Guide to strength: Field assessm
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under [illegible] blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Readily scored with a knife; a piece of core 150 mm lon[illegible] can be broken b[illegible]
High Strength	H	20 to 60	1 to 3	A piece of core [illegible]
Strength		200		geological pick to break through intact material; rock rings under hammer.

NOTES:

1 Material with strength less than 'Very Low' shall be described using soil characteristics. The presence of an original rock structure, fabric or texture should be noted, if relevant.

2 The method for measuring the uniaxial compressive strength shall be in accordance with AS 4133.4.2.1.

3 The method for measuring the point load strength index shall be in accordance with AS 4133.4.1.

No longer Extremely low strength rock

Now includes UCS ranges

Material with strength less than "Very Low" shall be described using soil characteristics. The presence of the original rock structure, fabric or texture should be noted, if relevant

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DATA FOR DESCRIPTION AND CLASSIFICATION OF SOILS

MAJOR DIVISIONS	GROUP SYMBOL	DESCRIPTION TYPICAL NAME
COARSE GRAINED SOILS (More than 65% of material is larger than 0.06mm) — GRAVEL AND GRAVELLY SOILS (More than 50% of coarse fraction is larger than 2.36mm)	GW	Well graded gravels and gravel sand mixtures, little or no fines
	GP	Poorly graded gravels and gravel sand mixtures, little or no fines
	GM	Silty gravels, gravel sand silt mixtures
	GC	Clayey gravels, gravel sand clay mixtures
SANDY SOILS (More than 50% of coarse fraction is smaller than 2.36mm)	SW	Well graded sands and gravelly sands, little or no fines
	SP	Poorly graded sands and gravelly sands, little or no fines
	SM	Silty sand, sand silt mixtures
	SC	Clayey sands, sand clay mixtures
FINE GRAINED SOILS (More than 35% of material is smaller than 0.06mm) — SILTS AND CLAYS (Liquid Limit not more than 50%)	LL<35 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
	LL>35 <50 CI	
	OL LL<35	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS (Liquid Limit more 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 muck and other highly organic soils

65%

65%

35%

35%

FIELD IDENTIFICATION

GRAVELS AND SANDS

	GRADATIONS	NATURE OF FINES	DRY STRENGTH	GROUP SYMBOL
GOOD	Wide range in grain size	"Clean" materials (not enough fines to bind coarse grains)	None	GW
POOR	Predominantly one size or range of sizes			GP
GOOD to FAIR	"Dirty" materials (excess of fines)	Fines are non plastic (1)	None to medium	GM
		Fines are plastic (1)	Medium to high	GC

SAND

GOOD	Wide range in grain size	"Clean" materials (not enough fines to bind coarse grains)	None	SW
POOR	Predominantly one size or range of sizes			SP
GOOD to FAIR	"Dirty" materials (excess of fines)	Fines are non plastic (1)	None to medium	SM
		Fines are plastic (1)	Medium to high	SC

SILT AND CLAY FRACTION

Fraction smaller than 0.20mm AS sieve size

DRY STRENGTH	DILATANCY	TOUGHNESS	
None to low	Quick to slow	None	ML
Medium to high	None to very slow	Medium	CL
Low to medium	Slow	Low	OL*
Low to medium	Slow to none	Low to medium	MH
High to very high	None	High	CH
Medium to high	None to very slow	Low to medium	OH*
Readily identified by colour, odour, spongy feel and generally by fibrous texture			Pt*

GRAVEL

DESCRIPTION	FIELD TEST
LOOSE	(NOTE: Indicative only - to be assessed by in-situ testing)
DENSE	By inspection of voids and particle packing

SAND

DESCRIPTION	FIELD TEST (Indicative only)	SPT, N Blows/ft	Relative Density%	DUTCH CONE VALUE (MPA)	DPT
VERY LOOSE SAND	Easily penetrated with 13mm reinforcing rod pushed by hand	0 5	0 15	0 2	0 - 1
LOOSE SAND	Easily penetrated with 13mm reinforcing rod pushed by hand Can be excavated with a spade 50mm wooden peg can be easily driven	5 10	15 35	2 5	1 - 3
MEDIUM DENSE SAND	Penetrated 300mm with 13mm reinforcing rod driven with 2kg hammer -- hard shovelling	10 30	35 65	5 15	3 - 8
DENSE SAND	Penetrated 300mm with 13mm reinforcing rod driven with 2kg hammer, requires pick for excavation 50mm wooden peg hard to drive	30 50	65 85	15 25	8 - 15
VERY DENSE SAND	Penetrated only 25 50mm with 13mm reinforcing rod driven with 2kg hammer	> 50	85 100	> 25	>15

SILT & CLAY

CONSISTENCY	FIELD TEST (Shear vane preferred)	Dynamic Cone Penetrometer Count /100mm	SPT, N BLOWS/	Undrained Shear Strength c_u kPa: Hand vane (kPa)	Unconfined Compressive Strength q_u kPa: Pocket Penetrometer (kPa)
VERY SOFT	Easily penetrated > 40mm by thumb Exudes between thumb and fingers when squeezed in hand	< 1	< 2	< 12	< 25
SOFT	Easily penetrated 10mm by thumb Moulded by light finger pressure	1 1 5	2 4	12 25	25 50
FIRM	Impression by thumb with moderate effort Moulded by strong finger pressure	1 5 3	4 8	25 50	50 100
STIFF	Slight impression by thumb cannot be moulded with finger	4 6	8 15	50 100	100 200
VERY STIFF	Very tough Readily indented by thumbnail	7 12	15 30	100 200	200 400
HARD	Brittle, indented with difficulty by thumbnail	> 12	> 30	> 200	> 400

* Note: Pocket penetrometer may overestimate q_u by a factor of 1.5 2.0

Friable — Can be easily crumbled or broken into small pieces by hand

Notes

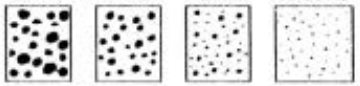
1. The above table follows the original Unified Classification System (USBR Earth Manual) and ASTM D 2487 except that it adopts the particle size limits given in AS 1726 and other standards, viz

Boulder	> 200mm
Cobble	63mm to 200mm
Gravel	2.36mm to 63mm
Sand	0.075mm to 2.36mm
Silt and Clay	< 0.075mm

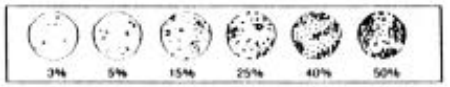
The system excludes the boulder and cobble fractions of the soil and classifies only the material less than 63mm in size

SAND

COARSE	MEDIUM	FINE	SILT
2.36-0.6	0.6-0.2	0.2-0.075	0.075-0.002



PROPORTIONS OF SECONDARY COMPONENTS



Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus 0.4mm sieve size particles. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)
After removing particles larger than 0.4mm sieve size, prepare a pat of moist soil with a volume of about 8000mm³. Add enough water if necessary to make the soil soft but not sticky.
Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.
Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics)
After removing particles larger than 0.4mm sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.
High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit)
After removing particles larger than the 0.4mm sieve size, a specimen of soil about 12mm cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about 3mm in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.
The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A line.
Highly organic clays have a very weak and spongy feel at the plastic limit.

DEGREE OF SATURATION OF SANDS -- DESCRIPTIVE TERMS

Condition of Sand	Criteria	Degree of saturation (%)
Dry	Non-cohesive and free running	0
Humid	Feels dry, grains "run" freely in hands	1 25
Damp	Feels cool, slight darkening of colour, grains have slight tendency to adhere to one another	25 50
Moist	Feels cool, darker colour, grains tend to adhere to one another	50 75
Wet	Feels cold, makes hands wet, should be close to water table	75 99
Saturated	Below water table, or static water level in excavation or drill holes	100

Terms not supported by AS 1726:2017

PROPORTION OF SECONDARY AND MINOR COMPONENTS

TERM	MEANING	Approximate proportion
Trace (minor component)	Just detectable by feel or eye. Soil properties of main component virtually unaffected at 0 - 5%. Easily detected by feel or eye at 5 - 15%. Soil properties only slightly affected by secondary or minor components.	0 - 5% fines in coarse grained soil <=15% accessory coarse fraction in coarse grained soil <=15% coarse fraction in fine grained soil
With (minor component)	Easily detected by feel or eye. At 5 - 15%, soil properties only slightly affected by secondary or minor components. At 15 - 20%, soil properties affected by secondary or minor components. At 20 - 30%, soil properties significantly affected by secondary or minor components.	>5,<=12% fines in coarse grained soil >15 <=30% accessory coarse fraction in coarse grained soil >15 <=30% accessory coarse fraction in fine grained soil
Prefix soil name (secondary component)	Easily detected by feel or eye. At 5 - 15%, soil properties only slightly affected by secondary or minor components. At 15 - >30%, soil properties affected to significantly affected by secondary or minor components.	>12% fines in coarse grained soil >30% accessory coarse fraction in fine grained soil >30% accessory coarse fraction in fine grained soil
And	Mixture of two soil types	35 - 50%

Reporting Implications

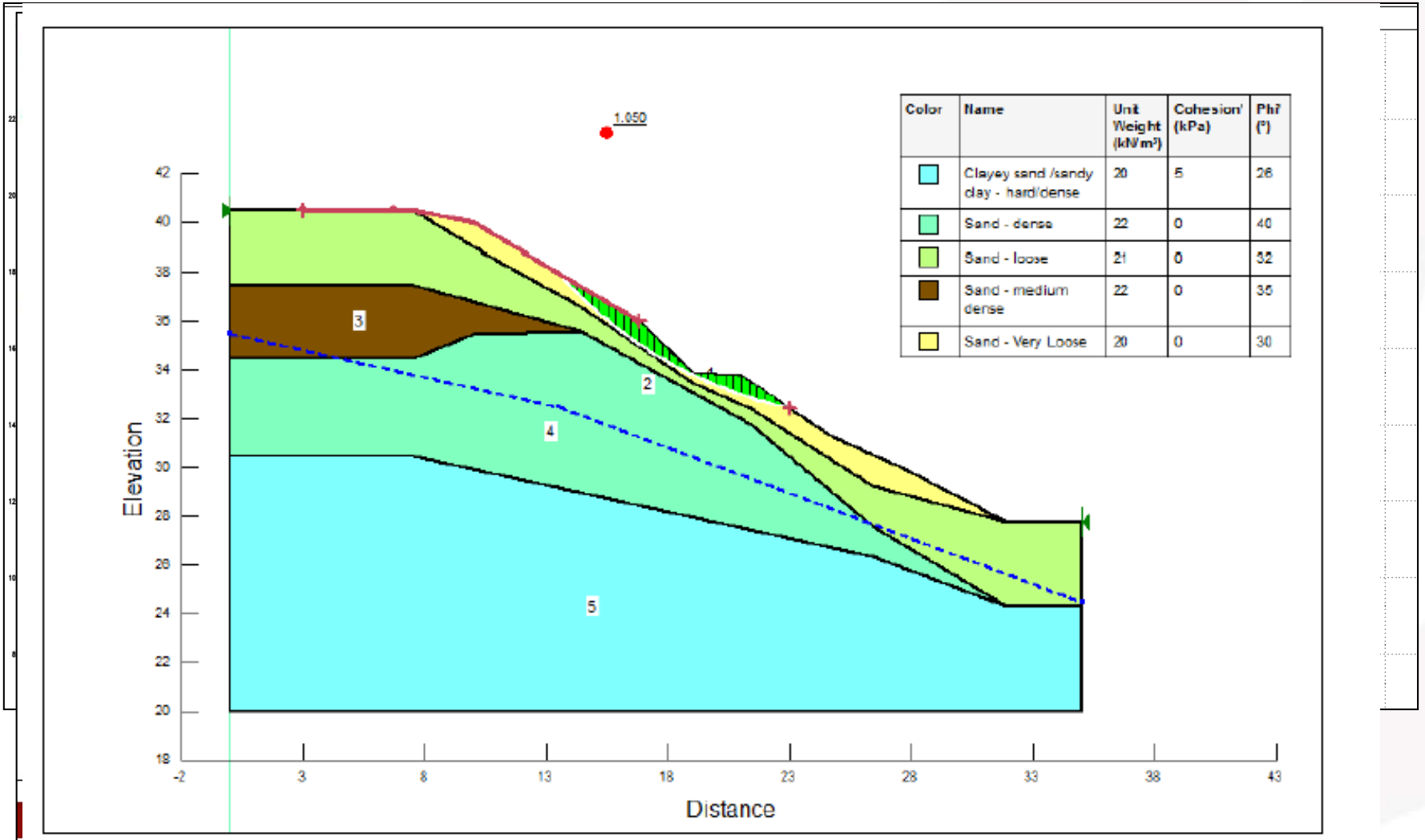


Figure 8: Slope stability analysis results

Other Changes

- New Code has a whole section of material alteration (extremely, highly, moderately and slightly) with abbreviations. This is based on visual assessment
- It has good guidance on description of defects
  - Situation by situation. Some circumstances it is important to describe each joint/defect (ie. Unfavourable joints in excavation face)
  - Other circumstances generalisation of defects may be better to provide geotechnical model (eg foundation design)
  - Terms such as “joint spacing is typically 100 mm to 300mm and most joints traces less than 100 mm”

Other Changes

- Has a more geological approach to jointing with good descriptions around dip, dip direction and strike
- Roughness (with roughness counts, waviness, etc)

Soil Classification Spreadsheet

Enter details and copy percentage passing from lab results

Enter Atteberg results, if any

Go to Results

%										
Bore/Pit	3006	4002	1	4008	SP1	SP2	SP3			
Depth (r	0.3	0.5 - 0.8	1.2 - 1.5	0.4	1	1	0.5			
Sieve Si	Percentage Passing									
75.000	100%	100%	100%	100%	100%	100%	100%			
53.000	100%	100%	100%	98%	100%	100%	100%			
37.500	100%	100%	100%	95%	100%	100%	100%			
26.500	97%	100%	99%	94%	100%	100%	100%			
19.000	94%	100%	97%	92%	100%	100%	100%			
13.200	92%	100%	88%	89%	100%	100%	100%			
9.500	89%	100%	76%	87%	100%	100%	100%			
6.700	86%	100%	71%	84%	100%	100%	100%			
4.750	84%	100%	67%	81%	100%	99%	99%			
2.360	79%	100%	51%	77%	100%	98%	98%			
1.180	74%	61%	40%	76%	100%	96%	96%			
0.600	70%	54%	31%	75%	94%	93%	90%			
0.425	67%	50%	28%	67%	92%	90%	85%			
0.300	63%	45%	25%	64%	86%	86%	75%			
0.150	51%	38%	21%	54%	85%	62%	50%			
0.075	42%	32%	14%	33%	83%	38%	29%			
0.045	38%	30%	12%		80%					
0.033	36%	28%	10%		75%					
0.023	35%	28%	8%		70%					
			7%		65%					
			5%		64%					
			5%		63%					
0.006	29%	24%	4%		45%					
0.005	27%	23%	3%		40%					
0.003	25%	20%	3%		35%					
0.002	24%	18%	1%		34%					
0.001	21%	18%			33%					
	Atterberg Testing									
LL	66	60	19			58				
PL	30	10	13			38				
PI	36	50	6			20				

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Soil Classification Spreadsheet

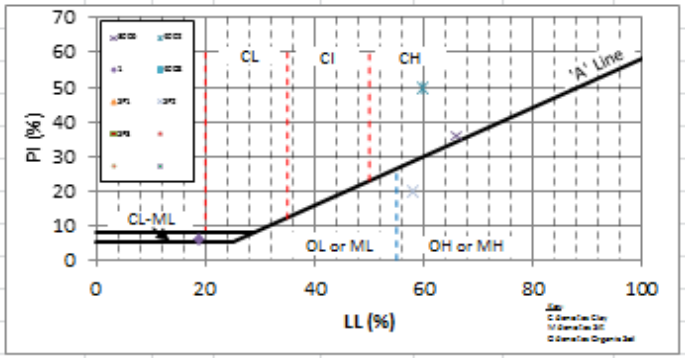
Grading Results and Logging to AS1726:2017

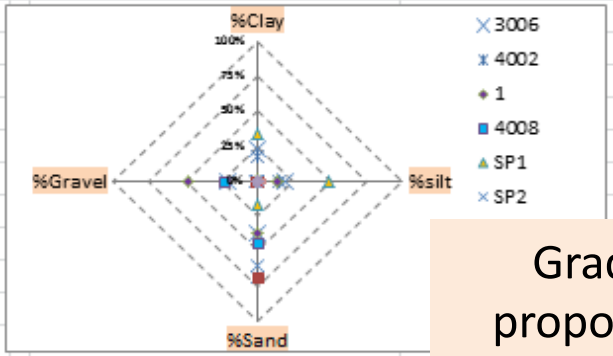
Bore/ Pit	Depth	Hydrometer	Atterberg	%Silt and clay	%Clay	%silt	%Sand	%Gravel	Description to AS1726:2017	Classification
3006	0.3	Yes	Yes	42%	24%	19%	36%	21%	Sandy/Silty Clay with gravel	CH
4002	0.5 - 0.8	Yes	Yes	32%	18%	14%	68%	0%	Clayey SAND	SC
1	1.2 - 1.5	Yes	Yes	14%	1%	13%	37%	49%	Silty/Sandy GRAVEL with trace clay	GM
4008	0.4	No	No	33%	-	-	44%	23%	Silty/Clayey SAND with gravel	SM/SC
SP1	1	Yes	No	83%	34%	49%	17%	0%	Clayey Silt with sand	ML or MH - see note 2
SP2	1	No	Yes	38%	-	-	60%	2%	Sandy/Clayey Silt with trace gravel	MH
SP3	0.5	No	No	29%	-	-	69%	2%	Silty/Clayey SAND with trace gravel	SM/SC

lude cobbles

1- Clay and silt fractions unknown (could be CL, CI,

2 -Where no atterberg testing, use tactile assessment





Presents data with comments on lab testing

Provides Soil portions

Give soil description and Unified Soil Classification

Grading proportions

Plasticity Curve

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Point Load to UCS and Pile Design Parameters

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Project: Maitland Hospital

Project Number 81719.09
Bore 3001
Surface Level 21.4

Enter UCS/PL ratio and adopted multiplier (guidance in box)

ted Multiplier for end bearing: 4.8

ted multiplier for UCS/I50 ratio: 17

Lower bound
Upper bound
Mean

UCS/I50 ratio

Depth	Elevation	Unit	Rock Type	Axial Value	Diametral Value	Estimated UCS		Ultimate End Bearing	Estimated UCS		
						Sandstone	Siltstone		12	15	20
2.38	19.02	1	1	-	0.04	0.66		3.90	0.5	0.6	0.8
2.38	19.02	1	1	0.07	-	1.14		5.14	0.8	1.0	1.3
2.46	18.94	1	1	-	0.05	0.79		4.27	0.6	0.7	0.9
2.46	18.94	1	2	0.14	-		2.38	7.40	1.7	2.1	2.8
3.53	17.87	1	2	-	0.23		3.96	9.55	2.8	3.5	4.7
3.53	17.87	1	2	0.18	-		3.04	8.37	2.1	2.7	3.6
4.03	17.37	1	1	-	0.21	3.63		9.14	2.6	3.2	4.3
4.03	17.37	1	1	0.10	-	1.73		6.32			
5.37	16.03	2	1	-	0.24	4.02		9.63			
5.37	16.03	2	1	0.15	-	2.48		7.55			
6.56	14.84	2	1	0.12	-	2.12		6.98			
7.03	14.37	2	1	-	0.39	3.59		12.33			
7.03	14.37	2	1	0.17	-	2.93		8.21	2.1	2.6	3.4
7.69	13.71	2	1	-	0.22	3.69		9.22	2.6	3.3	4.3
7.69	13.71	2	1	0.33		5.61		11.37			
8.14	13.26	2	1	-	0.57	9.69		14.94			
8.14	13.26	2	1	1.03	-	17.47		20.07			

Input depth, Unit, Rock Type and PL values

Rock Type
1 Sandstone
2 Siltstone, Laminite

LEGEND
- Class V Sandstone
- Class IV Sandstone
- Class III Sandstone
- Class II Sandstone
- Class I Sandstone

Provide range of estimated UCS based on common ratios

Calculates estimated UCS and ultimate end bearing

Colour codes rock class (based on Pells et al) and **using strength only – must consider defects/seams**

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Take Home Message

- It doesn't take a lot of fines to make a soil "fine grained". This reflects soil behaviour
- Extremely low strength rock should be logged as soil or 'extremely weathered (name of parent rock)'
- Pay attention to gradings and PIs (roll threads in field – take spray bottle)
- DP logging sheets and DP Field Procedure Log section of Company Manual being changed (out soon)
- New Code is a good recourse for Geo/Env Engineers

That’s all!

Thanks to the following people who are driving and assisting in the innovations to our procedures:

Grahame Wilson

Will Wright
Tim Swavley
Heidi Sirianni

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