

Seamless Geology of NSW

A paradigm shift in geological mapping

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Department of Planning and Environment



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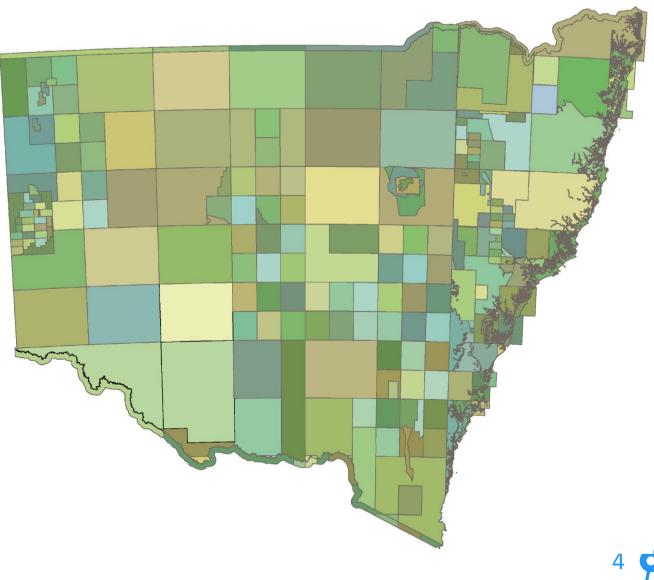
What is it?



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NSW Seamless Geology Project

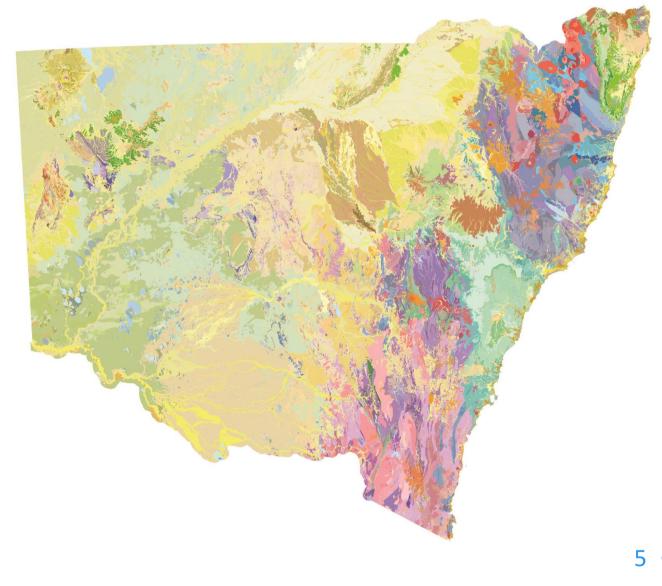
- Five year project (2013–2018).
- Joining the best available mapping across the state.
- Approximately 500 data sources at different scales and ages.
- Now in a consistent geodatabase format with a standard set of attributes.



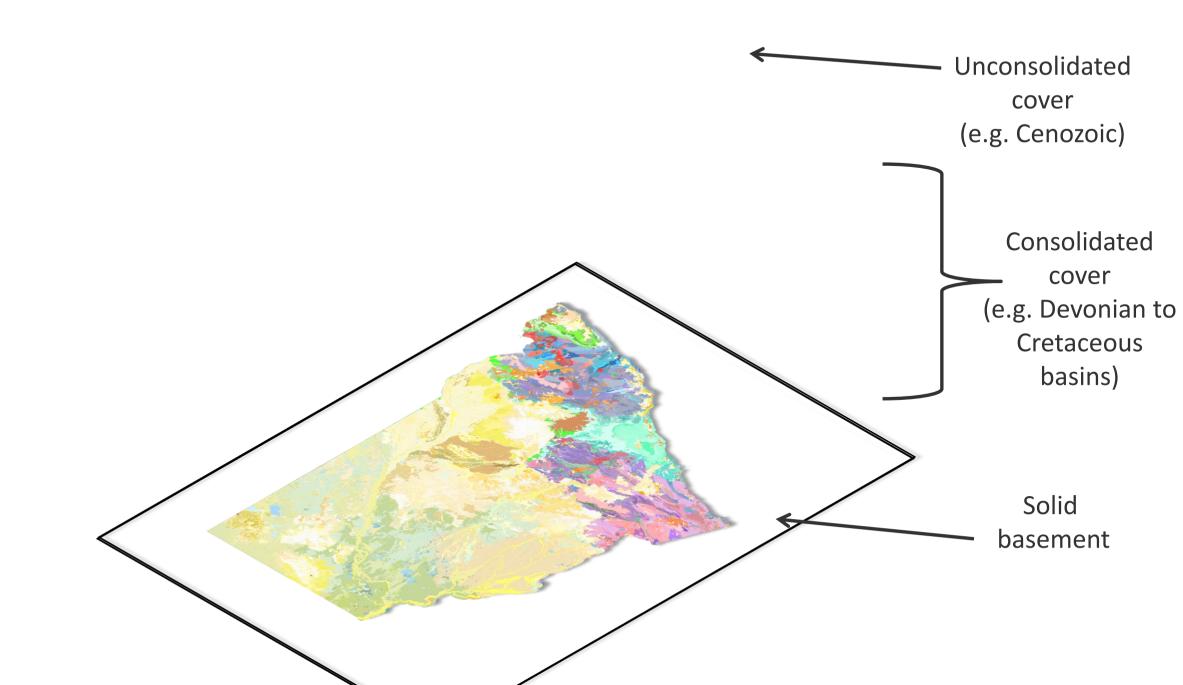


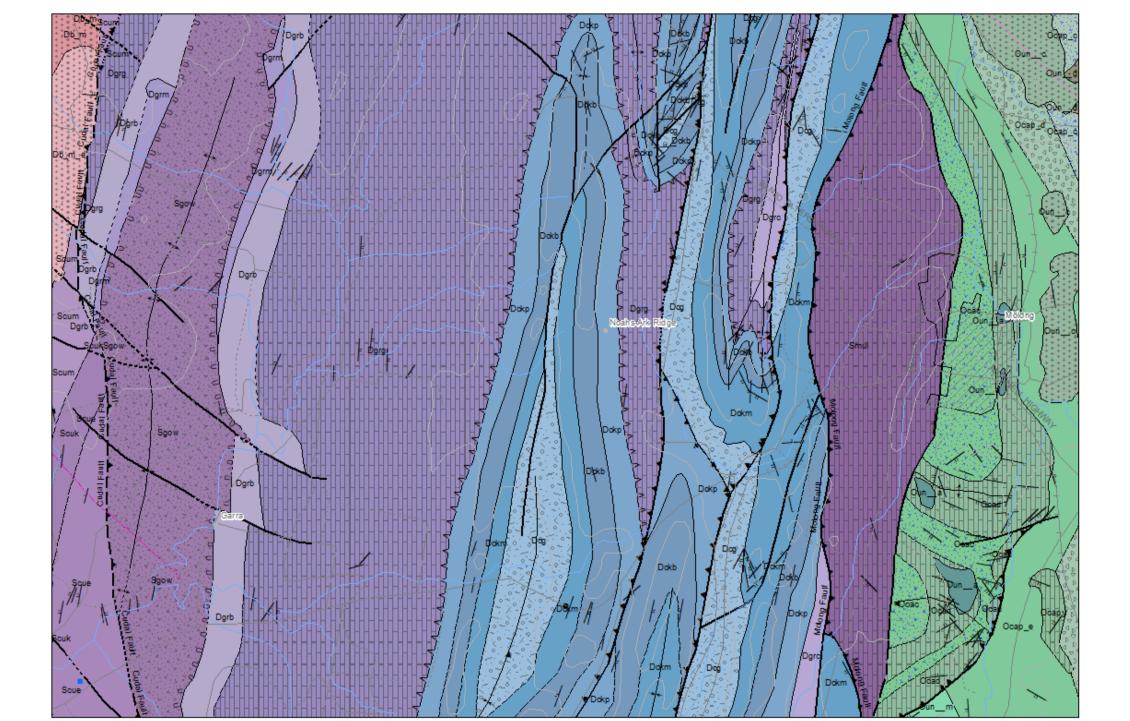
NSW Seamless Geology Project

- Connect line mismatches across boundaries, scale and units.
- Harmonise stratigraphic units.
- Create a series of eleven lithotectonic layers/provinces.







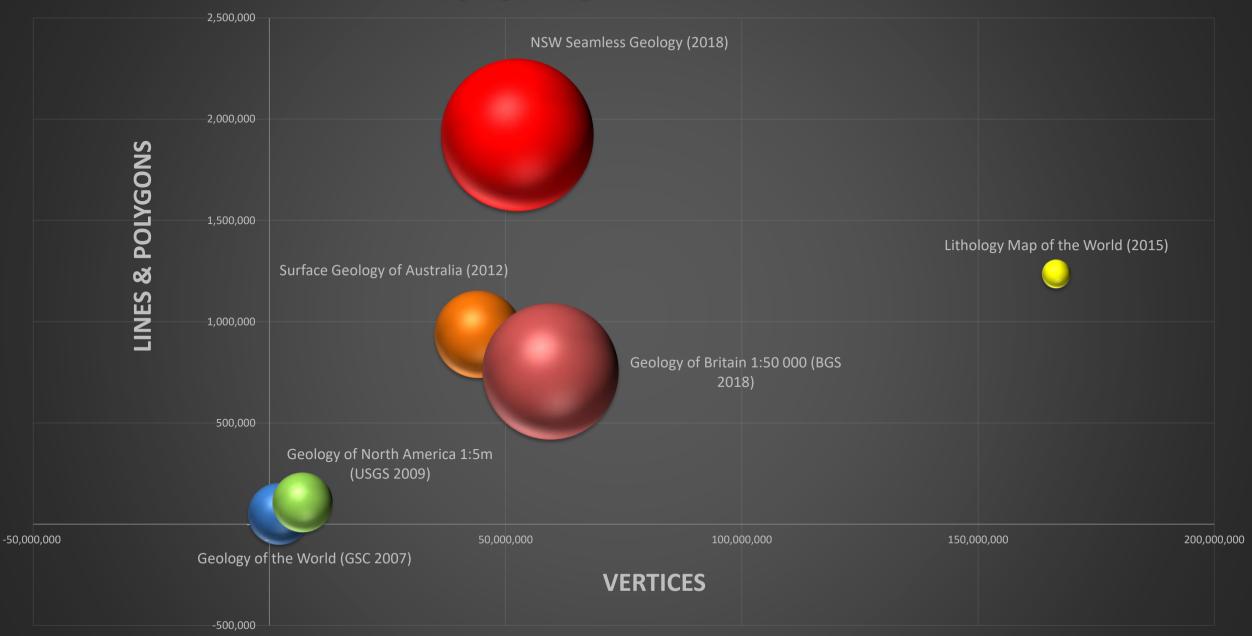


Significance of the dataset ϕ



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Large geological GIS datasets



Data attribution example: polygons

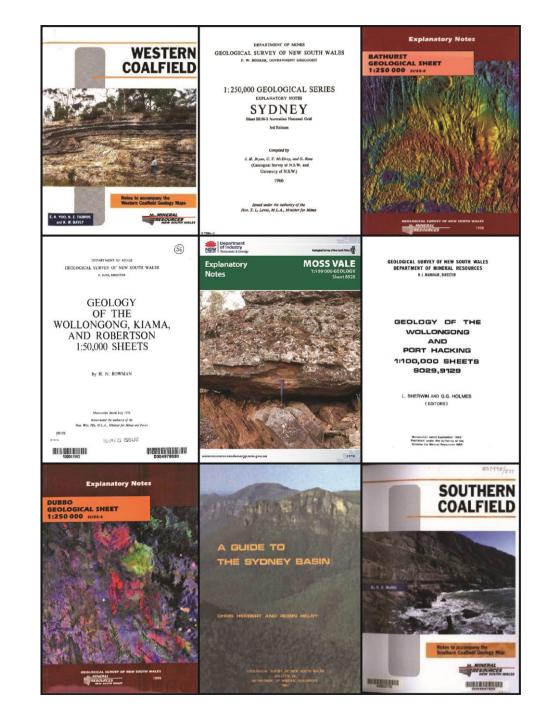
Name and description	Unit hierarchy	Province, cycle	e, system	Lithology, chemistry	Age	range	Depositional environment	Colour, shape
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19312 Lachian Orogen Cgug_a Guigong Grante - api Apite Bathu 19388 Lachian Orogen Cgug_a Guigong Grante - api Apite Bathu		hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit		Fine grained i LType Strongly Oxidis Moderate Sr - u Fine grained i LType Strongly Oxidis Moderate Sr - u				14#D6839 <nul> Polygon 0.00232 0 14#D6839 <nul> Polygon 0.01304 0.0000</nul></nul>
19371 Lachian Orogen Coug a Guloping Granite - apl Apite Bathu	thurst Supersuit Gulgong Suite <nul> Gulgong Granite Gulgong Gra <nul> Bath</nul></nul>	hurst supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniterous -Type intrusions Bathurst Supersuit hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniterous i-Type intrusions Bathurst Supersuit			n 2 Mississippian Mississippian (base) to Mississi 350.9 Ma to 323.2 Ma Mississippian n 2 Mississippian Mississippian (base) to Mississi 358.9 Ma to 323.2 Ma Mississippian		ar 358.9 Shallow crustal - continental Htype 214 131 149 214 131	14#D6839 <nul> Polygon 0.00393 0.0000</nul>
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19430 Lachian Orogen Cgug_a Gulgong Granite - apl Apite Bathu	thurst Supersuit Gulgong Suite <nul> Gulgong Granite Gulgong Gra <nul> Bath thurst Supersuit Gulgong Suite <nul> Gulgong Granite Gulgong Gra <nul> Bath</nul></nul></nul></nul>	hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit	e Bathurst Supersuite - G Lachlan Orogen/Carboniferous i-Type Intr <null> <null></null></null>	Fine grained LType Strongly Oxidis Moderate Sr - u Fine grained LType Strongly Oxidis Moderate Sr - u		43 PhanerozoiclPalaeoz 323.2 Mississippian 43 PhanerozoiclPalaeozoiclCa 43 PhanerozoiclPalaeoz 323.2 Mississippian 43 PhanerozoiclPalaeozoiclCa	ar 358.9 Shallow crustal - continental i-type 214 131 149 214 131 ar 358.9 Shallow crustal - continental i-type 214 131 149 214 131	14 #D6839 <nul> Polygon 0.01104 0.0000 14 #D6839 <nul> Polygon 0.00763 0.0000</nul></nul>
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19400 Lachian Orogen Cgug_r Gulgong Granite - rh Quartz-feldspar porphyritic r Bathu		hurst Supersuite/Guigo Lachian Groge Eastern Lachian Grogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Bathurst Supersuit	e Bathurat Supersuite - G Lachian Orogen/Carboniferous i-Type Int <tube -="" hulb-<="" td=""><td>Rhyolite I-Type Strongly Oxidis Moderate Sr - u</td><td>n 2 Mississippian Mississippian (base) to Mississi 358.9 Ma to 323.2 Ma Mississippian</td><td></td><td>ar 358.9 Shallow crustal - continental Ltype 179 75 77 179 75 7</td><td>77 #B34B4 «Null» Polygon 0.01335 0.0000</td></tube>	Rhyolite I-Type Strongly Oxidis Moderate Sr - u	n 2 Mississippian Mississippian (base) to Mississi 358.9 Ma to 323.2 Ma Mississippian		ar 358.9 Shallow crustal - continental Ltype 179 75 77 179 75 7	77 #B34B4 «Null» Polygon 0.01335 0.0000
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18000 Lachlan Orogen Coum Mudgee River Granit Biotte granodionte, biotte-gu Bathu	thurst Supersuit Gulgong Suite <nuit> Mudgee River Granite <nuit> <nuit> Bath</nuit></nuit></nuit>	hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous Fryge Intrusions Guigong Batholth hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous Fryge Intrusions Guigong Batholth	Guigong Batholith - Gul Lachian Orogen/Carboniferous I-Type Intr 28823 <nul></nul>	Monzonite Frype Strongly Cikids Untractionated		42 Phanerozoic/Palaeoz 298.9 Visean 132 Phanerozoic/Palaeozoic/Ca	ar 346.7 Shallow crustal - continental Ltype 196 100 103 196 100	10#C4646 <nul> Polygon 0.00926 0.0000</nul>
18015 Lachian Orogen Cgum Mudgee River Granit Biotte granodiorite, biotte-gu Bathu		hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous i-Type intrusions Guigong Batholith		Monzonite I-Type Strongly Oxidis Moderate Sr - u			ar 346.7 Shallow crustal - continental Hype 196 100 103 196 100	10#C4646 <nul> Polygon 0.01223 0.0000</nul>
18027 Lachian Orogen Cgum Mudgee River Grant Biotte granodiorite, biotte-gu Bathu 18040 Lachian Orogen Cgum Mudgee River Grant Biotte granodiorite, biotte-gu Bathu		hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Guigong Batholth hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Guigong Batholth		Monzonite I-Type Strongly Oxidis Moderate Sr - u Monzonite I-Type Strongly Oxidis Moderate Sr - u			ar 346.7 Shallow crustal - continental Hype 196 100 103 196 100 346.7 Shallow crustal - continental Hype 196 100 103 196 100	10#C4646 <null> Polygon 0.00416 0 10#C4646 <null> Polygon 0.02385 0.0000</null></null>
18115 Lachian Orogen Cgum Mudgee River Grant Biotte granodiorite, biotte-gu Bathu	thurst Supersuit Gulgong Suite <null> Mudgee River Granite <null> <null> Bath</null></null></null>	hurst Supersuite/Gulgo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Gulgong Batholith	Guigong Batholith - Gui Lachian Orogen/Carboniferous I-Type Intr 28823 <null></null>	Monzonite I-Type Strongly Oxidis Moderate Sr - u	n 2 Mississippian Visean (base) to Pennsylvania 346.7 Ma to 296.9 Ma Pennsylvanian		ar 346.7 Shallow crustal - continental I-type 196 100 103 196 100	10#C4646 <nul> Polygon 0.06765 0.0003</nul>
19660 Lachian Orogen Cguo Old Leake Quartz Mo Mafic quartz monzonite Bathu 18980 Lachian Orogen Cgur Home Rule Quartz M Leucocratic coarse-grained t Bathu	thurst Supersuit Guigong Suite <nul> Old Leake Quartz Mon <nul> <nul> eNul> Bath thurst Supersuit Guigong Suite <nul> Home Rule Quartz Mo <nul> <nul> eNul> Bath</nul></nul></nul></nul></nul></nul>	hurst Supersuite/Gulgo Lachtan Oroge Eastern Lachtan Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit hurst Supersuite/Gulgo Lachtan Oroge Eastern Lachtan Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Bathurst Supersuit		Monzonite LType <nul> <nul></nul></nul>	<null (base)="" 346.7="" 358.9="" <="" lower="" ma="" mississ="" p="" to="" tournaisi="" tournaisian=""> at 4 Pennsylvanian Pennsylvanian (base) to Penns 323.2 Ma to 298.9 Ma Pennsylvanian</null>		ar 358.9 Shallow crustal - continental i-type 191 101 110 191 101 ar 323.2 Shallow crustal - continental i-type 217 130 137 217 130	11#8F656 <null> Polygon 0.03932 0.0000 13#D9828 <null> Polygon 0.35172 0.0079</null></null>
19435 Lachan Orogen Cgur Home Rule Quartz In Cedeboratic coarse-graned I band		hurst Supersuite/Guigo Lachan Groge Eastern Lachan Grogen Hunter-Bowen cycle Carboniferous LType Intrusions Bathurst Supersuit		Monzonite LType Strongly Oxidis Weakly fraction Monzonite LType Strongly Oxidis Moderately frac	ti 5 Upper Mississi Serpukhovian (base) to Serpuk 330.9 Ma to 323.2 Ma Serpukhovian		ar 330.9 Shallow crustal - continental Ltype 189 109 128 189 109	12 #8D6D8 <nul> Polygon 1.37083 0.0209</nul>
15530 Lachlan Orogen Cguw Wiagdon Granite Medium-grained, felsic, equig Bathu	thurst Supersuit Gulgong Suite <nul> Wiagdon Granite <nul> <nul> diul> Bath</nul></nul></nul>	hurst Supersuite/Guigo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Guigong Batholth	Gulgong Batholth - Gul Lachian Orogen/Carboniferous I-Type Intr 19959 <null></null>	Grante LType <nub <nub<="" td=""><td>«Null Pennsylvanian Pennsylvanian (base) to Penns 323.2 Ma to 298.9 Ma Pennsylvanian</td><td>42 Phanerozoicl/Palaeoz 298.9 Pennsylvanian 42 Phanerozoicl/PalaeozoiclCz</td><td>ar 323.2 Shallow crustal - continental I-type 209 111 119 209 111</td><td>11#D16F7 <nul> Polygon 0.12694 0.0011</nul></td></nub>	«Null Pennsylvanian Pennsylvanian (base) to Penns 323.2 Ma to 298.9 Ma Pennsylvanian	42 Phanerozoicl/Palaeoz 298.9 Pennsylvanian 42 Phanerozoicl/PalaeozoiclCz	ar 323.2 Shallow crustal - continental I-type 209 111 119 209 111	11#D16F7 <nul> Polygon 0.12694 0.0011</nul>
		hurst Supersuite/Lewis Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Guigong Batholth hurst Supersuite/Lewis Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Guigong Batholth					ar 358.9 Shallow crustal - continental Hype 219 123 144 219 123 ar 358.9 Shallow crustal - continental Hype 207 136 153 207 136	14 #DB7B9 <null> Polygon 0.00961 0.0000 15 #CF889 <null> Polygon 0.01126 0.0000</null></null>
15134 Lachian Orogen Ciel Lewis Ponds Granite Biotte muscovite granite Bathu	thurst Supersuit Lewis Ponds S <nub <nub="" bath<="" granite="" lewis="" ponds="" td=""><td>hurst Supersuite/Lewis Lachian Groge Eastern Lachian Grogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Guigong Batholth</td><td>Guigong Batholith - Le Lachian Orogen/Carboniferous i-Type Intr 28114 <null></null></td><td></td><td>n 2 Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma Carboniferous</td><td>16 Phanerozoicl/Palaeoz 298.9 Carboniferous 16 Phanerozoicl/PalaeozoiclCa</td><td>ar 358.9 Shallow crustal - continental Livne 191 82 93 191 82 9</td><td>3 #BF525 <nul> Polynon 0.01389 0.0000</nul></td></nub>	hurst Supersuite/Lewis Lachian Groge Eastern Lachian Grogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Guigong Batholth	Guigong Batholith - Le Lachian Orogen/Carboniferous i-Type Intr 28114 <null></null>		n 2 Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma Carboniferous	16 Phanerozoicl/Palaeoz 298.9 Carboniferous 16 Phanerozoicl/PalaeozoiclCa	ar 358.9 Shallow crustal - continental Livne 191 82 93 191 82 9	3 #BF525 <nul> Polynon 0.01389 0.0000</nul>
	thurst Supersuit Lewis Ponds S <nul> Lewis Ponds Granite <nul> <nul> Bath</nul></nul></nul>	hurst Supersuite/Lewis Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Guigong Batholth	Guigong Batholth - Le Lachian Orogen/Carboniferous i-Type Intr 28114 <1005				ar 358.9 Shallow crustal - continental i-type 191 82 93 191 82 9	3 #8F525 <null> Polygon 0.04330 0.0000 11 #886C7 <null> Polygon 0.23041 0.0016</null></null>
11851 Lachian Orogen Co_b_g Burraga Granite - gra Coarse-grained, leucocratic Ober 12226 Lachian Orogen Co g Black Springs Granit Grev, medium-grained, equipr Ober		rron Supersute///Black Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith eron Supersute///Black Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith	Alulis Lachian Orogen/Carboniferous i-Type Intr <nulls <nulls="" <nulls<="" td=""><td>Granodiorite LType Strongly Oxidis Strongly fractio Granite LType Moderately Oxi Unfractionated</td><td></td><td></td><td>ar 358.9 Shallow crustal - continental Ltype 217 91 110 217 91 1</td><td>10 #09586 <nul> Polyaon 0.19971 0.0026</nul></td></nulls>	Granodiorite LType Strongly Oxidis Strongly fractio Granite LType Moderately Oxi Unfractionated			ar 358.9 Shallow crustal - continental Ltype 217 91 110 217 91 1	10 #09586 <nul> Polyaon 0.19971 0.0026</nul>
11796 Lachlan Orogen Co_i Isabella Granite Coarse-grained, equigranular Ober	eron Supersuite «Nul» abela Grante «Nul» «Nul» Ober	eron Supersuite///isabel Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Oberon Batholith	<null> Lachlan Orogen/Carboniferous I-Type Intr 26634 <null></null></null>	Granite I-Type Moderately Red Weakly fraction	at 4 Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma Carboniferous	16 PhanerozoiclPalaeoz 298.9 Carboniferous 16 PhanerozoiclPalaeozoiclCa	ar 358.9 Shallow crustal - continental Ltype 201 111 115 201 111	11#C96F7 «Null» Polyope 0.17689 0.0019
9025 Lachian Orogen Co_I Lockyersleigh Grant Pink, medium- to coarse-grain Ober 9030 Lachian Orogen Co_I Lockyersleigh Grant Pink, medium- to coarse-grain Ober		eron Supersute///Locky Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith eron Supersute///Locky Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith	Lachlan Orogen/Carboniferous I-Type Intr 10578 CI Lachlan Orogen/Carboniferous I-Type Intr 10578 CI	Grante LType <nub <nub<br="">Grante LType <nub <nub<="" td=""><td><null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to=""><null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to="">Carboniferous</null></null></td><td></td><td>ar 358.9 Shallow crustal - continental - type 207 136 142 207 136 ar 358.9 Shallow crustal - continental - type 207 136 142 207 136</td><td>14 #CF888 <nul> Polygon 0.00134 0 14 #CF888 <nul> Polygon 0.29841 0.0042</nul></nul></td></nub></nub>	<null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to=""><null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to="">Carboniferous</null></null>		ar 358.9 Shallow crustal - continental - type 207 136 142 207 136 ar 358.9 Shallow crustal - continental - type 207 136 142 207 136	14 #CF888 <nul> Polygon 0.00134 0 14 #CF888 <nul> Polygon 0.29841 0.0042</nul></nul>
9030 Lachian Orogen Co_1 Lockyersieligh Granit Pink, medium- to coarse-grain Ober 12578 Lachian Orogen Co_s Sloggets Granite Pink, coarse-grained, megacr Ober		eron Supersute///Locky/Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle (Carboniterous -Type Intrusions Oberon Batholth eron Supersute///Slogg Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle (Carboniferous -Type Intrusions Oberon Batholth	<tiul>Lachian Orogen/Carboniferous I-Type intr17001</tiul>	Granite I-Type Moderately Oxi Moderate Sr - u		16 Phanerozoic/Palaeoz 298.9 Carboniferous 16 Phanerozoic/Palaeozoic/Ca 16 Phanerozoic/Palaeoz 298.9 Carboniferous 16 Phanerozoic/Palaeozoic/Ca	ar 358.9 Shallow crustal - continental I-type 201 105 129 201 105	12#C9698 <nut> Polygon 0.14876 0.0009</nut>
12830 Lachlan Orogen Cobd Duckmalol Granite Grey, coarse-grained biotte Ober	eron Supersuite Oberon Suite <nuil> Duckmaloi Granite <nuil> <nuil> Ober</nuil></nuil></nuil>	eron Supersuite/Obero Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type intrusions Oberon Batholith	Oberon Batholith - Ober Lachian Orogen/Carboniferous I-Type Intr 5750 <null></null>	Granite +Type Moderately Oxi Moderate Sr - u			ar 358.9 Shallow crustal - continental Ltype 189 96 119 189 96 1	19#80607 chulk Polyoon 0.49353 0.0017
12558 Lachian Orogen Cobo_e Oberon Grante - equ Coarse-grained, equigranular Ober 12564 Lachian Orogen Cobo_p Oberon Grante - por Coarse-grained, porphyrtic b Oberon		rron Supersute/Obero Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith aron Supersute/Obero Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith	Oberon Batholth - Ober Lachian Orogen/Carboniferous I-Type Intr <null> <null <<="" <null="" n="" null=""></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null></null>	Grante I-Type Moderately Oxi Moderate Sr - u Grante I-Type Moderately Oxi Moderate Sr - u		43 Phanerozoic/Palseoz 323.2 Mississippian 43 Phanerozoic/Palseozoic/Ce 43 Phanerozoic/Palseoz 323.2 Mississippian 43 Phanerozoic/Palseozoic/Ce	ar 358.9 Shallow crustal - continental Hype 181 114 120 181 114 358.9 Shallow crustal - continental Hype 194 110 117 194 110	12#85727 <null> Polygon 0.23472 0.0029 11#C26E7 <null> Polygon 0.02370 0.0000</null></null>
12504 Lachan Orogen Clua Abercom Grante - por Coarse-grained, porphytic b Ober 11501 Lachian Orogen Clua Abercom Grante Pink to cream, leucocratic, m Ober	eron Supersuite Tuglow Suite <null> Abercorn Granite <null> <null> Ober</null></null></null>	aron Supersuite/Tuglo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholth	Oberon Batholith - Tugi Lachian Orogen/Carboniferous I-Type Intr 32 Cta	Grante I-Type <nul> <nul></nul></nul>	«Null Pennsylvanian Pennsylvanian (base) to Penns 323.2 Ma to 298.9 Ma Pennsylvanian	42 Phanerozoicl/Palaeoz 298.9 Pennsylvanian 42 Phanerozoicl/Palaeozoicl/Ca	323.2 Shalow crustal - continental Ltype 209 100 128 209 100	12#01648 chub Polyona (0.06189 0.0001
11559 Lachlan Orogen Ctua Abercom Granite Pink to cream, leucocratic, m Ober	eron Supersuite Tuglow Suite «Null» Abercorn Granite «Null» «Null» Ober	eron Supersuite/Tuglo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous i-Type Intrusions Oberon Batholith	Oberon Batholith - Tugi Lachlan Orogen/Carboniferous I-Type Intr 32 Cta	Granite LType «Null» «Null»	«Null Pennsylvanian Pennsylvanian (base) to Penns 323.2 Ma to 298.9 Ma Pennsylvanian		ar 323.2 Shallow crustal - continental Ltype 209 100 128 209 100	12 #D1648 <nul> Polygon 0.04503 0.0001</nul>
11624 Lachlan Orogen Ctuk Kanangra Granite Pink to cream, leucocratic, co Ober 11776 Lachlan Orogen Ctuk Kanangra Granite Pink to cream, leucocratic, co Ober		eron Supersuite/Tuglo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith eron Supersuite/Tuglo Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Oberon Batholith		Granite LType Strongly Oxidis Weakly fraction Granite LType Strongly Oxidis Weakly fraction			ar 358.9 Shallow crustal - continental i-type 204 86 98 204 86 9 ar 358.9 Shallow crustal - continental i-type 204 86 98 204 86 9	8 #CC566 <null> Polygon 0.00472 0.0000 8 #CC566 <null> Polygon 0.37623 0.0079</null></null>
12551 Lachlan Orogen Cubr Rossdhu Granite Pale pink, coarse-grained eq «Null	ul> Unassigned Bat <nul> Rossdhu Granite <nul> <nul> /Unas</nul></nul></nul>	assigned BathursI-type Lachlan Oroge Eastern Lachlan Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Unassigned Carbo	nif Unassigned Carbonifer Lachian Orogen/Carboniferous i-Type Intr 29669 «Nul»	Grante <nult> <nult> <nult></nult></nult></nult>	«Null Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma Carboniferous	16 PhanerozoiciPalaeoz 298.9 Carboniferous 16 PhanerozoiciPalaeozoiciCa	ar 358.9 Shallow crustal - continental S-type 179 80 84 179 80 8	14 #83505 <nul> Polypon 0.01242 0.0000</nul>
12560 Lachian Orogen Cubr Rossdhu Granite Pale pink, coarse-grained eq «Null	ul> Unassigned Bat <nub> Rossdhu Granite <nub> <nub> Ana: ub> Unassigned Bat <nub> Rossdhu Granite <nub> <nub> <nub></nub></nub></nub></nub></nub></nub></nub>	assigned Bathurst-type Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Unassigned Carbo	nif Unassigned Carbonifer Lachlan Orogen/Carboniferous I-Type Intr 29669 <nul></nul>	Grante <nul> <nul></nul></nul>	«Null Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 296.9 Ma (Autoniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma Carboniferous Carboniferous (base) to Carbo 358.9 Ma to 298.9 Ma	16 PhanerozoiclPalaeoz 298.9 Carboniferous 16 PhanerozoiclPalaeozoiclCa	ar 358.9 Shallow crustal , continental Subme 179 80 84 179 80 8	84 #83505 <nul> Polygon 0.10062 0.0002 14 #83505 <nul> Polygon 0.19151 0.0003</nul></nul>
12561 Lachian Orogen Cubr Rossdhu Grante Pale pink, coarse-grained eg «Null 5846 Lachian Orogen Cuc Unassigned Carbonif Felsic to intermediate intrusio «Null	ull- Unassigned Bat <1/ull- Rossdhu Grante <1/ull- <1/ull- <1/ull- Unassigned Car <1/ull- <1/u	assigned Bathurst-type Lachian Oroge Eastern Lachian Orogen Hunter-Bowen cycle Carboniferous I-Type Intrusions Unassigned Carbon assigned Carboniferou NSW None Hunter-Bowen cycle Carboniferous I-Type Intrusions Unassigned Carbon	nif Unassigned Carbonifer Lachian Orogen/Carboniferous i-Type Intr 29669 <null- nif Mull- Lachian Orogen/Carboniferous i-Type Intr <null- cm<="" td=""><td>Grante <tub <tub="" <tub<="" td=""><td><null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to="">(Null Carboniferous Mississippian (base) to Pennsyl 358.9 Ma to 298.9 Ma Pennsylvanian</null></td><td></td><td>ar 358.9 Shalow crustal - continental S-type 179 80 84 179 80 8 ar 358.9 Shalow crustal - continental Hype 137 172 199 137 172</td><td>14 #83505 <nub> Polygon 0.19151 0.0003 19#89ACC <nub> Polygon 0.50414 0.0129 *</nub></nub></td></tub></td></null-></null- 	Grante <tub <tub="" <tub<="" td=""><td><null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to="">(Null Carboniferous Mississippian (base) to Pennsyl 358.9 Ma to 298.9 Ma Pennsylvanian</null></td><td></td><td>ar 358.9 Shalow crustal - continental S-type 179 80 84 179 80 8 ar 358.9 Shalow crustal - continental Hype 137 172 199 137 172</td><td>14 #83505 <nub> Polygon 0.19151 0.0003 19#89ACC <nub> Polygon 0.50414 0.0129 *</nub></nub></td></tub>	<null (base)="" 298.9="" 358.9="" carbo="" carboniferous="" ma="" ma<br="" to="">(Null Carboniferous Mississippian (base) to Pennsyl 358.9 Ma to 298.9 Ma Pennsylvanian</null>		ar 358.9 Shalow crustal - continental S-type 179 80 84 179 80 8 ar 358.9 Shalow crustal - continental Hype 137 172 199 137 172	14 #83505 <nub> Polygon 0.19151 0.0003 19#89ACC <nub> Polygon 0.50414 0.0129 *</nub></nub>



Stratigraphic unit tables

- Best available compilation of literature and current field work.
- Replace explanatory notes.
- e.g. Illawarra Coal Measures





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Planning & MinView

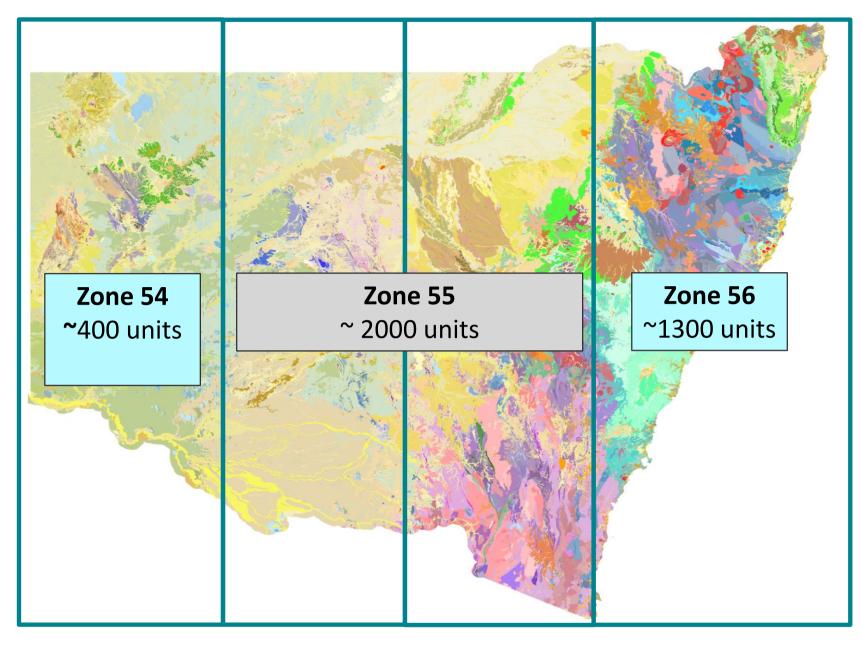
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	Illawarra Coal Measures (Pil) Clark (1866)		southern part of the basin. The area along the Kangaroo Valley marks the	and/or			South Wales.
attribution			southern extent of the unit, and from here it turns northward to the escarpment of	environmental			Mullard B.W., Cozens S.J. & Armstrong M. 1996. Tectonic control on
Source of name	The Illawarra region of the south coast of New SouthWales, where the unit is		the Illawarra Coastal Range.	hazards			sedimentation and coal formation in the Southern Coalfield. In: Proceedings of
		Relationships	The Illawarra Coal Measures conformably overlies the Shoalhaven Group and is	Geophysical	Unknown		the Thirtieth Newcastle Symposium on 'Advances in the study of the Sydney
		and boundary	unconformably overlain by the Narrabeen Group and Coal Cliff Sandstone.	characteristics			Basin', pp. 9-15. The University of Newcastle, Newcastle, New South Wales.
	refer to the coal-bearing sequence in the Illawarra district which he included in			Remarks	None		Pogson D.J. & Watkins J.J. 1998 Bathurst 1:250 000 geological Sheet. SI/55-8:
	the more generic 'Upper Coal measures'. Other terms were later used (e.g. the		The Illawarra Coal Measures in the Moss Vale area is typically recessive,	References	Balme B.E. & Foster C.B. 1996. Triassic (Chart 7). In: Young G.C. & Laurie		Explanatory Notes. Australian Geological Survey Organisation and Geological
	'Bulli Coal Measures' of David 1890 and David and Stonier 1891) but the ten		although in the far northwest of Moss Vale and northward onto Burragorang100		J.R. eds. An Australian Phanerozoic Timescale, pp. 136-147. Oxford Univer-	5	Survey of New South Wales SI/55-8
	'Upper Coal Measures' was widely in use in the geological literature of the ea		the unit is cliff forming (Trigg & Campbell 2016).		Press, Melbourne.		Retallack G.J. 1996. Early Triassic therapsid footprints from the Sydney Basin,
			In general, the Illawarra Coal Measures consist of sandstone, siltstone, shale and		Barnes R., Dawson M., Spiller F. 2002 Geology - Integration and upgrade: N		Australia. Alcheringa 20, 301–314.
	Measures was formally reinstated by Joplin, Hanlon and Noakes (1952). The		coal seams, with minor conglomeratic and tuffaceous beds. Contemporaneous		Western Regional Assessments: Brigalow Belt South Bioregion (Stage 2). A		Trigg S.J. & Campbell L.M. 2016. Moss Vale 1:100 000 geological sheet 8928.
	term Illawarra Coal Measures (Clarke 1866) was introduced into the Western		volcanic activity is evidenced by tuffaceous sections within the seams		project undertaken for the Resource and Conservation Assessment Council;		Explanatory Notes. Geological Survey of New South Wales, Maitland, NSW.
	Coalfield by Bryan et al. (1966) who traced the continuity of this unit from the		(Stephenson & Burch 2004).		NSW Western regional assessments Geological Survey of New South Wales		Wilson R.G. 1975. Southern Coalfield. In: Traves D.M. and King D. (Eds) -
		Primary	The Illawarra Coal Measures has been affected by wide amplitude, very open		WRA/19, 157pp.		Economic geology of Australia and Papua New Guinea - 2.Coal. AusIMM.
- on other the		structures/textur	folding and also faulting, at least some of which was active during sedimentatio	e de la companya de la	Bos F. 1988. Geology and coal resources of Sutton Forest. The Shell Compar	1	Monograph Series 6, 206-218.
	Pic Cumberland Subgroup	es	(see Mullard, Cozens & Armstrong 1996 and references therein; Moffitt 2000).		of Australia, Report C.R. 1521. New South Wales Geological Survey, Report	1	Yoo E.K., Tadros N.Z. & Bayly K.W. 2001. A compilation of the geology of the
	Pih Charbon Subgroup		Bos (1988) reported minor faulting with displacements typically less than 5 m.		2006/007.		Western Coalfield. Geological Survey of New South Wales report GS2001/204.
	Pin Nile Subgroup		Two major joint sets, both vertical, were reported (Bos 1988): the dominant set		Bowman H.N., Stroud W.J., Sherwin L. & Ray H.N. 1986. Sydney Basin		Young G.C. & Laurie J.R. (eds) 1996. An Australian Phanerozoic timescale.
	Pis Sydney Subgroup		trending 110° and the other trending 020°.		stratigraphy. In: Sherwin L. & Holmes G.G. eds., Geology of the Wollongon		Oxford University Press, Melbourne.
		Geochemistry	Unknown		and Port Hacking 1:100 000 sheets, 9029, 9129. Geological Survey of New	Figure caption	None
	The Cullen Bullen, Wallerawang, Charbon and Nile Subgroup are part of the	Structure	None identified		South Wales, Sydney.	Photo caption	
		(tectonic)			Bryan J. H., McElroy C. T. & Rose G. (compilers). 1966. Sydney 1:250,000		
		Metamorphism	Overall the Illawarra Coal Measures displays no effects of metamorphism excep		Geological Series - Explanatory Notes, Sheet SI/56-5. 3rd edition. Geological		
Parent unit	None	5.252	for local contact metamorphic effects produced by younger intrusions (Trigg &		Survey of New South Wales, Sydney.		
	The Illawarra Coal Measures is correlative with the Tomago Coal Measures as		Campbell 2016).		Byrnes J.G., Scheibnerova V. & Stuchbury R. 1981. Evidence for marine		
correlation	the Singleton Supergroup of the Newcastle and Hunter coalfields, respectively		The Illawarra Coal Measures is largely non-marine and rich in macro- and micro	4	influence during deposition of some coal measure sediments (Wongawilli coal	3	The second of the second
	(Barnes et al. 2002). It is also correlated with the Black Jackson Group of the		fossil floras. Marine shelly fossils have been reported from the unit (Byrnes,		seam) In: Abstracts of the Fifteenth Newcastle Symposium on 'Advances in t		
	Gunnedah Basin (Barnes et al. 2002). Although some of the constituent units of		Scheibnerova & Stuchbury 1981).		study of the Sydney Basin', p. 12. The University of Newcastle, Newcastle, ?	'	and the second sec
	the coal measures can be directly correlated, lateral relationships are complex (Herbert 1980).		Late Permian based on palynology and also U-Pb dating of some tuff horizons.		South Wales.		
D' 11		evidence	Young and Laurie (1996, Chart 6) showed the age of the unit ranging from		Cameron R.G., Meakin N.S. & Yoo E.K. 1999b. Narrabeen Group In: Meakin	1	
00	None		Kanzanian (part of the Guadalupian) to just below the top of the Permian.		N.S & Morgan E.J. (compilers) Dubbo 1:250 000 Geological Sheet SI/55-4, Explanatory Notes. 2nd edition. Geological Survey of New South Wales,		
or identifying			Bowman et al. (1986) noted that the top of the Permian is considered to be just		Explanatory Notes. 2nd edition. Geological Survey of New South Wales, Sydney.		
features			above the top of the Illawarra Coal Measures on palynological grounds, althoug	Ş	Carne J.E. 1908. The copper mining industry and the distribution of copper of		
Туре	There is no single type section for the Illawarra Coal Measures. Type sections the constituent units of the Illawarra Coal Measures were recorded by the		this is yet to be firmly established (Balme & Foster 1996; Retallack 1996). U-P		in New South Wales. Mineral		
	Standing Committee on Coalfield Geology of N.S.W. (1986) and are located		SHRIMP dating indicates that the Illawarra Coal Measures was deposited in a		Resources 6. Geological Survey of New South Wales.		A REAL PROPERTY AND A REAL
	mainly in the Lithgow region of the Sydney 1: 250 000 map sheet area.		relatively short time interval of less than ~12 million years (Carr, Fanning & Jones 2003).		Carr P., Fanning M. & Jones B.G. 2003. Geochronology of coal measures in		
	The Illawarra Coal Measures is thin in the western half of Western Coalfield	Unconformities		-	Sydney Basin from U-Pb SHRIMP dating of air-fall tuffs. In: Proceedings of		
	where it maintains a relatively uniform thickness of $100 \text{ m} - 200 \text{ m}$. In the	or hiatuses	None recognised		35th Symposium on 'Advances in the Study of the Sydney Basin', pp. 303–3		
		Environment of	Thelesser	-	The University of Wollongong, Wollongong, New South Wales.		
	900 m eastwards towards the trough areas of the Sydney and Gunnedah Basin	Linvironment of	Unknown		Clarke W.B. 1866. On the occurrence and geological position of oil-bearing		
	(Yoo et al. 2001). In the Southern				deposits in New South Wales. Quarterly Journal of the Geological Society of		
		emplacement	A factor of the Illener Coal Manner is the constantion of a share of		London 22, 439–448.		
	thickening to the north ($>$ 500 m), and thinning to less than 50 m in the south :	Economic	A feature of the Illawarra Coal Measures is the concentration of coal seams of		David T.W.E. 1890. The Coal Measures of New South Wales and their		
	west (Stephenson & Burch 2004.	geology	commercial importance. In the southern coalfields these are: Bulli seam, Balgownie seam, Wongawilli seam and Tongarra seam (Wilson 1975, Moffit		associated eruptive rocks. Journal of the Royal Society of New South Wales		
	The Illawarra Coal Measures forms the western and southern segments of the		2000) and in the western coalfields: Lithgow Coal, Lidsdale Coal, Ulan Coal,		257–271.		
	Sydney Basin. Along the western side of the Sydney Basin, the Illawarra Coal		Irondale Coal, Bungaba Coal Member, Moolarben Coal Member, Turill Coal		David T.W.E. & Stonier G.A. 1891. Report on coalmeasures of Shoalhaven		Photograph Pill: Exposures of the Illawarra Coal Measures and the
	Measures crops out nearly continuously (Bryan, McElroy & Rose 1966; Moff		Member, Katoomba Coal, Middle River Coal Member (Yoo et al. 2001)		District, and on a bore, near Nowra. Appendix No. 2J. Annual Report of the		disconforably overlying Hawkesbury Sandstone at Meryla Pass
		Geological	None known	4	Department of Mines of N.S.W. for 1890, pp. 244–255.		(GR 260150 6158550). Photographer S.J. Trigg.
	(Cameron, Meakin & Yoo 1999a) to the Canvonleigh area (Moffitt 2000) in	Geological	None known	4	Harper L. F. 1915. Geology and Mineral Resources of the Southern Coal-fiel	Compiler	Marta Vega after S.J. Trigg & L.M. Campbell (2016)
	(Cankron, Meakin & 100 1333a) to the Canyoneign alea (Mollitt 2000) in				The second state of the second state of the sources	Complier	Warta vega after 5.J. 1 rigg & L.M. Campbell (2010)

• Stratigraphic unit tables

- Zone 54
 - $_{\circ}~$ All compiled
 - $_{\circ}~$ In QA and waiting editing
- Zone 55
 - $_{\circ}~$ Being compiled
 - Zone 55 east due 31/12/18
 - $_{\odot}~$ Zone 55 west due 21/12/19
- Zone 56
 - $_{\circ}~$ All compiled
 - $_{\circ}~$ In QA and waiting editing





Value adding ϕ

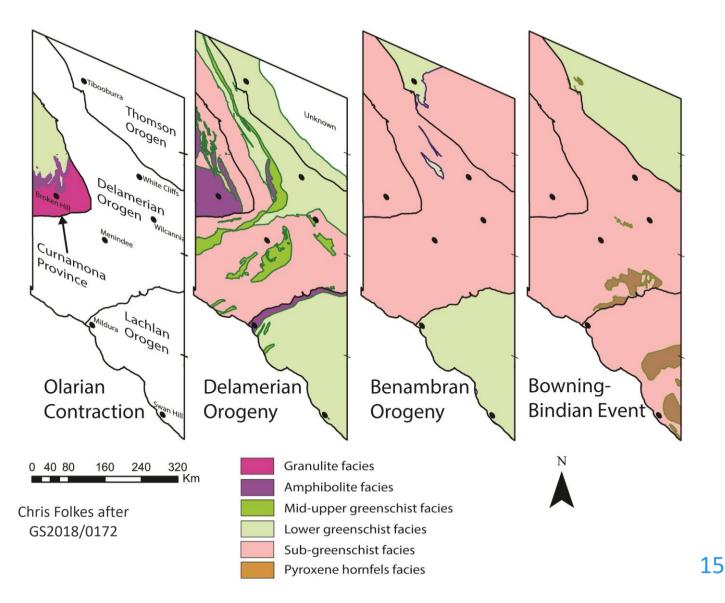
3



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Metamorphic maps

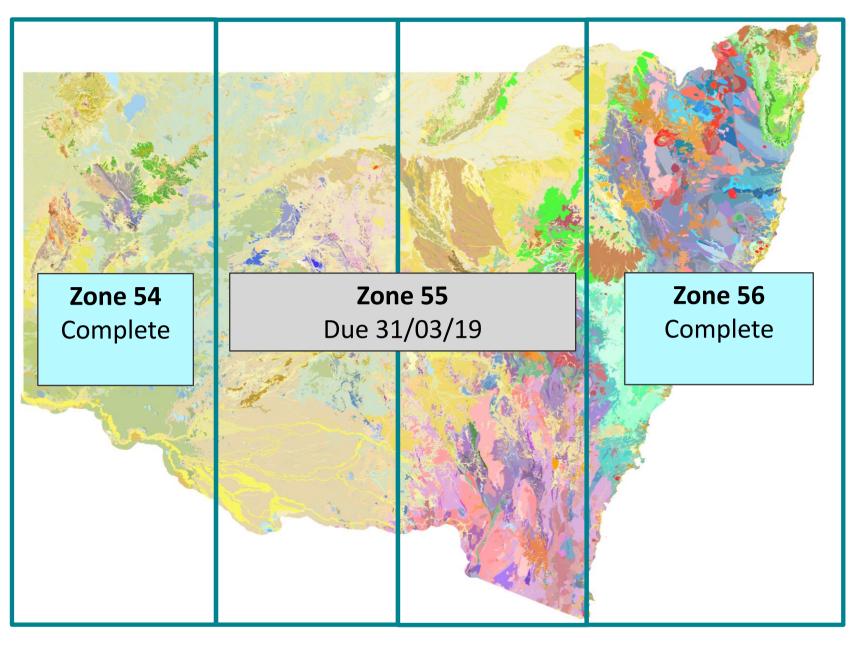
• Metamorphic facies and isograds mapped by geodynamic event.



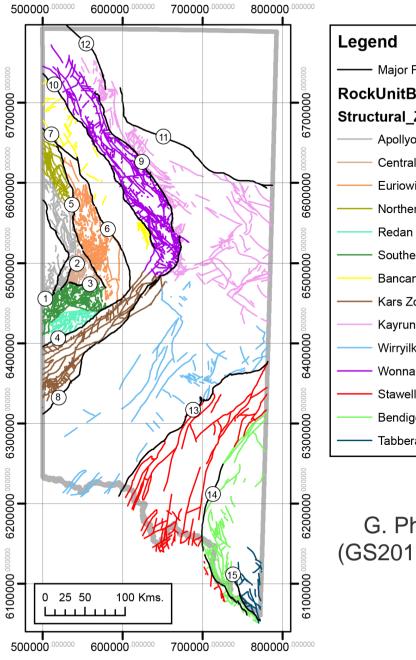


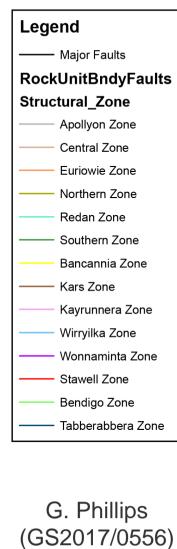
Metamorphic maps

- Zones 54 & 56 complete.
- Zone 55 currently underway.
 - $_{\odot}\,$ Due early 2019.









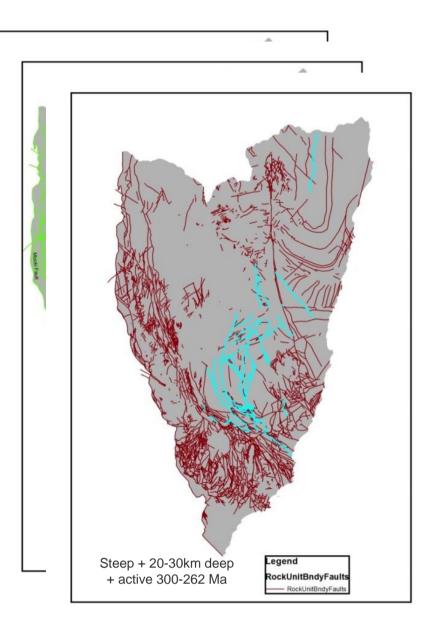
Fault attribution

- Every fault attributed with:
 - geometry 0
 - order 0
 - parent 0
 - kinematics by geodynamic event. 0

Sub System	Province	Structural features	Relevance for mineral prospectivity		
Olary Detachment	Curnamona	Faults located at the contact between the Broken Hill and Sundown groups.	Extensional detachment between the Broken Hill and Sundown Group is also a major redox boundary and potential site for Pb-Zn-Ag mineralisation (Gibson & Nutman, 2004).		
Cobham Kink Zone	Curnamona & Delamerian	NE-SW striking faults located in the Cobham Kink Zone.	NE-SW striking zone of crustal weakness that may have favoured repeated igneous intrusions (Gilmore et al., 2007).		
Arrowsmith	Delamerian	Dominantly NW-SE striking faults spatially associated with the Mt. Arrowsmith Volcanics.			
Larapintine	Delamerian	Basin bounding faults associated with the formation of post Delamerian basins.	Post-Delamerian basins including the Nuntherungie and Kayrunnera basins may contain orogenic gold.		
Grasmere Knee Zone	Delamerian	Faults located in the Grasmere Knee Zone.	Zone of higher-strain that may host structurally modified and remobilised VMS/Besshi Cu, Pb, Au and Ag deposits.		

Fault attribution data

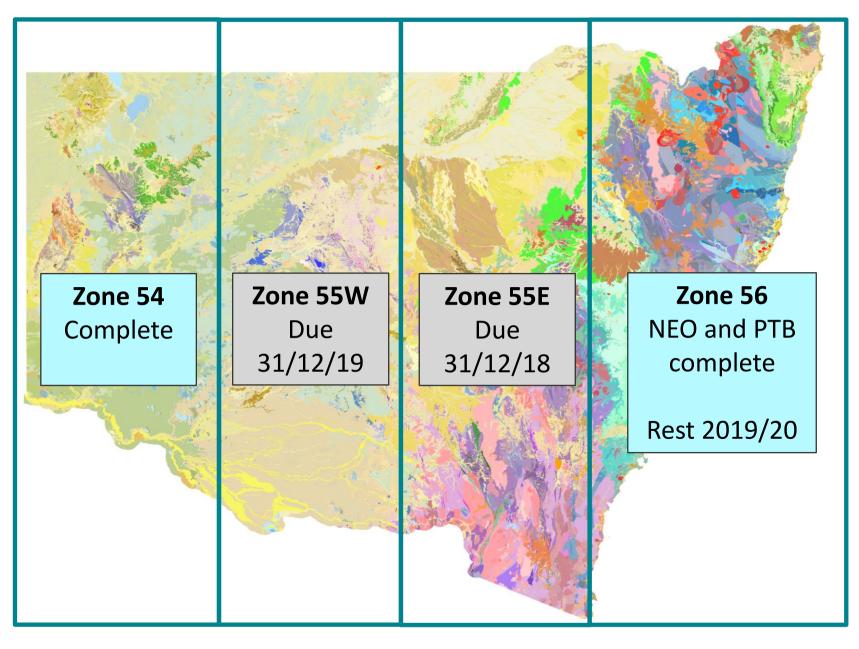
		-		
Last Edited By	G Phillips			
DMRCode	Fault, position accurate			
DMRCODE_Description	Fault, position accurate			
StructuralElementNan	Nowendoc Fault			
Parent	Wongwibinda Tia Fault System	Grouping		
Sub_system				
FaultOrder	ultOrder 2nd order fault			
FaultConfidence	Accurate			
Strike	136			
FaultDipDirection	Northwest	Architecture		
FaultDipAngle	ultDipAngle Steep (61-85 degrees)			
FaultCrustalDepth	Lower (Approximate 20 to 30 km depending on terrane)			
Length	5586			
GravityVisibility	low visibility	Geophysical		
MagneticVisibility	lagneticVisibility not visible			
Event1	Hunter Bowen Cycle (300-262 Ma)			
EventKinematics1	Normal dextral			
Event2	Hunter Bowen contraction (262-252 Ma)			
EventKinematics2	Reverse sinistral	Kinematics &		
Event3	<null></null>	event chronology		
EventKinematics3	<null></null>			
Eventlast	Hunter Bowen contraction			
Eventkinlast	Reverse sinistral			
Source_Data	Dirks et al., 1992; Landenberger et al., 1995; Farell, 1992;	•		
Comments	<null></null>			





G Fault attribution

- Zone 54 and NEO complete.
- Zone 55 due 2019.





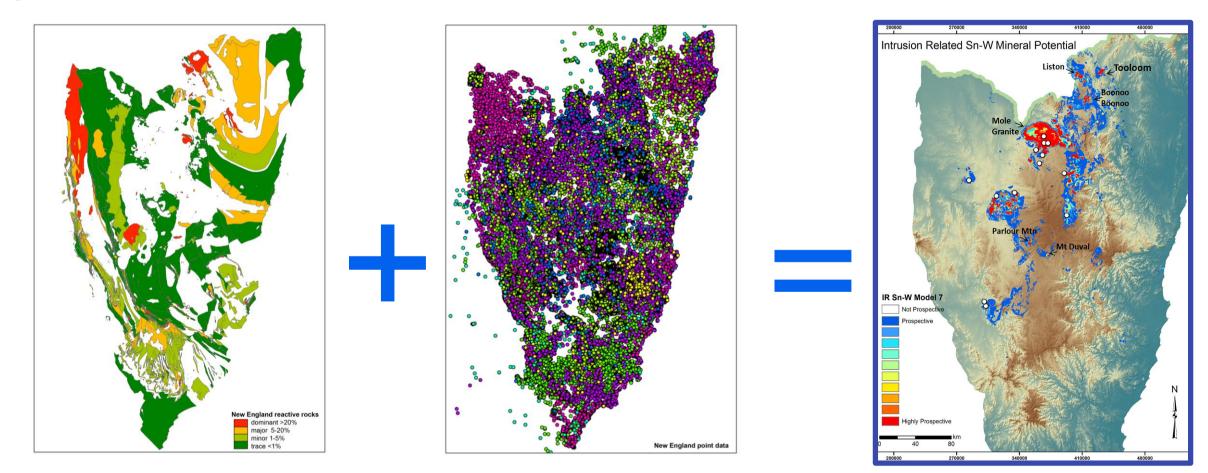
Integration of seamless and 3D geology



- Seamless outcrop & interpretation used to constrain 3D models.
- 3D models are then integrated with the seamless to improve it.
- This ensures a single geological model of NSW that is internally consistent in 2D and 3D.



Mineral potential mapping: New England Orogen





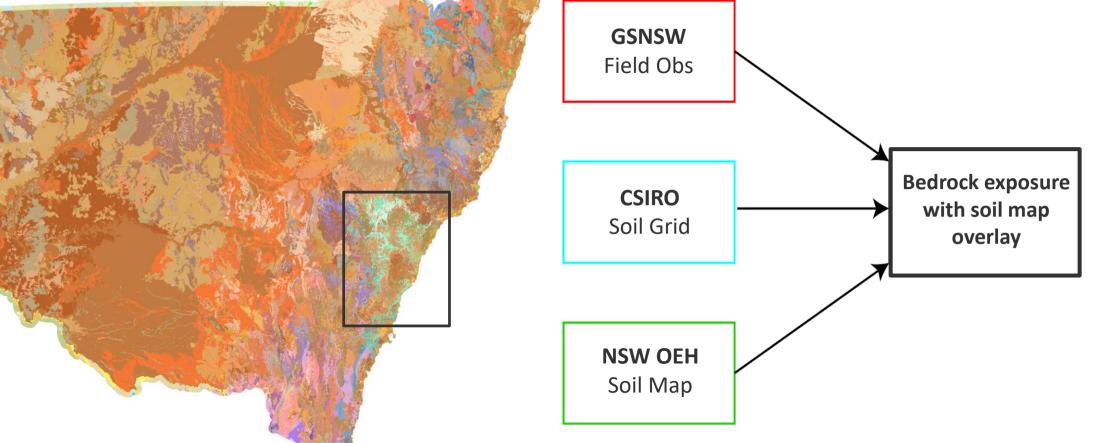
Seamless Geology

Point-based data

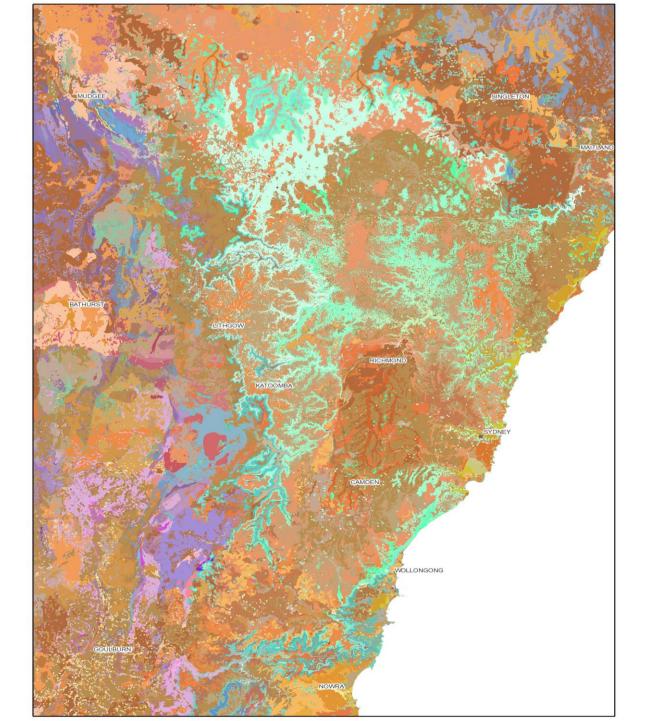
Reactive rocks (Seamless Geology value-add)



Bedrock exposure map







Bedrock exposure map example: Greater Sydney region

- Shows a much more reliable outcrop estimation.
- Will lead to better outcrop and soils mapping.

Summary: a new approach to mapping $\mathbf{6}$



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What's next? It's just the beginning...





Where do you get it?



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Accessing the data

Project webpage and GIS download:

https://www.resourcesandgeoscience.nsw.gov.au/seamless-geology

MinView:

https://minview.geoscience.nsw.gov.au/

Mobile maps:

https://www.geoscience.nsw.gov.au/phonemaps/







GIS Data

• ArcGIS

 $_{\odot}\,$ Good performing GIS software esp. with access to ArcGIS Pro.

• Mapinfo

 Some of the larger layers including the CSP are difficult to render depending on your computer specs.

• QGIS

- Free open source software
- $_{\odot}~$ Has similar capabilities to ArcGIS and MapInfo

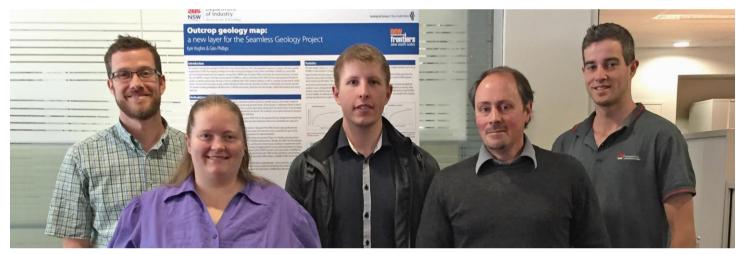








Seamless 'stitching' team



Glen Phillips (now external) Liann Deyssing James Ballard Gary Colquhoun Kyle Hughes Chris Folkes Joel Fitzherbert Alexa Troedson (now external) Phil Gilmore (Manager) John Greenfield (Director)



James Ballard james.ballard@planning.nsw.gov.au

