

# Index

Figures are shown in *italic*, tables in **bold**.

- 3D geological models  
Biferno River coastal plain, Italy  
184–189, *184–191*, **186**  
Glasgow 63, *64*, 67, 69  
3D medial axis (3DMA) method 208,  
211, *211*, 212, *212*, 214
- Accessing Subsurface Knowledge  
Network (ASK Network) 70, 78  
Acoustic Televiwer (ATV) scans 102,  
104–105, *106*, *107*, *108*, *109*  
Afulilo Dam, Samoa 169–177, *170*  
evaluation of proposed faults  
172–174, *172–175*  
geological setting 169–172,  
*170*, *171*  
geotechnical model 175  
subsurface investigations 174–175,  
*175*, *176*
- aggregate resources, Istanbul 55–61  
current problems 58, *58*, *59*  
history of quarrying 55–56, *56*, *57*  
recommendations for sustainable  
management 59–61, *59*, *60*
- AGS *see* Association of Geotechnical and  
Geoenvironmental Specialists  
(AGS); Australian Geomechanics  
Society (AGS)
- alteration processes 94  
American Society for Testing and  
Materials (ASTM) 218, 239  
analytical models 164  
andesite–dacite flow-dome complexes  
93, 96  
anthropogenic deposits, Glasgow 63, 69,  
**69**, 73, 74  
aquifer protection 46  
ASK Network (Accessing Subsurface  
Knowledge Network) 70, 78  
AS Miner Geotechnical Ltd (ASMG)  
121, 123, 124, **124**, *125*,  
128, **130**
- Association of Geotechnical and  
Geoenvironmental Specialists  
(AGS) 63, 67, 68–69  
ASTM *see* American Society for  
Testing and Materials (ASTM)  
Atterberg Limits 116, 239–240, **240**  
Australia  
landslides 119–132  
costs 125–126, **127**, **132**  
inventories 121–125, *122*, *123*, **124**,  
*125*, *126*, 130, 132  
risk management issues 119–121,  
*121*  
susceptibility zoning 120, 126–130,  
*129*, **130**, 131, *131*, 132  
*see also* Baralaba Coal Measures; coal  
seam gas water and clay liners;  
Latrobe Valley brown coal;  
Pilbara detrital valleys  
Australian Geomechanics Society (AGS)  
119–120, *121*  
autoclastic flow breccias 94  
Axminster bypass, Devon, UK 164, *164*
- Baillieston Till Formation **66**, **69**  
Bandanna Formation 101  
banded iron formation (BIF) sequences  
82, 83  
Baralaba Coal Measures 101–110  
footwall slope stability  
interpretation of Acoustic  
Televiwer scans 102, 104–105,  
*106–109*  
review of slope performance  
102–104, *103*, *104*  
regional and deposit geology 101–102  
structural interpretation 101, 102, *102*  
Baynes, Fred 5, 7, 10–11, 12–13  
Bellshill Clay Member **66**, **69**  
Berea sandstone  
permeability evolution 208, *208*,  
**209**, *209*  
pore geometry and permeability  
anisotropy 211–214, *212*, *213*,  
**214**, *214*  
tortuosity distribution 208, **209**, 212,  
213, *213*, 214  
BGS *see* British Geological Survey  
(BGS)  
BIF *see* banded iron formation (BIF)  
sequences  
Biferno River coastal plain, Molise  
179–193  
3D engineering geology model  
184–189, *184–191*, **186**  
geological setting 181–184, *182*, *183*  
geotechnical engineering issues  
189–191, *192*, *193*  
structural engineering issues 191–193  
borehole log data 45–46  
Bowen Basin Permian sequence 101  
Bowen Basin, Queensland *see* Baralaba  
Coal Measures  
brecciation 94  
Bridgeton Sand Member **66**, **69**, 73  
British Geological Survey (BGS) 39, 63,  
67, 68–69, 70, 173  
Brockman Iron Formation 82, 83, *83*, *84*,  
87, 88, 88, **89**  
Broomhill Clay Formation **66**, **69**  
Broomhouse Sand and Gravel Formation  
**66**, **69**, 73  
brown coals *see* Latrobe Valley brown  
coal  
Brunauer–Emmett–Teller (BET)  
method 207  
Cadder Sand and Gravel Formation  
**66**, **69**  
calcrete deposits 83, 85, **86**  
Campomarino Conglomerates Formation  
184–185, *184*, *185*  
Capricorn Orogeny 82  
Carboniferous subcrop topography,  
Moscow territory 45–53  
geology 46  
history of study of 47  
karst and karst-suffosion sinkholes 46,  
47, 49, 52–53, 52  
mapping 45–46, 47–53, 48, 50, 51, 52  
stratigraphy 49, **49**  
subsurface use in Moscow 45, 46,  
47, 49  
caverns *see* Longyou Caverns  
Channel Iron Deposit (CID) sequences  
83, 85  
Channel Tunnel, UK 163  
China *see* Longyou Caverns  
cities *see* urban planning; urban  
population and growth; urban  
subsurface management  
classification systems 9  
clays *see* coal seam gas water and clay  
liners; porewater salinity and  
residual shear strength of clays  
climate change 119  
Cloudy Hill, Hong Kong 163  
Clyde Clay Formation **66**, **69**  
Clyde Valley Formation **66**, **69**  
coal mining *see* Baralaba Coal Measures  
coals *see* Latrobe Valley brown coal  
coal seam gas water and clay liners  
227–236  
behaviour and properties of kaolinite  
227–229, 228  
compaction testing 229–230,  
231–234, **232**, 232  
consistency limit testing 229–230,  
231–234, **231**  
hydraulic conductivity testing 230,  
231, 233, 234–236  
sedimentation testing 230–231,  
234, 236  
test materials 229, **229**, 229, **230**, 230  
codes and standards 9, 10  
communications  
challenges 3–4, 3, 5–6, 7  
urban geoscience research 38–39,  
41, 42

- compaction testing 229–230, 231–234, **232**, **232**
- computed tomography (CT) *see* microfocus X-Ray CT
- conceptual models 161–163, **163**
- consistency limit testing 229–230, 231–234, **231**
- Consortium for the Industrial Development of the Biferno River valley (COSIB) 182
- copper mining *see* Tampakan copper porphyry deposit
- critical infrastructures *see* seismic vulnerability assessment of critical infrastructures
- CSG *see* coal seam gas water and clay liners
- CT *see* microfocus X-Ray CT
- Culshaw, Martin 6, 7–8
- dams *see* Afulilo Dam, Samoa
- data mining 126–127, **128**
- debris mobility modelling 138
- decision support systems 39
- de Freitas, Mike 4, 5, 6–7, 8, 8, 9
- Department of Infrastructure, Energy & Resources (DIER), Australia 121, 124–125
- description systems 9
- design event approach (DEA) to landslide assessments 135–136, 138–141, **142**
- desk study 63–64
- diatreme breccias 94
- DIER *see* Department of Infrastructure, Energy & Resources (DIER), Australia
- digital data transfer format, AGS 63, 67, 68–69
- Dingo fold belt 101
- dolerite dykes 82, 90, 93
- dune movement 165
- dust emission, quarrying 58, 58, 59, 60, **60**
- dykes, dolerite 82, 90, 93
- Early Permian Sills Formation 74
- earthquakes  
Molise region, Italy 181  
Samoa 171–172, **171**  
*see also* seismic hazards; seismic vulnerability assessment of critical infrastructures
- East European platform 46
- ecosystem services 22–23, **23**
- electronic distance measurement (EDM) 116, **116**
- engineering geology  
challenges 2–13  
classification systems 9  
codes and standards 9, **10**  
communications 3–4, 3, 5–6, 7  
knowledge and responsibilities 12–13  
models 10–11, **11**  
relationship with geology 3–4, 3, 8  
research 6–7, 8  
role in mining 11–12  
technology 7–8, 8  
defining 1, 2–3  
history 1–2
- Enhanced Natural Terrain Landslide Inventory (ENTLI), Hong Kong 136
- environmental impacts, of quarrying 58, 58, 59–61, 59, **60**
- ESRI Geodatabase 122, 128
- Eurocode 7 160–161, **160**
- evolutionary conceptual models 163
- extreme climatic events 119
- factor of safety approach to landslide assessments 135
- fault breccias 94
- faulting 180, **180**
- and Afulilo Dam, Samoa 172–174, 172–175
- Fookes, Peter 2–3, 4, 8, 9, 10–11, 13
- footwall slope stability *see* Baralaba Coal Measures
- funding, urban geoscience research 39–40
- future scenarios assessment 26–29, 27, **28**
- GA *see* Geoscience Australia (GA)
- gas adsorption method 207
- generalized conceptual models 161, 163, **163**
- geodomes 24
- Geographical Information System (GIS) 164  
*see also* Glasgow Geotechnical GIS
- geohazards  
cities 35, 40–41  
urban subsurface 25–26  
*see also* Afulilo Dam, Samoa; hazard maps; landslides; site classification map of Italy
- geomorphology  
and ground models 159, **160**, 164, 165–166  
Pilbara detrital valleys 83–84, **84**
- Geoscience Australia (GA) 121–122, **132**
- geoscience research for urban planning 37–42  
consultation 40–41  
dissemination of results 41, 42  
funding 39–40  
presentation of results 38–39, 42
- Geotechnical and Hydrogeological Engineering Research Group, Monash University 220
- geotechnical GIS *see* Glasgow Geotechnical GIS
- geotechnical logging system for highly disturbed rocks 94–99, **96**, 96, 97
- Glasgow City Council 64, 67, 70
- Glasgow Geotechnical GIS 63–78  
3D geological model of Glasgow 63, 64, 67, 69
- data  
geological information 69, **69**  
ground investigation data 67–68, **67**, 67, **68**  
mining information 69–70  
database creation 68–69, **68**  
data confidentiality 70  
data presentation 70–78  
cross-sections 74, 75  
descriptive information summaries 71–74, **73**  
percentiles used 70–71, 70  
summary data plots 70–71, 71, 72  
user-created plots 74–78, **76**, 76, 77, 78
- desk study 63–64  
geology of Glasgow 65–67, **65**, **66**
- gold mining *see* Tampakan copper porphyry deposit
- Gourock Formation **66**, **69**, 73
- Griffiths, Jim 6, 7–8, 9, **10**
- ground failure mechanisms 180, **180**
- ground models 159–167  
analytical models 164  
conceptual models 161–163, **163**  
geomorphology input 159, **160**, 164, 165–166  
observational models 163, **164**  
role of 160–161, **160**, **162**
- Hammersley Group 82, 83
- hazard maps  
landslide hazard, Hong Kong 140–141, **140–144**  
urban geoscience research 38–39  
urban subsurface 26  
*see also* site classification map of Italy
- hazard zoning 40  
landslide susceptibility  
Hong Kong 136–138, **139**, **140**  
SE Australia 120, 126–130, **129**, **130**, 131, **131**, 132
- high-sulphidation mineralization 94
- Hong Kong  
ground models 161, **162**, 163  
landslides 135–145, **138**  
design event approach (DEA) 135–136, 138–141, 142  
hazard assessments 140–141, **140–144**  
inventory 136, **137**, **139**  
magnitude 138–140  
susceptibility mapping 136–138, **139**, **140**

- Hutchinson, John 10–11  
hydraulic conductivity testing 230, 231, 233, 234–236  
hydrothermal alteration 94  
hydrothermal alteration breccias 94, 100
- IAEG *see* International Association for Engineering Geology and the Environment (IAEG)
- ICCP *see* International Commission of Coal Petrology (ICCP)
- ICOLD *see* International Commission on Large Dams (ICOLD)
- IGM *see* Intermediate Geotechnical Material (IGM)
- industrial plants *see* seismic vulnerability assessment of critical infrastructures
- INGV (Istituto Nazionale di Geofisica e Vulcanologia) 148, 149, 149
- interlayered illite/smectite *see* porewater salinity and residual shear strength of clays
- Intermediate Geotechnical Material (IGM) 219, **219**
- International Association for Engineering Geology and the Environment (IAEG) 1, 2
- International Commission of Coal Petrology (ICCP) 218
- International Commission on Large Dams (ICOLD) 172, 174, 175
- International Guidelines for Landslide Susceptibility, Hazard and Risk Zoning for Land-Use Planning (JTC-1) 120, 121
- intrusion carapace breccias 94
- iron ore mining *see* Pilbara detrital valleys
- Istanbul *see* aggregate resources, Istanbul Italian seismic code (NTC 2008) 147–148, **148**, **149**, 151, 156, 181
- Italian Strong Motion Network 151
- Italy *see* Biferno River coastal plain, Molise; site classification map of Italy
- Joffre Member 83, 88, 88
- kaolinite 116  
behaviour and properties of 227–229, 228  
*see also* coal seam gas water and clay liners; porewater salinity and residual shear strength of clays
- karst and karst-suffosion sinkholes 46, 47, 49, 52–53, 52
- Killearn Sand and Gravel Member **66**, **69**, 73
- kinematic wedge stability analysis 116, **117**
- Knill, Sir John 3, 4–5, 6, 9, 11
- landslides  
design event approach (DEA) 135–136, 138–141, 142  
factor of safety approach 135  
ground models 164  
Hong Kong 135–145, **138**  
design event approach (DEA) 135–136, 138–141, 142  
hazard assessments 140–141, 140–144  
inventory 136, 137, 139  
magnitude 138–140  
susceptibility mapping 136–138, 139, **140**  
quantitative risk assessment (QRA) 135, 141  
SE Australia 119–132  
costs 125–126, **127**, 132  
inventories 121–125, 122, 123, **124**, 125, 126, 130, 132  
risk management issues 119–121, 121  
susceptibility zoning 120, 126–130, 129, **130**, 131, 131, 132
- Latrobe Valley brown coal 217–226  
consolidation tests 221–224, 222, **223**, 223, 224  
overconsolidation ratio (OCR) 223, **223**, 224, 225  
pre-consolidation pressure **223**, 224–225, 224  
stress and deformation 225–226, 225  
geology and classification 217–218, 218  
physical properties 218–219, **219**, 220–221, **220**, 220, 221, 222  
records 219, 220
- Law Sand and Gravel Member **66**, **69**, 73
- lifelines *see* seismic vulnerability assessment of critical infrastructures
- light detection and ranging (LiDAR) 138
- Limestone Coal Formation **65**, 71
- liquefaction 180, 180
- Logdeck Andesite 93, 96, 100
- logging systems 8, 8, 9
- Longyou Caverns 1–2, 2, 197–205, 198  
clay interlayers 200–204, 200–204, **201**, **203**  
features and dimensions 199, 199, **200**  
geological setting 199–200  
siting methods used during excavation 204–205, 204  
time of construction 197–199, 199
- Lower Coal Measures Scotland Formation **65**, 71, 73, 74
- Loy Yang open cut, Victoria 219, 220  
*see also* Latrobe Valley brown coal
- mapping  
landslide hazard, Hong Kong 140–141, 140–144
- landslide inventories  
Hong Kong 136, 137, 139  
SE Australia 121–125, 122, 123, **124**, 125, 126, 130, 132
- landslide susceptibility  
Hong Kong 136–138, 139, **140**  
SE Australia 120, 126–130, 129, **130**, 131, 131, 132  
and technology 7–8, 8  
urban geoscience research 38–39  
urban subsurface 26  
*see also* Carboniferous subcrop topography, Moscow territory; site classification map of Italy
- Marra Mamba Iron Formation 82, 83, 83, 84, 87, 88, 88, **89**
- medial axis method 208, 211, 211, 212, 212, 214
- megacities 20, **21**, 22, 35
- mercury-injection porosimetry 207, 208, 208
- microfocus X-Ray CT 208–209, 209, 210
- Middle Coal Measures Scotland Formation **65**, 71, 73, 74, 76, 77, 78
- Millennium Ecosystem Assessment 22  
mineralization 93–94
- Mineral Resources Tasmania (MRT) 121, 124–125
- mining *see* aggregate resources, Istanbul; Baralaba Coal Measures; Pilbara detrital valleys; Tampakan copper porphyry deposit
- Molise region, Italy *see* Biferno River coastal plain, Molise
- Monash University 220
- Montesecco Clays Formation 184–185, 184, 186, **186**, 188, 189
- montmorillonite 116
- Morgenstern, Norbert 11
- Morwell Formation 217–218, 218
- Moscow *see* Carboniferous subcrop topography, Moscow territory
- MRT *see* Mineral Resources Tasmania (MRT)
- National Geotechnical Properties Database (NGPD), UK 67, 68–69, 68, 71
- National Landslide Hazards Mitigation Strategy, US 120, 132
- natural capital 19, 22–23, 24
- natural hazards  
cities 35, 40–41  
urban subsurface 25–26  
*see also* Afulilo Dam, Samoa; hazard maps; landslides; site classification map of Italy
- Newman Member 83, 83, 88, 90

- New South Wales, Australia  
 landslide costs 125–126, 132  
 landslide inventories 121, 122–123, 122, 123  
 landslide susceptibility modelling 126–128, 129
- New Zealand *see* Northern Wedge Failure (NWF)
- NGPD *see* National Geotechnical Properties Database (NGPD), UK
- noise pollution, quarrying 58, 59–60, 60
- Northern Wedge Failure (NWF) 111–118  
 engineering geology model 112–116, 113, 114, 115  
 failure geometry and initiation 111  
 kinematic stability analysis 116, **117**  
 monitoring 112, 112, 116, **117**, 118  
 recommendations 118  
 sensitivity analysis 117, 117
- Oakover Formation 83  
 observational models 163, 164
- Ophthalmian Orogeny 82
- Paisley Clay Member **66**, **69**, 71, 72, 73
- Pantano Clays 186, **186**, 189
- Paraburdoo Member 83, 83, 84, 88
- Passage Formation **65**, 71, 71, 73, 74
- peak ground acceleration (PGA) 180, 183
- periglacial environment, conceptual model of 161, 163
- Philippines *see* Tampakan copper porphyry deposit
- Pilbara detrital valleys 81–92, 82  
 detrital engineering geological models 85–87, 85, **86–87**, 90  
 geochemical and geophysical properties 88–90, **89**  
 geology 81–84  
 Archean bedrock 82, 83  
 Cenozoic detrital deposits 82–83, 85–87, 85, **86–87**, **88**, 88, 90  
 valley geomorphology 83–84, 84  
 methodology for using geochemical and geophysical data 84–85  
 mine slope stability and design **90**, 90, 91
- pipeline systems *see* seismic vulnerability assessment of critical infrastructures
- planning 35–42  
 geoscience research for 37–42  
 consultation 40–41  
 dissemination of results 41, 42  
 funding 39–40  
 presentation of results 38–39, 42  
 landslide susceptibility zoning  
 Hong Kong 136–138, 139, **140**  
 SE Australia 120, 126–130, 129, **130**, 131, 131, 132  
 planning system 36–37  
*see also* Glasgow Geotechnical GIS
- pollution, quarrying 58, 58, 59–61, 59, 60
- population *see* urban population and growth
- porewater salinity and residual shear strength of clays 239–248  
 discussion 246, 247, **247**  
 materials 239–240, **240**  
 sample preparation and test method 240–242, 240  
 test results 241–245, 242–247, **243**
- porous rocks 207–214  
 3D medial axis method 208, 211, 211, 212, 212, 214  
 Berea sandstone  
 permeability evolution 208, 208, **209**, 209  
 pore geometry and permeability anisotropy 211–214, 212, 213, **214**, 214  
 tortuosity distribution 208, **209**, 212, 213, 213, 214  
 microfocuss X-Ray CT 208–209, 209, 210
- porphyry alteration processes 94
- porphyry deposits *see* Tampakan copper porphyry deposit
- quantitative risk assessment (QRA)  
 industrial plants 179  
 landslides 135, 141
- quarrying *see* aggregate resources, Istanbul; Northern Wedge Failure (NWF)
- Quaternary deposits  
 Bowen Basin, Queensland 101  
 Glasgow 65, **66**, 67, 69, **69**  
 Moscow territory 46, 47, 51, 52–53, 52  
 Pilbara detrital valleys 85, 85, **86**, 88, **89**, 90
- Queensland, Australia *see* Baralaba Coal Measures; coal seam gas water and clay liners
- Rangal Coal Measures 101
- research grants 39–40
- residual shear strength of clays *see* porewater salinity and residual shear strength of clays
- Rewan Group 101–102
- risk versus innovation 9, 10
- river channel scour 165
- rockfalls 164
- rock mass classification systems 9
- Ross Sand Member **66**, **69**, 71, 72, 73
- salinity *see* coal seam gas water and clay liners; porewater salinity and residual shear strength of clays
- Samoa *see* Afulilo Dam, Samoa
- Scottish Coal Measures Group **65**, 71, 71, 73, 74, 76, 77, 78
- SECV *see* State Electricity Commission of Victoria (SECV)
- sedimentation testing 230–231, 234, 236
- See5 data mining software 126, 127, 128
- seismic amplification factors 147, 156, 157, 158
- seismic hazards  
 Molise region, Italy 183–184, 183  
*see also* Afulilo Dam, Samoa; site classification map of Italy
- seismicity, Samoa 169–172, 171
- seismic vulnerability assessment of critical infrastructures 179–193
- Biferno River coastal plain, Italy  
 3D engineering geology model 184–189, 184–191, **186**  
 geological setting 181–184, 182, 183  
 geotechnical engineering issues 189–191, 192, 193  
 structural engineering issues 191–193  
 integrated approach 181  
 seismic soil–structure interaction mechanisms 180, 180
- sensitivity analysis 117, 117
- Serracapriola Sands Formation 184–185, 184, 185
- SGS *see* strong ground shaking (SGS)
- sinkholes *see* karst and karst-suffosion sinkholes
- site classification map of Italy 147–158, **148**  
 applications 154–156, 155, 156, 157  
 critical aspects 156–158  
 future developments 158  
 lithoseismic classes map 151, **152**, 152, **153**, 158  
 method **150–151**, 151–153, **152**, 152, **153**, 154  
 reference studies 147–151, **148**, **149**, 149  
 seismic amplification factors 147, 156, 157, 158
- site investigations 5, 6  
*see also* ground models
- site-specific conceptual models 161–163
- site-specific observational models 164, 164
- siting methods, Longyou Caverns 204–205, 204
- slope stability 161, 180, 180  
*see also* Baralaba Coal Measures; Pilbara detrital valleys
- smectite *see* porewater salinity and residual shear strength of clays
- Stapledon, David 3–4, 5, 6, 8, 8, 9
- State Electricity Commission of Victoria (SECV) 217, 218, 220

- stockworking 94  
 Strathkelvin Clay and Silt Member  
   **66, 69**  
 stratovolcanic complex 93, 96  
 strong ground shaking (SGS) 180, 180  
 sustainable development 23  
 SWedge 116, **117**
- Tampakan Andesite Sequence (TAS)  
 93, 96  
 Tampakan copper porphyry deposit  
 93–100  
   engineering geology model 99–100,  
   98, 99  
   geological setting 93, 94, 95, 96  
   geotechnical logging system 94–99,  
   **96, 96, 97**  
   mineralization, alteration and  
   brecciation 93–94  
 Tasmania, landslide inventories 121,  
 124–125, 126  
 technology 7–8, 8  
 Tongan Trench 169–172, 171  
 tortuosity distribution, Berea  
   sandstone 208, **209**, 212, 213,  
   213, 214  
 transient pulse test 208  
 transportation issues, aggregates 58, 59,  
 60–61  
 Traralgon Formation 217–218, 218  
 trial adits, Longyou Caverns 204, 205  
 tsunami, Samoa 171–172
- United Kingdom National Ecosystem  
 Assessment 22–23
- University of Wollongong (UoW)  
 121, 122–123, 122, 123,  
 126–128, 129
- Upolu, Samoa *see* Afulilo Dam, Samoa
- Upper Coal Measures Scotland  
 Formation **65**, 71, 73
- Upper Limestone Formation **65**, 71,  
 71, 73
- Urban Futures methodology 26–29,  
 27, **28**
- urbanization 19, 20–22, 20, 22, 35–36
- urban planning 35–42  
   geoscience research for 37–42  
   consultation 40–41  
   dissemination of results 41, 42  
   funding 39–40  
   presentation of results 38–39, 42  
   planning system 36–37  
   *see also* Glasgow Geotechnical GIS
- urban population and growth 19, 20–22,  
 20, 22, 35–36
- Istanbul 55
- megacities 20, **21**, 22, 35
- urban subsurface management 19–31
- ecosystem services 22–23, **23**
- geohazards and geoassets assessment  
 25–26
- Moscow 45, 46, 47, 49
- subsurface uses 19, 23–24, 25
- sustainable approaches 23, 24–25  
   future scenarios assessment 26–29,  
   27, **28**
- Urban Sustainable Subsurface  
 Use Methodology (USSUM)  
 29–30, **29**
- Urban Sustainable Subsurface Use  
 Methodology (USSUM)  
 29–30, **29**
- Victoria, Australia  
 landslide inventories 121, 123–124,  
   **124**, 125  
 landslide susceptibility modelling  
 128–130, **130**, 131  
   *see also* Latrobe Valley brown coal  
   volcanoes, Samoa 171, 171, 172–173
- wastes, quarrying 58, 59
- wedge failures *see* Northern Wedge  
 Failure (NWF)
- West Angela Member 83, 83, 84, 88
- Western Australia *see* Pilbara detrital  
 valleys
- Western Midland Valley Westphalian  
 to Permian Sills **65**, 71,  
 73, 74
- Whaleback Shale Member 83,  
 88, 88
- Whitehall Quarry, New Zealand *see*  
 Northern Wedge Failure (NWF)
- Wilderness Till Formation **66**,  
**69**, 73
- wireline monitoring 112, 112
- Wittenoom Formation 83, 83
- X-ray computed tomography (CT)  
 208–209, 209, 210
- X-ray diffraction (XRD) 239
- Yallourn Formation 217–218, 218