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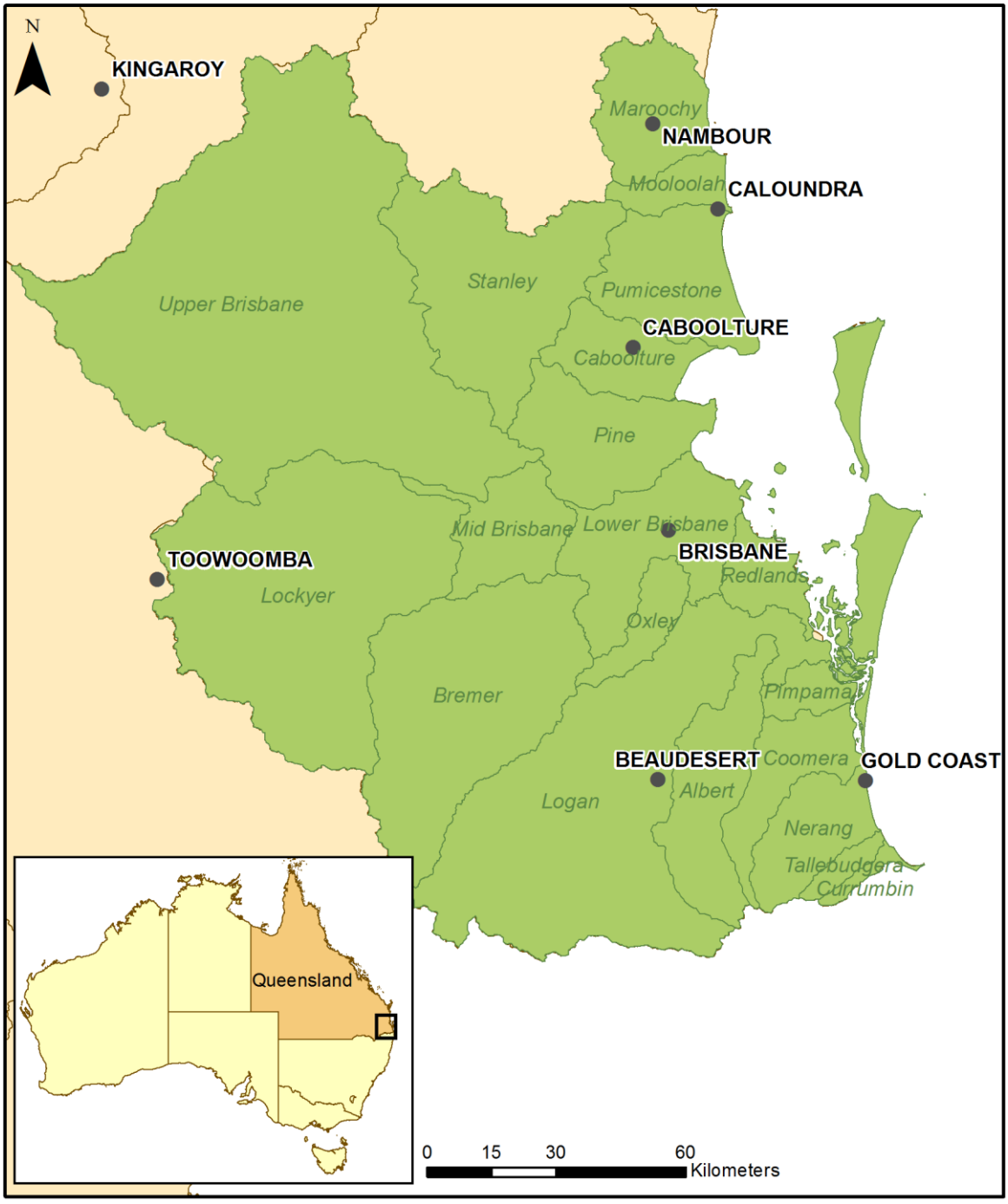
Groundwater dependent ecosystem mapping rule-sets for South East Queensland

Version 1.5

South East Queensland



Queensland Government

Groundwater dependent ecosystem mapping rule-sets

Groundwater dependent ecosystem mapping rule-sets are a combination of attributes (e.g. geology, rainfall, vegetation community, etc.) that describe the drivers, processes and interrelationships occurring between ecosystems and groundwater in a landscape based on local, expert knowledge. When applied to spatial data sets, these mapping rule-sets identify where ecosystems are or are potentially dependent on groundwater in a landscape.

Mapping rule-sets by catchment

Mapping rule-set	Drainage sub-basin														
	Albert River	Bremer River	Brisbane River[1]	Caboolture River	Coomera and Nerang Rivers[2]	Lockyer Creek	Logan River	Maroochy River	Mooloolah River	Moreton Island	Oxley Creek	Pine River	Redlands	Stanley River	Stradbroke Islands[3]
	Permeable rock aquifer (basalt) mapping rule-sets														
SEQ_RS_01	X	X	X	X	X	X	X	X	X			X		X	
SEQ_RS_02	X				X		X								
SEQ_RS_03	X	X	X		X	X	X							X	
SEQ_RS_04			X										X		X
	Deeply weathered rises and crests mapping rule-set														
SEQ_RS_05			X				X				X		X		

[1] Brisbane River includes the following catchments: Upper Brisbane, Mid Brisbane, and Lower Brisbane.

[2] Coomera and Nerang Rivers including the following catchments: Coomera River, Currumbin, Nerang River, Pimpama, and Tallebudgera.

[3] Stradbroke Islands includes other miscellaneous islands in Moreton Bay.

Mapping rule-set	Drainage sub-basin													
	Albert River	Bremer River	Brisbane River[1]	Caboolture River	Coomera and Nerang Rivers[2]	Lockyer Creek	Logan River	Maroochy River	Mooloolah River	Moreton Island	Oxley Creek	Pine River	Redlands	Stanley River	Stradbroke Islands[3]
	Sedimentary rock aquifer mapping rule-sets														
SEQ_RS_06	X	X	X	X			X				X	X		X	
SEQ_RS_06a		X	X			X									
SEQ_RS_07		X	X		X								X		
SEQ_RS_08			X		X	X	X				X				
SEQ_RS_09	X		X	X			X	X	X		X	X		X	
SEQ_RS_11													X		
SEQ_RS_12		X					X								
SEQ_RS_13								X							
SEQ_RS_14			X												
	Silkstone Formation mapping rule-set														
SEQ_RS_10		X	X												
	Fractured rock aquifer (metamorphic rock) mapping rule-set														
SEQ_RS_15	X		X	X	X		X				X	X	X	X	
	Fractured rock aquifer (igneous rock) mapping rule-sets														
SEQ_RS_16								X						X	
SEQ_RS_17			X											X	

Mapping rule-set	Drainage sub-basin														
	Albert River	Bremer River	Brisbane River[1]	Caboolture River	Coomera and Nerang Rivers[2]	Lockyer Creek	Logan River	Maroochy River	Mooloolah River	Moreton Island	Oxley Creek	Pine River	Redlands	Stanley River	Stradbroke Islands[3]
	Alluvial and colluvial aquifer mapping rule-sets														
SEQ_RS_18		X					X								
SEQ_RS_19			X												
SEQ_RS_20			X			X	X					X			
SEQ_RS_21	X	X	X	X	X	X	X	X	X		X	X	X	X	
SEQ_RS_22			X	X		X					X	X		X	
SEQ_RS_23			X			X									
SEQ_RS_24		X	X			X									
SEQ_RS_25		X	X												
SEQ_RS_26			X			X									
SEQ_RS_27			X								X				
SEQ_RS_28		X			X							X			
SEQ_RS_29			X												
SEQ_RS_30													X		
SEQ_RS_31													X		
SEQ_RS_32			X												
SEQ_RS_33														X	
SEQ_RS_34			X												

Mapping rule-set	Drainage sub-basin														
	Albert River	Bremer River	Brisbane River[1]	Caboolture River	Coomera and Nerang Rivers[2]	Lockyer Creek	Logan River	Maroochy River	Mooloolah River	Moreton Island	Oxley Creek	Pine River	Redlands	Stanley River	Stradbroke Islands[3]
	Catchment constriction mapping rule-sets														
SEQ_RS_35	X	X	X	X			X								
SEQ_RS_35a		X	X			X									
	Low-lying coastal swamp mapping rule-sets														
SEQ_RS_36			X	X	X		X	X	X			X	X		X
SEQ_RS_37								X							
	Coastal sand mass aquifer mapping rule-sets														
SEQ_RS_38			X	X	X		X	X	X			X			X
SEQ_RS_39										X					
SEQ_RS_39a															X
SEQ_RS_39b															X
SEQ_RS_39c															X
SEQ_RS_39d										X					X

Mapping rule-set	Drainage sub-basin														
	Albert River	Bremer River	Brisbane River[1]	Caboolture River	Coomera and Nerang Rivers[2]	Lockyer Creek	Logan River	Maroochy River	Mooloolah River	Moreton Island	Oxley Creek	Pine River	Redlands	Stanley River	Stradbroke Islands[3]
	Canal estate mapping rule-sets														
SEQ_RS_40					X			X	X						
SEQ_RS_41					X			X	X			X	X		X
	Other mapping rule-sets														
SEQ_RS_42		X	X		X	X	X	X	X			X	X	X	
SEQ_RS_43			X			X	X			X	X				X
SEQ_RS_44	X	X	X	X	X	X	X	X			X	X	X	X	X

Groundwater dependent ecosystem mapping rule-set descriptions

SEQ_RS_01—High rainfall permeable rocks (basalts) with near-permanent flow

Basalt weathers and oxidises relatively quickly in comparison to other rock types. Basalt is permeable and may form aquifers which store and transmit groundwater through the vesicles, fractures and weathered zones of the basalt. Discharge of groundwater is common around the contact between basalt and less permeable underlying geologies including bands of rhyolite and mudstone. Basalt uplands and associated basalt colluvium with high rainfall (>800 millimetres average annual rainfall) occurring along the McPherson Range, Great Dividing Range and Maleny Plateau are included in this mapping rule-set.

- Channels on or extending up to 1 kilometre from basalt and basalt colluvium with high rainfall are potential surface GDEs with near-permanent flow.
- Lacustrine and palustrine wetlands and riverine water bodies fringing streams on basalt, basalt colluvium or within 50 metres of the contact between basalt and other less permeable underlying rocks in high rainfall areas, are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing streams on basalt, basalt colluvium or within 50 metres of the contact zone between basalt and other less permeable underlying rocks in high rainfall areas, are potential terrestrial GDEs.

SEQ_RS_02—High rainfall permeable rocks (basalts) with permanent flow

Basalt weathers and oxidises relatively quickly in comparison to other rock types. Basalt is permeable and may form aquifers which store and transmit groundwater through the vesicles, fractures and weathered zones of the basalt. This mapping rule-set is restricted to basalt uplands with very high rainfall (generally >1600 millimetres average annual rainfall) such as the Springbrook and Lamington Plateaus.

- Channels on high rainfall basalt are potential surface GDEs with permanent flow.
- Lacustrine and palustrine wetlands and riverine water bodies fringing streams on basalt, in high rainfall areas, are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing streams on basalt in high rainfall areas, are potential terrestrial GDEs.

SEQ_RS_03—Low rainfall &/or low capacity permeable rocks (basalts)

Basalt weathers and oxidises relatively quickly in comparison to other rock types. Basalt is permeable and may form aquifers which store and transmit groundwater through the vesicles, fractures and weathered zones of the basalt. Discharge of groundwater is common around the contact between basalt and less permeable underlying geologies including bands of rhyolite and mudstone. Basalt and associated basalt colluvium occurring as either isolated caps or in areas with low rainfall (<800mm average annual rainfall) are included in this mapping rule-set and have a reduced groundwater storing capacity compared to basalt captured in rule-set SEQ_RS_01. The Great Dividing Range north of Woodbine, Jinbroken Range and western slopes of Mt Tamborine are included in this mapping rule-set.

- Channels on or extending up to 100 metres from basalt and basalt colluvium with low rainfall &/or low capacity are potential surface GDEs with intermittent flow.

- Lacustrine and palustrine wetlands and riverine water bodies fringing streams on low rainfall and/or low capacity basalt, associated colluvium, or within 50 metres of the contact between the basalt and other less permeable underlying rocks, are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing streams on low rainfall and/or low capacity basalt, associated colluvium, or within 50 metres of the contact zone between the basalt and other less permeable underlying rocks, are potential terrestrial GDEs. Mesic regional ecosystems on low rainfall and/or low capacity basalt are also potential terrestrial GDEs.

SEQ_RS_04—Petrie Formation along the shoreline of Moreton Bay (Redland basalt)

Basalt weathers and oxidises relatively quickly in comparison to other rock types. Basalt is permeable and may form aquifers which store and transmit groundwater through the vesicles, fractures and weathered zones. Weathered basalt of the Petrie Formation (Petrie basalt) occurring on the edges of Moreton Bay is captured by this mapping rule-set.

- Channels on Petrie basalt are potential surface GDEs. Lacustrine and palustrine wetlands and riverine water bodies on Petrie basalt are potential surface GDEs. Treed regional ecosystems and riverine wetlands on Petrie basalt are potential terrestrial GDEs.

SEQ_RS_05—Deeply weathered rises and crests

Deeply weathered rises and crests typically develop well-structured and well-drained permeable soils that readily store and transmit groundwater. Discharge of groundwater is common around the contact between deeply weathered soils and less permeable underlying geologies. The Sunnybank soil type situated to the south of Brisbane is included in this rule-set.

- Channels on or extending up to 100 metres from deeply weathered rises and crests are potential surface GDEs with intermittent flow.
- Lacustrine and palustrine wetlands and riverine water bodies on deeply weathered rises and crests or within 50 metres of the contact between the deeply weathered rises and crests and other less permeable underlying rocks, are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing streams on deeply weathered rises and crests or within 50 metres of the contact zone between the deeply weathered rises and crests and other less permeable underlying rocks are potential terrestrial GDEs.

SEQ_RS_06—Low porosity sedimentary rocks with intermittent flow

Fine to medium grained sedimentary rocks generally with a clay matrix, may store and transmit groundwater through fractures and weathered zones of what is otherwise a relatively low porosity rock. Lenses of medium grained sedimentary rock with greater porosity may occur in localised areas within the surrounding low porosity sedimentary rock. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes much of the Esk and Bryden Formations', the Tarong Beds, Colleges Conglomerate, some Gatton Sandstone and minor areas of Walloon Coal measures.

- Channels, excluding uppermost tributaries that conduct surface water only, on low porosity sedimentary rocks are potential surface GDEs with intermittent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.

- Lacustrine and palustrine wetlands and riverine water bodies fringing channels, excluding uppermost tributaries, on low porosity sedimentary rocks are potential surface GDEs with intermittent flow.
- Treed regional ecosystems and riverine wetlands fringing channels on low porosity sedimentary rocks are potential terrestrial GDEs with intermittent flow.

SEQ_RS_06a—Sedimentary rocks with saline flow

Fine to medium grained sedimentary rocks generally with a clay matrix, may store and transmit groundwater through fractures and weathered zones of what is otherwise a relatively low porosity rock. Lenses of medium grained sedimentary rock with greater porosity may occur in localised areas within the surrounding low porosity sedimentary rock. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes the Koukandowie Formation, occurrences of Gatton Sandstone south of Lockyer Creek and minor areas of Walloon Coal measures where groundwater discharge from these rocks is generally saline.

- Channels, excluding uppermost tributaries that conduct surface water only, on sedimentary rocks with saline flow are potential surface GDEs. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing these channels on sedimentary rocks with saline flow are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing these channels on sedimentary rocks with saline flow are potential terrestrial GDEs.

SEQ_RS_07—Medium porosity sedimentary rocks with intermittent flow

Medium porosity sedimentary rocks may be fine to coarse grained, generally with a sandy matrix and may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes parts of the Woogaroo Subgroup, and minor areas of Ripley Road Sandstone and Raceview Formation occurring in the Ripley Valley area.

- Channels on medium porosity sedimentary rocks are potential surface GDEs with intermittent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels on medium porosity sedimentary rocks are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing channels on medium porosity sedimentary rocks are potential terrestrial GDEs.

SEQ_RS_08—Edge of Clarence-Moreton basin sedimentary rocks

Porous sandstones of the Woogaroo Subgroup make up the earliest sedimentary rocks of the Clarence–Moreton Basin and tend to outcrop around its edge. These sandstones may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater may discharge typically along foot slopes and drainage lines on a near-permanent basis. In addition to parts of the Woogaroo Subgroup, occurrences of Gatton Sandstone north of Lockyer Creek are included in this mapping rule-set.

- Channels on the edge of Clarence-Moreton Basin sedimentary rocks are potential surface GDEs with near-permanent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels on edge of Clarence–Moreton Basin sedimentary rocks are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing channels on edge of Clarence–Moreton Basin sedimentary rocks are potential terrestrial GDEs.

SEQ_RS_09—Sedimentary rocks with near-permanent flow

Fine to medium grained sedimentary rocks may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes much of the Esk and Bryden Formations', the Tarong Beds, Colleges Conglomerate, some Gatton Sandstone and minor areas of Walloon Coal measures.

- Channels, excluding uppermost tributaries that conduct surface water only, on low porosity sedimentary rocks are potential surface GDEs with intermittent flow.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels, excluding uppermost tributaries, on low porosity sedimentary rocks are potential surface GDEs with intermittent flow.
- Treed regional ecosystems and riverine wetlands fringing channels on low porosity sedimentary rocks are potential terrestrial GDEs with near-permanent flow.

SEQ_RS_10—Silkstone Formation

The Silkstone Formation is mostly comprised of limestone and basalt, both of which may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set is restricted to the Silkstone Formation and the small occurrence of Flinders Dolomite south of Peak Crossing.

- Channels on Silkstone Formation are potential surface GDEs with intermittent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels on Silkstone Formation are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing channels on Silkstone Formation are potential terrestrial GDEs.

SEQ_RS_11—Sedimentary rocks associated with Leslie Harrison Dam

The sedimentary rocks associated with Leslie Harrison Dam are fine to coarse grained, generally with a sandy matrix and may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater may discharge typically along foot slopes and drainage lines, however the presence of wet heath vegetation indicates discharge occurs higher in the landscape as well. The groundwater table is often within the rooting zone of treed regional ecosystems. This mapping rule-set includes parts of the Woogaroo Subgroup, and minor areas of Tingalpa Formation adjacent to the dam.

- Channels on sedimentary rocks associated with Leslie Harrison Dam are potential surface GDEs.
- Lacustrine and palustrine wetlands and riverine water bodies on sedimentary rocks associated with Leslie Harrison Dam are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands on sedimentary rocks associated with Leslie Harrison Dam are potential terrestrial GDEs.

SEQ_RS_12—Sedimentary rocks associated with Fassifern scrub

Brigalow (*Acacia harpophylla*) and vine-forest species typify the Fassifern scrub. These species have a relatively high water demand which is likely to be met in part by groundwater from underlying sedimentary rocks. The Walloon Coal Measures are the dominant rock unit underlying the Fassifern scrub and are usually comprised of fine to coarse grained sedimentary rocks which may store and transmit groundwater through intergranular pore space, fractures and weathered zones. Groundwater is generally within the rooting depth of Fassifern scrub ecosystems and is also known to surface in the Roadvale area.

- Channels on sedimentary rocks associated with Fassifern scrub are potential surface GDEs.
- Lacustrine and palustrine wetlands and riverine water bodies on sedimentary rocks associated with Fassifern scrub are potential surface GDEs.
- Mesic regional ecosystems and riverine wetlands on sedimentary rocks that form the Fassifern scrub are potential terrestrial GDEs.

SEQ_RS_13—Sandstone overlying impervious rocks

Quartzose sandstone is permeable and may form aquifers which store and transmit groundwater through intergranular pore space, fractures and weathered zones. Discharge of groundwater is common along drainage lines, foot slopes and around the contact between quartzose sandstone and less permeable underlying rocks. Quartzose sandstone crests overlying rhyolitic tuff in the Parklands Regional Park area are included in this mapping rule-set.

- Channels on or extending up to 100 metres from quartzose sandstone are potential surface GDEs. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing streams on quartzose sandstone, or within 50 metres of the contact between the quartzose sandstone and other less permeable underlying rocks, are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing streams on quartzose sandstone or within 50 metres of the contact between quartzose sandstone and other less permeable underlying rocks are potential terrestrial GDEs.

SEQ_RS_14—Low porosity fractured sedimentary rocks

Fine to medium grained sedimentary rocks generally with a clay matrix may store and transmit groundwater through fractures and weathered zones within the rock. Groundwater may discharge typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set is applied to occurrences of the Marburg Subgroup in the upper Brisbane River catchment only.

- Upper tributaries usually carry surface runoff and it is the higher order (>3rd order) channels on low porosity sedimentary rocks that are potential surface GDEs.
- Mesic regional ecosystems, for example vine forests on low porosity sedimentary rocks are likely to meet their water requirements in-part from groundwater and therefore are potential terrestrial GDEs.

SEQ_RS_15—Fractured metamorphic rocks

Metamorphic rocks are generally hard and impervious and tend to only transmit groundwater through fractures and some bedding plains within the rock. Groundwater typically may discharge along drainage lines coinciding with fractures and bedding plains. In South East Queensland this mapping rule-set is applied to both metamorphosed sedimentary and metamorphosed volcanic rocks including the Neranleigh-Fernvale beds, Bunya Phyllite, Maronghi Creek beds, Pinecliffe Formation, Sugarloaf Metamorphics, Jimna Phyllite, Kurwongbah beds and Rocksberg Greenstone.

- Upper tributaries usually carry surface runoff and it is the higher order (>3rd) channels on low porosity sedimentary rocks that are potential surface GDEs.
- Mesic regional ecosystems for example vine forests, on low porosity sedimentary rocks are likely to meet their water requirements in-part with groundwater and therefore are potential terrestrial GDEs.

SEQ_RS_16—Fractured igneous rocks with near-permanent flow

Groundwater is stored and transmitted in the fractures and weathered zones of otherwise relatively impermeable igneous rocks. Groundwater may discharge from fractured igneous rock aquifers typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes areas of Bellthorpe Andesite, Cedarton Volcanics and Neurum Tonalite.

- Channels, excluding uppermost tributaries that conduct surface water only, on fractured igneous rocks are potential surface GDEs with near-permanent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels, excluding uppermost tributaries, on fractured igneous rocks are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing channels, excluding uppermost tributaries, on fractured igneous rocks are potential terrestrial GDEs.

SEQ_RS_17—Fractured igneous rocks with intermittent flow

Groundwater is stored and transmitted in the fractures and weathered zones of otherwise relatively impermeable igneous rocks. Groundwater may discharge from fractured igneous rock aquifers typically along foot slopes and drainage lines. In South East Queensland this mapping rule-set includes areas of Neara and Mount Byron Volcanics, Eskdale Granodiorite, Taromeo Igneous Complex, Neurum Tonalite, Northbrook beds and Crows Nest Granite.

- Channels, excluding uppermost tributaries that conduct surface water only, on fractured igneous rocks are potential surface GDEs with intermittent flow. The area fringing these channels represents the lower part of the landscape where groundwater is likely to discharge to the surface or be within rooting depth of treed regional ecosystems.
- Lacustrine and palustrine wetlands and riverine water bodies fringing channels, excluding uppermost tributaries, on fractured igneous rocks are potential surface GDEs.
- Treed regional ecosystems and riverine wetlands fringing channels, excluding uppermost tributaries, on fractured igneous rocks are potential terrestrial GDEs.

SEQ_RS_18—Colluvium

Colluvial aquifers form from unconsolidated sediments deposited at the base of a hillslope by rainwash, sheetwash, slow continuous downslope creep or a variable combination of these processes. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with a large deposit of colluvium situated at the base of Mt French. Other smaller deposits of colluvium are captured in other GDE mapping rule-sets.

- Potential surface GDEs on colluvial aquifers include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on colluvial aquifers include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_19—Tertiary-Quaternary high-level alluvium

Tertiary–Quaternary high-level alluvium (TQa), is a poorly consolidated or unconsolidated alluvial deposit in an ancestral valley which has been dissected by more recent channel activity. This process results in inverted relief whereby older alluvial deposits are higher in the landscape than younger alluvial deposits. In South East Queensland this rule-set is only applied to an uplifted area of TQa at Moggill. This area once supported pineapple farming but is now largely urbanised. Other occurrences of TQa which function like a high alluvial terrace are captured in other alluvial GDE mapping rule-sets.

- Channels on or extending up to 100 metres from Tertiary–Quaternary high-level alluvium are potential surface GDEs.
- Lacustrine and palustrine wetlands and riverine water bodies located within 50 metres of the contact between the Tertiary–Quaternary high-level alluvium and other less permeable underlying rocks, are potential surface GDEs.
- Riverine wetlands and regional ecosystems containing deep rooted tree species, located within 50 metres of the geological contact between Tertiary–Quaternary high-level alluvium and other less permeable underlying rocks, are potential terrestrial GDEs.

SEQ_RS_20—Alluvial aquifers with permanent natural flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with naturally permanently saturated alluvial aquifers. The distribution of these aquifers is restricted to areas with either high rainfall or a strong connection with an underlying aquifer.

- Potential surface GDEs on alluvial aquifers include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_21—Alluvial aquifers with near-permanent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with near-permanently saturated alluvial aquifers. The distribution of these aquifers is widespread throughout South East Queensland.

- Potential surface GDEs on alluvial aquifers include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers include regional ecosystems containing deep rooted tree species.

SEQ_RS_22—Alluvial aquifers with intermittent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with intermittently saturated alluvial aquifers. Such aquifers are common in the lower rainfall parts of South East Queensland.

- Potential surface GDEs on alluvial aquifers include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_23—Alluvial aquifers with saline, near-permanent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with saline, near-permanently saturated alluvial aquifers. These aquifers occur where saline discharge from adjacent sedimentary rock aquifers infiltrates the alluvial aquifer. Deep Gully in the Lockyer Creek catchment and upper Yarraman Creek are examples of alluvial aquifers with saline, near-permanent flow.

- Potential surface GDEs on alluvial aquifers include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_24—Alluvial aquifers with saline, intermittent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with saline, intermittently saturated alluvial aquifers. These aquifers occur where saline groundwater from adjacent sedimentary rock aquifers infiltrates the alluvial aquifer. Many creeks within the Lockyer Valley draining sandstone catchments such as Plain, Woolshed and Ma-Ma Creeks are examples of alluvial aquifers with saline, intermittent flow. Other examples include Black Snake Creek in the Brisbane River catchment and upper Purga Creek in the Bremer River catchment.

- Potential surface GDEs on alluvial aquifers with saline, intermittent flow include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with saline, intermittent flow include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_25—Alluvial aquifers with brackish, intermittent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with brackish, intermittently saturated alluvial aquifers. These aquifers occur where saline groundwater from adjacent sedimentary rocks infiltrates and mixes with fresh groundwater in the alluvial aquifer. Alluvial aquifers with brackish, intermittent flow occur in the Wivenhoe Pocket area and along a section of Purga Creek upstream of Peak Crossing.

- Potential surface GDEs on alluvial aquifers with brackish, intermittent flow include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with brackish, intermittent flow include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_26—Alluvial aquifers with intermittent flow and fluctuating salinity

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with intermittently saturated alluvial aquifers and fluctuating salinity. Aquifers discharging either fresh or saline baseflow upstream may influence salinity downstream in larger alluvial aquifers. The amount and timing of salinity delivered to the downstream alluvial aquifer can cause salinity levels to fluctuate. Often a cycle occurs whereby salinity may build up over time in an aquifer and then be discharged as a major saline baseflow event by fresh water recharge from a rainfall event. In South East Queensland this mapping rule-set includes Lockyer Creek and lower Cressbrook Creek.

- Potential surface GDEs on alluvial aquifers with intermittent flow and fluctuating groundwater salinity include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on with intermittent flow and fluctuating groundwater salinity include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_27—Modified alluvial aquifers with near-permanent flow

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Urban development may create an abundance of hard surfaces that can modify infiltration rates into alluvial aquifers. Hard surfaces generally increase runoff and reduce recharge of the alluvial aquifer. Concrete channels may prevent baseflow infiltrating underlying alluvial aquifers and may transport baseflow more frequently and over greater distances than would have naturally occurred. This rule-set identifies potential GDEs associated with alluvial aquifers along lower Kedron Brook and lower Oxley Creek that have modified infiltration from hard surfaces.

- Potential surface GDEs on modified alluvial aquifers with near-permanent flow include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on modified alluvial aquifers with near-permanent flow include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_28—Alluvial aquifers with permanent regulated flow from dams

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with alluvial aquifers with permanent regulated flow from dams. The distribution of these aquifers is restricted to below Moogerah, Hinze, Little Nerang and Pine River dams.

- Potential surface GDEs on alluvial aquifers with permanent regulated flow from dams include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with permanent regulated flow from dams include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_29—Alluvial aquifers with permanent regulated flow and fluctuating salinity

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. This rule-set identifies potential GDEs associated with permanently saturated alluvial aquifers with fluctuating salinity. In South East Queensland such aquifers occur in the regulated section of the Brisbane River downstream of Wivenhoe Dam to the estuary near Colleges Crossing.

Aquifers discharging either fresh or saline baseflow upstream may influence salinity downstream in larger alluvial aquifers. The amount and timing of salinity delivered to the downstream alluvial aquifer can cause salinity levels to fluctuate. Salinity may build up over time in the aquifer and then be flushed by freshwater released from Wivenhoe Dam.

- Potential surface GDEs on alluvial aquifers with permanent regulated flow and fluctuating salinity include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on aquifers with permanent regulated flow and fluctuating salinity include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_30—Alluvial aquifers with sustained flow from many in-stream dams

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Historical construction of many in-stream dams throughout the southern half of Redland catchments results in water infiltrating from the dams back into the surrounding alluvial aquifer. This sustainment of water results in an increase from near-permanent to permanent saturation within the alluvial aquifer.

- Potential surface GDEs on alluvial aquifers with sustained flow from many in-stream dams include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with sustained flow from many in-stream dams include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_31—Alluvial aquifers with sustained flow from in-stream dams

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Historical construction of in-stream dams throughout the northern half of Redland catchments results in water infiltrating from the dams back into the surrounding alluvial aquifer. This sustainment of water results in an increase in saturation within the alluvial aquifer.

- Potential surface GDEs on alluvial aquifers with sustained flow from in-stream dams include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with sustained flow from in-stream dams include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_32—Alluvial aquifers with regulated, intermittent flow from dams

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Large dams may withhold the amount of baseflow available to recharge downstream alluvial aquifers. In South East Queensland the alluvial aquifers below Perseverence Creek Dam, Cressbrook Dam, Lake Manchester and Enoggera Reservoir have been identified as having reduced groundwater flows due to regulation by the dams.

- Potential surface GDEs on alluvial aquifers with regulated, intermittent flow from dams include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers with regulated, intermittent flow from dams include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_33—Alluvial aquifers supplemented with effluent

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Discharge from sewage treatment plants may locally supplement the recharge of alluvial aquifers. This GDE mapping rule-set captures the section of alluvial aquifer likely to be supplemented by the Kilcoy sewage treatment plant.

- Potential surface GDEs on alluvial aquifers supplemented with effluent include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers supplemented with effluent include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_34—Saline alluvial aquifers supplemented with effluent

Alluvial aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through intergranular voids. Discharge from sewage treatment plants may locally supplement the recharge of alluvial aquifers. This GDE mapping rule-set captures the section of alluvial aquifer with saline groundwater that is likely to be supplemented by the Marburg sewage treatment plant.

- Potential surface GDEs on alluvial aquifers supplemented with effluent include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on alluvial aquifers supplemented with effluent include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_35—Catchment constrictions

Catchment constrictions are a narrowing in the width and/or depth of the catchment resulting in the formation of a catchment throat which acts as a ‘bottle-neck’. Often groundwater upslope of a catchment constriction is shallower due to the restriction of groundwater flow through the constriction point. There may also be a widening of the floodplain upslope of a catchment constriction due to the restriction of sediment flow through the constriction point.

- Potential surface GDEs on aquifers influenced by catchment constrictions include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on aquifers influenced by catchment constrictions include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_35a—Saline catchment constrictions

Catchment constrictions are a narrowing in the width and/or depth of the catchment resulting in the formation of a catchment throat which acts as a 'bottle-neck'. Often groundwater upslope of a catchment constriction is shallower due to the restriction of groundwater flow through the constriction point. There may also be a widening of the floodplain upslope of a catchment constriction due to the restriction of sediment flow through the constriction point. This mapping rule-set captures alluvial aquifers influenced by a catchment constriction and also receives saline discharge from upstream.

- Potential surface GDEs on aquifers influenced by catchment constrictions and salinity include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on aquifers influenced by catchment constrictions and salinity include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_36—Near-permanent low-lying coastal swamps

Aquifers associated with low-lying coastal swamps form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels, floodplains, estuarine, delta and other near-shore environments. These deposits store and transmit water to varying degrees through intergranular voids and are nearly permanently saturated. Acid sulphate soils are commonly associated with this mapping rule-set.

- Potential surface GDEs on near-permanently saturated aquifers associated with low-lying coastal swamps include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on near-permanently saturated aquifers associated with low-lying coastal swamps include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_37—Permanent low-lying coastal swamps

Aquifers associated with low-lying coastal swamps form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels, floodplains, estuarine, delta and other near-shore environments. These deposits store and transmit water to varying degrees through intergranular voids and are permanently saturated. Acid sulphate soils are commonly associated with this mapping rule-set.

- Potential surface GDEs on permanently saturated aquifers associated with low-lying coastal swamps include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on permanently saturated aquifers associated with low-lying coastal swamps include riverine wetlands and regional ecosystems containing deep rooted tree species.

SEQ_RS_38—Coastal sand masses (beach ridges)

Coastal sand masses often have one or more aquifers where groundwater has formed a freshwater lens in the intergranular voids of the unconsolidated sand. Groundwater may occur above low-permeability strata within the sand mass, for example coffee rock. Beach ridges, low elevation dunes and coastal sand plains on the mainland and South Stradbroke Island are included in this mapping rule-set.

- Potential surface GDEs on coastal sand masses include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on coastal sand masses include regional ecosystems containing deep rooted tree species.

SEQ_RS_39—Coastal sand masses (high dunes)

The coastal sand masses of Moreton and North Stradbroke Islands range from present day beaches to older high dunes. Sand islands often have one or more sand mass aquifers where groundwater has formed a freshwater lens in the intergranular voids of the unconsolidated sand. Perched aquifers may occur above low-permeability strata within the sand mass but GDEs relying on perched aquifers are mapped separately in rule sets SEQ_RS_39c and SEQ_RS_39d.

- Potential surface GDEs on coastal sand masses include lacustrine wetlands, palustrine wetlands, riverine water bodies and channels (represented by drainage lines).
- Potential terrestrial GDEs on coastal sand masses include regional ecosystems containing deep rooted tree species occurring below 50 metres elevation. Above 50 metres elevation groundwater is usually too deep for terrestrial vegetation to access.

SEQ_RS_39b—Permanent window lakes on coastal sand masses

Sand islands often have one or more sand mass aquifers where groundwater has formed a freshwater lens in the intergranular voids of the unconsolidated sand. Window lakes occur when the land surface dips below the water table. This GDE mapping rule set captures permanent window lakes within coastal sand masses.

- Blue Lake and two nearby vegetated swamps and internal channels are known permanent surface GDEs on coastal sand masses.

SEQ_RS_39c—Permanent perched lakes on coastal sand masses

Sand mass aquifers occur where groundwater has formed a freshwater lens in the intergranular voids of unconsolidated sand. Perched aquifers occur where the water is held at an elevation in the sand mass above the regional water table by an impervious layer usually made up of organic material and sand. Perched aquifers can be likened to perching a saucer above a much larger body of water. Perched lakes occur where the land surface dips below the perched water table. This GDE mapping rule set identifies permanent perched lakes within coastal sand masses.

- Brown Lake and Swallow Lagoon plus any internal channels are known permanent perched surface GDEs on coastal sand masses.

SEQ_RS_39d—Near-permanent perched lakes on coastal sand masses

Sand mass aquifers occur where groundwater has formed a freshwater lens in the intergranular voids of unconsolidated sand. Perched aquifers occur where the water is held at an elevation in the sand mass above the regional water table by an impervious layer usually made up of organic material and sand. Perched aquifers can be likened to perching a saucer above a much larger body of water. Perched lakes occur where the land surface dips below the perched water table. This GDE mapping rule set identifies near-permanent perched lakes within coastal sand masses.

- Tortise, Shag and Black Snake Lagoons, Lake Kounpee and Kounpee Swamp plus any internal channels are known near-permanent perched surface GDEs on coastal sand masses.

SEQ_RS_40—Brackish canal estates

In South East Queensland man made canals have been constructed in unconsolidated sedimentary aquifers. These aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels, estuarine, delta and other near-shore environments, or from wind and wave deposition of sand. These deposits store and transmit water to varying degrees through intergranular voids.

This mapping rule-set identifies man made canals with locks or weirs that largely prevent the inflow of marine water. Some marine water may infiltrate the unconsolidated sedimentary aquifer and at certain sites marine water is actively pumped into the canals, generally creating a brackish environment. The canals are usually dug deeper than the water table within the aquifer allowing groundwater to discharge from the aquifer into the canal.

SEQ_RS_41—Estuarine canal estates

In South East Queensland man made canal estates have been constructed in unconsolidated sedimentary aquifers. These aquifers form from particles such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels, estuarine, delta and other near-shore environments, or from wind and wave deposition of sand. These deposits store and transmit water to varying degrees through intergranular voids.

This mapping rule-set identifies man-made canal estates that are subject to tidal flows due to a direct connection with the marine environment. Marine water commonly infiltrates the unconsolidated sedimentary aquifer creating a salty water table. Usually a layer of freshwater develops on top of the salty water table. Canals dug into the aquifer may experience fresh groundwater discharge from the surrounding aquifer into the canal at low tide, then at high tide salty water may recharge back into the surrounding aquifer. This environment represents a man-made surface GDE.

Other mapping rule-sets

Other mapping rule-sets are a combination of attributes (e.g. geology, rainfall, etc.) that describe the drivers, processes and interrelationships of groundwater in a landscape based on local, expert knowledge. When applied to spatial data sets, these other mapping rule-sets identify the where groundwater is likely to occur at significant depth (e.g. 50 or more metres) in a landscape, where groundwater is likely to be actively recharging underlying permeable rocks or where groundwater is likely to be absent in a landscape.

SEQ_RS_42—Impoundments

Impoundments in the form of large dams are common in most major river catchments in South East Queensland. The dams capture baseflow from both surface water runoff and groundwater discharge occurring upstream. Impounding of large volumes of water can increase recharge into underlying permeable substrates. Groundwater leakage may occur where a permeable substrate underlies the dam wall.

SEQ_RS_43—Recharge zones

For the Queensland GDE mapping program, recharge zones are areas of permeable geology that water infiltrates and is transported within away from the local area. In this sense recharge zones do not support GDEs locally, but may support GDEs where discharge occurs some distance away.

SEQ_RS_44—Exclusion zones

For the Queensland GDE mapping program, exclusion zones are impervious areas where little or no infiltration occurs. Rainfall occurring in exclusion zones usually quickly runs off and as a consequence there is not enough groundwater to support GDEs.

Citation

Queensland Government (2017) *Groundwater dependent ecosystem mapping rule-sets for South East Queensland: version 1.5*, Queensland Government, Brisbane.