Appendix 1 –

Potential GDE data sheets

Site #: 1

Name: Wondado Spring

Map Ref: Mingenew

Site Coord: (296780E: 6789645N)

Features: Bookara Spring
Wondado Spring
GS15

Physiography/ Slope: Broad topographic depression

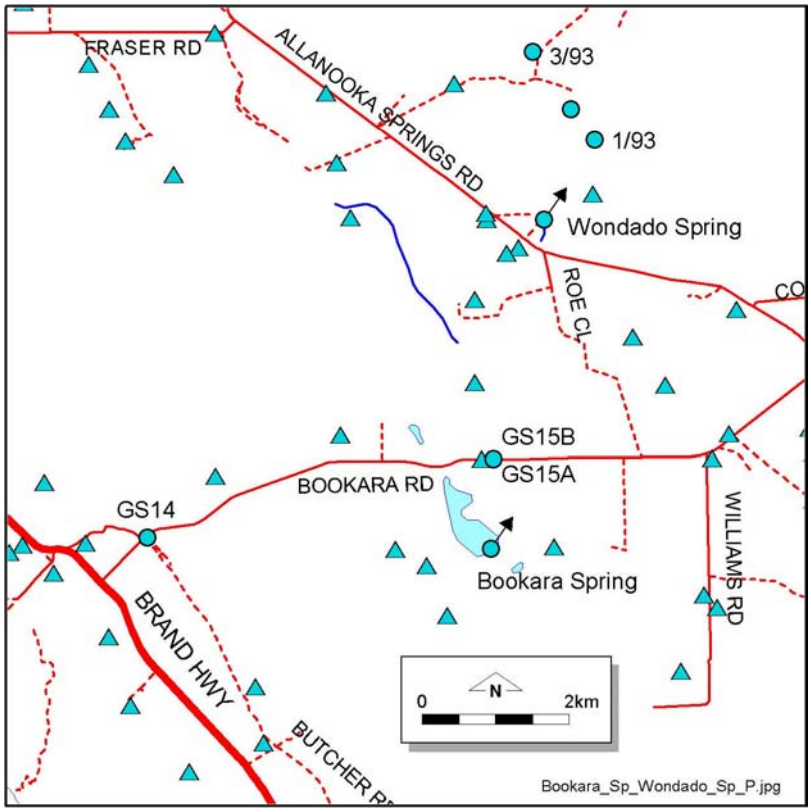
Geology: Tamala Limestone

Water/Ground Water Flow: Upward head from Yarragadee to Quaternary

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 2300 mg/L



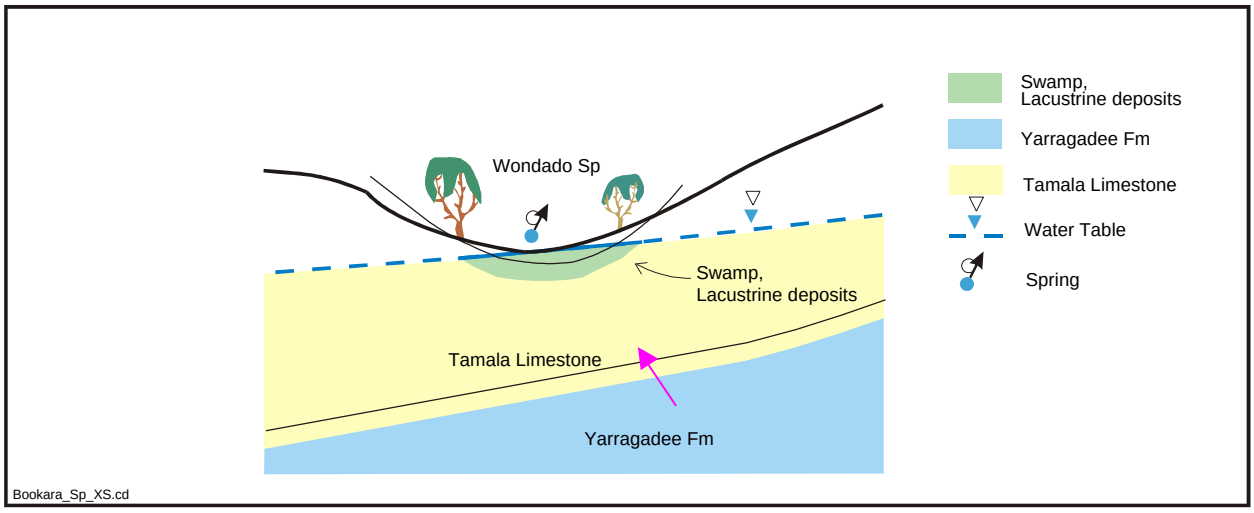
GDE Considerations:

- Patches of remnant native vegetation at spring site

Site Description:

- Shallow water levels in topographic depression
- Water levels maintained by upward head in Yarragadee Aquifer

Site Model:



Site #: 2

Name: Bookara Spring

Map Ref: Mingenew

Site Coord: (296054E: 6785190N)

Bores/Features: Bookara Spring
Wondado Spring
GS15

Physiography/ Slope: Lower slope

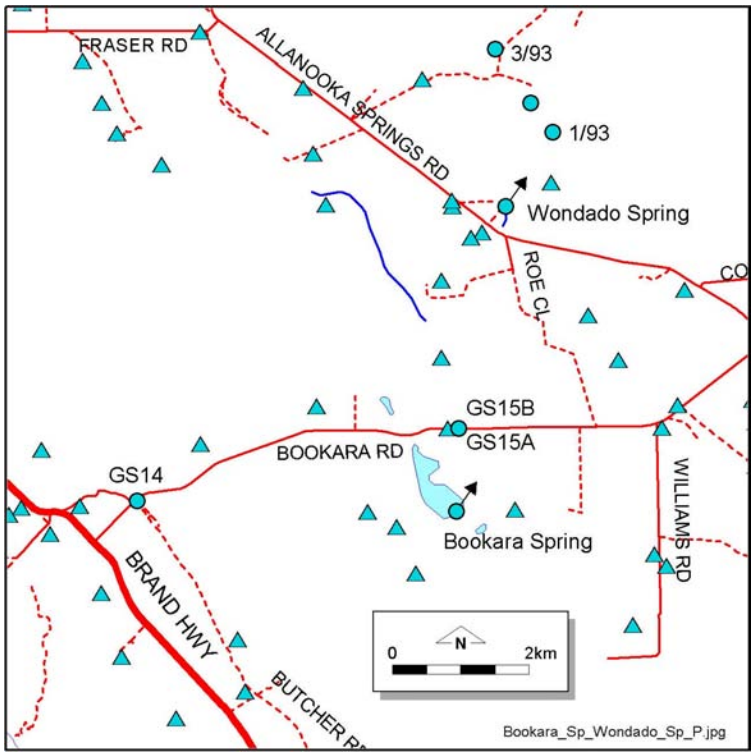
Geology: Tamala Limestone

Water/Ground Water Flow: Upward flow from Yarragadee to Quaternary

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 2300 mg/L



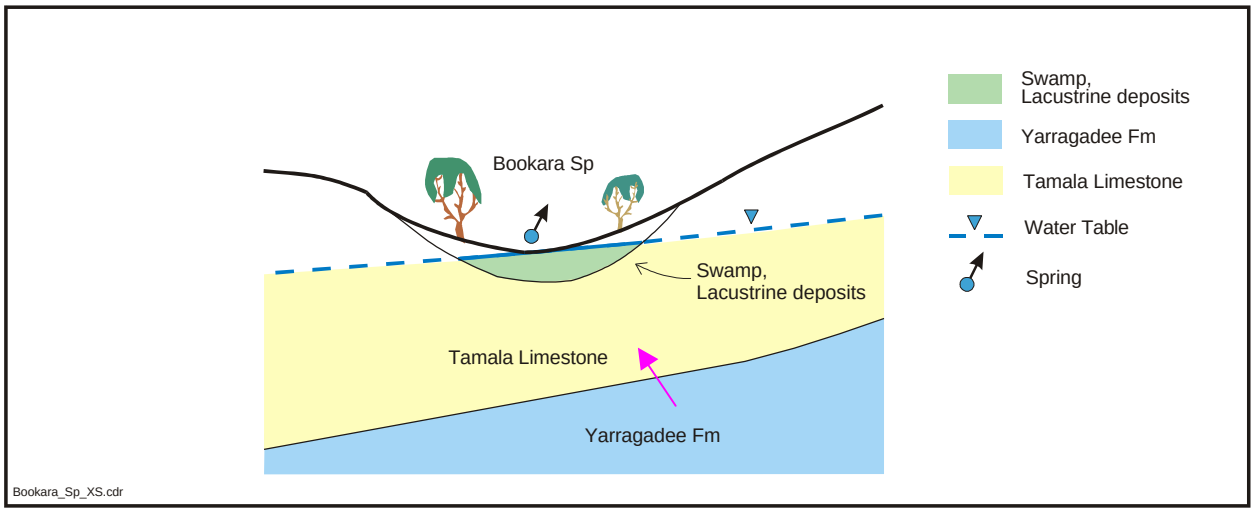
GDE Considerations:

- Patches of remnant native vegetation at spring site

Site Description:

- Watertable close to surface in low depression
- Groundwater discharge from Yarragadee Aquifer

Site Model:



Site #: 3

Name: Allanooka Swamp

Map Ref: Mingenew

Site Coord: (307887E: 6784640N)

Bores/Features: Allanooka Swamp
Allanooka borefield

Physiography/ Slope: Base of Gingin Scarp

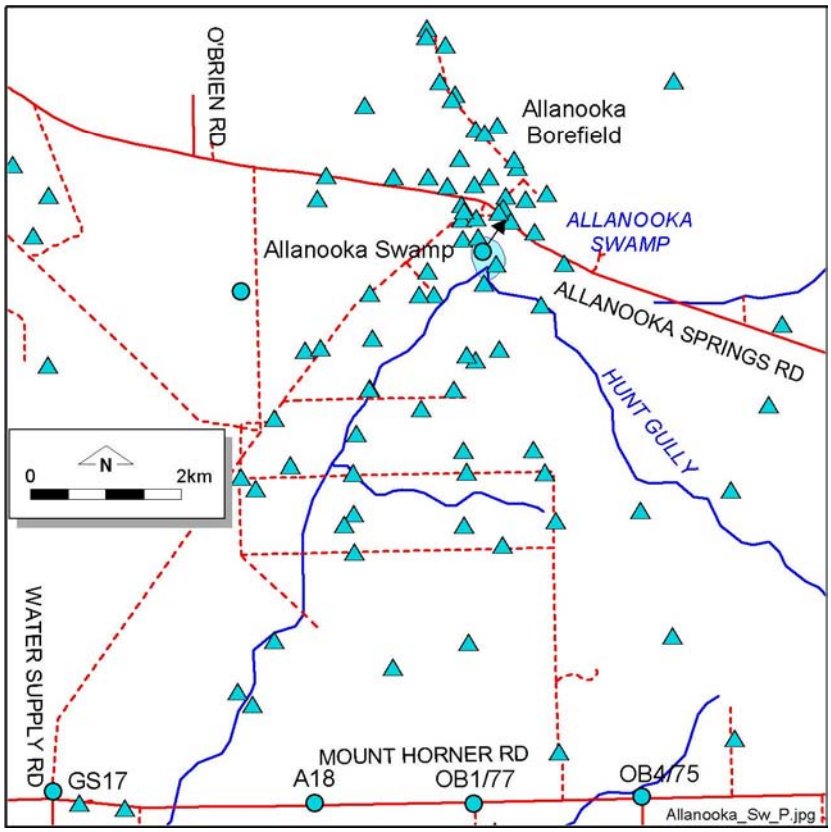
Geology: Alluvium and Yarragadee Formation

Water/Ground Water Flow: Perched system

Aquifer: Yarragadee Aquifer

Depth to WT: 20 to 30 m bgl

Salinity: Unknown



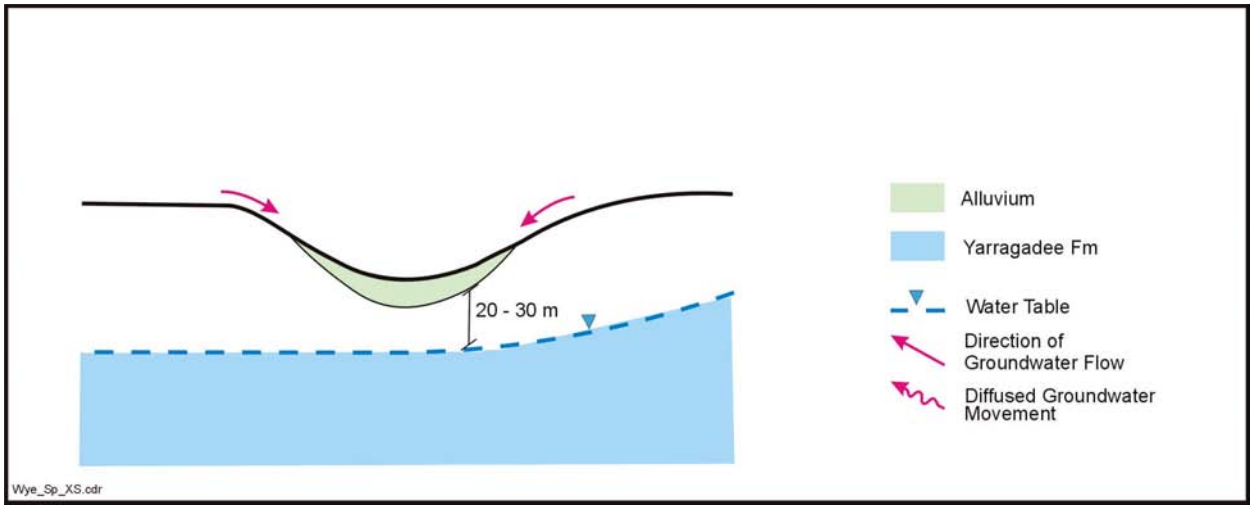
GDE Considerations:

- Watertable is greater than 20 m; hence, little to no GDE potential
- Wetland is seasonally inundated by surface water runoff
- Patches of remnant native vegetation surround wetland

Site Description:

- Alluvial sands overlying the Yarragadee Aquifer
- Watertable is greater than 20 m bgl
- Upward groundwater discharge from Yarragadee Aquifer

Site Model:



Site #: 4

Name: Wye Spring

Map Ref: Mingenew

Site Coord: (304381E: 6773245N)

Bores/Features: Wye Spring

Physiography/ Slope: Lower mid-slope

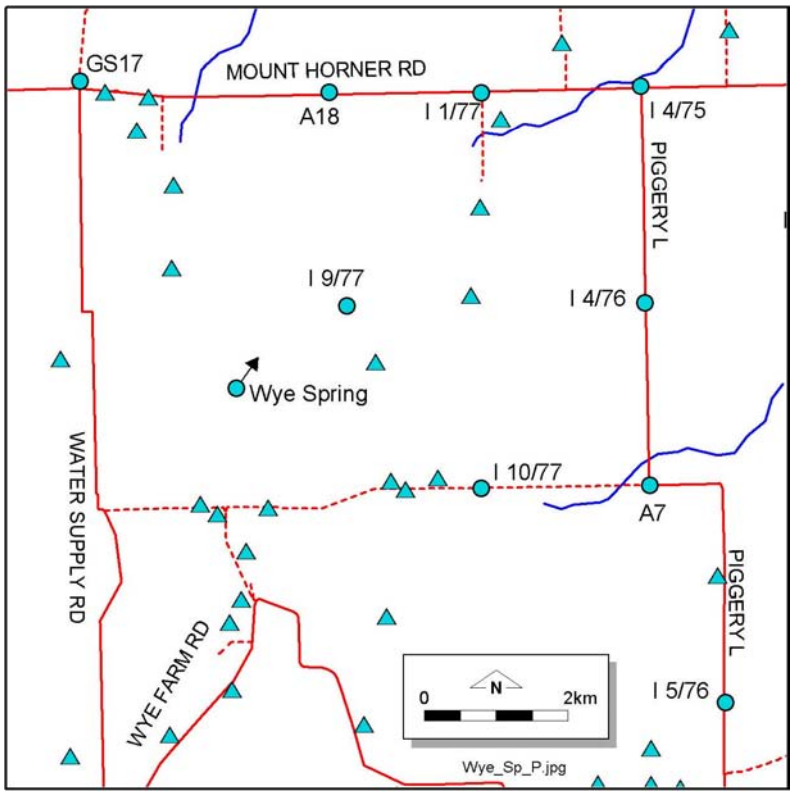
Geology: Tamala Limestone
Yarragadee Formation

Water/Ground Water Flow: Perched system

Aquifer: N/a

Depth to WT: 10 to 20 m bgl

Salinity: 590 – 1914 mg/L



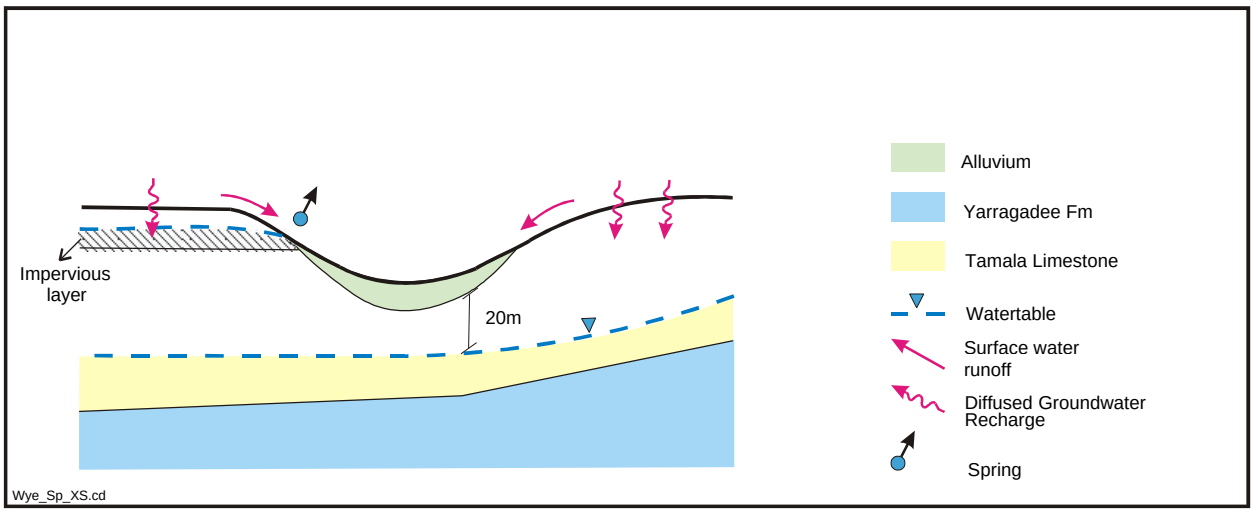
GDE Considerations:

- Not groundwater dependent
- Native vegetation in small scattered patches around spring site

Site Description:

- Spring fed by intermittent surface runoff, perched above water
- Spring is maintained by impervious sediments within Tamala Limestone
- Depth to watertable greater than 10 m

Site Model:



Site #: 5

Name: Nhargo Spring

Map Ref: Dongara

Site Coord: (297342E: 6 768001N)

Bores/Features: Army A41 bore

Physiography/ Slope: Lower slope

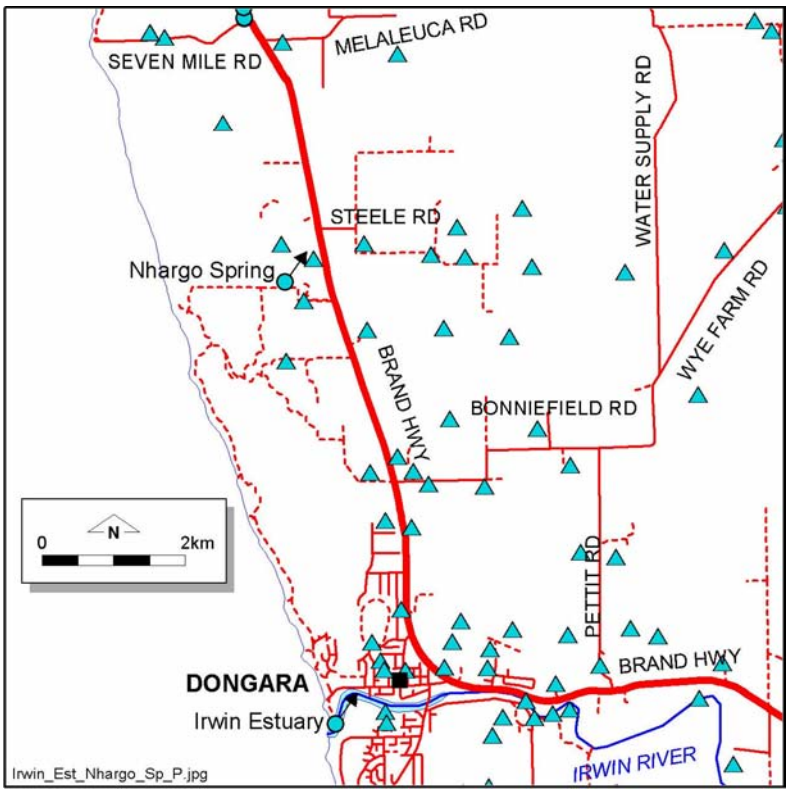
Geology: Tamala Limestone

Water/Ground Water Flow: Throughflow and discharge in Tamala Limestone

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 3200 - 6300 mg/L



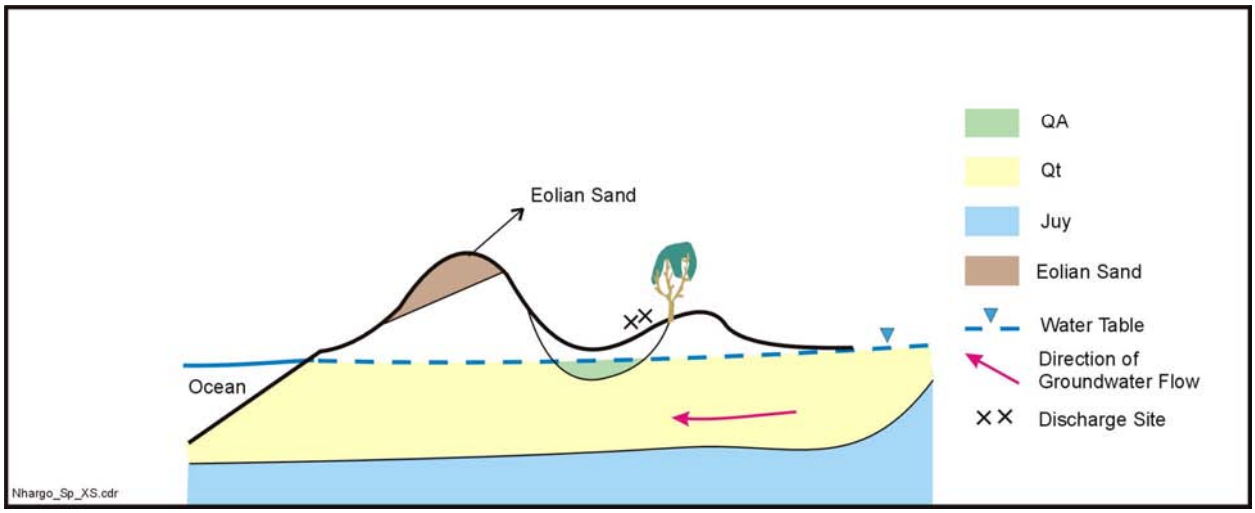
GDE Considerations:

- Abstraction will have only small impact on GDE
- The majority of the site has been cleared of native vegetation

Site Description:

- Watertable occurs within 0 to 5 m of surface and may be subject to tidal fluctuations
- Groundwater moves through Tamala Limestone towards the coast
- There may be some upward leakage from Yarragadee Aquifer into the superficials

Site Model:



Site #: 6

Name: Irwin Estuary

Map Ref: Dongara

Site Coord: (298039E: 6761853N)

Bores/Features: Town bores

Physiography/ Slope: Lower slope

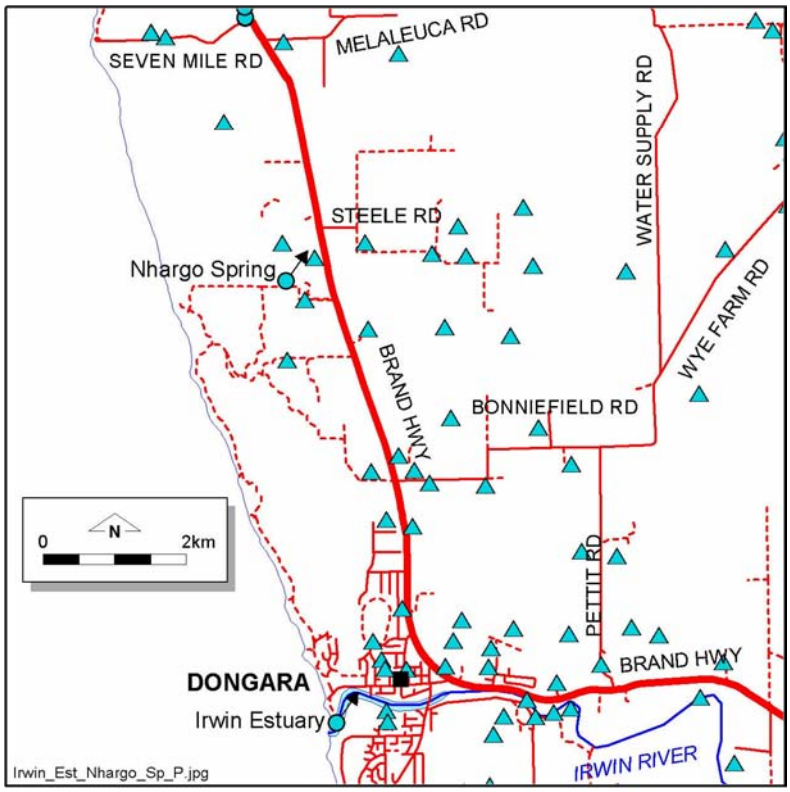
Geology: Tamala Limestone
Yarragadee Formation

Water/Ground Water Flow: Upward head gradient from Yarragadee to Superficial Formation

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: 760 – 6600 mg/L



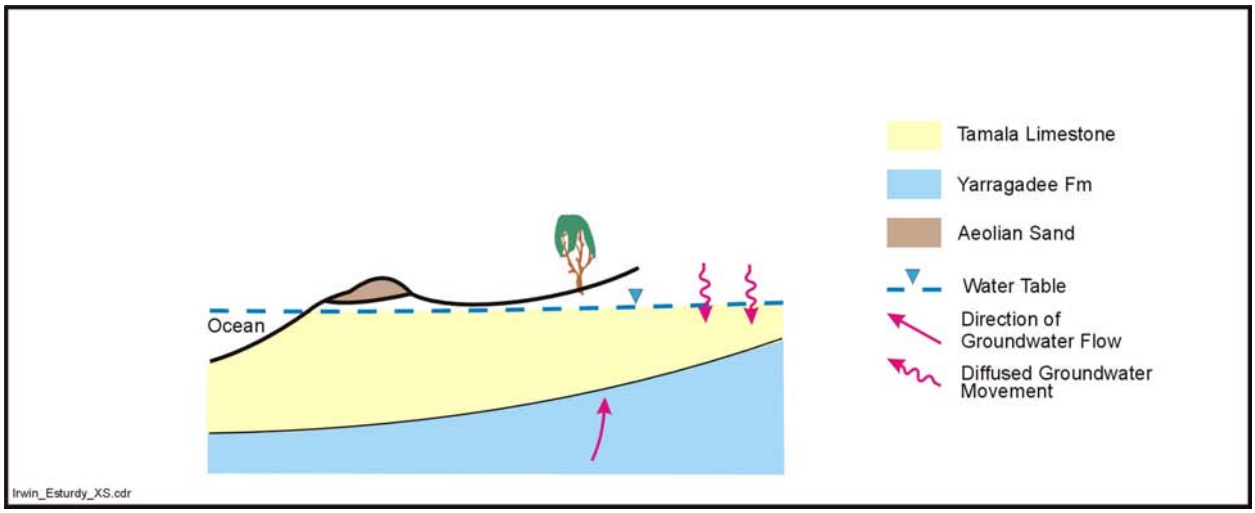
GDE Considerations:

- Fringing vegetation and fauna may be groundwater dependent
- Pumping may impact on surrounding native vegetation through increased likelihood of saltwater intrusion

Site Description:

- Watertable at or very near to the surface
- Groundwater in the superficial formations is fresh to brackish
- Recharge from rainfall and upward leakage from Yarragadee Formation
- Water levels influenced by flow from the Irwin River and tidal fluctuations

Site Model:



Site #: 7

Name: Irwin Spring

Map Ref: Mingenew

Site Coord: (318024E: 6766228N)

Bores/Features: Irwin Spring
BF9/1
Irwin View 5/77

Physiography/ Slope: Lower slope

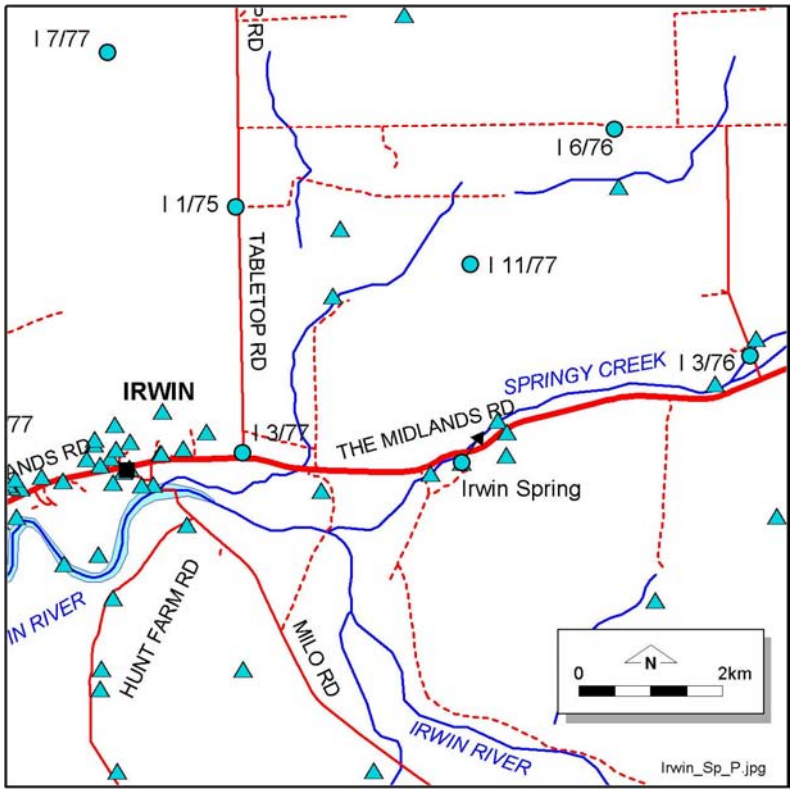
Geology: Yarragadee Formation

Water/Ground Water Flow: Upward head gradient

Aquifer: Yarragadee Aquifer

Depth to WT: At or near surface

Salinity: 860 mg/L



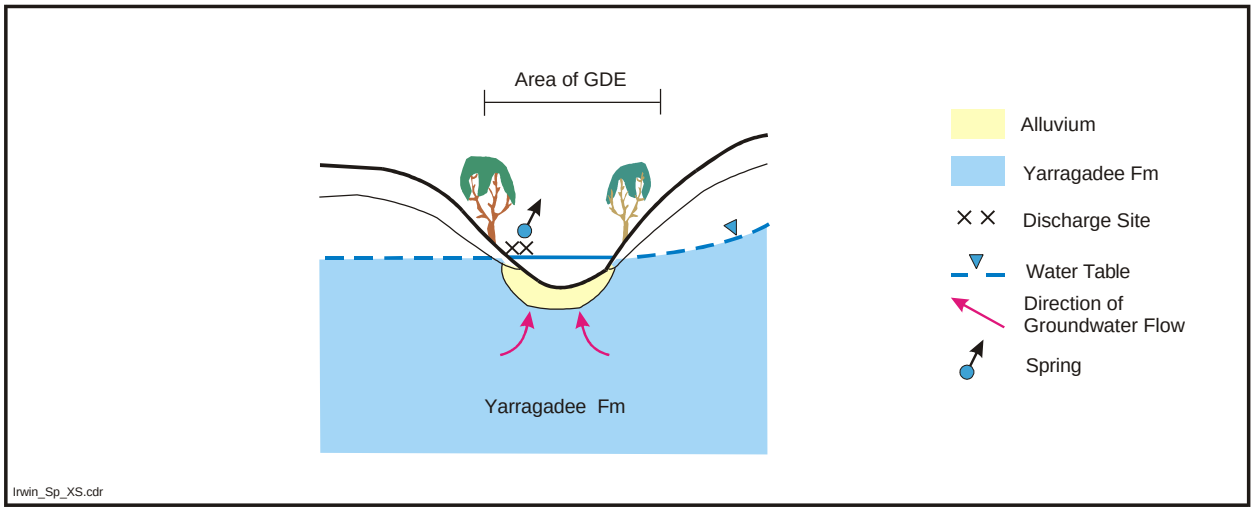
GDE Considerations:

- Water abstraction may impact on remaining vegetation
- Native vegetation present along Springy Creek

Site Description:

- Water level controlled by low topography
- Discharge towards Springy Creek
- Surface discharge from upper part of flow system occurs along the Irwin River

Site Model:



Site #: 8

Name: Walcott Soak

Map Ref: Mingenew

Site Coord: (323076E: 6768636N)

Bores/Features: Irwin Spring
Allanooka Irwin bores

Physiography/ Slope: Lower slope

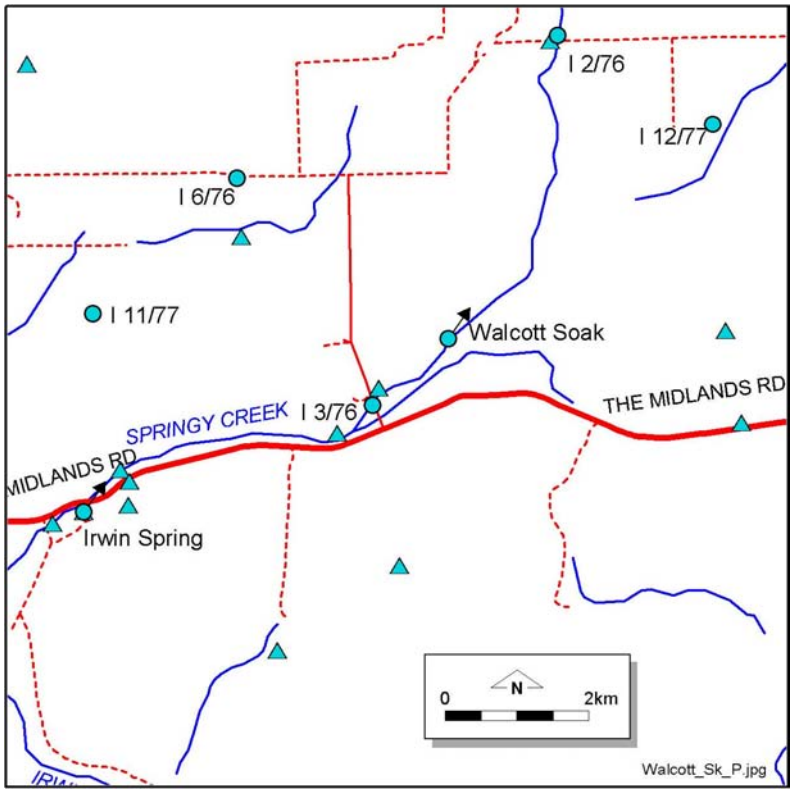
Geology: Yarragadee Fm

Water/Ground Water Flow: Upward flow from Yarragadee Aquifer

Aquifer: Yarragadee Aquifer

Depth to WT: At or near surface

Salinity: Unknown



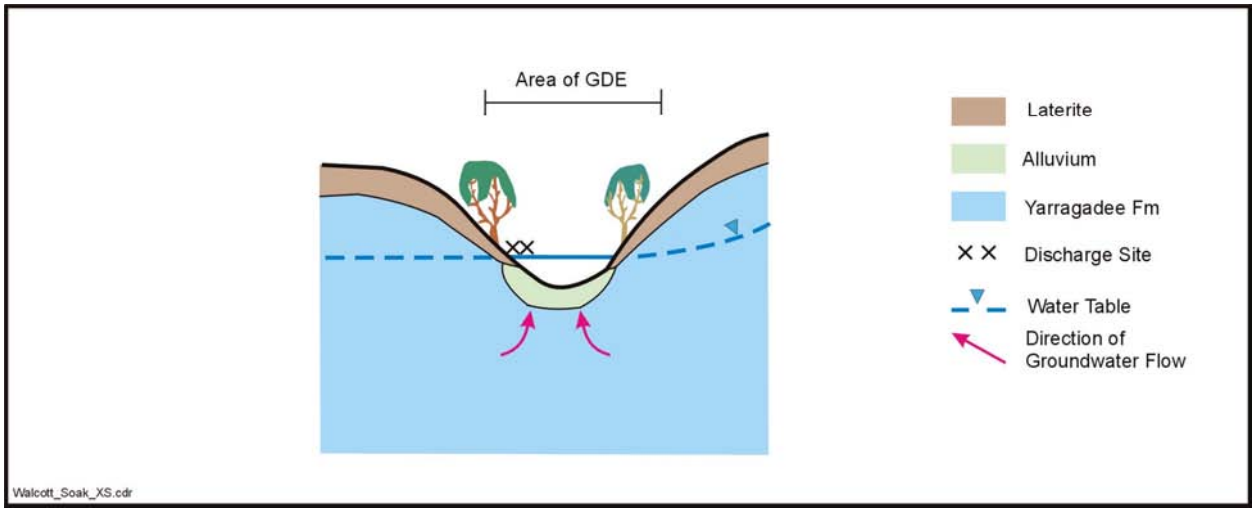
GDE Considerations:

- Native vegetation present in patches along Springy Creek

Site Description:

- Spring elevation at 70 m AHD
- Water levels controlled by topography
- Surface discharge from upper part of flow system occurs along Springy Creek

Site Model:



Site #: 9

Name: Mendara Spring

Map Ref: Mingenew

Site Coord: (321891E: 6761416N)

Bores/Features: Mendara Sp.
Watson's Bore

Physiography/ Slope: Lower mid-lower slope

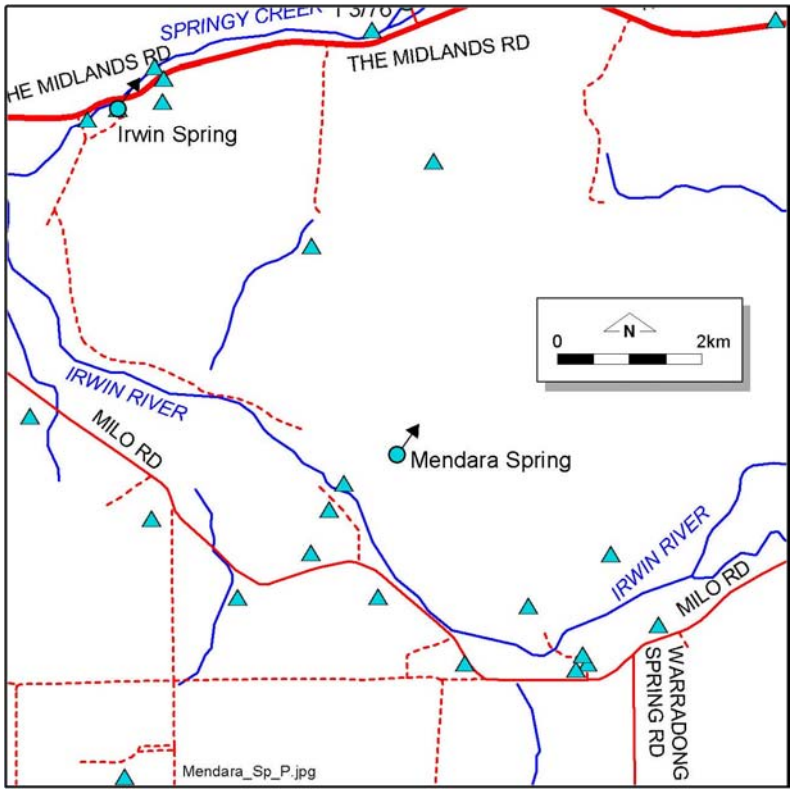
Geology: Yarragadee Fm

Water/Ground Water Flow: Upward head gradients

Aquifer: Yarragadee Aquifer

Depth to WT: At or near surface

Salinity: 360 – 1180 mg/L



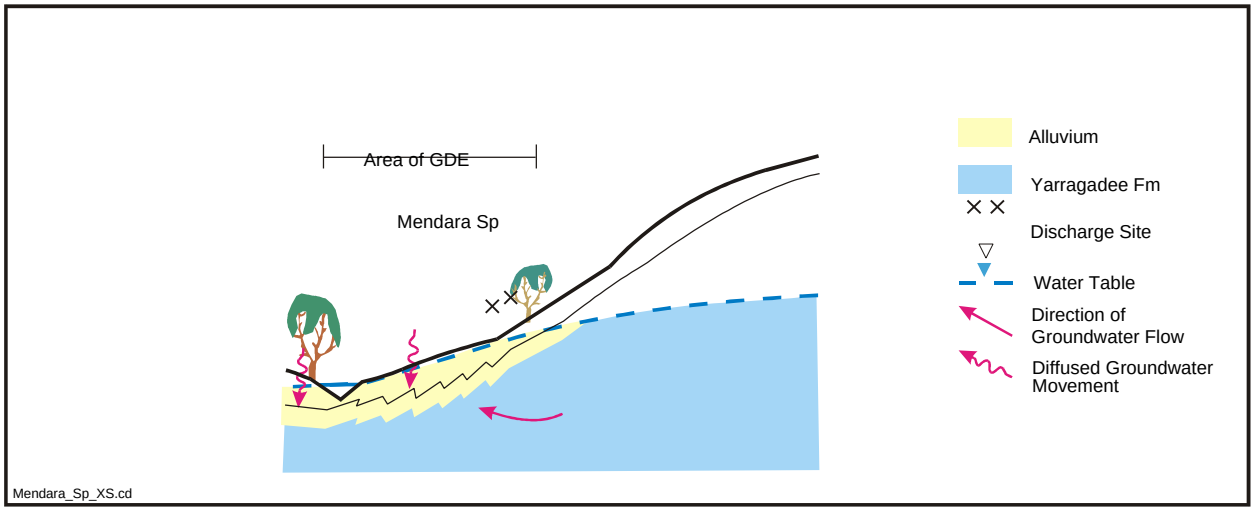
GDE Considerations:

- Water abstraction from the Yarragadee Formation may impact on remainder of vegetation along the river
- Native vegetation present in patches along the Irwin River

Site Description:

- Spring elevation at 70 m AHD
- Water levels controlled by topography
- Surface discharge from upper part of flow system occurs along the Irwin River

Site Model:



Site #: 10

Name: Lockier River

Map Ref: Mingenew

Site Coord: (334645E: 6766564N)

Bores/Features: Army Bores
Clancy Well

Physiography/ Slope: Lower slopes

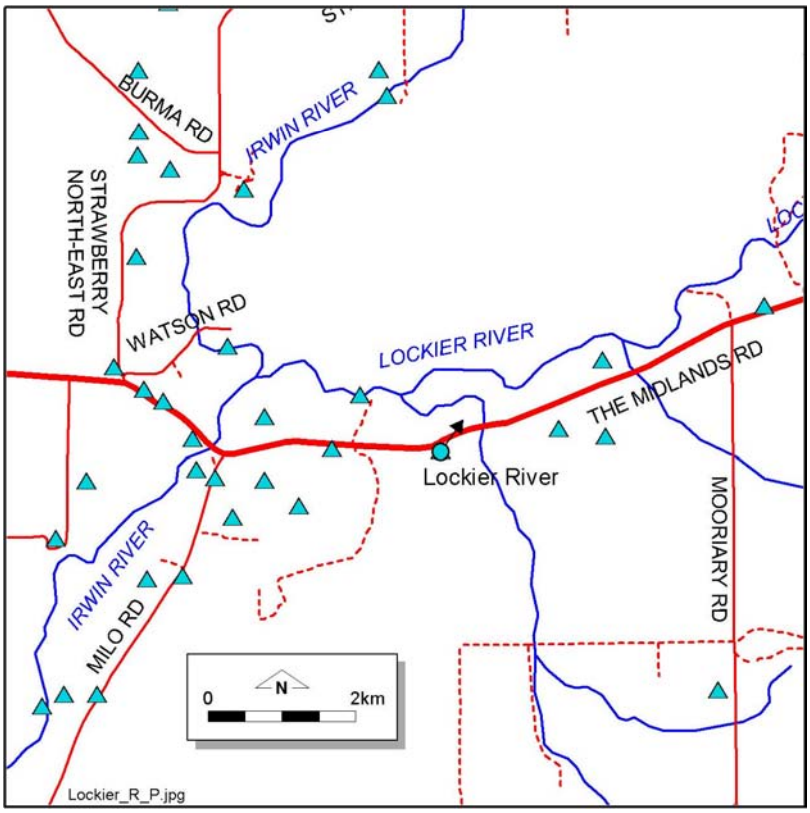
Geology: Yarragadee Fm

Water/Ground Water Flow:

Aquifer: Yarragadee and superficial

Depth to WT: 10 to 20 m bgl

Salinity: 4300 – 4700 mg/L



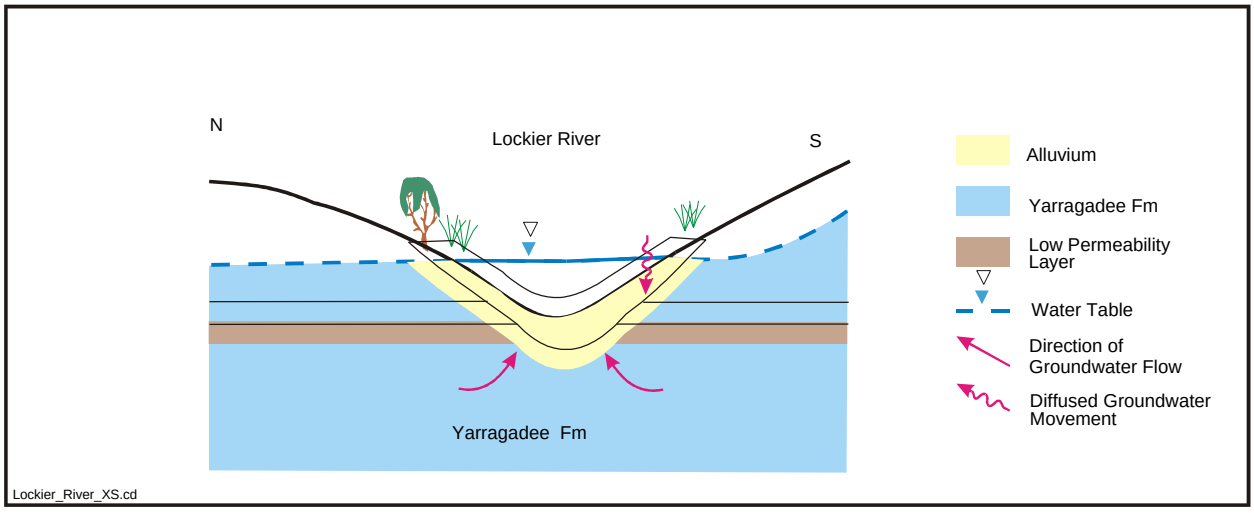
GDE Considerations:

- Vegetation present in patches along the Lockier River and at junction of Irwin-Mooriary Gully
- Further work is required to assess whether the vegetation is groundwater dependent or is dependent on surface water runoff
- Abstraction may impact on remainder of vegetation in Mooriary Gully

Site Description:

- Groundwater discharge to the Irwin River in its lower reaches partly maintains river vegetation
- Water levels controlled by topography
- Surface water fed – shallow water levels maintained by low permeability layers within the Yarragadee
- Recharge by direct rainfall

Site Model:



Site #: 11

Name: Mingenew Spring

Map Ref: Mingenew

Site Coord: (348424E: 6767903N)

Bores/Features: Goodaring Sp.
Mingenew Sp.
Eyregulla Sp.
Mingenew town bores

Physiography/ Slope: Lower to mid slope

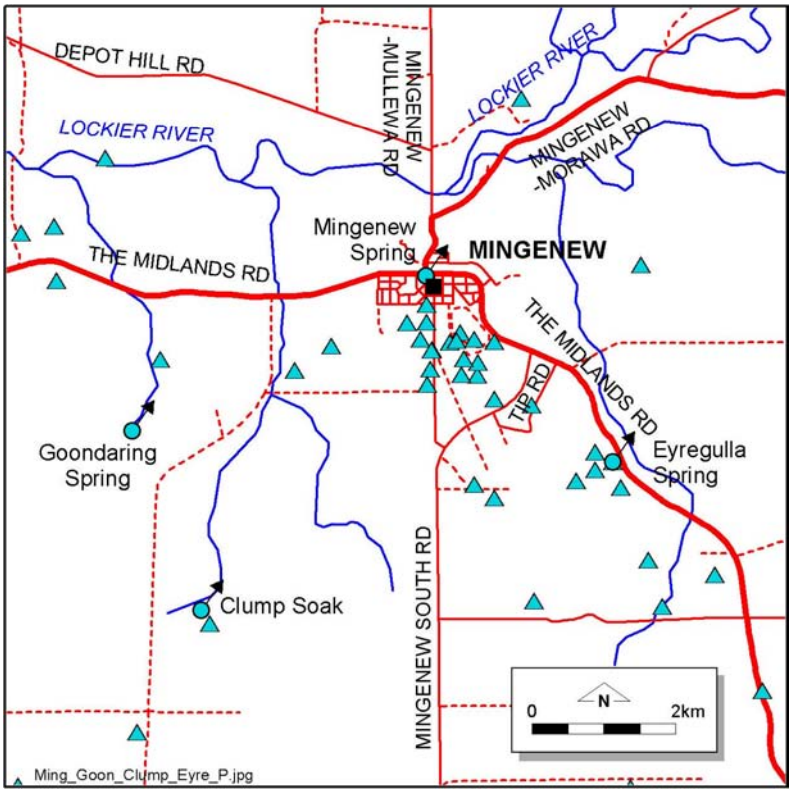
Geology: Yarragadee Fm
Otorowiri Siltstone

Water/Ground Water Flow: Upward flow in Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 750 mg/L



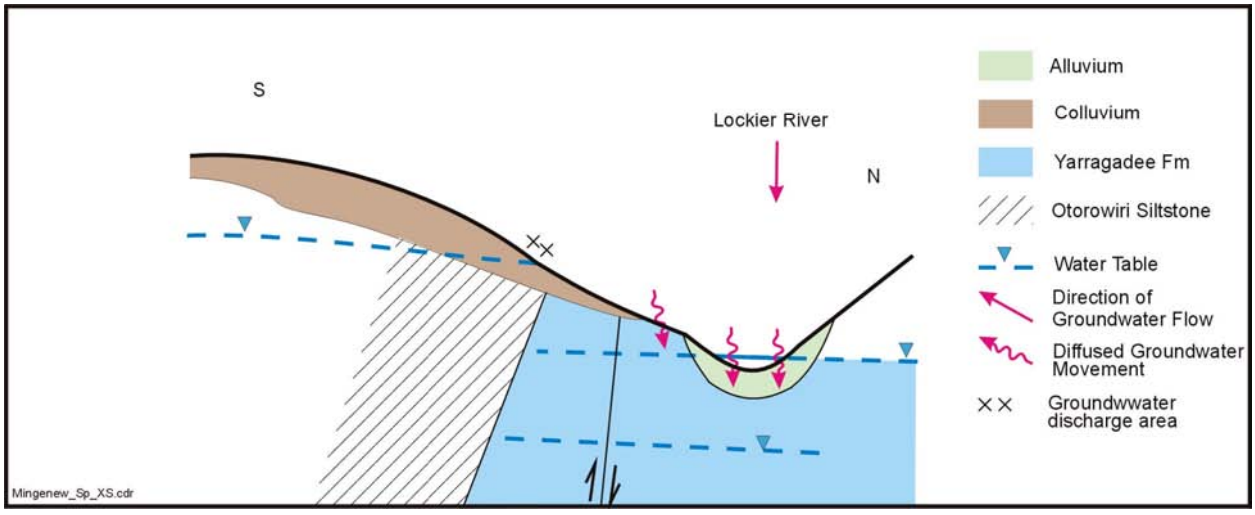
GDE Considerations:

- The site appears to be groundwater dependent
- Increase in water abstraction from the Parmelia is likely to impact on native vegetation present in localised areas within the town of Mingenew

Site Description:

- Spring located at Mingenew town site
- Buffer vegetation absent
- Spring maintained by water levels in the Parmelia Aquifer
- Parmelia Aquifer mainly recharged by rainfall where outcropping

Site Model:



Site #: 12

Site Name: Goondaring Spring

Map Reference: Mingenew

Site Coord: (344346E: 6767748N)

Bores/Features: Goondaring Sp.
Clump Soak
Eyregulla Sp.

Physiography/ Slope: Lower mid slope

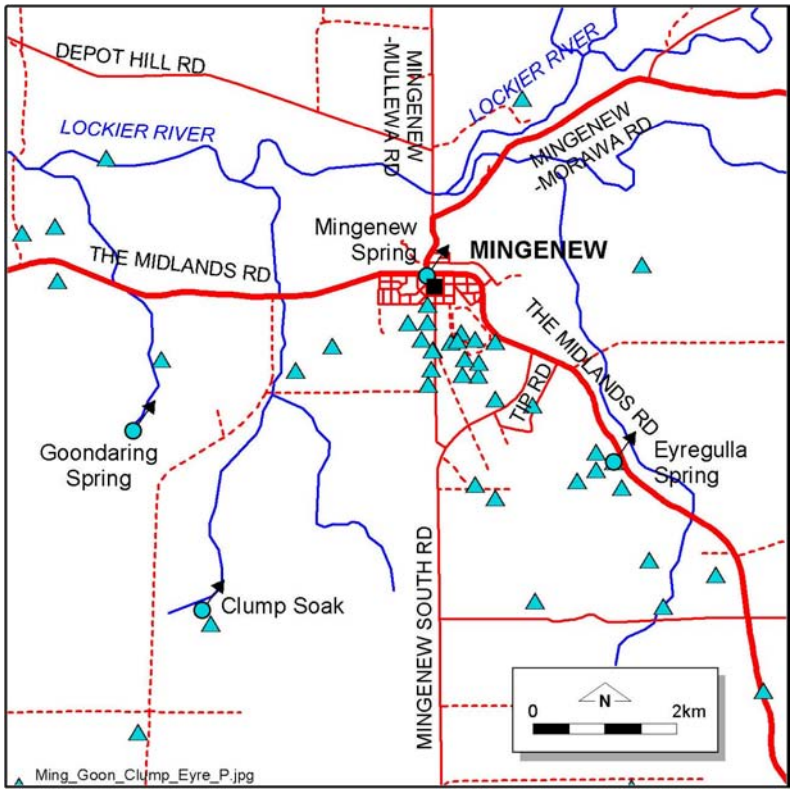
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: GWD from Parmelia Aquifer over Otorowiri Siltstone

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: Unknown



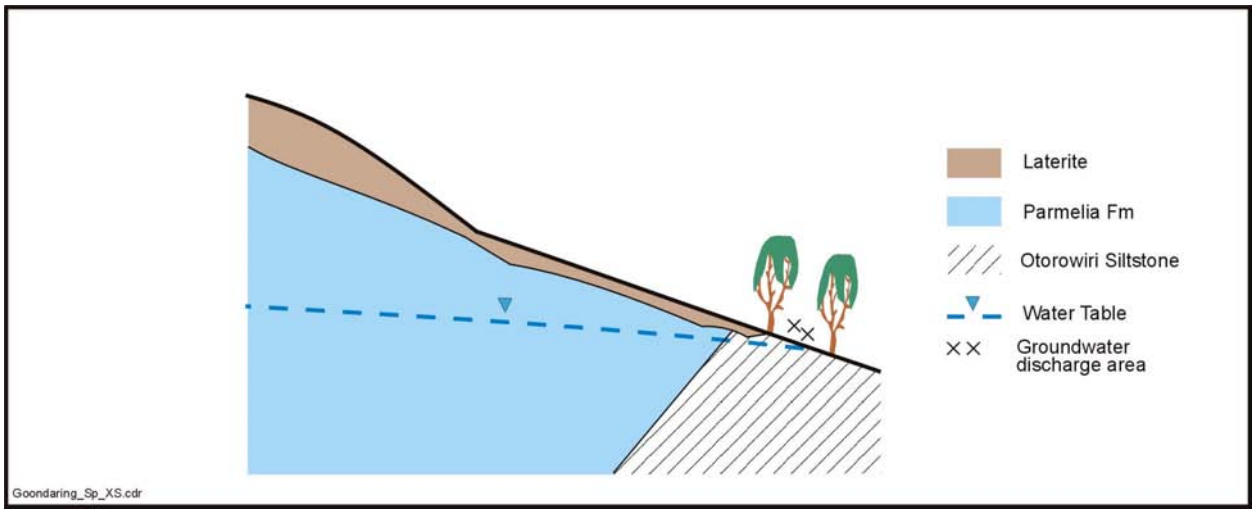
GDE Considerations:

- Groundwater dependent
- Water abstraction from the Parmelia may impact on native vegetation surrounding the site

Site Description:

- Spring discharge represents overflow from the Parmelia Aquifer at the outcrop of the Otorowiri Siltstone

Site Model:



Site #: 13

Name: Clump Soak

Map Reference: Mingenew

Site Coord: (345300E: 6765258N)

Bores/Features: The Clump
Goondaring Sp.
Eyregulla Sp.

Physiography/ Slope: Base of Scarp

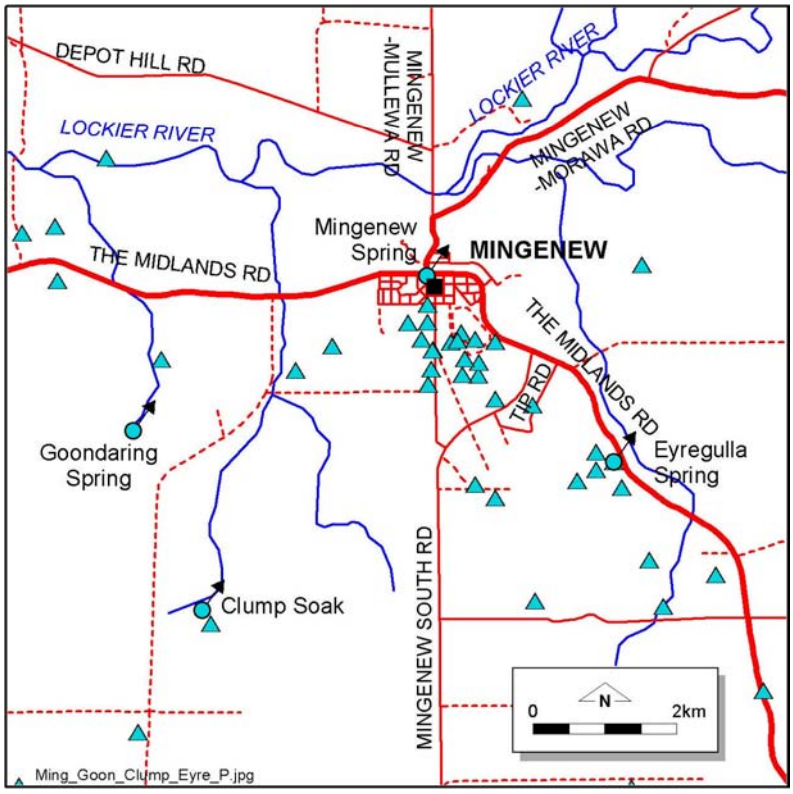
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 1120 mg/L



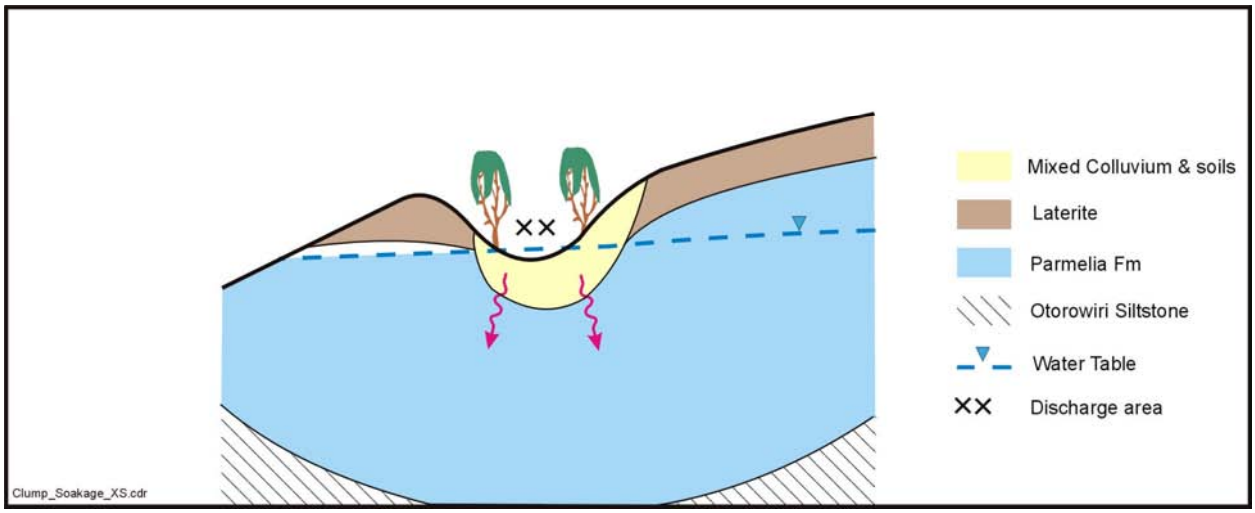
GDE Considerations:

- Groundwater dependent
- Likely to affect native vegetation surrounding the site

Site Description:

- Parmelia Aquifer is part of a shallow syncline bounded by the Otorowiri Siltstone
- Aquifer is recharged mainly by rainfall and surface runoff through the superficial sediments
- Spring represents overflow from Parmelia Aquifer

Site Model:



Site #: 14

Site Name: Eyregulla Spring

Map Reference: Mingenew

Site Coord: (351011E: 6767313N)

Bores/Features: The Clump
Goondaring Sp.
Eyregulla Sp.
Eyregulla farm well
#111-114

Physiography/ Slope: Lower mid slope

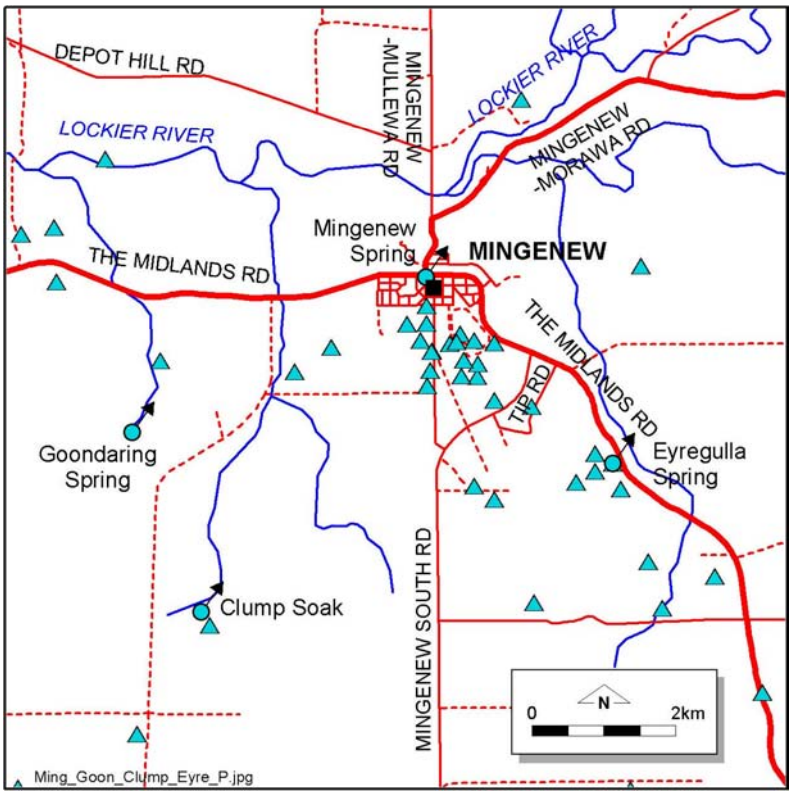
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 580 mg/L



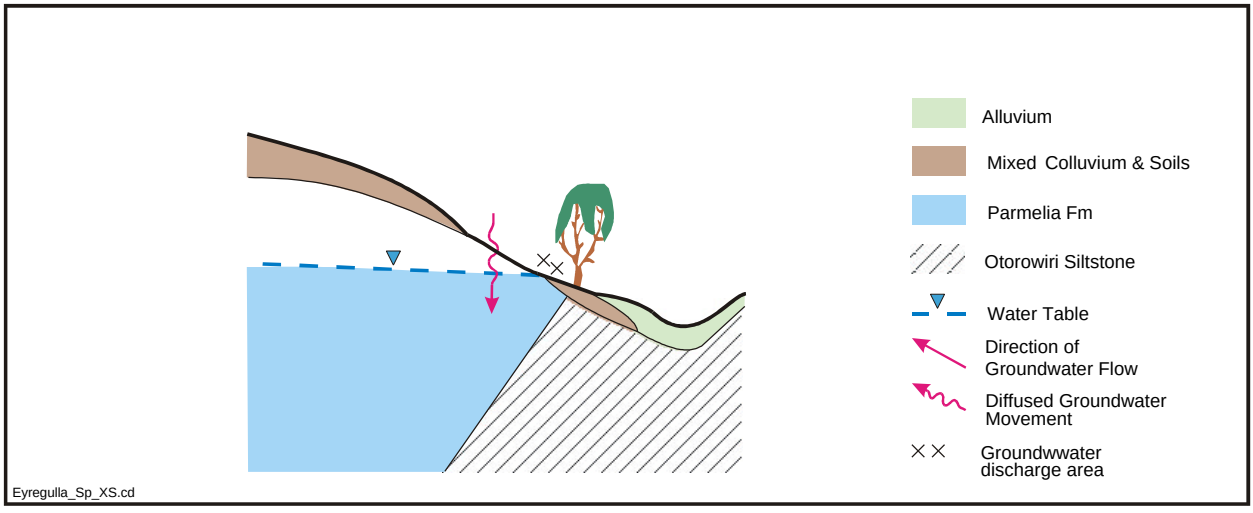
GDE Considerations:

- Groundwater dependent
- Water abstraction is likely to affect native vegetation surrounding the site

Site Description:

- Parmelia Aquifer is part of a shallow syncline bounded by the Otorowiri Siltstone to the west
- Aquifer is recharged mainly by rainfall and surface runoff through the superficial sediments
- Spring represents overflow from Parmelia Aquifer

Site Model:



Site #: 15

Name: Ejarno Spring

Map Reference: Mingenew

Site Coord: (315180E: 6756131N)

Bores/Features: Ejarno Sp.
LS34

Physiography/ Slope: Lower-slope

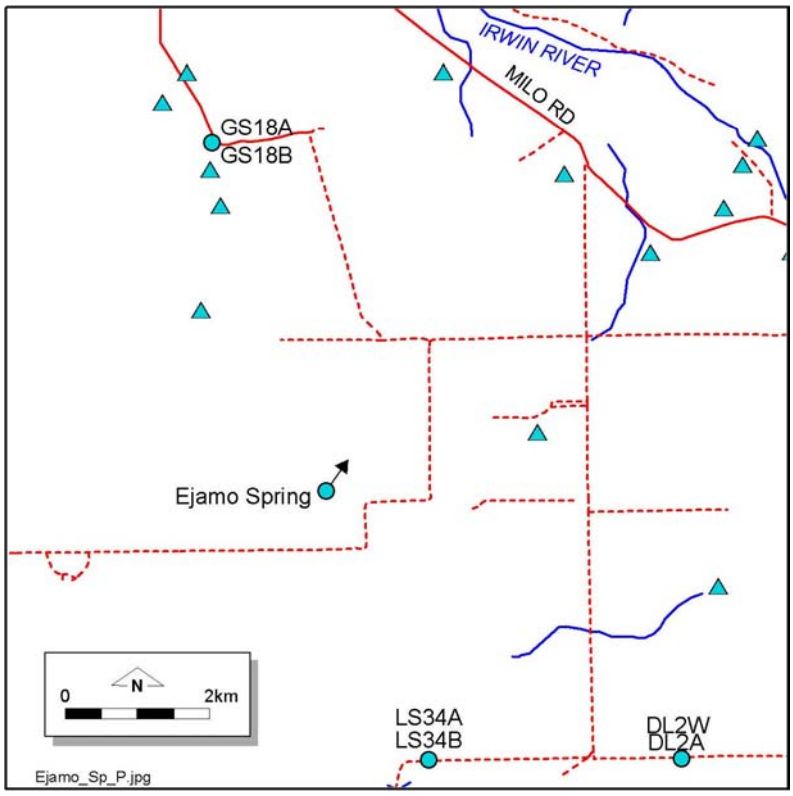
Geology: Guildford Fm.
Yarragadee Fm.

Water/Ground Water Flow: Downward head

Aquifer: Guildford Sand.

Depth to WT: At or near surface

Salinity: 460 mg/L

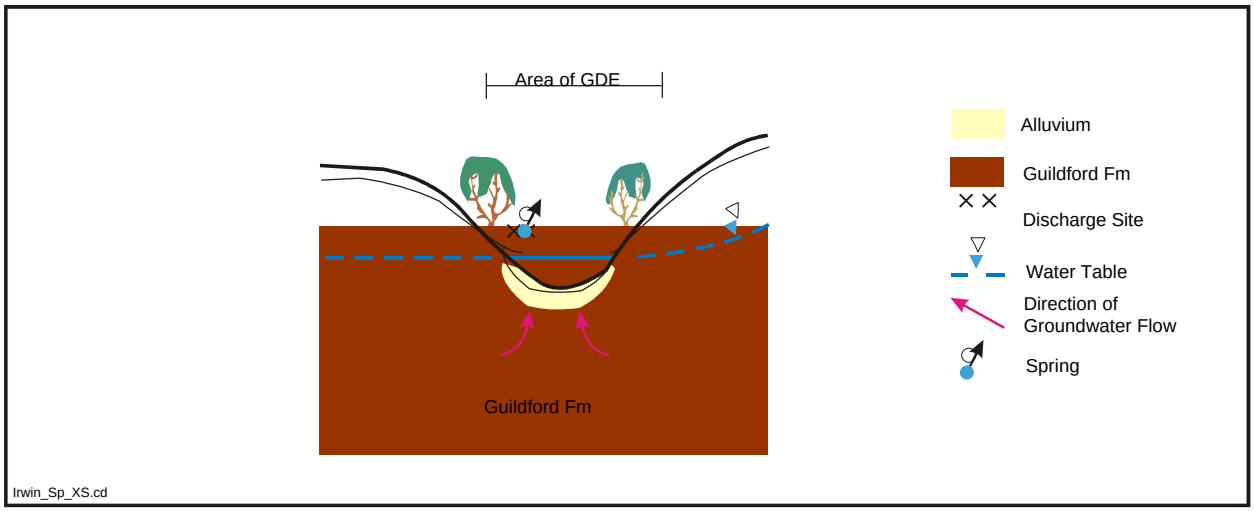


GDE Considerations:

- Water abstraction is likely to have low impact on GDE within the superficials
- Native vegetation intact

Site Description:

Site Model:



Site #: 16

Name: Warradong Spring

Site Coord: (325606E: 6752979N)

Bores/Features: Warradong Sp.

Physiography/ Slope: Mid-slope

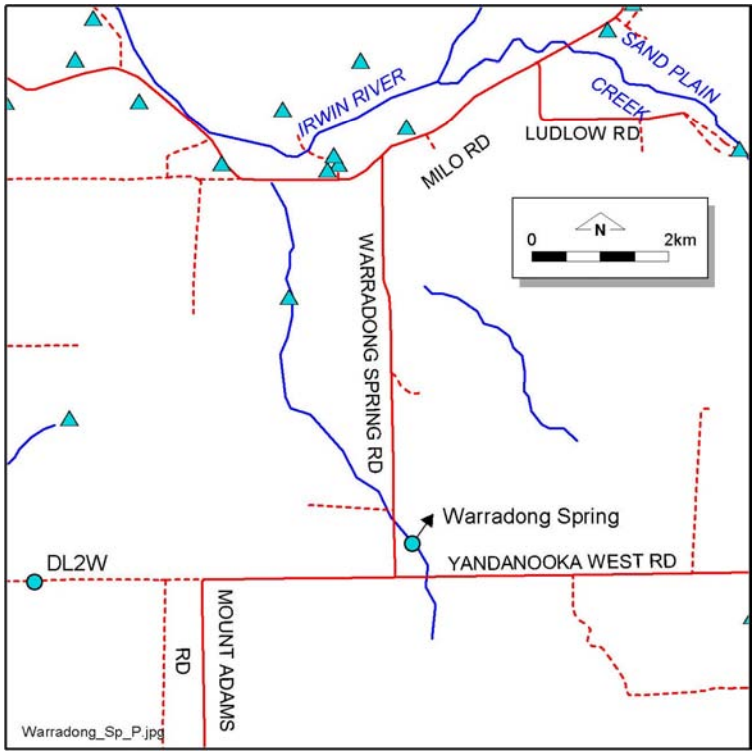
Geology: Yarragadee Fm

Water/Ground Water Flow: Perched system

Aquifer: Shallow perched aquifer

Depth to WT: > 50 m bgl in Yarragadee Aquifer

Salinity: unknown



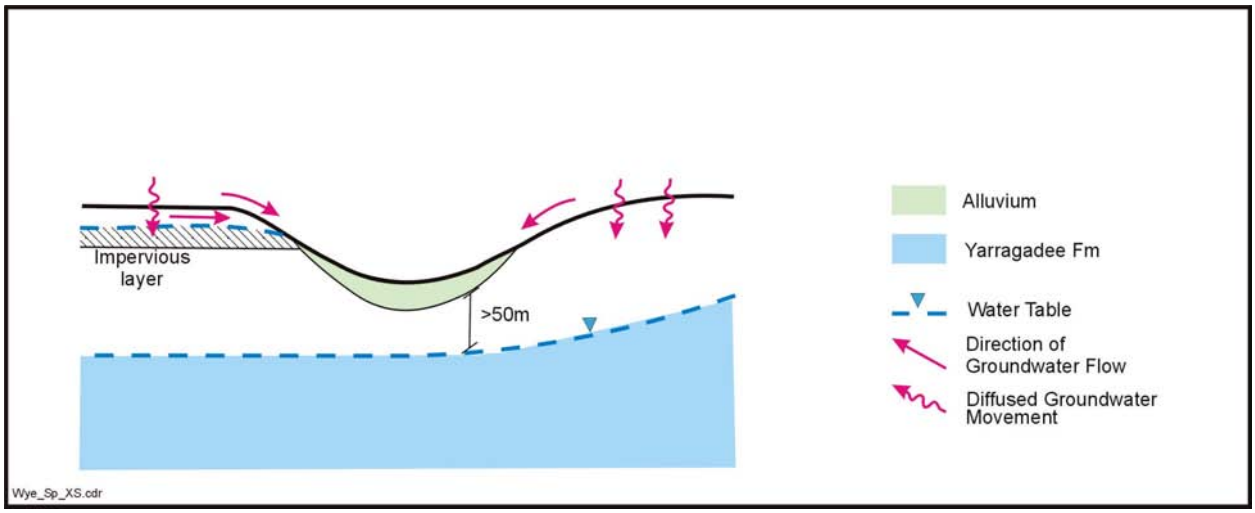
GDE Considerations:

- Not groundwater dependent
- Most vegetation has been cleared for farming

Site Description:

- Perched spring system
- Spring discharge closely related to rainfall events
- Large depth to regional watertable (>50 m bgl)

Site Model:



Site #: 17

Name: Mooriary Spring

Map Reference: Mingenew

Site Coord: (338451E: 6760667N)

Bores/Features: Mooriary Spring

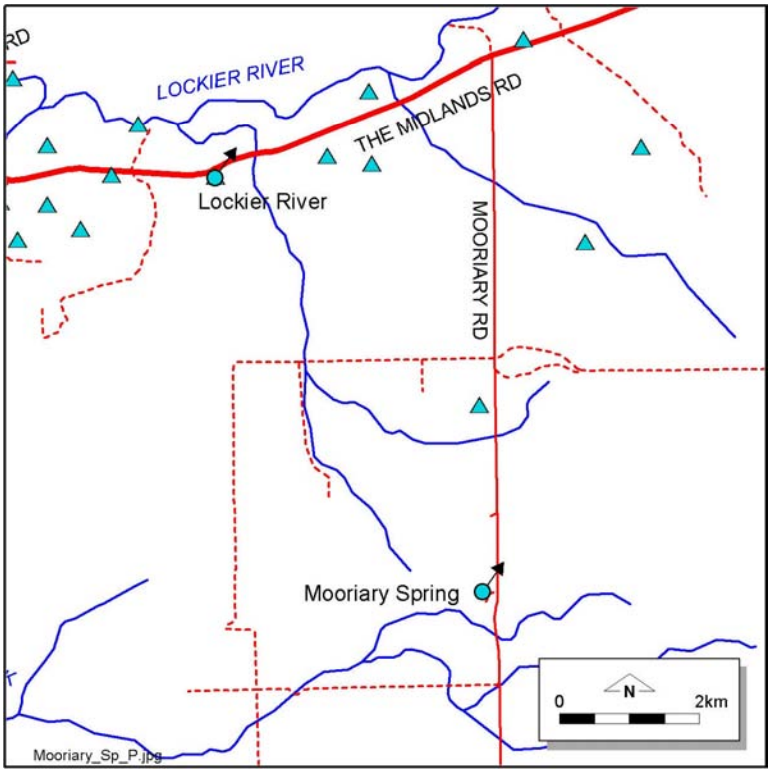
Physiography/ Slope: Lower mid-slope

Geology: Otorowiri Siltstone
Yarragadee Formation

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Salinity: 800 mg/L



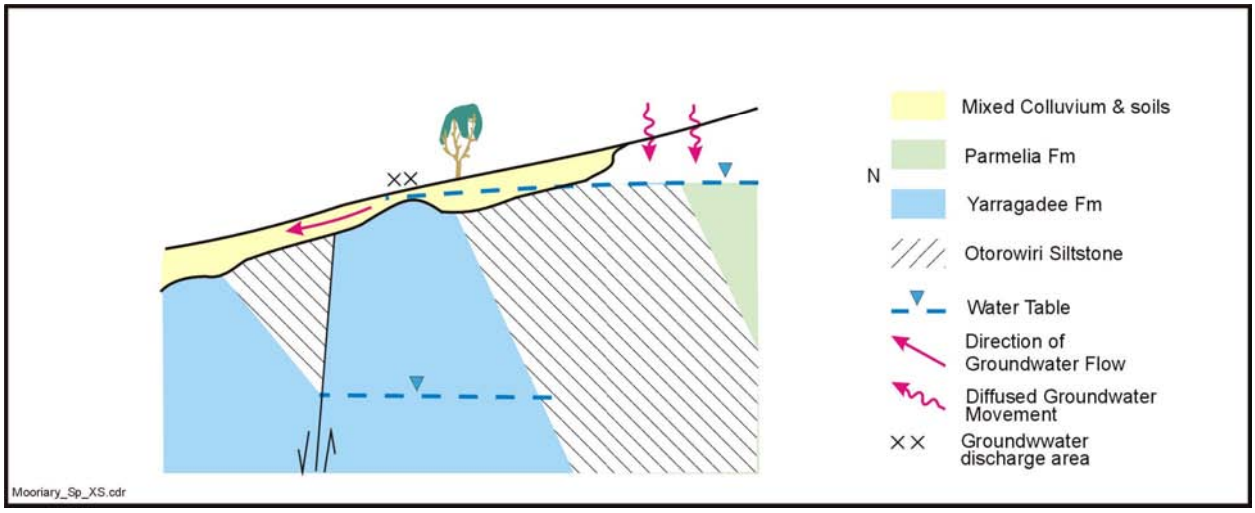
GDE Considerations:

- Groundwater dependent
- Native vegetation intact at spring site; surrounded by cleared farmland
- Vegetation positioned on Otorowiri Siltstone
- Potential impact to GDE related to salinisation
- Possible impact to GDE due to increased groundwater abstraction from the Parmelia Aquifer

Site Description:

- Yarragadee Aquifer has deep watertable (>50 m bgl) bounded by the low permeable Otorowiri Siltstone
- Elevation of spring slightly below the watertable, thus representing aquifer outflow
- Elevation of spring ~ 175 m AHD

Site Model:



Site #: 18

Name: Yuwarana Spring

Map Reference: Mingenew

Site Coord: (340900E: 6754510N)

Bores/Features: Yuwarana Spring
DL4B

Physiography/ Slope: Lower mid-slope

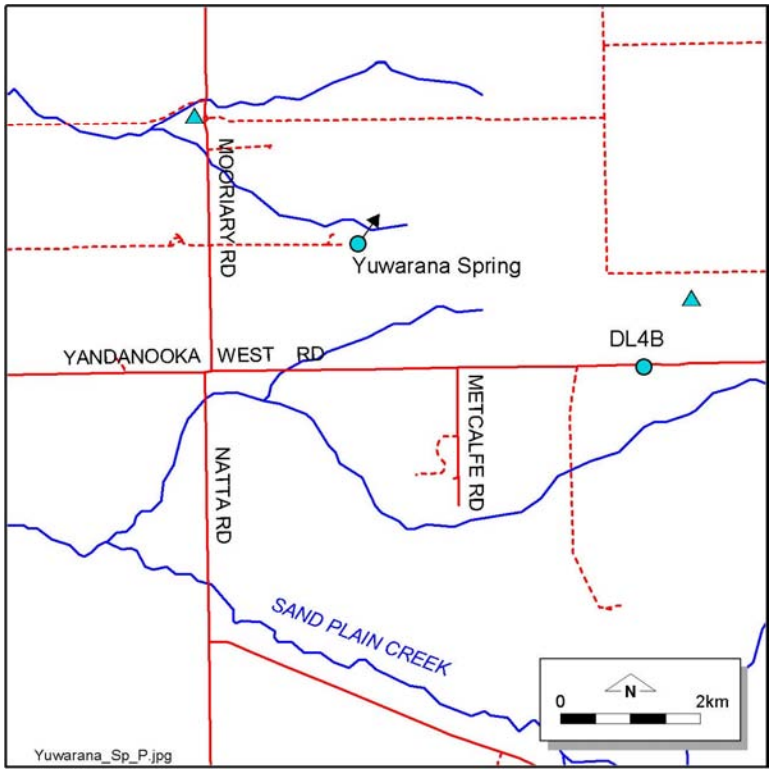
Geology: Parmelia Formation
Otorowiri Siltstone
Yarragadee Formation

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT:

Salinity: Unknown



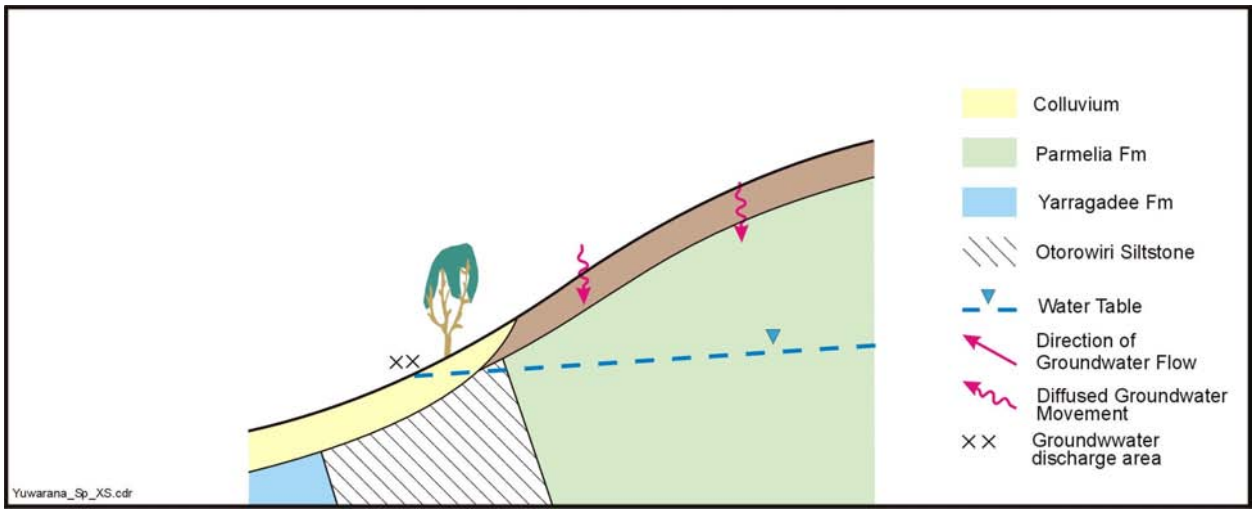
GDE Considerations:

- Water abstraction may have some impact on GDE

Site Description:

- Aquifer is recharged mainly by rainfall on its outcrop
- Spring occurs at an elevation lower than the watertable at the outcrop of the Otorowiri Siltstone
- Spring represents overflow from the Parmelia Aquifer

Site Model:



Site #: 19

Name: Mungenooka Spring

Map Reference: Dongara

Site Coord: (307183E: 6741930N)

Bores/Features: Mungenooka Spring
LS30
DP Bores

Physiography/ Slope: Lower slope

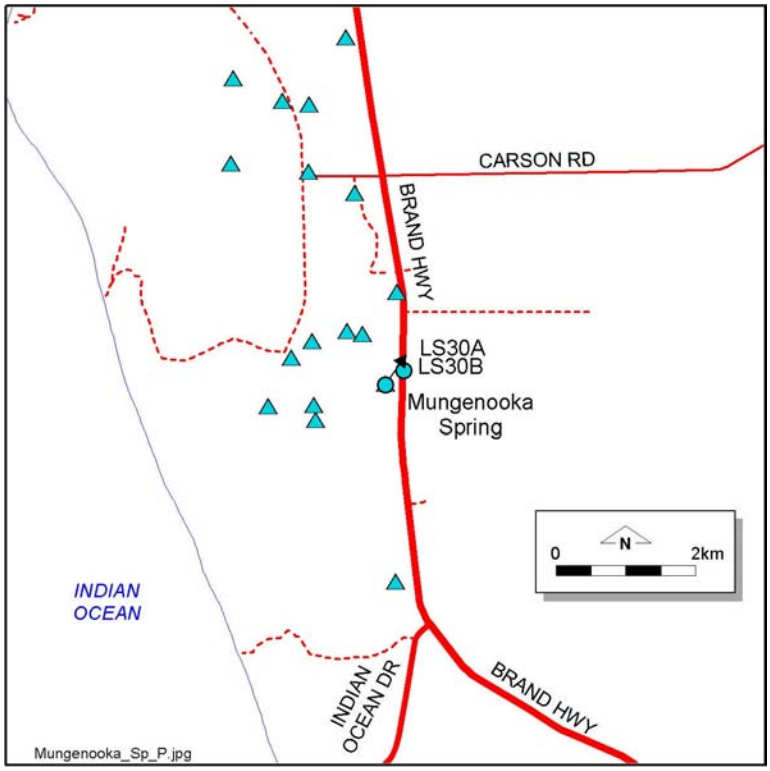
Geology: Tamala Limestone
Yarragadee Fm

Water/Ground Water Flow: Upward head gradients from the Tamala Limestone

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 3000-5300 mg/L



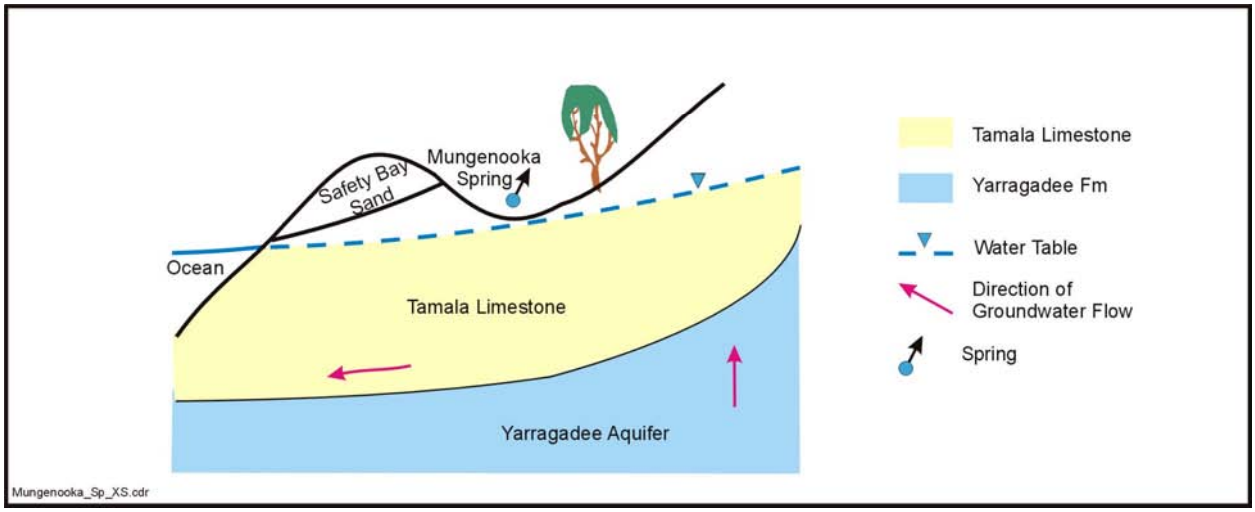
GDE Considerations:

- Increase in water abstraction may result in the intrusion of seawater
- Native vegetation cleared along the Brand Highway and at the Mungenooka Spring site – low to absent vegetation cover in areas of mobile dunes
- Vegetation mostly intact surrounding the DP bores

Site Description:

- Watertable close to the ground surface in topographic low area
- Water levels in the Tamala Limestone are maintained by upward head from the Yarragadee Aquifer

Site Model:



Site #: 20

Name: Otorowiri Spring

Map Reference: Mingenew

Site Coord: (355480E: 6742040N)

Classification: Discharge over Otorowiri Siltstone

Bores/Features: Otorowiri Sp.
AR2, AR7, AR10
AR11, AR15, AR13
AR3, AR9

Physiography: Lower mid-slope

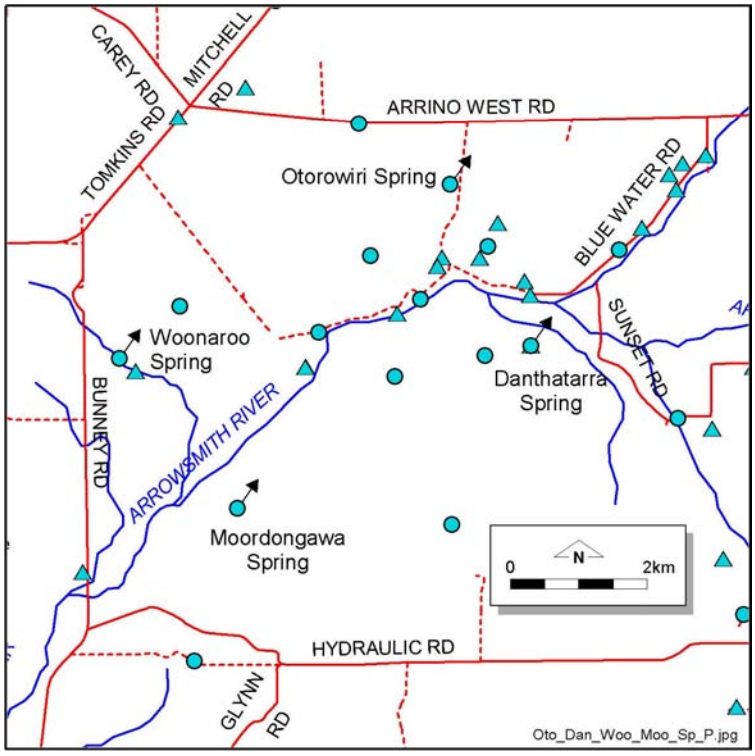
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: 850 mg/L



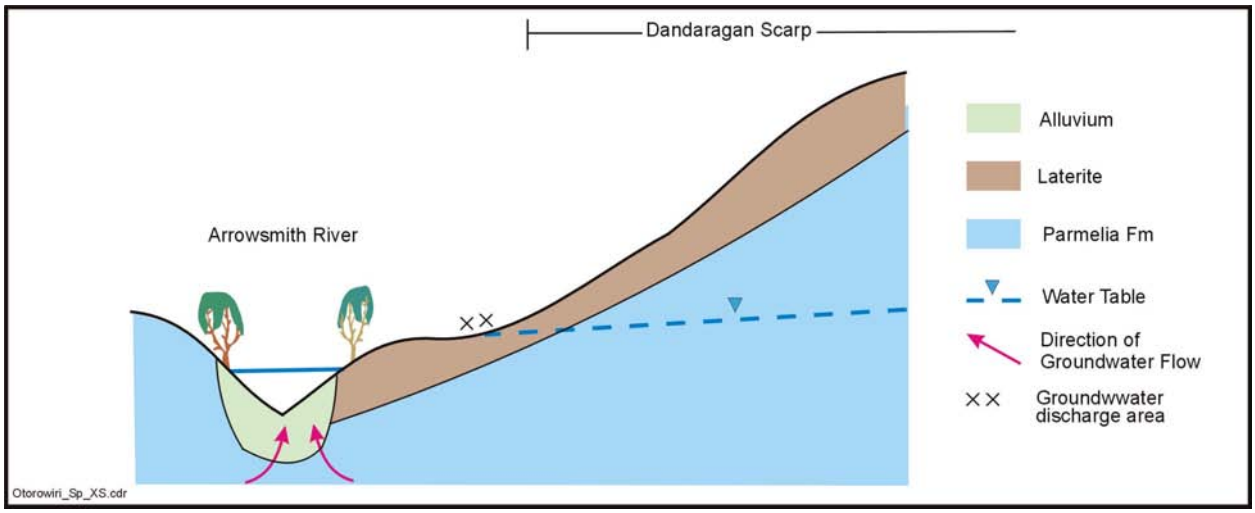
GDE Considerations:

- Water abstraction is likely to impact on GDE along the river
- Otorowiri Spring located within agricultural area and is extensively cleared
- Native vegetation predominantly located along the Arrowsmith River

Site Description:

- Spring located behind Dandaragan Scarp
- Groundwater flows towards the Arrowsmith River within the Parmelia Formation
- Spring is maintained by the water levels in the Parmelia Aquifer

Site Model:



Site #: 21

Name: Danthatarra Spring

Map Reference: Mingenew

Site Coord: (356651E: 6739689N)

Bores/Features: Danthatarra Sp.
AR1
AR10
AR14
AR15

Physiography/ Slope: Lower -slope

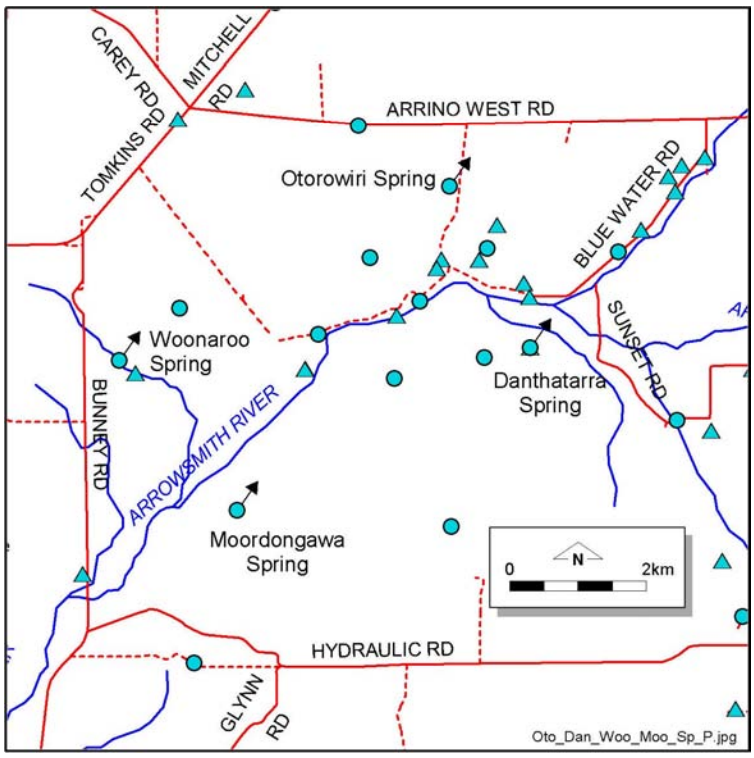
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: 800 mg/L



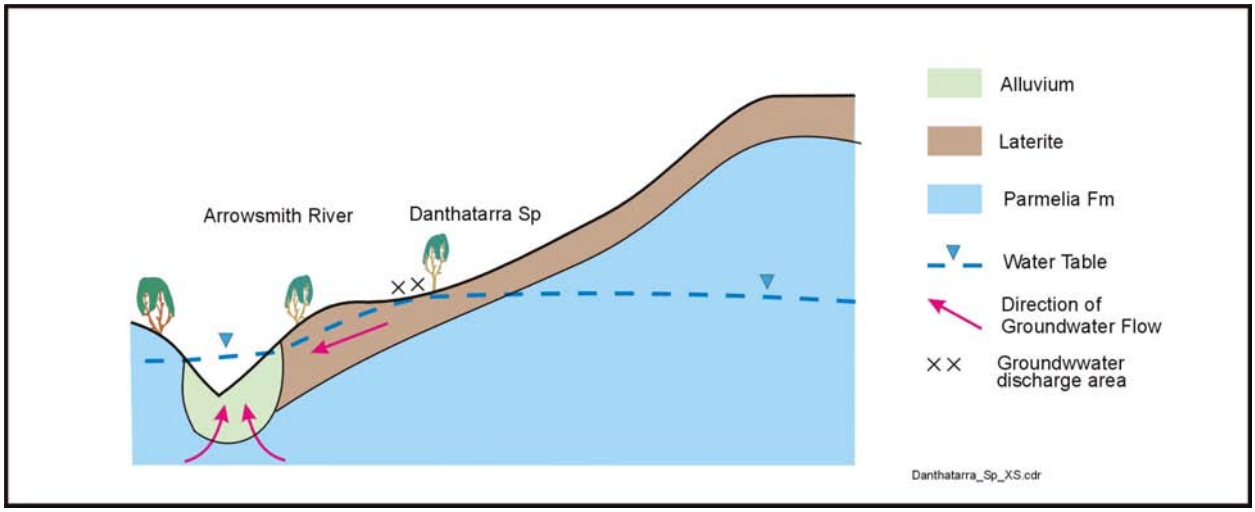
GDE Considerations:

- Water abstraction is likely to impact on GDE along the river
- Native vegetation predominantly located along the Arrowsmith River

Site Description:

- Spring located behind Dandaragan Scarp
- Groundwater flows towards the Arrowsmith River within the Parmelia Formation
- Spring is maintained by the water levels in the Parmelia Aquifer

Site Model:



Site #: 22

Name: Woonaroo Spring

Map Reference: Mingenew

Site Coord: (350654E: 6739500N)

Bores/Features: Woonaroo Sp.
Arrowsmith 4
AR18

Physiography/ Slope: Lower mid-slope

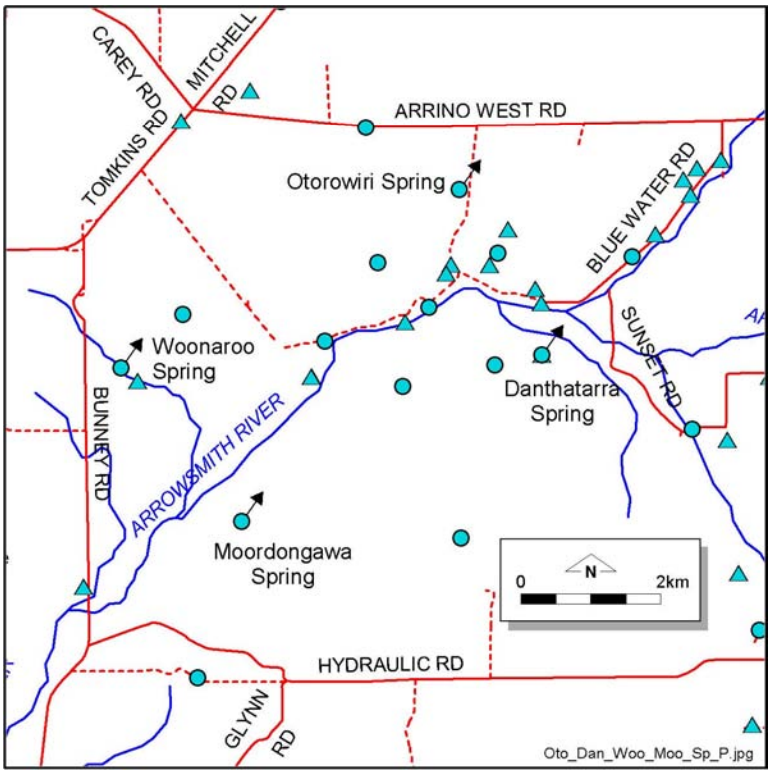
Geology: Parmelia Fm
Otorowiri Siltstone
Yarragadee Aquifer

Water/Ground Water Flow: Overflow from the Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: Unknown



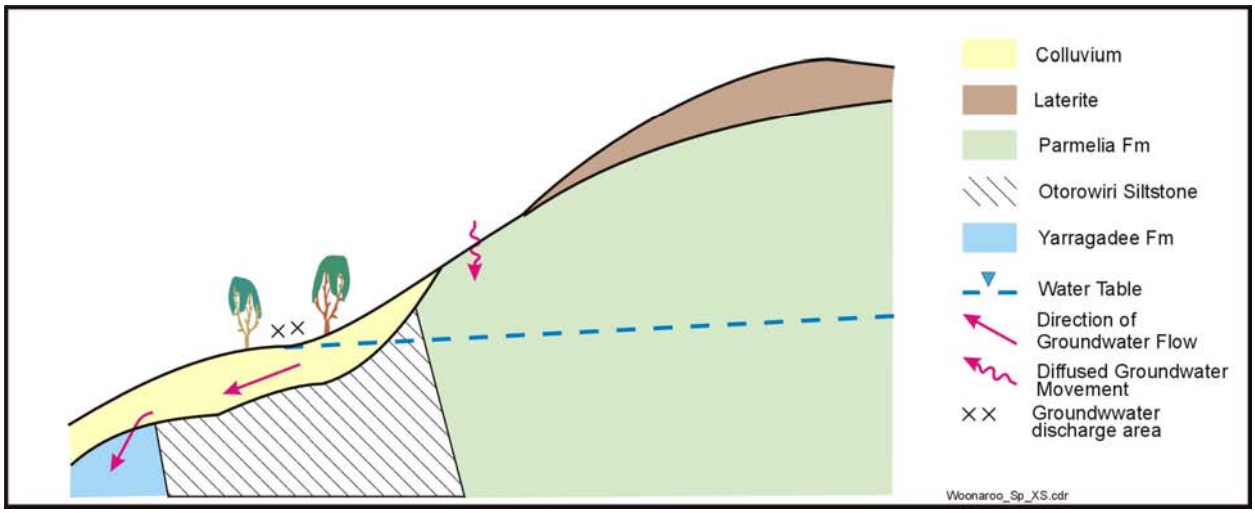
GDE Considerations:

- Water abstraction likely to impact on GDE

Site Description:

- Spring controlled by elevation i.e. base of Scarp
- Spring maintained by water levels from the Parmelia Aquifer
- Parmelia Aquifer mainly recharged by rainfall where outcropping

Site Model:



Site #: 23

Name: Moordongawa Spring

Map Reference: Mingenew

Site Coord: (352378E: 6737315N)

Bores/Features: Moordongawa Sp.
GA1 – GA15
AR4
AR8

Physiography/ Slope: Lower slope

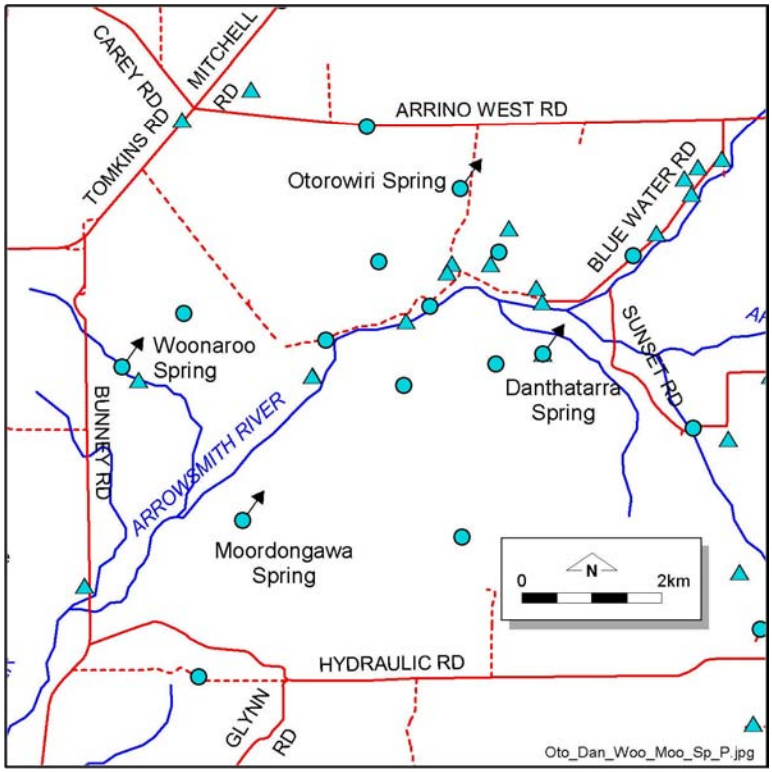
Geology: Parmelia Aquifer
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from the Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: Unknown



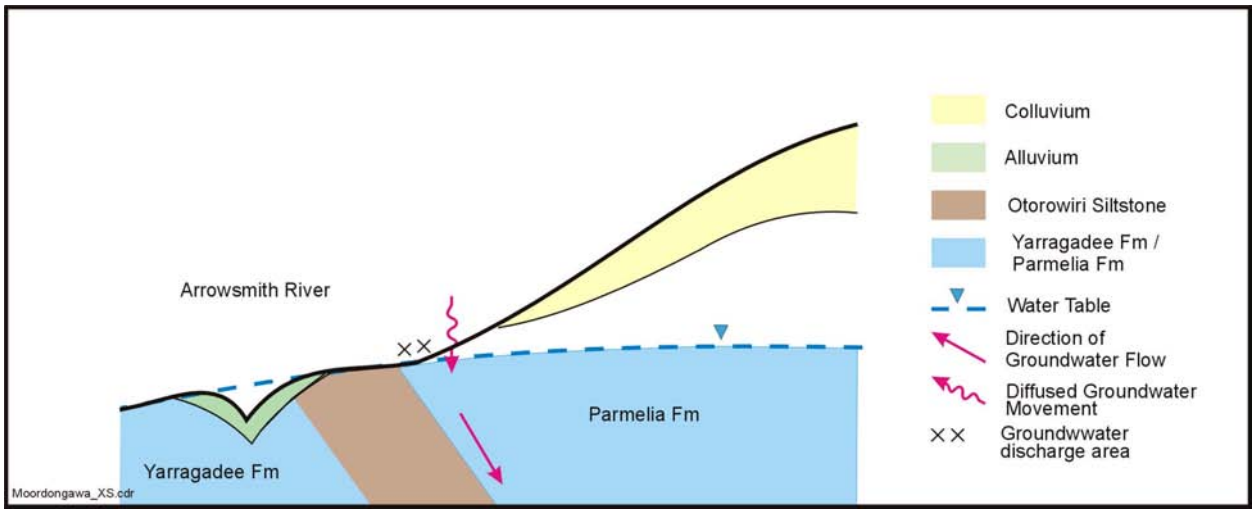
GDE Considerations:

- Water abstraction is likely to impact on GDE

Site Description:

- Spring maintained by water levels from the Parmelia Aquifer
- Parmelia Aquifer mainly recharged by rainfall where outcropping

Site Model:



Site #: 24

Name: Eramba Waterhole

Site Coord: (347531E: 6737170N)

Bores/Features: Eramba Waterhole
AR8
Woonaroo Sp.

Physiography/ Slope: Lower slope

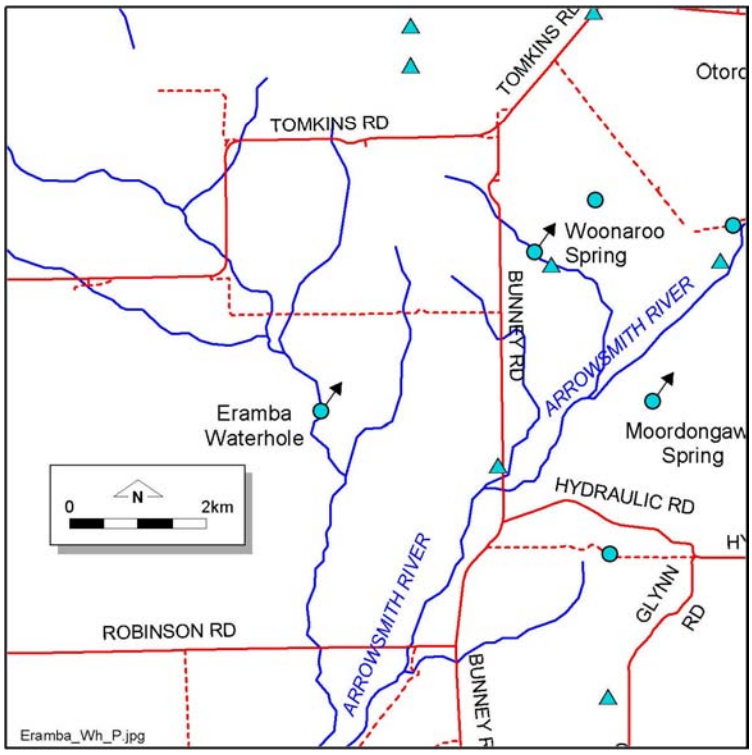
Geology: Yarragadee Fm

Water/Ground Water Flow: Perched system

Aquifer: Yarragadee Aquifer

Depth to WT: > 50 m bgl

Salinity: Unknown



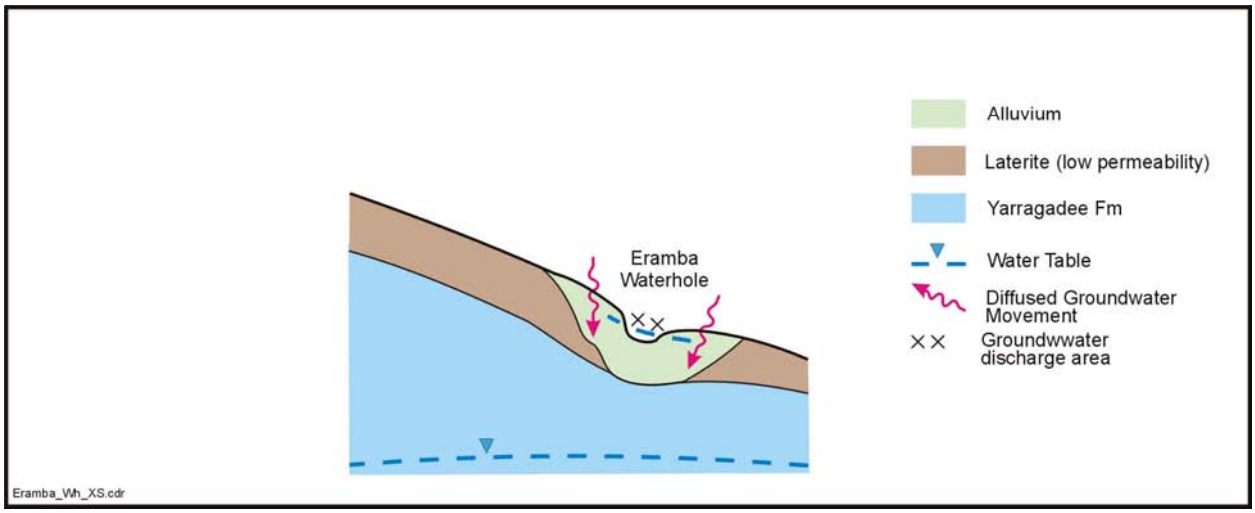
GDE Considerations:

- Not groundwater dependent
- Native vegetation in small patches at the site

Site Description:

- The waterhole is positioned within low permeability within the weathering profile of the Yarragadee Formation
- The presence of water at the site is dependent on rainfall and runoff
- The site is also highly prone to waterlogging

Site Model:



Site #: 25

Name: Indenuchba Spring

Map Reference: Arrowsmith-Beagle

Site Coord: (350576E: 6730868N)

Classification: GWD over Otorowiri

Bores/Features: #816, #817

Physiography/ Slope: Lower mid slope

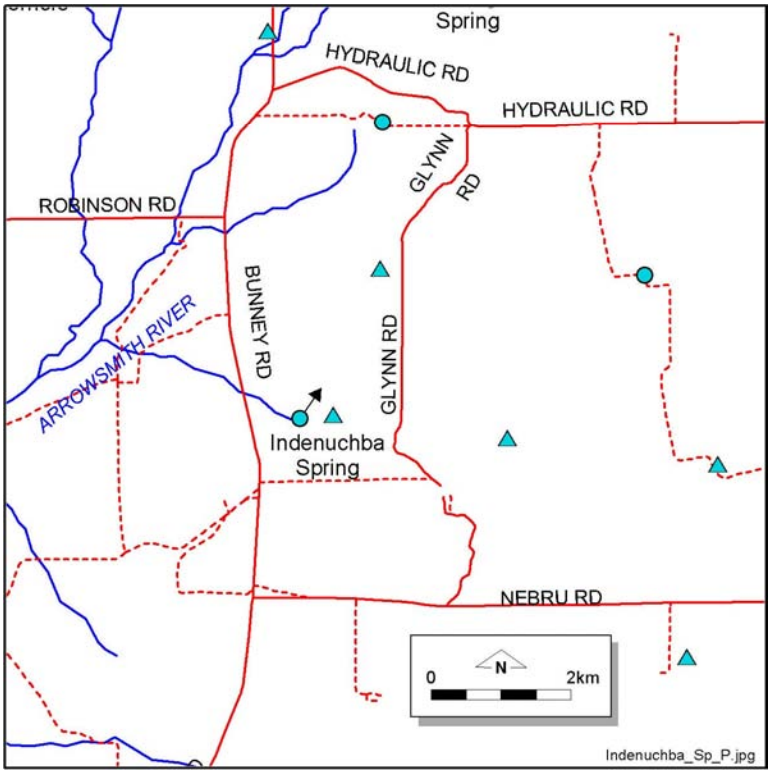
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 610-730 mg/L



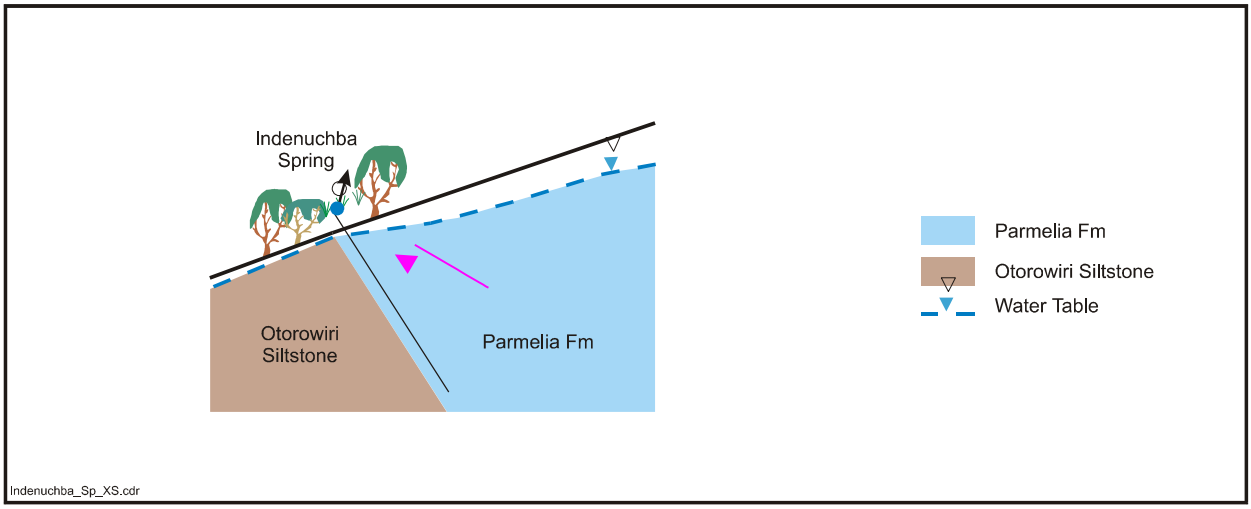
GDE Considerations:

- Pressure drop from water abstraction in the Parmelia Aquifer may impact on artesian springs and GDE
- Native vegetation mostly intact at the outcrop of Parmelia Formation

Site Description:

- Local recharge is by direct infiltration of rainfall at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The groundwater emerges as springs from saturated sediments in the Parmelia Aquifer along the Otorowiri Siltstone
- Groundwater in the Parmelia Formation is mostly utilised for stock and domestic water supply

Site Model:



Site #: 26

Name: Beharra Spring

Map Reference: Arrowsmith-Beagle Islands

Site Coord.: (320837E: 6729621N)

Bores/Features: LS28

Physiography/ Slope: Lower mid slope

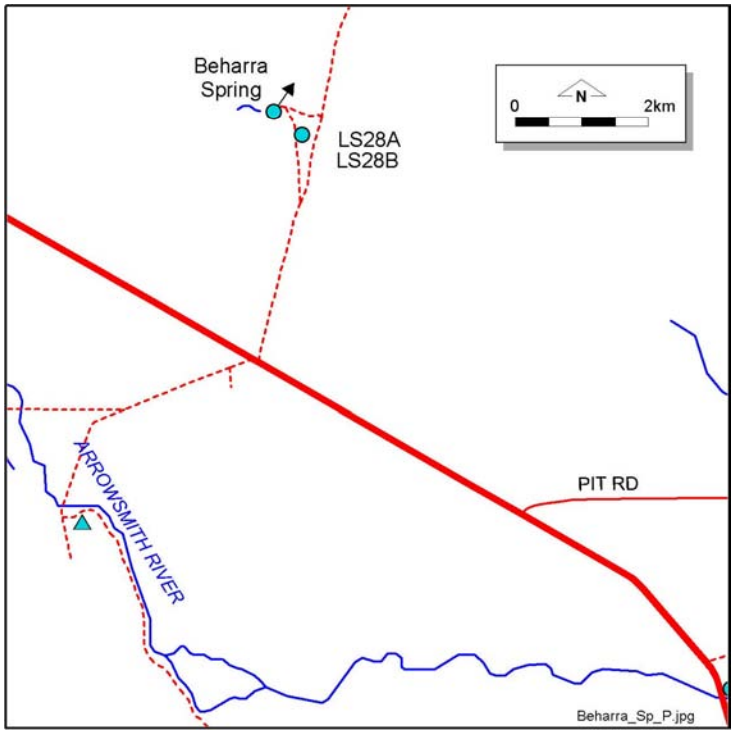
Geology: Guildford Formation
Yarragadee Formation

Water/Ground Water Flow: Westerly towards the coast

Aquifer: Guildford Aquifer

Depth to WT: At or near surface

Salinity: 810-910 mg/L



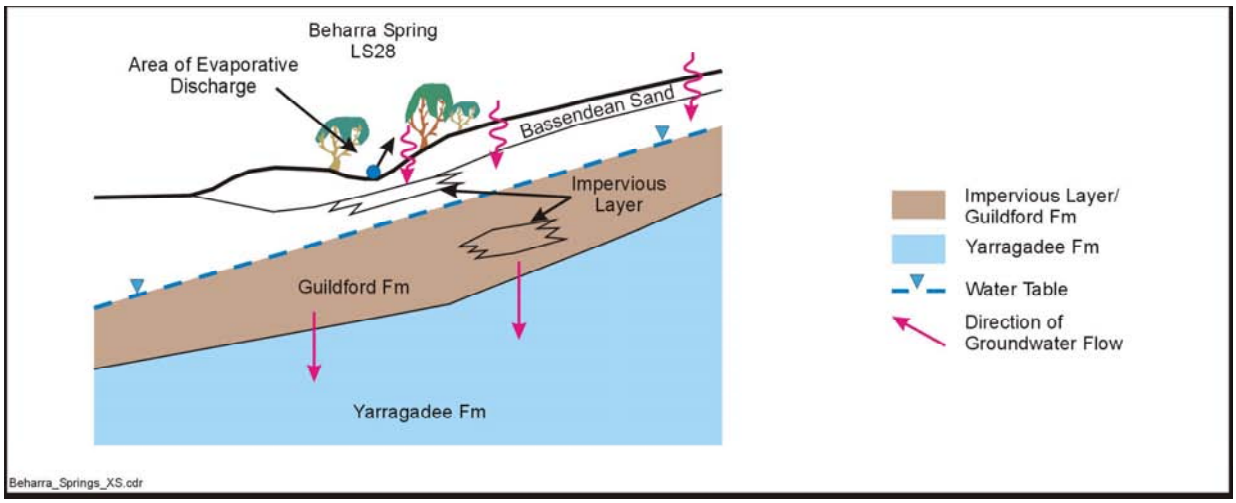
GDE Considerations:

- Abstraction may locally affect GDEs associated with the Guildford Aquifer
- Native vegetation cleared adjoining the wetland. Surrounding vegetation is still intact
- Groundwater from the Guildford Formation is mostly used for stock and domestic purposes
- Most groundwater in the area is abstracted from the underlying Yarragadee Formation for mineral-sands processing and agriculture

Site Description:

- The watertable is very close to the surface in low depressions
- Local recharge is by direct infiltration of rainfall through the Bassendean Sand
- Beharra Spring is associated with impervious sediments in the Guildford Formation (Guildford Clays)
- Downward hydraulic head gradients indicate discharge from the Guildford Fm into the Yarragadee Fm

Site Model:



Site #: 27

Name: Mooladarra Spring

Map Ref: Arrowsmith-Beagle

Site Coord: (350505E: 6725564N)

Bores/Features: Eneabba (5)

Physiography/ Slope: Lower mid slope

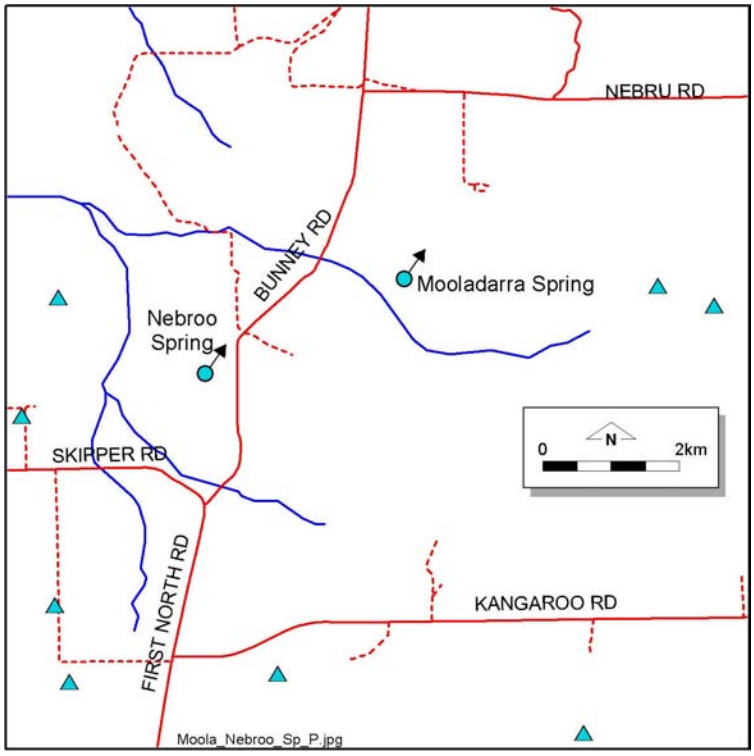
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from the Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: Unknown



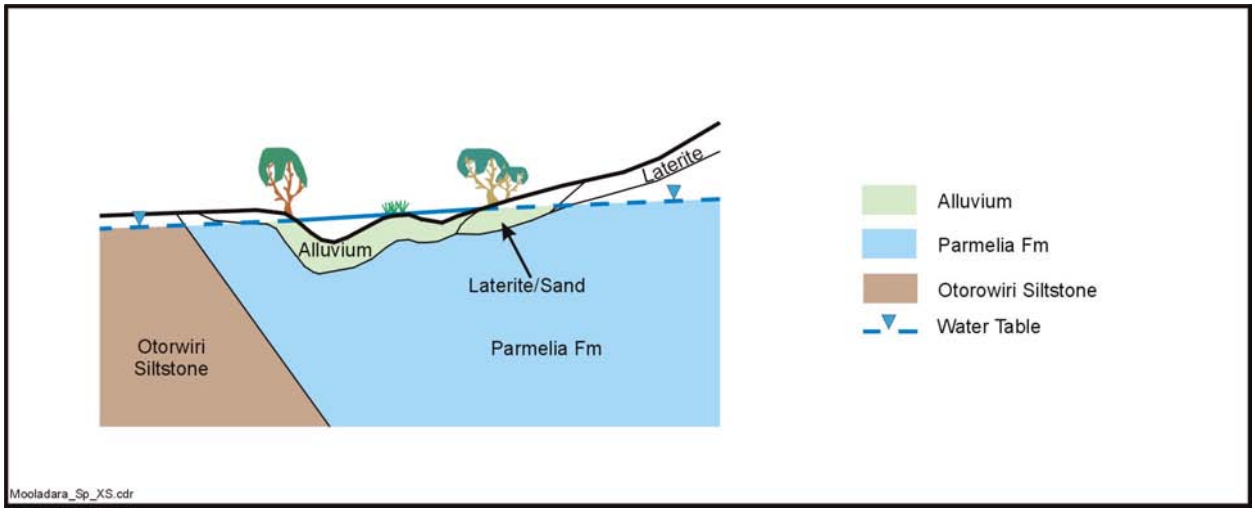
GDE Considerations:

- Pressure drop from water abstraction in the Parmelia Aquifer may impact on artesian springs and GDEs
- Native vegetation mostly intact at the GDE site

Site Description:

- Local recharge is via infiltration of rainfall through alluvium deposits and at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- Groundwater emerges as springs from saturated sediments in the Parmelia Aquifer along the Otorowiri Siltstone

Site Model:



Site #: 28

Name: Nebroo Spring

Map Reference: Arrowsmith-Beagle

Site Coord: (347600E: 6724180N)

Bores/Features: Nebroo Spring
Eneabba (5)

Physiography/ Slope: Lower mid slope

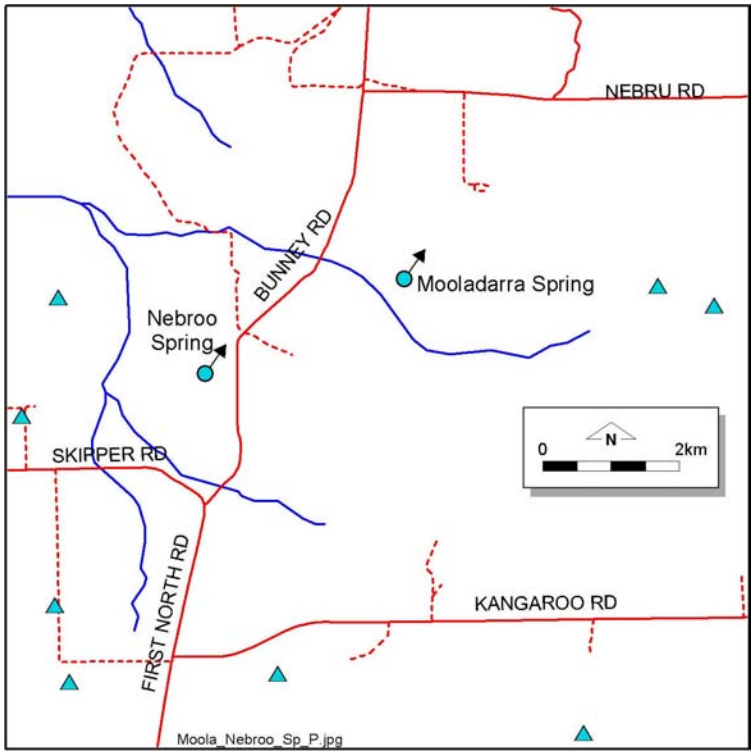
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: Unknown



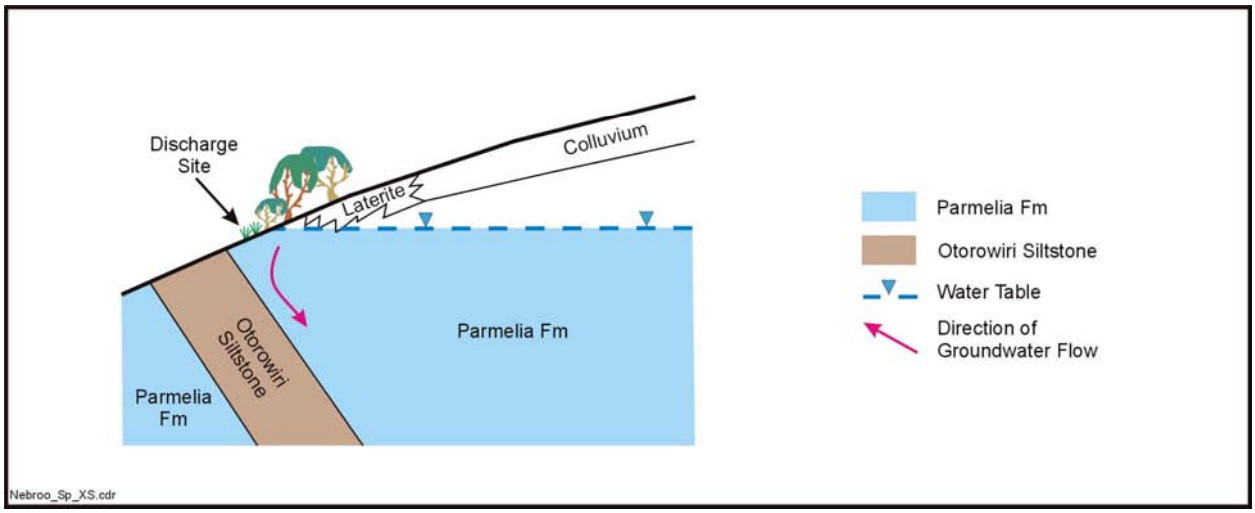
GDE Considerations:

- Water abstraction in the Parmelia Aquifer may impact on artesian springs and GDE
- Native vegetation mostly intact at the GDE site

Site Description:

- Local recharge is by direct infiltration of rainfall at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The groundwater emerges as springs from saturated sediments in the Parmelia Aquifer along the Otorowiri Siltstone

Site Model:



Site #: 29

Name: Donkey Spring

Map Reference: Arrowsmith-Beagle

Site Coord: (347925E: 6716540N)

Bores/Features: Donkey Spring
Eneabba (13)
No. 2

Physiography/ Slope: Lower mid slope

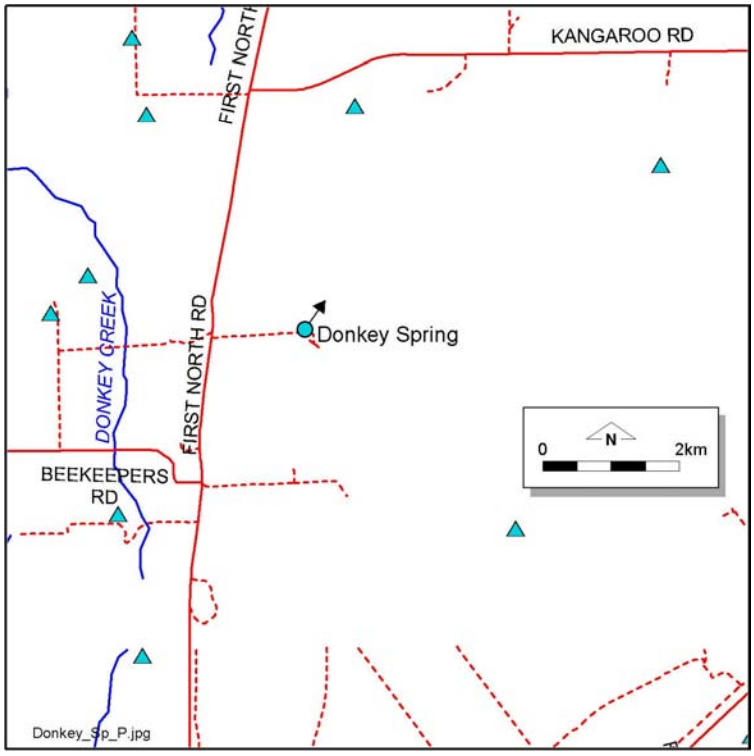
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from the Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: Unknown



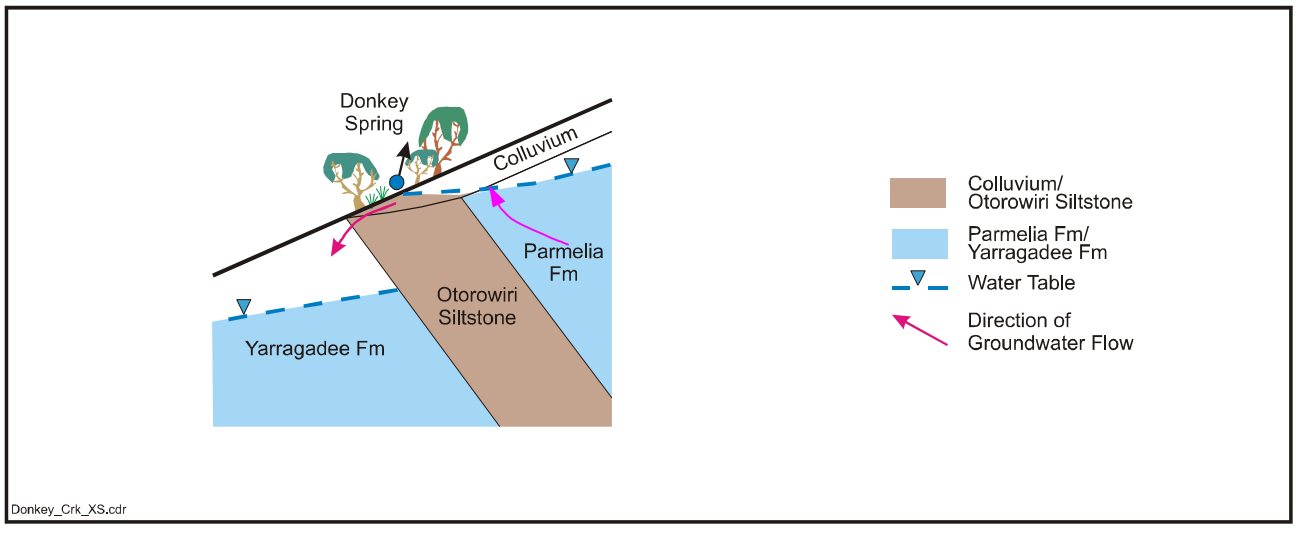
GDE Considerations:

- Pressure drop from water abstraction in the Parmelia Aquifer may impact on artesian springs and GDE
- Native vegetation mostly intact at the GDE site

Site Description:

- Local recharge is by direct infiltration of rainfall at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The groundwater emerges as springs from saturated sediments in the Parmelia Aquifer along the Otorowiri Siltstone
- Groundwater from the Parmelia Formation is used for stock and domestic water supply

Site Model:



Site #: 30

Name: Arrowsmith Lake

Map Reference: Arrowsmith-Beagle

Site Coord.: (314190E: 6730455N)

Bores/Features: LS27
KH2/KH3

Physiography/ Slope: Lower slope

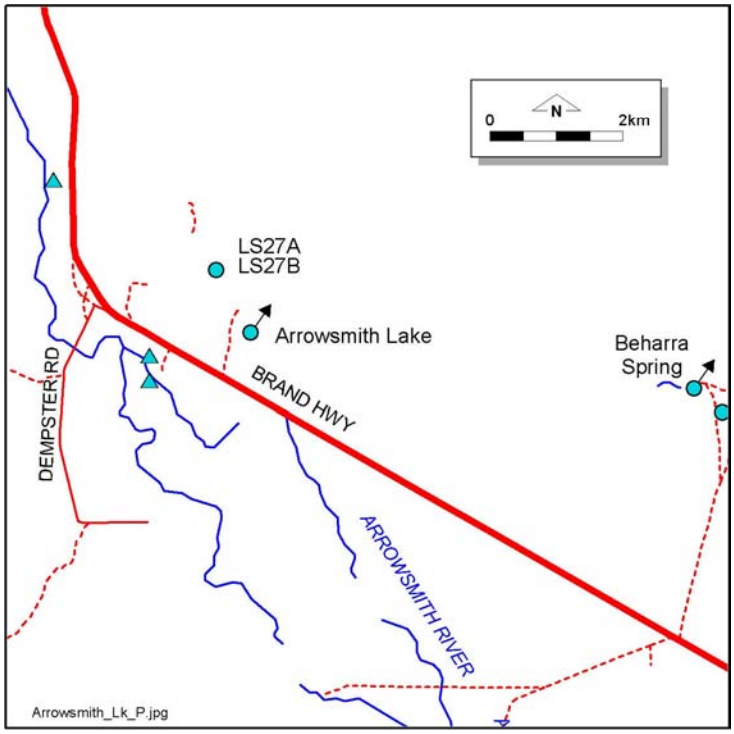
Geology: Tamala Limestone
Yarragadee Formation

Water/Ground Water Flow: Perched above the Tamala Limestone

Aquifer: Tamala Limestone

Depth to WT: 10 to 20 m bgl

Salinity: 430 mg/L



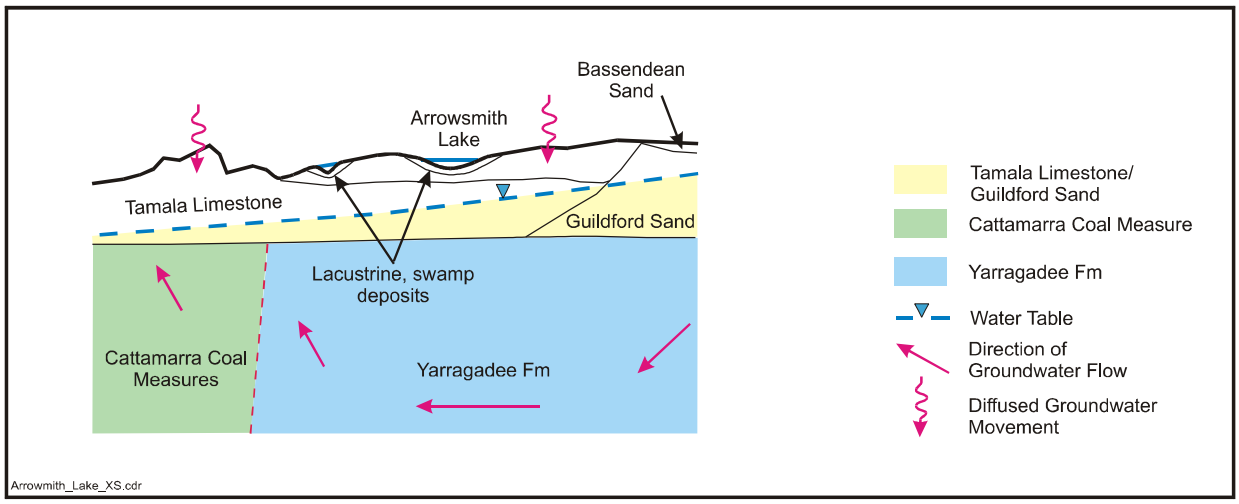
GDE Considerations:

- Not considered a groundwater dependent ecosystem
- Native vegetation mostly cleared downstream from Arrowsmith Lake and Green Grove Valley. Few isolated patches remain downstream from Green Grove Valley.

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- Arrowsmith Lake is perched above the watertable on top of Tamala Limestone due to less permeable lacustrine, swamp deposits
- Shallow swamps and lakes fill towards the end of winter from direct rainfall and runoff
- Groundwater from the Tamala Limestone is used for stock and domestic water supply

Site Model:



Site #: 31

Name: Knobby Head

Map Reference: Arrowsmith-Beagle

Site Coord: (303201E: 6717610N)

Bores/Features: LS22

Physiography/ Slope: Lower slope

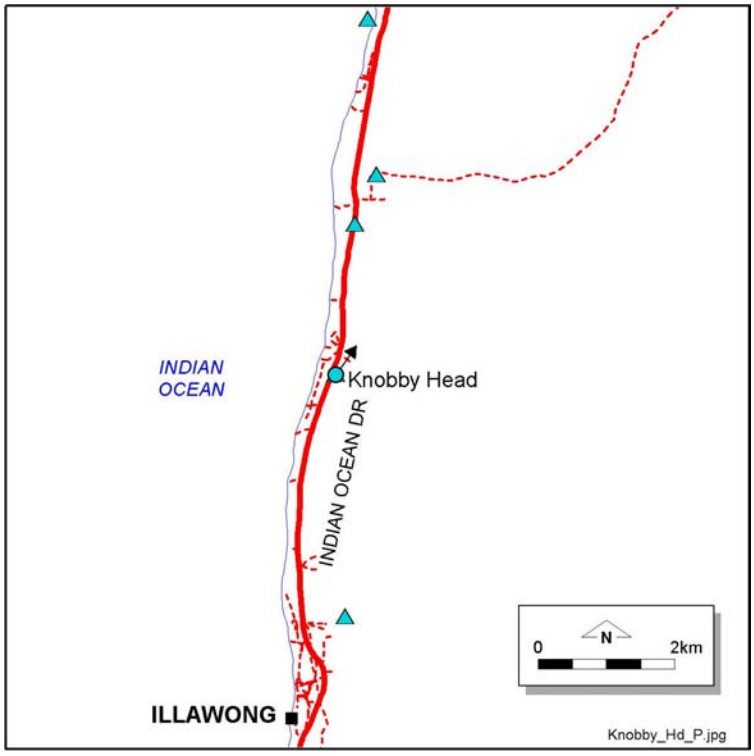
Geology: Tamala Limestone

Water/Ground Water Flow: Upward head from Cattamarra Coal

Aquifer: Tamala Limestone

Depth to WT: 0 to 10 m bgl

Salinity: 1215 mg/L



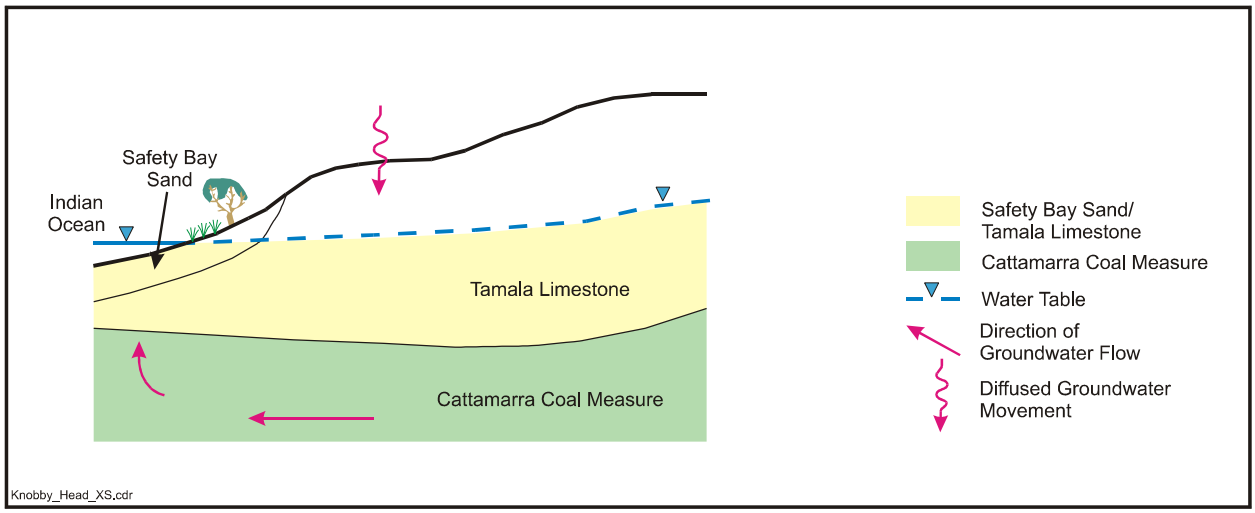
GDE Considerations:

- Over-extraction from the Tamala Limestone may cause saltwater intrusion into the aquifer, degrading the quality of the groundwater
- Coastal vegetation mostly intact surrounding well sites

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- Water levels maintained by sea level and upward heads from the Cattamarra Coal Measures

Site Model:



Site #: 32

Name: West Twin Hills lake system

Map Reference: Arrowsmith-Beagle

Site Coord: (322983E: 6708438N)

Classification: Ephemeral wetlands

Bores/Features: LS16/LS17

Physiography: Lower Slope

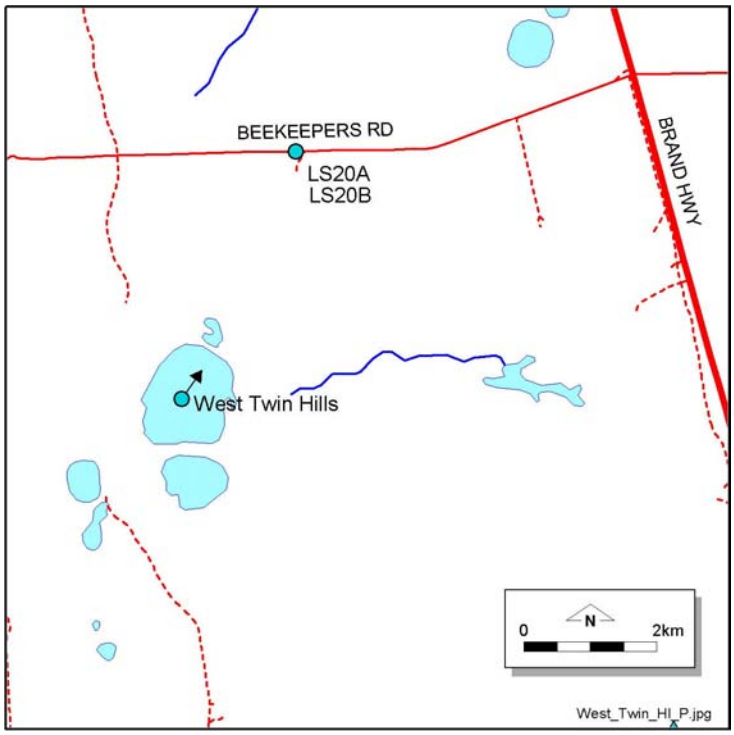
Geology: Tamala Limestone
Yarragadee Fm

Water/Ground Water Flow: Perched above the Tamala Limestone

Aquifer: Tamala Limestone

Depth to WT: Approx 10 m bgl

Salinity: Unknown



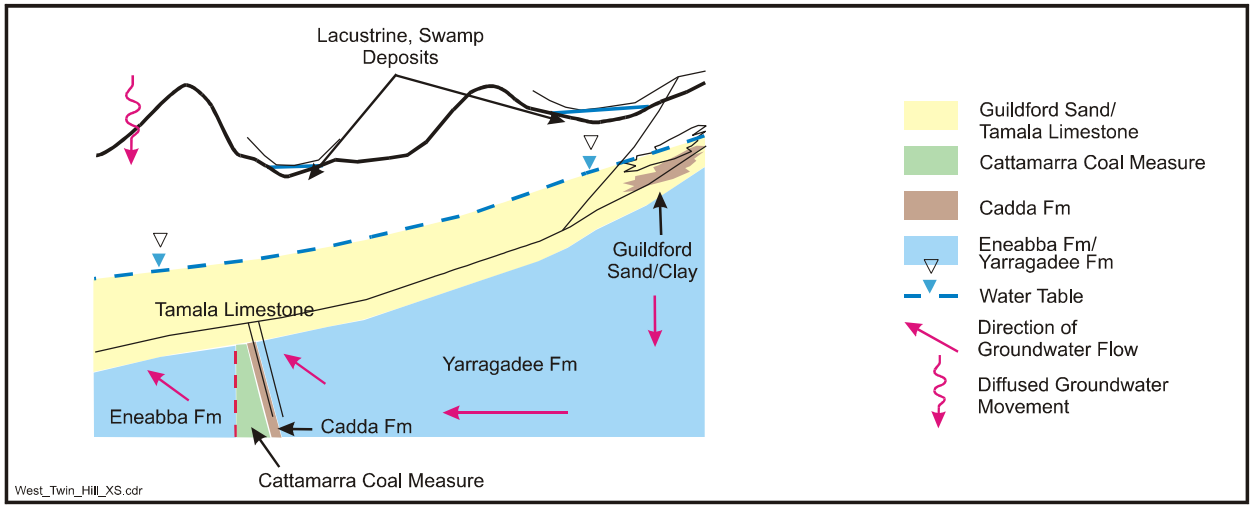
GDE Considerations:

- Not considered a groundwater dependent ecosystem
- Native vegetation partly cleared or lost from agricultural activities or ongoing decrease in the watertable

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- The lakes are perched above the watertable on top of the Tamala Limestone due to less permeable lacustrine and swamp deposits
- Shallow swamps and lakes fill towards the end of winter from direct rainfall, runoff, and groundwater flow when the watertable is high

Site Model:



Site #: 33

Name: Eneabba (No.2 Second Water Bore)

Map Reference: Arrowsmith-Beagle Islands

Site Coord: (334174E: 6703766N)

Bores/Features: No. 2 Second Water Bore
EL6/EL7

Physiography/ Slope: Base of Gingin Scarp

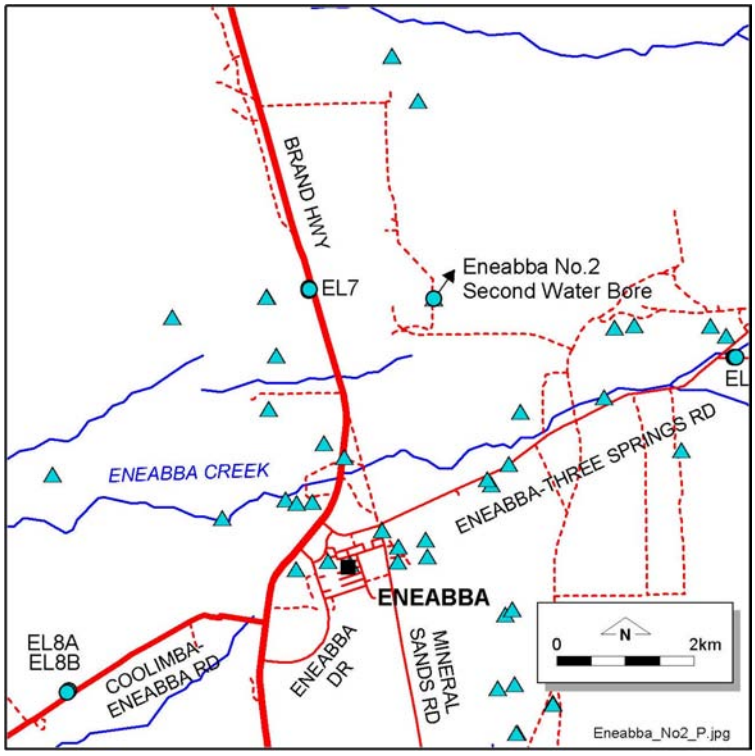
Geology: Yarragadee Fm

Water/Ground Water Flow: Perched system

Aquifer: Yarragadee Aquifer

Depth to WT: 40 to 50 m bgl

Salinity: 760 mg/L



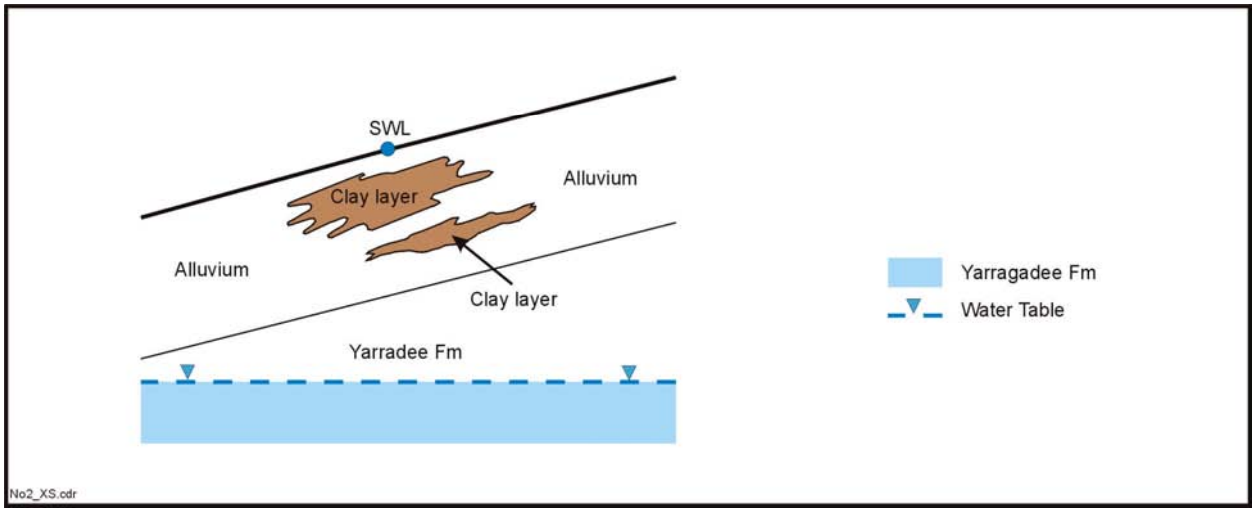
GDE Considerations:

- Not considered a groundwater dependent ecosystem
- Native vegetation mostly cleared at the site
- Groundwater from the Yarragadee Fm is used for mineral-sand processing at Eneabba. It is also used for the town water supply and for stock and domestic use

Site Description:

- Local recharge is by direct infiltration of rainfall through the alluvial deposits into the Yarragadee Formation
- Water level at the site is elevated above the watertable in the Yarragadee Aquifer (isolated from regional aquifer)
- Nearby creek (Eneabba Creek) discharges on to the alluvial at the base of Gingin Scarp
- Groundwater from the Yarragadee Fm is used for mineral-sand processing at Eneabba. It is also used for the town water supply and for stock and domestic use

Site Model:



Site #: 34

Name: Eneabba Spring

Map Reference: Arrowsmith-Beagle

Site Coord: (346193E: 6703401N)

Bores/Features: Eneabba Spring
EL4/EL5

Physiography/ Slope: Lower mid-slope

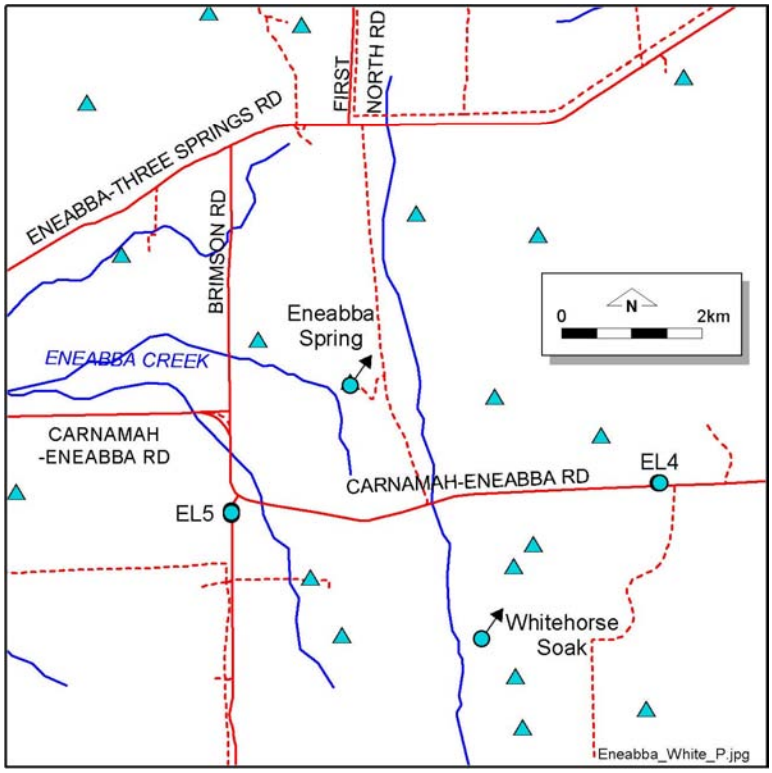
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 850 mg/L



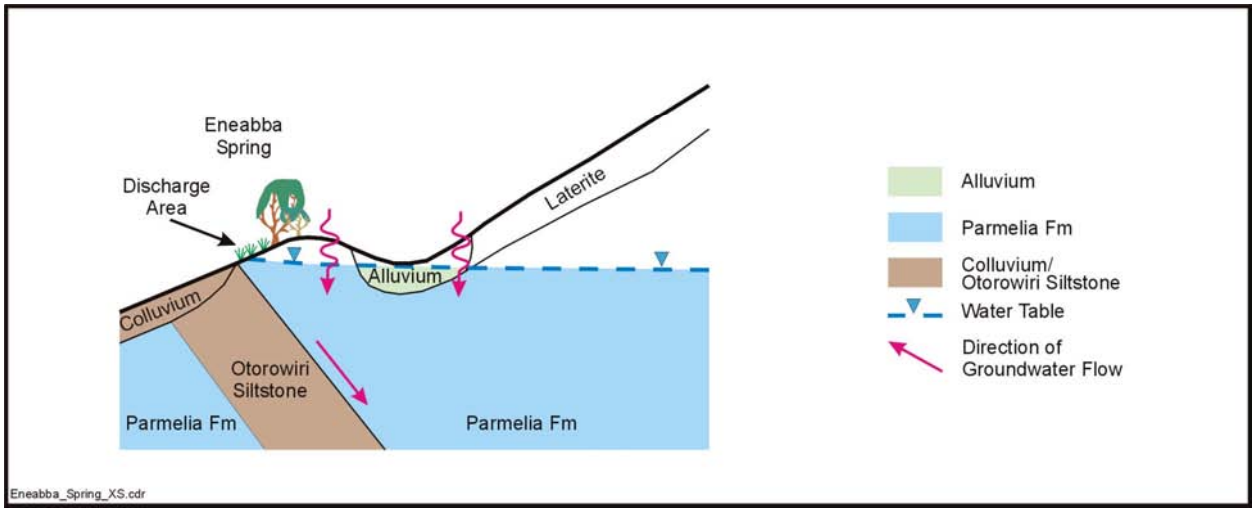
GDE Considerations:

- Pressure drop from water abstraction in the Parmelia Aquifer may impact on artesian springs and GDE
- Native vegetation mostly intact at the outcrop of Parmelia Formation

Site Description:

- Local recharge is by direct infiltration of rainfall at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The groundwater emerges as springs from saturated sediments in the Parmelia Aquifer along the Otorowiri Siltstone
- Groundwater in the Parmelia Formation is mostly utilised for stock and domestic water supply

Site Model:



Site #: 35

Name: Whitehorse Soak

Map Reference: Arrowsmith-Beagle

Site Coord: (348064E: 6699791N)

Bores/Features: Whitehorse Soak
EL4/EL5

Physiography/ Slope: Lower slope

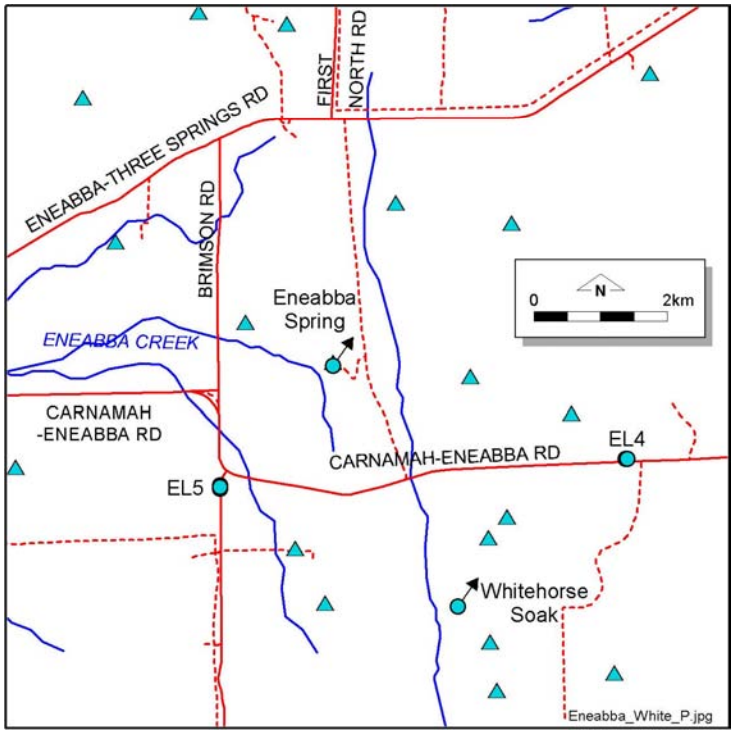
Geology: Parmelia Formation
Otorowiri Siltstone

Water/Ground Water Flow: Overflow from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: >4000 mg/L



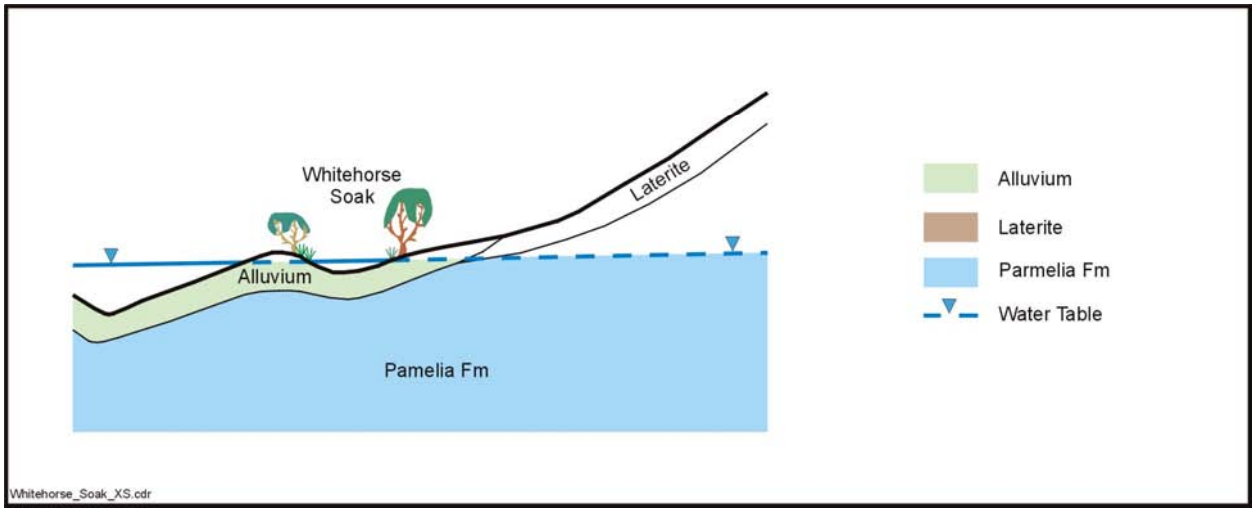
GDE Considerations:

- Pressure drop from water abstraction in the Parmelia Aquifer may impact on artesian springs and GDE
- Native vegetation mostly intact at the outcrop of Parmelia Formation

Site Description:

- Local recharge is via infiltration of rainfall through alluvium deposits and at the outcrop of the Parmelia Formation
- Watertable is close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The soak occurs in a small depression and represents the watertable of the Parmelia Aquifer
- Groundwater in the Parmelia Formation is mostly utilised for stock and domestic water supply

Site Model:



Site #: 36

Name: Lake Logue

Map Reference: Arrowsmith-Beagle

Site Coord: (320051E: 6696598N)

Bores/Features: Lake Logue
EL11/EL9

Physiography/ Slope: Lower slope

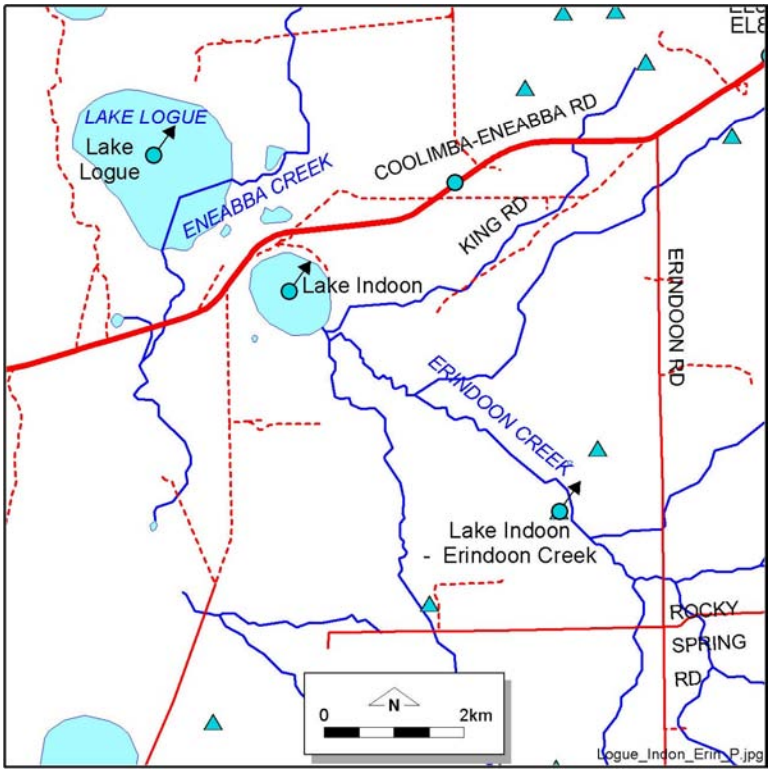
Geology: Tamala Limestone
Cattamarra Coal Measures

Water/Ground Water Flow: Perched system

Aquifer: Surficial deposits

Depth to WT: 10 to 15 m bgl

Salinity: 2550 mg/L



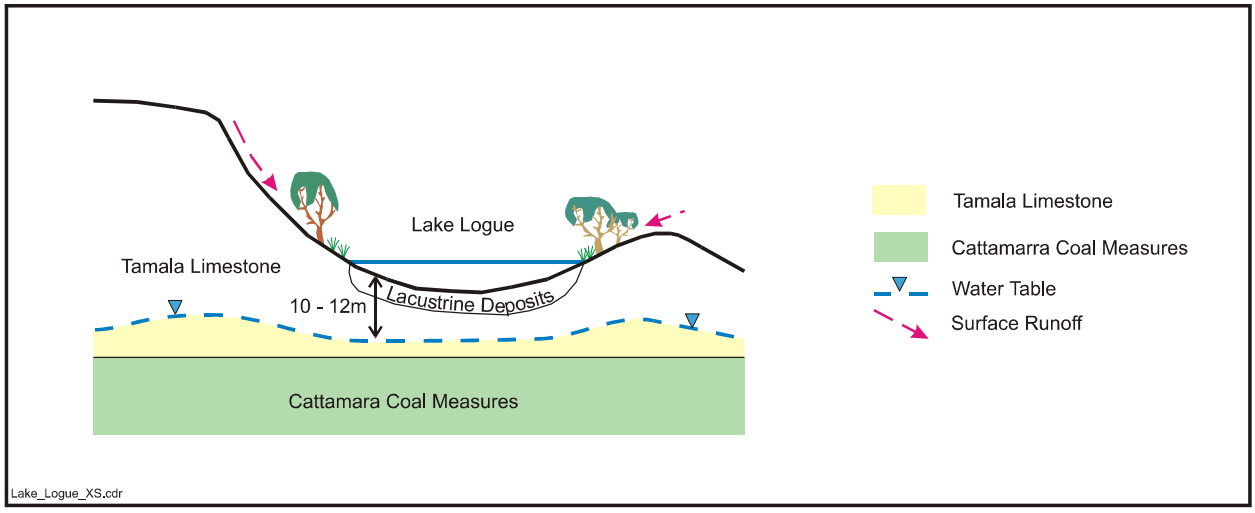
GDE Considerations:

- Not considered a groundwater dependent ecosystem
- Native vegetation intact within the Lake Logue Nature Reserve

Site Description:

- Local recharge is by surface runoff and direct infiltration of rainfall into the Tamala Limestone
- Lake Logue maintained by intermittent surface runoff
- The watertable is greater than 10 m deep underneath the lake, near the base of the Tamala Limestone
- Lake Logue is perched above the watertable and positioned within lacustrine, clay, and peat deposits
- Surface runoff flows directly into the cave system on the western edge of the lake

Site Model:



Site #: 37

Name: Lake Indoon

Map Reference: Arrowsmith-Beagle

Site Coord: (321982E: 6694663N)

Bores/Features: Lake Indoon/Logue
EL11/EL9

Physiography: Lower slope

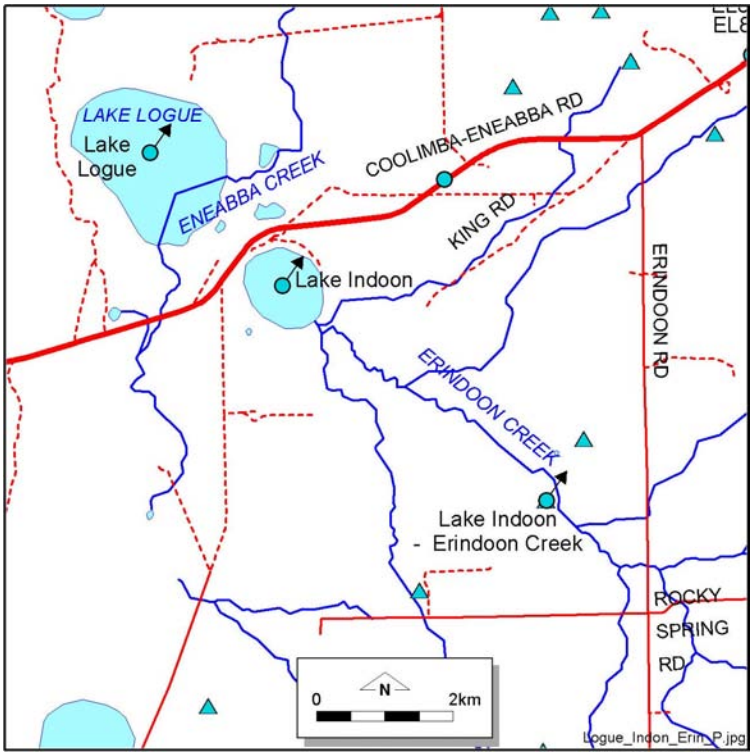
Geology: Tamala Limestone
Cattamarra CM

Water/Ground Water Flow: Upward head gradients from Cattamarra

Aquifer: Cattamarra Coal Measures

Depth to WT: Similar to lake levels

Salinity: Fresh to brackish



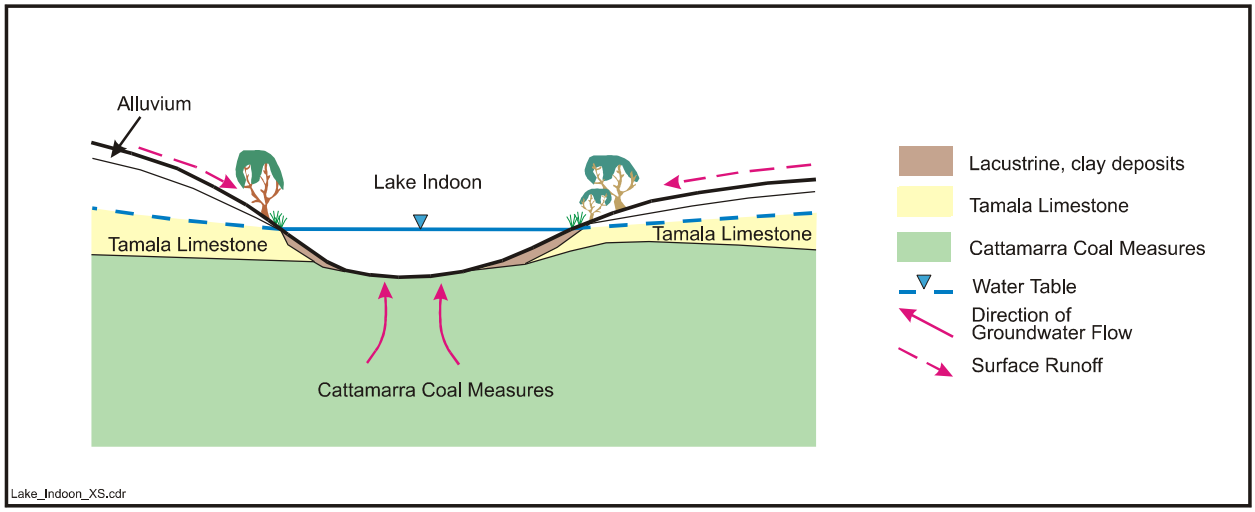
GDE Considerations:

- Hydrogeological understanding is poor due to lack of available information
- Over-extraction of groundwater from the Cattamarra Coal Measures may impact on GDE
- Upland vegetation is largely intact - vegetation cleared for agricultural activities to the south
- It is possible that Lake Indoon might be a perched lake

Site Description:

- Local recharge is by surface runoff and direct infiltration of rainfall into the Tamala Limestone
- Large catchment and groundwater connection with the Cattamarra Coal Measures contribute to maintain water levels in Lake Indoon

Site Model:



Site #: 38

Name: Bindoon – Erindoon Creeks

Map Reference: Arrowsmith-Beagle Islands

Site Coord: (325831E: 6691527N)

Bores/Features: No. 2/Eneabba (35)

Physiography/ Slope: Lower slope

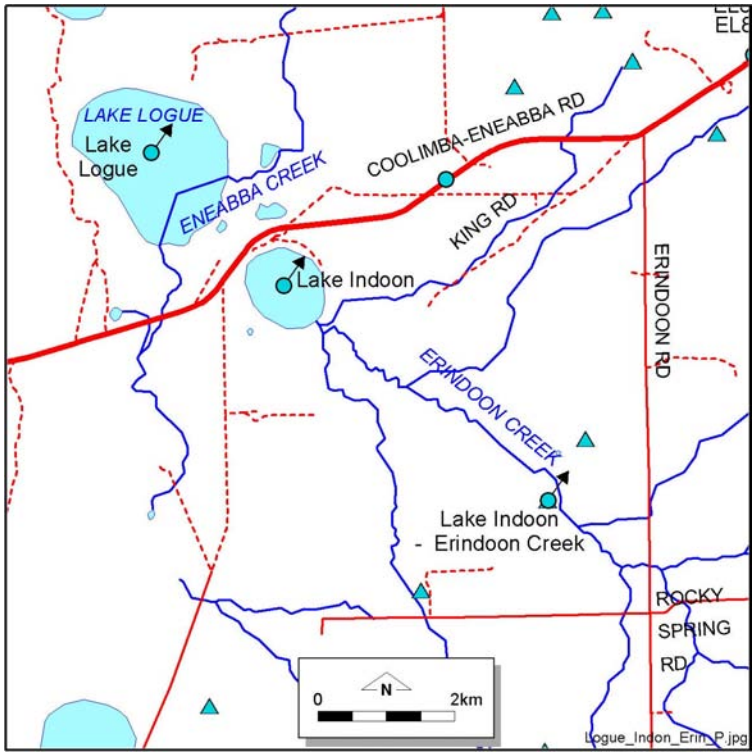
Geology: Cattamarra Coal Measures

Water/Ground Water Flow: Upward head gradients from Cattamarra

Aquifer: Cattamarra Coal Measures

Depth to WT: 0 to 5 m bgl

Salinity: 6000 mg/L



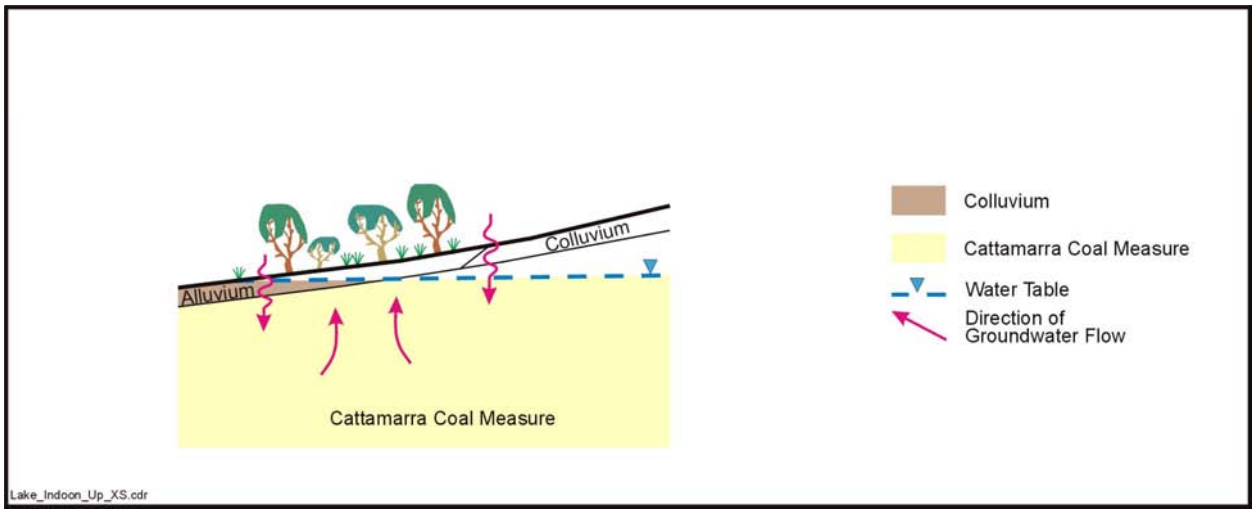
GDE Considerations:

- Over-extraction of groundwater from the Cattamarra Coal Measures used for farm water supplies may cause changes to the water regimes along the creeks
- Native vegetation intact in patches along Erindoon Creek
- Vegetation mostly cleared for agricultural activities along Bindoon Creek

Site Description:

- Local recharge is by surface runoff and direct infiltration of rainfall through alluvium deposits
- Shallow groundwater within the Cattamarra Coal Measures supports the base flows in the Erindoon and Bindoon Creeks

Site Model:



Site #: 39

Name: Rocky Spring

Map Reference: Arrowsmith-Beagle

Site Coord: (331078E: 6690309N)

Bores/Features: Rocky Spring

Physiography/ Slope: Mid-upper slope

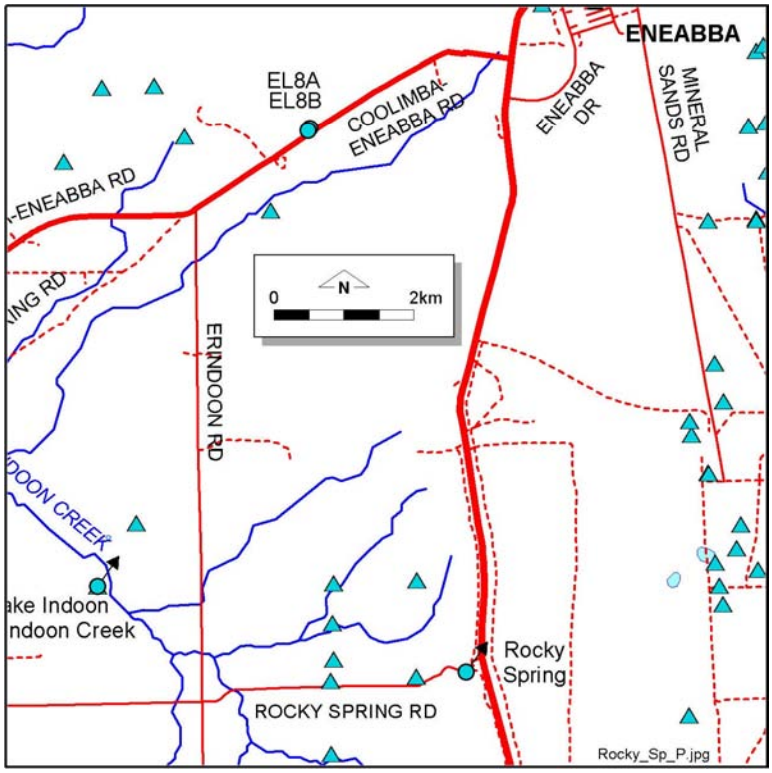
Geology: Yarragadee Formation
Cadda Formation
Cattamarra CM

Water/Ground Water Flow: Overflow from Yarragadee Aquifer

Aquifer: Yarragadee Aquifer

Depth to WT: 0 to 5 m bgl

Salinity: <1000 mg/L



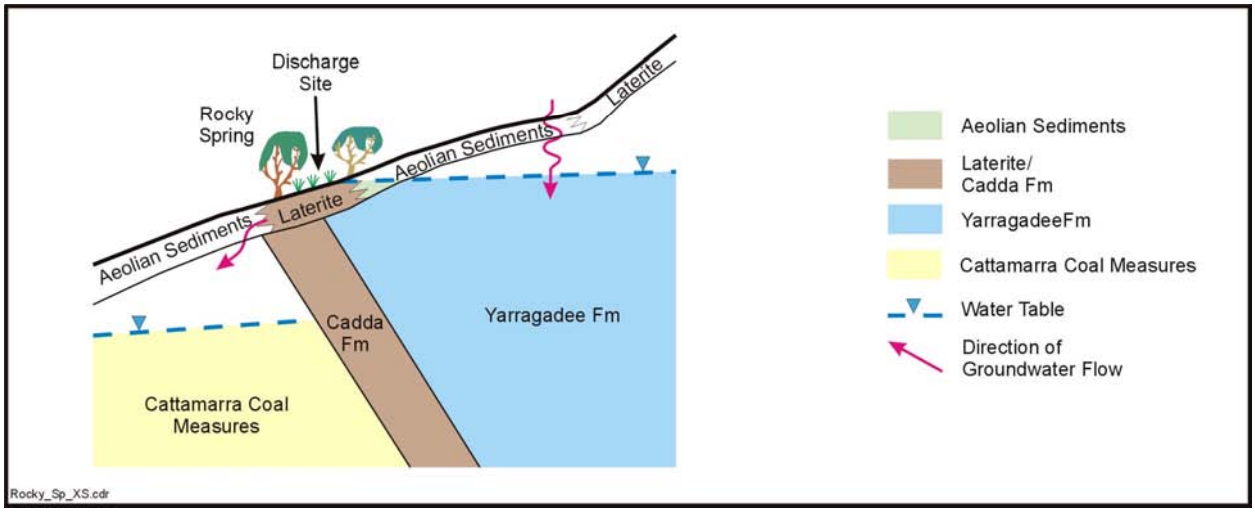
GDE Considerations:

- Over-extraction of groundwater from the Yarragadee Aquifer may impact on Rocky Spring
- Native vegetation intact as a band along the western side of the Brand Highway
- Vegetation mostly cleared to the west by agricultural and mining activities

Site Description:

- Local recharge is by direct infiltration of rainfall through the Bassendean Sand deposits
- The watertable is less than 10 m at the contact of the Cadda Formation near the base of the Gingin Scarp
- Rocky Spring represents discharge from the Yarragadee Formation through the sandy surficial sediments

Site Model:



Site #: 40

Name: Boolaroo Homestead 1

Map Reference: Arrowsmith-Beagle

Site Coord: (348202E: 6696085N)

Bores/Features: No.1
No.4

Physiography/ Slope: Lower slope

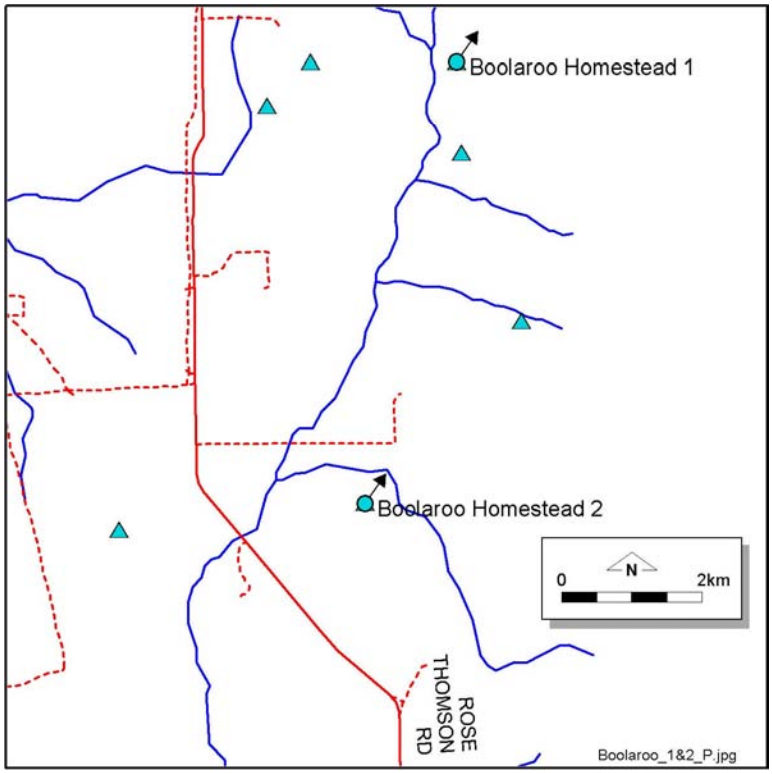
Geology: Yarragadee Formation
Otorowiri Siltstone

Water/Ground Water Flow: Baseflow in stream from Parmelia Aquifer

Aquifer: Parmelia Aquifer

Depth to WT: At or near surface

Salinity: 490 mg/L



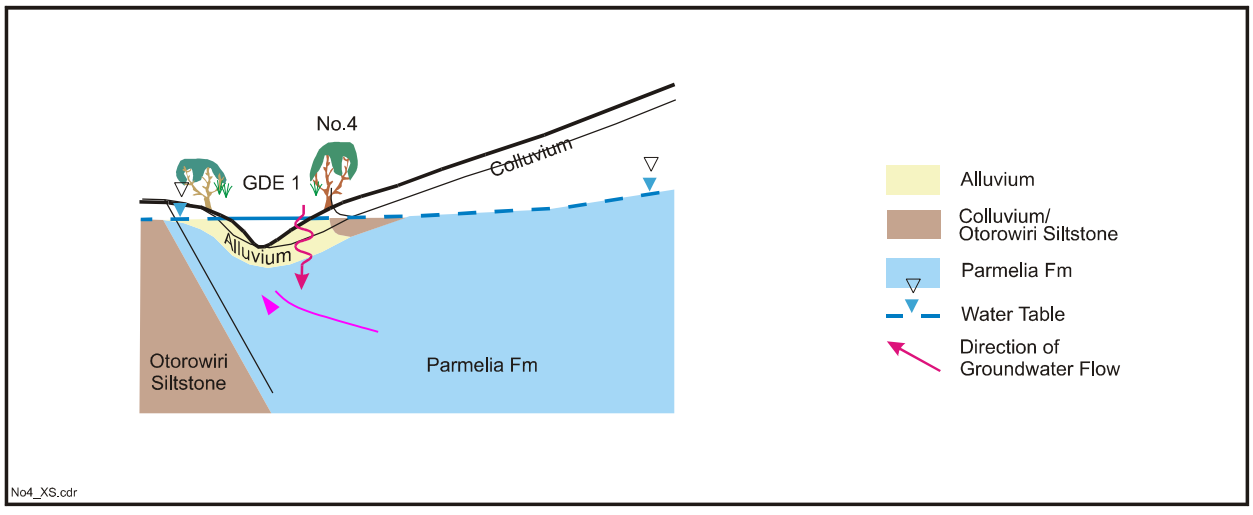
GDE Considerations:

- Abstraction from the Parmelia Aquifer may reduce river baseflow and potentially impact on the GDE
- Native vegetation mostly intact at the GDE site
- Low to absent vegetation for most of the river

Site Description:

- Local recharge is by direct infiltration of rainfall through alluvial deposits and at outcrop of the Parmelia Formation
- The watertable is very close to the surface at the contact of the Otorowiri Siltstone near the base of the Dandaragan Scarp
- The baseflow emerges as diffuse flow from saturated sediments in the Parmelia Aquifer underlying the stream and banks

Site Model:



Site #: 41

Name: Boolaroo Homestead 2

Map Reference: Arrowsmith-Beagle

Site Coord: (346892E: 6689787N)

Bores/Features: No.1
No.4

Physiography/ Slope: Lower slope

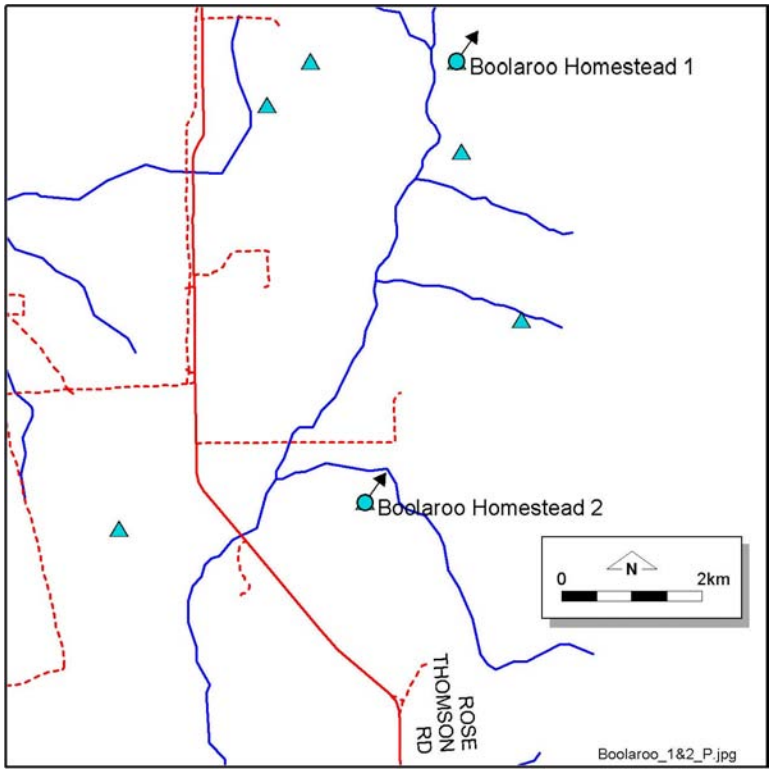
Geology: Otorowiri Siltstone
Yarragadee Fm

Water/Ground Water Flow: Baseflow in streams

Aquifer: Yarragadee Fm

Depth to WT:

Salinity: 2240 mg/L



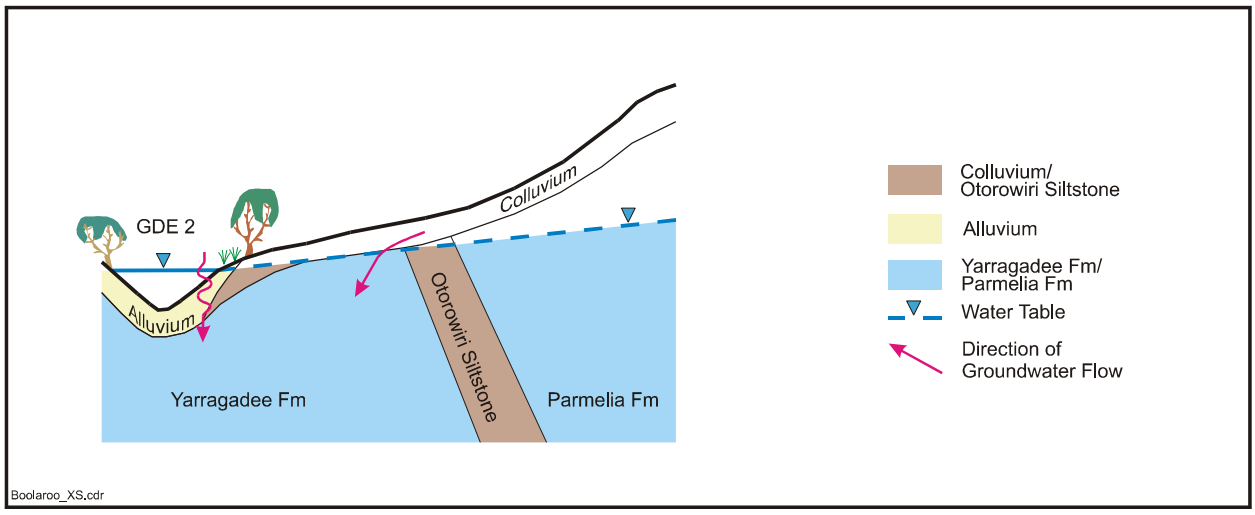
GDE Considerations:

- Abstraction from the Yarragadee Aquifer may reduce river baseflow and potentially impact on the GDE
- Small patch of remaining native vegetation
- Low to absent vegetation for most part of the river

Site Description:

- Local recharge is by direct infiltration of rainfall through alluvial deposits and by leakage from the Parmelia Aquifer
- Baseflow emerges as diffuse flow from saturated sediments in the Yarragadee Aquifer underlying the stream and banks
- Higher TDS, i.e. greater than 500 mg/L at Site #41, may originate from Parmelia discharge near Whitehorse Soak where TDS is greater than 4000 mg/L

Site Model:



Site #: 42

Name: Leeman Lagoon

Map Reference: Arrowsmith-Beagle

Site Coord: (309482E: 6682784N)

Bores/Features: Leeman Observation/ LS12

Physiography/ Slope: Lower slope

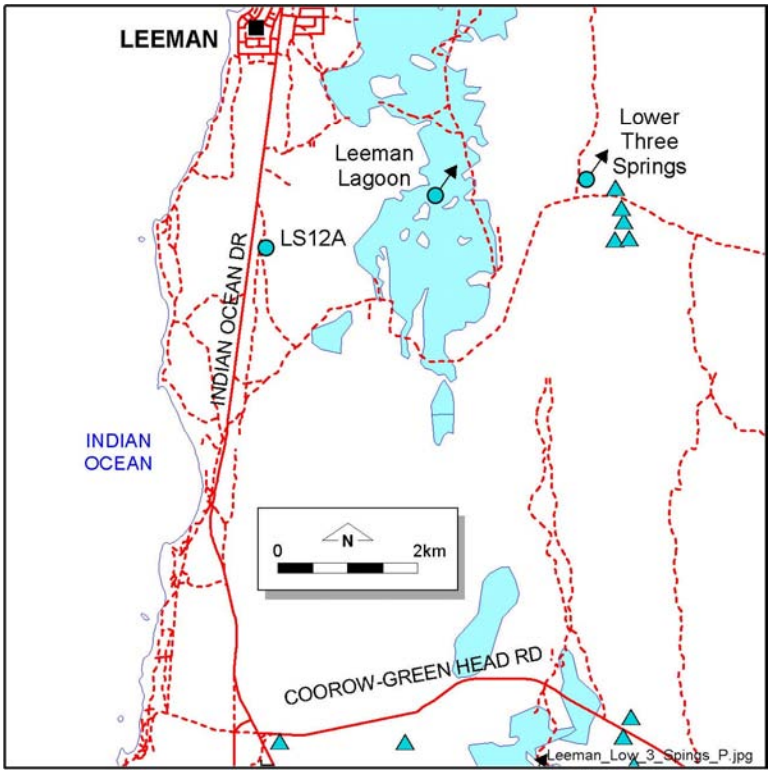
Geology: Tamala Limestone

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 34 000 mg/L



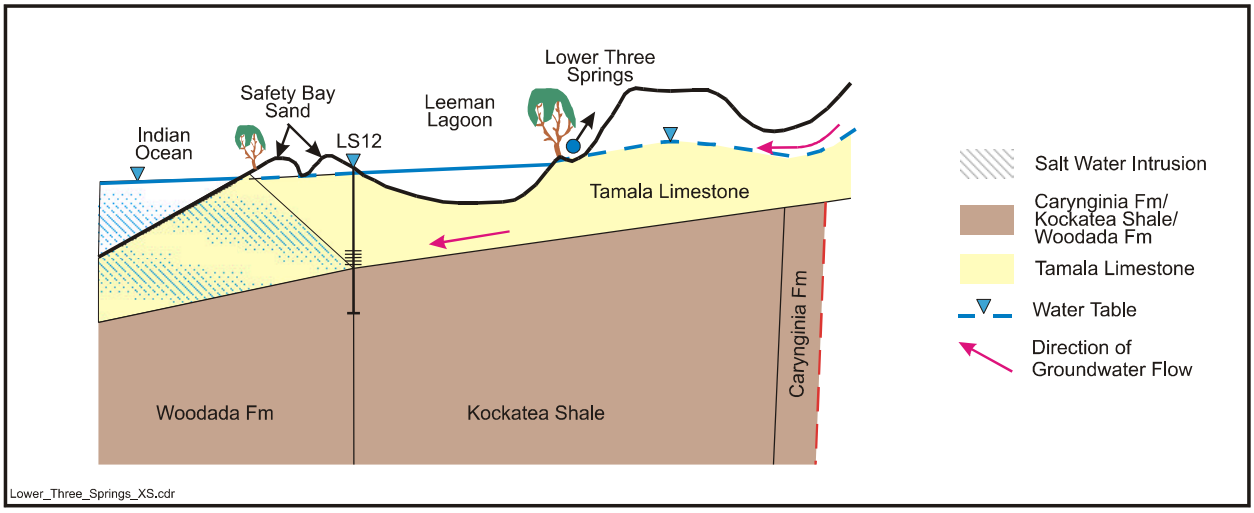
GDE Considerations:

- Over-extraction from the Tamala Limestone may cause saltwater intrusion into the aquifer
- Coastal vegetation mostly intact surrounding the Leeman Lagoon

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- Kockatea Shale underlying the Tamala Limestone provides an impermeable base preventing downward leakage
- Waterlevels are influenced by tidal fluctuations
- Leeman Lagoon is an area of evaporative discharge causing the lake to dry out to salt pan
- Leeman production bores abstract groundwater for town water supply from the Tamala Limestone

Site Model:



Site #: 43

Name: Lower Three Springs

Map Reference: Arrowsmith-Beagle Islands

Site Coord: (303634E: 6683015N)

Bores/Features: Leeman bores

Physiography/ Slope: Lower slope

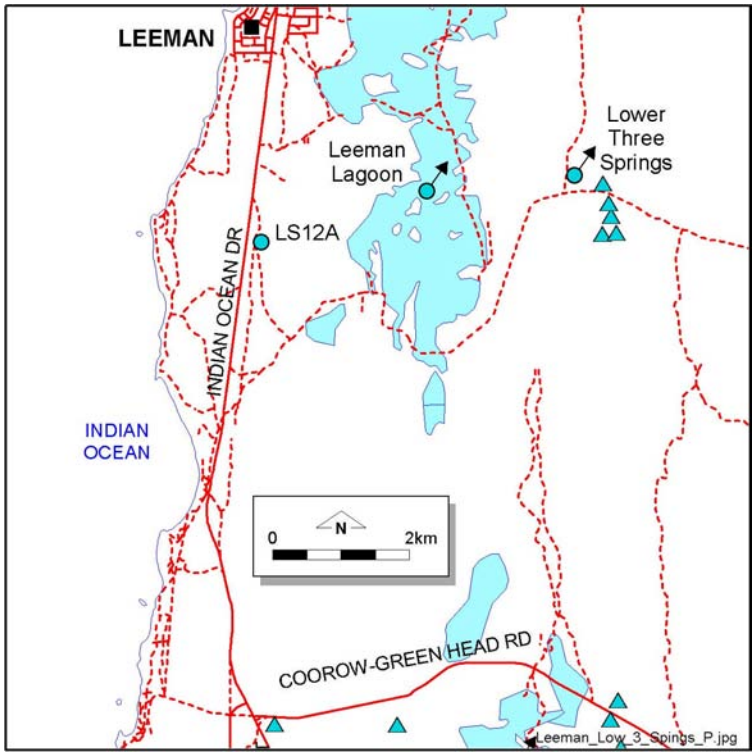
Geology: Tamala Limestone

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: 760 - 860 mg/L



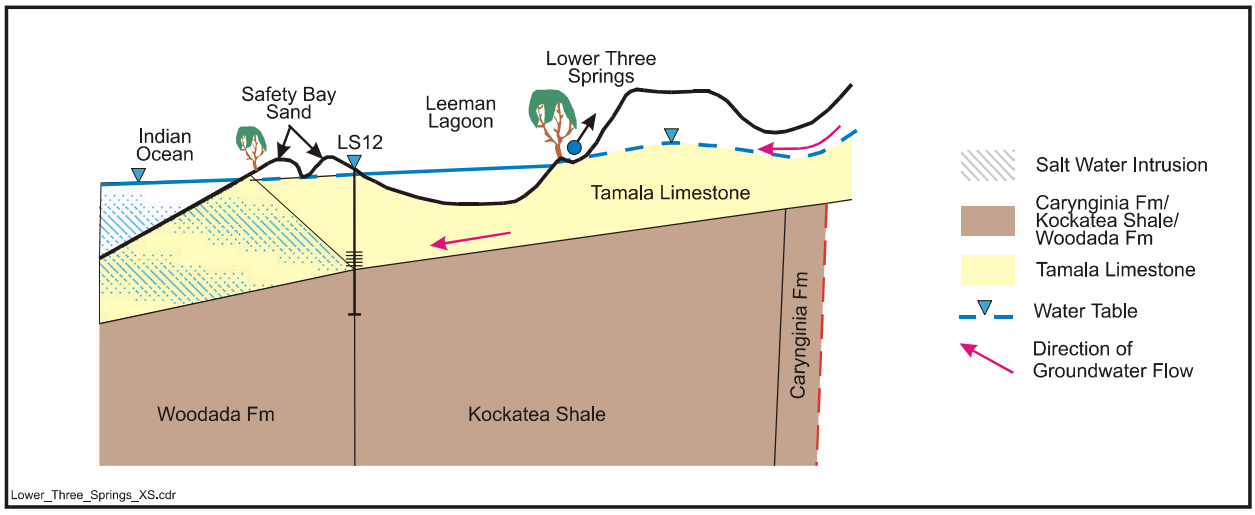
GDE Considerations:

- Over-extraction from the Tamala Limestone may cause saltwater intrusion into the aquifer
- Coastal vegetation mostly intact surrounding the Leeman Lagoon

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- Kockatea Shale underlying the Tamala Limestone provides an impermeable base preventing downward leakage
- Water levels are regulated by groundwater and sea level
- Spring discharge occurs from the Tamala Limestone in low depressions
- Leeman observation and production bores abstract groundwater for town water supply from the Tamala Limestone

Site Model:



Site #: 44

Name: Three Springs

Map Reference: Arrowsmith-Beagle

Site Coord: (315569E: 6681435N)

Bores/Features: Three Springs Bore
LS13

Physiography / slope: Lower Slope

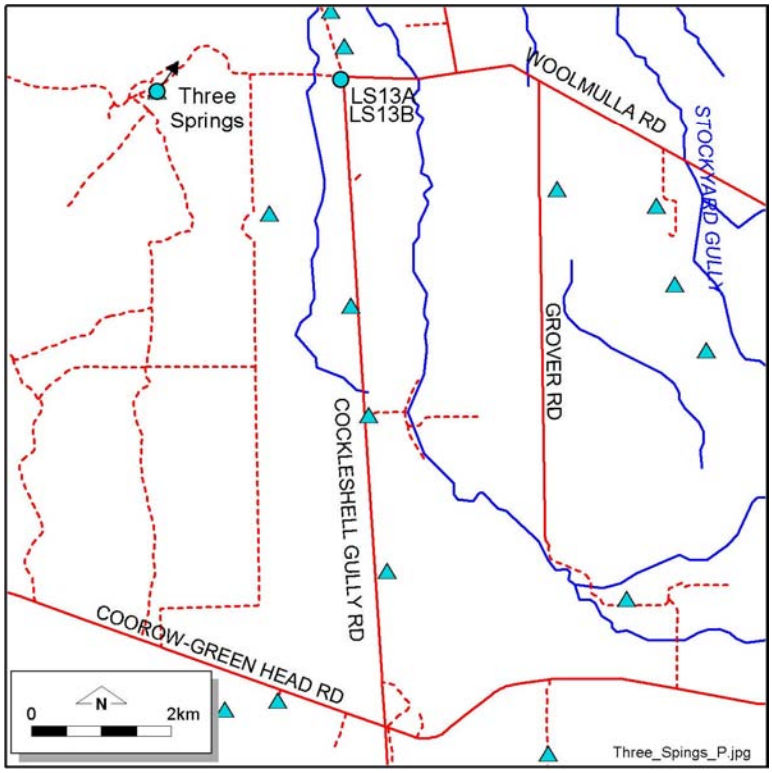
Geology: Tamala Limestone
Eneabba Fm

Water/Ground Water Flow: Upward discharge from Eneabba Fm

Aquifer: Superficial deposits

Depth to WT: At or near surface

Salinity: 520 mg/L



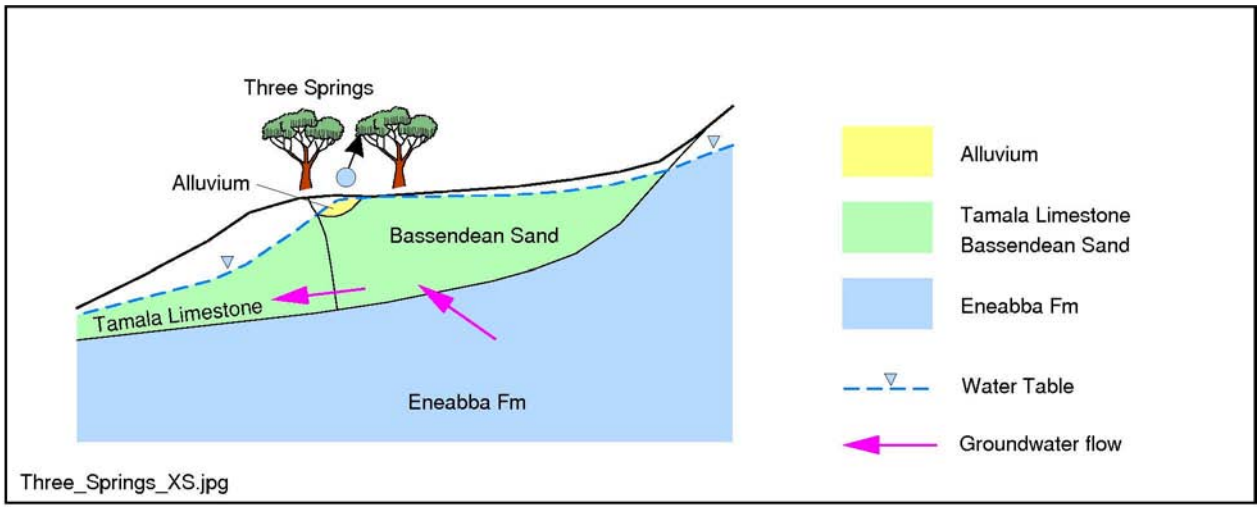
GDE Considerations:

- Over-extraction from the Eneabba Formation may cause decline in the water levels and impact on the GDE
- Native vegetation mostly intact surrounding the spring site, cleared at the site

Site Description:

- Local recharge is by direct infiltration of rainfall on the outcrop of the Eneabba Fm and alluvium deposits
- Eneabba Formation aquifer discharges into the overlying Tamala Limestone along the Beagle Fault
- Groundwater in the Eneabba Formation is extracted for the Leeman-Green Head town water supply

Site Model:



Site #: 45

Name: Green Head Lagoonal Lake

Map Reference: Hill River – Green Head

Site Coord: (308775E: 674409N)

Bores/Features: Green Head bores for town water supply

Physiography/ Slope: Lower slope

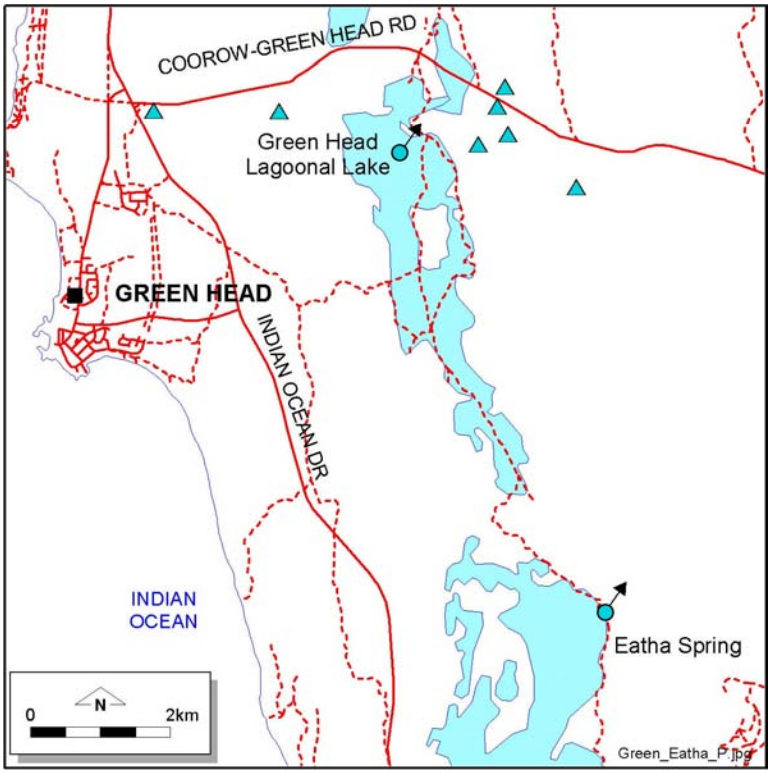
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 520 mg/L



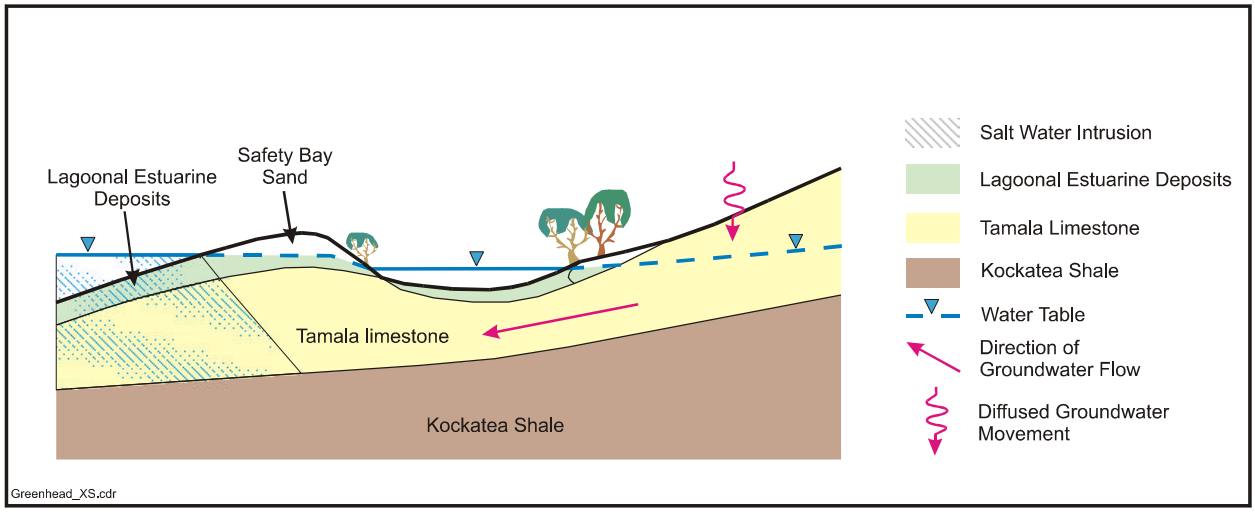
GDE Considerations:

- Over-extraction from the Tamala Limestone may cause decline in the water levels and impact on the GDE
- Coastal vegetation mostly intact surrounding the wetland area

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- The Kockatea Shale underlying the Tamala Limestone provides an impermeable base preventing downward leakage
- Water levels are very close to surface at low elevations
- Green Head Lagoon is an area of evaporative discharge causing the lake to dry out to salt pan

Site Model:



Site #: 46

Name: Warradarge Spring

Map Reference: Hill River – Green Head

Site Coord: (343880E: 6673355N)

Bores/Features: Warradarge Spring
Warradarge 1/71

Physiography/ Slope: Mid-slope

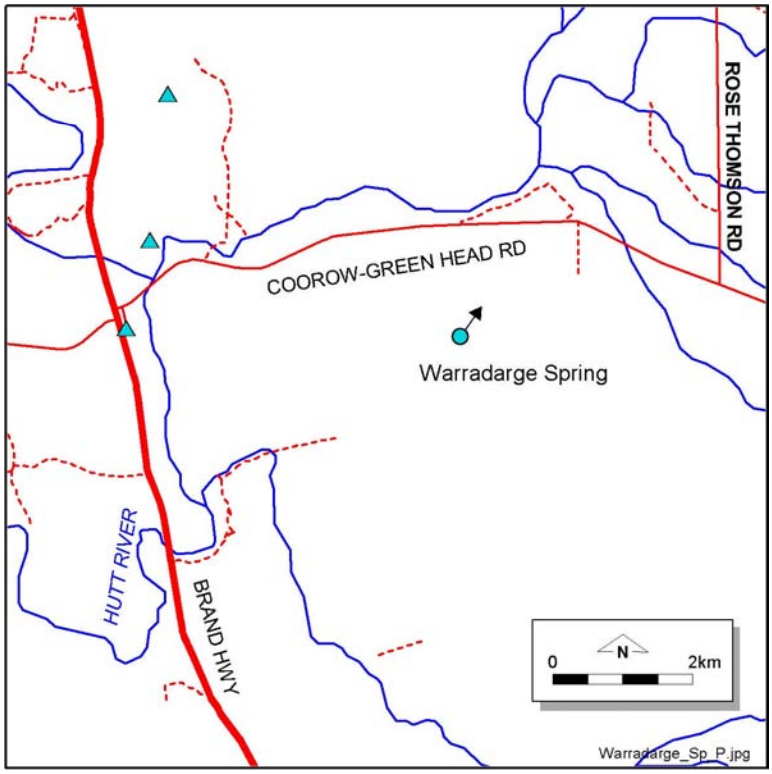
Geology: Yarragadee Formation

Water/Ground Water Flow: Perched system

Aquifer: Shallow perched aquifer

Depth to WT: >50 m bgl

Salinity: Unknown



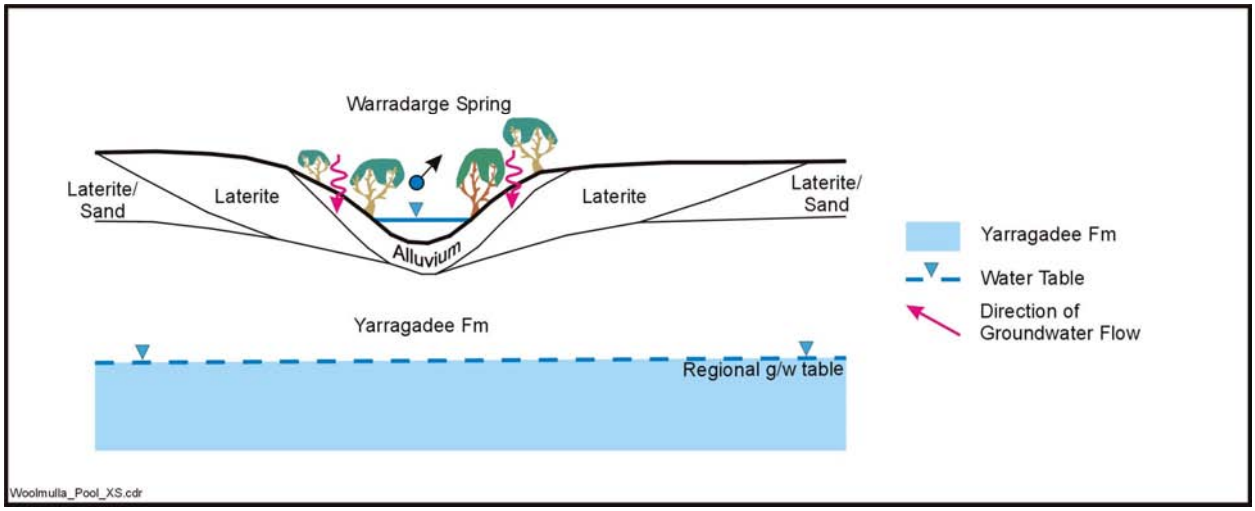
GDE Considerations:

- Not considered groundwater dependent ecosystem
- Land is cleared surrounding the spring site
- Small patches of vegetation uplands

Site Description:

- Local recharge is by direct infiltration of rainfall on the outcrop of the Yarragadee Formation
- Warradarge Spring occurs from perched water in the Yarragadee Formation, elevated above the watertable in the aquifer
- Laterites and less permeable layers within the Yarragadee Formation provide a barrier for groundwater connection with the aquifer

Site Model:



Site #: 47

Name: Eatha Spring

Map Reference: Hill River – Green Head

Site Coord: (311697E: 6667862N)

Bores/Features: Eatha Spring
LS10

Physiography/ Slope: Lower slope

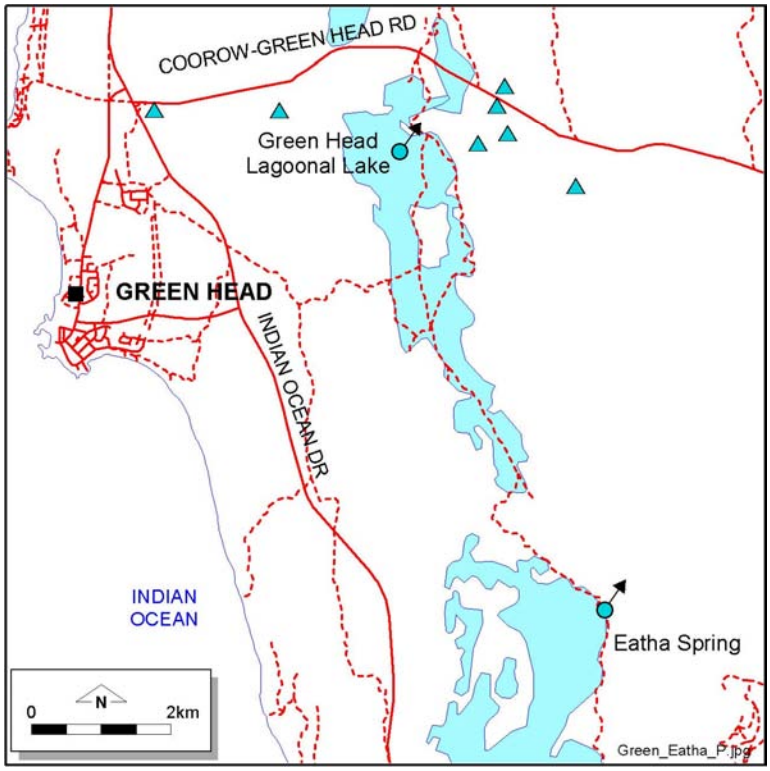
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: Unknown



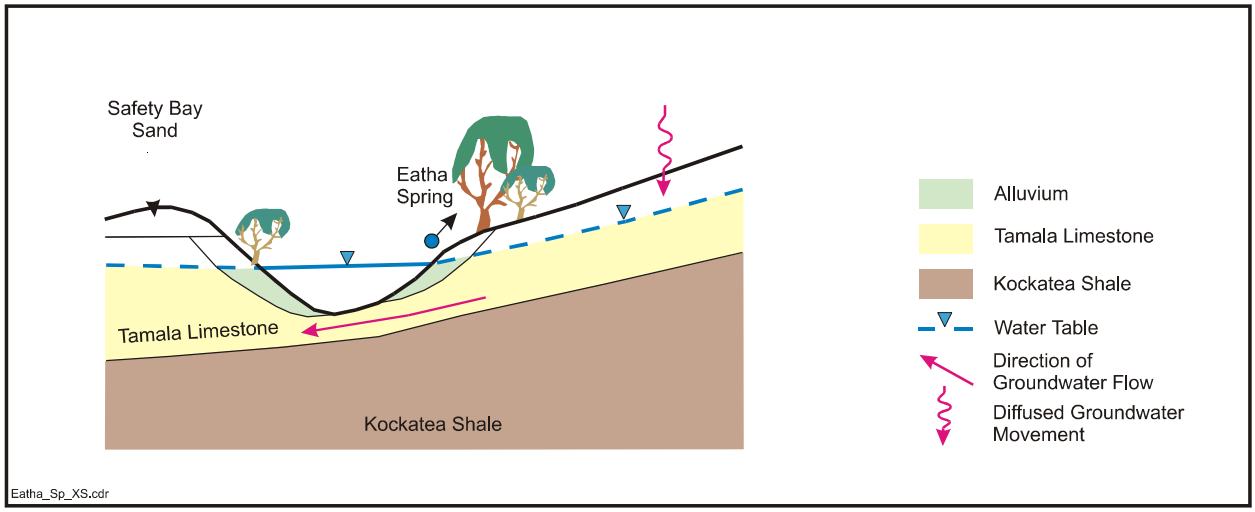
GDE Considerations:

- Over-extraction from the Tamala Limestone may cause decline in the water levels and impact on the GDE
- Coastal vegetation mostly intact surrounding the wetland area

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- The Kockatea Shale underlying the Tamala Limestone provides an impermeable base preventing downward leakage
- Leeman-Green Head Lagoon is an area of evaporative discharge causing the lake to dry out to salt pan
- Spring discharge occurs from the Tamala Limestone in low depressions

Site Model:



Site #: 48

Name: Diamond of the Desert

Map Reference: Hill River – Green Head

Site Coord.: (315691E:6666906N)

Bores/Features: Diamond of the Desert

Physiography/ Slope: Lower mid-slope

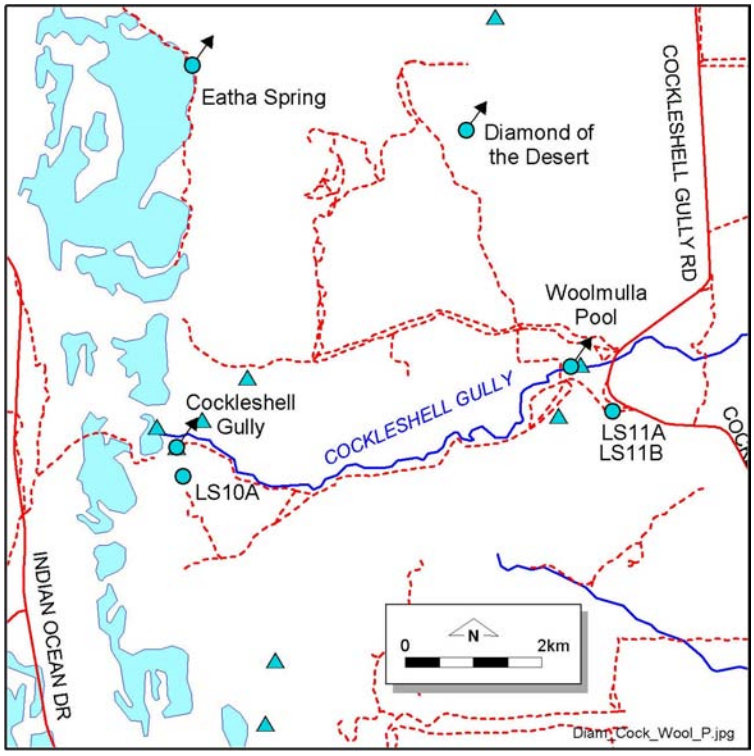
Geology: Tamala Limestone
Lesueur Sandstone
Carynginia Shale

Water/Ground Water Flow: Upward head gradient from the Lesueur Sst

Aquifer: Lesueur Sandstone

Depth to WT: At surface

Salinity: Approx. 500 mg/L



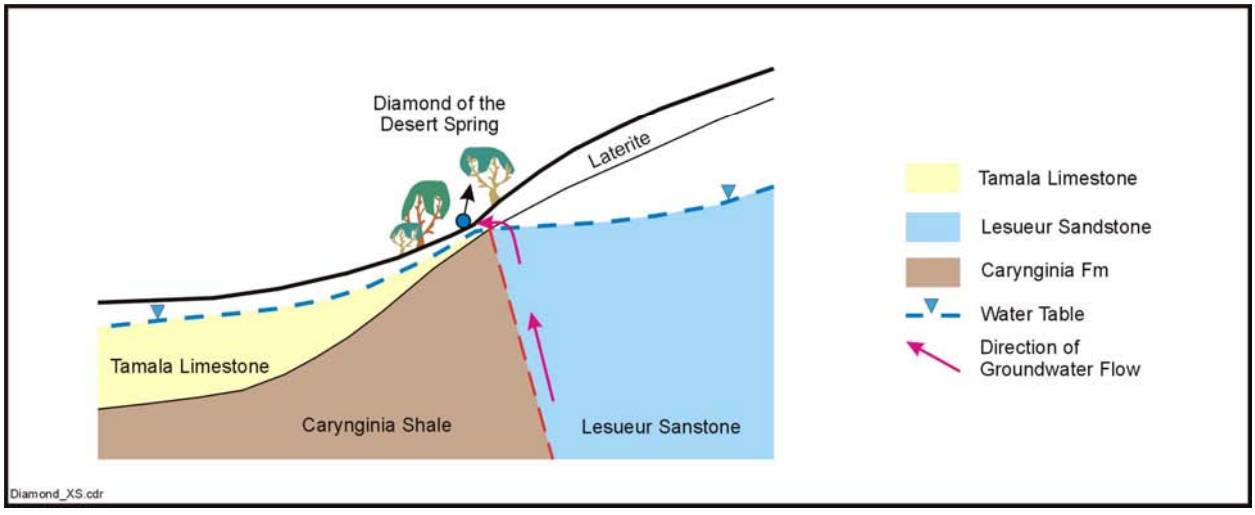
GDE Considerations:

- Extraction of groundwater in the Lesueur Sandstone may impact on the GDE. Diamond of the Desert Spring GDE is located nearby Mount Lesueur National Park, groundwater development in the area is unlikely
- Coastal vegetation mostly intact surrounding the spring site. Vegetation cleared for agriculture activities

Site Description:

- Local recharge is by direct infiltration of rainfall into the Lesueur Sandstone and surface runoff
- The Carynginia Shale underlying the Tamala Limestone provides an impermeable barrier causing upward discharge from the Lesueur Sandstone along the Beagle Fault and into the superficial formations
- Spring discharge occurs from the Gingin Scarp at a lower-mid slope
- Groundwater from the Tamala Limestone and Lesueur Sandstone is currently used for the Leeman-Green Head town water supply.

Site Model:



Site #: 49

Name: Cockleshell Gully

Map Reference: Hill River – Green Head

Site Coord: (311472E: 6662282N)

Bores/Features: LS10
No 3/4/5

Physiography/ Slope: Lower slope

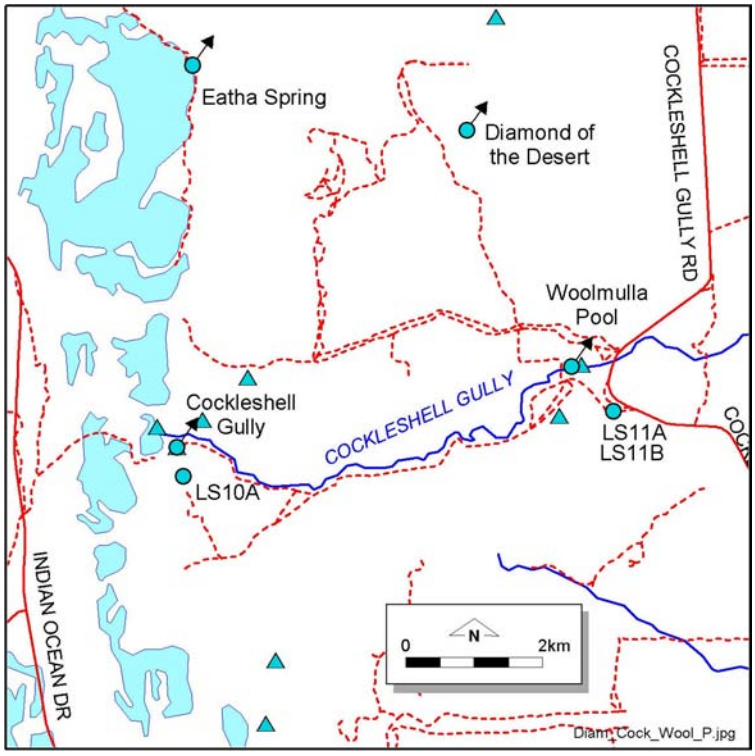
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 2800-4200 mg/L



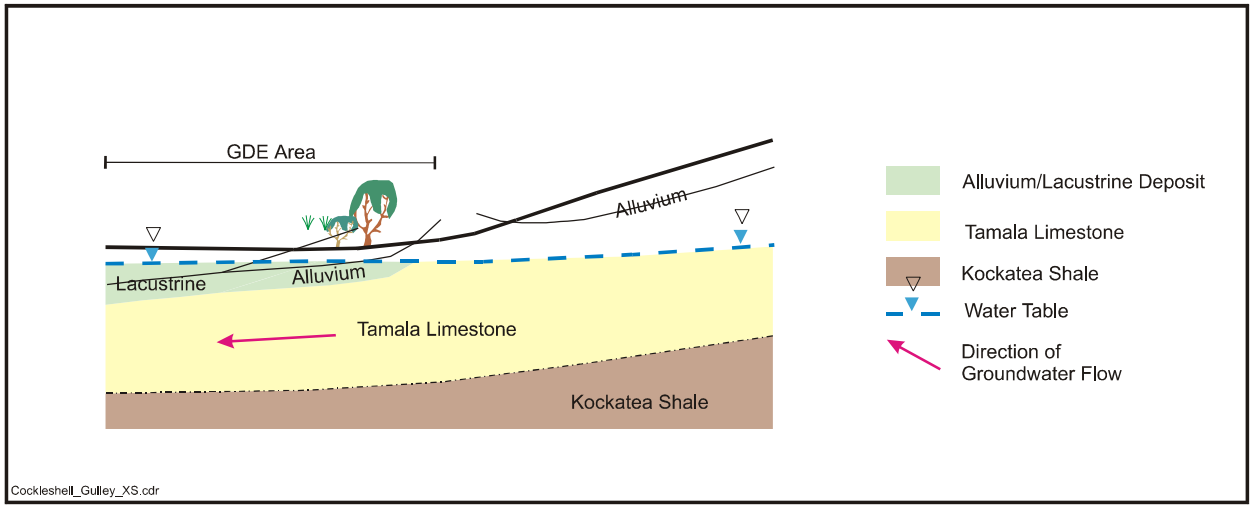
GDE Considerations:

- Over-extraction of groundwater in the Tamala Limestone may impact on the GDE. However, becuase the site is located near Mount Lesueur National Park, groundwater development in the area is unlikely
- Coastal vegetation mostly intact surrounding the GDE site. Small strip of vegetation is also present along the Cockleshell Gully from episodic surface runoff originating on the Arrowsmith Region

Site Description:

- Local recharge is by direct infiltration of rainfall into the Tamala Limestone and episodic surface runoff
- The Kockatea Shale underlying the Tamala Limestone provides an impermeable base preventing leakage into underlying formation
- TDS is elevated at the salt lake discharge boundary

Site Model:



Site #: 50

Name: Woolmulla Pool

Map Reference: Hill River – Green Head

Site Coord.: (317222E: 6663458N)

Bores/Features: LS11
No 6/House Bore

Physiography/ Slope: Mid-slope

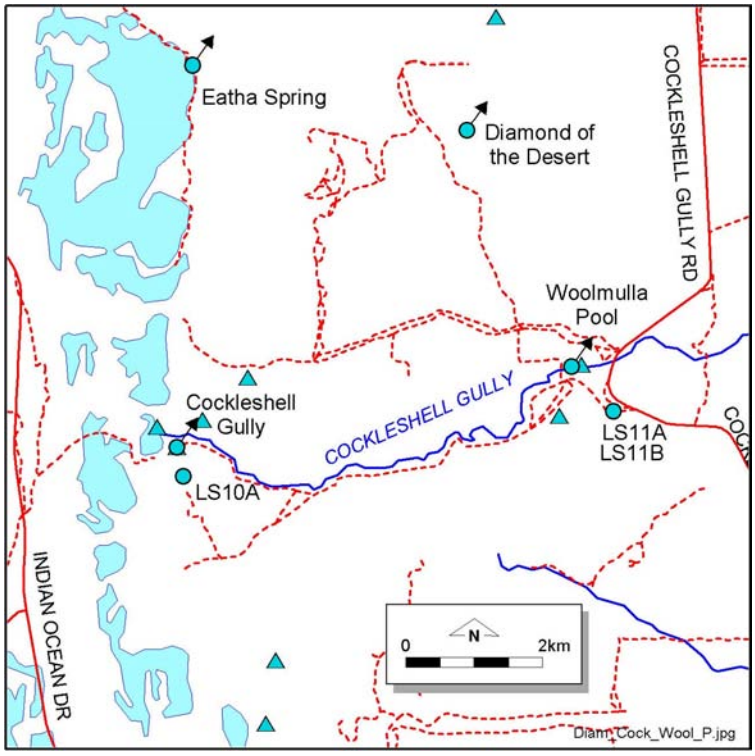
Geology: Lesueur Sandstone
Kockatea Shale

Water/Ground Water Flow: Upward head gradient from the Lesueur Sst

Aquifer: Lesueur Sandstone

Depth to WT: At or near surface

Salinity: 1020 mg/L



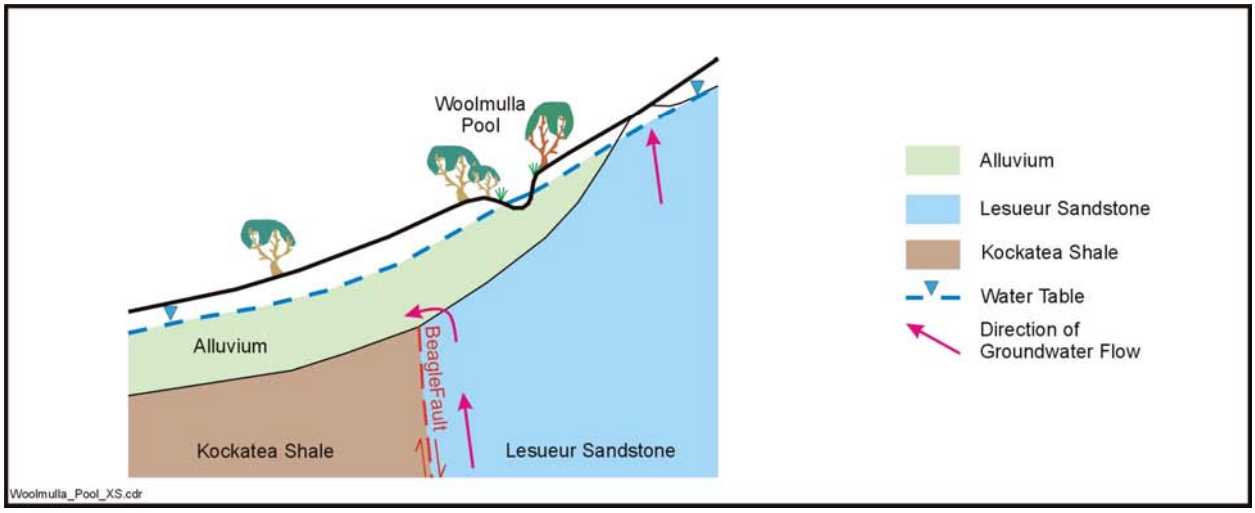
GDE Considerations:

- Over-extraction of groundwater in the Lesueur Sandstone may impact on the GDE. However, because the site is located nearby Mount Lesueur National Park, groundwater development in the area is unlikely
- Coastal vegetation mostly intact surrounding the GDE site along the base of the Gingin Scarp

Site Description:

- Local recharge is by direct infiltration of rainfall into the Lesueur Sandstone and episodic surface runoff
- The Kockatea Shale provides an impermeable barrier causing upward discharge from the Lesueur Sandstone along the Beagle Fault into the superficial formations
- Upward heads from the Lesueur Sandstone feed the Woolmulla Pool through the alluvium deposits
- No flow was found in river bed at the outcrop of the Lesueur Sandstone
- Groundwater from the Lesueur Sandstone is only used for Green Head Town water supply and a few farm bores

Site Model:



Site #: 51

Name: Jurien

Map Reference: Hill River – Green Head

Site Coord: (311622E: 6646191N)

Bores/Features: Jurien Bores
WL12

Physiography/ Slope: Lower slope

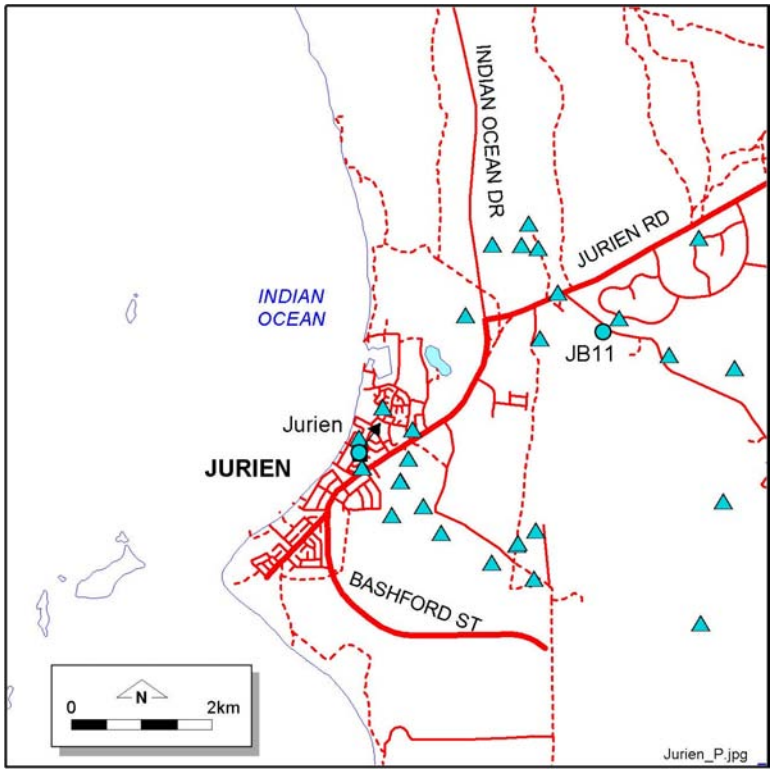
Geology: Safety Bay Sand
Tamala Limestone
Lesueur Sandstone
Woodada Formation

Water/Ground Water Flow: Upward head gradient from the Lesueur Sst

Aquifer: Safety Bay Sand / Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 760 - 1630 mg/L



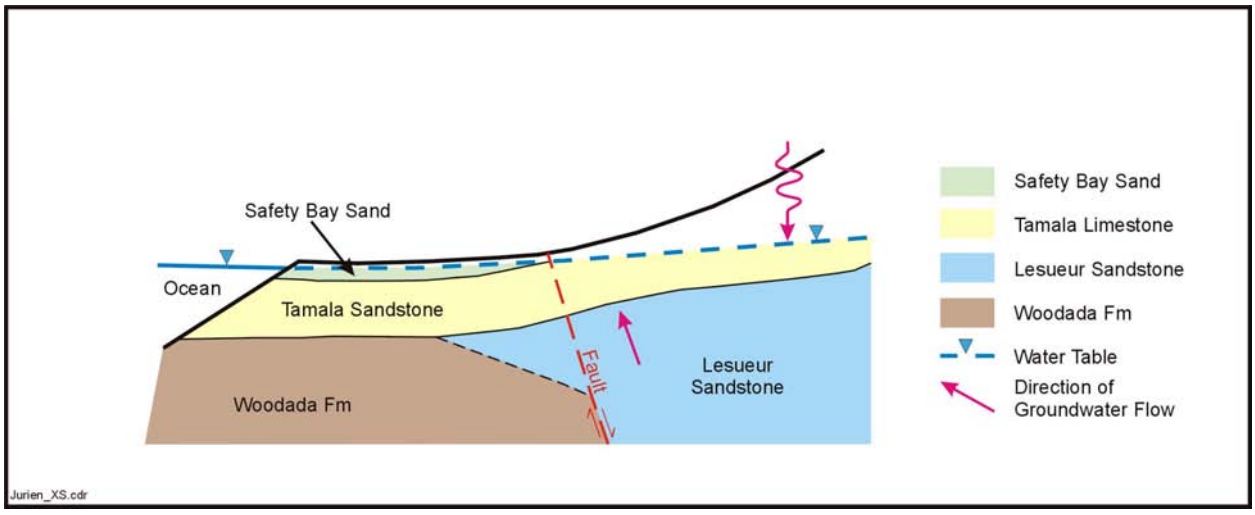
GDE Considerations:

- Over-extraction of groundwater in the Tamala Limestone may impact on the GDE
- Coastal vegetation is mostly intact SW and east of the Jurien townsite

Site Description:

- Local recharge is by direct infiltration of rainfall into the highly permeable Tamala Limestone
- The Woodada Formation provides an impermeable barrier causing upward discharge from the Lesueur Sandstone along the Beagle Fault into the superficial formations
- Potentiometric heads at the town site are close to mean sea level
- Groundwater from the Tamala Limestone less than 1000 mg/L is mainly used for farm bores

Site Model:



Site #: 52

Name: Swamps - Jurien

Map Reference: Hill River – Green Head

Site Coord: (322818E: 6651333N)

Bores/Features: LS9

Physiography/ Slope: Lower slope

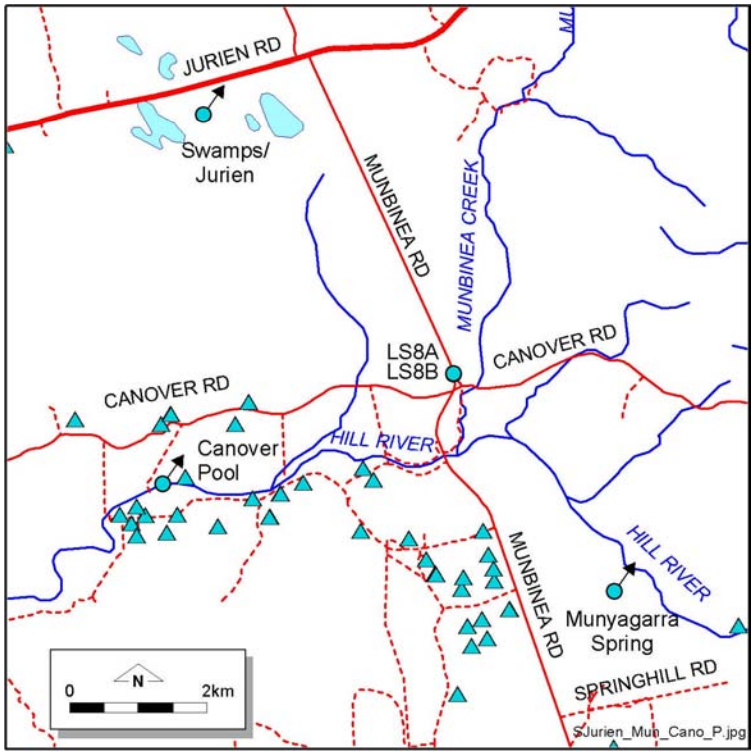
Geology: Lesueur Sandstone

Water/Ground Water Flow: Upward head gradient from the Lesueur Sst

Aquifer: Superficial deposits

Depth to WT: 0 to 10 m bgl

Salinity: Unknown



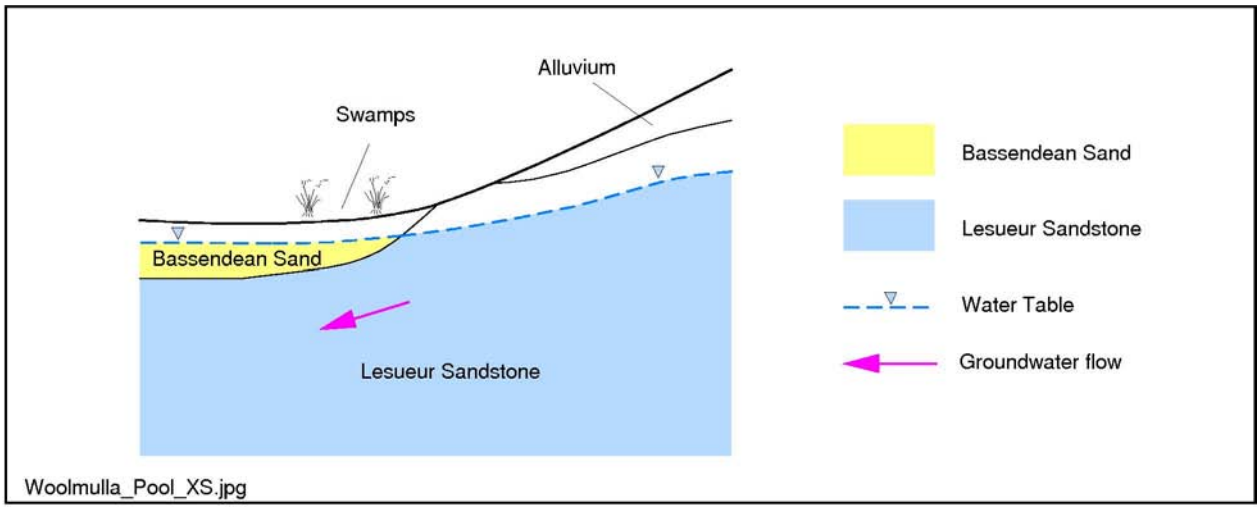
GDE Considerations:

- Over-extraction of groundwater in the Lesueur Sandstone impact on the GDE
- Native vegetation is partly intact at the swamp site

Site Description:

- Local recharge is by direct infiltration of rainfall into the Lesueur Sandstone at its outcrop
- The watertable is close to the surface at the base of Gingin Scarp
- The Lesueur Sandstone discharges upward into the superficial and surficial deposits and possibly maintains the swamps west of Cockleshell Gully Road
- Groundwater from the Lesueur Sandstone is only used for the Green Head town water and a few farm bores

Site Model:



Site #: 53/54

Name: Bitter/Coomallo Pools

Map Reference: Hill River – Green Head

Site Coord: (339164E: 6655159N)
(339272E: 6654137N)

Bores/Features: TP3
MP3

Physiography/ Slope: Lower slope

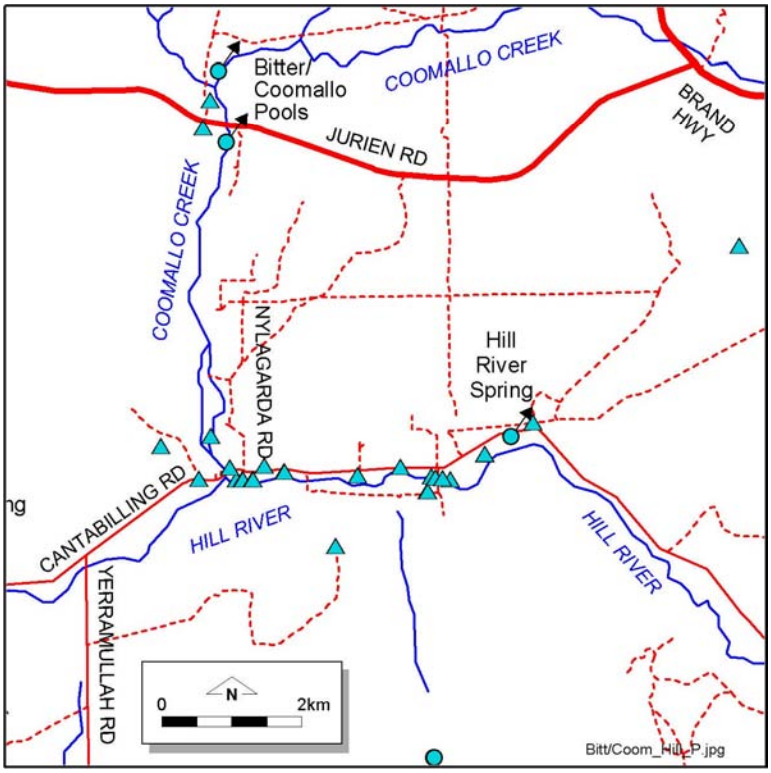
Geology: Yarragadee Fm

Water/Ground Water Flow: Upward heads in Yarragadee Aquifer

Aquifer: Yarragadee Fm

Depth to WT: At or near surface

Salinity: 940-1100 mg/L



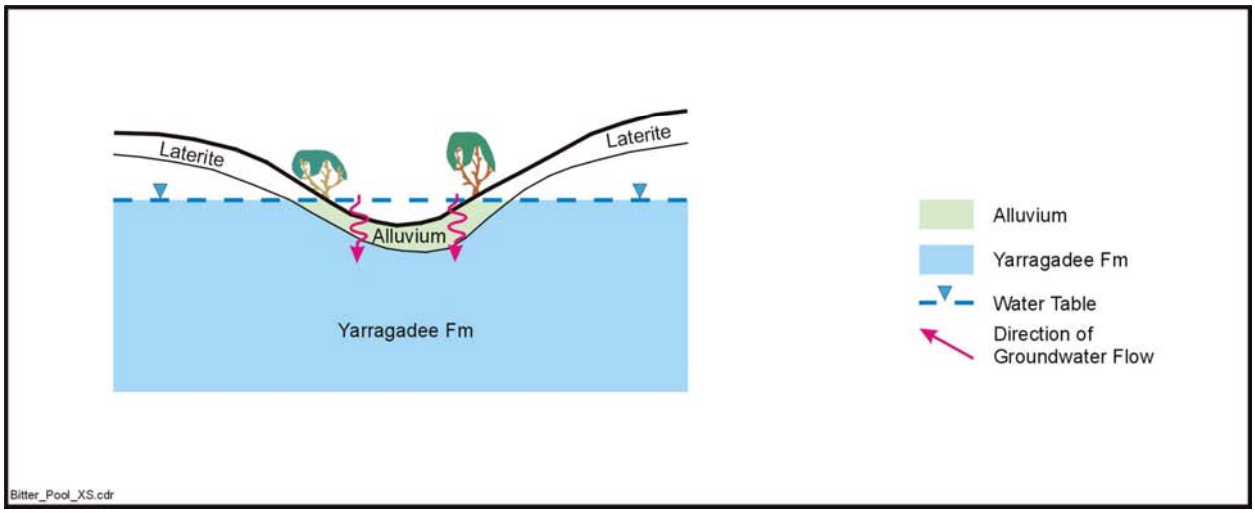
GDE Considerations:

- Over abstraction may impact on the GDE
- Native vegetation mostly intact along the Hill River

Site Description:

- Local recharge by infiltration of rainfall through the surficial deposits
- The Yarragadee Formation outcrops in small patches west/north of pools
- Water levels in the Yarragadee Aquifer are close to the surface and are at a similar level to those in Bitter/Coomallo Pools

Site Model:



Site #: 55

Name: Hill River Spring

Map Reference: Hill River – Green Head

Site Coord: (343328E: 6649942N)

Bores/Features: TP4/TP5
Rob 3/ Rob 7

Physiography/ Slope: Lower slope

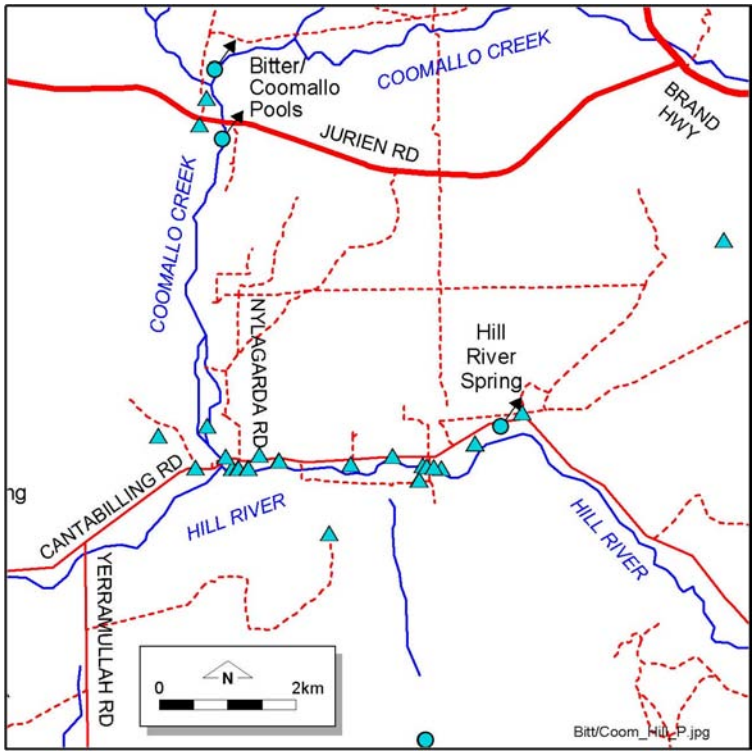
Geology: Yarragadee Fm

Water/Ground Water Flow: Upward head gradients

Aquifer: Yarragadee Fm

Depth to WT: At or near surface and locally artesian

Salinity: Unknown



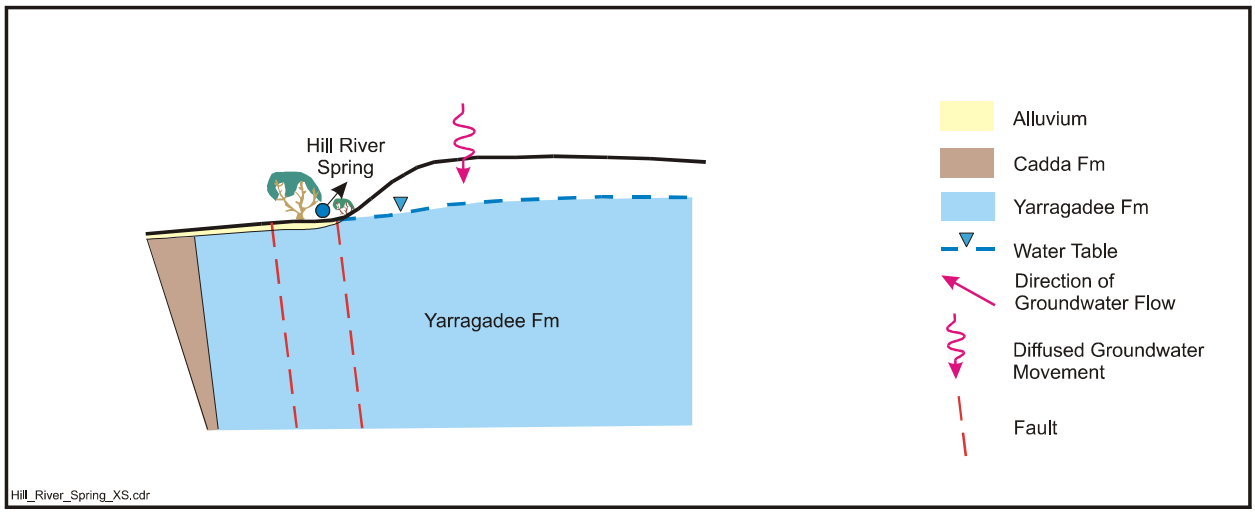
GDE Considerations:

- It is felt that there is little or no impact on GDE from water abstraction in the Yarragadee Aquifer due to rising water levels from land clearing
- Native vegetation mostly intact along the Hill River

Site Description:

- The Yarragadee Formation is unconfined and is recharged by infiltration of rainfall
- Water levels in the Yarragadee Aquifer are close to the surface, maintaining the Hill River Spring
- Bore flowing near intersection of Coomallo Creek and Hill River – artesian condition
- Groundwater discharges from the Yarragadee Aquifer in the form of springs and seeps along the valley floors of the Hill River

Site Model:



Site #: 56

Name: Rob 4 – GDE 2

Map Reference: Hill River – Green Head

Site Coord: (336939E: 6643400N)

Bores/Features: Deutscher No.3

Physiography/ Slope: Lower mid-slope

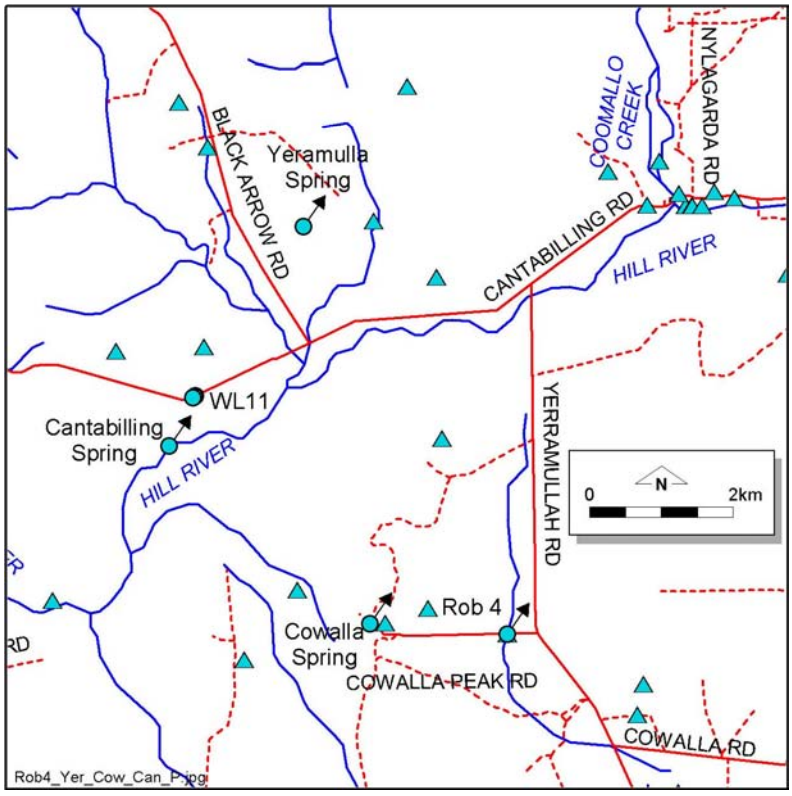
Geology: Cattamarra Coal Measures

Water/Ground Water Flow: North towards Hill River

Aquifer: Cattamarra Coal Measures

Depth to WT: 0 to 5 m bgl

Salinity: > 1330 mg/L



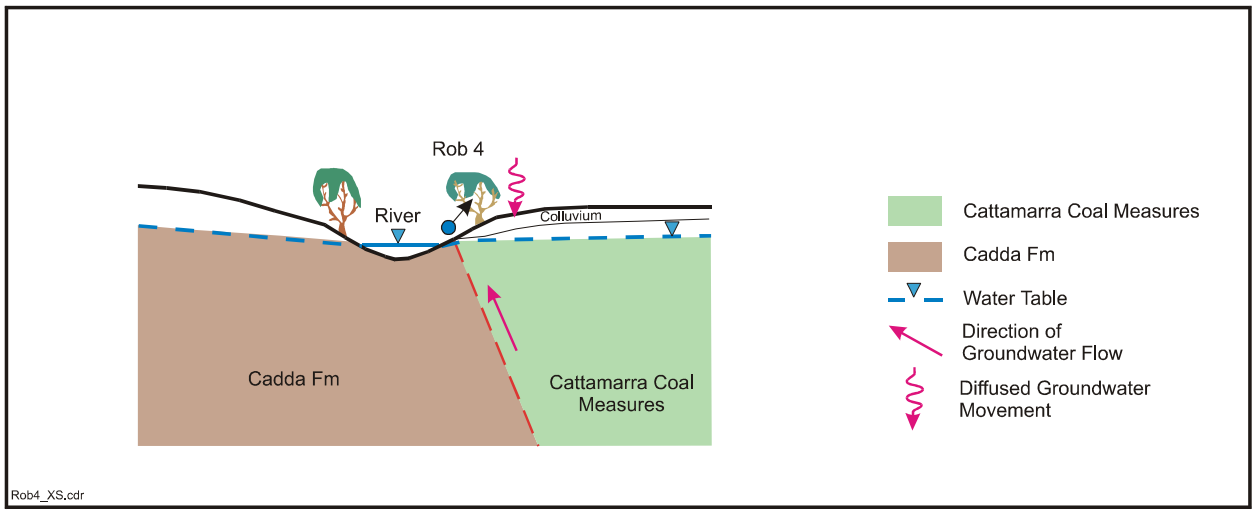
GDE Considerations:

- Native vegetation intact in a small patch south of Rob 4 Farmstay
- Additional water abstraction is likely to cause an impact on the remainder of the native vegetation

Site Description:

- Local recharge is by infiltration of rainfall through the colluvium deposits, by leakage through the confining beds of the Cattamarra Formation, and where the formation crops out
- Discharge is in low-lying areas where the potentiometric surface in the Cattamarra Coal Measures is above the streambed at the Cadda Formation Fault Boundary
- The Cattamarra Coal Measures is confined to the west by the Cadda Formation
- Groundwater from the Cattamarra Coal Measures is only used for farm water supplies

Site Model:



Site #: 57

Site Name: Yeramulla Spring

Map Reference: Hill River – Green Head

Site Coord: (334116E: 6649052N)

Bores/Features: No 71 spring, farm

Physiography/ Slope: Mid-slope

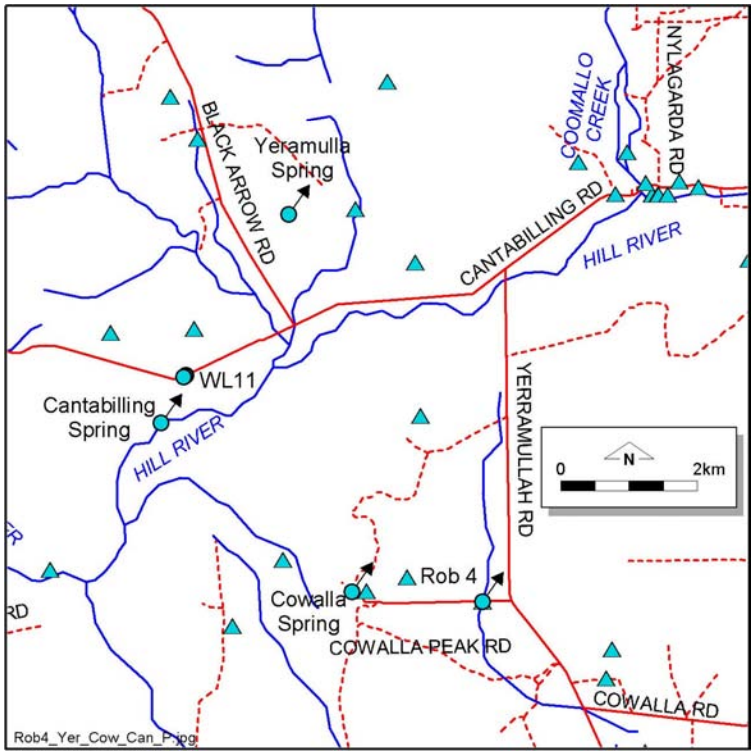
Geology: Cattamarra Coal

Water/Ground Water Flow: Southward towards Hill River

Aquifer: Cattamarra Coal

Depth to WT: At or near surface

Salinity: Approx. 3300 mg/L



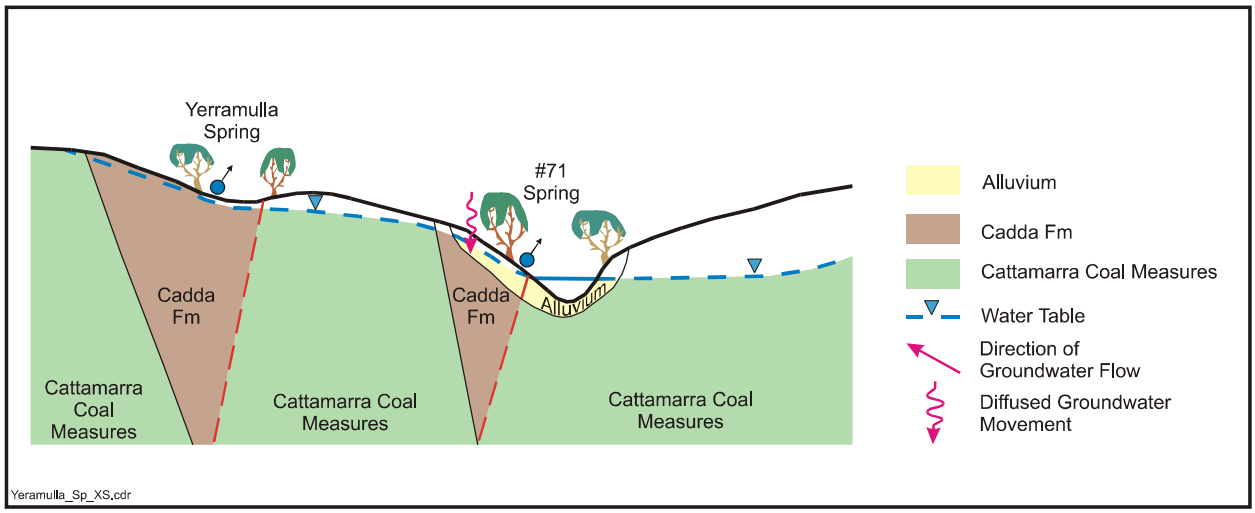
GDE Considerations:

- Native vegetation is intact at the spring site, vegetation mostly cleared for agriculture
- Additional water abstraction is likely to cause an impact on the remainder of the native vegetation

Site Description:

- Local recharge is by infiltration of rainfall through the surficial deposits and at outcrop of the Cattamarra Formation
- Spring discharge is in low-lying areas where the Cadda Formation acts as a hydraulic barrier
- Groundwater from the Cattamarra Coal Measures is only used for farm water supplies

Site Model:



Site #: 58

Name: Cowalla Spring – GDE 1

Map Reference: Hill River – Green Head

Site Coord: (335040E: 6643547N)

Bores/Features: Deutscher No 4 bore
No 1/No 2 bores

Physiography: Upper mid-slope

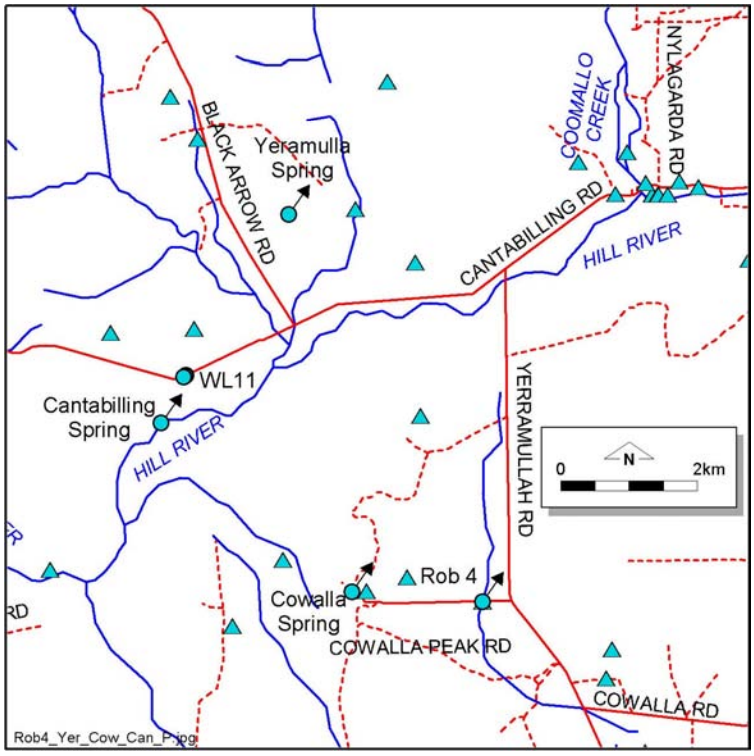
Geology: Yarragadee Formation

Water/Ground Water Flow: Upward head gradients

Aquifer: Yarragadee Fm

Depth to WT: 0 to 5 m bgl

Salinity: 4300 mg/L



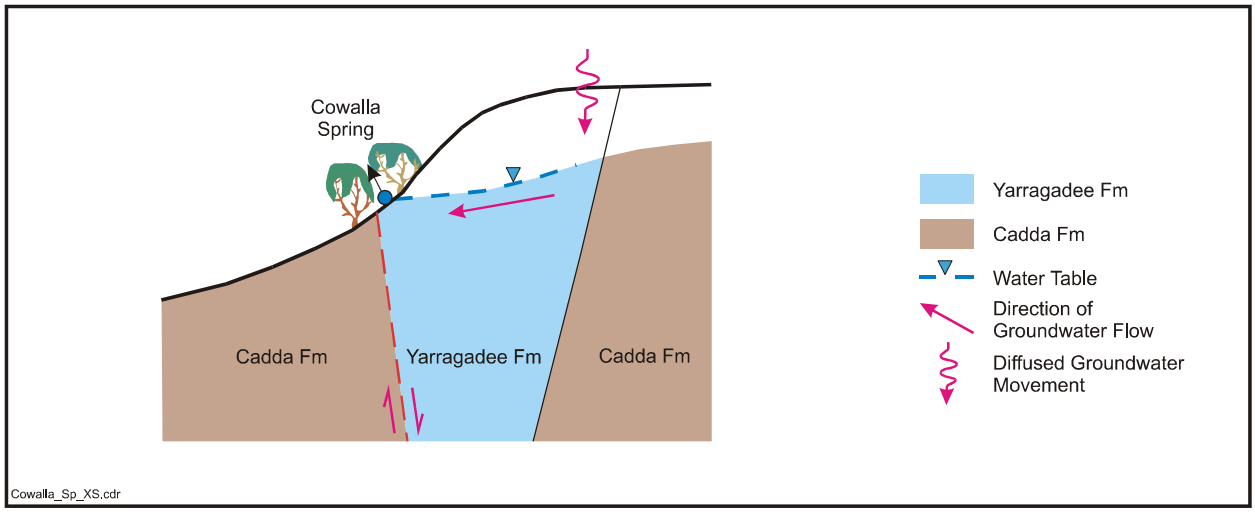
GDE Considerations:

- There is likely to be little impact on GDE from water abstraction
- The rising water levels due to clearing for agriculture and the relatively fresh groundwater may be altering the GDE status along the Hill River
- Mostly native vegetation intact along the Hill River and in small patches to the south
- Groundwater from the Yarragadee Formation is mainly for stock and domestic use

Site Description:

- Local recharge by infiltration of rainfall through the surficial deposits and at the outcrop of the Yarragadee Formation
- The spring coincides with the faulted lithological boundaries of the Cadda and the Yarragadee Formations
- The less permeable Cadda Formation at the western margin results in groundwater discharge

Site Model:



Site #: 59

Name: Cantabilling Spring

Map Reference: Hill River – Green Head

Site Coord: (332247E: 6646008N)

Bores/Features: WL11, No.69, No. 1

Physiography/ Slope: Lower slope

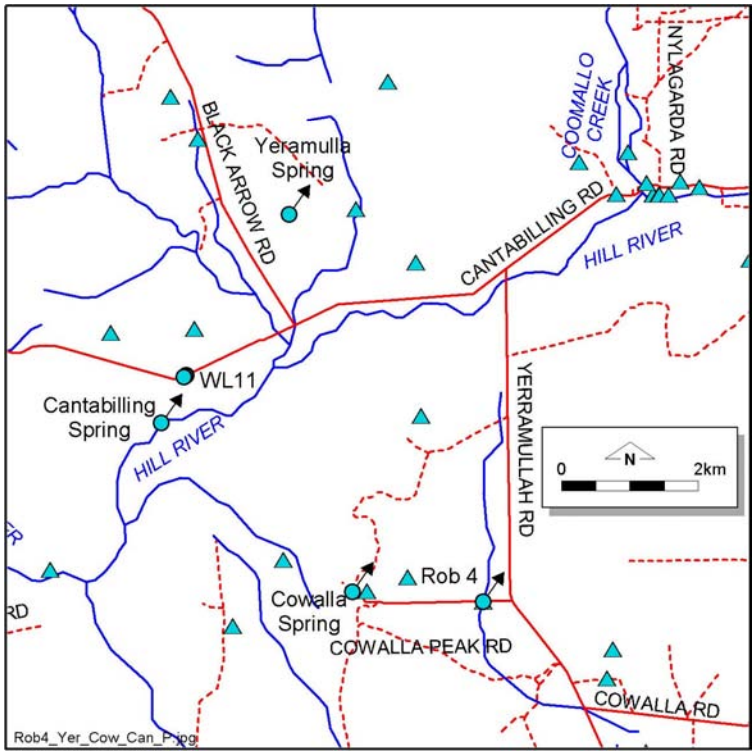
Geology: Cattamarra Coal

Water/Ground Water Flow: Baseflow in streams

Aquifer: Cattamarra Coal

Depth to WT: At or near surface

Salinity: 740 mg/L



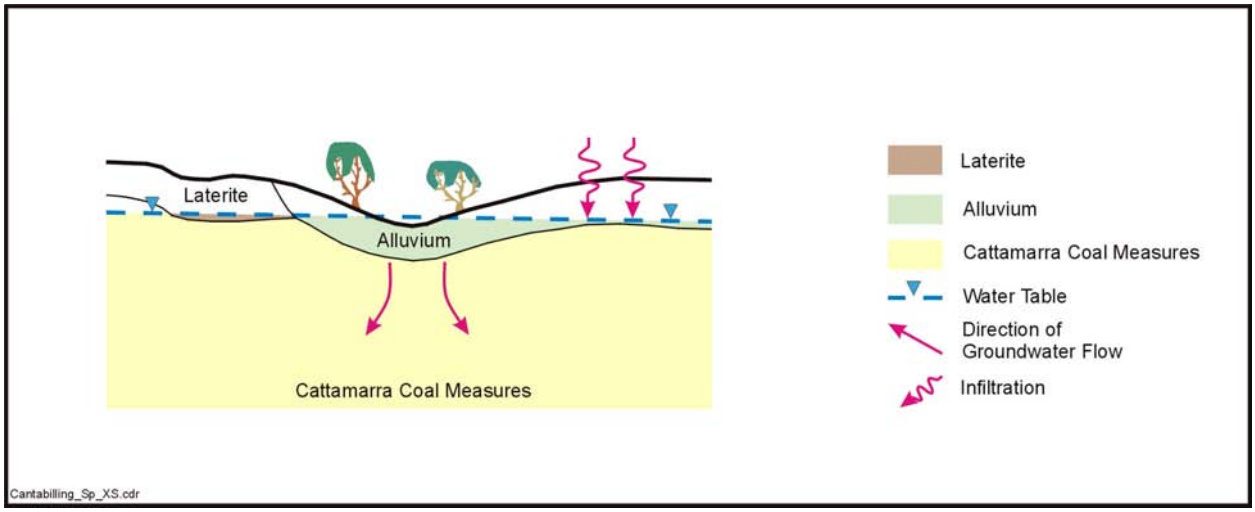
GDE Considerations:

- Native vegetation is intact along the Hill River
- Additional water abstraction is likely to affect the remainder of the native vegetation

Site Description:

- Local recharge is by infiltration of rainfall through the alluvium deposits and the confining beds of the Cattamarra Formation
- Discharge is in low-lying areas where the potentiometric surface in the Cattamarra Coal Measures is above the streambed
- The groundwater in the formation is relatively fresh with low TDS (~750 mg/L) in the top part of the aquifer
- Groundwater from the Cattamarra Coal Measures is only used for farm water supplies

Site Model:



Site #: 60

Name: Munyagarra Spring –

Map Ref: Hill River – Green Head

Site Coord: (328817E: 6644366N)

Bores/Features: No 1 bore
Cadda No 1 bore

Physiography/ Slope: Lower slope

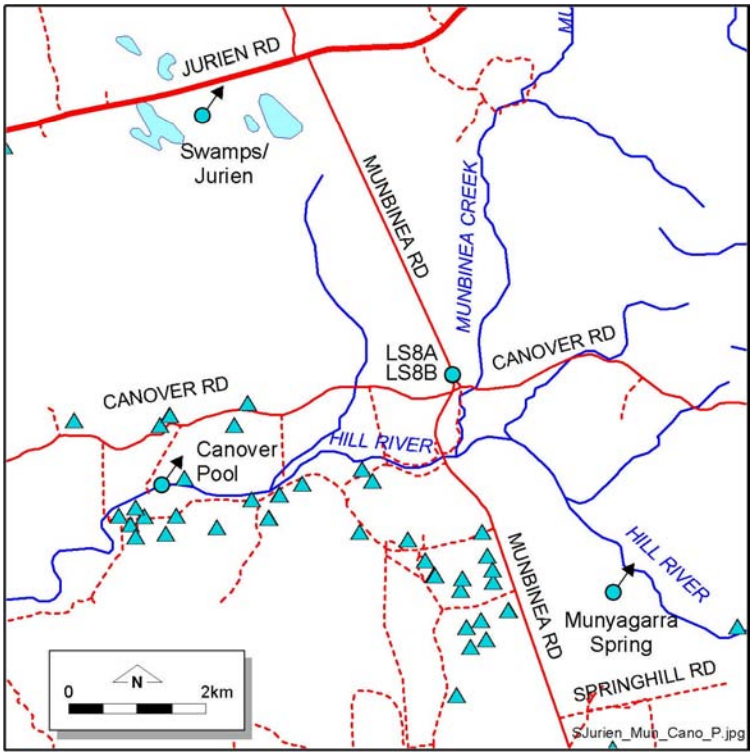
Geology: Eneabba Formation

Water/Ground Water Flow: Baseflow in stream

Aquifer: Eneabba Fm

Depth to WT: 0 to 5 m bgl

Salinity: 2000-3000 mg/L



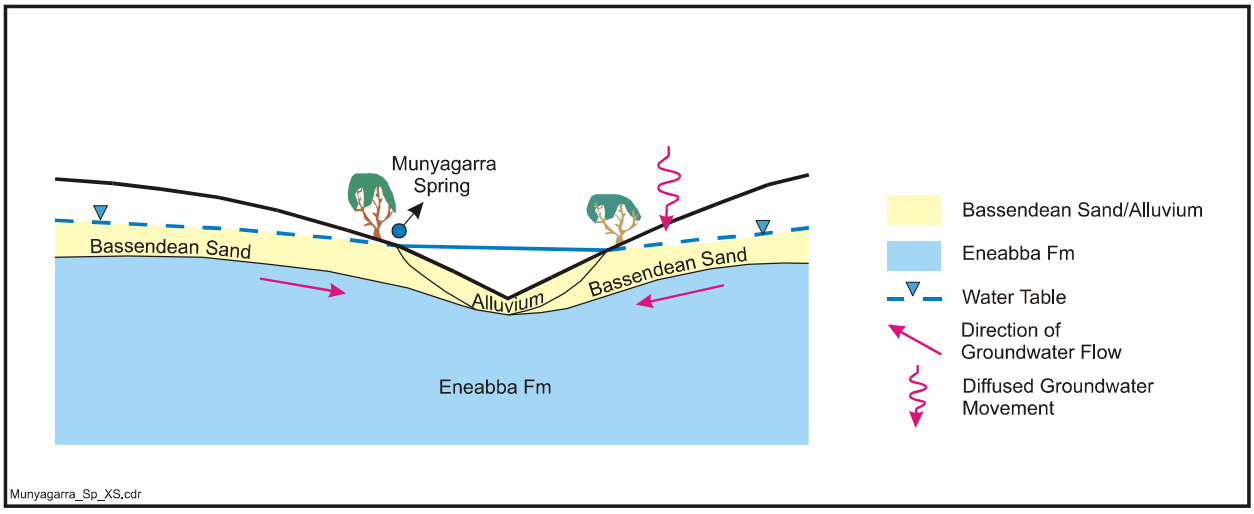
GDE Considerations:

- An increase in water abstraction from the Eneabba Formation may impact on the GDE
- Mostly native vegetation intact along the Hill River and in small patches to the south
- Groundwater from the Eneabba Formation is mainly for stock and domestic use

Site Description:

- Local recharge is by infiltration of rainfall through the alluvium and Bassendean Sand deposits and at the outcrop of the Eneabba Formation
- Discharge is in low-lying areas where the potentiometric surface in the Eneabba Formation is above the streambed

Site Model:



Site #: 61

Name: Canover Pool

Map Reference: Hill River – Green Head

Site Coord: (322231E: 6645930N)

Bores/Features: WCR bores

Physiography/ Slope: Lower slope

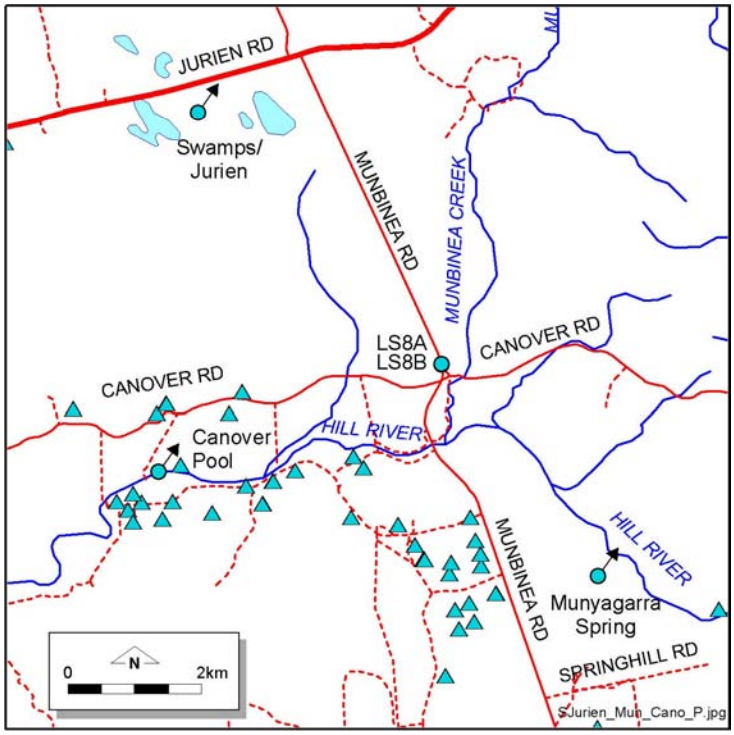
Geology: Tamala Limestone
Lesueur Sandstone

Water/Ground Water Flow: West towards the ocean

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: 650 mg/L



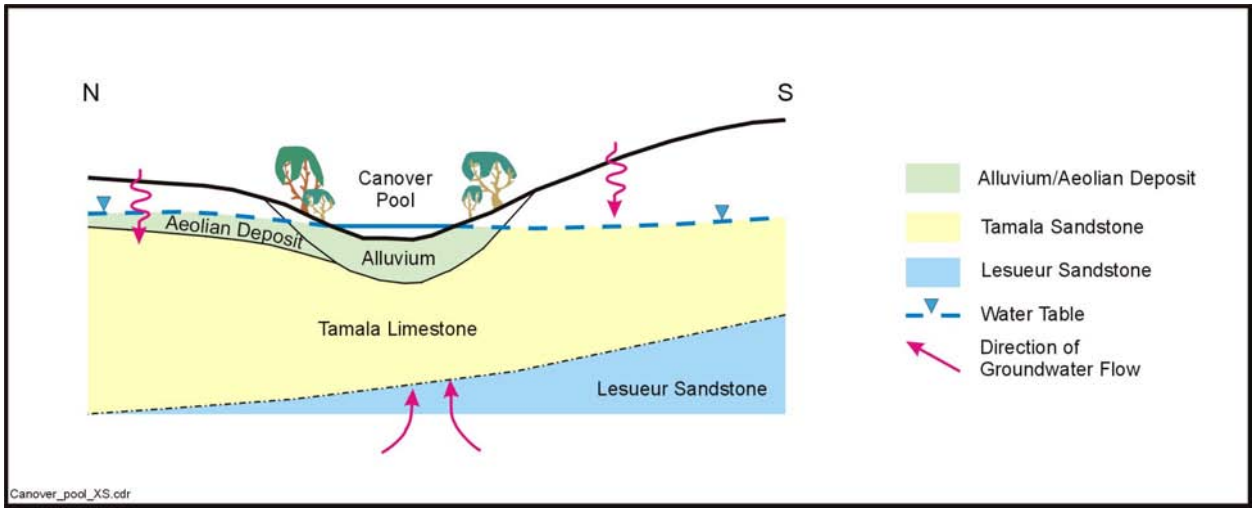
GDE Considerations:

- Native vegetation is intact along the Hill River, vegetation mostly cleared for agriculture.
- Groundwater abstraction from the Lesueur Sandstone affect the GDE

Site Description:

- Local recharge is by infiltration of rainfall through the surficial deposits and at outcrop of the Tamala Limestone
- Upward leakage from the Lesueur Sandstone into the Tamala Limestone
- Watertable at surface in low depressions
- Canover Pool is most likely an ephemeral pool fed by surface runoff
- Groundwater from the Tamala Limestone is used for the Jurien town water supply and a small number of farm bores

Site Model:



Site #: 62

Name: LS7 – GDE 3

Map Reference: Hill River – Green Head

Site Coord: (330264E: 6636014N)

Bores/Features: Farm bores, soaks

Physiography/ Slope: Lower slope

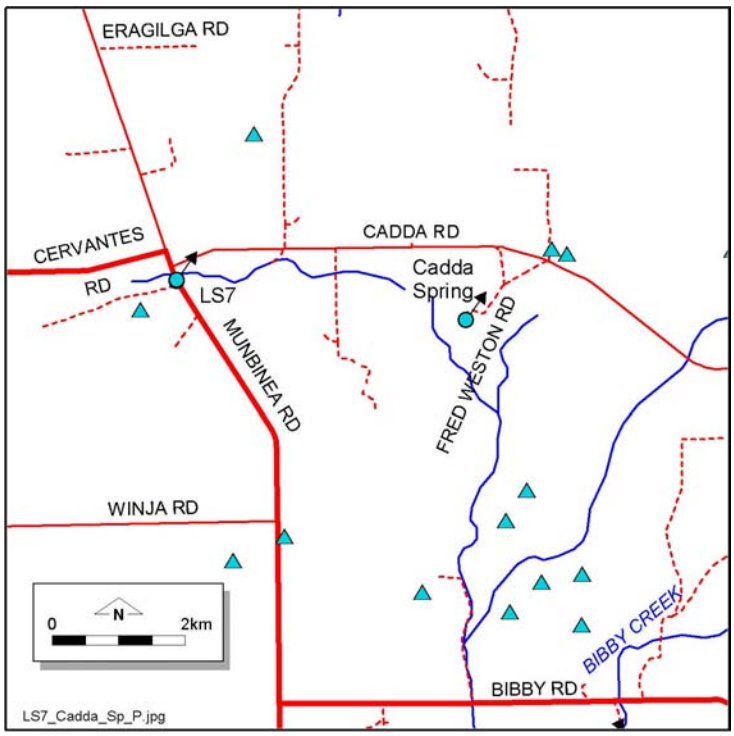
Geology: Eneabba Formation

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Superficial Eneabba Formation

Depth to WT: 5 to 10 m bgl

Salinity: 1050-2040 mg/L



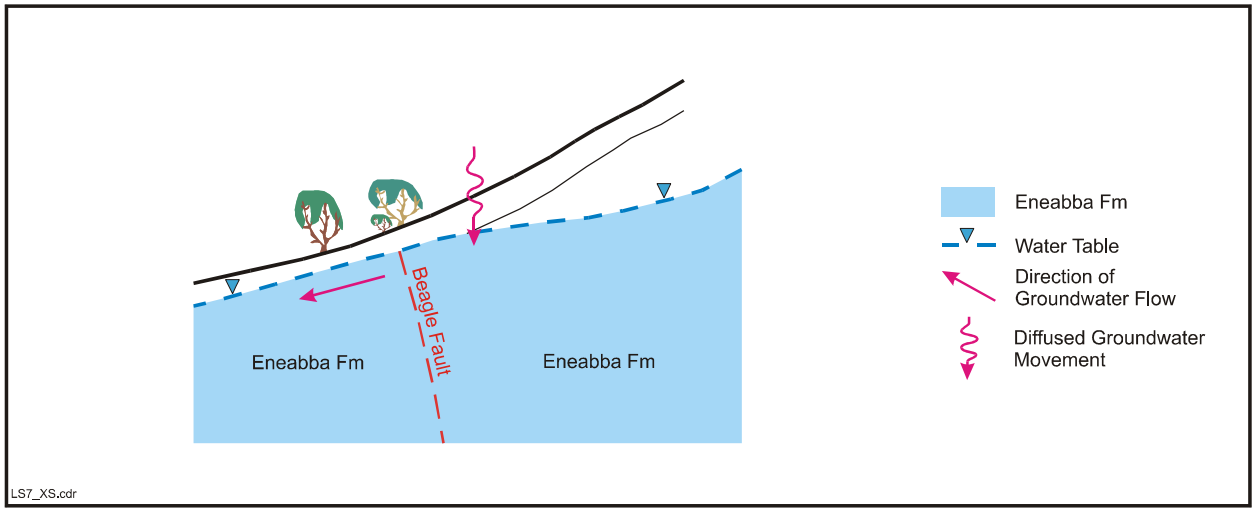
GDE Considerations:

- Native vegetation intact along the base of Gingin Scarp. Vegetation cleared for agriculture at LS7
- Increase in water abstraction from the Eneabba Formation may have some impact on the GDE

Site Description:

- Local recharge is by infiltration of rainfall through the sandy superficial formations and surface runoff in outcrop areas
- Discharge takes place into the overlying superficial formations along the Beagle Fault
- Watertable is close to the surface (6-10 m depth to groundwater) near or at the base of Gingin Scarp
- Groundwater from the Eneabba Formation is mainly for irrigation, stock and domestic use

Site Model:



Site #: 63

Name: Cadda Spring – GDE 1

Map Reference: Hill River – Green Head

Site Coord: (334600E: 6635416N)

Bores/Features: Farm bores, soaks

Physiography/ Slope: Lower mid-slope

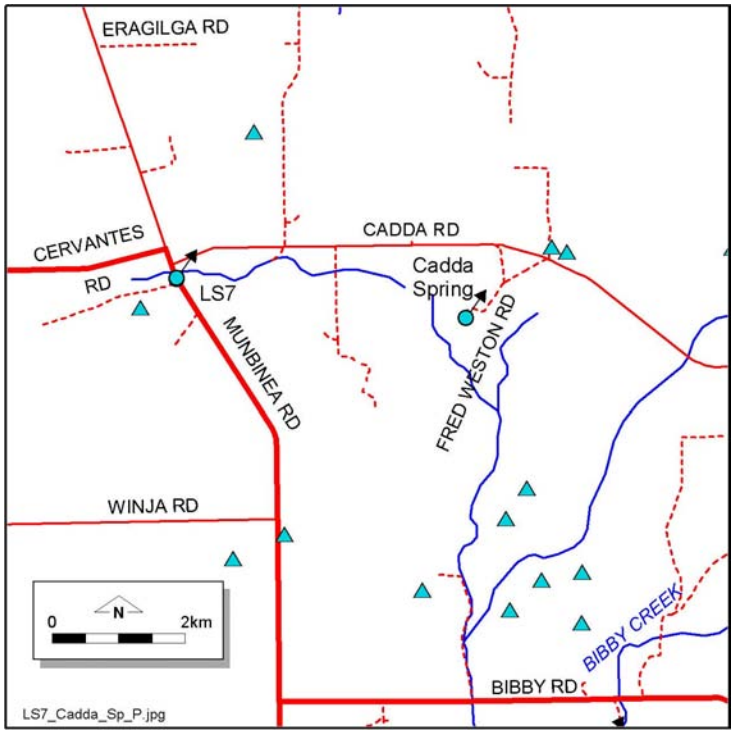
Geology: Yarragadee Formation

Water/Ground Water Flow: Upward heads from Yarragadee Aquifer

Aquifer: Yarragadee Aquifer

Depth to WT: At or near surface

Salinity: 1030-1120 mg/L



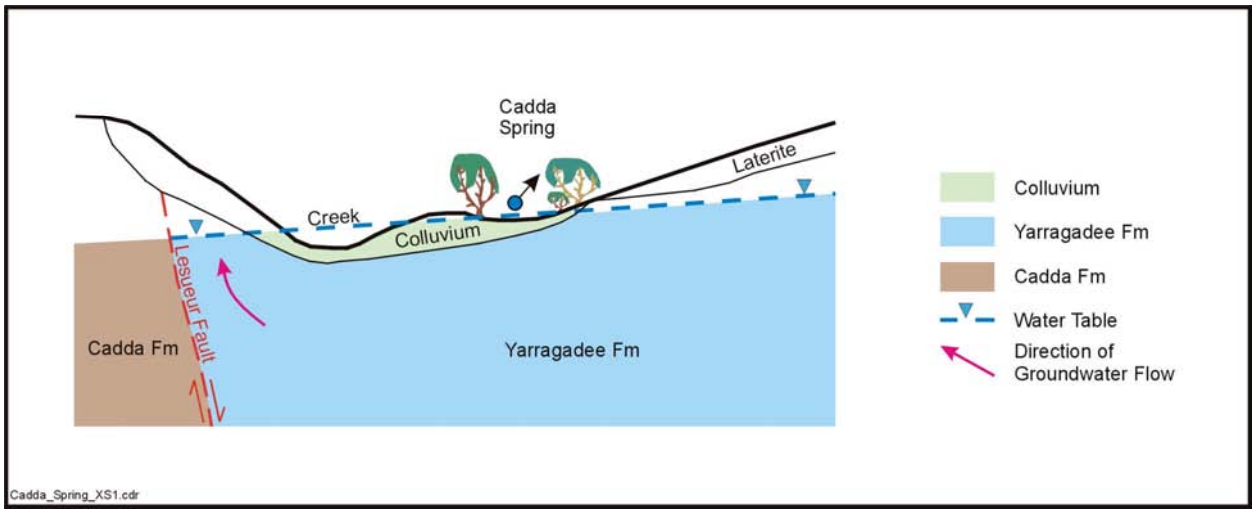
GDE Considerations:

- Native vegetation intact surrounding the spring site
- Increase in water abstraction from the Yarragadee Formation may have a significant impact on the GDE

Site Description:

- The Yarragadee Formation is a small inlier within the Cattamarra Coal Measures (shown on Plate 1)
- Local recharge is via rainfall through colluvium deposits and at the outcrop of the Yarragadee Formation
- Discharge is in low-lying areas where the potentiometric surface in the Yarragadee Formation is above the streambed
- Groundwater from the Yarragadee Formation in the area is mainly for stock and domestic use

Site Model:



Site #: 64

Name: Bibby Spring – GDE 2

Map Reference: Hill River – Green Head

Site Coord: (336670E: 6629006N)

Bores/Features: No 1 Bibby Spring

Physiography/ Slope: Lower slope

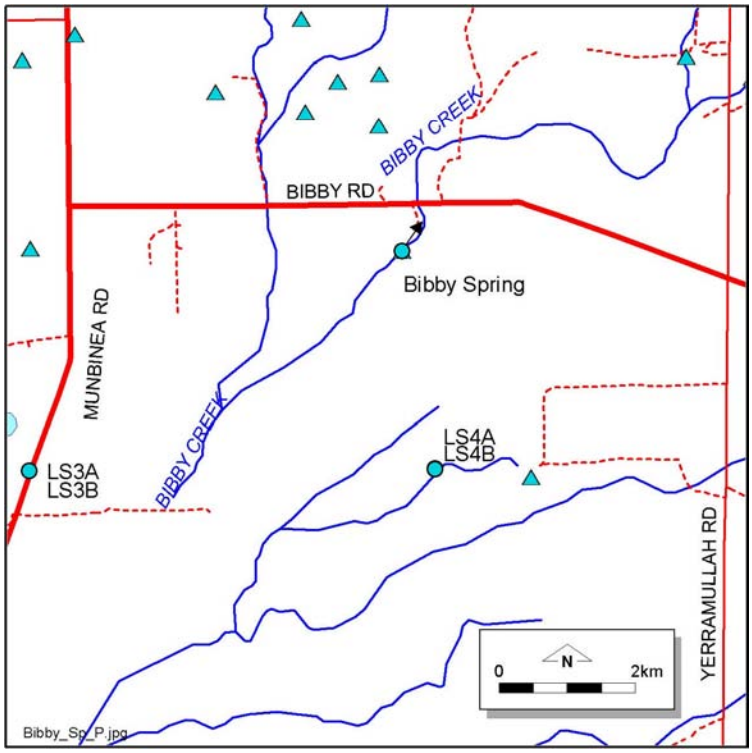
Geology: Cattamarra Coal Meas.

Water/Ground Water Flow: Westwards into the Cattamarra CM

Aquifer: Yarragadee Fm

Depth to WT: At or near surface

Salinity: Less than 1000 mg/L



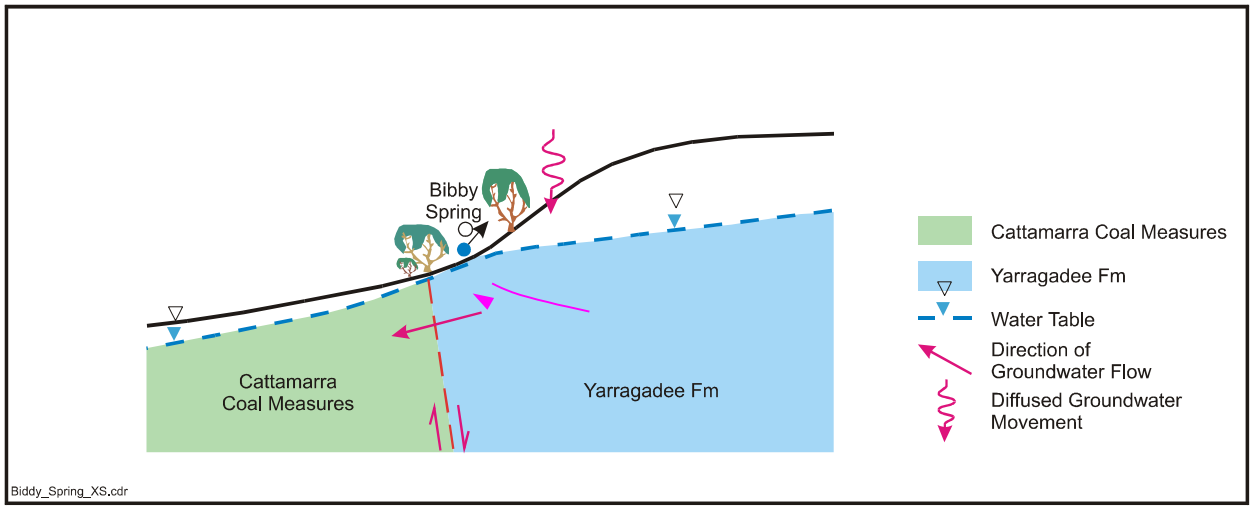
GDE Considerations:

- An increase in water abstraction from the Yarragadee Formation may impact on the GDE
- Native vegetation mostly intact along the Bibby Creek

Site Description:

- The Yarragadee Formation is a small inlier within the Cattamarra Coal Measures (shown on Plate 1)
- Local recharge is by infiltration of rainfall through the alluvium deposits and streamflow into the Yarragadee Formation
- Discharge is in low-lying areas where the potentiometric surface in the Yarragadee Formation is above the streambed
- The lower potentiometric heads in the Cattamarra Coal Measures aquifer indicate leakage across the Warradarge Fault through the Cattamarra Coal Measures and into the Tamala Limestone
- Groundwater from the Yarragadee Formation in the area is mainly for stock and domestic use

Site Model:



Site #: 65

Name: Lake Thetis

Map Reference: Hill River – Green Head

Site Coord: (315813E: 6623535N)

Bores/Features: No.1
No.6 ex-army bore
Lake Thetis

Physiography/ Slope: Lower slope

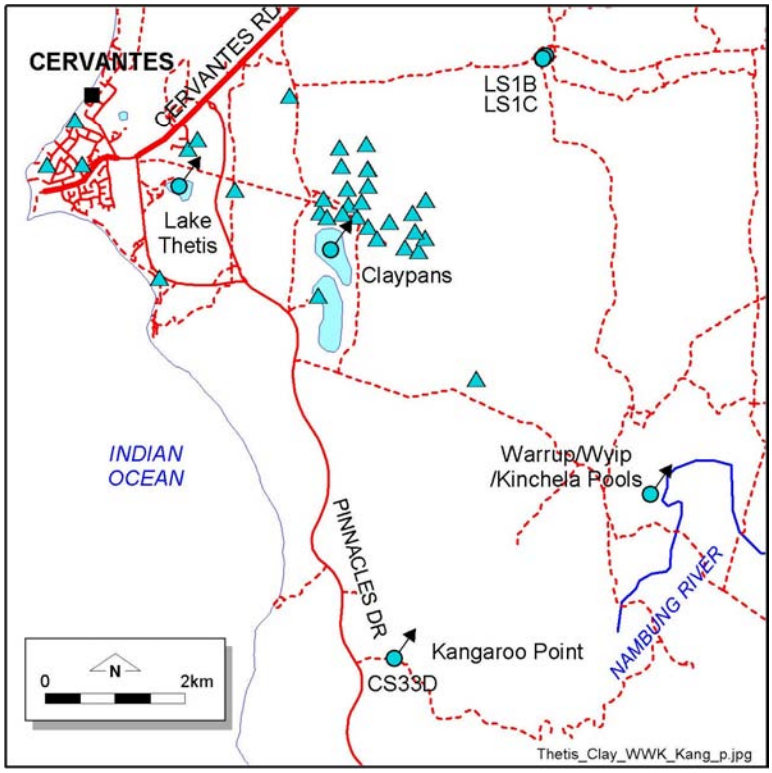
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Discharge from Tamala Limestone to the ocean

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: 4200-6500 mg/L



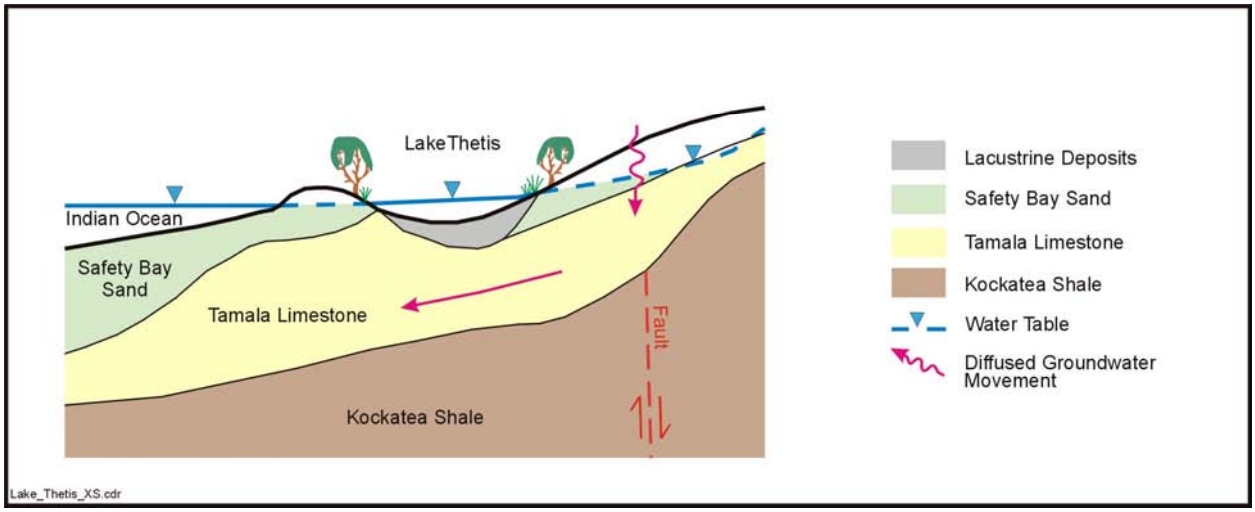
GDE Considerations:

- Significant impact on GDE from saltwater intrusion
- Intact vegetation around Lake Thetis

Site Description:

- Water levels regulated by sea level
- Recharge to the Tamala Limestone by direct rainfall and streamflow
- Groundwater salinity is highest at discharge boundaries formed by salt lake

Site Model:



Site #: 66

Name: Claypans

Map Reference: Hill River – Green Head

Site Coord: (317972E: 6622629N)

Bores/Features: No.8, 4/91, CS2

Physiography/ Slope: Lower slope

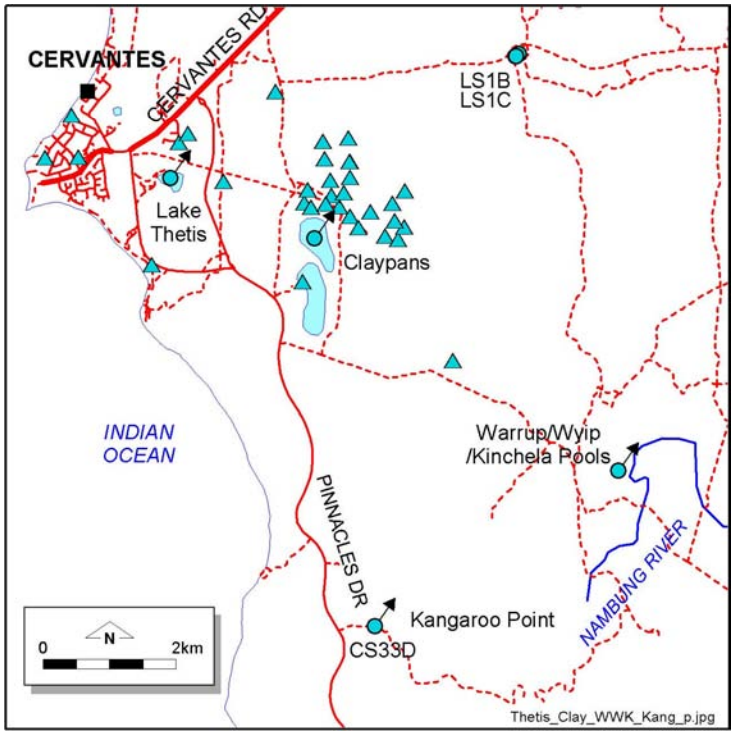
Geology: Tamala Limestone
Woodada Fm
Lesueur Sandstone

Water/Ground Water Flow: Discharge from Tamala Limestone towards the ocean

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: 920-1100 mg/L



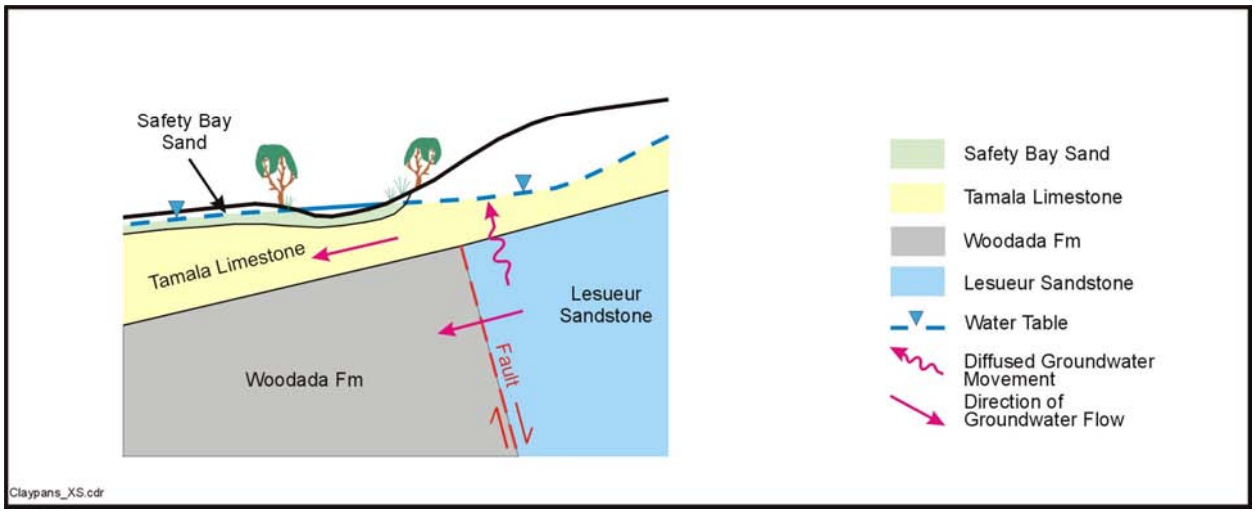
GDE Considerations:

- Significant impact on GDE from saltwater intrusion
- Intact vegetation around claypans

Site Description:

- Water levels regulated by sea level
- Recharge to the Tamala Limestone by direct rainfall, by seepage from runoff and streamflow
- Upward leakage from Lesueur Sandstone into the Tamala Limestone

Site Model:



Site #: 67

Name: Warrup/Wyip/Kinchela

Map Reference: Wedge Island

Site Coord: (322526E: 6619150N)

Bores/Features: CS34
Midlands No.6

Physiography/ Slope: Lower slope

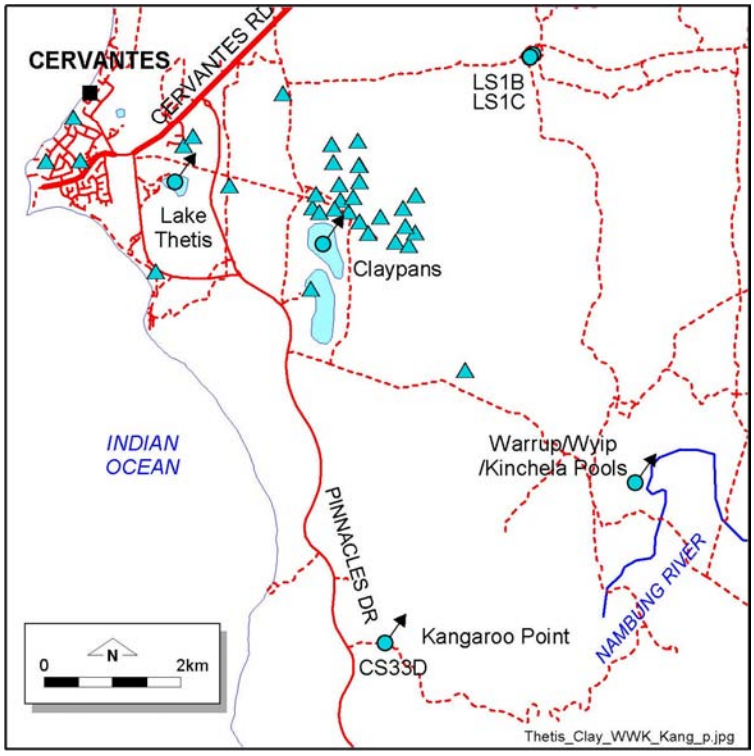
Geology: Tamala Limestone
Lesueur Sandstone

Water/Ground Water Flow: Lateral movement through the Tamala

Aquifer: Tamala Limestone

Depth to WT: At or near surface

Salinity: Unknown



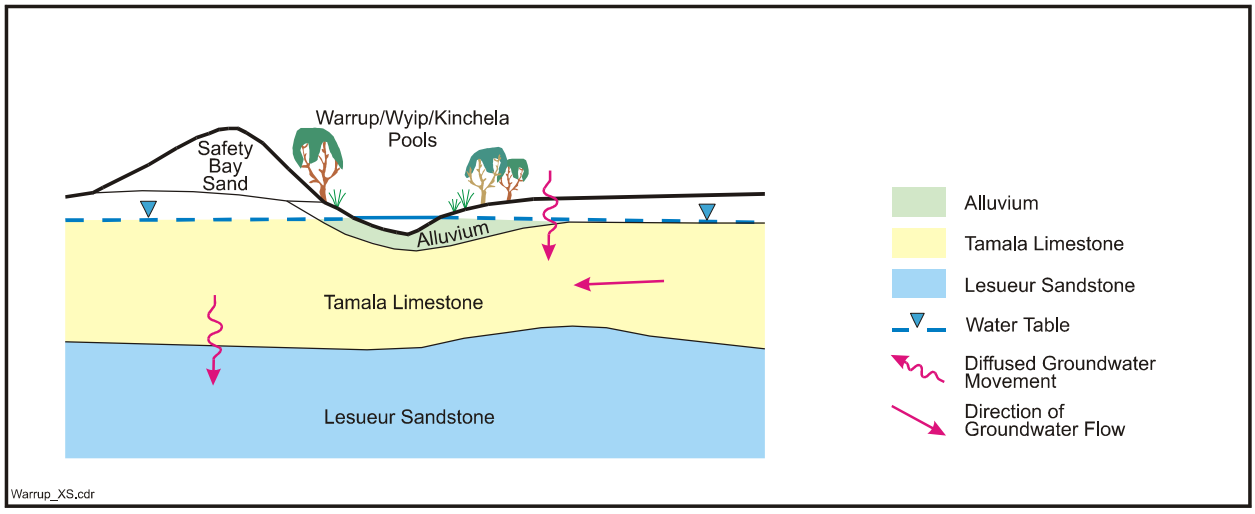
GDE Considerations:

- Abstraction from the Superficial Aquifer may impact on the GDE
- Unlikely that abstraction from the Lesueur Aquifer will impact on GDE
- Native vegetation intact surrounding pool sites

Site Description:

- Recharge by direct infiltration of rainfall and movement is downward and laterally to discharge in topographic depressions
- Watertable is close to the surface
- Pools are controlled by a decrease in permeability within the alluvium deposits
- Downward infiltration to the Lesueur Sandstone

Site Model:



Site #: 68

Name: Katoora Soak

Map Reference: Wedge Island

Site Coord: (327433E: 6621087N)

Bores/Features: No. 42
Midlands No.6

Physiography/ Slope: Lower slope

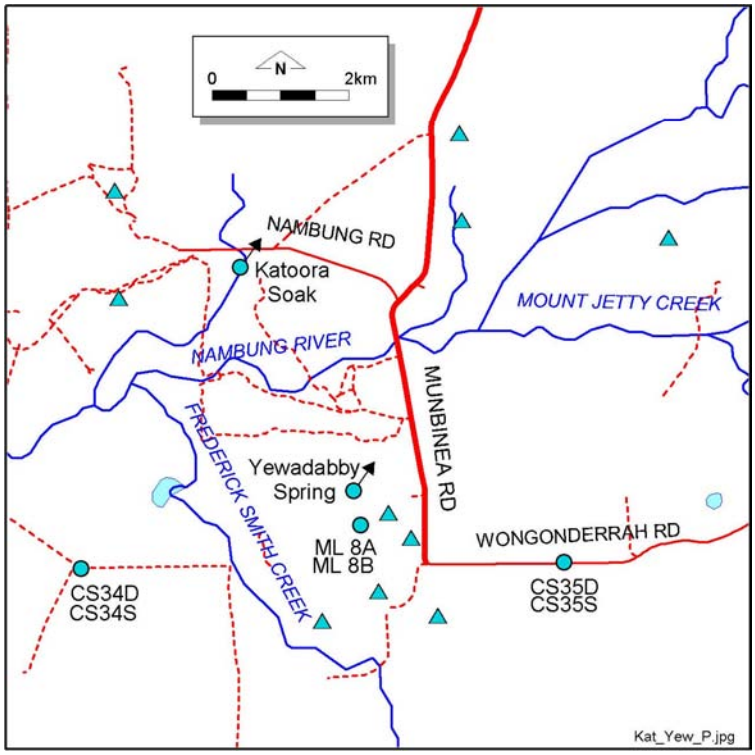
Geology: Bassendean Sand
Lesueur Sandstone

Water/Ground Water Flow: Lateral movement through the Tamala

Aquifer: Bassendean Sand
Guildford Formation

Depth to WT: At or near surface

Salinity: <1000 mg/L



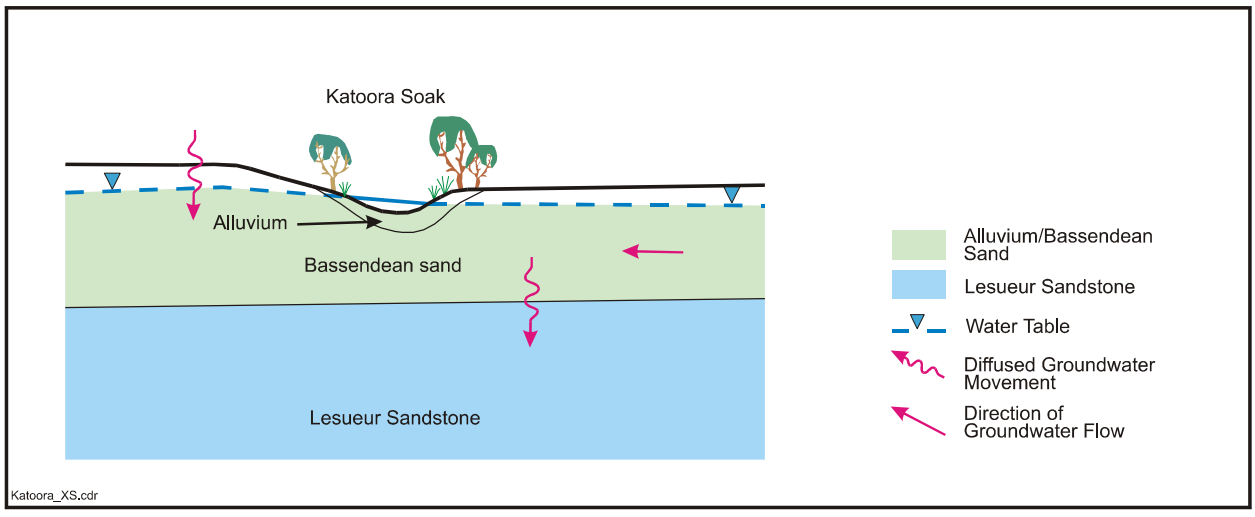
GDE Considerations:

- Abstraction from the Superficial Aquifer may impact on GDE
- The rise in the water salinity due to evapotranspiration effect may impact on GDE
- Unlikely that abstraction from the Lesueur Aquifer will impact on the GDE
- Native vegetation intact surrounding the Katoora site

Site Description:

- Recharge by direct infiltration of rainfall and streamflow
- Discharge is by leakage to the Lesueur Sandstone and by evapotranspiration
- Watertable is close to the surface in topographic depressions
- Soaks are controlled by a decrease in permeability in alluvium deposits

Site Model:



Site #: 69

Name: Yewadabby Spring

Map Reference: Wedge Island

Site Coord: (329092E: 6617828N)

Bores/Features: Yewadabby Sp. No.1
Yewadabby No.2 soak

Physiography/ Slope: Lower slope

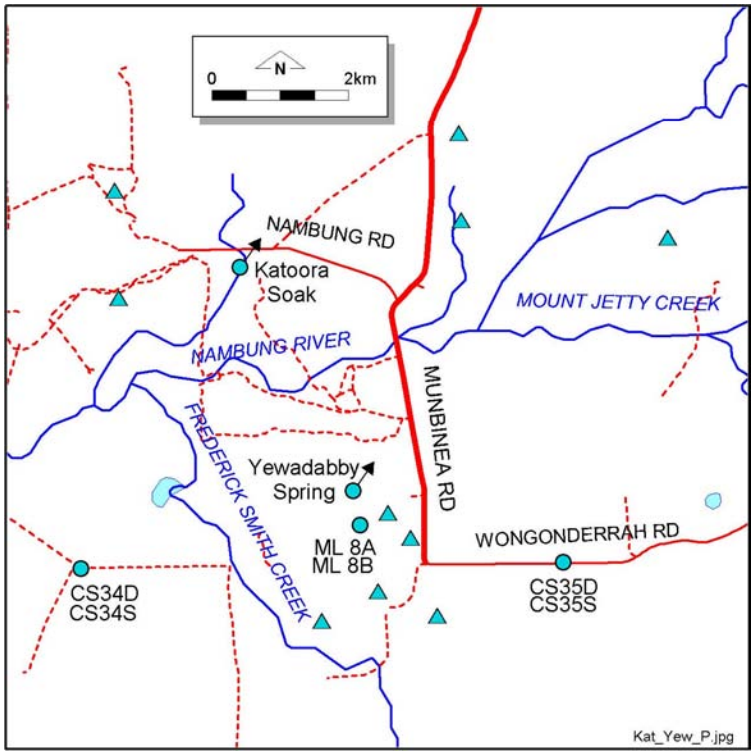
Geology: Bassendean Sand
Eneabba Fm
Lesueur Fm

Water/Ground Water Flow: Lateral movement through superficial

Aquifer: Bassendean Sand

Depth to WT: At or near surface

Salinity: 360 – 790 mg/L



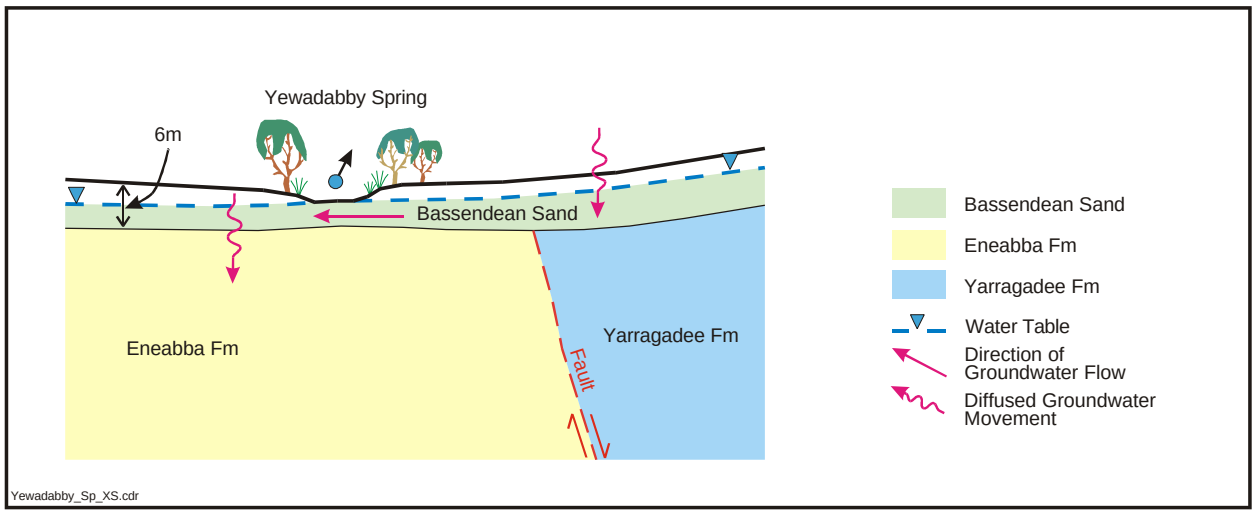
GDE Considerations:

- Abstraction from the Superficial Aquifer may impact on GDE
- Unlikely that abstraction from Eneabba Formation and Yarragadee Formation will impact on GDE

Site Description:

- Recharge by direct infiltration of rainfall and lateral discharge in topographic depressions
- Water is relatively fresh and close to the surface
- Soaks and spring controlled by a decrease in permeability within the Eneabba Fm
- Downward infiltration to the Eneabba Fm
- No.1 Well has an elevated salinity (6400 mg/L TDS) due to evapotranspiration in swampy areas

Site Model:



Site #: 70

Name: Wondamerra Spring

Map Reference: Wedge Island

Site Coord: (345157E: 6618098N)

Bores/Features: CS34
No.20

Physiography/ Slope: Lower mid-slope

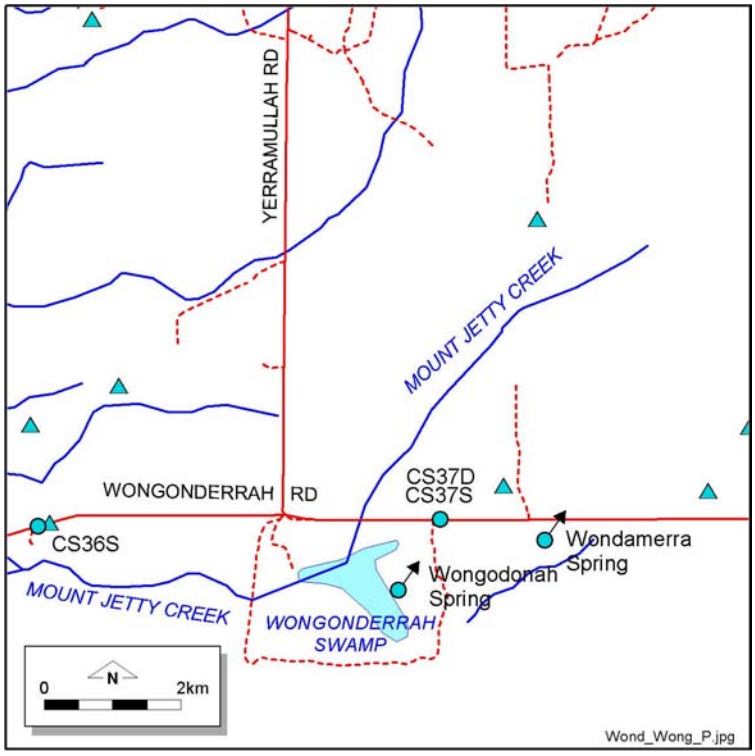
Geology: Bassendean Sand
Yarragadee Fm

Water/Ground Water Flow: Upward head gradient from Yarragadee

Aquifer: Yarragadee Fm

Depth to WT: At or near surface

Salinity: 360 – 690 mg/L



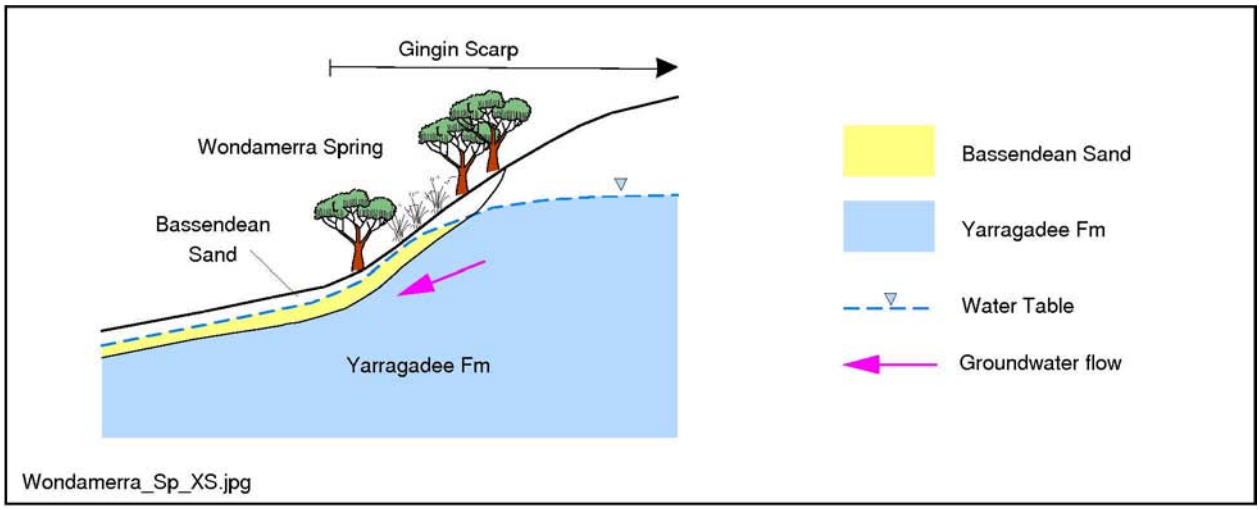
GDE Considerations:

- Groundwater abstraction may impact on GDE

Site Description:

- Upward leakage occurs from the Yarragadee Fm to the Superficial Fm where Warradarge Fault acts as a hydraulic barrier to westward groundwater movement below the superficial formations
- Watertable close to the surface
- The Yarragadee Formation is a major potential source of groundwater

Site Model:



Site #: 71

Name: Wongonderrah Spring

Map Reference: Wedge Island

Site Coord: (343025E: 6617367N)

Bores/Features: CS37

Physiography/ Slope: Lower mid-slope

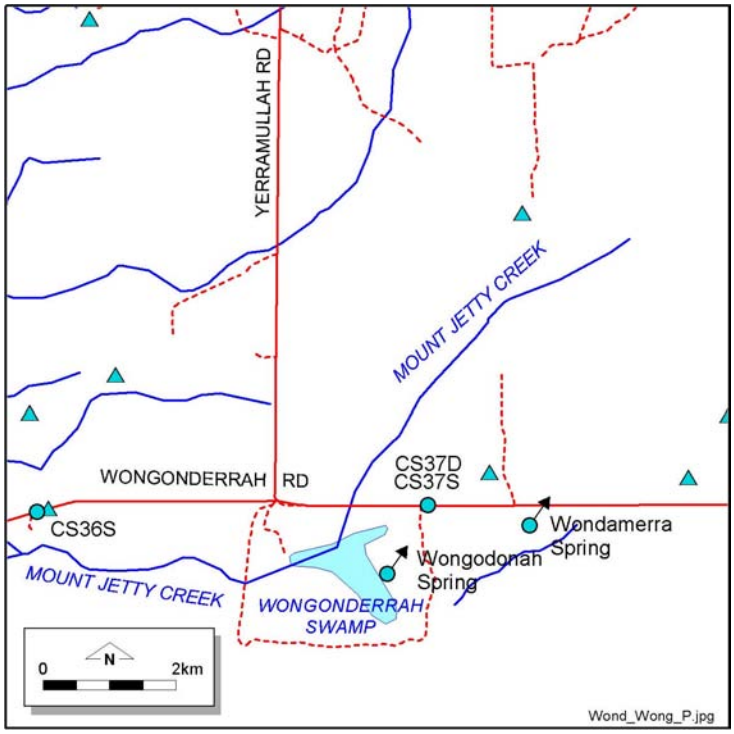
Geology: Bassendean Sand
Yoganup Fm
Yarragadee Fm

Water/Ground Water Flow: Upward head gradient

Aquifer: Yarragadee Fm

Depth to WT: At or near surface

Salinity: 360 – 500 mg/L



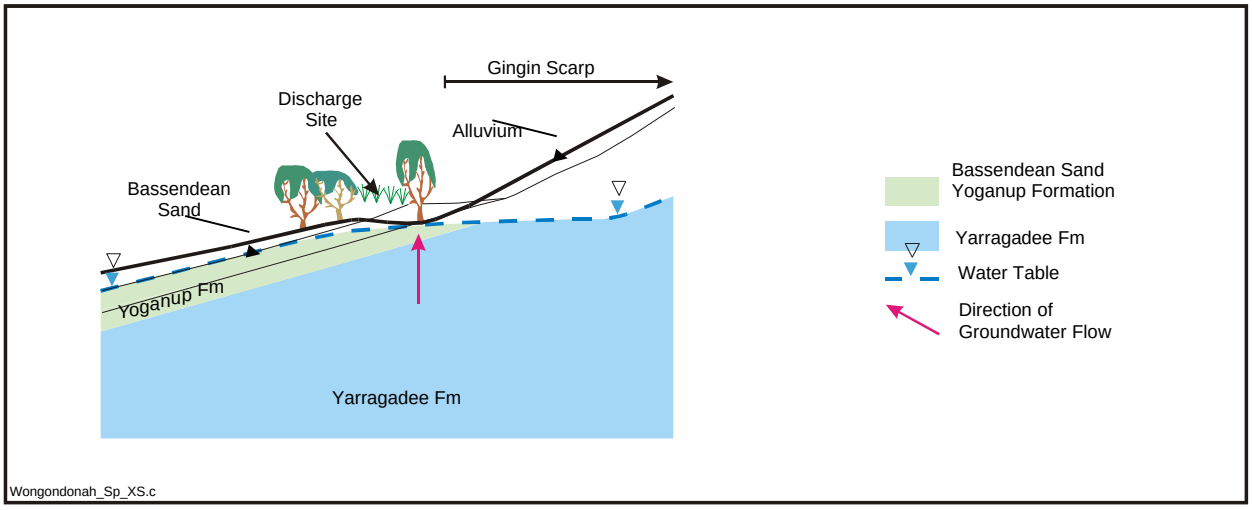
GDE Considerations:

- Groundwater abstraction may impact on GDE

Site Description:

- Upward leakage occurs from the Yarragadee Fm to the Superficial Fm
- It is possible that the Warradarge Fault acts as a hydraulic barrier to westward groundwater movement below the superficial formations
- Watertable is close to the surface

Site Model:



Site #: 72

Name: Kangaroo Point

Map Reference: Wedge Island

Site Coord: (318878E: 6616810N)

Bores/Features: CS33

Physiography/ Slope: Interdunal Depressions

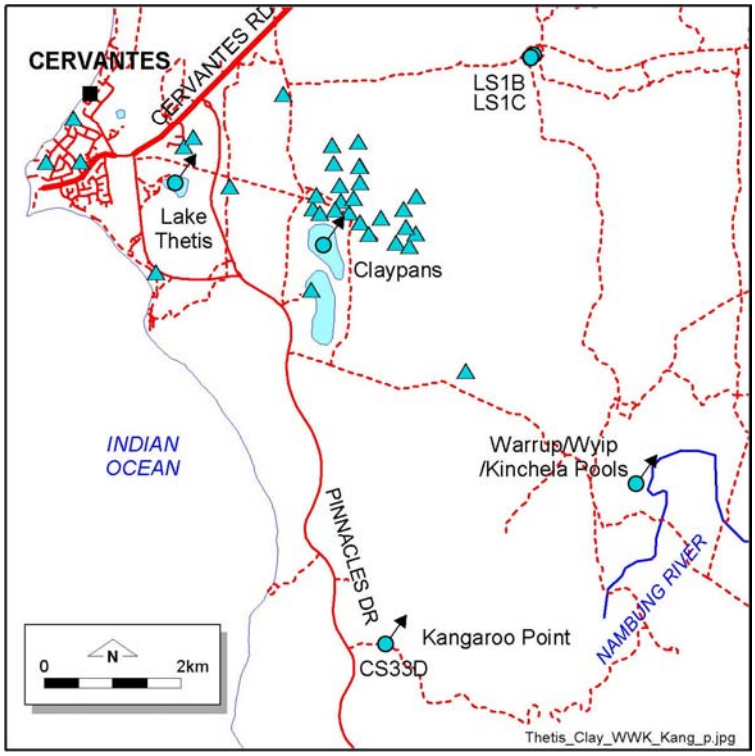
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Westward flow to ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: ~760 mg/L

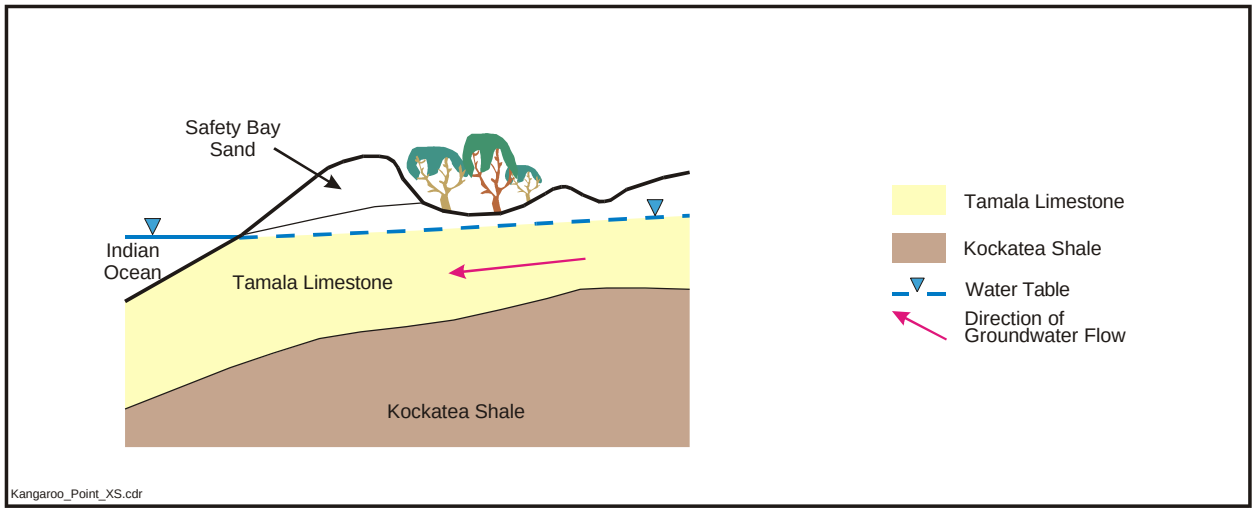


GDE Considerations:

Site Description:

- Water level is close to surface in interdunal depressions
- Recharge is mainly by direct infiltration of rainfall to the superficial aquifer
- Kockatea Shale acts as an impermeable base to the Tamala Limestone

Site Model:



Site #: 73

Name: Grey

Map Reference: Wedge Island

Site Coord: (321499E: 6606980N)

Bores/Features: CS28
ML9
CS23

Physiography/ Slope: Interdunal depressions

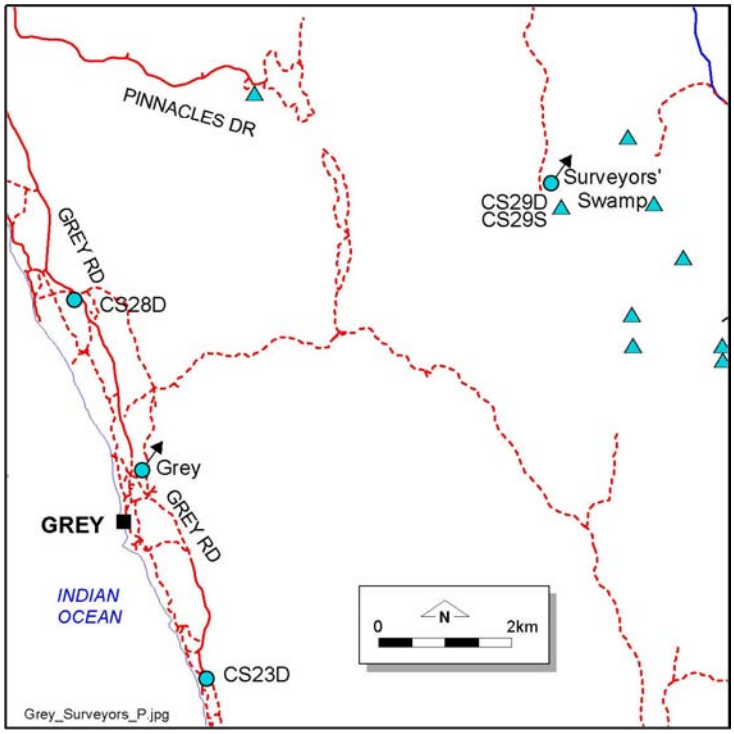
Geology: Tamala Limestone
Kockatea Shale

Water/Ground Water Flow: Westward flow to the ocean

Aquifer: Tamala Limestone

Depth to WT: 0 to 5 m bgl

Salinity: 430 – 2170 mg/L

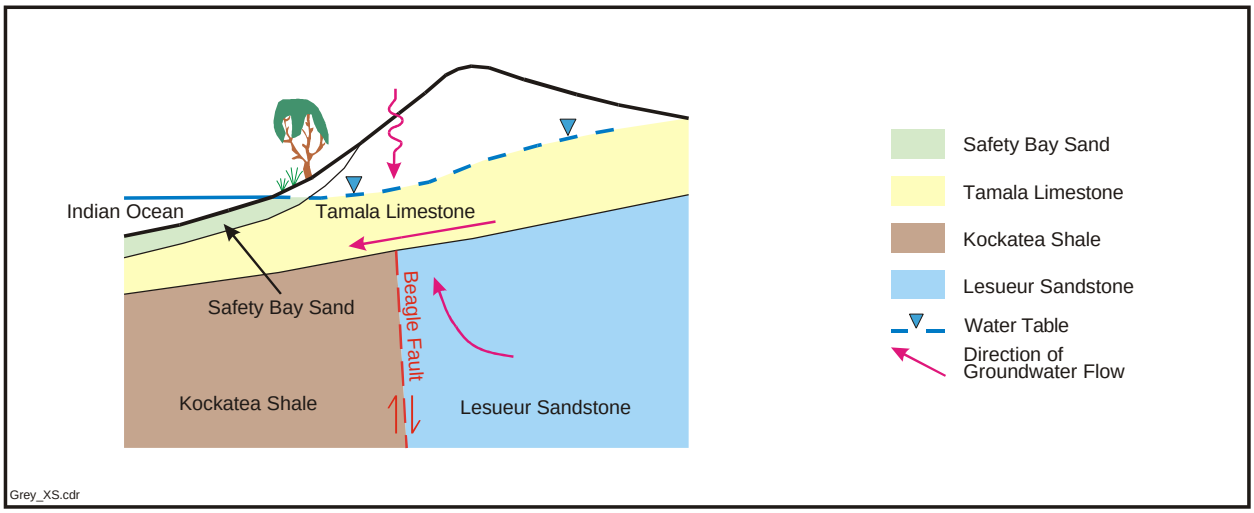


GDE Considerations:

Site Description:

- TDS is elevated at CD28 (2170 mg/L) – watertable closer to surface (discharge by evapotranspiration in the Bassendean Dunes)
- Water level is close to surface in interdunal depressions
- Recharge is mainly by direct infiltration of rainfall to the superficials and by upward leakage from the Lesueur Sandstone
- Kockatea Shale acts as an impermeable base to the Tamala Limestone

Site Model:



Site #: 74

Name: Surveyors' Swamp

Map Reference: Wedge Island

Site Coords: (327631E: 6611277N)

Bores/Features: CS29

Physiography/ Slope: Lower slope

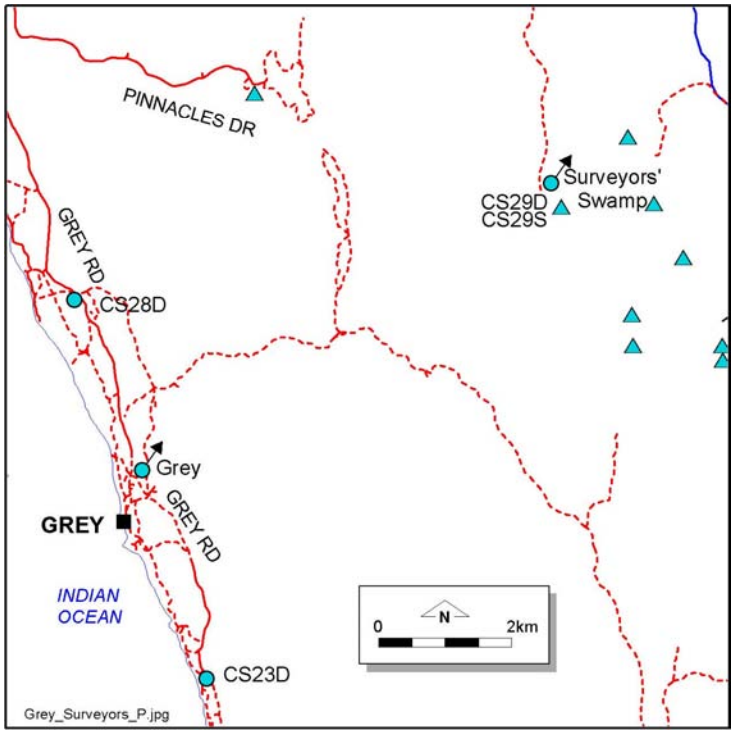
Geology: Tamala Limestone
Lesueur Sandstone

Water/Ground Water Flow: Westward flow to the ocean

Aquifer: Tamala Limestone

Depth to WT: 5 to 10 m bgl

Salinity: 350 mg/L



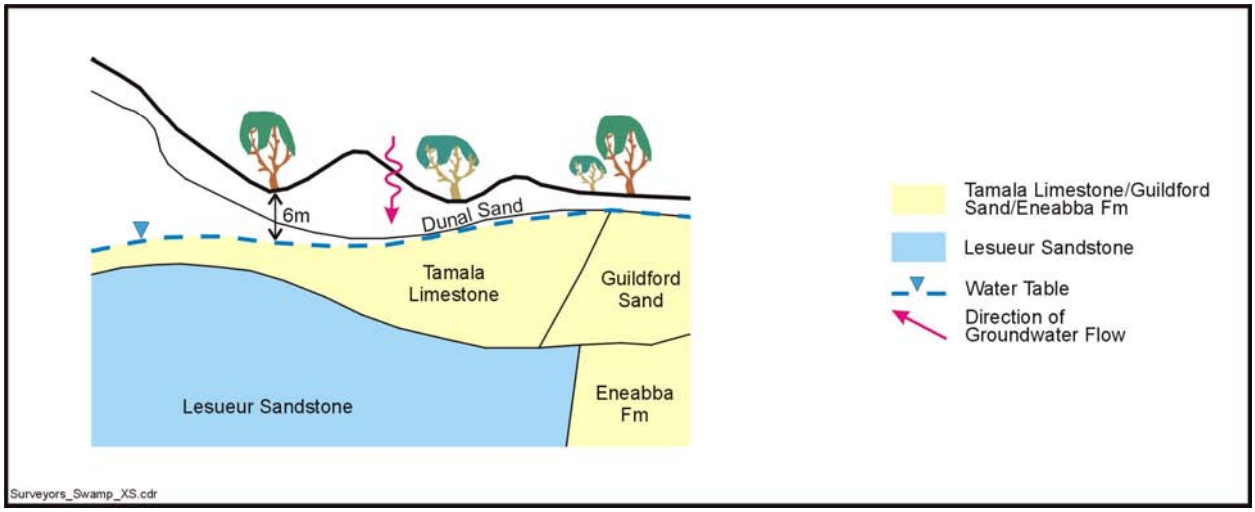
GDE Considerations:

- Groundwater abstraction from the limestone may impact on GDE
- Most GDEs are associated with interdunal depressions

Site Description:

- Watertable is close to surface in interdunal depressions
- Recharge is mainly by direct infiltration of rainfall to the Tamala Limestone and by upward leakage from the Lesueur Sandstone

Site Model:



Site #: 75

Name: Coonmadodo Spring

Map Reference: Wedge Island

Site Coord: (333802E: 6605435N)

Bores/Features: CS24
Coonmadodo No.4

Physiography/ Slope: Lower slope

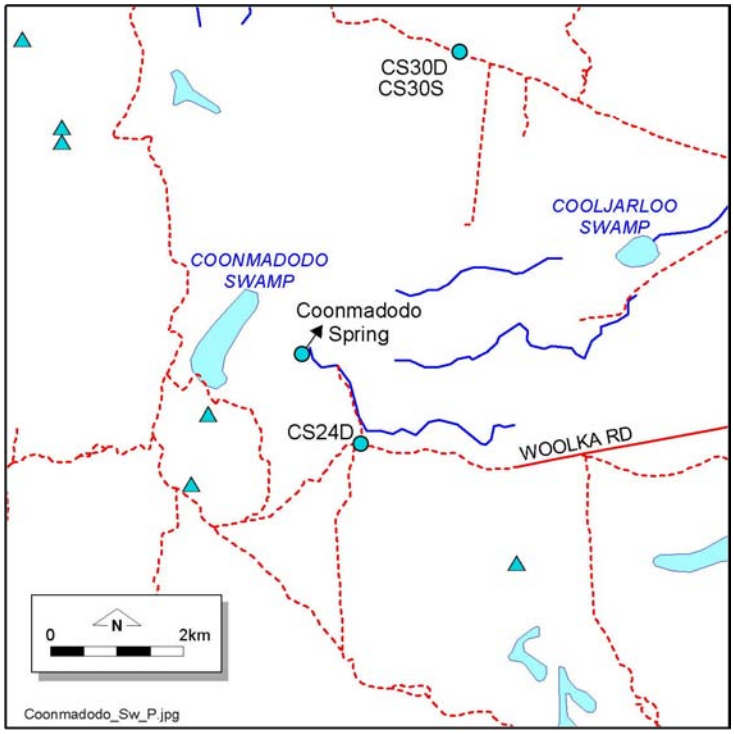
Geology: Bassendean Sand
Guildford Sand
Cattamarra CM

Water/Ground Water Flow: Westward flow to the ocean

Aquifer: Guildford Sand

Depth to WT: 0 to 5 m bgl

Salinity: 540-770 mg/L



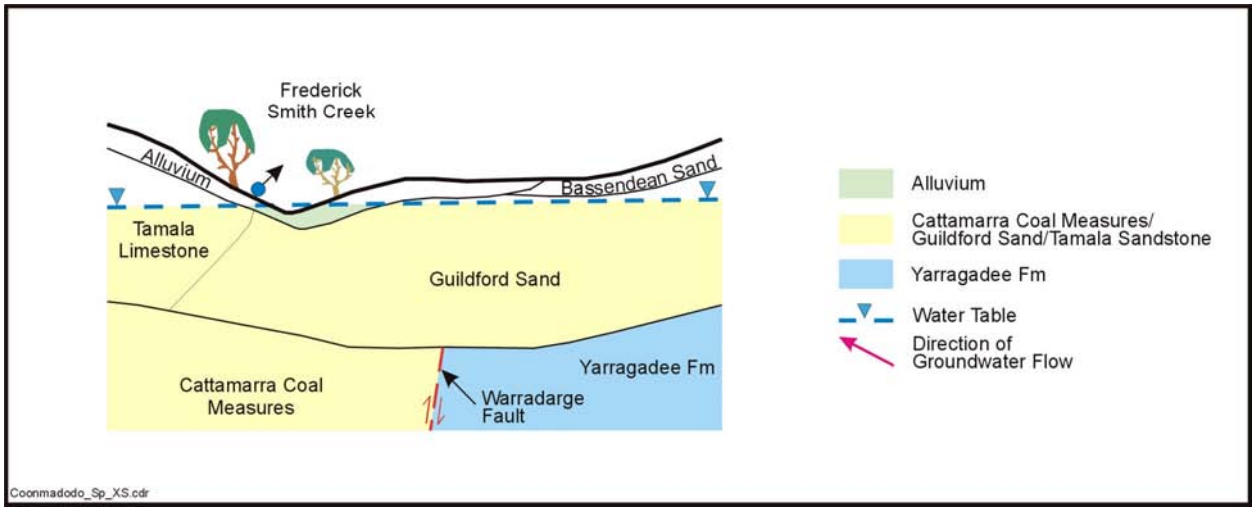
GDE Considerations:

- Groundwater abstraction from the Guildford Sand and the Cattamarra Coal Measures may impact on GDE
- Most GDEs are associated with interdunal depressions

Site Description:

- Watertable is close to surface in interdunal deposits
- Recharge is mainly by direct infiltration of rainfall to the Guildford Sand
- High TDS at CS24 is likely from the effect of evapotranspiration
- Groundwater flow is in the westerly direction towards the ocean

Site Model:



Site #: 76

Name: Cooljarloo Spring

Map Reference: Wedge Island

Site co-ords: (346029E: 6607267N)

Bores/Features: CS31
No.5

Physiography/ Slope: Lower slope

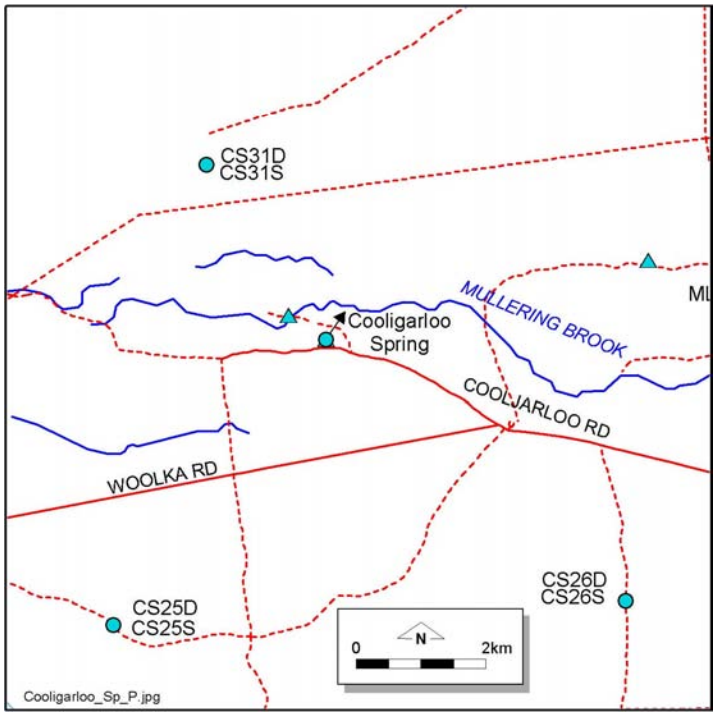
Geology: Bassendean Sand
Guildford Sand
Yarragadee Fm

Water/Ground Water Flow: Westward to ocean

Aquifer: Guildford Sand

Depth to WT: 0 to 5 m bgl

Salinity: 540 mg/L

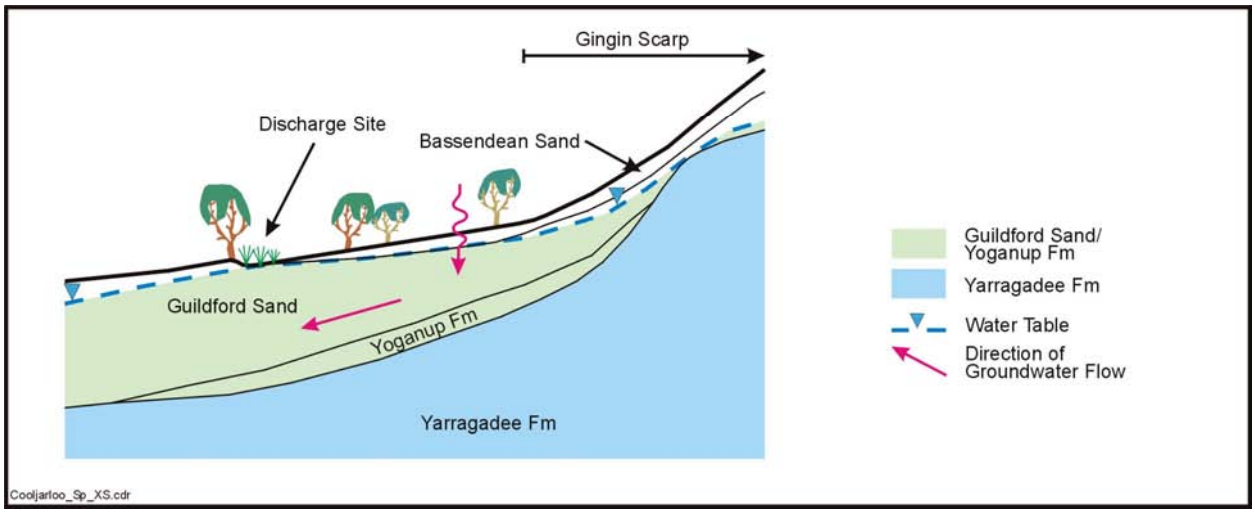


GDE Considerations:

Site Description:

- GDE is topographically controlled and coincident with the presence of Guildford Sand and alluvium
- Recharge to the superficial formations is mainly by direct infiltration of rainfall
- Watertable close to surface

Site Model:



Site #: 77

Name: Muralong Pool

Map Reference: Wedge Island

Site Coord: (354483E: 6607267N)

Bores/Features: CS32

Physiography/ Slope: Lower slope

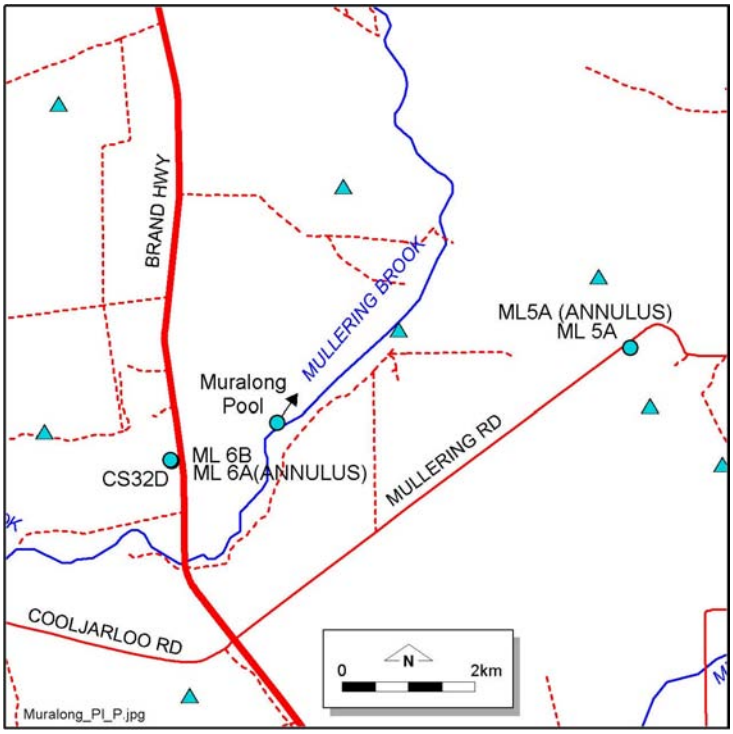
Geology: Yarragadee Fm

Water/Ground Water Flow: Upward hydraulic head gradient

Aquifer: Yarragadee Aquifer

Depth to WT: At or near surface

Salinity: 2360 mg/L



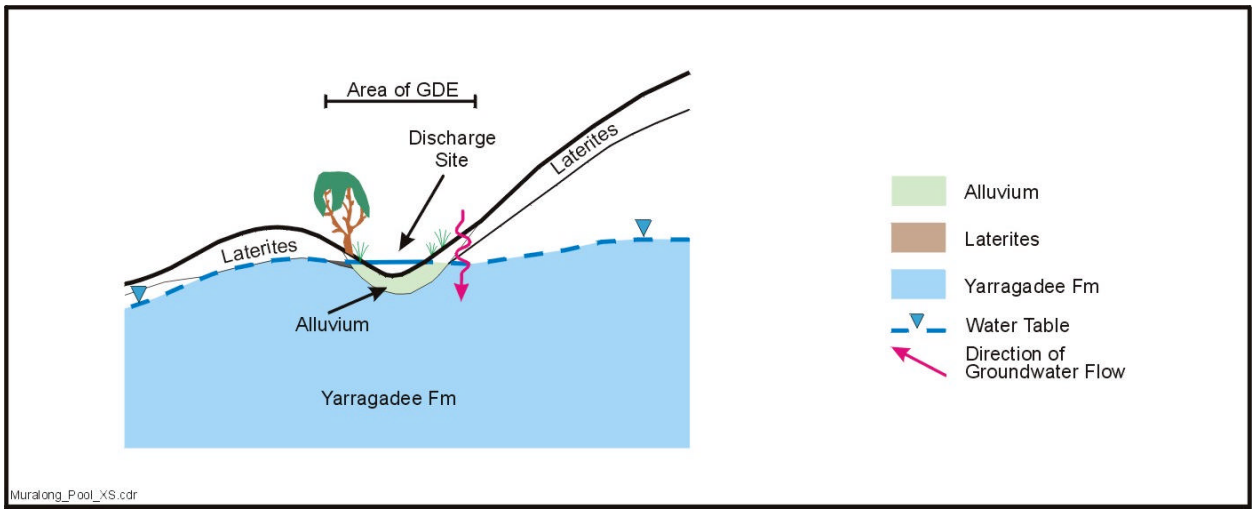
GDE Considerations:

- Native vegetation intact along Mullering Brook and Gingin Scarp

Site Description:

- Watertable at surface in low depression
- Recharge concentrated in the valley

Site Model:



Site #: 78

Name: Mimegarra Swamp

Map Reference: Wedge Island

Site Coord: (353961E: 6580652N)

Bores/Features: CS14
CS15
CS8

Physiography/ Slope: Lower slope

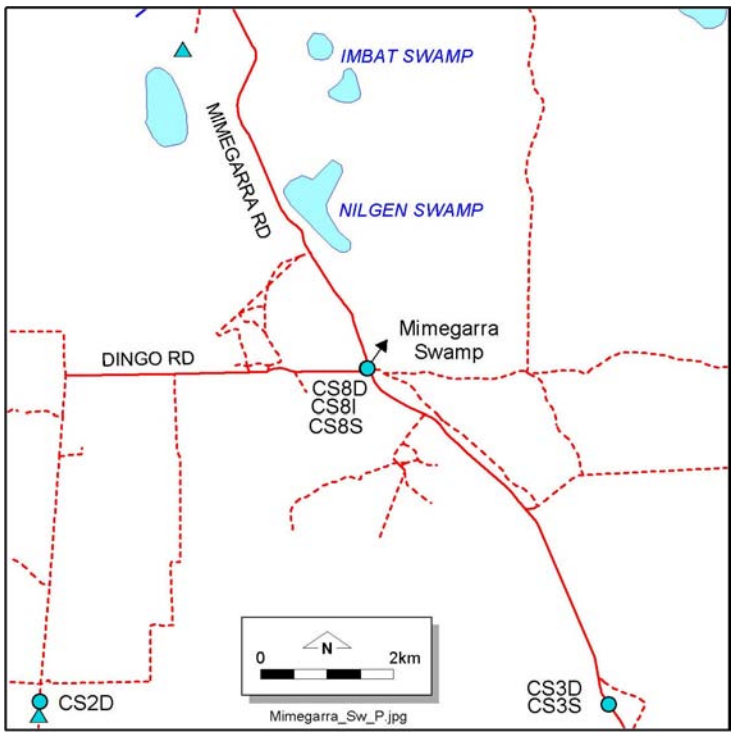
Geology: Guildford Fm
Tamala Limestone
Leederville Fm

Water/Ground Water Flow: Downward head gradient

Aquifer: Superficial aquifer

Depth to WT: 0 to 10 m bgl

Salinity: 390 – 920 mg/L



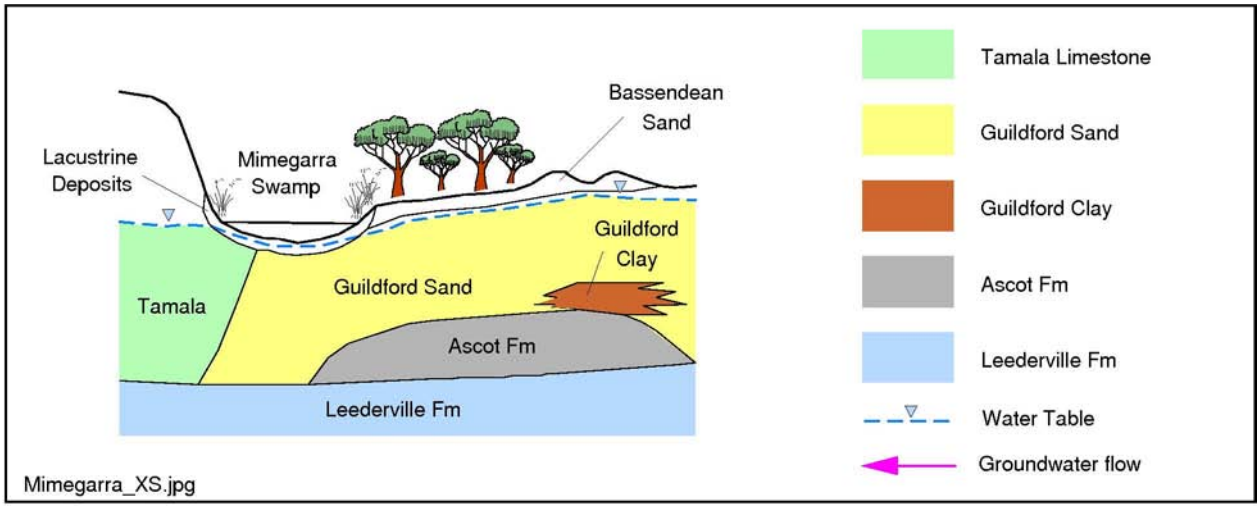
GDE Considerations:

- Marginal / fringing vegetation on bank of Mimegarra Swamp is considered to be groundwater dependent

Site Description:

- TDS increases at CS8 ranging 2800 – 4400 mg/L due to its location in swamplands
- Mimegarra Swamp is a perched system water and not connected to watertable
- Depth to watertable in the Guildford Fm is controlled mainly by the slope of the land surface
- Recharge to the superficial formations is mainly by direct infiltration of rainfall

Site Model:



Site #: 79

Site Name: Walyering Pool

Map Reference: Wedge Island

Site Coord: (362400E: 6605728N)

Bores/Features: Soaks
Alone's Bore
ML5

Physiography/ Slope: Lower slope

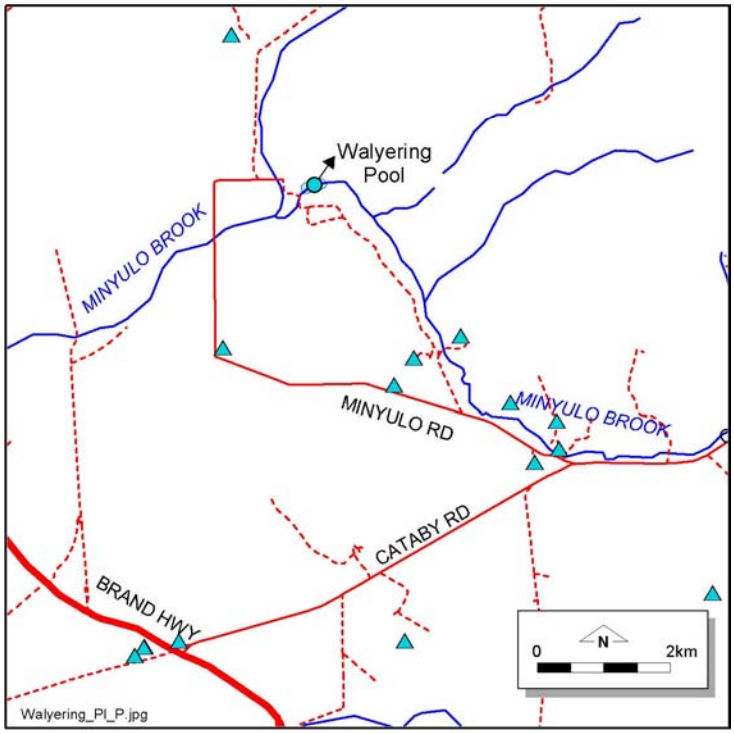
Geology: Yarragadee Fm

Water/Ground Water Flow: Downward

Aquifer: Yarragadee Aq.

Depth to WT:

Salinity: 789 mg/L



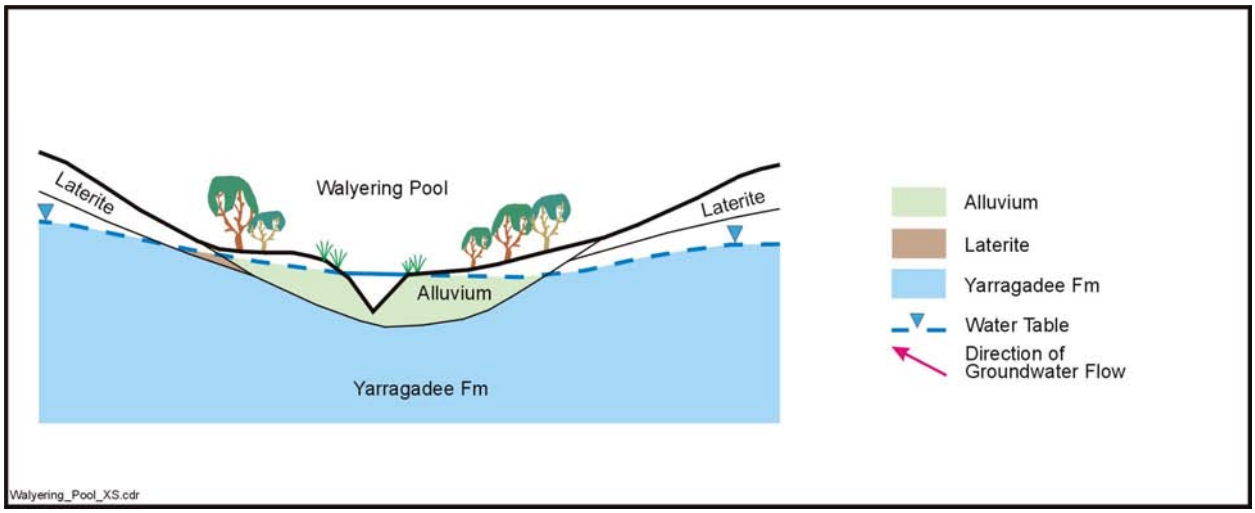
GDE Considerations:

- Native fringing vegetation is intact along the brook

Site Description:

- Recharge by downward leakage where Yarragadee is unconfined
- Discharge from the Yarragadee Fm along the lower part of the Minyulo Brook

Site Model:



Site #: 80

Name: Bunyanocca Spring

Map Reference: Dandaragan

Site Coord: (379791E: 6608594N)

Bores/Features: No.9
No.23
Bunyanocca Sp.

Physiography/ Slope: Upper mid-slope

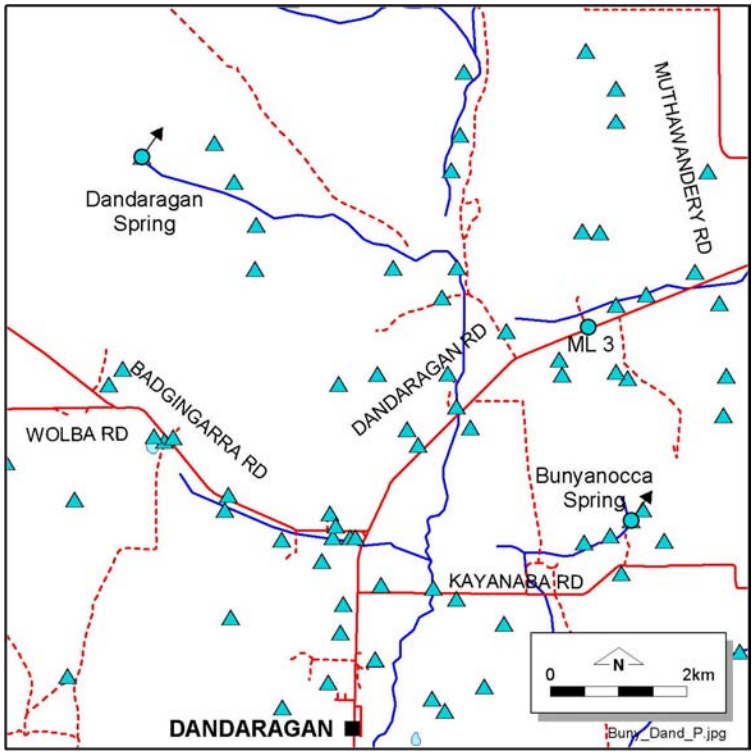
Geology: Lancelin Formation

Water/Ground Water Flow: Overflow from Poison Hill Aquifer

Aquifer: Poison Hill Aquifer

Depth to WT: At or near surface

Salinity: 1140 mg/L



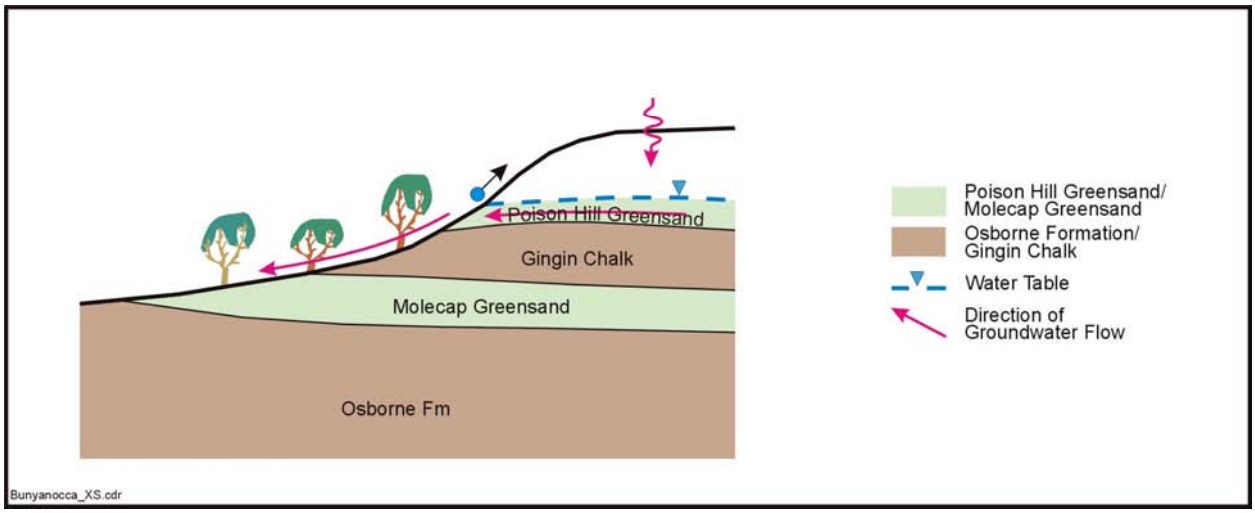
GDE Considerations:

- Vegetation occurs locally along the contact between the Poison Hill and Gingin Chalk

Site Description:

- Poison Hill Aquifer is unconfined
- Groundwater discharge in the form of springs controlled by the stratigraphy where Poison Hill overlies Gingin Chalk of lower permeability
- Recharge by direct infiltration of rainfall
- Depth to groundwater is less than 2 m along streams

Site Model:



Site #: 81

Name: Dandaragan Spring

Map Reference: Dandaragan

Site Coord: (372648E: 6613897N)

Bores/Features: No.26
No.23

Physiography/ Slope: Lower mid-slope

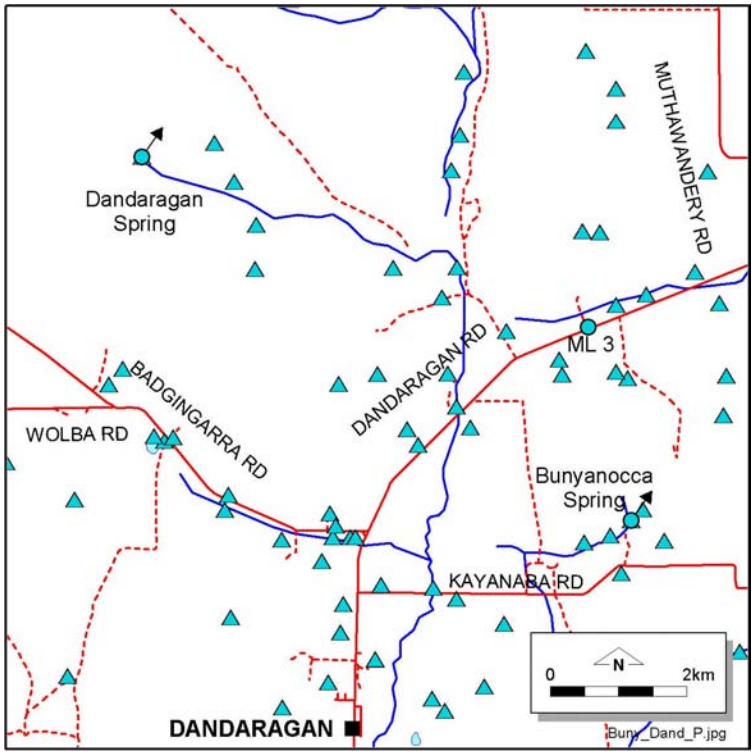
Geology: Lancelin Formation

Water/Ground Water Flow: Overflow from Poison Hill Aq.

Aquifer: Poison Hill Aq.

Depth to WT: At or near surface

Salinity: 450 mg/L

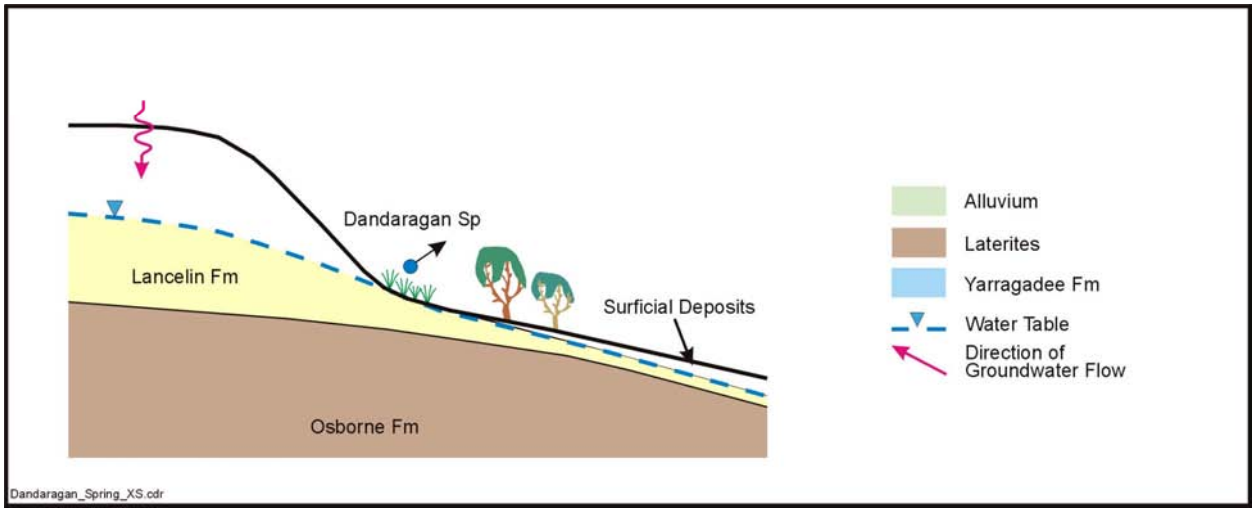


GDE Considerations:

Site Description:

- Discharge from the Lancelin Fm above the Osborne Fm
- Groundwater discharge in the form of springs at break of slope at the base of the Dandaragan Scarp
- Recharge by direct infiltration of rainfall
- Depth to groundwater is less than 2 m along streams
- TDS values may increase up to 1000 – 3000 mg/L where groundwater discharge occurs from clay rich or lateritic residual soils

Site Model:



Site #: 82

Name: Muthawandery Spring

Map Reference: Dandaragan

Site Coord: (379033E: 6619363N)

Bores/Features: No. 9, No. 10

Physiography/ Slope: Lower slope

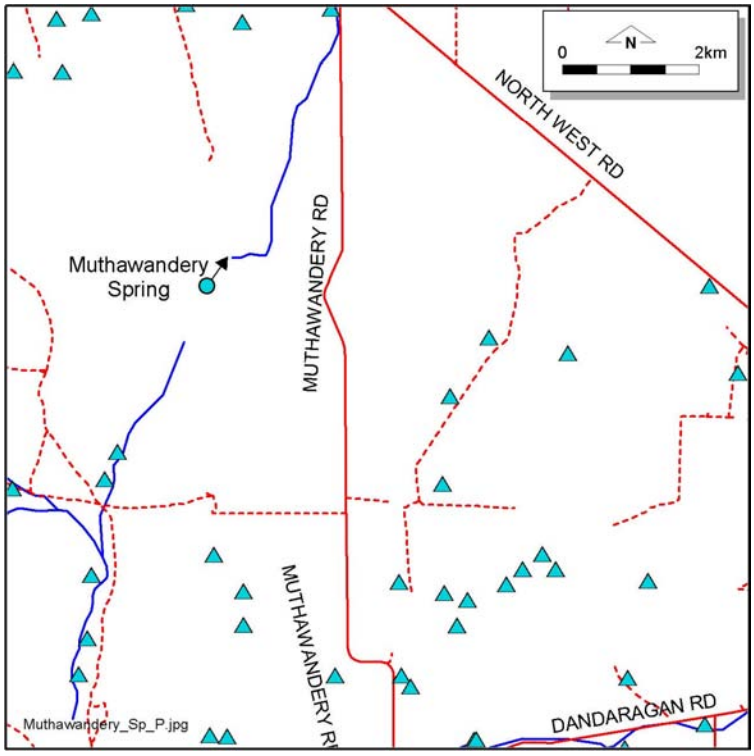
Geology: Lancelin Formation
Osborne Formation
Leederville Formation

Water/Ground Water Flow: Southward into the Minyulo Brook

Aquifer: Leederville Formation

Depth to WT: At or near surface

Salinity: 500-1000 mg/L



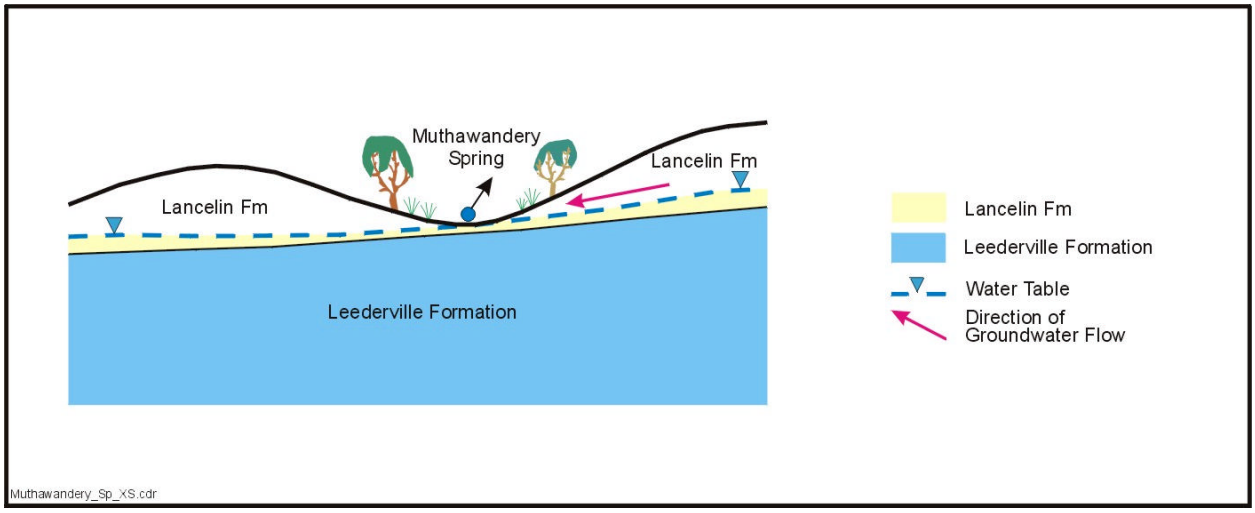
GDE Considerations:

- Vegetation intact at spring site. Vegetation mostly cleared for agriculture
- Increased groundwater abstraction from the Leederville Formation may impact on GDE

Site Description:

- Recharge by direct infiltration of rainfall at outcrops of the Leederville Formation and local runoffs
- Discharge occurs as small springs that drain into the Minyulo Brook at the base of the Dandaragan Scarp
- General direction of groundwater flow is from north to southwest
- The Leederville Aquifer is unconfined along parts of the valleys of the Minyulo Brook
- The Leederville Aquifer contains a large undeveloped resource of fresh to brackish groundwater

Site Model:



Site #: 83

Name: Kolburn Well

Map Reference: Dandaragan

Site Coord: (389745E: 6612890N)

Bores/Features: #12 Spring
Poison Hill

Physiography/ Slope: Lower slope

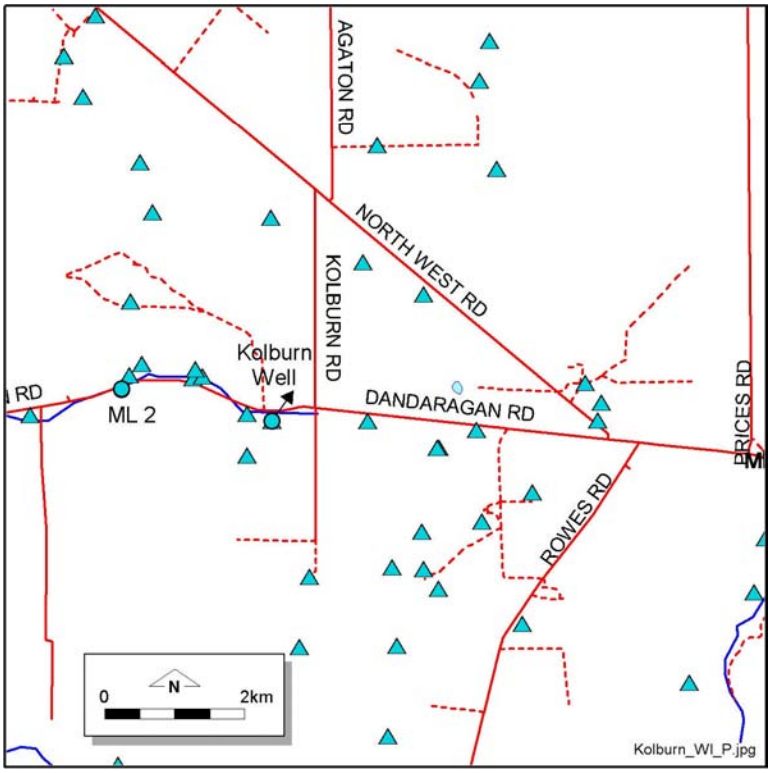
Geology: Lancelin Fm
Osborne Fm

Water/Ground Water Flow: Discharge over low permeability zone

Aquifer: Poison Hill Fm

Depth to WT: 0 to 5 m bgl

Salinity: 1700 mg/L



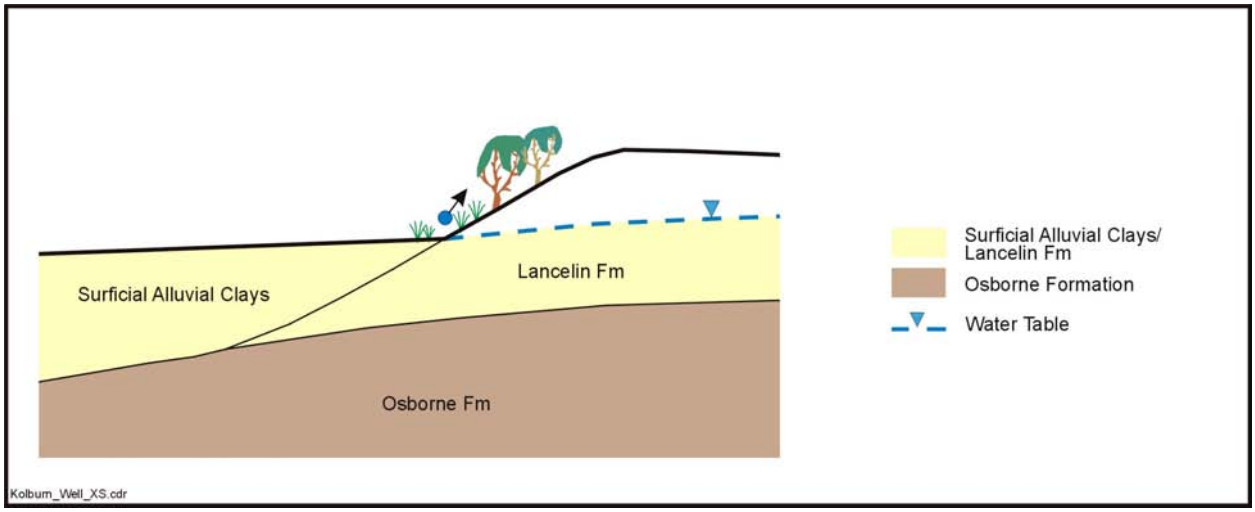
GDE Considerations:

- Native vegetation along stream
- Water abstraction from Poison Hill Aquifer is likely to have impact on GDE
- Area is highly susceptible to waterlogging

Site Description:

- Discharge in valley floors from the superficial formations above the Osborne Formation
- Osborne Formation is close to the surface
- Spring discharge #12 east of ML2
- The watertable is essentially a perched watertable
- The hydrogeology of this area is described by Kay (1999)

Site Model:



Site #: 84

Name: Yallalie Crater

Map Reference: Dandaragan

Site Coord: (383168E: 6629476N)

Bores/Features: Yallalie well
No.1
No.4

Physiography/ Slope: Low depression

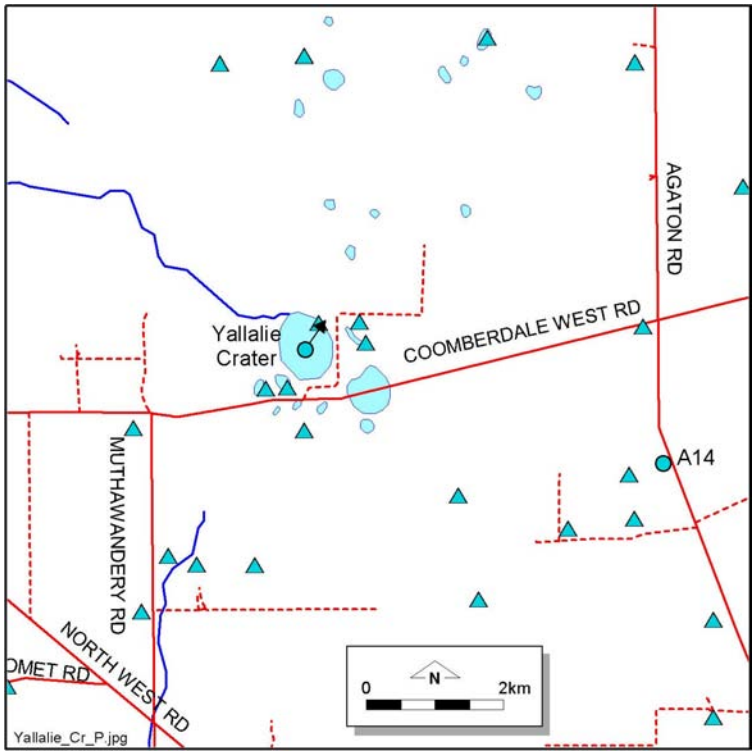
Geology: Greensand Fm

Water/Ground Water Flow: Perched system

Aquifer: Poison Hill

Depth to WT: Perched system

Salinity: 5300 mg/L



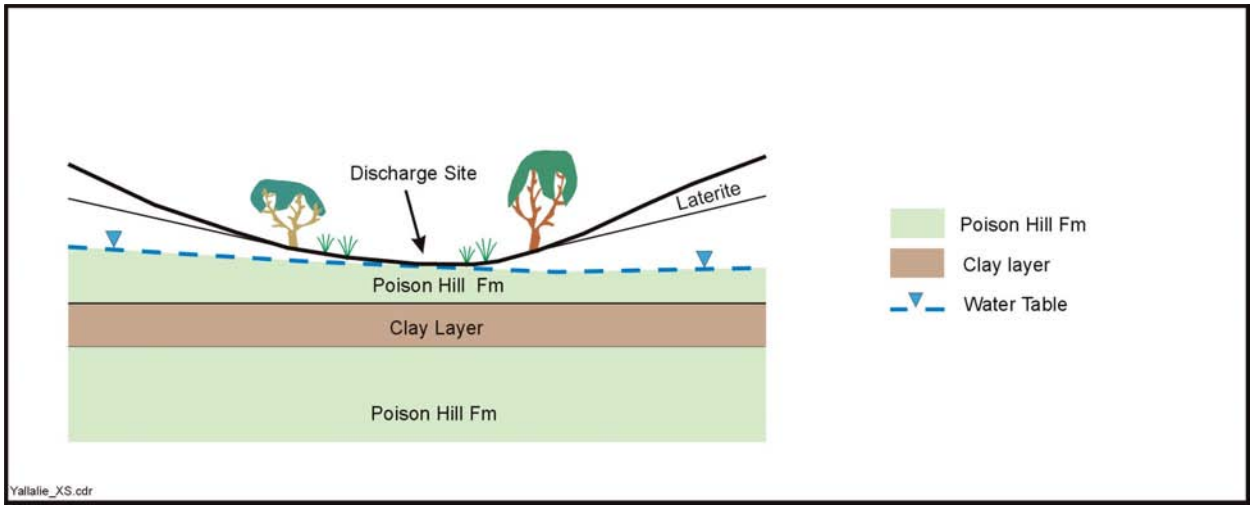
GDE Considerations:

- Not considered dependent on regional aquifer system

Site Description:

- Recharge by direct infiltration of rainfall and surface runoff
- High TDS due to evapotranspiration
- Discharge in topographic depressions
- Lakes maintained by shallow superficial discharge
- Poison Hill Aquifer isolated by the Osborne Fm
- Area is high susceptible to waterlogging

Site Model:



Site #: 85

Name: Warro Sp.

Map Reference: Dandaragan

Site Coord: (388547E: 6654971N)

Bores/Features: A13
WL2
A7
A23
A18

Physiography/ Slope: Mid-slope

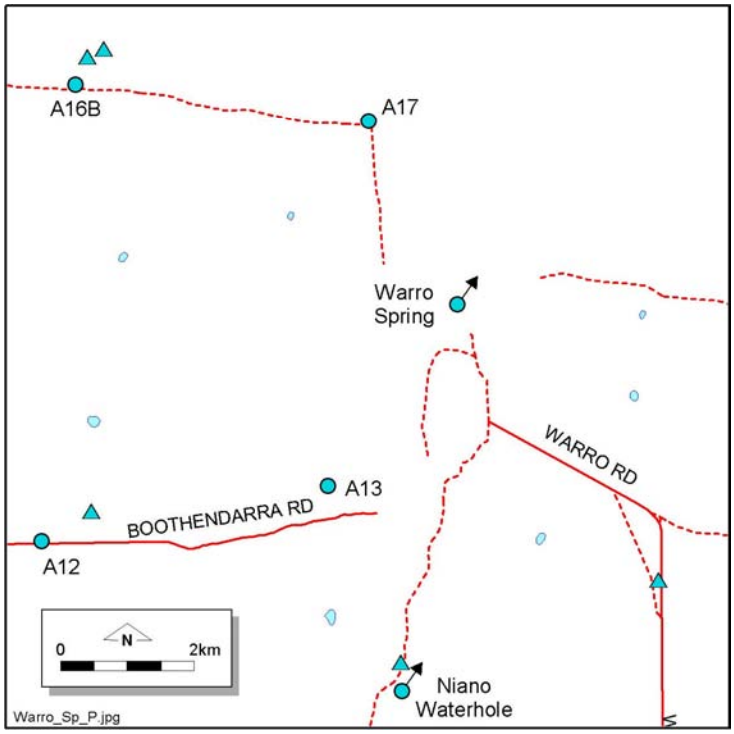
Geology: Laterites
Osborne Formation

Water/Ground Water Flow:

Aquifer: Surficial deposits

Depth to WT:

Salinity: < 1000 mg/L



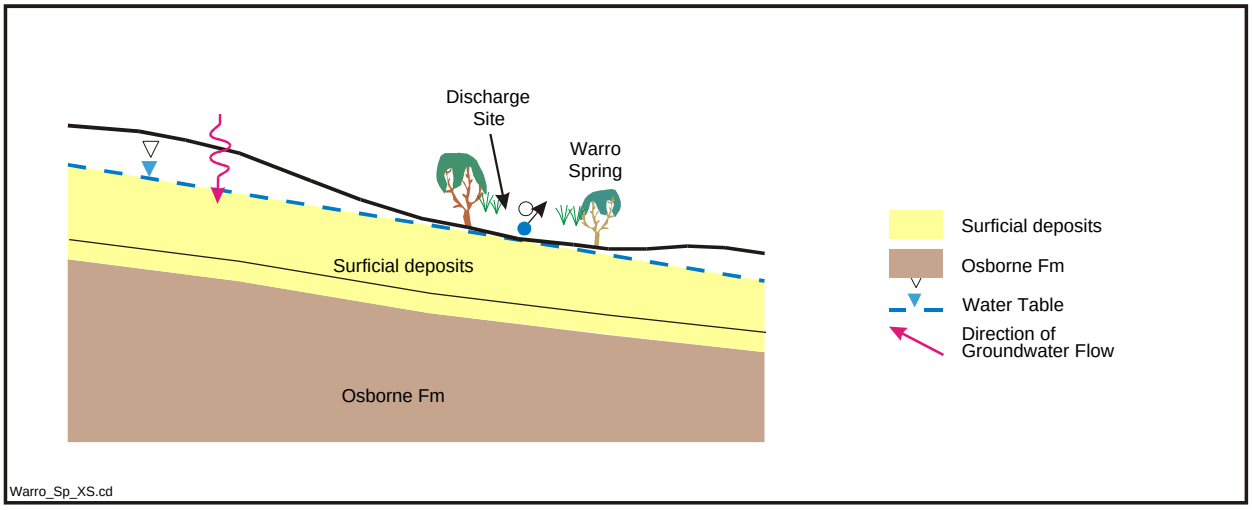
GDE Considerations:

- Only a small area of native vegetation at the site

Site Description:

- Recharge by direct infiltration of rainfall and associated runoff
- Thin localised, perched aquifers creating a line of shallow soaks and wells tapping into the Quaternary Sands
- All groundwater abstraction in the Agaton area is from the Leederville-Parmelia Aquifers

Site Model:



Site #: 86

Name: Niano Waterhole

Map Reference: Dandaragan

Site Coord: (388012E: 6650228N)

Bores/Features: Niano Waterhole

Physiography/ Slope: Mid-slope

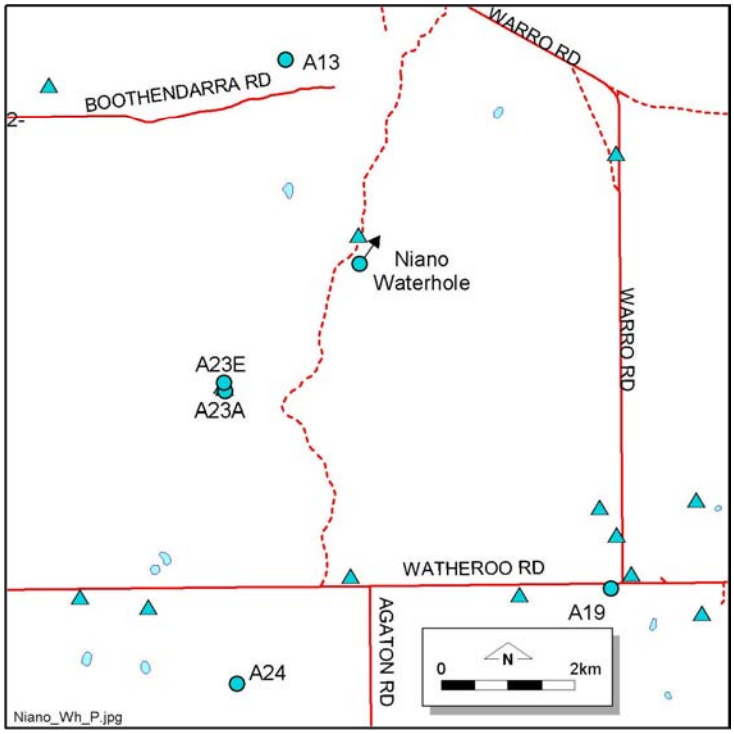
Geology: Surficial deposits
Osborne Formation

Water/Ground Water Flow:

Aquifer: Surficial deposits

Depth to WT: Perched system

Salinity: Unknown



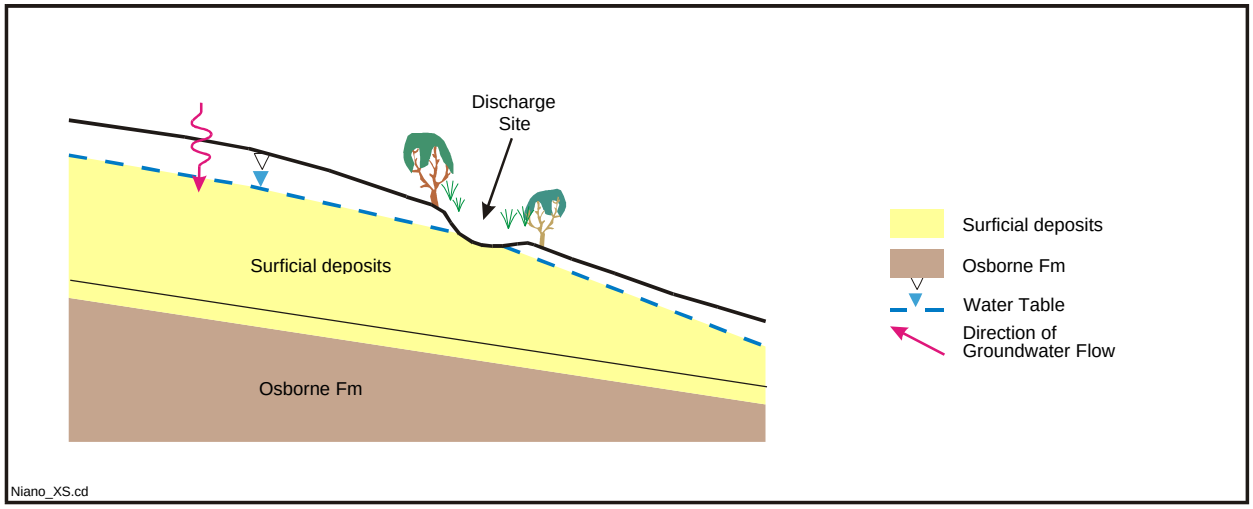
GDE Considerations:

- Not considered a GDE – perched system

Site Description:

- Recharge is by direct infiltration of rainfall and associated runoff
- Thin localised, perched aquifers creating a line of shallow soaks and wells tapping into the Quaternary Sands

Site Model:



Site #: 87

Name: Ingarno Waterhole

Map Reference: Dandaragan

Site Coord: (378279E: 6596013N)

Bores/Features: Caren Caren Brook

Physiography/ Slope:

Geology: Poison Hill

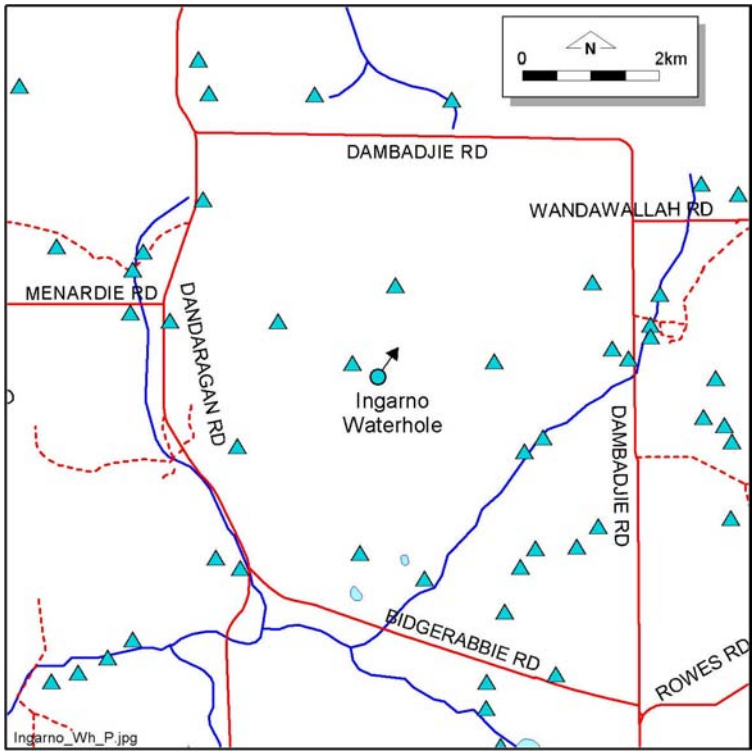
Water/Ground Water Flow: Discharge from superficials

Aquifer: Poison Hill Aquifer

Depth to WT: Less than 2 m bgl

Salinity: 153 – 1612 mg/L

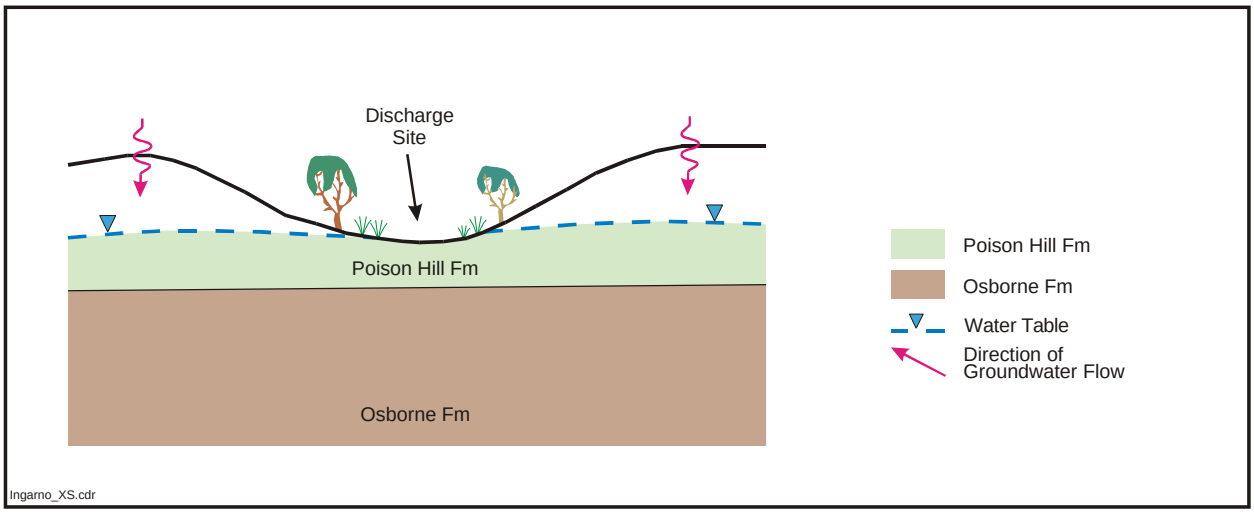
GDE Considerations:



Site Description:

- Discharge occurs from intermediate flow systems in low-lying areas due to aquifer saturations in broad open valleys
- Shallow groundwater < 2 m
- Presence of several soaks – perched water

Site Model:



Site #: 88

Name: Mogumber

Site Coord: (398772E: 6569779N)

Bores/Features: GL7
Mogumber Mission #1

Physiography: Lower slope

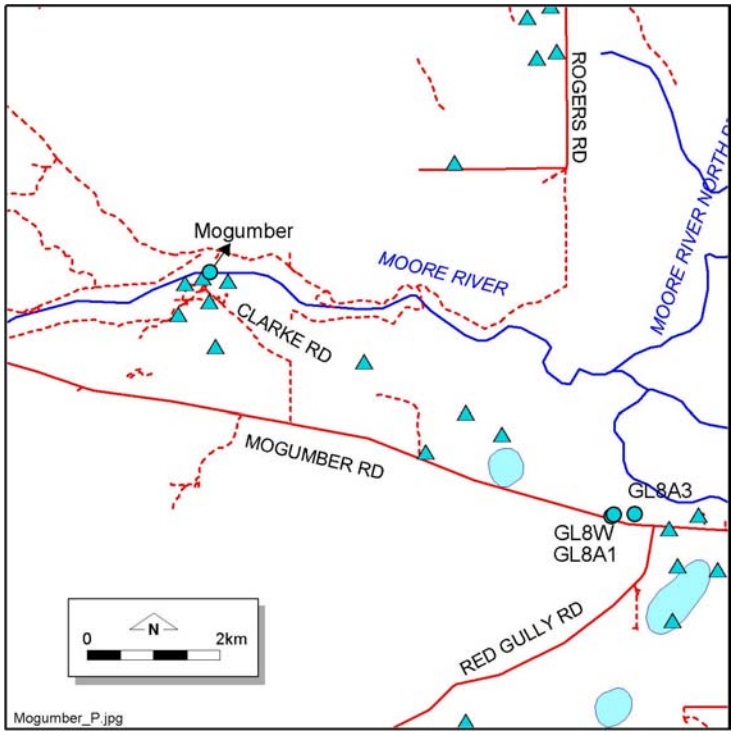
Geology: Poison Hill
Molecap Greensand
Osborne Fm

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Molecap Greensand

Depth to WT:

Salinity: 760 – 1570 mg/L



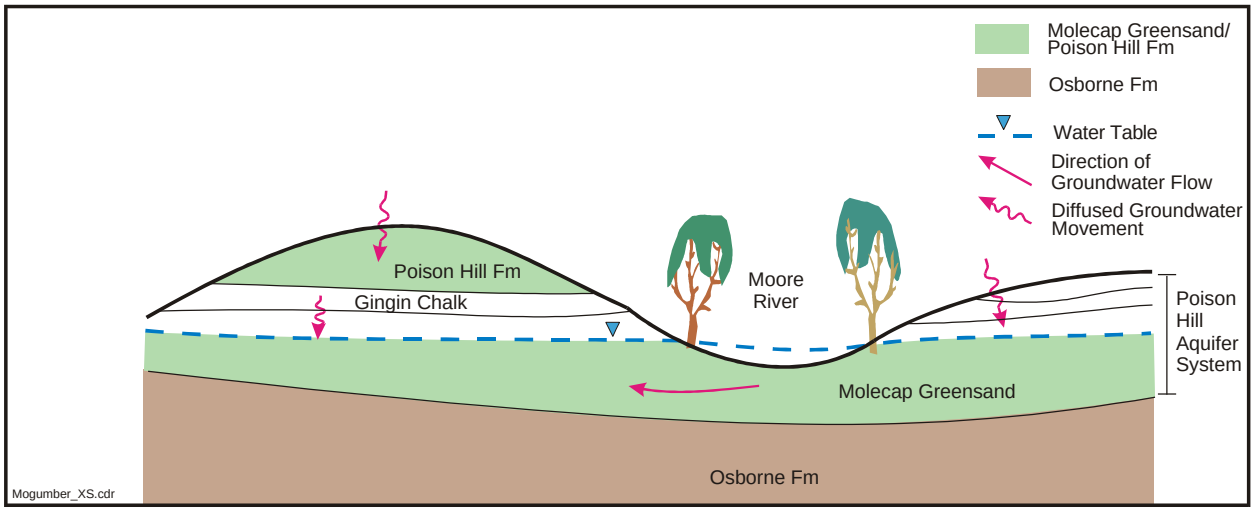
GDE Considerations:

- Increase in the groundwater abstraction from the Poison Hill Aquifer system may have impact on the GDE. Groundwater extraction from the Leederville will likely not have impact on the GDE
- Native vegetation is intact along the Moore River
- The groundwater is extracted mainly from the Leederville Aquifer. Some farm bores may obtain their water supplies from the Poison Hill Aquifer

Site Description:

- Flow direction in the Poison Hill Aquifer is related to the topography
- Recharge is by direct infiltration of rainfall and streamflow
- Discharge occurs at topographic lows, in valley floors
- Downward leakage of groundwater into the Molecap Greensand from the Poison Hill Fm and Gingin chalk
- Groundwater is isolated from the underlying Leederville Aquifer by the Osborne Formation

Site Model:



Site #: 89

Name: Gungawah Pool

Site Coord: (357542E: 6559114N)

Bores/Features: S4A
S3A

Physiography/ Slope: Lower slope

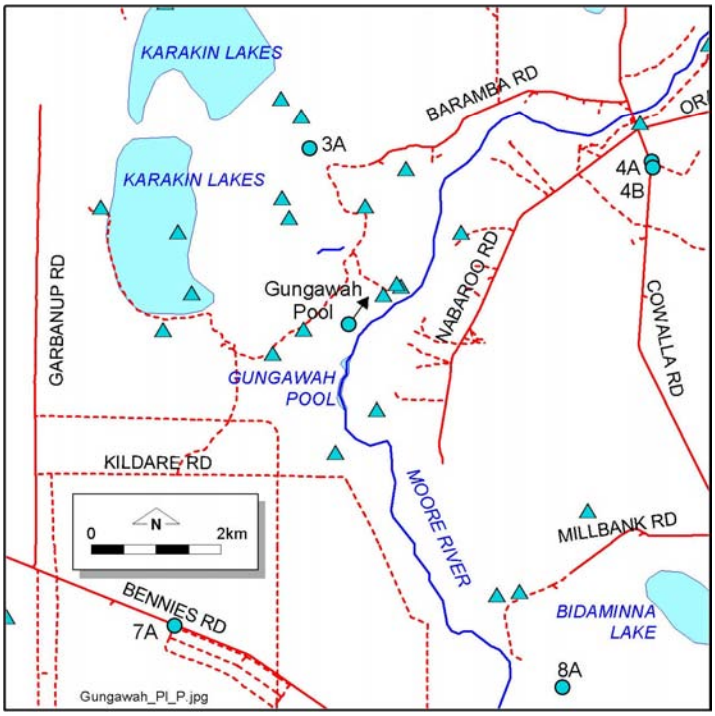
Geology: Tamala Limestone
Lancelin Formation

Water/Ground Water Flow: Downward head gradient

Aquifer: Tamala Limestone

Depth to WT:

Salinity: 429 – 603 mg/L



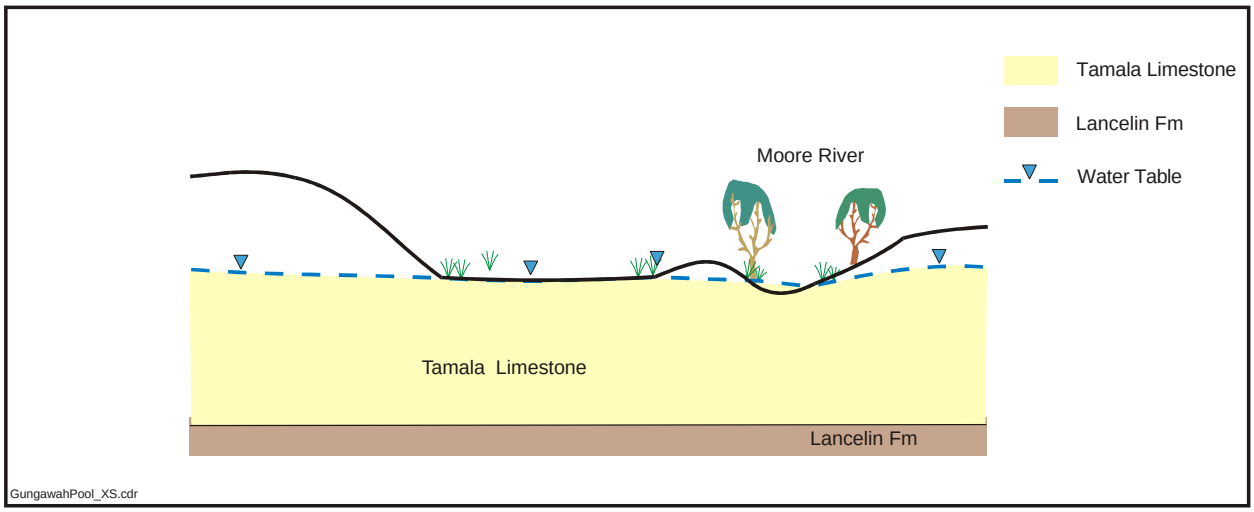
GDE Considerations:

- Further abstraction from the Tamala Limestone is likely to affect GDE

Site Description:

- Local recharge by infiltration of rainfall and associated runoff
- Water levels are close to surface in the superficials and in low topography

Site Model:



Site #: 90

Name: Yacangully Pool

Site Coord: (359939E: 6548332N)

Bores/Features: S8A
S12A

Physiography/ Slope: Lower slope

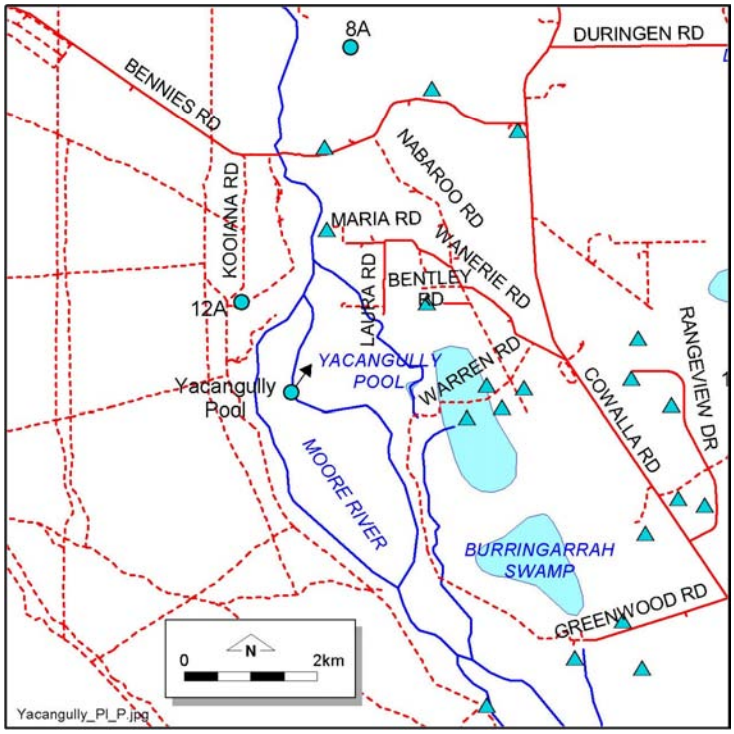
Geology: Tamala Limestone
Lancelin Fm

Water/Ground Water Flow: Downward head gradient

Aquifer: Tamala Limestone

Depth to WT:

Salinity: 357 – 740 mg/L

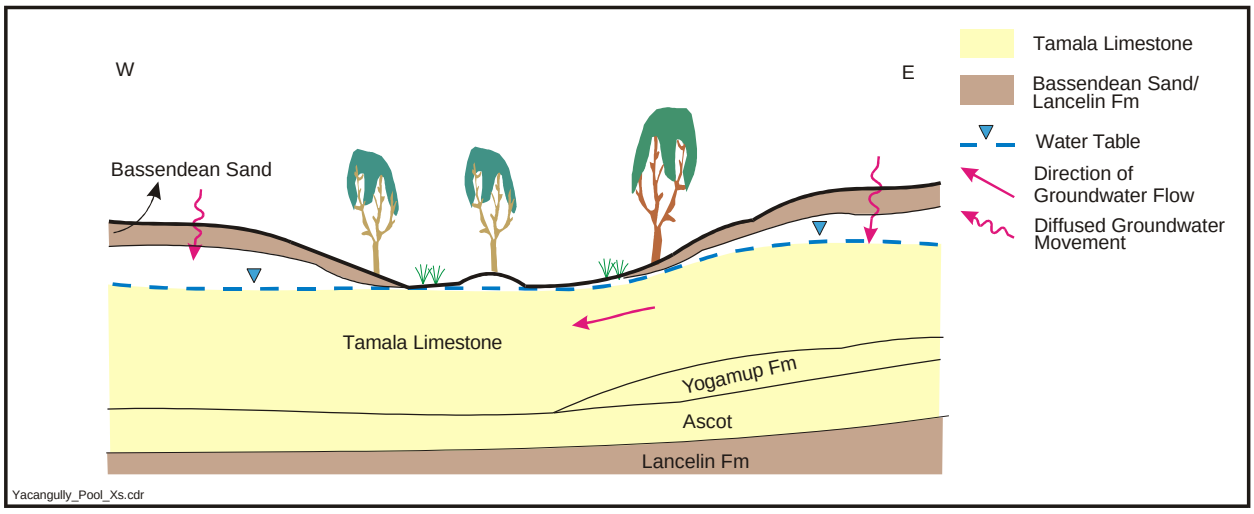


GDE Considerations:

Site Description:

- Local recharge by infiltration of rainfall and associated runoff
- Water levels are close to surface in the superficials and in low topography

Site Model:



Site #: 91

Name: Moore River – Gingin Brook

Site Coord: (367325E: 6536221N)

Bores/Features: YY10

Physiography/ Slope: Lower slope

Geology: Tamala Limestone
Lancelin Formation

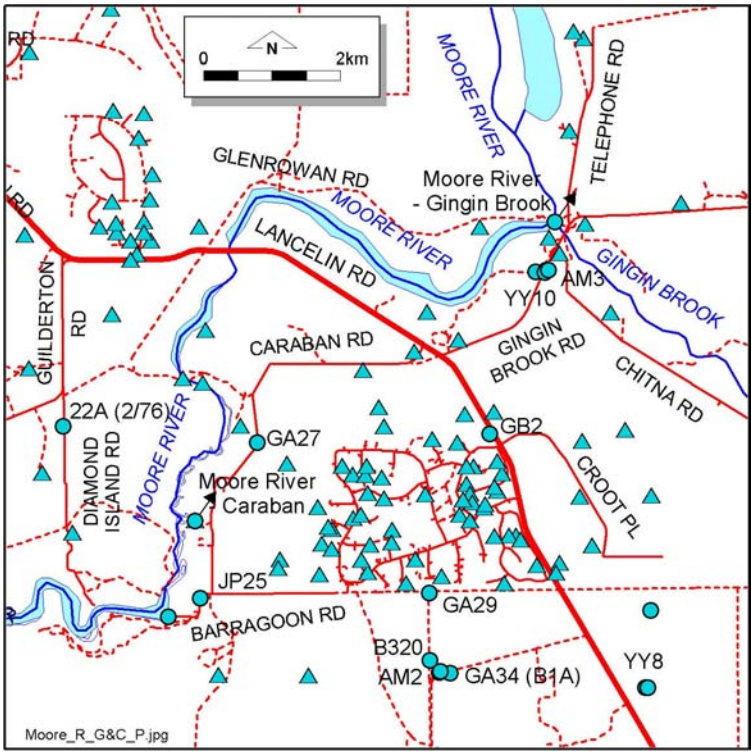
Water/Ground Water Flow: Downward gradient

Aquifer: Tamala Limestone

Depth to WT:

Salinity: 550 – 645 mg/L

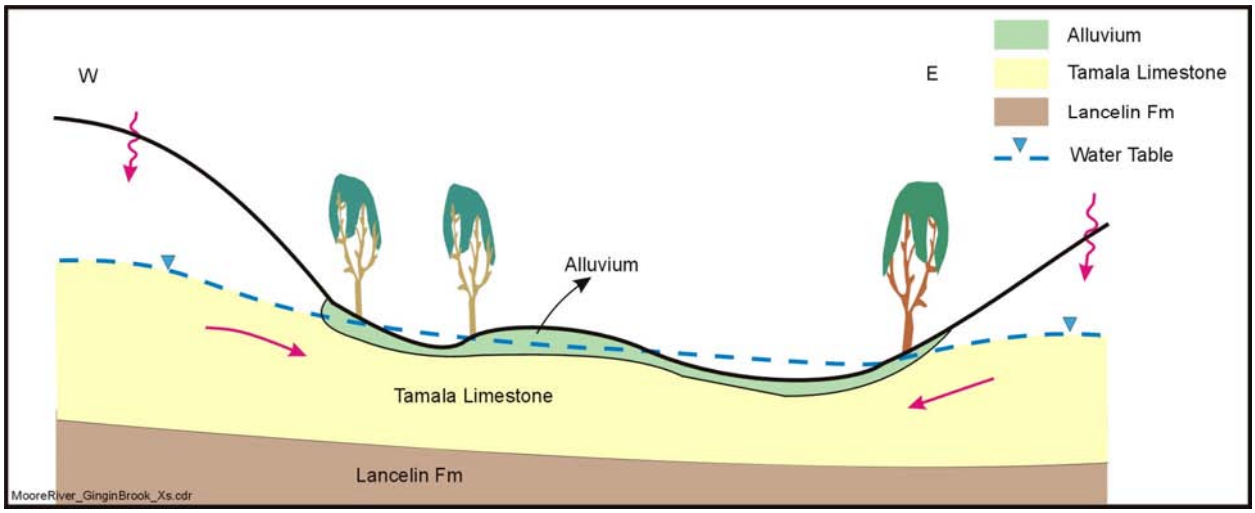
GDE Consideration:



Site Description:

- Discharge towards ocean
- Local recharge by rainfall
- Water levels close to surface in low topography

Site Model:



Site #: 92

Name: Moore River - Caraban

Site Coord: (362080E: 6531861N)

Bores/Features: JP25
GA27
#55
#56
#57

Physiography/ Slope: Lower slope

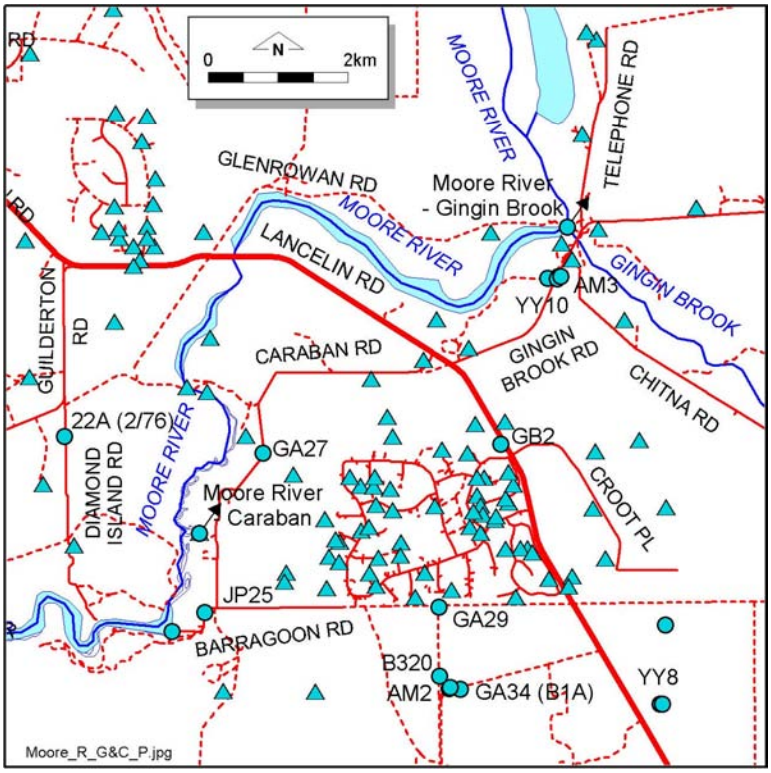
Geology: Tamala Limestone
Lancelin Fm

Water/Ground Water Flow:

Aquifer: Tamala Limestone

Depth to WT:

Salinity: 485 – 638 mg/L



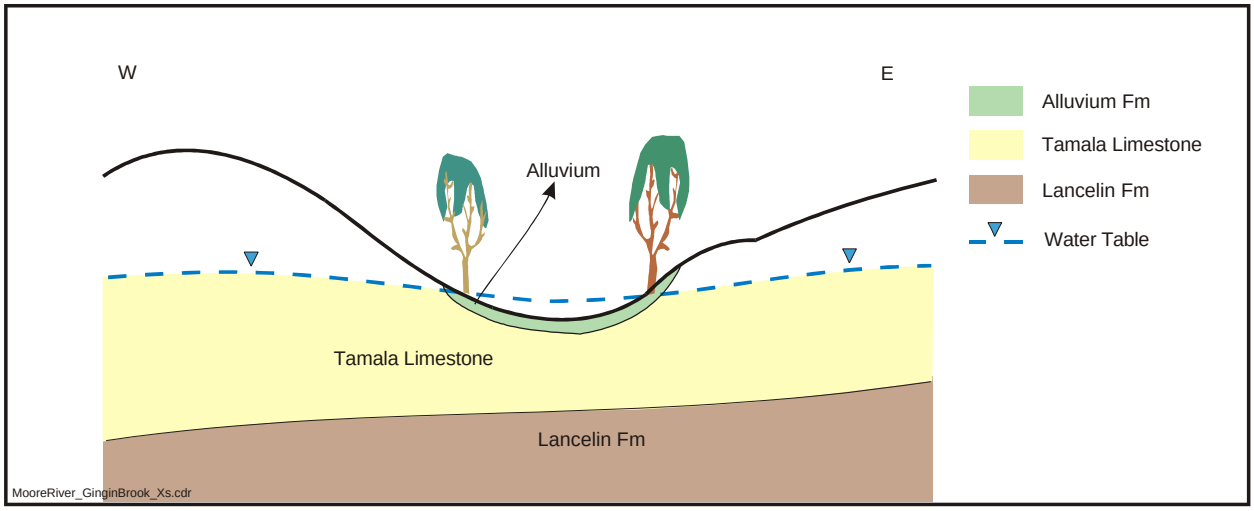
GDE Consideration:

- Further abstraction may have impact on GDE

Site Description:

- Discharge towards ocean
- Local recharge by rainfall
- Water levels close to surface in low topography

Site Model:



Site #: 93

Name: Ledge Point

Site Coord: (344821E: 6557198N)

Bores/Features: Production town bores

Physiography/ Slope: Lower slope

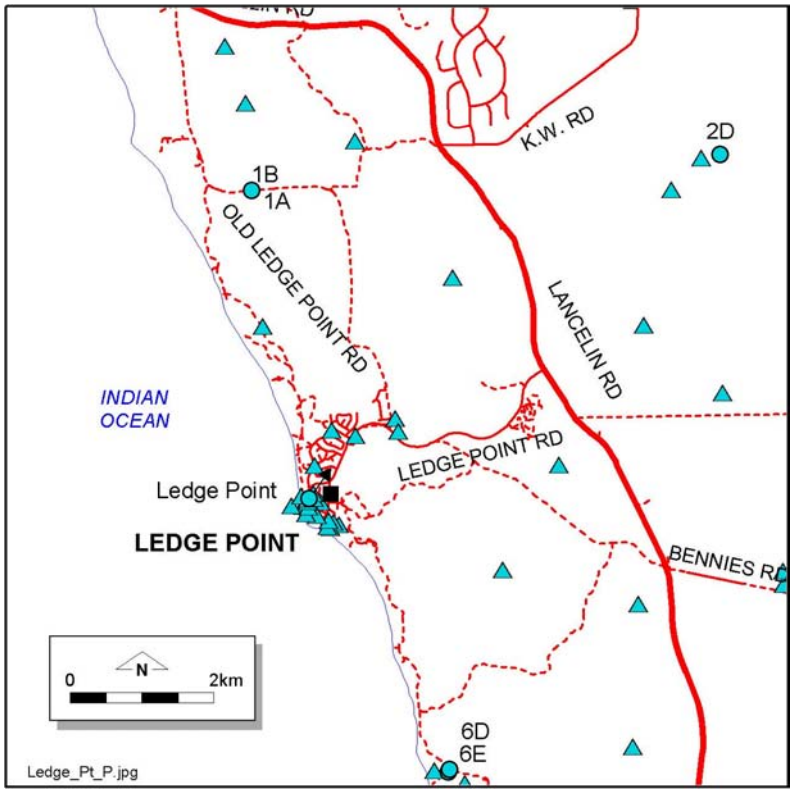
Geology: Tamala Limestone
Lancelin Fm

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Tamala Limestone

Depth to WT:

Salinity: 742 - 4400 mg/L



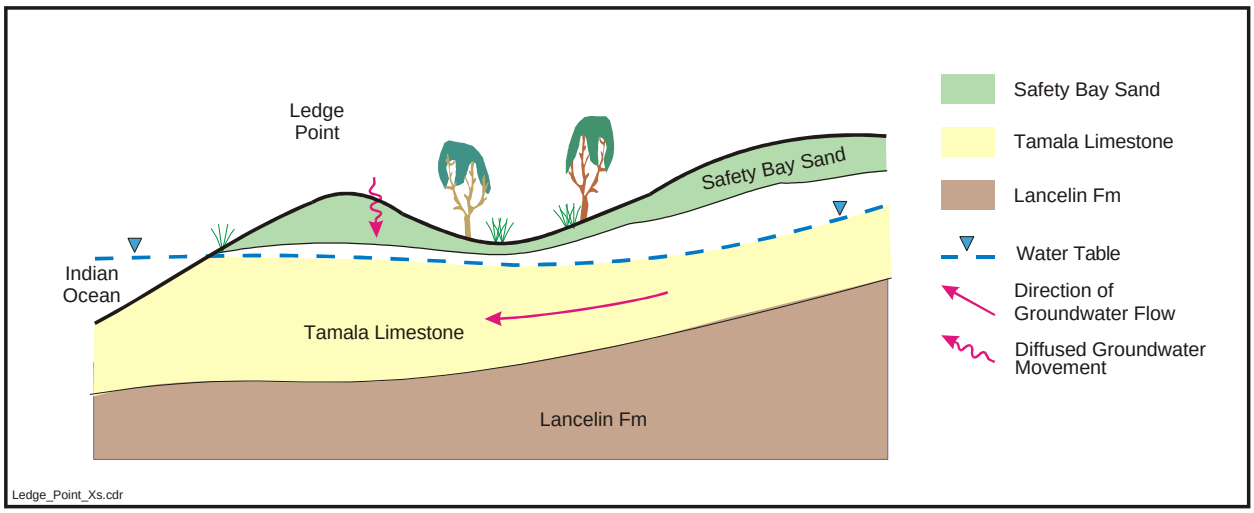
GDE Considerations:

- Significant impact on GDE from saltwater intrusion
- Vegetation intact west of Ledge Point
- Water extracted for livestock and domestic

Site Description:

- Water levels regulated by sea level
- Recharge to Tamala Limestone by direct rainfall
- Watertable close to the surface in low depressions
- High TDS(~4400 mg/L) is likely due to evapotranspiration

Site Model:



Site #: 94

Name: Lower Gingin Brook

Site Coord: (373065E: 6532240N)

Bores/Features: Livestock bore
GB8 GB4
GB7 GB13

Physiography/ Slope: Lower slope

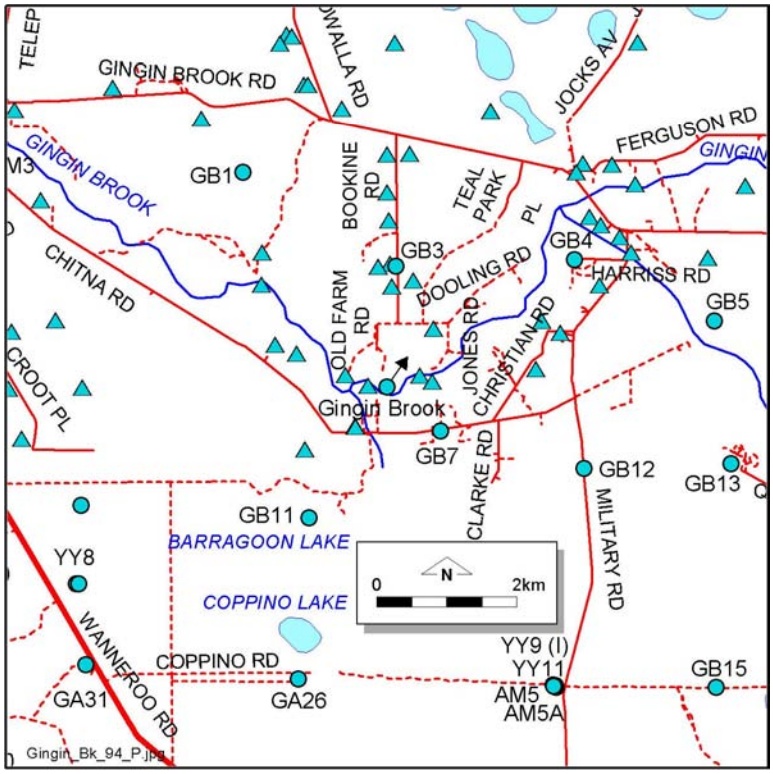
Geology: Bassendean Sand
Guildford Fm
Leederville Fm

Water/Ground Water Flow: Westward towards the ocean

Aquifer: Superficials

Depth to WT:

Salinity: 170 - 548 mg/L



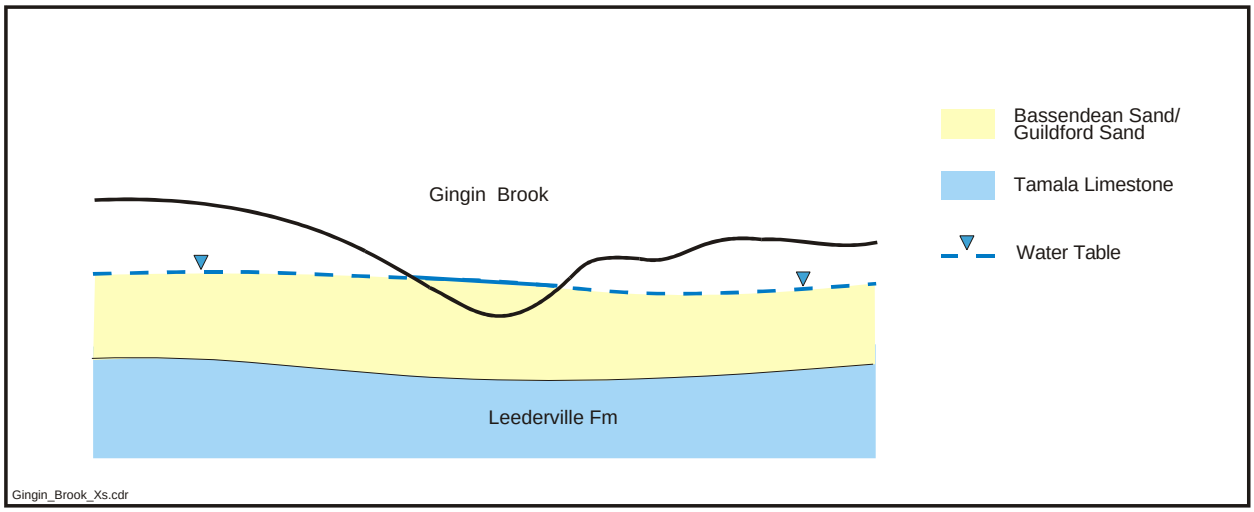
GDE Considerations:

- Vegetation mostly intact along Gingin Brook.
- Bores used for domestic, stock, irrigation water supply

Site Description:

- Discharge occurs along Gingin Brook
- Recharge occurs by direct precipitation and local runoff along the flows

Site Model:



Site #: 95

Name: Lennard Brook

Site Coord: (397781E: 6527627N)

Bores/Features: PB5A (Westralia Fruits)
Lennard Brook
GC3
AM7

Physiography/ Slope: Lower mid-slope

Geology: Greensand formations
Kardinya Shale

Water/Ground Water Flow: Localised discharge from Mirrabooka and Leederville Aquifers

Aquifer: Greensand formations (Mirrabooka Aquifer)

Depth to WT:

Salinity: Approx. 300 mg/L

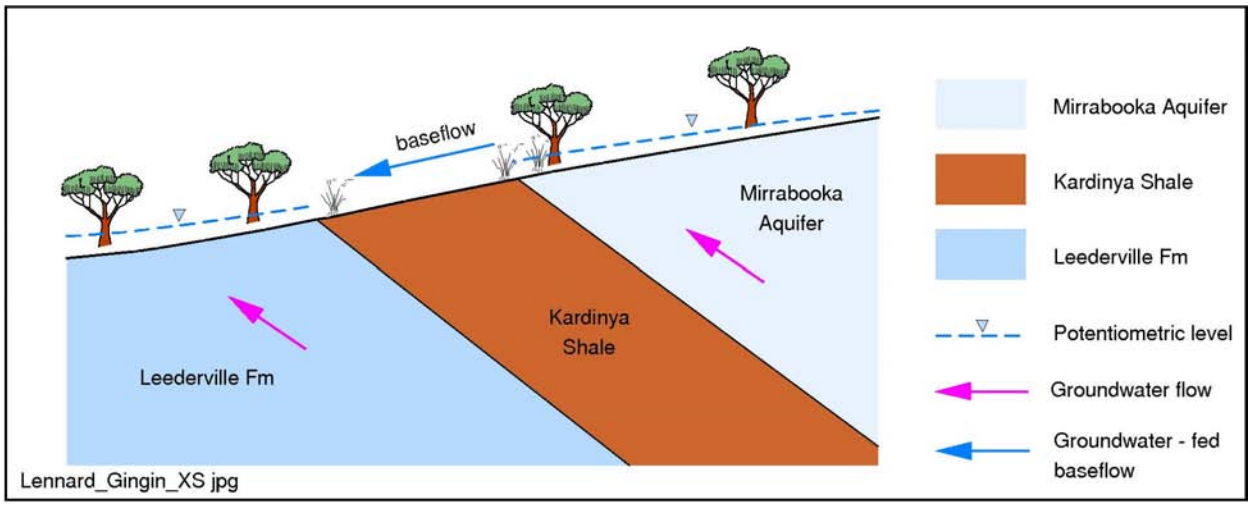
GDE Considerations:

- Water abstraction is likely to have high impact on brook
- Native vegetation intact along the brook

Site Description:

- Recharge by rainfall into the Greensand formations along topographic highs
- Discharge from the Mirrabooka and Leederville Aquifers is expressed as baseflow
- Discharge points are topographically controlled within drainage lines
- Kardinya Shale forms an important confining layer
- Groundwater levels appear to be declining due to high abstraction rates

Site Model:



Site #: 96

Name: Beermullah Lake

Map Reference: Gingin

Site Coord: (383912E: 6547605N)

Bores/Features:

Physiography/ Slope: Base of Gingin Scarp on the Swan Coastal Plain

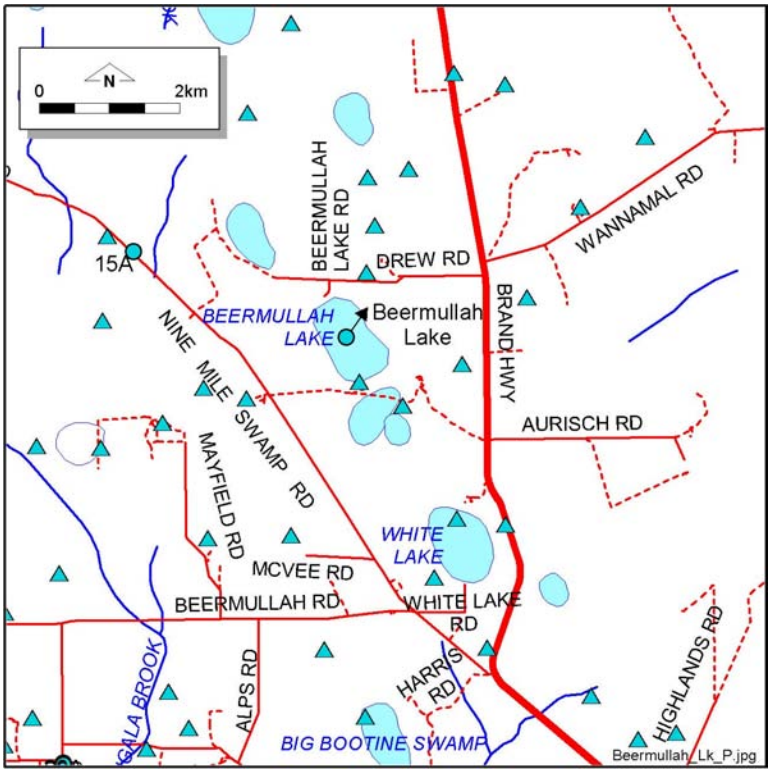
Geology: Guildford Clay

Water/Ground Water Flow: Little to no groundwater movement due to presence of aquitard

Aquifer: Guildford Clay (aquitard)

Depth to WT:

Salinity: Approx. 800 mg/L



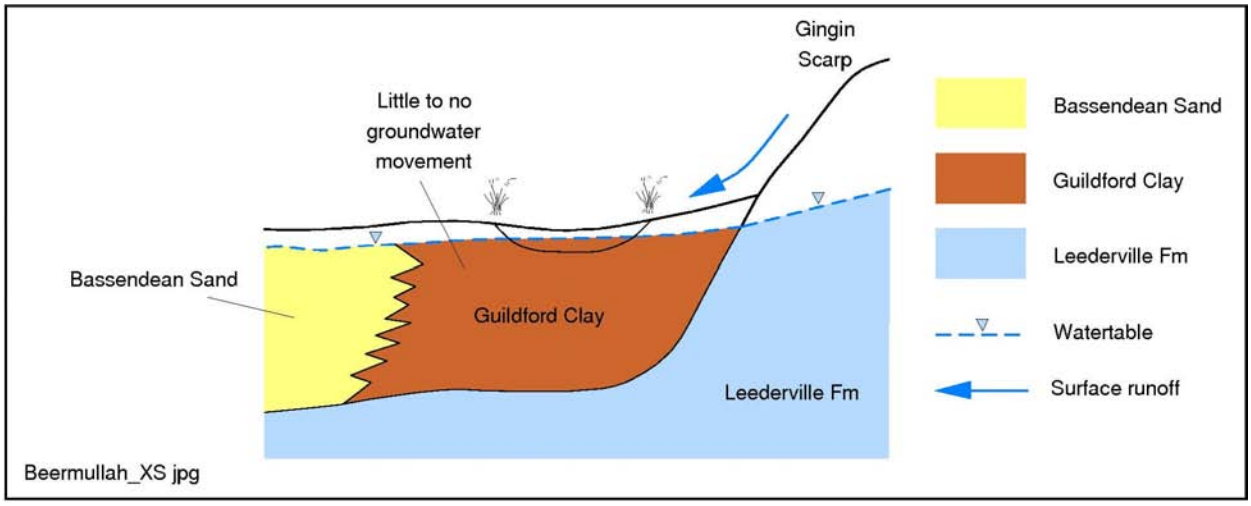
GDE Considerations:

- It is unlike that over-extraction of groundwater in the Guildford Clay would impact on the GDE
- Native vegetation is largely cleared at the wetland site

Site Description:

- The Guildford Clay is a regional aquitard
- The presence of water in the lake is related to the water level in the superficial aquifer
- Groundwater levels are near surface suggesting aquifer is full
- There are a number of bores used for livestock and domestic / household water supply

Site Model:



Site #: 97

Name: Quinns Ford

Site Coord: (383795E: 6572318N)

Bores/Features: GL6
GL5

Physiography/ Slope: Moore River

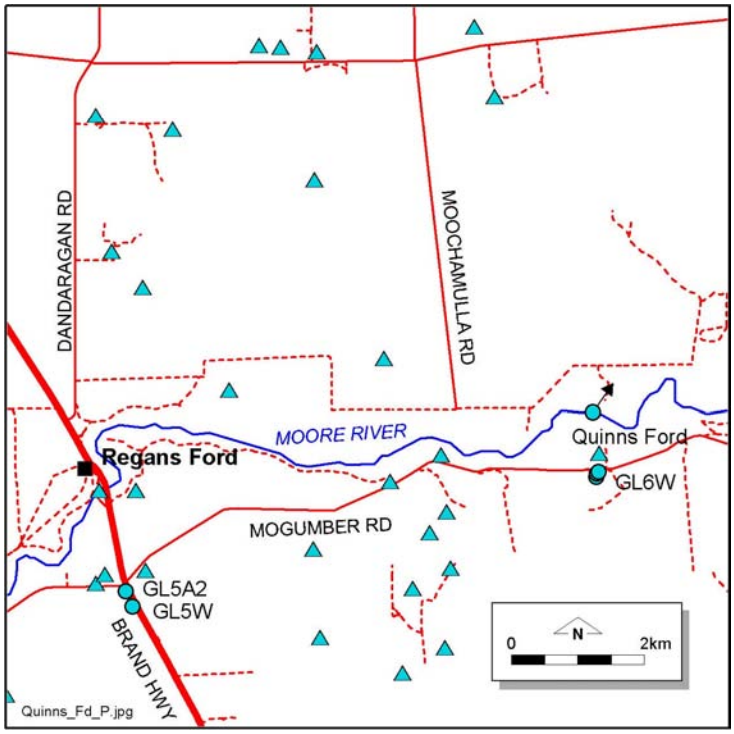
Geology: Leederville Formation
Osborne Formation

Water/Ground Water Flow: Upward head gradient – groundwater discharge into Moore River

Aquifer: Leederville Formation

Depth to WT:

Salinity: Approx. 600 mg/L



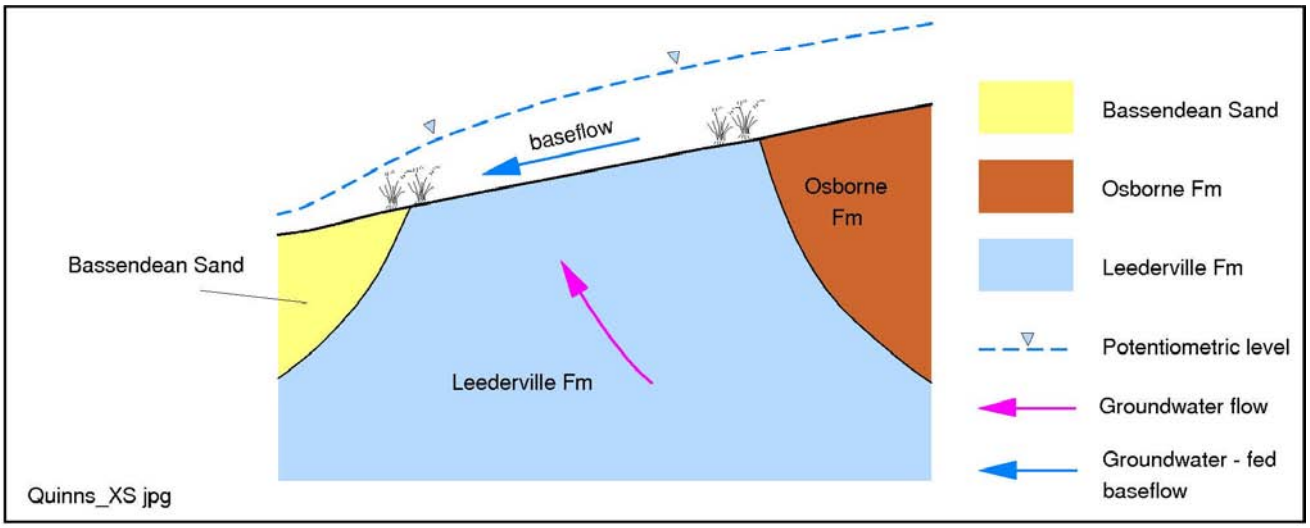
GDE Considerations:

- The vegetation is largely intact along the banks of the Moore River
- Ecosystems may have developed a dependency on groundwater discharging from the Leederville Aquifer

Site Description:

- Potentiometric surface in Leederville Aquifer is several metres above ground level
- There is significant groundwater discharge from the Leederville Aquifer
- Most water flowing at Quinns Ford is likely to be groundwater-fed baseflow
- It is possible that most GDEs are maintained by groundwater discharge

Site Model:



Site #: 98

Name: Gingin Brook

Site Coord: (397174E: 6533998N)

Bores/Features:

Physiography/ Slope: Lower mid-slope

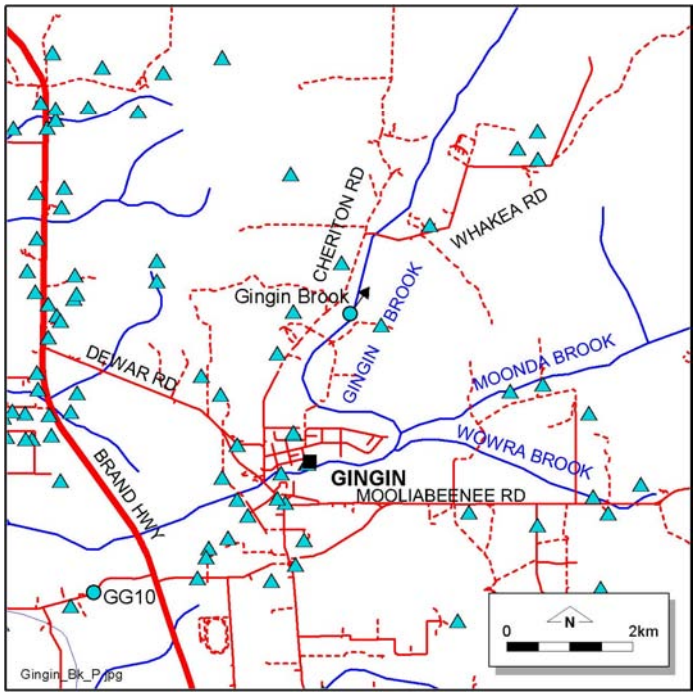
Geology: Greensand formations
Kardinya Shale
Leederville Formation

Water/Ground Water Flow: Localised discharge from Mirrabooka and Leederville Aquifers

Aquifer: Mirrabooka and Leederville Aquifers

Depth to WT:

Salinity: 139 – 305 mg/L



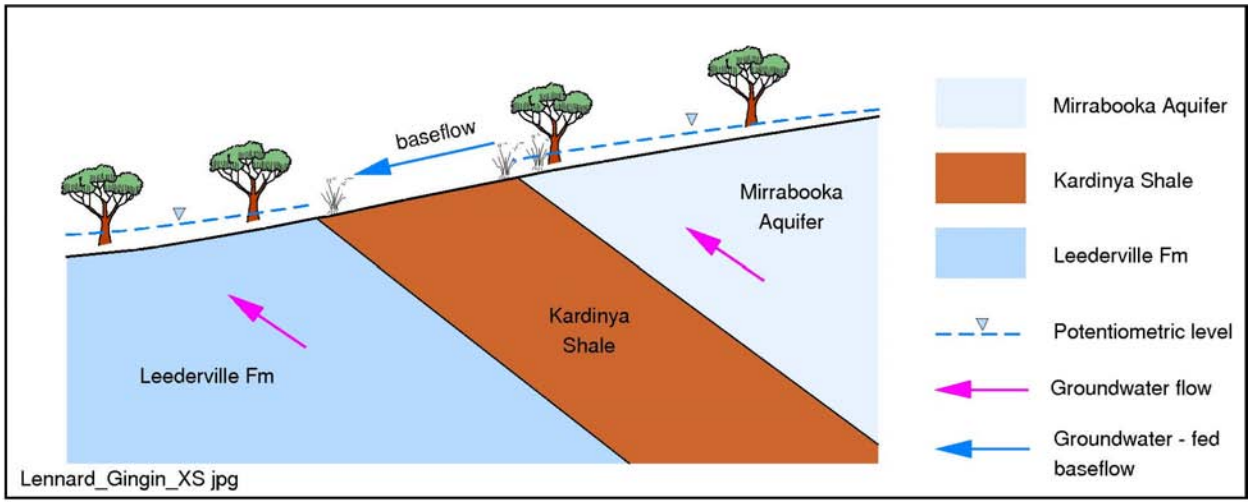
GDE Considerations:

- Water abstraction is likely to have high impact on brook
- Native vegetation intact along the brook

Site Description:

- Recharge by rainfall into the Greensand formations along topographic highs
- Discharge from the Mirrabooka and Leederville Aquifers is expressed as baseflow
- Discharge points are topographically controlled within drainage lines
- Kardinya Shale forms an important confining layer
- Groundwater levels appear to be declining due to high abstraction rates

Site Model:



Publication feedback form

The Department of Environment welcomes feedback to help us to improve the quality and effectiveness of our publications. Your assistance in completing this form would be greatly appreciated.

Please consider each question carefully and rate them on a 1 to 5 scale, where 1 is poor and 5 is excellent (please circle the appropriate number).

How did you rate the quality of information?

1 2 3 4 5

How did you rate the design and presentation of this publication?

1 2 3 4 5

How can it be improved?

1 2 3 4 5

……

How effective did you find the tables and figures in communicating the data?

1 2 3 4 5

How can they be improved?

……

……

……

How did you rate this publication overall?

1 2 3 4 5

If you would like to see this publication in other formats, please specify. (Eg. CD)

……

Please cut along the dotted line on the left and return your completed response to:

Publications Coordinator
Department of Environment
Level 2, Hyatt Centre
3 Plain Street
East Perth WA 6004
Fax: (08) 9278 0639

www.environment.wa.gov.au

Westralia Square
Level 8 141 St Georges Terrace
Perth Western Australia 6000
PO Box K822 Perth Western Australia 6842
Telephone (08) 9222 7000
Facsimile (08) 9322 1598
E-mail info@environment.wa.gov.au
www.environment.wa.gov.au

Hyatt Centre
Level 2 3 Plain Street
East Perth Western Australia 6004
PO Box 6740 Hay Street East Perth Western Australia 6892
Telephone (08) 9278 0300
Facsimile (08) 9278 0301
National Relay Service (Australian
Communication Exchange) 132 544
E-mail info@environment.wa.gov.au
www.environment.wa.gov.au