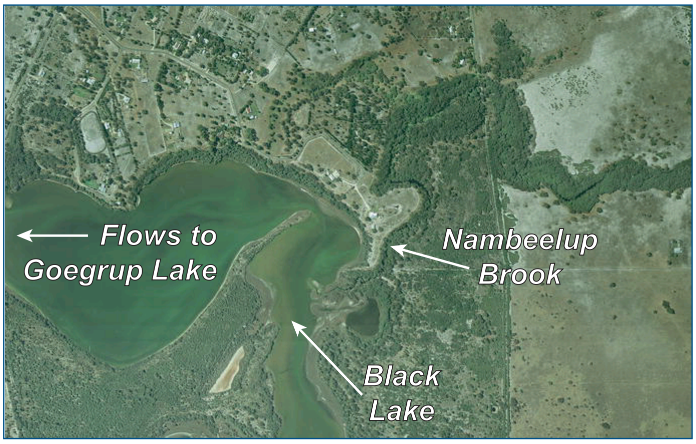
Nambeelup Brook

All of the Nambeelup Brook catchment is on the Swan Coastal Plain. The brook drains into Black Lake which feeds into Goegrup Lake (one of the Serpentine Lakes) and hence the Serpentine River. The Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 lists Black Lake as having high conservation significance.

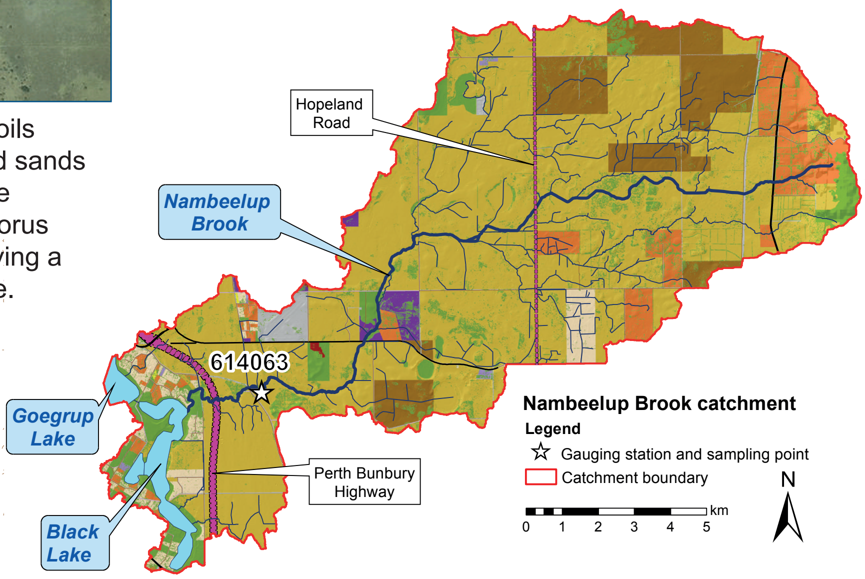


Land use classification (2006)		Area (km^2)	Area (%)
Animal keeping – nonfarming (horses)		9.0	6.3
Cattle for beef (predominantly)		89	62
Cattle for dairy		14	10
Conservation and natural		21	15
Horticulture		0.2	0.1
Industry, manufacturing and transport		4.2	2.9
Intensive animal use		0.1	0.1
Lifestyle block		4.1	2.8
Mixed grazing		1.3	0.9
Offices, commercial and education		0.01	<0.01
Recreation		0.01	<0.01
Residential		0.04	0.03
Total		**143**	**100**

To the west of Hopeland Road the catchment's soils consist of sandy and clayey swamps and leached sands with nearly 20% subject to inundation. Most of the catchment has a high or very high risk of phosphorus loss to waterways with 83% of the catchment having a phosphorus retention index (PRI) of less than five.

Water quality is monitored near the catchment outlet, at the gauging station at Kielman (614063), to the west of Paterson Road.

Flow was measured at the gauging station between May 1990 and September 1998 after which time the station was closed. It was reopened in February 2005. Nambeelup Brook flows year-round during wet years, but ceases to flow in dry years from around November to May.



The Nambeelup Brook catchment had the second-greatest percentage of land used for agriculture ('cattle for beef and dairy') within the Peel-Harvey catchment. It had the least natural vegetation coverage (km^2 and %) of the catchments draining to the Serpentine River, and the second-lowest percentage within the Peel-Harvey catchment.

In 2009 Nambeelup Brook had the second-highest median TN concentration and third-highest median TP concentration of the 13 sites sampled in the Peel-Harvey catchment.

Nutrient summary: median concentrations, loads and status classification at 614063

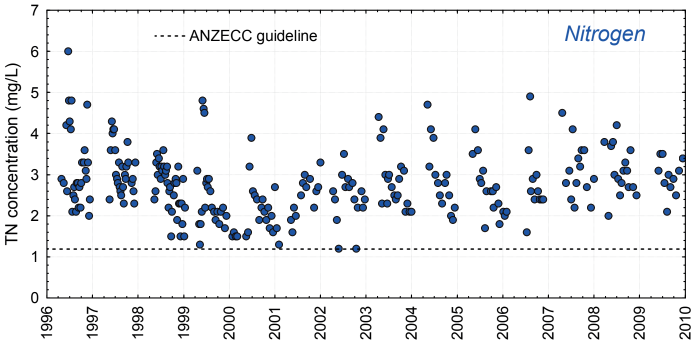
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Annual flow (GL)	25	32	5.5*							21*	3.7	12	15	16
TN median (mg/L)	2.8	3.0	2.8	2.2	1.95	2.6	2.6	2.8	2.8	2.65	2.4	3.1	3.0	3.1
TP median (mg/L)	0.68	0.68	0.60	0.55	0.445	0.66	0.63	0.73	0.69	0.595	0.605	0.59	0.58	0.46
TN load (t/year)	68	87	17*							67*	12	39	41	44
TP load (t/year)	15	20	3.4*							14*	2.4	7.7	8.7	7.6

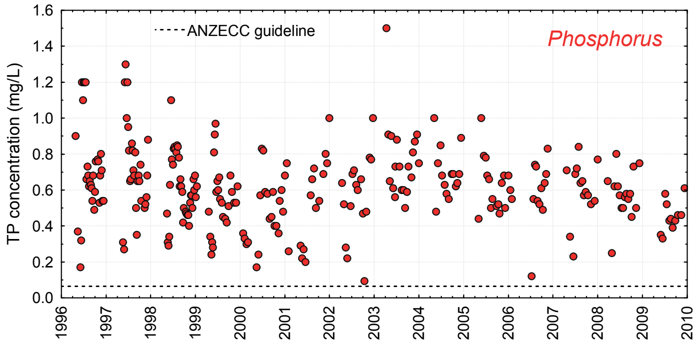
Status classification: Low, Moderate, High, Very high

Status reported for three-year period end (i.e. 1996–98 reported in 1998)
TN = total nitrogen TP = total phosphorus

* best estimate using available data

Total nitrogen (TN) and total phosphorus (TP) concentrations (1996–2009)





TN concentration:

Between 1996 and 2009 all but two TN samples (2002) exceeded the ANZECC[1] guideline for lowland rivers (1.2 mg/L).

During the same period 11% of TN samples exceeded 3.6 mg/L, three times the ANZECC[1] guideline.

TN trend:

Trend analysis was undertaken using data from 2005 to 2009 inclusive.

Once the data were adjusted for seasonality an emerging increasing trend (0.10 mg/L/year) was detected.

TP concentration:

Between 1996 and 2009, all TP concentrations exceeded the ANZECC[1] guideline for lowland rivers (0.065 mg/L).

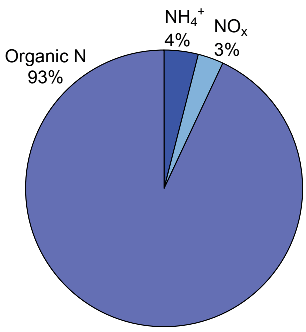
During the same period 39% of TP samples exceeded 0.65 mg/L, 10 times the ANZECC[1] guideline. The percentage of samples greater than 0.65 mg/L decreased from 43% (1996–2004) to 28% (2005–09).

TP trend:

Trend analysis was undertaken using data from 2005 to 2009 inclusive.

Once the data were adjusted for seasonality an emerging decreasing trend (0.023 mg/L/year) was detected.

Nutrient fractions (2005–09)



Nitrogen:

Most of the nitrogen (N) was organic in nature. Organic N consists of both dissolved organic and particulate nitrogen. It is derived from degrading plant and animal matter and fertilisers. It often needs to be further broken down before it can be used by plants and algae.

The remaining N was present as dissolved inorganic N (DIN) such as ammonium (NH_4^+) and N oxides (NO_x).

DIN is also derived from animal wastes and fertilisers but is readily available to plants and algae.

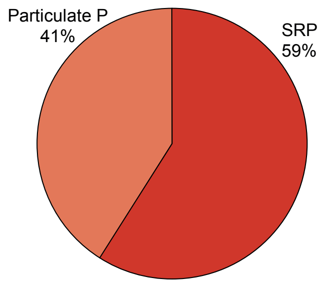
Nambeelup Brook as well as Gull Road Drain had the highest percentages of organic N of all the routine sampling sites in the Peel-Harvey catchment. This was most likely due to their animal-dominated land uses (cattle, sheep and pigs).

Nambeelup Brook - June 2005

Phosphorus:

More than half the phosphorus (P) was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

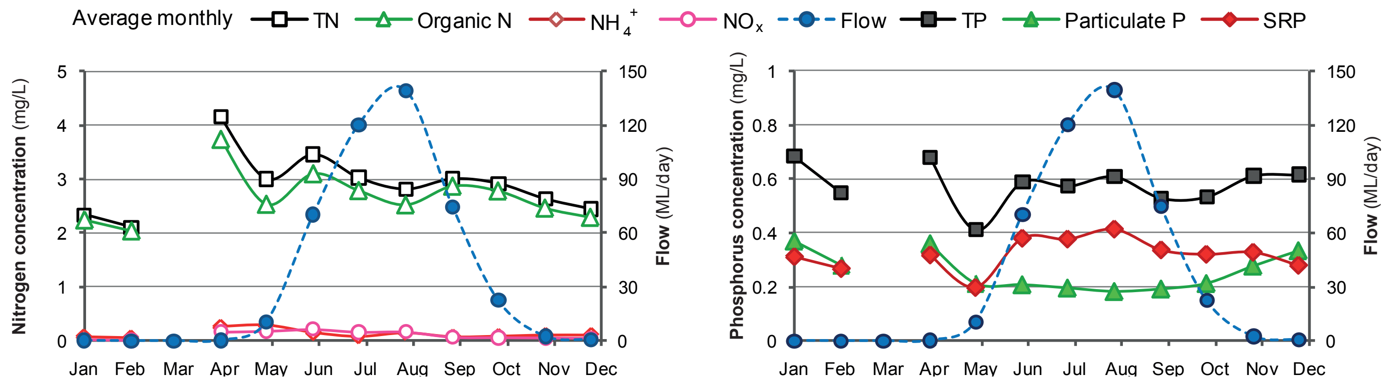
The remaining P was present as particulate P, which consists of sediment-bound forms of P and organic waste materials.



Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound phosphorus.

Nambeelup Brook was one of four routine sampling sites in the Peel-Harvey catchment that had more than half the phosphorus present as SRP. All four sites were in catchments where more than half the catchment area had a high or very high risk of phosphorus leaching into waterways.

Seasonal variation in nutrient concentrations and riverine flow (2005–09)



Nitrogen:

Nitrogen concentrations were greatest at the start of the flow season (first flush). The highest average monthly TN and organic N concentrations occurred in April and June.

Average monthly NH_4^+ and NO_x concentrations were hightest in April and May. NO_x concentrations were greater than NH_4^+ concentrations during winter.

All monthly TN averages exceeded ANZECC guidelines. Average monthly concentrations of NH_4^+ and NO_x exceeded ANZECC guidelines throughout much of the year.

Nambeelup Brook 614063 - May 2008

Phosphorus:

SRP concentrations were notably greater than particulate P between June and October during winter flows. This suggests excessive stores of soluble phosphorus from fertiliser use or animal waste are being flushed into the brook.

Increases in Particulate P during the dryer months may be attributed to stock access destabilising banks and mobilising sediments.

All average monthly TP and SRP concentrations exceeded ANZECC[1] guideline values.

	ANZECC 2000	Months exceeded
TN	1.2 mg/L	Alll*
NH_4^+	0.08 mg/L	Apr* – Jun, Aug, Oct – Dec
NO_x	0.15 mg/L	Apr* – Aug
TP	0.065 mg/L	All*
SRP	0.04 mg/L	All*

* Feb, Apr (< 3 samples per month), no sample collected in March

Stock exclusion

In 2003 landholders within the catchment were approached to undertake fencing as part of a Coastal Catchments Initiative (CCI) stock exclusion project. Fencing on several properties was completed in 2005 and may have contributed to the decreasing trend in TP concentrations.

Nambeelup District Water Management Strategy

The Department of Planning is preparing a District Structure Plan (DSP) for the Nambeelup Industrial Area to support growth in the Peel region. As part of the DSP's development a District Water Management Strategy is being developed by JDA in consultation with the Department of Water, Water Corporation and the Office of Environmental Protection Authority.

Downstream view - February 2007

614063 - March 2005

February 2006

Inlet pipes and staff gauge - March 2005

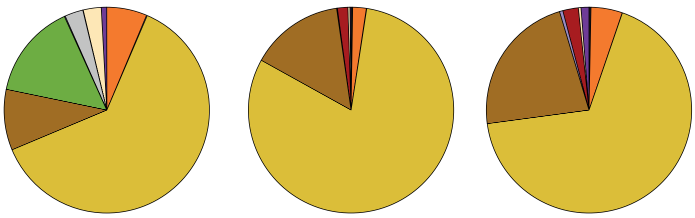
Modelled results (1997–2007)[2]

This page reports results from the Streamflow Quality Affecting Rivers and Estuaries (SQUARE) model. It estimated flow, nitrogen and phosphorus loads from the 13 subcatchments of the Peel-Harvey estuary.

Nutrient sources

There were two main sources of nutrient load in Nambeelup Brook: 'cattle for beef' and 'cattle for dairy'. These two land uses were responsible for 95% of the nitrogen and 90% of the phosphorus load within the catchment. The catchment also contained one licensed feedlot.

Area: **Nitrogen:** **Phosphorus:**



- Point sources
- Septic
- Animal keeping – non-farming (horses)
- Cattle for beef (predominantly)
- Cattle for dairy
- Conservation and natural
- Horticulture
- Industry, manufacturing and transport
- Intensive animal use
- Lifestyle block
- Mixed grazing
- Offices, commercial and education
- Recreation
- Residential

Annual exports to Peel Inlet

The Nambeelup Brook catchment is 1.7% of the area that drains to the Peel Inlet. On average it contributed to the Peel Inlet:

- 4% of the flow (19 GL/year)
- 6% of the nitrogen load (44 tonnes/year)
- 15% of the phosphorus load (10.5 tonnes/year).

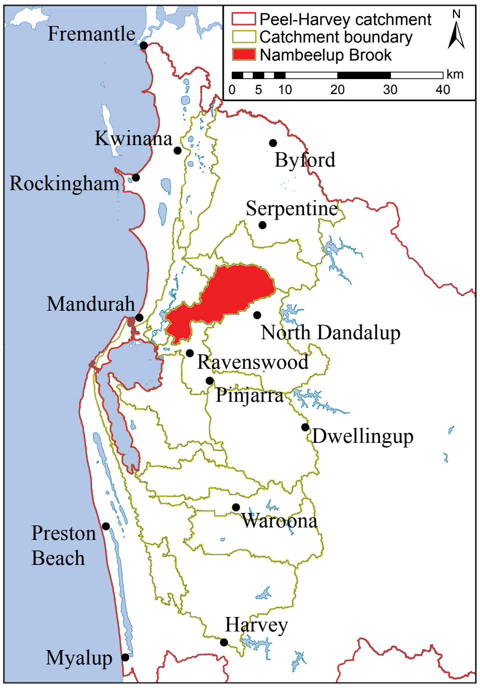
Remediation priority

The SQUARE-modelled data indicated that based on nutrient loads per cleared area (kg/ha/year):

- Nambeelup Brook requires medium-priority nitrogen and phosphorus remediation action.

Nambeelup Brook had the greatest phosphorus load per cleared area of the five catchments draining to the Serpentine River.

How Nambeelup Brook fits within the Peel-Harvey catchment: location and statistics



Catchment draining to estuary	Area (km^2)	Flow (GL)	TN load (tonnes/ year)	TN load per cleared area (kg/ha)	TP load (tonnes/ year)	TP load per cleared area (kg/ha)
Peel Main Drain	120	11	26	3.0	4.5	0.52
Upper Serpentine	502	55	106	3.8	21	0.75
Dirk Brook – Punrak Drain	134	18	51	7.5	5.6	0.82
Nambeelup	**143**	**19**	**44**	**3.6**	**10.5**	**0.86**
Lower Serpentine	94	6.2	9.7	1.6	2.9	0.49
Mandurah	24	3.0	7.9	5.0	1.3	0.84
Upper Murray	6 752	286	204	0.51	4.9	0.01
Lower Murray, mid Murray and Dandalup	638	74	198	6.4	4.9	0.16
Coolup (Peel)	151	23	42	3.2	15	1.2
Subtotal Peel Inlet	**8 558**	**496**	**701**	**1.4**	**73**	**0.14**
Coolup (Harvey)	113	16	26	3.3	14	1.8
Mayfield Drain	119	19	33	3.1	7.1	0.67
Harvey	710	142	259	6.9	39	1.0
Meredith Drain	56	11	16	4.3	8.3	2.2
Subtotal Harvey Estuary	**998**	**188**	**334**	**5.6**	**69**	**1.2**
Total Peel-Harvey estuary	**9 556**	**684**	**1 035**	**1.8**	**142**	**0.25**

References

[1] ANZECC & ARMCANZ 2000, *Australian guidelines for water quality monitoring and reporting*, National Water Quality Management Strategy, Paper no. 7, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

[2] Kelsey, P, Hall, J, Kretschmer, P, Quinton, B & Shakya D 2010, *Hydrological and nutrient modelling of the Peel-Harvey catchment*, Water Science Technical Series, Report no. 33, Department of Water, Western Australia.

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