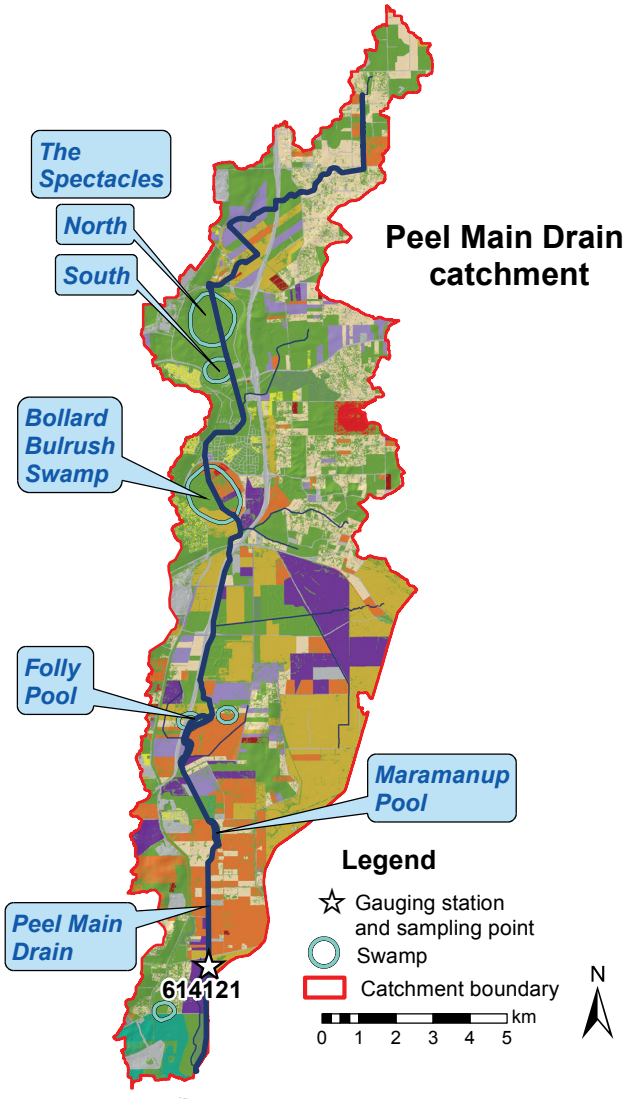
Peel Main Drain

Peel Main Drain flows in a southerly direction and passes through several pools or wetlands (swamps) before discharging to the Serpentine River at Kerulup Pool.

Since July 2006, water quality has been monitored near the bottom of the catchment at the gauging station on Karnup Road (614121). Flow has been recorded at Karnup Road since March 2005.



Peel Main Drain typically flows continuously between July and October each year and stops flowing during summer and autumn. The number of days the drain was dry ranged between 35 (Feb–Apr 2014) and 175 (Jan–May and Nov–Dec 2007).

Nearly half of the Peel Main Drain catchment (mostly north of Bollard Bulrush Swamp) has leached sands and a high or very high risk of phosphorus loss to waterways. Land use in this area is dominated by bushland and residential and lifestyle blocks. To the south the land has been cleared, mostly for agriculture such as stock grazing.

In addition to a piggery and several poultry farms, the catchment also has two sheep feedlots and an aquaculture facility that have Department of Environment Regulation licence conditions governing their discharges and report to the National Pollutant Inventory (Department of Environment Regulation).

Land use classification (2006)[1]	Area (km²)	Area (%)
Animal keeping – non-farming (horses)	12	10
Cattle for beef (predominantly)	16	13
Conservation and natural	47	39
Horticulture	5.6	4.6
Industry, manufacturing and transport	11	9.1
Intensive animal use	0.35	0.29
Lifestyle block	15	13
Mixed grazing	7.5	6.2
Offices, commercial and education	0.83	0.69
Plantation	1.9	1.6
Recreation	1.4	1.2
Residential	1.2	0.98
Total	**120**	**100**

Peel Main Drain - Upstream view 2002

Nutrient summary: median concentrations, loads and status classification at 614121

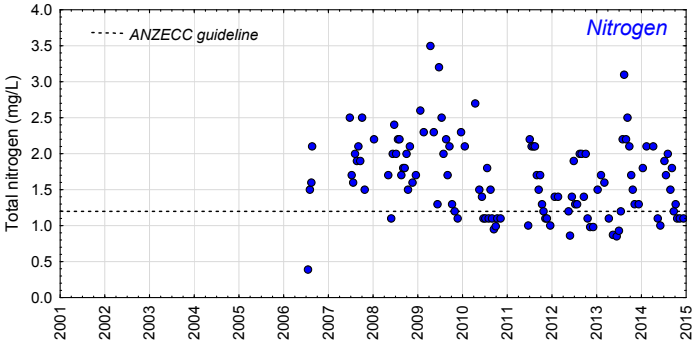
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual flow (GL)	-	-	-	-	10*	2.7	6.0	12	7.3	1.8	6.7	3.9	7.5	5.0
TN median (mg/L)	-	-	-	-	-	1.6	1.9	2.0	2.3	1.1	1.5	1.4	1.5	1.7
TP median (mg/L)	-	-	-	-	-	0.08	0.28	0.37	0.32	0.09	0.18	0.31	0.36	0.19
TN load (t/yr)	-	-	-	-	-	3.8	12	24	14	2.7	13	6.3	14	8.7
TP load (t/yr)	-	-	-	-	-	0.56	1.8	3.8	2.2	0.41	2.0	0.96	2.1	1.3

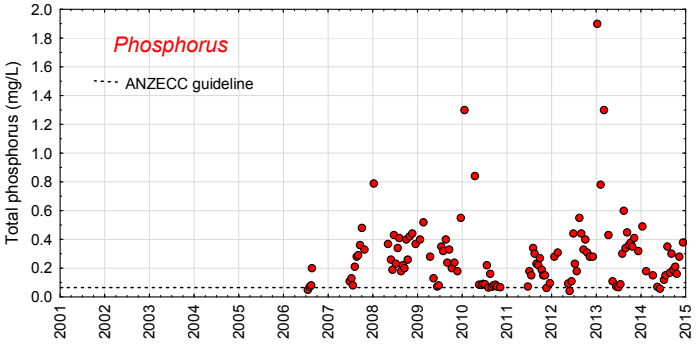
Status classification[2] Low Moderate High Very high

Status reported for three-year period end (i.e. 2012–14 reported in 2014)
TN = total nitrogen TP = total phosphorus

* best estimate using available data
(- not applicable)

Total nitrogen (TN) and total phosphorus (TP) concentrations (2006–14) at 614121





TN concentration:

The annual percentage of TN samples that exceeded the ANZECC[3] guideline for lowland rivers (1.2 mg/L) ranged between 43% (2010) and 100% (2007).

Between 2006 and 2009, 91% of samples exceeded the guideline (1.2 mg/L). The percentage of samples exceeding the guideline decreased to 61% between 2010 and 2014.

TN trend:

Trend analysis[2] used data from 2010 to 2014 inclusive.

Once the data were adjusted for flow no trend was detected.

TP concentration:

Between 2006 and 2014, 96% of the TP samples exceeded the ANZECC[3] guideline for lowland rivers (0.065 mg/L).

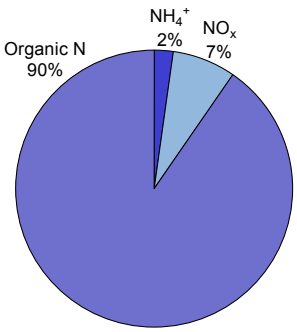
During this time an average of 72% of samples also exceeded double the guideline (0.13 mg/L). The annual percentage of samples that exceeded 0.13 mg/L ranged between 25% in 2006 to 94% in 2008.

TP trend:

Trend analysis[2] was not undertaken using data between 2010 and 2014 as the concentrations appear to increase, peaking in early 2013, before decreasing again.

Five years of continuously increasing, decreasing or relatively consistent concentrations are needed to calculate a trend.

Nutrient fractions (2010–14) at 614121



Nitrogen:

Most of the nitrogen (N) was organic in nature. Organic N consists of both dissolved organic and particulate N. 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 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.

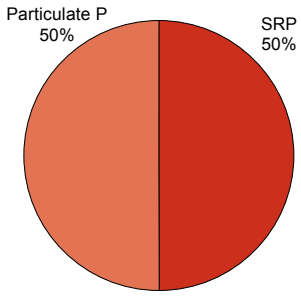
The Peel Main Drain had the lowest percentage of NH_4^+ of all the sites sampled in the Peel-Harvey catchment (2.2%). There was a slight decrease in the percentage of DIN (9.6%) compared to the 2006–09 period (14%).

Algal growth in Peel Main Drain (614121) – October 2006

Phosphorus:

Half the phosphorus (P) was present as particulate P, which consists of sediment-bound forms of P and organic waste materials.

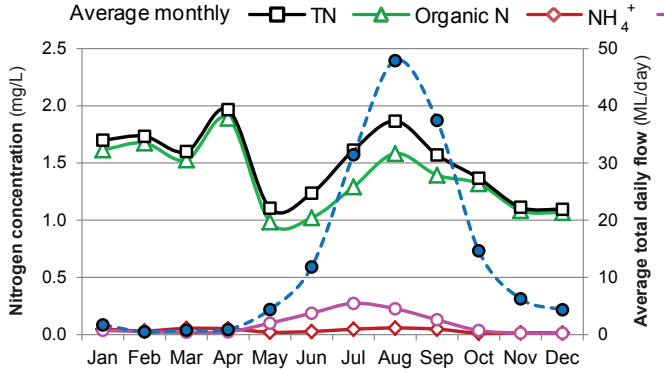
Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound P.

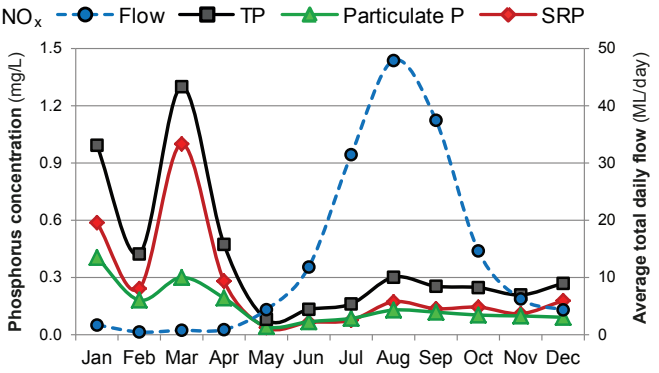


The remaining P was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

The percentage of SRP in Peel Main Drain increased from the 2006–09 period when it had the lowest percentage of SRP of the catchments draining to the Serpentine River (41%).

Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 614121





Nitrogen:

Average monthly nitrogen was dominated by organic N. Concentrations were diluted in May with the first flush but increased steadily over winter.

During winter NO_x concentrations increased notably while NH_4^+ hardly changed.

Average monthly concentrations of TN exceeded ANZECC[3] guidelines for most of the year while NO_x concentrations only exceeded guidelines during winter.

NH_4^+ concentrations remained below ANZECC[3] guidelines throughout the year.

Phosphorus:

Average monthly phosphorus concentrations were dominated by SRP with the exception of May to July when flows were increasing.

Concentrations were highest during summer and autumn, possibly due to nutrient-rich groundwater and algal growth. The high concentration of SRP in March was from a single sample in 2013. All average monthly TP concentrations exceeded ANZECC[3] guideline values. Average monthly SRP concentrations also exceeded guidelines for all months except May.

	ANZECC 2000[3]	Months exceeded
TN	1.2 mg/L	Jan–Oct*
NH_4^+	0.08 mg/L	None
NO_x	0.15 mg/L	Jun–Aug
TP	0.065 mg/L	All
SRP	0.04 mg/L	All*

*Except May.
(March had fewer than three samples)

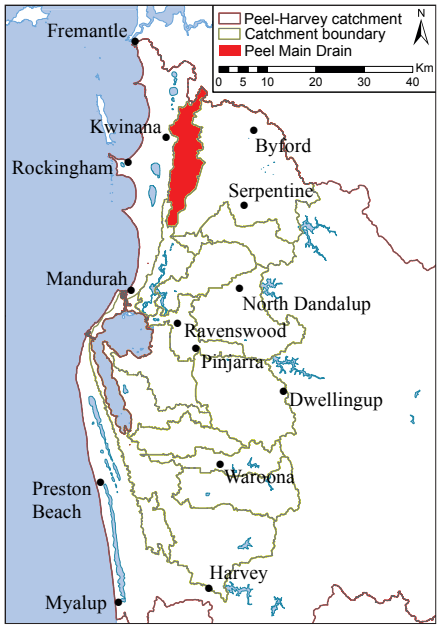
Changes in flow in the Peel Main Drain

Peel Main Drain Above: May 2007 Below: September 2008

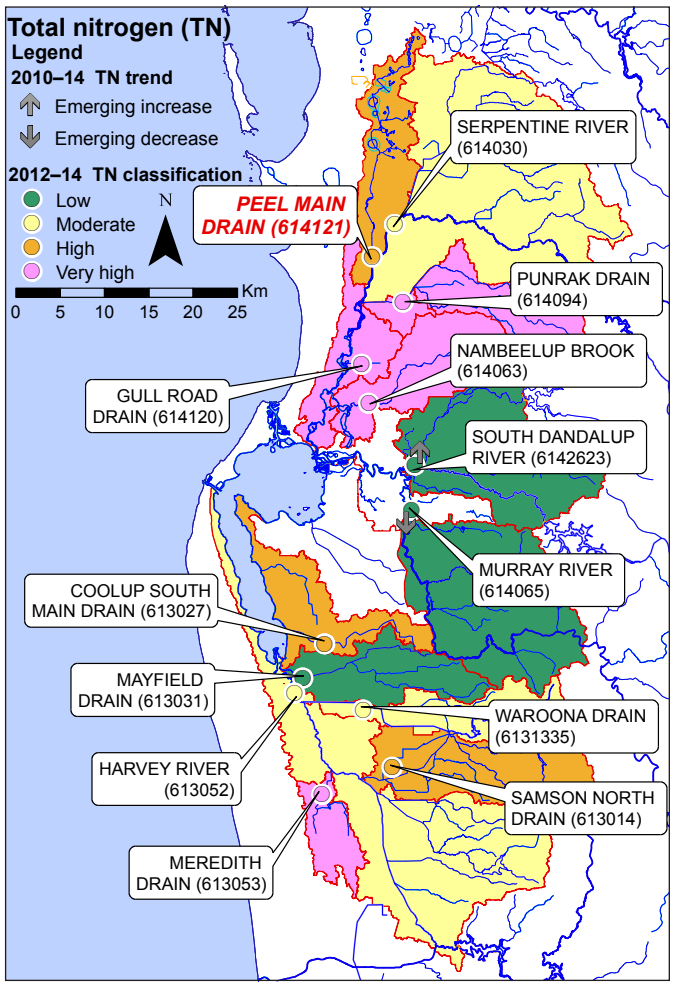
Downstream view from Karnup Road – January 2009

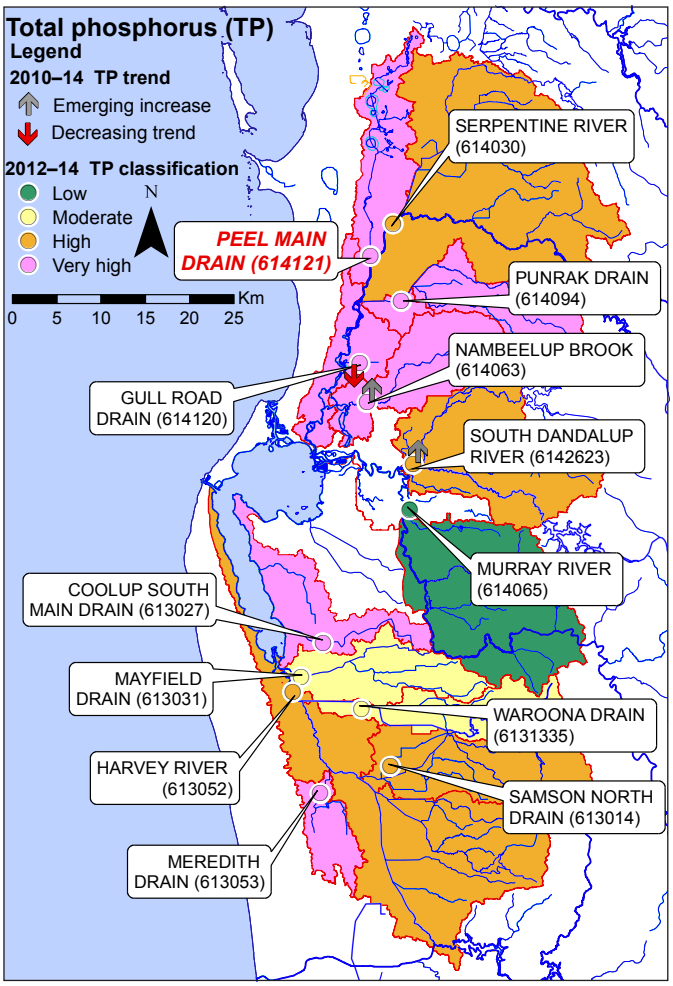
Algal growth and reeds approximately 5 km upstream at Zig Zag Road – October 2006

How the Peel Main Drain fits within the Peel-Harvey catchment: location and statistics



Catchment	Receiving waterbody	Sample site (AWRC)	Area (km²)	2014 Flow (GL)	2014 TN median (mg/L)	2014 TP median (mg/L)
Peel Main Drain	**Serpentine River**	**614121**	**120**	**5.0**	**1.7**	**0.19**
Upper Serpentine River	Serpentine River	614030	502	28	0.79	0.13
Dirk Brook – Punrak Drain	Serpentine River	614094	134	9.6	1.9	0.21
Nambeelup Brook	Serpentine River	614063	143	9.7	3.7	0.60
Lower Serpentine River - Gull Road Drain	Peel Inlet	614120	94	-	4.4	0.93
South Dandalup River	Murray River	6142623	243	-	1.1	0.11
Mid Murray River	Murray River	614065	293	153	0.57	0.01
Coolup South Main Drain	Harvey Estuary	613027	113	2.1	2.1	0.31
Mayfield Drain	Harvey Estuary	613031	119	15	0.73	0.03
Harvey River	Harvey Estuary	613052	408	98	1.4	0.15
Drakes Brook – Waroona Drain	Harvey River	6131335	107	-	0.99	0.07
Samson North Drain	Harvey River	613014	195	-	1.5	0.18
Meredith Drain	Harvey River	613053	56	-	2.8	0.38





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[1] 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.

[2] Department of Water 2015, *Catchment nutrient reports* (methods for the analysis of status classification, loads and trends), <http://www.water.wa.gov.au/water-topics/waterways/assessing-waterway-health/catchment-nutirent-reports>.

[3] 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.

ISBN 978-1-925174-72-4 (online)

Publication date: November 2016