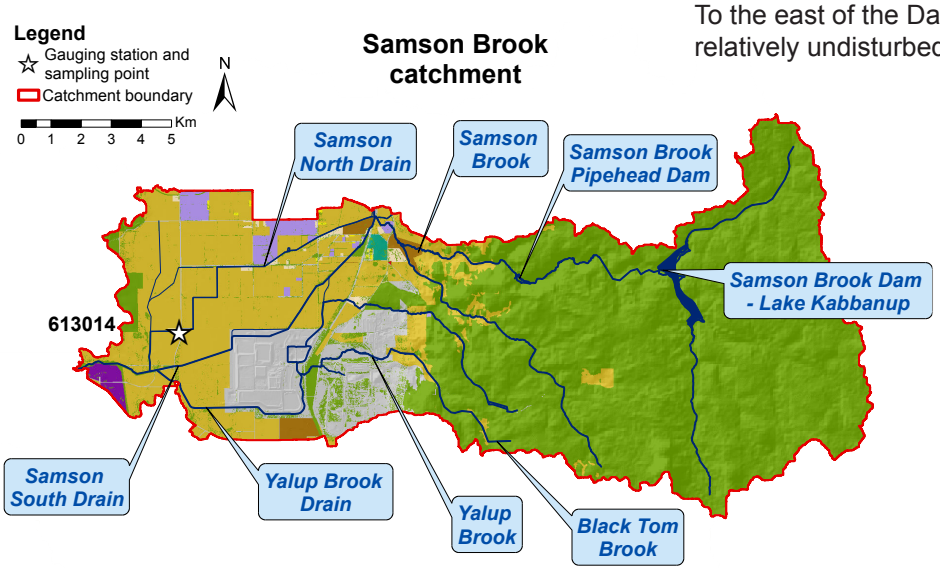
Samson North Drain

The Samson Brook catchment starts in the Dwellingup State Forest on the Darling Plateau and drains west to the Harvey River. Samson Brook is dammed at Lake Kabbanup (Samson Brook Dam) which is used to supply the Waroona Irrigation District. Seven kilometres downstream of the Samson Brook Dam is the Samson Brook Pipehead Dam. Originally a pipehead weir constructed in 1962, it was upgraded to a dam in 2003 and feeds water into the state water supply grid.

Land use classification (2006)[1]	Area (km²)	Area (%)
Cattle for beef (predominantly)	45	23
Cattle for dairy	1.8	0.91
Conservation and natural	125	64
Horticulture	2.7	1.4
Industry, manufacturing and transport	17	8.8
Lifestyle block	0.87	0.45
Mixed grazing	0.97	0.50
Offices, commercial and education	0.01	<0.01
Plantation	0.39	0.20
Residential	0.16	0.08
Total	**195**	**100**



Downstream of the dams, engineering works divert Samson Brook into Samson South and Samson North drains. Excessive flows may go north towards Waroona but are prevented from flowing into Waroona Drain. Samson North Drain flows through the north-west of the catchment and drains into Samson South Drain which in turn drains into the Harvey River downstream of Logue Brook.

Samson North Drain gauging station at Somers Road – March 2005

The catchment's monitoring site is on Samson North Drain at Somers Road (613014). The drain has been monitored for nutrients since 1990 while flow was measured from 1978 to 1999 and again between 2005 and early 2008. Samson North Drain flows year round.

Only 2% of the Samson Brook catchment is subject to seasonal inundation while 8% of the catchment has a high or very high risk of phosphorus leaching to waterways.

To the east of the Darling Scarp the catchment remains relatively undisturbed. West of the scarp, the land has been cleared, mostly for agriculture including stock grazing, cattle for dairy and horticulture. Nearly 9% of the catchment has industrial land uses.

ALCOA's Wagerup refinery has been in operation since 1984 and was expanded in 2006. It uses water from the brooks and drains that flow through or are adjacent to its holding. The alumina refinery processes bauxite from the nearby Willowdale bauxite mine.

Nutrient summary: median concentrations, loads and status classification at 613014

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual flow (GL)	-	-	-	-	5.6*	2.3	4.7*	-	-	-	-	-	-	-
TN median (mg/L)	1.2	1.6	1.9	1.8	1.2	2.9	1.9	1.5	1.9	1.0	1.4	1.3	1.9	1.5
TP median (mg/L)	0.16	0.21	0.23	0.24	0.11	0.53	0.16	0.14	0.22	0.13	0.18	0.23	0.18	0.18
TN load (t/yr)	-	-	-	-	14*	5.5	13*	-	-	-	-	-	-	-
TP load (t/yr)	-	-	-	-	1.7*	0.82	1.3*	-	-	-	-	-	-	-

Status classification[2] Low Moderate High Very high

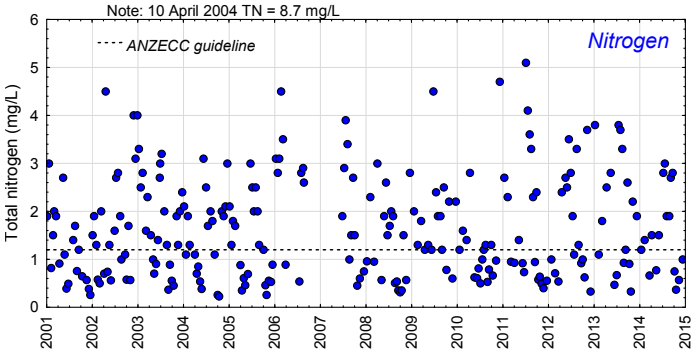
Status reported for three-year period end (i.e. 2012–14 reported in 2014)

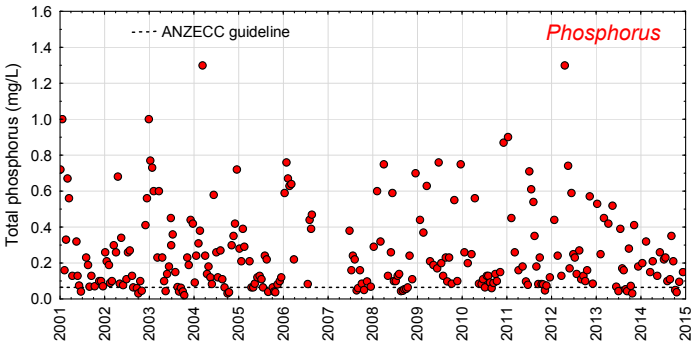
TN = total nitrogen TP = total phosphorus

* Best estimate using available data

(- not applicable)

Total nitrogen (TN) and total phosphorus (TP) concentrations (2001–14) at 613014





TN concentration:

The annual percentage of TN samples that exceeded the ANZECC[3] guideline for lowland rivers (1.2 mg/L) ranged between 35% (2010) and 80% (2006).

Between 2001 and 2014, 56% of samples exceeded the guideline. There was a 10% decrease in the number of samples that exceeded the guideline between the 2005–09 period (60%) and 2010–14 (50%).

TN trend:

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

No statistical trend was detected.

TP concentration:

The annual percentage of TP samples that exceeded the ANZECC[3] guideline for lowland rivers (0.065 mg/L) ranged between 67% (2005) and 100% (2006).

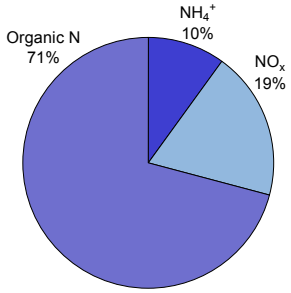
Between 2001 and 2014, 85% of samples exceeded the guideline. There was a 9% increase in the number of samples that exceeded the guideline between the 2005–09 period (81%) and 2010–14 (90%).

TP trend:

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

No statistical trend was detected.

Nutrient fractions (2010–14) at 613014



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.

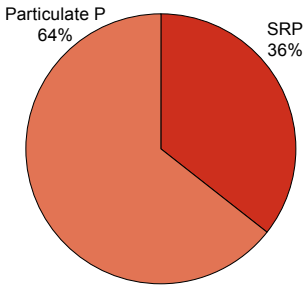
Samson North Drain had the highest percentage of NH_4^+ of all the sampled sites within the Peel-Harvey catchment and the second-highest percentage of DIN (Waroona Drain had the highest at 39%).

Samson North Drain – August 2005

Phosphorus:

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

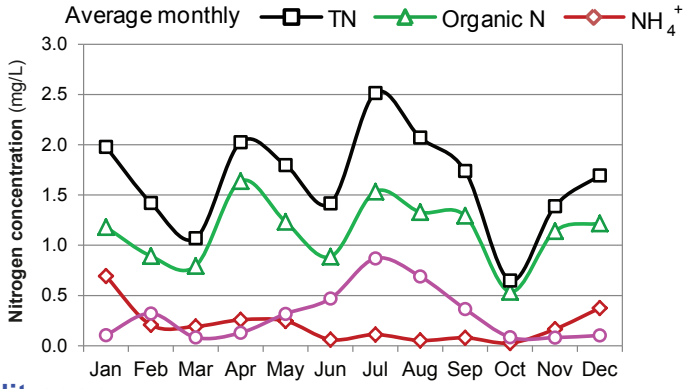
Particulate P is not readily available for uptake by plants and algae, but may become available over time as particles decompose or release bound P.

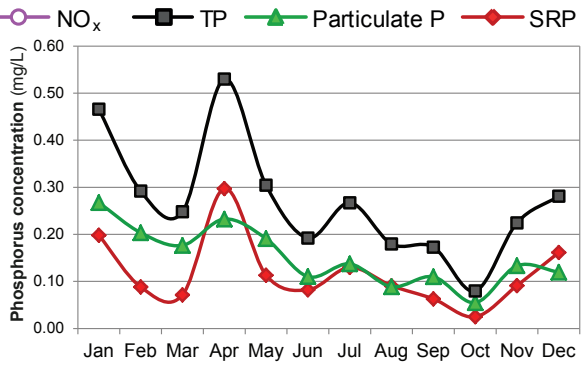


The remaining P was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

Samson North Drain had the third-highest percentage of SRP of the catchments draining to the Harvey Estuary. The other five sites discharging to the estuary had percentages of SRP ranging between 26% (South Dandalup River) and 53% (Meredith Drain).

Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 613014





Nitrogen:

Average monthly nitrogen concentrations were dominated by organic N throughout the year. DIN was dominated by NH_4^+ in summer and autumn and by NO_x in winter.

Average monthly concentrations of TN and NH_4^+ exceeded ANZECC[3] guidelines most of the year, while NO_x only exceeded guidelines during February and winter.

Upstream view of Samson North Drain at Somers Road – May 2006

Phosphorus:

Average monthly phosphorus concentrations were hightest during the summer and autumn months, peaking in April.

Average monthly particulate P concentrations were highter than SRP concentrations with the exception of April and December.

All average monthly TP concentrations exceeded the ANZECC[3] guideline. Average monthly SRP concentrations also exceeded the guideline most of the year except for October.

	ANZECC 2000[3]	Months exceeded
TN	1.2 mg/L	All*
NH_4^+	0.08 mg/L	Nov–May, Jul
NO_x	0.15 mg/L	Feb, May–Sept
TP	0.065 mg/L	All
SRP	0.04 mg/L	Nov–Sept
*Except March and October		

Ecological condition of Samson Brook

Ecological condition was assessed along two reaches of the Samson Brook: below the Samson Brook Dam (spring 2009; upper reach) and below the Samson Brook Pipehead Dam (autumn 2012; lower reach). The assessments were made with the South West Index of River Condition using data collected at field sites and desktop data from the best available sources.

Five native fish and crayfish species were found in the lower reach: western pygmy perch, nightfish, freshwater cobbler, gilgie and marron. Only freshwater crayfish were expected and found in the upper reach. Most species were found in abundance which suggests that availability and quality of habitat is good. However only a few gilgie were observed, and in the lower reach only a few western pygmy perch were recorded.

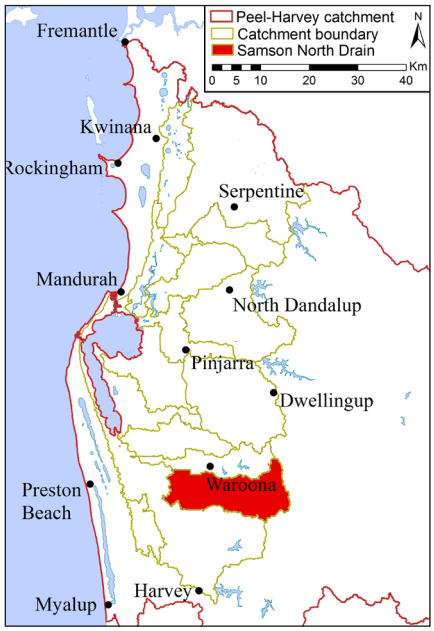
At sites on the lower reach, dissolved oxygen and temperature was within acceptable ranges. No data was available for the upper reach.

Along the upper reach almost 100% of the length was vegetated to a width of 49 m either side of the brook (maximum distance assessed). A reduced extent of fringing zone was apparent for the lower reach with only 30% of the reach length vegetated to a width of approximately 11 m either side.

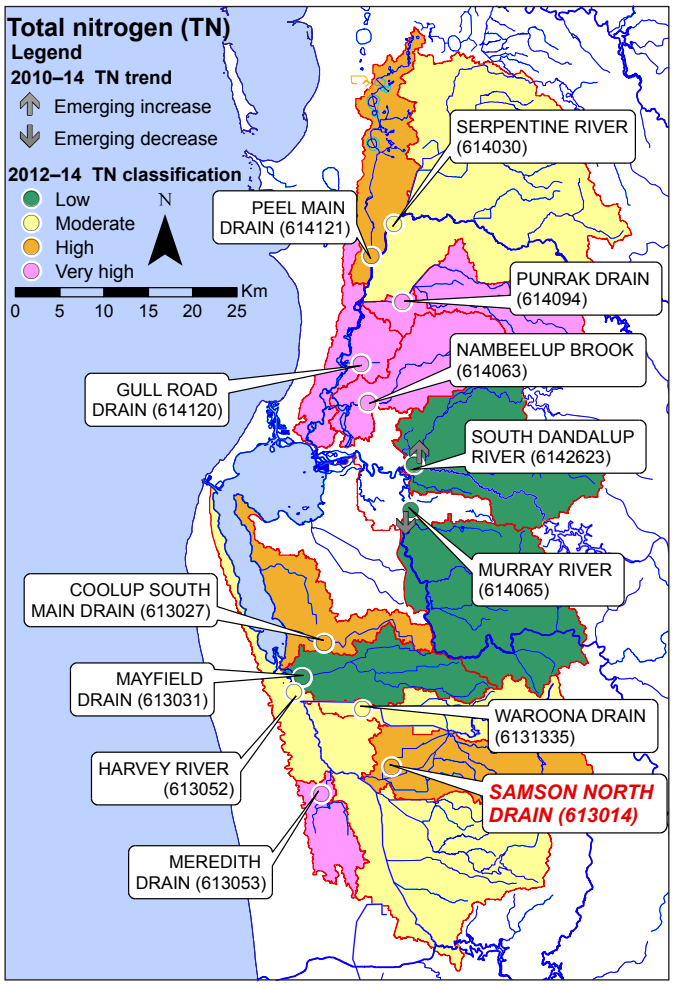
On the upper reach no exotic vegetation species were observed, while no data was available to assess nativeness on the lower reach.

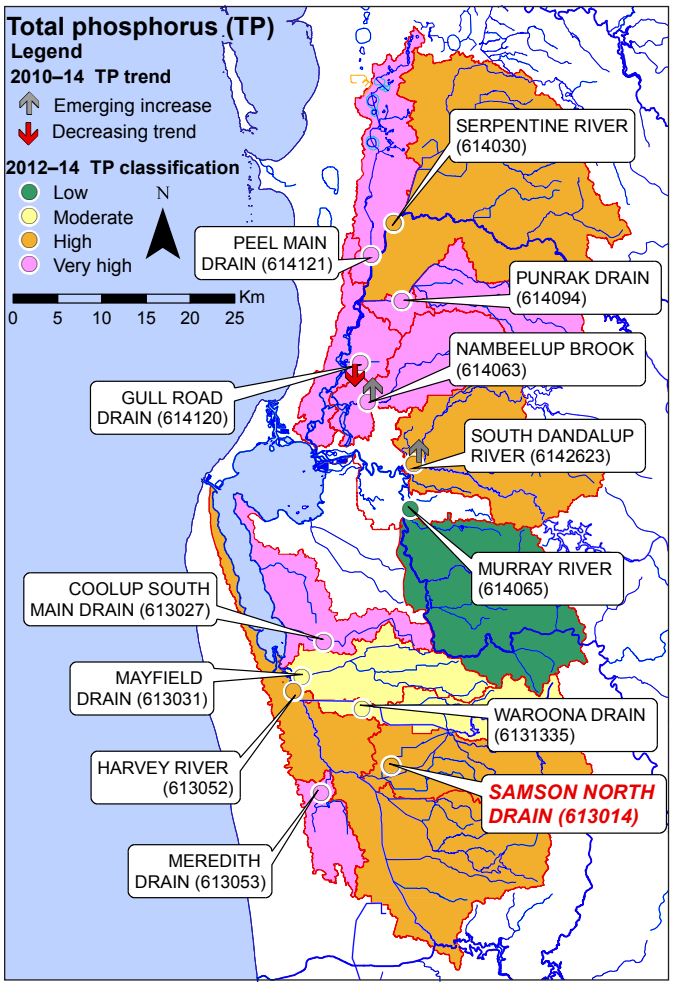
Samson Brook: Between Samson Brook Dam and Samson Brook Pipehead Dams

How Samson North 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.

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