South Perth

The South Perth catchment consists of numerous drains which are almost exclusively piped. They discharge to a variety of receiving water bodies including; lakes, compensating basins, infiltration basins, swales, soakwells, public open space reserves and both the Swan and Canning estuaries (there are more than 50 discharge points to the estuaries).

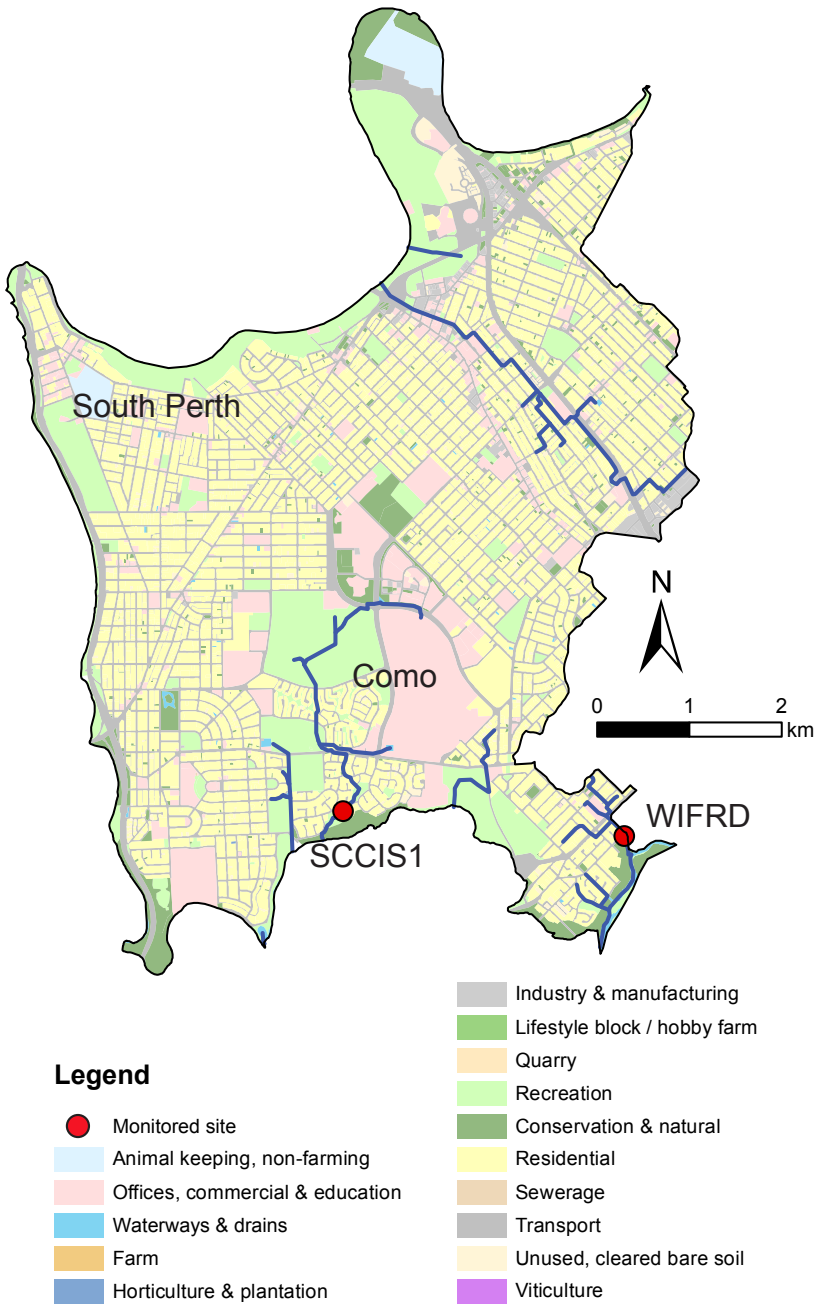
Development in the catchment occurred more slowly than in Perth due to the relative inaccessibility of the area until the construction of the Causeway in the 1840s. The fertile soils along the river were used for agriculture; predominantly dairy cows and market gardening. The market gardens remained in place until the 1950s. Over time the catchment has been converted to urban landuse though there are small pockets of remnant vegetation still present. Belmont Park Racecourse and the Burswood entertainment complex both lie within the South Perth catchment.

The soils in the catchment consist of leached sands, namely Spearwood and Bassendean sands. These sands have poor nutrient-retention capacities so any nutrients applied as fertiliser are quickly washed into groundwater when water is applied.

Water quality is monitored fortnightly at two points in the catchment, one on Wilson Main Drain (WIFRD), Wilson and one on an open drain near Galway Grove (SCCIS1), Waterford. These sites give an indication of the nutrients leaving these subcatchments but do not represent upstream areas or other subcatchments in South Perth.

South Perth – facts and figures

Average rainfall (2012–16)	~ 680 mm per year in the (Perth metro)
Catchment area	40 km^2
Per cent cleared area (2005)	94% (total catchment)
River flow	Flows year round
Main land uses (2005)	Residential and associated infrastructure (roads) (total catchment)



The sampling site near Galway Road (SCCIS1), August 2017.

The sampling site on Wilson Main Drain (WIFRD), August 2017.

Nutrient Summary: concentrations, rainfall and targets

Year	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual rainfall (mm)	009225	466.8	703.0	807.8	607.2	503.8	860.8	608.2	782.4	674.4	617.8	715.8
TN median (mg/L)	SCCIS1		0.77			0.81	0.92	0.55	0.64	0.90	0.69	0.80
TP median (mg/L)	SCCIS1		0.019			0.027	0.029	0.016	0.016	0.019	0.016	0.017
TN median (mg/L)	WIFRD							1.40	1.50	1.50	1.50	1.70
TP median (mg/L)	WIFRD							0.130	0.115	0.190#	0.150#	0.155

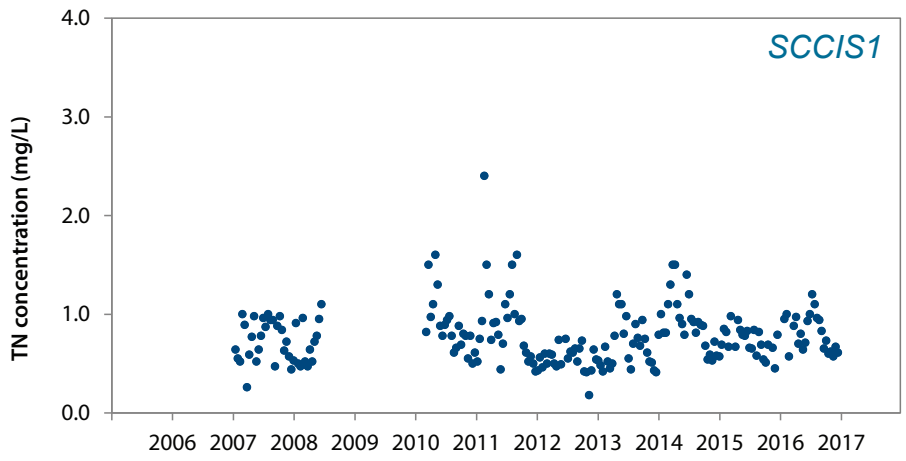
TN short term target = 2.0 mg/L TN long term target = 1.0 mg/L TP short term target = 0.2 mg/L TP long term target = 0.1 mg/L

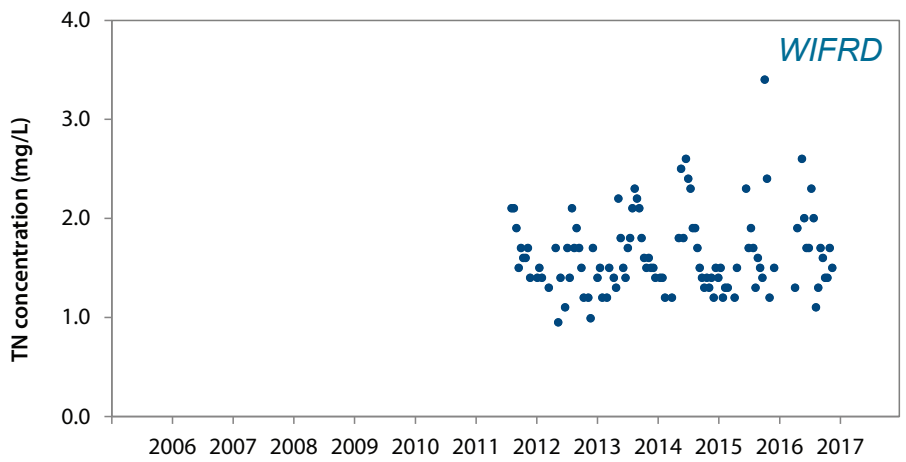
insufficient data to test target failing both short and long-term target passing short but failing long-term target passing both short and long-term target

* Best estimate using available data. # Statistical tests that account for the number of samples and large data variability are used for testing against targets on three years of winter data. Thus the annual median value can be above the target even when the site passes the target (or below the target when the site fails).

Changes in nutrient concentrations over time in South Perth

Total nitrogen concentrations over the 2006 to 2016 monitoring period





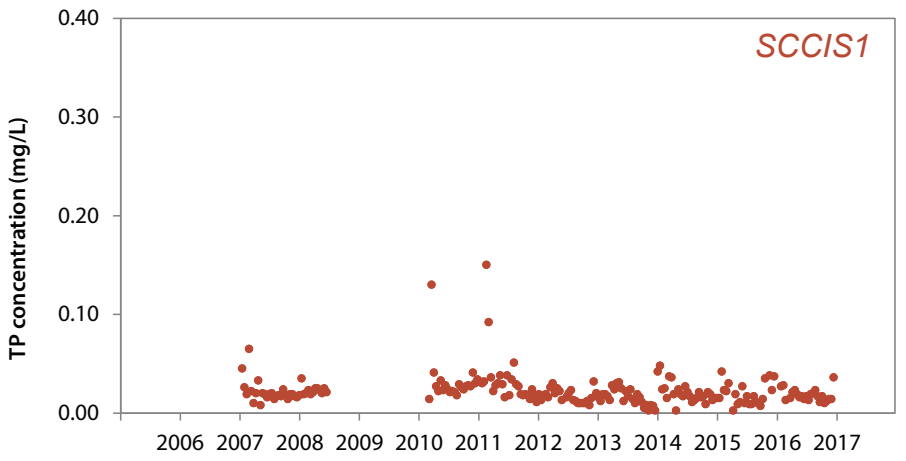
Trend

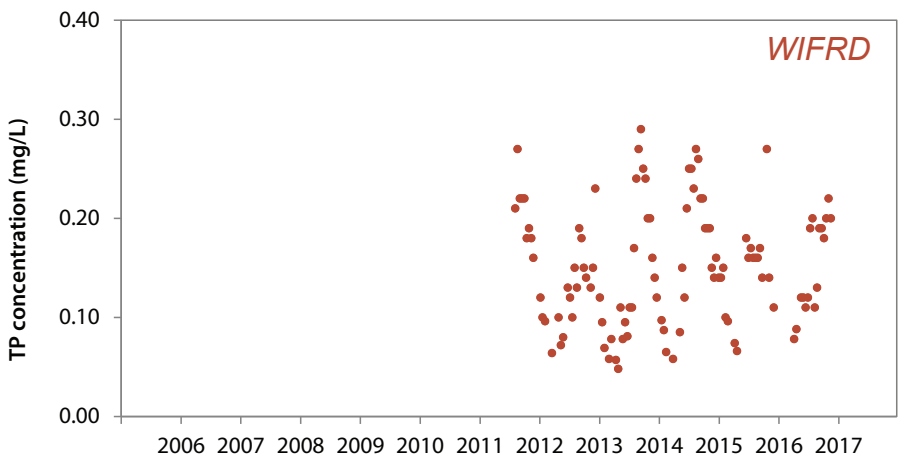
Total nitrogen (TN) concentrations appear to fluctuate from year-to-year at SCCIS1 and be stable at WIFRD. Concentrations were higher at WIFRD, the site with a smaller catchment. There were no TN trends detected at either site.

Target

SCCIS1 is passing both the short- and long-term TN targets. WIFRD, with its higher TN concentrations, is passing the short- but failing the long-term TN targets.

Total phosphorus concentrations over the 2006 to 2016 monitoring period





Trend

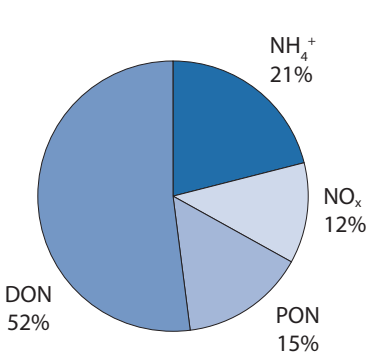
Total phosphorus (TP) concentrations appear stable at WIFRD and to be fluctuating from year-to-year at SCCIS1. Like with TN, TP concentrations were higher at WIFRD. There were no TP trends detected at either site.

Target

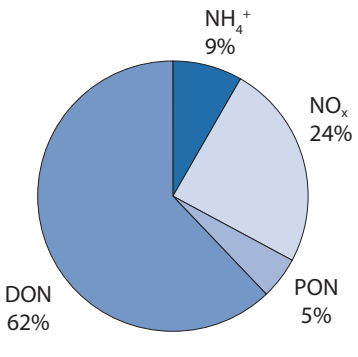
SCCIS1 is passing both the short- and long-term TP targets. TP concentrations are much higher in WIFRD and it is currently passing the short-term and failing the long-term TP targets.

Nutrient fractions in South Perth

Average composition of nitrogen (N) in South Perth over the 2012 to 2016 monitoring period



SCCIS1

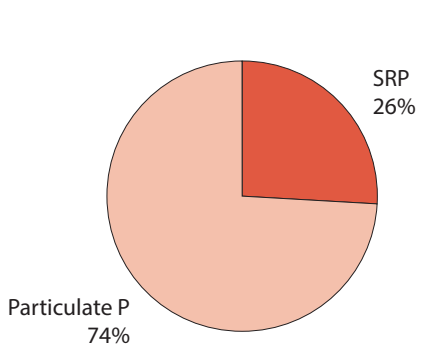


WIFRD

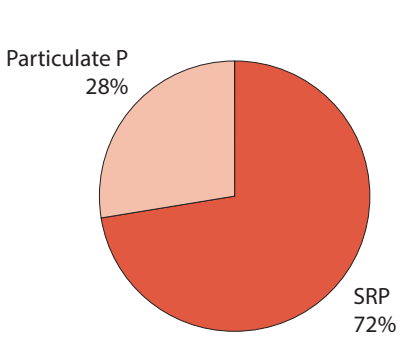
Nitrogen (N) composition varied a little at the two sites however most was present as dissolved organic N (DON). This is mostly organic compounds leached from peaty sub-soils and degrading plant and animal matter and is bioavailable. Particulate organic N (PON) is composed of plant and animal debris and needs to be broken down to become bioavailable. The remaining N was present as dissolved inorganic N (DIN, consisting of ammonium – NH_4^+ and N oxides – NO_x), which is mostly derived from animal waste and fertilisers and is bioavailable

There were no flow data for South Perth so loads have not been calculated.

Average composition of phosphorus (P) in South Perth over the 2012 to 2016 monitoring period



SCCIS1



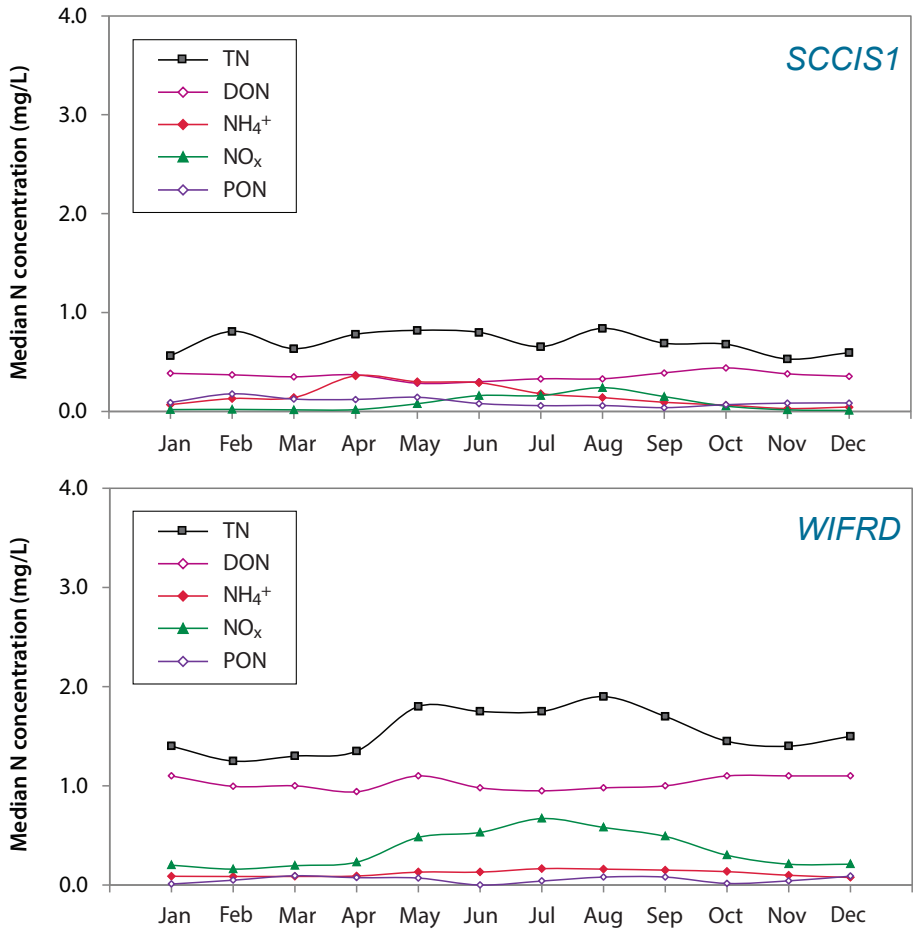
WIFRD

Phosphorus (P) composition was different at the two sites. SCCIS1 was dominated by particulate P, which consists of sediment-bound forms of P and organic material. Particulate P is not readily available for plant and algal uptake, but may become available over time. Soluble reactive phosphorus (SRP) was the dominant form at WIFRD and is likely derived from fertilisers, septic tanks and animal waste. It is readily available for plant and algal uptake. The reason for the difference in P composition is not clear however there are a large number of septic tanks upstream of WIFRD.

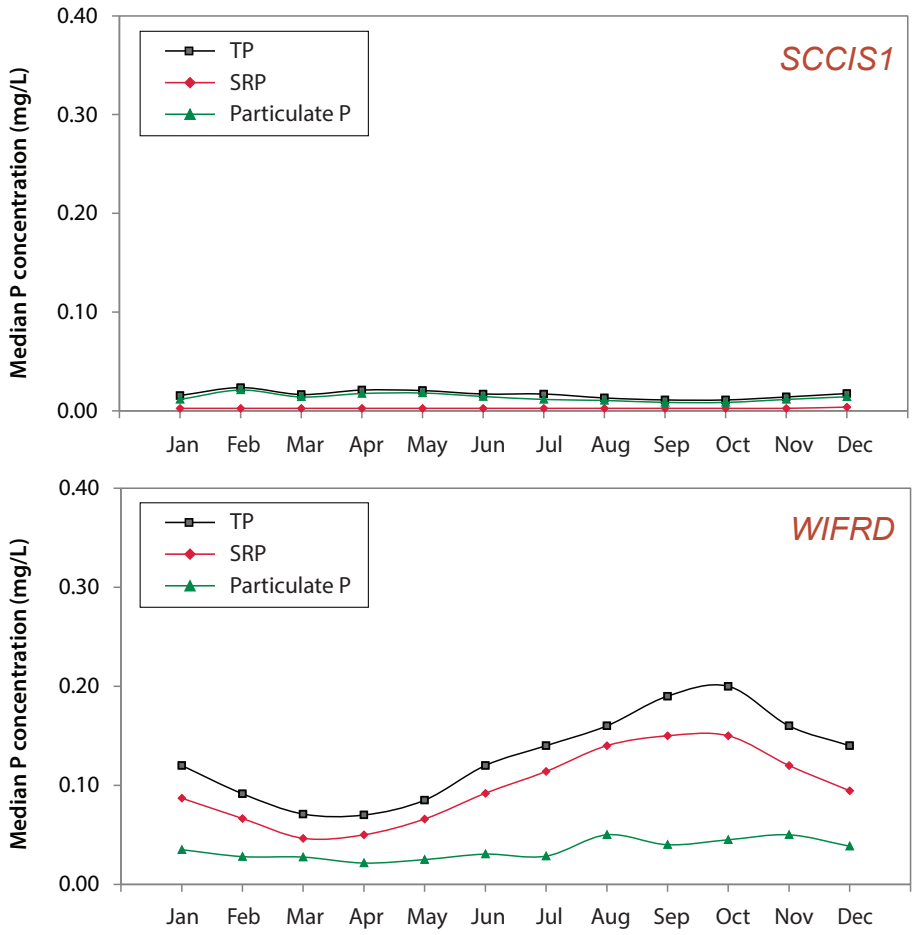
There were no flow data for South Perth so loads have not been calculated.

Seasonal variation in nutrient concentrations in South Perth

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

N concentrations behaved slightly differently at both sites. NO_x showed a seasonal response at both sites, suggesting that it is entering the drains via surface and subsurface flows following rainfall. At SCCIS1, NH_4^+ showed a first flush response, increasing as rains start, indicating that it is entering the drain via surface runoff. The other forms of N are probably entering via groundwater, surface and sub-surface flows.

Phosphorus

P concentrations showed very little change over the year at SCCIS1 suggesting that it is entering the drain via surface and sub-surface flow as well as groundwater. At WIFRD, SRP and TP showed a strong seasonal response, being highest in winter when flow and rainfall are highest. This suggests that SRP is entering the drain predominantly via surface and sub-surface flows in winter and from groundwater year-round.

Photo: Water Science Branch

Photo: Water Science Branch

Photo: Emma van Looij

Photographs of South Perth: (Top left) Concrete lined drain in the South Perth Catchment, November 2005. (Bottom left) Algal growth in a South Perth drain, November 2005, (Right) Ornamental lake in GO Edwards Park, July 2015.

Local nutrient reduction strategies for South Perth

Nutrient reduction strategies being undertaken or recently completed in the South Perth catchment include but are not limited to:

- A major water quality review of all monitoring data conducted by the South East Regional Centre for Urban Landcare (SERCUL) for the City of South Perth to identify major water quality issues in the city and to assist in future monitoring.
- Riverwise Sustainable Gardening Workshops Spring series held in 2016.
- The Kwinana Freeway Foreshore Management Plan is being developed by the City of South Perth in collaboration with the Department of Biodiversity, Conservation and Attractions (DBCA).
- The DBCA's Riverbank Program which has funded numerous projects across more than ten key foreshore sites in the South Perth catchment. Projects have included significant erosion control treatments such as construction of rock revetments, gabion mattresses, sand renourishment and bioengineering as well as restoration techniques using weed control and revegetation. Examples include projects at Hill 60 Rivervale, Como Beach and Mount Henry Spit.
- Cygnia Cove foreshore restoration works by the City of South Perth and the Riverbank Program which includes weed and erosion control and revegetation within the wetlands and foreshore reserve.
- The DBCA's Healthy Catchments Program aims to protect the environmental health and community benefit of the Swan Canning river system by improving water quality in the catchments. This is achieved through engaging partners and focusing the effort of local governments, sub-regional groups, the community and other organisations in water quality improvement activities.
- Coordinating and support of community led projects to reduce nutrient inputs into the Swan River in the south sub-region led by SERCUL and funded by DBCA.
- The Phosphorus Awareness Project which aims to assist the community in reducing their nutrient outputs through education, promotion and behaviour change programs.
- In 2014–15 the RiverWise-Waterwise behaviour change project was implemented involving a partnership between DBCA and the Water Corporation to reduce water consumption and fertiliser use through a personalised coaching approach to individual households.

Photo: Emma van Looij

Swan Canning water quality improvement plan

The *Swan Canning water quality improvement plan* (SCWQIP) complements the delivery of other major programs and presents a roadmap for reducing nutrient inputs into the river system. It uses sophisticated modelling to identify nutrient sources and provides nutrient-reduction targets for each of the subcatchments.

SCWQIP load and concentration targets for South Perth

	Max. acceptable load (t/yr)	Concentration target (mg/L)	% reduction required
TN	8.8	0.5	31%
TP	1.76	0.05	9%

For further information on the SCWQIP contact: rivers.info@dbca.wa.gov.au

Summary: South Perth

- SCCIS1 is currently passing both the short- and long-term TN and TP targets.
- The site on Wilson Main Drain (WIFRD) is currently passing the short- but failing the long-term TN and TP targets.
- Of the 33 sites sampled, WIFRD has one of the highest median TN and TP concentrations. SCCIS1 has one of the lowest TP median concentrations.
- Of the 33 sites sampled, WIFRD has the second-highest proportion of P present as bioavailable SRP, and SCCIS1 has one of the lowest.
- Overall, a 31% reduction in TN and a 9% reduction in TP is required for this catchment to meet its SCWQIP targets.

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For further information please contact the
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