Samson North Drain

This data report provides a summary of the nutrients at the Samson North Drain sampling site in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of the site, the drain enters the Harvey River and, from there, discharges into the Harvey Estuary.

About the catchment

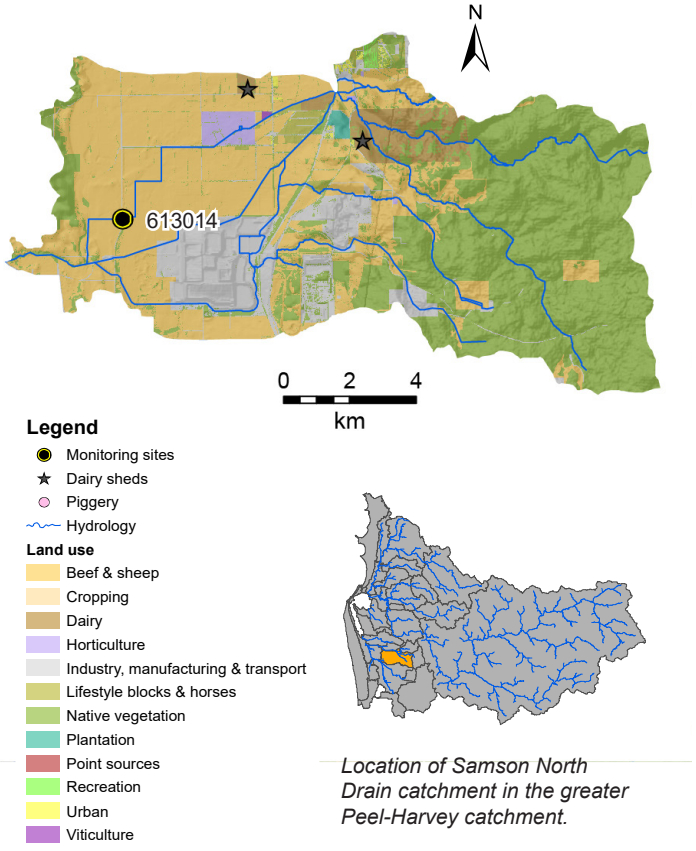
The Samson North Drain has a catchment area of about 138 km^2, just more than half of which has been cleared, mostly for beef and sheep grazing. The eastern portion of the catchment, on the Darling Scarp, still retains large areas of native vegetation. There are a number of natural and man-made waterways in this catchment, with only the Samson North Drain sampled. Alcoa's Wagerup Refinery is in the catchment; however, it is not upstream of the sampling site.

The soils on the Swan Coastal Plain portion of the catchment have a low capacity to bind phosphorus. This is often so poor that any phosphorus applied to them can be quickly washed or leached into drains and other waterways. Soils in the Darling Scarp portion generally have a good phosphorus-binding capacity and hence tend to bind phosphorus well, reducing the amount entering drains and waterways.

Water quality is sampled at site 613014, Somers Road, where Samson North Drain passes under Somers Road in Wagerup. The catchment area upstream of the sampling site is about 30 km^2. While there is a weir at this sampling site, flow is not currently measured.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the Samson North Drain sampling site were classified as high. The proportion of nitrogen present as total ammonia, a highly bioavailable type of nitrogen, was large compared with the other monitored catchments. The agricultural land use as well as the modified drainage system present all contributed to the high nutrient concentrations recorded at this site.



Location of Samson North Drain catchment in the greater Peel-Harvey catchment.

Facts and figures

Sampling site code	613014
Catchment area	138 km^2
Per cent cleared area (2015)	56 per cent
River flow	Permanent
Main land use (2015)	Native vegetation, beef and sheep grazing

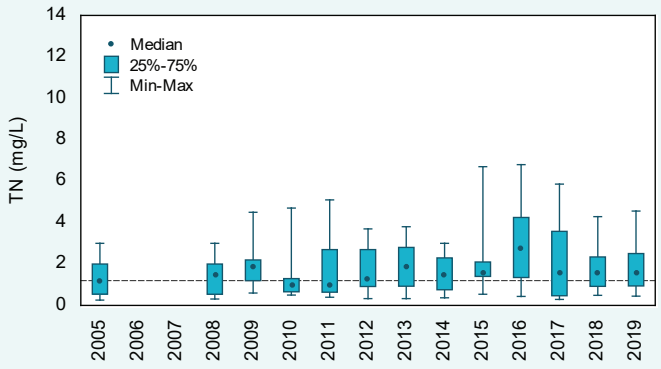
Samson North Drain

Nitrogen over time (2005–19)

Concentrations

Total nitrogen (TN) concentrations at the Samson North Drain sampling site were high compared with the other Peel-Harvey catchment sampling sites and fluctuated over the reporting period. The annual median TN concentrations were above the Bindjareb Djilba (Peel-Harvey estuary) Protection Plan water quality target for TN concentrations in most of the years where there were sufficient data to graph. The annual range in TN concentrations were also relatively large compared with the other Peel-Harvey sites. Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all years were classified as having a high TN concentration.

Samson North Drain



Total nitrogen concentrations, 2005–19 at site 613014. The dashed line is the protection plan TN target.

The weir at the Samson North Drain sampling site, May 2005.

Samson North Drain

Nitrogen (2019)

Types of Nitrogen

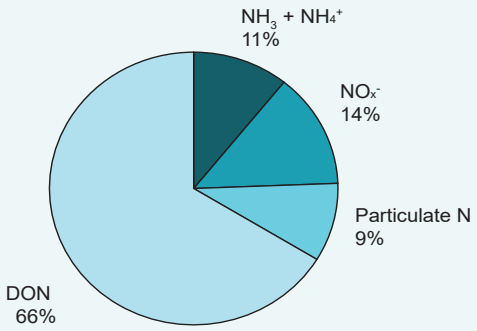
Total N is made up of different types of N. At the Samson North Drain sampling site, about two-thirds of the N was present as dissolved organic N (DON) which consists mainly of degrading plant and animal matter but may also include other types. Most types of DON need to be further broken down to become available to plants and algae, though some types are readily bioavailable. The proportion of N present as total ammonia (NH_3 + NH_4^+) was high compared with the other Peel-Harvey catchment sites, being the second highest (just lower than Drakes Brook–Waroona Drain which had 12 per cent). Along with nitrate (NO_x^-), total ammonia is readily bioavailable and is commonly sourced from fertilisers and animal wastes as well as natural sources.

Concentrations

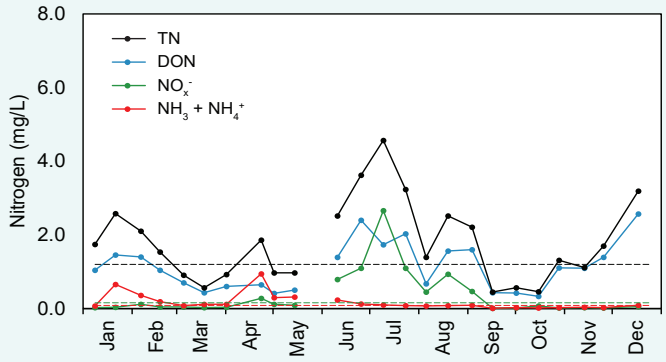
There were three main peaks in N concentrations at the Samson North Drain sampling site in 2019. The first was in January, where there was a peak in total ammonia, DON and TN concentrations. The reason for this peak is unknown, though it may be runoff from intensive land use further up in the catchment. The second peak occurred over the wetter winter months, when rainfall and flow were at their highest. This peak was most obvious in nitrate, TN and DON concentrations and was likely because of N being washed into the drain from surrounding land use via surface flows, the mobilisation of organic N that had been mineralised in soils and streams over the summer period and organic N from soils and remnant wetlands. The last peak, in December, was in TN and DON only. The reason for this peak is unclear. The dip in TN, DON and nitrate in August was probably the result of a dry spell which caused parts of the catchment to dry out, therefore no longer contributing nutrients. This dip was present at many of the Peel-Harvey catchment sites in both N and phosphorus concentrations.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



2019 average nitrogen fractions at site 613014.



2019 nitrogen concentrations at 613014. The black dashed line is the protection plan TN target, the red and green lines are the ANZECC trigger values for total ammonia and nitrate.

Samson North Drain flowing through farmland downstream of the sampling site, May 2020.

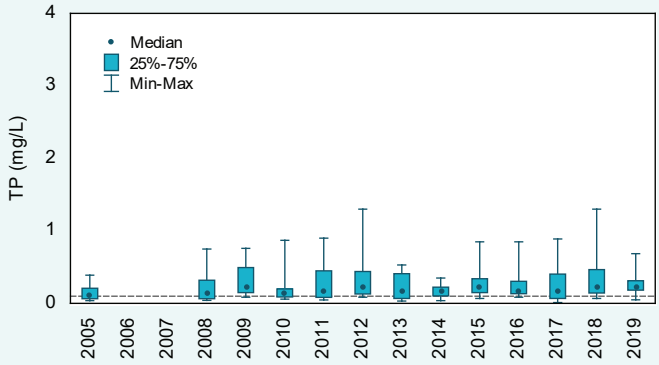
Samson North Drain

Phosphorus over time (2005–19)

Concentrations

Total phosphorus (TP) concentrations fluctuated over the reporting period at the Samson North Drain sampling site. The annual median was above the protection plan water quality target for TP concentrations each year where there were sufficient data to graph and concentrations were generally high compared with the other sites sampled in the Peel-Harvey catchment. Using the SWRWQA methodology, all years were classified as having a high TP concentration.

Samson North Drain



Total phosphorus concentrations, 2005–19 at site 613014. The dashed line is the protection plan TP target.

The v-notch weir at the Samson North Drain sampling site, May 2005.

Samson North Drain

Phosphorus (2019)

Types of phosphorus

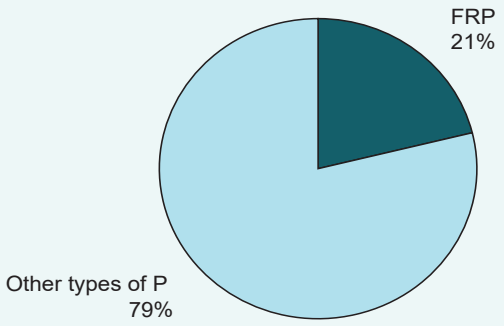
Total P is made up of different types of P. At the Samson North Drain sampling site, just under a quarter of the P was present as highly bioavailable phosphate; measured as filterable reactive P (FRP), in surface waters this is mainly present as phosphate (PO_4^{3-}) species. The phosphate was likely sourced from fertilisers and animal wastes as well as natural sources. The remaining P was present as either particulate P or dissolved organic P (DOP) or both (shown as 'Other types of P' in the chart below). Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood.

Concentrations

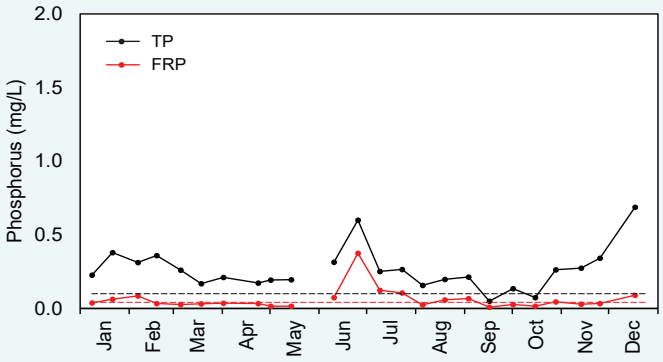
In 2019, P concentrations showed a similar pattern to N concentrations. The peak in TP and phosphate in June was most likely because of a first flush effect where the commencement of winter rainfall washed P into the drain from surrounding land use. Why concentrations of TP increased again from October is unclear. Throughout the year, it is likely P was entering the drain via both surface and groundwater flows as well as coming from in-stream sources and possibly some form of discharge. The small dip in TP and phosphate in August was probably the result of a dry spell which caused parts of the catchment to dry out, therefore no longer contributing nutrients. This dip was present at many of the Peel-Harvey catchment sites in both N and P concentrations.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



2019 average phosphorus fractions at site 613014.



2019 phosphorus concentrations at 613014. The dashed black line is the protection plan TP target, the red is the ANZECC trigger value for phosphate.

The staff gauge and weir at the Samson North Drain sampling site, May 2006.

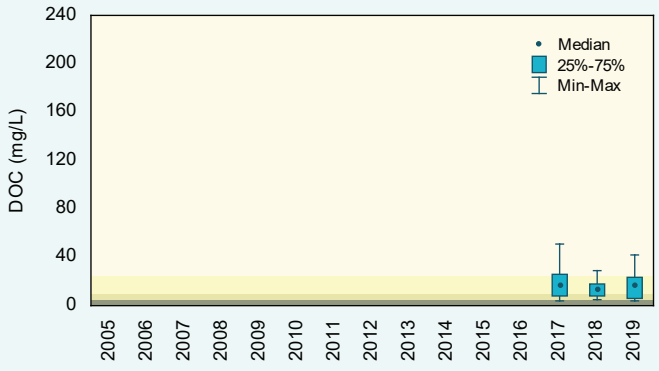
Samson North Drain

Dissolved organic carbon over time (2005–19)

Concentrations

There were only three years with enough dissolved organic carbon (DOC) data to graph at the Samson North Drain sampling site. Using the SWRWQA methodology, all years were classified as having a high DOC concentration.

Samson North Drain



Dissolved organic carbon concentrations, 2005–19 at site 613014. The shading refers to the SWRWQA classification bands.

low moderate high very high

Mcknoes Brook, a tributary of Samson North Drain on the Darling Scarp. The brook is in a largely natural state, December 2008.

Samson North Drain

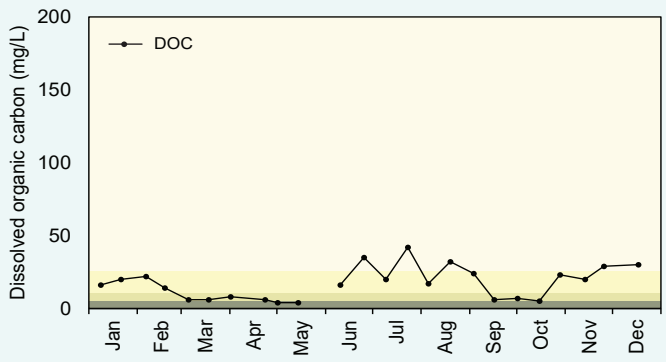
Dissolved organic carbon (2019)

Concentrations

DOC concentrations varied during the year at the Samson North Drain sampling site. The slightly higher concentrations during June to August may be because of DOC being washed into the drain via surface and groundwater flows when rainfall and flows were comparatively high. DOC was likely entering the Samson North Drain via surface and groundwater flows as well as coming from in-stream sources. DOC is sourced mainly from degrading plant and animal matter, including from agricultural land and natural organic matter in soils and wetlands. It varies widely in its bioavailability.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



2019 total dissolved organic carbon concentrations at 613014. The shading refers to the SWRWQA classification bands.

low moderate high very high

Mcknoes Brook on the Darling Scarp. Note the dense fringing vegetation consisting of a mix of native species, February 2010.

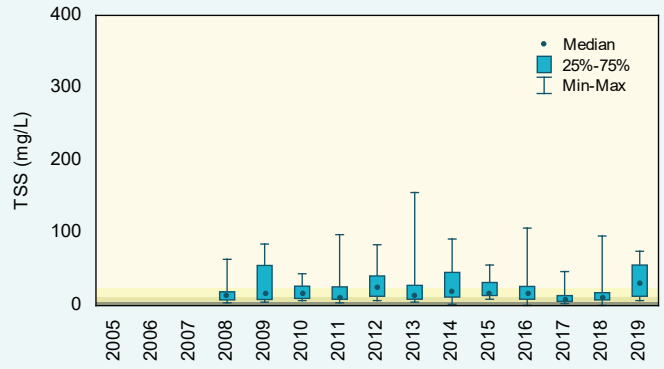
Samson North Drain

Total suspended solids over time (2005–19)

Concentrations

Total suspended solids (TSS) concentrations fluctuated over the reporting period at the Samson North Drain site. Using the SWRWQA methodology, all years were classified as having a high TSS concentration.

Samson North Drain



Total suspended solids concentrations, 2005–19 at site 613014. The shading refers to the SWRWQA classification bands.

low moderate high very high

Samson North Drain where it flows under Somers Road, September 2018.

Samson North Drain

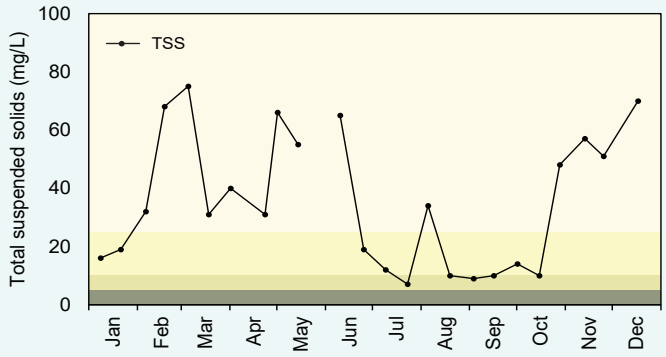
Total suspended solids (2019)

Concentrations

There was not a clear seasonal pattern present in TSS concentrations at the Samson North Drain sampling site. Concentrations were generally lower from about June to October when rainfall and flow were at their highest, suggesting that surface runoff was not the main source of particulate matter at this site. The peaks in TSS concentrations may have been because of a number of reasons such as a discharge upstream of the sampling site, stock accessing the drain for water and causing erosion, or in-stream plant or algal growth.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



2019 total suspended solids concentrations at 613014. The shading refers to the SWRWQA classification bands.

low moderate high very high

In vegetated catchments such as McKnoes Brook, the ash from bushfires can contribute significant amounts of nutrients and particulate matter to waterways, January 2016.

Samson North Drain

pH over time (2005–19)

pH levels

pH at the Samson North Drain sampling site fluctuated over the reporting period. The annual median was within the upper and lower Australian and New Zealand Environment and Conservation Council (ANZECC) trigger values every year though some samples fell outside these trigger values in a number of years.

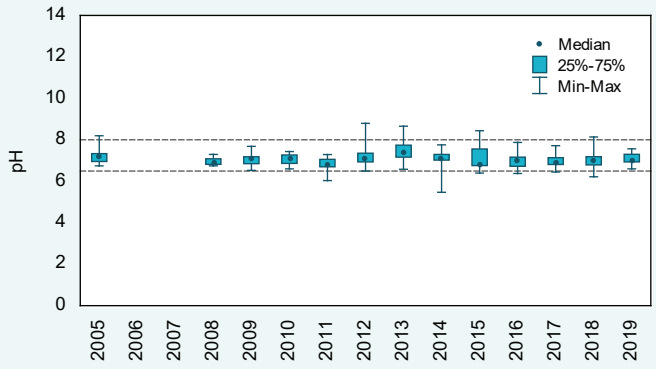
pH (2019)

pH levels

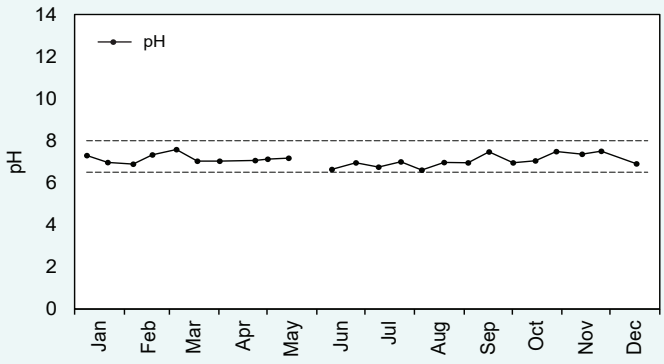
pH levels fluctuated during the year at the Samson North Drain sampling site. In 2019, all of the samples collected fell within the upper and lower ANZECC trigger values.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



pH levels, 2005–19 at site 613014. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 613014. The dashed lines are the upper and lower ANZECC trigger values.

There is a small area of viticulture a few kilometres upstream of the Samson North Drain sampling site, May 2020.

Samson North Drain

Salinity over time (2005–19)

Concentrations

Salinity fluctuated over the reporting period at the Samson North Drain sampling site. Using the Water Resources Inventory 2014 salinity ranges, all years were classified as fresh (note, in 2018, the SWRWQA salinity bands were used).

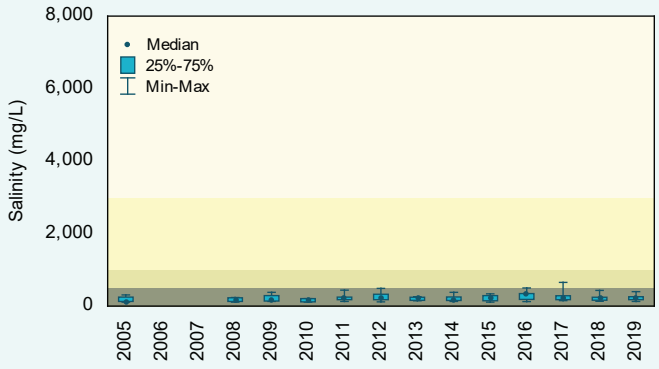
Salinity (2019)

Concentrations

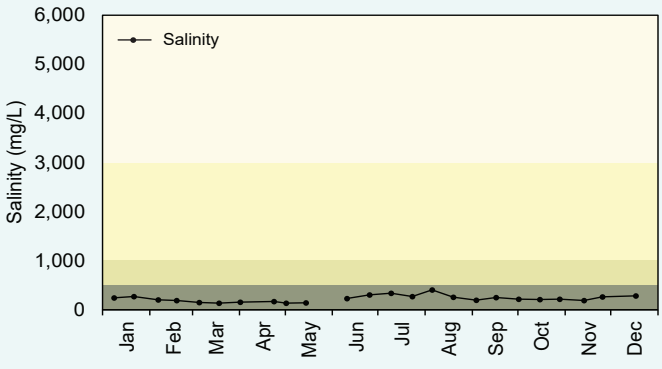
Salinity did not show a strong seasonal pattern at the Samson North Drain sampling site, with concentrations fluctuating during the year. All samples collected in 2019 fell into the fresh band of the Water Resources Inventory 2014 salinity ranges.

The drain was not flowing in late May, hence the missing data point.

Samson North Drain



Salinity concentrations, 2005–19 at site 613014. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 613014. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

Native Jarrah forest on the Darling Scarp in the Samson North Drain catchment, December 2010.

Samson North Drain

Background

Healthy Estuaries WA is a State Government program launched in 2020 and builds on the work of the Regional Estuaries Initiative. Collecting and reporting water quality data, such as in this report, helps build understanding of the whole system. By understanding the whole system, we can direct investment towards the most effective actions in the catchments to protect and restore the health of our waterways.

Nutrients (nitrogen and phosphorus) are compounds that are important for plants to grow. Excess nutrients entering waterways from effluent, fertilisers and other sources can fuel algal growth, decrease oxygen levels in the water and harm fish and other species. Total suspended solids, pH and salinity data are also presented as these help us better understand the processes occurring in the catchment.

You can find information on the condition of Peel-Harvey estuary at estuaries.dwer.wa.gov.au/estuary/peel-harvey-estuary/

Healthy Estuaries WA partners with the Peel-Harvey Catchment Council to fund best-practice management of fertiliser, dairy effluent and watercourses on farms.

- To find out how you can be involved visit estuaries.dwer.wa.gov.au/participate
- To find out more about the Peel-Harvey Catchment Council go to peel-harvey.org.au
- To find out more about the health of the rivers in the Peel-Harvey Catchment go to rivers.dwer.wa.gov.au/assessments/results

Methods

Variables were compared with the Bindjareb Djilba (Peel-Harvey estuary) Protection Plan concentration targets or ANZECC trigger values where available, or the SWRWQA bands or the 2014 Water Resources Inventory ranges. They were classified using the SWRWQA methodology. Standard statistical tests were used to calculate trends and loads. For further information on the methods visit estuaries.dwer.wa.gov.au/nutrient-reports/data-analysis

Glossary

Bioavailable: bioavailable nutrients refers to those nutrients which plants and algae can take up from the water and use straight away for growth.

Concentration: the amount of a substance present per volume of water.

Evapoconcentration: the increase in concentration of a substance dissolved in water because of water being lost by evaporation.

First flush: material washed into a waterway by the first rainfall after an extended dry period. The first flush is often associated with high concentrations of nutrients and particulate matter.

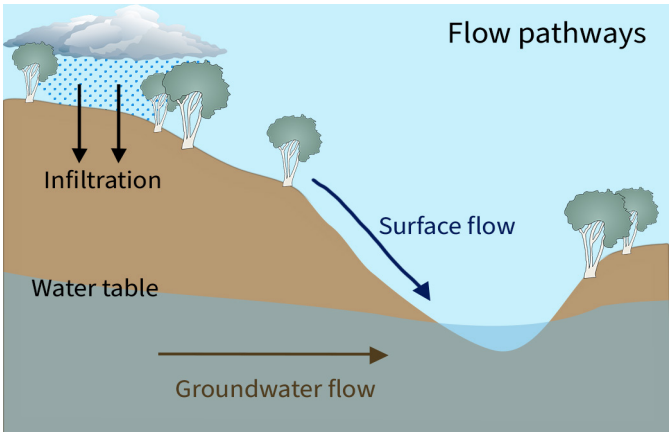
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

Load: the total mass of a substance passing a certain point.

Load per square kilometre: the load at the sampling site divided by the entire catchment area upstream of the sampling site.

Nitrate: The measurement for the nutrient nitrate actually measures both nitrate (NO_3^-) and nitrite (NO_2^-), which is reported as NO_x^-. We still refer to this as nitrate as in most surface waters nitrite is present in very low concentrations.

The schematic below shows the main flow pathways which may contribute nutrients, particulates and salts to the waterways. Connection between surface water and groundwater depends on the location in the catchment, geology and the time of year.



Samson North Drain Issue 2
Publication date: October 2023
ISSN: 2209–6779 (online only)