Mills Street Main Drain

Mills Street Main Drain is an artificial drainage network with numerous lined and unlined segments. The drain is deeply incised and flows year-round (though it did stop flowing in the summer of 2010–11 after a very dry winter). It discharges into the Wilson Wetlands, which then drains into the Canning Estuary below the Kent Street Weir in Cannington.

The catchment is almost entirely cleared for industrial, commercial and residential use. Wilson Wetlands are a small pocket of remnant vegetation and are part of the Canning River Regional Park. The park has a high conservation value as it contains the best-condition estuarine vegetation in the Swan Canning river system.

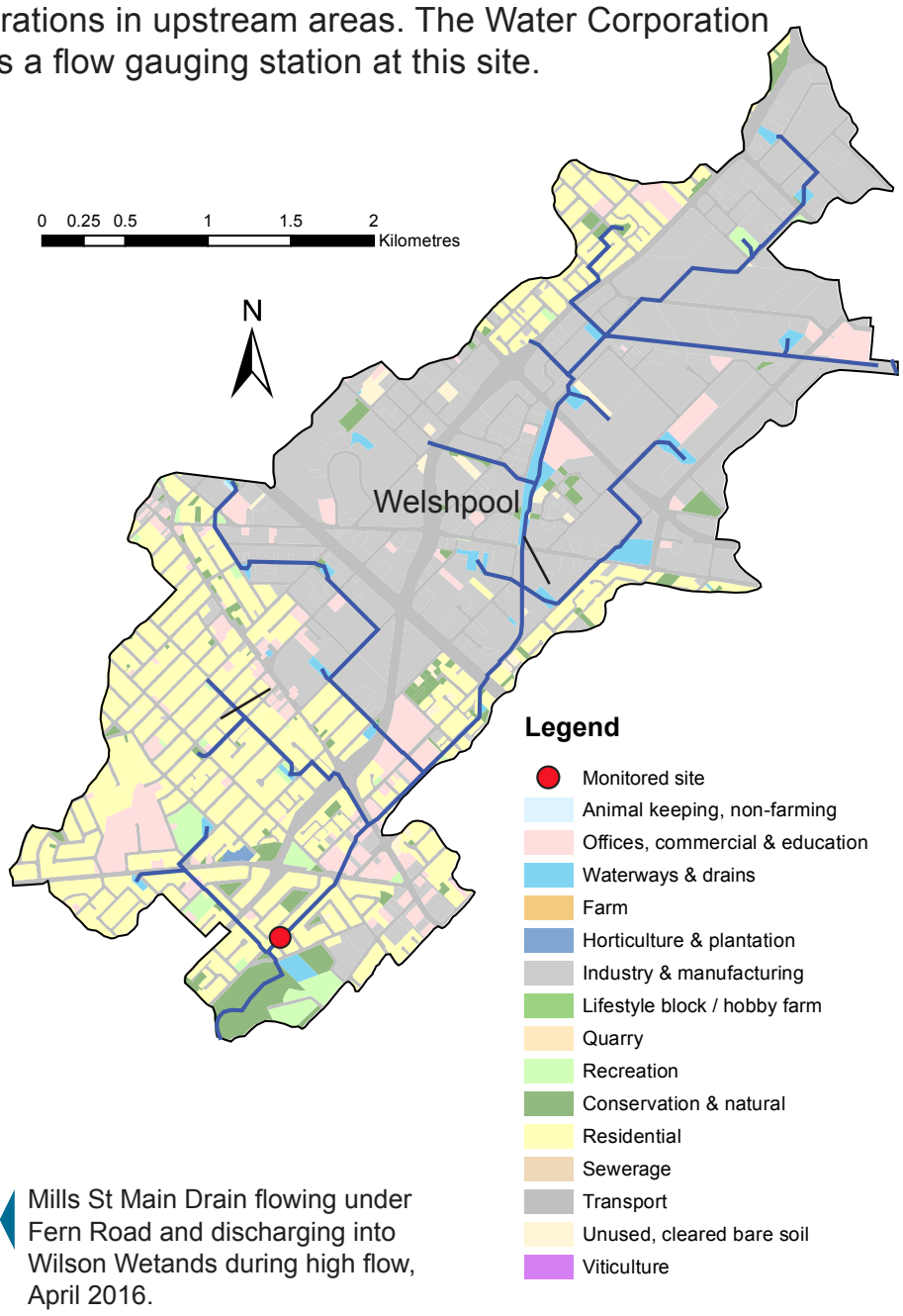
The predominant soils in the Mills Street Main Drain catchment are highly permeable Bassendean sands. Groundwater is very close to the surface (approximately 2–3 m) and flows towards the river. The combination of permeable soils and a high water table means a high risk of groundwater contamination exists. Any surface chemical or nutrient spill can leach rapidly to the groundwater and travel to the drains and river.

Water quality is monitored fortnightly at the catchment's lower end near Palm Place, Wilson. This site was chosen to estimate the nutrients leaving the catchment and entering the Canning Estuary, so the data do not represent nutrient concentrations in upstream areas. The Water Corporation operates a flow gauging station at this site.

Mills St Main Drain – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	12 km^2
Per cent cleared area (2005)	96%
River flow	Permanent No major water supply dams in catchment
Average annual flow	~ 3.5 GL per year (2015–16 average)
Main land uses (2005)	Industry and manufacturing, residential and associated transport infrastructure (roads)

Mills St Main Drain flowing under Fern Road and discharging into Wilson Wetands during high flow, April 2016.



Nutrient Summary: concentrations, estimated loads and targets

Year	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual flow (GL)	616043	1.9	2.8	4.3	3.2	2.2*	3.6				2.8*	4.2*
TN median (mg/L)	SWS1	1.25	1.40	1.40	1.05	0.99#	1.00#	0.97#	0.97#	0.86#	0.99#	0.87#
TP median (mg/L)	SWS1	0.110	0.130	0.135	0.120	0.088#	0.095#	0.097#	0.100#	0.085	0.098	0.082
TN load (t/yr)	SWS1	2.61	3.66	5.44	4.06	2.78*	4.50				2.88*	4.37*
TP load (t/yr)	SWS1	0.27	0.39	0.59	0.44	0.30*	0.48				0.33*	0.50*

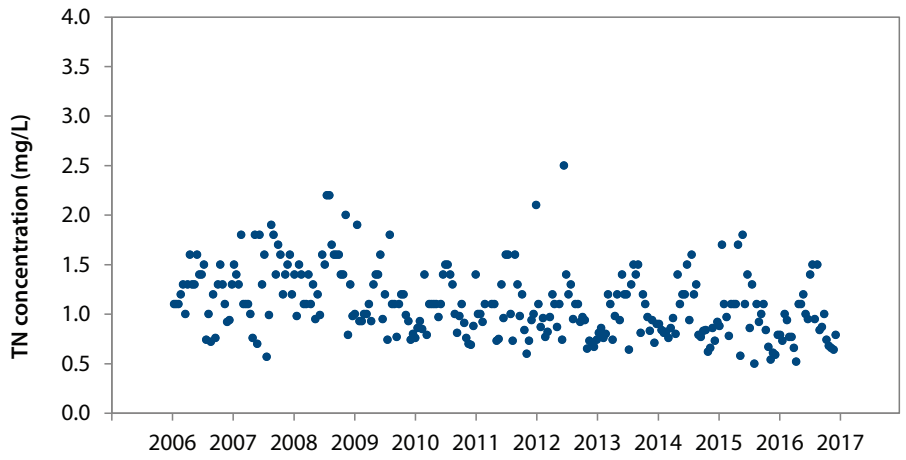
TN short term target = 2.0 mg/L TN long term target = 1.0 mg/L TP short term target = 0.2 mg/L TP long term target = 0.1 mg/L

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

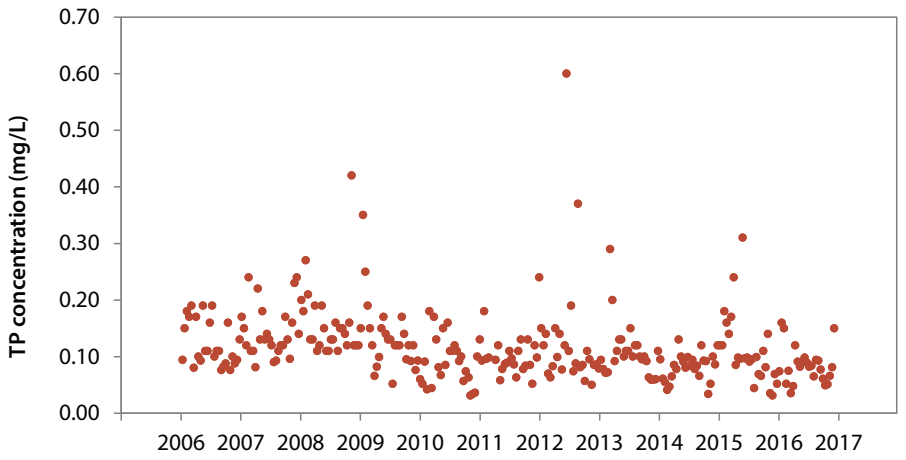
* Best estimate using available data. # Statistical tests that account for the number of samples and large data variability are used for testing against targets on three years of winter data. Thus the annual median value can be above the target even when the site passes the target (or below the target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

Changes in nutrient concentrations over time in Mills Street Main Drain

Total nitrogen concentrations over the 2006 to 2016 monitoring period



Total phosphorus concentrations over the 2006 to 2016 monitoring period



Trend

Total nitrogen (TN) concentrations appear to be decreasing over the reporting period. A decreasing long-term (2007–16) trend of 0.05 mg/L/yr was detected. The reason for this trend is difficult to pinpoint but it is possible that it is related to the in-fill sewerage program. The catchment was converted from septic to deep sewers about 25 years ago.

Target

Mills Street Main Drain has been passing the short-term but failing the long-term TN target for the reporting period.

High flows in Mills Street Main Drain, looking downstream from sampling site, April 2016.

Trend

Total phosphorus (TP) concentrations showed a similar pattern to TN with the exception of an apparent step change in 2009.

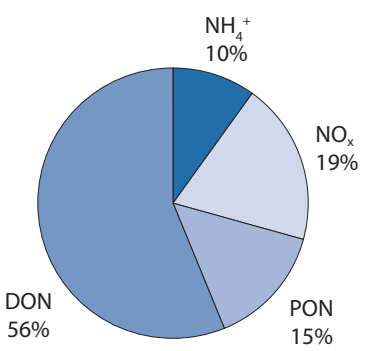
Why TP concentrations decreased at this point is unclear. An emerging decreasing long term (2009–16) trend of 0.004 mg/L/yr was detected. As for TN, the reason for this emerging trend is difficult to pinpoint although the possible explanation is the same; the in-fill sewerage program.

Target

Until 2013 Mills St Main Drain was passing the short-term but failing the long-term TP target. Since 2014 it has been passing the short- and long-term TP targets.

Nutrient fractions and estimated loads in Mills St Main Drain

Average composition of nitrogen (N) in Mills St Main Drain over the 2012 to 2016 monitoring period

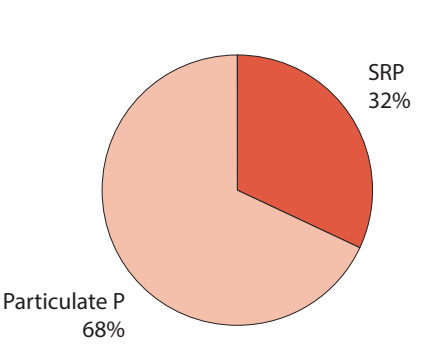


Nitrogen

Almost three-quarters of the nitrogen (N) was present in the form of organic N which consists of both dissolved organic N (DON) and particulate organic N (PON). DON largely comprises organic compounds leached from peaty subsoils and degrading plant and animal matter and is available for uptake by plants, algae and bacteria. PON is composed of plant and animal debris and needs to be further broken down to become available to plants and algae. The remainder of the N was present as dissolved inorganic N (DIN) consisting of ammonium – NH_4^+ and N oxides – NO_x. These forms of N are readily available to plants and algae. Likely sources of DIN are fertilisers used on home gardens and parkland, animal waste, septic tank leachate and discharges from industry.

As Mills St Main Drain did not have flow (and therefore load) information available for the last five years (2012–16) it was not possible to compare its loads with the other subcatchments.

Average composition of phosphorus (P) in Mills St Main Drain over the 2012 to 2016 monitoring period



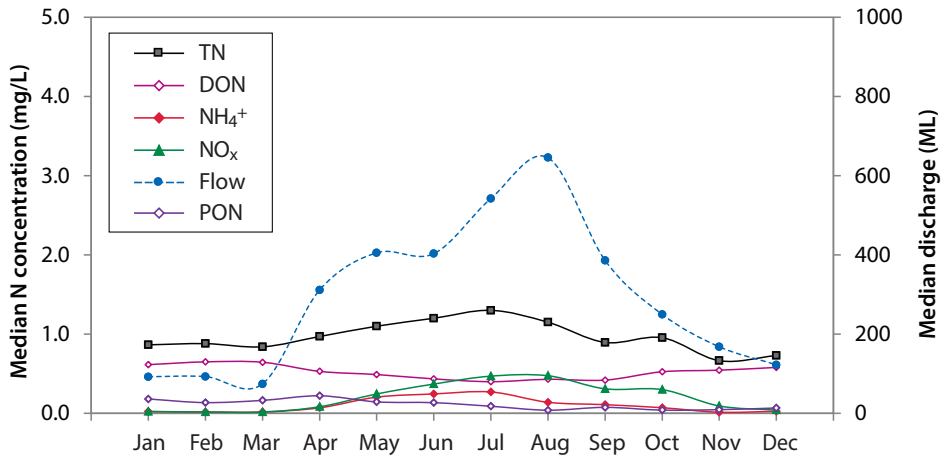
Phosphorus

Around two-thirds of the phosphorus (P) was present in the form of particulate P which is derived from organic waste material and sediment-bound forms of P. This form of P is not readily available for use by plants or algae, but may be broken down to available forms over time. The remainder of the P was present as soluble reactive phosphorus (SRP) which is readily available for plant and algal uptake. Likely sources of this form of P are fertilisers used on home gardens and parklands, animal waste, septic tank leachate and industrial discharge.

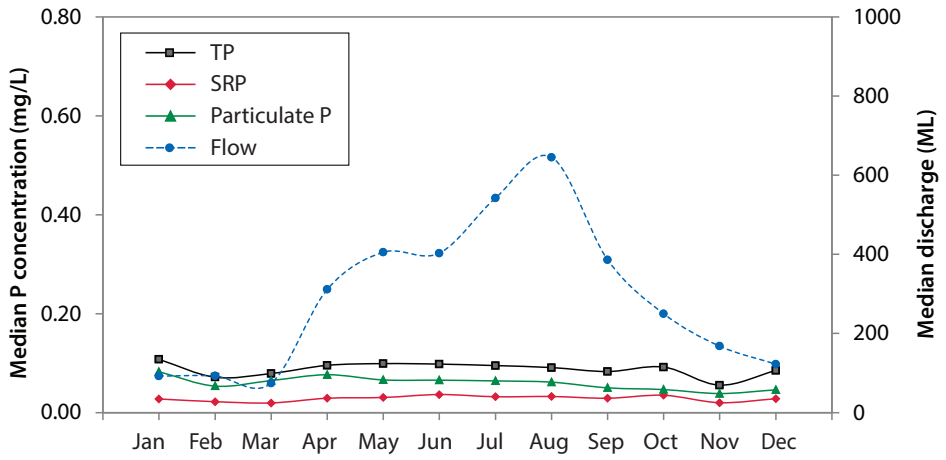
As Mills St Main Drain did not have flow (and therefore load) information available for the last five years (2012–16) it was not possible to compare its loads with the other subcatchments.

Seasonal variation in nutrient concentrations in Mills St Main Drain

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

DON and PON did not show a clear seasonal response, being fairly stable throughout the year. This indicates that groundwater and possibly industrial discharges are likely to be the major source of DON to the drain. Surface and sub-surface flow after rain transported all forms of N to the drain, particularly NO_x and NH_4^+ which increased slightly in spring to autumn compared with summer. N could also be entering the drain through illegal dumping and from industry wash-down bays and other discharge sources. These activities might take place year-round, hence the weak seasonal relationship.


Photo: Water Science Branch

Phosphorus

P concentrations did not show a distinct seasonal pattern, with concentrations being fairly stable throughout the year. Groundwater plays an important role in transporting SRP to the drain and illegal dumping and industry waste could also be contributing. Particulate P is predominantly from in-stream sources which includes algae and bacteria.


Photo: Dieter Tracey


Photo: Water Science Branch


Photo: Water Science Branch


Photo: Dominic Heald

Photographs of Mills St Main Drain: (Top left) Anvil Way compensating basin, vegetation growth in May 2011. (Bottom left) Anvil Way compensating basin, vegetation growth in April 2013. (Right) Mills St Main Drain gauging station where water quality samples are collected, April 2016.

Local nutrient reduction strategies for Mills Street Main Drain

Nutrient reduction strategies being undertaken or recently completed in the Mills Street Main Drain catchment include but are not limited to:

- The 2015–17 Light Industry Program, a project delivered by the Department of Water and Environmental Regulation in partnership with the Department of Biodiversity, Conservation and Attractions (DBCA) and seven local governments in the Swan Canning Catchment, including the Cities of Canning and Belmont. Businesses were audited and provided with recommendations or requirements to reduce the risk of releasing nutrient and non-nutrient contaminants into Mills Street Main Drain and surrounding waterways and groundwater systems. This program followed an earlier Light Industry Auditing Project, which saw around 250 small to medium enterprises audited by local government environmental health officers (supported by Perth NRM).
- The Anvil Way Compensating Basin Restoration and Living Stream Project, which was completed in 2010. The project restored a compensating basin in Welshpool to act as a nutrient-stripping living stream. Approximately 1400 m^3 of sediment was removed from the basin during construction. The living stream was constructed and revegetated to replicate a natural system capable of stripping nutrients and trapping sediments in specific zones for ease of future maintenance.
- Ongoing sub-regional partnership projects whereby the South East Regional Centre for Urban Landcare is working together with DBCA, local government and community groups to deliver water quality and community capacity-building outcomes.
- The Phosphorus Awareness Project which aims to assist the community in reducing their nutrient outputs through education, promotion and behaviour change programs.
- 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.

Swan Canning water quality improvement plan

The Swan Canning water quality improvement plan (SCWQIP) complements the River Protection Strategy (RPS) and presents a roadmap for reducing nutrient inputs into the Swan Canning river systems. It uses sophisticated modelling to identify nutrient sources and provides nutrient-reduction targets for each of the subcatchments.

The Mills Street Main Drain catchment has a local WQIP that draws together activities for improving water quality in the catchment and helps to target future investment for better water quality outcomes.

SCWQIP load and concentration targets for Mills Street Main Drain

	Max. load (t/yr)	Conc. target (mg/L)	% reduction
TN	2.6	0.50	63%
TP	0.28	0.050	64%

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

Photo: Brad Degens

Summary: Mills Street Main Drain

- There was a long-term decreasing trend in TN concentrations and an emerging long-term decreasing trend in TP concentrations.
- Mills Street Main Drain has been passing both the short- and long-term TP targets since 2014.
- It is currently passing the short- but failing the long-term TN targets.
- The proportion of P present as bioavailable SRP is one of the lowest of the 33 sites sampled.
- Overall, a 63% reduction in TN and a 64% reduction in TP is required for this catchment to meet its SCWQIP targets.

www.dwer.wa.gov.au
www.dbca.wa.gov.au

For further information please contact the
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