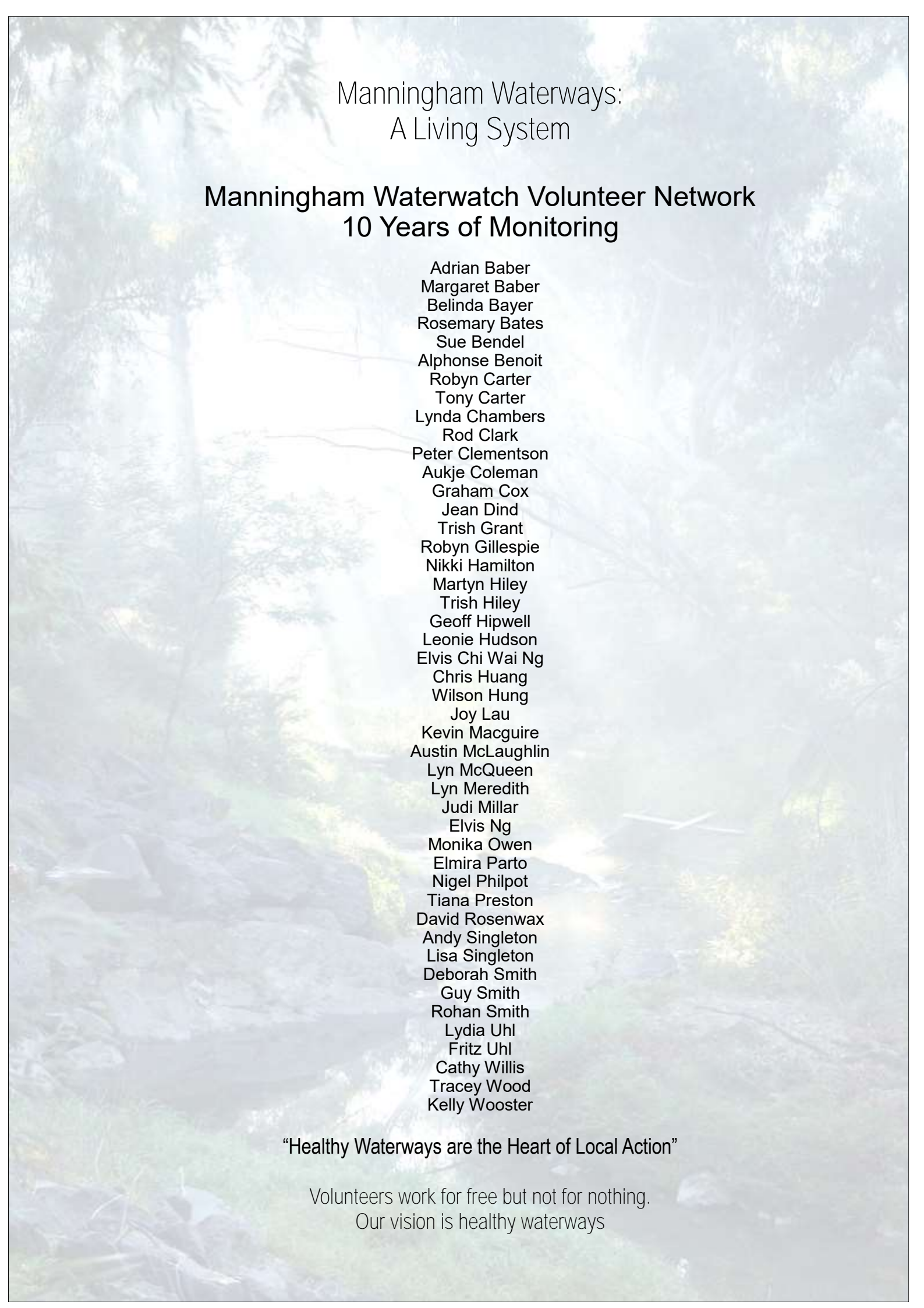


Manningham's Healthy Waterways Program

2020 Waterwatch Health Report

**Manningham Community
Citizen Science Program**
Communities caring for catchments





Manningham Waterways: A Living System

Manningham Waterwatch Volunteer Network 10 Years of Monitoring

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“Healthy Waterways are the Heart of Local Action”

Volunteers work for free but not for nothing.
Our vision is healthy waterways

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Environmental Water Outcomes:

Manningham Council Plan 2017—2021

- Support the protection of the green wedge and natural species.
- Sustainable management, monitoring and enhancement for the natural environment.
- Foster community partnerships in protecting natural spaces, parks, rivers and creeks.
- Advocates for integrated water management, utilizing stormwater harvesting for domestic use and offsetting potable usage and sewerage connection advocacy.
- Has progressed the implementation of Council's Strategic Water Management Plan and Water Sensitive Urban design program.
- Build community awareness and support of environmental issues.
- Optimise the management of our energy, waste and water.
- Demonstrate leadership in sustainable and innovative environmental practices.

Generation 2030 Strategy

- Is creating a strong, vibrant and well connected community that values its unique lifestyle and the protection of our natural spaces.
- Has fostered greater community understanding and participation in open space, bushland rivers and creek restoration.
- Enhanced the preservation and protection of our network of waterways.

Green Wedge Action Plan 2020

- Continued community engagement in the Domestic Waste Management Plan, Strategic Water Management Plan, and Storm Water Management Plan.
- Improved Council understanding of local ecological health through ecological monitoring and research.
- Encouraged a sense of place and community spirit in the Green Wedge and leadership through rewarding and empowering long-term stewards for the environment.

Manningham Securing the Future Strategy

- Assisting with monitoring extreme climate risks including flood events, reduction in biodiversity, drought, and other ecological pressures on our waterways and aquatic ecosystems.

Manningham Healthy City Plan

- Works towards a sustainable environment by making decisions and taking actions that reduce the impact on the natural environment.



Waterwatch Vision for Manningham's Waterways

To ensure current and future generations are empowered and actively involved in the sustainable use and management of our catchments.

Waterwatch helps the community understand water quality issues and how to manage them within catchments so as to create healthy waterways and promote the sustainable use of this precious and limited resource.

Mullum Mullum Creek

Manningham's Waterways

Manningham City Council is situated 18 kilometres to the east of Melbourne. The Yarra River forms the boundary of the municipality to the north and Koonung Creek to the south. Manningham's creeks support one of the largest networks of parks and open space in metropolitan Melbourne.

These waterways are a valued part of the local landscape and provide an important habitat and wildlife corridor linkage between the urban and peri-urban environments. Our local creeks and the Yarra River also provide a valuable aquatic ecosystem to fish, macroinvertebrates, frogs and other aquatic animals.

The parks and reserves associated with these waterways form a linear network of natural and modified bushland, open parkland and semi-rural open space. Large open spaces include Ruffey Lake Park, Westerfolds Park, Mullum Mullum Creek Linear Park, Warrandyte State Park, Currawong Bush Park and the 100 Acres Reserve.



Manningham Catchments



 Manningham Catchments

Manningham Waterway's Environmental Values

The environmental values of Manningham's waterways include in-stream habitat, recreational and landscape amenity, indigenous vegetation, tourism, aquatic ecosystems, wildlife corridors and areas of biological significance.

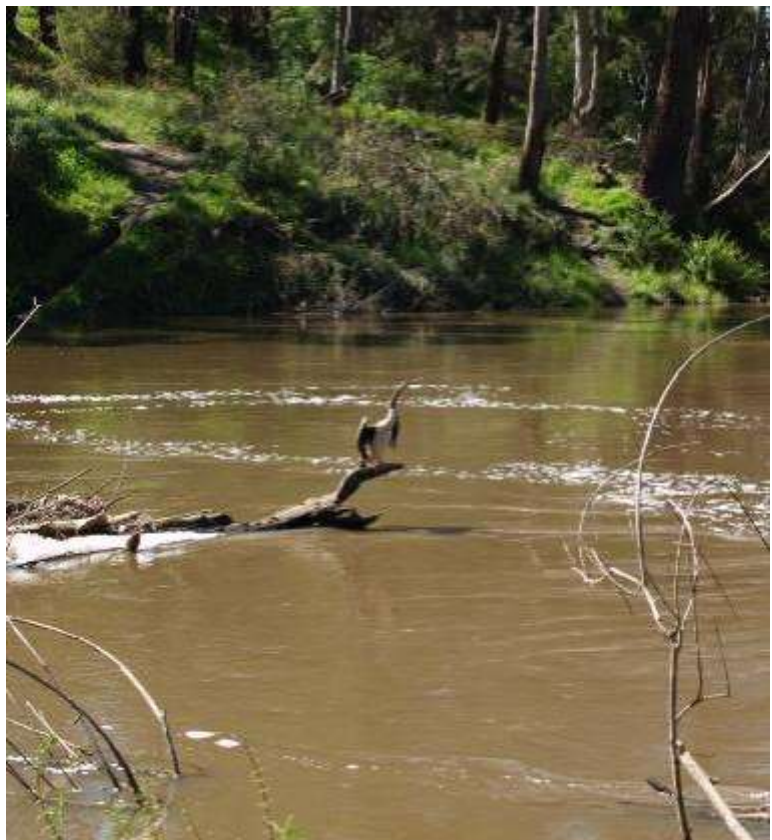
Identifying and protecting these environmental values is important to develop an overall health assessment, and to effectively establish a long term vision and management strategy.



The Importance of Reporting on Waterway Health

Water quality refers to the physical, chemical and biological characteristics of water in a waterway. Over the past 150 years our catchments have undergone significant change. Urban development, vegetation removal, grazing, increases in hard surfaces and construction of stormwater systems have all meant that the health of our local waterways are under threat. Water quality and waterway problems have a flow on effect, not only for Manningham's creeks, but also the Yarra River and Port Phillip Bay.

Regular monitoring and reporting will provide an update on conditions and help management actions to improve waterway health.



Manningham's Waterways

Brushy Creek

Brushy Creek has only a short section of waterway within the Manningham municipality. The creek enters Manningham at Lower Homestead Road one kilometre from its confluence with the Yarra River.



Brushy Creek, Wonga Park

Jumping Creek

Jumping Creek is situated within Manningham's Green Wedge. Much of the riparian vegetation is still intact and provides a significant wildlife corridor for a range of native fauna, platypus, indigenous fish and birds. The upper catchment is located in the urban suburb of Warranwood and Croydon North. The catchment is predominantly made up of semi-rural and small pasture properties.



Jumping Creek, Wonga Park

Koonung Creek

Koonung Creek runs along the southern border of the municipality. The creek has been significantly modified during the construction of the Eastern Freeway. Water sensitive urban design wetlands have been built to protect the creek's water quality and provides habitat for wildlife.



Koonung Creek, Doncaster



Manningham's Waterways

Mullum Mullum Creek

Mullum Mullum Creek divides the municipality in two distinct topographic and land use areas. To the west of Mullum Mullum Creek are the highly urbanised suburbs of Bulleen, Templestowe, Doncaster and Donvale. To the east are the more non-urban suburbs of Park Orchards, Warrandyte and Wonga Park.



Mullum Mullum Creek, Donvale

Ruffey Creek

Ruffey Creek flows through the highly urbanised suburbs of Doncaster, Doncaster East, Templestowe and Lower Templestowe. Ruffey Lake acts as a stormwater detention basin and provides an environmental and recreational resource for the municipality.



Ruffey Creek, Templestowe

Andersons Creek

Andersons Creek is approximately 8 kilometres long and has two main tributaries, Andersons Creek branch and the Harris Gully branch. The headwaters of Andersons Creek is in the highly urbanised suburb of Ringwood North and flows in a northerly direction through the suburbs of Park Orchards and Warrandyte. Andersons Creek discharges into the Yarra River at Everard Drive, Warrandyte.



Andersons Creek, Warrandyte

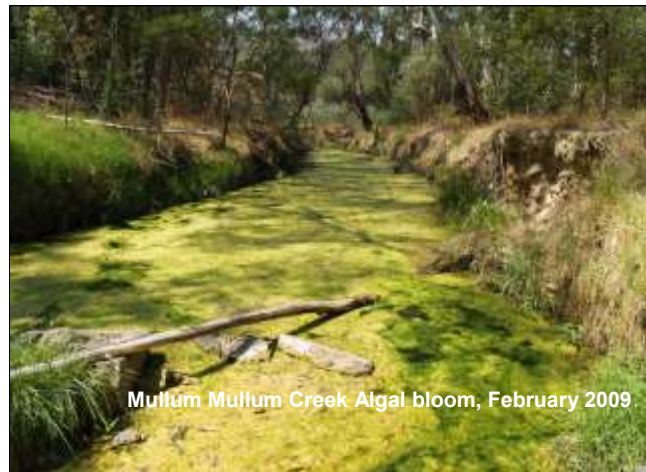
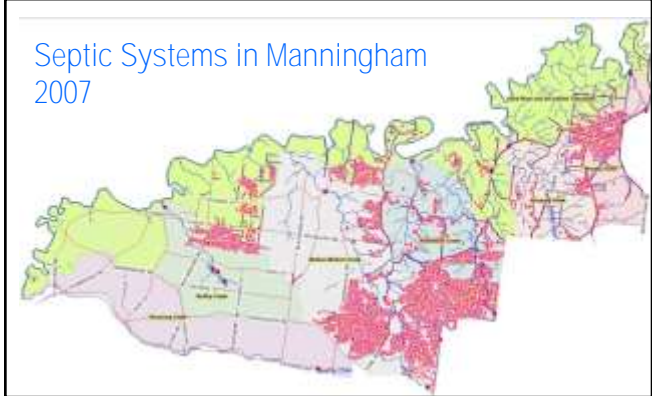
Un-sewered Manningham

In 2007, when Waterwatch Monitoring began, there were 4,620 local septic systems in use in Manningham.

Of these properties 60% discharged untreated greywater (waste from all fixtures other than toilet, eg remaining bathroom fixtures, kitchen sink, and laundry fixtures) directly into stormwater drains. These stormwater drains discharge highly polluted, highly concentrated household greywater directly into our local creeks.

The majority of these septic systems were installed in Manningham from the late 1950's up until 1997. These waste water systems were considered temporary solutions, with property owners permitted to discharge treated black water or untreated greywater into stormwater as an interim measure while the construction of Melbourne's sewerage system network was being built.

Septic Systems in Manningham
2007



Mullum Mullum Creek Algal bloom, February 2009



Household Wastewater Pollution

Septic tanks that are poorly maintained (if at all) result in the discharge of effluent to local stormwater drains which also discharge into local waterways.

It is necessary to identify wastewater threats and their likely impact on a range of public health, environmental and economic values.

Greywater contaminants vary from house to house and depend, amongst other factors, on the number of persons living in the house, their lifestyles and ages.



Common Contaminants in Household Greywater

Greywater from bathrooms, laundries and kitchen sinks can contain appreciable amounts of soaps and detergents, fabric softener, shampoo, hair conditioner, toothpaste, medicines, disinfectants, food particles, pesticides, dyes, cosmetics, lint and other fibres. Human waste products can include saliva, sweat, body oils, hair, blood, and some urine and faecal matter.

Households with inhabitants suffering from acute diseases such as gastroenteritis, eye or

ear infections, or waterborne hepatitis can produce greywater with considerable loads of bacteria or viruses. Households with people living with a chronic infectious condition (e.g. tuberculosis) may also produce greywater with increased infection risks.

Adults, children and animals that come into contact with contaminated creeks or river water may experience diarrhoea, stomach infections, ear, eye and throat infections as a result of high levels of E.coli present in the water.

Generic Domestic Wastewater Threats

Threat	Cause	Key Impacts
Failed systems with effluent discharge	<ul style="list-style-type: none"> Damaged effluent disposal drains/trenches Increased loading from extensions to dwellings Design criteria not complied with Faulty installation New works & activities impacting on disposal envelope Age Septic tank full 	<ul style="list-style-type: none"> Nutrients Pathogens Odour Visual amenity Oxygen depleting material Local land degradation (erosion) Pollution of water courses
Treated off site effluent discharge	<ul style="list-style-type: none"> Permitted system 	<ul style="list-style-type: none"> Pollution of water courses Local visual amenity
Treated on site effluent systems	<ul style="list-style-type: none"> Permitted system 	<ul style="list-style-type: none"> Local visual amenity Pollution of groundwater
Untreated off site effluent discharge	<ul style="list-style-type: none"> Poorly maintained system sand filter not functioning sand filter bypassed to stormwater septic tank full 	<ul style="list-style-type: none"> Nutrients & pathogens Odour Visual amenity Oxygen depleting material Local land degradation Pollution of water courses
Ineffective regulation	<ul style="list-style-type: none"> Failure to comply with permit conditions Ineffective data base Non-connection to sewer Unclear regulatory responsibilities 	<ul style="list-style-type: none"> Liability Increased incidence of preventable pollution and environmental degradation Increased risk to public health
Re-use of waste water	<ul style="list-style-type: none"> Allowed re-use Low water supply Poor management by individual residents 	<ul style="list-style-type: none"> Pathogens Odour

Manningham Domestic Wastewater Management Plan



Yarra Valley Water Community Sewer Project

Yarra Valley Water is constructing new sewer services to previously unsewered parts of Manningham.

This new sewer service was recently completed in the suburbs of Templestowe, Wonga Park and Warrandyte. Sewerage services are currently being constructed in Donvale and Yarra Valley Water is undertaking an innovative project to deliver sewerage services to the Park Orchards community.

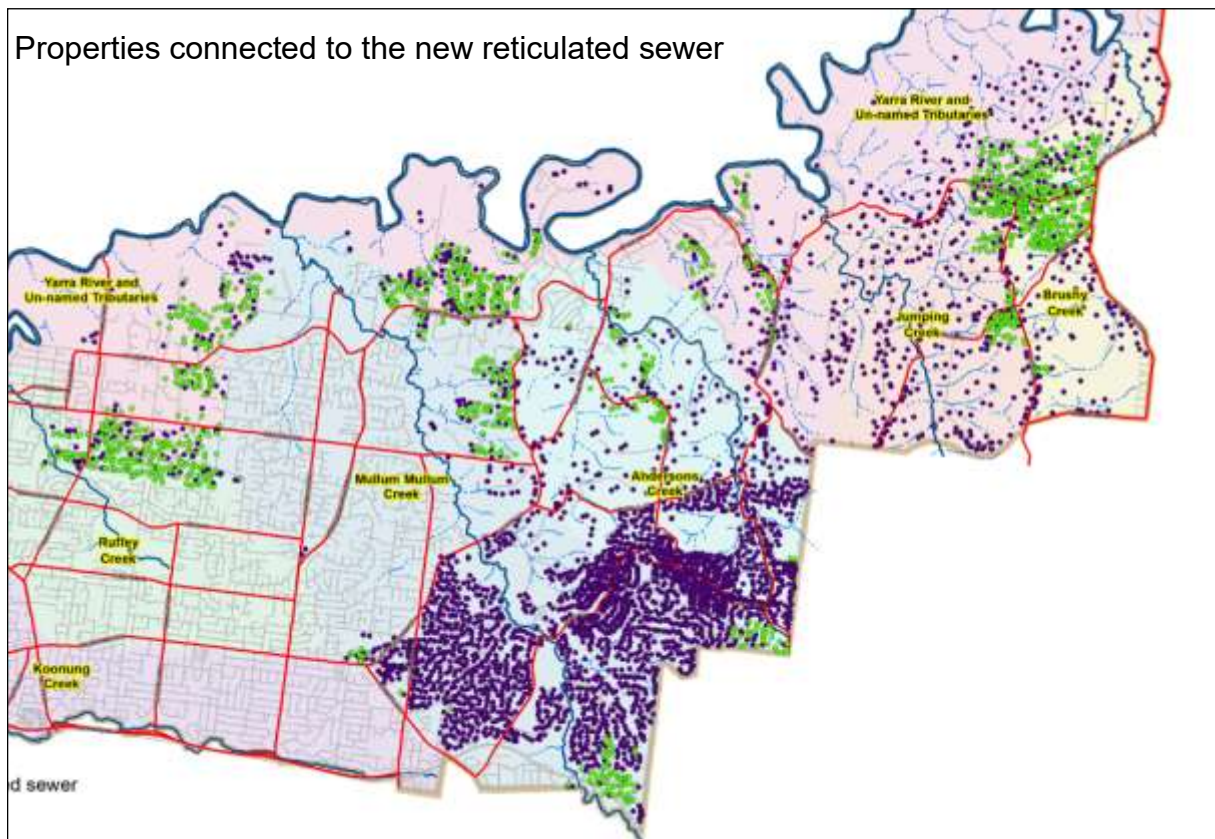
Where the new sewer has been provided properties which do not effectively contain their waste water on site (including split systems) are obliged to connect to this new service. If residents connect to a new sewer service within 12 months of the sewer

becoming available the normal contribution fee of \$500 will be waived.

As a result a large proportion of properties are connecting to the new sewer service.



Properties connected to the new reticulated sewer



Park Orchard and Donvale Sewer Project

Yarra Valley Water is constructing a new sewer service to properties in Donvale and are undertaking an innovative trial project to deliver sewerage services to over 1,200 residents in the Park Orchards area.

The trial project in Park Orchards aims to understand alternative approaches to managing wastewater in unsewered areas.

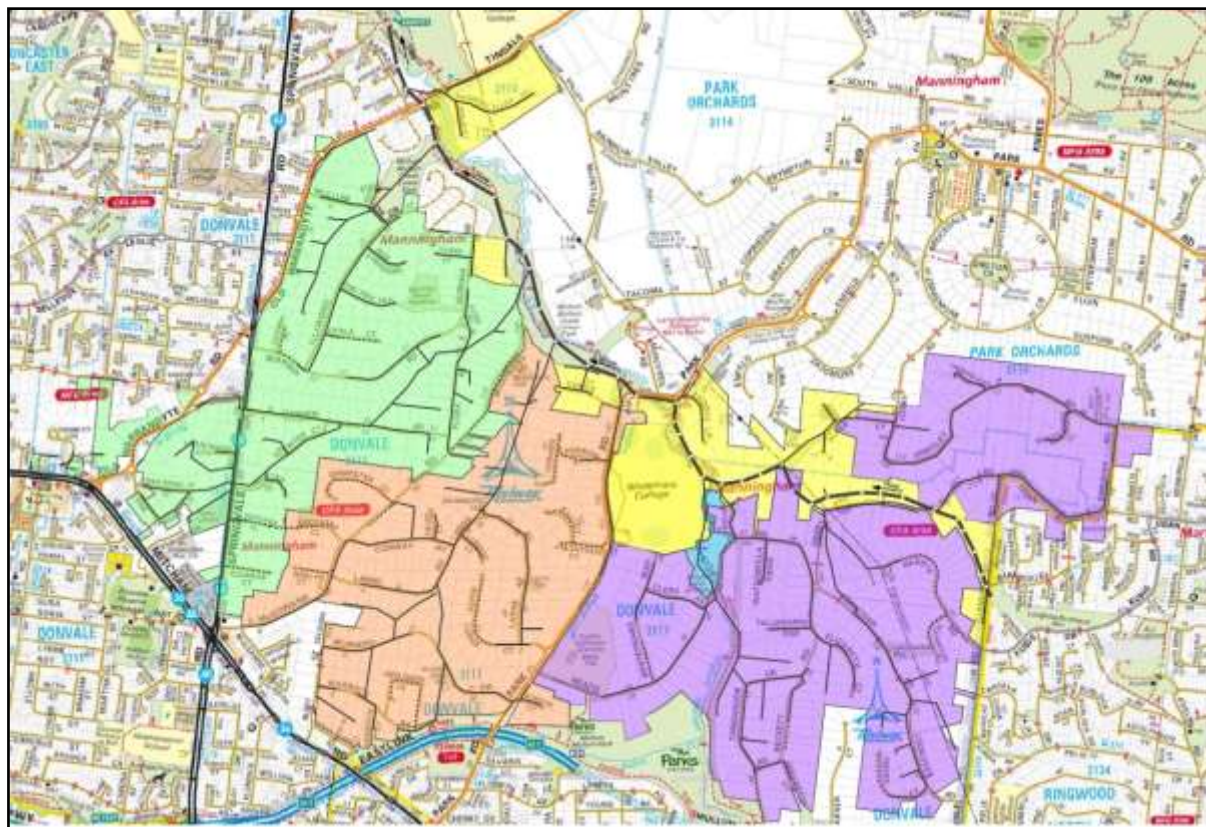
The project is evaluating the potential to maximise on-site irrigation of wastewater by upgrading existing septic systems or installing new ones where required.

Should the trial be successful Yarra Valley Water will consider using this approach where practical as an alternative to connecting them to a sewer pipeline.

Where properties don't have enough space to

accommodate a modern septic system (e.g. Park Orchard shopping precinct) a new sewer service will be provide. Construction of this new sewer service has begun.

For further information on the Yarra Valley Water Community Sewerage program visit: www.yvw.com.au/parkorchards.



Hard Surfaces and Flooding

Urban development, vegetation removal, increases in impervious surfaces and the construction of efficient stormwater systems has resulted in a dramatic increase in flow volumes in our creeks after heavy rainfall.

Stormwater surges carry massive amounts of energy that can mobilise stream sediment and erode stream banks, and subsequently deposit large amounts of sediments in the Yarra River and Port Phillip Bay.

Sediment can affect the health of waterways by smothering in-stream habitats, impacting aquatic wildlife, changing flora and fauna composition, and degrade water quality.

Waterwatch monitors turbidity, which is a measure of water clarity. Suspended particles of clay, silt, sand and algae causes the water to appear cloudy or muddy.

Monitoring sediment movement and active erosion can be difficult as changes may only take place during times of heavy rain.

Heavy rainfall over a short time frame can cause significant and damaging stormwater surges.

Reducing or slowing down these stormwater surges can be a challenge. Household water tanks that collect rainwater for onsite use is a great way to reduce this storm surge.

Waterwatch monitoring is done outside of any rainfall. This provides us with base flow data, which enables us to better detect the impacts of stormwater pollution particularly household wastewater pollution. This pollution is diluted during times of rainfall.

Pictorial evidence of stream banks erosion has been a successful way to reveal how active an eroding stream or gully is.





Hard Surfaces and Flooding

In peri-urban environments good land management practices and retention of catchment vegetation is extremely important to the ecology of streams. Large areas of vegetation promote seepage of rainfall into the substrate and reduces runoff during heavy rains. Streamside vegetation also plays an important role by filtering out suspended sediments and absorbs pollutants from runoff water. It also helps hold the soil profile together and reduce creek and river erosion.

Waterwatch together with its sister program Landcare, works to mitigate the effects of waterway erosion by reducing stormwater flows that scour creek beds and bank materials.

The Middle Yarra Landcare Network, including the Jumping Creek and Andersons Creek Landcare Groups, Friends of Warrandyte State Park, The Wonga Park Environment Group, Friends of Yarra Valley Parklands and the Friends of Yarran Dheran all engage local volunteers who undertake many conservation projects to protect our local waterways.



Manningham Waterwatch Monitoring Network

The Manningham Waterwatch Monitoring Network is a community coalition that aims to monitor the health of our local waterways, detecting changes and promote improvements in the health of local streams and catchments.

The Manningham Waterwatch Monitoring Network consists of 25 volunteers who monitor 29 sites across the municipality once per month. As monitoring is repeated over consecutive months and years, trends in waterway condition can be detected and used to identify and implement on-ground environmental activities leading to the improved health of local creeks, rivers and catchments.



Manningham Monitoring Design

Water quality monitoring is important so that water resources can be managed. The Manningham Waterwatch Monitoring Plan sets out a framework of monitoring objectives, sampling design, data analysis and findings. The plan is interactive and is reviewed and refined according to changing catchment conditions and issues.

The monitoring data can be compared across the municipality over time to build up a 'big picture' of catchment conditions and medium term water quality trends.

The Waterwatch monitoring community are stakeholders who not only have interest in our waterways but also aim to promote awareness of local issues and implement on ground action that will improve waterway health.

The monitoring design also aims to better understand aquatic ecological systems, monitor their change over time and identify what is currently impacting on the health of our waterways.





Waterwatch Monitoring Plan

Question 1: Why are we monitoring?

To monitor and assess the current health of our local waterways. Assess what is currently impacting on the health of our local waterways and identify opportunities for stream rehabilitation and education programs and projects.

Question 2: Who will use our data?

The primary users of Waterwatch data are local community and environment groups. Local council, Parks Victoria, Yarra Valley Water and Melbourne Water are secondary users of this data.

Question 3: How will the data be used?

Our Waterwatch data will be used:

- to assess the current health our local waterways;
- to provide information to help local councils and water managers make decisions affecting the creeks and river; and
- guide Waterwatch, Landcare and Friends of groups stream rehabilitation programs.

Question 4: What will be monitored?

Our group has identified a sweep of physical and chemical monitoring parameters including pH, electrical conductivity, turbidity, ortho phosphorus, temperature, ammonium, algae, and macroinvertebrates.

Question 5: What level of data quality is achievable?

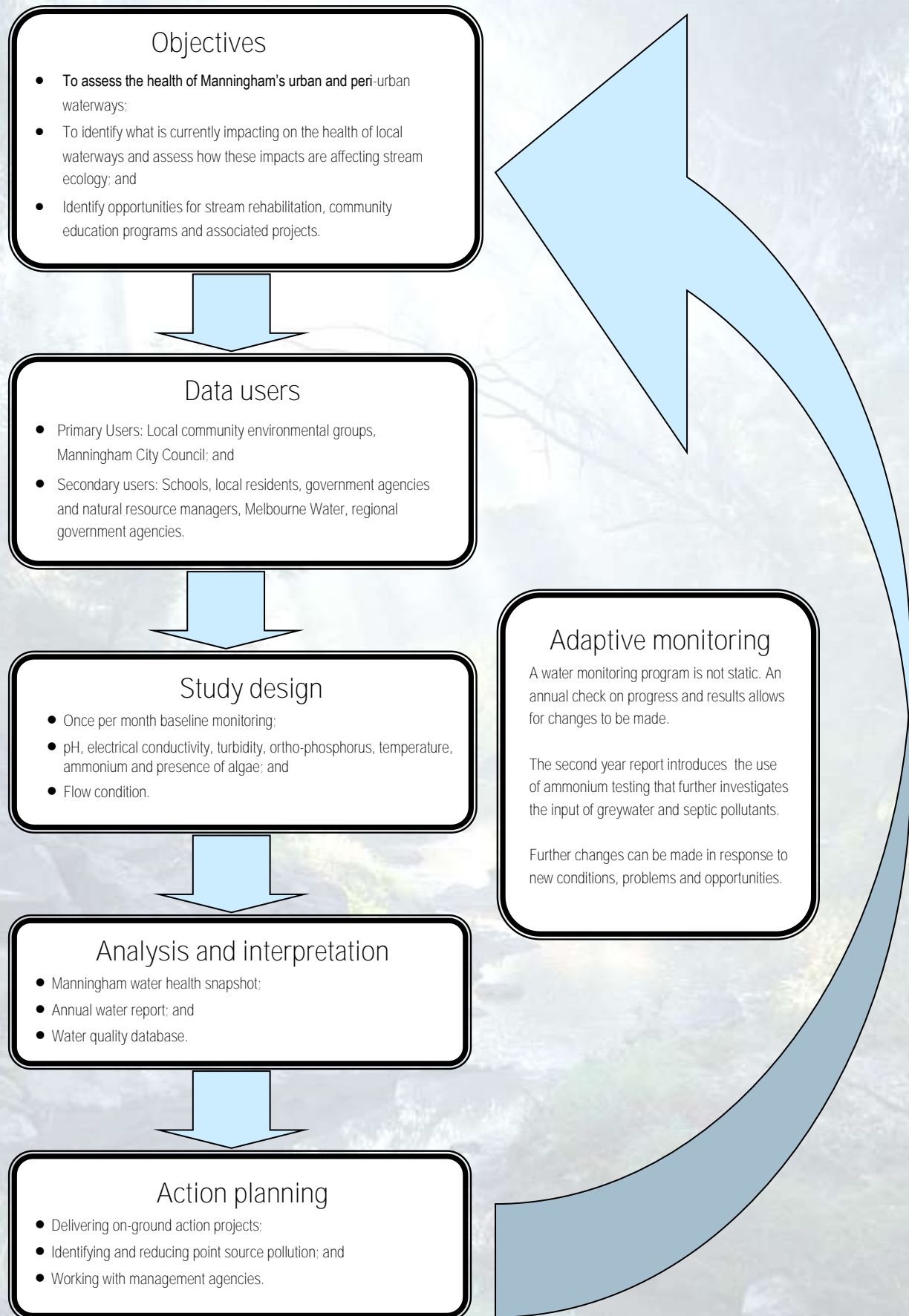
Our aim is to produce data that the local council and community groups can use to accurately answer the questions posed in this monitoring plan. The data is to be complete, representative and comparable across catchments. The accuracy tolerable error range (TER) is to be set at plus or minus 10% of the true value.

Question 6: How will we ensure the data is credible?

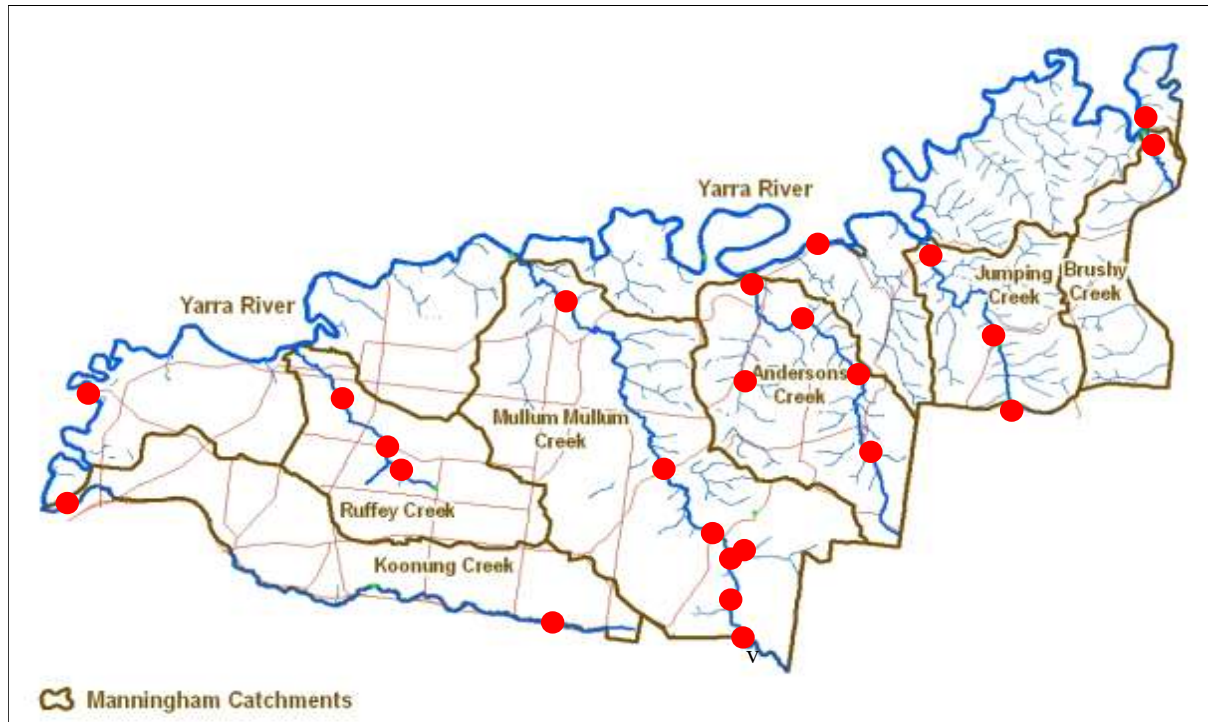
Each Waterwatch volunteer is to be trained by Melbourne Water's Waterwatch Coordinator and use quality controlled sampling and analytical water quality monitoring methods. Each year all Waterwatch monitoring groups and volunteers will undertake a Quality Assurance/ Quality Control Mystery Solution testing procedure that will accurately assess all participants and equipment.



Waterwatch Adaptive Monitoring Model



Waterwatch Monitoring Sites



Water Quality Indicators

Water quality indicators have been used by Waterwatch groups to assess the health of local waterways. These indicators include:

Ortho-phosphorus

Phosphorus is a nutrient that occurs naturally, however high levels of phosphorus from human activity can affect aquatic ecosystems and waterway health. This parameter can indicate where, when and how much nutrient pollution from greywater and septic discharge is impacting our waterways.

Electrical Conductivity

Electrical Conductivity (EC) is a measure of the ability of water to conduct an electric charge which is associated with mineral salts, so it is an indication of how much salt is in the water. Increased conductivity can indicate pollution from greywater and septic system discharge, urban road runoff and agricultural runoff.



Water Quality Indicators

Turbidity

Turbidity is the measure of water clarity. Particles such as soil, silt, sand and other substances in the water column that can impact on light passing through the water. This measurement can indicate the amount of sediment that is being washed into our waterways.

pH

pH is the measure of the acidity of water. The pH scale ranges from 1.0 (acid) through 7.0 (neutral) to 14.0 (alkaline). When it rains pollutants such as oil, detergents, industry and construction site runoff can enter our waterways and impact the pH levels. An increase or decrease in pH outside the normal range can be detrimental to the health of local waterways.

Ammonium

Sewerage and greywater is the main source of ammonium in our waterways. In Manningham streams the presence of ammonium in high concentrations can indicate point source sewage and/or greywater pollution, particularly from stormwater drains.



Mullum Mullum Creek stormwater pollution

Interpretive Guide




This report gives a summary of the water quality condition of Manningham's municipal waterways. The report rates current waterway and catchment condition from data collected over a three year period (May 2007—June 2010) using an A-to-F scale from the well established Australian and New Zealand Environment and Conservation Council (ANZECC) fresh water guidelines. These guidelines provide an authoritative guide for setting water quality objectives required to sustain current, and future, environmental values.

These guidelines provide government and the general community with a sound set of tools for assessing and managing ambient water quality in natural and semi-natural water resources. The strategy is based on the philosophy of Ecologically Sustainable Development (ESD). The guidelines are used as a resource in order to guide the ecological processes, on which life depends and is maintained.

Electrical Conductivity ($\mu\text{S}/\text{cm}$)

	Score	Description
	<100	Excellent Near-natural high water quality waterways
	<250	Good Meets Victorian water quality standards
	<500	Fair Some evidence of stress
	<750	Poor Evidence of stress
	<1250	Degraded Under considerable stress
	>1250	Very Degraded Under severe stress







Ortho-phosphorus (Mg/l P)

	Score	Description
	<0.008	Excellent Near-natural high water quality waterways
	<0.025	Good Meets Victorian water quality standards
	<0.050	Fair Some evidence of stress
	<0.10	Poor Evidence of stress
	0.10-0.20	Degraded Under considerable stress
	>0.21	Very Degraded Under severe stress

Turbidity (NTU)

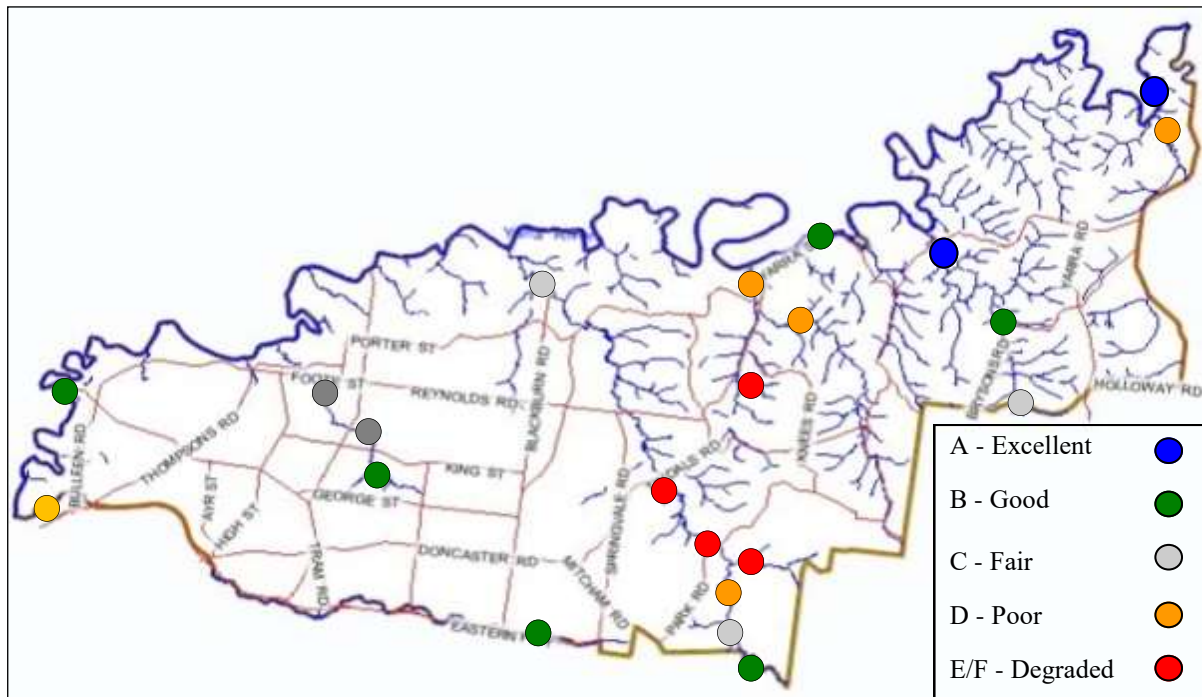
	Score	Description
	<15.0	Excellent Near-natural high water quality waterways
	<17.5	Good Meets Victorian water quality standards
	<20.0	Fair Some evidence of stress
	<30.0	Poor Evidence of stress
	<50.0	Degraded Under considerable stress
	>51	Very Degraded Under severe stress

pH (pH Units)

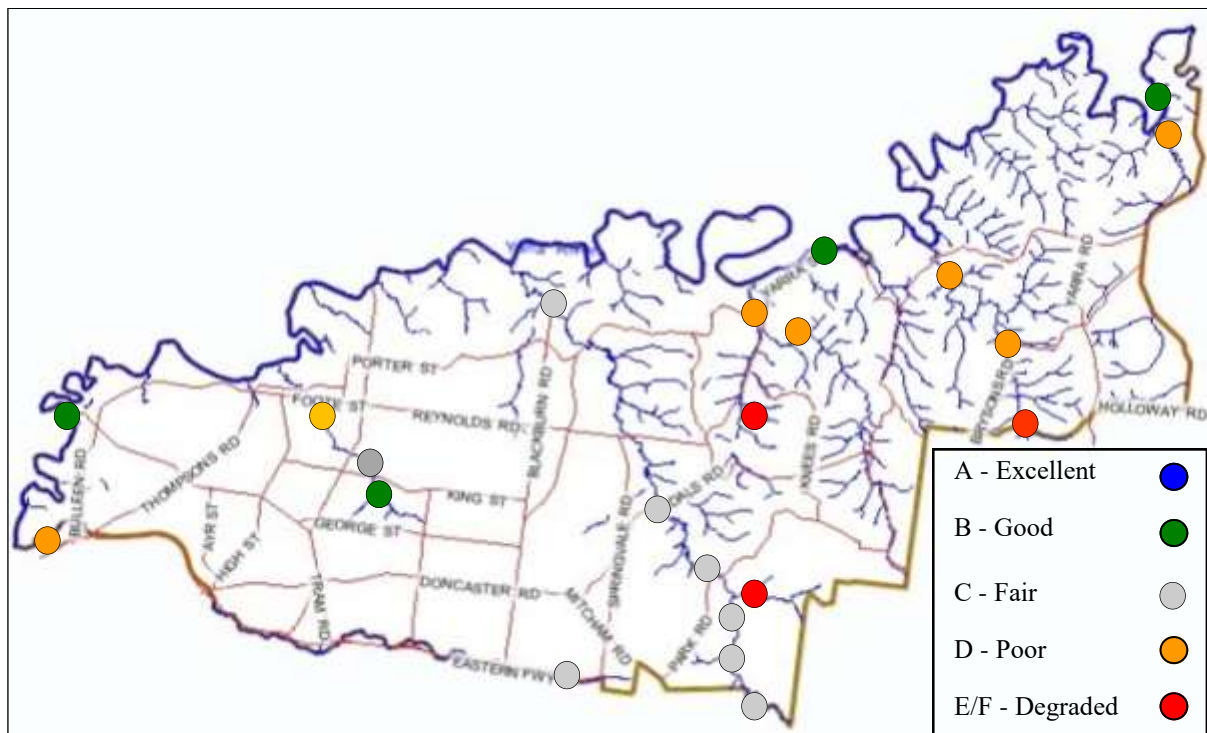
	Score	Description
	6.0-7.0	Excellent Near-natural high water quality waterways
	5.5-6 or <8.0	Good Meets Victorian water quality standards
	8.0-8.5	Fair Some evidence of stress
	5-5.5 or 8.5-9	Poor Evidence of stress
	<5.0 or >9.0	Degraded Under considerable stress
	>10.6 or <4.5	Very Degraded Under severe stress

Waterwatch Monitoring 2019 Results

2019 Ortho-phosphorus—Monitoring Results

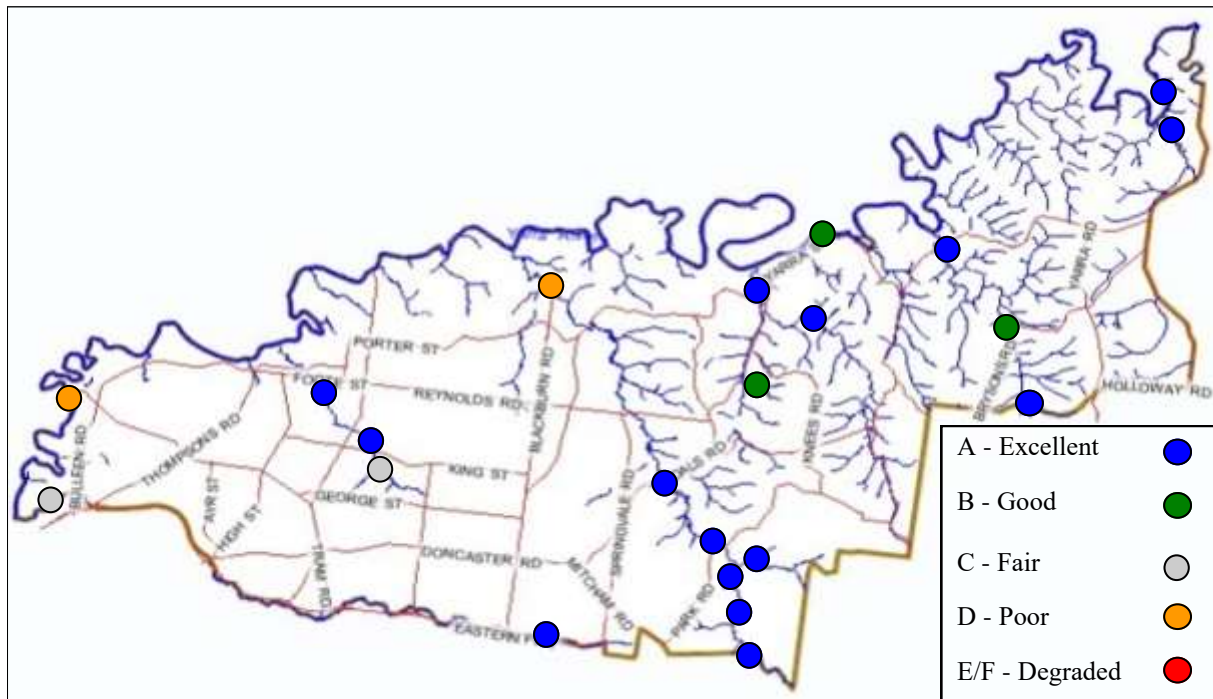


2019 Electrical Conductivity—Monitoring Results

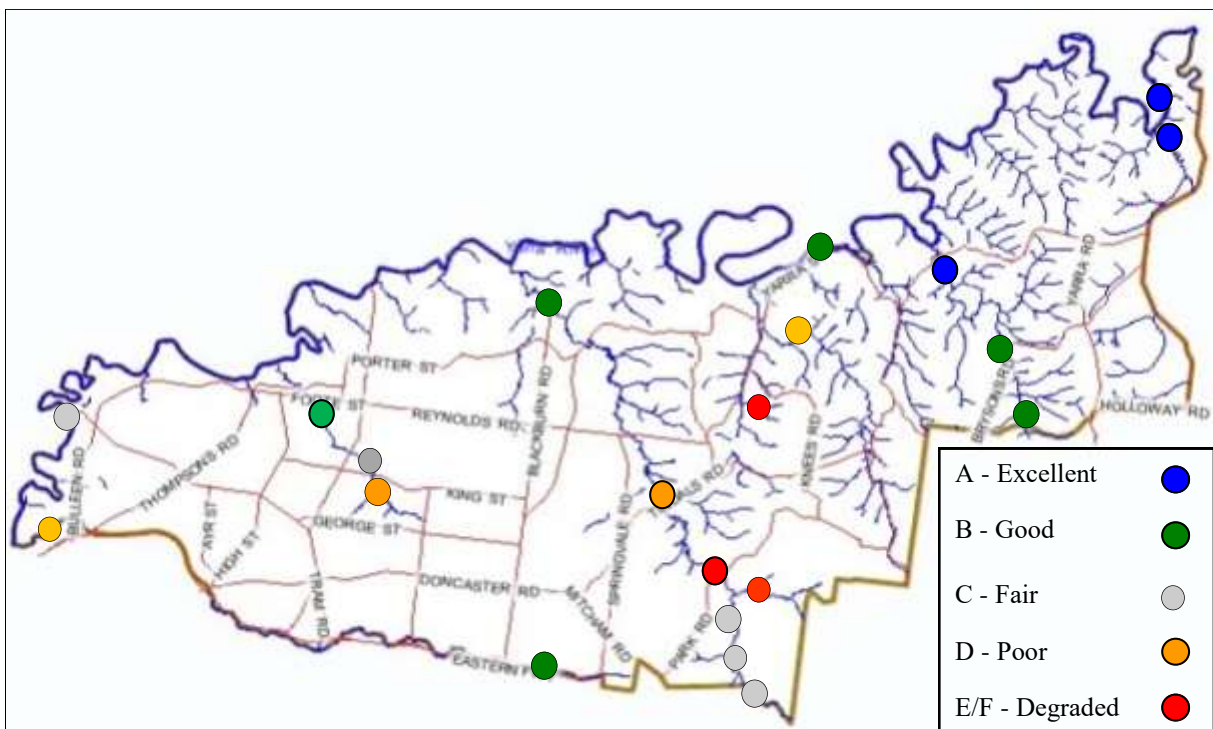


Waterwatch Monitoring 2019 Results

2019 Turbidity—Monitoring Site Results



2019 Ammonium —Monitoring Results



Catchment Report Card

The Waterwatch Health Report uses community water quality monitoring data collected at 29 sites across the municipality to assess the current health of Manningham's waterways. The report rates current waterway and catchment condition using an A-to-F scale from the ANZECC Water Quality Guidelines.



Manningham has much of its water courses essentially intact and undisturbed by urban development. The parks and reserves associated with these waterways form a linear network of natural and modified bushland, open parkland and semi-rural open space. This ecological setting can give the impression that the water quality of our local creeks are excellent. Waterwatch monitoring however has found that numerous stormwater drains are discharging highly polluted water into our local creeks. This stormwater is impacting the health of our local waterways by discharging excessive concentrations of the nutrient ortho-phosphorus.

Catchment rankings for 2019



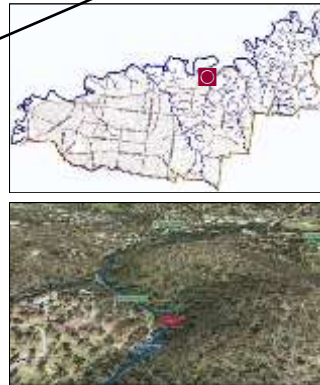


Guide to the Waterwatch Report Card

Monitoring Site
Site catchment and stream location.

Habitat Photos
Habitat photos taken upstream and downstream of the Waterwatch monitoring site.

Andersons Creek @ Gold Memorial



3D aerial map of Testing Site

Provides an aerial image of the local landscape surrounding the Waterwatch monitoring site.

2017 Results

	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating

An overall water quality health rating

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Overall Rating	E+	E+	E+	D	D-	E+	D-	D+	D+	D-	D-
Nutrient Rating											
Phosphorus	F-	F-	F	F-	F-	F	F+	D-	D-	E	D-
Ammonium (ANZECC guideline trigger value)											
% Pass		80	75	80	90	90	75	83	41	17	25
% Fail		20	25	20	10	10	25	17	59	83	75
Physio/chemical Rating											
Turbidity	C	B	B	B	A-	C-	B-	A-	A-	B-	A
Conductivity	E-	E+	E	E	E	D	E+	D-	E	E+	D-
pH	D	E+	E+	D-	D	E+	D	D	D	E+	D

Water Quality Trend

Analysis of the water quality as a percentage for each parameter over the past 10 years.

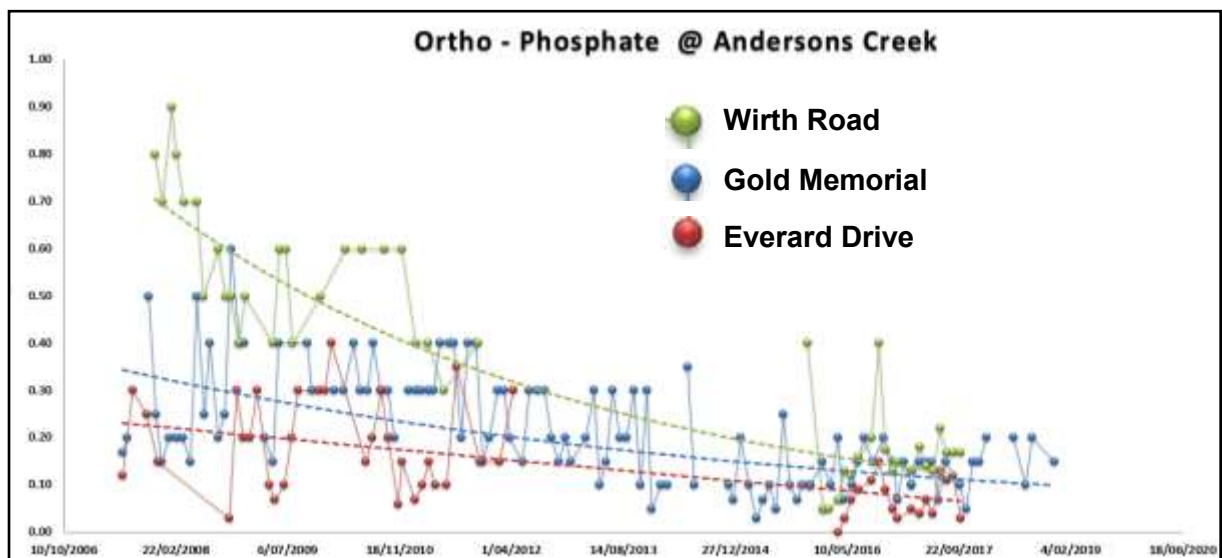
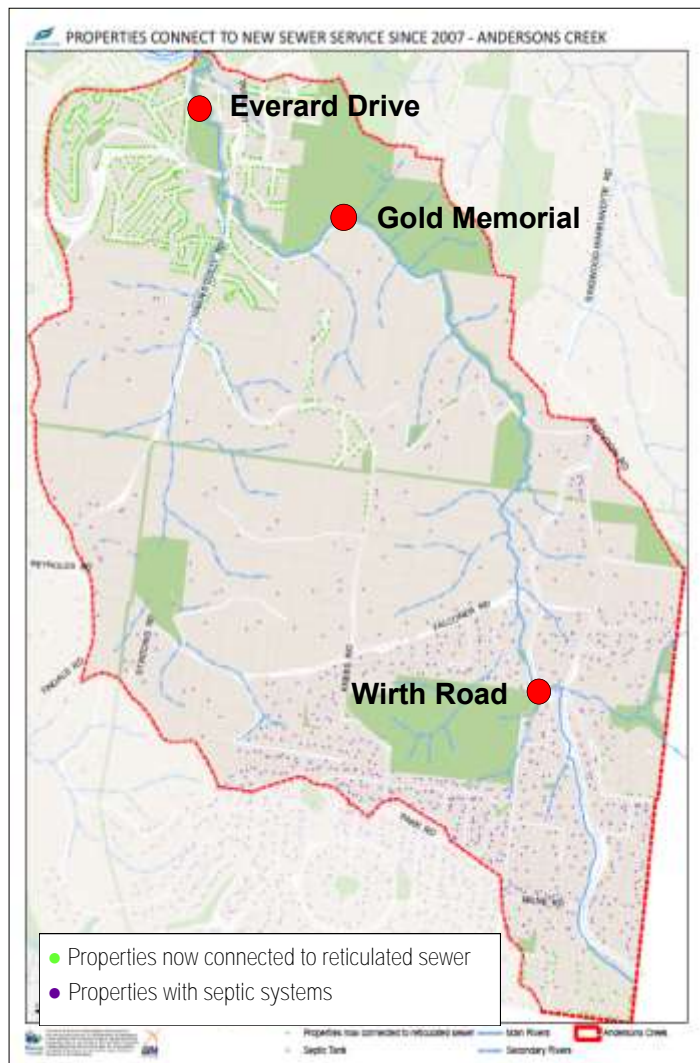
Andersons Creek

Waterwatch volunteers from the Andersons Creek Catchment Group have been monitoring Andersons Creek since 2007. The catchment is predominately un-sewered and is rated as highly degraded with high levels of phosphate, ammonium and electrical conductivity.

Predominantly a peri-urban catchment, Andersons Creek has a high population centre at the top of the catchment in Park Orchards and Ringwood North.

The un-sewered peri-urban suburb of Park Orchards is made up 3,100 residents. A majority of these properties have split greywater/septic systems that discharge household greywater into the local stormwater system. This stormwater system subsequently discharges directly into either the Mullum Mullum or Andersons Creek.

Further downstream the suburb of Warrandyte received a new sewer network in 2014 with most properties connecting to this sewer service by 2016.



Andersons Creek

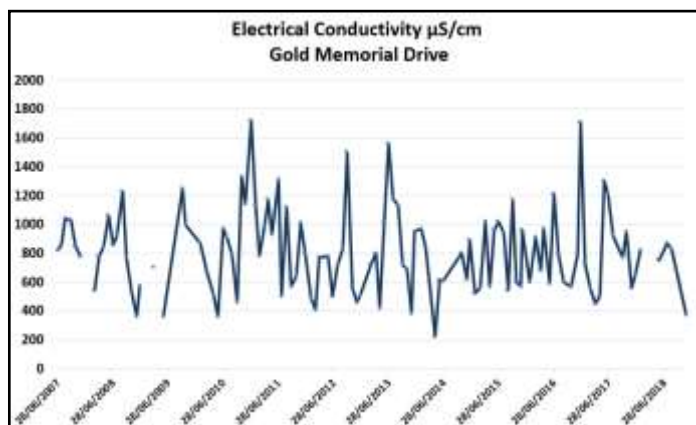
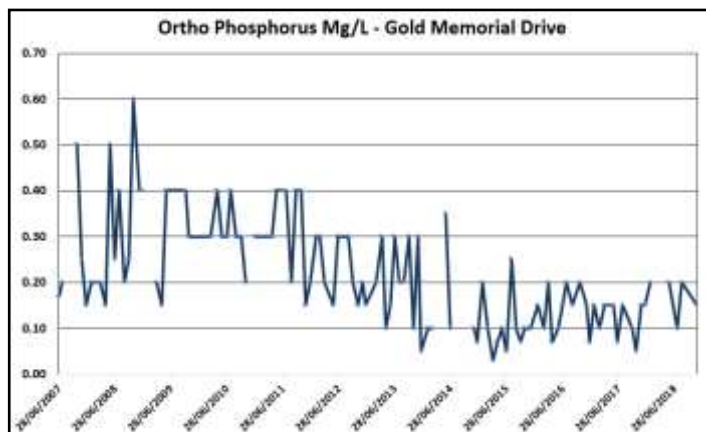
The water quality of Andersons Creek is considered highly degraded.

The majority of the pollution that enters Andersons Creek emanates from stormwater drains near the township of Park Orchards. This is in the upper section of the creek.

Waterwatch monitoring done immediately downstream of the Wirth Road stormwater drain indicates that the upper section of the creek is highly impacted by contaminants found in household wastewater. Ammonium, phosphate and conductivity levels found in the upper sections of the creek are rated in the 'very degraded' range. The likely source of this pollution is the hundreds of Park Orchard properties with split greywater septic systems. These properties discharge untreated household greywater directly to stormwater.

The water quality of Andersons Creek improved as it flows north through Manningham's Green Wedge. This section of creek is characterised by larger bush blocks where properties are able to maintain their household wastewater onsite. In addition to this the creek flows through the Warrandyte State Park which gives the creek a vegetation significant vegetation buffer and allows for freshwater recharge of the creek.

As Park Orchard gets its new reticulated sewer system, it is hoped that the water quality of the creek will improve significantly.



Andersons Creek @ Confluence









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	D-	D+	D+	D	C-	D-				C-	C-	
Nutrient Rating												
Phosphorus	F	F+	F	F	E+	E				D+	D	
Ammonium (ANZECC guideline trigger value)												
% Pass	100	100	87.5	100	100	100				100		
% Fail	0	0	12.5	0	0	0				0		
Physio/chemical Test Rating												
Turbidity	C-	E-	B-	C+	A	D				B+	A-	
Conductivity	E+	C-	D	E+	E	D-				D-	D-	
pH	B-	B	B	C	B-	B-				C	C	

Andersons Creek @ Gold Memorial Road



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	E+	E+	E+	D	D-	E+	D-	D+	D+	D-	D-	E+
Nutrient Rating												
Phosphorus	F-	F-	F	F-	F-	F	F+	D-	D-	E	D-	E
Ammonium (ANZECC guideline trigger value)												
% Pass		80	75	80	90	90	75	83	41	17	25	40
% Fail		20	25	20	10	10	25	17	59	83	75	60
Physio/chemical Rating												
Turbidity	C	B	B	B	A-	C-	B-	A-	A-	B-	A	B-
Conductivity	E-	E+	E	E	E	D	E+	D-	E	E+	D-	D
pH	D	E+	E+	D-	D	E+	D	D	D	E+	D	E+

Andersons Creek @ Husseys Lane









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	E+	E+	E+	D-	D-	E+	D	D+	D			
Nutrient Rating												
Phosphorus	F	F-	F-	F-	F-	F-	F	D	F			
Ammonium (ANZECC guideline trigger value)												
% Pass	100	100	87.5	100	100	100	90	80	60			
% Fail	0	0	12.5	0	0	0	10	20	40			
Physio/chemical Test Rating												
Turbidity	C+	B	B	B	A-	C	B+	B	B+			
Conductivity	F+	E+	F	E	E-	E+	E	E	E+			
pH	D	E+	D-	D	D+	D	C-	D+	D-			

Andersons Creek @ Below Wirth Road Drain



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	E	D-	D	D	D-	D-	D-		D-	D	D-	D-
Nutrient Rating												
Phosphorus	F-	F-	F-	F-	F-	F-	F-		F-	E+	E+	F
Ammonium (ANZECC guideline trigger value)												
% Pass	100	100	87.5	100	100	100	90		100	100		25
% Fail	0	0	12.5	0	0	0	10		0	0		75
Physio/chemical Rating												
Turbidity	A-	B	B	B	A+	A+	A+		A+	A+	A+	A
Conductivity	F	E-	E	E	F	F-	F-		F-	F	F	F
pH	B	B-	B	C+	C+	B-	B		B	C-	C+	B-

Brushy Creek

In 2007 there were 326 properties in the Brushy Creek Catchment registered with a septic tank.

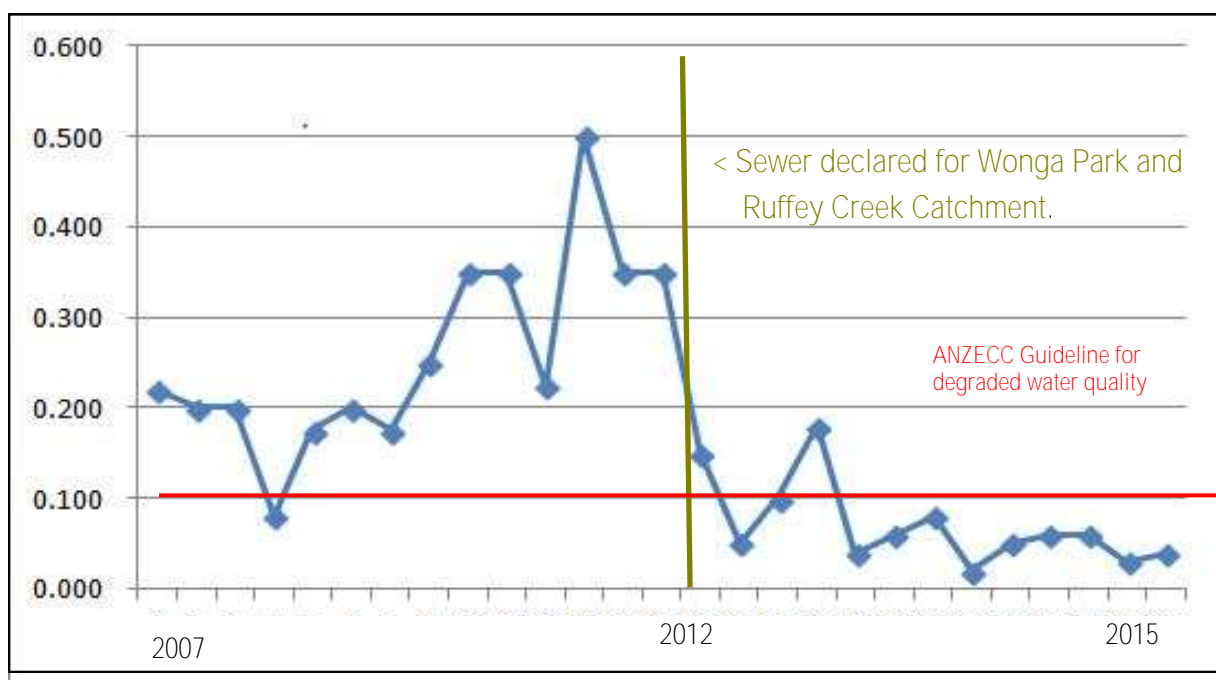
Of these properties 24 had split greywater/septic systems that discharge untreated greywater to stormwater while 66 properties discharged treated septic tank wastewater directly into the stormwater system that discharged into the creek.

The construction of the new Wonga Park sewerage service was completed in 2012. By the end of 2015 most properties were connected to the new sewer.

The results indicate that there was a significant reduction in ortho phosphate, electrical conductivity and ammonium in Brushy Creek after the completion and connection of local residents to the new sewer service.









Brushy Creek Ortho-phosphorus Levels in Wonga Park



Brushy Creek — Confluence of Yarra River



2017 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	D-	D+		C			D+	E+	C	C	C+	
Nutrient Rating												
Phosphorus	F	F-		E			C-	F	C-	D+	D+	
Ammonium (ANZECC guideline trigger value)												
% Pass							100	100	78	100	100	
% Fail							0	0	22	0	0	
Physio/chemical Rating												
Turbidity	D-	B		A+			E	F-	C	D+	A	
Conductivity	D	D		D			D+	D+	D	D+	D	
pH	B	B		B			B	B	B	B	B	

Jumping Creek

Jumping Creek flows for approximately 17 kilometres through the semi-rural suburbs of Wonga Park and Warrandyte.

The Jumping Creek catchment is less developed than all other catchments in Manningham and is **situated in Manningham's Green Wedge**. Most properties in Jumping Creek are relatively large with most household wastewater treated by a property septic system maintained onsite. The exception to this is the smaller block size properties in the Wonga Park Village precinct.

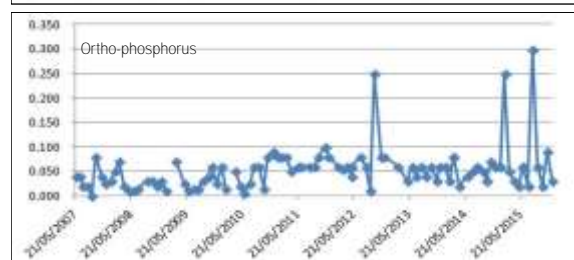
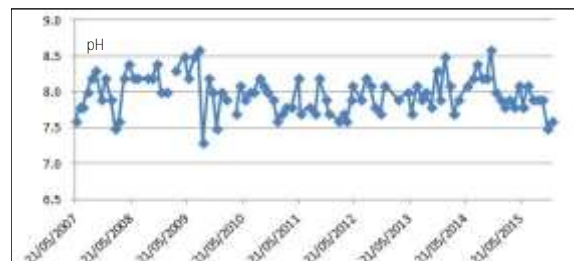
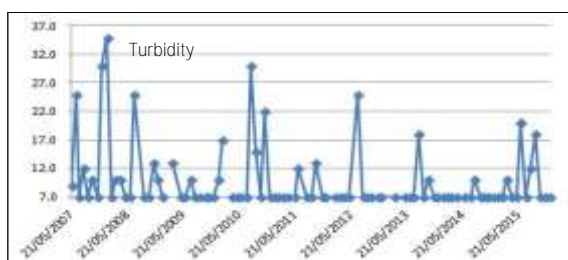
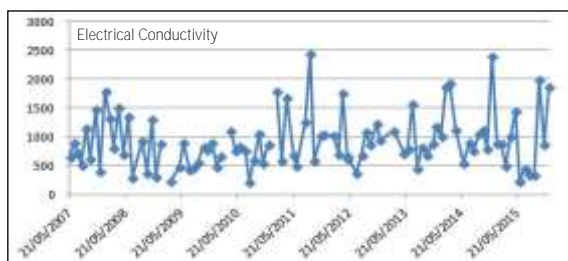
The water quality of Jumping Creek is rated as good as most household wastewater maintained within the property boundary.

Waterwatch monitoring of Jumping Creek has provided this report with good reference data of a semi-rural waterway that is not impacted by significant household wastewater pollution.









Properties connected to sewer in Andersons Creek

Merrill Crescent Waterwatch



Jumping Creek @ Merrill Crescent



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	C+	C	C+	C+	C	C	C	C-	C	C	C	C
Nutrient Rating												
Phosphorus	B-	B-	B-	C	D	D	D+	C-	C-	C	C	C
Ammonium (ANZECC guideline trigger value)												
% Pass		100	80	91	64	55	78	62	75	62	90	90
% Fail		0	20	9	36	45	22	38	25	38	10	10
Physio/chemical Test Rating												
Turbidity	B+	B+	A+	B+	A+	A	A	A+	A	B	A+	A
Conductivity	E+	E-	D	D-	E-	E	E	F	E+	D	E+	E
pH	B-	C+	C+	B-	B	B-	B	C+	B	C	C	C

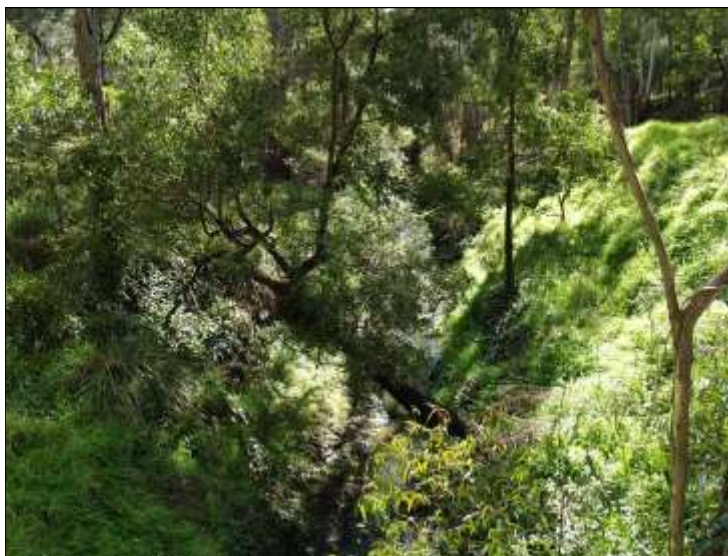
Jumping Creek @ Brysons Road









2017 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	C-	C	C	C	C-	C-	C-			C	C	
Nutrient Rating												
Phosphorus	A+	C+	D	D	C-	B-	C-			B	B	
Ammonium (ANZECC guideline trigger value)												
% Pass		100	67	100	100	100	100			100	100	
% Fail		0	33	0	0	0	0			0	0	
Physio/chemical Test Rating												
Turbidity	C+	A	A+	A-	A+	A+	B			A+	B	
Conductivity	E	E+	E	D-	E-	F	F+			D	D	
pH		C	B-	B	D-	D+	C			B	B	

Jumping Creek — Confluence of Yarra River



2016 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	C-	C-		C	C-						C+	
Nutrient Rating												
Phosphorus	D	C+		D-	A-						A	
Ammonium (ANZECC guideline trigger value)												
% Pass				100	100						100	
% Fail				0	0						0	
Physio/chemical Rating												
Turbidity	C	A-		B+	A+						A+	
Conductivity	E	D-		D+	E						D	
pH	B	C		B	D						B	

Koonung Creek

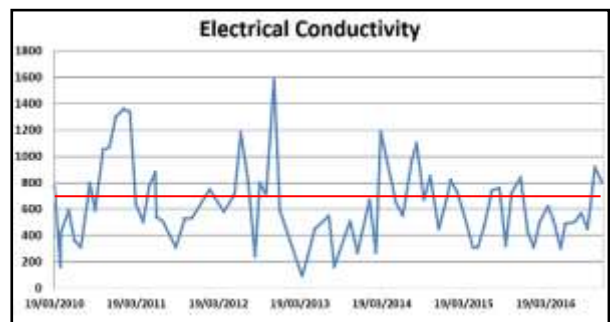
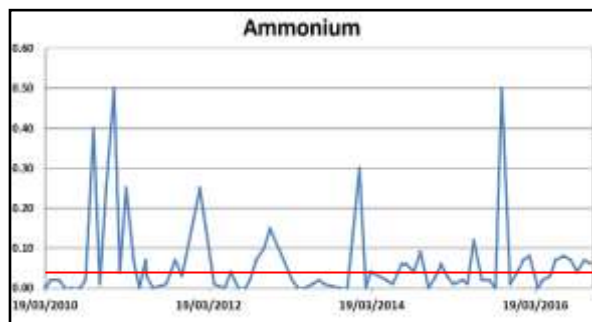
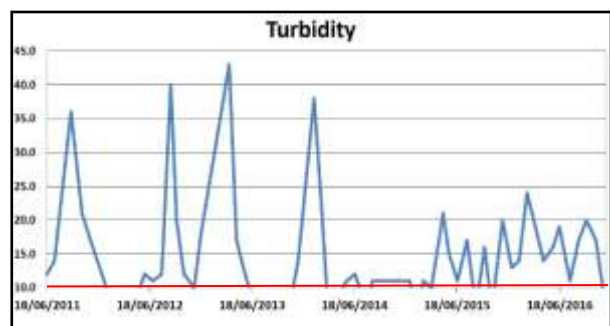
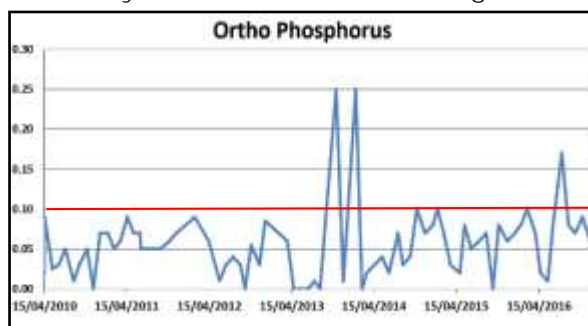
Koonung Creek runs along the southern border of the municipality. The catchment has been urbanised and the creek significantly modified or put underground during the development and construction of the Eastern Freeway.

Water sensitive urban design wetlands have been built alongside the freeway to protect the creek's water quality and to provide a wildlife refuge. The creek has been put underground for 4 kilometres between Doncaster Road and Thompsons Road and acts as an impenetrable barrier to aquatic wildlife between the Yarra River and the headwaters of the creek.

The construction of the new North East Link Freeway and the widening of the existing eastern Freeway is likely to have a severe impact on the creek.

Freeway Golf Course—Koonung Creek

The most significant species supported by Koonung creek is the Broad-finned Galaxia fish which is listed as threatened in Victoria.

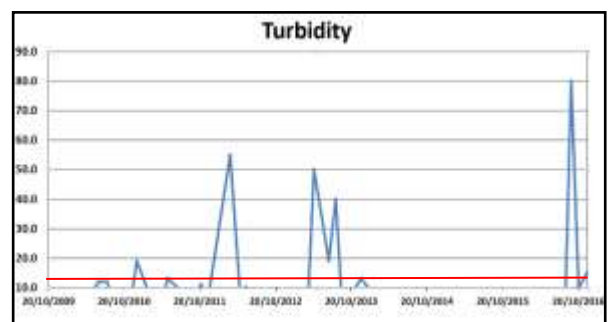
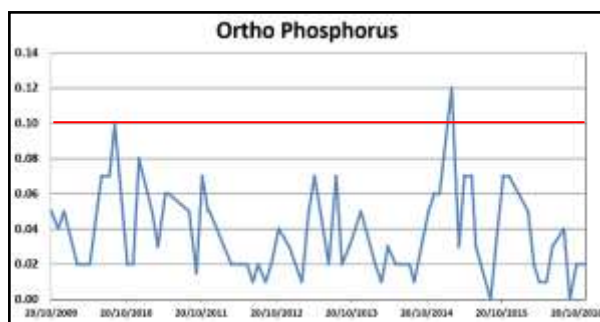
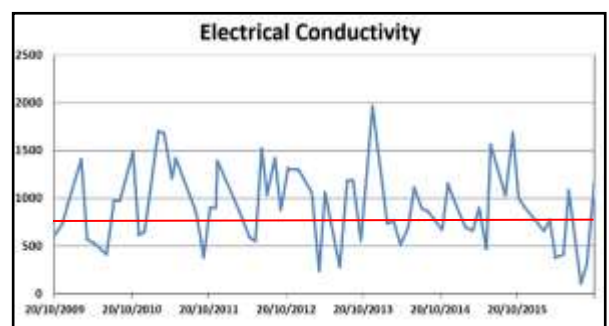
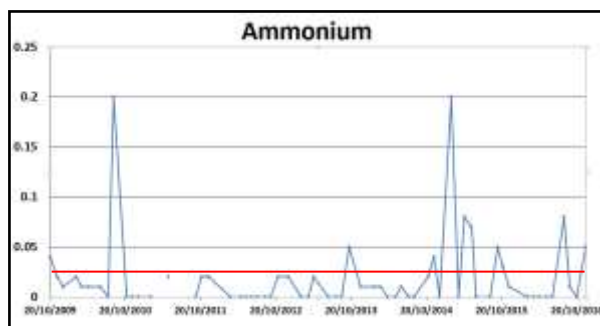




Koonung Creek



Leeds Street—Koonung Creek



Koonung Creek @ Freeway Golf Course









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating				C+	C	C	C+	C	C+	C-	D+	D
Nutrient Rating												
Phosphorus				C+	D+	C	B	C-	C-	D+	D	D-
Ammonium (ANZECC guideline trigger value)												
% Pass				82	27	50	100	36	58	36	36	36
% Fail				18	73	50	0	64	42	64	64	64
Physio/chemical Rating												
Turbidity				B	B	B	B+	B+	B+	B	C-	D
Conductivity				D-	E+	E+	C+	D-	D+	D+	D+	D-
pH				B	B-	B-	D	C+	B	B	B	B

Koonung Creek @ Leeds Street



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating			C+	C+	C	C	C-	C	C	C-	C	C
Nutrient Rating												
Phosphorus			C	C	D+	B	C+	B-	C-	C	B-	C
Ammonium (ANZECC guideline trigger value)												
% Pass			67	89	100	100	87	90	45	90	40	60
% Fail			33	11	0	0	13	10	55	10	60	40
Physio/chemical Rating												
Turbidity			A+	A+	A+	B-	B-	A+	A+	A+	A-	A+
Conductivity			D-	E	E-	F+	E	E	E	E+	E	E-
pH			C	B-	B	C+	C	C	B	B	B	B

Mullum Mullum Creek

Mullum Mullum Creek is considered one of the most polluted waterways in Manningham.

The majority of this pollution enters the creek via the local stormwater system. These stormwater drains discharge untreated greywater from the over 1,000 properties with split greywater/septic systems.

Waterwatch data suggests that the pollution of Mullum Mullum Creek is mainly clustered around five stormwater outlets in Donvale and Park Orchards

While the water quality of Mullum Mullum Creek is considered good at Beckett Road, by the time the creek reaches Tindals Road it is severely impacted by detergents and chemicals from household greywater.

Yarra Valley Water is constructing a new sewer service to properties in Donvale and are undertaking an innovative trial project to deliver sewerage services to over 1,200 residents in the Park Orchards area.



2007 map of Donvale and Park Orchards. Red dots indicate households with split grey water/ Septic systems



Urban stormwater system that discharges household wastewater directly into the creek. Red dots indicated Waterwatch monitoring sites.

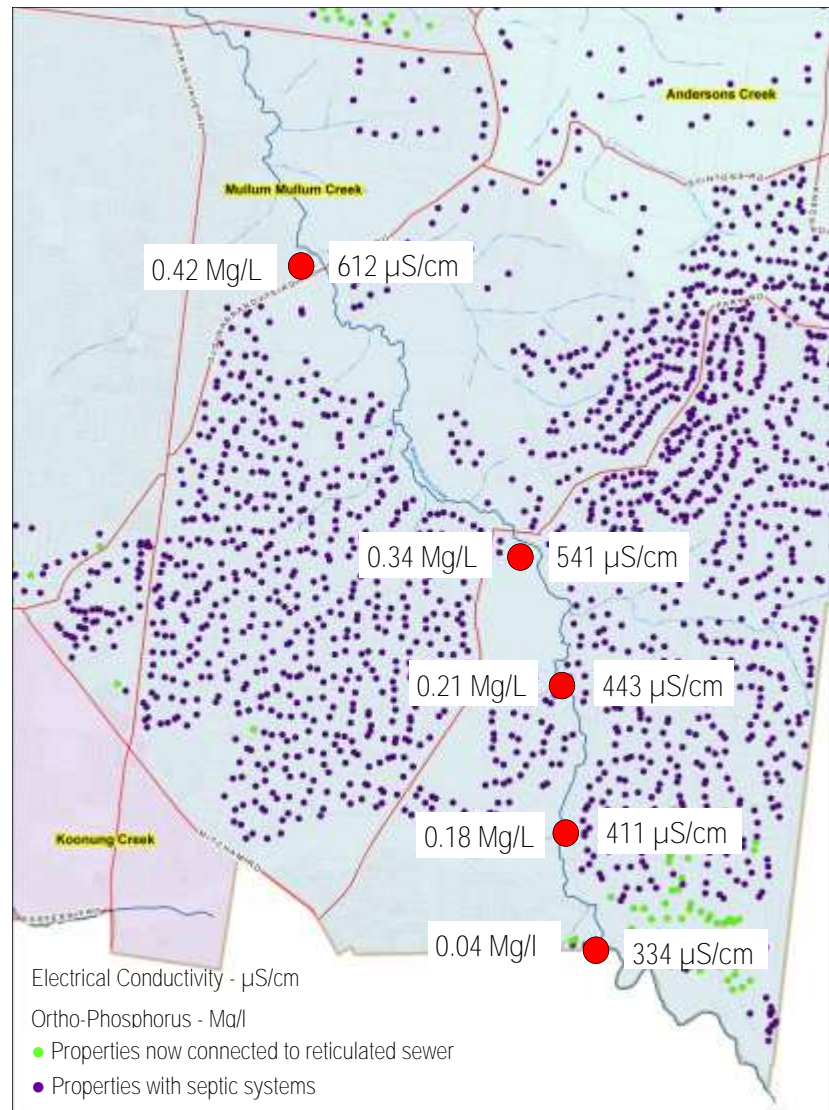
Mullum Mullum Creek

As the sewer backlog program is completed in the Mullum Mullum Creek Catchment, the water quality of the creek is expected to improve dramatically.

Mullum Mullum Creek is vulnerable to erosion particularly in the lower catchment after heavy rainfall.

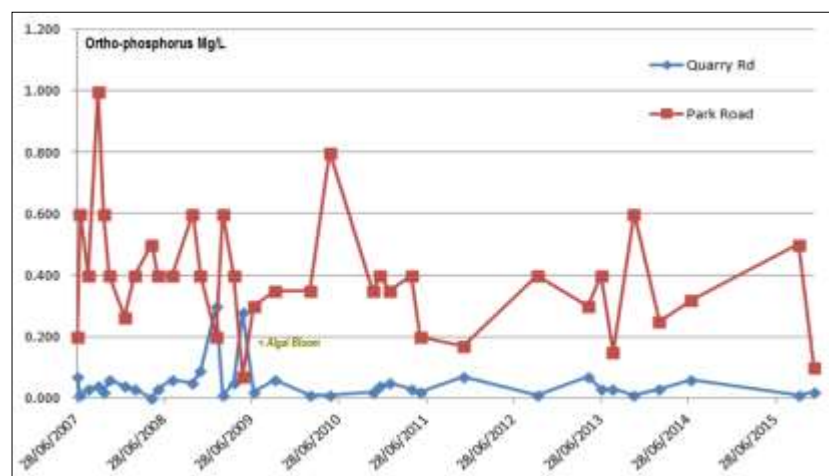
The runoff and flow rates of Mullum Mullum creek have increased dramatically since urbanisation. High flows after heavy rainfall have caused major scouring of the creek, causing significant creek erosion.

Creek erosion is particularly evident in the lower reaches of the creek where sandy silty sediment soils and soft clays are prone to erosion during times of high rainfall events.



Top Left: properties connected to the new Yarra Valley Water Sewer Service Since 2007

Left: The increase in Ortho-phosphate levels in Mullum Mullum Creek between Quarry Road and Park Road.



Mullum Mullum Creek @ The Parkway









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	E	D	C-	C-	D+	C-	C-	C	C-	C	B+	C
Nutrient Rating												
Phosphorus	F-	E-	E	E	F+	E	E-	F+	F	E-	D	E
Ammonium (ANZECC guideline trigger value)												
% Pass			100	92	75	100	100	100	100	75	100	100
% Fail			0	8	25	0	0	0	0	25	0	0
Physio/chemical Test Rating												
Turbidity	D	D-	B-	C	B-	A+	A+	B-	A+	A+	C	C
Conductivity	F-	C	D+	C-	E-	D-	D-	C+	D	D-	C-	C
pH	B	C+	C+	B-	B	B	C+	B	B	D+	B	B

Mullum Mullum Creek @ Tindals Road



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	D+	D+	D+	D+	D+	D+	C-	C-	C-	C-	D+	D
Nutrient Rating												
Phosphorus	F-	F-	F-	F	F-	F	F+	F	F	F-	E	E
Ammonium (ANZECC guideline trigger value)												
% Pass			60	12	83	72	20	25	80	70	50	20
% Fail			40	78	17	28	80	75	20	30	50	80
Physio/chemical Rating												
Turbidity	C	B+	A	B+	A+	A-	A	A	B+	A+	A+	A
Conductivity	D	D+	D	D+	D-	E+	D	D-	D-	D	D	D-
pH	B	B	C+	B-	B-	B	B	B	B+	C	C	C

Mullum Mullum Creek @ Park Road



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	D+	D+	F+	F-	F	D	C	C-	D	D	D	E
Nutrient Rating												
Phosphorus	F	F	F+	F-	F-	F-	F-	F-	E-	E-	E-	E-
Ammonium (ANZECC guideline trigger value)												
% Pass	33	20	33	80	25		67	50	0	70	67	70
% Fail	67	80	67	20	75		33	50	100	30	33	30
Physio/chemical Test Rating												
Turbidity	B	B	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+
Conductivity	D+	D+	E+	D	D-	D	C-	C	D	C-	C-	D+
pH	B	C+	C+	C+	C+	D	B-	B	C	C	C	C+



Mullum Mullum Creek @ Heads Road



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	D+	C-	C-	C+	C+	B-	C-	C	C	C	C	C
Nutrient Rating												
Phosphorus	F	E-	E	E+	D	D	D	D	D	D	D	D
Ammonium (ANZECC guideline trigger value)												
% Pass	67	80	67	80	67				70		70	70
% Fail	33	20	33	20	33				30		30	30
Physio/chemical Rating												
Turbidity	A+	B	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+
Conductivity	C-	C-	D	D	D+	C	D	C	C	C	C	C
pH		C+	C	B-	B-	B	C	C	C	C	C+	C+

Mullum Mullum Creek @ Tandarook Crescent



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Ortho Phosphorus	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Electrical Conductivity	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Turbidity	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
pH	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Ammonium	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	C-	D+	C+	C+	C+	C+	C	C+	C+	C	C+	C
Nutrient Rating												
Phosphorus	F-	E-	F	E-	F	D-	D	D	C+	C+	C+	C+
Ammonium (ANZECC guideline trigger value)												
% Pass		100	67	100	67		67		100	100	90	90
% Fail		0	33	0	33		33		0	0	10	10
Physio/chemical Test Rating												
Turbidity	A+	B-	A+	B-	A+	A+	A+	A+	A+	A-	A+	A+
Conductivity	C	C	D-	C	D-	D+	C	D+	C-	C	C+	C
pH		C+	C+	C+	C+	B-	C	B-	B-	C+	B	C

Mullum Mullum Creek @ Quarry Road









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	C+	C+	C	B-	B-	B-	C+	B-	B	B	B-	B-
Nutrient Rating												
Phosphorus	C+	C	D	B+	C	B-	C	C-	A+	B	B-	B-
Ammonium (ANZECC guideline trigger value)												
% Pass	100	100	67	100	100	100	100	100	100	100	90	100
% Fail	0	0	33	0	0	0	0	0	0	0	10	0
Physio/chemical Rating												
Turbidity	B	B	B	A+	A+	A+	B	A+	A+	B+	A+	B
Conductivity	C-	C	D	C-	C-	C	C+	C	B-	C	C+	C+
pH	B	C	C+	C	C+	D	C+	B-	C-	C	B-	C

Mullum Mullum Creek @ Paddy's Lane Tributary



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating	E	E	D	D	E	E	E	E	E	E	F	F
Nutrient Rating												
Phosphorus	F-	F-	F-	F-	F-	F-	F-	F-	F-	F-	F-	F-
Ammonium (ANZECC guideline trigger value)												
% Pass	0	0	0	0	0	0	0	0	0	0	0	0
% Fail	100	100	100	100	100	100	100	100	100	100	100	100
Physio/chemical Test Rating												
Turbidity	A	A+	A+	A+	B	A+	A+	A+	A+	A+	A+	B
Conductivity	F	F+	F+	F+	F	F-	F-	F-	F-	F-	F-	F-
pH	B	B	B	B	B	B	B	B	B	B	B	B



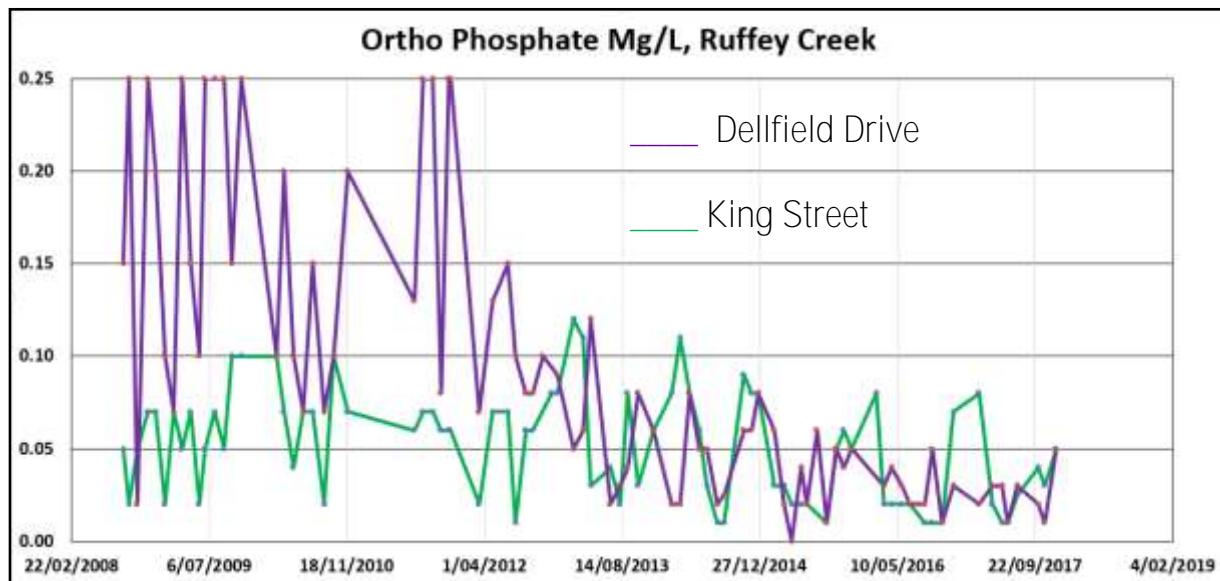
Ruffey Creek

Three monitoring sites have been established in the Ruffey Creek catchment.

One site is in Ruffey Lake with the other two sites are located upstream and downstream of the unsewered properties of Templestowe and their associated stormwater drains.

Since 2012 and the construction of the new sewer service to Templestowe, Ruffey Creek has been transformed from a severely polluted creek into a relatively healthy urban waterway.

To coincide with the declaration of the new sewer service Waterwatch hosted a community picnic in Templestowe in collaboration with Yarra valley Water, Manningham Council and local plumbers. As a result of this community engagement there was a 95% uptake by local residents to the new sewer service. This led to a dramatic improvement to water quality of the creek.



Top: Waterwatch data highlights the dramatic drop in Ortho-Phosphate in Ruffey Creek in 2012 and the completion of the Yarra Valley Water Sewer service.

Ruffey Creek @ King Street









2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating		C	C+	C	C	C-	C	C	C+	C	C-	C
Nutrient Rating												
Phosphorus		C	C-	D+	D	C-	D+	C-	C+	B	B-	B-
Ammonium (ANZECC guideline trigger value)												
% Pass		40	30	20	20	87.5	62	40	89	90	40	40
% Fail		60	70	80	80	12.5	38	60	11	10	60	60
Physio/chemical Test Rating												
Turbidity		A+	A	B-	A-	B-	B-	A	A+	B	A	A
Conductivity		F+	D	D-	E+	F	D-	D-	E	E+	E	D-
pH		B	C+	B	C+	B-	B-	B-	B-	B-	C+	C

Ruffey Creek @ Dellfield Drive



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating		D+	C-	C-	D+	D+	C-	C	C	C-	C+	C
Nutrient Rating												
Phosphorus		E-	F+	E+	F	D-	C-	C	C+	B-	B-	B-
Ammonium (ANZECC guideline trigger value)												
% Pass		80	50	62.5	100	86	75	70	80	60	100	80
% Fail		20	50	37.5	0	14	25	30	20	40	0	20
Physio/chemical Test Rating												
Turbidity		A+	A-	A-	A+	A-	B	A+	A-	B+	A-	A
Conductivity		F	D-	D-	E-	F-	E-	E	E-	D-	F+	E
pH		C+	B-	B-	C+	B-	B-	C+	B-	B-	B+	B



Ruffey Creek @ Ruffey Lake



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating						
Ortho Phosphorus						
Electrical Conductivity						
Turbidity						
pH						
Ammonium						

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating						C	C	C+	B-	C-	C-	C
Nutrient Rating												
Phosphorus						C+	A	C+	B+	B-	B	C
Ammonium (ANZECC guideline trigger value)												
% Pass						30	82	70	83	55	72	72
% Fail						70	18	30	17	45	28	28
Physio/chemical Rating												
Turbidity						C	D+	C+	C	D+	C+	C
Conductivity						C	C-	C	C+	C	B-	C
pH						D+	D+	B-	B	D+	D+	D-



Yarra River

The Yarra River catchment covers an area 4047 km². The upper reaches of the river contains some of the most pristine environments in Victoria.

The Yarra River enters the Manningham near Wittons Reserve at the confluence of Brushy Creek in Wonga Park.

All of Manningham's creeks discharge into the Yarra River between Brushy Creek and Koonung Creek, 52 kilometres downstream.

The Yarra River is an important water source for Melbourne and is a popular tourist site, as well as a spiritual destination for indigenous and non-indigenous Victorians. The Yarra River is an important ecological systems with Platypus regularly spotted in Manningham.

The Waterwatch data collected indicate that there is a noticeable increase in turbidity at Bullen when compared to Warrandyte.

The most likely cause of this increase in turbidity is the changing characteristic of the river between these two sites.

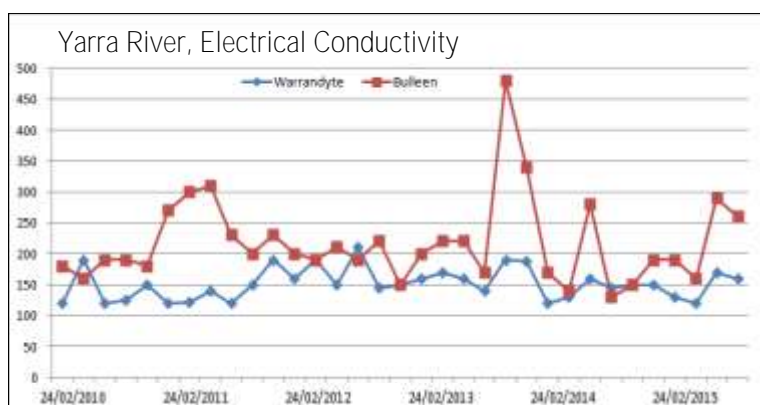
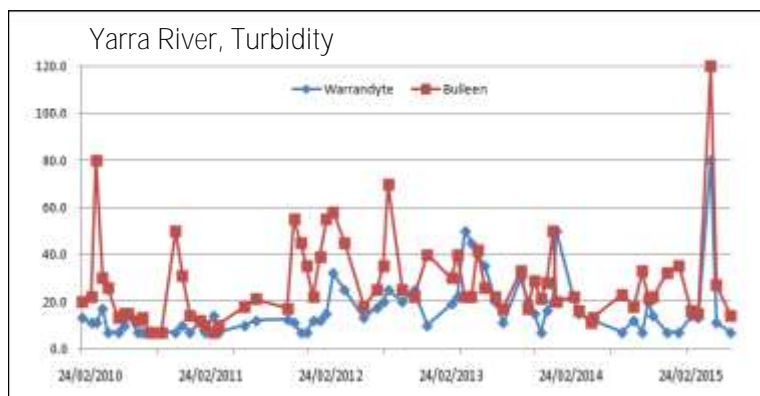
The river in Warrandyte is fast flowing with a rocky or gravel substrate. This compares with the river at Bullen which is a slow flowing, deep, meandering flood plain with a muddy base.



Yarra River, Wonga Park








Yarra River, Bullen



Yarra River @ Warrandyte Road Bridge



2019 Results	A Excellent	B Good	C Fair	D Poor	E Degraded	F Very Degraded
Overall Rating	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Ortho Phosphorus	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Electrical Conductivity	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Turbidity	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
pH	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Ammonium	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>

Water Quality Rating	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Overall Rating		B	B-	B-	C+	C	C+	B+	B+	B-	B	B
Nutrient Rating												
Phosphorus		B-	C	C+	C	C+	C	A	A-	B	B	B
Ammonium (ANZECC guideline trigger value)												
% Pass		100	60	92	100	90	80	100	100	100	90	100
% Fail		0	40	8	0	10	20	0	0	0	10	0
Physio/chemical Rating												
Turbidity		A+	C	B-	B-	C+	C	B	B+	C	B	B
Conductivity		B	B	B	B	B	B	B	B	B	B	B
pH		B	B	B	B-	C+						B

