Regulatory Framework for the Sustainable Discharge of Treated Wastewater from Level 2 WWTPs

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Enquiries:

Environment Protection Authority
GPO Box 1550
Hobart, Tasmania 7001
Telephone: (03) 6165 4599
Email: Enquiries@epa.tas.gov.au
Web: www.epa.tas.gov.au

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1. Preamble

Municipal wastewater treatment plants are part of the essential infrastructure required to support healthy communities. They collect and treat sewage and wastewater from cities and towns with the resulting treated effluent either re-used as recycled water or discharged to receiving water.

Recycled water has a range of well-recognised beneficial applications, many generating high economic returns. As an alternative to potable water it is commonly utilised in a wide variety of agricultural and industrial uses and in applications where returns on investment may be less easily quantifiable, such as creating vibrant green spaces and improving recreation facilities in urban settings. Another value of this alternative supply of water lies in the fact that its use couples directly to significant environmental benefits, in particular improved quality of our waterways by diversion of wastewater treatment discharges.

The purpose of this framework is to articulate the regulatory structure that is in place to support the discharge of treated effluent to sustainable reuse in Tasmania, diverting pollutants away from discharge to water towards beneficial use. Continuing discharges of treated effluent to water should not impact on recognised values of the receiving water and as a minimum should maintain or improve water quality over time. Recycled water schemes which receive treated wastewater should operate within a sustainable reuse framework.

This document is primarily intended to apply to Level 2 sewage treatment plants, being wastewater treatment works with a design capacity to treat an average dry weather flow of 100 kilolitres or more per day of sewage or wastewater under Schedule 2 of the *Environmental Management and Pollution Control Act 1994*.

1.1 Wastewater Treatment Plant Discharges

Wastewater treatment plants (WWTPs) that discharge treated effluent to waterways must meet strict environmental conditions to ensure the discharge does not adversely impact the waters. Discharge requirements for WWTPs are outlined in the *Emission Limit Guidelines for Wastewater Treatment Plants that Discharge to Inland and Marine Waters* (DPIPWE, 2001) and the *State Policy on Water Quality Management 1997*, (the State Policy) depending on the design capacity of the WWTP. The State Policy requires a minimum of AMT (that is, accepted modern technology) level of wastewater treatment capability for all new WWTPs discharging treated effluent to water. Existing plants are required to reduce waste discharges and move toward AMT discharge arrangements, unless it is demonstrated that the WWTP operations do not affect the recognised water quality values. Environmental and community values of water quality are known as Protected Environmental Values and are mostly represented in numerical terms by the Water Quality Objectives (WQOs) of the receiving waters.

1.2 Recycled Water

Guidance on sustainability and management of recycled water schemes in Tasmania is provided by the *Environmental Guidelines for the Use of Recycled Water in Tasmania* (DPIPWE, 2002; the Recycled Water Guidelines) and the *National Guidelines for Water Recycling: Managing Health and Environmental Risk, 2006*[1]. To date, recycled water schemes operating in Tasmania have almost exclusively sourced class B recycled water as described in the Recycled Water Guidelines. Class B recycled water is readily generated using standard secondary level wastewater treatment processes. While suitable for a large range of agricultural and industrial applications, class B recycled water is often unsuitable for prolonged discharge to inland, estuarine or marine waters. Hence, a key driver for establishing a recycled water scheme is often the avoidance of expensive, both in terms of upgrades to WWTPs and on-going operational costs, advanced

[1] For further information, please refer to https://epa.tas.gov.au/regulation/wastewater/useful-resources-for-wastewater-managers/managing-effluent-reuse

wastewater treatment capability that would enable the disposal of treated effluent to waterways. Other drivers can include off-setting the growth in demand for potable water to avoid the costs associated with developing new sources of supply and improving the liveability of communities.

The sustainability of recycled water schemes in Tasmania is strongly impacted by the effects of seasonal demand and climatic conditions, principally, rainfall patterns and cool temperatures. When effluent production and rainfall outstrips recycled water demand the water must be contained until such time as demand increases or discharged into local waterways.

The cost of constructing recycled water storages of sufficient capacity to contain the standard storage design requirement for recognition as a full reuse scheme of containing all waste in at least the 90th percentile wet year can be a major impediment to a scheme's implementation. Section 5.5 offers solutions to overcome this perceived barrier to implementation of an effluent reuse scheme.

The discharge of treated effluent, including excess recycled water, to waterways from WWTPs is a regulated activity under state legislation. This guidance document outlines the regulatory framework in place to ensure all discharges are, or move towards being, environmentally sustainable. It aims to provide incentives towards increased use of recycled water by promoting regulatory mechanisms that support the safe and sustainable use of recycled water as an alternative to sustainable discharge to waters.

2 Glossary

Acronym/Term	Meaning
ADF	Average Daily Flow – the daily flow into a wastewater treatment plant averaged over a specified period of time, being a combination of sanitary flow and other flow sources, including inflow and infiltration into the sewer network.
ADWF	Average Dry Weather Flow - the combined average daily sanitary flow from domestic, commercial and industrial sources.
AMT	Accepted Modern Technology – technology which has consistently demonstrated achievement of the desired effluent pollutant levels in economically viable situations, takes account of engineering and scientific developments in economically viable operations and pursues opportunities for waste minimisation.
AMT limits	As defined in Table 1 of the ELGs.
DGVs	Default Guideline Values of water quality are measurable thresholds or conditions of an indicator below or above which there is a low risk of unacceptable effects. DGVs in accordance with the National Water Quality Management Strategy are developed as indicators for the protection of Protected Environmental Values (PEVs).
ELGs	Emission Limit Guidelines for Sewage Treatment Plants that discharge Pollutants into Fresh and Marine Waters, DPIWE June 2001, or any subsequent updates of this document.
EMPCA	Environmental Management and Pollution Control Act 1994
EPN	Environmental Protection Notice, issued under the *EMPCA*.
Pathogen indicator bacteria	Bacteria that are used as indicators for the presence of disease-causing organisms. Escherichia coli (*E. coli)* are commonly used as indicator bacteria for the presence of faecal contamination in freshwater environments, as are

Acronym/Term	Meaning
	enterococci in both freshwater and estuarine/marine environments. Also referred to as faecal indicator bacteria (FIBs).
PEVs	Protected Environmental Values that reflect community values and uses of Tasmania's water resources.
SPWQM or State Policy	State Policy on Water Quality Management 1994. The SPWQM provides a framework for the identification of Protected Environmental Values (and uses) of water bodies, the development of water quality guideline values and water quality objectives setting process, and the management and regulation of point and diffuse sources of emissions to surface waters and groundwater in Tasmania.
WQOs	Water Quality Objectives are numeric values or other metrics set at levels aimed to protect the PEVs for a particular body of water and are used as a measure of environmental management performance specific to a waterbody.
WWTP	Wastewater treatment plant

3 SUSTAINABLE DISCHARGE REGULATORY FRAMEWORK

3.1 Sustainable Discharges of Treated Effluent

For the purpose of this document, a sustainable discharge of treated effluent is defined as a discharge which has been demonstrated to meet the requirements under the regulatory framework, given the current level of scientific understanding. Where a discharge of treated effluent is accepted as sustainable by the EPA based on the information provided, generally a "final" EPN will be issued to the activity which does not include conditions requiring investigation of plant upgrades in the short to medium term.

This document provides guidance on what information must be supplied to demonstrate a sustainable discharge situation.

3.2 Regulatory Framework

The regulatory framework for discharges from WWTPs is underpinned by the following environmental policies and guidelines:

1. State Policy on Water Quality Management 1997
2. Emission Limit Guidelines for Wastewater Treatment Plants Discharging to Inland and Marine Waters (DPIWE, June 2001)
3. Guide to EPA Regulatory Expectation for Wastewater Management in Tasmania 2020 (EPA Tasmania, 2020)

Under the State Policy discharge of wastewater to waterways is only permissible where all other practical options to minimise a pollutant discharge (waste avoidance, recycling and reuse) have been fully explored. Existing discharges should be rationalised and the creation of new point source discharges avoided. Where an outfall is the most prudent and feasible option for the disposal of treated wastewater, the discharge must not prejudice the achievement of WQOs of the receiving environment. Existing wastewater treatment plants must work towards achieving discharge levels equivalent to those which can be achieved using AMT and best practice environmental management. Where the WWTP operator demonstrates that it is not reasonable or practical to meet WQOs at the point of discharge, emission limits may be set so that WQOs are met at the edge of an appropriate mixing/dispersion zone. The *Technical Guidance for Water Quality Objectives (WQOs) Setting for Tasmania, August 2020* provides detail on the process for deriving

water quality guideline values, and the use of those values in the water quality objective setting process by the EPA.

The State Policy clarifies a number of conditions under which mixing zones are not an acceptable solution, including waters which receive primary contact recreation, waters that are recognised for significant ecological or scientific values or those that are close to potable water supply intakes or areas used for aquaculture.

The document *Emission Limit Guidelines for Sewage Treatment Plants that Discharge Pollutants into Fresh and Marine Waters* (ELGs) provides guidance and benchmarks for WWTP operation in compliance with the State Policy and specifies limits considered achievable by Accepted Modern Technology (AMT) for a range of performance parameters, including nutrient concentration levels. The ELGs apply to existing and new WWTPs with a maximum design capacity of no greater than 500 kL/day ADWF that discharge into fresh or marine waters. New plants should be designed to meet AMT limits or better and existing plants upgraded to AMT standard, including strict nutrient requirements, within a negotiated timeframe. A minimum dilution ratio of 1:80 (discharge volume: the lowest median seasonal flow rate over the period of record) is required at the point of discharge. This document also clarifies that EPA does not consider chlorination of effluent as best practice environmental management of wastewater treatment and disposal given the process can lead to a range of toxic disinfection by-products.

The timeframe for completion of upgrade to AMT effluent is determined in consultation with the EPA. All determinations are to reflect the move toward a final objective of only treated effluent of AMT quality discharged, or an AMT equivalent sustainable situation.

3.3 Site-Specific Emission Limits

The State Policy also provides guidance regarding the determination of site-specific emission limits under discharge conditions where the ELGs do not apply, or where AMT limits are inappropriate. The WWTP operator must demonstrate that it is neither reasonable nor practical to comply with the limits outlined in the ELGs and that discharging in accordance with non-AMT limits will not prejudice the achievement of recognised WQOs. The frequency and continuity of a discharge to a waterway is an important consideration in the context of such a determination, in addition to dilution/dispersion and an assessment of PEVs.

Guidance for developing a monitoring program to inform determination of site-specific discharge limits for a WWTP outfall is contained in the EPA document: *Ambient Monitoring Framework, 2014*[2]. This document describes the scientific investigations to be conducted in waters surrounding a discharge outfall to determine the assimilative capability of the receiving environment. Analysis of the data collected supports an evidence-based determination of discharge limits most appropriate for the discharge site. Appendix A provides further guidance on principles to apply in modelling existing impacts and the derivation of discharge to water limits including for potential future upgrade situations.

3.4 Future emission limits for existing WWTPs and receiving environment assessments

Ambient monitoring information contributes to the derivation of future sustainable limits for discharge to water. However, some in-principle considerations apply in the determination of future discharge limits. In accordance with the principles of section 16.2 of the State Policy, discharges of treated effluent to water must be at levels that reflect best practice environmental management. It is reasonable to assume that best practice environmental management does not include unnecessary emissions of pollutants to the environment. Therefore, continuation of the demonstrated current treatment performance of an existing

[2] Available from EPA Tasmania on request.

WWTP is the minimum expectation for future treatment performance, regardless of receiving environment condition.

Discharge arrangements for existing WWTPs are reviewed regularly by the EPA to ensure their on-going suitability. The permit for a WWTP may be varied to include environmental conditions relevant to any changes in the plant discharge arrangements.

3.5 New WWTP discharges to water

Proposed new WWTP discharges, including those to recycled water schemes, are a regulated activity and normal planning and approval requirements under state legislation apply. Separate requirements apply to the environmental assessment of the recycled water scheme associated with the WWTP discharge.

4 DISCHARGE CATEGORIES AND SUSTAINABLE DISCHARGE REQUIREMENTS

4.1 WWTP Discharge Categories

WWTP discharge categories are broadly based on the frequency of discharge to receiving waters and the relative level of reuse achieved compared to the WWTP inflow. There are three discharge categories:

Category 1 discharges – Continuous

Discharges full-time, with no or only minor reuse of treated effluent.

Category 2 discharges - Seasonal or reduced discharge

Seasonal discharge is typically required where circumstances dictate that partial reuse is feasible but full reuse is not an option. Consequently, a management approach is adopted that utilises recycled water during summer or dry season with controlled intermittent winter or wet weather discharges of treated wastewater to water. Alternatively, part of the effluent stream is diverted to a recycled water scheme, but discharge to water rarely ceases fully. Appropriate treated effluent or recycled water storage allows optimised timing, frequency and volume of discharges.

Category 3 discharges – Infrequent

Infrequent discharge is generally required for WWTPs associated with full reuse schemes. In this context, 'full reuse' means a scheme designed to consistently achieve total effluent reuse, except for calendar years during which rainfall received for the year exceeds the 90th percentile value.

There is scope for all three discharge categories to be recognised as being a 'sustainable discharge', provided the relevant conditions are met and the WWTP operator provides sufficient information about the likely environmental impact of the discharge to allow EPA assessment.

Table 1 provides a summary of specifications for and regulatory implications of the different discharge categories and provides guidance on the conditions under which the WWTP operator can reasonably expect the discharge from a WWTP to be recognised as a sustainable discharge.

The above categories apply to fully treated WWTP discharge flows. Short duration discharges due to infrastructure limitations (including WWTP treatment bypass discharge of high intensity rain events) are subject to the containment targets for the sewerage network contained in Table 6.3 of the *Sewage Pumping Stations Environmental Guidelines,* EPA 2019 and are not captured under the above categories.

Table 1: Categories of Discharge from WWTPs To Water & Regulatory Requirements

Category	Continuous Discharge	Seasonal or Reduced Discharge ("Partial reuse")	Infrequent Discharge ("Full reuse")
Frequency of discharge	Year-round discharge with no or minor concurrent reuse.	Continuous discharge with substantial volume reduction through diversion to reuse, or Controlled, periodic discharge required outside of 1 in 10 (90th %ile) wet years.	Controlled, infrequent discharge of fully treated flows restricted to 1 in 10 (90th %ile) wet years.
Standard environmental conditions applied in permit/EPN	Requirement to develop sustainable discharge management via: • Reuse Feasibility Study; • ELG Compliance Plan; • Ambient Monitoring Report; • Discharge Management Plan Periodic review of WWTP process and where applicable reuse scheme review (default frequency 5 years)	Requirement to develop sustainable discharge management via: • Reuse Feasibility Study; • ELG Compliance Plan; • Ambient Monitoring Report; • Discharge Management Plan Periodic review of WWTP process and reuse scheme review (default frequency 5 years)	Periodic review of WWTP process and reuse scheme review (default frequency 5 years); to include discharge to water frequency and associated impacts to receiving waters.
Reuse status	Treated wastewater discharge to water; little or no reuse.	Treated wastewater linked to partial reuse schemes; requires ongoing or periodic discharge to water. Waste containment less than 90th %ile wet years	Treated wastewater linked to 'full' reuse schemes. Waste containment designed for 90th %ile wet years
Mixing Zone (toxicants)	Must be determined via monitoring & modelling of key contaminants. May be set formally.	Must be determined via monitoring & modelling of key contaminants. May be set formally. Seasonal discharge practices considered in determination of mixing zone.	Generally not required due to infrequent occurrence of discharge
Dilution requirement	May be imposed, to be determined based on site-specific assessment	May be imposed, to be determined based on site-specific assessment	Not proposed.
Discharge Limits (concentration)	Default position: limits to be in line with ELG / AMT, or approved risk-based limits.	Case for more relaxed limits may be considered by EPA under section 18.3 of the State Policy.	More relaxed limits may be considered by EPA under section 18.3 of the State Policy.
Mass Load Limits	Annualised AMT Mass Load Limits for discharge to inland waters specified in the WWTP permit	Annualised AMT Mass Load Limits for discharge to inland waters specified in the WWTP permit.	Not proposed.
Ambient monitoring (investigative phase)	Comprehensive Ambient Monitoring Program (AMP) generally required by environmental conditions. As outlined in EPA's *Ambient Monitoring Framework* document.	Comprehensive Ambient Monitoring Program (AMP) generally required by environmental conditions. As outlined in EPA's *Ambient Monitoring Framework* document. <u>Seasonal discharges:</u> • Targeted monitoring to reflect seasonal discharge practices to inform impact assessment. • Option for ambient monitoring to be implemented as a component of reuse implementation, rather than in advance.	May not be required. If required, limited ambient monitoring targeted to the specific circumstances to determine effects of discharge practices.
Ambient monitoring (ongoing)	• To be determined based on outcomes of AMP; • Some ongoing monitoring generally expected (refer to: *Ambient Monitoring Framework*)	• To be determined based on outcomes of investigative phase; • If no mixing zone required, emphasis on biological monitoring instead of physico - chemical water quality parameters.	May not be required. If required, limited to: • To be determined based on outcomes of investigative phase; • Some biological monitoring; frequency determined on the basis of investigative phase results.
Key considerations for recognition as sustainable discharge situation (demonstrate in the Discharge Management Plan):	• All reasonable and practical measures have been taken to avoid or minimise the discharge and pollutants within the discharge • Reuse demonstrated as not reasonable or practically feasible • Existing treatment performance is maintained or improved over time • Effluent quality meets AMT or better requirements for pathogen indicators for inland and estuarine waters • Discharge does not prejudice the achievement of WQOs as demonstrated by the ambient monitoring assessment • No or 'small' mixing zone due to toxicants • Limited nutrient impact zone • Meets AMT equivalent nutrient mass load limits for discharges to inland waters • Sustainable emission limits approved by EPA and implemented • Post implementation ambient monitoring confirms no impact on WQOs • Regular review demonstrates any reuse scheme operates sustainably	• All reasonable and practical measures have been taken to avoid or minimise the discharge and pollutants within the discharge • Existing treatment performance is maintained or improved over time • Minimum 30% of discharge volume diverted to reuse on 5-year average • Effluent quality is minimum Class B Recycled Water. • Discharge does not prejudice the achievement of WQOs as demonstrated by the ambient monitoring assessment (on a seasonal basis for seasonal discharges) • No or 'small' mixing zone due to toxicants and pathogen indicators over the period of expected discharge. • Limited nutrient impact zone over period of expected discharge • Meets AMT equivalent annualised nutrient mass load limits for discharges to inland waters • Potentially established site-specific required dilution ratios for periodic discharge • Potentially approved suitable precautionary discharge arrangements • Post implementation ambient monitoring confirms no impact on WQOs • Regular review demonstrates reuse scheme operates sustainably	• Scheme designed for containment of all waste in a 90th %ile wet year • Level of reuse scheme performance demonstrated over several years • Post implementation ambient monitoring confirms no impact on WQOs • Regular review demonstrates reuse scheme operates sustainably

5 ELEMENTS OF SUSTAINABLE DISCHARGES

5.1 Best Practice Environmental Management Disinfection

Disinfection performance is a key indicator of treatment performance because failure results in direct risks to human health from the human derived pathogens that are present in wastewater. Pathogen indicator limits that are reflective of best practice disinfection as represented by the AMT pathogen indicator limits are the minimum requirement for Continuous Sustainable Discharge of treated effluent to rivers or estuaries. These limits are readily achievable by established wastewater treatment technologies. Better disinfection performance may be required under specific circumstances. The use of a mixing zone to manage pathogen discharges to inland or estuarine waters from a continuous discharge is not considered best practice for a sustainable discharge situation. For discharge to marine waters with a suitable outfall configuration, sustainable pathogen limits may include use of an approved mixing zone. For Seasonal/Reduced Sustainable Discharge, discharge to water limits may be set on the basis of ambient impact assessments over the duration of the expected seasonal discharge (minimum Class B recycled water requirements apply) to reflect the reduced risk and environmental benefit of substantial reuse.

5.2 Mixing Zones

A mixing zone as defined in the State Policy is a three-dimensional area of receiving waters surrounding a point of discharge of pollutants within which it is recognised that the WQOs for the receiving waters may not be achieved. A mixing zone can only be set if it complies with the basic principles outlined in section 20 of the State Policy. These principles include the use of best practice environmental management to reduce pollutants in the discharge and demonstration that it is not reasonable or practical to meet WQOs at the point of discharge.

Where a formal mixing zone around a point of discharge is designated it will generally be for the management of non-bioaccumulatory soluble toxicants (such as ammonia) whose impacts on biota are primarily related to their concentration.

If investigations undertaken in relation to a specific outfall indicate that the extent of the mixing zone is insignificant, and that the impacts are otherwise consistent with the provisions of the State Policy, then the mixing zone may not be formally recognised in the environmental conditions of any permit or EPN pertaining to that outfall. Investigations to demonstrate that a formally defined mixing zone is not required generally involve monitoring, modelling and analysis. In some cases, establishment of an appropriate dilution ratio trigger and a commitment to manage discharges so as to ensure adequate dilution is maintained may be required.

Seasonal or infrequent discharges managed so as to only discharge to waterways under higher ambient flow scenarios are less likely to require a formal mixing zone than continuous discharges. This statement is based on the assumption that it can be demonstrated that pollutants will be managed in a manner consistent with the State Policy. An initial investigation is generally necessary to adequately demonstrate such a case.

For existing wastewater discharges where the establishment of Seasonal, Reduced or Infrequent Discharge is proposed (that is, via the implementation of a recycled water scheme), the initial investigation may be a desktop assessment using site-specific ambient data, Default Guidelines Values (DGVs) published by the EPA[3], toxicant DGVs established under the National Water Quality Management Strategy[4] and other relevant guideline values for recreational water quality. This approach is reasonable given any diversion of discharge to sustainable reuse will improve environmental outcomes for the receiving water. Information

[3] DGVs are available one the EPA website www.epa.tas.gov.au or LISTmap www.thelist.tas.gov.au
[4] https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants

outlining the outcomes of such investigations will be reviewed by the EPA and may subsequently form the basis for a determination of an appropriate mixing zone. See also *Technical Guidance for Water Quality Objectives (WQOs) Setting for Tasmania* published by the EPA)

5.3 Nutrient Mass Loads

For all but Infrequent Discharge WWTPs discharging to inland waterways in Tasmania, an AMT equivalent nutrient mass load limit will be included in permits and/or EPNs which place a limit on the amount of major nutrients (nitrogen and phosphorus) which may be discharged to the inland waterway during any given year.

The intention of imposing such limits is to ensure that the nutrient load discharged over the course of a discharge season remains equivalent to the load discharged if the WWTP were to be upgraded to the level of Accepted Modern (Treatment) Technology (AMT) and all effluent discharged to waters. Mass load limits are generally based on the permitted average dry weather flow for a WWTP and set in consultation with the permit holder, allowing adequate lead times for compliance with the requirement. Where the average flow of a WWTP is significantly below the permitted dry weather flow and no significant catchment growth is forecast, the average daily flow plus a reasonable allowance (generally 25%) will form the basis of the future load limit.

Receiving environments with PEVs of 'pristine or near pristine' always require a site-specific assessment, and more stringent mass load limits may be imposed. For Infrequent Discharge WWTPs, a nutrient mass load limit may be imposed where ambient assessment indicates impacts on WQOs.

5.4 Minimum Dilution Requirements

The potentially damaging effect of treated wastewater on inland waters and estuarine waterways (particularly river dominated estuaries) is minimised by restricting discharge to periods when the receiving waters provide adequate dilution to assimilate any effluent inputs. The frequency and volume of wastewater discharges along with the flow, velocity and level of receiving water, are measured to determine when conditions are acceptable for discharge. A dilution ratio trigger may be specified in the relevant WWTP permit or EPN to mandate the river flow and effluent rate at which discharge may occur. For example, a defined stream velocity or river height at the discharge point (or a suitable flow gauge located elsewhere) can be used to ensure that effluent release is timed to coincide with flow conditions providing adequate dilution and mixing.

5.5 Storage Volumes of Recycled Water and Precautionary Discharge

Guidance regarding design criteria for recycled water storage facilities is contained in: *Environmental Guidelines for the Use of Recycled Water in Tasmania* (DPIPWE 2002) (the Recycled Water Guidelines) and other relevant guidance documents. This *Regulatory Framework for Sustainable Discharge of Treated Effluent from WWTPs* document provides guidance only in relation to recycled water storage sizing for effluent containment requirements as they relate to sustainable discharge categories.

The cost of design, operation and management of a recycled water scheme is significant. Construction of recycled water storage dams is often seen as 'cost-prohibitive' and key to proving the economic viability of a scheme. The Recycled Water Guidelines require storage dams designed to contain wastewater volumes up to a 1 in 10 year (90th %ile) wet year. Smaller recycled water storages which will require more frequent discharges to water will be recognised as providing a sustainable discharge scenario where it can be demonstrated that periodic discharges to waterways are managed to ensure the safety of human health and the environment when discharging.

Precautionary discharge from wastewater treatment plants or recycled water dams is performed under pre-determined, favourable discharge conditions despite the fact the dam may not be at full capacity. This action frees additional storage capacity at times when the risk of adverse environmental impact from the discharge is recognised to be low due to the high dilution provided by the receiving waterway at the time.

It is done to avoid a potential forced discharge from a full dam under less favourable discharge conditions. Protocols for the precautionary discharge of treated effluent may form a component of overall sustainable discharge arrangements for a WWTP linked to a recycled water scheme. The protocols are assessed by the EPA and must outline information that establishes discharge trigger levels for the recycled water, likely receiving water impacts and details of operational aspects of implementing and managing the precautionary discharge regime.

6 COMPLIANCE ASSESSMENT

The performance requirement for the portion of WWTP effluent which is discharged to a recycled water scheme is to meet a total parameter compliance of 90% or greater with discharge limits to land in the reporting period (i.e. 1 July to 30 June). This performance requirement reflects the reduced environmental risk from discharge to sustainable effluent reuse, as compared to discharge to waterways.

Once a recycled water scheme is operational, should circumstances arise that see the scheme fail for reasons beyond the control of the WWTP operator, interim regulatory arrangements will be imposed in consultation with the WWTP operator so as to not prejudice the parent WWTP compliance level until new discharge arrangements are developed.

APPENDIX A: Receiving Water Impact Assessments and Derivation of Discharge Limits

Disclaimer: This section provides guidance on EPA's expectations about modelling conditions to be used in receiving water impact assessments of treated effluent discharges. It also provides information about ground rules and default values to be applied in the derivation of proposed future sustainable discharge limits for existing WWTPs. The information provided serves as guidance only and may evolve over time as more information becomes available, such as an improved understanding of the impact of emerging contaminants including microplastics, pharmaceuticals and other chemical residues. It does not pre-empt or replace in any way a formal assessment under LUPAA or EMPCA.

Mixing Zones:

Under the State Policy, where waste reduction has been applied and the operator of the activity has demonstrated that discharge at levels equivalent to those which can be achieved using accepted modern technology are not reasonable and practical and it is not reasonable to meet WQOs at the point of discharge a mixing zone may be designated. A mixing zone must be formally approved by the EPA Board unless it is insignificant in size compared to the receiving environment.

Where a mixing zone is formally designated it will generally be set for the management of non-bioaccumulating toxicants (as opposed to bioaccumulating toxicants or nutrients). Pollutants other than these toxicants, such as physical and chemical stressors, must also be assessed but will generally not form the basis for a designated formally set mixing zone.

Nutrient dilution outputs are primarily used to define the potential extent of a nutrient impact zone and inform locations for biological studies, rather than designate mixing zone sizes.

For existing wastewater discharges, where the establishment of Seasonal, Reduced or Infrequent Discharge is proposed, unless site-specific Ambient Monitoring is the preferred option, the initial assessment may be undertaken on the basis of the relevant toxicant trigger values and EPA DGVs to represent receiving water quality, rather than monitoring data gathered specifically to derive site-specific receiving water quality. This approach is acceptable since the reduction of emitted pollutants (via diversion of pollutants to effluent reuse) will result in improvements to receiving water impacts.

Modelling to determine the mixing zone extent to achieve WQOs at the edge of the mixing zone should apply the following conditions:

Toxicant assessment:

- WWTP flow recent multi-year ADF +25% allowance or the future flow where growth is expected, 90th %ile effluent quality, 95th %ile background water quality, receiving water flow of 7Q10 or 5th %ile equivalent, to assess a 'worst likely dilution scenario'.
- WQOs to use are 95% protection level ANZG default guideline values (DGVs) for toxicants (or for toxicants with bioaccumulatory potential use 99% protection level) and low risk guideline values for pathogens (40 orgs enterococci/100mL, 150 orgs *E. coli*/100 mL for waters with current or potential recreational use), unless otherwise agreed.
- In the calculation of receiving water dilutions, where background concentrations are elevated above the relevant target concentration, seek feedback from EPA as to what background concentration level to use.
- Proposed future sustainable toxicant mixing zones in estuaries or rivers must be small: Generally, no more than 10m from the centre of the outfall, 5m in small streams or as otherwise agreed. In principle, toxicants must meet the target value within the initial dilution.

- Proposed future marine mixing zone sizes will be determined on a site-specific basis, by considering nearby PEVs (reefs, shore, harvesting) with an allowable toxicant/pathogen mixing zone of up to 50m so long as identified PEVs are not impacted.
- Plume dilution studies are required to demonstrate that the actual outfall configuration achieves dilutions similar to those modelled. Where significant differences between the estimated (modelled) and demonstrated (plume study) dilution exist, it may be necessary to upgrade the outfall configuration to achieve a sustainable discharge.

Future discharge of residual chlorine

- The default future discharge limit for total residual chlorine is 0.1 mg/L, unless a low risk toxicant mixing zone is demonstrated.
- Toxicant assessment conditions to assume a zero-background concentration.
- Like other toxicants, the requirement is to meet the toxicant DGV within the initial dilution, generally at a maximum distance of 10m from outfall in rivers and estuaries, 5m in smaller streams, 50m in marine situations.

Nutrient and Stressor Impact Modelling:

- Median effluent quality is to be used to derive annual and seasonal concentrations (TN, TP and physical and chemical stressors).
- Future situation assessment criterion for inland waters and estuaries are: default is for the site-specific WQOs or relevant stressor target values to be met under no more than annual 20th %ile ambient flows within a reasonable impact zone. Median seasonal ambient flow conditions should be assessed, where sufficient data exists to derive these.
- Default maximum impact zones to meet site-specific WQOs / stressor targets: maximum lengths of 50m in unidirectional streams, 250m radius in larger estuaries, 500m radius in marine situations. Impact zone to be no wider than 25% of the stream/estuary width and no longer than 5 times the stream width.
- The default position is for nutrient plumes not to merge with other significant nutrient plumes in the waterbody.
- A site-specific assessment of impact zones must always be undertaken.

Principle Considerations for Future Emission Limits for existing WWTPs:

- Section 17.2 of the State Policy requires existing activities to work towards achieving levels of pollutant discharges equivalent to those which can be achieved using AMT unless it can be demonstrated this is not reasonable or practical.
- Section 16.2 of the State Policy requires pollutants to be reduced to maximum extent reasonable and practical having regard to best practice environmental management. Increases to existing pollutant emissions are not in accordance with this principle.
- Proposed future discharge limits should not significantly exceed the lesser of current discharge limits (if contemporary) or current discharge concentration (90th %ile) performance.
- Discharge limits will be set to authorise normal operating conditions for the WWTP. Discharge limits are not set to reflect 'upset' or incident type operational conditions.
- Disinfection is a key indicator of treatment performance because it results in direct risks to human health and the pollutant is represented by indicator bacteria (rather than a measurement of the actual pathogen(s)). EPA will continue to apply the precautionary principle and set stringent limits for pathogen indicators.

- For WWTPs that discharge to substantial partial reuse (>30% of volume on 5 year average), discharge to water limits may be set on the basis of ambient impact assessments for the duration of the expected seasonal discharge (a minimum class B recycled water requirements applies), reflecting the reduced risk of this situation.
- For WWTPs that discharge to full reuse (designed to contain the wettest year in ten years, on average) due to the infrequent discharge, higher discharge limits are generally acceptable (a minimum class B recycled water requirements applies) without demonstration of the toxicant or nutrient impact zone. Where sensitive receptors that may be impacted by the discharge have been identified in close proximity to the discharge location, discharge impact assessment is required.
- AMT quality is the default future discharge limit for E. coli (and enterococci once an AMT value is determined) for all upgrading WWTPs discharging to inland waters and estuaries.
- EPA will give consideration to approving a maximum future pathogen concentration above the maximum AMT limit where sufficient evidence is provided to demonstrate the need for and extent (generally via modelling) of a mixing zone to meet low risk guideline values at the edge of the mixing zone.
- Where a future maximum pathogen limit above AMT is accepted by EPA, the AMT limit will generally be set as a percentile limit (generally P90 of 200 orgs E. coli/100 mL for inland, P50 of 200 orgs/100 mL & P90 of 500 orgs/mL for estuarine/marine) limit to ensure best practice disinfection is applied.
- An AMT equivalent nutrient mass load is the future minimum expectation for discharges to inland waters.
- All WWTPs discharging to inland waters must meet annual total nitrogen/total phosphorus mass loads limits equivalent to those under full discharge to water with AMT compliant effluent quality, based on the WWTP ADWF limit, or ADF +25% where ADF is significantly below permitted ADWF flow.
- No increases of total nitrogen/total phosphorus mass load discharge to water above current permitted loads for all WWTPs discharging to receiving water.

APPENDIX B: Default Monitoring Requirements for Discharge to Water

Effluent Quality Monitoring

Generally monthly or weekly monitoring conducted at WWTP outlet prior to discharge to reuse dam or water. Monitoring to include;

- Full suite of standard WWTP effluent monitoring parameters as per EPN requirement,
- Additional annual parameters for WWTPs discharging to effluent reuse schemes as per EPA standard monitoring requirements, and
- Additional monitoring requirements in accordance with the Recycled Water Guidelines apply at the point of discharge to the reuse scheme.

Ambient Water Quality Monitoring during Seasonal and Infrequent Discharge

During discharge (seasonal or infrequent) to waterways from WWTPs which usually discharge to recycled water schemes monitor at specified locations upstream and downstream of the outfall;

- Water quality sampling within a timeframe as specified in Permit/EPN following initial discharge, generally followed by monthly sampling intervals while discharging.
- Sample receiving water quality for:
    - ammonia, total nitrogen, nitrite, nitrate, total phosphorous, dissolved reactive phosphorus, total suspended solids, *E. coli*, enterococci, pH, temperature, electrical conductivity and blue-green algae, where specified.
- Biological monitoring at intervals as specified in Permit/EPN the frequency is specific to the estimated or actual discharge frequency.
- Sediment monitoring is required only where particular pollutants of concern that partition to sediments are identified (such as, copper, lead or zinc). Note: these pollutants should also be monitored in effluent.
- Where an ambient assessment has demonstrated that impacts of the discharge on WQOs at current levels of pollutants are unlikely, the ambient water quality sampling requirement may be reduced or waived following confirmation by water quality monitoring results.

Some key considerations relevant specifically to non-continuous discharges are:

- Sampling events are to be responsive to discharge patterns. Where it is feasible to establish upstream and downstream monitoring locations, ambient water quality monitoring will generally only be required at times when discharges are occurring with sampling frequencies adjusted to the sensitivity of the receiving environment.
- Where it is not possible to clearly differentiate between impacted and non-impacted sites, monitoring events should be designed to differentiate wastewater discharges from other aspects such as stormwater contamination. In those circumstances it will generally be necessary to undertake ambient monitoring regardless of whether a wastewater discharge occurs until the level of impact has been established.
- Statistically relevant datasets must be generated in order to characterise ambient conditions. Results of relevant monitoring undertaken in the past can be incorporated.
- For seasonal and infrequent discharges, appropriate biological monitoring to determine impacts over longer time scales is essential and must be comprehensively addressed by any monitoring plan. Sediment monitoring is required where pollutants partitioning to sediments are identified.

ENVIRONMENT PROTECTION AUTHORITY