

## Package Treatment Plant Operation and Management

### Reviewing and Approving System Applications



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## Introduction

In this session we will cover:

- Applications for approval of packaged wastewater treatment plants:
  - What information is required (by regulators)?
  - What information should be provided (by designers/proponents)?
  - What to look out for?
  - What to check?
  - How to check it?



## Background

- Uncertainty over which guidelines to use in NSW
- Variable approach from one Council to another
- Legacy of the handover from EPA to Councils
- Limited experience with package plants in many Councils
- Wide variety of systems and treatment methods
- Many old systems that are performing poorly
- Applications for approval for new systems ongoing and likely to increase in number, especially retirement villages, van parks, campgrounds etc. and wineries/distilleries
- Need sound approach to application assessment



## Background

Variety of facilities/institutions using package treatment plants:

- Very large houses with multiple bedrooms
- Mobile home villages / Caravan parks / Camps /
- National Park campgrounds
- Retirement villages / Nursing homes
- Hotel and Motels
- Resorts / Conference centres / Wedding venues
- Wineries / Distilleries
- Breweries
- Road houses
- Service centres
- Schools
- Church facilities / Meeting rooms
- Restaurants / Cafes
- Registered Clubs / Bowling Clubs
- Golf clubs / Sports facilities
- Industrial sites / Mines
- Military facilities



## Background

- Wide variation in loads:
  - From one plant to another, and
  - From time to time in any one plant
- Temporal variation (diurnal / seasonal)
  - Schools / campsites / racecourses / restaurants
- Unusual loads
  - Boutique cheese factory / Delicatessen / Distilleries
- Complex loads
  - Combined operations e.g. Winery, resort and conference centre
- Difficult loads
  - Hospital / aged care facilities / drug and alcohol rehabilitation centres / food factories / industrial sites/ retirement villages / mobile home parks with elderly / aging population



## What information is required to assist the approvals process?

Need a comprehensive list of information to ensure:

- Suitability of package treatment plant chosen
- Correct sizing of system
- Adequate operation and maintenance program
- Appropriate selection of land application system or discharge option
- Appropriate location of land application system
- Appropriate sizing of land application system



### Information sought from proponent

- A detailed list of information to be sought from a proponent to assist with the assessment of a development application for a small package sewage treatment plant follows these notes
- The list includes:
  - Information sought - categories of information and a broad description
  - Specific details
  - Rationale or reason for seeking information
- The list should be amended or refined as necessary to cover the specific needs of the site



### Information sought from proponent

Information sought:

- Project description
- Site plans
- Drainage and stormwater management plans
- Flow and load assessment
- Expected wastewater quality
- System selection
- Treatment process description



### Information sought from proponent

Information sought (continued):

- Staged development plan
- Drawings
- Estimated load for land application or discharge
- Expected treated wastewater quality
- Disinfection (means, testing/monitoring)
- Land application or disposal system selection
- Land application system sizing



### Determine Performance Requirements

- As laid down in guidelines / Standards
- Need flow and quality data in support of application (all non-domestic systems should have flow meters)
- Estimate land area availability and ensure sufficient space is available
- Consider odour control requirements in relation to proximity to receptors
- Consider likely noise levels in relation to OH&S and planning requirements
- Outline site assessment information required



### Assess Pollutant Load

- Initial desk study to collate information on load generating population, flows and quality of wastewater
  - Estimate resident population
  - Number of employees and visitors
  - Estimate water consumption
  - Multiply population figures by appropriate per capita values for:
    - Hydraulic load
    - Organic load
    - Nutrient load




### Problems with design flows and loads

- It is often difficult to obtain reliable flow and quality data, especially for small populations
- Major design issues to consider to avoid hydraulic and organic overloading and odour problems are:
  - Wastewater flow exceeding plant design through groundwater infiltration
  - Daily organic load above plant design due to seasonal influx of visitors





### Problems with design flows and loads

- Hydraulic shock loads on steep sites with short sewers or oversized pumps
- Large and rapid changes in wastewater temperature arising from trade flows
- Build up of grease and fat in treatment plant due to inadequate upstream removal (pre-treatment / lack of grease arrestor)
- Build up of solids in pump wells
- High proportion of commercial wastewater where insufficient allowance has been made to compensate for inhibition of biological treatment




### System Selection

#### System Selection and other Design Considerations


### System Selection

- There are a variety of techniques and tools available for selection of viable/suitable/acceptable treatment technologies for decentralised wastewater treatment systems, these range from:
  - Intensive/Complex – Triple Bottom Line, Net Present Value, Life Cycle Analysis and Integrated Water Cycle Management etc.
  - Rational/Semi-Quantitative – Expected System Performance, Site/System Requirements and Cost-Benefit Analysis
  - Informed/Qualitative – Vendor Bidding/Selling, Past Experience or Regulatory Prescription




### Rational System Selection

- The application of a Rational/Semi-Quantitative approach for system selection is a good “first pass” test for potential owners and managers of PTP technologies
  - Responds to regulatory limits (effluent quality) and conditions (system/environmental requirements)
  - Considers system/site limitations or constraints
  - Identifies range of appropriate alternatives
  - Matches system selection to an acceptable solution




### Rational System Selection

- Not a fixed approach
- Framework may be adjusted to suit system/site peculiarities
- While targeted at new installations, framework may also be used to examine/assess suitability of existing systems, or for consideration of system upgrades or expansion
- **Typically, we would suggest the following five-step approach**




### Rational System Selection Step 1 - Consultation

- Discuss system requirements with planning authority / environmental regulator
  - Planning Constraints (noise, odour, sensitive areas etc.)
  - System sizing (flow estimates, wastewater characteristics and variations)
  - Performance limits for both plant and re-use / effluent management systems (effluent quality)
  - Other requirements (water re-use, development staging)
  - Maintenance, Monitoring and Reporting




### Rational System Selection Step 2 - Site Assessment

- Identify site characteristics and potential interactions with the built and natural environment
  - Site Constraints (available land area, site levels, landform and soils, sensitive receptors, access and construction issues, power supply, site drainage/stormwater)
  - Existing / Required building elements (integration with current development, other land uses)
  - Opportunities (onsite re-use, landscape irrigation, agriculture etc.)




### Rational System Selection Step 3 - Development Assessment

- Identify development characteristics
  - Wastewater Generation (flow volumes, rates and variability, wastewater quality or characteristics)
  - Water Balance (water demand/supply, climate characteristics, irrigation potential and loading rates, storage requirements)
  - Opportunities (internal reuse, fire fighting water, ornamental)
  - Development (build-out, staging, future expansion?)
  - Resourcing (staff skill level, availability, external support)




### Rational System Selection Step 4 - Options Assessment

- Identify suitable treatment technologies using:
  - Tables comparing typical system performance, or
  - Other published sources
  - Sourced manufacturer/supplier information
- Confirm (general) option acceptability with regulatory agency staff
- Confirm with system manufacturers or suppliers that system options can meet performance limits (seek operational performance data for similar settings)
- Discuss potential problems/limitations with development staff and/or contractors




### Rational System Selection Step 5 - Cost-Benefit

- Following short-listing of possible treatment options use a cost-benefit approach to optimise system selection for a given site
- Considerations may include:
  - Capital and ongoing operational costs
  - System robustness / complexity / flexibility
  - Performance reliability
  - Specific effluent quality criteria (e.g. lowest N possible)
  - Manufacturer/Supplier support or warranty
  - Compatibility with downstream effluent reuse option




### System Performance Tables

- The following table illustrates typical performance expectations (effluent quality and sizing suitability information) a particular treatment technology
- Can be drawn up for all system types and can be used as a general guide to expected performance
- Many systems are designed for specific performance outcomes
- Where possible, manufacturers information should be used to confirm system loading and effluent quality data



### Extended Aeration Plants

Extended Aeration AS					
	Expected Effluent Quality				
BOD <sub>5</sub> (mg/L)	10	10	20	20	30
TSS (mg/L)	10	20	30	30	40
TN (mg/L)	<5	5	10	>10	--
FC (cfu/100mL)	<5	5-10	>10	--	--
Operational Scale					
1 - 50 EP					
51-200 EP					
200-1000 EP					
1000-2500 EP					



### System Performance

- Critical to have performance data for any plant
- For existing plants – helps understand - performance, identify areas for improvement and rectification
- For proposed plants confirms, validates likely performance.
- Data required for similar plant in similar operating scenario
- Data often not available or limited, so have limited assurance that proposed system will perform as expected/required



### Validity / Integrity of Information

- Need to be sure that the information provided is appropriate, valid and suitable for use
- Manufacturers tend to make great claims, but can they be supported?
- Information comes from a wide range of disciplines, so need to be sure consultant or designer has access to and has used the necessary skills of a range of professions

It is not just the treatment plant so ...

- Need appropriate selection and design of both the plant and the land application area or discharge option

