

Package Treatment Plant Operation and Management

**Risk Assessment and
Management**



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Risk Assessment Standard AS ISI 31000:2018

- Establish Context
- Communicate & Consult
- Identification of Risk
- Analysis of Risk
- Evaluation of Risk
- Treatment of Risk
- Monitor & Review

The risk management process




Figure 1 The Risk Management Process




Establish Context

- Risk Assessment prepared for Risks Associated with the:
 - Wastewater Treatment Plant
 - Wastewater Irrigation System
 - Wastewater Pump Stations
- To ensure the protection of the sensitive surrounding environments
 - Groundwater
 - Surface Water
 - Human Health




Context – Case Study

- PTP installed at a resort in a coastal town in Tasmania
- The resort will produce approximately 50,000L wastewater per day
- Secondary treatment with UV disinfection and Nitrogen Reduction
- All wastewater is treated in the PTP for irrigation of the lawns and gardens around the resort



Context – Case Study

- The plant and irrigation fields were appropriately designed and sized for the daily loads and have been approved by Council
- The resort is located on sand dunes and there is a high seasonal groundwater table
- The resort is set back approximately 100 meters from the coastal mean high water mark






Wyndham Resort




Package Treatment Plant Operation and Management

Cessnock, NSW

8-9 June 2021

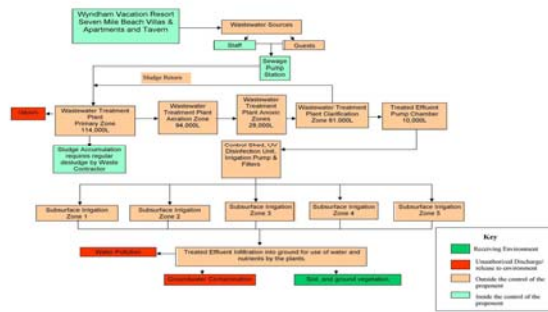
Communication and Consultation

Risk Assessment Workshop

- Who is involved?
 - Owner,
 - Operator,
 - Regulator,
 - Designer/Installer.
- Identification of Risks
 - What can happen?
 - Where and when?
 - Why and how can it happen?



Identification of Risks



Identification of Risks

Reference	Risk	Where	When	How
1	Failure of Plant	WWTP	Anytime	Vandalism, Power failure, fire, peak/low flows, Mechanical breakdown
2	UV Disinfection failure	WWTP	Anytime	Mechanical Breakdown, Power failure, poor effluent quality
3	Availability of Replacement parts	WWTP/ Irrigation Area	Frequently	Suppliers of equipment based on mainland
4	Natural Environmental Disaster	Resort	Unpredictable	Storms, Any Natural Event
5	Power Failure to Plant	WWTP	Frequently	Trees Storms, Substation problems
6	Fire	Resort	Anytime	Lightning



Analysis of Risks

- Develop an understanding of the risks
- Provides input into decisions on whether risks need to be treated and the most appropriate and cost effective risk treatment strategies
- Consider sources, their positive and negative consequences and the likelihood that those consequences may occur
- Factors that affect consequences and likelihood may be identified



Analysis of Risks

- A preliminary analysis can be carried out so that similar risks are combined or low impact risks are excluded from detailed study
- Excluded risks should still be listed
- Consequences and likelihood are assessed in the context of the effectiveness of the existing strategies and controls
- Consequences and likelihood can be estimated using qualitative assessment or quantitative assessment - statistical analysis and calculation



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Analysis of Risks

- Sources of information should include past records, practice and relevant experience published literature research, consultation, experiments prototypes, models, expert judgement
- DWE (2008) Interim NSW Guidelines for Management of Private Recycled Water Schemes, Department of Water & Energy



Analysis of Risks

- Risk Assessment Rationale

Table 2 Likelihood

Score	Descriptor	Definition
E	Almost certain	Event is expected to occur (several times/year)
D	Likely	Event will probably occur (once ever 1-3 years)
C	Possible	Event might occur (once every 3-10 years)
B	Unlikely	Event could occur (once every 20 years)
A	Rare	Event will occur only in rare circumstances (once every 100 years)



Analysis of Risks

Table 3 Consequence

Score	Descriptor	Definition	
		Human Health	Environment
5	Catastrophic	Severe illness or death affecting a large population	Severe permanent environmental impact
4	Major	Severe illness or death affecting a small population	Severe long term environmental impact
3	Moderate	Short term, low level illness, affecting large population	Localised medium term environmental impact
2	Minor	Short term, low level illness affecting small population	Localised short term environmental impact
1	Insignificant	No detectable human health illness	No detectable environmental impact



Analysis of Risk – Risk Matrix

Risk Ratings

		Consequence				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	E Almost Certain	Low	Medium	High	Very High	Very High
	D Likely	Low	Medium	High	Very High	Very High
	C Possible	Low	Medium	Medium	High	Very High
	B Unlikely	Low	Low	Medium	High	High
	A Rare	Low	Low	Low	Medium	High



Risk Analysis – Case Study Example

Risk	Likelihood	Consequence	Risk Rating
Odour	E	1	Low
Water Pollution	C	3	Medium
Monitored Plant failure	D	1	Low
Unmonitored Plant Failure	E	4	Very High
Irrigation Area Failure	C	2	Medium
Human illness	B	2	Low
Groundwater Contamination	C	3	Medium
Human or animal Disease outbreak	A	4	Medium



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Evaluate the Risks

- To make decisions based on the outcomes of risk analysis
- Which risks need treatment and establish those priority risks
- Compare the level of risk found during the analysis with the criteria established when context was considered



Evaluation of Risk – Case Study

Risk	Risk Rating	Risk Priority	Justification
Odour	Low	High	Amenity
Water Pollution	Medium	High	Public Amenity
Monitored Plant failure	Low	High	In order mitigate other risks
Unmonitored Plant Failure	Very High	High	Plant must be monitored
Irrigation Area Failure	Medium	Medium	Design and monitoring to be implemented
Human illness	Low	Low	
Groundwater Contamination	Medium	High	Public Amenity
Human or animal Disease outbreak	Medium	Medium	Public Amenity



Treatment of Risks

- Identify a range of options for treating risks assessing these options and the preparation and implementation of treatment plans
- Must balance the cost of each option against the benefits derived from it
- Cost of managing risk needs to be commensurate with the benefits obtained
- All direct or indirect costs must be considered financial or other



Treatment of Risks

- Legal and Social responsibility may override financial costs
- Treatment plans document how the chosen options will be implemented
- They should include: Proposed actions, resource requirements, responsibilities, timing, performance measures and reporting and monitoring requirements



Treatment of Risks

Identification of Risks		Evaluation of Risks		Treatment of Risk			
Risk	Risk Rating	Risk Priority	Existing Controls	Proposed Controls	Revised Rating	Comments	Treat Risk Y/N
Failure of Plant	Medium	High	Alarms	Monitoring, Alarms, Quarterly Inspection, Daily inspections	Medium	No change to risk with controls	Y
UV Disinfection failure	Low	Medium	Primary & Secondary Treatment	Cleaning, Inspection Maintenance and regular tube replacement	Low		Y
Availability of Replacement parts	Low	Low	Backup equipment kept by service provider	Source more backup equipment and lead times	Low	Financially High Risk	Y
Natural Environmental Disaster	Very High	Low	Emergency Procedures, Management Plan	Include in O&M Plan	Very High	Cannot reduce rating as controls will not stop from happening	N
Power Failure to Plant	Low	High	n/a	Generator backup to plant, pump truck availability	Low		Y
Fire	High	High	Water for fire control, Mopower	Asset Protection Zone around plant	Medium		Y



Monitor and Review

- Prepare Risk Assessment Report
- Report will be kept onsite and regularly reviewed and updated by Plant Management when new risks become apparent or old risks are eliminated or reduced due to changes in procedures or activity
- Update frequency – Annual Reviews

