

TRADE WASTE MANAGEMENT PLANS

**A GUIDE AND INDUSTRY TEMPLATE
FOR IMPROVING TRADE WASTE DISCHARGES**



A VICTORIAN TRADE WASTE INITIATIVE

Comments and acknowledgements

The production of these guidelines was funded by EPA.

A partnership between the Victorian Water Industry Association (VicWater) and the EPA was developed in 2002 that aims to reduce trade waste. A sub-committee representing individual water business*, EPA and VicWater developed this Guideline and Industry Template.

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Photography: Thanks to Ferro Chemicals, Masterfoods and SPC Ardmona for the photographs relating to their case studies. Other photographs by Katrina Hermann, VicWater.

This publication was printed on Cyclus offset 100% recycled fibre.

* Business represented: Barwon Water, Central Highlands Water, Goulburn Valley Water and South East Water.



TRADE WASTE MANAGEMENT PLANS

(TWMPs)

TERMINOLOGY

WATER BUSINESSES: Victoria's regional urban water authorities, and metropolitan retail and wholesale water companies, that collect and treat trade waste discharged to sewer.

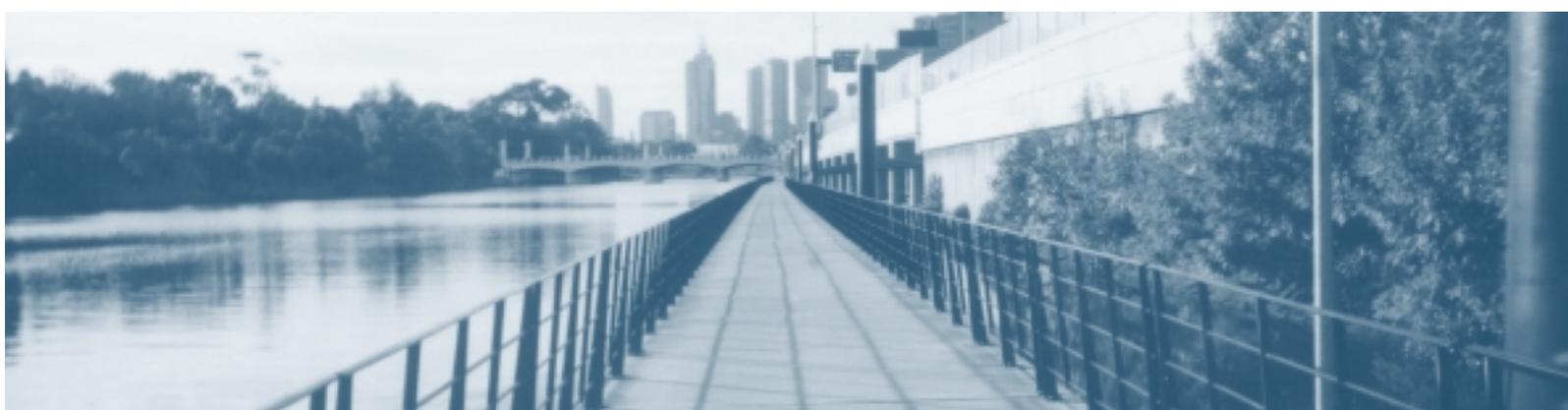
COMPANY: The businesses and organisations that discharge trade waste to the sewerage system.

EPA: Environment Protection Authority, Victoria. <http://www.epa.vic.gov.au>

VICWATER: Victorian Water Industry Association (VicWater).
<http://www.vicwater.org.au>

TWMP: Trade waste management plan (revised plan focusing on minimising flows and/or a specific critical load(s) or contaminant(s)).

TRADE WASTE: Trade waste is a discharge to sewer from industrial and commercial premises, specifically excluding wastewater from domestic residences and origins.



Why this guideline has been developed

The purpose of this guideline and the accompanying template is to assist companies to prepare and implement waste management plans focussed on reducing flows and/or specific elements of their trade waste discharges. This process should lead to outcomes that provide a benefit to the company as well as water businesses and the environment.

The strongest gains in trade waste reduction and cost savings come from reducing waste at the source using the principles of avoid, reduce, reuse and recycle. The higher up the waste hierarchy a company goes to reduce its waste the greater the financial benefit.

Equipment changes may be viewed as a 'permanent fix' in achieving water efficiency, cleaner production and trade waste management improvements. Changing employee behaviours, such as an operating procedure, may be viewed as a quick and inexpensive way to achieve similar savings without up-front capital expense. In reality, both the technical and human side of trade waste management issues must be addressed. Consistent training and awareness in combination with proper tools and equipment will achieve more permanent trade waste savings.

A PARTNERSHIP APPROACH

A key challenge for companies is to manage trade waste in a way that:

- Achieves their own business goals and increases efficiency;
- Allows their local water business to properly manage its treatment plants and assets;
- Meets the expectations of the local community and
- Minimises harm to their local environment.

In recognition of the advantages that a cooperative effort can deliver, this guideline has been developed to encourage a good working relationship between individual companies, their local water businesses and EPA to deliver the best outcome.

TRADE WASTE AGREEMENTS

Companies discharging trade waste to sewer are required to operate within the terms of a trade waste agreement negotiated with their local water business. The development of an effective TWMP should be considered a complementary tool for achieving best practice trade waste management in conjunction with the terms outlined in your trade waste agreement.

A template has been produced as a companion to this guideline to provide a practical tool for companies to use when preparing their TWMP.

Developing Your Trade Waste Management Plan

1

DETERMINE WITH YOUR LOCAL WATER BUSINESS

Either at the request of your local water business, or through your initiative, meet with your trade waste representative to determine any flows, critical loads or contaminants that should be prioritised for reduction. This will depend on your local water business' (current and predicted) acceptance standards and your present and future production processes and costs. (Ideally, you should consider 5 to 10 years forecasts of growth). At this meeting determine:

- the flows/contaminants/loads that need to be reduced;
- the amount these contaminants/loads need to be reduced; and
- when these reductions need to take place.

These three parameters will become the objectives of your TWMP. Also identify any other specific conditions that need to be met to ensure no unintended adverse consequences occur as a result of the works. For example, reducing flows without improving quality can lead to increased concentrations of pollutants going to sewer, which may have implications for the safe, ongoing operation of the sewer system.

2

OBTAIN SENIOR MANAGEMENT COMMITMENT

Senior management commitment is an essential ingredient. Unless your management is aware of what you are intending, your plan is unlikely to get off the ground. You need to ensure:

- Management is aware of your plans and what the company is aiming to achieve.
- Adequate resources can be allocated to the project.
- You can engage other employees in the process.
- All goals, targets and objectives are supported.

Throughout this process you will need to keep senior management informed of progress. One of the best ways to do this is to have someone from management on the project team.

PILKINGTONS – DANDENONG, VICTORIA

CASE STUDY

In the early 1990s the international glass manufacturer Pilkingtons appointed a Director of Environmental Affairs, with global responsibility, and developed a corporate environmental policy that included waste minimisation. To implement this policy in 1993-94 the company set itself a target of reducing waste by 50% by the year 2000.

3

ESTABLISH A PROJECT TEAM AND APPOINT A PROJECT MANAGER

The project manager is responsible for all aspects of the project. The project manager will be responsible for organising the team and assigning duties. She/He will keep the project team on schedule, through either weekly or fortnightly meetings. She/He should also ensure minutes are kept of meeting outcomes.

The project manager needs to not only possess technical skills but good communication and project management skills. The project manager must be able to motivate the team and be able to liaise with senior management and your local water business. The project team should be a small multidisciplinary team that can advise across relevant business areas. The project team should have people with adequate responsibility and/or specialist knowledge of a particular waste stream or process area. The project team may include for instance:

- site or works manager
- production manager or technical manger
- environmental engineer or officer
- sales manager
- supervisor with hands-on knowledge of how the process is actually conducted

The exact size of the project team will depend on the complexity of the project. If the project complexity is minimal and operational staffing small, the team may only consist of one person. If the project is large, the team may consist of between 6-8 people or multiple teams with responsibility for defined sections of the site.

FERRO CHEMICALS – GEELONG, VICTORIA

CASE STUDY

Ferro Chemicals produce a range of sulfur and ammonia based chemicals for the photographic, paper, agricultural, mining and food processing sectors. Ferro decided to undertake a waste management plan to reduce the loads being disposed to sewer and the resultant charges from the local water business.

The company consists of 10 full-time employees, so the project team was kept small, comprising the plant manager, site laboratory technician and an external consultant employed on a part-time basis. By using the WMP, Ferro's reduced its trade waste discharge concentration of sulfur by 45per cent and nitrogen by 87per cent. This resulted in the company's trade waste discharge costs decreasing by more than 40 per cent.



4

DEFINE TARGET AREAS OF THE PLAN

Once you've established a project team, your initial meeting(s) will define the key areas or processes of your company's operations that may be causing the trade waste flows/contaminants listed in the objectives of the TWMP. This will include defining all the apparatus and business units on the site, or sites, that produce a trade waste discharge containing the contaminants of concern.

VICTORIAN HIDES & SKINS – SUNSHINE, VICTORIA

CASE STUDY

VHSP Pty Ltd is one of Australia's major processors of bovine hides and skins. Processes include brining & salting, wet blue and the processing of pelts. Each year environmental objectives and targets are established and an environmental plan is implemented. Environmental targets were set to reduce biological oxygen demand (BOD), suspended solids (SS), sulfur and volume of effluent. Since a significant source of these contaminants came from the wet blue process, it was this area the company decided to target in its plan. As a result of the planning process the company identified and implemented improvements within the process that reduced BOD by 76 per cent, SS by 76 per cent, sulfur by 74 per cent and total effluent volume by 13 per cent.

5

COLLECT BACKGROUND INFORMATION

The project team's first action is a desktop review of the plant's design layout and corresponding data. This will provide an overview of the production system and the associated trade waste discharges. However, please note that in practise, the documented procedures are not always followed or may have been modified. Things to look at include:

- ▶ production activities at the site;
- ▶ readily available information on each activity (eg monitoring data, costs and procedures);
- ▶ overview of all substances and materials;
- ▶ overview of all wastes and emissions;
- ▶ environmental protection measures;
- ▶ regulatory requirements for each activity;
- ▶ all known water or trade waste problems;

5.1

SITE PLAN

A site plan provides an overview of the entire site. It is important in determining where processes/activities occur, as well as any obstacles and general logistics that may hinder or assist improvement options.

5.2

TRADE WASTE PROCESS

A process flow diagram should be prepared for each of the target areas defined in section 4 above, to monitor inputs from the beginning to end of the process, while tracing the generation of trade waste. It will help to pinpoint which parts of each process the team should concentrate on. A process flow diagram template and completed example is provided in Appendix A.

When you have identified the priority steps within each process, complete the table provided in section 5.2 of the TWMP template ranking the generation points for each contaminant from highest to lowest.



5.3

SITE WALK THROUGH

Next, the project team should undertake a 'site walk through' to trace the actual steps resulting in trade waste generation. A checklist or agenda is a good way of ensuring all the important points are addressed. The checklist should be prepared in advance of the 'site walk through' and should be distributed to all personnel involved in the inspection.¹ Items on the checklist might include:

- observation of work practices and procedures (how people are working)
- any leaks, spills or puddles on the floor
- whether the process is happening the way it should on paper
- how cleaning is undertaken
- can any of the waste be eliminated at first glance

A template recording observations during the 'site walk through' and an example is attached in Appendix B of the template. After the 'site walk through' add any priority areas that contribute to the flows/contaminants of concern to the table in section 5.2.

MASTERFOODS – BALLARAT, VICTORIA

CASE STUDY

Masterfoods Snackfood manufactures confectionery products and produces a high strength organic trade waste stream. To comply with their global policy, Masterfoods conducted a waste audit of their processes including a 'site walk through' and found that solid organic matter was being washed down the drain. By providing drums and bins for the solid material, the company was able to resell the recovered waste as a stockfeed. As a result, the organic load on Masterfood's treatment facility was more than halved. Flow on benefits included a 20 per cent reduction in sludge processing, additional income from the stock feed and reduced operational expenditure.



6

IDENTIFY AND ASSESS OPTIONS FOR IMPROVEMENT

This is the most important part of the project because this is where the ideas for potential improvement are found. In practise, beneficial ideas can be generated at any time, so remember to record all ideas as they occur.

Firstly determine the root cause of the flows/contaminants for each process step listed in the table in section 5.2. An example and table for determining the 'root cause' of flows/contaminants in a process is provided in Appendix C.

Systematically identifying improvement options can take many weeks and should be conducted carefully. A program of sampling, analysis and measurement may be required as well as some investigation into the fate of the waste and its environmental impact. The project team should be methodical and patient, and note any potential ideas for waste reduction during the assessment.

Where do I start?

A comprehensive set of trade waste minimisation options needs to be drawn up for each waste stream. The identification of options involves three steps:

- 1** brainstorming any possible options, regardless of cost or impact;
- 2** initial screening of identified options; and
- 3** detailed analysis of the priority options.

6.1

BRAINSTORMING OPTIONS

The generation of trade waste minimisation options does not need to be limited to the suggestions of the project team (see Tip 1 on the following page). Creative thinking should be encouraged during this process, as the aim is to come up with a list of possibilities that will be more thoroughly investigated later on. The following techniques and concepts should be considered when developing the trade waste minimisation options:

- Source reduction
- Good operating practices/ staff training
- Technology changes
- Input material changes
- Use of alternative inputs
- Product changes
- Recycling
- Use and reuse
- Reclamation



6.2

INITIAL SCREENING PHASE

The preliminary screening of options, involves ranking the options in order of merit, with the highest-ranking options identified for more detailed technical and economic feasibility analysis. Options can be screened by informal review, involving a decision by the project manager or a vote by the team, or by quantitative methods like the weighted sum method.ⁱⁱ

Regardless of the method employed, the screening procedure should consider the following:

- What are the expected direct and indirect benefits gained by using this option?
- Does the necessary technology exist and/or can housekeeping measure be taken to implement this option?
- Will it be cost-effective?
- What is the implementation period?
- Has the option been verified to work in your situation? Or is there sufficient evidence that it will work?

Tip 1 Ask for help

There is a wealth of information both internally and externally on waste minimisation. The people on the factory floor are likely to have ideas since they work with the system directly. Hold a workshop, create a suggestion box and even offer incentives for the most innovative ideas. Ask staff who know your plant the best, to give you ideas.

Asking your local water business or regional EPA officer for ideas is another option. If sufficient information has not been generated from within your business, arrange a meeting with the project team and others from outside your organisation to 'brain storm' the issue.



Tip 2 Think outside the square

At the outset it may be beneficial for the Project Team to take a step back from the day-to-day operations of the plant. By taking a 'bigger picture' view of the overall production and distribution process, you may identify innovative options for monumental improvement.

Rather than making preliminary investigations at a micro level (shop floor), it may be worth asking questions more broadly across your organisation. For example, by speaking to different operational units you may identify symbiotic opportunities i.e. outputs in one section that could be used as an input somewhere else in the process (eg. heat, water for cooling). You may identify big savings that would not be visible if each operational unit is analysed individually.

Other questions the project team might want to consider are:

- What is produced and why?
- Are there production units that may be able to work together for mutual advantage?
- What new technologies or techniques exist?
- What are other businesses doing to achieve the same or similar outcomes?
Are there examples from other businesses that you could learn from?
Ask around.
- How do we encourage our staff to give us ideas about potential improvements in the system?
- What current discharges, if isolated or treated, could become a possible saleable product or a substitute for current inputs?
- Are there any other local industries that might be able to use these by-products or can we use their by-products?



6.3

DETAILED ANALYSIS OF PRIORITY OPTIONS

You should now have a manageable number of options that are practical and worthy of further detailed analysis. A feasibility analysis, consisting of both technical and economic evaluations, should be carried out on the options.

The table below lists some aspects that should be addressed by these evaluations.ⁱⁱⁱ

Technical Evaluation	Economic Evaluation
Product quality	Capital cost
Safety and occupational health	Operating cost
Production constraints and flexibility	Potential savings (include any reduced quality/ volume charges or other non-compliance penalties)
Space requirements	
Installation requirements/ down time	Profitability requirements (payback period, net present value, and return on investment calculations)
Reliability	
Commercial availability	Intangible or qualitative benefits (improved corporate image, reduction in risk of non-compliance penalties)
Proven performance in a similar application	
Operator expertise and skill required	Payback period.
Potential new trade waste issues	

Other things to consider when evaluating options include:

- treatment and disposal costs
- lost raw materials costs
- compliance costs (eg monitoring, potential fines)
- OH&S improvements
- public image
- external relationships
- labour
- insurance premiums
- rate of return on investment
- energy and water costs
- maintenance costs
- time delays

To assist companies to analysis options, a table and example have been provided in Appendix D.

SPC ARDMONA – GOULBURN VALLEY, VICTORIA

CASE STUDY

SPC Ardmona is a top 200 ASX-listed food manufacturing company. Its core product range is deciduous fruit (pear, peach, apricots, plums and apples), baked beans, spaghetti and tomato sauces. Its two facilities in the Goulburn Valley process approximately 260,000 tonnes of fruit annually.

After gathering the relevant information the company identified the root cause of the problems then identified and assessed possible options. The company focused on improving equipment design and operator techniques that included:

- employing dry cleanup methods.
- ensuring hoses/taps were turned off when not in use.
- fixing leaks.
- appointing water monitors on each shift to communicate responsibilities.
- installing a medium pressure ring main system.
- directing condensate return from evaporators to the boilers.
- upgrading the trade waste facility, including solids recovery and the introduction of telemetry systems.
- incorporating bonuses and responsibilities into job descriptions.

The company saved approximately 550ML/year of potable water (30 per cent reduction) and reduced their trade waste by 475ML/year. It is estimated approximately 70 per cent of the water and trade waste reductions were associated with culture change.



7**DEVELOP AN ACTION PLAN**

Now that you have a list of improvement options, you should prepare a draft action plan to identify:

- What actions are to be taken?
- Which part of the process the action relates to?
- What type of improvement to trade waste will be achieved (eg. 20 per cent reduction in TDS)?
- When each action will be started and completed?
- Who will complete each action?
- How the action will be evaluated after it is completed?
- Will it reduce the contaminants of concern?

A table has been provided in section 7 of the TWMP template to record the actions that will be undertaken. Refer to the template example and transfer information where appropriate.

8**GAIN INPUT FROM LOCAL WATER BUSINESS FOR ACTION PLAN**

A meeting should be organised to discuss the plan with your local water business. It is important that the water business is aware of the proposed actions to minimise trade waste discharges.

Forward a copy of the draft action plan to your local water business prior to the meeting. At the end of this meeting both the company and the water business should have agreement on:

- The actions that will be undertaken by the company to reduce trade waste.
- The order in which these actions will be taken.
- When these actions will be completed.
- What type of monitoring will be used to measure progress and how and when it will be submitted.
- When the review of the action plan will be held.
- Other issues where appropriate.

RIVERLAND OILSEED PROCESSORS PTY LTD

Riverland Oilseed Processors is an oilseed crushing and extraction plant located at Numurkah, Northern Victoria. A plant expansion in 1996 created a number of environmental problems including hydrogen sulfide emissions, particulate and fugitive dust emissions and product loss to sewer. The company decided to implement an environmental improvement plan in consultation with EPA, Goulburn Valley Water and the local community. A key component to the reductions achieved was the ability to convert a waste product into a stockfeed. A 50per cent reduction in trade waste costs from \$100,000 to less than \$50,000 per annum which is directly attributable to reductions in flow, sodium (salt), phosphorus and nitrogen emissions.

9**GAIN MANAGEMENT COMMITMENT**

Using the criteria developed in your evaluations, the preferred options must be presented to senior management for approval. Senior management must endorse:

- The proposed work improvements.
- Approval for the expenditure.
- Approval of the project duration.
- Expected impacts of change on local water business, EPA, environment, community, staff, production quality, output, etc.

After any recommendations from the management team have been incorporated into the plan, the final action plan should be signed-off by senior management.

10**IMPLEMENT ACTION PLAN**

Now that the action plan is formalised, it is time for implementation. Basically this requires the project team to organise internal or external resources to undertake the required works.

COCA COLA AMATIL - MOORABBIN

Coca Cola Amatil (Australia) Pty Ltd – a soft drink manufacturer, undertook a waste management plan focussing on reducing water use. As a result the company reduced water consumption to 1.3 litres for every litre of product, becoming the third most efficient Coca-Cola plant in the world. Other spin-offs from the waste minimisation approach have been a 34per cent decrease in trade waste volumes, and annual savings of \$75,000 in water costs.

The company should thoroughly monitor the relevant waste streams before, during and after implementation of an action to determine whether improvements have occurred. Once each action is completed the company should notify their local water business. This information can be submitted with the inclusion of either monitoring data, at pre-arranged quarterly meetings or by phoning the relevant trade waste officer. Issues that should be discussed are:

- Delays in implementing any actions in the plan.
- Upsets in the process during implementation/commissioning.
- Where results did not meet expectations.
- Where results exceeded expectations.
- Other issues relating to the action plan.

AUTOMOTIVE SUPPLIER – SOUTH EAST SUBURBS

An automotive components supplier in south eastern Melbourne was having trouble with rising zinc levels in its trade waste discharge. Investigation revealed that staff were complying with stringent housekeeping procedures, and the company was unable to source any apparent problems.

The company then re-visited a waste management plan that had been prepared previously, and recognised that a project for measuring water consumption at each source had not been undertaken. Consequently, flow gauges were installed and detected that flow inputs were greater than required, contributing to the zinc problem.

By adjusting the flow rates accordingly, the load on the company's treatment plant was reduced by 30 per cent overcoming the immediate problems with zinc.

The company should review the overall success – or otherwise – of the TWMP after all elements of the action plan have been implemented. The aim of the review is to assess the value of the process and to document lessons learned for future programs. This is also the time to set new objectives for contaminants of concern not addressed in this plan. The water business should be involved in the review.

- i Further advice and assistance on conducting site inspections and identifying waste streams can be obtained from the following EPA publications:
 - Publication 351 – Waste Minimisation: Assessments and Opportunities for Industry*
 - Publication 277 – Guidelines for Preparing Waste Assessments*
- ii *EPA Publication 351 – Waste Minimisation: Assessments and Opportunities for Industry* provides an example of the weighted sum method to screen trade waste minimisation methods.
- iii Additional detailed assistance can be found in the *'Feasibility Analysis' section of EPA Publication 351 – Waste Minimisation: Assessments and Opportunities for Industry.*

Contaminants that will be addressed in the TWMP

1 _____ 2 _____ 3 _____ 4 _____ 5 _____

Objectives (what is to be done)	Amount (how much)	Time frame (when)
Eg. Reduce water consumption on site	20%	01/07/2006

Please attach flow and quality limits from your trade waste agreement to this template and tick the box when completed.

Are there any projected changes (eg increase in production or new product lines) that are likely to have a significant impact on this plan?

Yes

No

If Yes please provide details of these changes to your water business and an indication of trade waste flow and quality over the next 5 years.

2 SENIOR MANAGEMENT COMMITMENT

Do you have senior management commitment for this plan?

Yes

No

3 DEVELOP A PROJECT TEAM

Project manager: _____

Who are the members for the project team?

Name	Department/ position in company	Role in team (what they contribute to the team)

2 T

5 COLLECT BACKGROUND INFORMATION

5.1 Site plan

Attach a plan of the site to the TWMP *and tick box when completed.*

Consideration should be given to including the following in the site plan:

- Site layout
- Roads and footpaths
- Storage facilities (eg bunkers, silos etc)
- Service connections
- Hazardous goods storage areas
- Pipes and what they carry (eg water, trade waste)
- Buildings and process areas
- Treatment plants
- Discharge points

5.2 Trade waste process

Develop a process flow diagram using Appendix A for each of the target area processes/activities that generate trade waste listed in section 4 above.

Attach your process flow diagram(s) to the TWMP *and tick the box when completed.*

From the process flow diagram, identify the steps within the process that contribute to the key contaminants identified in the objectives. (Please do not include toilets, showers or other non industrial apparatus). Rank in order of priority from highest to lowest concern.

5.3 Site walk through

The team should conduct a site inspection to verify the actual operation of the process/activities (a template to assist the site walk through is provided in Appendix B).

Tick the box once the site walk through has been completed.

6

IDENTIFY AND ASSESS OPTIONS FOR IMPROVEMENT

Determine the root cause of each of the contaminants from the list in 5.1 using the format contained in Appendix C.

Tick the box when completed.

Develop options to address the root cause of the contaminants in these areas.

Tick the box when completed.

Rank each option based on the economic, technical and environmental considerations. (Refer to Appendix D for example).

Tick the box when completed.

Will any of the options to be implemented increase any other trade waste contaminants?

Yes

No

If **Yes**, consideration must be given to the consequences and if necessary, re-assess the proposed action.

7 DEVELOP AN ACTION PLAN

Prepare a draft action plan using the attached table below listing the intended actions, using the most favourable options identified in Step 6. An example of a completed action plan for an abattoir is provided below:

Action to be implemented	Part of the process	Contaminant addressed	Reduction expected	Start date	Completion date	Person responsible	Completed (yes/no)
--------------------------	---------------------	-----------------------	--------------------	------------	-----------------	--------------------	--------------------

OBJECTIVE 1: To reduce BOD to trade waste by 20%...

Use dry cleanup methods for manure	Stockyard	BOD (also water, Total N & P)	2% BOD 3% SS 7% N 8% P	Early January 2004	Mid January 2004	J. Roley (Shift supervisor)	
Update procedures for control of valves on blood collection system	Slaughter line (beef)	BOD (also SS & TDS)	4% BOD 3% SS 5% TDS	Mid January 2004	Late January 2004	J. Roley (Shift supervisor)	
Install dry dumping of paunch material	Slaughter line (beef)	BOD (also SS, Total N & P)	17% BOD 10% SS 16% N 30% P	Early June 2004	Early July 2004	P. Knight (operations manager)	

OBJECTIVE 2: To reduce water consumption by 15%...

Installation of trigger operated hand guns	Whole site	Water	2%	Early February 2003	Mid February 2004	P. Knight (operations manager)	
Install intermittent flow for viscera table wash sprays	Slaughter line (beef)	Water	5%	Late August 2004	Mid September 2004	S. Chan (quality control)	

ACTION PLAN FOR TRADE WASTE MANAGEMENT PLAN

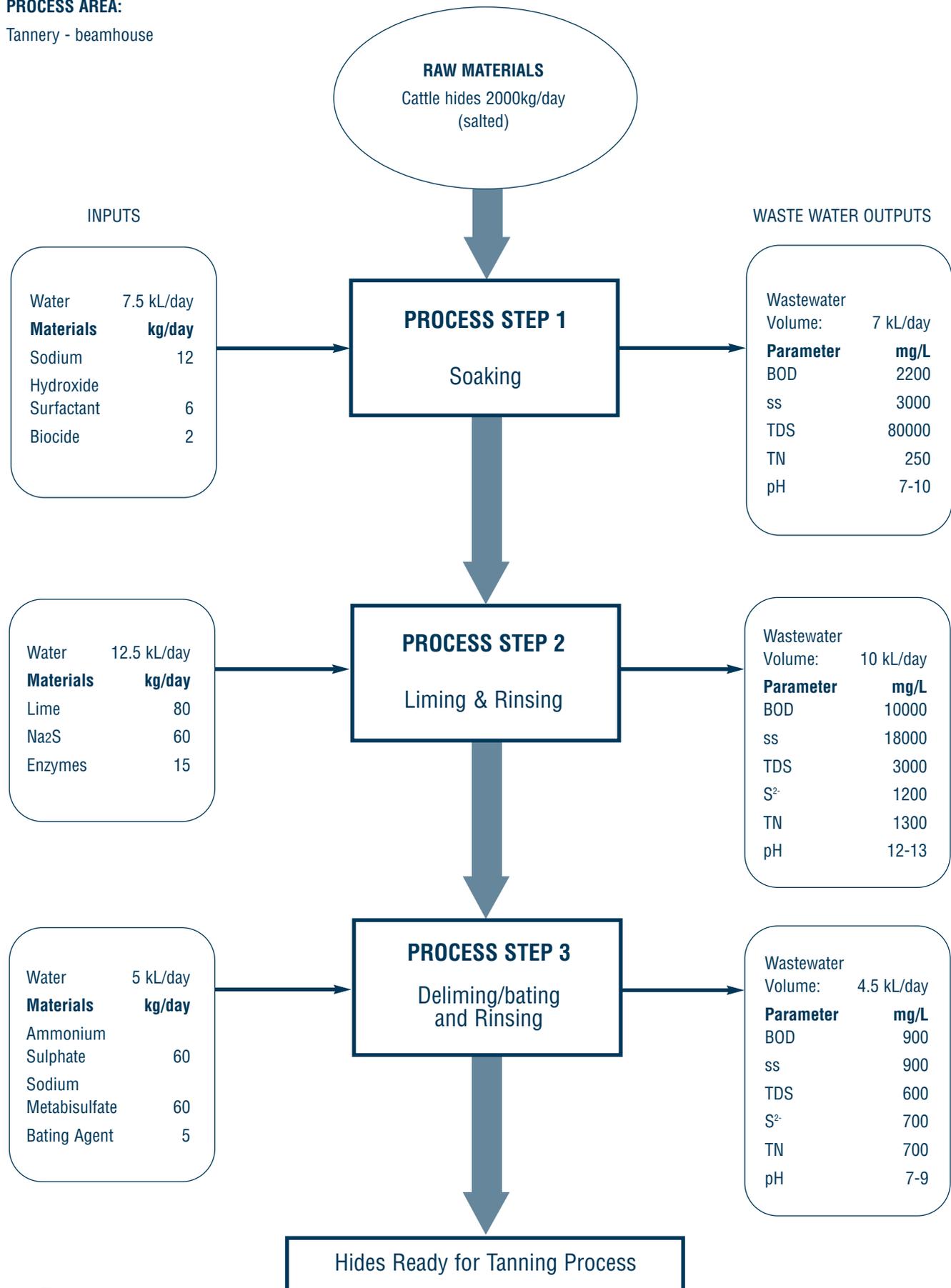
Action to be implemented	Part of the process	Parameter addressed	Reduction expected	Start date	Completion date	Person responsible	(yes/no)
Objective 1:							
1.							
2.							
3.							
Objective 2:							
1.							
2.							
3.							
Objective 3:							
1.							
2.							
3.							

Plan review date:

APPENDIX A: PROCESS FLOW DIAGRAM EXAMPLE

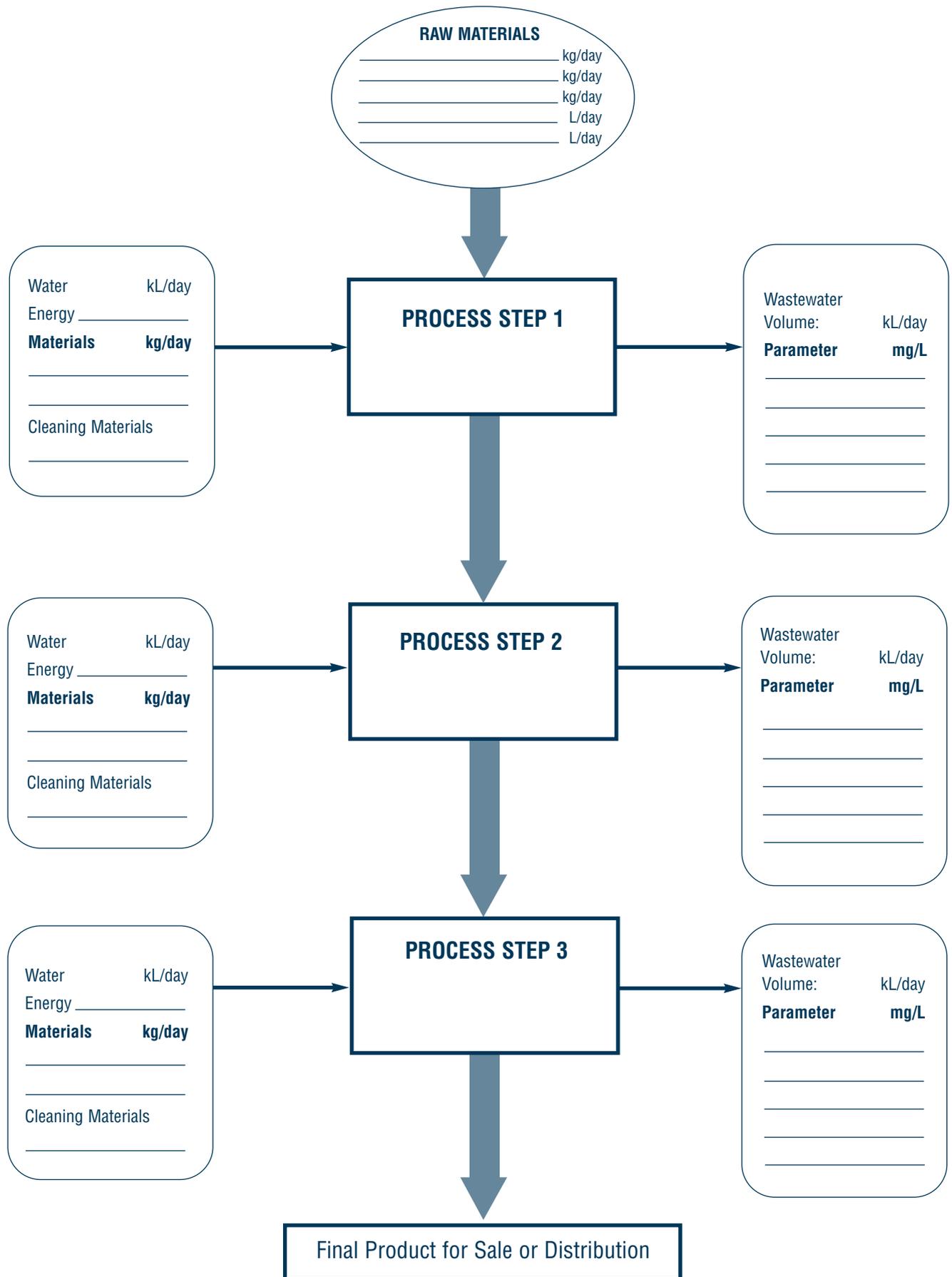
PROCESS AREA:

Tannery - beamhouse



PROCESS FLOW DIAGRAM TEMPLATE TO COPY

(Please add more process steps where necessary)



APPENDIX B: SITE WALK-THROUGH EXAMPLE AND TABLE

SITE WALK THROUGH TABLE EXAMPLE

Site location or process: HEAT TREATMENT – HOT DIPPING TOOLS IN SALT SOLUTIONS

POINT OF INTEREST	CONCERN	ACTION
Super heated salt bathing.	Tools submersed in salt solution drain onto floor when removed from bath.	Investigate options for collecting and recycling saline runoff.
High concentrations of sodium are used in this process.	Sodium can jeopardise the sustainability of wastewater re-use.	Investigate the suitability of alternative salt types, eg: magnesium.
Process is very small in comparison to that of other local heat treatment firm.	Unnecessary duplication of process.	Investigate need for in house heat treatment. Can it be outsourced?

SITE WALK THROUGH TEMPLATE

Site location or process:

POINT OF INTEREST	CONCERN	ACTION

APPENDIX C: ROOT CAUSE EXAMPLE AND TEMPLATE

EXAMPLE FOR IDENTIFYING THE ROOT CAUSE OF A PROBLEM

Site location or process: ABATTOIR - STOCKYARDS

PROBLEM	WHY	REASON
High BOD load in trade waste from stock yard (identified in process flow diagram and table in 5.2)	Why is the BOD load high from the stockyard area?	Investigation shows that BOD is contributed from by manure and other organic matter in the stockyard.
	Why is BOD contributed manure and other organic matter?	Manure and organic matter is being washed into the sewer during cleaning.
	Why is manure and organic matter being washed into the sewer during cleaning?	Operators washing manure into the sewer during cleaning operations.
	Why are operators washing manure into the sewer during cleaning operations	Current training and cleaning procedures state that stockyards are to be hosed down at the end of the shift.

SOLUTION: Retrain operators to shovel or sweep up manure and other solid organic matter instead of washing it into the sewer.

ROOT CAUSE TABLE (should be undertaken to identify cause of problems)

PROBLEM	WHY	REASON
	Why	

SOLUTION:

APPENDIX D: RANKING OPTIONS

EXAMPLE OF RANKING OPTIONS

Process: METAL FINISHING

ACTION	ECONOMIC EVALUATION	TECHNICAL EVALUATION	TRADE WASTE REDUCTION	PRIORITY
Reduce drag out from process baths to rinse tanks	<ul style="list-style-type: none"> ● Low cost ● Payback 0.3 years 	<ul style="list-style-type: none"> ● Easy to implement 	<ul style="list-style-type: none"> ● 20% reduction in TOS ● 10% reduction in TDS 	1
Repair leaks identified in site walk through	<ul style="list-style-type: none"> ● Low cost ● Payback 0.2 years 	<ul style="list-style-type: none"> ● Easy to implement ● Can be done after hours 	<ul style="list-style-type: none"> ● 20,000L/year in volume 	2
Substitute dilute HCl for H ₂ SO ₄ in cleaning	<ul style="list-style-type: none"> ● Low cost ● 0.5 years 	<ul style="list-style-type: none"> ● Reduced OHS risk ● Easy to implement ● No affect on process 	<ul style="list-style-type: none"> ● 5% reduction in TOS ● Reduction in pH 	3
Installation of heat exchanger	<ul style="list-style-type: none"> ● Medium cost ● Payback of 2 years 	<ul style="list-style-type: none"> ● Modification to process needed ● Minor downtime 	<ul style="list-style-type: none"> ● Reduction in temperature by 5°C 	4
Installation exchange system to recover sulfuric acid	<ul style="list-style-type: none"> ● Large cost ● Payback of 3 years 	<ul style="list-style-type: none"> ● Limited space ● Requires downtime for installation ● Requires some process modification 	<ul style="list-style-type: none"> ● 35% reduction in TOS ● 15% reduction in TDS 	Further investigation required
Substitute H ₂ SO ₄ in process bath	<ul style="list-style-type: none"> ● Low cost ● Payback 0.5 years 	<ul style="list-style-type: none"> ● Not possible (product quality affected) 	<ul style="list-style-type: none"> ● 70% reduction in TDS ● 50% reduction in TOS 	Not possible

