Tarago rail yards lead contamination

Information pack

May 2020

What we have done so far

- Set up a dedicated team of professionals, consultants and experts to carry out extensive testing, data analysis and investigation
- Brought in other government agencies to help provide expert advice across a range of issues including contamination outside the rail corridor
- Set up a dedicated website, phone number and email address
- Regular contact with various stakeholders including Goulburn-Mulwaree Council, Member for Goulburn, Heron Resources, Veolia, Department of Education
- Completed laboratory analyses on over 700 soil, water, dust and paint samples
- Completed in field XRF testing on over 250 soil samples
- Set up dust monitoring at four locations within the community
- Tested 32 residential properties and 9 discrete public spaces. Progressively contacting residents and community groups with results
- Set up 7 groundwater wells and 8 surface water monitoring locations within the rail corridor and on public land
- Contacted 24 households and 12 medical clinics to organise self nominated blood testing
- Removed the timber sleepers from the rail corridor
- Applied a polymer spray in the rail corridor to bind exposed soil and reduce dust and silt runoff
- Drafted a Voluntary Management Proposal for submission to the EPA

NSW Environment Protection Authority (EPA)

- The NSW Environment Protection Authority (EPA) is the primary environmental regulator for NSW. We partner with the community, business and government to protect human health, prevent the degradation of the environment and to reduce pollution and waste
- The EPA regulates contaminated land under the Contaminated Land Management Act 1997 (CLM Act) where contamination is significant enough to need regulation
- The EPA has powers to take action to ensure that contaminated land is investigated and cleaned up to an appropriate standard

The EPA:

- ✓ has reviewed the assessment of the Tarago railway yards and the extent of the lead contamination;
- ✓ has declared the Tarago railway corridor as significantly contaminated land under the Contaminated Land Management Act 1997; and
- ✓ is regulating Transport for NSW to ensure an appropriate voluntary management proposal is developed to progress further investigations and ensure the remediation of the contamination.

NSW Health

- Our role is to identify, prevent and minimise public health risks within our community
- NSW Health provides advice on potential health issues in response to presence of lead in the environment, particularly in children
- Blood lead levels exceeding 5 micrograms per decilitre are notified to NSW Health. Investigation can take place to identify the source of the lead, any broader risks exist to the community, and to assist GPs in medical management of cases where required

Work to date:

- ✓ Working with the community who have concerns about the potential to have elevated lead levels in their blood
- ✓ Working with partners to understand the source of lead and advising individuals on ways to reduce the risk to health from lead in the environment
- ✓ Engaging the Department of Education on management of drinking water in Tarago Public School

Department of Education

The role of Infrastructure Services in the Department of Education is to manage school property and keep parents informed of work.

Work to date:

- ✓ Commissioned testing in Tarago Public School by an independent hygienist, Greencap Pty Ltd, to conduct initial, targeted lead sampling and a preliminary risk assessment
- ✓ Greencap tested water, airborne lead and surface lead dust and soil
- ✓ A management plan has been put in place based on Greencap's recommendations, including:
  - o flushing tap water that has sat in pipes after school closure periods
  - o environmental deep clean of the school buildings
  - o four outside areas where elevated lead levels were found were remediated during the recent vacation
- ✓ As an additional precaution bottled water is being supplied for drinking water

Sources of contamination

- The historical lead ore activities in the rail yard are likely the primary source of contamination in the rail corridor
- These activities are also likely to have contributed to some off-site contamination
- The project team is currently assessing impacts within the rail corridor and within the township
- Other sources of lead in the environment need to be considered such as lead paint, building products, former leaded fuel exhausts, and other sources common in residential areas
- We are preparing an interim site management plan to ensure any immediate health risks are managed. Work on-site has already occurred as part of this

Reducing dust and run-off in the rail corridor

What does this mean for me?

- Results indicate localised off-site migration of contamination has occurred via movement in surface water and via airborne dust
- Private property testing indicates some potential risks related to soil, dust and sediment in rainwater tanks. We are communicating these with affected residents
- Existing data indicates risks from the presence of lead to the broader community are generally low and acceptable

What the testing shows

Soil

- Results indicate lead in most areas tested outside rail corridor fall below relevant thresholds
- Lead concentrations in soil within areas of the rail corridor exceed relevant thresholds
- Localised areas of lead contamination along the haul route from the mine to the rail corridor exceed guidelines

Groundwater

- Testing in rail corridor and public spaces show the presence of lead is below Australian drinking water guidelines

Surface water

- Results indicate contamination within watercourses downstream of the corridor is localised
- Contamination at the time of testing has not been observed in the Mulwaree River

Dust

- Dust monitoring results are captured over a longer period of time to include variations in weather conditions. We will supply results to the community as they become available

Voluntary Management Proposal

- The draft Voluntary Management Proposal (VMP) is available with this information pack and has had a preliminary review by the NSW Environment Protection Authority (EPA)
- The final VMP will be submitted to the EPA by 25 May for approval. The VMP is required under the Contaminated Land Management Act 1997
- The VMP primarily focusses on the land in the rail corridor as the declared area of contamination, however will include investigation of potential offsite impacts
- An interim site management plan will be developed to ensure immediate health risks from rail corridor contamination are managed for the community and workers

We welcome any comments on the VMP by 20 May 2020.

Three stage approach

The VMP has been broken down into three stages:

Stage 1

Assess the nature and extent of the contaminant at the site and the migration of the contaminant from the site

Develop an Action Plan for interim management of risks to off site receptors from the contaminant originating from the site

Stage 2

Develop remedial action plans (RAP(s) defining how risks associated with the contaminant originating from the site will be addressed

Stage 3

- Complete planning approval to conduct the works required
- Contract the civil and environmental works required
- Implement the RAP(s)
- Validate the RAP(s) has been implemented

What does remediation mean?

- Remediation is about preventing exposure pathways of contamination
- We remediate what we need to, to mitigate risk
- It may not necessarily mean removing the contamination but encapsulating it
- How we remediate the declared area of contamination will involve an options assessment process

Next steps and estimated timeframes

- Submit Voluntary Management Proposal (VMP) to NSW EPA for approval by 25 May 2020
- Complete private property testing and send out reports to residents by end of May 2020
- Complete assessment of contamination at site by end of July 2020
- Develop an interim site management plan by end of July 2020
- Implement interim management measures as identified
- Develop Remedial Action Plans (RAPs) by end of September 2020
- Obtain planning permits and approvals and procurement necessary to implement remediation within six months of completing RAPs
- Carry out work onsite within six months of the above (subject to obtaining planning approvals)
- Complete validation reporting and auditor review within six months of completing onsite work

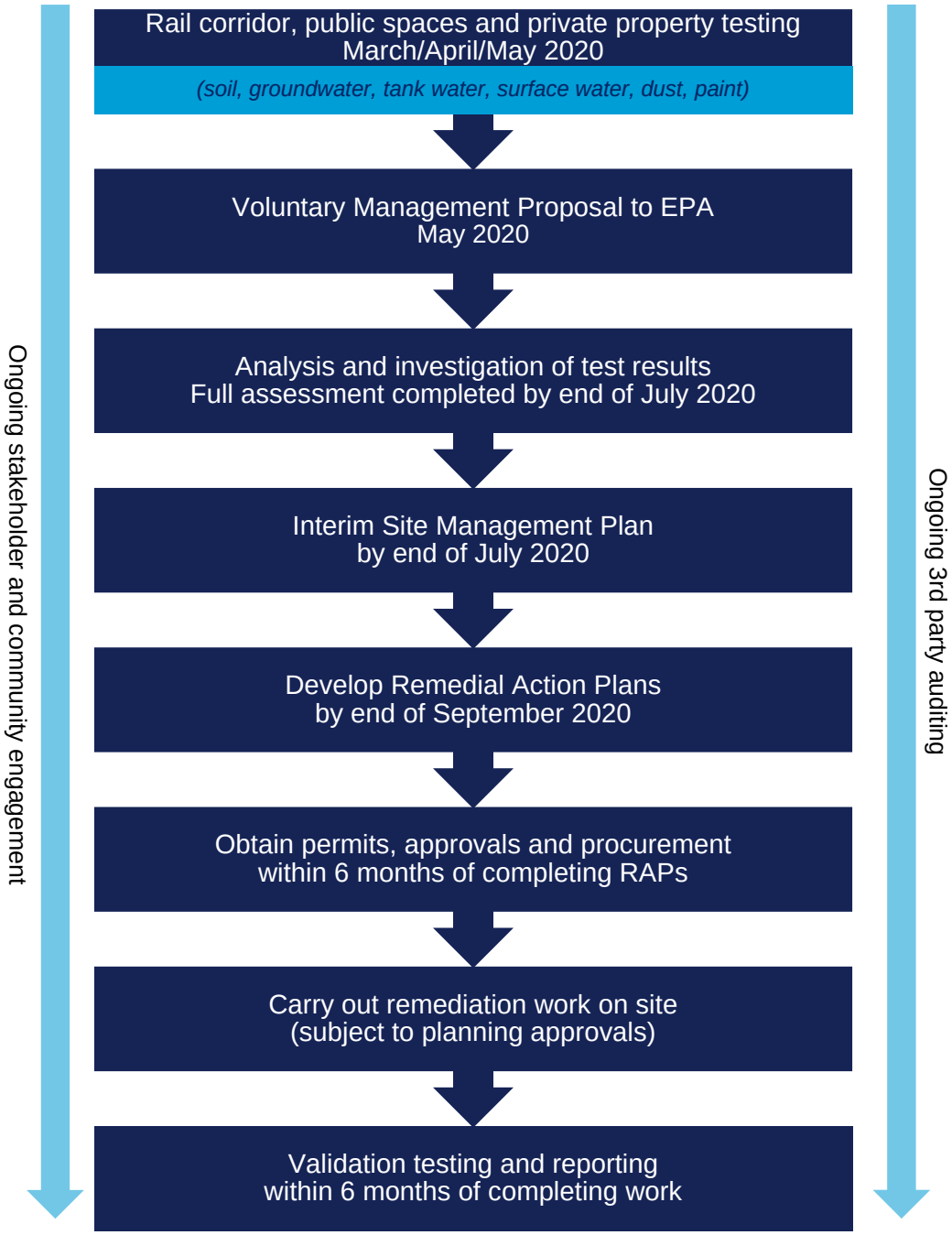
The health and safety of the community is our priority.

Actions from the interim site management plan will be carried out in the short term, while a long term Site Environmental Management Plan is developed.

Flowchart

May 2020

Key milestones for investigation, remediation and validation



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Voluntary Management Proposal

Tarago rail yards lead contamination May 2020

Overview

A voluntary management proposal is required as part of the regulation of declared contaminated sites such as the rail corridor at Tarago. The voluntary management proposal outlines how the contamination will be managed and may be approved by the EPA, with or without conditions

The Transport for NSW voluntary management proposal to manage the lead contamination in the rail corridor at Tarago will be submitted to the EPA by 25 May 2020.

The EPA monitors implementation of the proposal to ensure the land is managed and remediated appropriately.

The declared area of contamination by the EPA forms part of Lot 22 DP1202608 and falls within the Goulburn – Bombala rail corridor at Tarago.

The 'contaminant' is lead and has been found in soil and surface water within the site.

The lead contamination has impacted adjacent land (106 Goulburn Street).

A Voluntary Management Proposal is set out in the following way:

- Terms of the proposal as agreed between the EPA and Transport for NSW including; compliance with NSW environmental legislation, ensuring proposal is available to the public, record keeping and reporting and schedule of work
- Objectives and principal features of the proposal
- Key milestones and timeframes
- Submission of reports and timeframes

Objectives

The objectives of the VMP are to:

Stage 1

- Assess the nature and extent of the contaminant at the site and the migration of the contaminant from the site
- Develop an Action Plan for interim management of risks to offsite receptors from the contaminant originating from the site

Stage 2

- Develop Remedial Action Plans "RAP(s)" defining how risks associated with the contaminant originating from the site will be addressed

Stage 3

- Complete planning approval to conduct the works required in the RAP(s)
- Contract the civil and environmental works required to complete the RAP(s)
- Implement the RAP(s)
- Validate the RAP(s) has been implemented

Timeframes

Timeframes are outlined in the Voluntary Management Proposal and may be changed in agreement with the EPA.

It is important to note this three stage process could take up to two years to complete however an interim site management plan will address any health and safety to the community prior to completing the remediation works.

Features

Principal features of the proposal include:

Stage 1

- Collating and reviewing data
- Understanding the extent of the lead contamination within the declared site and at the former Ore Concentrate Load-Out Complex
- Installing groundwater monitoring wells to assess impacts
- Assessing the potential migration from the declared site in surface waters and sediments
- Preparing a detailed site investigation report.
- Developing an interim site management plan to mitigate risks from the lead contamination originating from the site to offsite receptors

Stage 2

- Assessing remedial options
- Selecting preferred remedial options
- Preparing Remedial Action Plans to define how the options will be implemented and validated
- Audit assessment

Stage 3

- Obtaining permits, approvals and procurement necessary to implement remediation
- Implementing Remedial Action Plans
- Compiling a validation report
- Audit assessment

Terms

Term	Definition
Site	Declared contaminated lot of land in rail corridor
Contaminant	Lead
Migration	Movement or transport of the contaminant by water, wind or other mechanism
Offsite receptors	Includes 106 Goulburn Street and any offsite ecological receptors that may be affected by the contaminant
Remediation	An action preventing future pathways of exposure
Remedial action plan	Summary of contamination, assessment of remedial options, selection and definition of remedial strategy and definition of validation requirements
Validation	Documented evidence that the remediation has been completed.
Ore concentrate load out complex	Area in rail corridor where lead ore was loaded onto rail wagons
Groundwater monitoring wells	Wells with a small diameter drilled into the ground, used for water quality analysis
Mitigate risks	Lessening negative impacts
Audit	Objective examination and evaluation
Procurement	Acquiring goods, services or works from an external source

Contact us

If you have any questions or would like more information please contact our project team:

02 4907 7525

JHRcorres@transport.nsw.gov.au

transport.nsw.gov.au/tarago

VOLUNTARY MANAGEMENT PROPOSAL UNDER THE CONTAMINATED LAND MANAGEMENT ACT 1997

Part 1

Preliminary Details

1. Proponent's Details

(a) Name and contact details

Trading as:	Transport for NSW
ABN:	18 804 239 602
Contact Name:	Terry Brady
Phone:	0408 487 421
Fax:	
Email:	Terrence.Brady@transport.nsw.gov.au
Postal address:	Level 3, 237 Wharf Rd, Newcastle NSW
Postcode:	2300
EPA licence number (if applicable):	

(b) Who the EPA should contact with technical enquiries about the proposal

Name:	Jonathan Tasker
Employer/Company:	Transport for NSW
Position title:	Senior Manager, Regional Infrastructure
Services, Type of business:	
Phone (business):	0428 448 473
Phone (after hours):	0428 448 473
Fax:	
Email:	Jonathan.TASKER@transport.nsw.gov.au

2. Site to which proposal applies

The site to which the proposal applies ("the site") forms part of Lot 22 DP1202608 and falls within the Goulburn – Bombala rail corridor at Tarago. The Site is within the Goulburn Mulwaree LGA in New South Wales.

The land to which this declaration applies is shown on the attached map and is shaded blue.

3. The contamination

Soil and surface water (when present) at the site are contaminated with substances and the contamination is significant enough to warrant regulation under the *Contaminated Land Management Act 1997*. The substance of concern ("the Contaminant") in soil is lead described as follows:

- lead concentrations in soil within the rail corridor (Lot 22 DP1202608) exceed national guideline values for the protection of human health and the environment
- lead contamination has impacted adjacent land at 106 Goulburn Street, Tarago (Lot 1 DP816626), with soil found to contain lead at concentrations exceeding national guideline values for the protection of human health and the environment
- there are complete exposure pathways to lead for occupants of 106 Goulburn Street, as well as potentially complete exposure pathways for persons working within the rail corridor and
- there are potentially complete exposure pathways for onsite and offsite ecological receptors

4. The management proposal

The management proposal ("the proposal") comprises:

a) the information set out above;
b) the undertakings set out in Part 2 of this document; and
c) the performance schedule set out in Part 3 of this document.

Part 2

Undertakings Included in Voluntary Management Proposal

THE PROPOSAL INCLUDES THE FOLLOWING UNDERTAKINGS:

General

1. All works or activities carried out in connection with the proposal, including sampling and preparation of associated reports ("the activities"), will be carried out in accordance with applicable provisions of *State Environmental Planning Policy 55 – Remediation of Land* and any requirements imposed under it in relation to the activities.
2. All matters listed as relevant to a remediation action plan by the EPA's *Guidelines for Consultants Reporting on Contaminated Sites* (2020) will be taken into account in the carrying out of the activities.
3. All the activities will be carried out consistently with guidelines made or approved under section 105 of the CLM Act.
   (See www.epa.nsw.gov.au/clm/guidelines.htm)
4. All the activities will be carried out in compliance with applicable NSW environmental legislation, and in particular:
   i) All the activities, including:
      (1) the processing, handling, movement and storage of materials and substances used to carry out the activities; and
      (2) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activities

      will be carried out in a competent manner;
   ii) All plant and equipment installed at the site or used in connection with the activities:
      (1) will be maintained in a proper and efficient condition; and
      (2) will be operated in a proper and efficient manner.
5. All the activities at the site will be carried out in a manner that prevents or minimises the emission of dust, odour and noise from the site.
6. Waste generated or stored at the Site will be assessed and classified in accordance with the EPA's *Waste Classification Guidelines Part 1: Classifying Waste*.

   (See www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm)
7. All waste transported from the Site that is required by the *Protection of the Environment (Waste) Regulation 2014* to be tracked must be tracked using the EPA's on-line tracking system or an alternative tracking system approved in writing by the EPA.

   (See www.epa.nsw.gov.au/owt/aboutowt.htm)
8. The proponent will make this voluntary management proposal available to the public free of charge and consents to the EPA placing this proposal on its public website.
9. The proponent will make all documents referred to in, and required to be prepared under, this voluntary management proposal available to the public free of charge,

unless the proponent identifies commercial-in-confidence or private/personal information (including information relating to a third party) within those documents. In these cases, the proponent will remove such information from the documents to make the documents suitable for public release.

10. The proponent will:

    i) prior to the implementation of the proposal provide for the EPA's approval a strategy for communicating about that implementation, particularly the actual management works, with members of the public who are likely to have a real interest in or be affected by that implementation; and

    ii) implement the strategy as approved in writing by the EPA.

Monitoring, Record Keeping & Reporting

11. At least until the EPA has notified the proponent that the EPA no longer considers that the contamination is significant enough to warrant regulation under the *Contaminated Land Management Act 1997*, record and retain all monitoring data and information and provide this record to the EPA at any reasonable time if so requested by the EPA and as specifically provided under the proposal.

12. The EPA will be informed in writing within 7 days of the proponent becoming aware of information or data indicating a material change:

    a) in conditions at the site, or

    b) in its surrounding environment,

    which could adversely affect the prospects of successful management of the site or result in harm to the environment.

13. The EPA will be informed in writing within 7 days of the proponent becoming aware of any failure, either by the proponent or any other person, to comply with any term of the proposal.

14. The EPA will be informed immediately of the proponent becoming aware of any information or data that indicates harm to the environment, as defined by the *Protection of the Environment Operations Act 1997*.

15. The EPA will be informed in writing as soon as practicable of any notification by the proponent, its employees or its agents to an appropriate regulatory authority other than the EPA of any pollution incident at the site within the meaning of the *Protection of the Environment Operations Act 1997*.

    (See http://www.epa.nsw.gov.au/licensing/dutytonotify.htm)

Performance Schedule

16. The performance schedule which is in Part 3 of this document will be adhered to.

PERFORMANCE SCHEDULE

1. Objectives of the proposal

The objectives of this proposal are to achieve the following outcomes within the specified timeframes:

Stage 1
O1 Assess the nature and extent of the Contaminant at the Site and the migration of the Contaminant from the Site
O2 Develop an Action Plan for interim management of risks to off site receptors from the Contaminant originating from the Site

Stage 2
O3 Develop remedial action plan(s) "RAP(s)" defining how risks associated with the Contaminant originating from the Site will be addressed

Stage 3
O4 Implement the RAP(s)
O5 Validate the implementation of the RAP(s)

This Schedule describes how each objective will be satisfied.

2. Principal features of the proposal

The principal features of proposal include, but are not limited to:

Stage 1 - Assessment of Contaminant at or originating from the Site

P1. Appoint a NSW EPA auditor accredited under the *Contamination Land Management Act 1997*.

P2. Collate and review data from third parties in relation to the Contaminant in soil and water in the Tarago area.

P3. Undertake delineation of the Contaminant within the Site and at the former Ore Concentrate Load-Out Complex.

P4. Install groundwater monitoring wells to assess impacts to groundwater from the Contaminant originating from the Site.

P5. Assess the potential migration from the Site of the Contaminant in surface waters and sediments.

P6. Prepare a Detailed Site Investigation report.

P7. Develop an Action Plan to define responses to mitigate risks from the Contaminant originating from the Site to offsite receptors.

Stage 2 - Remediation Action Plan

P8. Assess remedial options to address risks from the Contaminant on, or originating from, the Site.

P9. Select a preferred remedial option integrating consultation with the community and other stakeholders.

P10. Prepare a RAP(s) to define how the selected remedial option will be implemented and validated.

Proponent:

Site:

Proposal Date:

P11. Obtain Section B Site Audit Statement(s) from an Auditor accredited under the NSW EPA Site Auditor Scheme confirming:

- The assessment adequately characterises the degree and extent of the Contaminant at the Site and originating from the Site
- The RAP(s) is suitable to address risks associated with the Contaminant at the Site and originating from the Site.

Stage 3 Remediation and Validation

P12. Obtain planning permits and approvals and procurement necessary to implement remediation

P13. Implement the RAP(s)

P14. Compile a validation report(s) that describes and provides evidence of the activities taken to effect remediation and concludes on the success of remediation.

P15. Provision of a Site Audit Statement(s) from an Auditor accredited under the NSW EPA Site Auditor Scheme confirming remediation has occurred in accordance with the RAP(s) and objectives of this VMP are met, i.e. a Section B4 Site Audit(s).

3. Key milestones for investigation, remediation and other actions

All works set out in the proposal must be completed by the deadlines specified below:

Works	***Deadline***
T1. Investigation of Contaminant at or originating from the Site (P1-P6)	31 July 2020
T2. Development of an Action Plan to mitigate risks from the Contaminant originating from the Site to offsite receptors (P7)	31 July 2020
T3. Remediation action planning (P8-P11)	30 September 2020
T4. Preliminaries required to implement remediation (P12) including planning permits and approvals and procurement	Within 6 months of completing T3, subject to obtaining necessary approvals
T5. Implement Remediation (P13)	Within 6 months of completing T4
T6. Complete validation reporting and Auditor review of remediation (P14-P15)	Within 6 months of completing T5

4. Reporting requirements and timeframe for submission of reports

The EPA will be provided with the following reports:

R1 Detailed Site Investigation – Tarago. This report will include:

- A description of all investigative works relevant to the Contaminant at the site that have been completed
- Description of the degree and extent of the Contaminant:
  - Within and/or from the site; and
  - Otherwise within the area surrounding the site
- A conceptual site model assessing risks associated with the site Contaminant through potential source, pathway, receptor linkages

Proponent:

Site:

Proposal Date:

R2 Action Plan for Offsite Impacts from Tarago Rail Corridor. This report will include:
- Detailed description of measures that will be implemented to mitigate risks associated with the Contaminant originating from the site
- Confirmation of how the effectiveness of risk mitigation will be validated

R3 Remedial Action Plan (s) – The RAP(s) will include:
- Assessment of remedial options to address risks associated with the Contaminant at the site
- Selection of a preferred remedial option integrating consultation with the community and other stakeholders
- A Remedial Action Works Plan to define how the selected remedial option will be implemented
- A validation plan to define how the success of remediation will be assessed.

More than one RAP may be prepared.

R4 Section B Site Audit Statement. The appointed Site Auditor will prepare a Section B SAS to determine the adequacy of the Detailed Site Investigation (R1) in assessing risks associated with Contaminant at or originating from the site and the suitability of the Remedial Action Plan (R3) to mitigate these identified risks.

R5 Validation Report (s). The validation report(s) will include:
- A summary of contamination associated with the site identified in the Detailed Site Investigation (R1)
- A summary of the RAP(s) (R3)
- Assessment of remedial works completed against the preferred remedial strategy as described in the RAP(s) (R3)
- Completion of confirmatory testing and other validation measures described within the validation plan as described in the RAP(s) (R3)
- A clear statement assessing completion of the tasks required under the VMP.

More than one validation report may be prepared

R6 Section B4 Site Audit Statement(s). The Auditor will provide a Section B4 Site Audit Statement(s) and Site Audit Report(s) to determine compliance with this Voluntary Management Proposal.

These reports will be provided by the deadlines specified below:

Report	***Deadline***
R1. Detailed Site Investigation – Tarago	14 August 2020
R2. Action Plan for Offsite Impacts from Tarago Rail Corridor	14 August 2020
R3. RAP(s)	18 September 2020
R4. Section B Site Audit Statement	16 October 2020
R5. Validation Report (s)	Within 3 months of completing T5
R6. Section B4 Site Audit Statement (s) and Site Audit Report (s)	Within 6 months of completing T5

Proponent:

Site:

Proposal Date:

Signature of proponent

This application for approval of this voluntary management proposal may only be signed by a person(s) with the legal authority to sign it. The various ways in which the application may be signed, and the people who may sign the application, are set out in the categories below.

Please tick (✓) the box next to the category that describes how this application is being signed.

If the proponent is:		**The application must be signed and certified by one of the following:**
an individual	☐	the individual.
a company	☐ ☐ ☐ ☐	the common seal being affixed in accordance with the *Corporations Act 2001, or* two directors, or a director and a company secretary, or if a proprietary company that has a sole director who is also the sole company secretary – by that director.
a public authority other than a council	☐ ☐	the chief executive officer of the public authority, or by a person delegated to sign on the public authority's behalf in accordance with its legislation (Please note: a copy of the relevant instrument of delegation must be attached to this application).
a local council	☐ ☐	the general manager in accordance with s.377 of the *Local Government Act 1993* ('LG Act'), or the seal of the council being affixed in a manner authorised under the LG Act.

I/We (the proponent):

- ***apply for approval of the voluntary management proposal set out in this proposal and in any documents referred to in Part 1.4 of this proposal***
- ***declare that the information in this proposal form (including any attachment or document referred to in Part 1.4 of this proposal) is not false or misleading.***

Signature		Signature	
Name (printed)		Name (printed)	
Position		Position	
Date		Date	

Seal (if signing under seal):

Proponent:

Site:

Proposal Date:

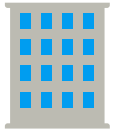
Soil assessment

Soil concentrations → Compared to → National concentration guidelines developed for the receptor group

Guidelines recognise that receptors are different.
A child playing in soil at home is expected to be more exposed to soil contamination than a factory worker at a concreted site.

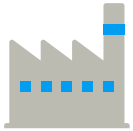
The child needs a higher level of protection (a lower guideline concentration). Guidelines are developed for the most sensitive receptor in four main land uses.

Homes, primary schools and day care
Lead Guideline 300mg/kg



Apartments
Lead Guideline 1200mg/kg

Parks and open space, secondary schools, footpaths
Lead Guideline 600mg/kg



Commercial and industrial
Lead Guideline 1500mg/kg

Dust assessment

Indoor dust

Compared to

Indoor dust guidelines – United States Environmental Protection Agency

Indoor dust mostly comes from outdoor soil and dust and paint. Kids playing on the floor ingest more dust than adults.

Babies and young children often put their hands and objects in their mouth which can have lead dust. Ingestion of lead dust is the main route of lead intake into the body

Indoor dust - floor

Lead Guideline 108 µg/m^2

Indoor dust - windowsills

Lead Guideline 1076 µg/m^2

Lead in paint

Lead Guideline <0.1%

Water assessment

Water concentrations → Compared to → National drinking water guidelines developed for everyone

Australian drinking water guidelines assumes that adults drink 2L of water per day for whole of their life and a 2-year old drinks about 1L.

Limited Water ingestion also occurs when using water for washing and watering garden and lawns or while swimming, fishing, boating or simply playing
(known as recreational ingestion)

Potable use

Lead Guideline 0.01 mg/L

10 x drinking water guidelines

Recreational use

(swimming, sprinklers etc)

Lead Guideline 0.1 mg/L

Lead – your health around the home

Lead can be hazardous to health.

Lead may be found in and around your home.

Always be vigilant in home cleanliness and personal hygiene to prevent lead exposure.

Lead in the environment

Lead is a naturally occurring element that has been used in a range of household, recreational and industrial products.

Many uses of lead have been phased out, including lead paint, leaded automotive fuel and some forms of solder used in plumbing. Lead continues to be used in lead-acid car batteries, some forms of solder, waterproof flashing for roofs and gutters, and radiation protection.

Due to this use across industries, lead can be found in the environment in many forms, including in:

- lead-based paint on houses built before 1970, and lead paint flakes around structures
- lead dust from industrial and domestic sources in soil, and in roof and wall cavities
- lead waste from industrial sources in soil
- some household products
- some vegetables and plants that are grown in contaminated soil
- eggs and other animal products from animals reared on contaminated soil.

Lead and your health

A common way for lead to enter the body is through breathing lead-contaminated dust or consuming lead-contaminated food or water.

Once within the body, lead can build up and cause a range of health problems.

Exposure to lead is linked to harmful effects on organs and bodily functions. Elevated blood lead levels can cause anaemia, kidney problems, and neurological or developmental effects.

Lead can harm people of all ages but the risks are greater in pregnant women, infants and children. Other factors that influence the impact of lead on an individual are their age and health status, the amount of lead and the duration of exposure.

If you suspect that you or your family have been exposed to lead, visit your doctor for advice.

For more information regarding the health effects of lead, please refer to the NHMRC Statement and Information Paper on the health effects of lead at www.nhmrc.gov.au/health-topics/lead-blood-levels.

Test for lead

Find out where the sources of lead are likely to be around your home by testing all suspected lead-contaminated surfaces and materials using commercially available lead test kits. These kits are available from major hardware retailers.

If you cannot test for lead, it is best to assume that paint, soil or dust is contaminated.

Preventing exposure at home

If lead dust is, or is likely to be, present at elevated levels around the home, there are a number of ways to minimise exposure to yourself and your family.

1. Wet-wiping and mopping

- If you live in an older home or close to a lead industry, wash front steps and verandas at least once a week.
- Wet-wipe benchtops, window sills, kitchens, furniture and toys using a high-phosphate detergent (such as liquid sugar soap).
- Mop floors using the three-bucket system

You will need three buckets (one for a detergent solution, one for dirty water and one for clean water), two mops or rags (one for cleaning with detergent and one for rinsing), and a high-phosphate detergent.

1. Start at the furthest corner from the door.
2. Wet the first mop in the bucket with detergent and wipe the area. Replace the detergent and water for every room or every half hour.
3. Squeeze the first mop into the empty “dirty water” bucket.
4. Wet the second mop in the “clean water” bucket and wipe the area to rinse.
5. Squeeze the second mop into the “dirty water” bucket.

2. Vacuuming

Ordinary vacuum cleaners do not filter fine lead particles. Use a ducted vacuum cleaner or one with a high-efficiency particulate air (HEPA) filter. If these are not available, vacuum when young children are not present, allow time for dust to settle and wet-wipe before children return.

3. Old carpets

Remove old carpets as they are much harder to clean than hard surfaces. To remove carpet, wet it first, roll it inwards, wrap it in plastic and tape it up. Mop the floor area once the carpet is removed.

Carpets may need to be safely disposed of if contaminated during renovations.

4. Pets

Animal coats may catch considerable amounts of dust, including lead-contaminated dust from inside or outside the home.

- Brush pets outside and ensure that children wash their hands after patting them.
- Wash animal bedding once a week.

5. Laundry

- Regularly wash children’s toys and blankets using a phosphate detergent, and rinse well.
- Do not shake or leave dusty clothes near children.
- Wash work clothes separately and use a phosphate detergent.
- Rinse the washing machine after use to avoid contaminating other clothes.

6. Play areas and sandpits

- Move play areas away from bare soil, and grow grass or plants in bare areas of dirt.
- Use clean sand in sandpits and cover when not in use.

7. Vegetable gardens

Lead dust in the air may deposit on vegetables, and some vegetables absorb lead from the soil.

- Always use raised vegetable gardens and wash vegetables before consuming.
- See the *Lead – gardening and home renovations* fact sheet for more advice.

8. Minimise your family’s exposure

- Prevent children from accessing lead-based hobby areas (e.g. in soldering).
- Always maintain a high level of hygiene.

Where to get advice

- Call the NSW EPA’s Environment Line on 131 555.
- Visit the NSW EPA lead safety web page at www.epa.nsw.gov.au/your-environment/household-building-and-renovation/lead-safety.
- Ask your doctor for information about blood tests and the effects of lead on your health.
- Contact The LEAD Group on 1800 626 086 or visit www.lead.org.au for independent advice on lead contamination and testing.

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Beware of lingering lead in your home and garden

- Lead can be hazardous to health
- Lead may be found in and around your home
- Be lead-safe while renovating and gardening

NSW EPA

www.epa.nsw.gov.au

Lead and your health

Exposure to lead is linked to harmful effects on organs and bodily functions. Elevated blood lead levels can cause anaemia, kidney problems and neurological or developmental effects.

Lead can harm people of all ages but the risks are greater in pregnant women, infants and children. Other factors that influence the impact of lead on an individual are their age and health status, the amount of lead and the duration of exposure.

If you suspect that you or your family have been exposed to lead, visit your doctor for advice.

For more information, please refer to the NHMRC Statement and Information Paper on the health effects of lead at www.nhmrc.gov.au/health-advice/environmental-health/lead-blood-levels.

Sources of lead in the home

Lead can be found in and around the home in:

- lead-based paint on houses built before 1970, and lead paint flakes around structures
- lead dust from industrial and domestic sources in soil, and in roof and wall cavities
- lead waste from industrial sources in soil
- some household products
- some vegetables and plants that are grown in contaminated soil
- eggs and other animal products from animals reared on contaminated soil.

Home renovations

Lead paint and lead dust in roof and wall cavities are significant hazards for renovators. Maintenance or renovation activities that can create or disturb lead dust include:

- preparing old lead paint surfaces by dry sanding or using open-flame torches
- demolishing or repairing walls, floors or ceilings
- replacing or maintaining plumbing in cavities
- moving carpets contaminated with lead dust.

Planning and preparation

- Test painted surfaces for lead using lead test kits from major hardware retailers.
- If lead is present, hire a professional who is trained and qualified to work safely with lead to do your renovations.
- If you decide to renovate yourself, take full safety precautions:
  - Consider work methods that deal with lead hazards safely and prevent pollution (e.g. never smoke in work areas).
  - Get disposable coveralls and a respirator that is approved under AS 1716 and fitted with a P1 or P2 filter. Basic paper masks may not fit well and do not protect against fine dust.
  - Consider the clean-up process.
  - Ensure pregnant women and children will not be exposed to lead during renovations.

Preparation

- Wash all walls with a commercially available phosphate detergent (such as liquid sugar soap).

Interior

- Seal the work area off from the rest of the house and outside areas by covering floors, doors and windows with plastic and tape.
- Remove soft furnishings (including curtains and carpets) or cover them with plastic.
- If removing old carpet, spray the surface with water to keep dust down. Roll the carpet inwards, wrap it in plastic and tape it up.

Exterior

- Lay plastic sheeting under the work area to prevent lead dust spreading.
- Close windows and doors.
- Inform your neighbours so they can protect themselves if dust blows their way.

Equipment and practices

When repainting:

- Use wet sanding and wet scraping methods.
- Do not use open-flame torches and heat guns as they create lead fumes.
- Some chemical strippers are dangerous, so follow the manufacturer's instructions.
- Avoid methylene chloride paint strippers.

When working in roof or wall cavities:

- Always arrange for the area to be cleaned by a professional using a vacuum cleaner fitted with a high-efficiency particulate air (HEPA) filter.
- Move soft furnishings and lay plastic under the access hole.

When plumbing:

- Use lead-free solder and flush the pipes with water for five minutes afterwards.

Cleanup

- Clean up before pregnant women, children or pets return to the property.
- Do not place the waste in household bins – check with your local council for safe disposal venues.
- Wet wash the work area with a phosphate detergent and then rinse with clean water.
- Rinse mops and cloths to avoid spreading contaminated debris.
- Seal waste in heavy-duty plastic bags and spray down dust with a water bottle before wrapping it up.
- Keep a high level of hygiene – wash your hands and face before smoking, drinking or eating.
- Wash work clothes separately from other clothes using a phosphate detergent and rinse the washing machine afterwards.

Gardening

If you live near a current or former lead pollution source (such as a mine, lead smelter or major highway), or if you have lead paint on or around your home, you must remain vigilant when gardening and growing or consuming vegetables from your garden.

What can you do?

If you think lead may be in your garden soil, cover patches of bare soil with certified clean soil from a nursery and grass or mulch to prevent exposure.

Some plants can absorb lead from the soil, so always use a pot or raised garden bed for growing vegetables. Raised garden beds should be:

- at least 30cm tall (higher for large plants)
- lined with mesh at the bottom to allow drainage and to prevent soil mixing
- filled with certified clean soil from a nursery.

Lead dust in the air can deposit on vegetables, so:

- always wash vegetables before eating them
- always wash your hands after gardening.

You can test your soil for lead. See details below for 'Where to get advice'.

Where to get advice

- Call the EPA Environment Line on 131 555.
- Visit the EPA lead safety webpage at www.epa.nsw.gov.au/leadsafety.
- Ask your doctor for information about blood tests and the effects of lead on your health.
- Contact The LEAD Group on 1800 626 086 or visit www.lead.org.au for independent advice on lead contamination and testing.

The EPA is proud to partner with Wollongong City Council for lead safety awareness

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city of innovation

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Lead exposure in children

Young children are most at risk from lead. Lead exposure can affect a child's mental and physical development. If you suspect that your child has been exposed to a toy containing lead, remove the toy immediately and contact your doctor for advice.

Last updated: 22 February 2016

What is the disease?

Lead is a naturally occurring heavy metal, often used in industry. It can be dispersed widely in the environment through contamination of water, dust, soil, and some paints.

Lead can affect anybody, but children under five years of age are at greater risk because they tend to put their hands or other objects into their mouths; they absorb more ingested lead than adults; and their brains are still at developing stage so they are more sensitive to the effects of lead.

What are the main sources of lead exposure in children?

Toys

Lead may be found in the paint on some toys. While Australian standards limit the amount of lead permissible in materials used to make and paint children's toys, some imported toys may present a risk. A significant proportion of toys sold in Australia are imported from other countries.

Environmental sources

- Paint - **l**ead-based household paints were used before 1970 in Australia and is still used in some countries.
- Dust - household dust may contain lead particles from deteriorating lead-based household paint, contaminated soil or dust brought into the house on your or your pets' feet.
- Soil - dirt can become contaminated with lead by deteriorating or removed lead-based paint, and previous industrial activities and mining.
- Water - some old household pipes used to be soldered with lead. Rainwater from water tanks may have increased lead levels if lead containing dust has contaminated the roof or guttering, or by leaching lead from the roof and pipes.

Also very old toys and cots with the original paint may contain unsafe levels of lead.

Exposure prone activities

- Renovating a house built before 1970.
- Hobbies - people can take lead residues into their homes on clothes, skin, hair and equipment after contact with lead in their work or in hobbies such as target shooting, making glazed pottery, stained glass, and making fishing sinkers.
- Occupations - such as mining and smelting.

How does lead affect children's health?

Lead can enter human body by inhalation or ingestion. It can affect almost every organ and system in the body. The symptoms of lead exposure depend on how long and what amount is ingested or inhaled by children. As lead poisoning often occurs without obvious symptoms, it can go unrecognised.

Lead exposure in childhood can cause behaviour and attention problems, learning difficulties and cognitive losses. It may also affect physical growth, blood cell development and the functioning of the kidneys.

Lead ingested by pregnant women can pass through the placenta and affect babies.

Lead poisoning is preventable

The following suggestions can reduce your child's lead exposure.

Behaviour to reduce potential lead exposure

- Frequently wash children's hands.
- Regularly wash family pets and toys.
- Regularly wash or wet-mop floors, stairs, and window sills to reduce dust.
- Remove recalled imported toys from children.

Safe environment

- House renovation - take care if renovating a house built before 1970.
- Pregnant women and young children should not be present while lead-based paint is being removed.
- Old paint - make sure your child does not have access to peeling or deteriorating paint or chewable surfaces painted with lead based paint, such as old cots.
- Soil and dirt - move play areas away from bare soil and try to keep your child out of the dirt.

Healthy and varied diet

Children who have dietary deficiencies in iron, calcium, and vitamin C are more susceptible to harm from lead exposure. Iron-sufficient diets discourage absorption of lead. Calcium competes with lead and can inhibit its absorption. Vitamin C may increase excretion by the kidneys.

Dietary sources of iron, calcium and vitamin C

Sources of iron

- Meat: lean beef, veal, ham, pork, chicken, lamb
- Cereal: iron fortified cereals, wheat germ
- Fish: clams, mussels, oysters, tuna, trout, cod, sardines
- Fruits: dried fruits (apricots, raisins, prunes, dates)
- Eggs
- Liver
- Vegetables (only fair sources): spinach, collard greens, lentils, peas, beans, peanut butter

Sources of calcium

- Milk, ice cream, yoghurt, cheese
- Fish: sardines, anchovies, shrimp, trout, cod, mackerel, tuna, salmon, crab, lobster
- Vegetables: cabbage, collard, kale broccoli, spinach, bok choy, mustard greens
- Fruits: oranges, pineapples, raisins, fortified orange juice

Sources of vitamin C

- Fruits: grapefruit, oranges, cantaloupe, strawberries, juices
- Vegetables: broccoli, green peppers, greens

What to do if you are concerned about lead exposure?

If you suspect that your child has been exposed to lead, contact your doctor or your local Public Health Unit. Further information can be obtained from your local public health unit. In NSW call **1300 066 055** to talk to your local Public Health Unit.

Rainwater tanks

Water is our most precious natural resource and something that most of us take for granted. We are increasingly becoming aware of the importance of water to our survival and its limited supply, especially in such a dry continent as Australia.

Well maintained rainwater tanks can provide a renewable supply of soft, clear and odourless water that can be used for a range of purposes. In some areas it may represent the primary source of household water.

Is the water safe to drink?

Generally yes. A properly maintained rainwater tank can provide good quality drinking water. Providing the rainwater is clear, has little taste or smell and is from a well maintained water catchment system it is probably safe and unlikely to cause any illness for most users.

Rainwater tanks are widely used as a source of drinking water throughout rural Australia. Water used for household purposes for drinking, food preparation or bathing should meet water quality guidelines in order to protect you and your family's health. The water should be free of harmful microorganisms or harmful levels of chemicals. By far the greatest potential risk to your health comes from contamination of water with harmful microorganisms such as bacteria and parasites from bird or animal droppings. Rainwater tanks can also be contaminated from roof or plumbing materials.

The microbiological quality of rainwater collected in domestic tanks will be poorer than that of many public water supplies. Occasionally there are cases of illness from contaminated rainwater. However, providing systems are well maintained the risk of harmful organisms being present is low.

Premises that serve the public or employees and use rainwater for drinking and/or cooking must comply with NSW Public Health Act 2010 and have a quality assurance program following the NSW Private Water Supply Guidelines.

Rainwater tanks in urban areas

In urban areas the public water supply remains the most reliable source of good quality drinking water for the community. In these areas NSW Health supports the use of rainwater tanks for non-drinking uses, such as toilet flushing, washing clothes or in water heating systems, and outdoors for uses such as garden watering, car washing, filling swimming pools, spas and ornamental ponds, and fire fighting. Use of rainwater conserves the public water supply and helps to reduce stormwater impacts. In urban areas NSW Health recommends that people use the public water supply for drinking and cooking because it is generally filtered, disinfected and fluoridated. Refer to NSW Guideline on use of rainwater where a public water supply is available. The quality of public water supplies is regularly monitored.
People who choose to use rainwater for drinking and cooking should be aware of potential risks associated with microbiological and chemical contamination. Rainwater tanks in urban areas can be contaminated with airborne contaminants from heavy traffic, smelters and heavy industry.

Rainwater installations must meet local council and water utility requirements.

What if I have a weakened immune system?

People with special health needs such as those who have a severely weakened immune system (the immunocompromised); including some people with HIV and AIDS, transplant recipients, dialysis patients and cancer patients; should talk to their doctor about potential risks from drinking rainwater. These people, and the very young or very old, may wish to take extra care by using only boiled, bottled or micro-filtered water and

avoiding foods and beverages that may contain rainwater. Please contact your doctor or local Public Health Unit if you require additional information on this issue.

Rainwater can be by disinfected by bringing to a rolling boil, and allowed to cool before drinking. An electric kettle with an automatic cut off switch is suitable. People should be aware of the dangers of scalding and be careful when boiling water.

Fluoride

Rainwater does not contain fluoride. Where rainwater is the major source of water for drinking and cooking, advice about alternative sources of fluoride should be sought from your local dentist, school or community dental service, or from the Australian Dental Association.

How can water quality be protected?

The provision of good quality water depends on correct design and installation followed by sensible maintenance of the rainwater tank and catchment area. The collection of rainwater involves "low maintenance, not no maintenance".

It is good practice to flush rainwater taps used for drinking or cooking for 2 to 3 minutes at the start of each day. This is because water that has been standing for a long time can dissolve metals such as copper and lead from the pipework. This “first-flush” of water can be used for washing up, watering plants or other non-drinking uses.

The tank

- Tanks are available in a wide range of materials including steel (galvanised and Aquaplate), concrete, fibreglass or plastic. All of these materials can be suitable providing the tanks have been manufactured specifically for the collection of rainwater. It is also important to note that:
- Some PVC pipes may contain lead so if the water is for drinking purposes, only high quality plastic pipe and fittings should be used (‘drinking water’ not ‘stormwater’ grade).
- There have been some reports that water collected from metal roofs can react with steel tanks to cause corrosion.
- Some types of new tanks may have to be washed or flushed before use. The manufacturer should be able to provide advice on whether this may be necessary.

When installed the tank should be covered to prevent light from reaching the water, as it will encourage the growth of algae. Every access point should be sealed unless in use. The inlet and overflow of the tank should incorporate a mesh cover and a strainer to keep out materials such as leaves and to prevent the access of mosquitoes and other insects.

The top of the tank should have a tightly sealed access cover, to stop animals and children entering but to allow access to the tank for cleaning and inspection purposes. Any ground level covers should also be sealed to prevent stormwater entering in-ground tanks.

The catchment

In general, house and shed roofs are used as catchment areas. Rainwater can be collected from most types of roofs, including asbestos roofs, providing they have not been painted with lead-based paints or coated with bitumen-based material.

Roofs coated with acrylic paints may contain dissolved detergents and chemicals that can affect the colour or taste of rainwater. The first few runoffs from these types of roofs may need to be discarded. Rainwater collected from the first few runoffs from new concrete tiled or metal roofs should also be discarded.

As a precaution the use of pesticide-treated timbers and lead flashing should be avoided in roof catchments. Also, if possible, rainwater should not be collected from parts of roofs incorporating flues from wood burners.

Overflows or discharge pipes from roof mounted appliances such as evaporative air conditioners or hot water systems should not be allowed to discharge onto the roof catchment area.

First flush devices

First flush devices prevent the first portion of roof run-off from entering the tank and will reduce the amounts of dust, bird droppings and leaves etc., that can accumulate on roofs, from being washed into tanks. The use of these devices is recommended.

Alternatively the tank inlet should be disconnected so that the first run-off of rain after a dry spell is not collected.

If your house is oversprayed by aerial chemical spraying, pert the collection pipe from your rainwater tank to prevent any pesticides from entering the tank. Clean the roof or wait until after the next rainfall before reconnecting your drinking water tank to your roof.

Tank maintenance

Proper maintenance of the tank, catchment system, roof, gutters and inlet is essential to ensure a safe supply of water and is best carried out before seasons when heavy rain is expected.

Roof catchments and gutters should be inspected and cleared of leaves and other debris every three or four months. Overhanging branches should also be removed where possible. If overhead wires are too close for safety, contact your local power authority for advice.

All screens should be cleaned regularly. Tanks should not be allowed to become breeding sites for mosquitoes. The best way to keep a tank free of mosquitoes is closely fitting, fine insect-proof screens (e.g. 1 mm) on all inlets and overflows. Screens should be inspected regularly (at least annually) to ensure they remain sealed and undamaged. Check for and repair any tank deterioration (e.g. holes that would allow mosquito entry). Rainwater should not be allowed to pool in containers or on surfaces below tank outlets or taps, as this can also provide a breeding site. If mosquitoes are detected in a tank the entry point should be located and closed.

Treatment should only be required when these measures fail. Historically, household kerosene or liquid paraffin was added to control mosquitoes. These compounds may interact with plastic tanks and linings and are not recommended. The Australian Drinking Water Guidelines now recommends the use of the pesticide s-methoprene for mosquito control in rainwater tanks.

Desludging

Tanks should be examined for accumulation of sludge at least every 2-3 years. If sludge is present in the tank it should be removed by siphon or by complete emptying of the tank (desludging).

Tanks with a ‘cone scour’ base are easy to clean by simply opening the cleaning outlet to allow the water to gush out with the sludge then rinse with a hose. Small, flat-bottomed tanks can be drained, rinsed with a hose and tilted to drain.

Working inside a tank can be very dangerous.
Do it yourself tank cleaning presents a number of risks including working in confined spaces and access into and out of the tank. Do not use fuel pumps or engines near or inside enclosed tanks due to the risk of carbon monoxide poisoning. It is important to be aware of work health and safety guidelines and Codes of Practice (Part 4.3 of the NSW Work Health and Safety Regulation 2011 and Australian Standard AS2865:2009 Confined spaces). Professional tank cleaners are available in some areas.

Tank cleaning

Where cleaning necessitates entering the tank, take care to ensure adequate ventilation is provided and an additional person is in attendance.

One method of cleaning big flat-bottomed tanks is to get inside with a bucket, shovel and broom and dig out the sludge. A second person should always be present to ensure the safety of the person inside the tank. Clean a big tank early in the morning or when the area is shaded to avoid heat exhaustion. For light inside the tank, use a battery lantern not a flame or electric extension. If chemicals are being used inside the tank, a respirator may be necessary.

It is important to check the structural condition of the tank before choosing a method of cleaning. Cleaning should generally be limited to removing accumulated sediments, leaf litter etc. Harsh cleaning methods may accelerate deterioration, for example, by removing the protective layer on the inside walls of a steel tank which will lead to tank corrosion.

So called ‘white rust’ caused by zinc-rich oxides on the inside of metal tanks is not a health risk and does not need to be removed.

Cleaning agents that might release hazardous fumes or adversely affect water quality after cleaning should not be used. After cleaning, it is recommended that the internal walls and floor of the tank be rinsed with clean water. Rinse water and sediment should be run to waste.

Discarded water should be diverted away from tank foundations, buildings and other structures. Water containing cleaning agents should not be allowed to flow into street guttering.

If the tank is your only source of water, it can still be desludged regularly by siphoning the sludge off. If the sediment has been stirred up, the water can be treated chemically with chlorine and/or boiled before consumption. The best arrangement is to have two tanks and clean them out alternately.

A concrete tank could crack if it dries out. Check with the tank supplier to find out if the type you have can safely remain empty for a few weeks. It might be necessary to put water in the tank to stop it from cracking.

Plastic tanks will need some water or should be tied down to stop them from blowing over in strong winds when they are emptied.

Disinfection

Rainwater can be by disinfected by bringing to a rolling boil, and allowed to cool before drinking. A kettle with an automatic shut off switch can do this.

Regular disinfection should not be necessary (unless required on medical advice). However, if you suspect that water in the tank is contaminated, it can be chlorinated by adding powdered swimming pool chlorine (calcium hypochlorite, 65% available chlorine) or liquid chlorine (sodium hypochlorite, 12.5% available chlorine). You should not use stabilised chlorine (chlorine cyanurates).

It takes about 5 milligrams of chlorine per litre to disinfect your tank. This is equivalent to 7 grams of calcium hypochlorite or 40 millilitres of sodium hypochlorite per 1000 litres of water. A level dessert spoon may be used as an approximate measure for 7 grams of powdered calcium hypochlorite. A lot of the chlorine may be used up during disinfection. There should be at least 0.5 milligrams per litre free chlorine, 30 minutes after the chlorine is added – you can use a pool chlorine test kit to measure how much chlorine is in the water. Note that milligrams per litre is the same as parts per million.

You should be able to smell the chlorine faintly an hour or so after treating the water. If you can’t, you may need to add a similar amount of chlorine again. Ideally the tank shouldn’t be used for at least 24 hours to allow the chlorine taste and smell to dissipate and for harmful microorganisms to be destroyed.

To maintain a safe water supply after the initial dosage, 1 gram of calcium hypochlorite or 4 millilitres of sodium hypochlorite per 1000 litres should be added to the rainwater tank and allowed to stand for a minimum of two hours. The water will be safe to drink provided the chlorine smell is not too strong.

It is important to mix the chlorine in a plastic bucket **in the open air** before adding it to the tank. Mix it thoroughly with the tank water. Do not pour water into chlorine always add chlorine to water.
Other forms of water treatment may also be used, such as disinfection with ultraviolet light (UV) or filtration. Not all filters remove or inactivate harmful microorganisms. If a filter is used for health reasons, then it should be meet an appropriate standard (such as AS/NZS 4348 or ANSI/NSF 53). Units that incorporate boiling, distillation or reverse osmosis processes are also satisfactory. An additional disinfection unit may be necessary to inactivate bacteria. It is important to follow the manufacturer's instructions. Filters should be correctly installed; maintained and replaced regularly otherwise they will become ineffective and can allow bacteria to grow that are then released into the filtered water. Please contact your local Public Health Unit for further advice on disinfection and filtration.

Water heating systems that operate between 60 and 70oC will kill harmful bacteria. The temperature should be 50oC or less at outlets used for personal hygiene. The temperature should be 43.5oC or less at outlets used for personal hygiene in childcare centres, schools, nursing homes, or similar facilities for sick, aged or disabled persons). Rainwater may cause corrosion in water heating systems. Suppliers can provide advice on modifying water heating systems to suit rainwater. It not recommended that water from the hot water tap be used for drinking or cooking.

Choosing a rainwater tank

The size of the tank required to meet household needs will depend on a number of factors including:

- Rainfall – the average annual rainfall, the pattern of distribution throughout the year and the variation from year to year.
- Roof Area – which places an upper limit on the amount of water that can be collected.
- Acceptable Level of Security – the risk or possibility of the tank running dry. A higher level of security will be required where tanks are the sole source of supply.
- Demand – which varies enormously from household to household and season to season depending on: number of people in the household; their water use habits; what the rainwater is used for and the number and type of water saving appliances.

Where a tank is to provide an alternative or secondary supply (e.g. to the public water supply), the size of the tank is not such a critical issue and often will depend on considering user requirements (garden watering, car washing etc.) balanced against cost.

What if I need more water from another source?

Rainwater may be supplemented by water from other sources such as rivers, creeks and dams (surface water) or bores (groundwater). However, water from these sources may require additional treatment, such as filtration and disinfection, to maintain water quality.

If you top up your tank from a water carter you should ensure that you are being supplied with clean drinking water from a clean tank. Waters Carters must comply with the *NSW Public Health Act 2010* by having a quality assurance program following the NSW Guidelines for Water Carters, and keeping records of deliveries. Water carters must be authorised by the local council to carry drinking water.