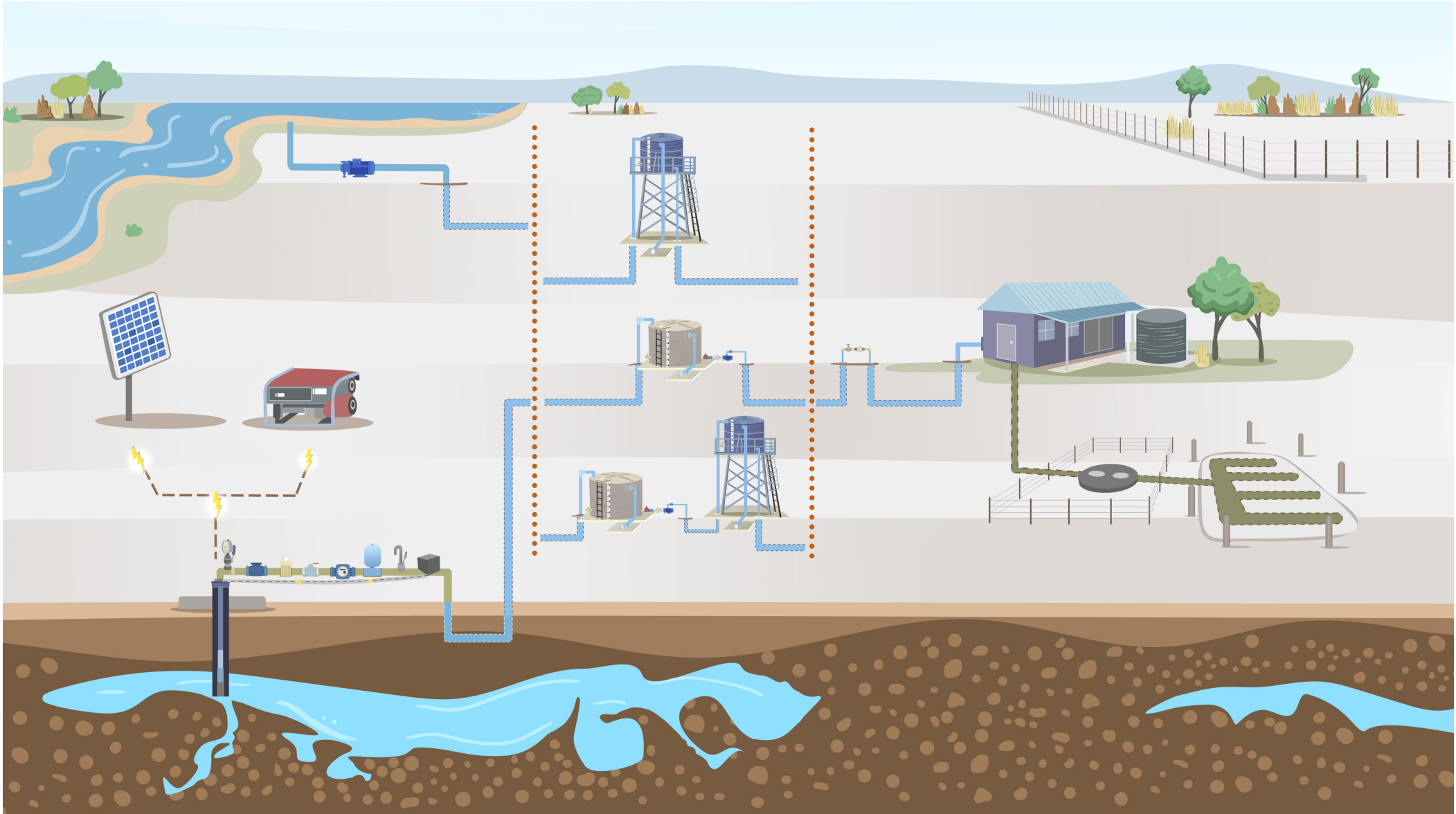


Water for Homelands

A Best Practice Guide for Remote NT Water Systems



Index (continued)		
Wastewater Management	> Overview	24
	> Septic Tanks	25
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	> Septic System Troubleshooting	27
Water for Homelands	> Meet Your Experts	28

These Resources provide an overview of basic, best practice water supply and wastewater system management relevant to systems commonly found in NT Homelands.

They provide a starting point for learning about how the systems work, checks and maintenance recommended to keep them working and support improved **water quality, water security** and **resident and worker health and safety**.

Water Quality

Each resource identifies Water Quality risks related to the environment, infrastructure, equipment, checks or maintenance actions shown on the page.

Water Security

Each resource identifies Water Security risks related to the environment, infrastructure, equipment, checks or maintenance actions shown on the page.

Resident/Workplace Health & Safety

Each resource identifies Health and Safety risks related to the environment, infrastructure, equipment, checks or maintenance actions shown on the page.

These Resources are also accompanied by:

- A **Water Site Survey and Maintenance Plan Template** that can be used to check and plan maintenance for your water supply and wastewater management system.
- A **Bore Risk Assessment Tool** that can help identify risks for a particular bore and provides risk management actions to reduce the likelihood of bore failure, or of contamination to the bore water source itself.

Establishing best practice water supply and wastewater system management in a Homeland provides a strong foundation for reducing risks and reducing costs associated with emergency repairs.

These Resources describe Basic Best Practice, Phase 1. Talk to your technical coordinator at HSG for information on later phases.

Basic Best Practice - Phase 1

Basic Phase 1 water supply and wastewater management identifies extreme risks for all sites. Example actions include developing an understanding of how systems work and implementing basic maintenance.

Basic Best Practice - Phase 2

Basic Phase 2 Water Supply and Wastewater Management supports Service Providers to address priority risks common to most sites as identified in Basic Phase 1 management, through homelands resident engagement and follow-up risk management actions.

Intermediate Best Practice

Intermediate water supply and wastewater management addresses significant site-specific risks identified during Basic Phase 1 and 2 management, and into the future through pre-planning. Example actions include developing water safety plans, disinfection and active management of high-risk water sources.

Advanced Best Practice

Advanced water supply and wastewater management addresses additional risks. Example actions include disinfection and active management of medium-high risk water sources, and additional contingency planning.

Pages 05-14

Turn to this Resource for information and guidance relating to Bores & Bore Water sources, including the bore pump and headworks, the infrastructure and equipment that pumps the water up from underground.

Bores &
Bore Water

Pages 15-16

Turn to this Resource for information and guidance relating to Surface Water sources that may also be used in NT Homelands, including the infrastructure and equipment that pumps the water from the source.

Surface
Water

Pages 17-21

Turn to this Resource for information and guidance relating to Pipes & Storage, the infrastructure and equipment responsible for transferring and storing water, and for distributing that water to houses or other points of usage.

Pipes &
Storage

Pages 22-23

Turn to this Resource for information and guidance relating to Rainwater Tanks, an important addition to a water management system that is commonly installed on houses and other buildings in NT Homelands.

Rainwater
Tanks

Pages 24-27

Turn to this Resource for information and guidance relating to Wastewater Management, the infrastructure and equipment responsible for treatment and disposal of sewage and wastewater.

Wastewater
Management

Water for Homelands > How to use these Resources

These Resources are not Standard Operating Procedures (SOPs) and do not contain enough information to design a water management system.

Contact your Technical Coordinator at HSG if you have questions about these resources or for help identifying specialists for new equipment, maintenance, repair or problem solving.

Users should carry out their own risk assessment, work to safe work practices and SOPs relevant to each system and use appropriate Personal Protective Equipment (PPE).

What to Look For / Equipment information

-  Icons included in these boxes indicate what to do when approaching infrastructure or equipment.
- B** Letters included in these boxes identify image labels and provide direction for particular infrastructure or equipment. There may be page numbers to direct you to more information.

 This icon means there is something specific to look for.

 This icon means there is something specific to listen for.

 This icon means that you should wait for the time indicated before performing the next task.

 This icon means there is a maintenance action to be performed.

 This icon means check the user's manual, manufacturer's instructions or SOPs.

 This icon is included where infrastructure should be secured and locked.

 This icon is included to indicate where electrical equipment or connections are present.

 This icon is included where additional information is available.

 This icon means your HSG Technical Coordinator or a specialist should be contacted.

B Equipment Name

These boxes provide information about specific infrastructure and equipment components that make up the water supply and wastewater system.

-  Icons included in Equipment boxes indicate what to look for. There may be page numbers to direct you to more information.

Task Name

-  Icons included inside Task boxes indicate what to do during that task.
-  This icon indicates that you might find a problem with infrastructure or equipment during a task.

Common Problems

Problem boxes list possible causes of a problem:

- Each dot point is a possible cause of a problem.

 These boxes provide additional information or indicate where to find additional information.

 This icon indicates where there is a specific Water Quality risk.

 This icon indicates where there is a specific Water Security risk.

 This icon indicates where there is a specific Resident/Workplace Health & Safety risk.

 This icon indicates that a specialist should be called or may be able to help.

SOPs and safe work practices are essential and not described in these Resources.

PPE does not replace minimising risks and eliminating hazards.

! Example PPE includes:

 Safety boots reduces risk of foot injury caused by impact, puncture, abrasion and chemicals.

 Ear muffs and plugs reduces risk of hearing damage caused by loud noise.

 Chemical resistant gloves reduce risk of hand injury due to hazardous substance exposure.

 Safety eyewear reduces risk of eye injury from bright light, foreign objects and liquids.

 Hard hats reduce risk of head injury caused by falling objects.

 High visibility (high-vis) clothing makes the wearer more visible to others.

 Respiratory Protection reduces risk of injury due to inhalation of gas, vapour and particulates.

 Fall-arrest systems reduce the likelihood of injury due to falling from heights.

 Sunscreen reduces risk of skin damage and cancer caused by exposure to sunlight and UV.

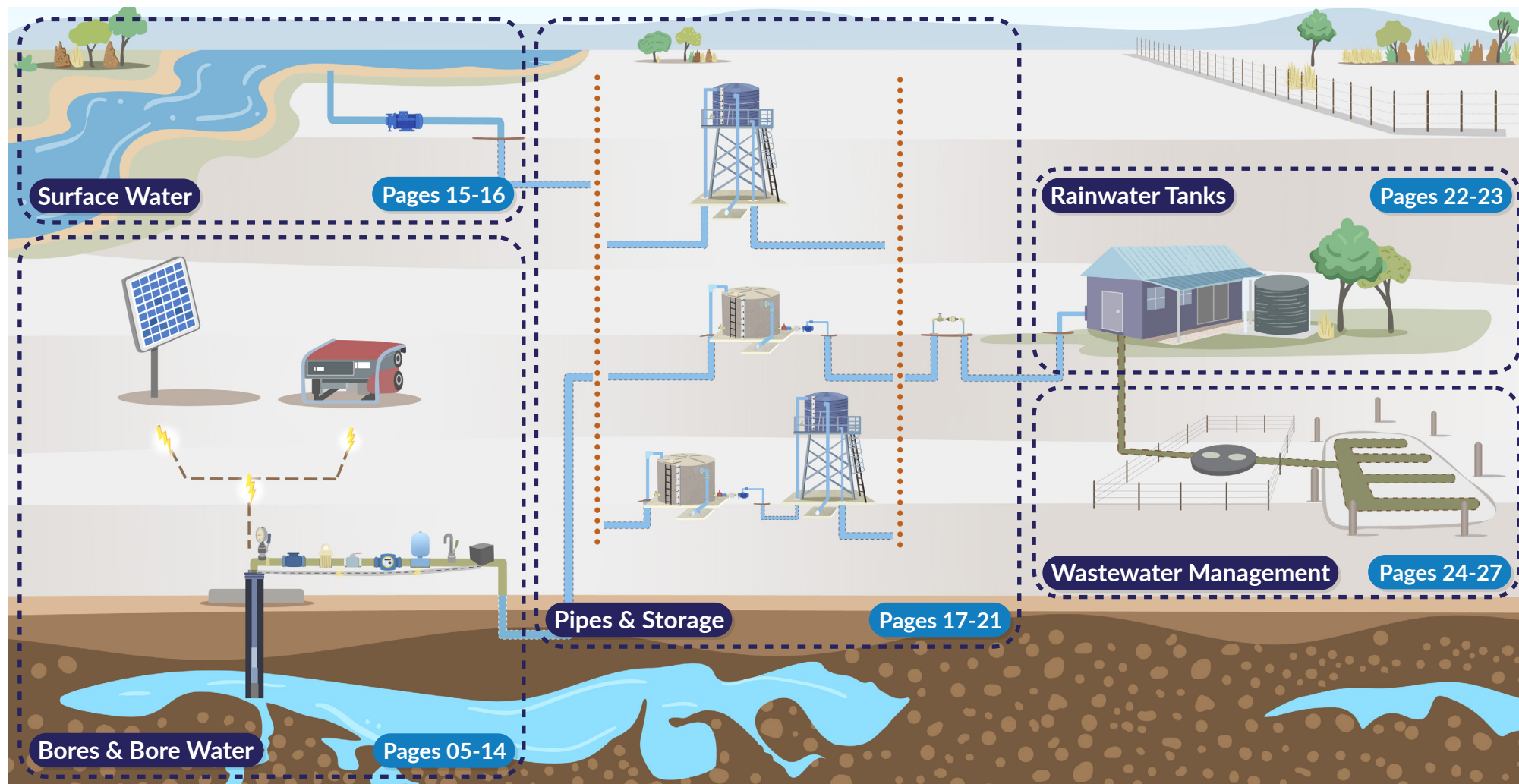
Water for Homelands > What Good Looks Like

04

The picture on this page shows a complete Water Management System, which includes a water source, water pipes and storage, and wastewater management. Each system may have some or all of the infrastructure shown.

The water source is the first place we can look after the quality and security of the water supply. Homelands can be supplied with bore water, surface water or rainwater.

Information on how to safely manage water quality, water security, and risks related to each component of the Water Management System can be found on the pages indicated below.



Bores & Bore Water

Surface Water

Pipes & Storage

Rainwater Tanks

Wastewater Management



Water Quality

Looking after your infrastructure is critical to water quality and public health. Water quality can turn bad from bugs, chemicals or minerals in the water, and drinking bad water can make residents very sick.

Water Security

Homelands can run out of water due to infrastructure and source failure. Identify and address risks to water security early to reduce the risk of running out of water and more expensive repairs later.

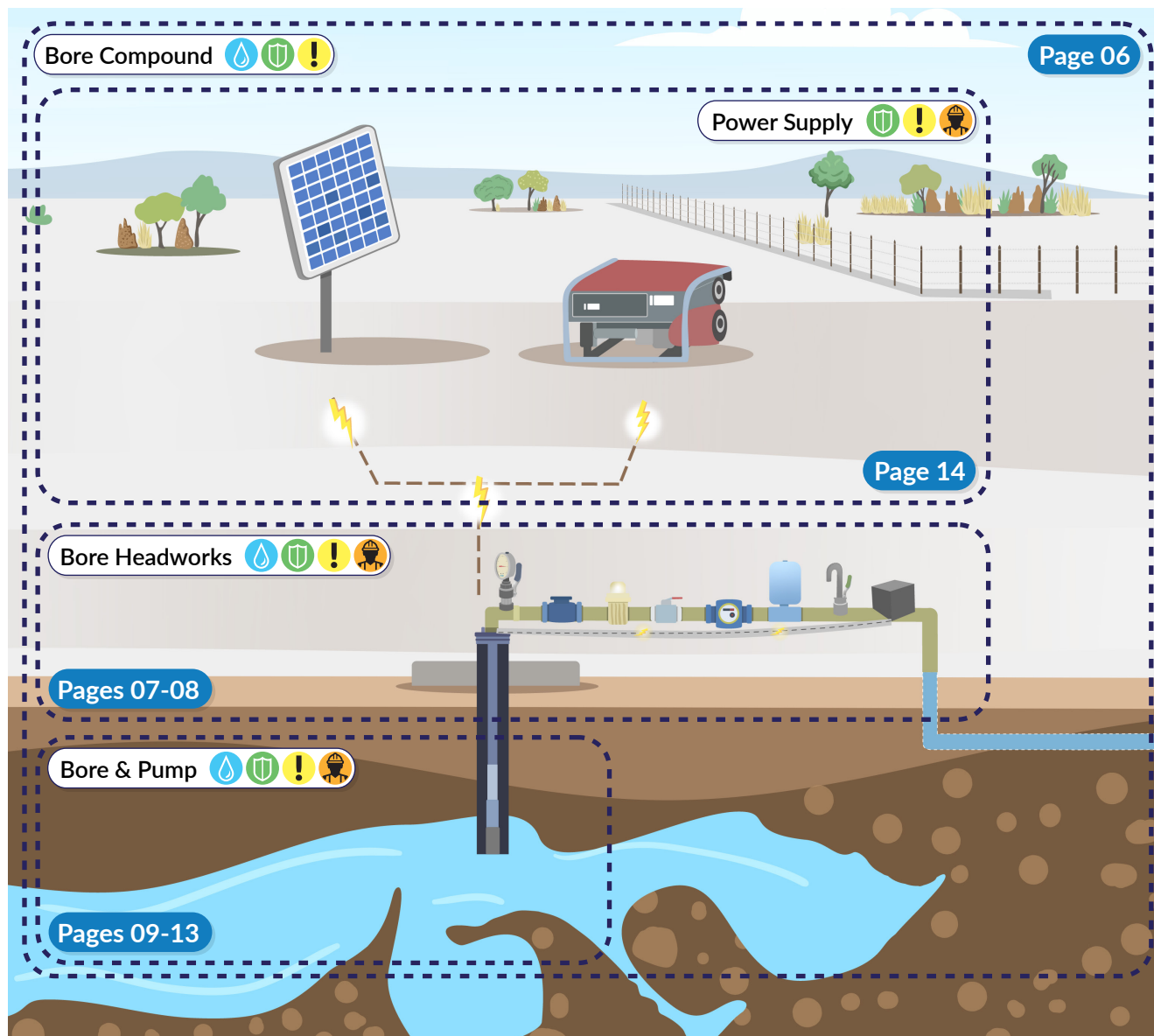
Resident/Workplace Health & Safety

To reduce the risk of accidents, injury, disease or death, water management infrastructure should be kept secure and in good condition. Workers must know how to work on that infrastructure safely.

Bores & Bore Water > Overview

This section describes best practice for looking after bores, the water source, and the surrounding areas to optimise the water quality, water security, and general safety.

Use the **Bore Risk Assessment Tool** for a site-specific assessment of the risks to your bore, and for actions you can take to reduce those risks.



Bores & Bore Water

- Know Your Bore** is an NTG website that contains information on nearly every bore in the NT.
Find the website by searching:
'Know Your Bore'
- Identify your bore by searching for the **RN (Registration Number)** of the bore you are interested in or by the address.
Select your bore by clicking on the yellow dot. Click the **View Report** link and this will show the drilling report, or the **Statement of Bore**.
- Guidance on how to read your Statement of Bore is available on page 13.**

Water Quality

The quality of the water is important to manage, and the bore and surrounding area is a key part in the supply system to manage this.

Water Security

Reliable access to the bore water source is important, and managing the bore infrastructure and supporting equipment can assist in achieving this.

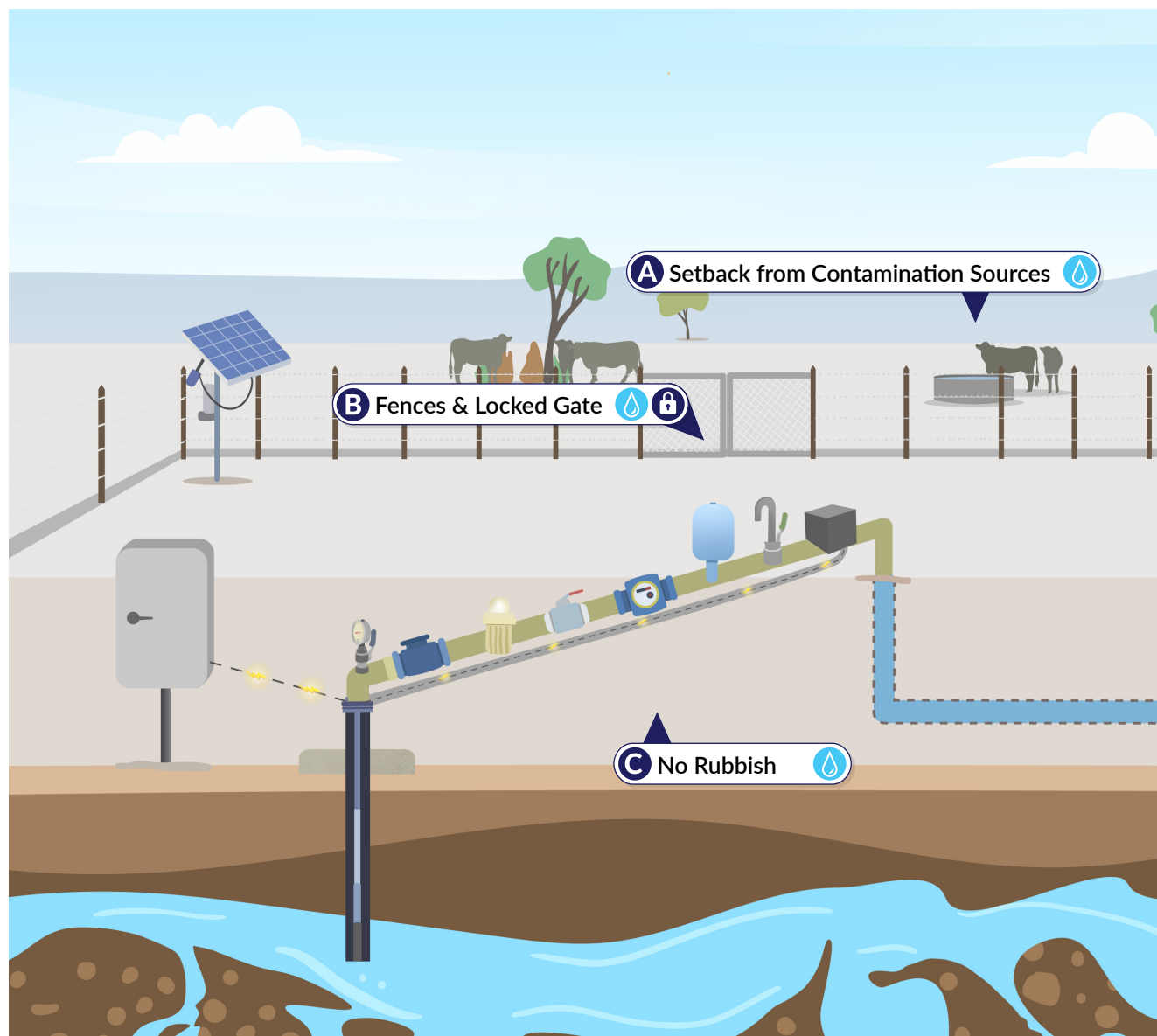
Resident/Workplace Health & Safety

Consideration for resident and workplace health and safety is necessary when managing water supplies. This includes when working around bore infrastructure and equipment.

Bores & Bore Water > Bore Compound

This picture shows the bore compound and what a good compound can look like. Each compound may have some or all of the components shown below.

Use the **Bore Risk Assessment Tool** for a site-specific assessment of the risks to your bore, and for actions you can take to reduce those risks.



What to Look For

- A** There should be no septic systems, toilets, or old unsealed bores nearby.

No animals like cows or horses should live within 100m of the bore. If possible, move water troughs and similar to keep them away.

No chemicals or herbicides should be used within 100m of the bore.
- B** Check gates are locked and fences are undamaged.
- C** Remove any rubbish, pollution, and overgrown grass and plants in the bore compound.
- D** Unusually green grass, pooled water, or drips are signs of water leaks. You may need to call a plumber to fix.

Water Quality

Any pollution or rubbish near the bore, including sewerage, dead animals or faeces, fuel, oil and chemicals (even in containers), rubbish, old cars and pooling water can contaminate the water supply.

Water Security

People and animals in the bore compound can damage infrastructure, equipment and power supplies. Overgrown grass and plants create fire hazards and tree roots can cause damage. Damage to infrastructure might mean the water supply fails.

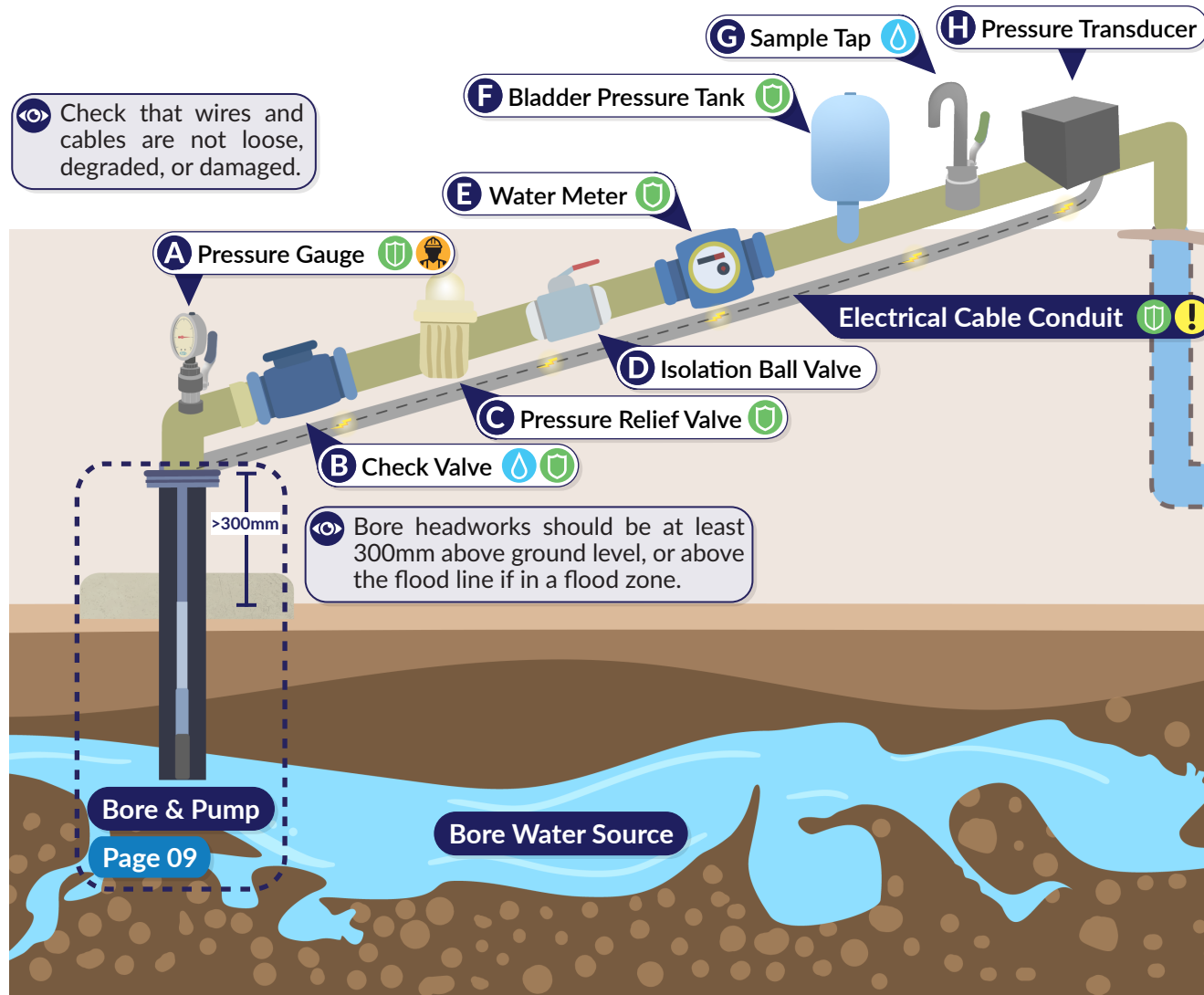
Resident/Workplace Health & Safety

The bore compound should be fenced and locked up to reduce the risk of accidents and stop animals or people entering the compound. Even small holes in a fence can mean the compound is not secure.

Bores & Bore Water > Bore Headworks

This picture shows the borehole, bore pump, and all the other pieces of equipment that a good water supply system uses to get bore water out and into storage tanks.

This equipment is known as the headworks. Each bore may have some or all of the headworks components shown below.



Bore Headworks Equipment

- A** Used to show the pressure at the pump outlet when the bore pump is on. More information is provided on page 8.
- B** Prevents water flowing back down the borehole. Also called a non-return valve.
- C** Releases pressure if there is blockage in the line. Used in older systems when the bore doesn't have an automatic pressure cutoff.
- D** Allows the pipework and bore pump to be isolated for maintenance.
- E** Records the volume of water used. For more information, see page 8.
- F** Regulates pressure to reduce pump cycling.
- G** Use a ball valve on the sampling point. These are cheaper and less likely to leak.
- H** Used to turn the pump off automatically when pipe pressure is high. Used to control tank levels. More information is available on page 11.

Water Quality

Gaps, cracks or holes in the bore and headworks can let pollution or other contaminants into the water that turn the water bad. Damage can lead to leaks and pooling water that attracts mosquitos, animals and other pests which also cause contamination.

Water Security

Green grass, shrubs or pooling water often mean there's a water leak. Leaks mean there is damage. The bore & headworks should also be silent - if you can hear noise or if the water flow is reduced or stopped, something is wrong and the water supply might fail.

Resident/Workplace Health & Safety

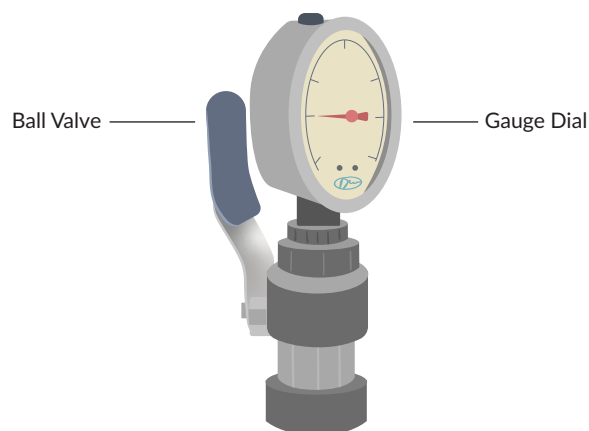
It is important that infrastructure be kept secure and in good condition to reduce the risk of accidents. Broken or poorly maintained equipment can cause electrocution.

These pictures show a Pressure Gauge and Water Meter. These are key pieces of equipment on the bore headworks that help users understand how much water is used, and how the water system is functioning.

A Pressure Gauge



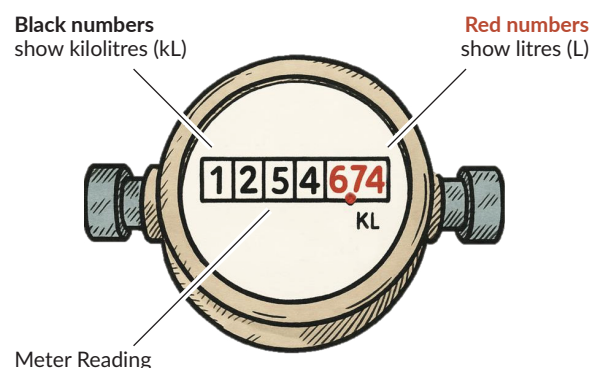
Pressure Gauges show the water pressure at the pump outlet when the bore pump is on.



D Water Meter



Water meters record how much water has passed or been pumped through.



The picture above shows a meter reading 1254kL and 674L, or 1254.674kL.

What to look for: Pressure Gauge

- A low cost ball valve will make it easier to replace the pressure gauge when required.
- Check the dial is moving and operational. The pressure will read what the water pressure is in the line.
- If pressure is much lower or higher than usual when the pump is on, there could be a problem.
- Pressure Gauges can fail due to UV (sun) exposure and are easily vandalised.
- If there is a problem with the pressure gauge it should be fixed or replaced.

What to look for: Water Meter

- Check the meter is operational by taking two readings over an hour while the bore is pumping water. The difference between these numbers is the water flow rate per hour.
A 'smart meter' can be added for remote water flow monitoring if a mobile network, internet or other communication method is available.
- If the meter reading does not change while water is flowing through, there is a problem.
- If there is a problem with the water meter it should be fixed or replaced.

09

GPS coordinates and tell your HSG coordinator.
Old bores need to be capped and sealed to
prevent source contamination.

If you find a bore that doesn't have a RN, record its



Surface Water

- ## Pipes & Storage

Rainwater Tanks

Wastewater Management

Poor installation, lack of maintenance, vandalism, storms and floods can result in damage to bore infrastructure and equipment, which might cause the water supply to fail.

All bore infrastructure and equipment creates risks of accident, injury or death. Ensure the bore, bore head and plinth are kept in good condition, and that staff and contractors know how to work with it safely.

i Information on selecting and maintaining a bore pump is available on page 12.

Bores & Bore Water > Bore & Pump > Bore health check

10

It is important to regularly check the borehole and concrete plinth for damage. Monitoring and maintenance on the condition of the bore may help prevent large repairs due to bore failure, and can reduce the risk of the water supply becoming

contaminated. This sheet shows some basic first steps to maintaining your bore. If there is significant damage to the bore and plinth, a specialist bore contractor might be required.

! Safety Always use safe work practices and procedures. Perform a Job Safety & Environmental Analysis (JSEA) before starting these checks and always wear appropriate Personal Protective Equipment (PPE).

Before you begin



- 👁 Check the area around the bore is clear for easy access and to carry out any inspection and maintenance works.

Small holes & cracks



- ❌ Small holes and cracks in the bore head and plinth are a contamination risk.
- 🔧 To fix small holes in the bore head, use a product like Waterproof Sikaflex, put a flanged bolt in holes or weld a plate over an area. Rubber gaskets should be used between metal surfaces to create a good seal.
- 🔧 To fix small cracks in the concrete, clean and fill with a repair mortar or grout.

Larger structural damage



- ❌ Larger cracks or structural damage to the concrete, or where the concrete is undermined due to erosion, is a contamination risk. This may require removal and replacement.
- 📞 If there is significant damage, the bore and concrete plinth will need inspection by a contractor to check the bore casing isn't damaged.

Leaks & pooling water



- ❌ Leaks and pooling water around the bore are a contamination risk.
- 👁 If there is water pooling or patches of green grass near the bore, there may be a leak. Prevent pooling water and erosion by directing water away from the bore and head works.
- 🔧 Find and fix the equipment or instrument that is leaking. This may require the equipment or instrument to be serviced or replaced.

Bore casing height



- ❌ Bore casing less than 300mm above the ground, or flood line if in a flood zone, are a contamination risk.
- 📞 Talk to your bore contractor about raising the height of the casing and bore head if required.

Flooding



- ❌ Bores are vulnerable to damage and contamination during floods and storms.
- 👁 After a flood, check that the bore headworks are in place and that no cracks or holes have formed in the bore head or plinth.
- 📞 There is also a risk of silt and sand filling the bore. A dip test can be carried out to determine if the water level has risen as a result of this. If this happens, a bore contractor will be required to clean out the bore and check for any damage.
- 📞 Water may become contaminated after a flood. Microbiological samples should be taken for testing and the water storage tank hand dosed with chlorine until the microbiological test results come back clear.

Who to call

- ❌ If you have encountered a problem in any of these checks, then there is a potential water security risk.
- 📞 Notify your HSG technical coordinator of the problem, and the risk.
- 📞 It is recommended to call a Bore Contractor to get large cracks, structural damage or equipment and instruments replaced. If you do not have a Bore Contractor, HSG should be able to recommend one.

Bores &
Bore Water

Surface
Water

Pipes &
Storage

Rainwater
Tanks

Wastewater
Management



A bore pump will, ideally, be controlled by a signal from the storage tank it pumps water into. The pump should automatically turn on when the tank water level is getting low, and turn off to stop the tank overflowing when it gets close to full.

Automatic overflow prevention is important to reduce the risk of accidental loss of water, and to reduce the risk of damage to infrastructure caused by overflowing water and erosion.

Automated Overflow Prevention

- Automated overflow control may be set up using a level switch or a ballcock valve, and can work with solar power or a timer.

Level Switch

- A water level switch on the storage tank can indicate when the tank is close to empty, automatically starting the bore pump. It can also indicate when the tank is full and the pump should stop.

This signal can be hard wired or remote.

Ballcock Valve

The bore pump can be automatically stopped by using a ballcock valve in the storage tank that stops water flowing into the tank and lets pressure build in the line until a pressure transducer turns off the pump.

- This type of valve is called a float valve and is a big version of what you might see in a toilet cistern.

Remote Monitoring

- Remote monitoring of bore pumps and tank water levels can help identify issues before they become problems requiring expensive repairs. Data can be accessed online, not just on site.

Other Flow Controls

- If the bore pump is not set up with automated overflow prevention it may be turned on and off at preset points during the day or night.

This set up does not automatically respond to the water level in the tank and will cause the tank to overflow if it's already full when the pump starts, or if the tank fills up during pumping.

Solar Power

- Without automated overflow prevention, solar power turns the bore pump on when the sun comes up, and off when the sun goes down (can also be set up with automated overflow prevention).

See page 14 for more information about solar power.

Timer

- With a timer, a bore pump can be set to turn on and off at certain times or intervals.
- For example, the timer could turn the pump on and off every 4 hours.

Visual Monitoring

- Visual monitoring using a flag level indicator can show the tank water level from a distance if the bore pump is controlled manually.

Common Overflow Control Problems

Problems with overflow control may be caused by:

- Bore pump damage/maintenance.
- Damage to the level switch, ball valve, or pressure transducer
- Leaks or blockages in the pipes between the bore and one or more storage tanks.
- Damage to electrical cabling or telecommunications, preventing control signals getting through.

Use these resources, the **Water Site Survey and Maintenance Plan Template** and the **Bore Risk Assessment Tool** for information on how to keep the system in working order.

Water Quality

Water overflowing from tanks can end up pooling rather than draining away. Pooled, standing water can attract animals which can contaminate the water supply. Mosquitoes and other pests can breed in it.

Water Security

Overflowing water leads to water loss and can cause erosion and structural damage to tanks and foundations. Tanks without overflow pipes can be damaged if too much water is pumped into them.

Resident/Workplace Health & Safety

Overflowing water that floods electrical equipment increases the risk of electrocution for people nearby. Shut off the electricity if it's safe to do so. Licenced electricians should be called for any electrical repairs.

Bores & Bore Water > Bore & Pump > Bore Pump health check

12

It is important to regularly check that the Bore Pump is operating properly and that water is flowing.

Monitoring pump operation and ensuring regular maintenance is completed may help prevent large

repairs later due to bore pump failure.

This sheet shows some basic steps to monitor your bore.

If maintenance is required it should be completed as per the manufacturers instructions.

! Safety Always use safe work practices and procedures. Perform a Job Safety & Environmental Analysis (JSEA) before starting these checks and always wear appropriate Personal Protective Equipment (PPE).

Before you begin



- 👁️ Check the pump is on at the control panel. Make sure there is enough space in the storage tank to hold more water.

Listen for pump noises



- 👂 Put your ear near the bore headworks. Usually the pump is silent or very quiet.
- ❌ If you hear any mechanical or unusual noises, it is likely there is a problem.

Check the water pressure



- 👁️ Check the water pressure using the pressure gauge as indicated on page 8. If the gauge is not working or reads 0kPa, you have no flow.
- 👁️ Look in the bore pump user manual to see if the pressure reading is within the safe operating range (the head pressure).
- ❌ A low pressure, or lower than usual, indicates the pump or bore hole might have a problem.
- ❌ A high pressure, or higher than usual, indicates there might be a blockage in the line.

Check the flow - water meter



- 👁️ If the bore headworks has a water meter, use it to check the bore pump flow.
Make sure the pump is on.
Write down the meter number, or take a photo.
- 🕒 Wait 1 hour. After an hour, write down the meter numbers, or take another photo.
The difference in the numbers recorded is the flow rate per hour.
- ❌ If the numbers are the same, there is a problem.
- 📖 Check the flowrate is similar to normal, or you can also check the bore pump user manual.

Check the flow - tank level indicator



- 👁️ If there is no flow meter, check the pump is working by monitoring the water level in the storage tank it pumps to, and ensuring it is increasing over a 1 hour period.
Use the external tank level gauge to check this.
To accurately do this check, you will need to limit flow out of the tank over this period.
- ❌ Ensure any limits on water provision over this testing have been communicated and agreed with residents.

Common Bore Pump Problems

Problems with Bore Pump Health may be caused by:

- Pump is too big for the bore water source.
- Bore pump damage / lack of maintenance.
- Low bore water source level.
- The bore is forking, meaning there is not enough water to pump.
- Silt or sand blocking the bore hole.
- Valve downstream from the bore jamming partially or completely shut.
- Pipes getting blocked by calcium, iron, silt or bacterial growth.

Choose the right pump for the bore water source using the **Statement of Bore** as a guide. A pump that is too big will cause damage, it won't provide more water. Specialist pump suppliers can help.

The **Water Site Survey and Maintenance Plan Template**, and the **Bore Risk Assessment Tool** have more information on how to keep the system in working order.

Who to call

- ❌ If you have encountered a problem during these checks, then there may be a Water Security risk.
- 📞 If the problem is pump or pipework related, you should call your plumber or pump supplier.
- 📞 If the problem is borehole or water source related, you should call your Bore Contractor.
- 📞 You can also get help from your HSG Technical Coordinator.

Bores & Bore Water

Surface Water

Pipes & Storage

Rainwater Tanks

Wastewater Management



RECEIVED
DATE 26/2/16 BY [redacted]
ENTER 4/3/19

Bore RN

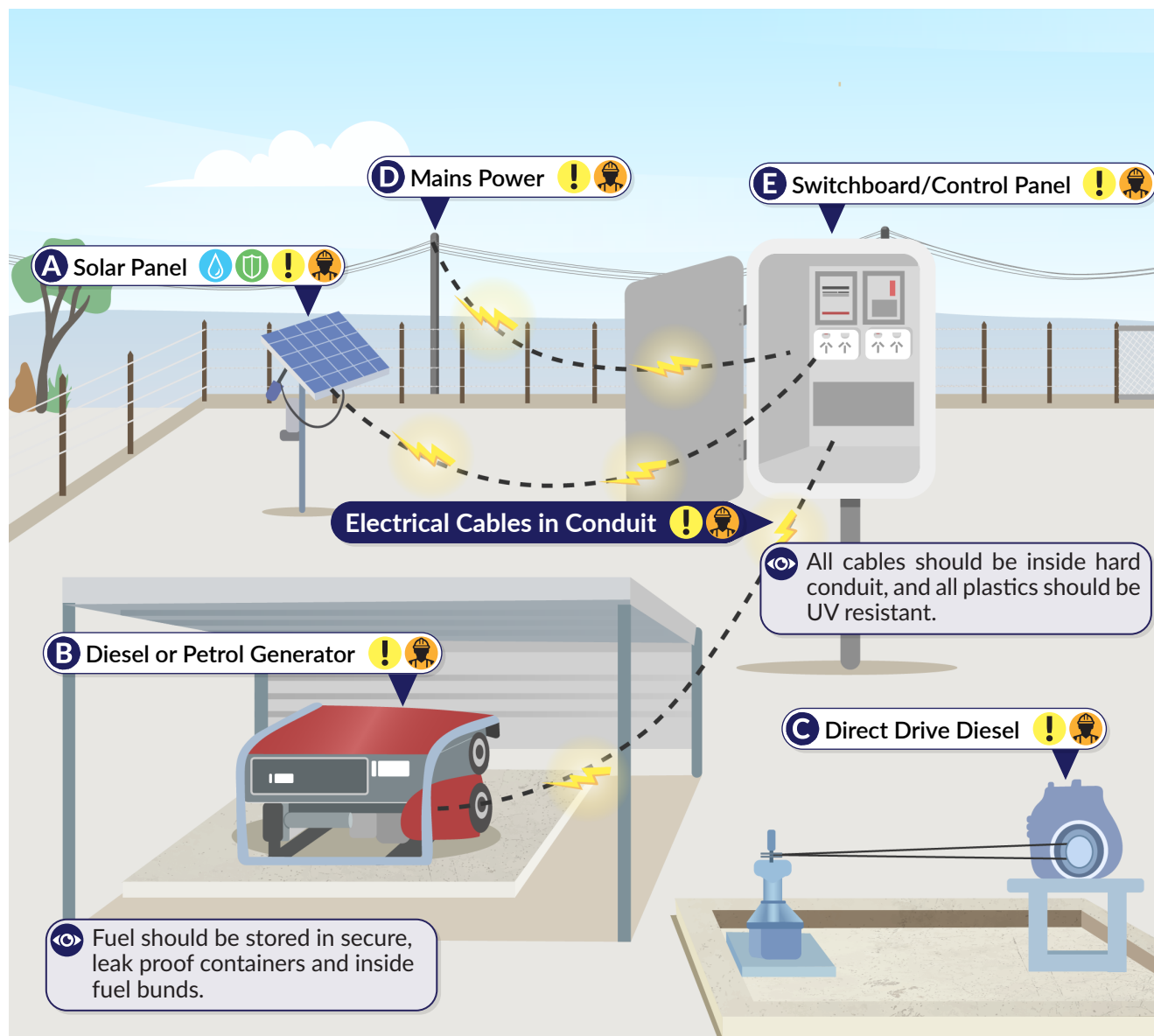


-  **A Statement of Bore**, also known as a **Drilling Report** or a **Bore Report**, has important information that will help you manage your bore. This information is issued by the drilling contractor when they drill the bore.
-  To find the Statement of Bore for your bore visit the **Know Your Bore** website and search using the **RN number** or location.
-  **A** **Strata Description**: The types of soil/rock encountered under the ground around the bore water source when the bore was drilled, and the depth where they were encountered.
-  **B** **Total depth of bore**, in meters below ground level.
-  **C** **The location of the bore screen underground**, in meters below ground level.
-  **D** **The type of bore screen installed around the bore pump**.
-  **E** **The size of the holes in the bore screen**.
-  **F** **Yield**, in litres per second, at time of bore construction. The bore pump should not exceed this yield.
-  **G** **Type of casing used in bore construction**.

Bores & Bore Water > Power Supply

This picture shows the equipment that can be used to power or drive a pump. The pump may be powered by electricity from solar panels, a generator or mains power, or may be driven mechanically by a diesel engine.

Electricity should be supplied from the relevant equipment via conduits to the pump. Electrical safety is very important to manage at the bore site. A licenced electrician should be used to fix any issues.



Power Supply Equipment

- A** Solar powered pumps are cheap to run and require very little maintenance. They only pump when the sun is out so storage needs to be large enough to supply at night and when cloudy.
- B** Generators can power pumps and other equipment, and require a constant supply of diesel/fuel to run.
- C** Older pumps may be directly driven by a belt connected to a diesel engine. They require a constant supply of diesel to run.
- D** The pump and other equipment may be connected to nearby mains electricity, which may be charged directly to residents or the Service Provider.
- E** The pump switchboard and controls should be lockable with an escutcheon plate fitted.

Water Quality

Fuel, oil and chemicals can contaminate the water supply when spilled or if containers leak.

Water Security

People and animals in the bore compound can damage equipment and power supplies, and potentially impact water supply. Grass and plants create fire hazards.

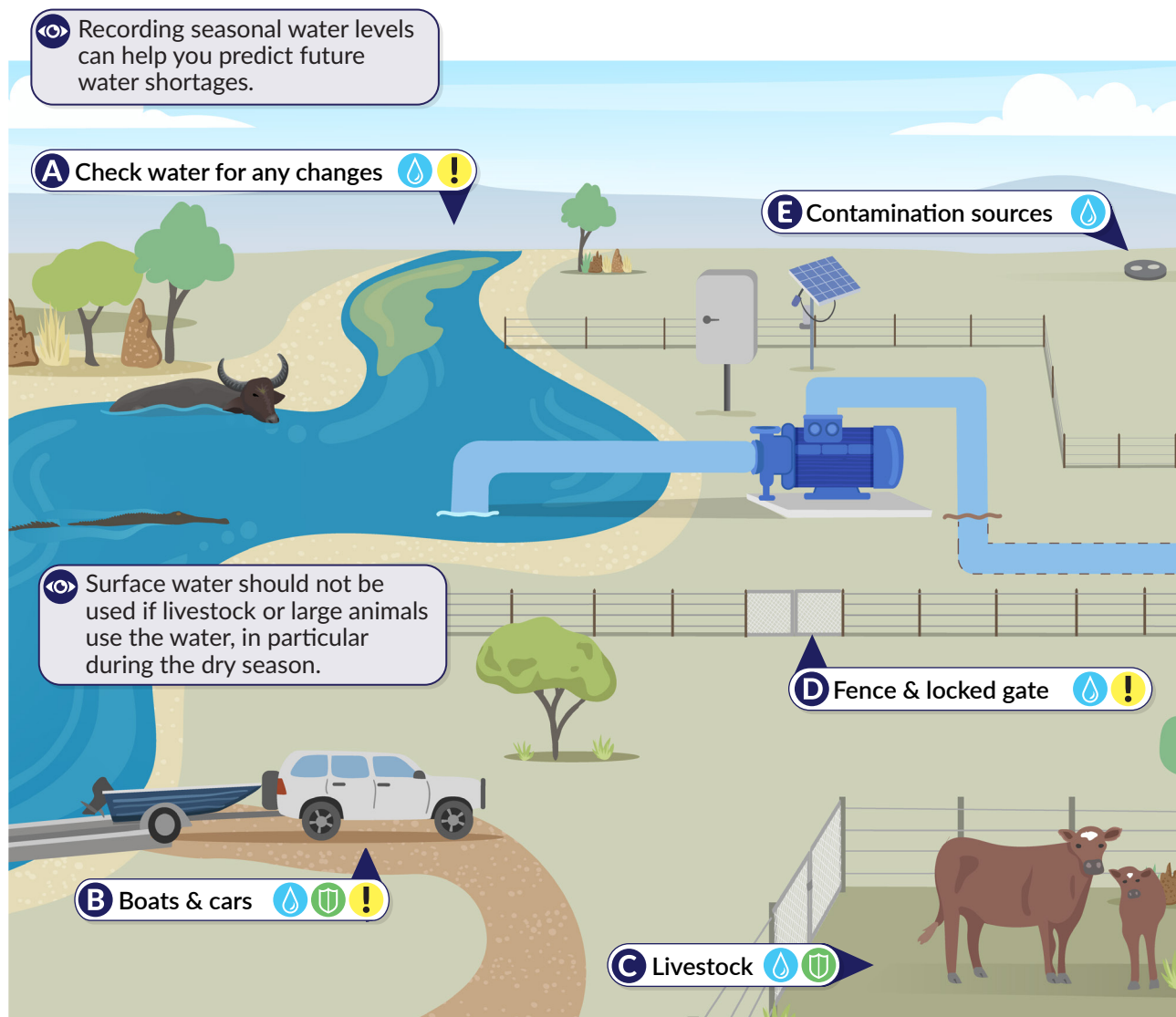
! Resident/Workplace Health & Safety

Loose wiring and damaged equipment can cause fires or electrocution. Fuel, oil and chemicals can be harmful if they get on skin or are ingested. Exposed belts and moving parts can cause injury. A licenced electrician should be used for any electrical repairs.

Surface Water > Overview

This section describes best practice for looking after surface water sources including springs, rivers, billabongs, lakes and dams, the areas around them and the equipment used to pump the water for use.

Some Homelands use surface water with an extra bore (pg 5) or rainwater (pg 22) supply for backup. If there is no disinfection for surface water sources then water should be boiled before drinking.



Surface Water

- A** If you see algae, mud, oil or changes to the colour or smell of the water, switch to another water source or call HSG for help. Avoid using the water.
- B** Do not let boats, cars or other vehicles in dams, lakes, billabongs, near or upstream from water intakes unless they are being used for water supply maintenance.
- C** Livestock can contaminate the water and damage equipment. Where possible keep livestock fenced in, downstream of the intake and with an alternative water source for animals to drink.
- D** Dams and equipment should be fenced with locked gates to keep people and animals out.
- E** Any septic systems, toilets and rubbish dumps nearby should be relocated. Rubbish on banks should be removed.

Water Quality

Surface water is easily contaminated and quality can change quickly. Nearby wastewater systems can contaminate water. Some algae can contaminate water and can be harmful if touched. Any pollution, including from boats, vehicles, rubbish, animals, algae, agricultural or other runoff can make the water bad.

Water Security

Equipment used to pump from surface water sources is easily damaged by people, animals, or exposure to severe weather and should be regularly maintained and checked to prevent failure. The amount of surface water available can change throughout the year.

Resident/Workplace Health & Safety

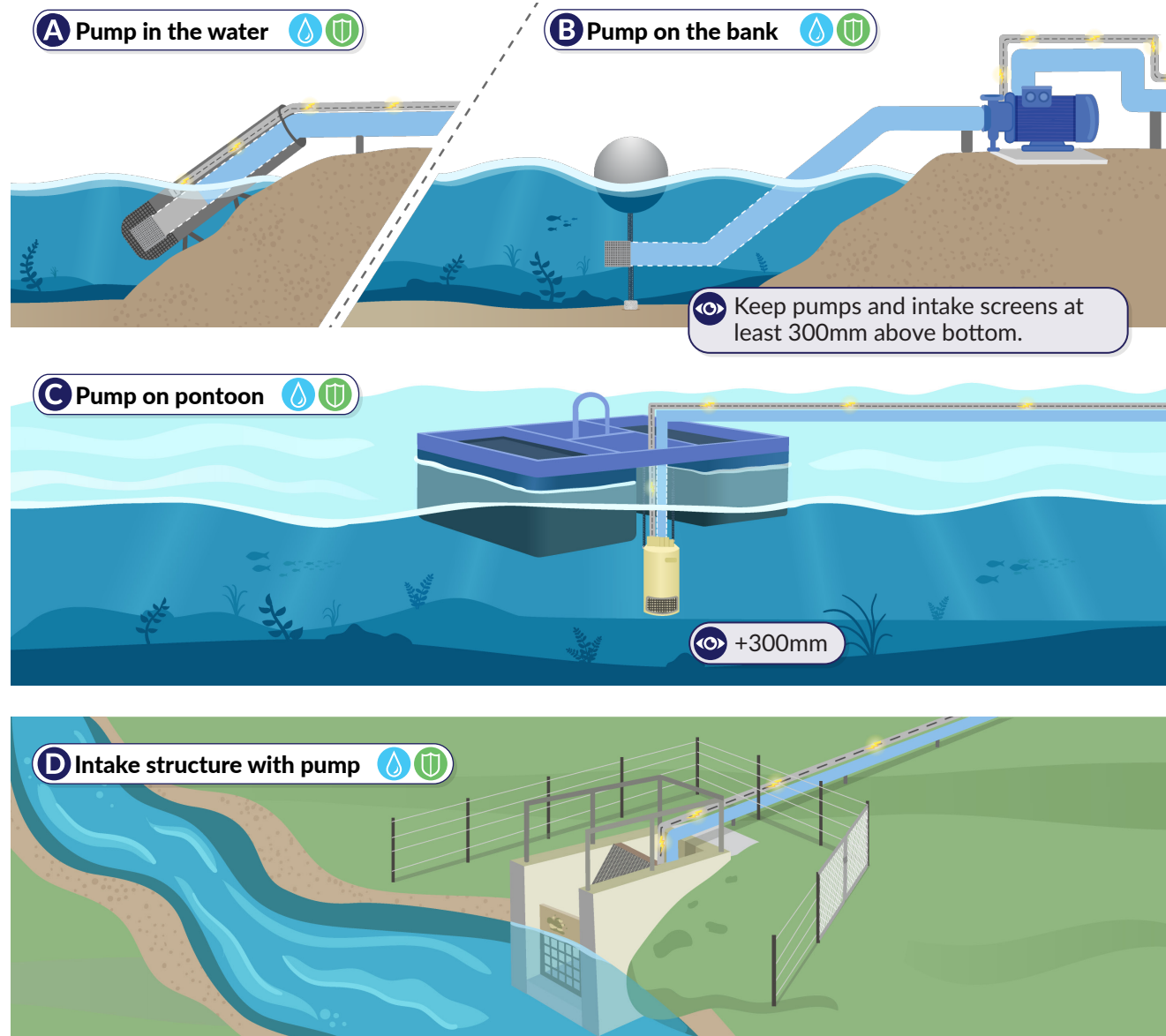
People can easily drown in surface water sources including springs, rivers, billabongs, lakes and dams, in particular when there are no fences, or banks are unstable or muddy. Dangerous wildlife like crocodiles or snakes might be in or near the water.

i Information on how to manage nearby wastewater systems is available on page 24.

Surface Water > Intakes & Pumps

Pump and intake setups for surface water sources can be very different due to the environment and requirements at the site. Equipment and risks can be similar to bore water supplies. Use the information in the Bore and Bore Water

sections to help understand infrastructure and risks: Bore Headworks (pg 7); Pressure Gauge & Water Meter (pg 8), Bore Pump Flow Control (pg 11), Bore Pump Health Check (pg 12) and Power Supply (pg 14).



Intakes & Pump Equipment

- A Pump in the water:** Suitable for all surface water sources, best where the bank is solid, not sandy or muddy. Intake pipe must be protected against floods and fast flows in rivers with a casing.
- B Pump on the bank:** Suitable for all surface water sources. Intake pipe must be protected in rivers. Keep flexible pipes between 100 to 300mm under the surface and off the bottom using a float.
- C Pump on pontoon:** Suitable for dams, billabongs or lakes, not for fast flowing water which can cause damage.
- D Intake structure with pump:** Used for all surface water sources, but best for springs and rivers that experience flood and where water quality changes regularly.

Water Quality

Silt from the bottom and scum from the top of the water can contaminate the water if sucked into the system. Reduce this risk by using an intake or pumping system that can be kept above the bottom and underneath the surface of the water.

Water Security

Silt and scum can block or damage intakes and pumps if sucked into the system. The intake must be able to operate with high and low water levels to reduce this risk. Intakes and pumps should be protected where possible from floods, storms, debris in the water and damage from people and animals.

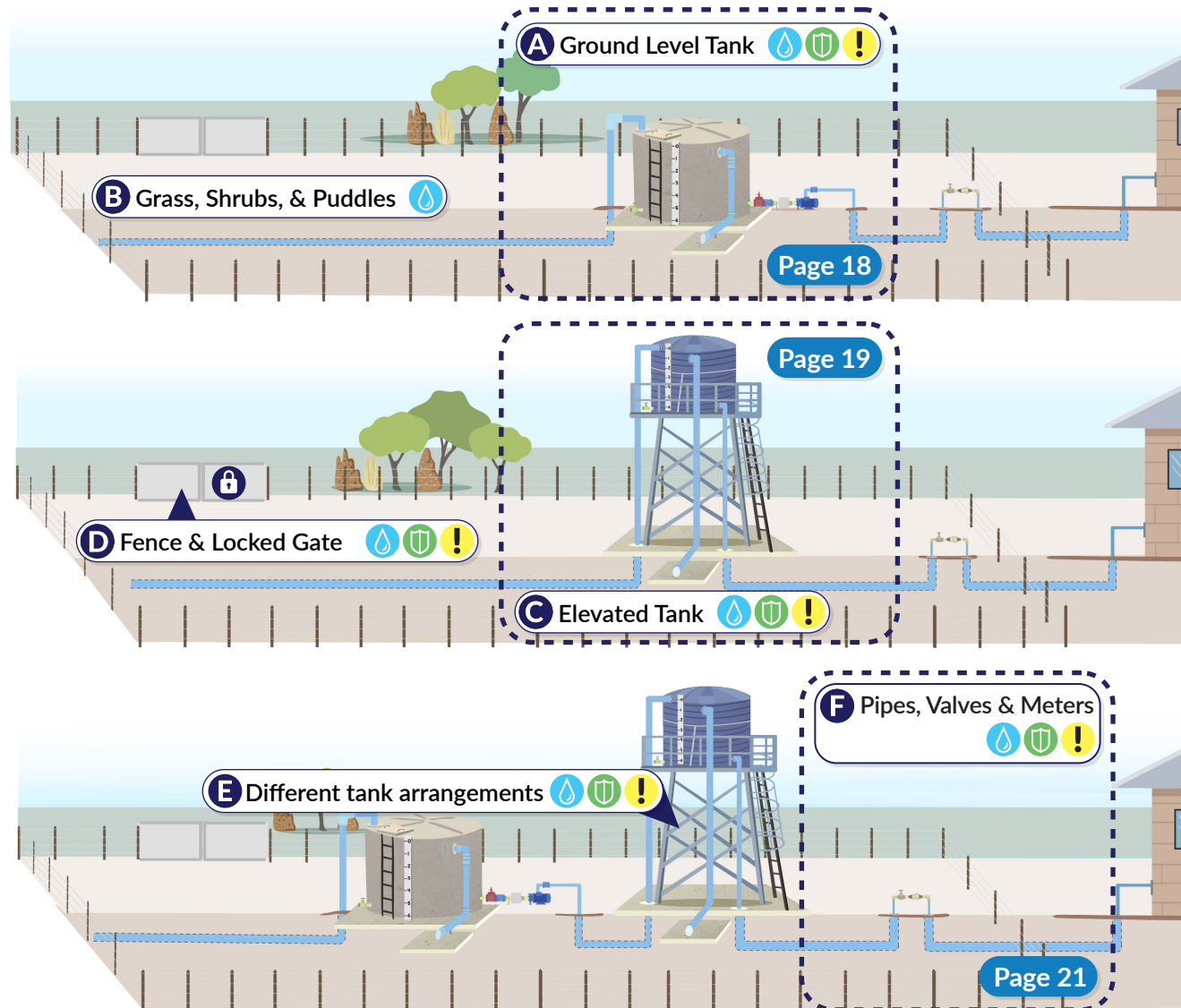
! Resident/Workplace Health & Safety

Equipment checks and required maintenance in and around water create big drowning risks and electrical and mechanical hazards, in particular when accessing using boats. Keep infrastructure secure and in good condition to reduce the risk of accidents.

Pipes & Storage > Overview

This section describes common water transfer, distribution and storage configurations. Tanks, pipes and the equipment that go with them are critical parts of a water supply system and need regular checks, maintenance and repair if there is

any damage. This can prevent surprise failures, water contamination or safety incidents. Different tank arrangements can be used depending on requirements and cost.



Pipes & Storage

- A** Information about Ground Level Tanks is available on page 18.
- B** Green grass, shrubs, and standing water near water infrastructure indicate there may be leaks. Cut back grass and shrubs to reduce fire risk. Do not use weed killer, it can contaminate the water.
- C** Information on Elevated Tanks is available on page 19.
- D** Water tank compounds should be clean, tidy and fenced. Any holes in the fence should be fixed and access gates should be locked.
- E** Additional tanks can improve water security: if one tank fails there is still water in the other.
- F** Information on pipes, valves and household water meters is available on page 21.
- E** Consider installing remote tank level monitoring to view water levels and water usage in real time. This can help identify problems sooner.

Water Quality

Animals and unauthorised people in tank compounds can damage infrastructure and contaminate stored water. Even small holes or cracks in pipes, tanks or fencing can let in animals, pests and contaminants.

Water Security

Any damage to water transfer pipes, water storage or water distribution infrastructure and equipment creates risks to the security of the water supply. Erosion, tree roots and fire can cause major damage. Calcium buildup is not unhealthy but can block pipes.

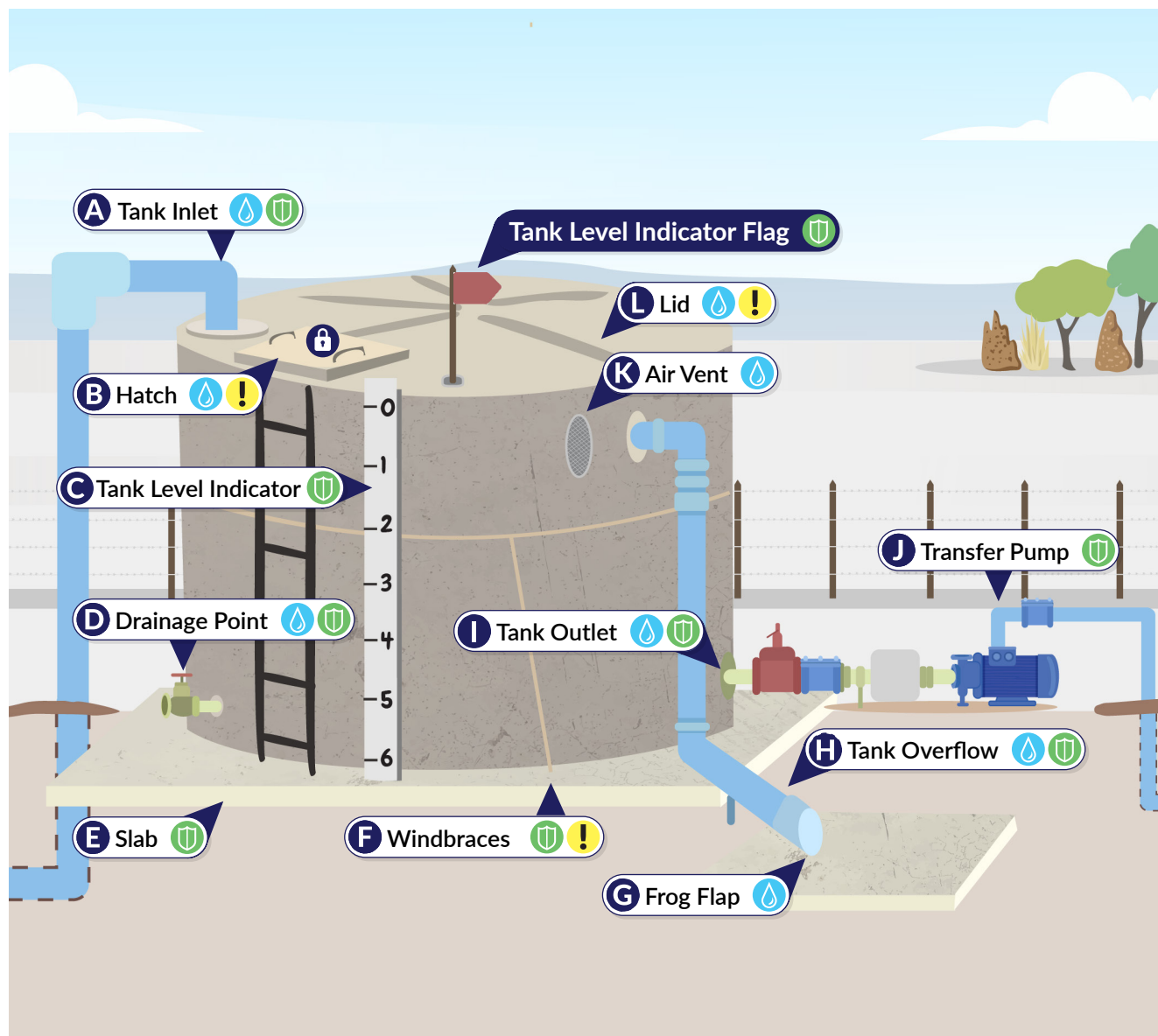
Resident/Workplace Health & Safety

All tanks and tank stands are hazardous and create risks of serious injury and death. Disused or damaged infrastructure has additional physical hazards. Safety procedures should always be followed.

Pipes & Storage > Ground Level Tanks

Ground level tanks are often where bore or surface water is pumped to. Ground level tanks are cheaper to install and maintain than elevated tanks so can provide a large storage volume and a lower cost than elevated tanks. To provide water pressure to users, ground level

tanks must pump to an elevated tank, be on a hill and gravity feed or a booster pump must be used. Ground level tanks can be made from reinforced concrete, steel or plastic and should be fully sealed with no leaks, gaps, cracks or holes.



Ground Level Tank Equipment

- A** Water is pumped into the tank from the source.
- B** Hatch locked to prevent unauthorised access.
- C** Shows the water level. Should be clearly visible from a distance with an indicator flag.
- D** Use to flush out the stored water for cleaning.
- E** Install tanks on a slab, ring beam or levelled compacted ground.
- F** Secure metal and plastic tanks with windbraces. These can go around or over the top of tanks.
- G** Install on overflow pipes to keep animals out.
- H** Direct away from the slab to reduce erosion.
- I** Ensure 150-200mm above the tank bottom to stop sediment being discharged with the water.
- J** Pumps water to the point of usage.
- K** Allows air in/out of the tank. Cover with mesh to keep insects and pests out.
- L** Ensure no gaps between tank lid and tank walls.

Water Quality

Gaps, holes, cracks and openings allow people, animals, pests and contaminants into the tank. Sludge or debris in the water may indicate contamination.

Water Security

Leaks are a risk to water security. Water accumulating near the tank may cause erosion and damage. Steel and plastic tanks can be damaged or destroyed by fire. Grass or shrubs near tanks are a fire risk and should be cut.

Resident/Workplace Health & Safety

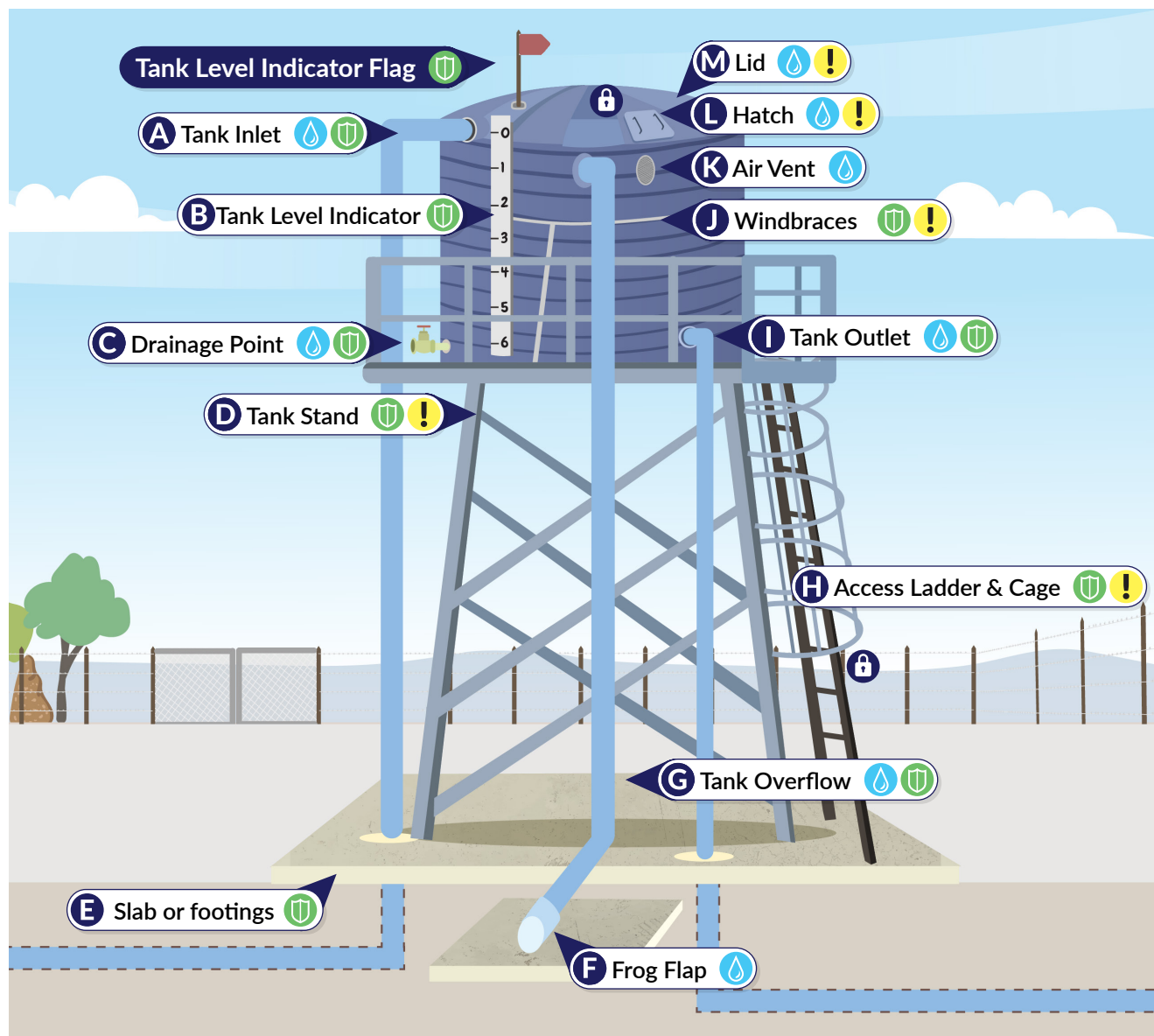
Working inside tanks is extremely dangerous. Workers should be licenced to work in confined spaces and always follow safety procedures. Mosquitoes breeding in and around tanks creates a risk of disease.

i Guidance on how to look after your water storage is available on page 20.

Pipes & Storage > Elevated Tanks

Elevated tanks are often more expensive to install and maintain than ground level tanks but keep water flowing during a power outage. Elevated tanks can be made from steel or plastic with a structural steel stand and reinforced concrete

foundation, and should be fully sealed with no leaks, gaps, cracks or holes.



Elevated Tank Equipment

- A** Water is pumped into the tank from the source.
- B** Shows the water level. Should be clearly visible from a distance with an indicator flag.
- C** Use to flush out the stored water for cleaning.
- D** Structural steel tank stand, perforated steel platform to allow drainage, hand rail for safety.
- E** Fix tank stands to slab or footings for stability.
- F** Install on overflow pipes to keep animals out.
- G** Direct overflow away from the tank to reduce erosion.
- H** Lock cage to prevent unauthorised access.
- I** Ensure 150-200mm above the tank bottom to stop sediment being discharged with the water.
- J** Secure metal and plastic tanks with windbraces. These can go around or over the top of tanks.
- K** Lets air in and out. Cover with mesh.
- L** Hatch locked to prevent unauthorised access.
- M** Ensure no gaps between tank lid and tank walls.

Water Quality

Gaps, holes, cracks, and openings allow people, animals and contaminants into the tank. Sludge or debris in the water may indicate contamination.

Water Security

Leaks are a risk to water security. Water accumulating near the tank may cause erosion and damage. Steel and plastic tanks can be destroyed by fire. Elevated tanks can blow over in high wind if not secured.

Resident/Workplace Health & Safety

Working inside tanks is extremely dangerous. Workers and contractors should have required licensing and follow safety procedures at all times. Drones can be used for inspection work to mitigate these risks.

i Guidance on looking after your water storage is available on page 20.

Pipes & Storage > Looking After Water Storage Tanks

20

Active maintenance of water storage tanks and related infrastructure is important to keep the water supply secure and available if needed, and to reduce the risk of water inside becoming contaminated.

Water storage tanks of all types are easily damaged and can become contaminated for many reasons, some common causes and solutions are detailed below.

Before you begin



- Remember – working in tanks and at heights is very dangerous and can cause death.

Workers should have required licencing such as working in confined spaces and at heights and should follow safety procedures at all times.

- Do not climb tanks or tank stands if ladders or metal structural supports are damaged or rusted. Consider using a drone to inspect instead.

Fences and gates



- Fix any holes in fences and ensure gates are kept locked to prevent unauthorised access and keep animals out.

Kids swim in the tank



If kids swim in the tank, consider disinfecting the water stored in the tank to make it safe. Chlorine is recommended.

- Secure the tank hatch so kids can't get in again.

Birds get in the tank



- Remove the birds from the tank. Use a high pressure hose to dislodge any nests and seal any gaps or holes to ensure birds don't get in again.

- If there is debris in the tank, drain the water and hose it out.

If birds get in the tank, consider disinfecting the water stored in the tank to make it safe. Chlorine is recommended.

Measuring and dosing free chlorine



- Free chlorine can be measured approximately with swimming pool chlorine test strips available from most hardware stores.

Dose with hypochlorite tablets, sodium hypochlorite or bleach. If dosing with bleach only use unscented bleach products.

Grass, trees, and vegetation



- Grass or plants growing around tanks creates a fire risk and should be removed.

Stagnant and standing water



- If there are puddles or standing water without any rain there is likely a leak.

- Check all tanks, pipes and equipment, seal any leaks found or call a licenced plumber for help.

- Stagnant water should be removed as it can be a breeding place for mosquitos and can attract other pests.

After bad weather



- Examine infrastructure for leaks and other damage, including stress fractures in tanks, elevated tank stands, fixings, slabs and footings.

- Make sure tank braces are still tight and undamaged.

- Ensure access hatches are closed and locked, and that tank lids remain firmly sealed with no gaps, cracks or holes between the lid and tank walls.

! Safety Always use safe work practices and procedures. Perform a Job Safety & Environmental Analysis (JSEA) before starting these checks and always wear appropriate Personal Protective Equipment (PPE).

Small leaks, holes, and gaps



- Small holes above the waterline in tanks, on lids or gaps between tanks and lids can be patched or sealed with a plastic welder for plastic tanks and parts, silicone for metal or plastic tanks and parts and flexible concrete filler for concrete tanks.

- Any products used must be certified for use with potable water according to the standard AS/NZS 4020:2018.

Erosion and structural damage



- Make sure there is no erosion around the slab as this can cause structural damage to the tank or tank stand.

Next steps



- Call a licenced tradesperson or tank specialist if there are cracks or holes below the water line, larger cracks above the water line, erosion around the slab, larger cracks or structural damage.

- You can also get help from your HSG Technical Coordinator.

Bores & Bore Water

Surface Water

Pipes & Storage

Rainwater Tanks

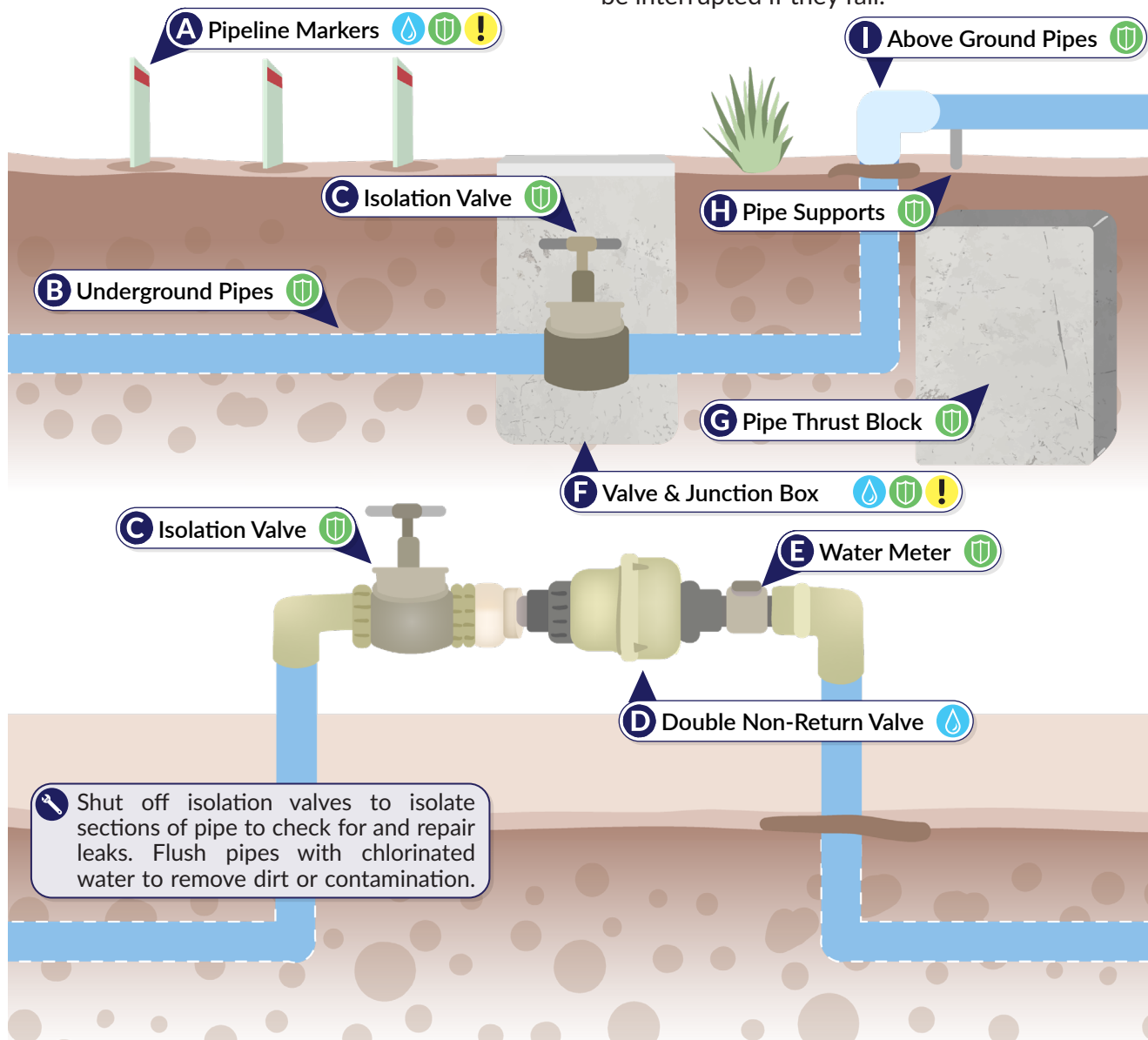
Wastewater Management



Pipes & Storage > Pipes, Valves & Meters

Pipes transfer water from the source to storage, between storage tanks, and to the point of use. Valves can be automatic or manual and shut off the water flow, or prevent it flowing backwards.

Water meters record how much water is used at a house or other point of usage. Pipes, valves and meters are key pieces of infrastructure and can cause the water supply to be interrupted if they fail.



Equipment

- A** Posts should be installed at intervals above underground pipes, at turns and junctions. Install to mark location of meter for ease of identification. Can help with finding leaks.
- B** Can be plastic - PVC, ABS or blue line poly.
- C** Used to manually shut off water flow.
- D** Prevents water flowing backwards.
- E** Use to measure the flow of water to the house or other point of usage.
- F** Install underground valves inside junction boxes to protect them. Keep boxes free from grass and vegetation.
- G** Install at bends to provide structural support and stop pipes shifting when under pressure.
- H** Structural support for pipes when elevated.
- I** Should be made from ductile iron to reduce damage from accidents, vandalism and the sun.
- X** No water coming from taps, very low water pressure or patches of unusually green grass and vegetation may indicate there is a leak.

Water Quality

Damage to these components may create holes or gaps that allow pollutants into the system that can contaminate the water.

Water Security

Damage to any of these pieces of equipment can cause water to be lost if there are leaks or cut off the water supply to houses if they fail.

Resident/Workplace Health & Safety

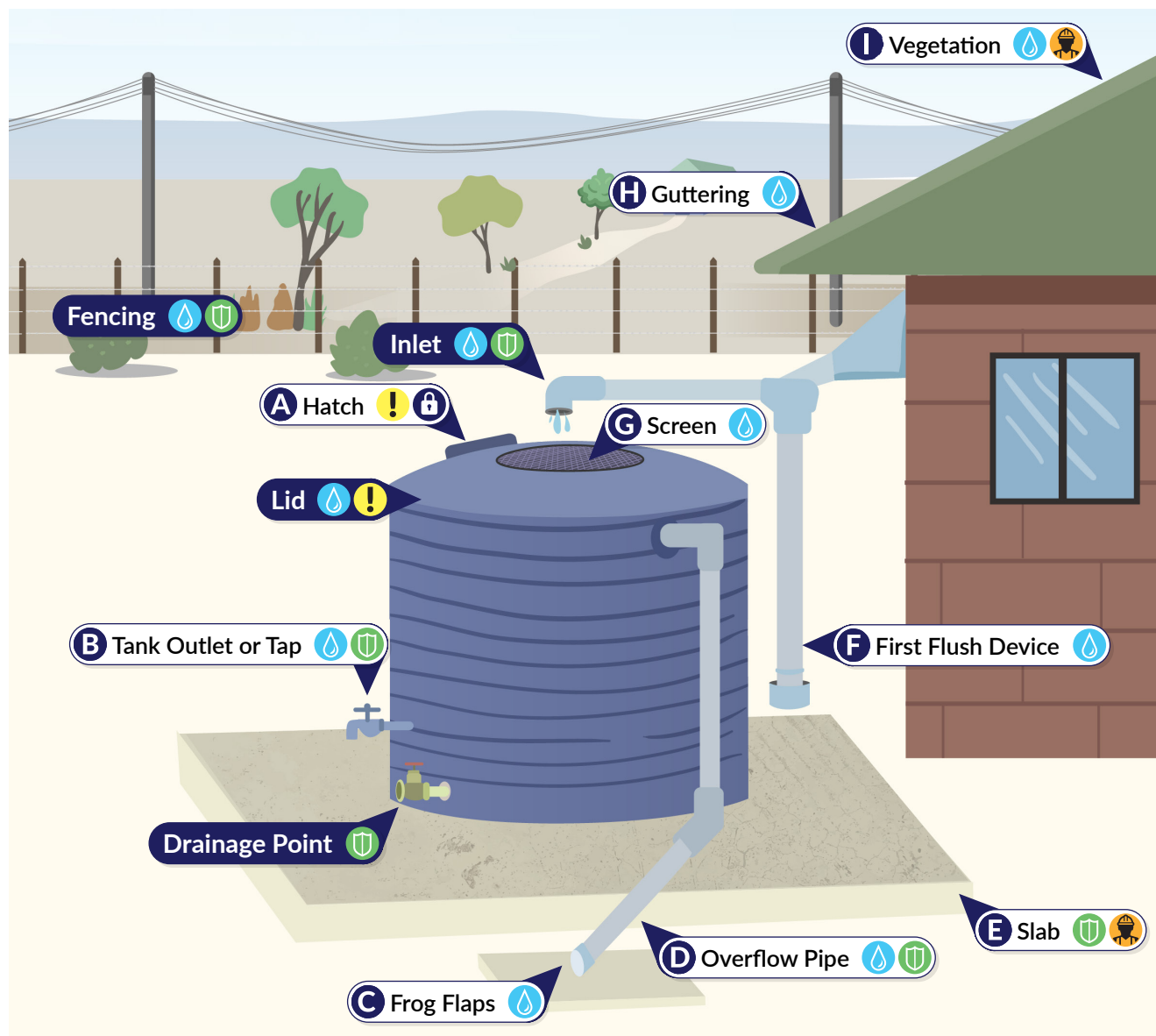
Standing water from leaks can attract mosquitoes and pests that spread disease. If components are not buried properly people may trip and injure themselves.

i Instructions for reading water meters are available on page 8.

Rainwater Tanks > Overview

Rainwater tanks (RWTs) store water collected from the roof of a house or other structures and can be used to store carted water in an emergency. RWTs should be made of plastic (PE), concrete or steel and sealed with no gaps, holes, cracks or

unscreened vents to reduce the risk of contamination and loss of water. Rainwater can be drawn directly from the tank or plumbed into the house. Where rainfall is low it is best to draw water from the tap on the tank.



Rainwater Tank Equipment

- A** Hatch locked to prevent unauthorised access.
- B** Ensure ~200mm above the tank bottom to stop sediment being discharged with the water. Taps should be spring loaded to prevent water wastage if left on.
- C** Install on overflow pipes to keep small animals out.
- D** Direct overflow away from the tank to reduce erosion.
- E** Install RWTs on a slab, ring beam or levelled compacted ground.
- F** Diverts initial flush of dirty water from the roof before it enters the tank.
- G** Prevents debris entering the tank.
- H** Sloped down towards the down pipe.
- I** Can block gutters and should be cut back and kept away from roofs.

Water Quality

Water in RWTs is easily contaminated by animals, insects, rubbish, vegetation and people swimming in the tanks.

Water Security

Water accumulating around RWTs can cause erosion, damage foundations and attract animals and pests. Plastic tanks are easily damaged by fire.

Resident/Workplace Health & Safety

Entering a rainwater tank is dangerous due to potential hazards. Persons required to enter a rainwater tank, work on top of a roof, or similar should have the necessary training and certifications to carry out the works.

i Guidance for looking after Rainwater Tanks is available on page 23

Rainwater Tanks > Looking After Rainwater Tanks

23

Maintenance of rainwater tanks is essential to stop water getting contaminated and to ensure the water inside is kept secure and available if needed. Tanks are easily damaged and contaminated. Common causes and solutions are detailed below.

Working in tanks and on roofs is very dangerous.

! Safety Always use safe work practices and procedures. Perform a Job Safety & Environmental Analysis (JSEA) before starting these checks and always wear appropriate Personal Protective Equipment (PPE).

Before you begin

- Remember – working in tanks and at heights is very dangerous and can cause death. Workers should have required licencing such as working in confined spaces and at heights and should follow safety procedures at all times.
- Make sure gutters are undamaged and free from debris. Check for rubbish in the tank, leaks or standing water nearby.
- Make sure there is no erosion around the tank as this can damage the slab.

Kids swim in the tank

- If kids swim in the tank, consider disinfecting the water stored in the tank to make it safe. Chlorine is recommended.
- Secure the tank hatch so kids can't get in again.

Birds get in the tank

- Remove the birds from the tank. Use a high pressure hose to dislodge any nests and seal any gaps or holes to ensure birds don't get in again.
- If there is debris in the tank, drain the water and hose it out.
- If birds get in the tank, consider disinfecting the water stored in the tank to make it safe. Chlorine is recommended.

Measuring and dosing free chlorine

- Free chlorine can be measured approximately with swimming pool chlorine test strips available from most hardware stores.
- Dose with hypochlorite tablets, sodium hypochlorite or bleach. If dosing with bleach only use unscented bleach products.

Vegetation, dust, and debris

- Dead leaves and vegetation from trees and shrubs above roofs, dust and other debris on the roof can block gutters and contaminate tank water.
- Trim any plants back so they don't overhang the roof.
- Grass or plants growing around tanks creates a fire risk and should be removed.

Stagnant and standing water

- If there are puddles or standing water without any rain there is likely a leak.
- Check all tanks, pipes and equipment, seal any leaks found or call a licenced plumber for help.
- Stagnant water should be removed as it can be a breeding place for mosquitos and can attract other pests.

Before and after rain

- Remove any debris in the guttering. Hose down the roof before the rain season to remove bird poo and other contaminants.
- Divert this water away from the rainwater tank.
- After rain clear the screen and first flush device of debris.

Small leaks, holes, and gaps

- Small holes above the waterline in tanks, on lids or gaps between tanks and lids can be patched or sealed with a plastic welder for plastic tanks and parts, silicone for metal or plastic tanks and parts and flexible concrete filler for concrete tanks.
- Any products used must be certified for use with potable water according to the standard AS/NZS 4020:2018.

Next steps

- Call a licenced tradesperson or tank specialist if there are cracks or holes below the water line, larger cracks above the water line, erosion around the slab, larger cracks or structural damage.
- You can also get help from your HSG Technical Coordinator.

Bores & Bore Water

Surface Water

Pipes & Storage

Rainwater Tanks

Wastewater Management



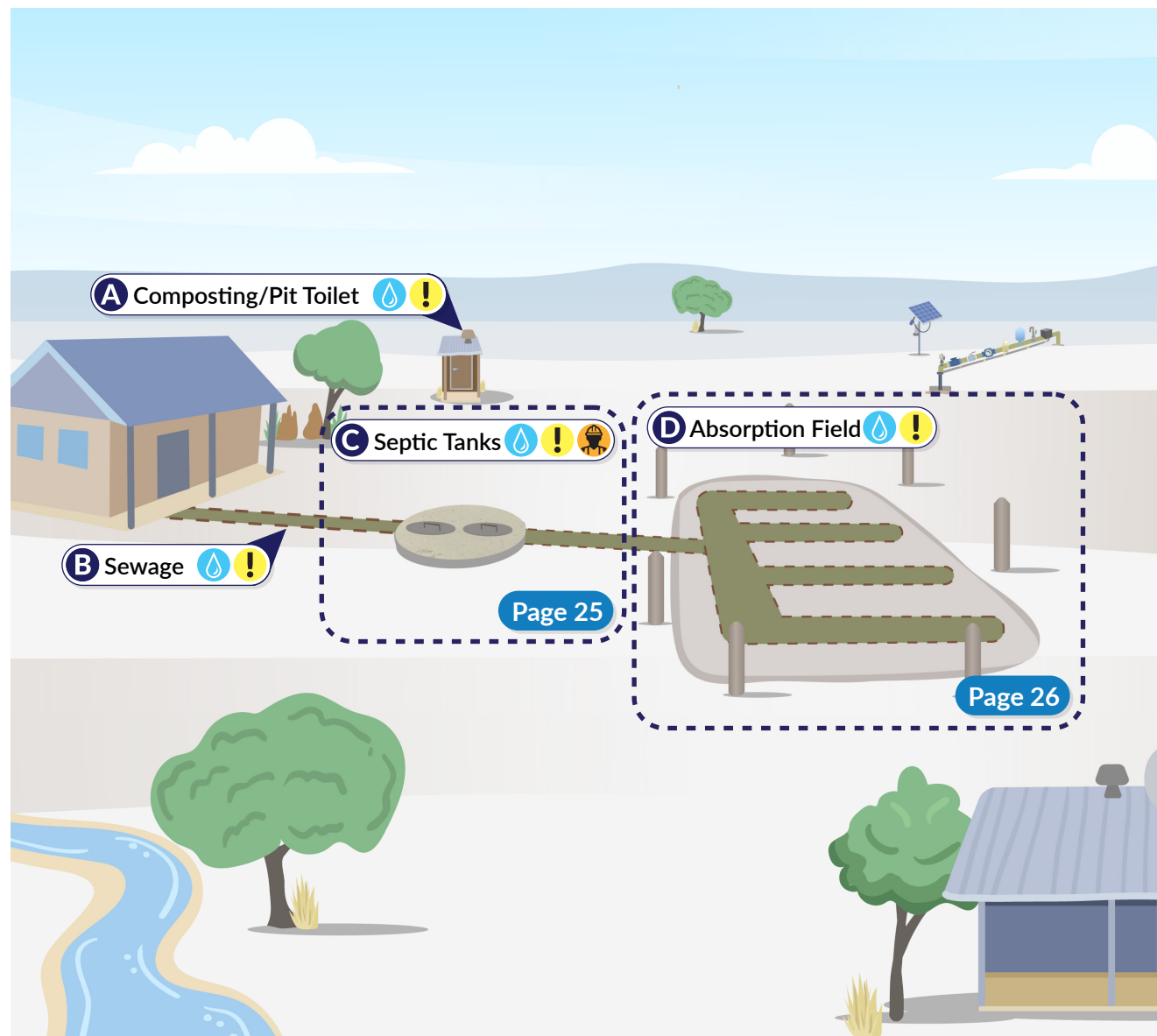
Wastewater Management > Overview

This section describes best practice wastewater management.

Wastewater flows from the house into a septic tank that separates the solids and treats the water. The water is then discharged into absorption

trenches and discharged into the soil where it naturally filters through.

Use the **Bore Risk Assessment Tool** to determine any site specific risks due to the proximity of the wastewater management system(s) to the bore.



Wastewater Management

- A** Visitors can easily overload a septic system and cause problems. A backup composting or pit toilet may be required.
- B** Wastewater that must be treated and disposed of safely.
- C** Receives and treats sewage. See page 25.
- D** Where water is discharged into the soil. See page 26.
- E** Slow drains, greener or longer grass, popped septic tank lids, bad smells, water ponding and sewage overflow indicate problems.
- F** Fixing leaky taps, toilets and showers will reduce the load on septic tanks. Drainage points should drain quickly under normal operation.
- i** It is recommended that the bore and any wastewater discharge locations are separated by more than 600m to avoid potential contamination risks. Use the Bore Risk Assessment Tool to determine if this is a risk at a particular location.

Water Quality

If septic systems are installed too close to a water source, are poorly maintained or damaged they can cause environmental problems, water contamination and disease.

Resident/Workplace Health & Safety

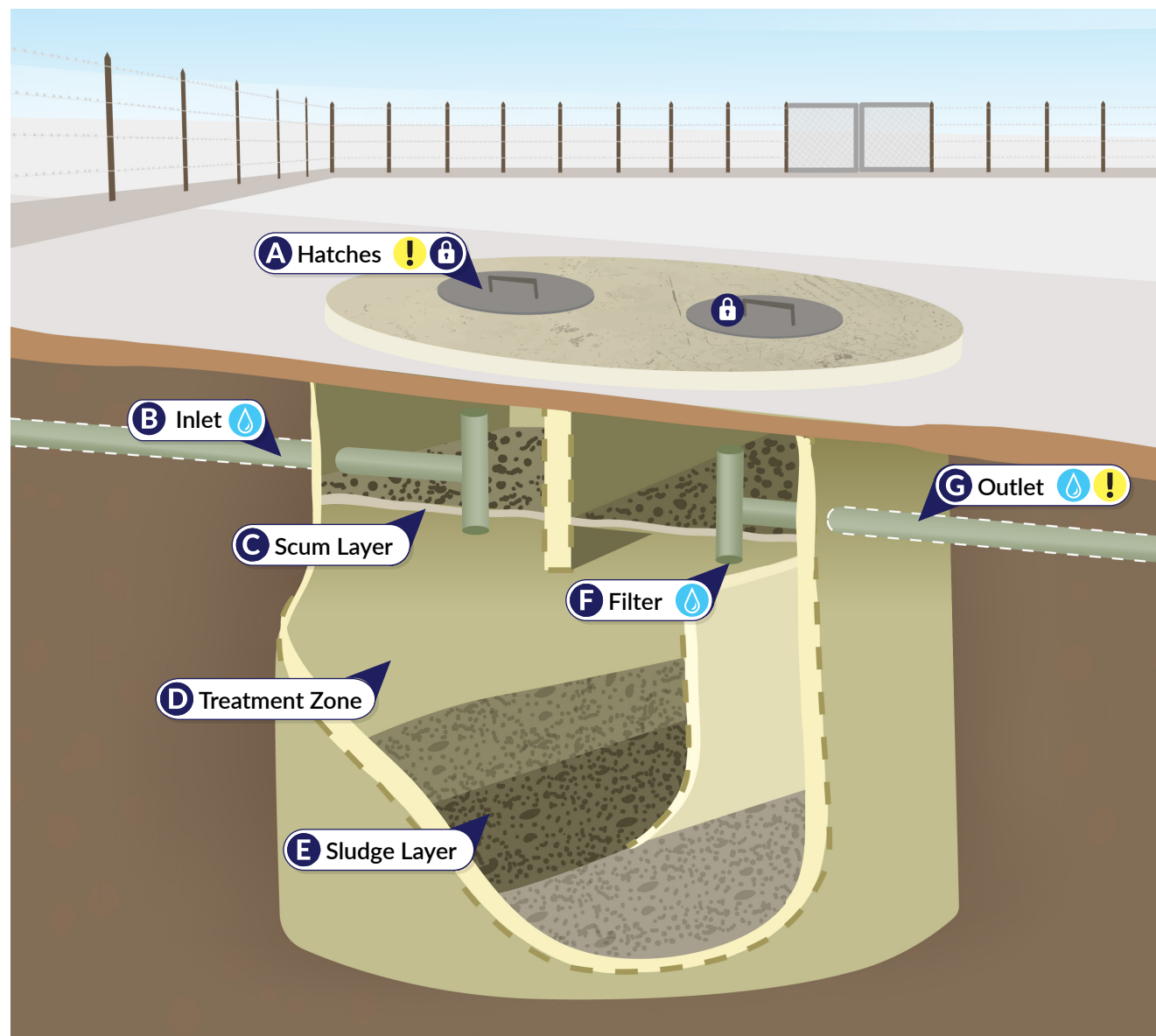
Sewage can cause disease and septic tanks can contain toxic, explosive gasses that will escape from hatches when open. Adults and children have died when inside septic tanks. Always wear appropriate PPE, ensure hatches are secure and locked and never smoke nearby.

- i** Septic system troubleshooting and guidance is available on page 27.

Wastewater Management > Septic Tanks

Septic tanks receive and treat sewage, and are the first part of a wastewater treatment system. They separate solids, wastewater and floating scum and make it possible to discharge the wastewater in to soil through absorption trenches for treatment.

Septic tanks may contain toxic gasses that can seriously injure or kill a person. They should only be worked on by staff or contractors with appropriate training. Septic tanks should never overflow.



Septic Tank Components

- A** Lock hatches to prevent unauthorised access.
 - B** Sewage enters here.
 - C** Formed of floating waste solids, prevents bad smells escaping.
 - D** Bacteria treats the wastewater here.
 - E** Formed of heavy solids that settle to the bottom.
 - F** Helps protect absorption trenches. Clean the filter regularly.
 - G** Treated wastewater exits here.
-  “Pump out septic tanks” are another type of septic tank that does not discharge to an absorption field. They are designed to hold water for a short time and need to be pumped out every 1-2 weeks.
-  Septic tanks that discharge into absorption fields need to be pumped out every 2-5 years, based on usage, if they are working properly. They are easily damaged by rubbish, chemicals, fats or other items put down drains. Septic tanks should only be pumped out by a qualified professional.

Water Quality

Leaks or untreated discharge from septic tanks create a major risk of bore water contamination.

Resident/Workplace Health & Safety

Problems with septic tanks create serious risks of disease, injury and death due to leaking sewage and toxic, explosive gasses. Always wear appropriate PPE, ensure hatches are secure and locked and never smoke nearby.

 Septic system troubleshooting and guidance is available on page 27.

Wastewater Management > Absorption Fields

Absorption trenches receive discharged, partially treated water from the septic tank and are laid out side by side in the Absorption Field. Water seeps out of the trenches into the ground where the soil and plants naturally filter the water as it goes into

the environment. Trenches should not be installed where ground water is high or where bedrock is close to the surface as they become ineffective. Trenches are easily damaged by plant roots growing into them and cars driving over them.



What to Look For

- A** Where the wastewater is discharged.
- B** Archway or pipe with holes in it that allows water to seep through, laid on a gravel bed and buried with layers of soil.
- C** Bollards to stop cars driving over or parking on the field and damaging the trenches.
- D** Ensure the field area is clear of trees and shrubs. Trees and shrubs can be downhill from the field to help absorb discharged wastewater.
- E** Earth bunds installed uphill to divert runoff away from the field.
- F** If ground water is high or bedrock is close to the surface, an alternative to absorption trenches might be needed. Examples include a mound system, constructed wetlands or a composting toilet.
- G** Contact a septic system supplier or a certified plumber for help.

Water Quality

Discharge from absorption trenches can contaminate ground water if the system isn't working properly or is damaged.

Resident/Workplace Health & Safety

Sewage can cause disease if it isn't properly treated through the septic tank and absorption trenches prior to discharge.

Raised or popped inspection hatches, overflowing sewage or discharge, ponding water nearby the septic tank or absorption trenches, foul smells like rotten eggs, greener grass or vegetation and household drains going down slowly are signs of

problems with a septic system. Septic systems should be regularly maintained to avoid problems. Residents often have information that can help with problem solving.

Before You Begin



Septic systems are very hazardous and can cause injury and death. Don't smoke nearby, always wear PPE when working in or around them, wash hands regularly and follow safety procedures.

- Make sure lids are secured and locked after any work to keep kids out.

Pump tanks out when full



Septic tanks are designed to retain sludge and scum until pumped out. If they're not pumped out they will stop working.

- Pump out septic tanks without absorption trenches should be pumped out every 1-2 weeks.
- Septic tanks with absorption trenches should not be allowed to get more than 2/3 full of solids and will need to be pumped out every 2-5 years, depending on usage.

Check sludge & scum levels



Septic tanks use bacteria to break down solids into effluent, sludge and scum. The amount of sludge and scum in the tank will tell you if the bacteria is healthy.

Insert a long metal or plastic stick wrapped in cloth into the inspection hatch to the bottom of the tank. When you take it out the sludge and scum will have marked the cloth.

- If there is sludge mark at the bottom of the stick, and a smaller scum mark near the top, the tank is healthy.
- If there is only a sludge mark at the bottom of the stick, the bacteria is likely to have died.
- If the stick comes out mostly covered with sludge and scum, the tank needs to be pumped out and the trenches are probably blocked.

Fix leaks, blockages, & overflow



- Fix leaking taps, toilets, showers and plumbing to reduce the load on septic tanks and reduce the chance of overflow.

Remove blockages from plumbing, tank outlets and trenches.

Install a composting or pit toilet if there are too many people or if visitors overload the system.

! Safety Always use safe work practices and procedures. Perform a Job Safety & Environmental Analysis (JSEA) before starting these checks and always wear appropriate Personal Protective Equipment (PPE).

Common Septic System Problems

Problems with the Septic System may be caused by:

- Blockages from fabric, debris, rubbish, grease or fats flushed down drains or toilets.
- Chemical cleaners and bleach in wastewater that can kill septic tank bacteria.
- Too much shade falling on absorption trenches.
- Debris or excess soil on the absorption field.
- Plant roots that have blocked trenches.
- Trenches unable to drain because the ground water level is too high.

Who to call

- If you have encountered a problem in any of these checks your septic system needs help.
- Call a septic system supplier or a licenced plumber to service the system or to pump the tank out, and tell residents about what often causes problems.
- You can also get help from your HSG Technical Coordinator.

The specialists and contractors detailed on this page can help you understand, maintain, test and repair the equipment and infrastructure that makes up your remote, off-grid water management system.

HSG can help if you need to find specialists and contractors that work in your area.

Homelands Services Group Technical Coordinators

This NTG team can provide technical support if something goes wrong with the water supply, and can provide appropriate specialist or trade recommendations and contact details.

Hydrogeologists & Bore Contractors

These people know all things bores and bore water. They can help with understanding your bore water source, infrastructure and equipment.

Hydrologists

These people understand surface water and can help with understanding your surface water source.

Pump Suppliers

Supply pumps and can provide specialist advice. Always buy pumps and special equipment from specialist suppliers, not from hardware stores.

Plumbers

Can help with pipes, tanks, septic systems and all things related to water supplied inside houses.

Electricians

You need a licenced electrician do any new electrical installations. Sometimes someone with a restricted electrical licence can do disconnecting and reconnecting work.

Water Testing Lab

Can test and analyse water samples taken from your water supply to identify what's in the water.

Contractors & Consultants

Can be engaged to help with technical problems, specialist trades or tasks, project planning, and design work.

Add your preferred contacts

Homelands Services Group

 1800 031 648

 homelands.program@nt.gov.au

Name:



Name:



Name:



Name:



Name:



Name:



Name:



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Name:



Bores &
Bore Water

Surface
Water

Pipes &
Storage

Rainwater
Tanks

Wastewater
Management

