ACT Government

Environmental Guidelines for Petroleum Storage in the ACT

Environment Protection Authority

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1 Introduction

Petroleum storage systems have been identified as a significant source of soil, groundwater and surface water contamination which can have adverse impacts on people, property and the environment.

The major environmental concerns with respect to petroleum storage come from:

- contamination of soil and groundwater from leaks or spills
- contaminated stormwater run-off.

These guidelines have been developed to provide guidance to those responsible for petroleum storage systems within the Australian Capital Territory (ACT).

For further information contact the Environment Protection Authority (EPA) on 13 22 81 or email environment.protection@act.gov.au , or visit www.accesscanberra.act.gov.au.

1.1 Scope

These guidelines have been prepared to provide guidance on the EPA's preferred methods for the installation, operation, maintenance, and removal of aboveground and underground petroleum storage systems, including used oil storage systems. These guidelines are advisory in nature. The technical details in these guidelines are suggested measures for meeting the requirements in the *Environment Protection Act 1997* (the Act).

These requirements are in addition to the Australian Standards AS 4897 – The Design, Installation and Operation of Underground Petroleum Storage (AS 4897) Systems and AS 1940 – The Storage and Handling of Flammable and Combustible Liquids (AS 1940). Readers are advised to refer to other relevant and appropriate publications, especially where new practices and processes receive industry endorsement.

1.2 Environment Protection Act

The Act, supported by the Environment Protection Regulation 2005 (the Regulation), is the primary pollution control legislation to protect the environment in the ACT. Under the Act, all people have a 'general environmental duty' to take practical and reasonable steps to prevent or minimise any environmental harm or environmental nuisance involved in conducting an activity. The Act and Regulation are administered by the EPA.

Environmental harm is defined under the Act as any impact on the environment as a result of human activity that has the effect of degrading the environment (whether temporary or permanent).

Environmental nuisance is defined under the Act as an unreasonable interference with the enjoyment by the public, a section of the public or a person of a place or area, if the interference caused or likely to be caused by dust, fumes, light, noise, odour or smoke, or an unhealthy, unsightly or otherwise offensive condition because of pollution.

Controls are therefore required to ensure that spillage or leakage of petroleum products into the environment is minimised and the risk of environmental harm or environmental nuisance occurring is reduced.

An explanation of the Act and Regulation can be found in the General Environment Protection Policy (General EPP) made under the Act. A copy of the Act, Regulation, General EPP and other instruments under the Act can be found at www.legislation.act.gov.au.

1.2.1 Environmental Authorisations

Larger scale petroleum storage facilities, designed to store more than 50m^3 (50,000 litres) of petroleum products, are also required to hold an Environmental Authorisation (EA) under the Act. The onus is on the person responsible for the operation of the facility and associated infrastructure to apply to the EPA for an EA.

It is an offence under the Act for a person to operate a facility designed to store more than 50m^3 of petroleum product without holding an EA in relation to that activity. It is also an offence to contravene an EA, which carries a maximum penalty of $100,000 for a corporation.

1.2.2 Duty to notify

Environmental harm

Under Section 23 of the Act there is a duty to notify the EPA of actual or threatened environmental harm. A person conducting an activity, such as the storage of petroleum products, has a duty to notify the EPA as soon as reasonably practicable after becoming aware that the activity has caused, is causing or is likely to cause serious or material environmental harm from pollution. The nature of the pollution, the action taken to deal with the pollution and any environmental harm it has caused must also be reported to the EPA.

Incidents at petroleum storage facilities which must be notified include (but are not limited to):

- a leak or spill from a petroleum storage system that is causing or is likely to cause a significant risk of harm to human health and/or a risk of material or serious environmental harm
- evidence on the site of free-phase hydrocarbons in surface water or groundwater
- evidence that offsite migration of hydrocarbons could occur, is occurring or has occurred.

Contaminated land

Under Section 23A of the Act there is also a duty to notify the EPA of the existence of contaminated land. The occupier or lessee of the land must notify the EPA in writing as soon as practicable after becoming aware that land which they are the lessee or occupier of is contaminated in such a way as to present, or is likely to present, a significant risk of harm to human health and/or a risk of material or serious environmental harm. Actual or likely remedial works in excess of $5000 or the detection of phase separated hydrocarbons in groundwater are examples of the existence of contaminated land which require the EPA to be notified.

The Contaminated Land Notification Form can be found at www.accesscanberra@act.gov.au.

Further information on contaminated site management and obligations of facility managers where contamination is detected can be found in the Contaminated Sites EPP made under the Act which can be found at www.legislation.act.gov.au.

Note: Copies of all environmental assessment reports which identify impacts to soil or groundwater at the site must be forwarded to the EPA.

1.3 Other approvals

Development approval under the *Planning and Development Act 2007*, building approval under the *Building Act 2004* and approvals under the *Dangerous Substances Act 2004* may also be required for petroleum storage systems.

For further information contact Access Canberra on 13 22 81.

2 Design and installation of petroleum storage systems

This section outlines the minimum standards for the design and installation of petroleum storage systems that can be used to mitigate pollution risks from petroleum products. The system should be designed by a suitably qualified person and comply with all relevant Australian Standards, recognised codes of practice, these guidelines and other relevant federal statutory requirements specific to the design and installation of petroleum storage systems.

Alternative measures that achieve the same or better performance than the stated standards may be used where justification is made to and accepted in writing by the EPA.

2.1 Underground Petroleum Storage Systems

An underground petroleum storage system (UPSS), including underground waste oil storage systems, should be designed, installed and maintained in accordance with AS 4897.

The EPA requires equipment level 1 as specified in AS 4897 for all new, significantly modified and replacement UPSSs. A summary of the requirements is provided below.

2.1.1 Tanks

The tanks of UPSS should meet the following requirements:

- be non-corrodible and comply with Section 4.2.1 of AS 4897
- be double walled and have an interstitial space between the two walls of the tank that is capable of being monitored for any breach of either the inner or outer wall of the tank
- be installed in a tank pit that is constructed in accordance with the manufacturers recommendations and AS 2758 – Aggregates and Rock for Engineering Purposes and AS 1141 – Methods for Sampling and Testing Aggregates
- have cathodic protection, where required, as detailed in Section 2.1.4.

2.1.2 Pipework

Pipework (or product piping) should meet the following requirements:

- be non-corrodible and comply with Section 4.3.1 of AS 4897
- consist of double-walled piping and have an interstitial space between the two walls of the piping that is capable of being monitored for any breach of either the inner or outer wall of the piping
- have cathodic protection, where required, as detailed in Section 2.1.4.

2.1.3 Tank fill points

Each tank fill point should meet the following requirements:

- be dedicated to one tank only
- be clearly labelled and identified
- provided with a spill containment device with a minimum capacity of 15 litres per fill point
- be accessible from the vehicle unloading or loading position with a hose no longer than 6 metres
- be accessible for visual inspection
- be located in a position that is isolated from the stormwater system - overflows and spills from the spill containment device should be directed to an oil/water separator or a stormwater quality improvement device.

2.1.4 Cathodic protection

UPSS with steel tanks and piping should be cathodically protected to minimise the risk of corrosion and the potential for leaks occuring.

The design and installation of these components should be in accordance with AS 2832.1 - Cathodic Protection of Metals – Part 1 Pipes and Cables (Part 1 AS 2832) and AS 2832.2 - Cathodic Protection of Metals – Part 2 Compact Buried Structures (Part 2 AS 2832) and Section 4.3.2 of AS 4897, and should meet the following requirements:

- Tanks and piping should be coated with a suitable di-electric material
- The cathodic protection system should be designed by a corrosion specialist, installed in accordance with their instructions and certified that the installation meets the requirements of Part 1 AS 2832, Part 2 AS 2832 and Section 4.3.2 of AS 4897
- The cathodic protection system should have permanent test points to enable maintenance and testing
- A UPSS should be electrically isolated from all components to which it is physically connected and for which cathodic protection is not intended, including being isolated from the electrical earth.

Cathodic protection systems should be inspected and tested within six to 12 weeks of installation and at least every year thereafter, in accordance with Part 1 AS 2832, Part 2 AS 2832 and instructions from a corrosion specialist.

The certification of the cathodic protection system shall be retained by the person responsible for the operation of the UPSS for the life of the system. When the person responsible changes, all documents must be transferred to the new person responsible for the operation of the UPSS.

2.1.5 Tank pit observation wells

Tank pit observation wells should be installed within the tank pit of a UPSS to monitor for the presence of liquid which may contain leaked or spilled petroleum products. Tank pit observation wells can also be used to check for vapours.

Tank pit observation wells should meet the following requirements:

- constructed by a competent and experienced person
- located in a position to intercept the tank excavation area
- installed in each individual tank excavation area with a minimum of two tank pit observation wells for excavations with two or more tanks
- installed so as not to penetrate the bottom of the tank excavation and terminate at least 150mm below the bottom of the tank
- installed within 150mm of the lowest point of the tank excavation
- clearly labelled to prevent unauthorised access and tampering
- sealed from the ground surface to the top of the filter pack.

2.2 Above-ground petroleum storage systems

An above-ground petroleum storage system should be designed, installed and maintained in accordance with AS 1940 – The Storage and Handling of Flammable and Combustible Liquids and AS 1692 – Steel Tanks for Flammable and Combustible Liquids.

2.2.1 Self-bunded petroleum storage tanks

Self-bunded petroleum storage tanks are constructed of double-walled materials that provide double protection against leakage. If the inner wall breaks, the outer wall prevents the contents of the tank from spilling and contaminating the surrounding area.

The installation of a self-bunded petroleum storage tank should meet the following requirements:

- the construction of the tank must be suitable to be filled with petroleum products
- there must be a clear access route to the fuel tank that is clear of clutter, hanging branches of trees and electrical lines
- the tank must be located in a suitable position that gives consideration to the location of waterways, the stormwater system, and drainage patterns on the site
- steel bollards must be installed to protect the tanks from damage
- the dispensing areas must be roofed with a minimum ten degree overhang.

Note: Generators that have an incorporated fuel storage facility must have bunding which has the capacity to store at least 110% of the fuel storage capacity.

2.2.2 Single-wall petroleum storage tanks

A single-wall petroleum storage tank is constructed with a single wall of material. The installation of a single-wall petroleum storage tank should meet the following requirements:

- tank must be installed within a bunded area
- bunded area must have a capacity of at least 110% of the tank's volume
- bunded area must be roofed with a minimum 10 degree overhang
- spills within the bunded area must be recovered, removed and disposed by a suitably qualified person to a suitably licensed facility, not discharged to stormwater or sewer
- steel bollards must be installed to protect the tanks from damage
- construction of the tank must be suitable to be filled with petroleum products.

2.3 Above-ground used oil storage systems

A person responsible for an above-ground used oil storage system must ensure that it is installed and maintained in accordance with the manufacturer's specifications to prevent leaks from occurring.

An above-ground used oil storage tank must be installed in a bunded area. For more information on the requirements of the bunded area, refer to Section 2.2.2.

2.4 Equipment Integrity Test

An Equipment Integrity Test (EIT) is conducted to evaluate if an UPSS is leaking to the environment, or is not providing containment as originally designed. An EIT should be performed on all new, repaired and significantly modified UPSS after installation is complete, but before the full commissioning of the system.

An EIT should meet the following requirements:

- capable of detecting a leak of 0.38 litres per hour, with a probability of detection of at least 95% and of false detection of 5% or less in accordance with AS 4897
- conducted by a competent and experienced person who must provide the person responsible for the UPSS with a certificate stating that the system passed the test, as well as the results of the test - these documents must be kept for the life of the UPSS
- Be a nationally approved and certified method of EIT that meets, at a minimum, the requirements or certification standards of the United States Environment Protection Agency (USEPA).

3 Air quality and noise

Air quality and noise are two potentially significant peripheral impacts of petroleum storage operations.

3.1 Vapour recovery systems

Air quality can be significantly affected by petroleum vapour emissions. Petroleum vapour contains toxic volatile organic compounds which contribute to localised and regional ground-level ozone air pollution. Vapour recovery can be installed to recover petroleum vapours and limit their escape into the atmosphere.

Stage 1 Vapour Recovery (VR1) captures the vapour displaced from underground storage tanks as the tanks are filled by road tankers. All new, significantly modified and replacement underground petroleum storage systems must have VR1 fitted to the storage tanks (apart from diesel and LPG).

Stage 2 Vapour Recovery (VR2) captures petrol vapours at the petrol pump when motor vehicles refuel and returns it to the underground fuel storage tank. VR2 is not a requirement of petroleum storage facilities in the ACT, however the appropriate installation and use of these systems is encouraged.

Vapour recovery systems should be fitted in accordance with AS 4897 and the NSW EPA Standards and Best Practice Guidelines for Vapour Recovery at Petrol Service Stations.

3.2 Noise

Service station sites can have many noise sources including truck and car movements, fuel deliveries, rubbish collection, operation of fuel pumping equipment, refrigeration and air conditioning plant, vehicle wash and vacuuming facilities, mechanical repairs and fast food outlets.

The noise generated from these activities, and others, is regulated under the Act and the Regulation. Except where otherwise permitted under the Regulation, an activity causes environmental harm if the noise emitted exceeds the noise standard set by either the Regulation or an Environmental Authorisation at the compliance point.

The Noise EPP made under the Act provides guidance on meeting the legislative requirements to prevent or minimise environmental harm.

4. Water management

Managing wastewater and stormwater flow on a site with petroleum storage is critical to prevent pollution to surface water, groundwater and soil. There are a number of pollutants in addition to petroleum found at petroleum storage facilities, including oil, grease, lubricants, engine coolant, and detergents that have the potential to contaminate surface water, groundwater and soil. The design of the site is critical to ensuring that the potential for stormwater contamination is minimised.

Contaminants from the site must not be released into stormwater infrastructure, roadside gutters, or areas outside of the site.

This section provides guidance to mitigate land, surface water and groundwater pollution risks. Alternative measures that achieve the same or better performance than the stated standards may be used where justification is made to and accepted in writing by the EPA.

The delivery of fuel into the petroleum storage system and the dispensing of fuel from the system are considered high risk activities. In service stations these activities may be carried out in different areas of the site.

4.1 Existing underground petroleum storage systems

This section applies to petroleum storage systems installed prior to 1 January 2019.

4.1.1 Fuel delivery area

All ground surfaces within the fuel delivery area must be made of impervious material. Asphalt is not considered to be a suitable material as it can react with petroleum products.

Drainage in this area must be directed to a spill containment device as detailed in Section 4.1.3.

Where the fuel delivery area is located outside of the covered fuel dispensing area, it is recommended that modifications are made to divert run-off to the treatment device for the covered fuel dispensing area. Alternatively drainage across the entire area can be captured in an appropriately sized Class 1 stormwater quality improvement device.

Where the fuel delivery area is located outside the covered fuel dispensing area, all reasonable measures must be taken to prevent spills entering stormwater infrastructure. Down-gradient stormwater drains should be covered during fuel delivery and drip pans placed under all hose connections.

Many older sites may not have been constructed with adequate drainage and infrastructure to contain spills and other contaminants onsite. However, the person responsible for the site still has a responsibility to ensure that practicable and reasonable steps are taken to prevent or minimise any pollution from the site that has the potential to cause environmental harm. This includes maintenance of any existing pollution control infrastructure installed, for example, cathodic protection, drains, sumps and triple interceptors.

4.1.2 Fuel dispensing area

The fuel dispensing area is to be located in a covered area to minimise the entry of stormwater. The covered area should be protected at the canopy line from the entry of surface waters from the

uncovered area by either a grade change or grated drains, or a combination of both. Canopies should extend to the maximum reach of nozzles and from that point have a 10 degree from vertical overhang to minimise rainwater entering the fuel dispensing areas.

No vehicle should be refuelled outside of the fuel dispensing area.

No drains that discharge directly to the stormwater system are to be located within the fuel dispensing area. Drainage in this area must be directed to a spill containment device as detailed in Section 4.1.3.

4.1.3 Spill containment

The following are acceptable controls for the containment and management of spills from the fuel delivery area and the fuel dispensing area.

- Class 1 full retention oil water separator. The device must be fitted with a hydrocarbon level visible and audible alarm and be sized appropriately for the catchment area of covered forecourt area plus a fuel spill from one fuel tanker compartment, prior to discharge to the sewer system (subject to approval from the relevant utility).
- Class 1 stormwater quality improvement device. The device must be fitted with a hydrocarbon level visible and audible alarm and be sized appropriately for the catchment area of the site plus a fuel spill from one fuel tanker compartment, prior to discharge to the stormwater system.

Note: A Class 1 full retention oil water separator or Class 1 stormwater quality improvement device must be designed to meet the requirements of British Standard *BS EN 858-1 – Separator Systems for Light Liquids (i.e. oil and petrol) – Part 1: Principles of Product Design, Performance and Testing, Marking and Quality Control* and Stormwater Australia's *Stormwater Quality Improvement Device Evaluation Protocol Field Monitoring*.

4.1.4 Parking, footpaths and trafficable areas

Areas of the site which contain the parking areas, footpaths and trafficable areas are of lower risk than fuel delivery and fuel dispensing areas, but stormwater falling on these lower risk areas may still become contaminated. These areas should be hard surfaced. It is preferable for stormwater from these areas to be diverted to a treatment system capable of removing litter, sediment and oil products.

The stormwater quality improvement device for these areas may include a high flow by-pass system to maintain the quality of the discharged water during periods of high rainfall.

Stormwater quality improvement devices may include:

- Class 1 full retention oil water separator with high level visible and audible alarm
- Class 1 stormwater quality improvement device for the catchment area of covered forecourt area plus a one fuel tanker compartment for the largest compartment attending the site.

Note: A Class 1 full retention oil water separator or Class 1 stormwater quality improvement device must be designed to meet the requirements of British Standard *BS EN 858-1 – Separator Systems for Light Liquids (i.e. oil and petrol) – Part 1:*

Principles of Product Design, Performance and Testing, Marking and Quality Control and Stormwater Australia's *Stormwater Quality Improvement Device Evaluation Protocol Field Monitoring*.

4.2 New petroleum storage systems

This section applies to new petroleum storage systems installed after 1 January 2020.

4.2.1 Fuel dispensing areas and fuel delivery areas

The fuel dispensing area and fuel delivery areas are to be located in a covered area to minimise the entry of stormwater. The covered area should be protected at the canopy line from the entry of surface waters from the uncovered area by either a grade change or grated drains, or a combination of both. Canopies should extend to the maximum reach of nozzles and from that point have a 10 degree from vertical overhang to minimise rainwater entering the forecourt areas.

No vehicle should be refuelled outside of the fuel dispensing area.

No stormwater drains are to be located within the fuel dispensing area or fuel delivery area.

All ground surfaces within the fuel dispensing area and fuel delivery area must be made of impervious material. Asphalt is not considered to be a suitable material as it can react with petroleum products.

Drainage in these areas should be directed to one of the following:

- Class 1 full retention oil water separator. The device must be fitted with a hydrocarbon level visible and audible alarm and be sized appropriately for the catchment area of covered forecourt area plus a fuel spill from one fuel tanker compartment, prior to discharge to the sewer system (subject to approval from the relevant utility).
- Class 1 stormwater quality improvement device. The device must be fitted with a hydrocarbon level visible and audible alarm and be sized appropriately for the catchment area of the site plus a fuel spill from one fuel tanker compartment, prior to discharge to the stormwater system.

Note: A Class 1 full retention oil water separator or Class 1 stormwater quality improvement device must be designed to meet the requirements of British Standard *BS EN 858-1 – Separator Systems for Light Liquids (i.e. oil and petrol) – Part 1: Principles of Product Design, Performance and Testing, Marking and Quality Control* and Stormwater Australia's *Stormwater Quality Improvement Device Evaluation Protocol Field Monitoring.*

4.2.2 Above-ground petroleum storage systems

All ground surfaces within the fuel dispensing area and fuel delivery area must be made of impervious material. Asphalt is not considered to be a suitable material as it can react with petroleum products. No fuel should be dispensed outside of this area.

Drainage in this area should be directed to a spill containment device as detailed in Section 4.1.3 or where the above ground tanks are installed in an excavated bund, drainage is to be directed back into the bund.

4.2.3 Parking, footpaths and trafficable areas

Areas of the site which contain the parking areas, footpaths and trafficable areas are of a lower risk than the fuel dispensing area and fuel delivery area, but stormwater falling on these areas may still become contaminated. These areas should be hard surfaced. The stormwater captured in this area should be diverted to a treatment system that is capable of removing litter, sediment and oil products.

Treatments may include:

- Class 1 full retention oil water separator with high level visible and audible alarm that is being used in the refuelling and dispensing areas
- Class 1 stormwater quality improvement device fitted with a high level visible and audible alarm and be sized appropriately for the catchment area of the site plus a fuel leak from one fuel tanker compartment, prior to discharge to the stormwater system
- suitably designed, sized and maintained bio-filtration system (also known as bio-retention systems and raingardens) to retain and slowly filter stormwater
- proprietary cartridge media filter systems that have Australian field testing to comply with Stormwater Australia's *Stormwater Quality Improvement Device Evaluation Protocol* (SQIDEP)

The stormwater quality improvement device may include a high flow by-pass system to prevent remobilisation of previously captured pollutants.

Note: A Class 1 stormwater quality improvement device must be designed to meet the requirements of BS EN 858-1 – Separator Systems for Light Liquids (i.e.. oil and petrol) – Part 1: Principles of Product Design, Performance and Testing, Marking and Quality Control and Stormwater Australia's *Stormwater Quality Improvement Device Evaluation Protocol Field Monitoring.*

4.2.4 Stormwater – water sensitive urban design

Water sensitive urban design is an approach to urban planning and design that seeks to integrate the management of the total water cycle to minimise the impacts of development, protect water quality, make more efficient use of water, reduce the cost of water infrastructure, and address flooding.

Water sensitive urban design could be used in many parts of petroleum storage sites including the roadways and footpaths within the site with bio-filtration systems or capturing roof water and using this for toilet flushing. For further information see the ACT Water Sensitive Urban Design Guidelines which can be found at www.environment.act.gov.au.

4.3 Spill kits

Spill kits are designed to be used on specific groups of chemicals to contain and clean up small scale spills.

Spill kits appropriate in size, type and equipment to the identified hazards shall be kept on site in strategic and easily accessible locations. Kits shall consist of, but not be limited to, the following:

- oil absorbent materials, booms and socks
- impervious drain covers

- drip trays
- spades and funnels
- hydrocarbon compatible containers
- appropriate personal protective equipment (PPE).

Employees should be aware of the incident management procedures for the site, who to contact in the event of a spill and be trained in spill clean-up procedures.

5 Ancillary activities

5.1 Mechanical workshops

Mechanical workshops can generate waste including:

- waste oils, lubricants, coolants and solvents (e.g. thinners)
- paints
- acids and alkalis
- oil/water separator waste liquid.

All repairs and servicing work should be done within the workshop area. Washing must not take place outside any designated wash bays within the workshop or an appropriately bunded and enclosed wash area.

Wastewater from wash bays and workshop areas must drain to either the sewer through an oil water separator (or other trade waste system approved by ICON Water) or to an underground storage tank that is emptied by a licensed contractor. The wastewater must not drain to the stormwater system. The wash area should be cleaned regularly to prevent the build-up of oil and other wastes.

5.2 Car wash facilities

Similar to mechanical workshops, wastewater from car wash facilities must be directed to an oil water separator, prior to discharging to sewer with the approval of ICON Water.

5.3 Chemical storage and hazardous materials

Chemicals should be stored in a bunded and covered storage area. The bunded area should be large enough to hold the contents of the largest container stored inside the bund, plus 10% of its volume.

Material Data Sheets (MDS) are information sheets about the safe use, storage and disposal of hazardous material. The MDS contains information that can save lives in an emergency. The MDS should be kept on site for every hazardous substance stored, handled or used. Ask the suppliers of hazardous substances for the MDS.

Liquids collected in the bunded areas should be pumped out by an ACT licensed waste contractor as quickly as possible. Small spills can be cleaned up with an adequate spill kit. Any absorbents used must be disposed of appropriately to a licensed waste facility. Chemical spills must not be hosed or washed down into the stormwater system or onto land.

Hazardous wastes must be managed, transported and disposed of appropriately. The movement of most hazardous waste must be tracked by the EPA during its transport by an ACT licensed transporter to an appropriately licensed facility for treatment, recycling or disposal.

6 Operational requirements

6.1 Environment Management Plan

All sites which have a petroleum storage system should develop and implement an Environment Management Plan (EMP). For sites with a petroleum storage capacity greater than 50m^3 the preparation of an EMP is a standard condition of the EA for the facility.

The EMP must be kept up-to-date and amended as required and a copy must be available for inspection by the EPA at the site. The EMP should include, but is not limited to:

- details of the petroleum storage system including the size, location and type of tanks and piping
- the address, block and section number of the site
- the contact details for the person responsible for the system, including 24 hour contact details
- the leak monitoring system for tanks and piping
- the leak and spill response procedures for the petroleum storage system
- the incident management procedures for the petroleum storage system
- the maintenance schedule for the petroleum storage system
- current as-built drawings for the petroleum storage system
- details of all specifications adopted in the design and installation of the storage system.

6.2 Leak detection

The purpose of leak detection is to identify leaks from the underground petroleum storage system.

6.2.1 Underground petroleum storage systems and tank piping

All UPSSs require a leak detection system for tanks and piping.

Where it is not practicable to implement such a system, a suitable alternative process to check for any loss from the UPSS on a regular basis must be implemented and accepted in writing by the EPA.

There are various methods of leak detection available, including:

- automatic tank gauging
- statistical inventory analysis
- interstitial monitoring
- groundwater monitoring
- line leak detection for pressure piping.

More than one of these methods is needed to satisfy the requirement that all practicable and reasonable steps are taken to prevent or minimise any environmental harm. To meet best industry practice, all leak detection methods should meet the following requirements:

- at least meet the detection limit of 0.76 litres per hour, with at least 95% accuracy
- be capable of detecting a leak from tank(s) and piping
- be conducted at least monthly
- be installed, calibrated and commissioned in accordance with the manufacturers specifications.

For further information on leak monitoring, refer to AS 4897.

6.2.2 Underground used oil storage systems

All underground used oil storage systems with a capacity of more than 5,500 litres require a leak detection system. Where it is not practicable to implement such a system, a suitable alternative process to check for any loss from the system on a regular basis must be implemented.

There are various methods of loss detection available, including:

- automatic tank gauging
- interstitial monitoring
- manual tank gauging (for tanks having a capacity less than or equal to 5,500 litres).

For further information on leak detection and monitoring procedures, refer to AS 4897.

6.3 Leak and spill response procedures

Leak and spill response procedures are detailed procedures that include appropriate responses to a leak or spill from the petroleum storage system and action(s) taken in the event of an incident.

The incident management procedure will need to document how the person responsible for the petroleum storage system can meet the following requirements:

- actions taken by staff upon discovery of a leak or spill
- activation of emergency shut down systems
- use of spill clean-up kits
- covering of drain entrances and bunding of impacted waterways
- notification of Emergency Services where necessary
- as soon as practicable, take such actions as required to identify the source and cause of a leak or spill (refer to Appendix A for further information)
- stop and mitigate any impact the leak or spill is having, or may have, on human health and the environment.

6.3.1 Discrepancy or loss investigation

When a potential discrepancy or loss is identified by the leak monitoring system, AS 4897 outlines the procedures to be taken to commence a discrepancy or loss investigation. A discrepancy or loss investigation should undergo a three-stage process, as outlined below:

Stage 1

Determine if the loss is due to an administrative, operational or mechanical cause. If the cause of the loss is determined to be an administrative, operational or mechanical cause then it should be escalated to the appropriate personnel. If the loss is unresolved, the loss investigation is upgraded to Stage 2.

Stage 2

Physical inspection of the site. The physical inspection of the site includes a meter calibration, visual inspection of pumps, visual inspection for an obvious leak and a visual inspection of the dipstick and other relevant equipment. If the cause of the loss cannot be resolved at this stage, the loss investigation is upgraded to Stage 3.

Stage 3

Physical testing of all the underground components of the system, including the tanks and pipes.

As soon as practicable after a discrepancy is confirmed as a leak or spill, the person responsible for the petroleum storage system must follow the incident management procedure to remove the risk of harm to human health and the environment.

6.4 Incident management procedures

As soon as practicable after a discrepancy or loss is confirmed as a leak or spill, the person responsible for the petroleum storage system must follow the incident management procedure to remove the risk of environmental harm.

The procedures should detail the following:

- notification of the incident to the EPA by calling 13 22 81
- actions taken as soon as practicable to prevent any further release of petroleum into the environment
- identification and mitigation of any fire, explosion or vapour hazards
- all steps taken to mitigate impacts of any petroleum that has leaked or spilled
- all steps taken to recover or remove petroleum that has leaked or spilled, so that the site does not pose a threat to the environment or human health and safety
- removal or, where practicable, repair of leaking components in accordance with industry best practice.

The EPA recommends that the person responsible for the petroleum storage system engages a suitably qualified and experienced person to assist in the development of an incident management procedure.

To determine the type, extent and level of contamination that may be present, an environmental site assessment (ESA) may be required. An ESA should address:

- contaminant concentrations in soil, groundwater and surface water
- the potential effects of contaminants on public health, the environment and building structures.

6.5 Record keeping

The person responsible for the petroleum storage system is required to keep records relating to:

- all incidents which have affected, is affecting or could affect the integrity of the storage system
- field sampling record sheets and chain-of-custody forms
- results of environmental monitoring including surface water and groundwater
- reconciliation records for all fuels and oils utilised and stored on site
- waste disposal certificates for any regulated or controlled wastes disposed off-site
- complaints received by employees or agents, in relation to pollution from, or on, the site.

6.6 Maintenance schedule

A maintenance schedule is required which outlines the maintenance to be carried out on the petroleum storage system and associated equipment and pollution controls, including stormwater quality improvement devices, water/oil separators, bunds, tanks, lines, gauges, indicators, probes, sensors and any other measuring instruments in the system. All checks, maintenance and calibration (where necessary) must be carried out in accordance with the manufacturer's specifications.

All data produced by the gauges, indicators, probes, sensors, monitoring wells and any other measuring instruments in the petroleum storage system must be recorded in a suitable format and be available for inspection by the EPA.

6.7 As-built drawings and plans

A copy of the as-built drawings and plans of the system must be included in the EMP and include the following information:

- a plan of the site showing the location of the petroleum storage system, including site levels and contours
- location of all buildings on the site
- associated infrastructure including tanks, pipes, dispensers and vents
- location of stormwater and sewerage infrastructure and stormwater and drainage flow paths
- the location of oil/water separators and stormwater quality improvement devices and, where installed, location of bunded areas
- location of all groundwater monitoring wells including the labels/codes by which they are identified
- location of tank pit observation wells
- all fences and gates
- any unsealed ground surfaces.

All as-built drawings and plans must include the date on which they were prepared.

7 Groundwater monitoring wells

7.1 Design and installation

A competent and experienced person should design the groundwater monitoring well system with the following undertaken as a minimum:

- identify the likely location/direction/flow of any existing or potentially contaminated groundwater plume/flow by determining:
  - the location of all tanks, pipe work, filling points and dispensers that are part of any petroleum storage system on the site
  - the hydraulic gradient on the site (to estimate the direction of groundwater flow, at least three wells are required in an approximately triangular pattern)
  - topographic slope and boundary conditions on the site
  - any variations, such as seasonal, that may occur to the site's hydraulic gradient
  - the location of any barriers or preferential pathways, such as service trenches, which may be present in the substrate of the site.
- develop a conceptual three-dimensional groundwater model (also known as a site conceptual/model or SCM) to:
  - maximise the likelihood of intercepting any groundwater impacted by hydrocarbons on the site
  - maximise the likelihood of intercepting groundwater entering the site, such as on the site boundary up hydraulic gradient from the underground petroleum storage system.

The person installing the groundwater monitoring well(s) is required to hold an ACT Drillers Licence. The installation of a groundwater monitoring well is generally exempt from the requirement for a Bore Work Licence under Section 10 of the Water Resources Regulation 2007.

Groundwater monitoring wells must be installed in accordance with AS 4897 (Equipment Level 1) and Edition 2 of the Minimum Construction Requirements for Water Bores in Australia (Land and Water Biodiversity Committee, 2003).

7.2 Local geology

Groundwater monitoring wells should be drilled to a depth that will enable groundwater at the site to be effectively monitored. If a confining layer has been encountered and groundwater not found by a depth of 15 metres, drilling can cease, unless contamination is present or local geology, such as unconsolidated sediments or fractures in the confining layer, indicates that contamination could find its way to a greater depth into the subsurface.

Where drilling for the groundwater well has stopped before groundwater is encountered, a scientifically defensible justification should be provided in writing to the EPA by the competent and experienced person responsible for making the decision.

7.3 Dimensions and components of groundwater monitoring wells

Groundwater monitoring wells must:

- have a minimum internal diameter of 50mm
- have sampling ports of suitable strength (e.g. 'class' of well casing), with machine slotted sections appropriately located to enable sampling of groundwater
- be gravel packed
- have cement/bentonite seals between sections
- have a lockable cap or gatic cover.

The porous media surrounding the monitoring bores should be composed of a material that does not affect the accuracy of the sample (e.g. no solvents should be used during the construction process).

The standpipe of monitoring wells must:

- be adequately sealed near ground level with cement-based grout
- have a lockable security cover over the top
- be located and constructed in such a way as to prevent damage and surface water and extraneous material, such as dirt and insects, entering the wells.

7.4 Tank pit observation wells

Tank pit observation wells are installed within the tank pit of a petroleum storage system to monitor for the presence of liquid which may contain leaked or spilled petroleum products. Tank pit observation wells can also be used to check for vapours.

The monitoring of tank pit observation wells should be included in the six-monthly groundwater monitoring. Refer to Section 2.1.5 for further information.

8 Groundwater monitoring

8.1 Groundwater sampling and analysis

Groundwater monitoring wells should be sampled and analysed within 30 days of commissioning for the parameters outlined in Table 1.

Groundwater sampling and analysis should be undertaken annually thereafter for the parameters outlined in Table 1 where groundwater monitoring wells are installed or more frequently where leakage of the fuel storage system is suspected. Details of the procedures and frequency of sampling and analysis must be included in the EMP for the site.

The EPA must be notified of any exceedance of the specified groundwater parameters identified by groundwater sampling and analysis. An exceedance of the groundwater parameters may indicate a leak. The leak detection procedures for the facility should be implemented to determine the source of the contamination.

Table 1: Groundwater monitoring parameters and criteria

Parameter	Criteria
pH	6.5 – 8.5[1]
Total Petroleum Hydrocarbons C6 – C9 C10 – C40	 No criterion set at this time 600µg/L[2]
BTEX(total) Benzene Toluene Ethyl Benzene	 950µg/L[3] 300µg/L[4] 140µg/L[4]
Xylenes o-xylene p-xylene Total xylene	 350µg/L[3] 200µg/L[3] 600µg/L[3]
Naphthalene	16µg/L[3]
Ethanol	1400µg/L[3]
Lead(Total)	3.4µg/L[3]*

* for sites where leaded fuels were stored

1. ANZECC & ARMCANZ (2000). Australian Water Quality Guidelines for Fresh and Marine Water Quality.
2. Dutch (2009) Intervention Level – Mineral Oil
3. CS NEPM (1999) – Schedule B1
4. ANZECC (1992) - Australian Water Quality Guidelines for Fresh and Marine Waters

Note: All analysis for organic and inorganic substances must be for total concentrations.

8.2 Groundwater monitoring

Groundwater should be monitored for the presence of hydrocarbons every six months. The monitoring may include visual assessment or the use of interface probes and/or gauges.

The details of these tests should be recorded and include:

- the date and time of the tests
- any observations, such as evidence of odour or sheen or indication of the presence of free-phase hydrocarbons
- the name and signature of the person who conducted the tests.

8.2.1 Visual assessment

To undertake a visual assessment, a single groundwater sample should be obtained using a bailer which meets the criteria outlined below. Immediately after the sample is raised from the well visual checks for sheen should be carried out by looking across the water surface in bright light and checking the outside of the bailer for a sheen or any signs of hydrocarbons.

The transparent bailer used to obtain the groundwater sample must be either a disposable bailer used only once, a bailer designated for exclusive use for that well or a bailer that has been properly decontaminated prior to being reused in another well.

8.2.3 Interface probe assessment

The interface probe assessment should be carried out, before any water samples are collected from the monitoring well, by an appropriately qualified and experienced person using an interface probe with a resolution of one millimetre. The interface probe assessment should be able to detect the presence of a minimum thickness of three millimetres of free-phase hydrocarbons.

The interface probe should be slowly lowered into the monitoring well to intercept the top of the water table in order to detect the presence of any phase-separated hydrocarbons.

8.3 Groundwater monitoring reports

Where impacts from petroleum products are detected in groundwater, a Groundwater Monitoring Event (GME) Report should be prepared.

The purpose of a GME Report is to provide information to detail how the results may impact on the environment.

At a minimum, a GME Report should include:

- an assessment of the results against the groundwater sampling parameters in Table 1- assessment against other criteria should be undertaken where results suggest potential risks to on and off-site receptors
- discussion on the source of the groundwater impacts, where identified, including the steps that have been and are to be undertaken to prevent the further release of hydrocarbons- a statement that the impacts relate to a historical source is only considered sufficient when the EPA has received previous information relating to these impacts
- full delineation of groundwater impacts in accordance with EPA endorsed guidelines, particularly where the impacted wells are located close to the site boundary and in the direction of inferred groundwater flow
- assessment of risks, against appropriate criteria, to off-site receptors where off-site impacts are identified
- proposed remedial strategies for the management of light non-aqueous phase liquid (LNAPL) and high dissolved phase concentrations of the parameters listed in Table 1 when detected (Note: an addendum to the EMP will be required to incorporate the remedial and assessment strategies for LNAPL/high dissolve phase management)
- proposed remedial measures to reinstate the environmental value of the groundwater resource where impacts above criteria are identified or appropriate justification as to why this is not necessary
- when a site has been subject to an independent contaminated site audit (for example re-tanking of the site), the monitoring results should be assessed against the criteria of the site's audit, when different to the criteria in the site's EA, and appropriate comment provided to ensure that the risks to human health and the environment, both on and off-site, remain consistent with the findings of the site's audit.

8.4 Detection and management of Light Non-Aqueous Phase Liquid

Where LNAPL is detected on site, it should be managed in accordance with guidance issued by the EPA.

8.5 Independent Environmental Audits

When the EPA has reasonable grounds to believe that petroleum storage activities have contaminated soil or groundwater off-site in such a way as to cause, or be likely to cause, either a significant risk of harm to human health or a significant risk of material environmental harm or serious environmental harm, the EPA may, by written notice, require an independent environmental audit.

The audit, when required, must be undertaken by an EPA approved environmental auditor and must audit the results of all environmental assessments, monitoring results and management actions, including remedial actions, associated with the identified impacts from the fuel storage activities.

9 Stormwater monitoring

The Regulation sets the water quality parameters for stormwater in the ACT. Urban areas are generally classified as 'drainage and open space catchments' in the Territory Plan Water Use and Catchment General Code. This means that the Urban Lakes and Ponds (AQUA/3) and Urban Wetland (AQUA/5) criteria from the Regulation are applied.

Exceedances in the sampling parameters provide information on whether the system is operating correctly and is being maintained in accordance with the manufacturer's specifications.

Discharge from a stormwater quality improvement device should be monitored biannually for the parameters listed in Table 2.

Table 2: Stormwater monitoring parameters and criteria

Parameter	Criteria
pH	6-9
Electrical conductivity	< 1000 µs/cm
Suspended solids	≤ 25mg/L
Turbidity	< 30 NTU
Dissolved oxygen	≥ 6mg/L
Oil and grease	< 10mg/L

Note: The results of the monitoring should be recorded on site and be available for inspection by the EPA.

10 Modifications and repairs to petroleum storage systems

Any significant modifications or repairs to a petroleum storage system should be designed and undertaken by a competent and experienced person in accordance with AS 4897.

Where contamination constituting material environmental harm (i.e. the cost of clean-up would be greater than $5,000) is discovered during the modification process then notification under Section 23A of the Act is required (see Section 1.2.2 for further information).

Note: Environmental harm is defined in the *Environment Protection Act 1997*.

11 Decommissioning of petroleum storage systems

The person responsible for the petroleum storage system immediately before it is decommissioned is responsible for the decommissioning and removal of the system.

An ESA should be undertaken and a copy of the written report provided to the EPA within three months of ceasing operation of the system.

The petroleum storage systems should be decommissioned, removed and potential site contamination assessed in accordance with:

- AS 4976
- EPA Contaminated Sites EPP
- relevant EPA information sheets
- National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended May 2013 (National Environment Protection Council).

The EPA should be notified in writing of the decommissioning procedure within 28 days of abandonment of a tank or petroleum storage system. Notification may be provided by email to environment.protection@act.gov.au.

All decommissioned tanks must be removed unless there are specific operational or structural reasons as to why they must remain. These reasons must be outlined or substantiated by an experienced and competent person.

Approval should be sought from the EPA wherever in-situ abandonment of a petroleum storage systems is proposed.

A copy of the consultant's final assessment report should be forwarded to the EPA for review and endorsement within 15 working days of the completion of the report.

Development approval under the *Planning and Development Act 2007* and building approval under the *Building Act 2004* are required for decommissioning petroleum storage systems. The Dangerous Substances Licensing Unit, Access Canberra should also be contacted when decommissioning above ground or underground petroleum storage systems.

12 References

Includes but is not limited to:

- AS 1692 – 2006: Steel Tanks for Flammable and Combustible Liquids
- AS 1940 - The Storage and Handling of Flammable and Combustible Liquids
- AS 2885.0 – 2008: Pipelines – Gas and Liquid Petroleum – General Requirements
- AS 2885.1 – 2012: Pipelines – Gas and Liquid Petroleum – Design and Construction
- AS 2885.2 – 2012: Pipelines – Gas and Liquid Petroleum – Operation and Maintenance
- AS 4897 - The Design, Installation and Operation of Underground Petroleum Storage Tanks
- AS 4976 – 2008: The Removal and Disposal of Underground Petroleum Storage Tanks
- AS 4977 – 2008 Petroleum Products – Pipeline, Road, Tanker Compartment and Underground Tank Identification
- AS /NZS 1020 – 1995: The Control of Undesirable Static Electricity
- AS/NZS 60079.10.1:2009 - Explosive Atmospheres – Classification of areas – Explosive gas atmospheres
- *Building Act 2004*
- *Dangerous Substances Act 2004*
- *Environment Protection Act 1997*
- Environment Protection Regulation 2005
- *Planning and Development Act 2007*
- *Work Health and Safety Act 2011*
- EPA Contaminated Sites Environment Protection Policy
- EPA Environmental Guidelines for the Preparation of an Environment Management Plan
- EPA General Environment Protection Policy
- EPA information sheets
- Minimum Construction Requirements for Water Bores in Australia (Land and Water Biodiversity Committee 2003)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended May 2013 (National Environment Protection Council).

13 Glossary of terms

Competent and experienced person

As defined in AS 4897, a person with appropriate practical and theoretical knowledge and actual experience to carry out a particular task safely and effectively. This person has the necessary ability and training and all the relevant qualifications, accreditations, certifications, licences and approvals required for the particular activity with which he or she is concerned, an understanding of relevant statutory requirements and of AS 4897, and an appreciation of the hazards involved. The person is also able to recognise the need for specialist advice or assistance when necessary and to assess the importance of the results of examinations and tests in the light of their purpose.

For the purposes of assessing potential contamination the person must be able to demonstrate that they meet the competencies found in Schedule B9 Guideline on Competencies and Acceptance of Environmental Auditors and Related Professionals of the National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended 2013.

Environmental Authorisation (EA)

Means an environmental authorisation under Part 8 of the *Environment Protection Act 1997*.

Environment Protection Authority (EPA)

Means the statutory position established under Section 11 of the *Environment Protection Act 1997*.

Fuel delivery area

The area where fuel tankers undertake tank filling and includes the remote fill points and spill box.

Fuel dispensing area

The immediate area surrounding the fuel dispensing bowsers where vehicles or other equipment and containers are routinely filled and at which there is a higher risk of contamination.

Light Non-Aqueous Phase Liquid (LNAPL)

An organic or inorganic liquid that is not miscible with water and has a specific gravity less than 1.0 (e.g. petrol, diesel etc.). Once a LNAPL infiltrates the ground it will stop at the height of the water table because the LNAPL is less dense than water.

Material environmental harm

Material environmental harm means environmental harm:

(a) that is significant, including environmental harm that becomes significant—

(i) over time; or

(ii) due to its frequent recurrence; or

(iii) due to its cumulative effect with other relevant events; or

(b) that is to an area of high conservation value, other than harm that is trivial or negligible; or

(c) that results in loss or damage to property to the value of more than $5,000; or

(d) that results in necessary remedial action costing more than $5,000.

Petroleum products

Any fuel that consists predominantly of a mixture of hydrocarbons derived from crude oil whether or not the fuel includes additives (such as ethanol) and includes oil and used oil.

Product piping

Piping that routinely contains petroleum product. For the purposes of this document, vent piping and vapour recovery piping are not classified as product piping.

Serious environmental harm

Serious environmental harm means environmental harm:

(a) that is very significant, including environmental harm that becomes very significant—

(i) over time; or

(ii) due to its frequent recurrence; or

(iii) due to its cumulative effect with other relevant events; or

(b) that is to an area of high conservation value and is significant, including environmental harm that becomes significant—

(i) over time; or

(ii) due to its frequent recurrence; or

(iii) due to its cumulative effect with other relevant events; or

(c) that results in loss or damage to property to the value of more than $50,000; or

(d) that results in necessary remedial action costing more than $50,000.

Significantly modified

Any modification to an underground petroleum storage system that involves the replacement of half or more of the tanks in a system.

Stage 1 vapour recovery

A system of pipes and valves designed to capture fuel vapour emissions as fuel delivery tankers unload petroleum to refill the underground tanks. The system captures the vapours that are displaced from the underground tank and diverts them back to the tanker compartment instead of releasing them to the atmosphere through the tank's vent pipe. This vapour is then returned to the fuel terminal where it can be recondensed back to motor spirit.

Stage 2 vapour recovery

A system designed to reduce the emission of vapour to atmosphere by capturing fuel vapour as a vehicle's fuel tank is being refilled. The fuel entering a vehicle's fuel tank displaces vapour which is captured at the fill point through the nozzle with the aid of an added vacuum system and is returned to the underground storage tank.

Territory Plan

Statutory instrument under the *Planning and Development Act 2007*.

Underground petroleum storage system (UPSS)

As defined in AS 4897, one or more completely or partially buried tanks that contain or are intended to contain petroleum, leak monitoring systems, cathodic protection and all product piping to, from or associated with the tanks and up to the inlet part of the dispensers.

Appendix A: Loss detection investigation

The following checks may be undertaken in order to assist in determining the cause of a discrepancy identified during a loss monitoring procedure.

Suspected issue to investigate	Loss/Gain?	System Check
Dip stick	Loss or gain	Check the following: • dip stick for wear/damage and replace if necessary • each tank has the correct dip stick • if using automation tank gauging, that the system is operating to the manufacturer's specifications.
Dispenser pumps are over or under dispensing	Loss or gain	Check the following: • that dispenser totals and console totals are recorded and operating within their accepted tolerances and that the records produced by each, for the same period, correlate within acceptable limits • the maintenance schedule and calibration of dispensers.
Equipment integrity test (EIT)	Loss or gain	If none of the above investigations reveals a reason for the discrepancy in the reconciliation records, an EIT may be considered and performed in accordance with AS 4897.
Interstitial monitoring (for appropriately designed storage systems only)	Loss	Check: • the system is active • leak detection measurements (e.g. liquid levels or pressure levels) are within the manufacturer's tolerances • leak detection measurements have been recorded for the system • when previous losses outside the manufacturer's leak detection tolerances have been reported in the last six months, undertake further investigation of the system to identify the source of leak.
Human error	Loss or gain	Check: • storage system installation records (was the installer accredited/ certified?) • for inaccurate measuring/recording • delivery losses/tank filling activities • for inadequate system management • failure to complete physical system checks.
Inventory records	Loss or gain	Check the inventory control records of the preceding three months (or to a point when records are deemed satisfactory) to ensure the discrepancy has not been caused by a record keeping error.

Suspected issue to investigate	Loss/Gain?	System Check
Pumps and piping manifolds	Loss	For a dispenser with a pump located inside the dispenser unit, remove covers and check valves and pipe work for leaks, both during operation and when switched off. For submersible pumps, lift the pit cover and check wells for leaks. For piping manifolds, lift the pit cover and check for any leak.
Recent repairs undertaken on storage system	Loss or gain	Check: • maintenance records • if repair and reuse was undertaken, whether compatible materials were used.
Sales test	Loss or gain	Determine tank and dispenser relationships by identifying single stock systems. Establish opening stock datum and do not alter the single stock systems for the duration of the sales test. During the sales test the operator should satisfy the requirements of the delivery procedures and run the test for five days unless significant loss or gain variations can be determined in a shorter period. The final stock reconciliation should be performed by the person responsible.
Security/pilfering	Loss	Check: • for sites that do not operate continuously (non-24 hour sites) that all tank openings (e.g. dip and fill points) are secured, in particular after hours • on self-serve sites, that controlled authorisation of dispensers is operating • where available, CCTV or similar security systems.
Tank pit observation wells and groundwater monitoring wells	Loss	Check: • for any evidence of petroleum in the tank pit observation well and/or groundwater monitoring well using a measuring instruments such as an interface probe or a clean see-through bailer lowered slowly into the well to observe water interface • for vapours by using portable gas analyser • undertake further investigation of the system to identify the leak source.
Temperature	Loss or gain	Check: • delivery temperature correction • calculations have been temperature corrected to 15°C (or recommended ambient temperature).

Suspected issue to investigate	Loss/Gain?	System Check
Vents	Loss	Check: • vent caps for any visible blockages • vents for evidence of petroleum blow-out at either vent outlet or below vents on ground or buildings.
Water	Gain	Check each tank for the presence of water by: • use of an interface probe • water-finding paste on a dipstick • identify entry point(s) (e.g. if tank has a hole or water is entering via open valve, fill point, etc.).

Note: The Australian Standards are to be complied with where they are not in conflict with the ACT Guidelines.