

Underground Petroleum Storage Systems

Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019

Draft for consultation



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1. Introduction

These guidelines provide details on the environmental requirements for operating underground petroleum storage systems in NSW.

Leaks and spills from underground fuel tanks and pipes are a common source of land and groundwater contamination in NSW. Many of the contaminated sites notified to the NSW Environment Protection Authority (EPA) have involved underground petroleum storage systems (UPSS).

There is a clear need for operators of a UPSS to guard against, monitor for, and fix leaks promptly. This can reduce environmental impacts, save costly clean-ups and protect the public.

1.1. Aim and scope

The guidelines in this document specify what level of environmental performance is expected of operators of a UPSS in NSW. They are designed to assist with achieving compliance with requirements of the **Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019** (the Regulation). The guidelines also summarise best-practice equipment and procedures in the fuel storage and delivery sector and refer to other sources of information about best practice.

The guidelines do not cover other legislation and legal obligations that UPSS operators are required to meet, such as those related to work health and safety, and dangerous goods requirements.

1.2. Regulatory framework

The NSW Government introduced a new law in 2008 requiring operators of UPSS to install best-practice tanks, pipes and monitoring equipment for underground fuel systems. The Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 also required operators to monitor for leaks and have documented management procedures on their underground fuel system.

The Regulation was updated in 2014 and 2019 to include changes in fuel systems terminology, technology and best practice. These guidelines are made under the Regulation and assist with its implementation. In the case of any inconsistency between the Regulation and these guidelines, the Regulation prevails to the extent of the inconsistency.

1.3. Appropriate Regulatory Authority

When the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation was first made on 1 June 2008, the EPA was declared to be the Appropriate Regulatory Authority (ARA) for all UPSS-related matters. The EPA was tasked with assisting the fuel industry to implement and comply with the new regulatory requirements. It was always envisaged that local councils would resume regulatory responsibility after an implementation period for the new regulatory requirements.

On 1 September 2019 local councils resumed responsibility for regulating most UPSS sites in their local areas. The EPA remains responsible for regulating UPSS sites that are:

- operated by a public authority, or
- subject to an Environment Protection Licence, or
- in the unincorporated areas of NSW where there is no local council, or
- subject to a notice, direction or requirement made, issued or given by the EPA before 1 September 2019 for a matter under the Regulation until the actions in that notice, direction or requirement have been complied with.

Contact details

NSW Environment Protection Authority (EPA)

Environment Line (02) 9995 5555 or 131 555 (from anywhere in NSW)

Email: upssreg@epa.nsw.gov.au

Local councils

To find the contact details for your local council, use the [search function](#) on the Office of Local Government website.

1.4. Application of the Regulation

The Regulation applies to all UPSSs in NSW, except for:

- storage systems where all tanks are situated wholly above ground (regardless of where any associated pipes, valves and other equipment are situated)
- sumps, separators, stormwater or wastewater collection systems, catchment basins, pits, septic tanks or other like structures, unless petroleum routinely passes through the structure from one part of the storage system to another
- bunded tanks that are situated below ground level but not in the ground (such as in a basement, cellar or tunnel)
- liquefied petroleum gas (LPG) storage systems.

A UPSS is defined in the Regulation as a system with one or more tanks that are completely or partially buried in the ground and which contain, or are intended to contain, petroleum. This definition also includes any piping associated with the tanks and fuel dispensers, but not piping related to vents or vapour recovery.

1.5. Related documents

These guidelines include references to the following Australian Standards:

- AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*
- AS 4976–2008, *The Removal and Disposal of Underground Petroleum Storage Tanks*
- AS 1940–1993, *Storage and Handling of Flammable and Combustible Liquids*.

1.6. Person responsible

The Regulation defines the **person responsible** for a UPSS as the person who has management and control of the storage system. The person responsible is legally required to ensure the UPSS complies with the requirements of the Regulation. Where a corporation is responsible for a UPSS, an individual who is authorised to act on behalf of that corporation must be nominated to the Appropriate Regulatory Authority as a contact.

Where a UPSS is no longer in use, but has not yet been decommissioned, the person responsible is the person who had management and control of the system immediately before it ceased operating. If that person cannot be located, the person who owns the land on which the UPSS is located is deemed to be the person responsible.

Where more than one party is involved in managing a UPSS site through specific legal and/or contractual arrangements, determining the person responsible is a question of fact that depends on the relevant management arrangements and what happens in practice.

1.7. Duly qualified person

The Regulation requires that a **duly qualified person** be used to carry out certain activities such as designing, installing or modifying a UPSS. Any testing, repairs and ongoing maintenance of the storage system must also be undertaken by a duly qualified person.

Each of these activities requires different skills and presents varying levels of complexity. Duly qualified persons of different specialisations may therefore be required to undertake different components or stages of an activity (i.e. different stages may require an architect, a hydrologist, a laboratory analyst, a groundwater consultant, a drilling contractor, and so on).

Affiliation to an industry accreditation scheme and/or having relevant trade permits or professional qualifications can help to indicate whether a person may be considered as being duly qualified to undertake the required activity. Table 2 in Appendix 2 provides a checklist to assist in your consideration of who is a duly qualified person.

1.8. Planning issues

Planning authorities, usually local councils, assess development proposals under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Such proposals include those for new or modified UPSS or their decommissioning. These planning processes are independent of the Regulation and are not affected by it.

Development proposals relating to UPSS sites do not require integrated development approval as UPSS sites do not require an Environment Protection Licence.

The Regulation requires specific conditions to be met in the design, installation and commissioning of all new and significantly modified UPSS, as well as when a tank is to be removed or replaced or the system decommissioned. These requirements are specified in Part 2 of the Regulation and should be considered at the planning stage.

Further information about planning issues is contained in Appendix 4: Planning and consent for a UPSS.

1.9. Exemptions

Clause 29 of the Regulation allows the appropriate regulatory authority to exempt a person or a class of person from any of the requirements of the Regulation.

The EPA issued exemptions to many UPSS sites when the Regulation was first introduced. These exemptions allowed time for UPSS operators to comply with the new requirements, such as the need to monitor for fuel losses and install groundwater monitoring wells. All these exemptions granted by the EPA have now expired.

It is the EPA's current policy that an exemption will only be considered where:

it is not possible for the person responsible to comply with certain provisions of the Regulation and equivalent environmental protection measures can be put in place. The equivalent measures must be designed and installed by a duly qualified person.

On 1 September 2019 councils became the appropriate regulatory authority for most UPSS sites in their local areas. Councils can exempt persons responsible for a UPSS in their local area from complying with any of the requirements of the Regulation. It is suggested that councils adopt a policy regarding the granting of exemptions, to ensure consistency and transparency.

Exemptions issued by the EPA or councils:

- may be granted on application or on their own motion
- may be issued to a person or to a class of persons
- must be in writing and either be published in the *Government Gazette* or served upon the person specified in the exemption order
- may be granted subject to conditions as specified in the exemption order
- may be granted for set periods of time or until revoked.

To apply for an exemption, contact the appropriate regulatory authority for the site (see section 1.3) to discuss the application process. The appropriate regulatory authority may charge an application fee for an exemption.

1.10. Compliance

The EPA and councils are responsible for enforcing compliance with the Regulation for sites for which they are the appropriate regulatory authority.

The EPA enforces compliance with the Regulation in accordance with its compliance policy. Councils enforce compliance in accordance with their own policies and procedures. The EPA cannot direct a council regarding compliance action for premises for which they are the appropriate regulatory authority, and vice versa.

Enforcement

Certain enforcement powers are available to appropriate regulatory authorities under the *Protection of the Environment Operations Act 1997* (POEO Act) to enforce compliance with the Regulation and manage and prevent pollution incidents. These include issuing clean-up notices and prevention notices requiring actions to be taken at UPSS sites.

Clean-up notices

Under the POEO Act, the appropriate regulatory authority may issue a clean-up notice requiring certain persons to take clean-up action where it reasonably suspects that a pollution incident has occurred or is occurring.

Actions that could be required may include:

- taking appropriate measures to prevent, minimise, remove, disperse, destroy or mitigate any pollution resulting, or likely to result, from the pollution incident
- ascertaining the nature and extent of the pollution incident and any actual or likely resulting harm to the environment or human health
- preparing and/or carrying out a remedial plan of action agreed to by the appropriate regulatory authority.

Prevention notices

Under the POEO Act, an appropriate regulatory authority may issue a prevention notice when it reasonably suspects that an activity has been or is being carried out in an 'environmentally unsatisfactory manner' as defined in the POEO Act.

Examples of actions that may be required by a prevention notice include:

- installing, repairing, altering, replacing, maintaining or operating control equipment or other plant
- monitoring, sampling or analysing any pollution or otherwise ascertaining the nature and extent of pollution or the risk of pollution
- preparing and carrying out a plan of action to control, prevent or minimise pollution or waste
- providing regular progress reports to the appropriate regulatory authority on implementing the action(s) required to be taken by the notice.

Penalties and offences

The **person responsible** is legally accountable for ensuring their UPSS site(s) complies with the Regulation. There are offences for contravention of the requirements of the Regulation. A person who commits an offence may receive a penalty notice or be prosecuted in court by the appropriate regulatory authority. The Regulation outlines the maximum penalties for offences in the event of court action. A list of penalty notice offences against the Regulation is contained in Schedule 6 of the Protection of the Environment Operations (General) Regulation 2009.

Penalties and offences under the POEO Act may also apply to the operation of a UPSS. For example, it is an offence for a person to willfully or negligently cause any substance to leak, spill or escape from a storage system in a manner that harms, or is likely to harm, the environment. It is also an offence to pollute waters or land.

Investigation

Chapter 7 of the POEO Act contains the powers of entry and investigation of authorised officers of the EPA and councils. An appropriate regulatory authority or authorised officer of the appropriate regulatory authority may require a wide range of documents to be provided. In these circumstances, anyone furnishing information or making a statement to the appropriate regulatory authority that they know is false or misleading in a material respect is guilty of an offence.

2. UPSS equipment

Leaks from underground fuel systems can cause contamination that can harm the environment and human health. Cleaning up contamination is also very expensive.

2.1. New, old and modified UPSS installations

The Regulation has some slightly different requirements depending on whether a **new** or **old** UPSS is involved.

A UPSS approved, installed or commissioned on or after 1 June 2008 is considered a **new** UPSS and must fully comply with the Regulation.

A UPSS approved, installed or commissioned before 1 June 2008 is considered an **old** UPSS.

Old UPSSs need to comply with all the operational requirements of the Regulation **except** that they do not need to be retrofitted with the new infrastructure specified in Part 2 of the Regulation unless there is a significant modification of the system.

Significantly modified UPSS

Any significant modification to an old or new UPSS triggers the need for the system to fully comply with the Regulation. **Significant** means any modification to the UPSS that involves replacement of:

- the whole system

or

- half or more of the tanks in the system.

2.2. Mandatory equipment for a new and modified UPSS

All new and significantly modified UPSS must have equipment installed as required by Australian Standard AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*. The equipment required by AS 4987–2008 includes (but is not limited to):

- non-corrodible tanks and piping
- secondary containment of tanks and piping
- overfill protection devices.

For further detail on what constitutes non-corrodible tanks and piping materials, what secondary containment requires and what overfill protection devices are, see Australian Standard AS 4897–2008.

The mandatory equipment specified in the Regulation represents the minimum requirements that must be included in new or significantly modified UPSS from an environment protection perspective. This is not intended to limit the use of alternative materials, designs, technology and methods where they can be shown to offer the same or better protection to the environment and human health as the specified equipment.

Tanks and piping will also need to conform with any other specifications required under state and federal statutory requirements relevant to UPSS for the storage of flammable liquids.

2.3. Leak detection systems

All UPSS, whether 'old' or 'new', must have a leak detection system installed and be regularly tested (see parts 3 and 4 of the Regulation). A leak detection system acts as a backup in case the loss monitoring system fails to detect a leak from the UPSS.

A UPSS cannot be used unless a leak detection system is in place. There are numerous types of leak detection systems available as outlined in Figure 1. The most appropriate leak detection system for a site will need to be recommended by a duly qualified person.

A [fact sheet on leak detection systems](#) has been prepared as a quick and simple reference.

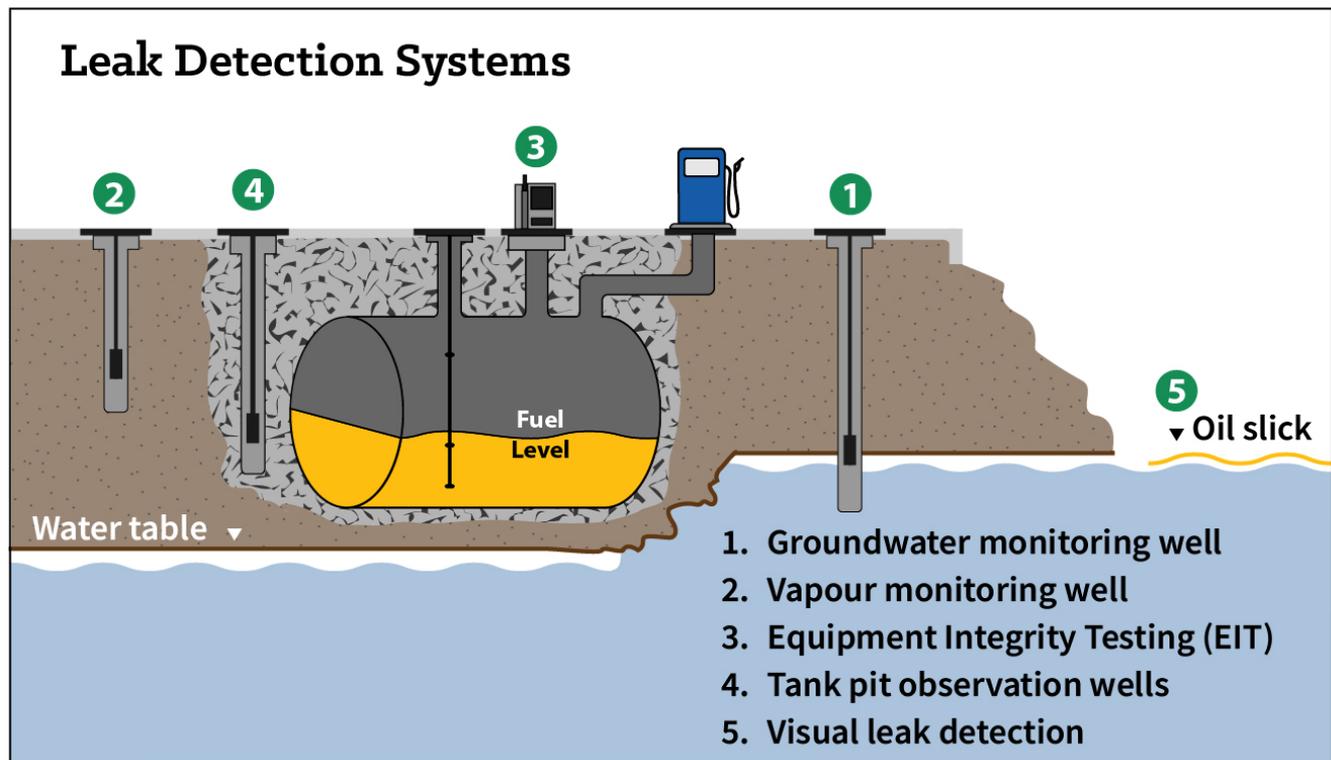


Figure 1 Leak detection systems for a UPSS

Groundwater monitoring wells

The preferred leak detection system is a network of groundwater monitoring wells around the UPSS. The wells must be tested every six months for the presence of fuel to help detect any leak in the system.

Installation of wells

A duly qualified person who is experienced in designing and/or installing groundwater monitoring wells, such as a groundwater consultant or groundwater well driller, should assess the UPSS site and determine the number and positioning of the wells.

The wells should be positioned to maximise the likelihood of intercepting contaminated groundwater if the UPSS were to leak. As a minimum, there should be one well installed up-gradient of the UPSS and two wells down-gradient. If groundwater cannot be found by a depth of 10 metres an alternative leak detection system should be considered.

The person who designs and/or installs a groundwater monitoring well is required to provide the person responsible for the UPSS with a written report on the installation of the groundwater monitoring wells. This report must outline the final construction details of the wells and the industry standards met in their design and installation, and confirm that the wells' design, location and installation satisfy industry best-practice requirements.

The location of each groundwater monitoring well and its designated number (e.g. MW 1, MW 2, etc.) must be identified as part of the **fuel system operation plan**.

Section 4.5.7 of Australian Standard AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*, gives further details about the construction and installation of groundwater monitoring wells.

Testing of wells

The wells must be tested at least every six months for evidence of fuel contamination. (See Figure 2.) Testing methods include bailing with visual and olfactory observation or use of an interface or photoionisation detector (PID) that can detect hydrocarbons.

Each well should be checked for the presence of hydrocarbons by using the bailer to obtain a single groundwater sample. The following checks should be made immediately after the sample is raised from the well:

- a visual check for a sheen by looking across the water surface in a bright light
- a visual check of the outside of the bailer for a sheen or any sign of hydrocarbons.

Any odour or sheen observed probably indicates the presence of fuel in the groundwater under the site.

All health and safety precautions should be followed. The duly qualified person is required to provide the person responsible for maintaining the groundwater monitoring wells with a detailed written instruction on how to undertake testing of the wells and recording the results.

The groundwater in each monitoring well must be sampled and analysed in a NATA-accredited laboratory:

- upon the installation of a new UPSS or tank
- where six-monthly testing indicates that groundwater may be contaminated by petroleum or
- upon the discovery of a leak, whether through loss monitoring for tanks and piping, inventory control, discrepancy or loss investigation, or some other method.

The results of groundwater testing and monitoring should be recorded in the fuel system operation plan for the UPSS and kept for at least seven years after the date the tests are made.

Groundwater test records

The results of the six-monthly groundwater monitoring tests must be recorded. The records must include:

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

Sample record sheets are provided in Appendix 3: Sample record sheets for groundwater monitoring. Copies of these records must be kept for at least seven years after the date the tests are made, ideally in the fuel system operation plan.

If it is determined that there are free-phase hydrocarbons in groundwater at the site, or it is likely that offsite migration of hydrocarbons is occurring or has occurred, the appropriate regulatory authority must be notified.

Alternative leak detection systems

Where groundwater monitoring wells are not effective or suitable, an alternative leak detection system can be used, providing it has been designed and installed by a **duly qualified person**. The duly qualified person must certify in writing that it is appropriate for the site and offers a level of environment protection equivalent to that of groundwater monitoring wells.

The following examples of alternative leak detection systems are not exhaustive. A duly qualified person is free to specify other alternative leak detection systems but must certify these as appropriate for the site. Written certification must be provided to the person responsible for the UPSS and kept with the fuel system operation plan. (See section 4.2.)

Vapour monitoring

This leak detection system can be used either continuously or regularly. Generally, it requires porous backfill material and a tracer element in the tanks that allows vapours to be detected. The vapours cannot be affected by rainfall (moisture) and any background contamination cannot interfere with readings.

Such a system requires installation of vapour monitoring wells designed and located appropriately by a duly qualified person.

Equipment Integrity Testing (EIT)

See section 3.2.

Tank pit observation wells

Tank pit observation wells are used to check whether liquid in the tank pit contains leaked or spilled petroleum, or vapours.

They are typically installed at the time a UPSS is installed, prior to backfilling the tank excavation, and are considered to be best practice. The tank pit observation well does not have to penetrate the groundwater table as this is not its main purpose.

Tank pit observation wells can be considered **instead of** groundwater monitoring wells where:

- the receiving environment of any groundwater flow that could potentially contain hydrocarbons is particularly sensitive and in close proximity to tanks, such as when the UPSS site is near surface waters or a dwelling with a basement
- the UPSS is located right next to the site boundary
- the groundwater table is usually greater than 12 metres.

When installing a tank pit observation well, the duly qualified person should confirm all the following construction details have been met:

- the well is installed so as to intercept the tank excavation area or be as close to it as is technically feasible
- the tank pit excavation is graded to a low point and a tank pit observation well has been installed to within 150 millimetres vertically of the low point
- at least one tank pit observation well is installed in each individual tank excavation pit. For an excavation pit with two or more tanks there must be at least two observation wells
- the well does not penetrate the bottom of the tank excavation and terminates at least 150 millimetres below the bottom of the tank
- the well is able to detect the presence of petroleum vapour and/or enable confirmation of free-phase petroleum in the tank excavation
- the well is clearly marked and secured to avoid unauthorised access and tampering
- the well is sealed from the ground surface to the top of the filter pack.

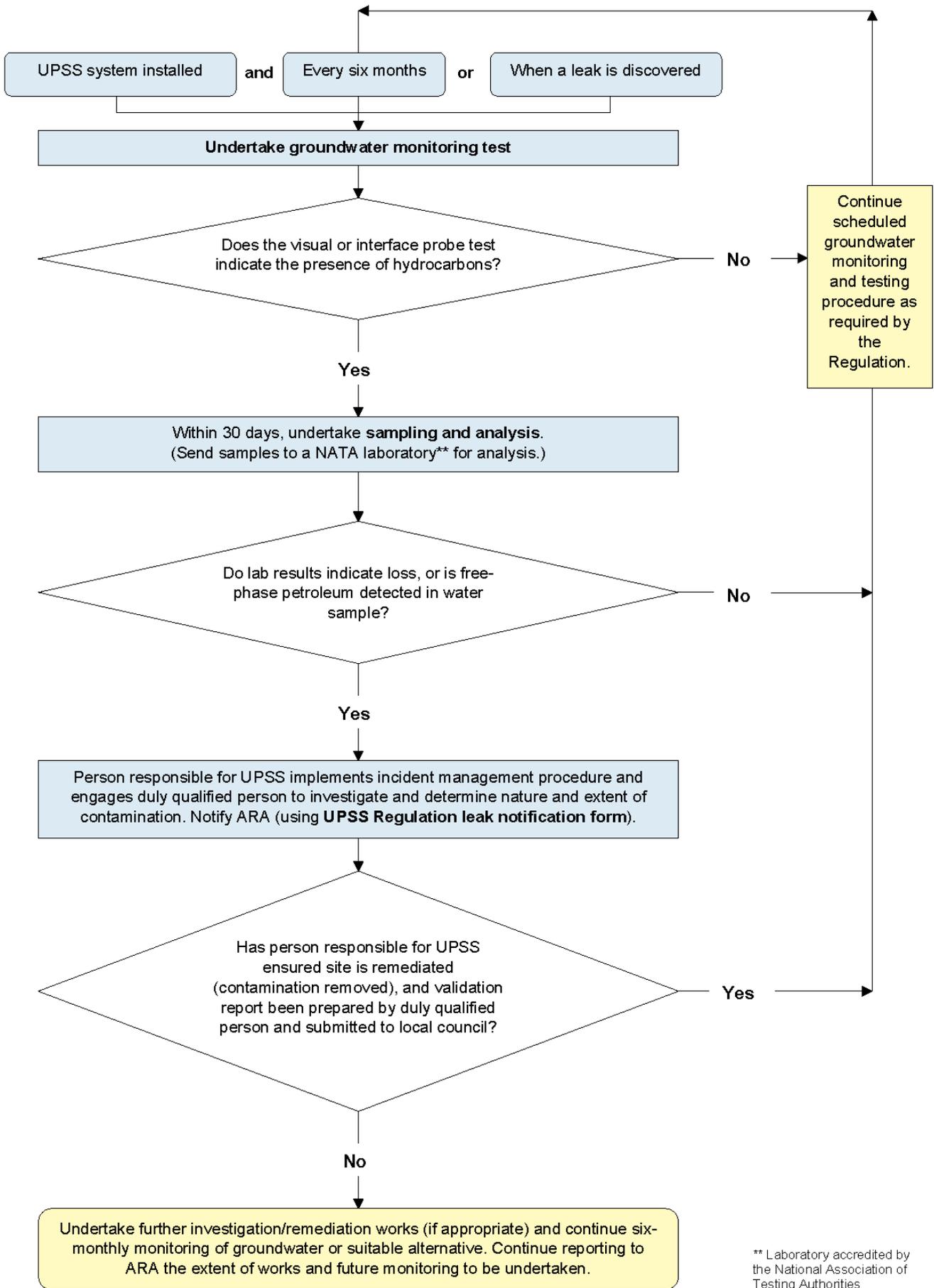


Figure 2 Testing, sampling and analysing for groundwater contamination

Visual observation

A duly qualified person may recommend visual observation as the most appropriate leak detection system for a site, particularly where it is determined groundwater monitoring wells would not be practical or effective, for example, for a marina site where tanks are located in a tidal zone, or where a UPSS is located next to a waterway.

A rigorous and regular visual check of the waterway (preferably twice a day) with records kept for inspection would be required to justify this as being an appropriate leak detection system.

The person responsible for the UPSS should also ensure that an incident management procedure can be rapidly activated to respond to any observed sheen or hydrocarbon contamination in the waterway.

2.4. Other recommended equipment and practices

Equipment or infrastructure that is not required under the Regulation but is part of good environmental practice at storage sites includes:

- tank pit observation wells
- additional monitoring/sensor probes
- the automatic shutdown/cut-off valves integral to the operation of the system.

See Australian Standard AS4987–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*, for further information.

Fill points

It is best practice that each fill point should:

- be dedicated to one tank only
- be accessible from the vehicle unloading or loading position with a hose no more than six metres long
- have a spill containment device with a minimum capacity of 15 litres
- have a system for the safe removal of any petroleum (or contaminated water) that collects in the spill containment device
- allow adequate access for visual inspection
- be identified on site drawings.

Dispenser sumps

It is best practice to install sumps under fuel dispensers to prevent the release of petroleum to the environment. Dispenser sumps should:

- be able to collect and contain leaks from the dispenser
- have a system in place to detect liquid in the sump and send an alarm or notification to the site operator
- have a system for the safe removal of any petroleum (or contaminated water) that collects in the sump.

Consideration should be given to keeping a record of the date, quantity and nature of any petroleum that is removed from a dispenser sump. While not required by the Regulation, these records may be useful for reconciliation purposes or in determining whether loss from a system to a dispenser sump is an ongoing problem that needs to be rectified.

Cathodic protection for tanks and piping

All new and significantly modified UPSS with steel tanks and piping should be cathodically protected against corrosion, and designed and installed in accordance with the following Australian Standards:

- AS 2832.1–2004, *Cathodic Protection of Metals: Part 1 – Pipes and Cables*
- AS 2832.2–2003, *Cathodic Protection of Metals: Part 2 – Compact Buried Structures*.

An effective cathodic protection system should minimise the risk of corrosion and the potential for petroleum to leak from a UPSS.

Best practice for cathodic protection of steel tanks and piping includes:

- inspection and testing within 12 weeks of installation and at least every year thereafter
- where impressed-current cathodic protection systems are used, monthly monitoring of the system in accordance with a corrosion specialist's instructions (to ensure correct operation)
- maintenance of cathodic protection systems in accordance with recommendations of the manufacturer
- documenting the maintenance requirements and inspection and testing procedures and retaining these records in the fuel system operation plan.

Management of forecourt areas

While not strictly a UPSS issue, management of forecourt run-off at a UPSS site is an important part of the design of the facility and should be considered at the planning stage. An EPA Practice Note, [Managing Run-Off from Service Station Forecourts](#), describes how to design and operate a best-practice management system for forecourt run-off to avoid polluting waters.

3. Design and installation of a UPSS

Fuel is often stored in underground storage systems to save space and for safety reasons. However, storing fuel underground creates a risk that a leak may occur undetected.

3.1. Design and installation – regulatory requirements

All new and significantly modified UPSS coming into operation for the first time (i.e. being commissioned) must be designed, installed and tested in accordance with the provisions of clauses 6–13 of the Regulation.

To meet the requirements of the Regulation, a UPSS must:

- be designed by a duly qualified person
- be installed by a duly qualified person
- include the equipment required by Australian Standard AS 4897–2008
- pass an **equipment integrity test** carried out in accordance with the written directions of a duly qualified person. (See section 3.2.)

The duly qualified person(s) who designs and/or installs a UPSS must prepare written documentation and details of all relevant industry standards and specifications used in the design and installation process. This documentation must be given to and retained by the person responsible for the system.

This is important information about the UPSS because standards and specifications may vary over time. This documentation will detail the standards and specifications used at the time the system was installed. If the system leaks in the future, the documentation can be used to determine how the system is configured and help find the source of the leak.

As part of this documentation process, current **as-built drawings** for the system must be prepared at the completion of the installation process and provided to the person responsible. The Regulation defines these drawings as ones that depict the current configuration of the UPSS in relation to the storage site (that is, as installed below ground level). There should be detailed site plans (to a recognisable scale) that depict the final installed configuration of all parts of a UPSS and any construction deviations from plan showing all features of the storage site as currently built. The drawings do not include pre-construction drawings.

3.2. Equipment integrity testing

An **equipment integrity test** (EIT) measures the containment integrity of the tanks, fittings and pipes by applying a pressure or vacuum to them and measuring any pressure changes. An EIT must be performed on all new, repaired and significantly modified UPSSs prior to the system being fully commissioned. The EIT must be undertaken in accordance with section 8.5 of AS 4897–2008. An EIT is also a useful diagnostic tool to assist in confirming a leak that has been detected from a loss monitoring system. (See section 4.3.)

The person performing the EIT must provide the person responsible for the UPSS with a certificate stating how the testing was carried out and results of the EIT. These documents must be kept for seven years after the system is decommissioned.

Minimum requirements for equipment integrity tests

An EIT should be:

- capable of detecting a leak of 0.38 litres per hour, with a probability of detection of at least 95% and a probability of false detection of 5%, or less in accordance with AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*
- conducted by a duly qualified person in accordance with the manufacturer's written instructions specific to the UPSS component/s
- a nationally approved and certified method of testing that meets, at a minimum, the requirements or certification standards of the *Standard test procedures for evaluating leak detection methods: Volumetric tank tightness methods US EPA/530/UST-90/004*, United States Environmental Protection Agency (USEPA 1990).

Usually an EIT involves a vacuum or pressure test (using inert gases) being performed on the UPSS. The duly qualified person carrying out the test will determine the best test method. Both tanks and pipework need to be tested.

Frequency of equipment integrity testing

The Regulation requires an EIT to be conducted:

- before a new UPSS is commissioned
- after any modification or upgrade of UPSS
- after any repair following the discovery of a leak in the system or replacement of tanks or piping.

EITs are generally not considered adequate as the sole method for leak detection because they are done infrequently. However, if an EIT is recommended as an alternative leak detection system for a UPSS, it should be done at least annually and coupled with **statistical inventory reconciliation analysis** (SIRA) done at least monthly.

3.3. Record-keeping

The Regulation requires documents detailing the design, installation, modification and repair of a UPSS to be kept for specified periods of time.

The person responsible must also keep records during the life of the system that detail any modifications, replacement of tanks or piping, any EITs and any decommissioning and site reports. To ensure this important documentation is preserved, it is required to be passed to subsequent operators of the UPSS upon transfer or sale of the system. Section 4.9 of these guidelines provides further details of record-keeping requirements.

Details of the certification and record-keeping requirements for EITs are outlined in Appendix C of AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*.

4. Operation of a UPSS

Operators of UPSSs must ensure their fuel systems are monitored for leaks.

4.1. Introduction

Part 4 of the Regulation requires the following measures to be in place for any operating UPSS:

- a fuel system operation plan
- a loss monitoring system
- an incident management procedure
- a maintenance schedule for the system
- an inventory of staff training and induction about the system.

These measures are required for all operating UPSSs, whether they are classed as ‘old’ (pre-1 June 2008) or ‘new’ (post-1 June 2008) systems.

4.2. Fuel System Operation Plan

A UPSS must not be used unless a fuel system operation plan (the plan) has been developed and implemented at the site by the person responsible. The plan is a document describing how the underground fuel system at the site is configured, managed and maintained. Staff should be able to refer to the plan quickly for guidance in the event of an incident (leak or spill) and inform contractors and regulators about the specific features of the site and system.

An EPA fact sheet, [Fuel System Operation Plans](#), provides a quick and simple reference.

The plan is required to contain the following information (see clause 18 of the Regulation):

- a loss monitoring system
- an incident management procedure for the system
- a maintenance schedule for the system
- current as-built drawings for the system. Where current as-built drawings are not available for a system (e.g. the system is very old and inadequate records have been kept), an approximate diagram of the known layout of the underground structures should be included, noting that ‘this is a best approximation’
- a plan of the storage site showing the location of the storage system, all buildings and associated infrastructure, all fences and gates, all groundwater monitoring wells (including any codes by which they are designated), and any unsealed ground surfaces and all drainage and services
- a list of industry standards that were complied with when designing, installing and operating the UPSS infrastructure
- copies of all specifications for the design, installation and modification of the UPSS
- an inventory of employee site induction and incident management training that has been undertaken on the site the name, postal address and 24-hour phone number for the person responsible for the UPSS, or, where a body or organisation is responsible, for an individual who is authorised to act on behalf of the company in relation to the control of the system
- the street address of the UPSS
- land title particulars (such as the lot and DP numbers) of the land on which the UPSS is situated
- the name of the person who owns the storage site (if the site owner is different from the person responsible for the UPSS)

- details of access to the system and its security, including information on all locks, gates, fences and the like, and how to open them
- the location of all records kept in accordance with Part 5 or 6 of the Regulation.

Format and keeping of the fuel system operation plan

The plan may be kept in hard copy or electronic format, or a combination of both. It may be kept as one consolidated document or as a collection of documents.

Regardless of format, the plan must be readily accessible on the storage site to provide guidance on the appropriate actions in the event of a leak or spill. The plan must also be kept up-to-date and amended by the person responsible as needed. It must be able to be provided to the appropriate regulatory authority upon request.

The person responsible for the UPSS must ensure the plan is prepared and implemented. However, it is recommended that duly qualified and experienced persons prepare certain procedural documents (such as the maintenance schedule, site drawings, and details of industry standards and specifications) to ensure that these documents are accurate and complete.

A fuel system operation plan must specifically contain a copy of each list of industry standards and the UPSS manufacturers specifications as required by clause 18(2)(f) and (g) respectively. If this information is not included, the person responsible can instead provide evidence in the plan of their attempts to obtain this information . (See clause 18(5)(c) of the Regulation.)

Where records which are a required component of the plan are stored offsite (e.g. groundwater monitoring records stored in electronic format), this location must be disclosed in the plan.

The person responsible for a UPSS must retain each version of the plan for at least seven years after the system's decommissioning of the UPSS. The person responsible may change if the site is sold or its ownership transferred, or through some other business or contractual change. In that case, all documents must be transferred to the new person responsible. These documents include copies of the current fuel system operation plan and any previous such plans (formerly known as environment protection plans).

4.3. Loss monitoring

A fuel storage system cannot be used unless a loss monitoring system is in place.

Monitoring for unexpected losses of fuel or gains of water in underground tanks and pipes will help detect any leaks early. Early detection will minimise environmental impacts and clean-up costs. Loss monitoring is mandatory for all UPSS, whether old, new or modified.

An EPA fact sheet, [Loss Monitoring Systems](#), provides a quick and simple reference.

A loss monitoring system is a fuel stock reconciliation system based on three data inputs:

- the amount of fuel delivered into the system
- the amount of fuel sold
- the amount of fuel remaining in stock.

It is designed to ensure that the amount of fuel that **should be present** in the UPSS is **actually present**, and that there are no unexpected losses or gains.

The loss monitoring system must be designed by a duly qualified person and comply with section 4.5 of Australian Standard AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*, **Loss monitoring methods**.

Various methods of loss monitoring are available. They can be broadly categorised into automated and manual methods.

Automated inventory reconciliation

Automated inventory reconciliation is the preferred loss monitoring method. Sensor probes in underground tanks perform **automated tank gauging** (ATG), constantly measuring the amount of fuel in each tank. This information is combined with fuel delivery and sales data and reconciled. This method can usually meet the performance criterion for detecting losses of fuel (or gains of water) from the system down to 0.76 litres per hour with at least 95% accuracy.

Manual wet stock reconciliation

This is a basic loss monitoring method that involves manually dipping tanks to measure fuel levels and calculating whether fuel is lost, or water gained, after accounting for fuel sales and deliveries.

Tank levels are typically measured daily by manually dipping each tank using a dipstick. This process is less accurate than automated systems because of uncertainties introduced by the calibration of the dipstick, the thermal expansion of fuel and how accurately the dipstick is read. Manual wet stock reconciliation is acceptable if the operator can demonstrate that the process can detect any loss from the system at or above 0.76 litres per hour with at least a 95% accuracy.

All manual dips and reconciliation undertaken must be recorded in a legible manner and kept on site. If requested by an authorised officer, the person responsible for the UPSS must be able to demonstrate that the amount of fuel that should be in the tank is the amount of fuel that is actually in it.

Statistical inventory reconciliation analysis

Statistical inventory reconciliation analysis (SIRA) is a best-practice method of loss monitoring using computer software to conduct ongoing statistical analysis of fuel inventory, delivery and dispensing data. It can be used with data inputs from either ATG and/or manual dipping methods. Note that the SIRA can only be as accurate as the data input to it.

SIRA is a service usually provided to UPSS operators by a specialist third party. It is mostly provided as a monthly report that flags data inconsistencies. These inconsistencies flag possible leaks in the system that the operator should investigate immediately. (See section 4.4 below.)

Other loss monitoring methods

Interstitial monitoring detects any change in liquid or pressure in the space between double-skinned tanks and piping systems. It is only suitable as a back-up loss monitoring system for a UPSS.

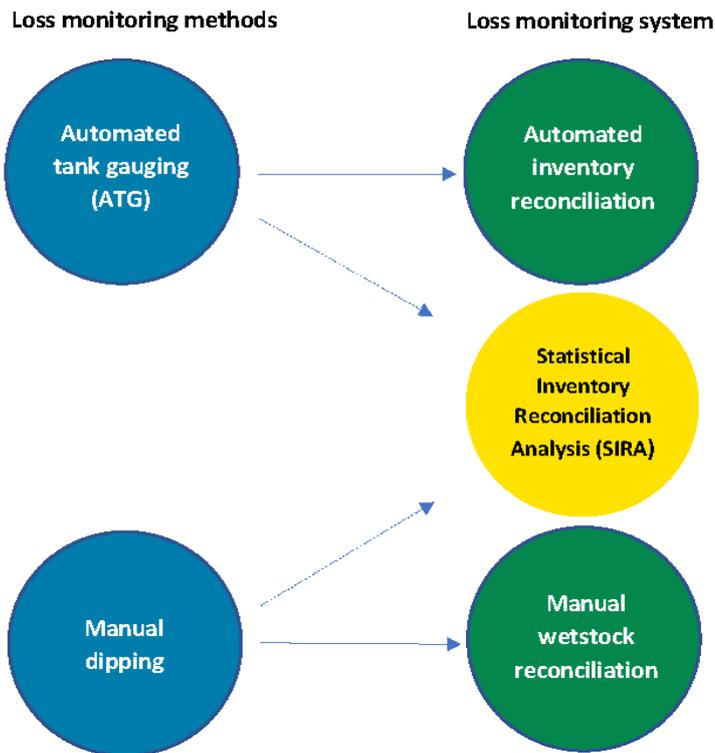


Figure 3 Loss monitoring systems and methods

Accuracy

The frequency, sensitivity and reliability of loss monitoring should lead to a high level of confidence that any potential fuel loss (or gain in water) will be detected in time to allow a response before a risk is posed to human health or the environment.

The loss monitoring system must at least meet the detection limit of 0.76 litres per hour, with at least 95% accuracy.

To achieve industry best practice, a duly qualified independent third party should certify that the loss monitoring methods used meet the requirements of the Regulation, in line with the protocols and system of verification recommended by the *Standard test procedures for evaluating leak detection methods: Volumetric tank tightness methods US EPA/530/UST-90/004*, United States Environmental Protection Agency (USEPA 1990).

4.4. Loss detection and investigation procedures

Discrepancies identified by the loss monitoring system can indicate a potential loss of fuel from the system or an influx of groundwater. It does not necessarily mean that the UPSS is leaking. A 'fail' or 'inconclusive' SIRA result could be caused by mis-calibrated dispensers, inaccurately metered deliveries, human error in recording, or stolen product.

If loss monitoring detects a discrepancy in fuel levels, or a fail notification is received from SIRA, the person responsible must investigate the discrepancy within 60 days of becoming aware of it. If a leak is confirmed, you must identify the source of the leak, stop it, fix it and record the details of the actions taken in your fuel system operation plan (see clause 21 of the Regulation.)

Investigating discrepancies may involve system checks, such as reviewing inventory records and checking measuring equipment and records. The person responsible may wish to engage a qualified person with suitable experience in discrepancy or loss investigations to identify the cause of the discrepancy.

See Appendix 5, Table 6, for suggested loss detection procedures.

4.5. Incident management procedures

All UPSS must have documented incident management procedures. These procedures are documented in the Fuel Systems Operation Plan and outline how the person responsible will verify whether the loss is the result of a leak or spill or some other cause, such as incorrectly calibrated equipment or faulty accounting procedures.

Where a discrepancy is identified as a leak or spill, the procedures should detail the following responses:

- notification of the incident to the appropriate regulatory authority
- 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
- actions to be taken to prevent migration of any petroleum that has leaked or spilled
- actions to be 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 UPSS components, in accordance with industry best practice.

4.6. Incident logs

The Regulation requires the person responsible for a UPSS to ensure that an incident log is maintained which records:

- actions by anyone, other than at the direction of the person responsible, that have affected, are affecting, or could affect the integrity of the UPSS
- any unplanned or abnormal incidents, including operational disruptions or equipment failures, that have affected, are affecting, or could affect the long-term safety of the UPSS.

The incident log must be kept onsite or at a location specified in the fuel system operation plan.

4.7. Incident notification

Where a leak or spill at a UPSS is causing or is likely to cause material harm to the environment or human health, the person responsible must verbally notify the appropriate regulatory authority of the incident **immediately**. The appropriate regulatory authority is either the council or the EPA (see section 1.3).

Failure to report such pollution incidents is an offence under Part 5.7 of the POEO Act. Incidents involving a UPSS that must be notified include (but are not limited to):

- a leak or spill from a UPSS, verified in accordance with loss detection or incident management procedures, that is causing or threatens material harm to human health or the environment
- 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.

A written notification must also be submitted to the appropriate regulatory authority **within seven days** of the incident leak being suspected. This written notification should be made using a leak notification form obtained from the appropriate regulatory authority (ARA). If the EPA is the ARA, use [the EPA's UPSS Regulation leak notification form](#).

4.8. System maintenance

A UPSS must not be used unless all gauges, indicators, probes, sensors and any other measuring instruments in the system are checked and maintained (and where necessary calibrated) in accordance with the manufacturer's specifications and/or recommendations. System maintenance procedures and a maintenance schedule must be documented in the fuel system operation plan.

4.9. Record-keeping

The Regulation requires certain documents detailing the design, construction, operation and decommissioning of UPSS to be kept for specified periods of time. This is to preserve vital information about the system so that in the event of any leak or failure, details can be accessed quickly and used in any response.

The person responsible for a UPSS must retain the following required documents for a minimum of **seven years from their date of creation**:

- certificates and associated documentation relating to equipment integrity testing
- data from any measuring instrument such as loss monitoring equipment and leak detection equipment
- documentation associated with loss investigation
- any notifications of a pollution incident involving the system given to the ARA.

The person responsible for a UPSS must retain the following documents for a minimum of **seven years from the date of the decommissioning of a UPSS**:

- certificates and associated documentation relating to equipment integrity testing
- reports detailing the installation of a leak detection system (e.g. a groundwater monitoring well installation report)
- each version of the fuel system operation plan
- records about any significant modifications to the system
- reports associated with the removal or replacement of tanks or the decommissioning of the system
- the incident log for the system
- any reports made as a consequence of action taken under Part 5.7 of the POEO Act in connection with a pollution incident involving the system

Changes in responsibility

Within 30 days of a change in responsibility for a UPSS, the person formerly responsible for the system must deliver to the new responsible person all the documents they have for the system that are required to be retained.

Access to records

Under the POEO Act, a fuel system operation plan must be provided to an authorised officer upon request.

5. Modifying a UPSS

Any significant modification to a UPSS (that is, replacing or upgrading half or more of the tanks in the system) means the whole UPSS must meet all the requirements of the Regulation.

The person responsible must ensure that all equipment and infrastructure is modified, repaired or reused in accordance with AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*, and with the procedures outlined in this section. Repairs must leave systems both structurally sound and fully functional.

Recommendations and requirements relating to the repair, testing, reuse and documentation of modifications are discussed in the following sections.

5.1. Repair of a UPSS

As a minimum, all relevant documentation associated with the repair of UPSS equipment must meet:

- the equipment manufacturer's instructions
- the equipment's original specifications
- be retained by the person responsible for repair for at least seven years.

Steel tanks

Steel tanks should be repaired only if they have been inspected internally by a competent and experienced person who can certify that the tank:

- is suitable for repair
- is structurally sound
- has not previously been repaired using an internal lining.

Where a duly qualified person has certified that the tank is suitable for repair, the repair should:

- be supervised by a lining-equipment manufacturer
- meet the requirements of industry best practice and occupational health and safety legislation.

When installation of the internal lining is complete, before the repaired tank is commissioned, it:

- should be inspected internally by a competent and experienced person and certified to be structurally sound
- should be cathodically protected
- must pass an equipment integrity test (section 3.2).

Other tanks

Tanks constructed of fibre-reinforced thermosetting resin composite, or with an outer wall of this material and a steel inner wall, should be repaired in accordance with the tank manufacturer's instructions and the requirements outlined in this section. Tanks should be repaired only if they have been internally inspected by a competent and experienced person: that person must certify that the tank has been repaired in accordance with the tank manufacturer's instructions.

The person responsible must ensure that the person repairing the system provides written documentation that it has been repaired in an appropriate manner and, where relevant, in accordance with the manufacturer's specifications.

Steel piping

Any steel piping that has leaked, is suspected of leaking, or is otherwise in need of repair, should **not** be repaired or reused but instead replaced.

Other piping

Piping, other than steel piping, that has leaked or is suspected of leaking, should be either replaced or repaired in accordance with the piping manufacturer's instructions, or abandoned.

Any replacement piping must meet the requirements outlined in section 4.3 of AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*. Repaired or replaced components must pass an equipment integrity test before the UPSS system is recommissioned.

5.2. Re-use of UPSS tanks

SafeWork NSW must be notified beforehand and approve of any proposed change to the contents of a tank, such as from diesel to unleaded petrol.

Non-steel tanks

The reuse of non-steel tanks should meet the following requirements:

- the tank has been designed and installed in accordance with the requirements of Chapter 3 of this guideline
- an equipment integrity test has been performed and the tank passed the test
- the tank manufacturer has inspected the tank to be reused, certified that it meets all the relevant requirements of this section, and provided a warranty appropriate for the expected life of the UPSS.

All relevant documentation associated with the reuse of the tank must be retained by the person responsible for a UPSS for at least seven years from the date the system is decommissioned.

Steel tanks

Steel tanks should only be reused when they meet the following requirements:

- the tank conforms with the requirements of AS 1692–2006, *Tanks for Flammable and Combustible Liquids*, as amended or updated
- the tank manufacturer has inspected the tank internally and externally and has certified that it is suitable for reuse because:
- the tank has not been repaired previously and
 - is structurally sound
 - no areas of the tank's walls are less than 100% of their original thickness
 - the tank dielectric coating has been tested and meets the requirements for a new tank, including condition, thickness and electrical insulation
- the tank is installed in accordance with the requirements of section 3 of this guideline
- an equipment integrity test has been performed and the tank passed the test.

5.3. Record-keeping – significant modifications

Details of any significant modifications to a UPSS must be documented and kept for at least seven years after decommissioning of the system. Records should include as a minimum:

- a comprehensive description of the modifications
- the dates the modifications were started and completed
- the results and certification of the equipment integrity test that was carried out
- a revised copy of the as-built drawings that reflects the modifications and is included with the fuel system operation plan.

6. Decommissioning a UPSS

Where a tank or UPSS has not been used to store fuel for two or more years or where it is not intended to be used to store fuel again, the UPSS or tank is deemed to be abandoned.

Abandoned UPSSs or tanks must be decommissioned appropriately. This means to remove the system or render it permanently unusable.

Proper decommissioning of an individual tank or UPSS significantly reduces the environmental and human health risk if the site is to be redeveloped in future. An environmental assessment is required to ensure that there is no adverse and/or ongoing contamination. A decommissioning report must be provided to the relevant council.

6.1. Decommissioning a tank or system

If a tank or UPSS has been abandoned, a duly qualified person must be engaged to:

- remove the tank and associated pipework

or

- if it is not reasonably practicable to remove the tank or UPSS, ensure that it is made safe by filling the tank with an inert solid material.

Examples of when it may be not be reasonably practicable to remove a tank include where the removal would damage:

- the supporting structure of an existing building
- an in-service tank or UPSS
- sub-surface pipework or electrical conduits.

In these circumstances, it is recommended that a duly qualified person (i.e. a structural or electrical engineer) confirms it is impractical to remove the tank/s.

If the UPSS or tank is to be removed from the ground, it must be correctly disposed of in accordance with:

- Australian Standard AS 1940–2004, *The Storage and Handling of Flammable and Combustible Liquids*
- Australian Standard AS 4976–2008, *The Removal and Disposal of Underground Petroleum Storage Tanks*
- SafeWork NSW safety alert WC01188, [Potential risks when removing underground storage tanks.](#)

6.2. Regulatory requirements

Clause 23 of the Regulation requires the person responsible for the storage system to advise the relevant local council at least 30 days prior to the proposed decommissioning of the tank or storage system. For urgent or unforeseen situations notification must be done as soon as possible.

Then, no later than 60 days following the decommissioning of a tank or UPSS, a report must be provided to the relevant local council (or the EPA, if the UPSS is located in an unincorporated area). If remediation of the site is required, the report is required no later than 60 days after the remediation has been completed.

The report must meet requirements outlined in Appendix 6: Site reporting requirements following decommissioning of a UPSS.

Where a disused tank is recommissioned, the Regulation will apply to the tank and any associated piping. This includes the need to conduct an equipment integrity test prior to recommissioning.

6.3. Work health and safety requirements

Along with environmental risk, an abandoned UPSS can pose significant risk to people and property. Any residual flammable vapour in a tank can be ignited resulting in fire and explosion. This presents a particularly dangerous hazard when an abandoned tank is left on a site which, in time, may be subject to redevelopment, excavation works and/or a change of land-use.

SafeWork NSW must be notified when a UPSS or underground tank has been abandoned. To notify SafeWork NSW the person responsible for the tank or UPSS will need to complete an online form, [Notification of Schedule 11 Hazardous Chemicals](#).

6.4. Site reporting and record-keeping

The person responsible for the tank or UPSS at the time of decommissioning must ensure that the site is investigated for any potential contamination. A decommissioning report must be prepared by a duly qualified person, such as a contaminated land consultant, in accordance with clause 23(3) of the Regulation.

Appendix 6 provides details of what must be included in the decommissioning report to the relevant local council (or EPA if the UPSS is located in an unincorporated area). The decommissioning report should provide a clear conclusion stating whether or not the site is suitable for its existing or proposed future use.

The decommissioning report of a tank or UPSS must be retained for seven years from the date of decommissioning.

In situations where there is a change of land use, additional site investigation, remediation and/or procedures may be required, consistent with the requirements of the relevant planning authority and State Environmental Planning Policy No 55 – Remediation of Land (or as amended).

Appendix 1: Definitions

The terms used in this guideline have the same meaning as the Regulation or as listed below. If any inconsistency arises, the definitions in the Regulation take precedence.

Table 1 Definitions of terms used in the UPSS Regulation

Term	Definition
Appropriate regulatory authority (ARA)	See definition in section 6 of the POEO Act, although in the context of the Regulation, local councils share the ARA responsibility for UPSS sites with the NSW EPA from the commencement of the Regulation on 1 September 2019.
As-built drawings (current)	Drawings that depict the current configuration of the storage system in relation to the storage site.
Cathodic protection system	Method of preventing or reducing corrosion of a metal surface by making the metal a cathode (i.e. the positive charge) by using either an impressed direct current or attached sacrificial anodes.
Commission	To bring a storage system or leak detection system into use for the first time following its installation, modification or repair.
Decommission	To remove a storage system or to render it permanently unusable.
Duly qualified person	A person who has competence and experience (in relation to a specific activity) that is recognised by a peak body in the relevant industry, or recognised generally in the relevant industry as appropriate for that activity
Fuel system operation plan (the plan)	Documentation for a storage system that contains the procedures and other information required by clause 18 of the Regulation.
Equipment integrity test (EIT)	A test conducted to evaluate whether a storage system is providing containment as originally designed, in accordance with the manufacturer's specification. The EIT must be able to detect a leak of 0.38 litres per hour with a probability of detection at least 95% and a false detection of 5% or less in accordance with AS4897-2008 (AS 2008a).
Groundwater monitoring well	A well that has been installed as part of a groundwater monitoring system around an UPSS site. It must be located in an appropriate place to detect any leaked petroleum that may have migrated into the groundwater (or to characterise the quality of groundwater flowing onto the UPSS site).
Incident management procedure	A documented response procedure to manage a leak or spill of petroleum from a storage system; also known as leak or spill response procedure.
Installation	The original installation of a storage system on the premises on the storage site including any work in the vicinity of the storage site necessary for the installation, and anything done to the system before it is commissioned.
Leak	Any loss of petroleum from a storage system because the storage system is not providing full and continuous containment. of petroleum
Loss detection	Procedures and processes able to identify the cause of a discrepancy (loss or gain) from any part of an UPSS (e.g. leak from tanks or pipework).
Loss monitoring system	One or more procedures for undertaking inventory control (reconciliation) of the petroleum in a system. The procedure/s must be able to identify a discrepancy in the volume of petroleum (either loss or gain) and the means to record any identified discrepancy which triggers the need for further action.

Term	Definition
Modification	Any upgrade, extension, alteration or replacement of the system, or any component of the system, but not including: <ul style="list-style-type: none"> • anything done to the system before it is first commissioned • anything done to the system after it is decommissioned • anything done to the system as part of routine maintenance (including any repairs to the system that are done in the course of regular scheduled upkeep of the system) • anything done to the system before 1 June 2008 • anything done to a storage site, or any building on a storage site, that does not directly affect the system.
Modified storage system	A storage system that has been modified.
New storage system	Any storage system that is not an old storage system.
Old storage system	Any storage system: <ul style="list-style-type: none"> • for which development consent had been obtained under the <i>Environmental Planning and Assessment Act 1979</i> before 1 June 2008 or <ul style="list-style-type: none"> • for which installation had lawfully commenced before 1 June 2008 or <ul style="list-style-type: none"> • that was commissioned before 1 June 2008.
Person responsible	The person who has the management and control of a system. If a system is no longer in use but has not been decommissioned, the person responsible is the person who had management and control of the storage system immediately before it ceased to be used or, if that person cannot be located, the person who owns the land on which the storage system is located.
Petroleum	Any fuel that consists predominantly of a mixture of hydrocarbons, whether or not the fuel includes additives (such as ethanol) and includes used oil.
Piping	Pipework within a UPSS that is integral to the transfer and routine containment of petroleum.
Remediate	In the context of this guideline, remediate means: <ul style="list-style-type: none"> • removing, dispensing, destroying, mitigating or containing the contamination of any land or waters or <ul style="list-style-type: none"> • eliminating or reducing any hazard arising from the contamination of the land, including by preventing the entry of persons or animals on the land.
Secondary containment	Equipment or infrastructure such as double-walled tanks and double-walled piping (with an interstitial space) that is designed to contain a leak and/or prevent it from escaping beyond the containment area of a UPSS.
Significant modification	Any modification to the system that results in: <ul style="list-style-type: none"> • the replacement of the whole system or <ul style="list-style-type: none"> • the replacement of a half or more of the tanks in the system.
Spill	Any loss of containment of petroleum from a storage system during physical management, such as: <ul style="list-style-type: none"> • transfer, delivery or removal • any UPSS operation • maintenance or testing • repair or closure.

Term	Definition
Storage system	A system of tanks, pipes, valves and other equipment that is designed to: <ul style="list-style-type: none"> • contain petroleum or <ul style="list-style-type: none"> • control the passage of petroleum into, out of, through or within the system, and includes any structure through which petroleum routinely passes from one part of the system to another.
Sump	In relation to a storage system, a structure used for the purpose of collecting spilled or excess oil, water and other liquids in the system.
Tank	A container or vessel intended for the storage of petroleum within a storage system that, for the purpose of the Regulation, is buried below the ground surface to such an extent that the base of the tank (in the ground) is not visible.
Underground petroleum storage system (UPSS)	Same meaning as storage system .
Use	To allow petroleum to remain in the system.
Used (waste) oil	Oil that has been used for lubricating or other purposes and has become unsuitable for its purpose due to the presence of impurities or loss of the original properties (and it is not intended for combustion).

Appendix 2: Duly qualified person checklist

The Regulation requires a duly qualified person to be a person who has competence and experience in relation to that specific activity. While there is no 'one size fits all' competency or qualification that sanctions a person as being duly qualified, the checklist below can be used to help determine whether the person undertaking a specific UPSS activity can be considered to be duly qualified.

Table 2 Qualifications and competencies of a duly qualified person

Qualifications and competencies

- Do they have appropriate qualification/s? (Engineering, science, environmental or relevant trade certificate.)
- Are they a member of a prescribed professional organisation? (That is, one that requires an entrance exam, minimum qualification and/or ongoing professional development.)
- Documented experience working on UPSS activities
- Knowledge of the Protection of Environment (Underground Petroleum Storage Systems) Regulation 2019
- Knowledge of the *Protection of the Environment Operations Act 1997*
- Understanding of the requirements of AS 4897–2008
- Familiarity with relevant industry standards, policies, requirements, guidelines and codes of practice

Appendix 3: Sample record sheets for groundwater monitoring

Table 3 Groundwater monitoring test record – six-monthly visual inspections – business details

Business details
Site name (or name of business)
Address
Lot and DP number
WorkCover dangerous goods (DG) notification number
WorkCover DG notification – expiry date

Table 4 Groundwater monitoring test record – six-monthly visual inspections – test details

Well number	Date	Time	Type of test (visual inspection*)	Observations (e.g. visible sheen or evidence of free-phase hydrocarbons)	Number of samples	Name of sampler	Company	ABN	Signature
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This form must be kept for at least seven (7) years from the date of the last test recorded.

* Interface probe results should be recorded on a separate sheet by a suitably qualified and experienced person.

Appendix 4: Planning and consent for UPSSs

Role of councils

From 1 September 2019, regulatory responsibility for the Protection of the Environment Operations (Underground Petroleum Storage System) Regulation 2019 (the Regulation) is shared between the NSW Environment Protection Authority and local authorities (councils). Councils continue to be responsible under the POEO Act for regulating environmental issues such as spills and stormwater pollution resulting from UPSS site activities.

A council also has responsibility for considering development applications incorporating a UPSS for which they are the **consent authority** under planning legislation. Councils should therefore establish a clear set of management requirements for UPSS installations at the planning stage. Incorporating UPSS requirements in consent conditions is an effective way to ensure that UPSS sites comply with the Regulation from the beginning of a development.

Australian Standards

Consent authorities are encouraged to ensure that new and significantly modified UPSS developments adopt design standards consistent with the Regulation and industry best practice set out in the appropriate industry standards, such as Australian Standard AS 4897–2008, *The Design, Installation and Operation of Underground Petroleum Storage Systems*.

Other industry standards that may be useful to planners and proponents include:

- AS 1940–2017, *Storage and Handling of Flammable and Combustible Liquids*
- AS 4976–2008, *The Removal and Disposal of Underground Petroleum Storage Tanks*.

General considerations for consent conditions

As with many developments, it may not be practical for all technical aspects to be resolved prior to the submission of a development application. However, to ensure all activities are completed to an appropriate standard by a duly qualified person, the planning authority may choose to include a broad condition of consent that the minimum requirements of the Regulation are met.

It may also be useful to stage when and how the requirements are to be met. For example, design of a new UPSS by a duly qualified person may be required at the consent stage, whereas the satisfactory results of an equipment integrity test may be required before an occupancy certificate is issued.

Council may also consider requiring declarations or proof of qualifications to be submitted with the development application, to support the claim that the contractors engaged are duly qualified persons.

Issues to be considered by consent authorities under the Regulation

A UPSS must meet all the relevant requirements of the Regulation where planning approval is granted **on or after 1 June 2008**.

The key issues that consent authorities should consider when assessing a UPSS development are outlined in Table 5 below.

Table 5 Guideline for Development Applications (DA) involving an underground petroleum storage system (UPSS) received by the planning authority

Action(s) the DA involves	What could be incorporated into the development consent conditions	Regulation (reference)
Design and installation of a new UPSS	<ul style="list-style-type: none"> • The UPSS must be designed and installed by a duly qualified person. • UPSS equipment must meet the relevant industry standards and design specifications, as documented in AS 4897. • The UPSS must not operate without loss monitoring and leak detection systems. • Installation reports for UPSS equipment must be prepared by a duly qualified person. • If relevant, a plan showing the locations of groundwater monitoring wells is prepared by a duly qualified person, should be included. • Current, 'as built' drawings of the system must be prepared by a duly qualified person and included in the fuel system operation plan. The newly installed UPSS must not be commissioned unless an equipment integrity test is performed. and the system has been certified as having satisfied the test • The person responsible must be provided with the certificate and the results of the equipment integrity test. 	Part 2 clauses 6–9 Part 3 clauses 15–17
A significant modification to an existing UPSS	<ul style="list-style-type: none"> • The modification must be designed and implemented by a duly qualified person. • Must meet the relevant industry standards and design specifications, as documented in AS 4897. • Must not be operated without loss monitoring and leak detection systems. • Must be recorded and current 'as built' drawings revised to reflect the modified system. • Must not be commissioned unless an equipment integrity test is performed. and the system has been certified as having satisfied the test and the person responsible provided with the certificate and the results of the equipment integrity test. 	Part 2 clauses 10–13 Part 5 clause 22 Part 3 clauses 15–17
Removal and/or replacement of a UPSS tank	<ul style="list-style-type: none"> • A report for the storage site must be prepared by a duly qualified person and submitted to the relevant local authority no later than 60 days after the tank is removed or replaced. • The report must describe the processes used to remove or replace the tanks concerned, assess contamination at the storage site, and detail any remediation work carried out during the removal or replacement of the tank. • A modified system involving the removal or replacement of any tank must not be commissioned unless an equipment integrity test is performed. • The person responsible for the UPSS must be provided with the certificate and the results of the equipment integrity test. 	Part 5 clause 24

Action(s) the DA involves	What could be incorporated into the development consent conditions	Regulation (reference)
Decommissioning of a UPSS	<ul style="list-style-type: none"> The person responsible for the storage system must notify the relevant local authority no later than 30 days before the system is decommissioned or removed. A site report must be prepared and submitted to the local authority no later than 60 days after the system is decommissioned. If remediation of the site is also required as part of decommissioning, the report must be submitted to the local authority no later than 60 days after the remediation is completed. The report must be prepared by a duly qualified person and describe the processes used to decommission the storage system and those used to assess contamination at the storage site. The report must also describe any remediation works that were carried out during the removal of the tanks. 	Part 5 clauses 23–24
Current or proposed operation of a UPSS	<ul style="list-style-type: none"> A fuel system operation plan (FSOP) must be prepared and implemented. Measuring instruments in the system must be checked and maintained in accordance with the manufacturer's instructions, (or the FSOP if there are no such instructions) and recording of the data produced. Undertake loss monitoring and appropriate record-keeping of the results. Test the leak detection system as per the written instructions of a duly qualified person. Investigate any discrepancies detected by the loss monitoring system within 60 days of becoming aware of the discrepancy. <p>In addition:</p> <ul style="list-style-type: none"> any documents required by clause 26 of the Regulation (such as records of activities, equipment integrity tests measuring instrument data and incidents) must be kept for at least seven years from their date of creation where responsibilities for the system change, all relevant records must be transferred to the new person within 30 days. 	Part 4 clauses 18–21 Part 6 clauses 26–28

Repair to a UPSS

Depending on the nature of the activity, repairs may not trigger the need for development consent. Following repair or rectification after discovery of a leak, a modified or repaired storage system can only be recommissioned where an Equipment Integrity Test (EIT) has been performed in line with the written directions of a duly qualified person and the system satisfies the EIT.

Appendix 5: Loss monitoring investigation

To assist in determining the cause of a discrepancy identified during loss monitoring, the following system checks may be initiated (where appropriate) by the person responsible for a UPSS.

Table 6 Suggested loss monitoring procedures

Suspected issue	Loss or gain?	System check
Inventory records	Loss or gain	Check the inventory control records of the preceding three months (or to a point where records are deemed satisfactory) to ensure the discrepancy has not been caused by a record-keeping error.
Security/pilfering	Loss	Check the following: <ul style="list-style-type: none"> for sites that do not operate continuously (non-24-hour sites), that all tank openings (e.g. dip and fill points) are secured on self-serve sites, that controlled authorisation of dispensers is operating CCTV or similar security system (where available) is working correctly.
Dipstick	Loss or gain	Check the following: <ul style="list-style-type: none"> the dipstick(s), for wear or damage (replace if necessary) that each tank has the correct dipstick if using automatic tank gauging, that the system is operating to the manufacturer's specifications.
Water	Gain	Check each tank for the presence of water by using: <ul style="list-style-type: none"> an interface probe or <ul style="list-style-type: none"> water-finding paste on a dipstick. Identify entry point(s) (e.g. if the tank has a hole, or water is entering via open valve, fill point, etc.).
Pumps and piping manifolds	Loss	For a dispenser with a pump located inside the dispenser unit, remove covers and check valves and pipework for leaks, both during operation and when switched off. For submersible pumps, lift the pump cover and check wells for leaks. For piping manifolds, lift the pit cover and check for any leak.
Tank pit observation wells and groundwater monitoring wells	Loss	Check: <ul style="list-style-type: none"> for any evidence of petroleum in the tank pit observation well and/or groundwater monitoring well, by using a measuring instrument such as an interface probe or a clean see-through bailer lowered slowly into the well to observe water interface for vapours, by using a portable gas analyser. Undertake further investigation of the system to identify the source of leak.
Vents	Loss	Check: <ul style="list-style-type: none"> vent caps for any visible blockages vents for evidence of petroleum blow-out at either vent outlet or below vents on ground or buildings.

Suspected issue	Loss or gain?	System check
Dispenser pumps are over or under dispensing	Loss or gain	<p>Check:</p> <ul style="list-style-type: none"> that dispenser totals and console totals are recorded and fall 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.
Sales test	Loss or gain	<p>Determine tank and dispenser relationships by identifying single stock systems.</p> <p>Establish opening stock information and do not alter the single stock systems for the duration of the sales test.</p> <p>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.</p> <p>The final stock reconciliation should be performed by the person responsible for the UPSS.</p>
Interstitial monitoring (for equipped UPSSs only)	Loss	<p>Check:</p> <ul style="list-style-type: none"> 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. <p>If any losses outside the manufacturer's leak detection tolerances have been reported in the last six months, further investigate the system to identify the source of leak.</p>
Human error	Loss or gain	<p>Check:</p> <ul style="list-style-type: none"> UPSS installation records – was the installer accredited/certified? for inaccurate measuring/recording delivery losses/tank filling activities for inadequate system management for failure to complete physical system checks.
Recent repairs undertaken on UPSS	Loss or gain	<p>Check:</p> <ul style="list-style-type: none"> maintenance of records in the case of repair and reuse, whether compatible materials were used.
Temperature	Loss or gain	<p>Check:</p> <ul style="list-style-type: none"> delivery temperature correction calculations have been temperature-corrected to 15°C (or recommended ambient temperature).
Equipment integrity test	Loss or gain	<p>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 section 3.2 of these UPSS Guidelines.</p>

Appendix 6: Site reporting requirements following decommissioning of a UPSS

Introduction

Where a UPSS has been decommissioned, abandoned or removed, clause 23 of the Regulation requires preparation of a report indicating whether or not the site is suitable for continued use. This section has been prepared to help achieve a uniform approach on site reporting requirements.

A decommissioning report must be submitted to the relevant local authority (usually council) within 60 days of the decommissioning of a system, tank or the completion of any necessary remediation works. Where a tank or UPSS located in an unincorporated area has been decommissioned, or the operator is a public authority, the decommissioning report is to be provided to the EPA.

Where a duly qualified person chooses to deviate from the relevant requirements of these guidelines, clear reasons must be given at each reporting stage to justify this decision.

The reporting requirements outlined below are consistent with reporting requirements in [Consultants Reporting on Contaminated Land: Contaminated Land Guidelines \(EPA 2020\) \(DOCX 180KB\)](#), which provides a comprehensive list of items to include for:

- site identification
- site history
- site condition and surrounding environment
- sampling and analysis
- conceptual site models.

Each subject on this bullet list needs to be considered for a UPSS that has been decommissioned, abandoned or removed. However, not all the items relating to each subject (as provided in the checklist) will be relevant to each site.

Regulatory requirements

Clause 23(3) of the Regulation requires the report being submitted to the relevant local authority to:

- be prepared by a duly qualified person in accordance with this UPSS guideline
- describe the processes used to remove or replace the tanks and assess contamination at the site
- describe any necessary remediation works.

Determining the risk of contamination

Each site with a decommissioned, abandoned or removed UPSS must first be assessed to determine if the tank has leaked and caused contamination, and if so, what the extent of contamination is.

There may be no immediate evidence of contamination at all. If there is contamination, it may be:

- in the immediate vicinity of the storage system, such as the tank pit
- across part of the site, or the whole site
- in areas beyond the site boundary.

The likelihood of contamination (or not) from a UPSS can be determined from certain risk factors such as (but not limited to):

- the age and condition of tanks, piping and associated equipment
- any localised ground and/or groundwater contamination identified on the walls and/or pooling at the bottom of the tank pit during excavation
- the history of compliance with loss monitoring and leak detection requirements
- any previous known leak incidents
- known hydrogeology of the local area; for example, preferential pathways such as cracks, fissures or utility corridors. These, along with impermeable material, need to be considered as likely conduits of hydrocarbon contamination.

The extent of contamination will need to be re-assessed if further evidence of contamination is identified or suspected during initial site excavations or sampling activities. The sampling and analysis plan will need to be escalated to ensure appropriate levels of testing is undertaken to establish the full extent of contamination.

If the appropriate regulatory authority reasonably believes contamination may have occurred across and/or beyond the site boundaries, it can request further sampling be conducted to confirm the contamination status.

The reasoning for determining the risk of contamination from a UPSS must be detailed clearly and concisely.

Example 1

An underground storage tank being decommissioned is assessed as being in good physical condition. There is no previous history of contamination from six-monthly testing of groundwater monitoring wells located onsite. The initial observation of the walls and bottom of the tank pit indicates no discolouration or contamination of soil or back fill.

Contamination risk: low.

Assessment scope: sample from tank pit walls and bottom and areas of associated pipework. Continue observation during decommissioning works for any change in contamination risk.

Example 2

The site is old and the age of the UPSS is unknown. The forecourt has evidence of staining and surface water management/disposal practices do not appear to meet best practice. Loss monitoring and leak detection records are unavailable. During excavation, it is observed that the tank pit has a slight odour.

Contamination risk: medium.

Assessment scope: samples collected only from the walls and/or bottom of the tank pit may not necessarily represent the full extent of contamination. The sampling plan should be extended appropriately to ascertain extent of contamination across the site.

Example 3

During tank pit excavation, it is observed that backfill from the tank pit (and/or surrounding soil profiles) is discoloured and/or has significant odour. The service station is in a low-lying area where the water table is generally high. A patch of vegetation on an adjacent site appears to be dying.

Contamination risk: high.

Assessment scope: samples collected only from the walls and/or bottom of the tank pit are unlikely to represent the full extent of contamination on and/or off site. The sampling plan should be extended appropriately to ascertain extent of contamination across and potentially beyond the site.

Reporting requirements

The following checklist is designed to help achieve a uniform approach to reporting on UPSS sites following decommissioning and assist compliance with clause 23 of the Regulation.

Table 7 Checklist for the decommissioning report

Report section	Required information	Included
Document control	Date, version number	<input type="checkbox"/>
	Author and reviewer (including qualification and/or certification details), contact details, company name, ABN	<input type="checkbox"/>
	Who commissioned the report	<input type="checkbox"/>
Executive summary	Background	<input type="checkbox"/>
	Objectives of the site investigation	<input type="checkbox"/>
	Summary of key findings, observations and sampling results	<input type="checkbox"/>
	Summary of conclusions and recommendations	<input type="checkbox"/>
Scope of works	Summary of the scope of work	<input type="checkbox"/>
Site identification	Name, address, lot & DP number, local government area	<input type="checkbox"/>
	Site owner's trading name, description of owner (company, operator, third party), current site use, reason for removal/decommissioning	<input type="checkbox"/>
	Details of person responsible for the UPSS (if different to site owner)	<input type="checkbox"/>
	Geographic coordinates	<input type="checkbox"/>
	Locality map	<input type="checkbox"/>
	Current site plan with scale bar, showing the direction of north, local water drainage and other local environmentally significant features	<input type="checkbox"/>
Site history	Summary of site use, zoning, owner history, proposed site use	<input type="checkbox"/>
	Current and historical details of the underground storage tanks located on site	<input type="checkbox"/>
Site condition and surrounding environment	Topography, hydrology, geology, groundwater depth and direction	<input type="checkbox"/>
	Direction of surface drainage	<input type="checkbox"/>
	Distance to surface water features and observations of any local sensitive environment/s	<input type="checkbox"/>
	Groundwater bores located on or near the site	<input type="checkbox"/>
	Summary of adjacent sites' use, zoning, offsite effects, etc.	<input type="checkbox"/>
Previous results	Summary of any evidence of site contamination, including discolouration of soils, dead or dying vegetation on or near the site, staining or discolouration of surface areas, any pooling of odorous and/or tainted water in the tank pit	<input type="checkbox"/>
	Summary of any previous equipment integrity tests and loss monitoring methods and results	<input type="checkbox"/>

Report section	Required information	Included
Sampling and analysis plan and sampling methodology	Sampling and analysis data quality objectives. (See Table 2(b) of the <u>Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA 2020)</u> if more detail is required.)	<input type="checkbox"/>
	Sampling strategy, methodology and justification	<input type="checkbox"/>
	Field screening protocols	<input type="checkbox"/>
	Photos, logs, field observations	<input type="checkbox"/>
	Conceptual site model (only if necessary)	(See Table 2(a) of the <u>Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA 2020)</u> if more detail is required.)
Validation results and discussion	Summary of all results, in a table that shows: <ul style="list-style-type: none"> essential details i.e. sample identification numbers, depth etc sample descriptions for all media (soil, groundwater etc) remediation criteria highlights of samples that exceed remediation criteria 	<input type="checkbox"/>
	Site plans or excavation logs of all sample locations	<input type="checkbox"/>
	Site plan(s) showing extent of soil and/or groundwater contamination	<input type="checkbox"/>
	Quality assurance and quality control (QA/QC)	(See Table 2(c) of the <u>Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA 2020)</u> if more detail is required.)
	Verification of compliance with regulatory requirements	<input type="checkbox"/>
	Identify and discuss any ongoing monitoring (if required)	<input type="checkbox"/>
Waste management (if applicable)	Waste classification reports in accordance with EPA Waste Classification Guidelines	<input type="checkbox"/>
	(See Table 2(d) of the <u>Consultants Reporting on Contaminated Land: Contaminated Land Guidelines (EPA 2020)</u> if more detail is required.)	
	Summary of material handling and tracking	<input type="checkbox"/>
Conclusions and recommendations	Brief summary of all findings	<input type="checkbox"/>
	Rationale and justification in reaching the conclusions	<input type="checkbox"/>
	Any recommendations based on the conclusions	<input type="checkbox"/>
	A clear statement that the duly qualified person considers the subject site to be suitable for the proposed use or other nominated potential uses	<input type="checkbox"/>
	A statement detailing all limitations and constraints on the use of the site (where applicable)	<input type="checkbox"/>
	Recommendations for further work, if appropriate	<input type="checkbox"/>

Reporting considerations

The decommissioning report is to show that:

- the objectives of any remedial activities have been met
- any remaining contamination on the site is not having an impact on the environment
- the site is suitable for its ongoing or future use.

The assessment of the site should focus on collecting clear evidence to ascertain whether these goals have been met.

Sampling programs at UPSS sites must identify and delineate the lateral and vertical extent of any contamination and arrive at a scientifically defensible and statistically valid dataset that characterises chemical concentrations.

Hydrocarbon contamination should be analysed using discrete samples. Composite sampling is not recommended and should be avoided because volatiles may be lost through mixing. For more information, refer to:

- [Consultants Reporting on Contaminated Land: Contaminated Land Guidelines \(EPA 2020\)](#)
- Australian Standard AS 4482.2–1999, *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil: Volatile Substances*
- Australian Standard AS 4482.1–2005, *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil: Non-volatile and Semi-volatile Compounds*.

A conceptual site model (CSM) is also useful to characterise a site. It can be used to test the assessment outcomes and indicate whether there are gaps in the data that may warrant further investigation and remediation.

The CSM should be updated as new information is obtained, creating a more realistic model for identifying issues such as permeability of the soil/sediment, known groundwater flow patterns within the area, and whether undetected preferential pathways for contaminant migration may be present. If a CSM is to be submitted to the appropriate regulatory authority, it must comply with the requirements of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended in 2013).

The necessary remediation goals and site assessment processes must be clearly defined and understandable to the appropriate regulatory authority.

Data quality objectives

Reporting activities should be informed by the **data quality objectives** (DQO) process, which is used to define the type, quantity and quality of data needed to support a decision relating to the environmental condition of the site. The development of a sampling program with a pre-determined DQO process provides the statistical basis for decision-making. A sampling analysis plan (SAP), which explains the justification for sampling and the practices to be adopted as part of the plan, should include a quality assurance/quality control protocol to ensure sample integrity. (See [Contaminated Land Management: Guidelines for the NSW Auditor Scheme \(3rd Edition 2017\) \(PDF 999KB\)](#).)

Quality assurance/Quality control (QA/QC)

The inherent nature of chemicals associated with UPSS (generally liquid, highly mobile and volatile) is such that degradation, volatilisation and/or transformation may affect a sample's integrity from the time the sample is recovered. Great attention should therefore be paid to preserving the sample's integrity, and how the sample is handled should be documented under a **chain of custody** protocol.

Guidance on appropriate sample collection and preservation methods, health and safety, decontamination of sampling equipment between successive sampling, and quality assurance procedures, can be found in Australian Standard 4482.1–2005, *Guide to the investigation and sampling of sites with potentially contaminated soil – Non-volatile and semi-volatile compounds*.

Soil sampling

Soil sampling (design and assessment) at a UPSS site should be undertaken in accordance with the following NSW guidelines:

- [Consultants Reporting on Contaminated Land: Contaminated Land Guidelines \(EPA 2020\) \(DOCX 180KB\)](#)
- [Contaminated Land Management: Guidelines for the NSW Auditor Scheme \(3rd Edition 2017\) \(PDF 999KB\)](#)

All contamination assessments for sites containing a UPSS should also be performed in line with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 1999) and *Assessment of underground storage systems* (EPHC & NEPC 2003).

It is recommended that waste materials exported for disposal or backfill sourced onsite or imported to the site, be characterised using an appropriate frequency and method of soil sampling. For further information, refer to the [Waste Classification Guidelines \(EPA 2014\)](#).

Where there are departures from the guidelines, clear justification should be given, and any significant deviations listed.

Groundwater assessment

Groundwater assessment is critical in determining any potential environmental effects of a UPSS. When UPSS contents leak into soil there may be low or non-detectable concentrations within the soil matrix even while groundwater is contaminated beyond drinking-water standards (Environment Protection and Heritage Council, *Assessment of Underground Storage Systems National Environment Protection Council (NEPC)*, 2003).

Groundwater assessment must be conducted where soil contamination has been encountered or identified. Keep in mind the possibility of residual groundwater contamination at sites where the UPSS has been abandoned or removed but the environmental assessment has been inadequate (or not done at all). Groundwater assessment at (or beyond) a UPSS site should be undertaken in accordance with the EPA's [Guidelines for the Assessment and Management of Groundwater Contamination \(EPA 2007\)](#).

The factors to consider in an assessment include:

- the distance to receptor(s), both surface and groundwater
- whether sufficient monitoring wells are located on site, installed correctly and positioned to intercept contaminants down-gradient
- whether bore logs are available and sufficiently detailed
- groundwater flow direction
- whether there are other potential sources of contamination.

Groundwater monitoring wells should be designed and installed by duly qualified persons as required under Part 3 of the Regulation.

The NSW Department of Planning, Industry and Environment (DPIE) and WaterNSW may have certain requirements for licensing the installation of water bores and wells and should be contacted before installing any wells on a UPSS site.

Contaminants of concern

The duly qualified person will need to determine a list of contaminants of concern to consider when investigating, remediating or reporting on a UPSS site. These may include, as a minimum:

- total petroleum hydrocarbons (TPH) (C₆-C₉, C₁₀-C₃₆)
- benzene, toluene, ethyl benzene and xylene (BTEX)
- chlorinated solvents (degreasers)
- polycyclic aromatic hydrocarbons (PAHs) including benzo(a)pyrene

- lead
- the pH of the medium.

Other analytes that should be considered include:

- MTBE and other possible additives, such as ethanol
- select heavy metals (such as cadmium, chromium, zinc, copper, mercury, arsenic and nickel)
- phenols.

Where additional contaminants are suspected and/or identified during preliminary site screening, these should also be included as part of the test suite.

Depending on site history, other possible contaminants could include:

- petroleum fuels, lubricating oils, and additives such as organometallic compounds, surfactants, biocides, molybdenate compounds and corrosion inhibitors
- waste oils and cooling liquids of highly variable compositions
- chemicals associated with the fuel manufacturing process, such as catalysts, metals and solvents that may have been used at the site (i.e. vanadium, cobalt, molybdenum and platinum)
- other chemicals, including pesticides/herbicides
- asbestos (as a result of mechanical repairs including the cleaning of parts, brake machining and other repairs).

Review of the site history supplemented by field screening can help determine if any information on potential contaminants can be gathered while on site.

Documenting field practices

Field observations and activities should be accurately recorded by an experienced person, through contemporaneous written notes supplemented by still photos or video. Good-quality visual evidence – photos and video – may be hard to obtain because of adverse site conditions, such as poor lighting in excavations. Appropriate personal protective equipment must be used and WH&S (work health and safety) procedures adhered to at sites that may have volatile substances, particularly in confined spaces.

Use standardised checklists to record critical aspects of tank pulls to ensure comprehensive and consistent data capture. The records provide evidence to justify decisions made during the site works and to allow critical assessment of the appropriateness of the site works undertaken.