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ACAPMA

Best Practice Guidelines

Management of Hydrocarbons in Stormwater at Retail Fuel Outlets

2017 Version

ACAPMA
The Voice of Downstream Petroleum

ACAPMA
Australasian Convenience and Petroleum Marketers Association

ABOUT THIS DOCUMENT

This document is one in a series of *Best Practice Guidelines* that has been prepared by the Australasian Convenience and Petroleum Marketers Association (ACAPMA) to assist fuel retailers with the management of their retail fuel sites.

The material provided in this document is of a general nature only. It is not intended for use by suppliers of equipment and services to the fuel retail industry in Australia given that much of this information is already detailed in relevant Australian Industry Standards and related Legislative Guidelines.

Rather, the information contained in this document is intended to provide a *Plain English* summary of the best practice processes that fuel operators should consider with respect to the ongoing management of key aspects of their retail fuel sites.

Fuel retailers seeking detailed information in relation to the design and/or alteration of service station infrastructure are strongly advised to secure the services of a qualified fuel system designer and/or petroleum services contractor.

The contact details of such contractors can be obtained by visiting **www.acapma.com.au** or calling the ACAPMA Secretariat on 1300 160 270.

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1. SCOPE OF CONSIDERATION

This Guideline has been developed to provide guidance with respect to the management of hydrocarbons contamination of stormwater at retail fuel outlets in Australia (including service stations, truck stops and unmanned retail facilities).

Contamination of stormwater with hydrocarbons typically occurs at fuel retail outlets due to one or more of the following:

a) Rainwater on the forecourt collecting oil and fuel residue from the forecourt area and transporting it into the on-site stormwater system during rain events
b) Fuel spillage during customer refuelling activity (i.e. minor spills)
c) Fuel spillage during tanker unloading activity (i.e. major and/or minor spills)
d) Forecourt cleaning activities
e) Vehicle servicing and repair activities

The scope of this Guideline extends to provision of:

» An overview of the legal responsibilities of service station operators to ensure that the design and operation of the stormwater systems installed at a service station site prevent discharge of water potentially containing hydrocarbons into urban stormwater systems, natural waterways and neighbouring properties
» Guidance on the key principles that should be adopted with respect to the design of stormwater systems at service stations
» A suggested framework for the selection of a stormwater system that successfully manages hydrocarbons in stormwater
» Guidance on the maintenance practices that should be employed for different types of stormwater treatment systems

This Guideline is not intended to provide detailed guidance with respect to the design and installation of stormwater management systems. Information in this regard should be sourced from the relevant Australian Standards, as interpreted by a suitably qualified petroleum services contractor or consultant.

Rather, the purpose of this Guideline is to provide service station operators with guidance on the factors that should be considered with respect to the design and operation of stormwater treatment systems at service stations.

2. OVERVIEW

The principal reasons that service station operators are required to install comprehensive stormwater management systems that provide satisfactory management of stormwater are to:

a) Ensure safe operation of their service station site
b) Prevent discharge of polluted stormwater water into natural watercourses, soil, neighbouring properties and related urban infrastructure (e.g. stormwater and sewer systems)

Discharge of polluted water from the stormwater system of a retail fuel site (as distinct from underground storage tanks) typically occurs because of:

» Major spill incidents that occur during the refilling of underground storage tanks, resulting in overfill of tanks and/or inadvertent discharge onto the service station forecourt
» Flooding of the forecourt and/or on-site wastewater treatment systems due to heavy rainfall
» Minor spills during customer refilling operations
» Site cleaning

2.1 SAFETY CONSIDERATIONS

In recent times, there have been several significant safety incidents that have occurred because of inadequate design of stormwater treatment systems on service station forecourts. These incidents can be grouped into two distinct categories.

» The first category involves incidents where large spills have occurred during the refilling of underground tanks that were not adequately contained by the capacity of the spill box and the supporting spill containment systems. Thus, substantial volumes of fuel were discharged onto the forecourt and flowed into neighbouring properties, creating a significant safety risk.
» The second category relates to poor maintenance of stormwater treatment systems – specifically sumps and/or gross pollutant traps. A failure to ensure that these systems were regularly 'skimmed' to remove hydrocarbons resulted in an increased concentration of hydrocarbons to the point that the concentration of fuel was sufficient to be ignited.

A review of the factors surrounding both above categories of incidents suggests that it is essential that service station operators ensure that:

» The design of forecourt spill containment and stormwater treatment systems is sufficient to contain large spills that may occur during a tanker refilling operation
» Spill containment and stormwater treatment systems are regularly inspected and maintained and that sumps and pollutant traps are located outside of the hazardous zone to minimise fire risk

2.2 ENVIRONMENTAL CONSIDERATIONS

Service station operators are required to take all reasonable steps to prevent pollution of the surrounding environment (due to the release of fuel-laden stormwater), including:

» Neighbouring properties
» Natural watercourses
» Urban infrastructure systems (i.e. stormwater and sewer systems)

2. OVERVIEW

2.3 LEGAL OBLIGATIONS

All Australian governments (i.e. federal, state/territory and local government) have introduced regulations that limit the concentration of hydrocarbons in stormwater that can be discharged from a service station site.

In many cases, these regulations are administered by the state/territory environmental agencies with input from other government agencies such as the water and sewer authorities.

For new sites, developers are required to install a stormwater system that will contain spills and prevent discharge of non-compliant stormwater into the surrounding natural and/or built environment.

Fuel retailers are strongly advised to consult with appropriate state/territory regulators to ensure that they understand the requirements for stormwater discharge from their sites.

2.4 ECONOMIC CONSIDERATIONS

Stormwater systems impose an economic cost to a retail fuel operation – both in terms of the capital cost of installation and ongoing costs for maintenance and monitoring.

While the economic cost of a properly designed, well-maintained stormwater system can be substantial, these costs are much lower than the average economic losses associated with an unlawful discharge of polluted stormwater (which include very substantial fines as well as the associated costs of environmental remediation).

It is therefore important that all reasonable efforts are taken to minimise the risk of an unlawful discharge of polluted stormwater. This will often mean designing the stormwater system to capture larger fuel spills than are typical, even though the likelihood of such spills may be relatively low (i.e. risk-based approach).

3. KEY DESIGN CONSIDERATIONS

The design (and operation) of the stormwater system must be of sufficient capacity to prevent off-site discharge of non-compliant stormwater collected from the service station forecourt.

To achieve this objective, consideration should be given to the design parameters outlined in the following sub-sections and summarised in Table 1.

3.1 WASTE STREAMS

The waste water generated at retail fuel outlets typically falls into one of four categories, namely:

- **Trade wastes**: These are typically wastes that result from food preparation activities and include waste cooking oil, fats and other dissolved solids
- **Sewage**: These waste streams typically comprise human waste from any rest rooms that may be installed at the site
- **Stormwater and fuel spills**: This is typically water that is collected from the forecourt. As this water flows across the forecourt it collects any fuel or oil residue that may be on the forecourt surface. Fuel spills are typically collected by stormwater systems and therefore need to be considered as part of this waste stream
- **Cleaning and ancillary activities**: These waste water streams arise due to forecourt cleaning activities, vehicle servicing activities and car wash activities.

The remainder of this document provides guidance in respect of stormwater and fuel spills only.

3.2 CAPTURE VOLUME

Given that fuel retailers are required to ensure that all stormwater discharge from a service station forecourt is compliant regardless of any forecourt spills that occur, the stormwater management system should be designed to capture a range of different spill volumes (capture volume) to prevent discharge of non-compliant stormwater.

Within the vicinity of the fill box, Australian Standard AS1940 (The Storage and Handling of Flammable and Combustible liquids – 2017) suggests that the capture volume should be the greater of the capacity of the largest compartment of any tanker using the facility, or 9000 litres – whichever is less.

While there is some debate about the application of this requirement to service stations (i.e. it is understood that this requirement was primarily intended for tanker loading at terminals), it appears that most regulators also impose this requirement for approval of stormwater systems at fuel retail outlets.

With respect to the customer filling area of the forecourt, there is currently no uniformly accepted capture volume. It is suggested, however, that the average spill volume in this area is relatively small (i.e. less than 5 litres per incident) and therefore a capture volume of approximately 20 litres would likely be sufficient.

It is suggested that, given the practical and economic difficulties of providing large capture volumes at many sites, there may be grounds for relaxing the above requirements where the fuel retailer has performed a risk analysis based on a minimum three-year spill history.

Site factors such as the size and grade of the hardstand area, as well as the canopy coverage of the refuelling area, will increase or decrease the capture volume that should be used in the design of the system.

3. KEY DESIGN CONSIDERATIONS

STEP	ACTION	CONSIDERATION
1	Determine the capture volume required for the design of the system by considering the likely spill size	Estimation of the spill size should take account of the potential for spills to occur due to tanker unloading incidents and customer filling incidents
2	Determine the treatment flow rate and volume	The treatment volume and flow rate is used to determine the capacity of the stormwater treatment system to be installed (e.g. incorporates first flush device) or the division of the site into discrete capture zones
3	Source information from the relevant Commonwealth, state/territory and local regulatory authorities on the maximum allowable discharge limits for stormwater at the site	It is recommended that systems be designed to support a maximum allowable hydrocarbon concentration of 5mg/l in stormwater discharge. Some jurisdictions impose lower limits according to the nature of the discharge point and so it is necessary to secure advice from the relevant authorities on the exact nature of the legal requirements
4	Consider separating the site into discrete zones according to areas with high contaminant risk and those with low contaminant risk	Ideally, the stormwater system should be designed to only treat the stormwater that contains concentration of contaminants that exceed regulations. By separating the site into low contaminant and high contaminant zones (e.g. tanker unloading and customer filling areas), the cost-effectiveness of the stormwater management system can be optimised
5	Select the stormwater equipment that is most appropriate for the subject site based on consideration of: » The nature of the stormwater loading » The nature of treatment requirements » The capital and recurrent cost of all equipment » The nature of the ongoing maintenance burden	There is a tendency for fuel retailers to select the cheapest equipment without appreciating that such a choice can result in higher annual operating costs and a higher maintenance burden. It is recommended that the fuel retailer engages a suitably qualified and experience professional to: a) Assist with the design and selection of the preferred stormwater treatment system b) Assist with the preparation of an appropriate maintenance regime for future operation of the stormwater system

Table 1: Factors to consider in the design of a stormwater management system

3.3 TREATMENT VOLUME

It is generally not necessary to treat the entire volume of runoff that is initially captured by the site stormwater system as a significant proportion of this run-off may not be contaminated by fuel.

The total captured volume can therefore be classified into: (a) runoff that needs to be treated (i.e. treatment volume); and, (b) the volume that can reasonably be allowed to pass through the system untreated.

Consequently, the stormwater management system can be designed to accommodate an approach that either utilises a first flush system or seeks to separate the total captured volume by the zone in which it was collected.

First flush systems effectively capture the initial volume of water runoff (to a pre-determined design capacity) for later treatment, with the remaining volume allowed to pass through the stormwater system untreated.

The adoption of an approach based on site zones is discussed below (refer sub-section 3.4).

3. KEY DESIGN CONSIDERATIONS

3.4 ALLOWABLE STORMWATER DISCHARGE

Stormwater systems that are installed at a service station site must be designed and maintained in such a manner as to ensure that all stormwater discharged from the site does not exceed the maximum allowable hydrocarbon concentration.

Unfortunately, most current Australian state/territory governments do not actually specify a maximum allowable hydrocarbon concentration, thereby implying that stormwater discharge should contain zero hydrocarbons. Such an approach is considered unrealistic as it:

a) Ignores the fact that many urban watercourses will contain a small percentage of hydrocarbons that have been washed into the stormwater systems from roadways, carparks and other hardstand areas, and
b) Ignores the fact that the economic costs of such an approach are generally prohibitive and cannot be economically justified given the likely low incremental environmental benefit.

Therefore, it is recommended that, in the absence of any prescribed limits in government regulations, the maximum allowable hydrocarbon discharge in stormwater should be 5mg/l. This limit is consistent with the standards operating in comparable jurisdictions such as Great Britain (British Standards) and Europe (EN 858).

Fuel retailers should ensure that they fully understand the nature of all specific regulations regarding the compliant stormwater discharge, including any specific limits that may apply owing to the nature of the discharge point (i.e. limits varying for discharge into environmentally sensitive natural waterways versus discharge into urban stormwater).

3.5 SITE ZONING

Ideally, the design of the stormwater management system should be divided into distinct zones. These zones can be used to separate areas where likely higher concentration of fuel-laden stormwater can be separated from stormwater which is essentially free of fuel contamination.

By dividing the retail site into discrete zones, the system can be tailored to the specific requirements of the likely discharge/spill volumes in each section of the site as opposed to wholesale adoption of a solution that accommodates the requirements of the highest contaminant zone, resulting in potential over-engineering (and unnecessary costs) for the lower contaminant zones that exist across most of the site.

While there are a variety of approaches adopted for the classification of service station sites into different zones, it is recommended that the service station site be divided into two categories of zones for the purposes of stormwater management.

These zones need to be physically separated from the electrical zones and can be summarised as follows:

» High contaminant zones (Class S1 Zone): These are areas where there is a potential for fuel to be spilled onto the forecourt. Typically, these areas include the customer filling area and the area immediately surrounding the fill box. These are areas where, if the consequences of stormwater system failure are severe, there may be a need to consider bunding of the zone.
» Low contaminant zones (Class S2 Zone): These are areas where there is a very low or nil potential for fuel being spilled onto the hardstand area of the site. Typically, these are areas located on the extremities of the site such as the areas near the convenience store and/or areas set aside for customers to access tyre inflation and water facilities.

Water collected from the two zones should be assessed by a qualified contractor/consultant to determine the most appropriate treatment regime for each zone, to ensure compliance with the relevant standard for the receiving discharge for each zone.

3. KEY DESIGN CONSIDERATIONS

3.6 STORMWATER EQUIPMENT OPTIONS

There is a variety of different equipment options for the treatment of stormwater at service stations.

These options vary markedly in nature, capital cost, ongoing maintenance burden and whole-of-life costs.

The key determinant in the selection of stormwater equipment should be to ensure full containment of the design capture volume (refer to sub-section 3.2) and prevention of any off-site discharge exceeding the allowable stormwater discharge (refer to sub-section 3.4).

3.7 FIT-FOR-PURPOSE DESIGN

As with all site infrastructure, fuel retailers should select the stormwater management system that provides a fit-for-purpose solution. This means that consideration should be given to the:

- Initial capital cost of design and installation
- Ongoing costs of operation (including regular sampling costs)
- Complexity and frequency of system maintenance, including the training requirements of on-site staff
- Direct and indirect costs of failing to comply with discharge regulations

4. MAINTENANCE AND MONITORING CONSIDERATIONS

4.1 TREATMENT VOLUME

Treatment of hydrocarbons in stormwater systems requires that there is always a sufficient level of water in the system to support the separation of hydrocarbons. The system should therefore be periodically inspected to ensure that it has not 'run dry'.

4.2 RISK MANAGEMENT

All fuel retailers in Australia are legally required to ensure that the nature of the stormwater being discharged from their site is compliant with state/territory regulations. Discharge of non-compliant stormwater carries risk of significant fines for the site operator and/or the site owner.

It is therefore essential that the site operator ensures that all reasonable steps are taken to guarantee compliance with legislated stormwater requirements from site commissioning to site decommissioning.

4.3 STORMWATER SYSTEM MAINTENANCE PLAN

The specific requirements for the maintenance of a stormwater management system will vary with the nature of the site, the environmental sensitivity of the area in which the site is operating and the nature of the stormwater treatment equipment installed on the site.

Fuel retailers should therefore work with qualified petroleum contractors and/or service providers to develop a maintenance plan that is appropriate for the stormwater system that has been installed on their site.

This plan should be formally documented as either a separate document (including a diagram of the system) or ideally included in the site Environmental Management Plan (EMP). This EMP should be readily accessible by site staff.

4.4 SITE OPERATOR TRAINING

Site orientation and training programmes should be developed to ensure that all site staff have a working knowledge of the stormwater systems that are installed on the site.

Staff should also be trained in the relevant maintenance procedures and be advised of the procedure for escalation of any problems that may be observed with the operation of the stormwater system.

4.5 SYSTEM MAINTENANCE RECORDS

The fuel retailer should maintain records of all maintenance performed on the stormwater management system. These records should be updated when any modifications to the system are undertaken.

Retention of a comprehensive set of records is likely to be valuable in the event of an observed breach of state/territory stormwater regulations, as it provides formal evidence of comprehensive management of regulatory obligations.

4.6 STORMWATER MONITORING

Monitoring of stormwater systems is a formal requirement of most regulations. Fuel retailers should therefore develop (and implement) a monitoring regime that has been developed in consultation with the manufacturer of the stormwater system. Ideally, this monitoring protocol should be developed under the umbrella of the site maintenance plan and/or Environmental Management Plan (EMP).

SUMMARY

The operators of retail fuel outlets in Australia have a legal obligation to ensure that their operations do not cause environmental damage to the surrounding natural and built environments.

This obligation extends to ensuring that the concentration of any hydrocarbons in stormwater that is discharged from a retail fuel site does not exceed a maximum allowable concentration.

Where Australian state/territory environmental regulations do not prescribe a specific concentration, it is recommended that the system be designed to ensure that the maximum concentration in any stormwater discharged from the site does not exceed 5mg/l.

The design of these systems should be of sufficient size to ensure retention and treatment of stormwater in the event of both heavy rainfall and likely fuel spills. The key factors that should be considered in the sizing of a stormwater treatment system include:

- Size and grade of the hardstand area
- Average rainfall intensity
- The canopy coverage of the customer dispensing area
- The average size of tanker deliveries (and possible spill size)
- An analysis of the size of spills in the customer dispensing area

Fuel retailers should ensure that the stormwater systems are installed by a qualified contractor/consultant and are periodically inspected and maintained.

Site staff should also be adequately trained in the operation and maintenance of the system.

Further information about this Guideline can be obtained by contacting ACAPMA on 1300 160 270 or emailing the ACAPMA Secretariat at **communications@acapma.com.au**.

GLOSSARY OF TERMS

Allowable stormwater discharge	The maximum concentration of hydrocarbons that is permissible in any off-site discharge of stormwater collected at the site
Capture volume	The total spill volume that should ideally be captured by the stormwater collection system installed on the site
Treatment volume	Environmental Management Plan. A formal plan documenting how the environmental risks associated with the operation of the site are being managed
Treatment volume	The maximum volume of stormwater for which the stormwater treatment systems (as opposed to collection systems) are to be designed

USEFUL REFERENCES

ANZECC 2000	Australian and New Zealand Guidelines for fresh and marine water quality (Volume 1) **www.environment.gov.au/system/files/resources/53cda9ea-7ec2-49d4-af29-d1dde09e96ef/files/nwqms-guidelines-4-vol1.pdf**
AS 1940 (2017)	The storage and handling of flammable and combustible liquids (2017) **www.infostore.saiglobal.com/en-au/Standards/AS-1940-2017-1925007/**
BS:EN858-2 (2003)	Separator systems for light liquids (e.g. Oil and Petrol). Selection of nominal size, installation, operation and maintenance (2003) **www.infostore.saiglobal.com/store/details.aspx?ProductID=901095**
NZ Ministry for the Environment (1998)	Environmental Guidelines for water discharges from Petroleum Industry Sites in New Zealand (1998) **www.mfe.govt.nz/sites/default/files/media/Hazards/water-discharges-guidelines-dec98_0.pdf**

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