SQUADRON ENERGY

Port Kembla Energy Terminal Environmental Management Plan

Systems Commissioning and Preservation

PKGT-AIE-STE-ENV-PLN-0001

4 December 2024

Final

Revision Control

Revision	Date	Issue	Author	Reviewed	Approved	Signature
0	05/09/2024	Final	BB	KL	AL	[click the RHS '+' to repeat row]
1	04/12/2024	Final	BB	KL	AL	[click the RHS '+' to repeat row]

Confidentiality

Disclaimer

GLOSSARY

Abbreviation	Meaning
AIE	Australian Industrial Energy Pty Ltd
AQMP	Air Quality Management Plan
ASSMP	Acid Sulphate Soils Management Plan
CEMP	Construction Environmental Management Plan
CSP	Contaminated Spoil Protocol
CSSI	Critical State Significant Infrastructure
CTMP	Construction Traffic Management Plan
dB	Decibel
DECC	Department of Environment and Climate Change (now DPHI)
DEMP	Dredge and Excavation Management Plan
DPE	Department of Environment (now DPHI)
DPHI	Department of Planning, Housing and Infrastructure
DPIE	Department of Planning, Infrastructure and Environment (now DPHI)
ECR	Emplacement Cell Report
EGP	Eastern Gas Pipeline
EHMP	Ecological Health Monitoring Program
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning and Assessment Act, 1979
EPA	Environment Protection Authority
EPL	Environment Protection Licence
ESCP	Erosion and Sedimentation Control Plan
FFMP	Flora and Fauna Management Plan
FSRU	Floating Storage and Regasification Unit
GPT	Gross Pollutant Trap
HUFP	Heritage Unexpected Finds Protocol
LAeq	A-weighted, equivalent continuous sound level in decibels
LNG	Liquified Natural Gas
LTEMP	Long-term Environmental Management Plan
NSW	New South Wales
NVMP	Noise and Vibration Management Plan
ORF	Onshore Receival Facility
PIRMP	Pollution Incident Response Management Plan
PKET	Port Kembla Energy Terminal
POEO Act	Protection of the Environment Operations Act 1997

Abbreviation	Meaning
SDS	Safety Data Sheet
SMP	Spoil Management Plan
SQE	Squadron Energy Pty Ltd
SSI	State Significant Infrastructure
SSI-8471	Infrastructure Approval
TfNSW	TfNSW
WQMP	WQMP

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1 Introduction

1.1 Background

Australian Industrial Energy (AIE), a wholly owned company of Squadron Energy Pty Ltd (SQE), is developing the Port Kembla Energy Terminal (the project). The project involves the development of a liquefied natural gas (LNG) import terminal (the Terminal) at Port Kembla, south of Wollongong in NSW.

The project consists of four key components:

- LNG carrier vessels —transporting LNG from production facilities all around the world to demand centres.
- Floating Storage and Regasification Unit (FSRU) — a cape-class ocean-going vessel, which would be moored at Berth 101 in Port Kembla.
- Berth and wharf facilities — including landside offloading facilities to transfer natural gas from the FSRU into an underground natural gas pipeline located on shore.
- Gas pipeline — a Class 900 carbon steel high-pressure pipeline connection from the berth to the existing gas transmission network.

The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with Section 5.13 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and Schedule 5 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). The project received Infrastructure Approval (SSI 9471) from the then Minister for Planning and Public Spaces on 29 April 2019 and an overview of the approved project is provided in Section 2.1.

As the Project transitions from the construction phase to an operational phase, a series of testing and commissioning processes is required to be undertaken to ensure the Terminal and systems operate safely and as per design, including electricity and other external connections, gas collection and transfer pipelines and connections, noting that there will be no inclusion of natural gas during this stage.

Following successful systems commissioning of the Terminal, the Project will be placed into a phase of preservation, effectively enabling a safe state of dormancy whereby associated plant and equipment can remain on the ready in the event of plant start up in the future. Collectively, this stage of the project will be referred to as the Systems Commissioning and Preservation Stage.

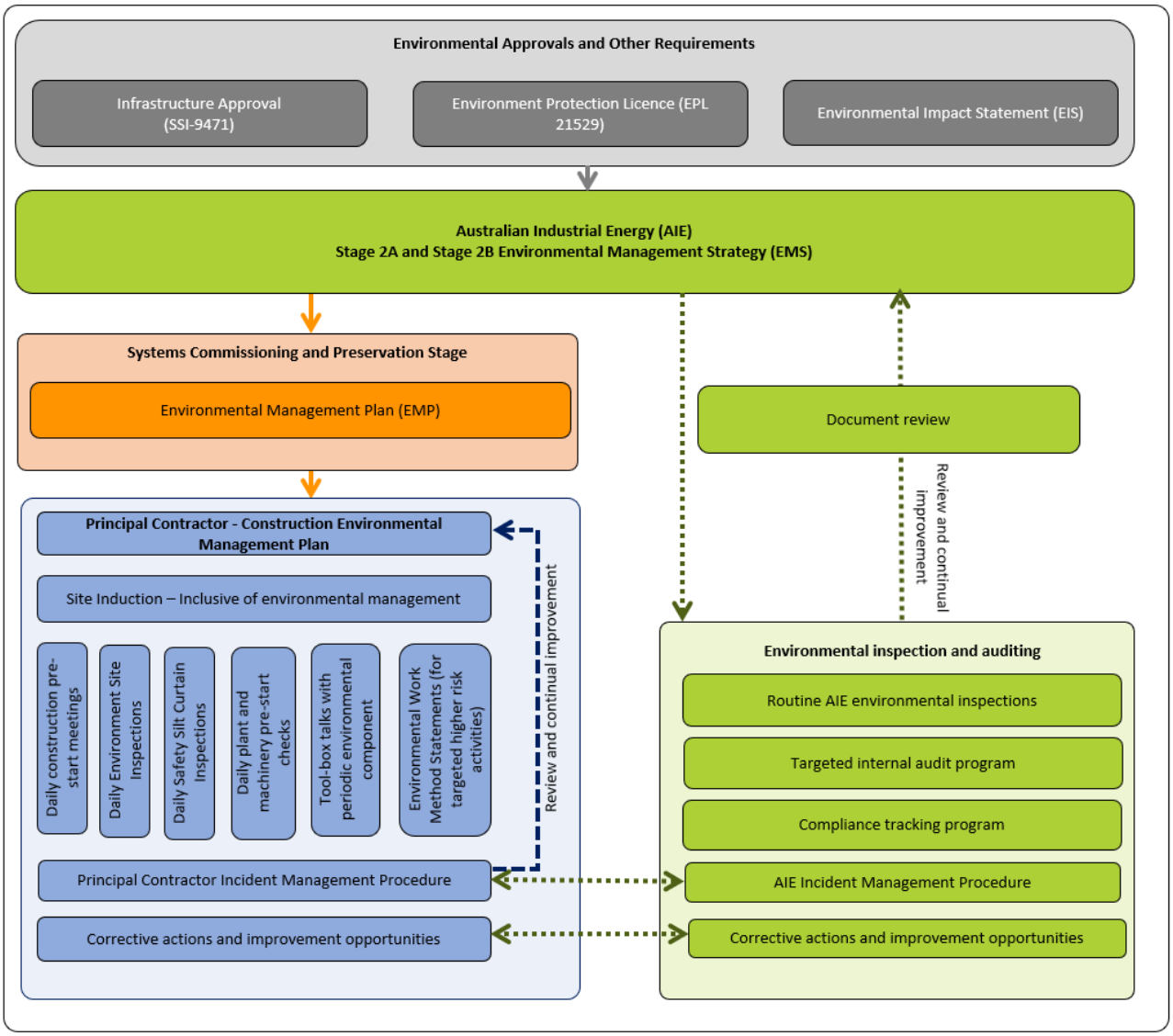
Refer to Section 2 for further details with regards to works and activities associated with the Systems Commissioning and Preservation Stage.

1.2 Purpose of this EMP and relationship to the EMS

This Environment Management Plan (EMP) has been developed to provide a supplementary environmental management tool for the works to be undertaken as part of the Systems Commissioning and Preservation Stage of the Port Kembla Energy Terminal (PKET) Project and sits under the Stage 2A and Stage 2B Environmental Management Strategy for Stage 2A and 2B - Marine Berth Construction and Dredging – Land and Marine Based (Australian Industrial Energy, 28 February 2022) (the Approved EMS), including any relevant Stage 2A and Stage 2 environmental management sub-plans.

Figure 1-1 below details the relationship of this EMP with the Approved EMS and other relevant approval documentation.

Figure 1-1 EMP relationship with the Approved EMS



A breakdown of the approved Stage 2A and Stage 2B environmental management sub-plans and applicability to the Systems Commissioning and Preservation Stage is presented below in Table 1-1.

Table 1-1 Stage 2A and Stage 2B Environmental management plans applicable to the Systems Commissioning and Preservation Stage

Management plan	Applicable to Systems Commissioning and Preservation Stage (Yes/No)	Comment
Environmental Management Strategy, Revision A, dated 11/02/2022 (EMS)	Yes	Overarching Environmental Management Strategy (EMS) remains applicable to all works. The EMS contains key information and requirements including the following: • Project background and overview • Legislative and other requirements • Communications and complaints management • Environmental inspection and reporting requirements • Incident and emergency management • Document review and improvement.
Air Quality Management Plan, Revision B, dated 15/02/2022 (AQMP)	No	• Construction works complete • Site surfaces have been stabilised • Dust risk has been removed • EPL has been updated to reflect this, with the removal of air quality / dust monitoring requirements at Berth 101 • Any relevant mitigation measures and controls with regards to air quality management are included in Section 7.
Acid Sulphate Soils Management Plan, Revision D, dated 10/06/2022 (ASSMP)	No	• Excavation works complete • Risk of acid sulfate soil management has been removed.
Contaminated Spoil Protocol, Revision E, dated 04/05/2022 (CSP)	No	• Excavation works complete • Any unexpected finds in relation to contamination will be managed in accordance with the unexpected finds procedure. Refer to Section 7 and Appendix A for further details. • Any hydrocarbon spill and follow-up response will be managed in accordance with Section 4.4.
Construction Traffic Management Plan, Revision B, dated 17/03/2022 (CTMP)	No	• Traffic movements associated with spoil haulage and large vehicles complete • Marine traffic movements complete • Bulk traffic movements not required during Systems Commissioning and Preservation Stage • Mitigation measures and controls with regards to site access and light vehicle movements are addressed in Section 7.
Dredge and Excavation Management plan, Revision D, dated 04/05/2022 (DEMP)	No	• Dredging and excavation works complete.
Emplacement Cell Report, Revision 8, dated 16/06/2022 (ECR)	No	• Emplacement cell construction complete.
Emergency Spill Plan, Revision 1, dated 30/05/2022	Yes	• Land-based works only • Minimal requirement for storage and handling of fuels and chemicals (refer to Section 7 for further details).

Management plan	Applicable to Systems Commissioning and Preservation Stage (Yes/No)	Comment
Erosion and Sediment Control Plan, Revision D, dated 22/04/2022 (ESCP)	No	• Construction works complete • Site surfaces have been stabilised • Sealed internal road network • In-line stormwater control devices and on-site retention basin for surface water runoff • Erosion and sedimentation risk removed.
Flora and Fauna Management Plan, Revision 1, dated 30/05/2022 (FFMP)	No	• Construction works complete • Any unexpected finds and / or injured fauna will be managed in accordance with Section 7.
Heritage Unexpected Finds Protocol, Revision A, dated 11/02/2022 (HUFP)	No	• Construction works complete • Any unexpected finds of heritage significance (or suspected heritage significance) will be managed in accordance with Appendix A.
Noise and Vibration Management plan, Revision 1, dated 30/05/2022 (NVMP)	No	• Construction works complete • Works to be undertaken during the approved hours as per EPL and SSI-9471 • No vibration generating works required • Any relevant mitigation measures and controls with regards to noise management are included in Section 7 • Complaints management will be managed in accordance with Section 4.6.
Spoil Management Plan, Revision E, dated 04/05/2022 (SMP)	No	• Excavation works complete • Spoil handling and stockpiling not required
Water Quality Monitoring Plan, Revision D, dated 13/05/2022 (WQMP)	No	• Marine works complete • Stormwater management will be undertaken in accordance with Section 7.

1.3 EMP objectives

This EMP has been developed to meet the following objectives associated with the Systems Commissioning and Preservation Stage:

- Describe the environmental setting and sensitivities of the site
- Identify the applicable regulatory framework applicable to the works
- Identify the potential environmental impacts associated with the undertaking of the works
- Describe the mitigation measures required to be implemented to manage the potential environmental impacts
- Allocate responsibilities for the implementation and management of this EMP
- Identify the monitoring, reporting and review requirements for this EMP.

1.4 Structure of this EMP

This EMP has been prepared to be consistent with the *Environmental management guidelines for construction (Edition 4)* (DPIE, 2020).

A summary of the sections and content of this EMP is provided below in Table 1-2.

Table 1-2 EMP Structure

EMP Section	Content summary
Revision control	Revision status, preparation and approval details of current and historical versions.
Glossary	Provision of a consolidated list of abbreviations and meanings.
Section 1 – Introduction	Describes the project background, purpose and structure of the EMP.
Section 2 – Project description	Project overview, site location and further details with regards to activities associated with the Systems Commissioning and Preservation Stage of the works.
Section 3 – Legislative and other requirements	Includes details of the overarching approval pathway (based on the EMS and Project EIS) in addition to relevant legislation and other approval considerations including the following: • Conditions of approval under SSI- • Conditions under EPL 21529 • Relevant commitments / requirements under the EIS.
Section 4 – Environmental management framework	Includes an overview of the Project Environmental Management Framework and interaction / interface with the EMS. In addition, this section includes the implementation / operational component of the EMP and where relevant, relies upon the overarching EMS. Key elements of Section 4 include: • Relationship with the Project EMS • Roles and responsibilities in relation to the EMP development and implementation • Environmental monitoring, inspection and auditing • Training and awareness of project personnel and contractors • Environmental emergency and incident response, and management of non-conformance • Complaints management
Section 5 – Existing environment	Details of the existing environment where relevant to the works / scope under the Systems Commissioning and Preservation Stage focusing on pertinent elements of stormwater management and areas of known contamination.
Section 6 – Environmental aspects and impacts	Review of key environmental aspects and impacts associated with the Systems Commissioning and Preservation Stage of the works, including relevant mitigation measures and controls.
Section 7 – Environmental management	This section includes details of relevant mitigation measures and controls required to be implemented as per the above legislative and other considerations, in additional general best practice.
Section 8 – Document review and update	Details on the requirement for document and review, and the need for continual improvement.
Section 9 – References	References

2 Project description

2.1 Overview of the Project and works completed to date

Squadron Energy Pty Ltd (SQE), formerly Australian Industrial Energy (AIE), is building a liquefied natural gas (LNG) import terminal (Port Kembla Gas Terminal) on the east coast of New South Wales (NSW). The project scope involves long-term lease of a Floating Storage and Regasification Unit (FSRU), construction of a berth and wharf facilities (dredging, cell emplacement work, onshore receival facility (ORF)) at Port Kembla Inner Harbour, and construction of a new pipeline (also known as the lateral) which will be tied into the existing Eastern Gas Pipeline (EGP) at Kembla Grange.

The LNG carriers will discharge their cargo to the FSRU. The LNG is then pumped through RLNG trains where degasified LNG is produced and pressurised (RLNG) in accordance with the nomination process. Such raw RLNG, odourised at the onshore facility is ultimately injected into the existing Eastern Gas Pipeline (EGP) which forms part of NSW gas pipeline network.

Refer to Section 5 (Project description) of the Project EIS for further details regarding project description.

The Company has been granted a Project Approval by the NSW Government and commenced project early works in December 2021. The scheduled target for construction completion of the facility is in 2024.

Status of work completed to date are summarised below in Table 2-1:

Table 2-1 Summary of completed works

Stage	Package	Activities	Status
1	Early Enabling Works	Demolition of Berth 101, removal of structures and land based excavation works, and Cone Penetration Testing in the Outer Harbour to inform Emplacement Cell design and relocation of Bunker Oil Pipeline.	Complete
2A	Marine Berth Construction – Land Based	Completion of excavation works undertaken during Stage 1.	Complete
		Transport of spoil materials to Emplacement Cell Construction Site.	Complete
		Quay wall construction.	Complete
		Installation of communications conduit, potable water line, 11kV power cable, and pad-mount substation within the MBD Site Compound.	Complete
		Construction of the ORF, which comprises three areas: Wharf Topside Area; Utility Area; and Common Area.	Complete
2B	Marine Berth Construction and Dredging – Land and Marine Based	Excavation/dredging of the MBD Site Compound in the Inner Harbour and construction of the Emplacement Cell in the Outer Harbour	Complete
		Marine based construction activities including installation of navigational aids and revetment shore protection.	Complete
3	Pipeline Installation including tie-ins (NGP)	Construction of an 18” onshore natural gas pipeline approximately 6.3km in length from the Berth 101 site boundary to tie-in facility at Cringila for connection to the Eastern Gas Pipeline Pipeline construction to occur concurrently with Jemena, subject to separate set of management plans.	Complete
NA	Systems Commissioning and Preservation	Systems Commissioning - Test and verify the functioning of all individual portions of equipment and verify the system function end to end	Ongoing
		Pipeline preservation – Hydrotested, purged and placed into a state of preservation	Ongoing
		Onshore Receival Facility (ORF) – Leak tested, lines cleaned and placed into state of preservation	Ongoing

2.2 Systems Commissioning and Preservation

The systems commissioning activities will be undertaken to test and verify the functioning integrity of all individual portions of equipment and test and verify the system function end to end. The process will ensure all systems are operating as intended.

At completion of the systems commissioning activities, the site will enter a phase of preservation. The preservation phase means no major works will occur onsite and the infrastructure and equipment will only require maintenance as required. Through regular maintenance, the preservation phase aims to retain equipment in a manner which will ensure it is fit for use when required, this may also involve the use of nitrogen (e.g. for gas pipeline preservation and other ancillary equipment as required).

It is noted that the Systems Commissioning and Preservation Stage covered under this EMP assumes the absence of the Floating Storage Regasification Unit (FSRU) and the absence of any hydrocarbons (including natural gas) within the system and associated components.

Further details regarding the work and activities to be completed as part of the Systems Commissioning and Preservation Stage are summarised below in Table 2-2.

Table 2-2 Summary of Systems Commissioning and Preservation Stage

Stage	Activities	Timing*
Systems Commissioning	• Complete boundary isolations and install area delineation tape for system and subsystems prior to energisation • Perform point to point tests for all cabling prior to energisation to ensure correct termination points • Conduct static testing of instruments, control, safety and communications systems • Conduct all testing on instrument loop, electrical equipment, mechanical equipment, pressure testing, fire and gas systems, telecoms, CCTV and security systems • All loop tests are to end to end tested and proven from the control system to the final element • Conduct motor test runs • Complete cleaning, flushing and drying of all piping systems • Carry out nitrogen leak testing.	December 2024
Preservation	**Pipeline** • Piping and equipment will be gauged, hydrotested, dried and purged and blanketed with nitrogen gas to prevent corrosion • The nitrogen blanket pressure will be remotely monitored, including the setting of alarm limits during preservation / commissioning • There is a physical isolation (air gap) between the Port Kembla Pipeline and the EGP **Onshore Receival Facility (ORF)** • All ORF equipment will be leak tested and lines cleaned and dried • Equipment placed under preservation – nitrogen where required • No odourant or significant volumes of hazardous chemicals on site	December 2024 to FSRU arrival

*Timing is indicative

2.3 Site location and access

The site of the Project is situated at Port Kembla within the Illawarra region of NSW, about 80 kilometres south of Sydney. Port Kembla is mainly characterised by an existing import and export terminal and multiple other business, cargo, logistics, bulk goods, and heavy industrial facilities in the vicinity.

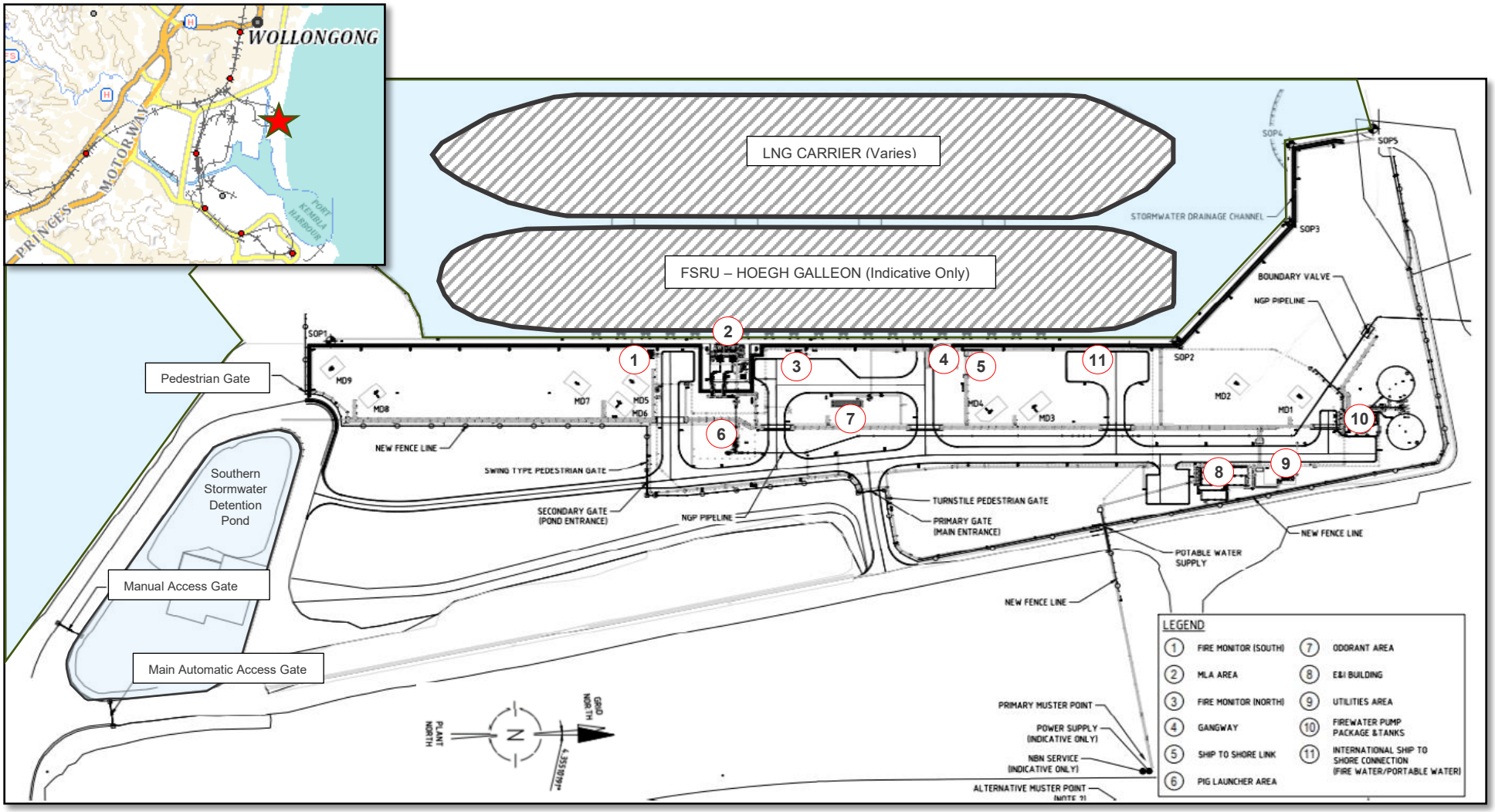
Port Kembla is situated about two kilometres south of the centre of Wollongong. Other localities surrounding Port Kembla and the Project site include Mangerton, Mount St. Thomas and Figtree to the north-west; Unanderra to the west; Berkeley to the south-west; and Cringila, Lake Heights, Warrawong and the residential region of Port Kembla to the south.

The Project will be predominantly located within land zoned for dedicated port and industrial uses. Berth and wharf facilities, as well as the FSRU, would be situated at Berth 101 at the Inner Harbour, while the gas pipeline would extend around the periphery of port operations from Berth 101 to a tie-in point at Cringila. A site overview is provided as Figure 2-1 and a more detailed site layout plan for Berth 101 is provided in Figure 2-2.

Figure 2-1 Site location

**Source of base map: Elvis - Elevation and Depth - Foundation Spatial Data*

Figure 2-2 Berth 101 site layout plan



3 Legislative and other requirements

3.1 Planning framework

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the statutory basis for planning and environmental assessment in New South Wales. The Minister for Planning, statutory authorities and local councils are responsible for implementing the EP&A Act. The EP&A Act provides the framework for environmental planning and development approvals and includes provisions to ensure that the potential environmental impacts of a development are assessed and considered in the decision-making process.

The project has been declared CSSI in accordance with section 5.13 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and Schedule 5 of the Planning Systems SEPP. The PKGT EIS (GHD, 2018) was prepared to support the development application for determination by the NSW Minister for Planning.

The Project received Infrastructure Approval (SSI 9471) from the Minister for Planning and Public Spaces on the 24th of April 2019.

A detailed overview of the applicable legislation for the project and modifications are outlined in the PKGT EIS and detailed further in Section 4 of the Overarching Stage 2A and Stage 2B Environmental Management Strategy (EMS).

3.2 Project approval (SSI-9471)

The project approval conditions under SSI-9471 relevant to the Systems Commissioning and Preservation Stage of the works are presented below in Table 3-1, including how the condition has been addressed within this EMP or suitable cross reference to the overarching EMS.

Table 3-1 Relevant conditions of approval (SSI-9471)

Source Reference	Requirement	Addressed
Sch02 C01 Obligation to minimise harm	In addition to meeting the specific performance criteria established under this approval, the Proponent must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable or feasible, minimise any material harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under this approval.	The EMS and this EMP
Sch02 C02 Terms of approval	The Proponent must carry out the development: (a) generally in accordance with the EIS; and (b) in accordance with the conditions of this approval. Note: The general layout of the development is shown in Appendix 2.	The EMS and this EMP
Sch02 C14 Operation of the Plant and Equipment	The Proponent must ensure that all plant and equipment used on site, or to monitor the performance of the development is: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Section 7
Sch03 C01 Water pollution	Unless an environment protection licence authorises otherwise, the Proponent must comply with Section 120 of the POEO Act. Notes: Section 120 of the POEO Act makes it an offence to pollute any waters. The EPA has recommended the following limits for water pollutants should apply for the development: an equivalent suspended sediment of no more than 50 mg/L above background turbidity levels during the construction stage; No more than 20 ug/L of Total Residual Chlorine and a temperature of no less than 7o C below ambient water temperature for water discharges from the FSRU.	Section 7

Source Reference	Requirement	Addressed
Sch03 C27 Amenity	**Construction Hours** Unless the Secretary agrees otherwise, the Proponent may only undertake construction activities on site between: (a) 7 am to 6 pm Monday to Friday; (b) 8 am to 1 pm Saturdays; and (c) at no time on Sundays and NSW public holidays. The following construction activities may be undertaken outside these hours without the approval of the Secretary: (a) the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; (b) emergency work to avoid the loss of life, property and/or material harm to the environment; (c) construction works that cause LAeq (15 mins) noise levels that are: • no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and • no more than the noise management levels specified in Table 3 of the Interim Construction noise Guideline (DECC, 2009) at other sensitive land uses; and • continuous or impulsive vibration values, measured at the most affected residence, are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing vibration: a technical guideline (DEC, 2006); and • intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing vibration: a technical guideline (DEC, 2006); or (d) where a negotiated agreement has been reached with affected receivers;	Section 7
Sch03 C28(a) Noise and Vibration - minimisation	The Proponent must minimise the noise of the development, including any associated traffic noise.	Section 7
Sch03 C29 Lighting	The Proponent must: (a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development; (b) ensure that all external lighting associated with the development complies with Australian Standard AS4282 (INT) 1995 - Control of Obtrusive Effects of Outdoor Lighting, or its latest version; and (c) ensure the visual appearance of all ancillary infrastructure (including paint colours, specifications and screening) blends in as far as possible with the surrounding landscape.	Section 7
Sch03 C31 Air	The Proponent must minimise and/or prevent the: (a) dust emissions of the development, including wind-blown and traffic generated dust; (b) surface disturbance of the development; and (c) greenhouse gas emissions of the development.	Section 7
Sch03 C31 Air	The Proponent must ensure that air emissions from the development comply with the requirements of any EPL issued for the development.	Section 7
Sch03 C35 Meteorology	35. Prior to commencement of construction, the Proponent must ensure that there is a suitable meteorological station operating in the vicinity of the site. The meteorological station must be maintained so as to be capable of continuously monitoring the following parameters: air temperature, wind direction, wind speed, rainfall, relative humidity, and any requirement specified in an EPL. Unless a suitable alternative is approved by the Secretary following consultation with the EPA, the meteorological station must be capable of monitoring weather conditions in accordance with: (a) AM-1 Guide to Siting of Sampling Units (AS 2922-1987); (b) AM-2 Guide for Horizontal Measurement of Wind for Air Quality Applications (AS 2923-1987); and	Section 7

Source Reference	Requirement	Addressed
	(c) AM-4 On-Site Meteorological Monitoring Program Guidance for Regulatory Modelling Applications.	
Sch03 C36(a) Waste	The Proponent must minimise the waste generated by the development.	Section 7
Sch03 C36(b) Waste	The Proponent must classify all waste generated on site in accordance with the Waste Classification Guidelines (NSW EPA 2014), or its latest version.	Section 7
Sch03 C36(c) Waste	The Proponent must store and handle all waste generated on site in accordance with its classification.	Section 7
Sch03 C36(d) Waste	The Proponent must ensure all waste is disposed of off-site at appropriately licenced facilities.	Section 7
Sch04 C01 Environmental Management Strategy	Prior to the commencement of construction, the Proponent must prepare an Environmental Management Strategy for the development to the satisfaction of the Planning Secretary. (Refer to EMS for further details) The Proponent must implement the approved Environmental Management Strategy for the development.	EMS
Sch04 C05 Incident Notification	The Department must be notified in writing via the Department's Major Projects Website immediately after the Proponent becomes aware of an incident on site. The notification must identify the development, including the application number, and set out the location and nature of the incident.	EMS Section 9.12 (Notifiable incident under the POEO Act
Sch04 C06 Non-compliance Notification	The Department must be notified in writing to via the Department's Major Projects Website within 7 days after the Proponent becomes aware of any non-compliance. The notification must identify the development, including the application number, set out the condition of approval that the development is non-compliant with, the way in which it does not comply, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance.	EMS Section 8.6 (Non-compliance, corrective, and preventative actions)
Sch04 C07 Compliance Reporting	The proponent must provide regular compliance reports to the Department on the development in accordance with the relevant requirements of the Department's guideline Compliance Reporting Post Approval Requirements (2020), or its most recent edition.	EMS Section 8.4 (Environmental reporting)
Sch04 C08 Regular Reporting	The Proponent must provide regular reporting on the environmental performance of the development on its website in accordance with the reporting requirements in any strategies, plans or programs approved under the conditions of this approval.	EMS Section 8.4 (Environmental reporting)

3.3 Environment Protection Licence (EPL 21529)

The project requirements under the Project EPL (EPL No. 21529) relevant to the Systems Commissioning and Preservation Stage of the works are presented below in Table 3-2, including how the requirement has been addressed within this EMP or suitable cross reference to the overarching EMS.

Table 3-2 Relevant conditions of EPL 21529

Source Reference	Requirement	Addressed
L1.1 Limit Conditions - Pollution of waters	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	Section 7
L3.1 Potentially offensive odour	The licensee must not cause or permit the emission of offensive odour beyond the premises boundary. Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in	Section 7

Source Reference	Requirement	Addressed
	the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.	
O2.1 Operating Conditions - Maintenance of plant and equipment	All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	Section 7
O3.1 Operating Conditions - Dust	The premises must be maintained in a condition that minimises and/or prevents the emission of dust from the premises at all times.	Section 7
O4.5 Processes and management	The southern pond in Berth 101 must be maintained to ensure that sedimentation does not reduce their capacity by more than 20% of the design capacity.	Section 7
R1.1 - Annual Return documents	The licensee must complete and supply to the EPA an Annual Return in the approved form comprising: 1. a Statement of Compliance, 2. a Monitoring and Complaints Summary, 3. a Statement of Compliance - Licence Conditions, 4. a Statement of Compliance - Load based Fee, 5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan, 6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and 7. a Statement of Compliance - Environmental Management Systems and Practices. At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.	EMS Section 8.4.2 (Annual Return)
R2.1 Notification of environmental harm	**Notification of Environmental Harm** Notifications must be made by telephoning the Environment Line service on 131 555. *Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.*	EMS Section 9.12 (Notifiable incident under the POEO Act)
R2.2 Notification of environmental harm	The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.	EMS Section 9.12 (Notifiable incident under the POEO Act)
E2.1 Pollution Incident Response Management Plan (PIRMP)	**Pollution Incident Response Management Plan (PIRMP)** The Licensee must prepare a 'Pollution Incident Response Management Plan' (PIRMP) that complies with Part 5.7A of the POEO Act (1997) in relation to the activity to which the licence relates. The PIRMP must be in the form required by the 'Regulations' and include the following: - the procedures to be followed by the holder of the relevant environment protection licence, or the occupier of the relevant premises, in notifying a pollution incident to: (Refer to EMS for further details)	Section 4.4.2

3.4 EIS Environmental Commitments

The project commitments made under the Project Environmental Impact Statement (EIS, GHD 2019) relevant to the Systems Commissioning and Preservation phase of the works are presented below in Table 3-3, including how the commitment has been addressed within this EMP or suitable cross reference to the overarching EMS.

Table 3-3 Relevant EIS environemntal commitments

Ref	Requirements	Addressed
EIS_01 (H2)	A protocol to be followed in the event of an unexpected find would be developed and would include clear lines of communication and stop work procedures to be followed.	Section 7
EIS_02 (TB5)	Declared priority weeds will be managed according to requirements of the NSW Biosecurity Act 2015. Soil material and stripped groundcover vegetation with the potential to contain priority weeds will not be removed from the project site. Soil disturbance will be avoided as much as possible to minimise the potential for spreading weeds.	Section 7
EIS_03 (TB8 / W11)	A site-specific Emergency Spill Plan will be developed and will include spill management measures in accordance relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including TfNSW and EPA officers).	Section 4.4
EIS_04 (TB10)	Any herbicides used for weed control will be applied to the manufacturer's specifications and as outlined in the manufacturer's MDSD.	Section 7
EIS_05 (AQ4)	Control on-site traffic by designating specific routes for haulage and access and limiting vehicle speeds to below 25 km/hr	Section 7
EIS_06 (G1)	All plant and equipment used during the construction works shall be regularly maintained to comply with the relevant exhaust emission guidelines.	Section 7
EIS_07 (LV6)	Roads providing access to the site and work areas would be maintained free of dust and mud as far as reasonably practicable.	Section 7
EIS_08 (ME10)	Appropriate waste containment facilities will be included on site and managed to avoid overflow or accidental release to the environment.	Section 7
EIS_09 (ME10)	All recyclable and general wastes to be collected in labelled, covered bins (and compacted where possible) for appropriate disposal at a regulated waste facility. Solid non-biodegradable and hazardous wastes will be collected and disposed of onshore at a suitable waste facility	Section 7
EIS_10 (ME11)	A Safety Data Sheet (SDS) will be available for chemicals and hydrocarbons in locations nearby to where the chemicals / wastes are stored.	Section 7
EIS_11 (ME12)	Emergency spill response procedures would be developed and implemented when required.	Section 7
EIS_12 (NV1)	Provide site inductions to all employees, contractors and subcontractors. The induction must at least include: - All relevant project specific and standard noise and vibration mitigation measures - Relevant licence and approval conditions - Permissible hours of work - Any limitations on noise generating activities with special audible characteristics - Location of nearest sensitive receivers - Construction employee parking areas - Designated loading/unloading areas and procedures - Site opening/closing times (including deliveries) - Environmental incident procedures	Section 4.3
EIS_13 (NV6)	Turn off equipment after use.	Section 7
EIS_14 (NV7)	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. No excessive revving of plant and vehicle engines. Controlled release of compressed air.	Section 7
EIS_15 (TB9/W12)	An emergency spill kit will be kept on site at all times. All staff will be made aware of the location of the spill kit and trained in its use.	Section 7

4 Environmental management framework

The following section outlines the overarching management arrangements for the project including roles and responsibilities, reporting, records, training, incident management and complaints.

4.1 Roles and responsibilities

All personnel working on the Project are responsible for:

- Reporting all environmental incidents or near misses to their supervisor.
- Carrying out work duties at all times in an environmentally sensitive and responsible manner.

The key personnel and their responsibilities with regards to environmental management during the Systems Commissioning and Preservation Stage are detailed below in Table 4-1.

Table 4-1 Roles and responsibilities with regards to environmental management

Role	Responsibility
Site Manager	The environmental responsibilities of the Site Manager include: • Ensure adequate resources are assigned to the site • Overall site responsibility for Health, Safety, Security and Environmental Compliance • Day to day management of the site • Ensures that environmental incidents requiring investigation are followed up and measures are effective • Liaison with Squadron Energy and government authorities as required • Ensure Leaders are completing training scheduling as per the Training Report received from the Business Operations Coordinator.
Corporate Environment Manager	The environmental responsibilities for the Corporate Environment Manager include: • Ensure employees and contractors are provided with, and understand the known environmental hazards and risks associated with the scope of work • Ensure there is compliance with statutory requirements, EPA Licence and conditions of Project Approval • Ensure employees are completing relevant environmental training as per the training matrix • Oversees environmental and operational activities and provides direction • Ensuring environmental risk management is incorporated into work processes.
Site HSE Manager	The environmental responsibilities of the Site HSE Manager include: • Review this EMP annually, or as otherwise agreed with DPHI • Ensure that environmental obligations are met and prepare reports on compliance, including the annual compliance report • Obtain relevant environmental licences, permits and approvals • Manage environmental consultants and contractors • Consultation with regulatory agencies • Liaise with government agencies and relevant stakeholders • Supports the investigation of environmental incidents and near misses • Maintain environmental documents.
Site personnel	The environmental responsibility of all site personnel (including employees and subcontractors) include: • Comply with this EMP and associated environmental management processes and procedures • Prepare activity specific Environmental Work Method Statement (EWMS) that comply with the EMS and EMP • Conduct work in an environmentally responsible manner and in accordance with the OEMP and Environmental Work Method Statements (EWMS) as required • Report any environmental incidents or near-miss environmental incidents • Maintain environmental records as required.

4.2 Environmental monitoring, inspections and auditing

4.2.1 Reporting and monitoring

Environmental reporting and monitoring and audit requirements for the project are undertaken in accordance with the approved management plans (refer to Section 1.2) and SQE's EPL No 21529.

Specific environmental reporting requirements to be undertaken during the Systems Commissioning and Preservation Stage are presented below in Table 4-2. Refer to Section 4.4 and Section 4.5 respectively for reporting requirements in response to incident and non-compliance management.

Table 4-2 Environmental reporting requirements

Report	Source	Requirement	Report name	Frequency	Resp.
Environmental performance reporting	CoA 8, Sch. 4 Section 66(6) of the POEO Act.	The Proponent must provide regular reporting on the environmental performance of the development on its website in accordance with the reporting requirements in any strategies, plans or programs approved under the conditions of this approval. Under the Protection of the Environment Operations Act 1997 (POEO Act), holders of environment protection licences (licensees) must publish or make pollution monitoring data available to members of the public.	EPL Monthly Report	Monthly	HSE Manager
EPL Reporting	EPL Cond. R1.5	The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').	EPL Annual Return	Annually	HSE Manager

4.2.2 Environmental inspections

As a minimum, periodic environmental inspection of the work sites with the relevant site personnel (Site HSE Manager or delegate) to evaluate the effectiveness of environmental controls and general compliance with the implementation of this EMP for site-based activities.

All environmental inspections including observations and works undertaken to repair / rectify any issues identified will be documented accordingly.

4.2.3 Environmental auditing

Environmental audits will be undertaken in accordance with Section 8.3 of the approved Stage 2A and 2B EMS. The audit scope where applicable, will be broadened to include the works covered by the Systems Commissioning and Preservation Stage.

4.2.4 Ecological Health Monitoring Program

In accordance with Condition M5.1 of EPL 21529, AIE are required to implement the Port Kembla Ecological Health Monitoring Program and associated reporting as per the GHD/AIE proposal dated September 2021, Rev G (EPA reference DOC21/864104-1).

The purpose of the Ecological Health Monitoring Program (EHMP) (the Program) is to assess and monitor impacts of Port Kembla Energy Terminal (PKET) construction and post-bulk dredging activities on harbour

wide ecological health of Port Kembla Harbour. The monitoring program has been designed in accordance with the NSW Environmental Protection Authority (EPA) requirements as specified in Environment Protection Licence 21529.

Table 4-3 below includes a summary of the EHMP monitoring phases completed to date.

Table 4-3 EHMP Monitoring status

EHMP Phase	Description	Status
Phase 1	Baseline Construction Monitoring Event 1	Completed in the summer of 2021/2022. Outcome documented in the Port Kembla Gas Terminal Ecological Health Monitoring Report – Year 1, GHD December 2022.
Phase 2	Construction Monitoring Event 2, completed in the summer of 2022/23	Completed in the summer of 2022/2023. Outcome documented in the Port Kembla Gas Terminal Ecological Health Monitoring Report – Year 1 and 2, GHD December 2023.
Phase 3	Construction Monitoring Event 3	Completed in the summer of 2023/2024. Report pending.
Additional phases	By negotiation and agreement with EPA	To be determined.

This EMP will be updated accordingly to reflect any changes to the requirements associated with the implementation of the EHMP relevant to the Systems Commissioning and Preservation Stage.

4.3 Environmental training and awareness

All personnel working on the site, including sub-contractors, shall be competent to conduct their work without harm to people, environment or assets. Personnel shall complete all necessary site training and induction requirements before commencing work on site.

Communication and training on environmental issues within the project team will be maintained, as a minimum, through the following forums (organiser as noted):

- Periodic project team meetings.
- Periodic Environmental management team meetings with relevant contractors
- Toolbox talks and daily pre-start briefing
- Minutes of formal meetings will be taken and distributed to record issues raised and actions required, with action status established at subsequent meetings.
- Monthly review of the internal SQE Environmental Compliance Tracking register .

All internal meetings include appropriate documentation in the form of agenda and formal distribution via the project's document system.

4.4 Incident management and emergency response

Incident management and emergency response are detailed in the approved management plans. A summary is provided in the sections below.

4.4.1 Incident management

All incidents that occur during the undertaking of the Systems Commissioning and Preservation Stage will be managed to satisfy the requirements of the EMS.

The Site HSE Manager must be notified immediately of any actual or potential environmental incident or near miss. These may include, but are not limited to the following:

- Spill of any dangerous goods or hazardous substance to ground or water.

- Works conducted outside of the approved hours of construction / operation without appropriate authorisation.
- Substantiated complaints received from members of the community or regulatory authorities.
- Regulatory breaches such as fines, prosecutions, improvement notices, breaches of licence conditions.
- All incidents of third-party property damage or loss.
- Incidents involving impact or potential damage to items or places of cultural heritage significance.
- Any other unexpected find associated with heritage, contamination or fauna.

In the event of a Notifiable Incident as defined under the Protection of the Environment Operations Act 1997 (POEO Act), the Site HSE Manager is responsible for immediately notifying the EPA, and any other relevant authority, of pollution incidents on or around the site via the EPA Environment Line (telephone 131 555) in accordance with Part 5.7 of the POEO Act. The circumstances where this will take place include:

- If the actual or potential harm to the health or safety of human beings or ecosystems is not trivial.
- If actual or potential loss or property damage (including clean-up costs) associated with an environmental incident exceeds $10,000.

Follow-up written notification to the EPA and any other relevant authorities will be required in accordance with the POEO Act and requirements of the EPA. This includes the provision of written details of the notification to the EPA within 7 days of the date on which the incident occurred.

All notifiable incidents will also be managed, documented, and reported in accordance with Section 9.1.2 of the EMS (Notifiable incident under the POEO Act).

4.4.2 Emergency response

Actual or potential emergency situations will vary in type and severity. The required level of response and notification will be at the discretion of the Site Manager in consultation with the Site HSE Manager.

Any emergency situation may require only isolated containment and control or may require the complete evacuation of the site and notification of relevant emergency services. Consideration should be made of the response requirements for different situations. If at any time there is uncertainty on how to proceed, response should be for the worst possible scenario. Ultimately, the Site Manager has authority and responsibility to instigate an evacuation if he/she feels it is warranted.

In the event of an emergency, the following plans listed in Table 4-4 shall be consulted and implemented, as relevant.

Table 4-4 Project emergency plans

Plan	Reference	Application
Principal Contractor Local Emergency Response Plan	-	Principal Contractor's emergency response plan implemented in the event of any incident occurring during a Project activity as per the Contractor's policies and management framework.
SQE Port Kembla Gas Terminal Emergency Spill Plan	PKGT-AIE-PRO-039	Developed as a sub-plan to the EMS to be implemented detailing: • Response plans in the event of land or water-based spill events. • Inspections, notification, and incident management requirements in accordance with the Infrastructure Approval (SSI 9471) and EPL No 21529 in relation to spills.
SQE Pollution Incident Response Management Plan (PIRMP)	PKGT-AIE-PRO-007	Implemented immediately in the event of a pollution incident occurring during a Project activity. The PIRMP: • Outlines the actions to be taken during or immediately after a pollution incident. • Lists details of relevant authorities to be notified, as required. • Outlines community and neighbour notification details, as required.
SQE Emergency Management Procedures	PKGT-AIE-PRO-014	Implemented immediately in the event of any emergency incident occurring during the Project. Procedures include: • Types of emergencies and the detailed steps to be taken in response. • Notification details to relevant authorities and AIE Project team. • Incident response to follow up from incident and preventative actions to be implemented, if applicable.

4.5 Environmental non-compliance and corrective actions

A non-compliance, for the purpose of the Systems Commissioning and Preservation Stage of PKET is defined in the Conditions of Approval as an occurrence, set of circumstances or development that is a breach of the approval.

Where an actual or potential non-compliance is identified, it shall be investigated and reported to DPHI in accordance with Condition 6 of Schedule 4 of the Approval which requires the following:

The Department must be notified in writing via the Department's Major Projects Website within 7 days after the Proponent becomes aware of any non-compliance. The notification must identify the development, including the application number, set out the condition of approval that the development is non-compliant with, the way in which it does not comply, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance.

Non-compliances shall be recorded and addressed by raising a non-compliance within the Squadron Energy compliance /risk management tool (Archer), using the 'Event Management' module. Non-compliance records on Archer include documentation and tracking of the following:

- Event type
- Date
- Category (Including 'Environment')
- Event description
- Location / Project asset
- Event owner
- Other stakeholders
- Non-conformance rating
- Non-conformance type
- Non-conformance status
- Supporting attachments

Corrective actions will be developed to rectify non-compliances and preventative actions in order to prevent a re-occurrence of the non-compliance. A register of non-compliances, corrective actions and preventative actions will be maintained through Archer.

The Environmental Compliance and Performance Report will be prepared on an annual and monthly basis respectively, documenting project environmental performance, compliance related issues and the associated corrective and preventative actions and opportunities for improvement.

4.6 Complaints management

All complaints, where a third party has identified a construction activity as being unsatisfactory or unacceptable, will be dealt with promptly and efficiently in accordance with the complaint and dispute response flow chart shown in Figure 4-1, utilising the cloud-based platform Consultation Manager for the management of all complaints and enquiries.

SQE will operate a free 24-hour Community Information Line (1800 789 177) where members of the community can leave details about an inquiry, they may have regarding construction activities and this message will be passed on to site personnel and/or the Stakeholder Engagement Team, as appropriate. The phone number is listed on the SQE website (https://www.squadronenergy.com/our-projects/port-kembla-energy-terminal) and will be provided on all community newsletters.

In addition, a dedicated project email has been established (portkembla@squadronenergy.com) for receipt of any enquiries / complaints with a link provided on the SQE website.

Initial responses to complaints will be provided within 24 hours of the complaint being received. As part of the response, a review of the activity will be undertaken. If required and possible, immediate changes will be made to reduce any impact on the community. In some cases, the issues cannot be resolved immediately, ongoing actions might be required to resolve the issue.

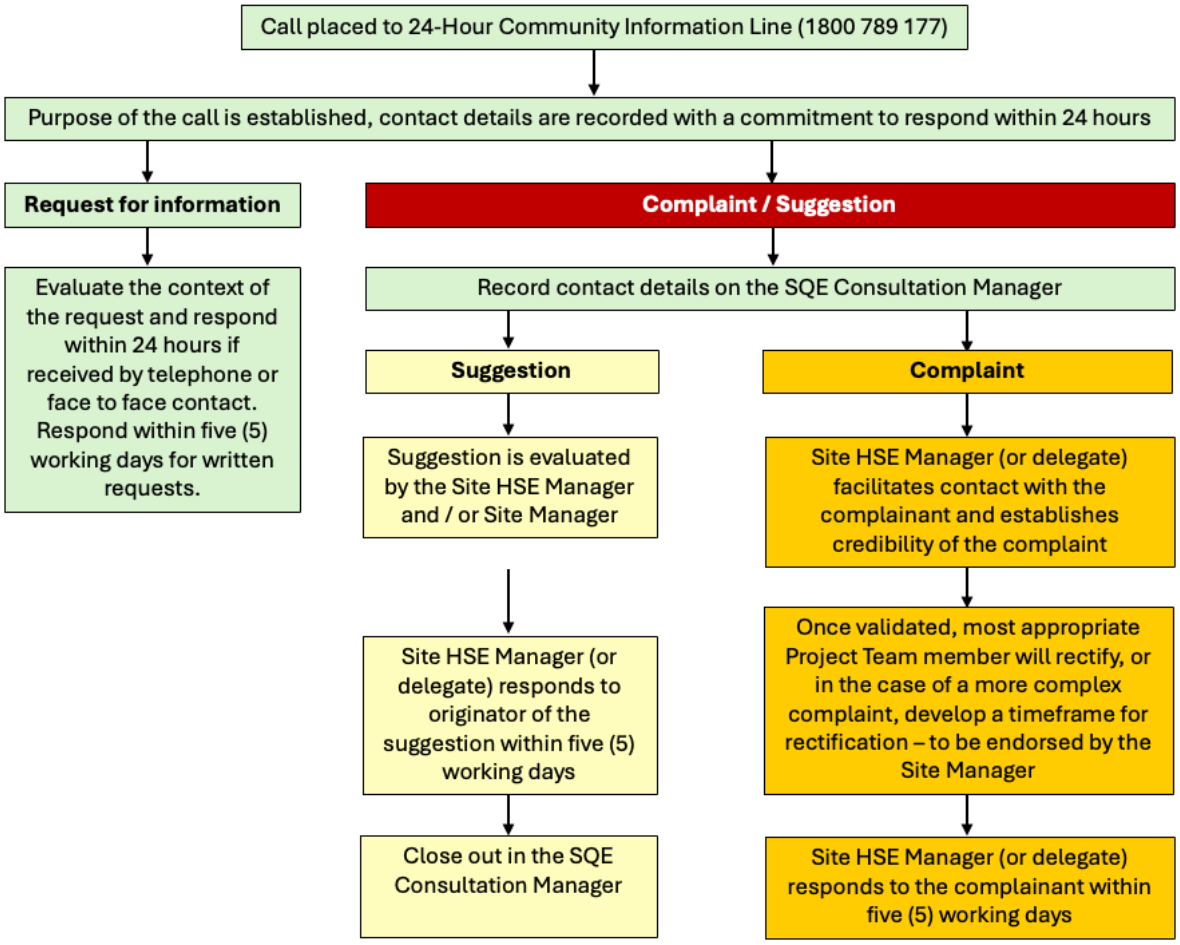
All complaints will be recorded in Consultation Manager. The following information will be recorded for each complaint:

1. The date and time of the complaint.
2. The method by which the complaint was made.
3. Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.
4. The nature of the complaint.
5. The action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant.
6. If no action was taken by the licensee, the reasons why no action was taken.

Consultation Manager will be maintained by the Site HSE Manager or delegate, and will detail what the issue was, initial response provided, how and when the issue was resolved, and by whom. Records will be kept for at least four years after the complaint was made and will be produced on request by any authorised officer of the EPA.

Where resolving a complaint with a third party is protracted or develops into a dispute, the Site HSE Manager shall escalate proactively to Corporate Environment Manager or Site Manager to assist with resolution. The responsible party will work proactively with the complainant to resolve the dispute including having face to face meetings, site familiarisation sessions and agreeing on actions to resolve the dispute. All communications and agreed actions shall be documented within Consultation Manager.

Figure 4-1 Complaint and dispute response flow chart



5 Existing environment

The following sections provide an outline of the existing environment for aspects relevant to the Systems Commissioning and Preservation Stage of the works. For other environmental aspects not covered below, refer to the overarching EMS and EIS.

5.1 Stormwater management

Based on the data provided in the AIE Port Kembla *Development Site Drainage Water Treatment Study Scope of Work* (Incitias, 20/07/2021), the mean annual rainfall received by the site is 1118mm, with a mean monthly maximum being received in March (143mm) and a mean monthly minimum being received in July (53mm). Further detail with regards to rainfall statistics for the area surrounding the site is provided below in Table 5-1.

Table 5-1 Monthly rainfall data (millimetres)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	97	127	143	108	81	118	53	71	57	86	88	73	1118
Lowest	10	7	6	1	2	8	0	0	0	2	16	8	406
Median	81	95	103	58	56	80	38	30	49	63	85	54	1076
Highest	318	375	582	492	431	623	219	626	206	316	302	277	1847

Data from Port Kembla (BSL Central Lab) weather station for years 1964-2018 (Station Number: 068131)

During the Systems Commissioning and Preservation Stage of the works, the surface of the site will be completely stabilised, consisting of a combination of asphalt (road) and concrete and compacted road base surfaces.

The site is divided into two (2) watershed catchments, the Northern and the Southern Catchments. Further details regarding flow path, discharge point and primary treatment processes are provided below in Table 5-2, and presented in Figure 5-1.

Table 5-2 Surface water management

Catchment	Flow characteristics	Surface water control measures
Northern	Contains approximately 20% of the overall site surface area All runoff derived from concrete and compacted road-base Serviced by perimeter open trench drain along the western edge of the site Drains to a harbour discharge point at the north-western corner of the site.	1 x inline stormwater baffle box 1 x inline stormwater FlowFilter (refer to Appendix C for further details of the inline FlowFilter)
Southern	Contains approximately 80% of the overall site surface area Runoff derived from concrete, compacted road-base, and sealed roadways Serviced by perimeter open trench drain along the western edge of the site in addition to road stormwater pits with water also received from Seawall Road runoff Discharges from southern sediment pond overflow, draining to the harbour at the southern corner of the site.	400KL sediment pond, completed with baffles and access for sediment removal and maintenance Floating oil separator within sediment pond (including ability to remove floating trash and debris) - refer to Appendix C for further details of the floating oil separator. Open trench drain - 2 x inline gross pollutant traps (GPTs) (Ecoceptor 1500 or similar) capable of removing sediment and light-liquids prior to discharge into the southern sediment pond (refer to Appendix C for further details).

Figure 5-1 Surface water management overview

5.2 Soils and contamination

Stage 1 of the project at Berth 101 (Early Enabling Works) involved the demolition and removal of all existing surface infrastructure, disconnection and removal of all underground services, and excavation to 2.5 m PKHD and was completed on 18 January 2022. The material excavated as part of the demolition / remediation process was segregated into contaminated and uncontaminated materials, with contaminated materials either disposed off-site or segregated for further management during the later stages of the project, and uncontaminated materials stockpiled and generally reused on site as controlled fill.

During Stage 1, 66 individual unexpected finds were identified. Of these 66, 54 were considered to be contamination requiring remediation with 53 being asbestos and one being the presence of coal tar in the walls of a former substation. The remaining 12 unexpected finds were not considered to be contamination.

At the culmination of Stage 1, ACM remained at the boundary of, and beyond the dredge and excavation area limit, generally relating to redundant infrastructure such as pipes and conduits.

Additionally, asbestos remains contained onsite within the T5 containment cell and stockpiling area on the former C6 conveyor. Future works must consider and manage these items to avoid impacts on human health and the environment.

Ongoing management of these items will be required in accordance with the Berth 101 Long Term Environmental Management Plan (LTEMP) (at the time of preparing this EMP, the Berth 101 LTEMP was in early draft and was not available for inclusion).

A summary of remnant asbestos remaining on site (including beyond the excavation boundary) is shown in Figure 5-2.

During the Systems Commissioning and Preservation Stage, fuel and chemical storage will be minimal and restricted to low volumes of fuel (diesel and petrol), lubricants and oils. Any major refuelling of plant and equipment if required would be undertaken by a mobile min-tanker or similar.

Figure 5-2 Summary of remnant asbestos remaining on site

**Source: Figure 3 of the Stage 1 Conclusion – Contamination and stockpile summary (GHD, 2022)*

6 Environmental aspects and impacts

The following section outlines identified environmental risks and measures to mitigate impacts on the environment from the Systems Commissioning and Preservation Stage in addition to those already identified in the approved Stage 2A and 2B management plans.

An environmental risk assessment was undertaken in May 2024 for the Systems Commissioning and Preservation Stage as presented in Table 6-1, using the SQE risk assessment descriptors, risk likelihood descriptors and risk matrix details below in Figure 6-1.

The risk assessment determined that all environmental aspects and impacts associated with the works for the Systems Commissioning and Preservation Stage are considered either medium or low risk, and can be managed with the implementation of existing mitigation measures and controls as detailed in the relevant approved Stage 2A and 2B management plans (refer to Table 1-1 for details on the relevant management plans), in addition to the additional mitigation measures and controls presented in the sections below.

Figure 6-1 SQE Risk Matrix

Assessment Criteria – Likelihood

RATING	POTENTIAL FOR RISK TO OCCUR	PROBABILITY
Almost Certain	**Expected** to occur **in most** circumstances.	>90%
Likely	Will **probably** occur **in most** circumstances.	51-90%
Possible	More or less an **even chance** of occurring.	26-50%
Unlikely	**Not expected** to occur.	10-25%
Rare	Would **only** occur in **exceptional** circumstances.	<10%

Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium

Assessment Criteria – Consequence

RATING	ENVIRONMENT
Catastrophic	**Impact Scale:** Catastrophic environmental impacts that are largely or entirely uncontained, resulting in extensive off-site impacts. **Impact Duration:** Permanent and irreversible harm to the environment is likely. Significant rehabilitation/ restoration works is required and with significant cost. Full recovery is not likely, however partial recovery may be possible over the long term. **Legislation:** Major breach of legislation likely to result in prosecution. Partial or full restriction on operations is likely.
Major	**Impact Scale:** Unauthorised and significant environmental impacts that are largely uncontained, resulting in off-site impacts. **Impact Duration:** Long-term impacts (>10 years). Significant rehabilitation/ restoration work is required over the long term, but eventual partial or full recovery is likely. **Legislation:** Major breach of legislation that may result in prosecution or other regulatory actions. Partial or full restriction on operations is possible.
Moderate	**Impact Scale:** Unauthorised environmental impacts largely contained to the project site but may involve some off-site impacts. **Impact Duration:** Temporary, medium-term impacts (3-10 years). Rehabilitation/ restoration work is required over the medium term but likely to result in eventual full recovery. **Legislation:** Breach of legislation or approval condition. Prosecution unlikely but other regulatory action almost certain.
Minor	**Impact Scale:** Unauthorised environmental impact that is contained to the project site but may extend outside the immediate work/operational area. **Impact Duration:** Temporary, short-term impacts (i.e.. 1-3 years). Rehabilitation/ restoration work is required over the short term and will result in eventual full recovery. **Legislation:** Breach of approval condition that is reportable to government agencies. Regulatory action may occur.
Insignificant	**Impact Scale:** Localised environmental impact that is contained to the project site and contained to the immediate work/operational area. **Impact Duration:** Temporary and very short-term impacts (i.e.. days/ weeks/months). Rehabilitation/ restoration work can be undertaken quickly, without significant costs, and will result in full recovery. **Legislation:** Minor breach of a project plan / procedure. Generally, not an event reportable to government agencies.

Table 6-1 Systems Commissioing and Preservation environmental risk assessment

Activity	Env Aspect	Env Impact	Likelihood / Consequence Risk	Key management tool
Systems Commissioning	**Water** Uncontrolled water release Inclement weather (rainfall)	Water quality impact Aquatic flora and fauna impact	Unlikely / Minor Medium	• Stormwater controls • Clean water for hydrostatic testing • Monitoring and inspection • Incident management procedure
	Contamination Interception of known or unknown contamination	Ground contamination Exposure of ACM Unlawful or inappropriate material disposal	Unlikely / Minor Medium	• Known location of existing contamination on site • Review known contamination locations prior to any ground disturbance • Implementation of unexpected finds protocol
	Contamination Hydrocarbon spills	Ground contamination Water quality impact	Unlikely / Insignificant Low	• Minimal volumes to be stored • Bunding controls • Refuelling controls • Minimal mobile vehicles / plant on site • Monitoring and inspection • Incident and emergency response
	Air quality Inclement weather (wind) Traffic	Nuisance dust generation	Unlikely / Insignificant Low	• Sealed surface • Minimal traffic movements • Inspection • Incident and emergency response
	Noise Noise generated from gas release	Impact on sensitive receivers	Unlikely / Insignificant Low	• Adherence to approved hours • Inspection • Incident and emergency response
Preservation	**Water** Uncontrolled water release Inclement weather (rainfall)	Water quality impact Aquatic flora and fauna impact	Unlikely / Minor Medium	• Stormwater controls • Clean water for hydrostatic testing • Monitoring and inspection
	Contamination Interception of known or unknown contamination	Ground contamination Exposure of ACM Unlawful or inappropriate material disposal	Unlikely / Minor Medium	• Known location of existing contamination on site • Review known contamination locations prior to any ground disturbance • Implementation of unexpected finds protocol
	Contamination Hydrocarbon spills	Ground contamination Water quality impact	Unlikely / Minor Medium	• Minimal volumes to be stored • Bunding controls • Monitoring and inspection
	Air quality Gas storage / testing	Air quality impacts	Unlikely / Insignificant Low	• Use of inert gas where required (nitrogen) • Low volumes to be stored • Remote monitoring

7 Environmental mitigation measures and controls

With the implementation of the mitigation measures and controls presented below in Table 5-4, it is expected that environmental impacts associated with the Systems Commissioning and Preservation Stage of the works will be negligible.

Table 7-1 Water quality mitigation measures

Ref.	Mitigation measure	Timing	Responsibility
General			
EMM_01	Implement all reasonable and feasible measures to prevent, and if prevention is not reasonable or feasible, minimise any material harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under the approval.	As required	Site Manager
EMM_02	Ensure temporary lighting required during the construction period is sited and designed to avoid light spill into the surrounding area.	As required	Site Manager
EMM_03	Review the weekly forecast and monitor the potential for inclement weather such as wind and rainfall. In times of extreme inclement weather forecast, increase surveillance / monitoring as required.	Weekly	Site HSE Manager
EMM_04	Weeds are to be managed on site as required by a suitably licensed contractor, trained and qualified in the use of herbicides. Any herbicides used for weed control will be applied to the manufacturer's specifications and as outlined in the manufacturer's SDS.	As required	Site HSE Manager
EMM_05	Prior to any excavations required on site, consult with the HSE Manager to confirm location of pre-existing contamination (refer to Section 5.2).	Prior to any excavation	Site Manager
Stormwater and spill management			
EMM_06	Implement the emergency spill procedures as per Section 4.4 of this EMP to prevent / minimise the loss of fuels / chemicals or pollutants from entering the stormwater system.	As required	Site Manager
EMM_07	A Safety Data Sheet (SDS) will be available for chemicals and hydrocarbons in locations nearby to where the chemicals / wastes are stored.	As required	Site HSE Manager
EMM_08	All fuels and chemicals on site will be appropriately bunded in accordance with the NSW EPA's Storing and Handling Liquids: Environmental Protection - Participants Manual. Refer also to the Australian Standard AS 1940:2017 (The storage and handling of flammable and combustible liquids).	As required	Site HSE Manager
EMM_09	All site personnel will be appropriately trained through toolbox talks for the minimisation and management of accidental spills.	As required	Site Manager

Ref.	Mitigation measure	Timing	Responsibility
EMM_10	Ensure adequately stocked land-based hydrocarbon spill response kits are available on site at all times, located near the source of potential spills.	As required	Site HSE Manager
EMM_11	Ensure there an adequately stocked marine-based hydrocarbon spill response kit available on site, capable for deployment in the event of a marine spill.	As required	Site HSE Manager
EMM_12	The Southern Pond in Berth 101 must be maintained to ensure that sedimentation does not reduce their capacity by more than 20% of the design capacity.	As required	Site HSE Manager
EMM_13	The Southern Pond is to be inspected routinely to ensure there are no visual indicators of water contamination, including oil / grease sheens. Routine inspections are to be documented.	As required	Site HSE Manager
EMM_14	Ensure all in-line stormwater water management controls are inspected at minimum frequency of monthly, including a check for sediment build-up and signs of damage / blockage. The monthly inspection is to be documented.	As required	Site HSE Manager
Noise			
EMM_15	Works may only be undertake during the hours: (a) 7 am to 6 pm Monday to Friday; (b) 8 am to 1 pm Saturdays; and (c) at no time on Sundays and NSW public holidays. Approval may be required for any works outside of the above hours. Consult the HSE Manager	As required	Site Manager
Air Quality and dust			
EMM_16	Ensure dust generation from site is managed at all times to prevent any off-site dust migration. Implement suitable control measures such as reinstate stabilised surface or water application as required.	As required	Site HSE Manager
EMM_17	All plant and equipment used during the construction works shall be regularly maintained to comply with the relevant exhaust emission guidelines.	As required	Site Manager
EMM_18	Plant and equipment are to be turned off when not being used for an extended period of time.	As required	Site Manager
EMM_19	Prior to the commencement of daily use of any plant / equipment, complete and document a pre-start check to ensure the plant / equipment is operating free of any excessive exhaust emissions and to ensure there are no obvious signs of fluid leaks / spills.	As required	Site Manager
EMM_20	Ensure associated works do not cause or permit the emission of offensive odour beyond the premises boundary.	As required	Site Manager
EMM_21	Roads providing access to the site and work areas would be maintained free of dust and mud as far as reasonably practicable.	As required	Site Manager

Ref.	Mitigation measure	Timing	Responsibility
Waste and resource management			
EMM_22	Minimise waste generation where possible, and maximise recycling. Ensure adequate waste receptacles are provided on site to allow for waste segregation and recycling.	As required	Site Manager
EMM_23	Ensure that all waste to be taken off site is classified in accordance with the Waste Classification Guidelines (NSW EPA 2014), or its latest version.	As required	Site HSE Manager
EMM_24	Store and handle all waste generated on site in accordance with its classification	As required	Site Manager
EMM_25	Ensure all waste is disposed of off-site at appropriately licenced facilities	As required	Site HSE Manager
EMM_26	Whilst there are no planned excavations required during the Systems Commissioning and Preservation Stage of the works, in the unlikely event that excavation is required (i.e. emergency repairs etc.), ensure that the unexpected finds protocol (refer to Appendix A of this EMP) is implemented in the event of encountering potential unexpected contamination including the following: • Stained or discoloured fill, soils, or seepage water • Odorous fill, soils, or seepage water • Construction wastes such as concrete, bricks, timber, tiles, asbestos sheeting, fragments, and pipes • General rubbish such as plastic, glass, packaging • Imported materials.	As required	Site Manager
Ecological Health Monitoring Program			
EMM_27	Further negotiations to be undertaken with the EPA with regards to the need and timing of the next phase of monitoring in accordance with the Ecological Health Monitoring Program. Any associated changes to EPL 21529 to be reflected in this EMP.	As required	Site HSE Manager

8 Document management and review

8.1 Record management

Record management will be as required under Section 10.1 of the approved Stage 2A and 2B Environmental Management Strategy.

8.2 Document review and revision

This EMP will be reviewed and updated, as required under Condition 3 of Schedule 4 of Infrastructure Approval (SSI 9471) to ensure the objectives of the applicable approval conditions contained within are being met throughout the Systems Commissioning and Preservation Stage of the project. In addition, as required under Condition 4 of Schedule 4 of Infrastructure Approval (SSI 9471), this EMP must be reviewed, and if necessary, revised within 3 months (unless otherwise agreed with DPHI) for any of the following:

- Following the submission of an incident report as per Condition 5, Schedule 4 in Infrastructure Approval (SSI 9471) (refer to Section 9 of the Stage 2A and 2B EMS).
- Following approval of any modification to the conditions of approval outlined in Infrastructure Approval (SSI 9471).
- At the direction of the Planning Secretary as per Condition 4, Schedule 2 in Infrastructure Approval (SSI 9471).

Where a review leads to a revision of this plan, within four weeks the revised document will be submitted to the Planning Secretary for approval unless otherwise agreed with the Planning Secretary.

9 References

Australian Standard AS 4282:1995 - *Control of Obtrusive Effects of Outdoor Lighting*

Australian Standard AS 1940:2017 *(The storage and handling of flammable and combustible liquids).*

GHD 2018*, Port Kembla Gas Terminal Environmental Impact Statement (EIS)*

GHD 2021*, Port Kembla Ecological Health Monitoring Program and associated reporting as per the GHD/AIE proposal (EPA reference DOC21/864104-1)*

Incitias 2021*, AIE Port Kembla Development Site Drainage Water Treatment Study Scope of Work*

NSW DPIE 2020, *Environmental management guidelines for construction (Edition 4)*

NSW EPA 2014, *Waste Classification Guidelines*

NSW EPA 2021, *Environment Protection Licence No. 21529*, dated 3 December 2021.

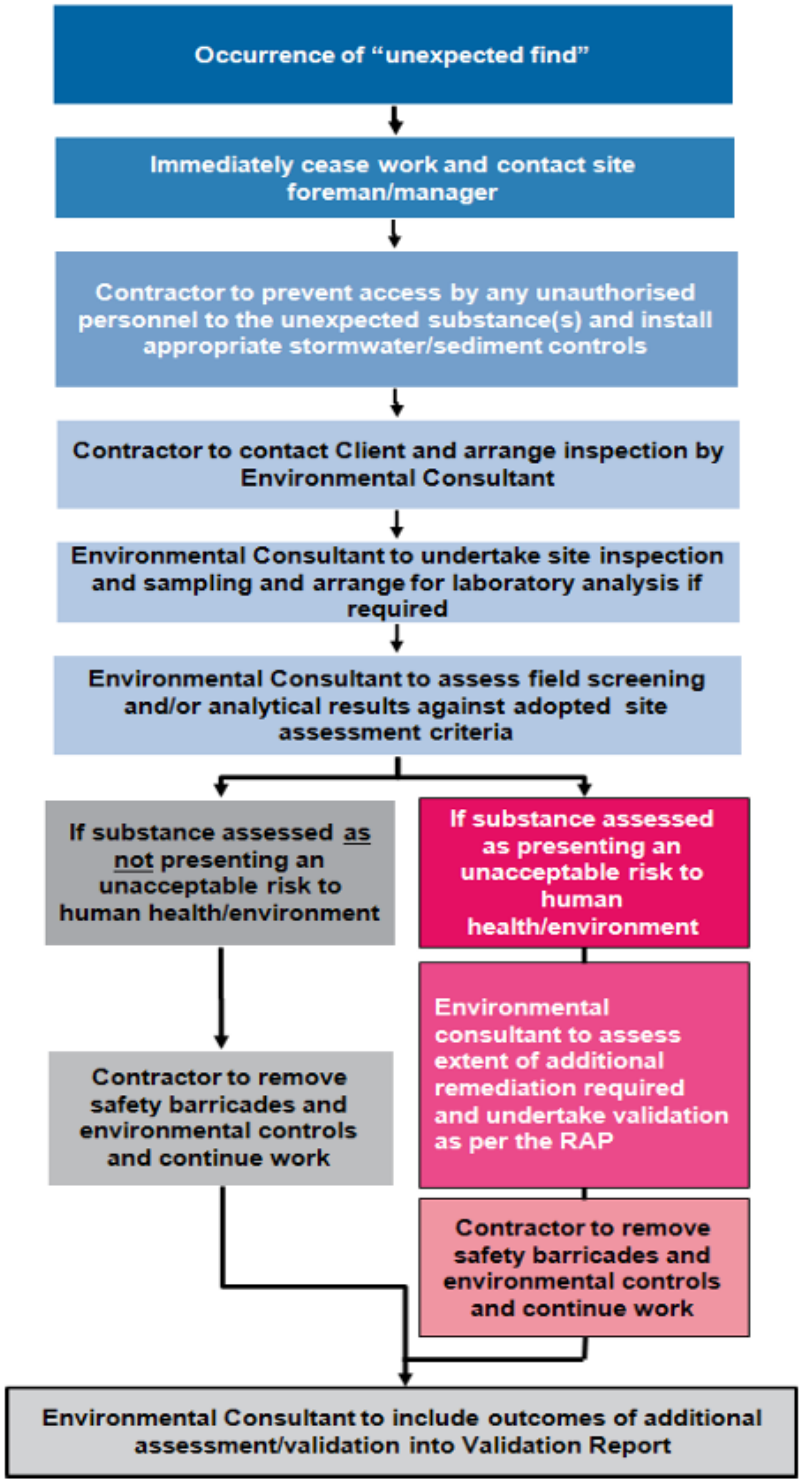
NSW Department of Planning, Industry and Environment (DPIE) 2020*, Compliance Reporting Post Approval Requirements*

NSW Government 1979, *Environment Planning and Assessment Act 1979* (EP&A Act)

NSW Government 1997, *Protection of the Environment Operations Act 1997* (POEO Act)

Appendix A Unexpected Finds Procedure

Contamination – Unexpected Finds Protocol



Heritage – Unexpected Finds Protocol

The Unexpected Finds Protocol that must be followed by any work personnel in the event of an unexpected heritage item being discovered. This procedure has been prepared in consultation with Heritage NSW and the ILALC.

(*Source: AIE Heritage Unexpected Finds Protocol Early Enabling Works Stage 1A, 2021*).

Table** Error! No text of specified style in document.**.1 Unexpected Heritage items find procedure

Step	Action
1	**Stop work, protect item and inform the site supervisor**
1.1	– Stop all work in the immediate area of the item and notify the Site Manager and the Site HSE Manager.
1.2	– Establish a 'no-go zone' around the item. Use high visibility fencing, where practical.
1.3	– Inform all site personnel about the no-go zone.
1.4	– Inspect, document and photograph the item.
1.5	*Is the item likely to be bone?* – Where it is obvious that the bones are human remains, you must notify the local police by telephone immediately. They may take command of all or part of the site. Where human remains are likely to be Aboriginal ancestral remains, also contact Heritage NSW on (02) 9873 8500.
1.6	– Confirm with the site environment representative that the site is unexpected and if a permit is in place
2	**Contact and engage an Aboriginal or Historical archaeologist and/or an Aboriginal heritage consultant**
2.1	– Site HSE Manager is to contact a qualified Aboriginal or Historical archaeologist to discuss the location and extent of the item and arrange a site inspection, if required. – If requested, provide photographs.
3	**Preliminary assessment and recording of the find**
3.1	– In a minority of cases, the Aboriginal or Historical archaeologist or ILALC Representative may determine from the photographs that no site inspection is required because no archaeological constraint exists for the Project (e.g., the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'). – Any such advice should be provided in writing to the Site Manager and Site HSE Manager (e.g., via email)
3.2	– Arrange site access for the Aboriginal or Historical archaeologist/Aboriginal heritage consultant to inspect the item as soon as practicable.
3.3	– Subject to the Aboriginal or Historical archaeologist/Aboriginal heritage consultant's assessment, work may recommence at a set distance from the item. Existing protective fencing established in Step 1 may need to be adjusted to reflect the extent of the newly assessed protective area. No works are to take place within this area once established.
3.4	– The Aboriginal or Historical archaeologist/Aboriginal heritage consultant may provide advice after the site inspection and preliminary assessment that no heritage constraint exists for the Project (e.g., the item is not a 'relic' or a 'heritage item' or an 'Aboriginal item'. Any such advice should be provided in writing (e.g., via email or letter with the consultant's name and company details clearly identifiable) to the Site Manager / Site HSE Manager.
3.5	– Where required, seek additional specialist technical advice (such as a forensic or physical anthropologist to identify skeletal remains. – The Aboriginal or Historical archaeologist/Aboriginal heritage consultant can provide contacts for such specialistconsultants.

Step	Action
3.6	– Where the item has been identified as a 'relic' or 'heritage item' or an 'Aboriginal object' the Aboriginal or Historical archaeologist should formally record the item. – Where an Aboriginal object is recorded it must be registered on the Aboriginal Heritage Information Management System (AHIMS) in accordance with section 89A of the NPW Act.
3.7	– Heritage NSW (Heritage Division for non-Aboriginal relics and Planning and Aboriginal Heritage Section for Aboriginal objects) can be notified informally by telephone at this stage by the AIE HS&E Manager Any verbal conversations with regulators must be noted on the Project file for future reference. – Heritage NSW Environment Line ph. (02) 9873 8500. – Email: heritagemailbox@environment.nsw.gov.au – Registered Aboriginal Parties (RAP) will be notified at this point to inform them of unexpected find.
4	– **Aboriginal or Historical Archaeologist to prepare management requirements for site**
4.1	– An archaeological or heritage management plan is developed outlining management actionsto ensure damage to the site is minimised and work can recommence. – This plan will be developed by the Aboriginal or Historical archaeologist in consultation with the RAP's, Heritage NSW and DPHI as required.
5	**Notify the regulator, if required.**
5.1	– If notification is required, complete the template notification letter, including the archaeological/heritage management plan and other relevant supporting information. For historical relics a Section 146 notification form will be required to be submitted to the HeritageDivision.
5.2	– Forward the signed notification letter to Heritage NSW and the Planning Secretary.
5.3	– A copy of the final signed notification letter, archaeological or heritage management plan and the site recording form is to be kept on file and a copy sent to the Project Manager
6	**Resume work**
6.1	– Project's EMS / EMP is updated to reflect any additional controls and requirements
6.2	– Seek written clearance to resume Project work from the Site Manager and the Site HSE Manager and the Aboriginal or Historical Archaeologist/Aboriginal heritage consultant. – Clearance would only be given once all archaeological excavation and/or heritage recommendations and approvals (where required) are complete. – Resumption of Project work must be in accordance with all relevant Project/heritage approvals/determinations.
6.3	– If required, ensure archaeological excavation/heritage reporting and other heritage approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies

Appendix B DPHI EMP Checklist

Appendix A – EMP preparation checklist

Use the checklist below to help develop an EMP that contains all the required information. The checklist should be completed and supplied to the Department with the EMP. One checklist should be submitted for each EMP.

Requirement	Plan reference	Yes/ No/ NA
Document preparation and endorsement		
Has the EMP been prepared in consultation with all relevant stakeholders as per the requirements of the conditions of consent?	EMP has been provided to NSW DPHI	Yes
Have the views of the relevant stakeholders been taken into consideration? Have appropriate amendments been made to the EMP and does the EMP clearly identify the location of any changes?	Stakeholder review comments have been reflected in this plan	Yes
Has the EMP been internally approved by an authorised representative of the proponent or contractor?	Page 2 – Revision control table	Yes
Version and content		
Does the EMP describe the proponent's Environmental Management System (EMS) (if any), and identify how the EMP relates to other documents required by the conditions of consent?	Section 1.2 (Purpose of this Supplementary EMP)	Yes
Does the EMP include the required general content and version control information?	This checklist. Version control documented on Page 2	Yes
Does the EMP have an introduction that describes the project, scope of works, site location and any staging or timing considerations?	Section 1 (Introduction) and Section 2 (Project description)	Yes
Does the EMP reference the project description?	Summary of project description provided in Section 2.1 (Overview of the Project and works completed to date) with suitable cross reference to the EIS	Yes
Does the EMP reference a Community and Stakeholder Engagement Plan (or similar) or include community and stakeholder engagement actions (if required)?	Complaints management addressed in Section 4.5 (Complaints). Community and stakeholder engagement will be implemented as per the overarching EMS.	Yes
Have all other relevant approvals been identified? Has appropriate information been provided regarding how each approval is relevant?	Addressed in the overarching EMS	Yes
Has the environmental management structure and responsibilities been included?	Section 4.1 (Roles and responsibilities)	Yes
Does the EMP include processes for training of project personnel and identify how training and awareness needs will be identified?	Section 4.3 (Environmental training)	Yes
Does the EMP clearly identify the relevant legal and compliance requirements that relate to the EMP?	Addressed in the overarching EMS	Yes
Does the EMP include all the conditions of consent to be addressed by the EMP and identify where in the EMP each requirement has been addressed?	Addressed in the overarching EMS	Yes

Requirement	Plan reference	Yes/ No/ NA
Have all relevant guidelines, policies and standards been identified, including details of how they are relevant?	Addressed in the overarching EMS	Yes
Is the process that will be adopted to identify and analyse the environmental risks included?	Section 6 (Environmental aspects and impacts)	Yes
Have all the environmental management measures in the EIA been directly reproduced into the EMP?	Addressed in the overarching EMS	Yes
Have any additional environmental management measures been included in the EMP?	Section 7 (Environmental mitigation measures and controls)	Yes
Have environmental management measures been written in committed language?	All mitigation measures / controls have been written in a committed language. Refer to Section 7 (Environmental mitigation measures and controls)	Yes
Have project environmental management measures, including hold points, been identified and included?	Section 7 (Environmental mitigation measures and controls)	Yes
Are relevant details of environmental monitoring that will be carried out included?	Section 4.2 (Reporting and monitoring, inspection and auditing)	Yes
Have the components of any environmental monitoring programs been incorporated?	Section 4.2.1 (Reporting and monitoring)	NA
Are environmental inspections included?	Section 4.2.2 (Environmental inspection)	Yes
Does the EMP document all relevant compliance monitoring and reporting requirements for the project?	Refer to overarching EMS.	Yes
Does the EMP describe the types of plans or maps (such as environmental control maps) that will be used to assist with the management of environmental matters on site?	Refer to overarching EMS.	Yes
Does the EMP list environmental management documents?	Refer to overarching EMS.	Yes
Is an auditing program referenced?	Section 4.2.3 (Environmental auditing)	Yes
Does the EMP include the incident notification and reporting protocols that comply with the relevant conditions of consent?	Section 4.4 (Incident management and emergency response)	Yes
Does the EMP identify the project role/position that is responsible for deciding whether an occurrence is an incident?	Section 4.4.1 (Incident management)	Yes
Does the EMP describe a corrective and preventative action process that addresses the requirements?	Section 4.4 (Incident management and emergency response)	Yes
Does the EMP include details of a review and revision process that complies with the requirements?	Section 8 (Document management and review)	Yes

Appendix C Equipment specification for stormwater in-line controls

BaffleBox

Gross Pollutant Trap for tailwater conditions, & dry storage

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Atlan STORMWATER

APPLICATIONS

- Council storm drain retrofits
- Commercial, retail & residential sites
- Litter prone urban areas
- Scrap metal, solid waste & oil storage sites
- Part of treatment train
- Construction sediment & erosion

Tested Treatment Efficiencies*

POLLUTANT	EFFICIENCY
Gross Pollutants (GP)	100%
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	30%
Total Nitrogen (TN)	10%

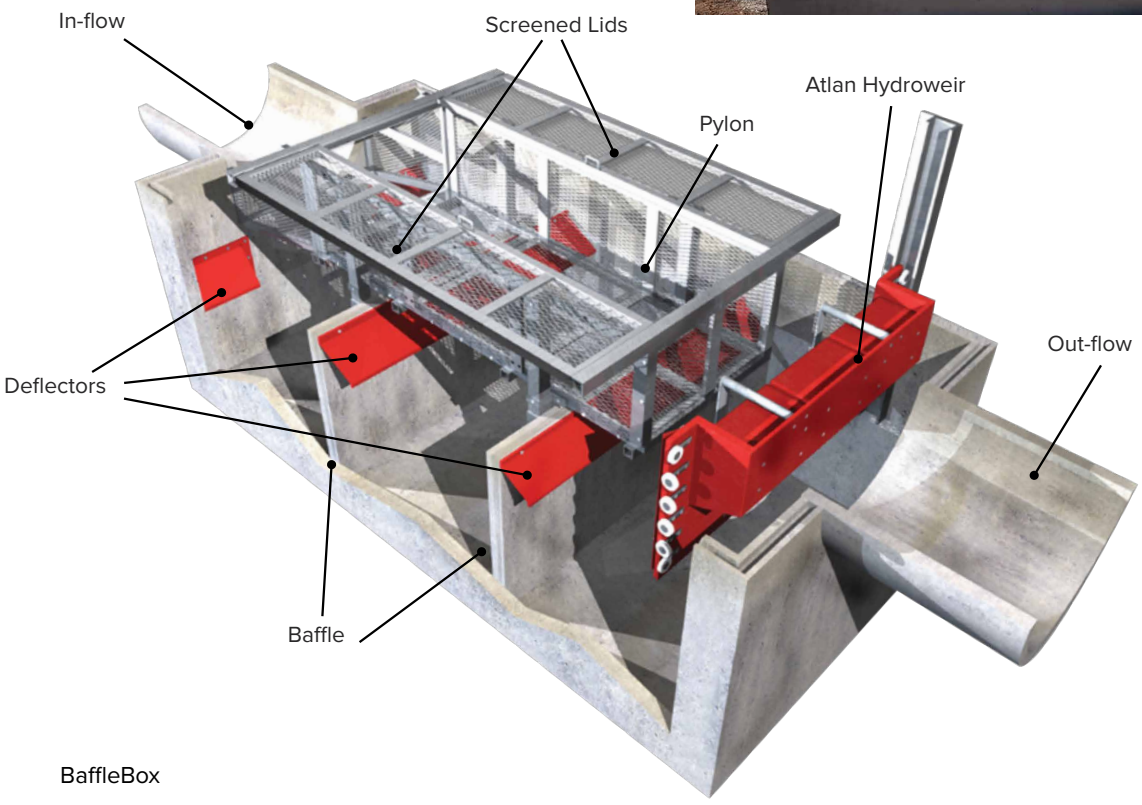
*Contact Atlan to confirm approved performance for the project LGA

The BaffleBox is a precast concrete or fibreglass structure containing a series of sediment settling chambers separated by baffles.

The primary function of baffle boxes is to provide primary treatment, and remove sediment, suspended particles, plastics, debris and associated pollutants from stormwater.

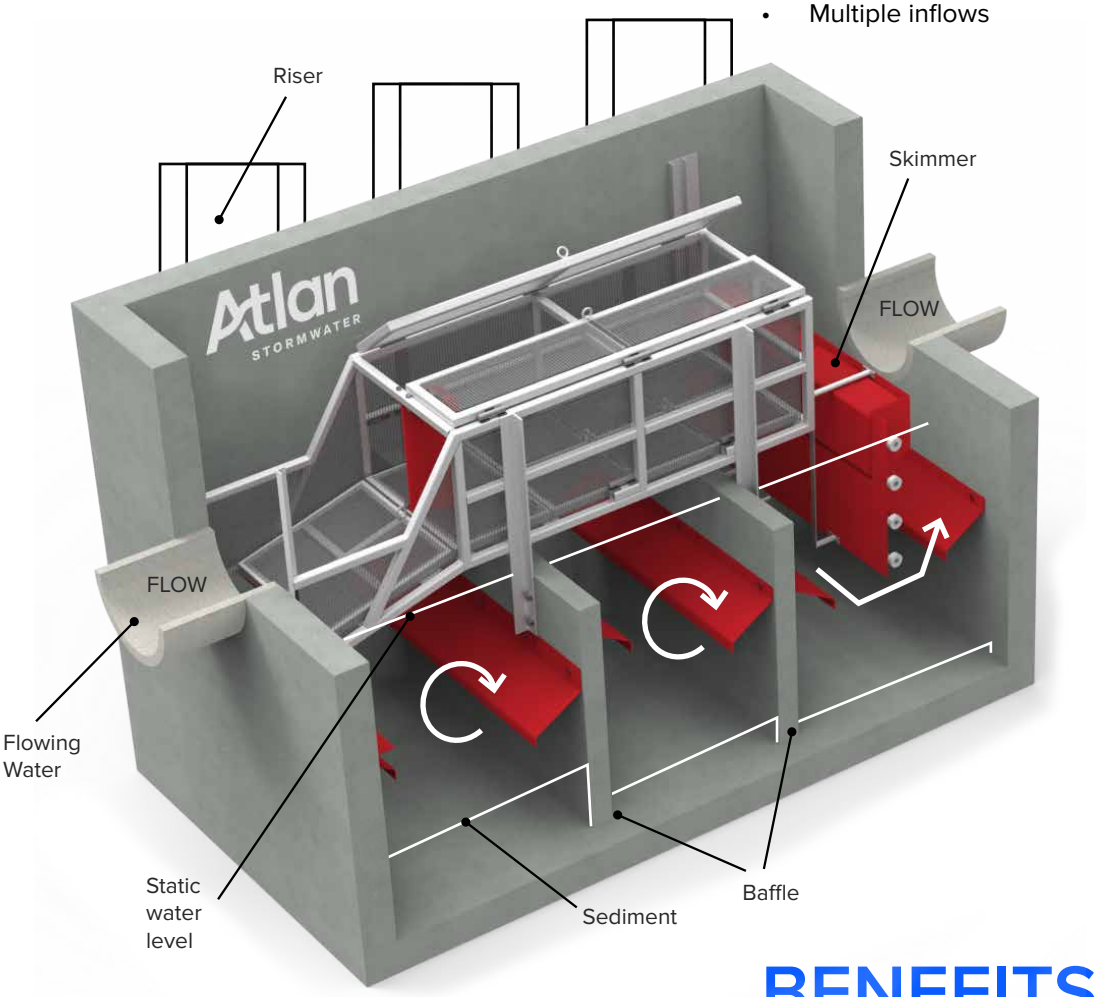
ATLAN VIEW OBSERVATION COVER

The Atlan View Observation Cover is the perfect addition for your outreach or educational projects. Constructed of aluminium reinforced fibreglass panels, it is built to last. These devices are perfectly positioned to help the local community learn about stormwater treatment while improving water quality outcomes. Educational signage is included with every Atlan View Observation Cover illustrating to the public how the treatment system works and the benefits of protecting our waterways with GPT devices.



FEATURES

- Pollutant separating baffle box
- Treats the entire flow
- Minimal head loss with floating weir - 350mm of headloss even with the screen entirely blocked
- Separates foliage - maintaining a dry storage
- Effective sediment removal capabilities
- Designed to accommodate community education opportunities
- Fits within existing easements
- Multiple inflows



50 YEAR CONCRETE - DESIGN LIFE

BENEFITS

- Ideal retrofit capability
- Quick and easy to install
- Efficient installation & project timelines
- Easy & safe maintenance
- Fits within existing easements
- High performance end-of-line treatment
- Retrofits existing systems

BaffleBox

Gross Pollutant Trap for tailwater conditions, and dry storage

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Joy in water

'We believe clean waterways are a right not a privilege and we work to ensure a joy in water experience for you and future generations.'

Andy Hornbuckle

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FlowFilter

Cartridge filter for tertiary stormwater treatment

atlan.com.au

Atlan
STORMWATER

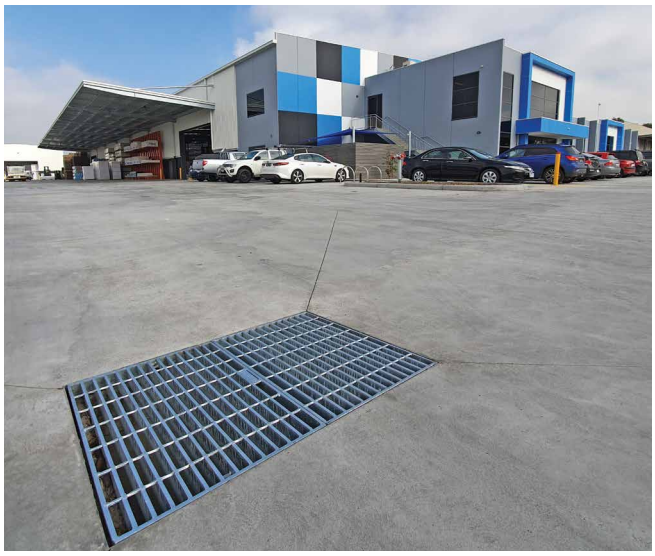
FlowFilter is a specialist stormwater filtration system that is purpose-built to reduce the footprint of WSUD on constrained projects. Manufactured, designed, and engineered in Australia using fibre-reinforced polymer (FRP) this generational asset is supplied with a 25-year warranty & 100-year design life.

This innovative approach to stormwater treatment uses an up-flow filtration process. With minimal head drop required between inlet and outlet, these devices are suitable for installation on flat sites or low gradient developments. The stormwater is treated within the unit by the following processes: sedimentation, filtration, adsorption, and precipitation.

The FlowFilter has been extensively laboratory and field tested for the removal of pollutants – including heavy metals, total suspended solids (TSS), and nutrients (Phosphorous and Nitrogen).

APPLICATIONS

- Car parks & shopping centres
- Council depots
- Industrial estates
- Heavy vehicle maintenance
- Transport depots & loading bays
- Tunnels
- Highways & transport corridors
- Recycling yards
- Airport aprons & tarmacs



FEATURES

- Manufactured, designed, and engineered in Australia at our FRP production facility.
- Lightweight, easy to install and minimal on-site lifting requirements (no crane required).
- Reduced on-site footprint.
- Up-flow filtration process suitable for flat sites requiring only 250 mm of hydraulic head.
- Scalable sizes with variable cartridge configurations from 1 to 39 filter cartridges.
- Treatment flow rates from 2.5 litres per second (LPS) to 156 litres per second installed in offline configuration.
- Custom-designed inline systems available.
- Installed in trafficable and non trafficable applications.

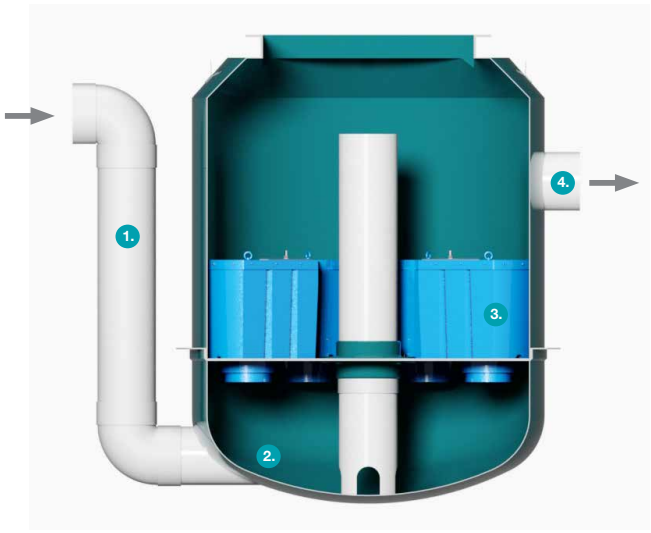
SPECIFICATIONS

MODEL	NO. CARTRIDGE	TFR	ID (m)	HEIGHT (m)	INLET/ OUTLET (mm)
400 SERIES					
HS.400/1	1	2.5 LPS	1.13	1.5	100
HS.400/2	2	5 LPS			
HS.400/3	3	7.5 LPS			
1200 SERIES					
HS.1200/4	4	12 LPS	1.20	2.60	225
1500 SERIES					
HS.1500/4	4	16 LPS	1.50	2.00	225
HS.1500/5	5	20 LPS			
HS.1500/6	6	24 LPS			
1850 SERIES					
SHS.1850/7	7	28 LPS	1.85	2.00	225
2200 SERIES					
HS.2200/7	7	28 LPS	2.20	2.50	225
HS.2200/8	8	32 LPS			
HS.2200/9	9	36 LPS			
2500 SERIES					
HS.2500/10	10	40 LPS	2.50	2.70	300
HS.2500/11	11	44 LPS			
HS.2500/12	12	48 LPS			
HS.2500/13	13	52 LPS			
HS.2500/14	14	56 LPS			
HS.2500/15	15	60 LPS			
HS.2500/16	16	64 LPS			
3000 SERIES					
HS.3000/17	17	68 LPS	3.00	2.85	300
HS.3000/18	18	76 LPS			
HS.3000/19	19	76 LPS			
HS.3000/20	20	80 LPS			
HS.3000/21	20	84 LPS			
3500 SERIES					
HS.3500/22	22	88 LPS	3.50	2.95	375
HS.3500/23	23	92 LPS			
HS.3500/24	24	96 LPS			
HS.3500/25	25	100 LPS			
HS.3500/26	26	104 LPS			
HS.3500/27	27	108 LPS			
HS.3500/28	28	112 LPS			
HS.3500/29	29	116 LPS			
HS.3500/30	30	120 LPS			
HS.3500/31	31	124 LPS			
4000 SERIES					
HS.4000/32	32	128 LPS	4.00	3.25	375
HS.4000/33	33	132 LPS			
HS.4000/34	34	136 LPS			
HS.4000/35	35	140 LPS			
HS.4000/36	36	144 LPS			
HS.4000/37	37	148 LPS			
HS.4000/38	38	152 LPS			
HS.4000/39	39	156 LPS			

Tested Treatment Efficiencies*

POLLUTANT	EFFICIENCY
Gross Pollutants (GP)	100%
Total Suspended Solids (TSS)	85%
Total Phosphorus (TP)	66%
Total Nitrogen (TN)	43%
Petroleum Hydrocarbon	82%

*Contact Atlan to confirm approved performance for the project LGA

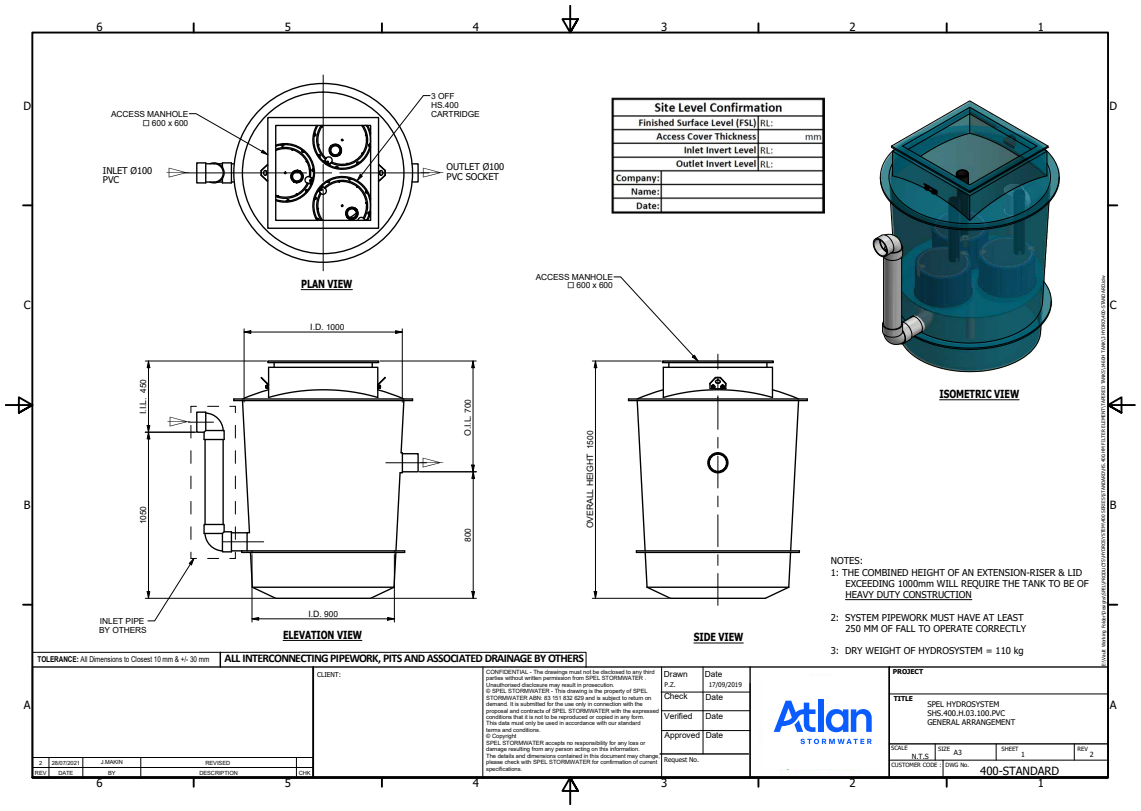


Operating System

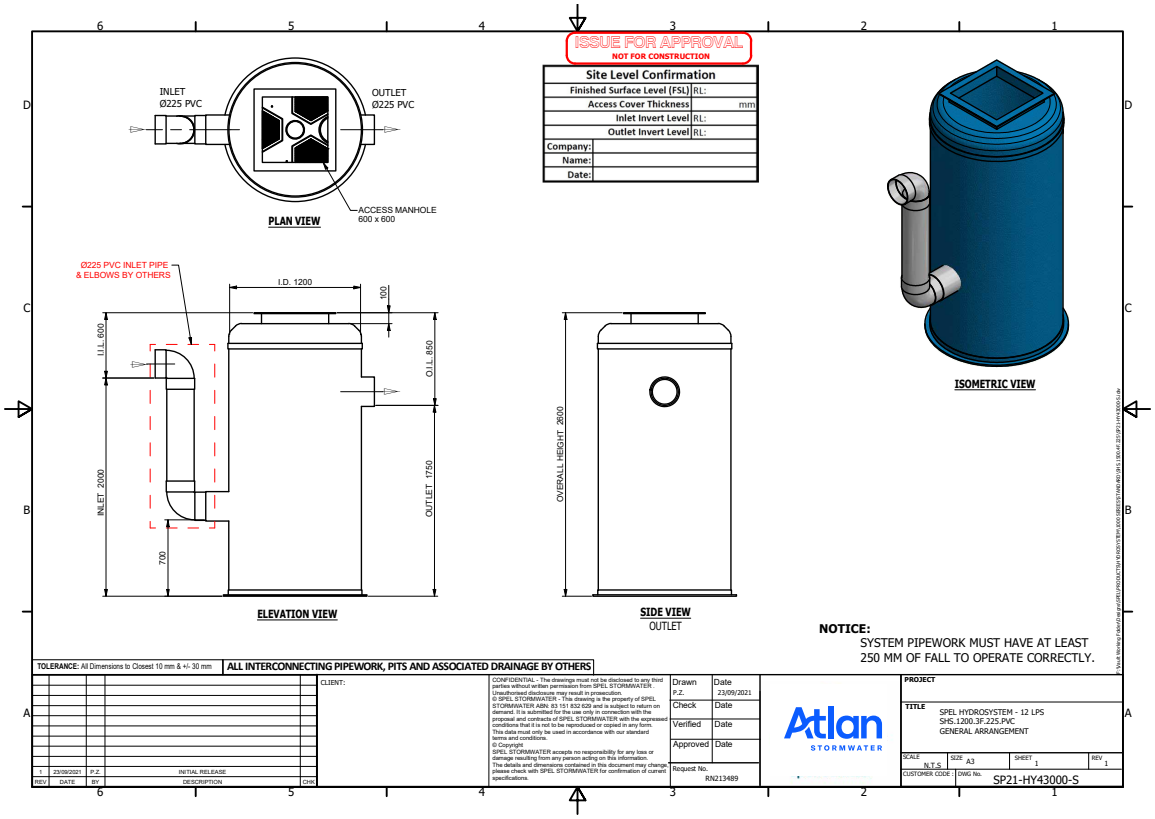
1. Stormwater from catchment enters the offline FlowFilter inlet.
2. Sediment is retained within the sump area.
3. Filter cartridges operate in an up-flow process. The fine sediment is physically removed, and dissolved pollutants are precipitated and adsorptively bound to the filtration media.
4. Treated water flows from cartridges to outlet and into downstream water network.

DRAWINGS

Model HS.400

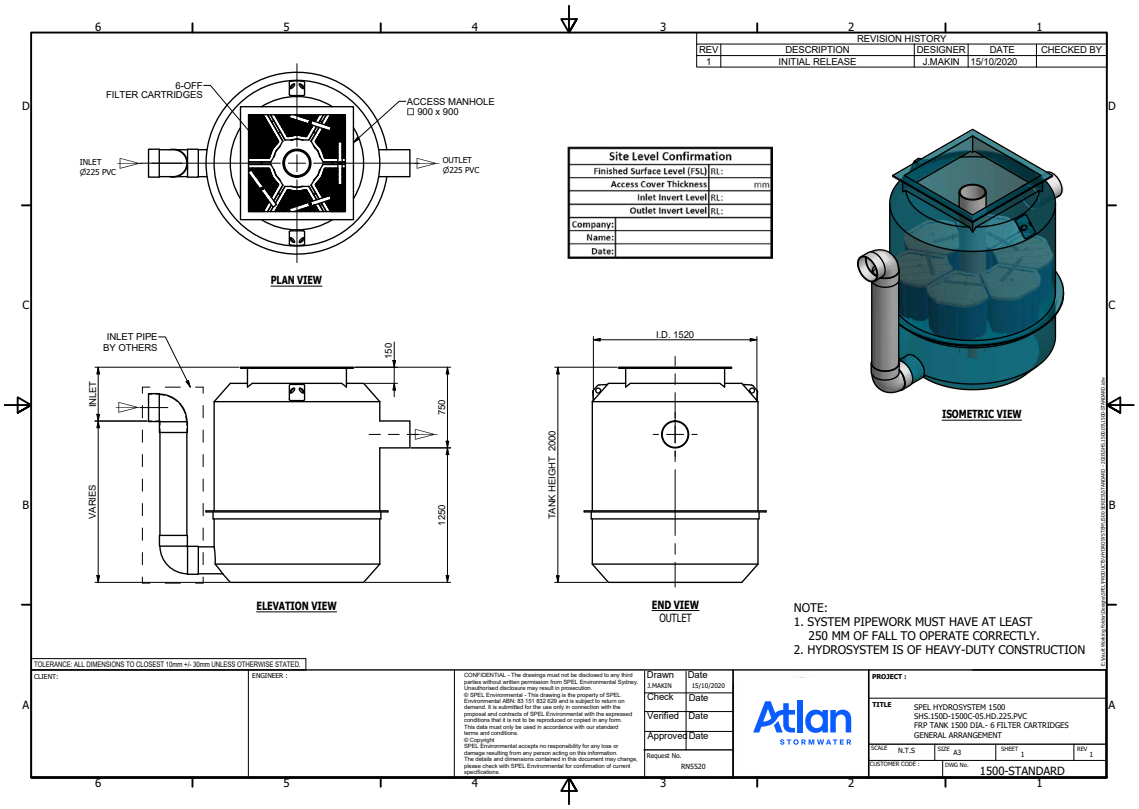


Model HS.1200



DRAWINGS

Model HS.1500



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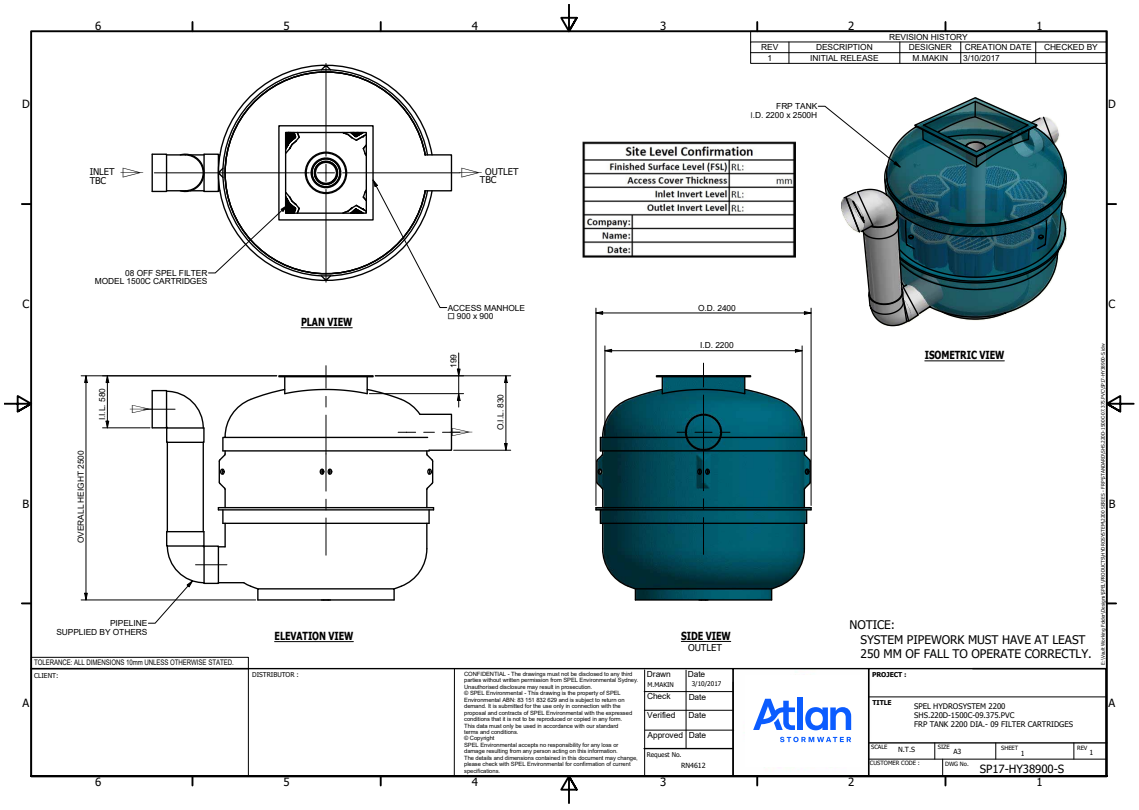
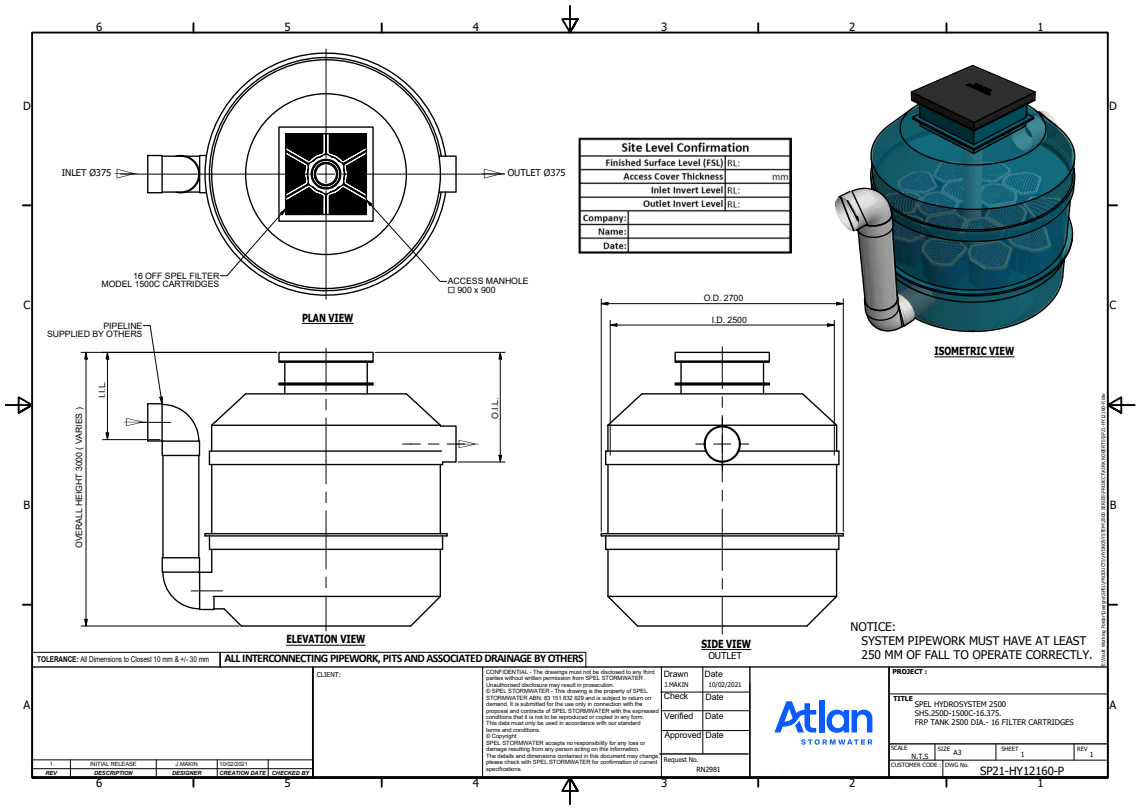
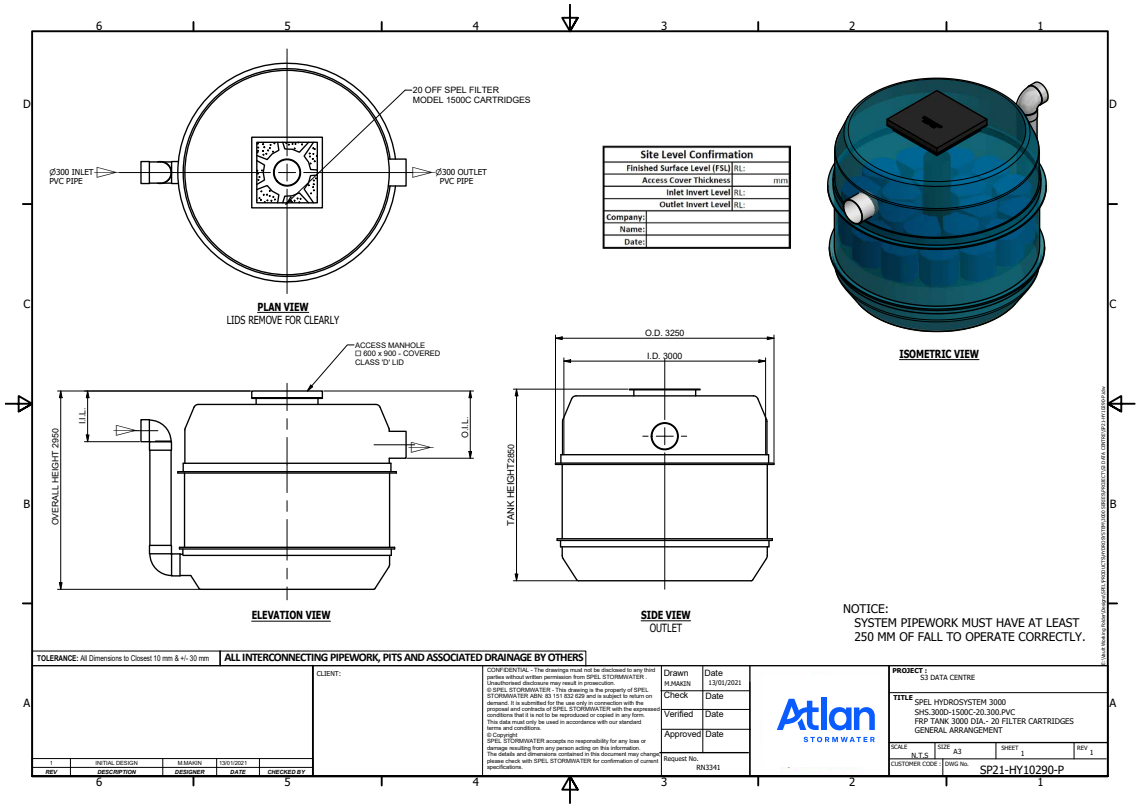


DRAWINGS

Model HS.2500

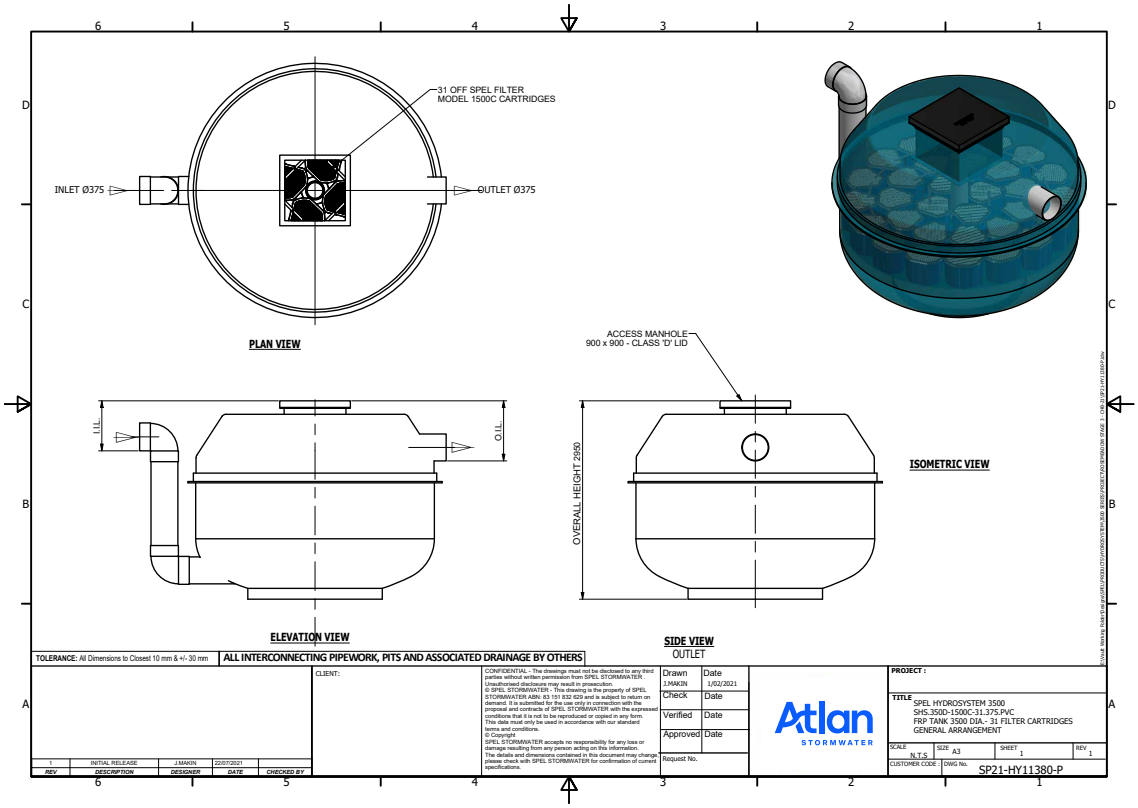


Model HS.3000

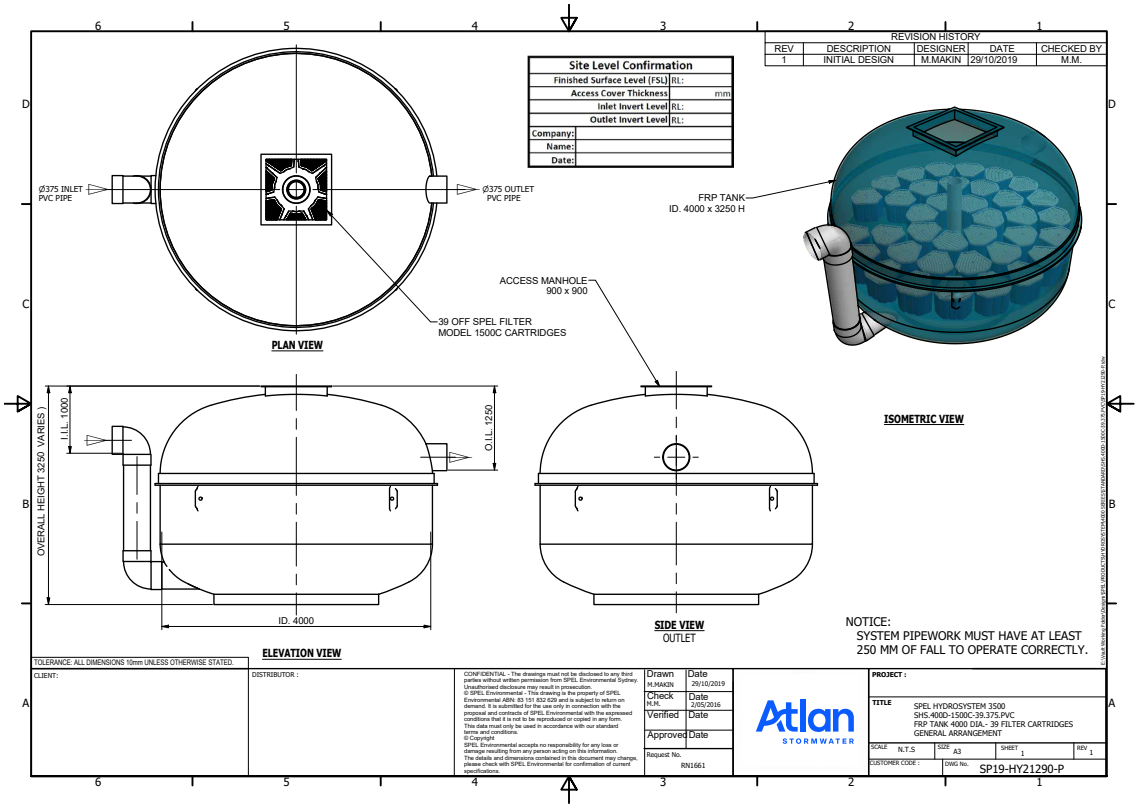


DRAWINGS

Model HS.3500



Model HS.4000



FlowFilter

Cartridge filter for tertiary stormwater treatment

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'We believe clean waterways are a right not a privilege and we work to ensure a joy in water experience for you and future generations.'

Andy Hornbuckle

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100 Silverwater Rd, Silverwater NSW 2128 Australia
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Global Spill & Safety

Global Cube Boom

Installation, operation and maintenance instructions

Equipment list and specifications

Type	Global Cube Boom		
Code	CB1000SD-15M		
Overall height	1000mm		
Freeboard	270mm		
Draft	730mm		
Fabric	Polyurethane (1220gsm)		
Material (floats)	Foam-filled HDPE		
Material (other)	316ss hardware		
Boom connectors	Extruded aluminium ASTM		
Weight per metre	9.5kg		
Anchor points	2 per 15 metre section		
Tensile strength	18,500kg		
Ballast	Lead blocks		
Buoyancy to weight	4:1		
Section length (standard)	15 metres	**Other**	

Last updated: April 2023

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Introduction

Global cube boom is an impervious, non-absorbent, floating, oil containment boom with foam-filled moulded floats above the water and a ballast-weighted skirt below the water. A cube boom is suitable for use in harbours, ponds, dams and rougher waters and has good wave-following characteristics. Use this boom to surround vessels at refuelling wharves, jetties, drilling and dredging operations.

The size of the boom should be selected in relation to the water conditions in which it will be deployed. As a general rule, the minimum freeboard should be selected to prevent the spill from splashing over the float and the skirt sized to prevent or reduce escape of the spill under the boom.

Receipt of equipment

Unpack the equipment carefully and inspect, taking care not to damage any of the components. Complete the following checks and procedures:

- Check the item(s) and description(s) on the packing slip agrees with the purchase order requirements.
- Check for transport damage.
- Check for missing or incomplete items.
- Check that during transport, items have not vibrated or become loose.

If any defect is found, contact Global Spill Control with the purchase order number, packing slip number and a full description of the defect.

Standard Operating Procedures

Introduction

The size of the boom should be selected in relation to the water conditions in which it will be deployed. As a general rule, the minimum freeboard size should prevent oil from splashing over the boom and the draft size needs to prevent or reduce any escape of oil underneath the boom.

Safety

These instructions should be read and understood prior to installing, operating or maintaining the equipment. It is essential installers and users of the equipment know how to perform all operations described in this document and apply them at all times during the use, operation or maintenance of the equipment.

Global Spill Control cannot be responsible for damage or injury resulting from unsafe use of the product, lack of maintenance or incorrect product or system application. Follow all safety precautions, warnings and instructions to ensure the equipment is operated within its design criteria to avoid personal injury or property damage.

- Installation, operation and maintenance must be carried out by qualified personnel in accordance with the guidelines and regulations set down by the relevant regulatory authorities
- Never operate the equipment in a manner that may cause harm to yourself or others

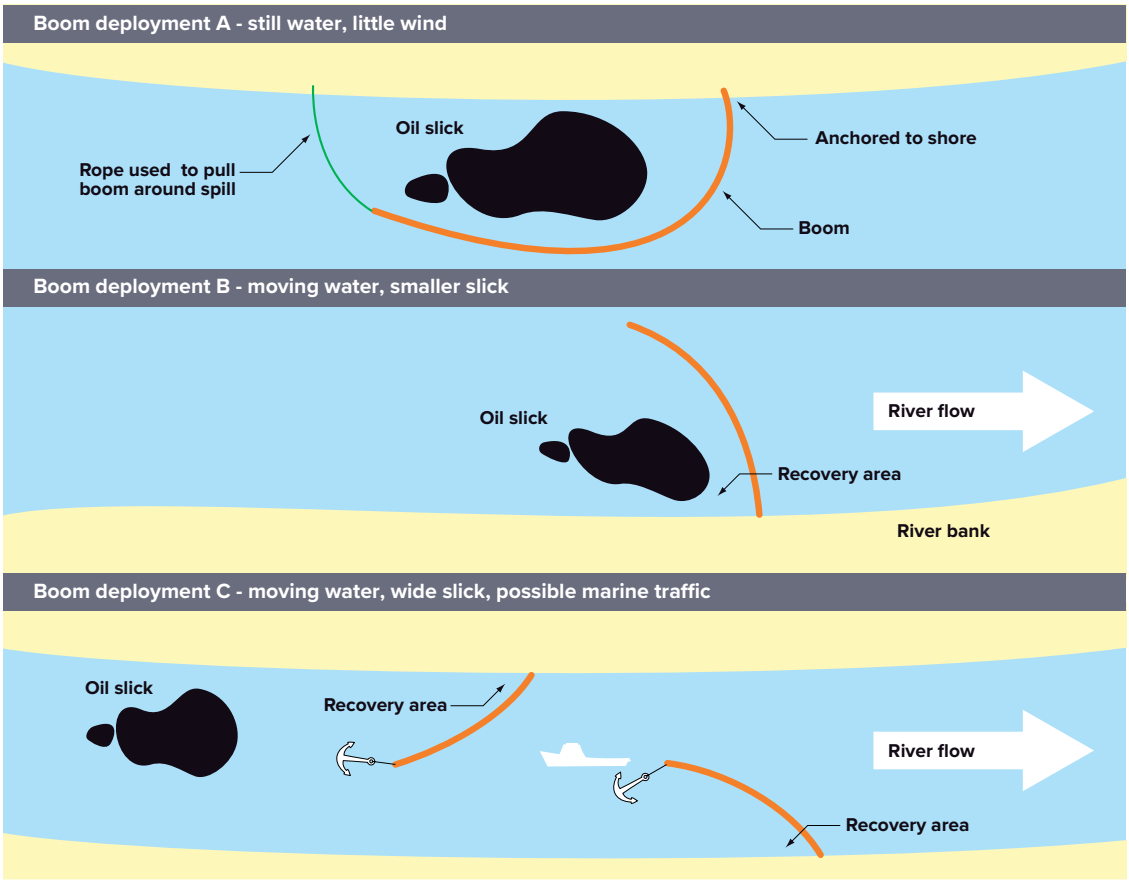
Wear appropriate PPE (personal protective equipment) in accordance with site rules and regulations. This should include (but is not limited to) as a minimum:

- Eye protection - safety glasses or goggles
- Hand protection - work gloves
- Appropriate clothing and footwear

Factors affecting boom deployment

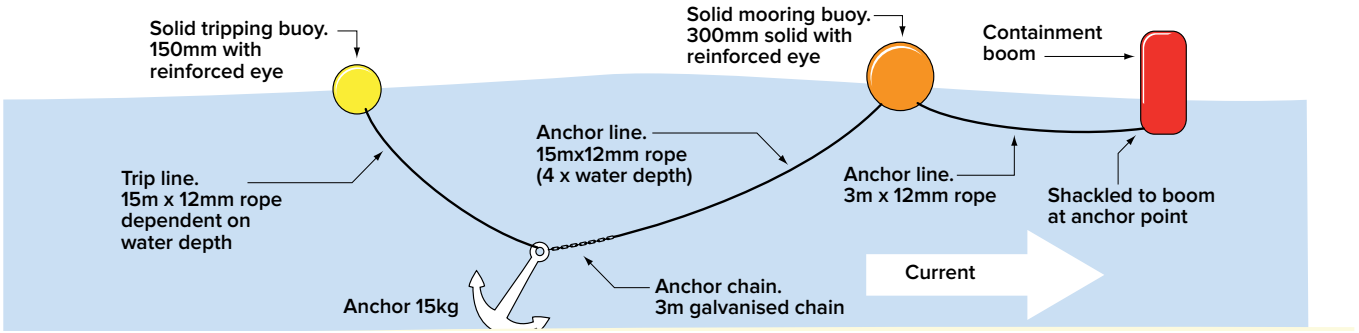
Boom deployment should take into consideration a number of factors (see diagram below for visual reference):

- Location: a quiet, still area away from turbulent water, pipe outlets etc. where oil/fuel can coalesce is best. The area should be safely accessible to response teams and recovery equipment.
- Current: in theory, booms cannot contain spills against water velocities exceeding 0.5m/sec when acting at right angles. In some conditions, it may be difficult to contain the spill when the velocity exceeds 0.16m/sec. To check the water velocity (V m/sec), measure the time (T sec) it takes to float an object (such as an orange) over a given distance (D metres) and calculate V=T/D. Deploy the boom accordingly.
- Angle of deployment: angling a boom across the current reduces the interfacial speed of the oil/fuel striking the boom. The sharper the angle, the lower the interfacial speed and therefore the more effective the oil containment.
- Turbulence: The forces of wind, waves and current may render booms ineffective or difficult to deploy. High water velocity from turbulence may allow contained oil to escape below the boom whilst wind and wave action may cause the contained oil/fuel to splash over the boom float.
- The force exerted by wind directly on the freeboard of the boom can create a sail effect. Do not launch booms across the wind.
- Select appropriate moorings and towing vessels for the boom length, size and water conditions. As a rule of thumb, a doubling of the current velocity or towing speed would entail a four fold increase in the force exerted on the boom.
- Booms should be deployed and anchored to prevent wind, current and wave action causing damage to the boom from rubbing or abrasion on wharves, jetties, vessels, reefs or barnacles.
- Booms deployed against a shoreline should continue up the bank to the high water mark.
- Booms deployed in tidal conditions should use a tidal compensator which has a vertical slide affixed to the end.



Towing and anchoring

- Booms should be joined together using the ASTM connectors before they are deployed.
- In still waters, a team using ropes may be able to draw the boom straight across a pond or small river, from one side to the other.
- When there is a wind or current, it may be necessary to head into the wind or current.
- When towing with a vessel, use an appropriate towing bridle (see image to right).
- Correct anchoring is vital if booms are to perform effectively, especially if a wind or current is present. Generally both ends of the boom are anchored to the shore or a bank, using a rope connected to the ASTM in such a way as to use the full strength of the ballast chain. In exposed conditions, intermediate anchors connected to the bottom of the water body or shore may also be required (see diagram below).



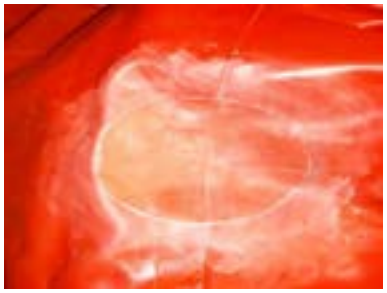
Maintenance and storage

- To ensure extended boom life, clean and remove oils or fuels off the boom immediately after recovery. Position the boom in a suitable location where oil, fuel, contaminated water or any cleaning fluids can all be captured to prevent them from escaping into the environment. Dispose of these products in an appropriate and environmentally acceptable manner.
- Disconnect boom sections and clean individual sections one at a time.
- Boom that has been deployed in an aquatic environment for a long period of time may be subject to accumulation of aquatic organisms (biofouling). This should be removed by high pressure water blasting or scraping, taking care not to damage the boom components.
- Use an industrial degreaser/detergent such as Global Green diluted as per the manufacturer's instructions to clean both sides of the boom.
- Wash of detergent with fresh water and allow the boom to dry fully.
- Replace any damaged wear strips or floats. Repair or replace punctured, abraded or damaged skirt sections.
- Store the dry boom in a dry place, protected from UV exposure and vermin.

Repair

Floats and wear strips are easily replaced if damaged or become worn. Minor abrasive damage and small holes in PVC or urethane booms can be repaired by non-skilled labour.

- Thoroughly clean the repair area with methylated spirits or similar, applied with a clean rag. Remove all traces of oil and surface grime.
- Allow the area to air dry.
- Cut a patch (of similar material) approximately 50% larger than the area to be repaired. A circular shape tends to work best.
- Apply Bostik Sole Attaching Cement 1669 (or equivalent) to one side of the patch and the area around the hole or abrasion. Allow to dry.
- When touch-dry and tacky, place the patch over the hole and press down firmly.
- Use a heat gun to gently heat and 'dry' the adhesive.
- Dust with talcum powder when finished (see diagram to the right).



Warranty

Global Spill Control warrants that during the warranty period, the product will be free from defects in materials and workmanship.

Warranty on non Global Spill Control components will be limited to the warranty provided by the original equipment manufacturer and cover against defects in materials and workmanship.

The warranty period is twelve (12) months from commissioning or eighteen (18) months from date of supply, whichever occurs first. The defective goods must be returned freight paid and at the purchaser's risk to Global Spill Control.

Global Spill Control may replace or repair any warrantable item at its discretion.

Global Spill Control's liability under this warranty does not extend to indirect or consequential loss (including loss of profit or business) to the purchaser. Warranty does not extend to normal wear and tear experienced over the life of the product.

Global Spill & Safety

Permanent Deployment Boom

Installation, operation and maintenance instructions

Equipment list and specifications

Type	Solid float permanent deployment boom
Code	PDB450-20
Overall height	450mm
Freeboard	90mm
Draft	360mm
Fabric	CoolGuard FTL30 - 1100gsm
Material (floats)	Foam-filled HDPE
Material (other)	316SS hardware
Boom connectors - type	Extruded aluminium ASTM Z F962 I Australian Standard
Weight per metre	5.2kg
Anchor points	2 per 15 metre section
Tensile strength	3,900kg
Ballast chain / tension member	8mm I hot dip galvanised
Buoyancy to weight	4:1
Section length (standard)	20 metres

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Last updated: February 2021

Receipt of equipment

Unpack the equipment carefully and inspect, taking care not to damage any of the components. Complete the following checks and procedures:

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- Check for missing or incomplete items.
- Check that during transport, items have not vibrated or become loose.

If any defect is found, contact Global Spill & Safety with the purchase order number, packing slip number and a full description of the defect.

Introduction

Permanent deployment boom (PDB) is an impervious, non-absorbent, floating, oil containment boom with foam-filled moulded floats above the water and a ballast-weighted skirt below the water. Permanent deployment booms are suitable for use in harbours, ponds, dams and rougher waters and have good wave-following characteristics.

Use this boom to surround vessels at refuelling wharves, jetties, drilling and dredging operations, as well as for permanent deployment to protect desalination and cooling water intake structures.

The size of the boom should be selected in relation to the water conditions in which it will be deployed. As a general rule, the minimum freeboard should be selected to prevent the spill from splashing over the float and the skirt sized to prevent or reduce escape of the spill under the boom.

Safety

These instructions should be read and understood prior to installing, operating or maintaining the equipment. It is essential installers and users of the equipment know how to perform all operations described in this document and apply them at all times during the use, operation or maintenance of the equipment.

Global Spill & Safety cannot be responsible for damage or injury resulting from unsafe use of the product, lack of maintenance or incorrect product or system application. Follow all safety precautions, warnings and instructions to ensure the equipment is operated within its design criteria to avoid personal injury or property damage.

Installation, operation and maintenance must be carried out by qualified personnel in accordance with the guidelines and regulations set down by the relevant regulatory authorities.

Never operate the equipment in a manner that may cause harm to yourself or others

Wear appropriate PPE (personal protective equipment) in accordance with site rules and regulations or that is specified by AMSA for national response team members. This should include (but is not limited to) as a minimum:

Long sleeve shirt and trousers shall be worn.

Safety footwear shall be worn.

High visibility vest or coveralls shall be worn.

Safety gloves shall be worn.

Safety hats shall be worn when working with lifting and hoisting equipment and near suspended loads.

Life jackets shall be worn when working on or near the water's edge.

Safety glasses shall be worn.

Ear plugs shall be worn when operating noisy equipment eg: air blowers, diesel pump, power pack.

Standard Operating Procedures

Boom connectors

Various connectors are used to join booms of different lengths and size together. In Australia, we use the US ASTM connector in a reverse configuration. As other boom connectors are manufactured around the world, care and planning is needed to ensure all booms used have the same connectors, or adaptors will be required.

Our most commonly used Australian ASTM boom connectors allow booms of different diameters and shape to be joined efficiently and effectively. If different booms do need to be joined, ensure that the flotation is in alignment along the bottom of the float. This should prevent oil escaping underneath.

▲ ASTM connectors.

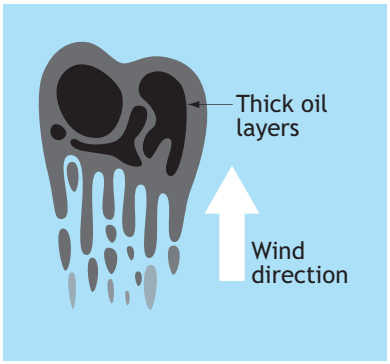
How oil spreads on water

Several factors affect the spread of oil when it comes into contact with a body of water, the initial factor being the volume spilled. A small instant spill may spread more rapidly than a slow discharge.

Other factors such as surface tension between the oil, air and water can influence spreading. Very viscous oils will spread more slowly than oils with light viscosity, i.e. lube oil will spread slower than diesel fuel. Spills into cold water spread slower if the water temperature is lower than the pour point of the oil.

If the spill continues on water unabated, it will carry on spreading with the viscosity becoming less important.

The oil slick may break up and form narrow bands or “windrows” parallel to the wind direction.



▲ As the slick breaks up it creates ‘windrows’ parallel to the wind.

Evaporation

Evaporation may remove some of the spill from the water. The speed and extent of the evaporation depends mainly on the type of spill. Light oils such as kerosene and diesel fuel will evaporate more quickly than heavier type oils. Weather conditions may influence evaporation. As a general rule the higher the wind speed and ambient temperature, the greater the rate of evaporation.

Boom deployment

Booms should be deployed where they will help coalesce the oil quickest, so a quiet still area is best. Deployment of booms should be away from weirs, rapids and pipe outlets to allow the oil/fuel to coalesce, or come back to the surface.

In practice, booms should only be deployed where recovery teams and equipment can be brought safely to the location. There is no benefit in recovering a spill hundreds of metres from any access point because it may be impossible to collect.

The forces of both wind and current can quickly render booms totally ineffective or make deployment almost impossible.

Boom deployment theory states that booms cannot work effectively in currents moving faster than 18m per minute but in reality, oil moving faster than 10m per minute is extremely hard to contain.

Use a simple test in a river situation to establish the speed of the current carrying an oil slick.

Pace out 10m on the riverbank and mark the distance with easy to see objects. An orange gives the most accurate simulation of oil on water because about 1/3 is above the water and thus affected by wind, whilst 2/3 is below the surface and thus affected by current. However an apple, twig, block of wood or something that floats can also be used to test the current speed. Drop the test object upstream of the measured distance and time its movement between the markers.

As an almost universal rule, booms should be joined and air inflated booms inflated, before the boom is deployed.

Boom anchor points should be installed where booms are to be anchored to a bank, river or wharf side unless there are natural anchors which can be used. See separate section on anchoring booms.

A boom acts like a sail in windy conditions because the wind blows on the freeboard as if it were a sail. Therefore launching booms across the wind can be an almost futile exercise. In extreme conditions booms can parasail into the air.

The boom skirt acts in much the same way in fast flowing currents. Launching a boom across a fast flowing stream simply may not work.

Angling a boom across the current reduces the interfacial speed of the oil striking the boom. The sharper the angle the lower the interfacial speed and therefore the more effective the boom will be in containing oil. However the sharper the angle the more boom that will be required. At 45º the interfacial speed is halved but the amount of boom needed increases by half again. At 30º the amount of boom required, doubles.

In still water, on a small pond or dam, a team using ropes may be able to draw the boom straight across from one side to the other to contain, and then corral, an oil spill.

However, where there is wind or current it may be necessary to head into the wind or current with a boat or when pulling a boom manually with rope. By launching or walking the boom upwind or upstream of the final desired anchor point, the natural elements are used to take the boom to the desired location.

▲ The boat heads into the wind to enable the deployment of the boom

▲ Boom contains spill near bank. Note the boom is anchored into position.

Intermediate anchors

In exposed conditions and depending on the type of boom in use, intermediate anchors may be necessary. Intermediate anchors to either the bottom of the water body, to the shore or to both, can help keep a boom correctly positioned and operating most effectively.

Anchoring a boom can be a difficult task. As an example, the following diagram highlights the recommended configuration for deployment of the anchoring system.

Some foam filled fence booms are particularly prone to wind and can lie flat instead of floating upright.

Inflatable booms generally have better wave following and oil retention characteristics in a current, but should be protected from scuffing and other physical damage. Foam filled and curtain booms have similar properties.

Anchoring a boom

Correct anchoring is vital if booms are to perform effectively, especially if a wind and/or current is present. These forces on oil containment booms can be substantial and are exacerbated in tidal or flood conditions.

Most containment booms are fitted with a cable or chain that is joined as one continuous section through the boom connectors.

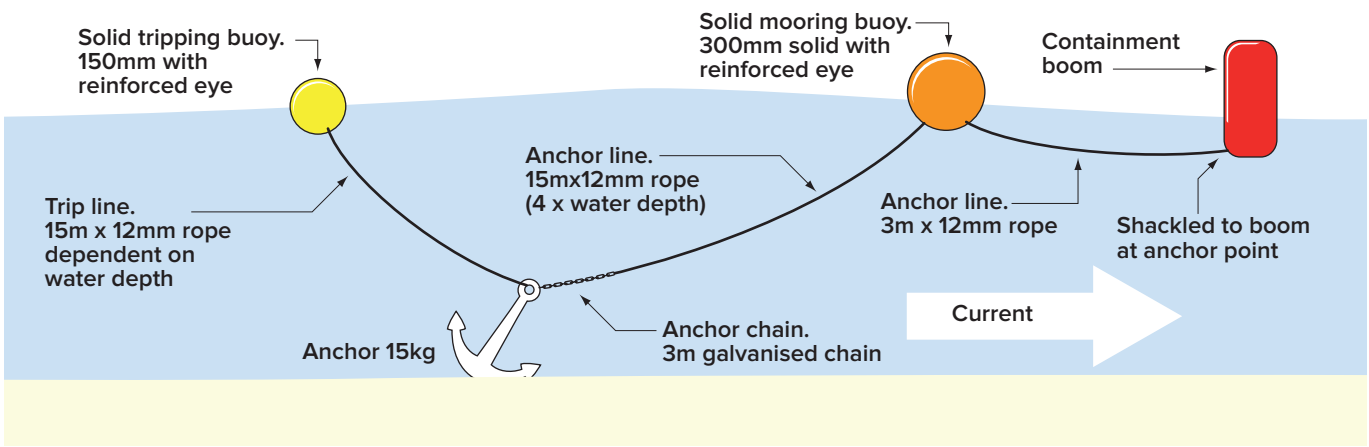
Where to anchor a boom

Generally the boom must be anchored to shore or bank, using a rope that connects to the boom connector in such a way as to use the full strength of the chain or cable in the bottom of the boom.

Various anchors can be used but will generally be:

- anchors can also be used where the far end of the boom, or all of the boom, is anchored in the water away from the shore
- a conveniently sited and substantial tree at the waterside
- a substantial fence post at the waterside
- a bridge abutment
- a steel or wooden upright hammered into the bank by the spill team
- a Danforth or sand anchor on the beach or sandbar normally used in tidal areas and particularly with beach booms
- large rocks where it is impossible to drive stakes into the ground
- a weighted cable on a wharf or quayside or vertical river bank
- sliding anchor point or tidal compensator which is fabricated and permanently installed.

Boom anchoring system



Key points to consider when anchoring a boom:

- Anchor/tie ropes should be kept as close to the ground as possible so they continue in a straight line from the end of the boom to the anchor point.
- Always tie off the anchor rope so that it can be untied and moved quickly if wind or water conditions change.
- When using a substantial tree as an anchor point, try to protect the bark of the tree from damage. Tie off as near to the base of the tree as practicable.
- Driving two or three steel or wooden fence posts into the soil so the back post(s) can be used to anchor the front one, substantially increases the tension or weight the posts can take.
- Tie anchor ropes near the base of the front post and try to protect the rope from chaffing with plastic pipe, rags or absorbents positioned between the rope and the post.
- Anchor ropes can be tied around large rocks where there is no substantial alternative, but ensure that the rope can not slip over the rock if the water level changes.
- Danforth or sand anchors are frequently used on beaches because they provide the best anchor option – preferable to fence posts that might be affected by the tide and waves.
- Highlight the tie ropes with danger tape and signage to prevent injury to others.

▲ Three point anchor system.

▲ Danforth anchor set.

▲ Tidal compensator permanently installed.

Basic boom deployment methods

Still water, little wind

Deploy the booms on the water after joining them together. Take the booms across the front of the spill, then corral the spill into the clean up/recovery area. This can be achieved by walking down either bank at the same time, or using a boat one side and walking down the other. Often long lengths of rope are used to guide the booms from either bank or shore. Moving the boom slowly, surround the spill and pull the boom towards the clean up area. (See Diagram A on the next page.)

Moving water, small oil slick

When the oil slick is moving due to wind or current or both, it is essential that the boom be deployed at an angle. As explained in the previous section on boom deployment, the faster the oil slick is moving, the sharper the angle needed.

The oil will hit the angled boom and slide down its face towards the chosen recovery area. (See Diagram B on the next page.)

Depending on the width of the pond or river, a boat may be needed to deploy the boom. In this scenario, the boom is deployed and the wind and current bring the oil to the boom. (Remember the wind can change so have a back-up plan.)

Moving water, wide oil slick, possible marine traffic

When boats must still move on the same waterway as the spill, a boom may be deployed to recover the oil but not block the river traffic.

This can create problems for responders. There are several ways to deploy the booms to do this but all need a gap with the booms overlapped so the spill cannot escape. Secure anchoring is the key to this deployment.

As with the previous scenario, the booms are deployed and the spill travels to them.

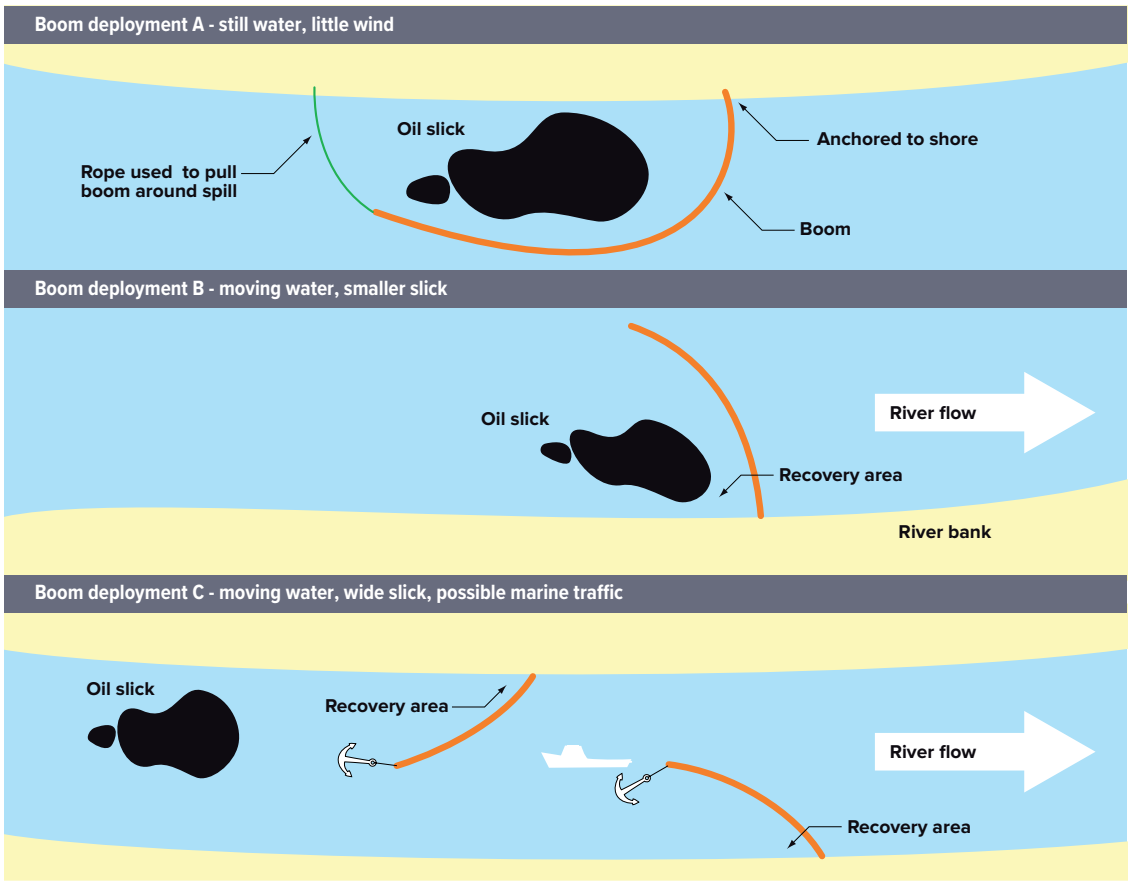
▲ Deploying a tidal boom from the shoreline

▲ V-boom configuration

Factors affecting boom deployment

Boom deployment should take into consideration a number of factors (see diagram below for visual reference):

- **Location:** a quiet, still area away from turbulent water, pipe outlets etc. where oil/fuel can coalesce is best. The area should be safely accessible to response teams and recovery equipment.
- **Current:** in theory, booms cannot contain spills against water velocities exceeding 0.5m/sec when acting at right angles. In some conditions, it may be difficult to contain the spill when the velocity exceeds 0.16m/sec. To check the water velocity (V m/sec), measure the time (T sec) it takes to float an object (such as an orange) over a given distance (D metres) and calculate V=T/D. Deploy the boom accordingly.
- **Angle of deployment:** angling a boom across the current reduces the interfacial speed of the oil/fuel striking the boom. The sharper the angle, the lower the interfacial speed and therefore the more effective the oil containment.
- **Turbulence:** The forces of wind, waves and current may render booms ineffective or difficult to deploy. High water velocity from turbulence may allow contained oil to escape below the boom whilst wind and wave action may cause the contained oil/fuel to splash over the boom float.
- The force exerted by wind directly on the freeboard of the boom can create a sail effect. Do not launch booms across the wind.
- Select appropriate moorings and towing vessels for the boom length, size and water conditions. As a rule of thumb, a doubling of the current velocity or towing speed would entail a four fold increase in the force exerted on the boom.
- Booms should be deployed and anchored to prevent wind, current and wave action causing damage to the boom from rubbing or abrasion on wharves, jetties, vessels, reefs or barnacles.
- Booms deployed against a shoreline should continue up the bank to the high water mark.
- Booms deployed in tidal conditions should use a tidal compensator which has a vertical slide affixed to the end.

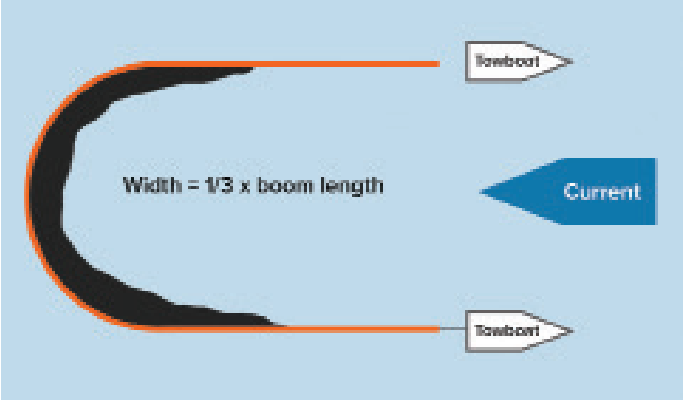


Guidelines for towing a boom

Boom is pulled by towboats in various configurations to contain and recover slicks. Boat speed is typically less than 1 knot (0.5m/sec).

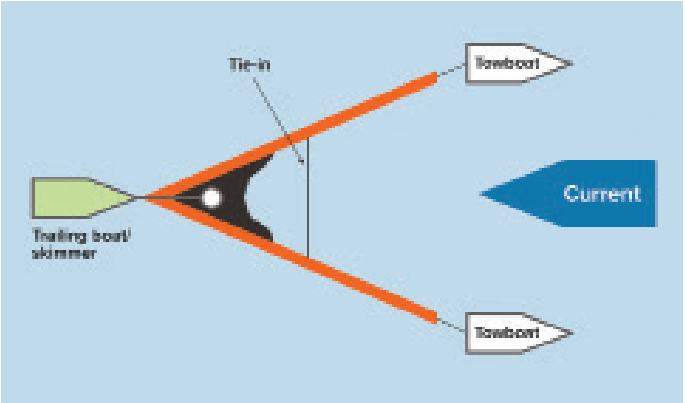
U-booming

Two vessels can tow a boom in a U-configuration by drifting downstream, holding in a stationary position or by moving upstream toward the spill source.



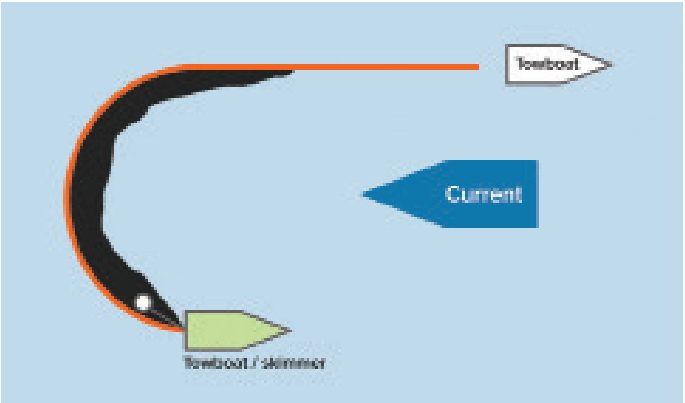
V-booming

Boom can be deployed in a V-configuration using three vessels and a skimmer. A tie-in is usually needed to maintain the V-shape.



J-booming

Boom can be towed in a J-configuration that will divert oil to a skimmer to allow simultaneous containment and recovery.



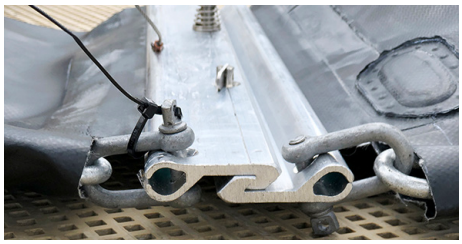
Preparation for deployment

The size of the boom should be selected in relation to the water conditions in which it will be deployed. As a general rule, the minimum freeboard size should prevent oil from splashing over the boom and the draft size needs to prevent or reduce any escape of oil underneath the boom.

The end of each boom section is fitted with an aluminium ASTM connector. These universal 'Z' or 'claw' connectors allow sections of boom to be joined together to form longer sections.

- Spring loaded toggle pins push through holes in the ASTM connectors allowing sections to be quickly secured during deployment or disconnected during boom recovery.
- When joining different styles of boom or joining old boom with new boom, additional holes can easily be drilled through the aluminium ASTM connectors.

▲ Connecting pieces of boom together



▲ The claw grip used by ASTM connectors

Determine if the boom is to be deployed from a vessel or from a shore structure.

Determine how much boom is to be deployed and if midpoint anchoring is required.

Prepare the deployment site by removing any rubbish or objects that may impede deployment operations.

If the surface over which the boom is to be deployed is rough, it will be necessary to lay down an anti-abrasion mat.

It is important that the team leader is in a location where they can communicate with the operator(s) and also be able to see the whole operation without any obstructions. Hand signals may be used as the working area can be noisy environment.

Booms should be joined together using the ASTM connectors at each end of the boom before they are deployed.

Towing and anchoring

In still waters, a team using ropes may be able to draw the boom straight across a pond or small river, from one side to the other.

When there is a wind or current, it may be necessary to head into the wind or current.

When towing with a vessel, use an appropriate towing bridle.

Correct anchoring is vital if booms are to perform effectively, especially if a wind or current is present. Generally both ends of the boom are anchored to the shore or a bank, using a rope connected to the ASTM in such a way as to use the full strength of the ballast chain. In exposed conditions, intermediate anchors connected to the bottom of the water body or shore may also be required.

Fixed deployment - fluctuating water height

For permanent installation or long term deployment, the boom should be able to move freely and unhindered with any height change in the water level. E.g. tidal movement. The boom should be protected from abrasion and anchored such that it does not rub on structures such as jetties, pylons or rock walls. Mid-point anchoring may also be required to prevent the boom from rubbing on structures.

For installations where the boom is fixed between two walls (eg channel, flume or canal) and there is tidal movement or changing water heights, the use of tidal compensators is recommended (available separately). These allow the boom to slide up or down with the tide or change in water height. A tidal compensator should be fitted at each end of the boom, comprising:

- rail (channel, pipe or tube) fixed to the wall at each end
- float with ASTM connector on one side (to join to the boom) and nylon guide bushes on the other side (to slide up and down the fixed rail)
- rubber seal to seal against the wall

When installing the boom, it is important to calculate the force of the current on the boom to ensure it does not tear away from the compensator.

Angling the boom across the current is also necessary to reduce the interfacial speed of the oil striking the boom.

Containing oil where currents exceed 0.7 knots is very difficult because the oil will generally entrain and follow the water path under the boom. In these instances, it is necessary to deploy the boom at an angle to the flow direction. This will result in an increase in boom length required. Refer table below:

Knots	m/sec	Angle to current	2m channel	4m channel	6m channel	8m channel	10m channel	12m channel
			Length of boom required (metres)					
0.7	0.36	90°	2.0	4	6	8	10	12
1.0	0.51	45°	2.8	6	8	11	14	17
1.5	0.77	28°	4.3	9	13	17	21	26
2.0	1.03	20°	5.9	12	18	23	29	35
2.5	1.29	16°	7.3	15	22	29	36	44
3.0	1.54	13°	8.7	17	26	35	43	52
3.5	1.80	11°	10	20	30	40	51	61
4.0	2.06	10°	12	23	35	46	58	69
4.5	2.31	9°	13	26	39	52	65	78
5.0	2.57	8°	14	29	43	58	72	86

Maximum deployment angles to flow direction at different current strengths for bottom tension booms to prevent escape of oils.

Calculations are based on an escape velocity of 0.7 knots (0.35 m/sec) at 90 degrees.

Maintenance, cleaning and storage

Maintenance

Carefully inspect the boom for damage or deterioration, checking the ASTM end connectors are not damaged.

Replace toggle pins and lanyards if damaged or faulty. Re-drill holes in the connector if the toggle pin holes are worn, elongated or oversize.

Remove marine growth and biofouling from the connectors.

Check the chain connection at each end connector. Clean and lubricate the D-shackle pin or replace if damaged or faulty.

Along the full length of the boom, check the ballast chain and chain pocket are not damaged. Also check the anchor points are undamaged.

Replace any damaged components or floats. Repair or replace punctured, abraded or damaged skirt sections.

Cleaning

To ensure extended boom life, **clean and remove oils or fuels off the boom immediately after recovery**.

- Position the boom in a suitable location where oil, fuel, contaminated water or any cleaning fluids can be captured, preventing them from escaping into the environment. Dispose of these contaminants in an appropriate and environmentally-acceptable manner.
- Disconnect boom sections and clean individual sections one at a time using salt or fresh water.
    - ➔ Use an industrial degreaser/detergent, such as Global Green, diluted as per the manufacturer's instructions to clean both sides of the boom. Do not use water with temperature above 50 °C
    - ➔ Wash off detergent with fresh water and allow the boom to dry fully prior to storing.
- Permanently-deployed boom should be **inspected every three months whilst in situ**. It may be necessary to remove the boom from the water to inspect.
    - ➔ Boom that has been deployed in an aquatic environment for a long period of time may be subject to accumulation of aquatic organisms (biofouling). This should be removed by high pressure water-blasting or scraping using a nylon brush or scraper, taking care not to damage the boom components.
    - ➔ Remove the boom from the water and position in a suitable location where contaminated water or any cleaning fluids can all be captured to prevent them from escaping into the environment. Dispose of these products in an appropriate and environmentally acceptable manner.
    - ➔ Disconnect boom sections and clean individual sections one at a time using salt or fresh water.
    - ➔ Use an industrial degreaser/detergent, such as Global Green, diluted as per the manufacturer's instructions to clean both sides of the boom. Do not use water with temperature above 50 °C
    - ➔ Re-deploy as required.

Storage

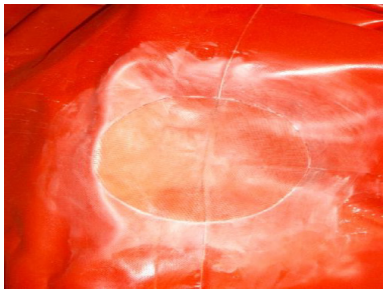
- Store the dry boom in a dry place, protected from UV-exposure and vermin.
    - ➔ Stored boom should be inspected yearly and should always be stored in good working order and ready for the next operation.

Repair

The ASTM connectors, toggle pins or lanyards are easily replaced if damaged or become worn.

Minor abrasive damage and small holes in thermoplastic fabrics (PVC or urethane) and geomembrane fabrics (XR5 or CoolGuard) can be repaired using a repair kit.

- Thoroughly clean the repair area with methylated spirits or isopropyl alcohol, applied with a clean rag. Remove all traces of oil and surface grime.
- Allow the area to air dry.
- Cut a patch (of similar material) approximately 50% larger than the area to be repaired. A circular shape tends to work best.
- Apply Bostik Sole Attaching Cement 1669 (or equivalent) to one side of the patch and the area around the hole or abrasion.
- Allow to dry.
- When touch-dry and tacky, place the patch over the hole and press down firmly.
- Use a heat gun to gently heat and 'dry' the adhesive.
- Dust with talcum powder when finished (see diagram to the right).



▲ Finished repair dusted with talcum powder

Large holes and damage to seams can be repaired using a hot air welder.

Large holes and damage to seams can be repaired using a hot air welder to fuse or join a patch of similar fabric to the damaged area.

- Thoroughly clean the repair area with methylated spirits or isopropyl alcohol, applied with a clean rag. Remove all traces of oil and surface grime.
- Allow the area to air dry.
- Cut a patch of similar material approximately 50% larger than the area to be repaired. A circular shape tends to work best.
- Use a hot air welder to weld the patch to the boom.
- Heat both sheets until you see a small change in the colour to a brighter/shinier surface.
- End the welding with a minimum of 25mm outside the damaged area.
- Use a roller during the welding process to press the surfaces together.
- Use an oversized patch and cut the edges after cooling.

Large holes and damage to seams can be repaired using the above technique or returned to Global Spill & Safety for high frequency welding repair at our Melbourne factory.

Warranty

Global Spill & Safety warrants that during the warranty period, the product will be free from defects in materials and workmanship. Warranty on non-Global Spill & Safety components will be limited to the warranty provided by the original equipment manufacturer and cover against defects in materials and workmanship.

The warranty period is twelve (12) months from commissioning or eighteen (18) months from date of supply, whichever occurs first. The defective goods must be returned freight paid and at the purchaser's risk to Global Spill & Safety. Global Spill & Safety may replace or repair any warrantable item at its discretion.

Global Spill & Safety's liability under this warranty does not extend to indirect or consequential loss (including loss of profit or business) to the purchaser. Warranty does not extend to normal wear and tear experienced over the life of the product.

Squadron Energy is Australia's leading renewable energy company. Proudly Australian owned, our mission is to be a driving force in Australia's transition to a clean energy future by providing green power to our customers.

We develop, operate and own renewable energy assets in Australia, with 1.1 gigawatts (GW) of renewable energy in operation and a development pipeline of 20GW.

With proven experience and expertise across the project lifecycle, we work with local communities and our customers to lead the transition to Australia's clean energy future.

Squadron Energy acknowledges the Traditional Owners of Country throughout Australia. We pay our respects to Elders past , present, and emerging.

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