NSW Ports Port Botany

2021 Hazard Audit of Bulk Liquids Berth No.2

For NSW Ports

25 February 2021

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Arriscar Risk Engineering Solutions

Arriscar Pty Limited
www.arriscar.com.au

Sydney
Level 26
44 Market Street
Sydney NSW 2000
T: +61 2 9089 8804

Melbourne
Level 2 Riverside Quay
1 Southbank Boulevard
Southbank VIC 3006
T: +61 3 9982 4535

DISTRIBUTION LIST

Name	Organisation	From (Issue)	To (Issue)
Wayne Ashton	NSW Ports	Rev A	Rev 0
Steve Cowley	NSW Ports	Rev A	Rev 0

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Summary

NSW Ports operates two Bulk Liquid Berths (BLB) at Port Botany, NSW. Various terminal operators use the BLBs for import/ export of bulk chemicals and fuels. The ship/shore transfer operations are carried out by the individual terminal operators. NSW Ports has an overall governance responsibility for the BLBs.

NSW Ports is required by NSW Department of Planning to undertake a hazard audit of Bulk Liquids Berth No.2 (BLB2) in accordance with the conditions of development consent.

NSW Ports commissioned Arriscar Pty Ltd to undertake the 2021 Hazard Audit in January 2021. The previous audit was conducted in 2017 [1].

This report contains the findings of the current Hazard Audit of BLB2, that includes the operations of Terminal, Vopak and the governance role of NSW Ports.

NSW Ports personnel and user facility personnel were very helpful and open during the audit. The following major findings arose from the audit:

- Process safety is managed at BLB2 on the site is carried out in accordance with a well-developed Safety Management System (SMS). The SMS covers both the maintenance aspects of BLB2 and the governance aspects of the product transfer operations carried out by BLB2 user companies.
- New dock lines and equipment have been installed at BLB2 by Quantem for import of refined petroleum products. This facility was commissioned in 2018.
- There have been incidents of minor product spill in BLB2. These were contained and there have been no significant safety or environmental incidents.
- In general, the SMS is well linked to the process safety management, providing a process and evidence of how the process risks are managed at the Berth.
- The SMS covers all regulatory requirements defined in the NSW WHS Regulation for a major hazard facility (MHF), even though BLB2 is not classified as an MHF.
- The maritime structures are inspected annually by NSW reports. The last audit was in January 2020. Minor improvements were identified, but there were no safety related issues.

Some potential improvements were identified as part of the present Hazard Audit. Some aspects are highlighted below:

- KPIs have been set for lead and lag indicators of safety performance, but in many cases, performance standards have not been set. This is necessary to compare KPI against target performance.
- A comparative review of Operating Procedures of NSW Ports, Quantem and Vopak (Berth Operations) would be useful in identifying overlaps and bring consistency.
- In many cases, NSW Ports closes out a permit to work issued approving the User Company PTW, as satisfactory and safe. For a User Company owned asset, it is not appropriate for NSW Ports to sign off as satisfactory and safe. It is up to the User Company to do so. It would be useful if NSW Ports creates a Work Clearance Form to approve the PTW issued by the user company, ensuring there is no conflict in the Berth for the task to proceed, and reserve the NSW Ports PTW form only for work on NW Ports assets.

- While joint emergency exercises have been held and lessons learnt identified, there is no evidence of actions arising and implementation. The lessons learn must result in remedial actions with implementation responsibility allocated.
- The Fire Safety Study addendum for BLB2 addresses the new Quantem refined fuel pipelines to Area C, but does not address the Area C ship/shore transfer related assets of Quantem on the berth.

One of the most important findings was the need to clearly identify the communication interfaces between NSW Ports and the BLB2 user companies, and the information that needs to be exchanged among them.

The auditor found that the facility has been well maintained and operated safely and that all personnel are aware of the potential hazards and the control measures in place. The safety management system and its implementation are considered adequate for the governance role of NSW Ports.

Recommendations have been made where overall safety at BLB2 can be further improved. These have been allocated priorities for implementation (Auditor's judgement).

Recommendations

The following recommendations were developed for NSW Ports Management for additional improvements to overall safety at BLB2.

Nineteen recommendations have been made. Each recommendation is categorised based on its relative significance from 1 (highest) to 3 (lowest). Recommendations that are directly associated with a legal requirement (e.g. condition of development consent, etc.) are generally allocated to the highest category.

Priority 1: 3; Priority 2: 16 and Priority 3: 3. Of the 19 recommendations, responsibilities were allocated as:

- NSW Ports: 10
- Quantem: 6
- Vopak: 3

It would be necessary for NSW Ports to liaise with the BLB user companies in implementing the recommendations.

No.	Recommendation	Responsibility	Target Completion Date	Priority
1/21	Set Performance Standards for the KPIs to compare actual performance against the performance standard, as measure of SMS effectiveness. For example, specify the target % of planned workplace inspections completed.	NSW Ports	28/2/2022	2
2/21	For hot work permit issued by NSW Ports as a clearance to a Vopak or Quantem issued hot work permit, there is no need for NSW Ports to repeat the gas testing results in already issued by the User, as the test is not carried out by NSW Ports. It is sufficient to acknowledge that gas testing has been done (tick box).	NSW Ports	31/8/2021	2
3/21	Use the NSW Ports permit to work form only when NSW Ports is the primary permit authority, and work carried out on the Ports assets. Where Berth User the primary the permit authority, NSW Ports will become the Clearance Authority. A new Work Clearance form needs to be developed for this purpose.	NSW Ports	31/8/2021	1
4/21	There needs to be a guidance in the SMS or Operations Manual as to what kind of 'hot work' does not require gas testing, but only a portable gas monitor needs to be carried.	NSW Ports	31/08/2021	2
5/21	Include in the inspection checklist for the spillage containment vessel, the status of the spark arrestor as an integrity item.	NSW Ports	31/03/2021	1
6/21	The modification form was not effectively used in its paper form. Ensure that this is rectified in the digital format of the MOC system.	NSW Ports	28/02/2022	2
7/21	The ERP Section does not contain an organisation chart for emergency management. This needs to be included in the next revision.	NSW Ports	28/02/2022	2
8/21	The ERP section fails to mention the roles of gas and fire detectors in initiating emergencies, and the subsequent response. A section needs to be added to the response manual.	NSW Ports	28/02/2022	2
9/21	Develop an action plan to implement the actions arising from emergency exercises, in consultation with all stakeholders. Update the ERP as necessary to reflect the lessons learnt from emergency exercises.	NSW Ports	31/08/2021	1

No.	Recommendation	Responsibility	Target Completion Date	Priority
10/21	Quantem needs to review and update their operations manual, specifically relating to BLB2 operations, as the targeted review date has lapsed.	Quantem	28/02/2022	2
11/21	It is recommended that NSW Ports undertake a Fire Safety Study update of BLB2 to cover ship/shore operations of Quantem refined fuel pipelines.	Quantem/ NSW Ports	28/02/2022	2
12/21	Reinstate the competency-based training program for Quantem's operations at the BLB.	Quantem	28/08/2022	3
13/21	Quantem needs to maintain a record of BLB contractors' training for refresher training planning.	Quantem	28/08/2022	3
14/21	Quantem must include a section in the Terminal ERP that BLB emergencies are covered by NSW Ports' procedures and include this in the contractor induction.	Quantem	28/02/2022	2
15/21	Apart from annual joint exercises with NSW Ports, Quantem must consider desk top exercises for emergency response with the BLB2 contractor.	Quantem	28/02/2022	2
16/21	Consider conducting a training course on the ship/shore checklist in the digital format with BLB operator and BLB User operators to ensure common interpretation of the requirements.	NSW Ports	28/02/2022	2
17/21	Vopak to update Organisation Chart to show the interface of Vopak operators at the BLB and BLB control room (dotted lines where appropriate)	Vopak	28/08/2022	3
18/21	The incidents in Vopak's ENABLEON incident database relating to BLB do not appear anywhere in NSW Ports' records. It appears there is a communication gap which needs to be addressed.	Vopak	28/02/2022	2
19/21	The last review of procedure OPS005-1B was in June 2017. It is subject to a 3 yearly review and update, and must be done in 2021.	Vopak	28/02/2022	2

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Notation

Abbreviation	Description
2-oo-2	2- out of -2
AFFF	Aqueous Film Forming Foam
AS	Australian Standard
ASIO	Australian Security Intelligence Organisation
BLB	Bulk Liquids Berth
CCTV	Closed Circuit Television
CEO	Chief Executive Officer
CO	Carbon Monoxide
DPI&E	Department of Planning, Industry & Environment
EAM	Enterprise Asset Management
EI	Energy Institute
E-MODALMX	NSW Port Operations Management Software
ENABLEON	Vopak Incident Reporting Software
EPA	Environment Protection Authority (NSW)
EPL	Environmental Protection Licence
ERC	Emergency Release Coupling
ERP	Emergency Response Plan
ESD	Emergency Shutdown
ESDV	Emergency Shutdown Valve
FRNSW	Fire & Rescue NSW
FSS	Fire Safety Study
H_2S	Hydrogen Sulphide
HAC	Hazardous Area Classification
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HIPAP	Hazardous Industry Planning Advisory paper
ID	Identification

Abbreviation	Description
INFORME2	Vopak Maintenance Management Database
INTEGRIM	Quantem Incident Reporting Software
IR	Infra-Red
KISSLOW	Vopak Management of Change Database
kPag	Kilo-Pascals gauge
KPI	Key Performance Indicator
LEL	Lower Explosive Limit
LOS	Line of Sight
LPG	Liquefied Petroleum Gas
LTI	Lost Time Injury
MEX	Maintenance Management Software used by NSW Ports and Quantem
MHF	Major Hazard Facility
MLA	Marine Loading Arm
MOC	Management of Change
MSIC	Maritime Security Identification Card
MTI	Medically Treated Injury
O_2	Oxygen
P&ID	Piping & Instrumentation Diagram
PAMS	Property Asset Management System
PANSW	Port Authority of NSW
PBEARS	Port Botany Emergency Alarm Response System
PHA	Preliminary Hazard Analysis
PPE	Personal Protection Equipment
PROTECHT	Port Botany Incident Reporting Database
PS	Performance Standard
PTW	Permit to Work
QRA	Quantitative Risk Assessment
RAM	Reliability, Availability and Maintainability

Abbreviation	Description
SDS	Safety Datasheet
SHEQ	Safety, Health, Environment and Quality
SIL	Safety Integrity Level
SMS	Safety Management System
SOP	Standard Operating Procedure
SWL	Safe Working Load
VOC	Volatile Organic Carbon
WHS	Workplace Health & Safety

1 INTRODUCTION

1.1 Background

Port Botany Operations Pty Ltd, trading as NSW Ports, is responsible for the management of the port facilities at Port Botany, NSW. Their main role and responsibility is to maintain the Port infrastructure for the tenants and Port users. The container terminals are operated by stevedores. Shipping in and out of the BLBs is controlled by the Port Authority of NSW.

A condition of development consent for BLB2 development was to undertake a Hazard Audit every 3 years after the first audit, in accordance with NSW Department of Planning Industry and Environment (DPI&E) "Hazardous Industry Planning Advisory Guidelines" (HIPAP) No.5 [2]. This audit is to be undertaken by an approved independent auditor and the report submitted to the NSW Department of Planning. The hazard audit was carried out in January 2021.

This report contains the findings of the Hazard Audit of BLB2, including the ship/shore transfer operations of tenant companies (Vopak and Terminals).

Following a merger between GrainCorp Bulk Liquids and Terminals Pty Ltd, the new company has been rebranded as Quantem Pty Ltd in July 2020.

1.2 Audit Scope

The scope of the Hazard Audit included the following areas of NSW Ports and BLB2 tenants (Quantem and Vopak):

- Company organisation, safety policy and safety responsibility structure;
- Safety Management System (SMS), specifically covering the procedures for operation, maintenance, training, change management, incident investigation and emergency response;
- Plant areas directly under the control of NSW Ports:
  - Bulk Liquids Berth No. 2
  - Firewater system
  - Security and access control, and
  - Coordination of work carried out at BLB2.
- Terminal ship to shore transfer manifold, valves and pipework, including the emergency shutdown (ESD) system for the bitumen lines and proposed refined petroleum product import lines.
- Vopak marine loading arms (MLAs), manifold, valves and pipework, and ESD system.
- Documentation related to the above items, including document control and record keeping.

Marine loading arms and hose manifolds are operated and maintained by the user companies, including the emergency shutdown (ESD) system. The emergency response is initially provided by the user, with an overarching responsibility by NSW Ports. The licence agreement between NSW Ports and the User Company sets out the responsibilities.

The focus of the hazard audit was on the effectiveness of the Safety Management System (SMS) in managing process safety at BLB2.

1.3 Auditors

The audit was carried out by Dr Raghu Raman and Mr John Paul Maiorana from Arriscar.

Dr Raman is a chemical engineer, with more than 50 years of total experience since graduation. This includes 12 years in the chemical industry in production, process design, process development, project engineering and safety engineering and 8 years of research and teaching in chemical engineering at university level. For the last 35 years, Dr Raman has provided specialist consulting services in process safety and risk management to industry and government.

Mr Maiorana is a Chemical Engineer, with 18 years of industrial, and safety and risk management experience operating within the Australian, USA and Asian regions. This includes consulting in all areas of process safety, including: HAZOP, HAZID, QRA, SIL, HAC, FSS, PHA, RAM, and Safety Case Development, under various regulatory regimes.

2 AUDIT METHODOLOGY

2.1 Overview

This Hazard Audit was conducted based on the guidelines given in HIPAP No. 5, "Hazard Audit Guidelines" [2].

To provide a structure for the site visits, Arriscar utilised an audit process covering the elements in a process safety management system. The elements listed in the NSW Ports SMS for BLBs, are compared with the standard requirements in Table 1.

Table 1 - Process Safety Management Elements Audited

Element	Process Safety Management System Element	Matching BLB SMS Element
1	Structure, responsibility and accountability	Safety Management Policy and Implementation
2	Process safety information	Operating Procedures
3	Standards, codes and regulations	Listed in the BLB Operations Manual
4	Process risk management	Pre-startup review, Safe Working Practices
5	Process/equipment integrity	Equipment Integrity
6	Training and performance	Training and Education
7	Management of suppliers/third party services	Managing Contractors, Procurement
8	Management of change	Management of Change
9	Emergency preparedness and response	Emergency Planning
10	Incident reporting and investigation	Accident / Injury / Near-Miss Reporting and Investigation
11	Audits and corrective actions	Monitoring Procedures
12	Security Management	Security

It can be seen that all the required elements have been addressed in the BLBs SMS.

The Vopak SMS has 20 elements, and includes additional elements not relevant to BLB2 such as management of operations, confined spaces, tank storage etc. Otherwise all the above 12 elements in Table 1 are present in the Vopak SMS.

Quantem has a similar SMS manual.

In addition, compliance audit with AS 3846-2005 [3] was included in the scope.

2.2 Verification Process

The Hazard Audit comprised three major components:

- BLB2 site and equipment inspections;
- Personnel interviews; and
- Document reviews.

Site visits were conducted as follows:

NSW Ports - 18th January 2021

Vopak - 20th January 2021

Quantem - 23rd January 2021

Discussions were held with several personnel at the site.

The discussions were structured to establish if:

- The SMS is adequately documented (manuals, procedures, forms, and other related documents);
- Staff are aware of the system (adequately communicated to staff); and
- The system is working to ensure safety is adequately managed (staff following procedures, follow-up actions implemented, and records kept and available).

Discussions with the personnel summarised in the following table took place as part of the Hazard Audit.

An audit protocol was developed and findings were recorded as the audit progressed. Details are given in Section 7.

All personnel were extremely helpful and open during the audit.

Table 2 – Personnel Involved in Audit

Name	Role	Organisation
Mr Wayne Ashton	BLB Manager	NSW Ports
Mr Steve Cowley	Operational Controls Manager	NSW Ports
Ms Aneeza Qazi	SHEQ Advisor	Vopak
Mr Muslim Bhimani	Sydney Terminal Manager	Vopak
Mr Trent Martin	Operations Manager	Vopak
Mr Steve Barclay	Terminal Manager	Quantem
Mr Sidney Liu	Maintenance Coordinator	Quantem
Mr Nathan McCartney	Operator	Quantem

Document reviews of a selection of procedures were carried out. Random checks of completed forms were done (e.g. modification form, work permits) to check degree of completion and to assess the effectiveness of the systems in place.

2.3 Report Structure

This report is intended to be read as a stand-alone document without reference to other documents. The broad structure is:

- Overview of BLB infrastructure (Section 5).
- Overview of BLB operations (Section 5).
- Overview of SMS (Section 6).
- Findings and recommendations for each audit element (Section 7) for the three entities.

3 SITE DESCRIPTION

3.1 Location

BLB2 is located between Brotherson Dock and Molineux Point, to the south of BLB1, Port Botany, NSW. A map of the site location is shown in **Error! Reference source not found.** with respect to other tenants at Port Botany.

Figure 1 – BLB2 Location Map

3.2 BLB2 Infrastructure

A site layout diagram of BLB2 is shown in Figure 2.

3.2.1 Infrastructure under NSW Ports

The site comprises the following main infrastructure components:

- Main retaining wall
- Mooring dolphins
- Dry chemical extinguishers on wheeled trolleys (2 x 70 kg)
- Hydrants and hose reels
- Fire monitor tower (remotely operated)
- Retractable access bridge to ship's deck from fire monitor tower for crew access
- Access road (Charlotte Road/ BLB2 Site Road)
- BLB2 berth office

The main BLB office is located at BLB1. The BLB2 berth office at the wharf is manned only during a ship/shore transfer.

3.2.2 Vopak Infrastructure

- Two marine loading arms and hydraulics
- Common manifold
- Associated instrumentation
- Pipelines from BLB2 to Vopak Terminal

3.2.3 Terminals Infrastructure

- Common manifold with five (5) chemical product dock lines with hose connections to ship.
- Manual isolation valves for product lines at wharf.
- Independent dock lines for bunker fuel and bitumen, hose connections and ESD valves.
- New manifold for two (2) refined petroleum products import with 14" hose connections and ESD valves.
- Pipelines of chemicals, bitumen to Areas A and B, and refined petroleum products to Area C of Terminals. The bitumen line is insulated and heat traced (electric).

The refined petroleum products import lines to Quantem have been commissioned and are fully operational.

3.3 Staffing

3.3.1 NSW Ports

BLB2 is essentially unmanned except during a ship visit and during any maintenance activity. Most of the staff are located at the BLB1 office. The staffing consists of the following:

- General Manager, Operations (located in the main office at Brotherson House)

- BLB security officer at BLB gatehouse (present 24/7)
- BLB maintenance coordinator
- BLB officers (operate on a 9-hour shift with 1 hour overlap between shift changeovers)

The BLB officers are contractors, supplied by OPEC Pty Ltd.

3.3.2 Quantem

Terminals was rebranded as Quantem Pty Ltd in 2020. Quantem has contracted the bulk liquids transfer operations to contracting companies, who supply the labour. The supervision of the operations is carried out by Quantem. There would be 4 persons at the berth during connection/disconnection and 2 persons during ship/shore cargo transfer.

3.3.3 Vopak

Vopak uses its own personnel to operate the wharf. There would be up to 3 persons during connection/ disconnection of the hydraulic loading arm, and pigging, all Vopak employees. During transfer, there would be 1 person minimum at the berth.

Vopak does not use contractors for ship/shore transfer operations.

3.4 Site Security

BLBs 1 and 2 are enclosed by a chain wire fence approximately 2 m high, with barbed wire at the top.

There are two vehicle access point to the site:

(a) from Charlotte Road (main access route)

(b) from Molineux Point to BLB2 Site Road (emergency access)

Access point (a) is controlled by automatic sliding security gate, operated by the BLB operator at the BLB1 office. Access point (b) is manually operated, and not normally used. The site is well lit at night.

All staff required to work on BLB are required to have a Maritime Security Identification Card (MSIC). This includes a check by Federal Police and ASIO. Employees access the BLB site through a security turnstile, operated by MSI C & ID swipe card.

Visitors to the site must contact the BLB security gate and may be allowed access subject to authorisation, and must complete a BLB general induction.

No weapon of any type is permitted on the berth or ship.

A camera surveillance system is installed at the BLBs and monitored from the BLB1 security gate.

3.5 Shipping Movements

There have been a total of 1450 ships at BLB1 and BLB2 since 2017 to date.

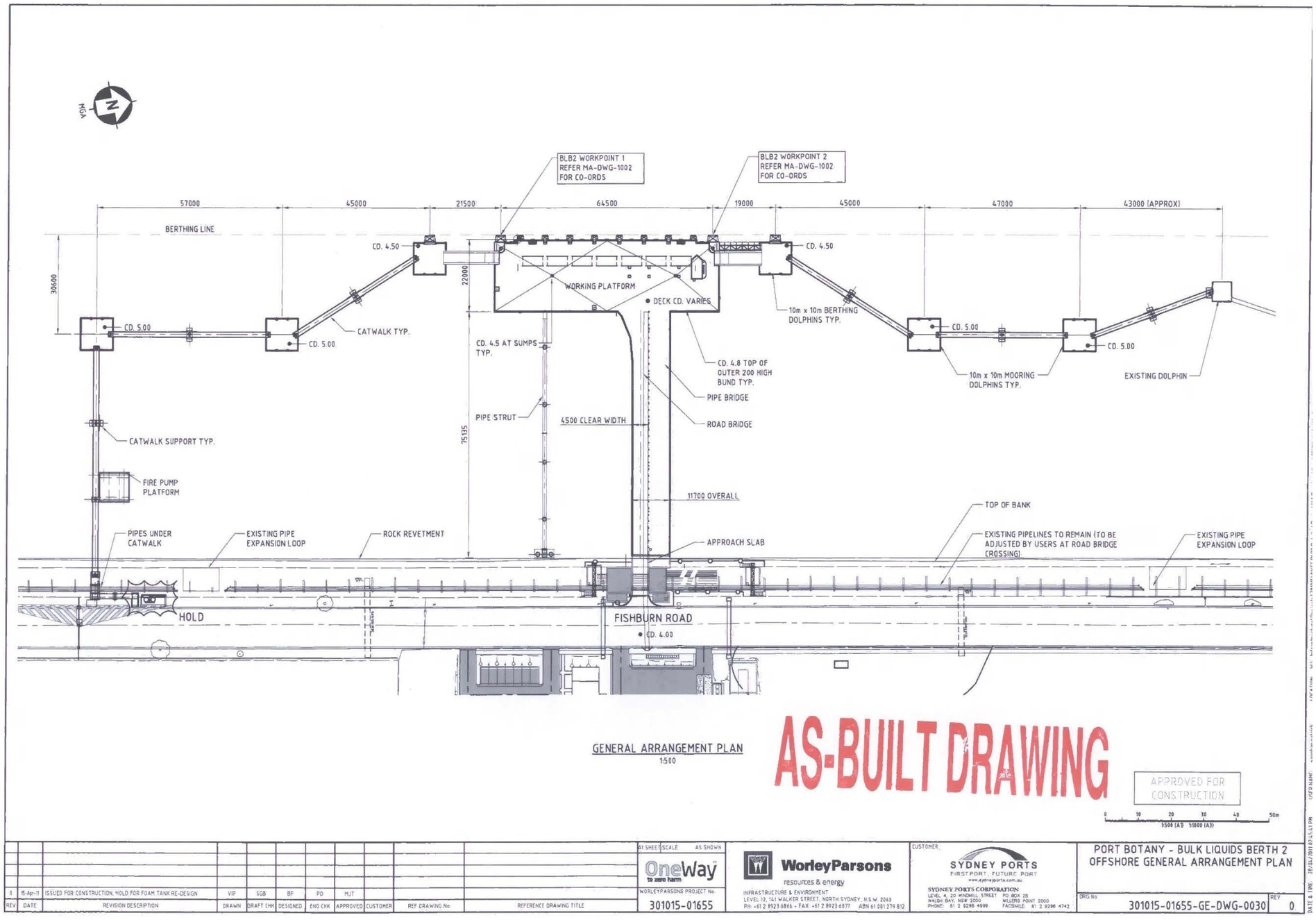

Figure 2 – BLB2 Site Layout

3.6 BLB2 Ship/Shore Transfer Operations

3.6.1 Quantem

In BLB2, there are seven (7) dock lines for bulk liquids transfer operated by Quantem. Two of the dock lines are dedicated to bunker fuel and bitumen respectively. The bitumen line is heat traced due to its high viscosity.

There are no loading arms, and transfer is by flexible hoses. The hoses are kept at the Terminal and brought to BLB2 whenever a transfer is required. Five of the chemical dock lines have a manual isolation valve each, that has to be closed by the operator in an emergency. Emergency shutdown (ESD) valves are installed on the fuel oil (FO) line and the bitumen line. The actuating motive power for the pneumatically actuated valves is nitrogen, provided from bottles at the wharf.

Emergency alarm activation station is located at the wharf and at the approach to the berth. On activation they raise an alarm locally and at the BLB office, but no executive action.

ESD activation stations are located for the FO line and bitumen line at the wharf and at BLB office for remote shutdown.

Each ESD valve is tested for reliability prior to commencement of a transfer and recorded in the wharf isolation valve checklist.

The dock lines are cleaned after the transfer. Any spill is collected in a spill collection tray and taken back to the Terminal for safe disposal.

In 2018, Terminals constructed two new dock lines, each 14” in diameter, for refined petroleum products. The existing manifold for Vopak is extended to connect the two new lines to Quantem Area C.

There are no loading arms and the transfer is through flexible hoses. ESD valves are installed on the wharf.

3.6.2 Vopak

There are two hydraulic marine loading arms (MLA) installed at the Vopak facility. A hydraulic power unit cabinet at the berth provides the hydraulic power for the arms movement.

There are ESD valves on the MLAs that automatically shut if the MLA safe operating limits are exceeded.

In addition, there is an emergency release coupling (ERC) on each MLA, that can be activated by the wharf operator in an emergency.

On completion of unloading, the outboard side of the MLA is drained back to the storage tank in the Vopak terminal. The inboard side of the arm is drained to a local pump suction. The pump at the wharf pumps the liquid back to the storage tank.

Pigging is carried out with gaseous nitrogen, which is piped to the wharf.

3.6.3 Utilities

The main utilities and services in the berth are:

- Nitrogen cylinders which also provides instrument gas for pneumatically actuated valves
- The site power is supplied by Energy Australia

- There is an emergency diesel-driven generator set
- Utilities water is supplied from Sydney Water supply main
- A workshop is provided for minor maintenance work
- Push button/ break glass wharf alarm system
- Berth firefighting system (see Section 5.6)

Communication on the berth is achieved primarily by use of intrinsically safe two-way radios, carried by all personnel. Sufficient redundancy exists to provide backup radios in the event of a fault. A multi battery charger in the control room allows for charging of radio batteries.

3.7 Fire Fighting Equipment

The site is equipped with firefighting equipment consisting of:

- Fire detection (thermal detectors or manual detection).
- Fire alarm initiated by thermal detector or activation of break glass unit or fire alarm buttons.
- Fire alarm signal to a fire monitoring service to take further action.
- Firewater pump house (supplying both BLB1 and BLB2).
- Firewater monitor tower with foam induction system for hydrocarbon fires with remote operation of the monitors.
- 2x70 kg dry chemical portable extinguisher system on wheeled trolleys.

A safety equipment layout of BLB2 is shown in

Figure 3.

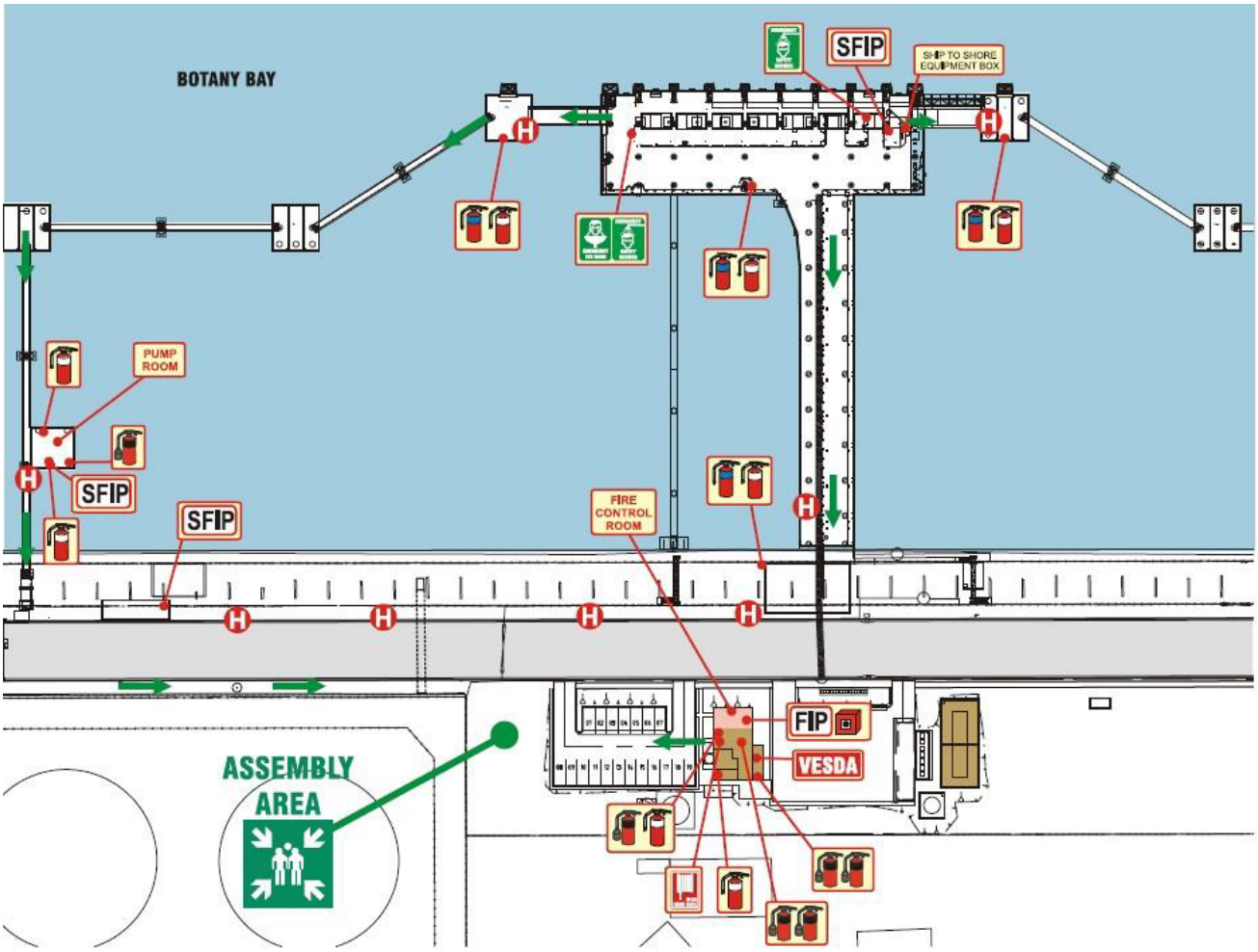

Figure 3 - BLB2 Safety Equipment Layout

4 SAFETY MANAGEMENT SYSTEM

4.1 Overview

NSW Ports has developed a Safety Management System manual, with elements matching the requirements of a process safety management system as listed in Table 1. The manual is available to all site personnel.

The SMS elements are described in detail below.

4.2 Element 1 - Structure, Responsibility and Accountability

The SMS is tiered as follows:

- Workplace Health & Safety Policy that defines the management commitment.
- Core elements of the SMS, based on the hazards and risks in BLB1 and BLB2.
- Detailed procedures, forms, checklists etc.

The NSW Ports WHS Policy emphasises commitment to management leadership and accountability and states the goals and objectives in relation to safety performance.

4.3 Element 2 – Process Safety Information

This element overarches other elements in managing hazards on the site.

The operating procedures manual describes the hazards on the site, and significant safety, environmental, property and/or security risks.

For activities involving the Terminal Companies at the BLBs, the risk assessment of their respective operations is carried by the Companies, and approved by NSW Ports, as part of the governance role.

The hazards and risks are highlighted in the safety induction manual for persons accessing the BLBs.

NSW Ports keeps a record of the following process safety information:

- Berth equipment design basis and design details;
- Chemicals stored and processed;
- Hazardous area classification;
- Details of safety critical equipment;
- Piping and Instrumentation Diagrams (P&IDs);
- A technical library as a basis for maintenance and enhancement of skills and knowledge.

Information may be stored in a wide variety of forms including engineering drawings, data sheets, registers, photographs and manuals. Within NSW Ports, this information is located in the Document Management System.

For all equipment installed and operated by the Terminal Companies at BLB 1 and BLB 2, the process safety information is to be retained by the Terminal Operators and available to NSW Ports on request.

4.4 Element 3 – Standards, Codes and Regulations

The BLB Operations Manual contains a list of the following, as applicable to the site:

- Acts and Regulations
- Guides, Codes and Standards

The above cover both Australian and International guidelines and standards relating to dangerous goods handling and maritime standards.

Details are provided in the Operations Manual and appear comprehensive.

4.5 Element 4 – Process Risk Management

In a governance role, NSW Ports does not have a direct role in process risk management, which falls under the responsibility of the respective Terminal Companies. However, pre-startup review and Safe Working Practices come under Element 4.

Pre-startup safety reviews ensure that new facilities, plants or processes are checked against safe design, construction and process specifications before operation is allowed to commence. Pre-start-up safety reviews include procedures for confirming in writing that:

- Equipment has been fabricated, installed and constructed in accordance with the design specifications;
- Written procedures, including safety, operating, maintenance and emergency procedures are in-place;
- All pre-commissioning procedures, including physical inspections and leak and pressure testing, have been completed and the results documented;
- All agreed measures arising out of HAZOPs and other hazard identification studies, as well as other pre-construction and pre-commissioning safety studies, have been implemented;
- New processes and significant modifications to existing processes have been carried out in accordance with the management of change procedures;
- Employees are qualified and have been appropriately involved in the review process.
- Pre-start-up checklists have been completed correctly, including ensuring that alarm systems have not been corrupted or inadvertently modified during a shutdown, and that temporary bypasses of trips and other safety equipment are all reversed.

Safe working practices include the following:

- Permits and procedures for maintenance and construction including:
    - Cold work;
    - Hot work;
    - Liquid wharf clearance certificate;
    - Line cleaning;
    - Confined space entry;
    - Tagging of equipment, for example, portable electrical equipment;
    - Lock out and tag out; and
    - Isolation and re-commissioning of plant and equipment including utilities;

- Handover between shifts;
- Supervision of safe work practices by the BLB Officer and BLB Manager;
- Procedures for hazardous processes such as rigging, scaffolding and cranes;
- Working at heights;
- Classification and definition of hazardous areas;
- Internal site traffic control and movement of vehicles; and
- Control of access to hazardous areas and processes.

For all construction and maintenance work controlled by the Terminal Companies at BLB 1 and BLB 2, the NSW Ports Permit-to-Work system is used in conjunction with the Terminal Company's permit systems.

4.6 Element 5 – Process and Equipment Integrity

The SMS describes the asset integrity management program. The following assets are controlled by NSW Ports:

- BLB1 and BLB2 including containment systems
- Fire protection systems (diesel pumps, emergency generator)
- Control building
- Security systems including gates, access control and CCTV, and
- Gangways for ship access.

The integrity management program consists of:

- Planned inspection and maintenance program including repairs where required
- Defined frequency of inspections and testing of equipment and alarms
- Monitoring and reporting of equipment defects/ faults/ degraded performance
- Spare parts management including quality assurance in procurement

The documentation for the above NSW Ports requirements is stored within the NSW Ports Property Asset Management System (PAMS).

4.7 Element 6 – Training and Performance

The employee training program of NSW Ports consists of the following:

- Criteria and processes for employee section and on-going training
- Induction to new employees and contractors (refreshed 2-yearly) and records kept
- Properties of dangerous goods handled at the facility;
- Safe working practices;
- Detailed equipment operation, including:
    - Shipping transfers; and
    - Emergency conditions and responses;

- SMS implementation and responsibilities.

4.8 Element 7 – Management of Suppliers/ Third Party Services

The following 3rd party service providers are used by NSW Ports at the BLBs.

1. Brownlec Pty Ltd - Maintenance of electrical equipment in classified hazardous areas.
2. Prime Pumps – Inspection and maintenance of fire protection equipment and monitoring site fire alarm through dedicated communication link.
3. Star Group – Electrical equipment maintenance (Generators and lighting).
4. Halliday Engineering – Mechanical maintenance.
5. Treli Mechanical Pty Ltd – Mechanical maintenance. Selected on the basis of previous track record with NSW Ports.

A contractor selection procedure exists whereby contractor is selected on the basis of their safety performance and existing safety management systems, besides professional competence.

All contractor personnel are inducted in site safety and in safe work procedures. Contractors used by Terminal Companies are inducted in the use of NSW Ports permit to work (PTW) system, in conjunction with the respective Company's own permit systems.

The induction process includes:

- NSW Ports WH&S Commitment
- BLB site function, security and access
- Responsibilities of the contractor and NSW Ports under the WHS regulation
- Visitor access arrangements
- De-matching requirements (ignition control)
- PPE requirements
- Emergency response and evacuation routes/ assembly areas
- Specific hazards – working at water's edge, gangway access
- Incident reporting
- First aid facilities available
- Driver site safety rules
- Work Permits
- Hazardous substances handled at the BLBs and Safety Data Sheets (SDS)
- Asbestos warnings
- Drug and alcohol policy

4.9 Element 8 – Management of Change

Management of Change (MOC) is an important element in the SMS. This element describes the requirements and responsibilities for the management of changes at the site. The purpose is to ensure that changes and modifications to equipment, communication systems, procedures and organisational structure are reviewed and documented for their potential impact on health, safety

and the environment prior to implementation. If the change is temporary, the termination time is to be specified.

Special Change Assessment Forms have been designed for the change management process.

- Equipment, Alarm setting and procedures
- Structures and buildings
- Organisational change
- Completion check sheets

The approval authority is the BLB Manager.

Modifications to Terminal Company owned equipment is managed by the Terminal Company, a copy of which is sent to NSW Ports for review and records.

A similar procedure exists for Vopak and for Quantem.

4.10 Element 9 – Emergency Preparedness and Response

Emergency Management describes the requirements and responsibilities for developing and maintaining an effective emergency response system at the BLBs. The BLB Emergency Response Plan is the documented outcome of this emergency response system. This forms Section 18 of the BLB Operations Manual.

A written emergency has been developed and maintained that is appropriate to the level of risk at the BLBs.

Quantem has its own emergency response plan, that includes the BLBs. However Vopak ERP covers only the Terminal and Vopak follows the NSW ERP for BLBs. If the User has own ERP for BLB, it should be consistent with the NSW Ports ERP.

Copies of these plans must be provided to NSW Ports and kept at the BLB Office.

4.11 Element 10 - Incident reporting and investigation

NSW Ports has an accident / injury / near-miss reporting and investigation procedure. This covers prompt reporting and investigation of accidents and near misses, and the communication of relevant information to all personnel. Main features of this element are:

- Supportive and non-punitive approach to comprehensive reporting of accidents and near misses.
- Identification of corrective actions to prevent future occurrences.
- Implementation of corrective actions within specified time frame.
- Accidents/injuries/near-misses associated with the Terminal Companies activities at the BLBs are to be assessed using the NSW Ports procedure as well as the Terminal Company's systems.
- Monthly review of reported incidents.

4.12 Element 11 – Audits and Corrective Actions

The safety performance monitoring procedure includes:

- Maintaining the WHS Policy up-to-date;

- Hazard control measures for identified hazards;
- Performance standards and indicators;
- Review of performance against standards in reviews and audits.

The following audits and reviews are undertaken:

- Routine walk through audits by management
- Monthly workplace safety inspections (Safety Security & Traffic Manager/ General Manager Operations)
- Annual Corporate audits
- External audits as required by DPI&E
- External audits by Terminal Companies/ Cargo owners (as required)

All audit findings are followed up and actions taken as appropriate.

4.13 Element 12 – Security Management

NSW Ports has an approved Maritime Security Plan for BLB 1 & 2 which covers threats from outside the facility (e.g. trespassing, unauthorised entry, theft, burglary, vandalism, bomb threats, or terrorism) and inside the facility (e.g. sabotage, disgruntled employee or contractor actions and workplace violence). The security plan is approved by the Office of Transport Security. It covers:

- Facilities in-place to monitor and control security and authorised access to the site (fencing, gates, security lighting and security cameras).
- Preventing unauthorised access
- Requirements for access (MSIC & ID card, pass signed by Ship's Master/ Agent)
- BLB general induction completion

It is a requirement that the security plan be reviewed and updated at least annually.

5 STATUS OF IMPLEMENTATION OF 2017 HAZARD AUDIT RECOMMENDATIONS

Table 3 summarises the recommendations listed in Refs. 1 and 2, and the status of implementation.

Table 3 – Status of Previous Audit Recommendations Implementation

No.	Recommendation	Finding	Status
1/17	Upload the latest WHS policy dated 27/4/2016 into the intranet to replace the superseded version which does not specify 'zero harm'.	Policy updated. Latest policy dated 20/8/2018. Goal of zero harm has not been mentioned in the policy but is specified in SMS Section 7.2. [4]	Closed
2/17	Include the following lead indicators for safety performance and set KPIs: (a) % of conforming PTWs as one more lead indicator (b) Management of change process correctly implemented and drawings updated (c) Number of emergency exercises *completed* versus planned (d) % of planned maintenance completed on schedule	SMS Section 7.5 [4] updated to include the new lead indicators. The lead indicators are listed as KPIs.	Closed
3/17	The SMS was due for review in March 2017 was not completed. The review is overdue and must be undertaken as soon as possible.	Review completed and revised manual issued in January 2021.	Closed
4/17	Keep a hard copy of the current SMS at BLB1 office as contractors have no access to the intranet.	SMS hard copy kept at BLB office.	Closed
5/17	Undertake a review and update of BLB Operations Manual which was due in March 2017	Completed. Updated Operations Manual issued in December 2010.	Closed
6/17	Review the list of user company procedures in the Operations Manual for relevance to NSW Ports' governance role.	This was not done in the v.5 update. Recommendation made in this report.	Open
7/17	Update out of date Safety Data Sheets to current ones. Vopak to supply current SDS.	Updated. Many SDSs expire in Feb. 2021. Update of SDS as they expire is an on-going task.	Closed
8/17	Complete the identified non-compliant elements in the hazardous area compliance survey for BLB2.	Hazardous area drawings updated and re-issued in September 2019 [5]	Closed

No.	Recommendation	Finding	Status
9/17	Develop a risk review procedure for capital projects, as part of MOC process.	The latest revision of SMS contains requirements for MOC review for capital projects and contains a checklist for assessment of change for buildings and structures (Appendix 4 of [4]).	Closed
10/17	Include questions on the Permit to Work system/ Isolation in the induction quiz.	Included in Module 2 of induction	Closed
11/17	NSW Ports to ensure that returned work permit forms be signed off by the permit authority noting the work as complete or incomplete as the case may be.	This is being carried out well. However, there are some issues with the dual Permits to Work that can be improved. Included as recommendations in this report.	Closed
12/17	The modification form is not being effectively used for change management and there is no/inadequate documentation for changes that have occurred at the BLB during the audit period. This is a serious non-conformance and should be remedied.	The modification system has been fully revised and updated in the revised SMS. Changes have been documented.	Closed
13/17	The ERP Section does not contain an organisation chart for emergency management. This needs to be included in the next revision.	Incomplete	Open
14/17	Conduct two emergency drills for BLB2, one jointly with Vopak and the other jointly with Terminals Pty Ltd, for a flammable liquid spill and fire scenario and review the Emergency Plan based on lessons learnt. This exercise is to be part of annual on-going emergency exercises.	Emergency drills completed. Lessons learnt were documented. However, it is not clear how actions arising were tracked and implemented. Recommendations have been made.	Closed
15/17	NSW Ports, in liaison with Terminals must undertake a review of the 2011 Fire Safety Study to ensure that the existing fire protection system at BLB2 can adequately protect against loss of containment and fire scenarios of the new refined petroleum products import modifications.	The original fire safety study for BLB2 has been updated with an Addendum in 2018 [6]. Deficiencies in the study were identified and included in recommendations in this report.	Closed

No.	Recommendation	Finding	Status
16/17	Vopak to ensure that returned work permits are signed off by the Permit Authority as complete/ incomplete/ equipment is safe to work on etc.	Very few work permits relating to BLB2 were reviewed with Vopak as most of the permits are archived away from site. The sign off on completion was complete in the forms reviewed.	Closed

6 AUDIT FINDINGS

This section contains the findings and recommendations from the Hazard Audit of NSW Ports' BLB2 at Port Botany. The recommendations are listed in the Summary section of this document.

The findings are summarised in Tables 4, 5-6 and 7-8 for NSW Ports, Vopak and Quantem respectively.

Table 4 – Audit Findings for NSW Ports Operations

Item	Question	Findings	Recommendations
Element 1 – S&HE Management Commitment			
1.1	Is there a current safety policy at the site?	The NSW Ports WHS Policy has been updated. The current policy is dated 13 August 2018, and forms Appendix 1 of the SMS manual [4]. It commits to providing safe working conditions to staff, contractors, visitors and others. This Policy is signed by the NSW Ports CEO. The goal of 'zero harm' is not mentioned in the policy but is included in the SMS manual [4].	
1.2	How is the Policy communicated?	The policy is in Appendix 1 of the SMS manual. It is displayed on the notice boards. It is also available in the NSW Ports Intranet. The personnel interviewed acknowledged that they are familiar with the Policy.	
1.3	Has safety objectives and targets been defined for the site and do they include process safety?	KPIs have been set for monitoring safety performance. Both lead and lagging indicators have been set. Lag indicators are LTI, MTI first-aid injuries and loss of containment incidents. Process safety aspects of user operations are covered by the Terminal Companies (Vopak Australia, Quantem Pty Ltd). Lead and lag Key Performance Indicators (KPIs) have been defined and progress monitored monthly. **Leading Indicators:** • % of planned workplace inspections completed • % of accident and incident investigations completed on-time	

Item	Question	Findings	Recommendations
		• % of training programs completed on-time • % of planned maintenance completed on-time • % of planned audits and the resulting actions completed on-time • Number of emergency exercises completed versus planned • Management of change process correctly implemented and drawings updated • Percentage of conforming permits to work • 5 yearly test for chloride penetration in concrete surfaces **Lagging Indicators:** • Number of lost time injuries per year Number of medical treatment injuries per year • Number of first aid treatment injuries per year • Number of losses of containment per year • Number of regulatory breaches and/or off-site complaints (e.g. noise or odour) per year	
1.4	Have performance standards been defined and implemented?	While the indicators are measured and monitored, there are no performance standards set to compare against to evaluate effectiveness of the system.	1/21 Set Performance Standards for the KPIs to compare actual performance against the performance standard, as measure of SMS effectiveness. For example, specify the target % of planned workplace inspections completed.
1.5	Have responsibilities and accountabilities for safety been defined and implemented?	Roles and responsibilities are outlined clearly in Section 5.4 of the SMS manual [4].	

Item	Question	Findings	Recommendations
1.6	Is the Safety Management System documented and integrated?	The SMS is a stand-alone document is no longer a paper document and is available on-line to all employees. All the elements of the SMS are clearly described. Latest revision is V.5, January 2021.	
1.7	Is the management system readily accessible to employees?	The SMS manual is available in the Intranet at both BLBs. The SMS requirements are included in the contractor induction. The hard copy is kept at BLB1 office.	
Element 2 – Safety Information			
2.1	What information is available to ensure the safe operation of plant (e.g. process manual, basis of design information etc.)?	The operations manual is on the Intranet. Detailed drawings of layout and P&IDs are kept in the BLB1 office. The design basis document for BLB2, produced by Worley Parsons is kept in BLB1 office. The latest Operations Manual is V.5.0, dated December 2020 [7].	
2.2	What operating procedures are available and are they up to date?	The operations manual was last updated in December 2020. The contents cover the following topics [7]: • Duties and responsibilities of NSW Ports personnel • Duties of the Operating Companies • Access to and from the Vessel • Bunker Barge Operations (suspended operations) • Cargo Handling Operations (carried out by Vopak or Quantem) • Entry of Persons to the Wharf or Berth Area • Entry of Vehicles to the Berth • Work Carried Out at the Berth or in the Pipeline Corridor including issue of Work Permits • Spillage Retrieval System • Wharf Emergency Systems • Fire Protection System	

Item	Question	Findings	Recommendations
		• Emergency Procedures The manual also contains a number of checklists for shipping operations: Pre-arrival, post-departure, ship-shore, simultaneous products handling. The ship/shore checklist is used by all berth user companies.	
2.3	How are operations log recorded and communicated?	The operations log is now electronically recorded. Shift handover information is electronically available to incoming shift operator. Paper based logbook system is no longer used. A new software "E-MODALMX" has been implemented since the last audit for online recording and report generation. The software was custom developed for the Ports in 2018.	
2.4	What process and site drawings are available and how are these kept up to date?	The 'as built' drawings of BLB2 are kept at the BLB1 office building. Any changes arising from potential modifications are captured in the MOC procedure, which requires relevant update of the drawings affected. There have been no changes to the wharf layout since the last audit.	
2.5	How is safety information communicated to personnel (staff, contractors)	The hazard register compiled by NSW Ports for BLB operations is still in force. The induction manual has been replaced by an electronic induction system. The induction contains information on hazardous substances handled at the BLBs. Communications on safety is through inductions and toolbox meetings.	
2.6	Are Safety Data Sheets (SDSs) available and current?	SDS register for all products handled in the BLBs are kept in BLBs in a file. Quantem provides copies of SDS of all products handled to NSW Ports, for each shipment. SDSs provided by Vopak are on file.	
2.7	How is the inventory of hazardous materials managed and recorded?	There is no hazardous material inventory at the BLB for the site. All pipelines are pigged after cargo transfer, with the exception of jet fuel pipeline. This jet fuel line is kept isolated when not in use. Electronic records are maintained.	
2.8	Has the hazardous area classification requirements been	The hazardous area drawing has been updated for BLB2. A review of the hazardous area drawings showed that the BLB2 area is classified as either Zone 1 (when there is a ship alongside) or Zone 2 hazardous area (during no transfer	

Item	Question	Findings	Recommendations
	identified and implemented?	operations), under IEC 60079.10.1	
2.9	What safety critical operating parameters have been defined and how are they monitored?	The main safety critical elements under the responsibility of NSW Ports are: (a) BLB firewater system. The FW main must be kept at 1200 kPag pressure and firewater must be available at 700 kPag at the hydrant. The foam induction system must produce a 3% AFFF foam solution, when required. The firewater system maintenance contractor (Prime Pumps) checks that these parameters are met, and the information is logged. Logbooks were inspected during the audit. (b) Wharf structural integrity. This is checked and maintained by chloride penetration test. Chloride in cement dropped to below 0.4%, which is considered a low level risk for corrosion [8]. (c) Wind speed monitor. At 35 knots and above, ship to shore transfer is stopped. Ship is still connected. The wind speed is monitored by ship and at the BLB office. (d) A new gas detection system has been installed at BLB2 in 2020. The hydrocarbon vapour detector (Drager) is a line-of-sight (LOS) detector, and alarms at the BLB office. (e) There are two IR fire detectors installed at BLB2. On detecting a fire (2-oo-2 voting), the system automatically sends emergency signal to Fire & Rescue NSW.	
Element 3 – Standards, Codes and Regulations			
3.1	Which licenses have been obtained and are they current?	The development consent for BLB2 is the main document. No EPA licence is required for BLB. BLB2 User Companies have their own EPA licences. Vopak also has an MHF licence. Quantem is not classified as an MHF.	

Item	Question	Findings	Recommendations
3.2	How is compliance with relevant Codes and Standards achieved?	The main governing standards are: AS 3846 – Handling of hazardous substances in Ports AS 60079.10.1 – Hazardous area classification The audit found that the fire protection system conforms to Section 10.5 of AS 3846. Hazardous area drawings have been updated for BLB2 (sighted during the audit). A review of the integrity of electrical equipment to comply with the area identified a few areas of non-compliance mainly due to the harsh marine environment. Remedial works were undertaken since the last audit.	
Element 4 – Risk Management			
4.1	How are hazards identified?	There is a hazard register for BLBs, compiled from the safety reports of the users.	
4.2	What is the process for risk management?	There is a high-level risk register in the induction manual. Risk reviews are carried out as part of MOC, and through audits and action tracking.	
4.3	What system is used to ensure potentially hazardous activities are undertaken in a safe manner (i.e. safe work practices)	In Section 12 of the Operating Manual [7], the PTW system is described in detail. This is used for all work by NSW Ports in the BLBs. A copy is attached in the Appendix. For any work on the Berth User Company owned asset (e.g. marine loading arms, product piping, valves and manifold), a PTW is issued by the user Company. NSW Ports then issues an overarching PTW before the work is undertaken. Details are given in Section 8.7 of the SMS [4]. Appendix K of the Operating Manual displays a copy of the PTW. A review of 45 used work permits indicated that 38 were in full compliance (85%). There were 2 non-compliances and 4 observations: 1. Hot work permit was issued by NSW Ports where it is not required. Cold work permit must have been issued.	The following improvements are recommended for the PTW system: 2/21 For hot work permit issued by NSW Ports as a clearance to a Vopak or Quantem issued hot work permit, there is no need for NSW Ports to repeat the gas testing results in already issued by the User, as the test is not carried out by NSW Ports. It is sufficient to acknowledge that gas testing has been done (tick box).

Item	Question	Findings	Recommendations
		2. For hot work permits, the results of gas testing entered in the berth user PTW are repeated. This is not appropriate as no testing is actually conducted by NSW Ports. It is required to be entered only for tasks if NSW Ports is the primary permit issuing authority. 3. For a cold work permit issued by Vopak, the overarching permit by NSW Ports was a hot work permit with gas testing results entered. There was no evidence of independent gas testing (Permit 10036 Dated 1/10/2019) 4. A hot work permit (1632) was issued by Quantem when it was not required. No gas testing was done. NSW Ports issued an overarching cold work permit. The error appears to have been on the part of Quantem. 5. Cold work permit was issued by Vopak (10070), against which a hot work permit was issued by NSW Ports. 6. A hot work permit was issued (10071) for which there was no gas testing. It was later explained that not all hot work required gas testing, only a portable gas monitor was required to be carried. This was not explicitly specified. The work permit issued by NSW Ports contains a section for acceptance of work site by BLB officer that states, "The work site has been left in a SATISFACTORY/UNSATSFCTORY condition and IS/IS NOT safe for normal operational use." For a permit issued by the use company work on the user asset, it is not considered appropriate for BLB officer to sign off as the site be 'SATISFACTORY' and 'IS safe for use', as it is not NSW Port's equipment/ asset. While it is appropriate to point out UNSATISFACTORY condition, acceptance for use of the Berth User Company asset has to be done only by the berth user. All that BLB officer can do is to sign off a clearance as the work is completed to enable other	3/21 Use the NSW Ports permit to work form only when NSW Ports is the primary permit authority, and work carried out on the Ports assets. Where Berth User the primary the permit authority, NSW Ports will become the Clearance Authority. A new Work Clearance form needs to be developed for this purpose. 4/21 There needs to be a guidance in the SMS or Operations Manual as to what kind of 'hot work' does not require gas testing, but only a portable gas monitor needs to be carried.

Item	Question	Findings	Recommendations
		work to be carried out at the berth. The User Company then signs off their form as completed and the equipment safe for use. Apart from the above improvements suggested in the recommendations, the system works well, and appears to be strictly followed.	
4.4	How are ignition sources controlled?	BLBs are hazardous area classified. PTW controls portable electrical equipment, hot work. The induction describes the BLBs as 'dematched' areas.	
4.5	How have hazardous zones been defined?	Updated BLB2 hazardous area classification diagrams were sighted during the audit. Zone 1 and Zone 2 areas have been marked on the layout. The classification is based on AS 60079.10.1 and EI 15. EI 15 required a large distance from the berth to be classified as Zone 1 during ship/shore transfer. This could severely restrict activities on the berth every time a ship is alongside. A hazardous area classification undertaken on the basis of vapour dispersion modelling may assist in reducing the Zone 1 area when a ship is alongside and remove some of the restrictions. The current hazardous area classification is, however, more conservative.	
4.6	What process is used to ensure safe isolation of plant and equipment?	Process equipment isolation is the responsibility of the User Company. For NSW Ports controlled equipment, any isolation follows the lock out and tag out procedure. See Tables 5 and 6.	
4.7	What housekeeping program is in place?	Housekeeping is covered in Appendix H of the Operations Manual (Ship pre-arrival and post-departure checklist). The housekeeping standards at BLB2 were found to be of high quality.	
4.8	How are waste management requirements complied with?	Any product spill is contained in the spill collection tank at the BLB. The product is then removed by vacuum sucker road tankers for safe disposal. Minor spills are contained in the bunded area and cleaned up using a cleanup kit, which is safely disposed through an approved waste collection service. The stormwater sump is normally closed. It is tested for quality and if found	

Item	Question	Findings	Recommendations
		acceptable, released via the interceptor pit, or pumped out in tankers and set out to a waste treatment facility. NSW Ports reported that during the audit period, the spill collection tank was hardly used, as there were no significant spills.	
4.9	Is there a list of confined spaces?	A list of 10 confined spaces have been compiled in the Induction Manual. These refer to various access pits within BLB boundaries. Each confined space has been risk assessed and a risk ranking ascribed. Access to pipe tunnels under the road, under roof pipe gallery areas, diesel tank access, spill containment tank access has been rated 'extreme' and others vary from significant to moderate and low. A confined space entry permit is required for entry, in addition to the PTW form.	
Element 5 – Equipment Integrity			
5.1	How is preventive maintenance managed?	NSW Ports uses the MEX asset management software for maintenance management. All equipment all entered into the database and critical items are flagged. The software automatically generates work orders for preventive maintenance from pre-programmed schedule. KPIs are bult into the software.	
5.2	What is the process for ensuring mechanical integrity of process equipment?	The only process equipment under NSW Port's management is the spill containment vessel. The vessel complies with AS 1940-2017 requirements (vent fitted with spark arrester), hazardous area classified. The spillage tank is inspected 6-monthly. The previous inspection report was sighted [9]. There is no specific item to check the integrity of the spark arrestor (e.g.cleaning of any blockage etc)	5/21 Include in the inspection checklist for the spillage containment vessel, the status of the spark arrestor as an integrity item.
5.3	What is the process for ensuring mechanical integrity of rotating	The only rotating equipment are: (a) firewater pumps. These are located in BLB1, and supply BLB2. The pumps are tested with freshwater for 30 minutes as part of preventive maintenance program. (b) Sump pump. Used for	

Item	Question	Findings	Recommendations
	equipment?	pumping out stormwater as required.	
5.4	What is the process doe ensuring integrity of mobile plant and equipment?	There is no installed crane at BLB2. The only mobile equipment are two inherently safe diesel forklifts. The forklifts are maintained by LenCrow (contractor) under a hire agreement.	
5.5	What is the process for ensuring integrity of structures?	The BLB2 wall is a critical structure. A chloride penetration test has been carried out in 2019. The results showed <0.1% chloride levels in cement and structural integrity is considered good. The maritime structures are inspected annually by NSW reports. The last audit was in January 2020 [10]. Minor improvements were identified, but there were no safety related issues.	
5.6	What is the system for ensuring that trip and interlock testing is adequate?	Trip and interlock testing on process equipment is carried out by the BLB2 user companies. This is not applicable for NSW Ports activities. Testing and calibration of the gas detector is carried out by Drager and maintenance of fire detectors by Wormald for NSW Ports.	
Element 6 – Training and Performance			
6.1	How are new employees inducted?	There is a safety induction manual (PowerPoint slides), updated to reflect up to date conditions. This is presented to the employees by BLB Manager, along with the Operations Manual and the SMS Manual to give an overall picture of safety and job requirements. Each person then has to answer a written induction quiz and pass the test. The quiz has been updated to include Permit to Work.	
6.2	How are contractors inducted?	Contractors have to undergo the same induction procedure as employees. In the section on work permits in the induction slides, the requirement of the User Company's work permit in order to obtain NSW Ports overarching work permit is also mentioned.	

Item	Question	Findings	Recommendations
6.3	Is the induction manual sufficient to gain an understanding of the emergencies at the BLB?	The manual lists possible types of emergencies, which are general and non-specific. The section on "Possible Types of Emergencies" can be improved to describe emergencies associated with each User Company Operation. This information is provided in the User Company Emergency Plan, available to NSW Ports. An example is that cryogenic spill of spill as a hazard is not mentioned in the induction manual. This applies to BLB1, but the induction manual is common to both berths.	
6.4	How is the competency of personnel ensured?	A written quiz is to be answered by all inducted personnel for testing their understanding and competence.	
Element 7 – Management of suppliers/third party services			
7.1	How are contractors selected and engaged?	BLB officers are contractors, provided by OPEC Pty Ltd. The level of training/ induction required is specified in the contractor service agreement (sighted during audit). For other service providers, a selection criterion has been developed that includes professional competence, safety performance record, and contractor's safety management system. There have been no changes to the contractors since the last audit. Two additional contractors have been added: Drager for gas detector maintenance and Wormald for fire detectors maintenance.	
7.2	How are contractors managed on site?	The BLB officer/ coordinator supervises the contractors. Sometimes User Company representative may be present if contractor were to work on the User Company's equipment. During ship/shore transfer, there is a representative from the user (Vopak/ Quantem) at the wharf besides the NSW Ports operator who patrols the area.	
7.3	How is the quality of work	Contractors at the site generally work under a work permit. Once the	

Item	Question	Findings	Recommendations
	carried out verified?	contractor has finalised the work, for NSW Port assets, the completeness and quality are inspected by BLB officer. Work on Berth User assets is the responsibility of the User.	
Element 8 – Management of Change			
8.1	How are changes/ modifications controlled and assessed?	There is a formal change management procedure (plant/ equipment/ alarm setting changes, changes to procedures and organisation changes). The form has to be filled and authorised prior to implementation. User Companies have their own MOC procedures. In 2020, NSW Ports started digitalising the modification system, starting with ship/shore checklist. Paper checklist is no longer used. The modification procedure in the SMS manual was found to be comprehensive and detailed.	
8.2	How are changes/ modifications recorded?	There is a modification register for all relevant documentation. Since the last audit, there have been three significant modifications: (a) Digitalising of modification system. Final approval for a modification can only be given when initial safety reviews/ cost justification are completed. (c) Hydrocarbon vapor/ H_2S gas detector installation in BLB2. The H_2S detector is for any release during bitumen transfer (July 2018). No modification form was sighted for the gas detector installation.	6/21 The modification form was not effectively used in its paper form. Ensure that this is rectified in the digital format of the MOC system.
Element 9 – Emergency Preparedness and Response			
9.1	Is there an emergency response plan for the site?	The emergency response plan (ERP) forms Chapter 16 of the BLB Operations Manual, and Appendix N. The latest issue of the ERP is dated December 2020.	7/21 The ERP Section does not contain an organisation chart for emergency management. This needs to be included in the next revision. 8/21 The ERP section fails to mention the

Item	Question	Findings	Recommendations
			roles of gas and fire detectors in initiating emergencies, and the subsequent response. A section has to be added to the response manual.
9.2	Are emergency drills carried out?	The following emergency drills were carried out during the audit period: 1. The scenario was a loss of containment from the ships manifold on BLB2 spilling HFO onto the deck of the vessel, on the berth and into the water. Conducted on 11/8/2017. Participating members were from NSW Ports, NSW Fire & Rescue, PANSW, and Quantem (then Terminals). Lessons learnt [11]: - BLB officer had great difficulties managing communications traffic, having to listen to 4 radio channels at the same time, and carrying out emergency duties as well. - BLB2 alarm noise very high in BLB control room, hard to hear communications. Alarm turned off, but others could not her to enable evacuation. - It was thought that an ESD switch for Quantem at BLB office would be useful. - Quantem (Terminals) had difficulties estimating quantity of spill. 2. ULP spill from transfer line from ship alongside BLB2 to Vopak terminal. Conducted on 26/11/2018. Attended by NSW Ports, Vopak, Quantem, Port Authority of NSW, OPEC systems, BSMS security. The findings were [12]: - Lack of an emergency organisation chart (see Recommendation 11/21) - Lack of radio communications protocol (wharf to Quantem wharf to Vopak, BLB office to ship, contacting Fire & Rescue, all going on simultaneously, no one fully knew what was going on. Same problem	9/21 Develop an action plan to implement the actions arising from emergency exercises, in consultation with all stakeholders. Update the ERP as necessary to reflect the lessons learnt from emergency exercises.

Item	Question	Findings	Recommendations
		in 2017 simulation repeated itself. - PBEARS Alarm button was not activated in the simulation - - Problems re-setting water deluge system (Operator training requirements identified) - Not clearly established as to who advises neighbouring operational sites of potential evacuations required - No traffic control. Fire & Rescue trucks drove into the simulated flammable vapour cloud. Valuable lessons were learnt and a number of action items identified for implementation. 3. Benzene release from ship alongside BLB1 to Quantem (Terminals at that time). Conducted on 26/10/2019. Attended by NSW Ports, Quantem, Port Authority of NSW, OPEC systems, BSMS security, DP World. The findings relevant to BLB2 were [13]: - Port Botany operations shiftmaster (PANSW) was not contacted directly about the incident. - Some problems in evacuation head count in BLB1 and BLB2	
9.3	Are personnel adequately trained in emergency preparedness and procedures?	Annual emergency drills have been conducted, but lessons learnt do not seem to have been fully implemented as similar problems appear in the emergency drills each year. See Recommendation 15/21.	
9.4	What emergency alarm/ shutdown systems are in place?	A push button wharf alarm is installed, and tested before every ship/shore transfer. The alarm sounds at the wharf and at BLB office. The alarm is treated as site alarm for both BLBs. The break glass fire alarm automatically calls the fire brigade and alarms at the	

Item	Question	Findings	Recommendations
		DA Fire monitoring centre. The ESD system is associated with each user company asset. This is tested by the user company prior to each ship/shore transfer. Note: for Quantem, there is no ESD valve on the dock line for chemicals transfer, only for bunker fuel, bitumen and the refined petroleum product lines. The ESD valves for bunker fuel and bitumen can be remotely operated from BLB1 control room.	
Element 10 - Incident reporting and investigation			
10.1	How are incidents reported?	All BLB incidents are reported in a form designed for this purpose. Any incidents relating to User Company operations are separately reported by the User Company, a copy of which is made available to NSW Ports. All reported incidents are entered into a computer database. The previous database STEMS has been replaced by PROTECHT. This is a companywide reporting system including Port Botany, Port Kembla and the Enfield Intermodal facility.	
10.2	How are incidents investigated?	Unless the incident is related to assets controlled by NSW Ports, or an injury is sustained, NSW Ports does not get involved in the User Company incident investigation. A copy of the incident investigation report is sent by BLB User Company to NSW Ports. This report is reviewed by NSW Ports for assurance of due process. For incidents under the management of NSW Ports, the procedure is described in Section 8.9 of the SMS [4] describes the system.	
10.3	What incidents have occurred at BLB2 since last audit?	11 incidents have been reported since the last audit. 2 of them related to speeding vehicles in BLB2 and 2 of them related to fishing boats in restricted waters, and 1 involved a trip injury. Appropriate actions were taken.	

Item	Question	Findings	Recommendations
		Process incidents and near misses reported were: 1. 4/1/2018: A drone crashed into Vopak Bitumen site. No damage occurred. Matter was referred to NSW Police. 2. 3/3/2019: Bitumen import lines were prepared by Terminals with nitrogen purge. When a pressure gauge was removed for replacement, residual bitumen in the line sprayed on Operator. Up to 20L loss was reported. No significant injury. 3. 25/5/2019: Approximately 4000L Jet fuel leak from JUHI pipeline to airport from a hole in the line. While unrelated to BLB2, event occurred in the vicinity of BLB2 and ship transfer was suspended as a precaution, Leak stopped temporarily pending repair. No ignition occurred. Fuel soaked into the ground in the pipeline corridor. NSW Fire & Rescue attended. Vopak notified SafeWork NSW and EPA. 4. 18/8/2019: Onboard unauthorised hot work on ship's manifold while alongside (classified hazardous area). Ship was notified and activity stopped, and recommenced in accordance with SOP. Near miss report was completed by vessel charterer with actions to be taken by shipping company.	
10.4	Is there a system to capture and action findings from incident investigation?	The procedure specifies that all actions arising from investigations of incidents under the direct responsibility of NSW Ports must be implemented and closed out by the specified date. This is a performance standard. Tracked by PROTECHT software.	
Element 11 – Audits and Corrective Actions			
11.1	How often are internal audits undertaken? Who conducts these audits?	There are no formal internal audits, apart from scheduled workplace inspections.	
11.2	How often external audits	External audits are:	

Item	Question	Findings	Recommendations
	are undertaken? Who undertakes these?	(a) KPMG Business Resilience Audit. No safety issues identified. (b) Hazard audit as part of consent conditions. The previous hazard audit was conducted by Arriscar in 2017. The present audit is the third audit in accordance with the 3-yearly audit schedule, required by development consent conditions. (c) An environmental audit was conducted by DECA in January 2020 [14]. The facility was found to be broadly compliant with very few non-conformances. The BLB User Companies may conduct their own audits.	
11.3	What system is used to capture audit findings and to ensure these are actions?	THE SMS procedure requires that all recommendations arising from audits are captured in an action plan, with a schedule for implementation. Actions are tracked by PROTECHT software. Table 3 summarises the status of the recommendations of the 2017 hazard audit.	
Element 12 – Security Management			
12.1	Has a security plan been prepared for the BLB?	A Maritime Security Plan has been prepared for BLB1 and BLB2. This addresses access issues and provisions to prevent unauthorised access. The Security Plan has been developed with and approved by the Office of Transport Security. The procedure requires annual review and update of the plan.	
12.2	How is security managed at the site?	The BLB has security cameras installed and monitored from the BLB1 security gatehouse. The gatehouse is manned 24/7. The BLB is completely fenced and personnel access is only through a turnstile at the security gatehouse to authorised persons, using an access card.	

Table 5 – Audit Findings for Quantem Pty Ltd

Item No	Question	Findings	Recommendations
Element 1 - Structure, responsibility and accountability			
1.1	Is there a current safety policy at the site?	Group policy adopted. Not site specific.	
1.2	How is the Policy communicated?	Policy signed by CEO displayed on the wall. Included in inductions and training manuals. Latest date July 2020.	
1.3	Have safety objectives and targets been defined for the site and do they include process safety?	Quantem Terminal operations objectives applies to BLB1 and BLB2 ship/shore transfer operations. The KPIs are occupational health & safety (OHS) related and do not address process safety.	
1.5	Have responsibilities and accountabilities for safety been defined and implemented?	Organisation chart covers safety responsibilities. National HSE manager's role includes Port Botany operations. Operations managers (site A and Site B/C) are responsible for safety of respective part of BLB2 (Site A for Chemicals and Site B/C for Bitumin and refined petroleum products). At the time of audit a single Operations manager was responsible for all operations at BLB2, pending appointment of a new Operations manager for Site B/C.	
1.6	Is the Safety Management System documented and integrated?	Safety Management System manual covers operations at BLB1 and BLB2. The SMS has 14 elements and covers all the 12 elements framework used this audit.	
1.7	Is the management system readily	On-line access available	

Item No	Question	Findings	Recommendations
	accessible to employees?		
Element 2 – Process Safety Information			
2.1	Is there a process manual for the operation of the plant?	Operating procedures manual exists. Was found to be out of date.	10/21 Quantem needs to review and update their operations manual, specifically relating to BLB2 operations, as the targeted review date has lapsed.
2.2	Are process hazards identified and communicated to operators?	The ship unloading and loading procedures cover the hazards of the operations. Operators trained in procedures.	
2.3	Are Safety Data Sheets (SDSs) available and current?	A set of SDSs is given to Ports by the ship every time a cargo unloading occurs. SDSs for all products are available on-line, provided by the chemicals supplier.	
2.4	Is there a material inventory at the site?	No inventory at BLB2, apart from the pipeline to Terminals inventory during transfer.	
2.5	Have the hazard area classification (HAC) requirements been identified and implemented?	All of BLB2 berth area is classified into Zone 1 and Zone 2 hazardous areas and all electrical equipment managed by Quantem were reported to be in compliance.	
2.6	Are process and site drawings current and available on the site?	P&IDs for BLB2 are current.	

Item No	Question	Findings	Recommendations
2.7	Are there site wide SOPs in place?	There are SOPs for (a) product unloading from ship to Terminal and (b) Product loading to ship. There is a program to update all SOPs to electronic format in 2021. Partially completed in 2020.	
2.9	Have safety critical operating parameters been defined?	(a) Integrity of the ESD valves at the berth for Bitumen and refined fuels line. (b) Integrity of the hoses used for transfer.	
Element 3 - Standards, Codes and Regulations			
3.1	Have the required licenses been obtained and are they current?	Section 2.2 of the EPA licence for BLB2 covers the berth infrastructure owned by Quantem. The EPA licence for Quantem covers the storage areas and not the BLBs.	
3.2	How is compliance to relevant codes and standards achieved?	The main applicable Australian Standard is: AS 3846 –2005, The handling and transport of dangerous cargoes in port areas Compliance assessment is provided in Table 6.	
Element 4 – Risk Management			
4.1	How are hazards identified?	BLB hazards are included in the Quantem site hazard identification list. Risk assessment procedure.	
4.2	What is the process for risk management?	Quantem site risk management procedures in the Risk Assessment Guidelines apply to BLB operations. Applied through the SMS and procedures. Risk matrix is used for risk ranking. Quantem is moving towards implementing a policy of 'continual improvement' in Safety, with goals and personal performance evaluation.	
4.3	Is there a process for controlling ignition sources?	Hazardous area classification and complying electrical equipment. Permit to work (Issued by Quantem and NSW Ports).	

Item No	Question	Findings	Recommendations
		Appropriate "no smoking" signs. Whole of BLB is a dematched area.	
4.4	How is fire detection and protection integrity managed?	Maintenance of fire protection equipment is under the management of NSW Ports, and covered in Table 5 – Audit Findings for Quantem Pty Ltd for NSW Ports. A fire safety study was conducted by Quantem for Areas A and C, but this study did not include the ship/shore transfer operations in the BLBs. A fire safety study addendum to cover the new refined fuel pipelines from BLB2 to Quantem Area C was undertaken by Advisian [6]. However, this study did not cover ship/shore transfer fire hazards in BLB2 for Quantem refined fuel import operations.	11/21 It is recommended that NSW Ports undertake a Fire Safety Study update of BLB2 to cover ship/shore operations of Quantem refined fuel pipelines.
4.5	Is there an emergency shutdown system in place?	The chemicals dock lines have only manual isolation valves. The fuel oil dock line and the bitumen dock line both have ESD valves that can be locally and remotely operated (from BLB1 office). The refined fuel lines have ESD valves that are operated through a local ESD station.	
Element 5 –Equipment Integrity			
5.1	How is preventive maintenance managed?	The maintenance database software MEX is used at Quantem for preventive maintenance scheduling and data management. MEX also covers the BLB operations of Quantem, with annual inspections scheduled.	
5.2	What is the process for ensuring mechanical integrity of pressure vessels?	There are no pressure vessels. Leak testing is carried out with nitrogen for every ship/shore connection.	
5.3	What is the process for ensuring mechanical integrity	Not applicable. In the event of an ESD valve closure at the berth, the ship's pump has internal relief valves to recycle the product back to the cargo tank, and prevent overpressurisation of the wharf.	

Item No	Question	Findings	Recommendations
	of pressure safety valves?		
5.4	What is the process for ensuring mechanical integrity of rotating equipment?	There are no pumps installed at the berth. A portable diaphragm pump is brought in for solvent flushing of lines from an IBC container. Line pigging is done through nitrogen as the motive fluid.	
5.5	What is the process for ensuring mechanical integrity of atmospheric storage tanks?	Applicable only to the Terminal. Not applicable for BLB.	
5.7	What is the process for ensuring integrity of structures?	Not applicable. Wharf structures are maintained by NSW Ports.	
5.8	What is the system for ensuring trip and interlock testing and process control is adequate?	There are 7 dock lines including the fuel oil and bitumen lines. The two latter lines have an emergency shutdown (ESD) valve each installed at the berth. The actuating motive power for the pneumatically actuated valves is nitrogen. The refined petroleum product lines are fitting with ESD valves. Each ESD valve is tested for reliability prior to commencement of a transfer and recorded in the wharf isolation valve checklist. There are no emergency disconnection provisions (flanged connections).	
5.9	How is other safety equipment (e.g. fire detection and protection equipment) inspected and	Maintained by NSW Ports.	

Item No	Question	Findings	Recommendations
	maintained?		
5.10	How is progress of maintenance activities monitored?	Through MEX database, which can track and report outstanding items, and behind schedule items.	
5.11	Is there a permit to work system in place?	A combined Safe work/ Hot work form exists for Quantem Terminal and also used for BLB related work. For hot work, an overarching permit is issued by NSW Ports. A confined space entry from is separately issued with the PTW form for work in Quantem Terminal. The hot wok permit number is cross-referenced in the confined space entry permit form. There are no confined spaces under Quantem's responsibility at BLB2.	
5.12	Is there an isolation process in place?	Manual isolation valves for all routine operations. ESD valves on FO, bitumen and refined fuel lines in an emergency.	
5.13	What housekeeping program is in place?	Quantem has appointed Contractor NXBlue for maintaining housekeeping at the BLBs. A safety skid is taken to BLB from the Terminal for each shipment. The skid consists of cleanup kit, spill response PPE, long distance breathing apparatus etc, as some chemical vapours can be toxic.	
Element 6 – Training Management			
6.1	Is there an induction program for new and transferred employees?	There is a Ports induction program run by NSW ports and all Terminals personnel involved in BLB operations must have completed it in order to obtain entry passes.	
6.2	Is there an induction program for contractors?	The Ports induction program applies to contractors as well. In addition, Quantem has an induction program specific to dock lines and cargo transfer operations.	

Item No	Question	Findings	Recommendations
6.3	Is there a competency-based training program at the site?	A system existed at the time of previous audit, which appears to have become defunct. No formal competency-based training system exists. Safety performance is incorporated in personnel performance review.	12/21 Reinstate the competency-based training program for Quantem's operations at the BLB.
Element 7 - Management of suppliers/third party services			
7.1	How are contractors selected and engaged?	Ship/shore operations are carried out by contractors in BLB2 for Quantem. (a) Zeus for Areas B and C (bitumen and refined fuels) (b) NXBlue for Area A (chemicals) Contractors are provided with the induction program and sign off. No formal training record exists.	13/21 Quantem needs to maintain a record of BLB contractors' training for refresher training planning.
7.2	How are contractors managed while on site?	Contractors report to BLB office to inform the BLB operators before entering the BLB area. Workforce from the contracting company has been stable during the audit period.	
Element 8 – Management of Change			
8.1	Is there a management of change (MoC) process in place?	There is a formal MoC form at Quantem for all changes, as part of the SMS. Any changes to dock lines and associated equipment are initiated and managed by Terminals, in liaison with NSW Ports.	
8.2	How are changes/ modifications recorded?	Quantem reported that this is achieved through the site modification control system.	
8.3	What changes have been recorded since the last Hazard	No changes have been made to Quantem equipment at BLB2 since the last audit.	

Item No	Question	Findings	Recommendations
	Audit?		
Element 9 – Emergency preparedness and response			
9.1	Is there an emergency response plan for the site?	The emergency response plan for the Quantem Terminal does not address BLB emergencies. Quantem reported that they use NSW Ports' emergency procedures, but this is not mentioned in the Quantem ERP. In an emergency NSW Ports takes control and liaises with NSW FR and the EPA.	14/21 Quantem must include a section in the Terminal ERP that BLB emergencies are covered by NSW Ports' procedures and include this in the contractor induction.
9.2	Are emergency drills carried out?	See Item 9.2 of Table 4.	
9.3	Are personnel adequately trained in emergency preparedness and procedures?	No formal schedule of training was identified.	15/21 Apart from annual joint exercises with NSW Ports, Quantem must consider desk top exercises for emergency response with the BLB contractor.
Element 10 – Incident reporting and Investigation			
10.1	Is there an incident reporting and investigation procedure?	The Terminal incident reporting procedure applies to BLB operations of Quantem. The INTEGRIM software is used for incident reporting.	
10.2	How are incidents reported?	Operator reports to the shift controller who enters the incident in INTEGRIM.	
10.3	Are incidents investigated to root causes?	The Quantem Terminal manager conducts the investigation with the involvement of NSW Ports.	
Element 11 – Audits and corrective actions			
11.1	Is there an internal audit program in	Routine internal safety inspections carried out.	

Item No	Question	Findings	Recommendations
	place?		
11.2	Is there an external audit process in place?	BLB2 audits are carried out by NSW Ports.	
11.3	Is there a system to capture findings and ensure these are actioned?	All actions arising go into an action plan and tracking.	

Table 6 – Compliance Review of Quantem Operations with AS-3846 -2005

Item No	AS-3846 Clause	Requirement	Findings	Recommendations
1	2.4.4 Trained personnel in attendance	Dangerous cargos should only be handled by persons skilled in handling such cargos and by persons being trained (and who are supervised by a trained person).	Minimum two (2) trained persons are present during connecting the hose to the ship. One additional person for each extra line connected during cargo transfer. Contractor training provided by Quantem.	
2	2.4.5 Personal protective equipment	Whenever dangerous cargos are being handled, appropriate personal protective equipment (PPE) shall be readily available in accordance with regulatory requirements and used when necessary.	PPE provided to all personnel. Wearing of PPE mandatory by induction and operating procedure.	
3	2.4.7 Safety showers	Whenever a toxic, corrosive or skin sensitising substance is handled in bulk, a safety shower and eyewash facilities (both using fresh water) shall be	Safety shower and eyewash installed at BLB2 and maintained by NSW Ports.	

Item No	AS-3846 Clause	Requirement	Findings	Recommendations
		provided and kept ready for use. Such equipment may be of a portable type.		
4	8.2.2.4 Cargo handling plan	A cargo handling plan shall be prepared	Cargo handling plan is prepared and sent to ship before arrival for each cargo. Sample document sighted during audit and found satisfactory.	
5	8.2.2.5 Emergency information	In addition to the cargo handling plan, the Master shall provide the following documents: (a) Information on the characteristics of the cargos on board or to be loaded. (b) Crew list. (c) Fire control plan. (d) Ship's emergency management plan.	This is received by Quantem and shared with NSW Ports in advance of ship's arrival, for each ship arrival. Quantem prepares product discharge plan/ dock line/ hoses required/ destination tank. Typical plan sighted during audit.	
6	8.2.2.7 Ship/ shore checklist	A ship/shore safety checklist shall be completed. All items that are within the responsibility of the ship shall be checked by the ship's representative, and all items that are within the responsibility of the berth operator shall be checked by the berth operator's representative.	The ship/shore checklist has been digitalised by NSW Ports (except bunkering) and available on-line to Quantem. Typical copies of checklist sighted during the audit and found to be satisfactory. NSW Ports receives a copy. Bunkering has been suspended currently. Quantem reported that there seems to be different interpretations of the requirements between BLB operator	16/21 Consider conducting a training course on the ship/shore checklist in the digital format with BLB operator and BLB User operators to ensure common interpretation of the requirements.

Item No	AS-3846 Clause	Requirement	Findings	Recommendations
			and Quantem contractor. This needs to be resolved.	
7	8.2.2.3 Means of escape from ship	Where a fire or explosion in the shore manifold area could block the escape route of persons from the ship, a means of escape shall be available	The walkway to the tower is the primary escape route. If this is unavailable a Jacob's ladder is provided for alternative escape to shore. This is part of ship/shore checklist.	
8	8.2.12.1 Operation of pipelines, loading arms and flexible hoses	The following procedures and precautions shall be taken upon the completion of every bulk transfer of liquid dangerous cargos: (a) Close dock valves and ship valve and depressure the hose (b) Drain hose and depressure prior to disconnecting the hoses from the ship. (c) The seaward end of hose shall be closed liquid-tight	There is no loading arm at the berth used by Terminals for cargo transfer. Flexible hoses are used. Hoses are kept in the Terminal and brought to the berth for each cargo transfer. Pipeline is pigged with foam pigs to clear the liquid to storage tank. A pig receival station is installed at the terminal. Pipeline is cleaned out with solvent or water and left empty. The line can be used for another product without cleaning if the products are compatible. However, fuel oil line, bitumen line and refined fuel lines are dedicated lines. Dock lines can be made free of chemical vapour by nitrogen purging. Piped nitrogen line is proved from the Terminal and connections are	

Item No	AS-3846 Clause	Requirement	Findings	Recommendations
			provided to the dock lines at the berth. Each dock line is isolated by manual valve. FO, bitumen and refined fuel lines ESD valves are closed prior to disconnection.	
9	8.3.7.3 Control of ignition sources	(a) restriction on the use of non-intrinsically safe radios (b) No ignition sources within 25m from ship and in classified hazardous areas	Intrinsically safe (IS) radios are provided by Quantem at the berth and for the ship's master. Integrity of insulation flanges also tested. Integrity of classified hazardous areas maintained by NSW Ports for BLB2 equipment under the Port's control.	

Table 7 – Audit Findings for Vopak Operations

Item No	Question	Findings	Recommendations
Element 1 - Structure, responsibility and accountability			
1.1	Is there a current safety policy at the site?	There is a global corporate policy for all Vopak Terminals in Australia. The current policy is a HSE policy and undated.	
1.2	How is the Policy communicated?	Displayed on the wall. Included in employee inductions and training manuals.	
1.3	Have safety objectives and targets been defined for the site and do they include process safety?	Globally set Key Performance Indicators (KPIs) apply to the Vopak Terminal and BLB2 operations. Incidents are classified into 3 tiers, depending on cost of the incident. This covers spills and near misses (Failure of safety systems to operate on demand). Tier 1 incidents are classified as minor. Tier 2 and Tier 3 incidents are loss of containment type events. The targets for 2021 were being reviewed by Vopak at the time of audit. There are also operational and maintenance process safety targets set (see Sections 4 and 5 below)	
1.5	Have responsibilities and accountabilities for safety been defined and implemented?	There is a full time HSEQ Advisor located at Port Botany Terminal, reporting to the Sydney Terminal Manager. The Advisor also ensures MHF compliance. There is at least one operator present at the berth 24/7 during transfer operations. There are two operators during loading arms connection and disconnection. The 2021 organisation chart for the Terminal includes Terminal operators but does not include BLB operators.	17/21 Vopak to update Organisation Chart to show the interface of Vopak operators at the BLB and BLB control room (dotted lines where appropriate)

Item No	Question	Findings	Recommendations
1.6	Is the Safety Management System documented and integrated?	Safety Management System manual covers operations at BLB2. SHE 14B – Work Health & Safety. Last update was May 2018. It is certified to ISO 18001 by SGS.	
1.7	Is the management system readily accessible to employees?	On-line access available, as part of document management system, and regularly updated.	
Element 2 – Process Safety Information			
2.1	Is there a process manual for the operation of the plant?	Operating procedure OPD 0005-LPcovers BLB operations. Last review was dated 7/12/16 and is due for a review in 2021.	
2.2	Are process hazards identified and communicated to operators?	Vopak Terminal is a licensed Major Hazard Facility (MHF). As part of the Safety Report, the Terminal Operations Major Accident (MA) Register covers process safety. A separate sheet has been created for BLB operations. Communicated to employees through interactive workshops where assessments are carried out.	
2.3	Are Safety Data Sheets (SDSs) available and current?	SDSs for all products are available online. Sighted during audit. All were current (< 5 years old). The electronic system automatically sends letters to all suppliers asking for update of SDS.	
2.4	Is there a material inventory at the site?	No inventory at BLB2, apart from the pipeline inventory to the Tanks during transfer.	
2.5	Have the hazard area classification (HAC) requirements been identified and implemented?	Drawing same as that developed by NSW Ports [5].	
2.6	Are process and site drawings current and available on the site?	Up to date drawings are maintained. Sighted by auditor during the audit. Drawing No: 5640-86-P&ID-79, BLB2 Wharf Unloading, dated 25/9/2019.	

Item No	Question	Findings	Recommendations
2.7	Are there site wide SOPs in place?	There are 3 major documents that cover the BLB2 operations: - Ship unloading work instructions - Ship/shore transfer operations task matrix - Loading arm installation operations and maintenance manual	
2.9	Have safety critical operating parameters been defined?	A set of parameters have been defined for the Terminal. Parameters applicable to BLB2 include: velocity of flow in the pipeline (maximum 7m/s), power supply to safety instrumentation at berth, instrument air supply pressure, MLA operating limits, Loading Arms ERC ultimate response.	
Element 3 - Standards, Codes and Regulations			
3.1	Have the required licences been obtained and are they current?	1. The EPA licence for Vopak covers the Terminal (stormwater discharge), but not BLB specifically. BLB2 is covered by EPL for NSW Ports. 2. Major Hazards Facility licence issued by SafeWork NSW. Instrument of development consent from DPE&I 3. Pipeline licence for use of pipeline corridor 4. BLB2 user licence reporting obligations include site condition and pipeline inspection reports.	
3.2	How is compliance to relevant codes and standards achieved?	The applicable Australian Standard is AS 3846 –2005, The handling and transport of dangerous cargoes in port areas. Compliance assessment is provided in Table 8. 2-yearly ISO 9001/ 14001 certification audits by a 3rd party are commissioned by Vopak. An exhaustive checklist exists. HIPAP No.5 Hazard Audit undertaken by NSW Ports for BLB2. HIPAP No.5 Hazard Audit of Vopak Site B undertaken by Vopak – covers BLB2.	

Item No	Question	Findings	Recommendations
Element 4 – Risk Management			
4.1	How are hazards identified?	Comprehensive hazard identification was carried out in the MHF licensing process. The Safety Report was sighted during audit.	
4.2	What is the process for risk management?	A risk assessment with rule sets is used for assessing risks on site (including BLB2) using in-house workshops. Performance monitoring through leading indicators for process safety. These are: Safety Observation Round (SOR), PTW, unsafe acts, unsafe conditions. Number of first aid incidents (personal safety).	
4.3	Is there a process for controlling ignition sources?	Hazardous area classification and complying electrical equipment. Permit to work (hot work permits issued by Vopak and NSW Ports). Appropriate “no smoking” signs. Whole of BLB is a dematched area.	
4.4	How is fire detection and protection integrity managed?	Maintenance of fire protection equipment is under the management of NSW Ports, and covered in the main hazard audit. Leak/ fire detection by two operators present at the wharf during connection/ disconnection of cargo transfer, and at least one operator at other times. Liaison with deck watch and Vopak central control room.	
4.5	Is there an emergency shutdown system in place?	Local ESD buttons are provided at two locations in the berth (a) near the loading arms at the berth and (b) near exit walkway. The ESD can be either locally operated or remotely from the Vopak Terminal Control Room.	

Item No	Question	Findings	Recommendations
Element 5 –Equipment Integrity			
5.1	How is preventive maintenance managed?	The maintenance database software INFORME2 is used. This software is used globally by Vopak in its worldwide Terminal operations. Preventive and corrective maintenance scheduling and data processing is managed by INFORME2. It also covers BLB2 operations of Vopak. KPIs have been defined for maintenance: a) PM work orders overdue (must be completed within a month of due date, if not completed within due date. Target 2/month. b) Process safety WOs completed on schedule. Target 100%. c) Corrective maintenance on-time completion target 98%. 100% compliance has been achieved. d) Valve closure times checked monthly. Closure times specified by surge study. Records showed limits and measured values. e) ERC tested 6-monthly. Last test September 2020. f) Gas testing for hot work permit issue (% LEL, CO, H_2S, VOC and % O_2 reported It was found that performance targets for maintenance planning and management at Vopak are of a high standard and they are being achieved. INFORME2 raises monthly reports and cumulative report to date listing outstanding tasks for follow up.	
5.2	What is the process for ensuring mechanical integrity of pressure vessels?	Not applicable for BLB2	
5.3	What is the process for ensuring mechanical integrity of pressure safety	Not applicable for BLB2	

Item No	Question	Findings	Recommendations
	valves?		
5.4	What is the process for ensuring mechanical integrity of rotating equipment?	Not applicable for BLB2	
5.5	What is the process for ensuring mechanical integrity of atmospheric storage tanks?	Applicable only to Terminal tanks. Not applicable for BLB2.	
5.7	What is the process for ensuring integrity of structures?	Not applicable to Vopak. BLB2 structures are maintained by NSW Ports.	
5.8	What is the system for ensuring trip and MLA envelope protection (slew left, slew right, upper tilt) testing and process control is adequate?	The ESD system and loading arms Emergency Release Coupling (ERC) are tested 2-monthly. Schedule generated by INFORME2. Last testing was carried out in September 2020 Document was sighted during the audit. The ERC is also checked for integrity of the insulating flange in these tests.	
5.9	How is other safety equipment (e.g. fire detection and protection equipment) inspected and maintained?	Maintained by NSW Ports.	
5.10	How is progress of maintenance activities monitored?	Through INFORME2 database, which can track and report outstanding items, and behind schedule items. INFORME2 also generates KPIs to compare against targets. The software has been developed by Enterprise Asset Management (EAM).	
5.11	Is there a permit to work (PTW) system in place?	The Vopak Terminal PTW system applies to BLB2 operations. A dedicated Permit Operator prepares the permit. Shift leaders are the permit authorities. A Job Safety Analysis (JSA) form and a toolbox form are signed off by permit authority and person doing	

Item No	Question	Findings	Recommendations
		the work. Permits are not allowed to be carried across shifts. Must be re-approved for the new shift crew. Overarching hot work permits are also issued by NSW Ports. Where a cold work requires gas testing, Vopak issues a hot work permit for the task to ensure that gas testing is carried out. There were very few used permits relating to BLB2. Older permits are archived away from the site. No non-conformance was identified.	
5.12	Is there an isolation process in place?	Manual isolation valves for routine operations and ESD valves in an emergency.	
5.13	What housekeeping program is in place?	The procedures require the berth to be left clean and any spills clean-up after the ship leaves. Routine housekeeping checks are part of other checks by casual operators. Vopak conducts monthly checks. Site visit to BLB2 indicated that housekeeping standard are well maintained.	
Element 6 – Training Management			
6.1	Is there an induction program for new and transferred employees?	There is a Ports induction program run by NSW ports and all Vopak personnel involved in BLB operations must have completed it in order to obtain entry passes. Vopak does not use contractors for ship/shore transfer operations.	
6.2	Is there an induction program for contractors?	The Ports induction program applies to contractors as well. In addition, Vopak has an induction program specific to BLB2 and	

Item No	Question	Findings	Recommendations
		cargo transfer operations. Contractors are used only for mechanical and electrical maintenance work. The contractor is also required to attend the safety committee meeting.	
6.3	Is there a competency based training program at the site?	All persons working at BLB have to complete a training on safe work instructions. The two applicable modules are BLB1 for bitumen and BLB2 for Bitumen and fuels. These have to be signed off after a competency assessment (questionnaire based). The certification is valid for 2 years before re-induction. .	
Element 7 - Management of suppliers/third party services			
7.1	How are contractors selected and engaged?	Preventive maintenance relating to mechanical equipment is carried out by PM Installations. Preventive maintenance relating to electrical equipment and instrumentation is carried out by Sherry Services Pty Ltd. Both contractors operate on an “on-call” basis. All contractors are inducted in safety, and NSW Ports issues Access Control Key, with an expiry date. There is a contractor inductee register. No contractor can access BLB without an access control key.	
7.2	How are contractors managed while on site?	Vopak Terminal personnel oversee the contractor work through routine communications during cargo transfer.	
Element 8 – Management of Change			
8.1	Is there a management of change (MoC) process in place?	There is a formal MoC form at Vopak for all changes, as part of the SMS. Last revision was in April 2019. This includes a comprehensive checklist, risk assessment, approvals and	

Item No	Question	Findings	Recommendations
		closeout. The risk assessment determines if a HAZOP is required for the modification. The template of the form was sighted during the audit. The MOC is fully electronic titled KISSLOW.	
8.2	How are changes/ modifications recorded?	There is a change control register where the forms are filed online. There is no paperwork.	
8.3	What changes have been recorded since the last Hazard Audit?	The changes during the audit period are: 1. BLB2 nitrogen line extension (hard piping to replace hose)	
Element 9 – Emergency preparedness and response			
9.1	Is there an emergency response plan for the site?	The emergency response plan for the Vopak Terminal also addresses wharf emergencies. In an emergency NSW Ports takes control and liaises with FRNSW and the EPA.	
9.2	Are emergency drills carried out?	An emergency drill was conducted with NSW Ports in November 2018. See Section 9.2 of Table 4.	
9.3	Are personnel adequately trained in emergency preparedness and procedures?	Emergency procedures and response are covered in the inductions. Emergency release coupling auto/manual release at the berth is simulated 6-monthly, and records maintained.	
Element 10 – Incident reporting and Investigation			
10.1	Is there an incident reporting and investigation procedure?	The Vopak Terminal incident reporting procedure applies to BLB2 operations. The information is entered on-line in a template and the completed form is printed out. The system also generates the names of people who would receive the report, including NSW Ports.	

Item No	Question	Findings	Recommendations
10.2	How are incidents reported?	Reporting form was sighted during the audit. The incident management system ENABLEON is used for recording and reporting. Incidents during the audit period include the following: 1. 22/6/19: Small nitrogen leak on the gaseous nitrogen line between BLB1 and BLB2. No safety impact and the leak was repaired. 2. 22/9/2020: Ship's crew attempted to connect a compressed air line to blow ship's manifold that contained flammable vapour. This could have resulted in an explosion, Vopak operator detected this through CCTV and stopped it. 3. 7/11/2020: Slops collected in a bucket on board was being brough to shore vis gangway. Operator slipped and spilt bout 15L of fuel. Cleaned up with adsorbent pads. 4. 12/11/20: Leak from ship manifold to sea through an on-board leaking valve. No ignition and no injuries. Reported to EPA.	18/21 The incidents in Vopak's ENABLEON incident database relating to BLB do not appear anywhere in NSW Ports' records. It appears there is a communication gap which needs to be addressed.
10.3	Are incidents investigated to root causes?	All incidents are investigated to the root causes, and is led by the safety coordinator. For Tier 2 and Tier 3 incidents (none have occurred), the national HSEQ manager/ local HSEQ coordinator would also be involved in the investigation.	
Element 11 – Audits and corrective actions			
11.1	Is there an internal audit program in place?	Vopak conducts 5-yearly internal audits on a rotating basis to cover all its operations. No internal audit has been carried out on BLB2. However, for each ship transfer, a Safety Observation Review (SOR) is conducted and findings recorded. SOR reports	

Item No	Question	Findings	Recommendations
		were sighted during the audit. There were no issues of concern that would stop a shipping operation.	
11.2	Is there an external audit process in place?	External audits are conducted as follows: (a) By Vopak global program – 4 yearly. Last audit was in 2016. The 2020 audit was delayed due to COVID-19. There were no findings for BLB2 in the 2016 audit. (b) By the oil companies whose product is stored at Vopak Terminal (Q8, BP, Mobil, Ampol, United) (c) Required by the NSW Department of Planning as a condition of development consent for BLB2 to NSW Ports. The present audit comes under this category and commissioned by NSW Ports.	
11.3	Is there a system to capture findings and ensure these are actioned?	All actions arising go into an action plan and tracking. Monthly report on status of action plan and close out generated and discussed in management team meetings. Ship's berthing and mooring audit was carried out by Vopak's marine division. It was found that SWL on mooring equipment was not displayed. This information was not shared with NSW Ports. This once again revealed communication issues between berth users and NSW Ports. Since the time this has been identified in the audit, NSW Ports and Vopak met to improv communication channels on audit findings. A draft recommendation has been closed out.	

Table 8 – Compliance Review of Vopak Operations with AS-3846 -2005

Item No	As-3846 Clause	Requirement	Findings	Recommendations
1	2.4.4 Trained personnel in attendance	Dangerous cargos should only be handled by persons skilled in handling such cargos and by persons being trained (and who are supervised by a trained person).	Two (2) trained persons at all times during cargo transfer (connection/ transfer/ disconnection). A training matrix exists.	
2	2.4.5 Personal protective equipment	Whenever dangerous cargos are being handled, appropriate personal protective equipment (PPE) shall be readily available in accordance with regulatory requirements and used when necessary.	PPE provided to all personnel. Wearing of PPE mandatory by induction and operating procedure. In addition, in 2020, COVID-19 masks were provided.	
3	2.4.7 Safety showers	Whenever a toxic, corrosive or skin sensitising substance is handled in bulk, a safety shower and eyewash facilities (both using fresh water) shall be provided and kept ready for use. Such equipment may be of a portable type.	Safety showers and eyewash are installed at BLB2 and maintained by NSW Ports. Eyewash checked for functionality during audit.	
4	8.2.2.4 Cargo handling plan	A cargo handling plan shall be prepared	Pre-arrival plan is prepared and sent to ship before arrival for each cargo. Sample document sighted during audit and found satisfactory. There were 1450 ships from 2017 to date in BLB1 and BLB2.	

Item No	As-3846 Clause	Requirement	Findings	Recommendations
5	8.2.2.5 Emergency information	In addition to the cargo handling plan, the Master shall provide the following documents: (a) Information on the characteristics of the cargos on board or to be loaded. (b) Crew list. (c) Fire control plan. (d) Ship's emergency management plan.	This is received by Vopak and shared with NSW Ports in advance of ship's arrival, for each ship arrival.	
6	8.2.2.7 Ship/ shore checklist	A ship/shore safety checklist shall be completed. All items that are within the responsibility of the ship shall be checked by the ship's representative, and all items that are within the responsibility of the berth operator shall be checked by the berth operator's representative.	A standard ship/shore checklist for bulk cargo transfer has been prepared and issued to Vopak by NSW Ports. This checklist is used by ship and berth representatives and signed off. In 2020, this system was fully digitalised by NSW Ports.	
7	8.2.2.3 Means of escape from ship	Where a fire or explosion in the shore manifold area could block the escape route of persons from the ship, a means of escape shall be available	The Jacob's ladder (an outboard ladder belonging to the ship) is lowered and kept ready prior to cargo transfer. This is part of ship/shore checklist.	
8	8.2.5 Moorings	All new bulk liquid berths, including bulk gas berths, shall be fitted with quick-release devices.	Quick release couplings fitted. Mooring is not carried out by Vopak, but visually checked by personnel at the berth. If additional tension is required, this	

Item No	As-3846 Clause	Requirement	Findings	Recommendations
			is carried out by the ship on request from Vopak.	
9	8.2.9 Operation of sea and overboard discharge valves	All sea and overboard discharge valves that are connected to cargo or ballast pumps, other than those to segregated ballast lines, shall be kept closed, unless permitted by the designated port officer.	Vopak personnel inspect the scupper valves and ensure that they are closed prior to commencing the cargo transfer. The Vessel Master is responsible to ensure that this is done.	
10	8.2.12.1 Operation of pipelines, loading arms and flexible hoses	The following procedures and precautions shall be taken upon the completion of every bulk transfer of liquid dangerous cargos: (d) Close cargo line valves and ship valve (e) Drain MLA of all dangerous cargo and depressure prior to disconnecting from the ship.	The MLA outboard is drained by gravity to ship's tank. The MLA in-board is pumped into the pipeline to the Terminal by installed pumps at BLB2. The pipeline is pigged with a solid pig to clear the liquid to storage tank. A pig receival station is installed at the Vopak Terminal. The pipelines are then made free of any fuel vapour by nitrogen purging. Piped nitrogen line is provided from the Terminal and connections are provided to the MLA in-board at the berth. The pneumatic actuated isolation valve is controlled by nitrogen as the motive fluid.	19/21 The last review of procedure OPS005-1B was in June 2017. It is subject to a 3 yearly review and update, and must be done in 2021.

Item No	As-3846 Clause	Requirement	Findings	Recommendations
			Procedure No. OPS005-1B dated June 2017 was sighted during the audit. It is reviewed 3-yearly unless any changes are required prior to the scheduled date.	
11	8.3.7.3 Control of ignition sources	(a) restriction on the use of non-intrinsically safe radios (b) No ignition sources within 25m from ship and in classified hazardous areas	Intrinsically safe (IS) radios are provided by Vopak at the berth and for the ship's master. Integrity of classified hazardous areas maintained by NSW Ports for BLB2 equipment. Electrical audits carried out by Vopak in BLB1 and BLB2 for hazardous area integrity.	

7 REFERENCES

[1] Arriscar Pty Ltd, "2017 Hazard Audit of Bulk Liquids Berth No.2, Port Botany for NSW Ports," Report No. J-000281-REP-01-Rev 0, Sydney, November 2017.

[2] NSW Department of Planning, "Hazardous Industry Planning Advisory Paper No.5, Hazard Audit Guidelines," ISBN 978-0-73475-864-4, Sydney, January 2011.

[3] S. Australia, "AS 3846-2005 The handling and transport of dangerous cargoes in port areas," 2005.

[4] NSW Ports, "Bulk Liquids Berth 1 & 2 Safety Management System, v.5.0," January 2021.

[5] NSW Ports, *Hazardous area drawings for BLB 2 - 502741-0000-DRG-EE-0005-0 to 0008-0,* 2018.

[6] Advisian, "Bulk Liquids Berth 2 Fire Safety Study Addendum - Addition of DN 350 Petrol and Diesel Pipeline to Terminals Site C," 301015-03922-SR-REP-0001 Rev.0, May 2018.

[7] NSW Ports, *Bulk Liquids Berths 1 & 2 Port Botany - Operations Manual,* December 2020.

[8] ARUP, "Port Botany Marine Structures Inspection Program (MSIP)," 249519-00-REP-001, December 2016.

[9] Halliday Engineering, "Six Monthly Inspection of 100kL Spillage Tank - A14-2 (iv) at Bulk Liquids Berth, Port Botany," April 2020.

[10] C. Varming, "Routine Inspection Report for Maritime Structures - Asset PB-MAR-BLB2, Port Botany," NSW Ports, 2020.

[11] NSW Ports, "Terminals/ NSW Ports Emergency Exercise," 11 August 2017.

[12] NSW Ports, "BLB 2018 Annual Emergency Exerise," 28 November 2018.

[13] NSW Ports, "BLB 2019 Annual Emergency Exercise," 28 October 2019.

[14] J.Dickson, "Independent Environmental Audit Bulk Liquids Berth No.2 Operations - Final report," Dickson Environmental Consulting & Audit, January 2020.

[15] Standards Australia, AS-3846: The handling and transport of dangerous cargoes in port areas, 2005.

Appendices

Appendix A Summary of Documents Reviewed

Table 9 – NSW Ports Documents Reviewed

Element	SMS Element
Safety Management System Manual, Bulk Liquids Berth 1 and 2, Revision 1.2, December 2020	All
Work Health & Safety Policy, 20 August 2018	1
NSW Ports organisational chart	1
Port Botany BLB2 Site Plan, 301015-01655-GE-DWG-0006, Rev 0	2
Port Botany BLB2 Hazardous Area Plan, 502741-0000-DRG-EE-0005-0 to 0008-0, 2018	2
Port Botany Marine Structure Inspection Program (MSIP) 249519-00-Rep-001, 12 August 2016, Arup Pty Ltd	5
Port Botany Bulk Liquids Berth 1 and 2 Operations Manual, v 5, December 2020	2,3,4
Samples of issued PTW forms	4
Testing records of firefighting system at BLB2, Port Botany by DA Fire Services Fire pump test log sheets	5
Port Botany Bulk Liquids Berth 1 and 2 General Induction,	4,6
Skills, Training Requirements extracted from Service provider contract agreement	6, 7
BLB Operator/Contractor/Visitor Quiz (post-induction)	6
Management of Change procedure	8
Bulk Liquids Berths 1 & 2 Emergency Plan – v.5, December 2020 (Part of Operations Manual)	9
Emergency drill review 2017	9
Emergency drill review 2018	9
Emergency drill review 2019	9
Incident review forms (BLB2 Incidents) 2017-2020	10
JUHI pipeline – post-incident review	10
Independent Environmental Audit, January 2021	11
Ship/shore electronic checklist – viewed online, 2020	2
Modifications Register	8

Table 10 - Quantem Documents Reviewed

No.	Document Description
1	Shipping log – cargo transfer, Lists tanks that received the product and times
2	Ship discharge/ Loading Plan. Lists product, ship's tanks, Quantem tanks and parcel size transferred.
3	Cargo planning sheet signed off by Ship's chief officer and Terminals loading master. Lists name of ship, shore tank numbers where product is received, dock line number, and expected duration of transfer at set pumping rate.
4	Health, Safety, Environment and Quality (HSEQ) policy of Quantem Pty Ltd
5	Job Hazard Analysis risk matrix and rule sets and JHA worksheets for various hazards (generic).
6	Operations procedure manual
7	Wharf isolation valve checklist – Lists valve open/ close position for each dock line, prior to transfer. Only the nominated dock lines receiving product are open, the rest closed.
8	P&ID of new refined petroleum product import dock lines
9	Wharf ESD valves test results log sheets

Note: Many of the documents were viewed on-line, assisted by the Operations Manager, and control room operator in Area A.

Table 11 - Vopak Documents Reviewed

No.	Document Description
2	Incident list relating to BLB2
3	Organisational Chart
4	MOC procedure
5	Copy of work order for ERC testing printed from INFORME2
6	MOC Register
7	WHS policy
8	Valve closure time measurements log
9	BLB2 operating procedure
10	Major Accident Register from MHF Safety Report
11	MLA envelope protection, ERC and import lines ESD test records
12	MoC form template

Note: Many of the documents were viewed on-line, assisted by the HSEQ Advisor and Operations Manager.