

Maintaining compliance with Defence criteria and safety standards as EO operations expand beyond the Commonwealth Property Boundary

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ACOR CONSULTANTS

Company Snapshot

Founded in 1997, ACOR Consultants began as a group of engineers with a unique set of personal and professional values, providing specialist consulting services across Sydney.

We have since grown into a multi-disciplinary firm employing more than 400 staff in offices across Australia.

Our aim is to add value at every stage of a project by bringing together passionate, dedicated people who challenge, explore, and expand traditional thinking through a hands-on approach.



Overview & Objective

1. Case Study 1: Ammunitioning and De-ammunitioning Royal Australian Navy Vessels at Commercial Ports in Australia
2. Case Study 2: Deployable Traverse Designs Used Across the World

- Demonstrate challenges of applying established EO safety criteria in non-traditional environments
- Discuss how proportionality may evolve from competition to conflict while preserving the intent of EO safety regulation

Case Study 1

AMMUNITIONING AND DE-AMMUNITIONING RAN VESSELS AT COMMERCIAL PORTS

- Review commercial ports to determine potential NEQ capacity
- Generic QD calculations performed using ACOR software for easily identifiable ES. Non-compatible land uses identified via satellite imagery, Google Maps and Port Handbooks.
- Limited to information publicly available, requiring assumptions. Less control over development and operations.
- Criteria:
  - EO Capability
  - Maritime Infrastructure
  - Landside Logistics
  - Security
  - Environment and heritage
  - Commercial Feasibility

Case Study 1

PORT OF BROOME (EXAMPLE ONLY)

- 600 km north of Port Hedland and 1,800 km south of Darwin
- Commercial trading port and key export hub for cattle and mineral sands
- Supply base for fishing, pearling and offshore oil and gas vessels
- 10 berths
- Currently allows dangerous cargoes, including explosives, associated with the mining and offshore oil and gas industries





ACOR EXPLOSIVE ORDNANCE CALCULATION SHEET - ***STATIC STORAGE***

Table 1: Project Information			
Client:		Job Number:	
Site:		Assessor:	
Address:		Reviewer:	
Comments:		Date:	
This is example of calculation sheet use. Grey cells are template or automatically generated and should not be altered. Blue cells are mandatory and must be filled in. Green cells can be used to either calculate QD based on NEQ, or NEQ based on QD.			

Table 2: Site Classes			
Type 1	Light Frangible Structure	ESH	Explosives Storehouse
Type 2	Heavy-walled Building	PB	Process Building
Type 3	Earth Covered Building (ECB)	IB	Inhabited building
Type 4	Igloo		
Type 5	Process Building		
PTR	Public Traffic Route		
IB	Inhabited Building of Traditional Construction		
VB	Inhabited Building of Vulnerable Construction		

Update images

FALSE

Set FALSE for best performance
Set TRUE when printing licences
TRUE will cause extra lag

Table 3: PES Lookup

a	b	c
Rear facing ECB	Side facing ECB	Front facing ECB
d	e	f
Heavy Wall, Heavy Roof	Heavy wall structure, doors towards a site	Heavy Wall, Light Roof
i	j	
Open Stack/Light structure, traversed	Open Stack/Light structure, untraversed	

Table 4: ES Lookup

1	2	3	4	5	6	7	8	9	10	11
NATO ECB, 7 bar Igloo, rear facing	NATO ECB, 7 bar Igloo, side facing	NATO ECB, 7 bar Igloo, front facing	ECB, 3 bar Igloo, rear facing	ECB, 3 bar Igloo, side facing	ECB, 3 bar Igloo, front facing	Front facing ECB, doors protected from high velocity projectiles	Front facing ECB, with door traverse	Rear facing ECB	Side facing ECB	Front facing ECB
12	13	14	15			18	19	20	21	22
Heavy Wall, Heavy Roof	Heavy Wall, Light Roof	Medium Building, traversed	Medium B untravers			Process Building, heavy roof, traversed	Process Building, light roof, traversed	Process Building, light or heavy roof, untraversed	Public traffic route, light traffic	Public traffic route, medium traffic
23	24	25	26a	26b	27a	27b	27c	28a	28b	28c
Public traffic route, dense traffic	Inhabited building, traditional	Inhabited building, vulnerable	Office/Admin, less than 20 people	Office/Admin, 20 or more people	Overhead Power Grid, Supergrid Network	Overhead Power Grid, Normal Network	Overhead Power Grid, Minor Network	POL Facilities/Pipelines, protected/undergrou	POL Facilities/Pipelines, unprotected, vital	POL Facilities/Pipelines, unprotected, non-vital

CALCULATE MINIMUM PTRD, IBD AND VBD ARCS

Table 5: PES Building Details

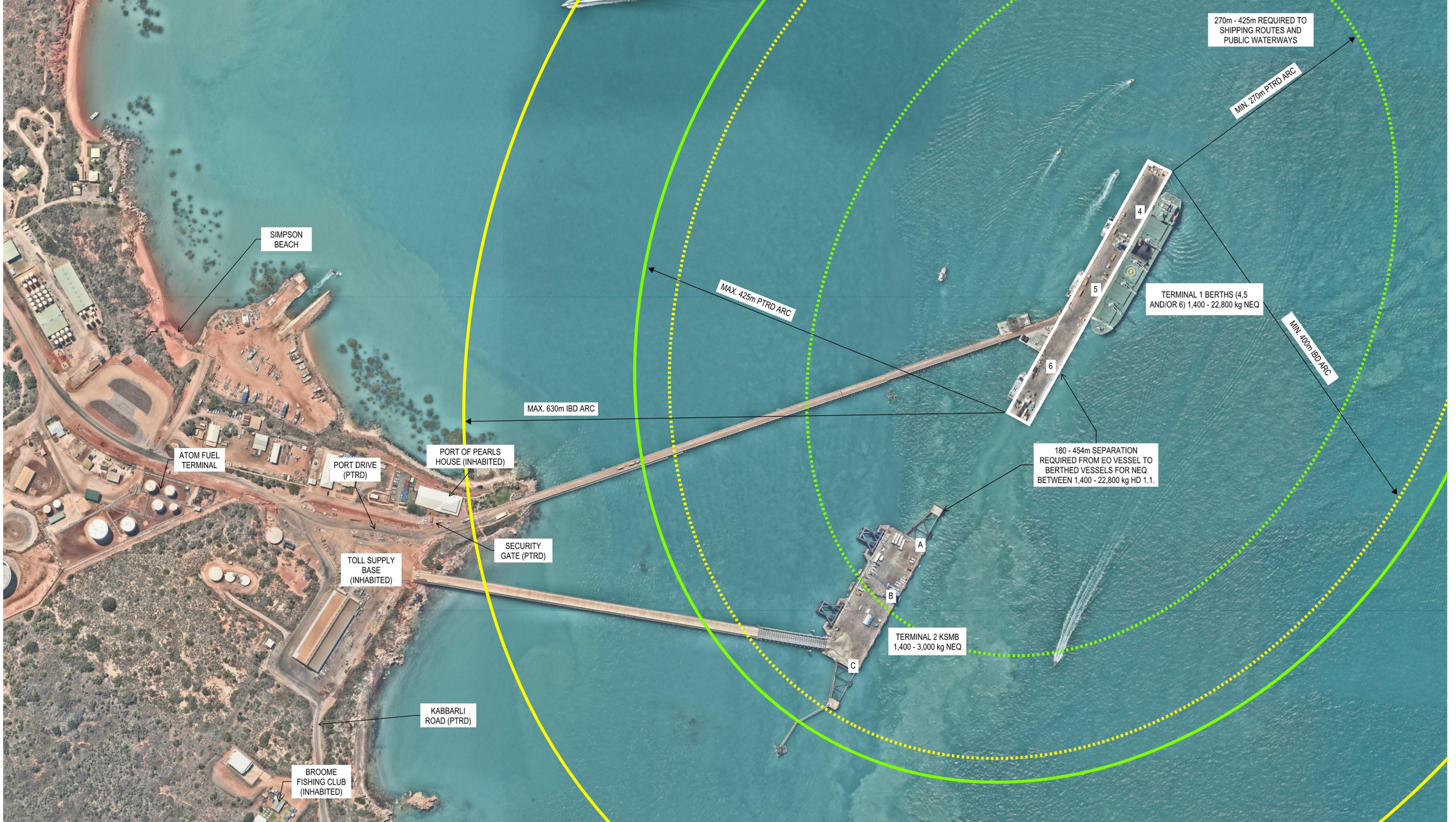
PES Name	Licence Number	MCE <= 50kg	PES Internal Volume > 20m^3		ES Thermal Protection		ES eDEOP HD1.2 Protection	
RAN Vessel	na	Yes	Yes		Maximum (conservative)		Maximum (conservative)	
HD 1.1	HD 1.2.1	HD 1.2.2	HD 1.2.3	HD 1.3.3	HD 1.3.4	HD 1.4	HD 1.5	HD 1.6
1	1	1	1	1	1	1	1	1

Demolition Ground Calculator

AUW of explosives (kg)	2	OR	Safety distance allocated (m)	1000
Safety distance needed (m)	796		AUW allowed (kg)	7.8

Table 6: ES Building Details

PES Lookup ID	Type	Note: Images not updated	No.	ES Name	ES Lookup ID	Type	Note: Images not updated	Actual Distance from PES (m)	eDEOP - Min Dist from PES (m)	AASTP - Min Dist from PES (m)	eDEOP HD1.1 Conditions	AASTP Blast Conditions
i	Open Stack/Light structure, untraversed		ES 1	PTRD	22	Public traffic route, medium traffic			270	155	Directional effects of debris	None
i	Open Stack/Light structure, untraversed		ES 2	IBD	24	Inhabited building, traditional			400	230	Flying and falling glass etc	None
i	Open Stack/Light structure, untraversed		ES 3	VBD	25	Inhabited building, vulnerable			800	230	Flying and falling glass etc	None


270m - 425m REQUIRED TO SHIPPING ROUTES AND PUBLIC WATERWAYS
MIN. 270m PTRD ARC
SIMPSON BEACH
MAX. 425m PTRD ARC
TERMINAL 1 BERTHS (4,5 AND/OR 6) 1,400 - 22,800 kg NEQ
MIN. 400m IBD ARC
4
5
6
MAX. 630m IBD ARC
ATOM FUEL TERMINAL
PORT DRIVE (PTRD)
PORT OF PEARLS HOUSE (INHABITED)
180 - 454m SEPARATION REQUIRED FROM EO VESSEL TO BERTHED VESSELS FOR NEQ BETWEEN 1,400 - 22,800 kg HD 1.1.
SECURITY GATE (PTRD)
TOLL SUPPLY BASE (INHABITED)
A
B
C
TERMINAL 2 KSMB 1,400 - 3,000 kg NEQ
KABBARLI ROAD (PTRD)
BROOME FISHING CLUB (INHABITED)

Case Study 1

KEY CONSTRAINTS IDENTIFIED AND LESSONS LEARNT

- Min. inhabited building distances drive significant exclusion zones (400-630 m)
- Separation to other vessels can constrain port operations
- Shipping routes and public waterways become critical exposed sites
- Availability of public information can significantly influence outcomes

Compliance becomes increasingly difficult when Defence does not control surrounding land use, development, or port operations.

Case Study 2

DEPLOYABLE TRAVERSE SYSTEMS FOR EXPEDITIONARY EO STORAGE

"Maintaining explosive ordnance safety outcomes when traditional permanent infrastructure is no longer available, affordable, or sufficiently agile”

Case Study 2

THE CHALLENGE: TRADITIONAL TRAVERSES IN A DEPLOYABLE ENVIRONMENT

DEOP101 criteria is largely based on:

- Permanent Commonwealth-owned facilities
- Established EO depots
- Traditional earth traverses
- Long planning and construction timelines

Future operations during conflict may require:

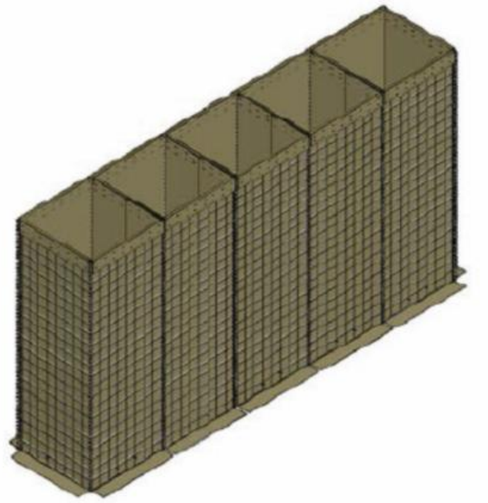
- Expeditionary ammunition storage
- Commercial infrastructure utilisation
- Rapid force dispersal
- Increased weapons stockpiles



Case Study 2

ALTERNATIVE 1 – EARTH FILLED AND MODULAR PROTECTIVE SYSTEMS

Barrier type	Key Characteristics	Typical Application
Sandbags / BlastSax	Relatively simple construction using filled bags	
HESCO gabions	Wire-reinforced geotextile containers filled with earth or rock.	Forward operating bases
Earth-filled steel bins	Modular steel retaining structures, including ARMCO-type revetments.	Flight line operations
Earth-filled shipping containers	ISO containers arranged in a double-width, two-container-high configuration and filled with earth or sand.	Temporary ammunition parks



Lined units, interconnected



- The US DDESB-approved HESCO barricade configuration was tested for ammunition storage cells containing 4,001 kg NEQ of HD 1.1.
- The standard K6 separation distance was 38 m.
- Full-scale testing demonstrated prevention of prompt propagation at an IMD of 8.5 m with the specified HESCO configuration.

Case Study 2

ALTERNATIVE 2 – CANTILEVER WALL

- Substantial Dividing Walls (SDW)
- Pendine wall concepts
- Vertical face traverses
- L-block systems



Figure 2 Pendine Wall (Blocks minimum of 610mm deep)

Key findings from the US testing discussed in the report:

- Three tests were conducted between 2000 and 2001.
- Tested walls included 304 mm and 610 mm reinforced concrete configurations.
- Donor explosive quantities included 200 kg and 1,362 kg.
- No sympathetic reactions occurred in the acceptor munitions during the three tests, although some munitions experienced deformation.

Case Study 2

ALTERNATIVE 3 – WATER BARRIERS

Barrier type	Key Characteristics	Typical Application
Anti-frag tanks	2.4 m high and 1 .2 m in diameter, contains ~2,000 L of water. Shelf life of 20 years	Long term, permanent storage
Poldine Wall	Thin plastic bags filled with water, hung over expanded polystyrene foam blocks or wooden poles suspended by rope	EOD work and field or temporary storage of ammunition



Poldine Wall.



Poldine Bomb Shelter (walls and roof).

Anti-frag tanks

Advantages:

- Reusable.
- Resistant to accidental mechanical damage.
- Can follow straight or curved configurations.
- Relatively long service life (reported as over 20 years).

Limitations:

- Require relatively level, compacted ground.
- Heavy to position, even when empty.
- Better suited to longer-term or permanent storage than rapidly deployed arrangements.

Poldine wall

Advantages:

- Lightweight and compact when empty.
- Can be assembled into different heights and configurations.
- Can be erected on uneven ground.
- Relatively inexpensive.

Limitations:

- Vulnerable to accidental mechanical damage.
- Not designed for repeated reuse.
- Requires periodic inspection and maintenance for longer-term use.



Case Study 2

ALTERNATIVE 4 – BALLISTIC FOAM

- The report references 2020 experimental research into dry aqueous foam and its ability to mitigate explosive effects.
- The research investigated small C4 explosive charges (82–250 g) confined by dry aqueous foam.
- Reported findings:
  - Up to 80% reduction in explosion fireball radius.
  - Average peak pressure reduction of approximately 70%.
  - Approximately 62% reduction in impulse.
  - Demonstrated attenuation of shock propagation.
- The dry aqueous foam may be used for the attenuation of blast effects against a potential threat of high explosive detonation at public places.

Case Study 2

- Defence criteria were largely developed around fixed infrastructure and controlled environments.
- International examples demonstrate that alternative protective construction can provide opportunities to reduce separation distances while maintaining specific safety outcome.
- The engineering solution may change, but the required safety outcome must remain clearly defined and justified.
- Considerations:
  - Threat scenario – What explosive effects are we trying to mitigate?
  - Barrier performance – Does the system intercept fragments, mitigate blast, or prevent sympathetic detonation?
  - NEQ and HD - What quantities and hazard divisions can the system accommodate?
  - Deployment - Can it be rapidly installed, relocated and maintained?
  - Site constraints - Can it be used on constrained sites or uneven ground?



Questions?



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