OIL SPILL RISK ASSESSMENT FOR THE COASTAL WATERS OF QUEENSLAND AND THE GREAT BARRIER REEF MARINE PARK

Jointly prepared by Queensland Transport and the

Great Barrier Reef Marine Park Authority

August 2000

Great Barrier Reef Marine Park Authority

Queensland Government
Queensland Transport

PREFACE

This report is the culmination of a 12 month study conducted by Queensland Transport and the Great Barrier Reef Marine Park Authority.

The report examines in detail the risk profile for Queensland Coastal Waters and the Great Barrier Reef Marine Park for serious marine oil spills from shipping.

Risk assessment underpins the preparation and planning for marine oil spill preparedness and response within Queensland. This assessment provides a timely update to ensure Queensland's strategy for protection of our pristine coastal waters and World Heritage Listed Great Barrier Reef Marine Park maintains world's best practice.

The report is open for public comment at the same time as a review has been initiated by the Deputy Prime Minister into Great Barrier Reef Ship Safety and Pollution Prevention Initiatives.

The report provides a valuable source of information to assist the review process but also contains issues and recommendations that lie outside the terms of reference of the review.

We welcome any written comments on this report, including comments on the proposed recommendations, to assist with the preparation of a final report.

Written comments are required by 31 March 2001 and can be mailed to:

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*** Not attached at this stage.**

ABREVIATIONS AND DEFINITIONS

AMSA	Australian Maritime Safety Authority
AFMA	Australian Fish Management Authority
AIS	Automatic Identification System
AUS	Australian
AUSREP	Australian Ship Reporting System
AusSAR	Australian Search and Rescue
CLC	Civil Liability Convention
COLREGS	International Regulations for Preventing Collisions at Sea
CPA	Closest Point of Approach
DGPS	Differential Global Positioning System
DNV	Det Norske Veritas
DWT	Dead Weight Tonnage
ECDB	Electronic Chart Database
ECDIS	Electronic Chart Display Information System
EPA	Environmental Protection Agency
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GPS	Global Positioning System
GRT	Gross Registered Tonnage
IHO	International Hydrographic Office
IMO	International Maritime Organisation
ISGOTT	International Safety Guide for Oil Tankers and Terminals
ITOPF	International Tanker Owners Pollution Federation
MARPOL	International Convention for the Prevention of Pollution by Ships
MEHRA	Marine Environment High Risk Area
MV	Motor Vessel
Nm	Nautical Mile
OPRC	International Convention on Oil Pollution Preparedness Response and Cooperation
OSIR	Oil Spill Intelligence Report
P&I	Protection and Indemnity
PS(PPS)	Protection of the Sea (Prevention of Pollution by Ships) Act
PSSA	Particularly Sensitive Sea Area
QAL	Queensland Alumina Limited
QDPI	Queensland Department of Primary Industries
QPWS	Queensland Parks and Wildlife Service
QT	Queensland Transport
RAN	Royal Australian Navy
REEFPLAN	Oil Spill Contingency Plan for the Great Barrier Reef
RN	Royal Navy
SCOPIC	Special Compensation Protection and Indemnity Clause
SOLAS	International Convention for the Safety of Life at Sea
SRS	Ship Reporting System
State Committee	Queensland State Oil Pollution Committee
TOMPA	Transport Operations (Marine Pollution) Act
TOMSA	Transport Operations (Marine Safety) Act
UKC	Under Keel Clearance
UNCLOS	United Nations Convention on Law of the Sea
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTS	Vessel Traffic System

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EXECUTIVE SUMMARY

This report presents the methodology and results of an assessment of the risk of a significant oil spill occurring within Queensland Coastal Waters (including Ports), Torres Strait and the Great Barrier Reef. The assessment has considered only low frequency/high impact events, ie. Tier 2 spills (10 tonnes or greater). Staff from Queensland Transport and the Great Barrier Reef Marine Park Authority undertook the risk assessment.

The assessment does not attempt to quantify absolute risk levels, but compares the relative risk between different geographical regions. The risk model incorporates information on:

- Shipping and boating patterns;
- Navigational requirements;
- Maritime incidents; and
- Environment and socio - economic vulnerability.

The model was ground truthed through fieldwork and interviews with mariners and environmental managers.

The risk assessment identified several areas of high risk. These were:

- Torres Strait;
- Inner route of the Great Barrier Reef (north of Cape Flattery);
- Port of Cape Flattery;
- Whitsunday Islands, though this risk profile was highly influenced by a single maritime sector, cruise shipping;
- Moreton Bay;
- Hydrographers Passage, and;
- Great North East Channel.

The probable accident types and critical scenarios were limited to grounding and collision in that order, with the following inherent critical scenarios apparent;

- Grounding, in the Torres Strait, inner route, Moreton Bay and Whitsunday Islands;
- Collision, in the inner route and Port of Cape Flattery, the latter contact with the berth;
- Machinery failure resulting in grounding or collision, a probable contributory factor for an incident in the Torres Strait, inner route and Whitsunday Islands; and
- Oil transfer, mainly in ports.

The risk assessment focuses on marine oil spills, which present the greatest risk of pollution in Queensland waters. Chemical spills, whilst covered under the National Plan arrangements are not analysed in depth because the risk is considered low due to low traffic densities.

The risk model has focussed primarily on coastal waters and the Great Barrier Reef Marine Park, which is the key perspective for both Queensland Transport and the Great Barrier Reef Marine Park Authority. The study of ports is considered indicative of what may occur in ports but more detailed studies may be required in these areas.

The risk assessment makes 12 recommendations aimed at reducing the risk factors.

The key outcome of the risk assessment is the recommendation and promulgation of specific Marine Environment High Risk Areas (MEHRAs). It is hoped that the notification of these areas will promote behavioural change amongst the mariners who navigate ships through these areas as well as the owners and charterers who have responsibility for ships operating within these areas.

PROPOSED MEHRAs FOR QUEENSLAND

Prepared by Maritime Division, Maritime Services Branch, 20 Sep 00
Map Ref: S15-36

Queensland Government
Queensland Transport
Map 1

1.0 RECOMMENDATIONS

Prevention

Recommendation 1

The following regions be declared Marine Environment High Risk Areas (MEHRAs):

- Prince of Wales Channel,
- Great North East Channel,
- Inner Shipping Route, between Cape Flattery and Torres Strait,
- Whitsunday Islands and associated passages,
- Hydrographers Passage,
- Moreton Bay.

The MEHRAs are to be communicated to shipping through Notice to Mariners, Reef Guide, Navigation Charts and other media as appropriate.

Recommendation 2

Areas identified as MEHRAs be given high priority for the development of IHO Standard Electronic Navigation Charts.

Coastal pilots should be encouraged to employ ECDIS whilst piloting within the GBR compulsory pilotage areas.

Recommendation 3

AIS be regulated for non-SOLAS vessels operating in the GBR to ensure a complete and fully integrated traffic management system.

The introduction of AIS should be accelerated ahead of the IMO timelines for the GBR.

As an interim measure, the AFMA sponsored VMS data for fishing vessels should be relayed to REEFCENTRE to improve interaction between ships and fishing vessels.

Recommendation 4

The Whitsunday Islands be declared a compulsory pilotage area for cruise shipping.

AMSA develop pilot licensing standards for the Whitsunday Islands.

The Whitsunday Islands be declared a Pilotage Area under Queensland legislation to improve traffic management and monitoring for all vessels in the area.

Recommendation 5

An extensive education program be directed towards operators of small craft, in particular fishing vessels, outlining responsibilities for navigation within confined waters and under COLREGS.

A compliance program be developed to ensure small craft conform to legislation regarding the safe operation of their vessels, in particular the absolute need for maintaining a proper lookout.

All trawlers to be fitted with a loudspeaker to the after deck and other appropriate means to monitor VHF radio to enhance maintaining a proper lookout.

Recommendation 6

Mariners be further encouraged to report non-compliance with COLREGS, unacceptable practices and near misses such as to provide better insights into the lessons which can be learned from these incidents.

Recommendation 7

The hydrographic survey of Fairway Channel be completed, a recommended route marked on charts, appropriately monumented with navigation aids and promulgated as an alternate deep-water route.

Preparedness

Recommendation 8

Consideration be given to increasing equipment stockpiles at the following locations:

- The Port of Cape Flattery be upgraded to a lower Tier 2 capability, taking into account the high risk nature of berthing practices, the lack of significant stockpiles on site, the remoteness of the location and the proximity to a MEHRA;
- A lower Tier 2 capability be established at Shute Harbour and that a local area contingency plan be established, taking into account the increased risk due to cruise ship operations, the relative remoteness of the area and the proximity to a MEHRA;
- A Tier 1 response capability be established at Lockhart River with an additional dispersant stockpile at Iron Range airport as a staging area for the fixed wing dispersant contract, taking into account the remoteness of the area and proximity to a MEHRA;
- A dispersant stockpile be established at Heathlands Station as a staging area for the fixed wing aerial dispersant contract, taking into account the remoteness of the area and proximity to a MEHRA.

Recommendation 9

An ongoing review of response capability and likely radii of action be conducted for high risk areas within Queensland and the GBR Marine Park to evaluate current and proposed equipment dispositions and response arrangements, including the fixed wing aerial dispersant capability.

Response planning standards need to be developed in consultation with all lead agencies for response within Queensland.

Recommendation 10

Emergency towage arrangements for the Great Barrier Reef and Torres Strait be reviewed as a matter of urgency to ensure there is an adequate emergency towage capacity available. A joint government industry committee be commissioned to consider the options and provide recommendations.

Recommendation 11

A commercial arrangement be established with a shipper/s, possibly Queensland Alumina Limited (QAL), whose fleet regularly transit the inner route, to enable the National Plan to utilise commercial vessels for logistical support to far north Queensland.

Recommendation 12

A training program for indigenous communities be established to improve the overall response capacity and understanding within far North Queensland.

2.0 INTRODUCTION

The Queensland State Oil Pollution Committee (State Committee) identified a need to review the current location and disposition of oil spill response equipment within Queensland. Risk assessment has underpinned past decision making for oil spill preparedness in Queensland, however much of this assessment has been conducted on an ad hoc basis. A formal assessment of the risk of a significant marine oil spill has not been previously undertaken in Queensland.

A formal risk assessment process offers several advantages to the management of oil spills. Firstly, it enables managers to identify the likely causes of oil spills for a specified area. Secondly, it enables managers to compare the relative risk between different geographical regions. Thirdly, it provides a basis for the identification of appropriate management strategies to reduce the overall risk for a given region, either through preventative or preparedness strategies.

Further, there is a high community and political concern about the effects of a large marine oil spill within the Great Barrier Reef. Despite the strong framework of preventative measures currently in place, such as the Ship Reporting System, REEFPLAN, compulsory pilotage and so forth, recent groundings within the GBR have heightened concerns and provided a trigger for ongoing development of regulations, technology and systems to further reduce the risks of marine incidents.

From a purely economic perspective, the economic loss to the tourism and fishing industries alone from a major oil spill within Queensland would be massive. These industries are currently valued at $2.5 billion per year. It should be noted that in the aftermath of the *Sea Empress* oil spill at Milford Haven, United Kingdom, an area not dissimilar in nature to many Queensland communities, the economic losses to the community were valued at (Hill and Bryan, 1997):

- Loss of 1100 jobs and an estimated 16 million pounds in wages;
- 30-35% loss of fishing effort in the 3 months of closure at a cost of 4.7 million pounds, though this does not take into account long term losses to fish stocks; and
- Losses of 20.64 million pounds out of a total of a normal 160 million pound turnover on tourism.

This Risk Assessment report:

- Details and assesses the legislative and management programs in place to manage oil spills;
- Assesses and prioritise the causal hazards and ensuing risks of oil spills; and
- Recommends strategies aimed at preventing or reducing the risks and impacts of oil spills.

2.1 Background

Previously a coarse risk assessment was conducted as part of the 1993 Review of the National Plan. This assessment used traffic density, environmental sensitivity and hazards to navigation as the three criteria for determining risk. The 1993 Review assessed the entire eastern coastline of Queensland and Torres Strait as high risk. Whilst this conclusion highlights the sensitivities in Queensland there is a need to conduct further analysis and 'drill down' so that a more strategic view can be provided for oil spill prevention and response in Queensland.

More recently, Det Norske Veritas (DNV), as part of the 1999/2000 National Plan Review undertook a risk assessment. Whilst the DNV risk analysis was quantitative, it suffered from similar problems of scale as the 1993 assessment. The DNV risk assessment recommended that individual jurisdictions conduct more specific analyses of risk.

2.2 History

On the 3rd March 1970 Queensland experienced its worst oil spill, when between 1400 and 4000 tonnes of crude oil was released after the motor tanker *Oceanic Grandeur* struck an uncharted rock in the Torres Strait. The vessel was under pilotage and proceeding to the AMPOL oil refinery in Brisbane.

The impacts of the incident were poorly documented however substantial effects were noted on the pearl culture industry within the region and to substantial parts of the far northern coastline. There are no records of impacts occurring to the northern Great Barrier Reef. The spill was the second largest in Australian history, behind the *Kirki*, which spilled 17,000 tonnes of light crude oil off the coast of Western Australia in 1991.

In more recent times the precautionary response to the grounding of the *Peacock* in July 1996 was the largest response operation undertaken within Queensland (though no oil was spilled) and a fuel spill from the motor tanker *Barrington* caused significant pollution with the Brisbane River in 1998.

Photo 1: *MV Peacock* aground on Piper Reef in 1996.

2.3 Requirement for a Risk Assessment

Risk management principles are widely recognised as an integral part of good management practice. Risk management is an iterative process, which supports better decision making by contributing a greater insight into risks and where they occur, and their overall impacts. Risk management principles have been adopted by many disaster and emergency management organisations within Australia. Risk assessment underpins the preparation and planning for oil spill prevention and response strategies.

Risk assessment is one step in the overall risk management process.

This study looks at possible hazards, the likelihood of them occurring, the seriousness and then deciding what action can be taken to prevent it occurring or to reduce the risk to an acceptable level, whilst bearing in mind the costs of prevention and mitigation strategies.

Risk management principles lend themselves to the management of marine incidents. In particular the structured manner in which it blends the elements of prevention, preparedness, response and recovery into a single strategy allowing management agencies to effectively focus resources and strategies on those elements that will have the greatest effect at reducing risk.

Queensland Transport and Great Barrier Reef Marine Park Authority have jointly completed the risk assessment and associated management plan to improve shipping safety and pollution response capacity within Queensland Coastal Waters, the Great Barrier Reef Marine Park and Queensland Ports.

3.0 OBJECTIVE

The objective of the study is to identify areas within Queensland Coastal Waters and the Great Barrier Reef Marine Park that are at highest risk from a significant oil spill from ships at sea and make recommendations to reduce the risks associated with these activities.

The risk assessment is not attempting to quantify absolute risk, but determine relative risk between regions. The determination of a level of relativity between different areas will assist in the efficient allocation of finite resources. From the risk assessment, consideration has been given to an appropriate response capability to ensure adequate protection against the local risk levels.

This study is separate to the Australia wide risk assessment conducted by DNV as part of the 1999-2000 National Plan Review. One of the recommendations of the DNV report was that agencies conduct a more detailed analysis within their respective jurisdictions.

4.0 SCOPE OF WORK

4.1 Incident Scope

There are a number of causes of marine oil spills, including illegal discharge, transfer mishaps and grounding or collision leading to loss of fuel and/or cargo.

The risk assessment is focused on accidents that have the potential to cause Tier 2 or greater spills of oil (greater than 10 tonnes of oil). That is, the low frequency/high impact events, which are largely due to accidents such as grounding or collision. Risk in this study is defined as the probability of a ten tonne or greater marine oil spill combined with the environmental, economic and social impacts from the spill.

Smaller spills, in particular illegal or operational discharges are difficult to predict, both in terms of occurrence and location.

4.2 Geographical Scope

The geographical scope of the risk assessment is that of Queensland Coastal Waters including Queensland ports, Torres Strait and the Great Barrier Reef Marine Park. Refer to Map 2.

Queensland Coastal Waters extend from the Northern Territory border to the New South Wales border, a distance of some 7000 kilometres. Within that span there are 15 trading ports. Also abutting Queensland Coastal Waters is the Great Barrier Reef Marine Park, which covers 350,000 square kilometres.

The risk assessment has not considered the outer route of the Great Barrier Reef in detail, due to lack of credible traffic data. An assessment (The Great Barrier Reef and Torres Strait Shipping Study) of the outer route was conducted by the James Cook University of North Queensland in company with Caltex Australia Pty Ltd in 1994. The findings were inconclusive but the assessment determined that the use of the inner route was preferable to the outer route given the availability of pilots comparatively increased the overall safety of the passage. The comparative assessment of the inner route versus outer route should be continually monitored and analysed again in the future.

4.3 Temporal Scope

The risk assessment is based on shipping movement data for the financial year period's 1997-1998, 1998-1999 and shipping incident data for the period 1985-1999.


OIL SPILL RISK ASSESSMENT
FOR QUEENSLAND AND THE GREAT BARRIER REEF
Great North East Channel
Prince of Wales Channel
Weipa
Coral Sea
Cape Flattery
Grafton Passage
Cairns
Palm Passage
Mourilyan
Lucinda
Townsville
Hydrographers Passage
Abbot Point
Mackay
Hay Point
Capricorn Channel
QUEENSLAND
Gladstone
Curtis Channel
Bundaberg
LEGEND
Inner Shipping Route
Outer Shipping Route
Recognised Entrances
Great Barrier Reef Marine Park Limits
Compulsory Pilotage Shipping Route
Ship Reporting Area
BRISBANE
SHIPPING ROUTES
Ship Reporting Area
Great Barrier Reef Marine Park
© The State of Queensland, Department of Transport (Queensland). 2000
Prepared by Maritime Division, Maritime Services Branch. 19 Sep 00
Map Ref: S15-3
Queensland Government
Queensland Transport
Map 2

5.0 STAKEHOLDERS

The risk assessment has taken into account the views of key stakeholders. For the purposes of the risk assessment these were classified according to:

- Those stakeholders who could provide technical input and expert judgement into the risk evaluation; and
- Those stakeholders that may be impacted by oil spills and therefore need to be considered in terms of risk reduction strategies.

Considerable time was spent with stakeholders to define the scope of the issues causing marine oil spills and to crosscheck results of the risk analysis*.*

Section 12 of the report lists all stakeholders consulted throughout the project.

6.0 LEGAL FRAMEWORK

The risk reduction strategies recommended by this report will be influenced by the international conventions to which Australia is a signatory in addition to Commonwealth and Queensland legislation. The ability to implement some risk reduction strategies may be blunted by the international and domestic legal framework, whilst other measures may assist Australia in meeting its international obligations.

6.1 International Conventions

The international nature of the shipping industry requires much of its regulation to be conducted via international agreement. These agreements provide the basis for much of the domestic legislation. Key international conventions that the risk assessment must consider are listed blow.

6.1.1 <u>International Convention on Oil Pollution Preparedness Response and Cooperation (OPRC 90)</u>

OPRC 90 aims to increase the level of preparedness to respond to marine oil spills and to facilitate international cooperation and mutual assistance in preparing for and responding to major oil spills. OPRC 90 details the obligations on signatories for the maintenance of credible oil spill response arrangements. The Convention amongst other things makes provisions for:

- Oil pollution emergency plans for ships, oil platforms and ports;
- Oil pollution reporting procedures;
- Establishment of national and regional systems for preparedness and response;
- Facilitation of international cooperation and mutual assistance;
- Exchange of information;
- Promotion of research and development; and

- Technical cooperation and training.

OPRC 90 has recently been extended to cover chemical spill response as well as oil.

OPRC 90 has not been given effect within Australia through legislation, though the managers of the National Plan use the criteria established within OPRC 90 to measure the overall effectiveness of the Plan.

6.1.2 International Convention for the Prevention of Pollution from Ships 1973 and 1978 Protocol (MARPOL);

The MARPOL Convention is the most comprehensive international initiative aimed at reducing pollution from shipping operations. The Convention details standards for the discharges of five pollutants:

- Oil;
- Bulk noxious liquids;
- Harmful substances in a packaged form;
- Sewage (not ratified); and
- Garbage.

MARPOL also sets out construction requirements for vessels to reduce the risks of pollution occurring and to manage waste onboard.

The risk assessment must work within the MARPOL requirements, with any risk reduction strategies considered to be in excess of MARPOL provisions being required to be approved by the IMO.

An important feature of the convention is the concept of “special areas”, which are sea areas recognised as being of high ecological importance. The declaration of a body of water as a “special area” enables a coastal state to implement stricter conditions of passage than normal.

6.1.3 United Nations Convention on Law of the Sea 1982 (UNCLOS).

UNCLOS amongst other matters imposes obligations on coastal states to protect and preserve the marine environment. For example under Article 192, “*States have the obligation to protect and preserve the marine environment*”.

However UNCLOS also defines the powers and terms under which a coastal state can impose protective measures. These powers vary according to the maritime zone within which an activity takes place, ie. territorial sea is12nm as opposed to the exclusive economic zone which is 200nm.

6.1.4 International Convention for the Safety of Life at Sea (SOLAS)

SOLAS prescribes standards to ensure adequate safety provisions for ships and their crews. It stipulates requirements for the construction and equipment of ships and navigation practices.

Changes to construction and equipping of ships to improve safety will require the agreement of the IMO. The former also requires substantial lead in periods, as changes in ship construction take some periods of time to be effective. The average age of the world fleet is approximately 19 years.

6.1.5 Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS)

The COLREGS are often referred to as the "rules of the road" and prescribe requirements for the navigation and safe conduct of all vessels and requirements for collision avoidance. The Convention applies in Australia under Commonwealth and State legislation through the International Regulations for Preventing Collisions at Sea 1972.

6.1.6 World Heritage Convention

The World Heritage Convention's central theme is the idea that there are cultural and natural properties of such outstanding value from a global perspective that these sites and properties should be conserved and protected for the benefit of all humanity. The Convention legitimises a global interest in the protection and management of properties on the World Heritage List.

The Convention places a duty upon a State Party to do all it can and to the utmost of its own resources to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage of areas listed for World Heritage. Significant marine pollution incidents have the potential to seriously impact upon these values and as such, measures should be implemented to reduce the potential for such incidents to occur.

Queensland contains two marine areas on the World Heritage List, the Great Barrier Reef and the Great Sandy Region (Fraser Island).

6.2 Domestic Legislation

A number of Commonwealth and Queensland Acts implement provisions contained within the International Conventions detailed above. The provisions contained within these Acts provide avenues for the introduction of risk reduction strategies and limit the application of others. Commonwealth and Queensland legislation that will need to be considered include:

6.2.1 Transport Operations (Marine Pollution) Act 1995

The Transport Operations Marine Pollution Act (TOMPA) implements MARPOL requirements within Queensland Coastal Waters and is administered by Queensland Transport.

TOMPA requires the Chief Executive Officer of Queensland Transport to develop and approve strategies to protect Queensland's marine and coastal environments from the effects of ship sourced pollutants into coastal waters.

The risk assessment is fundamental to achieving these strategies, by ensuring that the current array of prevention and response programs reflects the current risk profile.

Queensland Transport is the lead combat agency for response to marine oil spills within Queensland Coastal Waters and the Great Barrier Reef Marine Park.

6.2.2 Great Barrier Reef Marine Park Act 1975

The GBRMP Act regulates activities within the Great Barrier Reef Marine Park, including those conducted by shipping. The GBRMP Act implements the pollution discharge measures of MARPOL.

The Great Barrier Reef Marine Park Authority administers the GBRMP Act.

The GBRMPA is the agency with statutory responsibility for the GBRMP, but works closely with AMSA and QDOT to deliver strategies reducing the risk of oil spills impacting upon the Marine Park.

6.2.3 Protection of the Sea (Prevention of Pollution by Ships) Act 1983

The PS(PPS) Act implements the provisions of MARPOL 73/78 and is the primary statute regulating pollution from ships in Australia. The PS(PPS) Act has effect for all Australian waters, however there is a rollback provision for occasions where States have enacted MARPOL legislation. In the case of Queensland this has been achieved through TOMPA.

The PS(PPS) still has effect for waters within the Great Barrier Reef Marine Park which are outside State coastal waters, ie. 3nm from the baseline.

The PS(PPS) Act is administered by the Australian Maritime Safety Authority.

6.2.4 Navigation Act 1912

The Navigation Act regulates the construction, conduct and crewing of shipping using Australian waters. The Navigation Act gives effect to the requirements of MARPOL in relation to the construction of ships and SOLAS in terms of navigation and COLREGS.

The Navigation Act is being reviewed and some changes to the current provisions and structure can be expected.

The Australian Maritime Safety Authority administers the Navigation Act.

6.2.5 Environment Protection and Biodiversity Conservation Act 1999

The Federal Minister for the Environment and Heritage has exempted actions undertaken under the auspices of the National Plan from the provisions of this statute.

7.0 RISK ASSESSMENT METHODOLOGY

The risk assessment employed the guidelines established within the Australian Standard AS/NZS 4360:1999 on Risk Management.

The approach to the risk analysis is captured in seven discrete stages. In simple terms the process involves:

- Hazard identification: what can go wrong and why,
- Frequency analysis: how often can things go wrong,
- Consequence analysis: how much harm can be caused by the event,
- Risk calculation: frequency or likelihood combined with consequence.

The key elements of the risk management process are as follows:

7.0.1 Establish the Context

This defines the strategic, organisational and environmental context within which the risk analysis and treatment plan operates. The boundaries for the study were set to ensure that significant risks are not overlooked and the context is defined within terms of:

- The broad range of incidents being assessed by the analysis (Section 7.1);
- The geographic scope of the analysis (Section 4.2);
- The time period over which the assessment has been conducted (Section 4.3);
- The international and domestic legal framework within which the analysis and in particular the treatment plan, will operate (Section 6); and
- The organisational responsibilities of key management agencies (Section 6.2).
- The context also enables the risk assessment criteria to be established. The risk assessment criteria are detailed in (Section 7.0.3).

7.0.2 Identify the Risks

This stage examined the potential credible hazards relevant to the study area and the interaction of the hazards with the environment. The hazards have been limited to those with a realistic chance of occurring, combined with an analysis of the vulnerability of the subject area from an environmental, economic and social perspective.

Expert input from a range of stakeholders was an essential component to identifying the risks.

The main issues addressed were:

- Identifying a credible list of incident types which can cause a tier 2 spill (Section 7.1); and
- Identifying the conditions under which such incidents could occur (Section 7.2).

The risk assessment did not consider high frequency/low impact events, such as operational discharges. Such incidents are random and are not predictable from the risk criteria established for this assessment. Importantly, such issues have been adequately addressed through the international conventions and legislation.

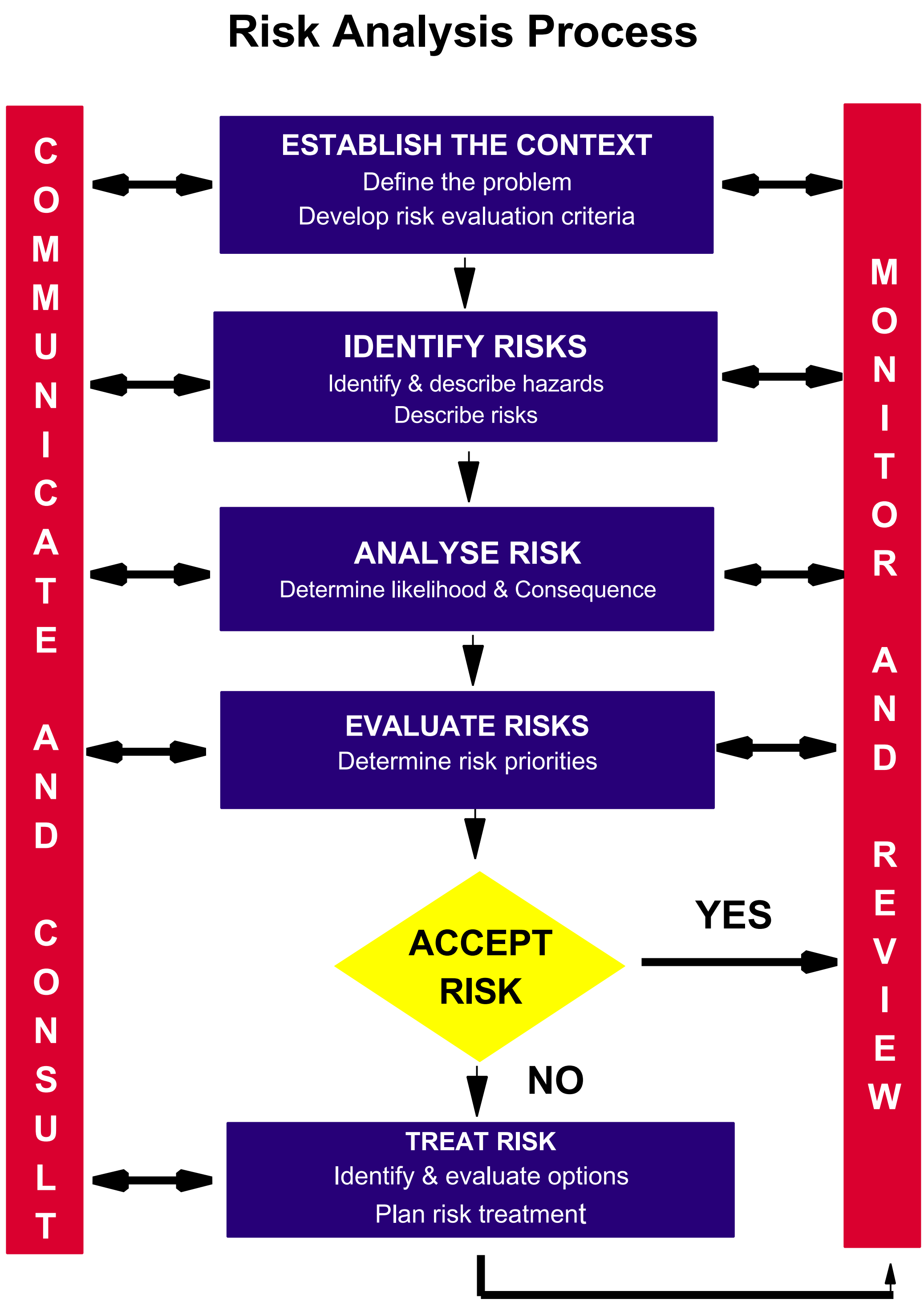


Figure 1 : Risk Assessment Methodology Flow Chart

7.0.3 Risk Analysis

The risk analysis sought to determine relative risk between different geographic locations, incident types and classes of vessel. The analysis did not consider existing controls, though these were factored in during the risk treatment process.

The analysis did consider:

- Historical records;
- Traffic patterns and frequency;
- Incident reports and statistics;
- Individual experiences; and
- Expert technical advice and judgement.

Given the relatively sparse number and distribution of incident data for Queensland, the expert judgement of practitioners who have a deep understanding of the issues has been crucial to the study.

The analysis assigned a rating of;

1. High,
2. Medium, or
3. Low,

According to

1. Likelihood, and
2. Consequence.

Key criteria for likelihood were traffic density, navigational complexity and difficulty, accident history, whilst key criteria for consequence were environmental and socio-economic vulnerability of the specific geographic region.

A conservative approach has been adopted when analysing data and the overall estimate of risk has erred on the high side to take account of the uncertainty in some data.

The calculation of the level of risk can be seen utilising the two-dimensional matrix combining likelihood and consequence. Refer to Figure 2.

Risk = Likelihood x Consequence

7.0.4 Risk Evaluation

The risk evaluation considered those areas that were classified high or medium risk. The causes of the risk for each of these areas were evaluated and prioritised in terms of overall importance. Some risks will require treatment and others can be accepted. The unacceptable high risks advance to the next stage, which is treatment.

Areas classified low risk were not considered, but should be continually monitored to ensure that risks remain low and tolerable.

7.0.5 Risk Treatment

The risk evaluation process identifies the relative priority of the factors causing risk levels to be elevated. Treatment options were developed (Section 9) to reduce the importance of

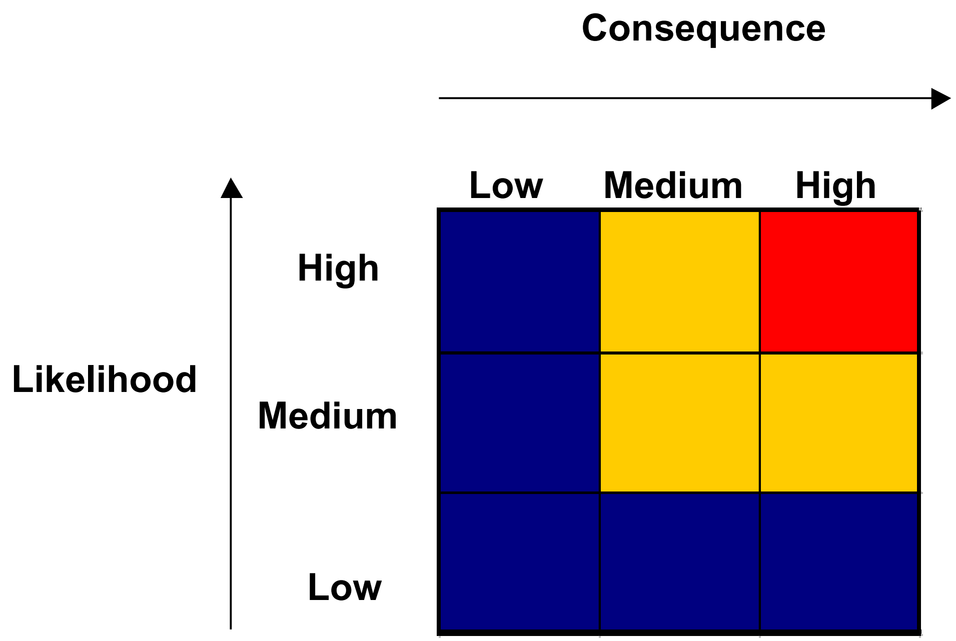
The level of risk is produced by combining the Probability and Likelihood with Exposure and Consequence of each event.

Likelihood

- Data & Statistics
- Expert Advice
- Historical Records
- Ground Truthing
- Consultation
  Individual Experience

Consequence

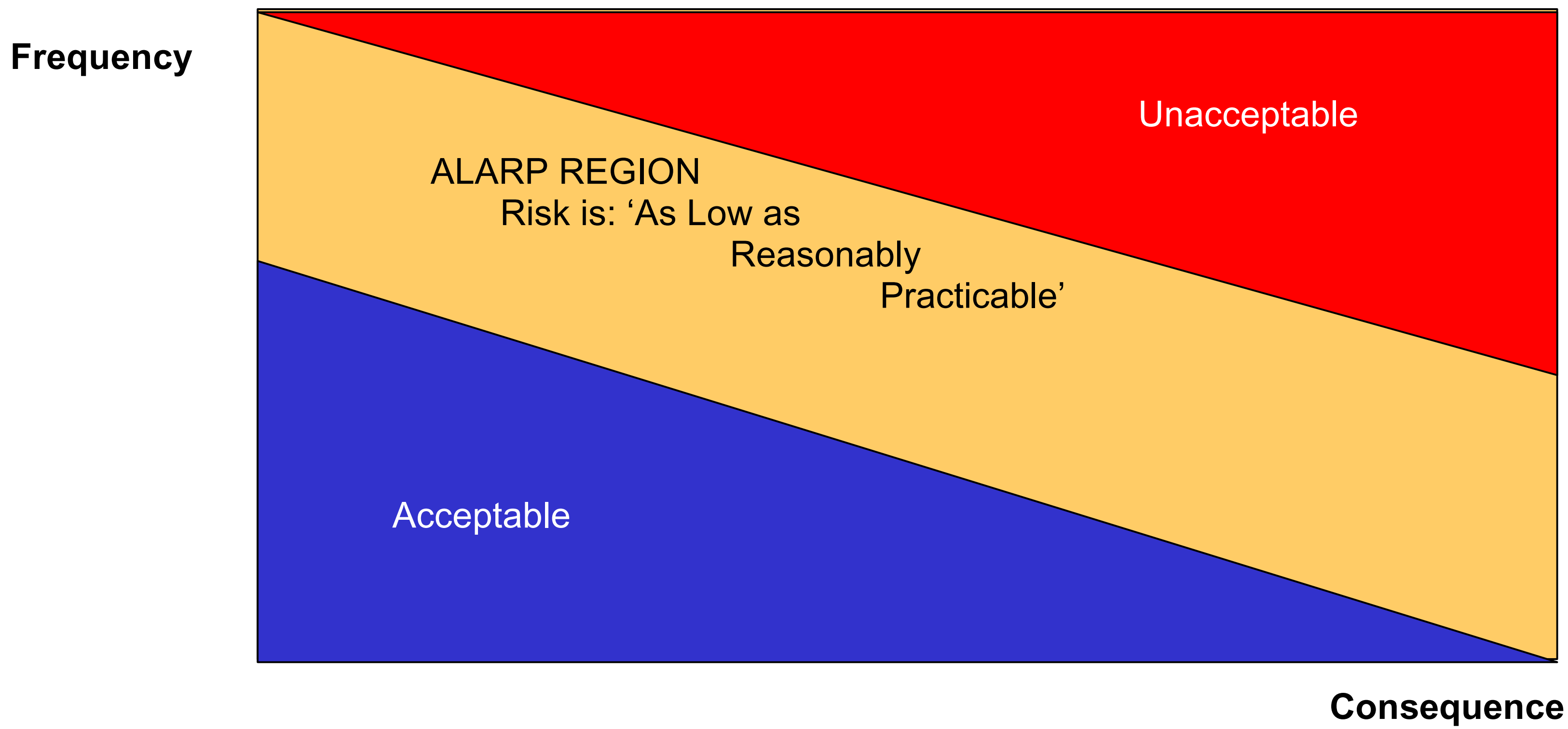
- Environmental
- Ecological
- Habitat
- Fisheries
- Tourism
- Aquaculture
- Cultural
- Economic



Legend

- Risk unacceptably high (MEHRA)
- Risk medium (tolerable but monitor)
- Risk low (acceptable with review)

Figure 2: Risk Assessment Matrix



The frequency and consequence of an event occurring will determine how it is rated in terms of being acceptable or unacceptable.

Figure 3: Risk acceptance graph

the casual factors of the risk. The objective is to ensure that the unacceptable risks are reduced to an acceptable level.

Risk treatment has four possible means:

- Risk avoidance: cease activity;
- Risk reduction: reduce likelihood and/or consequence;
- Risk transfer: pass risk to another party (insurance/compensation);
- Risk retention.

Clearly the ideal risk reduction strategies are those implemented with minimum cost or effort and these have been strongly focussed on.

The assessment considered both preventative and preparedness measures aimed at reducing the risk for each of the specified areas. The selection of strategies considered:

- The likely effectiveness of the strategy;
- Cost – benefit of implementation;
- Timeframe in which the strategy could be achieved and is likely to show an effect; and
- Process for implementation.

The key deliverable for reducing risk is the promulgation of MEHRAs, which are seen as the optimum means for alerting mariners to the risk areas. The authors consider that responsibility for the control of risk is best borne by the mariners onboard ships along with the owners and charterers of ships.

7.0.6 Monitor and Review

The risk assessment is to be reviewed on a 12 monthly basis to ensure that the risk profile remains current and valid and any changing circumstances do not alter the risk profile. This process incorporates the lessons learned from recent incidents within the study area. The risk treatment plan will be reviewed on a 3 yearly basis.

7.0.7 Communicate and Consult

Consultation with stakeholders was a key component of the risk assessment process. The consultation process is outlined in Section 5.

Stakeholders from industry and regulatory agencies are an integral component in the communication loop.

Recent groundings within the Great Barrier Reef have sharpened the sensitivity of the community to potential pollution incidents. Managing the public perception or "outrage factor" is fundamental to risk management. Public perception during an incident response is based on outrage and not science. One of the key aspects to this phase is to improve community understanding about the difficulty with responding to serious marine oil spills in remote locations. It is important that the community, politicians and the media do not have unrealistic expectations about responding to serious marine oil spills.

7.1 Hazard Identification and Analysis

A hazard is defined as a situation, which can cause potential harm to the environment. This section involves identifying a hazard that can cause an adverse impact and characterising the risk presented by that hazard. The study has generated a comprehensive and representative set of events which can realistically cause a tier 2 spill. These events are:

- Collision: the striking together of two vessels whilst underway;
- Grounding: a vessel touches the sea bottom, either powered or drifting;
- Contact: a vessel strikes an external object other than another vessel or sea bottom;
- Cargo transfer failure: a cargo spill occurs while conducting ship/shore or ship/ship loading or unloading;
- Fire/explosion: occurs onboard vessel but not due to above;
- Structural failure: the hull cracks;
- Sinking: a vessel sinks due to breach in watertight integrity or adverse loading.

Examination of worldwide historical data on shipping accidents identified grounding and collision as the major causes. Within the study area, grounding is the most likely cause of an incident.

The risk of a serious marine incident and resultant marine pollution is directly related to:

- Frequency of ship movement;
- Physical and mechanical condition of the ship and its equipment;
- Performance of ship's crew, including pilot;
- Traffic density;
- Hydrographic and meteorological conditions;
- Type and quantity of pollutants onboard.

Causes of marine oil spills are grouped into operations and accidents. Operational incidents such as loading/unloading and bunkering tend to occur in ports. Accidents such as collisions and groundings tend to occur enroute between ports.

Whilst this analysis considers the risk of an oil spill from a tanker is real and significant, there is also a real potential for major spills from other type of vessels such as bulk carriers which can carry as much as 5,000 tonne of bunkers onboard. Many consultees believe the greatest risk of an oil spill along the Queensland coast comes from non-tankers. A typical Panamax size bulk carrier (70,000DWT) would be carrying approximately 4,000 tonne of bunkers.

Information provided by ITOPF indicates that most spills from tankers occur in ports and at oil terminals during routine operations such as loading/unloading and bunkering. The majority of these spills are small with over 90% involving quantities of less than 7 tonnes. In comparison accidents such as collisions and groundings generally account for larger spills, but account for less than 10% of all spills from tankers. About 20% of these incidents involve quantities in excess of 700 tonnes. Refer to Table 1.

Statistics from OSIR International Oil Spill Database show that in 1999, the international trend of fewer and smaller large oil spills is continuing. Refer to Figure 4.

Spill scenarios differ between coastal waters and ports.

The primary cause of an accident in coastal areas will be grounding or collision. These incidents will normally result due to human error but machinery failure (propulsion or steering gear) may also be a contributory factor for grounding within confined waters.

	<7 (tonnes)	**7-700 (tonnes)**	**>700 (tonnes)**	**Total**
OPERATIONS				
Loading/Discharging	2759 (90%)	294 (9%)	17 (1%)	3070
Bunkering	541 (95%)	25 (5%)	0	566
Other Operations	1162 (96%)	47 (4%)	0	1209
ACCIDENTS				
Collisions	153 (32%)	236 (50%)	86 (18%)	475
Groundings	219 (42%)	196 (37%)	103 (21%)	518
Hull Failures	555 (82%)	73 (10%)	43 (8%)	671
Fire & Explosions	149 (80%)	16 (8%)	19 (12%)	184
Other	2214 (92%)	162 (6%)	35 (2%)	2411
TOTAL	7752 (85%)	1049 (11%)	303 (4%)	9104

Table 1: The incidence of international oil spills by cause, 1974 – 1999.

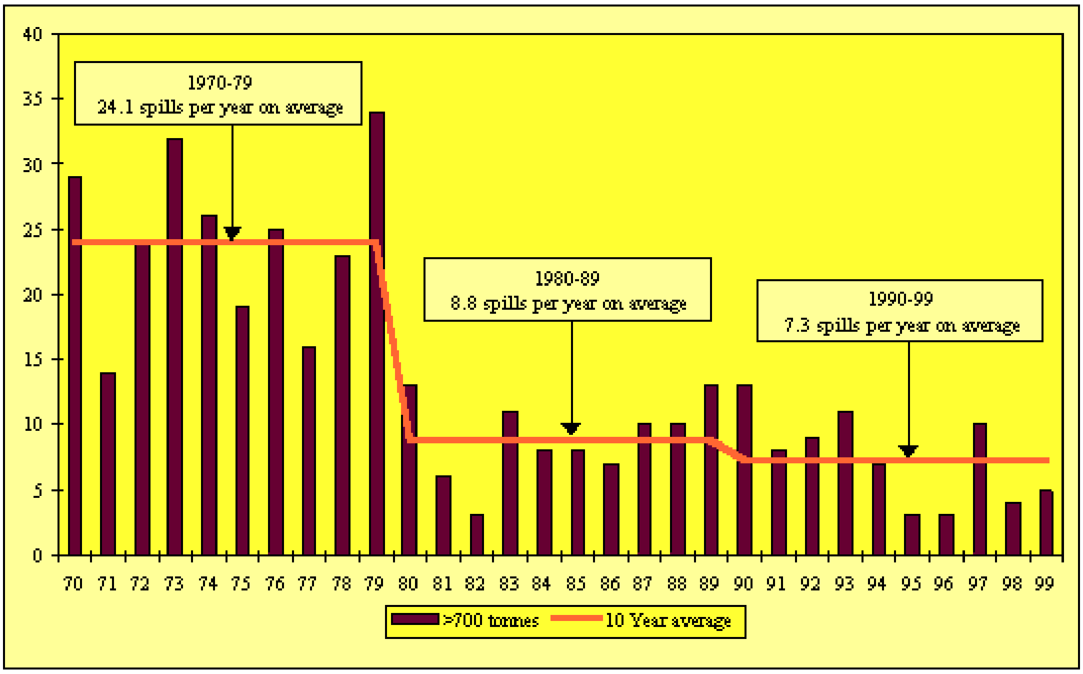


Figure 4: Trends in International Oil Spills. (www.itopf.com/stats.html)

The primary cause of an incident within port areas will be grounding, collision, contact and transfer operations and bunkering.

Coastal contributory factors:

- Number of vessel movements;
- Traffic density;
- Navigational hazards;
- Transit time through area.

Port contributory factors:

- Number of vessel movements;
- Traffic density;
- Navigational hazards;
- Transit time through area;
- Amount of oil imported and exported;
- Number of oil transfer operations;
- Number of bunkering operations.

7.2 Navigational Risk

The Queensland coastline presents considerable difficulties to the navigation of large ships. The main difficulties lie in the passage through the shallow confined waters of Torres Strait and the inner route of the Great Barrier Reef north of Cairns. The inner route offers protection from the sea and weather, being inside fringing reefs, but there are also inherent difficulties with numerous shoals, restricted sea room, limiting depths and reefs. Considerable skill, bolstered by the local knowledge of coastal pilots is required to navigate this area.
A crucial component in the development of the risk assessment was the identification of those areas, which presented particular difficulties to navigation, and where departure from the planned track will quickly put the vessel into a hazardous situation.

Issues considered contributory factors under navigational difficulty include:

- Close proximity to shore and shoals,
- Restricted sea room,
- Shallow water depths (limiting UKC),
- Nature of seabed,
- Confinement of water way,
- Strong tidal streams (particularly cross streams),
- Strong trade winds (even cyclones at times),
- Heavy rain squalls and resultant restricted visibility,
- Traffic density and congestion (particularly a high concentration of fishing vessels),
- Choke points for traffic,
- The length of time to undertake a passage through a particular hazard.

In addition to the large fleet of ships which regularly transit the inner route, a significant number of recreational vessels, commercial tourist vessels, and fishing vessels ply these waters, making it a congested waterway at times.

The hazards to navigation were identified through two processes:

- Consultation with key stakeholders, including coastal pilots and masters that regularly transit these areas; and
- Undertaking a passage from Weipa to Gladstone onboard the *River Boyne,* to view first hand the issues affecting navigation through these areas.

Photo 2: Howick Island Light, North Channel (commonly known as Snake Gully) – Photograph taken from the bridge of the *River Boyne*.

Photo 3: Megaera Reef, North Channel (commonly known as Snake Gully) - Photograph taken from the bridge of the *River Boyne.*

Navigational difficulty for mariners decreases as the ship moves south down the eastern seaboard from Torres Strait. The coastline south of Cairns to Gladstone presents less difficulty than to the north of Cairns and the coastline south of Gladstone once outside the GBR to the New South Wales border is reasonably simple with ample sea room and vessels are far less constrained by draught.

The Gulf of Carpentaria is not a complex area to navigate within.

Great North East Channel and Hydrographers Passage are difficult areas to navigate, whilst the remaining connecting passages to the Coral Sea; Grafton Passage, Palm Passage, Capricorn Channel and Curtis Channel are less difficult to navigate.

7.3 Shipping Traffic Patterns

The traffic data for shipping was sourced from Queensland Transport, AUSREP, SRS, pilotage companies and ports.

Various shipping routes traverse the waters of the Queensland coast. The Queensland coast is used regularly by shipping accessing Queensland ports, vessels transiting between the Indian Ocean and Pacific Ocean via Torres Strait and vessels transiting the Queensland coast bound to or from southern ports.

There are over 10,000 vessel movements along the Queensland coast every year and approximately 2,500 ships transit the inner route between Torres Strait and Cairns each year, which equates to about 7 ships per day. About 20% of vessels utilising the inner route are transit vessels not trading with Queensland ports. There are also a number of passages connecting the inner route with the Coral Sea. Over 70% of vessels use the inner route, whilst the remainder transit Grafton, Palm and Hydrographers Passage. Bulk carriers comprise the greatest proportion of shipping, some 200,000 DWT plus, which is generated by the trade passing through the bulk ore ports of Hay Point, Abbot Point and Gladstone. Less than 10% of shipping are oil tankers, with most conducting a northerly transit with the carriage of refined product to northern ports from the southern refineries in Brisbane and Sydney.

There is some uncertainty with the number of vessel movements through Torres Strait and Great North East Channel, as these areas are not covered by compulsory pilotage. It is understood that all tankers are piloted through these areas.

Data in Appendix 3 depicts the coastal traffic movements in a six-month period. The six-month period was necessary to closely analyse the available data. There has been some difficulty in estimating coastal traffic movements. It is difficult to discern precise ship movements through AUSREP because of the 24-hour reporting interval. The difficulty with coastal movements is due to a voyage having a number of permutations including; a passage between two Australian ports, a passage between an Australian port and in/out of AUSREP area, and a passage between two points of the AUSREP system. AUSREP is mandatory for all vessels entering Australian ports but only voluntary for passing traffic. There is far less difficulty in calculating vessel movements into ports.

Figure 5 shows the plotted ship positions as reported to the Australian Rescue Coordination Centre in Canberra through the AUSREP system for 1999.

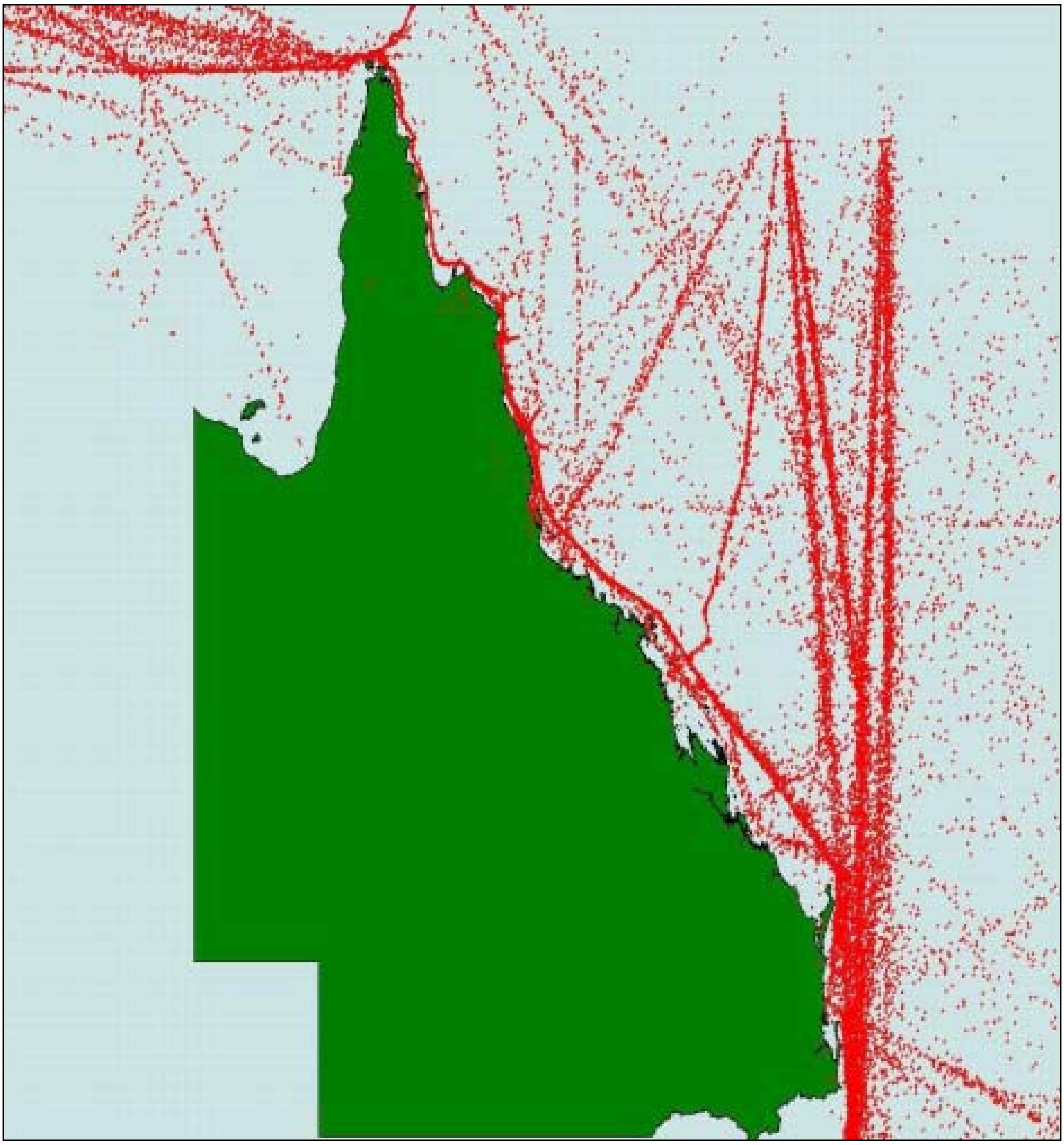


Figure 5: Scatter Plot of Queensland Shipping Movements, 1999.

There are a number of passages connecting with the Coral Sea including Great North East Channel, Grafton Passage, Palm Passage, Hydrographers Passage, Capricorn Channel and Curtis Channel.

By world standards the Queensland coast does not generate sufficient traffic to produce sufficient shipping activity to produce serious congestion. The Queensland coast and ports are not subject to saturation levels of traffic. Although by Australian standards, traffic on the Queensland coast is relatively heavy.

Ships on the Queensland coast can be classified into several categories:

- International through traffic, not visiting Australian ports (there is considerable international through traffic using the Torres strait and Great North East Channel as a passage between the Coral Sea and the Arafura Sea);
- Foreign flagged trading vessels visiting Australian ports;
- Australian flagged vessels trading overseas;
- Australian and foreign flagged coastal traders;
- International and Australian non-commercial traffic eg. naval vessels, yachts, tourist vessels etc.

In terms of tanker traffic, coastal product tankers up to 60,000 DWT utilise the inner coastal route providing products to Queensland ports, whilst larger crude tankers up to 100,000 DWT bound for southern refineries utilise the outer route. There is a conscious effort on behalf of oil companies to avoid the inner route. The outer route was surveyed in 1997 and has attracted additional use. Further data and analysis is required for vessels transiting the outer route.

Photo 4: A container ship transiting the Inner Route.

Large crude tankers have draught restrictions to utilise the inner route and Torres Strait.

Approximately 60 tankers utilise the inner route north of Cairns each year. About 100 tanker movements occur through Great North East Channel each year.
Queensland is susceptible to the *passing tanker syndrome* whereby crude tankers utilise the outer route through the Coral Sea but are not trading with Queensland ports, apart from Brisbane which has two refineries. These vessels pose risks to the Queensland coast but a percentage are not paying the AMSA *Protection of the Sea* levy for ensuring preparedness.

7.4 Incident History

The incident history was derived from the Marine Incidents Investigation Unit and Queensland Transport. The incident data was mapped to provide insights into where the "hot spots" are and to determine whether the incident history matched the high and medium risk areas identified within the hazard analysis.

Maps in Appendix 1 depict the incident statistics over the period 1985 to 1999.

Analysis of the incident data indicates that the Torres Strait and the Inner Route north of Cairns has the highest concentration of incidents. For the period 1985 to 1999 there were 11 collisions and 19 groundings within the inner route, which equates to over 2 incidents per year. All incidents for the period have been analysed. The Torres Strait and inner route have the highest incident rate in Australian waters. Given that approximately 2,500 ships utilise the inner route per year, the pro- rata rate of incidents is small but considerably higher than the remainder of the state and elsewhere on

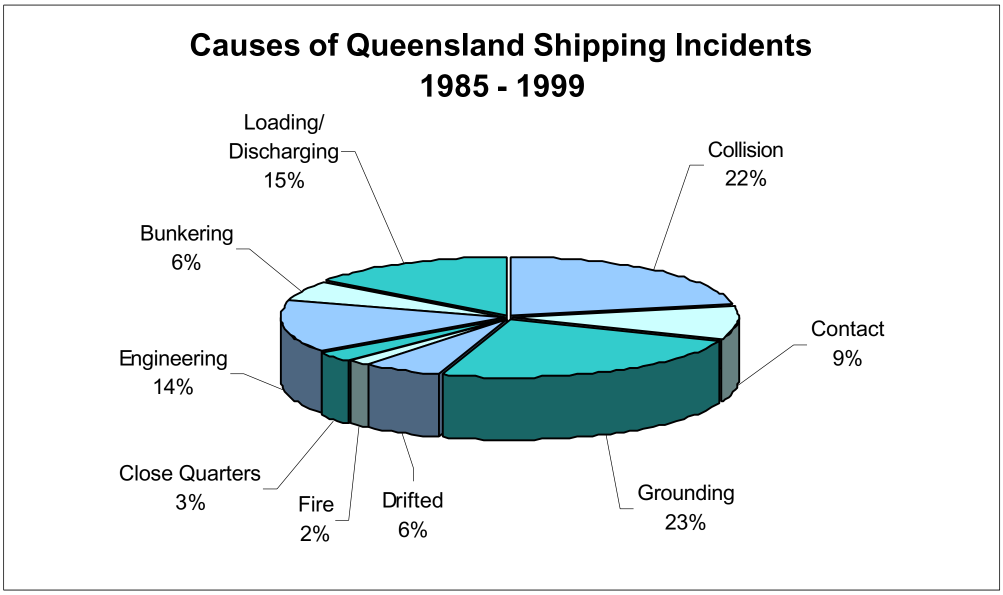


Figure 6: Causes of shipping incidents in Queensland Coastal waters between 1985 and 1999

the Australian coast. The inner route is not a busy sea-lane by world standards. When traffic volumes are considered, the statistical likelihood of an incident is small. The majority of incidents within the GBR occur at night. The most predictable and probable serious incident within the GBR will be a grounding followed by a collision between a ship and a fishing vessel or yacht. Most of the groundings were caused by human error, with machinery failure only responsible for a minor contribution. Loss of main propulsion or steering gear failure is a real concern in Torres Strait and much of the inner route as there is little time to apply corrective action or anchor.

In more recent times between March 1995 and May 1999 there were 7 serious groundings in the inner route/Torres Strait sector: *Carola, Svendborg Guardian, Peacock, Thebes, Dakshineshwar, Nol Amber* and most recently *New Reach*. Human error was the cause of six of these incidents and one by machinery failure. Six of these vessels had coastal pilots onboard, which once again demonstrates pilotage does not remove the risk. Once again the worldwide trend of the human element contributing to over 80% of marine incidents is validated.

In all of the groundings, which occurred there was no oil spilt, nevertheless the potential was high. Luckily the groundings did not occur on hard or jagged sea bottom.

Historically, none of the incidents on the Queensland coast has resulted in a loss of the ship or serious pollution except for the *Oceanic Grandeur* grounding incident in Torres Strait in 1970. This was a serious incident caused by the vessel hitting an uncharted rock with contributing factors likely to include less tide than predicted and not enough allowance for squat.

Collision between two ships is rare. The only ship to ship collision of note was the collision between *HMAS Fremantle* and *River Embley*. The likelihood of collision between two merchant ships is extremely small and is lower than the likelihood of groundings.

Almost all collisions involve a large merchant ship colliding with fishing vessels. In most cases the cause was not maintaining a proper lookout by either vessel. Trawlers are a real risk to shipping using the inner route north of Cairns and this is supported by the findings that almost all collisions involved a fishing vessel or small craft. A major pollution incident is unlikely to occur from these type of incidents but there may be a grounding caused by collision avoidance action.

7.5 Ports

The scope of the risk analysis does include Queensland ports but further analysis is also required within individual ports.

In ports, incidents have the potential to affect large areas, habitats and many people very quickly. Against this there are also a number of risk reduction measures in place such as pilotage, VTS, towage, well-recognised operating procedures, and of course immediate response measures if there is an incident.

Trade through Queensland ports has been increasing steadily during the last five years and this growth is expected to continue. In addition, the trend is towards bigger ships with more cargo and more bunkers which means shipping incidents will have the potential to be increasingly severe.

Ports and the seaward approaches to ports are areas where marine traffic becomes considerably more dense and higher incident rates are prevalent.
Worldwide figures show about 70% of marine oil spills occur in ports. Spills occurring in ports have a far greater potential to cause adverse coastal and environmental impacts, compared with spills at sea.

A port’s exposure depends on a number of parameters. A port will rank highly in terms of risk if it has a high frequency rate of ship visits, handles a large amount of oil products, presents difficult navigational hazards, is in close proximity to sensitive environments, and does not have ready access to any readily deployable equipment stockpiles.

Incidents in ports generally occur due to bunkering, berthing (contact) and transfer operations.

There are 15 trading ports within Queensland: Karumba, Weipa, Thursday Island, Cape Flattery, Cairns, Mourilyan, Lucinda, Townsville, Abbot Point, Mackay, Hay Point, Port Alma, Gladstone, Bundaberg and Brisbane. Refer to Appendix 8. There are also approximately 6,000 ship visits to Queensland ports each year.

Port activity data was sourced through Queensland Transport, Bureau of Transport and Economics and port authorities.

Analysis of shipping within ports considered ship visit frequency, ship type, ship size, tanker visits and bunkering operations. This data is summarised in graphical form at Appendix 2.

The estimate of port movements is more reliable than coastal traffic movements.

Simple methods of port activity were combined with analysis of incidents within ports and expert judgement provided by pilots to yield the level of risk.

The ports of Cape Flattery and Brisbane were considered to be high risk.

7.6 Environmental and Socio-Economic Vulnerability

There are two broad classes of impacts that may occur when an oil spill takes place. These are:

- environmental effects; and
- socio-economic effects.

A difficulty with determining the relative vulnerability of each region is the assessment units are based on regions rather than local areas. This means that each regional unit may contain areas of high vulnerability to oil spills. To overcome this problem, definitions were developed to rate the different regions against each other. Three broad groups were identified and are described below.

All coastal habitats are vulnerable to oil spill impact.

The assessment of each of the regions was consolidated during a workshop involving environmental oil spill coordinators from each EPA region. Vulnerability maps illustrating sensitive receptors were produced and reviewed by GBRMPA, QDPI, EPA and QPWS agency representatives.

In addition to the environmental sensitivity of the area, the severity of the impact of an oil spill will depend on numerous factors such as:

- amount of oil spilled,
- nature of the oil,
- distance from the shore and difficulty in responding,
- weather conditions,

- wind and current conditions.

It is expected that the vulnerability aspect of the risk assessment will be improved in future with the implementation of the Oil Spill Response Atlas and completion of the Representative Areas project within GBRMPA.

7.6.1 High Vulnerability

An oil spill will cause significant and long lasting impacts over a wide area. Cleaning up these areas would be protracted and may only be partially successful.

Environmentally the region will contain large areas of coastal wetlands, large areas of inter-tidal coral reefs and seagrasses, significant populations of rare and endangered species.

Economically the region will have dominant tourism and fishing industries.

Culturally the region will support traditional hunting and collecting economies and subsistence collecting, fishing and hunting will be a significant part of the economy.

7.6.2 Medium Vulnerability

An oil spill will cause significant and long lasting impacts, though restricted to localised areas.
These areas should recover and are capable of being cleaned up reasonably effectively.

Environmentally the region will contain wetlands (though generally these will be fringing systems only), inter-tidal habitats will be present, though generally they will not be key habitat for important species, and significant populations of wildlife, though not rare and/endangered species.

Marine industries will be important within the region, but are not the dominant component of the economy.

Culturally the region will support traditional collecting and hunting, though not for subsistence.

7.6.3 Low Vulnerability

An oil spill will cause relatively little damage and is unlikely to have long lasting impacts. That is, most habitats will be able to recover within 3 years.

Environmentally the region will contain limited amounts of wetlands and those that are present will be fringing systems only, small amounts of inter-tidal habitat and common species may be prevalent.

Little or no marine industries.

Little traditional use of the region.

7.7 Risk Evaluation

Consider the distribution of risk in terms of traffic densities, accident frequencies and accident consequences.

A review of international shipping patterns indicates that the main areas at risk from marine oil spills are ports which are subject to pollution from contact, collision and groundings, and coastal areas of high traffic density or “choke points” such as Torres Strait which are susceptible to spills from collision or grounding.

Following the production of the vulnerability and hazard maps, these were overlayed to compile the final composite map depicting the combination of both. Refer to Appendix 6.

Areas that represent as high/high are nominated as MEHRAs.

Risks were considered both from a vulnerability and likelihood perspective within the risk matrix. The matrix positions were chosen on collective judgement, rather than detailed calculations.

8.0 RESULTS

8.1 Hazard Maps

The navigational hazard maps at Appendix 5 have been compiled to depict areas presenting the greatest navigational difficulty and likelihood of an incident.

The critical scenarios identified within the “hot spots” were:

Location:	**Type of Incident Likely:**
Prince of Wales Channel:	Grounding or collision
Inner route north of Cape Flattery:	Grounding or collision
Cape Flattery:	Contact
Great North East Channel:	Grounding or collision
Whitsunday Islands:	Grounding or collision
Hydrographers Passage:	Grounding
Moreton Bay:	Grounding or collision

8.2 Vulnerability Maps

The Maps at Appendix 4 depict the relative vulnerability of the Queensland coastline to impact from a large oil spill. The maps do not rate the environmental significance of particular areas, though in most cases there is a correlation between the general environmental significance of an area and vulnerability to oil spills.

Most of the coast of the State was rated as having a medium to high vulnerability to damage from an oil spill. This is not a surprise given that a large proportion of the coastline contains inter-tidal habitats that are particularly sensitive to oiling events.

In overall terms environmental vulnerability had minimal influence on the risk profile, given the relatively homogenous nature of the coastline in terms of sensitivity to oil spills.

8.3 Risk Maps (MEHRAs)

The risk maps depict the combined profiles of exposure (likelihood) and vulnerability (consequence) and present the overall risk profile for Queensland. Following the generation of the separate likelihood and consequence maps, these were superimposed to show the areas of high/high risk and these areas are the proposed MEHRAs.

The proposed designated MEHRAs for the state are shown at Map 2.

In summary, the proposed MEHRAs were designated for the following reasons:

8.3.1 Prince of Wales Channel

- Shallow water region with extensive shoals, banks and reefs;
- Subject to strong currents and tidal streams;
- Subject to strong trade winds and exposure to severe weather at times;
- A complex tidal regime making UKC calculations critical;
- Navigational complexity;
- A narrow channel in parts with limited sea room with the channel being 800 metres wide in parts;
- A high concentration and diversity of traffic, including large tankers, bulk carriers, container ships, cruise ships, fishing vessels, recreational craft;
- Important marine habitats including seagrass beds, coral reefs and an extensive dugong habitat;
- Area contains a large prawn and lobster fishery;
- A significant breeding ground for numerous species;
- A high diversity of marine life;
- High cultural significance and indigenous dependency.

8.3.2 Great North East Channel

- Shallow water region with extensive shoals, mobile sand banks and reefs;
- Subject to strong currents and tidal streams;
- Subject to strong trade winds and exposure to severe weather at times;
- Navigational complexity;
- A high concentration and diversity of traffic, including large tankers, bulk carriers, container ships and fishing vessels;
- Area contains considerable habitats, seagrass beds, mangroves and coral reefs;
- High cultural significance and indigenous dependency.

8.2.3 Inner Route North of Cape Flattery, including port of Cape Flattery

- Shallow water regions with extensive shoals, banks and reefs;
- Subject to strong tidal streams and currents;
- Subject to strong trade winds and exposure to severe weather at times;
- Navigational complexity with numerous turning points and limiting depths;
- A narrow channel in parts with limited sea room;
- A high concentration and diversity of traffic, including tankers, bulk carriers, container ships;
- A high concentration of fishing vessels and small craft especially at night;
- Important marine habitats including mangroves, seagrasses and coral reefs;
- Important marine animals including Dugong and Turtles;
- High cultural significance;
- World renowned particularly sensitive sea area;
- A difficult berthing manoeuvre at Cape Flattery;
- World Heritage Area and Marine Park.

8.2.4 Whitsunday Islands

- Subject to extremely strong tidal streams and currents, including cross currents;
- Subject to strong trade winds;
- A high concentration of cruise ships transiting close inshore;
- Navigational complexity;
- A high concentration of commercial and recreational small craft, including significant cross traffic;
- Important marine habitats including seagrasses, mangroves and fringing coral reefs;
- A primary attraction for the tourism industry;
- High socio-economic value;
- High recreational and commercial asset.
- World Heritage Area and Marine Park.

8.2.5 Hydrographers Passage

- Subject to extremely strong tidal streams and currents, including cross currents;
- Subject to strong trade winds and exposure to severe weather at times;
- Navigational complexity;
- A high concentration of large bulk carriers;
- A very narrow channel (1nm) with extremely limited sea room;
- Extensive coral reefs;
- World Heritage Area and Marine Park.

8.2.6 Moreton Bay

- Subject to strong tidal streams;
- Navigational complexity;
- A high concentration and diversity of traffic, including large crude and product tankers, bulk carriers, cruise ships, container ships;
- Two oil refineries service the numerous tanker movements;
- A high concentration of fishing vessels, commercial and recreational small craft especially at night;

- World renowned marine park and one of the most important marine resources in Australia;
- Exceptional biodiversity and an important nursery for many species;
- High cultural significance;
- High recreational and commercial asset and subject to extensive commercial activities;
- Important marine habitats including seagrasses and mangroves;
- Important marine animals, including Dugong;
- High socio-economic value.

9.0 DISCUSSION AND RECOMMENDATIONS

9.1 Prevention

9.1.1 Marine Environment High Risk Areas (MEHRAs)

The GBR was designated a Particularly Sensitive Sea Area (PSSA) by the IMO in 1991. The declaration of the PSSA was based on environmental sensitivity and not risk to navigation.

The report of Lord Donaldson's inquiry into the Prevention of Pollution from Merchant Shipping 'Safer Ships, Cleaner Seas', established the concept of Marine Environment High Risk Areas (MEHRAs). MEHRAs will provide a distinct educational and awareness tool designed to alert mariners to areas hazardous to navigation and at risk of exceptional environmental damage. To this end, areas classified only as high/high on the risk matrix were considered as MEHRAs, ie. the area must be highly sensitive to oiling and at high risk of an incident occurring.

MEHRAs as proposed by Lord Donaldson were to be small in number to give them maximum effect and to impress upon mariners the particular care that must be taken when transiting these areas. Lord Donaldson in discussing the MEHRA concept stated "*it is impossible to give high level protection to all areas which might deserve it – there are so many*".

An excessive number of MEHRAs would lessen the overall effect as human nature allows a lower level of vigilance when increased readiness is required over prolonged periods. Mariners would be expected to exercise particular caution when transiting a MEHRA. Increased precautionary measures may include increased bridge resource management, an additional lookout, reduced speed, enhanced radio watch and communication with other vessels. The MEHRA would demand higher standards of care from the mariner, not only in the interest of the marine environment, but also in their own interests as damage caused may entail higher compensation to be paid should there be an incident.

MEHRAs may also have a role for courts determining the liability of ships involved in marine incidents or undertaking unsafe practices when transiting such areas.

Strong consideration has been given to establishing exclusion zones with the view to separating different activities such as fishing and shipping. These measures are not considered appropriate at this point, however may have greater relevance when measures suggested within this report are reviewed for effectiveness.

Recommendation 1A

The following regions be declared Marine Environment High Risk Areas (MEHRAs):
- **Prince of Wales Channel**
- **Great North East Channel**
- **Inner Shipping Route, between Cape Flattery and Torres Strait**
- **Whitsunday Islands and associated passages**
- **Hydrographers Passage**
- **Moreton Bay**

The declaration of these areas as MEHRAs will need to be communicated to the shipping industry if they are to have any effect. The main means of communicating information to the shipping industry within Queensland waters are:

- Navigation Charts;
- Reef Guide;
- Notice to Mariners; and
- Reef Centre.

It is considered that REEFCENTRE is not an appropriate means of communicating MEHRAs to mariners given the intensive workload already assigned to the operators. The designation of MEHRAs on navigation charts is a longer-term objective requiring further consultation with the RAN Hydrographer, but should be proceeded with, as navigation charts are the primary information tools for the mariner. Shorter-term communication tools are the Notice to Mariners, information from which are transferred onto navigation charts and the Reef Guide.

Recommendation 1B

MEHRAs be communicated to mariners via:
- **Notice to Mariners in the first instance;**
- **Reef Guide; and**
- **Navigation Charts.**

9.1.2 Electronic Chart Display and Information System (ECDIS)

The hydrographic chart is the primary aid for navigating a vessel through unfamiliar waters. Traditional navigation methods using the paper chart require the mariner to calculate two pieces of information instantly, where the ship is and where the ship is heading. This information must then be transferred to the hydrographic chart to identify any dangers that might be present in the waters ahead. At any stage of this process it is possible for an error to occur. Any number of factors including calculation error, poor weather conditions and navigation equipment failure can cause this. (Eaton: 1990)

With the advent of computer mapping and satellite navigation technologies the opportunity exists for navigation practices to be substantially upgraded. ECDIS combines these technologies to provide a system that automatically locates a ship's position upon an electronic chart. There is a strong view amongst stakeholders of the value of navigation services such as ECDIS and DGPS in improving safety of navigation in confined waters and ensuring the protection of the marine environment.

International statistics show that nearly 90% of ship groundings are caused by navigation error. The key to reduce this risk is to remove the human element.

ECDIS is a combination of three technologies, which provide the mariner with continuous, real time, high accuracy position superimposed on an electronic chart display.

Global Positioning System

The Global Positioning System (GPS) is a satellite based radio-navigation system developed by the United States Department of Defence.

Through the use of base stations at fixed locations it is possible to correct the data received from the GPS to an accuracy of 1-10 metres (Higgens et.al.: 1992). This is referred to as differential GPS (DGPS). If the corrections are broadcast in real time via a radio transmitter, DGPS information can be used for navigation purposes. AMSA has implemented such a service for the entire Great Barrier Reef. Refer to Figure 7.

The US Government has recently removed Selective Availability from the GPS network. It is expected that DGPS will provide an even more reliable navigation aid than was previously the case.

AMSA's 1998 GPS/DGPS user survey of 392 vessels showed that 99.7% carried a single GPS and 44% carried two or more GPS receivers. GPS can therefore be considered standard equipment on merchant shipping.

Electronic Chart Database.

An Electronic Chart Database (ECDB) is a series of digital map overlays, each of which contain a single theme of information. In the case of ECDIS the ECDB would contain that information currently depicted upon the hydrographic chart, eg. bathymetry, navigation hazards and navigation aids. Each overlay can be manipulated or integrated with other layers within the database to provide the mariner with the information necessary to navigate through a particular region. For example the bathymetry overlay could be manipulated to display those areas of water deep enough for the draught of the vessel.

In doing so the mariner would be able to remove surplus information and simplify the decision making process. Such information could also be integrated with tidal stream and current information to depict areas where adjustments to the ship's course may be

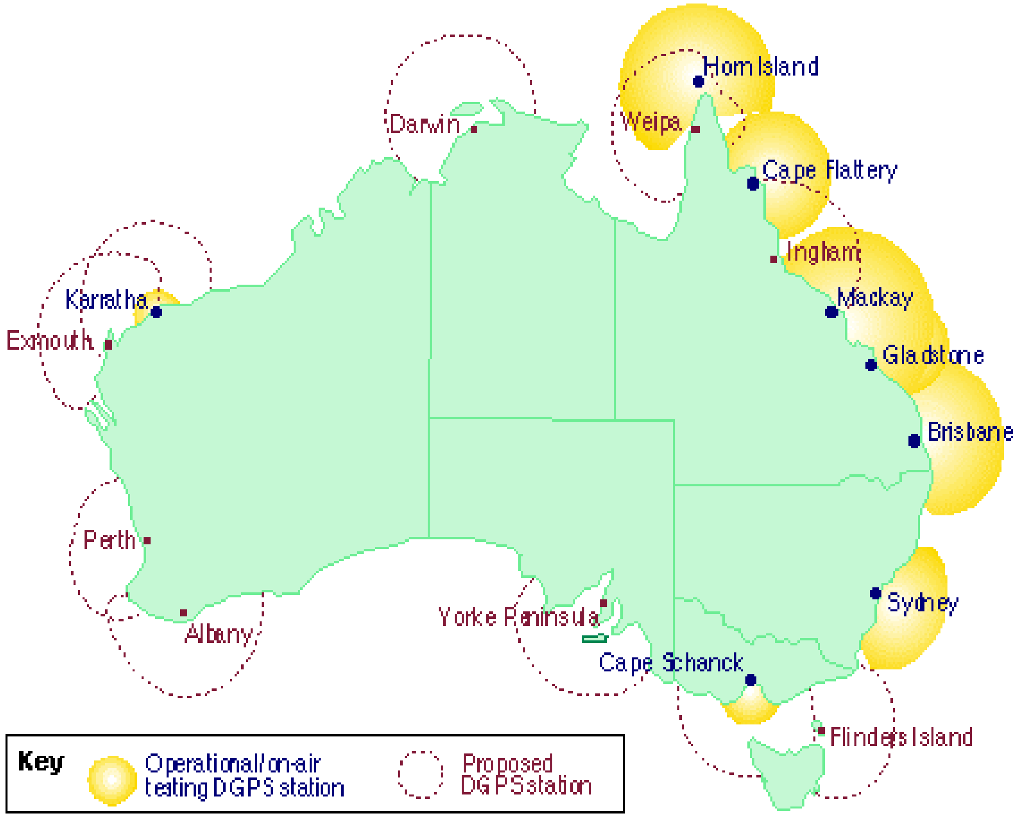


Figure 7: Differential Global Positioning Systems Configuration

necessary. Dependent upon what is considered desirable it is also possible to include other information within the database that previously could not be depicted on the hydrographic chart, such as sensitive environments and Marine Park zoning.

The RAN Hydrographer has completed the IMO Standard Electronic Chart Database for the GBR south to 12 degrees latitude (ENC1).

ECDIS

The computer graphic component visually depicts the vessel's position on the chart background to allow the mariner to visualise the above information. It is also possible for this information to be displayed at a number of scales dependant upon the task at hand.

Through the integration of each of these technologies an ECDIS is able to continuously update the ship's position on a given chart with a high degree of accuracy. The mariner is able to program a planned route into the system and monitor the ship's progress, either automatically by the system or visually, in relation to this route on the computer screen. If the vessel deviates from the pre-programmed course an acoustic warning can be emitted and corrections made to the course. This is characterised as a grounding avoidance system. North American statistics estimate that such a system has the potential to reduce the incidence of groundings by as much as 70% (Leech). There are a comprehensive set of alarms to cover off course, approaching danger, CPA violation, depth and positioning. ECDIS allows instantaneous and continuous determination of position.

The IMO with advice from IHO has set an implementation period of 2002 for ECDIS implementation. However given the significance of the GBR and the importance that the IMO has placed upon the region it would be appropriate for Australia to consider accelerating the implementation of mandatory ECDIS for shipping using the GBR ahead of the international timeframe. Coastal pilots should be required to carry portable ECDIS through the GBR. The portable system would need to be lightweight, robust and easy to set up and use.

In other parts of the globe, it has already been muted that vessels will not be allowed to carry certain hazardous cargoes without having an ECDIS onboard, For example, the RN Hydrographer, Rear Admiral John Clarke has indicted this may be the case for vessels transiting the English Channel.

Improvement to navigation through emerging technology and minimisation of the human element is the most effective means for reducing the risk of marine oil spills.

Recommendation 2A

Areas identified as MEHRA's be given high priority for the development of IHO Standard Electronic Navigation Charts.

Recommendation 2B

Coastal pilots should be encouraged to employ ECDIS whilst piloting within the GBR compulsory pilotage areas.

9.1.3 Automatic Identification System (AIS)

There are other emerging navigational technologies on the horizon, which will enhance ship safety and reduce the risk of marine pollution. Compared to air traffic, ships are relatively unidentifiable at sea. SRS has significantly enhanced ship detectability and identification through reporting but Automatic Identification System (AIS) will further enhance this capability.

Through IMO, there will be a progressive introduction of AIS, starting with new passenger ships on 1 July 2002, extending to all SOLAS ships by 2008. Consideration should be given to accelerating this introduction. Portable transponder systems are available and are being trialed in Canada and the US. Queensland Transport and AMSA are currently conducting AIS trials in the Great Barrier Reef.
AIS and VMS systems can considerably enhance navigational safety and traffic management through ship monitoring and reporting.

AIS can be utilised in the ship to shore mode or the ship to ship mode. Various parameters are broadcast from the ship such as identification, position, course and speed to shore and/or other ships. The system can assist shore based identification, tracking and monitoring of vessels as well as collision avoidance in the ship to ship mode. AIS also provides better responsiveness to marine incidents and marine pollution.

Vessels requiring AIS should be extended to non-SOLAS vessels including fishing vessels. Providing small craft with AIS will greatly assist their detection, especially during heavy rainsqualls where radar detection is difficult. There is already a pseudo AIS for fishing vessels in the shape of the Australian Fish Management Authority (AFMA) sponsored Vessel Monitoring System (VMS) which allows AFMA (Canberra) to monitor the position of fishing vessels. VMS is primarily designed to monitor compliance with fishery management arrangements but also enhances safety for fishing vessels.

In an endeavour to improve the interaction between ships and fishing vessels there is a strong case for VMS data to be transmitted to REEFCENTRE. This will assist REEFCENTRE to monitor the location of fishing vessels, identification and concentration of fishing vessels and subsequent alerting of ships in the SRS network. If AIS is mandated for non- SOLAS vessels operating in the GBR, a complete and fully integrated traffic management system will result.

AIS will also considerably enhance capacity for detection of ships engaging in illegal discharges and to that end will act as a strong deterrent to these practices.

Ultimately AIS could be integrated with ECDIS thus providing a powerful and sophisticated tool for safer navigation, and collision avoidance.

Recommendation 3

Regulate AIS for non-SOLAS vessels utilising the GBR to ensure a complete and fully integrated traffic management system.

The introduction of AIS should be accelerated ahead of the IMO timelines for the GBR.

As an interim measure, the AFMA sponsored VMS data for fishing vessels should be relayed to REEFCENTRE to improve interaction between ships and fishing vessels.

9.1.4 Compulsory Pilotage in Whitsunday Islands

The Gr*eat Barrier Reef Marine Park Act 1975* enables the Authority to declare areas within the Marine Park compulsory pilotage areas. Currently the inner-shipping route (north of Cairns) and Hydrographers Passage have been declared compulsory pilotage areas for ships over 70 metres in overall length and for all oil, chemical and liquid gas carriers.

Also, IMO Resolution A.710(17) recommends pilotage for Prince of Wales Channel and Great North East Channel.

Pilotage has reduced the potential for collision and groundings, but as was the case with the *Oceanic Grandeur* and recent groundings within the GBR, it does not eliminate the risk.

Cruise ships operating within the Whitsunday Islands navigate relatively close to hazards, in particular when moving to and from anchorages. Visits by cruise ships to the Whitsunday Islands are increasing and there are added pressures caused by the commercial need of these ships operating close to shore to afford the best views and convenience to passengers. Proximity to land and or shoals escalates the level of risk because there is less time to initiate corrective action should problems be encountered. Cruise ships operate in these areas without the assistance of normal infrastructure that would be provided by a port, eg. tugs. The grounding of the *Cape Grafton* at Dent Island in 1994 highlighted the hazards associated with operating close to shore, in particular where there is a failure of shipboard systems.

There is also a large concentration of recreational and charter vessels and considerable cross traffic operating in the Whitsunday Islands, further heightening the risk of an incident.

In recent times the GBRMPA have required cruise ships to utilise the services of a coastal pilot to assist with navigation through these areas as a condition of their permit. A pilot is viewed as improving the safety of cruise shipping operations.

Approximately 70% of all shipping transiting Whitsunday Passage have a pilot embarked.

Given the Authority policy to simplify permit conditions, it is believed there is value in declaring the Whitsunday Islands to be a compulsory pilotage area for all cruise shipping.

Recommendation 4A

The Whitsunday Islands be declared a compulsory pilotage area for cruise shipping.

To obtain a pilot's license an individual must complete 6 passages of the inner route and 20 passages of Hydrographers Passage (Marine Orders 54). Currently there is no requirement for pilot licensing within the Whitsunday Islands. This means that authorities have no basis upon which to ensure that pilots operating within this region have appropriate skills, particularly given the nature of the operations.

Recommendation 4B

AMSA develop pilot licensing standards for the Whitsunday Islands.

Apart from cruise shipping there is no real need or demand to utilise Whitsunday Passage as an alternative route to the recommended outer route. The outer route presents no significant disadvantage to ships from a time/distance perspective, although Whitsunday Passage is some 2.4 Nm shorter. Whitsunday Passage should not be encouraged as a route for coastal shipping. Removal of the recommended route through Whitsunday Passage on charts AUS 370 and AUS 371 is seen as a means for achieving this goal.

Another means considered for improving marine safety and vessel traffic management within the Whitsunday Islands is to declare the area a *Pilotage Area* under the *Transport Operations Marine Safety Act*. This will afford better control of all vessels including the regular recreational and commercial traffic and better traffic monitoring. Centralised traffic monitoring and communications through REEFCENTRE will enhance marine safety for all users of the area.

Recommendation 4C

The Whitsunday Islands be declared a Pilotage Area under Queensland legislation to improve traffic management and monitoring for all vessels in the area

9.1.5 Close Quarter Encounters with Small Vessels

The GBR is regularly used by a large number of fishing vessels and other small craft (eg. cruising yachts). AMSA and Queensland Transport are regularly advised of close quarter incidents between fishing vessels and trading ships, and the accident history has identified a number of actual collisions. Numerous mariners consulted advised of near misses with fishing vessels due to non-compliance with the COLREGS.

The risk assessment has identified several choke points, particularly within the inner route north of Cairns, where fishing vessels and large merchant vessels have a heightened risk of collision. A major problem identified during consultations was with the ability of merchant ships to communicate with fishing vessels within restricted waterways. Most merchant ships are constrained by draught with little sea room to conduct collision avoidance. It would appear that some fishing vessels are not maintaining a proper watch by either maintaining a visual lookout or monitoring the marine radio. This is in breach of COLREGS (*Rule 5: Every vessel shall at all times maintain a proper lookout by sight and hearing…).*

Commercial pressures dictate that fishing vessels are minimally manned with the crew often on the after deck and the wheelhouse is unmanned. In order to address this issue of communication, all fishing vessels should be fitted with a VHF radio loudspeaker on the after deck. This will ensure crews are aware of ships in close proximity and enhance their situational awareness.

Merchant ships often experience uncertainty as to the smaller vessel's intended actions when considering close quarter situations and collision avoidance, particularly at night when working lights obscure navigation lights. Coastal pilots have advised that enhanced communications would create greater surety for them by at least knowing the fishing vessel has heard the merchant ship's intentions.

Improved communication between merchant ships and small craft is viewed as essential to reduce the risk of collision or collision avoidance induced grounding. Fishing vessel crews need to be cognisant of merchant ship's restricted manoeuvrability and sea room due to draught constraints.

Mariners will attest that many small craft do not 'paint' well on radar and are impossible to see over the bow of a large ship, except at range. Consideration needs to be given to small craft working these areas to be fitted with radar reflective devices.

There has been a steady increase in the number of yachts utilising the Queensland coast. Yachts can be a hazard to shipping at night. Prior to GPS, most yachts would have found an anchorage overnight but now many will remain underway.

Recommendation 5

An extensive education program be directed towards operators of small craft, in particular fishing vessels, outlining responsibilities for navigation within confined waters and under COLREGS.

A compliance program be developed to ensure small craft conform to legislation regarding the safe operation of their vessels, in particular the absolute need for maintaining a proper lookout.

All trawlers to be fitted with a loudspeaker to the after deck and other appropriate means to monitor VHF radio to enhance maintaining a proper lookout.

9.1.6 Reporting Contraventions of COLREGS and Near Miss Incidents

Reports from mariners indicate that there are numerous breaches of the COLREGS within Queensland Coastal Waters and GBR. Similarly there are many reports of near misses which had the potential to cause major pollution damage.

There is little doubt that near miss incidents are frequently under reported. The collection of this information is essential for collating statistics and gaining further insights into the types of situation and causal factors, which influence human error. Worldwide statistics indicate that over 80% of marine incidents are caused by human error. A collision, which was narrowly avoided, could have been extremely serious with disastrous consequences. The Commonwealth Navigation Act requires vessels to report incidents such as collisions and groundings but there is also a requirement to report COLREG contraventions and near misses. Reports should be made to RCC Canberra but unfortunately this is not happening on every occasion. Reporting is not occurring for a number of reasons but typically because the mariner has avoided the situation, does not see the merit in reporting, or the prospects of anything constructive being done against the breach vessel.

Reporting of near miss incidents is seen as crucial to enhancing marine safety management. Incidents should be reported without fear of incrimination. The development of a near miss database will assist in the prevention of similar real incidents. Lessons learned will assist in error prevention by analysing trends and conditions, which develop prior to an incident and the application of lessons learned to prevent similar occurrences.

Air safety has a superior system for reporting and investigating near misses and this system should be examined for marine safety.

Recommendation 6

Mariners be further encouraged to report non-compliance with the COLREGS, unacceptable practices and near misses such as to provide better insights into the lessons which can be learned from these incidents.

9.1.7 New Routes to Enhance Navigational Safety

Improved routeing is seen as a positive means to reduce risk. Improved routeing may provide deeper water, more sea room, less complex navigation, and separation of fishing vessels from merchant ships.

There are two proposed routes, which will achieve this goal.

Fairway Channel

Fairway Channel offers a deeper water route between Cape Melville and Cape Direction. The channel is also less complex from a navigational perspective. The channel has been significantly surveyed, with only some minor work required at the northern end in the vicinity of Frederick Patches where it rejoins the inner route. Following completion of this survey, which is scheduled for 2000 by the RAN Hydrographic Service, a full route survey will be conducted to check the corridor.

Some small coastal traffic is already utilising Fairway Channel, which saves approximately 15 Nm compared to the existing inner route.

On completion of the survey, it is expected that the route will be marked with the appropriate navigation aids by AMSA.

Coastal pilots are keen to have the route marked as it less demanding for navigation and will assist fatigue management by providing an additional rest break for pilots.

Great North East Channel

The existing route through Great North East Channel is a hazardous track, which does not have a compulsory pilotage requirement. Pilotage is recommended, but of the approximate 800 ships, which transited the area last year, only 46% embarked a pilot.

Safety of navigation for Great North East Channel was considerably enhanced earlier this year when the preferred route was moved further to the east, bypassing the ‘dog leg’ through Vigilant Channel. There are moves afoot to take the preferred route further to the east and provide deeper water between Caldbeck Reef, Smith Cay and Dalrymple Island. Local fishermen have some concerns with the proposed new route, as the route will pass close to fishing grounds. Additional navigation aids are planned for the route in 2000, which will further enhance safety. Shipping is already using this route.

Recommendation 7

The hydrographic survey of Fairway Channel be completed, a recommended route marked on charts, appropriately monumented with navigation aids and promulgated as an alternate deep-water route.

9.2 Preparedness

9.2.1 Response Equipment

The risk assessment identified a number of high-risk areas along the Queensland Coast which in the view of the authors do not have adequate equipment levels commensurate with the risks that are present within these areas. The authors note that in some cases, remoteness rules out several response options, however there is still some significant room for improvement.

Areas of Queensland, which are of high risk of an oil spill are:

- Torres Strait,
- Great North East Channel,
- Northern inner shipping route,
- Port of Cape Flattery,
- Whitsunday Islands,
- Hydrographers Passage,
- Moreton Bay.

There are adequate equipment stockpiles to respond to incidents within Torres Strait, Hydrographers Passage (though significant logistical problems are associated with responding offshore) and Moreton Bay.

The risk assessment rated both the northern inner route and Torres Strait as high-risk areas for marine incidents. This conclusion is supported by the National Plan Review Risk Assessment and an assessment conducted by the Bureau of Transport and Economics. Contributing factors to the high-risk level were:

- Length of passage (up to 48 hours);
- Navigational difficulty;
- Restricted waterways and limiting depths;
- Density of vessels, in particular when the northern trawl fleet is operating;
- High environmental values of the areas; and
- High indigenous cultural value and importance of hunting and fishing for subsistence.

The level of preparedness for an oil spill within these regions is limited. There is a small stockpile of equipment located within the Torres Strait, in particular 12 tonnes of dispersant and spray bucket at Horn Island and a small amount of boom and a skimmer at Thursday Island. There is no equipment located adjacent to the northern inner shipping route.

Management actions for the northern GBR and Torres Strait have mainly focused on prevention and in particular the introduction of coastal pilotage and mandatory reporting through the Ship Reporting System. It has been considered not cost effective to stage large amounts of equipment on Cape York. Generally speaking this assessment is correct, however there are some preparedness actions which can be undertaken that would significantly improve response actions within the region.

9.2.2 Fixed Wing Aerial Dispersant Contract

The National Plan has a contract with Australian Maritime Resources to provide a fixed wing aerial dispersant capability for oil spill response within Australian waters. The contract requires an aircraft to be en-route to an oil spill within four hours of notification. In most cases the aircraft will be in transit ahead of this time as there are permanent aircraft on standby at Emerald and St George in Queensland.

Current dispersant stockpiles are located at Cairns and Horn Island. Operation of aircraft from Cape York will require the relocation of dispersant to the airfield from where the aircraft are operating. The efficiency of the fixed wing contract on Cape York could be improved by locating quantities of dispersant at various airstrips along the Cape. Suggested locations are:

- Lockhart River (Iron Range airport),
- Cape Flattery,
- Heathlands Station.

It is considered that such stockpiles should be of dispersant which is effective on the heavy fuel oils contained in ship’s bunkers.

Queensland will rely heavily on the offshore application of dispersant by fixed wing aircraft for a significant spill in far north Queensland. Given logistical problems, predominant weather and sea conditions and technical limitations, offshore containment and recovery is not considered to be an effective means of responding to oil spills in northern Queensland.

Additional options may be required to secure suitable fixed wing aircraft for northern Queensland, possibly agricultural aircraft operating on the Atherton Tablelands. Investigation of alternative options for far north Queensland is required. Recommendation 9 recommends that an audit of response arrangements for high-risk areas be undertaken, including those arrangements for fixed winged dispersant application. This is important as the weathering rates for heavy fuel oils mean that dispersants are unlikely to be effective 24 hours after spillage. Dispersant application aircraft must be operating prior to this period. A limitation on rapid response is availability/positioning of aircraft. The advantage of dispersant stockpiles near high-risk areas is not fully effective if aircraft are not available.

Photo 5: Airstrip at Heathlands Station. Refer to Appendix 8.

9.2.3 Equipment

The Port of Cape Flattery has been identified as a high-risk operation, by nature of a difficult berthing practice without tugs and exposure to weather. This problem is exacerbated by the remoteness of the port. There have been a number of incidents involving the berthing of vessels at Cape Flattery and spills have been documented. The most likely incident type is the breach of wing tanks against the berth leading to a loss of 10-100 tonnes. The Port of Cape Flattery Contingency Plan considers the worst case scenario of such an incident to be up to 400 tonnes.

Consideration should be given to locating equipment commensurate with the risk posed by the operations at Cape Flattery. Response arrangements will need to be negotiated with the silica mine for deployment of equipment. This would include training of staff.

Lockhart River has a regular barge operation providing coastal trade. The vessel carries quantities of fuel to the community. The barge landing is exposed to the prevailing southeast weather conditions and the potential exists for minor oil spills to occur. It is considered that a tier 1 capability be provided to Lockhart River to cover this threat. The equipment would also be available as a first response to incidents within the inner route, ie. to boom a leaking vessel.

The Whitsunday Islands have been identified a high-risk area due to the number of cruise ships that operate within the area and the merchant shipping using Whitsunday Passage. Exercise Cumberland was held in 1999 and demonstrated distinct shortfalls with responding to an incident offshore within the Whitsunday Islands. Response times were in excess of 4 hours; equipment required had to be moved from Mackay (at least one hour by truck). Given the sensitive nature of the area, both in environmental and economic terms, it is recommended that an equipment stockpile be located at Shute Harbour. It is further recommended that such a stockpile should be of a size that will enable the booming of endangered or breached vessels.

Recommendation 8

Consideration be given to the establishment of the following equipment stockpiles:
- **A lower Tier 2 capability (maximum 100 tonnes) at the Port of Cape Flattery;**
- **Dispersant stockpiles be established at Lockhart River and Heathlands Station;**
- **A Tier 1 capability at Lockhart River; and**
- **A lower Tier 2 capability at Shute Harbour, sufficient to boom distressed vessels.**

9.2.4 Response Preparedness Audit

The response to the grounding of the *Peacock* and several training exercises, in particular Exercise Cumberland, have raised concerns over the capacity of the National Plan to respond to oil spills remote from major population centres. There has been no analysis as to the capacity of the National Plan to respond to remote location spills, at least in terms of response and deployment timings, and whether this meets Government and community expectations.

Case Study 1 – Grounding of Peacock

The Peacock grounded on Piper Reef to the north of Lockhart River (some 400 km north of Cairns, **(see Figure 8).** The response took place 80km north of the nearest township. The response presented significant logistical difficulties, not the least of which was actually locating equipment on site. The situation was aided by the fact that no oil was spilled and time could be taken to properly plan and support the precautionary response operation. However if oil had been released at the time of grounding, a totally different situation would have resulted. There can be no confidence that equipment could have been located on site within 24 hours of the grounding occurring. Aerial dispersant application using fixed wing aircraft would have been the only viable response option during the first daylight period, though no assessment has been conducted as to how long this would have taken to be operational. Under the contract, an aircraft is required to be in transit to the staging area within four hours of call out from its base in either Emerald or St George. It can be expected that there would be flying times of 2-3 hours. Worst case scenario would be that no dispersant would be sprayed within 8 hours of the incident occurring.

The assessment of response timings, based on current and proposed equipment stockpiles and transportation plans, is required to determine the capability of the National Plan within Queensland. The assessment should consider several different response scenarios for identified high-risk areas. Suggested areas include the Torres Strait, inner shipping route north of Cairns, Whitsunday Islands, Moreton Bay and the Gulf of Carpentaria. The results of the assessment can be used to determine whether current and proposed response planning is adequate and also to educate Governments and the public to the real logistical difficulties posed by remote area responses.

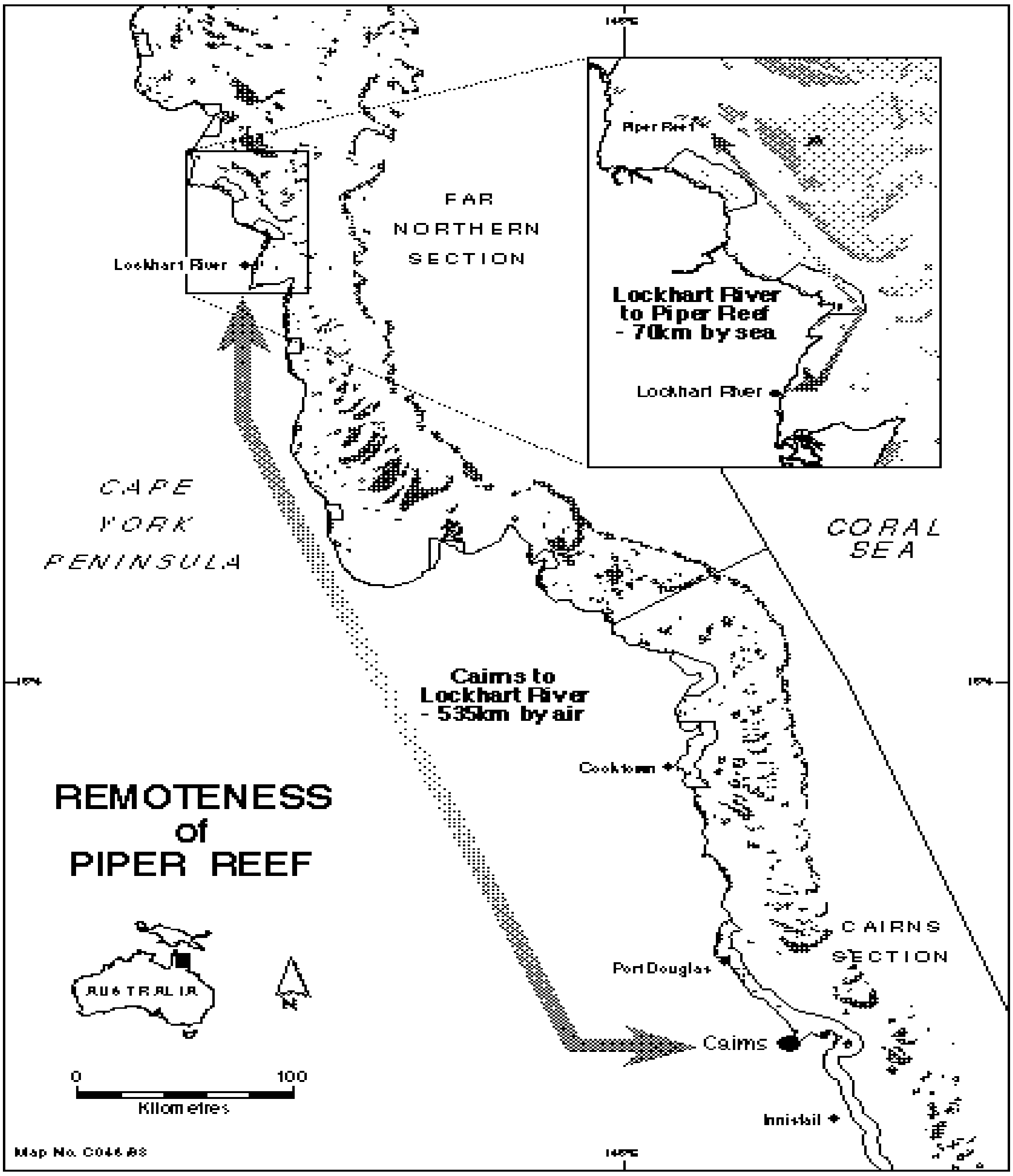


Figure 8: Location of the grounding of the *MV Peacock*

Case Study 2 – Exercise Cumberland (Oil spill in Whitsunday Islands)

A response exercise was held to test arrangements to respond to an incident within the Whitsunday Islands. The Whitsunday Islands cannot be considered a remote location, however there was still a significant time lapse between when the exercise incident occurred and the actual deployment of equipment. A period of 5 – 6 hours was estimated. The application of dispersant via a helicopter spray bucket may have been possible earlier than this period, however such a response option would have limited effectiveness on a Tier 2 or larger spill.

The high-risk areas of the inner route north of Cape Flattery and Hydrographers Passage are remote from established equipment stockpiles and trained personnel. These issues came to the forefront during the precautionary response and support to the refloat to the *Peacock* grounding in 1996.

<u>Recommendation 9</u>

An ongoing review of response capability and likely radii of action be conducted for high risk areas within Queensland and the GBR Marine Park to evaluate current and proposed equipment dispositions and response arrangements, including the fixed wing aerial dispersant capability.

Response planning standards need to be developed in consultation with all lead agencies for response within Queensland.

9.2.5 <u>Emergency Towage and Salvage</u>

The risk of a major marine incident can be reduced through prompt emergency towage or salvage. The effectiveness of having such a capability has been demonstrated during the response to the *Kirki* (off Western Australia in 1991) and the *Peacock* (northern GBR in 1996).

More recently the chemical tanker, *Stolt Otome,* suffered an engine failure near Shoalwater Bay and required emergency towage to a safe haven. The incident (described below) highlighted significant deficiencies in the emergency towage capability available to incidents on the Reef.

These include:

- Reluctance on the part of port authorities to release tugs for non-port work;
- Lack of tugs and trained crews suitable for offshore emergency towage;
- Reduced economic incentive for towage companies to maintain tugs capable of working on the open water; and
- Fewer marine casualties on a worldwide basis.

Australia is a signatory to the *International Convention on Salvage 1989*. Article 11 of the Convention prescribes obligations on Australian authorities for cooperation in the provision of facilities to salvors, including admittance to ports for vessels in distress. Article 14 of the *Salvage Convention* also provides incentives for the salvor to assist vessels, which threaten the marine environment through the *Special Compensation Protection and Indemnity Clause (SCOPIC).* SCOPIC provides the mechanism for salvors to respond to pollution threats from marine casualties, even though the case may offer little economic interest to the salvor.

Consideration of the type and location of the tug/s needs to take into account; the risk of grounding, inherent hazards, prevailing weather, type and density of traffic, sensitivity of the coast, existing availability.

Case Study 3 – *Stolt Otome*

The *Stolt Otome* was a loaded chemical tanker that broke down at the northern end of Capricorn Channel. The response to assist the vessel highlighted a number of issues regarding emergency towage and salvage arrangements.

The vessel required towage assistance, however there were problems in providing the services required. These included:

- Difficulties in accessing an appropriate tug, as several ports would not release tugs to assist.
- A tug was eventually acquired from the Port of Mackay. Importantly the *Stolt Otome* was a small vessel (approx 7000 grt); should the vessel have been larger then the tug may not have been capable of providing assistance, especially when the sea conditions deteriorated.

There is no immediately obvious solution to the problem or the appropriate funding provisions. A strong case has been made for utilising a multi purpose vessel for emergency towage and not confining the task to minimising environmental risk, ie. a vessel capable of towage but can also be employed for other tasks such as:

- Navigation aid maintenance,
- Marine pollution response,
- Search and Rescue,
- Surveillance, etc.

This issue is a complex one and possibly controversial, however all possible solutions to the problem need to be explored. As such, it is considered that a Commonwealth, State and Industry review of arrangements for emergency towage within the Great Barrier Reef and Queensland coast is a high priority.

A committee should be established to conduct the review and should comprise AMSA, QT, GBRMPA and Industry.

Recommendation 10

A review of emergency towage and salvage arrangements for the GBR and Torres Strait be conducted by a joint government/industry committee to determine if the current capability is adequate.

9.2.6 Logistical Support for Far Northern Responses

Given the high risk rating for the inner route (north of Cape Flattery), improvements in response capability are required for this area. The remote location of the region means that logistical support to any operation in this area will be difficult, especially in terms of resupply. Such problems were identified during the response to the grounding of the *Peacock.*

The logistics effort required for far north Queensland is a complex scenario. Logistics requires the movement, delivery and resupply of personnel and equipment in a timely fashion.

Past operations have utilised vessels of opportunity transiting the inner route to transport heavy equipment, sustain and resupply response operations in the region. However it is considered that a level of surety above vessels of opportunity is required.

There are regular transits of the region by a fleet of vessels operated by QAL, between Gladstone and Weipa on a daily basis. A commercial arrangement with QAL to access transport and supply capacity on these vessels during an emergency response would provide greater surety to transport support for operations in the northern areas of Queensland.

Recommendation 11

A commercial arrangement be established with a shipper/s, possibly QAL, whose fleet regularly transits the inner route, to enable the National Plan to utilise commercial vessels for logistical support to Far North Queensland.

9.2.7 Training for Indigenous Communities

Indigenous people have a long and close association with the coastal and marine environment within Queensland and their management of these areas has always been inherent in their cultural practices. The strong traditional ties remaining within these areas and also the large degree to which these communities rely upon the marine and coastal environment to supplement their diet heightened the risk profile, especially in terms of vulnerability of northern communities.

Indigenous communities in far North Queensland and Torres Strait provide a key resource base for reporting and responding to marine pollution incidents. It is fair to say that the potential of this resource base has not been utilised by the National Plan and integration of indigenous issues in response planning has been neglected until recently.

A strong partnership needs to be developed with indigenous communities in order to strengthen the overall capacity and readiness in far north Queensland.

Case Study 4 – Grounding of *Peacock*

The *Peacock* grounded on Piper Reef to the north of the community of Lockhart River. Lockhart River is a community comprised of a number of traditional aboriginal clan groups, one of which has Piper Reef within its sea country.

Lockhart River was used as a staging point for response equipment and personnel, before deployment to Piper Reef. This was organised through the Lockhart River council.

A lack of consultation with the community created several problems for the response organisation:

- A lack of understanding by the traditional owners as to what actions were being taken to protect their sea country;
- A lack of understanding by the community itself as to what the response personnel were doing in their community. There were significant disruptions to the community in the early stages of the response and some tensions developed between the community and response personnel;
- Local advice was not incorporated into response plans in the early stages of the operation.

Recommendation 12

A training program for indigenous communities be established to improve the overall response capacity and understanding within far North Queensland.

9.2.8 Containment Boom for Tankers during Transfer Operations

Most spills from tankers occur in ports and at oil terminals during routine operations such as loading and discharging. The majority of these spills are relatively small with over 90% involving quantities less than 7 tonnes.

Consideration has been given to the merits of requiring containment boom to be placed around every tanker conducting transfers at terminals. This discussion follows the spill from the tanker *Laura D'Amato* in Sydney Harbour in August 1999. Whilst booming will certainly expedite containment of any spill, it also raises issues in regard to emergency access to and from the ship and ship movement in an emergency. Also booming is only practical at still water berths. On balance it has been decided that mandatory booming of tankers is not required for Queensland ports and the existing arrangements in place reflect current best practice as prescribed under the *International Safety Guide for Oil Tankers and Terminals (ISGOTT).*

Containment boom should be readily available for rapid deployment during transfer operations.

9.3 Recovery

9.3.1 Bunkers Convention

A means of risk treatment is to transfer the risk.

There are a number of liability regimes in place to cover compensation for damage caused by marine oil spills. The Civil Liability Convention (CLC) and Fund Conventions cover pollution damage from tankers. Liability regimes provide a pro-active strategy for risk reduction by exposing the polluter to massive compensation claims.

Figures show very clearly that over 80% of ship movements into Queensland ports are bulk carriers and general cargo ships, some of which may be carrying nearly 10,000 tonne of bunkers. Tankers constitute less than 10% of movements. Records provided from the UK P&I Club show that over 50% of marine oil spill claims are from bunker spills.

The IMO introduced compulsory insurance cover for tankers in 1969. Thirty years later it is time for a liability convention for non-tankers to cover the potentially serious incidents involving bunker spills. Cover for damage caused by ship's bunkers remains the only gap in a comprehensive international regime of liability and compensation for pollution from ships.

The development of an International Bunker Convention needs to be pursued with vigour. Australia has been providing considerable input for the development of a Bunkers Convention through the IMO Legal Committee. The first stage of the process, a Diplomatic Conference is planned for 2001.

10.0 CONCLUSION

The current suite of risk reduction measures in place in Queensland does address the most significant risks in the system ie. grounding and collision, and provides a solid framework on which to build additional preventative measures. All risk reduction programs are incremental and the results of the risk assessment can be utilised to improve navigational safety and marine environment protection in Queensland.

Queensland has a high level of readiness when considering the existing risk profile. However there are certain areas where the risk is too high and additional risk reduction strategies need to be implemented.

Like this study has conducted a more in depth analysis of the Queensland coast following on from the DNV Australia wide risk assessment, there is a need for ports to conduct more localised risk assessments.

The declaration and promulgation of MEHRAs is seen as a positive means for providing a higher level of protection for the marine environment against ship sourced pollution in Queensland and a key plank in the overall risk reduction strategy. MEHRAs will strengthen the existing framework of preventative measures in place. It is hoped that MEHRAs will provide the trigger for behavioural change amongst the mariners, owners and charterers of ships transiting the Queensland coast.

Introducing new regulations is not seen as the optimal means for improving the situation and reducing the risk, especially when numerous incidents are occurring from existing regulations being ignored or not being observed.

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12.0 LIST OF STAKEHOLDERS

1. ASP Ship Management
2. Australian Fish Management Authority
3. Australian Marine Parks Tourist Operators
4. Australian Maritime Safety Authority
5. Australian Reef Pilots Ltd.
6. Australian Shipowners Association
7. Australian Shipping Federation
8. Australians Customs Service
9. Balkanu Cape York Development Corporation
10. BHP Transport & Logistics Pty. Ltd.
11. BP Australia Pty Ltd
12. Brisbane Marine Pilots Pty. Ltd.
13. Bundaberg Port Authority
14. Cairns Port Authority
15. Caltex
16. Commonwealth Bureau of Meteorology
17. Det Norske Veritas
18. Environmental Protection Agency
19. Gladstone Port Authority
20. Great Barrier Reef Marine Park Authority
21. Gulf Freight Services Pty. Ltd.
22. Hydro Marine Pilots Pty. Ltd.
23. Mackay Port Authority
24. Port of Brisbane Corporation
25. Ports Corporation of Queensland
26. Queensland Coastal Pilot Service Pty. Ltd.
27. Queensland Department of Primary Industries
28. Queensland Transport
29. Queensland Tug & Salvage Co. Pty. Ltd.
30. Rockhampton Port Authority
31. Royal Australian Navy Hydrographic Service
32. Seaswift Shipping
33. Shell
34. Sunfish Queensland
35. Teekay Shipping (Aust.) Pty. Ltd.
36. Townsville Port Authority
37. United Salvage Pty. Ltd.