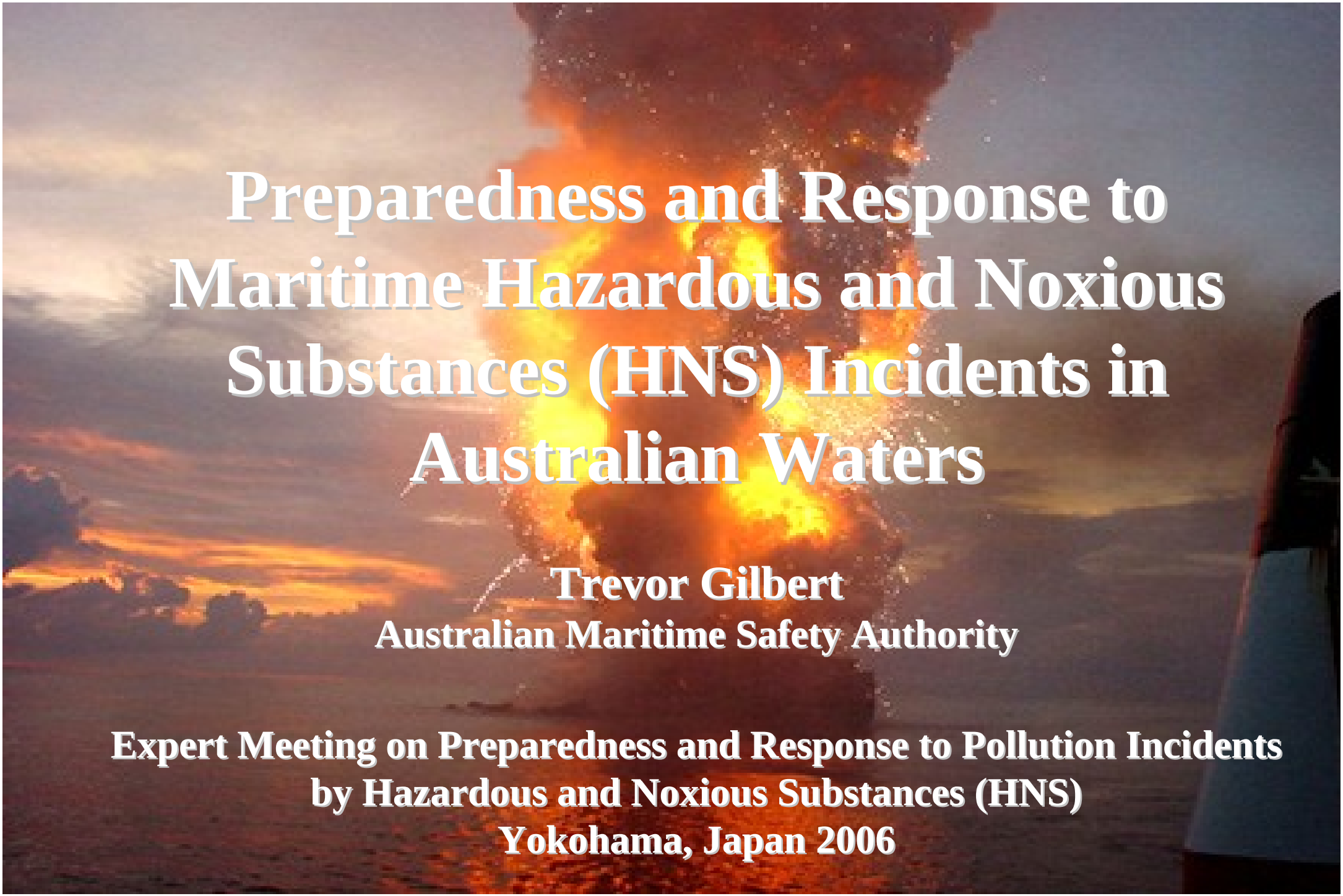


Preparedness and Response to Maritime Hazardous and Noxious Substances (HNS) Incidents in Australian Waters

Trevor Gilbert
Australian Maritime Safety Authority

Expert Meeting on Preparedness and Response to Pollution Incidents by Hazardous and Noxious Substances (HNS)
Yokohama, Japan 2006

Australian Government
Australian Maritime Safety Authority

The Global Chemical Trade

• Worldwide, hundreds of millions tonnes of HNS, dangerous goods and chemicals are transported by sea each year.

•About 1/3 of all chemicals produced are traded by ship world-wide approx US$660 billion

• Most are carried in bulk in deep-sea and regional trade in the Asia/Pacific region.

• HNS are shipped to, from and around Australia in specialised chemical tankers, in bulk chemical tanks carried in other vessels or in packaged form.

In 2004 World Chemical Sales = 1,736 Billion Euros.

Ref. RNCOS report IM0002-55 March05

Australian Shipping Statistics – 2004-5

- **Number of Calls at Australian Ports – 23,000 pa**
- **Ports & Coastline** — **70 ports (37,000 km coastline)**
- **Trade by ships** — **99.5% by weight (73.5% value)**
- **Value Exports** — **A$ 101,800,000,000**
- **Value Imports** — **A$ 108,200,000,000**
- **Quantity of Exports** — **605,100,000 tonnes**
- **Quantity of Imports** — **69,000,000 tonnes**
- **HNS Imports** — **10.7 mega tonnes (8.9% by value A$)**
- **Cost HNS Imports** — **A$ 18,700,000,000**
- **Eg – Australia is the world's largest importer of Caustic Soda 1.5 mega tonnes (2004)**

Ref. BTRE, WL#39 2005

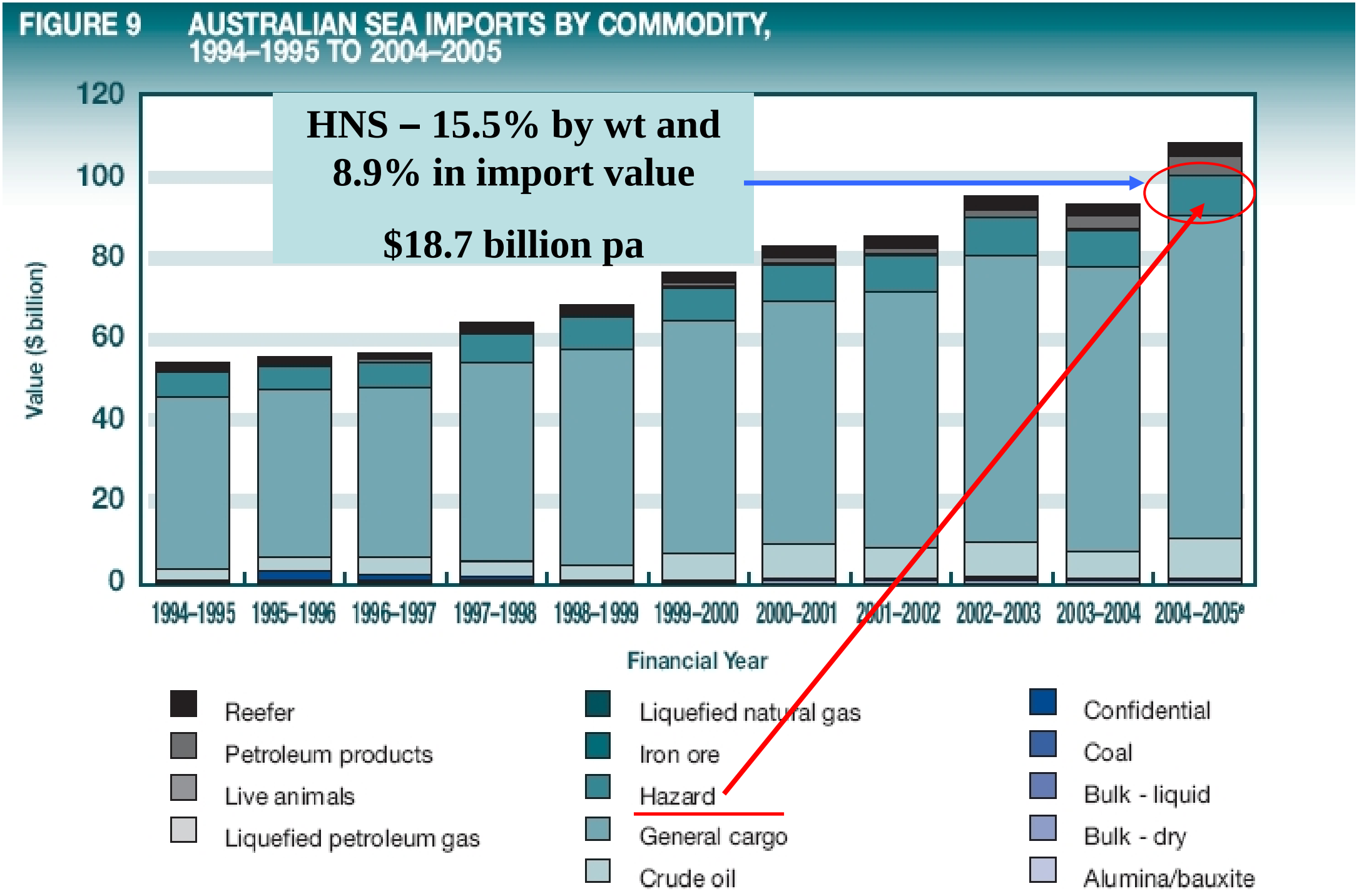
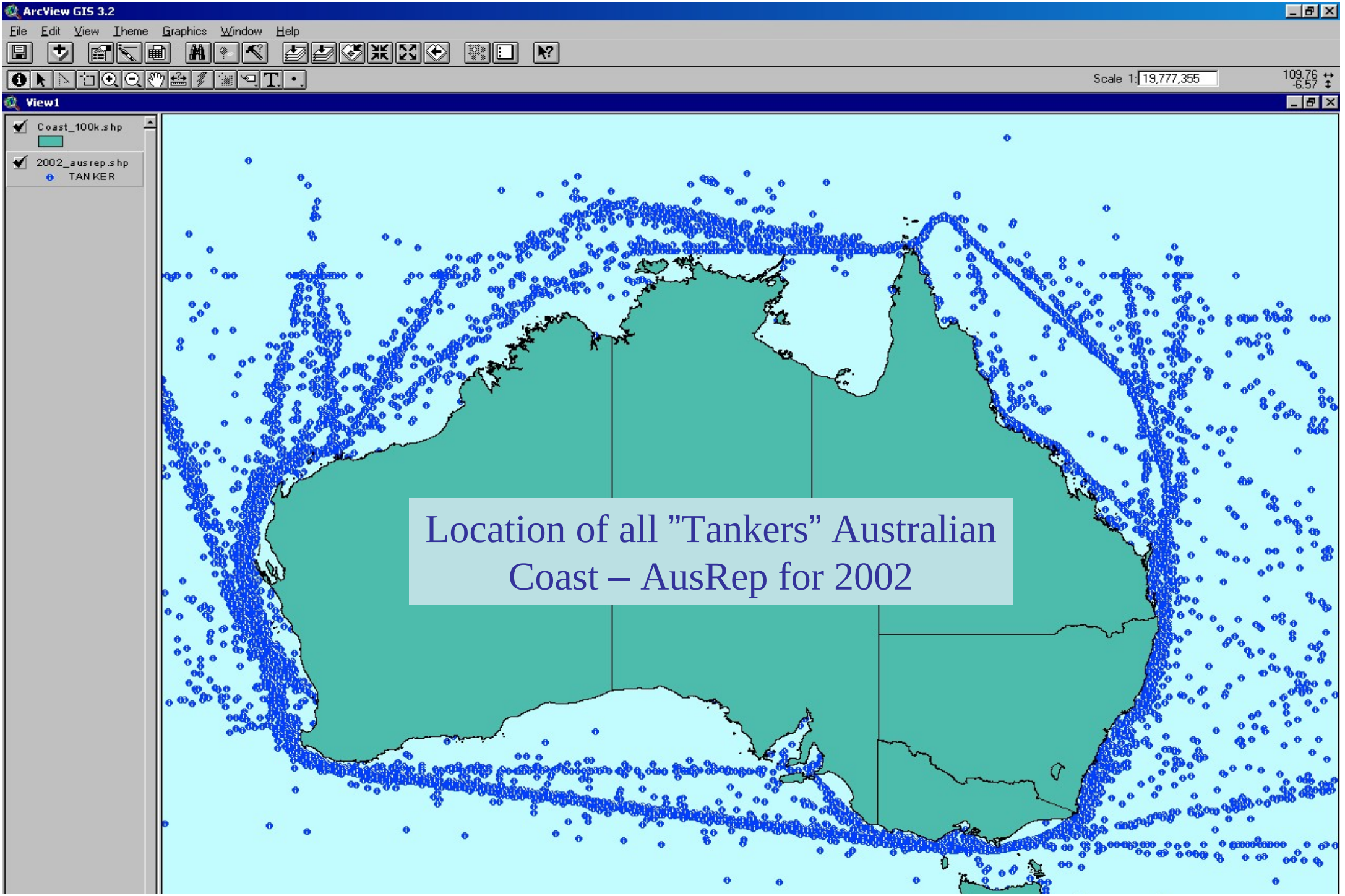


FIGURE 9 AUSTRALIAN SEA IMPORTS BY COMMODITY, 1994–1995 TO 2004–2005
HNS – 15.5% by wt and 8.9% in import value
$18.7 billion pa
Value ($ billion)
120
100
80
60
40
20
0
1994–1995
1995–1996
1996–1997
1997–1998
1998–1999
1999–2000
2000–2001
2001–2002
2002–2003
2003–2004
2004–2005*
Financial Year
Reefer
Petroleum products
Live animals
Liquefied petroleum gas
Liquefied natural gas
Iron ore
Hazard
General cargo
Crude oil
Confidential
Coal
Bulk - liquid
Bulk - dry
Alumina/bauxite


Scale 1: 22,233,932
142.23
-10.56
Ship Reporting Information - AUSREP region 1999-2001
Shipping routes of Australia.


ArcView GIS 3.2
File Edit View Theme Graphics Window Help
Scale 1: 19,777,355
109.76
-6.57
View1
Coast_100k.shp
2002_ausrep.shp
TANKER
Location of all ”Tankers” Australian Coast – AusRep for 2002

Incidents in 1991 – Focused Government & Public Attention

Kirki – Coast – Western Australia

Major chemical accident in 1991 Port Melbourne Victoria, Australia

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Australian Maritime Safety Authority

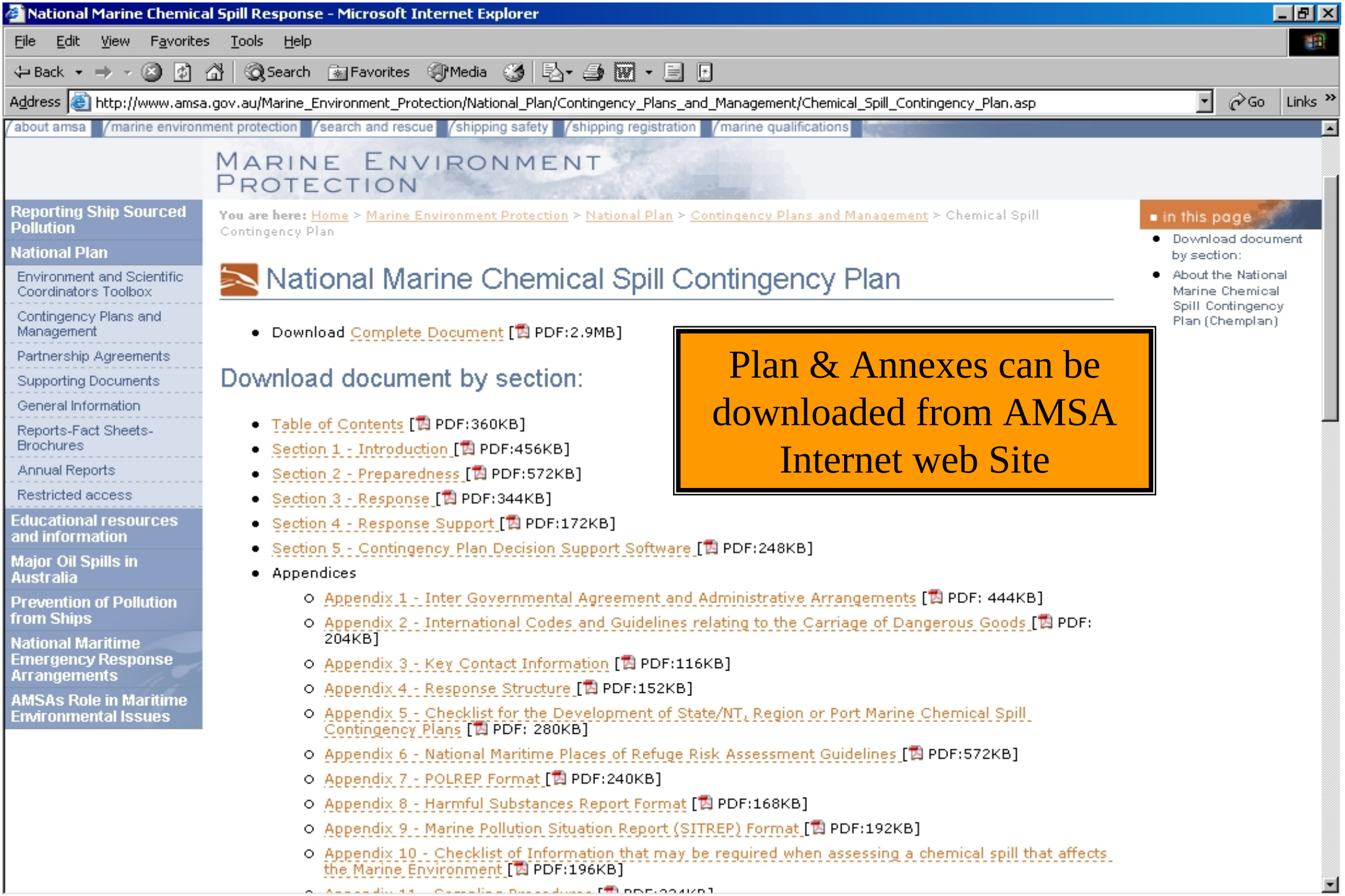
First Step – Contingency Plan

Australian National Maritime Chemical Spill Contingency Plan "CHEMPLAN"

- *Action required by National government auditors and independent review of the oil spill National Plan*

Purpose and Objectives

- The plan provides for a pattern of coordinated and integrated management by agencies of the Commonwealth, State, local governments and industry to maritime pollution involving chemicals and hazardous substances from vessels.


National Marine Chemical Spill Response - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://www.amsa.gov.au/Marine_Environment_Protection/National_Plan/Contingency_Plans_and_Management/Chemical_Spill_Contingency_Plan.asp
Go Links
about amsa
marine environment protection
search and rescue
shipping safety
shipping registration
marine qualifications
MARINE ENVIRONMENT PROTECTION
Reporting Ship Sourced Pollution
National Plan
Environment and Scientific Coordinators Toolbox
Contingency Plans and Management
Partnership Agreements
Supporting Documents
General Information
Reports-Fact Sheets-Brochures
Annual Reports
Restricted access
Educational resources and information
Major Oil Spills in Australia
Prevention of Pollution from Ships
National Maritime Emergency Response Arrangements
AMSAs Role in Maritime Environmental Issues
You are here: Home > Marine Environment Protection > National Plan > Contingency Plans and Management > Chemical Spill Contingency Plan
in this page
Download document by section:
About the National Marine Chemical Spill Contingency Plan (Chemplan)
National Marine Chemical Spill Contingency Plan
Download Complete Document [PDF:2.9MB]
Plan & Annexes can be downloaded from AMSA Internet web Site
Download document by section:
Table of Contents [PDF:360KB]
Section 1 - Introduction [PDF:456KB]
Section 2 - Preparedness [PDF:572KB]
Section 3 - Response [PDF:344KB]
Section 4 - Response Support [PDF:172KB]
Section 5 - Contingency Plan Decision Support Software [PDF:248KB]
Appendices
Appendix 1 - Inter Governmental Agreement and Administrative Arrangements [PDF: 444KB]
Appendix 2 - International Codes and Guidelines relating to the Carriage of Dangerous Goods [PDF: 204KB]
Appendix 3 - Key Contact Information [PDF:116KB]
Appendix 4 - Response Structure [PDF:152KB]
Appendix 5 - Checklist for the Development of State/NT, Region or Port Marine Chemical Spill Contingency Plans [PDF: 280KB]
Appendix 6 - National Maritime Places of Refuge Risk Assessment Guidelines [PDF:572KB]
Appendix 7 - POLREP Format [PDF:240KB]
Appendix 8 - Harmful Substances Report Format [PDF:168KB]
Appendix 9 - Marine Pollution Situation Report (SITREP) Format [PDF:192KB]
Appendix 10 - Checklist of Information that may be required when assessing a chemical spill that affects the Marine Environment [PDF:196KB]

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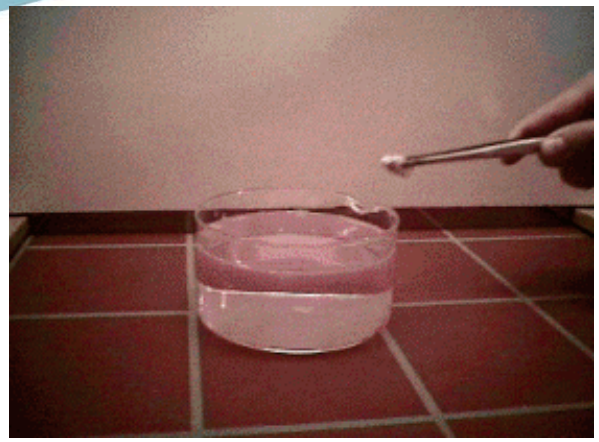
Objectives Of CHEMPLAN



Sodium metal & water

- National approach to maritime chemical spill response.
- Integrate with (and support) State / NT / Regional / Industry / Port / Site Emergency & Disaster Contingency Plans (detailed plans).
- Identify unique resources and response equipment required.
- Multi agency training & awareness programs.

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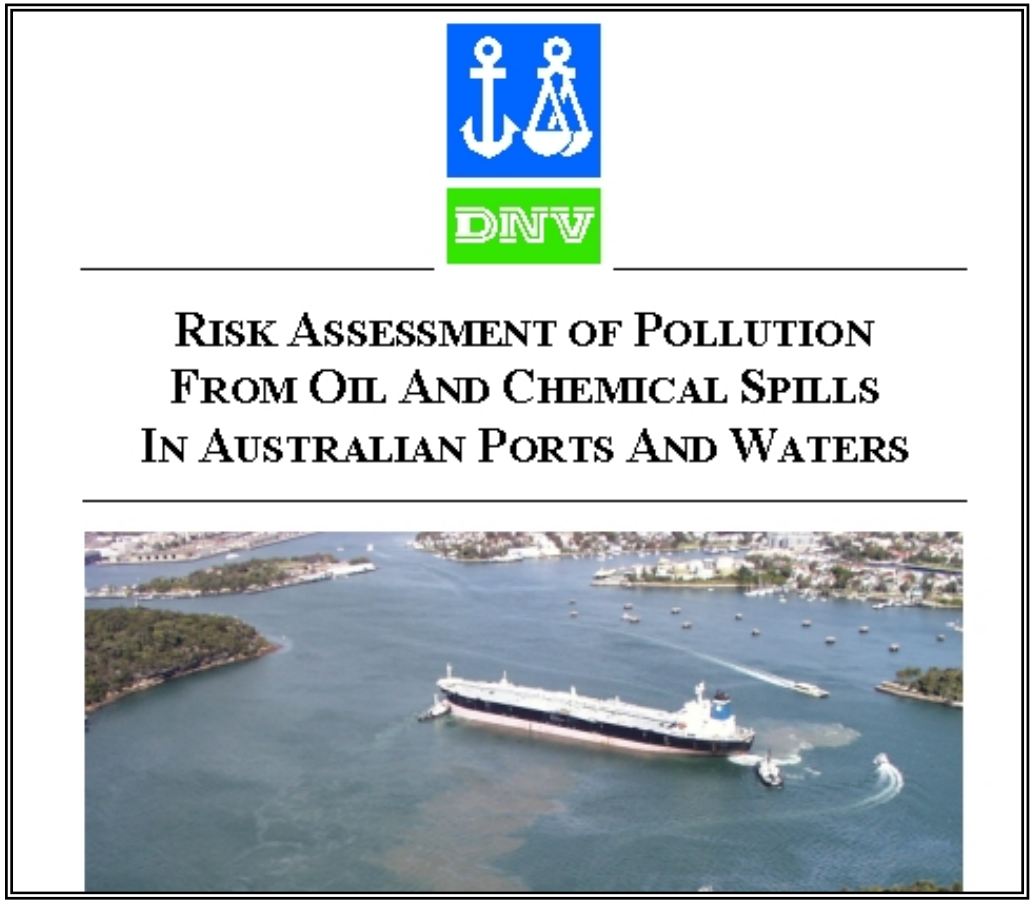
HNS - Risk Assessment

- DNV Oil and Chemical Spill Risk Assessment carried out in 2000.
- Insufficient information on HNS available.
- New HNS Risk Assessment currently underway by Lloyds Register to be completed June 2006.



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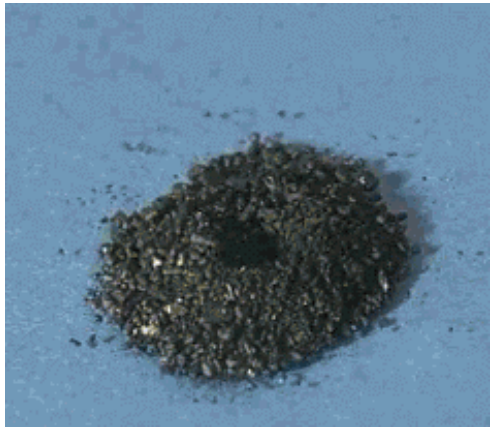
Chemical Spills From Vessels Could Result From Accidental or Intentional Releases.

- Vessel grounding or collision.
- Major fire or explosion.
- Technical problems.
- Cargo self reaction or incompatible mixes.
- Cargo shifting or poor handling of products.
- Hull or other vessel structural failure.
- Container/tank structural failure.
- Dangerous reactions of cargo.
- Flooding of chemical compartments.
- Loss of tank environmental control.



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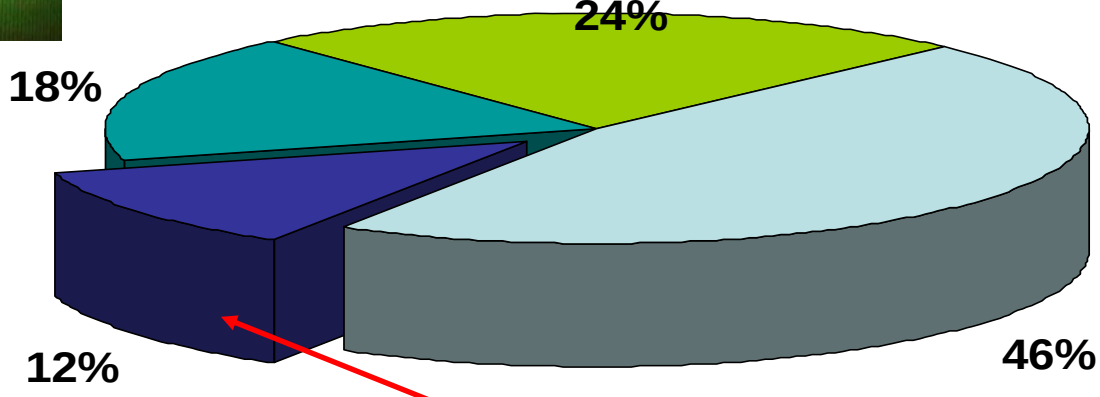
Properties of Hazardous Substances Carried in Bulk by Sea

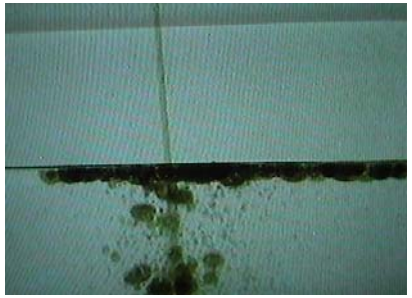
For 200 Most Commonly Carried Bulk Chemicals

Dissolvers

Soluble

Sinkers





Non- Volatile Floaters

Volatile Floaters

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The Response To Maritime Chemical Spill Differs Greatly From Oil Spill Response.

- Skimming of oil from the water surface can be carried out with reasonable success; this is often not feasible or safe for chemical spills.
- The large variety of HNS carried by sea makes each incident involving chemicals unique and each response must be tailored for that unique situation.

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Main HNS Problem Area for Australia

- Poor packing and storage – containers
- Unknown packaged substances washing ashore
- Loss of cargo overboard
- Intermediate bulk containers (IBCs) leaking

Poor stowage and damage in transit may cause chemical incidents on board or at the docks.

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HNS Incidents- Australia

- Xanthates (a chemical used in floatation processing in the mining industry.)
- Very reactive substance that when heated in contact with water vapour forms carbon disulphide (CS2),
- CS2 very toxic and extremely flammable gas.
- Carried in “bulker bags” and wooden cradles/boxes within the shipping containers
- Incidents in Port of Fremantle, Darwin and Port Botany.

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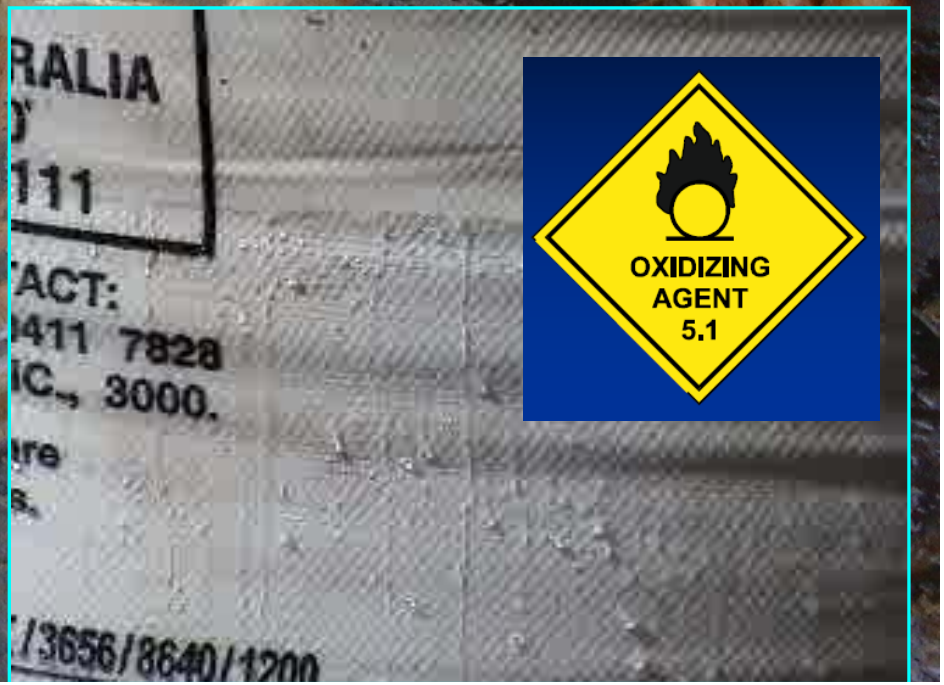
HNS Incidents- Xanthates

- Very low flash point of CS2 (-30C)
- Wide explosion range LEL 1.3% to UEL 50%.
- The simple action of opening the metal doors of shipping containers with CS2 gas build up inside has caused explosions in incidents.
- CS2 is toxic, corrosive, can affect breathing and can blister the skin and lungs in high concentrations
- Neither water nor foam can be used to combat fires. Its TWA is only 1-10 ppm and its lethal concentration ILDH is 500ppm.
- The decomposition of xanthates will increased heating of the material and generation of further explosive gases (runaway reactions).



Vessel Hold Gladstone - 2004

Explosive Grade Ammonium Nitrate

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Response Operations – Under CHEMPLAN

- State/NT Fire Brigade Hazardous Chemical (HazChem/HazMat) units respond under direction from Combat/Statutory Agency.
- Chemical Companies are responsible for their terminals.
- Packages washed ashore requires State/NT response.

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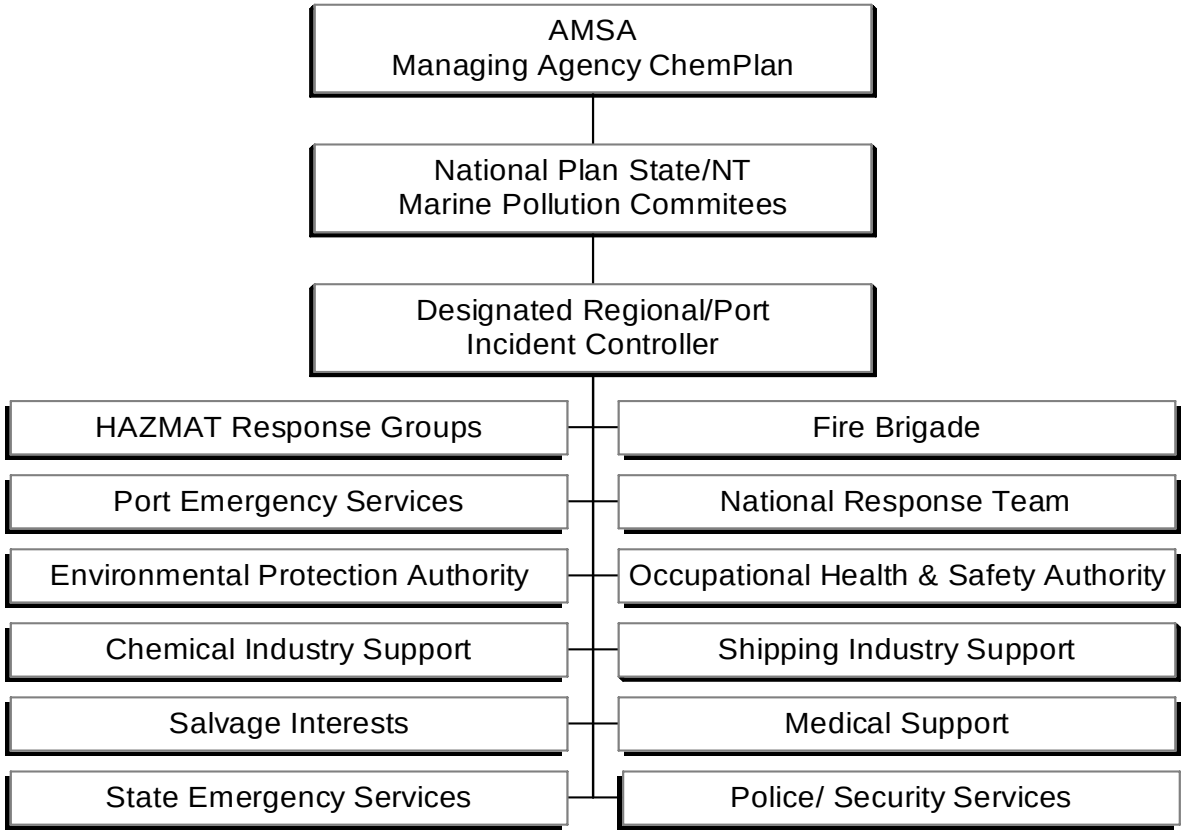
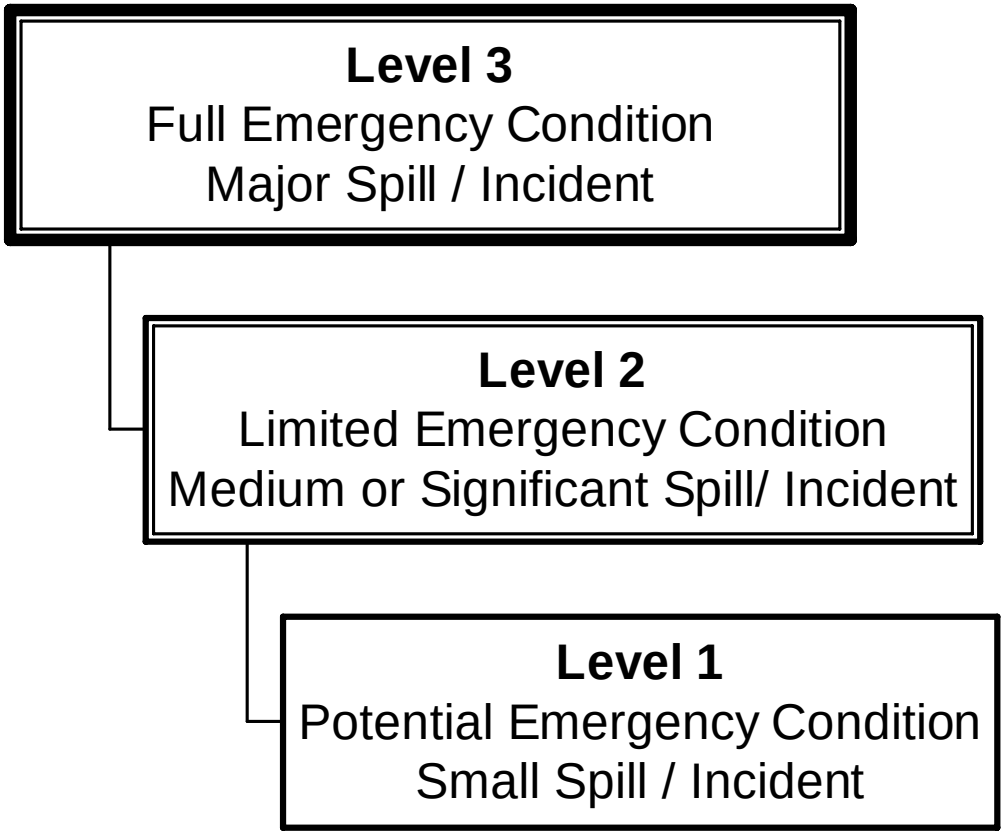
CHEMPLAN - Agencies & Incident Support



CHEMPLAN - 3 ‘Levels’ for Response Planning Based Scale of Incident



Local plans should allow escalation from one tier to another if required.

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Specialist Advice & Assistance

- Australian Maritime Safety Authority.
- National Response Team (through AMSA).
- Plastics & Chemical Industry Association (PACIA).
- Oil & Shipping Industries.
- State/NT Department of Transport – Marine.
- Emergency Management Australia (EMA).
- Fed. Dept Environment & Heritage.
- Great Barrier Reef Marine Park Authority.

Maritime Chemical Spill Response - Prime Considerations

Photo Jim Lilley

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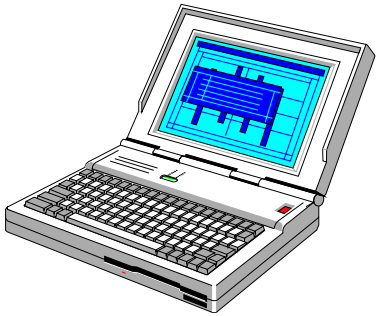
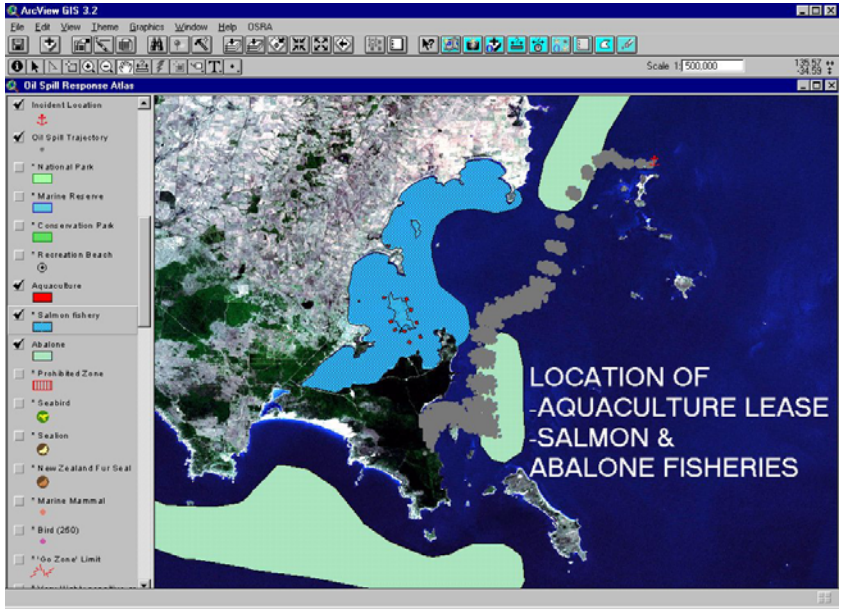
Decision Support Tools Available Under CHEMPLAN.





- Oil Spill Trajectory Modeling
- Oceanographic & Meteorological Information (Present & Predicted)
- Oil Spill Response Atlas (GIS) for Australia
- IMDG, IBC etc Codes & Regulations
- Risk Assessment Models - Scale of Incident
- Chemical Data Bases, Physical Properties, Behavior, Hazards, Response Options
- Chemical Gas Plume Dispersion Models.

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Physical Properties of Chemicals Affect Their Behaviour During Spills & Available Response Options

- The behaviour of a pollutant will depend upon the physical properties of the chemical, these include;
  - phase (solid, liquid or gas)
  - boiling point
  - vapour pressure (volatility)
  - solubility in water
  - density of chemical
  - density of vapour
  - viscosity.

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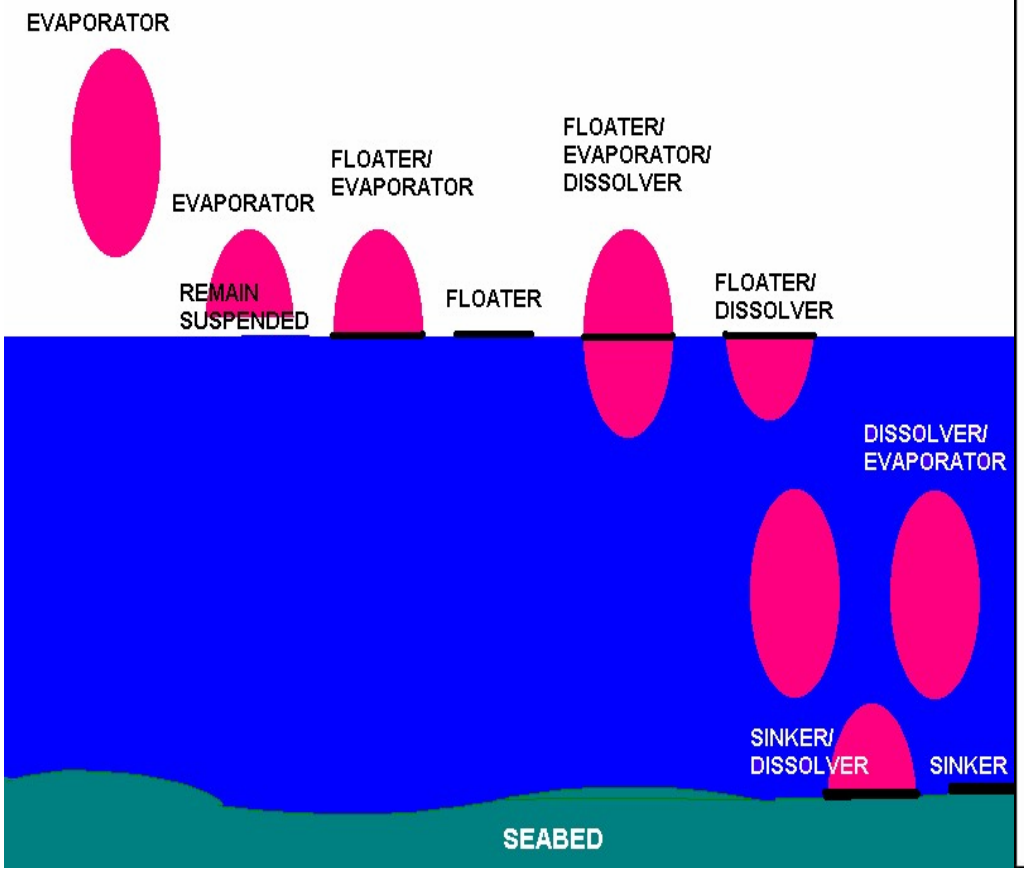
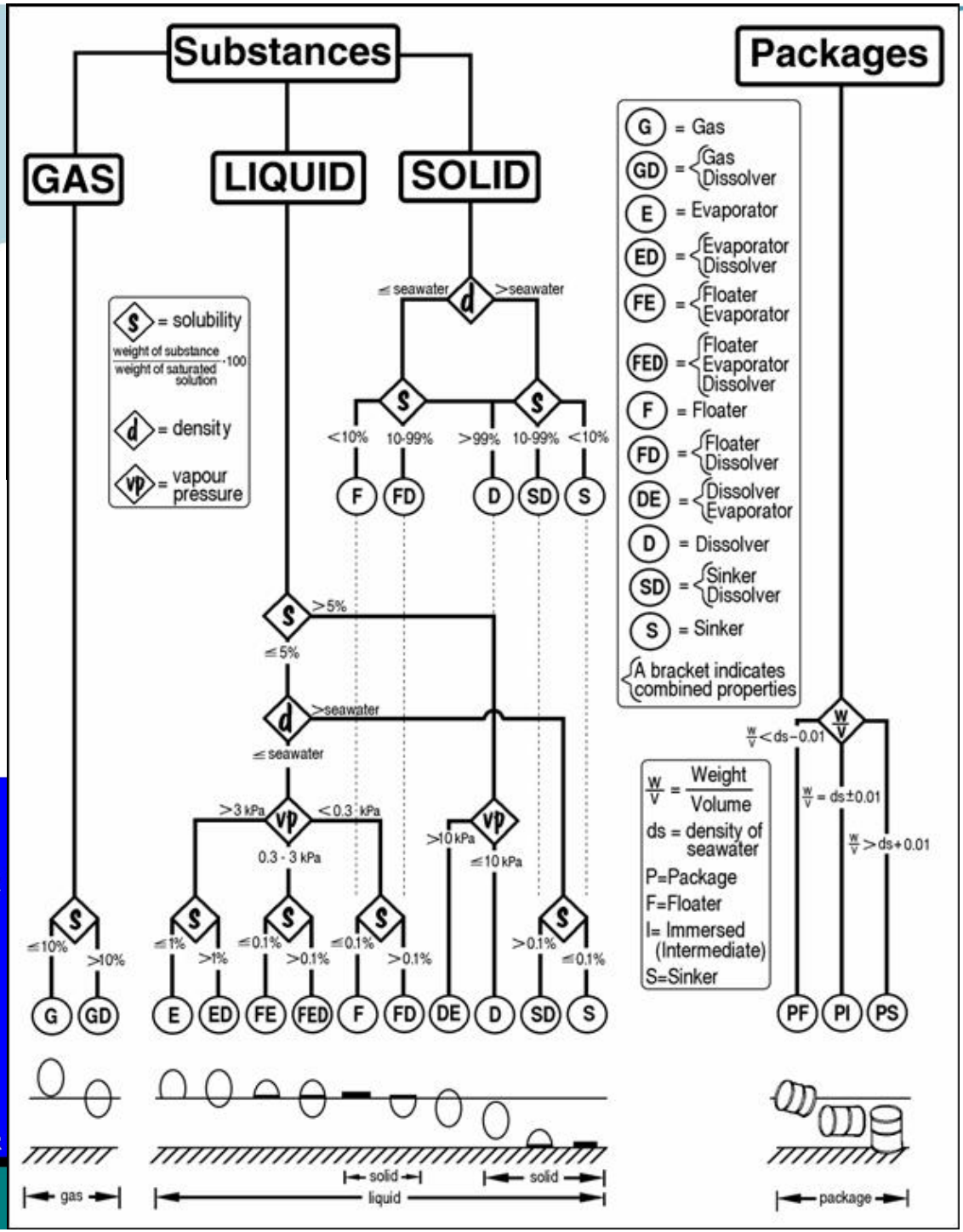
Behaviour of chemicals split at sea can be determined by the physical properties.

Australia uses the European





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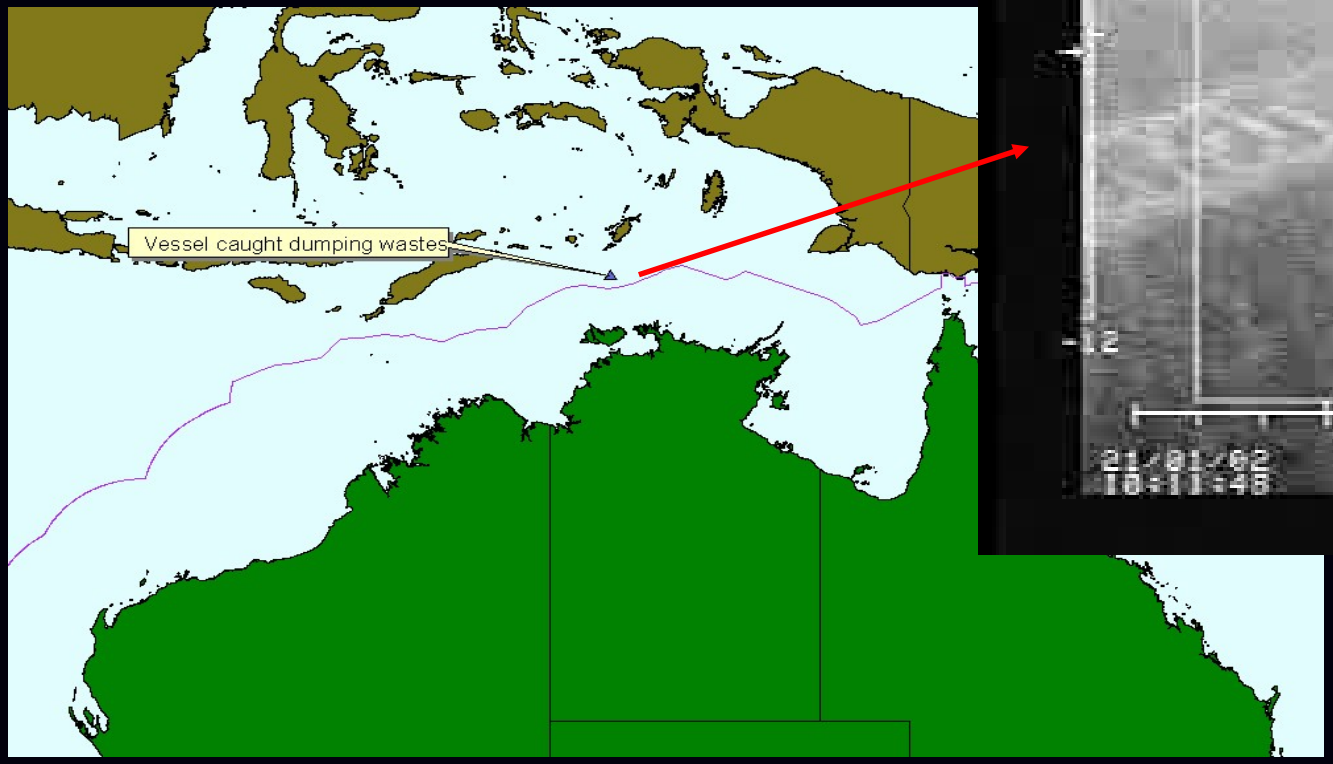
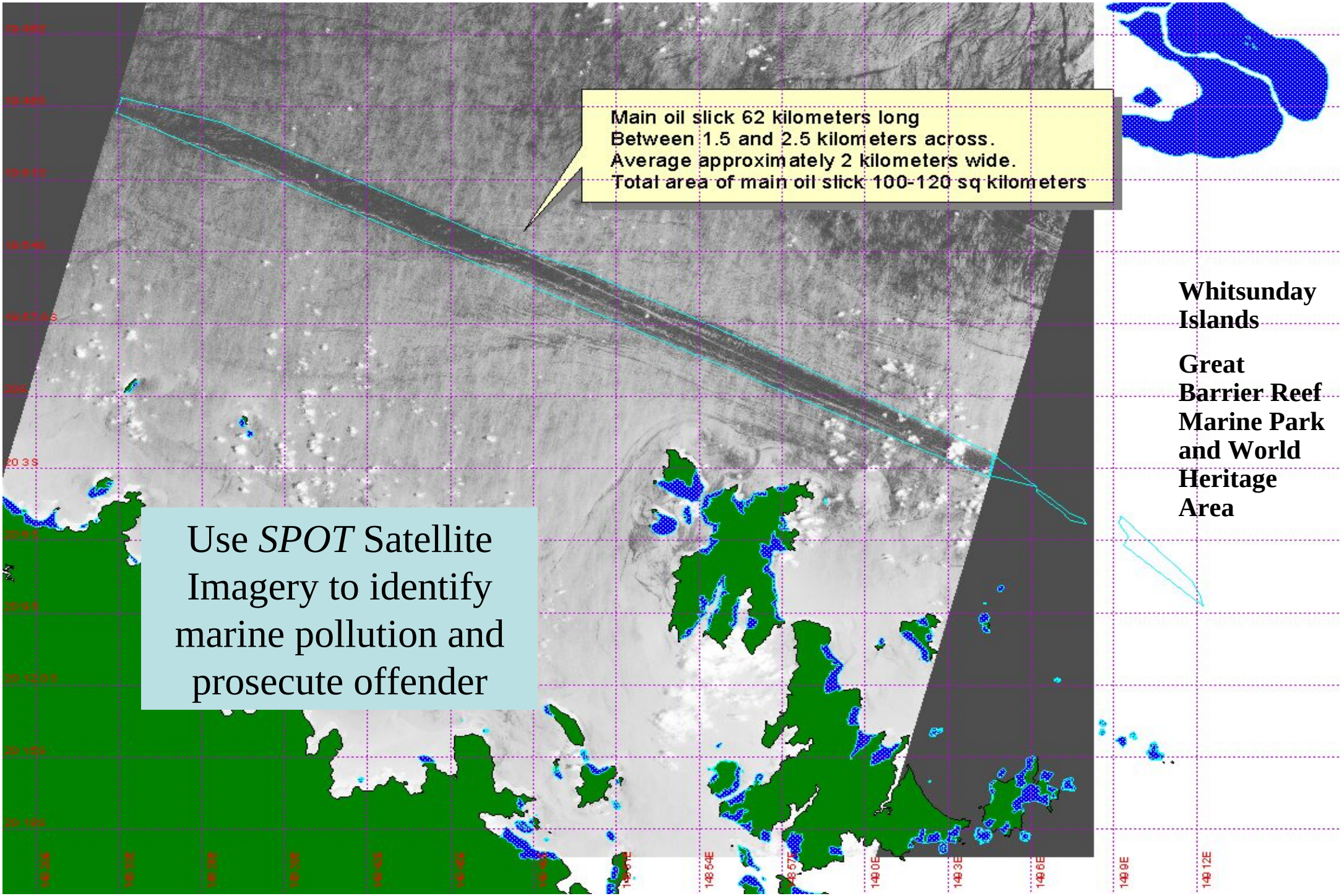
Night Surveillance Use of Infrared Australian CoastWatch Aircraft




Main oil slick 62 kilometers long
Between 1.5 and 2.5 kilometers across.
Average approximately 2 kilometers wide.
Total area of main oil slick 100-120 sq kilometers
Whitsunday Islands
Great Barrier Reef Marine Park and World Heritage Area
Use *SPOT* Satellite Imagery to identify marine pollution and prosecute offender

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Air Monitoring for container leakage & plume dispersion/hazard zone

Some chemical plumes may be:

- Invisible
- Toxic at very low levels
- Require specialist monitoring equipment.

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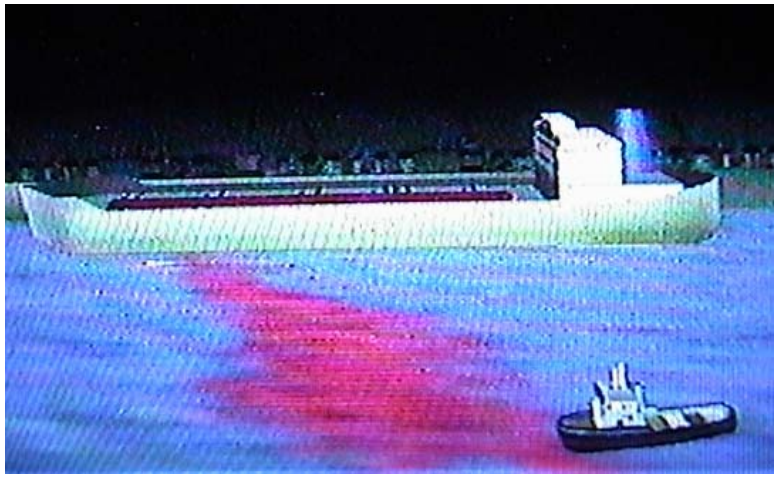
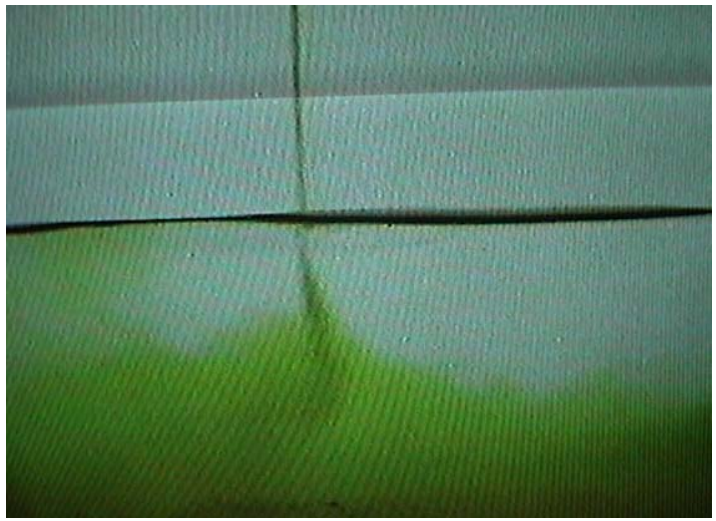
Chemical Spill Plume Monitoring Surface & Subsurface



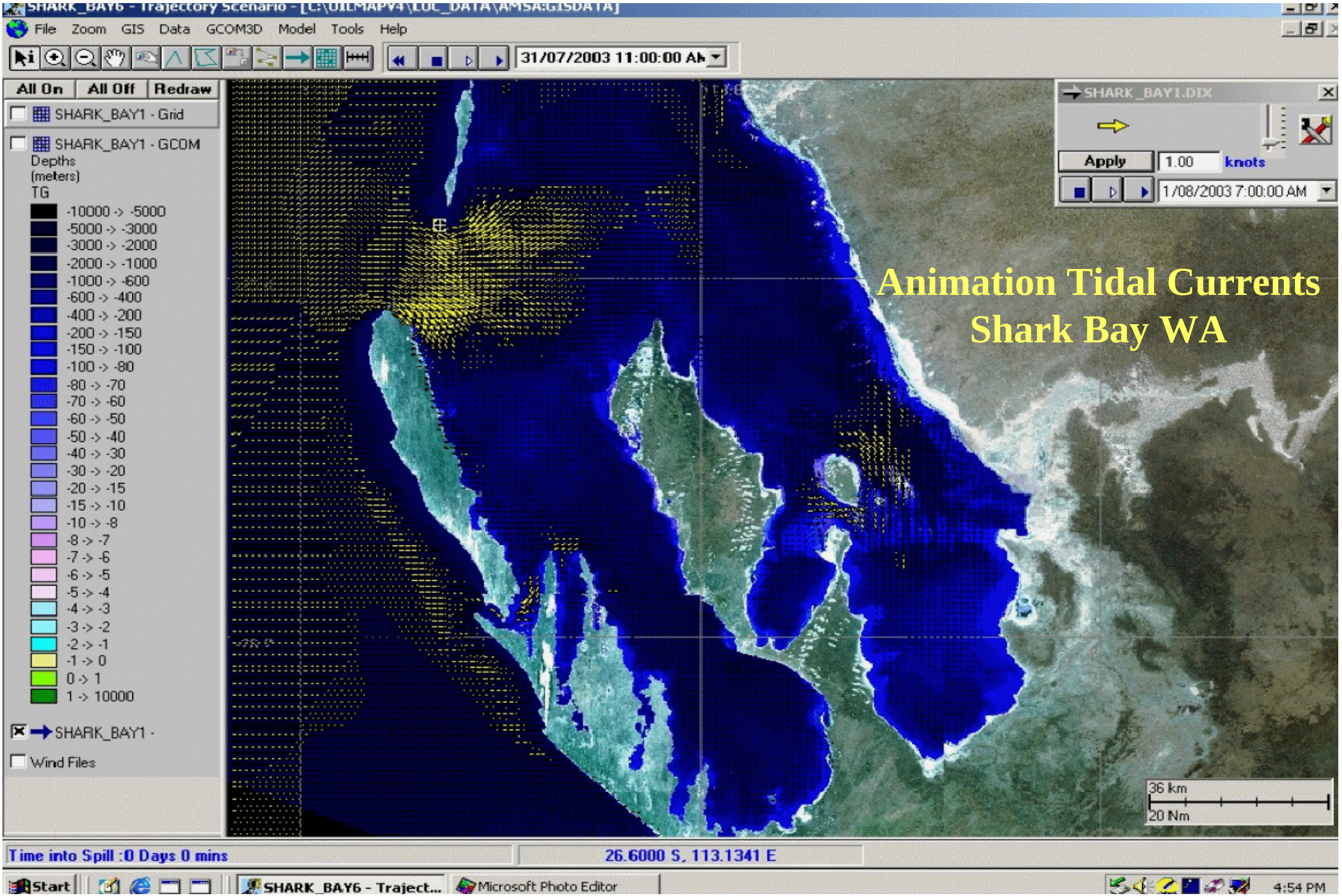


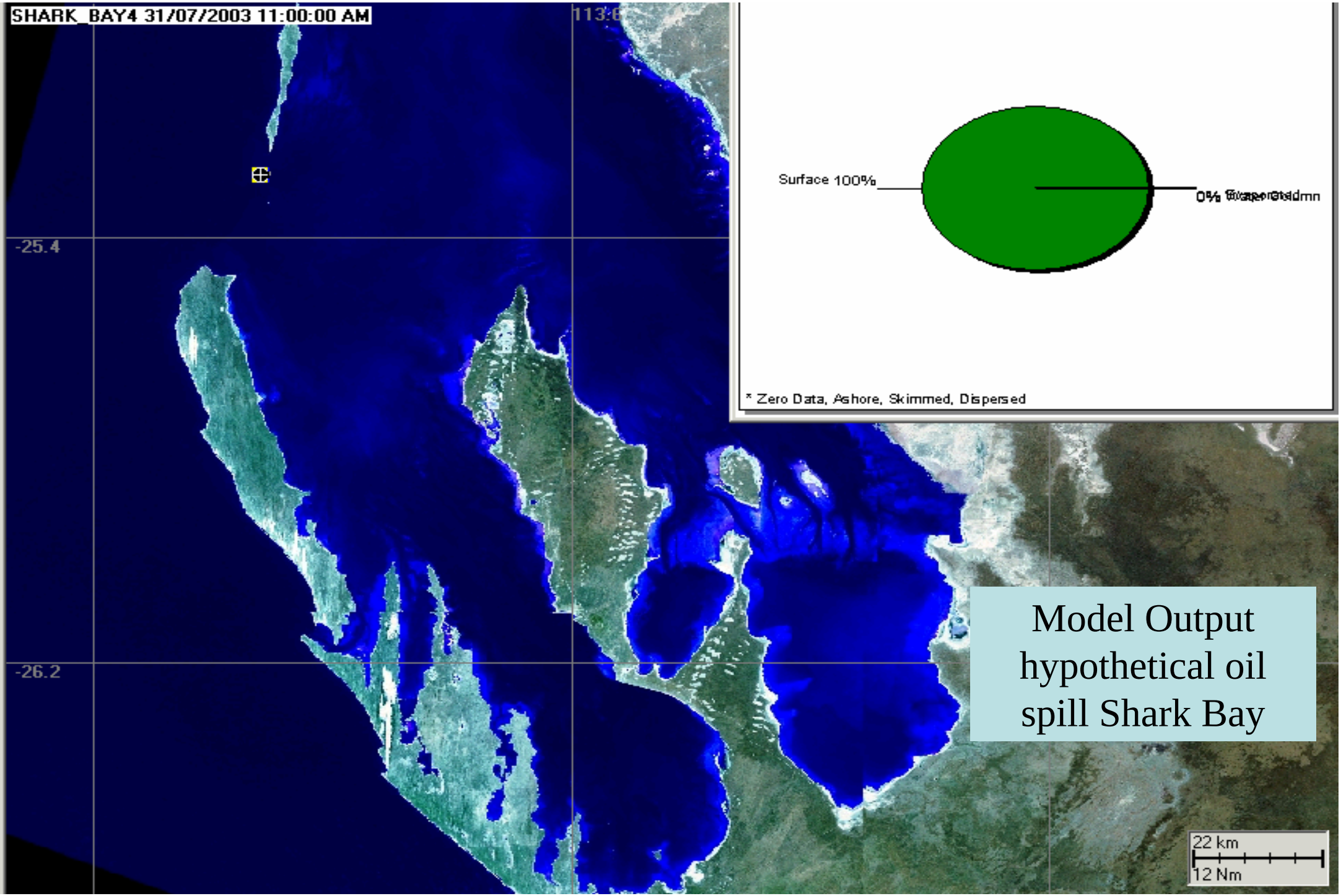
Plume monitoring must be done in 3 dimensions in water column.

Computer Trajectory Modelling of Spills

Use of GIS based spill models:

- operational use ie. determination of speed & direction of slick or plume
- training purposes & exercises
- “what-if” contingency planning
- risk analysis
- back-tracking to vessels illegally discharging pollutants.


SHARK_BAY6 - Trajectory Scenario - [L:\OILMAP\V4\LOL_DATA\AMSA\GISDATA]
File Zoom GIS Data GCOM3D Model Tools Help
31/07/2003 11:00:00 AM
All On All Off Redraw
SHARK_BAY1 - Grid
SHARK_BAY1 - GCOM
Depths
(meters)
TG
-10000 -> -5000
-5000 -> -3000
-3000 -> -2000
-2000 -> -1000
-1000 -> -600
-600 -> -400
-400 -> -200
-200 -> -150
-150 -> -100
-100 -> -80
-80 -> -70
-70 -> -60
-60 -> -50
-50 -> -40
-40 -> -30
-30 -> -20
-20 -> -15
-15 -> -10
-10 -> -8
-8 -> -7
-7 -> -6
-6 -> -5
-5 -> -4
-4 -> -3
-3 -> -2
-2 -> -1
-1 -> 0
0 -> 1
1 -> 10000
SHARK_BAY1 -
Wind Files
SHARK_BAY1.DIX
Apply
1.00
knots
1/08/2003 7:00:00 AM
Animation Tidal Currents
Shark Bay WA
36 km
20 Nm
Time into Spill :0 Days 0 mins
26.6000 S, 113.1341 E
Start
SHARK_BAY6 - Traject...
Microsoft Photo Editor
4:54 PM


SHARK_BAY4 31/07/2003 11:00:00 AM
-25.4
-26.2
Surface 100%
* Zero Data, Ashore, Skimmed, Dispersed
Model Output hypothetical oil spill Shark Bay
22 km
12 Nm

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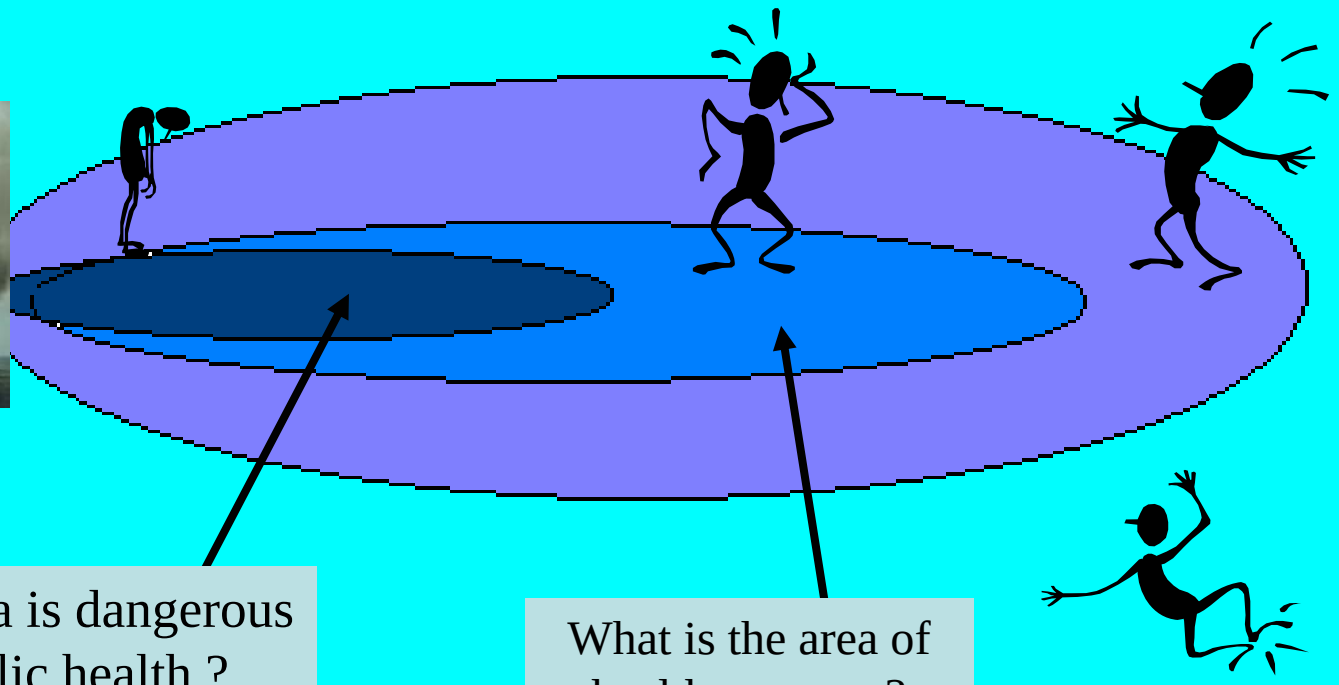
Predicted Chemical Gas Release Plumes

ALOHA – US Software Package Available.



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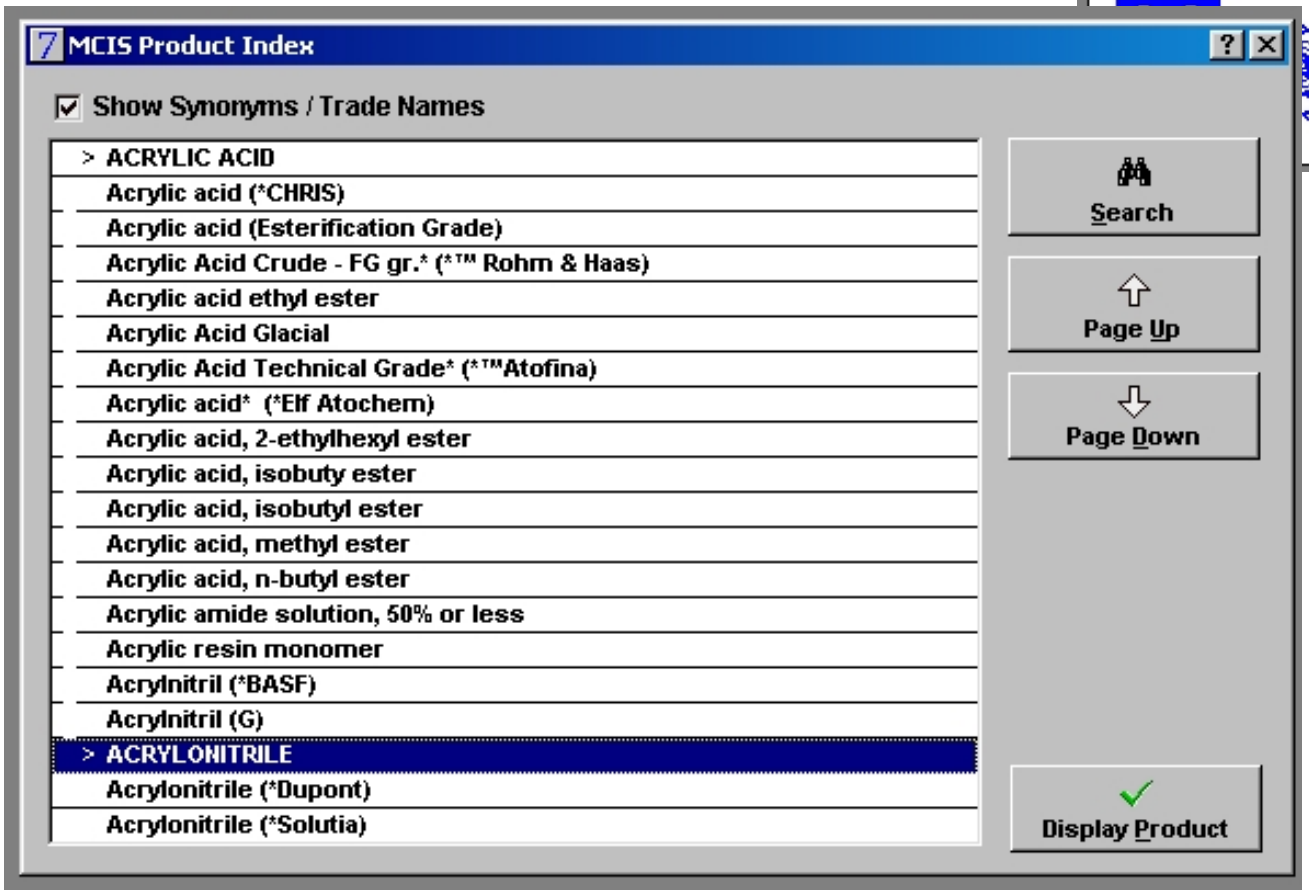

Regulatory Information

Shipping Requirements

Physical Properties

Reactivity /Containment

Cargo Handling & Cleaning Tanks

Emergency Response Guides

Marine Pollution GESAMP

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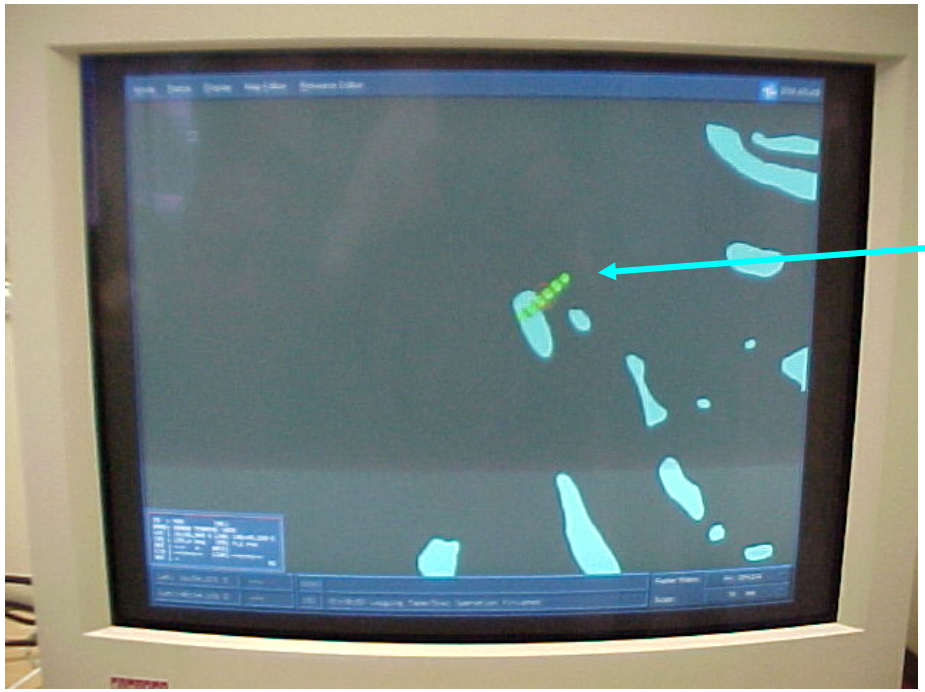
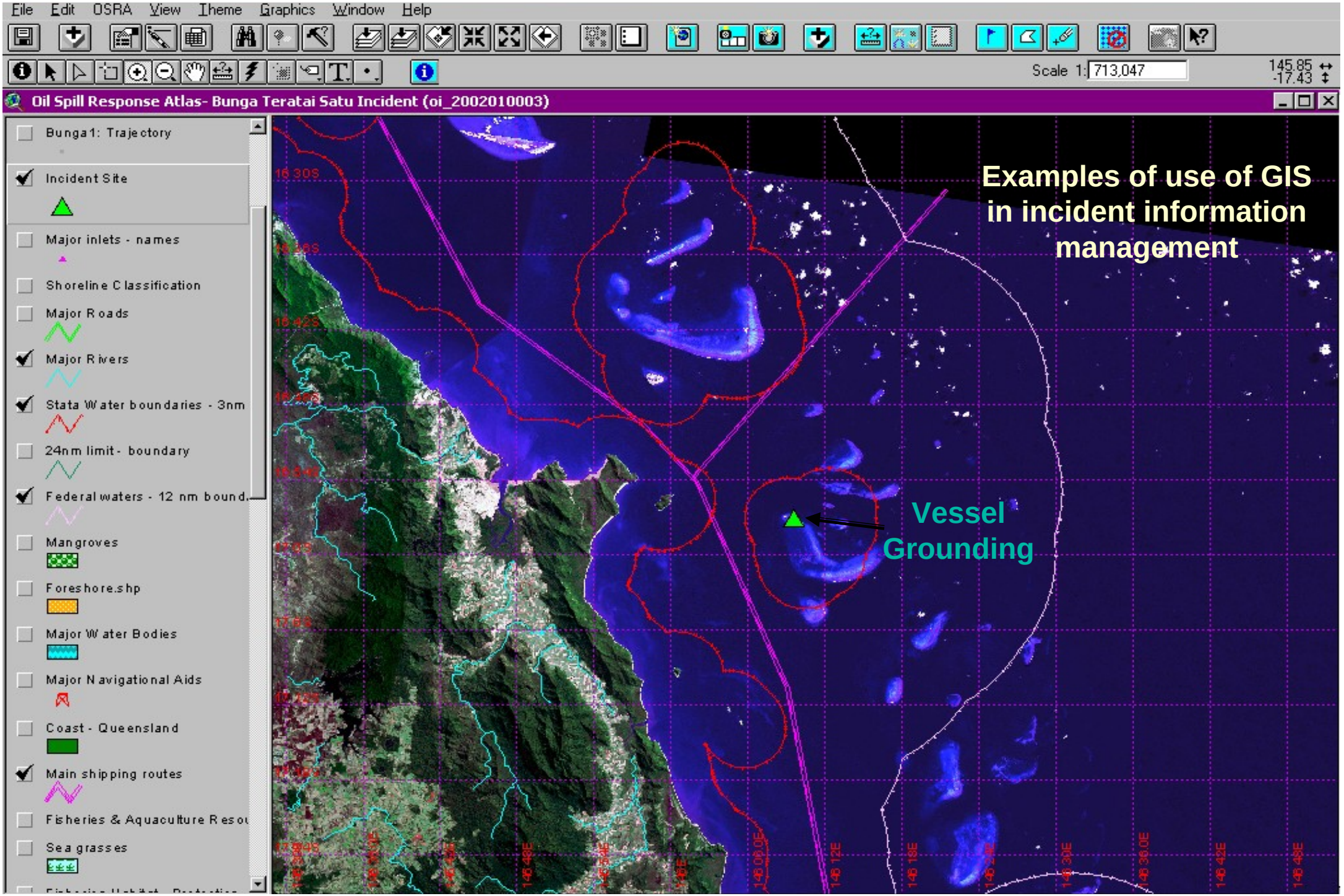
Examples of Use of the National Plan Oil Spill Response Atlas - GIS



Grounding of *Bunga Teratai Satu*, Great Barrier Reef


File Edit OSRA View Theme Graphics Window Help
Scale 1: 713,047
Oil Spill Response Atlas- Bunga Teratai Satu Incident (oi_2002010003)
Bunga1: Trajectory
Incident Site
Major inlets - names
Shoreline Classification
Major Roads
Major Rivers
Stata Water boundaries - 3nm
24nm limit - boundary
Federal waters - 12 nm bound
Mangroves
Foreshore.shp
Major Water Bodies
Major Navigational Aids
Coast - Queensland
Main shipping routes
Fisheries & Aquaculture Resou
Sea grasses
Examples of use of GIS in incident information management
Vessel Grounding

File Edit OSRA View Theme Graphics Window Help

Scale 1:

146.31
-16.83

SHIP2

CAIRNS

ARLINGTON REEF

16 54S

16 57.6S

17S

17.3S

145.39E

145.42E

145.45E

145.48E

145.51E

145.54E

145.57.0E

146E

146.03.0E

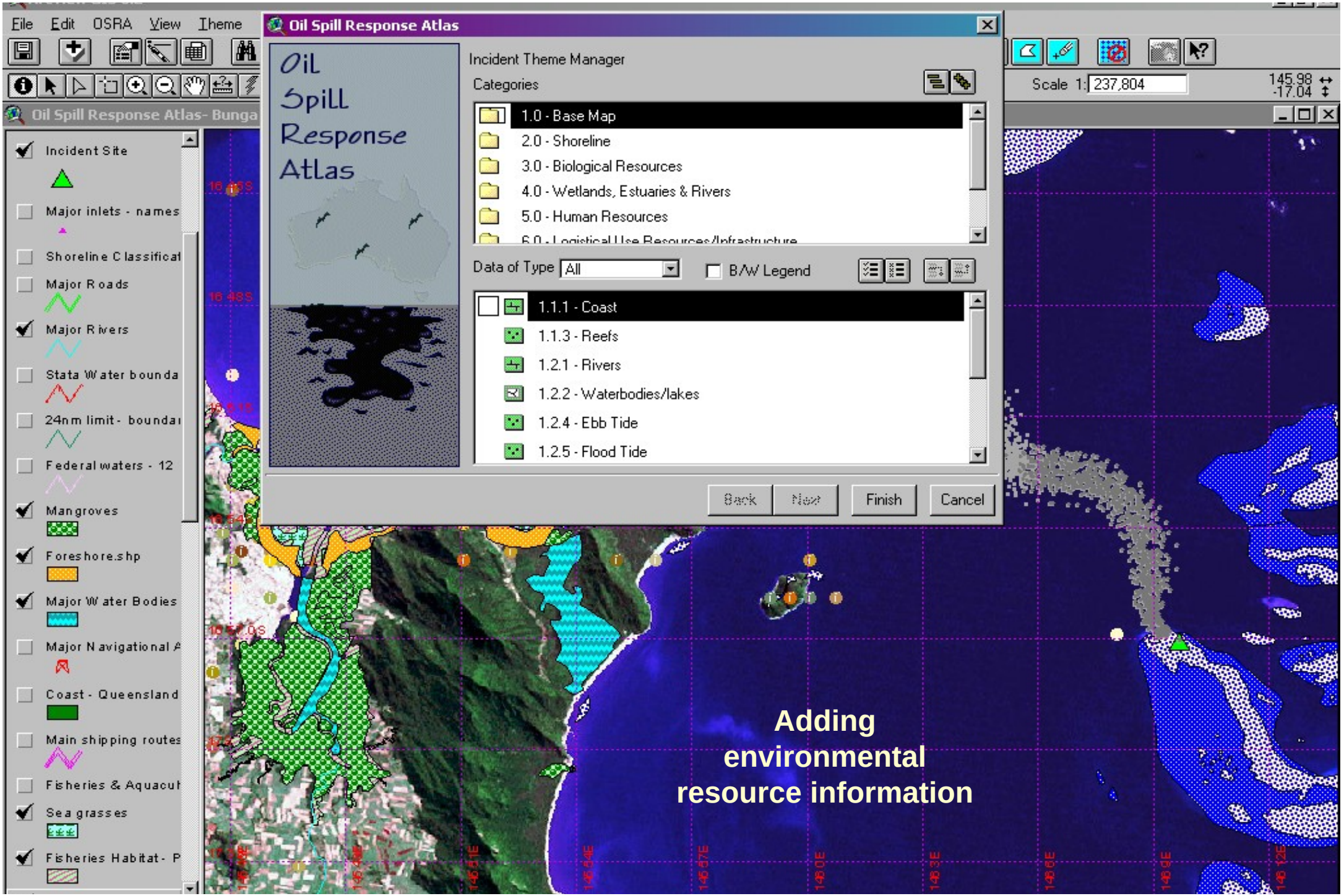
146.06.0E

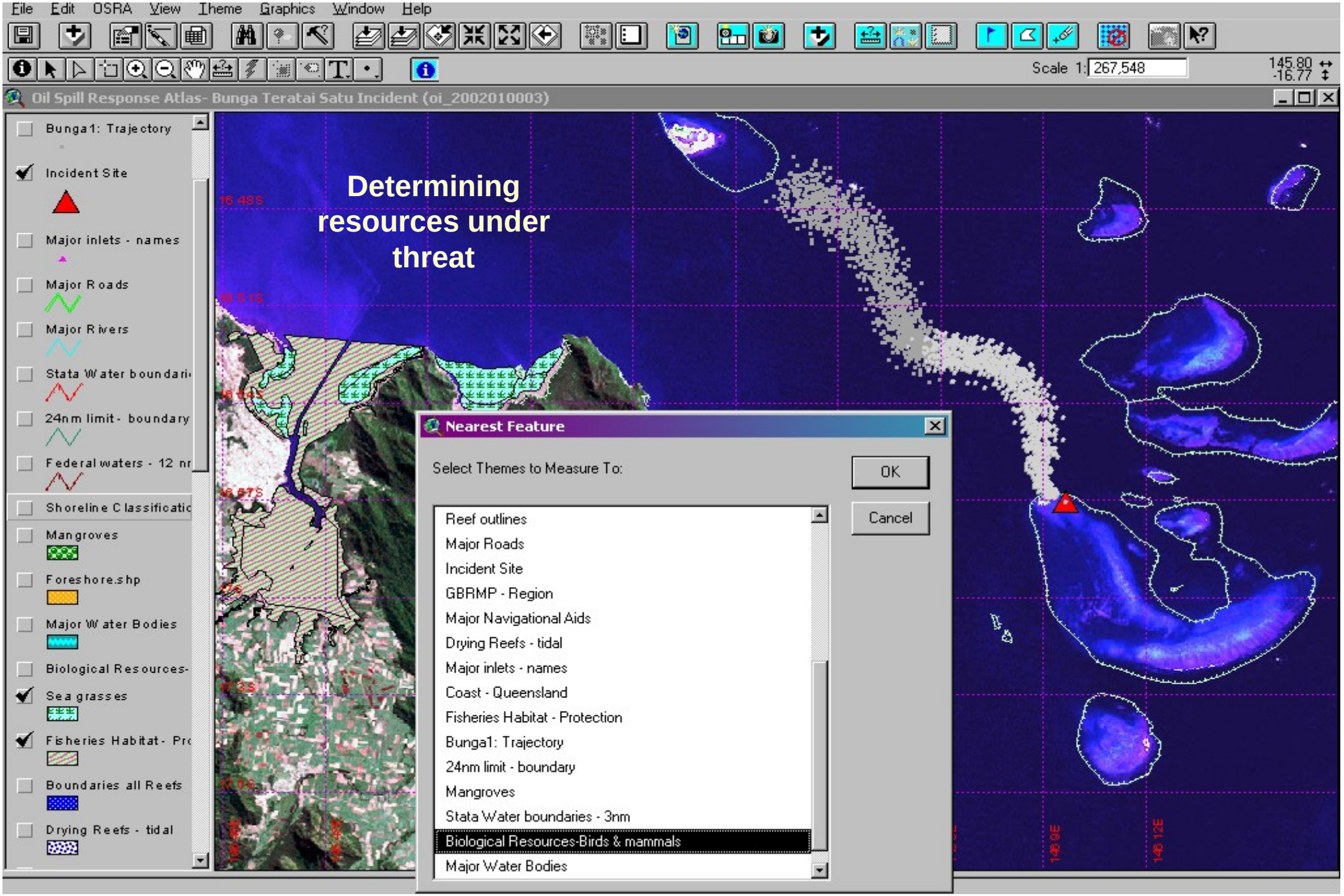
146.9E

146.12.0E

146.15E

146.18.0E


File Edit OSRA View Theme
Oil Spill Response Atlas
Oil Spill Response Atlas
Incident Theme Manager
Categories
1.0 - Base Map
2.0 - Shoreline
3.0 - Biological Resources
4.0 - Wetlands, Estuaries & Rivers
5.0 - Human Resources
Data of Type All
B/W Legend
1.1.1 - Coast
1.1.3 - Reefs
1.2.1 - Rivers
1.2.2 - Waterbodies/lakes
1.2.4 - Ebb Tide
1.2.5 - Flood Tide
Back
Next
Finish
Cancel
Oil Spill Response Atlas- Bunga
Scale 1: 237,804
Incident Site
Major inlets - names
Shoreline Classificat
Major Roads
Major Rivers
Stata Water bounda
24nm limit - boundar
Federal waters - 12
Mangroves
Foreshore.shp
Major Water Bodies
Major Navigational A
Coast - Queensland
Main shipping routes
Fisheries & Aquacul
Sea grasses
Fisheries Habitat - P
Adding environmental resource information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Oil Spill Response Atlas- Bunga Teratai Satu Incident (oi_2002010003)
Bunga1: Trajectory
Incident Site
Major inlets - names
Major Roads
Major Rivers
Stata Water boundari
24nm limit - boundary
Federal waters - 12 nr
Shoreline Classificatic
Mangroves
Foreshore.shp
Major Water Bodies
Biological Resources-
Sea grasses
Fisheries Habitat - Pro
Boundaries all Reefs
Drying Reefs - tidal
Determining resources under threat
Nearest Feature
Select Themes to Measure To:
OK
Cancel
Reef outlines
Major Roads
Incident Site
GBRMP - Region
Major Navigational Aids
Drying Reefs - tidal
Major inlets - names
Coast - Queensland
Fisheries Habitat - Protection
Bunga1: Trajectory
24nm limit - boundary
Mangroves
Stata Water boundaries - 3nm
Biological Resources-Birds & mammals
Major Water Bodies

Australian Government
Australian Maritime Safety Authority

Maritime Chemical Spill & Emergency Response Training - Course Outline

- National Maritime Chemical Spill Contingency Plan
- Ship Construction, Safety & Control Systems
- Codes of Practice eg IMO
- Ship Operations & Emergency Systems
- Response to Chemical Spills
- Tools to Assist Responders
- Contingency Plans & Reporting Systems
- Specialised Cargo Systems
- Ship Inspection & Damage Control.
- Improvement of CHEMPLAN.

Zinc, sulphur & heat

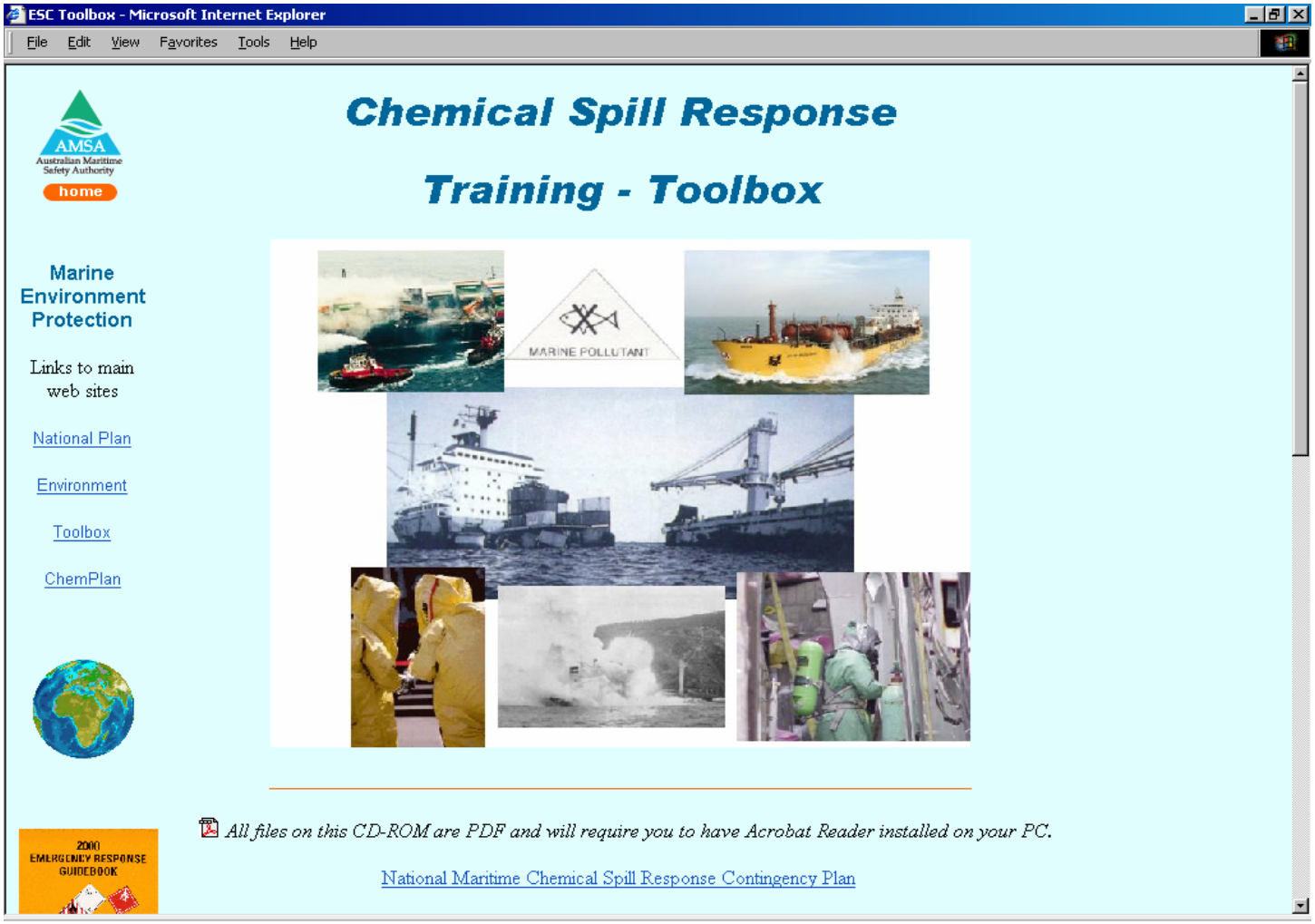
Australian Government
Australian Maritime Safety Authority

Structure of CHEMPLAN Level 2 Training Course

- 3 ½ days ½ day exercise on final day.
- 2 exercise scenarios HNS incidents.
- Presenters from local Fire Authorities, AMSA & other response organisations.
- Session include CHEMPLAN, its background, roles & responsibilities, response support mechanisms.
- Series of 4 training videos and workbooks on “the risk”, “assessment & analysis”, “response options” & “contingency planning”.
- Modules on the hazards of chemicals, surveillance & monitoring of chemical spills, safety of personnel, decision support systems, incident management & checklists, etc.
- Emphasis on HNS case histories and shipping accidents world wide.

Australian Government
Australian Maritime Safety Authority

Resources Provided on Training Course Interactive CD-ROM



Questions Welcome