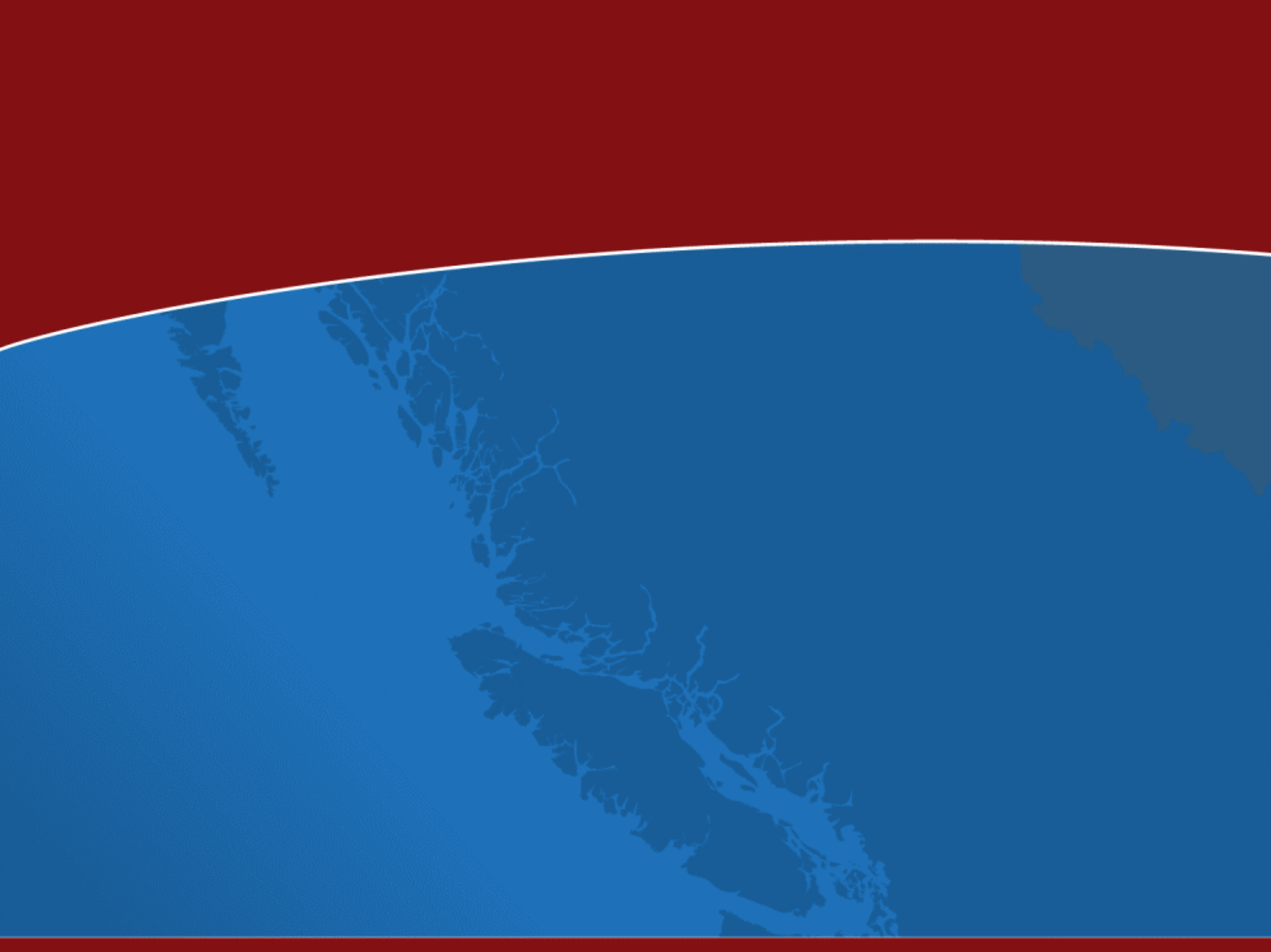
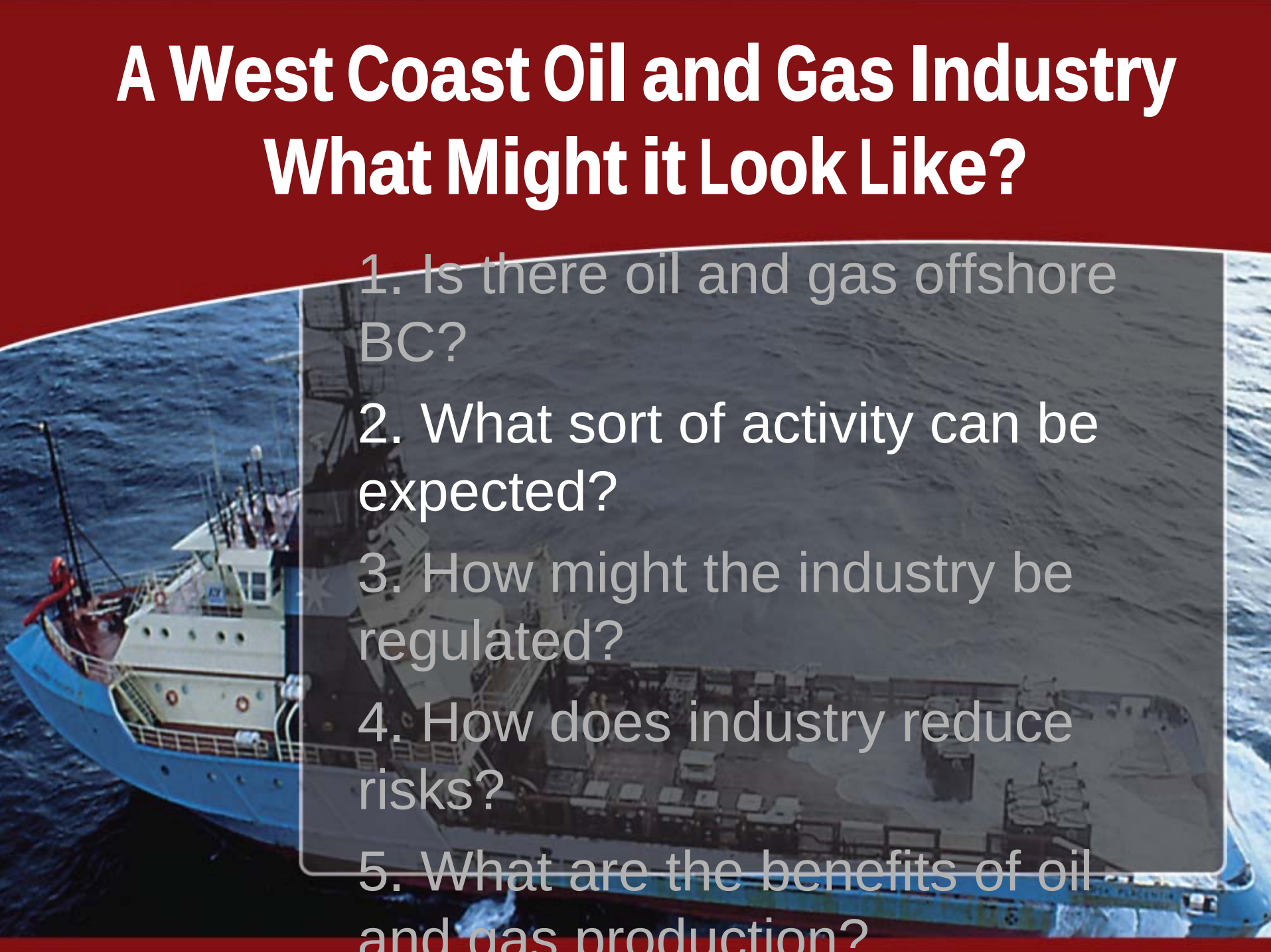


A West Coast Oil and Gas Industry What Might it Look Like?



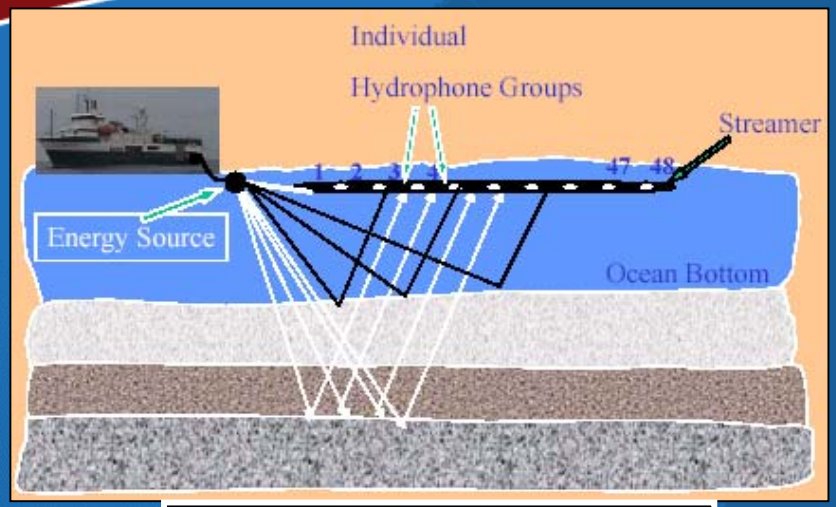
1. Is there oil and gas offshore BC?
2. What sort of activity can be expected?
3. How might the industry be regulated?
4. How does industry reduce risks?
5. What are the benefits of oil and gas production?

What sort of activity can be expected?

5 Step Process

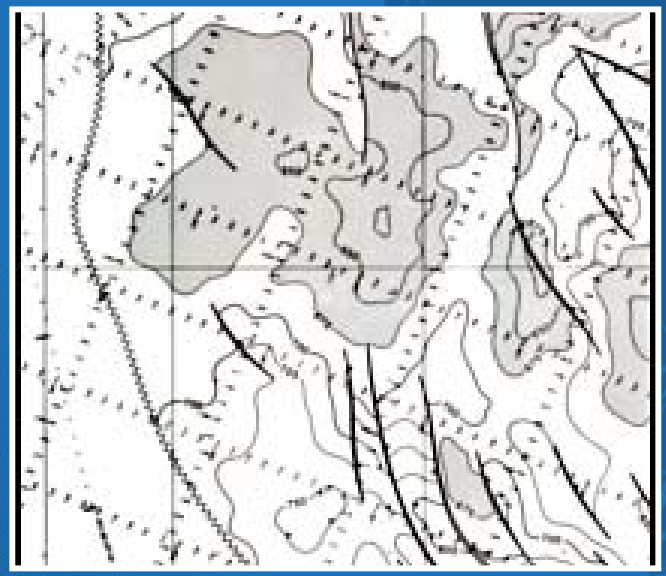
- *Step 1 Seismic Surveying* - to find oil & gas Prospects
- *Step 2 Exploration Drilling* - to see if any Prospects contain oil and gas (Discovery)
- *Step 3 Appraisal Drilling* - to see if any of the Discoveries meet all the requirements to be commercially produced as a Field
- *Step 4 Development and Production* - Oil and /or gas will be produced from each Field for at least 15 years before Decommissioning
- *Step 5 Decommissioning* - Involves the removal of all Field facilities and restoration of the site

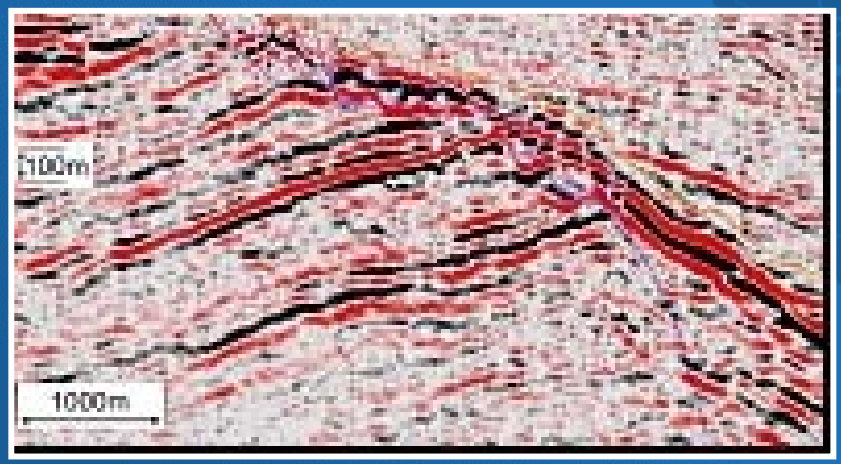
Step 1 - Seismic Surveying. What is it?



- Use low frequency sound from a compressed air source to reflect sound waves from layers below the seabed to create images like a slice through the earth.
- Sound emitted as pulses from compressed air guns towed behind vessel
- Reflected sound is recorded on a string of hydrophones >3 km long towed behind same vessel. It is like echo sounding.

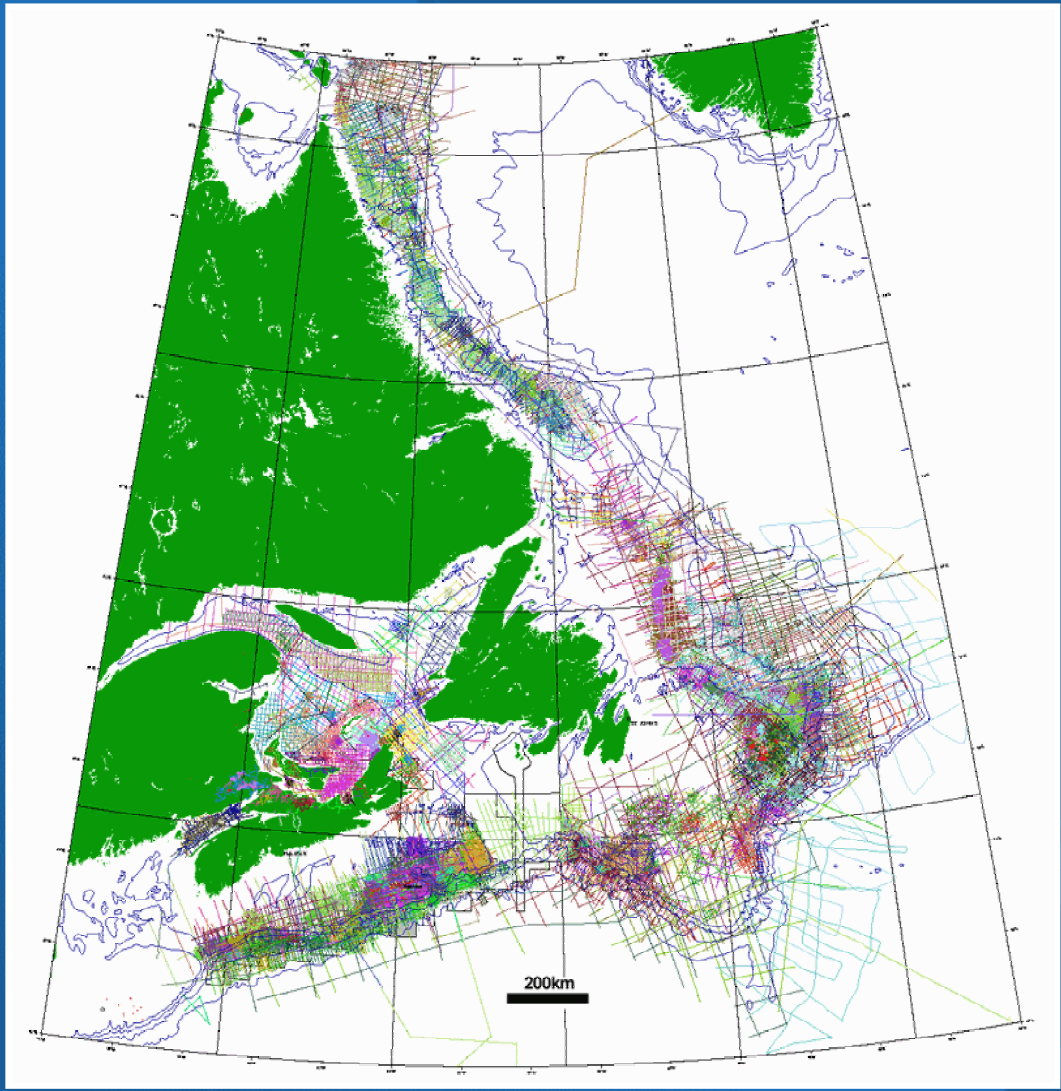
Step 1 - Seismic Surveying. What is it?





- Seismic data costs about $800 /km to collect.
- Data is collected at 5 knots on predetermined courses.
- Minimum operating water depth is 30 m.
- Data is processed producing maps and cross sections of the subsurface.
- The objective is to identify the faults and folds which we call **prospects** and which will become the target of **exploration drilling**

Canadian East Coast Seismic Coverage



- There is 45 years of history of seismic surveying on the East Coast.
- On the Pacific Coast, Shell and Chevron recorded thousands of kms of data before the moratorium
- Over the past 30 years, modern survey and analysis techniques require fewer surveys.

Step 1 - Seismic Surveying. Conclusions

- Seismic data quality has improved over the last 30 years requiring fewer lines and greater definition of prospects.
- This leads to more precise positioning of exploration wells requiring fewer wells.
- Seismic source now uses compressed air and ramp-up in intensity at the start of a survey and causes aquatic species to move away. Known as **Soft Start**
- The entire Queen Charlotte Basin could be surveyed in 60 to 90 days
- Prospect delineation seismic would depend on the number of prospects found. Each could be surveyed in a few days
- Seismic noise levels have been shown to cause no harm to aquatic species unless in immediate vicinity of source (6 metres). Observers and **Soft Start** procedures reduce likelihood of exposure.

Step 2 – Exploration Drilling

What is it?

- Seismic will have defined top 10 prospects
- A single exploration rig will drill one well in each, such as the Sedco 135 shown here
- Today's cost >$40 MM each
- Improvements to drilling technology since 1960s
  - Drilling mud
  - "blowout prevention"
  - Directional drilling
  - Rig design – safety and performance

Step 2 – Exploration Drilling

3 types of offshore rigs

Semi sub

Eirik Raude
Nova Scotia

Photo courtesy of A. MacRae, August 2001

Jack-up

Rowan Gorilla II
Nova Scotia

Photo courtesy of Sable Offshore Energy Inc

Drillship

Glomar Atlantic
Discovered Hibernia
1979

Photo from Energy Under the Sea Natural Resources Canada 1985

Step 2 – Exploration Drilling

Objective

To drill one well in each prospect (the discovery well) and look for signs of oil and gas by:

- Examining Cores & Drill Cuttings
- Wireline Logging
- Testing

Drilling Mud –

What is it? Naturally occuring bentonite and barite

Uses?

- Return the drill cuttings to surface
- Lubricate the drill bit & stabilize the wellbore
- Prevent the uncontrolled release of fluids

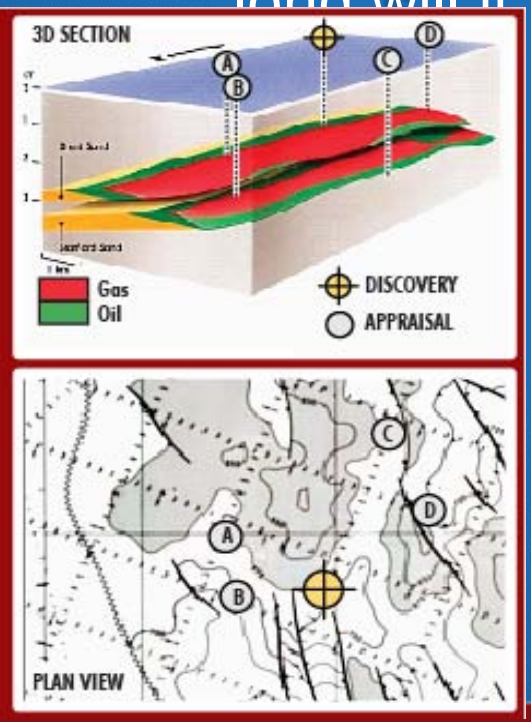
Issues?

- Oil and diesel additives no longer used –replaced by low toxicity polymers
- Recycled & re-used…expensive!

Step 3 - Appraising a Discovery

How much oil or gas might this discovery contain?

- How big is the field? How broken up is it? How many compartments (pools)?
  What is the best way of producing the oil and gas to get the most out (recovery)? How much will it cost? How long will it take?
  - Perhaps additional 3D seismic data is acquired for the immediate area to map the discovery in detail
  - 3 or 4 follow up wells drilled
  - Extensive sampling of rocks and fluids for chemical and physical properties
  - Extensive flow testing & pressure measuring



Step 4 – Development & Production

Production Facility
- purpose built - not just a drill rig

3 Main Functions:

1. Drill development & service wells (multiple wellslots 35+/-)
2. Control production of fluids
3. Storage of oil and transhipment point

Significant capital cost:

- Billion $+
- Hibernia Platform >$5 billion

Steel Jacket Platform

FPSO

Step 4 – Development & Production

Facilities: -2 types

Platforms (usually attached to sea floor)

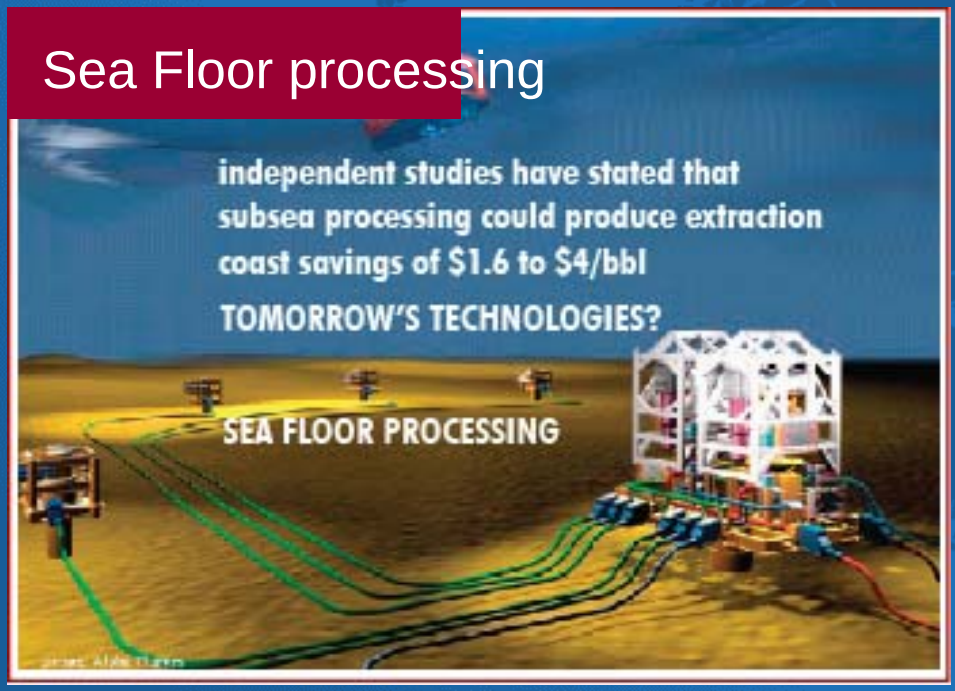
FPSO (floating, production, storage & offloading)

Technology Developments

Sea Floor Processing – (Advantages?)

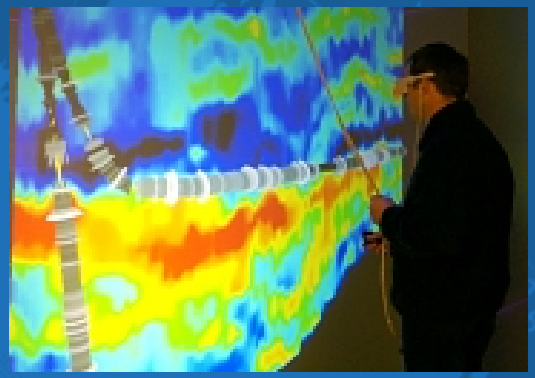
Steel Jacket Platform

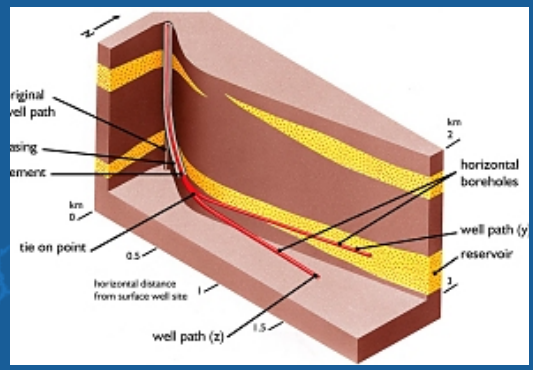
Sea Floor processing

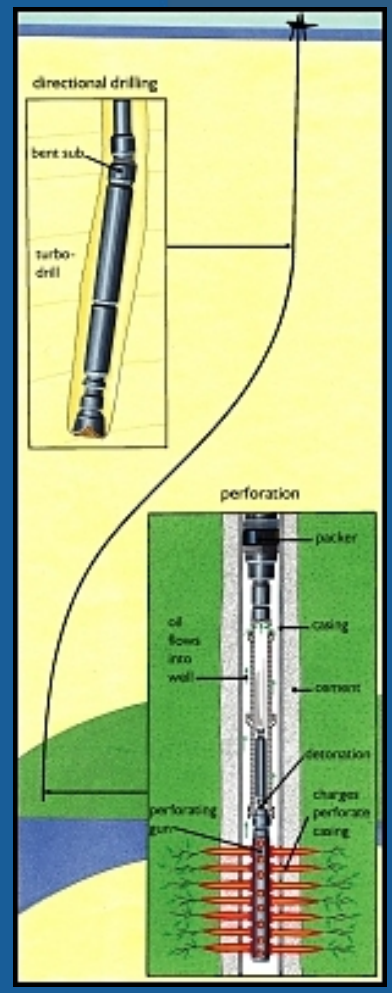


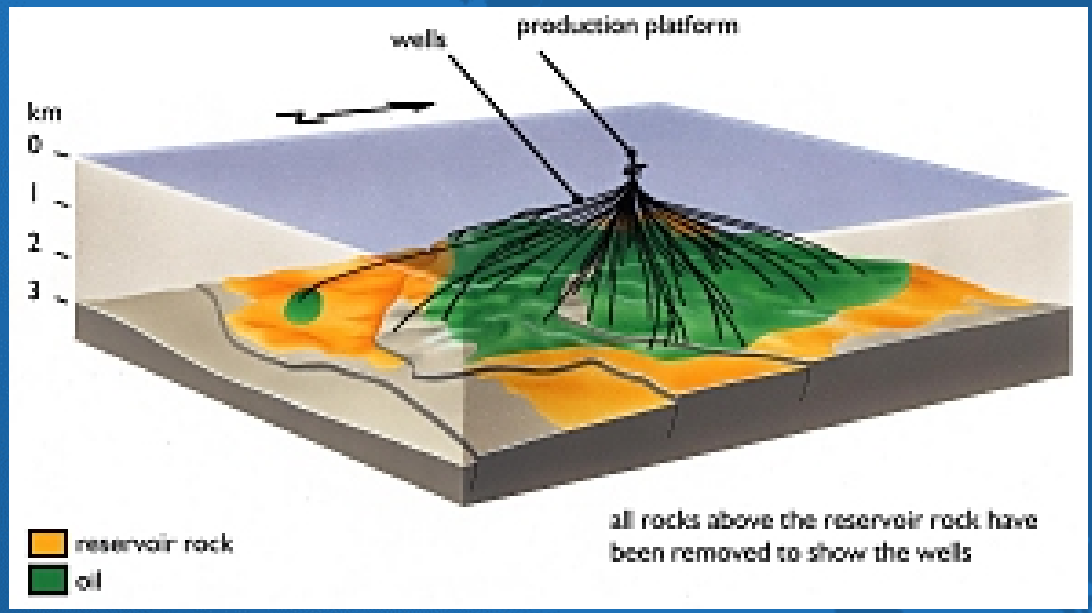
Step 4 – Development & Production

Production Plan Uses Technology Developments such as Directional Drilling





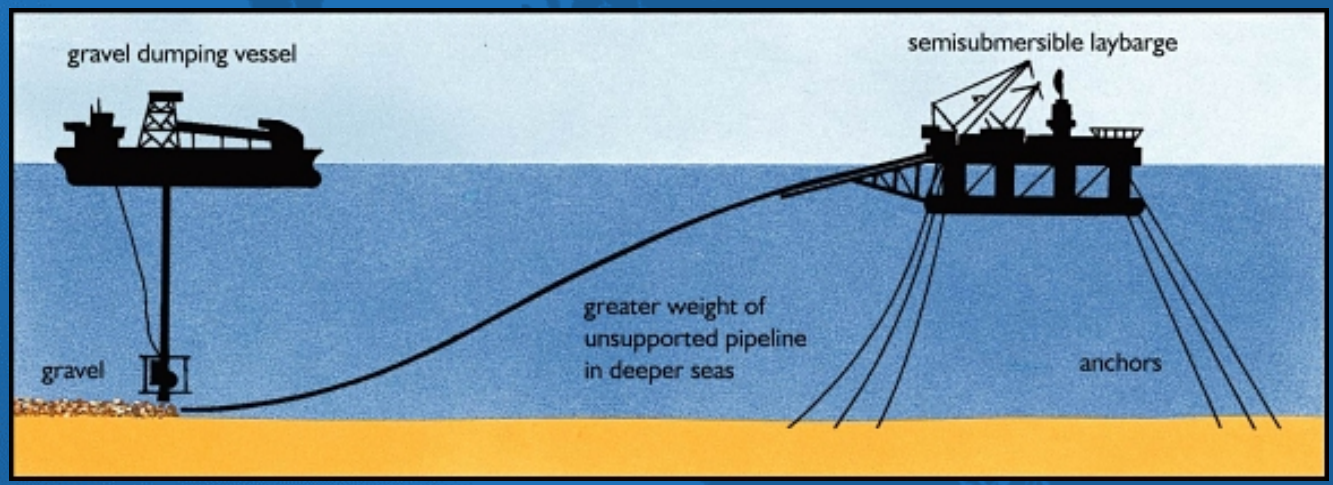


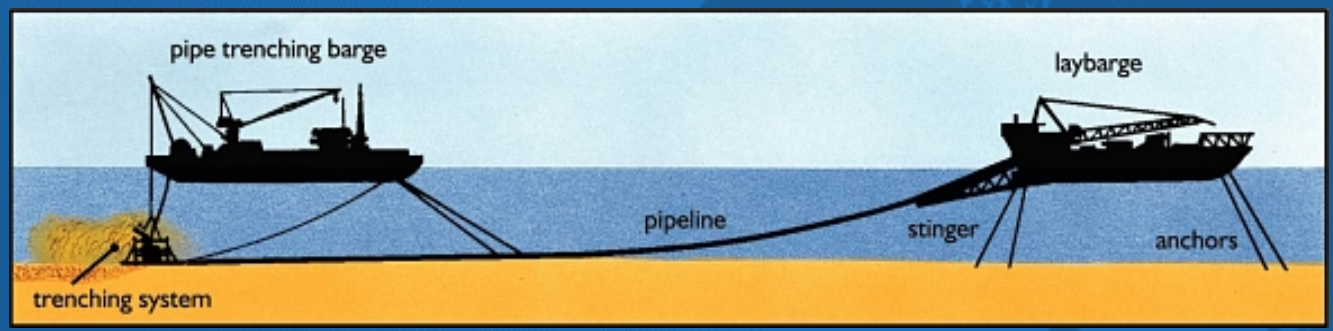


Step 4 – Development & Production

Transportation

- Gas or Oil?
- Pipelining or shuttle tanker?





Step 5 - Decommissioning

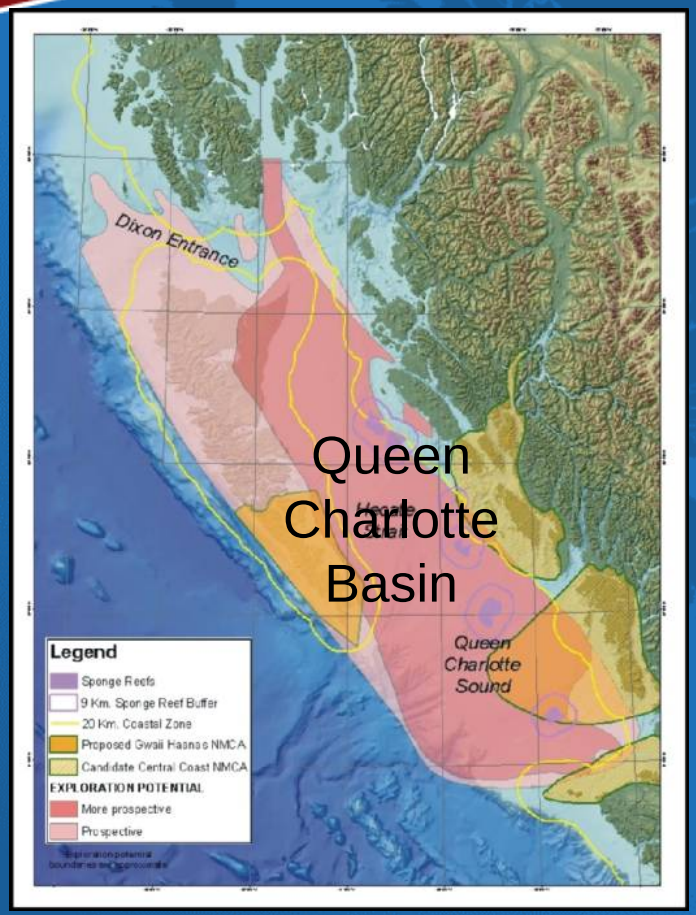
Platforms & Pipelines
– depends on jurisdictional regulations

Removal & Disposal of...

- **Structures**
  - Platforms versus FPSO versus Seafloor
  - Remove topsides
  - Artificial Reef – Marine Park (decommissioned structures have proven to be beneficial)
- **Pipelines**

What Might We Expect?

Summary – Initial Focus on Queen Charlotte Basin



- Steps 1 & 2 - *Exploration* (3 –5 years)
  Basin-wide seismic survey followed by a single exploration rig drilling upto 10 prospects in the prospective area. Each 10x10 Kms
- Step 3 - *Appraisal* (2 years)
  Detailed seismic and appraisal drilling of discovered prospects
- Step 4 - *Production* (15 –30 years)
  Fixed production platform or