HP1 101 - Session 3:
Drift

“The HPI 5+5”

HPI Principles

Through continual learning, we constantly improve the defenses that protect us from the errors all of us can make

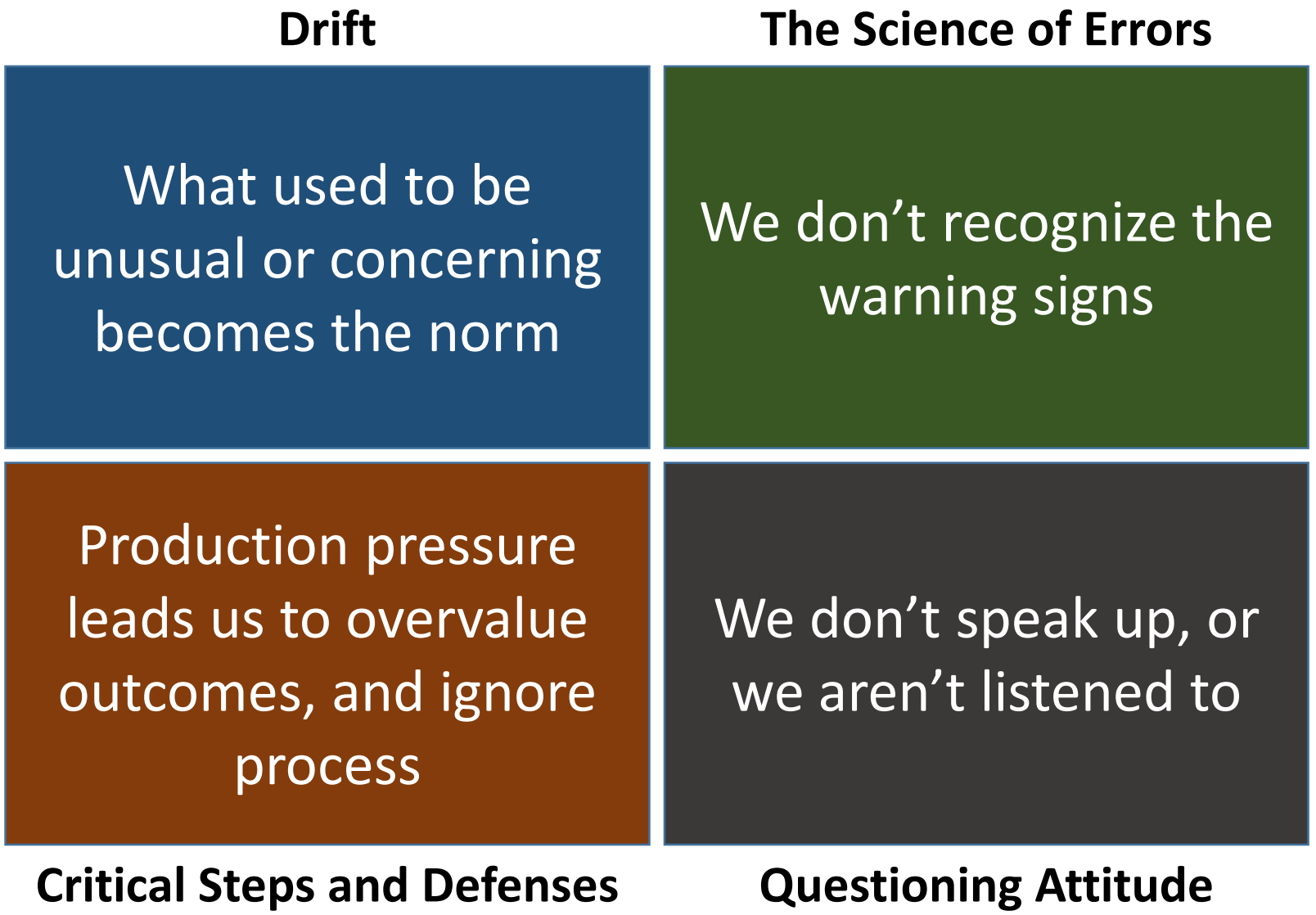
1	We all make errors – it’s a matter of when, not if
2	These errors follow a recurring pattern, and are predictable and manageable
3	Curiosity drives us to examine our practices and learn from our errors
4	As employees, we are the solution, not the problem
5	Excellence is not the absence of failure, but the presence of process and defenses

Core HPI Concepts

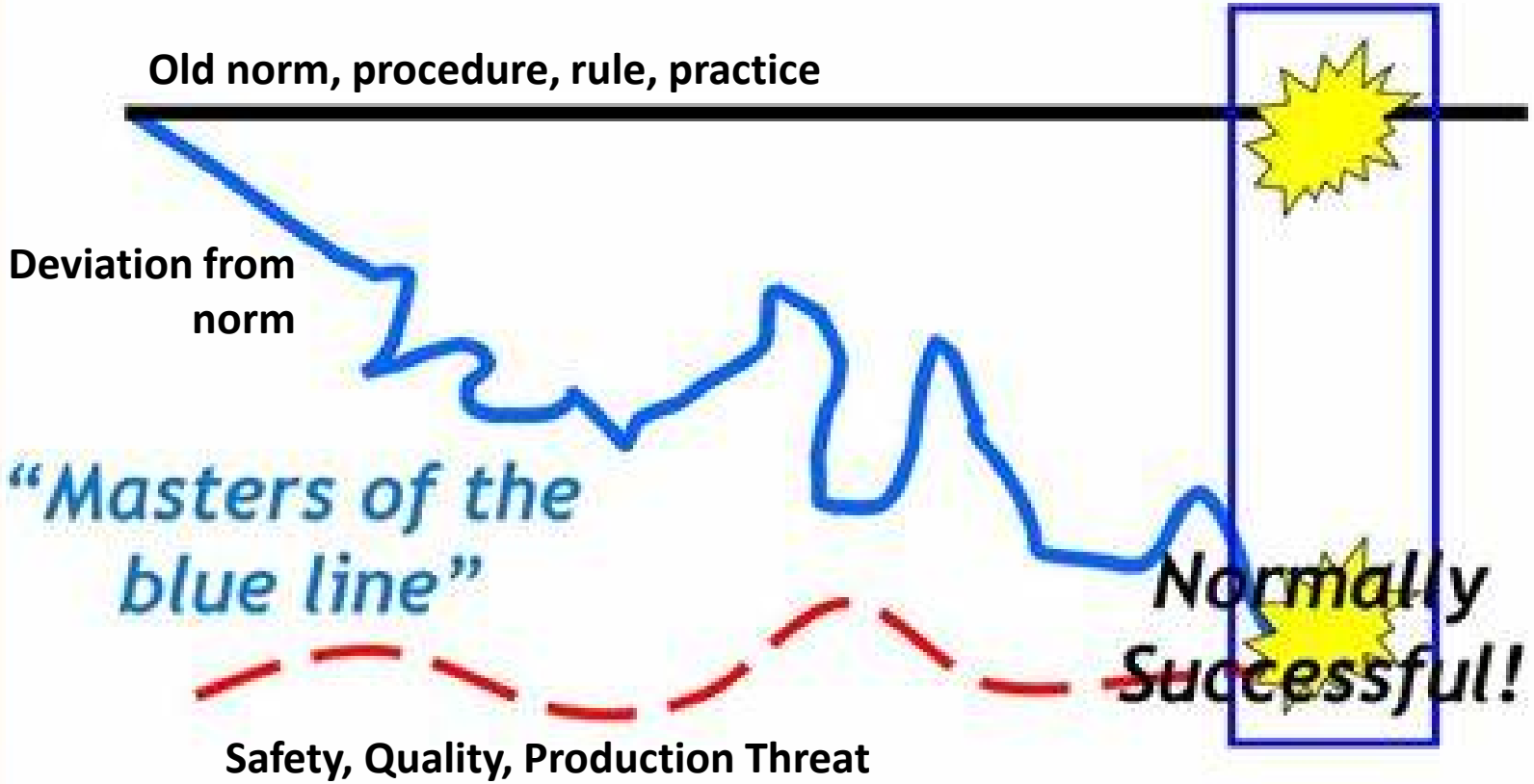
Questioning Attitude

Errors	Defenses
Critical Steps	Drift

Four ingredients of all human-caused events



Work as Planned vs. Work in Practice



(Conklin, 2012)

- 11 million gallons of oil spilled
- 1300 miles of coastline polluted
- Millions of animals killed
- $3.5 billion cleanup cost
- Oil contamination still present

The Exxon Valdez Disaster

Catastrd

1955 First dou… 40+ crew…

1973 2 Coast … have pre…

1977 Prince W… (VTC) pl…

1980 The stat… Hinchinb…

1984 Unfores… outside … Captain … the first …

1986 CO of Co… Exxon Va… tanker; 1… Captain … Requirer…

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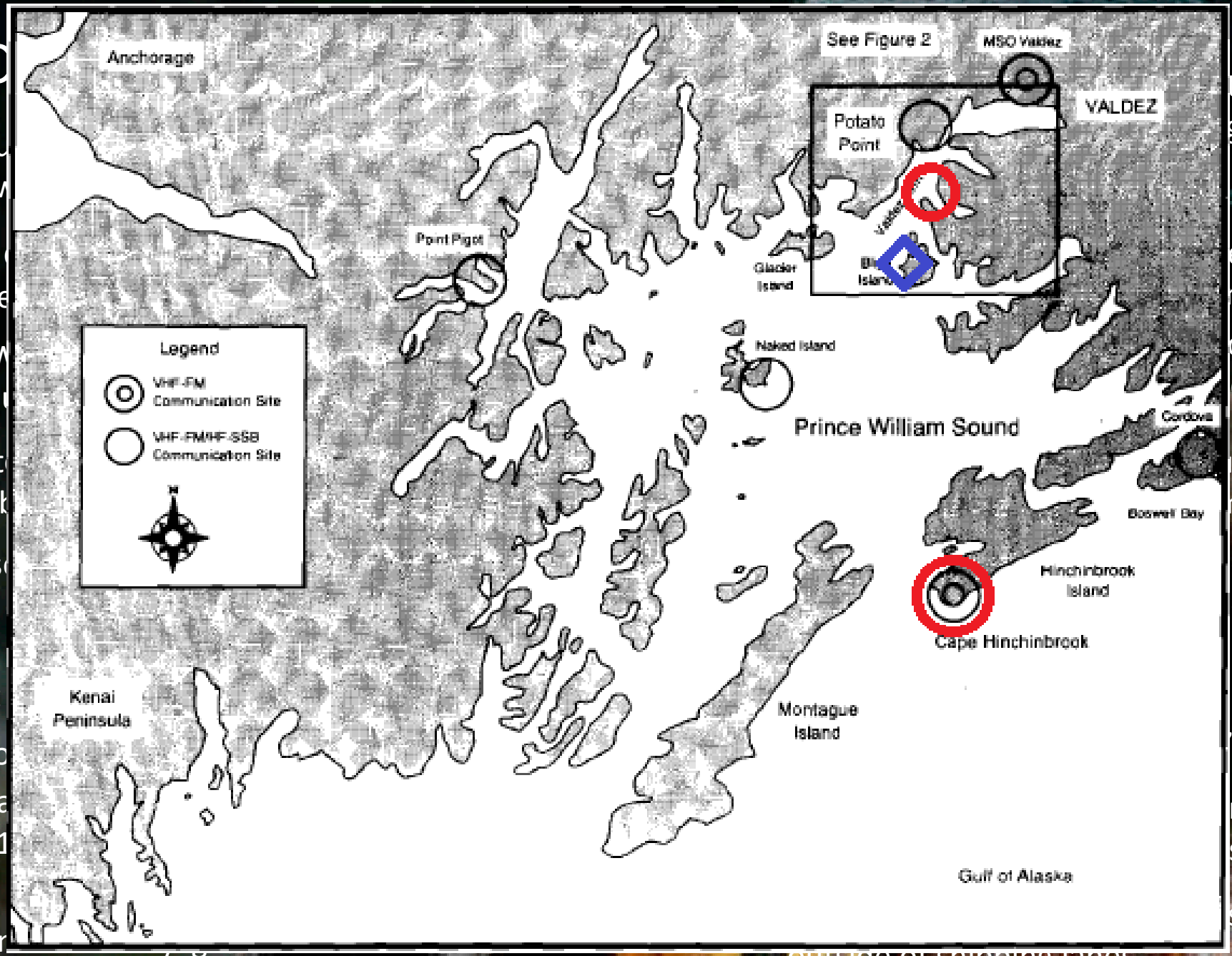
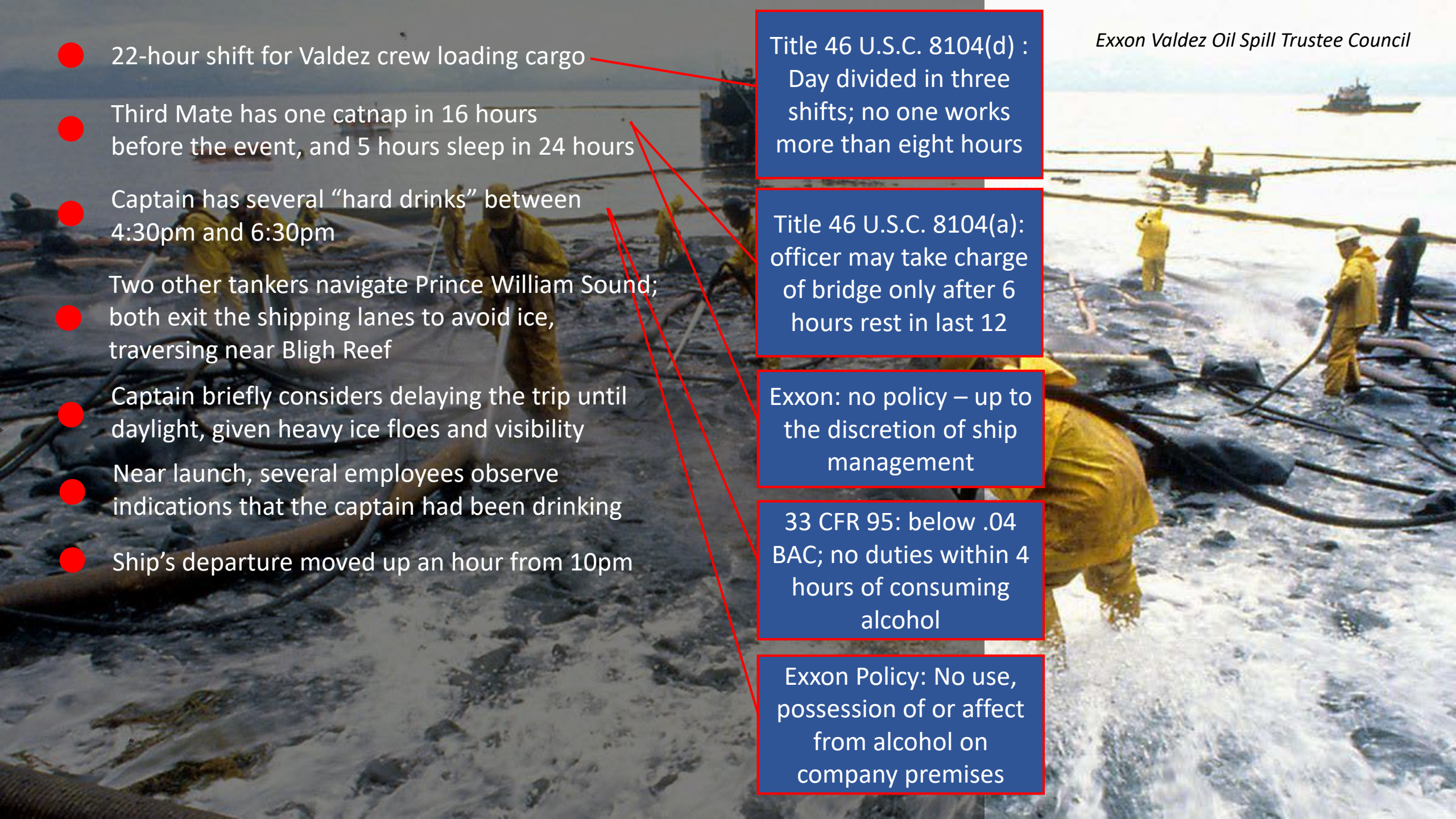


Natalie Fobes / Getty



- 22-hour shift for Valdez crew loading cargo
- Third Mate has one catnap in 16 hours before the event, and 5 hours sleep in 24 hours
- Captain has several “hard drinks” between 4:30pm and 6:30pm
- Two other tankers navigate Prince William Sound; both exit the shipping lanes to avoid ice, traversing near Bligh Reef
- Captain briefly considers delaying the trip until daylight, given heavy ice floes and visibility
- Near launch, several employees observe indications that the captain had been drinking
- Ship’s departure moved up an hour from 10pm

Title 46 U.S.C. 8104(d) : Day divided in three shifts; no one works more than eight hours

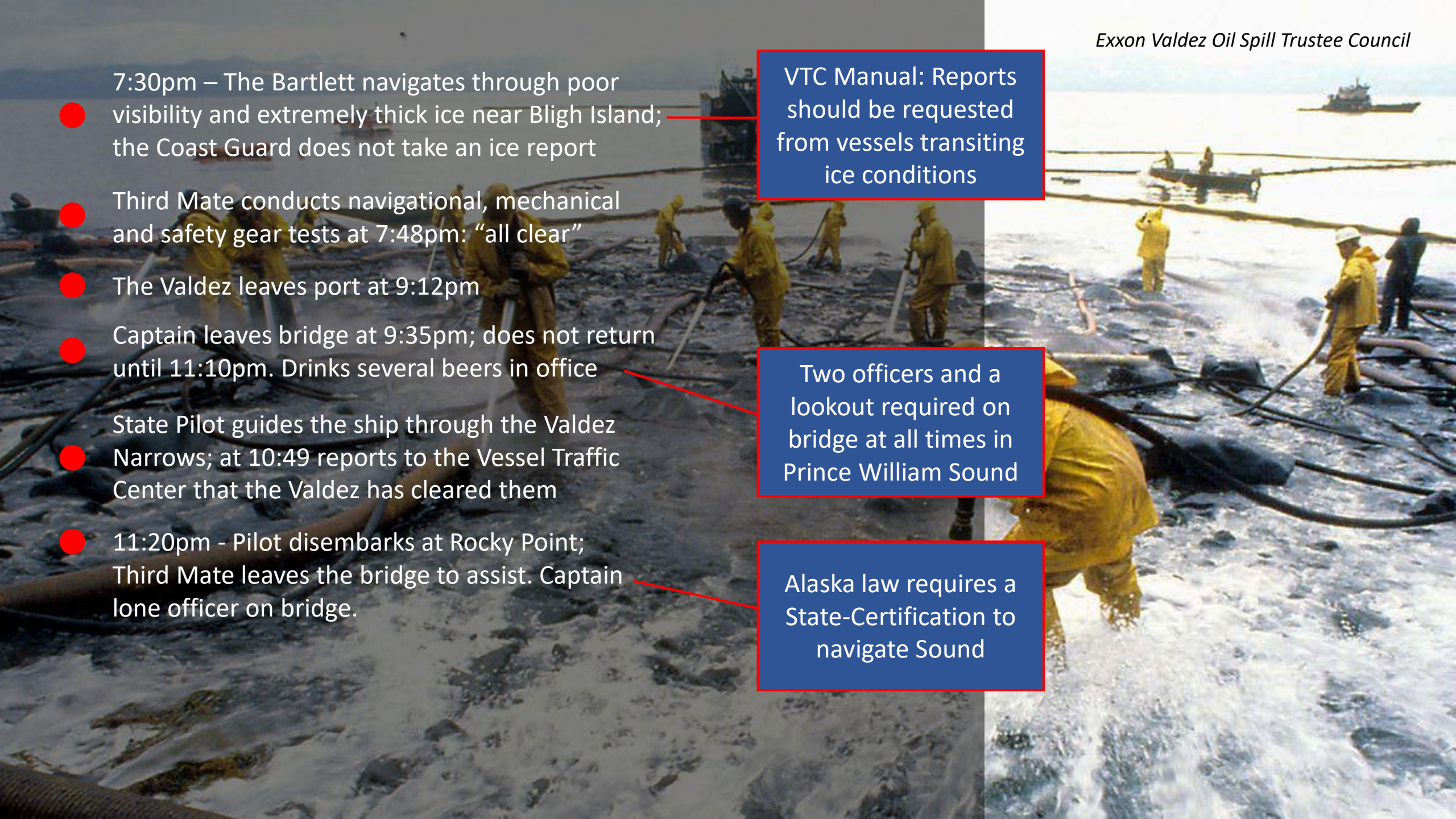
Title 46 U.S.C. 8104(a): officer may take charge of bridge only after 6 hours rest in last 12

Exxon: no policy – up to the discretion of ship management

33 CFR 95: below .04 BAC; no duties within 4 hours of consuming alcohol

Exxon Policy: No use, possession of or affect from alcohol on company premises

Exxon Valdez Oil Spill Trustee Council



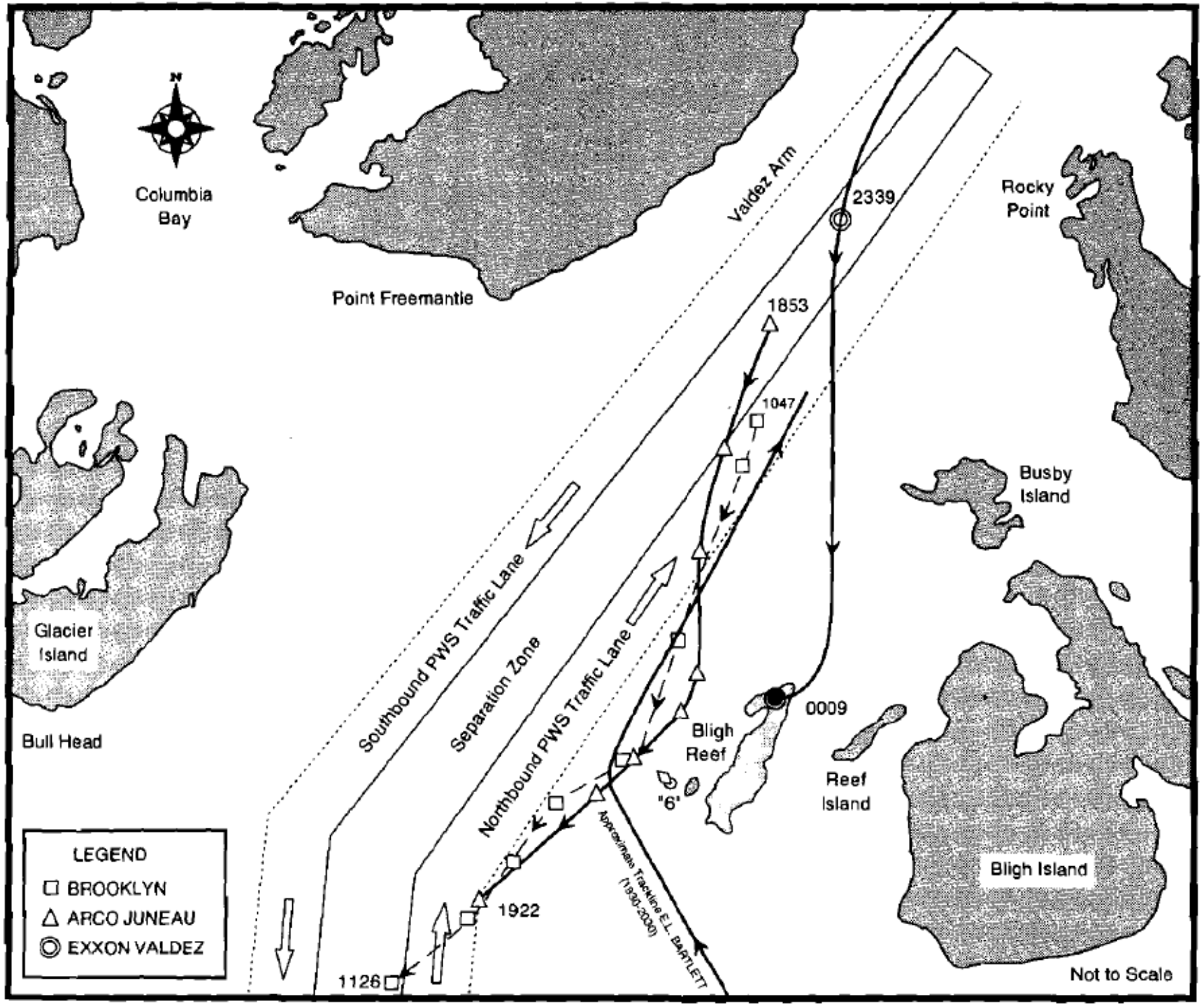
Exxon Valdez Oil Spill Trustee Council

- 7:30pm – The Bartlett navigates through poor visibility and extremely thick ice near Bligh Island; the Coast Guard does not take an ice report
- Third Mate conducts navigational, mechanical and safety gear tests at 7:48pm: “all clear”
- The Valdez leaves port at 9:12pm
- Captain leaves bridge at 9:35pm; does not return until 11:10pm. Drinks several beers in office
- State Pilot guides the ship through the Valdez Narrows; at 10:49 reports to the Vessel Traffic Center that the Valdez has cleared them
- 11:20pm - Pilot disembarks at Rocky Point; Third Mate leaves the bridge to assist. Captain lone officer on bridge.

VTC Manual: Reports should be requested from vessels transiting ice conditions

Two officers and a lookout required on bridge at all times in Prince William Sound

Alaska law requires a State-Certification to navigate Sound


N
Columbia Bay
Point Freemantle
Valdez Arm
2339
Rocky Point
1853
1047
Busby Island
Glacier Island
Bull Head
Southbound PWS Traffic Lane
Separation Zone
Northbound PWS Traffic Lane
0009
Bligh Reef
"6"
Reef Island
Bligh Island
Approximate Tracking E.L. BARTLETT (1990-2000)
1922
1126
LEGEND
BROOKLYN
ARCO JUNEAU
EXXON VALDEZ
Not to Scale

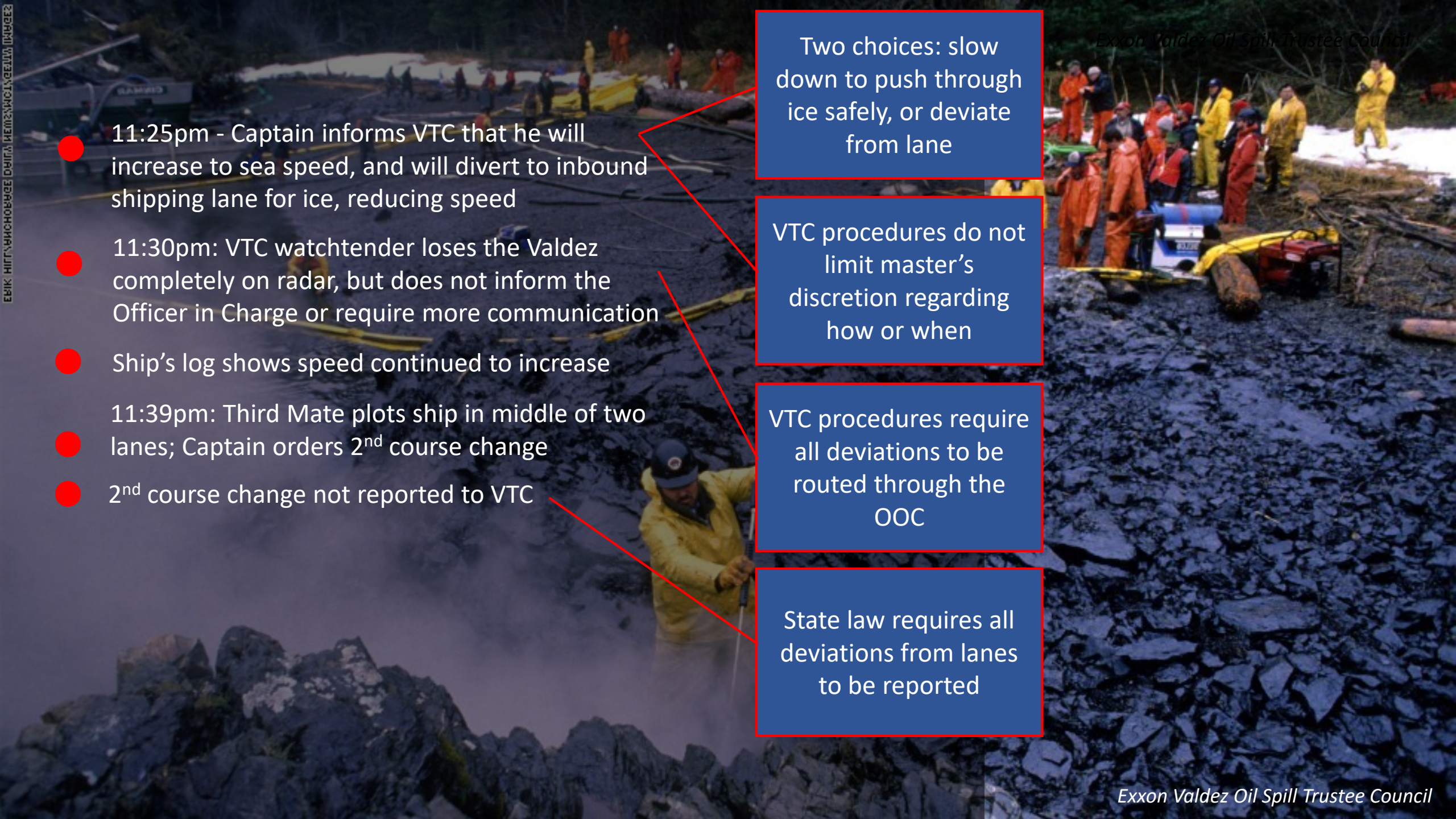
- 11:25pm - Captain informs VTC that he will increase to sea speed, and will divert to inbound shipping lane for ice, reducing speed
- 11:30pm: VTC watchtender loses the Valdez completely on radar, but does not inform the Officer in Charge or require more communication
- Ship's log shows speed continued to increase
- 11:39pm: Third Mate plots ship in middle of two lanes; Captain orders 2nd course change
- 2nd course change not reported to VTC

Two choices: slow down to push through ice safely, or deviate from lane

VTC procedures do not limit master's discretion regarding how or when

VTC procedures require all deviations to be routed through the OOC

State law requires all deviations from lanes to be reported



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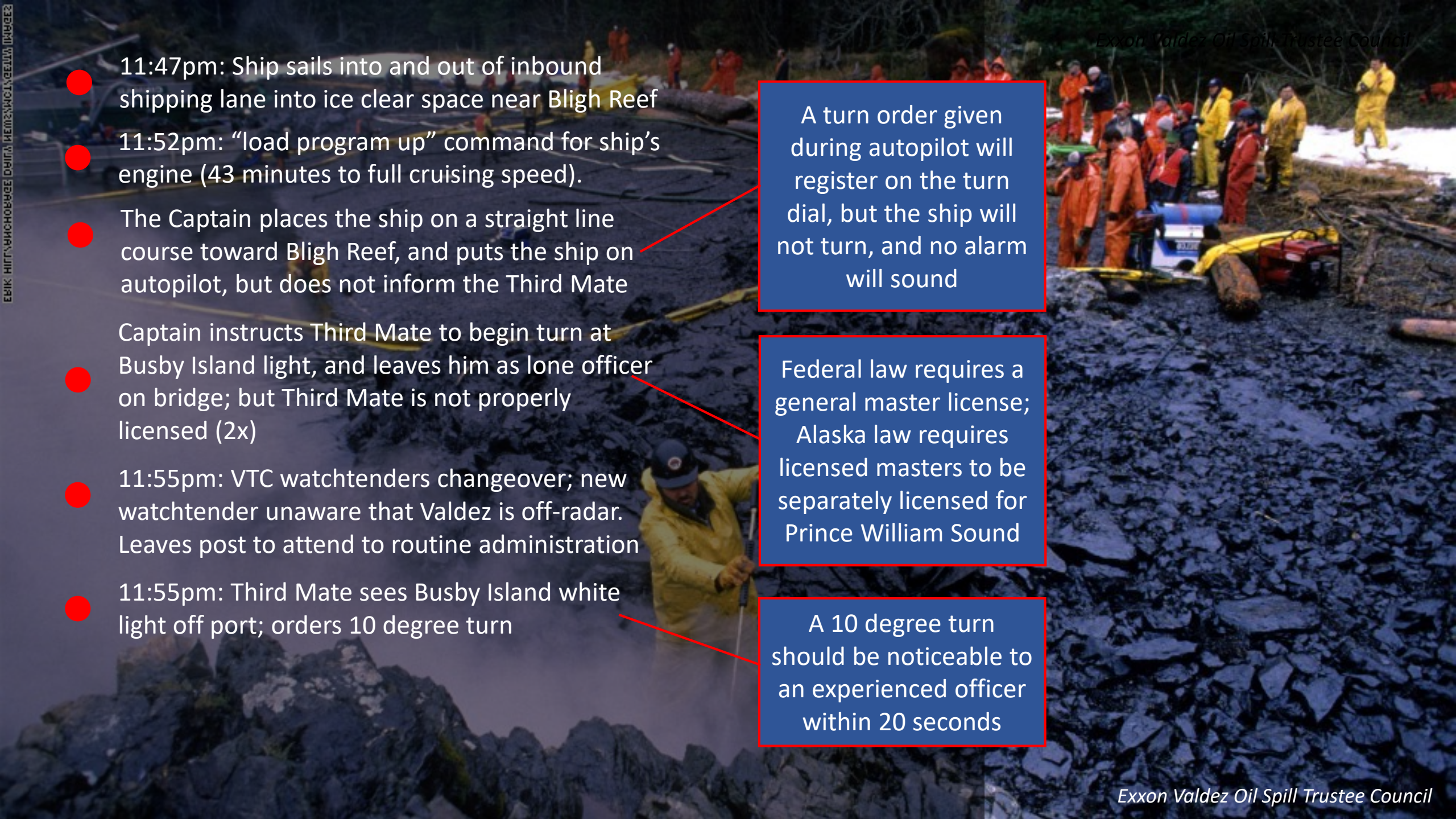

- 11:47pm: Ship sails into and out of inbound shipping lane into ice clear space near Bligh Reef
- 11:52pm: “load program up” command for ship’s engine (43 minutes to full cruising speed).
- The Captain places the ship on a straight line course toward Bligh Reef, and puts the ship on autopilot, but does not inform the Third Mate
- Captain instructs Third Mate to begin turn at Busby Island light, and leaves him as lone officer on bridge; but Third Mate is not properly licensed (2x)
- 11:55pm: VTC watchtenders changeover; new watchtender unaware that Valdez is off-radar. Leaves post to attend to routine administration
- 11:55pm: Third Mate sees Busby Island white light off port; orders 10 degree turn

A turn order given during autopilot will register on the turn dial, but the ship will not turn, and no alarm will sound

Federal law requires a general master license; Alaska law requires licensed masters to be separately licensed for Prince William Sound

A 10 degree turn should be noticeable to an experienced officer within 20 seconds

Exxon Valdez Oil Spill Trustee Council

Exxon Valdez Oil Spill Trustee Council

- 12am: Third mate not relieved by Second Mate, who he instructed to rest after the long shift
- 12:01am: Third Mate realizes the ship has not turned at all; lookout reports red light from Busby Island light.
- 12:02am: Lookout returns: Bligh Reef light appears off starboard bow, instead of port.
  Third Mate and helmsman hit autopilot button at same time; ship begins gradual turn
- 12:03am: Third Mate orders hard right rudder
- 12:04am – first rock struck, tearing three holes
- 2 miles south, Valdez runs aground on reef
- Captain vainly attempts to remove ship from reef, against advice of his crew
- Valdez's engines inadvertently remain in full throttle for 15 minutes
- 12:26am – Captain radios VTC
- 3am – Coast Guard investigators board ship
- 10am – Captain's BAC registers at .1

Exxon Valdez Oil Spill Trustee Council

Exxon Valdez Oil Spill Trustee Council

1. Those guarded by a norm / procedure / practice understand and believe in the "why": the specific risks they're protected from (**HPI Principles 1 & 2**)
2. They've helped design it – they own the rule or procedure (**HPI Principle 4**)
3. Everyone (supervisors & employees) continually monitors and improves the norm's effectiveness (in the field) (**HPI Principles 3 & 5**)

Three Defenses for Drift