

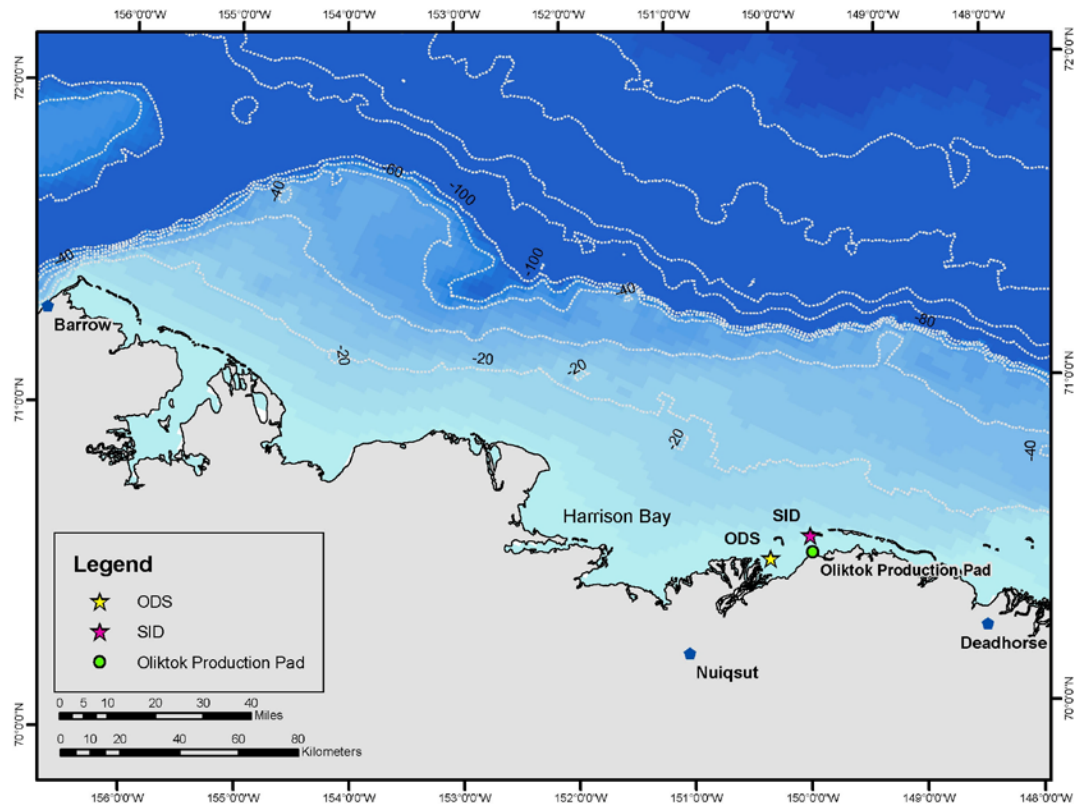
## 2008 Offshore Monitoring Program Results



Open Water Meeting

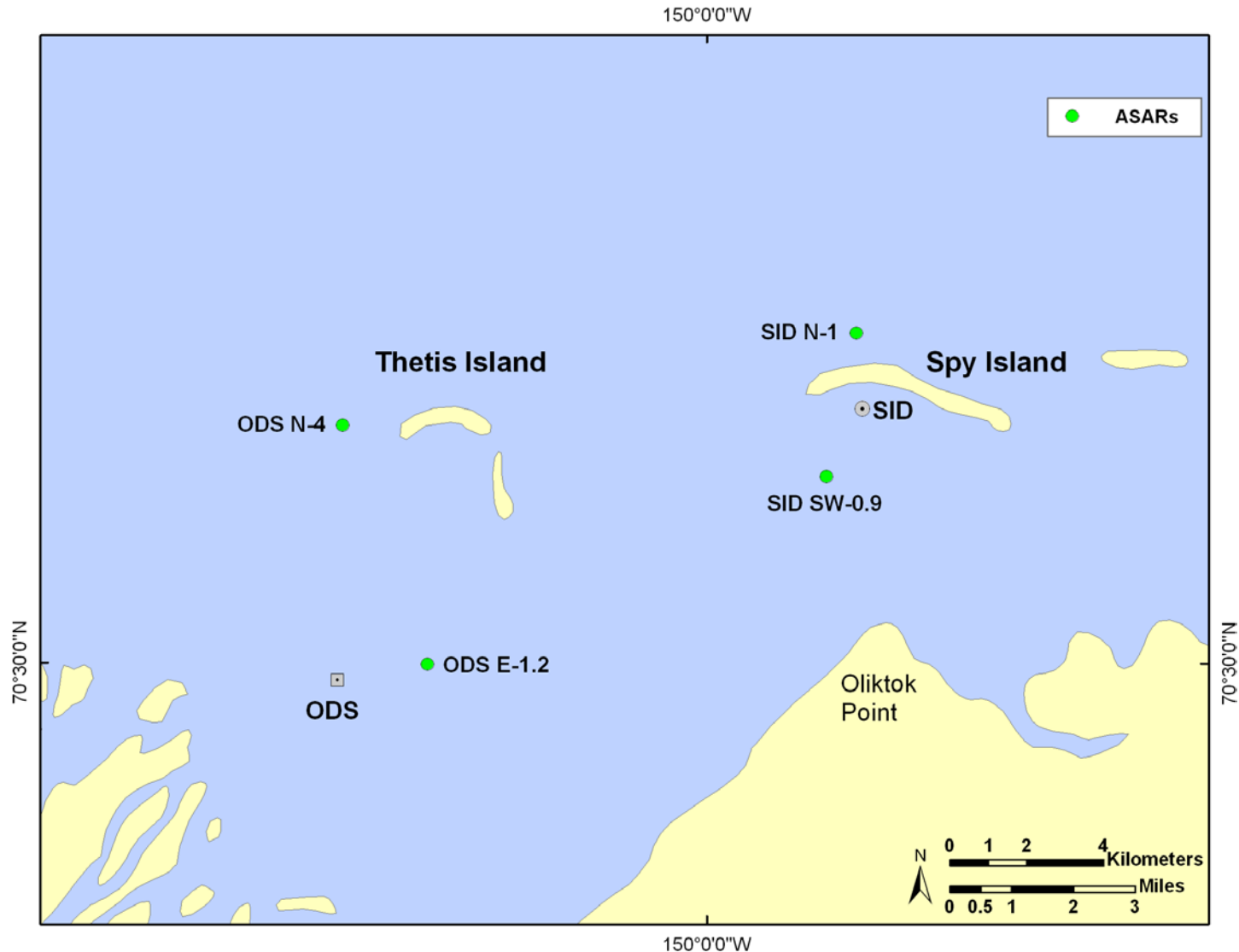
April 7, 2009

- Final facility checkout
- Development drilling
- Transportation operations (helicopter & vessels)
- Oil production



1. Monitor in-water sound with ASARs near and distant ODS and vessels
2. Sounds and spectral content of vessels
3. Characterize distribution of whale calls with DASARs
4. Characterize distribution of whales from aerial survey

# Monitor In-Water Sounds

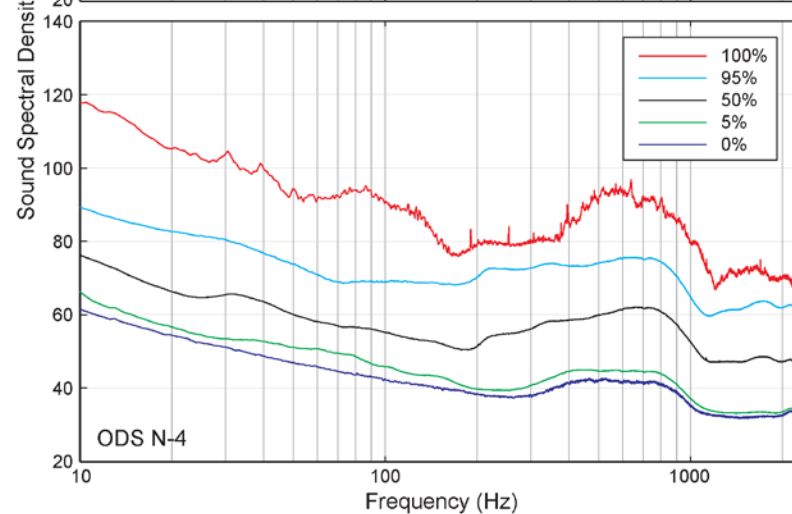
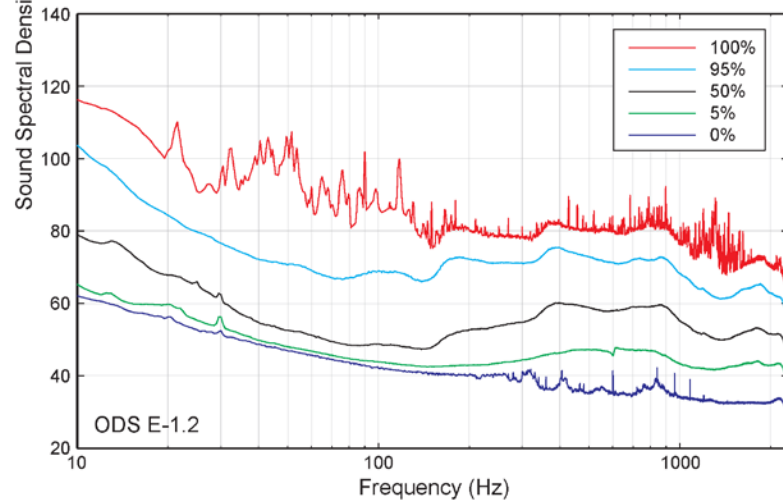
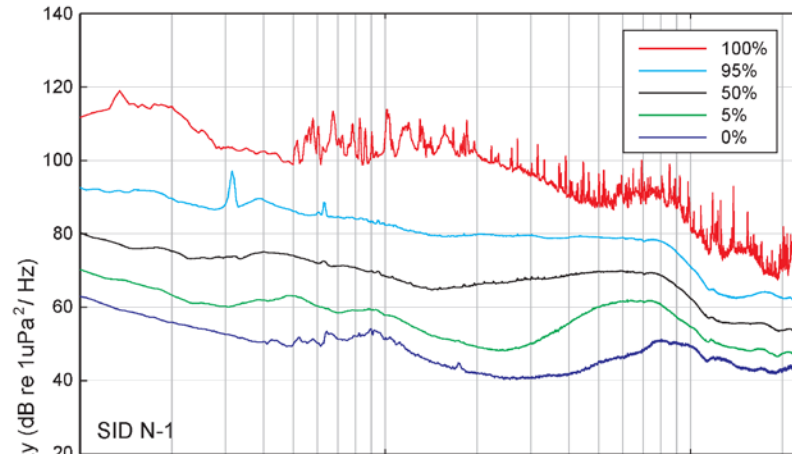
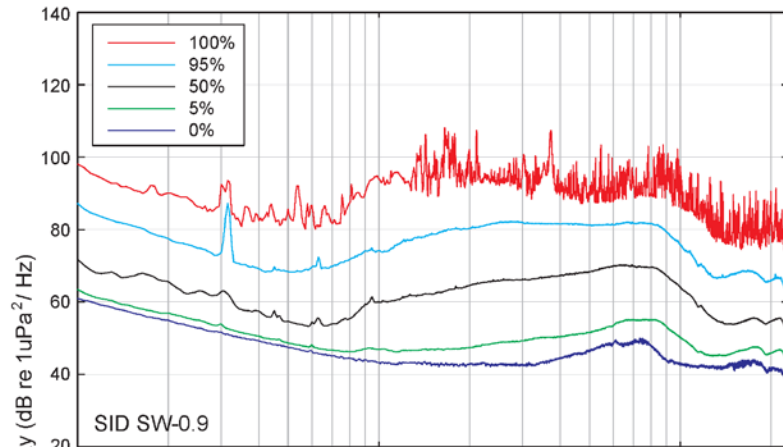


## ASAR Locations

- **Four ASARs deployed August 11 - September 25**
- **Searched for drilling noise**
  - Examined 0.1-10 Hz band for 45 day record
  - Drill string should have produced 1-2.3 Hz tone
  - No drilling tones were detected on all four ASARs
- **Searched for machinery noise**
  - Examined 10-2300 Hz band for 45 day record
  - No sounds from machinery were detected

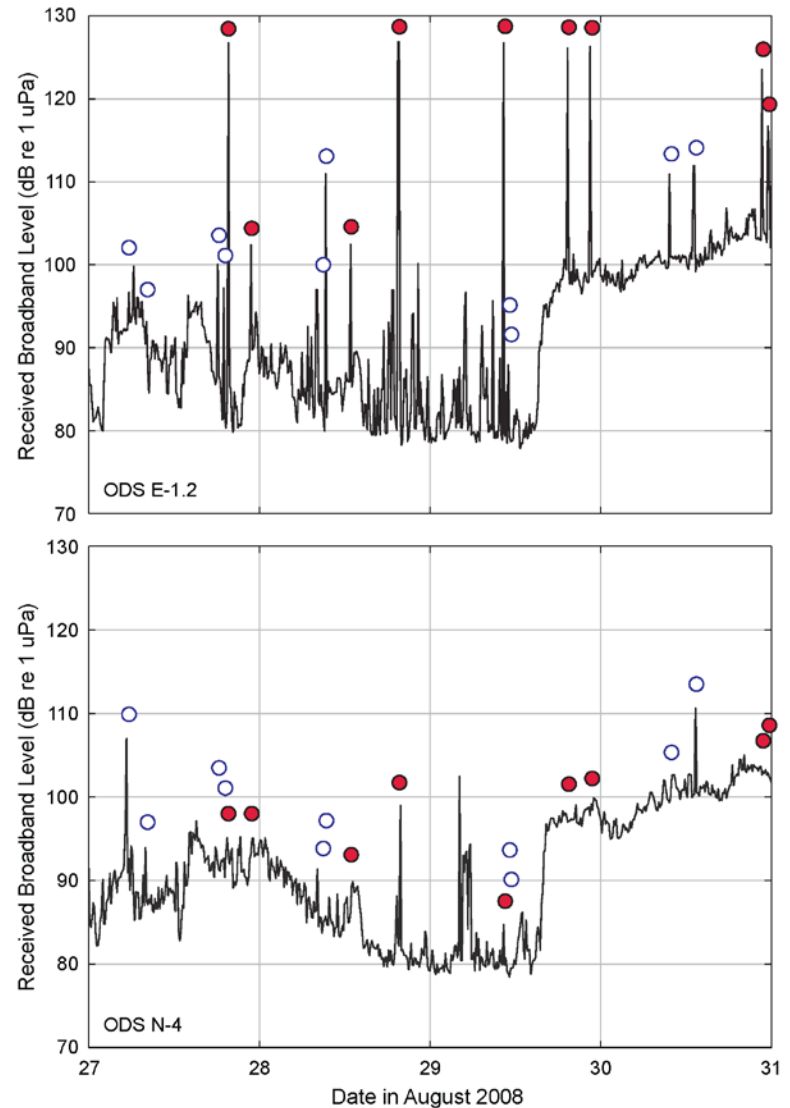
# ASAR Data (10-2300 Hz)

## Statistical sound pressure spectral densities near drillsite ASARs





- Characterized sounds from vessels
  - GPS units on vessels
  - Detected vessels at ASAR ODS E-1.2
  - Sounds at or below ambient conditions at ASAR ODS N-4



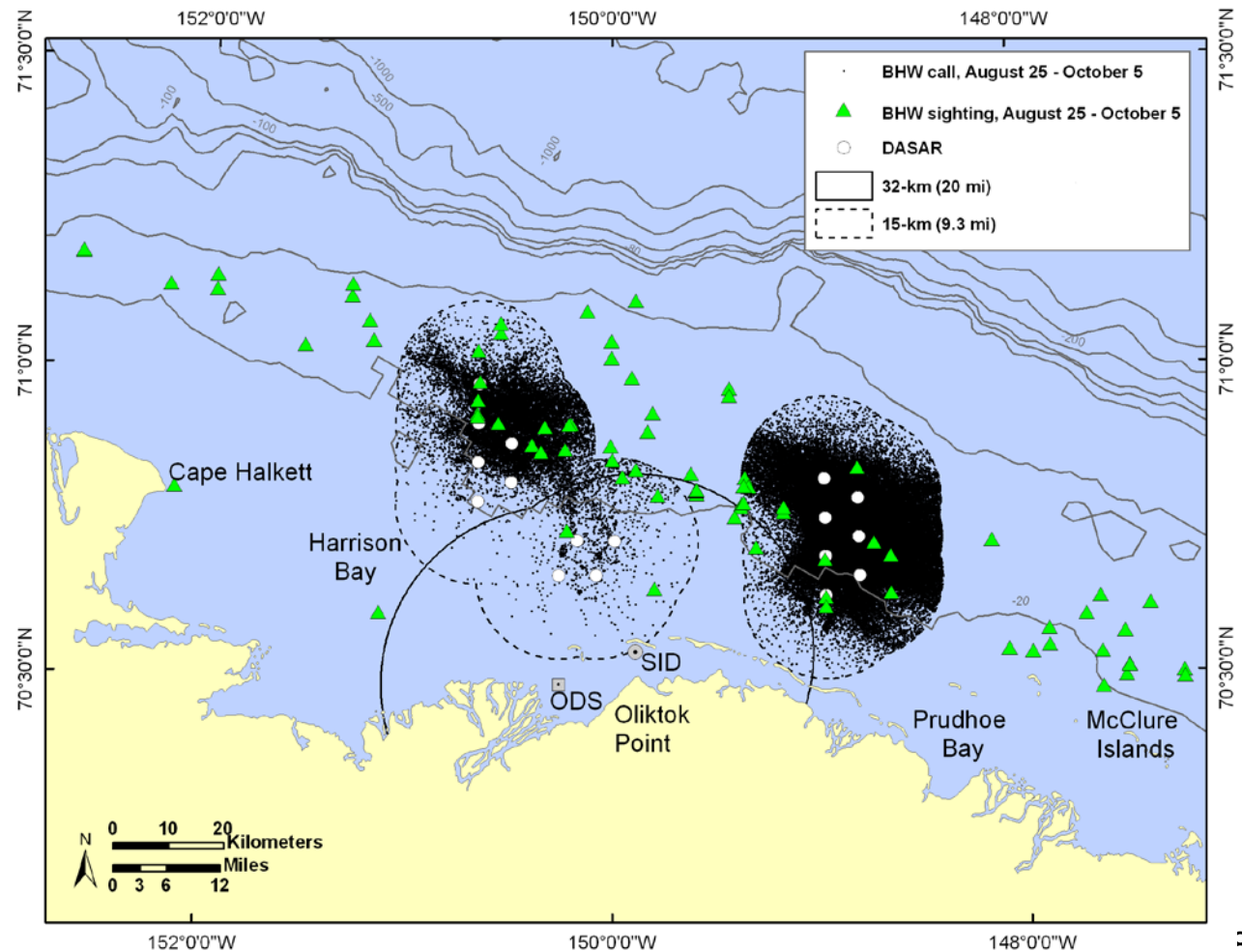
- Support vessels estimated at 100 db at 2 miles
- Barge estimated at 100 db at 2.3 miles

| Vessel Name         | Transit Speed |      | Range to sound pressure levels (in m, units dB re 1 $\mu$ Pa ) |     |     |      |               |
|---------------------|---------------|------|--|-----|-----|------|---------------|
|                     | km/h          | kt   | 140  | 130 | 120 | 110  | 100           |
| American Resolution | 33.6          | 18.2 | 51   | 140 | 400 | 1100 | 3100 (1.9 mi) |
| American Pioneer    | 25.8          | 13.9 | 28   | 85  | 260 | 780  | 2400 (1.5 mi) |
| Snow White          | 25.2          | 13.6 | 67   | 170 | 440 | 1100 | 2900 (1.8 mi) |
| MV Stryker          | 9.1           | 4.9  | 200  | 410 | 850 | 1800 | 3700 (2.3 mi) |



# Whale Calls & Aerial Surveys Results

- Collaborated with Shell & Eni on Site 1 DASAR array and aerial survey



- No drilling tones detected
- Vessel sounds at or below ambient conditions near the barrier islands
- Call analysis and aerial surveys detected few bowhead whales within 20 miles of the ODS
- Vessel and drillsite sounds did not overlap with whale locations

# Proposed Vessel Route 2009

