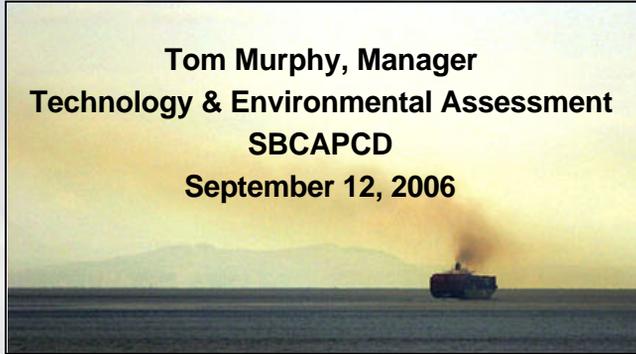
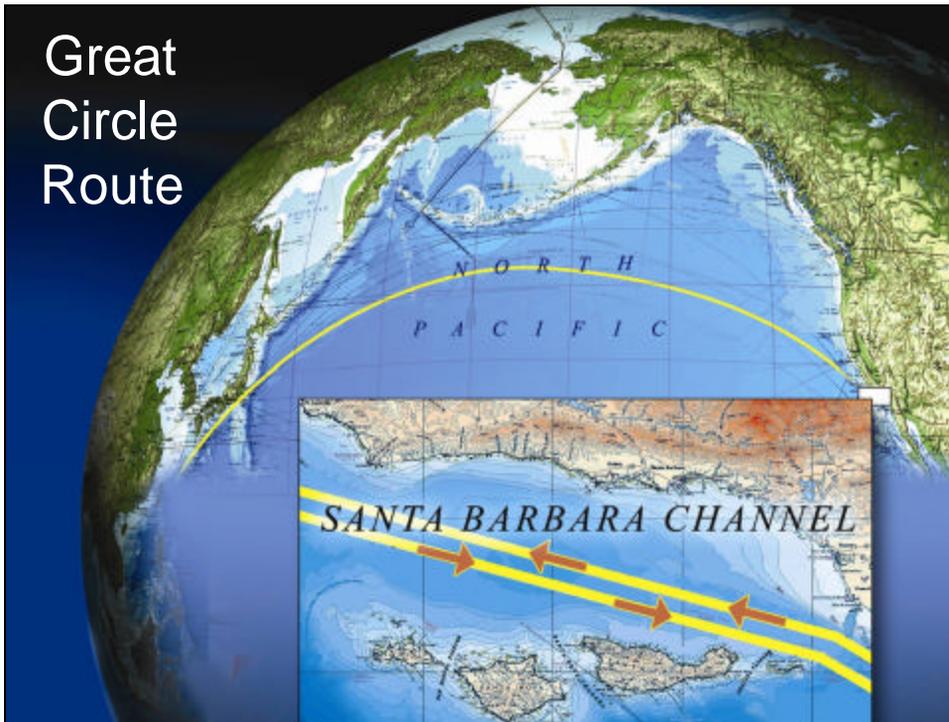


Marine Shipping Emissions Maritime Working Group Meeting

Tom Murphy, Manager
Technology & Environmental Assessment
SBCAPCD
September 12, 2006



Great
Circle
Route

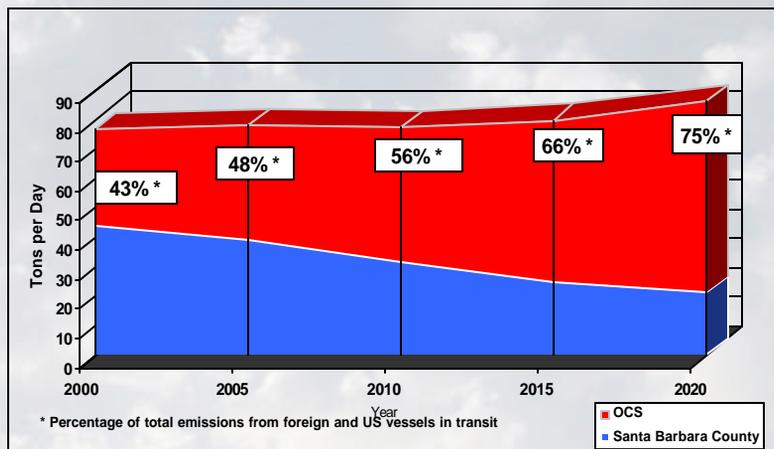


Santa Barbara Case Study

- Over 7,000 annual transits
- 130 miles of coastline
- Large 2-stroke engines
- Vessels burning heavy bunker fuels
- Majority of the vessels are foreign flagged
- Trade volumes expected to continue increasing



Santa Barbara County NOx * Emission Forecast



* NOx = Onshore + OCS

Santa Barbara Marine Emissions Inventory

2005 SB Marine Inventory

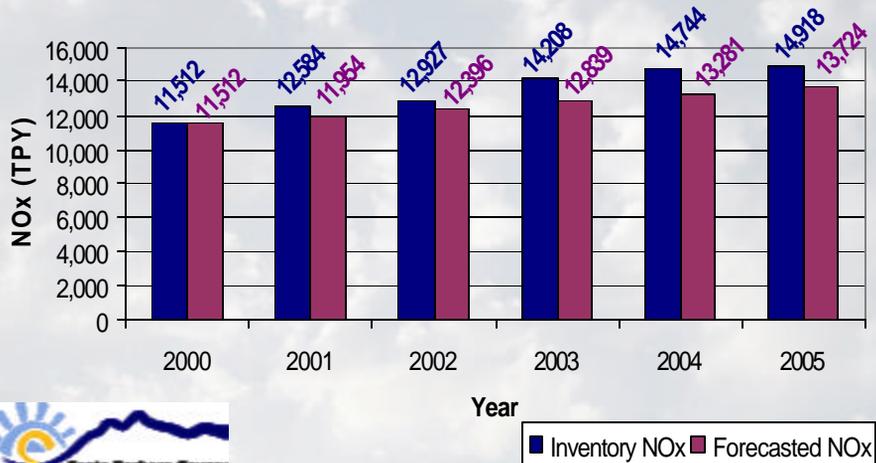
- 7,086 Transits
- 14,918 Tons of NOx
- 10% of the vessels were responsible for about 56% of the total NOx emissions
- 83% of all of the NOx emissions from container ships
- 92% of the NOx emissions from foreign-flagged vessels

Comparing the SB inventories for 2000 and 2005

- 8% increase in the annual number of vessels
- 10% increase in annual transits
- 35% increase in annual installed power
- 30% increase in annual NOx emissions



Santa Barbara Marine Emissions Inventory vs. Forecast



Demonstration Project

APL Singapore



Vessel Information	
Vessel	APL Singapore
Ship type	Containership
TEU Capacity	5,108
Flag	United States
Built	1995

Engine Information	
Engine	MAN B&W
Model	11K90MC-C
Type	2-Stroke
Engine power	66,398 hp

2005 Santa Barbara Impact (Source: SB Inventory)	
Transits	19
NOx rank	43 (out of 1,468 vessels)
NOx emissions	67 Tons
PM emissions	5 Tons
SOx emissions	46 Tons

Demonstration Project

Emission Control Technologies

- **Technologies:**
 - Fuel-water emulsification system
 - Slide valves
- **Project Cost:**
 - About \$780,000 for hardware + Installation
 - CARB Carl Moyer multi-district funding award (2005)
 - Contract between APL and BAAQMD
- **Annual Emissions Reductions in CA Coastal Waters:**
 - NOx = 65 TPY, PM = 4 TPY
 - CA weighted Moyer cost-effectiveness = \$1,370/ Ton
- **Participants:** APL, BAAQMD, SLOAPCD, VCAPCD, SBCAPCD, EPA, CARB, MARAD, PoLA, PoLB, MAN B&W



Demonstration Project Emissions Testing

- **Cost:** About \$100,000
- **Emissions Testing:**
 - **Pollutants:** NO_x, PM, SO_x, HC, CO, CO₂
 - Various vessel operating modes
 - Fuel oil and lube oil analysis
 - In-use, ocean-going vessel emissions testing protocol
- **Funding Partners:**
 - PoLA and PoLB
 - VCAPCD, SLOAPCD and SBCAPCD
- **Testing Contractors:**
 - UC Riverside and MAN B&W



Questions ?



Photo by Steve Ringman, [The Seattle Times](#)