

AIR QUALITY MANAGEMENT AND MARINE VESSEL EMISSIONS ON THE WEST COAST OF CANADA

U.S. Maritime Administration

Workshop on Maritime Energy & Clean Emissions

Washington, D.C. January 29 - 30, 2002

Morris Mennell

Air Quality Management Section

Pacific & Yukon Region



**Environment
Canada**

**Environnement
Canada**

Presentation Outline

- **Air Quality Management in the Vancouver Region**
 - Protecting air quality in a sensitive airshed
- **Ship Emission Initiatives on Canada's West Coast**
 - Technical studies and cooperative action
- **Georgia Basin / Puget Sound International Airshed Planning**
 - Seeking joint solutions to common problems

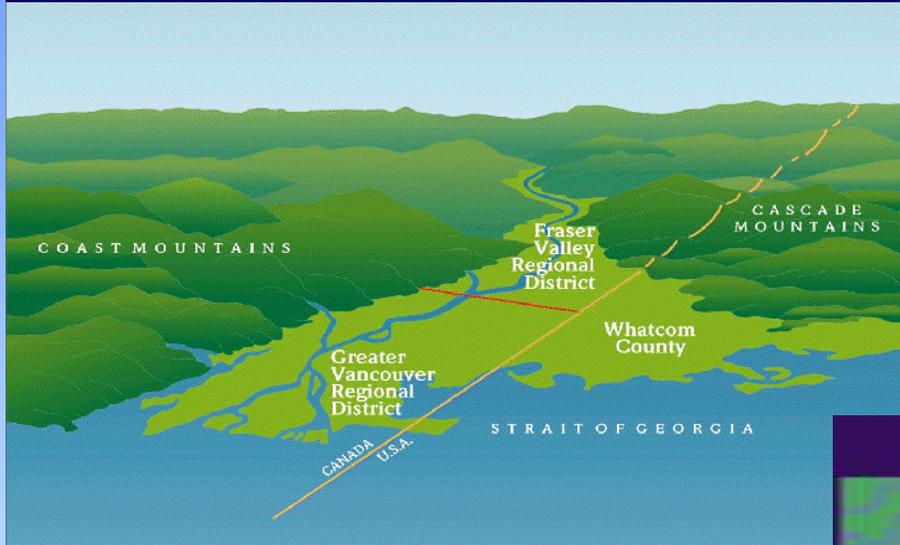
The Port of Vancouver

- **Setting**
 - Natural deep harbour on 150 km of shoreline
 - Major economic contributor in city of 2 million
- **Cargo**
 - 26 terminals with 57 berths
 - 75 million tonnes of cargo per year
- **Cruise Ships**
 - 320 sailings per year
 - 1 million revenue passengers



Georgia Basin / Puget Sound International Airshed

Georgia Coast Cascade Air Basin



Georgia Basin/Puget Sound



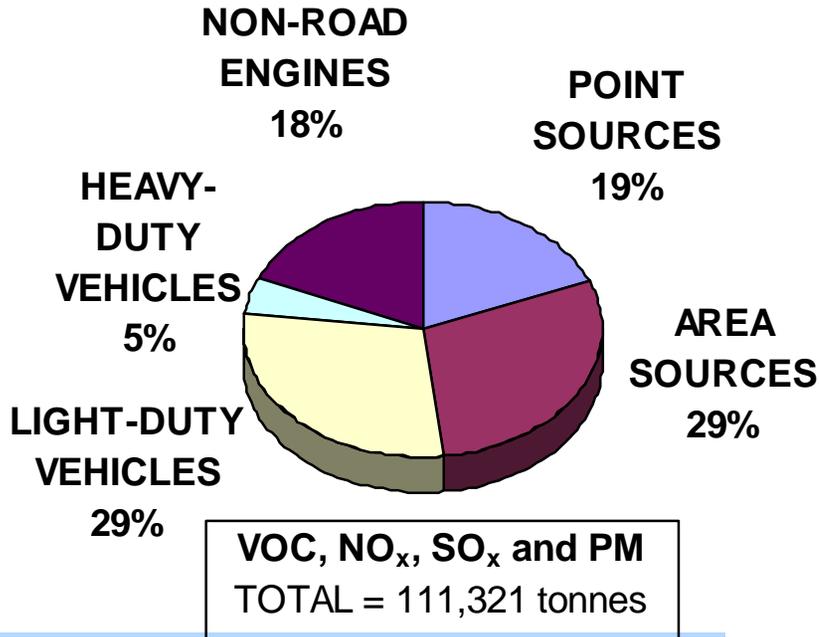
Air Quality Issues in Vancouver Urban Area

- **Citizens place high priority on clean air**
- **Residential and business areas close to emission sources**
- **Geography and meteorology trap emissions**

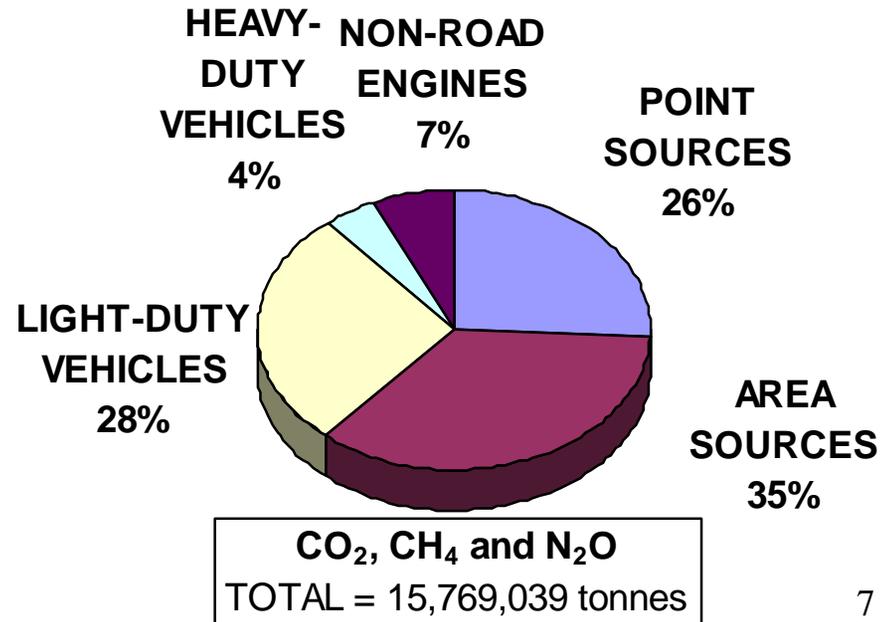
Air Quality Issues in Adjacent Suburban and Rural Areas

- **Pollution transported from urban areas combines with agricultural emissions**
- **Elevated levels of fine particulate & ozone smog**
- **Citizens very concerned about impaired visibility**

1998 Vancouver Region Air Emissions



Greenhouse Gases

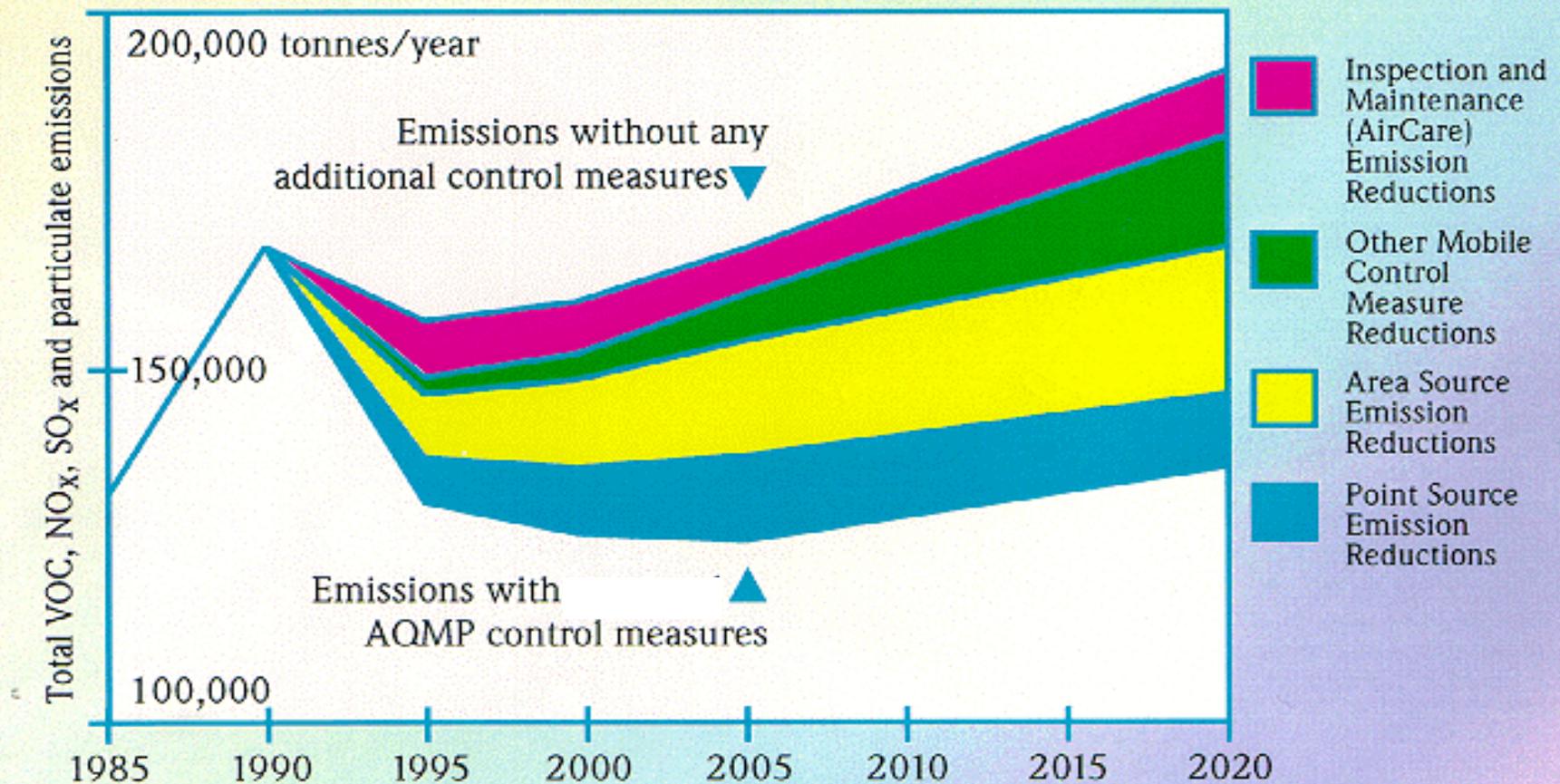


Marine Vessel & On-Road Emissions in the Vancouver Region

	B.C. FERRIES	HARBOUR VESSELS	OCEAN- GOING VESSELS	TOTAL MARINE VESSELS	HEAVY- DUTY VEHICLES	LIGHT- DUTY VEHICLES
VOC	68	143	149	360	668	16,053
NOx	204	3,663	5,388	9,255	4,077	15,122
SOx	147	157	7,569	7,873	98	561
PM-10	33	57	449	539	300	334
GHGs	98,684	216,681	268,755	584,120	699,071	4,345,749

- Light-duty and heavy-duty vehicle emission data from year 1999 GVRD Emission Inventory Report.
- B.C. Ferry, harbour vessel and ocean-going vessel emission data from year 2000 Marine Vessel Emission Inventory Draft Report, Levelton Engineering Ltd., January 18, 2002.

1994 Vancouver Regional Air Quality Management Plan



Ship Emission Initiatives on Canada's West Coast

- **Current Emission Criteria**
 - **Canada Shipping Act: 20% opacity limit**
 - **Stringent regulation of cargo loading emissions**
 - **Sulphur content of locally available fuels**
 - **Marine diesel: avg. 0.13% and max.0.3% S**
 - **Residual fuel oil: ~2.5% S**
- **Technical Studies**
 - **Marine vessel emission inventories**
 - **1997/1998 marine vessel emission test project**
 - **Joint technology demonstration project with shipowner(s) to evaluate NO_x emission control process.**

Environment Canada

Marine Vessel Emissions Test Project



- **Project Objectives**

- Measure ship emissions in port & Georgia Basin
- Provide new data to verify emission factors
- Compare results with Lloyd's Registry studies and proposed IMO standards

- **Marine Vessels Participating in the Project**

No. of Vessels	Vessel Type	Avg. Engine Rating / rpm
9	Cargo & Container	31,876 hp @ 114 rpm
1	Car Ferry	5,850 hp @ 425 rpm
2	Cruise Ship	11,586 hp @ 514 rpm
1	Work Boat (Tug)	1,900 hp @ 1200 rpm

Ship Emission Test Sequence

Auxiliary Engines:



Dock-side

Main Engines:



Maneuvering



Low Speed Cruise



Normal Cruise



1997 Ship Emission Test Results

VESSEL NAME	TYPE	SPEED (rpm)	NITROGEN	OXIDES (NO _x)	EMISSIONS
			kg / tonne fuel	g / kW-hr	Proposed IMO
<u>MANEUVERING</u>					
Mozu Arrow	Cargo	70	57	8.14	17.00
Star Davanger	Cargo	75	35	4.38	17.00
Seaboard Skauboard	Cargo	71	54	5.59	17.00
<u>LOW CRUISE</u>					
Charles H. Cates I	Tug	1,000	45	11.49	11.30
Mozu Arrow	Cargo	80	59	12.66	17.00
Star Davanger	Cargo	95	39	4.61	17.00
Seaboard Skauboard	Cargo	101	55	5.57	17.00
<u>NORMAL CRUISE</u>					
Charles H. Cates I	Tug	1,600	49	12.83	10.29
Mozu Arrow	Cargo	90	83	16.52	17.00
Star Davanger	Cargo	133	52	10.81	17.00
Seaboard Skauboard	Cargo	125	85	12.42	17.00
<u>PUSHING</u>					
Charles H. Cates I	Tug	1,800	65	16.78	10.05

Marine Vessel Emissions Initiative

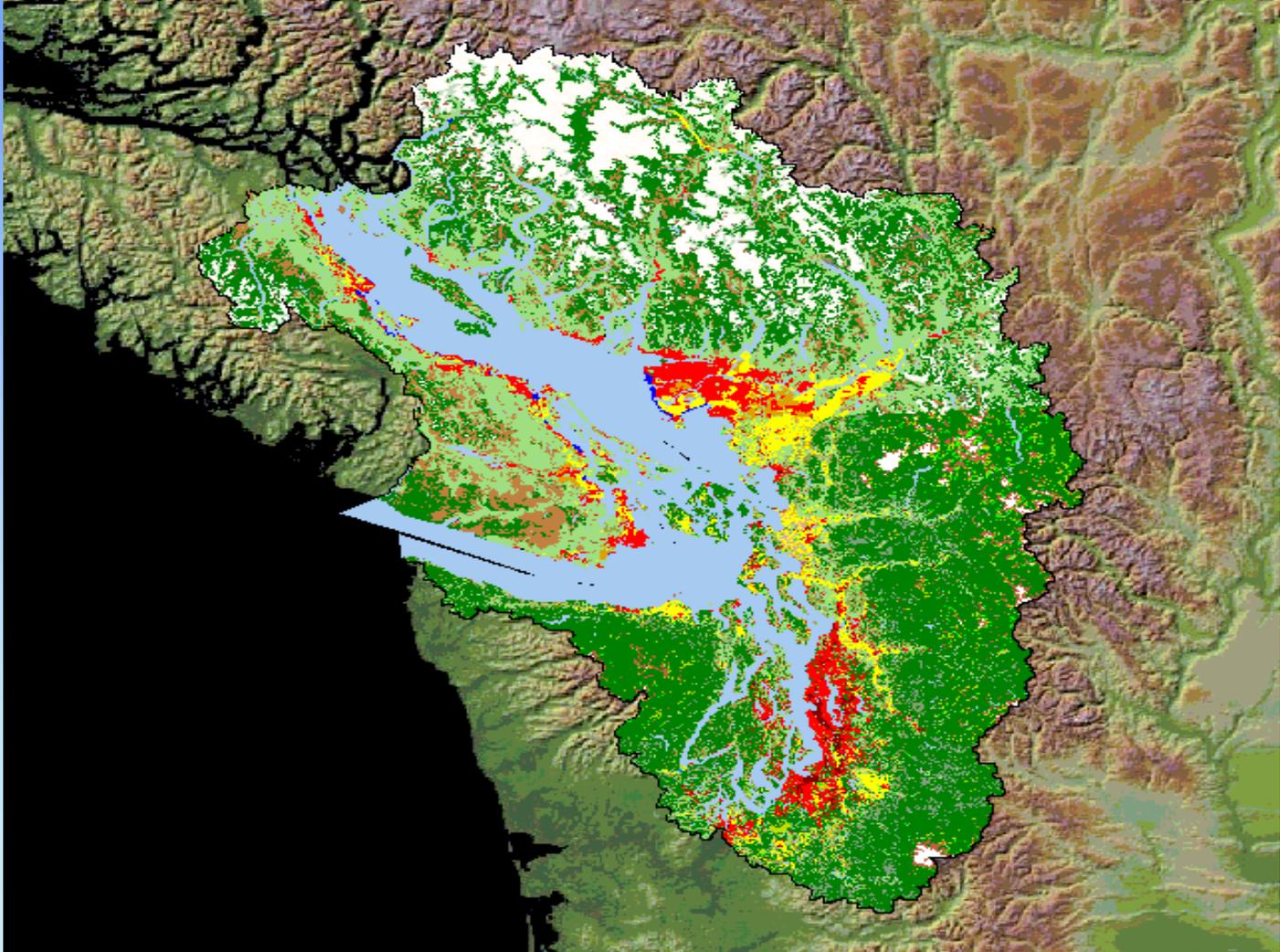
• **Next Steps**

- Evaluate marine fuel quality options
- Review marine vessel environmental measures of U.S. federal government and west coast States
- Explore need for Environmental Code of Practice for cruise ship industry operating out of B.C. Ports
- Propose voluntary adoption of low-sulphur marine fuel in the Georgia Basin and Puget Sound
- Initiate action for an IMO designation as a Special Area in which international shipping must use fuels with less than 1.5% sulphur

• **Longer-term Challenge**

- New measures have been announced for reduction of light-duty and heavy-duty vehicle engine emissions and sulphur content of motor vehicle fuels
- As a consequence, marine vessels in large ports near cities could become an ever larger percentage of the source of harmful urban air pollutants

Georgia Basin / Puget Sound International Airshed Planning



Purpose of the GB/PS International Airshed Plan

**To develop an international action plan
based on:**

- **a common understanding of the airshed,**
- **agreed upon results to be achieved,**
- **and a coordinated set of actions**

**in advance of developing of a Pacific Northwest
Ozone Annex under the Canada-U.S. Air Quality
Agreement by 2004.**

GB/PS International Airshed Plan Progress to Date

- **Inclusive Partnership Formed**
 - Federal, state/provincial, regional/local agencies
 - Tribes and 1st Nations
 - Public, NGOs, business/industry stakeholders later
- **Statement of Intent Drafted**
- **Early Actions Initiated**
 - Airshed Characterization
 - Common Database
 - Clearinghouse of Current Practices
 - Identifying Problems and Fixing Them
 - Clean Vehicles and Fuels
 - Transboundary New Source Review

GB/PS International Airshed Plan Path Forward

ACTION:

Airshed Characterization



**Plans of
partners**



**Action Plan to achieve
air quality goals**



**Pacific Northwest
Ozone Annex - 2004**

Presentation Summary

AQ Management in the Vancouver Region

A very sensitive airshed with cleaner air than 1980's but challenged by rapid growth in population and motor vehicles

Marine Vessel Emissions

A significant source of SO_x and NO_x in the port which needs to be addressed in the context of an regional air plan.

Georgia Basin / Puget Sound International Airshed Plan

Work initiated on a transboundary plan to solve common problems and inform a decision on a western Ozone Annex



Presentation Summary

- **AQ Management in the Vancouver Region**
 - A very sensitive and constrained airshed
 - Air quality is better, but public want more action
 - Continued rapid growth is a challenge
- **Marine Vessel Emissions**
 - A significant source of regional SO_x and NO_x
 - Ship emission reductions in ports are needed
 - More focus on ship emissions in Vancouver as other transportation sources are reduced
- **GB/PS International Airshed Plan**
 - All agree to work together on common problems
 - The plan will inform a decision on West Ozone Annex
 - Transborder early actions are underway