Illinois Emissions Inventory Review

St. Louis
November 19, 2004

- 2002 Periodic Inventory and Milestone Demonstration
- LADCO's Efforts to Identify Candidate Control Measures
- Candidate Control Measures

Illinois
Environmental
Protection Agency

Bureau of Air
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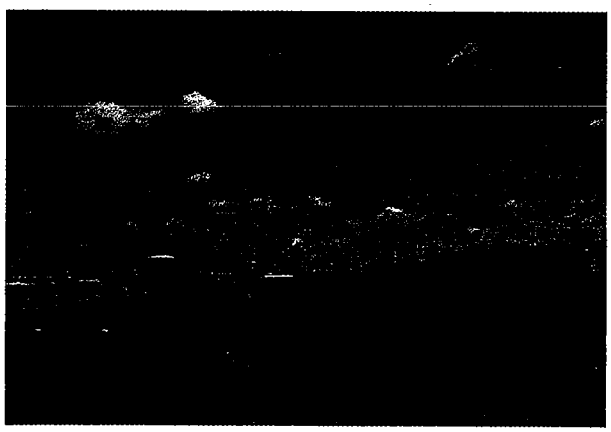
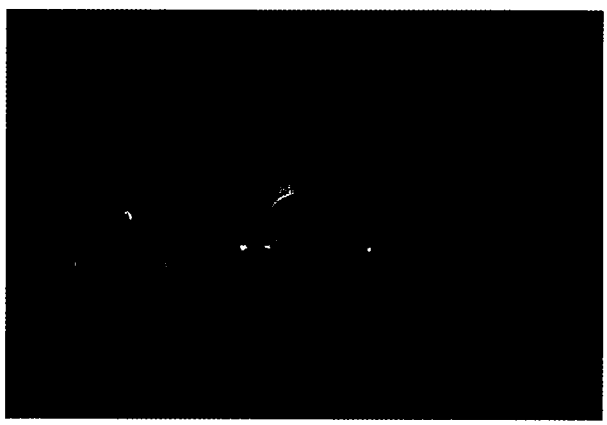
November 2004

IEPA/BOA/04-023

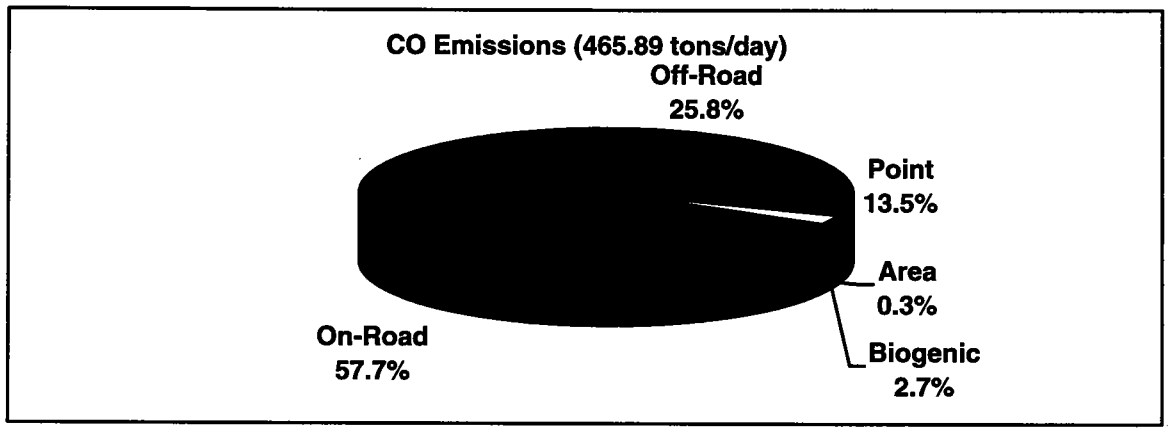
Illinois Periodic Emission Inventory and Milestone Demonstration for 2002

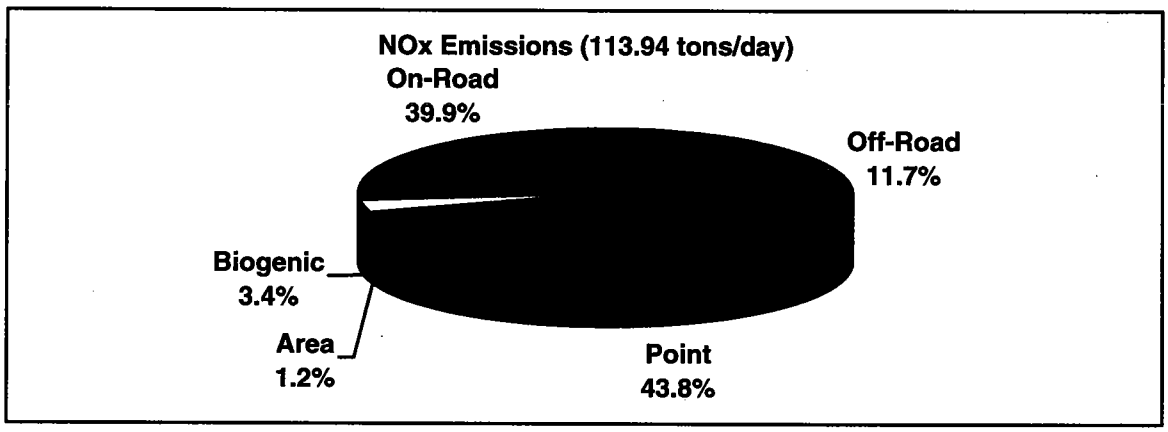




Governor Rod R. Blagojevich
Director Renee Cipriano

Figure 2-6: Metro-East NAA Ozone Precursor Emissions (tons/day)





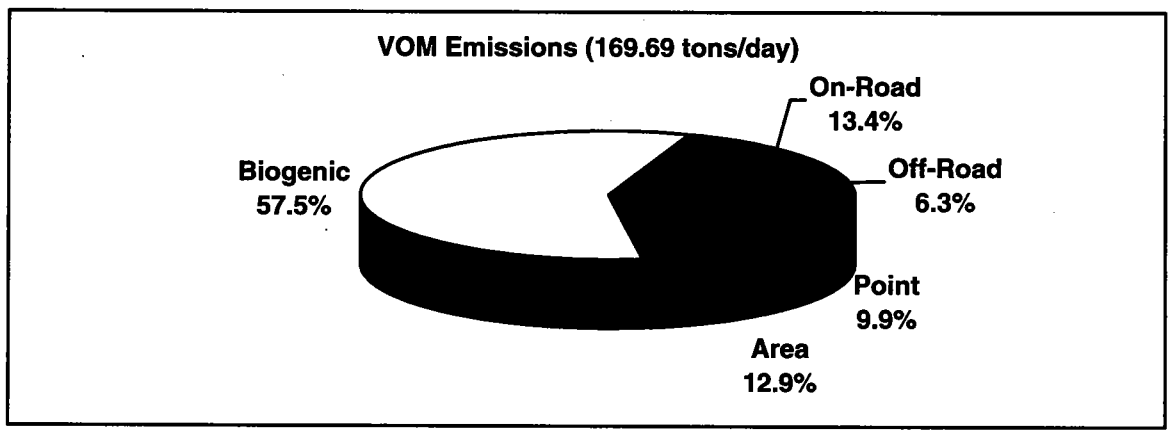
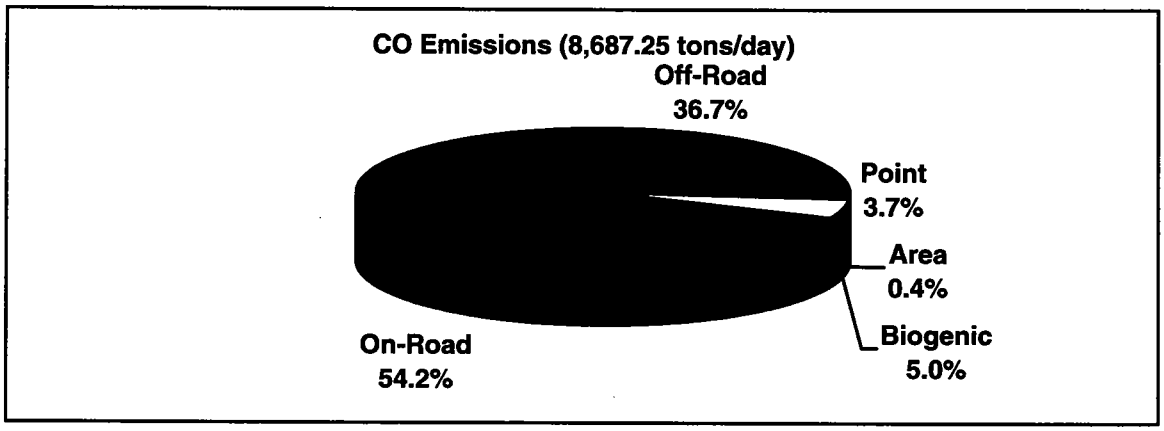
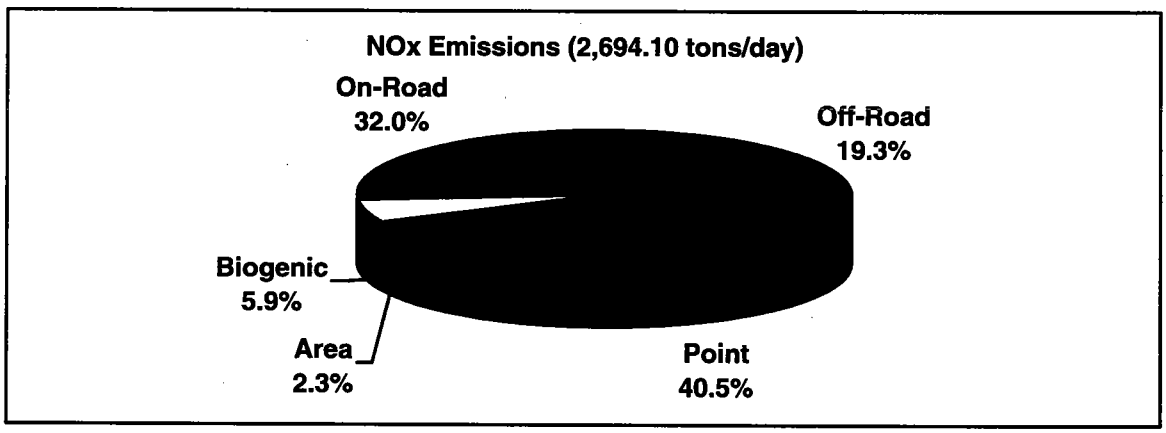


Figure 2-8: Statewide Ozone Precursor Emissions (tons/day)





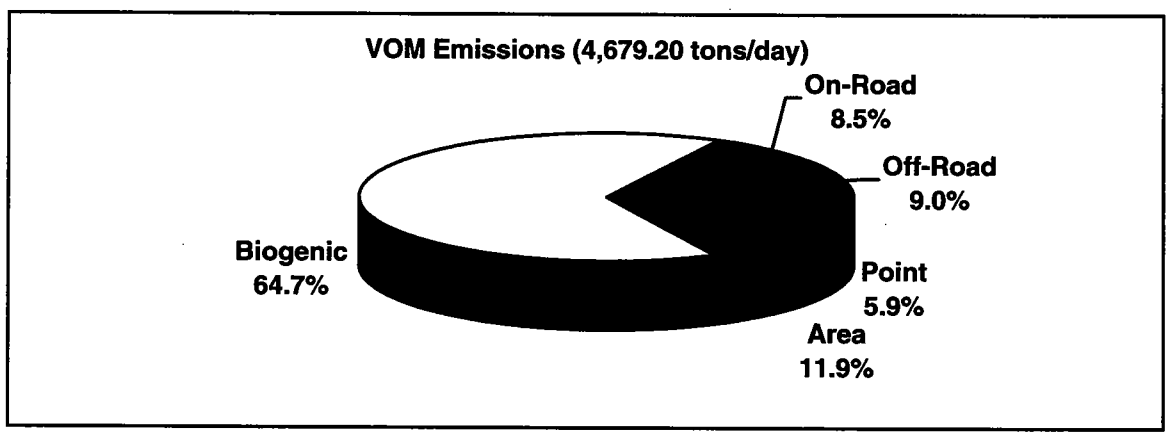
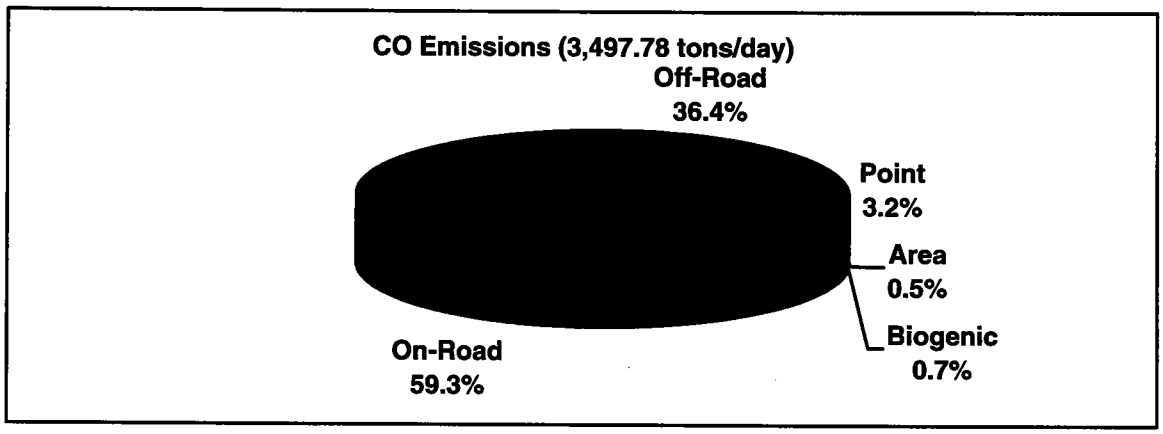
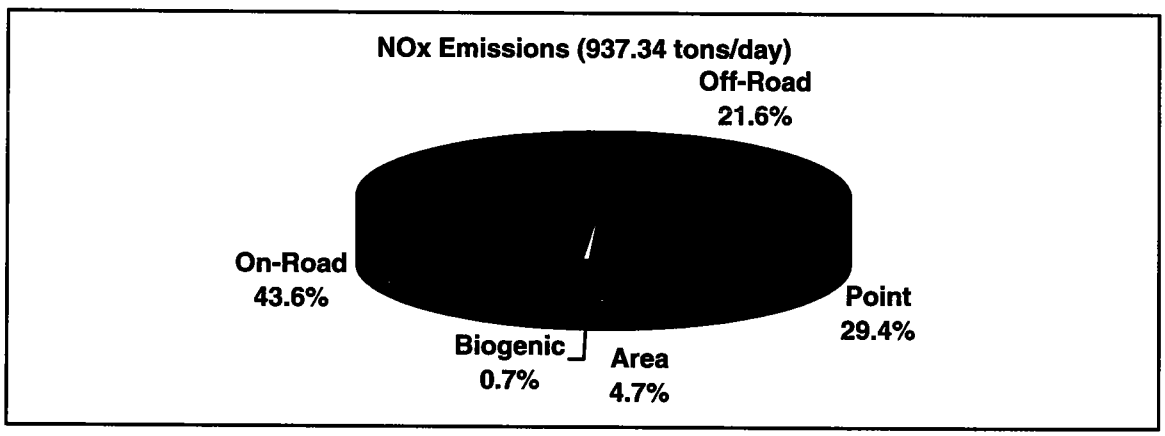


Figure 2-5: Chicago NAA Ozone Precursor Emissions (tons/day)





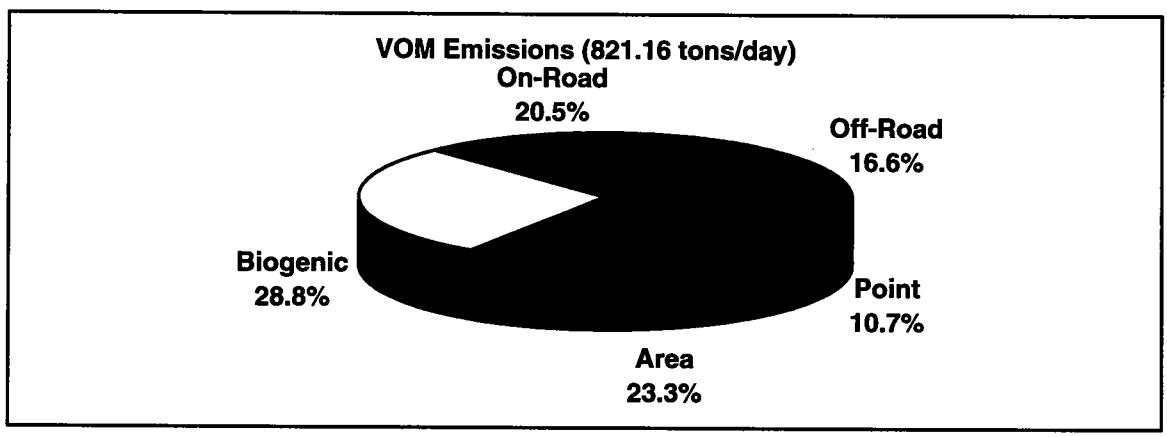
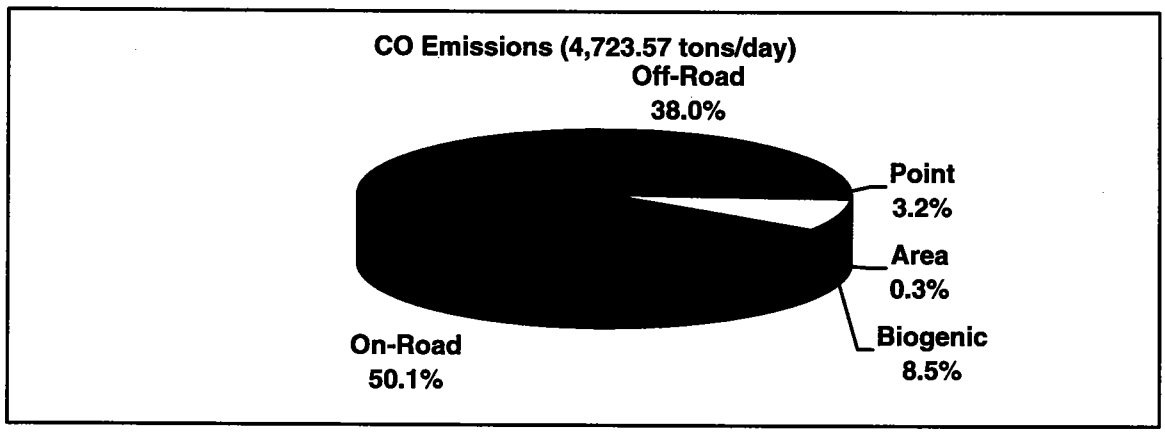
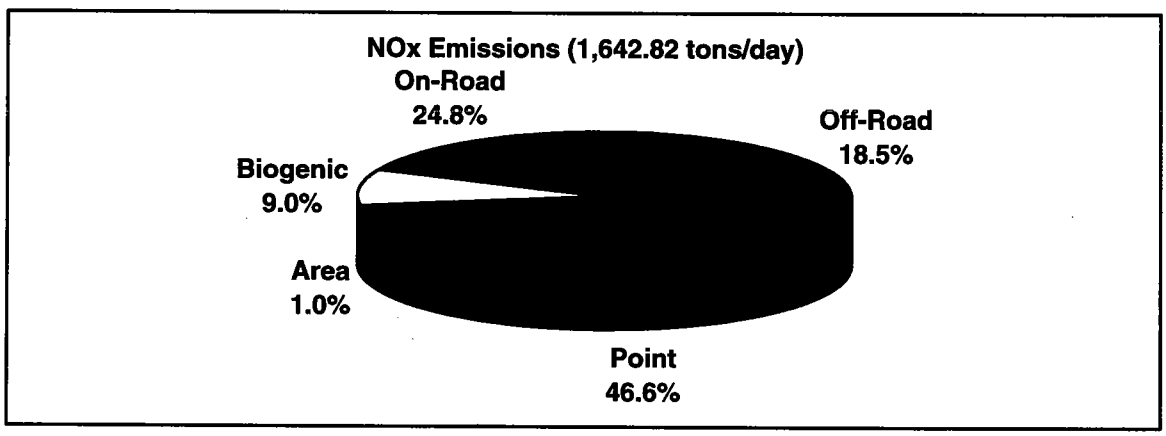


Figure 2-7: Attainment Area Ozone Precursor Emissions (tons/day)





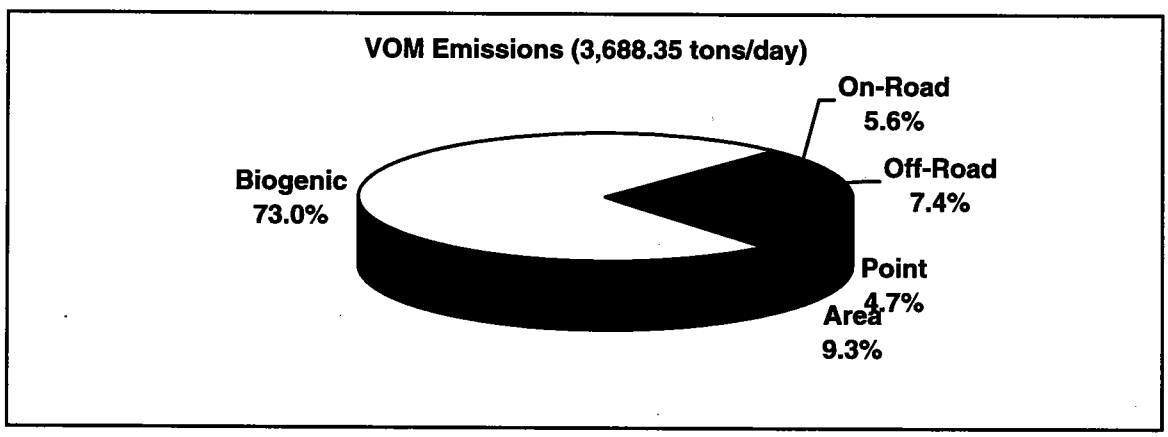
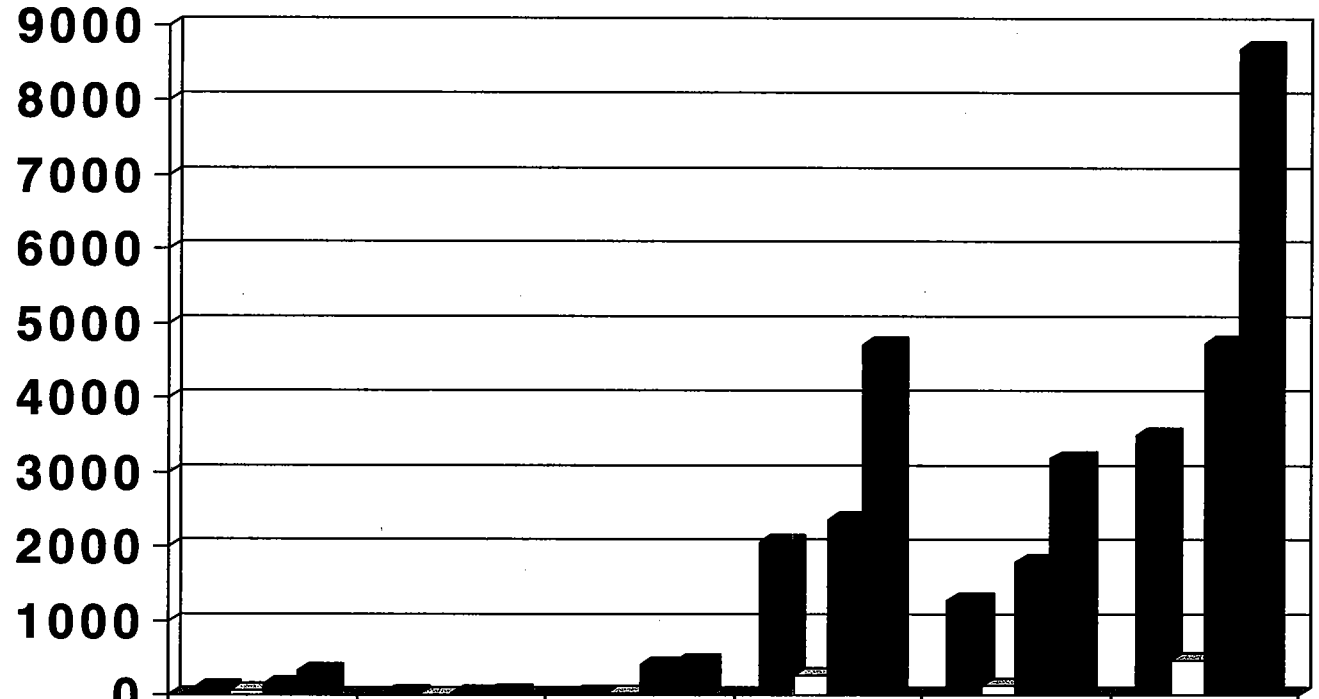
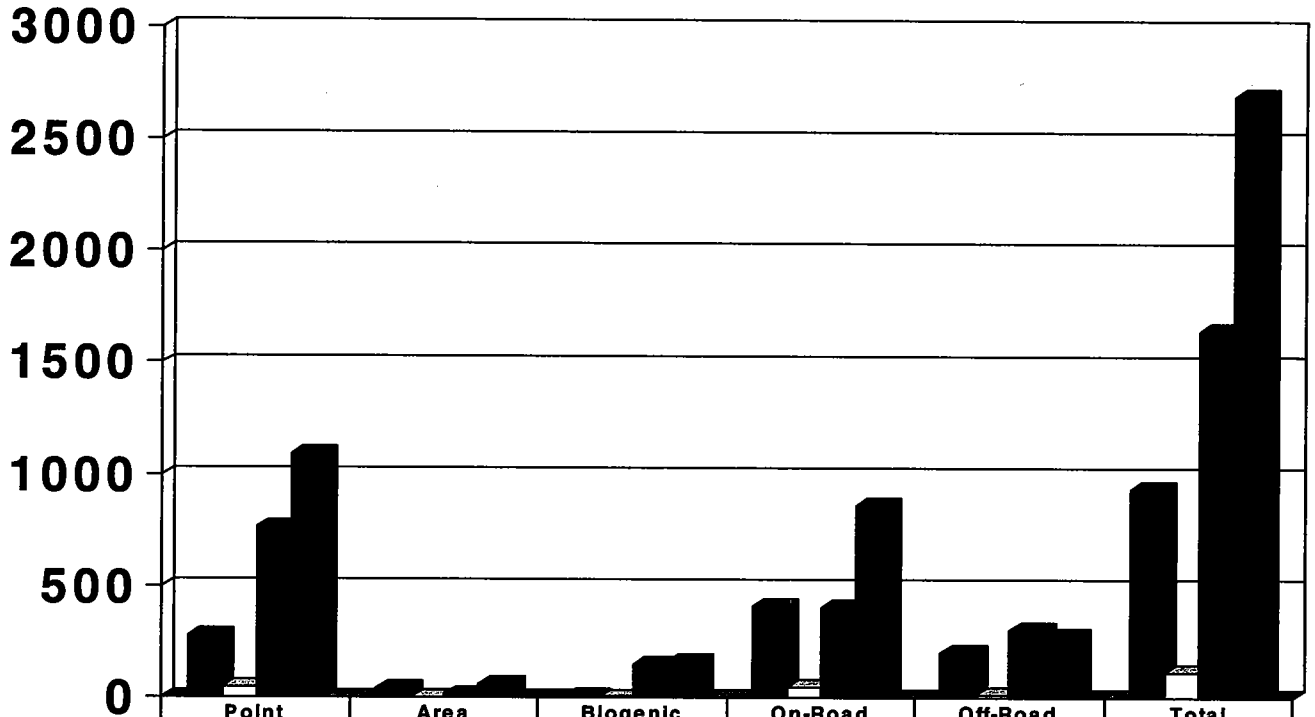


Figure 2-1: Illinois 2002 CO Emission Summary (tons/day)



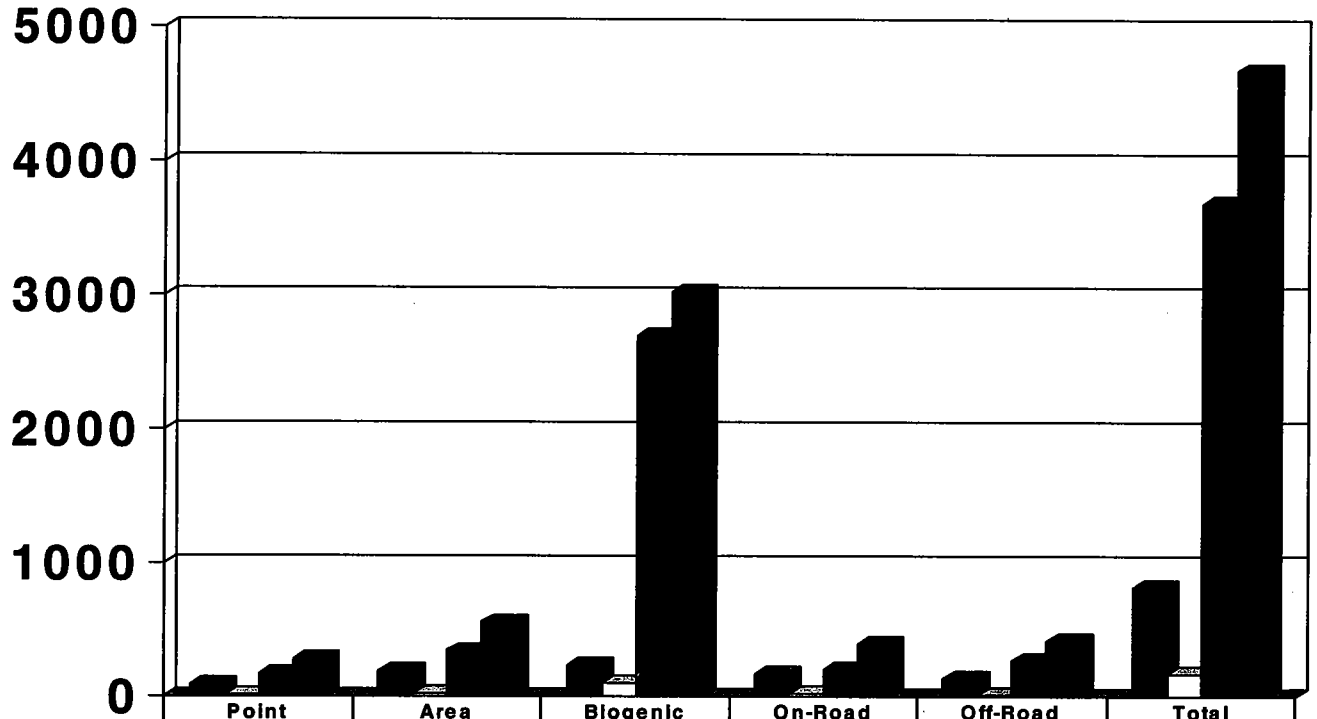
	Point	Area	Biogenic	On-Road	Off-Road	Total
Chicago	110.52	18.47	23.74	2072.52	1272.53	3497.78
Metro East	62.85	1.41	12.55	268.88	120.2	465.89
Attainment	150.97	14.03	400.44	2364.82	1793.31	4723.57
Statewide	324.35	33.91	436.73	4706.22	3186.04	8687.25

Figure 2-2: Illinois 2002 NOx Emission Summary (tons/day)



	Point	Area	Biogenic	On-Road	Off-Road	Total
Chicago	275.73	43.73	6.83	409.01	202.04	937.34
Metro East	49.91	1.4	3.84	45.45	13.34	113.94
Attainment	765.05	17.15	148.58	407.42	304.62	1642.82
Statewide	1090.69	62.28	159.25	861.88	273.99	2694.1

Figure 2-3: Illinois 2002 VOM Emission Summary (tons/day)



	Point	Area	Biogenic	On-Road	Off-Road	Total
■Chicago	88.14	191.57	236.71	168.35	136.39	821.16
□Metro East	16.85	21.83	97.54	22.73	10.74	169.69
■Attainment	173.24	343.21	2691.83	206.08	273.99	3688.35
■Statewide	278.23	556.61	3026.08	397.16	421.12	4679.2

Table 6-3: 2002 Anthropogenic Ozone Inventory Typical Summer Day Emissions (tons/day)

	Point	Area	On-Road	Off-Road	Total
Chicago NAA					
CO	110.52	18.47	2,072.52	1,272.53	3,474.04
NOx	275.73	43.73	409.01	202.04	930.51
VOM	88.14	191.57	168.35	136.39	584.45
Metro-East NAA					
CO	62.85	1.41	268.88	120.20	453.34
NOx	49.91	1.40	45.45	13.34	110.10
VOM	16.85	21.83	22.73	10.74	72.15
Attainment Area					
CO	150.97	14.03	2,364.82	1,793.31	4,323.13
NOx	765.05	17.15	407.42	304.62	1,494.24
VOM	173.24	343.21	206.08	273.99	996.52
Statewide					
CO	324.35	33.91	4,706.22	3,186.04	8,250.52
NOx	1,090.69	62.28	861.88	520.00	2,534.85
VOM	278.23	556.61	397.16	421.12	1,653.12

Table 6-4: ROP Target, Projected and Actual VOM and NOx Levels Typical Summer Day Emissions (tons/day)

Year	Chicago NAA VOM			Attainment Area NOx		
	Target	Projected	Actual	Target	Projected	Actual
1990			1,216.56			2,085.80
1996	857.02	835.81	770.93	1996.56	1723.97	1,747.94
1999	807.82	772.72	667.58	1820.51	1632.81	1,746.10
2002	770.11	647.64	584.45	1657.23	1538.83	1,494.24
2005	740.92	613.47		1514.41	1019.35	
2007	729.13	591.58		1412.76	977.17	

These values are presented graphically below in Figures 6-1 and 6-2.

LADCO's Efforts to Identify Candidate Control Measures

Project Overview

- Candidate Control Measures
  - **Identify potential emission reduction measures**
  - Conduct technical and cost analysis
  - Fresh assessment of RACT for VOC and NOx

- BART Regional Engineering Analysis
  - Prioritize non-EGU source categories
  - Identify potential emission reduction measures
  - Recommend approach for BART analysis
  - Implement BART approach for specific sources

Control Strategy Scenarios

- On-the-Books (OTB)
- On-the-Way (Proposed, not Final)
- Candidate Control Measures

“On the way” Controls

- Proposed CAIR
- Measures in EPA’s proposed implementation guidance for ozone and PM

Format for White Papers

- **Source Category Description**
- **Regulatory History**
- **Description of Candidate Control Measures**
- **Expected Emission Reductions**
- **Cost Effectiveness and Basis**
- **Geographic/seasonal Applicability**
- **Time Frame for Implementation**
- **Regulatory Implementation Issues**
- **Other Impacts**
- **References**

Update on Fresh Assessment of RACT

- Review basis for current RACT rules
  - Based on guidance from mid-1990s or earlier
- Compare relative stringency of LADCO state RACT rules to other agencies
  - South Coast, Bay Area, NJ, MD, MA
- Provide recommendations for tightening RACT

Other Contractual Efforts Underway...

- E.H. Pechan – Develop growth and control files for emissions modeling.
- ICF Consulting – Develop growth factors for electric utilities using IPM model.

Candidate Control Measures

2002 TYPICAL SUMMER DAY EMISSIONS OF VOM, NOx and SO_2
Emissions Stated in Tons Per Day (TPD)

Metro East NAA VOM	
SOURCE CATEGORY	VOM (tpd)
Highway Vehicles - Gasoline	21.79
Nonroad - Marine Vessels	9.85
Petroleum Storage/Transport - Industrial	6.10
Nonroad - Gasoline	5.13
Solvents - Pesticide Application	3.91
Solvents - Consumer Solvents	3.56
Nonroad - Diesel	3.10
Solvents - Architectural/Maintenance Coatings	3.09
Solvents - Asphalt Application	3.08
Petroleum Storage/Transport - Service St (Stage I & II)	2.98
Industrial Process - Petroleum Refinery	2.93
Solvents - Degreasing	1.79
Solvents - Industrial Surface Coating	1.67
Waste Disposal & Recycling - Industrial (C/I and landfills added)	1.61
Industrial Process - Metals (Iron)	1.48
Solvents - Graphic Arts	1.37
Nonroad - Railroads	1.34
Highway Vehicles - Diesel	0.94
Fuel Comb. - Industrial	0.72
Industrial Process - Other NEC (includes cement and pulp/paper)	0.60
Solvents - Auto Refinishing	0.47
Fuel Comb. - Utility	0.46
Solvents - Dry Cleaning	0.38
Fuel Comb. - Comm/Inst	0.37
Solvents - Non-industrial Surface Coating (endup with traffic m p)	0.34
Nonroad - Aircraft	0.29
Fires - Structural/Prescribed/Wild	0.14
Waste Disposal & Recycling - Open Burnin	0.07
Industrial Process - Chemical Mfg.	0.06
Fuel Comb. - Residential	0.05
Nonroad - LPG & NG	
Agricultural Crops	
Construction	
Paved Roads	
Unpaved Roads	
Livestock Waste	
Fertilizer Applications	

Metro East NAA NOx	
SOURCE CATEGORY	NOx (tpd)
Highway Vehicles - Diesel	23.66
Fuel Comb. - Industrial	22.55
Highway Vehicles - Gasoline	21.81
Nonroad - Diesel	17.61
Fuel Comb. - Utility	16.31
Nonroad - Railroads	5.36
Industrial Process - Metals (Iron)	4.77
Industrial Process - Petroleum Refinery	3.15
Nonroad - Marine Vessels	1.34
Fuel Comb. - Residential	0.86
Fuel Comb. - Comm/Inst	0.79
Waste Disposal & Recycling - Industrial (C/I and landfills added	0.57
Nonroad - Gasoline	0.42
Industrial Process - Chemical Mfg.	0.30
Nonroad - Aircraft	0.21
Industrial Process - Other NEC (includes cement and pulp/pape	0.14
Fires - Structural/Prescribed/Wild	0.02
Waste Disposal & Recycling - Open Burnin	0.01
Nonroad - LPG & NG	
Solvents - Degreasing	
Solvents - Dry Cleaning	
Solvents - Graphic Arts	
Solvents - Asphalt Application	
Solvents - Pesticide Application	
Solvents - Consumer Solvents	
Solvents - Industrial Surface Coating	
Solvents - Architectural/Maintenance Coatings	
Solvents - Non-industrial Surface Coating (endup with traffic m p)	
Solvents - Auto Refinishing	
Petroleum Storage/Transport - Industrial	
Petroleum Storage/Transport - Service St (Stage I & II)	
Agricultural Crops	
Construction	
Paved Roads	
Unpaved Roads	
Livestock Waste	
Fertilizer Applications	

Metro East NAA SO_2	
SOURCE CATEGORY	**SO_2 (tpd)**
Fuel Comb. - Utility	32.76
Industrial Process - Petroleum Refinery	31.56
Fuel Comb. - Industrial	10.06
Industrial Process - Metals (Iron)	9.41
Industrial Process - Chemical Mfg.	5.19
Highway Vehicles - Gasoline	1.35
Nonroad - Marine Vessels	1.33
Industrial Process - Other NEC (includes cement and pulp/pape	1.04
Nonroad - Railroads	0.59
Highway Vehicles - Diesel	0.50
Waste Disposal & Recycling - Industrial (C/I and landfills added	0.33
Nonroad - Diesel	0.22
Fuel Comb. - Comm/Inst	0.05
Nonroad - Gasoline	0.03
Fuel Comb. - Residential	0.02
Fires - Structural/Prescribed/Wild	0.00
Nonroad - Aircraft	0.00
Waste Disposal & Recycling - Open Burnin	0.00
Nonroad - LPG & NG	
Solvents - Degreasing	
Solvents - Dry Cleaning	
Solvents - Graphic Arts	
Solvents - Asphalt Application	
Solvents - Pesticide Application	
Solvents - Consumer Solvents	
Solvents - Industrial Surface Coating	
Solvents - Architectural/Maintenance Coatings	
Solvents - Non-industrial Surface Coating (endup with traffic m p)	
Solvents - Auto Refinishing	
Petroleum Storage/Transport - Industrial	
Petroleum Storage/Transport - Service St (Stage I & II)	
Agricultural Crops	
Construction	
Paved Roads	
Unpaved Roads	
Livestock Waste	
Fertilizer Applications	

SOURCE CATEGORY	CONTROLS ACCOUNTED FOR IN 2002 INVENTORY	OR PROPOSED REGS (REDUCTIONS AFTER 2002)	CANDIDATE CONTROL MEASURES
Fuel Comb. - Utility	PSD/NSR/NSPS; RACT in NAA	NOx SIP Call (except WI)	Mercury MACT
	Title IV SO2 Emission Allowances	Clean Air Interstate Rule	Controls Beyond CAIR Emission Reductions
	Title IV Phase I/II NOx limits	Combustion Turbine MACT	Conservation/energy efficiency
			Fuel Switching - Coal to Natural Gas
			Fuel Switching - high-sulfur to low-sulfur coal
			Renewables (biomass, solar, hydro and wind)
Fuel Comb. - Industrial	PSD/NSR/NSPS; RACT in NAA	NOx SIP Call (except WI)	Beyond NOx SIP Call Emission Limits
		Boiler/Heater/RICE MACT	Lower Size Threshold for NOx SIP Call Limits
			Fuel switching during ozone season
			Incentives for Co-generation
Fuel Comb. - Comm/Inst			Conservation/energy efficiency
			Incentives for Co-generation
Highway Vehicles - Gasoline	Tier 1 Tailpipe Emission Standards	Tier II Tailpipe/Sulfur Standards	Transportation control measures (Transit, HOV lanes, road pricing, commuter alternatives, etc.)
	I/M Milwaukee, Chicago, Louisville, St. Louis, Cleveland/Akron, Dayton/Springfield, and Cincinnati		I/M more stringent/greater geographic coverage; remote sensing, high emitting vehicle scrappage
	Reformulated Gasoline Phase II in Chicago, Milwaukee		Clean Fuel Fleets
	Reid Vapor Pressure limits in non-RFG counties		California Low Emission Vehicles
			Reformulated Gasoline Opt-in/Lower RVP
			Alternative fuels - SEMCOG
			Improving fuel efficiency
Highway Vehicles - Diesel	Heavy duty Diesel standards	Heavy duty diesel (2007) engine standards/low sulfur fuel	Heavy-Duty Vehicle Testing
		Clean School Bus USA	Heavy-Duty Idling Restrictions
		Voluntary Diesel Retrofit Program	Expand Fleet Retrofit Programs
Nonroad - Gasoline	Phase I Small SI Engine Standards	Phase 2 Small SI Engine Standards	Container spillage control measures
		Recreational Vehicle Standards	Subsidize electric lawnmowerers
Nonroad - Diesel	CI Engine Standards	2004 Nonroad Diesel Engines and Sulfur Rule	Electric/alternative fuels
		Voluntary Diesel Retrofit Program	Expand engine retrofit programs
Nonroad - Aircraft	ICAO Emission Standards		
Nonroad - Marine Vessels	1999 Commercial Marine Diesel Rule	New Commercial Marine Engine Standards	
Nonroad - Railroads	1997 Federal Locomotive Rule	New Railroad Locomotive Standards	
Nonroad - LPG & NG		Large SI Engine standards	
Fuel Comb. - Residential			Wood stove/fireplace reductions;
			Wook stove replacement (trade-in) program
			Education and Advisory Program
			Reduced Residential Energy Demand
			SCAQMD Rule 1121 residential water heater NOx controls
Waste Disposal & Recycling - Industrial	PSD/NSR/NSPS; RACT in NAA		Gas collection systems at landfills
	2-, 4-, 7-year MACT		
Waste Disposal & Recycling - Open Burnin	Open Burning Regs		Mandatory/voluntary burning bans
Solvents - Degreasing	2-, 4-, 7-year MACT		Conversion to non-VOC solvents
	State Rules		SCAQMD 1122 (VOC content limit)
Solvents - Dry Cleaning	2-, 4-, 7-year MACT		Non-VOC solvents or emission controls
Solvents - Graphic Arts	2-, 4-, 7-year MACT		Low VOC materials or emission controls (Permanent Total Enclosures and Incineration)
Solvents - Asphalt Application			Low VOC formulations

Solvents - Pesticide Application			Low VOC formulations
			Better Pest Management practices
			Limit pesticide application in ozone season
Solvents - Consumer Solvents	Part 59 Consumer Product Rule		CARB Mid-term and Long-term Limits
Solvents - Industrial Surface Coating	PSD/NSR/NSPS; RACT in NAA	10-year MACT	Beyond CTG RACT or statewide RACT
	2-, 4-, 7-year MACT		
Solvents - Architectural/Maintenance Coatings	Part 59 AIM Federal Rule		OTC Model Rule; SCAQMD Phase III limits
Solvents - Non-industrial Surface Coating			CARB/SCAQMD rules
Solvents - Auto Refinishing	Part 59 Auto Refinish Federal Rule		CARB BARCT Limits
Industrial Process - Chemical Mfg.	PSD/NSR/NSPS; RACT in NAA	10-year MACT	RACT or statewide RACT
	2-, 4-, 7-year MACT	RACT in 8-hr NAA	
Industrial Process - Metals	PSD/NSR/NSPS; RACT in NAA	10-year MACT	RACT or statewide RACT
	2-, 4-, 7-year MACT		Revisit PM limits for steel mills
Industrial Process - Petroleum Refinery	PSD/NSR/NSPS; RACT in NAA	CCU/CRU/SRU MACT	RACT or statewide RACT
	2-, 4-, 7-year MACT		Alternatives to flaring; Smart LDAR
			RACT on SO2/NOx from Process Heaters
Industrial Process - Other NEC	PSD/NSR/NSPS; RACT in NAA	10-year MACT	RACT or statewide RACT
(includes cement and pulp/paper)	2-, 4-, 7-year MACT		Cement kiln/pulp mill controls?
Petroleum Storage/Transport - Industrial	PSD/NSR/NSPS; RACT in NAA	Organic liquids 10-yr MACT	Beyond CTG RACT or statewide RACT
	2-, 4-, 7-year MACT		Lower tank applicability threshold
Petroleum Storage/Transport - Service St	Stage I/II RACT		Statewide Stage II
			Stage I and II for marinas
			California certification of vapor recovery
			Portable container spillage measures
Agricultural Crops			Dust control programs
Construction			Dust control programs
Fires - Structural/Prescribed/Wild			
Paved Roads			Vacuum Sweeping
Unpaved Roads			Chemical stabilization or paving
Livestock Waste			Chemical additives
Fertilizer Applications			

Prioritized List of Midwest RPO Candidate Controls

1. **Fuel Combustion-Utility**

   * Controls beyond CAIR emission reductions

2. **Fuel Combustion-Industrial**

   * Beyond NOx SIP Call emission limitations

   * Lower size threshold for NOx SIP Call emission limitations

3. **Highway Vehicles-Gasoline**

   * I/M more stringent (e.g., greater geographic coverage, remote sensing, high emitting vehicle scrappage)

   * Alternative fuels (To be addressed by SEMCOG fuels study)

4. **Highway Vehicles-Diesel**

   * Expand fleet retrofit programs

   * Heavy-duty idling restrictions

5. **Nonroad-Gasoline**

   * Container spillage control measures

6. **Nonroad-Diesel**

   * Expand engine retrofit programs

7. **Degreasing Solvents**

   * Low VOC Formulations

Prioritized List of Midwest RPO Candidate Controls

(Continued)

8. Solvents-Asphalt Applications
   * Low VOC Formulations

9. Solvents-Consumer Solvents
   * CARB mid-term and long-term limits

10. Solvents-AIM
    * OTC Model Rule, SCAQMD Phase III limits (White Paper already provided)

11. Industrial Processes-Metals
    * Revisit PM Limits for Steel Mills

12. Industrial Processes-Petroleum Refineries
    *RACT or statewide RACT
    * RACT on SOx/NOx from process heaters

13. Petroleum Storage and Transport
    * Statewide Stage II
    * Stage I and II for marinas