



16<sup>th</sup> Annual International Emission Inventory Conference

# A New Database Program for Creating Area Source Inventories

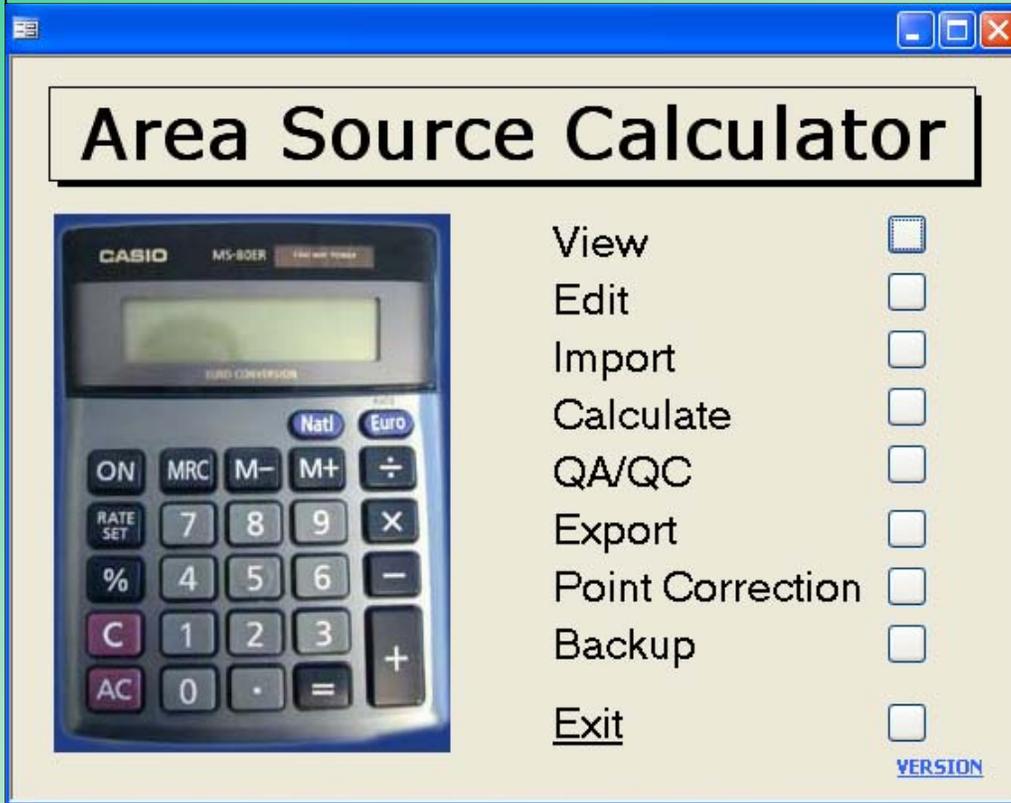
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Ohio EPA

Columbus, OH



# Area Source Calculator



- Prepare fast/efficient NIF Area/Nonpoint Emission Inventories
- Minimize repetitive steps by automation
- Consistency
- Multi-Year inventories
- Better use of State resources
- An experiment of a working inventory tool using commercially available software



# Motivation – Data Management

- Manually Intensive
  - Microsoft Excel
- Time Consuming
  - Ohio Inventory > 70,000 records
- Tradeoff
  - Management vs. Quality/Quantity



# Motivation – Existing Programs

- Few area inventory tools on the market
- Large learning curve
- Limited State budget
- Expensive to modify and maintain
- Not meeting State needs



# Motivation - Experimentation

- 'Pilot' Scale
  - A tool based on a simple inventory methodology designed by the State
- Low-Risk
  - Inexpensive
  - Utilize State resources
  - Control development time
- Upgradeable
  - Easily adaptable to new inventory requirements
  - Enhance menu options and other tool features (QA/QC, etc)
- Incorporate it into a suite of similar applications
  - Aircraft Emissions Calculator
  - Mobile Emissions Calculator
  - Point Source Tool, etc



# Methodology - Parameters

- Create emission records based on:
  - Source Classification Code (SCC) (Who?)
  - Pollutant of interest (What?)
  - Ohio County (Where?)
  - Year of Inventory (When?)



# Methodology - Estimation

- Controlled

$$\text{CEM} = A \times \text{EF} \times (1 - \text{CE} \times \text{RP} \times \text{RE})$$

**CEM** = Controlled Emission Value

**A** = Activity

**EF** = Emission Factor

**CE** = Control Efficiency

**RP** = Rule Penetration

**RE** = Rule Effectiveness

- Uncontrolled

$$\text{UEM} = A \times \text{EF}$$

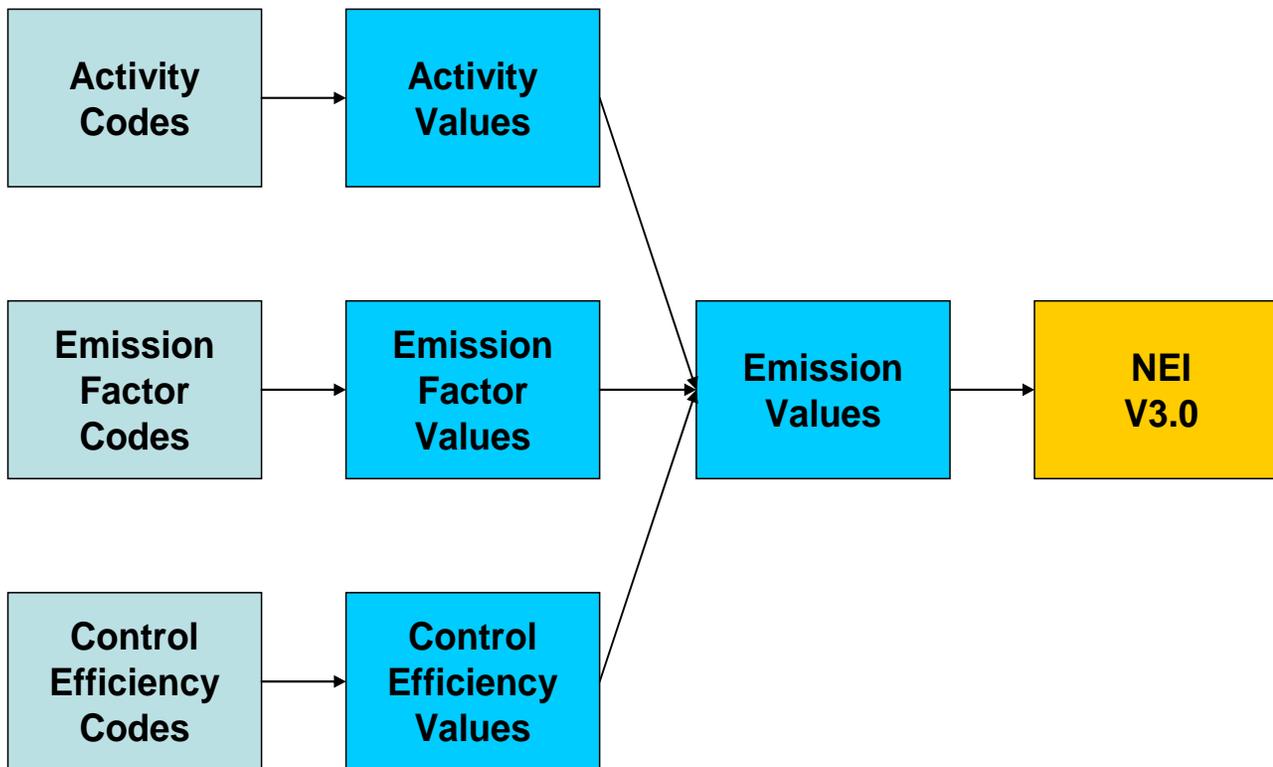
**UEM** = Uncontrolled Emission Value

**A** = Activity

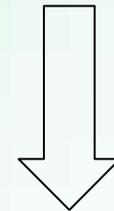
**EF** = Emission Factor



# Methodology – Flow Chart



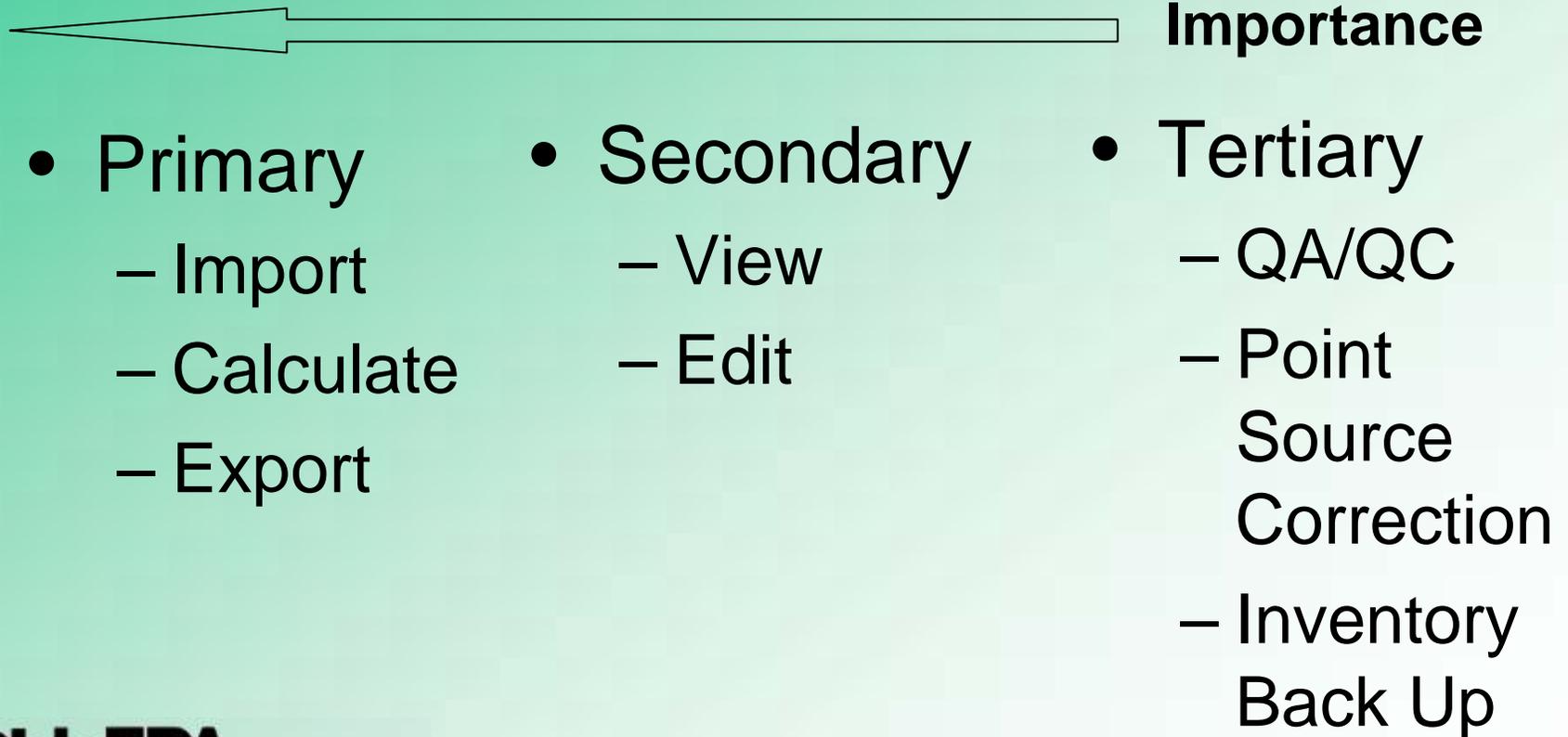
- Activity
- Emission Factor
- Control Efficiency



- Emission



# Functions





## Primary - Import

**Import**

View    Import    QA/QC     
 Edit    Calculate    Export  

SCC: Structure Fires  
 Year: 2005    Default Pollutants?  
 Emission Units: LB  
 Activity Units: Fires - Structures (TON)  
 Emission Factor Units: LB / TON  
 Control Efficiency Type: None

Select Type of Data

Emissions?  
 Activity?  
 Emission Factor?  
 Control Efficiency?  
 Growth Factors?

County?	FIPS:	County:	State:	Nation:	Pollutant?	Pollutant:
<input checked="" type="checkbox"/>	39001	Adams	Ohio	United States	<input checked="" type="checkbox"/>	CARBON MONOXIDE
<input checked="" type="checkbox"/>	39003	Allen	Ohio	United States	<input checked="" type="checkbox"/>	NITROGEN OXIDES
<input checked="" type="checkbox"/>	39005	Ashland	Ohio	United States	<input type="checkbox"/>	PARTICULATE MATTER
<input checked="" type="checkbox"/>	39007	Ashtabula	Ohio	United States	<input checked="" type="checkbox"/>	PARTICULATE MATTER <10 MICRONS
<input checked="" type="checkbox"/>	39009	Athens	Ohio	United States	<input checked="" type="checkbox"/>	PARTICULATE MATTER LESS THAN 2.5 MICRONS
<input checked="" type="checkbox"/>	39011	Auglaize	Ohio	United States	<input checked="" type="checkbox"/>	VOLATILE ORGANIC COMPOUNDS
<input checked="" type="checkbox"/>	39013	Belmont	Ohio	United States	<input type="checkbox"/>	ACROLEIN
<input checked="" type="checkbox"/>	39015	Brown	Ohio	United States	<input type="checkbox"/>	FORMALDEHYDE
<input checked="" type="checkbox"/>	39017	Butler	Ohio	United States	<input type="checkbox"/>	HYDROCHLORIC ACID
<input checked="" type="checkbox"/>	39019	Carroll	Ohio	United States	<input type="checkbox"/>	HYDROGEN CYANIDE
<input checked="" type="checkbox"/>	39021	Champaign	Ohio	United States	<input type="checkbox"/>	

Record: 1 of 88      Record: 2 of 10

    
     
 Excel  
 Access  
 Text

- Import
  - Emission
  - Activity
  - Emission Factor
  - Control Efficiency
- By
  - SCC
  - Pollutant
  - County
  - Year



# Primary - Calculate

Calculate

View    Import    QA/QC  
 Edit    Calculate    Export

SCC?	Name:	SCC:	SCC_L1:	Select	Year:
<input type="checkbox"/>	Agricultural Pesticides - Corn	2461850002	Solvent Utilizati	Select All	2005
<input checked="" type="checkbox"/>	Agricultural Pesticides - Hay & Grains	2461850006	Solvent Utilizati	Include Control Efficiency? <input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	Agricultural Pesticides - Soy Bean	2461850005	Solvent Utilizati		
<input checked="" type="checkbox"/>	Architectural Surface Coating - Solvent Based	2401002000	Solvent Utilizati		

Record: 16 of 52

Activity:

Emission Factor:

Activity?	County:	Activity:	Name:	Year:	Emission Factor?	Pollutant:	Factor:	Units:
<input checked="" type="checkbox"/>	Adams	18700	Harvested Acres	2005	<input checked="" type="checkbox"/>	DIMETHFORMAM	0.00804573	LB / PERSO
<input checked="" type="checkbox"/>	Adams	1900	Harvested Acres	2005	<input checked="" type="checkbox"/>	ETHYLBENZENE	0.069193278	LB / PERSO
<input checked="" type="checkbox"/>	Adams	28260	Population	2005	<input checked="" type="checkbox"/>	ETHYLENE GLY	0.009654876	LB / PERSO
<input checked="" type="checkbox"/>	Adams	28260	Population	2005	<input checked="" type="checkbox"/>	HEXANE	0.333093222	LB / PERSO
<input checked="" type="checkbox"/>	Allen	79100	Harvested Acres	2005	<input checked="" type="checkbox"/>	METH ETH KET	0.090112176	LB / PERSO

Record: 1 of 352

Record: 1 of 25

Control Efficiency:

Emissions:

Control Efficiency?	Pollutant:	County:	Value:	Desc
<input checked="" type="checkbox"/>	VOC	Ashtabula	0.9	Stage II Storag
<input checked="" type="checkbox"/>	VOC	Butler	0.9	Stage II Storag
<input checked="" type="checkbox"/>	VOC	Clark	0.9	Stage II Storag
<input checked="" type="checkbox"/>	VOC	Clermont	0.9	Stage II Storag
<input checked="" type="checkbox"/>	VOC	Cuyahoga	0.9	Stage II Storag

Record: 1 of 16

- Calculate
  - Controlled
  - Uncontrolled
- By
  - SCC
  - Year
  - Activity
  - Emission Factor
  - Control Efficiency





# Secondary - View

View

View     Import     QA/QC  
 Edit     Calculate     Export

SCC:

Type:  Code:

Year:  Level 1:

County:  Level 2:

Pollutant:  Level 3:

Units:  Level 4:

SCC:	Name:	County:	Pollutant:	Value:	Units:	Year:	Document
▶ 2401005000	Autobody Refinishing	Adams	VOC	36738	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Allen	VOC	140504	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Ashland	VOC	70590	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Ashtabula	VOC	135096	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Athens	VOC	83161	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Auglaize	VOC	61100	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Belmont	VOC	89960	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Brown	VOC	58201	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Butler	VOC	456144	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Carroll	VOC	39260	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Champaign	VOC	51870	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Clark	VOC	187369	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Clermont	VOC	247299	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Clinton	VOC	55731	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Columbiana	VOC	145184	LB	2005	Calculated by Ohio using the formula E
2401005000	Autobody Refinishing	Coshocton	VOC	47957	LB	2005	Calculated by Ohio using the formula E

Record: 1 of 88

- View
  - Emission
  - Activity
  - Emission Factor
  - Control Efficiency
- By
  - SCC
  - Year
  - County
  - Pollutant
  - Units



## Secondary - Edit

Edit

View    Import    QA/QC  
 Edit    Calculate    Export

Main Menu

Exit

SCC: Autobody Refinishing

Type: Emission Factor   Code: 2401005000

Year: 2005   Level 1: Solvent Utilization

County:   Level 2: Surface Coating

Pollutant:   Level 3: Auto Refinishing: SIC 7532

Units:   Level 4: Total: All Solvent Types

SCC
   
 Type
   
 Year
   
 County
   
 Pollutant
   
 Units

Pollutant: BUT CARBITOL

Emission Factor: 0.00481

Type: LB / PERSON

SCC: 2401005000

Year: 2005

Rating:

Documentation:

US EPA Speciate database (LB/LB VOC Converted to LB/PERSON)

Record: 1 of 12

SCC:	Name:	Pollutant:	Value:	Units:	Rating:	Year:	
▶ 2401005000	Autobody Refinishing	BUT CARBITOL	0.00481	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	BUT CELLOSOL	0.026	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	CARBITOL	0.00104	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	CELLOSLV ACE	0.00312	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	CELLOSOLVE	0.00208	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	ETHYLENE GLY	0.00208	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	METH CARBITO	0.00104	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate
2401005000	Autobody Refinishing	METH ETH KET	0.1508	LB / PERSON	AP-42 Unrated	2005	US EPA Speciate

- **Modify**
  - Emission
  - Activity
  - Emission Factor
  - Control Efficiency
  
- **By**
  - New
  - Delete
  - Edit
  - Duplicate



# Tertiary

- Quality Assurance/Quality Check (QA/QC)
  - Provide basic inspection
  - Minimize overlap with other programs
    - NIF 3.1 Basic Format and Content Checker
- Point Source Correction
  - Reduce instances of Point/Area source double counting
- Inventory Back Up



# New Inventory

- Import new Activity (Import)
- Duplicate Emission Factor (Edit)
- Calculate Emissions (Calculate)
- Export to NIF V3.0 (Export)



# Conclusions

- Advantages
  - Automation of some repetitive tasks
  - Easier management of data
  - Simple estimation method
  - Compatible with NIF V3.0
  - Low-risk experimentation of inventory concepts
  - “Source Category-Specific” Analysis



# Conclusions

- Disadvantages
  - Limited to Area/Nonpoint inventories
  - Still requires some manual calculation of activities
  - May not encompass all inventoried SCC's
  - Size limitation: 1GB (imposed by Microsoft Access 2003)
  - Not a web application yet



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Questions?





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# Thank You!

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