

Large Scale Emissions Inventory

San Diego, CA

Stephen S. Koo, B.A.Sc.

May 1 / 2003



Acknowledgement

- Sarah Kelly – ITEP
- Doug Solomon – EPA OAQPS



Agenda

- Objectives
- System Modules & Architecture
- Database Structure
- Data Entry Facilitation
- QA / QC
- Questions

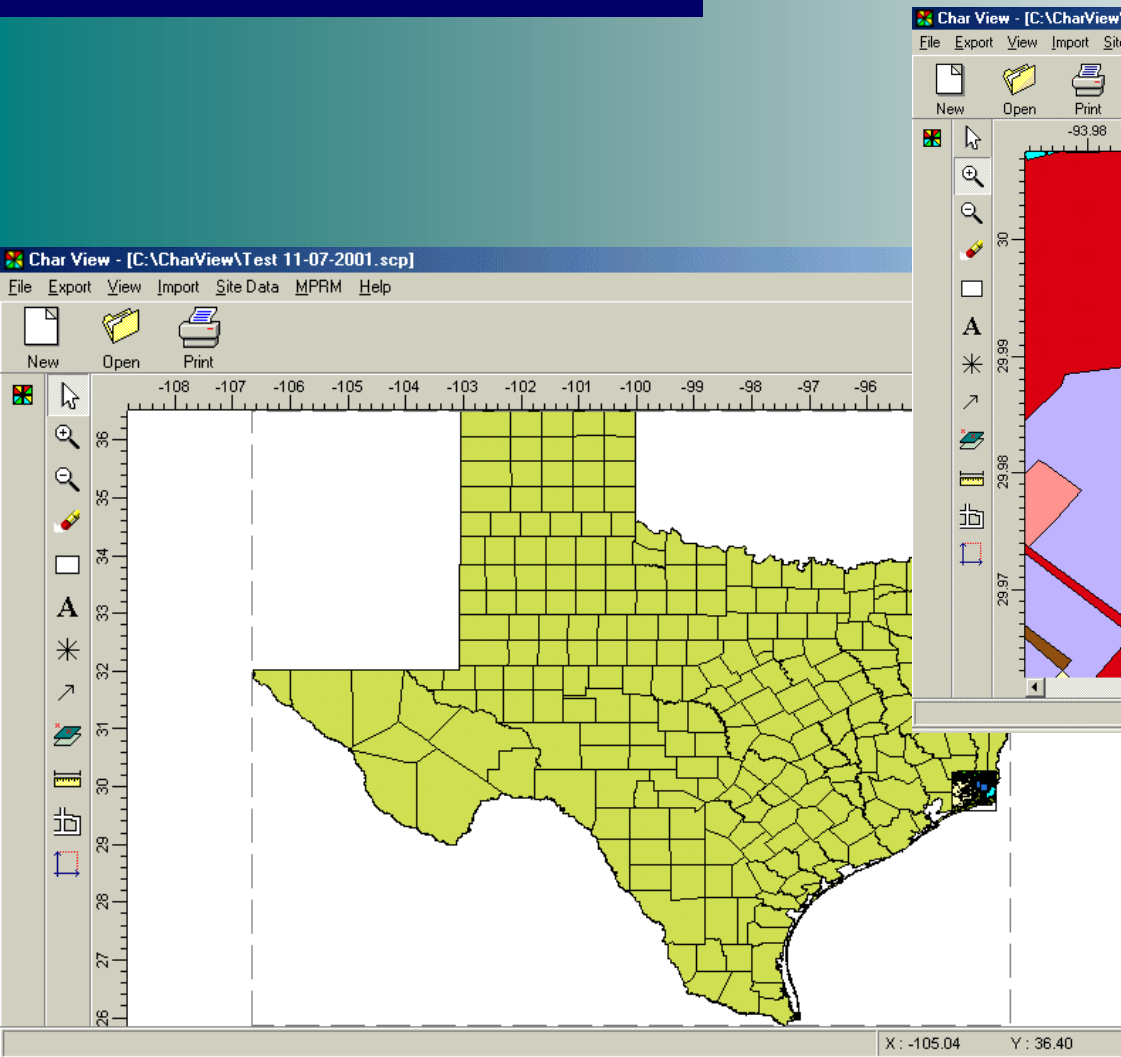
Who is Lakes Environmental



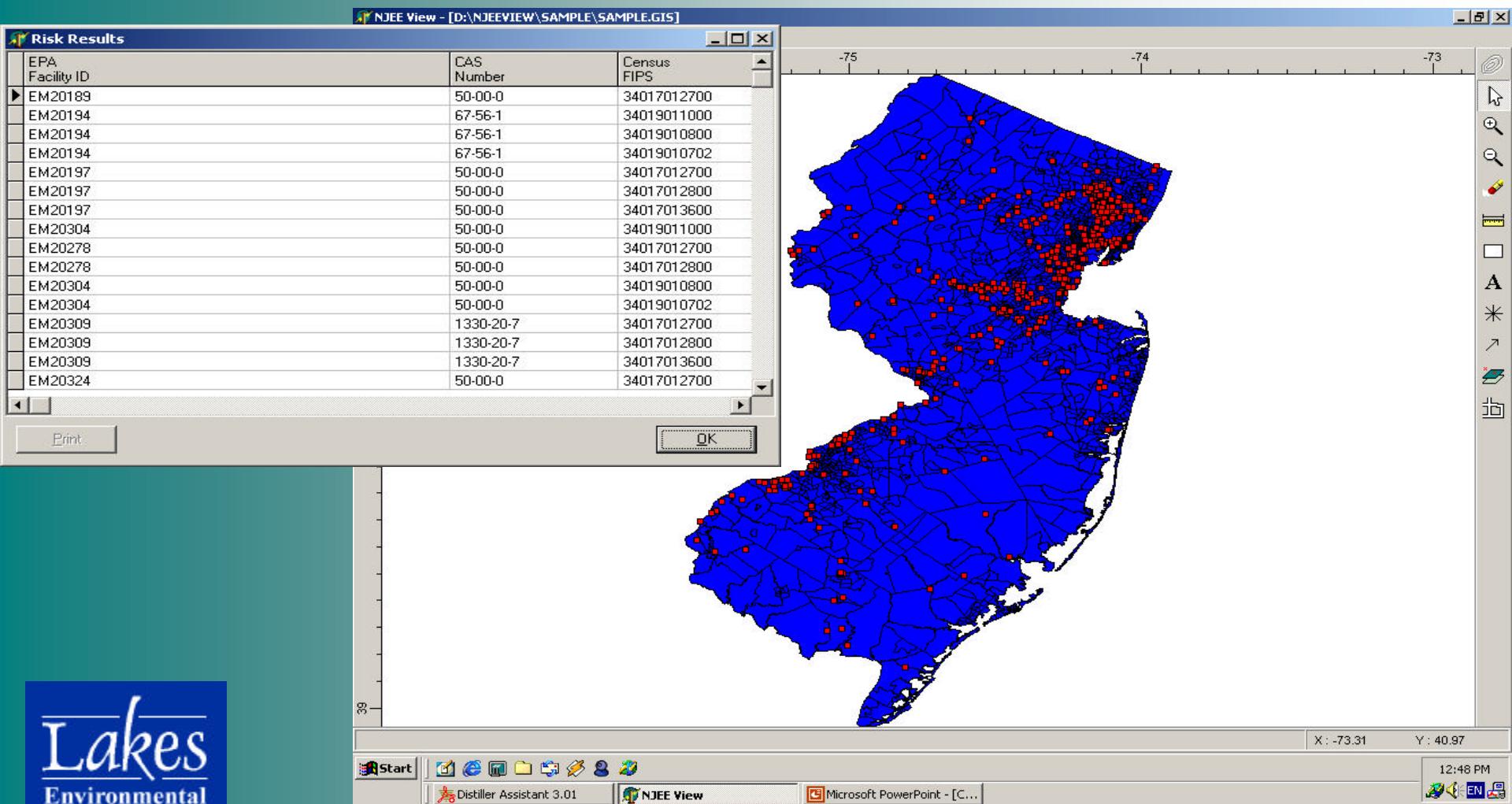
Environmental Software

- ISC-AERMOD View
- AUSTAL View
- IRAP-h View
- Eco-Risk View

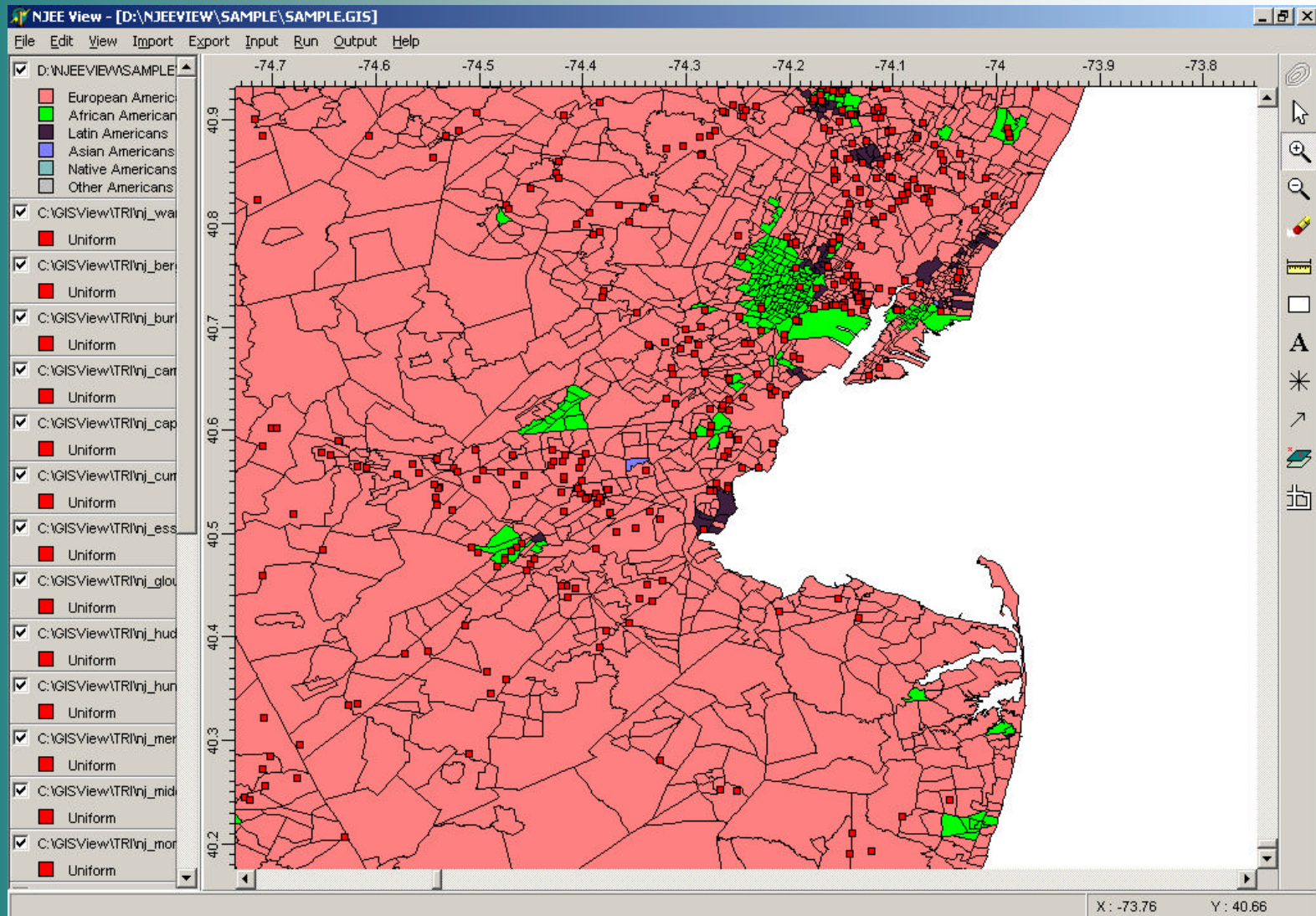
Cumulative Risk Assessment



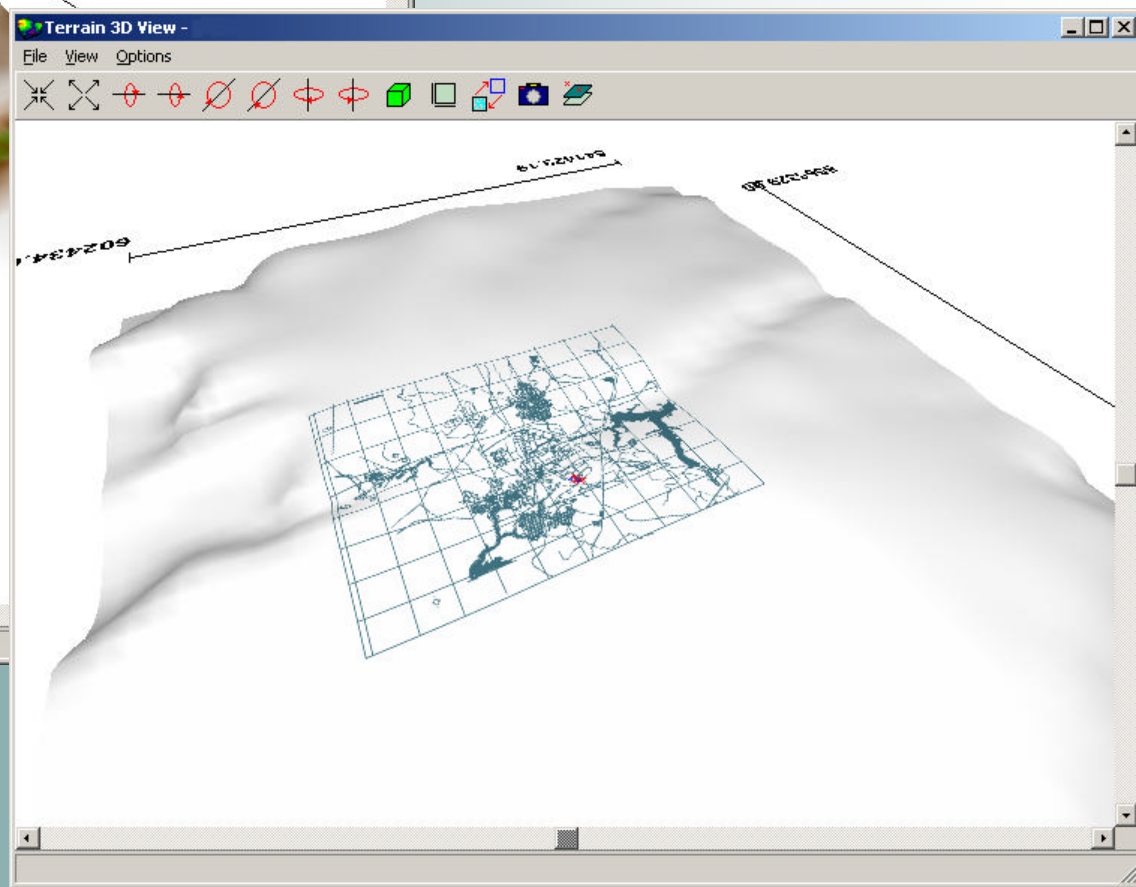
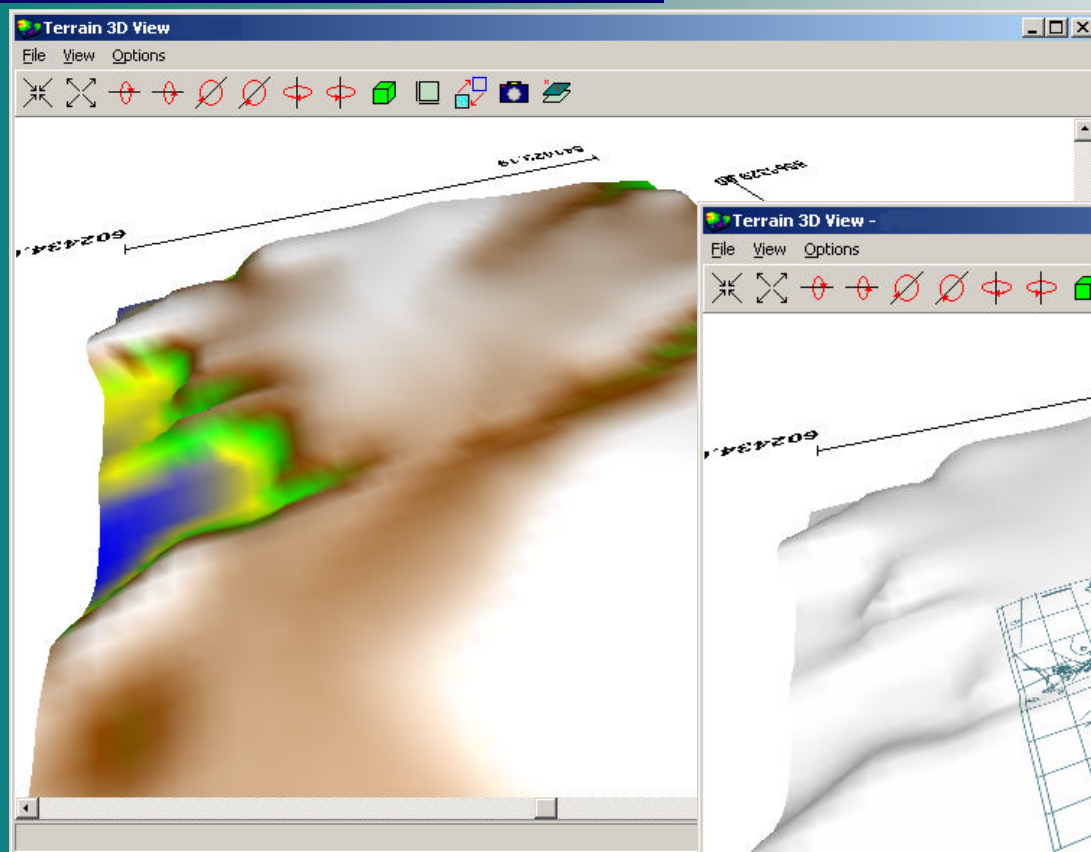
NJEE View

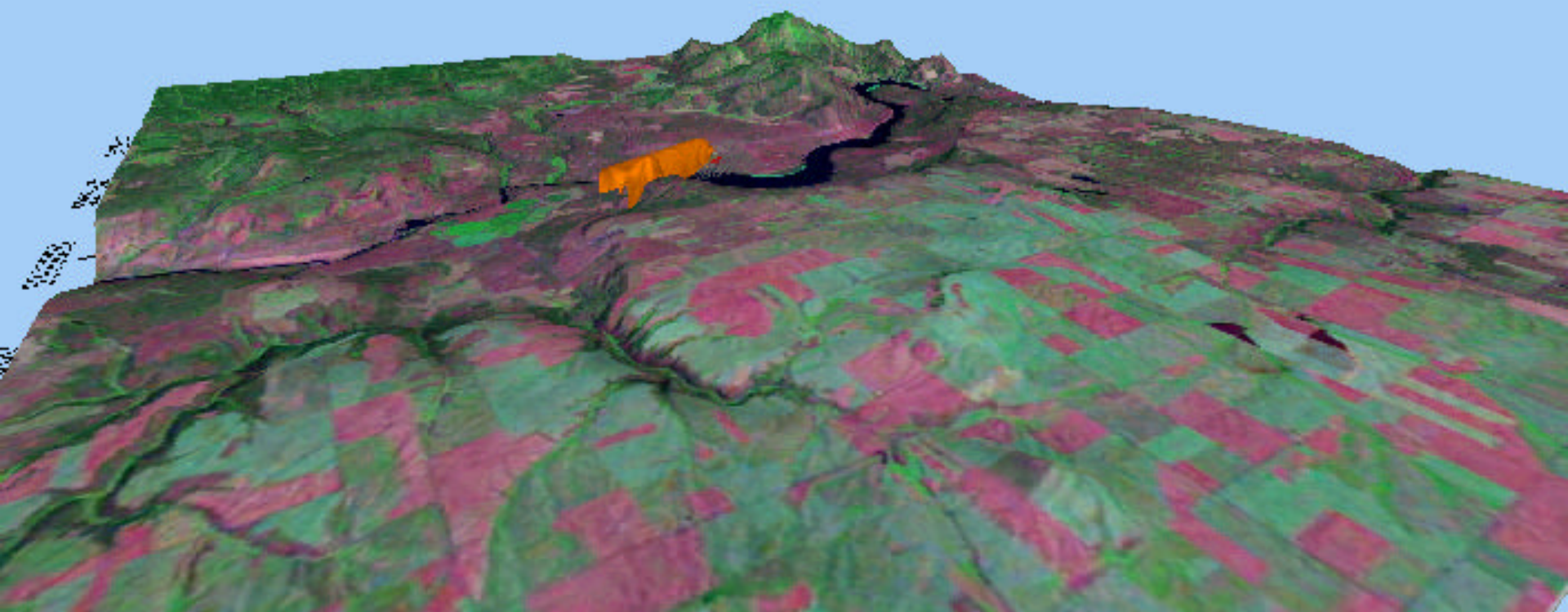


NJEE View



3D Visualization





Data Availability

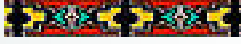
- WWW.WEBGIS.COM
- WWW.WEBMET.COM
- WWW.WEBLAKES.COM
- WWW.WEBCPI.COM
- WWW.WEBTHERMAL.COM

System Objectives





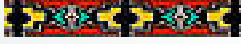
Objectives



- Emission inventory software with a very user-friendly interface
- Facilitate emission inventories by environmental professionals
- Emission estimates technically defensible



Requirements



- Requirement Specification
- User Feedback
- QA \ QC Procedures
- Consistent Interface
- Documentation
- Training

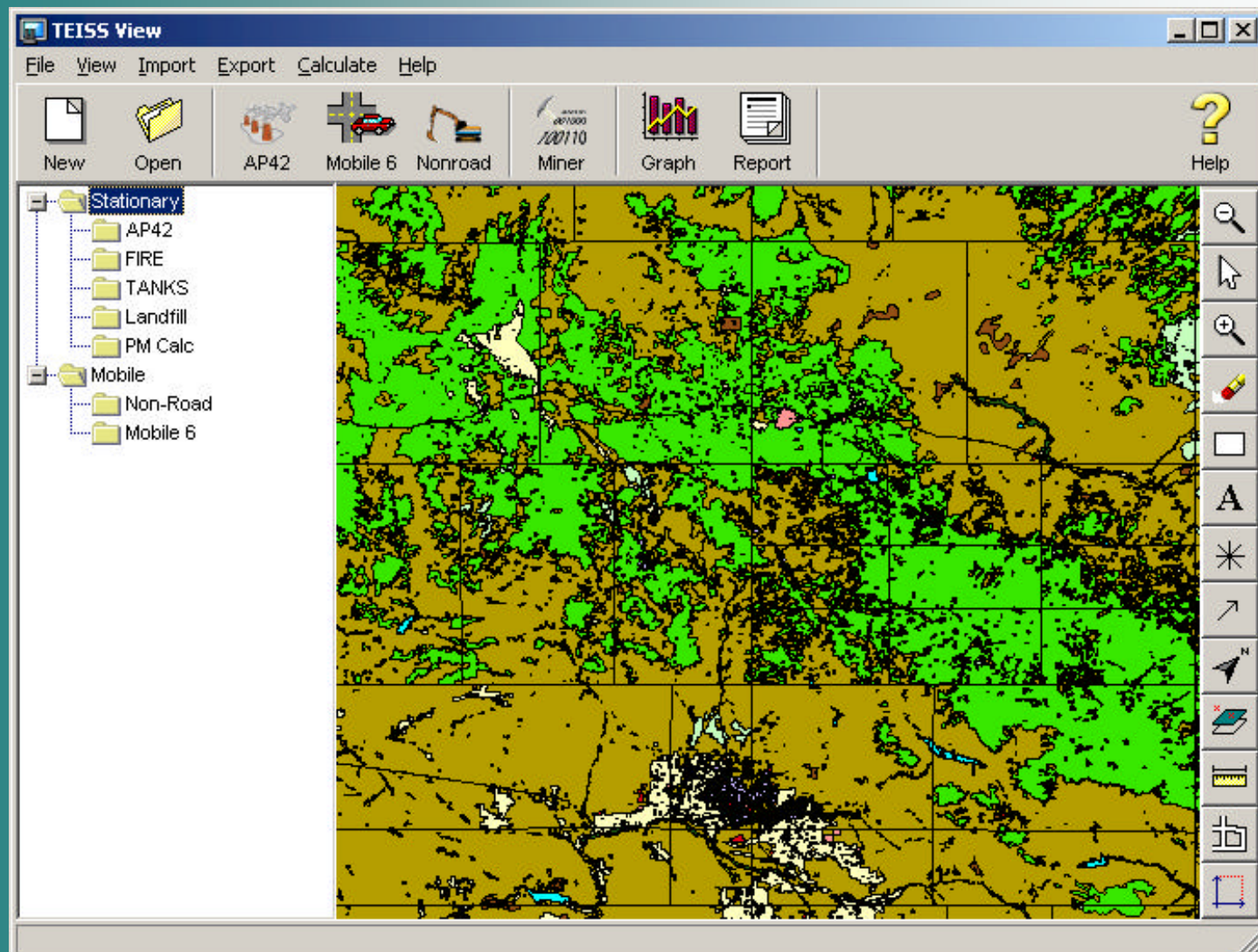
System Modules

System Modules

- GIS
- Calculators
- MOBILE6
- NON-ROAD
- Other Functions



Mapping



Calculators

AP-42 Emissions Estimators

- 1.0 External Combustion Sources
 - 1.1 Bituminous and Subbituminous Coal Combustion
 - 1.2 Anthracite Coal Combustion
 - 1.3 Fuel Oil Combustion
 - 1.4 Natural Gas Combustion
 - 1.5 Liquefied Petroleum Gas Combustion
 - 1.6 Wood Residue Combustion in Boilers
 - 1.7 Lignite Combustion
 - 1.8 Bagasse Combustion in Sugar Mills
 - 1.9 Residential Fireplaces
 - 1.10 Residential Wood Stoves
 - 1.11 Waste Oil Combustion
- 2.0 Solid Waste Disposal
 - 2.1 Refuse Combustion
 - 2.2 Sewage Sludge Incineration
 - 2.3 Medical Waste Incineration
 - 2.4 Municipal Solid Waste Landfills
 - 2.5 Open Burning
 - 2.6 Automobile Body Incineration
 - 2.7 Conical Burners
- 3.0 Stationary Internal Combustion Sources
 - 3.1 Stationary Gas Turbines
 - 3.2 Natural Gas-Fired Reciprocating Engines
 - 3.3 Gasoline and Diesel Industrial Engines
 - 3.4 Large Stationary Diesel and All Other Engines
- 4.0 Evaporation Loss Sources
 - 4.1 Petroleum Industry
 - 4.2 Organic Chemical Process Industry
 - 4.3 Liquid Storage Tanks
 - 4.4 Inorganic Chemical Industry
 - 4.5 Food and Agricultural Industries
 - 4.6 Wood Products Industry
 - 4.7 Mineral Products Industry
 - 4.8 Metallurgical Industry
 - 4.9 Miscellaneous Sources
 - 4.10 Greenhouse Gas Biogenic Sources

External Combustion

External combustion sources, such as boilers, and commercial and gas are the major fossil fuel also used in relatively small about 95 percent of the total Nationwide consumption in of bituminous coal, nearly 3 91 x 10 liters (24 billion gallons) of residual oil, and 57 x 10¹² cubic feet of natural gas.

Power generation, process heating, and combustion sources of sulfur dioxide and nitrogen oxides. The following sections present details of these sources.

Emissions Estimation Calculators

Click Button to Launch Desired Calculator

AP-42

Stationary Gas Turbines

Stationary gas turbines are applied in electric power generators, in gas pipeline pump and compressor drives, and in various process industries. Gas turbines (greater than 4021 horsepower (electric) or 3 megawatts (electric)) are used in electrical generation for continuous, peaking, or standby power. The primary fuels used are natural gas and distillate (No. 2) fuel oil, although residual fuel oil is used in a few applications.

Stationary Gas Turbines

Turbine Information General Results HAP Results Metal HAP Results

Units:

Reciprocating Engine Type:

Applicable SCCs: 2-01-002-01, 2-02-002-01/03, 2-03-002-02/03

Control System:

Fuel Heating Value: Btu/scf @ 60°F

Fuel Sulfur Content: %

Fuel Quantity Fired: m³

AP-42

Stationary Gas Turbines

Stationary gas turbines are applied in electric power generators, in gas pipeline pump and compressor drives, and in various process industries. Gas turbines (greater than 4021 horsepower (electric) or 3 megawatts (electric)) are used in electrical generation for continuous, peaking, or standby power. The primary fuels used are natural gas and distillate (No. 2) fuel oil, although residual fuel oil is used in a few applications.

Stationary Gas Turbines

Turbine Information General Results HAP Results Metal HAP Results

Units:

Reciprocating Engine Type:

Applicable SCCs: 2-01-002-01, 2-02-002-01/03, 2-03-002-02/03

Control System:

Fuel Heating Value: Btu/scf @ 60°F

Fuel Sulfur Content: %

Fuel Quantity Fired: m³

Mobile 6

- Min / Max Temperature
- Vehicle Speed
- Distributions
- Fuel RVPs

MOBILE View - [C:\MobileView\Example1\Examole1.MVP]

File Data Run View Tools Help

New Open Print Run Editor Graph

MOBILE6 Project

- Project Info
- Pollutants
- Output Options
- Run 1
 - Scenario 1.1
 - Scenario 1.2
 - Scenario 1.3
 - Scenario 1.4
 - Scenario 1.5

Run: Run 1

	Description	Status
☒	Min/Max Temperature	60.0/93.0 °F
☒	Hourly Temperature	not used
☒	Absolute Humidity	75.0 gr/lb
☒	A/C - Cloud Cover	off
☒	A/C - Peak Sun	off
☒	A/C - Sunrise/Sunset	off

Scenario: Scenario 1.1

	Description	Status
☒	Min/Max Temperature	60.0/93.0 °F
☒	Hourly Temperature	not used
☒	Absolute Humidity	75.0 gr/lb
☒	A/C - Cloud Cover	off
☒	A/C - Peak Sun	off
☒	A/C - Sunrise/Sunset	off
☒	Calendar Year	2012
☒	Altitude	low
☒	Month	January

Environment Fuel Options Emissions Vehicle Information Vehicle Activity VM Programs Alternative Regulations

MOBILE View

Name: EVALUATION MONTH

Status: Optional.

Section: Scenario.

Description: This command provides the option of calculating emission factors for January 1 or July 1 of the calendar year of evaluation.

Default: January or "1".

Explanation: MOBILE6 allows the choice of January 1 or July 1. The specified month will affect emission calculations in two ways:

1. by changing the composition of the fleet (July 1 emission factors will reflect an additional six months of fleet turnover, or replacement of older vehicles by

WRPLOT View - Lakes Environmental Software

File Edit Help

Display: ☒ Wind Speed ☐ Wind Direction ☐ Stability Classes

Unit of Measurement: ☐ Knots ☒ Meters/Second

Met Data Information Frequency Count Freq

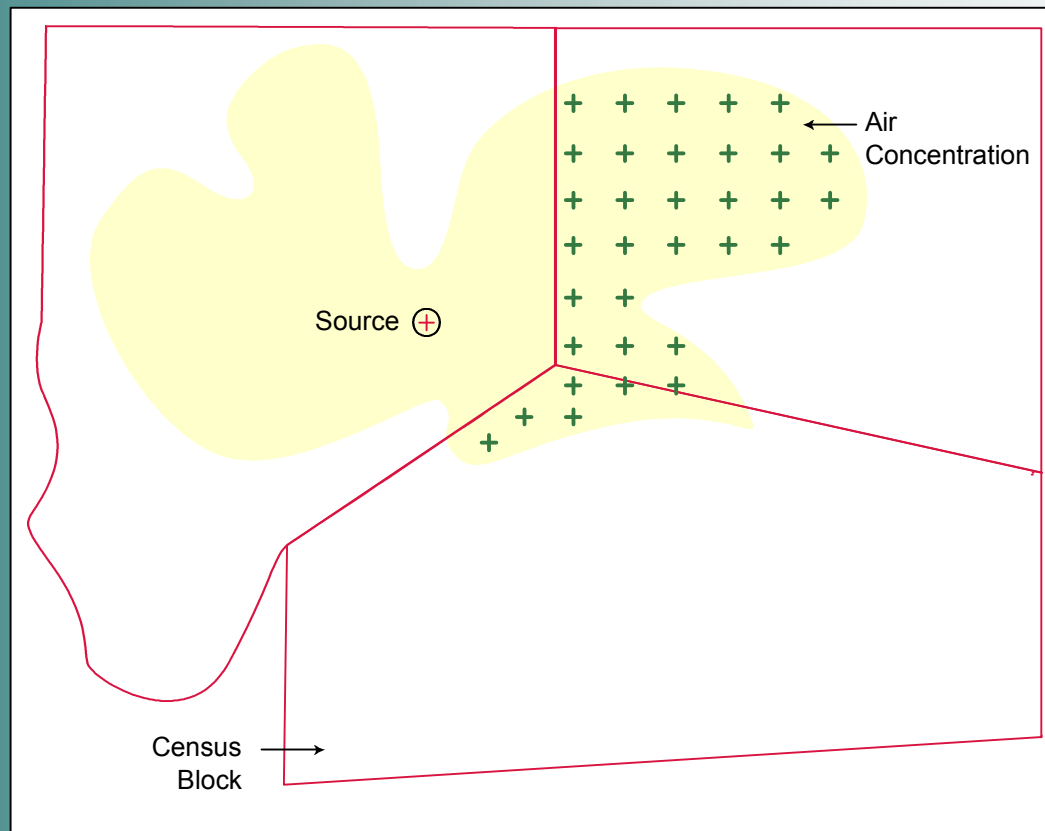
Station #12960 - HOUSTON/INTERCONTINENTAL ARPT

start 6 Windows Ex... Asmdata.d - Wo... MOBILE View 6:06 PM

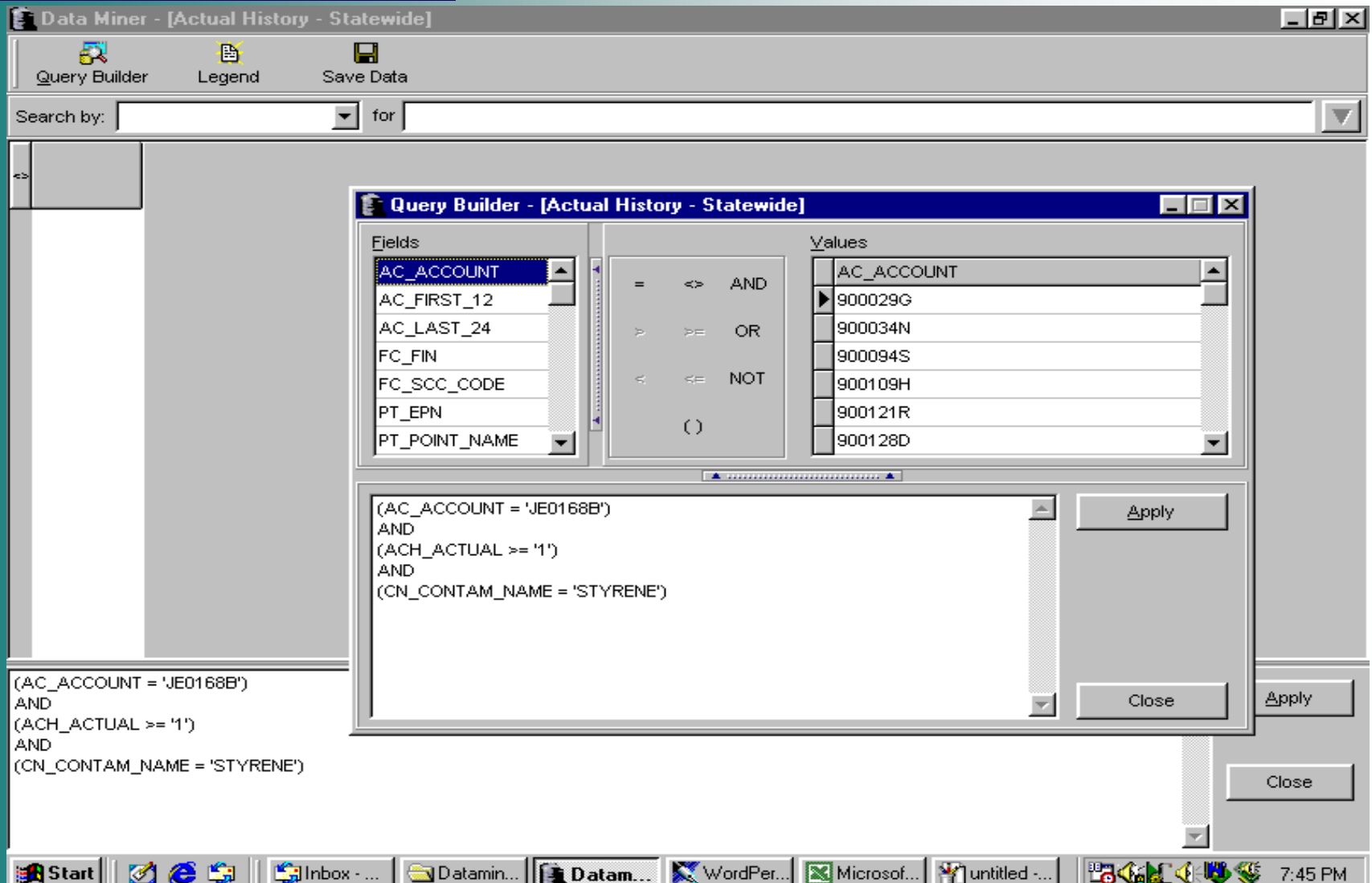
Area Source Allocations



- Polygon Intersection
- GIS Area Allocation



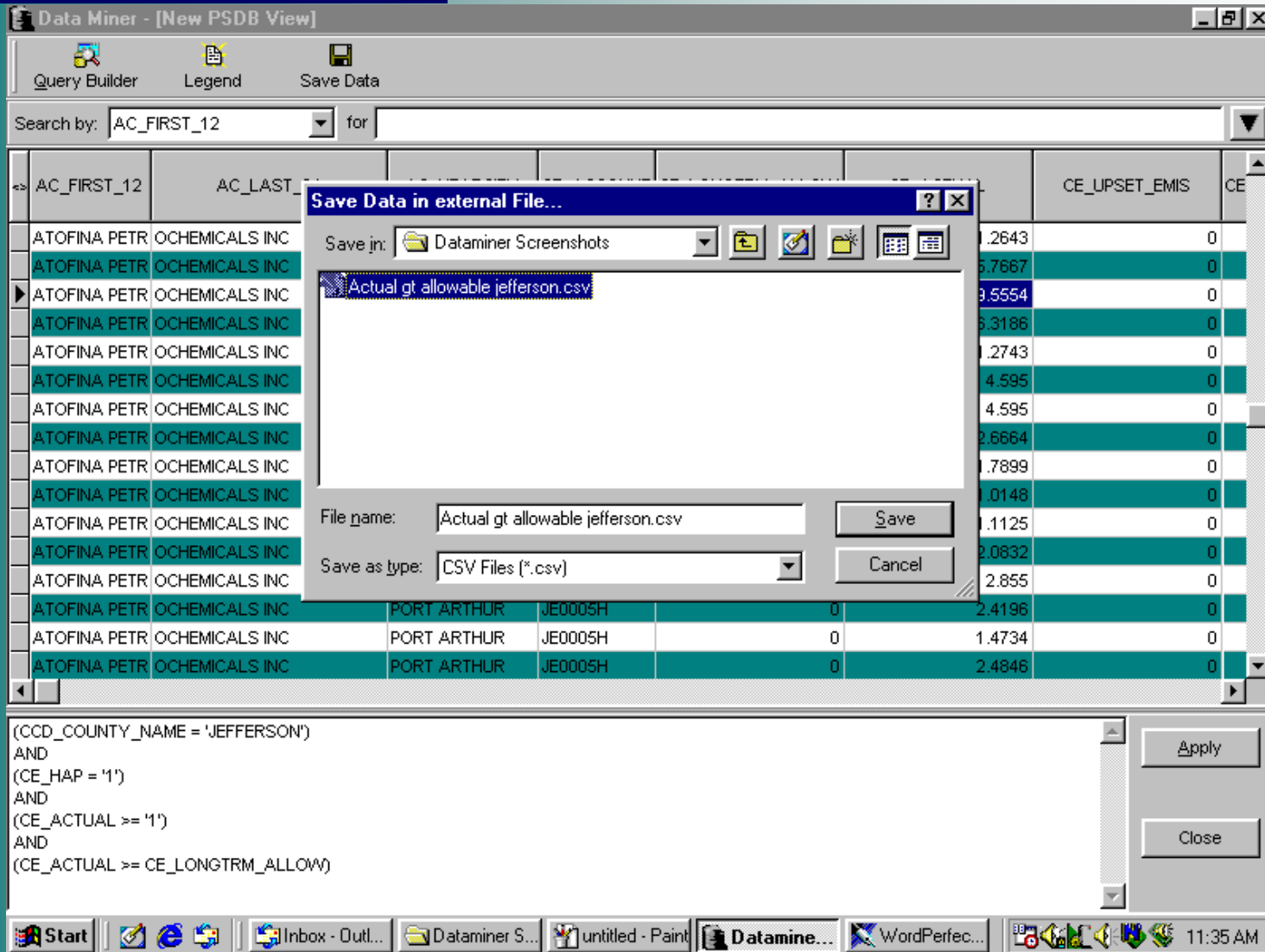
DataMiner – Query Builder



Data Miner



DataMiner – Saving Results



DataMiner – Excel Review

Microsoft Excel - Actual gt allowable jefferson.csv

File Edit View Insert Format Tools Data Window Help

A18 = SOUTHERN MAN

	A	B	D	E	F	G	H	J
	AC FIRST 12	AC LAST 24	CE ACCO	CE_LONGTRM A	CE_ACTUAL	CE_UPSE	CE_PERMIT	CN_CONTAM NAME
5	EI DU PONT	DE NEMOURS &	JE0033C	1.92	2.7278	0	4351	NITROBENZENE
6	EI DU PONT	DE NEMOURS &	JE0033C	1.53	1.9633	0	4351	NITROBENZENE
7	EI DU PONT	DE NEMOURS &	JE0033C	0.18	3.6058	0	4351	NITROBENZENE
8	EXXON MOBIL	CHEMICAL CO	JE0065M	0	5.444	1.0126	6860	ETHYLENE
9	EXXON MOBIL	CHEMICAL CO	JE0065M	0	54.2199	0	6860	ETHYLENE
10	EXXON MOBIL	CHEMICAL CO	JE0065M	0.47	6.2184	0	6860	ETHYLENE
11	EXXON MOBIL	CHEMICAL CO	JE0065M	0.47	2.7009	0	6860	ETHYLENE
12	EXXON MOBIL	CHEMICAL CO	JE0065M	0	35.428	0.389	8758	ETHYLENE
13	THE GOODYEA	TIRE & RUBBER	JE0039N	0	7.23	4.4658	9481	HEXANE
14	THE GOODYEA	TIRE & RUBBER	JE0039N	0	227.0174	0	9481	HEXANE
15	PREMCOR REF	NING GROUP	JE0042B	0	1.2026	0	19404	CUMENE
16	HUNTSMAN CO	PORATION	JE0052V	0.3	2.1505	0	19949	BUTADIENE
17	OILTANKING B	EAUMONT PART	JE0010O	6.36	7.6596	0	21356	METHYL TERT-BUTY
18	SOUTHERN MA	UFACTURING CC	JE0168B	20.02	43.9	0	27354	STYRENE
19	SOUTHERN MA	UFACTURING CC	JE0168B	20.02	43.9	0	27354	STYRENE
20	EQUISTAR CHE	MICALS L P	JE0011M	1.12	1.12	0	673B	ETHYLENE
21	EQUISTAR CHE	MICALS L P	JE0011M	11.19	20.23	0	673B	ETHYLENE
22	ATOFINA CHEM	ICALS INC	JE0074L	0	1.057	0	865A	ETHYLENE
23	ATOFINA CHEM	ICALS INC	JE0074L	0.03	1.0314	0	865A	HYDROGEN SULFID
24	EQUISTAR CHE	MICALS L P	JE0011M	0	21.68	0	4295A	ETHYLENE
25	PREMCOR REF	NING GROUP	JE0042B	1.72	2.98	0	8133A	HYDROGEN SULFID
26	NECHES RIVER	TREATMENT CC	JE0320T	0	5.4094	0		ACETALDEHYDE
27	AMERIPOL SY	NPOL CORP	JE0017A	0	1.619	0		ACETONE
28	THE GOODYEA	TIRE & RUBBER	JE0039N	0	8.8953	0		ACETONE
29	ENTERPRISE T	RANSFORMATION	JE0444V	0	1.25	0		ACETONE

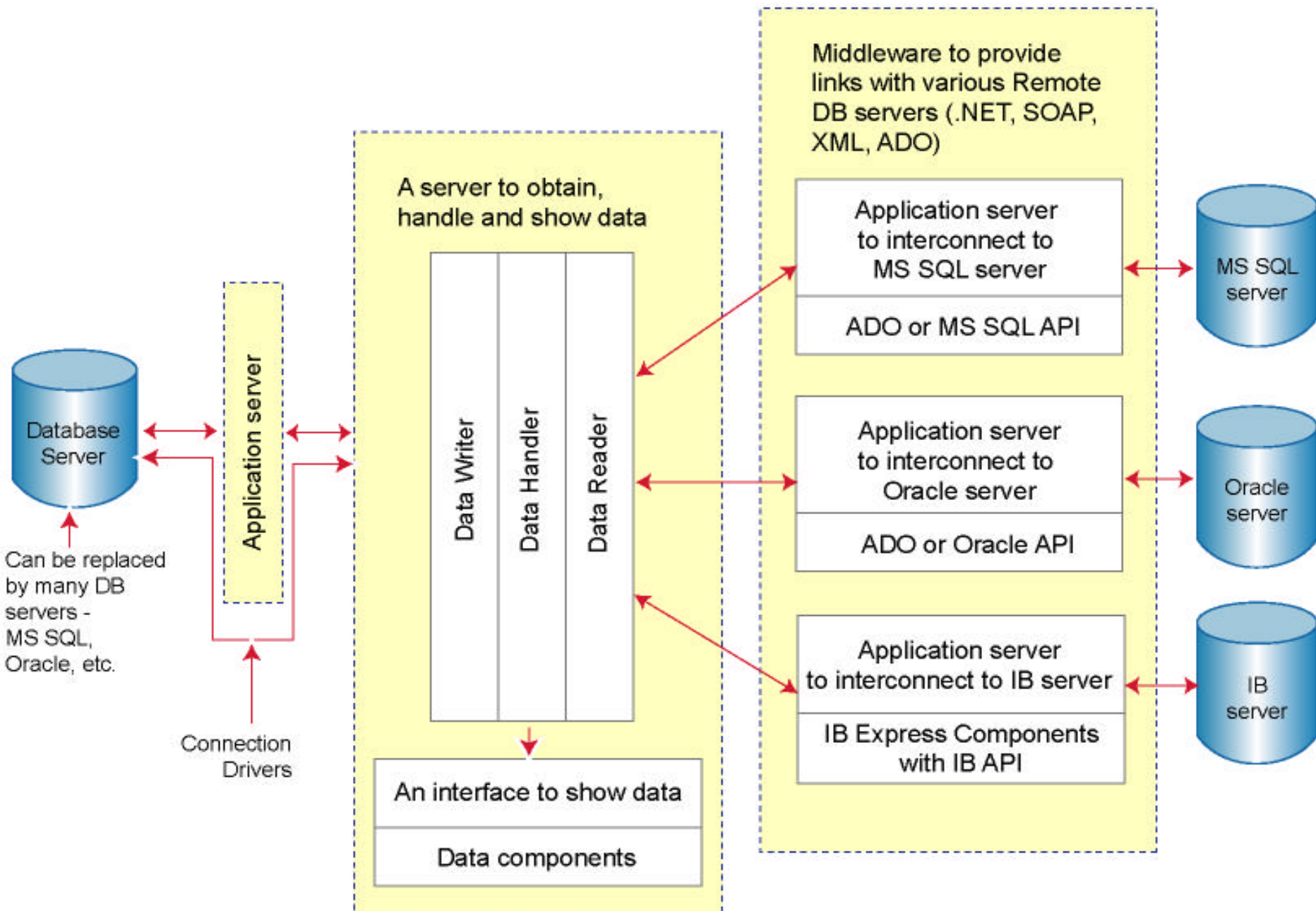
Ready Sum=54837.84 NUM

Start Inb... Da... unt... Da... W... M... Ho... 5:37 PM

System Architecture

Software Engineering

- Integration Problem
- Modularity
- Cost
- Development Time
- Maintenance
- Changing Data Formats
- Scalability

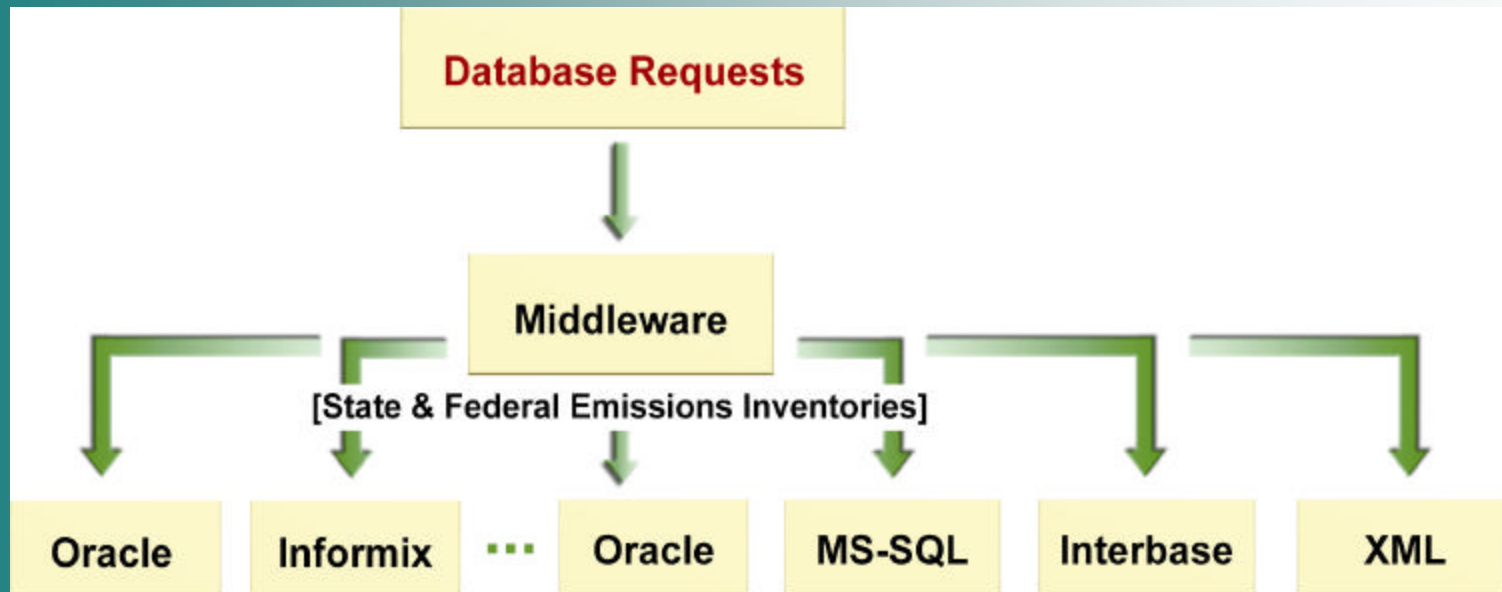


Lan / Web Based

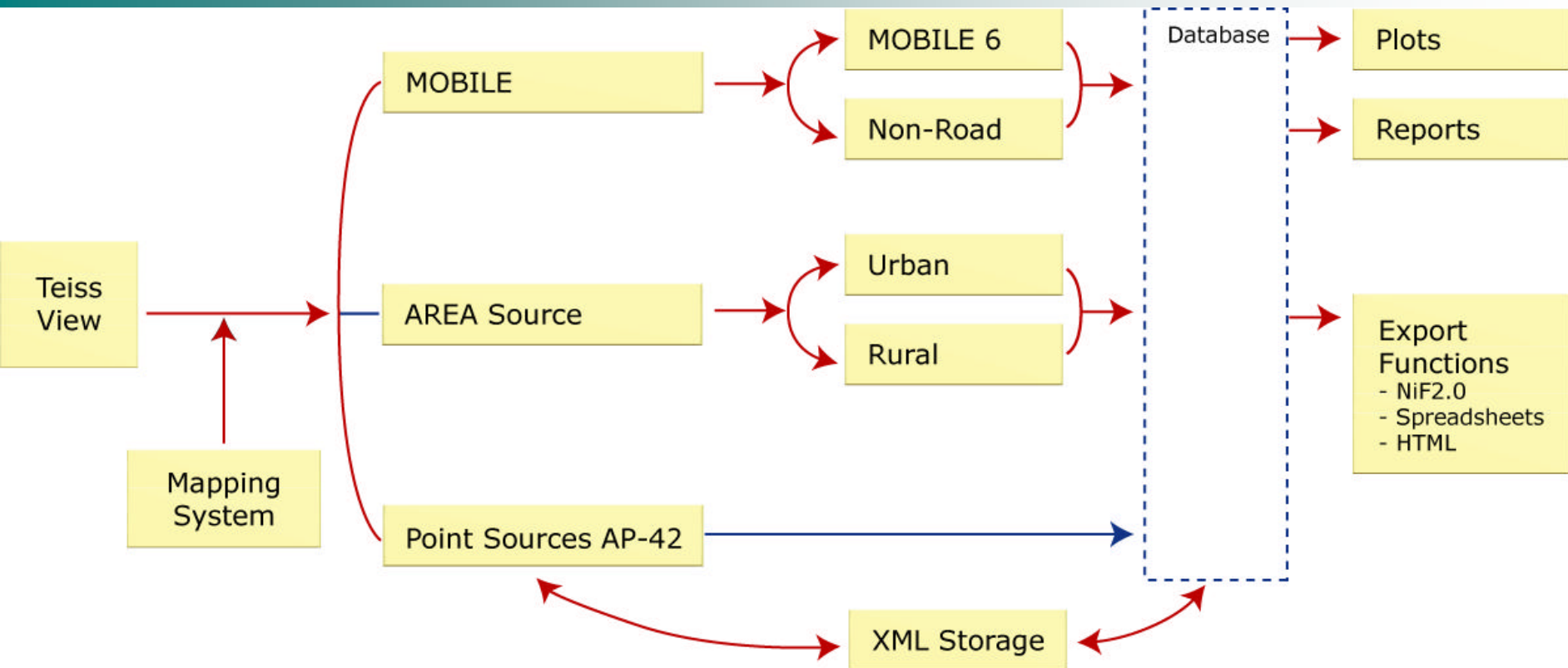
- Spatial and Temporal Database
- 100% Arc View Compatible
- Thick and Thin Clients

Scalable Architecture

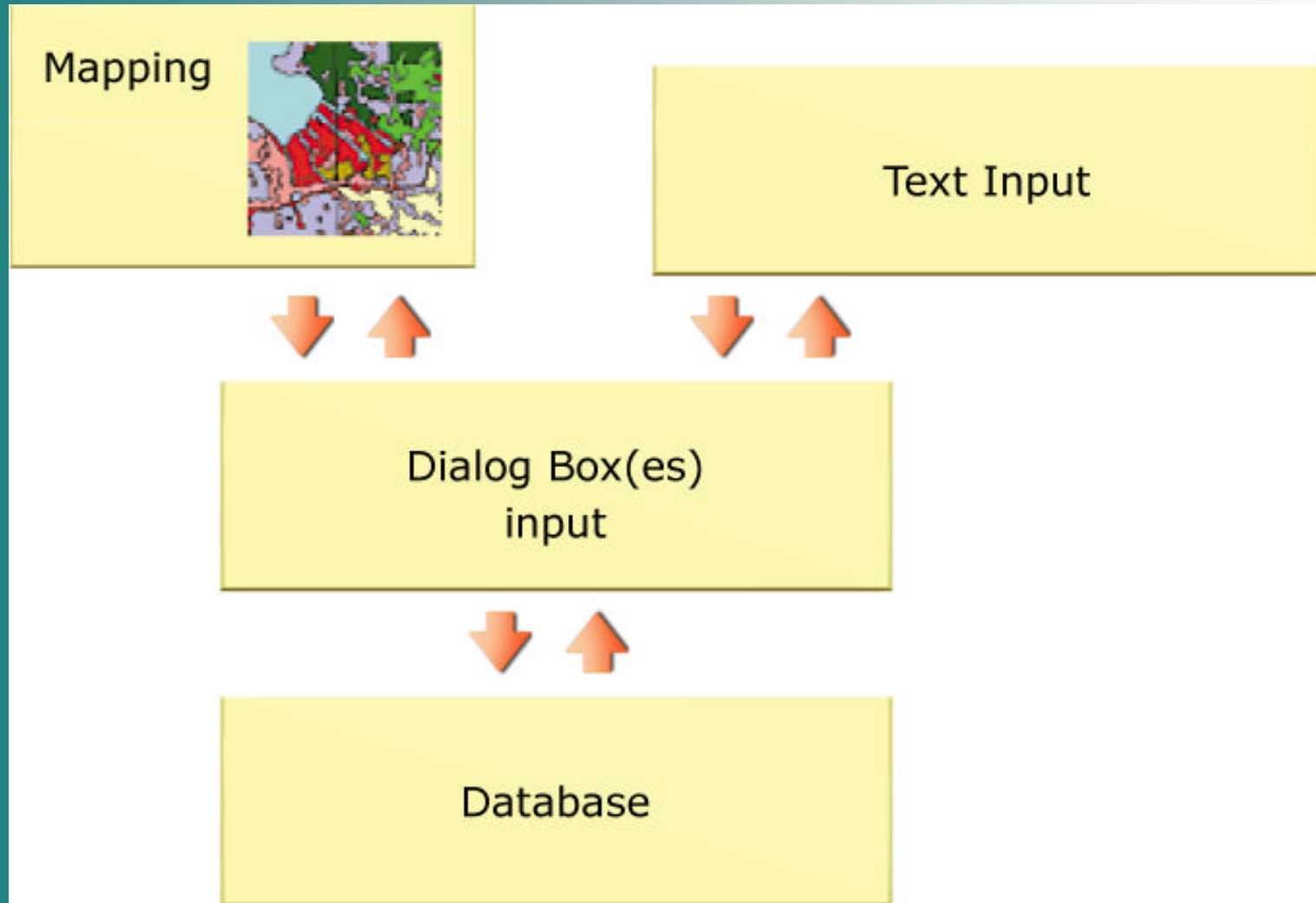
- Desktop / Stand-Alone App
 - Client / Server DBMS Independence
 - Web & .NET
 - XML



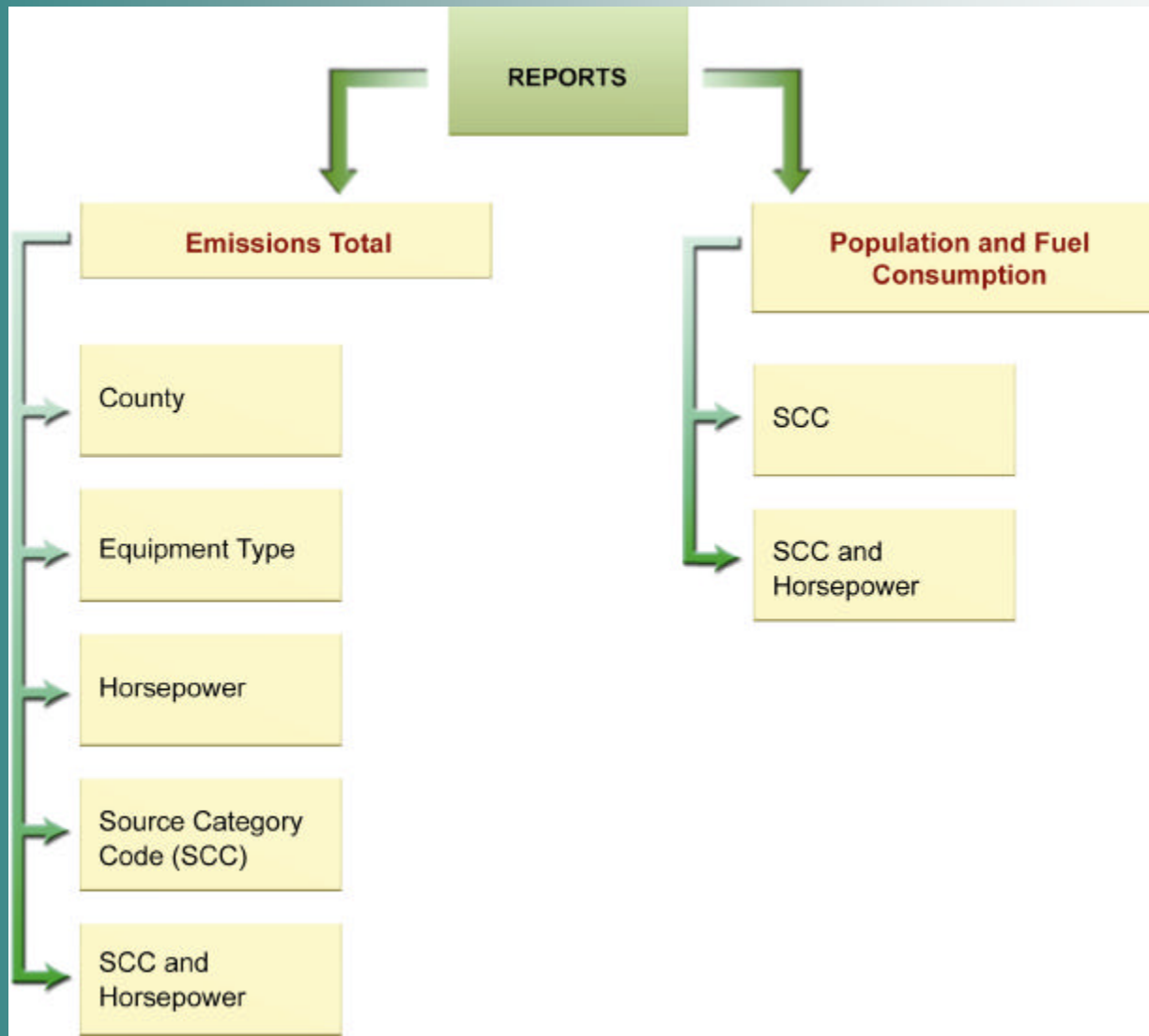
TEISS Software Components



GIS and text input integration



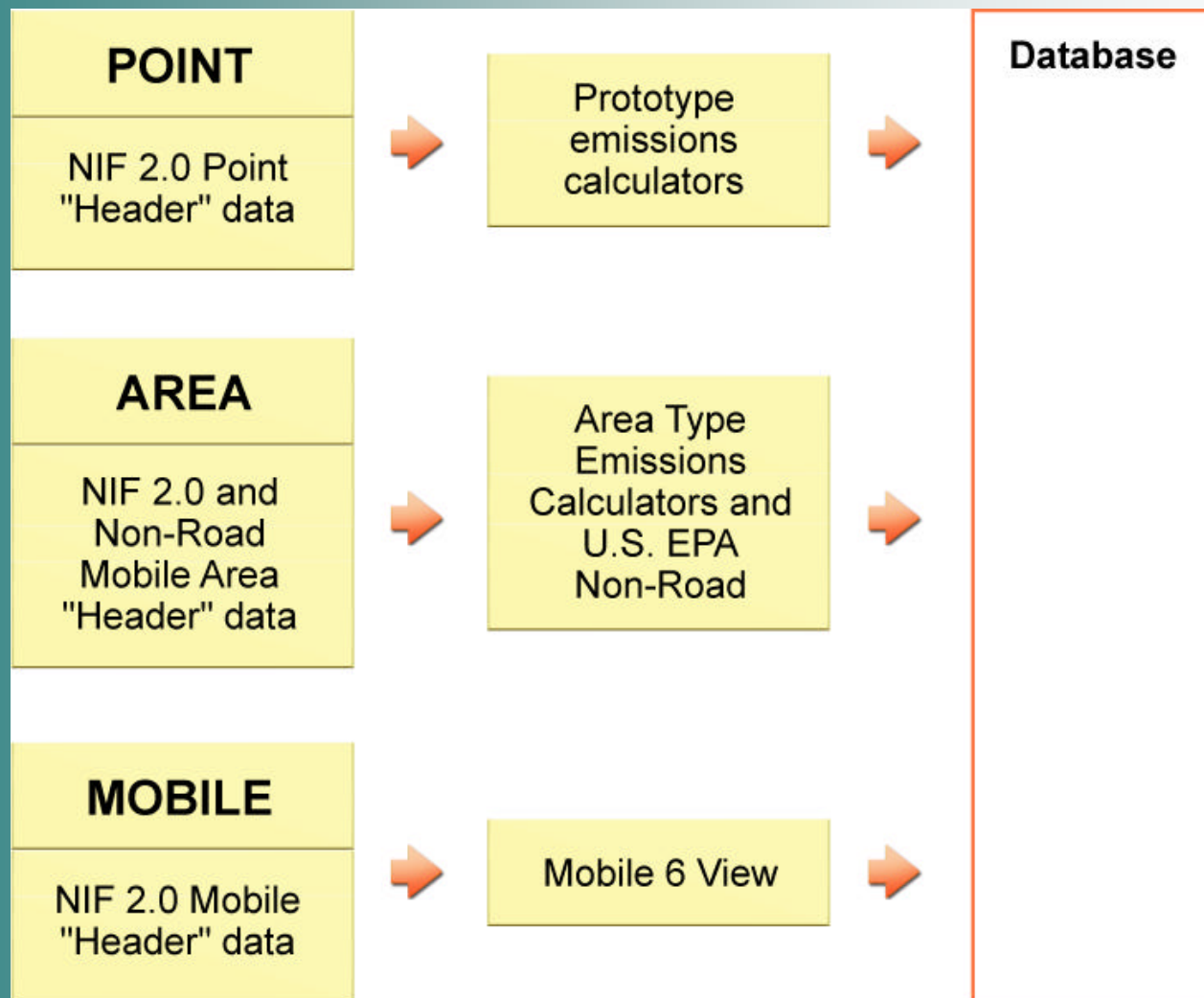
Reports



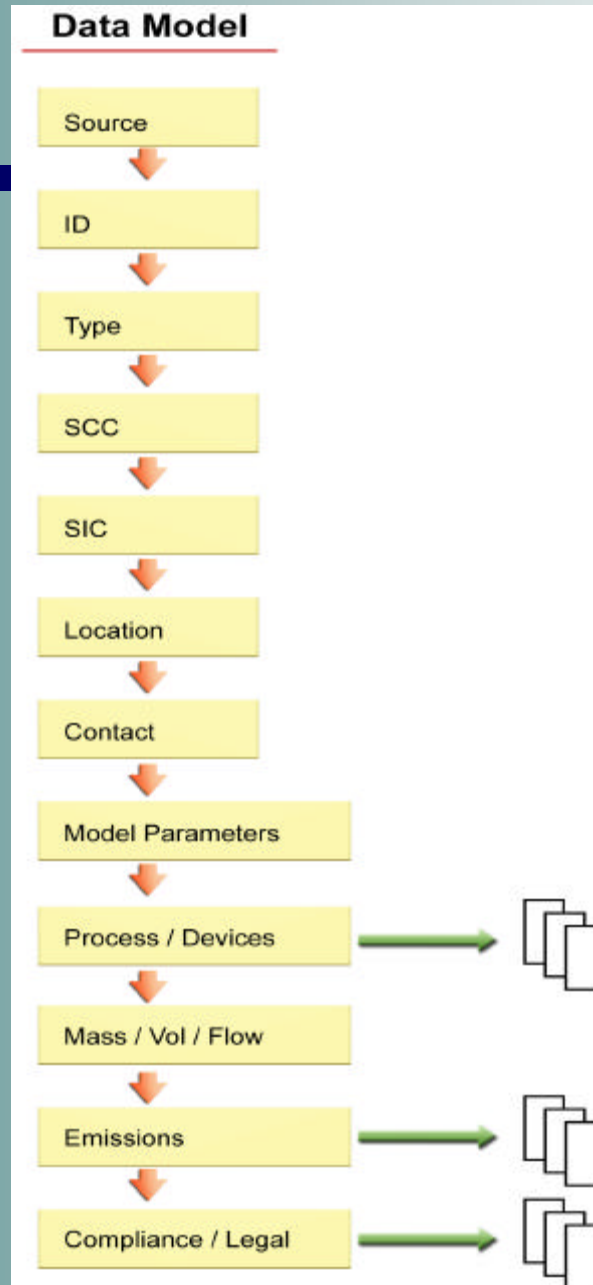
Database Structure



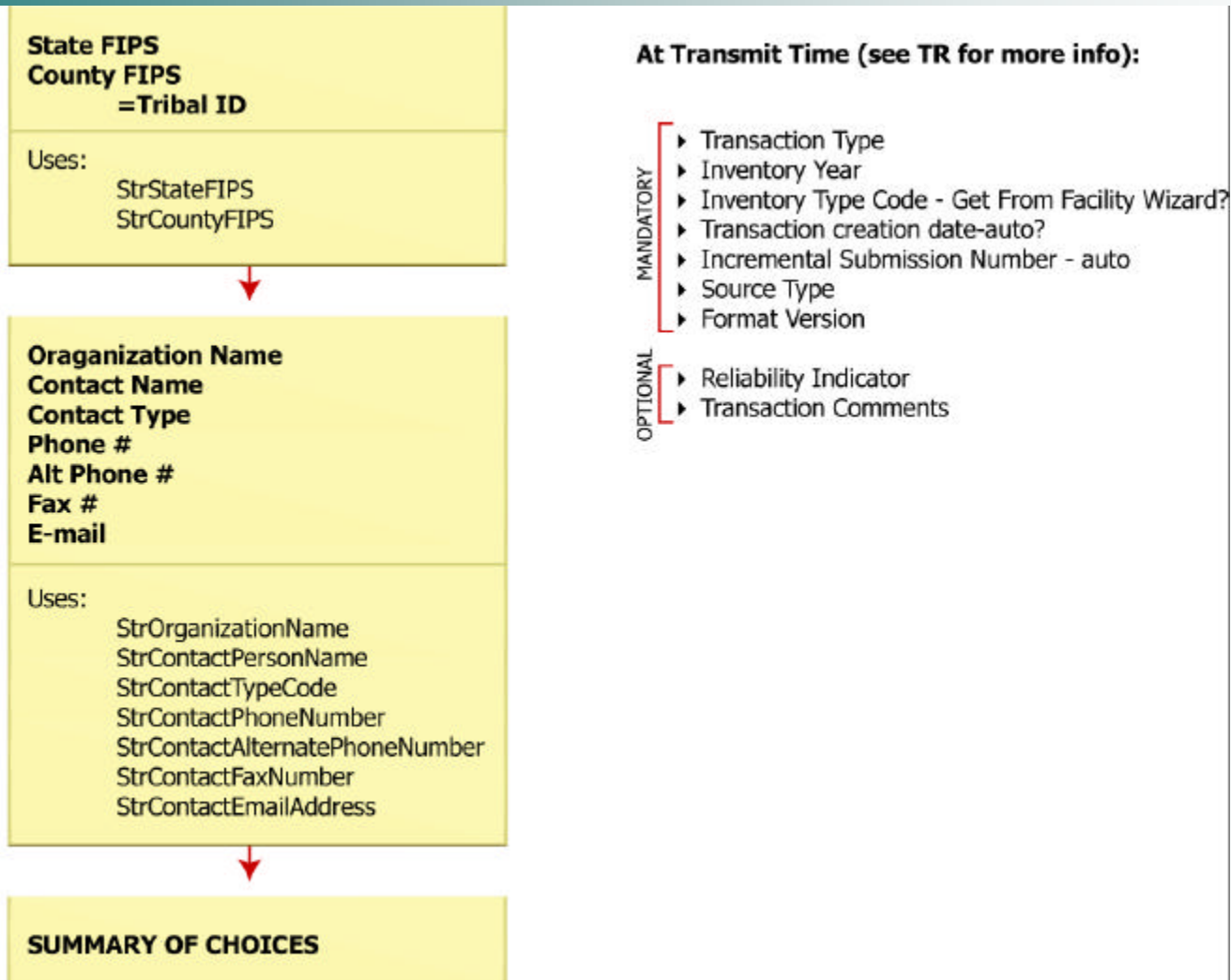
General Database Structure



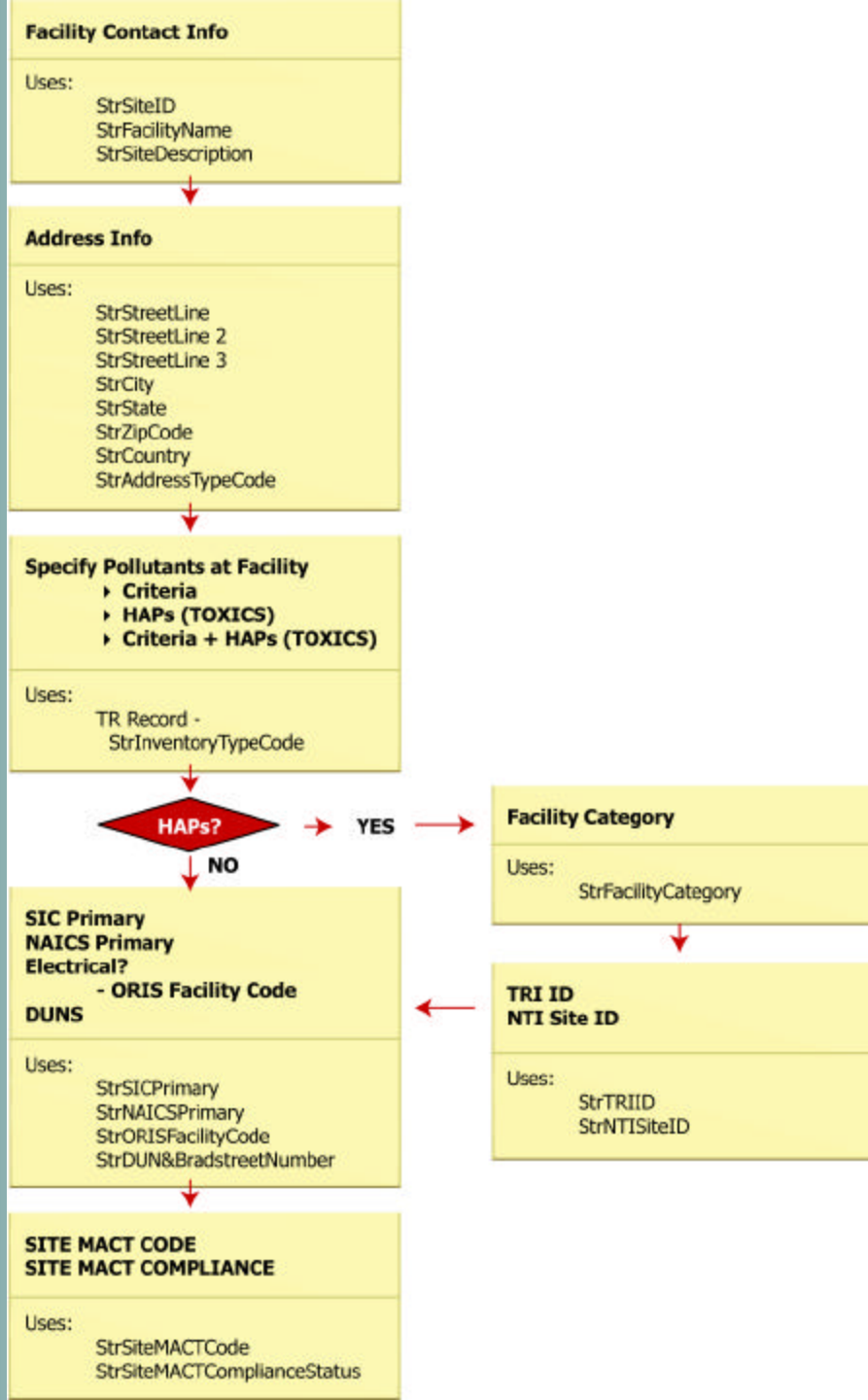
General Database Structure



Tribal Land Data Flowchart



Facility Data



Emission Unit Data

Emission Unit Info

Uses:

StrEmissionUnitID
StrSICUnivLevel
StrNAICSUnitLevel
StrORISBoilerID
StrEmissionUnitDescription



Design Capacity

Uses:

SngDesignCapacity
StrDesignCapacityUnitNumerator
StrDesignCapacityUnitDenominator
sngMaxNamePlateCapacity

QA / QC

Lakes
Environmental

QA / QC - Input

- Range Checks
- Missing Value Checks
- Statistical Checks
- Referential Integrity Guarantee

QA / QC - Code

- Unit Testing – Automated
- Dedicated Software Testers
- Various “Code Checking” Products

Data Entry Facilitation



Tribal Land Wizard

Data Wizard - Tribal Land

FIPS Information

State FIPS
Specify the Federal Information Processing Standards (FIPS) code for the State:

Tribal ID
Specify the Tribal ID code and description for the desired Tribal Land.

Tip

The Tribal ID code is specified in place of the County FIPS code. Both the State FIPS and Tribal ID codes are required to properly generate and submit to the National Emissions Inventory.

Data Wizard - Tribal Land

Contact Information

Organization Name
Specify the name of the organization that will be submitting emission reports:

Contact Person Name
Lead contact for organization transmitting emissions dataset:

Contact Type **Contact Phone #**

Alternate Phone # (Optional) **Contact Fax # (Optional)**

Contact E-mail Address
Lead contact for organization transmitting emissions dataset:

Facility/Site Data Wizard

Data Wizard - Facility Data

Facility Contact Information

Site/Facility ID
Unique State/Local/Tribal ID for this facility that is reported consistently over time.

Facility Name
Specify the name of the facility at this location:

Facility Description (Optional)
Provide any comments /description for the facility:

Help Cancel < Back Next >

Data Wizard - Facility Data

Facility Contact Information

Street Address

City **State**

Country **ZIP Code**

Address Type Code
Indicates if specified address is the physical, mailing or parent address. Report the physical address if available.

Help Cancel < Back Next > Finish

EMISSIONS UNIT WIZARD

Data Wizard - Emission Unit Data

Emission Unit Information



Emission Unit ID
Specify a unique state/local/tribal numeric identifier. This is used to distinguish each emission unit of a plant.

Emission Unit Description (Optional)

SIC Unit Level
Specify the unit level Standard Industrial Classification System Code:

NAICS Unit Level
Specify the unit level North American Industry Classification System Code:

ORIS Boiler ID (Optional)
Unique identifier for electric generating units (primarily SIC=4911). This code is assigned by the Dept. of Energy - Energy Information Administration (EIA).

Help Cancel < Back Next > Finish

Data Wizard - Emission Unit Data

Design Capacity - Optional



Design Capacity (Optional)
Numeric value of average operational capacity for the Emission Unit. May be equal to the design capacity of control unit when reporting (secondary) emissions that result from operation of the control device itself. The Design Capacity should be reported if the Emission Unit is a boiler or a turbine.

Design Capacity Unit Numerator (Optional)
The units of capacity for an Emission Unit (i.e., MW, KW, lbs/hr).

Design Capacity Unit Denominator (Optional)
The units of capacity for an Emission Unit (i.e., MW, KW, lbs/hr).

Max Nameplate Capacity (Optional)
Numeric value of rated design capacity at 100% (max) operation. The value reported should be in the same units as those reported for Design Capacity.

Help Cancel < Back Next > Finish

EMISSIONS RELEASE POINT WIZARD

Data Wizard - Emission Release Point Data

Emission Release Point Overview



Emission Release Point ID
Unique state/local/tribal numeric identifier used to distinguish geographic location where emissions are released to ambient air.

Emission Release Point Description (Optional)
Provide an optional description of the Emission Release Point, up to 80 characters in length:

Emission Release Point Type
Describes the physical configuration of the release point and whether it is a stack or non-stack:

Select Emission Release Point Type

Help Cancel < Back Next > Finish

Data Wizard - Emission Release Point Data

Emission Release Location



Geocoordinates

☐ Lat/Long

Degrees Minutes Seconds

Latitude: ☐ N ☐ S

Longitude: ☐ W ☐ E

☐ UTM

UTM Zone:

X-coord (km):

Y-Coord (km):

Tip
The coordinates for the Release Point can be specified in either Latitude/Longitude or Universal Transverse Mercator system coordinates. The wizard will ensure that the geocoordinates are reported in the required geocoordinate system.

Help Cancel < Back Next > Finish

EMISSIONS RELEASE POINT WIZARD

Data Wizard - Emission Release Point Data

Stack Parameters

Stack Dimensions

Stack Height [ft]:

Stack Diameter [ft]:

Stack Fenceline Distance [ft]:

Exit Gas Parameters

Exit Gas Velocity [ft/s]:

Exit Gas Flow Rate [ft³/s]:

Exit Gas Temperature [F]:

Tip

Data Wizard - Emission Release Point Data

Non-Stack Parameters

Non-Stack Data

Horizontal Area Fugitive:
Horizontal area of fugitive emissions.

Release Height Fugitive:
Release height (above terrain).

Fugitive Dimensions Unit:
Unit of measure - same for area and height.

Tip

EMISSION PROCESS WIZARD

Data Wizard - Emission Process Data

Emission Process Overview



Emission Process ID
Unique state/local/tribal numeric identifier reported consistently over time.

Emission Process Description (Optional)
Provide an optional description of the Emission Process, up to 78 characters in length:

SCC Code (Required for Criteria Pollutants)
Select the appropriate EPA Source Category Classification Code for the Emission Process:

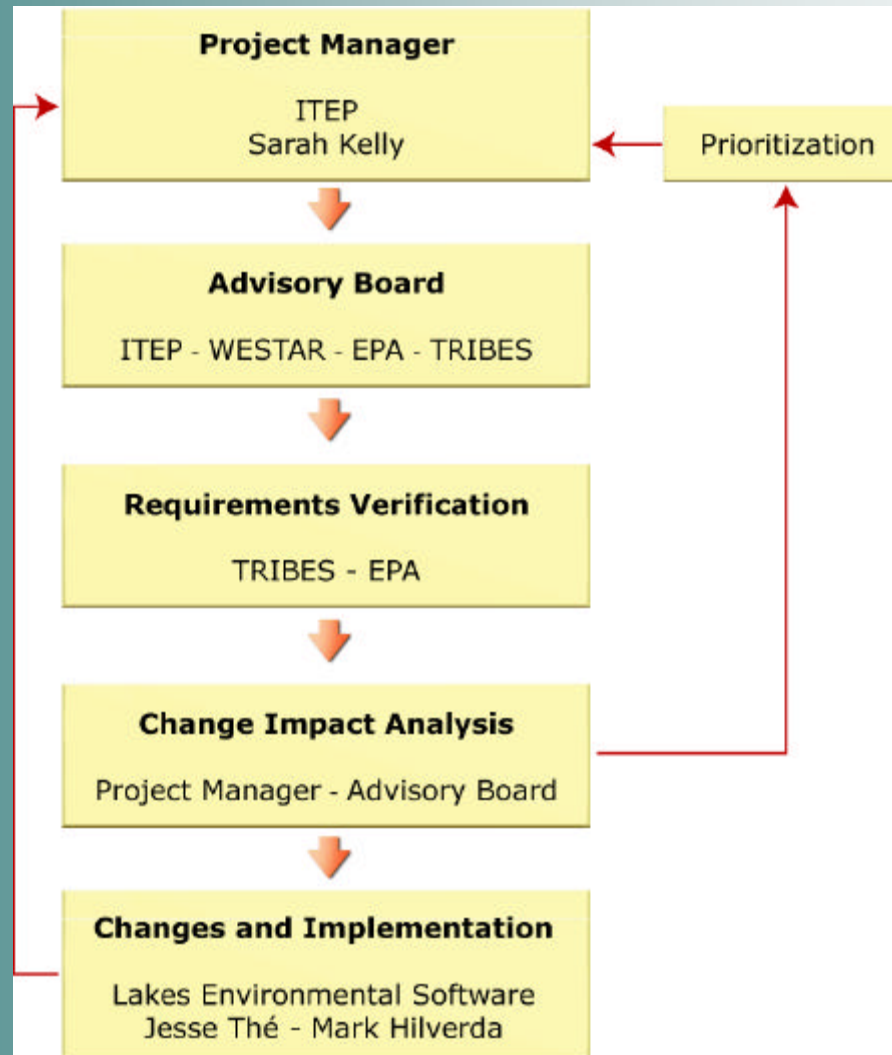
Select SCC Code

[Help](#) [Cancel](#) [< Back](#) [Next >](#) [Finish](#)

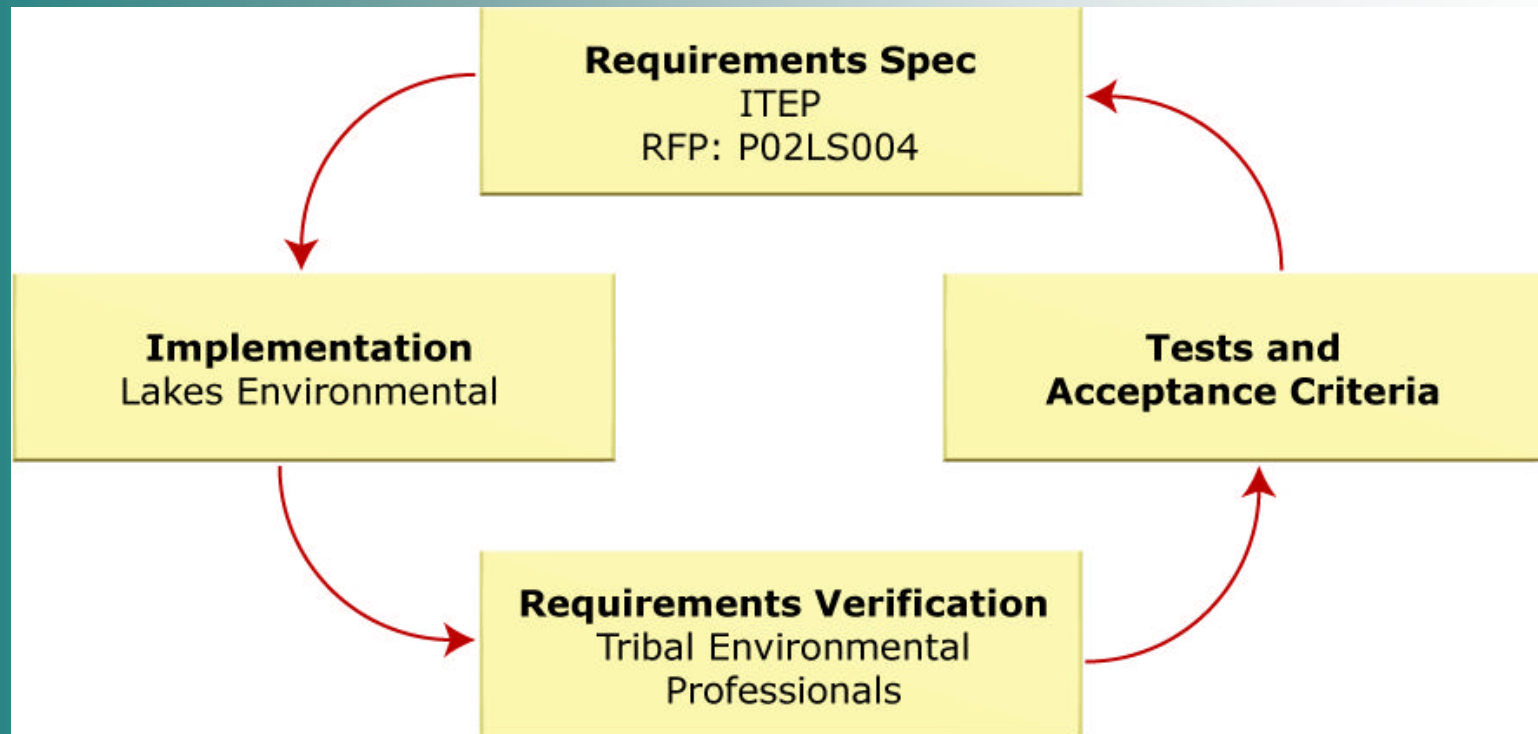
Change Management



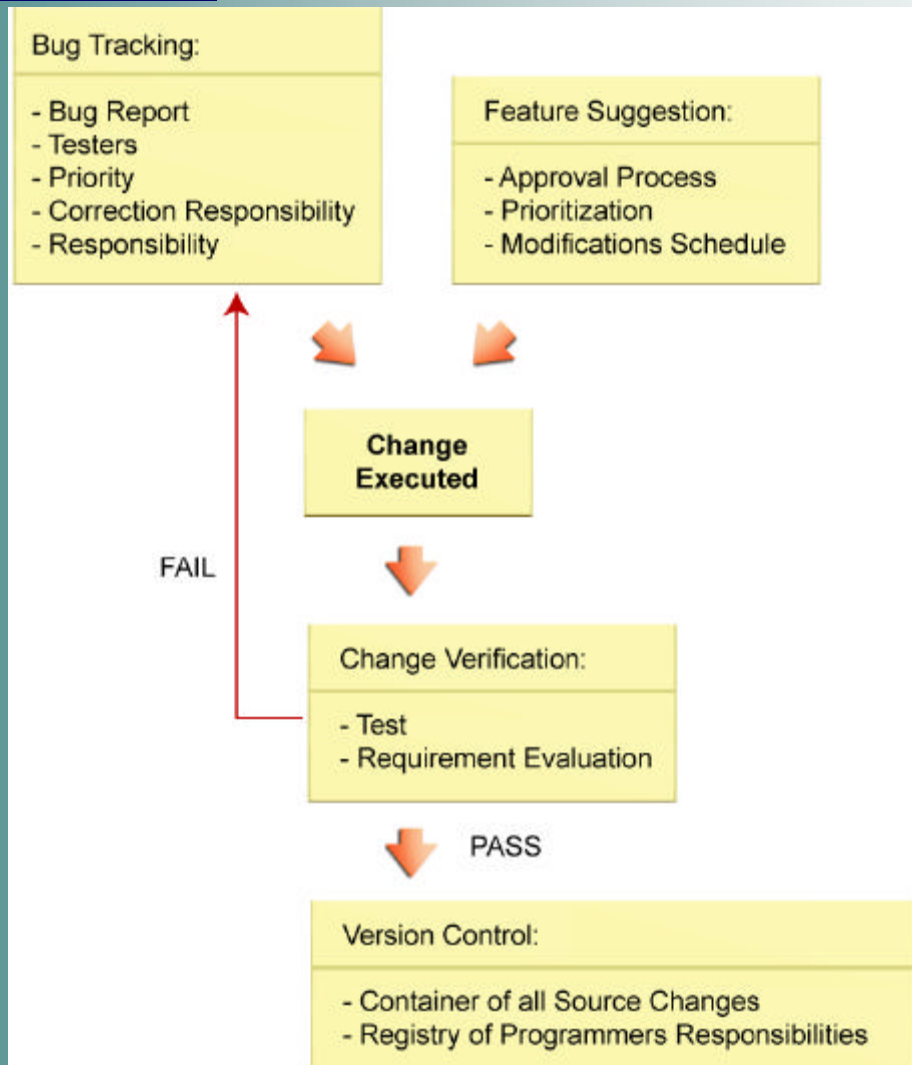
Changes Initiated by ITEP



Acceptance of Specs Changes



Corrections and Usability Enhancements



Hands-On

Lakes
Environmental

Closure



Closure

■ **Thank you for your time**

■ **Steve@WebLakes.com**

■ **Tel: (519) 746-5995**

