

Module 2

Getting Acquainted



Module Overview

- Introduction to the MOVES graphical user interface (GUI):
 - Menu items
 - Navigation panel
- Exercise: Create a RunSpec using National-scale inputs
 - Review results using the Summary Reporter
 - Purpose is to become familiar with MOVES and learn back of the envelope calculations, rather than demonstrate a recommended method for inventory analysis

Key References

- MOVES2014a User Guide (also applies to MOVES2014b)
- Policy Guidance on the Use of MOVES2014 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes
- Both documents are available at:
 - <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>
- Using MOVES for Estimating State and Local Inventories of On-Road Greenhouse Gas Emissions and Energy Consumption
 - Updated June 2016
 - Available at: <https://www.epa.gov/state-and-local-transportation/estimating-road-greenhouse-gas-emissions>

Introduction to the MOVES Graphical User Interface (GUI)



The MOVES Graphical User Interface (GUI)

Begin by opening MOVES2014b

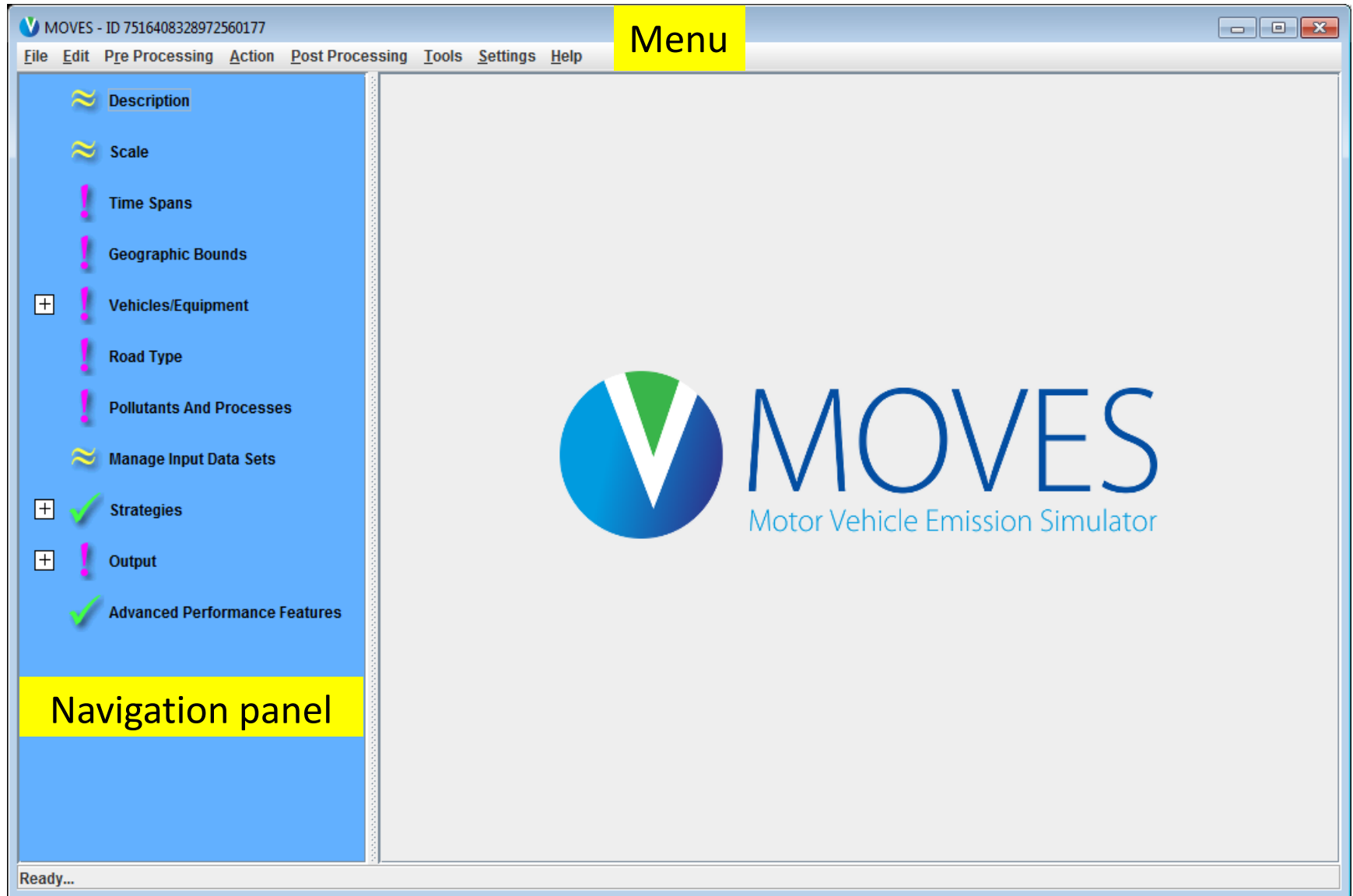
- On your desktop, double-click the “MOVES2014b” icon
- Make sure it's MOVES2014b, if you have multiple versions



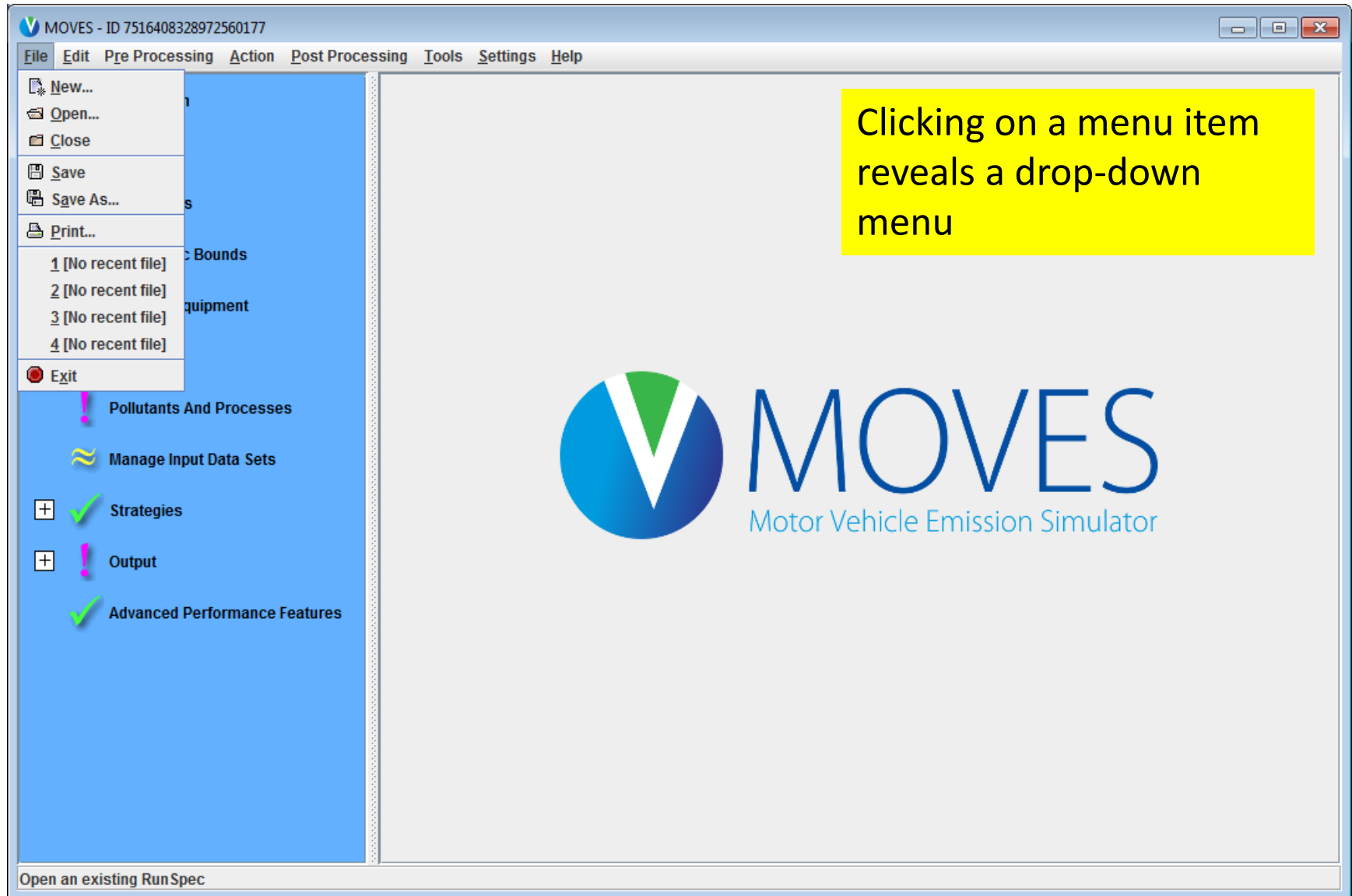
View

- Menu items
- The navigation panel

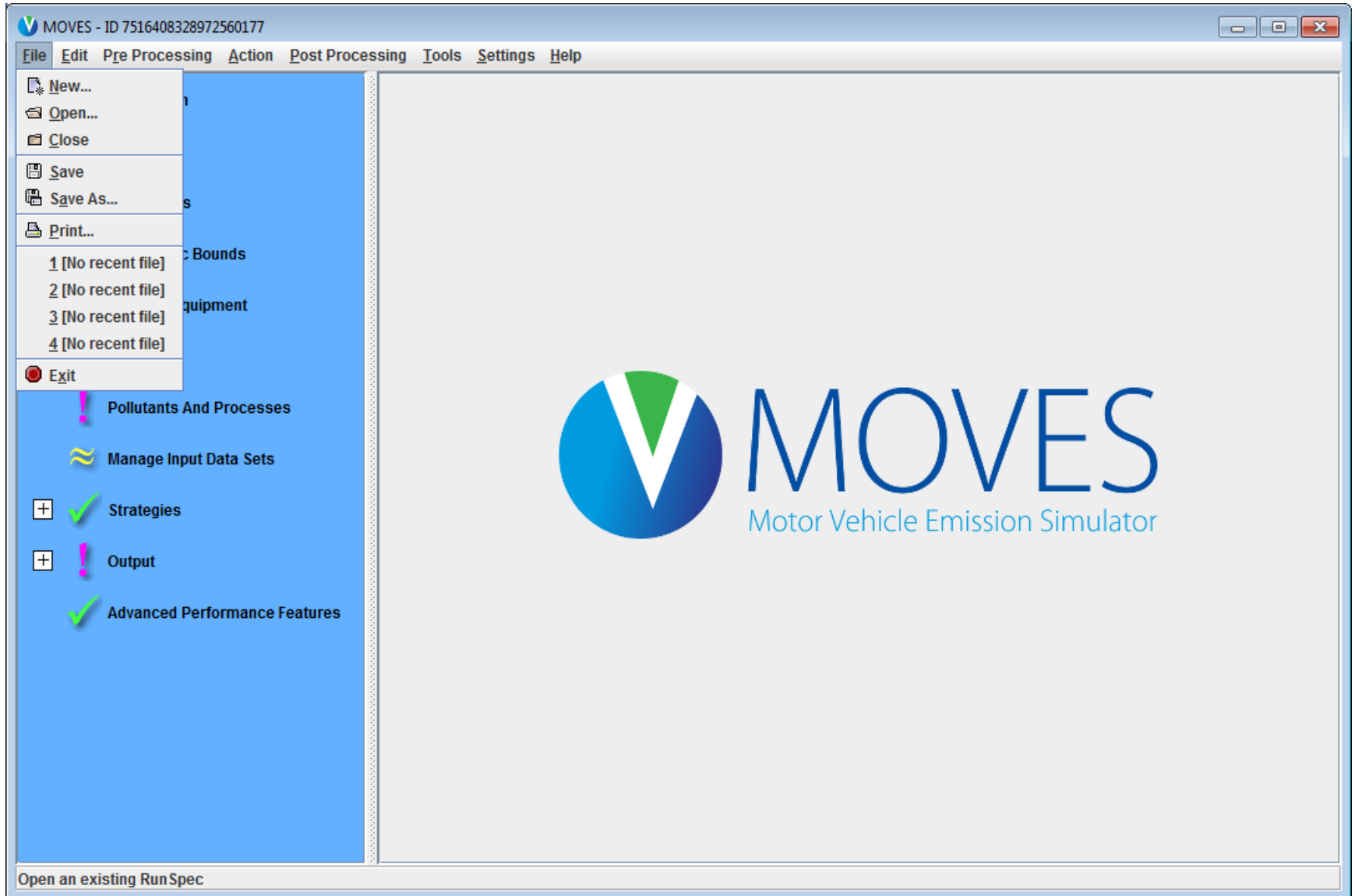
MOVES Graphical User Interface (GUI)



GUI Menu Items



File



File

Choices under File (New, Open, Close, Save/as, Print) refer to the RunSpec

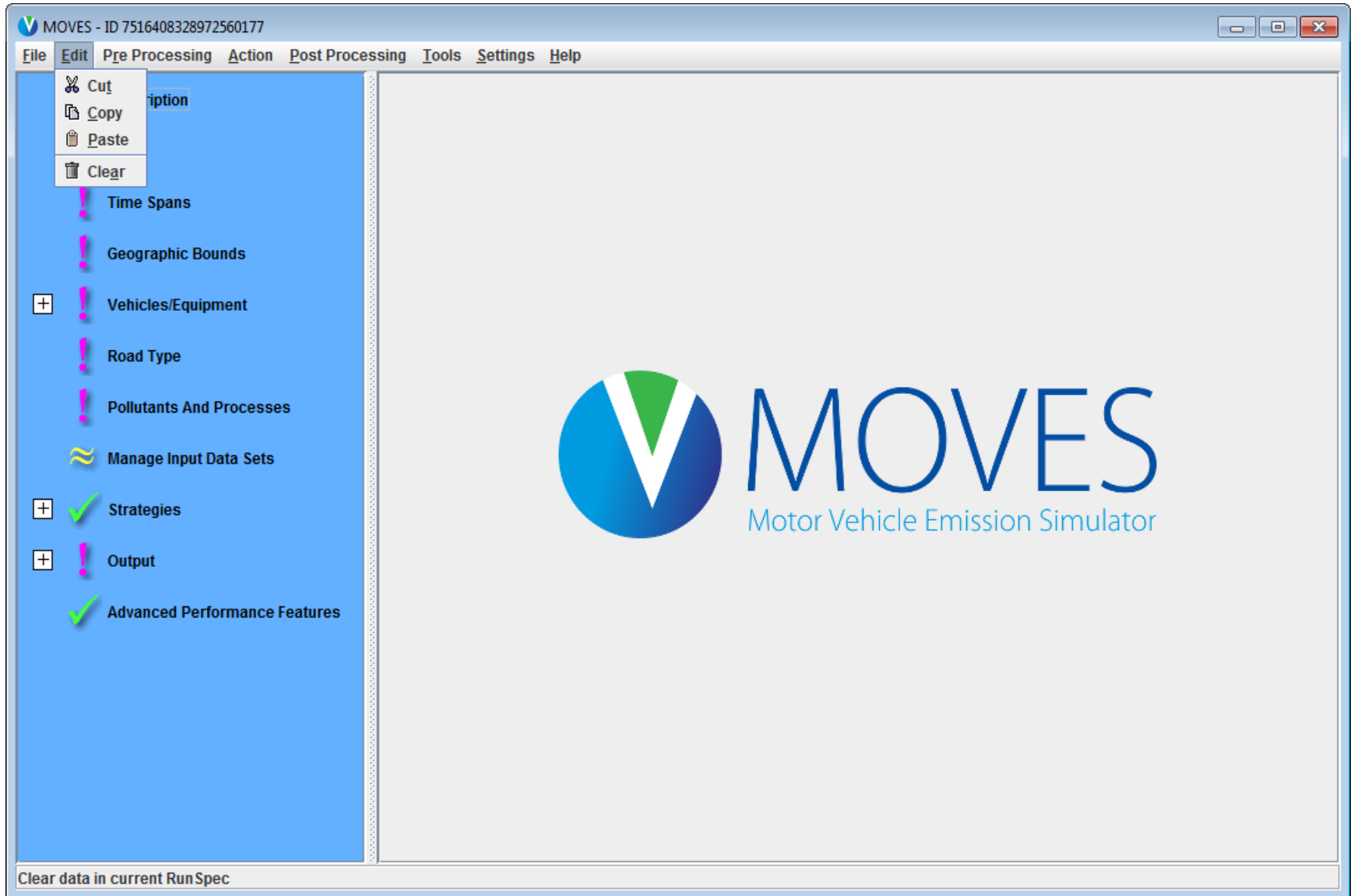
- Print will print the XML version of the RunSpec, not a screen shot
- Your latest saved RunSpecs are also listed

Saved RunSpecs can be reloaded and run again or edited

Tips for RunSpec file name conventions

- Only letters, numbers and underscores (_) should be used
- Use “ .mrs” extension, for “MOVES RunSpec”
- Details like location, year, or other descriptions can distinguish similar RunSpecs
- Examples:
 - “NewYorkState_2009_GHG.mrs”
 - “Washtenaw_2025_ozone.mrs”

Edit



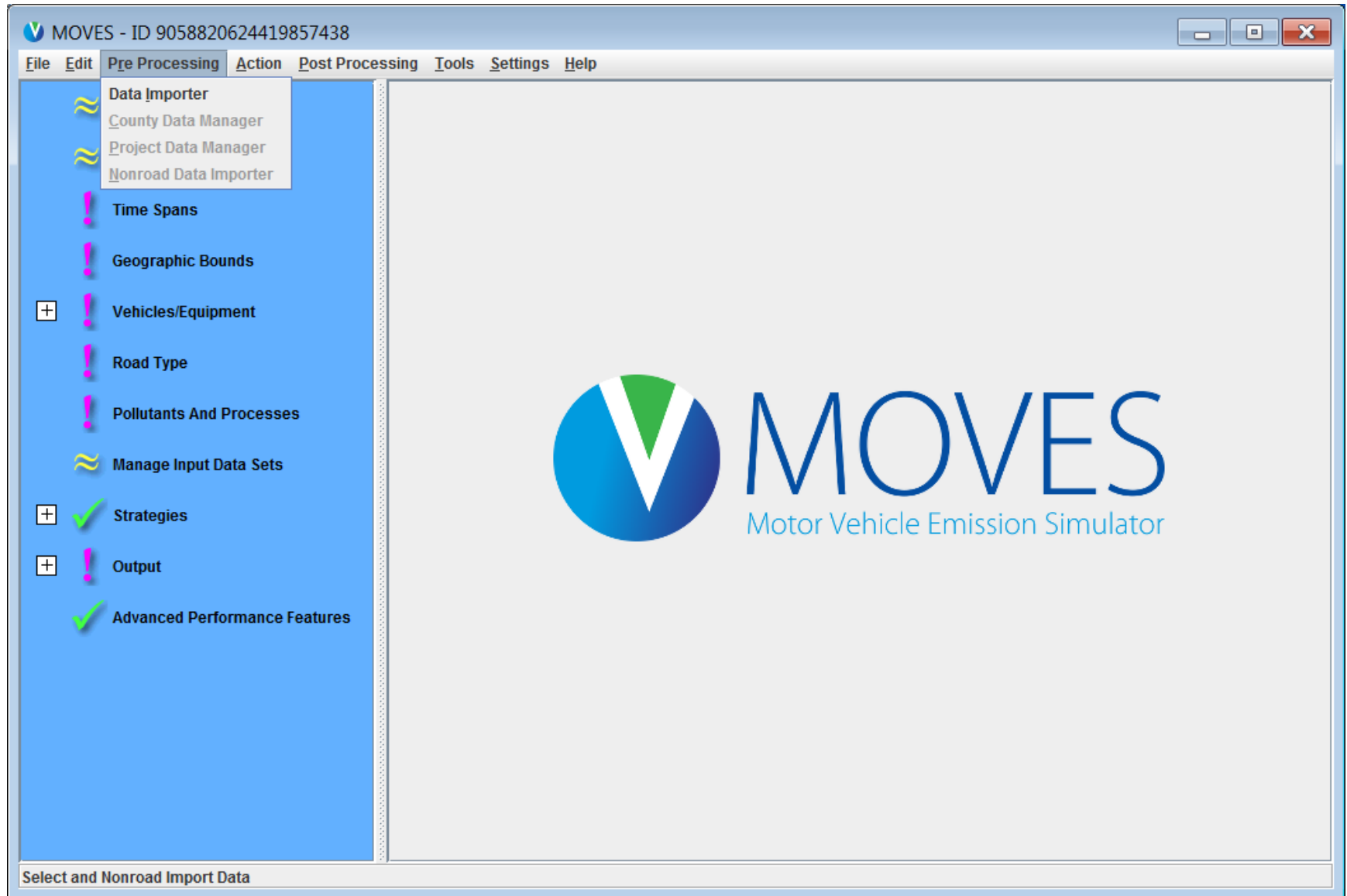
Edit

Standard commands for manipulating text

- Cut
- Copy
- Paste
- Clear

*Only available in text entry sections of MOVES RunSpec

Pre Processing



Pre Processing

Accesses data managers to create input databases for local data

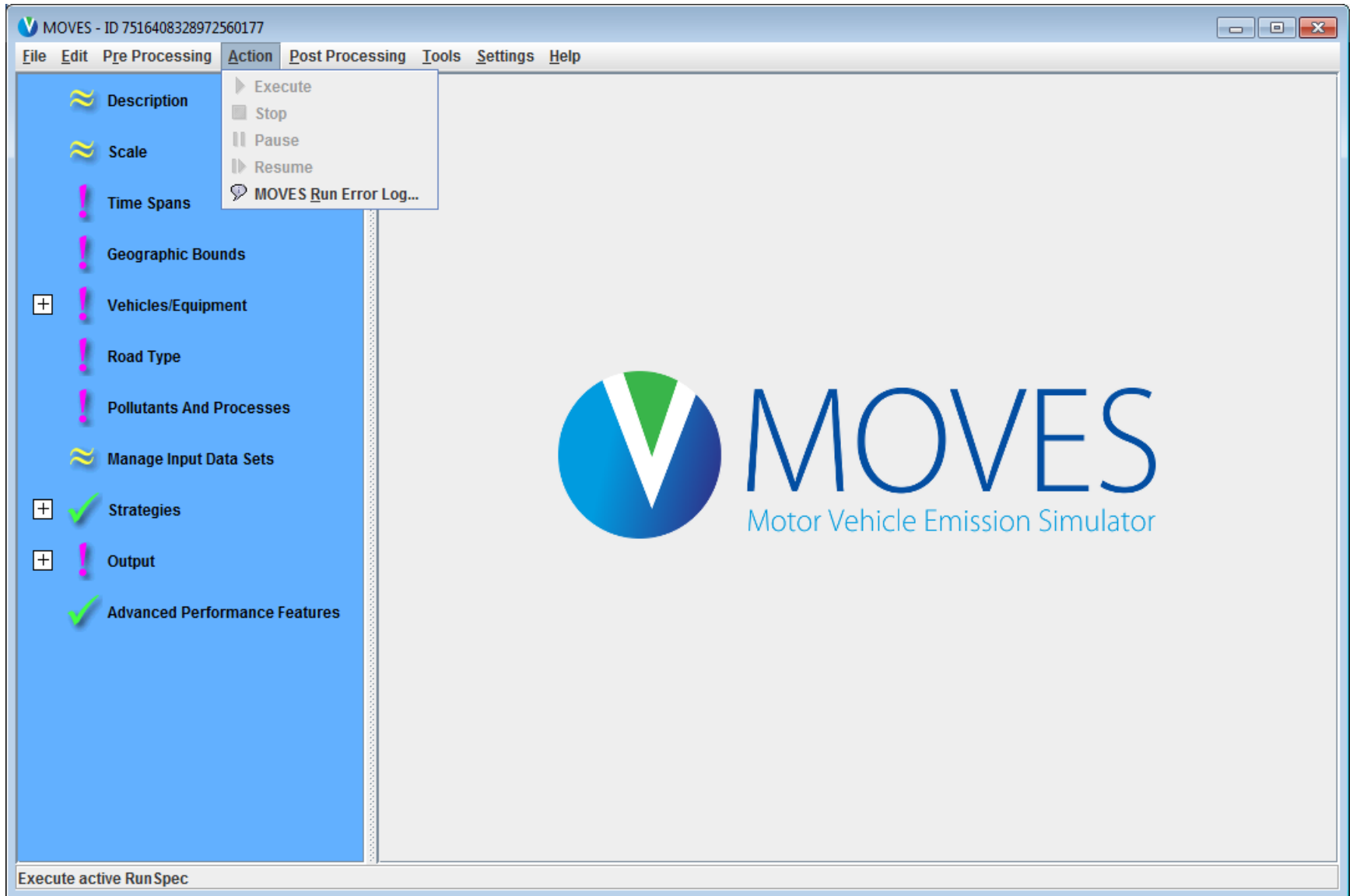
- Data managers contain templates to ensure that data is correctly formatted

Data Manager	Scale	Necessary?
Data Importer	National	No, optional
County Data Manager	County	Yes
Project Data Manager	Project	Yes
Nonroad Data Importer <i>Covered in Module 10</i>	Nonroad: National	No, optional

Local data is entered before MOVES is run (hence, “pre process”)

County or Project Data Manager can also be accessed within the RunSpec panels – illustrated later in course

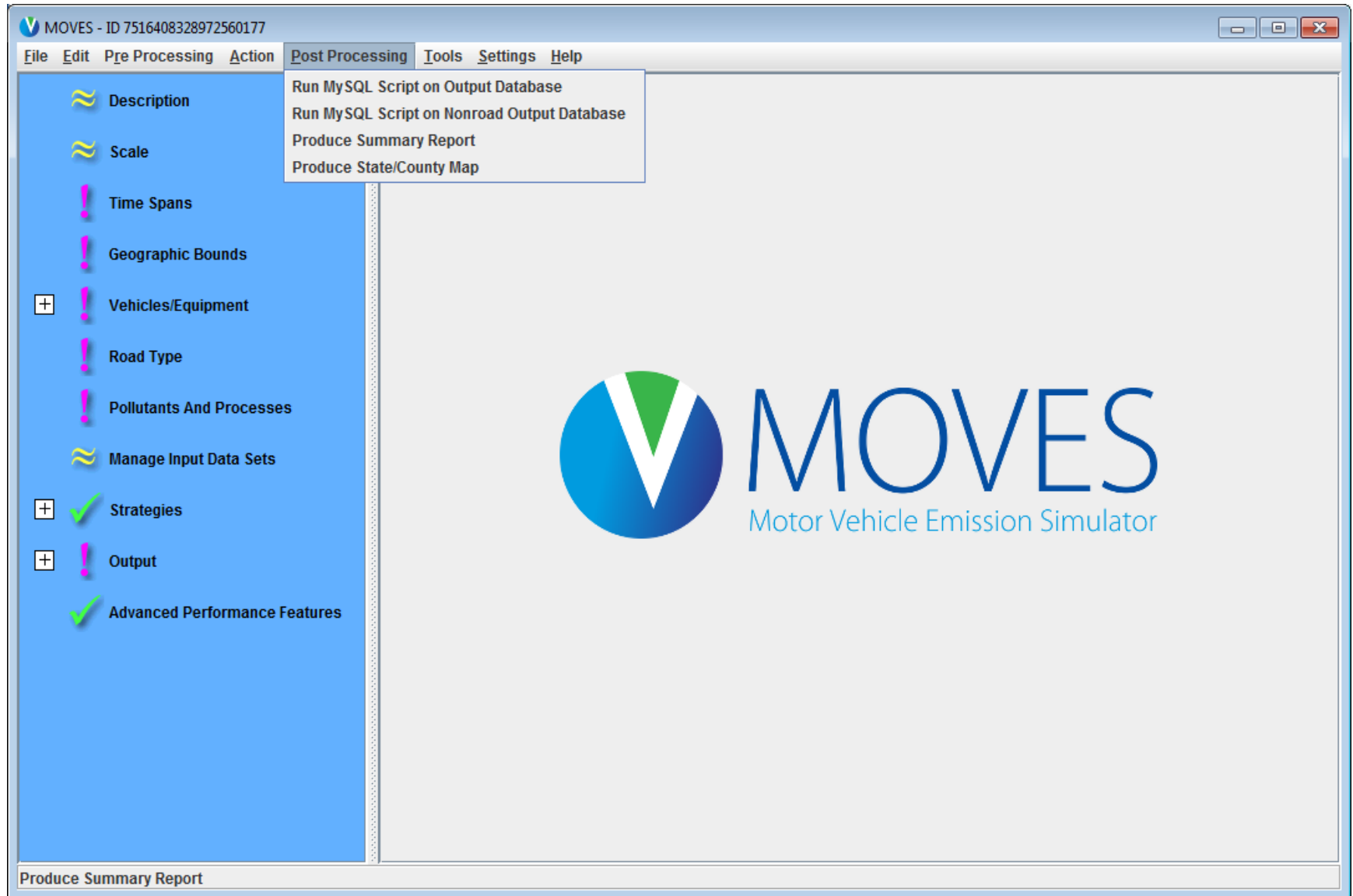
Action



Action

- Execute: Runs MOVES if RunSpec is complete (or a completed RunSpec file opened)
- Stop: Terminates an in-progress MOVES run (run cannot be resumed)
 - Alternatively, you can close the DOS window to end and close MOVES
- Pause: Pauses a MOVES run in progress
- Resume: Resumes a MOVES run that has been paused
- MOVES Run Error Log: Displays an error log for the selected output database

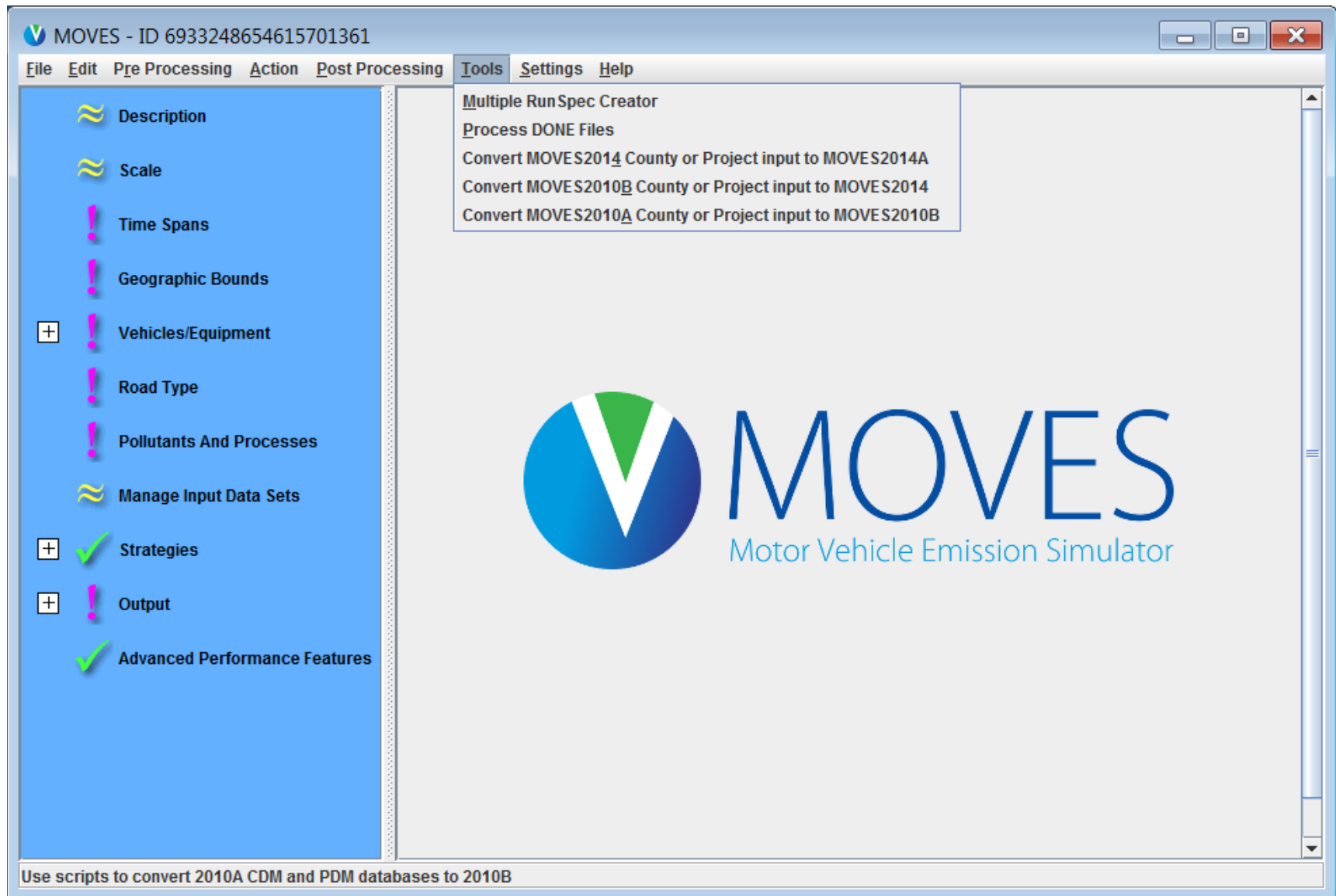
Post Processing



Post Processing

- Options available once a MOVES run is completed successfully:
 - Run MySQL Script on Output Database
 - Enables you to select from a set of MySQL scripts (programs) to further process MOVES output databases
 - Covered in Module 4
 - Run MySQL Script on Nonroad Output Database
 - Covered in Module 10
 - Produce Summary Report
 - We will use later in this module
 - Produce State/County Map
 - Displays RunSpec output in color or gray-scaled maps (not covered in this training)

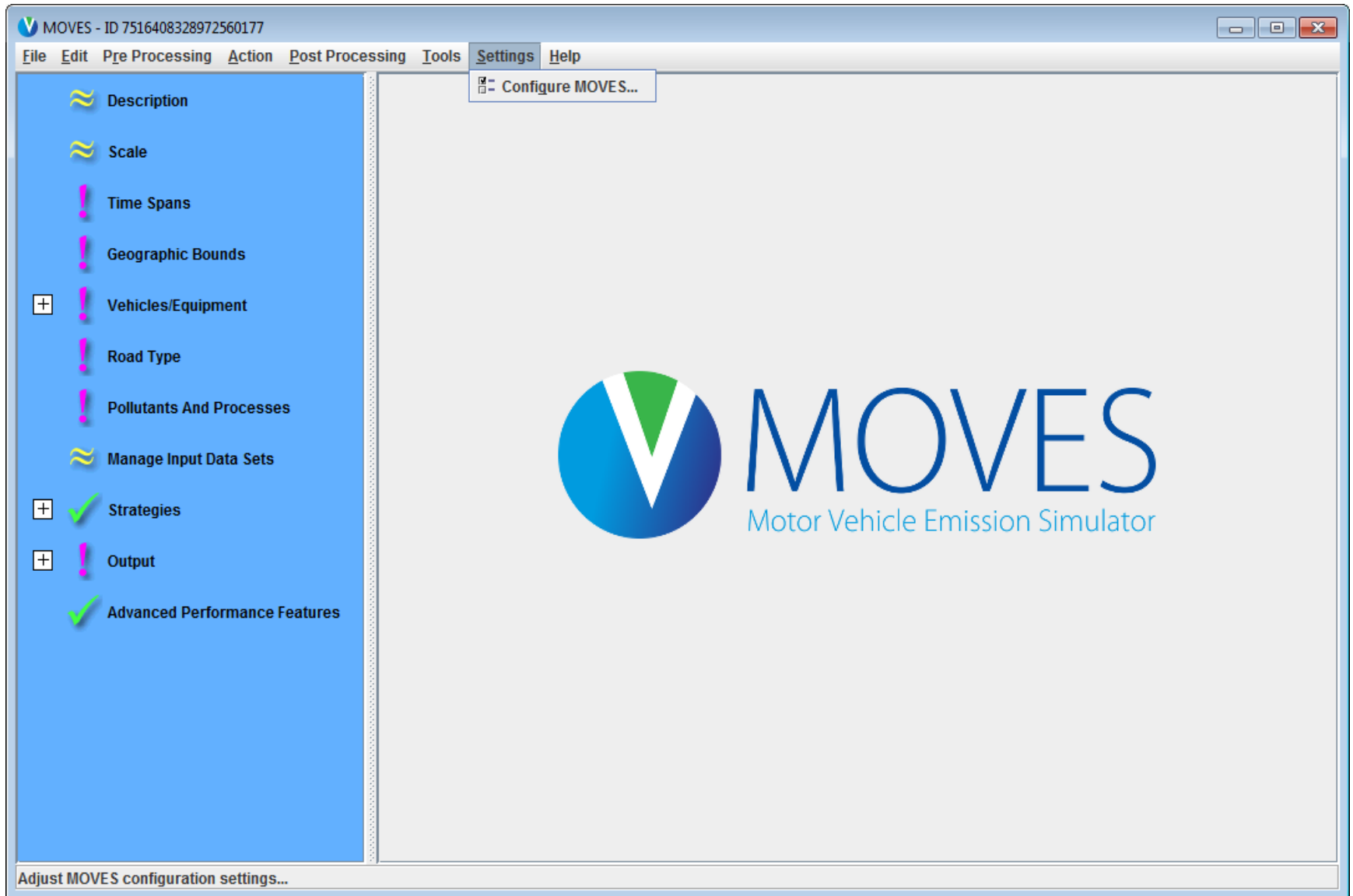
Tools



Tools

- Tools are not covered in this course; see MOVES2014a User Guide (which also applies to MOVES2014b) for additional information
- Multiple RunSpec Creator
 - Used when you need to execute a batch of similar MOVES runs
- Process DONE Files
 - An advanced tool not recommended for most users, related to how MOVES is configured for networks
- Convert MOVES2014 County or Project input into MOVES2014a
 - Note, if the older database's fuels and I/M tables were based on MOVES2014 defaults, the analysis must be reperformed with MOVES2014a default data after using the converter
 - Converted RunSpec can be used with MOVES2014b
- Convert MOVES2010b County or Project input into MOVES2014
 - Same note as above regarding fuels tables
- Convert MOVES2010a County or Project input into MOVES2010b
 - Tool still available, if you need to convert MOVES2010a databases to MOVES2014a

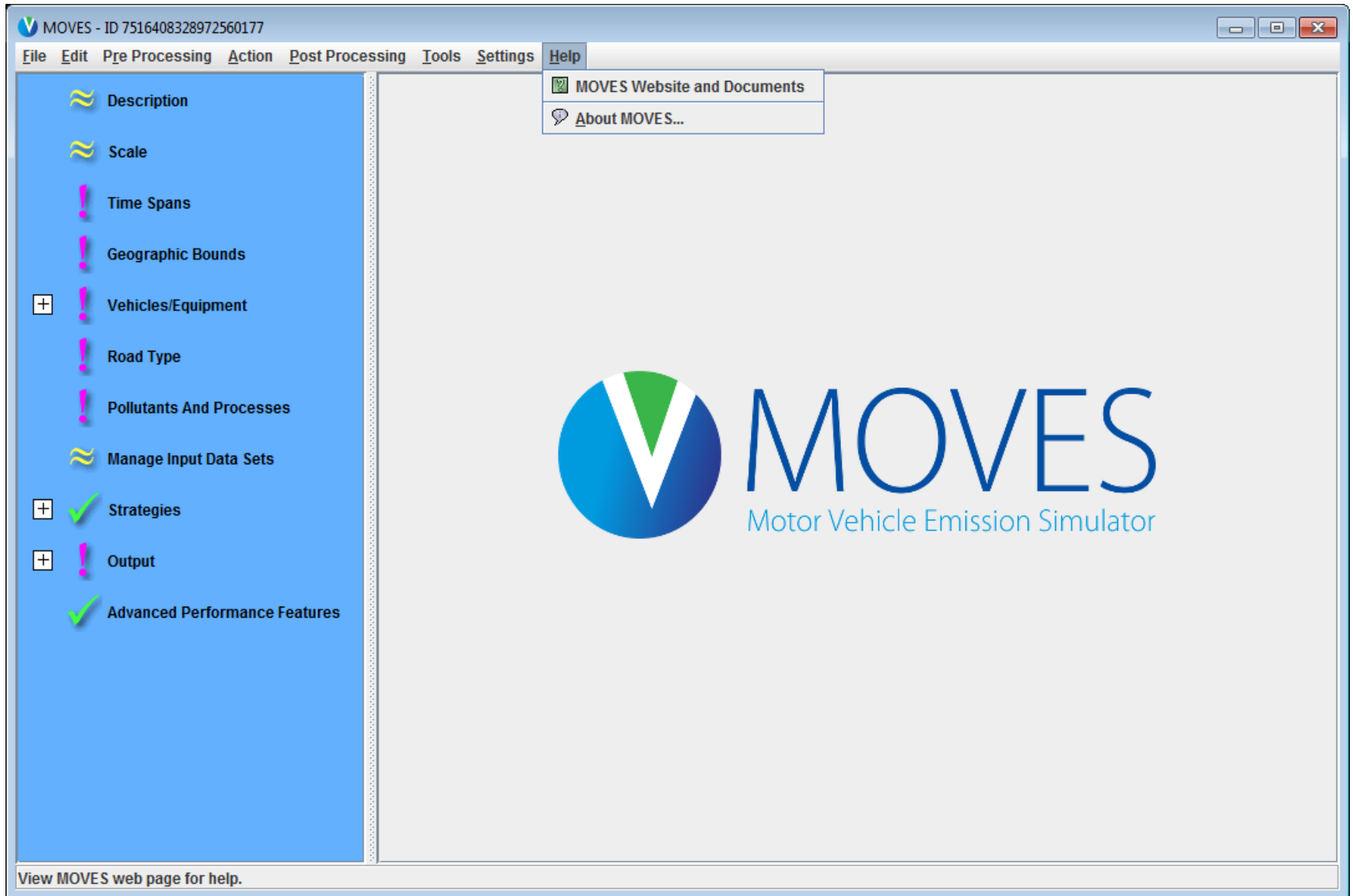
Settings



Settings

- Configure MOVES
 - Allows user to set up the basic MOVES operating configuration, e.g., so multiple worker computers on the same network could access same drives/folders
 - Settings are not covered in this course, see User Guide for more information

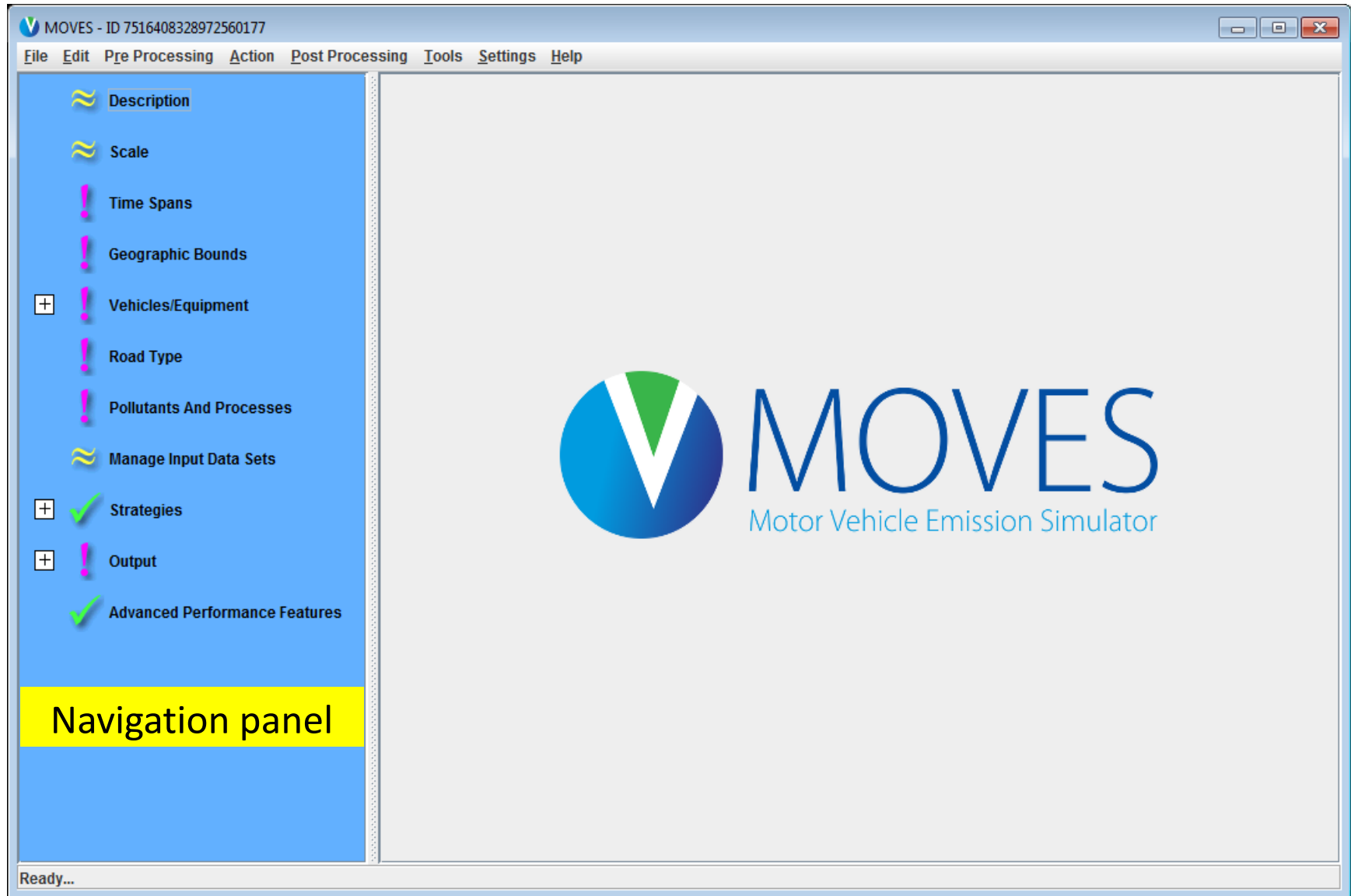
Help



Help

- MOVES Website and Documents
 - Links to MOVES website with User Documents and Tools
- About MOVES...
 - Clicking will provide version and release date of model

Navigation Panel



Navigation Panel

- The GUI Navigation Panel is used to set up your RunSpec
- The RunSpec specifies the scale, location, time period, alternate data and output preferences of a MOVES run.
- To setup a RunSpec, complete each item on the Navigation Panel by making selections on the sub-panels
 - Items marked with \approx are optional but recommended
 - Items marked with ! are required
 - NOTE: All items on the Navigation Panel must show ✓ or \approx to run MOVES.

Exercise: Create a RunSpec for
using National-scale inputs



Hands-on Exercise: National Scale Run

Purpose: Learn to use the Navigation Panel and create a RunSpec

Let's create a RunSpec to answer the question:

- How much total HC was emitted from on-road vehicles in Lake County, Indiana in a typical summer day in 2015?

We will do the same run in Module 3 at the *County scale* and compare results

Note:

- This exercise scenario is intentionally simplified to facilitate learning, limit complexity, and reduce MOVES run time
- You cannot use the national scale for SIP or conformity purposes – this is for comparison only

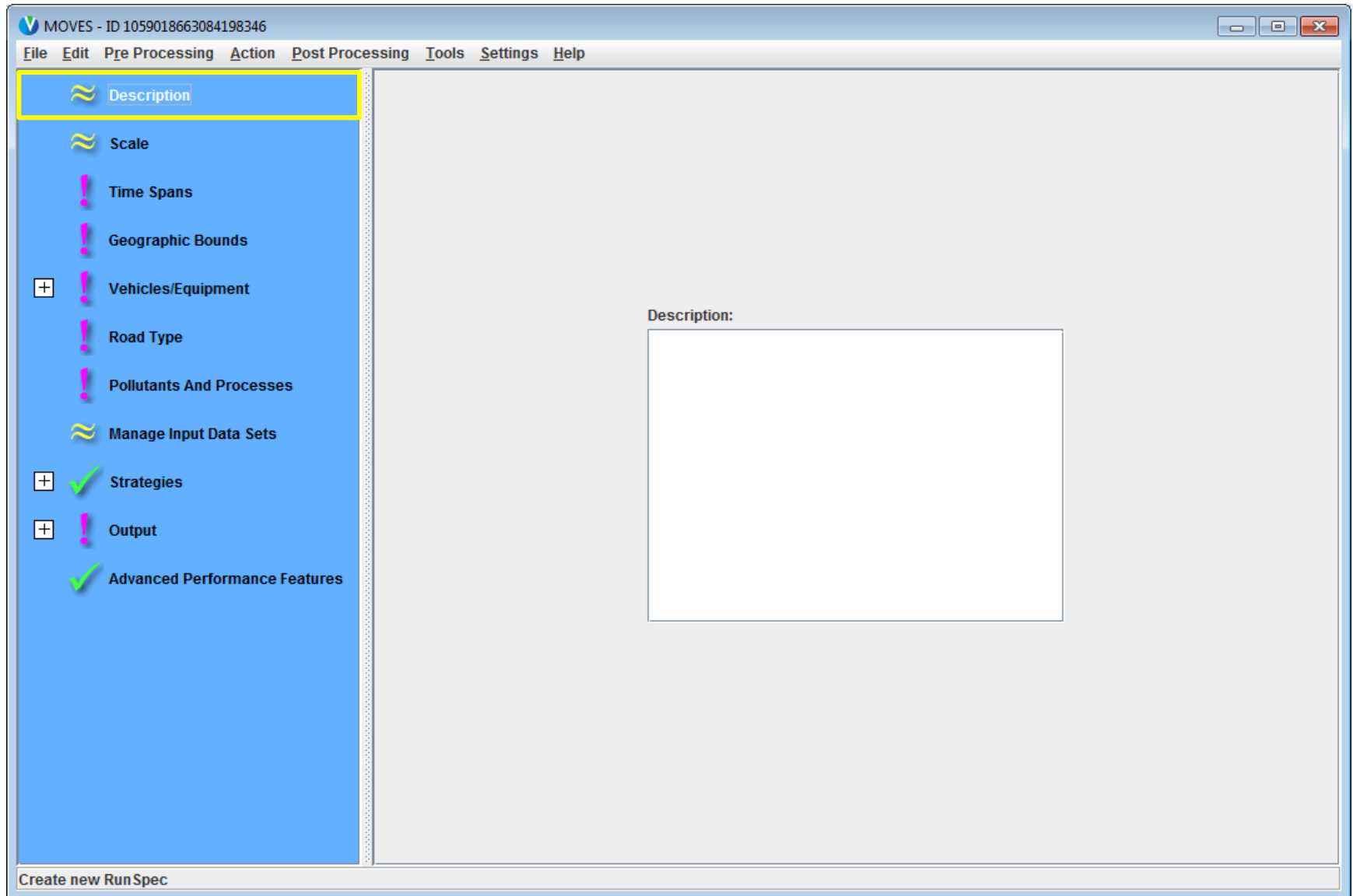
Exercise Overview

- Modeling one county: Lake County, Indiana
 - This is a portion of Chicago-Gary ozone nonattainment area
- Typical summer day in 2015
 - Will select month of July and model only “weekday” days, all hours to represent this typical day
- Subset of vehicle types
 - Diesel, gasoline, and ethanol (E-85) passenger cars and trucks
 - Diesel transit buses
 - Normally, all vehicle types would be selected

Exercise Overview

- All road types
 - Urban restricted and unrestricted
 - Rural restricted and unrestricted
 - Off-network
- Total gaseous hydrocarbons, all processes
 - All processes = starts, running, evaporative, crankcase, etc.
 - One pollutant (THC) selected for training purposes; normally, more pollutants would need to be modeled for a SIP or conformity run

Description Panel



Description Panel

Allows the user to describe the RunSpec (what is being modeled)

- Include details like location, time period, pollutant type, or whatever else is unique about the run
- Up to 5,000 characters of text, but no quotation marks, ampersand or backslash characters allowed
- Description appears in the MOVESRun table of the output database
- Description is optional but useful to keep track of runs

Instructions for our National Scale Run Exercise:

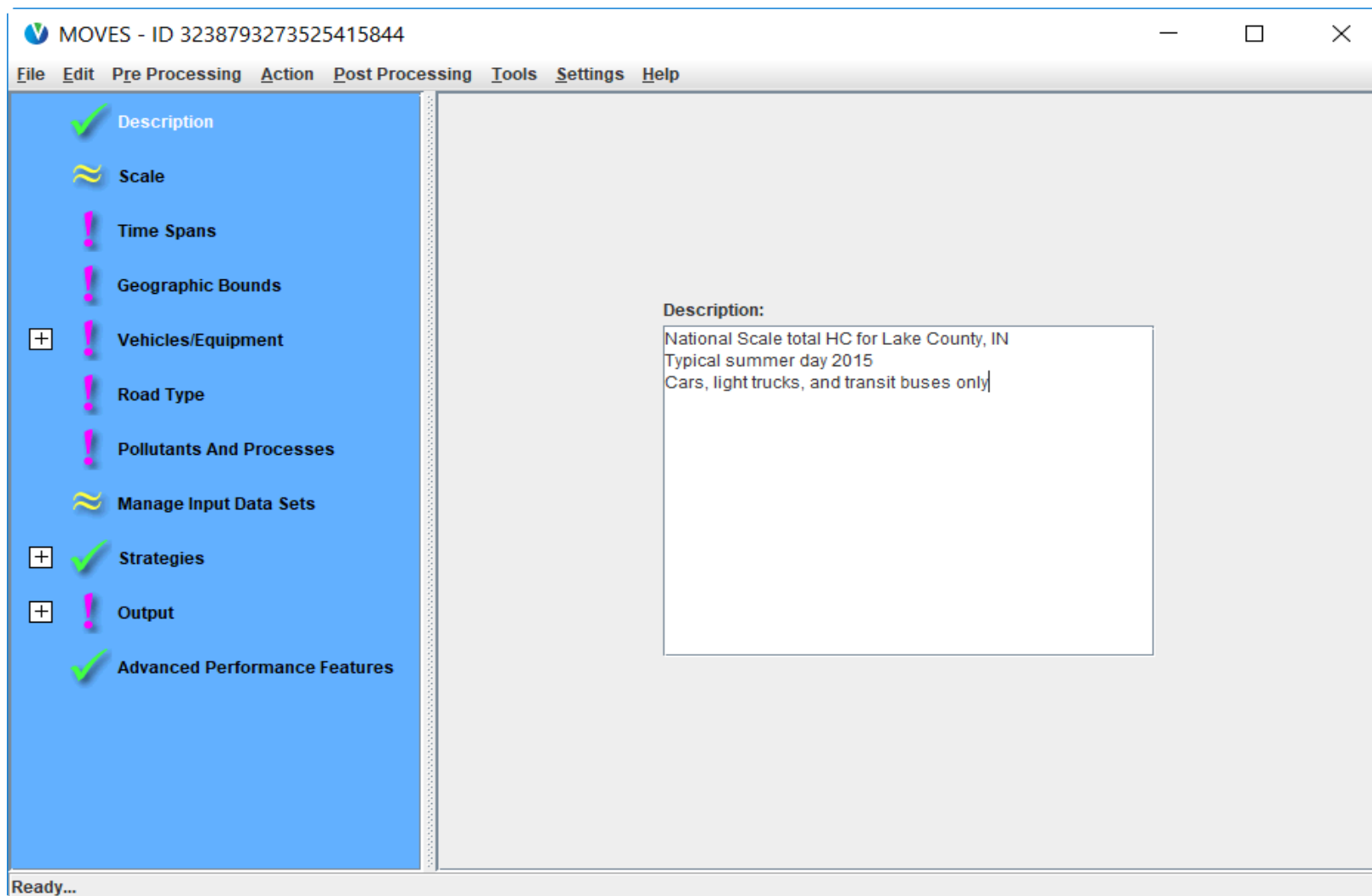
Type:

National scale total HC for Lake County, IN

Typical summer day 2015

Cars, light trucks, and transit buses only


Description Panel





Scale Panel


MOVES - ID 6933248654615701361



File Edit Pre Processing Action Post Processing Tools Settings Help


 Description


 **Scale**


 Time Spans



 Geographic Bounds



  Vehicles/Equipment


 Road Type

 Pollutants And Processes

 Manage Input Data Sets

  Strategies

  Output

 Advanced Performance Features


Model

☒ Onroad

☐ Nonroad

Domain/Scale

☒ National Use the default national database with default state and local allocation factors.

 Caution: Do not use this scale setting for SIP or conformity analyses. The allocation factors and other defaults applied at the state or county level have not been verified against specific state or county data and do not meet regulatory requirements for SIPs and conformity determinations.

☐ County Select or define a single county that is the entire domain.

Note: Use this scale setting for SIP and regional conformity analysis. Use of this scale setting requires user-supplied local data for most activity and fleet inputs.

☐ Project Use project domain inputs.


Note: Use this scale setting for project-level analysis for conformity, NEPA, or any other regulatory purpose. Use of this scale setting requires user-supplied data at the link level for activity and fleet inputs that describe a particular transportation project.

Calculation Type

☒ Inventory Mass and/or Energy within a region and time span.

☐ Emission Rates Mass and/or Energy per unit of activity.

MOVES ScenarioID:

 Caution: Changing these selections changes the contents of other input panels. These changes may include losing previous data contents.

View MOVES web page for help.


Scale Panel


- On this panel, the user selects:
 - Model Type (Onroad or Nonroad)
 - Domain/Scale (National, County, or Project)
 - Calculation type (Inventory or Emission Rates)
- Instructions for our National Scale Run Exercise:
 - Model Type: Onroad
 - Domain/Scale: Choose National scale
 - Calculation Type: Choose Inventory


Scale Panel


MOVES - ID 6933248654615701361



File Edit Pre Processing Action Post Processing Tools Settings Help


 Description


 **Scale**


 Time Spans



 Geographic Bounds



  Vehicles/Equipment


 Road Type

 Pollutants And Processes

 Manage Input Data Sets

  Strategies

  Output

 Advanced Performance Features


Model

☒ Onroad

☐ Nonroad

Domain/Scale

☒ National Use the default national database with default state and local allocation factors.

 Caution: Do not use this scale setting for SIP or conformity analyses. The allocation factors and other defaults applied at the state or county level have not been verified against specific state or county data and do not meet regulatory requirements for SIPs and conformity determinations.

☐ County Select or define a single county that is the entire domain.

Note: Use this scale setting for SIP and regional conformity analysis. Use of this scale setting requires user-supplied local data for most activity and fleet inputs.

☐ Project Use project domain inputs.


Note: Use this scale setting for project-level analysis for conformity, NEPA, or any other regulatory purpose. Use of this scale setting requires user-supplied data at the link level for activity and fleet inputs that describe a particular transportation project.

Calculation Type

☒ Inventory Mass and/or Energy within a region and time span.

☐ Emission Rates Mass and/or Energy per unit of activity.

MOVES ScenarioID:

 Caution: Changing these selections changes the contents of other input panels. These changes may include losing previous data contents.

View MOVES web page for help.

Time Spans Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

! Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

! Road Type

! Pollutants And Processes

Manage Input Data Sets

+ ✓ Strategies

+ ! Output

✓ Advanced Performance Features

Time Aggregation Level

☐ Year ☐ Month ☐ Day ☒ Hour

Years

Select Year: ▼

Years:

Months

☐ January ☐ July

☐ February ☐ August

☐ March ☐ September

☐ April ☐ October

☐ May ☐ November

☐ June ☐ December

Days

☐ Weekend

☐ Weekdays

Hours

Start Hour: ▼

End Hour: ▼

View MOVES web page for help.

Time Spans Panel

- For what time period should MOVES calculate emissions?
- All five sections on this panel must be completed:
 1. Time Aggregation Level: only one selection can be made
 - MOVES can “preaggregate” information before the run – compute a weighted average of MOVES data, such as temperature, over a time period (Year, Month, Day)
 - Preaggregation by Year, Month, or Day sacrifices precision to improve run time
 - Default is “Hour” which means no preaggregation
 - **NOTE: Hour MUST be used for any regulatory purpose**
- Instructions for our National Scale Run Exercise:
 - Select Hour

Time Spans Panel (cont'd)

2. Year
 - County and Project scales: only one year per run
 - National scale: multiple years can be selected
 3. Months: One or more months (including all) can be selected
 4. Days: One or both types can be selected
 5. Hours: One or more hours (including all) can be selected
-
- Instructions for our National Scale Run Exercise:
 - Year: select *2015*, then click “Add”
 - Month: select *July*
 - Days: select *Weekdays*
 - Hours: click “Select All”

Time Spans Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

☒ Description
☒ Scale
☒ Time Spans
☐ Geographic Bounds
☐ Vehicles/Equipment
☐ Road Type
☐ Pollutants And Processes
☐ Manage Input Data Sets
☐ Strategies
☐ Output
☒ Advanced Performance Features

Time Aggregation Level
☐ Year ☐ Month ☐ Day ☒ Hour

Years
Select Year: 2015 Add
Years:
2015
Remove

Months
☐ January ☒ July
☐ February ☐ August
☐ March ☐ September
☐ April ☐ October
☐ May ☐ November
☐ June ☐ December
Select All Clear All

Days
☐ Weekend
☒ Weekdays
Select All Clear All

Hours
Start Hour: 00:00 - 00:59
End Hour: 23:00 - 23:59
Select All Clear All

View MOVES web page for help.

Geographic Bounds Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description
✓ Scale
✓ Time Spans
! Geographic Bounds
+ ! Vehicles/Equipment
! Road Type
! Pollutants And Process
≈ Manage Input Data Sets
+ ✓ Strategies
+ ! Output
✓ Advanced Performance

Region:
☐ Nation
☐ State
☒ County
☐ Zone & Link
☐ Custom Domain


States:
ALABAMA
ALASKA
ARIZONA
ARKANSAS
CALIFORNIA
COLORADO
CONNECTICUT
DELAWARE
DISTRICT OF COLUMBIA


Counties:

Selections:

Select All Add Delete

Geographic Bounds Requirements
Please select a state and county.

 Caution: For SIP or regional conformity analyses, you must go back to the Scale window and select "County" before specifying a county in this window.

 Caution: You have selected National scale with detail at the State or County level. MOVES will use the default national database with default state and local allocation factors. These factors have not been verified against actual state or county level data and do not meet regulatory requirements for SIPs and conformity determinations.

View MOVES web page for help.

Geographic Bounds Panel

For what geographic area should MOVES calculate emissions?

Options are based on Scale panel choice

Scale	Options for Geographic Bounds
National	<ul style="list-style-type: none">• Nation• State (select one or more)• County (select one or more – can be in different states)
County	<ul style="list-style-type: none">• County• Custom Domain
Project	<ul style="list-style-type: none">• County• Custom Domain

Geographic Bounds Panel

- Since we selected National in the Scale panel, we can choose Nation, State, or County
 - National scale refers to use of national default data, rather than area to be modeled
- Instructions for our National Scale Run Exercise:
 - For “Region:”, select *County*
 - Highlight *Indiana* from the list of states, scroll down and highlight *Lake County*, and click “Add”

Geographic Bounds Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ **Geographic Bounds**

+ ! Vehicles/Equipment

! Road Type

! Pollutants And Process

≈ Manage Input Data Sets

+ ✓ Strategies

+ ! Output

✓ Advanced Performance

Region:
☐ Nation
☐ State
☒ **County**
☐ Zone & Link
☐ Custom Domain

States:
FLORIDA
GEORGIA
HAWAII
IDAHO
ILLINOIS
INDIANA
IOWA
KANSAS
KENTUCKY

Counties:
INDIANA - Knox County
INDIANA - Kosciusko County
INDIANA - La Porte County
INDIANA - Lagrange County
INDIANA - Lake County
INDIANA - Lawrence County
INDIANA - Madison County
INDIANA - Marion County
INDIANA - Marshall County

Selections:
INDIANA - Lake County

Select All Add Delete

Geographic Bounds Requirements

!

Caution: For SIP or regional conformity analyses, you must go back to the Scale window and select "County" before specifying a county in this window.

!

Caution: You have selected National scale with detail at the State or County level. MOVES will use the default national database with default state and local allocation factors. These factors have not been verified against actual state or county level data and do not meet regulatory requirements for SIPs and conformity determinations.

View MOVES web page for help.

Reminder from Module 1: National Scale

- With this scale, MOVES uses information in the MOVES default database
 - User does not need to create an input database
- **CAUTION: Default data in MOVES is not always the most current or best available for any specific county or state**
 - Some defaults are national but applied as-is to the geographic area chosen
 - Some defaults are national and are “downscaled” for geographic area chosen
 - Some defaults are for specific areas (e.g., type of I/M program)

On Road Vehicles Equipment Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ Geographic Bounds

[-] ! Vehicles/Equipment

- ! On Road Vehicle Equipment
- ! Road Type
- ! Pollutants And Processes

~ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

Fuels:

- Compressed Natural Gas (CNG)
- Diesel Fuel
- Electricity
- Ethanol (E-85)
- Gasoline

Source Use Types:

- Combination Long-haul Truck
- Combination Short-haul Truck
- Intercity Bus
- Light Commercial Truck
- Motor Home
- Motorcycle
- Passenger Car
- Passenger Truck
- Refuse Truck
- School Bus
- Single Unit Long-haul Truck
- Single Unit Short-haul Truck
- Transit Bus

Selections:

Select All

Select All

Delete

Add Fuel/Type Combinations

On Road Vehicle Equipment Requirements

Please select a Fuel and Source Use Type combination.

View MOVES web page for help.

45

MOVES Source Types & HPMS Vehicle Types

MOVES		HPMS	
Source Type ID	Source Types	Vehicle Type ID	Vehicle Type
11	Motorcycle	10	Motorcycles
21	Passenger Car	25	Light Duty Vehicles
31	Passenger Truck		
32	Light Commercial Truck		
41	Intercity Bus	40	Buses
42	Transit Bus		
43	School Bus		
51	Refuse Truck	50	Single Unit Trucks
52	Single Unit Short-haul Truck		
53	Single Unit Long-haul Truck		
54	Motor Home		
61	Combination Short-haul Truck	60	Combination Trucks
62	Combination Long-haul Truck		

On Road Vehicles Equipment Panel

- What types of vehicles do you want to include?
- For most analyses, all valid gasoline, ethanol, diesel, and CNG vehicle combinations should be used
- **NOTE:** On this panel, the “Fuels” column refers to the *vehicles* that *can* use this type of fuel, not whether the fuel is used

On Road Vehicle Equipment Panel

- Ethanol (E-85):
- Ethanol must be selected if you are modeling all on-road emissions (*every* county has flex-fuel vehicles in its fleet)
- MOVES default fleet includes some E-85 vehicles; not selecting ethanol will result in lost VMT from these vehicles
- What if no ethanol is used in your area? You would still select “Ethanol” on this panel, and assign gasoline to these vehicles within the “Fuels” tab of the County Data Manager (covered later)
- Compressed Natural Gas:
- MOVES allocates some transit bus VMT to Compressed Natural Gas (CNG)
- Therefore, users should either
 - Select the CNG transit bus combination; or
 - Change CNG transit bus VMT to zero (illustrated later)
- Otherwise, emissions from VMT allocated to CNG buses will be missing from the results

On Road Vehicles Equipment Panel

- Instructions for our National Scale Run Exercise: (shown on next two slides)

Select

- Fuels: Diesel Fuel, Ethanol (E-85), and Gasoline
(use <Ctrl> to select more than one at a time)
- Source Use Types: Light Commercial Truck, Passenger Car, Passenger Truck
- Click “Add Fuel/Type Combinations”

Also select:

- Fuels: Compressed Natural Gas, Diesel Fuel, Gasoline
- Source Use Type: Transit Bus
- Click “Add Fuel/Type Combinations”

On Road Vehicles Equipment Panel

MOVES - ID 9058820624419857438

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

! Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

Fuels:

Compressed Natural Gas (CNG)

Diesel Fuel

Electricity

Ethanol (E-85)

Gasoline

Source Use Types:

Combination Long-haul Truck

Combination Short-haul Truck

Intercity Bus

Light Commercial Truck

Motor Home

Motorcycle

Passenger Car

Passenger Truck

Refuse Truck

School Bus

Single Unit Long-haul Truck

Single Unit Short-haul Truck

Transit Bus

Selections:

Diesel Fuel - Light Commercial Truck

Diesel Fuel - Passenger Car

Diesel Fuel - Passenger Truck

Ethanol (E-85) - Light Commercial Truck

Ethanol (E-85) - Passenger Car

Ethanol (E-85) - Passenger Truck

Gasoline - Light Commercial Truck

Gasoline - Passenger Car

Gasoline - Passenger Truck

Select All

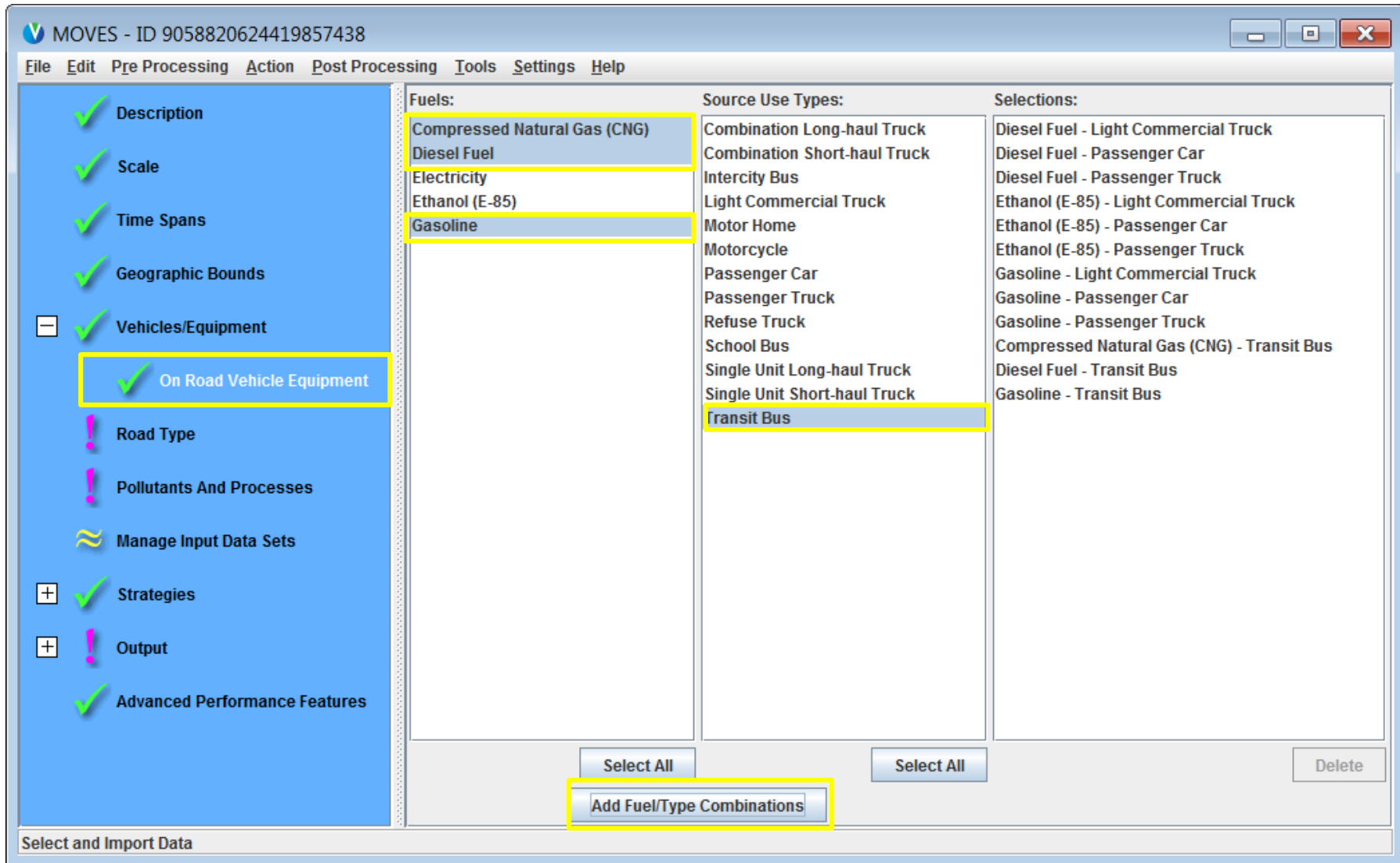
Select All

Delete

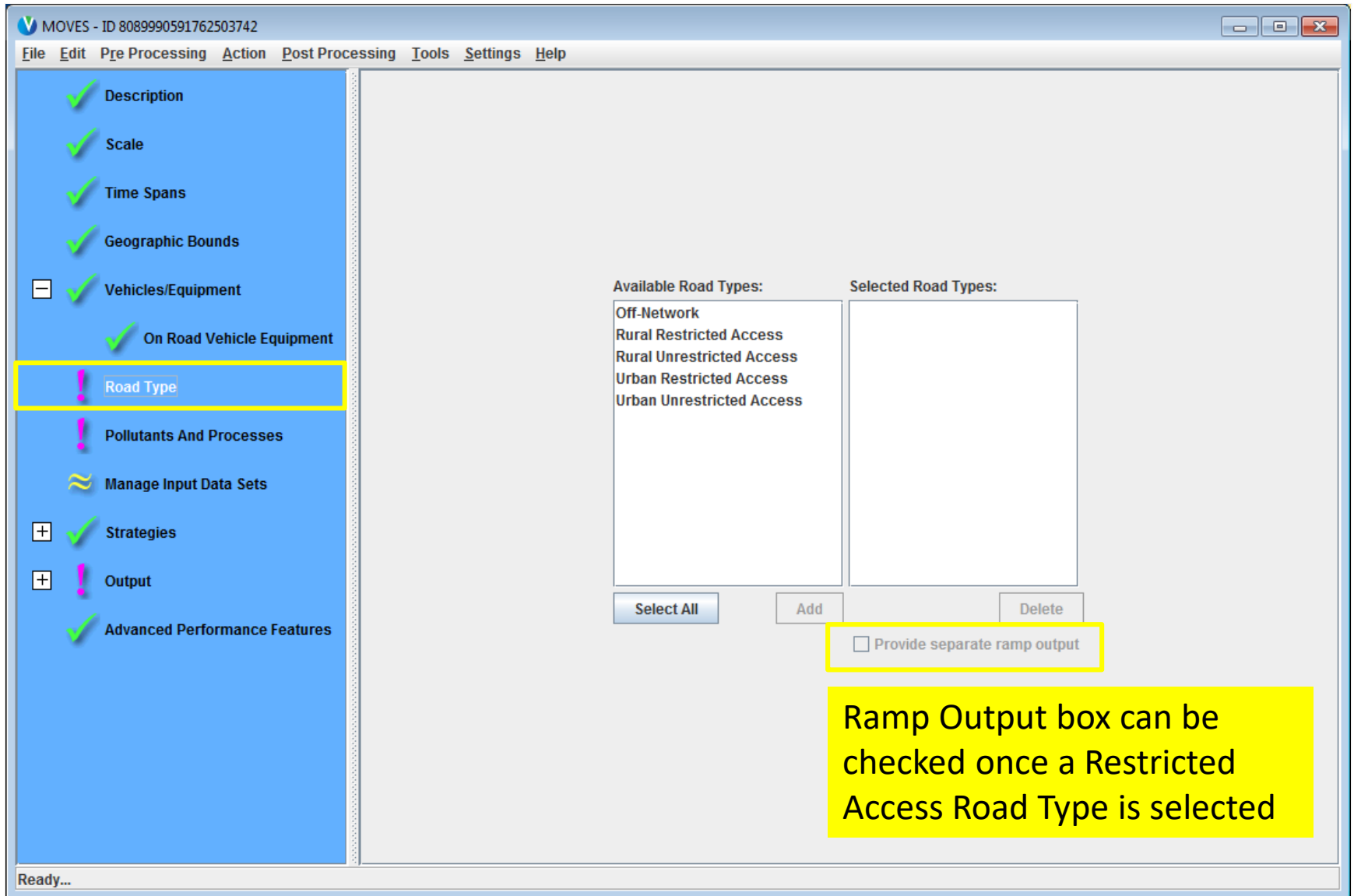
Add Fuel/Type Combinations

Select and Import Data

On Road Vehicles Equipment Panel



Road Type Panel



Road Type Panel

What road types are you including?

MOVES Road Types	Use to Represent	Emission Processes Occurring on Road Type:
1 Off-Network	Parking areas	Start, hotelling, and resting evaporative emissions
2 Rural Restricted	Controlled-access highway (i.e., entrance/exit via ramps): freeways and interstates	All running emissions, including running evaporative
3 Rural Unrestricted	All other roads (arterials, local, collector, etc.)	
4 Urban Restricted	See row 2 – but urban	
5 Urban Unrestricted	See row 3 – but urban	

Road Type Panel

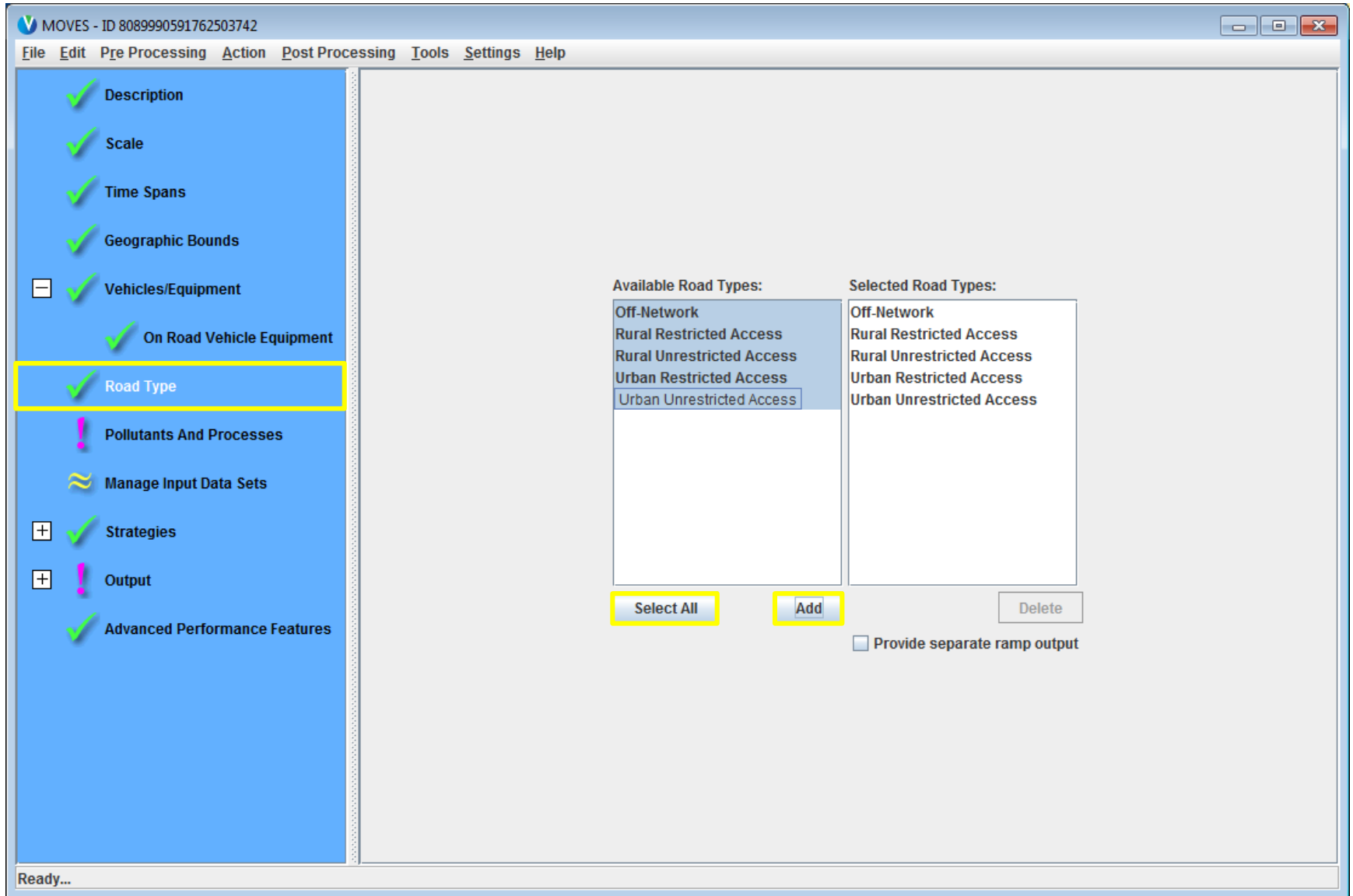
- MOVES now allows ramps to be modeled separately – if you check the box, ☒ Provide separate ramp output
- **NOTE: This selection is optional and total inventory will not be affected**

If not selected:	If selected:
1 Off-Network	1 Off-Network
2 Rural Restricted	
3 Rural Unrestricted	3 Rural Unrestricted
4 Urban Restricted	
5 Urban Unrestricted	5 Urban Unrestricted
	6 Rural Restricted without ramps
	7 Urban Restricted without ramps
	8 Rural Restricted ramps
	9 Urban Restricted ramps

Road Type Panel

- Generally, select all road types, unless there's a specific reason not to
 - For example, the county you have selected does not contain roads of a given type (e.g., an urban county with no rural roads)
- Instructions for our National Scale Run Exercise:
 - Click “Select All,” then “Add”
 - (Do not check “Provide separate ramp output”)

Road Type Panel



Pollutants and Processes Panel

MOVES - ID 8089990591762503742

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

! Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

	Running Exhaust	Start Exhaust	Brakewear	Tirewear	Evap Permeation	Evap Fuel Vapor V
<input type="checkbox"/> Total Gaseous Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organic Compounds	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Carbon Monoxide (CO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Oxides of Nitrogen (NOx)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Oxide (NO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Dioxide (NO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Acid (HONO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Ammonia (NH3)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Oxide (N2O)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> [+] Primary Exhaust PM2.5 - Species	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM10 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Sulfur Dioxide (SO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Total Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Atmospheric CO2	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Ethanol	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MTDC						

Select Prerequisites

Clear All

Ready...

Pollutants and Processes Panel

Which pollutants, and which emissions processes are you modeling?

More pollutants/processes will increase run-time

Box to the left of the pollutant name has two uses:

- Selects all, or unselects all chosen processes for a pollutant
- Indicates at least one process for this pollutant has been selected
- **NOTE:** Scroll bars at bottom & left side of table; table extends beyond what's shown on the screen

Pollutants and Processes Panel

- Some pollutant-process selections automatically select certain road types
- Some pollutants and processes are “chained”
 - MOVES indicates what additional pollutants or processes are needed
 - Clicking “Select Prerequisites” will automatically select required pollutants/processes
- Instructions for our National Scale Run Exercise:
 - Choose “Total Gaseous Hydrocarbons” by clicking the box on the left (selects all processes)

Pollutants and Processes Panel

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

✓ Pollutants And Processes

≈ Manage Input Data Sets

[+] ✓ Strategies

[+] ! Output

✓ Advanced Performance Features

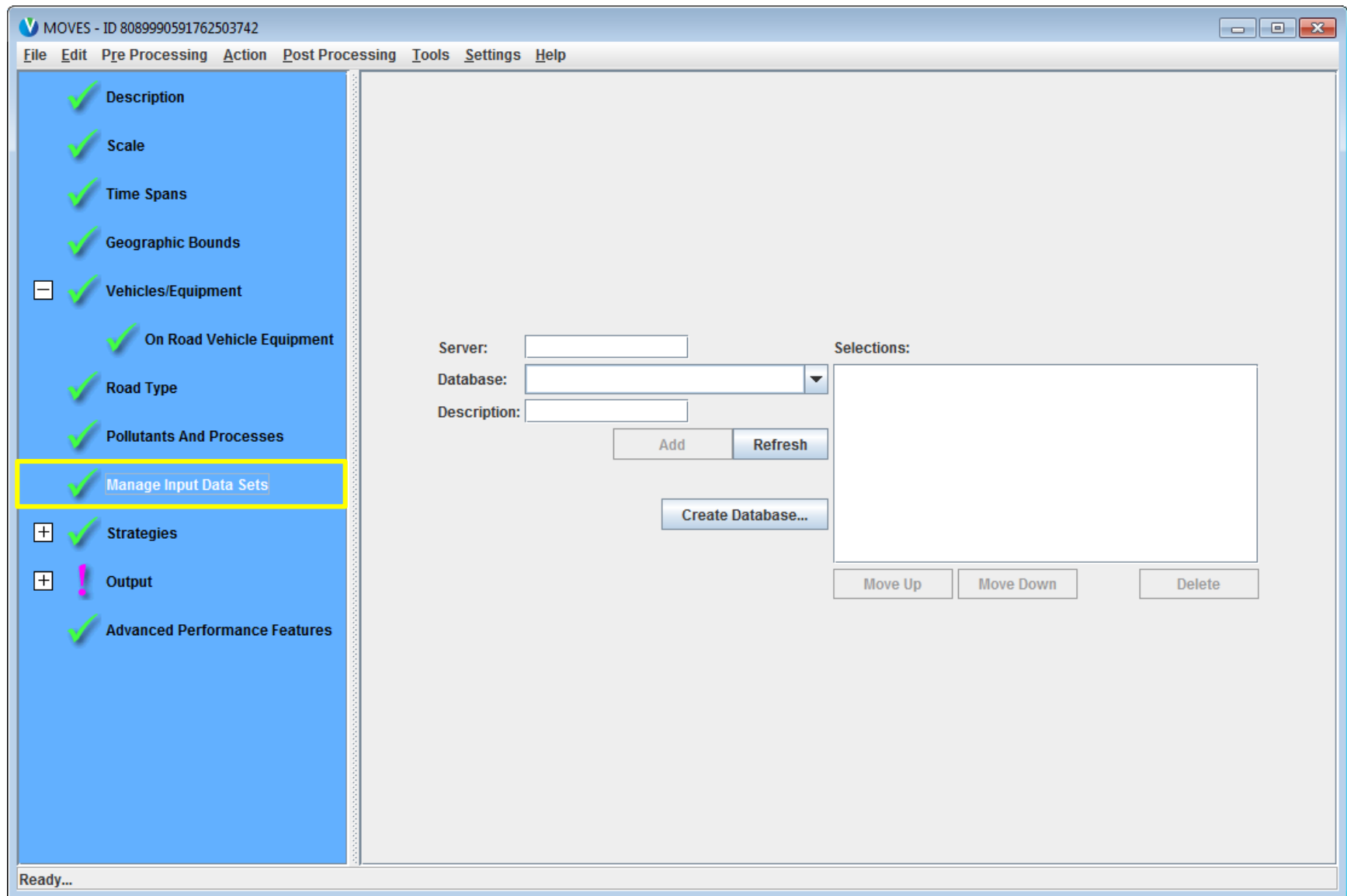
	Running Exhaust	Start Exhaust	Brakewear	Tirewear	Evap Permeation	Evap Fuel Vapor V
✓ Total Gaseous Hydrocarbons	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Non-Methane Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Volatile Organic Compounds	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Carbon Monoxide (CO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Oxides of Nitrogen (NOx)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Oxide (NO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrogen Dioxide (NO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Acid (HONO)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Ammonia (NH3)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Nitrous Oxide (N2O)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> [+] Primary Exhaust PM2.5 - Species	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			<input type="checkbox"/>			
<input type="checkbox"/> Primary PM10 - Tirewear Particulate				<input type="checkbox"/>		
<input type="checkbox"/> Sulfur Dioxide (SO2)	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Total Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> Atmospheric CO2	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>				

Select Prerequisites

Clear All

View MOVES web page for help.

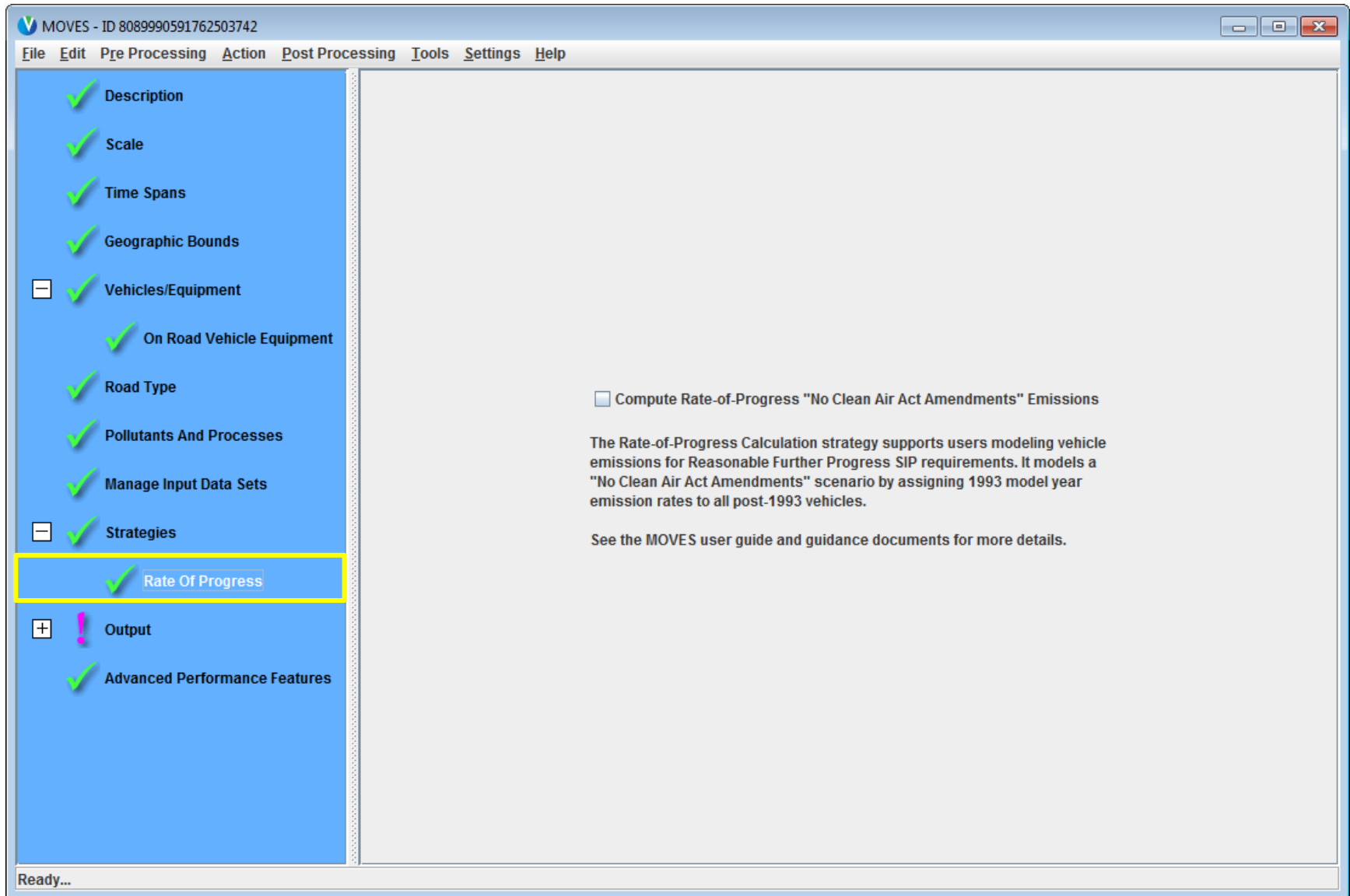
Manage Input Data Sets Panel



Manage Input Data Sets Panel

- This feature is not used in most cases and not needed for our exercise
- Just clicking on this panel will change \approx to ✓
- Instructions for our National Scale Run Exercise:
 - Click the panel to change the \approx to ✓
 - Click to the Strategies panel

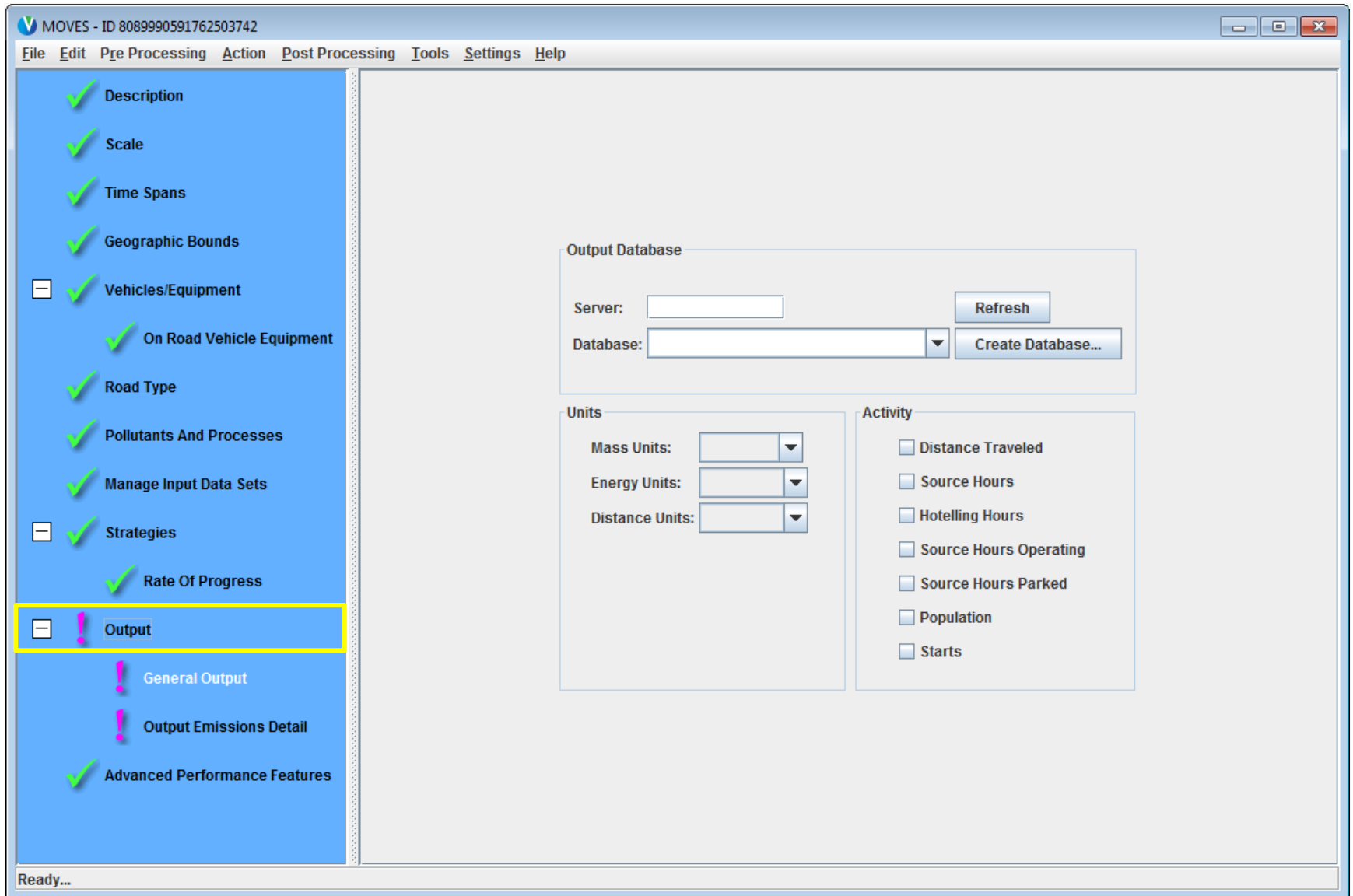
Strategies Panel



Strategies Panel

- Rate of Progress panel (ROP)
 - Allows users to identify the RunSpec as an ROP run, which will estimate emissions as if the 1990 Clean Air Act Amendments had not been implemented
- Instructions for our National Scale Run Exercise:
 - Click the panel to change the \approx to ✓
 - Click the Output panel, then General Output

Output Panel



Output Panel

- Two sub-panels:
 - General Output:
 - In what output database do you want MOVES to put results?
 - In what units do you want output?
 - Output Emissions Detail:
 - What level of detail do you want MOVES to report?

Output – General Output

- User must identify the output database
 - Tip: name an output database with “_out”
 - Enter a unique name to have MOVES make a new output database, unless you want to use one already made
- Output from multiple MOVES runs (i.e., multiple RunSpecs) can be stored in the same database
 - Output from each RunSpec will be identified by a different MOVES run ID
 - Only recommended when there’s a reason to do so, e.g. each run is a county in a nonattainment area and the results will later be summed

Output – General Output

- Units must be selected for:
 - Mass (Kilograms, Grams, Pounds, U.S. Ton)
 - Grams may be the best choice for criteria pollutants/precursors and air toxics
 - Tons is recommended for CO₂
 - Energy (Joules, KiloJoules, Million BTU)
 - Distance (Kilometers, Miles)

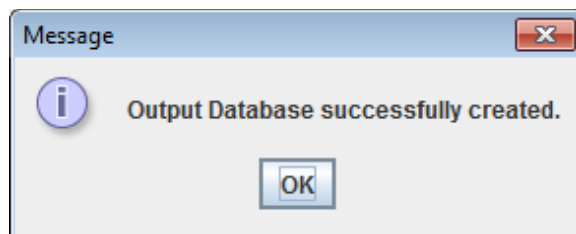
Output – General Output

- Activity (vehicle activity) selections are optional
- Reported only for the selections made (geographic area, time period, vehicles, etc.)

Activity Output Options	Notes
Distance Traveled	VMT that MOVES calculates based on choices made; Can be compared to VMT you input as a check
Source Hours	
Hotelling Hours	Reported for combination long-haul trucks only
Source Hours Operating	
Source Hours Parked	
Population	This is vehicles (not people)
Starts	

Output – General Output

- Instructions for our National Scale Run Exercise:
 - In Database box, type “lake_2015_training_out”
 - After clicking *Create Database*, you should get this message:



- Click *OK*
- For units, select:
 - Mass Units: Grams
 - Energy Units: Joules
 - Distance Units: Miles
- For activity, select Distance Traveled and Population

Output – General Output

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ✓ Geographic Bounds
- [-] ✓ Vehicles/Equipment
 - ✓ On Road Vehicle Equipment
- ✓ Road Type
- ✓ Pollutants And Processes
- ✓ Manage Input Data Sets
- [+] ✓ Strategies
- [-] ! Output
 - ✓ General Output
 - ! Output Emissions Detail
 - ✓ Advanced Performance Features

Output Database

Server: Refresh

Database: lake_2015_training_out Create Database...

Units

Mass Units: Grams

Energy Units: Joules

Distance Units: Miles

Activity

- ☒ Distance Traveled
- ☐ Source Hours
- ☐ Hotelling Hours
- ☐ Source Hours Operating
- ☐ Source Hours Parked
- ☒ Population
- ☐ Starts

View MOVES web page for help.

Output – Output Emissions Detail

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ✓ Geographic Bounds
- [-] ✓ Vehicles/Equipment
 - ✓ On Road Vehicle Equipment
 - ✓ Road Type
 - ✓ Pollutants And Processes
 - ✓ Manage Input Data Sets
 - [+] ✓ Strategies
 - [-] ✓ Output
 - ✓ General Output
 - ✓ Output Emissions Detail**
 - ✓ Advanced Performance Features

Always

☒ Time

☒ Location

☒ Pollutant

for All Vehicle/Equipment Categories

☐ Model Year

☐ Fuel Type ☐ Fuel Subtype

☐ Emission Process

☐ Estimate Uncertainty

On Road/Off Road

☒ On Road/Off Road

On and Off Road

☐ Road Type

☐ Source Use Type

☐ SCC

☐ Regulatory Class

Off Road

☐ Sector

☐ Engine Tech.

☐ HP Class

Number of iterations:

☐ Keep pseudo-randomly sampled input

☐ Keep output from each iteration

View MOVES web page for help.

Output – Output Emissions Detail

- Several choices can be made on this panel
 - For what time period do you want results?
 - For what geographic area?
 - Do you want emissions broken out, for example, by fuel type, emissions process, or vehicle type?

Output – Output Emissions Detail

- “Always” options:
 - Time: Default level of output aggregation by time is same as selection made in Time Spans panel
 - User can select a longer period of time, e.g. if “Hour” selected in Time Spans panel, user can choose:
 - Hour
 - 24-Hour Day (results for one weekday and one weekend day)
 - Portion of Week (weekday results are total of 5 weekdays and weekend results are total of 2 weekend days)
 - Month
 - Year
- **CAUTION:** Once longer time period selected, you cannot get information for shorter time periods without re-running MOVES

Output – Output Emissions Detail

- “Always” options:
 - Location: Default level of output aggregation is the same geographic level selected in Geographic Bounds panel
 - Pollutant
 - User can change it to larger geographic area
 - E.g., if modeling counties in a two-state metro-area, user can choose State for emissions from each state’s portion
 - **CAUTION:** once a larger area is selected, you cannot get information for smaller geographic areas without re-running MOVES

Output – Output Emissions Detail

- Other output detail is optional
 - More selections results in more detail (rows of output data)
- MOVES report emissions by:
 - “for All Vehicle/Equipment Categories” options
 - Model year (**CAUTION:** will increase output x 31)
 - Fuel type
 - Emissions process (e.g., starts, running emissions)
 - “On/Off Road” options
 - Road type
 - Source use type (type of vehicle, perhaps the most useful)
 - Source Classification Code (SCC), an EPA reporting code

Output – Output Emissions Detail

- Instructions for our National Scale Run Exercise:
 - “Always” options will already be populated.
 - “for All Vehicle/Equipment Categories,” select:
 - Fuel type
 - Emissions process
 - “On Road/Off Road” options, select:
 - Road Type
 - Source Use Type

Output – Output Emissions Detail

MOVES - ID 6933248654615701361

File Edit Pre Processing Action Post Processing Tools Settings Help

- ✓ Description
- ✓ Scale
- ✓ Time Spans
- ✓ Geographic Bounds
- [-] ✓ Vehicles/Equipment
 - ✓ On Road Vehicle Equipment
 - ✓ Road Type
 - ✓ Pollutants And Processes
 - ✓ Manage Input Data Sets
 - [+] ✓ Strategies
 - [-] ✓ Output
 - ✓ General Output
 - ✓ **Output Emissions Detail**
 - ✓ Advanced Performance Features

Always

☒ Time

☒ Location

☒ Pollutant

for All Vehicle/Equipment Categories

☐ Model Year

☒ Fuel Type ☐ Fuel Subtype

☒ Emission Process

☐ Estimate Uncertainty

On Road/Off Road

☒ On Road/Off Road

On and Off Road

☒ Road Type

☒ Source Use Type

☐ SCC

☐ Regulatory Class

Off Road

☐ Sector

☐ Engine Tech.

☐ HP Class

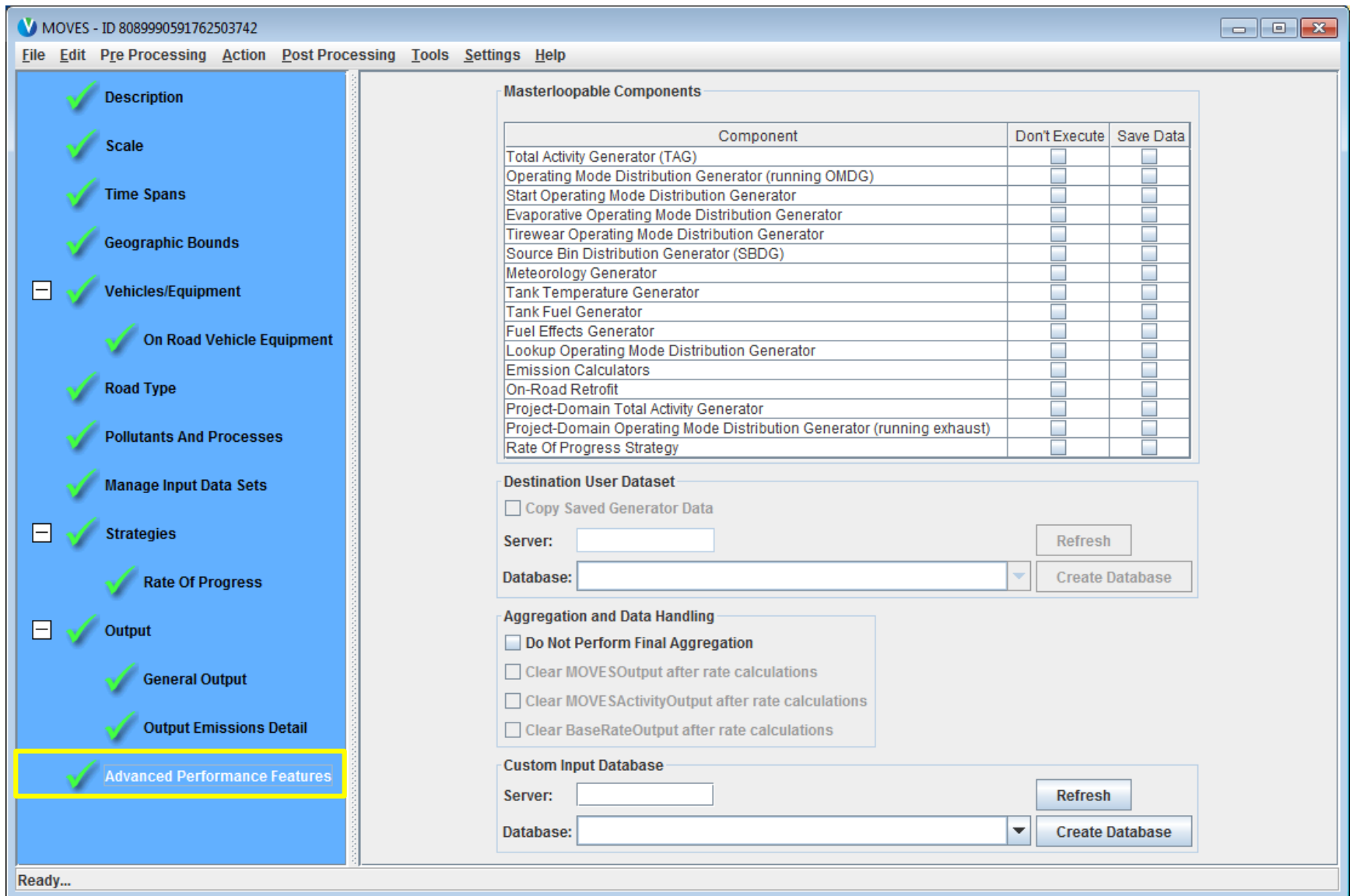
Number of iterations:

☐ Keep pseudo-randomly sampled input

☐ Keep output from each iteration

View MOVES web page for help.

Advanced Performance Features Panel



Advanced Performance Features Panel

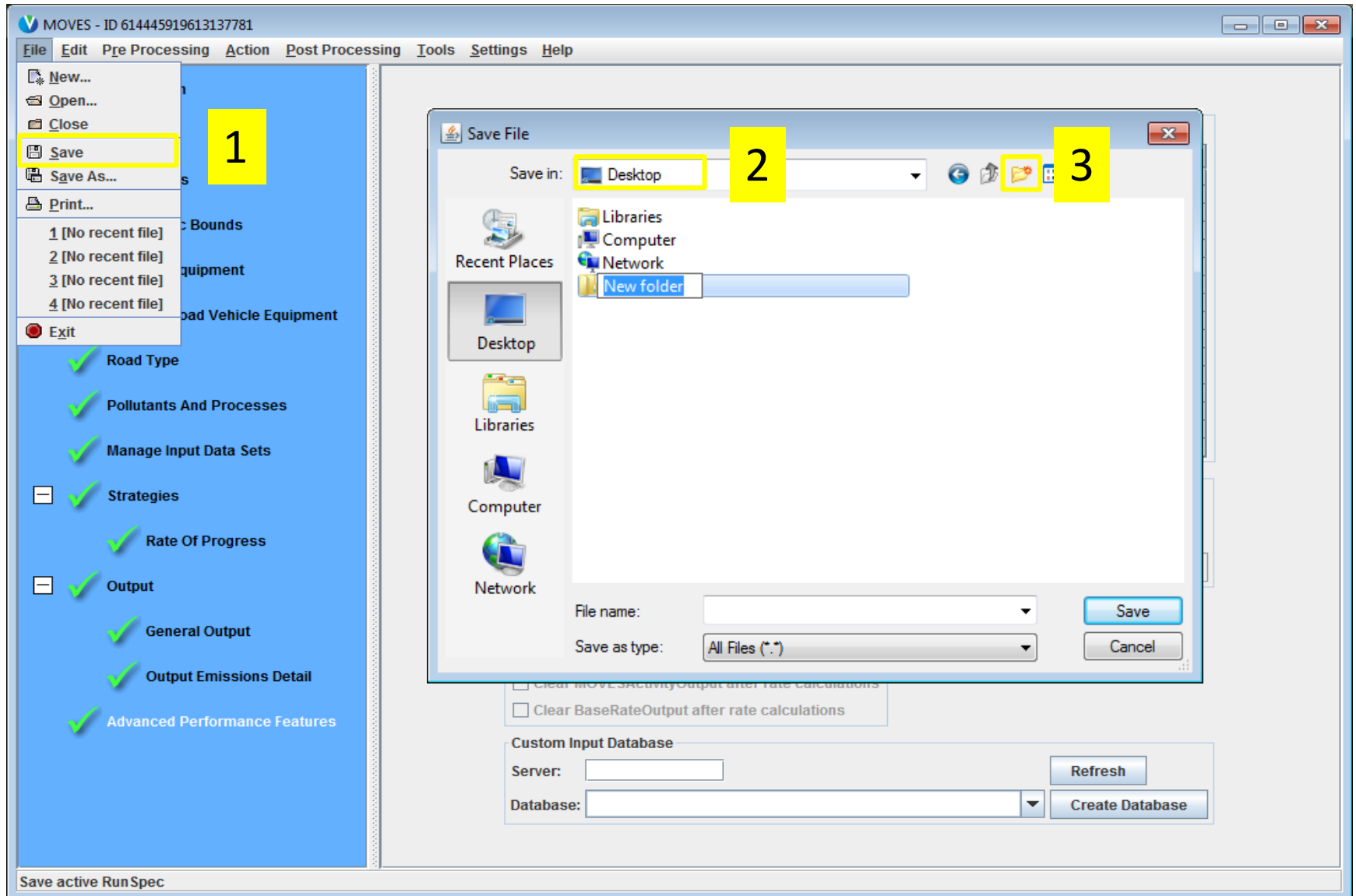
- Not covered in this course, see User Guide for more information
- This panel will not be used in most cases, however,
 - “Masterloopable Components” section can be used with batch runs
 - Options toward the bottom of the panel are for diagnostic work and their use is strongly discouraged

Saving the RunSpec

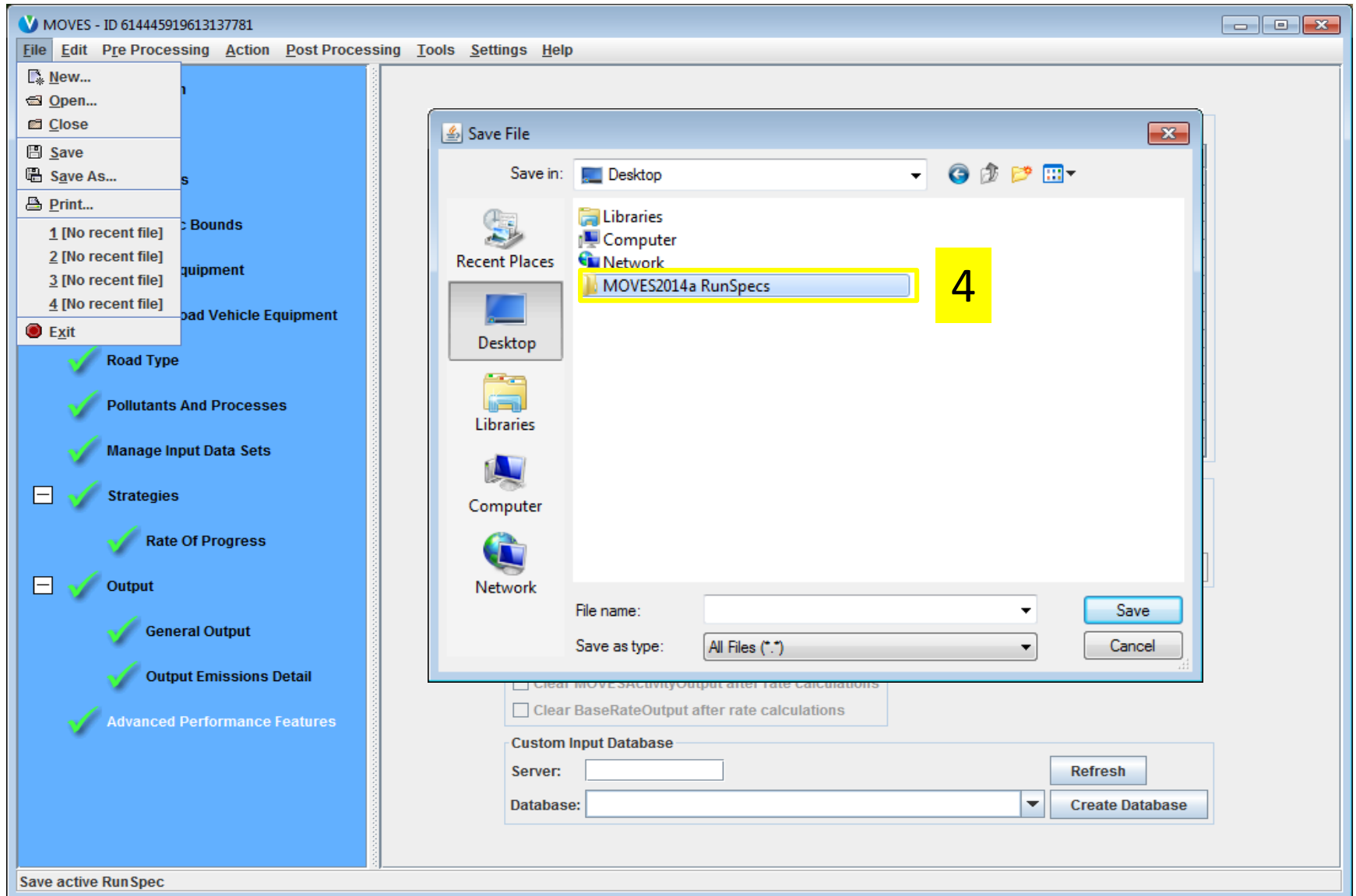
NOTE: Relate the RunSpec name to input/output database name

- Instructions for our National Scale Run Exercise:
 - No input database created
 - Output database name: “lake_2015_training_out”
 - Save the RunSpec as: “lake_2015_training_natl.mrs” in a new folder on the desktop:
 1. From File menu, select Save
 2. Create a new folder on your Desktop called “MOVES2014b RunSpecs”
 3. Name the RunSpec file “lake_2015_training_natl.mrs”
 4. Click Save

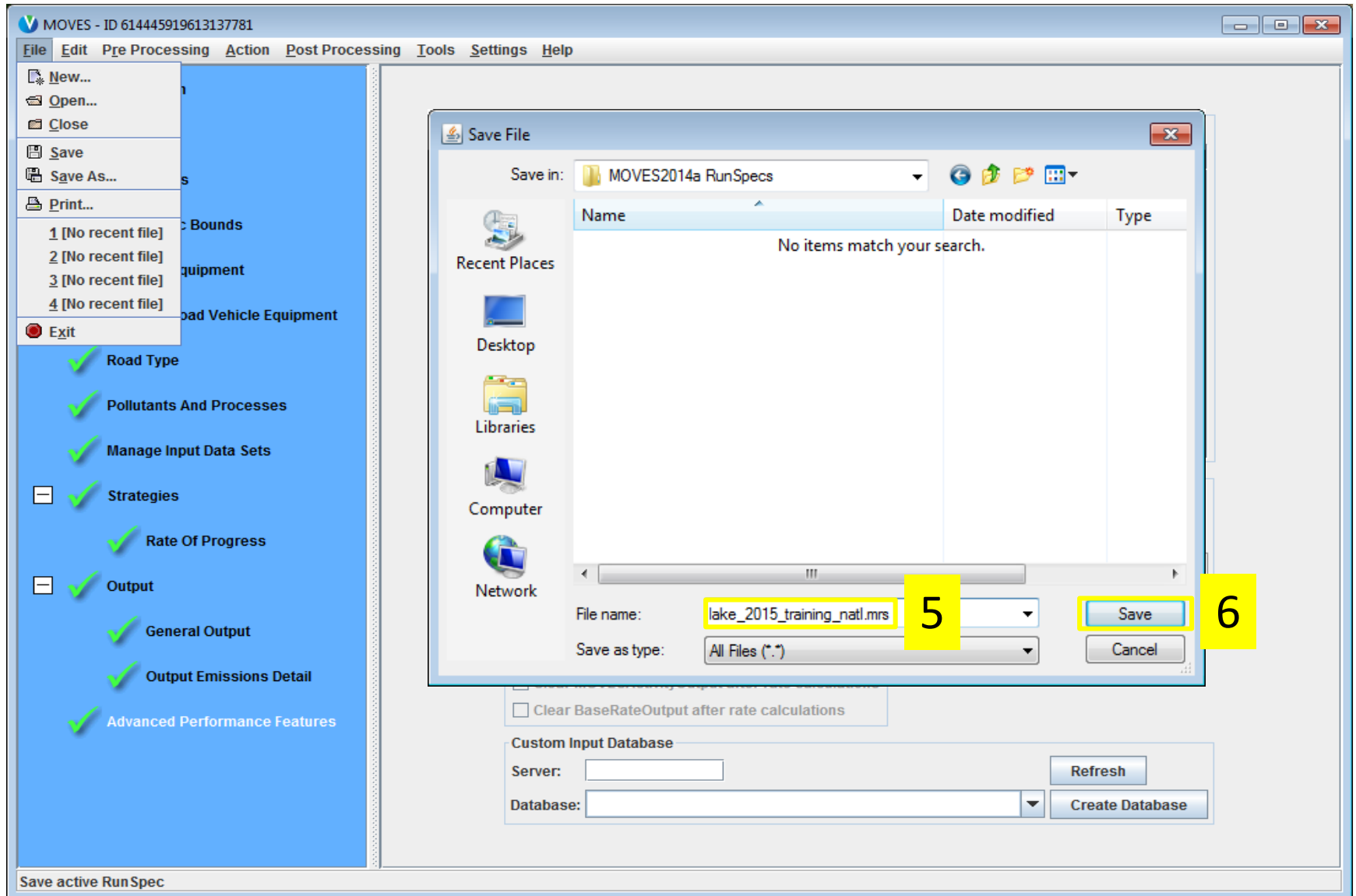
Saving the RunSpec



Saving the RunSpec



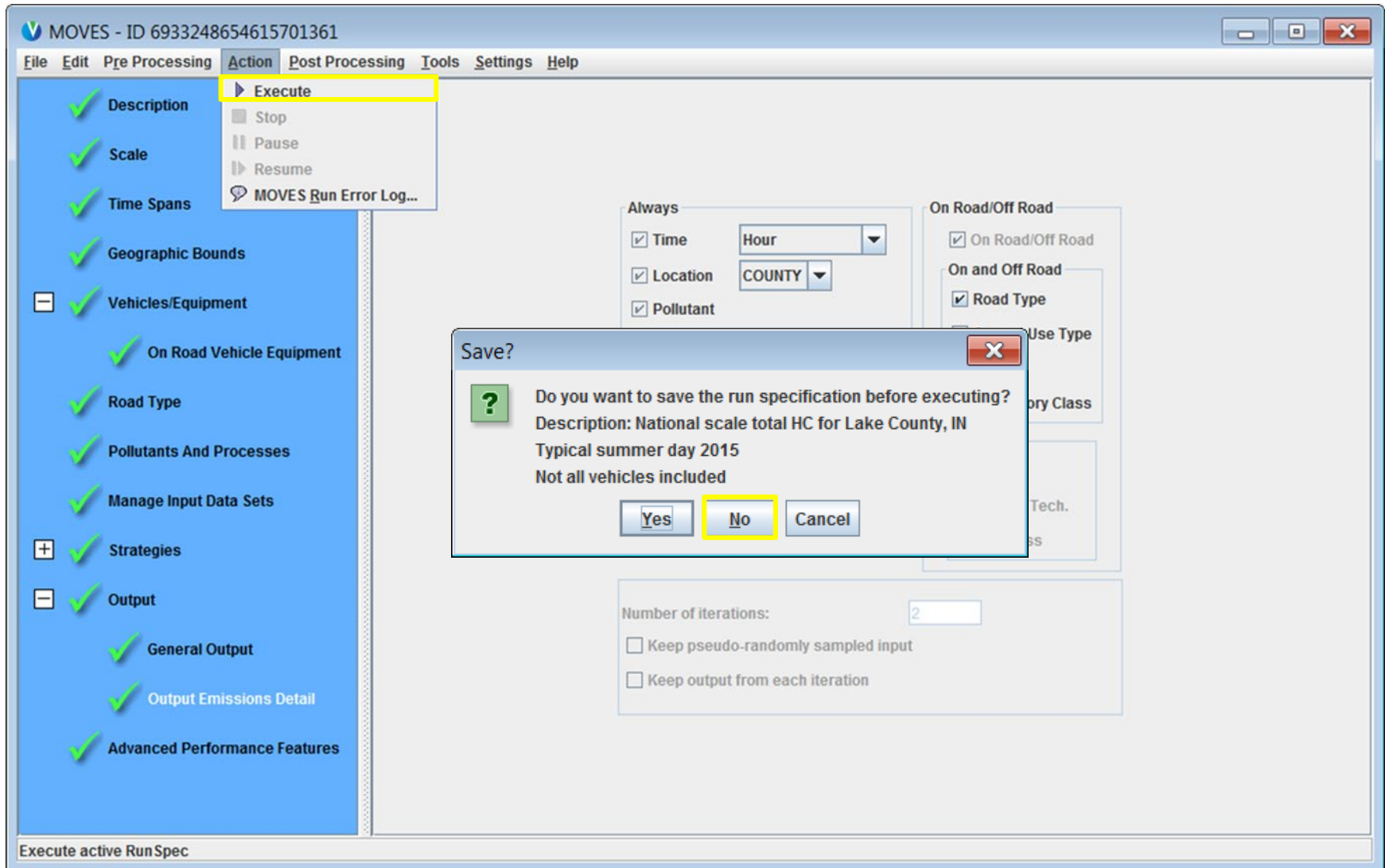
Saving the RunSpec



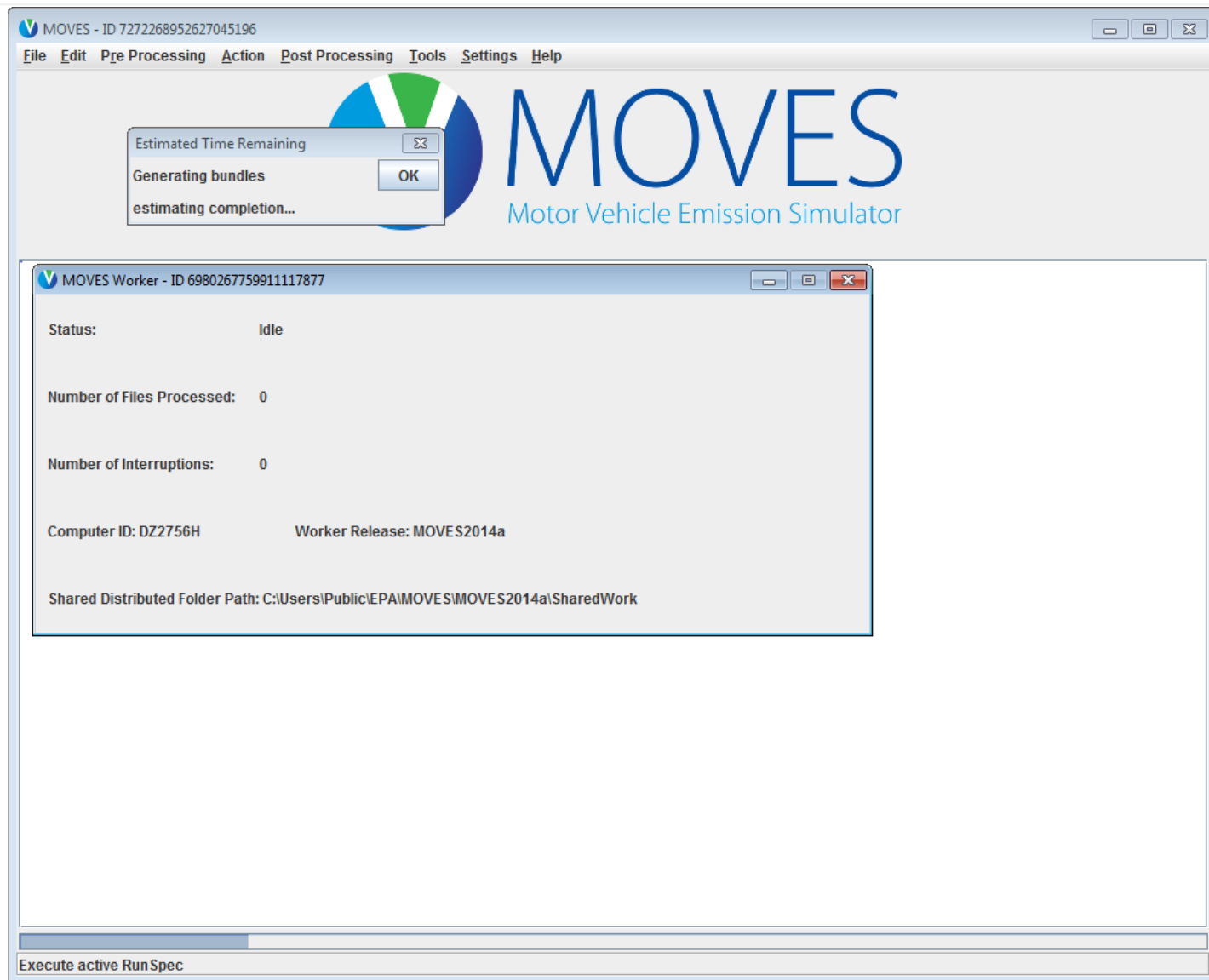
Running MOVES

- MOVES needs your action to begin the run
- Instructions for our National Scale Run Exercise:
 - Click the Action Menu
 - Click “► Execute” menu item
 - When prompted to save the run specification, click “No” as we have already saved the RunSpec
 - NOTE: Executing the RunSpec will open a new window display any warning messages with a status bar and open a dialog box that estimates time remaining.
 - This run should take less than 10 minutes

Running MOVES

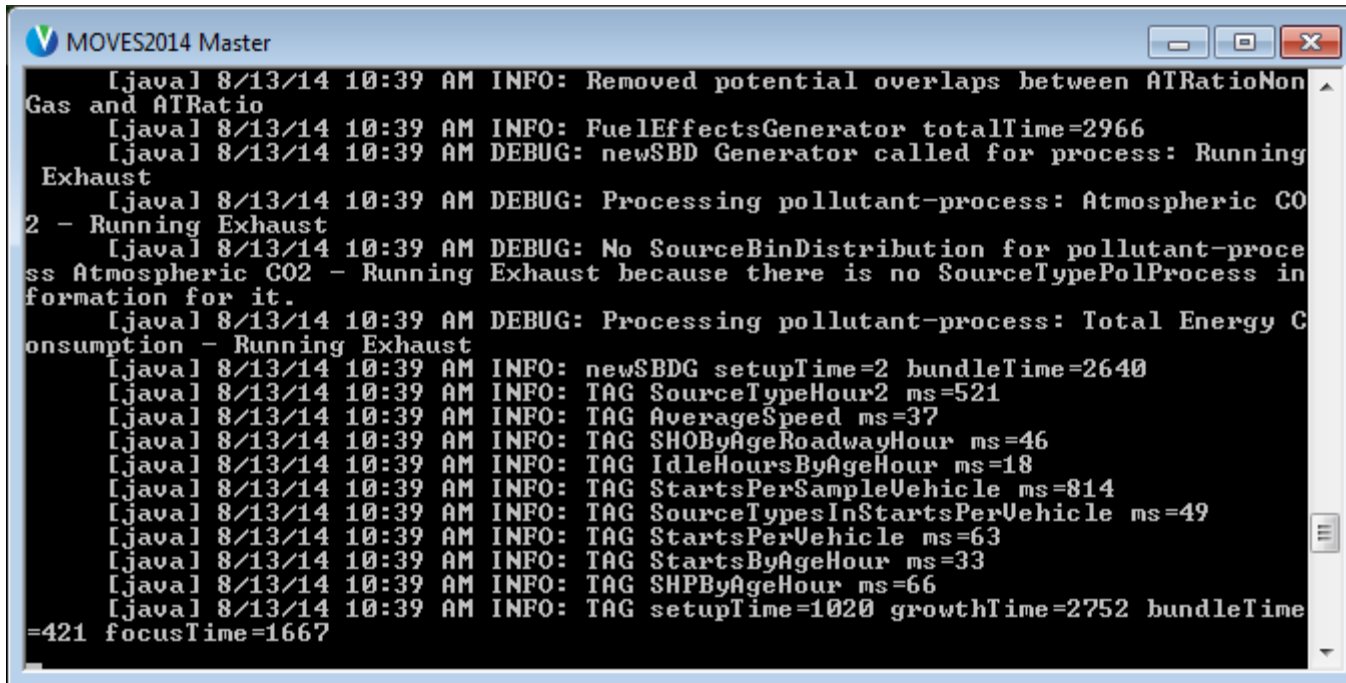


Running MOVES



Running MOVES

- When a RunSpec is executing, the DOS window will produce significant amounts of text

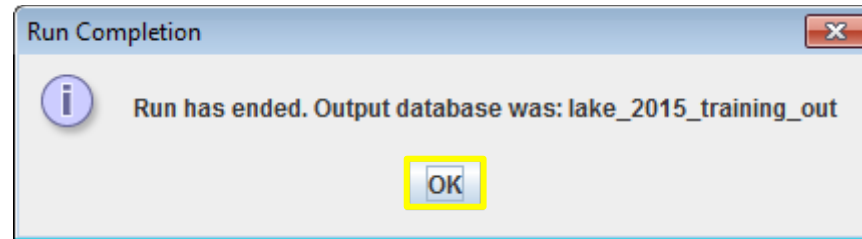


```
MOVES2014 Master
[java] 8/13/14 10:39 AM INFO: Removed potential overlaps between ATRatioNon
Gas and ATRatio
[java] 8/13/14 10:39 AM INFO: FuelEffectsGenerator totalTime=2966
[java] 8/13/14 10:39 AM DEBUG: newSBD Generator called for process: Running
Exhaust
[java] 8/13/14 10:39 AM DEBUG: Processing pollutant-process: Atmospheric CO
2 - Running Exhaust
[java] 8/13/14 10:39 AM DEBUG: No SourceBinDistribution for pollutant-proce
ss Atmospheric CO2 - Running Exhaust because there is no SourceTypePolProcess in
formation for it.
[java] 8/13/14 10:39 AM DEBUG: Processing pollutant-process: Total Energy C
onsumption - Running Exhaust
[java] 8/13/14 10:39 AM INFO: newSBDG setupTime=2 bundleTime=2640
[java] 8/13/14 10:39 AM INFO: TAG SourceTypeHour2 ms=521
[java] 8/13/14 10:39 AM INFO: TAG AverageSpeed ms=37
[java] 8/13/14 10:39 AM INFO: TAG SHOByAgeRoadwayHour ms=46
[java] 8/13/14 10:39 AM INFO: TAG IdleHoursByAgeHour ms=18
[java] 8/13/14 10:39 AM INFO: TAG StartsPerSampleVehicle ms=814
[java] 8/13/14 10:39 AM INFO: TAG SourceTypesInStartsPerVehicle ms=49
[java] 8/13/14 10:39 AM INFO: TAG StartsPerVehicle ms=63
[java] 8/13/14 10:39 AM INFO: TAG StartsByAgeHour ms=33
[java] 8/13/14 10:39 AM INFO: TAG SHPByAgeHour ms=66
[java] 8/13/14 10:39 AM INFO: TAG setupTime=1020 growthTime=2752 bundleTime
=421 focusTime=1667
```

- NOTE: If errors occur, this text may help identify problems. This gets saved to moveslog.txt

Running MOVES

- A run is complete when you see the following window:



- Click OK

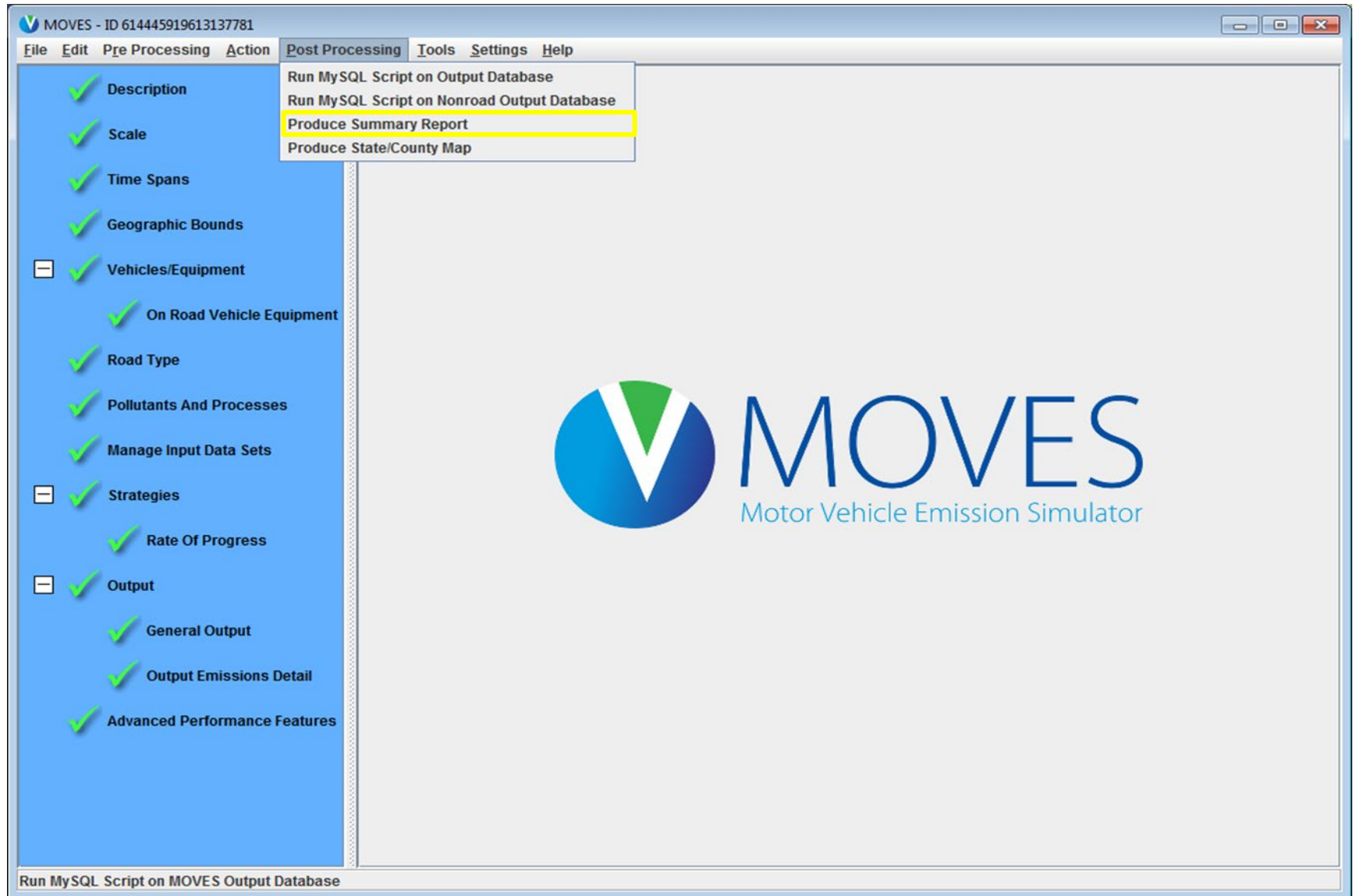
Accessing Results

- MOVES output can be accessed via:
 - MySQL Workbench (much more flexible; covered in Module 4)
 - MOVES Post Processing Summary Reporter (quick and easy)
 - Reports can be viewed onscreen, printed, or saved to import in Excel
 - For the Summary Reporter to operate properly, the RunSpec which produced the output needs to be loaded in MOVES
 - Summary Reporter works best for relatively simple National Scale runs
 - Recommend using Workbench for most analysis

Accessing Results

- Instructions for our National Scale Run Exercise:
 - From the Post Processing menu, select Produce Summary Report
 - A pop-up appears, Select Emissions Processes to Report
 - Select default, All Processes
 - Click OK


Post Processing



Specify Parameters for Summary Report

- Use the next screen to:
 - Give the report a title (optional)
 - Specify the base portion of table names used to store various portions of the report (optional, but if not changed, the report will be overwritten next time)
 - Select run number, categories, and data items reported
 - Use the Add, Add All, Remove, Remove all buttons to make selections
 - Choose the categories to be distinguished in the report
 - See user guide for additional details about the summary reporter
- Instructions for our National Scale Run Exercise:
 - Click *Add All* under “Run Number(s)”
 - Under “Categories”, select “sourceTypeID” and click *Add*
 - Under “Data Items”, select “Total Hydrocarbons” and click *Add*
 - Click OK

Specify Parameters for Summary Report

 Specify Parameters for Summary Report

Specify Report for Emission Process: Total of All

Report Description: Summary Report

Report Table Name: SummaryReport

Run Number(s)

Run: 1 Time: 2015-11-19 15:23:17.0 G:\lake_2015_training_natl.mrs

Categories

yearID
monthID
dayID
hourID
stateID
countyID
sourceTypeID
fuelTypeID

Data Items

Distance
Total Gaseous Hydrocarbons

Selection

Remove **Remove All**

OK **Cancel**

Selecting Parameters

Specify Parameters for Summary Report

Specify Report for Emission Process: Total of All

Report Description: Summary Report

Report Table Name: SummaryReport

Run Number(s)

Run: 1 Time: 2015-11-19 15:23:17.0 G:\lake_2015_training_natl.mrs

Add Add All

Categories

yearID
monthID
dayID
hourID
stateID
countyID
sourceTypeID
fuelTypeID

Add Add All

Data Items

Distance
Total Gaseous Hydrocarbons

Add Add All

Selection

Run: 1 Time: 2015-11-19 15:23:17.0 G:\lake_2015_training_natl.mrs

Remove Remove All

Selection

sourceTypeID

Remove Remove All

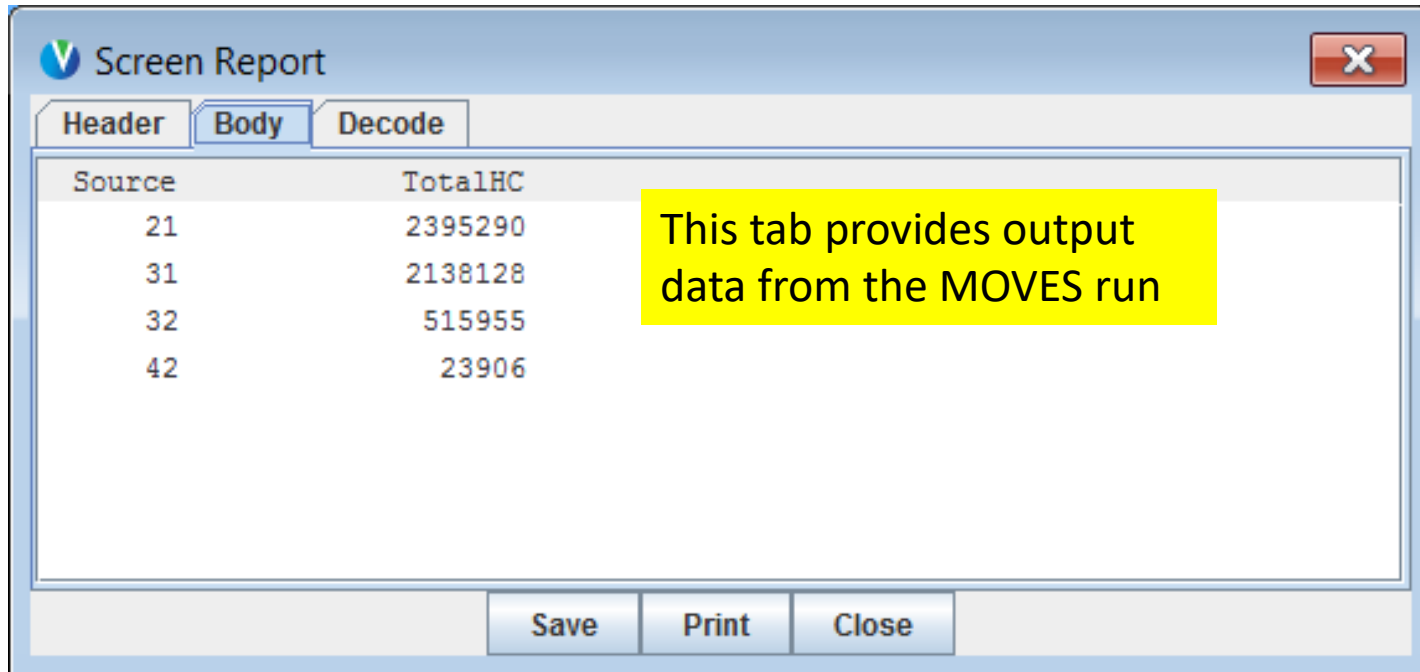
Selection

Total Gaseous Hydrocarbons

Remove Remove All

OK Cancel

The Summary Report – Body Tab



Screen Report

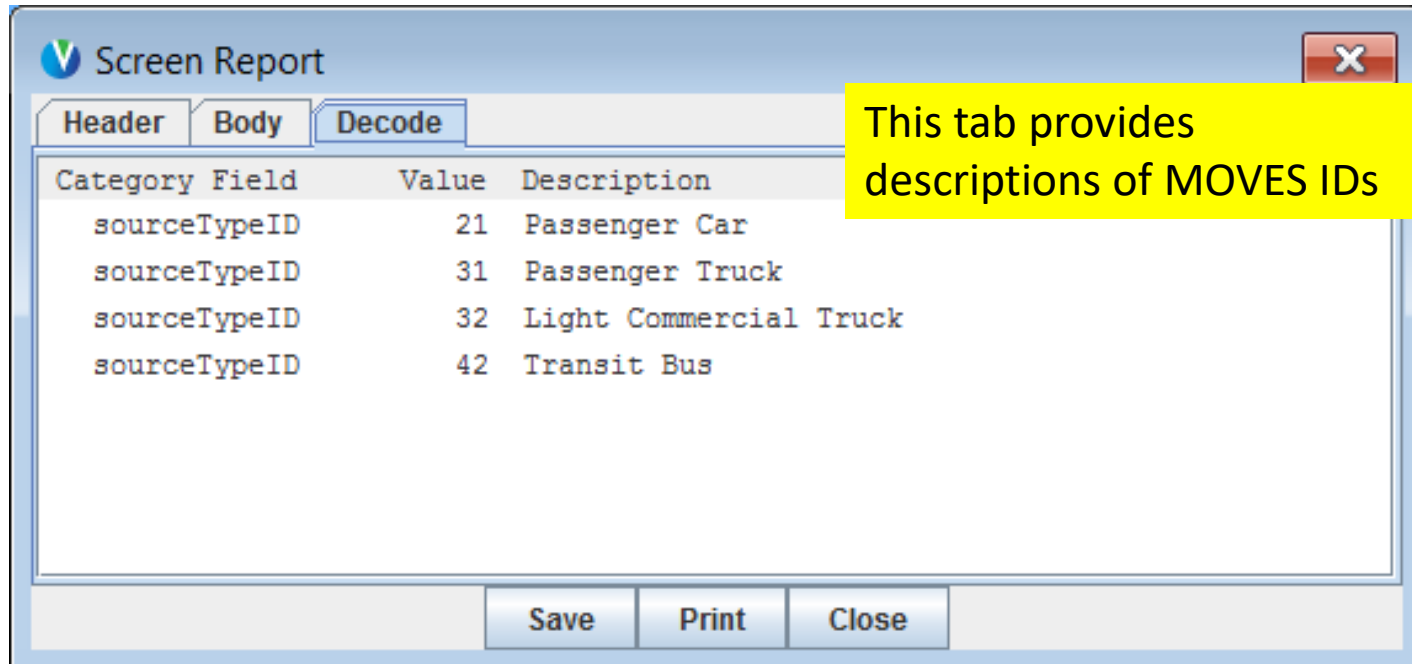
Header Body Decode

Source	TotalHC
21	2395290
31	2138128
32	515955
42	23906

This tab provides output data from the MOVES run

Save Print Close

The Summary Report – Body Tab



What if you want total HC?

- Using the output from the run we just finished, we could either
 - Save the summary report, open it in Excel, and sum the TotalHC column, or
 - Rerun the summary report, but select only “MOVES Run ID” from Categories and “Total Hydrocarbons” from Data Items
 - In other words, by **not** requesting emissions by source type, you’re having it report the total
- Instructions for our National Scale Run Exercise:
 - Click *Add All* under “Run Number(s)”
 - Under “Categories,” select “MOVESRunID” and click *Add*
 - Under “Data Items,” select “Total Hydrocarbons” and click *Add*
 - Click OK

What if you want total HC?

Specify Parameters for Summary Report

Specify Report for Emission Process: Total of All

Report Description: Summary Report

Report Table Name: SummaryReport

Run Number(s)

Run: 1 Time: 2015-11-19 15:23:17.0 G:\lake_2015_training_natl.mrs

Add Add All

Categories

dayID
hourID
stateID
countyID
sourceTypeID
fuelTypeID
roadTypeID
MOVESRunID

Add Add All

Data Items

Distance
Total Gaseous Hydrocarbons

Add Add All

Selection

Run: 1 Time: 2015-11-19 15:23:17.0 G:\lake_2015_training_natl.mrs

Remove Remove All

Selection

MOVESRunID

Remove Remove All

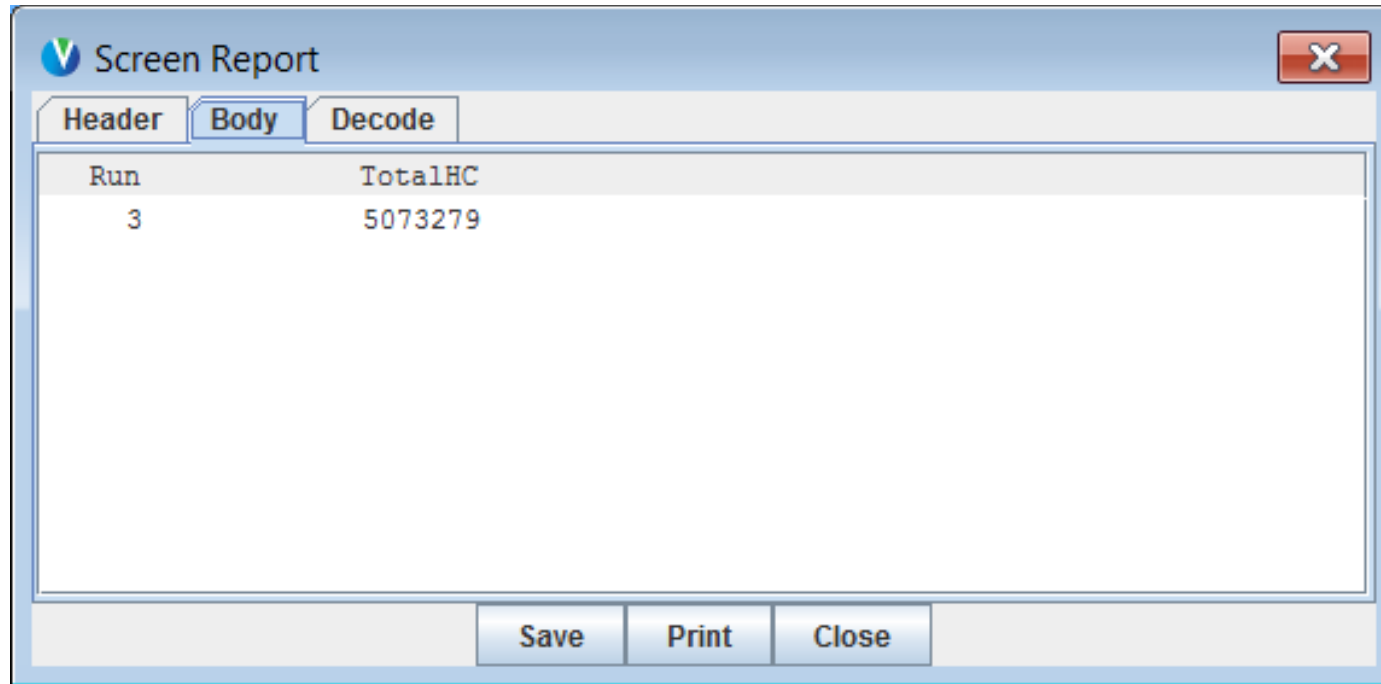
Selection

Total Gaseous Hydrocarbons

Remove Remove All

OK Cancel

Total HC is reported



Screen Report

Run	TotalHC
3	5073279

Save Print Close

Questions?

