Web-Based Inventory Applications

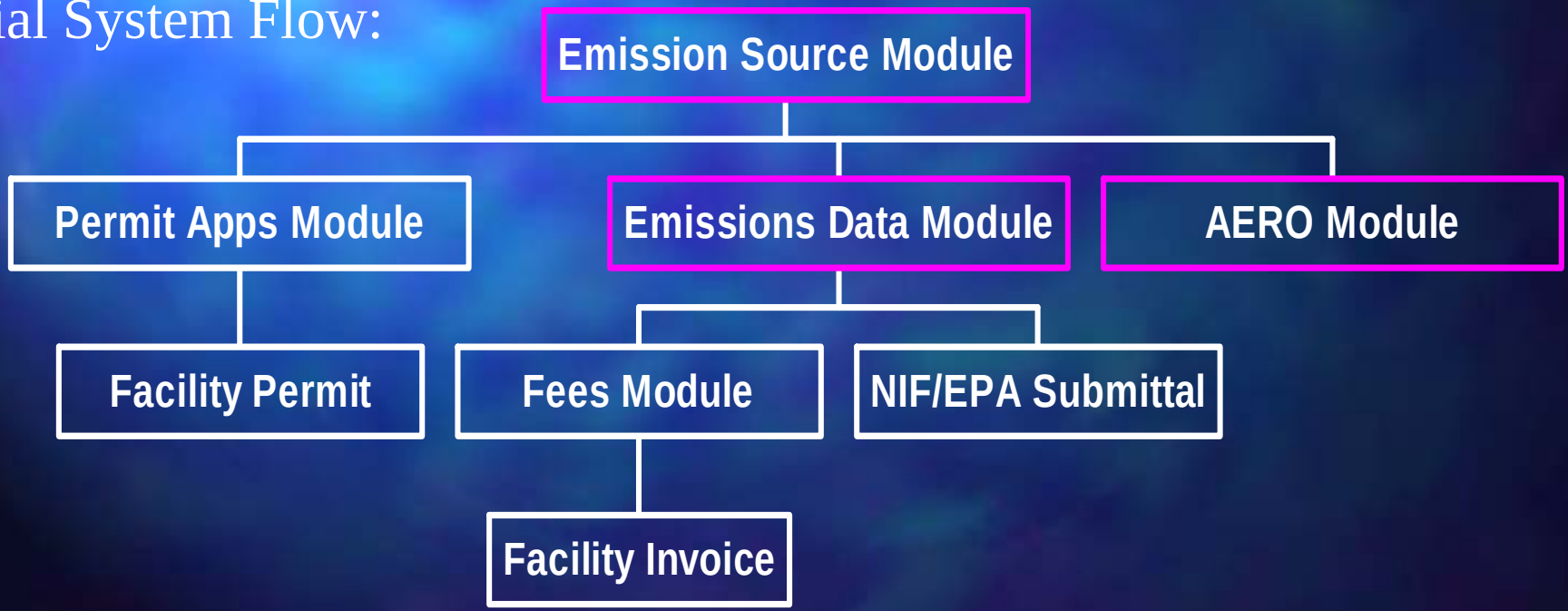
Implementing Quality Assurance Checks to Improve Data Integrity, Quality, and Processing Efficiency

Background

- ~ 3100 permitted facilities
  - ~ 400 Title V
  - ~ 2700 Synthetic Minor and Small
- Title V- inventoried annually for Criteria and HAP emissions
- Synthetic Minor and Small – inventoried on a rolling 5 year cycle tied to permit renewal for Criteria and HAP emissions

Data Management System Overview

- Relational database run by Oracle software
- Data is stored in a centralized database and is shared by all modules
- ESM is a core module, feeding data to ED, AERO, Permit Applications, and other modules (not shown).
- Partial System Flow:



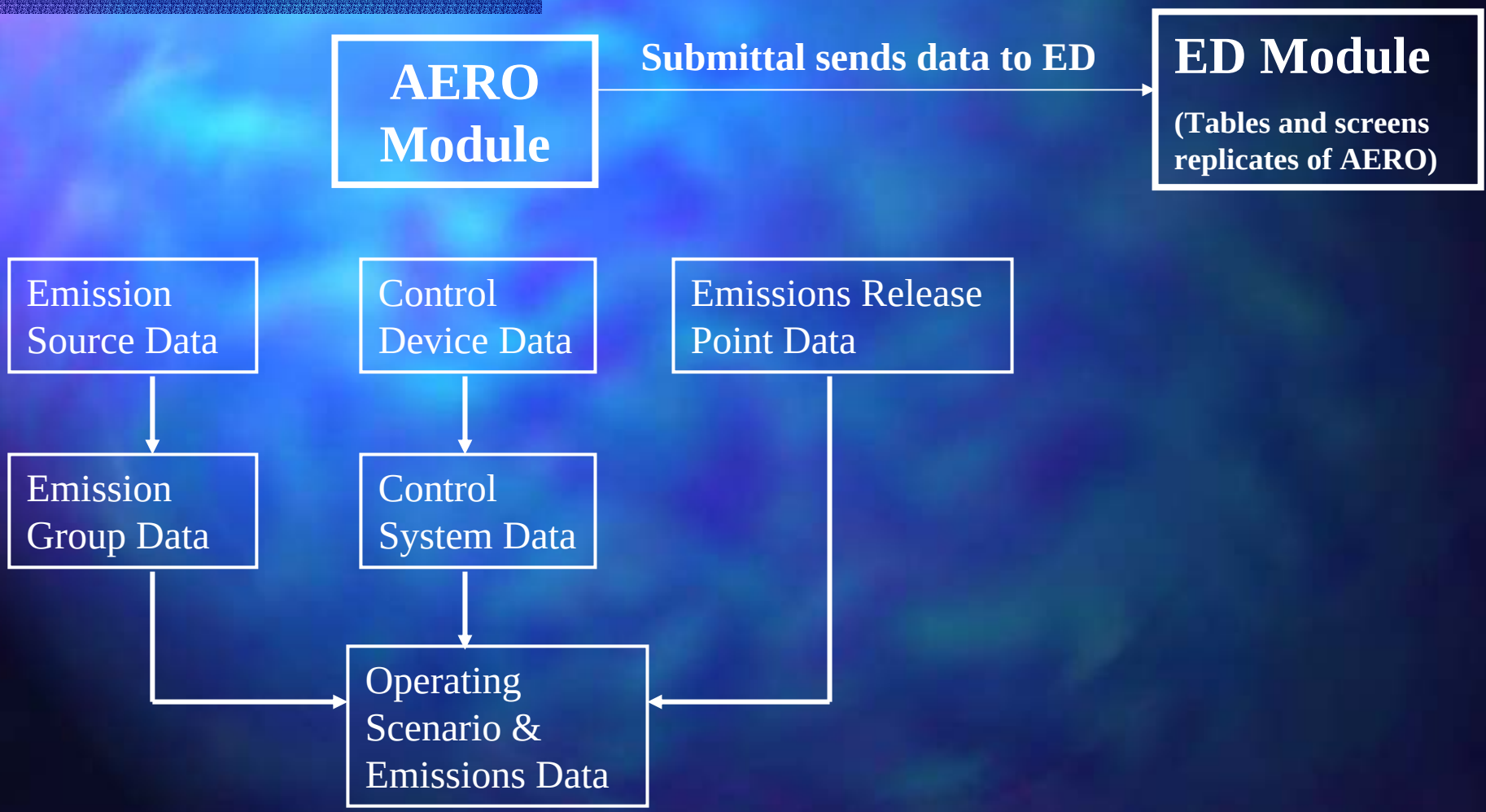
NC's Web-Based Application

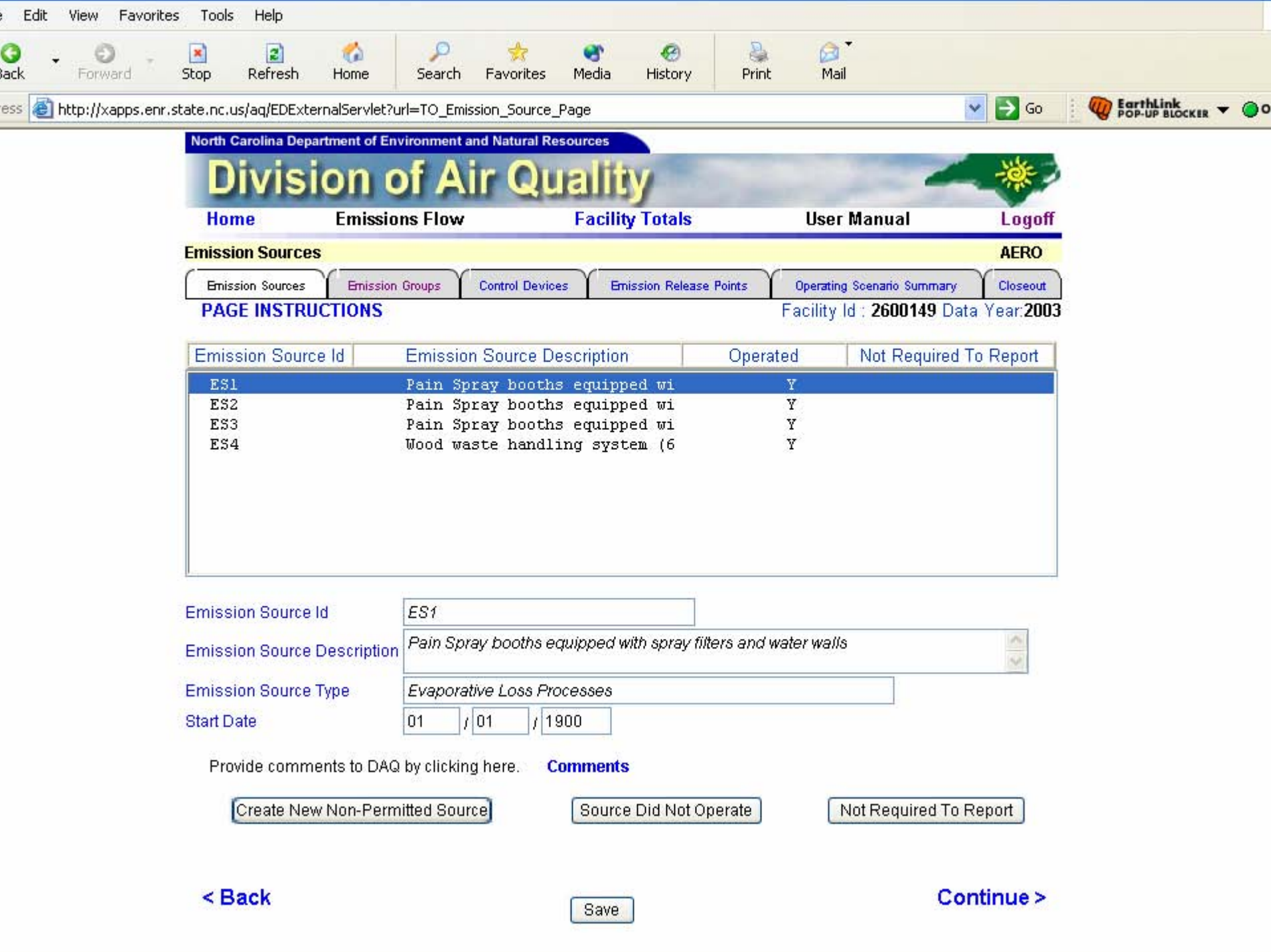
Two (2) Interfaces:

- *Facility Interface – Air Emissions Reporting On-line (**AERO**) Module
  - Facility users enter data and submit EI on-line
- *Agency Interface – Emissions Data (**ED**) Module
  - DAQ users enter/edit/review data

*The structure of AERO and ED tables and screens are very similar.

Flow of Data in AERO (and ED)




Edit View Favorites Tools Help
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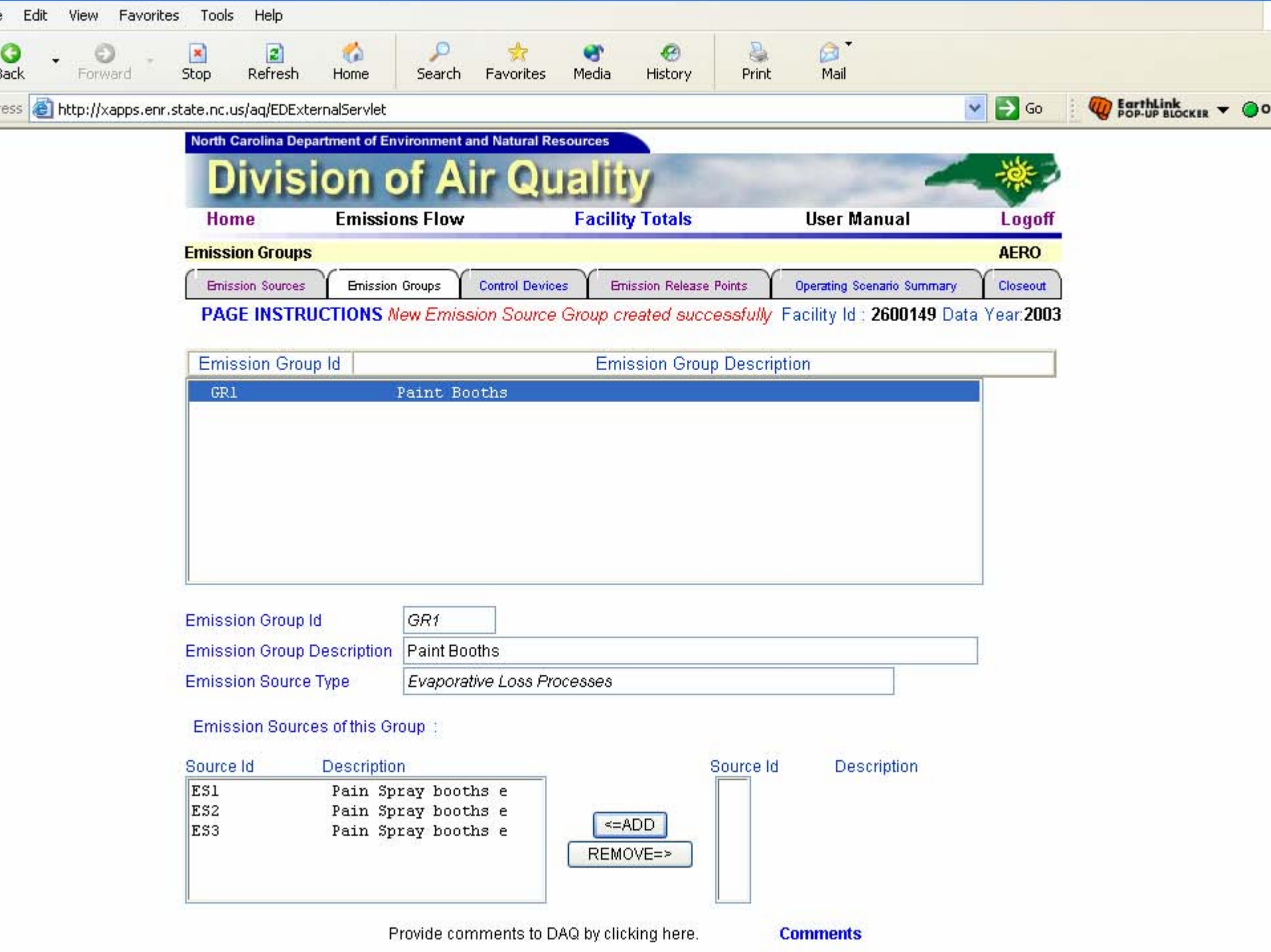
http://xapps.enr.state.nc.us/aq/EDExternalServlet?url=TO_Emission_Source_Page
Go
EarthLink POP-UP BLOCKER
North Carolina Department of Environment and Natural Resources
Division of Air Quality
Home
Emissions Flow
Facility Totals
User Manual
Logoff
Emission Sources
AERO
Emission Sources
Emission Groups
Control Devices
Emission Release Points
Operating Scenario Summary
Closeout
PAGE INSTRUCTIONS
Facility Id : 2600149 Data Year:2003
Emission Source Id
Emission Source Description
Operated
Not Required To Report
ES1 Pain Spray booths equipped wi Y
ES2 Pain Spray booths equipped wi Y
ES3 Pain Spray booths equipped wi Y
ES4 Wood waste handling system (6 Y
Emission Source Id
ES1
Emission Source Description
Pain Spray booths equipped with spray filters and water walls
Emission Source Type
Evaporative Loss Processes
Start Date
01 / 01 / 1900
Provide comments to DAQ by clicking here.
Comments
Create New Non-Permitted Source
Source Did Not Operate
Not Required To Report
< Back
Save
Continue >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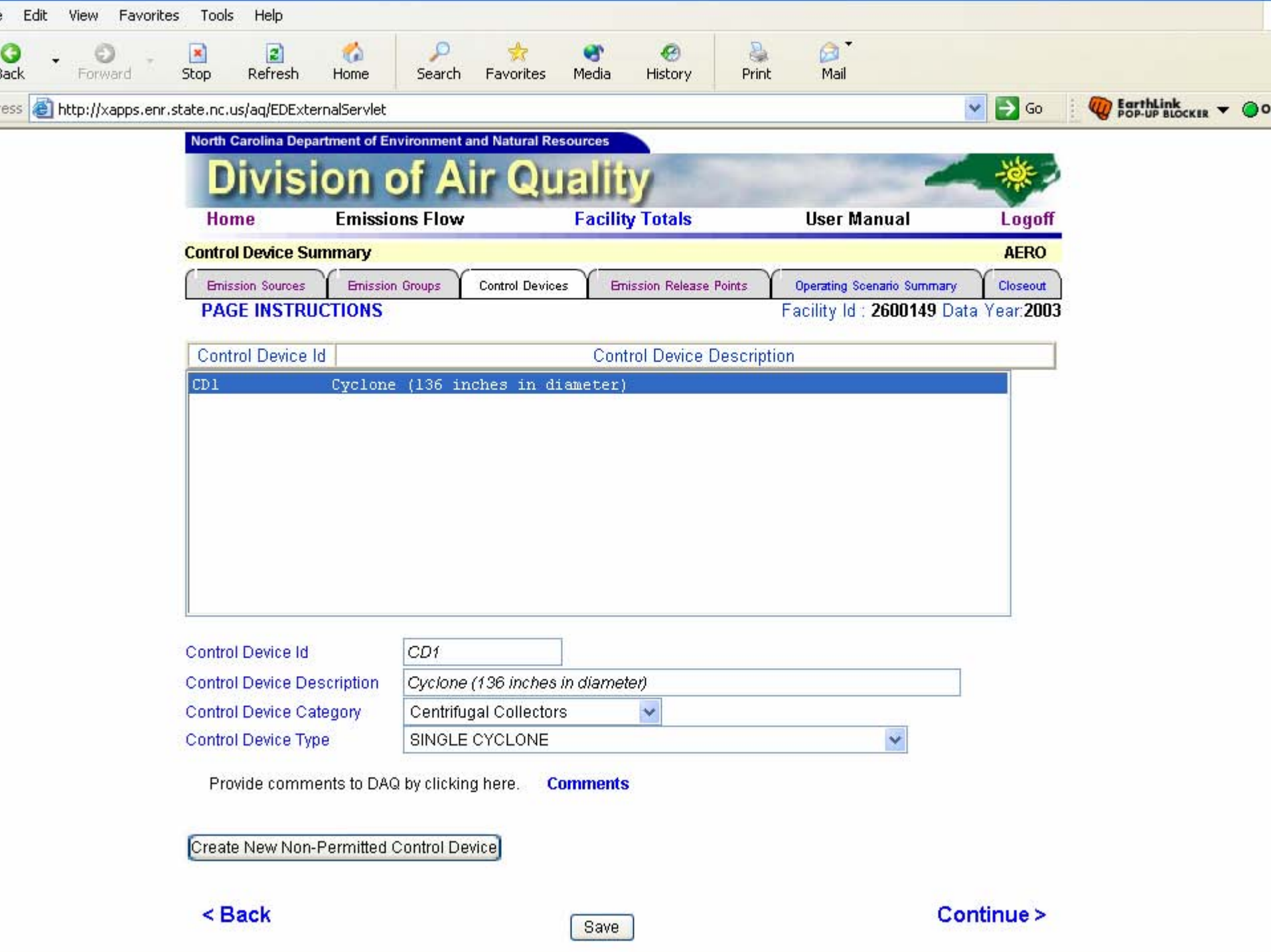
Back Forward Stop Refresh Home Search Favorites Media History Print Mail
http://xapps.enr.state.nc.us/aq/EDExternalServlet
Go
EarthLink POP-UP BLOCKER
North Carolina Department of Environment and Natural Resources
Division of Air Quality
Home Emissions Flow Facility Totals User Manual Logoff
Emission Groups AERO
Emission Sources Emission Groups Control Devices Emission Release Points Operating Scenario Summary Closeout
PAGE INSTRUCTIONS New Emission Source Group created successfully Facility Id : 2600149 Data Year:2003
Emission Group Id
Emission Group Description
GR1 Paint Booths
Emission Group Id GR1
Emission Group Description Paint Booths
Emission Source Type Evaporative Loss Processes
Emission Sources of this Group :
Source Id Description
ES1 Pain Spray booths e
ES2 Pain Spray booths e
ES3 Pain Spray booths e
<=ADD
REMOVE=>
Source Id Description
Provide comments to DAQ by clicking here.
Comments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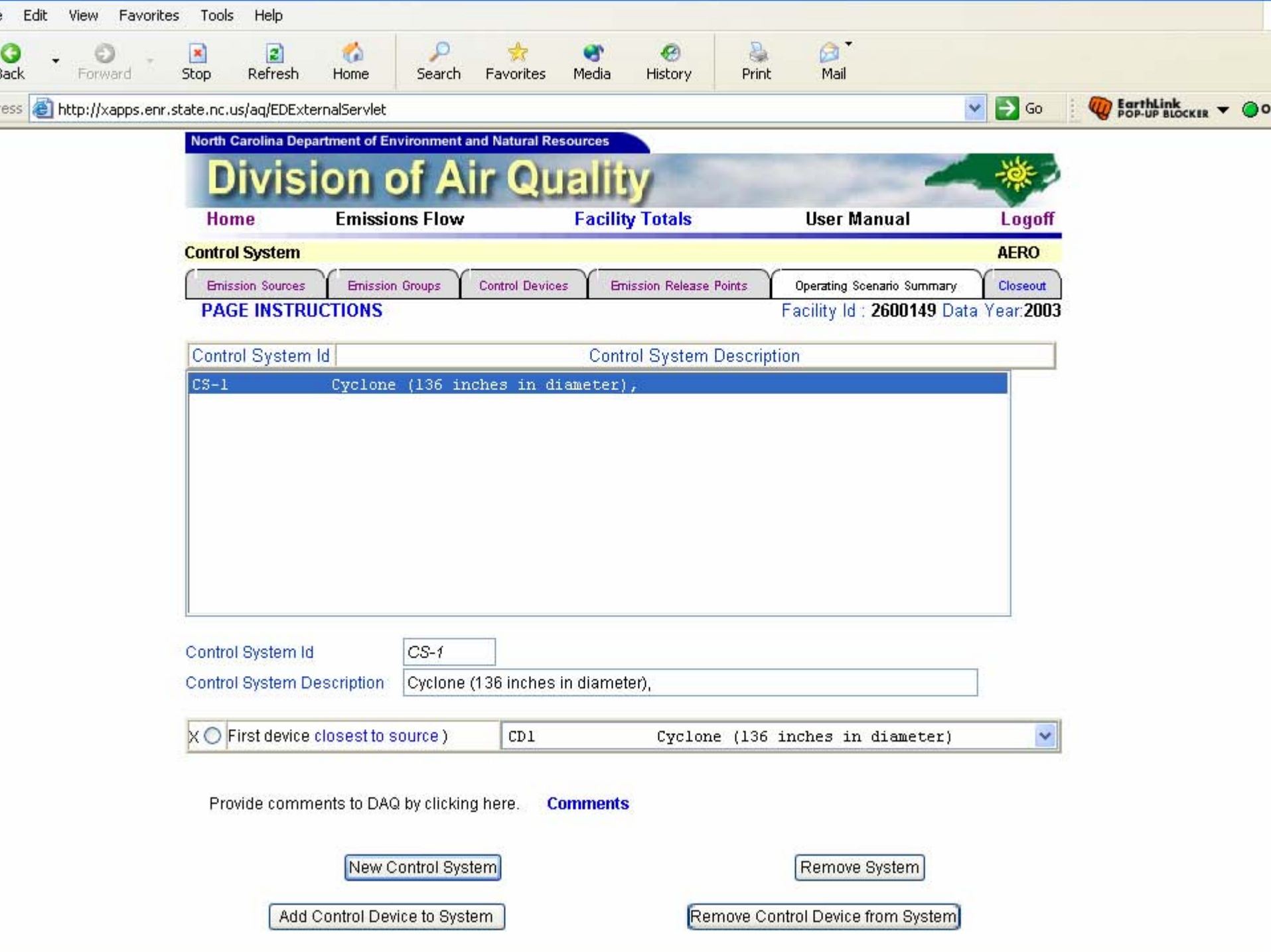
Home Emissions Flow Facility Totals User Manual Logoff
Control Device Summary AERO
Emission Sources Emission Groups Control Devices Emission Release Points Operating Scenario Summary Closeout
PAGE INSTRUCTIONS
Facility Id : 2600149 Data Year:2003
Control Device Id
Control Device Description
CD1 Cyclone (136 inches in diameter)
Control Device Id CD1
Control Device Description Cyclone (136 inches in diameter)
Control Device Category Centrifugal Collectors
Control Device Type SINGLE CYCLONE
Provide comments to DAQ by clicking here. Comments
Create New Non-Permitted Control Device
< Back
Save
Continue >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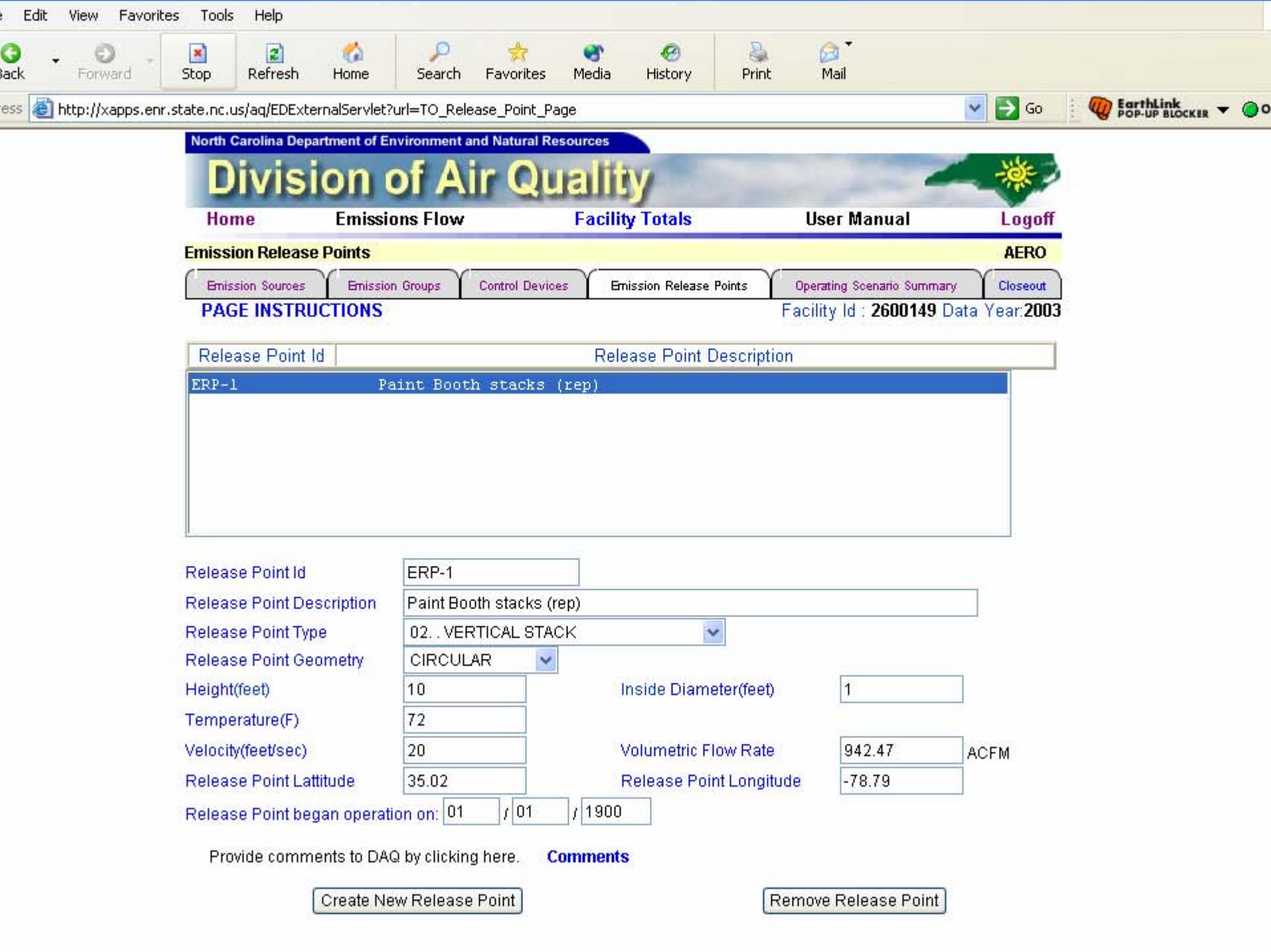
Division of Air Quality
Home Emissions Flow Facility Totals User Manual Logoff
Control System AERO
Emission Sources Emission Groups Control Devices Emission Release Points Operating Scenario Summary Closeout
PAGE INSTRUCTIONS
Facility Id : 2600149 Data Year:2003
Control System Id
Control System Description
CS-1 Cyclone (136 inches in diameter),
Control System Id CS-1
Control System Description Cyclone (136 inches in diameter),
X First device closest to source) CD1 Cyclone (136 inches in diameter)
Provide comments to DAQ by clicking here. Comments
New Control System
Remove System
Add Control Device to System
Remove Control Device from System


Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites Media History Print Mail
http://xapps.enr.state.nc.us/aq/EDExternalServlet?url=TO_Release_Point_Page
Go
EarthLink POP-UP BLOCKER
North Carolina Department of Environment and Natural Resources
Division of Air Quality
Home Emissions Flow Facility Totals User Manual Logoff
Emission Release Points
AERO
Emission Sources Emission Groups Control Devices Emission Release Points Operating Scenario Summary Closeout
PAGE INSTRUCTIONS
Facility Id : 2600149 Data Year:2003
Release Point Id
Release Point Description
ERP-1 Paint Booth stacks (rep)
Release Point Id ERP-1
Release Point Description Paint Booth stacks (rep)
Release Point Type 02. . VERTICAL STACK
Release Point Geometry CIRCULAR
Height(feet) 10
Inside Diameter(feet) 1
Temperature(F) 72
Velocity(feet/sec) 20
Volumetric Flow Rate 942.47 ACFM
Release Point Lattitude 35.02
Release Point Longitude -78.79
Release Point began operation on: 01 / 01 / 1900
Provide comments to DAQ by clicking here. Comments
Create New Release Point
Remove Release Point

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Division of Air Quality

Operating Scenario Summary

AERO

PAGE INSTRUCTIONS

Facility Id : **2600149** Data Year:**2003**

< Back Continue >

OS Not Operated	Id	Description	Status
	GR1	**Paint Booths**	
○	OS1		
	Add New Operating Scenario		
	ES4	**Wood waste handling system (6000 acfm airflow)**	
	Add New Operating Scenario		

< Back Continue >

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Division of Air Quality

Operating Scenario Update AERO

You may SAVE your work ANY time and return to it Later

Confidential Information ☐ Please check the box if you are separately submitting data for this Operating Scenario as confidential information

Emission Group Id	GR1	Emission Group Description	*Paint Booths*
Operating Scenario Id	OS1	SCC Description	*Not required by facility, will be completed by DAQ*
*Operating Scenario Description			

*Annual Throughput	0	*Units	/Year

Normal Operating Schedule:

*Hours Per Day 24	*Days per Week 7	*Weeks per Year 52	Hours per Year 8760
*Start Date 01 / 01 / 2003		*End Date 12 / 31 / 2003	
*Typical Start Time: 0000		*Typical End Time: 2359	

Seasonal Periods Percent Annual Throughput in CY 2003

*Dec-Feb 25	*Mar-May 25	*June-Aug 25	*Sept-Nov 25

Save Operating Scenario

Save Operating Scenario

Please associate Control System and/or Release Points before entering emissions data

Release Point

Emission Release Points Associated with this Operating Scenario

Release Point Id	Description	%thru Each Emission Release Point
ERP-1	Paint Booth stacks (rep)	100

Actual Emissions per Pollutant for this Operating Scenario

You must submit calculations and documentation of emission factors or other estimation methods used, according to instructions from DAQ, electronically or on paper. See Help for further instructions.

Criteria(NAA QS) Pollutants	Pollutant Code	Emission Estimation Method	Emission Factor (Pounds/)	2003 Emissions for this OS(Tons/year)
CO	CO	08		
NOx	NOx	08		
PM(TSP)	TSP	08		
PM10	PM10	08		
PM2.5	PM2.5	08		
SO2	SO2	08		
VOC (Meeting Federal Definition as photochemically reactive)	VOC	08		

Add Pollutants Delete Pollutants

HAP/TAP deminimus doc

	HAPs/TAPs Pollutants	CAS#(Orother Group	Emission Estimation	Emission Factor	2003 Emissions for

Add Pollutants Delete Pollutants

HAP/TAP deminimus doc

	HAPs/TAPs Pollutants	CAS# (Orother Group Code)	Emission Estimation Method	Emission Factor (Pounds/)	2003 Emissions for this OS (Pounds/yr)
○	Butoxy Ethanol 2- (Butyl Cellusolve) (Component of GLYET)	111-76-2	08		
○	Dioxane, 1,4-	123-91-1	08		
○	Formaldehyde	50-00-0	08		
○	Methanol	67-56-1	08		
○	Methyl chloroform	71-55-6	08		
○	Methyl ethyl ketone	78-93-3	08		
○	Methyl isobutyl ketone	108-10-1	08		
○	Methylene chloride	75-09-2	08		
○	Toluene	108-88-3	08		
○	Vinyl acetate	108-05-4	08		
○	Xylene	1330-20-7	08		

Provide comments to DAQ by clicking here. **Comments**

Add Pollutants Delete Pollutants Delete OS Data Entry Complete

< Back Save **Continue >**

Closeout and Quality Assurance

It is required that you make the necessary corrections based on the quality assurance reports below, prior to submittal to ensure that all data submitted via AERO are complete and meet DAQ system requirements. Quality Assurance checks are performed prior to inventory submittal. When problems with facility data are found, Quality Assurance reports showing data that need to be corrected will be listed below. All items required for electronic submittal are marked with an asterisk and must be addressed prior to electronic submittal of your emissions inventory. The links on this page will lead you through all the necessary steps to finalize the emissions inventory for this facility.

After electronic submission of your facility's emissions data and prior to due date, the Certification form signed in blue ink by the Responsible Official, all supporting documentation of emission factors (stack test data etc.), and emission data calculations must be submitted to the regional inventory contact listed in your emission inventory notification letter. The supporting documentation can be submitted via email, in MS Office format. It is suggested that any information submitted through the US Postal Service be sent certified. If any of your facility's contacts have changed since your last emission inventory submission or permit application, please complete the General Information form and submit this form along with the other information.

Abode Acrobat Reader may need to be installed to view/print forms and reports 

General Comments Use this link to make general comments to DAQ and/or review all comments made while entering your emission inventory.

*** Operating Scenarios Set to Incomplete**

Each Operating Scenario listed below has an incomplete data status. Please go to the Operating Scenario Summary page, choose the operating scenario listed below and either mark it 'Not Operated' or 'Data Entry Complete'. Inventory data cannot be submitted without completing this.

Group Id	Group Description	OS Id
GR1	Paint Booths	1

*** Emission Sources with incomplete data status**

Each Emission Source listed below has an incomplete data status. Please go to the Emission Sources page, choose the Emission Source listed below and either mark it 'Not Operated' or 'Not Required To Report'. If it was operated, please add an Operating Scenario and enter emissions. Inventory data cannot be submitted without completing this.

Source Id	Source Description
ES4	Wood waste handling system (6000 acfm airflow)

This report sums the emissions entered for individual emission sources. Please click the link to run this report and verify the facility-wide emissions were summed correctly from all facility emission sources.

Facility Totals

This report sums the emissions entered for individual emission sources. Please click the link to run this report and verify the facility-wide emissions were summed correctly from all facility emission sources.

Facility Totals

Please Print:

* Certification Form
* Complete Emission Inventories as entered in AERO
* General Information Change Form

After all quality assurance requirements have been satisfied and Facility Totals have been verified, click the button below to submit your facility's emission inventory electronically. In addition, the Certification form must be signed by the Responsible Official. The original and one copy of certification form and one set of all supporting documentation and calculations must be submitted to the appropriate Regional office prior to the emission inventory due date. To obtain the certification form, a copy of emission data entered into the AERO system and general information form, click on the links above.

Submit Inventory To NCDAQ

The Key for a Successful Application ??

- Completely and accurately defining data requirements

When ??

- **Before** you create the application

“Defining Data Requirements”

1. Determine data elements and data conditions.
2. Is the data obligatory or are we requesting it ?
3. How do we make sure we receive all the data we require?
4. How do we increase the quality of the data?

Determining Data Elements: *Required or Requested*

- EPA's NIF 3.0 Specifications
  - Mandatory - (Emission Unit ID, Lat and Long, ERP ID, etc.)
  - "Like To Have" – (Annual Throughput, Operating Schedule, etc.)
- State and Local government program requirements
  - Mandatory - (Facility ID, Data Entry/Review Complete Date, etc.)
- EPA/State/Local government program future needs
  - "Like To Have" (ERP specific Lat and Long data)

Determining Data Conditions:

Ensure all data conditions required by NIF 3.0 are met by your system:

- Emission Unit record must have a corresponding Emissions record
- Emissions Release Point record must have a corresponding Emissions record
- Site record must have a corresponding Emission Unit record
- Etc…

Ensuring Receipt of all Required Data

- After determining all “required” data elements, create a Quality Assurance (QA) check for each requirement.

- After determining all “required” data conditions, create a QA check for each requirement.

Increasing the Quality of the Data

•Define data element parameters (as applicable), then create a QA check for each parameter.

Quality Assurance Goals:

1. Receipt of all *required* data (on-time)
2. Increased accuracy and integrity of submitted data
3. Decreased Processing Time (facility and agency)

Quality Assurance Methods:

- **Immediate Quality Assurance (IQA) check**: interrupts the user during the data entry process and forces data corrections immediately.

- **Delayed Quality Assurance (DQA) check**: does not interrupt the user during data entry, but instead keeps track of incomplete data conditions and requirements for the user to correct sometime prior to submittal.

Why Have Two Different QA Methods?

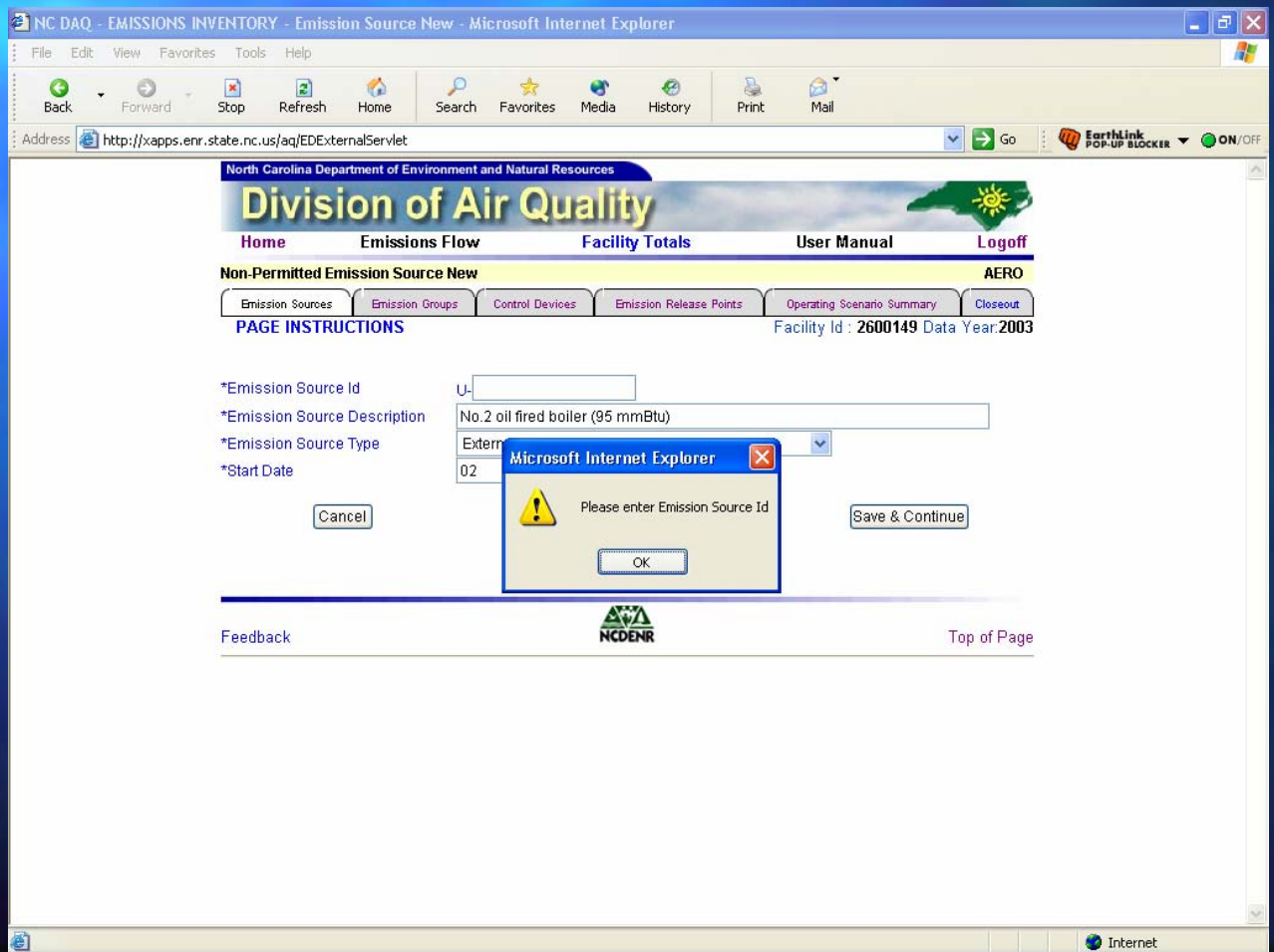
To create a more user-friendly application!

How Do IQA Checks Work?

- Immediately alerts user when data requirements are incomplete or data values are outside set parameters
- Stops forward movement in the application until required data are complete
- Displays errors on a *screen-by-screen* and *field-by-field* basis
- Provides help for user

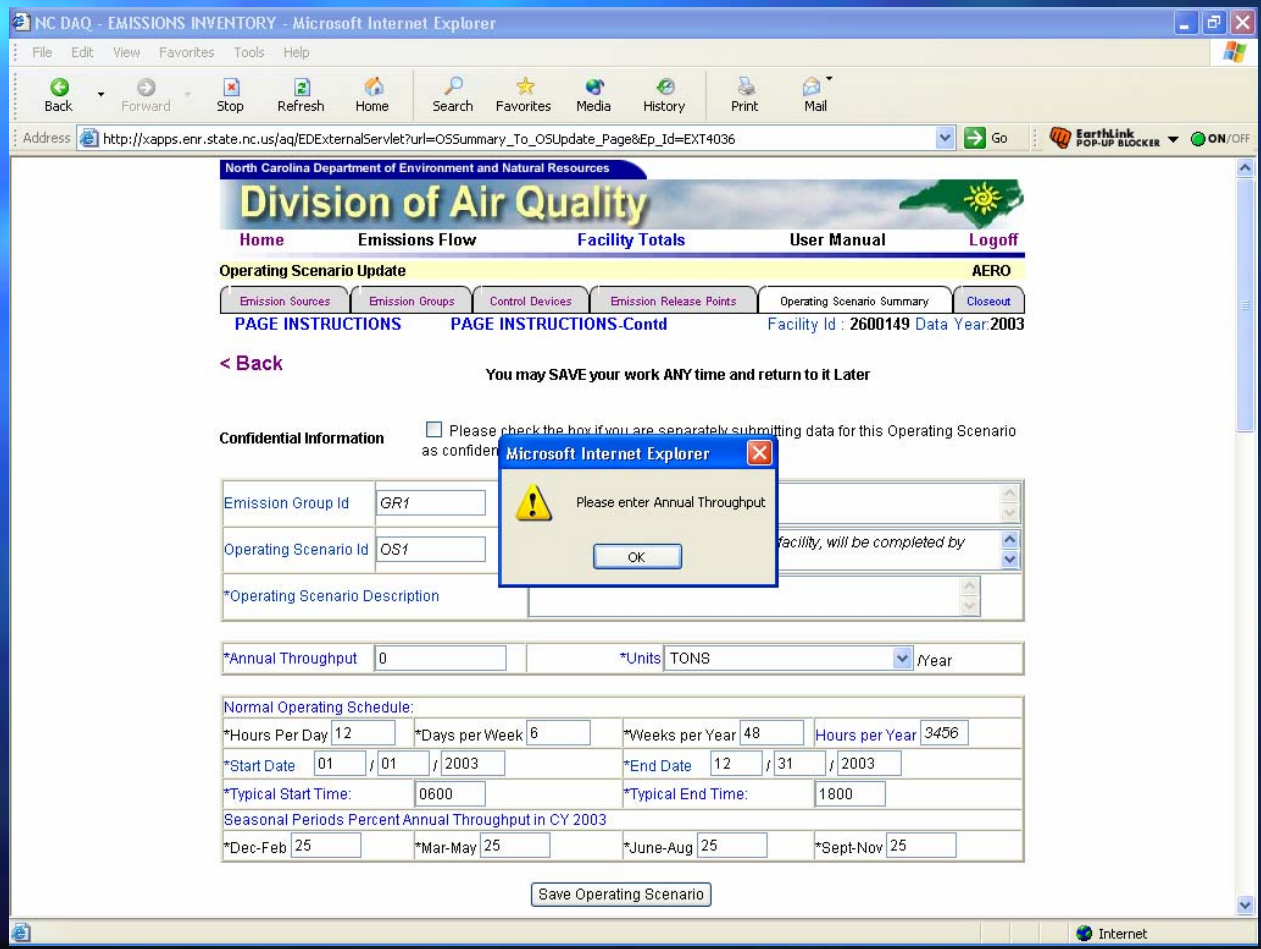
IQA Checks: Example #1 Screen-By-Screen

The Emission Source ID (ES ID), for a newly created emission source, was not entered before saving the data record. The IQA check stops progress and a pop up warning notifies user that ES ID must be complete before saving the record. User must complete the field before proceeding to the next data screen.



IQA Checks: Example #2 Screen-By-Screen

The annual throughput was not entered before saving the Operating Scenario. The IQA check stops progress and a pop up warning notifies user that annual throughput must be complete before saving the record. User must complete the field before proceeding to the next data screen.

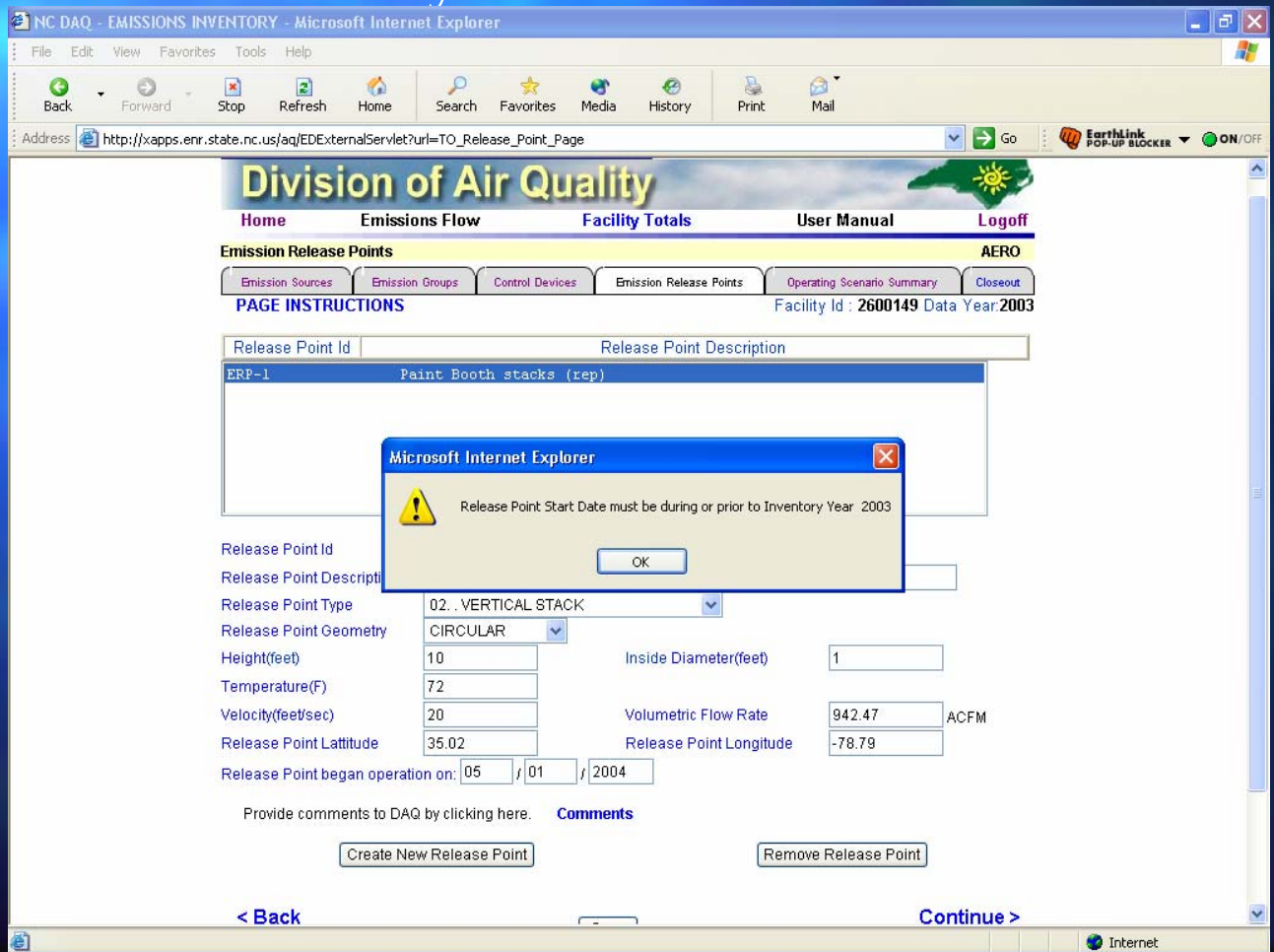


How Do IQA Checks Improve Processing Efficiency ?

- Reduces (if not eliminates) hands-on completeness check
- No more waiting for missing data

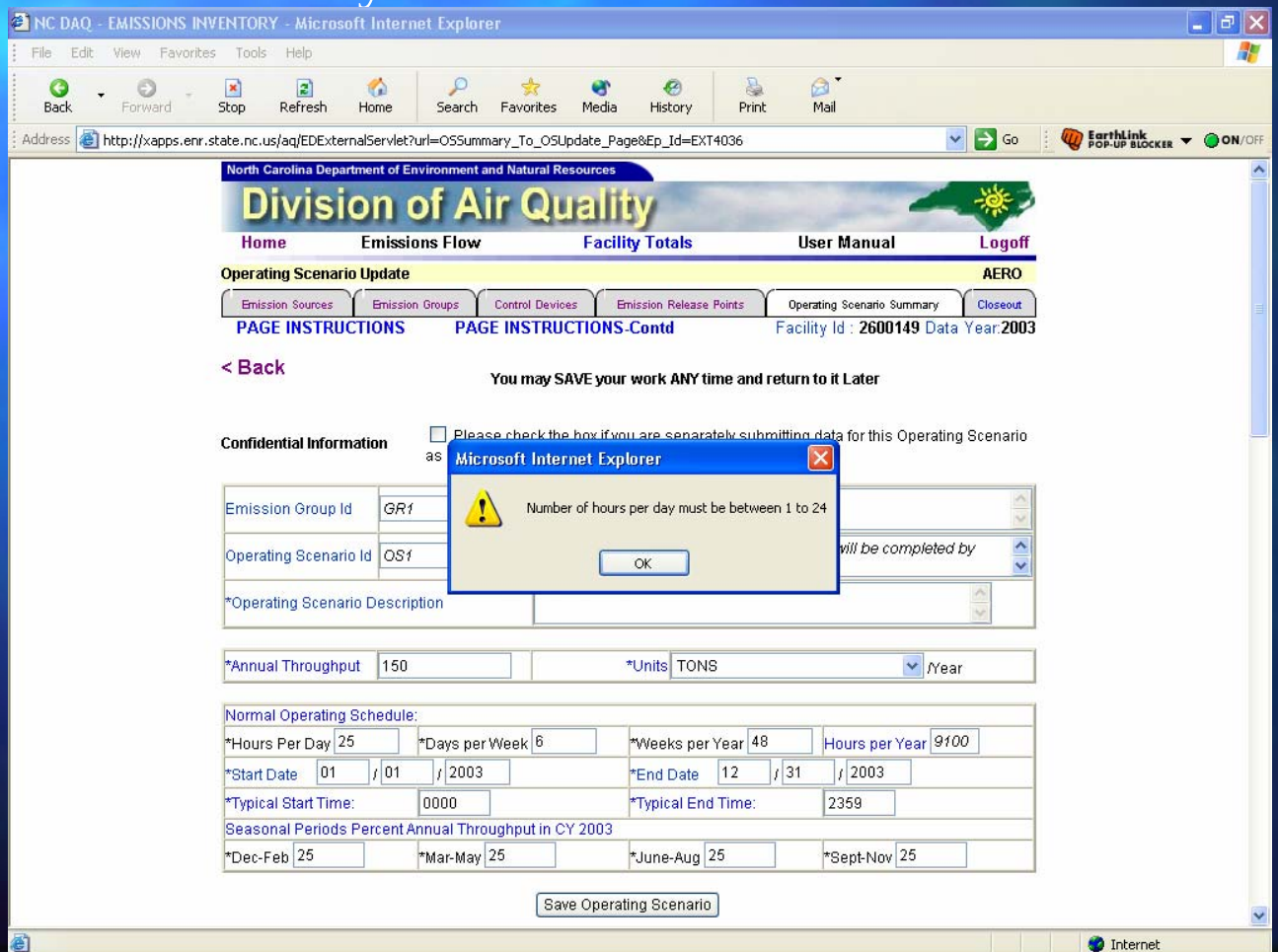
IQA Checks: Example #1 Field-By-Field

User enters 02/15/2007 for Emission Release Point (ERP) start date field. IQA check stops progress and a pop up warning notifies user that start date must not be greater than the current inventory year (i.e. 12/31/2003). User must enter an acceptable date before data entry can continue.



IQA Checks: Example #2 Field-By-Field

User enters the value 25 in the data field “Hours (of operation) per Day”, the IQA check stops progress and a pop up warning notifies user that the acceptable data values for this field are between 1 and 24. User must enter an acceptable data value before data entry can continue.



How Do IQA Checks Improve Data Quality ?

- Data identified by system as erroneous is not accepted
- Provides user with data guidance during data entry

How Do DQA Checks Work?

• Performed every time save button is pressed on any screen, and updates a running total report

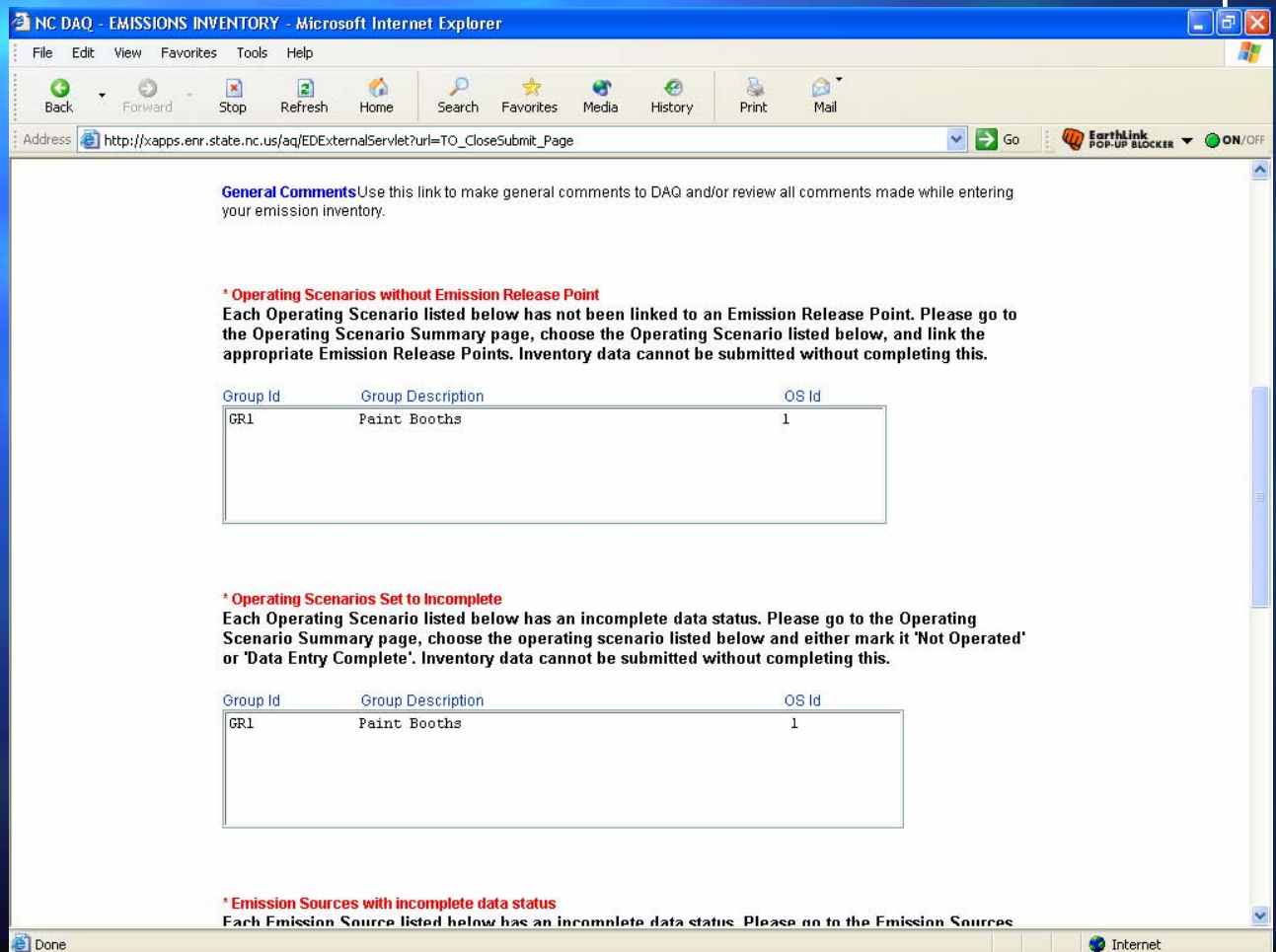
•Alerts user at the end of the data entry process that required data elements or conditions are incomplete

•Stops only the submittal of the inventory until the requirements have been met

•Provides help for user

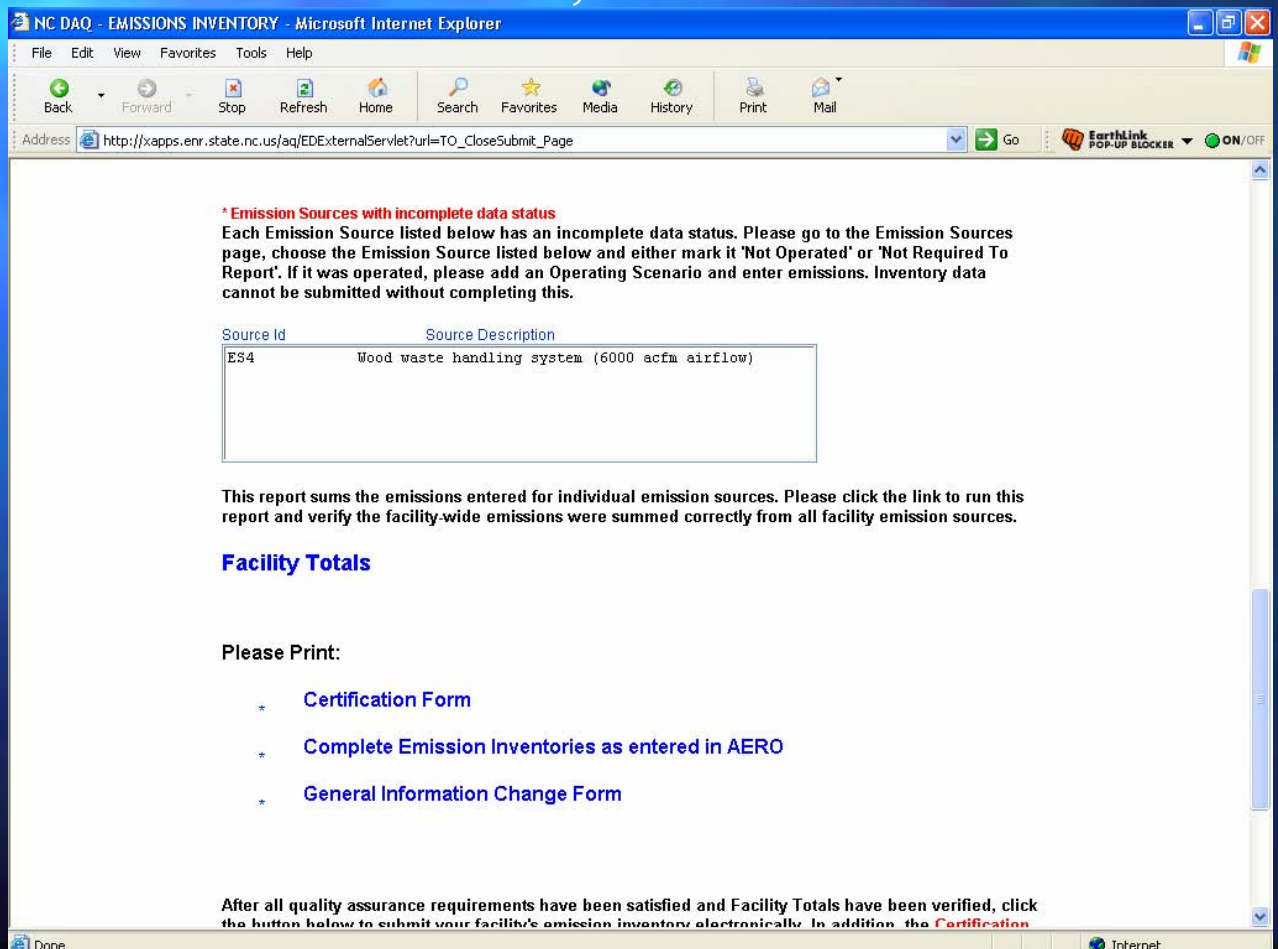
DQA Checks: Example #1

User creates an OS and starts entering emissions related data, but doesn't know all the ERP parameters. System allows OS to be saved without an ERP associated. On the Closeout screen the user sees a report listing all OS's without ERP's associated and the EI cannot be submitted until report is null.



DQA Checks: Example #2

User inadvertently omitted entering data for an Emission Source (ES). System verifies that each ES either has a completed OS or has been marked as "not required to report" or "not operated." User sees a report listing all ES's not meeting criteria on Closeout screen, and EI cannot be submitted until report is null.



How Do DQA Checks Improve Processing Efficiency & Data Quality?

- Eliminates hands-on completeness check
- No more waiting for missing data
- Data entry process doesn’t stall while waiting for information.
- Provides user with data guidance during data entry

Cumulative Effect of IQA & DQA Checks:

Increased Data Integrity

- "Data integrity can be defined as the soundness and completeness of data."

Cumulative Effect of IQA & DQA Checks:

- Without QA checks – users could submit incomplete EI's
  - By automatically verifying that required data elements and data conditions are complete, they ensure more complete data submittals.
- Without QA checks – users could submit inaccurate data
  - By automatically verifying that data values are within defined parameters, they ensure that more accurate (sound) data is submitted.

Table 1. Example IQA Checks Facility Interface (AERO)

Screen Name in AERO	Description of QA Check	Parameters (if applicable)
Emission Source	Source ID for new sources	< 21 characters; No duplicates
Emission Source	Start Date for new sources	< 01/01/200X (X=current year)
Emission Source	Source Type for new sources	
Emission Source	Emission source description for new sources	
Emission Group	All sources have same source type for new groups	
Emission Group	Emission group description for new groups	
Control Device	Device ID for new devices	< 21 characters; No duplicates
Control Device	Device Category for new devices	
Control Device	Device Type for new devices	
Control System	Device ID's in new systems	No duplicate devices in system

Table 2. Example DQA Checks Facility Interface (AERO)

Display Screen in AERO	Description of QA Check
Closeout	Show Operating Scenarios Without Emission Release Points **(Data Condition)**
Closeout	Show Operating Scenarios With Incomplete Data Status **(Data Condition)**
Closeout	Show Emission Sources With Incomplete Data Status **(Data Condition)**
Closeout	Show Operating Scenarios With < 100% Emissions Accounted for Through ERP **(Data Condition)**
Closeout	Control Devices Without Category and Type **(Data Element)**
Closeout	Emission Source Without Source Type **(Data Element)**

Agency Interface: Additional QA's

ED includes a few additional QA checks.

IQA Checks:

Screen Name in ED	Description of QA Check	Parameters (if applicable)
Operating Scenario	New OS's must have SCC	

DQA Checks:

Screen Name in ED	Description of QA Check
Facility Approval	Operating Scenarios Without SCC's **(Data Element)**
Facility Approval	Sources, Groups, Control Devices, Control Systems, and Emission Release Points Not Marked Accepted **(Data Element)**
Facility Approval	Approval Type selected **(Data Element)**
Facility Approval	Data Entry/Review Date Completed **(Data Element)**

Summary

- Improving processing efficiency is simple as changing to web-based EI application
- **Real** gain in quality and integrity is found in QA checks
- Data Uses: Modeling, Planning, Rule Development, Risk Assessments
- The beginning- the goal was to collect data, didn't matter how good
- Now- the longer we collect, we see that quality data is important
- The future- we need to develop better ways to not only collect and process data, but create data (i.e. emission factors, etc.)