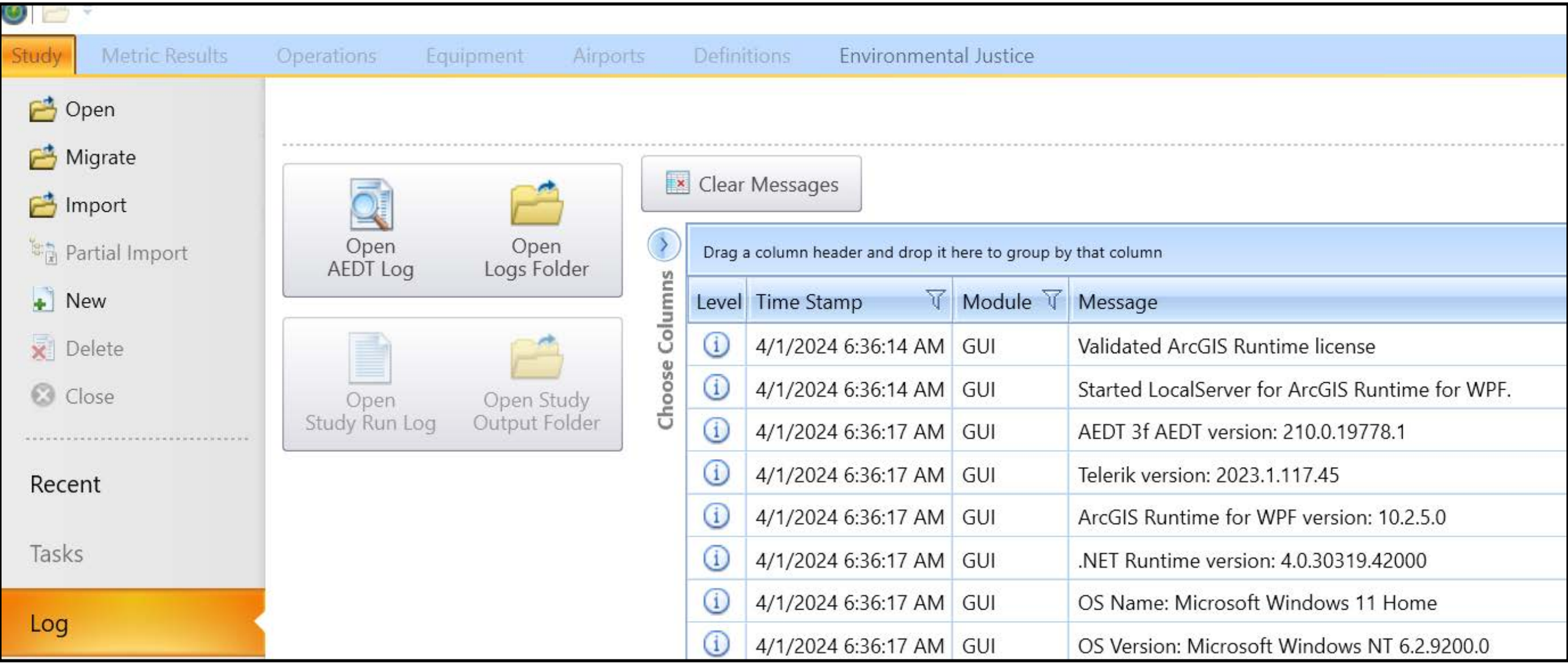
CEE 5614 - Analysis of Air Transportation Systems
Quick Review of AEDT

Virginia Tech - Air Transportation Systems Laboratory

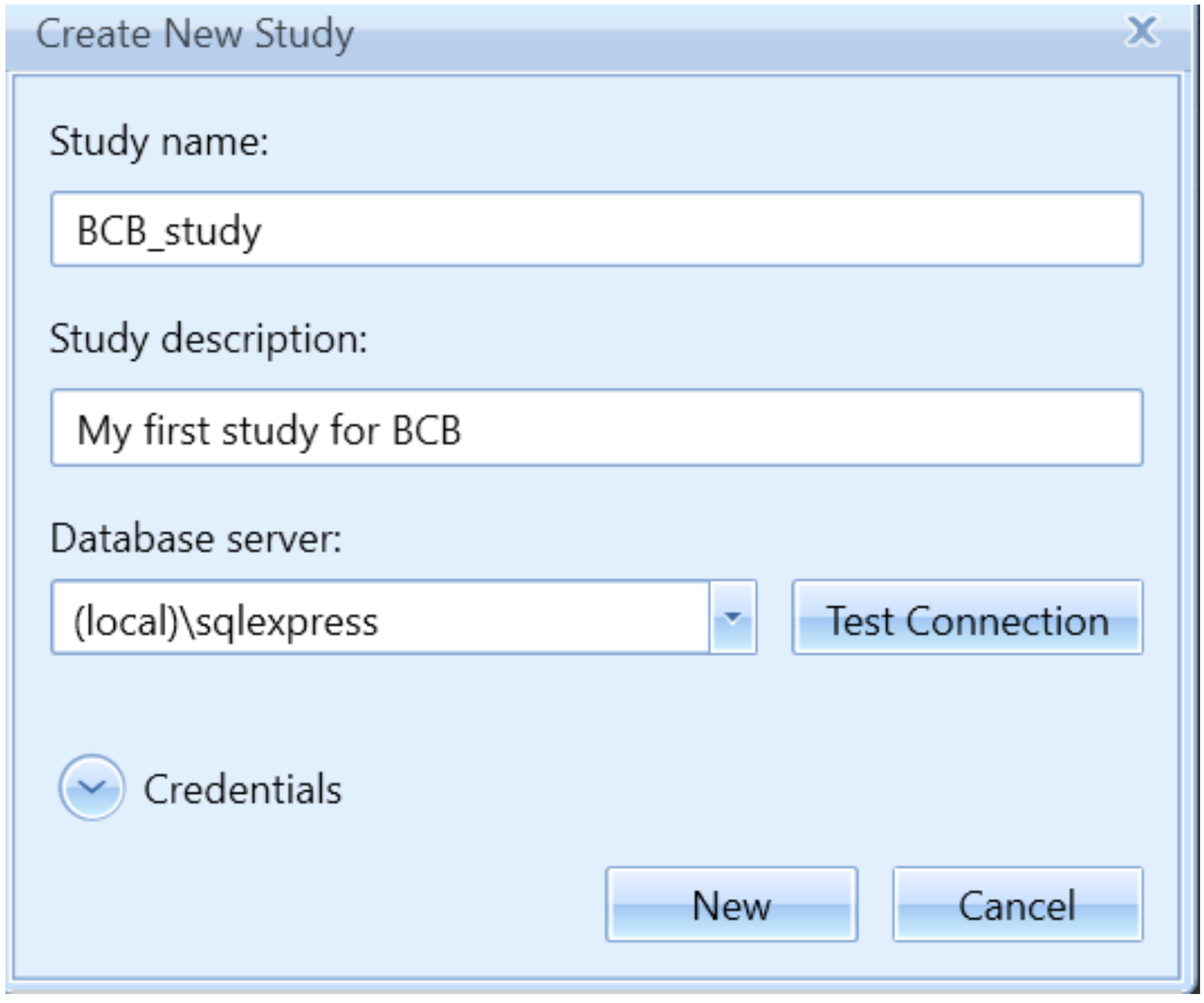
Start a New Scenario

- Starts a new airport analysis



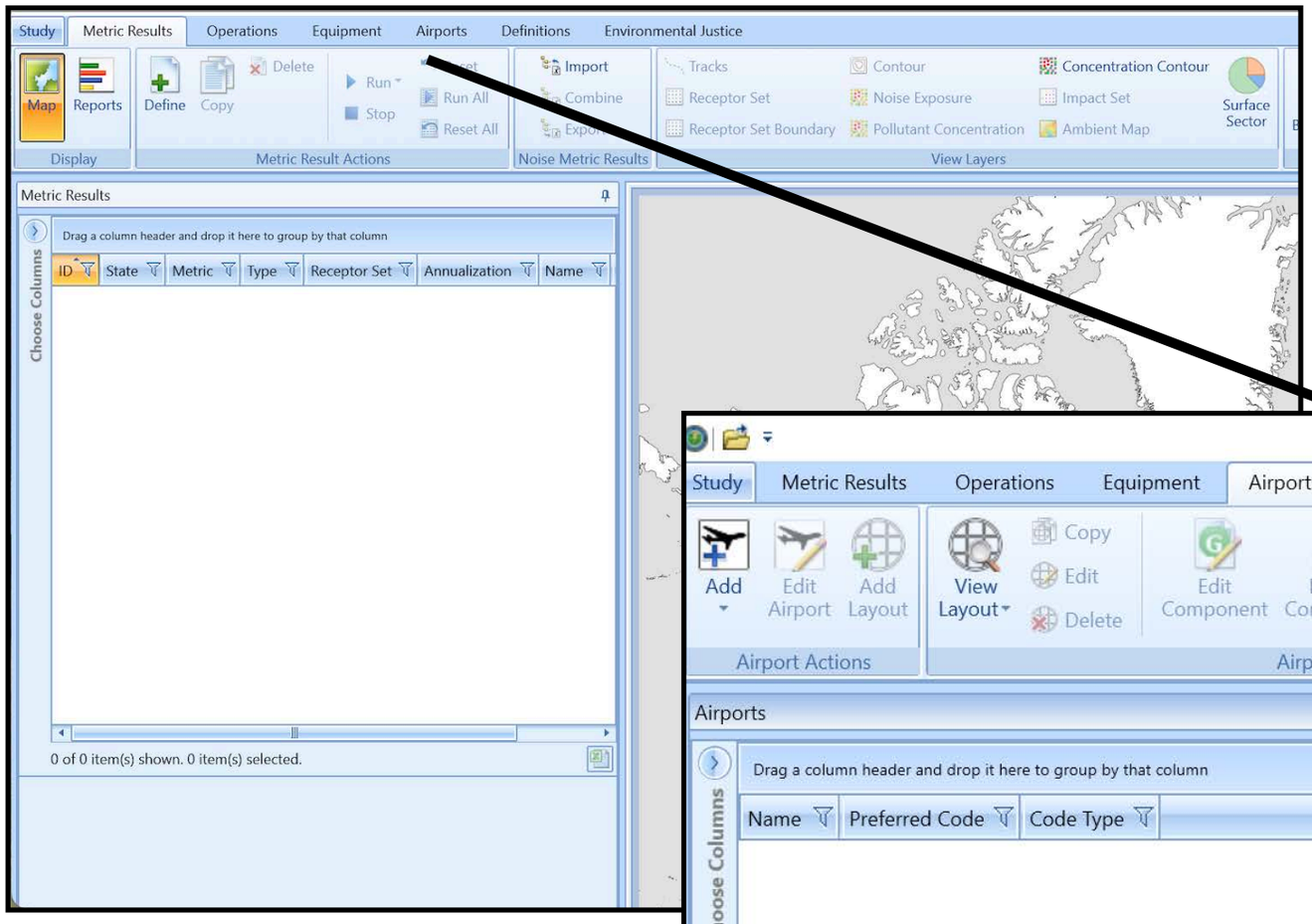
Define Your New Scenario

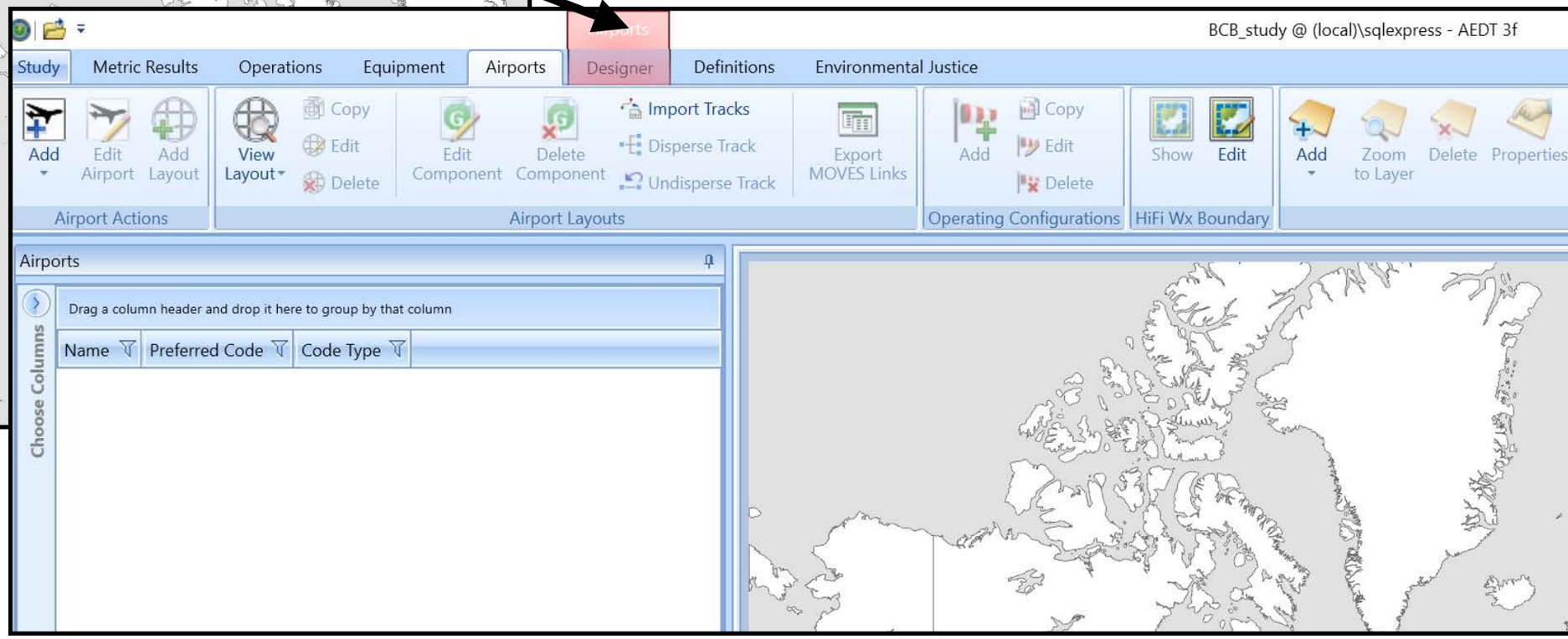
- Creates a new scenario
- Connects to the SQL express (database)



Define Your New Scenario

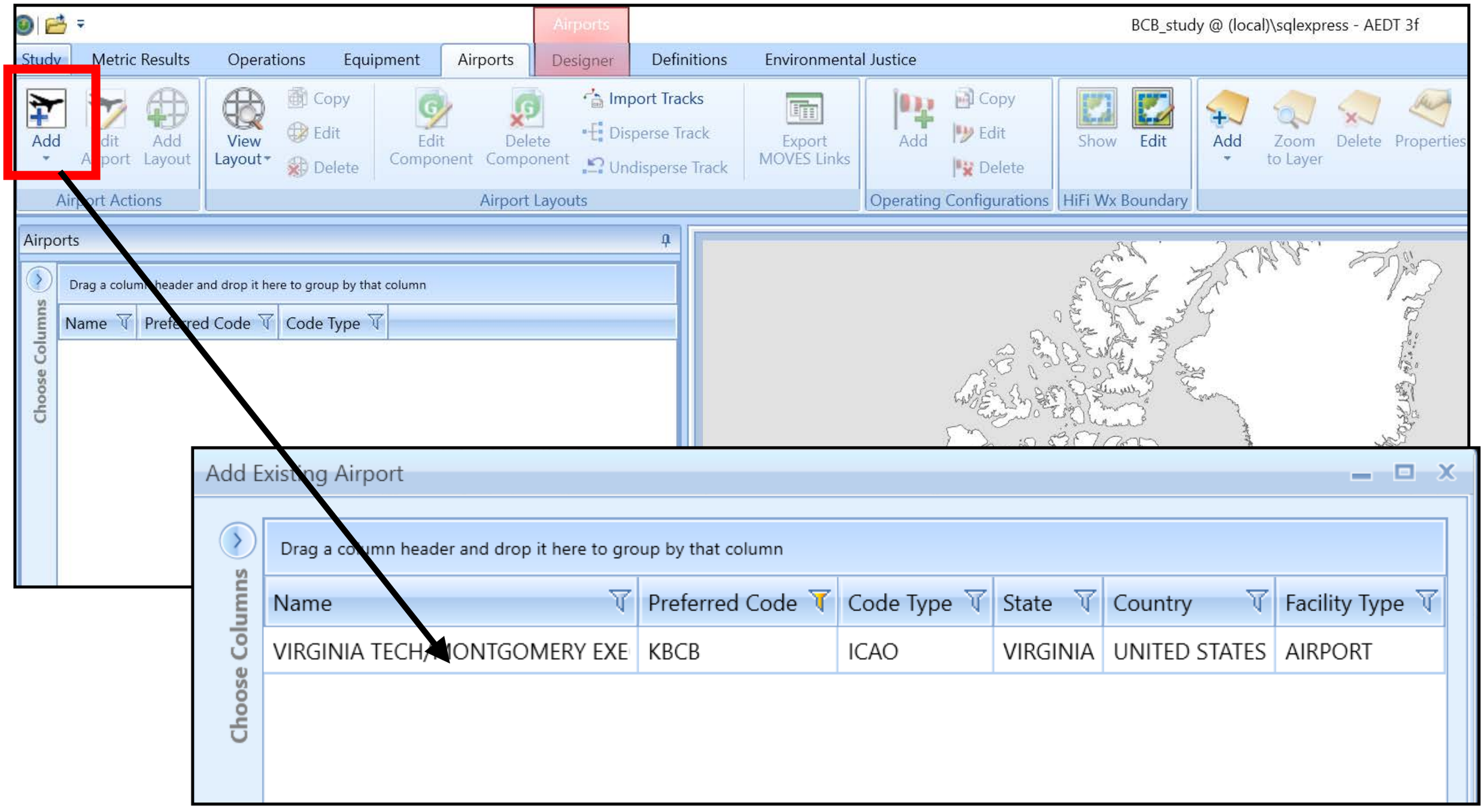
- Ready to define our airport
- You can define the runway coordinates or use the large worldwide database inside AEDT





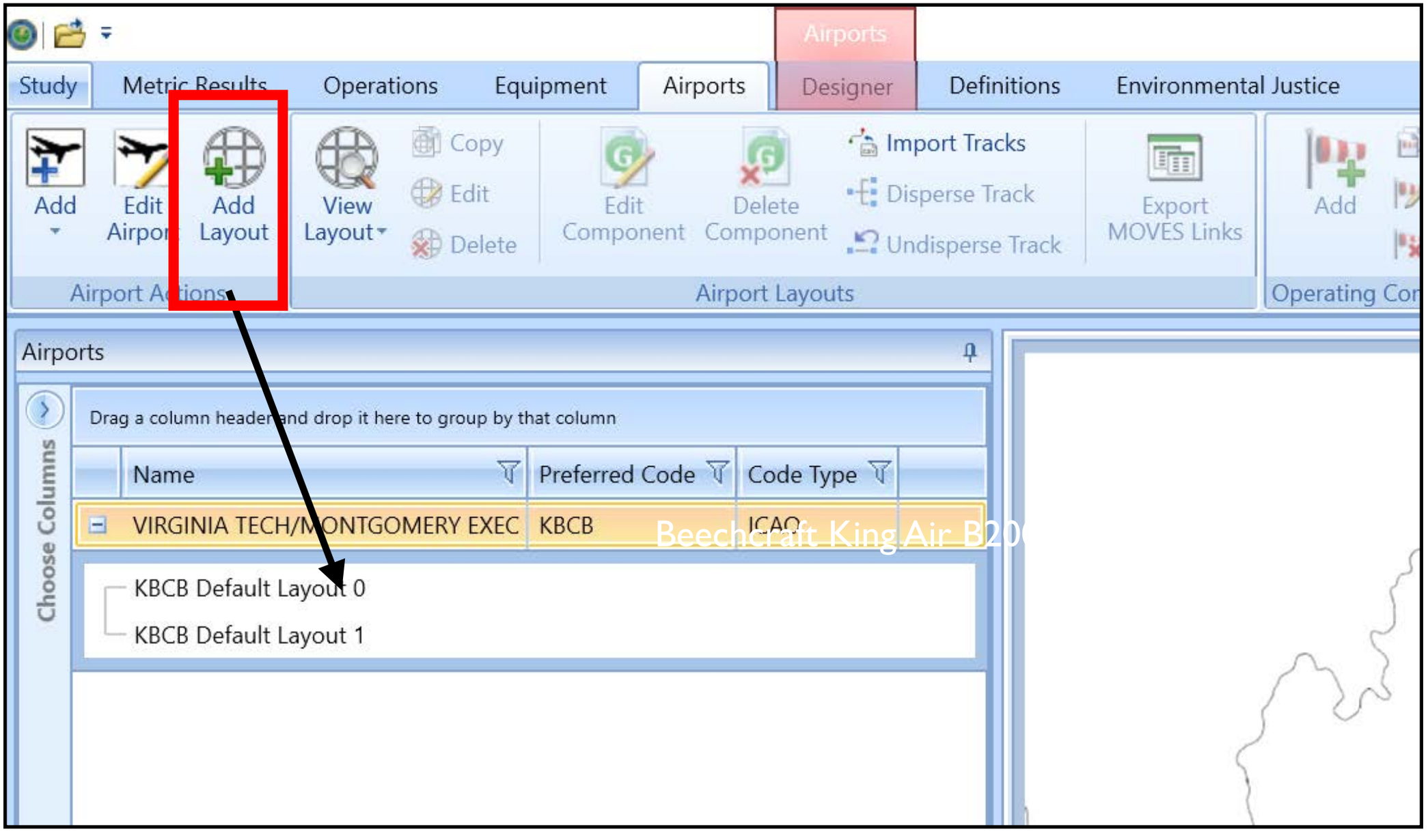
Add Your Airport

- You can define the runway coordinates or use the large worldwide database inside AEDT



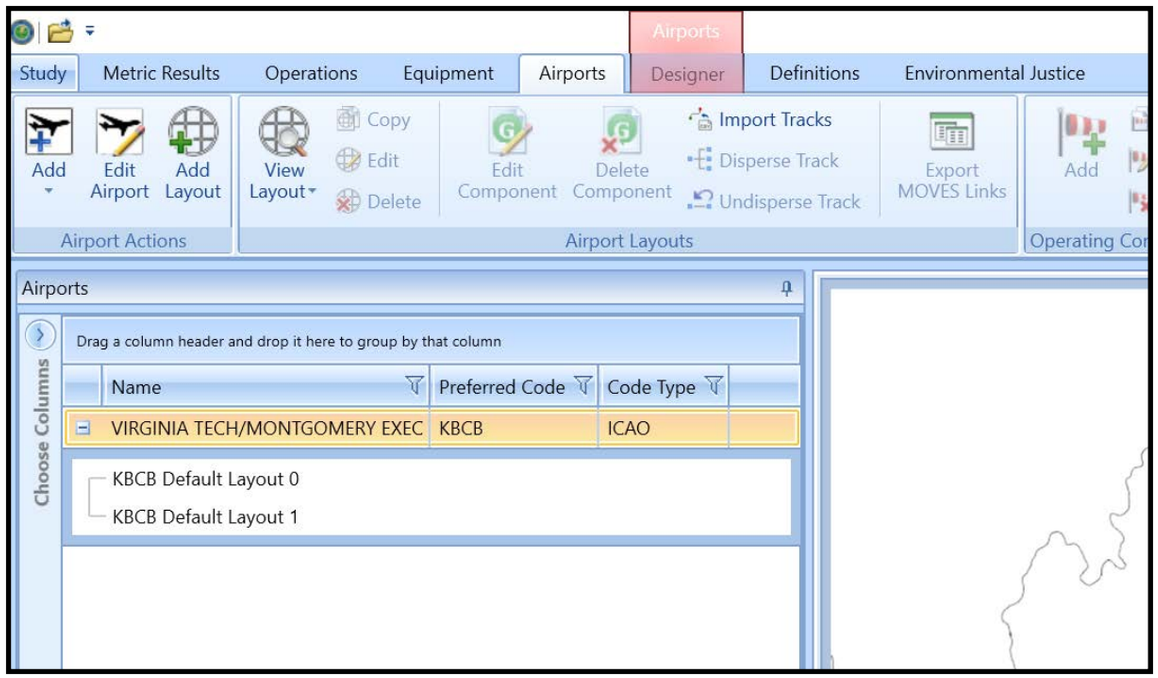
Add an Airport Layout

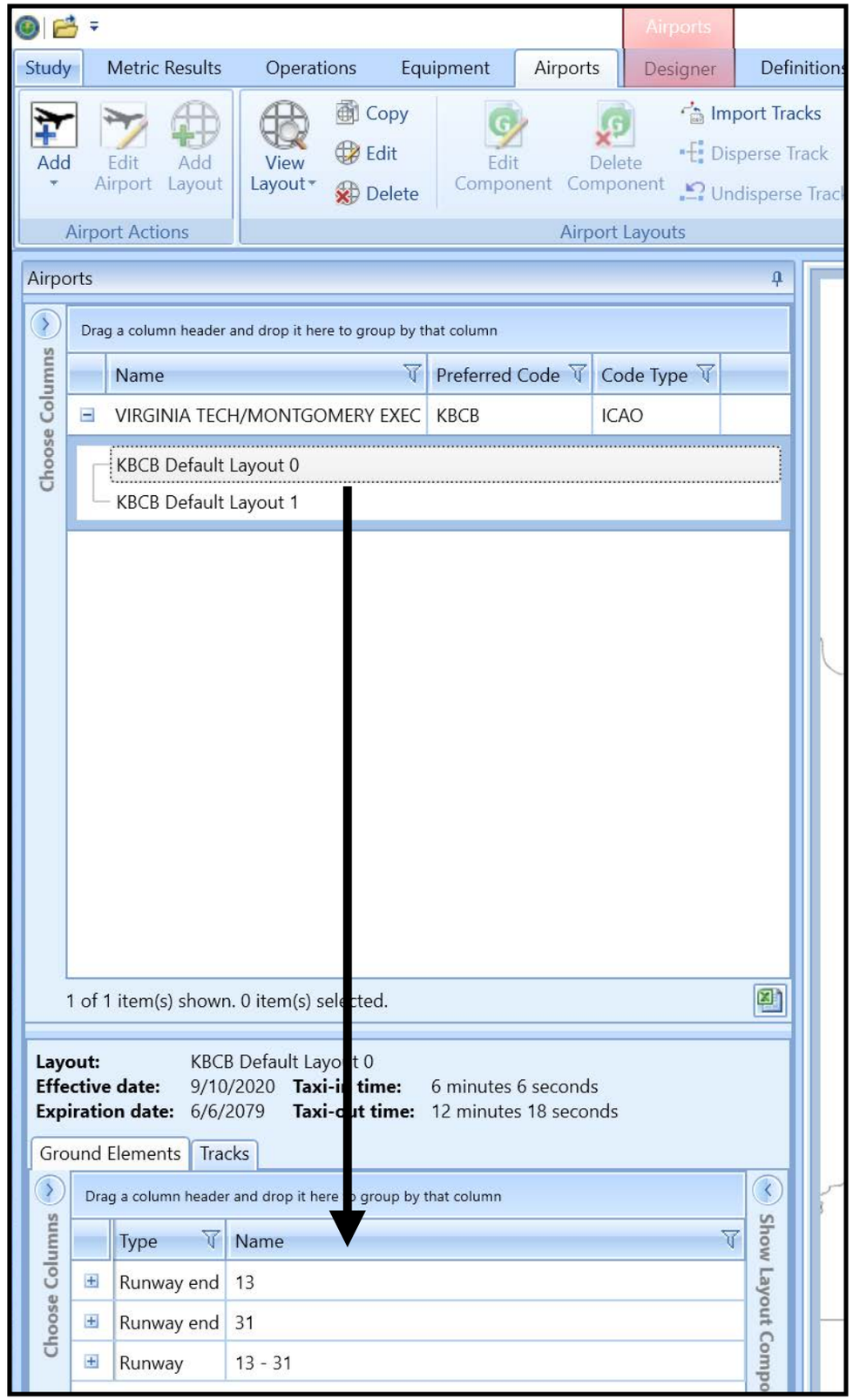
- Layouts show airports at different points in time
- Example Default Layout 1 shows the airport before the runway extension



Verify the Airport Information

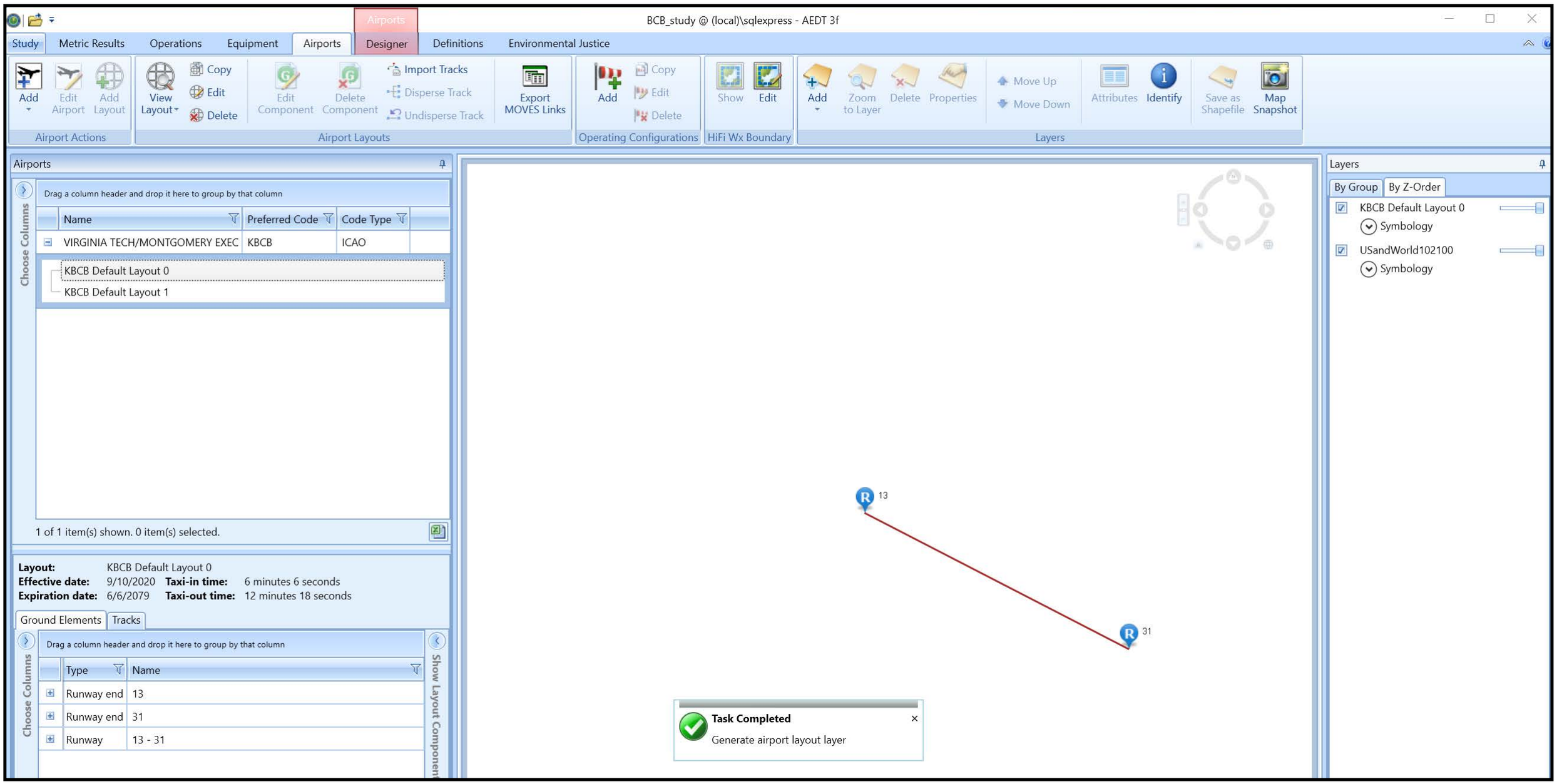
- Layouts show airports at different points in time





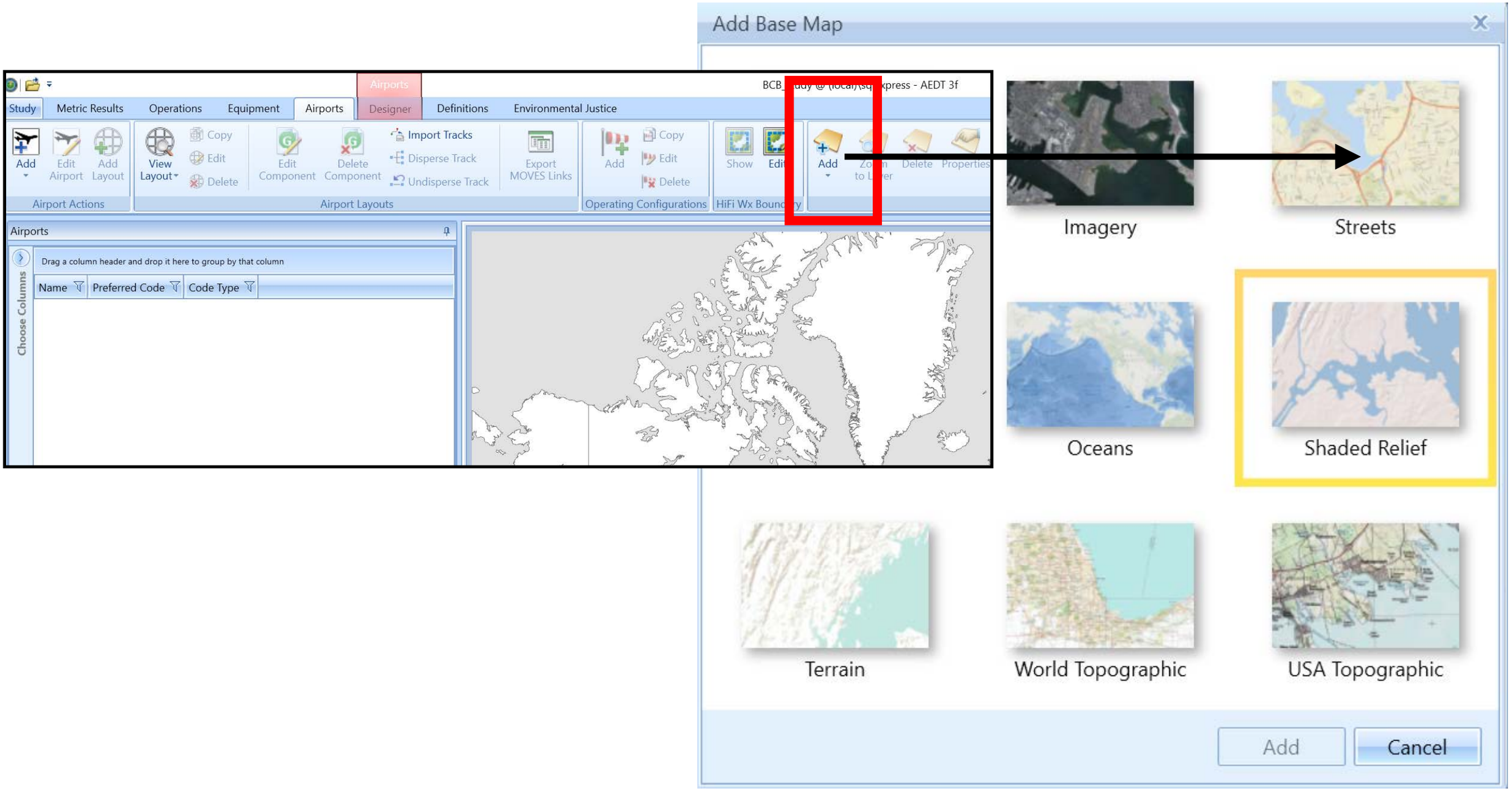
Airport Runway Information

- The airport runways show in the map window



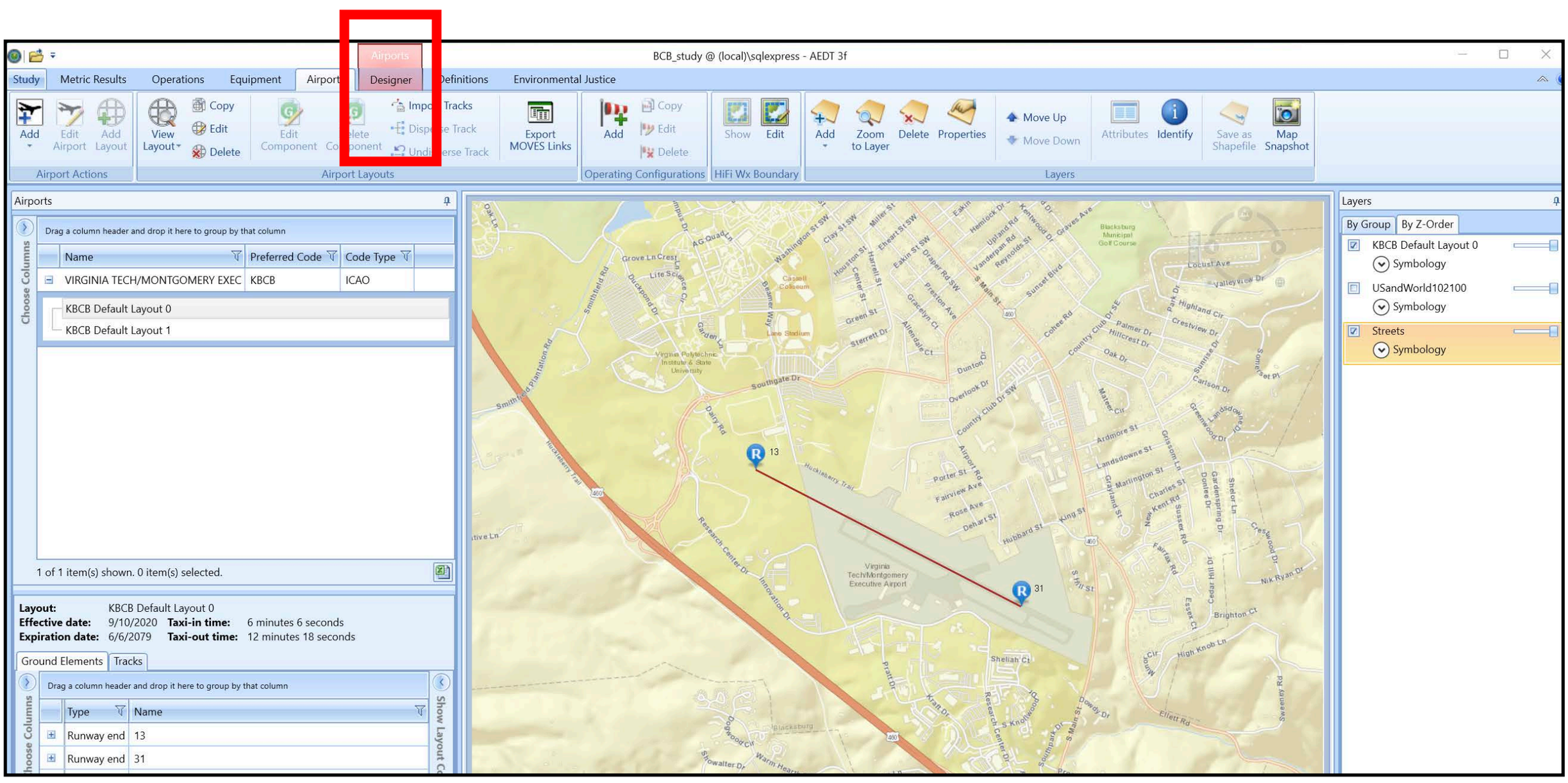
Add a Base Map

- Adding a base map conveys information about terrain, streets, etc.



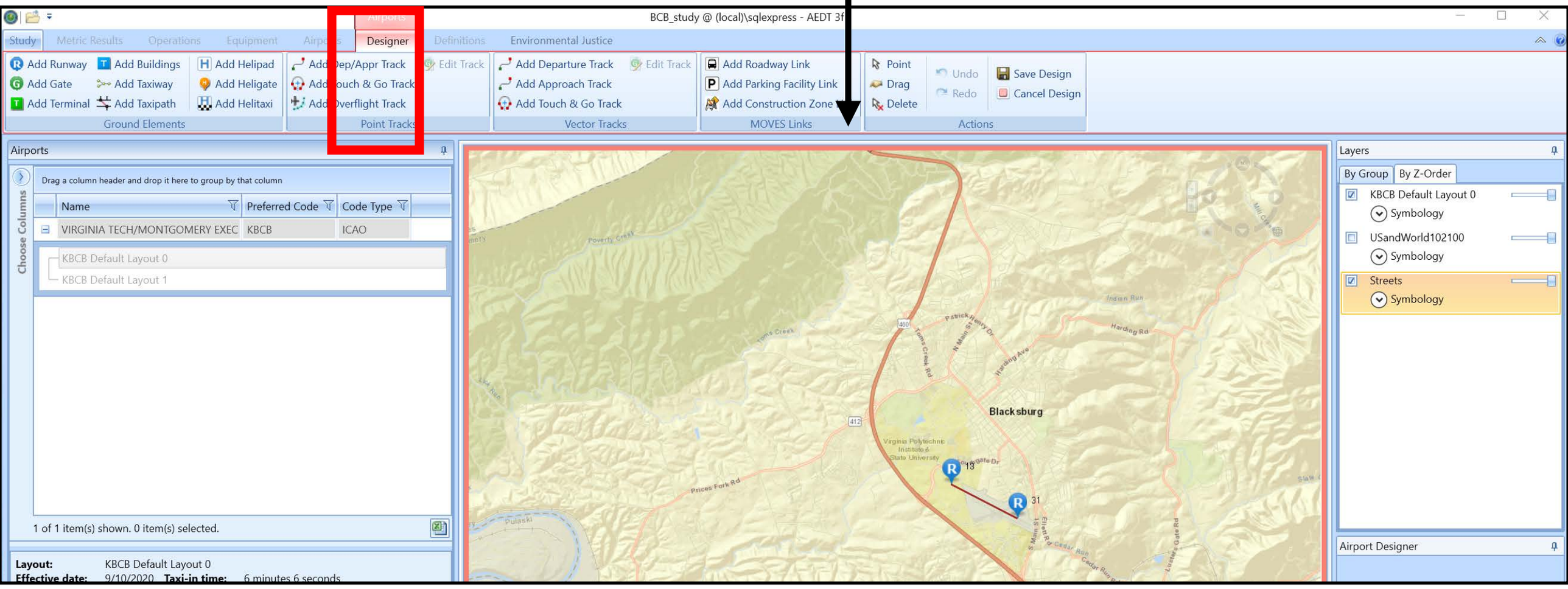
BCB Airport with a Base Map

- BCB airport with street map added



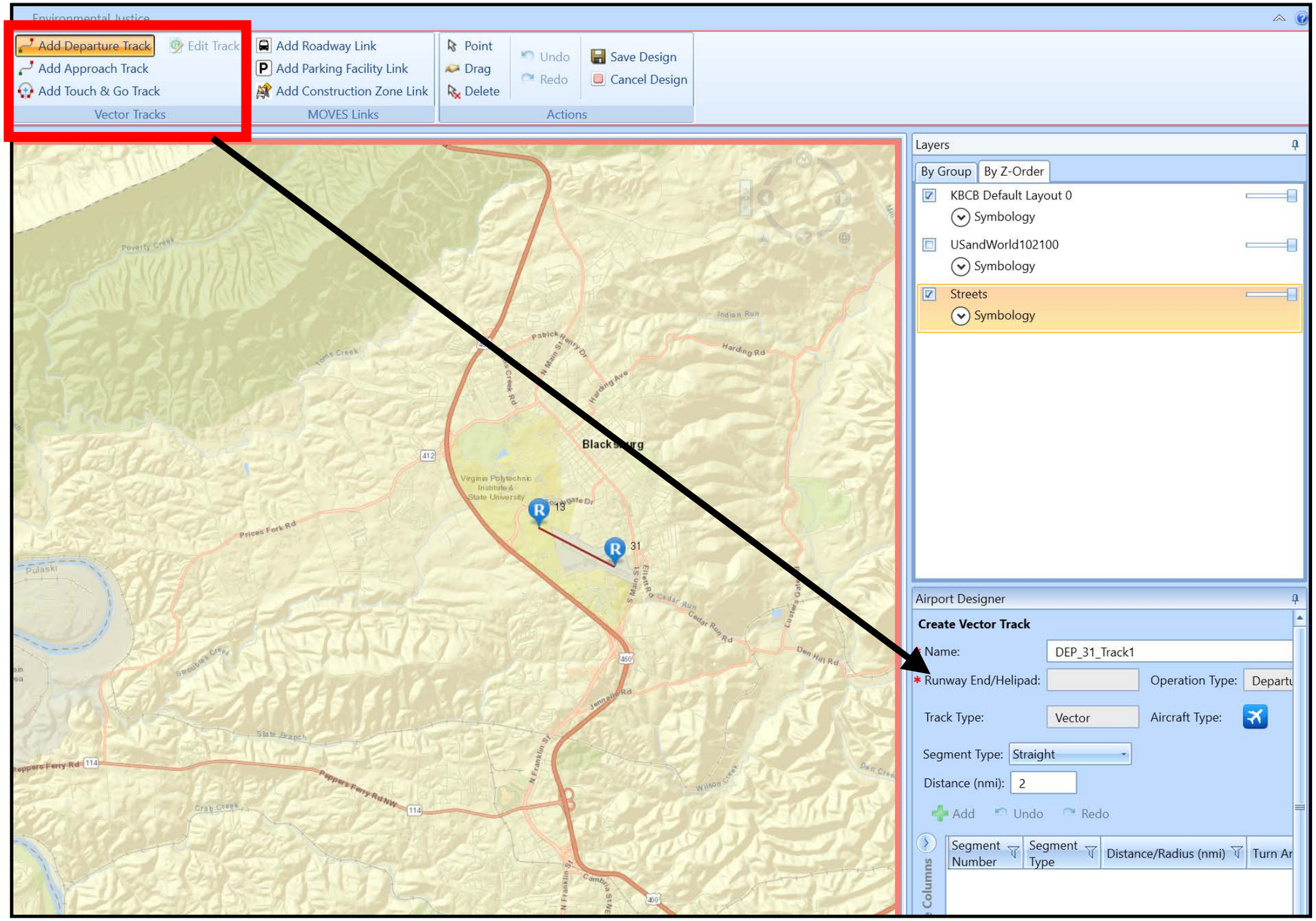
Airport Designer Mode to Add Tracks

- In airport designer mode we can add flight tracks, taxiways, and gates
- Note that the tab below designer mode changes context



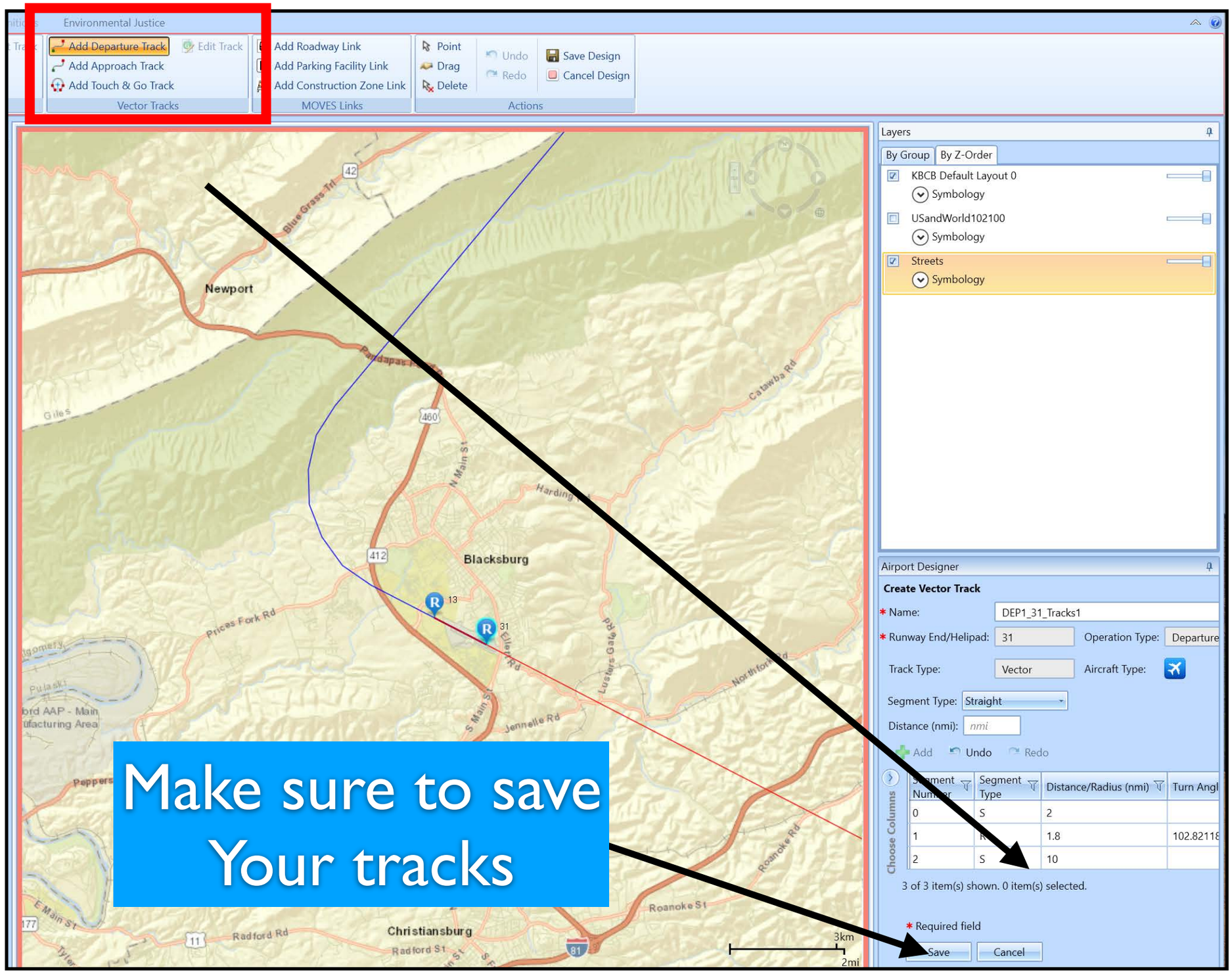
Airport Designer Mode: Add Tracks

- AEDT has two types of tracks: vector or point tracks



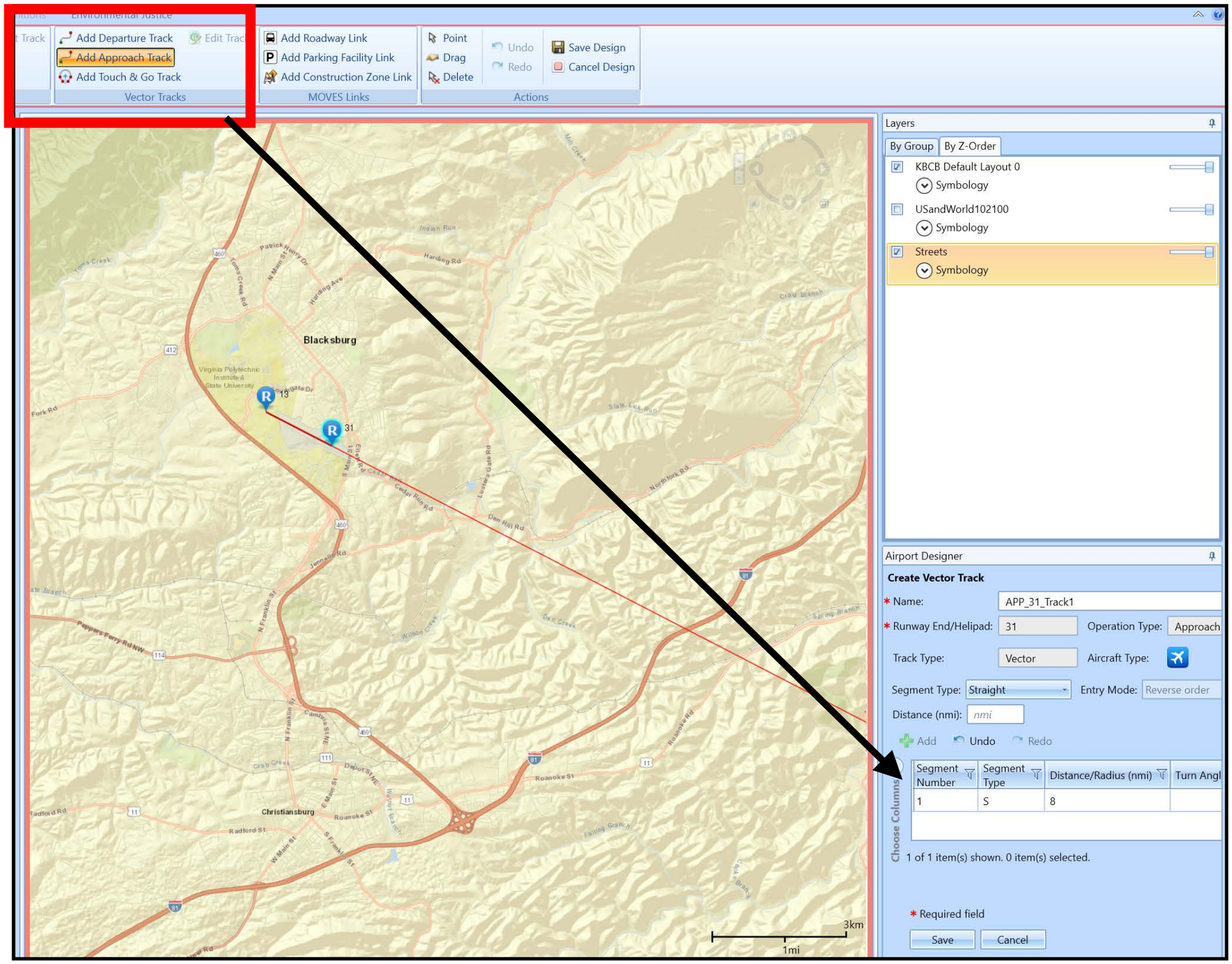
Multi-segment Departure Track

- I defined a vector track with three segments



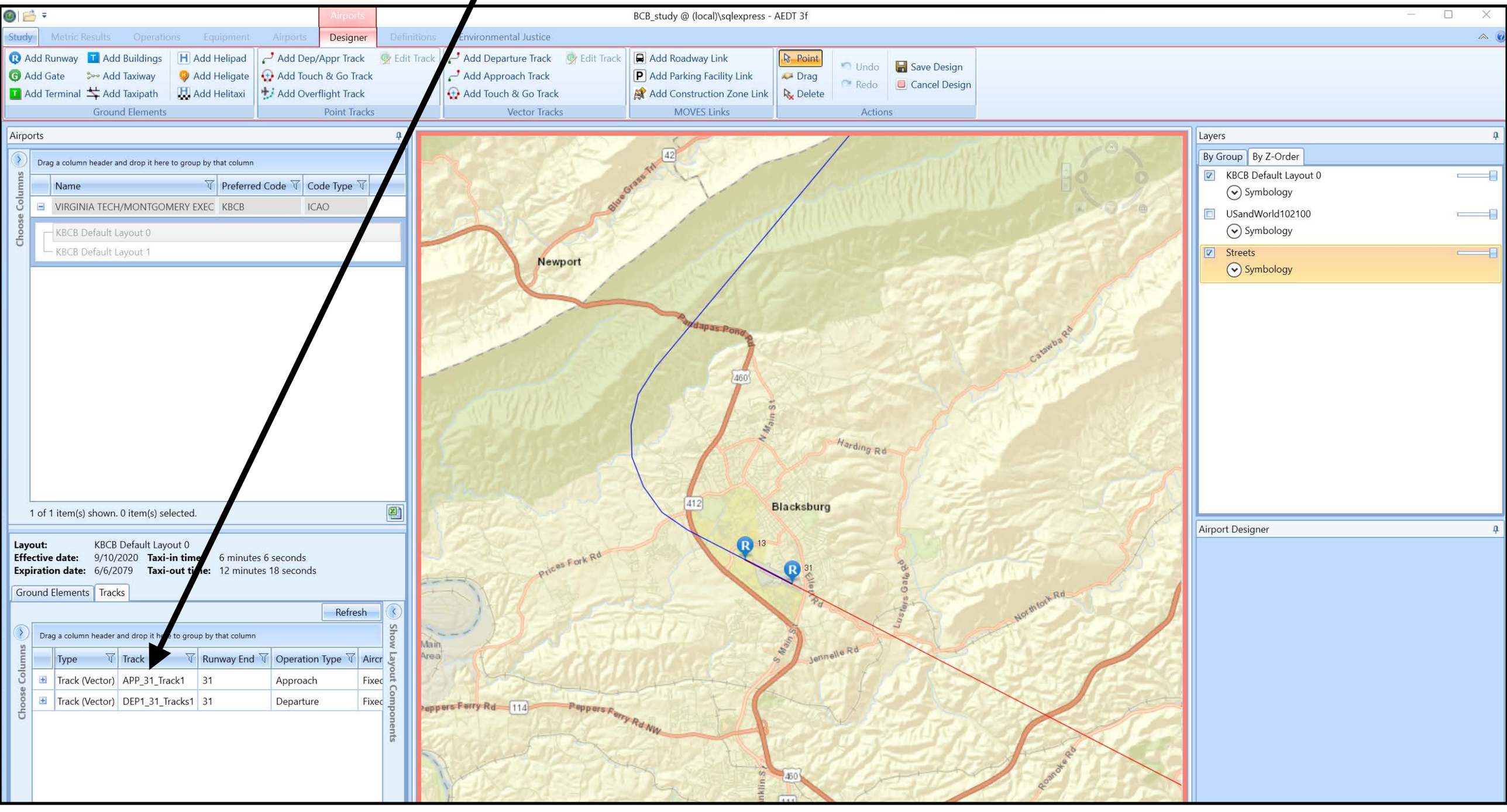
One-segment Arrival Track

- I defined a vector track with one segment



Airport Layout with Tracks

- Verify that all the tracks are good and added to the panel



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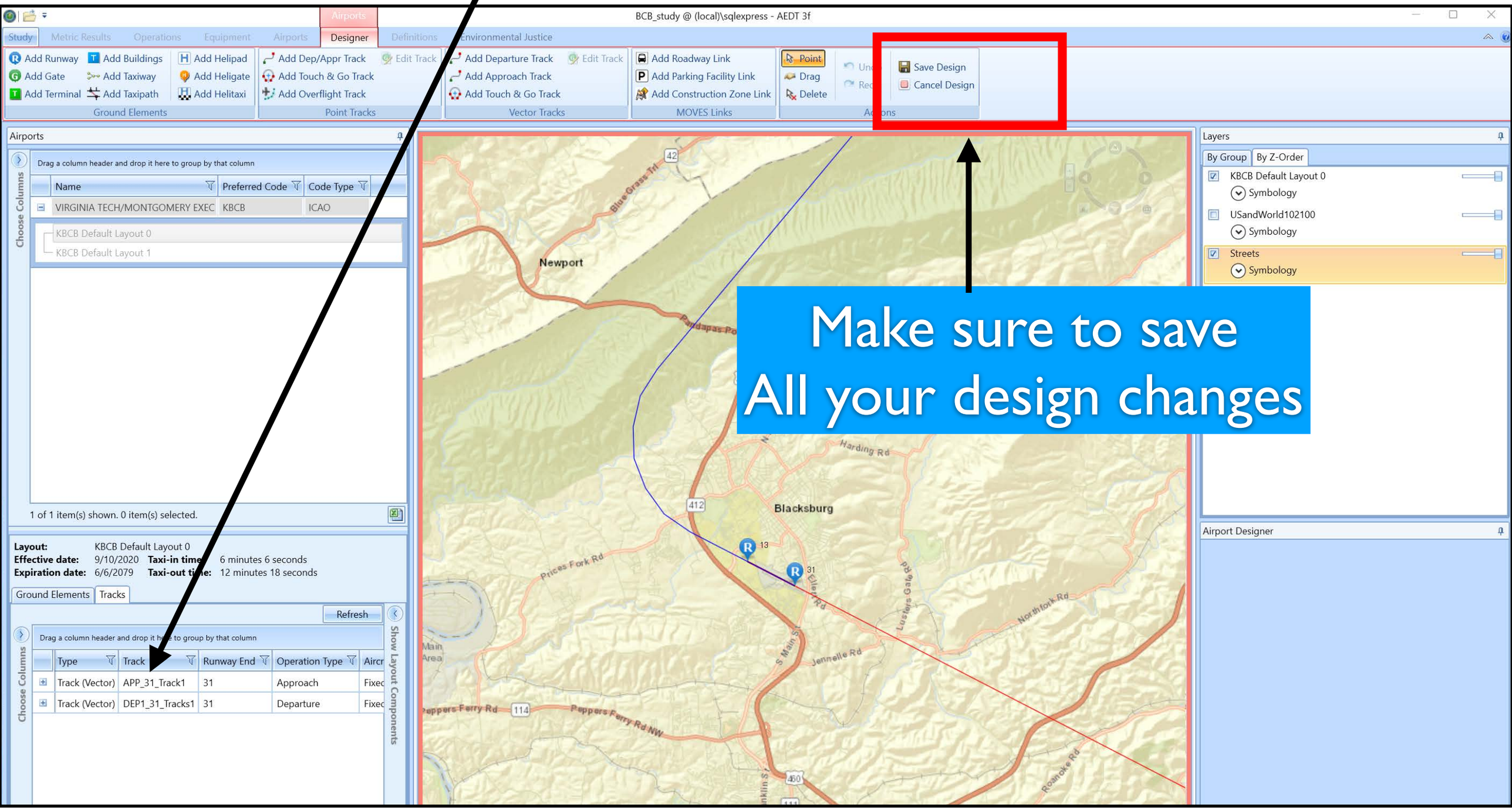
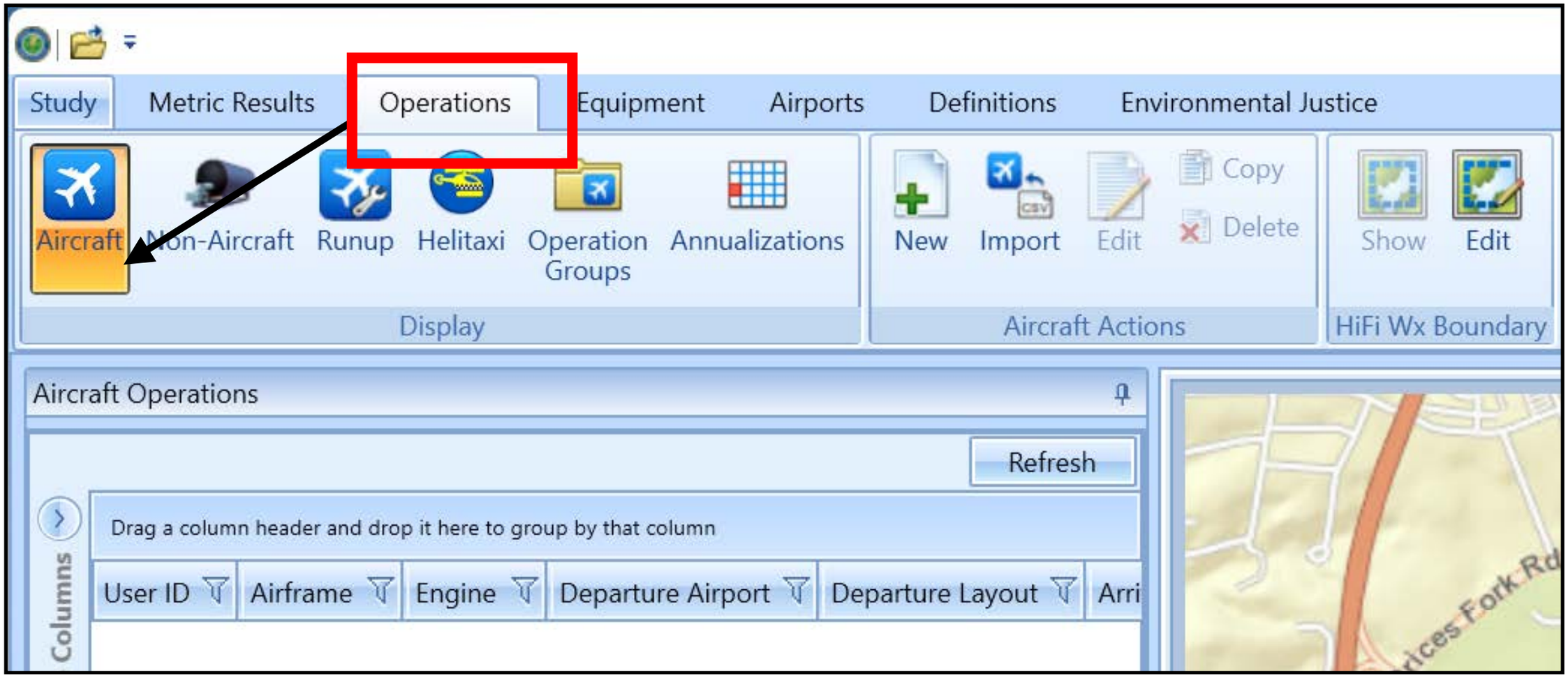
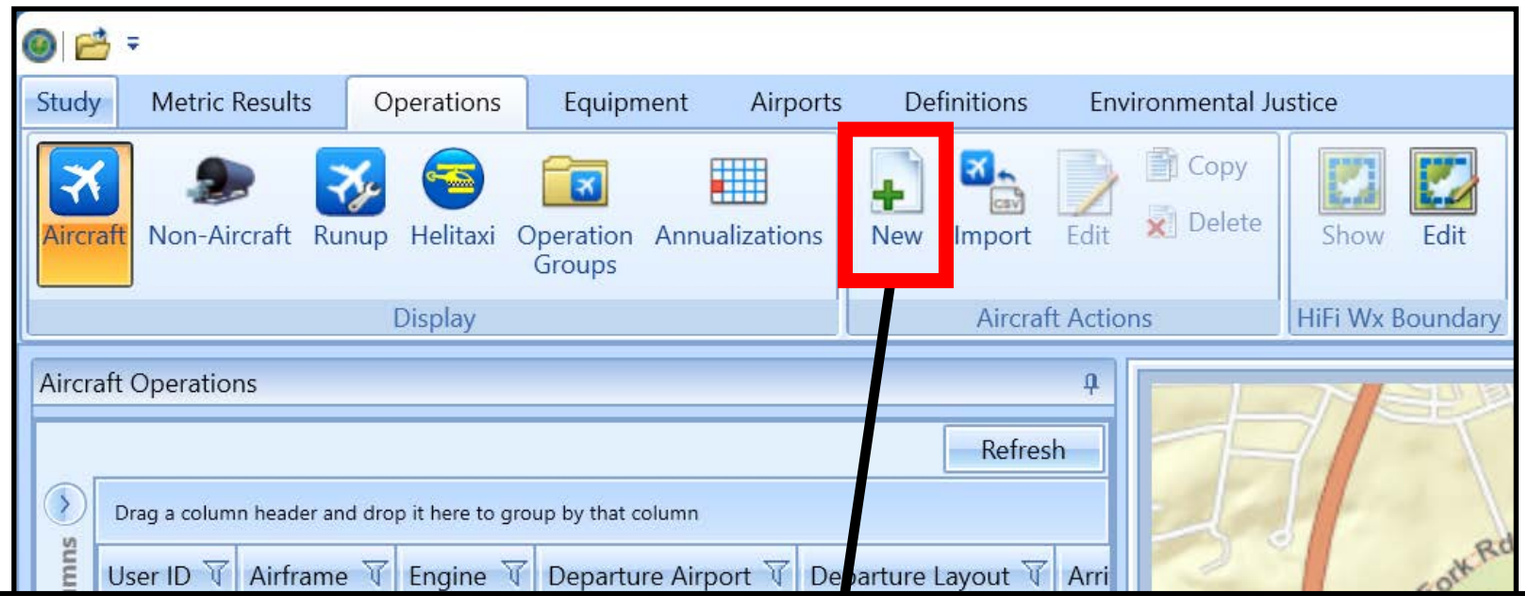


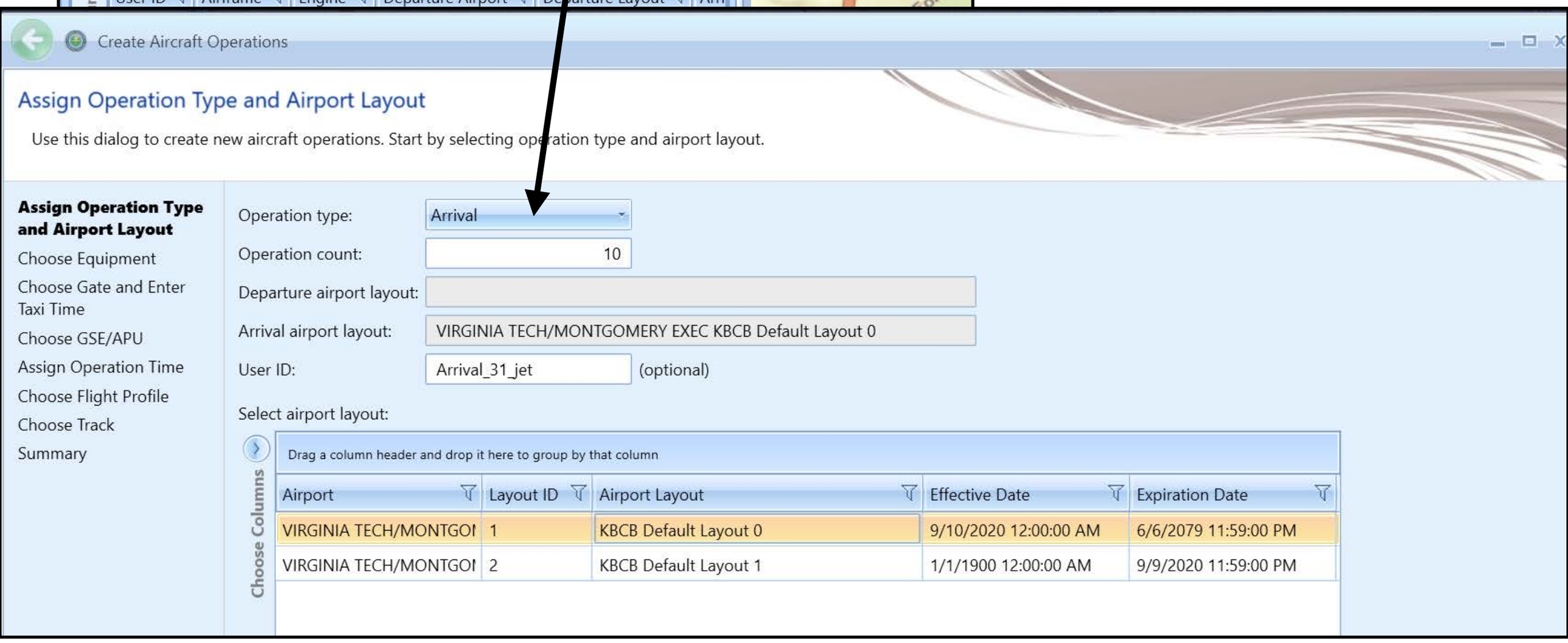
Airport Operations (Flights)

- Verify that all the tracks are good and added to the panel

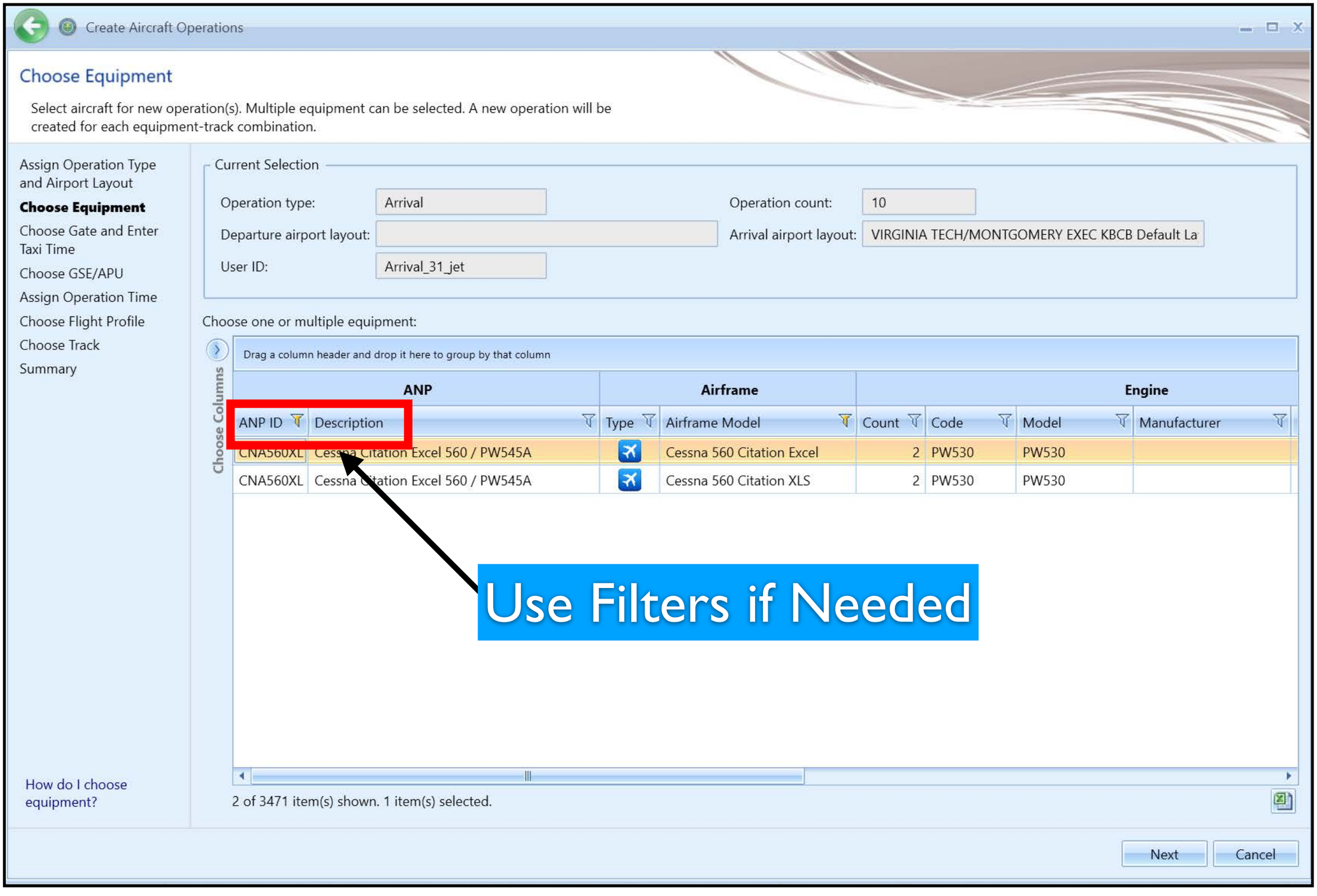


Airport Operations (Create Ops)

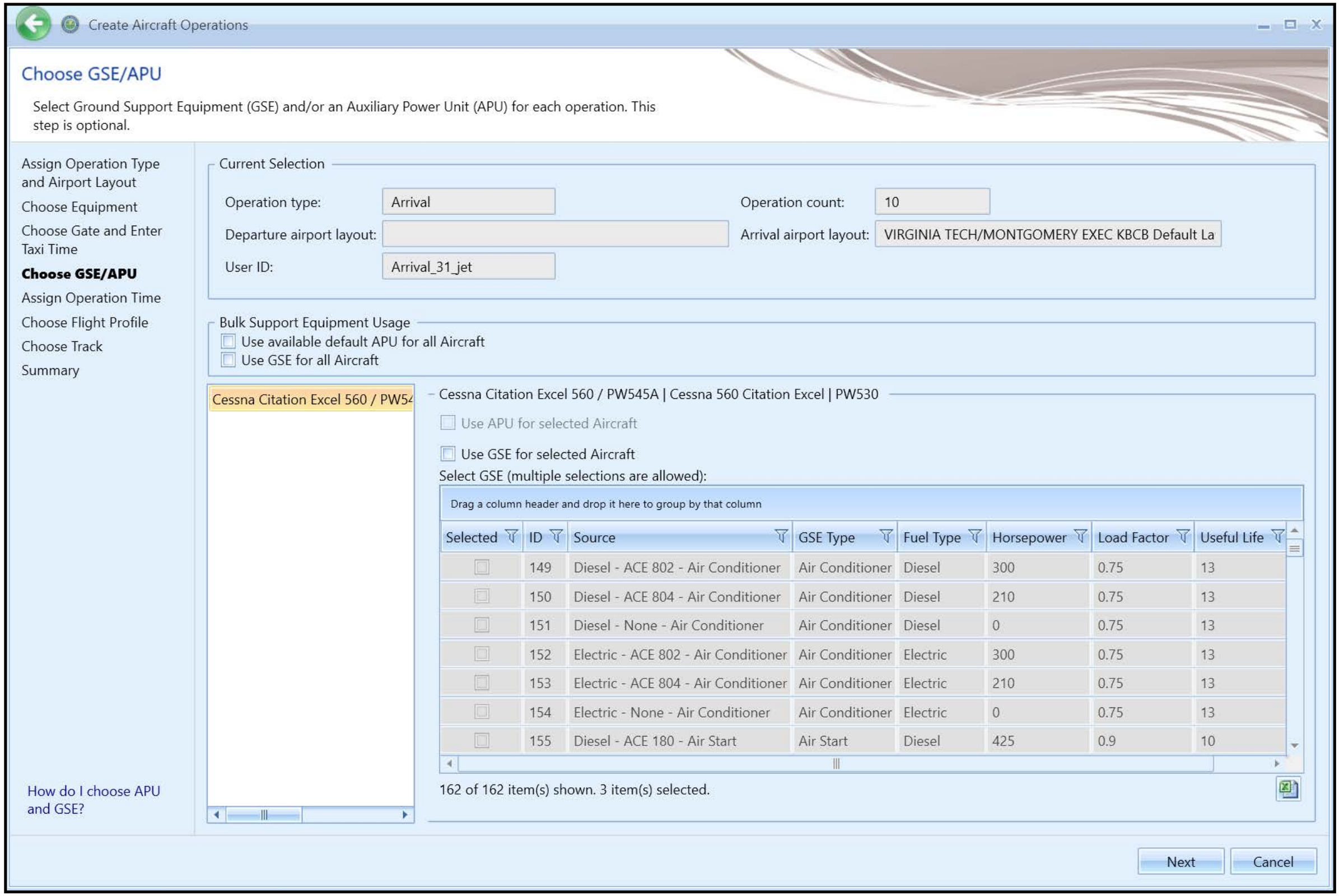




Airport Operations (Cessna 560XL)



Airport Ground Operations (Cessna 560XL)



Airport Operations Time and Procedures

Create Aircraft Operations

Assign Operation Time

Assign a specific operation time or operational profiles. This applies to all the operations being created.

- Assign Operation Type and Airport Layout
- Choose Equipment
- Choose Gate and Enter Taxi Time
- Choose GSE/APU
- **Assign Operation Time**
- Choose Flight Profile
- Choose Track
- Summary

Current Selection

Operation type:	Arrival	Operation count:	10
Departure airport layout:		Arrival airport layout:	VIRGINIA TECH/MONTGOMERY EXEC KBCB Default La
User ID:	Arrival_31_jet		

Date range of selected airport layout: 9/10/2020 - 6/6/2079

Assign operation time

Operation time: 4/1/2024 8:00 AM

Create Aircraft Operations

Choose Flight Profile

Select a flight profile for each operation.

Approach Flight Profile

- Assign Operation Type and Airport Layout
- Choose Equipment
- Choose Gate and Enter Taxi Time
- Choose GSE/APU
- Assign Operation Time
- **Choose Flight Profile**
- Choose Track
- Summary

Current Selection

Operation type:	Arrival	Operation count:	10
Departure airport layout:		Arrival airport layout:	VIRGINIA TECH/MONTGOMERY EXEC KBCB Default La
User ID:	Arrival_31_jet		
Operation time:	4/1/2024 8:00:00 AM		

Cessna Citation Excel 560 / PW54

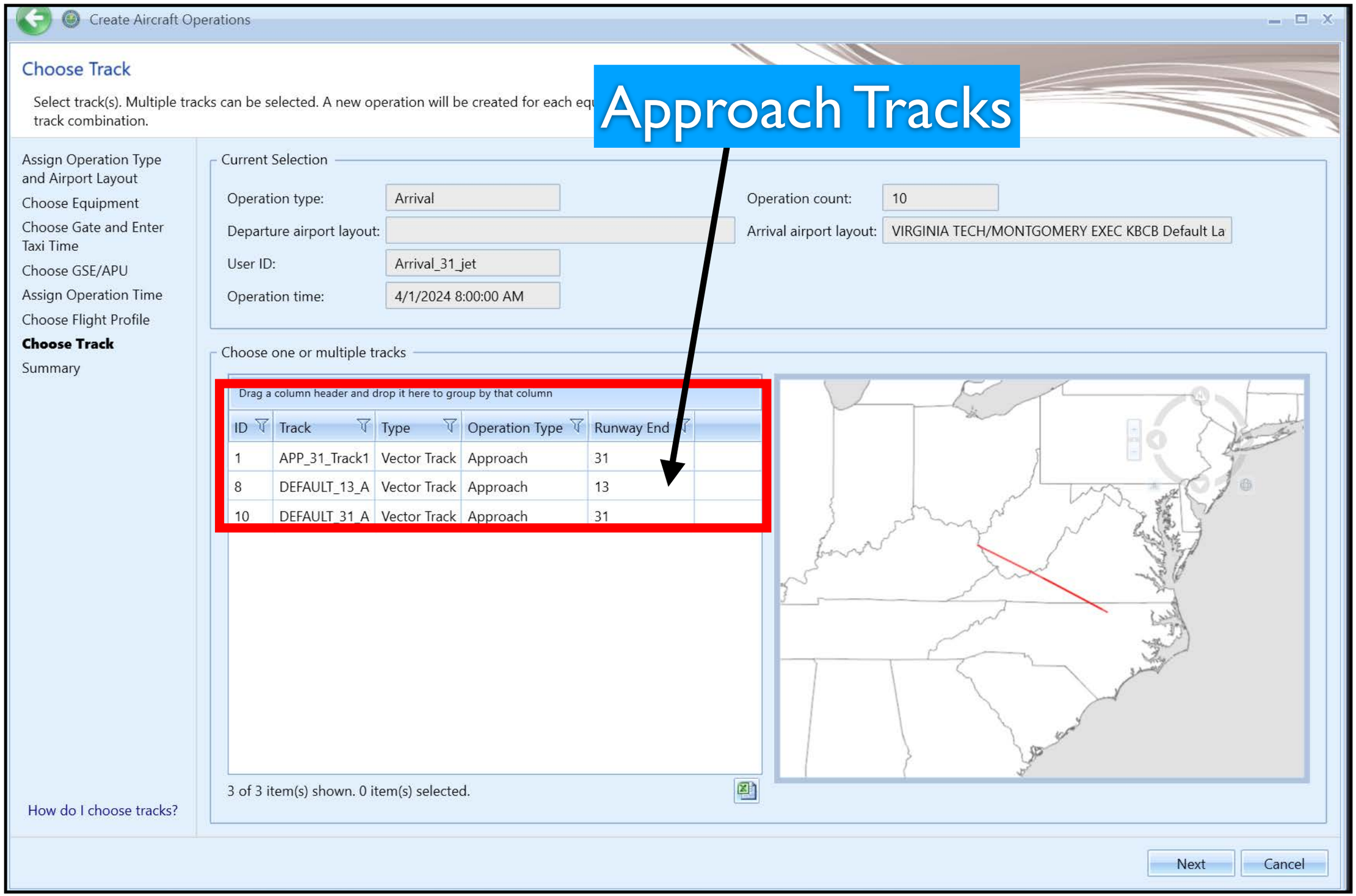
Cessna Citation Excel 560 / PW545A | Cessna 560 Citation Excel | PW530

Choose flight profile:

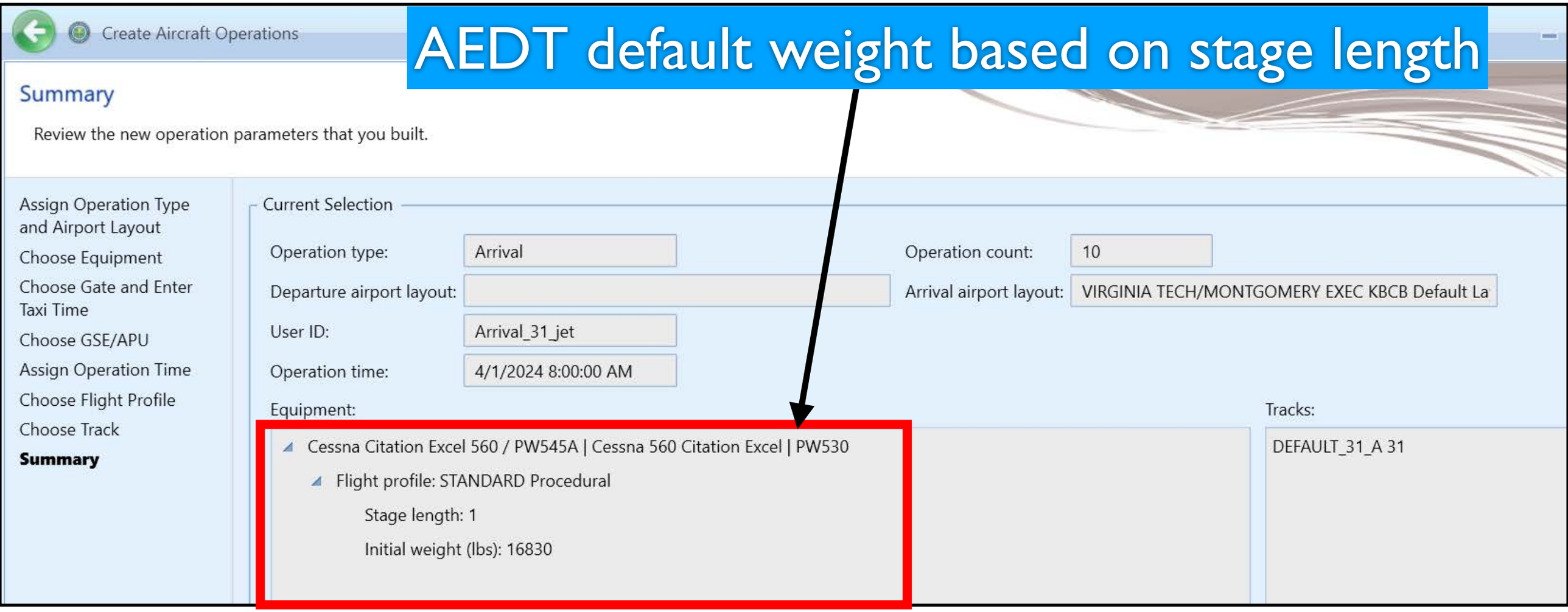
Drag a column header and drop it here to group by that column

Profile ID	Profile Name	Operation Type	Profile Type	Stage Length	Weight (lbs)	ANP ID	Workflow
2239	STANDARD	Approach	Procedural	1	16830	CNA560XL	ANP Only

Airport Operations : Track Selection



Airport Operations :Verify Aircraft Operation Data



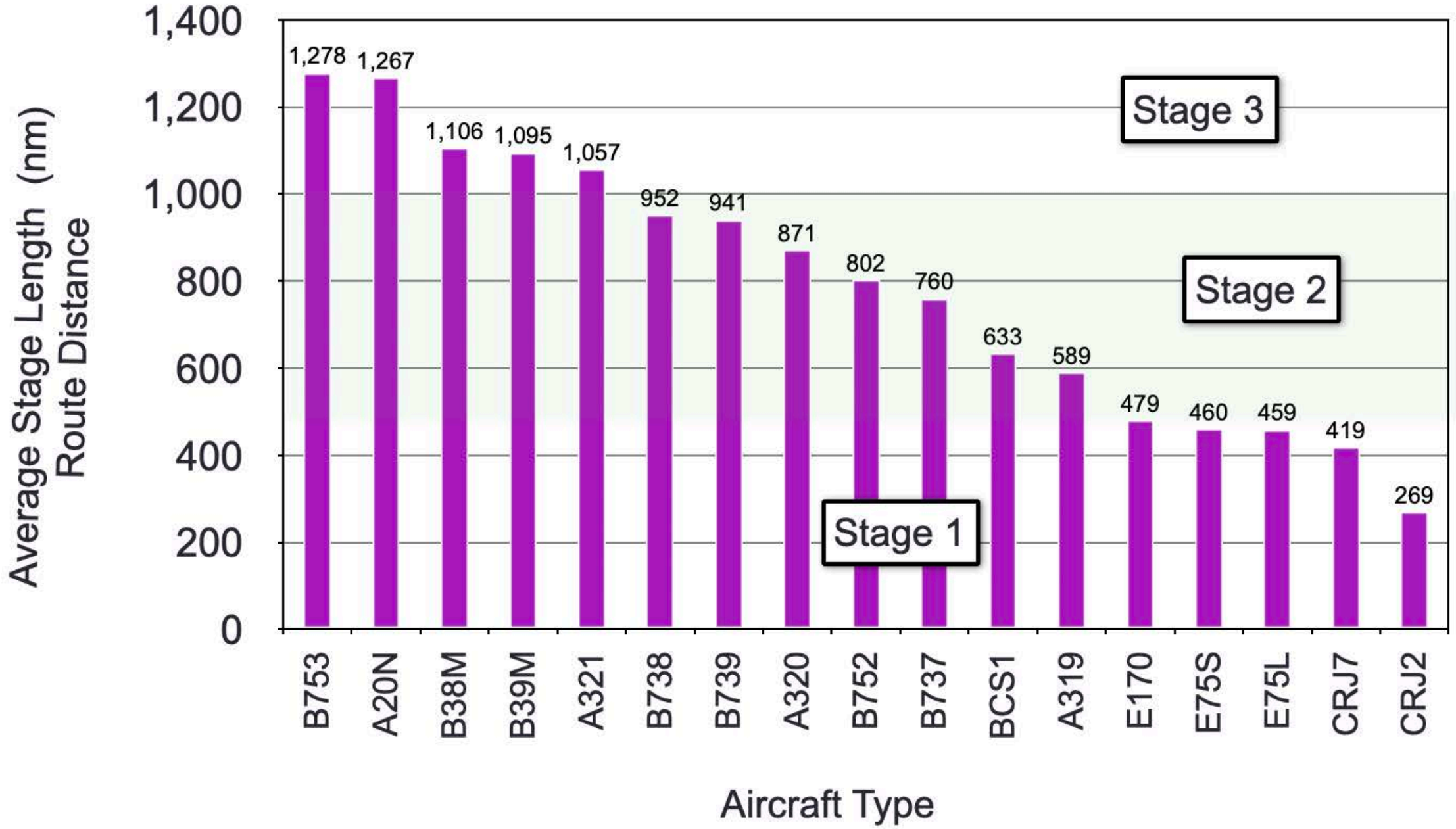
Airport Operations : Aircraft Stage Length

Table 11-30 Departure Takeoff Weights Form

Stage number	Trip length (nmi)	Representative Range
1	0-500	350
2	500-1,000	850
3	1,000-1,500	1,350
4	1,500-2,500	2,200
5	2,500-3,500	3,200
6	3,500-4,500	4,200
7	4,500-5,500	5,200
8	5,500-6,500	6,200
9	6,500-7,500	7,200
10	7,500-8,500	8,200
11	>8,500	
M	Maximum range at MTOW	

Source: AEDT 3f User's Manual

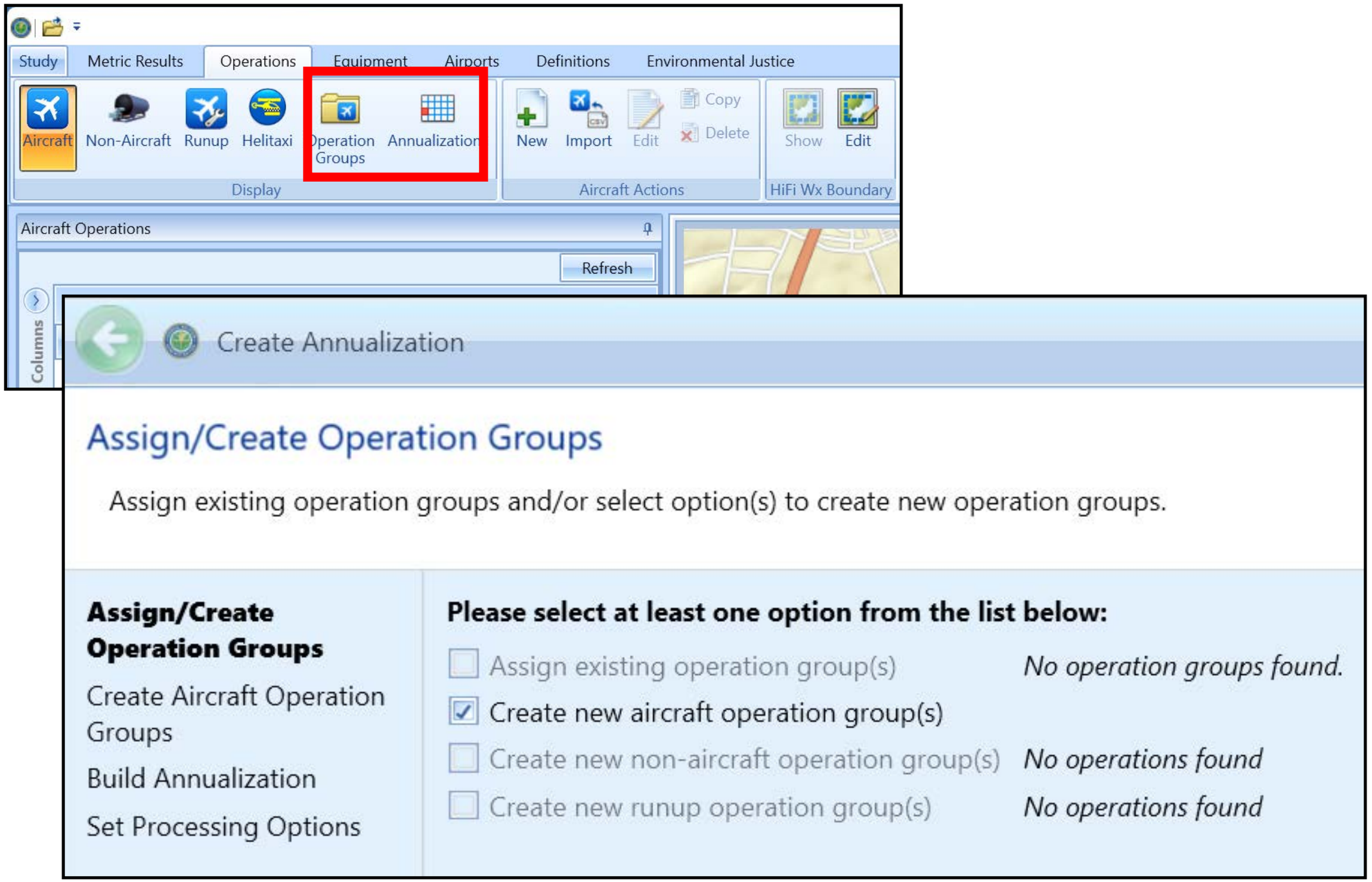
Example Stage Length Analysis



Estimate the distribution of stage lengths flown

Source: Chicago O'Hare Noise Study

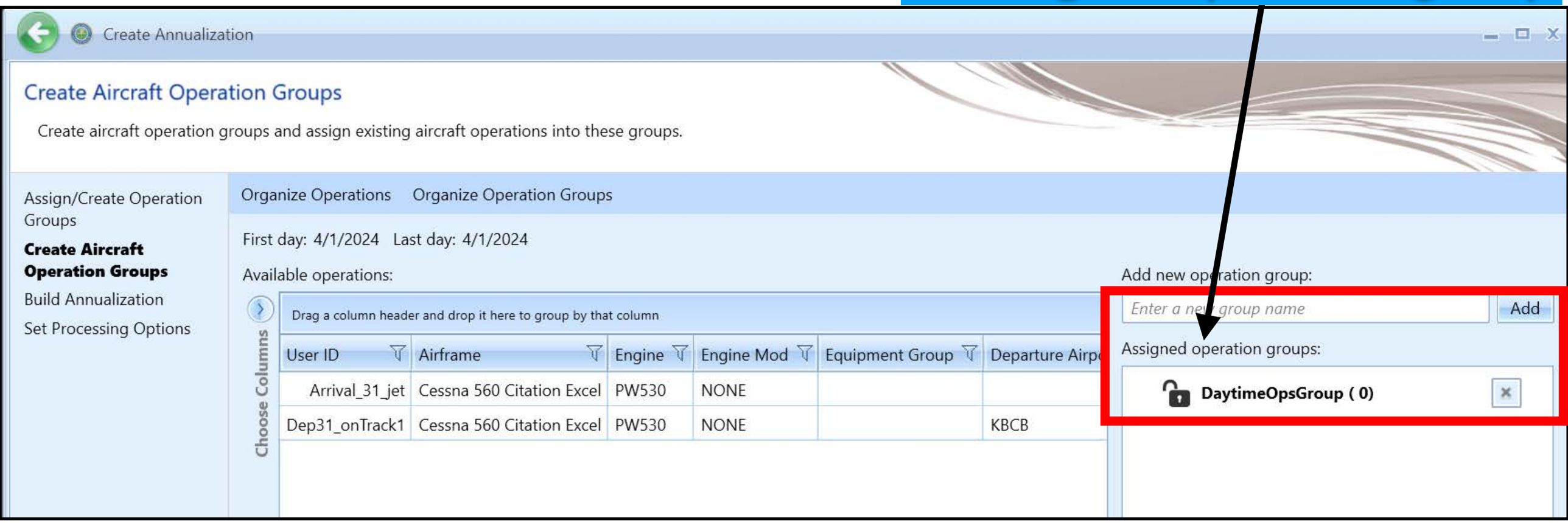
Airport Operations : Create Groups of Operations



Airport Operations : Create Groups of Operations

- Operations are bundled into groups to be annualized
- Example includes arrival and departure operations from BCB by Cessna 560XL aircraft

Adding an operator group

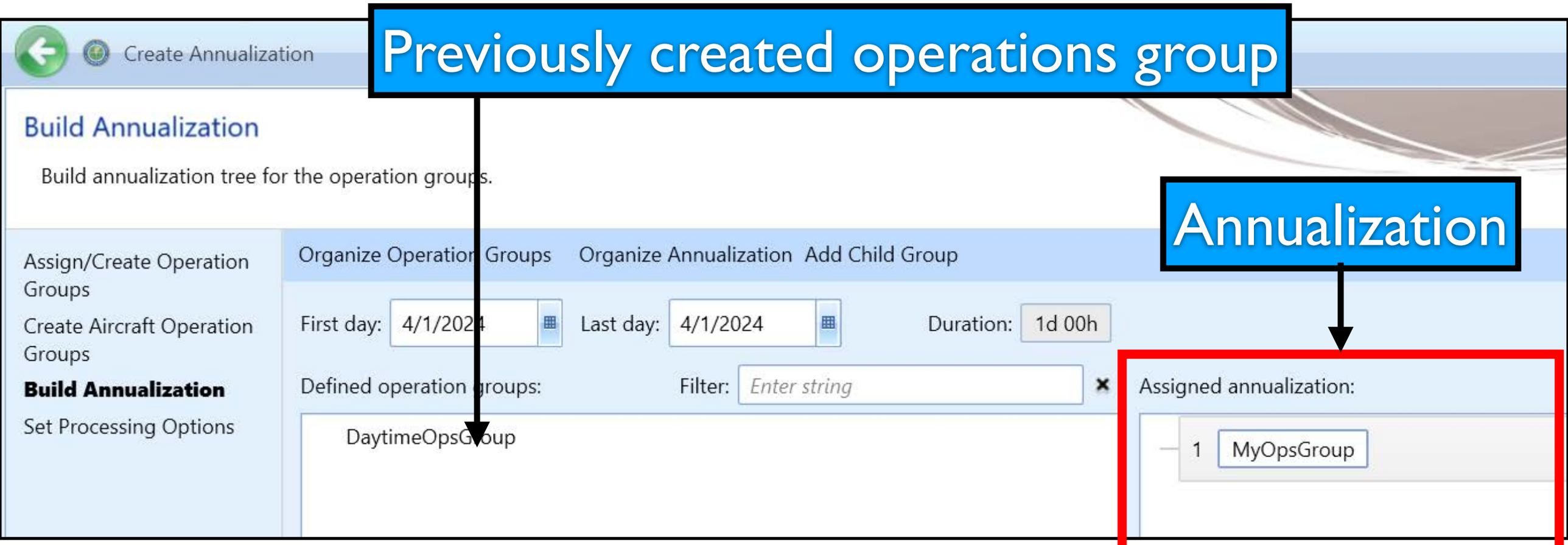


Airport Operations : Add Aircraft Operations to a Group

- Operations are on the left panel
- You can drag the operations from the left to the right panel to complete the group

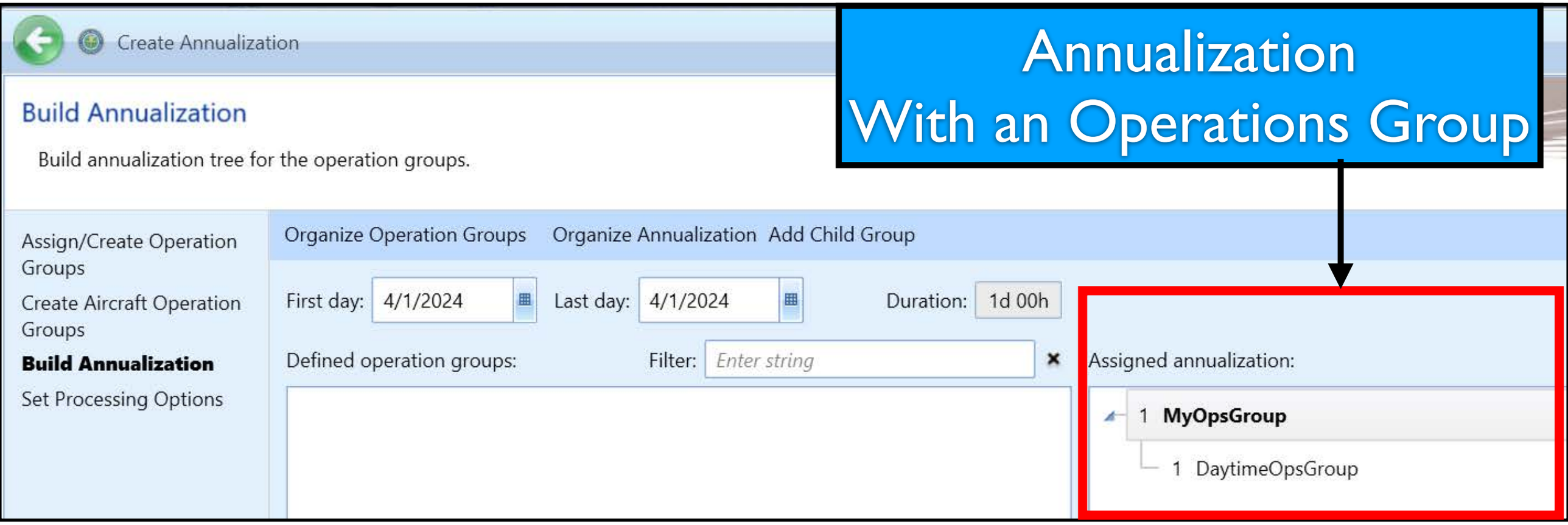
Airport Annualization

- Groups can be combined to build annualizations
- Example: airport operations operating in a single runway configuration can constitute a group
- Multiple runway configurations can be combined into an annualization



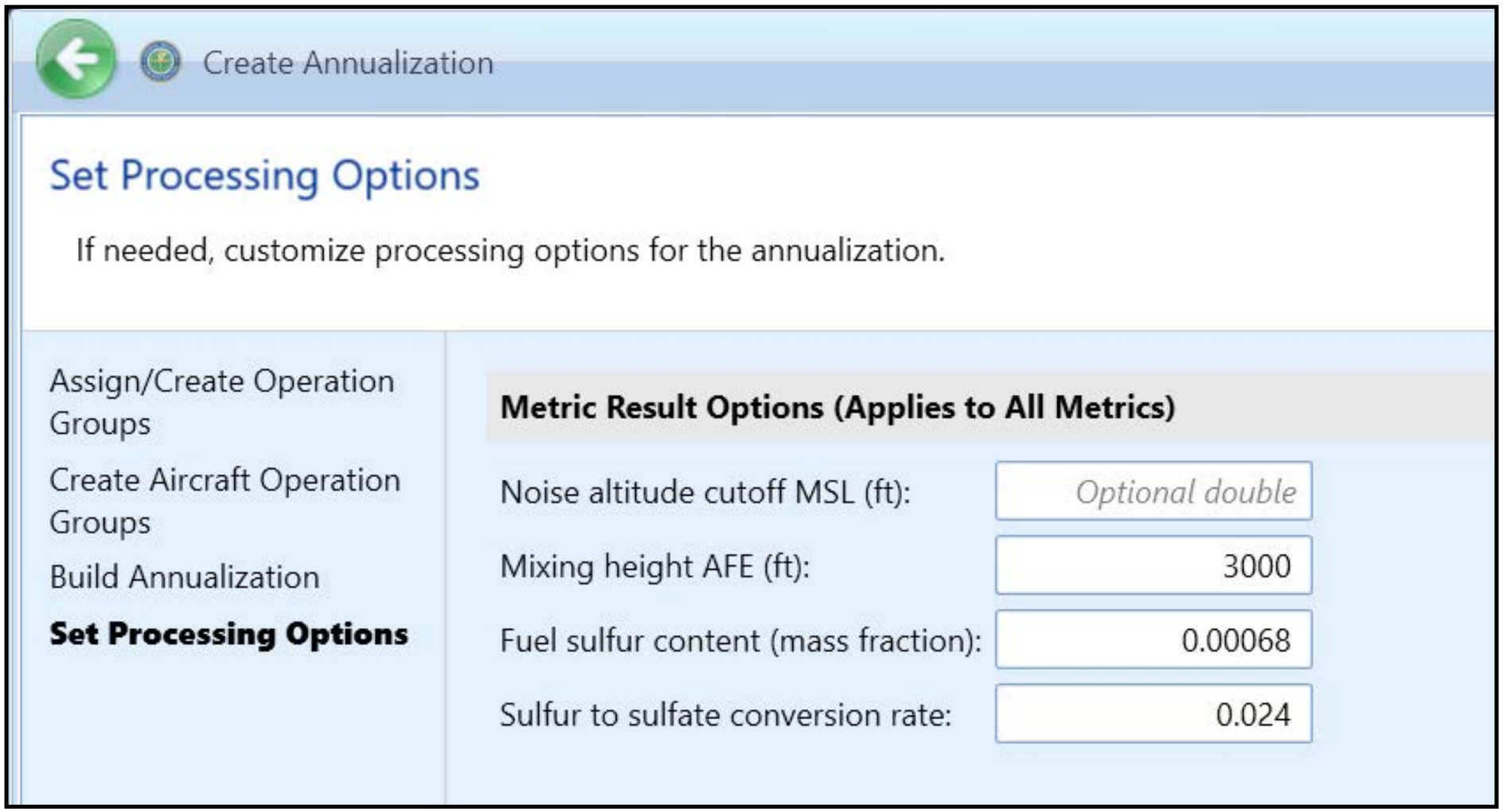
Airport Annualization (2)

- Previously defined operations group (DaytimeOpsGroup) is part of the annualization



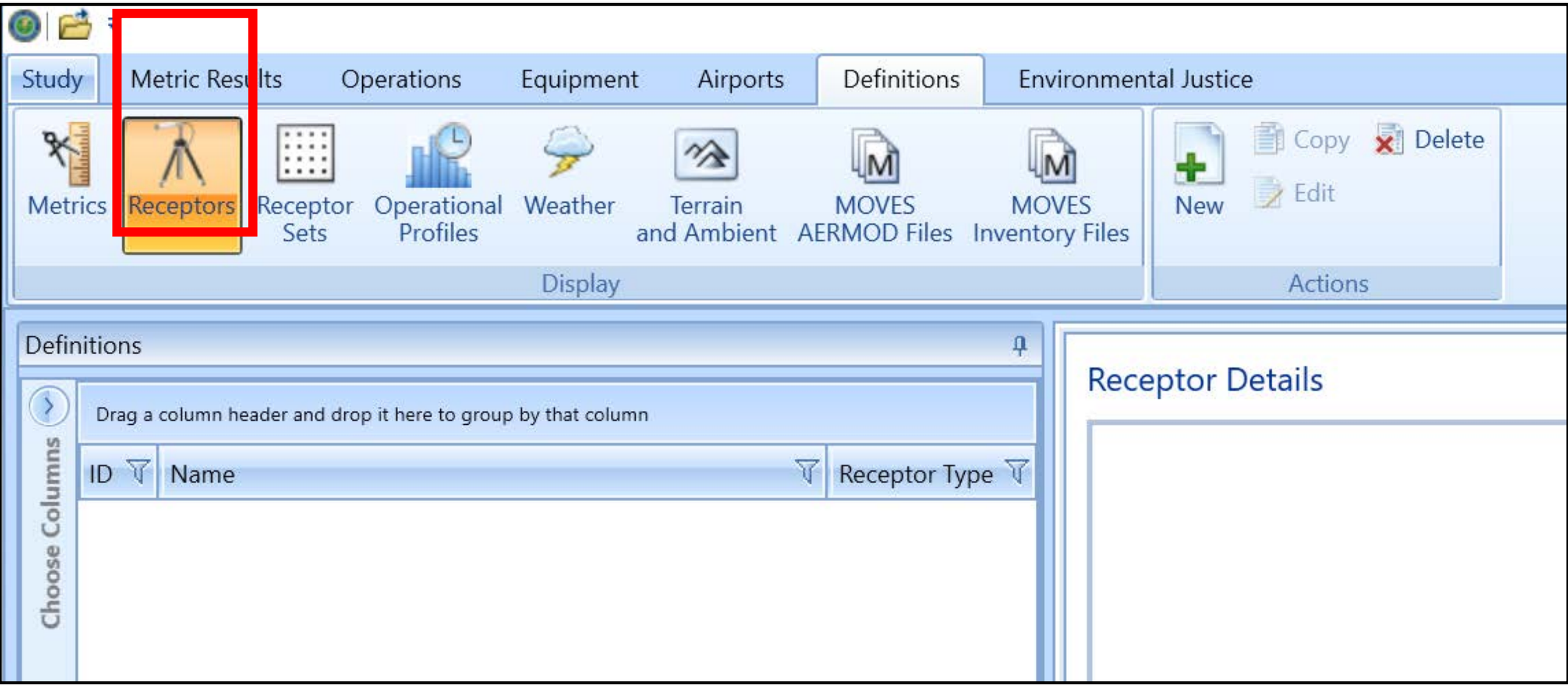
Processing Options for Annualization

- Accept the default values in this window



Receptors

- Receptors constitute ground locations where noise and emissions will be evaluated
- Can be a grid or individual locations
- Receptors are created under **Definitions**

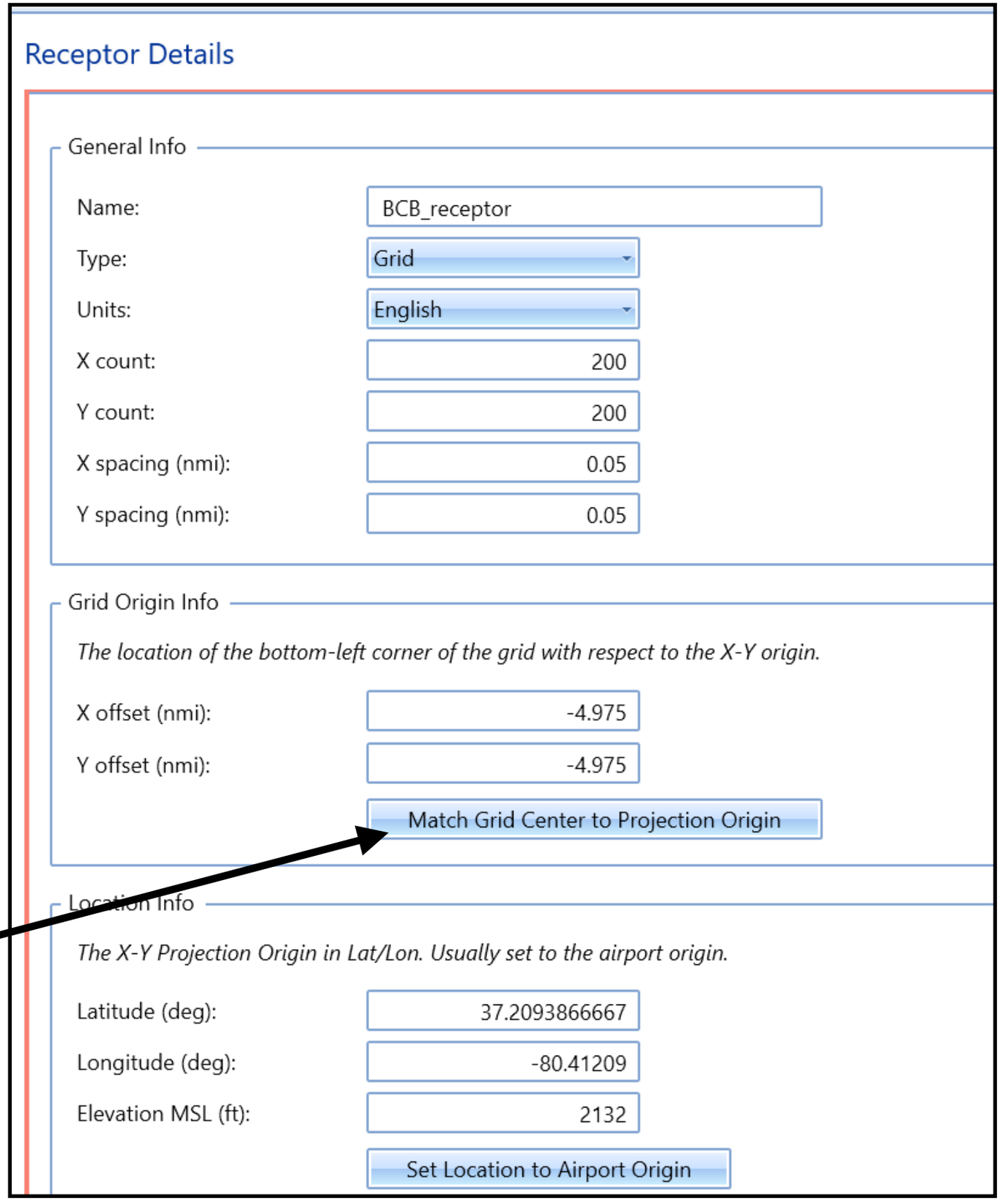


Receptor Information

- Try to use small spacing to improve the resolution of the noise contours

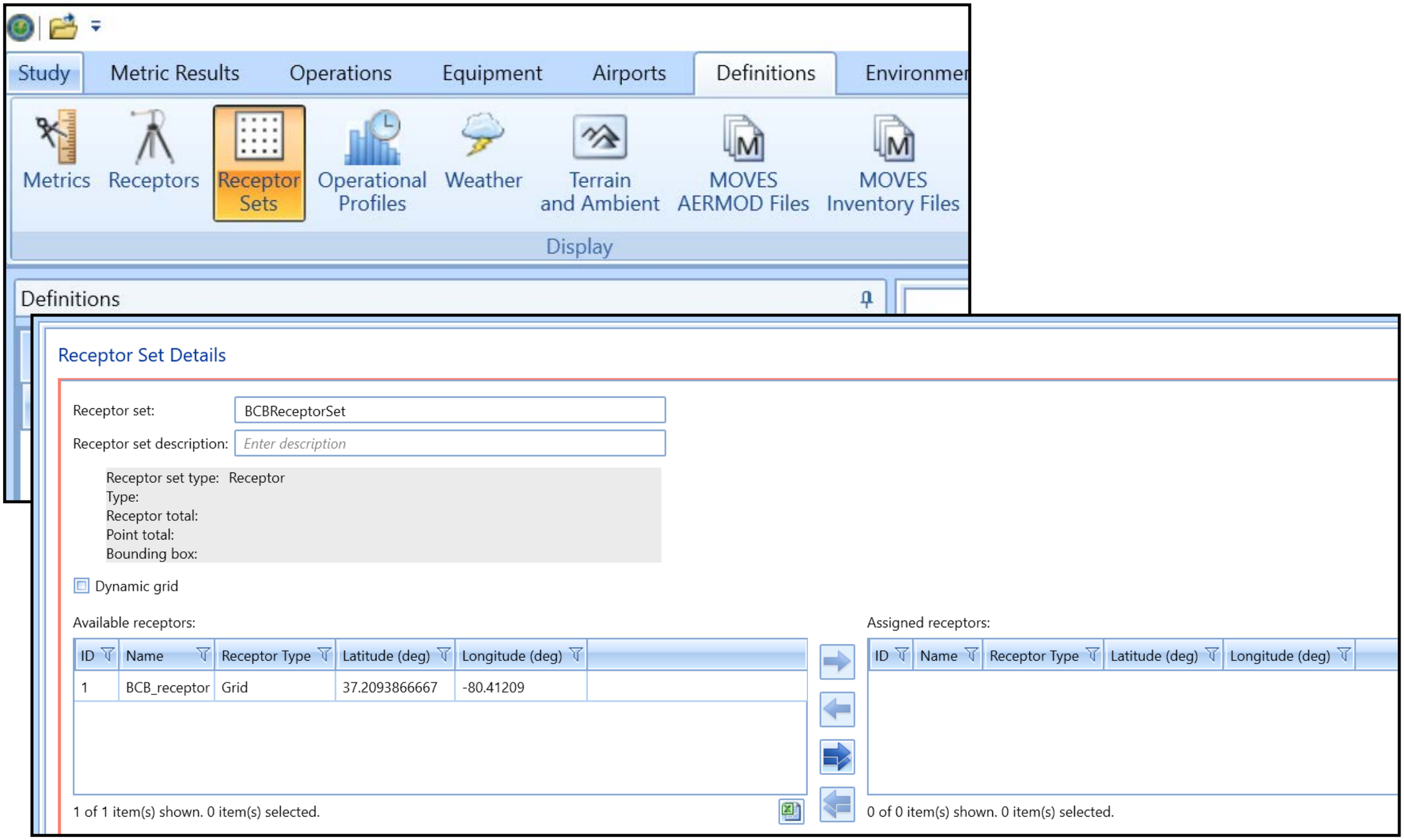
200 receptors at 0.05 nm spacing covers 10 nm

Grid origin can be automatically set by AEDT



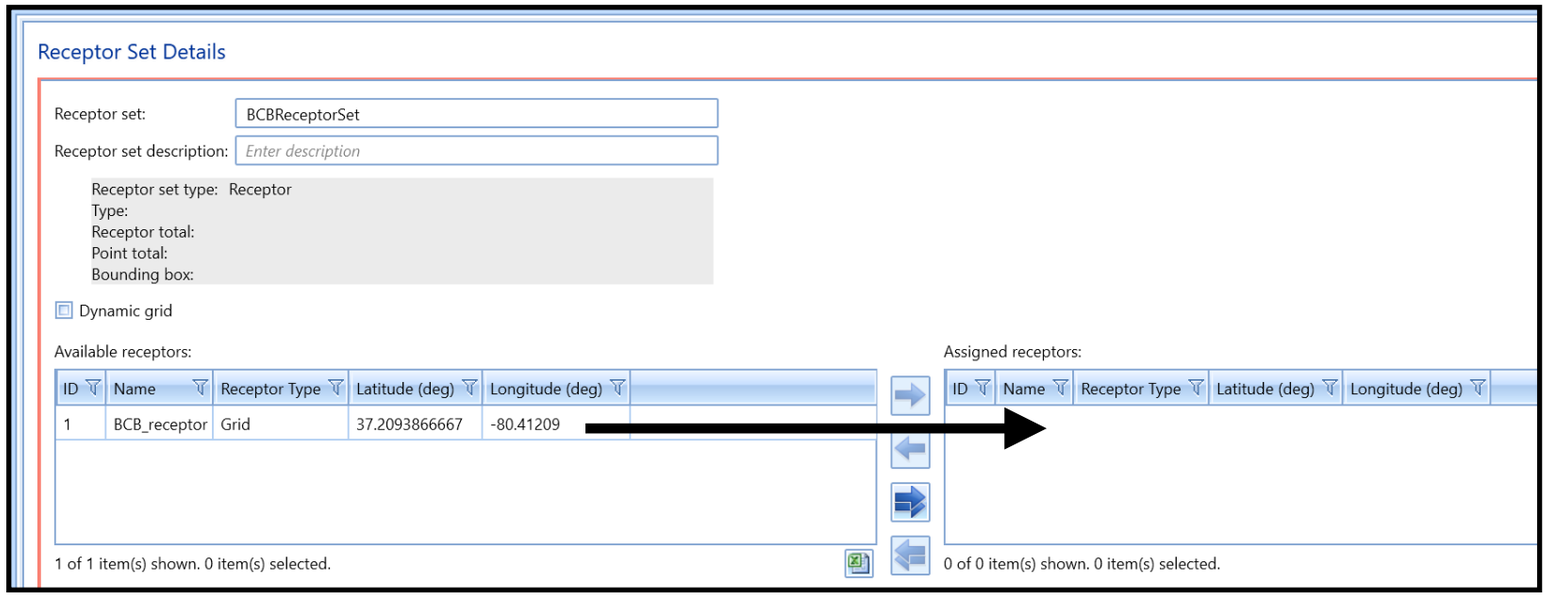
Receptor Sets Information

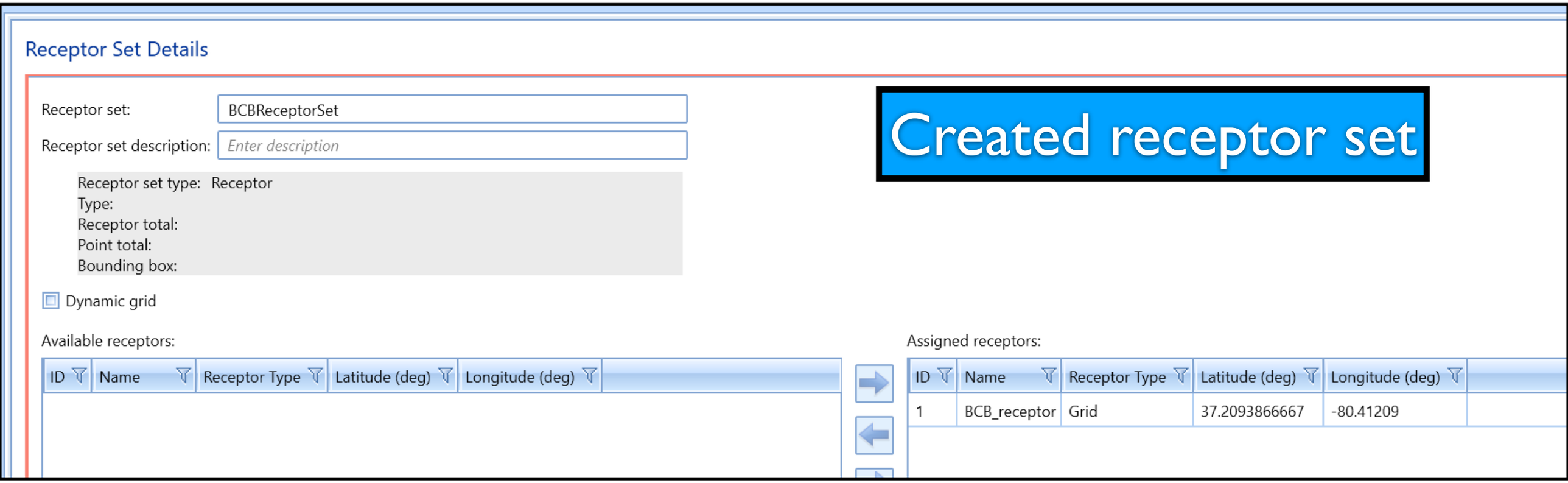
- At least one receptor set is needed in your study
- Example, one receptor for noise, one for emissions



Receptor Sets Information

- Drag the receptor from the left panel to the right to create a receptor set

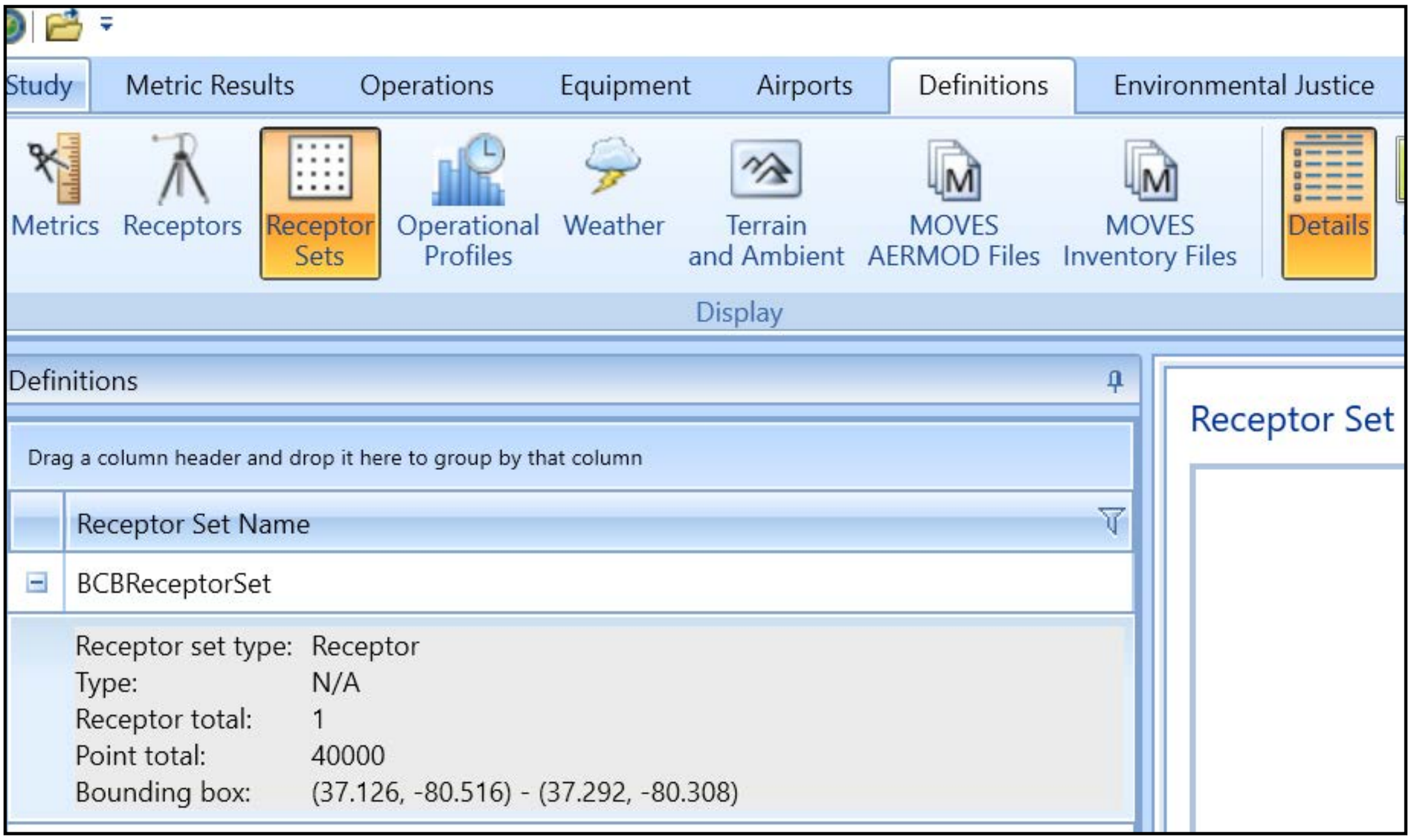




Created receptor set

Receptor Set Details

- The receptor has 40,000 data point in the grid (200 x 200 data points)



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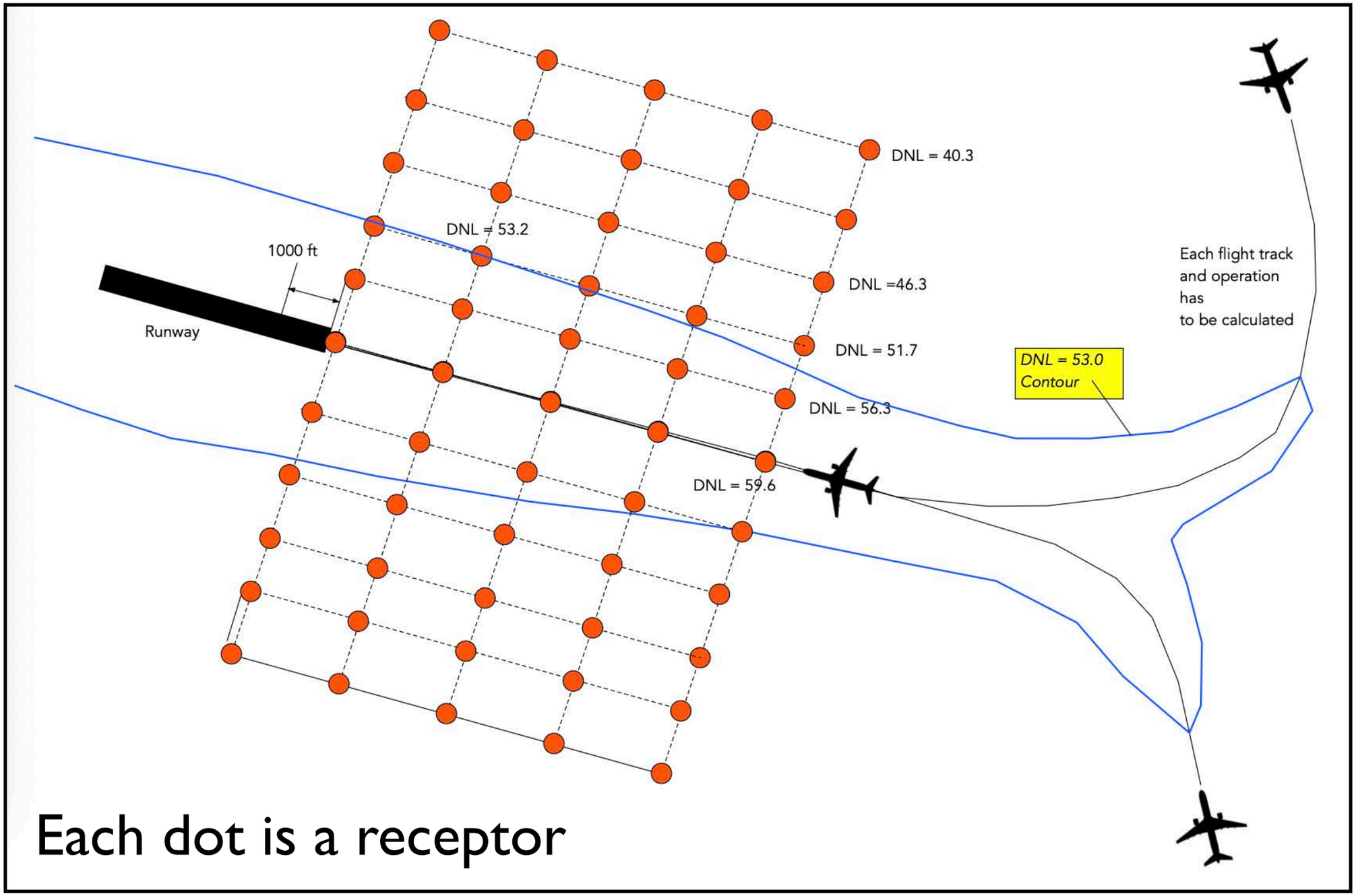
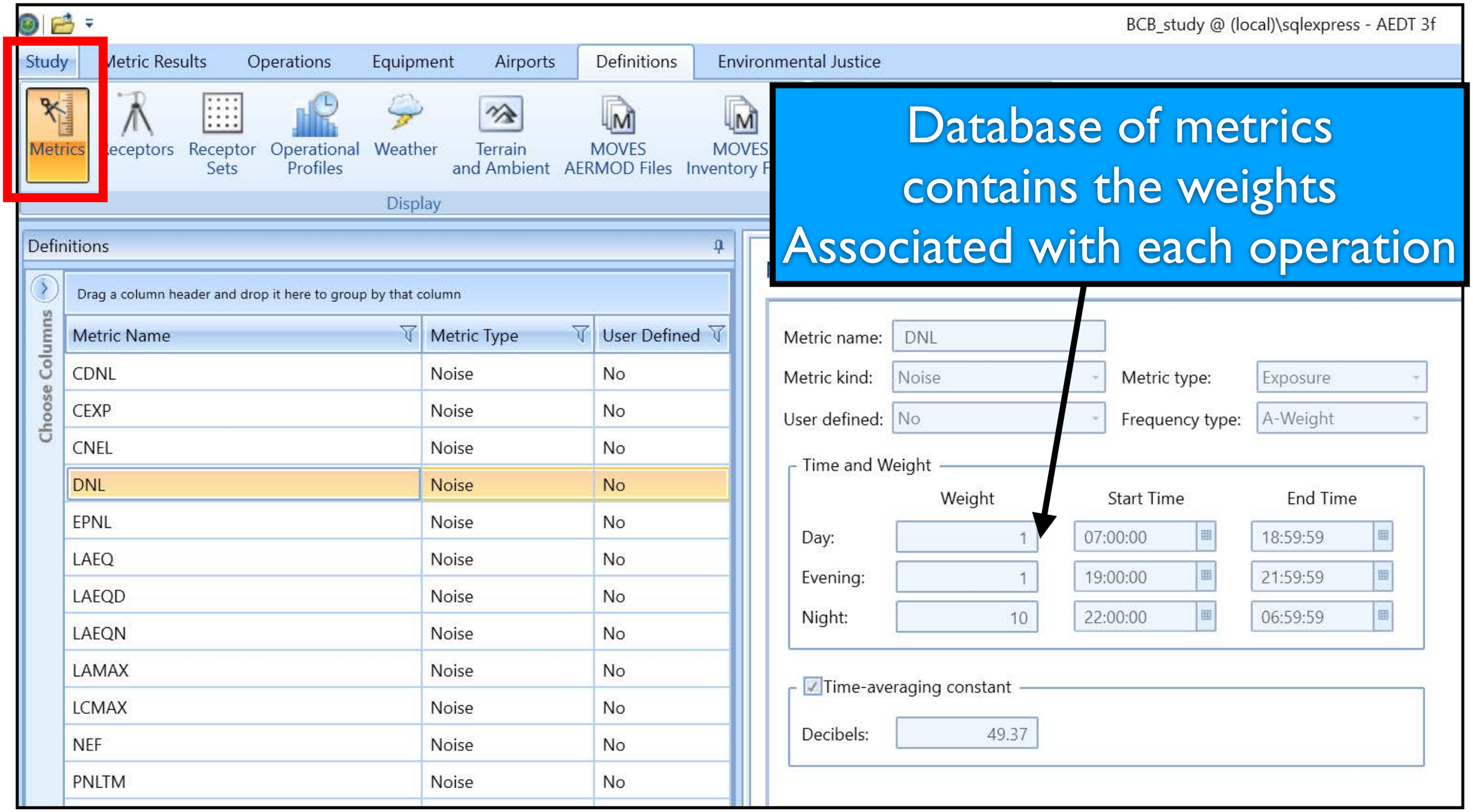


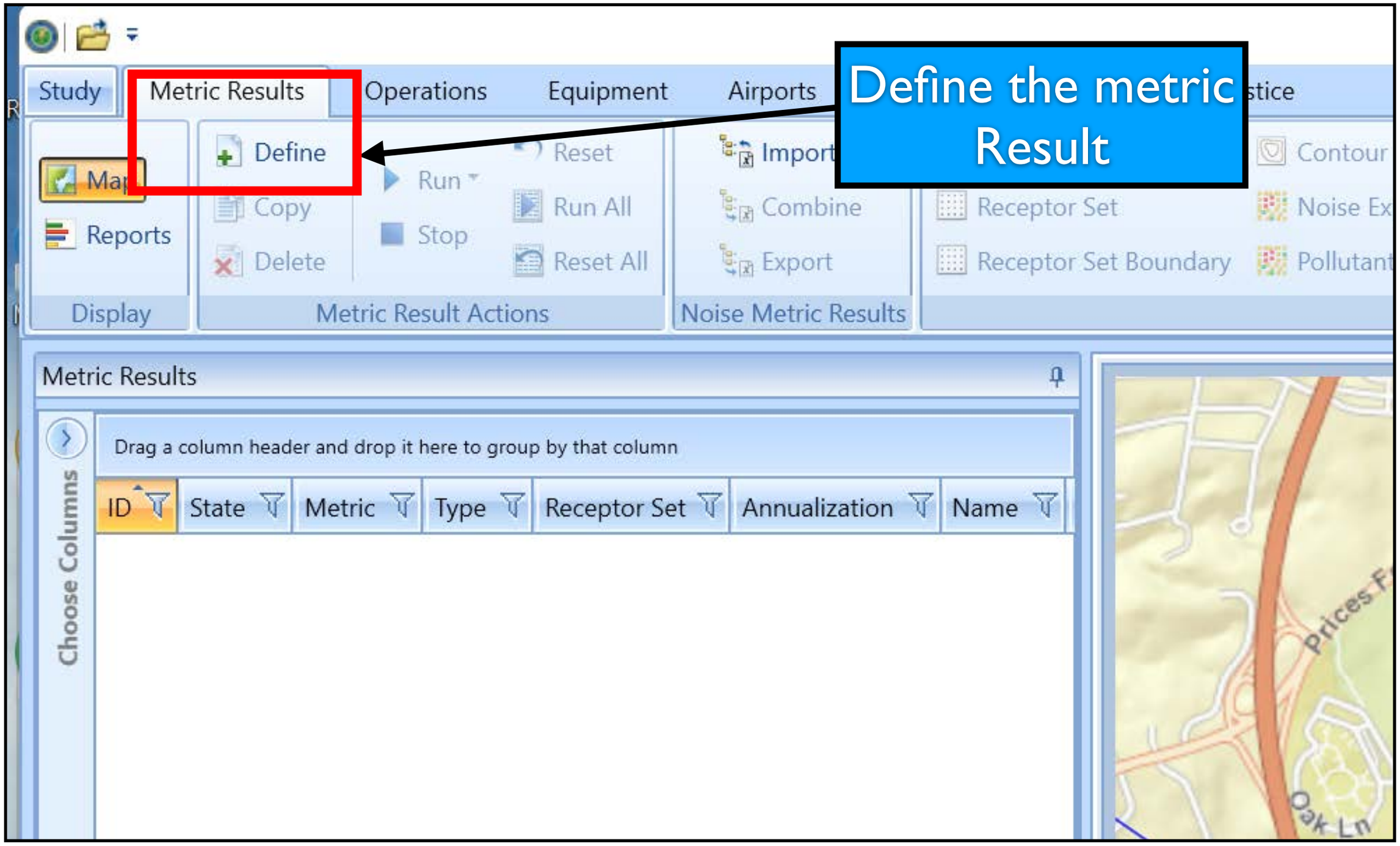
Metrics for a Study

- AEDT has more than 12 noise metrics
- Metrics are reviewed under the **Study tab**



Create a Metric for the Study

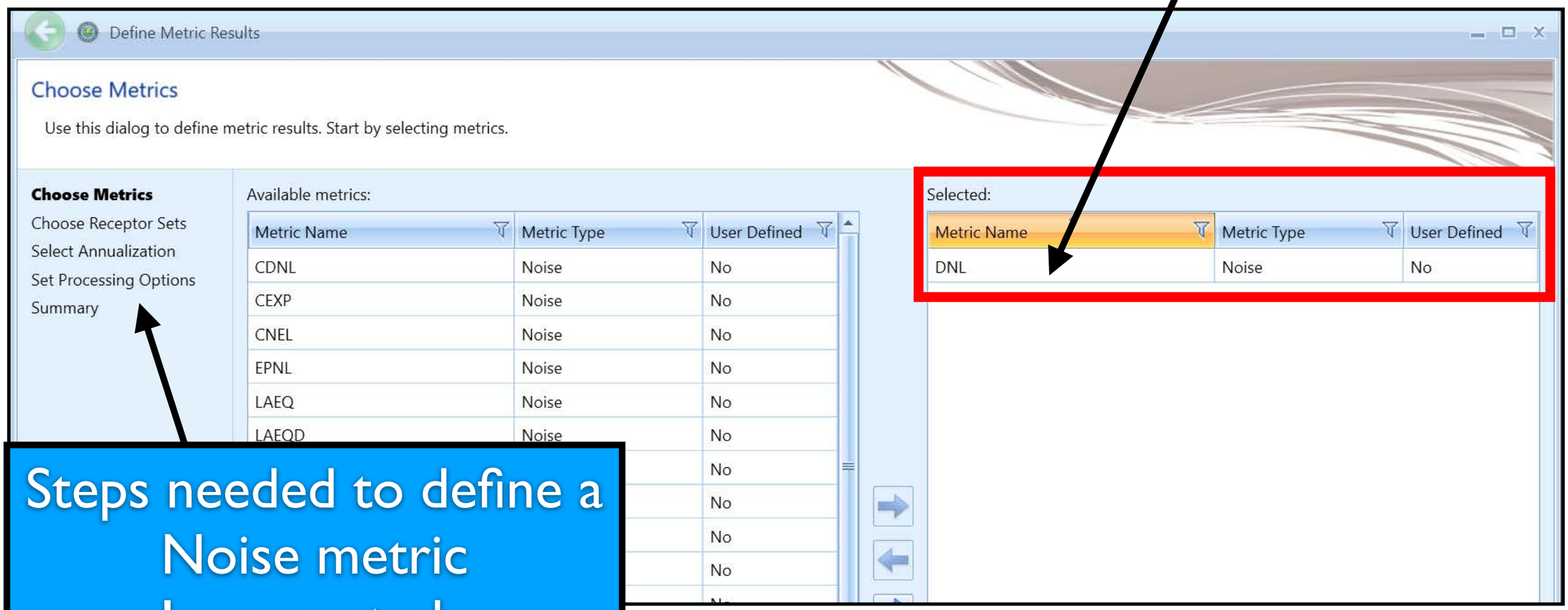
- Create a metric for the study
- Metrics are created under **Metrics Results**



Select a Metric for the Study

- Selecting a metric for the study involves dragging the available metric row (left panel) to the right panel

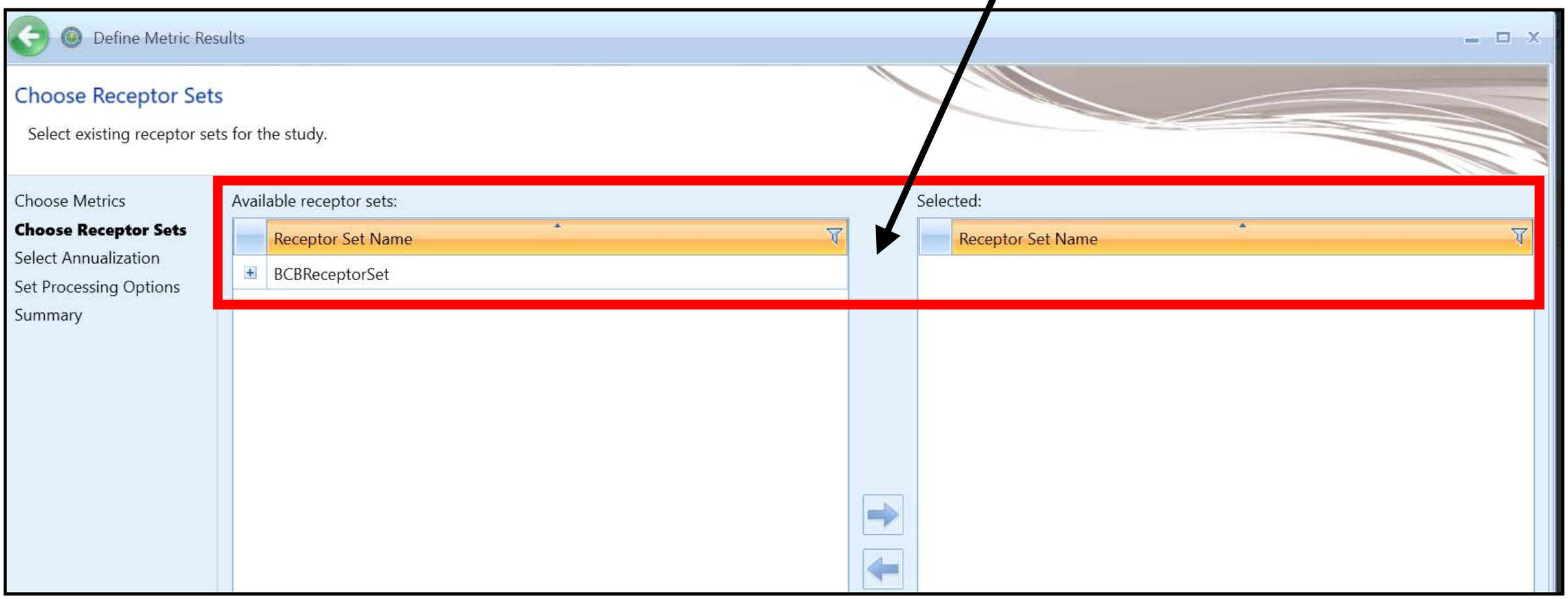
Drag the noise metric From the left panel to The right panel



Steps needed to define a Noise metric In your study

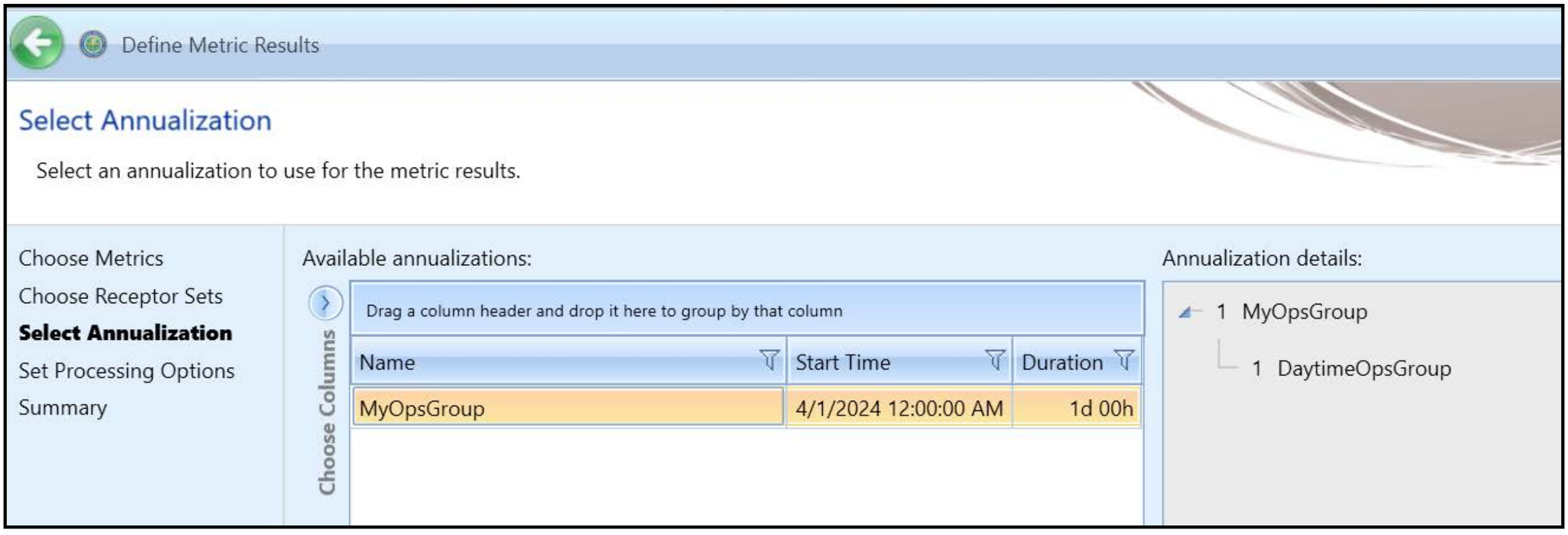
Select a Receptor Set to Estimate the Metric in the Study

- Remember that multiple receptor sets may be available



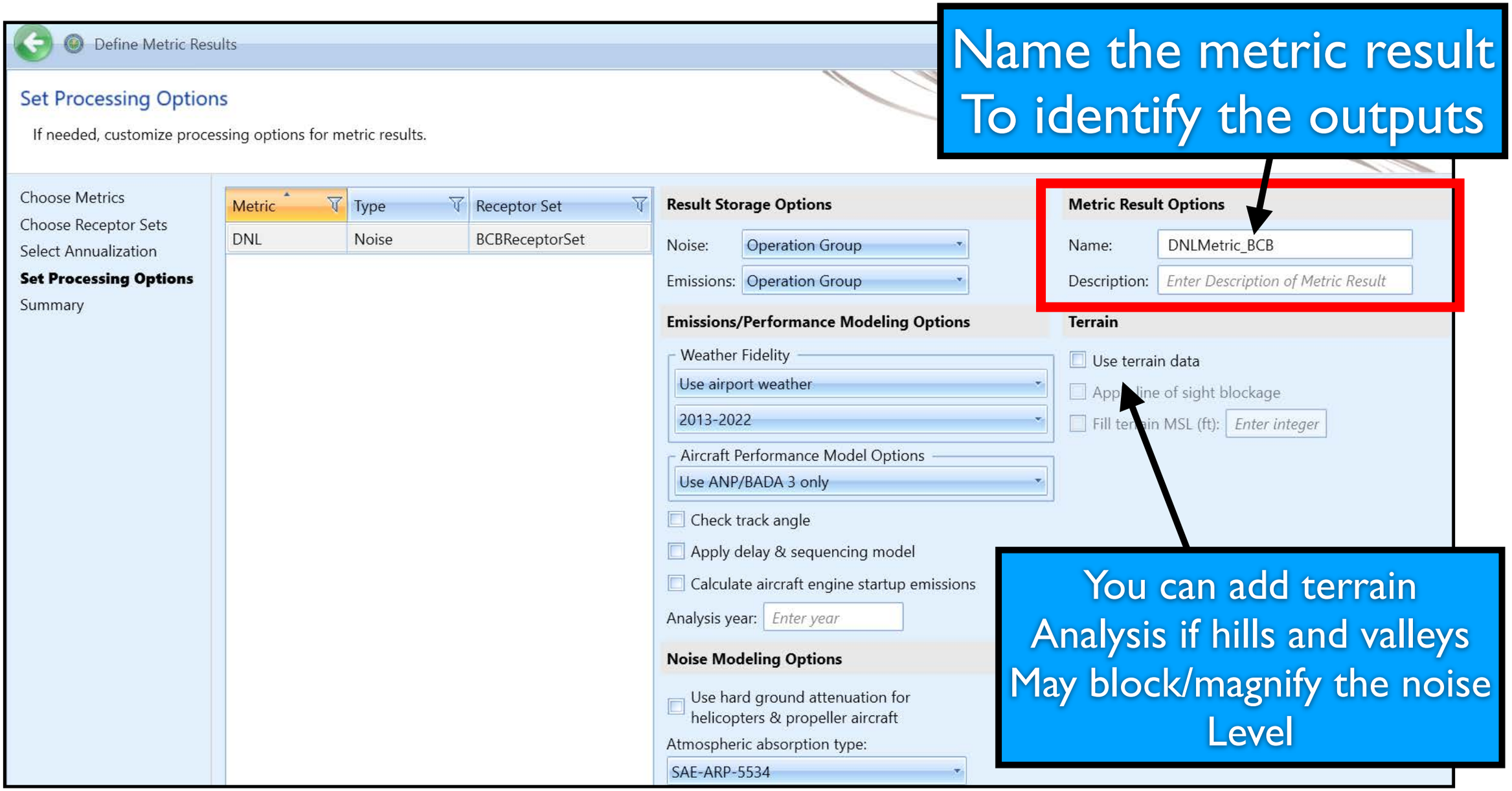
Select the Annualization to Estimate the Metric in the Study

- Select the annualization associated with the metric in your study

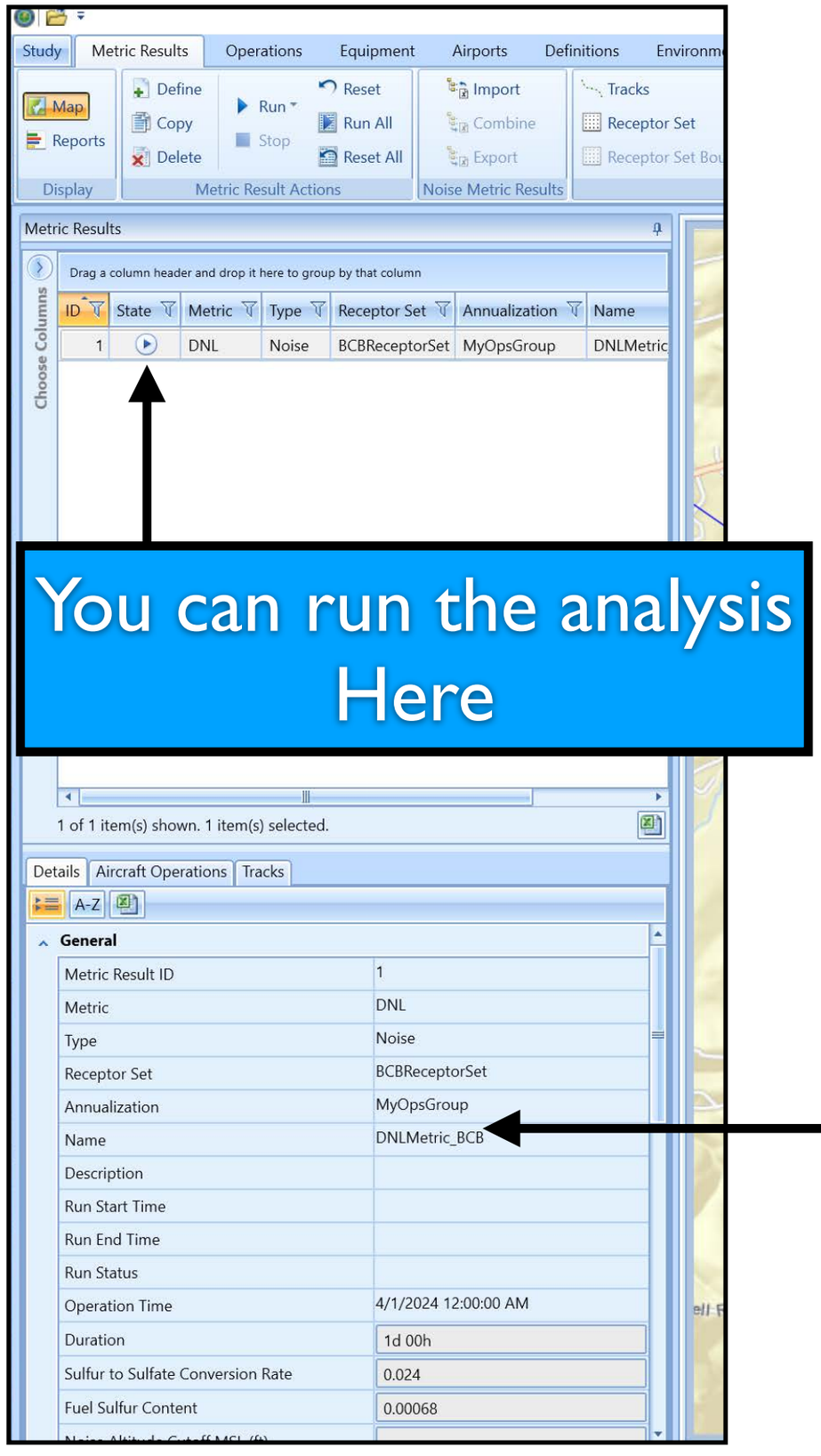


Select the Processing Options to Estimate the Metric in the Study

- Default options are generally OK
- You can specify the aircraft performance options



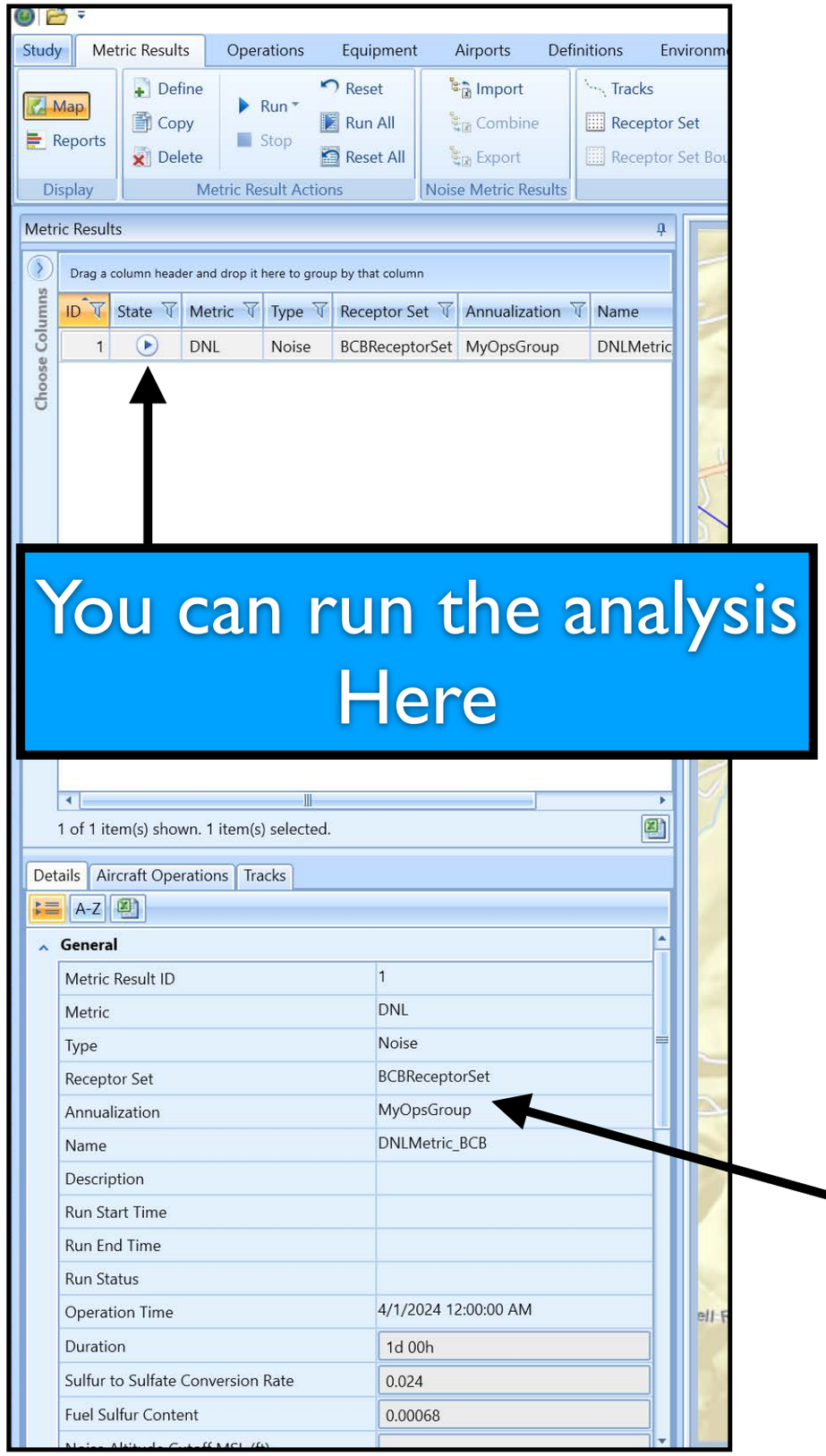
Summary Page of Metric in the Study



- A summary window presents all options selected in the study

Summary Page of Metric in the Study

- A summary window presents all options selected in the study

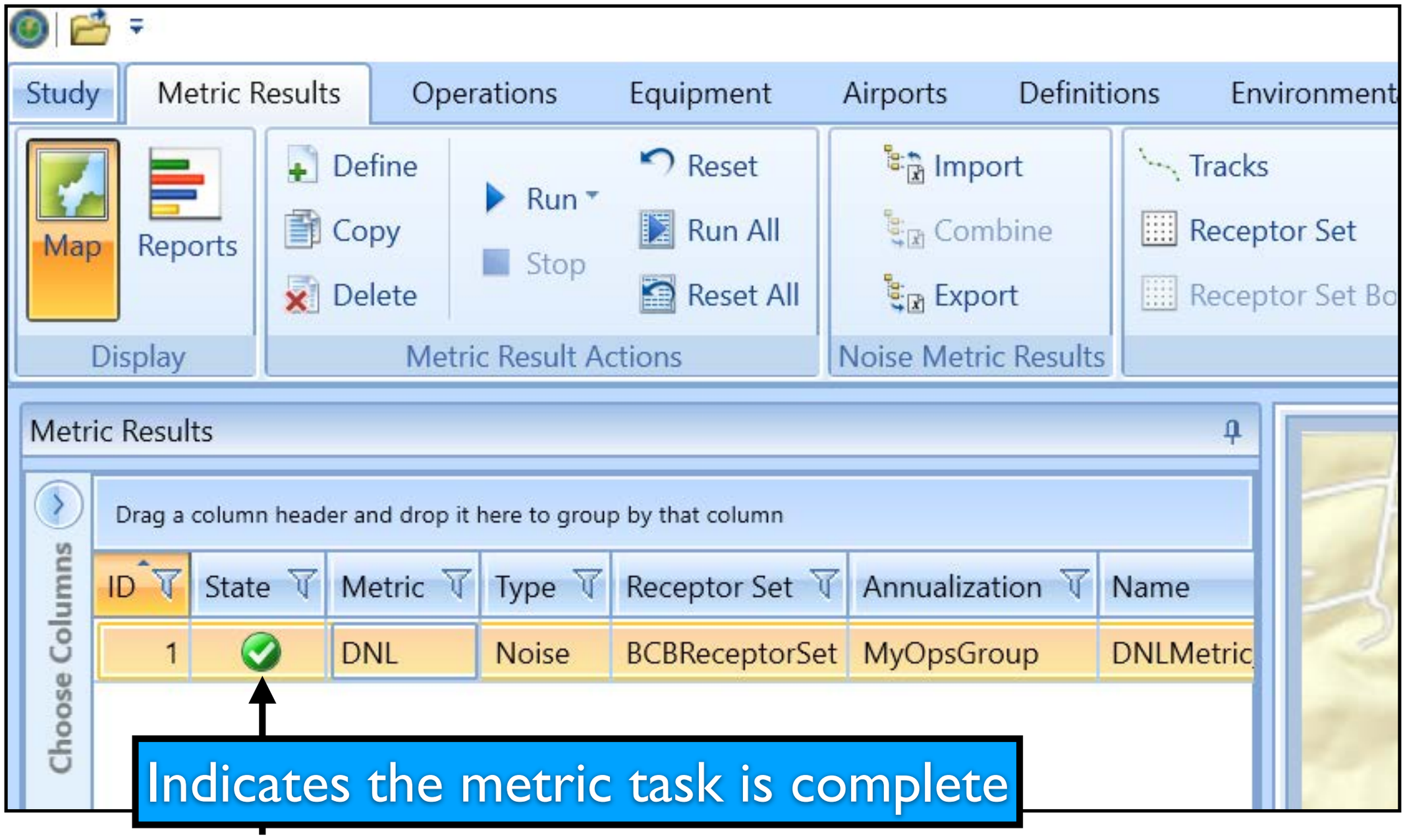


You can run the analysis Here

Review all your options

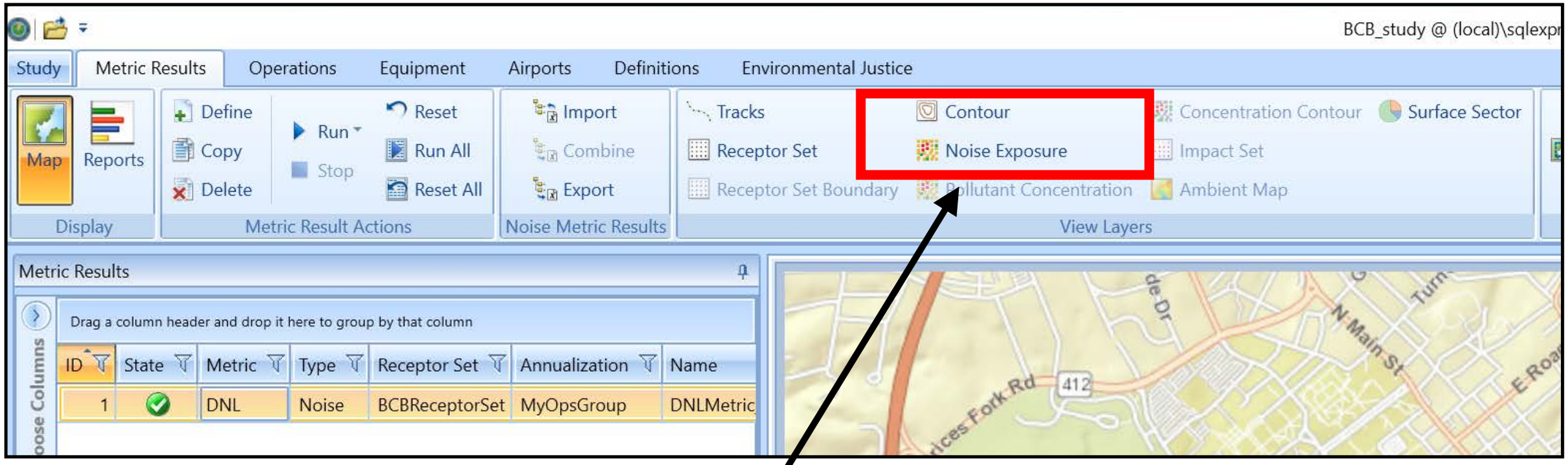
Metric Task Completed

- Run times of a metric study can take from a couple of minutes to hours depending on the complexity of the study



Creating Noise Contours

- Noise contours or exposure maps can be created for the study metric completed
- Maps are discrete values of noise levels
- Contours are interpolated values of equal noise levels



Creating Noise Contours

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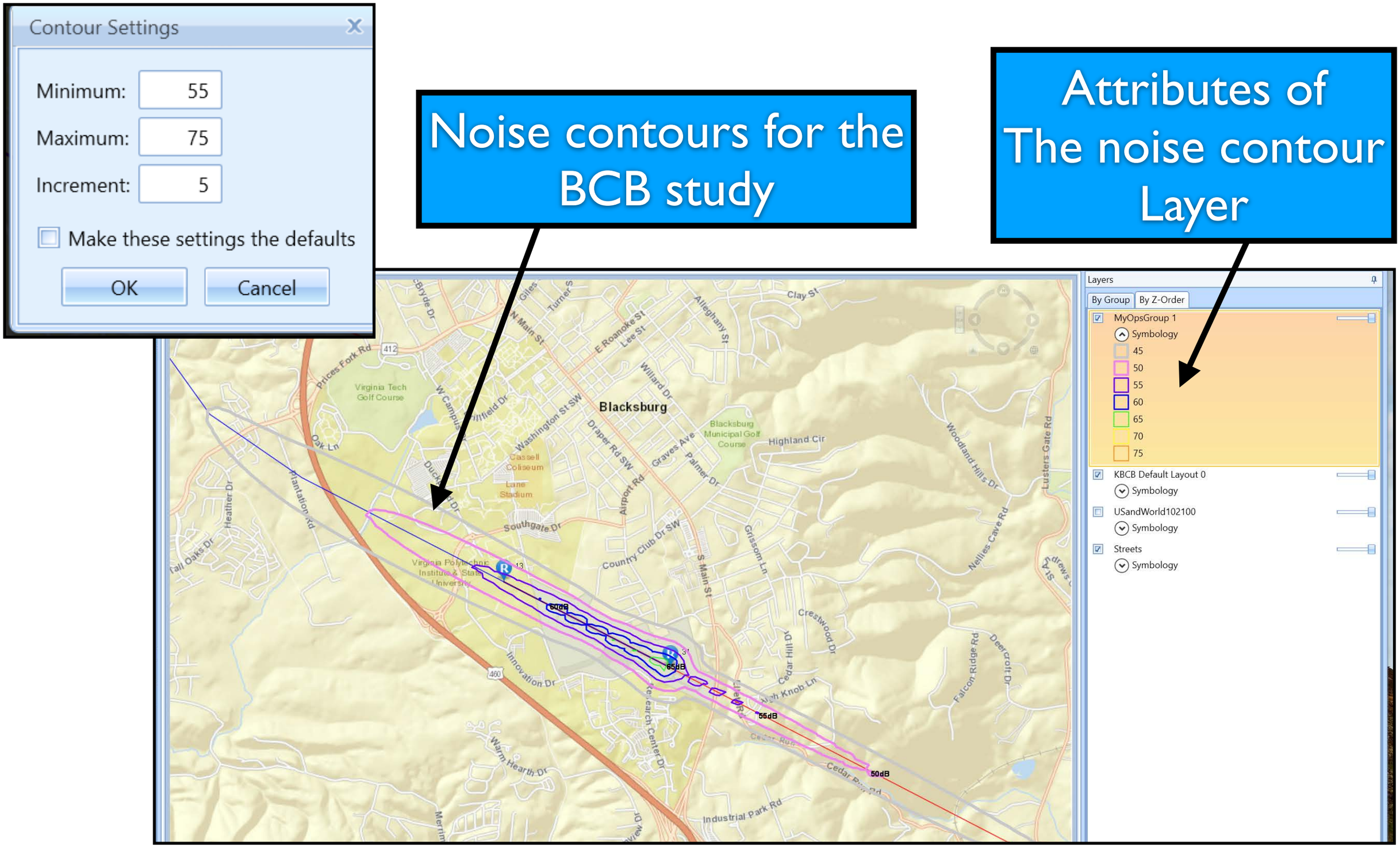
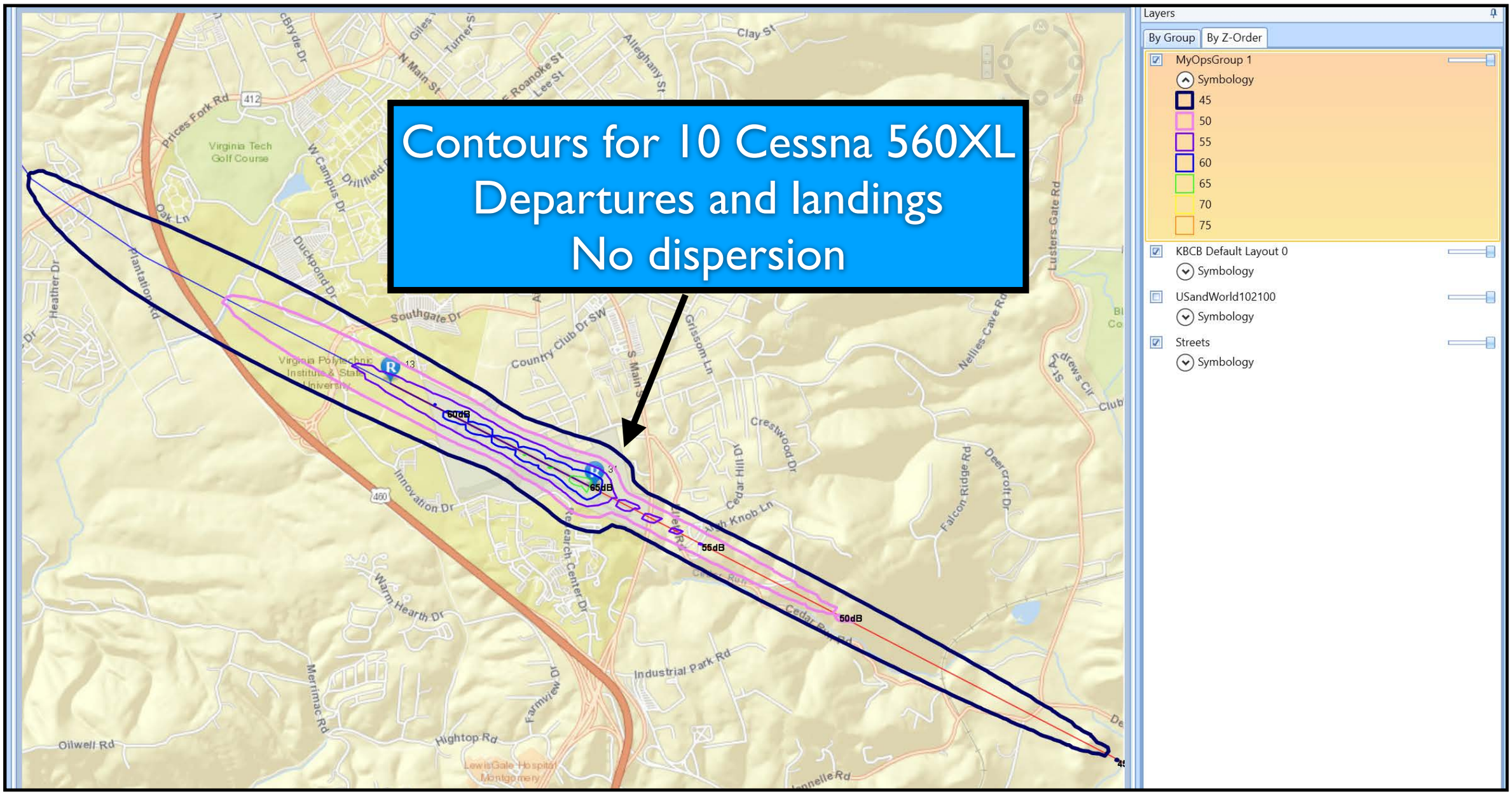


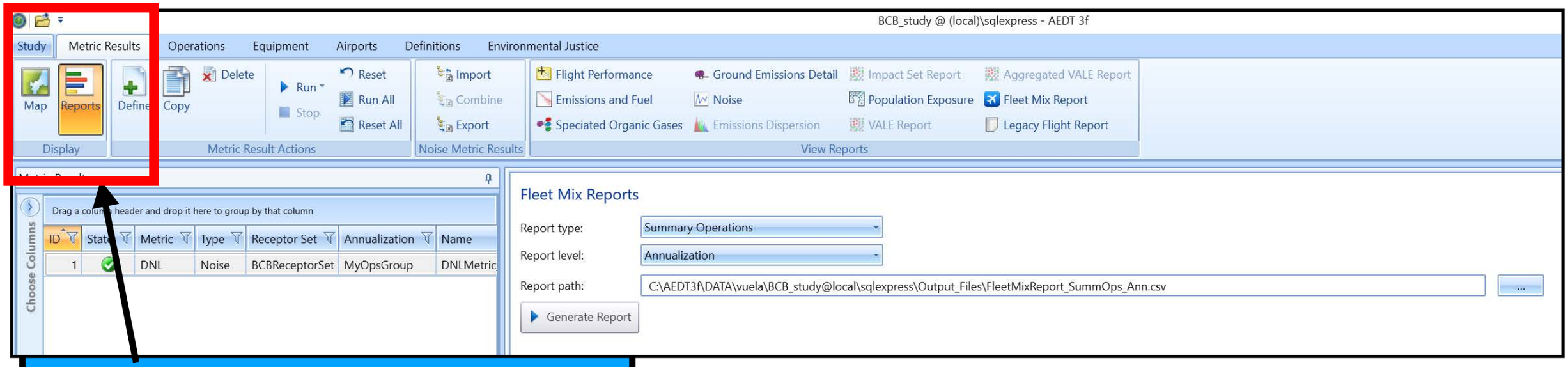
Noise Contours

- Noise contours can be exported as shapefiles (used in many other applications)
- You can change the properties of the contours



AEDT Reports

- Flight performance
- Emissions and fuel consumption
- Organic gases
- Ground emissions (requires Ground service equipment)
- Population exposure
- Fleet mix report



AEDT Reports: Emissions

- Creates summary or detailed report of fuel and emissions
- Can select by operations group
- Can change the units of the report

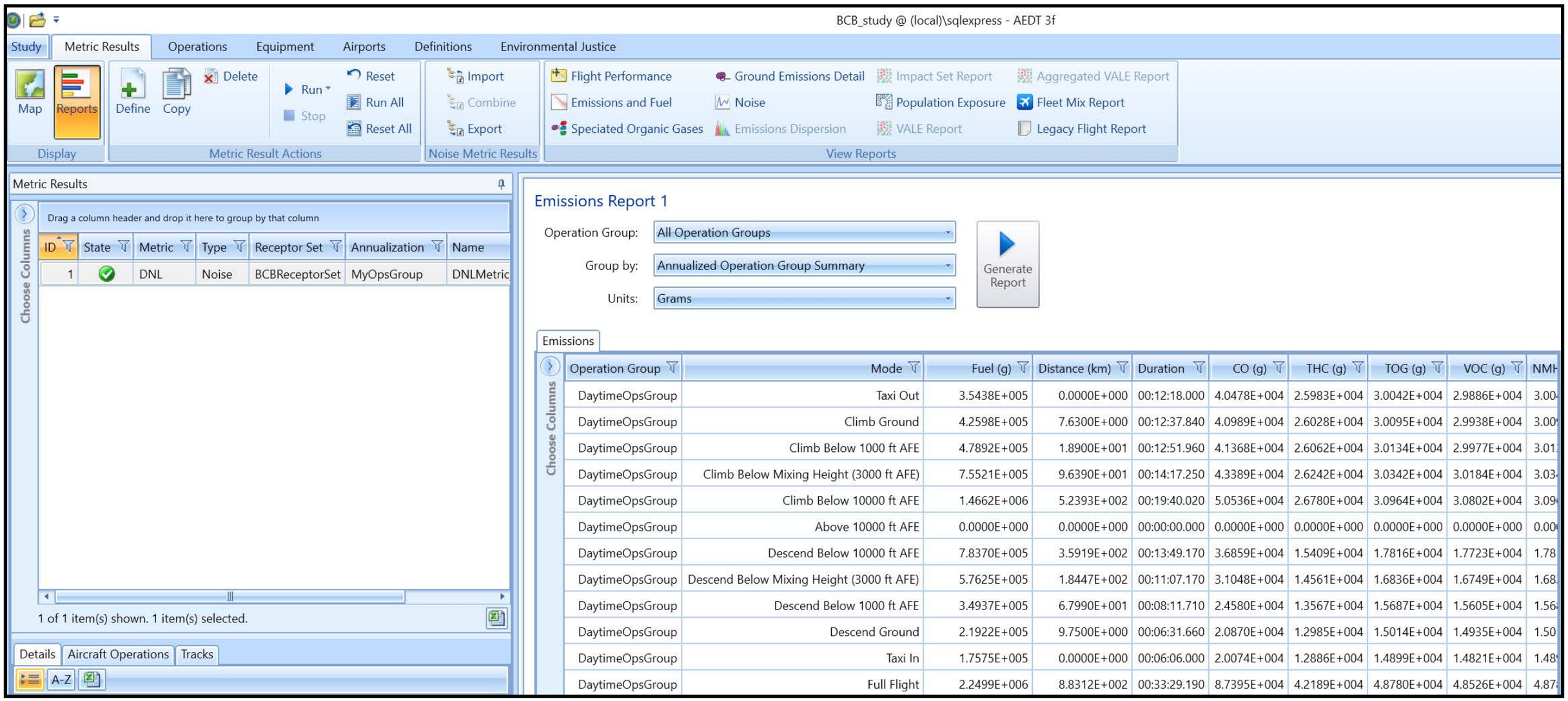
Creates emissions report

Summary information

Browse reports

AEDT Reports: Emissions Report

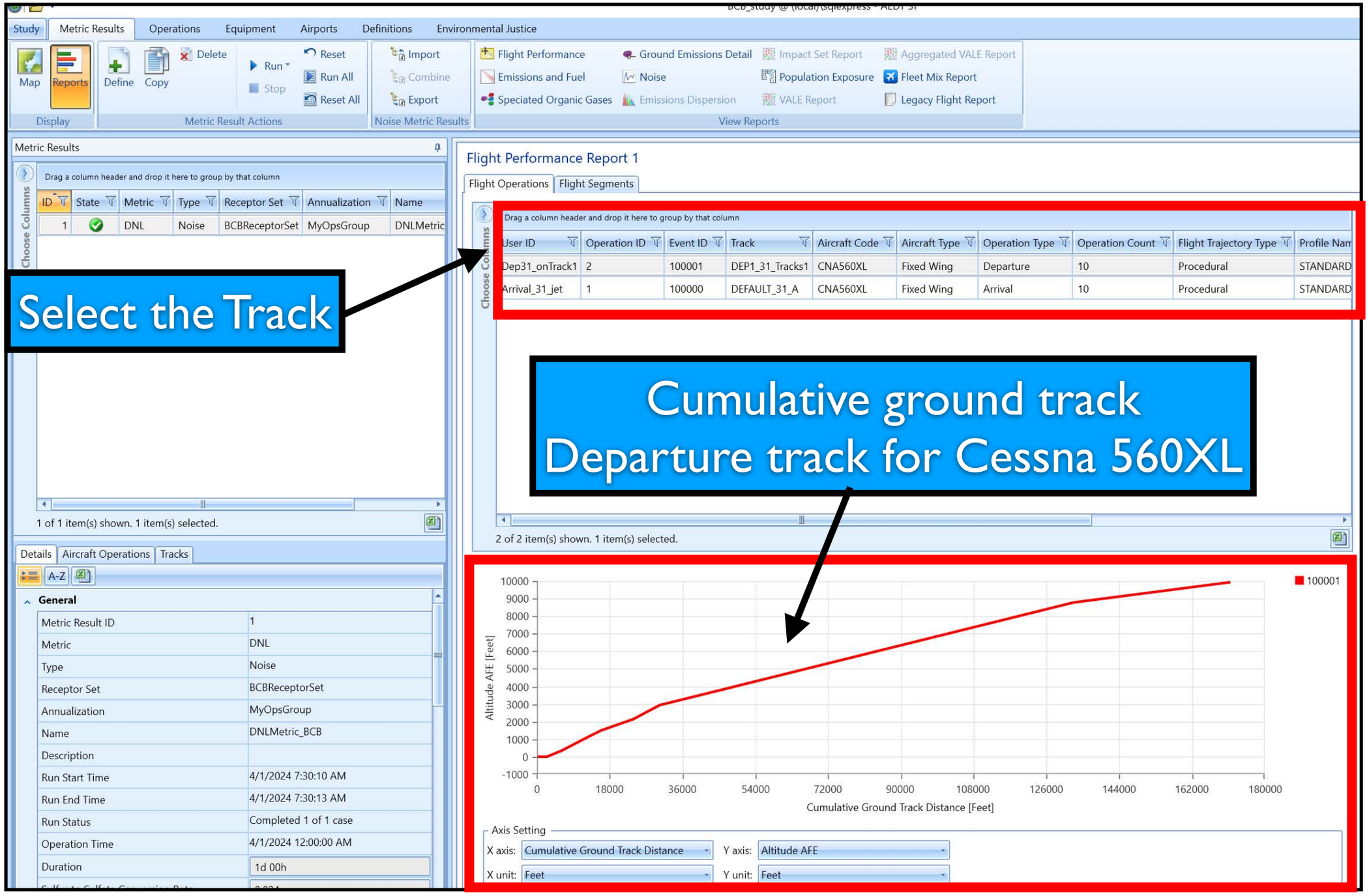
- Note the report starts /ends at the 10,000 feet mixing layer
- Taxi-in, Taxi-out, Climb, Descend phases included



Operation Group	Mode	Fuel (g)	Distance (km)	Duration	CO (g)	THC (g)	TOG (g)	VOC (g)	NMH
DaytimeOpsGroup	Taxi Out	3.5438E+005	0.0000E+000	00:12:18.000	4.0478E+004	2.5983E+004	3.0042E+004	2.9886E+004	3.00
DaytimeOpsGroup	Climb Ground	4.2598E+005	7.6300E+000	00:12:37.840	4.0989E+004	2.6028E+004	3.0095E+004	2.9938E+004	3.00
DaytimeOpsGroup	Climb Below 1000 ft AFE	4.7892E+005	1.8900E+001	00:12:51.960	4.1368E+004	2.6062E+004	3.0134E+004	2.9977E+004	3.01
DaytimeOpsGroup	Climb Below Mixing Height (3000 ft AFE)	7.5521E+005	9.6390E+001	00:14:17.250	4.3389E+004	2.6242E+004	3.0342E+004	3.0184E+004	3.03
DaytimeOpsGroup	Climb Below 10000 ft AFE	1.4662E+006	5.2393E+002	00:19:40.020	5.0536E+004	2.6780E+004	3.0964E+004	3.0802E+004	3.09
DaytimeOpsGroup	Above 10000 ft AFE	0.0000E+000	0.0000E+000	00:00:00.000	0.0000E+000	0.0000E+000	0.0000E+000	0.0000E+000	0.00
DaytimeOpsGroup	Descend Below 10000 ft AFE	7.8370E+005	3.5919E+002	00:13:49.170	3.6859E+004	1.5409E+004	1.7816E+004	1.7723E+004	1.78
DaytimeOpsGroup	Descend Below Mixing Height (3000 ft AFE)	5.7625E+005	1.8447E+002	00:11:07.170	3.1048E+004	1.4561E+004	1.6836E+004	1.6749E+004	1.68
DaytimeOpsGroup	Descend Below 1000 ft AFE	3.4937E+005	6.7990E+001	00:08:11.710	2.4580E+004	1.3567E+004	1.5687E+004	1.5605E+004	1.56
DaytimeOpsGroup	Descend Ground	2.1922E+005	9.7500E+000	00:06:31.660	2.0870E+004	1.2985E+004	1.5014E+004	1.4935E+004	1.50
DaytimeOpsGroup	Taxi In	1.7575E+005	0.0000E+000	00:06:06.000	2.0074E+004	1.2886E+004	1.4899E+004	1.4821E+004	1.48
DaytimeOpsGroup	Full Flight	2.2499E+006	8.8312E+002	00:33:29.190	8.7395E+004	4.2189E+004	4.8780E+004	4.8526E+004	4.87

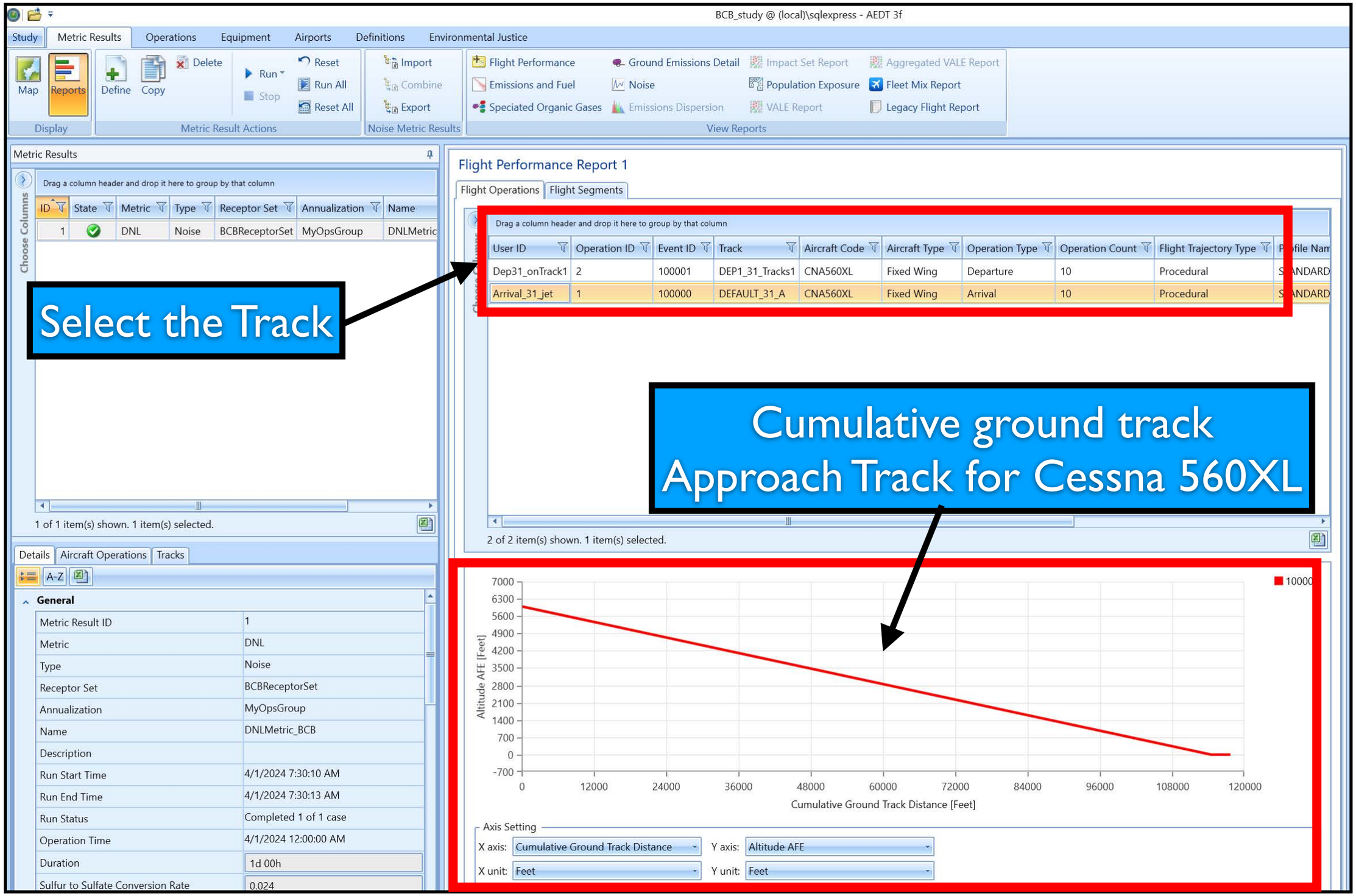
AEDT Reports: Flight Performance

- Review the departure and approach profiles modeled in AEDT



AEDT Reports: Flight Performance

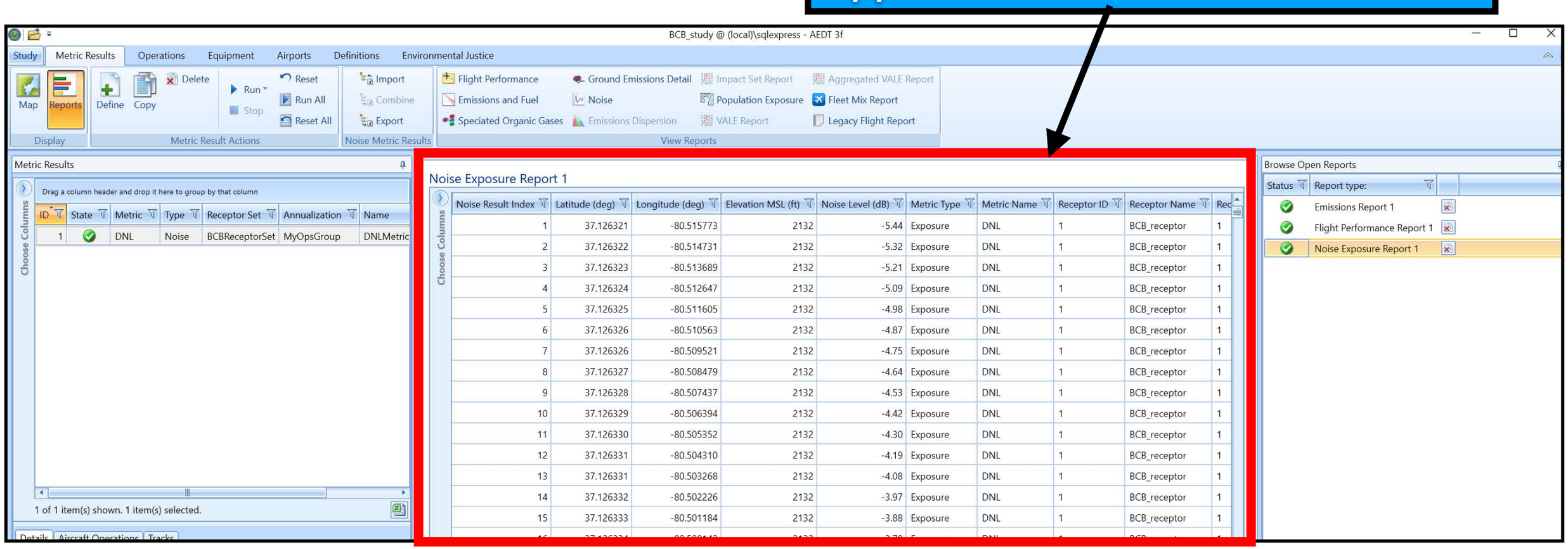
- Approach profile for Cessna 560XL



AEDT Reports: Noise Exposure Report

- Detailed report of noise metric at each receptor
- 40,000 receptors in our simple BCB analysis
- DNL reported at each receptor

Cumulative ground track
Approach Track for Cessna 560XL



AEDT Reports: Noise Exposure Report

- Detailed report of noise metric at each receptor
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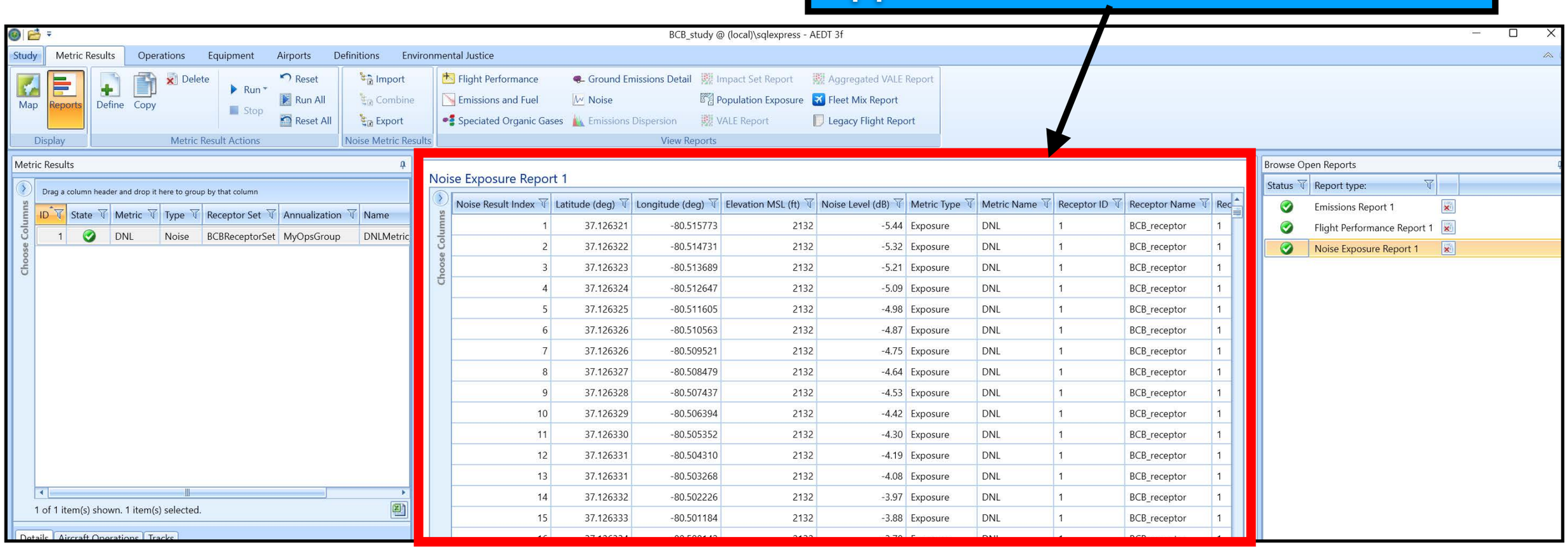
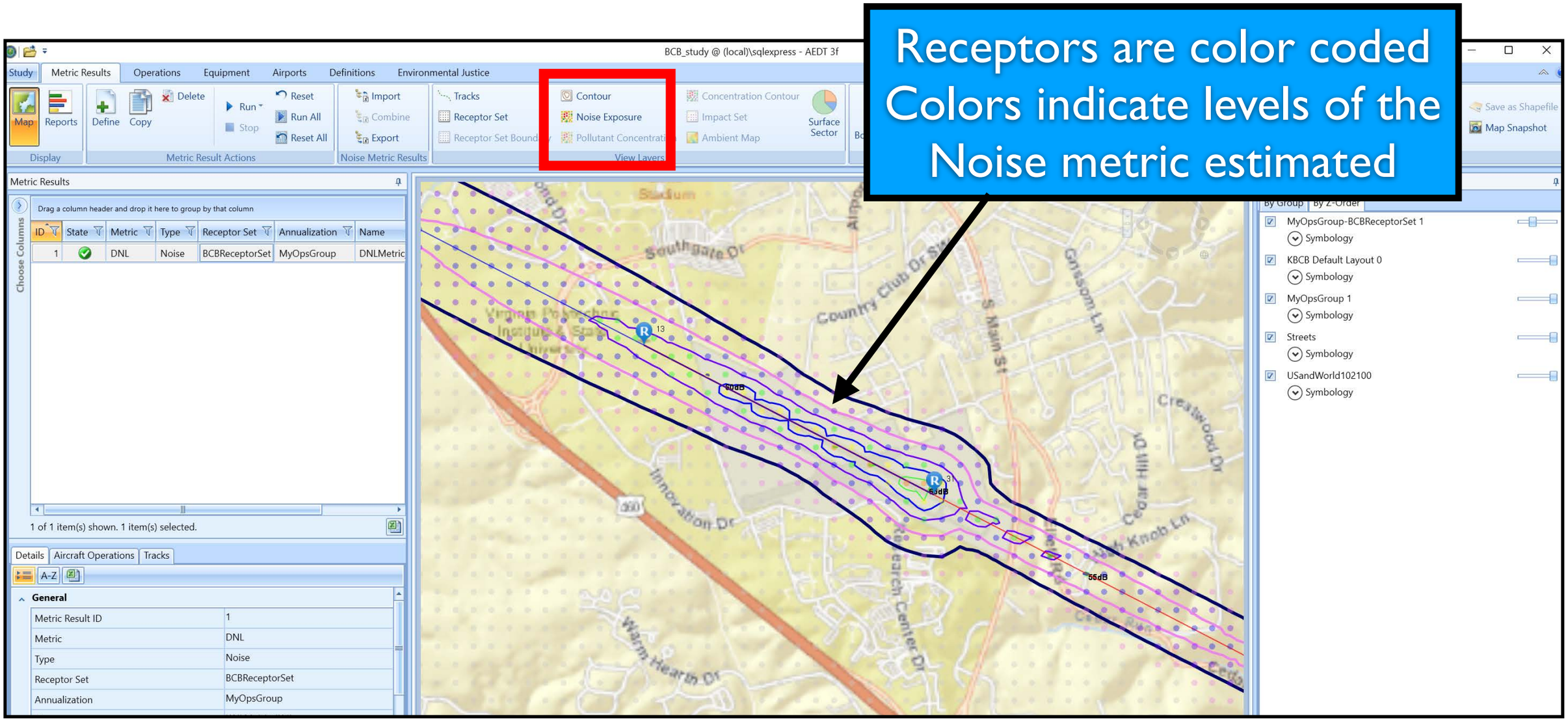
Cumulative ground track Approach Track for Cessna 560XL



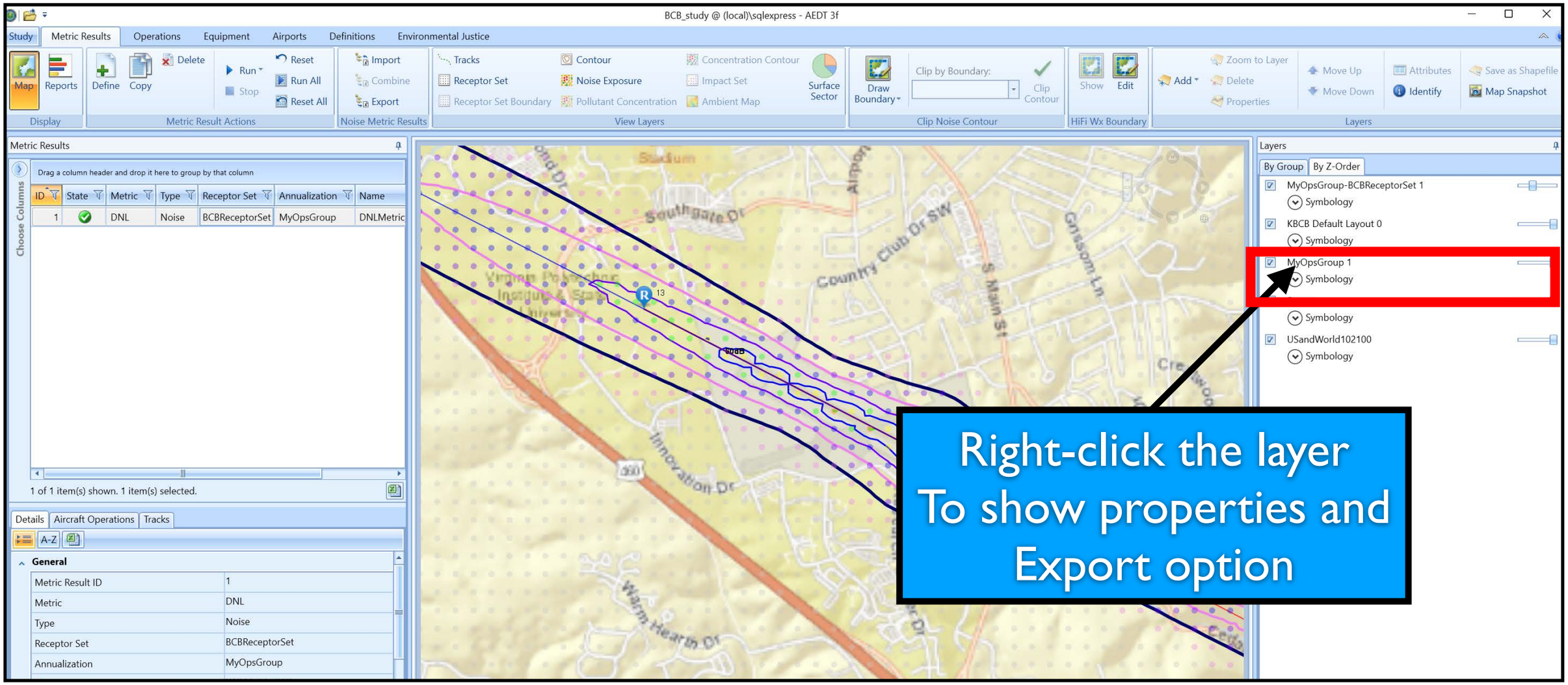
AEDT Reports: Noise Exposure Map

- Detailed report of noise metric at each receptor
- 40,000 receptors in our simple BCB analysis
- DNL reported at each receptor

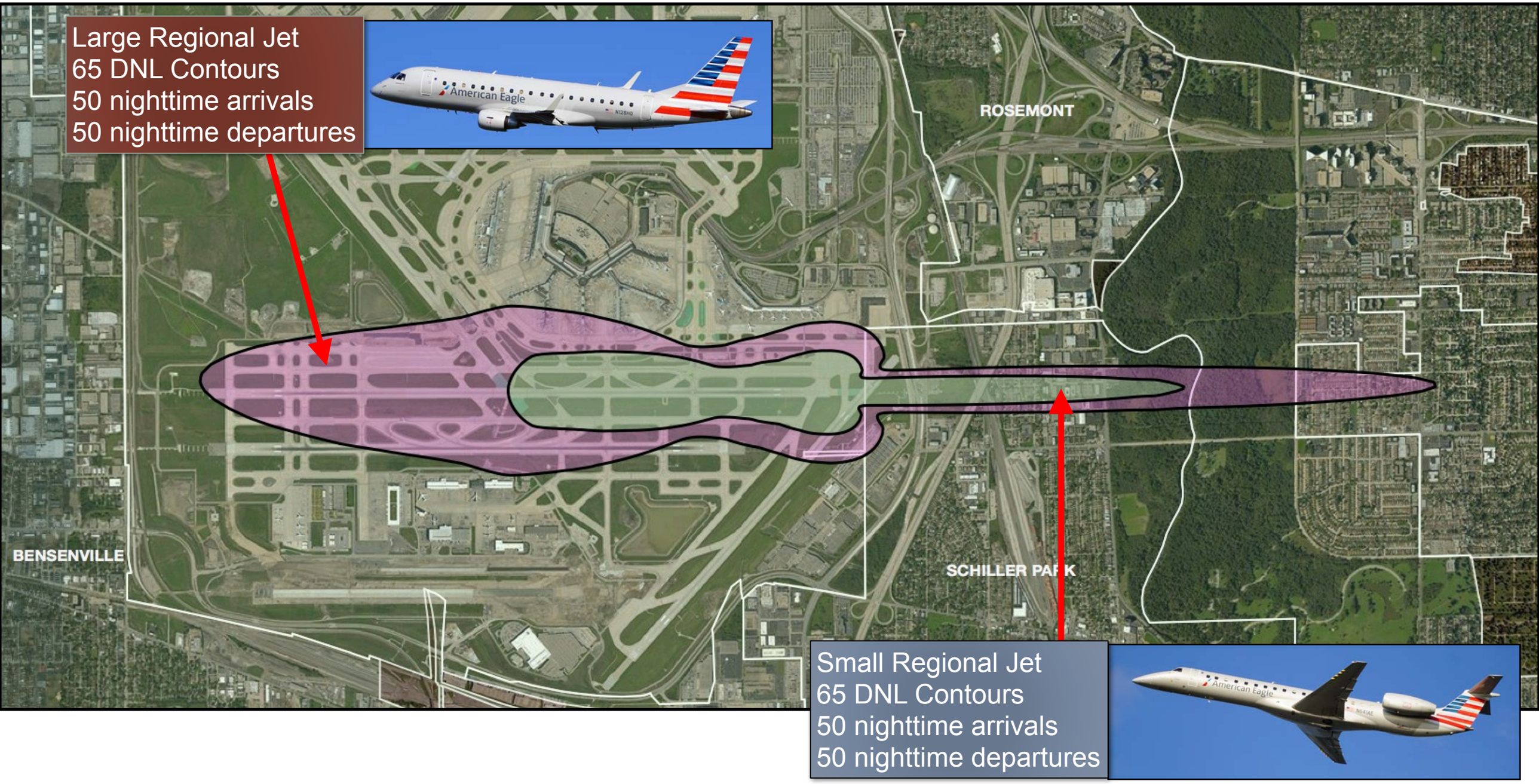


Export Layers to Other Applications

- Layers generated by AEDT can be exported in shape file format to other applications
- Select the layer and right-click to show the properties and export options



Using GIS Software to Manipulate AEDT Layers



Exported shapefiles in Cartographica

Next Steps

- Add details to the airport
  - Taxiways
  - Ground service equipment
  - Other noise sources

- Predict population affected by each contour level
- Predict noise levels at discrete points in the community
  - Churches
  - Schools
  - Hospitals