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Using Databases with Dispersion Modeling: Putting It All Together

Introduction

To take full advantage of the Unitized Emission Rate dispersion modeling technique using a database, there are a series of steps to follow, which are listed below. The steps described are for use in MS Access database file. The steps should be followed in the order given. If you choose to use a database platform other than MS Access, some of the SQL syntax will need to be adjusted.

It is assumed that the user has already created a blank database in Access.

The list of high level tasks are as follows:

- Build SQL statements to create database tables and queries for summarized model results
- Process and import AERMOD PLOTFILE model results to database
- Execute queries to summarize model results

SOP for Building Database Tables:

1. Select the **Create** menu item, then click on the Query Design tool

2. The Show Table dialog will appear. Click the Close button.
3. In the lower right-hand corner of the display, click on the SQL tab
4. The Query1 tabbed form will appear. To create the table tblEPN_Source, copy and paste the following SQL statement:
   CREATE TABLE tblEPN_Source
   (
       EPN varchar(255) NOT NULL PRIMARY KEY,
       source_id varchar(8) NOT NULL
)

5. Click on the Run tool Run to execute the SQL statement. The table should appear in the TOC under Tables ⊞ tblEPN_Source

6. To create the table tblEPN_Emissions, copy and paste the following SQL statement to replace the previous statement:
   CREATE TABLE tblEPN_Emissions
   (
       EPN varchar(255) NOT NULL,
       air_contaminant varchar(255) NOT NULL,

```
    scenario varchar(255) NOT NULL,
    emission_rate varchar(255) NOT NULL,
    rate_units varchar(255) NOT NULL
)
```

7. Click on the Run tool ![Run] to execute the SQL statement. The table should appear in the TOC under Tables.

8. To create the table tblAERMOD_PLOTFILE, copy and paste the following SQL statement to replace the previous statement:

```
CREATE TABLE tblAERMOD_PLOTFILE
(
    FILE_NAME varchar(255) NOT NULL,
    AVG_TIME varchar(255) NOT NULL,
    GRP_NAME varchar(255) NOT NULL,
    YR varchar(255),
    MO varchar(255),
    DY varchar(255),
    HR varchar(255),
    X varchar(255) NOT NULL,
    Y varchar(255) NOT NULL,
    Z varchar(255),
    Zhill varchar(255) NOT NULL,
    Zflag varchar(255) NOT NULL,
    CONC varchar(255) NOT NULL,
    HI_VALUE varchar(255)
)
```

9. Click on the Run tool ![Run] to execute the SQL statement. The table should appear in the TOC under Tables.

The three tables created are the only tables necessary to perform the queries to summarize model results. The next sets of steps is the populate these tables with data.

SOP for populating data tables

1. First, add data to tblEPN_Source. Double click on ▦ tblEPN_Source .
2. Under the EPN field heading, enter the identifier for permit EPNs and the associated source identifier under the source_id field heading. Press enter or return to commit the record to the database.
3. Next, add data to tblEPN_Emissions. Double click on ▦ tblEPN_Emissions

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4. Fill the data in under the appropriate data field. Make sure the EPN values you enter have already been entered into tblEPN_Source. When you enter the value for rate_units, enter either LB/HR or TPY as appropriate.

SOP for Importing Model Results

The import process consists of three steps: Reformat, Import, and Insert. The steps for reformatting the raw data in the PLOTFILE generated by AERMOD consider the use of the utility NKAermodToCSV.

1. Launch the utility by double clicking on the file NKAermodToCSV.exe.
2. You will need to navigate to the directory containing the PLOTFILEs you want to process. Click on the Select button in the upper right portion of the utility interface.
3. Navigate to the directory containing the PLOTFILEs you want to process. Then click OK.
4. All files in the directory will be listed. Select the files to process by clicking the check box next to the file type and file name. The default file type is Plot.
5. After you have clicked the check boxes for all files to process, click on the Create CSV button located across the bottom of the utility interface.
6. When the file processing is complete, a notification dialog box will appear. Click OK to dismiss the dialog.
7. Click the upper right corner of the utility interface (red square with white X) to close the utility.
8. Launch MS Access and open the Access database that contains your project database.
9. In Access, select the External Data menu item, click on the New Data Source icon to expand to menu items. Select From File | Text File. The Get External Data – Text File dialog box will appear
10. Click on the Browse button, then navigate to the CSV file created in Step 5. Click the Open button.
11. In the Import Text Wizard, it should be indicated the file is Delimited. If not, click on the check box next to Delimited. Then click Next.
12. In the next form of the wizard, make sure that Comma is selected as a delimiter. Select " from the Text Qualifier drop down list and check First Row Contains Field Names. Then click Next.
13. In the next form of the wizard, change the Data Type of all fields to Short Text. You have to do this for each field. When done, click Next.
14. On the next wizard form, check No primary key. Then click Next.
15. You should be on the last wizard form. Under Import to Table: change the table name to AERMODOutput_PLT. Then click Finish. When the next form appears, click Close.
16. If no errors were raised during the import process, execute the query qryInsert_tblAERMOD_PLOTFILE by double clicking.

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SOP for Creating Queries for Model Results Summary

The query below performs the calculation of applying the source emission rates to predicted unitized concentrations. The unitized concentrations are based on source emission rates of 1 gram per second (g/sec). If you use a unitized rate of 1 pound per hour (lb/hr), then you will need to replace the conversion factor of 0.1259 with a value of 1 in order for the query to return the appropriate values.

1. Select the **Create** menu item, then click on the Query Design tool

2. The Show Table dialog will appear. Click the Close button.
3. In the lower right-hand corner of the display, click on the SQL tab

4. The Query1 tabbed form will appear. Copy and paste the following SQL statement:

```
SELECT
    ConcSUM_By_XY.air_contaminant,
    ConcSUM_By_XY.scenario,
    ConcSUM_By_XY.AVG_TIME,
    Max(ConcSUM_By_XY.CONC_SUM) AS GLCmax
FROM
    (SELECT
        ConcBySource.air_contaminant,
        ConcBySource.scenario,
        ConcBySource.AVG_TIME,
        ConcBySource.X,
        ConcBySource.Y, Sum(ConcBySource.CONC) AS CONC_SUM
    FROM
        (SELECT
            tblAERMOD_PLOTFILE.FILE_NAME AS OUTPUT_FILE,
            tblAERMOD_PLOTFILE.AVG_TIME,
            tblEPN_Source.EPN,
            tblAERMOD_PLOTFILE.X,
            tblAERMOD_PLOTFILE.Y,
            Switch(
                [tblEPN_Emissions].[scenario]='1-HR',
(0.1259*CDbl([tblAERMOD_PLOTFILE].[CONC])*CDbl([tblEPN_Emissions].[Emission_rate])),
[tblEPN_Emissions].[scenario]='ANNUAL',
(0.1259/4.38*CDbl([tblAERMOD_PLOTFILE].[CONC])*CDbl([tblEPN_Emissions].[Emission_rate]))
                ) AS CONC,
```

```
              tblEPN_Emissions.air_contaminant,
              tblEPN_Emissions.scenario
          FROM
              tblEPN_Emissions
          INNER JOIN
              (tblEPN_Source
          INNER JOIN
              tblAERMOD_PLOTFILE
        ON
              tblEPN_Source.source_id = tblAERMOD_PLOTFILE.GRP_NAME)
        ON
              (tblEPN_Emissions.EPN = tblEPN_Source.EPN) AND
              (tblEPN_Emissions.scenario = tblAERMOD_PLOTFILE.AVG_TIME)
          WHERE
              tblEPN_Emissions.scenario ='1-HR')  AS ConcBySource
          GROUP BY
              ConcBySource.air_contaminant,
              ConcBySource.scenario,
              ConcBySource.AVG_TIME,
              ConcBySource.X,
              ConcBySource.Y)  AS ConcSUM_By_XY
      GROUP BY
          ConcSUM_By_XY.air_contaminant,
          ConcSUM_By_XY.scenario,
          ConcSUM_By_XY.AVG_TIME;
```

5. To save the query, select the menu item File | Save. The query as qryGLCmax_ESL_GENERIC.

6. Click on the Run tool [!Run] to execute the SQL statement.

Depending upon how may emission sources, air contaminants, and receptors are included in your project, the query above may take a few minutes to return results.