Using and Improving NEI Data for Residual Risk and Technology Review (RTR) Projects

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Objectives

- Review statutory background – section 112 of CAA
- General approach and review the RTR process
- Identify data issues
- Review source category examples
- Summary of overall data changes
- Data change effects on residual risk
Statutory Background –
Section 112 MACT Program

- Residual risk assessment under CAA section 112(f)(2)
  - Assess the risk remaining (residual risk) after application of MACT standards and promulgate more stringent standards for a source category if necessary to protect public health with an ample margin of safety or to prevent adverse environmental effects, 8 years after promulgation of original MACT

- Technology review under CAA section 112(d)(6)
  - Review and revise MACT standards as necessary taking into account developments in practices, processes, and control technologies, every 8 years
Background on Approach

- NEI database – used as the starting point for inputs to the risk modeling, using HEM-3
- Currently conducting analysis for source categories with MACT compliance dates of 2002 and earlier
- Source categories divided into phases (Phase I and Phase II); and Phase II further divided into groups (Groups 1, 2, 3)
<table>
<thead>
<tr>
<th>Phase I - Completed</th>
<th>Phase II, Group 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke Ovens</td>
<td>Gasoline Distribution</td>
</tr>
<tr>
<td>Dry Cleaning</td>
<td>Ethylene Oxide Sterilizers</td>
</tr>
<tr>
<td>Industrial Cooling Towers</td>
<td>Magnetic Tape</td>
</tr>
<tr>
<td>HON</td>
<td>Halogenated Solvents</td>
</tr>
<tr>
<td><strong>Phase II, Group 3</strong></td>
<td></td>
</tr>
<tr>
<td>Acrylic and Modacrylic Fibers</td>
<td>Primary Lead Smelting</td>
</tr>
<tr>
<td>Chrome Electroplating (3 subcategories)</td>
<td>Publicly Owned Treatment Works</td>
</tr>
<tr>
<td>Ferroalloys Production</td>
<td>Pulp and Paper Production</td>
</tr>
<tr>
<td>Flexible Polyurethane Foam</td>
<td>Secondary Aluminum Production</td>
</tr>
<tr>
<td>Off-site Waste and Recovery</td>
<td>Secondary Lead Smelting</td>
</tr>
<tr>
<td>Phosphoric Acid/ Phosphoric Fertilizer Prod</td>
<td>Steel Pickling—HCl Process</td>
</tr>
<tr>
<td>Polycarbonates Production</td>
<td>Wood Furniture</td>
</tr>
<tr>
<td>Polyether Polyols Production</td>
<td>Wool Fiberglass</td>
</tr>
<tr>
<td><strong>Group 2B</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Group 2C</strong></td>
<td></td>
</tr>
<tr>
<td>Primary Aluminum Reduction</td>
<td></td>
</tr>
</tbody>
</table>
RTR Data Process – Show Me the Data!

- Conduct engineering review of NEI data
  - Included additional project data, if available and appropriate
  - Create ANPRM* data set
- Release of ANPRM to request public comments
  - Comments from State/local agencies and industry
  - Received revisions to emissions, facilities and facility names, MACT codes, stack parameters, and coordinates
  - Create NPRM data set
- Proposal and Promulgation of risk determination and standards
  - Residual risk analysis based on NPRM data set

(*ANPRM: Advanced Notice of Proposed Rule Making)
ANPRM Data Requests

Input on Source Category Representation
Names and addresses for facilities
- Which should be included but are not
- Which should not be included
- Identify area sources and provide documentation

Facility-Specific and Emissions-Point-Specific Data
Facility location and identification
- Facility name
- Facility address
- Facility category code (major or area source)

Emission point data
- SCC and MACT codes
- Emissions of each HAP, ton per year (tpy)
- Emissions-release point type (e.g., fugitive, vertical, horizontal, gooseneck, vertical with raincap, downward facing vent)
- Emissions-release characteristics (e.g., stack height, stack diameter, exist gas temperature, velocity, flow rate)
- Emissions point latitude and longitude coordinates

Data characteristics
- Acute emissions factors
- Speciation of metal HAPs and polycyclic organic matter
- HAP emissions performance level (i.e., actual, allowable, maximum)
Data Issues

- Are the correct facilities included in the source category and can Industry identify their facilities in the dataset?
- Are the correct emissions units included in the source category and can Industry identify emissions units within their facilities?
- How are data handled for facilities subject to multiple MACT rules?
- Are assumptions for HAP speciation correct?
- Do the emissions represent actuals or allowables?
- How will data be augmented when facilities are missing and when anticipated HAP are missing from units within a facility?
- How will EPA address incomplete control technique information?
- How to group SCCs together under source category emissions units?
Are the correct facilities included in the source category?

Petroleum Refineries

Petroleum Refining Source Category MACT1 – Dropped Facilities

<table>
<thead>
<tr>
<th>NEISiteID</th>
<th>FacilityName</th>
<th>City</th>
<th>State</th>
<th>Reason for Deleting</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEI12419</td>
<td>NEDERLAND MARINE TERMINAL</td>
<td>NEDERLAND</td>
<td>TX</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEI21174</td>
<td>CENCO OIL</td>
<td>SANTA FE SPRINGS</td>
<td>CA</td>
<td>Closed 1995</td>
</tr>
<tr>
<td>NEI24425</td>
<td>CONOCOPHILLIPS - SANTA MARIA</td>
<td>SANTA MARIA</td>
<td>CA</td>
<td>Not a Refinery</td>
</tr>
<tr>
<td>NEI39879</td>
<td>RIVERHEAD TERMINAL-CONOCOPHILLIPS</td>
<td>RIVERHEAD</td>
<td>NY</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEI40622</td>
<td>BP WEST COAST PRODUCTS, LLC</td>
<td>PORTLAND</td>
<td>OR</td>
<td>Not a Refinery</td>
</tr>
<tr>
<td>NEI46497</td>
<td>CHEVRON PHILLIPS CHEMICAL PUERTO RICO CORE INC.</td>
<td>GUAYAMA</td>
<td>PR</td>
<td>p-xylene manuf; closed 2002</td>
</tr>
<tr>
<td>NEIAR1070110</td>
<td>TE PRODUCTS PIPELINE COMPANY</td>
<td>HELENA</td>
<td>AR</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEICA03713</td>
<td>ARCO PRODUCTS CO. MARINE TERMINAL</td>
<td>LONG BEACH</td>
<td>CA</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEIDE0050093</td>
<td>MARITRANS</td>
<td>DELAWARE BAY</td>
<td>DE</td>
<td>Not a Refinery</td>
</tr>
<tr>
<td>NEIN371</td>
<td>MARATHON ASHLAND PET., CLARKSVILLE TERM.</td>
<td>CLARKSVILLE</td>
<td>IN</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEILA13809</td>
<td>UNION CARBIDE/TAFT &amp; STAR</td>
<td>HAHNVILLE</td>
<td>LA</td>
<td>Chemical Plant</td>
</tr>
<tr>
<td>NEINY2640500</td>
<td>EXXONMOBIL - PORT MOBIL TERMINAL</td>
<td>STATEN ISLAND</td>
<td>NY</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEIPA2125</td>
<td>GULF OIL LIMITED PARTNERSHIP NEVILLE IS</td>
<td>PITTSBURGH</td>
<td>PA</td>
<td>Not a Refinery</td>
</tr>
<tr>
<td>NEIPA2136</td>
<td>MOTIVA ENTERPRISES LLC</td>
<td>CORAPOPOLIS, PA</td>
<td>PA</td>
<td>Terminal</td>
</tr>
<tr>
<td>NEIWV0730002</td>
<td>ST. MARYS REFINING COMPANY</td>
<td>ST. MARYS</td>
<td>WV</td>
<td>Terminal</td>
</tr>
</tbody>
</table>
Are the correct facilities included in the source category?

Marine Vessel Loading

- Public comment: “San Bernard Terminal Dock No. 1” with NEI number “NEI3TX48039San” in Sweeny, TX, address of “CR 372 at San Bernard River” renamed to “ConocoPhillips San Bernard Terminal Dock No. 1”
  - Looked at all facilities in ANPRM dataset in Brazoria Co. TX: Not in ANPRM dataset?
  - NEITXT$11613—ConocoPhillips San Bernard Terminal; Sweeny, TX; CR 372
  - NEI2TX139—San Bernard Terminal; Sweeny, TX; end of CR 321, on Ave. A (CR 372) 2
  - NEI6519—ConocoPhillips Sweeny; Old Ocean, TX; Hwy 35 and 524 at Old Ocean
How are data handled for facilities subject to multiple MACT rules?

**Petroleum Refineries**

- Petroleum Refining MACT 1 (MACT Code 0503)
  - Thermal cracking
  - Vacuum distillation
  - Crude distillation
  - Hydrotreating
  - Hydrorefining
  - Isomerization
  - Polymerization
  - Lube oil processing
  - Hydrogen production
  - Fugitive emissions and Equipment Leak emissions from FCCU, CRU, and SRU would be covered here
  - etc.

- Petroleum Refining MACT 2 (MACT Code 0502)
  - Catalytic cracking units (FCCU)
  - Catalytic reforming units (CRU)
  - Sulfur plant units (SRU)
Are assumptions for HAP speciation correct?  
Wool Fiberglass

- Cr emitted from deterioration of Cr refractories
- Cr test data available from state agency showed 100% Cr 6+
- Used worse case speciation profile at 100% Cr 6+ (applied for generically-reported Cr cpds)
- Currently preparing ANPRM dataset
Are assumptions for HAP speciation correct?
Aerospace Manufacturing and Rework

- Cr emitted from source category; 61 facilities of 137 facilities reported Cr or Cr cpds emissions
- In ANPRM, assumed 25% Cr 6+ (based on information from 1 facility)
- Public comments ranged from 0% to 100% Cr 6+
- EPA reviewed and confirmed the 25% Cr 6+ (applied for generically-reported Cr cpds)
Do the emissions represent actuals or allowables?

Mineral Wool Production

- MACT std has Emissions Factor format:
  - 0.1 lb PM/ton melt
  - 0.06 lb Formaldehyde/ton melt

- Emissions test data available; calculated “average” emissions levels for the industry
  - 0.044 lb PM/ton melt
  - 0.038 lb Formaldehyde/ton melt

- Compared the average “actual” emissions levels for the industry to the MACT limits.
  - PM: 0.1 / 0.044 = 2.3; so MACT allowable PM emission rate is $2.3x$ higher than avg emissions
  - Formaldehyde: 0.06 / 0.038 = 1.6; so MACT allowable Formaldehyde emission rate is $1.6x$ higher than avg emissions

- Estimate allowables at ~$2x$ higher than actuals
Do the emissions represent actuals or allowables?

Aerospace Manufacturing and Rework

- One facility with markedly higher emissions – \(40\times\) higher than next closest facility
- Reviewed permit, TRI data, and contacted the facility
- “Allowable,” but back-calculated from a fenceline ambient concentration limit by modeling – gave an unrealistic even implausible allowable level
  - At maximum production, 365 d/yr, not reach these levels
- Worked with facility to provide more realistic emissions levels
What to do about missing data or missing HAP?

Pulp and Paper MACT II

- Expect Cd and Hg emissions from all facilities but only reported from a few facilities
- Power boilers, recovery furnaces, smelt dissolving tanks (SDT), lime kilns, and other combustion sources
- Identified units by SCCs that were missing Cd and Hg
- Used AP-42 emissions factors, NCASI emissions factors along with activity levels to estimate emissions.
- Used average EF and worse-case EF depending on information on specific type of source
What to do about missing data or missing HAP?

Wool Fiberglass

- Expect HAP metals emissions (As, Cr, etc.) and MeOH emissions from all facilities but only reported from about half of facilities
- Developed overall source category factors based on those facilities that did report specific HAP
  - Summed emissions and developed ratio
  - Cr: 0.35 ton Cr/3,434 ton PM10: 0.0001019 ton Cr/ton PM10
  - MeOH: 1,132 ton MeOH/337 ton Formald. = 3.36 ton MeOH/ton Formald.
What to do about incomplete control technique information?

Marine Vessel Loading

- Question about control level at St. Linden Terminal in Linden, NJ:
  - NEI facility ID of NEINJ030093
  - Address of “South Wood Avenue”
  - APC_ID field is “Unknown”
- No facility contact information given in NEI
- No listing of facility found; Looked at state permit site for NJ DEP for all facilities in Union County
- Contacted facility and they confirmed “Controlled”
# All facilities in Union County NJ – Find St. Linden MVL Terminal

<table>
<thead>
<tr>
<th>PI Number</th>
<th>Facility Name</th>
<th>Facility Address</th>
<th>Facility City</th>
</tr>
</thead>
<tbody>
<tr>
<td>40192</td>
<td>NEW YORK TERMINALS LLC</td>
<td>534 SOUTH FRONT ST</td>
<td>ELIZABETH</td>
</tr>
<tr>
<td>40608</td>
<td>PORT AUTHORITY OF NEW YORK &amp; NEW JERSEY</td>
<td>NEWARK INTERNATIONAL AIRPORT</td>
<td>NEWARK</td>
</tr>
<tr>
<td>41738</td>
<td>SUPPORT TERMINAL OPERATING PARTNERSHIP LP</td>
<td>EXXONMOBIL REFINING &amp; SUPPLY COMPANY</td>
<td>LINDEN</td>
</tr>
<tr>
<td>41766</td>
<td>TUSCAN DAIRY FARMS</td>
<td>750 UNION AVE</td>
<td>UNION</td>
</tr>
<tr>
<td>41767</td>
<td>INFINEUM USA LP - BAYWAY CHEMICAL PLANT</td>
<td>Corner of Park &amp; Brunswick Avenues</td>
<td>Linden</td>
</tr>
<tr>
<td>41780</td>
<td>BUCKEYE PIPE LINE CO LINDEN STATION</td>
<td>BUCKEYE PIPE LINE COMPANY LP</td>
<td>LINDEN</td>
</tr>
<tr>
<td>41799</td>
<td>ST LINDEN TERMINAL LLC INLAND FACILITY</td>
<td>4501 TREMLEY PT RD</td>
<td>LINDEN</td>
</tr>
<tr>
<td>41800</td>
<td>ST LINDEN TERMINAL LLC SHORESIDE FACILITY</td>
<td>4501 TREMLEY PT RD</td>
<td>LINDEN</td>
</tr>
<tr>
<td>41801</td>
<td>GULF OIL LTD PARTNERSHIP LINDEN TERMINAL</td>
<td>2600 MARSHES DOCK RD</td>
<td>LINDEN</td>
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<tr>
<td>41802</td>
<td>INTERBAKE FOODS INC</td>
<td>891 NEWARK AVE</td>
<td>ELIZABETH</td>
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<tr>
<td>41803</td>
<td>CITGO PETROLEUM CORP LINDEN TERMINAL</td>
<td>4801 SOUTH WOOD AVE</td>
<td>LINDEN</td>
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<tr>
<td>41805</td>
<td>CONOCO PHILLIPS</td>
<td>1400 Park Ave</td>
<td>Linden</td>
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</table>
### Overall Summary of ANPRM Data Changes – Phase II, Group 1

<table>
<thead>
<tr>
<th>MACT Code</th>
<th>MACT Source Category</th>
<th>Original Number of Facilities</th>
<th>Revised Number of Facilities</th>
<th>Original Emissions (total tons)</th>
<th>Revised Emissions (total tons)</th>
<th>Percentage of Change in Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1301</td>
<td>GMACT—Acetal Resins Production</td>
<td>3</td>
<td>3</td>
<td>38.48</td>
<td>38.48</td>
<td>0.00%</td>
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<tr>
<td>1307</td>
<td>Polymers and Resins I—Butyl Rubber Production</td>
<td>2</td>
<td>2</td>
<td>502.0</td>
<td>502.0</td>
<td>0.00%</td>
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<tr>
<td>1312</td>
<td>Polymers and Resins II—Epoxy Resins Production</td>
<td>3</td>
<td>4</td>
<td>15.47</td>
<td>15.59</td>
<td>0.77%</td>
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<tr>
<td>1313</td>
<td>Polymers and Resins I—Ethylene–Propylene Rubber Production</td>
<td>5</td>
<td>5</td>
<td>1,067</td>
<td>1,062</td>
<td>-0.47%</td>
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<tr>
<td>1409</td>
<td>GMACT—Hydrogen Fluoride Production</td>
<td>2</td>
<td>2</td>
<td>5.48</td>
<td>5.48</td>
<td>0.00%</td>
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<tr>
<td>1320</td>
<td>Polymers and Resins I—Neoprene Production</td>
<td>1</td>
<td>1</td>
<td>289.1</td>
<td>138.9</td>
<td>-52%</td>
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<tr>
<td>1322</td>
<td>Polymers and Resins II—Non-Nylon Polyamides Production</td>
<td>4</td>
<td>4</td>
<td>6.37</td>
<td>6.37</td>
<td>0.00%</td>
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# Overall Summary of ANPRM Data Changes – Phase II, Group 2

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<th>MACT Code</th>
<th>MACT Source Category</th>
<th>Original Number of Facilities</th>
<th>Revised Number of Facilities</th>
<th>Original Emissions (total tons)</th>
<th>Revised Emissions (total tons)</th>
<th>Percentage of Change in Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0701</td>
<td>Aerospace Industries</td>
<td>301</td>
<td>267</td>
<td>2,337</td>
<td>1,509</td>
<td>-35%</td>
</tr>
<tr>
<td>0603</td>
<td>Marine Vessel Loading</td>
<td>126</td>
<td>135</td>
<td>256.0</td>
<td>248.1</td>
<td>-3.1%</td>
</tr>
<tr>
<td>0409</td>
<td>Mineral Wool Production</td>
<td>12</td>
<td>8</td>
<td>509.1</td>
<td>430.8</td>
<td>-15%</td>
</tr>
<tr>
<td>0504</td>
<td>Natural Gas Transmission and Storage</td>
<td>123</td>
<td>123</td>
<td>273.2</td>
<td>330.5</td>
<td>21%</td>
</tr>
<tr>
<td>0501</td>
<td>Oil and Natural Gas Production</td>
<td>2,823</td>
<td>5,463</td>
<td>10,515</td>
<td>13,737</td>
<td>31%</td>
</tr>
<tr>
<td>0503</td>
<td>Petroleum Refineries</td>
<td>153</td>
<td>152</td>
<td>8,510</td>
<td>5,717</td>
<td>-33%</td>
</tr>
<tr>
<td>1201</td>
<td>Pharmaceutical Production</td>
<td>222</td>
<td>27</td>
<td>2,465</td>
<td>1,051</td>
<td>-57%</td>
</tr>
<tr>
<td>1311</td>
<td>Polymers and Resins I—Epichlorohydrin Elastomers Production</td>
<td>1</td>
<td>1</td>
<td>105.5</td>
<td>105.5</td>
<td>0.00%</td>
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<tr>
<td>1315</td>
<td>Polymers and Resins I—Hypalon Production</td>
<td>1</td>
<td>1</td>
<td>32.00</td>
<td>30.60</td>
<td>-4.4%</td>
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<tr>
<td>1321</td>
<td>Polymers and Resins I—Nitrile Butadiene Rubber Production</td>
<td>4</td>
<td>5</td>
<td>82.91</td>
<td>50.57</td>
<td>-39%</td>
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<tr>
<td>1325</td>
<td>Polymers and Resins I—Polybutadiene Rubber Production</td>
<td>5</td>
<td>4</td>
<td>2,311</td>
<td>1,992</td>
<td>-14%</td>
</tr>
<tr>
<td>1339</td>
<td>Polymers and Resins I—Styrene-Butadiene Rubber/Latex Production</td>
<td>15</td>
<td>14</td>
<td>351.8</td>
<td>306.9</td>
<td>-13%</td>
</tr>
</tbody>
</table>
Risky Business

- How did we perform the risk assessment for RTR?
  - Inhalation Assessment
    - Utilizes Human Exposure Model 3 (HEM3)
  - Multipathway/Ecological Assessment
    - Utilize TRIM Screen Model
Facility HEM-3
Tool for Human Exposure Modeling
Version 1.2.0 Beta

Prepared for:
Risk and Exposure Assessment Group
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared by:
EC/R Incorporated
6330 Quadrangle Drive, Suite 326
Chapel Hill, NC 27517

EPA Contract 68-D-01-071

Available at:
http://www.epa.gov/ttn/fera/human_hem.html
RTR: HEM3 Summary

- Based on EPA’s AERMOD (07026)
  - Gaussian plume model
  
  \[
  C = \frac{Q}{2\pi \sigma_y(x) \sigma_z(x) u} \left[ e^{-\frac{y^2}{2\sigma_y(x)^2}} - \frac{(z-h)^2}{2\sigma_z(x)^2} + e^{-\frac{(z+h)^2}{2\sigma_z(x)^2}} \right]
  \]

- $Q$= emission rate and $H$ is plume release height and $X$ is downwind distance

- Run for each facility in source category to predict both chronic & acute; cancer & noncancer risks
- Receptors based on 2000 census blocks
- Meteorological data selected for each facility

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RTR: Inhalation Assessment Results

- **Chronic**
  - Maximum Individual Risk (MIR) - highest risk at a census block centroid (cancer & noncancer)
  - Cancer incidence
  - Cancer risk distributions

- **Acute**
  - Maximum off-site impact – highest of census block and polar grid receptors

- **Population risk levels**
  - Facility and source category cancer incidence levels
RTR: Multipathway and Ecological Screening

- Iterative process for source categories emitting PBT-HAPS
  - Cadmium compounds
  - Chlordane
  - Chlorinated dibenzodioxins and furans
  - DDE
  - Heptachlor
  - Hexachlorobenzene
  - Hexachlorocyclohexane (all isomers)
  - Lead compounds
  - Mercury compounds
  - Methoxychlo
  - Polychlorinated biphenyls
  - Polycyclic organic matter
  - Toxaphene
  - Trifluralin

- TRIM model (multipathway) in screening mode
- TRIM model in refined mode
How does the inventory effect risk?

- Amount of specific HAP compounds emitted (Q)
  - Concentration (and risk) is directly proportional to the emission rate

- Emission release point/stack coordinates (x)
  - Concentration is inversely proportional to plume travel distance

- Stack parameters: height, diameter, exit gas temperature, exit gas velocity, exit gas flow rate. (h)
  - Concentration is inversely proportional to plume release elevation (physical plume height and plume rise)

- Area Source parameter: width, length, height of area source
  - Concentration is inversely proportional to surface area
Plume concentration as a function of release height and downwind distance

Ground Level Concentration (ug/m³) vs. Downwind Distance (meters)

- Release Height (m)
  - 0
  - 1
  - 2
  - 3
  - 4
  - 5
  - 10
  - 20
  - 30
Source Location Example 1

MIR:
Location A = 100 in a million
Location B = 5 in a million
Source Location Example 2

MIR:
Location A = 1000 in a million
Location B = 4000 in a million