

Missouri's Air Toxics Program

November 2023

Joshua Garlock – Consultant



trinityconsultants.com



Agenda

1. Toxics & Air Permitting
2. The Meaning of Risk Assessment Levels
3. What if your model doesn't pass?
4. Summary and Takeaways

Introduction: Toxics & Air Permitting

Permitting Thresholds

- ▶ We normally think of two thresholds:
 - DeMinimis – 10 CSR 10-6.060(1)(A)
 - Insignificant – 10 CSR 10-6.061(3)(A)(3)

Pollutant (Note 1)	Insignificant Levels (lbs/hour) (Note 2)	Regulatory <i>De Minimis</i> Levels/ Federal Significance Levels (tons per year)
PM ₁₀	1.0	15
PM _{2.5}		10
SO _x	2.75	40
NO _x	2.75	40
VOC	2.75	40
CO	6.88	100
HAPs	0.5 (Note 3)	10/25



Permitting Thresholds

- ▶ What potential-to-emit do you compare against the SMAL?
- ▶ For a new facility, look at site-wide PTE.
- ▶ For an existing facility:
 - Evaluate HAPs just like any other pollutant.
 - Account for the increase in PTE from your project.
 - ◆ New equipment?
 - ◆ Downstream effects?
 - ◆ De-Bottlenecking?

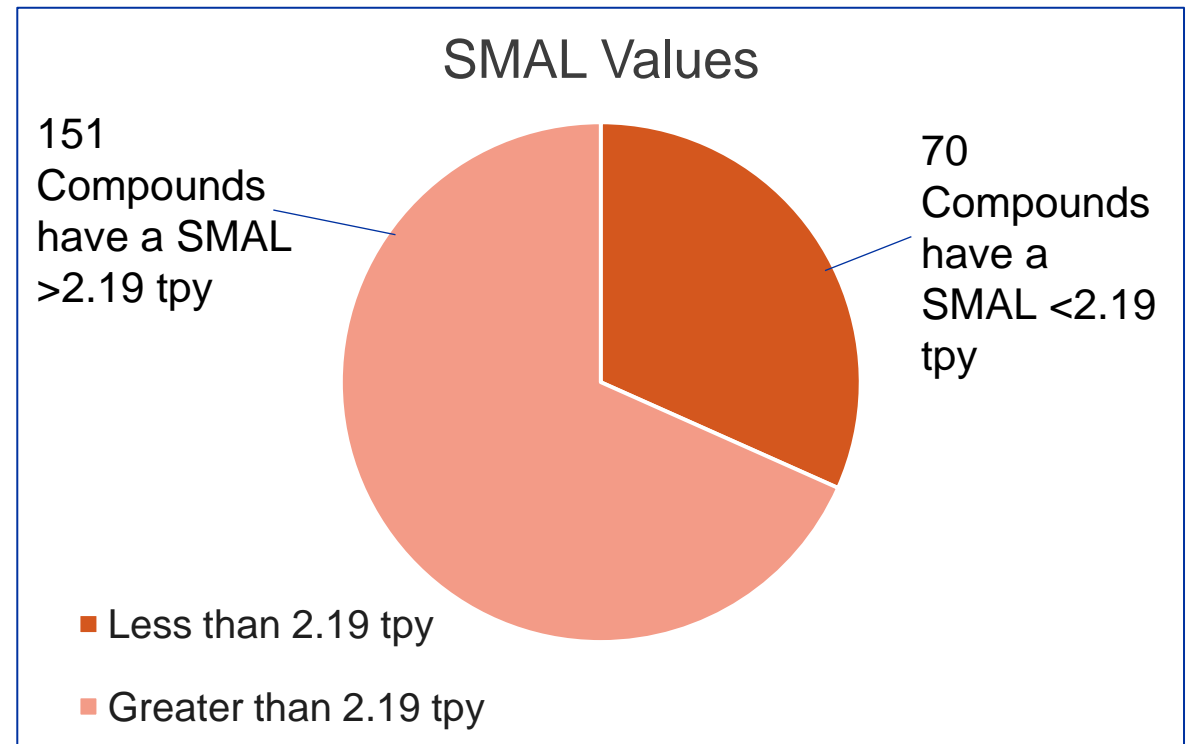
Permitting Thresholds

Note 3: The insignificance level indicated is a general value. This exemption may not apply to a HAP with an annual emission rate that exceeds its screening model action level as established in subsection (12)(J) of 10 CSR 10-6.060.

- ▶ 10 CSR 10-6.060(2)(T): Screening model action levels (SMALs)—
The emission threshold of an individual hazardous air pollutant (HAP) or HAP group that triggers the need for an air quality analysis of the individual HAP.
- ▶ 10 CSR 10-6.060(3)(I): Final Permit Issuance: Any installation subject to this rule will be issued a permit and be in effect if all of the following conditions are met: ... 6. The installation will not exceed the RALs required for all pollutants that exceed the SMALs;

What does this mean?

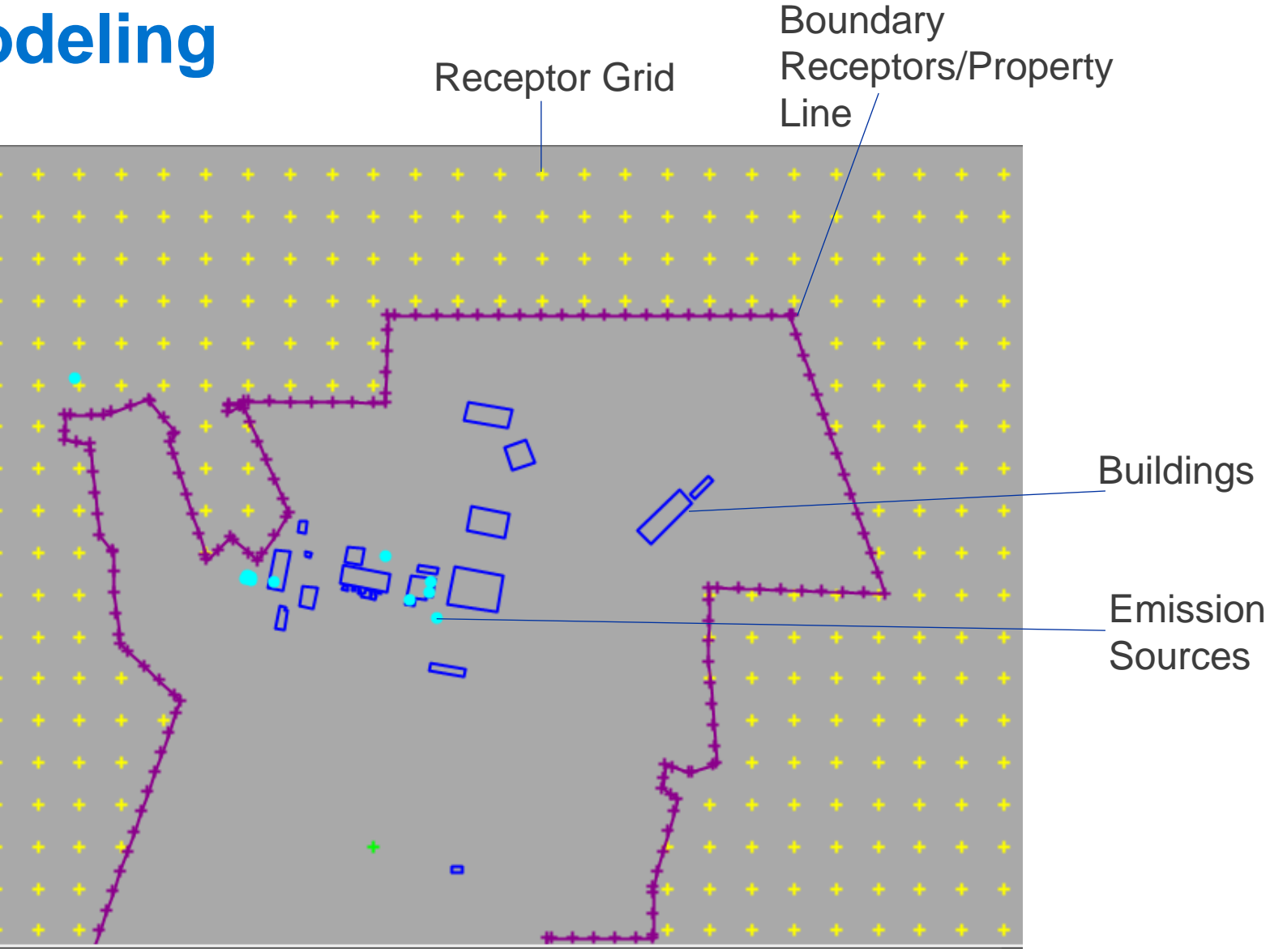
- ▶ Some compounds have extremely low SMALs
- ▶ For reference, the insignificant level of 0.5 lb/hour is equivalent to 2.19 tons per year
- ▶ A few examples:
 - Acrolein: 0.04 tpy
 - Benzene: 2 tpy
 - Dioxins/Furans: 6.0E-7 tpy
 - Ethylene Oxide: 0.1 tpy
 - Lead Compounds: 0.1 tpy



What Happens Next?

- ▶ For projects above the SMAL, perform an air quality analysis
- ▶ In most instances, accomplished with AERMOD modeling
- ▶ If the model demonstrates concentrations below the following, then it “passes”:
 - less than 4% of the Risk Assessment Level (RAL) for the project by itself OR
 - less than the RAL(s) when plant-wide potential emissions of the toxic are considered
- ▶ RALs can have multiple averaging periods
- ▶ Example:
 - Acrolein: 24-hour RAL of $6.9 \mu\text{g}/\text{m}^3$, Annual RAL of $0.02 \mu\text{g}/\text{m}^3$

Modeling



MDNR's SMAL/RAL Table



**Air Pollution Control Program
Table of Hazardous Air Pollutants, Screening Model Action Levels,
and Risk Assessment Levels**

Chemical	CAS #	SMAL (tons/yr)	8-HR RAL ($\mu\text{g}/\text{m}^3$)	24-HR RAL ($\mu\text{g}/\text{m}^3$)	Annual RAL ($\mu\text{g}/\text{m}^3$)	10x Annual RAL ($\mu\text{g}/\text{m}^3$)	Group ID	VOC	PM	Synonyms
ACETALDEHYDE	75-07-0	9		2	0.5	5		Y	N	ACETIC ALDEHYDE, ALDEHYDE, ETHANAL, ETHYL ALDEHYDE
ACETAMIDE	60-35-5	1						Y	N	ACETIC ACID AMIDE, ETHANAMIDE
ACETONITRILE	75-05-8	4	933.33					Y	N	METHYL CYANIDE, ETHANENITRILE, CYANOMETHANE
ACETOPHENONE	98-86-2	1						Y	N	ACETYL BENZENE, METHYL PHENYL KETONE AND HYPNONE
ACETYLAMINOFLUORINE, [2-]	53-96-3	0.005					V	Y	Y	N-2-FLUORENYL ACETAMIDE, N-FLUOREN-2-YL ACETAMIDE, 2-ACETAMIDOFUORENE
ACROLEIN	107-02-8	0.04		6.9	0.02			Y	N	ACRYLALDEHYDE, ACRYLIC ALDEHYDE, ALLYL ALDEHYDE, PROPENAL
ACRYLAMIDE	79-06-1	0.02	0.0533					Y	N	PROPENAMIDE, ACRYLIC AMIDE, ACRYLAMIDE MONOMER, ETHYLENOCARBOXAMIDE
ACRYLIC ACID	79-10-7	0.6	80					Y	N	PROPENOIC ACID, ETHYLENE CARBOXYLIC ACID, VINYLFORMIC ACID

The Meaning of Risk Assessment Levels

RAL?

- ▶ 10 CSR 10-6.060(2)(S): Risk assessment levels (RALs)—Ambient concentrations of air toxics that are not expected to produce adverse cancer and noncancer health effects during a defined period of exposure. The RALs are based upon animal toxicity studies, human clinical studies, and human epidemiology studies that account for exposure to sensitive populations such as the elderly, pregnant women, children, and those having respiratory illness such as asthma.



How are RALs Derived?

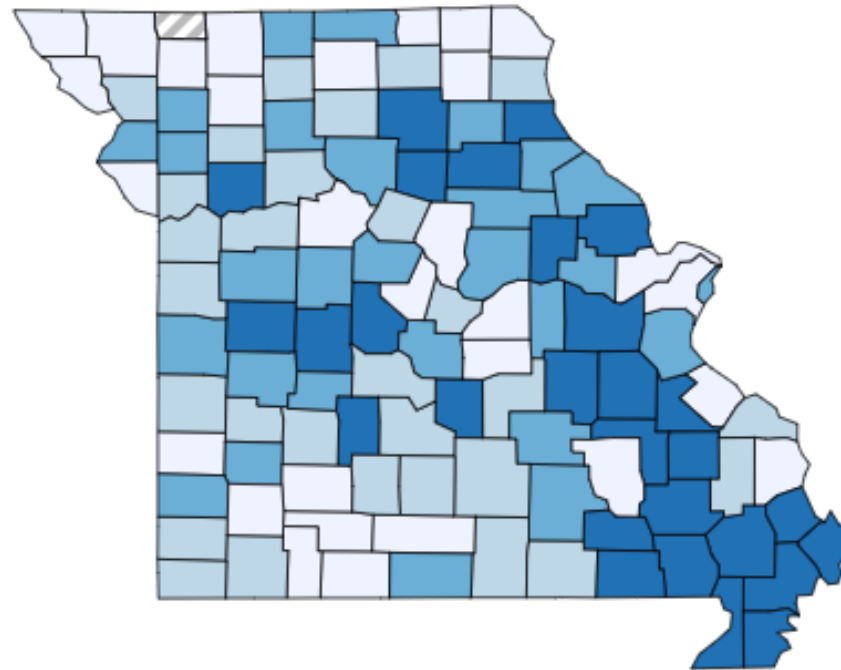
- ▶ MDNR utilizes data available from EPA's Integrated Risk Information System (IRIS) to set RALs and SMALs.
- ▶ IRIS provides assessments of the health hazards of various chemicals.
- ▶ Specifically, IRIS derives Reference Concentrations (RfC) for chemicals.
- ▶ RfC: An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

How are RALs Derived?

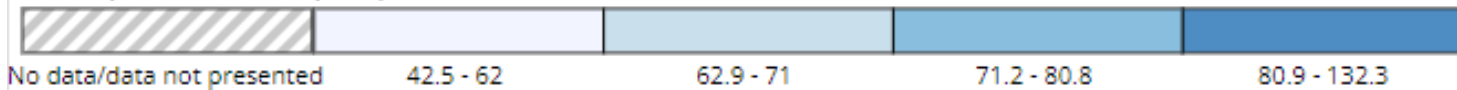
- ▶ Note for 10x Annual RAL in MDNR's SMAL/RAL Table: EPA guidance (EPA-453/R-99-001, March, 1999) recommends that the HAPs whose cancer risk is due to chronic exposure (70-year lifetime exposure) must meet a lifetime cancer risk level in the range of 1-in-10,000 to 1-in-1,000,000. The Air Pollution Control Program allows a lifetime cancer risk level of 1-in-100,000 which corresponds to a maximum exposure level of 10 times the annual RAL.

Rate of New Cancers in Missouri

Lung and Bronchus, All Ages, All Races and Ethnicities, Male and Female, 2016-2020
Rate per 100,000 people



Rate per 100,000 people

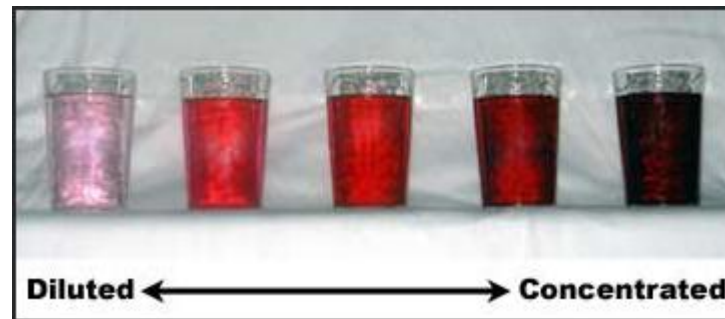


IRIS and Risk Assessment

- ▶ IRIS provides two steps in risk assessment:
 - Hazard Identification, which identifies credible health hazards associated with exposure to a chemical, and
 - Dose-Response Assessment, which characterizes the quantitative relationship between chemical exposure and each credible health hazard. These quantitative relationships are then used to derive toxicity values.



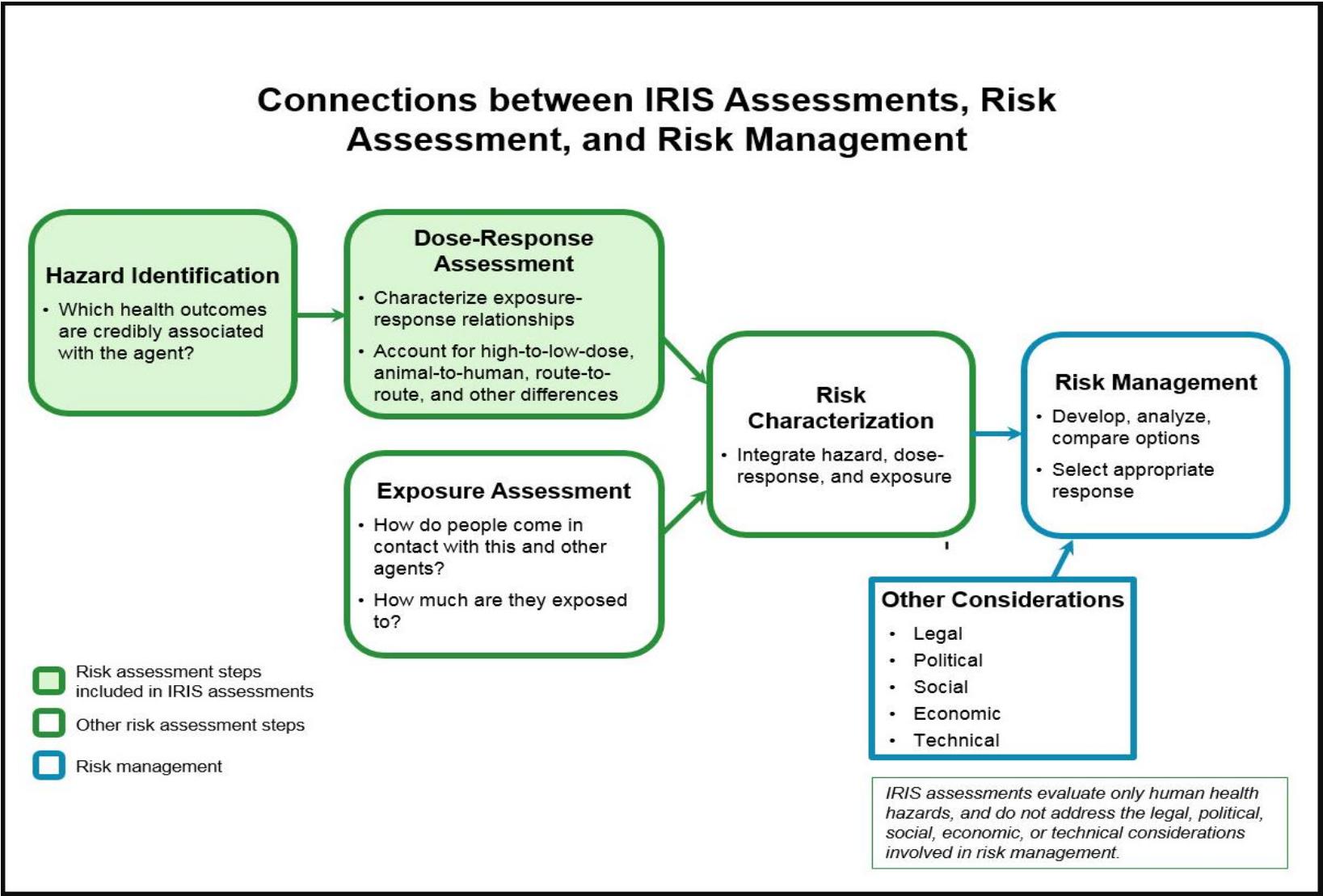
+



=

IRIS

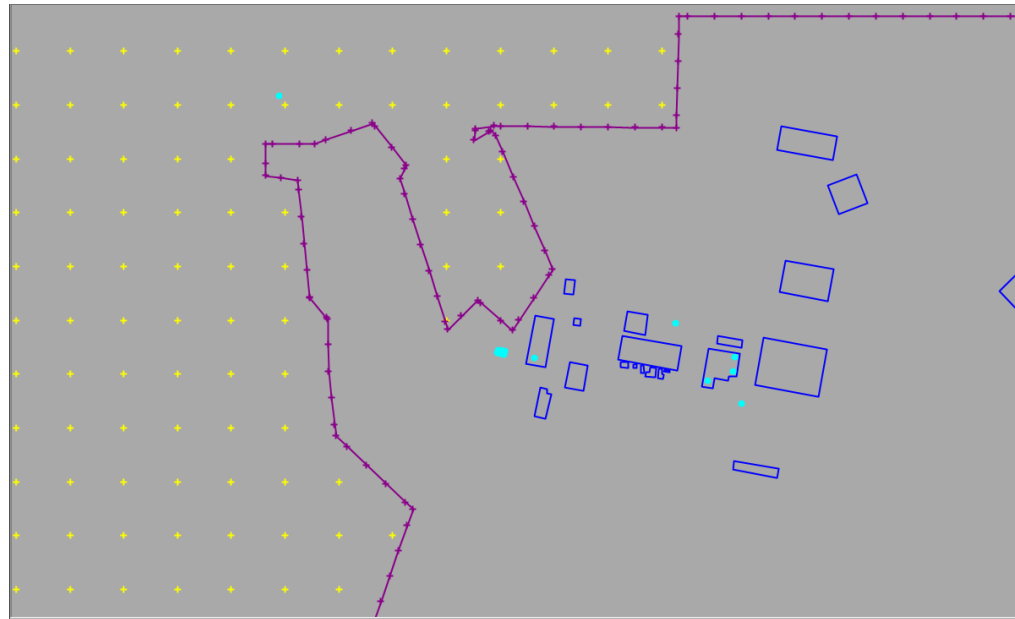
IRIS and Risk Assessment



What if You Exceed the RAL?

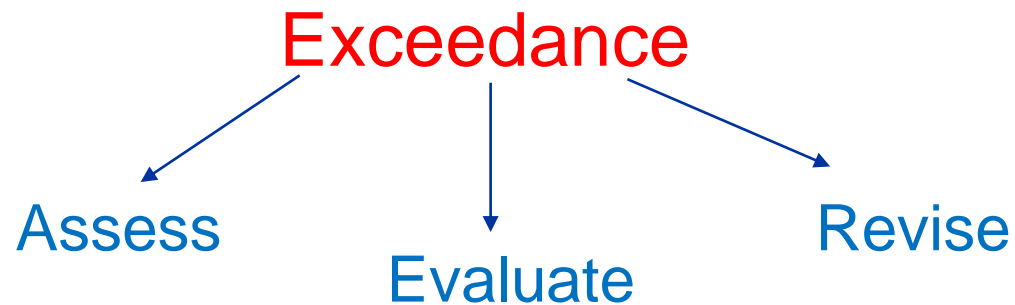
First Steps

- ▶ By far, the easiest method is to show modeled concentrations below the RAL.
 - Refine your models.
 - Are controls viable, or could they be improved?
 - If emissions are from a stack, can the design be altered?



Exceeding the RAL

- ▶ While the best option is to remain below the RAL, there are strategies to overcome this.
 - Conduct a facility-specific risk assessment.
 - Evaluate the specific HAP emitted by the facility.
 - Request a revision to the RAL.



Facility Risk-Assessment

- ▶ Remember what RAL is – Risk Assessment Level.
- ▶ A facility-specific risk assessment can utilize a number of different evaluation methods.
 - An easy first step is to run the model using EPA's Human Exposure Model 4 (HEM4 software).
 - HEM4 utilizes AERMOD in conjunction with US Census data to measure anticipated exposure.
 - These exposure values can then be cross-referenced against pollutant-specific risk thresholds to generate a risk assessment.

Example HEM4 Output

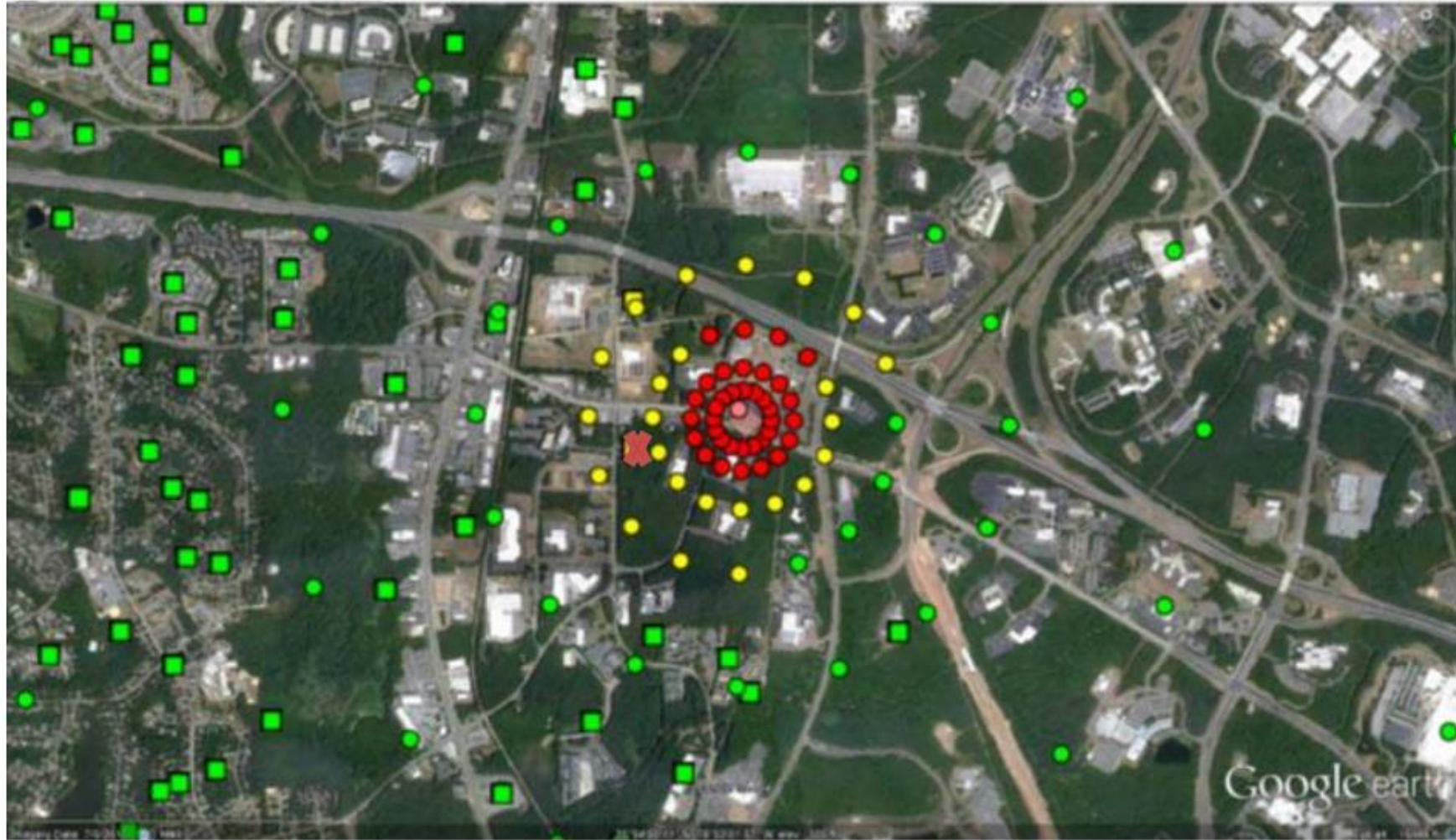


Figure 38. Sample Source_risk.kmz HEM4 Output

Facility Risk-Assessment/HAP Evaluation

- ▶ What if HEM4 isn't helpful?
- ▶ Next step may be to evaluate the specific compounds emitted.
 - Some HAPs, like metal compounds, are a broad category of different materials, but have only 1 RAL.
 - However, some compounds may have more specific risk evaluations.
 - These values are often derived by EPA from the CDC's Agency for Toxic Substances and Disease Registry (ATSDR).



Facility Risk-Assessment/Monitoring

- ▶ What about monitoring?
- ▶ Actual monitoring may be utilized as a method as well.
 - This will allow for “real world” data to be produced showing the exposure data is below acceptable risk levels.
 - Note- your monitoring plan will need to be approved by MDNR.
 - Be confident monitoring will be in your favor!



Summary & Takeaways

Permitting

- ▶ If your project exceeds the SMAL:
 - Conduct modeling using either project-specific or facility-wide emissions.
 - If the model doesn't pass, evaluate how to reduce toxics emissions and/or refine the model.
 - Remember, RALs and SMALs are based on actual risk studies.

Risk Evaluation

- ▶ If your project still exceeds the RAL:
 - Conduct modeling using the HEM4 program to evaluate actual exposure levels.
 - Evaluate the risk of specific compounds emitted by the facility.
 - Propose setting up a monitoring network to obtain “real world” exposure data.
 - Remember to discuss a challenging project with MDNR early and often!

Questions?

Joshua Garlock – Consultant

Joshua.Garlock@trinityconsultants.com

Ph: (630) 450-2197

