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LOCKHEED MARTIN

Habit 2.0

CODE FOR ASSESSING CONTROL ROOM HABITABILITY

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Prepared for 2016 Joint Action Group for Atmospheric Transport and Dispersion Modeling Annual Conference, at George Mason University, Fairfax, VA: June 14, 2016

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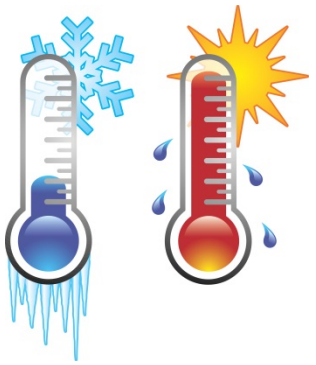
Habitability Issues at NRC

Radiological

Non-radiological



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Request for Additional Information (RAI) No. 6158

"…the staff posits that since chlorine and sulfuric acid clearly fit the definition of a heavy gas that **ALOHA modeling is the more appropriate program (i.e. as opposed to HABIT) to use for determining main control room habitability.** More specifically, the use of the HABIT Gaussian model may be producing non-conservative results for these two heavy gases. The staff requests that … **a comprehensive justification for why the results are appropriate and conservative.**" (November 2011)

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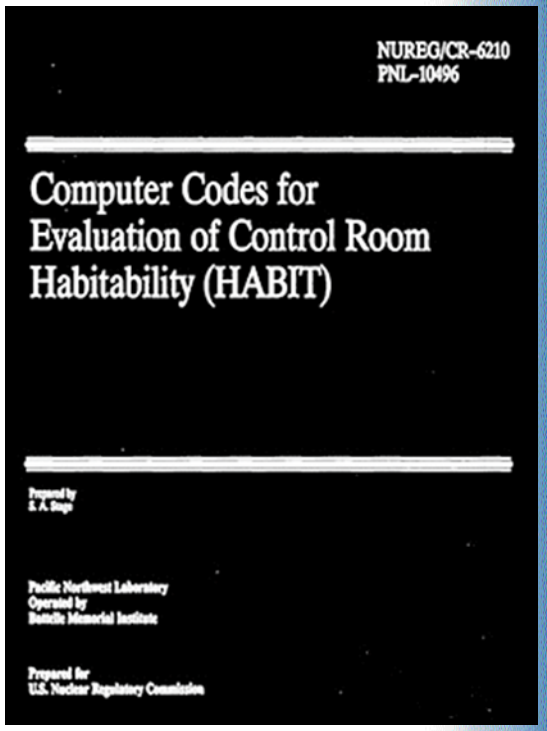
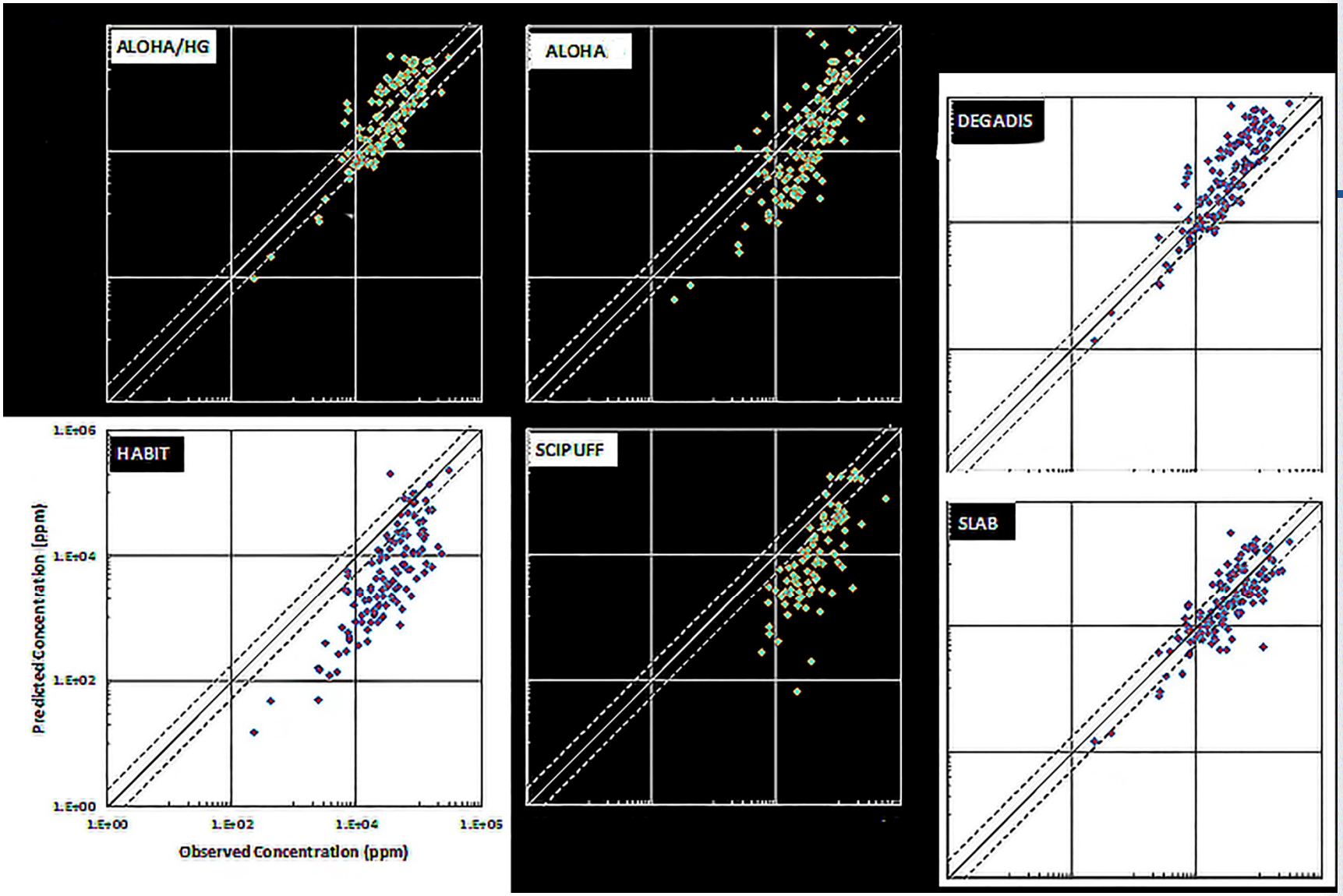
HABIT Project Overview

- **Phase I (June 2014 – Feb. 2015):**
  - ❑ Rehost **HABIT v1.1** FORTRAN code
  - ❑ Complete **HABIT v1.2** (2/14/2015)
  - ❑ Develop new User Manual
- **Phase II (April 2015 – Sept. 2016):**
  - ➢ Build **HABIT v2.0** by importing DEGADIS and SLAB codes (5/15/16)
  - ➢ Update NUREG/CR-6210 (9/30/16)





Comparison between the "Observed" and "Predicted" Concentrations (ppm)

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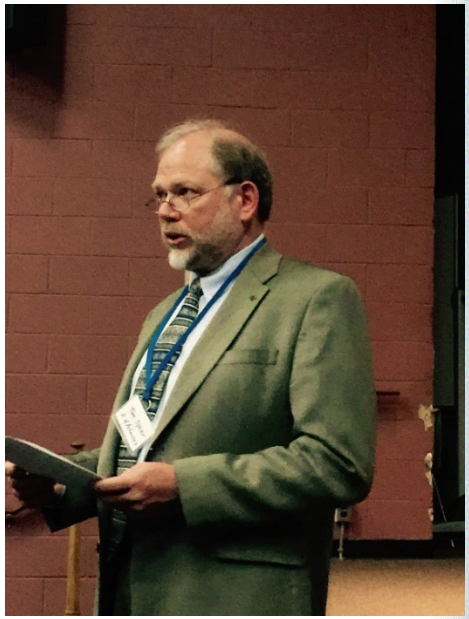
PHASE-II

April 2015 - Sept 2016

- **Integrate HABIT-DEGADIS-SLAB codes**
- **Program BMW criteria for test on dense-gas model importance**
- **Update NUREG/CR-6210**

Dr. TOM O. SPICER

(10/27/2015)



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BMW Criteria

Britter and McQuaid found that denser-than-air effects are important if:

$$\frac{g(dm/\rho_s)}{D_s u_r^3}\left(\frac{\rho_s - \rho_a}{\rho_a}\right) > 0.15^3 = 0.0034$$

For puffs or instantaneous gas releases, denser-than-air effects are important if:

$$\frac{g(m/\rho_s)^{1/3}}{u_r^2}\left(\frac{\rho_s - \rho_a}{\rho_a}\right) > 0.2^2 = 0.04$$

Where g is the acceleration due to gravity and ρ_a is the ambient air density.

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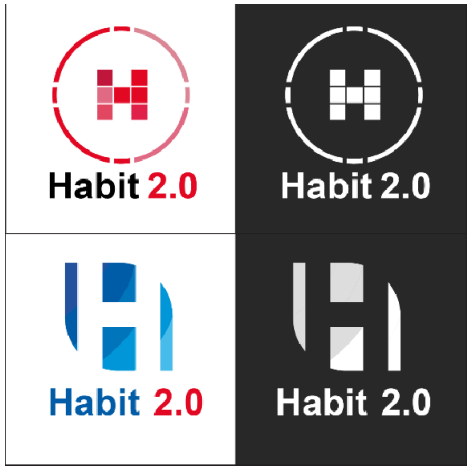
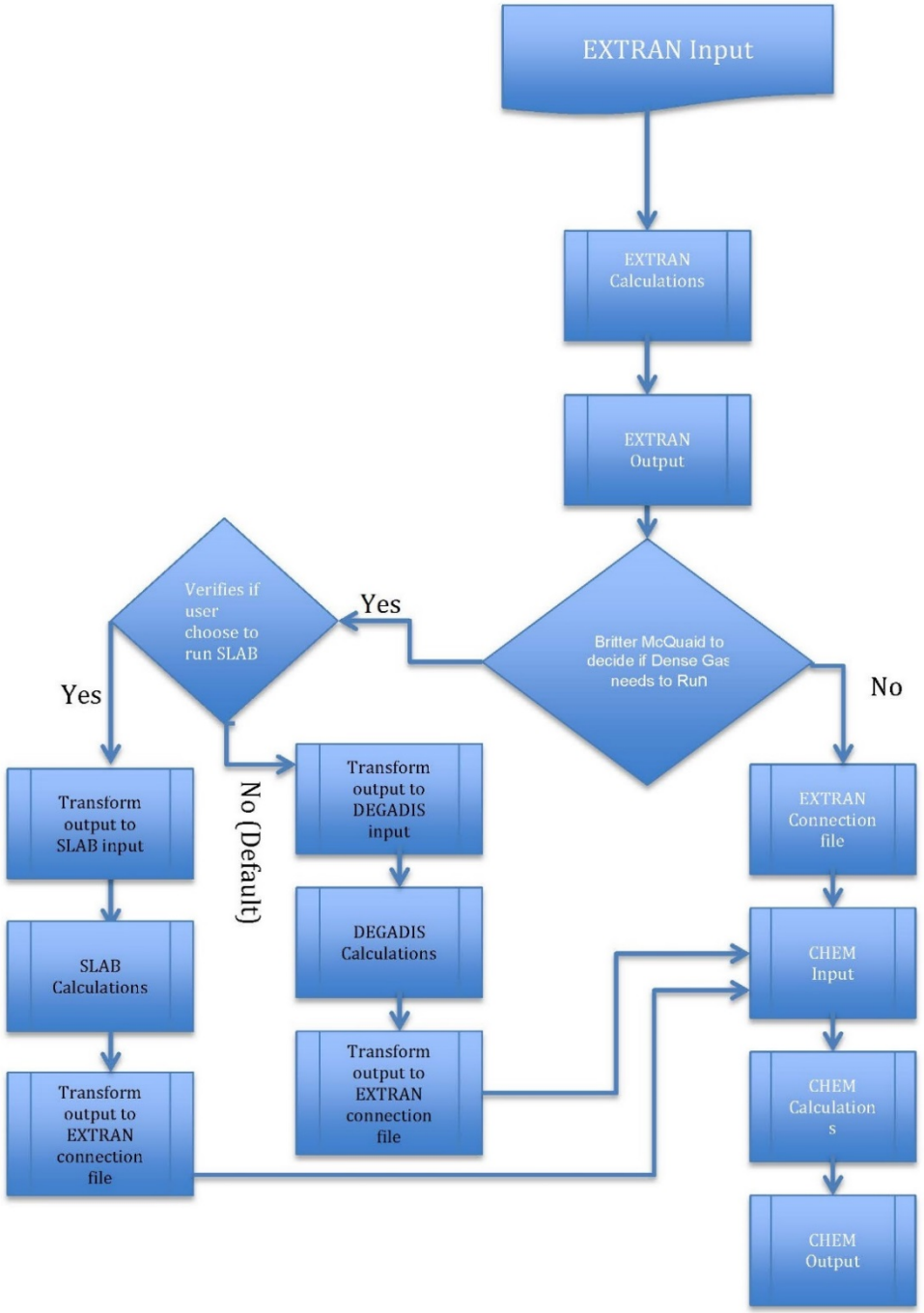
Flowchart





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Extended Work

- Design HABIT main screen and remove radiological application
- Make HABIT screen pages and fonts adjustable that fit larger monitors
- Pilot intake height study
- Add D&S spill scenarios to HABIT
- Develop ALOHA-HABIT comparison tests and analyze the results

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