AERSCREEN Update

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AERSCREEN Finalization Workgroup

- Jim Haywood, Chair, Michigan DEQ
- Karen Wesson, EPA
- Roger Brode, EPA (formerly with MACTEC)
- James Thurman, EPA
- Bob Paine, ENSR
- Lloyd Schulman, TRC
- Acknowledge Herman Wong, EPA Region 10

What is AERSCREEN?

- AERSCREEN refers to applying the AERMOD model in a “screening mode”
  - SCREEN option added to AERMOD in 1995 forces model to calculate centerline concentration for each source/receptor/meteorology combination
  - SCREEN option limits output to 1-hour averages and selects NOCHKD option to eliminate date sequence checking
- AERSCREEN interface developed by Jim Haywood
  - **AERSCREEN** program provides interface to run AERMOD in SCREEN mode, incorporates MAKEMET, BPIPPRM and AERMAP
  - **MAKEMET** program generates matrix of meteorological conditions based on user-specified surface characteristics, formatted for input to AERMOD (.sfc and .pfl files)

Description of AERSCREEN

- MAKEMET includes loops through meteorological parameters:
  - Wind speed (stable and convective)
  - Cloud cover (stable and convective
  - Max/min ambient temp (stable and convective)
  - Solar elevation angle (stable and convective)
  - Convective velocity scale (w*) (convective only)
  - Mechanical mixing heights (stable only)
- Uses AERMET subroutines to calculate u* and L, also calculates convective mixing heights
- Generates AERMOD-ready surface and profile files with site-specific screening meteorology

Description of AERSCREEN

- AERSCREEN command-prompt program developed by Jim Haywood, Michigan DEQ
  - Interactive data entry (command prompts/DOS Screen)
  - Single point, volume, area or flare source
  - Flat or complex terrain (user-specified list of 7.5-minute or 1-degree DEM – hopefully also 15-minute files soon)
  - PRIME building downwash (specify stack location for single tier or provide BPIPPRM input file)
  - MAKEMET meteorology with site-specific surface characteristics
  - Search routine to locate worst-case impact location
  - Re-Use of previous AERSCREEN run files
  - Includes factors for 3-hour, 8-hour, 24-hour and annual averages; similar to SCREEN3 factors (not finalized yet)

AERSCREEN Status

- Draft AERSCREEN package submitted to EPA regions on 4/25/06 for internal (alpha) review and testing
- Comments received from several regions and states; many comments related to problems with AERMAP
- Public release of draft AERSCREEN package “as soon as possible”

AERSCREEN Status

- AERSCREEN program updated to use new AERMAP and AERMOD executables; AREA, AREACIRC and Flare source options added
- AERMET NR_ANG bug fix incorporated
- Surface characteristic options being modified to provide some linkage with AERSURFACE
- Previous testing to be updated with latest version; additional testing of AERSCREEN vs. on-site met data also planned
- Additional documentation, including draft user's guide and test results, needed before public release

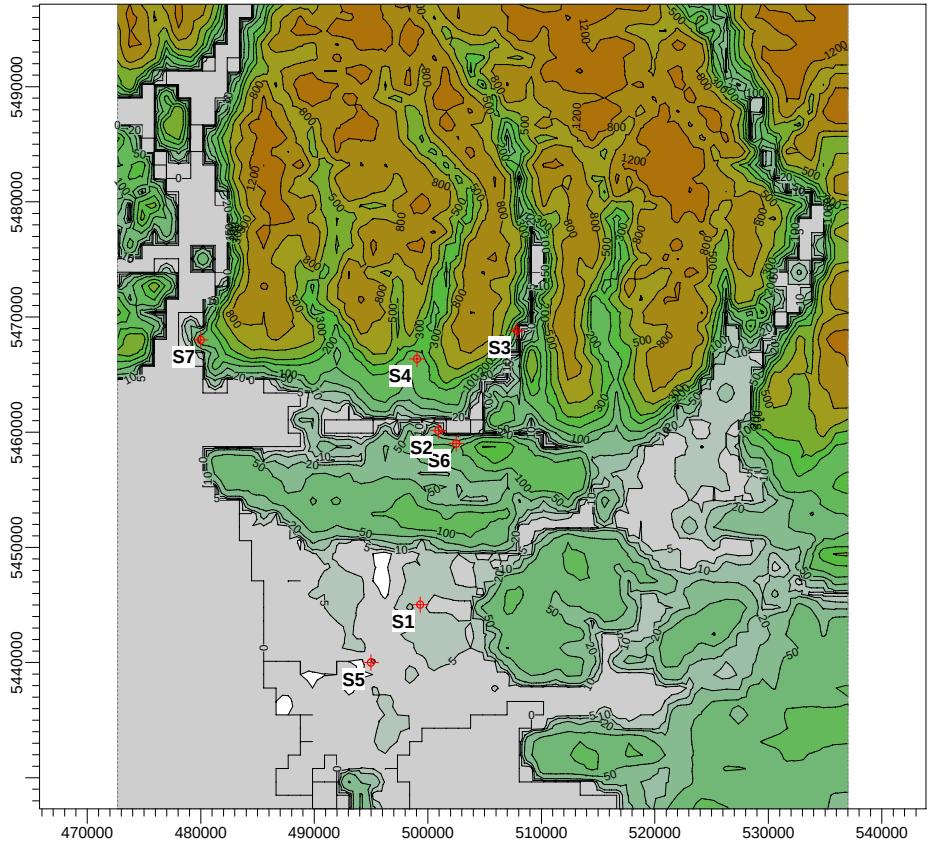
AERSCREEN Tests

- Significant testing to date shows good results across wide range of applications
- “Good” defined as reasonable conservatism compared to AERMOD refined estimates
- Testing performed for rugged terrain applications with downwash – minor modifications to MAKEMET

Database	Type	No. of sources	Max. Ratio	Min. Ratio	Median Ratio
Jim Haywood	Miscellaneous	7	5.20	1.09	2.35
Karen Wesson	Stack downwash	32	2.54	0.96	1.17
Karen Wesson	Stack non-downwash	26	2.18	0.97	1.49
Roger Brode	Flat Terrain Non-downwash Rural & Urban	168	2.98	0.98	1.05
Roger Brode	Complex Terrain Varying Source/ Terrain Distance	168	4.56	0.96	1.18
Bob Paine	Complex Terrain	28	7.46	1.08	2.23

PROJECT TITLE:

British Columbia AERSCREEN Tests
Source Group Locations



Terrain Contours — meters

0.0 5.0 10.0 20.0 50.0 100.0 200.0 300.0 500.0 800.0 1200.0 1800.0 2400.0

COMMENTS:	SOURCES: **7**	COMPANY NAME:	
	RECEPTORS: **0**	MODELER:	
		SCALE: 1:476,448 — 0 — 10 km	
			PROJECT NO.:

Table 5.2b: Highest 1-hour Screening vs. Refined Results for SeaTac Airport Surface Characteristics

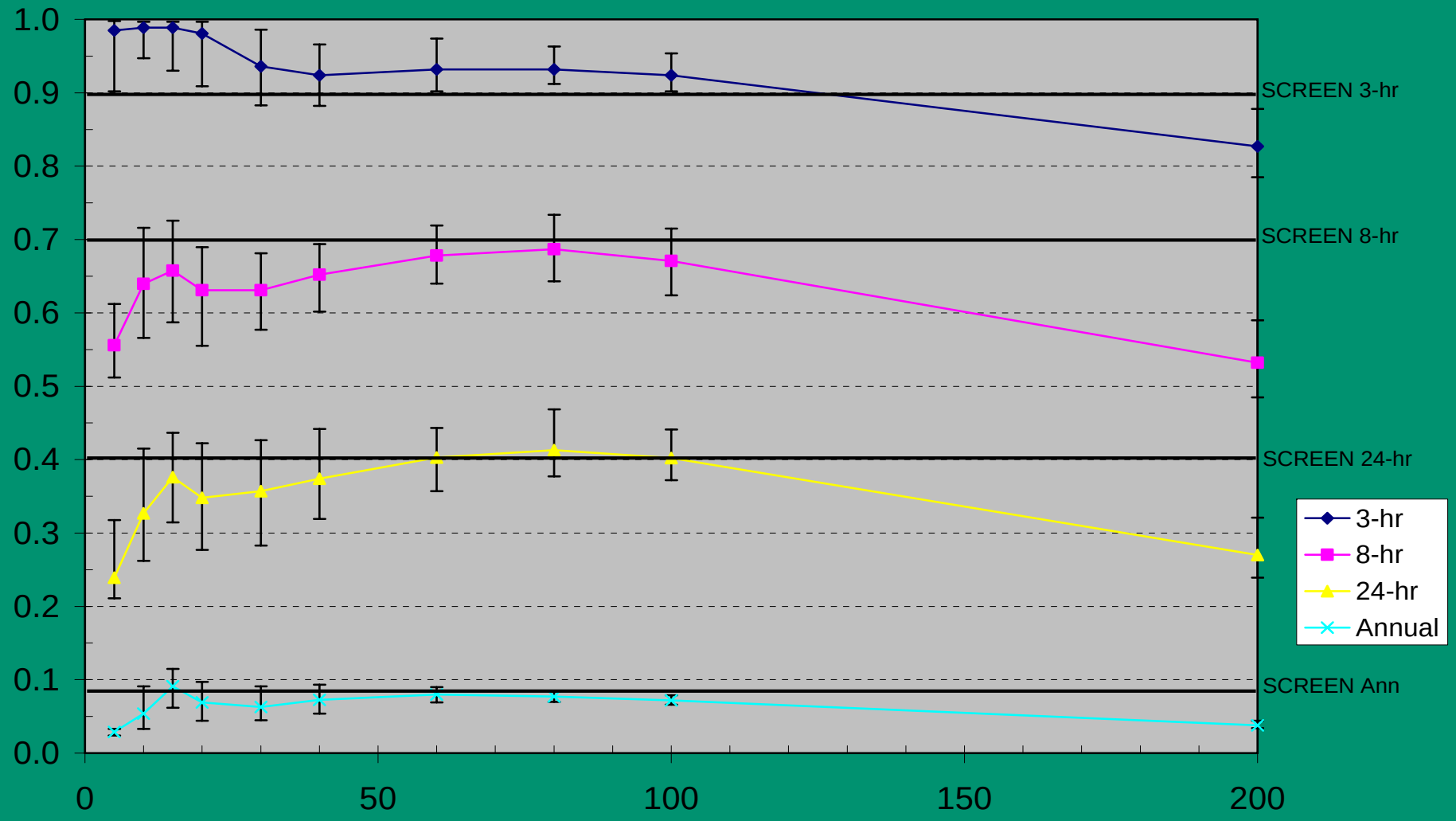
Source Location	Source ID	Screening χ/Q	Screening Elevation (m MSL)	Screening Hill Height Scale (m MSL)	Refined χ/Q	Refined Elevation (m MSL)	Refined Hill Height Scale (m MSL)	Screening/ Refined Ratio
S1	S1_LG	1.809	172	343	1.215	172	343	1.490
S1	S1_MD	11.063	7	7	9.610	7	7	1.151
S1	S1_SM1	1039.690	8	8	982.543	7	7	1.058
S1	S1_S10	637.866	7	7	354.042	8	8	1.802
S1	S1_SM2	357.879	7	7	343.719	7	7	1.041
S1	S1_S08	157.525	7	7	153.008	7	7	1.030
S2	S2_LG	22.772	183	203	20.287	183	203	1.122
S2	S2_MD	307.198	77	1178	226.239	82	1178	1.358
S2	S2_SM1	906.567	31	1178	905.019	31	1178	1.002
S2	S2_S10	1162.820	34	1178	829.149	39	1178	1.402
S2	S2_SM2	420.120	30	1178	397.065	29	1178	1.058
S2	S2_S08	399.932	49	1178	329.575	52	1178	1.213
S3	S3_LG	38.410	187	1178	24.717	193	1499	1.554
S3	S3_MD	257.356	78	1178	163.786	85	1178	1.571
S3	S3_SM1	6047.862	37	1178	1768.820	40	1178	3.419
S3	S3_S10	6047.862	37	1178	4662.883	39	1178	1.297
S3	S3_SM2	847.681	44	1178	882.339	44	1178	0.961
S3	S3_S08	599.342	49	1178	506.168	49	1178	1.184
S4	S4_LG	16.585	363	1178	12.337	366	1009	1.344
S4	S4_MD	79.196	254	1009	55.373	260	1009	1.430
S4	S4_SM1	1069.212	204	1009	1010.431	204	1009	1.058
S4	S4_S10	775.393	210	1009	615.640	215	1009	1.259
S4	S4_SM2	360.180	202	1009	330.230	201	1009	1.091
S4	S4_S08	155.487	202	1009	150.366	202	1009	1.034
S5	S5_LG	1.104	164	343	0.712	173	1009	1.551
S5	S5_MD	11.093	4	4	9.556	1	1	1.161
S5	S5_SM1	1068.335	4	4	988.166	3	3	1.081
S5	S5_S10	636.110	2	6	341.107	4	4	1.865
S5	S5_SM2	359.929	2	2	328.516	1	1	1.096
S5	S5_S08	155.917	2	3	151.804	2	2	1.027

Averaging Time Factors (current draft/still under development)

- 3-hour: fixed ratio of 0.95 *(SCREEN3 = 0.90 ± 0.10)*;
- 8-hour: fixed ratio of 0.70 *(SCREEN3 = 0.70 ± 0.20)*;
- 24-hour : fixed ratio of 0.40 for plume heights up to 100m, then linearly interpolated to a ratio of 0.30 for plume heights above 200m *(SCREEN3 = 0.40 ± 0.20)*
- Annual: fixed ratio of 0.10 for plume heights up to 100m, then linearly interpolated to a ratio of 0.04 for plume heights above 200m *(SCREEN3 = 0.08 ± 0.02)*.

Figure 1: AERSCREEN Averaging Period Ratios vs. Plume Height

(line shows 95th-percentile and error bars show 90th and 98th percentiles)



AERSCREEN: Topics for Discussion

- Results from testing vs. AERMOD refined mode
- Averaging time factors: Results? Fixed vs varying?
  - Tentative plan to release AERSCREEN for beta testing with SCREEN3 “upper bound” factors and refine later; i.e,
    - 1.0 for 3-hr
    - 0.9 for 8-hr
    - 0.6 for 24-hr
    - 0.1 for Annual
- Multiple source screening?
- MAKEMET and “site-specific” minimum wind speed and anemometer height? Defaults?