Overview of Regulatory Wood Smoke Initiatives/Model Rules

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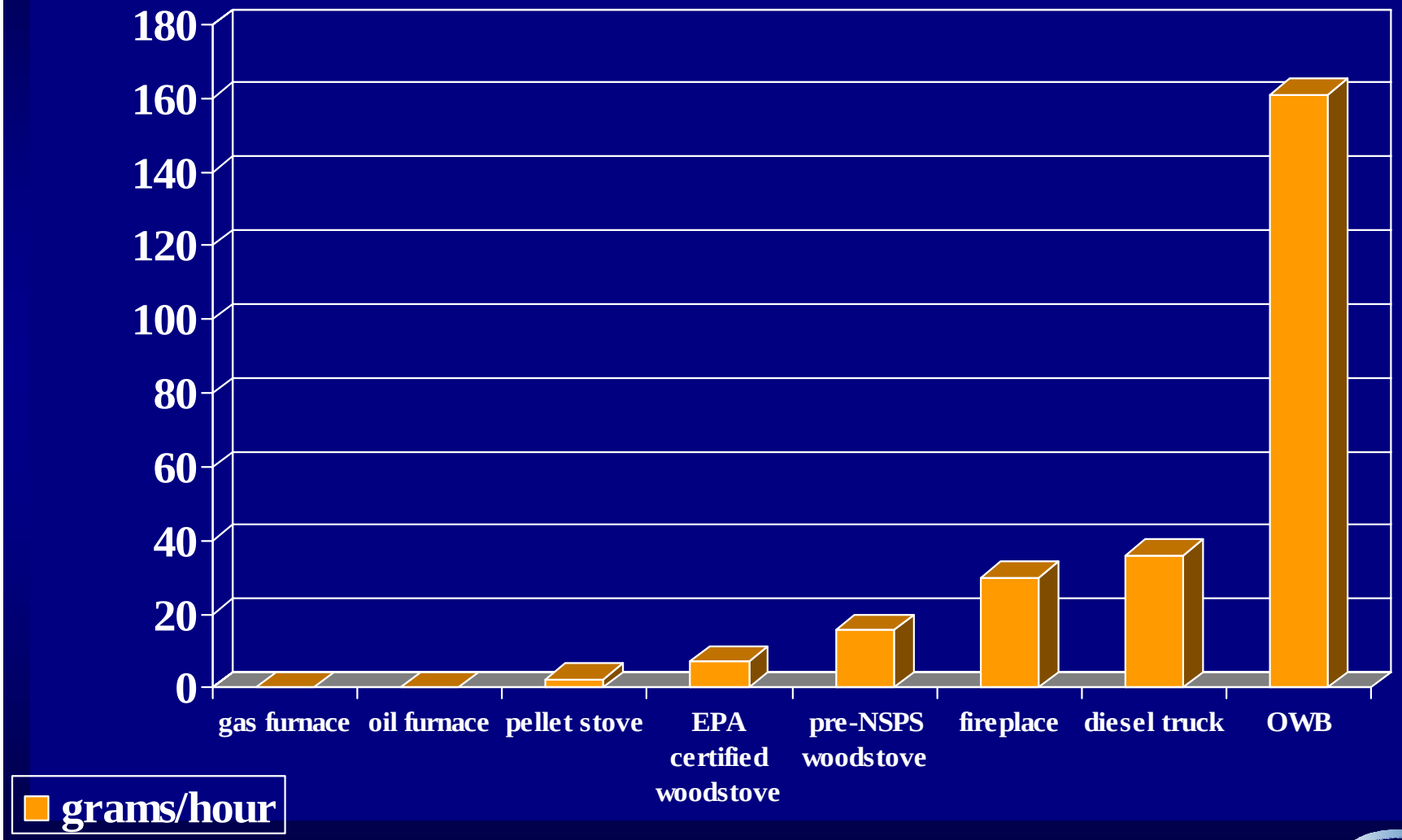
Residential Wood Combustion Regional Haze
SIP meeting
July 12, 2007

Comparing Particulate Emissions (g/hr)



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Prohibitions for Woodburning Devices

- Restriction Fuels
- Installation of Woodburning Appliances
- Non-certified Appliance Removal
- No Burn Days
- Nuisance
- Opacity
- Bans

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Restriction on Fuels

- **Purpose of this strategy is to ensure the use of seasoned wood**
  - since wood moisture levels dictates, in part, the amount of particulate emissions that will be generated by the burning of wood.
  - Green wood emits more particulate matter than seasoned wood because the moisture interferes with efficient combustion.
  - Develop regulation that would prohibit the use of the following fuels in a woodburning appliance: wet or unseasoned wood, garbage, treated wood, plastic products, rubber products, waste oil, paints, solvents, coal, glossy colored papers, particle board and salt driftwood.
- **Advantages**
  - it would help to prevent people from burning green wood and other inappropriate fuels.
  - It would also help curtail emissions of toxic substances and obnoxious odors
  - Reduce emissions from old appliances are being used
- **Disadvantage**
  - To be effective, this by-law will require:
    - public education to raise awareness of the measure
    - Aggressive enforcement for proper implementation.

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Installation of New Units

- The purpose of this strategy would be to develop a program that would only allow the installation of EPA certified appliances** or units that meet certain emission limits.

- Advantages
  - Would close the loopholes within the NSPS that allows certain woodstoves, pellet stoves, fireplaces and OWBs to circumvent federal emission requirements
  - Would ensure that only cleaner units are installed
  - Lessened enforcement burden

- Disadvantages
  - Would require significant outreach to distributors and vendors

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Non-certified Appliance Removal
Time Limit

- Purpose: to mandate the removal or rendering inoperable all non-certified outdoor hydronic heaters within the State by a certain date.

- Advantages
  - control strategy will directly reduce particulate emissions
  - will accelerate the removal of non-certified appliances

- Disadvantages
  - Agency would have to undertake an extensive enforcement program at the end of the deadline as many homes may still have a non-certified appliance.
  - There will be substantial costs to homeowners who rely on woodstoves as their primary heating source
  - Some states may not have enforcement authority in residential situations

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Non-certified Appliance Removal

Prior Sale or Transfer of Real Property

- Prior to the completion or consummation of a sale or transfer of any real property, all existing non-certified outdoor hydronic heaters must be replaced, removed, or rendered permanently inoperable.

- **Advantages**
  - The control strategy will directly reduce particulate emissions
  - removal of non-certified appliances prior to the sale of a home will result in immediate emission reductions
  - appliances will be removed or replaced at a favorable time when the costs for removal or replacement may be handled through the home sale transaction

- **Disadvantages**
  - It will be an additional item that a seller must address as part of a home sale transaction
  - Effectiveness relies on home inspection process and willingness of realtors to comply with the requirement
  - There will be substantial costs to homeowners who rely on woodstoves as their primary heating source

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No-burn Days
Curtailment of Non-certified Appliances

- This strategy prohibits the use of all non-certified woodburning appliances during poor air quality periods.
  - Non-compliance with this prohibition would result in fines and penalties.
  - Exemptions may be provided for households that rely on woodburning appliances as their primary heating source.

- **Advantages**
  - Sends a message that certified appliances are better than non-certified appliances
  - Reduce 24-hour concentrations of PM2.5 on the worst air quality days

- **Disadvantages**
  - Resource intensive to monitor and enforce
  - Requires significant investment in education and outreach

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No-burn Days
Staged Curtailment

- This strategy employs a "two-stage“ for limiting use of woodburning appliances
  - Partial restriction during moderately bad air quality days and total curtailment of during severe poor air quality days
  - Violators would be subject to fines and penalties.
  - Exemptions could be provided for households that rely on woodburning appliances as their primary heating source.

- Advantages
  - Sends a message that certified appliances are better than non-certified appliances and the implications for use of all woodburning devices
  - Reduce 24-hour concentrations of PM2.5 on the worst air quality days

- **Disadvantages**
  - Resource intensive to monitor and enforce
  - Requires significant investment in education and outreach

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Nuisance

- This strategy defines a specific nuisance definition for wood smoke
  - Maine is defining a wood smoke nuisance as any visible emissions that cross onto a neighboring property for period of fifteen minutes
- **Advantages**
  - Provides for a recourse for people being “smoked out” of their house by a neighbor without having to employ general private/public nuisance situations
  - It can be used as an educational tool
- Disadvantage
  - May require investment by homeowner to replace nuisance units
  - States may lack enforcement authority in residential situations

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Opacity

- This strategy applies an opacity limit to limit the density of smoke emitted from the chimney of a woodburning appliance
  - In many jurisdictions, the legal opacity for smoke emissions from woodburning appliances is up to 20%. Emissions over this limit for more than a six minute period are considered violations
- Advantages
  - It provides an objective measure of emissions from woodburning appliances
- Disadvantages
  - requires certified personnel
  - Visible opacity measurement cannot be done at night
  - Requires that enforcement personnel are present when unit is in operation
  - Some states limit opacity requirements to commercial operations

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Bans

- This strategy would ban the sale of all new units and/or establish a timeline for removal of all existing units.

- Advantages
  - strategy will directly reduce particulate emissions

- Disadvantages
  - Difficult to implement
  - Resource intensive to enforce

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Outdoor Wood-fired Boilers
P Johnson 2005 Upstate NY

Unique OWB issues

- Good idea but bad implementation
  - Design Parameters
    - four-season utility, “8760” days/year for hot water
    - poor combustion design, oxygen-starved smolder low temp burn
    - Unlike EPA-certified residential wood stoves, OWBs to are not designed for complete combustion
    - Short stack height combined with low flue velocities results in poor dispersion
    - Generally no combustion controls and lack retrofit or add-on air pollution controls
    - 100,000 to 3,200,000 maximum btu/hr output (500,000 btu unit most common)
  - Fuel use
    - Some manufacturers support burning green or scrap wood
    - Distributors recommend burning anything
    - Large firebox can hold almost anything (average 60 ft^3)
    - Enforcement programs identified residents burning tires, garbage, landscape waste, and railroad ties

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Scope of the problem

- NSPS not applicable, EPA exempted these units from the wood stove regulations and does not intend to develop federal regulations at this time
- Limited emissions data, no protocol or accepted test method, however ASTM working on draft test method that may be final by October 2007 but has significant issues!
- Installation of outdoor wood boilers (OWB) is growing significantly.

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OWB Model Rule

- Adoption of common emissions standards/regulatory elements will push manufacturers to make cleaner units and ease compliance burden
- Place compliance burden on distributors and manufacturers rather than homeowners
- Likely that some manufacturers may challenge states regulations
- If states do not adopt emission standards likely that current generation of units will continue to be sold and may result in enforcement issues related to transport of units across state lines

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Estimated Sales Trends

- Estimates that by the end of 2006 there were approximately 198,000 – 290,000 units in use nationwide
- Sixty-eight percent of the units put in place in the last three years
- Manufacturers estimated annual growth in sales over past three years 100-350%
- Estimate that 500,000 units could be in place nationally by 2010.
- Manufacturers estimate that fifty percent of units replacing indoor units
- Sales concentrated in nineteen states (CT, IN, IL, IA, KY, ME, MA, MI, MN, MO, NH, NY, NC, OH, PA, VT, VA, WV and WI) but sales area expanding

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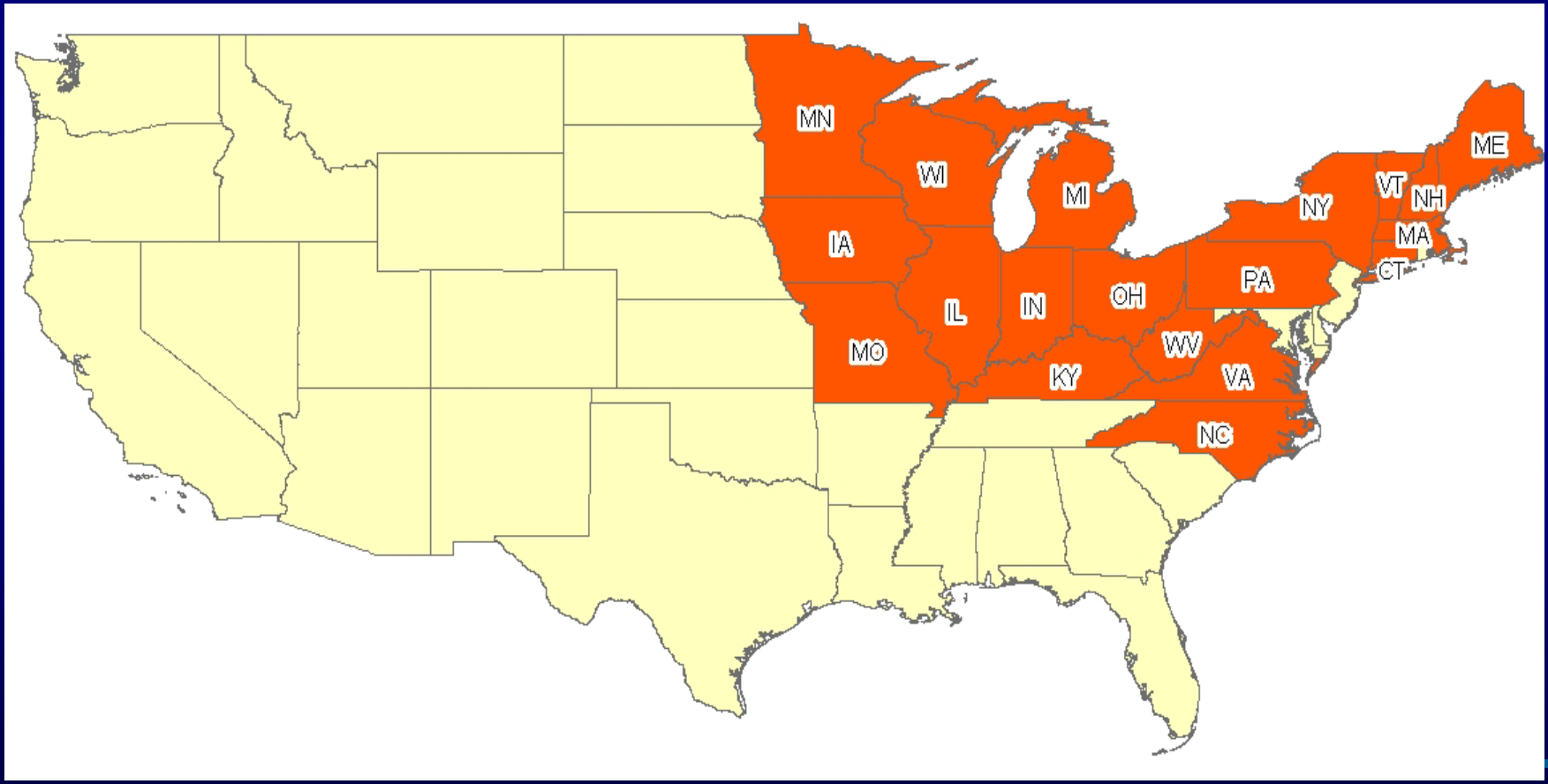
Sales Concentration

- 95% of sales in nineteen states



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What do we know about current generation of units

- NESCAUM stack test
  - smallest unit emitted 161 g/hr this compares with most woodstoves today emitting under 4.5 grams per hour particulate matter
  - Smallest unit potential to emit 1.5 tons per year total particulate matter
- NESCAUM ambient monitoring indicated that local impacts could be substantial
- Modeling analysis should current units have potential to create local exceedences of fine particulate NAAQS at distances of 500 feet
- Dave Brown risk assessment indicates that cancer risk for people living within 1,000 ft of OWB is 1 in 100,000

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Critical Elements of Model Rule

- NESCAUM developed OWHH model rule with EPA, states, and manufacturers
  - http://www.nescaum.org/topics/outdoor-hydronic-heaters
- Model rule broad document but identified key areas where states should strive to maintain consistency
- Critical elements include:
  - Critical Definitions – what type of units to include
  - Emission limits – move toward the Phase II goal of 0.32 lb/mmBTU heat output
  - Test method procedure – common EPA referenced test method to determine emission rates. EPA has been posted method and validating this spring
  - Certification process – EPA leveraging ETV program to verify independent lab test results
  - Labeling requirements – common requirements for hangtags & labeling

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Conversion existing emission limits

Standard	Standard limits	Lbs/mmBTU Input	Lb/mmBTU output
Vermont emission limit	0.2 gr/dscf	0.436	0.61 (@ 72% effic.)
EPA NSPS Method 28 Non Catalytic units	7.5 g/hr	0.73	1.16 (@ 63% effic.)
EPA NSPS Method 28 Catalytic units	4.1 g/hr	0.40	0.55 (@ 72% effic.)
Washington - catalytic units*	2.5 g/hr	0.24	0.34 (@ 72% effic.)
Washington - All Others*	4.5 g/hr	0.44	0.7 (@ 63% effic.)
CSA - units with burn rates > 5.3 kg/hr	0.137 g/MJ output	0.23 (@ 72% effic.)	0.32

* Washington state standard applies to all solid fuel devices 1,000,000 BTUs or less

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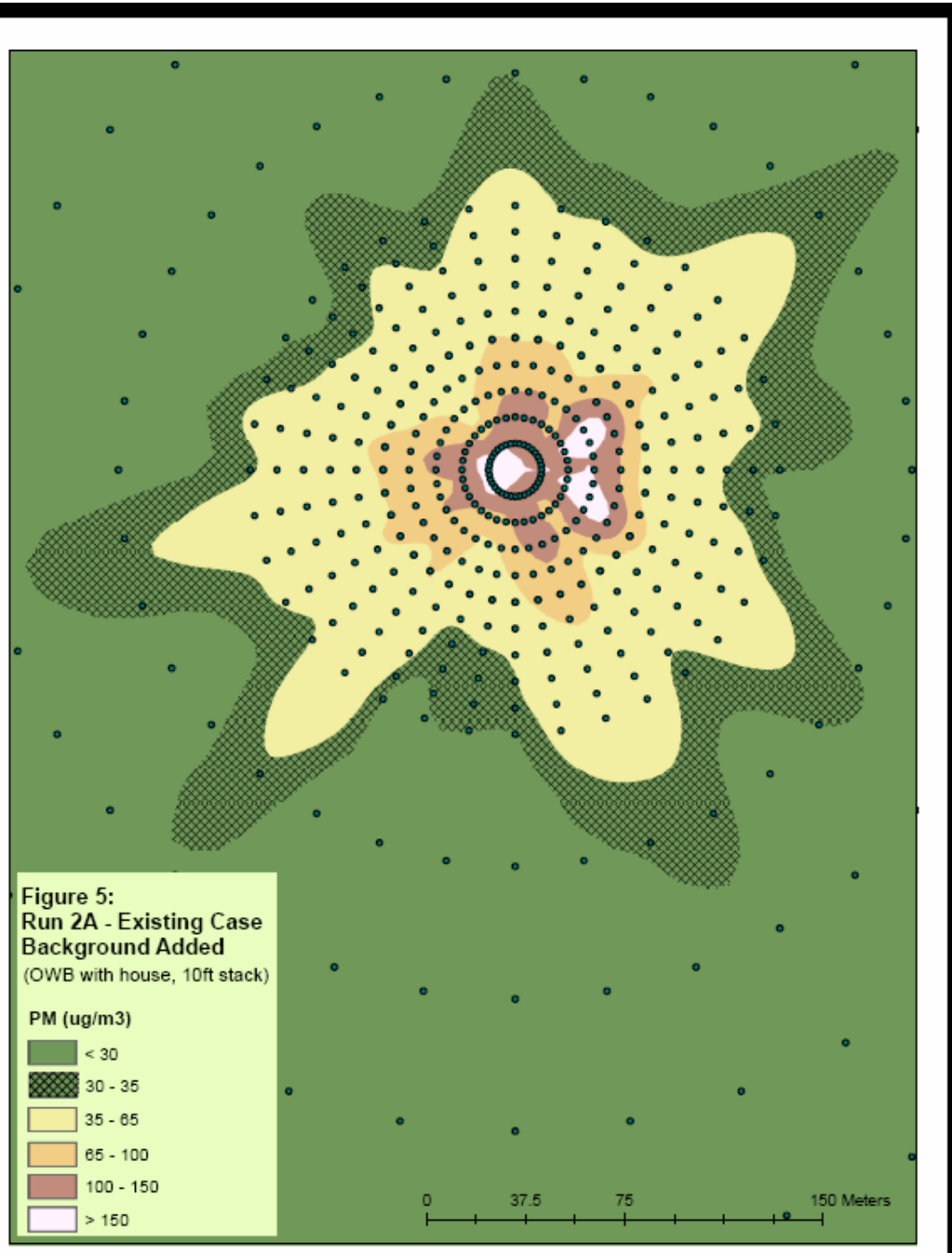
Figure 5:
Run 2A - Existing Case
Background Added
(OWB with house, 10ft stack)
PM (ug/m3)
< 30
30 - 35
35 - 65
65 - 100
100 - 150
> 150
0
37.5
75
150 Meters

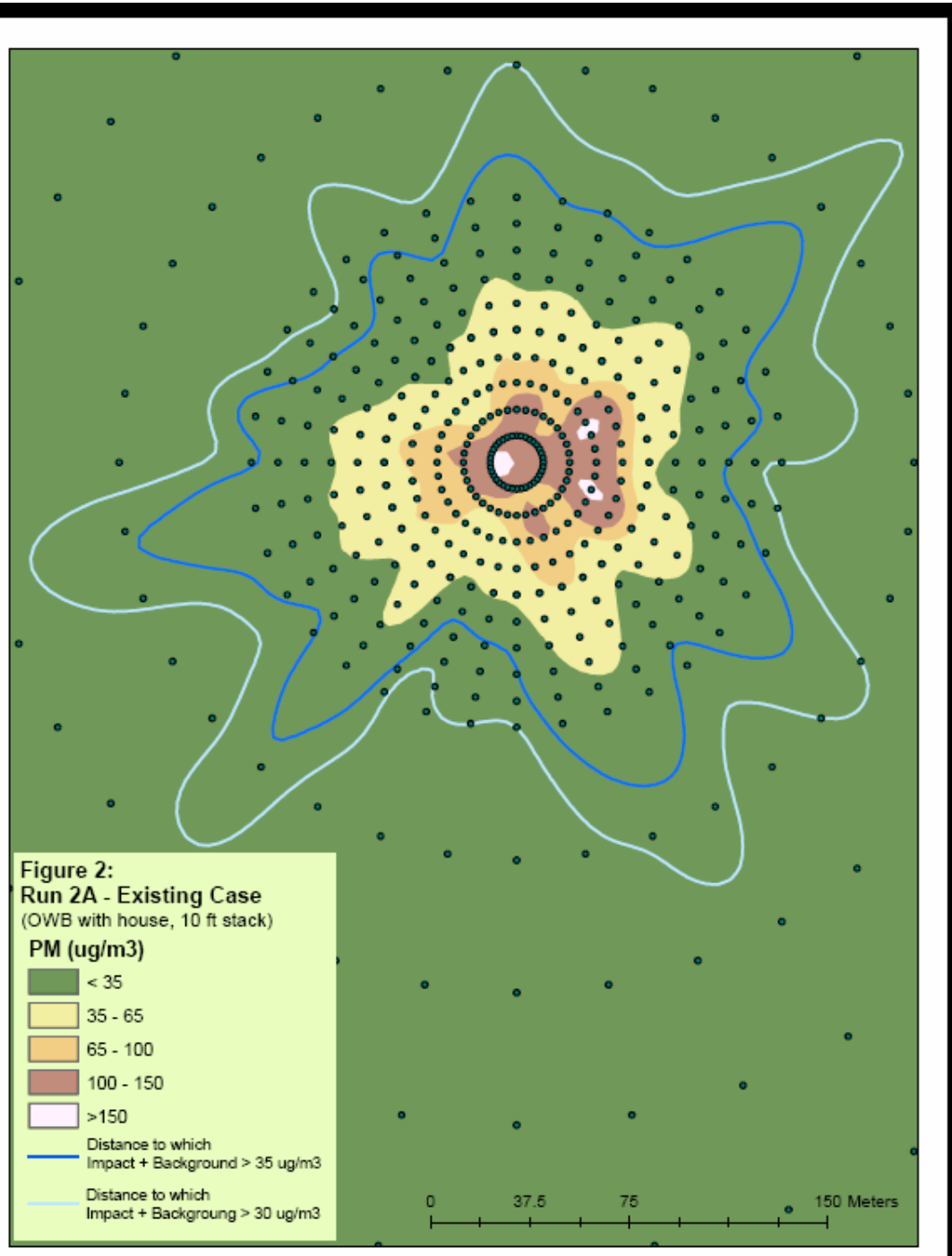
Figure 2:
Run 2A - Existing Case
(OWB with house, 10 ft stack)
PM (ug/m3)
< 35
35 - 65
65 - 100
100 - 150
>150
Distance to which
Impact + Background > 35 ug/m3
Distance to which
Impact + Backgroung > 30 ug/m3
0
37.5
75
150 Meters

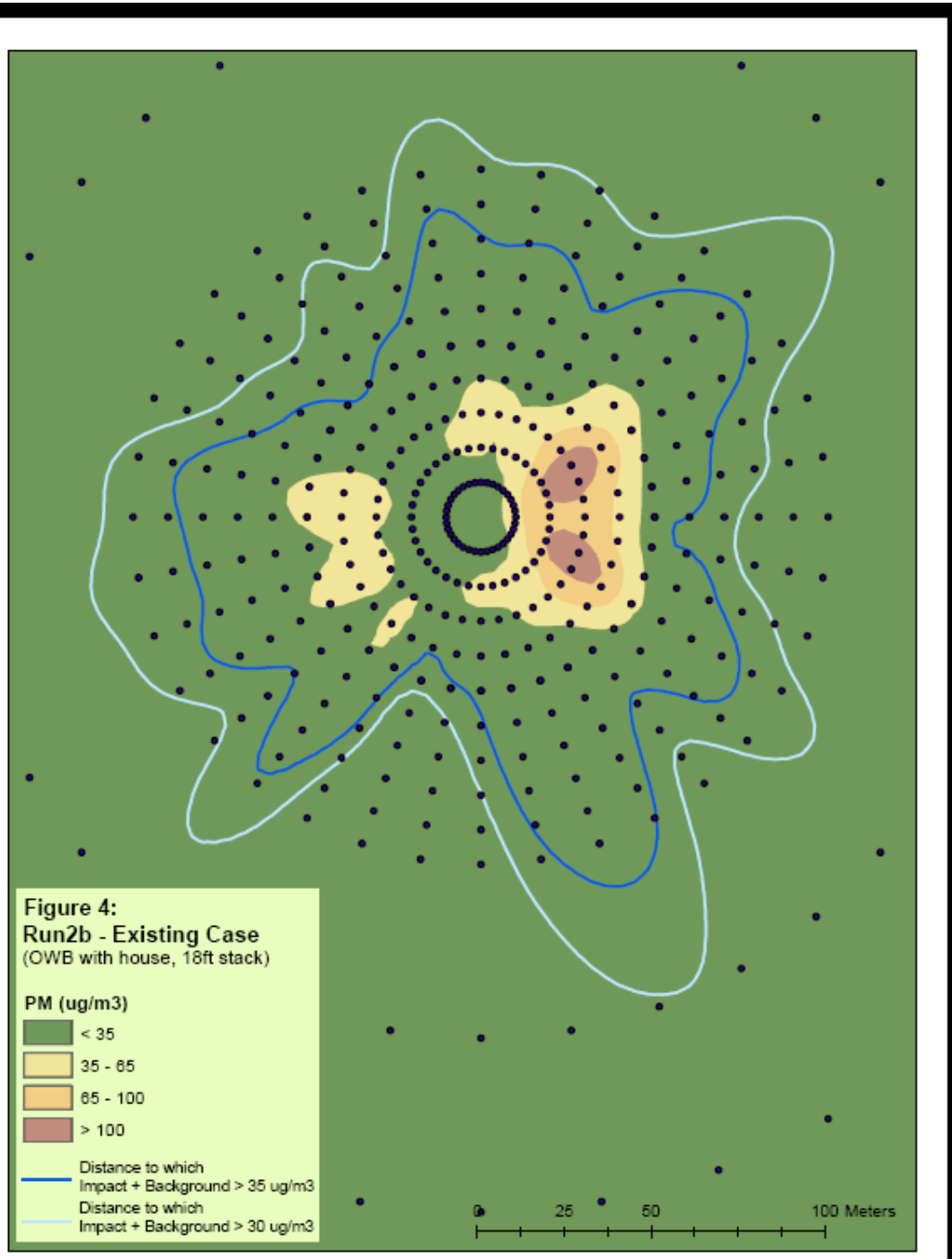
Figure 4:
Run2b - Existing Case
(OWB with house, 18ft stack)
PM (ug/m3)
< 35
35 - 65
65 - 100
> 100
Distance to which
Impact + Background > 35 ug/m3
Distance to which
Impact + Background > 30 ug/m3
0
25
50
100 Meters

Phase I Emission Limit

- 0.44 lb/mmBtu heat input
  - Same emission standard for residential and commercial units
- 500 foot setback and stack height requirements
- March 31, 2008 Compliance date
- Technical basis – technology transfer standard – this is the same lb/mmbtu rate that 85% of the current generation RWD meets.
- Modeling indicates that Phase I emission standard will cause exceedences locally*
- Several units commercially available likely to meet this standard

*modeling could not model worst case terrain condition = valley, slow wind speed, elevated receptors

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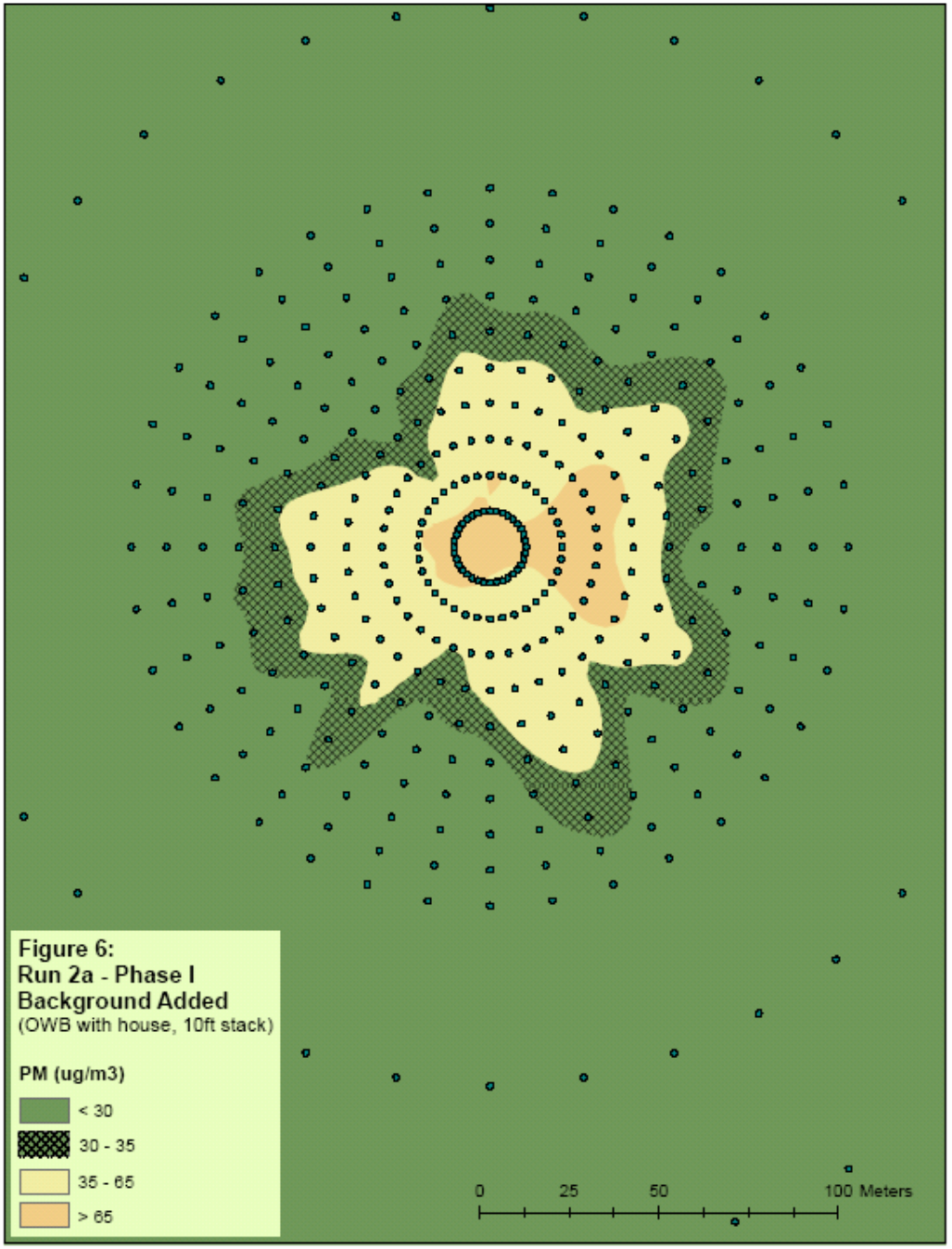
Figure 6:
Run 2a - Phase I
Background Added
(OWB with house, 10ft stack)
PM (ug/m3)
< 30
30 - 35
35 - 65
> 65
0
25
50
100 Meters

Phase II Emission Limit

- Residential emission limit:
  - 0.32 lb/mmBtu heat output with no individual test run shall exceed 15 grams per hour.
  - No setback requirement
- Commercial emission limit
  - 0.32 lb/mmBtu heat output with no individual test run shall exceed 20 grams per hour.
  - Setback requirement: 300 feet or more from a property line and stack 5 feet higher than the peak of any structure within 150 feet
- Compliance date – March 31, 2010
- Technical basis – local compliance with NAAAQS - technology forcing standard
- Modeling indicates that Phase II will not cause exceedences locally* = max impact 30 ug/m3
- One unit commercially available can meet this standard

*could not model worst case terrain condition = valley, slow wind speed, elevated receptors

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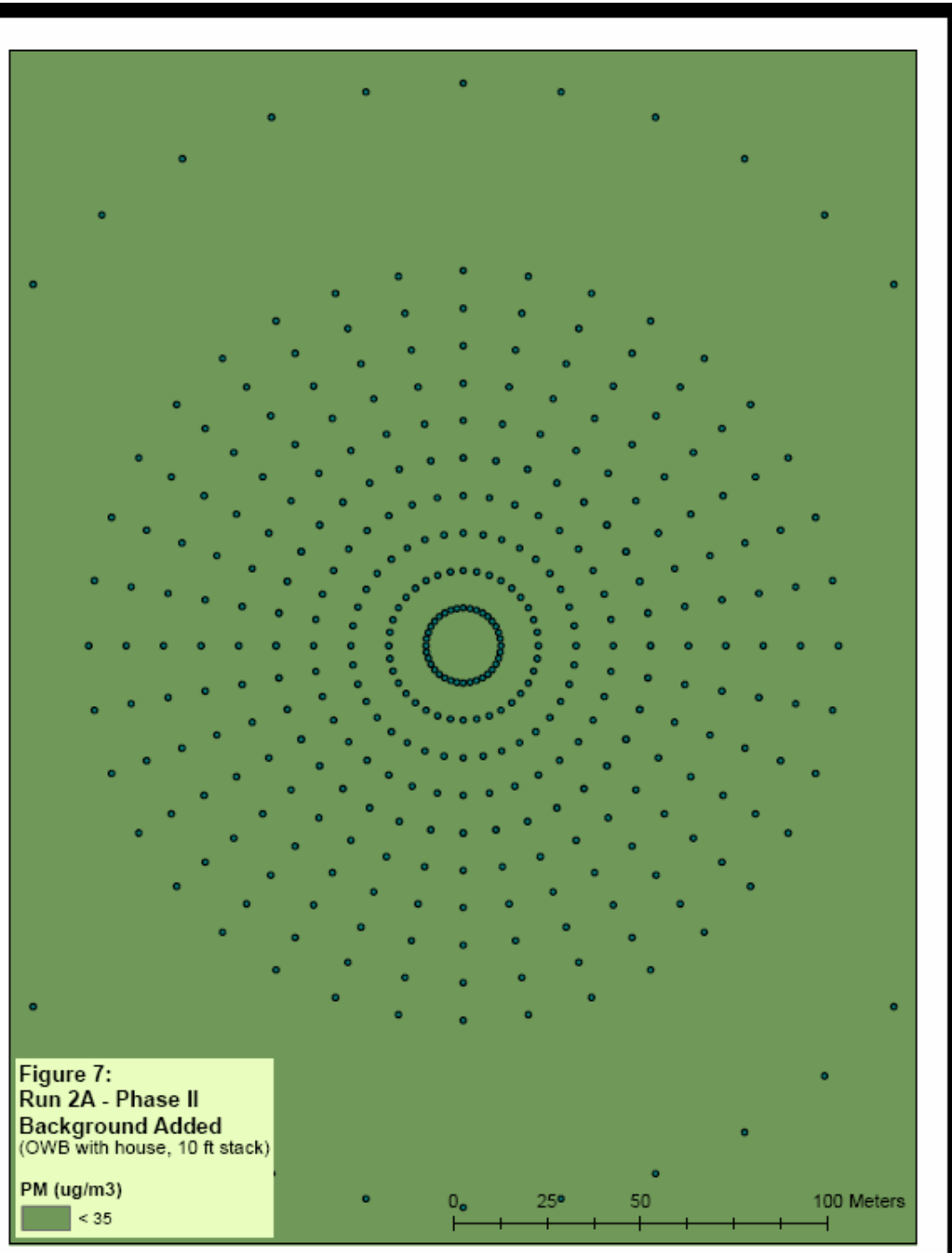
Figure 7:
Run 2A - Phase II
Background Added
(OWB with house, 10 ft stack)
PM (ug/m3)
< 35
0
25
50
100 Meters

Opacity standard

- Applies to all units
- Defined as:
  - No person shall cause or allow the emission of a smoke plume from any outdoor hydronic heaters to exceed an average of 20% opacity for six consecutive minutes in any one-hour period.
  - Except that emissions may not exceed 40% opacity for 20 minutes during a the startup period of a new fire. This only includes initial firing of the unit, where no coal bed exists. This exception does not apply to refueling.
- States may choose to apply their existing opacity requirements.

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Resources

- Outdoor Wood Boilers
  - http://www.nescaum.org/topics/outdoor-hydronic-heaters/
  - http://www.epa.gov/owhh/resources.htm
- EPA woodstoves
  - http://www.epa.gov/woodstoves/programs.html
- Environment Canada
  - http://www.ec.gc.ca/cleanair-airpur/default.asp?lang=En&n=50E7D551-1

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