AEG Special Joint Meeting/Symposium

"Assessment, Monitoring and Mitigation of Naturally Occurring Asbestos (NOA) Hazards in the Western U.S."

OUTDOOR AIR SCRUBBING

BACK TO BASICS

FUNDAMENTAL SCIENCE APPLIED TO NOA MITIGATION

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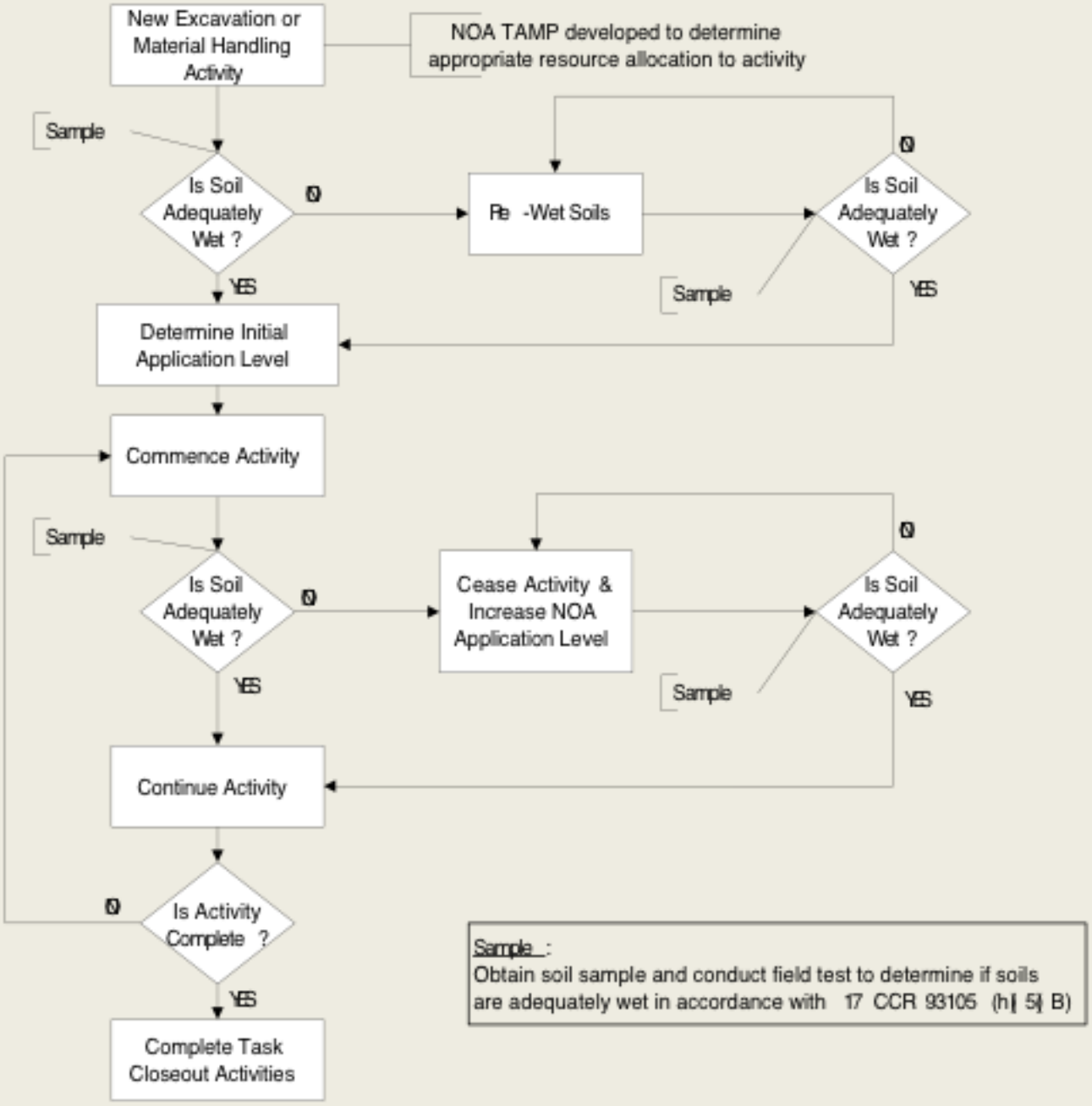
KUMA's Strategy for NOA Control

NOA TAMP (Task Analysis & Mitigation Plan)

- Identify Particulate Source Areas
- Identify Particulate Control Methods
  - ü area mist
  - ü point source mist
  - ü soil glues
  - ü adequately wet soil
  - ü consolidation of soil
- Mitigate all sources

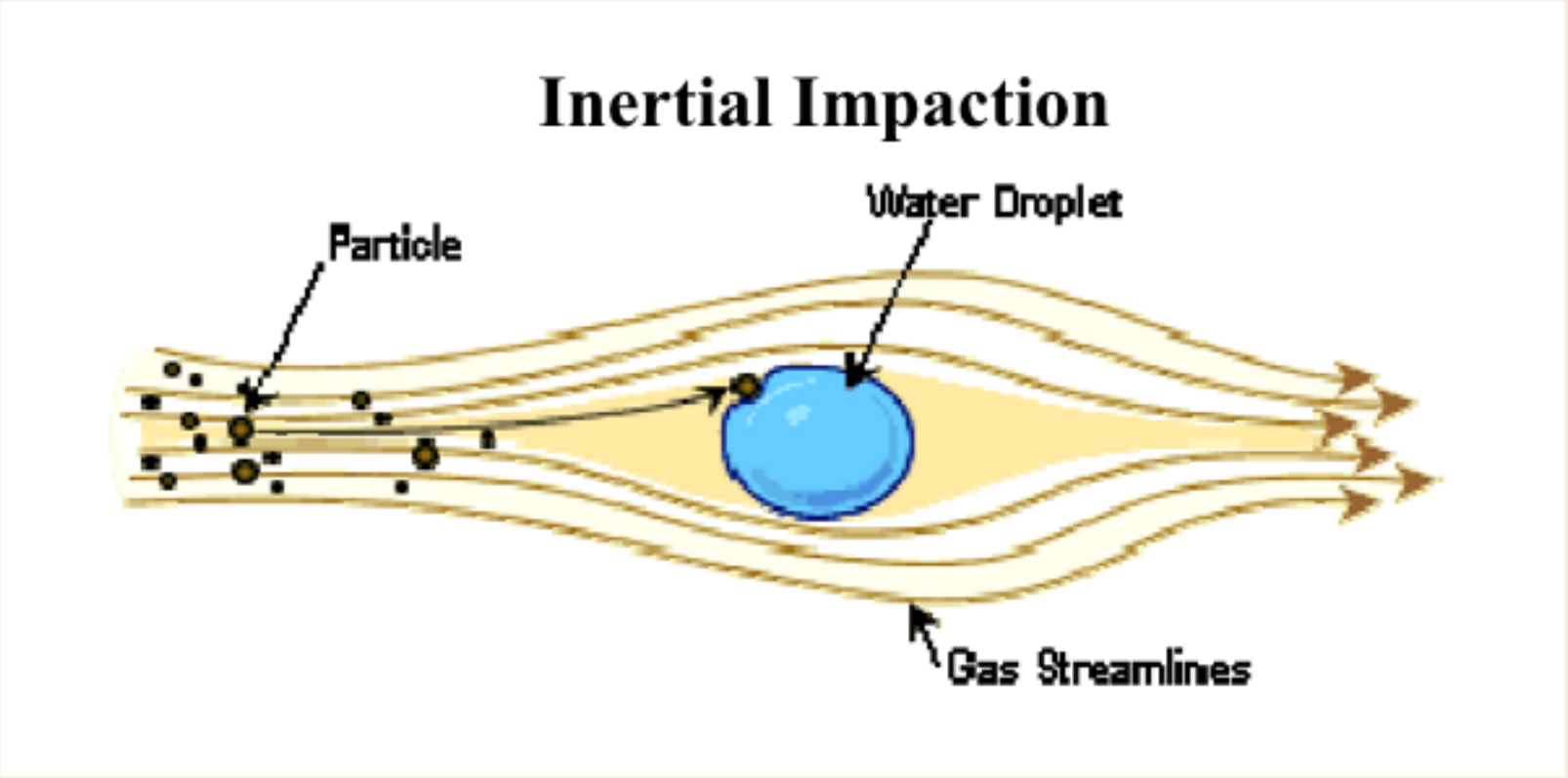
NOA Control using Adequately Wet Testing



Particulate Collection

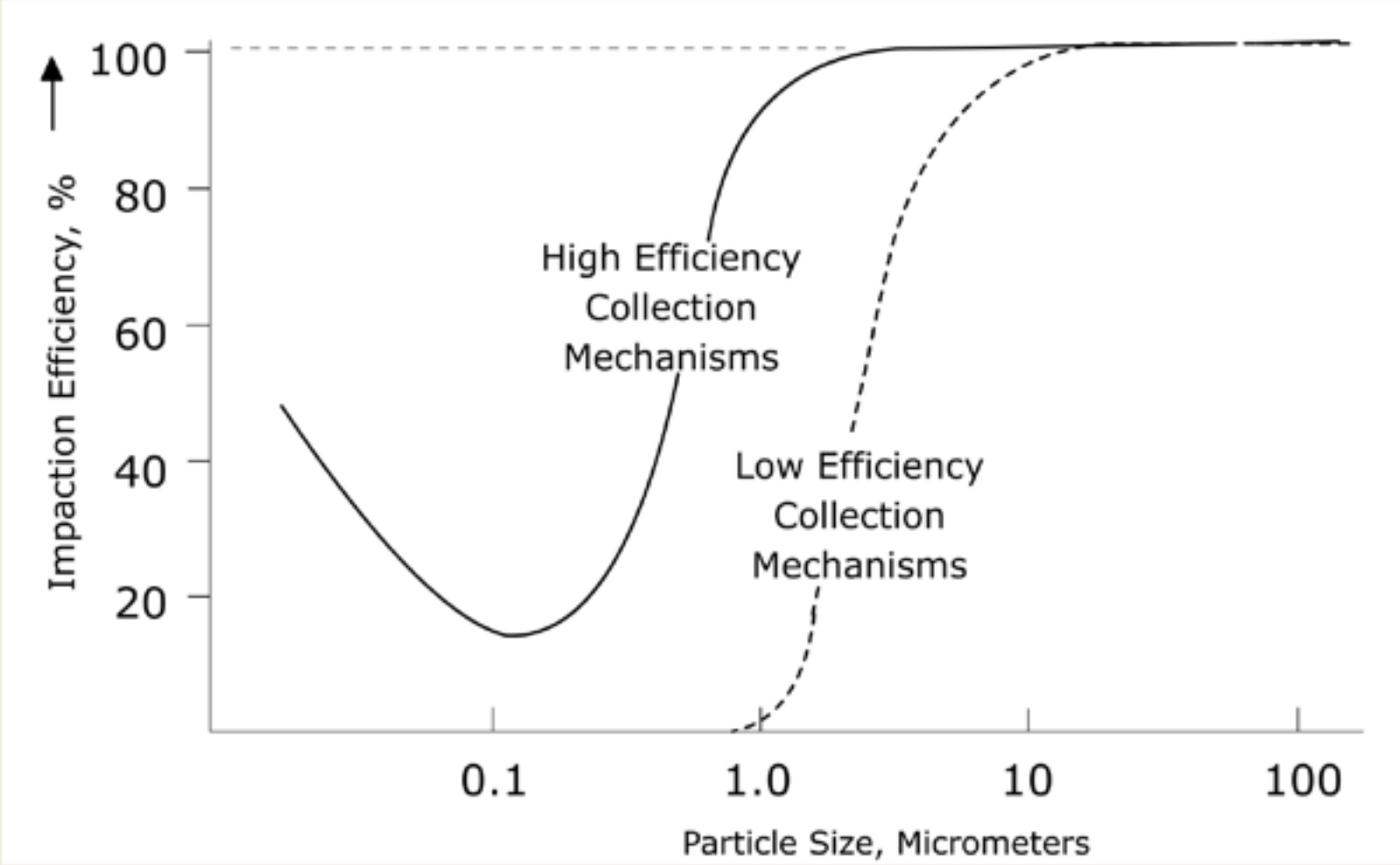
- Inertial Impaction
- Collection Efficiency
- Dust (NOA) Collection Process
- Water Particle Distribution
- Comparison of Typical Dust Control Methods to KUMA's Methods

Particulate Collection



Collection Efficiency

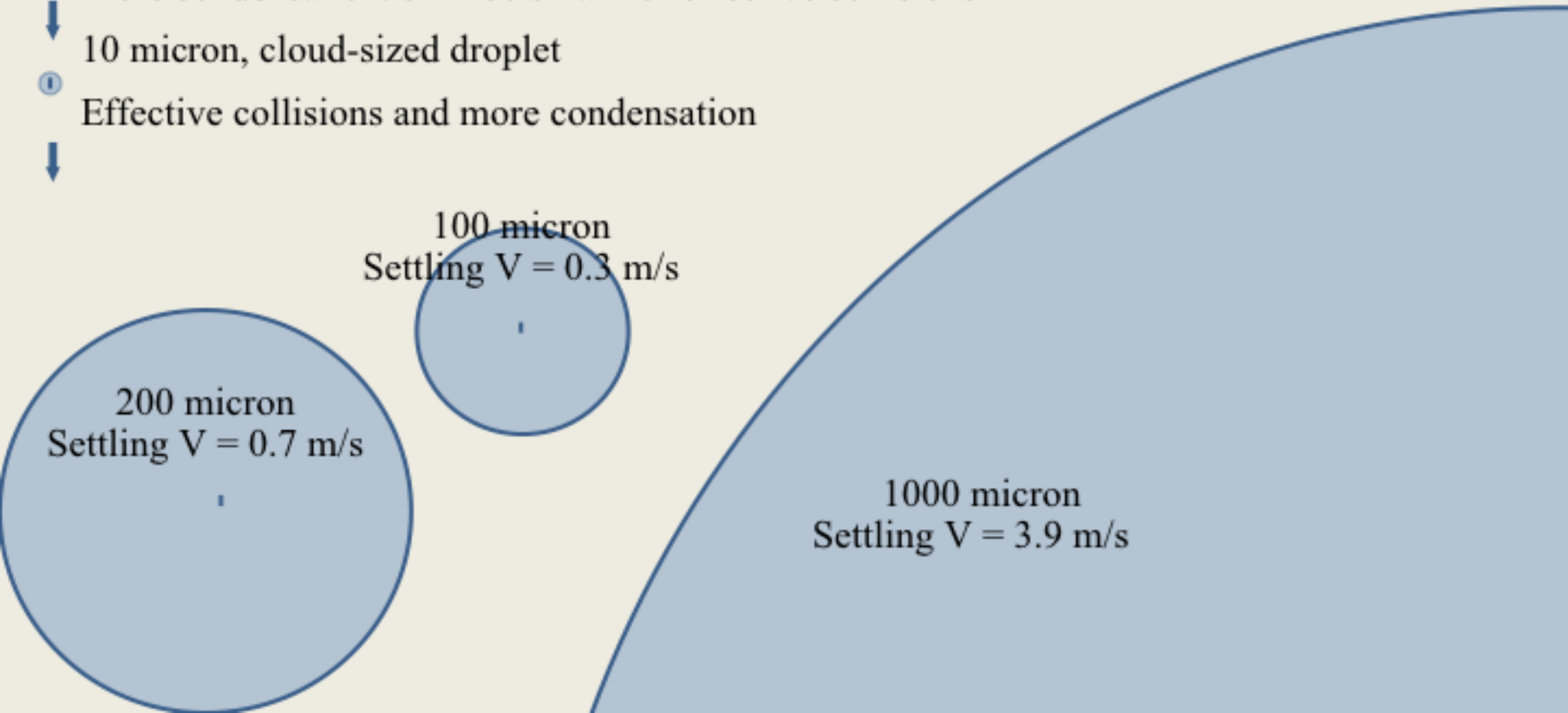
General relationship between particle size and collection efficiency



Source: EPA-APTI: 413 Control of Particulate Matter Emissions, 5th Edition, Chapter 4

Dust (NOA) Collection Process

- 5 micron long asbestos fiber floating in the air
- Water condensation: NOA fiber too small for effective collisions
- Nucleated condensation of water molecules and small water particles impaction
- More condensation: still too small for effective collisions
- 5 micron size water droplet with NOA fiber nuclei
- More condensation: still too small for effective collisions
- 10 micron, cloud-sized droplet
- Effective collisions and more condensation



WATER PARTICLE DISTRIBUTION – KUMA SYSTEMS

Particle Data Before Coalescence

	D10	D20	D32	D50	D90
Particle Aerodynamic Diameter (µm):	0.000278	10	38	50	60
Percent of water volume:	10%	10%	12%	18%	40%
Volume (gallons) of water per minute:	8.8	8.8	10.56	15.84	35.2
Weight (grams) of water per minute:	333.08	333.08	399.696	599.544	1332.32
Weight (grams) of particle:		5.24E-10	2.87E-08	6.54E-08	1.13E-07
Number of Particles:	1.15E+25	6.36E+11	1.39E+10	9.16E+09	1.18E+10

After Condensation, Coalescence and Evaporation

Particle Aerodynamic Diameter (µm):	0.000278	10	1000	3000
Percent of water volume:	60%	10%	10%	20%
Volume (gallons) of water per minute:	52.8	8.8	8.8	17.6
Weight(grams) of water per minute:	199,848	33,308	33,308	66,616
Weight (grams) of particle:	RH	5.24E-10	5.24E-04	1.41E-02
Number of Particles:	6.88E+27	6.36E+13	6.36E+07	4.71E+06

Assumptions

Wind Speed (mph): 5

Initial Relative Humidity: 19%

Final Relative Humidity: 100%

Temp (degrees F): 90

Work Area: 50' wide x 15' high x 440' long

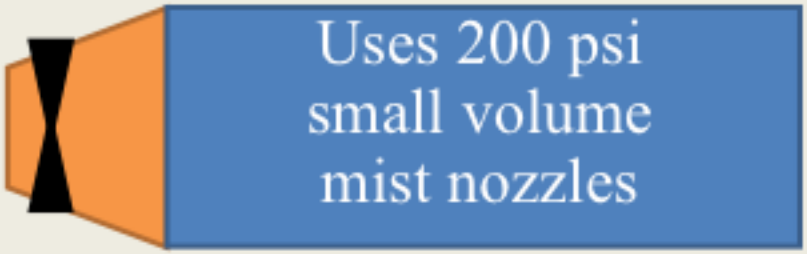
Air Treated: 330,000 cubic ft/min

Water Flow Rate: 88 gallons per minute
(30% remains onsite 70% migrates off site)

Comparison of Typical Water Spray Methods

Fire Hose (velocity >10 mph)
10,000 micron drops

100 psi



Spray Fan (velocity >100 mph)
~40 micron drops
Water and air at the same velocity

KUMA Mist Gun (velocity >400 mph)
Very small (32% under 40 micron drops)
Uses high volume spray nozzle

2,000 psi

KUMA Video

Question & Answers