Asbestos Site Assessment Framework – Day 2

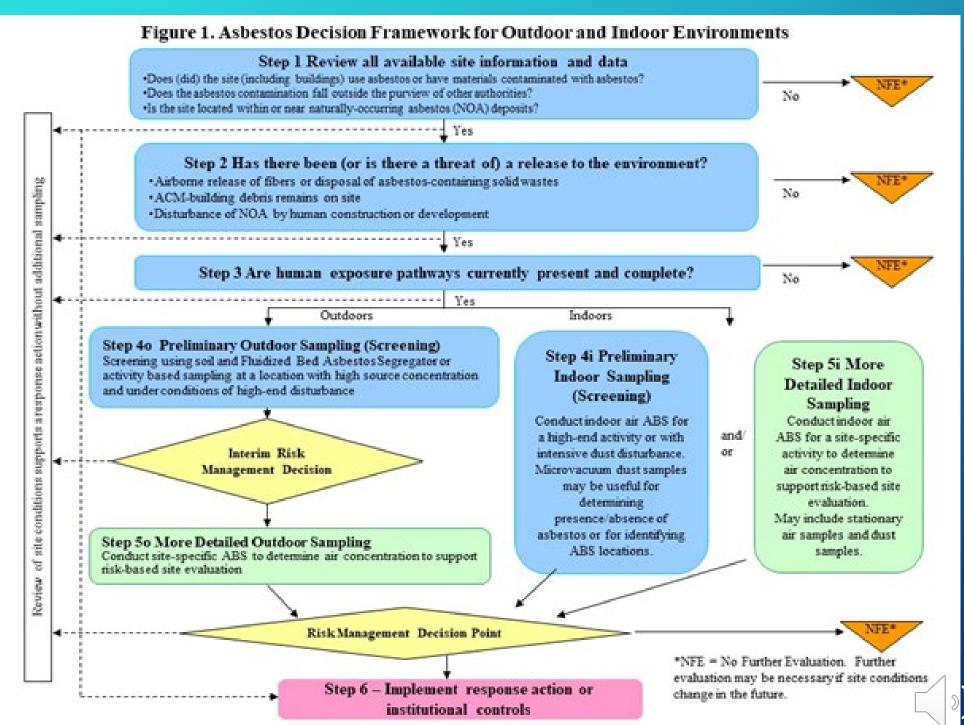
Technical Review Workgroup Asbestos Committee



The Framework Process



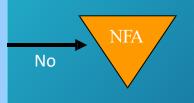
Outline of the Framework



Step 1 - Review all available site information and data

Does (did) the site (including buildings) use asbestos or materials contaminated with asbestos?

Does the asbestos contamination at the site fall outside the purview of other authorities? Is the site located within or near naturally-occurring asbestos (NOA) deposits?



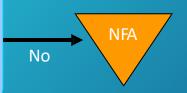
- Historic documents from facility operations
- Products that the facility produced
- Visual inspection of facility
- Review of previous environmental sampling that may have occurred
- Interview current people who work on the site or live nearby



Step 2 – Has there been (or is there a threat of) a release to the Environment?

Airborne release of fibers or disposal of asbestos-containing solid wastes ACM-building debris remains on site

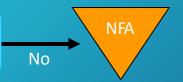
Disturbance of NOA by human activities (e.g., construction)



- Commercial operations that processed, transported or received products that contained asbestos
- Asbestos-containing building materials in poor condition
- Disturbance of soil that contains naturally occurring asbestos
- Potential for release into environment and/or deposition in indoor environments



Step 3 – Are human exposure pathways currently present and complete?



- Begin with current receptors that may contact contaminated materials
 - Workers, trespassers, recreational activities, nearby residential buildings
- Estimate potential future uses of the property
- Generally, a pathway would be considered complete unless there is no activity possible at the site or if the contamination is unavailable for contact (e.g., under pavement)
- Outdoor and indoor sampling will follow a parallel pathway.



Step 4o – Preliminary Outdoor Sampling (Screening)

Screening using soil and Fluidized Bed Asbestos Segregator or activity-based sampling at a location with high source concentration and under conditions of high-end disturbance

- Collect air samples using ABS methods
 - Raking or a site-specific activity is the preferred ABS scenario
- May also collect soil samples for determination of percent asbestos to better characterize nature and extent of contamination



Step 4i – Preliminary Indoor Sampling (Screening)

Conduct indoor air ABS for high-end activity with intensive dust disturbance. Microvacuum dust samples may be useful for determining presence/absence of asbestos or for identifying ABS locations.

- Collect
 environmental data
 using ABS methods
 - Sweeping or a site-specific activity is preferred method
 - Air sampling with fans can be used for indoor ambient air
- May also collect dust samples to better characterize nature and extent of contamination





Risk Management Decision Point 1

- Outcome 1 No asbestos is detected in screening samples or asbestos concentrations are below risk-based level of concern
 - May lead to no further evaluation
- Outcome 2 Asbestos detected at or above the risk-based level of concern
 - May lead to further investigation or response action



Step 5o – More Detailed Outdoor Sampling

Conduct site-specific ABS to determine air concentrations to support risk-based site evaluation.

Step 5i – More Detailed Indoor Sampling

Conduct site-specific ABS to determine air concentrations to support risk-based site evaluation. May include stationary air samples and dust samples.

- Collect more site-specific data to determine appropriate response
 - Use of actual site-specific scenarios that are expected to occur on the site
 - Samples collected over a larger area or more indoor areas and/or frequency of sampling increases to obtain a better estimate of site-wide exposures



Risk Management Decision Point 2

- Outcome 1 Estimates of exposure below riskbased level of concern
 - No further evaluation recommended
- Outcome 2 Estimates of exposure are at or above risk-based level of concern
 - Implement response action or institutional controls
- Outcome 3 Estimates of exposure may not provide adequate information to support site decision
 - Additional evaluation may be needed



Step 6 – Implement response action or institutional controls

- Variety of options are available
 - Remove soil or contaminated material
 - Install a permanent cap over the contaminated areas
 - Place institutional controls (ICs) on the property that restrict use of (and therefore exposure to) the contaminated areas
 - Combination of above

Q&A Break

Case Study: Dort Food Storage Emergency Response







- Building damaged by fire in 2013
- Abandoned, structurally unsound building (piles of rubble)
- Day care center in adjacent building had play area within rubble (for 6 years)
- Genesee County Land Bank and MI EGLE requested EPA assistance on Jan 9, 2020
- EPA conducted assessment then an emergency response to address friable asbestos identified in building ruins
- EPA also cleaned day care center playground equipment where possible, and sampled within the day care center to evaluate track in



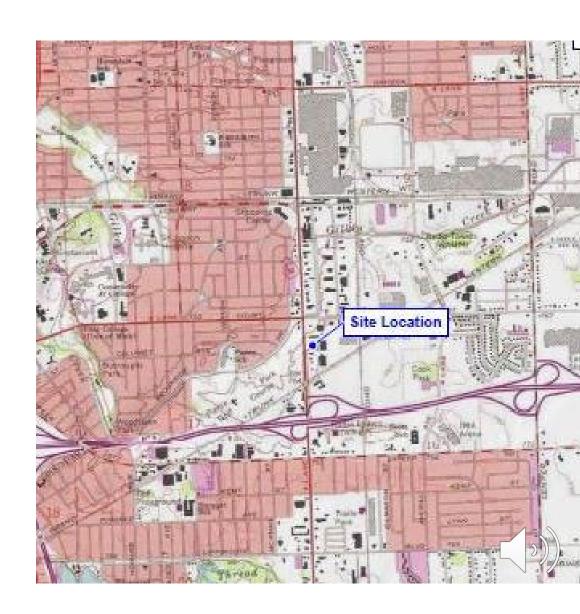




Dort Site Location

- Flint, MI
- Mixed commercial and industrial area

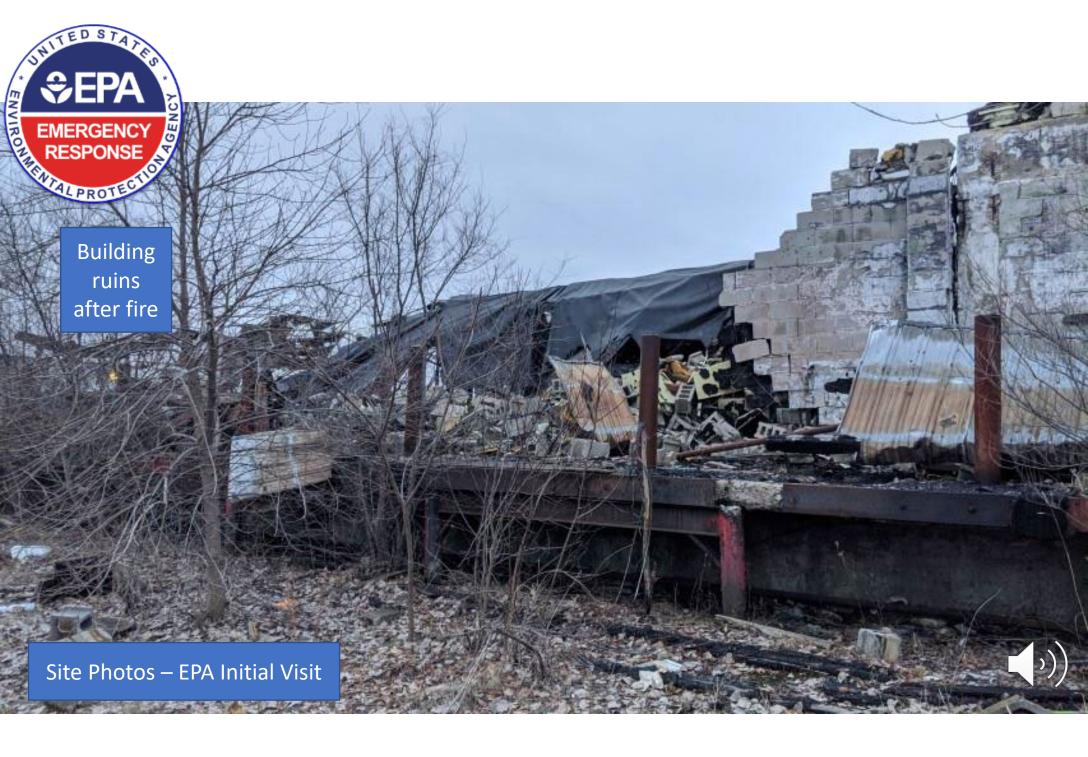






Site Location









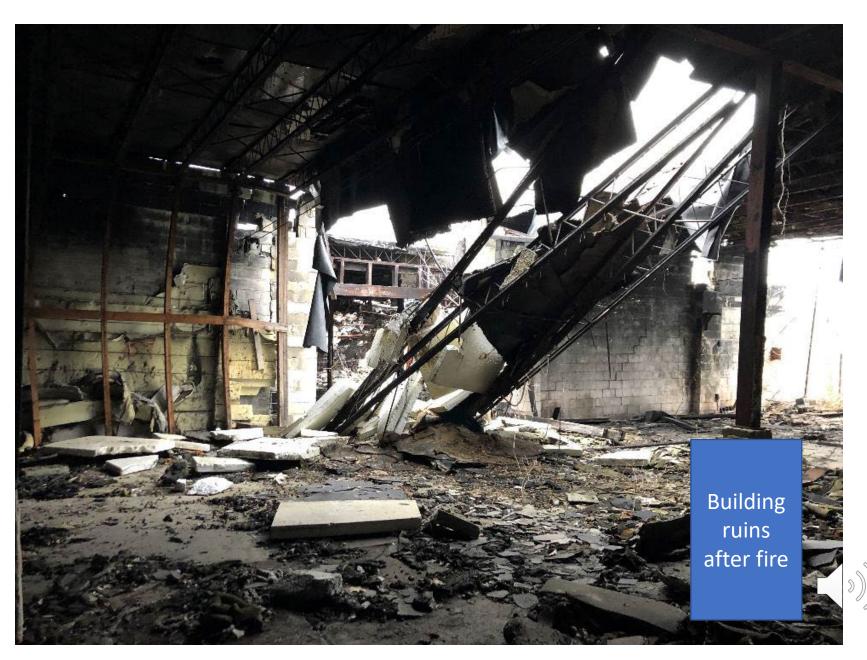






























Using the Framework to help determine how to address an asbestos site

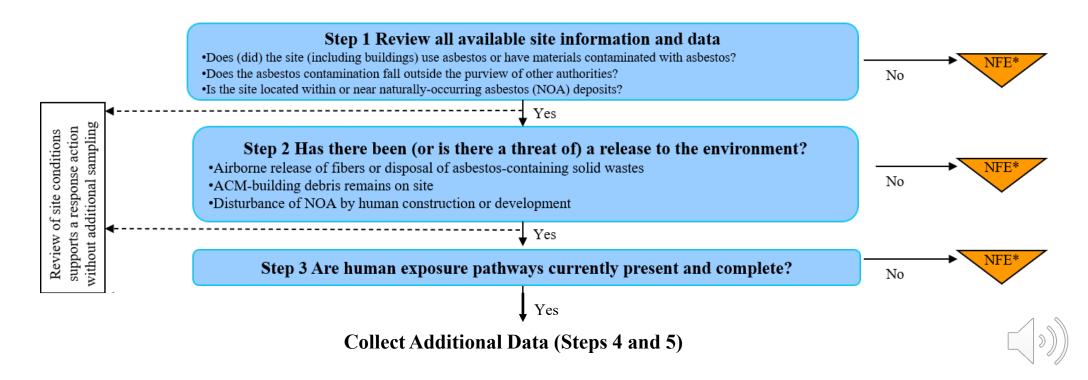
Figure 1. Asbestos Decision Framework for Outdoor and Indoor Environments Step 1 Review all available site information and data *Does (did) the site (including buildings) use asbestos or have materials contaminated with asbestos? •Does the asbestos contamination fall outside the purview of other authorities? No *Is the site located within or near naturally-occurring asbestos (NOA) deposits? Step 2 Has there been (or is there a threat of) a release to the environment? ·Airborne release of fibers or disposal of asbestos-containing solid wastes sam pling No ·ACM-building debris remains on site Disturbance of NOA by human construction or development Review of site conditions supports a response action without additional Step 3 Are human exposure pathways currently present and complete? Outdoors Indoors Step 40 Preliminary Outdoor Sampling (Screening) Step 4i Preliminary Screening using soil and Fluidized Bed Asbestos Segregator or Step 5i More activity based sampling at a location with high source concentration Indoor Sampling **Detailed Indoor** and under conditions of high-end disturbance (Screening) Sampling Conduct indoor air ABS for Conduct indoor air a high-end activity or with and/ ABS for a site-specific Interim Risk intensive dust disturbance. activity to determine Microvacuum dust samples Management Decision air concentration to may be useful for support risk-based site determining evaluation. presence/absence of May include stationary asbestos or for identifying air samples and dust Step 50 More Detailed Outdoor Sampling ABS locations. sam ples. Conduct site-specific ABS to determine air concentration to support risk-based site evaluation Risk Management Decision Point *NFE = No Further Evaluation Further evaluation may be necessary if site cor Step 6 - Implement response action and/or change in the future.

institutional controls



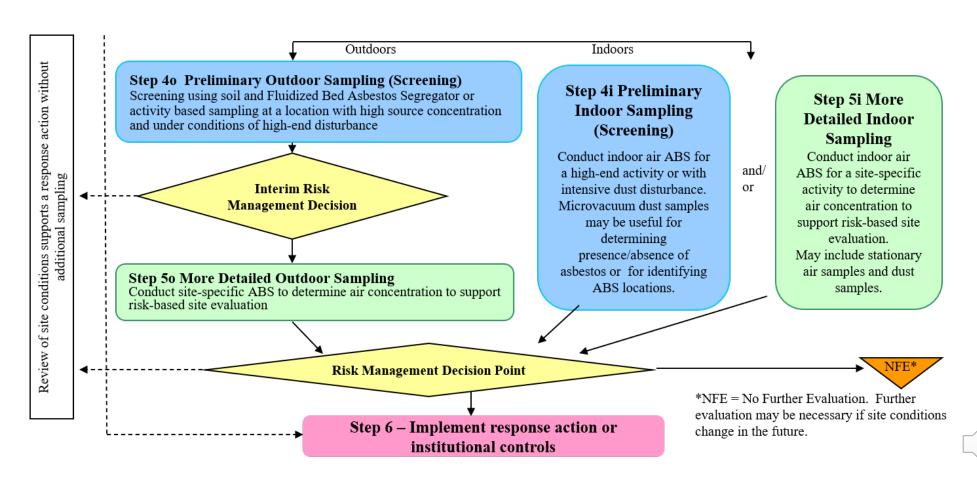
Using the Framework to help determine how to address an asbestos site

Framework Steps 1-3: Evaluating Existing Information





Framework Steps 4-6: Additional Data and Actions





Framework Step 1 – Review Existing Info.

Step 1 - Review all available site information and data

Does (did) the site (including buildings) use asbestos or materials contaminated with asbestos?

Does the asbestos contamination at the site fall outside the purview of other authorities? Is the site located within or near naturally-occurring asbestos (NOA) deposits?



- Existing Information Evaluated
 - County assessed former building site in 2019
 - County contractor collected 92 samples of 127 building material and identified drums on site
 - Building materials analyzed using PLM EPA Method 600/R-93/116
 - Chrysotile asbestos, at levels up to 10%, was identified in 9 classes of building materials
 - Lab determined materials to be non-friable
 - Conclusion: Proceed to Framework Step 2

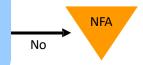




Framework Step 2 – Release Evaluation

Step 2 – Has there been (or is there a threat of) a release to the Environment?

Airborne release of fibers or disposal of asbestos-containing solid wastes ACM-building debris remains on site Disturbance of NOA by human activities (e.g., construction)



- Existing Information Evaluated:
 - County's building ruins assessment documented:
 - ACM present and in poor condition
 - Potential for release into environment and/or deposition in indoor environments exists
 - Initial site visit document:
 - Nearby sensitive receptors
- Next Step: Conduct field assessment of friability of asbestos present at former building site via EPA Site Assessment





Framework Step 2 – Release Evaluation

Step 2 - Has there been (or is there a threat of) a release to the Environment?

Airborne release of fibers or disposal of asbestos-containing solid wastes ACM-building debris remains on site

No Disturbance of NOA by human activities (e.g., construction)

- EPA assessed structural integrity of building and then assessed materials (where feasible)
 - Building determined to be structurally unsound
 - Damaged building materials contained friable asbestos
 - Drums contained low levels of hazardous substances
- Conclusion: Friable asbestos documented on site. ACM also could have been tracked indoors.
 - Proceed to Framework Step 3



Example of burned debris that tested positive ACM and was friable



Framework Step 3 – Exposure Pathway Evaluation

Step 3 - Are human exposure pathways currently present and complete?



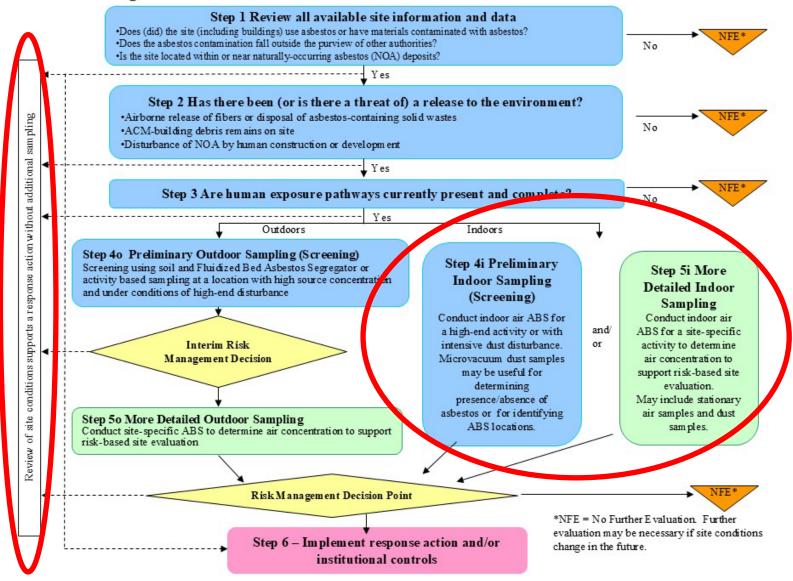
County and EPA Assessment documented:

- 1) Complete human exposure pathways exist outdoors in and near the building ruins site
 - a) Children attending day care, workers, trespassers, nearby commercial building occupants
- Further assessment was needed to determine whether a complete human exposure pathway was present indoors within the day care building
 - a) Unknown whether asbestos had been tracked into or been introduced into the building via ventilation



Pathway from Step 3 to Response Action and Indoor Sampling

Figure 1. Asbestos Decision Framework for Outdoor and Indoor Environments





Emergency Response Initiated to Address Building Ruins

Key Planned Response Actions:

- ACM debris management plan, including appropriate control mechanisms (e.g., wetting)
- Demolishing remaining building and retrieving ACM
- Removing, securing, staging, packaging, transporting and disposing of ACM, identified hazardous substances, ACM-impacted wastes, and pollutants and contaminants at EPA-approved disposal facilities in accordance with EPA Off-

Site Rule (40 C.F.R. § 300.440)

- Restoring the Site
- Sampling and decontaminating contaminated structures, surfaces, playground equipment and play areas as necessary
- Decontaminating equipment
- Demobilizing personnel and equipment

EPA We Are Cleaning Up in Your Area Dort Food Storage Site

Flint, Michigan

The U.S. Environmental Protection Agency is cleaning up contaminated material at the Dort Food Storage site, located at 925 S. Dort Highway., in Flint. Cleanup will begin during the week of January 27, 2020. Work hours are generally 8 a.m. through 6 p.m. Here's what workers will do:

- Demolish the building ruins to remove asbestos-containing mates small containers.
- Transport and dispose of contaminated waste at an approved facility.
- Backfill the site with clean fill.
- Follow a safety plan, including air monitoring to protect the health of workers and the public.

For more information, contact EPA On-Scene Coordinator Elizabeth Nightingale at nightingale.elizabeth@epa.gov or 734-770-8402; or EPA On-Scene Coordinator Terry Stilman at stilman.terry@epa.gov or 678-576-6440.



Photos of Emergency Response in Outdoor Area









































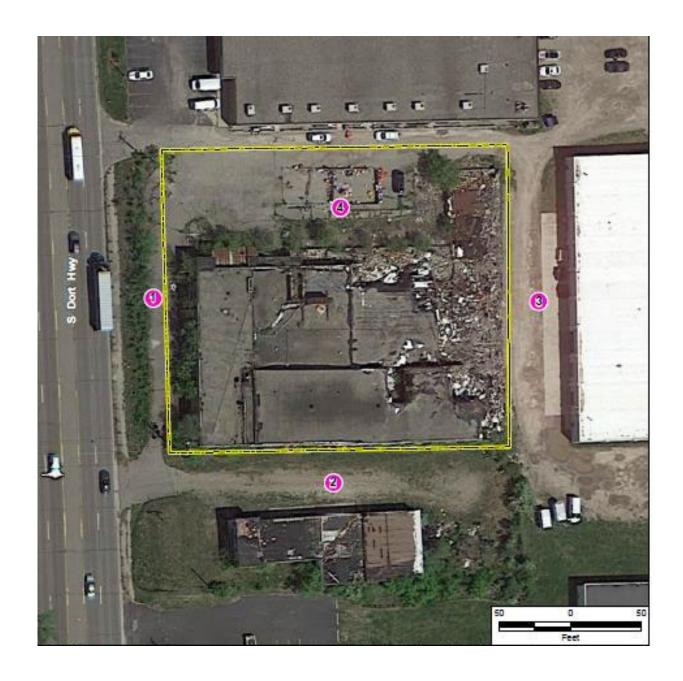


Air Monitoring and Sampling

- Implemented during all site work
- 4 perimeter stations
- Perimeter Particulate Monitoring (PM 2.5 and PM 10)
 - DustTrakTM DRX particulate air monitors
- Asbestos Sampling
 - Daily, concurrent with particulate monitoring
 - PCM NIOSH Method 7400 followed by TEM via NIOSH 7402 if detections
 - Work Zone Action Limit: if > 0.1 fiber/cm³ then Level C (OSHA PEL)
 - Perimeter Action Limit: AL 0.001 f/ cm³ (Framework/Asbestos TRW consultation)



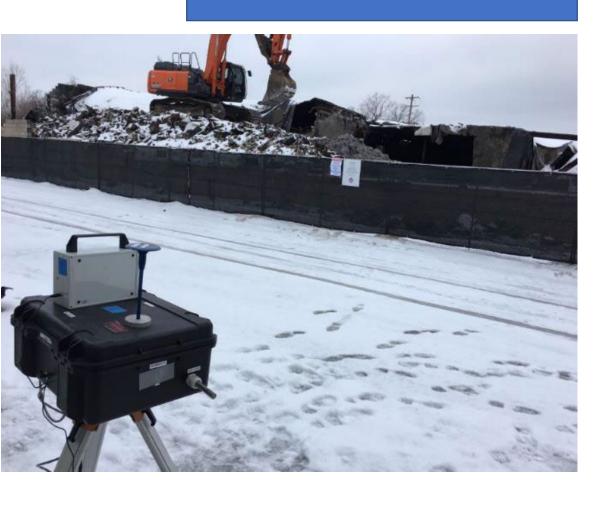
Perimeter
Air
Monitoring/
Sampling
Locations







Air Monitoring and Sampling Stations









VIPER: DEPLOYMENT MANAGER

Welcome nightingale.elizabeth@epa.gov! [Log Out]

Deployments (2)

Help

Viper system

provided real time notification of any particulate action level

exceedances

R05 Dort Food Storage Deployment [Edit]

All Times Eastern, DST Observed

Start: 2/3/2020

End:

Description: Alarms and Notifications



DustTrak(s):

~	Instrument ID	Connection	Location	stel	total TWA	PM10 TWA	RESP TWA	PM2.5 TWA	PM1 TWA	Total	PM10	RESP	PM2.5	PM1	5Min PM10 TWA
0	(<u>.1) DustTrak</u> * DT1	OK [Edit]	43.0165792, -83.6543266		0.012 twa	0.012 twa	0.011 twa	0.011 twa	0.011 twa	0.017 mg/m3	0.017 mg/m3	0.016 mg/m3	0.016 mg/m3	0.016 mg/m3	0.020140 mg/m3
0	(<u>.2) DustTrak</u> * DT2	OK [Edit]	43.0162600, -83.6538140		0.011 twa	0.016 mg/m3	0.016 mg/m3	0.016 mg/m3	0.016 mg/m3	0.015 mg/m3	0.018267 mg/m3				
0	(<u>.3) DustTrak</u> * DT3	OK [Edit]	43.0166170, -83.6532720		0.012 twa	0.022 mg/m3	0.022 mg/m3	0.022 mg/m3	0.022 mg/m3	0.021 mg/m3	0_ p? mg/m3				
0	(<u>.4) DustTrak</u> * DT4	OK [Edit]	43.0168950, -83.6538520	False bool	0.012 twa	-0.002 mg/m3	-0.002 mg/m3	-0.002 mg/m3	-0.002 mg/m3	-0.002 mg/m3	-0.002000 mg/m3				

NOAA NWS Observations(s):

~	Instrument ID	Connection	Location	Received
	I IIISCI GIII CIIC ID	Connection	LUCATION	NCCCIVCU



Perimeter Air Sampling and Monitoring Results

Air Sampling (Asbestos)							
	PCM R (total fik	TEM Results (asbestos fibers/cc)					
	Min.	Max.	Max.				
Site Action Level	0.001	0.001	0.001				
Weekly Average – Week 1	<0.0006	<0.0007	<0.0003				
Weekly Average – Week 2	<0.0007	<0.0010	<0.0006				
Weekly Average – Week 3	<0.0005	<0.0005	NA				
Weekly Average – Week 4	<0.0007	<0.0010	NA				





Framework Steps 4 and 5 – Outdoor Clearance Sampling

Step 4o – Preliminary Outdoor Sampling (Screening)

Screening using soil and Fluidized Bed Asbestos Segregator (FBAS) or activity-based sampling (ABS) at a location with high source concentration and under conditions of high-end disturbance

Step 50 – More Detailed Outdoor Sampling

Conduct site-specific ABS to determine air concentrations to support risk-based site evaluation.

- After removing all suspected ACM and establishing final grade at site, EPA conducted soil sampling using FBAS and air sampling during ABS to verify that the outdoor exposure pathway had been eliminated
 - ABS air sampling is traditionally used for clearance, whereas soil sampling for clearance is still considered a developing methodology
 - Here EPA sampled both soil and air in clearance sampling, to add information to the research comparing the two methodologies



Clearance Soil Sampling

- Process Used
 - Divided site into 4 grids (4 decision units)
 - Collected 30-point incremental samples from each grid
 - Analyzed soil samples by CARB 435* PLM method
 - Detection Limit = 0.25%.
 - If any detections greater than 0.25%, re-scrape surface soils in grid, and resample
 - If trace detections, run FBAS @ EMSL
 - FBAS*
 - If less than 100,000 structures per gram of soil no follow up needed
 - If greater than 100,000 structures per gram of soil re-scrape and resample grid
- No asbestos was detected in any of these soil samples
 - No FBAS samples were run



*Action levels for CARB and FBAS developed in consult with the Asbestos TRW and Health Agencies



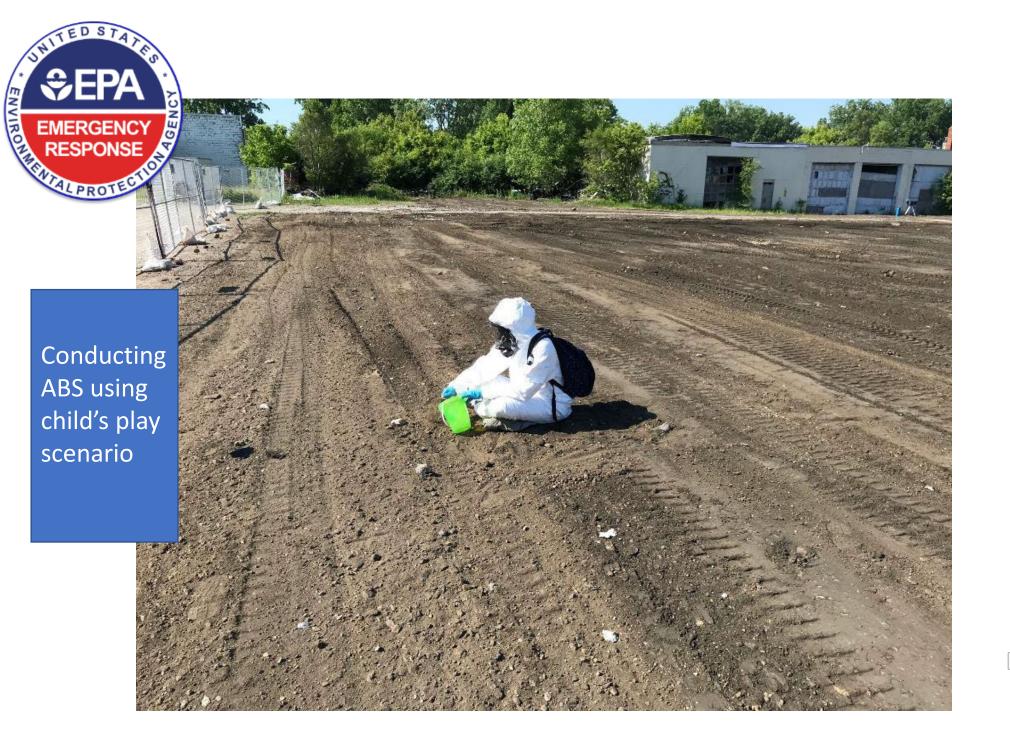


Clearance Air Sampling using Activity Based Sampling

- Process Used
 - Divided site in half
 - Used child's play scenario, sampling air during play
 - Sampling personnel played in dirt for a combined 200 minutes in each site half
 - Each person sampling was fitted with two air sampling pumps – one high flow and one low flow
 - Action levels established*
 - Commercial/industrial: 0.007 f/cc
 - Day care play: 0.04 f/cc
- No asbestos was detected in any of these samples

*Action levels
developed
using
equations
recommended
in the
Framework,
and in
consultation
with the TRW
and Health
Agencies.









Risk Management Decision Point

Because no asbestos was detected in either the air/ABS or soil samples no further action was needed in the outdoor area and site was restored.

Figure 1. Asbestos Decision Framework for Outdoor and Indoor Environments Step 1 Review all available site information and data Does (did) the site (including buildings) use asbestos or have materials contaminated with asbestos? •Does the asbestos contamination fall outside the purview of other authorities? No *Is the site located within or near naturally-occurring asbestos (NOA) deposits? Step 2 Has there been (or is there a threat of) a release to the environment? ·Airborne release of fibers or disposal of asbestos-containing solid wastes without additional sampling No ·ACM-building debris remains on site Disturbance of NOA by human construction or development Step 3 Are human exposure pathways currently present and complete? Outdoors Indoors Step 40 Preliminary Outdoor Sampling (Screening) Step 4i Preliminary Screening using soil and Fluidized Bed Asbestos Segregator or Step 5i More activity based sampling at a location with high source concentration Indoor Sampling **Detailed Indoor** and under conditions of high-end disturbance (Screening) Sampling Conduct indoor air ABS for Conduct indoor air conditions supports a high-end activity or with ABS for a site-specific Interim Risk intensive dust disturbance. activity to determine Microvacuum dust samples Management Decision air concentration to may be useful for support risk-based site determining evaluation. presence/absence of May include stationary asbestos or for identifying air samples and dust of site Step 50 More Detailed Outdoor Sampling ABS locations. sam ples. Conduct site-specific ABS to determine air concentration to support risk-based site evaluation Risk Management Decision Point *NFE = No Further E valuati auon may be necessary if site or Step 6 - Implement response action and/or change in the future.

institutional controls



Building Ruins Area Restored

- 80 tons of metal recycled
- 1,800 CY material reused
- Restored site via hydroseeding then mulching after clearance sampling







Framework Step 4i & 5i- Day Care Center Interior Sampling

Step 4i – Preliminary Indoor Sampling (Screening)

Conduct indoor air ABS for high-end activity with intensive dust disturbance. Microvacuum dust samples may be useful for determining presence/absence of asbestos or for identifying ABS locations.

indoor sampling for asbestos vary across Regions.

- EPA and Health Agencies were concerned that asbestos may have been introduced into daycare via track in or ventilation systems
- The team conducted an initial walkthrough of the day care center
 - Only obvious exposed potential ACM in building was ceiling tiles
 - Dust present in air intakes, air returns, and on infrequently cleaned surfaces
 - Primary flooring surfaces included tile and permanently installed carpet
- MDHHS developed a Site-Specific Public Health Action Plan (SSPHAP), in consultation with ATSDR and EPA, to evaluate this concern
 - The SSPHAP contained a sampling strategy, action levels, a response plan to implement if exceedances were encountered, and a communication strategy





Gather
Preliminary Data
(and Additional
Data as Need)

Figure 1. Asbestos Decision Framework for Outdoor and Indoor Environments Step 1 Review all available site information and data *Does (did) the site (including buildings) use asbestos or have materials contaminated with asbestos? •Does the asbestos contamination fall outside the purview of other authorities? No *Is the site located within or near naturally-occurring asbestos (NOA) deposits? Step 2 Has there been (or is there a threat of) a release to the environment? ·Airborne release of fibers or disposal of asbestos-containing solid wastes action without additional sampling No ·ACM-building debris remains on site Disturbance of NOA by human construction or development Step 3 Are human exposure pathways currently present and complete? No Outdoors indoors Step 40 Preliminary Outdoor Sampling (Screening) Step 4i Preliminary Screening using soil and Fluidized Bed Asbestos Segregator or Step 5i More Indoor Sampling Detailed Indoor (Screening) Sampling Conduct indoor air ABS for Conduct indoor air a high-end activity or with and/ ABS for a site-specific intensive dust disturbance. activity to determine Microvacuum dust samples air concentration to may be useful for support risk-based site determining evaluation. presence/absence of May include stationary asbestos or for identifying air samples and dust ABS locations. sam ples. entration to support ement Decision Point *NFE = No Further Evaluation Further evaluation may be necessary if site Implement response action and/or change in the future. institutional controls



Day Care Center – SSPHAP Interior Sampling Strategy

- Bulk sampled potential existing ACM (ceiling tile)
 - Action Limit >1% ACM
- Microvac sampled within 10 by 10 cm grids of:
 - Carpet
 - Air supply/return
 - Horizontal surfaces
 - Action Limit >5000 structures/cm² via ASTM D5755-09(2014)e1
- Wipe sampled within 10 by 10 cm grids of:
 - Tile
 - Air supply/return
 - Horizontal surfaces
 - Action Limit >5000 structures/cm² / via ASTM D6480 19
- Did not use ABS because the day care center was in use

Exception to Outdoor Play Requirements Obtained

Information for You About Asbestos at 925 Dort Highway

What has been found?

The Michigan Department of Health and Human Services has learned that asbestos is in the burned building at 925 Dort Highway. The asbestos could get into the air and be breathed in by people in or near the building, including children playing in the outdoor playground of the daycare.

This does not mean your child has breathed in asbestos while playing outside near the building.

What can you do?

As a precaution, we strongly recommend your child does not play outside in the playground near the burned building until the asbestos has been removed.

Staying at the daycare and playing inside can continue. It is unlikely asbestos has or will make its way inside. Time spent walking into the building from the parking lot is not a concern.

Contact with the building's materials should be avoided. If contact does occur, wash hands and any clothing that was worn as soon as possible to avoid breathing in any asbestos that might be on them.





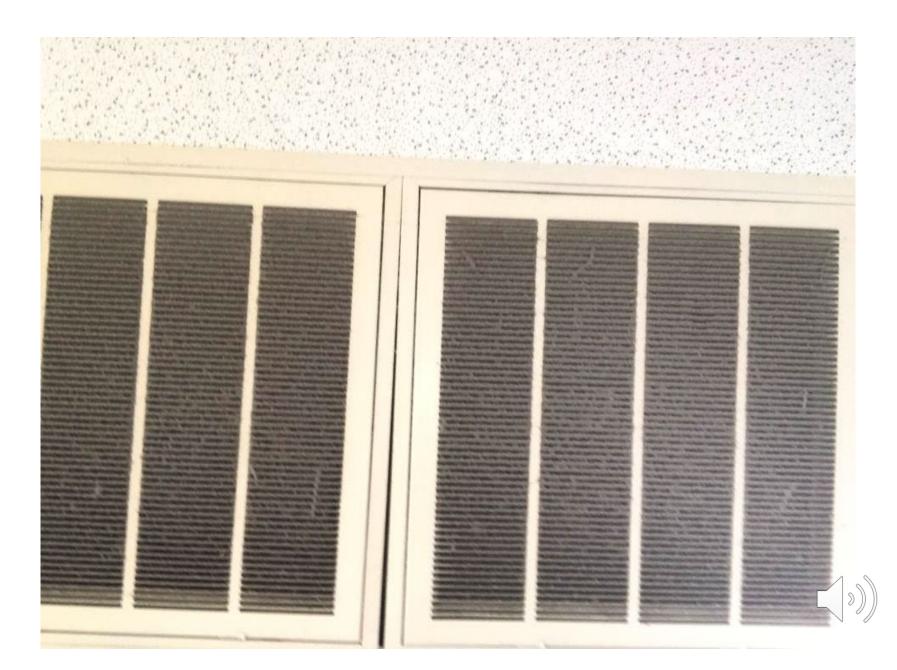


Bulk samples collected from all 3 types of ceiling tiles observed





Visible dust sampled in air returns with wipe and microvac techniques





Visible dust
on horizontal
surfaces
sampled with
wipe and
microvac
techniques



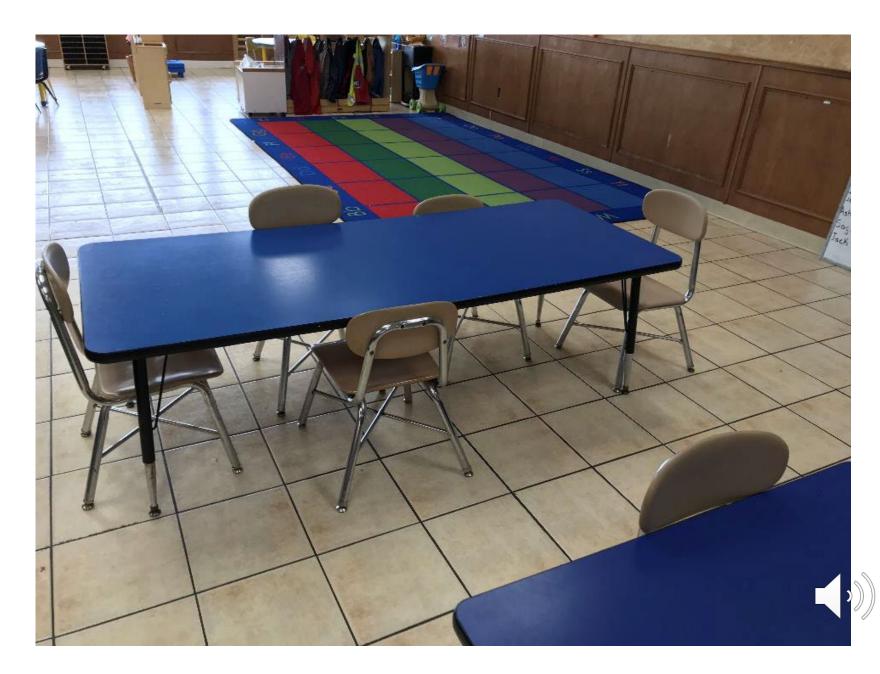


Carpet
sampled
along least
and most
traveled
pathways
with
microvac
technique





Tile surfaces sampled with wipe technique





Day Care Center Assessment – Bulk Results

Bulk Ceiling Tile Sampling Results

- All nondetect
- Action Limit >1%

Sample Name	Material	Asbestos Content (%)	Material Type	Condition	Location
DFS-BULK-H-01-02152020	Ceiling tile, 2'x4' long wormhole pattern	ND	Miscellaneous, Friable	Fair	Suite H Ceiling
DFS-BULK-H-02-02152020	Ceiling tile, 2'x4' pinhole pattern	ND	Miscellaneous, Friable	Good	Suite H Ceiling
DFS-BULK-H-03-02152020	Ceiling tile, 2'x4' long wormhole pattern	ND	Miscellaneous, Friable	Fair	Suite H Ceiling
DFS-BULK-I-01-02152020	Ceiling tile, 2'x4' pinhole pattern	ND	Miscellaneous, Friable	Good	Suite I Ceiling
DFS-BULK-K-01-02152020	Ceiling tile, 2'x4' long wormhole pattern	ND	Miscellaneous, Friable	Fair	Suite K Ceiling
DFS-BULK-K-02-02152020	Ceiling tile, 2'x4' pinhole pattern	ND	Miscellaneous, Friable	Good	Suite K Ceiling
DFS-BULK-K-03-02152020	Ceiling tile, 2'x4' medium wormhole pattern	ND	Miscellaneous, Friable	Good	Suite K Ceiling
DFS-BULK-K-04-02152020	Ceiling tile, 2'x4' medium wormhole pattern	ND	Miscellaneous, Friable	Good	Suite K Ceiling
DFS-BULK-K-05-02152020	Ceiling tile, 2'x4' medium wormhole pattern	ND	Miscellaneous, Friable	Good	Suite K Ceiling

Notes

DFS Dort Food Storage Facility

ND Not detected





Day Care Center Assessment – Microvac Results

Microvac Results

- All below Action Limit
- Action Limit >5000 structure s/cm²

Location	Surface Description	Fraction Filtered	Asbestos Structures Concentration ¹ (str/cm ²)
Suite H (North)	Window blind track (top)	0.50	<527
Suite H (South)	Door frame (top)	0.50	527
Suite H (Central)	Return vent mesh	0.50	<527
Suite H (Central)	Supply vent diffusion plates	0.50	<527
Suite H (South)	Carpet (2' north of rear, interior-doorway)	0.50	<527
Suite H (South)	Carpet (4' north of rear, interior-doorway)	0.50	<527
Suite H (Central)	Carpet (mid-room)	0.50	<527
Suite I (North)	White bookshelf (top)	0.25	<1,054
Suite I (South)	Electrical box (top)	0.50	<527
Suite I (Central)	Supply vent diffusion plates	0.50	<527
Suite I (Central)	Return vent mesh	0.50	<527
Suite K (South)	Partition wall (top)	0.50	<527
Suite K (Central)	Return vent mesh	0.50	<527
Suite K (North)	Supply vent diffusion plates	0.50	<527
	Suite H (North) Suite H (South) Suite H (Central) Suite H (Central) Suite H (South) Suite H (South) Suite H (Central) Suite I (North) Suite I (South) Suite I (Central) Suite I (Central) Suite I (Central) Suite K (South)	Suite H (North) Window blind track (top) Suite H (South) Door frame (top) Suite H (Central) Return vent mesh Suite H (Central) Supply vent diffusion plates Suite H (South) Carpet (2' north of rear, interior-doorway) Suite H (South) Carpet (4' north of rear, interior-doorway) Suite H (Central) Carpet (mid-room) Suite I (North) White bookshelf (top) Suite I (South) Electrical box (top) Suite I (Central) Supply vent diffusion plates Suite I (Central) Return vent mesh Suite K (South) Partition wall (top) Suite K (Central) Return vent mesh	Location Surface Description Filtered Suite H (North) Window blind track (top) 0.50 Suite H (South) Door frame (top) 0.50 Suite H (Central) Return vent mesh 0.50 Suite H (Central) Supply vent diffusion plates 0.50 Suite H (South) Carpet (2' north of rear, interior-doorway) 0.50 Suite H (South) Carpet (4' north of rear, interior-doorway) 0.50 Suite H (Central) Carpet (mid-room) 0.50 Suite I (North) White bookshelf (top) 0.25 Suite I (South) Electrical box (top) 0.50 Suite I (Central) Supply vent diffusion plates 0.50 Suite K (South) Partition wall (top) 0.50 Suite K (Central) Return vent mesh 0.50

Boldface values indicate chrysotile asbestos was detected, but at a concentration below 5,000 str/cm2, the cleanup criterion for dust

recommended by MDHHS.

The cleanup criterion recommended by MDHHS for dust is 5,000 str/cm2

DFS Dort Food Storage Facility

Michigan Department of Health and Human Services MDHHS

str/cm² Structures per square centimeter





Day Care Center Assessment – Wipe Results

Wipe Results

- All below Action Limits
- Samples with high particulates had higher detection limits, but same areas were also sampled with microvac
- Action Limit >5000 structures/cm²

Sample Name	Location	Surface Description	Fraction Filtered	Asbestos Structures Concentration ¹ (str./cm ²)
DFS-WIPE-H-01-02152020	Suite H (North)	Window blind track (top)	0.020	<5,270
DFS-WIPE-H-02-02152020	Suite H (Central)	Return vent mesh	0.020	<5,270
DFS-WIPE-H-03-02152020	Suite H (North)	Supply vent diffusion plates	0.002	<52,696
DFS-WIPE-I-01-02152020	Suite I (North)	White bookshelf (top)	0.002	<52,696
DFS-WIPE-I-02-02152020	Suite I (Central)	Supply vent diffusion plates	0.002	<52,696
DFS-WIPE-I-03-02152020	Suite I (Central)	Return vent mesh	0.002	<52,696
DFS-WIPE-K-01-02152020	Suite K (South)	Partition wall (top)	0.002	<52,696
DFS-WIPE-K-02-02152020	Suite K (Central)	Return vent mesh	0.002	<52,696
DFS-WIPE-K-03-02152020	Suite K (North)	Supply vent diffusion plates	0.002	<52,696
DFS-WIPE-K-04-02152020	Suite K (South)	Tile floor (3' north of rear door)	0.200	<878
DFS-WIPE-K-05-02152020	Suite K (South)	Tile floor (5' north of rear door)	0.200	<878
DFS-WIPE-K-06-02152020	Suite K (Central)	Tile floor (mid-room)	0.300	<878

Notes:

The cleanup criterion recommended by MDHHS is 5,000 str/cm2.

DFS Dort Food Storage Facility

MDHHS Michigan Department of Health and Human Services

str/cm² Structures per square centimeter

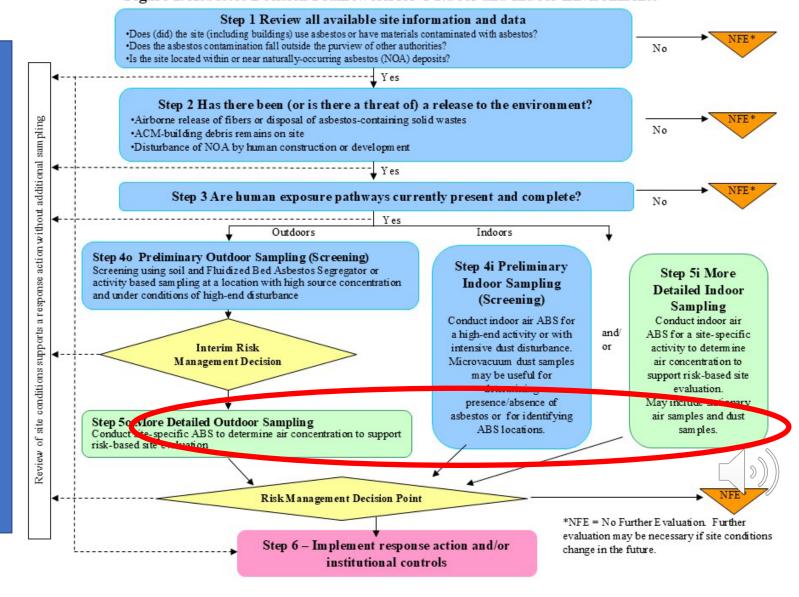




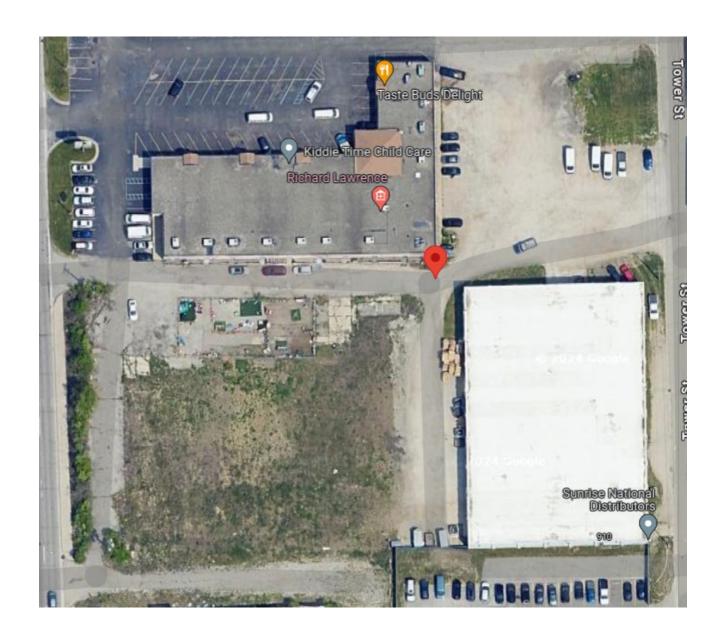
Risk Management Decision Point

Consulted with Health Agencies about results, including high detection limits for some wipe samples. Because areas sampled with wipes were also microvac sampled, and all detections were below applicable action levels, no further action was deemed necessary in the indoor area (daycare center)

Figure 1. Asbestos Decision Framework for Outdoor and Indoor Environments











Key Recommendations from this Site's OSCs

- Bring on crews with extensive asbestos experience & appropriate credentials
- Consult the Asbestos TRW for any asbestos questions
- Work closely with ATSDR, Health Departments and EPA Risk Assessors to protect public health
- Utilize structural engineer to evaluate structural integrity of damaged buildings prior to entering





Q&A Break

Site Contacts

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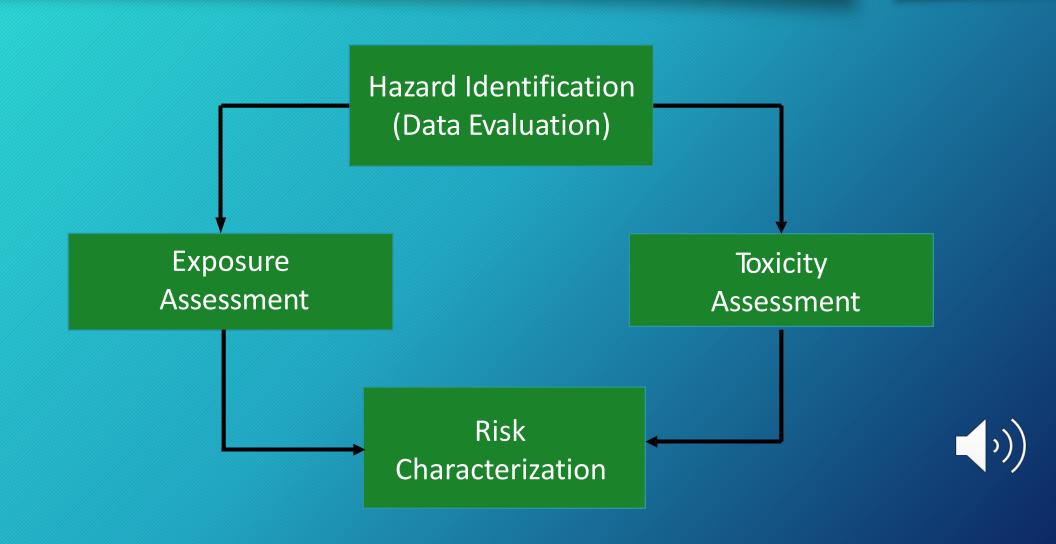
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Risk Assessment Process

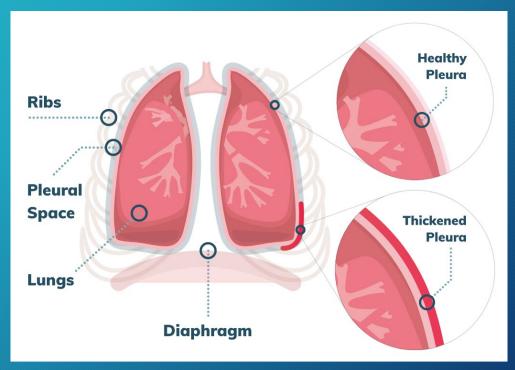


Hazard Identification

- Inhalation of asbestos increases the risk of both:
 - <u>carcinogenic effects</u> lung cancer, mesothelioma, gastrointestinal cancers, and laryngopharyngeal cancer
 - non-carcinogenic effects asbestosis, pleural disease, auto-immune diseases
- Mineral type (serpentine, amphibole) and fiber dimensions (length, width, and aerodynamic diameter) are likely to influence toxicity
 - Risks are evaluated using PCMe dimensional criteria

Toxicity Assessment

- Two IRIS Toxicological Reviews available
 - 1986 General Asbestos:
 - Inhalation Unit Risk (IUR)
 - 2014 Libby Amphibole Asbestos (LAA):
 - IUR
 - Reference concentration (RfC)



Mesothelioma.com

Toxicity Assessment

- 1986: General Asbestos Inhalation Unit Risk (IUR) –
 0.23 (f/cc)⁻¹ (lifetime)
 - Addresses lung cancer and mesothelioma
 - PCM fiber as surrogate for exposure
 - Based on commercial grade asbestos
 - Applicable to any of the regulated forms of asbestos
 - Other amphiboles meeting PCMe dimensional criteria may also be evaluated in the risk assessment
- Adjustable based on less-than-lifetime exposures
 - See Table H-4 in Framework Appendix H



Example Age-Adjusted IURs

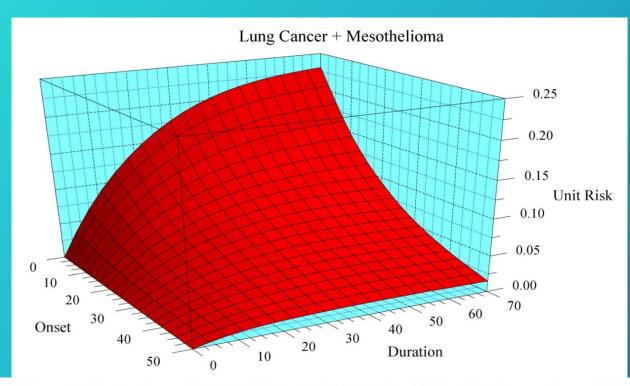


TABLE 2. Lifetime Inhalation Unit Risk (IUR) (f/cc)⁻¹ and Less-than-Lifetime Inhalation Unit Risk (IUR_{LTL}) (f/cc)⁻¹ Values for Various Continuous Exposure Scenarios

Age at first	Duration of exposure (years)									
exposure (years)	1	5	6	10	20	24	25	30	40	LT
0	0.010	0.046	0.055	0.084	0.14	0.147	0.15	0.17	0.19	0.23*
5	0.0085	0.039	0.046	0.070	0.11	0.13	0.13	0.14	0.16	
10	0.0068	0.031	0.038	0.058	0.094	0.098	0.10	0.11	0.13	
20	0.0046	0.021	0.027	0.038	0.063	0.065	0.066	0.075	0.83	
30	0.0031	0.014	0.018	0.025	0.042	0.043	0.045	0.048	0.052	

Toxicity Assessment

- 2014: IUR and RfC for <u>Libby Amphibole Asbestos (LAA)</u>
 - IUR 0.169 (f/cc)⁻¹ [rounded to 0.17 (f/cc)⁻¹]
 - Also based on lung cancer and mesothelioma
 - Not adjusted for age at first exposure and exposure duration
 - RfC 9 x 10⁻⁵ f/cc
 - Based on the prevalence of localized pleural thickening (LPT) in workers exposed to asbestos from Libby vermiculite

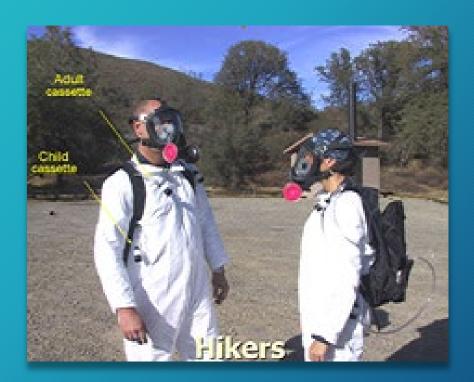
Exposure Assessment

- EPA site evaluations have included asbestos in indoor dust, residential gardens or driveways, and recreational areas (ballfields, ATV/jogging trails)
- Consistent with EPA RAGS, exposure parameters (e.g., exposure duration, frequency, etc.) should represent reasonable maximum exposure (RME) scenarios
- Use default parameters, or site-specific parameters when available, for receptor populations



Exposure Point Concentrations (EPC)

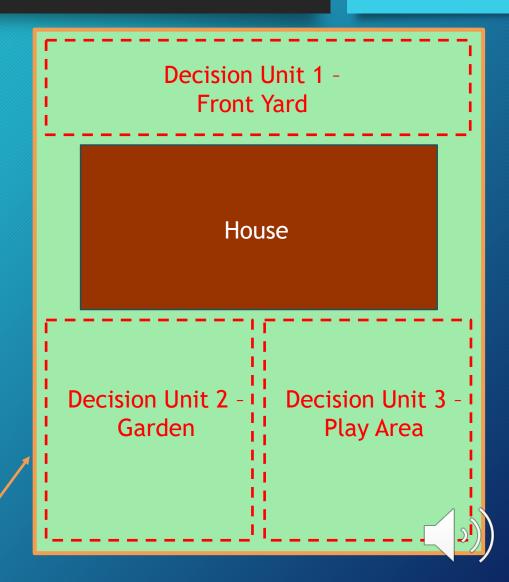
- Utilize ABS Results
 - Disturbance of asbestoscontaminated soils or indoor dusts
 - Air analysis (TEM) is needed for quantitative risk assessment calculations.
- EPC: Based on the simple mean value of the data set used
 - Method to calculate Upper Confidence Limit (UCL) has not yet been established
 - Non-detects (NDs) should be evaluated using a value of 0





Exposure and Decision Units

- Exposure Unit (EU) -Geographic area within which a receptor comes in contact with contaminated soil
- Decision Unit (DU) a physical area of soil where a decision is to be made based on data specific to the targeted soil



Time Weighting Factors

 Used to determine the proportion of time (e.g., hours per day, days per year) over which specific exposure activities may occur

1. General Asbestos TWF (cancer) = ET/24 x EF/365

- ET=Exposure Time (hours)
- EF=Exposure Frequency (days)
- ED (Exposure Duration in years) term is <u>omitted</u> because the IUR is <u>already adjusted</u> for age at first exposure and exposure duration (as described on slides 62-63)
- Important for non-continuous exposures
 - Continuous TWF = 24/24 x 365/365 = 1
 - Child Playing in Soil TWF = $2/24 \times 350/365 = 0.08$



2. LAA TWF (cancer and noncancer) = ET/24 x EF/365 x ED/70

 ED term is retained because the IUR for LAA is not already adjusted for age at first exposure and exposure duration as was the U.S. EPA (1986) IUR

Risk Characterization

General Asbestos - Cancer Risk

- General Equation for cancer risk: ELCR = IUR x CA x TWF
 - ELCR=Excess Lifetime Cancer Risk
 - IUR_{a.d}=Inhalation Unit Risk (f/cc)⁻¹
 - CA=Concentration in air (i.e., EPC)
 - TWF=Time Weighting Factor
- Applies to assessment for general asbestos
- Differs for Libby Amphibole Asbestos (LAA)



Child Recreational

- The child is assumed to play:
- 2 hours per day
- 350 days per year
- 5-years (ages 1-6)
- The airborne asbestos concentration in the breathing zone measured during ABS was 0.02 s/cc.





Exposure Parameters: CA = 0.02 s/cc $IUR_{1.5} = 0.045 (f/cc)^{-1}$ Age at 1st exposure = 1 ED = 5 years TWF = $2/24 \times 350/365 = 0.080$ ET = 2 hours per day EF = 350 days per year ELCR = $0.02 \text{ s/cc} \times 0.045 \text{ (f/cc)}^{-1} \times 0.080 = 7 \times 10^{-5}$



Adult Gardener

The exposure while gardening is assumed to be:

- 26 years, starting at age 20
- 10 hours/day, 50 days/year
- The EPC while gardening (ABS) was 0.02 s/cc

Exposure to asbestos in ambient air assumed to occur when not gardening:

- 14 hrs/day, 50 days/year
- 24 hrs/day, 300 days/year
- The ambient air measured in the community (stationary air monitoring) was 0.0007 s/cc



- Gardening
 - CA=0.02 s/cc
 - $IUR_{20.26} = 0.070 (f/cc)^{-1}$
 - ELCR=0.070 (f/cc)⁻¹ x 0.02 s/cc x 10 hrs/24 hrs x 50 days/365 days = 8×10^{-5}
- Ambient Air, on gardening days
 - CA=0.0007 s/cc
 - ELCR=0.070 (f/cc)⁻¹ x 0.0007 s/cc x 14 hrs/24 hrs x 50 days/365 days = 4×10^{-6}
- Ambient Air, on non-gardening days
 - ELCR=0.070 (f/cc)⁻¹ x 0.0007 s/cc x 24 hrs/24 hrs x 300 days/365 days = 4×10^{-5}



• Total ELCR = $8 \times 10^{-5} + 4 \times 10^{-6} + 4 \times 10^{-5} = 1 \times 10^{-4}$

Risk Characterization

LAA - Cancer Risk

 Differs from general asbestos risk calculations since the IUR for LAA is not adjusted for age at first exposure and exposure duration

```
    ELCR = IUR<sub>LA</sub> x CA x TWF
    ELCR = Excess Lifetime Cancer Risk
    IUR = Inhalation Unit Risk (f/cc)<sup>-1</sup>
    CA = Concentration in air (i.e., EPC in s/cc)
    TWF = Time Weighting Factor (ET/24 x EF/365 x ED/70)
```



LAA Example - Child Recreational

A child is exposed to ambient air (CA = 0.02 s/cc) for 2 hours/day, 350 days per year, from age 1 to 6.

- ELCR = $0.17 (f/cc)^{-1} x (0.02 s/cc x 2 hrs/24 hrs x 350 days/365 days x 5 yrs)/(70 yrs)$
- ELCR = **2 x 10**⁻⁵



Estimating Noncancer Hazard to LAA

- HQ = CA x TWF x AF(TSFE) / RfC
 - CA = Concentration in Air (s/cc)
 - TWF = Time Weighting Factor (ET/24 x EF/365 x ED/70)
 - AF(TSFE) = Adjustment Factor for time since first exposure
 - RfC = Reference Concentration (f/cc)



Adjustment for Time Since First Exposure

- TSFE = time (years) between the age when exposure first began and the time when the health outcome is evaluated
- Goal is to evaluate the hazard when exposure begins at age ≥ 0 and when health assessment occurs at age 70
- TSFE = 70 age at first exposure
- The Adjustment Factor (AF) for TFSE = ratio of predicted LPT prevalence for TSFE < 70 years compared to TSFE at 70 years



Example - Continuous Lifetime Exposure

- LAA concentration = 0.0008 s/cc
- Continuous exposure 24 hrs/day, 365 days/year beginning at age 0 and extending to age 70.
- The HQ is calculated as follows:
 - ED = 70 0 = 70 yrs
 - TSFE = 70 0 = 70 yrs
 - AF(TSFE) = 1.00
- HQ = $0.0008 \text{ s/cc} \times (24 \text{ hrs/}24 \text{ hrs}) \times (365 \text{ days/}365 \text{ days}) \times (70 \text{ yrs/}70 \text{ yrs}) \times (1.00) / 9 \times 10^{-5} \text{ f/cc}$



HQ = 9

Example - Less Than Continuous Exposure

- LAA concentration = 0.040 s/cc
- 1 hr/day, 250 days/year, from age 20 to age 45
 - ED = 45 20 = 25 yrs
 - TSFE = 70 20 = 50 yrs
 - AF(TSFE) = 0.353 (from Framework Table I-1)

Age first exp.	TSFE	AF(TSFE)
20	50	0.353

- HQ = 0.040 s/cc x (1 hr/24 hrs) x (250 days/365 days) x (25 yrs/70 yrs) x (0.353) / 9 x 10⁻⁵ f/cc
- <u>HQ = 2</u>



LAA Risk vs Hazard

Although the cancer risk may not exceed the target risk range, noncancer hazard can exceed risk benchmark

Scenario	EPC (s/cc)	Risk	Hazard
Continuous	0.0008	1E-04	9
Less than continuous	0.04	7E-05	2

Increasing Complexity

- The 2021 Framework includes additional exposure scenarios to reference for more unique site-specific purposes
- Includes simultaneous (exposure to asbestos during different activities occurring at the same age interval) and sequential (exposure during activities at two or more age intervals) scenarios
- AF(TSFE) is applied differently across simultaneous and sequential scenarios
- These are not common situations, but are presented in the Framework when site conditions apply; consult the TRW (Asbestos Committee for assistance in these instances (asbestoshelp@epa.gov)

Developing Air Levels of Concern (LOC)

- Important for guiding site investigations, response actions and identifying appropriate detection levels for establishing data quality objectives (DQOs)
- The exposure assumptions used should match the exposure scenario appropriate for the site
- Calculate LOC by modifying the risk equations for general asbestos (cancer only) and LAA (compare both cancer and noncancer and use the lower value)

General Asbestos LOC

- Equation: LOC (s/cc) = Target Risk

 [IUR x TWF]
- Example: Assume receptor exposure for 1-hour/day (ET), 156 days/year (EF) for 24 years (ED) beginning at age 20.
- TWF = ET/24 hours EF/365 days
 - = 1 hour/24 hours x 156 days/365 days = 0.018
- IUR = $0.068 (f/cc)^{-1}$
- Assuming a target risk of 1x10⁻⁶:
- LOC (s/cc) = $1 \times 10^{-6} / [0.068 (f/cc)^{-1} \times 0.018] = 0.0008 s/cc$



LAA LOC (cancer)

- Equation: LOC (s/cc) = Target Risk[IUR x TWF]
- Example: Assume receptor exposure for 1-hour/day (ET), 156 days/year (EF) for 24 years (ED) beginning at age 20.
- TWF = ET/24 hours x EF/365 days x ED/70 years
 - = 1 hour/24 hours x 156 days/365 days x 24 years/70 years = 0.0061
- IUR = $0.17 (f/cc)^{-1}$
- Assuming a target risk of 1x10⁻⁶:
- LOC (s/cc) = $1 \times 10^{-6} / [0.17 (f/cc)^{-1} \times 0.0061] = 0.001 s/cc$



LAA LOC (noncancer)

- Equation: LOC (s/cc) = (Target HQ x RfC_{LA}) / (TWF x AF)
- Example: Assume receptor exposure for 1-hour/day (ET), 156 days/year (EF) for 24 years (ED) beginning at age 20.
- ED = 44 years -20 years = 24 years
- TSFE = 70 years 20 years = 50 years
- AF(50) = 0.353 (from Framework Table I-1)
- TWF = 1 hour/24 hours x 156 days/365 days x 24 years/70 years = 0.0061
- Assuming a target HQ of 1:



• LOC (s/cc) = $(1 \times 9 \times 10^{-5} \text{ f/cc}) / (0.0061 \times 0.353) = 0.042 \text{ s/cc}$

Example LOC -General Asbestos vs LAA

Asbestos Type	LOC		
General Asbestos (cancer)	0.0008 s/cc		
LAA (cancer)	0.001 s/cc		
LAA (noncancer)	0.042 s/cc		

Time-weighted average OSHA regulatory limit = 0.1 f/cc



Asbestos Risk Assessment Key Take-Aways

- Primary route of concern = inhalation exposure
- ABS should be used to assess risk
- Air analysis (TEM) is needed for quantitative risk assessment calculations
- EPCs should be calculated for each exposure scenario and decision unit
 - Should be calculated by averaging across samples and using a value of 0 for non-detects
- IURs available for general asbestos and LAA
- RfC only available for LAA
- General asbestos TWF equation requires modification to accommodate less-than-lifetime exposures
- LAA basic TWF equation is used



Unique Asbestos Risk Assessment Issues

- The TRW Asbestos Committee is available for consultation to support site assessments
 - Additivity if there are exposures to multiple carcinogens in addition to asbestos
 - Use of life tables
 - Calculation differences between LAA and General Asbestos
 - Use of non-cancer LAA toxicity value in risk assessment uncertainty discussions at sites with other forms of amphibole asbestos
 - Other uncertainties unique to asbestos risk assessment
 - asbestoshelp@epa.gov

Final Q&A

The Asbestos TRW technical resources page contains multiple resources that may be helpful including:

- Asbestos Framework
- ERT Helpful Hints for ABS document
- ABS SOP
- ABS and Analytical Videos
- Asbestos TRW Consultations
- For asbestos questions, email the TRW at <u>asbestoshelp@epa.gov</u>



https://www.epa.go v/superfund/asbesto s-superfund-sitestechnical-resources



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