Appendices:

Appendix A – Relevant exposure pathways associated with vermiculite expansion sites and Vermiculite NW

Appendix B – Environmental samples from the Vermiculite NW site

Table A1 – Summary of past, present, and future pathways of exposure to asbestos associated with vermiculite expansion at Vermiculite NW, Spokane, WA

Pathway Name	Exposure Scenario(s)	Past Pathway Status	Present Pathway Status	Future Pathway Status
Occupational	Former workers exposed to airborne Libby asbestos during handling and processing of contaminated vermiculite	Complete	Not applicable	Not applicable
	Current workers exposed to airborne Libby asbestos from residual contamination inside former processing buildings	Not applicable	Eliminated	Eliminated
Household Contact	Household contacts exposed to airborne Libby asbestos brought home on workers' clothing	Complete	Eliminated	Eliminated
Waste Piles	Community members (particularly children) playing in or otherwise disturbing onsite piles of contaminated vermiculite or waste rock	Potential	Eliminated	Eliminated
Onsite Soils	Current onsite workers, contractors, or community members disturbing contaminated onsite soils (residual contamination, buried waste)	Not applicable	Potential	Potential
Ambient Air	Community members or nearby workers exposed to airborne fibers from plant emissions during handling and processing of contaminated vermiculite	Potential	Eliminated	Eliminated
Residential Outdoor	Community members using contaminated vermiculite or waste material at home (for gardening, paving driveways, fill material)	Potential	Potential	Potential
Residential Indoor	Community members disturbing household dust containing Libby asbestos fibers from plant emissions, workers' clothing, or residential outdoor waste	Potential	Potential	Potential

Table A2. Completed and potential pathways of exposure evaluated at the Vermiculite NW site Spokane, WA

PATHWAY NAME	ENVIRONMENTAL MEDIA & TRANSPORT MECHANISMS	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSURE POPULATION	TIME
Occupational	Suspension of Libby asbestos fibers or contaminated dust into air during materials transport and handling operations or during processing operations	Onsite	Inhalation	Former workers	Past
Household Contact	Suspension of Libby asbestos fibers into air from dirty clothing of workers after work	Workers' homes	Inhalation	Former and/or current workers' families and other household contacts	Past
Waste Piles	Suspension of Libby asbestos fibers into air by playing in or otherwise disturbing piles of vermiculite or waste rock	Onsite, at waste piles	Inhalation	Community members, particularly children	Past
Onsite Soils	Suspension of Libby asbestos fibers into air from disturbing contaminated material remaining in onsite soils (residual soil contamination, buried waste)	At areas of remaining contamination at or around the site	Inhalation	Current onsite workers, contractors, community members	Future
Ambient Air	Stack emissions and fugitive dust from plant operations into neighborhood air	Neighborhood around site	Inhalation	Community members, nearby workers	Past
Residential Outdoor	Suspension of Libby asbestos fibers into air by disturbing contaminated vermiculite brought offsite for personal uses (gardening, paving driveways, traction, fill)	Residential yards or driveways	Inhalation	Community members	Past, present, future
Residential Indoor	Suspension of household dust containing Libby asbestos fibers from plant emissions, workers' clothing, or residential outdoor waste	Residences	Inhalation	Community members	Past, present, future

Appendix B: Environmental Samples

Table B1 - Results of Air Sampling (June 9, 1972 and November 5, 1973)[12, 13]

Operation	Concentration (f/cc)	Date Sampled
Bagging	3.4	June 9, 1972
Lift Truck Operator	0.4	
Redi-Earth Mixing[a]	5.7	
Bagging	19	November 5, 1973
Bagging	15.3	
Charging the mixer [b]	50.0	
Charging the mixer	25.0	
Unloading Ore	8.6	
Bagging / Forklift Operator	6.1	
Bagging	6.8	
Sewing and Bagging	6.5	

a = mix of sphagnum, peat moss, and vermiculite
b = process consisted of dumping bags of vermiculite and asbestos into the mixer to create an acoustical plaster

Table B2. Asbestos analysis of soil samples taken April 27, 2000 and September 5, 2001 from the former Vermiculite NW facility located in Spokane, Washington [16, 17]

Location	media	Total Asbestos		Type
		PLM	TEM	
On-site	surface soil	ND	TR	Chrysotile
		ND	TR	Chrysotile, Tremolite
		ND	TR	Chrysotile
		TR	TR	Chrysotile, Tremolite
		2%	1.1%	Tremolite, Chrysotile
		ND	ND	NA
		ND	ND	NA
		ND	ND	NA
		2%	-	Amosite, Chrysotile
		<1%	-	Amosite, Chrysotile
		ND	-	NA
		<1%	-	Tremolite
	drain dirt	ND	-	NA
	surface soil	<1%	0.7%	Chrysotile, Tremolite- Actinolite
		ND	ND	NA
		3+%	0.25%	Chrysotile, Amosite
	drain dirt	<1%	-	Chrysotile, Tremolite-Actinolite
	surface soil	2%	ND	Chrysotile
		ND	-	NA
		ND	-	NA
		<1%	ND	Tremolite-Actinolite

Table B2. (Continued)

Location	media	Total Asbestos		Type
		PLM	TEM	
Off-site	surface soil	<1%	-	Tremolite-Actinolite
		<1%	-	Chrysotile
		ND	-	NA
		<1%	-	Tremolite-Actinolite
		ND	-	NA
		ND	-	NA
		ND	-	NA
		ND	ND	NA
		ND	-	NA
		<1%	ND	Tremolite-Actinolite
Off-site	surface soil	<1%	<0.1%	Chrysotile, Tremolite-Actinolite
Chattaroy , WA Off-stie		<1%	-	Tremolite-Actinolite
		<1%	-	Tremolite-Actinolite
Off-site		ND	-	NA

ND – Not Detected
TR – Trace
NA – Not Applicable

Certification

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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