Expert Disclosure of Barry I. Castleman, Sc.D.

Qualifications

1. Dr. Barry Castleman holds a Bachelor of Environmental Science degree in Chemical Engineering and a Master of Science degree in Environmental Engineering both from Johns Hopkins University. In addition, he received a Doctor of Science degree from the Johns Hopkins School of Hygiene and Public Health where his research focused on the historical corporate response to known hazards associated with asbestos. Dr. Castleman's *curriculum vitae* is Attachment 1 to this disclosure.

Dr. Castleman has many years of experience as a practitioner and researcher in the fields of public health, industrial hygiene, environmental engineering and chemical engineering, as well as several decades of research in the area of asbestos including his doctoral thesis completed in 1985. Dr. Castleman has spent a majority of his career researching and studying the historic state of knowledge regarding the hazards of asbestos and how corporations reacted to such knowledge. He has studied companies that took appropriate measures to prevent and control asbestos hazards in the work place and beyond, as well as those that have not. Dr. Castleman has extensively consulted, presented, taught courses, and published peer reviewed papers on the topic of the historic response of corporations to knowledge regarding the hazardous nature of asbestos. Dr. Castleman published a leading treatise regarding the historic response of corporations to knowledge of the hazardous nature of asbestos entitled, "*Asbestos: Medical and Legal Aspects*," which was originally published in 1984 and is now in its fifth edition. Dr. Castleman has specifically researched and studied the historic state of knowledge regarding asbestos hazards of the Railroad industry, including railroads including the predecessors of BNSF[1], and his book contains a section on this topic. He has also extensively studied the railroad industry and BNSF's contemporaneous response to such knowledge. He is personally familiar with the source and authenticity of various historic documents including the Association of American Railroads and Alton Railroad documents which are referenced below.

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[1]Unless more specifically referenced, the term "BNSF" refers to the Burlington Northern Santa Fe Railway along with its predecessor railroads including but not limited to the Chicago, Burlington & Quincy Railroad Company (Burlington Railroad), the Atchison, Topeka and Santa Fe Railroad Company (Santa Fe Railroad) and the Great Northern Railroad.

2. Dr. Castleman has studied the vermiculite operations in Libby and has reviewed scores of relevant historic documents regarding those processing and shipping operations as well as BNSF's knowledge regarding asbestos and vermiculite. In addition, we anticipate Dr. Castleman's review of the reports of Dr. Terry Spear, Dr. Julie Hart, Dr. Julian Marshall, Dr. Carrie Redlich, and Dr. Arthur Frank, along with the associated documents and information and, within the context of his expertise, will generally concur with those disclosures.

Summary of Opinions

3. Based on his training, the available record, and his extensive research and experience, it is expected that Dr. Castleman's testimony and opinions, to a reasonable degree of certainty, will include:

a. The hazards associated with exposure to airborne asbestos fibers have been widely recognized in medical, industrial, and insurance circles since 1930.

b. Available documentation demonstrates that the American railroad industry, including BNSF predecessors, was well informed and quite aware of the hazards associated with asbestos exposure in the 1930s. This knowledge extended to a recognition and understanding of worker and bystander exposures to asbestos as well as exposure prevention and control techniques. Some of the specific information, documents, and reference materials demonstrating BNSF's early knowledge of the hazards associated with asbestos exposure are summarized below and discussed in more detail in the expert report of Dr. Julie Hart.

c. Available information demonstrates BNSF's early and repeated notice of, and attendant knowledge that the vermiculite mined in the Libby area was inextricably contaminated with asbestos. Some of the specific information, documents, and reference materials demonstrating BNSF's early notice and knowledge that the vermiculite it hauled out of Libby was contaminated with asbestos are summarized below and discussed in more detail in the expert report of Dr. Julie Hart.

d. Available information demonstrates that BNSF was aware that its vermiculite shipping operations in Libby, and its downtown Libby operations in general, were very dusty.

e. Despite this knowledge, and the then current understanding of asbestos hazard prevention, the record is devoid of any evidence that BNSF ever attempted to

characterize the environmental/air quality conditions in its Libby operations, control dust in their operations, clean or control the vermiculite material that was present and clearly visible throughout their Lincoln County properties, provide respiratory protection to their employees, prevent the spread of asbestos containing vermiculite dust from their properties to nearby properties, or require the use of appropriate dust control practices in vermiculite related railroad activities. As a result, BNSF employees, their family members, and members of the Lincoln County community were unnecessarily exposed to dangerous levels of Libby Amphibole Asbestos.

f. BNSF's actions, and failures to act, did not comport with the then current understanding of asbestos hazards and exposure prevention, did not meet the then current asbestos exposure control and prevention standards of care, did not meet applicable industrial hygiene standards, and violated applicable public health standards, including federal safety regulations set forth under OSHA.

BNSF's Knowledge of Asbestos

Sources of BNSF's knowledge of asbestos and attendant health concerns, as well as BNSF's knowledge of Libby asbestos, include the following:

4. **BNSF was aware of asbestos hazard by 1930s**: BNSF and its predecessor railroads have been aware of the hazard presented by asbestos exposure for many decades. This knowledge is documented throughout the available literature by the 1930s.

5. **AAR Documents**: Several of BNSF's predecessor railroads were members of the Association of American Railroads (AAR) and had agents that were members of the AAR Medical and Surgical Section. For example, the Chicago, Burlington & Quincy Railroad Company (Burlington Railroad), the Atchison, Topeka and Santa Fe Railroad Company (Santa Fe Railroad) and the GNRR were members of the AAR. The Medical and Surgical Section held annual meetings and issued reports on the meetings. Both the Burlington and Santa Fe Railroads had members in attendance at these meetings. In 1937, Dr. D.B. Moss, medical director of Burlington Railroad, was Chairman of the AAR Medical and Surgical Section and presented on the topic of occupational disease and the current state of knowledge regarding asbestos exposure. He advised other members of the AAR that dust could be harmful to workers and that asbestos was one of the principal sources

of toxic dust exposure to railroad workers. At the same time, Dr. Moss advised AAR members that asbestosis was strictly a dust disease, caused only by exposure to asbestos.

The AAR Medical and Surgical Section reports acknowledged the hazard of asbestos exposure including asbestosis, pneumoconiosis, pulmonary fibrosis and cancer as well as the process of disease and latency periods. These reports also demonstrate an in-depth understanding of how asbestos travels through the air, often to distant locations, and asbestos exposure prevention including through the use of protective equipment, wet procedures and separating non-essential workers from such activities. Documents consistently reference the specific attendance of high-ranking Board officers and medical officials of the GNRR, Santa Fe and Burlington railroads. A chronological summary of some of these reports follows:

6. **AAR 1932.** The Committee on Occupational Disease and Rehabilitation presented on the subject of "dust as an industrial Hazard:"

> Dust pathology may occur in any occupation where dust is produced and inhaled in sufficient quantity over a long enough period of time. ***
> In conclusion, we wish to emphasize the facts that under certain conditions inhalation of dust cause a fibrosis of the lungs know as pneumoconiosis and that this is an industrial health hazard, that it can be prevented by proper use of water and ventilation, that after fibrosis develops secondary infection is prone to occur and tuberculosis is often engrafted on the fibrosis and the radiographic examination is the easiest and most reliable means of diagnosis.

The Chief Medical Officer of the Great Northern Railroad was present at the meeting (p. 13), the Chief Medical and Surgical Officer of the Burlington Railroad, Dr. Moss, was a member of the Committee of Occupational Diseases and Rehabilitation, and the Surgeon General of the Bureau of Public Health Service was an honorary member (p. 7).

7. **AAR 1935.** The Medical and Surgical Section of the AAR's Committee on Occupational Diseases and Rehabilitation reported:

> We as railroad surgeons are undoubtedly more interested in silicosis and asbestosis than in other types [of lung disease].

The Report went on to discuss the cause and symptoms of asbestosis. It then recommended medical monitoring practices for employees working in dust and disease prevention techniques including removal of dust, using wet methods, use of respirators and "frequent analysis of the dust content of the air at different times during the working hours."

8. **AAR 1937.** The report discussed the recently enacted Illinois Workmen's Occupational

Diseases Act noting that:

> Silica, asbestos, and lead are the principal substances generating toxic dusts to which railway employees may be exposed… It is obvious that avoidance of great exposure to toxic dusts and other poisonous substances used in or generated by manufacturing processes and of unfavorable working condition, is the first essential in preventing and controlling occupational diseases. (pp. 19-21).

The report then discussed the importance of pre-employment physicals and histories, as well as periodic physical examination of employees "in occupations in which known hazards exist." (p. 21). The report discussed proper dust control measures, including the use of personal protection including respirators. It went on to state "silicosis and asbestosis are strictly dust diseases . . . contracted only by breathing silica or asbestos dust. . . . Prevention and control, therefore, consists of protecting the employee against exposure by the means best adapted to preventing the generation and dispersion of these harmful dusts." The 1937 report demonstrated early BNSF knowledge of the deadly and disabling nature of asbestos exposure, and its prevention.

9. **AAR 1939.** An extensive discussion of pneumoconiosis took place and Dr. Lanza presented on the topic of "Medical Progress Toward Further Protection of Industrial health; Report of Medical Committee, Including Plans for 1939. This speaker stated that in his opinion instead of removing man from dust infection work that the dust should be removed from the work. He urged periodic examinations … He also referred to an international labor board which has made some investigations along these lines." (p. 38).

10. **AAR 1940.** Discussions noted that much "time and study" has been devoted to "pneumoconiosis" by the "Air Hygiene Foundation of America, Inc." (name changed to Industrial Hygiene Foundation in 1941). The committee noted that Air Hygiene Foundation meetings don't directly apply to the railroads, "yet many details are brought out at their annual meetings which can be made of immense value to the railroads." (p. 29).

11. **AAR 1951-1953.** The AAR Committee on Disability and Rehabilitation "mention silicosis and asbestosis as forms of [lung] disease most interesting to railroad surgeons." (p. 34). The committee recommended medical examinations at the time of hiring to include history and chest x-ray, "particularly in those occupations where unusual quantities of silica or asbestos dust have been encountered or are contemplated as a routine occupational exposure." (p. 34).

12. **AAR 1957.** The Committee on Disability and Rehabilitation altered the language on

pneumoconiosis from the 1951-53 reports, adding that periodic x-ray examinations should be done "annually" on employees exposed to dust. (p. 24).

13. **AAR 1958.** As with the other meetings, members of virtually all of the major railroads in the United States were present. Doctors reported that, "there is very good proof that asbestos is a cause of carcinoma. This is seen in individuals working with asbestos, particularly miners. It is also seen among plumbers who work with asbestos, seamfitters (sic) particularly." (p. 81). The doctor referenced a study "in which he showed there was a higher incidence of cancer among the operating staffs of the railroads than among the non-operating staffs." The study reported "that lung cancer cases were more than three times as numerous among 'operating' railroad workers (engineers, firemen, brakemen, conductors, switchmen, and roundhouse personnel) than 'non-operating' workers. Yet the former group made up only about 25 percent of the work force."

In addition to these AAR reports, Railroad claims agents discussed asbestosis at meetings and in their journals beginning in the 1930s.[2]

14. **Alton Railroad Documents**: The railroad industry was well aware of the hazards of toxic dusts, including asbestos, by the 1930s. A collection of documents commonly referenced as Alton Railroad Documents were created pursuant to the operation of the Railroad Engineering and Shop Committee, of which the Burlington and Santa Fe Railways were members. The Alton Documents demonstrate the railroad industry's extensive knowledge of the hazards of asbestos as well as methods of prevention and detection of asbestos related disease by the railroad industry from the 1930s forward.

In a November 28, 1936 letter from Armstrong Chinn, Chief Engineer of the Alton Railroad Company and Chairman of the Railroad Engineering and Shop Committee, to railroad executives including J.P. Morris, Division Master Mechanic of the Santa Fe Railway and D.B. Moss, Chief Medical Officer of the Burlington Railroad, Mr. Chin recounted the first meeting of the committee. Mr. Chin reported, in part:

> [A]s [the committee's] first work, we are to give consideration to and recommend what action seems immediately advisable to protect the railroads from the following possible occupational diseases:
> 1. Asbestosis, from handling asbestos materials, such as boiler lagging . . .[1]

[1] Unless otherwise noted, all emphasis herein has been added.

[2] P. Folger, "Legal and Other Aspects of Dust Hazards," Minutes of the 45th Annual Meeting of the Association of Railway Claim Agents, held in May, 1934, pp. 27-48; O.G. Browne, "Silicosis," The Bulletin 19:281-284, April 1935; E.R. Hayhurst, "Common Occupational Diseases and Their Differential Diagnosis," Minutes of the 48th Annual Meeting of the Association of Railway Claim Agents held in May, 1937, pp. 31-41.

In a January 5, 1937, letter from an attorney for the Illinois Central Railroad Company to railroad executives including D.B. Moss, Chief Medical Officer of the Burlington Railroad, the railroad demonstrated early knowledge regarding the highly toxic nature of asbestos, problems with the migration of asbestos fibers, and the principle for bystander exposure:

> A discussion was had concerning the best methods of protecting workers from Asbestosis and Silicosis. The men handling Asbestos or doing sand-blasting are not the only ones exposed to the danger of these diseases, as the dusts they make in doing their work create a danger to others that may be working in the vicinity.

The letter further discussed that various railroads "have already studied the question of danger from these diseases, and have put out specific instructions to reduce the hazard."

The Alton Documents also include "Recommendations for Protection Against Occupational Diseases," which stated in relevant part:

> In submitting the revised recommendations for prevention of occupational diseases such as lead poisoning, silicosis, and asbestosis, the Committee recognized that the recommendations which are made and designed to comply with the requirements under the Health and Safety Act, and are to be considered a minimum. Some railroads may carry on more expansive operations, which expose employee to the risk of disease or injury by contact with harmful dusts, fumes or gases. Control of such hazards is imperative . . . The first consideration, and the most important, is isolation of any excessively dusty processes, to protect employees in the vicinity engaged in other work and not aware of the risk to which they are exposed. This may necessitate a considerable re-arrangement and re-location of equipment. . . .
> All dusts and all poisonous fumes may not be eradicated, but they can be controlled and reduced to a degree which is recognized by sanitarians and by experience to be non-hazardous, and the Committee recommends that at points where extensive operations are carried on, after available mechanical appliances for ventilation are installed, periodic examinations of its air should be carried on to determine the quantity and composition of the dust, . . . It is only by such examinations that the presence of harmful substances in the air can be ascertained and the adequacy of the ventilation systems checked.
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> These recommendations relate to the engineering control. No less important is the medical control. . . . Supplementing a satisfactory pre-employment history, a physical examination should be made paying particular attention to signs indicating disease of the heart or lungs. The environment in which an employee may be required to work makes necessary this inquiry into the occupational history and physical condition to ascertain that there is no history of previous exposure which may cause impairment and no condition present which may be made worse by occupation. No less important is the periodic physical examination of employee engaged in occupations known to be health hazards

> if a correct diagnosis is to be made and the proper balance struck between diseases which are unfavorably influenced by occupation and these diseases in which occupation has no bearing. The Committee recommends that employees engaged in work which is recognized as more than a normal hazard such as exposure to silica, asbestos, or lead dusts, be examined semi-annually, or more frequently whenever there appears to be indications for doing so, with transfer of employees who are becoming impaired, to less hazardous work. (Emphasis added).

The Alton series of documents further discussed the hazard asbestos exposure presents to railroad employees and those surrounding them as well as state of the art discussions of exposure prevention techniques. These documents demonstrated the early and extensive understanding by the railroad industry, including BNSF, that asbestos presents a serious health hazard, disturbance of asbestos containing materials presents a hazard even to people in the area who are not engaged in the disturbance activities, that periodic examinations of air for the presence of asbestos dust is necessary in railroad work areas, how exposures can be prevented and reduced, and that periodic physical examinations are necessary among employees engaged in work involving asbestos.

15. **Alton info shared with AAR in 1937**: In June of 1937, shortly after the above referenced Alton interaction, the knowledge of the hazard and prevention of asbestos exposure demonstrated in the Alton documents was shared with the other Railroads that were part of the American Association of Railroads, including the GNRR. At the 1937 AAR meeting, Dr. D.B. Moss, Medical Director of BNSF predecessor Burlington Railroad, active member of the Shop and Engineering Committee responsible for authoring the Alton documents, and the then current Chairman of the AAR Medical and Surgical Section, presented on the findings of the Shop and Engineering Committee regarding the topic of occupational disease advising the other members of the AAR that dust could be harmful to workers and that asbestos was one of the principal sources of toxic dust exposure to railroad workers. At the same time, Dr. Moss advised AAR members that asbestosis was strictly a dust disease, caused only by exposure to asbestos. For the 1937 AAR meeting, W.P. Kenney, President of the Great Northern Railroad, and S.T. Bledsoe, President of the Atchison, Topeka & Santa Fe Railway, were on the Board of Directors, and Dr. D.C. Webb, Chief Surgeon of the Great Northern Railway was on the Committee of Direction for the Medical and Surgical Section.

Despite the documented knowledge and recommendations going back to the mid-1930s, BNSF never followed its own guidance in Libby even throughout the 1990s.

16. **National Safety Council Documents**: BNSF predecessors, including the Great Northern Railroad, the Burlington Railroad and the Santa Fe Railroad were members of the Railroad Section of the National Safety Council. See National Safety Council Railroad Section Chairman List; Discovery Request No. 68 (1987). The National Safety Council published and disseminated numerous articles documenting the hazards of asbestos exposure in the 1930s and later.

17. **Misc. docs. evidencing RR knowledge of asbestos hazard**: In 1960, asbestos was listed as one of seven materials which had been "suspected as lung carcinogens" in an article by Dr. I. Kaplan of the Baltimore and Ohio Railroad ("Relationship of Noxious Gases to Carcinoma of the Lung in Railroad Workers." J.A.M.A. 171:2039-2042, Dec. 12, 1959, reprinted in The Bulletin 44:511-520, 1960); see also 11/18/1980 BNSF correspondence noting "Asbestos is one of the few materials which has been demonstrated to be capable of causing cancer in humans." BNSF was aware that "concerning asbestos containing products" "the hazard exists whenever dust is produced during the life cycle of the product." 3-29-1979 BNSF correspondence; see also 4/10/1979 BNSF memorandum "Discussion on Hazardous Materials – Products containing asbestos."

18. **Other sources of RR knowledge of asbestos hazard and IH standards**: BNSF had an extensive exposure to applicable industrial hygiene standards of care throughout the years that it shipped Libby vermiculite. BNSF maintained a Medical Department, an Industrial Hygiene Department, a Safety Department, and a Geology/Mineral Research Department. In addition to being a member of the National Safety Council, the Association of American Railroads, and the Shop and Engineering Committee, BNSF's industrial hygienists were members of the American Industrial Hygiene Association as well as the American Society of Safety Engineers and BNSF's medical officers were members of the American Occupational Medical Association. See Discovery Request No. 68 (1987); BNSF's Response to Sixth Discovery Requests - Kleeck. BNSF maintained a vast industrial hygiene and occupational medicine library and received an extensive number of publications on the topic for the use of their Medical Department and industrial hygienists including various texts on asbestos hazards and prevention. See e.g. List of publications received by BNSF Medical Department (1987). The Railroad had a Safety Division and regularly sent employees working therein to safety training courses. See 1/11/1982 BNSF correspondence.

19. **RR understanding of safety regulations**: The Railroad was aware of applicable safety regulations and regularly discussed their impact on their operation. See e.g. 4/19/1974 BNSF correspondence, discussing Federal safety regulations and training "required by law"; 1/9/1984

BNSF memorandum discussing OSHA regulations for the exposure to asbestos and BNSF's responsibility to conform thereto; 3/24/1981 Letter from BNSF to OSHA requesting an additional copy of booklet entitled "Training Requirements in OSHA Standards" and a page from the publication discussing the Railroad's obligation to analyze work environments for potential exposure to toxic dust; 5/16/1975 BNSF Correspondence discussing OSHA regulations and their effect on Railroad industry; 6-6-1974 BNSF memorandum regarding Federal Respirator Regulations; 3/29/1979 BNSF correspondence discussing "the strict federal regulations controlling work practices with asbestos;" 4/26/1979 BNSF correspondence; 4/10/1979 BNSF correspondence discussing stringent OSHA regulations regarding asbestos including the permissible exposure limit. Despite its understanding and above referenced recognition of these safety standards, in 1981 BNSF itself recognized that "The asbestos program within the Burlington Northern Railroad has been rather hit and miss." BNSF_0570**.** Despite its clear awareness and understanding of applicable OSHA standards, BNSF flailed to comply with OSHA asbestos regulations in its operations in Lincoln County, including 29 CFR 1910 "regarding asbestos and other chemical hazards in the workplace." Since their inception in 1971, this OSHA asbestos regulation has been significantly modified on multiple occasions. Some examples of applicable and germane provisions from this specifically referenced regulation follow:

As one example, the **1971** regulation contains the PEL of 5 f/cc and sets forth respirator requirements that must be used when PELs cannot be met, implicitly imposing a requirement for air sampling of a workplace with asbestos containing materials to determine if PELs are being exceeded. The regulation also includes provisions that require that "Asbestos waste and scrap shall be collected and disposed of in sealed bags or other containers" and that "All cleanup of asbestos dust and blowing shall be performed by vacuum cleaners. No dry sweeping shall be performed." 29 CFR 1910.93a (later renumbered as Section 1910.1001); 37 FR 11318, June 7, 1972. Based on the descriptions of BNSF operations in Lincoln County, none of these standards were observed during active vermiculite operations in Lincoln County or thereafter until cleanup operations began in the early 2000s. BNSF performed dry sweeping of the yard and its tracks in Lincoln County on a regular basis throughout applicable periods of operation.

As another example, the **1974** OSHA asbestos regulation required that wet methods be used whenever practicable when working with asbestos. The 1974 regulation also provided:

> (f) *Monitoring* - (1) *Initial Determinations*. Within 6 months of the publication of this section, every employer shall cause every place of employment where asbestos fibers are released to be monitored to determine whether every employee's exposure is below the PEL.

The sampling required included both personal and environmental samples. BNSF apparently did not perform any air monitoring in Lincoln County until the EPA mandated cleanup began in the early 2000s. The 1974 regulation also contains Caution Label requirements requiring that labels be "affixed to all … products containing asbestos fibers." It also includes the following section:

> "(h) *Housekeeping* – (1) *Cleaning*. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration."

The presence of asbestos fibers on the surfaces of BNSF properties as well as excessive dispersion of asbestos (measured at up to 14 f/cc during sweeping activities in the Libby railyard more than a decade after active mining and shipping operations ceased and measured at high levels at BNSF's river loading point during active operations) from BNSF activities in Lincoln County has been clearly established. The employer is further required to provide comprehensive medical examinations and annual follow up examinations to employees who have worked in an occupation exposed to airborne concentrations of asbestos fibers, with no requirement that this exposure exceed the then applicable PEL. Based on my understanding of BNSF operations in Lincoln County, none of these standards were observed.

The OSHA permissible exposure limits have changed over time, but it has consistently been recognized that injurious exposures can occur at levels below the PEL. See e.g., OSHA's recently issued reference concentration for Libby amphibole asbestos of 0.00009 f/cc. When asbestos is present in a workplace, an employer is required to perform personal and environmental air monitoring to conclusively establish that the workplace is safe. BNSF never performed required air monitoring during active vermiculite loading and shipping operations. Without performing the necessary sampling or relying on other reliable objective data, there is no way to rule out an injurious exposure and BNSF is unable to establish that airborne asbestos levels were below any applicable PELs. Further, because adequate air sampling was not performed by BNSF, it is not possible to provide a precise estimation of its workers exposure levels. Had BNSF met the requirements of OSHA in its Lincoln County properties, it would have also protected the

neighboring community from unnecessary exposures to its asbestos dust.

20. **RR self-imposed safety standards**: In addition to the applicable safety regulations and general industrial hygiene practices to which BNSF was subject, the Railroad set forth its own self-imposed safety responsibilities which similarly demonstrate its knowledge of these protective principles. See e.g. BNSF Responsibilities for Safety – Content from Supervisor/Foreman seminars on safety 1975-1976 setting forth what BNSF considers to be "the fundamental requirements" and requiring inspection of "Atmospheric conditions, e.g. dusts;" 5/16/1975 BNSF memorandum discussing the BN Safety Policy which states "Safety is essential for efficient transportation and Safety is the primary concern and continuing responsibility of each supervisor and employee alike;" 9/11/1981 BNSF correspondence attaching a BNSF Respiratory Protection Program representing "the minimum which will meet all requirements" and setting forth the BNSF policy that "Burlington Northern will use substitution, engineering, and administrative controls to reduce employee exposures to toxic substances whenever feasible. When not feasible, or while being implemented, respiratory protection will be used."

BNSF's Knowledge of Libby Asbestos

21. **RR knowledge of Libby asbestos by 1920s**: BNSF's knowledge of the presence of asbestos in the vermiculite ore on Vermiculite Mountain near Libby is demonstrated in relevant literature, publications and BNSF company documents by the 1920s.

22. **Geological Publications**: Geologic studies of the material on Vermiculite Mountain beginning in the 1920s revealed the presence of tremolite asbestos in the vermiculite. *Pardee and Larsen* (1925, 1926, 1929); *Kreigel* (1940); *Perry* (1948); *Johns* (1959); *Bassett* (1959); *Peck* (1960); *Weeks* (1981). As discussed below, several of the geologic studies were funded by BNSF.

> **DEPOSITS OF VERMICULITE AND OTHER MINERALS IN THE RAINY CREEK DISTRICT, NEAR LIBBY, MONT.** Pardee JT, Larsen ES. 1929.
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> Deposits of vermiculite and other minerals in the Rainy Creek District, near Libby, Montana: USGS Bulletin; 805: 17-28.
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> In the Rainy Creek district in Montana the workings of the Vermiculite & Asbestos Co. expose several bodies of amphibole asbestos which are of dikelike or tabular form and of different widths. As commonly understood, the term asbestos embraces the fibrous varieties of several minerals, including anthophyllite, tremolite, actinolite, and crocidolite, which belong to the

amphibole group, and chrysotile, a variety of serpentine. A large body of the vermiculite is being developed commercially by the Zonolite Co. In addition several smaller bodies are being explored by the Vermiculite & Asbestos Co., and in some of these bodies the mineral makes up from 30 to 84 per cent of the pyroxenite country rock. Samples representing areas of several square feet at different places in the workings of the Vermiculite & Asbestos Co. contained from 30 to 84 per cent of vermiculite. Apparently there is a huge amount of such mixed material. Locally the pyroxene (diopside) of the large pyroxenite mass has been changed by hydrothermal metamorphism to an amphibole of fibrous habit, related to tremolite. The minerals known commercially as amphibole asbestos are more or less useful, their value depending on their quality and the relative location of the deposits.

SUMMARY OF OCCURRENCE, PROPERTIES, AND USES OF VERMICULITE AT LIBBY, MONTANA. Kriegel WW. 1940.

Summary of occurrence, properties, and uses of vermiculite at Libby, Montana. Bulletin of The Amer. Ceramic Soc. 19 (3): 94-97.

Though many deposits of vermiculite have been found throughout the United States, including North Carolina, South Carolina, Colorado, New Mexico, California, Idaho, Wyoming, the New England States, and other parts of Montana, the history and development of the industry are closely allied with that of the Libby deposits and companies. A second series of dikes intersecting the ore body consists of material high in amphibole asbestos with less altered pyroxenite. Where the concentration of asbestos is sufficiently high, it is mined and marketed.

GEOLOGIC INVESTIGATIONS IN THE KOOTENAI-FLATHEAD AREA, NORTHWEST MONTANA. WESTERN LINCOLN COUNTY. Willis M. Johns. **STATE OF MONTANA BUREAU OF MINES AND GEOLOGY**. 1959 (known as "Bulletin 12").

This report was prepared under a cooperative agreement with, and funded by, BNSF.

The largest vermiculite mine in the United States has been developed by the Zonolite Company in the Rainy Creek district 7 miles northeast of Libby. Although the company has an expanding plant in Libby, the bulk of the concentrate is shipped as crude vermiculite to expanding plants throughout the country. The expanded vermiculite is marketed under the trade-name, Zonolite. The pyroxenite is very coarse grained and composed of vermiculite, aegerine-augite, soft fibrous amphibole asbestos (tremolite), magnetite, and locally a little biotite. Fibrous amphibole asbestos, because its specific gravity is very near that of vermiculite, causes much trouble in milling the lower grade ores in which the asbestos is abundant. If a process could be perfected to make a clean

separation of vermiculite and asbestos, both products would be marketable, and much material now mined and dumped as waste could be milled and made to yield a profit.

THE ORIGIN OF THE VERMICULITE DEPOSIT AT LIBBY, MONTANA. THE AMERICAN MINERALOGIST, Bassett WA. 1959.

The origin of the vermiculite deposit at Libby, Montana. Am. Mineral. 44: 282-299.

Four alteration minerals predominate, asbestos (tremolite-actinolite), biotite, hydrobiotite, and vermiculite. Many thin (approximately 1 inch), white asbestos veins cut through the pyroxenite. The asbestos has been identified by x-ray diffraction and optically as tremolite-actinolite.

23. **BNSF scientific analyses of Libby Ore**: By 1925, BNSF was one of the first entities to perform a geo-chemical analysis of the Libby Ore. See 11/1/1925 Zonolite Publication - GNRR chemical geological analysis of Libby Ore, p. 4; 1926 Publication summarizing early GNRR chemical/geological analysis of the Libby Ore, p. 2. Over the ensuing years, BNSF showed a continued interest in the economic potential of the Libby Ore and development of the resource. Among other things, BNSF issued reports on the vermiculite operations prepared by its Division of Economic Research, sampled/tested the ore several times, and visited the mine site on multiple occasions.

An August 30, 1963 letter from Alva J. Haley of Great Northern's "Mineral Research and Development Department" to J.A. Kelly, president of the Zonolite Company, discusses Great Northern's visit to the Zonolite headquarters and apparent intent to engage in a cooperative business endeavor involving the agricultural application of Zonolite's vermiculite ore. The letter provides:

Dear Mr. Kelly,

I very much enjoyed our talk in your office the other day and immediately upon my return to Seattle discussed the entire matter with Mr. Ralph Watson, our Geologist on the west end; we are fully prepared to pursue the matter of biotite investigation in accordance with your wishes. As soon as we have the samples and analyses, Mr. Watson will locate an agronomist for you who can and will undertake to proceed with the testing.

In the event that it might be more convenient for you, Mr. Watson can arrange to be in Libby on September 18 or 19 and would be happy to discuss this matter

> with Mr. Bleich. The two of them could then take samples; whichever way you prefer.

See 8/30/1963 GNRR correspondence (Emphasis added). In 1976, the BNSF Geology Department visited the W.R. Grace mine. An August 20, 1976, letter from Ronald Seavoy of BNSF to Ray Kujawa of W.R. Grace provides:

> Dear Ray,
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> Fred and I had a very delightful and informative time during your guided tour of the Zonolite Mine. Thank you very much for taking the time to show us the geology and allow us to collect specimens.
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> I was particularly interested in vermiculite, having worked for Johns-Manville exploring for asbestos and knowing more than most geologists about industrial minerals. When I returned to the motel and washed some of the specimens I collected, I could see very clearly what you meant by the low temperature alteration solutions that produced vermiculite.
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> The thing that clearly indicated the low temperature of formation was the way the very large crystals of pyroxene (enstatite?) were partially altered to tremolite-talc rock … (Emphasis added).

24. **Company Records**: The corporate records of the Great Northern Railway, held and maintained by the Minnesota Historical Society, contain various documents demonstrating BNSF's early knowledge of the presence of asbestos in the vermiculite mined in Lincoln County as well as a great interest in the economic development of the Libby vermiculite mine.

Correspondence beginning in early 1929 between G.R. Martin, Vice President of the Great Northern Railway and others demonstrates this interest and knowledge. Mr. Martin sought information regarding the vermiculite product being mined in the area from local railroad employees and the United States Department of the Interior Geological Survey. See 4/6/1929 Letter from A.B. Ashby to Mr. Martin, 4/29/1929 Letter from Mr. Kenney to Mr. Martin and 5/13/1929 Letter and attachments from Mr. J.T. Pardee to Mr. Martin with Great Northern Railway's President's Office Seal regarding Bulletin 805-B**.** When asked about railroad knowledge of the vermiculite, local railroad employee W.F. Kenney informed Mr. Martin that they "have heard of this; in fact, have rates in [effect], but only a very small quantity of it has moved." The noted geologist Mr. Pardee provided Mr. Martin with the study entitled "Deposits of Vermiculite and other Minerals in the Rainy Creek District near Libby, Montana" (Bulletin 805-B (1929)) which

provides as follows:

> The deposits described are in an easily accessible area about 7 miles northeast of Libby Mont. . . . About two-thirds of the stock consists of a coarse-grained pyroxenite that ranges from nearly unmixed pyroxene to nearly unmixed biotite or its alteration product vermiculite. ***
>
> The principal minerals thus produced are white mica, aegirite and aegirite-diopside (both locally vandiferous), vermiculite, and fibrous amphiboles… A large body of the vermiculite is being developed commercially by Zonolite Co. In addition several smaller bodies are being explored by the Vermiculite & Asbestos Co., and in some of these bodies the mineral makes up from 30 to 84 per cent of the pyroxenite country rock. Vermiculite is comparatively new to commerce…
>
> On the spur north of Kearney Creek much of the pyroxene of the large pyroxenite body has been altered to amphibole of a fibrous habit that is known commercially as amphibole asbestos. ***
>
> The area under consideration is the lower part of the basin of Rainy Creek, about 7 miles northeast of Libby, Mont. (See pl. 1.) It is easily reached from the main automobile highway along the north bank of the Kootenai River by a short branch road up Rainy Creek. The Great Northern Railway approaches within 2 miles, but it lies on the opposite bank of the river. A few miles below Rainy Creek, however, a logging railroad crosses to the north bank. ***
>
> Locally the pyroxene (diopside) of the large pyroxenite mass has been changed by hydrothermal metamorphism to an amphibole of fibrous habit, related to tremolite.
>
> In the Rainy Creek district in Montana the workings of the Vermiculite & Asbestos Co. expose several bodies of amphibole asbestos which are of dikelike or tabular form and of different widths. The largest, as exposed by open cuts, appears to by 100 feet or more long and from a few feet to 14 feet wide. A body 4 feet or more wide exposed in the face of a tunnel at a depth of 150 feet or more may be the downward continuation of the same deposit. Several smaller bodies are exposed in other workings…
>
> As commonly understood, the term asbestos embraces the fibrous varieties of several minerals, including anthophyllite, tremolite, actinolite, and crocidolite, which belong to the amphibole group, and chrysotile, a variety of serpentine. ***
>
> For a few inches on both sides of the veins the pyroxene of the wall rock is changed to a fibrous amphibole related to actinolite and glaucophane.

Plate 1 of the report is a geologic map of the Rainy Creek district which clearly shows the Zonolite and the Vermiculite & Asbestos Co. developments located immediately adjacent to each other, on top of vermiculite mountain, and directly over the pyroxenite deposit, referenced above as being associated with, and having been altered to, amphibole asbestos. The map also shows the Great Northern Railroad running in close proximity to the deposits.

Also attached to Mr. Pardee's letter to Mr. Martin was an April 8, 1929 report from the American Mining Congress Special Daily Information Service, Washington, D.C., which provided that "the vermiculite deposit near Libby, which is more extensive than other know similar deposits in this country, is accompanied by asbestos."

These reports put BNSF's predecessor on notice, as of 1929, that the ore coming from the Rainy Creek area, which they were already engaged in shipping, was highly intermixed with tremolite and actinolite type amphibole asbestos.

25. **RR interest in economic development of vermiculite operations**: The railroad's interest in the economic development of this resource continued and in 1959 the railroad funded a State of Montana Bureau of Mines and Geology Report known as "Bulletin 12," entitled "Progress Report on Geologic Investigations in the Kootenai-Flathead Area, Northwest Montana." The report was prepared under a cooperative agreement with, and funded by, BNSF. Bulletin 12 provides:

> The largest vermiculite mine in the United States has been developed by the Zonolite Company in the Rainy Creek district 7 miles northeast of Libby… In 1939, the several different operations were combined into one under the Universal Zonolite and Insulation Company… A 1,000-ton mill, erected in 1948, produced 350 to 400 tons of concentrate per day, and it is presently being enlarged. Although the company has an expanding plant in Libby, the bulk of the concentrate is shipped as crude vermiculite to expanding plants throughout the country. The expanded vermiculite is marketed under the trade-name, Zonolite.
>
> The [vermiculite] deposit is an elongated stock composed of pyroxenite and syenite. The stock intrudes strata of both the Wallace and Striped Peak formations in the trough of a northwest-trending syncline. The pyroxenite is very coars-grained and composed of vermiculite, aegerine-augite, soft fibrous amphibole asbestos (tremolite), magnetite, and locally a little biotite. ***
>
> This unusual stock has many minerals of potential value. The vermiculite, of course, is being actively marketed at present. **Fibrous amphibole asbestos, because its specific gravity is very near that of vermiculite, causes much**

> **trouble in milling the lower grade ores in which the asbestos is abundant. If a process could be perfected to make a clean separation of vermiculite and asbestos, both products would be marketable...** (Emphasis added).[3]

The following year BNSF funded a second State of Montana Bureau of Mines and Geology Report entitled "Bulletin 17" providing:

> It consists primarily of augite pyroxenite altered on a large scale to biotite, hydrobiotite, and vermiculite. Veins of asbestos intrude the pyroxenite (see. pl. 2). Outcrops of this body are very few, and the only good exposures are at the Zonolite Company's open pit in the vicinity of Vermiculite Mountain (east central part of sec. 22, T. 31 N., R. 30 W.).
>
> Four alteration minerals predominate: asbestos (tremolite-actinolite), biotite, hydrobiotite, and vermiculite. The name hydrobiotite is applied to the interstratified biotite-vermiculite from Libby. This mineral along with vermiculite and biotite, constitutes the commercial vermiculite ore.

In 1970, BNSF funded a further State of Montana Bureau of Mines and Geology Report entitled "Bulletin 79" providing in relevant part:

> RAINY CREEK STOCK
>
> The Rainy Creek stock is west of the Kootenai River about 8 miles northeast of Libby. This large complex stock of pyroxenite and syenite underlies part of the valley of Rainy Creek and extends east beneath Vermiculite Mountain. ***
>
> Pyroxenite within the Zonolite pit is light gray to yellowish-green coarse-grained friable rock composed of vermiculite, aegirite, aegiritediopside, soft fibrous tremolite, apatite, magnetite, garnet, biotite, and hydrobiotite…
>
> Tremolite (amphibole asbestos) forms at the expense of pyroxenite in altered zones bordering syenite apophyses and quartz veins that cut the pyroxenite mass (Boettcher, 1963). ***

---

[3] This description of the Libby Vermiculite Deposit appears to have been referenced by the Railroad in 1964, in drafting a Great Northern Goat article on the vermiculite facility; "Ore masses are cut by syenite rock dikes varying in width from a few inches to many feet." Bordering the syenite apophysis and related syenite dikes in the pyroxenite are alteration halos of tremolite after pyroxenite, which are of potential economic importance as a source of brittle asbestos. ***

> The Rainy Creek pluton has many minerals of potential value, besides the vermiculite, which is being marketed at present. Amphibole asbestos (tremolite)… may be profitable byproducts if separation can be achieved

economically and if markets can be developed for these minerals.

Bulletin 79 also included a figure depicting the Rainy Creek Stock, which showed the mine operations located directly over the pyroxenite deposit and the Great Northern Railroad passing by in close proximity to the mine location.

26. **Asbestos Shorts**: In addition to the freight rates from Libby for amphibole asbestos shipments reported in 1927 (referenced above), in 1962, the Zonolite Company, operator of the vermiculite mine near Libby, communicated with BNSF about the possibility of hauling pure asbestos from Libby to various locations throughout the United States This is memorialized by a Zonolite memorandum confirming communications between BNSF and Zonolite and quoting rates to the Zonolite Company for prospective hauling of pure asbestos. See Asbestos Shorts Shipping Rates Memo, 4/30/1962. Zonolite also inquired with Great Northern's Montana tax agent regarding joint tax treatment for their vermiculite and proposed asbestos businesses given that the mining was to be done from the same property in Libby. See 2-21-1962 Zonolite Memorandum. Former BNSF Director of Industrial Hygiene James Shea confirmed these communications between the GNRR and W.R. Grace and that Bulletin 12 conveyed that then current milling technologies were unable to separate the asbestos from the vermiculite in admitting that the GNRR was aware there was "amphibole material in the vermiculite product." 1/26/2007 Deposition of James Shea, pp. 99-100.

BNSF's Director of Environmental Operations, Melvin Burda, further confirmed that a motivation of BNSF in funding Bulletin 12 was to explore the potential for shipments of the Libby asbestos to be made on its lines and admits, with reference to Bulletin 12, that he was aware of the difficulty with separating the vermiculite concentrate from the asbestos. See 1/25/2007 Deposition of Melvin Burda, p. 55.

27. **Railcar Warnings**: W.R. Grace correspondence of October 24, 1972 discussed new regulations requiring that railroad cars carrying Libby Ore carry asbestos warning labels "in the form of a placard posted on both sides of the vehicle." By at least 1977 and thereafter, railcars carrying the Libby Ore were marked with asbestos warning placards reading as follows:

CAUTION
Contains asbestos fibers.
Avoid creating dust.

Breathing asbestos dust may cause serious bodily harm.

See e.g. W.R. Grace correspondence of 10/24/1972, 6/21/77, 6/28/77 and W.R. Grace's response to the Second Request for Information Regarding the Libby Asbestos site, February 22, 2000.

The Libby Historical Society also had the attached rail car vermiculite ore warning label in its archives which was also used by Grace on cars carrying Libby vermiculite ore. River Loading Point workers remember affixing these warning signs on hopper cars going to private customers, and BNSF employees remember seeing these warnings on outgoing vermiculite cars. BNSF employees also remember a meeting of BNSF employees and management with W.R. Grace manager William McCaig after BNSF employees first noticed the warnings on the outgoing railcars. See e.g. Deposition of Bruce Carrier.

Beginning in 1972, W.R. Grace placed government required signs in the mine and processing facilities with the following warning:

ASBESTOS DUST HAZARD
Avoid Breathing Dust.
Wear Assigned Protective Equipment.
Do Not Remain In Area Unless Your Work Requires It.
Breathing Asbestos Dust May Be Hazardous To Your Health.

W.R. Grace shipped bagged vermiculite ore in BNSF boxcars, which beginning in March 1976 each carried a warning label reading:

CAUTION CONTAINS ASBESTOS FIBERS
BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

See e.g. W.R. Grace's response to the Second Request for Information Regarding the Libby Asbestos site, February 22, 2000, pp. 14, 20.

BNSF executives and its geology department visited the W.R Grace mine on several occasions, at which time the government required asbestos dust warning signs in the mine and the asbestos warning labels on bags of vermiculite concentrate would have further informed BNSF of the asbestos hazard associated with the ore they were hauling.

Beginning in 1974, Grace supplied Material Safety Data Sheets to customers receiving

shipments of vermiculite ore stating that it contains the "Hazardous Ingredient" tremolite asbestos and advises to avoid creating airborne dust and to use dust control techniques when handling the material. See 7/19/1977 MSDS and W.R. Grace's response to the Second Request for Information Regarding the Libby Asbestos site, February 22, 2000. BNSF was aware of, and received MSDS for the Libby vermiculite materials.

28. **Agency Reports/Publications**: In October 1968, the U.S. Department of Health, Education and Welfare reported on its atmospheric and bulk asbestos sampling at Libby. See U.S. Public Health Department Tremolite Sampling Report 10/8/1968 and 10/17/1968. By the mid-1970s the EPA was engaged in investigations of, and publications regarding, the asbestos content of the Libby vermiculite. See e.g. EPA's Libby Vermiculite/Asbestos Timeline; EPA 1977, Asbestos Fibers in Discharges from Selected Mining and Milling Activities; EPA 1981, Asbestos-Contaminated Vermiculite; EPA 1983, "According to the submitter, the Libby Vermiculite deposit has long been known to be contaminated with tremolite, an asbestiform mineral;" EPA 1985, "W.R. Grace and Company, the largest domestic supplier and user of vermiculite, acknowledged in 1971 the presence of asbestos contamination in the ore mined at their Libby, Montana facility. Even after the ore was processed to remove impurities, some amphibole asbestos was detected in the vermiculite (EPA 1980a)."[2] These materials were freely available to BNSF.

29. **National Newspaper Publications**: The problems with asbestos in the Libby vermiculite ore were announced publicly nationwide in various news publications by the 1970's. See e.g. Louisa, VA Article 9/3/76; 10/24/1979 Letter from USM to U.S. Consumer Product Safety Commission, attaching various articles and publications demonstrating the "general acknowledgement that vermiculite ore contains tremolite asbestos." In 1985, Ralph Nader's magazine, Public Citizen, reported that Libby workers, in particular, were ailing. Then in 1988, a leading Montana newspaper, The Missoulian, ran a front-page Sunday-edition story about Libby's dying workers and widows filing lawsuits against the company.

BNSF continued to make shipments of the vermiculite material until 1993. The above materials uncontrovertibly establish BNSF's early actual and constructive knowledge of the presence of toxic asbestos in the vermiculite ore coming from Libby.

[2] EPA 1980(a) also notes that employees in loading areas are exposed to up to 5 f/cc and notes that "a substantial portion of the general public also is potentially exposed to asbestos contaminated vermiculite".

30. **Liukonen testimony**: Larry Liukonen was the industrial hygienist for BNSF from 1979-1987 and during that time he became the Director of Industrial Hygiene for BNSF. Mr. Liukonen has testified that prior to 1979, he was not aware that BNSF had ever conducted any studies to determine whether its workers had been exposed to asbestos. (Liukonen depo. of 1/24/2007 at p. 39). Mr. Liukonen testified that the written program developed by the Safety and Rules Department for BNSF, prior to his employment, did not address asbestos. Mr. Liukonen testified that BNSF did have some friable asbestos-containing materials in different places where BNSF employees worked, and that BNSF never instructed its employees to wear respirators while working with or around asbestos-containing materials. Mr. Liukonen also testified that Labor Relations for BNSF undertook to tell all of the BNSF employees that they should not work with friable asbestos-containing material sometime in the early 1980s, and before 1979, the employees were working with the friable asbestos-containing materials. Mr. Liukonen also testified that BNSF's program to generally educate their employees about chemicals that they might work with did not address asbestos.

Mr. Liukonen further testified that he had no knowledge regarding the operations that BNSF conducted in Libby while he was employed by the company, that he had no knowledge of whether the vermiculite BNSF hauled out of Libby, Montana contained asbestos, that he never made any attempt to evaluate the work that the workers in Libby were doing on a daily basis, and that as far as he knew, no one else did either. (Id. pp. 40-45.)

31. **BNSF's oversight of River Loading Point:** BNSF owned the property on which the River Loading Point was located and oversaw all construction of and modifications to the River Loading Point and was responsible for inspecting and maintaining the siding track. This included reviewing and approving plans for all River Loading Point dust control equipment prior to its installation. See e.g. Railroad Dust Control Approval 3/9/1962; 3/30/1962; 1/21/1971; and 11/10/1977. In requesting BNSF's review and approval of the 1971 additional dust control facilities, Grace informed BNSF that they were being installed to "comply with Air Pollution Control Regulations in the state of Montana." After a BNSF derailment destroyed the River Loading Point loading equipment in 1979, BNSF again reviewed and approved the new River Loading Point construction plans. See BNSF_HHP_000480 discussing necessity of approval of plans by BN with district engineers as well as improvements meant to minimize liability for "**possible over exposure to personnel**."

32. **Community Exposures:** As referenced in Dr. Castleman's "Asbestos: Medical and Legal Aspects," a threat to life from breathing asbestos has long been recognized as extending not only to workers and their families, but to community members as well, including individuals only slightly exposed to the dust. Moreover, levels of exposure insufficient to produce asbestosis can nonetheless cause cancer. As the effects of breathing asbestos fibers into the lungs are not immediate, taking even decades to realize, community members in Libby were not likely to identify the dangers of their exposure to asbestos. As early as 1929 asbestos fibers found in an asbestos factory neighbor's lungs were recognized as a result of exposure to the dust, even though the individual had never been inside the factory.

It was known by 1933 that the particular shape and size of inhaled asbestos fibers result in significant retention within the lung and may cause scarring, regardless of the concentration of the asbestos dust in the air. Thus, if individuals could develop advanced asbestosis from brief, intense exposure, there was also potential for an equal lung burden accumulated through long-term, low-level exposure.

By 1937, railroad companies recognized the potential for bystander exposure from handling of asbestos. By the mid-1940s, doctors for the Canadian Johns-Manville Corporation had seen chest X-ray changes typical of asbestosis in some of the mining town residents without any occupational exposure to asbestos. In 1950, Dr. Heuper of the National Cancer Institute warned of the increased risk of lung cancer to the general public from air pollution including asbestos and other carcinogens. In 1963, asbestos bodies in the lungs were found to be rampant within the crocidolite asbestos mining region of South Africa, affecting not only workers but their family members and the surrounding community. Unrestrained use of asbestos gradually broadened the population at risk from workers with direct contact with asbestos to the general population in the vicinity of workplaces where asbestos was used, such as the BNSF railyard in Libby, Montana.

In sum, BNSF clearly had early knowledge of the hazard presented by asbestos, the proper means of identifying its presence, and appropriate means of preventing exposure. Further, BNSF had ample notice and knowledge of the asbestos contained in the vermiculite it was hauled for more than 60 years. Given the close proximity of BNSF's operations and associated industrial level activities to downtown Libby, Libby's residential neighborhoods, businesses, places of employment, public parks, sporting fields, and public swimming pool, BNSF could and should have recognized the high risk of substantial exposure of community members to asbestos fibers

generated on or emanating from BNSF's properties. Thus, under the applicable standard of care, BNSF could and should have recognized, warned of, and addressed the asbestos hazard that BNSF's vermiculite related activities were producing in the Libby area.

In addition to the above referenced materials and subject matters, it is anticipated that in offering his opinions regarding BNSF's knowledge of asbestos and its historical corporate response to the known hazards of asbestos as well as the attendant standards of care, Dr. Castleman will address other certain materials and subject matters referenced in the Expert Report of Dr. Julie Hart, the Expert Report and Affidavit of Dr. Arthur Frank, and the Affidavit of Dr. Barry Castleman submitted herewith.

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